A Customer-First Approach to Data Center Migration

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Project Performance Corporation (PPC) designed a new Data Center facility and implemented a migration strategy to facilitate the move of nearly 400 servers, twice as many workstations, and nearly as many people to new office space with minimal interruption of service.

About Our Client

Our client provides superior satellite and aerial imagery, location information products, and image processing services to customers anywhere and at any time. For example, the photo in Figure 1 was taken from a satellite orbiting over 400 miles above the Earth. It depicts the Oshika Peninsula of Japan before the earthquake of March 11, 2011. The photo in Figure 2 was taken of the same area after the earthquake. The devastation that resulted from the quake is obvious.

Producing products such as these requires orchestrating a complex infrastructure of servers, applications, and network devices. Controlling the flight path of the satellites, downloading massive amounts of data, and processing that data are just a few of the essential elements that must be seamlessly orchestrated.

The data center topology that made this product possible had expanded over its lifetime to provide separate business functions for their corporate (non-classified data) users and for their production (proprietary and classified data) users. Data and access security were high priorities for the company.

The Challenge

When a company expands rapidly, there is a natural tendency for project engineering teams to drive the shape of the network. The result can be a “bolt-on” approach that achieves the functional result of accommodating the project, but does not scale well or preserve other key features of a healthy network, such as redundancy at strategic levels of the topology, separation of function within an infrastructure, naming standards, configuration standards, monitoring, and manageability.

Geographic redundancy had been addressed to a limited extent for their production work, focusing on the ability to control their satellites from another geographic location. Business-critical corporate resources (servers, applications, and storage) did not have any geographic redundancy.
Client resources were challenged with an expanding workload of new projects, as well as maintenance of the existing applications, servers, and network infrastructure. Additionally, they were in a hiring mode to support new contracts.

The client’s decision to move to a new facility provided PPC with an excellent opportunity to address the concerns we had identified in their network infrastructure.

The Solution

Project Performance Corporation quickly determined that a key component of the strategy required “seeding” the new data center and office space with upgraded network equipment, to create an operational infrastructure for the physical move of people and servers. This would allow a smoother transition and a potential plug-and-play environment as servers and people were positioned at the new location. We started with a study of their existing network infrastructure.

A multi-faceted approach was selected to maximize the retrieval of information. PPC made use of the client’s current monitoring tool, Solar Winds. Existing network diagrams were reviewed, and privileged level access to the client’s non-classified switches and routers was requested. From this vantage point, we conducted logical searches for active connections between the network devices. We also conducted physical inspections of the hardware and network connections and produced a current “As-Is” map of the client network, as shown below (redacted).

Figure 3 - We conducted physical inspections of the hardware and network connections and produced a current “As-Is” map of the client network

The PPC team also interviewed the client’s network engineering points of contact and asked for specific information on their mission, sensitivities to interruption, current approach to redundancy, disaster...
recovery, business continuity processes, future plans for VoIP, circuit requirements, and consolidation of circuits and network equipment.

Making a list of the client’s requirements and working with our points of contact helped us finalize a highly redundant, scalable, and deterministic network design for our client. We also helped the client identify business processes and systems that needed continuity during the migration, as shown in the diagram below (redacted). As the design took shape and the capabilities became clear, the client agreed that the investment would provide the qualities we had outlined.

Figure 4 - Making a list of the client’s requirements and working with our points of contact helped us finalize a highly redundant, scalable, and deterministic network design for our client. We also helped the client identify business processes.

A tremendous amount of detailed documentation was collected to inventory each server, switch, router, and storage platform. As with any dynamic company, we also faced challenges as the client’s requirements increased and changed in the days and weeks prior to the equipment and people move. We worked with the client to arrange a “freeze” date when no further changes would be brought into the environment.

The Successful Outcome

PPC and its subcontractor, Sev1Tech, evaluated the options and provided the client a path for the least disruptive and simplest approach to their migration. Ultimately, the decision was to move both people and the data center in a single weekend—nearly 400 servers, twice as many workstations, and nearly as many people.
The transition from the legacy network to the PPC-designed infrastructure includes the following highlights:

1. **Multiple single points of failure vs. no single points of failure.** This was accomplished by modularizing each platform, from the core to the user access level, and designing port channels between core, distribution, and access layers. Cisco Virtual Switching System (VSS) platforms were used where appropriate to simplify the management images while providing transparent redundancy.

2. **Disparate mix of network platforms vs. standardization on supportable network platforms.** The legacy network had hardware and software components that had settled at different levels of Cisco’s Internetwork Operating System (IOS). Some equipment was found to be end-of-sale and end-of-life. Some equipment had not been rebooted for several months, which validated the client’s sensitivity to interruption in their business cycle. The new design capitalized on a definitive set of network models that Cisco projected as stable for a 3- to 5-year period. Whenever possible, more robust platforms were used so the environment could scale without forcing the client to “fork-lift” in an upgrade.

3. **Layer 2 vs. Layer 3 to the edge design.** The legacy network was rife with VLANs that were extended throughout the topology. This is a normal progression of a topology that started small and grew quickly. PPC recognized the potential problems and recommended a Layer 3 topology that restricted VLANs to just the local user level and prevented massively disruptive spanning tree loops and layer 2 convergence issues.

4. **Static route vs. routing protocols.** As another example of a network that grew suddenly, traffic in the legacy network was controlled by static routes at nearly every level. PPC recommended routing protocols that eliminated the extensive manual labor involved in maintaining static routes throughout the network. At the client’s request, Enhanced Interior Gateway Routing Protocol (EIGRP) was implemented.

**A Key to Our Success - Having the Right Team in Place**

Amazing results are accomplished when the right team is in place. It was important to work with the client teams closely, getting input and buy-in on virtually every type of connection and device configuration. Our intent was to structure the changes so the client felt ownership of both the process and our ideas. PPC continually reassured and reiterated that after our work was done the network belonged to them, was theirs to maintain and grow, and that they needed to be intimately involved in the decisions and implementation process.

The result was an absolute success, where both PPC and client resources worked as a unified team to anticipate issues and resolve unexpected events in a timely manner. The user community hardly hiccupped and business continuity was maintained through the migration effort.

I was fortunate to be working with the outstanding team of Laura Geiger, Frank Hughes, David Stepp, Scott Lucas (with special thanks for his superb work on the configurations and design considerations), and David Pinkerton. With this team, as well as the sub-contractors we had in place, I focused on the design of the client’s new network: identifying areas of improvement such as the four highlights mentioned above; implementing best practices on switches and routers; standardizing network procedures and naming conventions; evaluating transition strategies; and strategically positioning network resources that would support their growth over the next three to five years. Follow-on work with the client developed from our efforts and included the work and contributions of William Edgin and Michael Healy.
About Project Performance Corporation

Project Performance Corporation serves as the North American Operations arm of AEA, an internationally recognized consultancy. We are part of a 1,200-person multi-disciplinary team of information technology professionals, project management experts, scientific and technical experts, and legal and regulatory specialists dedicated to providing fully integrated and business-oriented solutions. We have offices in the northern Virginia and Maryland suburbs of Washington, DC, and London. Our cutting edge IT and management solutions benefit governments around the world and Fortune 500 decision makers. Committed to quality management, PPC has been externally assessed at CMMI Maturity Level 3 and is ISO 9001:2008-registered.

About the Author

Prior to joining PPC, John Lancaster served on Sprint’s engineering staff for over 21 years, filling various roles as an IBM network engineer, team leader, Data Center network engineer, and architect. His most recent experience focused on network designs, standards, and efficiencies in data centers and campus environments.

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