Independent Review

Cameras and Systems Project

For the
State of Vermont Buildings and General Services (BGS),
Department of Corrections (DOC), and
Department of Information & Innovation (DII)

Submitted to the
State of Vermont, Office of the CIO
By

Strategic Technology Services

12/8/2016

Attachments:

1. Project Costing Spreadsheet (FINAL-REVIEW-SOV-DOC-CamerasAndSystems-STS_Cost_Detail_FINAL.xlsx)
2. Risk Register (FINAL-REVIEW-SOV-DOC-CamerasAndSystems-STS_Risk_Register_FINAL.pdf)
3. Access Gate Server and Workstation Spec Sheet (ags-8x11-matrixpages.pdf)
4. Axis Camera Spec Sheet (chs_axis_en_68930_1609_hi.pdf)
5. Milestone Systems XProtect Enterprise Spec Sheet (Milestone_XProtect Enterprise_2016R2_Specification Sheet_A4_ENG_PDF_WEB.pdf)
6. Milestone Systems XProtect Enterprise End of Life Announcement (XProtect_Enterprise_R2_WhatsNewBrief.pdf and FAQ_XProtect_Enterprise_R2.pdf)
7. Milestone Systems Support Description (milestone-care_faq_partners_final.pdf)
8. Milestone Systems Approach to Security (Ensuring_end-to-end_protection_of_video_integrity_XProtect_Smart_Client.pdf)
9. Milestone Systems Enterprise Architecture (Advanced VMS 2016 System Architecture Document.pdf)

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1. Executive Summary

Provide an introduction that includes a brief overview of the technology project and selected vendor(s).

Project Summary

1. **Parties**:
    a. The State of Vermont Buildings and General Services (BGS) maintains and leases facilities to State of Vermont Department of Corrections (DOC).
    b. BGS has existing contracts with several vendors to complete work related to the Cameras and Systems upgrade project, including:
        i. Halifax Security DBA North American Video: Contract#: 32147; 8/1/2016 – 7/31/2018 - $250K
        ii. Greybar: Contract#: 32154; 8/1/2016 – 7/31/2018 - $250K
        iii. Peck Electric: Contract#: 21039; 11/17/2011 – 4/30/2017 - $200K
        iv. Omega Electric: Contract#: 21013; 11/16/2011 – 10/31/2016; $999K
        v. First Choice: Contract#: 21253; 12/29/2011 – 4/30/2016; $200K
        vi. TwinState: Contract#: 21259; 12/30/2011 – 10/31/2016; $200K
        vii. CFW Electric – No contract
        viii. ADI – No contract

Category	Product	Vendor(s)
Camera	AXIS line of cameras	North American Video and ADI
Camera	Samsung line of cameras	North American Video, Greybar and ADI
Camera	Sony line of cameras	North American Video, Greybar and ADI
Video Management Software	Milestone Server and Camera Licenses	North American Video and Greybar
Server	AGS AccessGate Server	Greybar
Workstation	AGS AccessGate Workstation	Greybar
Cabling, Camera Installation	Cabling Infrastructure	Peck Electric, Omega Electric, CFW Electric, First Choice, TwinState

2. **Scope, Budget and Term**:
    a. This System and Camera project original scope was intended to replace servers, cameras and video management software (VMS) at 7 Corrections facilities over a 6-7 year time period (2015-2021), based on funding and time availability. See the Project Summary chart below.
    b. Actual costs for the completed projects were not available to the Independent Reviewer, as the costing was not accounted for on a per-site basis.
    c. After the original project scope was defined, the scope and resulting budget for these projects increased as a result of a PREA (Prison Rape Elimination Act) Audit started in 2013 and was completed in 2016.
        i. A budget for each site has historically been approved by Legislature annually at approximately $100K/site.
        ii. The original scope expanded to include additional cameras recommended from the PREA Audit to cover "blind" monitoring locations. As a result, costs increased due to additional cameras and associated camera software licenses.
    d. Project costs *allocated* to BGS/DOC increased further due to all cabling costs now being allocated to the project, vs. being allocated to DII, which was done for the MVRCF project.

Project Summary Chart:

FACILITY/SITE	WHEN	Original Number of Cameras by Type (fixed, PTZ)	# OF NEW CAMERAS	Total Cameras by Type (fixed, PTZ)	BUDGET per IT ABC Form
MVRCF – Rutland, VT	Completed June 2015 (Peck Electric-$20K)	Orig: 32 total	2	Total: 34 (26 fixed, 8 ptz)	Budget: $46.6K
NSCF – Newport, VT	Completed June 2016 (CFW Electric-$77.5K) Original scope of 60 cameras	Orig: 49 (46 fixed, 3 ptz)	82 (81 fixed, 1 ptz)	Total: 128 (125 fixed, 3 ptz)	Budget: $58.8K
NWSCF – St. Albans, VT	Started - To be completed Dec 2016 (Omega-$146K) – Original scope of 74 cameras, now 104 cameras	Orig: 44 (41 fixed (3 of which closed circuit), 3 ptz)	60 (45 fixed, 15 ptz)	Total: 104 (86 fixed, 18 ptz)	Budget: $65.2K; Projected: $722K See Project spreadsheet which includes internal staffing cost
SSCF – Springfield, VT	Wait till July, 2017 to see if funding exists	Orig: 127 (111 fixed, 16 ptz)	TBD	TBD	Orig Budget: $120.5K; Revised budget: $555K
NECC – St. Johnsbury, VT	Partially complete; As cameras die, re-cable and point to Milestone server	Orig: 33 (30 fixed, 3 ptz)	40 (36 fixed; 4 ptz thus far; Perhaps more to be purchased	Total: 73 (66 fixed, 7 ptz)	Orig Budget: $45.9K
CRCF – So. Burlington, VT	Partially complete; As cameras die, re-cable and point to Milestone server	Orig: 62 (54 fixed, 8 ptz)	1 fixed Perhaps more to be purchased	Total: 63 (55 fixed, 8 ptz)	Orig Budget: $51.9K
SESCF – Windsor, VT	2020 or 2021	Orig: 54 (47 fixed, 7 ptz) (Bob Arnell)	TBD		Orig Budget: $52.3K

a. Implementation:
    i. Elapsed actual project duration varies based on each project scope, but is typically not more than 6 months.
b. Operations:
    i. There is no formal Operations-related agreement with vendors for support or maintenance with the following exceptions:
        - Software maintenance agreement with Milestone software for cameras which provides software upgrade as per the project cost spreadsheet; Software support is via the software reseller, who admittedly don't have staff who know/support the software. This is identified in the Risk Register.
        - Hardware warranty of the Access Gate servers and workstations directly from the vendor over a period of 4 years at no additional cost.

The chart below shows a "Before" and "After" snapshot of the solution:

CATEGORY	BEFORE	AFTER
Camera	Pelco Models: Fixed: ICS-2CA6 "type" Dome cameras. There is a mix of generic analogs that were removed as well. Analog Pelco PTZ Cameras were Spectra 3 and 4.	Axis; P3215-V/VE; IP Dome Camera Axis; Q1615-E; Exterior HD IP Camera Axis; Q3505-V; Interior Dome Camera Axis; Q8414-LVS; Corner Mount Vandal Camera Axis; Q6044-E; Exterior HD IP Camera PTZ Axis; P1425-LE; Exterior Bullet Camera Samsung; SNP-6320RH; IP PTZ Camera with IR Sony; SNC-VM601; Network IP Camera
Video Management Software	Pelco DX Client Pelco DS ControlPoint	Milestone XProtect Enterprise Base License and individual camera licenses
Server	Pelco DX8000/8100	AXIS AccessGate AGS-HD253-1608-5N 18TB NVR or AXIS ACCESS GATE NET AGS-HD-254-4848-6HC
Workstation	No Pelco workstations or specially configured workstations. Normal State Supplied machines provided by DII	AXIS ACCESS GATE AGS-WSXE-8 Workstation or AXIS ACCESS GATE AGS-SFF NG17NUC or standard HP workstation procured by DII

3. Approach:

a. Hardware and software procured by BGS from the hardware, software, and camera vendors.
b. Servers and workstations configured by DII Staff, and installed by BGS Security technicians.
c. Cameras and wiring installed by a selected electrical vendor, under the direction of BGS Security team.
d. Solution validation done by BGS Security technicians.

4. Management:

a. Team members from BGS and DOC are aligned to complete solution implementation.

5. Solution and Cost:

The attached project cost spreadsheet covers a 10 year period to support the expected life-cycle, and is summarized in the following table:

Total Costs (10 years): $3,657,423
Implementation: $2,327,943
Operations: $1,329,480

Cost Category	Implementation	Operations
Software:	$169,785	$0
Software Maintenance:	$0	$378,428
Hosting: (hosted on site)	$0	$0
Implementation Services: (Cabling vendor)	$847,743	$0
Hardware: 10% of hardware cost allocated to annual replacement budget	$0	$664,552
Servers, Workstations, Monitors, Switches, UPS, Rack (Operations:$2K annually after Year 4 for server/workstation warranty)	$453,726	$66,000
Cameras	$436,173	$0
Camera Mounting Hardware	$35,821	$0
Other	$22,750	$0
Internal staffing:	$318,500	$220,500
Contingency:	$0	$0
DII PMO and Indep. Review	$43,445	$0
TOTAL	**$2,327,943**	**$1,329,480**

As we do not know actual costs for completed projects (MVRCF and NSCF), we don't know with certainty the total funding required to complete the project.

We estimate the project to be 50% complete, and it is expected that all outstanding invoices have been paid. The remaining work is comparable to work completed thus far, so it is reasonable to assume 50% of the project has been paid for, and 50% of the project costs are outstanding.

Further, as we don't know what has been paid to date, DOC agreed to use an extrapolated cost method, using the assumptions listed below.

The Northwest State Correction Facility project in St. Albans is used as the pricing baseline, as that project is currently underway and costs are known. The most significant project cost drivers include:

1. Quantity of cameras purchased and related camera software licenses required for each camera.
2. Types of cameras purchased: Fixed cameras purchased to date average $553/camera while Pan-Tilt-Zoom camera average $2,164/camera.
3. Scope of work for cable installers. For example, the NWSCF had external perimeter cameras added, which included external construction (digging and fiber cables installed).

Assumptions:

1. Using the increase in camera count based on completed facilities completed (MVRCF and NSCF) as well as the facility in progress (NWSCF) as the baseline to determine camera count increase, we found those sites increased camera counts 2.5x. As such, we applied a 2.5x increase of the original camera count for facilities not yet completed (SSCF, NECC, CRCF, SESCF). Further, even though NECC is not yet considered complete, 40 cameras have been added, which puts them at 73 cameras, and 2.5x their original 33 would put them at 83 cameras. Therefore, we are expecting that 10 additional cameras will be added, and calculations for NECC have taken this into account.

2. The mix of cameras between those that are fixed and those that are PTZ cameras is derived from known camera counts. The data in the table below shows that 89% of total cameras are fixed, and thus, 11% are PTZ:

FACILITY	Total # of Cameras	Fixed	PTZ	% of Fixed
MVRCF	34	26	8	76%
NSCF	128	125	3	98%
NWSCF	104	86	18	83%
SSCF	127	111	16	87%
NECC	73	66	7	90%
CRCF	63	55	8	87%
SESCF	54	47	7	87%
TOTAL	**583**	**516**	**67**	**89%**

3. Most facilities will have re-cabling done for existing cameras and new cabling done to support new cameras. This is priced at $600 per camera, unless actual costs are known. The per camera cost is derived based on known costs for 3 facilities (MVRCF, NSCF, and NWSCF) outlined in the table below:

Facility	Price	Number of Cameras	Price/Camera
MVRCF	$21,000	34	$618
NSCF	$77,600	128	$606
NWSCF	$51,197	97	$528
TOTAL	**$149,797**	**259**	**$578 (rounded up to $600)**

4. Some facilities will have an additional cabling cost component added, namely wiring outdoor/yard areas, per PREA audit findings as detailed below. The approach used for NWSCF was a point to point wiring (and some point to point to another point), in order to reduce cost vs. encircling the entire yard perimeter. Given that NWSCF followed a pattern of placing cameras at the corners and one each on the left and right side, plus entrance ways, for a total of 8, we will assume that same number of cameras and cost ($94,692 for 7 new cameras and 1 existing camera location) for the following sites per the PREA audit findings:
    a. SESCF: "*During the tour, it was determine that there many blind spots on the grounds of the facility.*"
    b. SSCF: "*During the tour, it was determine that there are some blind spots on the grounds (yard) of the facility. The auditor suggests the addition of several cameras be installed in the yard to enhance the observation of the recreation area.*"

5. Hardware costs are extrapolated as follows:
    a. Server section: Assumed high end server for all facilities.
    b. Workstation section: Assumed 1 each, an HP and Access Gate workstation for all facilities.
    c. Switch section: The quantity of switches are correlated to the number of cameras to ensure adequate ports are available.
    d. Monitor and Other sections: Where quantities of 1, we assume all facilities only need 1 of those items (48" monitor, UPS, Rack, etc.)
    e. Mounting Hardware section: Costs are derived using the actual costs from NWSCF project as follows: Using the camera counts of NWSCF as the basis, a percentage is applied to each facility, which is the percentage of each facility's camera counts compared to NWSCF camera counts.

6. Implementation effort required by State is expected to be equivalent for each site.

7. Funding:
    a. We were informed of Capital Budget funds expended as of 10/1/2016 on the Cameras and Systems project, but there is no breakout of which facility those funds apply to. Therefore, we applied those funds across MVRCF and NSCF randomly.

1.1 Cost Summary

IT Activity Lifecycle:	10 Years
Total Lifecycle Costs:	**$3,657,423**
PROJECT COSTS *(see detail in table below)**:***	***$2,327,943***
OPERATING COSTS *(see detail in table below)**:***	***$1,329,480***
CURRENT OPERATING COSTS:	**$392,000**
Difference Between Current and New Operating Costs:	**$937,480 increase over 10 years**
Funding Source(s) and Percentage Breakdown if Multiple Sources:	See table below

Cost Category	Implementation	Operations
Software:	$169,785	$0
Software Maintenance:	$0	$378,428
Hosting: (hosted on site)	$0	$0
Implementation Services: (Cabling vendor)	$847,743	$0
Hardware: 10% of hardware cost allocated to annual replacement budget	$0	$664,552
Servers, Workstations, Monitors, Switches, UPS, Rack (Operations:$2K annually after Year 4 for server/workstation warranty)	$453,726	$66,000
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Camera Mounting Hardware	$35,821	$0
Other	$22,750	$0
Internal staffing:	$318,500	$220,500
Contingency:	$0	$0
DII PMO and Indep. Review	$43,445	$0
TOTAL	**$2,327,943**	**$1,329,480**

Funding Source(s) and Percentage Breakdown if Multiple Sources:

FUNDING SOURCE	% of TOTAL	FUNDING APPLIED TO (Implementation or Operations)	FUNDING AMOUNT
STATE FUNDING: Dept Code: 2013: 1305100041 (Corrections Cameras and Systems) **Implementation**	7.49%	Implementation	$99,391
STATE FUNDING: Dept Code: 2014: 1405100042 (Corrections Cameras and Systems) **Implementation**	18.79%	Implementation	$249,185
STATE FUNDING: Dept Code: 2015: 1502600041 (Corrections Cameras and Systems) **Implementation**	7.50%	Implementation	$99,473
STATE FUNDING: Dept Code: 2016: 1602600042 (Corrections Cameras and Systems) **Implementation**	7.47%	Implementation	$99,089
STATE FUNDING 2017: (Corrections Cameras and Systems) Implementation	0.00%	Implementation	$0
STATE FUNDING: **Operations - DOC Security Budget**	18.10%	Operations	$240,000
STATE FUNDING: **Operations - AHS Central Office**	10.29%	Operations	$136,500
STATE FUNDING: **Operations - BGS Fee For Service**	30.35%	Operations	$402,500
FEDERAL FUNDING: None	0.00%	Operations	$0
TOTAL	**100%**		**$1,326,138**

Implementation Funds: $547,138

Operational Funds: $779,000 (need additional $2.33M to fund project from Ops or from other source**)**

Funding is inadequate for this project:

	Available Funding	Costs	Overage/(Shortage)
Implementation	$547,138	$2,327,943	($1,780,806)
Operations	$779,000	$1,329,480	($550,480)
Total	**$547,138**	**$3,494,548**	**($2,331,286)**

1.2 Disposition of Independent Review Deliverables

Deliverable	Highlights from the Review *Include explanations of any significant concerns*
Acquisition Cost Assessment	Evaluated metrics show comparable pricing. See *Cost Comparison* (**Section 5.2)** for details.
Technology Architecture Review	The underlying Technology Architecture is sound, with the exception of how data security is configured. See *Technology Architecture* (**Section 6)** for details.
Implementation Plan Assessment	The approach to solution implementation appears sound. See *Assessment of Implementation Plan* (**Section 7)** for details.
Cost Analysis and Model for Benefit Analysis	Cost analysis provides approximate annual cost. No monetary benefits defined. See *Cost Benefit* (**Section 8)** for details.
Impact Analysis on Net Operating Costs	Increase in Operating Costs per attached Project Cost spreadsheet.

1.3 Identified High Impact &/or High Likelihood of Occurrence Risks

Risk Description	State's Planned Risk Response	Reviewer's Assessment of Planned Response
See Risk Register		

1.4 Other Key Issues

Recap any key issues or concerns identified in the body of the report.

1. No other issues identified.

1.5 Recommendation

Provide your independent review recommendation on whether or not to proceed with this technology project and vendor(s).

The following recommendations are made relative to this pending project:

1. Identify adequate funding sources for the remaining sites, and proceed only as funded.
2. Create site(project)-based budgets and costing, tracking budget and costs at the following level of detail:
    a. Cabling-related costs
    b. Camera-related costs, including all mounting hardware
    c. Computer Hardware-related costs, including workstations, servers, UPS, racks, switches, etc.
    d. Software costs, specifically video management software.
3. Maintain tighter purchasing controls. Noted that 104 cameras needed for NWSCF, but 119 purchased.
4. Use attached Project Cost Spreadsheet as model for budgeting and managing future sites.
5. Address any remaining "High Risk" Risk Register items.
6. If Risk Register items adequately reduced to an acceptable level, proceed with additional projects/sites.

1.6 Certification

I certify that this Independent Review Report is an independent and unbiased assessment of the proposed solution's acquisition costs, technical architecture, implementation plan, cost-benefit analysis, and impact on net operating costs, based on the information made available to me by the State.

e-Signed by David Gadway
on 2016-12-13 18:24:54 GMT

Signature

December 13, 2016

Date

1.7 Report Acceptance

The electronic signatures below represent the acceptance of this document as the final completed Independent Review Report.

e-Signed by Barbara Cormier
on 2016-12-13 18:29:05 GMT

DII Oversight Project Manager

December 13, 2016

Date

e-Signed by Richard Boes
on 2016-12-13 20:07:43 GMT

State of Vermont Chief Information Officer

December 13, 2016

Date

2. Scope of this Independent Review

Add or change this section as applicable.

2.1 In-Scope

The scope of this document is fulfilling the requirements of Vermont Statute, Title 3, Chapter 45, §2222(g):

The Secretary of Administration shall obtain independent expert review of any recommendation for any information technology initiated after July 1, 1996, as information technology activity is defined by subdivision (a)(10), when its total cost is $1,000,000 or greater or when required by the State Chief Information Officer.

The independent review report includes:

- An acquisition cost assessment
- A technology architecture review
- An implementation plan assessment
- A cost analysis and model for benefit analysis
- An impact analysis on net operating costs for the agency carrying out the activity
- A procurement negotiation advisory services contract (as needed)

2.2 Out-of-Scope

If applicable, describe any limits of this review and any area of the project or proposal that you did not review.

- Procurement Advisory Services.

3. Sources of Information

3.1 Independent Review Participants

List the individuals that participated in this Independent Review.

Name	Employer and Title	Participation Topic(s)
Lisa Menard	Department of Corrections Commissioner – **Project Sponsor**	Project scope, deliverables, resource allocation and budget
Margie Klark	BGS Security **– Cameras and Systems Project Coordinator**	Project scope, deliverables, resource allocation and budget
Lucas Herring	DOC IT Director **– Cameras and Systems Project Coordinator**	Project scope, deliverables, resource allocation and budget
Barb Cormier	DII Oversight Project Manager	Project Management Oversight
Bob Arnell	DOC Operations Manager; Point of Contact between Project and DOC Management	DOC Operations
Whitney Tucker	BGS Capital Construction Budget Manager	BGS Project funding
Matt D'Agostino	DOC Finance Manager	DOC Project funding
Travis Gough	BGS IT Staff	Technical specifications
John Quinn	DII IT Manager; Responsible for Server Configuration	DII role in configuring servers
Ray Danis	DII Network Engineering	DII role in cabling
Wendy Yoder	State of Vermont PREA Director	PREA Audit scope and results
John Hunt	DII Chief Technology Officer	Enterprise Architecture
Glenn Schoonover	DII Chief Information Security Officer	Solution security
Suzanne Thomas	Halifax Security DBA North American Video	Role of NAV in Milestone support
Dennis Fortune	Milestone Systems	How to get Milestone support and options for migrating off of XProtect Enterprise as End of Life has been announced
Doug Shubert	Access Gate	Server warranty, and options for extending warranty

3.2 Independent Review Documentation

Complete the chart below to list the documentation utilized to compile this independent review.

*All document sources are from Barb Cormier, unless otherwise noted.

Document Name	Description	Source*
RFP SECURITY CAMERA AND EQUIPMENT may 1016.pdf	Cameras and Systems Project RFP	
IR Statement of Work RFP - DOC Camera and Services Project .docx	Independent Review Statement of Work	
FirstChoice_21253 co3.pdf	BGS Cabling contract with First Choice	
NWSCF_FloorPlan.pdf	NWSCF Camera/Floor Plan	
Omega_21023.pdf	BGS Cabling contract with Omega Electric	
OMEGA_NWSCF CameraWiring Quote 7-18-16.pdf	Omega quote for NWSCF	
Peck_21039.pdf	BGS Cabling contract with Peck Electric	
TwinState_21259 CO4.PDF	BGS Cabling contract with Twin State Electric	
All Lines - Peck Data 11692.pdf	BGS Cabling contract with Peck Electric	
BGS 21039 CO4 PECK DATA AA14 AND WAIVER FOR TIME SIGN.pdf	BGS Cabling contract amendment with Peck Electric	
eSigned 21039 CO4 PECK DATA.pdf	BGS Cabling contract amendment with Peck Electric	
BGS 21039 CO5 PECK ELECTRIC COMPANY.pdf	BGS Cabling contract amendment with Peck Electric	
BGS 21039 CO6 PECK ELECTRIC COMPANY.pdf	BGS Cabling contract amendment with Peck Electric	
Peck contract 21039.pdf	BGS Cabling contract with Peck Electric	
SOW NSCF.PDF	SOW for CFW Electric for NSCF	
NAV_NWSCF_Cameras.pdf	North American Video camera and related material invoice for NWSCF	
NWSCF Cameras Final 4-4-16.doc	NWSCF Camera scope of work	
NWSCF Security Camera Part Matrix.docx	NWSCF Camera parts list	
ags-8x11-matrixpages.pdf	Access Gate server spec sheet	Access Gate web site
Copy of FacilityCamerasCostAnalysis11 05 2014 REV1.xlsx	BGS/DOC Project Budget – All sites	
DOC CCTV Budget Prop 2014.docx	BGS/DOC Project Budget – All sites	
SSCFFY18CostProjection.xlsx	SSCF Project Budget	
ITABC_DOC Facility Inmate Surveillance20140625.pdf	IT ABC Form – 1/31/2014	
02 (Security Camera PR0009) Meeting Minutes 20140825.docx	Project team meeting minutes	
02 (Security Camera PR0009) Meeting Minutes 20140908.docx	Project team meeting minutes	
02 (Security Camera PR0009) Meeting Minutes 20141010.docx	Project team meeting minutes	
02 (Security Camera PR0009) Meeting Minutes 20150122.docx	Project team meeting minutes	
02 (Security Camera PR0009) Meeting Minutes 20150616.docx	Project team meeting minutes	
DOC-Facility-Cameras-Summary_Status_Report09.01.2016.docx	Project status report	
DOC-Facility-Cameras-Summary_Status_Report10.06.2016.docx	Project status report	
DOC Cameras and Systems Risk_Evaluation20160720.doc	DII Project Risk assessment	
LucasHerringPM Qualification20160720.xlsx	PM qualification assessment	
Rutland Prison Concerns.pdf	DII Network Site Survey of MVRCF–August, 2014	
SOV_DOC_IR_KickoffAgenda.docx	IR Kickoff Agenda	
DOC_Meeting_LucasHerring_MargieKlark.docx	Notes from IR Meeting with Lucas Herring and Margie Klark	
DOC_Meeting_LucasHerring_MargieKlark-V2.docx	Notes from follow up questions with Lucas Herring and Margie Klark	
DOC_Meeting_MattDagostino.docx	Notes from IR call with Matt D'Agostino	
DOC_Meeting_TravisGough.docx	Notes from IR email exchange with Travis Gough	
DOC_Meeting_WendyYoder.docx	Notes from IR call with Wendy Yoder	
DOC_Meeting_WhitneyTucker.docx	Notes from IR call with Whitney Tucker	
DOC_OpenQuestions.docx	IR Open questions	
Addendum 1 6.12.15DOC-BGScommentsv2.doc	BGS Security contractor contract addendum	
DOC Cameras and Systems.docx	DII 1 page summary for million dollar report	
ServerForensics.docx	Server forensics and security memo	

01181-15759.pdf	NAV Invoice	
15712.pdf	NAV Purchase Order	
15771.pdf	Greybar Purchase Order	
Graybar wAGOedits25Jul2016.docx	Greybar Purchase Order	
NORTH AMERICAN VIDEO SECURITY edits.docx	Halifax Security Inc. DBA North American Video contract	
PO01181-16077.pdf	Greybar Purchase Order	
SF-16-25.pdf	NAV Purchase Authorization	
SF-16-29.pdf	NAV Purchase Authorization	
SF-16-30.pdf	NAV Purchase Authorization	
SF-16-36.pdf	MEI Purchase Authorization	
SF-16-41.pdf	NAV Purchase Authorization	
SF-16-43.pdf	Greybar Purchase Authorization	
SF-16-44.pdf	NAV Purchase Authorization	
SF-16-46.pdf	NAV Purchase Authorization	
chs_axis_en_68930_1609_hi.pdf	AXIS Cameras product spec sheet	AXIS web site
FullSetOfInvoicesFrom4668_001.pdf	Invoices related to Cameras project	Whitney Tucker
MilestoneCustomerDashboard_TechnicalInformation.pdf	Milestone Dashboard Technical Specs	Milestone web site
Milestone_Interconnect.pdf	Milestone Interconnect spec sheet – Allows all Milestone VMS products to be connected via XProtect Corporate	Milestone web site
Milestone_XProtect_Enterprise_Sales_Kit.zip	XProtect Enterprise product information	Milestone web site
Milestone_XProtect_Enterprise_Technical_Kit.zip	XProtect Enterprise technical information	Milestone web site
Product_catalog_2016_web.pdf	Milestone product catalog	Milestone web site
XProtect_Enterprise_R2_WhatsNewBrief.pdf	End of life description of XProtect Enterprise	Milestone web site
DX8100_Server_Specs.pdf	Pelco server specs	Pelco web site
Pelco DX8100 Series DVR Client_Op Pgm_manual.pdf	Pelco client software manual	Pelco web site
Pelco DX8100 Series DVR Server_Op Pgm_manual.pdf	Pelco server software manual	Pelco web site
SC-784 Spectra Enhanced_GMA-US.pdf	Pelco Spectra PTZ Camera specs	Pelco web site
DOC_StakeHolders.docx	Product stakeholder list	
Advanced VMS 2016 System Architecture Document.pdf	Milestone xProtect System Architecture	Dennis Fortune, Milestone
Ensuring_end-to-end_protection_of_video_integrity_XProtect_Smart_Client.pdf	Milestone xProtect Security Approach	Dennis Fortune, Milestone
milestone-care_faq_partners_final.pdf	Milestone xProtect extended Support options	Dennis Fortune, Milestone

4. Project Information

4.1 Historical Background

Provide any relevant background that has resulted in this project.

The State of Vermont Buildings and General Services (BGS) maintains and leases facilities to State of Vermont Department of Corrections (DOC). As part of ongoing operational maintenance, BGS requested from the Legislature and received funding of approximately $100K annually to upgrade from analog to digital format, the video monitoring cameras, as well as related servers and workstations, at each facility. It was expected that one facility per year would be upgraded.

After the initial funding request was made, a PREA (Prison Rape Elimination Act) audit yielded recommendations to add cameras to locations not currently monitored, which expanded the scope and projected costs for the project. Further, DII asked that cabling-related costs be allocated to the project.

These changes pushed the project over the $1M threshold, requiring the project to undergo an Independent Review (IR). This IR Report comes into play after two sites have been upgraded, one is in progress, and 4 additional sites remain.

The in-progress site, Northwest State Correction Facility, was used as the basis of this IR report.

A summary of sites, project status, scope, and budget:

FACILITY/SITE	WHEN	Original Number of Cameras by Type (fixed, PTZ)	# OF NEW CAMERAS	Total Cameras by Type (fixed, PTZ)	BUDGET per IT ABC Form
MVRCF – Rutland, VT	Completed June 2015 (Peck Electric-$20K)	Orig: 32 total	2	Total: 34 (26 fixed, 8 ptz)	Budget: $46.6K
NSCF – Newport, VT	Completed June 2016 (CFW Electric-$77.5K) Original scope of 60 cameras	Orig: 49 (46 fixed, 3 ptz)	82 (81 fixed, 1 ptz)	Total: 128 (125 fixed, 3 ptz)	Budget: $58.8K
NWSCF – St. Albans, VT	Started - To be completed Dec 2016 (Omega-$146K) – Original scope of 74 cameras, now 104 cameras	Orig: 44 (41 fixed (3 of which closed circuit), 3 ptz)	60 (45 fixed, 15 ptz)	Total: 104 (86 fixed, 18 ptz)	Budget: $65.2K; Projected: $722K See Project spreadsheet which includes internal staffing cost
SSCF – Springfield, VT	Wait till July, 2017 to see if funding exists	Orig: 127 (111 fixed, 16 ptz)	TBD	TBD	Orig Budget: $120.5K; Revised budget: $555K
NECC – St. Johnsbury, VT	Partially complete; As cameras die, re-cable and point to Milestone server	Orig: 33 (30 fixed, 3 ptz)	40 (36 fixed; 4 ptz thus far; Perhaps more to be purchased	Total: 73 (66 fixed, 7 ptz)	Orig Budget: $45.9K
CRCF – So. Burlington, VT	Partially complete; As cameras die, re-cable and point to Milestone server	Orig: 62 (54 fixed, 8 ptz)	1 fixed Perhaps more to be purchased	Total: 63 (55 fixed, 8 ptz)	Orig Budget: $51.9K
SESCF – Windsor, VT	2020 or 2021	Orig: 54 (47 fixed, 7 ptz) (Bob Arnell)	TBD		Orig Budget: $52.3K

4.2 Project Goal

Explain why the project is being undertaken.

High level goals of the project include:

- Replace analog video cameras with digital video cameras;
- Increase number of cameras to meet PREA Audit recommendations (see summary below);
- Upgrade servers storing video at each site;
- Replace data cabling, changing from coaxial to Ethernet Category 6.

Relevant Summary Findings from PREA Audit:

Cameras and Systems-related recommendations fall within two PREA audit standards:

- 115.13 Supervision and Monitoring
- 115.18: Upgrades to Facilities and Technologies

The PREA Audit findings below are grouped by site, and within each site, findings relevant to Cameras and Systems are grouped within the standards.

CRCF PREA Audit Submitted: 2/20/2015; Auditor: Melinda D. Allen

115.18: Upgrades to Facilities and Technologies:

Interviews with staff indicate that consideration is afforded when modifying, expanding or designing a facility. The NOSCF has not had any recent significant upgrades or changes in technology or facilities. The facility does have video cameras that are recorded and maintained for approximately thirty days, depending on the activity or movement within the facility. The facility uses a combination of standard digital video cameras and pan-tilt zoom cameras in order to better monitor the facility.

SESCF PREA Audit Submitted: 2/20/2015; Auditor: Melinda D. Allen

115.18: Upgrades to Facilities and Technologies:

Interviews with staff indicate that consideration is afforded when modifying, expanding or designing a facility. The SESCF has added or upgraded many of the video cameras to monitor activity within the facility. The video is recorded and maintained for approximately thirty days, depending on the activity or movement within the facility. The facility uses a combination of standard digital video cameras and pan-tilt zoom cameras in order to better monitor the facility. During the tour, it was determine that there many blind spots on the grounds of the facility. The auditor suggests the addition of multiple mirrors and/or cameras be installed in order to better monitor the wood shed, potato barn and the "tool crib." There are currently many vulnerable lines of sight, making it difficult for staff to monitor inmate activity. While the purchase and installation of additional cameras can be costly, I would recommend the facility add additional cameras and mirrors over the course of the next three years in order to eliminate the blind spots. In order to gain compliance, the facility has created a three-year plan to address the technological needs of the facility. The auditor has reviewed the plan and agreed that this will be a viable solution.

NECC PREA Audit Submitted: 5/16/2015; Auditor: Melinda D. Allen

115.18: Upgrades to Facilities and Technologies:

Interviews with staff indicate that consideration is afforded when modifying, expanding or designing a facility. The NECC has not had any recent significant upgrades or changes in technology or facilities. The facility does have video cameras that are recorded and maintained for approximately thirty days, depending on the activity or movement within the facility. The facility uses a combination of standard digital video cameras and pan-tilt zoom cameras in order to better monitor the facility. During the tour, it was determine that there many blind

spots in the housing units of the facility. The auditor suggests the addition of several cameras be installed to enhance the observation of the housing units, in particular, to provide for a visual of the doors to the bathroom and showers in the units. While the purchase and installation of additional cameras can be costly, I would recommend the facility add additional cameras to eliminate any blind spots in the housing units in order to improve upon the overall safety and security of the facility. Many of the existing cameras are dated and of low quality for recording. The facility should develop a three-year plan for addressing the blind spots in the facility. The facility could also consider the use of large mirrors to enhance the line of sight of the officers in the unit. When developing an adequate staffing plan, the agency may choose to emphasize higher staffing levels rather than comprehensive video monitoring. Indeed, best practices suggest that video monitoring is not an adequate substitute for sufficient numbers of staff. In any event, so long as the facility makes its best efforts to comply, document and justify deviations, and consider how technology may enhance protections), then the failure to incorporate or add video monitoring technology does not cause a facility to be out of compliance with the standards.

NSCF PREA Audit Submitted: 5/19/2015; Auditor: Melinda D. Allen

115.18: Upgrades to Facilities and Technologies:

Interviews with staff indicate that consideration is afforded when modifying, expanding or designing a facility. The NOSCF has not had any recent significant upgrades or changes in technology or facilities. The facility does have video cameras that are recorded and maintained for approximately thirty days, depending on the activity or movement within the facility. The facility uses a combination of standard digital video cameras and pan-tilt zoom cameras in order to better monitor the facility. During the tour, it was determine that there many blind spots in the housing units of the facility. The auditor suggests the addition of several cameras be installed to enhance the observation of the housing units, in particular, to provide for a visual of the doors to the bathroom and showers in the units. While the purchase and installation of additional cameras can be costly, I would recommend the facility add additional cameras to eliminate any blind spots in the housing units in order to improve upon the overall safety and security of the facility. There are also a lot of blind spots in the common areas to include the foyer into the dining room, both VCI buildings, the education center, pantry, gymnasium, law library (niches), boiler area, wood sheds, and recreation yard. The facility should develop a three-year plan for addressing the blind spots in the facility. The facility could also consider the use of large mirrors to enhance the line of sight of the officers in the unit. When developing an adequate staffing plan, the agency may choose to emphasize higher staffing levels rather than comprehensive video monitoring. Indeed, best practices suggest that video monitoring is not an adequate substitute for sufficient numbers of staff. In any event, so long as the facility makes its best efforts to comply, document and justify deviations, and consider how technology may enhance protections), then the failure to incorporate or add video monitoring technology does not cause a facility to be out of compliance with the standards.

MVRCF PREA Audit Submitted: 8/17/2015; Auditor: Melinda D. Allen

115.18: Upgrades to Facilities and Technologies:

Interviews with staff indicate that consideration is afforded when modifying, expanding or designing a facility. The MVRCF has not had any recent significant upgrades or changes in technology or facilities. However, the video cameras are not currently viewable as they are in the midst of an upgrade to the system. Video cameras are typically recorded and maintained for approximately thirty days, depending on the activity or movement within the facility. The facility uses a combination of standard digital video cameras and pan-tilt zoom cameras in order to better monitor the facility. During the tour, it was determine that there many blind spots in the housing units of the facility. The auditor suggests the addition of several cameras be installed in the to enhance the observation of the housing units, in particular, to provide for a visual of the doors to the bathroom and showers in the units. While the purchase and installation of additional cameras can be costly, I would recommend the facility add additional cameras to eliminate any blind spots in the housing units in order to improve upon the overall safety and security of the facility. Many of the existing cameras are dated and of low quality for recording. As previously stated, they are in the process of upgrading the system. The facility should develop a three year plan for addressing the concerns listed above during the corrective action. When

developing an adequate staffing plan, an agency may choose to emphasize higher staffing levels rather than comprehensive video monitoring. Indeed, best practices suggest that video monitoring is not an adequate substitute for sufficient numbers of staff. In any event, so long as the facility makes its best efforts to comply, document and justify deviations, and consider how technology may enhance protections), then the failure to incorporate or add video monitoring technology does not cause a facility to be out of compliance with the standards.

NWSCF PREA Audit Submitted: 7/28/2015; Auditor: Melinda D. Allen

115.13 Supervision and Monitoring:

During the tour, it was determine that there many blind spots in the housing units of the facility. The auditor suggests the addition of several cameras be installed to enhance the observation of the housing units, in particular, to provide for a visual of the doors to the bathroom and showers in the units. There are also several blind spots in the common areas such as the pantry kitchen dish room law library

115.18: Upgrades to Facilities and Technologies:

Interviews with staff indicate that consideration is afforded when modifying, expanding or designing a facility. The NWSCF has not had any recent significant upgrades or changes in technology or facilities. The facility does have video cameras that are recorded and maintained for approximately thirty days, depending on the activity or movement within the facility. The facility uses a combination of standard digital video cameras and pan-tilt zoom cameras in order to better monitor the facility. The Offender Management System was upgraded in March 2015.

SSCF PREA Audit Submitted: 2/20/2015; Auditor: Melinda D. Allen

115.18: Upgrades to Facilities and Technologies:

Interviews with staff indicate that consideration is afforded when modifying, expanding or designing a facility. The SSCF has not had any significant upgrades or changes in technology or facilities since the facility is relatively young. Video cameras are recorded and maintained for approximately thirty days, depending on the activity or movement within the facility. The facility uses a combination of standard digital video cameras and pan-tilt zoom cameras in order to better monitor the facility. During the tour, it was determine that there are some blind spots on the grounds (yard) of the facility. The auditor suggests the addition of several cameras be installed in the yard to enhance the observation of the recreation area. Staff have marked the areas with paint to designate areas that inmates are not allowed to cross. The "barrier" seems to be working. Inmates interviewed understand what the lines mean and acknowledge the restricted zone. While the purchase and installation of additional cameras can be costly, I would recommend the facility add additional cameras to eliminate any blind spots in the yard, so staff do not have to be so vigilant in watching these areas and can spend more time observing the activities in the yard. The facility has developed a three year plan for addressing the concerns listed above during the corrective action. The auditor has reviewed these plans and find them to be sufficient to address the issue.

4.3 Project Scope

Describe the project scope and list the major deliverables. Add or delete lines as needed.

Overall Scope: The project scope is adequately described in Section 4.2 above.

4.3.1 Major Deliverables

1. Video cameras installed per site map, with 30 days of video stored on fault tolerant servers, data cabling meeting Category 6 standards.
2. Be able to view camera at any facility from a central or remote location.
3. Enhanced security practices of staff due to monitoring of actions.
4. Enhanced safety of inmates to reduce sexual predatory practices.
5. Increased both staff and inmate safety.
6. Reduce litigation cost based on false accusations of inmates.
7. Increased review of practices when grievances or litigation occurs.
8. Enhanced Security Threat Group (STG) monitoring.

4.4 Project Phases, Milestones and Schedule

Provide a list of the major project phases, milestones and high level schedule. You may elect to include it as an attachment to the report instead of within the body.

There are no specific phases, milestones, or schedules on this project. It is expected that one Corrections facility will be upgraded per year, starting in 2015, and going until 2020 or 2021, with projects taking not more than 6 months to complete.

Due to the secure nature of the facility, the implementation typically occurs follows in the following order:

1. Cable the facility (cabling contractor)
2. Install the server (BGS technician)
3. Connect new cameras connected to server with small monitor (cabling contractor)
4. Replace old cameras (cabling contractor)
5. Replace monitors (cabling contractor or BGS technician)

Payments for hardware and software are made within 30 days of invoice.
Payments for cabling contractors are made upon project completion.

5. Acquisition Cost Assessment

List all acquisition costs in the table below (i.e. the comprehensive list of the one-time costs to acquire the proposed system/service). Do not include any costs that reoccur during the system/service lifecycle. Add or delete lines as appropriate. Based on your assessment of Acquisition Costs, please answer the questions listed below in this section.

The following chart represents the Acquisition Costs for the stated project period. Detailed composition of these numbers are found in the attached project cost spreadsheet.

IT Activity Lifecycle:	10 Years
Total Lifecycle Costs:	**$3,657,423**
PROJECT COSTS *(see detail in table below)**:***	***$2,327,943***
OPERATING COSTS *(see detail in table below)**:***	***$1,329,480***
CURRENT OPERATING COSTS:	**$392,000**
Difference Between Current and New Operating Costs:	**$937,480 increase over 10 years**
Funding Source(s) and Percentage Breakdown if Multiple Sources:	See table below

Cost Category	Implementation	Operations
Software:	$169,785	$0
Software Maintenance:	$0	$378,428
Hosting: (hosted on site)	$0	$0
Implementation Services: (Cabling vendor)	$847,743	$0
Hardware: 10% of hardware cost allocated to annual replacement budget	$0	$664,552
Servers, Workstations, Monitors, Switches, UPS, Rack (Operations:$2K annually after Year 4 for server/workstation warranty)	$453,726	$66,000
Cameras	$436,173	$0
Camera Mounting Hardware	$35,821	$0
Other	$22,750	$0
Internal staffing:	$318,500	$220,500
Contingency:	$0	$0
DII PMO and Indep. Review	$43,445	$0
TOTAL	**$2,327,943**	**$1,329,480**

Funding Source(s) and Percentage Breakdown if Multiple Sources:

FUNDING SOURCE	% of TOTAL	FUNDING APPLIED TO (Implementation or Operations)	FUNDING AMOUNT
STATE FUNDING: Dept Code: 2013: 1305100041 (Corrections Cameras and Systems) **Implementation**	7.49%	Implementation	$99,391
STATE FUNDING: Dept Code: 2014: 1405100042 (Corrections Cameras and Systems) **Implementation**	18.79%	Implementation	$249,185
STATE FUNDING: Dept Code: 2015: 1502600041 (Corrections Cameras and Systems) **Implementation**	7.50%	Implementation	$99,473
STATE FUNDING: Dept Code: 2016: 1602600042 (Corrections Cameras and Systems) **Implementation**	7.47%	Implementation	$99,089
STATE FUNDING 2017: (Corrections Cameras and Systems) Implementation	0.00%	Implementation	$0
STATE FUNDING: **Operations - DOC Security Budget**	18.10%	Operations	$240,000
STATE FUNDING: **Operations - AHS Central Office**	10.29%	Operations	$136,500
STATE FUNDING: **Operations - BGS Fee For Service**	30.35%	Operations	$402,500
FEDERAL FUNDING: None	0.00%	Operations	$0
TOTAL	**100%**		**$1,326,138**

Implementation Funds: $547,138

Operational Funds: $779,000 (need additional $2.33M to fund project from Ops or from other source**)**

Funding is inadequate for this project:

	Available Funding	Costs	Overage/(Shortage)
Implementation	$547,138	$2,327,943	($1,780,806)
Operations	$779,000	$1,329,480	($550,480)
Total	**$547,138**	**$3,494,548**	**($2,331,286)**

5.1 Cost Validation

Describe how you validated the Acquisition Costs.

The Acquisition Costs were validated through the following methods:

1. Comparison of Hourly Rates of Similar Services
2. Comparison of Hardware and Software Prices
3. Comparison with Projects of Similar Scope

1. Comparison of Hourly Rates of Similar Services:

The hourly rates for services provided by the 5 cabling vendors, and the % increase between the rates are listed below:

Hourly Rate	% Increase
$47	
$53	12.77%
$65 (current project)	22.64%
$75 (2 vendors)	15.38%

No work has gone to the $75/hour vendors, and the remainder of the work has been fairly evenly distributed among the vendors representing the first 3 rates.

In summary, the hourly rate of the current cabling vendor is on the high side, but is offset by the overall lower project cost noted below.

2. Comparison of Hardware and Software Prices:

BGS submitted requests for proposals for all hardware and software associated with this project. The prices for all items came back comparably priced, with the exception of the servers and workstations, which are only sourced through Greybar. As such, servers/workstation pricing comparison cannot be made.

In summary, these items include:

Category	Product	Vendor(s)
Camera	AXIS line of cameras	North American Video and ADI
Camera	Samsung line of cameras	North American Video, Greybar and ADI
Camera	Sony line of cameras	North American Video, Greybar and ADI
Video Management Software	Milestone Server and Camera Licenses	North American Video and Greybar
Server	AGS AccessGate Server	Greybar
Workstation	AGS AccessGate Workstation	Greybar

3. **Comparison with Projects of Similar Scope:**

The services component of this project is fulfilled by the cabling vendors. The table below uses a price/camera metric comparing the current NWSCF project to the two previous projects (MVSCF and NSCF):

Site	Price	Number of Cameras	Price/Camera
MVRCF	$21,000	34	$618
NSCF	$77,600	128	$608
NWSCF* (current project)	$51,197	97	$528
TOTAL	$149,797	259	$578

*Note: The current project contains a segment of work that was not part of the scope of work of the first two projects, specifically external work involving perimeter wiring and camera installation. That dollar amount ($95K) has been excluded for purposes of this comparison.

In summary, the price/camera for two projects are comparable, and lower for NWSCF, with the current project below the average cost as well. This lower project price offsets the higher hourly rate of the current cabling vendor noted above.

5.2 Cost Comparison

How do the above Acquisition Costs compare with others who have purchased similar solutions (i.e., is the State paying more, less or about the same)?

Point of Comparison	Measure
Hourly Rates:	Costs are high in comparison to other rates, but the overall project cost is lower per the "Similarly Scoped Projects" measure below, making this measure **comparable**.
Hardware and Software Prices:	Costs are **comparable** in comparison to other bids.
Similarly Scoped Projects:	Costs are **comparable** to similarly scoped projects.

5.3 Cost Assessment

Are the Acquisition Costs valid and appropriate in your professional opinion? List any concerns or issues with the costs.

As outlined in the Cost Comparison **Section 5.2** above, in summary, this project has costs which are **comparable** to the analyzed cost comparison attributes.

Additional Comments on Acquisition Costs:

None.

6. Technology Architecture Review

After performing an independent technology architecture review of the proposed solution, please respond to the following.

SUMMARY:

1. Digital cameras connected via Ethernet CAT6 cabling, transmitting video over a local area network at each Corrections facility, with 30 days of video stored on Access Gate Windows 2012 Server, using Milestone XProtect Enterprise Video Management System.
2. Internal Project Management and Subject Matter staff supporting the project.
3. See **Appendix 4** for detailed technology specifications.

1. State's IT Strategic Plan: Describe how the proposed solution aligns with each of the State's IT Strategic Principles:

i. Leverage successes of others, learning best practices from outside Vermont.
ii. Leverage shared services and cloud-based IT, taking advantage of IT economies of scale.
iii. Adapt the Vermont workforce to the evolving needs of state government.
iv. Apply enterprise architecture principles to drive digital transformation based on business needs.
v. Couple IT with business process optimization, to improve overall productivity and customer service.
vi. Optimize IT investments via sound Project Management.
vii. Manage data commensurate with risk.
viii. Incorporate metrics to measure outcomes.

a. The following describes how this project exploits these principles:

i. Leverage successes of others, learning best practices from outside Vermont.
   1. *The proposed solution is proven and in use in many other Corrections facilities.*

ii. Leverage shared services and cloud-based IT, taking advantage of IT economies of scale.
   1. *This solution does not leverage cloud-based IT, as each Corrections facility has its own server functioning as local video storage.*

iii. Adapt the Vermont workforce to the evolving needs of state government.
   1. *The proposed solution is expected to support desired operational improvements, including additional video monitoring locations which is expected to reduce incidences.*

iv. Apply enterprise architecture principles to drive digital transformation based on business needs.
   1. *If Enterprise Architecture is defined as "alignment between IT and business concerns: to guide the process of planning and design the IT/IS capabilities of an enterprise in order to meet desired organizational objectives", then this project does deploy such principles to drive digital transformation of business needs by changing from analog to digital video and upgrading from coaxial to Cat-6 cabling infrastructure.*

v. Couple IT with business process optimization, to improve overall productivity and customer service.
   1. *Productivity is expected to improve slightly due to two factors: Additional cameras provide video coverage in areas where in-person monitoring would otherwise be required, as well as use of a reliable and feature-rich video management system.*

vi. Optimize IT investments via sound Project Management.
   1. *There is no Vendor Project Management role. BGS is working in concert with DOC staff to manage implementation, but no formal Project Management methodology is used.*

vii. Manage data commensurate with risk.
   1. *The approach to data security is in question. See the SECURITY section below.*

viii. Incorporate metrics to measure outcomes.
   1. *This project has no established metrics.*

2. **Service Level(s):** What is the desired service level for the proposed solution and is the technical architecture appropriate to meet it?

