NCS
Northeast Computer Systems, Inc.

INDEPENDENT REVIEW

OF A PROPOSED

ENTERPRISE VOIP IMPLEMENTATION

For the
State of Vermont
Department of Information & Innovation (DII)

Submitted to the
State of Vermont, Office of the CIO
by:

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1. EXECUTIVE SUMMARY

A NOTE ON TERMS

The following terms have specific meaning in this Independent Review:

- **VoIP**
  Voice over Internet Protocol – Voice telephony utilizing conventional IP data circuits

- **Centrex system**
  The existing State telephony solution, employing traditional and/or digital phones, whether or not it employs brand-name Centrex service. As such, it does include ISDN service.

- **Telecom Surplus**
  The Telecom Dept ID associated with the CIT Fund. For details on the source or use of this fund, contact DII.

- **Telecom Group**
  The State employees currently managing the Centrex system.

- **Network Group**
  Network engineers performing a variety of network design, management, and maintenance services for DII, intended to participate in this project.

1.1 COST SUMMARY

IT Activity Lifecycle:	7 years
Total Lifecycle Costs:	$ 8,224,831.43
Total Implementation Costs:	**$ 1,046,389.33**
New Annual Operating Costs:	*$ 1,306,320.00* [1]
Difference Between Current and New Operating Costs:	$ (875,640.00)[2]
Funding Source(s) and Percentage Breakdown if Multiple Sources:	

	FY16	FY17	FY18-22
State Telecom Surplus	**100%**	**6%**	**0%**
Other State Funds	**0%**	**94%**	**100%**

[1] New Annual Operating Costs shown equals annual cost of operations in FY19, the first full year of costs for total project estimate of 8700 devices.

[2] Calculation is $ 1,306,320 (FY19 operating cost) minus $ 2,181,960 (Current monthly Centrex cost per line of $20.90 X 12 months X 8700 lines). See Section 9.2, below, for description of current Centrex cost.

1.2 DISPOSITION OF INDEPENDENT REVIEW DELIVERABLES

Deliverable	Highlights from the Review *Include explanations of any significant concerns*
Acquisition Cost Assessment	• **The total cost of acquisition (implementation) is favorable compared to a national researched mean.** • **The cost of acquiring handsets may not be favorable when compared to those available to a much larger state.** • **The cost of acquiring necessary network hardware will be comparable to Vermont's usual costs.** • **Hosted solutions are inherently operational expense (opex) intensive, while an on-premises solution is inherently capital expense (capex) intensive.**
Technology Architecture Review	• **Implementation of VoIP services at the state government level represents a nationally ongoing transformation. A recent report by the National Association of State Chief Information Officers (NASCIO) summarizes best practices and approaches for a transition to VoIP and IP Telephony. The proposed project is well aligned with its recommendations.** • **The proposed project employs enterprise-grade cloud services, housed by the vendor in secure data centers, and connected to the State network via managed data services included in the cloud solution. The resulting implementation would serve a large proportion of Vermont State government telephony needs, and could be expanded over time to serve all agencies requiring or requesting telephone service.** • **We recommend that the State focus this project solely on voice telephony, until such time that it can perform sufficient planning and analysis to make decisions concerning other UCS applications.**
Implementation Plan Assessment	**In general, the timetable proposed by the State, and accepted by the vendor, is realistic and on-time at this point prior to contract execution. The Vendor's proposed implementation plan conforms to the State's timetable expectations, and we see no reason to doubt the likelihood of its success.**
Cost Analysis and Model for Benefit Analysis	• **The intangible benefits of this project were identified in the original Project Charter, and are positive to the State. The single most significant tangible benefit is an overall lowered cost of telephone service to the State, and this project**

	achieves that significantly, while maintaining and enhancing alignment with the State's IT Strategic Plan. • **Funding over the long-term is supplied by internal billing of State agencies to cover costs of telephony operations. In the first and second years of this project, available monies from the "Telecom Surplus" will be applied to the project.** • **Cost Savings in State telephony costs, reflected in lower interagency telephony billing for agencies employing VoIP solution.** • **An additional potential cost reduction (intangible benefit) of $36,612 / yr. by deploying fax over VoIP.**
Impact Analysis on Net Operating Costs	• **The project as conceived is cost-effective. With the Telecom Surplus included as planned, the project has a negative cost impact for the State from the very first year. Without the Telecom Surplus included, the project shows break-even by year 2, FY17.** • **The project will be able to distribute phone service to State agencies at a billing per line that is 63% or 70% of current billing-per-line, and 60% or 67% of current cost-per-line, depending upon whether the Telecom Surplus offset is considered as part of the project for rate projection purposes.[3]** • **The ongoing annual cost of the project in the last fiscal year of the lifecycle shows a reduction of approximately 19% from the current annual cost of supplying Centrex service for the same number of lines. This is a significant reduction, although it does not achieve the Project Charter's stated target of at least 25% reduction by post- project.**

1.3 IDENTIFIED HIGH IMPACT &/OR HIGH LIKELIHOOD OF OCCURRENCE RISKS

NOTE: Throughout the narrative text of this document, **Risks and Issues are identified by bold red text**, and an accompanying tag (**_RISK_ID# _0_**) provides the Risk or Issue ID to reference the risk, response, and reference in the Risk Register.

The following table lists the risks identified as having high impact and/or high likelihood (probability) of occurrence.

Note that none of the risks in the following table have* both *high impact and high probability. Only two rise to the level of a moderate total rating (impact X probability = 31-60).

[3] This statement is based on the on a single estimated flat rate over the project lifecycle resulting in the least negative cost (i.e., closest to zero) to the State in the two scenarios given. The actual inter-agency rate to be billed by the State depends on factors beyond this review and at the complete discretion of the State.

Please see the **Risk & Issues Register, in Section 10**, for details.

Identified High Impact &/or High Probability of Occurrence Risks in this project:

Risk Description	RATING IMPACT / PROB	State's Planned Risk Response	Reviewer's Assessment of Planned Response
Vendor's assigned Project Manager does not hold PMP certification	3/10	Vendor's primary PM holds significant experience in closely relevant projects, and expects PMP certification within the coming year. State accepts this Project Manager's assignment for the time being.	Concur
Some IP phones may not have full (SRTP) voice encryption capability, so that State employees could unknowingly violate Federal or State required security standards, especially for transmission of private/personal information.	10/2	Mitigate: The State will not purchase any phones now, or throughout the lifecycle of this service that are not capable of full SRTP encryption. Users of phones needing encrypted calls will be trained in proper operation.	Concur, but recommend explicit policy promulgation
Voicemail or Call Recordings, if stored on softphone computers or HHDs, may not be encrypted	10/4	Accept: develop training materials, usage policies for State employees on acceptable secure use	Concur
The State may not be appropriately compensated if service level targets are not achieved by the vendor.	9/1	We expect this risk will be eliminated in the course of contract negotiations, as the State requires adequate contract remedies.	Concur
The State may be in violation of Federal and State emergency notification (e911) requirements in the project as planned**.**	10/5	Mitigate: 1. Provide 911 services to VoIP users through the configuration of one POTS line connected to the LAN router at each location. 2. Centrally locate Centrex phones throughout each facility (e.g., 1 line per floor, clearly labeled and accessible).	The State should seek confirmation by internal legal opinion that the planned response meets requirements.
Current State technical support staff do not possess specialized training or credentials in VoIP technology	4/7	Mitigate: Ensure adequate knowledge transfer from Vendor to State technical staff so that, over implementation year, State staff acquire sufficient expertise in VoIP network configuration, operation, and troubleshooting to minimize need for outsourced or Vendor-supplied engineering resources.	concur
Vendor's solution includes capabilities which are not defined as in-scope for this project	3/9	Accept: Business needs will be assessed at each location as part of the implementation plan. The demand service fees for some of the service offerings will help control the unanticipated costs. The business leads from Office 365 and VoIP Implementation projects will meet to discuss potential conflicts by the end of June 2015.	Concur
Cost of vendor *recommended* Onsite System / Voice Engineer for Central Vermont is quoted at a fixed 1 year price of $175,000 / yr.	9/2	Avoid: Negotiate length/cost of Engineer services with Vendor: State prefers to have minimum necessary time frame for this role.	Concur

1.4 OTHER KEY ISSUES

VoIP introduces new security risks not present in the Centrex approach. Although we concur with the States response plans, security risks identified in the risk register could potentially create reputational and legal risk for the State. We recommend ***ongoing*** *attention, policy promulgation, and training for users* throughout the life of the project.

1.5 RECOMMENDATION

We recommend that the VoIP Implementation Project proceed as planned, following successful contract negotiations with the selected vendor and confirmation internal to the State that the implementation will be e911 compliant for State and Federal purposes.

1.6 CERTIFICATION

I hereby certify that this Independent Review Report represents a true, independent, unbiased and thorough assessment of this technology project/activity and proposed vendor(s).

_____ _____

Signature **Date**

2. SCOPE OF THIS INDEPENDENT REVIEW

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 (which includes a Risk Analysis)
- A cost analysis and model for benefit analysis; and
- An impact analysis on net operating costs for the Agency carrying out the activity

2.2 OUT-OF-SCOPE

- A separate deliverable contracted as part of this Independent Review may be procurement negotiation advisory services, but documentation related to those services are not part of this report.
- Proposals and vendors other than the bidder selected as first choice through the proposed project's procurement process were not evaluated in this Review**.**
- Most features of the State's existing telephone solution ("Centrex solution"), which the proposed project would replace, are not explicitly described in this report. Only the estimated costs to the State of the existing Centrex solution replaced by the proposed project are assessed, for purposes of comparison. Other State telephone costs, security implications and architectural features of the existing Centrex solution are not explicitly assessed, although some features may be referenced in passing.

3. SOURCES OF INFORMATION

3.1 INDEPENDENT REVIEW PARTICIPANTS

Name	Date	Employer and Title	Participation Topic(s)
Guildford, Jayna*	April 20, 2015	SOV DII, Project Manager	Project Management, Overall Project, Project Risk
Dessureau, Phillip*	April 20, 2015	SOV DII, Project Manager	Project Management, Overall Project, Project Risk
Welch, Jon*	April 20, 2015 May 7, 2015	SOV DII, Telecommunications & Network Engineering Director	Overall Project
Danis, Ray	May 7, 2015	SOV DII, Network Engineer	Network Implementation
Jaquith, Peter	May 7, 2015	SOV DII, Network Engineer	Network Implementation
Green, Jack**	May 7, 2015	SOV DII, (Acting) Chief Information Security Officer	Security Analysis
Rowley, Kris	May 18, 2015	SOV DII, Systems Security Director	Security Analysis
Morey, Michael K.	May 12, 2015	SOV DII, Chief Technology Officer	Enterprise Architecture
Rowley, Kris	May 18, 2015	SOV DII,	Security Analysis
Haley, Martha	June 11, 2015	SOV DII, Enterprise Project Management Office Director	Project Management Policy
Mullins, Joe	June 24, 2015	SOV DII, Information Technology Specialist	Current Centrex Cost
LeDonne, Jan	May 7, 2015	NWN, Project Manager	Vendor Project Management
Shea, Ted**	May 7, 2015	NWN, Senior Account Executive	Vendor Project Management

*Participated throughout IR; Date indicates first officially scheduled interview.
**Answered followup questions after initial interview(s).

3.2 INDEPENDENT REVIEW DOCUMENTATION

The following documents were used in the process and preparation of this Independent Review

Document	Source
***SOV Unified Communications – IT Activity Business Case & Cost Analysis* (2014).**	State of Vermont -- DII
***Enterprise VoIP Implementation Project Charter* (2015).**	State of Vermont-- DII
***Sealed Bid Information Technology Request for Proposal for Enterprise Voice over Internet Protocol Communications Solution* (2014).**	State of Vermont -- DII
***VoIP Implementation Project Log,* (2015).**	State of Vermont-- DII
***Project Schedule Diagram for Senior Technology Leadership Team* (2015).**	State of Vermont-- DII
***State of Vermont IT Strategic Plan 2015-2019* (2015)**	State of Vermont
***Information Technology Bid for Enterprise Voice over Internet Protocol Communications Solution, Volume I. Technical Proposal* (2015).**	NWN
***Information Technology Bid for Enterprise Voice over Internet Protocol Communications Solution, Volume II. Cost Proposal* (2015).**	NWN
***NWN Hosted Collaboration Solution (HCS) for State of Vermont,* PowerPoint Presentation for Technical Demonstration, (2015)**	NWN
***NWN Communication Service Level Agreements* (2015).**	NWN
***Information Technology Bid for Enterprise Voice over Internet Protocol Communications Solution,* Appendices 1-5 (2015).**	NWN
***VoIP BAFO Spreadsheet (Best and Final Offer)* (2015).**	NWN
***Hosted VoIP Enables State and Local Government Success* (2017).**	Alcatel-Lucent
***Electronic Messages Best Practice For All Public Agencies* (Date Effective: APRIL 1, 2009).**	Vermont State Archives Records Administration & DII

***VoIP and IP Telephony: Planning for Convergence in State Government* (May, 2005).**	The National Association of State Chief Information Officers
***New York State Station Equipment rates*, http://apps.cio.ny.gov/telecom/rates.cfm?sort=description, (retrieved May 5, 2015).**	New York State
***Nemertes 2014-15 Benchmark Report Unified Communications in the Cloud* (2015).**	Nemertes
***True Cost of Ownership of IP Telephony and UC,* Webinar, (April 8, 2015). From research conducted Jan-Mar, 2014.**	Nemertes
United States Internal Revenue Service, *IRS Privacy Impact Assessment, ID Number 805,* date of approval March 19, 2014, *http://www.irs.gov/pub/irs-utl/Convergence_Jabber_WebEx-pia.pdf* (retrieved June 18, 2015).	US Internal Revenue Service

4. PROJECT INFORMATION

4.1 HISTORICAL BACKGROUND

Most Vermont State offices currently employ traditional telephones (digital or analog, depending upon the office/location) which in turn are connected to phone jacks (not data jacks). The telephone network is dedicated to voice telephone (including fax) service only, and is not shared by the State's data network infrastructure. Services on this traditional voice infrastructure range from directly provisioned individual phone lines to concentrated shared lines (generically called "Centrex" lines, sometimes also referred to using the earlier term, "PBX"). Digital Centrex systems were the terminal technology in the development of Public Switched Telephone Networks (PSTN). Digital Centrex systems aggregate the phone lines in a large enterprise, so that a smaller number of lines to the “phone company” can serve a large number of phones in the enterprise, provisioned on a percentage basis (e.g., 20:1). Although Centrex systems do offer some economy of scale, compared to provisioning individual phone lines. Although they enable many additional services – such as conferencing, call transfer, call waiting, and call centers – they suffer from several drawbacks:

- they require provisioning lines to the enterprise’s office locations, limiting the fungibility of lines for a workforce which may be re-allocated among locations;
- they require a significant capital expense in equipment, which must be taken into account in ongoing financial planning;
- they limit the portability of phone numbers (to a lesser extent than in the past, however);
- they rely on equipment which, in general, is no longer developed and may not be available in new form from vendors;
- they require a physical infrastructure (phone wiring) separate from that used for other data streams and communications.

