

## State Street Corporation Banks on a High-Availability MPLS Network

### EXECUTIVE SUMMARY

#### CUSTOMER NAME

- State Street Corporation  
Boston, Massachusetts, United States

#### INDUSTRY

- Financial Services

#### BUSINESS CHALLENGE

- Improve network availability
- Consolidate and simplify network topology
- Create a foundation for extending voice and video applications enterprise-wide

#### NETWORK SOLUTION

- Deployed redundant dual-carrier network
- Changed core network from hub-and-spoke model to any-to-any topology
- Extended IP Communications capabilities company-wide using Cisco 3800 Series integrated services routers

#### BUSINESS VALUE

- Reduced global telecom expenses by 40 percent
- Increased network management productivity by approximately 68 percent with 34 percent fewer staff members
- Dramatically increased network availability

State Street Corporation built an “enabling” network to dramatically improve availability while extending voice and other innovative services enterprise wide.



#### BUSINESS CHALLENGE

With \$10.1 trillion in assets under custody as of December 31, 2005, State Street Corporation is recognized as the leading servicer of U.S. mutual funds and pension plans. The company is also the leading institutional investment manager in the United States with \$1.4 trillion under management as of December 31, 2005. Founded in 1792 and headquartered in Boston, Massachusetts, State Street now employs more than 21,000 people in 26 countries and 100 geographic markets worldwide.

State Street's network must support clients' investment strategies globally. During the 1990s, as State Street experienced rapid growth, its existing network was extended numerous times to keep up, eventually spanning more than 100 financial markets. Network nodes were located in more than 60 offices around the world and supported more than 500 client connections. Many network extensions had been built without considering futures scalability and as a result, the network was difficult to manage.

In addition to serving clients and business partners, the network also supports many different business units within State Street—all of which facilitate portions of time-sensitive trade settlements. Ensuring timely settlement depends on network availability. Unfortunately, the existing network infrastructure suffered from frequent performance problems that affected availability. When Gordon Bither assumed responsibility as State Street's senior vice president of integrated network solutions in 2003, he faced a tremendous challenge.

"Availability means everything to our business, and the existing network was not delivering it," says Bither. "We wanted to deploy a network architecture that would ensure high availability and also help us control costs, improve our end users' experiences, and allow us to deploy voice and video."

State Street reevaluated its entire network architecture and strategy, deciding to consolidate its carrier relationships, outsource network installation and management, and build a network foundation for the future. One requirement for the new network was that it be based on equipment from Cisco Systems®.

"Deploying a Cisco network was a criteria because of our companies' strong relationship," says Bither. "We choose partners who can ensure that we are able to maintain the highest level of availability and efficiency, and Cisco is one of those partners. We also choose service providers on that basis." In 18 months, State Street completed a comprehensive network re-construction and migrated from a single-carrier Frame Relay global network to a fully managed dual-carrier network.

## **NETWORK SOLUTION**

State Street chose dual, managed Multiprotocol Label Switching (MPLS) WAN services from AT&T and MCI to meet its global connectivity network requirements. Both carriers support approximately equal volumes of network traffic, and each is capable of carrying 100 percent of the traffic in the event of a failure in the other's network. The two service providers are responsible for monitoring service-level agreement (SLA) compliance.

With the WAN decision made, Bither and his team, led by Steve J. White, vice president of network engineering for State Street, began working on a comprehensive core network strategy. The new network architecture creates a solid infrastructure foundation that scales to support advanced services, such as security, wireless, voice, and video. The network is also designed to enable a repeatable infrastructure deployment process across all State Street locations. White's team defined six standard service models for State Street offices and eight standard service models for client organizations. Each service model includes SLA targets that are based on the different requirements of the offices and client institutions.

State Street's remote offices are connected to the MPLS WAN using Cisco 7200 Series routers or Cisco Catalyst® 3750 Series switches, depending on the specific needs of the remote office. The MPLS WAN is fully meshed, enabling any-to-any connectivity across the infrastructure, including primary data center connectivity.

The company's core network is deployed in eight data centers around the world, where the company's applications and systems are centralized for distribution. The core network is built on dual Cisco Catalyst 6509 or 6513 switches connected by Gigabit Ethernet links. The Catalyst 6500 Series switches are configured for delivering high availability with redundant switch fabric modules, dual power supplies, and redundant supervisor engines with subsecond failover.

