

2011 NASCIO RECOGNITION AWARD NOMINATION

Nomination Category: Risk Management Initiatives

E-Commerce Portal Infrastructure

State of California, Franchise Tax Board

Technology Services Division

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Section B. Executive Summary

Each year, Californians file more than 17 million personal and business state income tax returns with the California Franchise Tax Board (FTB). Taxes administered by FTB typically generate more than \$60 billion each year or approximately 65% of the state's General Fund. Most of FTB's business is performed over the Internet, including the filing of 71% (11.1 million) of all returns. For FTB, the Internet has grown from a small channel to download tax forms to the department's main method of conducting business. FTB's e commerce (ECOM) applications must remain available and millions of tax records must be protected or California can lose taxpayers' confidence and a significant amount of revenue.

However, FTB's network evolved piecemeal over many years, without an overall plan for an integrated infrastructure that could withstand equipment failures and external and internal attacks. FTB initiated the E-Commerce Portal Infrastructure (EPI) Project to address risks in four key areas: availability, security, scalability, and manageability to ensure a network capable of supporting current and future E-Commerce applications.

The EPI solution uses industry best practices and cutting edge technology that mitigates FTB's risks and provides a solution for future growth. The EPI Project:

- Provides a highly available network with comprehensive, unified security and "zero-day" threat mitigation, with dual network paths;
- Improves security of taxpayer data, including a highly secure transaction environment composed of a multi-layered, hierarchical network environment that is self-defending and which eliminates single points of failure;
- Is highly scalable, using virtualized network technology that allows FTB to deploy new applications and services without redesign or procurement of additional system components, thereby providing cost-effective services to California citizens; and
- Improves manageability of FTB's network through centralized management tools that allow FTB to perform changes and upgrades to multiple environments in a single change window.

The EPI Project aligns with California's Statewide IT Strategic Plan and the NASCIO Risk Management category since it addresses IT security and privacy challenges related to internal and external threats such as: cyber attacks, major infrastructure failures, remote access, and application vulnerabilities. This allows FTB to efficiently meet the public policy goals of state leaders by giving us the ability to quickly and securely implement state e-initiatives. The EPI Project introduced an innovative solution that allows FTB to mitigate identified risks and business problems. FTB was the first state organization to implement a network infrastructure of this magnitude, providing a model for other states with critical data security needs.

Section C - Description

Problem

The Internet is the California Franchise Tax Board's (FTB's) main business channel. In 2010, taxpayers filed 17 million tax returns with FTB, 71 percent of which (11.1 million) were received electronically. With the amount of business done electronically, any failure of FTB's e commerce (ECOM) infrastructure can risk delaying revenue collection of up to \$1 billion per day during peak tax filing season. In addition, FTB maintains millions of pieces of confidential taxpayer information. To serve Californians, FTB's network must remain secure and available.

Security assessments showed that FTB's network had numerous risks in four main categories: Availability, security, scalability, and manageability, as described below:

1. **Availability** - The infrastructure contained many single points of failure that jeopardized FTB's ability to provide an uninterrupted ECOM environment to its internal and external customers. Taking one device down also took down the entire infrastructure. FTB also had a single Internet connection, making it vulnerable to physical threats and natural disasters.
2. **Security** – FTB had a reactive Intrusion Detection System (IDS) that could not block malicious attacks such as “zero-day” and “denial of service” attacks. Analyzing IDS data required manual diagnoses by local administrators so security was slow to block threats to FTB's confidential taxpayer data and/or network.
3. **Scalability** – The infrastructure limited FTB's ability to add new applications to the DMZ. Each new application required new hardware/software, which resulted in a lengthy procurement process, making it difficult to implement frequent changes in tax law or new programs.
4. **Manageability** – FTB had no centralized management tool for network devices, making support difficult.

Solution

When identifying solutions to address its risks, FTB considered three main strategies:

1. Continue adding new hardware to the existing environment in a piecemeal fashion. This would not have solved the long-term business problem.
2. Create a new environment with traditional appliance-based hardware. This would not provide flexibility and would have exposed FTB to many of the same risks associated with the old environment.
3. Design a new environment using cutting edge modular-based technology to leverage virtualization. This approach allowed FTB to mitigate identified risks and business problems, while strategically positioning FTB to lead California state government to face emerging cyber threats.