Traditional Centrex does have some advantages:

- Traditional phone systems are highly reliable. A commonly accepted figure is 99.999% uptime;
- Planning and budgeting for Centrex systems has a long history and is well-understood. CFO’s tend to know how to budget for traditional phone systems;
- News stories notwithstanding, tradition PSTN is considered to be highly secure, and generally meets federal and state standards for secure conversations;
- The workforce is familiar with standard telephones, and need little training;
- E911 emergency service is available as a matter of law on all PSTN;
- The enterprise may have a large capital investment in Centrex.

State telephone services of this type are managed internally by DII staff known as the "Telecom Group."

Globally, large enterprises have begun to shift significantly toward the employment of “Voice over IP” (VoIP) for telephone services (usually called “voice telephony” to distinguish these from services available from traditional Local Exchange Companies (LEC). VoIP systems address all of the

disadvantages listed above for Centrex systems. In recent years, they have begun to make significant inroads into the advantages of Centrex. Additionally, they bring new advantages, significant enough to warrant a slow but sure shift to VoIP.

The National Association of State Chief Information Officers (NASCIO) identifies Economy, Flexibility, Resilience, and Productivity as the main advantages.[4]

4.2 PROJECT GOAL

The project is expected to improve government effectiveness, cut costs, and increase productivity. [5]

The specific goals of the present project include:

Objective 1: Reduce the cost of telecommunications services inclusive of both landlines and cellular devices for State Government.

a) Reduce net operational costs by at least 25% annually post project completion.
b) Implementation and one-time costs ROI needs to be positive in three years or less.
c) Investments do not exceed cost savings over seven (7) year period.
d) Eliminate unnecessary redundancy of services.
e) Complete project within agreed upon variances.

Objective 2: Have the infrastructure and service capabilities to deliver cost effective telecommunications services to the new Waterbury complex.

Objective 3: Keep pace with current telecommunication standards by replacing legacy technologies.

a) Increase supportability and ability to deliver business requirements
b) Be no less secure than the current system.
c) Deliver a user experience comparable to POTS (Latency, voice quality, how VMS work, by prod).
d) Technical staff will be trained in security awareness before implementation at each site.
e) Satisfy/support business and regulatory requirements pertaining to VoIP security.

Objective 4: Position the State of Vermont for future technology services.

a) Implement system that allows additional UC Functionality
b) Offer a flexible dial plan option
c) Increased capability to measure call activity
d) Some users will eliminate desk phones
e) Increased mobility for users

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[4] The National Association of State Chief Information Officers , *VoIP and IP Telephony: Planning for Convergence in State Government,*pp. 7-8 *(*May, 2005).

[5] State of Vermont*, DII – Enterprise VoIP Implementation Project Charter*, p. 3 (2015).

We believe the most compelling driver for this project is an expectation of cost savings over the long haul. There are a number of approaches which support this expectation, but chief among them are (1) an expectation that the cost-per-phone charged to State agencies will be significantly lower; and (2) that the increased fungibility of phone lines "virtualized" by VoIP will allow the State greater flexibility of cost assignment compared to Centrex-style contracts (which tend to a greater extent to be tied geographically to State office locations). **We agree that these expectations are realistic, although they must be tempered with the realities of a large deployment project.**

4.3 PROJECT SCOPE

IN-SCOPE

1. Development of an RFP.
2. Engagement with a vendor for transition services, and ongoing support.
3. Transition of State telecommunications from current phone services to VoIP services.
4. Identify risks associated with outages, e.g. power and network, and create a risk mitigation plan.
5. The EPMO will manage this project in accordance with its standards for a Robust project.
6. E911 compliance, including next generation E911.
7. Purchasing/deployment/replacement of network infrastructure.
8. Purchasing/deployment/replacement/modification of telecommunication infrastructure.
9. Development of a deployment strategy.
10. Develop cost recovery and ongoing billing plan.

OUT-OF-SCOPE

1. Non-IP-telephony applications (e.g., Unified Communications, Video Conferencing, Shared Workspaces, etc.)
2. Direct integration with State PSAP's.
3. Anything not explicitly in scope.
4. Locations not included in the deployment plan.
5. Network infrastructure investments beyond the scope of the VoIP project
6. Agency/Department specific enhancements beyond current service level

4.3.1 MAJOR DELIVERABLES[6]

The following is derived from the vendor's implementation proposal, in response to State's RFP, key document deliverables in **bold black**:

Initiate Phase
External Kickoff Meeting
Schedule for Design and Status Meetings
Assess Phase
Site visits
Environmentals – Findings Document
Conduct scans and/or assessments (optional)
Design Phase
Design meeting and project plans for implementation
Design document
Prepare Phase
Hosted collaboration provisioning
System Configuration
Standard Phone Features
Existing Telephony Integrations
Proof of Concept (Test and Acceptance Plan)
Execute Phase (Cutover and Training)
Detailed Bill of Materials (BOM) equipment and/or software components as identified in Technical Proposal Reference Materials section
Installation and Configuration
Deployment
"Train the trainer"
Training documents
End User Training (optional)
Go Live
Gate Review – production implementation acceptance
Transition to Post Cut Over Support
Technical documentation
Quick reference guides, admin & collaboration guides (manufacturer)
All documentation and manuals received with products
Project documentation
Project plan / task list / work schedules
Status reports
Action item list & Issues report

[6] **Extracted from:** NWN Technical Proposal, *Part E. Implementation/Transition Plan*, pp. E-2 to E-10 (February 24, 2015).

4.4 PROJECT PHASES, MILESTONES, AND SCHEDULE

The State's Project Charter for this project defines the following milestones and deliverables:

Project Milestone	Date
Project Start Date	November 2014
Milestone 1: **Project Definition** **Workplan** **Signed Business Case & Cost Analysis**	November 8, 2014
Milestone 2: Project Charter	March 2015
Milestone 3: Signed Contract	July 31, 2015
Milestone 4: Project Management Plan Approved **Including, but not limited to: all pm component plans as required for a robust project, training requirements and plan for all users and staff, risk matrix, deployment plan, and cost recovery and ongoing billing plan.**	Within 2 weeks of contract signing.
Milestone 5: RACI Matrix	Within 2 weeks of contract signing.
Milestone 6: Gap analysis on existing VoIP Implementations	TBD
Milestone 7: Technical Solution Design	Within 2 weeks of contract signing.
Milestone 8: Deployment Plan	Within 2 weeks of contract signing.
Milestone 9: First site implementation completed and accepted	September 2015
Milestone 10: Waterbury Complex implementation completed and accepted	April 20, 2016
Milestone 11: Year 1 implementation plan completed and accepted	July 2016
Milestone 12: Year 2 implementation plan completed and accepted	July 2017
Milestone 13: Year 3 implementation plan completed and accepted (if needed)	July 2018
Project End Date	July 2018

5. ACQUISITION COST ASSESSMENT

Acquisition Costs	Cost	Comments
Hardware Costs	$ 912,406.00	Cost of handsets (phones)
Software Costs	$ 8,000.00	Survivable Site Configuration/Setup
Implementation Services	$ 43,500.00	Porting Phone Numbers
System Integration Costs	$ --	
Professional Services (e.g. Project Management, Technical, Training, etc.)	$ 65,733.33	Onsite System-Voice Engineer in Central Vermont / Training
<<Other>>	$ 16,750.00	**Independent Review**
Total Acquisition Costs	**$ 1,046,389.33**	

5.1 COST VALIDATION:

DESCRIBE HOW YOU VALIDATED THE ACQUISITION COSTS.

Using the vendor supplied response to State's request for a BAFO spreadsheet (based on State template) as a starting point, along with the vendor's original BAFO Cost Proposal, we consulted State project participants to produce detailed breakout of State-selected options. These were compared to external sources as listed in Cost Comparison, below.

Ongoing conversations with project personnel confirmed the State's choices for

- Hardware acquisitions (routers; handsets; survivability options)
- Estimated lines deployed
- Basic and enhanced service options
- Any other line items

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)?

Because this project is a cloud implementation, acquisition costs are not strictly comparable to that of an on-premises solution. Hosted solutions are inherently operation expense (opex) intensive, while an on-premises approach is inherently capital expense (capex) intensive. The major cost over the project lifecycle will be ongoing per-device VoIP service provided by the vendor at a monthly rate. One useful comparison we can make – although not strictly an acquisition cost – is a comparison of monthly, per-device (user) **basic service cost** over the lifecycle (7 years) of the project to an available recent average monthly cost for enterprise VoIP deployments.

In such a comparison, **we find the present vendor proposal (BAFO) projects an average monthly cost of $11.20, compared to a published research mean of $19.83.**[7],[8] In this comparison, we find the vendor's proposal to be a reasonable cost for the State.

We can, however, reasonably compare the acquisition cost of handsets ("desk phones"), as proposed by the vendor (BAFO), to identical handsets purchased by another state, in this case New York State.[9] This produces the following comparison:

Phone Types *	Proposed Model	Unit Purchase Price	NYS rate
Basic or Lobby (BAFO)	Cisco 3905	**$ 44.00**	**$ 38.64**
Basic or Lobby	Cisco 6901	**$ 47.00**	**$ 42.94**
Basic or Lobby	Cisco 7811	$ 90.00	N/A
Mid-Range - 10/100	Cisco 7821	$ 110.00	N/A
Mid-Range - 10/100/1000 (BAFO)	Cisco 7841	**$ 146.00**	**$ 141.45**
Mid-Range	Cisco 8941	$ 110.00	N/A
High-End	Cisco 8841	$ 215.00	N/A
High-End	Cisco 8851	$ 260.00	N/A
High-End	Cisco 9951	**$ 350.00**	**$ 300.55**
Wireless IP	Cisco 7926	$ 545.00	N/A
Conference - (BAFO)	Cisco 8831	**$ 558.00**	**$ 540.61**

[7] Nemertes, *True Cost of Ownership of IP Telephony and UC,* Webinar, (April 8, 2015).
From research conducted Jan-Mar, 2014.

[8] Our calculation is: (Estimated total cost over lifecycle of **$8,190,131**) / (7 years of lifecycle) / (12 months) / (8700 devices) = $14.20 / device / month

[9] New York State, *New York State Station Equipment rates*, http://apps.cio.ny.gov/telecom/rates.cfm?sort=description, (retrieved May 5, 2015).

Here, **we find that handsets purchased by NYS are approximately 85% to 96% of the cost of handsets quoted by the vendor for the present project**, suggesting that the State of Vermont may possibly negotiate better prices for handsets. However, the NYS rates shown may merely reflect increased volume and buying power of a much larger state.

The final consideration for comparison is the cost of network hardware upgrades necessary for the project. These comprise two Cisco Session Border Controllers, currently included in the per-device rate of the project (BAFO) and Cisco SRST capability for sites requiring the survivability option. Here, the State chooses to negotiate rates with the vendor to match prices available through the State's usual Cisco vendor(s). Therefore, **we are assured the State will get its best rate for these items.**

5.3 COST ASSESSMENT:

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

Conclusions:

- **The total cost of acquisition (implementation) is favorable compared to a national researched mean.**
- **The cost of acquiring handsets may not be favorable when compared to those available to a much larger state.**
- **The cost of acquiring necessary network hardware will be comparable to Vermont's usual costs.**

Additional Comments on Acquisition Costs:

- ***The State intends to partially offset first year acquisition costs by use of available funds referred to as "Telecom Surplus", in the amount of approx. $748,000***
- ***Other funding sources are explained in Section 8, Cost Benefit Analysis, below.***

6. TECHNOLOGY ARCHITECTURE REVIEW

6.1 STATE'S IT STRATEGIC PLAN

DESCRIBE HOW THE PROPOSED SOLUTION ALIGNS WITH EACH OF THE STATE'S IT STRATEGIC PRINCIPLES:

A. Leverage successes of others, learning best practices from outside Vermont.

Implementation of VoIP services at the state government level represents a nationally ongoing transformation. A recent report by the National Association of State Chief Information Officers (NASCIO) summarizes best practices and approaches for a transition to VoIP and IP Telephony.[10] The proposed project is well aligned with its recommendations.

B. Leverage shared services and cloud-based IT, taking advantage of IT economies of scale.

The proposed project employs enterprise-grade cloud services, housed by the vendor in secure data centers, and connected to the State network via managed data services included in the cloud solution. The resulting implementation would serve a large proportion of Vermont State government telephony needs, and could be expanded over time to serve all agencies requiring or requesting telephone service.

C. Adapt the Vermont workforce to the evolving needs of state government.

This cloud-based solution reduces the need for in-State high-level VoIP expertise, compared to an on-premises solution; while, at the same time, allows for sufficient knowledge transfer to allow a flexible IT staff to meet ongoing deployment, configuration, and help resources for State agencies. This should allow State staff to focus on serving people and their needs within government, rather than supporting and maintaining specialized hardware.

D. Apply enterprise architecture principles to drive digital transformation based on business needs

The proposed implementation builds explicitly on the State's significant fiscal and design investment in the existing digital infrastructure represented by GOVnet and the State's data centers, while avoiding an increase in process management investment by employing a cloud solution.

[10] NASCIO, *VoIP and IP Telephony: Planning for Convergence in State Government* (May, 2005).

E. Couple IT with business process optimization, to improve overall productivity and customer service

Equipment Optimization: Replaces existing Centrex and conventional phones with IP-based network and devices, building on existing State expertise, while eliminating the need to capitalize, manage, and maintain central servers (due to cloud solution).

Operating Procedures: Shifts management and configuration of phone system gradually to DII networkers, increasing flexibility of work assignment and building on existing expertise.

Control Optimization: Off-loads special phone expertise, monitoring, and management to cloud vendor, guaranteeing consistency and updates with diminished investment.

F. Optimize IT investments via sound Project Management

This project is managed subject to Robust Project Management Standards,[11] based on its scale. PMBOK principles are employed throughout. At this time, a lead Project Manager (subsuming Project Management Oversight, as this project is already within the DII EPMO) and an auxiliary Project Manager are cooperating on the project. A Sharepoint site provides project communications, and houses the project risk register, timeline, records, and other project management needs.

The vendor has assigned a primary Project Manager for implementation, pending the execution of the contract, as well as an engineering Project Manager specifically assigned to technical implementation and architectural concerns for initial design. The primary Project Manager is designated as a single point of contact at the vendor for the State of Vermont. The vendor agrees that PMBOK principles will be employed throughout, although vendor's project management language differs in minor respects.