   Desired Service Levels were not defined in the RFP. See the ***Service Level Agreement*** section below for a description of the Service Levels proposed by Vendor.

3. **Sustainability:** Comment on the sustainability of the solution's technical architecture (i.e., is it sustainable?).

   - Access Gate Server: Based on Windows Server 2012. 4 year warranty. Additional warranty can be purchased. Replacements readily available. This solution is expected to be sustainable.

   - Camera: From vendors as noted above (i.e. Samsung, Axis, Sony). 1 year warranty. Replacements readily available. This solution is expected to be sustainable.

   - Video Management Software: Milestone Systems XProtect Enterprise. Support through reseller, with additional support available directly from Milestone at additional cost (this option not selected). Solution has features which meet DOC's requirements. Solution has been announced to be End of Life, as such, solution is not sustainable beyond 2020 or 2022 for an additional support fee. Migration to another Milestone Systems solution is available. This is highlighted in the Risk Register.

4. **License Model:** What is the license model (e.g., perpetual license, etc.)?

   The proposed video management software solution from Milestone Systems is a perpetual software license model, with an upfront license fee and annual software maintenance fees.

   See the cost spreadsheet for the detailed components of what comprises the proposed solution.

5. **Security:** Does the proposed solution have the appropriate level of security for the proposed activity it will perform (including any applicable State or Federal standards)? Please describe.

Security Architecture and Design: Describe the Vendor's proposed approach to support technical controls and technology solutions that must be secured to ensure the overall security of the System:

1. **Data in Transit**: Per page 7 of the attached "Ensuring_end-to-end_protection_of_video _integrity_XProtect_Smart_Client.pdf", there are two methods of encrypting data within the XProtect Corporate* solution. It is the Independent Reviewer's understanding that neither of the two methods below are currently deployed at any of the DOC sites:
   a. A virtual private network (VPN) tunnel can be set up between the camera and Recording Server using standard equipment or software. The VPN will encrypt all data transmitted through the tunnel and thus protect against unauthorized access to the video. Using a VPN is a generic solution that can be used with any camera.
   b. HTTP Secure (HTTPS) for a subset of cameras, and many cameras support HTTPS. In order to have the solution support this option, Independent Review asked Vendor whether turning on HTTPS transport is a configuration option within the software, or a function of the camera itself? Vendor indicated: "*Both, though ultimately it's a camera function. After adding a camera, you must enable HTTPS within the software to initiate an HTTPS request to the camera. So it must be configured in the camera and then "turned on" in our software.*" Independent Reviewer asked Milestone which cameras support HTTPS, and they answered: "*Many different cameras supply HTTPS that our device packs can handle. You can search for camera models and see if they support HTTPS on our website: https://www.milestonesys.com/solution-partners/supported-hardware/ .*"
      i. **NOTE:** The Independent Reviewer performed a spot check at the link above, of the following cameras which were purchased for the NWSCF project and all show HTTPS support: AXIS P1425-LE, AXIS P3215-VE, AXIS Q8414-LVS, and AXIS Q6115-E.

2. **Data at Rest**: It is the Independent Reviewer's understanding that neither of the two methods below are currently deployed at any of the DOC sites:
   a. The database can be configured to **encrypt the recordings in two modes: "Light" and "Strong" or**
   b. The database can be set to **sign the recordings digitally** to prevent tampering

      i. Both of the database **encryption modes** "**Light**" and "**Strong**" are secure and use the same DES-56 encryption technology. The difference is how much of the recordings are encrypted.
         1. Strong" encrypts all parts of the video data stored in the database but requires more processing power to do so because everything needs to be encrypted
         2. "Light" only encrypts the first part of the JPEG or MPEG-4/H.264 video data called the header, and because of this, it uses less processing power to encrypt the video. The video will still be secure if someone tries to hack the database because the video cannot be decoded without the information contained in the encrypted header.

      ii. **Digital signature**: The digital signature is created by calculating a Message-Digest 5 (MD5) algorithm hash of the recordings. The hash is then signed with a Digital Signature Algorithm (DSA) and stored with the recordings. If the content later on is changed or parts of the recordings are removed, the MD5 hash and signature will no longer match, making it possible to detect that the recordings have been tampered with. Enabling encryption and digital signature of the recordings does not alter the actual recorded audio or video content in any way. If the recorded audio or video contains some form of embedded watermark

information, it will still be possible to verify the authenticity of the audio or video, either by the camera vendor or by a method/tool provided by the camera vendor.

***** As XProtect Enterprise is being deployed, and the Security document provided addresses XProtect Corporate, Independent Reviewer asked vendor whether the security model describing XProtect Corporate applied to XProtect Enterprise. Vendor reply is as follows: *"Enterprise runs a separate "core engine" than our Advanced platforms, so there are a variety of differences. In general, though, most of that documentation applies – cameras deliver video to the recording server in similar ways, video is delivered to the Smart Client similarly, and the Smart Client indeed the same product for both. The differences would be in the features the Advanced platform has: failover, the rules engine, digital signatures and encryption on the server, etc."*

Static Code Review Findings:
None conducted to date.

Penetration Test Findings:
None conducted to date.

In summary, the **Security features available** appear sound, although there are questions as to whether these features are configured/deployed. This is identified in the Risk Register.

6. **Hosting Environment**
    a. Not applicable, as application is hosted locally.
    b. The on premise infrastructure appears sound, based on the Access Gate server configuration, and Cat-6 Ethernet cabling, and Cisco switch usage.

In summary, the **Hosting Environment** appears sound.

7. **Compliance with the Section 508 Amendment to the Rehabilitation Act of 1973, as amended in 1998:** Comment on the solution's compliance with accessibility standards as outlined in this amendment. Reference: http://www.section508.gov/content/learn

Vendor indicates solution complies with Section 508 Amendment to the Rehabilitation Act of 1973.

In summary, the solution appears to meet **Section 508 Amendment to the Rehabilitation Act of 1973**.

8. **Disaster Recovery:** What is your assessment of the proposed solution's disaster recovery plan; do you think it is adequate? How might it be improved? Are there specific actions that you would recommend to improve the plan?

Please see DR/BC section described in **Appendix 4**.

In summary, the **DR/BC** plan is not sound, and is identified in the Risk Register.

9. **Data Retention:** Describe the relevant data retention needs and how they will be satisfied for or by the proposed solution.

   There is no data backup solution deployed.

   Video is retained for 30 days and then overwritten as disk space is needed, as described in **Appendix 4**.

   The lack of data backup is identified in the Risk Register.

10. **Service Level Agreement:** What is your assessment of the Service Level Agreement (SLA) provisions that the proposed vendor will provide? Are they appropriate and adequate in your judgment?

SUMMARY OF SLAs:

- Access Gate Server: No specific SLAs. Product is warranted, but vendor does not provide a specific response time for repair.

- Camera: No specific SLAs. Product is warranted, but vendor does not provide a specific response time for repair.

- Video Management Software: Milestone Systems XProtect Enterprise. Support is obtained through product resellers, who admittedly, do not know the Milestone Systems solution well enough to provide support. Support can also be purchased directly through Milestone, at "Plus", "Premium", and "Elite" levels. The "Plus" level is in place, but has no specific support service SLA attached. See the attached document titled "milestone-care_faq_partners_final.pdf" for additional information. See the graphic below for a summary of these options.

Milestone Care™ Basic
Milestone Care Basic is a complimentary, self-service support offering that comes with every Milestone product. It includes eLearning modules and access to user forums and an online knowledge base.

Milestone Care™ Plus
Milestone Care Plus ensures you always have access to the newest functionality for your VMS by giving you free access to software updates, and it lets you take advantage of Connected Services, like the Customer Dashboard and push notifications (alarm notifications sent via Milestone Mobile)

Milestone Care™ Premium
Milestone Care Premium offers round-the-clock access to Milestone Technical Support and service level agreements with committed response times. It's an ideal option when you want to ensure that any potential system issues are addressed promptly.

Milestone Care™ Elite
Milestone Care Elite is a customizable support offering with a dedicated Milestone Technical Account Manager. It offers committed resolution times to any critical issues with your Milestone product. It is designed for organizations with mission-critical surveillance installations.

	Care Basic	Care Plus	Care Premium	Care Elite
Trade-in value on software products	30%	100%	100%	100%
24/7 Technical Support	–	–	✓	✓
Committed response time (15 minutes/phone, 4 hours/email)	–	–	✓	✓
Technical Account Manager	–	–	–	✓

The remainder of this section provides detail on available Milestone Systems software SLAs.

Support description summary:

Milestone Care™ Plus: Ideal for installations of all sizes, and provides flexibility for installations that may grow in size or require more advanced functionality over time. (15% of software license fee annually).

- All the free benefits included in Milestone Care Basic
- Immediate access to latest software versions and functionality
- Unique trade-in policy: receive 100 percent credit for your current Milestone product when upgrading to a newer version of your existing Milestone product or upgrading to a more advanced Milestone product
- Milestone Customer Dashboard gives reseller/integrator access to monitor system performance

Milestone Care™ Premium: Targeted at larger customer with business-critical installations that require around-the-clock expert support. ($1,500 one-time fee, plus 7% of software license fee annually).

- All the free benefits of Milestone Care Basic
- Requires Milestone Care Plus
- Direct technical email and phone support, and expert assistance 24/7/365 available for end-customers (this applies to the end-customer and to the reseller supporting the given software license code)
- Selection of local dial-in numbers and support languages
- Prioritized handling
- Service Level Agreement (SLA) with committed response times

Milestone Care™ Elite: High-end, customizable offering for mission-critical installations (Only provided as requested and targeted at very large clients. Pricing is customized as well).

- All the free benefits of Milestone Care Basic
- Requires Milestone Care Plus
- Dedicated Milestone Technical Account Manager monitors the resolution performance of reported cases
- 24/7/365 direct access to Milestone Technical Support
- Prioritized technical email and phone support handling
- Service Level Agreement (SLA) with committed response and resolution times
- Training of customer's first-line support team
- Monthly reporting

Milestone SLA Metrics:

Per the attached "milestone-care_faq_partners_final.pdf", SLAs begin with the "Premium" level of support, and provide RESPONSE TIMES, while "Elite" provides both RESPONSE TIMES and RESOLUTION TIMES:

All severities have a first response within 15 minutes if reported by phone, and within four hours if reported online. In addition to these initial response times, there are service objectives for progress status reporting.

Severity level	First response time
Critical	One hour
Severe	Four hours
Moderate	Eight hours
Minor	12 hours

In summary, there are no **Service Level Agreements** in place. This is identified in the Risk Register.

11. **System Integration:** Is the data export/reporting capability of the proposed solution consumable by the State? What data is exchanged and what systems will the solution integrate/interface with*?* ***Please create a visual depiction*** and include as **Appendix 1** of this report. Will the solution be able to integrate with the State's Vision and financial systems (if applicable)?

    The proposed System Integration methodology is consumable by the State, given the API approach available, although, there is not expected to be a need to utilize this. See **Appendix 1** for details.

    In summary, the approach to **System Integration** is sound and adequate.

Additional Comments on Architecture:

None.

7. Assessment of Implementation Plan

7.1 Implementation Readiness

After assessing the Implementation Plan, please comment on each of the following.

1. **The reality of the implementation timetable**

   There is no formal project plan or implementation schedule.

   Implementation per site typically takes not more than 6 months, with the specific timeline a function of the number of cameras to be installed and/or level of complexity of the cabling work (i.e. NWSCF requires perimeter cabling and cameras, while not all sites do).

2. **Training of users in preparation for the implementation**

   Training is provided by BGS Security technicians to Corrections personnel who will be using the Milestone System XProtect Enterprise software.

   In summary, the **training** approach appears sound and adequate.

3. **Do the milestones and deliverables proposed by the vendor provide enough detail to hold them accountable for meeting the Business needs in these areas:**

   A. Project Management
   B. Training
   C. Testing
   D. Design
   E. Conversion (if applicable)
   F. Implementation planning
   G. Implementation

   Many of the items listed above are not applicable to this project, per the summary below:

   - There is no formal Project Management.
   - The vendor is not providing training.
   - Electrical contractors test for Cat 6 compliance. BGS technicians confirm video is captured and stored.
   - DII approves the network design.
   - There is no data conversion.
   - BGS Security team coordinates Implementation schedule with Correction facility.

   In summary, **holding the vendor accountable to most items is not applicable. For those items "owned" by the vendor, specifically Cat 6 certification, there is sufficient detail to hold the vendor accountable.**

4. **Does the State have a resource lined up to be the Project Manager on the project? If so, does this person possess the skills and experience to be successful in this role in your judgement? Please explain.**

    a. There is no formal Project Management on this project. However, between Margie Klark representing BGS Security and Lucas Herring and Bob Arnell representing DOC, *project coordination* is adequate.

5. **Readiness of impacted divisions/departments to participate in this solution/project**

    a. BGS Security and DOC are prepared to participate in this project.

    Based on our experience conducting IRs, when comparing this project to other technology projects, the involved department's staff appear to be fully prepared to undertake a project of this scope.

    However, the BGS staff who implements and supports the proposed solution is very thin, as only one person knows how to support and configure the servers and milestone software. This is identified in the Risk Register.

6. **Project Management**

This section describes vendor's approach to **Project Management**.

As noted above, Project Management is not used on this project.

In summary, the lack of a formal **Project Management** approach does not appear to be a detriment to this project.

7. **Adequacy of design, development, migration/conversion, and implementation plans**

This section describes the approach to **design, development, migration/conversion, and implementation**.

Design is relevant to the cabling infrastructure, and that design is adequately provided by DII.

There is no development for this project.

There is no migration or conversion for this project.

There are no formal implementation plans for this project. The implementation approach is a function of coordination between BGS Security and the individual facilities.

Due to the secure nature of the facility, the implementation typically occurs follows in the following order:

1. Hardware and software procured by BGS from the respective vendors.
2. Servers and workstations configured by DII Staff.
3. Wiring installed by selected electrical vendor, under the direction of BGS Security team.
4. Server installed by BGS technician.
5. Connect new cameras connected to server with small monitor by electrical vendor.
6. Old cameras replaced by electrical vendor.
7. Monitors replaced by electrical vendor or BGS technician.
8. Solution validation done by BGS Security technicians.

In summary, the **implementation** approach appears sound and adequate for this type of project.

This section describes vendor's approach to **System Integration**.

There is no System Integration for this project.

See **Appendix 1** for additional detail.

This section describes vendor's approach to **Conversion/Migration**.

There is no Conversion/Migration for this project.

8. Adequacy of support for design, development, conversion/migration, and implementation activities

a. DESIGN/DEVELOPMENT:

i. DII Network design demonstrate adequate support in this area.

b. CONVERSION/MIGRATION:

i. Not applicable for this project.

c. IMPLEMENTATION:

i. Electrical contractor, BGS Security, and DOC all demonstrate adequate support in this area.

9. Adequacy of agency and partner staff resources to provide management of the project and related contracts (i.e. vendor management capabilities)

a. As noted above, there is no formal Project Management used on this project.

10. Adequacy of testing plan/approach

There is no formal testing plan on this project.

The key functions to confirm include Category 6 certification and that video is stored on the servers.

Each cabling/electrical vendor contract requires such Category 6 certification validation.

BGS Security technicians confirm that video is stored correctly.

In summary, the **Testing Plan/Approach** appears sound and adequate for this project.

11. General acceptance/readiness of staff

The overall Acceptance and Readiness of BGS Security and DOC staff is strong. The team is comprised of qualified members, who are motivated to implement the proposed solution.

Additional Comments on Implementation Plan:

None.

7.2 Risk Assessment & Risk Register

*After performing a Risk assessment in conjunction with the Business, please create a **Risk Register** as an **Appendix 2** to this report that includes the following:*

1. ***Source of Risk**: Project, Proposed Solution, Vendor or Other*
2. ***Risk Description**: Provide a description of what the risk entails*
3. ***Risk ratings to indicate**: Likelihood and probability of risk occurrence; Impact should risk occur; and Overall risk rating (high, medium or low priority)*
4. ***State's Planned Risk Strategy**: Avoid, Mitigate, Transfer or Accept*
5. ***State's Planned Risk Response**: Describe what the State plans to do (if anything) to address the risk*
6. ***Timing of Risk Response**: Describe the planned timing for carrying out the risk response (e.g. prior to the start of the project, during the Planning Phase, prior to implementation, etc.)*
7. ***Reviewer's Assessment of State's Planned Response**: Indicate if the planned response is adequate/appropriate in your judgment and if not what would you recommend.*

See **Appendix 2.**

Additional Comments on Risks:

None.

8. Cost Benefit Analysis

This section involves four tasks:

1) *Perform an independent Cost Benefit Analysis.*

2) ***Create a Lifecycle Cost Benefit Analysis spreadsheet*** *as an* ***Appendix 3*** *to this report. A sample format is provided.*

a) The cost component of the cost/benefit analysis will include all one-time acquisition costs, on-going operational costs (licensing, maintenance, refresh, etc.) plus internal costs of staffing and "other costs". "Other costs" include the cost of personnel or Vendors required for this solution, enhancements/upgrades planned for the lifecycle, consumables, costs associated with system interfaces, and any costs of upgrading the current environment to accept the proposed solution (new facilities, etc.).

b) The benefit side of the cost/benefit will include: 1. Intangible items for which an actual cost cannot be attributed. 2. Tangible savings/benefit such as actual savings in personnel, Vendors or operating expense associated with existing methods of accomplishing the work which will be performed by the proposed solution. Tangible benefits also include additional revenue which may result from the proposed solution

c) The cost benefit analysis will be for the IT activity's lifecycle.

d) The format will be a column spreadsheet with one column for each year in the lifecycle. The rows will contain the itemized costs with totals followed by the itemized benefits with totals.

e) Identify the source of funds (federal, state, one-time vs. ongoing). For example, implementation may be covered by federal dollars but operations will be paid by State funds.

3) *Perform an analysis of the IT ABC form (Business Case/Cost Analysis) completed by the Business.*

4) *Respond to the questions/items listed below.*

1. **Analysis Description:** Provide a narrative summary of the cost benefit analysis conducted: The approach used was to gather all costs associated with project for a **10 year period**, identify revenue sources for the project, and identify tangible and intangible benefits that might also be used as revenue sources or expense reductions.

    a. COST COMPONENT: See the cost summary chart below as well as the attached spreadsheet referenced in **Appendix 3** to gain an understanding of:
        i. Use of Funds (Costs)
        ii. Source of Funds
        iii. Change in Operating Costs

Cost Category	Implementation	Operations
Software:	$169,785	$0
Software Maintenance:	$0	$378,428
Hosting: (hosted on site)	$0	$0
Implementation Services: (Cabling vendor)	$847,743	$0
Hardware: 10% of hardware cost allocated to annual replacement budget	$0	$664,552
Servers, Workstations, Monitors, Switches, UPS, Rack (Operations:$2K annually after Year 4 for server/workstation warranty)	$453,726	$66,000
Cameras	$436,173	$0
Camera Mounting Hardware	$35,821	$0
Other	$22,750	$0
Internal staffing:	$318,500	$220,500
Contingency:	$0	$0
DII PMO and Indep. Review	$43,445	$0
TOTAL	**$2,327,943**	**$1,329,480**

    b. BENEFIT COMPONENT:
        i. See the Tangible and Intangible Benefits described below.

2. **Assumptions:** List any assumptions made in your analysis.
    a. See assumptions noted above in the Executive summary. Additional assumptions are listed below.
    b. Staff reductions are not expected or contemplated through the implementation of this solution.
    c. There is no revenue recovery anticipated.
    d. Costs are segmented into **Project Cost** and **Operational Costs.**

3. **Funding:** Provide the funding source(s). If multiple sources, indicate the percentage of each source for both Acquisition Costs and on-going Operational costs over the duration of the system/service lifecycle.
    a. The primary source of funds include those identified in the following chart, the detailed amount from which are specified in the attached Project Cost spreadsheet referenced in **Appendix 3**:

Funding Source(s) and Percentage Breakdown if Multiple Sources:

FUNDING SOURCE	% of TOTAL	FUNDING APPLIED TO (Implementation or Operations)	FUNDING AMOUNT
STATE FUNDING: Dept Code: 2013: 1305100041 (Corrections Cameras and Systems) **Implementation**	7.49%	Implementation	$99,391
STATE FUNDING: Dept Code: 2014: 1405100042 (Corrections Cameras and Systems) **Implementation**	18.79%	Implementation	$249,185
STATE FUNDING: Dept Code: 2015: 1502600041 (Corrections Cameras and Systems) **Implementation**	7.50%	Implementation	$99,473
STATE FUNDING: Dept Code: 2016: 1602600042 (Corrections Cameras and Systems) **Implementation**	7.47%	Implementation	$99,089
STATE FUNDING 2017: (Corrections Cameras and Systems) Implementation	0.00%	Implementation	$0
STATE FUNDING: **Operations - DOC Security Budget**	18.10%	Operations	$240,000
STATE FUNDING: **Operations - AHS Central Office**	10.29%	Operations	$136,500
STATE FUNDING: **Operations - BGS Fee For Service**	30.35%	Operations	$402,500
FEDERAL FUNDING: None	0.00%	Operations	$0
TOTAL	**100%**		**$1,326,138**

Implementation Funds: $547,138

Operational Funds: $779,000 (need additional $2.33M to fund project from Ops or from other source**)**

4. **Tangible Benefits:** Provide a list and description of the tangible benefits of this project. Tangible benefits include specific dollar value that can be measured (examples include a reduction in expenses or reducing inventory, with supporting details).
    a. There are no tangible benefits that can be monetized through this project.

5. **Intangible Benefits:** Provide a list and description of the intangible benefits of this project. Intangible benefits include cost avoidance, the value of benefits provided to other programs, the value of improved decision making, public benefit, and other factors that become known during the process of analysis. Intangible benefits must include a statement of the methodology or justification used to determine the value of the intangible benefit.
    a. Improved video quality going from analog to digital.
    b. Improved video coverage by adding more cameras.

c. Compliance with PREA Audit recommendations.
d. Strengthening overall facility security.
e. Increased availability for Corrections Staff to perform duties instead of dealing with camera issues/requests.
    i. Cost avoidance of overtime costs, valued at $34.49 per hour based on salary and appropriate associated benefits, which is the same number used in the OMS project, at 1 hour per week for 50 weeks and in seven locations is $12,071.50.
f. Decreased litigation costs from events that recorded in current and additional areas.
    i. Using similar numbers as provided in the OMS project, $50,000 cost avoidance.
g. Decrease investigation time, both internally and externally, related to events within the facility.
    i. Using similar numbers as provided in the OMS project, $10,600.
h. Decrease the risk for Medical Payments for Inmates and staff due to less incidents occurring in the facility.
    i. Using the amount of medical payment cost avoidance in the OMS project, but decreased by a factor of 10 due to the number of related incidents, $10,600 in cost avoidance.
i. Decreased risk of unseen locations where life safety issues can occur. This can also be viewed as prevention of issues in high-risk locations.
j. Central Office Staff save hours per month with ability to review video from central location.
k. Reduce the time needed for DOC staff to view files compared to Legacy System(s).
l. All cameras are on the same system, creating a better support environment and which allows for consistent training across the department.
m. Buying replacement equipment would be through approved State policy, rather than trying to locate outdated equipment via other means.
n. Decrease reporting of fraudulent events from additional coverage areas.

6. **Costs vs. Benefits:** Do the benefits of this project (consider both tangible and intangible) outweigh the costs in your opinion? Please elaborate on your response.
    a. There are no tangible dollar benefits with this project.
    b. There is some monetary value assigned to some of the intangible benefits.
    c. Per the following chart, given current operating costs of **$392K** over 10 years and the new expected operating costs of **$1.3M** over 10 years, we expect an operating cost increase of **$937K** with a **$2.3M** implementation cost to achieve that.
    d. As such, the monetary benefits do not outweigh the costs. Monetary benefits should not be the reason to pursue this project.

IT Activity Lifecycle:	10 Years
Total Lifecycle Costs:	**$3,657,423**
PROJECT COSTS *(see detail in table below)**:***	***$2,327,943***
OPERATING COSTS *(see detail in table below)**:***	***$1,329,480***
CURRENT OPERATING COSTS:	**$392,000**
Difference Between Current and New Operating Costs:	**$937,480 increase over 10 years**
Funding Source(s) and Percentage Breakdown if Multiple Sources:	See table below

7. **IT ABC Form Review:** Review the IT ABC form (Activity Business Case and Cost Analysis) created by the Business for this project. Is the information consistent with your independent review and analysis? If not, please describe.
    a. Reviewed the IT ABC Form that was completed in January, 2014, and compared it to the IR project cost spreadsheet.
    b. Other findings of note:
        i. The IT ABC form suggested the solution was to be hosted, but there are no hosting costs allocated.
        ii. Operational staff cost of .07 FTE, while the IR project cost spreadsheet shows .35 FTE.
        iii. There is detailed costs by site which total $441,447, yet $420,447 was stated to be the implementation costs, a delta of $21K:

SITE	SITE BUDGET PER IT ABC FORM
SSCF	$120,528
MVRCF	$46,681
NSCF	$58,815
NWSCF	$65,262
SESCF	$52,315
CRCF	$51,903
NESCF	$45,943
TOTAL	**$441,447**

        iv. As noted elsewhere in this IR Report, the scope of work changed due to a PREA Audit suggesting additional cameras, as well as cabling vendor costs now being allocated to this project whereas they were not budgeted in this IT ABC Form.
    c. The chart below lists the data from the IT ABC form compared to this project budget, which is $2.55M over the original IT ABC Form budget.

ITEM	IT ABC FORM Budget	IR budget	% increase (decrease) over IT ABC Budget	% increase over IT ABC Budget
Implementation Budget	$457,076	$2,327,943	**$1,870,867**	**409%**
M&O Budget (10 year total)	$267,600	$1,329,480	**$1,061,880**	**397%**
TOTAL	**$724,676**	**$3,657,423**	**$2,932,747**	**405%**

Additional Comments on the Cost Benefit Analysis:

No additional comments.

9. Impact Analysis on Net Operating Costs

1.) Perform a lifecycle cost impact analysis on net operating costs for the agency carrying out the activity, minimally including the following:
a) Estimated future-state ongoing annual operating costs, and estimated lifecycle operating costs. Consider also if the project will yield additional revenue generation that may offset any increase in operating costs.
b) Current-state annual operating costs; assess total current costs over span of new IT activity lifecycle
c) Provide a breakdown of funding sources (federal, state, one-time vs. ongoing)
2.) Create a table to illustrate the net operating cost impact.
3.) Respond to the items below.

As noted in **Section 1.1** above, the Cost Summary for this project is:

IT Activity Lifecycle:	10 Years
Total Lifecycle Costs:	**$3,657,423**
PROJECT COSTS *(see detail in table below):*	***$2,327,943***
OPERATING COSTS *(see detail in table below):*	***$1,329,480***
CURRENT OPERATING COSTS:	**$392,000**
Difference Between Current and New Operating Costs:	**$937,480 increase over 10 years**
Funding Source(s) and Percentage Breakdown if Multiple Sources:	See table below

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STATE FUNDING 2017: (Corrections Cameras and Systems) Implementation	0.00%	Implementation	$0
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STATE FUNDING: **Operations - BGS Fee For Service**	30.35%	Operations	$402,500
FEDERAL FUNDING: None	0.00%	Operations	$0
TOTAL	**100%**		**$1,326,138**

Implementation Funds: $547,138

Operational Funds: $779,000 (need additional $2.33M to fund project from Ops or from other source**)**

Funding is inadequate for this project by $2.3M:

	Available Funding	Costs	Overage/(Shortage)
Implementation	$547,138	$2,327,943	($1,780,806)
Operations	$779,000	$1,329,480	($550,480)
Total	**$547,138**	**$3,494,548**	**($2,331,286)**

1. See the spreadsheet attached in **Appendix 3** to review impact to Operating Costs.

2. Provide a narrative summary of the analysis conducted and include a list of any assumptions.
   a. The detailed spreadsheet provided with this analysis breaks out costs as follows:
      i. Implementation (Project) Costs: Costs tied specifically to the Vendor. In other words, those costs that are incurred because we are undertaking the project.
      ii. Operating Costs: Internal costs, consisting of staffing and telecommunication costs, and external costs consisting of contracted services and on-going use of the software and related hosting.
      iii. Total Costs: Project Costs plus Operating Costs.

   b. The TOTAL COSTS are broken out as **IMPLEMENTATION (Project) COSTS** and **OPERATING COSTS**.

3. Explain any net operating increases that will be covered by federal funding. Will this funding cover the entire lifecycle? If not, please provide the breakouts by year.
   a. There are no Federal Funding sources. All Operating Costs/Operating Cost increases are funded with State of Vermont dollars.

4. What is the break-even point for this IT Activity (considering implementation and on-going operating costs)?
    a. There is no break-even point. This project is expected to cost more than current operational costs.

Appendix 1 - System Integration

SYSTEM INTEGRATION/INTERFACES

Not applicable. There are no data integration points or systems interfaced with for this project.

The Milestone software does possess the following integration-related features:

- A published application programming interface (API);
- ONVIF-compliant video out interface in the form of Milestone ONVIF Bridge, which enables standardized and secure private-to-public video integration, and ensures full video interoperability in multi-vendor installations; (ONVIF: A global and open industry forum to create a standard for how IP products within video surveillance and other physical security areas can communicate with each other. ONVIF is an organization started in 2008 by Axis Communications, Bosch Security Systems and Sony.)

Appendix 2 - Risk Register

See attached document: FINAL-REVIEW-SOV- DOC-CamerasAndSystems-STS_Risk_Register_FINAL.pdf

Appendix 3 – Lifecycle Costs and Change in Operating Costs

See attached document: FINAL-REVIEW-SOV-DOC-CamerasAndSystems-STS_Cost_Detail_FINAL.xlsx

Appendix 4 – Technology Infrastructure

ARCHITECTURE

Summary:

- Digital cameras connected via Ethernet CAT6 cabling, transmitting video over a local area network at each Corrections facility, with 30 days of video stored on Access Gate Windows 2012 Server, using Milestone XProtect Enterprise Video Management System
- No data backup plan

Video Storage Server Standard Configuration:

- Microsoft Windows Server 2012

Vendor Applications:

- Milestone XProtect Enterprise Video Management System:
  - See attached (*Milestone_XProtect Enterprise_2016R2_Specification Sheet_A4_ENG_PDF_WEB.pdf*) as well as https://www.milestonesys.com/our-products/video-management-software/xprotect-enterprise
- Note: This application has been announced by the software vendor that the June 2016 release is the last release, with software support only (no new features) provided through June, 2020, and recommends moving to another solution in their product line. See End of Life Announcement attached to this report ("*XProtect_Enterprise_R2_WhatsNewBrief.pdf*" and "*FAQ_XProtect_Enterprise_R2.pdf*"). This is identified in the Risk Register.

Video Codecs:

- H264
- JPEG

The graphics below provide a summary of the Enterprise Architecture.

Of note, for this implementation, there is one physical server, and it is from Access Gate, not from Milestone. All functions noted (Management Server, Database Server, and Recording Server) are installed on that one server, not separate servers.

Management server

The management server is the central VMS component. It handles the system configuration, distributes the configuration to other system components, such as the recording servers, and facilitates user authentication. The configuration is stored on a standard Microsoft SQL server installed on either the management server itself or on a separate dedicated server.

Recording server

The recording server is responsible for all communication, recording, and event handling related to devices such as cameras, video and audio encoders, I/O modules, and metadata sources. Examples of actions the recording server handles: Retrieve video, audio, metadata and I/O event streams from the devices; Record video, audio and metadata from devices.)

Media database

The system stores the retrieved video, audio and metadata in the customized high performance Milestone media database which is optimized for recording and storing audio and video data. The media database supports various unique features including multistage archiving, video grooming, encryption, and adding a digital signature to the recordings.

XProtect Management Client

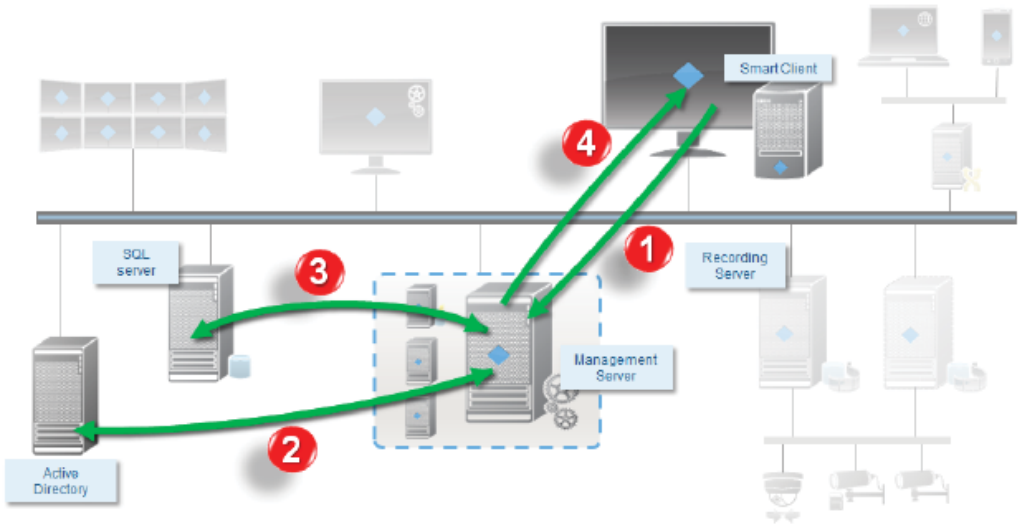
The Management Client is the administration interface for all parts of the system.

XProtect Smart Client

XProtect Smart Client is the main client for the VMS, offering a full set of advanced features and designed for a day-to-day use by dedicated operators. XProtect Smart Client is designed to run remotely from the operators' computer and supports multiscreen usage in full screen mode or in floating windows mode where the user can resize the windows and move them around freely.

Login:

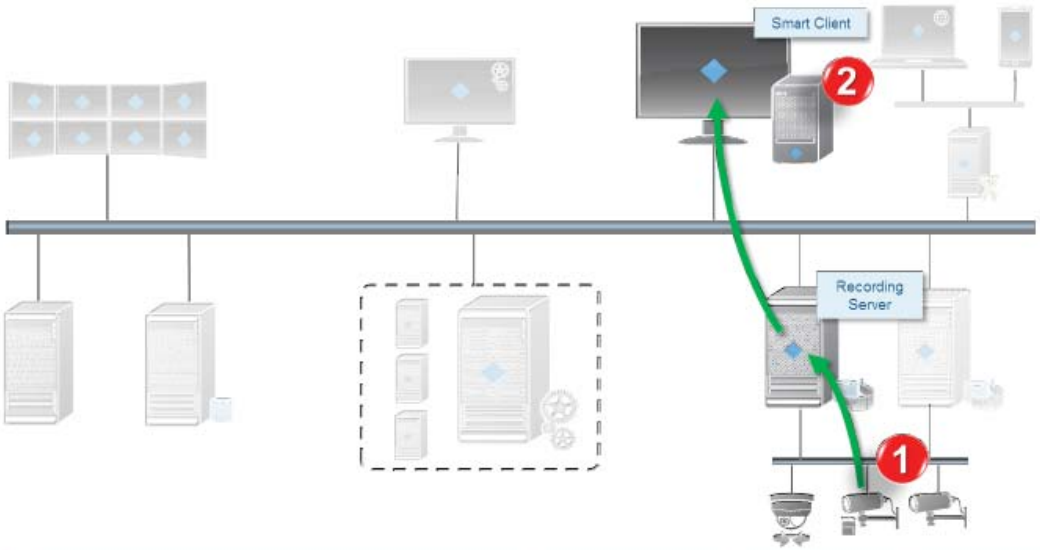
Login



	Process	Port	Protocol	Bandwidth
1	XProtect Smart Client connects to the Management Server and attempts to log in	Configurable. Typically port 80 for an AD user and port 443 for a basic user	HTTP for an AD user and HTTPS for a basic user.	Low 1 Kbit/call
2	The management server contacts Active Directory to authenticate the user	OS- and AD-dependent.	OS- and AD-dependent.	Low 5 Kbit/call
3	User-specific configuration is retrieved from the SQL database	1433	TCP	Depends on configuration
4	Login is granted and the configuration is sent to XProtect Smart Client	Configurable. Typically port 80 for an AD user and port 443 for a basic user.	HTTP for an AD user and HTTPS for a basic user	Depends on configuration, Typically 1-10 MByte

Video Capture:

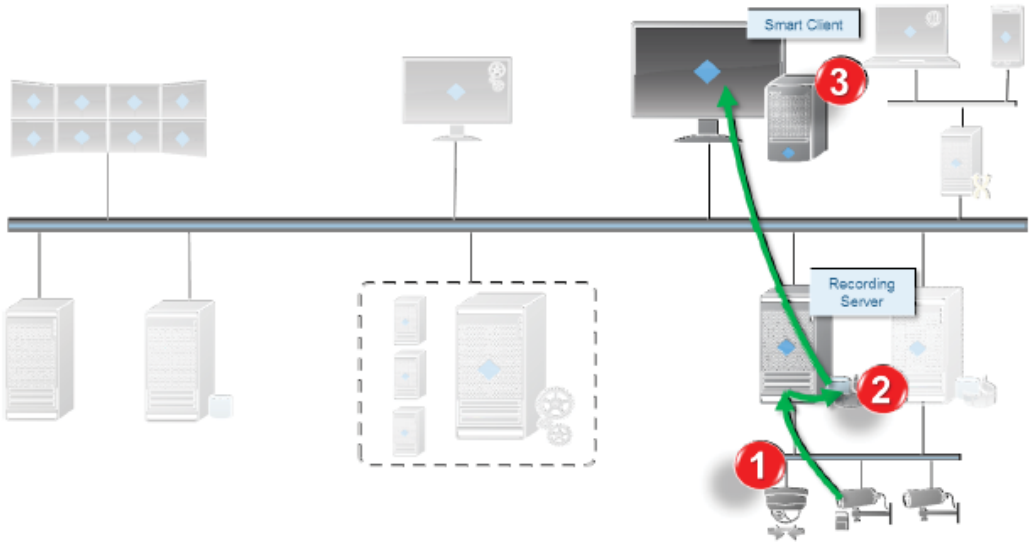
Live video and audio



	Process	Port	Protocol	Bandwidth
1	Live streams from cameras retrieved by the recording server	Configurable. Typically port 80	Configurable. Typically RTSP, UDP, TCP/IP	Device configurable. Typically 1-10 Mbit/s
2	Streams are sent to XProtect Smart Client on request	Configurable. The default port is 7563	Configurable, TCP/IP, UDP Multicast. The default is TCP/IP	Usage dependable, sum of camera streams viewed

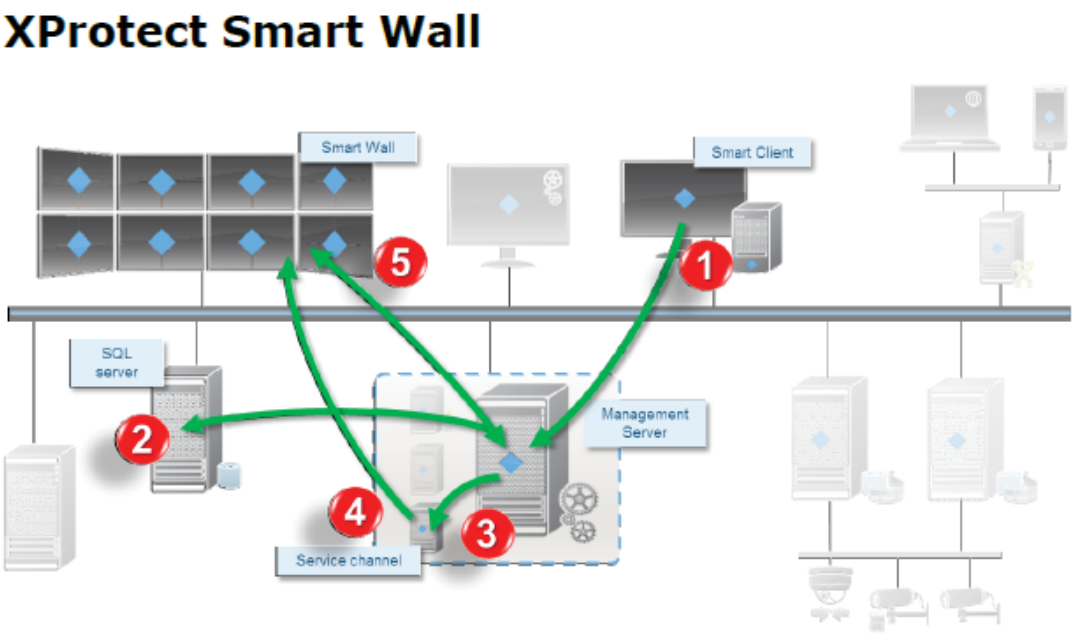
Video Playback:

Play back video and audio



	Process	Port	Protocol	Bandwidth
1	Recording stream from cameras retrieved by the recording server	Configurable. Typically port 80	Configurable. Typically RTSP, UDP, TCP/IP	Device configurable. Typically 1-10 Mbit/s
2	The stream is recorded in the recording server database based on rules	N/A	N/A	Device configurable. Typically 1-10 Mbit/s
3	The recorded stream are retrieved by XProtect Smart Client on playback request	Configurable. The default port is 7563	TCP/IP	Usage dependable, sum of camera streams viewed

Video Projection onto Smart Wall:



	Process	Port	Protocol	Bandwidth
1	An XProtect Smart Client user updates the XProtect Smart Wall view	Configurable. The default is 5432	TCP/IP	Low 1 Kbit/call
2	The XProtect Smart Wall view configuration is updated and stored in the SQL server	1433	TCP	Low 1 Kbit/call
3	Management server contacts the service channel	80	HTTP	Low 1 Kbit/call
4	The service channel sends a notification to the XProtect Smart Client running the XProtect Smart Wall	Configurable. Typically 80 for an AD user and 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1 Kbit/call
5	The XProtect Smart Client running the XProtect Smart Wall retrieves and applies new layout	Configurable. Typically 80 for an AD user and 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1 Kbit/call

PRODUCTION ENVIRONMENT

- 1 file server storing video. There is no test environment.

CLIENT

- Client workstation running XProtect Smart Client (Windows-based application).

HOSTING

- Software and stored video hosted in file server located at each Corrections facility. The specifications of each server is configured to the expected processor load required, and video storage requirements of that server.
- The Access Gate **Reliance** line of servers is used. See examples of two such server specifications below and in the attached ("*ags-8x11-matrixpages.pdf*"):
    - ACCESS GATE AGS-HD-253-**16**08-5**N** 18TB NVR (Reliance 16, 3U)
        - 3 = 3TB drives
        - 16 = number of drive slots
        - 08 = Number of drives
        - 5 = RAID TYPE
        - N = No Hot Spare (If H, H=Hot Spare)
    - ACCESS GATE NET AGS-HD-254-**48**48-6**H**C (Reliance 24, 5U)
        - 4 = 4TB drives
        - 48 = Number of drive slots
        - 48 = Number of drives
        - 6 = RAID TYPE (RAID controllers support up to 24 drives, so 2 RAID controllers))
        - H = H=Hot Spare, N=No Hot Spare
        - C = Custom

SYSTEM MONITORING

- There is no specific system monitoring.

DISASTER RECOVERY/BUSINESS CONTINUITY

There is no on site or off site backup, and the expected RTO is at least one week, based on a spare server being available, but which must be installed and configured at a site if/when a disaster occurs.

In summary, the **Disaster Recovery/Business Continuity** plan puts DOC in an exposed position. This is identified in the Risk Register.

DATA BACKUP/RESTORE

As noted above, there is no on site or off site backup. While the server RAID array provides some protection against disk failure, all video can still be lost. For example should 2 disks in a RAID 5 configuration fail, the entire array fails, and with no data backup, all video would be lost.

In summary, the **Data Backup/Restore** plan puts DOC in an exposed position. This is identified in the Risk Register.

BGS and DOC: Cameras and Systems Project
RISK REGISTER DESCRIPTION:

1. Risk Description: Provide a description of what the risk entails
2. Source of Risk: Project, Proposed Solution, Vendor or Other
3. Risk Rating: Risk ratings to indicate: Likelihood and probability of risk occurrence; Impact should risk occur; and Overall risk rating (high, medium or low priority)
4. Risk Strategy: State's Planned Risk Strategy: **Avoid, Mitigate, Transfer or Accept**
    a. Avoid: Avoid the activity; activities with a high likelihood of loss and large impact.
    b. Mitigate: Develop a plan to reduce risk to reduce the risk of potential loss; activities with a high likelihood of occurring, but impact is small.
    c. Transfer: Outsource risk (or a portion of the risk - Share risk) to third party or parties that can manage the outcome; activities with low probability of occurring, but with a large impact. Often times this is transferred back to vendor.
    d. Accept: Take the chance of negative impact, eventually budget the cost (i.e. a contingency budget line); activities where cost-benefit analysis determines the cost to mitigate risk is higher than cost to bear the risk, then the best response is to accept and continually monitor the risk.
5. Timing of Risk Response: Describes the suggested timing for carrying out the risk response (e.g. prior to the start of the project, during the Planning Phase, prior to implementation, etc.)
6. State's Planned Risk Response: Describe what the State plans to do (if anything) to address the risk (See Risk Response table)
7. Reviewer's Assessment of State's Planned Response: Indicate if the planned response is adequate/appropriate in your judgment and if not what would you recommend.

Department Action Step: Respond to the sections highlighted in yellow (Risk Strategy, State's Planned Risk Response) and send copy back to David Gadway for review

RISK REGISTER:

NOTE: Hyperlinks are used to navigate. From the Risk Register, CTL-CLICK on a RISK # to see the Risk Response, or from the Risk Response, CTL-CLICK on a RISK # to go back to the Risk Register.

Risk #:	Risk Description	Source of Risk	Risk Rating: Impact	Risk Rating: Probability	Risk Rating: Overall Risk	**State Risk Strategy Summary** (Avoid, Mitigate, Transfer, Accept)	Timing of Response	Reviewer Assessment of Response
1a	Budget/Funding: There is not adequate funding for this project. Per the project spreadsheet.	Project	High	High	High		ASAP	*Review Risk Response plan for steps necessary to mitigate risk.*
2a	Contract Item: There were no contracts found/available for vendors CFW Electric nor ADI, yet work is being done/paid for with these vendors. Do these contracts exist?	Project	Medium	Medium	Medium		ASAP	Risk Mitigated.
3a	Vendor Risk: Service Level Agreements may not meet BGS/DOC expectations. Recommend developing a written document stating what the SLAs are for each vendor (cabling, camera, server (Access Gate), video management system (Milestone)) and determine if those SLAs are adequate. Recommend obtaining pricing for Milestone Premium and Elite support to determine if obtaining support from Milestone directly is of interest.	Project	High	High	High		ASAP	*Review Risk Response plan for steps necessary to mitigate risk.*
3b	Vendor Risk: Milestone XProtect Enterprise video management system has been indicated by vendor to be End of Life as of 2020. Determine when it is prudent to switch to another Milestone product – See https://www.milestonesys.com/our-products/video-management-software/xprotect-enterprise/ for additional information.	Project	Medium	Medium	Medium		ASAP and before next Facility implementation	Risk Response plan acceptable.

4a	SOV Service Level/Staffing: BGS staff who implements and supports the proposed solution is very thin, as only one person knows how to support and configure the servers and milestone software.	Project	Medium	Medium	Medium		Ongoing	
5a	Project Management Staffing: No risk noted.							
6a	Project Schedule: No risk noted.							
7a	Infrastructure: Backup: There is no on site or off site backup. While the server RAID array provides some protection against disk failure, all video can still be lost. For example should 2 disks in a RAID 5 configuration fail, the entire array fails, and with no data backup, all video would be lost.	Project	High	High	High		ASAP	*Review Risk Response plan for steps necessary to mitigate risk.*
7b	Infrastructure: DR/BC: There is no formal DR/BC plan. There is an "extra" server preconfigured that can be deployed in the event of a failed server that falls outside of warranty, but the RTO of 1 week appears to be too long before resuming video capture.	Project	High	High	High		ASAP	*Review Risk Response plan for steps necessary to mitigate risk.*
7c	Infrastructure: Number of Days of Video Capture: During the IR, it was stated that 30 days of video capture is needed, but only 10 days of video is stored on the servers. Need clarity on how many days are needed, and if 30, need to size servers to adequately support that number of days.	Project	Medium	Medium	Medium		ASAP	Risk Mitigated. All sites have 30 days of video retention, except for SESCF, with 28 days.
8a	Scope/Functional Requirements: No risk noted.							
9a	Interoperability: No risk noted.							
10a	Compliance/Regulatory: No risk noted.							