FTB chose Option 3 as the best solution because:

- It best addresses the four main risk areas of availability, security, scalability, and manageability facing FTB's network infrastructure and e-commerce availability;
- It is a cost-effective means to accommodate future growth in ECOM programs.

EPI has been in full operation for over a year and a half. It is based on a highly available, scalable and secure network that is centrally managed. It has performed as expected and successfully addressed the four main risk areas to the network. The project was initiated on January 17, 2007. The project team members conducted a Proof of Concept in October of 2008. The FTB put the EPI network into production on August 28, 2009 and finalized the project November 19, 2009.

EPI Technical Details

To ensure availability and information security, EPI is a highly secured transaction environment that is self-defending and which protects FTB and our customers. EPI allows FTB to maintain network connectivity during hardware failures or scheduled maintenance. To accomplish its objectives, EPI features:

- A multi-layered hierarchical network architecture that eliminates single points of failure.
- Security controls segmented into three zones that ensure security and availability. These technical controls are made up of dual-authored firewalls, intrusion detection and prevention system (IDPS), distributed denial-of-service (DDoS) prevention system and security incident event management system. The three zones include:
 - An Internet Public Zone, which directly interfaces FTB to the Internet and provides the first layer of defense.
 - An Extranet Secured Zone, a second layer of defense comprised of redundant Edge (separates FTB's internal network from the demilitarized zone (DMZ) and DMZ switch blocks.
 - An Intranet Secure Zone, which protects FTB's internal network from internal attacks.
- Virtual technology, allowing FTB to deploy new applications and services without significant network redesign or procurement of additional system components.

To address availability or accessibility to taxpayer data, EPI has provided FTB's customers the avenue to research for CA state tax information and subsequently file online with the confidence and assurance that the FTB will be available and secure 24 hours a day, 365 days a year.

EPI Project Management and Communication

The State of California was completely responsible for the oversight and outcome of the project. To ensure project success the EPI Project Manager provided regular status reports to the California Technology Agency, FTB's Chief Information Officer, the project

sponsor and steering committee. To ensure a successful outcome, FTB had internal and external independent verification and validation of requirement analysis throughout the project lifecycle, along with the review of test documentation and discussions with stakeholders.

EPI used the California's Project Management Methodology (CA-PMM) required by the California Technology Agency for all projects. The CA-PMM provides the framework for the entire Project Management Cycle from project concept to maintenance and operations.

The EPI Project Management Plan included communication strategies to ensure awareness, support, and adoption from critical stakeholders. Communication included:

- Using SharePoint and FTBNet (FTB's intranet site) as a means to share information regarding project status, documentation and meetings to educate our stakeholders and promote awareness and adoption.
- Regular project impact reports to customers via meetings and regular status reports to keep team members and stakeholders informed. The EPI Project also utilized FTB's department-wide change control process as a means of keeping key areas informed of equipment installation, changes in processes and implementation of the EPI network.

Section D. Significance of the Project

The EPI project is significant for many reasons including the innovative scope and approach of the project. Most importantly, EPI provides a secure platform so taxpayers and tax practitioners can use FTB's efficient e-government services safely, securely, and with confidence, allowing FTB to collect revenue more effectively for the State of California. EPI meets FTB's needs for the four main risk areas of availability, security, scalability, and manageability. In addition:

- The EPI project has improved government operations by leveraging technology in a safe, reliable and efficient manner, allowing FTB to pursue its goal of automating the tax filing and collections processes, results of which include:
 - A reduction in the number of seasonal employees hired during peak filing season, from 1,961 in 2001 to 1,374 in 2011.
 - Increasing the accuracy of captured tax return information as a result of automated tax return processing.
- The EPI infrastructure now allows routine maintenance of all devices to occur without taking the network offline or affecting customers.

With EPI, FTB showed innovation as the first state organization in the nation to implement an ECOM infrastructure of this magnitude, utilizing multiple virtual network components. This design provides a number of significant benefits:

- It is highly secure and self-healing due to the use of IDPS and DDoS guard, which automatically respond and block malicious and denial-of-service attacks.