There is a risk to the project resulting from the fact that the vendor's assigned primary Project Manager is not currently certified as a Project Manager Professional (PMP), the certification that the State prefers vendors' Project Managers to hold. _RISK_ID# _1_ However, the State has decided for the time being not to contest this point, and to accept the risk, because

- the vendor's assigned primary Project Manager's experience is extensive, well-documented, and specifically on-point to the proposed project, and
- the vendor's assigned primary Project Manager is pursuing PMP certification and expects to be certified within the coming year.

[11] State of Vermont, *DII – Enterprise VoIP Implementation Project Charter*, p. 9 (2015).

G. Manage data commensurate with risk

Telephony remains arguably the States most important and most-used means of communication, certainly with its citizens, notwithstanding the inroads of web and email, and is probably still more significant than postal services, when taken as a whole. The system's continuity, reliability, safety (of confidentiality), and ease-of-use have a significant impact on the State's proper function, effectiveness, and reputation. The proposed solution addresses all these points in a realistic manner, as detailed in the rest of this document.

H. Incorporate metrics to measure outcomes

The proposed solution includes significant production of usage and billing records, as well as training in generation of useful reports from this data. The State reasonably expects to gain deep knowledge about costs and usage patterns, which may lead to more accurate and cost-effective billing, deployment, and operation of the system.

6.2 SUSTAINABILITY

The vendor's solution employs the Cisco Unified Communications System (UCS). This platform evolved over 22 years, and may be called a mature technology. As per the State's requirements, it uses generally available open source protocols and as such maintains compatibility with a wide variety of available hardware (handsets, etc.). The Cisco solution is "built in to the network," i.e., it relies on a Cisco network router infrastructure for most efficient operation. The State's enterprise architecture, being Cisco based, maintains this compatibility. *Note: Some aspects of the solution, notably the Jabber "soft client" for devices, although using open source protocols, are proprietary in their operation Unified Communications (UC) clients. However, as the State considers UC functions to be outside the scope of this IP telephony project, we do not here discuss these aspects further.*

VoIP technology, in general, has grown significantly in the past several years. Over that time, the SIP protocol has become very common for local deployments – as in this project (with H.323 continuing to dominate in long-haul applications). Since Cisco has moved its architecture strongly to SIP, the vendor's solution will continue to be compliant with widely accepted standards for the foreseeable future. Furthermore, the proposal specifically guarantees all major and minor updates to the Cisco UCS infrastructure during the lifecycle of the project. As this is a cloud solution, the State will not need to acquire, install, maintain, or monitor updates.

6.3 SECURITY

As a communication platform, the proposed solution potentially carries all possible combinations of State communication scenarios: employee to employee; agency to agency; state to federal; state to

citizen; etc. It also carries both data in motion (e.g., phone calls) and data at rest (e.g., voicemail, recorded conversations or conferences, pre-recorded messages). As a result, the State becomes responsible for protecting the confidentiality of this data, subject to a great deal of federal and state law. Two major examples are Federal Tax Information (FTI), subject to IRS regulation under publication 1075 (2014), and Personal Health Information (PHI), subject to statutory regulation under the Health Information Portability and Accountability Act (HIPAA) and the Health Information Technology for Economic and Clinical Health Act (HITECH Act).

The vendor's technical proposal responds fully to the State's RFP requirements for security, documenting SSAE 16 / SOC 2 certification as an "umbrella" for comprehensive business practices, controls, and procedures addressing NIST SP 800-58, ISO, FERPA, and ISO 1075 publications. NWN completed SSAE 16 Type II certification, requiring an independent audit and opinion (passed) on design and effectiveness of applicable controls, including controls related to managed security services, change management, service delivery, support services, environmental services, logical and physical security, managed hosting services, and managed storage and backup services available in all NWN's data centers.[12]

The office of the (acting) Chief Information Security Officer of the State of Vermont has reviewed the vendor's proposal for security issues, and the Systems Security Director has stated, "NWN is fully compliant with the IRS 1075 as is explicitly noted throughout the document. They are also compliant with NIST 800.53r4 as well as 802.1X for wireless. They appear to meet all of the required protocols such as EAP, SNDP, HTTPS, SRTP, it uses encryption of all SCCP or SIP signaling messages. Encryption is noted for data in motion as well as data at rest."

We agree with this as an assessment of the vendor's infrastructure and the potential of its platform. However, we point out that, as with other communication systems, security is a matter not only for the system manager but also for the system user: in this case, the user is the State of Vermont and its employees. Two areas of potential risk emerge:

- **Data in motion:** VoIP data streams involve protocols for signaling, control, and media. Signaling and control allow the system to connect calls when placed, and to manage the media streams while the call is underway. Media streams are the data carrying audio (voice) and potentially video. If data streams are intercepted and not encrypted, they may be "read" by an unauthorized third party.

  In the vendor's system, signal and control streams will be encrypted as a matter of course. **Media streams can only be encrypted if the source and endpoint devices support SRTP (Secure Real-time Transport Protocol).** This depends upon the device as manufactured. Most Cisco IP phones as proposed by the vendor support SRTP, but the least expensive (model 3905) does not. Furthermore, the user of an SRTP-capable phone must know how to operate the phone properly to employ encryption. This leads to a risk that **State employees could unknowingly violate Federal or State required security standards, especially for transmission of**

[12] NWN Technical Proposal, *Part B. Functional and Technical Requirements*, pg. B-8 (February 24, 2015).

private/personal information (e.g., see IRS xx, HIPAA, HITECH Act.) _RISK_ID# _2_ To mitigate this risk, the State has decided it will not purchase any phones now, or throughout the lifecycle of this service that are not capable of full SRTP encryption. Users of phones needing encrypted calls will be trained in proper operation.

(*Note: when the remote party in a call is located on the Public Switched Telephone Network, the remote endpoint is not the State's responsibility. In practice, PSTN calls are considered point-to-point, and therefore not as easily intercepted, although, in fact, they can be "tapped" by intruders employing physical access to phone lines. PSTN calls commonly do not employ security equivalent to encryption, i.e. "scrambling." In spite of this, recent statutes and regulatory rules seem to reflect the fact that VoIP is* ***capable*** *of higher security than PSTN, and should therefore employ this better security for the protection of citizens' and government's confidential information.)*

Similarly, we have a minor concern with use of the Jabber soft client. The proposed solution allows the use of so-called "soft clients." These are computer programs which operate on personal computers, tablets, or smartphones, and emulate the functions of a hardware telephone. They can be extremely useful in the present scenario, as they allow a State employee to communicate via a known telephone number without the cost or presence of a hardware handset. The vendor's Cisco-based solution employs the Cisco client called "Jabber." The IRS, in its *recommendations* for protecting Federal Tax Information in VoIP systems, states, "Soft-phone systems, i.e. software on user's computer to implement VoIP, should not be used with VoIP networks that transmit FTI".[13] This leads to a risk that **use of the Jabber soft client could violate IRS 1075 recommendations**. **_RISK_ID# _3_** However, we note that the most recent iteration of the Jabber soft client is SRST-capable. This leads to the probability that, with proper training, State employees might securely employ the soft client without violation of IRS recommendations. Additionally, the IRS itself appears to be considering the use of the Jabber client on its own VoIP network.[14] Nonetheless, we recommend confirming this conclusion with the IRS and/or the Attorney General.

- **Data at rest:** Although the Jabber soft client is SRTP-capable, as of the most recent version, and the data-in-motion risk may be mitigated with proper training, there is a risk that **Voicemail, Conversation, or Conference Recordings may be saved to a device which is not inherently secure. _RISK_ID# _4_** The device may be a computer, smartphone, tablet, or other device. Such saved recordings may violate statutory or regulatory requirements, as described above. We recommend that the State provide advice and training for those Agencies that must be concerned with protecting citizens' private data. This may require only allowing soft clients capable of recording, or the downloading of recordings without a soft client, on devices which are encrypted and thus protected from any casual or intentional prying.

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[13] United States Internal Revenue Service, *Section 9.18.13 - Protecting FTI in (VOIP) Voice over IP Networks*, http://www.irs.gov/uac/Section-9.18.13---Protecting-FTI-in-%28VOIP%29-Voice-over-IP-Networks (retrieved May 1, 2015).

[14] United States Internal Revenue Service, *IRS Privacy Impact Assessment, ID Number 805,* date of approval March 19, 2014, *http://www.irs.gov/pub/irs-utl/Convergence_Jabber_WebEx-pia.pdf* (retrieved June 18, 2015).

6.4 DISASTER RECOVERY

Disaster recovery assessments for this solution involve two main areas:

a. **Disaster recovery for infrastructure and configuration:** In this cloud-based solution, disaster recovery for infrastructure and configuration is assured mainly by vendor's security certifications (see #3, above). Compliance with these certifications, along with the vendor's Service Level Agreement (SLA, see #6, below) assure us that the system is recoverable in a very short period of time.

b. Disaster recovery for State sites which lose connectivity to the cloud-hosted solution, due to weather, power outage, civil disturbance, or other cause. In these scenarios, the objective is to restore phone service as soon as possible, so that critical State services, communication between State offices, and citizen-to-State calls may continue. The State proposes to accomplish this in one or more of several ways, depending upon the State office location(s):

i. In larger sites (such as large State office buildings), the State will deploy the vendor-managed and supplied "Survivability Option," using routers with a Survivable Remote Site Telephony (SRST) option and module enabled. With this option, the State's router(s) at the site can detect the loss of connectivity to the vendor's cloud data center, and in a very short amount of time (configurable), automatically connect the location's IP phones to the PSTN through conventional phone lines (such as PRI), or seek an alternate route to locations which may have connectivity. When the local connection to the cloud is restored, the previous configuration is automatically restored. Although an outage may diminish the capacity for multiple simultaneous calls, basic communication continues with the usual phone numbers.

ii. In sites which carry redundant data connections to other State sites, SRST modules may be used in the event of loss of cloud connectivity to continue telephony connections to other State sites, employing alternate data routes, even though PSTN lines are not installed.

iii. In very small sites, no SRST option may be used. Instead, simple PSTN handsets can provide alternative telephony during outages.

iv. The mobility of the Jabber soft client allows for the ability to stand up locations with IP Telephony services if a major disaster causes location(s) to be vacated for an extended period of time. For example, in an event such as the recent Hurricane Irene, the State could maintain voice services throughout the relocation of personnel to a location with network capability, without having to engage with voice service providers and work through long gaps of unavailable services.

6.5 DATA RETENTION

Configuration Data: The vendor, as part of the cloud hosting solution, manages and maintains all configuration data, including number assignment, topology, call routing, etc., in its secure data centers. The State properly relies on vendor's security and disaster recovery certifications (see #3, above) to assure continuity of configuration data. Also, see Redundancy and Recoverability, in Section 6.7, below.

Media Content Data: The State's employees, in the normal course of their work, will be producing a significant amount of saved audio data, in the form of voicemail recordings, conference recordings, recorded calls, recorded announcements, and so forth. The actual storage site(s) of this data, like configuration data, will be hosted on the vendor's servers in the secure data center(s). However, it falls to the State to determine the selection and length of time such recordings are saved. Under normal State procedure related to freedom of information principles, each Agency makes the determination for its own data. Public agencies are responsible for developing their own internal policies and procedures to assure that the requirements outlined in agency and general record schedules are being consistently applied across the agency. The Secretary of State consolidates oversight of the management of public records. Pursuant to 1 V.S.A. § 317a, 3 V.S.A. § 117, 3 V.S.A. § 218, 3 V.S.A. § 2222, and 3 V.S.A. § 2283b the Vermont State Archives and Records Administration (Office of the Secretary of State) and the Department of Information and Innovation (Agency of Administration) are authorized to establish and promulgate standards, procedures and techniques for the effective management of public records.

We suggest that user training and information supplied to Agencies employing VoIP contain appropriate advice on maintenance and retention of Voice records.

6.6 SERVICE LEVEL AGREEMENT

The vendor has supplied sample Service Level Agreements, setting forth performance targets for monitoring, management, and on-demand support services. The targets represent a high quality of performance, consistent with standards generally expected in enterprise cloud deployments.

At the time of writing, the vendor has not supplied a list of remedies in the event the vendor does not achieve the targets. Therefore, **there is a risk that the State will not be appropriately compensated if service level targets are not achieved by the vendor.** **_RISK_ID# _5_** We expect this risk will be eliminated in the course of contract negotiations, as the State requires adequate contract remedies.

6.7 SYSTEM INTEGRATION

IS THE DATA EXPORT REPORTING CAPABILITY OF THE PROPOSED SOLUTION CONSUMABLE BY THE STATE?

Yes, the vendor's solution includes Call Detail Record (CDR) data through an application which allows appropriate export to the State's billing records process. This capability was demonstrated by the vendor to the State's satisfaction.[15]

WHAT DATA IS EXCHANGED AND WHAT SYSTEMS (STATE AND NON-STATE) WILL THE SOLUTION INTEGRATE/INTERFACE WITH?

[15] Jon Welch, Jayna Guilford, *IR Interview* (May 7, 2015).

As a cloud-based solution, the implementation must necessarily interface with the State's equipment on a continuous basis. Although the Cisco HCS solution can be considered to be "built-in" to the network, relying as it does on interconnected and properly configured routers throughout the deployment, there is nonetheless a demarcation point, represented by 2 session border controllers (SBC), proposed in the preliminary design. These SBC's provide separation of the vendors network from the State network for all but data necessary to the operation, monitoring, and maintenance of the solution.

DESCRIPTION OF THE NETWORK

The accompanying simplified system diagram (see Attachment 1, *Simplified VoIP System Diagram*) shows the main functional components of the solution.

OVERALL NETWORK DESCRIPTION

The **SOV Data Center** represents one of at two State data centers which will form the demarcation point for the vendor's "cloud," and will house the SBC, as well as interconnecting directly or indirectly with all State networks (here called **GOVnet**), the public Internet, and via **SIP trunks** with the Public Switch Telephone Network (**PSTN**), by way of third-party provider(s). State citizens or other external parties would normally reach the State phone system through the PSTN, whatever their original source.

SIP trunks provide a digitally-based network connection to aggregate State phone traffic to the PSTN, instead of employing (for example) analog-based T1 lines. SIP trunks are allocated on a estimated proportional basis of 1 trunk for 20 lines, or 5% (since it is extremely unlikely that all State phones would be calling through the PSTN at the same time.

The **NWN Data Center** represents one of two hosted Data Centers belonging to the vendor. They are connected to the State SBC's via **MPLS lines** provisioned and monitored by the vendor. The Data Center houses the central controlling server(s) or **Cisco Unified Communication System (CUCS)**. All signaling, monitoring, maintenance, call routing, and configuration data flows between State and vendor Data Centers. ***However, voice data itself generally flows directly between endpoints on the State network***.

Finally, it will be possible to connect a variety of soft clients via the public **Internet**, to allow remote workers to connect if desirable. This service would be available to non-WAN users (e.g., home-based, DSL supported sites, etc.)

