PMI Award for Project Excellence Application 2015

Project Title: IPv6 HLAN Network Upgrade

Lead Nominator: Mark Sias
Relationship: Project Manager

Introduction/Summary

Overview

Our mission at Lockheed Martin was to help our customer, Mission Support Services save the internet. Yes, save the internet. Like other heroes (The Avengers, Batman, John Wayne or Lassie), our talented team of hardware and software experts was called upon to upgrade our customers infrastructure and implement the next generation of internet protocol address standard, Internet Protocol Version 6 or IPv6.

Every device on the internet requires a serial number and under the old internet addressing system IPv4 (which uses 32bit), the limited number of addresses available to the world was being reached. The global growth of cell phones, tablets, printers, game players and other devices hooked up to the internet was about to come to an end. Oh no!

To address this upcoming internet disaster a new standard was created by experts in the field. Internet Protocol Version 6 uses 128 bits instead of 32 bits creating trillions of new addresses for future use so no man, women or child will every have to be told “no you can’t have internet access”, at least not because of an internet address limitation.

Our IPv6 HLAN Network Upgrade project team’s scope was to revitalize the Hanford Federal Cloud (HFC) network to take advantage of future growth opportunities; to expand the ways the Department of Energy can serve their customers, and to implement this new IPv6 compliance standard being required for public/external facing servers and services. This included design, procurement and installation of network equipment and software as well as the moving and redevelopment of a great many external facing applications to work with IPV6 capable servers.

The successful completion of this project would mean our customer the Department of Energy could better serve the public interest by keeping vital government services online and available no matter what addressing system the public’s chosen device may use. It would also enhance the networks ability to provide additional services to members of the public using mobile devices.

Business Need

Driven by a desire to improve public access to its internet services provided on the Hanford Federal Cloud (HFC) our customer was positioning itself ahead of the curve by incorporating IPv6 to better serve the public interest. The Office of Management and Budget issued OMB M-05-22 and laid the groundwork for the required implementation of IPv6. In order to facilitate timely and effective IPv6 adoption, government agencies were asked to:

"Upgrade public/external facing servers and services (e.g. Web, email, DNS, ISP services, etc.) to operationally use native IPv6".

The intent of the requirement is to ensure that any and all network services agencies provide to the general public over the Internet are seamlessly accessible via both IPv6 and IPv4. That is, a service that is both accessible external to the agency (i.e., over the Internet) and accessible to general public users.

In summary, if there is a US Government provided network service that is currently available to all users of the public Internet, that service must be available to a user who only has IPv6 capabilities.

Business Objectives

Key objectives for the project were:

- Comply with OMB M-05-22 mandate requirements
- Make it easier to implement new technologies (IPv6), and security functionalities
- An updated network is needed to implement increasing requests from DOE-HQ to enhance network security and performance at DOE sites.
- External applications would be capable of adhering to industry standards

Remove risks for not upgrading the network devices:

- Non-compliance with government mandates
- Remove potential risk of rating poorly on IG/OA/third-party security audit due to outdated network hardware/technologies
- Remove old 2003 servers. This reduces threats on both security and operational functions.

Solution that was implemented

This project required both software and hardware upgrades to improve capacity and functionality of the HLAN DMZ to facilitate IPv6 protocol. This scope of work included the full implementation of.

- Extending the internal HLAN Active Directory domain into the DMZ using a secure function called RODC (Read-only Domain Controller)
- Deploy a suite of management services in the DMZ (SCOM, SEP, Chimera, Nessus) that would be used to manage the DMZ to an Enterprise level
- Upgrade hardware and software on all web servers and database servers.
- Transition of over 50 web applications to new environment.
- Coordination of over 50 Subject Matter Experts in various technology fields.
- Implementation of modern and secure methods for accessing servers and transferring data.