11a	Security: Need to review whether solution is configured to support data encryption both at rest and in transit. It appears that the XProtect Enterprise solution supports at rest and in transit encryption, but it is not clear that the solution has been deployed or configured in that manner. See Appendix A for a description of data encryption options.	Project	High	High	High		Prior to contract execution	*Review Risk Response plan for steps necessary to mitigate risk.*
12a	Other: No Risk Noted.							

RISK RESPONSE:

Risk #:	State's Planned Risk Response and Reviewer's Assessment of State's Risk Response
1a	**STATE'S RISK RESPONSE:** *The amount listed for the implementation costs for NWSCF are misleading as there are $45,500 for internal staffing that are not charged to capital funds and $43,445 that are for all implementations, not only NWSCF. Additionally, the amount listed is from FY16 funds and does not include the FY17 allocation to support Facility issues. Additional funding for operations will be requested in future allocations per the Legislative cycle, which will include costs related to this project. From the report, a budget needs to be maintained by the BGS Capital Construction Budget Manager and DOC/BGS will use this information for each future allocation request to support implementation and operations. It is important to note that Capital requests are submitted bi-annually- implementation at additional sites does not begin until adequate funding is secured through this process. DOC has requested $1,000,000 in FY18 to support ongoing facility security issues.* **STATE RISK RESPONSE #2:** **REVIEWER'S ASSESSMENT:** The only funding source known for this project is from the Capital Bill, as listed below: FY2014: $100,000 (Section 4(a)(2), 4(b)(2) titled "Corrections - Security upgrades at facilities - supplemental Funding") FY2015: $100,000 (Section 4(a)(2), 4(b)(2) titled "Corrections - Security upgrades at facilities - supplemental Funding") FY2016: $100,000 (Section #: 4(a)(2), titled "DOC Cameras and Systems") FY2017: $0 (Section #: 4(a)(2), titled "DOC Cameras and Systems") If as is noted above, the "FY17 allocation to support Facility issues" is in fact a funding source, please provide which Section in the Capital Budget is the funding source and an acknowledgement from BGS, DOC, or AHS budget authorization that those funds may be allocated to this project. If future funding sources are going to be requested in FY18, that is good to note. It would make sense to clarify which of the $1M request is to be allocated to the Cameras and Systems project, as has been done in prior years. **REVIEWER'S ASSESSMENT #2:** Discussed during Independent Review meeting of 12/8/2016, Capital and Operational funding will be requested, but is not yet committed.
2a	**STATE'S RISK RESPONSE:** *Cabling is provided through DII Network oversight. This issue needs to be addressed by DII Networking if there are statements of work being completed with vendors that are not on contract. However, CFW & Omega are on the statewide electrical contract. DOC/BGS agree that Contracts should be in place for these services to be procured from. At this time, the Division of Purchasing and Contracting is reviewing the statewide electrical contracts and discussions are underway to consolidate and incorporate all data cabling and security work into this overarching contract. Prior to NWSCF no contracts were issued to cover equipment, therefore all equipment was purchased through the procurement process of either an RFP, a purchase authorization or the dollar amount was under the threshold for procurement process. Since NWSCF, BGS has entered into contracts with two equipment venders which will cover any future purchases.* **REVIEWER'S ASSESSMENT:** As BGS generates contracts with contractors, it is the Independent Reviewer's understanding that BGS has access to the CFW contract. Can BGS provide the Independent Reviewer a copy of the CFW contract? Additionally, the risk also mentions the ADI contract, which is not addressed in the Risk Response. Can BGS provide the Independent Reviewer a copy of the ADI contract? Further, there is a difference in understanding regarding how cabling/electrical SOWs have been issued for this project, with BGS stating that DII is procuring cabling work, and DII indicating that BGS is procuring cabling work. We can discuss this point during the IR meeting on 10/31.

	REVIEWER'S ASSESSMENT #2: It is the Reviewer's understanding that Departments ultimately pay the cabling bills and those bills are allocated to that Department budget or other source, but not to DII. Departments may or may not receive design assistance from DII on cabling projects. Risk is mitigated through additional information provided in how cabling contracts work.
3a	**STATE'S RISK RESPONSE:** *SLAs have been requested and researched in the past, which DOC/BGS agree should be in place. Switch to Milestone Expert or Pro can be obtained with the premium care software license agreement and support package. AccessGate offers a full 4-year lifecycle warranty less the drives on the hardware. This will add costs to operations at each location and will need to be addressed with risk 1a. DOC/BGS will work together on the requirement needed for the SLAs with Access Gate and Milestone to ensure the correct support is requested and in place moving forward.* *Additionally BGS Security has contracts in place with venders for service and installation of smaller scale security projects (under $25,000). If a camera were to need replacement or repair, these venders can be used for this and their existing contract outlines expectations.* **REVIEWER'S ASSESSMENT:** Once the SLAs are defined and reviewed with DII Enterprise Architecture group for validity, this risk will be considered mitigated.
3b	**STATE'S RISK RESPONSE:** *BGS determined the software initially for procurement and lifecycle, which there was no mention of end of life by the vendor at the time. DOC/BGS will work on gathering requirements to determine the best solution moving forward. DOC/BGS will discuss the timing of the current implementation schedule with the need to upgrade software and plan accordingly on when the transition to a different software solution needs to occur.* **REVIEWER'S ASSESSMENT:** Risk Response plan acceptable.
4a	**STATE'S RISK RESPONSE:**
5a	**STATE'S RISK RESPONSE:** N/A. No risk noted.
6a	**STATE'S RISK RESPONSE:** N/A. No risk noted.
7a	**STATE'S RISK RESPONSE:** *DOC/BGS and Legal Counsel have discussed this in the past and solutions have been cost prohibitive. It was stated that the Network could not handle the traffic to maintain an offsite backup system and there were no funds to procure redundant servers or expand the Network capacity at the time. DOC as the end user has accepted this risk for this reason. If the implementation of the project is dependent upon having suitable redundant servers onsite, the additional $40,000 average cost per server per site will need to be considered along with the other financial risk items with risk 1a and backups should be planned and executed in coordination with DII server team.* **REVIEWER'S ASSESSMENT:**

	Review Risk Response plan with DII Enterprise Architecture group for acceptance. Would an on-site backup solution address this issue, and cost much less than a $40K server? **REVIEWER'S ASSESSMENT #2:** Discussed during Independent Review meeting of 12/8/2016, and added $5K per site for backup solution. When backup solution implemented, this risk will be considered mitigated.
7b	**STATE'S RISK RESPONSE:** *Similar to risk 7a, DOC/BGS and Legal Counsel have discussed this in the past and solutions have been cost prohibitive. There is a forensic unit through Champlain College that AHS has an agreement with for services to retrieve video from servers for legal and other reasons, but all parties agreed and accepted the risk of a 1 week timeline to re-establish connections using the current backup server. If the implementation of the project is dependent upon having suitable redundant servers onsite, the additional $40,000 average cost per server per site mentioned in risk 7a will need to be considered along with the other financial risk items with risk 1a. DOC/BGS will explore training additional staff and/or issuing an RFP to have a vender on retainer contract to shorten the 1 week timeline for re-establishment.* **REVIEWER'S ASSESSMENT:** Review Risk Response plan with DII Enterprise Architecture group for acceptance. Would an on-site backup solution provide adequate BC/DR, and cost much less than a $40K server? **REVIEWER'S ASSESSMENT #2:** Discussed during Independent Review meeting of 12/8/2016, and BGS to develop Business Continuity Plan to define action steps to take and define RTO (Recovery Time Objective) when a server failure occurs. When Business Continuity Plan developed by BGS and accepted by DOC, this risk will be considered mitigated.
7c	**STATE'S RISK RESPONSE:** *The independent Reviewer's comment is based on the AccessGate contact's response that servers are normally configured for only 10 days of video storage, whereas the BGS server configuration is stated to be at 30 days. Since the report stated a discrepancy, DOC/BGS are validating the actual amount of time the video is stored at each location (more information will be gathered by 10/28). DOC has additional concern with these numbers as there is agreement and understanding with the Human Rights Commission that 30 days are to be maintained with the ability to retrieve and store specific video footage for legal reasons. If it is determined that the server capacity isn't large enough for the video storage needed, a larger server will need to be procured to meet the demand at each location and DII staff will be consulted to determine the necessary size prior to purchase and will need to be considered along with the other financial risk items with risk 1a.* **REVIEWER'S ASSESSMENT:** Awaiting results of the number of days of video storage analysis. **REVIEWER'S ASSESSMENT #2:** Per email of 10/28/2016: From: Gough, Travis Sent: Friday, October 28, 2016 11:34 AM To: Herring, Lucas <Lucas.Herring@vermont.gov> Cc: Arnell, Bob <Bob.Arnell@vermont.gov>; Klark, Marjorie <Marjorie.Klark@vermont.gov>; Touchette, Mike <Mike.Touchette@vermont.gov> Subject: Camera Server Retention I have verified all Milestone Servers are at 30 days for Retention. CRCF is borderline with only 1.18 TB of Storage Free. We will need to upgrade the drives or add a DAS soon if we want to keep the 30 days as we just replaced 4 cameras with new IP HD Cameras. This will affect the retention even at 5FPS. Risk is mitigated through additional information provided. All sites have 30 days of video retention, except for SESCF, with 28 days.

8a	**STATE'S RISK RESPONSE:** N/A. No risk noted.
9a	**STATE'S RISK RESPONSE:** N/A. No risk noted.
10a	**STATE'S RISK RESPONSE:** N/A. No risk noted.
11a	**STATE'S RISK RESPONSE:** *BGS states that there has never been any "encryption" with data in the prior system being replaced, PELCO, or in the Milestone system. This is because the State does not move data beyond or outside the State Network, Govnet, and all servers reside behind the states firewall. The system is not open to cloud services and there has never been any security concern of encrypting data. If encryption is needed in the future, we can configure that way.* Plan to try this at MVRCF as of 12/8/2016. **REVIEWER'S ASSESSMENT:** Review Risk Response plan with DII Chief Information Security Officer for acceptance. **REVIEWER'S ASSESSMENT #2:** Discussed during Independent Review meeting of 12/8/2016, and BGS to conduct a trial with MVRCF through configuring Milestone to encrypt data. When encryption is successfully implemented, this risk will be considered mitigated.
12a	**STATE'S RISK RESPONSE:** N/A. No risk noted.

Appendix A

Additional Resources:

- Milestone contact: Dennis Fortune; djf@milestone.us – 978-793-0804
- Milestone documentation (which is attached: (Ensuring_end-to-end_protection_of_video_integrity_XProtect_Smart_Client.pdf).

Description of Milestone Systems Corporate encryption:

Data in Transit: Per page 7 of the attached "Ensuring_end-to-end_protection_of_video _integrity_XProtect_ Smart_Client.pdf", there are two methods of encrypting data. It is the Independent Reviewer's understanding that neither of the two methods below are deployed:

1. A virtual private network (VPN) tunnel can be set up between the camera and Recording Server using standard equipment or software. The VPN will encrypt all data transmitted through the tunnel and thus protect against unauthorized access to the video. Using a VPN is a generic solution that can be used with any camera.
2. HTTP Secure (HTTPS) for a subset of cameras.

Data at Rest: It is the Independent Reviewer's understanding that neither of the two methods below are deployed:

1. The database can be configured to encrypt the recordings in two modes: "Light" and "Strong" or
2. The database can be set to sign the recordings digitally to prevent tampering

Both of the database encryption modes "Light" and "Strong" are secure and use the same DES-56 encryption technology. The difference is how much of the recordings are encrypted.

1. Strong" encrypts all parts of the video data stored in the database but requires more processing power to do so because everything needs to be encrypted
2. "Light" only encrypts the first part of the JPEG or MPEG-4/H.264 video data called the header, and because of this, it uses less processing power to encrypt the video. The video will still be secure if someone tries to hack the database because the video cannot be decoded without the information contained in the encrypted header

Digital signature: The digital signature is created by calculating a Message-Digest 5 (MD5) algorithm hash of the recordings. The hash is then signed with a Digital Signature Algorithm (DSA) and stored with the recordings. If the content later on is changed or parts of the recordings are removed, the MD5 hash and signature will no longer match, making it possible to detect that the recordings have been tampered with. Enabling encryption and digital signature of the recordings does not alter the actual recorded audio or video content in any way. If the recorded audio or video contains some form of embedded watermark information, it will still be possible to verify the authenticity of the audio or video, either by the camera vendor or by a method/tool provided by the camera vendor.

DOC: Cameras and Systems Project

STATEMENT OF: Use of Funds (Expenses), Source of Funds (Revenue), Cash Flow, and Net Change in Operating Cost

Click on the links to the left to go to that data

CASH FLOW ANALYSIS: Click Here

SUMMARY:		IMPLEMENTATION and OPERATING COSTS:		
Total Cost:	$3,657,423	Implementation Costs:	$2,327,943	
Total Funding:	$1,326,138	New Operating Costs:	$1,329,480	
State Funding:	$1,326,138	Current Operating Costs:	$392,000	
Federal Funding:	$0			
Potential Revenue Recovery:	$0	NET CHANGE IN OPERATING COSTS-Decr./(Incr.):		($937,480)
Funding Excess/(Shortage):	($2,331,286)		State Decrease/(Increase):	($937,480)
			Federal Decrease/(Increase):	$0

USE OF FUNDS - START

Description	Note	Unit Price	Impl/Ops	Total	Units	Prior Costs	IMP-Completed (FY15) - MVRCF Rutland	IMP-Completed (FY16) - NSCF - Newport	IMP-In Progress (FY17) - NWSCF St. Albans	IMP-Future (FY17) - SSCF Springfield	IMP-Future (FY18) - NECC St. Johnsbury	IMP-Future (FY19) - CRCF S. Burlington	IMP-Future (FY20) - SESCF Windsor	M&O Year 2 (FY18)	M&O Year 3 (FY19)	M&O Year 4 (FY20)	M&O Year 5 (FY21)	M&O Year 6 (FY22)	M&O Year 7 (FY23)	M&O Year 8 (FY24)	M&O Year 9 (FY25)	M&O Year 10 (FY26)	Software Total
EXTERNAL-RELATED COSTS																							
VENDOR COSTS																							
SOFTWARE AND SERVICES																							
SOFTWARE ❶																							
Software Being Licensed:																							
Camera Count							34	128	104	318	83	155	135										
MILESTONE SYSTEMS - XPEBL- XProtect Enterprise Base License	Cost Range from $1109 to $1154		I				$1,154	$1,154	$1,154	$1,154	$1,154	$1,154	$1,154										$8,078
MILESTONE SYSTEMS - YXPEBL- XProtect Enterprise Base License Annual Support	18% of XPEBL license fees		O				$0	$0	$0	$0	$0	$0	$0	$1,454	$1,454	$1,454	$1,454	$1,454	$1,454	$1,454	$1,454	$1,454	$13,086
MILESTONE SYSTEMS - XPECL - XProtect Camera License	A function of the number of cameras; Pricing from $149.25 to $169.15	$169.15	I				$5,751	$21,651	$17,592	$53,705	$13,955	$26,218	$22,835										$161,707
MILESTONE SYSTEMS - YXPECL - XProtect Camera License Milestone Care PLUS	18% of YXPECL license fees		O				$0	$0	$0	$0	$0	$0	$0	$29,107	$29,107	$29,107	$29,107	$29,107	$29,107	$29,107	$29,107	$29,107	$261,966
MILESTONE SYSTEMS - Milestone Care PREMIUM	One time fee of $1500 plus 7% of YXPECL license fees	Optional should a Technical Support Service Level Agreement be desired with Milestone	O				$1,500	$0	$0	$0	$0	$0	$0	$11,320	$11,320	$11,320	$11,320	$11,320	$11,320	$11,320	$11,320	$11,320	$103,376
Variable Costs:																							
None							$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
SOFTWARE TOTAL							**$8,405**	**$22,805**	**$18,746**	**$54,859**	**$15,109**	**$27,372**	**$23,989**	**$41,881**	**$41,881**	**$41,881**	**$41,881**	**$41,881**	**$41,881**	**$41,881**	**$41,881**	**$41,881**	**$548,213**
SERVICES																							
			Impl/Ops				Prior Costs		Current Costs	Future Costs													
Implementation																							
Cabling and Camera Installation:							**Peck Electric**	**CFW Electric**	**Omega Electric**	**TBD**	**TBD**	**TBD**	**TBD**										$0
Actual Cabling Costs (known)			I				$21,000	$77,500															$98,500
NWSCF Cabling Job (detailed):																							
Main Building; 33 new, 38 replaced			I				$0	$0	$39,988	$0	$0	$0	$0										$39,988
I&J Units; 5 new, 2 replaced			I				$0	$0	$3,359	$0	$0	$0	$0										$3,359
VCI Building; 8 new, 1 replaced			I				$0	$0	$4,979	$0	$0	$0	$0										$4,979
Auto Shop; 4 new			I				$0	$0	$1,397	$0	$0	$0	$0										$1,397
Silva Building, 3 new, 3 replaced			I				$0	$0	$1,474	$0	$0	$0	$0										$1,474
Perimeter Fence, 7 new			I				$0	$0	$94,682														$94,682
Estimated Cabling Costs:																							
Per Camera			I							$190,500	$49,500	$93,000	$81,000										$414,000
Perimeter			I							$94,682	$0	$0	$94,682										$189,364
Variable Costs																							$0
None noted			I				$0	$0	$0	$0	$0	$0	$0										$0
																							$0
Other																							$0
Contingency			I				$0	$0	$0	$0	$0	$0	$0										$0
																							$0
TOTAL: IMPLEMENTATION SERVICES						$0	$21,000	$77,500	$145,879	$285,182	$49,500	$93,000	$175,682	$0	$0	$0	$0	$0	$0	$0	$0	$0	$847,743
Other Services:																							
None noted							$0	$0	$0	$0	$0	$0	$0										$0
Other Services Total:							**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
SERVICES TOTAL						$0	$21,000	$77,500	$145,879	$285,182	$49,500	$93,000	$175,682	$0	$0	$0	$0	$0	$0	$0	$0	$0	$847,743
SOFTWARE AND SERVICES TOTAL						$0	$29,405	$100,305	$164,625	$340,041	$64,609	$120,372	$199,671	$41,881	$41,881	$41,881	$41,881	$41,881	$41,881	$41,881	$41,881	$41,881	$1,395,956
MAINTENANCE AND OPERATIONS SUPPORT																							
Server and Workstation Maintenance			O				$0	$0	$0	$0	$0	$0	$0	$0	$2,000	$4,000	$6,000	$8,000	$10,000	$12,000	$12,000	$12,000	$66,000
MAINTENANCE AND OPERATIONS SUPPORT TOTAL				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,000	$4,000	$6,000	$8,000	$10,000	$12,000	$12,000	$12,000	$66,000
HARDWARE	Unit Price				Qty for NWSCF																		
Hardware for Implementation																							
Server:																							
ACCESS GATE AGS-HD253-1608-5N 18TB NVR		$15,986.00	I		0		$0	$0	$0	$0	$0	$0	$0										$0
ACCESS GATE NET AGS-HD-254-4848-6HC		$42,718.00	I		1		$42,718	$42,718	$42,718	$42,718	$42,718	$42,718	$42,718										$299,026
Workstation:																							
HP Workstation / Client PC 8 Monitor Support		$3,000.00	I		1		$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000										$21,000
ACCESS GATE AGS-WSXE-8 Workstation		$7,300.00	I		1		$7,300	$7,300	$7,300	$7,300	$7,300	$7,300	$7,300										$51,100
ACCESS GATE AGS-SFF NG17NUC		$2,176.00	I		0		$0	$0	$0	$0	$0	$0	$0										$0
Switch:																							
Cisco 24 port POE Network Switch		$2,700.00	I		0		$2,700	$0	$0	$0	$0	$0	$0										$2,700
Cisco 48port POE Network Switch		$4,700.00	I		2		$0	$9,400	$9,400	$28,200	$4,700	$14,100	$14,100										$79,900

Camera:																										
Bullet			$507.00	I		0		$0	$0	$0	$0	$0	$0	$0											$0	
Dome			$566.00	I		0		$0	$0	$0	$0	$0	$0	$0											$0	
Fixed																									$0	
AXIS P3215-VE Outdoor Fixed; Part#: 0615-001			$553.00	I		86		$14,378	$69,125	$14,378	$61,383	$5,530	$30,415	$25,991											$221,200	
AXIS 1080P IP FIXED O/D WDR DO; Part#: 0619-001			$938.00	I		2		$0	$0	$0	$0	$0	$0	$0											$0	
AXIS P1425-LE; Part# 0623-001			$525.00	I		4		$0	$0	$0	$0	$0	$0	$0											$0	
AXIS Q8414-LVS Network Camera, Met; Part#: 0709-001			$976.00	I		9		$0	$0	$0	$0	$0	$0	$0											$0	
Pan-Tilt-Zoom																										
SAMSUNG 2NP 150M IR PTZ HD 1080P; Part#: SNP6320RH			$2,164.00	I		17		$17,312	$6,492	$36,788	$34,624	$2,164	$17,312	$15,148											$129,840	
AXIS Q6115E/ PTZ/ 1080P/ 30X; Part#: 0652-004			$2,253.00	I		1		$0	$0	$2,253	$0	$0	$0	$0											$2,253	
Backup Solution			$5,000.00	I		1		$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000											$35,000	
Monitor:																										
32" monitor			$350.00	I		15		$1,575	$6,300	$5,250	$15,750	$525	$7,875	$6,825											$44,100	
48" monitor			$540.00	I		1		$540	$540	$540	$540	$540	$540	$540											$3,780	
Mounting Hardware:																										
Wall or Pole Mount			$36.00	I		13		$140	$562	$468	$1,404	$47	$702	$608											$3,931	
AXIS Wall or Pole Mount			$73.00	I		0		$0	$0	$0	$0	$0	$0	$0											$0	
Pack of 5 Conduit Bracket			$30.00	I		18		$162	$648	$540	$1,620	$54	$810	$702											$4,536	
Pole Mount			$60.00	I		2		$36	$144	$120	$360	$12	$180	$156											$1,008	
Back Box			$22.00	I		4		$26	$106	$88	$264	$9	$132	$114											$739	
Back Box for SBP-3			$40.00	I		13		$156	$624	$520	$1,560	$52	$780	$676											$4,368	
Mounting Plate			$22.00	I		4		$26	$106	$88	$264	$9	$132	$114											$739	
Pendant Kit			$36.00	I		1		$11	$43	$36	$108	$4	$54	$47											$302	
Ceiling Mount			$90.00	I		1		$27	$108	$90	$270	$9	$135	$117											$756	
AXIS Weathershield Kit			$22.00	I		2		$13	$53	$44	$132	$4	$66	$57											$370	
Microphone 3.5mm			$105.00	I		2		$63	$252	$210	$630	$21	$315	$273											$1,764	
Pole Mount Adapter			$36.00	I		7		$76	$302	$252	$756	$25	$378	$328											$2,117	
Corner Mount			$36.00	I		6		$65	$259	$216	$648	$22	$324	$281											$1,814	
Long Arm Wall Mount			$181.00	I		2		$109	$434	$362	$1,086	$36	$543	$471											$3,041	
Output Outdoor CCTV Power Supply	Only needed for yard cabling		$130.00	I		15		$0	$0	$1,950	$5,850	$0	$0	$2,535											$10,335	
Other:																										
Tripplite UPS			$650.00	I		1		$650	$650	$650	$650	$650	$650	$650											$4,550	
Tripplite 48U Rack			$1,600.00	I		1		$1,600	$1,600	$1,600	$1,600	$1,600	$1,600	$1,600											$11,200	
Misc Materials / Cables / Hardware			$1,000.00	I		1		$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000											$7,000	
Hardware for Operations	Assume 10% annual maintenance cost for equipment			O	$0			$9,868	$15,677	$13,486	$21,672	$7,503	$13,606	$13,035		$9,868	$25,545	$39,031	$60,703	$68,206	$81,812	$94,847	$94,847	$94,847	$664,552	
HARDWARE TOTAL								$108,552	$172,442	$148,347	$238,389	$82,533	$149,667	$143,386		$9,868	$25,545	$39,031	$60,703	$68,206	$81,812	$94,847	$94,847	$94,847	$1,613,022	
					$0			$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
HOSTING FEES			Impl/Ops																							
Internally hosted, so $0				O				$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
HOSTING TOTAL								$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
OTHER FEES																										
Independent Review				I				$0	$0	$13,895	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$13,895	
																									$0	
OTHER TOTAL					$0	$0	$0	$0	$0	$13,895	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$13,895	
TOTAL VENDOR COSTS					$0		$0	$137,957	$272,748	$326,867	$578,430	$147,142	$270,039	$343,058		$51,749	$69,426	$84,912	$108,584	$118,087	$133,693	$148,728	$148,728	$148,728	$3,088,873	
DII FEES																										
Oversight Project Manager/Enterprise Architect - Flat Rate				I	$0			$0	$0	$29,550	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$29,550	
DII FEES TOTAL								$0	$0	$29,550	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$29,550	
TOTAL EXTERNAL-RELATED COSTS							$0	$137,957	$272,748	$356,417	$578,430	$147,142	$270,039	$343,058		$51,749	$69,426	$84,912	$108,584	$118,087	$133,693	$148,728	$148,728	$148,728	$3,118,423	
INTERNAL COSTS																										
DEPARTMENTAL INTERNAL COSTS			Impl/Ops																							
Staff Development/Training				O				$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Travel and Expenses				I				$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
WAN Costs				O				$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Current Solution Maintenance				O				$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Other 3rd Party Software				I				$0	$0	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Staffing Costs: ❷	Assuming $70K fully loaded																									
State Staff: Implementation	Proj Mgt	5% FTE from DOC		I				$3,500	$3,500	$3,500	$3,500	$3,500	$3,500	$3,500		$0	$0	$0	$0	$0	$0	$0	$0	$0	$24,500	
	Implementation	50% FTE from BGS		I				$35,000	$35,000	$35,000	$35,000	$35,000	$35,000	$35,000		$0	$0	$0	$0	$0	$0	$0	$0	$0	$245,000	
	Other	10% FTE from DOC		I				$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000		$0	$0	$0	$0	$0	$0	$0	$0	$0	$49,000	
State Staff: Operations	Regular, ongoing support	25% FTE from BGS		O				$0	$0	$0	$0	$0	$0	$0		$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$157,500	
	Regular, ongoing support	10% FTE from DOC		O				$0	$0	$0	$0	$0	$0	$0		$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$63,000	
DEPARTMENTAL INTERNAL COSTS TOTAL								$45,500	$45,500	$45,500	$45,500	$45,500	$45,500	$45,500		$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$539,000	
TOTAL INTERNAL COSTS								$45,500	$45,500	$45,500	$45,500	$45,500	$45,500	$45,500		$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$539,000	
TOTAL COSTS (IMPLEMENTATION and OPERATIONS)							$0	$183,457	$318,248	$401,917	$623,930	$192,642	$315,539	$388,558		$76,249	$93,926	$109,412	$133,084	$142,587	$158,193	$173,228	$173,228	$173,228	$3,657,423	
COST BREAKOUT (IMPLEMENTATION and OPERATIONS)																										
Implementation							$0	$172,088	$302,571	$388,431	$602,258	$185,139	$301,933	$375,522		$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,327,943	
Operations							$0	$11,368	$15,677	$13,486	$21,672	$7,503	$13,606	$13,035		$76,249	$93,926	$109,412	$133,084	$142,587	$158,193	$173,228	$173,228	$173,228	$1,329,480	
COST BREAKOUT TOTALS (IMPLEMENTATION and OPERATIONS)							$0	$183,457	$318,248	$401,917	$623,930	$192,642	$315,539	$388,558		$76,249	$93,926	$109,412	$133,084	$142,587	$158,193	$173,228	$173,228	$173,228	$3,657,423	$0

USE OF FUNDS - END

SOURCE OF FUNDS - START

Revenue Source:				Prior	(FY15) - MVRCF Rutland	(FY16) - NSCF - Newport	(FY17) - NWSCF St. Albans	(FY17) - SSCF Springfield	(FY18) - NECC St. Johnsbury	(FY19) - CRCF S. Burlington	(FY20) - SESCF Windsor	Year 2 (FY18)	Year 3 (FY19)	Year 4 (FY20)	Year 5 (FY21)	Year 6 (FY22)	Year 7 (FY23)	Year 8 (FY24)	Year 9 (FY25)	Year 10 (FY26)	TOTAL
																					$0
Assume Year 1 is Implementation related, Years 2-x are Operations related																					
❸																					
STATE FUNDING 2013; Dept Code: 1305100041 (Corrections Cameras and Systems) **Implementation**	7.49%	Spent $99K	I	$0	$99,000	$0	$391	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$99,391
STATE FUNDING 2014; Dept Code: 1405100042 (Corrections Cameras and Systems) **Implementation**	18.79%	Spent $191,476	I	$0	$0	$191,476	$57,709	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$249,185
STATE FUNDING 2015; Dept Code: 1502600041 (Corrections Cameras and Systems) **Implementation**	7.50%	Spent $2400	I	$0	$0	$2,400	$97,073	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$99,473
STATE FUNDING 2016; Dept Code: 1602600042 (Corrections Cameras and Systems) **Implementation**	7.47%	Spent $0	I	$0	$0	$0	$99,089	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$99,089
STATE FUNDING 2017: (Corrections Cameras and Systems) **Implementation**	0.00%	No funding in Capital Bill for Corrections Cameras and Systems	I	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
STATE FUNDING: **Operations - DOC Security Budget**	18.10%	$20K in budget annually	O	$0	$20,000	$20,000	$20,000	$0	$20,000	$20,000	$20,000	$0	$0	$0	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$240,000
STATE FUNDING: **Operations - AHS Central Office**	10.29%	Covers DOC staff assigned to this project	O	$0	$10,500	$10,500	$10,500	$10,500	$10,500	$10,500	$10,500	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$136,500
STATE FUNDING: **Operations - BGS Fee For Service**	30.35%	Covers BGS staff assigned to this project	O	$0	$35,000	$35,000	$35,000	$35,000	$35,000	$35,000	$35,000	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$402,500
FEDERAL FUNDING:None	0.00%			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL:	100.00%			$0	$164,500	$259,376	$319,762	$45,500	$65,500	$65,500	$65,500	$24,500	$24,500	$24,500	$44,500	$44,500	$44,500	$44,500	$44,500	$44,500	$1,326,138

Summary by State and Federal:

		Prior	(FY15) - MVRCF Rutland	(FY16) - NSCF - Newport	(FY17) - NWSCF St. Albans	(FY17) - SSCF Springfield	(FY18) - NECC St. Johnsbury	(FY19) - CRCF S. Burlington	(FY20) - SESCF Windsor	Year 2 (FY18)	Year 3 (FY19)	Year 4 (FY20)	Year 5 (FY21)	Year 6 (FY22)	Year 7 (FY23)	Year 8 (FY24)	Year 9 (FY25)	Year 10 (FY26)
State Funding	**$1,326,138**	0	$164,500	$259,376	$319,762	$45,500	$65,500	$65,500	$65,500	$24,500	$24,500	$24,500	$44,500	$44,500	$44,500	$44,500	$44,500	$44,500
Federal Funding:	**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

		Funding Overage/(Shortage):
Implementation Funds:	$547,138	
Implementation Costs:	$2,327,943	($1,780,806)
Operational Funds:	$779,000	
Operational Costs:	$1,329,480	($550,480)

SOURCE OF FUNDS - END

PROJECT CASH FLOW - START

	Prior	(FY15) - MVRCF Rutland	(FY16) - NSCF - Newport	(FY17) - NWSCF St. Albans	(FY17) - SSCF Springfield	(FY18) - NECC St. Johnsbury	(FY19) - CRCF S. Burlington	(FY20) - SESCF Windsor	Year 2 (FY18)	Year 3 (FY19)	Year 4 (FY20)	Year 5 (FY21)	Year 6 (FY22)	Year 7 (FY23)	Year 8 (FY24)	Year 9 (FY25)	Year 10 (FY26)	TOTAL
IMPLEMENTATION																		
Use	$0	$172,088	$302,571	$388,431	$602,258	$185,139	$301,933	$375,522	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,327,943
Source	$0	$99,000	$193,876	$254,262	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$547,138
Net Cash by Fiscal Year:	$0	($73,088)	($108,695)	($134,169)	($602,258)	($185,139)	($301,933)	($375,522)	$0	$0	$0	$0	$0	$0	$0	$0	$0	($1,780,806)
Cash Flow:	$0	($73,088)	($181,783)	($315,952)	($918,211)	($1,103,350)	($1,405,283)	($1,780,806)	($1,780,806)	($1,780,806)	($1,780,806)	($1,780,806)	($1,780,806)	($1,780,806)	($1,780,806)	($1,780,806)	($1,780,806)	($1,780,806)

	Prior	(FY15) - MVRCF Rutland	(FY16) - NSCF - Newport	(FY17) - NWSCF St. Albans	(FY17) - SSCF Springfield	(FY18) - NECC St. Johnsbury	(FY19) - CRCF S. Burlington	(FY20) - SESCF Windsor	Year 2 (FY18)	Year 3 (FY19)	Year 4 (FY20)	Year 5 (FY21)	Year 6 (FY22)	Year 7 (FY23)	Year 8 (FY24)	Year 9 (FY25)	Year 10 (FY26)	TOTAL
OPERATIONS																		
Use	$0	$11,368	$15,677	$13,486	$21,672	$7,503	$13,606	$13,035	$76,249	$93,926	$109,412	$133,084	$142,587	$158,193	$173,228	$173,228	$173,228	$1,329,480
Source	$0	$35,000	$35,000	$35,000	$35,000	$35,000	$35,000	$35,000	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$17,500	$402,500
Net Cash by Fiscal Year:	$0	$23,632	$19,323	$21,514	$13,328	$27,497	$21,394	$21,965	($58,749)	($76,426)	($91,912)	($115,584)	($125,087)	($140,693)	($155,728)	($155,728)	($155,728)	($926,980)
Cash Flow:	$0	$23,632	$19,323	$21,514	$36,960	$46,820	$42,908	$58,925	$176	($76,250)	($168,162)	($283,746)	($408,832)	($549,525)	($705,253)	($860,981)	($1,016,709)	($926,980)
NET Cash Flow:	$0	($49,457)	($138,828)	($251,483)	($840,413)	($998,056)	($1,278,595)	($1,632,152)	($1,690,902)	($1,767,327)	($1,859,239)	($1,974,823)	($2,099,910)	($2,240,602)	($2,396,330)	($2,552,058)	($2,707,786)	$0

CASH FLOW - END

NET CHANGE IN OPERATING COSTS - START

			Year 1 (FY17)	Year 1 (FY17)	Year 1 (FY17)	Year 1 (FY17)	Year 1 (FY17)	Year 1 (FY17)	Year 1 (FY17)	Year 2 (FY18)	Year 3 (FY19)	Year 4 (FY20)	Year 5 (FY21)	Year 6 (FY22)	Year 7 (FY23)	Year 8 (FY24)	Year 9 (FY25)	Year 10 (FY26)	TOTAL
Proposed Operating Costs:																			
Total New Operating Costs	*Per Row 149*		$11,368	$15,677	$13,486	$21,672	$7,503	$13,606	$13,035	$76,249	$93,926	$109,412	$133,084	$142,587	$158,193	$173,228	$173,228	$173,228	$1,329,480
Total: Proposed Operating Costs:			$11,368	$15,677	$13,486	$21,672	$7,503	$13,606	$13,035	$76,249	$93,926	$109,412	$133,084	$142,587	$158,193	$173,228	$173,228	$173,228	$1,329,480
Current Operating Costs:																			
Staffing:																			
State Labor Hours to maintain current solution	Regular, ongoing support	25% FTE from BGS; 10% from DOC	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$24,500	$392,000

Annual Maintenance of Current Solution: None noted	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total: Current Operating Costs:	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$24,500***	***$392,000***
Net Operating Cost Decrease/(Increase)	**$13,122**	**$8,823**	**$11,014**	**$2,828**	**$16,997**	**$10,894**	**$11,465**	**($51,749)**	**($69,426)**	**($84,912)**	**($108,588)**	**($118,087)**	**($133,690)**	**($148,728)**	**($146,728)**	**($148,728)**	**($937,480)**	

NET CHANGE IN OPERATING COSTS - END

NOTES / ASSUMPTIONS:

1. Software on Local Server Model
2. Staffing levels anticipated through this project
3. Funding Sources

The open platform company

Milestone Systems

XProtect® Advanced VMS 2016

System Architecture Document

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All names of people and organizations used in the examples in this text are fictitious. Any resemblance to any actual organization or person, living or dead, is purely coincidental and unintended.

This product may make use of third party software for which specific terms and conditions may apply. When that is the case, you can find more information in the file **3rd_party_software_terms_and_conditions.txt** located in your Milestone system installation folder.

Introduction

The Milestone XProtect® Advanced VMS 2016 System Architecture Document contains illustrations and descriptions of communication and dataflow between the most common system components in a distributed installation of XProtect® Corporate or XProtect® Expert.

The document shows a range of scenarios with a supporting illustration and a description of actions supplemented by information about port numbers, protocols and bandwidth usage.

The illustrations are simplified and primarily focus on the general dataflow between system components. This means that less important flows may have been omitted in order to reduce the level of complexity.

Target audience and purpose

This document's primary audience is system integrators and IT administrators with limited experience and knowledge about Milestone XProtect Advanced VMS solutions and who are in the process of selecting, deploying, administrating, maintaining and expanding a VMS.

The purpose of the document is to provide insight to the benefits and simplicity of using Milestone XProtect Expert and Corporate as a VMS, including an introduction of the system components and the system architecture.

This document should enable the reader to understand:

- The overall system architecture
- The primary system components and their functions
- Provide guidelines to basic system design

The reader of the document should have general experience with administrating an IT installation.

Overall system architecture

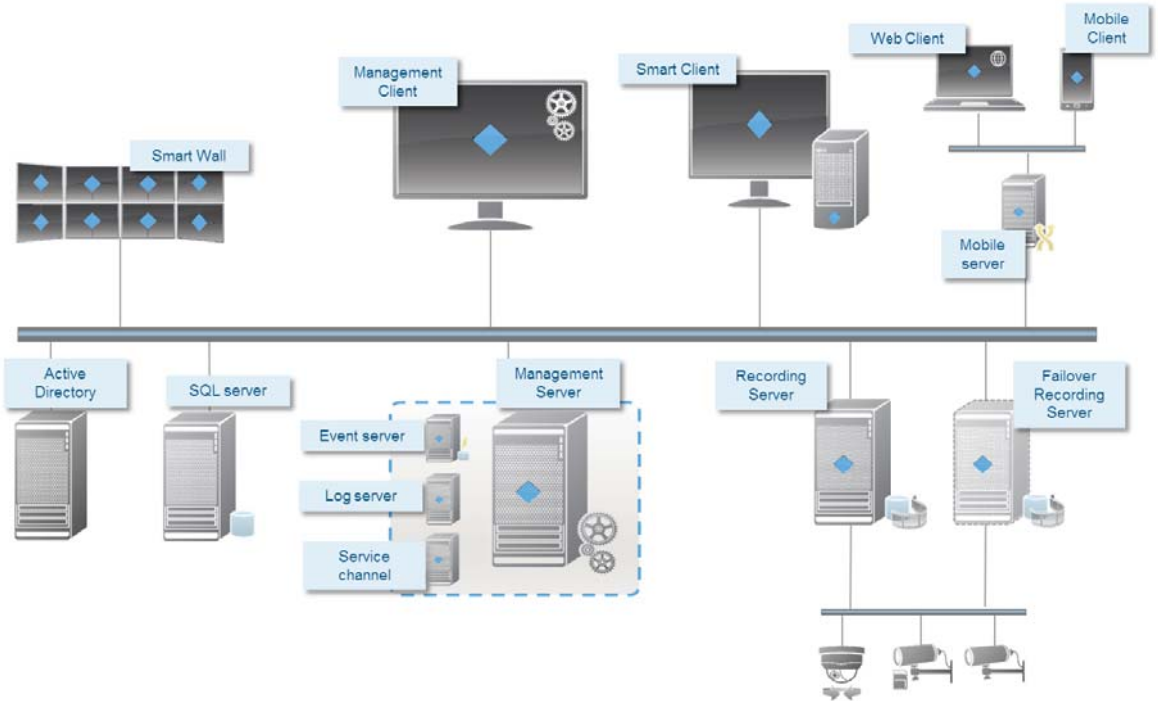
To enable scaling of thousands of cameras across multiple sites, the system consists of several components that handle specific tasks. You can install all components on a single server if the server can handle the load, or you can install the components on separate, dedicated servers to scale and distribute the load.

Depending on hardware and configuration, smaller systems with between 50~100 cameras can run on a single server.

For systems with more than 100 cameras, Milestone recommends that you use dedicated servers for all or some of the components.

You do not need all components in all installations. However, you can add them if the functionality they offer is needed at a later time, for example, failover recording servers or Mobile servers for hosting and providing access to both XProtect Web Client and Milestone Mobile.

The diagram below shows an overview of the system components.



Note:

- XProtect Expert does not support failover recording servers.
- XProtect Smart Wall is an add-on product for XProtect Expert.

Server components

Management server

The management server is the central VMS component. It handles the system configuration, distributes the configuration to other system components,such as the recording servers, and facilitates user authentication.

The configuration is stored on a standard Microsoft SQL server installed on either the management server itself or on a separate dedicated server.

Failover management server

You can get failover support on the management server by installing the management server in a Microsoft windows cluster. The cluster ensures that another server takes over the management server function in case the first server fails.

For more information on configuring Failover Clusters in Windows Server 2008 R2, see http://technet.microsoft.com/en-us/library/ff182338(v=ws.10).aspx

For more information on configuring Failover Clusters in Windows Server 2012, see http://technet.microsoft.com/library/hh831579

Recording server

The recording server is responsible for all communication, recording, and event handling related to devices such as cameras, video and audio encoders, I/O modules, and metadata sources. Examples of actions the recording server handles:

- Retrieve video, audio, metadata and I/O event streams from the devices.
- Record video, audio and metadata from devices.
- Provide operators with access to live and recorded video, audio and metadata.
- Provide operators with access to device status.
- Trigger system and video events on device failures or events.
- Perform motion detection and generate smart search metadata.

The recording server is also responsible for communicating with other Milestone products when using the Milestone Interconnect technology.

For more information, see http://www.milestonesys.com/SharePoint/White%20papers/Milestone_Interconnect.pdf

Failover recording server

The failover recording server is responsible for taking over the recording task in case a recording server fails.

The failover recording server operates in two modes:

1. Standard failover, for monitoring multiple recording servers
2. Hot standby, for monitoring a single recording server.

Media database

The system stores the retrieved video, audio and metadata in the customized high performance Milestone media database which is optimized for recording and storing audio and video data.

The media database supports various unique features including multistage archiving, video grooming, encryption and adding a digital signature to the recordings.

Event server

The event server handles the tasks related to events, alarms, maps and third-party integrations via the Milestone Integration Platform.

Events:

- All system events are consolidated in the event server so there is a single place and interface for partners to make integrations that use system events.
- The event server offers third-party access for sending events to the system via the Generic events or Analytics events interface.

Alarms:

- The event server hosts the alarm feature, alarm logic, alarm state and handling of the alarm database. The alarm database is stored in the same SQL server as the management server uses.

Maps:

- The event server also hosts maps. You configure and use maps in the XProtect Smart Client.

Milestone Integration Platform:

- You can install third-party developed plug-ins on the event server and utilize access to system events.

You can get failover support on the event server by installing the event server in a Microsoft Windows Cluster. The cluster ensures that another server takes over the event server function in case the first server fails.

For more information on configuring Failover Clusters in Windows Server 2008 R2, see http://technet.microsoft.com/en-us/library/ff182338(v=ws.10).aspx

For more information on configuring Failover Clusters in Windows Server 2012, see http://technet.microsoft.com/library/hh831579

Log server

The log server is responsible for storing all log messages for the entire system. The log server uses the same SQL server as the management server and is typically installed on the same server as the management server. If you want to, you can install it on a separate server if you need to increase the management or log server performance.

The system can create three types of logs:

- System log: the system administrator can choose to log errors, warnings and information or a combination of these. The default is to log errors only.
- Audit log: the system administrator can choose to log user activity in clients in addition to login and administration logs.
- Rule log: the system administrator can use the rule log to create logs on specific events.

Service channel

The service channel is responsible for communicating service and configuration messages to XProtect Smart Client, the Milestone Mobile server, and third-party components listening to the service channel. This includes communicating updates to an XProtect Smart Wall monitor layout or communicating that a specific failover server is active.

Mobile server

The Mobile server is responsible for giving Milestone Mobile client and XProtect Web Client users access to the system.

In addition to acting as a system gateway for the two clients, the Mobile server also can also transcode video as the original camera video stream in many cases are too large to fit the bandwidth available for the client users.

Milestone recommends that you install the Mobile server on a dedicated server.

SQL server

The management server, event server and log server use an SQL server to store, for example, configuration, alarms, events and log messages.

The XProtect Expert and XProtect Corporate installer includes Microsoft SQL Server 2012 Express which you can use freely for systems up to 300 cameras.

For larger systems over 300 cameras, Milestone recommends that you use the latest SQL Server 2014 Standard or Enterprise on a dedicated server as these editions can handle larger databases and offer backup functionality.

Client components

XProtect Management Client

The Management Client is the administration interface for all parts of the system.

The VMS is designed for large-scale operation so the Management Client is designed to run remotely from, for example, the administrator's computer.

When you select a function in the node tree, the settings for this node appear, typically in a second tree structure where you can manage sub items. Once you have selected the correct item, the actual settings appear in the properties dialog box in the upper right hand corner. The settings are grouped on various tabs if an item has many settings.

XProtect Smart Client

XProtect Smart Client is the main client for the VMS, offering a full set of advanced features and designed for a day-to-day use by dedicated operators.

XProtect Smart Client is designed to run remotely from the operators' computer and supports multiscreen usage in full screen mode as shown below or in floating windows mode where the user can resize the windows and move them around freely.

For more information, see http://www.milestonesys.com/Software/XProtect-Clients/XProtect-Smart-Client/

XProtect Web Client

XProtect Web Client is a client designed for the occasional or remote user that needs easy access to live monitoring, playback and export. XProtect Web Client also provides access to activating system events and outputs.

For more information, see http://www.milestonesys.com/Software/XProtect-Clients/XProtect-Web-Client/

Find compatible browsers under XProtect Web Client here: http://www.milestonesys.com/SystemRequirements

Milestone Mobile client

The Milestone Mobile client is a client designed for the user on the going. It offers easy access to live monitoring, playback and export of video, as well as access to activating system events and outputs.

You can use the Milestone Mobile client as a remote recording device by using the device's built-in camera and the Milestone Video Push feature. With Video Push activated, video from the device's camera is streamed back to the VMS and recorded as if it is a standard camera.

For more information, see http://www.milestonesys.com/Software/XProtect-Clients/XProtect-Mobile/

Find the operating systems compatible with Milestone Mobile here:
http://www.milestonesys.com/SystemRequirements

Additional products and components

XProtect Smart Wall

XProtect Smart Wall is designed for control centers to display live video from selected cameras on one or more video wall displays.

There are several ways you can select the cameras:

- Manually using the XProtect Smart Client.
- Via the VMS' rule system on events and/or time schedule.
- Via MIP SDK integrations.

XProtect Smart Wall does not require a dedicated XProtect software component itself, nor does it use a dedicated XProtect client - all the required components are included in the standard XProtect Corporate Management Server and XProtect Smart Client. It just needs a PC running XProtect Smart Client to show the Smart Wall views.

XProtect Smart Wall 2016 is included in XProtect Corporate 2016. You can be purchase it as an add-on for XProtect Expert 2016.

For more information, see https://www.milestonesys.com/our-products/xprotect-addons/xprotect-smart-wall/

MIP SDK

The Milestone Integration Platform Software Development Kit (MIP SDK) is a comprehensive tool that makes it easy to create applications, plug-ins or integrations for Milestone's XProtect products.