REDUNDANCY AND RECOVERABILITY

(*See Attachment 1, NWN diagram, Basic/Standard Functional Elements*)

The vendor's dual Data Centers, along with redundant connections to two State Data Centers, as described above, provide a strong measure of redundancy, contributing to swift recoverability in the event of a loss of connectivity between State and one of the vendor's Data Centers.

The vendor's Data Centers are located in North Carolina and California, providing geographic separation in the event of regional disaster. The Data Centers are fully redundant, meaning that they hold "live" synchronized duplicates of infrastructure, servers, and data. As a result, in the event of a complete disconnection of one Data Center, the other can "take over" immediately, without necessity for restoration operations, and maintaining full State data and configuration.

The MPLS high speed, high availability data connections to the State also utilize a redundant, high-availability architecture, with primary and backup transport circuits. These lines are automatically upgraded in capacity before 50% capacity is reached, ensuring that State connections experience no delays.

The multiple connections to State Data Centers creates another layer of resiliency, as the disconnection of one State Data Center from the "cloud" connection to the vendor leaves another live connection with full capacity.

SURVIVABILITY OF STATE SITES

State Sites contain a variety of endpoints, which may be handsets (desk phones or conference phones), workstation-based soft phones, or soft clients on smartphones, tablets, and other devices (if allowed by State in each location). **Survivable Sites** employ a router configured with the **SRST option**, so that in the event of a loss of connection to State or Cloud, an alternate route via PSTN and/or alternative network connection may be employed to continue phone service at a reduced level until the outage is resolved. **Non-survivable sites** may still employ conventional phones not connected to the VoIP system, to allow some continuation of telephone continuation in the event of a VoIP outage. Some **Very Small Sites** may not be connected to the VoIP system at all – an example would be a State equipment garage with only one phone[16] -- to forego the installation of a router and data connection.

Survivability of a given site as described above represents an option offered by the vendor and chosen on per-site option at the State's discretion. The configuration of the option is also at the State's discretion. The cost models used in this Independent Review employ the State's current estimate of the number of survivable site router options it will employ over the lifecycle of the project.

E911 CONNECTIVITY

The project charter lists "E911 compliance, including next generation E911" as an in-scope requirement.[17] Current FCC rule FCC 05-116 requires that providers of "interconnected VoIP telephone services using the Public Switched Telephone Network (PSTN)" meet Enhanced 911 (E911) obligations. E911 systems automatically provide to emergency service personnel a 911 caller's call back number and,

[16] Jon Welch, *Interview for IR* (May 7, 2015).

[17] State of Vermont, *DII – Enterprise VoIP Implementation Project Charter*, pg 4 (February 23, 2015).

in most cases, location information.[18] The vendor, in its Technical Proposal, states, "The NWN solution utilizing PSTN SIP services fully complies with the FCC requirements for interconnected VoIP services."[19] Similarly, the State of Vermont has a statutory requirement that "Any privately owned telephone system shall provide to those end users the same level of 911 service that other end users receive and shall provide ANI signaling, station identification data, and updates to Enhanced 911 databases under rules adopted by the Board."[20]

The vendor's cost proposal provides e911 (Emergency Notification) service as an "enhanced option" at additional cost, on a per-device basis. At the time of writing, the State has decided it will not employ this option at all for VoIP phones. There is a risk that **the State may be in violation of Federal and State emergency notification (e911) requirements in the project as planned**. **_RISK_ID# _6_**

At this point in project development, the State intends to respond to this risk in the following ways:

1. **Continue managing E911 location information via an external portal that will be made available to the State Telecom Group.**

   Currently the Telecom Group manages E911 information through a legacy system that will be replaced in mid-July 2015, by the new E911 portal. The State is looking to continue its current process of maintaining E911 location records as long as all VoIP off-net call sessions, routed over the SIP trunk, delivers actual originator phone number in the clear. Meaning, the PSTN must recognize the actual call originator number, allowing the PSAP dispatcher to match against record in the new E911 database.

2. **(Optional) Centrally locate Centrex phones throughout each facility (e.g., 1 line per floor, clearly labeled and accessible).**

   This option may be implemented as part of this solution, dependent upon further discussions with the DII CIO. Reason for further discussion is due to the lack of requirement with providing an available phone to employees if power disrupts VoIP services at a location. Current E911 requirements are as follows: If a PSTN/VoIP phone is provided to a State employee, it must also be configured to allow access to 911 services.

3. **State will seek legal confirmation via attorney general and e911 board on compliance of selected mitigation(s).**

   We have strongly recommended that the State seek internal legal confirmation via the Attorney General's office that this response will keep the State compliant with E911

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[18] United States Federal Communications Commission, *Rule FCC 05-116*, https://transition.fcc.gov/cgb/voip911order.pdf (retrieved May 1, 2015).

[19] NWN Technical Proposal, *Part B. Functional and Technical Requirements*, pg. B-8, ¶5 (February 24, 2015).

[20] Vt. State. tit. 30, Ch. 87, § 7057, Privately owned telephone systems, (2011).

requirements, and the State is in the process of doing so. The technology employed in the present solution has advanced in some ways more quickly than statutory and regulatory requirements for emergency service; the questions involved are being considered by the e911 board, the attorney general's office, and DII. We are satisfied that the process now underway will result in a safe and compliant plan. That plan will likely conclude after this Independent Review is completed and submitted.

VISUAL DEPICTION OF SYSTEM ARCHITECTURE

A simplified visual depiction of the whole system architecture is included in Attachment 1 of this report.

To depict the redundancy and recoverability explained in the Description of the Network, above, a vendor-provided diagram showing the redundant vendor Data Centers and redundant MPLS connections to State Data Centers, as well as more network detail, is also included in Attachment 1.

WILL THE SOLUTION BE ABLE TO INTEGRATE WITH THE STATE'S VISION AND FINANCIAL SYSTEMS (IF APPLICABLE)?

N/A

ADDITIONAL COMMENTS ON ARCHITECTURE:

ENTERPRISE ARCHITECTURE

The Chief Technology Officer, in his assessment of the project's enterprise architecture, expressed two concerns, which he did not feel rose to the level of suggesting a project delay:[21]

1. The impact of voice communications on network capacity and performance has not been adequately assessed in advance of the project

   Analysis:

   In response to the above concern, the Telecommunications & Network Engineering Director has responded that the state has completed an available bandwidth analysis at each site, and validated it will be acceptable for implementation of VoIP services. If bandwidth at a location proves to be not sufficient, the State's network team will bring it into compliance. Any current WAN site will be voice compliant. As part of daily operations, the State has alerts in the network monitoring system for increasing bandwidth utilization allowing the State to ID sites that may need to be upgraded. Given that voice impact on a network is lighter and generally more

[21] Michael Morey, *IR Interview (phone)* (May 12, 2015).

predictable than other real-time data streams (e.g., video, collaboration), the State's approach seems reasonable and likely to succeed.

2. Features of the proposed solution may compete with or duplicate features the State is building or considering in other Enterprise solutions (such as Office 365), without having fully discussed the business need.

   Analysis:

   The solution proposed by the vendor comprises a "Unified Communications" (UC) system that, in its fully-realized implementation, supports not only voice telephony (VoIP), but also a web collaboration platform, video conferencing and calling, instant messaging, and other UC applications. These other capabilities are, at this point, explicitly out-of-scope for this telephony-only project; and yet, many of the capabilities will be in place – particularly as they are built-in to the Jabber soft client – and the temptation may be great to "roll out" these features without sufficient planning. We believe this possibility rises to the level of a risk that the **vendor's solution includes capabilities which are not defined as in-scope for this project** **_RISK_ID# _8_** and these out-of-scope capabilities have not been assessed by the State for business need, network impact, cost as compared to alternative solutions, or conflict with other enterprise projects (such as Office 365 including Skype/Lync).

   The State plans to convene a meeting to discuss related business need in June of this year, and this is a reasonable approach.

   Beyond the assessment of business need, however, a potentially more important impact of project "scope-creep" is financial and network-architectural.

   - Although UC (such as Cisco UCS) *platforms* employ open and commonly used protocols, UC *implementations* (such as Cisco Jabber or Office 365) are often highly proprietary. The Jabber client will not work in the Office 365 environment or *vice-versa*, though they may employ the same protocols. Therefore, the choice of a UCS can result in a mix of competing platforms within the enterprise, with the resultant possibility of supporting both, at increased expense.
   - As mentioned above, real-time data streams other than voice will require significant assessment and planning, especially as the State does not have historical data to predict use (as it does with conventional phone service).
   - There is no "PSTN" for Video, Collaboration, IM, and other UCS applications. External clients consist of endpoints on the public Internet, or on other enterprise networks. Although these applications *may* be used internally, we find that they are more in demand as connectors between the State and the outside world. This leads to a requirement, if deploying such capability widely in the enterprise, to supply an adequate number of external interfaces (such as Session Border Controllers), at increased cost; and perhaps more significantly, to provide greatly increased help desk resources for

external clients connecting to internal State resources. There is no equivalent need for remote support in the strict Voice Telephony world, as it disappears at the SIP trunk.

Consequently, we recommend that the State focus this project solely on voice telephony, until such time that it can perform sufficient planning and analysis to make decisions concerning other UCS applications.

STAFF QUALIFICATIONS

Even after the completion of the implementation phase, network-related issues may arise that affect the quality or reliability of calls, regardless of the total capacity of the network. The vendor's design process takes into account Quality of Service (QoS) parameters for the State's network, but even with these controls eventual adjustment may be needed. The vendor provides call quality support and assurances, but does not directly control the State's network, and will inevitably need to rely on cooperation from the Network Group. The State has little previous experience in large VoIP deployments (particularly in "front-line" network technician staff). Unanticipated or unresolved network issues could lead to unexpected costs, revealing a risk that **current State technical support staff do not possess specialized training or credentials in VoIP technology**. **_RISK_ID# _7_** One advantage of a hosted solution is specifically to avoid having to employ highly specialized staff for a single project. The State's proposed solution is to rely initially on the initial bandwidth analyses of its internal technical staff, and then on the assessment expertise of the vendor and its local engineer, mitigating the risk by ensuring adequate knowledge transfer from Vendor to State technical staff. Over the implementation year, State staff should acquire sufficient expertise in VoIP network configuration, operation, and troubleshooting to minimize the need for outsourced or Vendor-supplied engineering resources.

7. ASSESSMENT OF IMPLEMENTATION PLAN

7.1 .THE REALITY OF THE IMPLEMENTATION TIMETABLE

In general, the timetable proposed by the State, and accepted by the vendor, is realistic and on-time at this point prior to contract execution. The Vendor's proposed implementation plan conforms to the State's timetable expectations, and we see no reason to doubt the likelihood of its success. (Please see the next section for comments about the Waterbury Complex implementation timing.)

7.2 READINESS OF IMPACTED DIVISIONS/ DEPARTMENTS TO PARTICIPATE IN THIS SOLUTION/PROJECT (CONSIDER CURRENT CULTURE, STAFF BUY-IN, ORGANIZATIONAL CHANGES NEEDED, AND LEADERSHIP READINESS).

Generally accepted project management principles recommend redundancy of information among stakeholders, which is to say, the unexpected absence of a key stakeholder for any reason should not result in the loss of key project information (of course, you might lose expertise until it can be replaced; but you should not lose project decisions or findings). This desired redundancy needs improvement on the current project. Key stakeholders understand this need and are moving to rectify it.[22] The situation is not unusual for large projects at this early stage (before contract execution). The State understands the need for project resiliency, and we are confident in the State's ability to build this in to the project. (See #4, below, for project communication platform.)

At the same time, DII staff both senior and junior strongly support this project. Although large, the project encompasses familiar technical ground in that it builds on current network infrastructure and existing Department expertise. We found no one expressing a desire to delay or forego the project. We did encounter several comments, from senior and junior levels, that the expected opening of the new State Waterbury Complex drives the timetable for this project. (Anticipating VoIP implementation, the wiring of the Complex will omit traditional telephone wiring to State offices, and deploy only network data lines and ports.) We assess this reality as natural: in a large enterprise, projects drive other projects. At the same time, there is a widely acknowledged risk that **project implementation could be delayed beyond opening date of Waterbury Complex State facility**. **_RISK_ID# _9_** The project is not currently behind schedule, but large projects are always unpredictable. In the event this risk comes to pass, the State intends to deploy mobile (cell) phone connectivity to temporarily meet State needs.

We feel there may be some "culture clash" between large-project PMBOK-style project management (preferred by DII and a requirement listed in the RFP for this project)[23] and traditional network engineering and technical staff project implementation, which often more closely resembles Agile and Agile Scrum processes. This naturally occurs because network engineering professionals are valued for their creative practical response to emerging needs and crises more than for their documentation skills. DII has embraced PMBOK principles for some time, but may be new to other, though compatible, styles

[22] *IR Interviews* (May 7, 2015).

[23] State of Vermont, *Sealed Bid Information Technology Request for Proposal for Enterprise Voice over Internet Protocol Communications Solution*, pg. 8 (2014).

of project development. These differences can lead to creative project improvement if managed successfully; or they can lead to frustration and miscommunication. We recommend some conscious understanding and translation of these differences, probably at the project leadership level.

7.3 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

The vendor states that its "project delivery methodology is consistent with the Project Management Institutes PMBOK guidelines."[24] The vendor expressed an understanding of the State's requirement of PMBOK-style project management communication (risk management, scope management, and change management registers, etc.) and will participate in a shared, State-hosted Sharepoint PM site. Based on the vendor's sample implementation plan, and the vendor's experience and references, the State feels confident in the compatibility and competence of the vendor's project management. (See Section 6.1.F, above, for comments about the vendor's PM certification.)

B. Training

The vendor's training plan employs a "train the trainer" approach, preferred by the State because it transfers knowledge to State experts. The plan looks extensive and reliable.

C. Testing

The Acceptance Test Plan will be developed in the implementation of the project, and is accounted for in detail in the vendor's sample implementation plan. The vendor demonstrates a deep knowledge of the areas that will have to be assessed.

D. Design

The vendor's design relies on mature VoIP technologies, and an industry-standard, single-vendor platform (Cisco UCS). The chosen components and architectural network design conform in all ways to the State's requirements.

E. Conversion (if applicable)

N/A

F. Implementation planning

[24] NWN Technical Proposal, *Part C. Professional Services*, pg. C-3 (February 24, 2015).

The vendor supplied a preliminary implementation plan as part of its Technical Proposal in response to the State's RFP. The extensive plan demonstrates a sophisticated understanding of the proposed platform as well as experience in meeting a realistic timetable.

G. Implementation

The State's project team expressed confidence in the vendor's proposed plan, capacity, technical demonstration, experience, and references, and expects a successful implementation on this basis. We agree.

7.4 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 JUDGMENT? PLEASE EXPLAIN.