Top Three Reasons This Project should receive the PMI Award for Project Excellence

1. This type of network protocol transition is considered very challenging in the world of information technology. Developing an innovative solution that meets the customers' needs and then successfully carrying out that vision without impacting government services to the public makes it an exceptionally important project.
2. Following PMI standards and practices this project team delivered all the customer deliverables to the customer's satisfaction on schedule and under budget.
3. This project improved access to vital government services that do more than just entertain us or make us laugh. The services provided by our customer help insure the health, safety and quality of life for people all across the Pacific Northwest.

Sponsor Letter

The sponsor letter is provided as a separate document.

Schedule

Processes or techniques to develop the schedule
Effective management of schedule to project success

To develop our schedule we built it from the ground up with information drawn from the scope baseline and expert judgment provided by our carefully chosen subject matter experts. First we built a schedule management plan for this project to better understand our expectations for how we would define measure and track progress. Then we followed with the other time management processes of Define Activities, Sequence Activities, Estimate Activity Resources, Estimate Activity Durations, and finally Develop Schedule. During each process phase the subject matter experts met individually and in group meetings with the Project Manager to develop and refine each process stage of the schedules development.

Our goal was to have a quality schedule that would provide a host of valuable outputs throughout the life of the project as well as help validate some lessons learned. We wanted a schedule that would allow us to verify we had incorporated everything we needed to accomplish from our scope statement. Further we wanted our schedule to help define or confirm our critical path and help us with determining resource requirements, accurately perform Earned Value Management, predict project duration, milestones and labor costs. Once base lined we could show justification for resource needs and when we would need them allowing for superior resource planning, risk management planning, change management planning and how those changes would affect cost and budget. Our goal was to build a schedule based on the work to be done that would allow the Project Manager to drive the schedule and the project stakeholders to evaluate the projects progress along the way.

Once our project began we used the Control Schedule process to monitor and control the project throughout the life of the project. We used performance reviews, resource optimization techniques, software, and schedule compression techniques to help manage schedule options and find the

preferred schedule or path forward. Our schedule outputs like work performance information, schedule forecasts and change requests all helped us to update our project management plan and meet our objectives. With a reliable resource loaded schedule we empowered our entire team including the customer to be proactive and make smarter decisions about everything that made up our project.

Cost

Project cost was effectively developed and managed describing the processes
How management of cost contributed to the success of the project

To develop our project costs we first developed a cost management plan using as inputs our project charter, enterprise environmental factors, and organizational process assets. Using tools like expert judgment, analytical techniques and meetings we produced our cost management plan for estimating costs, determining budget, tracking variances and controlling costs.

Our goal for estimating costs was to be able to accurately baseline our costs for budgeting purposes and measure changes to cost as changes were proposed or uncovered within the project over time. This provided customers, stakeholders and others clearer definition of the cost impact of changes from the baseline. It also helps with risk management and other analysis where cost could be a factor.

We began estimating material costs once we had a complete end to end solution defined and the architecture drawings and solution were validated in design reviews. We began estimating labor costs once we had a scope baseline, resource plan and project schedule. Using various tools like expert judgment, bottom-up estimating, project management software and group decision making techniques we determined activity cost estimates and updated project documents including our resource loaded schedule.

We then determined our budget using our activity cost estimates, project schedule and resource calendars along with expert judgment to establish a cost baseline. From this baseline we developed our Spend Plan to help with meeting our project funding requirements and updated our project documents.

Once the project began we controlled costs thru the monitoring and controlling processes. Following our cost management plan and complying with our project funding requirements we tracked spending against our baseline and looked for variances. Then we addressed thru regular performance reviews those variances and determined the impact of those variances and what if any action should be taken. We also used the cost information in managing the change control process and in performing risk analysis.

Management of cost contributed greatly to our projects success. It allowed us to better measure our work performance against the plan. It improved our ability to accurately forecast how much funding would be needed at any given time. It provided a quantifiable cost measure that could be used for changes requests and risk management. As a result the customer, stakeholders, project manager and

subject matter experts can see the cost impact of the their decisions and take proactive steps to fix problems before they become much bigger problems. Our project finished under budget and was able to return some funding to the customer allowing them to fund over runs on other projects.