For more information, see http://www.milestonesys.com/mipsdk/

Software Manager

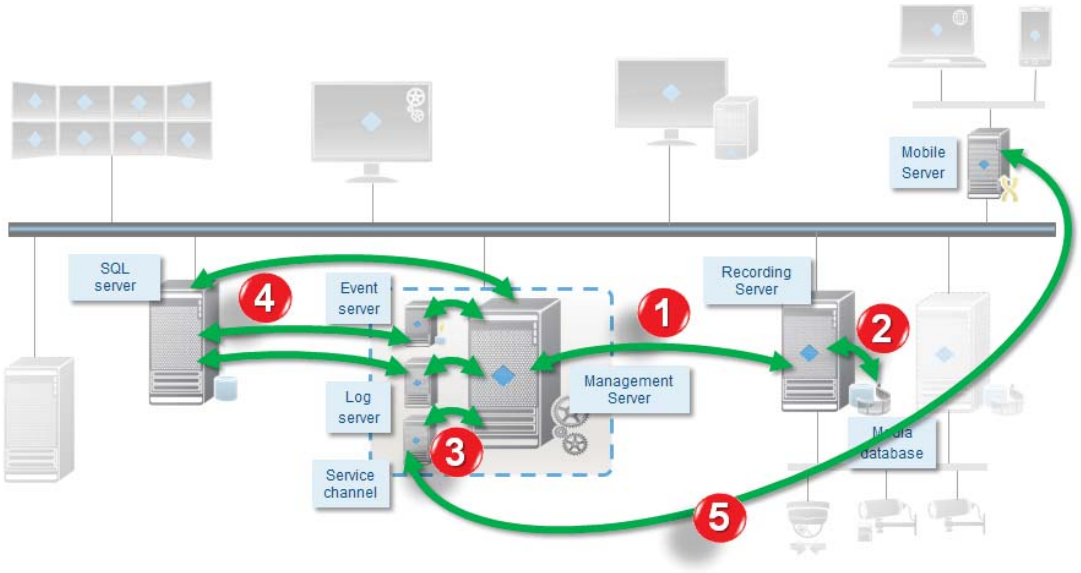
The Software Manager is a tool that you, from a central point, can use to remotely install and upgrade recording servers, recording server device packs and XProtect Smart Clients on servers or PCs in the network.

For larger installations the tool makes it easy and fast to remotely upgrade the components that are installed on servers and client PCs.

For more information, see https://www.milestonesys.com/xprotectutilities

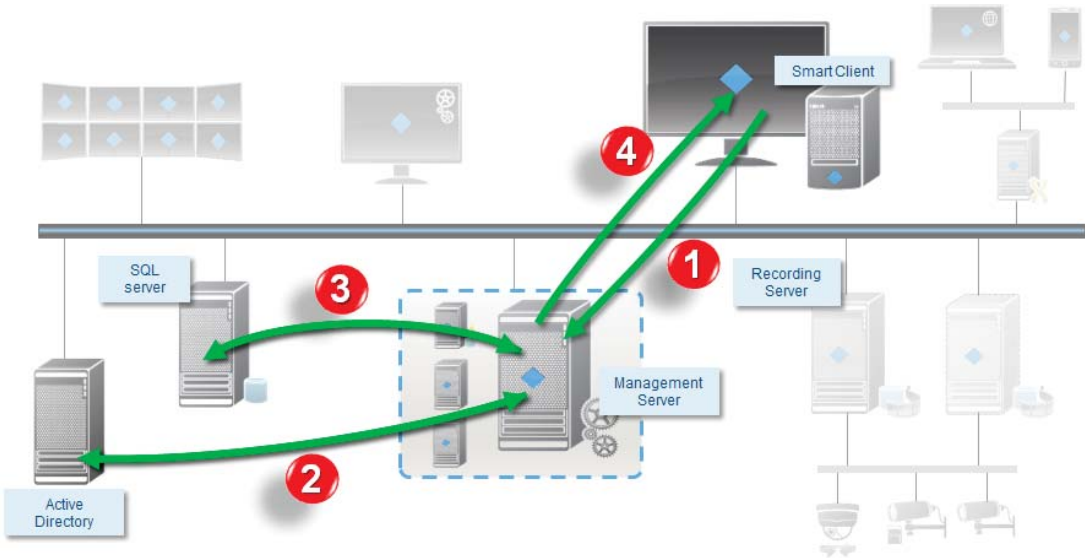
System communication and data flow

Server communication



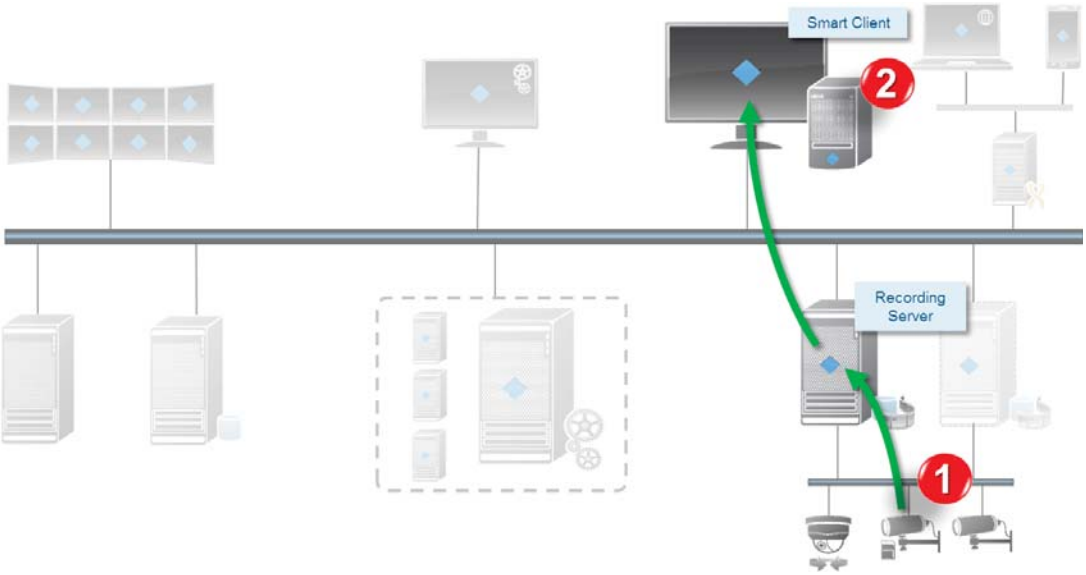
	Component	Port	Protocol	Bandwidth
1	Management server - Recording server	9993	TCP	1 Kbit/call
2	Recording server - Media database	-	-	-
3	Management server - Internal	8080	UDP	1 Kbit/call
4	SQL database communication	1433	TCP	1 Kbit/call
5	Service channel - Mobile server	80	HTTP	1 Kbit/call

Login



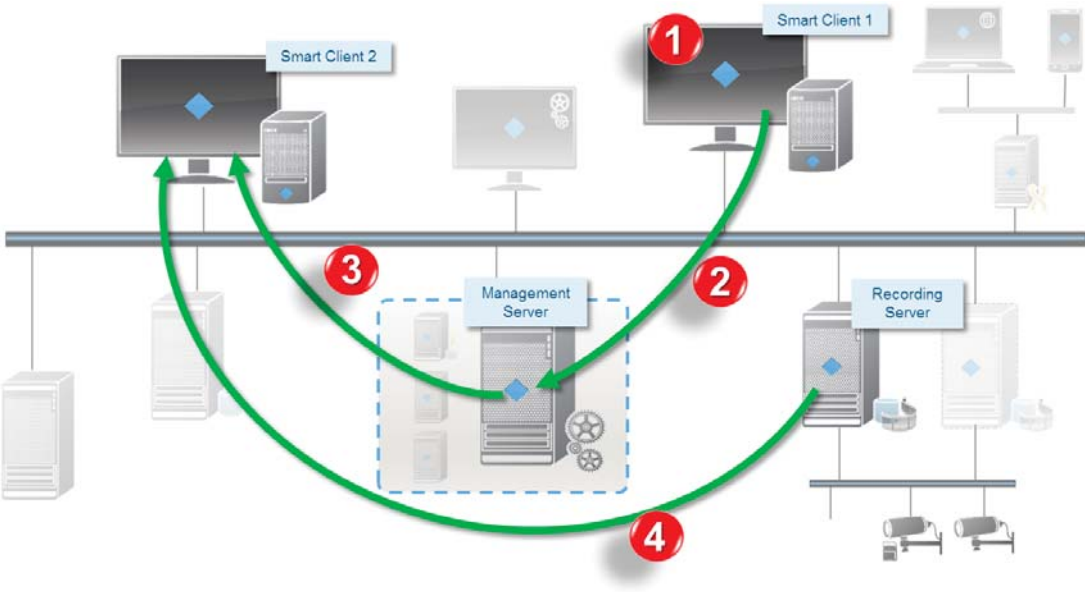
	Process	Port	Protocol	Bandwidth
1	XProtect Smart Client connects to the Management Server and attempts to log in	Configurable. Typically port 80 for an AD user and port 443 for a basic user	HTTP for an AD user and HTTPS for a basic user.	Low 1 Kbit/call
2	The management server contacts Active Directory to authenticate the user	OS- and AD-dependent.	OS- and AD-dependent.	Low 5 Kbit/call
3	User-specific configuration is retrieved from the SQL database	1433	TCP	Depends on configuration
4	Login is granted and the configuration is sent to XProtect Smart Client	Configurable. Typically port 80 for an AD user and port 443 for a basic user.	HTTP for an AD user and HTTPS for a basic user	Depends on configuration, Typically 1-10 MByte

Live video and audio



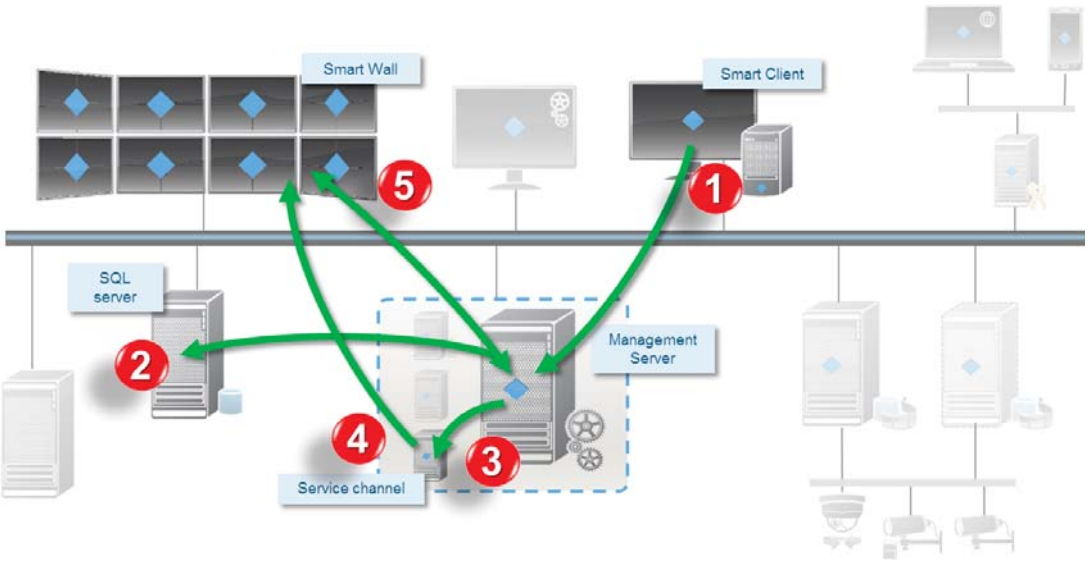
	Process	Port	Protocol	Bandwidth
1	Live streams from cameras retrieved by the recording server	Configurable. Typically port 80	Configurable. Typically RTSP, UDP, TCP/IP	Device configurable. Typically 1-10 Mbit/s
2	Streams are sent to XProtect Smart Client on request	Configurable. The default port is 7563	Configurable, TCP/IP, UDP Multicast. The default is TCP/IP	Usage dependable, sum of camera streams viewed

Matrix



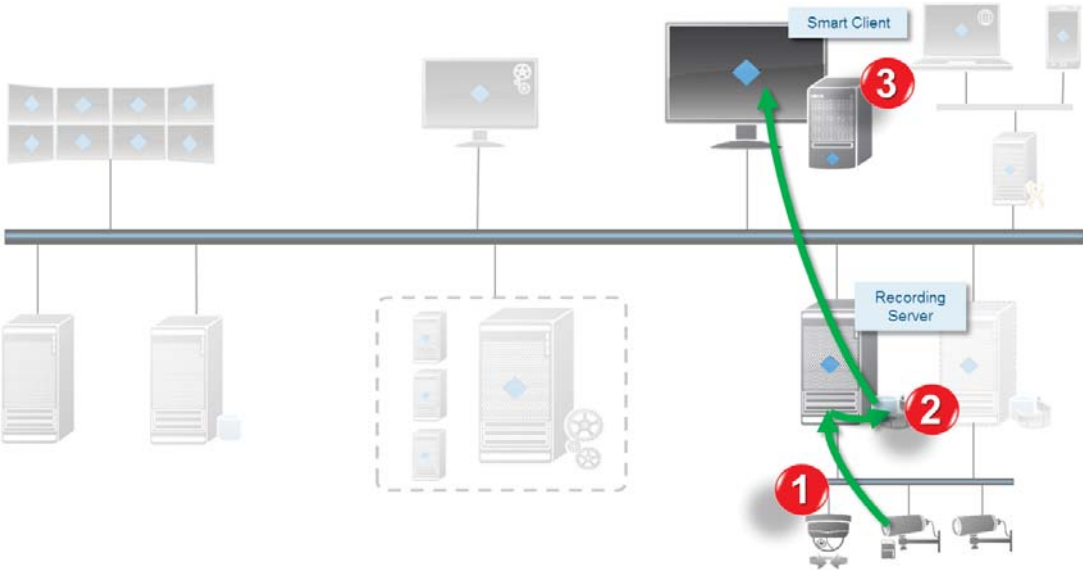
	Process	Port	Protocol	Bandwidth
1	XProtect Smart Client user selects to send a camera to a Matrix-recipient	N/A	N/A	N/A
2	Information sent to Management server	Configurable. Typically port 80 for an AD user and port 443 a for basic user	HTTP for AD user and HTTPS for basic user	Low 1 Kbit/call
3	Management server sends request to Matrix-recipient on specified IP address and port(Smart Client 2)	Configurable. The default port is 12345	TCP/IP	Low 1 Kbit/call
4	Streams are sent to XProtect Smart Client from recording server on request	Configurable. The default port is 7563	Configurable, TCP/IP, UDP Multicast. The default is TCP/IP	Usage dependable, sum of camera streams viewed

XProtect Smart Wall



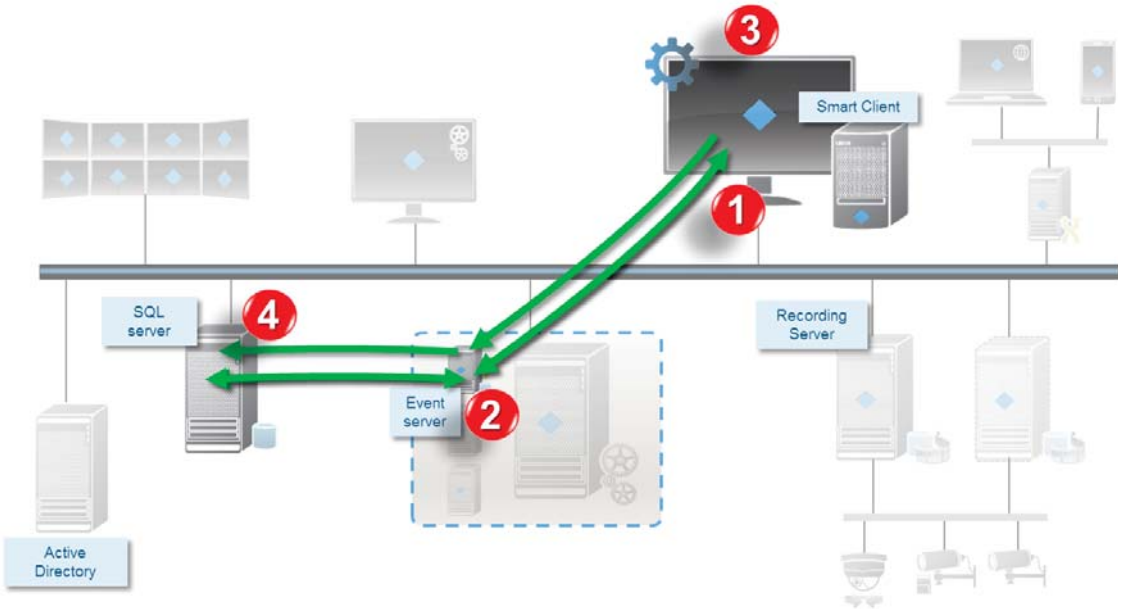
	Process	Port	Protocol	Bandwidth
1	An XProtect Smart Client user updates the XProtect Smart Wall view	Configurable. The default is 5432	TCP/IP	Low 1 Kbit/call
2	The XProtect Smart Wall view configuration is updated and stored in the SQL server	1433	TCP	Low 1 Kbit/call
3	Management server contacts the service channel	80	HTTP	Low 1 Kbit/call
4	The service channel sends a notification to the XProtect Smart Client running the XProtect Smart Wall	Configurable. Typically 80 for an AD user and 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1 Kbit/call
5	The XProtect Smart Client running the XProtect Smart Wall retrieves and applies new layout	Configurable. Typically 80 for an AD user and 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1 Kbit/call

Play back video and audio



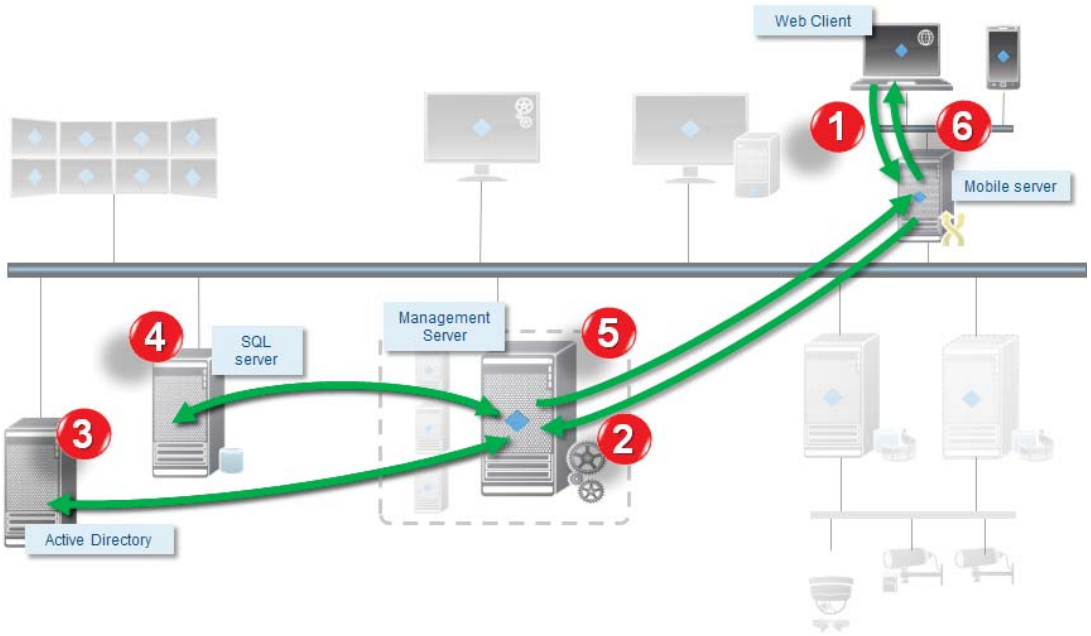
	Process	Port	Protocol	Bandwidth
1	Recording stream from cameras retrieved by the recording server	Configurable. Typically port 80	Configurable. Typically RTSP, UDP, TCP/IP	Device configurable. Typically 1-10 Mbit/s
2	The stream is recorded in the recording server database based on rules	N/A	N/A	Device configurable. Typically 1-10 Mbit/s
3	The recorded stream are retrieved by XProtect Smart Client on playback request	Configurable. The default port is 7563	TCP/IP	Usage dependable, sum of camera streams viewed

View and manage alarms



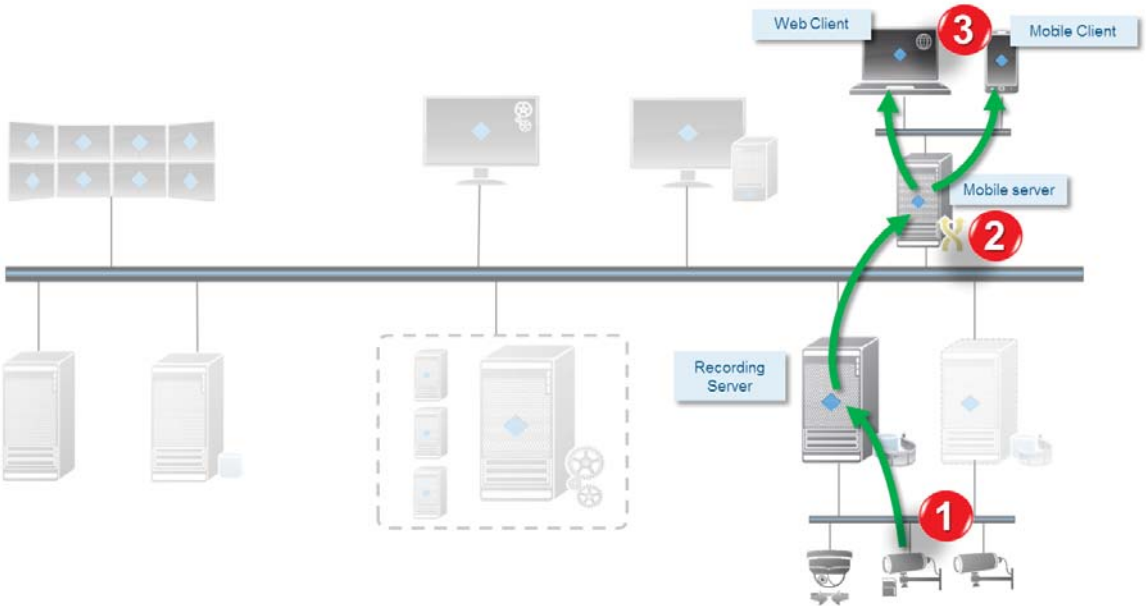
	Process	Port	Protocol	Bandwidth
1	XProtect Smart Client requests an alarm list from event server	Configurable. The default port is 22331	TCP/IP	Low 1 Kbit/call
2	The alarm list is retrieved from the SQL server and returned to XProtect Smart Client	1433	TCP	Low 100 Kbit/call
3	The alarm is handled and its state/details is updated by the user	-	-	-
4	New state/details stored on the SQL server	1433	TCP	Low 1 Kbit/call

Login for XProtect Web Client and Milestone Mobile



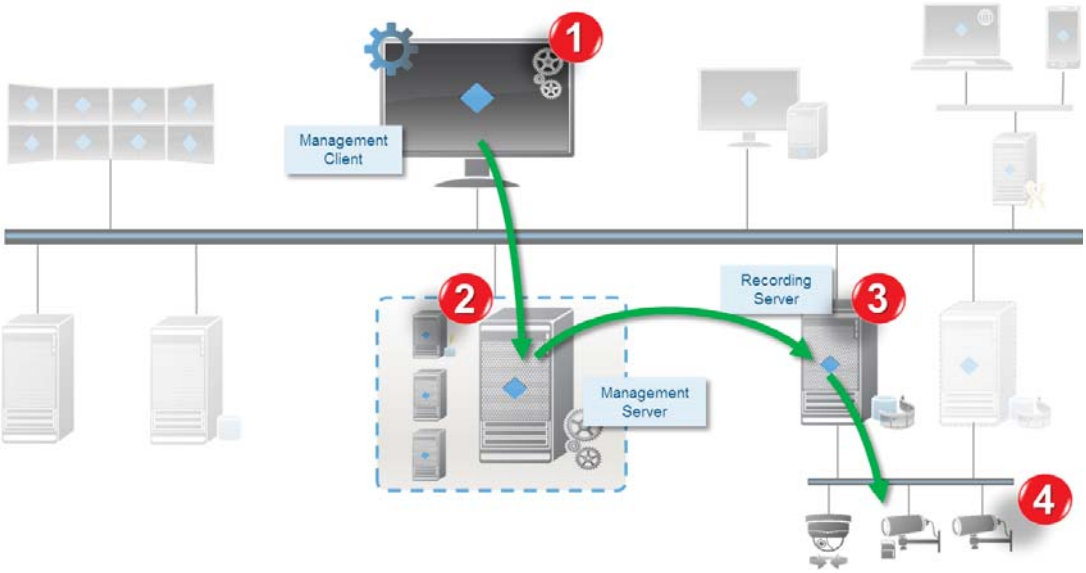
	Process	Port	Protocol	Bandwidth
1	Login request from XProtect Web Client or Milestone Mobile received on the mobile server	Configurable. Typically 8081 for HTTP and 8082 for HTTPS	HTTP or HTTPS	Low 1Kbit/call
2	The mobile server forwards request to the management server	Configurable. Typically 80 for an AD user and 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1Kbit/call
3	The management server contacts Active Directory to authenticate the user	OS- and AD-dependent	OS- and AD-dependent	Low 1Kbit/call
4	User-specific configuration is retrieved from the SQL database	1433	TCP	Configuration dependent
5	Information returned to the mobile server	Configurable. Typically 80 for an AD user and 443 for a basic user	HTTP for an AD User and HTTPS for a basic user	Configuration dependent, typically 1-10 MByte
6	The login is granted and configuration is sent to XProtect Web Client or Milestone Mobile	Configurable. Typically 8081 for HTTP and 8082 for HTTPS	HTTP or HTTPS	Configuration dependent, typically < 100 KByte

Live video for XProtect Web Client and Milestone Mobile



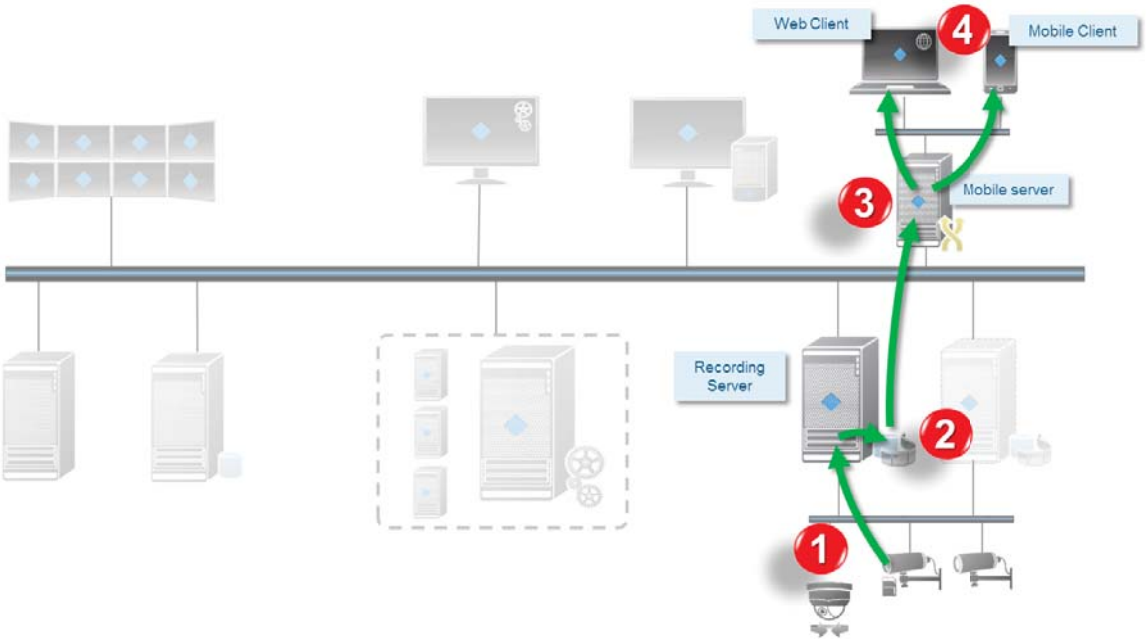
	Process	Port	Protocol	Bandwidth
1	Live stream(s) from cameras retrieved on the recording server	Configurable. Typically port 80	Configurable. Typically RTSP, UDP, TCP/IP	Device configurable. Typically 1-10 Mbit/s
2	Streams are sent to the mobile server for transcoding or as direct streaming	Configurable. The default is 7563	Configurable, TCP/IP, UDP Multicast. The default is TCP/IP	Usage dependable, sum of camera streams viewed
3	Video is streamed to the clients	Configurable. Typically 8081 for HTTP and 8082 for HTTPS	HTTP or HTTPS	Transcoding: typically 50–200 Kbit/s Native: device configurable. Typically 0.05-1 Mbit/s

Management Client configuration update



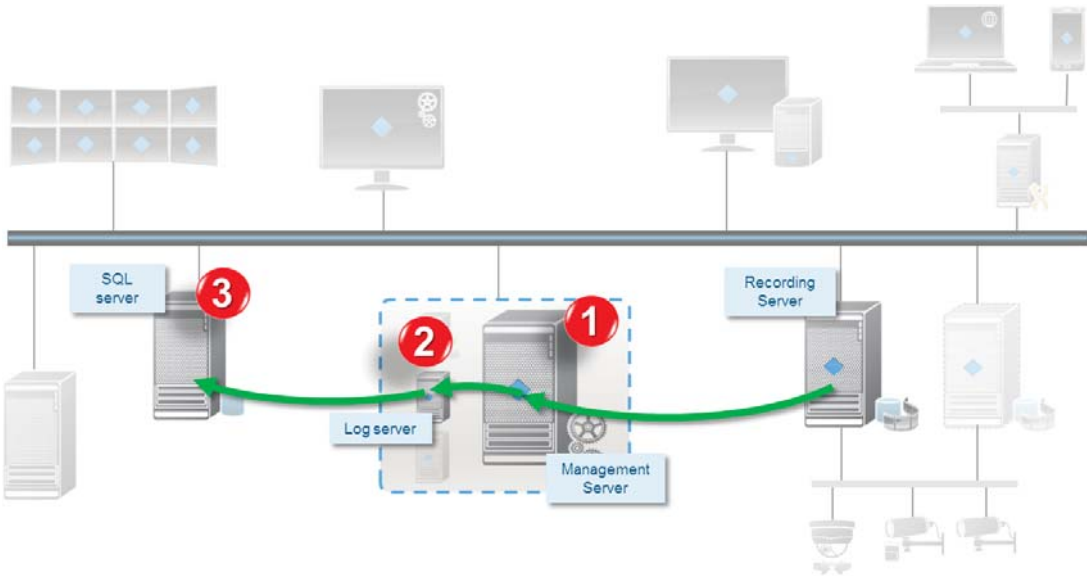
	Process	Port	Protocol	Bandwidth
1	Configuration updated on the Management Client			
2	Changes are stored on the Management server	Configurable. Typically 80 for an AD user and 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 10 Kbit/call
3	Configuration update sent to relevant components. In this case, the recording server	9993	TCP/IP	Low 1 Kbit/call
4	If updates concern cameras, the recording server applies new settings	Configurable. Typically 80 for HTTP and 443 f>or HTTPS	HTTP or HTTPS	Low 1 Kbit/call

Recording and playback video for XProtect Web Client and Milestone Mobile



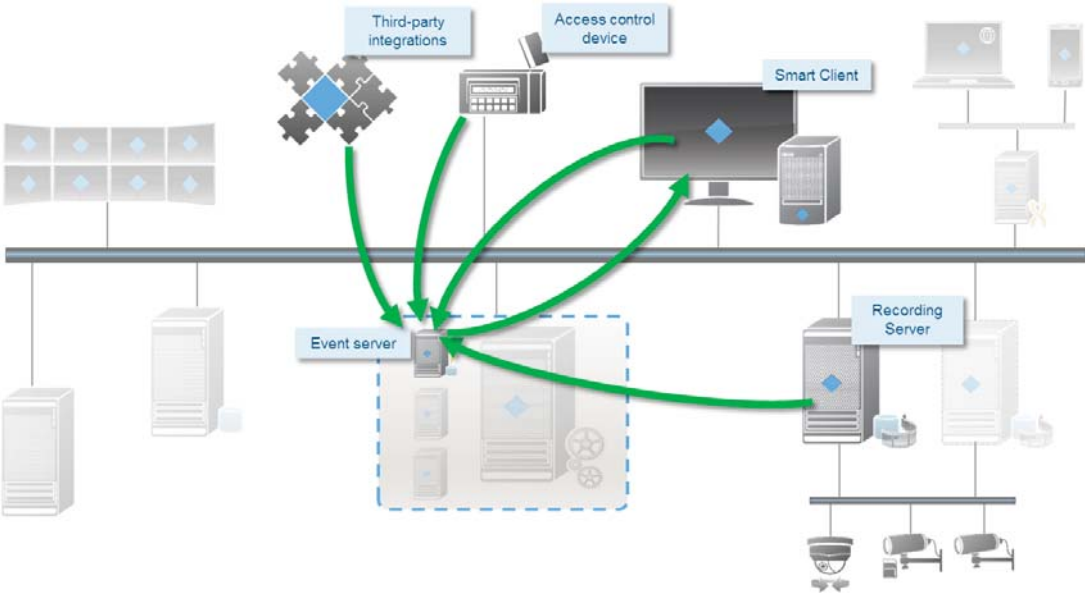
	Process	Port	Protocol	Bandwidth
1	Recording stream from cameras retrieved on the recording server	Configurable. Typically port 80	Configurable. Typically RTSP, UDP, TCP/IP	Device configurable. Typically 1-10 Mbit/s
2	The stream is recorded in the recording server database based on rules	Configurable. The default is 7563	Configurable. TCP/IP, UDP Multicast. The default is TCP/IP.	Usage dependable, sum of camera streams viewed
3	Recordings are sent to the mobile server for transcoding or as direct streaming	Configurable. Typically 8081 for HTTP and 8082 for HTTPS	HTTP or HTTPS	Transcoding: typically 50–200 Kbit/s Native: device configurable Typically 1-10 Mbit/s
4	Video is streamed to clients	-	-	-

Log server



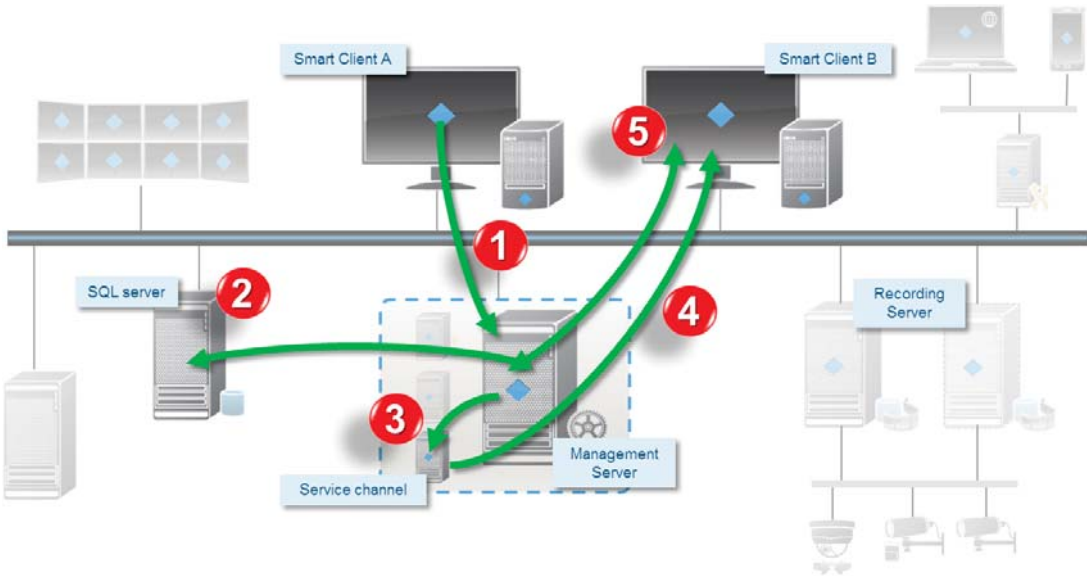
	Process	Port	Protocol	Bandwidth
1	The Management server or recording server creates a log message	9993	TCP	Low 1 Kbit/call
2	The log message is forwarded to the log server	Configurable. The default is port 80.	HTTP	Low 1 Kbit/call
3	The log message is stored in the SQL server database	1433	TCP	Low 1 Kbit/call

Event server



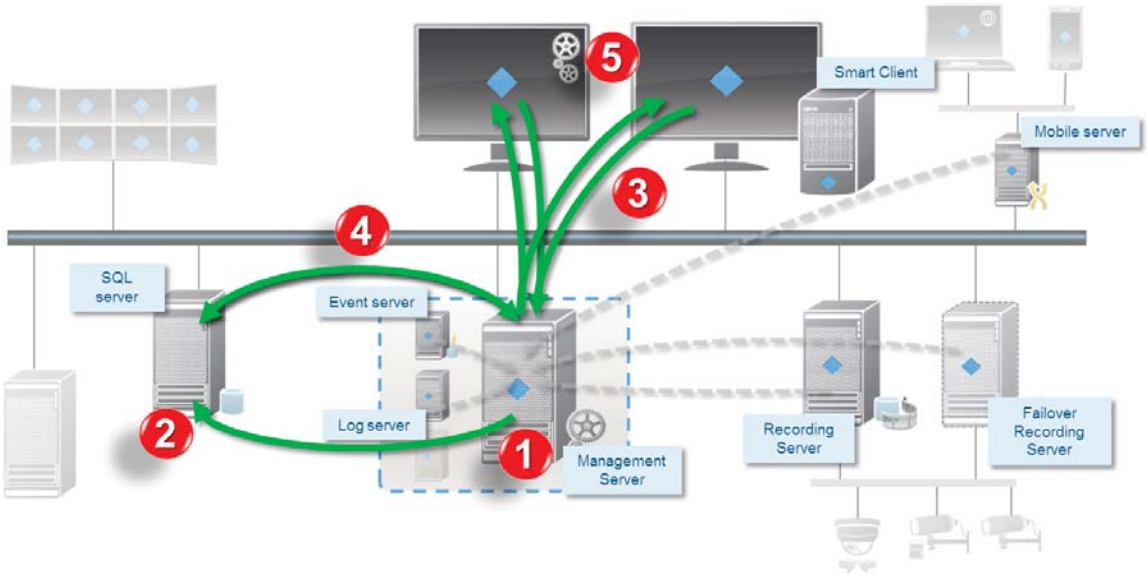
	Process	Port	Protocol	Bandwidth
	Data about alarms, access control or map updates are received on the event server	-	-	-
	Third-party integrations MIP Message Communication	22333	TCP/IP	Low 1 Kbit/call
	Access Control integrations	Depends on the integration	TCP/IP	Low 1 Kbit/call
	Analytics events	Configurable. The default port is 9090	TCP/IP	Low 1 Kbit/call
	Generic events	Configurable. The default ports are 1234 and 1235	TCP/IP, UDP	Low 1 Kbit/call
	Recording server	7563	TCP	Low 1 Kbit/call
	The event server sends data to XProtect Smart Client to show in alarm list, XProtect Access or the map overview. The XProtect Smart Client user responds to the notification and returns data to event server	-	-	-

Service channel – view update



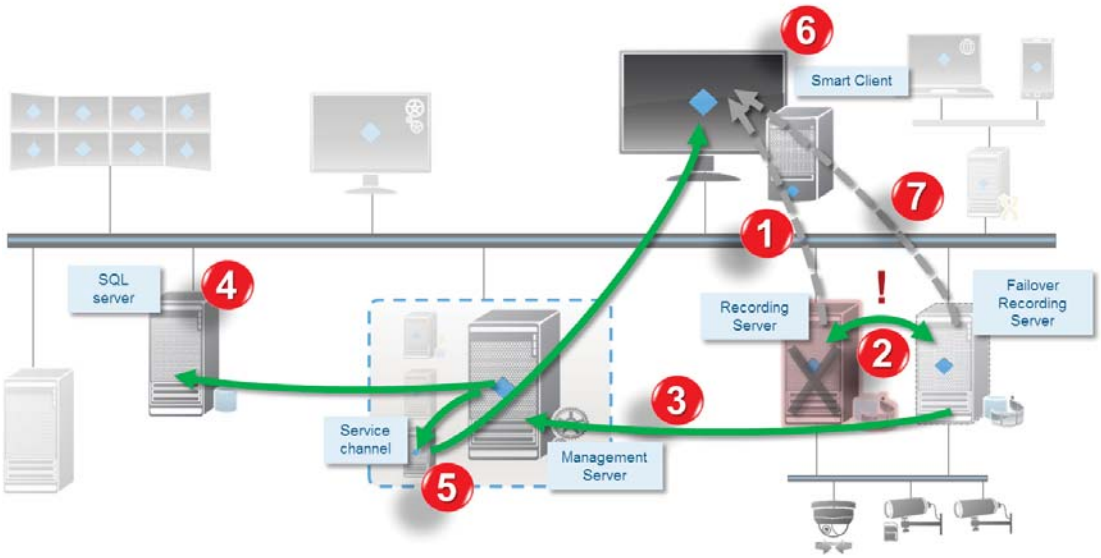
	Process	Port	Protocol	Bandwidth
1	View updated on XProtect Smart Client A	Configurable. Typically port 80 for an AD user and port 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1 Kbit/call
2	The configuration is stored in the SQL server	1433	TCP	Low 1 Kbit/call
3	The management server contacts the service channel with update information	80	HTTP	Low 1 Kbit/call
4	The service channel sends notification about view update to XProtectSmart Clients	Configurable. Typically port 80 for an AD user and port 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1 Kbit/call + constant low use
5	XProtect Smart Clients retrieves and applies the new view	Configurable. Typically port 80 for an AD user and 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1 Kbit/call

Data collector



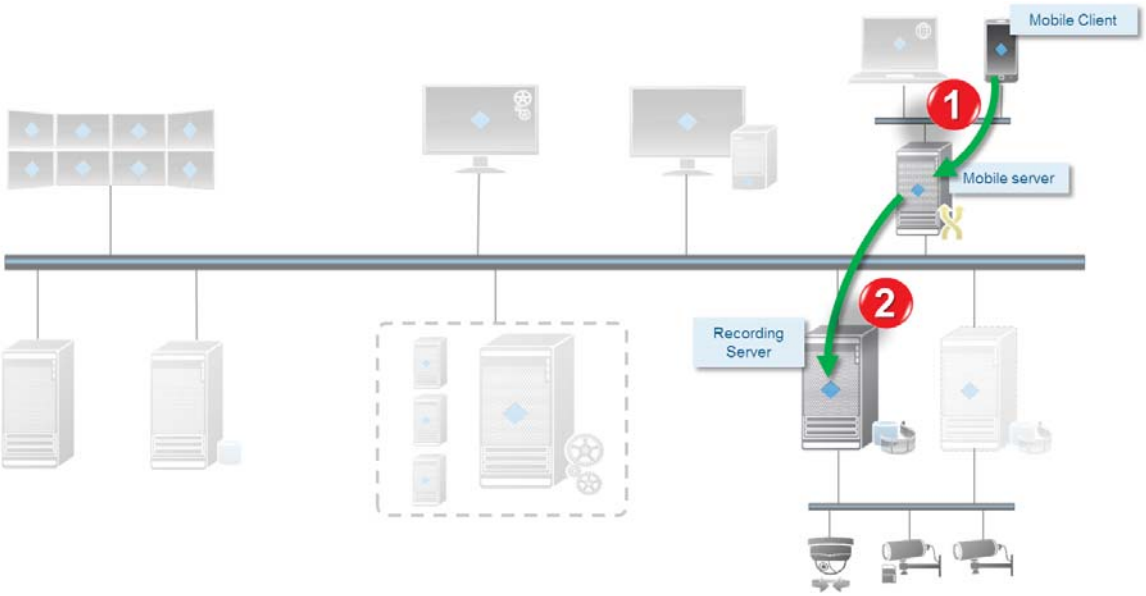
	Process	Port	Protocol	Bandwidth
1	System status received on management server delivered by: log server, event server, recording server, failover recording server and mobile server	7609	HTTP	Low 10 Kbit/call
2	The collected data is stored on the SQL server	1433	TCP	Low 1 Kbit/call
3	XProtect Smart Client or the Management Client requests status via System Monitor	80	HTTP	Low 1 Kbit/call
4	Requested data is collected from the SQL server	1433	TCP	Low 100 Kbit/call
5	Data returned to clients	80	HTTP	Low 100 Kbit/call

Recording server failover



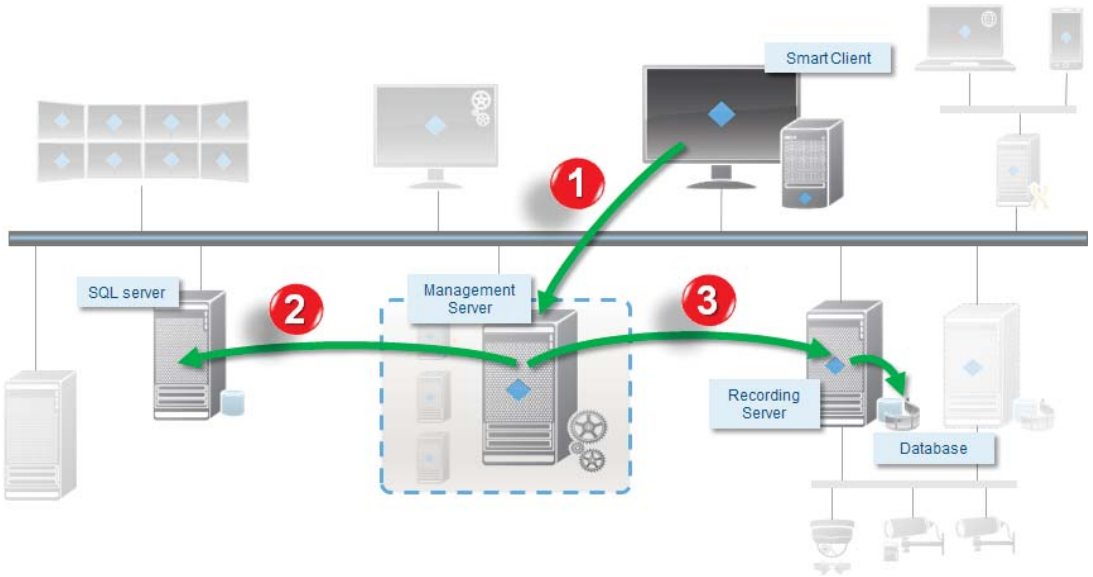
	Process	Port	Protocol	Bandwidth
1	Video streamed from the recording server	Configurable. The default port is 7563	Configurable. TCP/IP, UDP Multicast. Default TCP/IP	Sum of camera streams viewed
2	Alive messages exchanged between recording and failover recording server	Configurable. Default is 11000	Configurable, TCP/IP	Low 1 Kbit/call
3	Cold standby: failover message sent, configuration retrieved, start failover Hot standby: failover message sent, start failover	80	HTTP	Configuration dependent
4	Configuration updated with active failover recording server	1433	TCP	Low 1 Kbit/call
5	Update configuration message sent to service channel	80	HTTP	Low 1 Kbit/call
6	Update message distributed to all clients	Configurable. Typically 80 for an AD user and 443 for a basic user	HTTP for an AD user and HTTPS for a basic user	Low 1 Kbit/call
7	Video streamed from failover recording server	Configurable. The default port is 7563	Configurable. TCP/IP, UDP Multicast. Default TCP/IP	Sum of camera streams viewed
	Media retrieved from failover recording server when recording server is available	5210	TCP	-

Video push



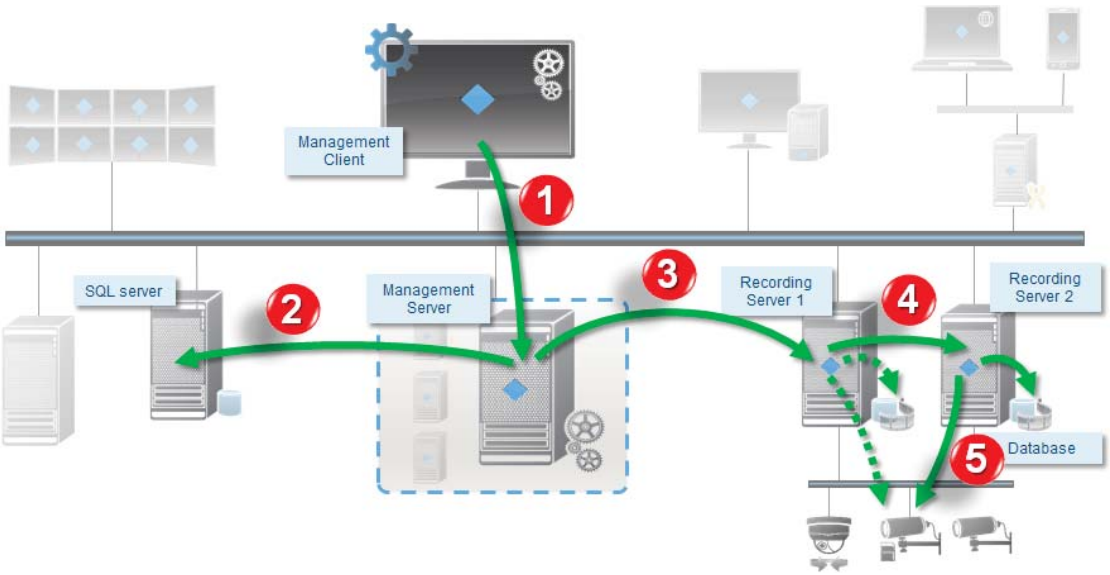
	Process	Port	Protocol	Bandwidth
1	Video push stream sent instantly to the mobile server	Configurable. Typically port 8081 for HTTP and port 8082 for HTTPS	HTTP or HTTPS	Usage dependable, resolution and frame-rate set up in the mobile device. Typically 0.05 – 1 Mbit/s
2	The video push stream is retrieved by recording server using the specific video push device driver	Configurable. Typically port 40001 (40002, 40003, if many devices are present)	TCP/IP	Usage dependable, resolution and frame-rate set up in the mobile device. Typically 0.05 – 1 Mbit/s

Evidence lock



	Process	Port	Protocol	Bandwidth
1	The user creates an evidence lock in XProtect Smart Client. The information sent to the Management server	Configurable. Typically port 80 for an AD user and port 443 for a basic user	HTTP for AD User and HTTPS for a basic user	Low 1Kbit/call
2	The Management server informs recording server to store and protect the locked recordings in the Media database	9993	TCP	Low 1Kbit/call
3	Management server stores information about the evidence lock in the SQL server	1433	TCP	Low 1Kbit/call

Move hardware



	Process	Port	Protocol	Bandwidth
1	The user moves hardware from Recording server 1 to Recording server 2 in Management Client	-	-	-
2	The Management server receives the update in the configuration and stores it in the SQL server database	1433	TCP	Low 1Kbit/call
3	The Management server sends update to Recording server 1	9993	TCP	Low 1Kbit/call
4	The Management server sends update to Recording server 2	9993	TCP	Low 1Kbit/call
5	Recording server 2 connects to Hardware. All new recordings are stored in the Recording server 2 database	-	-	-
	Old recordings are still available on Recording server 1. The system deletes them when the retention time expires. Recordings marked with evidence lock are not deleted until the evidence lock's retention time expires	5210	TCP	
	The management server contacts service the channel with update information	80	HTTP	Low 1 Kbit/call
	Clients connect to Recording server 2	-	-	-

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About Milestone Systems

Milestone Systems is a global industry leader in open platform IP video management software, founded in 1998 and now operating as a stand-alone company in the Canon Group. Milestone technology is easy to manage, reliable and proven in thousands of customer installations, providing flexible choices in network hardware and integrations with other systems. Sold through partners in more than 100 countries, Milestone solutions help organizations to manage risks, protect people and assets, optimize processes and reduce costs. For more information, visit:

http://www.milestonesys.com.