#### **Elements of State Street Corporation's High-Availability Network**

- Dual-carrier, managed fully meshed MPLS network
- Both carriers capable of carrying 100 percent of traffic
- Carrier-based SLA compliance monitoring and reporting
- Cisco Catalyst 6500 series switches with redundant switch fabric modules, dual power supplies, and redundant supervisor engines with subsecond failover
- QoS deployed for voice and data using Low-Latency Queuing techniques
- Cisco 3800 and 2800 series integrated services routers configured with Hot Standby Routing Protocol (HSRP) and Survivable Remote Site Telephony (SRST)

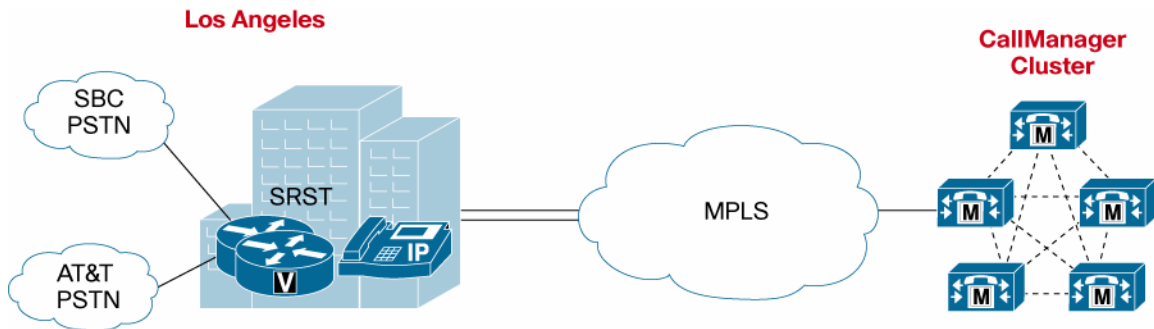
The core network connects to a distribution-layer network, which is also built using Cisco Catalyst 6500 Series switches. State Street chose Cisco Catalyst 6500 Series switches for its network access layer as well. Using Catalyst 6500 Series switches in all network layers allows State Street to pursue a network model that facilitates a network segmentation topology and allows it to separate critical business applications from user assistance applications. Internet connectivity is provided by various service providers around the world, terminating at Cisco 7200 Series routers over a separate network in each data center.

“The Cisco Catalyst 6500 Series switch is a superb technical solution that can scale easily—simply by replacing line cards rather than by having to change chassis,” says White. “The ability to scale from 32 to 720 Gbps in the same backplane and in the same chassis is impressive. We expect this switch to be a 10-year platform and to be in our environment for a long time.”

A secondary objective of deploying a new network infrastructure was to reduce communication costs. During 2002, State Street had evaluated IP telephony technology to support a small remote office and chose a Cisco voice over IP (VoIP) solution. In the succeeding three years, the company continued to deploy a Cisco VoIP solution for each new office that it opened. With a new network foundation that was now capable of supporting voice companywide, and with the required quality of service (QoS), Bither and White had a compelling business case for deploying an enhanced Cisco IP Communications solution.

As Figure 1 illustrates, State Street deployed Cisco CallManager systems in its data centers to provide centralized call processing features company-wide and eliminate the need to deploy separate private branch exchange (PBX) systems in each remote office. In addition to significantly reducing or avoiding PBX licensing and maintenance costs, centralized CallManager systems greatly simplify management. Existing PBX systems are integrated with the CallManager environment through Cisco Communication Media Modules (CMMs)—Catalyst 6500 Series line cards that provide flexible, high-density T1 and E1 gateways. With the CMMs, State Street can connect its existing time division multiplexing (TDM) network and provide connectivity to the public telephone system while taking advantage of innovative new IP Communications solutions.

**Figure 1.** Centralized Call Processing Extends Advanced IP Communication Solutions to Remote Offices



- **Centralized Call Processing**
  - Quincy Cluster
  - LA Initial Deployment 50 IP Phones
  - Rye Brooke NY
  - G.729 voice calls to State Street Locations
- **Dual SRST Gateways**
  - SRST Reference is the HSRP Address
- **Centralized Unity Voice Mail—Grafton**
  - G.711 Region for Voice Mail

In addition to supporting employees and institutional clients, State Street supports business partners and traders through numerous internal contact centers that provide investment manager services, help desks, access to financial business units, and assistance with other critical business processes. The company’s goal is to support call center agents around the world, giving clients “with the sun” access to trading staff and assistance.

“To achieve that goal, we layer IP Communications capabilities on our core infrastructure,” says White. “We chose Cisco CallManager and Cisco IP Contact Center to deploy an innovative IP-based contact center over our new network.” Cisco IP Contact Center provides State Street with intelligent contact routing, call treatment, and unified IP telephony capabilities across a distributed environment. It transparently integrates inbound, outbound, Web collaboration, and email communication while enabling State Street to preserve its investments in interactive voice response and other existing call center technology.