Scope

Show that project scope was effectively developed and managed (processes or techniques)
How effective management of scope contributed to project success

To develop our project scope we first developed a Scope Management Plan using the Plan Scope Management process. We then followed with Collect Requirements and Define Scope processes. We created a WBS from the top down using decomposition to create work packages for tracking scope.

With the Collect Requirements process we used document analysis, context diagrams, Delphi Technique, and finally Group Decision Making Techniques to produce requirements documents like our Functional Requirements document. When defining scope we used tools like expert judgment and techniques like brainstorming to deliver our project scope statement.

Once the project began we used the control scope process managing change requests and making sure people were using our change management system. We held regular meetings to review schedule, scope, budget and spending levels. When people had recommended changes it went before a group of subject matter experts for review and approval. If changes to scope were approved we added it to our scope baseline and other project related documents.

As work was being completed on each deliverable we followed the Validate Scope process to confirm the deliverable was accepted by the project team, stakeholders and the customer. We used requirements documentation and verified deliverables with an independent government website that verifies IPv6 compliance. This validated our work so the deliverables were accepted by all.

Following these scope related processes and techniques helped us maintain control over scope creep and validate the work being performed was within our approved scope. This helped us stay on schedule and on budget while meeting all the projects deliverables.

Team

Show team operated as a high performing team aligned and focused on project goals (processes and techniques).

Early on we created a Plan for Human Resource Management that we hoped would aid us in assembling a high performing team in the future. We outlined the processes we would use later like Define Roles and Responsibilities, Organizational Charts and our Staffing Management Plan to select

and align our carefully chosen team members so they would be able to focus on specific, assigned project goals.

Armed with the results of our Human Resource Management Plan we assembled a small group of subject matter experts and they in turn began locating and acquiring resources that would help us reach each project deliverable. This project required talented team members from many different functional groups. Once we had negotiated commitments from the functional managers we inserted our newly selected team members into our resource loaded schedules and our project organizational charts. We then used our project management software to generate our specific project staff assignments and resource calendars.

At this point we knew the team we had assembled was technically advanced and aligned with our project deliverables so we began focusing on team building activities. We worked to enhance interpersonal skills and communication channels amongst team members from each newly created group and the larger team as a whole. Before sharing our organizational charts and communications plan at our kickoff meeting we held several informal group meetings so people could better get to know each other and understand each team member's circumstances. We informally discussed our upcoming work and how we could better communicate our concerns and help each other in the future. This created a motivation for everybody to feel invested in the project and to care about each other's work and their role on the project. These soft skills paid off as the project progressed because being friends helped promote collaboration and problem solving and removed misunderstandings and conflicts down the road when tight deadlines and other stress related factors could have a negative impact on moral and project performance. All these earlier activities created an environment built around teamwork and achievement. Later it created a high performing team with a focus on achieving specific, time sensitive project deliverables.

Show how team performance contributed to success?

The resulting high level of team performance contributed in many ways to project success. It meant the various aspects of our Project Management Plan could be carried out much more aggressively because people had a deeper level of understanding and commitment to all the plans that make up the Project Management Plan. Greater level of assimilation meant following change management processes went more quickly making us more nimble as a team and better able to address risk management issues in a more timely and cost effective manner. We operated as a high performing team because we had become friends first and that contributed to our support of each other's project deliverables. When individual deliverables are met on time and on budget the project as a whole is on schedule and on budget.

Stakeholders

Show stakeholder expectations effectively managed (processes, techniques)
How effective management of expectations and communications contributed to project success.

Our first step was to Plan Stakeholder Management. We performed stakeholder analysis to identify our stakeholders and identify the level of involvement we felt each would likely have in the project. We also tried to define stakeholder satisfaction and expectations. Once this was done we Managed Stakeholder Engagement by defining our communication methods and who and how often project status would be communicated to the stakeholders. We reviewed our stakeholder analysis from time to time throughout the projects lifecycle.

We controlled Stakeholder Engagement with the use of information management systems like SharePoint sites to keep the stakeholders informed of our progress and issues log. We also held weekly or bi-weekly meetings with different stakeholders to review project performance as it relates to their specific needs.