The State deems this a "robust" project, and has assigned a qualified project manager holding PMP certification. (Originally, the State assigned that PM, who may be considered as primary PM, and another, secondary PM, for training purposes. The secondary has now moved on to other projects.) We have seen and reviewed the project management Sharepoint site for this project, which has been created by the project manager. It is well-ordered, structured and populated according to accepted PMBOK principles, and used properly by project stakeholders. The vendor has stated that it will participate and use the Sharepoint, as the State desires and grants access, as the primary repository for project management communications.[25] We have communicated with the project manager repeatedly during the course of this review, and have seen her in meetings with other project stakeholders; she appears to be confident, well-organized, and competent. We have no reservations about her qualifications or competence.

The project Sharepoint site includes (among other items) the following documents required for a "robust" project:

- IT Activity Business Case & Cost Analysis (ABC Form)
- Project Charter
- Project Plan
- Formal Acceptance
- Project Management Plan
- Communication Management Plan
- Roles & Responsibilities
- Risk Log
- Change Requests Log
- Budget Log
- Issue/Action Items/Decisions Log
- Requirements

[25] NWN Project Manager and Senior Sales Executive, *DII/VoIP Implementation Project Managers' IR Phone Conference Interview* (May 7, 2015).

- Project Status Reports
- Meeting Agenda/ Minutes

The following required items are not present, but are not expected until the project is underway:

- Test Plan
- Test Cases & Results
- Implementation Plan
- Customer Satisfaction Survey
- Lessons Learned

She does appear to be experiencing some concern arising from the "cultural" issues described in #2, above. It is not unusual for a project manager in an organization which is not fully "projectized" (to use the PMBOK term)[26] to feel some frustration at the disconnect between project responsibility – being held accountable for project progress and outcomes – and project authority – being able to allocate human and financial resources. The PMBOK acknowledges a wide range of authority for project managers,[27] so this does not constitute a judgment about DII. We note that this project, being within DII where the EPMO is housed, adopts a somewhat different policy for assigning an oversight project managers (OPM) than that applied for projects originating in different agencies. In projects assigned to a newly hired PM, an individual OPM from the EPMO office staff is assigned to the project. For PMs who are not newly hired, as in the present case, the Supervisor (EPMO Director) fills the role of OPM. It is well beyond the scope of this review to evaluate the policy of OPM assignment one way or the other, but we point out that our observations in the past of projects in other State Agencies have shown a significant benefit from the presence of an EPMO OPM: the "local" Agency PM gets a sense of collaboration and assistance from the OPM.

Additional Comments on Implementation Plan

none

[26] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, Fifth Edition, p.25 (Project Management Institute, Inc., 2013).

[27] *Ibid*, p. 25

8. COST BENEFIT ANALYSIS

8.1 ANALYSIS DESCRIPTION:

We constructed a cost spreadsheet conforming to the State's required format for Independent Reviews, populated with cost data derived from the vendor's Best And Final Offer (BAFO), with options selected by the State's choice at the time of writing. The values in the spreadsheet were derived from a second, more detailed worksheet based on the BAFO spreadsheet provided by the vendor in response to a format given the vendor by the State. We added additional lines to more clearly break out individual costs over years, and to show options selected by the State with corresponding quantities.

We calculated tangible benefits primarily through the Cost Impact Analysis (Chapter 8, below), comparing estimated costs over the project lifecycle to estimated costs of continuing the current Centrex system.

8.2 ASSUMPTIONS:

- The current cost of providing voice telephony via Centrex was calculated for us by the State, using currently available data. As the State currently uses an internal billing system that itemizes usage and options per device, we conclude that using the estimate per device per month gives a usable and reasonable figure for benefit calculations.

- For the first fiscal year of implementation, we used exact numbers as we understood them, for the number of devices installed (3285). For years 2 and 3, we used the State's estimate of 3285 and 2130, respectively. Therefore, the total number of devices installed per the Cost Spreadsheet over 3 years amounts to 8700. The actual number of deployed devices may vary in the actual project, but this estimate is consistent with project planning and documentation, as well as with the vendor's expectations.

- Based on conversation with the business lead for the project, we estimate available funds from the "Telecom Surplus" at $748,000. The actual number may vary.

- On-Site vendor-supplied System Engineer is estimated at 4 months @ ($175,000/12). This price has yet to be negotiated (see Additional Comments, below).

8.3 FUNDING:

Funding over the long-term is supplied by internal billing of State agencies to cover costs of telephony operations. In the first year of this project, available monies from the "Telecom Surplus" will be applied to the project. Although all funding is internal to the State, the breakdown would look approximately like this:

	FY16	FY17	FY18-22
State Telecom Surplus	**100%**	**9%**	**0%**
Other State Funds	**0%**	**91%**	**100%**

This appears to be an appropriate use of the Telecom Surplus.

8.4 TANGIBLE COSTS & 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).

- **Cost Savings in State telephony costs, reflected in lower interagency telephony billing for agencies employing VoIP solution.**
  The Cost Impact analysis shows that the project will be able to distribute phone service to State agencies at a lower cost per line of 75% to 81% of current billing-per-line, or 71% to 77% of current cost-per-line, depending upon whether the Telecom Surplus offset is considered as part of the project for rate projection purposes.
  See Cost Impact Analysis, *below*.

8.5 INTANGIBLE COSTS & 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.*

- **Cost Avoidance: Installation of separate telephony network cabling and porting in new construction and upgraded facilities.** VoIP uses the State's network cabling and porting infrastructure for services. New or upgraded construction (such as increased office density) need only build/upgrade IP network cabling and porting. Some employees using wireless and soft clients could eliminate need for close-at-hand ports entirely.
- **Cost Avoidance: Eliminate need to maintain and support existing dedicated traditional voice cabling.** The need for any maintenance and support of traditional cabling, whether outsourced by the State or performed by State employees, will end when that cabling is no longer needed, having been replaced by VoIP over data lines. **(**Depending upon solution(s) chosen for 911 capability, some standard telephone cabling may remain in some locations that have mostly shifted to VoIP, but this would be a relatively small amount.)
- **Cost Avoidance: Increased fungibility of VoIP phone numbers compared to Centrex equivalent reduces time spent by State employees in re-locating State office phone numbers, including soft client numbers, without complicated forwarding.**
- **Potential Cost Reduction of $36,612/yr. by deploying fax via VoIP:** The proposed project supports sending and receiving fax documents, at an additional service cost.

  Current State analog fax devices use a Centrex line, without enhanced features, making them less expensive than most voice State Centrex lines. The average monthly cost of an analog fax line is $15. With 276 fax lines in operation, the current cost may be estimated at 276 x 15 x 12 = **$49,680 (per year).**

  The State's understanding of the vendor's BAFO cost for fax services shows a cost for the equivalent number of fax lines available as a per-device cost of 276 x 3.25 x 12 = $10,764 (per year) **plus** a concurrent channel charge per-month of 192 x 12 = $2304 (per year), **for a total of $13,068 (per year), for a reduction of $36,612 per year.**

  The analysis of this potential is ongoing. The vendor cost for the service has not yet been fully confirmed by the State's negotiators, and we would expect a hardware cost, for T38-compatible Analog Telephony Adapters (allowing the use of existing analog fax machines) and/or VoIP fax machines directly supporting T-38. T-38 is the protocol used for fax transmission over VoIP circuits.

- **Efficiency: As VoIP is implemented, services formerly provided by the Telecom Group are transferred to network engineers.** Network engineers may be assigned a wide variety of IT tasks, and may use State personnel funds more efficiently as the need for specific telephony tasks flex.

(Retirement of old Centrex style phones as a result of this project will likely result in some recovery due to surplus sales. However, salvage value is normally built into depreciation of capital assets like phones, so any such recovery cannot be claimed as a benefit.)

8.6 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.

Yes. The intangible benefits of this project were identified in the original Project Charter, and are positive to the State. The single most significant tangible benefit is an overall lowered cost of telephone service to the State, and this project achieves that significantly, while maintaining and enhancing alignment with the State's IT Strategic Plan.

8.7 IT ABC FORM REVIEW:

The IT/ABC form represents planning and costs for the project at a very early phase which differs significantly from the project as it has subsequently developed. The table below delineates the key differences.

IT/ABC	Project As Currently Developed
Proposed Unified Communications (UC) System	VoIP only in-scope; UC now out-of-scope (see comments in Architecture analysis, above)
Anticipated on-premises hardware platform and management	Utilizes cloud hosting, minimal State-purchased hardware and management resources
Lifecycle total cost $ 13,661,560.00	Lifecycle cost $ 8,224,831.43

The cost changes in the project as it developed represent significantly greater alignment with the State's preference for cloud-hosted solutions. Scope changes are discussed more fully in Section 6.7.*Additional Comments on Architecture*, above.

Other differences in the IT/ABC relate to the major factors listed in the table above.

Additional Comments on the Cost Benefit Analysis:

1. At the current state of negotiations, there is a risk due to the fact that the **cost of vendor *recommended* Onsite System / Voice Engineer for Central Vermont is quoted at a fixed 1 year price of $175,000 / yr. _RISK_ID# _10_** The State will want to employ some of these services initially, with the intention that knowledge transfer will empower the State to continue deployment without on-site engineering assistance over an initial period of time. At this point, the State intends to negotiate a 4 month period with the vendor.
2. A recent study by Nemertes found that enterprise deployments of cloud-hosted VoIP frequently encountered an unexpected increase in costs in the 2nd year of operation, leveling out in the 3rd. Study participants indicated this reflected an unexpected increased need to educate departments on the business need advantages of VoIP. We do not think enough is yet known about this phenomenon to merit identifying a risk, but point out that the State may need to increase internal advocacy efforts.

9. IMPACT ANALYSIS ON NET OPERATING COSTS

9.1 INSERT A TABLE TO ILLUSTRATE THE NET OPERATING COST IMPACT.

See **Attachment 4 – Cost Impact Analysis**

9.2 PROVIDE A NARRATIVE SUMMARY OF THE ANALYSIS CONDUCTED AND INCLUDE A LIST OF ANY ASSUMPTIONS.

The State intends for the cost of telephone service to State agencies to be distributed among the budgets of agencies using the service, to reasonably reflect the cost of operations for each agency. The department managing telephone service (DII) uses inter-agency billing to distribute the operational cost. Ideally, the cost of telephone service as billed to an agency should reflect the cost to the State of acquiring that service. Because telephone service is a Cost of Doing Business, it will in practical terms flex up and down depending on the State's workforce size and need for telephone service (both basic service and enhanced services). Because of this inherent flexibility, we think the most useful point of cost impact analysis is at the level of cost-per-line (as Centrex is considered, equivalent term to cost-per-device in this VoIP proposal).

CENTREX COST PER LINE AND CENTREX BILLING COST PER LINE

Attachment 4 includes a set of 4 tables titled **Current Cost and Billing (Invoiced) of Centrex Service**. These tables were prepared for us by the Director of Telecommunications & Network Engineering, using currently available State data. As described in *A Note On Terms* at the beginning of this Independent Review, above, the term "Centrex" is used loosely to describe all current State analog and digital service, including ISDN. Two options are shown:

- Option 1 lists calculations for all phone lines.
- Option 2 lists calculations for all phone lines *except* miscellaneous special purpose lines that are out-of-scope for the proposed VoIP project.

We used the Option 2 tables for the following analysis, as it shows a more exact comparison.

Each of the 2 Options includes 2 tables:

- The **INVOICED** table shows the internal billing, or invoicing, for the listed phone lines
- The **ACTUAL** table shows the actual costs paid by the State.

The State's internal billing does not exactly correspond to its costs. We used the billing or actual figures as appropriate, and as described below in our analysis. Each table also includes a column titled "11% surcharge." This represents the cost of funding FTE positions that support these demand services.[28]

[28] Director of Telecommunications & Network Engineering, *Email* (June 24, 2015).

The cost impact scenarios described below do **not** include the shifted cost of personnel from Telecom Group to Network Group, because (1) the net cost to the State of the shift is neutral, and (2) there is no straightforward way of calculating the change to Centrex total cost as a result of the shift, proportional to the number of new lines in the VoIP implementation. To reflect this on the current cost side of the equation, the "11% surcharge" is **not** included for Current Centrex Cost.

COST-PER-LINE, PROPOSED TO CURRENT

We first present two straightforward scenarios :

- The ***cumulative*** actual cost of providing traditional Centrex lines in the same quantity as that estimated for this project, compared with:
    1. **Scenario One:** The ***cumulative*** cost of implementing the VoIP solution, using the annualized rate of lines/devices as indicated in Section 9, Cost Benefit Analysis, above; ***not*** including any inter-agency billing for VoIP lines, but ***including*** the application of the Telecom Fund in FY16.
    2. **Scenario Two:** The ***cumulative*** cost of implementing the VoIP solution, using the annualized rate of lines/devices as indicated in Section 9, Cost Benefit Analysis, above; ***not*** including any inter-agency billing for VoIP lines, and ***not including*** the application of the Telecom Surplus in FY16.

APPROXIMATION OF INTER-AGENCY BILLING FOR VOIP

As the State desires inter-agency billing for phone service to approximately distribute the actual cost of such service, it will likely be necessary to adjust the cost of VoIP service to reflect the acquisition and operational cost.

We present two simplified scenarios to demonstrate a per-line VoIP cost that remains flat over the 7-year lifecycle of the present project and represents **the lowest to-the-cent VoIP per line billing rate resulting in a very small 7-year surplus.**

3. **Scenario Three:** Sample Flat VoIP Rate Over Project Lifecycle, with 7-year total, Telecom Surplus **included**.
4. **Scenario Four**: Sample Flat VoIP Rate Over Project Lifecycle, with 7-year total, Telecom Surplus **not included**.

In the actual event, we expect the State would instead choose a gradually lowering rate over the lifecycle, to achieve a very small surplus on an annual basis. (The business office has already developed a cash flow worksheet to evaluate this option.)

Following each of these billing scenarios, we show two **percentage** calculations: one uses the average *billing* (invoice) per line of the current Centrex solution, rather than the Centrex *cost* per line. The other calculation uses the average *cost* per line of the current Centrex solution.

WHAT THE SCENARIOS DEMONSTRATE:

Scenarios One and Two show that this project as conceived is cost-effective. With the Telecom Surplus included as planned, the project has a negative cost impact for the State from the very first year. Without the Telecom Surplus included, the project shows break-even by year 2, FY17.

Scenarios Three and Four show that the project will be able to distribute phone service to State agencies at a billing per line that is 63% or 70% of current billing-per-line, and 60% or 67% of current cost-per-line, depending upon whether the Telecom Surplus offset is considered as part of the project for rate projection purposes.[29]

COST IMPACT IN FINAL YEAR OF LIFECYCLE

The ongoing annual cost of the project in the last fiscal year of the lifecycle shows a reduction of approximately 19% from the current annual cost of supplying Centrex service for the same number of lines. This is a significant reduction, although it does not achieve the Project Charter's stated target of at least 25% reduction by post- project.[30]

[29] This statement is based on the on a single estimated flat rate over the project lifecycle resulting in the least negative cost (i.e., closest to zero) to the State in the two scenarios given. The actual inter-agency rate to be billed by the State depends on factors beyond this review and at the complete discretion of the State.