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Category	NVR Server	NVR Server	SFF NVR Server		SFF NVR Server	
AGS Model	**Stream Line**	**Stream Line**	**Reliance 1**		**Reliance 2**	
Product ID	**SL4-A1**	**SL-SA**	**SD06-1**	**SD12-1**	**SD12-2**	**SD25-2**
Base Part Number	AGS-SL4-A1	AGS-SL-SA	AGS-SD06-1-X	AGS-SD12-1-X	AGS-SD12-2-X	AGS-SD25-2-X
Throughput	30Mbps	30Mbps	6 Mbps	12 Mbps	12 Mbps	25 Mbps
Chassis Type	L Shape w/ Monitor	Mid-Tower	Small Form Factor		Small Form Factor	
Power Supplies	380W	380W	160W		250W	
Dimensions	15"W x 10"D x Adj H	16.6"H x 7.8"W x 16.5"D	10.4"H x 4.4"W x 9.1"D		7.48"H x 8.46"W x 12.80"D	
Motherboard	Intel i5 Series	Intel i5 Series	Intel i5 Series		Intel i5 Series	
Processor (socket)	Intel Core i5 (1156)	Intel Core i5 (1156)	Intel Core i5 (1156)		Intel Core i5 (1156)	
Cores/HT- Core Ghz	2C/4T - 3.2Ghz	2C/4T - 3.2Ghz	2C/4T - 3.2Ghz	2C/4T – 3.6Ghz	2C/4T - 3.2Ghz	2C/4T – 3.6Ghz
Memory	2GB (16GB max)	2GB (16GB max)	2GB (8GB max)	4GB (8GB max)	2GB (8GB max)	4GB (8GB max)
Memory Type	non-ECC	non-ECC	non-ECC		non-ECC	
USB Ports	6 rear - 2 front	6 rear - 2 front	6 rear - 2 front		6 rear - 2 front	
Ethernet NIC	1x 10/100/1000	1x 10/100/1000	1x 10/100/1000		1x 10/100/1000 W/Opt Second	
Onboard Graphics	Intel Graphics Technology	Intel Graphics Technology	Intel Graphics Technology		Intel Graphics Technology	
Graphics Ports	DVI-I / DVI-D / HDMI	DVI-I / DVI-D / HDMI	DVI-I / HDMI		DVI-I / HDMI	
Graphics Cards	GT 240 DVI-I	GT 240 DVI-I	N/A		N/A	
Audio	5.1 Channel	5.1 Channel	7.1 Channel		7.1 Channel	
Serial Port	1 internal optional	1 internal optional	1 internal optional		1 internal optional	
Management	Intel AMT vPro	Intel AMT vPro	WfM		WfM	
O/S Drive	2TB 3.5"	2TB 3.5"	1 or 2 TB 3.5"		1 or 2 TB 3.5"	
Max Storage	Shared O/S	Shared O/S	Shared O/S		4 TB 3.5" SATA	
Hot Swap Bay	N/A	N/A	N/A		N/A	
RAID	N/A	N/A	N/A		1	
DVD/RW	Included	Included	Included		Included	
Monitor	Included	Optional	Optional		Optional	
Keyboard/Mouse	Included	Optional	Included		Included	
Warranty	Four-year limited	Four-year limited	Four-year limited		Four-year limited	
Pre-installed O/S	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro		Vista Business or Win 7 Pro	
VMS Pre-installed	Optional Free Installation	Optional Free Installation	Optional Free Installation		Optional Free Installation	

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Category	1U NVR Server	1U NVR Server	1U NVR Server		
AGS Model	**Reliance 2-1U**	**Reliance 3-1U**		**Reliance 4-1U**	
Product ID	**SD50-02-1U**	**HD100-03-1U**	**SD50-04-1U**	**HD100-04-1U**	**HD250-04-1U**
Base Part Number	AGS-SD5X-020Y-RN	AGS-HD10X-030Y-RZ	AGS-SD5X-040Y-RZ	AGS-SD10X-040Y-RZ	AGS-SD25X-040Y-RZ
Throughput	50 Mbps	100 Mbps	50 Mbps	100 Mbps	250 Mbps
Chassis Type	Intel 1U Rack Mount	Intel 1U Rack Mount	Intel Certified 1U Rack Mount		
Power Supplies	350W	350W	500W		
Dimensions	1.70"H x 16.9"W x 20"D	1.70"H x 16.9"W x 25.51"D	1.75"(H) x 19"(W) x 28"(D)		
Motherboard	Intel Xeon 3400 Series	Intel Xeon 3400 Series	Intel i5 Series	Intel Xeon 3400 Series	Intel Xeon 5600 Series
Processor (socket)	Intel Dual Core (1156)	Intel Quad Xeon (1156)	Intel Core i5 (1156)	Intel Quad Xeon (1156)	Dual Quad Xeon (1366)
Cores/HT- Core Ghz	2C/2T – 2.8Ghz	4C/8T – 2.8Ghz	2C/4T – 3.6Ghz	4C/8T – 2.8Ghz	4C/8T – 2.4Ghz
Memory	2GB (32GB max)	4GB (32GB max)	4GB (16GB max)	4GB (32GB max)	6GB (192GB max)
Memory Type	non-ECC	ECC	non-ECC	ECC	Reg ECC
USB Ports	4 rear - 1 front	4 rear - 1 front	6 rear - 2 front	4 rear - 2 front	
Ethernet NIC	2x 10/100/1000	2x 10/100/1000	1x 10/100/1000	2x 10/100/1000	
Onboard Graphics	Integrated 8MB	Integrated 8MB	Intel Graphics Technology	Integrated 8MB	
Graphics Ports	VGA	VGA	DVI-I / DVI-D / HDMI	VGA	
Graphics Cards	N/A	N/A	N/A		
Audio	N/A	N/A	5.1 Channel	N/A	
Serial Port	1 rear - 1 front	1 rear - 1 front	1 internal optional	1 rear - 1 front	
Management	IPMI 2.0	IPMI 2.0	Intel AMT vPro	IPMI 2.0	
O/S Drive	3.5"	3.5"	2.5" 40GB SSD internal		
Max Storage	4TB	6TB	8TB		
Hot Swap Bay	N/A	3	4		
RAID	0, 1	0, 1, 5	0, 1, 5, 6 + Hot Spare		
DVD/RW	Included	Included	Included		
Monitor	N/A	N/A	N/A		
Keyboard/Mouse	N/A	N/A	N/A		
Warranty	Four-year limited	Four-year limited	Four-year limited		
Pre-installed O/S	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro		Win Server 2008
VMS Pre-installed	Optional Free Installation	Optional Free Installation	Optional Free Installation		

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Category		Tower/RM NVR Server		2U NVR Server	
AGS Model	**Reliance 6 Tower / 6U RM**			**Reliance 8-2U**	
Product ID	**SD50-06**	**HD100-06**	**HD250-06**	**HD100-08**	**HD250-08**
Base Part Number	AGS-SD5X-060Y-RZ	AGS-HD10X-060Y-RZ	AGS-HD25X-060Y-RZ	AGS-HD10X-080Y-RZ	AGS-HD25X-080Y-RZ
Throughput	50 Mbps	100 Mbps	250 Mbps	100 Mbps	250 Mbps
Chassis Type	Intel 6 Storage Drive Tower/RM Chassis			Intel Certified 2U Rack Mount	
Power Supplies	400W	400W	600W w/opt Redundant	600W 1+1 Hot Swap Redundant	
Dimensions	17.8"H x 9.26"W x 19"D			3.5"H x 19"W x 28"D	
Motherboard	Intel i5 Series	Intel Xeon 3400 Series	Intel Xeon 5600 Series	Intel Xeon 3400 Series	Intel Xeon 5600 Series
Processor (socket)	Intel Core i5 (1156)	Intel Quad Xeon (1156)	Dual Quad Xeon (1366)	Intel Quad Xeon (1156)	Dual Quad Xeon (1366)
Cores/HT- Core Ghz	2C/4T – 3.6Ghz	4C/8T – 2.8Ghz	4C/8T – 2.4Ghz	4C/8T – 2.8Ghz	4C/8T – 2.4Ghz
Memory	4GB (16GB max)	4GB (32GB max)	6GB (192GB max)	4GB (32GB max)	6GB (192GB max)
Memory Type	non-ECC	ECC	Reg ECC	ECC	Reg ECC
USB Ports	6 rear - 2 front	4 rear - 2 front		4 rear - 2 front	
Ethernet NIC	1x 10/100/1000	2x 10/100/1000		2x 10/100/1000	
Onboard Graphics	Intel Graphics Technology	Integrated 8MB		Integrated 8MB	
Graphics Ports	DVI-I / DVI-D / HDMI	VGA		VGA	
Graphics Cards	Optional			Optional	
Audio	5.1 Channel	N/A		N/A	
Serial Port	1 internal optional	1 rear - 1 front		1 rear - 1 front	
Management	Intel AMT vPro	IPMI 2.0		IPMI 2.0	
O/S Drive	3.5" 250GB Enterprise internal w/optional RAID1			2.5" 40GB SSD internal w/ opt. RAID1	
Max Storage	12TB			16TB	
Hot Swap Bay	6			8	
RAID	0, 1, 5, 6 + Hot Spare			0, 1, 5, 6 + Hot Spare	
DVD/RW	Included			Included	
Monitor	Optional			N/A	
Keyboard/Mouse	Included			N/A	
Warranty	Four-year limited			Four-year limited	
Pre-installed O/S	Vista Business or Win 7 Pro	Vista or 7 opt Svr 2008	Win Server 2008	Vista or 7 opt Svr 2008	Win Server 2008
VMS Pre-installed	Optional Free Installation			Optional Free Installation	

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Category		Tower/RM NVR Server		3U NVR Server	
AGS Model	Reliance 10 Tower / 5U RM			Reliance 16 3U	
Product ID	SD50-10	HD100-10	HD250-10	HD100-16	HD250-16
Base Part Number	AGS-SD5X-10YY-RZ	AGS-HD10X-10YY-RZ	AGS-HD25X-10YY-RZ	AGS-HD10X-16YY-RZ	AGS-HD25X-16YY-RZ
Throughput	50 Mbps	100 Mbps	250 Mbps	100 Mbps	250 Mbps
Chassis Type	Intel 10 Storage Drive Tower/RM Chassis			Intel Certified 3U Rack Mount	
Power Supplies	670W	670W	750W Redundant	650W 2+1 Hot Swap Redundant	
Dimensions	17"H x 8.6"W x 28.4"D			5.4"H x 19"W x 28"D	
Motherboard	Intel i5 Series	Intel Xeon 3400 Series	Intel Xeon 5600 Series	Intel Xeon 3400 Series	Intel Xeon 5600 Series
Processor (socket)	Intel Core i5 (1156)	Intel Quad Xeon (1156)	Dual Quad Xeon (1366)	Intel Quad Xeon (1156)	Dual Quad Xeon (1366)
Cores/HT- Core Ghz	2C/4T – 3.6Ghz	4C/8T – 2.8Ghz	4C/8T – 2.4Ghz	4C/8T – 2.8Ghz	4C/8T – 2.4Ghz
Memory	4GB (16GB max)	4GB (32GB max)	6GB (192GB max)	4GB (32GB max)	6GB (192GB max)
Memory Type	non-ECC	ECC	Reg ECC	ECC	Reg ECC
USB Ports	6 rear - 2 front	4 rear - 2 front		4 rear - 2 front	
Ethernet NIC	1x 10/100/1000	2x 10/100/1000		2x 10/100/1000	
Onboard Graphics	Intel Graphics Technology	Integrated 8MB		Integrated 8MB	
Graphics Ports	DVI-I / DVI-D / HDMI	VGA		VGA	
Graphics Cards	Optional	Optional		Optional	
Audio	5.1 Channel	N/A		N/A	
Serial Port	1 internal optional	1 rear - 1 front		1 rear - 1 front	
Management	Intel AMT vPro	IPMI 2.0		IPMI 2.0	
O/S Drive	3.5" 250GB Enterprise internal w/optional RAID1			2.5" 40GB SSD internal w/ opt. RAID1	
Max Storage	20TB			32TB	
Hot Swap Bay	10			16	
RAID	0, 1, 5, 6 + Hot Spare			0, 1, 5, 6 + Hot Spare	
DVD/RW	Included			Included	
Monitor	Optional			N/A	
Keyboard/Mouse	Included			N/A	
Warranty	Four-year limited			Four-year limited	
Pre-installed O/S	Vista Business or Win 7 Pro	Vista or 7 opt Svr 2008	Win Server 2008	Vista or 7 opt Svr 2008	Win Server 2008
VMS Pre-installed	Optional Free Installation			Optional Free Installation	

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VAU 50

Category	5U NVR Server		DS DMS Tower/RM	DS VAU Server	
AGS Model	**Reliance 24-5U**		**Reliance DMS**	**Reliance VAU**	
Product ID	**HD100-24-5U**	**HD250-24-5U**	**HD250-DMS**	**HD50-VAU**	**HD100-VAU**
Base Part Number	AGS-HD10X-24YY-RZ	AGS-HD25X-24YY-RZ	AGS-HD250-DMS	AGS-HD50-VAU	AGS-HD100-VAU
Throughput	100 Mbps	250 Mbps	250 Mbps	50 Mbps	100 Mbps
Chassis Type	Intel Certified 5U Rack Mount		Intel Tower/RM	Intel 1U RM	
Power Supplies	950W 2+1 Hot Swap Redundant		600W w/ Redundant PS	350W	450W 1+1 Redundant
Dimensions	8.25"H x 19"W x 28"D		17.8"H x 9.26"W x 19"D	1.67"H x 16.93"W x 20"D	1.69"H x 17.76"W x 26.42"D
Motherboard	Intel Xeon 3400 Series	Intel Xeon 5600 Series	Intel Xeon 5600 Series	Intel Xeon 3400 Series	Intel Xeon 5600 Series
Processor (socket)	Intel Quad Xeon (1156)	Dual Quad Xeon (1366)	Dual Quad Xeon (1366)	Intel Quad Xeon (1156)	Dual Quad Xeon (1366)
Cores/HT- Core Ghz	4C/8T – 2.8Ghz	4C/8T – 2.4Ghz	4C/8T – 2.4Ghz	4C/8T – 2.8Ghz	4C/8T – 2.4Ghz
Memory	4GB (32GB max)	6GB (192GB max)	4GB (192GB max)	4GB (32GB max)	4GB (192GB max)
Memory Type	ECC	Reg ECC	Reg ECC	ECC	Reg ECC
USB Ports	4 rear - 2 front		4 rear - 2 front	4 rear - 1 front	4 rear - 2 front
Ethernet NIC	2x 10/100/1000		2x 10/100/1000	2x 10/100/1000	
Onboard Graphics	Integrated 8MB		Integrated 8MB	Integrated 8MB	Matrox G200 8MB
Graphics Ports	VGA		VGA	VGA	
Graphics Cards	Optional		N/A	N/A	
Audio	N/A		N/A	N/A	
Serial Port	1 rear - 1 front		1 rear	1 rear	N/A
Management	IPMI 2.0		IPMI 2.0	IPMI 2.0	
O/S Drive	2.5" 40GB SSD internal w/ opt. RAID1		3.5" Enterprise	3.5" Enterprise	
Max Storage	48TB		Ext SAS & FC	6TB	8TB
Hot Swap Bay	24		N/A	3	4
RAID	0, 1, 5, 6 + Hot Spare		1, 5	1, 5 + Hot Spare	
DVD/RW	Included		Included	Included	
Monitor	N/A		Optional	N/A	
Keyboard/Mouse	N/A		Included	N/A	
Warranty	Four-year limited		Four-year limited	Four-year limited	
Pre-installed O/S	Vista or 7 opt Svr 2008	Win Server 2008	Win Server 2008	Win Server 2008	Win Server 2008
VMS Pre-installed	Optional Free Installation		Optional Free Installation	Optional Free Installation	

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Category	Workstation	Workstation	Workstation	Workstation	Workstation
AGS Model	**Mirador SO**	**Mirador SB**	**Mirador MB**	**Mirador ME**	**Mirador LE**
Product ID	**WSSO**	**WSSB**	**WSMB**	**WSME**	**WSLE**
Base Part Number	AGS-WSSO	AGS-WSSB	AGS-WSMB	AGS-WSME	AGS-WSLE
Camera Views	8	16	32	48	64
Chassis Type	Tower	Tower	Intel Tower/RM Chassis	Tower	Intel Tower/RM Chassis
Power Supplies	380W	430W	600W	850W	1000W
Dimensions	16.6"H x 7.8"W x 16.5"D	18"H x 8.1"W x 18.3"D	17.8"H x 9.26"W x 19"D	18"H x 8.1"W x 18.3"D	17.8"H x 9.26"W x 19"D
Motherboard	Intel i5 Series	Intel i5 Series	Intel Xeon 3400 Series	Intel i7 Series	Intel Xeon 5600 Series
Processor (socket)	Intel Core i5 (1156)	Intel Core i5 (1156)	Intel Quad Xeon (1156)	Intel Core i7 (1366)	Dual Quad Xeon (1366)
Cores/HT – Speed	2C/4T – 3.2 Ghz	4C/4T – 2.8 Ghz	4C/8T – 2.8 Ghz	4C/8T – 3 Ghz	8C/16T – 2.4Ghz
Memory	2GB DDR3 (8GB max)	4GB DDR3 (8GB max)	4GB DDR3 (32GB max)	4GB DDR3 (16GB max)	4GB DDR3 (192GB max)
Memory Type	non-ECC	non-ECC	ECC	non-ECC	Reg ECC
USB Ports	6 rear - 2 front	6 rear - 2 front	4 rear - 2 front	8 rear - 2 front	4 rear - 2 front
Ethernet NIC	1x 10/100/1000	1x 10/100/1000	2x 10/100/1000	1x 10/100/1000	2x 10/100/1000
Onboard Graphics	Intel Graphics Tech.	Intel Graphics Tech.	Integrated 8MB	N/A	N/A
Graphics Ports	DVI-I / DVI-D / HDMI	DVI-I / DVI-D / HDMI	VGA	N/A	N/A
Graphics Cards	N/A	GT 240 DVI-I (1)	GT465 Dual DVI-I (2)	GT465 Two Dual DVI-I (4)	GT465 Two Dual DVI-I (4)
Audio	5.1 Channel	5.1 Channel	N/A	7.1 Channel	7.1 Channel
Serial Port	1 internal optional	1 internal optional	1 rear	Optional	Optional
Management	Intel AMT vPro	Intel AMT vPro	IPMI 2.0	WfM	IPMI 2.0
O/S Drive	250 GB 3.5"	250 GB 3.5"	250 GB 3.5"	250 GB 3.5"	250 GB 3.5"
RAID	0, 1	0, 1	0, 1	0, 1	0, 1
DVD/RW	Included	Included	Included	Included	Included
Monitor	Optional	Optional	Optional	Optional	Optional
Keyboard/Mouse	Included	Included	Included	Included	Included
Warranty	Four-year limited	Four-year limited	Four-year limited	Four-year limited	Four-year limited
Pre-installed O/S	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro
Viewing Client	Optional Free Installation	Optional Free Installation	Optional Free Installation	Optional Free Installation	Optional Free Installation

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Category	Video Matrix	Video Matrix	Video Matrix	Hybrid
AGS Model	**Reliance NSS**	**Reliance NSC**	**Reliance NSV**	**Reliance HB-2**
Product ID	**NSS**	**NSC**	**NSV**	**HB-2**
Base Part Number	AGS-NSS	AGS-NSC	AGS-NSV	AGS-HB-2
Throughput	50 Mbps	16 Camera Views	48 Camera Views	50 Mbps
Chassis Type	Intel 1U Rack Mount	Tower	4U Rackmount	Desktop
Power Supplies	350W	430W	850W	380W
Dimensions	1.70"H x 16.9"W x 20"D	18"H x 8.1"W x 18.3"D	7"(H) x 19"(W) x 20"(D)	5.5"H x 17.5"W x 16.3"D
Motherboard	Intel Xeon 3400 Series	Intel i5 Series	Intel i7 Series	Intel i5 Series
Processor (socket)	Intel Dual Core (1156)	Intel Core i5 (1156)	Intel Core i7 (1366)	Intel Core i5 (1156)
Cores/HT- Core Ghz	2C/2T – 2.8Ghz	4C/4T – 2.8 Ghz	4C/8T – 3 Ghz	2C/4T – 3.6Ghz
Memory	4GB (32GB max)	4GB DDR3 (8GB max)	4GB DDR3 (16GB max)	2GB (16GB max)
Memory Type	non-ECC	non-ECC	non-ECC	non-ECC
USB Ports	4 rear - 1 front	6 rear - 2 front	8 rear	6 rear - 2 front
Ethernet NIC	2x 10/100/1000	1x 10/100/1000	1x 10/100/1000	1x 10/100/1000
Onboard Graphics	Integrated 8MB	Intel Graphics Technology	N/A	Intel Graphics Technology
Graphics Ports	VGA	DVI-I / DVI-D / HDMI	N/A	DVI-I / DVI-D / HDMI
Graphics Cards	N/A	GT 240 DVI-I (1)	GT465 Two Dual DVI-I (4)	Optional
Audio	N/A	5.1 Channel	7.1 Channel	5.1 Channel
Serial Port	1 rear - 1 front	1 internal optional	Optional	1 internal optional
Management	IPMI 2.0	Intel AMT vPro	WfM	Intel AMT vPro
O/S Drive	250 GB 3.5"	250 GB 3.5"	250 GB 3.5"	Shared O/S
Max Storage	N/A	N/A	N/A	4TB
Hot Swap Bay	N/A	Optional	Optional	N/A
RAID	0, 1	0, 1	0, 1	0, 1
DVD/RW	Included	Included	Included	Included
Monitor	N/A	Optional	Optional	Optional
Keyboard/Mouse	N/A	Included	Optional	Included
Warranty	Four-year limited	Four-year limited	Four-year limited	Four-year limited
Pre-installed O/S	Win Server 2008	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro	Vista Business or Win 7 Pro
VMS Pre-installed	Optional Free Installation	Optional Free Installation	Optional Free Installation	Optional Free Installation
OnSSi VMS	Matrix Switcher	Matrix Client	Matrix Viewer	Not Applicable

AGS ACCESS GATE SERVERS

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SAS24

SAS16

SAS48

Category	Storage	Storage	Storage	Storage	Storage	Storage
AGS Model	**Citadel 3 Combo**	**Citadel 4 Combo**	**Citadel SAS16**	**Citadel SAS24**	**Citadel SAS48**	**Citadel MAX**
Product ID	**COMBO3**	**COMBO4**	**SAS16**	**SAS24**	**SAS48**	**FC60**
Base Part Number	AGS-COMBO3-X-0Y-RZ	AGS-COMBO4-X-0Y-RZ	AGS-SAS16-X-YY-RZ	AGS-SAS24-X-YY-RZ	AGS-SAS48-X-YY-RZ	Call for Assistance
Throughput	3 Gbps max	3 Gbps max	6 Gbps SAS	6 Gbps SAS	6 Gbps SAS	Dual 4 x 2 Gbps FC
Chassis Type	SFF	SFF	3U Rack mount	5U Rack mount	8U Rack mount	48U Cabinet
Power Supplies	A/C Adaptor	A/C Adaptor	650W 2+1 Hot Swap Redundant	950W 2+1 Hot Swap Redundant	950W 3+1 Hot Swap Redundant	3900W per drawer
Dimensions	Tower	Tower	5.4"H x 19"W x 28"D	8.25"H x 19"W x 28"D	14"H x 19"W x 28"D	86.8"H x 28"W x 42" D
Interconnect	USB2, 1GE, eSATA	USB2, 1GE, eSATA	iSCSI, SAS or FC Expander	iSCSI, SAS or FC Expander	iSCSI, SAS or FC Expander	Fibre-Channel
Ports	1-USB, 1-1GE, 1-eSATA	4-USB, 2-1GE, 2-eSATA	external HBA & JBOD Interface	external HBA & JBOD Interface	external HBA & JBOD Interface	external SAN, NAS
Serial Port	N/A	N/A	1 Management port	1 Management port	2 Management port	Management controller
Management	Display & Web Browser	Display & Web Browser	Serial	Serial	Serial	Java GUI
Max Storage (TB)	6	8	32	48	96	60 TB to 1,200 TB
Hot Swap Bay	N/A	N/A	16	24	48	60 per drawer
RAID	0, 1, 5,6,10,JBOD	0, 1, 5,6,10,JBOD	0, 1, 5, 6 + Hot Spare	0, 1, 5, 6 + Hot Spare	0, 1, 5, 6 + Hot Spare	5 in five HDD cluster
Warranty	Four-year limited	Four-year limited	Four-year limited	Four-year limited	Four-year limited	Three-year limited

Part Number System: base part number (red letters get replaced)
X = 1 for 1TB Drive or 2 for 2TB Drive
Y = The total number of drives: 1, 2 etc.. (upto the Maxium Drive Count)
R = 1 for RAID1, 5 for RAID5, 6 for RAID6, N for No RAID
Z = H for Hot Spare or N for No Hot Spare

Example;
Reliance 6; Base part number is AGS-HD10X-060Y-RZ

Purchase Order: **AGS-HD102-0605-5H with optional RM kit.**

This will configure a Reliance 6 HD100 with 5 - 2TB hard drives in a RAID5 including a Hot Spare. Total drive count is 5.
Plus an optional rack mount kit. (If you are using this as a tower then no optional RM kit is required.)

RAID & Hot Spare Examples
NN = No RAID - No Hot Spare
RAID 5 (adds one (1) additional drive to your required storage count)
RAID 5 + Hot Spare (adds two (2) additional drives to your required storage count)
RAID 6 (adds two (2) additional drives to your required storage count)
RAID 6 + Hot Spare (adds three (3) additional drives to your required storage count)

For further assistance please contact one of our sales representatives. Visit our website www.accessgate.net for their contact information.

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OnSSI IP To The Core Certified Channel Partner
works to your advantage.
AXIS COMMUNICATIONS
PELCO by Schneider Electric
LINKSYS A Division of Cisco Systems, Inc.
BOSCH
ANIXTER
American Dynamics A Tyco International Company
GraybaR works to your advantage.

FALL 2016

Product comparison tables

Network video, audio and access control

AXIS COMMUNICATIONS

Solutions for a smarter and safer world

Secure and improve your business with an end-to-end Axis solution. We provide a complete range of solutions, whether you need a smart system for basic surveillance or a more advanced system for security on a larger scale.
All of our systems are easy to install, and everything is designed with open IP standards that easily connect with your existing IT infrastructure. Our solutions adapt to your changing needs so you can start out with a basic system and add new possibilities when you want them. With our smart solutions, you can secure and develop your business – both now and in the future.

1) Small systems
Starting small with AXIS Companion

Keep your business safe with a cost-effective, easy-to-use security and surveillance solution. It's designed specifically for small businesses like shops, hotels or offices.

Fore more information, please visit: www.axiscompanion.com/

2) Mid-size systems
Active security with AXIS Camera Station

Protect your business with an end-to-end security and surveillance solution designed for the active operator. The system is perfect for schools, manufacturing sites and other mid-size installations.

3) Large-scale systems
Take security to the next level

Keep your site safe with a solution based on Axis' open IP products. Combine them with hardware and software from our wide range of partners to create a system that meets your business and operational needs – whether it is for an airport, public transportation, city surveillance, or any other complex installation.

Security as a service
Hassle-free surveillance in the cloud

Take the hassle out of security and surveillance by hosting everything in the cloud. With a hosted solution from one of Axis' partners, you can secure your business with a managed service.

Axis product features
Common features found in Axis products

Axis network camera and video encoder features:

- AXIS Video Hosting System with One-Click Connection
- ONVIF Profile S compliant
- Video compression
  - H.264
  - Motion JPEG
- Analytics
  - Motion detection
  - Tampering alarm
  - AXIS Camera Application Platform[1]
- Security
  - Multi-level passwords
  - IP-filtering
  - HTPPS encryption
  - IEEE 802.1X[2]
- Network
  - IPv4/v6 and QoS

1) AXIS P72 and AXIS M70 Video Encoders do not support ACAP.
2) Except AXIS P39-R Series, specially designed for onboard surveillance and certain Axis video encoders.

Axis product naming structure

Below is a quick guide to Axis product naming structure, which gives useful shorthand information on the product and product features.

AXIS Q1615-E Mk II

Product line		Product type		Series no.	Running no.	Resolution/channels		Extension		Version no.
Q	Most advanced, secure video solutions for mission-critical systems	1 2	Fixed cameras			1	VGA	640x480	-C	Cooling enclosure	Mk II
P	Versatile and secure advanced video solutions	3 4	Fixed dome cameras			2	4CIF	704x480 (NTSC) 704x576 (PAL)	-E	Outdoor enclosure	
M	Affordable, intuitive and dependable video solutions	5 6	PTZ cameras			3	SVGA	800x600	-L	LED illumination	
F*	Flexible, modular system for a wide variety of discreet surveillance products	7	Video encoders/ decoders			4	HDTV 720 1.3 MP	1280x720 1280x1024	-P	Panoramic view 360°	
T	A range of accessories that increase the benefits of network video	8	System products			5	HDTV 1080 2 MP	1920x1080 1600x1200	-R	Rugged	
		9	Accessories			6	3 MP – < 5 MP	2048x1536	-V	Vandal-resistant	
						7	5 MP - < 8 MP	2560x1920	-W	Wireless	
						8	4K Ultra HD 8 MP	3840x2160	-S	Stainless steel enclosure	
						9	> 8.3 MP	> 3840x2160			

Series name = AXIS Q16

*Including AXIS F41/F44 Main Unit

Axis fixed network cameras

		AXIS Q17 Series		AXIS Q16 Series			
	AXIS Q8414-LVS 	AXIS Q1775[a] AXIS Q1775-E[b] 	AXIS Q1765-LE[a] AXIS Q1765-LE PT Mount[b] 	AXIS Q1635[a] AXIS Q1635-E[b] 	AXIS Q1615 Mk II[a] AXIS Q1615-E Mk II[b] 	AXIS Q1615[a] AXIS Q1615-E[b] 	AXIS Q1614[a] AXIS Q1614-E[b] 
Max. video resolution (pixels)	1280x960 (approx. 1.3 MP)	1920x1080 (2 MP/HDTV 1080p)	1920x1080 (2 MP/HDTV 1080p)	1920x1200 (2 MP)	1920x1080p (2 MP)	1920x1200 (2 MP)	1280x960 (1 MP)[3]
Horizontal field of view	105° - 49°	67.8° – 8.1°	59° - 4°	102° – 33°[a] 76° - 43.3°[b]	115° - 39°[a] 72° - 39°[b]	120° - 40°[a], 90° - 40°[b]	100° - 34°[a], 80° - 34°[b]
Image sensor	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.9"	Progressive scan CMOS 1/2"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/3"
Lens	Varifocal, 2.5 - 6 mm/F1.2 Remote focus and zoom, P-Iris	3.8 - 38 mm, F1.8 – 3.4 Autofocus	4.7 – 84.6 mm/F1.6 – 2.8 Auto iris and Autofocus	Varifocal, 4 - 13 mm/F1.5[a], 4.4–10/F1.3[b] C-mount Remote back focus	Varifocal 2.8 - 8.5 mm/F1.2 i-CS lens, CS-mount	Varifocal 2.8 - 8 mm/F1.3 P-Iris, CS-mount Remote back focus	Varifocal 2.8 - 8 mm/F1.2 P-Iris[2], CS-mount Remote back focus
Day and night	●	●	●	●	●	●	●
Min. illumination (lux)	0.1 (Color) 0.02 (B/W)	0.23 (Color) 0.05 (B/W)	0.5 (Color) 0.04 (B/W)	0.1 (Color), 0.01 (B/W) HDTV 1080p 50/60 fps: 0.2 (Color), 0.02 (B/W)	HDTV 1080p 25/30fps: 0.11 (Color), 0.02 (B/W) HDTV 1080p 50/60 fps: 0.22 (Color), 0.04 (B/W) HDTV 720p 100/120 fps: 0.44 (Color), 0.09 (B/W)	WDR: 0.18 (Color), 0.04 (B/W) HDTV 1080p 50/60 fps: 0.36 (Color), 0.08 (B/W)	WDR: 0.4 (Color), 0.06 (B/W) HDTV 720p 50/60 fps: 0.2 (Color), 0.04 (B/W)
Frames per second	25/30 (1280x960) 25/30 (HDTV 720p)	50/60 (HDTV 1080p)	25/30 (HDTV 1080p)	50/60 (HDTV 1080p) 25/30 (WUXGA)	100/120 (HDTV 720p) 50/60 (HDTV 1080p) 25/30 (HDTV 1080p) with WDR	25/30 (WUXGA) 50/60 (HDTV 1080p)	50/60 (HDTV 720p) 25/30 (Extended D1, 1280x960)
Pan/Tilt/Zoom	-	10x Optical, 12x Digital zoom	18x Optical, 12x Digital zoom PTZ preset[b], Guard tour[b]	-	-	-	-
Audio support	Two-way	Two-way	Two-way[a]	Two-way Built-in mic[a]	Two-way Built-in mic[a]	Two-way Built-in mic[a]	Two-way Built-in mic[a]
Alarm in-/outputs	1/1	1/1	1/1[a] RS485/RS422 for pan/tilt control[b]	1/1	1/1	1/1	1/1
Additional analytics*	Audio detection	Audio detection Gatekeeper	Audio detection Gatekeeper	Audio detection Shock detection	Audio detection, Shock detection	Audio detection, Shock detection	Audio detection, Shock detection
Power	PoE IEEE 802.3af/at Limited IR: Class 2 Full IR: Class 3	AC/DC[a] PoE IEEE 802.3af/at Class 3[a], Class 4[b]	AC/DC PoE IEEE 802.3af/at Class 3	AC/DC[a], High PoE[b], PoE IEEE 802.3af/at Class 3	DC[a], High PoE[b] PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 2[a], Class 3[b]	High PoE[b] PoE IEEE 802.3af/at Class 3
Outdoor ready	-	●[a]	●	●[a]	●[a]	●[a]	●[a]
Other	White and Metal models, IP66 and NEMA 4X ratings, IK10+ 50 joules stainless steel, IR LED (940 nm), WDR- Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Lightfinder technology	Arctic Temperature Control[b], Pixel Counter, Leveling assistant, WDR-Dynamic Capture, Defogging, Memory card slot, IP66 and NEMA 4X ratings[b], IK10[b], Corridor Format[a]	WDR-Dynamic Contrast, Arctic Temperature Control, RS422/RS485[b], OptimizedIR, Memory card slot, IP66 and NEMA 4X ratings, Corridor Format[a]	Zipstream, Arctic Temperature Control[b], Lightfinder, IP66 and NEMA 4X ratings[b], IK10[b], WDR-Forensic Capture, Electronic Image Stabilization, Auto rotation, Leveling assistance, Defogging, Pixel counter, Memory card slot, Corridor Format[a]	Zipstream, Arctic Temperature Control[b], WDR-Forensic Capture, IP66, NEMA 4X and IK10 ratings[b], Electronic Image Stabilization, Auto rotation, Leveling assistance, Pixel counter, Memory card slot, Defogging, Corridor Format[a]	Zipstream, Arctic Temperature Control[b], WDR-Forensic Capture, IP66 and NEMA 4X ratings[b], Electronic Image Stabilization, Auto rotation, Leveling assistance, Pixel counter, Memory card slot, Defogging, Corridor Format[a]	Arctic Temperature Control[b], IP66 and NEMA 4X ratings[b] WDR- Dynamic Capture, Auto rotation, Leveling assistance, Pixel counter, Memory card slot, Corridor Format[a]

Notations (a) and (b) refer to the corresponding product models for the column
(2) AXIS Q1614/-E also support DC-iris lens
(3) 1400x1050 (1.4 MP) scaled resolution available via VAPIX®

**) More included analytics can be found on page 2*

Axis fixed network cameras

	AXIS P14 Series				
	AXIS P1435-E[a] AXIS P1435-LE[b]	AXIS P1428-E	AXIS P1427-E[a] AXIS P1427-LE[b]	AXIS P1425-E[a] AXIS P1425-LE[b]	AXIS P1405-E[a] AXIS P1405-LE[b]
					
Max. video resolution (pixels)	1920x1080 (HDTV 1080p)	4K UltraHD 3840x2160 (8.3 MP)	1920x1080 (HDTV 1080p) 2592x1944 (5 MP)	1920x1080 (2 MP/HDTV 1080p)	1920x1080 (2 MP/HDTV 1080p)
Horizontal field of view	3–10.5 mm: 95°–35° 10–22 mm: 34.5°–18°	35°–105°	27°–92°	33°–92°	34°–93°
Image sensor	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.5"	Progressive scan CMOS 1/3.2"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"
Lens	P-Iris, Autofocus 10.5mm: Varifocal, 3–10.5mm/F1.4, 3.5x Optical zoom 22mm: Varifocal 10–22mm/F1.85, 2x Optical zoom	Varifocal, 3.3–9.8mm/F1.6 P-Iris, Autofocus, 3x Optical zoom	Varifocal, 2.8–9.8mm/F1.6 P-Iris, Autofocus, 3.5x Optical zoom	Varifocal, 3–10.5mm/F1.4 P-Iris, Autofocus, 3.5x Optical zoom	Varifocal, 2.8–10mm/F1.6, P-Iris, Autofocus, 3.5x Optical zoom
Day and night	●	●	●	●	●
Min. illumination (lux)	3–10.5mm: 30 fps: 0.12 (Color), : 0.01 (B/W) 60 fps: 0.24 (Color), 0.02 (B/W) 10–22 mm: 30 fps: 0.16 (Color), 0.02 (B/W) 0.32 (Color), 0.03 (B/W) 0 lux with IR illumination on[B]	1.4 (Color), 0.3 (B/W)	0.35 (Color), 0.07 (B/W)	0.25 (Color), 0.05 (B/W)	0.35 (Color), 0.07 (B/W)
Frames per second	50/60	25/30	25/30 12,5/12 (5 MP) 16/20 (3 MP)	25/30	25/30
Audio support	-	-	-	-	-
Alarm in-/outputs	1/1	1/1	1/1	1/1	-
Additional analytics*	*	*	*	*	*
Power	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3
Outdoor ready	●	●	●	●	●
Other	Zipstream, WDR-Forensic capture, Lightfinder Remote zoom and focus, Memory card slot, IP66/IP67 and NEMA 4X ratings, OptimizedIR[b], Corridor Format	WDR-Dynamic Contrast, Remote zoom and focus, Memory card slot, IP66/IP67 and NEMA 4X ratings, Corridor Format	WDR-Dynamic Contrast, Remote zoom and focus, Memory card slot, IP66/IP67 and NEMA 4X ratings, OptimizedIR[b], Corridor Format	WDR-Dynamic Contrast, Remote zoom and focus, Memory card slot, IP66/IP67 and NEMA 4X ratings, OptimizedIR[b], Corridor Format	WDR-Dynamic Contrast, Remote zoom and focus, Memory card slot, IP66/IP67 and NEMA 4X ratings, Built-in IR[b], Corridor Format

Notations (a) and (b) refer to the corresponding product models for the column

*) More included analytics can be found on page 2

Axis fixed network cameras

	AXIS P13 Series			AXIS M11 Series		
	AXIS P1365 Mk II[a] AXIS P1365-E Mk II[b]	AXIS P1364[a] AXIS P1364-E[b]	AXIS P1357[a] AXIS P1357-E[b]	AXIS M1145[a] AXIS M1145-L[b]	AXIS M1125[a] AXIS M1125-E[b]	AXIS M1124[a] AXIS M1124-E[b]
						
Max. video resolution (pixels)	1920x1080	1280x960	2592x1944 (5 MP)	1920x1080 (2 MP/HDTV 1080p)	1920x1080 (2 MP/HDTV 1080p)	1280x720 (1 MP/HDTV 720p)
Horizontal field of view	112-39(a) 84-39(b)	92.3-33.3[a] 83 - 33.3[b]	92° - 32°[a] 80° - 32°[b]	95° - 34°	91° - 32°	91° - 32°
Image sensor	Progressive scan CMOS 1/2.8	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/3.2"	Progressive scan CMOS 1/2.9"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"
Lens	Varifocal 2.8 - 8 mm/F1.3 P-Iris, CS mount	Varifocal 2.8 - 8.5 mm/F1.3 P-Iris, CS mount Remote back focus	Varifocal 2.8 - 8 mm/F1.6 P-Iris[2], CS mount Remote back focus	Varifocal 3-10.5 mm/F1.4 P-iris	Varifocal 3-10.5 mm/F1.4 DC-iris	Varifocal 3-10.5 mm/F1.4 DC-iris
Day and night	●	●	●	●	●	●
Min. illumination (lux)	0.11 (Color) 0.01 (B/W)	0.1 (Color) 0.01 (B/W)	0.2 (Color) 0.04 (B/W)	0.4 (Color) 0.08 (B/W)	0.25 (Color) 0.05 (B/W)	0.25 (Color) 0.05 (B/W)
Frames per second	50/60 (HDTV 1080p) without WDR 25/30 (HDTV 1080p) with WDR	50/60 (HDTV 720p) without WDR 25/30 (HDTV 720p) with WDR	30 (HDTV 1080p) 20 (3 MP) 12 (5 MP)	25/30 (HDTV 1080p)	25/30 (HDTV 1080p)	25/30 (HDTV 720p)
Audio support	Two-way Built-in mic[a]	Two-way Built-in mic[a]	Two-way Built-in mic[a]	-	-	-
Alarm in-/outputs	2 configurable inputs/outputs	1/1	1/1	1/1	1/1	1/1
Additional analytics*	Audio detection	Audio detection	Audio detection	*	AXIS Cross Line Detection	AXIS Cross Line Detection
Power	DC[a] PoE IEEE 802.3af/at Class 3	DC[a] PoE IEEE 802.3af/at Class 3	DC[a] PoE IEEE 802.3af/at Class 3, High PoE[b]	PoE IEEE 802.3af/at Class 1	PoE IEEE 802.3af/at Class2	PoE IEEE 802.3af/at Class2
Outdoor ready	●[b]	●[b]	●[b]	-	●[b]	●[b]
Other	Zipstream, WDR-Forensic Capture, Lightfinder, Corridor Format, Multiview streaming, IP66/IP67 and NEMA 4X-ratings[b], IK10[b], Memory card slot	Zipstream, WDR-Forensic Capture, Lightfinder, Corridor Format, Multiview streaming, IP66/IP67 and NEMA 4X ratings[b], IK10[b], Memory card slot	Arctic Temperature Control[b], WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Multiview streaming, IP66 and NEMA 4X ratings[b], Corridor Format[a]	Digital PTZ, Memory card slot, Built-in IR illumination[b], OptimizedIR[b], Corridor Format	WDR-Forensic Capture, Zipstream, Digital PTZ, IP66 and NEMA 4X ratings[b], IK10[b], Pixel counter, Memory card slot, Corridor Format,	WDR-Forensic Capture, Zipstream, Digital PTZ, IP66 and NEMA 4X ratings[b], IK10[b], Pixel counter, Memory card slot, Corridor Format,

Notations (a) and (b) refer to the corresponding product models for the column
(2) AXIS P1357/-E also support DC-iris lens

**) More included analytics can be found on page 2*

Axis fixed network cameras

	AXIS M10 Series					
	AXIS M1054 	AXIS M1034-W 	AXIS M1025 	AXIS M1014 	AXIS M1013 	AXIS M1004-W 
Max. video resolution (pixels)	1280x800 (1 MP)	1280x800 (1 MP)	1920x1080 (2 MP)	1280x800 (1 MP)	800x600	1280x800 (1 MP)
Horizontal field of view	84°	80°	94°	80°	67°	80°
Image sensor	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/2.7"	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/4"
Lens	2.9 mm/F2.0 Fixed iris	2.8 mm/F2.0 Fixed iris, Adjustable focus	3.6 mm/F2.8 Fixed iris Adjustable focus	2.8 mm/F2.0 Fixed iris Adjustable focus	2.8 mm/F2.0 Fixed iris Adjustable focus	2.8 mm/F2.0 Fixed iris Adjustable focus
Min. illumination (lux)	1.2 (Color) 0 with LED on	1.2 (Color) 0 with LED on	1.5 (Color)	1.2 (Color)	1.2 (Color)	1.2 (Color)
Frames per second	30 (1280x800) 30 (HDTV 720p)	30 (1280x800) 30 (HDTV 720p)	30 (HDTV 1080p)	30 (1280x800) 30 (HDTV 720p)	30 (800x600)	30 (1280x800) 30 (HDTV 720p)
Audio support	Two-way Built-in mic and speaker	Two-way Built-in mic and speaker	-	-	-	-
Alarm in-/outputs	1/1	1/1	-	-	-	1/1
Additional analytics*	Audio detection	Audio detection	*	*	*	*
Power	DC PoE IEEE 802.3af/at Class 2	DC PoE splitter available	DC PoE IEEE 802.3af/at Class 1	DC PoE splitter available	DC PoE splitter available	DC PoE splitter available
Outdoor ready	-	-	-	-	-	-
Other	Built-in PIR sensor, Illumination LED, Digital PTZ, Corridor Format	Built-in PIR sensor, Illumination LED, Digital PTZ, IEEE 802.11b/g/n, Corridor Format	HDMI™ output (Micro) in HDTV 720p, Digital PTZ, Memory card slot, Corridor Format	Digital PTZ, Memory card slot, Corridor Format	Digital PTZ, Memory card slot, Corridor Format	Digital PTZ, IEEE 802.11b/g/n, Corridor Format