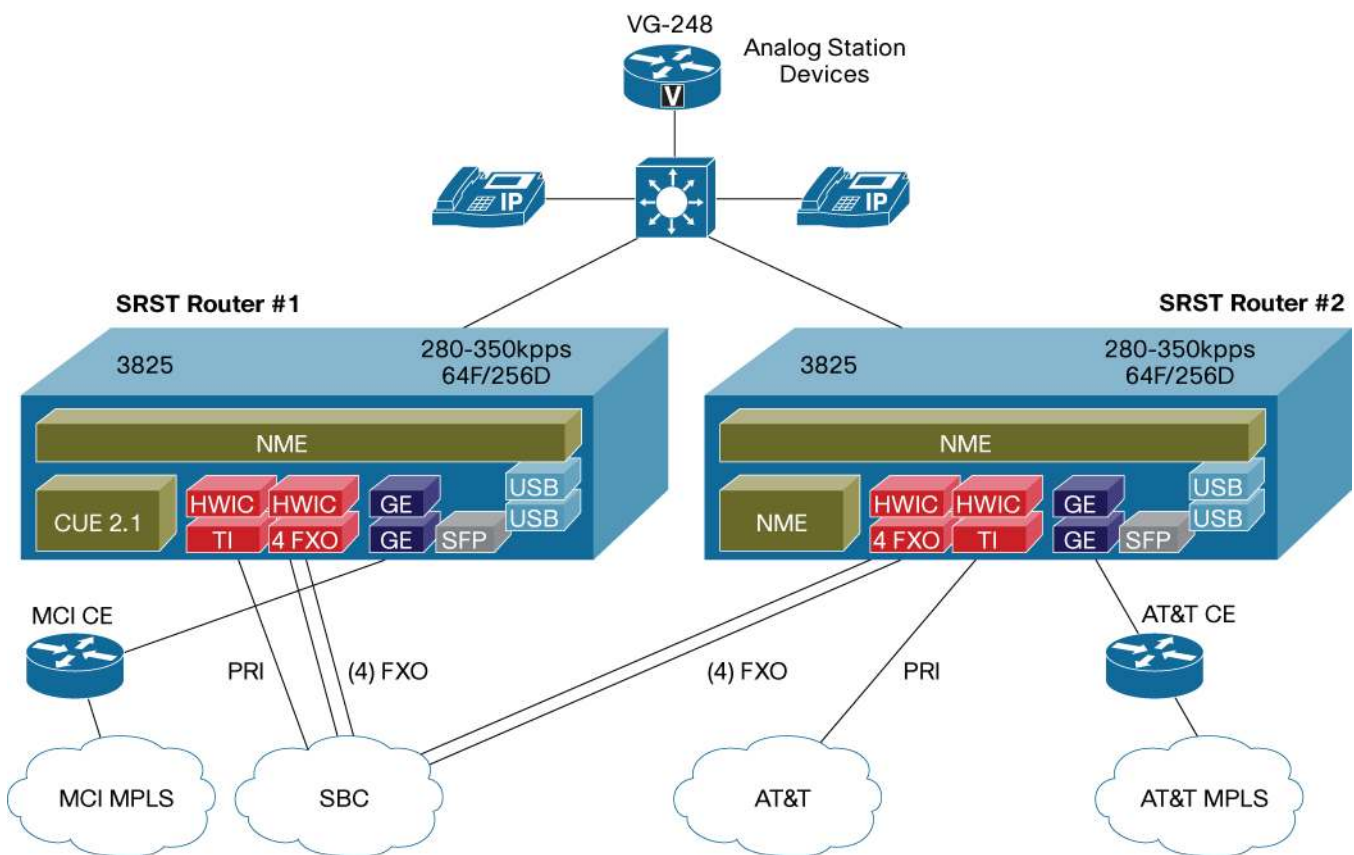
**“The Cisco 3800 integrated services routers provide compact, resilient capacity for PSTN capabilities, as well as support audio conferencing. In the future, we plan to standardize on the Cisco 3845 Integrated Services Router for small to medium-sized offices.”**

—Steve J. White, Vice President for Network Engineering, State Street Corporation

State Street is extending IP Communications solutions to remote offices using dual Cisco 3800 Series integrated services routers. These routers are ideally suited to remote offices with a range of application needs. They support business telephony and contact center agent connectivity through a centralized CallManager cluster. As shown in Figure 2, the Cisco 3800 Series integrated services routers provide gateway connectivity to public switched telephone network (PSTN) providers using T1/E1 primary rate interfaces (PRIs) and analog foreign exchange office ports to central office trunks for overflow and 911 emergency services. In some locations, the Cisco Unity Express Module provides auto attendant capabilities.