- Due to redundancy, Ecommerce applications continue to function during unexpected hardware failures, when administrators perform troubleshooting, or maintenance.
- The virtual environments make FTB agile, due to our ability to quickly implement new applications without additional hardware and software.
- Switch, router, firewall and load-balancer are supported within the same chassis, reducing hardware, software, electricity and environmental requirements.
- System upgrades and maintenance are transparent to customers and performed using centralized management tools.

The EPI Project addresses the Governor's priorities of reducing costs and increasing government efficiency. In addition, EPI furthers several priorities identified in the NASCIO's State CIO 2011 Priorities and the state's IT Strategic Plan while benefiting taxpayers, business partners and the Internal Revenue Service (IRS):

- **Cost Control:** With EPI, FTB can add new applications without new hardware purchases and with minimal effort. This has decreased the cost of new tax applications and the number of employees necessary to maintain the network.
- **Consolidation:** The use of virtual technology has reduced the number of appliances and servers needed to support applications, resulting in lower maintenance and environmental overhead costs.
- **Security:** The EPI project implemented several security safeguards (described in detail in Section C) to protect the confidentiality of taxpayer data, protect the network from internal and external attacks and stop attacks as they occur.
- **Broadband and Connectivity:** The EPI Project includes redundant, geographically diverse internet connections, insuring that FTB, external business partners and taxpayers have a reliable connection for electronic communication.
- **Infrastructure:** The EPI project provides the base infrastructure necessary to support all current and future E-Commerce applications.
- **Virtualization:** The EPI project uses the most revolutionary network virtualization technologies available at the time, such as virtual firewalls, load balancers, routers, switches and centralized management tools.

Section E. Benefit of the Project

EPI's benefits align with the project's four major objectives of availability, scalability, security, and manageability.

1. **Availability:** The EPI network's high availability significantly improves FTB's operations. Before EPI, the network was offline up to 30 minutes per month for routine maintenance, which affected up to 20 million data transactions. Since EPI, FTB has incurred no network down time due to routine maintenance.
2. **Scalability:** The EPI environment uses scalable virtual technology that allows FTB to efficiently deploy applications without procuring new hardware that would

have been necessary with FTB's prior environment. New virtual environments can be implemented in as little as a week. Before EPI, hardware procurement alone would take 6 months to a year.

3. Security: EPI has significantly improved our visibility of threats. The IDPS has enhanced security resulting in the detection and automatic blocking of more than 200 malicious attacks per month. Additionally, in the first six month period after implementation, the DDoS system alerted us to 187 events.
4. Manageability: EPI has improved the manageability of FTB's network with centralized management tools that allow us to perform changes and upgrades to multiple environments in a single change window with no outage. In the old environment, these same changes would have required multiple change windows resulting in multiple outages.

Operational Benefits: The EPI Project benefits multiple stakeholders including: California taxpayers, strategic business partners, tax practitioners and other governmental agencies. The EPI project's measurable operational benefits to the State of California are:

- The EPI network protects taxpayer information, providing confidence that online transactions are reliable and secure. The improved security allows FTB to meet stringent IRS regulations, required to access IRS federal taxpayer information, which generates \$600 million per year in tax revenue for the State of California.
- Currently, 65% of the state's general revenue, more than \$60 billion annually, traverses the EPI network. This revenue is crucial to the State of California and an interruption could significantly interrupt the state's cash flow. During the last week of peak filing season, FTB collects over 1 billion dollars per day through its E-Commerce network.
- The EPI network provides security and scalability to support FTB's innovative web applications such as FTB.CA.GOV and E-File, which allowed the electronic submission of over 11 million returns in 2011.

While the EPI project recognized some cost savings, the tangible fiscal outcome of this project is cost avoidance due to the potential for the delayed collection of revenue for the State of California. EPI's actual one-time cost was \$5,795,863 and annual ongoing cost of \$1,428,389 (including personnel costs).

EPI also provides qualitative outcomes including increased employee morale and teamwork. During the EPI project design phase, all team members cohesively worked together to architect the system and develop common logic and standards that were applied throughout the design. This fosters a team atmosphere where network engineers can easily work on any environment within the EPI framework.