[30] State of Vermont, *DII – Enterprise VoIP Implementation Project Charter,* pg. 3 (2015).

9.3 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.

N/A

9.4 WHAT IS THE BREAK-EVEN POINT FOR THIS IT ACTIVITY (CONSIDERING IMPLEMENTATION AND ON-GOING OPERATING COSTS)?

With the Telecom Surplus included, the break-even point is in the first year, FY16. With the Telecom Surplus not included, break-even point is in year 2, FY17.

10. RISK ASSESSMENT & RISK REGISTER

The risks identified throughout this review are collected below, along with an assessment of their significance, a description of the State response and timing, and our evaluation of the State response.

ADDITIONAL COMMENTS ON RISK

None

RISK REGISTER

The following table explains the Risk Register components:

Risk ID:	Identification number assigned to risk.
Rating:	An assessment of risk significance, based on multiplication of (impact X probability ratings) (see below). 11. **1-30 = low** 12. **31-60 = moderate** 13. **61 – 90 = high**
Impact:	Assessment of severity of negative effect, scale of 1 – 10, from least to most severe
Probability:	Assessment of likelihood of risk occurring, scale of 1 – 9, from least to most likely
Description:	Description of the risk
Source:	Where the risk originates
Impact Description:	Description of the risk
State's Planned Response:	Decision to *avoid*, *mitigate*, or *accept* risk Detailed description of response to risk, in order to accomplish decision
Timing:	When the response should occur
Reviewer's Assessment:	Reviewers evaluation of the State's planned response

Risk ID: 1	Rating: Impact: Probability:	30 3 10
Description:	**Vendor's assigned primary Project Manager does not hold PMP certification**	
Source:	Vendor	
Impact Description:	Deviates from DII and State Project Management preferences, especially for a project designated "Robust" due to size and scope. There	
State's Planned Response:	**Accept:** Vendor's primary PM holds significant experience in closely relevant projects, and expects PMP certification within the coming year. State accepts this Project Manager's assignment for the time being.	
Timing:	Contract Execution, Project Commencement	
Reviewer's Assessment:	Concur	

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Risk ID: 2	Rating: 20 Impact: 10 Probability: 2
Description:	**Some IP phones may not have full (SRTP) voice encryption capability, so that State employees could unknowingly violate Federal or State required security standards, especially for transmission of private/personal information.**
Source:	Intrinsic to Cisco architecture and most VoIP systems in general
Impact Description:	State employees could unknowingly violate Federal or State required security standards, especially for transmission of private/personal information.
State's Planned Response:	**Mitigate:** **The State will not purchase any phones now, or throughout the lifecycle of this service that are not capable of full SRTP encryption. Users of phones needing encrypted calls will be trained in proper operation.**
Timing:	Before hardware purchase decisions and throughout lifecycle of project
Reviewer's Assessment:	Concur, but recommend explicit policy promulgation

Risk ID: 3	Rating: 9 Impact: 3 Probability: 3
Description:	**Use of Jabber softphone may violate IRS 1075 *recommendations* (note: not requirement): See IRS Section 9.18.13 - Protecting FTI in (VOIP) Voice over IP Networks**
Source:	Client vendor (Cisco)
Impact Description:	IRS 1075 IRS Office of Safeguards recommends no use of softphones "with" network transmitting PFI (probably also applies to HIPAA-related PHI).
State's Planned Response:	**Accept:** **Since Jabber client now supports SRTP encrypted conversations (NIST-approved) . The recommendations precede the development of this capability, and therefore the client itself probably meets IRS 1075 needs.**
Timing:	Deployment
Reviewer's Assessment:	Concur, but recommend confirmation from Cisco, IRS and/or AG

Risk ID: 4	Rating: 40 Impact: 10 Probability: 4
Description:	**Voicemail or Call Recordings, if stored on softphone computers or HHDs, may not be encrypted**
Source:	Cisco platform, Vendor
Impact Description:	May violate IRS and HITECH Act standards and/or recommendations.
State's Planned Response:	**Mitigate:** **Develop training materials, usage policies for State employees on acceptable secure use**
Timing:	Deployment
Reviewer's Assessment:	Concur

Risk ID: 5	Rating: 9 Impact: 9 Probability: 1
Description:	**The State may not be appropriately compensated if service level targets are not achieved by the vendor.**
Source:	Vendor
Impact Description:	At the time of writing, vendor has not supplied a list of remedies in the event the vendor does not achieve the targets.
State's Planned Response:	**Avoid:** **We expect this risk will be eliminated in the course of contract negotiations, as the State requires adequate contract remedies.**
Timing:	Contract Execution
Reviewer's Assessment:	Concur

Risk ID: 6	Rating: 50 Impact: 10 Probability: 5
Description:	**The State may be in violation of Federal and State emergency notification (e911) requirements in the project as planned**.
Source:	Vendor's licensing model
Impact Description:	Possible violation of **Vt. State. tit. 30, Ch. 87, § 7057 2011** requiring that *"Any privately owned telephone system shall provide to those end users the same level of 911 service that other end users receive and shall provide ANI signaling, station identification data, and updates to Enhanced 911 databases under rules adopted by the Board."* Possible violation of FCC rule **FCC 05-116** requires that providers of "interconnected VoIP telephone services using the Public Switched Telephone Network (PSTN)" meet Enhanced 911 (E911) obligations. A confirmed violation could result in reputational risk to the State, as well as increased cost to rectify any deficiency.
State's Planned Response:	Mitigate: 1. Continue managing E911 location information via an external portal that will be made available to the State Telecom Group. 2. Centrally locate Centrex phones throughout each facility (e.g., 1 line per floor, clearly labeled and accessible). 3. **State will seek legal confirmation via attorney general and e911 board on compliance of selected mitigation(s).**
Timing:	Project deployment
Reviewer's Assessment:	Concur

Risk ID: 7	Rating: 28 Impact: 4 Probability: 7
Description:	**Current State technical support staff do not possess specialized training or credentials in VoIP technology**
Source:	State
Impact Description:	Additional cost to State if technical resources must be acquired, outsourced, or purchased from Vendor
State's Planned Response:	**Mitigate:** **Ensure adequate knowledge transfer from Vendor to State technical staff so that, over implementation year, State staff acquire sufficient expertise in VoIP network configuration, operation, and troubleshooting to minimize need for outsourced or Vendor-supplied engineering resources.**
Timing:	Project lifecycle
Reviewer's Assessment:	Concur

Risk ID: 8	Rating: 27 Impact: 3 Probability: 9
Description:	**Vendor's solution includes capabilities which are not defined as in-scope for this project**
Source:	Cisco solution as implemented by Vendor
Impact Description:	Unanticipated increased future cost to the State. Several capabilities being voice and associated functions are included by design in the Vendor's proposal , for example in the Jabber softphone client – such as video capabilities, instant messaging, whiteboard; and as a general capability for videoconferencing. Their easy availability could encourage adoption by State users. However, these out-of-scope capabilities have not been assessed by the State for business need, network impact, cost as compared to alternative solutions, or conflict with other enterprise projects (such as Office 365 including Skype/Lync).
State's Planned Response:	**Accept:** **Business needs will be assessed at each location as part of the implementation plan. The demand service fees for some of the service offerings will help control the unanticipated costs. The business leads from Office 365 and VoIP Implementation projects will meet to discuss potential conflicts by the end of June 2015.**
Timing:	Project implementation
Reviewer's Assessment:	Concur

Risk ID: 9	Rating: 20 Impact: 4 Probability: 5
Description:	**Project implementation could be delayed beyond opening date of Waterbury Complex State facility**
Source:	State and Vendor
Impact Description:	Additional cost to State due to funding temporary voice solution in Waterbury. The Waterbury Complex anticipates an IP voice alternative to PSTN service, as offices are wired for data, but not for PSTN. If the present project is not sufficiently advanced in implementation at the opening of the Waterbury Complex, alternative telephone access will be needed for some or all State offices in the complex.
State's Planned Response:	**Mitigate:** **State employees will use cell phones until VoIP is in place if necessary.**
Timing:	Lead time necessary for Waterbury deployment
Reviewer's Assessment:	Concur

Risk ID: 10	Rating: 14 Impact: 7 Probability: 2
Description:	**Cost of vendor *recommended* Onsite System / Voice Engineer for Central Vermont is quoted at a fixed 1 year price of $175,000 / yr.**
Source:	State and Vendor
Impact Description:	Additional cost if State must purchase Onsite System / Voice Engineer for initial year of implementation at $175,000 / yr.
State's Planned Response:	**Mitigate:** **Negotiate length/cost of Engineer services with Vendor: State prefers to have minimum necessary time frame for this role.**
Timing:	Contract execution
Reviewer's Assessment:	Concur

11. ATTACHMENTS

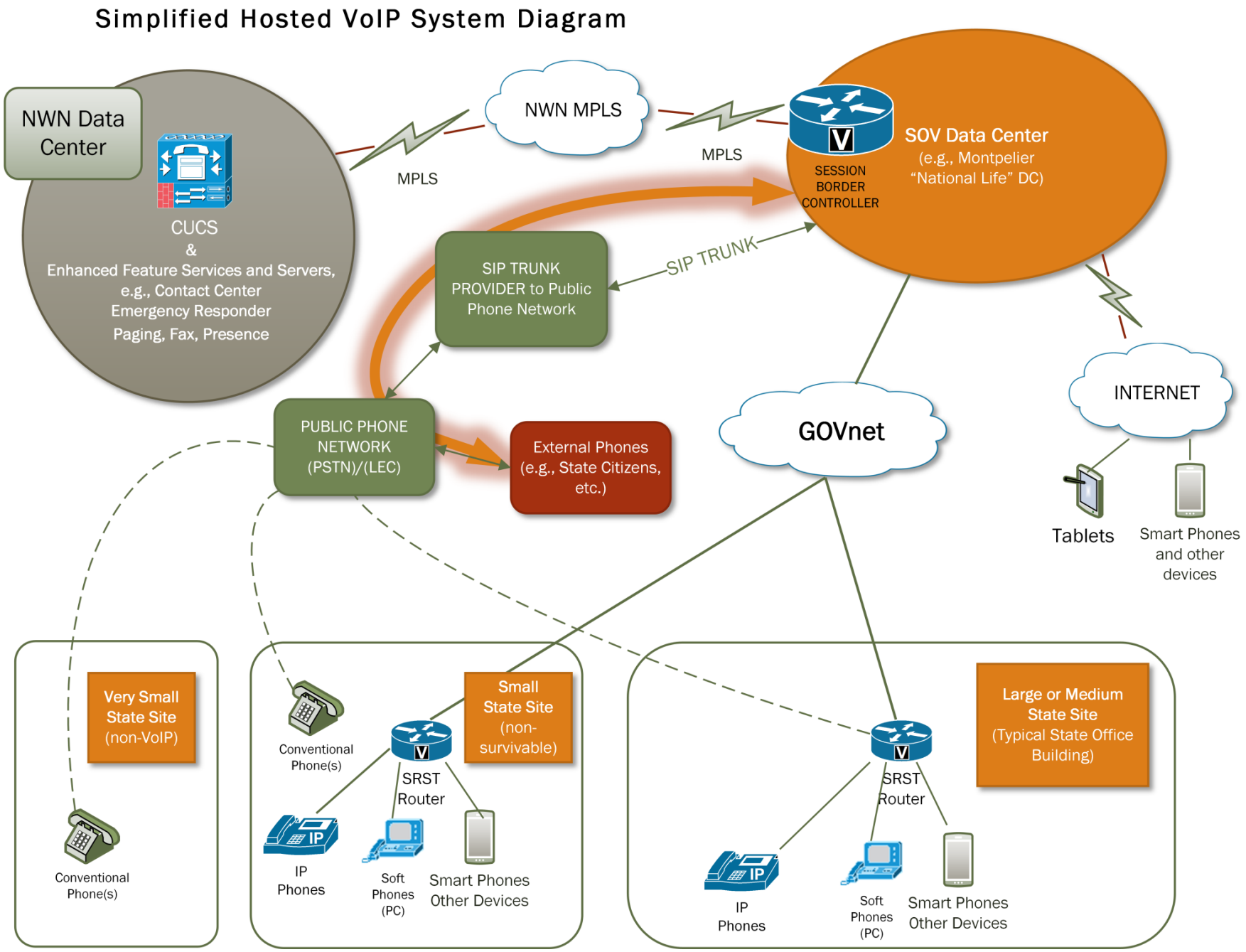
Attachment 1 – Illustration of System Integration