This versatile routing platform usually is connected to a Cisco Catalyst 3750 series Switch, which includes Power over Ethernet features to power Cisco IP phones. Each Cisco 3800 Series Integrated Services Router is configured with Hot Standby Routing Protocol (HSRP) and Survivable Remote Site Telephony (SRST) features that will help ensure business continuity, allowing voice service to continue in the event of a WAN failure. The routers are also equipped with Cisco High-Density Extension Modules. These modules allow connectivity directly to the PSTN in the event of a router failure or building power outage. If power is lost in the facility, there would still be several analog phones capable of placing and receiving PSTN calls. The Cisco 3800 Series integrated services routers are managed by State Street and connected over Ethernet to a carrier-managed edge device, which connects to the MPLS network.

**Figure 2.** Remote Office Dual SRST Gateway Detail. Each Remote Office That Relies on Voice Services Over the WAN Uses a Dual Router Configuration for Maximum Availability.



“The Cisco 3800 integrated services routers provide compact, resilient capacity for PSTN capabilities, as well as support audio conferencing,” says White. “In the future, we plan to standardize on the Cisco 3845 Integrated Services Router for small- to medium-sized offices.” Currently the Cisco 3800 Series routers are deployed in Rye Brook, New York; Los Angeles, California; and London, England. For offices where voice is not a requirement, State Street deploys Cisco 2800 Series routers.

With voice running over the WAN and future plans for deploying video applications, State Street benefits from the QoS features inherent in its MPLS WAN services to prioritize voice over less-delay-sensitive network traffic. The company can take advantage of basic MPLS traffic management features and standard queuing mechanisms, such as Low-Latency Queuing for voice. Voice control traffic is marked as Media Gateway Control Protocol and H.323 control traffic, while data applications are routed according to class-based, weighted fair queuing markers.

## PRODUCT LIST

- Cisco Catalyst 6500 and 3750 Series switches
- Cisco 7200 Series routers
- Cisco 3800 and 2800 Series integrated services routers
- Cisco CallManager and Cisco IP Contact Center
- Cisco NetFlow Collection Engine

## BUSINESS VALUE

State Street deployed its regional data centers and more than 65 offices within 18 months—without a problem. Today the company has completed migration of approximately 90 percent of its clients' sites over the MPLS WAN.

“By aligning people, processes, and network products with a disciplined approach to network design, we have dramatically reduced network complexity,” says Bither. “Our first-time success rate on changes has increased from 67 to 98 percent. We have improved productivity by approximately 68 percent with 34 percent fewer staff members.”

With the dual-carrier, MPLS WAN, State Street has experienced dramatic improvement in network availability. By moving from a hub-and-spoke topology to an any-to-any model, the company has reduced the demands on its regional data centers and enabled remote sites to more easily access and use distributed, high-performance applications and services.

“The new topology has also enhanced our disaster-recovery capabilities,” says White. “Because locations no longer rely on a specific hub, they're able to automatically route around a potential failure and access applications without human intervention. We extended that model to our client network, so client traffic will be carried on a secure extranet, which allows them to route to any of our data centers. If an event occurs that disrupts part of the network, we can recover these clients automatically if necessary.”

From the deployment of the new Cisco network and IP Communications solutions, Bither also reports a reduction of the company's global telecom expenses by 40 percent. Now with a powerful service-oriented network infrastructure in place, State Street has many plans for systematically deploying new capabilities.

**“From a business viewpoint and a technology advancement perspective, we believe that Cisco networking solutions provide us with the enhanced features that we were looking for. They delivered ease of use for our employees, enhanced our disaster recovery capabilities, significantly improved network reliability, and allowed us to consolidate our call-processing architecture and control costs.”**

—Gordon H. Bither, Senior Vice President, Integrated Network Solutions, State Street Corporation

## **NEXT STEPS**

“Our goal is to implement a global QoS strategy in 2006,” says White. “Although we have deployed QoS in network locations that support voice traffic, we are moving toward a completely traffic-engineered environment that will allow us to manage traffic with more granularity instead of just adding bandwidth.”

Currently White and his team are using the Cisco NetFlow Collection Engine to provide data for making traffic-engineering decisions as they prepare to add video applications to the network and develop their network-wide QoS strategy. Other potential projects include implementing unified messaging and adding wireless capabilities.

“From a business viewpoint and a technology advancement perspective, we believe that Cisco networking solutions provide us with the enhanced features that we were looking for,” says Bither. “They delivered ease of use for our employees, enhanced our disaster recovery capabilities, significantly improved network reliability, and allowed us to consolidate our call-processing architecture and control costs.”

## **FOR MORE INFORMATION**

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To learn more about Cisco switching solutions, visit: <http://www.cisco.com/go/switching>

To learn more about Cisco IP Communications solutions, visit: <http://www.cisco.com/go/ipc>

To learn more about State Street Corporation visit: <http://www.statestreet.com>

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