) More included analytics can be found on page 2

Axis modular cameras

	AXIS F Series								
	AXIS F Main Units			AXIS F Sensor Units					
	AXIS F44 	AXIS F41 	AXIS F34 	AXIS F4005[a]/AXIS F4005-E[b] 	AXIS F1035-E 	AXIS F1025 	AXIS F1015 	AXIS F1005-E 	AXIS F1004[a] AXIS F1004 Bullet[a]/Pinhole[b] 
Max. video resolution (pixels)	1920x1080	1920x1200	1920 x 1080	1920x1200/1080	1920x1200/1080	1920x1200/1080	1920x1200/1080	1920x1200/1080	1280x720 (HDTV 720p)
Horizontal field of view	-	-	-	113°[a]/110°[b] (1080p mode) 73°[a]/71°[b] (720p mode)	194° (1080p mode) 112° (720p mode)	92° (1080p mode) 56° (720p mode)	108° - 53° (1080p mode) 65° - 35° (720p mode)	113° (1080p mode) 73° (720p mode)	102°[a]/57°[b]
Image sensor	-	-	-	Progressive scan CMOS 1/2.8" (effective)	Progressive scan CMOS 1/2.8" (effective)	Progressive scan CMOS 1/2.8" (effective)	Progressive scan CMOS 1/2.8" (effective)	Progressive scan CMOS 1/2.8" (effective)	Progressive scan CMOS 1/4" (effective)
Lens	-	-	-	2.8 mm/F2.0, Fixed iris	Fish-eye, 1.3 mm/F2.8, Fixed iris	Pinhole, 3.7 mm/F2.5, Fixed iris	Varifocal, 3–6 mm/F2.0, Fixed iris	2.8 mm/F2.0, Fixed iris	2.1 mm/F2.2[a] 3.7 mm/F2.5[b] Fixed iris, Pinhole[b]
Min. illumination (lux)	-	-	-	0.3 (Color)	0.3 (Color)	0.3 (Color)	0.3 (Color)	0.3 (Color)	0.4 (Color)[a] 0.5 (Color)[b]
Frames per second	25/30 per channel, 720p mode without WDR 12.5/15 per channel, 1080p mode 12.5/15 per channel, 720p mode with WDR	50/60 in 1080p without WDR 25/30 in 1080p with WDR 25/30 in 1920x1200 without WDR	25/30 per channel, 720p mode 12.5/15 per channel, 1080p mode	Max 50/60 (HDTV 1080p)	Max 50/60 (HDTV 1080p)	Max 50/60 (HDTV 1080p)	Max 50/60 (HDTV 1080p)	Max 50/60 (HDTV 1080p)	Max 25/30 (HDTV 720p)
Audio support	Two-way	Two-way	-						
Alarm in-/outputs	4 configurable inputs/outputs	4 configurable inputs/outputs	-						
Additional analytics*	Audio detection	Audio detection	*						
Power	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3						
Outdoor ready	-	-	-	●[b]	●	-	-	●	-
Other	Supports 4 sensor units, Zipstream, Quad View, WDR-Forensic Capture, Rugged, Suitable for use in vehicles, 2 memory card slots, Pixel counter, Corridor Format	Supports 1 sensor unit, Zipstream, WDR-Forensic Capture, Rugged, Suitable for use in vehicles, Memory card slot, Pixel counter, Corridor Format	Supports 4 sensor units, Zipstream, Quad view, WDR-Dynamic Contrast, 2 memory card slots, Pixel counter, Corridor Format	IP66[b], IK09[b], Suitable for use in vehicles[b], Corridor Format, WDR-Forensic Capture, For use with AXIS F Main Units	IP66 and NEMA 4X ratings, Rugged, WDR-Forensic Capture, For use with AXIS F Main Units	WDR-Forensic Capture, For use with AXIS F Main Units	WDR-Forensic Capture, For use with AXIS F Main Units	IP66 and NEMA 4X ratings, Rugged, WDR-Forensic Capture, For use with AXIS F Main Units	WDR, For use with AXIS F Main Units

Notations (a) and (b) refer to the corresponding product models for the column

*) More included analytics can be found on page 2

Axis modular cameras

		AXIS P12 Series					AXIS P85 Series		
	AXIS P1264 	AXIS P1254 	AXIS P1244 	AXIS P1224-E 	AXIS P1214[a] AXIS P1214-E[b] 	AXIS P1204 	AXIS P8535 	AXIS P8524 	AXIS M2014-E 
Max. video resolution (pixels)	1280x720 (HDTV 720p)	1280x720 (HDTV 720p)	1280x720 (HDTV 720p)	1280x720 (HDTV 720p)	1280x720 (HDTV 720p)	1280x720 (HDTV 720p)	1920x1200	1280x720p (HDTV 720p)	1280x720 (HDTV 720p)
Horizontal field of view	57°	102°	102°	145°	57°[a] 81°[b]	57°	92°	57°	81°
Image sensor	Progressive scan CMOS 1/4" (effective)	Progressive scan CMOS 1/4" (effective)	Progressive scan CMOS 1/4" (effective)	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/2.8" (effective)	Progressive scan CMOS 1/4" (effective)	Progressive scan CMOS 1/4"
Lens	3.7 mm/F2.5 Fixed iris, Pinehole	2.1 mm/F2.2 Fixed iris	2.1 mm/F2.2 Fixed iris	1.56 mm/F2.8 Fixed iris	3.7 mm/F2.5[a] 2.8 mm/F2.0[b] Fixed iris	3.7 mm/F2.5 Fixed iris	3.7 mm/F2.5 Fixed iris	3.7 mm/F2.5 Fixed iris	2.8 mm/F2.0 Fixed iris, Fixed focus
Min. illumination (lux)	0.5 (Color)	0.4 (Color)	0.4 (Color)	0.8 (Color)	1.2 (Color)	1.2 (Color)	0.3 (Color)	1.2 (Color)	1.0
Frames per second	25/30 (HDTV 720p)	25/30 (HDTV 720p)	25/30 (HDTV 720p)	25/30 (HDTV 720p)	25/30 (HDTV 720p)	25/30 (HDTV 720p)	50/60 (HDTV 1080p) without WDR 25/30 (1920x1200) without WDR 25/30 (HDTV 1080p) with WDR	25/30 (HDTV 720p)	25/30 (HDTV 720p)
Audio support	-	-	-	-	-	-	Two-way audio	-	-
Alarm in-/outputs	-	-	-	1/1	1/1	1/1	4 configurable inputs/ outputs	-	1/1
Additional analytics*	*	*	*	*	*	*	Audio detection	*	*
Power	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 2	DC PoE IEEE 802.3af/at Class 2	DC PoE IEEE 802.3af/at Class 2	DC PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class2
Outdoor ready	-	-	-	Sensor unit	Sensor unit[b]	-	-	-	●
Other	Zipstream, WDR, Pixel counter, Corridor Format, Memory card slot	Zipstream, WDR, Pixel counter, Corridor Format, Memory card slot	Zipstream, WDR, Pixel counter, Corridor Format, Memory card slot	IP66 and NEMA 4X ratings, Sensor unit, Memory card slot	IP66 and NEMA 4X ratings[b], Sensor unit[b], Memory card slot	Memory card slot	Zipstream, Eye-level camera in black/silver housing, Metric/Imperial height strip, WDR-Forensic Capture, Pixel counter, Memory card slot	Eye-level camera in black/silver housing, Metric/Imperial height strip, Pixel counter, Memory card slot	Memory card slot, Corridor Format

Notations (a) and (b) refer to the corresponding product models for the column

) More included analytics can be found on page 2

Axis fixed dome network cameras

	AXIS Q37 Series		AXIS Q36 Series		AXIS Q35 Series
	AXIS Q3709-PVE 	AXIS Q3708-PVE 	AXIS Q3617-VE 	AXIS Q3615-VE 	AXIS Q3505-V[a] AXIS Q3505-VE[b] 
Max. video resolution (pixels)	3x 3840x2880 (4K Ultra HD)	3x 2560x1920 (5 MP)	3072x2048 (6 MP)	1920x1200 (2.3 MP)	1920x1200 (2.3 MP)
Horizontal field of view	180°	180°	101° - 46°	100° - 46°	9 mm: 105° - 35° 22 mm: 33° - 16°
Image sensor	Progressive scan CMOS 3x 1/2.3"	Progressive scan CMOS 3x 1/1.8"	Progressive scan CMOS 1/1.8"	Progressive scan CMOS 1/1.9"	Progressive scan CMOS 1/2.8"
Lens	3x 5.0 mm/F2.8 Fixed focus	3x 5.0 mm/F2.8 Fixed focus	4.1 - 9 mm/F1.6 P-iris, IR corrected Remote focus and zoom	4.1 - 9 mm/F1.6 P-iris, IR corrected Remote focus and zoom	9 mm: 3-9 mm/F1.3 22 mm: 9-22 mm/F1.3 Varifocal, P-Iris, IR corrected, Remote focus and zoom
Day and night	●	●	●	●	●
Min. illumination (lux)	2 (Color) 0.4 (B/W)	0.3 (Color) 0.06 (B/W)	0.18 (Color) 0.03 (B/W)	WDR-Forensic Capture and Lightfinder: 0.1 (Color), 0.02 (B/W)	9 mm: WDR-Forensic Capture and Lightfinder: 0.18 (Color), 0.04 (B/W) 22 mm: WDR-Forensic Capture: 0.28 (Color), 0.06 (B/W)
Frames per second	25/30 (4K Ultra HD) 16/20 (3x 11 MP)	25/30 (Quad HD) 16/20 (3x 5 MP)	25/30 (4 MP with WDR) 20 (6 MP without WDR)	50/60 (HDTV 1080p) 25/30 (HDTV 1080p with WDR and Lightfinder)	25/30 (with WDR) 50/60 (without WDR)
Audio support	-	-	-	-	Two-way Mic as optional accessory[a]
Alarm in-/outputs	-	-	-	-	1/1
Additional analytics*	*	*	*	*	Audio detection
Power	PoE IEEE 802.3af/at Class 4	PoE IEEE 802.3af/at Class 4	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 2[a], Class 3[b]
Outdoor ready	●	●	●	●	●[a]
Other	Three camera heads, IP66 and NEMA 4X ratings, IK10, Digital PTZ, Guard tour, WDR-Dynamic Contrast, Pixel counter	Three camera heads, Zipstream, IP66 and NEMA 4X ratings, IK10, Digital PTZ, Guard tour, WDR-Forensic Capture, Pixel counter	Zipstream, IP6K9K/IP66/IP67 and NEMA 4X ratings, IK10, WDR-Forensic Capture, Digital PTZ, EIS, Lightfinder technology, Corridor Format	Zipstream, IP6K9K/IP66/IP67 and NEMA 4X ratings, IK10, WDR-Forensic Capture, Digital PTZ, EIS, Lightfinder technology, Corridor Format	Zipstream, IP66 and NEMA 4X ratings[b], IK10, WDR-Forensic Capture, Digital PTZ, Pixel counter, Memory card slot, Lightfinder technology, Corridor Format

Notations (a) and (b) refer to the corresponding product models for the column

) More included analytics can be found on page 2

	AXIS P39-R Series			
	AXIS P3915-R 	AXIS P3905-R[a] / AXIS P3905-RE[b] 	AXIS P3904-R 	AXIS P3707-PE 
Max. video resolution (pixels)	1920x1080 (2 MP)	1920x1080 (2 MP)	1280x720 (1 MP)	4x 1920x1080 (8 MP) 1920x1440 (Quad view)
Horizontal field of view	87°	87°[a] 56°[b]	87°	108°–54° (1080p mode) per lens 67°–36° (720p mode) per lens
Image sensor	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 4x 1/2.8"
Lens	3.6 mm/F2.0 Fixed iris, M12 mount	3.6 mm/F2.0[a] 6 mm/F1.6[b] Fixed iris, M12 mount	3.6 mm/F2.0 Fixed iris, M12 mount	Varifocal, Fixed iris 4x 2.8–6 mm/F2.0
Day and night	-	-	-	-
Min. illumination (lux)	0.2 (Color)	0.2 (Color)	0.2 (Color)	0.3 (Color)
Frames per second	30 (HDTV 1080p)	30 (HDTV 1080p)	30 (HDTV 720p)	25/30 (720p mode) 12.5/15 (1080p mode)
Audio support	One-way	-	-	-
Alarm in-/outputs	1/1	-	-	-
Additional analytics*	Audio detection	*	*	*
Power	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 2
Outdoor ready	-	⬢[a]	-	⬢
Other	Rugged connectors for mobile surveillance, IP66/IP67 and NEMA 4X ratings, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Corridor Format	Rugged connectors for mobile surveillance, IP6K9K[b]/IP66/IP67 and NEMA 4X ratings, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Corridor Format	Rugged connectors for mobile surveillance, IP66/IP67 and NEMA 4X ratings, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Corridor Format	Four camera heads, Quad view, Zipstream, IP66/IP67, NEMA 4X ratings, IK09, Pixel Counter, Corridor Format

Axis fixed dome network cameras

	AXIS P33 Series				
	AXIS P3384-V[a] AXIS P3384-VE[b]	AXIS P3367-V[a] AXIS P3367-VE[b]	AXIS P3365-V[a] AXIS P3365-VE[b]	AXIS P3364-V[a]/-LV[a] AXIS P3364-VE[b]/-LVE[b]	AXIS P3354
					
Max. video resolution (pixels)	1280x960 (approx. 1.3 MP)[3]	2592x1944 (5 MP)	1920x1080 (HDTV 1080p)	1280x960 (approx. 1.3 MP)[3]	1280x960 (approx. 1.3 MP)(3)
Horizontal field of view	84° - 30°	84° - 30°	100° - 35°	6 mm: 105°- 49° 12 mm: 82°- 24°	6 mm: 105°- 49° 12 mm: 82°- 24°
Image sensor	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/3.2"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/3"
Lens	Varifocal, Remote focus and zoom, IR corrected, P-Iris, 3–9 mm/F1.2	Varifocal, Remote focus and zoom, IR corrected, P-Iris, 3–9 mm/ F1.2	Varifocal, Remote focus and zoom, IR corrected, P-Iris, 3–9 mm/F1.3	Varifocal, Remote focus and zoom, IR corrected, P-Iris 6 mm: 2.5–6 mm /F1.2 12 mm: 3.3–12 mm/F1.4	Varifocal, Remote focus and zoom, IR corrected, P-Iris 6 mm: 2.5–6 mm /F1.2 12 mm: 3.3–12 mm/F1.4
Day and night	●	●	●	●	●
Min. illumination (lux)	With Dynamic Capture: 0.5 (Color), 0.08 (B/W) With Lightfinder: 0.15 (Color), 0.03 (B/W)	0.2 (Color), 0.04 (B/W)	0.2 (Color), 0.04 (B/W)	6 mm: 0.1 (Color), 0.02 (B/W) 12 mm: 0.15 (Color), 0.03 (B/W) 12 mm: 0.18 (Color), 0.04 (B/W) (AXIS P3364-LV/-LVE)	6mm: 0.1 (Color), 0.02 (B/W) 12mm: 0.15 (Color), 0.03 (B/W)
Frames per second	25/30 (1280x960) 25/30 (HDTV 720p)	30 (HDTV 1080p) 30 (1600x1200) 20 (2048x1536) 12 (2592x1944)	25/30 (HDTV 1080p) 25/30 (HDTV 720p)	25/30 (1280x960) 25/30 (HDTV 720p)	25/30 (1280x960) 25/30 (HDTV 720p)
Audio support	Two-way Built-in mic[a]	Two-way Built-in mic[a]	Two-way Built-in mic[a]	Two-way Built-in mic[a]	-
Alarm in-/outputs	1/1	1/1	1/1	1/1	-
Additional analytics*	Audio detection	Audio detection	Audio detection	Audio detection	Audio detection
Power	PoE IEEE 802.3af/at Class 2[a], Class 3[b]	PoE IEEE 802.3af/at Class 2[a], Class 3[b]	PoE IEEE 802.3af/at Class 2[a], Class 3[b]	PoE IEEE 802.3af/at Class 2[a], Class 3[b]	PoE IEEE 802.3af/at Class 2
Outdoor ready	●[b]	●[b]	●[b]	●[b]	-
Other	Vandal resistant, IP66 and NEMA 4X ratings[b], WDR-Dynamic Capture, Digital PTZ, Pixel counter, Memory card slot, Lightfinder technology Corridor Format	Vandal resistant, IP66 and NEMA 4X ratings[b], WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Corridor Format	Vandal resistant, IP66 and NEMA 4X ratings[b], WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Corridor Format	Vandal resistant, IP66 and NEMA 4X ratings[b], WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Lightfinder technology, OptimizedIR (-L), Corridor Format	Tamper resistant, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Lightfinder technology Corridor Format

Notations (a) and (b) refer to the corresponding product models for the column
(3) 1400x1050 (1.4 MP) scaled resolution available via VAPIX®

**) More included analytics can be found on page 2*

Axis fixed dome network cameras

	AXIS P32 Series				AXIS M30 Series		
	AXIS P3225-LV[a] AXIS P3225-LVE[b]	AXIS P3224-LV[a] AXIS P3224-LVE[b]	AXIS P3215-V[a] AXIS P3215-VE[b]	AXIS P3214-V[a] AXIS P3214-VE[b]	AXIS M3046-V	AXIS M3045-V	AXIS M3044-V
							
Max. video resolution (pixels)	1920x1080	1280x960	1920x1080 (2 MP/HDTV 1080p)	1280x720 (HDTV 720p) 1280x960 (1.3 MP)	2688x1520 (4 MP)	1920x1080 (2 MP)	1280x720 (1 MP)
Horizontal field of view	92°–34°	92°–34°	95° - 34°	92° - 33°	128°	106°	82°
Image sensor	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/3"
Lens	Varifocal 3-10.5 mm/F1.4 Remote focus and zoom IR corrected, P-Iris	Varifocal 3-10.5 mm/F1.4 Remote focus and zoom IR corrected, P-Iris	Varifocal 3-10.5 mm/F1.4 Remote focus and zoom IR corrected, P-Iris	Varifocal 2.8-10 mm/F1.6 Remote focus and zoom IR corrected, P-Iris	2.4 mm/F2.2 M12 mount, Fixed iris, Fixed focus	2.8 mm/F2.0 M12 mount, Fixed iris, Fixed focus	2.8 mm/F2.0 M12 mount, Fixed iris, Fixed focus
Day and night	●	●	●	●	-	-	-
Min. illumination (lux)	0.25 (Color) 0.0 (B/W) with IR illumination	0.25 (Color) 0.0 (B/W) with IR illumination	0.25 (Color) 0.05 (B/W)	0.3 (Color) 0.06 (B/W)	0.3 (Color)	0.25 (Color)	0.25 (Color)
Frames per second	50/60 without WDR 25/30 with WDR	50/60 without WDR 25/30 with WDR	25/30 (HDTV 1080p)	25/30 (HDTV 720p)	50/60 (HDTV 720p) 25/30 (HDTV 1080p)	50/60 (HDTV 720p) 25/30 (HDTV 1080p)	25/30 (HDTV 720p)
Audio support	-	-	-	-	-	-	-
Alarm in–/outputs	-	-	-	-	-	-	-
Additional analytics*	*	*	*	*	*	*	*
Power	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 1	PoE IEEE 802.3af/at Class 1	PoE IEEE 802.3af/at Class 1
Outdoor ready	●[b]	●[b]	●[b]	●[b]	-	-	-
Other	Zipstream , Vandal resistant, IP66 and NEMA 4X ratings[b], IK10[b], WDR-Forensic Capture, OptimizedIR, Digital PTZ, Pixel counter, Memory card slot, Corridor Format	Zipstream , Vandal resistant, IP66 and NEMA 4X ratings[b], IK10[b], WDR-Forensic Capture, OptimizedIR, Digital PTZ, Pixel counter, Memory card slot, Corridor Format	Vandal resistant, IP66 and NEMA 4X ratings[b], WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Corridor Format	Vandal resistant, IP66 and NEMA 4X ratings[b], WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Corridor Format	HDMI Output, Zipstream, IK08, Digital PTZ, WDR, Corridor Format, Pixel counter	HDMI Output, Zipstream, IK08, Digital PTZ, WDR, Corridor Format, Pixel counter	Zipstream, IK08, Digital PTZ, WDR, Corridor Format, Pixel counter

Notations (a) and (b) refer to the corresponding product models for the column

) More included analytics can be found on page 2

Axis fixed dome network cameras

	AXIS M30 Series				
	AXIS M3037-PVE	AXIS M3027-PVE	AXIS M3026-VE	AXIS M3025-VE	AXIS M3024-LVE
					
Max. video resolution (pixels)	2592x1944 (5 MP)	2592x1944 (5 MP)	2048x1536 (3 MP)	1920x1080 (2 MP/HDTV 1080p)	1280x800 (1 MP)
Horizontal field of view	187°	187°	106°	91°	77°
Image sensor	Progressive scan CMOS 1/3.2"	Progressive scan CMOS 1/3.2"	Progressive scan CMOS 1/3.6" (effective)	Progressive scan CMOS 1/2.7"	Progressive scan CMOS 1/4"
Lens	1.27mm/F2.0 IR corrected, Fixed iris, M12 mount	1.3 mm/F2.8 Fixed iris, M12 mount	2.0 mm, F2.0 Fixed iris, M12 mount	3.6 mm/F2.0 Fixed iris, M12 mount	2.8 mm/F2.0 Fixed iris, M12 mount
Day and night	●	●	●	●	●
Min. illumination (lux)	0.3 (Color) 0.06 (B/W)	0.3 (Color) 0.06 (B/W)	0.3 (Color) 0.06 (B/W)	0.8 (Color) 0.16 (B/W)	0.8 (Color) 0.16 (B/W) 0 with LED on
Frames per second	12 (2592x1944)	12 (2592x1944)	25/30 (HDTV 1080p) 25/30 (1600x1200) 16/20 (2048x1536)	25/30 (HDTV 1080p)	25/30 (1280x800)
Audio support	Two-way	-	-	-	-
Alarm in-/outputs	1/1	1/1	1/1	1/1	1/1
Additional analytics*	Audio detection	*	*	*	*
Power	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 2
Outdoor ready	●	●	●	●	●
Other	360°/270°/180° Panoramic views, SIP support, IP66 and NEMA 4X ratings, IK10, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot	360°/180° Panoramic views, IP66 and NEMA 4X ratings, IK10, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot	Vandal resistant, IP66 and NEMA 4X ratings, IK10, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Corridor Format	Vandal resistant, IP66 and NEMA 4X ratings, IK10, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Corridor Format	Vandal resistant, IP66 and NEMA 4X ratings, IK10, WDR-Dynamic Contrast, Digital PTZ, Pixel counter, Memory card slot, Built-in IR, Corridor Format

) More included analytics can be found on page 2

Axis fixed dome network cameras

Axis pan/tilt/zoom network cameras

	AXIS M30 Series			AXIS Q61 Series		
	AXIS M3007-P[a] AXIS M3007-PV[b]	AXIS M3006-V	AXIS M3014	AXIS Q6128-E	AXIS Q6115-E	AXIS Q6114-E
						
Max. video resolution (pixels)	2592x1944 (5 MP)	2048x1536 (3 MP)	1280x800 (1 MP)	3840x2160 (4K Ultra HD)	1920x1080 (HDTV 1080p)	1280x720 (HDTV 720p)
Horizontal field of view	187°	134°	80°	70.7° - 6.2°	63.4° - 2.3°	58.3° - 2.1°
Image sensor	Progressive scan CMOS 1/3.2"	Progressive scan CMOS 1/3.6" (effective)	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/2.3"	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/3"
Lens	1.3 mm/F2.8 Fixed iris, M12 mount	1.6 mm/F2.8 Fixed iris, M12 mount	2.8 mm/F2.0 Fixed iris	3.9-46.8 mm, F1.8-2.0 Autofocus, Auto iris 12x optical, 12x digital zoom	4.4-132 mm, F1.4-4.6 Autofocus, Auto iris 30x optical, 12x digital zoom	4.3-129 mm, F1.6-4.7 Autofocus, Auto iris 30x optical, 12x digital zoom
Day and night	-	-	-	●	●	●
Min. illumination (lux)	0.6 (Color)	0.6 (Color)	1 (Color)	0.45 (Color) 0.03 (B/W)	0.2 (Color) 0.02 (B/W)	0.15 (Color) 0.008 (B/W)
Frames per second (50/60 Hz)	12 (2592x1944)	25/30 (HDTV 1080p) 25/30 (1600x1200) 16/20 (2048x1536)	25/30 (1280x800) 25/30 (HDTV 720p)	50/60 (HDTV 1080p) 25/30 (4K Ultra HD)	50/60 (HDTV 1080p)	50/60 (HDTV 720p)
Pan/Tilt/Zoom	Digital PTZ	Digital PTZ	Digital PTZ	256 preset 360° endless, Tilt +20° to -90° Guard tour, Tour recording	256 preset 360° endless, Tilt +20° to -90° Guard tour, Tour recording	256 preset 360° endless, Tilt +20° to -90° Guard tour, Tour recording
Additional analytics*	*	*	*	Shock detection Autotracking Active Gatekeeper	Shock detection Autotracking Active Gatekeeper	Shock detection Autotracking Active Gatekeeper
Power	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 2	PoE IEEE 802.3af/at Class 1	PoE+, High PoE (Midspan supplied)	High PoE, (Midspan supplied)	High PoE, (Midspan supplied)
Outdoor ready	-	-	-	●	●	●
Other	360°/180° Panoramic views, Vandal resistant[b], IP42[b], Discreet design with uncovered lens[a], WDR-Dynamic Contrast, Pixel counter, Memory card slot	Vandal resistant, IP42, WDR-Dynamic Contrast, Pixel counter, Memory card slot, Corridor Format	Recessed mounting, Pixel counter	Speed dry, Sharpdome technology, Electronic image stabilization, Defogging, Pixel counter, Memory card slot, Arctic Temperature Control, IP66 and NEMA 4X ratings, IK08	Zipstream, Speed dry, Sharpdome technology, Electronic image stabilization, WDR-Dynamic Capture, Defogging, Pixel counter, Memory card slot, Arctic Temperature Control, IP66 and NEMA 4X ratings, IK08	Zipstream, Speed dry, Sharpdome technology, Highlight compensation, Lightfinder, Electronic image stabilization WDR-Dynamic Capture, Defogging, Pixel counter, Memory card slot, Arctic Temperature Control, IP66 and NEMA 4X ratings, IK08

Notations (a) and (b) refer to the corresponding product models for the column

) More included analytics can be found on page 2

Axis pan/tilt/zoom network cameras

	AXIS Q60 Series					
	AXIS Q6055[a] AXIS Q6055-E[b] 	AXIS Q6054[a] AXIS Q6054-E[b] 	AXIS Q6052[a] AXIS Q6052-E[b] 	AXIS Q6045-C Mk II 	AXIS Q6045-S Mk II 	AXIS Q6000-E Solo 
Max. video resolution (pixels)	1920x1080 (HDTV 1080p)	1280x720 (HDTV 720p)	720x576 (50 Hz) 720x480 (60 Hz)	1920x1080 (HDTV 1080p)	1920x1080 (HDTV 1080p)	4 x 1280x720 (HDTV 720p) Quad view 1920x1440 (4:3)
Horizontal field of view	62.8° - 2.23°	62.9° - 2.2°	47.0° – 1.5°	62.8° - 2.23°	62.8° - 2.23°	360°
Image sensor	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	4 x Progressive scan CMOS 1/2.8"
Lens	4.44 – 142.6 mm, F1.6 – 4.41	4.4 – 132 mm, F1.4 – 4.6	3.3–119 mm, F1.4–4.2	4.44 - 142.6 mm, F1.6 - 4.41 auto iris and autofocus	4.44 - 142.6 mm, F1.6 - 4.41 auto iris and autofocus	1.37 mm/F2.0 Fixed focus, Fixed iris
Day and night	●	●	●	●	●	-
Min. illumination (lux)	0.3 (Color) 0.03 (B/W)	0.2 (Color) 0.04 (B/W)	0.25 (Color) 0.008 (B/W)	0.3 (Color) 0.03 (B/W)	0.3 (Color) 0.03 (B/W)	0.3 (Color)
Frames per second (50/60 Hz)	50/60 (HDTV 720p) 25/30 (HDTV 1080p)	25/30	50/60	50/60 (HDTV 720p) 25/30 (HDTV 1080p)	50/60 (HDTV 720p) 25/30 (HDTV 1080p)	25/30 (Quad view) 25/30 (HDTV 720p)
Pan/Tilt/Zoom	360° endless, 180°[a]/220°[b] tilt, 32x optical, 12x digital zoom, 256 presets, Guard tour, Tour recording	360° endless, 180°[a]/220°[b] tilt, 30x optical, 12x digital zoom, 256 presets, Guard tour, Tour recording	360° endless, 180°[a]/220°[b] tilt, 36x optical, 12x digital zoom, 256 presets, Guard tour, Tour recording	360° endless, 220° tilt, 32x optical, 12x digital zoom, 256 presets, Guard tour, Tour recording	360° endless, 220° tilt, 32x optical, 12x digital zoom, 256 presets, Guard tour, Tour recording	Yes[4]
Audio support	Two-way[a, 2]	Two-way[a, 2]	Two-way[a, 2]	-	-	-
Alarm in-/outputs	4 configurable[a, 2]	4 configurable[a, 2]	4 configurable[a, 2]	2 configurable inputs/outputs	2 configurable inputs/outputs	-
Additional analytics*	Autotracking, Active Gatekeeper, Shock detection, Audio detection[a], Object removed, Enter/Exit detector, Fence detector, Object counter	Autotracking, Active Gatekeeper, Shock Detection, Audio detection[a]	Autotracking, Active Gatekeeper, Shock detection, Audio detection[a]	Autotracking, Active Gatekeeper, Object removed, Enter/exit detector, Fence detector, Object counter	Autotracking, Active Gatekeeper, Object removed, Enter/exit detector, Fence detector, Object counter	Audio detection
Power	PoE+[a]/High PoE[b] IEEE 802.3at Class 4 AC/DC[a, 2]	PoE+[a]/High PoE[b] IEEE 802.3at Class 4 AC/DC[a, 2]	PoE+[a]/High PoE[b] IEEE 802.3at Class 4 AC/DC[a, 2]	12 V DC	12 V DC	High PoE IEEE 802.3af/at Class 4
Outdoor ready	●[b]	●[b]	●[b]	With active cooling for operation in temperatures up to 75°C/167°F	●	●
Other	Arctic Temperature Control[b], Shadows and highlights recovery, Electronic Image Stabilization, Automatic defog, IP52[a]/IP66[b], NEMA 4X and IK10 rating[b], WDR, Pixel counter, Memory card slot	Arctic Temperature Control[b], Shadows and highlights recovery, Electronic Image Stabilization, Automatic defog, IP52[a]/IP66[b], NEMA 4X and IK10 rating[b], WDR, Pixel counter, Memory card slot	Arctic Temperature Control[b], Shadows and highlights recovery, Electronic Image Stabilization, Automatic defog, IP52[a]/IP66[b], NEMA 4X and IK10 rating[b], WDR, Pixel counter, Memory card slot	Continuous motion 24/7, 2xSFP slots for fiber, 2xRJ45 connectors, Highlight compensation, Automatic defog, IP66, NEMA 4X and MIL-STD-810G ratings, WDR, Pixel counter, Memory card slot	Pressurized, Stainless steel casing, Continuous motion 24/7, 2xSFP slots for fiber, 2xRJ45 connectors, Highlight compensation, Automatic defog, IP6K9K/IP66/IP67, NEMA 4X/6P and MIL-STD-810G 509.5 ratings, IK103, WDR, Pixel counter, Memory card slot	4 x Cameras, For integration with AXIS Q60-E, IP66 and NEMA 4X ratings, Memory card slot

Notations (a) and (b) refer to the corresponding product models for the column

(2) With multi-connector cable - sold separately
(3) Except valves on top
(4) Valid for AXIS Q60-E products

**) More included analytics can be found on page 2*

Axis pan/tilt/zoom network cameras

	AXIS P56 Series		AXIS P55 Series	
	AXIS P5635-E 	AXIS P5624-E 	AXIS P5515[a] AXIS P5515-E[b] 	AXIS P5514[a] AXIS P5514-E[b] 
Max. video resolution (pixels)	1920x1080 (HDTV 1080p)	1280x720 (HDTV 720)	1920x1080 (HDTV 1080p)	1280x720 (HDTV 720p)
Horizontal field of view	63.5°-2.4°	59°-4°	59.2°-5.2°	59.2°-5.2°
Image sensor	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/2.3"	Progressive scan CMOS 1/2.3"
Lens	4.3 - 129 mm F1.6 - 4.7 Autofocus, Auto iris 30x optical, 12x digital zoom	4.7 - 84.6 mm F1.6 - 2.8 Autofocus, Auto iris 18x optical, 12x digital zoom	3.8 - 42.9 mm F1.4-2.1 Autofocus, Autoiris 12x optical, 10x digital zoom	3.8 - 42.9 mm F1.4-2.1 Autofocus, Autoiris 12x optical, 10x digital zoom
Day and night	●	●	●	●
Min. illumination (lux)	0.3 (Color) 0.01 (B/W)	0.3 (Color) 0.01 (B/W)	0.7 (Color) 0.08 (B/W)	0.7 (Color) 0.08 (B/W)
Frames per second (50/60 Hz)	25/30 (HDTV 1080p)	25/30 (HDTV 720p)	25/30 (HDTV 1080p)	50/60 (HDTV 720p)
Pan/Tilt/Zoom	100 presets 360° endless 180° tilt	100 presets 360° endless 180° tilt	100 presets 360° pan via Auto-flip 180° tilt	100 presets 360° pan via Auto-flip 180° tilt
Audio support	Two-way	-	Two-way[a]	Two-way[a]
Alarm in-/outputs	4 configurable inputs/outputs[2]	-	4 configurable inputs/outputs[a][2]	4 configurable inputs/outputs[a][2]
Additional analytics*	Audio detection Advanced Gatekeeper	Advanced Gatekeeper	Audio detection[a] Advanced Gatekeeper	Audio detection[a] Advanced Gatekeeper
Power	AC/DC PoE IEEE 802.3af/at Type 2 Class 4	PoE IEEE 802.3af/at Type 2 Class 4	AC/DC PoE IEEE 802.3af/at Class 3	AC/DC PoE IEEE 802.3af/at Class 3
Outdoor ready	●	●	●[b]	●[b]
Other	Shock detection, Zipstream, WDR-Forensic Capture, Electronic Image Stabilization IP66 and NEMA 4X ratings, IK10 Memory card slot, Pixel counter	Zipstream, Shock detection, WDR-Forensic Capture, IP66 and NEMA 4X ratings, IK10 Memory card slot, Pixel counter	Zipstream, Pixel counter, Memory card slot, IP51[a]/IP66[b] and NEMA 4X[b] ratings WDR-Dynamic Contrast	Zipstream, Pixel counter, Memory card slot, IP51[a]/IP66[b] and NEMA 4X[b] ratings WDR-Dynamic Contrast

Notations (a) and (b) refer to the corresponding product models for the column
(2) With multi-connector cable - sold separately

**) More included analytics can be found on page 2*

Axis pan/tilt/zoom network cameras

	AXIS P54 Series		AXIS M50 Series		AXIS V59 Series	
	AXIS P5415-E 	AXIS P5414-E 	AXIS M5014[a] AXIS M5014-V[b] 	AXIS M5013[a] AXIS M5013-V[b] 	AXIS V5915 	AXIS V5914 
Max. video resolution (pixels)	1920x1080 (HDTV 1080p)	1280x720 (HDTV 720p)	1280x720 (HDTV 720p)	SVGA 800x600	1920x1080 (HDTV 1080p)	1280x720 (HDTV 720p)
Horizontal field of view	59° - 4°	59° - 4°	60°	45°	63.7°	58.3°
Image sensor	Progressive scan CMOS 1/2.9"	Progressive scan CMOS 1/2.9"	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/4"	Progressive scan CMOS 1/2.8"	Progressive scan CMOS 1/3"
Lens	4.7 - 84.6 mm, F1.6 - 2.8 Autoiris, Autofocus 18x optical, 12x digital zoom	4.7 - 84.6 mm, F1.6 - 2.8 Autoiris, Autofocus 18x optical, 12x digital zoom	3.6 mm/F1.8 3x digital zoom	3.6 mm/F1.8 3x digital zoom	4.3 - 129 mm F1.6-4.7 Autofocus, P-Iris control 30x optical, 12x digital zoom	4.3 - 129 mm F1.6-4.7 Autofocus, P-Iris control 30x optical, 12x digital zoom
Day and night	●	●	-	-	●	●
Min. illumination (lux)	0.5 (Color) 0.04 (B/W)	0.4 (Color) 0.04 (B/W)	1.4 (Color)	1.4 (Color)	1.0 (Color) 0.03 (B/W)	0.6 (Color) 0.03 (B/W)
Frames per second (50/60 Hz)	25/30 (HDTV 1080p)	25/30 (HDTV 720p)	30	30	50/60 (HDTV 1080p)	50/60 (HDTV 720p)
Pan/Tilt/Zoom	100 presets ± 135° pan 0° - 90° tilt Limited guard tour	100 presets ± 135° pan 0° - 90° tilt Limited guard tour	25 presets ±180° pan 90° tilt	25 presets ±180° pan 90° tilt	256 presets, Pan: ±170° Tilt: -20° - 90°	256 presets, Pan: ±170° Tilt: -20° - 90°
Audio support	Two-way	Two-way	One-way, built-in mic[a]	One-way, built-in mic[a]	Two-way, Stereo	Two-way, Stereo
Alarm in-/outputs	4 configurable inputs/outputs	4 configurable inputs/outputs	-	-	2 configurable inputs/outputs	2 configurable inputs/outputs
Additional analytics*	Audio detection Advanced Gatekeeper	Audio detection Advanced Gatekeeper	Audio detection[a]	Audio detection[a]	*	*
Power	24 V DC PoE+ IEEE 802.3af/at Class 4	24 V DC PoE+ IEEE 802.3af/at Class 4	PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 3	8-28 V DC	8-28 V DC
Outdoor ready	●	●	-	-	-	-
Other	For wall-mount installations only, Built-in wall bracket, Repaintable integrated sunshield, Direct drive pan/tilt system, Pixel counter, Memory card slot, IP66 and NEMA 4X ratings	For wall-mount installations only, Built-in wall bracket, repaintable integrated sunshield, Direct drive pan/tilt system, Pixel counter, Memory card slot, IP66 and NEMA 4X ratings	IP51[a]/IP66[b] ratings, IK10[b], Pixel counter, Memory card slot	IP51[a]/IP66[b] ratings, IK10[b], Pixel counter, Memory card slot,	Electronic image stabilization, WDR-Dynamic Capture Memory card slot, 2x Canon XLR3, 3.5 mm stereo line out, HDMI, 3G-SDI	Electronic image stabilization, WDR-Dynamic Capture Memory card slot, 2x Canon XLR3, 3.5 mm stereo line out, HDMI, 3G-SDI

Notations (a) and (b) refer to the corresponding product models for the column

) More included analytics can be found on page 2

Axis thermal network cameras

	AXIS Q87 Series		AXIS Q86 Series			
	AXIS Q8722-E	AXIS Q8721-E	AXIS Q8665-LE	AXIS Q8665-E	AXIS Q8632-E	AXIS Q8631-E
						
Max. video resolution (pixels)	Visual camera: 1920x1080 (2 MP/HDTV 1080i) Thermal camera: 640x480	Visual camera: 1920x1080 (2 MP/HDTV 1080i) Thermal camera: 384x288	1920x1080 (2 MP/HDTV 1080p)	1920x1080 (2 MP/HDTV 1080p)	640x480	384x288
Horizontal field of view	Visual camera: 48.1° - 5.1° Thermal camera: 35 mm: 18° or 60 mm: 10°	Visual camera: 48.1° - 5.1° Thermal camera: 35 mm: 16° or 60 mm: 9°	59° - 4°	59° - 4°	35 mm: 18°	35 mm: 10.7°
Image sensor	Visual camera: Progressive scan CMOS 1/3 Thermal camera: Uncooled Micro bolometer	Visual camera: Progressive scan CMOS 1/3" Thermal camera: Uncooled Micro bolometer	Progressive scan CMOS 1/2.9"	Progressive scan CMOS 1/2.9"	Uncooled Micro bolometer	Uncooled Micro bolometer
Lens	Visual camera: 5.1 - 51 mm/F1.8 Auto iris and Autofocus Thermal camera: 35 mm/F1.2 or 60 mm/F1.2	Visual camera: 5.1 - 51 mm/F1.8 Auto iris and Autofocus Thermal camera: 35 mm/F1.2 or 60 mm/F1.2	4.7 - 84.6 mm/F1.6 - 2.8 Auto iris and Autofocus 18x optical, 12x digital zoom	4.7 - 84.6 mm/F1.6 - 2.8 Auto iris and Autofocus 18x optical, 12x digital zoom	35 mm/F1.2	35 mm/F1.2
Day and night	Visual camera	Visual camera	●	●	-	-
Detection range (m/yd.)	35 mm: 1050/1148[c], 3200/3500[c] 60 mm: 1800/1970[c], 5500/6015[c]	35 mm: 700/766[c], 2200/2405[d] 60 mm: 1200/1312[c], 3700/4046[d]	-	-	35 mm: 1050/1148[c], 3200/3500[d]	35 mm: 1030/1126[c], 3100/3390[d]
Sensitivity	NETD < 100 mK	NETD < 100 mK	-	-	NetD < 70 mK	NetD < 70 mK
Min. illumination (lux)	Visual camera: 2 (Color), 0.2 (B/W)	Visual camera: 2 (Color), 0.2 (B/W)	0.5 (Color) 0 (B/W)	0.5 (Color) 0.04 (B/W)	-	-
Frames per second	Visual camera: 25/30 (HDTV 1080i) 25/30 (HDTV 720p) Thermal camera: 8.3/30[5]	Visual camera: 25/30 (HDTV 1080i) 25/30 (HDTV 720p) Thermal camera: 8.3/30[5]	25/30 (HDTV 1080p)	25/30 (HDTV 1080p)	8.3/30[5]	8.3/30[5]
Pan/Tilt/Zoom	32 presets, 360° endless pan, -45° to +20° tilt	32 presets, 360° endless pan, -45° to +20° tilt	PTZ preset, Guard tour, 360° endless pan, +90° to -40° tilt	PTZ preset, Guard tour, 360° endless pan, +90° to -40° tilt	PTZ preset, Guard tour, 360° endless pan, +90° to -40° tilt	PTZ preset, Guard tour, 360° endless pan, +90° to -40° tilt
Additional analytics*	Gatekeeper	Gatekeeper	*	*	Shock detection	Shock detection
Power	24 V AC 50/60 Hz, 200 W, 230/120 V AC 50/60 Hz Requires AXIS Q87-E Power Supply	24 V AC 50/60 Hz, 200 W, 230/120 V AC 50/60 Hz Requires AXIS Q87-E Power Supply	24 V AC: 8 A 100/120/230 V AC: IR inactive: Max: 55 W IR active: Max: 115 W	24 V AC: 4 A 120/230 V AC: Max: 55 W	24 V AC: 4 A 120/230 V AC: Max: 55 W	24 V AC: 4 A 120/230 V AC: Max: 55 W
Outdoor ready	●	●	●	●	●	●
Other	IP66 rating	IP66 rating	Integrated IR, Pixel counter, WDR-Dynamic Contrast, IP66 and NEMA 4X ratings	Pixel counter, WDR-Dynamic Contrast, IP66 and NEMA 4X ratings	Palette setting, IP66 and NEMA 4X ratings	Palette setting, IP66 and NEMA 4X ratings

Notations (a) and (b) refer to the corresponding product models for the column
Notations (c) and (d) refer to detection range measured for (c) humans 1.8 x 0.5 m and (d) vehicles 4 x 1.5 m, calculated with Johnson's criteria
(5) Up to 30 fps within EU, Norway, Switzerland, Canada, USA, Japan, Australia, New Zealand. Up to 8.3 fps in other countries. Frame rate above 9 fps may be subject to export control regulations

**) More included analytics can be found on page 2*

Axis thermal network cameras

	AXIS Q29 Series	AXIS Q19 Series		
	AXIS Q2901-E[a] AXIS Q2901-E PT Mount[b]	AXIS Q1942-E	AXIS Q1941-E	AXIS Q1932-E[a] AXIS Q1932-E PT Mount[b]
				
Max. video resolution (pixels)	336x256	640x480	384x288	640x480
Horizontal field of view	9 mm: 35° 19 mm: 17°	10 mm: 63° 19 mm: 32° 35 mm: 17° 60 mm: 10°	7 mm: 55° 13 mm: 28° 19 mm: 19.4° 35 mm: 10.7° 60 mm: 6.2°	10 mm: 57° 19 mm: 32° 35 mm: 18° 60 mm: 10°
Image sensor	Uncooled Micro bolometer	Uncooled Micro bolometer	Uncooled Micro bolometer	Uncooled Micro bolometer
Lens	9 mm/F1.25 19 mm/F1.25	10 mm/F1.25 19 mm/F1.23 35 mm/F1.20 60 mm/F1.25	7 mm/F1.2 13 mm/F1.0 19 mm/F1.23 35 mm/F1.2 60 mm/F1.25	10 mm/F1.2 19 mm/F1.0 35 mm/F1.2 60 mm/F1.25
Detection range (m/yd.)	-	10 mm: 291/318[c] 892/978[d] 19 mm: 573/627[c] 1757/1921[d] 35 mm: 1079/1179[c] 3307/3617[d] 60 mm: 1833/2005[c] 5623/6149[d]	7 mm: 200/219[c] 600/656[d] 13 mm: 400/437[c] 1200/1312[d] 19 mm: 580/634[c] 1740/1903[d] 35 mm: 1000/1094[c] 3150/3445[d] 60 mm: 1800/1968[c] 5400/5906[d]	10 mm: 320/350[c] 990/1083[d] 19 mm: 580/634[c] 1800/1968[d] 35 mm: 1050/1148[c] 3200/3500[d] 60 mm: 1800/1968[c] 5500/6015[d]
Object temperature range	-40 °C to 550 °C (-40 °F to 1022 °F)	-	-	-
Sensitivity	NETD < 50 mK	NetD < 50 mK	NetD < 70 mK	NetD < 70 mK
Frames per second	8.3	8.3/30[5]	8.3/30[5]	8.3/30[5]
Pan/Tilt/Zoom	PTZ preset, Guard tour[b]	-	-	PTZ preset[b], Guard tour[b]
Audio support	Two-way[a]	Two-way	Two-way	Two-way[a]
Alarm in-/outputs	2 configurable inputs/outputs[a], RS485/RS422 for pan/tilt control[b]	2 configurable inputs/outputs	2 configurable inputs/outputs	2 configurable inputs/outputs[a] RS485/RS422 for pan/tilt control[b]
Additional analytics*	Audio detection[a] Cross Line Detection, Shock detection	Audio detection Shock detection	Audio detection Shock detection	Audio detection[a] Cross Line Detection
Power	AC/DC PoE IEEE 802.3af/at Class 3	AC/DC PoE IEEE 802.3af/at Class 3	AC/DC PoE IEEE 802.3af/at Class 3	AC/DC PoE IEEE 802.3af/at Class 3
Outdoor ready	●	●	●	●
Other	RS422/RS485[b], Memory card slot, IP66/IP67 and NEMA 4X ratings, Isothermal palette, Palette setting, Corridor Format[a]	Zipstream, IP66/IP67 and NEMA 4X rating, Palette setting, Electronic Image Stabilization, Memory card slot, Corridor Format	Zipstream, IP66/IP67 and NEMA 4X ratings, Palette setting, Electronic Image Stabilization, Corridor Format, Memory card slot	RS422/RS485[b] Memory card slot, IP66 and NEMA 4X ratings, Palette setting, Corridor Format

Notations (a) and (b) refer to the corresponding product models for the column
Notations (c) and (d) refer to detection range measured for (c) humans 1.8 x 0.5 m and (d) vehicles 4 x 1.5 m, calculated with Johnson's criteria
(5) Up to 30 fps within EU, Norway, Switzerland, Canada, USA, Japan, Australia, New Zealand. Up to 8.3 fps in other countries. Frame rate above 9 fps may be subject to export control regulations

Explosion protected network cameras

	XF40-Q1765 and XP40-Q1765	
	XF40-Q1765	XP40-Q1765
		
Max. video resolution (pixels)	1920x1080 (2 MP/HDTV 1080p)	1920x1080 (2 MP/HDTV 1080p)
Horizontal field of view	59° - 4°	59° - 4°
Image sensor	Progressive scan CMOS 1/2.9"	Progressive scan CMOS 1/2.9"
Lens	4.7 – 84.6 mm/F1.6 – 2.8 Auto iris and Autofocus	4.7 – 84.6 mm/F1.6 – 2.8 Auto iris and Autofocus
Day and night	●	●
Min. illumination (lux)	0.5 (Color), 0.04 (B/W)	0.5 (Color), 0.04 (B/W)
Frames per second	25/30 (HDTV 1080p)	25/30 (HDTV 1080p)
Pan/Tilt/Zoom	18x Optical, 12x Digital zoom PTZ preset	18x Optical, 12x Digital zoom PTZ preset, Guard tour
Additional analytics*	*	*
Power	AC	AC
Outdoor ready	●	●
Other	WDR-Dynamic Contrast, Memory card slot, IP66/IP67 and NEMA 4X ratings, IK10, Stainless steel	WDR-Dynamic Contrast, Memory card slot, IP66/IP67 and NEMA 4X ratings, IK10, Stainless steel

**) More included analytics can be found on page 2*

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Go scalable! Recorder solution

Extended recording and ready to scale with changing needs.
Up to 8 cameras per recorder and **1 to 2 months** retention time

AXIS Companion Recorder 8CH 2TB
AXIS Companion Recorder 8CH 4TB

	AXIS Companion Dome		AXIS Companion Cube		AXIS Companion Eye	
	-V	-WV	-L	-LW	-L	-LVE
						
Max. video resolution (pixels)	1920x1080 (2 MP)		1920x1080 (2 MP)		1920x1080 (2 MP)	
Horizontal angle of view	106°		110°		115°	
Day and night	No		Yes		Yes	
Min. illumination (lux)	0.25		0.25 (Color) 0.05 (B/W) 0 with IR on		0.2 (Color) 0.04 (B/W) 0 with IR on	
Power	PoE IEEE 802.3af/802.3at Class 1	Micro USB for DC power	PoE IEEE 802.3af/802.3at Class 2	Micro USB for DC power	PoE IEEE 802.3af/802.3at Class 2	
Outdoor ready	No IP42 water and dust resistant, IK08 impact-resistant		No		No IP42 water and dust resistant	Yes IP66-, NEMA 250 Type 4X and IK08-rated
Other	HDMI output (micro), Zipstream, Memory card slot, WDR, Corridor format		IR illumination, Built-in PIR sensor, Built-in microphone, Built-in speaker, Zipstream, Memory card slot, WDR, Corridor format		IR illumination, Zipstream, Memory card slot, WDR, Corridor format	
Wireless interface	N/A	IEEE 802.11 a/b/g/n, support for Wi-Fi Protected Setup™	N/A	IEEE 802.11 a/b/g/n, support for Wi-Fi Protected Setup™	N/A	

AXIS Companion IP cameras are supported only by AXIS Companion video management software and mobile apps for iOS and Android devices.