Attachment 2 – Risk & Issues Register Summary

Attachment 3 – Lifecycle Cost Benefit Analysis

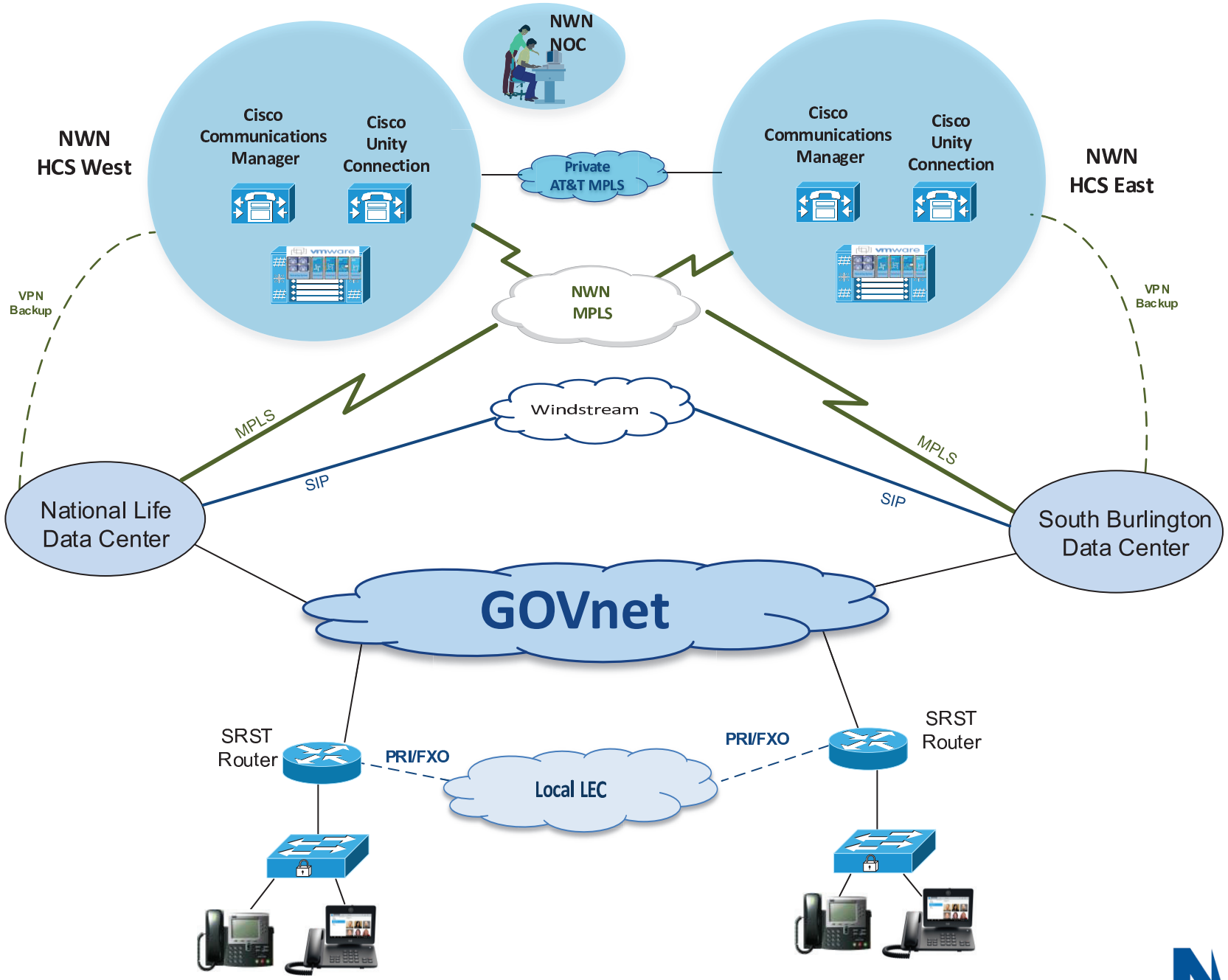
Attachment 4 – Cost Impact Analysis

ATTACHMENT 1 – ILLUSTRATION OF SYSTEM INTEGRATION



Basic/Standard Functional Elements

VERMONT



NWN CORPORATION

ATTACHMENT 2 – RISK & ISSUES REGISTER SUMMARY

RISK SUMMARY

Risk ID	Risk Description	Overall Rating	Impact	Prob-ability	Source	State Response	Reviewer's Assessment
1	**Vendor's assigned primary Project Manager does not hold PMP certification**	30	3	10	Vendor	**Accept: Vendor's primary PM holds significant experience in closely relevant projects, and expects PMP certification within the coming year. State accepts this Project Manager's assignment for the time being.**	Concur
2	**Some IP phones may not have full (SRTP) voice encryption capability, so that State employees could unknowingly violate Federal or State required security standards, especially for transmission of private/personal information.**	20	10	2	Cisco architecture and VoIP Systems	**Mitigate: The State will not purchase any phones now, or throughout the lifecycle of this service that are not capable of full SRTP encryption. Users of phones needing encrypted calls will be trained in proper operation.**	Concur Recommend explicit policy
3	**Use of Jabber softphone may violate IRS 1075 *recommendations* (note: not requirement): See IRS Section 9.18.13 - Protecting FTI in (VOIP) Voice over IP Networks**	9	3	3	Client vendor	**Accept:** **Since Jabber client now supports SRTP encrypted conversations (NIST-approved) . The recommendations precede the development of this capability, and therefore the client itself probably meets IRS 1075 needs.**	Concur Recommend confirmation
4	**Voicemail or Call Recordings, if stored on softphone computers or HHDs, may not be encrypted**	40	10	4	Cisco, Vendor	**Mitigate:** **Develop training materials, usage policies for State employees on acceptable secure use**	Concur
5	**The State may not be appropriately compensated if service level targets are not achieved by the vendor.**	9	9	1	Vendor	**Avoid:** **We expect this risk will be eliminated in the course of contract negotiations, as the State requires adequate contract remedies.**	Concur

6	**The State may be in violation of Federal and State emergency notification (e911) requirements in the project as planned**.	50	10	5	Vendor license model, State	**Mitigate:** 1. Continue managing E911 location information via an external portal that will be made available to the State Telecom Group. 2. Centrally locate Centrex phones throughout each facility (e.g., 1 line per floor, clearly labeled and accessible). 3. **State will seek legal confirmation via attorney general and e911 board on compliance of selected mitigation(s).**	Concur
7	**Current State technical support staff do not possess specialized training or credentials in VoIP technology**	28	4	7	State	**Mitigate:** **Ensure adequate knowledge transfer from Vendor to State technical staff so that, over implementation year, State staff acquire sufficient expertise in VoIP network configuration, operation, and troubleshooting to minimize need for outsourced or Vendor-supplied engineering resources.**	Concur
8	**Vendor's solution includes capabilities which are not defined as in-scope for this project**	27	3	9	Cisco as implemented by vendor	**Accept:** **Business needs will be assessed at each location as part of the implementation plan. The demand service fees for some of the service offerings will help control the unanticipated costs. The business leads from Office 365 and VoIP Implementation projects will meet to discuss potential conflicts by the end of June 2015.**	Concur
9	**Project implementation could be delayed beyond opening date of Waterbury Complex State facility**	20	4	5	State, vendor	**Mitigate:** **State employees will use cell phones until VoIP is in place if necessary.**	Concur
10	**Cost of vendor *recommended* Onsite System / Voice Engineer for Central Vermont is quoted at a fixed 1 year price of $175,000 / yr.**	14	7	2	State, vendor	**Mitigate:** **Negotiate length/cost of Engineer services with Vendor: State prefers to have minimum necessary time frame for this role.**	Concur

ISSUES SUMMARY: None identified

ATTACHMENT 3 – LIFECYCLE COST BENEFIT ANALYSIS

see following pages

Project Name:				DII VoIP Implementation									
Description	**Included in Vendor Fixed Price**	**Qty[7]**	**Unit Price**	**Initial Implementation**	**Maintenance**	**Maintenance**	**Maintenance**	**Maintenance**	**Maintenance**	**Maintenance**	**Maintenance**	**Refresh & Maintenance**	**Total**
Fiscal Year				**FY 2016-18**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**FY2022**	**FY 2024**	
Hardware													
Server Hardware				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Network Upgrades[1]				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Desktop Hardware				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Phones[2]				**$ 912,406.00**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 912,406.00
Hardware Total				**$ 912,406.00**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 912,406.00
Software as a Service													$ -
Product License				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Product License				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Product License				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Product License				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Product Per-User Charges				$ -	$ 132,582.60	$ 596,621.70	$ 993,457.80	$ 1,191,420.00	$ 1,191,420.00	$ 1,191,420.00	$ 1,191,420.00	$ -	$ 6,488,342.10
Database				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Operating System Software				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Additional Server Software				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Additional Network Software													
Other													
Survivable Site Management[3]				$ -	$ 2,600.00	$ 13,000.00	$ 15,600.00	$ 15,600.00	$ 15,600.00	$ 15,600.00	$ 15,600.00	$ -	$ 93,600.00
Survivable Site Setup and Config One/Time[4]				$ 8,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,000.00
Storage (Voice etc.)				$ -	$ 700.00	$ 2,100.00	$ 2,100.00	$ 2,100.00	$ 2,100.00	$ 2,100.00	$ 2,100.00	$ -	$ 13,300.00
Software Total				**$ 8,000.00**	**$ 135,882.60**	**$ 611,721.70**	**$ 1,011,157.80**	**$ 1,209,120.00**	**$ 1,209,120.00**	**$ 1,209,120.00**	**$ 1,209,120.00**	**$ -**	**$ 6,603,242.10**
Consulting				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Third-Party - Technical				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Third-Party - Business				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Deployment				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Upgrade				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other (Project Management)				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Consulting Total				$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ -
Training													$ -
Trainer				$ 7,400.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,400.00
Other				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Training Total				**$ 7,400.00**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 7,400.00
													$ -
Other													$ -
Implementation Services				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Porting Phone Numbers				$ 43,500.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 43,500.00
Sip Trunks				$ -	$ 32,400.00	$ 64,800.00	$ 97,200.00	$ 97,200.00	$ 97,200.00	$ 97,200.00	$ 97,200.00	$ -	$ 583,200.00
Customization / Development				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Deliverables				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Independent Review				$ 16,750.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,750.00
Other Total				**$ 60,250.00**	**$ 32,400.00**	**$ 64,800.00**	**$ 97,200.00**	**$ 97,200.00**	**$ 97,200.00**	**$ 97,200.00**	**$ 97,200.00**	**$ -**	**$ 643,450.00**
Personnel - Additional													
Technical Staff				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Onsite System / Voice Engineer in Central Vermont[5]				$ 58,333.33	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 58,333.33
Increase in Network Group to Project				$ -	$ 66,040.17	$ 203,073.51	$ 312,225.53	$ 426,708.22	$ 437,375.92	$ 448,310.32	$ 459,518.08	$ -	$ 2,353,251.75
Decrease in Telecom Group to Project[6]					$ (66,040.17)	$ (203,073.51)	$ (312,225.53)	$ (426,708.22)	$ (437,375.92)	$ (448,310.32)	$ (459,518.08)		$ (2,353,251.75)
Business Staff				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
DII Proj. Mgt. & Enterprise Architecture Services				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Personnel - Additional Total				**$ 58,333.33**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 58,333.33**
Grand Total				**$ 1,046,389.33**	**$ 168,282.60**	**$ 676,521.70**	**$ 1,108,357.80**	**$ 1,306,320.00**	**$ 1,306,320.00**	**$ 1,306,320.00**	**$ 1,306,320.00**	**$ -**	$ 8,224,831.43

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NOTES / ASSUMPTIONS:

1. Vendor includes 2 Session Border Controllers (SBC) at $3700 total as part of monthly service plan quoted in BAFO, shown here as "Product Per-User Charges." State may choose to source SBCs from its own vendor(s) at cost saving.
2. Number and types of phones estimated according to attached Cost Breakout Worksheet. Phone prices based on vendor's BAFO offering.
3. See attached Cost Breakout Worksheet.
4. See attached Cost Breakout Worksheet.
5. Vendor offered and recommended 1 yr. onsite engineer at $175K/yr. fixed price. State intends to negotiate shorter period at monthly cost. Monthly cost estimated here as 4 months at $175K/12.
6. Increase to Network Group cost is exactly matched by decrease to Telecom Group cost. Net impact to State is neutral.
7. For all quantities and unit prices, see Cost Breakout Worksheet attachment.

State of Vermont Voice over Internet Protocol (VoIP) Solution Implementation												
Best and Final Offer (BAFO) Template												
Description	Qty	Unit Price	FY1	FY2	FY3	FY4	FY5	FY6	FY7	Total		
Implementation												
Installation and Configuration		*Included in line 63*										
Onsite System / Voice Engineer in Central Vermont[1]	**4**	$ 14,583.33	$ 58,333.33									
FY16 Porting Phone numbers	3,285	$ 5.00	$ 16,425.00							$ 16,425.00		
FY17 Porting Phone numbers	3,285	$ 5.00		$ 16,425.00						$ 16,425.00		
FY18 Porting Phone numbers	2,130	$ 5.00			$ 10,650.00					$ 10,650.00		
											$	43,500.00
Network Services to connect to State Network		*Included in line 63*								$ -		
Project Management		*Included in line 63*								$ -		
Professional Services if Applicable		*Included in line 63*								$ -		
FY16 SRST One-Time Config/Setup Services Small	-	$ 500.00	$ -							$ -		
FY16 SRST One-Time Config/Setup Services Medium	-	$ 750.00	$ -							$ -		
FY16 SRST One-Time Config/Setup Services Large	-	$ 1,000.00	$ -							$ -		
FY16 SRST One-Time Config/Setup Services Enterprise	2	$ 2,000.00	$ 4,000.00							$ 4,000.00		
FY17 SRST One-Time Config/Setup Services Small	-	$ 500.00		$ -						$ -		
FY17 SRST One-Time Config/Setup Services Medium	-	$ 750.00		$ -						$ -		
FY17 SRST One-Time Config/Setup Services Large	-	$ 1,000.00		$ -						$ -		
FY17 SRST One-Time Config/Setup Services Enterprise	2	$ 2,000.00		$ 4,000.00						$ 4,000.00		
FY18 SRST One-Time Config/Setup Services Small	-	$ 500.00			$ -					$ -		
FY18 SRST One-Time Config/Setup Services Medium	-	$ 750.00			$ -					$ -		
FY18 SRST One-Time Config/Setup Services Large	-	$ 1,000.00			$ -					$ -		
FY18 SRST One-Time Config/Setup Services Enterprise	-	$ 2,000.00			$ -					$ -		
										$ -	$	8,000.00
Implementation Total			**$ 78,758.33**	**$ 20,425.00**	**$ 10,650.00**	**$ -**	**$ -**	**$ -**	**$ -**	$ 109,833.33	$	51,500.00
										$ -		
Hardware										$ -		
Server/Appliance Hardware		*Included in line 63*								$ -		
Session Border Controller(s)[2]	2	*Included in line 63*								$ -		
FY16 Phones with dual Gb ethernet ports	2,285	$ 90.00	$ 205,650.00							$ 205,650.00		
Multi-Line Phones with dual Gb ethernet ports	350	$ 146.00										
FY16 Lobby Phones (basic)	75	$ 44.00	$ 3,300.00							$ 3,300.00		
FY16 Conference Phones - Large*	40	$ 558.00	$ 22,320.00							$ 22,320.00		
FY16 Conference Phones - Small*	150	$ 558.00	$ 83,700.00							$ 83,700.00		
FY16 Soft Phone Licenses/Software	385	$ -	$ -							$ -		
FY17 Phones with dual Gb ethernet ports	2,285	$ 90.00		$ 205,650.00						$ 205,650.00		
Multi-Line Phones with dual Gb ethernet ports	350	$ 146.00										
FY17 Lobby Phones (basic)	75	$ 44.00		$ 3,300.00						$ 3,300.00		
FY17 Conference Phones - Large*	40	$ 558.00		$ 22,320.00						$ 22,320.00		
FY17 Conference Phones - Small*	150	$ 558.00		$ 83,700.00						$ 83,700.00		
FY17 Soft Phone Licenses/Software	385	$ -		$ -						$ -		
FY18 Phones with dual Gb ethernet ports	1,461	$ 146.00			$ 213,306.00					$ 213,306.00		
Multi-Line Phones with dual Gb ethernet ports	269											
FY18 Lobby Phones (basic)	50	$ 44.00			$ 2,200.00					$ 2,200.00		
FY18 Conference Phones - Large*	20	$ 558.00			$ 11,160.00					$ 11,160.00		
FY18 Conference Phones - Small*	100	$ 558.00			$ 55,800.00					$ 55,800.00		
FY18 Soft Phone Licenses/Software	230	$ -			$ -					$ -		
* If only one size conference phones offered												
Other Equipment										$ -		
										$ -		
Hardware Total			**$ 314,970.00**	**$ 314,970.00**	**$ 282,466.00**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 912,406.00**		
Number of Lines			**3285**	**3,285**	**2,130**	**8700**	**8700**	**8700**	**8700**			
Cost of Phones	**$ 912,406.00**											
Software												
System Software		*Included in line 63*										
Product License(s)		*Included in line 63*										
Software Total			**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**		
Initial Implementation Costs (Over 3 Years)			**$ 393,728.33**	**$ 335,395.00**	**$ 293,116.00**							
Total Year 3 Implementation		**$ 1,022,239.33**										
Operating Costs * Provide Annual Costs**												
Managed Services		*Included in line 63*										
Hosting Fee		*Included in line 63*										
Annual Basic Plan Service Fee	3285	$ 8.99	$ 118,128.60	$ 354,385.80	$ 354,385.80	$ 354,385.80	$ 354,385.80	$ 354,385.80	$ 354,385.80	$ 2,244,443.40		
Annual Miscellaneous Plan Service Fee	0		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
ISI Call Accounting / Reporting	3285	$ 1.10	$ 14,454.00	$ 43,362.00	$ 43,362.00	$ 43,362.00	$ 43,362.00	$ 43,362.00	$ 43,362.00	$ 274,626.00		
Paging over the phone (per concurrent channel)	0	$ 1.30	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Call Recording – Ad Hoc (per device)	0	$ 12.50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
FaxOverIP (per concurrent channel)	0	$ 192.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Annual Basic Plan Service Fee	3285	$ 8.99		$ 177,192.90	$ 354,385.80	$ 354,385.80	$ 354,385.80	$ 354,385.80	$ 354,385.80	$ 1,949,121.90		
Annual Miscellaneous Plan Service Fee	0	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -		
ISI Call Accounting / Reporting	3285	$ 1.10		$ 21,681.00	$ 43,362.00	$ 43,362.00	$ 43,362.00	$ 43,362.00	$ 43,362.00	$ 238,491.00		
Paging over the phone (per concurrent channel)	0	$ 1.30		$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Call Recording – Ad Hoc (per device)	0	$ 12.50		$ -	$ -	$ -	$ -	$ -	$ -	$ -		