By building a plan and working to that plan we were able to keep our stakeholders expectations fresh in everyone's mind. Early and continuous communication with the various groups of stakeholders meant few surprises, reduced risk, and greater buy in to proposed solutions and team activities. Furthermore all proposed changes and variances were put before the stakeholders in a timely manner reducing rework and miscommunication since they were often part of the decision making process. All this left little new material to be reviewed late in the program that had not already been reviewed by the stakeholders many times before. This resulted in no late surprises outside of a few minor technical glitches. This effective management of stakeholder expectations and communications kept our project on schedule and on or under budget.

Risk

Show processes and techniques for effectively managing risk
How effective management of risk contributed to project success.

Our first objective was to Plan Risk Management by developing a Risk Management plan that covered how risks would be measured, managed and communicated to the team. Once we had our plan, we set out to create our risk register using the Identify Risks process. We performed this process several times during the project whenever we felt new information about possible risks had come to light. We used information gathering techniques and expert judgment analysis to identify our most significant project risk factors.

Once we had our Risk Register created or updated we then set out to Perform Qualitative Risk Analysis to determine which risks should be considered the highest priority. We performed a Risk Probability and Impact Assessment and created a Probability and Impact Matrix to help set our priorities. At this

point we would subject our resulting risk priorities list to Perform Quantitative Analysis. We used Expected Monetary Value Analysis and Sensitivity Analysis along with Expert Judgment to update our risk register with our findings. Following the earlier steps listed above we would then Plan Risk Responses by developing a strategy for handling each risk and to update the risk register to reflect this.

Throughout the project we followed the Control Risks process for monitoring and controlling risk. In reviewing our actuals vs our planned strategies we used regular risk reassessments and technical performance measurements to evaluate how we had handled identified risks in the risk register and did things go as planned.

As a result of our following these risk management processes we were able to effectively manage project risk. We were able to identify and take advantage of positive risk / opportunities and mitigate most negative risks or threats. As a result the project finished on schedule and under budget. Our deliverables to the customer were never put in serious doubt because our processes allowed us to take preemptive action to reduce risk before it could become a significant factor in delivering our deliverables to the customer.

Change

Show changes to scope, schedule and cost were effectively managed (processes or techniques)
How effective change management contributed to project success.

Throughout the life of the project we Performed Integrated Change Control. Each week in our status meetings any team member who believed they had been asked to perform work that was outside our existing scope was encouraged to bring this up for discussion. If after an initial discussion the group agreed we may be dealing with new scope we would set up a change control meeting to discuss the change request further.

At this follow up meeting we would discuss the source of the change and evaluate it through the Perform Integrated Change Control process to better understand its impact on the project deliverables. If we determined it was new scope we would investigate the possible impact of the change of scope on, schedule, budget and quality using tools and techniques like expert judgment and meetings. Once the impact to the project as a whole was fully evaluated we would work with the customer and stakeholders to determine what our path forward should be. Did the customer want to add or subtract the scope and the resulting costs and schedule impact to the project?

If approved by the customer and our team, change requests would be added to the change log and implemented to become part of direct and manage project work. Updates to the project management plan would also be made and any required contract changes would be made showing the customer accepted the change to scope and the related costs and impact to schedule.

As a result of our Perform Integrated Change Control process we had effective change management. Our change control board was made up of subject matter experts able to identify and measure the impact of proposed changes on the project as a whole. These processes further allowed us to avoid possible scope creep and the additional costs and impact to schedule that this can lead to. Because of our change management processes we were able to better communicate & integrate approved changes in scope more quickly helping us to meet all our deliverables and make changes with only a minimum measured impact to the project.

Lessons Learned

Show how lessons learned from previous projects (if any) were integrated in this one.
How the integration of lessons learned contributed to project success.

We did not have a formal lessons learned document from a similar previous project to work with. The idea of doing an IPv4 to IPv6 conversion project had been discussed before many times, but we had never actually performed one.