Axis video encoders

	AXIS Q74 Series					
	AXIS Q7436 	AXIS Q7424-R Mk II 	AXIS Q7414 	AXIS Q7411 	AXIS Q7404 	AXIS Q7401 
Max video resolution (pixels)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)
Frames per second	50/60 per channel	25/30	25/30	50/60	25/30	25/30
Video source	6 BNC composite inputs	4 BNC composite inputs	4 BNC composite inputs	1 BNC composite input	4 BNC composite inputs	1 BNC composite input
Audio support		Two-way	Two-way	Two-way	Two-way on one channel	Two-way
Alarm in-/outputs	4 configurable inputs/outputs per channel	4 configurable inputs/outputs	2 configurable inputs/outputs per channel	4 configurable inputs/outputs	2 configurable inputs/outputs per channel	4 configurable inputs/outputs
Additional analytics*	*	Audio detection	Audio detection	Audio detection	Audio detection	Audio detection
Pan/tilt/zoom support	●	●	●	●	●	●
Power	-	DC PoE IEEE 802.3af/at Class 3	-	DC PoE IEEE 802.3af/at Class 3	DC	DC PoE IEEE 802.3af/at Class 2/3, Supports power output for analog camera
Serial connectors	RS-485	RS-422/RS-485	RS-422/RS-485	RS-422/RS-485	RS-422/RS-485	RS-422/RS-485
Version: Standalone/Blade	Blade	Standalone	Blade	Standalone	Standalone	Standalone
Other	-	Rugged, SFP slot, Operates in temperatures from -40°C - 75°C (-40°F - 167°F) Memory card slot, Quad-view	-	Coax PTZ Control, Memory card slot	-	Memory card slot

**) More included analytics can be found on page 2*

Axis video encoders

	AXIS P72 Series			AXIS M70 Series		
	AXIS P7224 	AXIS P7216 	AXIS P7214 	AXIS M7016	AXIS M7014 	AXIS M7011 
Max. video resolution (pixels)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)	720x480 (NTSC) 720x576 (PAL)
Frames per second	25/30	25/30 per channel	25/30	25/30 per channel	15	25/30
Video source	4 BNC composite inputs	16 BNC composite inputs	4 BNC composite inputs	16 BNC composite inputs	4 BNC composite inputs	1 BNC composite input
Audio support	Two-way	Two-way	Two-way	-	-	-
Alarm in-/outputs	4 configurable inputs/outputs	4 configurable inputs/outputs per channel	4 configurable inputs/outputs	-	-	-
Additional analytics*	Audio detection	Audio detection	Audio detection	*	*	*
Pan/tilt/zoom support	●	●	●	●	●	●
Power	-	AXIS PS-P power supply	DC PoE IEEE 802.3af/at Class 3	AXIS PS-P power supply	DC PoE IEEE 802.3af/at Class 3	PoE IEEE 802.3af/at Class 1
Serial connectors	RS-422/RS-485	RS-422/RS-485	RS-422/RS-485	RS-422/RS-485	RS-422/RS-485	RS-422/RS-485
Version: Standalone/ Blade	Blade	Standalone	Standalone	Standalone	Standalone	Standalone
Other	Quad-view	SFP slot, Memory card slots, Quad-view	Memory card slot, Quad-view	Memory card slots, Quad-view	Memory card slot, Quad-view	Memory card slot

**) More included analytics can be found on page 2*

Rack solutions 23

	12 Channel Rack	84 Channel Rack
	AXIS 291 1U 	AXIS Q7920 
Number of slots	3	14
Blades supported	AXIS Q7436, AXIS Q7414, AXIS P7224	AXIS Q7436, AXIS Q7414, AXIS P7224
Maximum number of channels	18	84
Rack size	1U	5U
Rack width	19"	19"
Built-in power supply	Power supply	Two redundant power supplies
Network	One Ethernet 10BASE-T/100BASE-TX/1000BASE-T (Gigabit Ethernet) port	Four Ethernet 10BASE-T/100BASE-TX/1000BASE-T (Gigabit Ethernet) ports, Four SFP slots

Designed for high-density installations, Axis video encoder rack solutions accommodate multiple video encoder blades in the same rack.

Accessories

Mounts

All you need to complete your installation

Midspans

For powering up your PoE device via an Ethernet cable.

Housing and Cabinets

Protective housings and enclosures for cameras and accessories

I/O & Audio

To add input/output and audio capabilities

Illuminators

White and infrared LED illuminators

Installation tools

Tools for simplifying your installation

Joysticks & control boards

Modular control board for professional camera and video management

Lenses

Optional lenses to meet special requirements

Media converters

Ethernet over fiber or Coax

Power adapters

For direct power to your device.

Storage

Reliable edge storage for video surveillance.

Switches

Enable efficient connection among networked-based devices

For more information, visit www.axis.com/accessories

Axis housings & cabinets 24

Axis network video housings & cabinets, worldwide

	Product	Compatible with:
	AXIS T92E Housing Series Aluminum construction Indoor/Outdoor AXIS T92E05: Power not required AXIS T92E20: PoE IEEE 802.3af or High PoE	AXIS T92E05: AXIS M11 Series, AXIS P13 Series, AXIS Q1755 AXIS T92E20: AXIS M1113, AXIS M1114, AXIS P13 Series, AXIS Q16 Series, AXIS Q1755
	AXIS T93F Housing Series Impact-resistant polymer, Indoor/Outdoor AXIS T93F05: Power not required AXIS T93F10: 12-28 V DC; 20-24 V AC AXIS T93F20: PoE IEEE 802.3af or High PoE	AXIS M1124, AXIS M1125 (AXIS T93F05/T93F20) AXIS P13 Series AXIS Q16 Series
	AXIS T93G05 Protective Housing Impact-resistant polymer, Indoor/Outdoor Power not required	AXIS M1124 AXIS M1125
	AXIS T98A-VE Cabinet Series: AXIS T98A15-VE, AXIS T98A16-VE, AXIS T98A17-VE, AXIS T98A18-VE, AXIS T98A19-VE	See: www.axis.com/products/enclosure-cabinets/axis-t98a-ve-surveillance-cabinet-series
	AXIS T97A10 Enclosure IP66-rated wall mount enclosure	AXIS Q7401 Video Encoder, AXIS P8221 Network I/O Audio Module, AXIS P7701 Video Decoder

Media converters

Axis network video housings & cabinets, worldwide

	Product	Compatible with:
	AXIS T864 PoE+ over Coax Series	All Axis network video products
	AXIS T8604 Media Converter Switch	All Axis network video products

AXIS Camera Station

AXIS Camera Station is a fully-featured video management system, perfect for schools, retail and manufacturing. It offers effective video management that meets the needs of active users in medium-sized businesses.

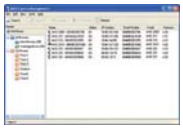
For more information, visit:
www.axis.com/products/axis-camera-station

AXIS Companion

AXIS Companion is a basic surveillance system, ideal for small stores and offices. The system easy to install and manage, even for the casual user.

For more information, visit:
www.axiscompanion.com

AXIS Camera Management



Powerful and efficient installation and management tool for Axis network video products. Available for free download.

AXIS Camera Application Platform

AXIS COMMUNICATIONS
COMPATIBLE APPLICATION

AXIS Camera Application Platform enables compatible applications, typically intelligent video applications, to be downloaded to Axis network video products.

Axis Application Development Partners

AXIS COMMUNICATIONS
APPLICATION DEVELOPMENT PARTNER

A wide variety of software solutions for video surveillance, remote monitoring or broadcasting are available from more than 800 Axis Application Development Partners.

Hosted video

AXIS COMMUNICATIONS
VIDEO SERVICE PROVIDER

With a hosted video solution, Axis network of partners provide surveillance as a cloud-based service, often completed with additional services. Typical for businesses with many small sites such as convenience stores.

For more information, visit:
www.axis.com/hosting

AXIS Extended Warranty

Peace of mind. Year after year.

Axis offers a 3-year standard* warranty from the date of purchase. AXIS Extended Warranty gives additional coverage up to 5 years.

For more information please visit: www.axis.com/warranty

* Some exceptions may apply.

Technical services

Axis stays with you all the way.

At Axis, we help our partners and end customers find solutions. Start with our support web at www.axis.com/support for your product questions. With more than 400 FAQs in our extensive database, you are sure to find the product details you need. You can also submit advanced queries related to your Axis solution using the Online Helpdesk.

Axis network video recorders

	AXIS S20 Series			AXIS S10 Series			AXIS S90 Series	
	AXIS S2024 	AXIS S2016 	AXIS S2008 	AXIS S1048 Mk II 	AXIS S1032 Mk II 	AXIS S1016 Mk II 	AXIS S9002 	AXIS S9001 Mk II 
	Compatible with all Axis network cameras and encoders including HD, Standard resolution, High resolution, Pan Tilt Zoom and Thermal ameras with firmware 4.30 or later.							
Number of channels and licenses	24	16	8	48 (Upgradable to 64)	32 (Upgradable to 48)	16 (Upgradable to 32)	Desktop terminal, no licenses included	Desktop terminal, no licenses included
Memory	1x 8GB	1x 8GB	2x 4GB	2x 4GB	2x 4GB	2x 4GB	2x 4GB	2x 4GB
Storage	3x 4TB	2x 4TB	1x 4TB	6x 4TB (20TB usable space after RAID)	4x 4TB (12TB usable space after RAID)	2x 4TB	500GB	500GB
Operating system	Microsoft Windows 10 IoT Enterprise							
Live Video streams	25 split views or 1x 4K Ultra HD views	25 split views or 1x 4K Ultra HD views	25 split views or 1x 4K Ultra HD views	-	-	25 split views or 1x 4K Ultra HD views	25 split views or 3x 4K Ultra HD views	25 split views or 1x 4K Ultra HD views
Recording	384 Mbit/s	256 Mbit/s	128 Mbit/s	64 Channels 512 Mbit/s	48 Channels 384 Mbit/s	32 Channels 256 Mbit/s	-	-
Power	Max: 500 W, 100 to 240 V AC 277 W PoE Dedicated	Max: 500 W, 100 to 240 V AC 277 W PoE Dedicated	Max: 280 W, 140 W PoE Dedicated	Max: 495 W, 100 to 240 V AC	Max: 350 W, 100 to 240 V AC	Max: 365 W, 100 to 240 V AC	Max: 365 W, 100 to 240 VAC	Max: 315 W, 100 to 240 VAC
Connectors	2x USB 2.0, 2x USB 3.0, 1x VGA, 1x HDMI, 1x eSATA, 24x PoE RJ45, 2x Switch uplink RJ45, 2x Server LAN RJ45	2x USB 2.0, 2x USB 3.0, 1x VGA, 1x HDMI, 1x eSATA, 16x PoE RJ45, 2x Switch uplink RJ45, 2x Server LAN RJ45	2x USB 2.0, 2x USB 3.0, 1x VGA, 1x HDMI, 8x PoE RJ45, 2x Switch uplink RJ45, 2x Server LAN RJ45	4x USB 2.0, 2x VGA, Serial port, 4x Ethernet, 2x Power inlet	1x USB 2.0, 2x USB 3.0, 2x VGA, Serial port, 2x Ethernet, 2x Power inlet	6x USB 2.0, 4x USB 3.0, 1xDisplay Port, 1xDual Link DVI-I, Ethernet, Line-in/out	6x USB 2.0, 4x USB 3.0, 4x Mini Display Port, 1x VGA, 1xDual Link DVI-I, Ethernet, Line-in/out	6x USB 2.0, 4x USB 3.0, 1x Display Port, 1xDual Link DVI-I, Ethernet, Line-in/out
Supported monitors	2	2	2	Complete with Desktop Terminal	Complete with Desktop Terminal	2	4	2
Warrenty	3 years	3 years	3 years	3 years, hardware replacement service				
Other	Rack mountning brackets	Rack mountning brackets	Mounting brackets	-	-	-	Complete with either AXIS S1032 Mk II or AXIS S1048 Mk II	Complete with either AXIS S1032 Mk II or AXIS S1048 Mk II

	Axis' network door stations	
	AXIS A8004-VE 	AXIS A8105-E 
Max. video resolution (pixels)	HDTV 720p (1280x720)	HDTV 1080p (1920x1200)
Horizontal field of view	97°	180°
Image sensor	Progressive scan CMOS 1/3"	Progressive scan CMOS 1/2.8" (effective)
Lens	2.8 mm, F2.8 Fixed iris, Megapixel resolution	1.56 mm, F2.8, Fisheye, Fixed iris
Min. illumination (lux)	0.4 (0 lux with LED on)	2.0 lux without WDR, 2.2 lux with WDR (0 lux with LED on)
Audio support	Two-way Built-in mic and speaker	Two-way Built-in mic and speaker
Ports	2x Relay output 4x I/O, Line out	1x Relay output 2x I/O
Additional analytics*	Tamper detection, Audio detection, Shock detection	Tamper detection, Audio detection, Shock detection
Power	PoE IEEE 802.3af/at Class 3, PoE+ IEEE 802.3af/at Class 4, 10-28 V DC	PoE IEEE 802.3af/at Class 3
Outdoor ready	●	●
SIP (VoIP)	●	●
Other	Vandal-resistant, IP66/IP67 and NEMA 4X ratings, WDR-Dynamic Capture, Memory card slot, Digital PTZ	UL294, IP65 and NEMA 4X ratings, Digital Corridor Format, WDR-Forensic Capture, Zipstream, Memory card slot, Digital PTZ, Mullion style installation

AXIS C3003-E Network Horn Speaker

AXIS C3003-E Network Horn Speaker is a simple-to-install outdoor loudspeaker that provides clear, long-range speech for remote speaking in video surveillance applications. In live video monitoring situations, AXIS C3003-E enables an operator to remotely address people and deter unwanted activity. The loudspeaker makes announcements possible from anywhere with network connectivity. It is ideal for perimeter protection in areas such as parking lots, and construction and critical infrastructure sites.

- Clear, long-range speech
- Simple installation with network cable and PoE
- Easy integration with major video management software
- Supports SIP (VoIP)
- Ensured reliability with Auto Speaker Test

*) More included analytics can be found on page 2

AXIS A1001 Network Door Controller

AXIS A1001 Network Door Controller is installed by each door. This open, non-proprietary platform for access management meets the requirements for basic access management as well as larger and more advanced enterprise systems. AXIS A1001 comes with a built-in access management software for smaller installations with basic access management needs, AXIS Entry Manager is developed with a focus on ease of use and intuitive handling.
To meet the requirements for advanced enterprise systems with a large number of credentials AXIS A1001 has an open interface for integration with third-party video management software and other systems.

- Open platform for third-party software
- Simple installation with network cable and PoE
- Support most reader types
- Scalable and future-proof
- Plenum rated

AXIS A4011-E Reader

AXIS A4011-E Reader is a touch-free reader intended for indoor and outdoor use designed to perfectly match AXIS A1001 Network Door Controller.
The reader is both future proof and backward compatible since it supports several different card formats.

- Indoor and outdoor ready
- Supports most smart card formats
- Illuminated keypad
- Ergonomic design
- Intuitive user interface

AXIS A9188 Network I/O Relay Module

AXIS A9188 Network I/O Relay Module is an intelligent module with configurable I/Os and relays and supports supervised inputs. With its open platform it offers a high level of integration with AXIS A1001 Network Door Controller and other facility systems, such as elevator control for floor management and HVAC (Heating, ventilation and AC) systems. It can also be used with AXIS Video Hosting System, AXIS Camera Station or third party partner software. The module provides power to I/O devices and can extend the functionality of any Axis product where you need additional I/Os or relays.

- 8 I/Os with supervised inputs and configurable levels
- 8 form C relays
- 12 and 24 V DC output
- PoE+ or 12 and 24 V DC input
- Open API for software integration, including VAPIX

AXIS A4010–E Reader without Keypad

AXIS A4010-E Reader without Keypad is designed to perfectly match AXIS A1001 Network Door Controller. The cost-efficient reader has no keypad and its small form factor enables easy placement. Two LED symbols give clearly visible feedback. The reader supports touch-free entry with most entry card formats, and is suitable for both indoor and outdoor installation. IP65 classification makes it ready for harsh environments.

- Indoor and outdoor ready
- Support for most smart card formats
- 2 LED symbols give clearly visible feedback
- IP65 classified
- Designed to perfectly match AXIS A1001

AXIS Camera Application Platform

ACAP (AXIS Camera Application Platform) is an open platform available on most Axis cameras that allows you to add analytics and other applications to meet specific security and business requirements. In Axis Application Gallery, you will find ACAP applications developed by Axis or Axis' application development partners. These applications are ready to be embedded directly in Axis' products to perform analysis of live or recorded such as cross-line detection, people counting, license plate recognition – and much, much more.

For more information, visit: www.axis.com/techsup/cam_servers/dev/application_platform/

AXIS Perimeter Defender

AXIS Perimeter Defender is a flexible, scalable video analytics application for perimeter surveillance and protection. The application comes with intuitive management and setup tools in one single management interface and has all the features needed for easy implementation, including system-design tools and automatic calibration.

For more information, visit: www.axis.com/global/en/products/axis-perimeter-defender/overview

AXIS Cross Line Detection

AXIS Cross Line Detection is especially suitable for general monitoring of entrance and exit points in low-traffic areas, detecting objects such as persons and vehicles that cross a defined virtual line.

For more information, visit: www.axis.com/products/crossline/

AXIS Video Motion Detection

AXIS Video Motion Detection is an application specially suitable for motion detection for indoor or outdoor installations with low traffic areas. The application integrates with the camera's internal event manager, enabling various system notifications.

For more information, visit: www.axis.com/products/axis-video-motion-detection

Gatekeeper

Gatekeeper zooms in on an object as it enters the center of the image, then zooms out after a pre-set of seconds.

Advanced Gatekeeper offers the same feature but the object does not have to be in the center of the image.

Active Gatekeeper includes tracking when the object moves.

Active Tampering Alarm

The Active Tampering Alarm functionality enables the detection of disrupted camera operation by automatically alerting the operator when a camera is manipulated in any way.

Audio Detection

This application detects noise – such as the breaking of a window or voices – and uses this as a trigger to transmit and record video, or to alert operators of suspicious activities. Please note that local legislation or codes of practice sometimes limits the use of this feature.

Autotracking

Axis' autotracking enables a PTZ dome camera to automatically follow a moving object in a scene. This ensures that when an incident occurs, the right part of the scene is recorded with enough image quaity to enable identification.

Axis innovates

As the world leader in network video, Axis is constantly working to provide advanced technology for our network cameras. Our research and development efforts have resulted in several technologies, which have enhanced our cameras' capabilities.

Zipstream

Optimized for video surveillance, Axis' Zipstream technology is a radically more efficient H.264 implementation, offering bandwidth and storage savings without compromising on important image details. Even greater savings with the latest Zipstream with dynamic frame rate.

Find out more at: www.axis.com/zipstream

Lightfinder

Lightfinder technology offers high light sensitivity, excellent image quality with low noise but a wealth of details, and better color reproduction in low light.

Find out more at: www.axis.com/learning/web-articles/technical-guide-to-network-video/lightfinder-technology

Wide dynamic range (WDR)

Wide dynamic range is a feature in some Axis network cameras that handles a wide range of lighting conditions in a scene. In a scene with extremely bright and dark areas or in backlight situations where a person is in front of a bright window, a typical camera would produce an image where objects in the dark areas would hardly be visible. WDR solves this by applying various techniques to enable objects in both bright and dark areas to be visible.

Find out more at: www.axis.com/technologies/wide-dynamic-range

Sharpdome / Speed Dry

The Sharpdome technology offers innovative mechanics that make the entire dome rotate, in contrast to a conventional dome where the camera rotates inside the dome.

The Sharpdome technology includes Axis' unique Speed Dry function that helps to provide sharp images in rainy weather. It can also simplify dome cleaning, allowing for more efficient methods such as high pressure cleaning. With the Speed Dry function activated, the dome vibrates at high speed. It breaks the surface tension of the water and removes the drips.

ONVIF Profiles in Axis products

Axis network video products with firmware 6.30 or higher now support ONVIF Profile G in addition to ONVIF Profile S. ONVIF provides profile specifications to standardize communication between IP-based physical security products so that conformant products from different companies can work together.

ONVIF Profile G is about video storage and recording. It is a specification that allows an ONVIF Profile G conformant device, such as a network camera, and a conformant client, such as a video management software, to work together to support configuration, searching, playback and retrieval of recordings on on-board/network-attached storage. Profile G also includes support for receiving audio and metadata stream if the client supports those features. The list of Axis products that support ONVIF Profile G will continue to grow, so always please check the Onvif website as it is the authoritative source for a list of all ONVIF conformant products.

ONVIF Profile S, meanwhile, is about streaming video-enabling a conformant client to configure, request and control streaming of video data over an IP network from a conformant device. It also includes support for PTZ control, receiving audio and metadata stream and relay outputs if those features are supported by the client. There are more than 270 Axis products that support ONVIF Profile S.
In addition to ONVIF Profile S and G, Axis also supports ONVIF Profile C for IP-based access control systems. ONVIF Profile C conformant devices and clients support site information, door access control, and event and alarm management.

More information on ONVIF can be found on the ONVIF website. www.onvif.org

Supported cameras with both ONVIF Profile S and G

AXIS F34
AXIS F41
AXIS F44

AXIS M1124
AXIS M1124-E
AXIS M1125
AXIS M1125-E

AXIS M3006-V
AXIS M3007-P
AXIS M3007-PV
AXIS M3026-VE
AXIS M3027-VE

AXIS P1364
AXIS P1364-E
AXIS P1365 Mk II
AXIS P1365-E Mk II

AXIS P1435-E
AXIS P1435-LE

AXIS P3224-LV
AXIS P3224-LVE
AXIS P3225-LV
AXIS P3225-LVE

AXIS Q1615
AXIS Q1615-E
AXIS Q1615 Mk II
AXIS Q1615-E Mk II
AXIS Q1635
AXIS Q1635-E

AXIS Q3505-V
AXIS Q3505-VE

AXIS Q7436

68930/EN/R2/1609

About Axis Communications

Axis offers intelligent security solutions that enable a smarter, safer world. As the market leader in network video, Axis is driving the industry by continually launching innovative network products based on an open platform - delivering high value to customers through a global partner network. Axis has long-term relationships with partners and provides them with knowledge and ground-breaking network products in existing and new markets.

Axis has more than 2,100 dedicated employees in more than 50 countries around the world, supported by a global network of over 80,000 partners. Founded in 1984, Axis is a Sweden-based company listed on NASDAQ Stockholm under the ticker AXIS.

For more information about Axis, please visit our website www.axis.com.

Distributed by:

White paper

Ensuring end-to-end protection of video integrity

Prepared by:

John Rasmussen, Senior Technical Product Manager, Corporate Business Unit, Milestone Systems

Date: May 22, 2015

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Introduction

In applications and installations where video plays a critical role as evidence material, it is paramount that the video is transmitted, stored and in general handled in a secure way; from the time it is captured by the camera to the time it is used as evidence, for example in a court of law.

Milestone XProtect® Corporate and XProtect® Smart Client provide a series of security mechanisms that enable users to maintain full end-to-end security and integrity of recorded video data. Video database encryption, digital signing of video databases and a function to prevent re-export of the exported material are core components of Milestone's video management solution for ensuring and protecting the integrity of the video evidence.

Purpose and target audience

The purpose of this white paper is to give a general overview of how video is transmitted from the camera and stored securely in the XProtect® Corporate Recording Server databases, as well as how exported recordings are secured and validated in the XProtect® Smart Client – Player when used as evidence.

The primary audience for this white paper is individuals or organizations with surveillance projects/installations where video and evidence handling is critical. The target group might include (but is not limited to) the following audiences:

- surveillance system architects/designers and
- surveillance project consultants
- security officers
- companies
- organizations and
- law enforcement bodies

This white paper should enable the reader to understand how recordings are secured from transmission from the camera to viewing exported recordings as evidence, as well as how to implement and use the extended security in the most optimal way.

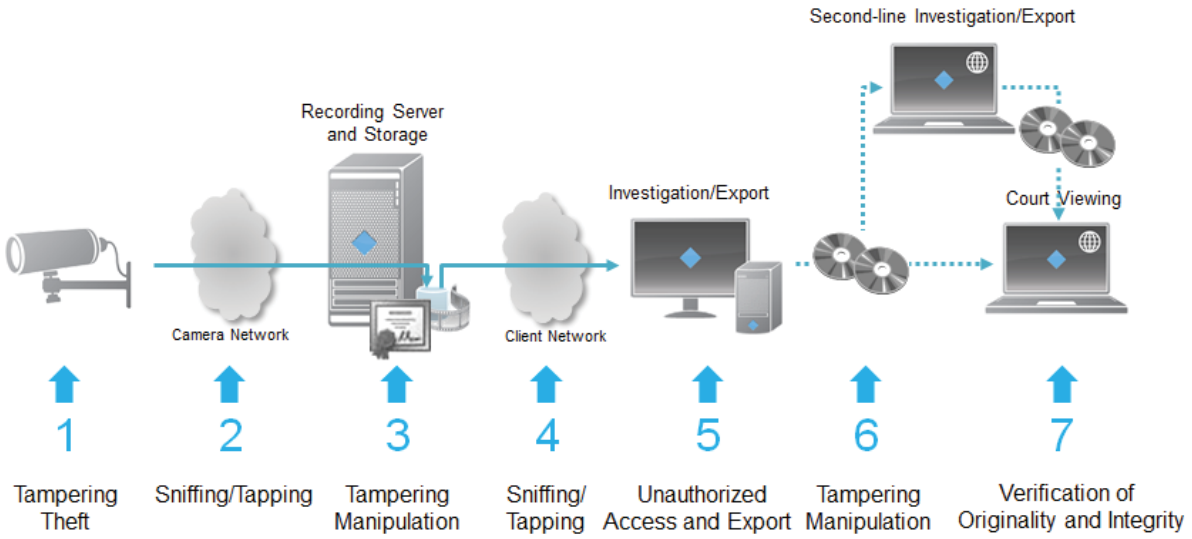
The reader is assumed to have a general understanding of Milestone XProtect® Corporate and IP video management solutions in general.

Video flow and inherent security risks

In any video surveillance system, analog or digital, there is an inherent security risk in the different parts, components or data/video transportation media used. These

elements of the system may be tampered with or the security of them can be compromised.

In digital video surveillance systems, the video flow is typically as illustrated below.



Each function and component has its own inherent risks, examples of which are listed here:

1. Video is captured by a camera
    - *Camera may be disconnected, stolen or simply vandalized*
    - *Camera may be tampered with by turning it or by covering the lens*
2. Video is streamed over the network to a Recording Server
    - *The network may be disconnected or flooded with unwanted data due to a distributed denial-of-service (DDOS) attack*
    - *The network may be compromised giving unauthorized persons access to tapping into the transmitted video*
3. The Recording Server stores the video in its video database
    - *The Recording Server may be turned off or fail*
    - *Microsoft® Windows® security could be compromised giving local or remote access to the video database files*
4. Live or recorded video is sent over a network to a client

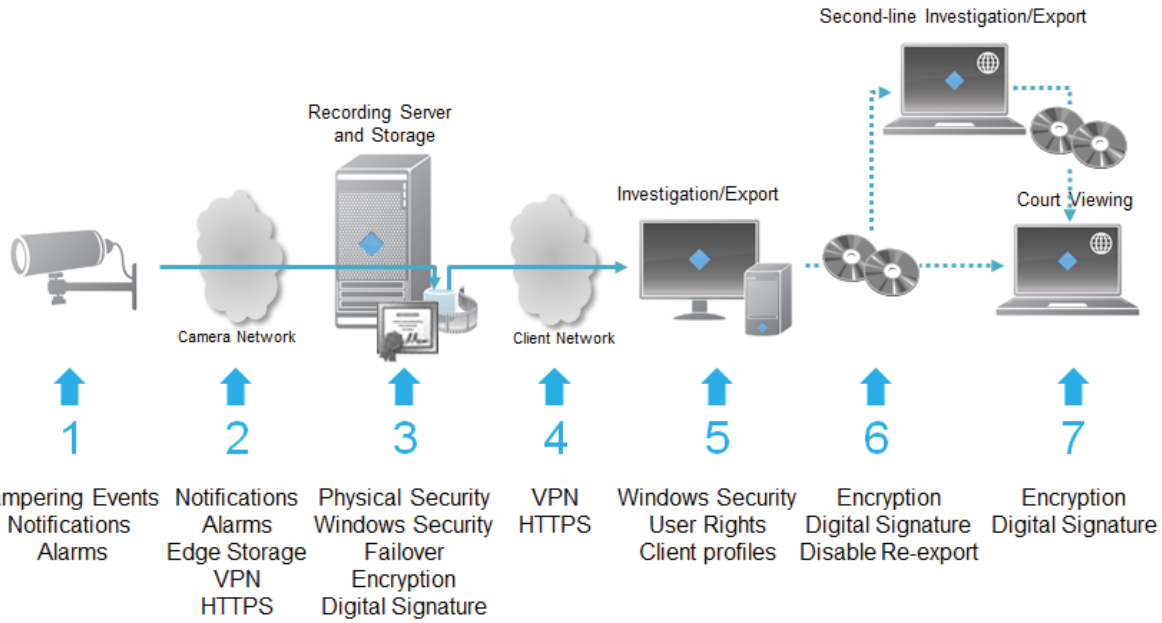
- *The network may be disconnected or flooded with unwanted data due to a DDOS attack*
- *The network may be compromised giving unauthorized persons access to tapping into the transmitted video*

5. The client decodes the video and displays it on the monitor and offers a function to export video recordings for evidence
    - *Unauthorized persons may try to hack or otherwise obtain login credentials to gain unauthorized access to viewing and exporting video*
    - *Authenticated surveillance users may try to tamper with exported material*
6. Exported evidence media is transported from the surveillance site to police or a court
    - *The exported video may be viewed and copied by unauthorized persons*
    - *The exported video may be tampered with removing critical sequences of the recorded video or be modified to give another impression of the recorded evidence*
7. The exported evidence is viewed by police or a judge in court
    - *The exported video may have been tampered with removing critical sequences of the recorded video or be modified to give another impression of the recorded evidence*

Addressing security concerns and risks

As highlighted in the previous section, there are several places where security can be breached. To address these security concerns and inherent risks, Milestone has implemented several security functions in addition to the standard security measures that can be used to increase the security of the overall video system and its recordings.

The below illustration shows the possible security measures to counter tampering and fraud in each of the video flow steps.



1. Video captured by camera

Risk: *Camera may be disconnected, stolen or simply vandalized*

Milestone XProtect® Corporate will automatically detect if the camera is not responding or stops streaming video to the system. Once the system detects this it issues a “communication error” event, which triggers alarms or rules that notifies the right people of the issue.

Risk: *Camera may be tampered with by turning it or by covering the lens*

Many cameras can detect tampering events of different kinds, such as tampering, video loss, and temperature. These events can be received by the XProtect® Corporate system that triggers alarms or rules, which notifies the right people of the issue.

2. Video streamed to the Recording Server

Risk: *The network may be disconnected or flooded with unwanted data due to a DDOS attack*

Milestone XProtect® Corporate will automatically detect if the camera is not responding or stops streaming video to the system. Once the system detects this it issues a "communication error" event, which triggers alarms or rules that notifies the right people of the issue.

In addition to creating alarms or notifications via emails, XProtect® Corporate also supports Edge Storage on select devices. Edge Storage offers the function to record video in the camera itself and let the Recording Server retrieve these recordings after a network failure, effectively ensuring video recording even for periods with no connection to the camera.

For more information on Edge Storage support in XProtect® Corporate: http://www.milestonesys.com/SharePoint/White%20papers/Milestone_Edge_Storage_with_flexible_retrieval.pdf

Risk: *The network may be compromised giving unauthorized persons access to tapping into the transmitted video*

Two methods can be used to protect the transmitted video: VPN tunneling and HTTPS.

A virtual private network (VPN) tunnel can be set up between the camera and Recording Server using standard equipment or software. The VPN will encrypt all data transmitted through the tunnel and thus protect against unauthorized access to the video. Using a VPN is a generic solution that can be used with any camera.

In addition to a VPN, XProtect® Corporate also supports HTTP Secure (HTTPS) for a subset of cameras. HTTPS uses Secure Socket Layer (SSL) and offers encrypted communication directly with the camera without a VPN tunnel.

For more information about VPN, HTTPS and SSL:

http://en.wikipedia.org/wiki/Virtual_private_network

http://en.wikipedia.org/wiki/HTTP_Secure

http://en.wikipedia.org/wiki/Transport_Layer_Security

3. Video stored in the Recording Server database

Risk: *The Recording Server may be turned off or fail*

XProtect® Corporate supports Recording Server failover, which is a function where one or more dedicated Failover Recording Servers monitor the state of the primary Recording Servers. If the primary Recording Servers stop responding, due to failure or being turned off, for example for maintenance, the Failover Recording Servers take over the task of recording the video.

In addition to the failover support, Edge Storage can also help because, as described in the previous section, it can record video in the camera, allowing the Recording Server to retrieve the video once it is up and running again.

Risk: *Windows (the operating system) security could be compromised giving local or remote access to the video database files*

To prevent unauthorized access to the video database files several layers of security can be implemented:

- Physical security
    - Access to the room with the physical Recording Server should be limited to a few authorized people only
- Windows Server security
    - Local console and remote desktop access to the server running the Recording Server should be limited to a few authorized people
    - Windows should be set to automatically logout after a short time of inactivity
    - Windows should be kept updated with the newest service releases
- Recording Server database
    - The database can be configured to encrypt the recordings in two modes: “Light” and “Strong”
    - The database can be set to sign the recordings digitally to prevent tampering

Both of the database encryption modes “Light” and “Strong” are secure and use the same DES-56 encryption technology. The difference is how much of the recordings are encrypted.

- “Strong” encrypts all parts of the video data stored in the database but requires more processing power to do so because everything needs to be encrypted
- “Light” only encrypts the first part of the JPEG or MPEG-4/H.264 video data called the header, and because of this, it uses less processing power to encrypt the video. The video will still be secure if someone tries to hack the database

because the video cannot be decoded without the information contained in the encrypted header

The digital signature is created by calculating a Message-Digest 5 (MD5) algorithm hash of the recordings. The hash is then signed with a Digital Signature Algorithm (DSA) and stored with the recordings. If the content later on is changed or parts of the recordings are removed, the MD5 hash and signature will no longer match, making it possible to detect that the recordings have been tampered with.

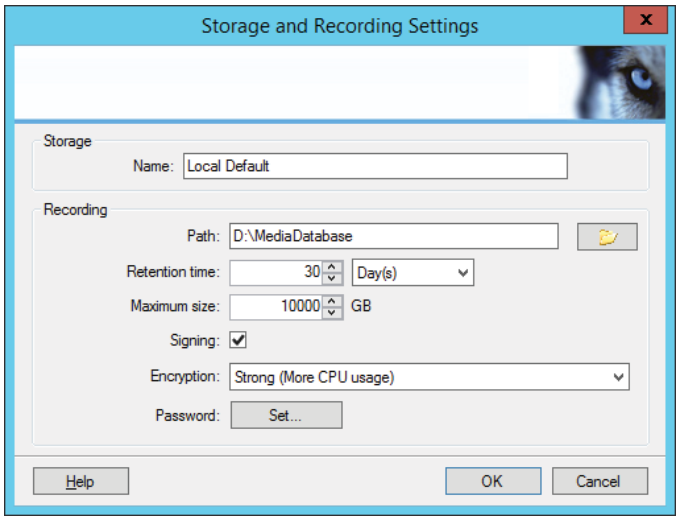
Enabling encryption and digital signature of the recordings does not alter the actual recorded audio or video content in any way. If the recorded audio or video contains some form of embedded watermark information, it will still be possible to verify the authenticity of the audio or video, either by the camera vendor or by a method/tool provided by the camera vendor.

For more information on MD5 and DSA:

http://da.wikipedia.org/wiki/MD5

http://en.wikipedia.org/wiki/Digital_Signature_Algorithm

Configuration of the database is done in the XProtect® Corporate Management Client, and it is a simple matter of selecting the **Signing** check box and selecting either **Light** or **Strong** in the **Encryption** field.



4. Live or recorded video is send to a client over a network

Risk: *The network may be disconnected or flooded with unwanted data due to a DDOS attack*

In case the network is flooded with unwanted data, the connection to the client may be disconnected or rendered inoperable. In this case the operator will immediately see this and can alert the administrator about the issue.

While the clients may not be able to view live or recorded video, the Recording Server can continue to record video unaffected if the network has been designed as two separate networks; one for clients and one for cameras.

Risk: *The network may be compromised giving unauthorized persons access to tapping into the transmitted video*

As with the network connection from the cameras to the Recording Server, the transmitted video from the Recording Server to the client can be protected by using VPN tunneling.

In addition to VPN tunneling, XProtect® Web Client and XProtect® Mobile also support HTTPS.

5. Live or recorded video viewed and exported to a media

Risk: *Unauthorized persons may try to hack or otherwise obtain log-in credentials to gain unauthorized access to viewing and exporting video*

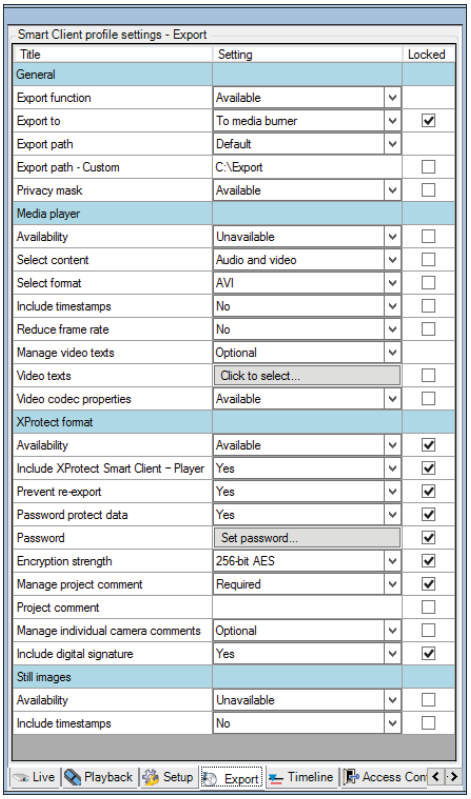
To prevent someone from hacking into the system, XProtect® Corporate relies on secure Windows Active Directory® (AD) authentication that offers strong protection against hacking.

In extension to the built-in technical security in Windows AD, it is important that all users of the system have their own separate Windows AD account because a single account, or just a few shared accounts, will make it hard to control who knows the user name and password and thus who can access the system. Using separate accounts for each user will also make it easier to investigate in the XProtect® Corporate audit log who logged in, viewed live or recorded video or who exported video from the system.

In addition to securing access to the client, XProtect® Corporate offers centrally controlled security settings with time profiles that set when and which cameras can be viewed live, played back and exported by the user. Furthermore, XProtect® Corporate can control all export settings available in the XProtect® Smart Client via a so-called XProtect® Smart Client profile.

Below is highlighted a few of the XProtect® Smart Client profile's export settings with the recommended value for the most secure export.

- **Export to** set to **To media burner**
- **XProtect® format** set to **Available**
- **Media player** and **Still image** formats set to **Unavailable**
- **Include XProtect® Smart Client – Player** set to **Yes**
- **Prevent re-export** set to **Yes**
- **Password protect data** set to **Yes**
- **Password** set to a predefined password
- **Encryption strength** set to **256-bit AES**
- **Manage project comments** set to **Required**
- **Include digital signature** set to **Yes**



The **Locked** check box must be selected for all of the above settings to ensure that an XProtect® Smart Client user cannot override them.

The full list of the XProtect® Smart Client profile's export settings can be seen in the screenshot to the right on the previous page.

6. Exported evidence media is transported from the surveillance site to police or a court

To prevent unauthorized persons from viewing or copying exported video, Milestone's XProtect® Smart Client support three levels of security on the exported video database:

1. Database encryption with password protection
2. Disable re-export
3. Digital signature

Risk: *The exported video may be viewed and copied by unauthorized persons*

The database encryption supports up to 256-bit advanced encryption standard (AES) and access is protected by a password.

XProtect® Smart Client offers the option to prevent the exported video from being re-exported when viewed again in the XProtect® Smart Client – Player. This ensures that the video cannot be exported in another format or be exported to the XProtect® format again but without encryption and digital signing.

Risk: *The exported video may be tampered with removing critical sequences of the recorded video or be modified to give another impression of the recorded evidence*

When video that should be exported is protected with a digital signature on the Recording Server, the signature of the recorded video will be checked during the export to ensure that the video has not been tampered with on the Recording Server.

If the recorded video passes the signature check, including the original digital signature, the video is exported to a new database created by XProtect® Smart Client on the client PC. During the export, XProtect® Smart Client adds its own signature so the video is protected by two signatures – the original one made during recording and the one created by XProtect® Smart Client during the export.

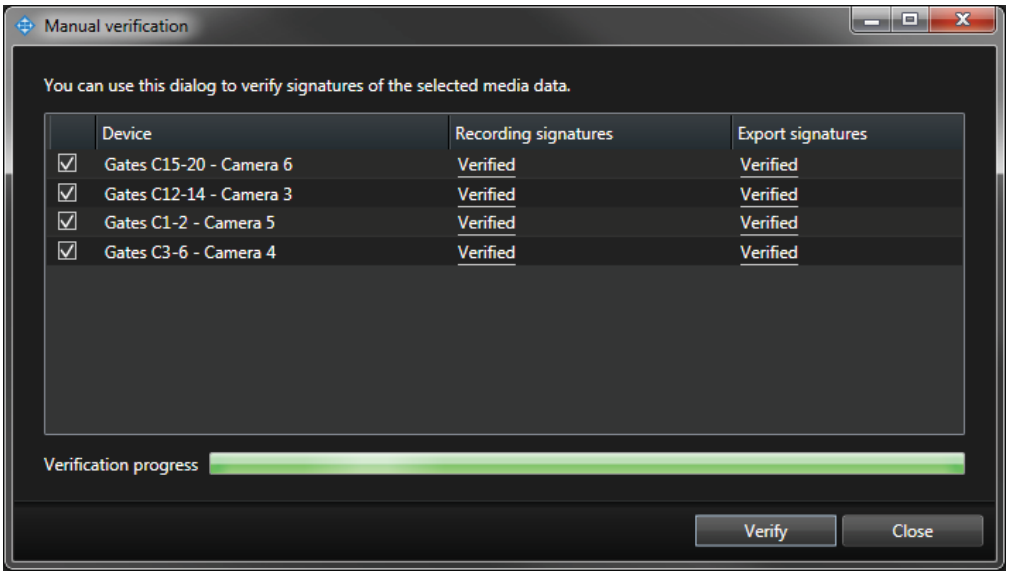
7. The exported evidence is viewed by police or a judge in a court

Risk: *The exported video may have been tampered with removing critical sequences of the recorded video or be modified to give another impression of the recorded evidence*

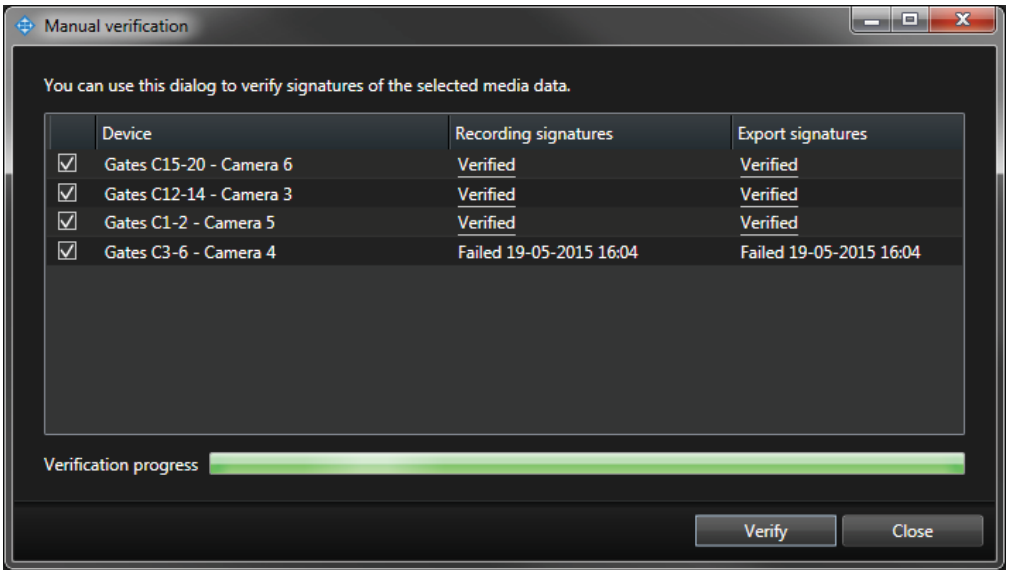
When the exported recordings protected by encryption and digital signing are viewed again by police or a judge in court, the XProtect® Smart Client – Player will request the user to enter the password to decrypt the recordings. Once the correct password has been entered, the client informs the user that the video is signed and can be verified by clicking the **Verify Signatures...** button.

This indicates for the person viewing the video that the recordings have been protected by an encryption and in addition to this have a digital signature that can be verified for authenticity. Activating the digital signing verification will open a new window and may take some time to complete depending on the size of the recordings and amount of cameras in the export. When completed, it will display if the recordings have been tampered with or if the integrity is intact.

The below screenshot shows an example of correctly validated databases.



Both signatures can be validated directly in the Player. If the validation fails, the dialog box will display the time of the first failed segment of the database as seen in the screen shot below.



Benefits and summary

By combining a set of standard security functions and concepts with a set of solution unique functions, Milestone XProtect® Corporate enables users to deploy video surveillance solutions with full end-to-end security.

With the encryption and signing features in XProtect® Corporate and XProtect® Smart Client, it is possible to keep streamed and recorded video secure and prove the integrity of recordings all the way from the original stream from the camera and to the point where it is viewed, for example in a court of law.

For companies that require strict control of the export format and security settings, the XProtect® Smart Client profile can be used to control export settings and parameters strictly from a central point.

Milestone XProtect® Corporate and XProtect® Smart Client offers secure handling of video all the way from the point where it is captured and streamed from the camera to the video surveillance system and to the time it is viewed as evidence.

The Open Platform Company

About Milestone Systems

Founded in 1998, Milestone Systems is the global industry leader in open platform IP video management software. The XProtect® platform delivers powerful surveillance that is easy to manage, reliable and proven in thousands of customer installations around the world. With support for the widest choice in network hardware and integration with other systems, XProtect® provides best-in-class solutions to video enable organizations – managing risks, protecting people and assets, optimizing processes and reducing costs. Milestone software is sold through authorized and certified partners. For more information, visit **www.milestonesys.com**

Milestone Systems Headquarters, DK
Tel: +45 88 300 300

Milestone Systems US
Tel: +1 503 350 1100

End-of-Development Announcement XProtect Enterprise

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General Questions

Why does Milestone stop the development of XProtect Enterprise?
The IP video surveillance industry is a dynamic high-paced industry that has undergone significant development during the last decade. XProtect Enterprise was introduced in 2004, and during the 12 years it has been in the market, it has shaped the IP VMS market with its flexibility, openness and usability. With thousands and thousands of satisfied customers around the globe, XProtect Enterprise has gained tremendous market recognition over the years.

As the VMS market leader, Milestone invests heavily in research and new product development annually. In 2013 Milestone introduced XProtect Expert as a product specifically designed for the upper mid-market segment. Offering superior functionality and system performance, at an equivalent price level as XProtect Enterprise, XProtect Expert has proven to be the market's preferred choice.

In addition to this, Milestone further strengthens its mid-market offering by increasing the scalability of XProtect Professional[1], which offers a similar level of functionality as XProtect Enterprise, but at a more competitive price.

With the recent enhancements to XProtect Expert and XProtect Professional, the relevance of XProtect Enterprise in Milestone's XProtect VMS portfolio has been reduced. With the ambition to have a broad product portfolio that provides our partners with a competitive solution that meets customers' needs and budget, Milestone has decided to make XProtect Enterprise 2016 R2 the last version of XProtect Enterprise.

How will this affect existing XProtect Enterprise end customers?
Milestone's decision to not release new versions of XProtect Enterprise will not have any immediate effect on end customers or Milestone partners.