FaxOverIP (per concurrent channel)		0	$ 192.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Annual Basic Plan Service Fee		2130	$ 8.99			$ 114,892.20	$ 229,784.40	$ 229,784.40	$ 229,784.40	$ 229,784.40	$ 229,784.40	$ 1,034,029.80		
Annual Miscellaneous Plan Service Fee		0	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -		
ISI Call Accounting / Reporting		2130	$ 6.50			$ 83,070.00	$ 166,140.00	$ 166,140.00	$ 166,140.00	$ 166,140.00	$ 166,140.00	$ 747,630.00		
Paging over the phone (per concurrent channel)		0	$ 1.30			$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Call Recording – Ad Hoc (per device)		0	$ 12.50			$ -	$ -	$ -	$ -	$ -	$ -	$ -		
FaxOverIP (per concurrent channel)		0	$ 192.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Total Per-User				$ 132,582.60	$ 596,621.70	$ 993,457.80	$ 1,191,420.00	$ 1,191,420.00	$ 1,191,420.00	$ 1,191,420.00	$ 1,191,420.00	$ 6,488,342.10		
Annual Maintenance		*Included in line 63*												
Hardware Upgrades		*Included in line 63 (on an as needed basis)*												
Sofware Upgrades		*Included in line 63 (all major and minor upgrades from MFG are included)*												
SIP Trunks / Circuits*	Annual Cost		$ 216.00	$ 32,400.00	$ 64,800.00	$ 97,200.00	$ 97,200.00	$ 97,200.00	$ 97,200.00	$ 97,200.00	$ 583,200.00			
***Specify # of trunks/circuits & sizes**	**# of trunks/circuits**		**450**											
SIP T1 Call Path(s) if Applicable														
Storage @ $35/100GB		5	$ 35.00	$ 700.00	$ 2,100.00	$ 2,100.00	$ 2,100.00	$ 2,100.00	$ 2,100.00	$ 2,100.00	$ 13,300.00			
Operating Costs Total				**$ 165,682.60**	**$ 663,521.70**	**$ 1,092,757.80**	**$ 1,290,720.00**	**$ 1,290,720.00**	**$ 1,290,720.00**	**$ 1,290,720.00**	**$ 7,084,842.10**			
Contact Center ***Provide Annual Costs														
Installation and Configuration														
Server/Appliance Hardware														
Server/Appliance Software														
Agent License		-	$ 54.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			
Supervisor License		-	$ 54.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			
Recorder License		-	$ 7.50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			
Voice Mail License		-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			
Fax over Ip License		-	$ 3.25	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			
Annual Maintenance		*Included in line 52*												
Managed Services		*Included in line 52*												
Contact Center Total				**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**			
Survivability * Provide Annual Costs**														
FY16 Small Survivable Site (1- 50)		-	$ 100.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			
FY16 Medium Survivable Site (51-200)		-	$ 205.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			
FY16 Large Survivable Site (201-500)		-	$ 305.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			
FY16 Enterprise Survivable Site (501+)		2	$ 325.00	$ 2,600.00	$ 5,200.00	$ 7,800.00	$ 7,800.00	$ 7,800.00	$ 7,800.00	$ 7,800.00	$ 46,800.00			
FY17 Small Survivable Site (1- 50)		-	$ 100.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -			
FY17 Medium Survivable Site (51-200)		-	$ 205.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -			
FY17 Large Survivable Site (201-500)		-	$ 305.00		$ -	$ -	$ -	$ -	$ -	$ -	$ -			
FY17 Enterprise Survivable Site (501+)		2	$ 325.00		$ 7,800.00	$ 7,800.00	$ 7,800.00	$ 7,800.00	$ 7,800.00	$ 7,800.00	$ 46,800.00			
FY18 Small Survivable Site (1- 50)		-	$ 100.00			$ -	$ -	$ -	$ -	$ -	$ -			
FY18 Medium Survivable Site (51-200)		-	$ 205.00			$ -	$ -	$ -	$ -	$ -	$ -			
FY18 Large Survivable Site (201-500)		-	$ 305.00			$ -	$ -	$ -	$ -	$ -	$ -			
FY18 Enterprise Survivable Site (501+)		-	$ 325.00			$ -	$ -	$ -	$ -	$ -	$ -			
Pricing for Survivable Sites include Managed Services														
Survivablitiy Total				**$ 2,600.00**	**$ 13,000.00**	**$ 15,600.00**	**$ 15,600.00**	**$ 15,600.00**	**$ 15,600.00**	**$ 15,600.00**	**$ 93,600.00**			
Training														
Note: Provide a supplement with training options and descriptions		**Per student**												
Administrator (in-depth classroom training)		10	$ 185.00	$ 1,850.00							$ 1,850.00			
Service Desk & Desktop Support Staff (classroom preferred)		30	$ 185.00	$ 5,550.00							$ 5,550.00			
Trainer		-	$ 9.25	$ -							$ -			
End User		-	$ 9.25	$ -	$ -	$ -					$ -			
Training Total				**$ 7,400.00**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 7,400.00**			
Total to Vendor				**$ 569,410.93**	**$ 1,011,916.70**	**$ 1,401,473.80**	**$ 1,306,320.00**	**$ 1,306,320.00**	**$ 1,306,320.00**	**$ 1,306,320.00**	**$ 8,208,081.43**			
Independent Review											$ 16,750.00			
NOTES / ASSUMPTIONS:										**Grand Total**	**$ 8,224,831.43**			

All costs should be annual unless otherwise noted
If costs are included with another line, indicate which line it's included with

1. Vendor quotes and recommends 1 yr. fixed rate of $175,000. State will negotiate shorter period, here shown as 4 months of monthly rate ($175,000 / 12).

2. Vendor includes 2 Session Border Controllers (SBC) at $3700 total as part of monthly service plan quoted in BAFO, shown here as "Product Per-User Charges." State may choose to source SBCs from its own vendor(s) at cost saving.

ATTACHMENT 4 – COST IMPACT ANALYSIS

See following pages

Current Cost and Billing (Invoiced) of Centrex Service[1]

OPTION 1

INVOICED					ACTUAL				
Phone Services	**Count**	**Price**	**Total**	**Plus 11% Surcharge**	**Count**	**Price**	**Total**	**Plus 11% Surcharge**	
FP - Centrex+VM+DL	2304	$23.00	$52,992.00	$58,821.12	2311	$23.00	$53,153.00	$58,999.83	
FP - Centrex+VM	5047	$18.25	$92,107.75	$102,239.60	4808	$18.25	$87,746.00	$97,398.06	
FP - Centrex Only	2802	$15.40	$43,150.80	$47,897.39	4030	$15.40	$62,062.00	$68,888.82	
FP - Flexlink	113	$19.20	$2,169.60	$2,408.26	116	$30.31	$3,515.96	$3,902.72	
FP - ISDN	973	$26.70	$25,979.10	$28,836.80	1110	$40.00	$44,400.00	$49,284.00	
VTel - ISDN					3	$74.00	$222.00	$246.42	**(Note: Includes $600 MRC VTel FP Trunk)**
VTel - Centrex	365	$37.61	$13,727.65	$15,237.69	367	$38.04	$13,960.68	$15,496.35	
	11604		$230,126.90	$255,440.86	12745		$265,059.64	$294,216.20	
	Monthly Avg		**$19.83**	**$22.01**	**Monthly Avg**		**$20.80**	**$23.08**	

OPTION 2 (Totals w/o 232 Misc lines (alarm, elevator, HVAC & modem)

INVOICED					ACTUAL				
Phone Services	**Count**	**Price**	**Total**	**Plus 11% Surcharge**	**Count**	**Price**	**Total**	**Plus 11% Surcharge**	
FP - Centrex+VM+DL	2304	$23.00	$52,992.00	$58,821.12	2311	$23.00	$53,153.00	$58,999.83	
FP - Centrex+VM	5047	$18.25	$92,107.75	$102,239.60	4808	$18.25	$87,746.00	$97,398.06	
FP - Centrex Only	2570	$15.40	$39,578.00	$43,931.58	3798	$15.40	$58,489.20	$64,923.01	
FP - Flexlink	113	$19.20	$2,169.60	$2,408.26	116	$30.31	$3,515.96	$3,902.72	
FP - ISDN	973	$26.70	$25,979.10	$28,836.80	1110	$40.00	$44,400.00	$49,284.00	
VTel - ISDN					3	$74.00	$222.00	$246.42	**(Note: Includes $600 MRC VTel FP Trunk)**
VTel - Centrex	365	$37.61	$13,727.65	$15,237.69	367	$38.04	$13,960.68	$15,496.35	
	11372		$226,554.10	$251,475.05	12513		$261,486.84	$290,250.39	
	Monthly Avg		**$19.92**	**$22.11**	**Monthly Avg**		**$20.90**	**$23.20**	

NOTES:
1. See Section 9.2 for a description of these tables.

VoIP Implementation Cost Impact Analysis

Current Average Centrex Cost / line	$	20.90
Current Average Centrex Billing / line	$	19.92

Cumulative Comparison of VoIP to Centrex (to show break-even point)

(note: for total 8700 devices over lifecycle)

SCENARIO ONE (incl. Telecom Surplus):	FY16	FY17	FY18	FY19	FY20	FY21	FY22	Lifecycle Total
Cumulative Total Cost VoIP (VoIP billing not incl.)	$ (66,040)	$ 850,078	$ 2,251,551	$ 3,557,871	$ 4,864,191	$ 6,170,511	$ 7,476,831	**$ 7,476,831**
Cumulative Current Avg. Cost	$ 411,939	$ 1,612,017	$ 3,635,973	$ 5,817,933	$ 7,999,893	$ 10,181,853	$ 12,363,813	**$ 12,363,813**
Cumulative Difference (VoIP - Centrex)	$ (477,979)	$ (761,939)	$ (1,384,422)	$ (2,260,062)	$ (3,135,702)	$ (4,011,342)	$ (4,886,982)	**$ (4,886,982)**

SCENARIO TWO (not incl. Telecom Surplus):	FY16	FY17	FY18	FY19	FY20	FY21	FY22	Lifecycle Total
Cumulative Total Cost VoIP (VoIP billing not incl.)	$ 586,161	$ 1,598,078	$ 2,999,551	$ 4,305,871	$ 5,612,191	$ 6,918,511	$ 8,224,831	**$ 8,224,831**
Cumulative Current Avg. Cost	$ 411,939	$ 1,612,017	$ 3,635,973	$ 5,817,933	$ 7,999,893	$ 10,181,853	$ 12,363,813	**$ 12,363,813**
Cumulative Difference (VoIP - Centrex)	$ 174,222	$ (13,939)	$ (636,422)	$ (1,512,062)	$ (2,387,702)	$ (3,263,342)	$ (4,138,982)	**$ (4,138,982)**

Sample Flat VoIP Rate Over Lifecycle

(8700 devices; with and without Telecom Surplus)

SCENARIO THREE (incl. Telecom Surplus):	FY16	FY17	FY18	FY19	FY20	FY21	FY22	Lifecycle Total
Example Billing Rate per VoIP line	$ 12.64	$ 12.64	$ 12.64	$ 12.64	$ 12.64	$ 12.64	$ 12.64	
Total VoIP billing (annualized)	$ 249,134	$ 725,789	$ 1,224,058	$ 1,319,616	$ 1,319,616	$ 1,319,616	$ 1,319,616	
Total System Cost after Billing w/ Telecom Surplus	$ (315,175)	$ 190,329	$ 177,416	$ (13,296)	$ (13,296)	$ (13,296)	$ (13,296)	**$ (613)**
Billing per VoIP line as % of Avg. Centrex *Billing*	**63%**							
Billing per VoIP line as % of Avg. Centrex *Cost*	**60%**							

SCENARIO FOUR (not incl. Telecom Surplus):	FY16	FY17	FY18	FY19	FY20	FY21	FY22	Lifecycle Total
Example Billing Rate per VoIP line	$ 13.91	$ 13.91	$ 13.91	$ 13.91	$ 13.91	$ 13.91	$ 13.91	
Total VoIP billing (annualized)	$ 274,166	$ 798,712	$ 1,347,044	$ 1,452,204	$ 1,452,204	$ 1,452,204	$ 1,452,204	
Total System Cost after Billing w/o Telecom Surplus	$ 311,995	$ 213,205	$ 54,429	$ (145,884)	$ (145,884)	$ (145,884)	$ (145,884)	**$ (3,907)**
Billing per VoIP line as % of Avg. Centrex *Billing*	**70%**							
Billing per VoIP line as % of Avg. Centrex *Cost*	**67%**							