Milestone is dedicated to providing its partners and end customers with reliable video surveillance solutions, so XProtect Enterprise will be available for additional purchase until June 1, 2020. Milestone will likewise continue to support XProtect Enterprise (for details please refer to the question: *Will Milestone continue to provide support on XProtect Enterprise?*). Milestone will also continue to issue device packs with support for new camera models even though there will be no further versions of the XProtect Enterprise VMS software.

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[1] Milestone recommends partners and customers to use XProtect Expert or XProtect Corporate in installations with more than 250 cameras.

This implies that customers that are satisfied with their existing Milestone XProtect Enterprise system do not need to take any immediate actions.

However, customers who want to expand and develop their Milestone surveillance solution are offered favorable migration plans to Milestone's Advanced VMS solutions. For details, please refer to: *Migration Campaign* section.

Will Milestone continue to provide support on XProtect Enterprise?
Yes, Milestone is committed to provide customers and partners technical support on XProtect Enterprise 2016 R2 until June 1, 2020, according to Milestone's normal product lifecycle: https://www.milestonesys.com/support/product-lifecycle/.

Customers requiring support after June 1, 2020 can subscribe to Milestone Care Premium (www.milestonesys.com/our-services/milestone-care-premium/) for technical support for two additional years, until June 1, 2022.

Milestone will provide technical support to customers requiring support beyond June 1, 2022 on individual contract basis.

Will there be new device packs issued for XProtect Enterprise?
Yes, although there will be no new versions of the XProtect Enterprise VMS software, Milestone will continue releasing new device packs for XProtect Enterprise. This means that existing XProtect Enterprise customers will have access to new camera models when supported in the device packs issued by Milestone.

Will existing XProtect Enterprise end customers be able to expand their systems?
Yes, existing XProtect Enterprise end customers will be able to purchase additional device licenses to their existing systems until June 1, 2020.

Will XProtect Enterprise be available for new customers?
Yes, XProtect Enterprise will remain available to new customers until June 1, 2020.

I have a new customer looking to buy XProtect Enterprise, is there a different product I should recommend instead?
Milestone recommends new customers to consider XProtect Expert or Milestone Husky M500 Advanced, which both offer superior functionality and performance at an equivalent price level as XProtect Enterprise. A third alternative is XProtect Professional that offers a similar feature set, at a lower price level.

XProtect Expert and Milestone Husky M500 Advanced require Milestone certification to sell, while all Milestone partners can sell XProtect Professional.

Why does Milestone continue to offer Care Plus on XProtect Enterprise?
Milestone Care Plus is an investment protection service that gives free access to new versions of a product and full trade-in credit when upgrading to a more advanced Milestone product. Milestone continues to offers Care Plus on XProtect Enterprise to enable customers who engage with XProtect Enterprise after June 1, 2016 to fully protect their investment in connection with a future migration to a more advanced Milestone product.

Migration Campaign

Who is the campaign for?

The XProtect Enterprise migration campaign is available to all Milestone end customers with XProtect Enterprise systems that have been purchased and initially activated before June 1, 2016.

During which period will the campaign run?

The migration campaign will be open from June 1, 2016 until December 31, 2016.

Which products can end users migrate to?

The migration campaign offers XProtect Enterprise end customers favorable upgrade paths to the following Milestone products:

- XProtect Expert
- Milestone Husky NVR M500 Advanced

What is the actual campaign proposition?

The table below details the actual campaign proposition, dependent on which product the customer wants to migrate to, and whether or not the end customer has Care Plus coverage on his existing XProtect Enterprise installation.

Migrate existing Enterprise customers to:	**WITH** CARE PLUS	**WITHOUT** CARE PLUS
XPROTECT® EXPERT	**Get:** Free software upgrade **When you buy:** 2 additional years of Milestone Care Plus at a 50% discount	**Get:** Free software upgrade **When you buy:** A minimum of two years Milestone Care Plus
HUSKY™ M500A	**Get:** Corresponding camera licenses at a 90% discount **When you buy:** The new Husky M500 Advanced	**Get:** Corresponding camera licenses at a 60% discount **When you buy:** The new Husky M500 Advanced

Please see the appendix for principal order examples.

What are the main product benefits of XProtect Expert compared to XProtect Enterprise?

Being introduced to the market in 2013, XProtect Expert is built on the latest technology platform that offers far higher system scalability and video handling performance. This translates directly to cost savings on system server hardware, even when the system grows to several hundred or even thousands of cameras.

Other distinct features of XProtect Expert include:

- **Powerful central management**
  Manage multiple servers easily and consistently, which reduces the operational cost

- **Failover recording servers**
  Reliable video recording that minimizes risk of losing live and recording capability

- **Versatile rule engine**
  Makes it possible to automate security tasks and control of external systems, while increasing responsiveness and reducing operational costs

- **System monitoring tools**
  Proactive system management tool the maximizes system reliability and up-time

- And much more

Read more about XProtect Expert here: https://www.milestonesys.com/our-products/video-management-software/xprotect-expert/.

For full product comparison, please refer to the Milestone Systems XProtect Video Management Software Product Comparison Chart (https://www.milestonesys.com/files/XProtectOverview/Current/Milestone_XProtect_Comparison_Chart.pdf).

What are the advantages of upgrading to Husky M500 Advanced?

The new Husky M500 Advanced is a high-performing NVR unit designed to meet high demands in the mid-market. The unit is preloaded with XProtect Expert, which means that it brings all the same functions as the software offering.

Husky M500A becomes especially relevant in situations where the end customer wants to replace and upgrade the system hardware, as a part of the upgrade of the system. Offering the market's highest price-performance ratio with a guaranteed throughput of 600 Mb/s recording capability, Husky M500A is an appealing choice to standard off-the-shelf server solutions, where considerable savings can be made.

Husky M500A is shipped with Windows 10 and XProtect Expert 2106 preloaded. This enables partners to save time both in during the solution design and in the onsite installation phase.

Can existing XProtect Enterprise customers upgrade to XProtect Corporate?
Yes, existing XProtect Enterprise customers can of course upgrade to XProtect Corporate. This migration path is however not included in the campaign offer, but follows Milestone's current trade-in and upgrade policies. For details, please contact your Milestone sales person, or Milestone's partner and sales support team.

Is it possible to downgrade a customer from XProtect Enterprise to XProtect Professional?
No, product downgrades are not supported by Milestone's present trade-in policy.

Why should end customers migrate?
There is no immediate need for end customers to migrate their XProtect Enterprise systems, as Milestone will support and keep the product available until June 1, 2020. However, Milestone recommends end customers to make use of the migration passage campaign due to the following reasons:

- Maintain the value of their Milestone investment
- Benefit from extra functionality in the new product
- Ensure continued access to new innovative functionality
- Make use of the advantageous campaign offer

How do I get an overview of my customers eligible for this campaign?
Milestone resellers can get an overview of the Milestone products that they have sold via the Customer Dashboard (previously known as software registration site), which is an integral part of My Milestone (accessed via Milestone's public website). If you are missing a product or otherwise have difficulties getting an overview, Milestone's partner and sales support team can help you.

How do I find out if my end customers have Care Plus coverage?
Milestone resellers can get an overview their customers' Milestone products, and their respective Care coverage, via the Customer Dashboard. The Customer Dashboard is an integral part of My Milestone, which is accessed via Milestone's public website.

How do I make use of the campaign?
To make use of the campaign offers you shall contact Milestone's partner and sales support team and place a manual order. As a part of this process, you need to present the Software License Code of the XProtect Enterprise that is to be upgraded. Please refer to the appendix to this FAQ for an overview of principle order examples.

What are the commercial terms for this campaign?
The campaign offer follows the normal terms and conditions in Milestone's channel partner program, with respect to discount, margins and other commercial conditions.

Where can I find more information about the campaign?
For further information about the migration campaign please refer to the product news page on My Milestone. You can also turn to your Milestone sales person, or Milestone's partner and sales support team, with specific questions related to the implications of the end-of-development announcement, or the migration campaign.

Where can I find instructions on how to migrate a customer system?
As a part of the XProtect 2016 R2 release, Milestone produces a dedicated guide on how to upgrade an XProtect Enterprise system to one of Milestone's Advanced VMS solutions: XProtect Expert or XProtect Corporate.

This guide will provide technical personnel with stepwise instructions on what actions to take during the migration, plus necessary preparations that shall be addressed before commencing the migration.

The guide will be published in the Manual and Guides download section in the Support area (https://www.milestonesys.com/support/manuals-and-guides/), where it will be listed together with XProtect Expert, XProtect Corporate and Husky M500 Advanced.

The guide will likewise be published on My Milestone together with the overall campaign information, and be available to both Milestone's distributor and reseller partners.

How do I get in contact with the Milestone's partner and sales support team?
You can easily get in contact with Milestone's partner and sales support team in your region via phone or email:

Region	Phone	Email
Americas	+1 503 350 1100	us-sales@milestone.us
Asia Pacific (APAC)	+65 6678 7678	APJSales@milestonesys.com
Europe (Middle East and Africa) (EMEA)	+45 88 300 684	purchase@milestonesys.com
Middle East and Africa (MEA)	+971 4 3641380	dxbsales@milestonesys.com

Appendix – principle order examples

Case 1 – XProtect Enterprise customer with Care Plus upgrades to XProtect Expert

Number of device licenses: 75
Care Plus coverage: Active – expires 2017-03-15

SKU ID	SKU Description	Type	Quantity	Campaign Project Discount	Comment
UXPEBL	Trade-in XProtect Enterprise Base License credit with Care Plus	Trade-in	1	100%	Existing XProtect Enterprise traded in at zero value.
UXPECL	Trade-in XProtect Enterprise Camera License credit with Care Plus	Trade-in	75	100%	
XPETBL	XProtect Expert Base License	Base License	1	100%	New XProtect Expert licenses issued at zero cost.
XPETDL	XProtect Expert Device License	Device License	75	100%	
SUBTOTAL	**Price of License upgrade**				**Licenses upgraded free of charge**
Y2XPETBL	Two years Care Plus for XProtect Expert Base License	Care Plus	1	50%	MSRP according to price list with 50% discount
Y2XPETDL	Two years Care Plus for XProtect Expert Device License	Care Plus	75	50%	
SUBTOTAL	**Price of 2 years additional Care Plus**				**2 Years Care Plus purchased at 50% discount**

New Care Plus coverage: Active – expires 2019-03-15

Case 2 – XProtect Enterprise customer without Care Plus upgrades to XProtect Expert

Number of device licenses: 75
Care Plus coverage: Not active

SKU ID	SKU Description	Type	Quantity	Campaign Project Discount	Price
TXPEBL	Trade-in XProtect Enterprise Base License credit without Care Plus	Trade-in	1	100%	Existing XProtect Enterprise traded in at zero value.
TXPECL	Trade-in XProtect Enterprise Device License credit without Care Plus	Trade-in	75	100%	
XPETBL	XProtect Expert Base License	Base License	1	100%	New XProtect Expert licenses issued at zero cost.
XPETDL	XProtect Expert Device License	Device License	75	100%	
SUBTOTAL	**Price of License upgrade**				**Licenses upgraded free of charge**
Y2XPETBL	Two years Care Plus for XProtect Expert Base License	Care Plus	1	0%	MSRP according to price list
Y2XPETDL	Two years Care Plus for XProtect Expert Device License	Care Plus	75	0%	
SUBTOTAL	**Price of 2 years additional Care Plus**				**2 Years Care Plus purchased at ordinary MSRP**

Care Plus coverage: Active – expires 2 years after upgrade

Case 3 – XProtect Enterprise customer with Care Plus upgrades to Husky 500A

Number of device licenses: 75
Care Plus coverage: Active – expires 2017-03-15

SKU ID	SKU Description	Type	Quantity	Campaign Project Discount	Price
UXPEBL	Trade-in XProtect Enterprise Base License credit with Care Plus	Trade-in	1	100%	Existing XProtect Enterprise traded in at zero value.
UXPECL	Trade-in XProtect Enterprise Camera License credit with Care Plus	Trade-in	75	100%	
HM500A-XPETDL	Husky M500A XProtect Expert NVR Device License, incl. 3 years Care Plus	Device License	75	90%	Same number of XProtect Expert NVR Device License, incl. 3 years Care Plus purchased with 90% discount
HM500A-XPET-xxxx	Husky M500A XProtect Expert NVR, xxxx, RAID 5/10, Rack Mounted, 0 devices Licenses	Unit	1	0%	M500A unit of choice purchased at MSPR pricet
SUBTOTAL	**Price of License upgrade**				**Total price for M500A unit with same amount of device licenses plus 3 additional Care Plus coverage**

New Care Plus coverage: Active – expires 2020-03-15

Case 4 – XProtect Enterprise customer without Care Plus upgrades to Husky 500A

Number of device licenses: 75
Care Plus coverage: Not active

SKU ID	SKU Description	Type	Quantity	Campaign Project Discount	Price
TXPEBL	Trade-in XProtect Enterprise Base License credit without Care Plus	Trade-in	1	100%	Existing XProtect Enterprise traded in at zero value.
TXPECL	Trade-in XProtect Enterprise Device License credit without Care Plus	Trade-in	75	100%	
HM500A-XPETDL	Husky M500A XProtect Expert NVR Device License, incl. 3 years Care Plus	Device License	75	60%	Same number of XProtect Expert NVR Device License, incl. 3 years Care Plus purchased with 60% discount
HM500A-XPET-xxxx	Husky M500A XProtect Expert NVR, xxxx, RAID 5/10, Rack Mounted, 0 devices Licenses	Unit	1	0%	M500A unit of choice purchased at MSPR price
SUBTOTAL	**Price of License upgrade**				**Total price for M500A unit with same amount of device licenses and 3 Care Plus coverage**

Care Plus coverage: Active – expires 3 years after upgrade

XProtect® Enterprise 2016 R2

Specification Sheet

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Feature Overview

XProtect Enterprise server modules

- **Open platform:**
  Open application programming interface (API)/software development kit (SDK) support seamless integration with third-party applications
- **Multi-server and multi-site video surveillance solution:**
  Unlimited recording of video from IP cameras, IP video encoders and selected digital video recorders (DVRs) with analog cameras
- **Wide IP camera and device support:**
  Supports more than 2,400 IP cameras, encoders and DVRs from 120 different manufacturers
- **ONVIF™ and PSIA compliant:**
  Supports ONVIF™ and PSIA compliant cameras and devices
- **Optimized recording storage management:**
  Unique data storage and archiving solution that combines superior performance and scalability and cost-efficient, long-term video storage
- **Wide compression technology support:**
  Supports a variety of compression methods: MJPEG, H.263, MPEG-4 Pt. 2 Simple Profile and Advanced Simple Profile, H.264/MPEG-4 AVC, and MxPEG
- **Dual streaming:**
  Hardware use is optimized with two independent, configurable video streams, one for live viewing and one for recording. No client side configuration needed
- **System configuration wizards:**
  Guide the user through the process of adding cameras, configuring video and recording, adjusting motion detection and configuring users
- **Built-in video motion detection:**
  Independent of camera model
- **Automatic license activation:**
  Automatic online or offline activation. 30-day grace period for device licenses.
- **Privacy masking:**
  The privacy masking capability enables administrators to define privacy masks for individual cameras to hide areas in the camera view that must not be visible or recorded in order to comply with local legislation
- **Easy installation:**
  Start the installation with a few mouse clicks – all languages and applications in one installer (Management Application supports 11 languages). Unified installer that is shared between all XProtect Professional VMS products[1]. You can even add components to or remove them from your installation at a later time
- **Supported by the Software Manager:**
  Deploy XProtect Enterprise centrally via the Software Manager utility
- **Support for Customer Dashboard**
  Resellers can monitor the health of installed systems with a valid and active SUP, so actions can be taken proactively before the issue becomes a problem for the customer. This offers peace of mind to system owners
- **Evidence collection**
  With the evidence collection mode, recordings are retained even when a camera is deleted from the system or if a hard disk runs out of space

XProtect Enterprise client modules

- **Power of choice:**
  Use any of the three available clients, XProtect Smart Client, XProtect Web Client and Milestone Mobile
- **View live video:**
  Use any client for constant live monitoring
- **View recorded video:**
  Use any client to review incidents
- **Situational awareness:**
  With support for Maps and Alarms, the XProtect Smart Client offers real-time situational awareness
- **Common design:**
  The XProtect clients share common design and basic functionalities, such as camera views, enabling a seamless switch between interfaces as needs require
- **PTZ Control:**
  With any of the clients pan-tilt-zoom (PTZ) cameras can be controlled; therefore, suspicious activity can be investigated
- **Share or export recordings:**
  Export video in native database format and share with external viewers using the XProtect Smart Client Player. Moreover, instantly share exports between Milestone Mobile and XProtect Web Client using a server side export to avoid moving large files through remote connections
- **Output control and event triggering:**
  Use any of the clients to activate system events or trigger outputs on the connected devices
- **Push Notifications**
  Receive push notifications in Milestone Mobile when alarms are triggered or alarms are assigned to a specific user. Even when the application is not running
- **Available in 29 languages**
  Use any of the clients in your preferred language from the list of the 29 languages supported.

[1] XProtect Enterprise, XProtect Professional, XProtect Express, XProtect Essential and XProtect Go

Detailed Product Features

XProtect Enterprise server modules

XProtect Enterprise server 2016 R2

Management Application

- A single Management Application provides a consolidated single point of access to XProtect Enterprise Recording Servers
- System configuration wizards guide the user through the process of adding cameras, configuring video and recording, adjusting motion detection and configuring users
- Device scanning enables the fast discovery of camera devices using methods such as Universal Plug and Play, broadcast and IP range scanning
- Smart bulk configuration option allows simultaneous changes to the settings across multiple devices in few clicks
- The adaptable application behavior guides novice users, while expert users can optimize the application for a more advanced use
- Export and import of system and user configuration data enables a reliable system operation and fast system recovery
- System cloning enables users to efficiently clone multiple systems with the same or similar configuration
- The import of offline configuration data enables offline editing of configuration data, including camera and device definitions
- Each time a configuration change is confirmed, automatic system restore points are created enabling an easy rollback to previously defined system configuration points. This also enables the cancelation of undesired configuration changes and restoration of earlier valid configurations
- Automatic configuration wizard helps users to configure the system when the Management Application starts for the first time

Recording Server

- Native 64-bit recording server provides for optimal utilization of available hardware resources
- Evidence Mode preserves recorded video. If no space is available, recording stops rather than deleting older recordings. Recordings from deleted cameras can be viewed in the XProtect Smart Client
- Flexible multi-site, multi-server license structure charged per hardware device
- Unlimited number of installed cameras with simultaneous recording and live view
- Recording quality depends entirely on camera and video encoder capabilities: no software limitation (30+ frames per second per camera)
- Cameras supporting SSDP, mDNS or ONVIF Discovery added to the local network can automatically be discovered, installed and included in the default Smart Client view
- The Milestone Customer Dashboard allows resellers to take immediate action and fix any problems on a customer's installation for example: a broken camera, hard disk failure, etc.
- Dual streams from cameras can be optimized individually on compression, resolution and frame rate, meeting recording and live monitoring requirements
- Bandwidth is optimized with multi-streaming by splitting a single camera video stream to different streams for live view and recording, therefore they can each be optimized independently with respect to frame rate and resolution
- Simultaneous digital multi-channel video and audio recording and live viewing (relaying)
- Connectivity to cameras, video encoders and selected DVRs supports MJPEG, H.263, MPEG-4 Pt. 2 Simple Profile and Advanced Simple Profile, H.264/MPEG-4 AVC, and MxPEG
- Recording technology: secure high-speed database holding JPEG images or MPEG4 and MxPEG streams including audio
- Unlimited recording capacity with multiple archives possible per day
- Hourly to daily database archiving with optional automatic move to network drive saves storage capacity on the local server – with images still available transparently for playback
- Start recording on event
- Authenticate access based on Microsoft Active Directory user account, or XProtect username and password
- Authorize access privileges per Microsoft Active Directory user account/group, XProtect user profile or grant full access
- Audit logs of exported evidence by user and file
- Audit logs of client user activity by time, location and camera
- Local console management of the Recording Server accessible from the notification area
  - Start and stop Recording Server service
  - Access to Recording Server configuration settings
  - Access to Recording Server help system
  - View system status and log information
  - Built-in web server for download and launch of clients and plug-ins
- Remote access for XProtect Smart Client and XProtect Web client
- User profiles control access to: live view, PTZ, PTZ presets, output control, events, listen to microphone, talk to speaker, manual recording; playback, AVI export, JPG export, XProtect (database) export, sequences, Smart Search and audio – as well as set up views, edit private views and edit shared public views
- Client-initiated start of recording based on predefined recording time or manual stop and access privileges

- Start cameras on live view requests from clients
- Built-in camera independent motion detection; choice of fully adjustable sensitivity or automatic sensitivity adjustment, zone exclusions, recording activation with frame rate speed up and alert activation through email or SMS
- Two-way audio enables integrated control of microphones and speakers connected to IP devices
- On predefined events Matrix remote commands are automatically sent to display live video remotely on computers running XProtect Smart Client
- Flexible notification (sound, email and SMS) and camera patrolling scheduling, triggered by time or event
- PTZ preset positions, up to 50 per camera
- Absolute and relative PTZ positioning
- PTZ go-to preset position on events
- Combine PTZ patrolling and go-to positions on events
- Set multiple patrolling schedules per camera per day: i.e. different for day, night and weekend
- PTZ scanning on supported devices: viewing or recording while moving slowly between PTZ positions
- Video motion detection-sensitive PTZ patrolling among selected presets allows sending of wipe and wash commands to supported PTZ models
- Copy a Smart Client – Player to all hard drives used for recording and archiving. A Smart Client Project file is also created (when the recording server is shut down), making it simple and easy to access video even if the hard drive is removed from the server

Mobile Server

- Runs as a dedicated service, allowing it to be installed either together with an existing installation or on dedicated hardware for more demanding installations
- Can transcode video so the streams are robust and can adapt to changing connection bandwidth. The server also optimizes the use of available bandwidth to get the best possible stream quality
- Several options for the administrator to configure the system to meet performance expectations. Including optional transcoding, client-side decoding, or a dynamic combination depending on streams
- The Mobile server plug-in in the Management Application will give access to the Milestone Mobile server management in order to change default settings and read out miscellaneous status information
- Multiple Milestone Mobile servers can be installed in parallel, offering redundant setups and/or allowing more simultaneous users. They also allow users to connect to a server of their choice
- Can be configured through the tray controller to easily adjust or update settings
- Use either a default-generated certificate for HTTPS encrypting the connection to the Milestone Mobile server or provide your own custom certificate
- All configuration of Video Push is done from the server, so users can download and use the Milestone Mobile client without having to do any configuration
- Supports creating server side export through XProtect Web Client and Milestone Mobile.
- The Milestone Mobile management plug-in allows administrators to configure codec used as well as manage ongoing and completed exports
- Automatically installs the XProtect Web Client. No additional setup is needed
- Smart Connect can automatically configure network addresses and validate external connectivity, as well as invite users to start using Milestone Mobile

XProtect Enterprise client modules

XProtect Smart Client

- Dedicated task-oriented tabs for the Sequence Explorer and Alarm Manager in addition to the traditional Live and Playback tabs
- Application theme support with a choice of dark or light theme
- Installed per default on a Recording Server for local viewing and playback of video and audio
- Camera search function, which promptly finds cameras, type of cameras and views in the system with the ability to create temporary views to display all or a subset of cameras matching the search criteria
- Start recording on cameras for a predefined time (default five minutes). Subject to privileges set by administrator
- Support for native 64-bit operating systems
- Independent playback capability allows for instant play back of recorded video for one or more cameras, while in live and playback mode
- Interactive, multi-layered maps provide the operator with a comprehensive overview of cameras, devices and layouts of an entire surveillance installation
- Seamlessly export video in various formats including video from multiple cameras, with evidence viewer, data logs and user notes included
- The storyboarding function makes it possible to include video sequences from different or overlapping time intervals form different cameras in the one and the same export
- When exporting video in AVI or MKV format, the export can be played back in a standard player application. When exporting in MKV format the video is exported in the same format as originally recorded (similar to creating database export), as long as privacy masking is not enabled and video

is recorded in H.264, JPEG or MPEG-4, except for MPEG-4 short header mode.
- Quickly gather and refine evidence using Smart Search to locate changes or objects in the video
- With multi-channel, two-way audio, it is easy to communicate with people at gates/entrances or broadcast messages to many people at once
- Live view digital zoom allows zoomed-out recordings while the operator can digitally zoom in to see details
- "Update on Motion Only" optimizes CPU use by letting motion detection control whether or not the image should be decoded and displayed. The visual effect is a still image in the view until motion is detected
- Shared and private camera views offer 1x1 up to 10x10 layouts in addition to asymmetric views
- Views optimized for both 4:3 and 16:9 screen ratios
- Multiple computer monitor support with a main window and any number of either windowed or full screen views
- Hotspot function for working in detail with a camera selected from a view containing multiple cameras
- Carousel function allows a specified view to rotate between predefined cameras with individual timing and order with multiple appearances. Carousel function can be controlled allowing the operator to pause the carousel function and to switch to previous or next camera
- Overlay buttons provide intuitive control of cameras, camera-integrated devices and other integrated systems directly from the camera view
- Matrix function to view live video from multiple cameras through the Image Server in any view layout with a customizable rotation path, remotely controlled by XProtect Smart Clients or Recording Servers sending Matrix remote commands
- Send Matrix remote commands to display live video remotely on computers running XProtect Smart Client
- Cameras' built-in audio sources available in live and in playback
- Separate pop-up window displaying sequences and time intervals in thumbnail previews, the Sequence Explorer gives a visual overview of recorded video combined with smooth navigation
  – Presents recorded sequences for individual cameras, or all cameras in a view
  – Available in both live and playback modes
  – Smooth navigation with sliding preview and "drag-and-throw" function for video thumbnails
  – Instant playback of video sequences
- Application options allow users to adapt the layout and personalize the application to their particular preferences
- Dual authorization offers an optional additional level of system security, where XProtect Smart Client users are granted access to the system only when a second user or supervisor has confirmed the log-in with a successful authorization of the second user
- Create, edit or delete PTZ presets (not possible for PTZ type 2, where PTZ presets are stored in the camera device, and can't be modified from the XProtect software)
- Control PTZ cameras by using;
  - PTZ preset positions
  - PTZ point-and-click control
  - Overlay buttons
  - PTZ zoom to a defined rectangle
  - Video overlaid PTZ control
  - Virtual joystick function
  - Joystick
- 360° ImmerVision Enables® panomorph lens technology removes blind spots and allows operators to track, detect and analyze the entire area in live or playback mode. Only one device license required for the 360° panomorph lens
- Camera Navigator allows the easy tracking of objects
- Milestone Integration Platform Software Development Kit (MIP SDK) 4.5 plug-in support
- XProtect Smart Client – Player replaces the former viewer application and offers efficient handling of multiple exports
- Support for hardware accelerated decoding using Intel Quick Sync video

XProtect Smart Client - Player

- Playback recorded or received video and audio evidence
- Has by default a simplified even more user-friendly interface compared to the XProtect Smart Client, including the capability to switch back to the full XProtect Smart Client interface, with almost the same functions as the XProtect Smart Client
- Instant one-click playback for easy viewing of exported video evidence
- Advanced second-level investigation tools make it easy to refine exported video and re-export the most essential evidence
- The project tool allows users to merge video exports or archives from two different locations or XProtect systems together into one new export
- View up to 100 time-synched cameras during playback
- Scrollable activity timeline with magnifying feature
- Instant search on recordings based on date/time and activity/alarm
- Evidence can be generated as a printed report, a JPEG image, an AVI or MKV film or in XProtect format
- Export audio recordings in WAV or AVI format
- Audio in MKV export is PCM, and therefore available in a decoded version of what was originally recorded
- Export video digitally zoomed to view area of interest only and to minimize export footprint size

- Re-export evidence in XProtect, AVI or MKV format with the XProtect Smart Client - Player for instant, easy viewing by authorities
- Encryption and password protection option for exported recordings and files
- Ability to add comments to exported evidence, also encrypted
- De-interlacing of video from analog cameras
- 360° ImmerVision Enables® panomorph lens technology
- Automatically copied to all hard drives used by the recording server to store recordings and archives

XProtect Web Client

- Access XProtect Smart Client views through the browser and avoid advanced setup
- Shared views can be managed centrally via the server with administrator/user rights and user groups
- Playback video easily including fast/slow playback, single frame step, and jump to date/time with frame preview while adjusting time
- Search for cameras and views to quickly find specific cameras in the system
- Control PTZ cameras remotely using preset positions
- Dynamic bandwidth optimization when streaming from server to client giving a better use of bandwidth
- Optional client-side decoding for improved video quality and reduced server load
- Create AVI files or save JPEG images
- Create investigations with one or more cameras to quickly access them from anywhere and convert to exports when needed
- Export on the server to avoid moving large video files back and forth. Users can download only the files they need or save them to download when a faster connection is available
- Trigger outputs and events with live view of related camera
- System login using XProtect user name and password
- System login using Microsoft Active Directory user
- Secure connection through HTTPS
- No installation required on the client's computer

Milestone Mobile

- Add login credentials for multiple servers in the Milestone Mobile client to easily switch between sites or different connection addresses
- Views are inherited from the connected XProtect VMS system. The client automatically obtains the user's private and shared views from the system to be used as camera lists in the Milestone Mobile client
- A view with all cameras is automatically generated allowing the Milestone Mobile client to be used when no views are set up. It also provides a quick way of searching through cameras
- Cameras can be viewed in full screen to take better advantage of the device's screen. It is also possible to search through cameras in a view while in full screen by swiping left or right
- Search for cameras and views to quickly find specific cameras in the system
- Digital pinch to zoom enables users to zoom in on a part of the image for closer review and conduct detailed investigation of video when using megapixel or high-definition cameras
- Playback recordings from the database and select a specific time or recorded sequence to start playback, step through recordings and select a playback speed
- View recordings from the database while keeping an eye on what is currently happening. The client displays a live picture-in-picture frame of the same camera when in playback mode. The picture-in-picture can be moved by dragging and double-tapping will return to live view
- Control PTZ cameras either manually or by selecting predefined presets for quick navigation
- Video Push allows users to use the camera in their mobile device as any other camera in the installation. It is very easy to use and requires no setup in the mobile device
- Trigger outputs and events:
  Users can use their mobile device to trigger outputs connected to the XProtect VMS or trigger user-defined events to have greater control on the go
- Connect securely to the Milestone Mobile server using HTTPS encryption
- Export on the server to avoid moving large video files back and forth. Download only the required files or save them to download later when a faster connection is available
- View and manage alarms with easy access to related video recordings
- Receive push notifications when new alarms are triggered or alarms are assigned to a user
- Automatic server setup with Smart Connect

Integration options

- XProtect's open SDK makes it possible to incorporate video in your business processes through seamless integration of third-party applications, such as video analytics and access systems
- Compatible with XProtect® Access, an add-on to enable easy integration of third-party access control solutions with Milestone's video management solutions. Users of the Smart Client have a consolidated interface to operate the access control systems with dedicated functions to effectively monitor access events, manually assist passages and conduct investigations on specific access points or cardholders
- Compatible with XProtect® Retail, an add-on investigation tool for performing advanced data analysis. Based on transaction data from point-of-sale (POS) or automated teller machines (ATMs), XProtect Retail links data with corresponding video from relevant cameras
- Compatible with XProtect® Transact that directly links video with transaction data from POS or ATMs. Transactions and corresponding video can be monitored live or viewed later to identify shrinkage, fraud or simply validate a transaction
- With Milestone Interconnect, XProtect Corporate provides continuous monitoring of alarm status from XProtect servers, video surveillance cameras and external devices
- Compatible with XProtect Screen Recorder, an add-on function that enables XProtect VMS to inconspicuously capture screen recordings of any Microsoft Windows-based PC or POS terminal. Captured screen recordings are managed just like camera recordings and can therefore be viewed in live and playback mode, and exported for evidence
- Integrate with systems such as access control, alarms, gates and building management using hardware input/output (I/O), internal events and TCP/IP events

Miscellaneous

System Requirements

The listing of the system requirements are moved online to better service our customers. Please find the system requirements per product here:
https://www.milestonesys.com/support/product-system-requirements/

Supported languages

For details on supported languages, please refer to: http://www.milestonesys.com/support/supported-languages/

Licensing structure

Base license

- An XProtect Enterprise base server license is mandatory for installing the product. The product may be installed on an unlimited number of computers designated as master servers per software license code (SLC). The product may be installed on an unlimited number of slave server computers per designated master server using the same SLC
- The base server license contains the XProtect Enterprise server module and XProtect Mobile server, plus the client modules XProtect Smart Client, XProtect Smart Client – Player, XProtect Web Client and Milestone Mobile

Device license

- To connect to a hardware device, one license per device is required. In total, for all copies of the product installed under the same base license, the product may only be used with as many cameras as you have purchased device licenses for
- Video encoders connected to multiple analog cameras require a device license per IP address in the encoder to operate
- I/O devices require a device license per I/O device
- An unlimited number of device licenses may be purchased
- To extend the installation with additional device licenses, you must purchase them and re-activate your licenses

Client license

- The XProtect Enterprise client modules: XProtect Smart Client, XProtect Smart Client – Player, XProtect Web Client and Milestone Mobile do not require additional licenses and can be installed and used on any number of computers

End-of-Development Announcement

With the release of XProtect Enterprise 2016 R2, Milestone announces end-of-development of the XProtect Enterprise product. This means that no further releases will be made of the product, beyond the 2016 R2 release. XProtect Enterprise will remain available for purchase until June 1, 2020. Milestone is also committed to provide customers and partners technical support on XProtect Enterprise 2016 R2 until June 1, 2020, with the availability of extended support beyond this date.

Milestone recommends new customers to consider XProtect Expert or Milestone Husky M500 Advanced, which both offer superior functionality and performance at an equivalent price level as XProtect Enterprise. A third alternative is XProtect Professional that offers a similar feature set, at a lower price level.

Frequently Asked Questions (FAQs)

This document contains the answers to the most frequently asked questions about the Milestone Care service portfolio. The document is divided up into the following sections:

- Milestone Care service packages
- Online support portal
- Phone support
- Market introduction and availability
- Pricing and ordering
- Impact on existing Milestone offerings

Milestone Care service packages

What is Milestone Care?
Milestone Care is a complete suite of operational maintenance and support services that is available for all Milestone solutions. Designed to provide the right level of coverage to meet the specific needs of each end-customer, Milestone Care consists of a base service offering and three commercial service offerings: Milestone Care™ Basic Milestone Care™ Plus, Milestone Care™ Premium and Milestone Care™ Elite.

Each containing varying levels of the service components enabling our end-customers to select the Milestone Care package that best fulfills their needs today and in the future Milestone Care is designed as a complement to the support that end-customers get from resellers and integrators.

What part of Milestone Care is available for free with every Milestone solution?
This offering is called **Milestone Care™ Basic** and includes the following resources:

- Online e-Care portal: an easy-to-navigate, searchable resource including chat assistance, self-help guides, video tutorials and knowledge base
- User forum: online community where you can find and share solutions with Milestone users around the world
- Continuously updated systems: free and immediate access to all video management software (VMS) service releases, add-on software, clients and device packs
- Unique trade-in policy: receive 30 percent credit for your current Milestone product when upgrading to a newer version of your existing Milestone product or upgrading to a more advanced Milestone product

- E-learning portfolio: a portfolio of self-paced training modules for end-users with focus on usage of Milestone's products. The portfolio of available e-learning modules will continuously be extended during 2015
- Technical support: Our dedicated technical support team is available for all Milestone partners during business hours
- Partner service and sales support: Our sales support team is available for issues regarding order placement and/or fulfillment during business hours

What are the three commercial Milestone Care offerings?

To complement the free offering of Milestone Care, three commercial offerings for end-customers are also available.

- **Milestone Care™ Plus**

  Ideal for installations of all sizes, and provides flexibility for installations that may grow in size or require more advanced functionality over time. Milestone Care Plus replaces the current Software Upgrade Plan (SUP).
  - All the free benefits included in Milestone Care Basic
  - Immediate access to latest software versions and functionality
  - Unique trade-in policy: receive 100 percent credit for your current Milestone product when upgrading to a newer version of your existing Milestone product or upgrading to a more advanced Milestone product
  - Milestone Customer Dashboard gives reseller/integrator access to monitor system performance

- **Milestone Care™ Premium**

  Targeted at larger customer with business-critical installations that require around-the-clock expert support.
  - All the free benefits of Milestone Care Basic
  - Requires Milestone Care Plus
  - Direct technical email and phone support, and expert assistance 24/7/365 available for end-customers (this applies to the end-customer and to the reseller supporting the given software license code)
  - Selection of local dial-in numbers and support languages
  - Prioritized handling
  - Service Level Agreement (SLA) with committed response times

- **Milestone Care™ Elite**

  High-end, customizable offering for mission-critical installations
  - All the free benefits of Milestone Care Basic
  - Requires Milestone Care Plus
  - Dedicated Milestone Technical Account Manager monitors the resolution performance of reported cases
  - 24/7/365 direct access to Milestone Technical Support
  - Prioritized technical email and phone support handling

- Service Level Agreement (SLA) with committed response and resolution times
- Training of customer's first-line support team
- Monthly reporting

What products are covered by the Milestone Care program?
All Milestone products are covered by Milestone Care, including XProtect video management software, XProtect add-on software and the Milestone Husky NVR series.

What is the committed response time for Milestone Care Premium and Milestone Care Elite?
All severities have a first response within 15 minutes if reported by phone, and within four hours if reported online. In addition to these initial response times, there are service objectives for progress status reporting.

Severity level	First response time
Critical	One hour
Sever	Four hours
Moderate	Eight hours
Minor	12 hours

What is the committed resolution time for Milestone Care Elite?
Contact your Milestone Sales representative for more details.

What is the value of Milestone Care for Distributors and Resellers?
Milestone Care enables our channel partners to take advantage of our global presence and support expertise and provide an attractive, flexible service offering to their end-customers. The three commercial service offerings grows with the end-customer's business and paves the way for a long-term business relationship between our partners and their customers.

The Milestone Care program is a significant replacement of our existing SUP and enables us to support different types of end-customers in the most value-enhancing way. It ensures our solutions are comprehensively safeguarded, in terms of investments, updates and upgrades, and critical incident response. This new support and maintenance offering will empower our partners to deliver and sell a complete service offering.

- Milestone channel partners contacting Milestone Technical Support on behalf of a customer with Milestone Care Premium will receive prioritized handling
- Milestone Care offerings enable Channel Partners to generate additional revenue complementary to license sales
- Resellers can build lifecycle business relations with end-customers and generate recurring revenue options when prolonging Milestone Care offerings at expiry
- High end-customer satisfaction driven by the availability of the vast range of free resources and the range of optional commercial offerings

- Milestone Customer Dashboard can serve as platform for the add-on of paid services, such as a system monitoring services where a partner is paid to proactively monitor and maintain end-customer systems

Platinum and Diamond partners will receive prioritized queuing when calling technical support, as a part of their partner tier.

Online support portal

What resources are available in the e-Care portal?
The e-Care portal is an easy-to-navigate, searchable resource including chat assistance, self-help guides, video tutorials, support community and knowledge base.

What can the new chat assistance be used for?
The License Chat is available all weekdays for licensing issues & queries only.
It offers licensing support in English, Danish, Dutch, French, German, Italian, Spanish, and Russian according to agents' availability.

Is the e-Care portal free of charge?
Yes.

Does the e-Care portal require login credentials?
Certain functions in the e-Care portal require that users are logged in. This includes the ability to post, vote and follow in the e-Care portal community, contact support via web case or phone and download hot fix files.

What languages are available in e-Care portal?
The portal is currently available in English. However, Milestone is investigating the possibility of localizing some selected content in the future. However, some of the resources published via the e-Care portal, including manuals and selected knowledge base articles, are localized.

Which e-learnings will be available in the e-Care portal?
The e-learning courses are hands-on, self-paced training modules. Milestone will gradually publish new e-learning courses, and currently available courses include:

- "Installing and Configuring the Milestone Husky M30 and Milestone Husky M50"
- "Configuring and Using Milestone Husky M10"
- "How to use the XProtect Smart Client"

Phone Support

In which countries is a local dial-in number available?

Local dial-in numbers can are available for the following countries:

Denmark	+45 88300620
France	+33 184020316
Germany	+49 21025656987
Italy	+39 0294751082
Singapore	+65 31589911
Australia	+61 390086795
Belgium	+359 24927075
Netherlands	+31 202625597
United Kingdom	+44 1184024726
USA	+1 (503) 350 1100 - Select 2
United Arab Emirates	+971 (0)45592702

Dial-in numbers can also be found on milestonesys.com starting May 2015.

What languages are supported?
The main support language is English. Based on availability, local language support in Europe, the Middle East and Africa includes Danish, Dutch, German, French, Italian, Russian and Spanish. Based on availability, local language support in the Americas includes Spanish.

Market introduction and availability

When will Milestone Care be commercially available?
Milestone Care Plus and Milestone Care Premium will be available in the Q3 2015 price list, valid as of July 1, 2015. Milestone Care Elite is available now.

Milestone Care Plus and Milestone Care Premium will be listed in the Q3 - 2015 Milestone price list. Milestone Care Plus will be available for purchase in Milestone Online Ordering System (MOOS) as of July 1 2015, whereas you have to contact Milestone Partner Service & Sales Support if you want to purchase Milestone Care Premium. Milestone Care Elite will be listed without pricing, as it is a customizable

option. If you are interested in purchasing Milestone Care Elite, please contact your local Milestone Sales representative.

When will Milestone start informing the channel about Milestone Care?
Distributor communication will happen on May 6, 2015 via email and followed up by a series of webinars on May 13 and 20. Please refer to MyMilestone for details and registration.

Reseller communication will take place on June 2, 2015 via email and information on MyMilestone, followed up by a series of localized webinars second and third week of June. Milestone resellers and integrators can sign up for these webinars via MyMilestone.

Pricing and ordering

Who can purchase Milestone Care packages?
The Milestone Care service suite is an offering which can be purchased by any Milestone end-customer via their Milestone reseller or system integrator.

What is the price of Milestone Care?
Price for one year:

Service Package	Price
Milestone Care Basic	Free of charge
Milestone Care Plus	18 percent of MSRP
Milestone Care Premium	7 percent of MSRP + startup fee of EUR/USD 1,500 per end-customer*
Milestone Care Elite	Individual contracts starting at EUR/USD 50,000 *

*Milestone Care Plus is required before purchasing Milestone Care Premium or Milestone Care Elite

The Milestone Care service offerings are all sold through our standard distribution model with a coverage period of one to five years, thus providing resellers with recurring revenue opportunities.

How can I order and renew the commercial Milestone Care service offerings?
Milestone Care Plus and Milestone Care Premium will be available on the Milestone price list and can be ordered, just as SUP is being ordered/renewed today. Milestone Care Elite is a customizable offering hence ordering and renewal procedure will be part of the individual contract.

Impact on existing Milestone offerings

Will Milestone continue to offer SUP after the introduction of Milestone Care?

No. SUP will be replaced by Milestone Care Plus. Existing stock keeping units (SKUs) will be maintained, but renamed.

What happens to customers that have SUP coverage today?
They will be informed and converted to Milestone Care Plus with no additional charges or loss of benefits incurred.

Will Milestone continue to offer Incident Tickets after the introduction of Milestone Care?
No. The prioritized support service previously facilitated by the incident tickets will be replaced by Milestone Care Premium. The Incident Tickets will not be available in Milestone price list as of July 1, 2015.

What happens to already purchased Incident Tickets?
Existing tickets will be valid for the remainder of the ticket term (maximum one year).

Will Milestone accept Technical Support calls from end-customers?
End-customers are encouraged to seek support from their reseller, and the reseller can then call Milestone for support if needed. With the introduction of Milestone Care, end-customers with Milestone Care Premium or Milestone Care Elite will have the option to directly reach Milestone Technical Support.

How will Milestone Care affect technical support for partners?
Resellers and distributors can still call Milestone Technical Support within business hours and benefit from local dial in numbers and localized support in selected countries. Platinum and diamond partners, and partners contacting Milestone on behalf of a customer with Milestone Care Premium will receive prioritized queuing when contacting Milestone Technical Support.

Will the purchase of XProtect Essential or XProtect Express include one year of Milestone Care Plus?
Yes, the purchase of XProtect Essential of XProtect Express will include one year of Milestone Care Plus. As Milestone Care Plus replaces the SUP there are no actual changes. In addition, the Milestone Husky NVR series will include three years of Milestone Care Plus.

Additional information

Please contact your local Milestone sales representative or the Milestone Partner Service and Sales Support, if you have additional questions that are not covered in this document.

XProtect® Enterprise 2016 R2

With support for unlimited numbers of cameras, XProtect Enterprise is easy-to-use, yet advanced open platform IP video management software (VMS) for medium and large multi-site installations. It has comprehensive features that help operators view multi-site locations with an unlimited number of cameras, react quickly to incidents and efficiently export video. XProtect Enterprise includes configuration wizards and automatic hardware detection, which significantly reduce the time and cost of installing surveillance systems with many cameras.

The 2016 R2 release of XProtect Enterprise will be the last release of the product. The product will remain available for purchase until June 1, 2020, and Milestone will continue to support the product until June 1, 2020, with the possibility for extension. New customers are recommended to use XProtect® Expert, XProtect® Professional or the new Milestone Husky™ NVR M500 Advanced.

XProtect® Enterprise 2016 R2 in short

With the release of XProtect Enterprise 2016 R2, **Milestone announces end-of-development of the XProtect Enterprise product**. This means that no further releases will be made of the product, beyond the 2016 R2 release. XProtect Enterprise will remain available for purchase until June 1, 2020. Milestone is also committed to provide customers and partners technical support on XProtect Enterprise 2016 R2 until June 1, 2020, with the availability of extended support beyond this date.

Milestone recommends new customers to consider XProtect Expert or Milestone Husky M500 Advanced, which both offer superior functionality and performance at an equivalent price level as XProtect Enterprise. A third alternative is XProtect Professional that offers a similar feature set, at a lower price level.

XProtect Enterprise 2016 R2 includes a new range of automatic management configuration features which make it easy to effortlessly configure and maintain XProtect Enterprise installations. XProtect Enterprise 2016 R2 is shipped together with the updated version of XProtect Smart Client, XProtect Web Client and Milestone Mobile, and the 2016 R2 version of XProtect Smart Wall.

New key features in XProtect Enterprise 2016 R2

Ease of configuration features

A new range of automatic management configuration features make it easy to effortlessly configure and maintain XProtect Enterprise installations.

- In addition to the existing automatic camera discovery, the new automatic IP address assignment*, makes finding, adding and assigning IP addresses to cameras easier than ever. Now the VMS automatically find and assigns IP addresses to all connected IP devices on the network, saving time and effort when setting up cameras

- Through automatic time synchronization* cameras that are discovered automatically are configured to synchronize with a time server. Time synchronization across the connected devices ensures that all video is recorded with similar time stamps for accurate incident investigation and evidence collection

- Using automatic storage distribution, the VMS optimizes disk storage by intelligently spreading out video data across the different drives in the system, reducing the effort and time of system installation

Where:
*On supported devices only, please refer to: https://www.milestonesys.com/solution-partners/supported-hardware/

XProtect® Smart Client – simplified mode
Continuing on the path of making our products easy-to-use, a simplified mode in XProtect Smart Client addresses the needs of occasional system users. Now users can choose to run XProtect Smart Client in a simplified mode, which has only the most common and basic video functionalities. Users can toggle between the simplified and advanced modes and the client will automatically start with the last mode used.

Viewing interfaces
XProtect Enterprise 2016 R2 is shipped with new versions of all viewing interfaces:
- XProtect Smart Client 2016 R2
- XProtect® Web Client 2016 R2
- Milestone Mobile 2016 R2

Localization
Please refer to: http://www.milestonesys.com/support/supported-languages/

System requirements
For details on system and operating system requirements, please refer to:
https://www.milestonesys.com/support/product-system-requirements/

Product licensing
The 2016 R2 edition of XProtect Enterprise is licensed with a new license series, which means that licenses for existing XProtect Enterprise installations must be upgraded or traded-in to be able to install and run the 2016 R2 version of the XProtect Enterprise software. There are no changes to the licensing structure of XProtect Enterprise 2016 R2, compared to earlier versions.

Product availability
XProtect Enterprise 2016 R2 and associated XProtect clients are generally available per **June 1, 2016**.

XProtect Enterprise will remain to be available for expansion purchase (additional devices to existing systems) and new purchases until June 1, 2020.

Product support
Recognizing the broad installed base of XProtect Enterprise, Milestone is committed to provide customers and partners with technical support on XProtect Enterprise 2016 R2 until June 1, 2020, according to Milestone's normal product lifecycle.

Customers requiring support after June 1, 2020 can subscribe to Milestone Care Premium (www.milestonesys.com/our-services/milestone-care-premium/) for technical support for two additional years, until June 1, 2022. Milestone will provide technical support to customers requiring support beyond June 1, 2022 on individual contract basis.

More information about the end-of-development announcement

Please contact your Milestone sales representative, for additional information about the end-of-development announcement of XProtect Enterprise, and the potential impact it may have on your installation of Milestone business.