



Case Study

## Cisco Small Mobile Office Makes Flexibility Affordable and Practical

**Cisco IT Case Study / WAN/LAN/Metro / Small Mobile Office:** This case study describes Cisco IT's internal solution deployment of a compact Small Mobile Office within the Cisco global network, a leading edge enterprise environment that is one of the largest and most complex in the world. Cisco customers can draw on Cisco IT's real-world experience in this area to help support similar enterprise needs.

**The Cisco® Small Mobile Office (SMO) solution originated in Europe, the Middle East, and Africa (EMEA) in early 2000, a time of rapid expansion for Cisco Systems®. Adds, moves, and changes were happening at such a fast pace that the management team was challenged to plan, resource, and budget for these changes. On-site resources for cabling, project management, and engineering accounted for 60–80 percent of the technical infrastructure costs to deploy a small office. Cisco IT needed a solution that would make the total cost of ownership predictable and improve the return on capital investment. These needs are just as important today under changed business conditions.**

The original version of the solution, dubbed "E-Rack," was an office infrastructure system self-contained within a reusable shipping rack. The advent of Cisco AVVID (Architecture for Voice, Video and Integrated Data) allowed this to be a pure Cisco solution. E-Rack included routers, switches, Cisco CallManager, and infrastructure application servers. The idea was to build a "one size fits all" solution in an assembly line manner in a central location that could be shipped to its eventual destination. Although it was recognized that not every office would need all the equipment provided in the E-Rack, the intent was to standardize, to control costs, and to provide a predictable run rate.

As the technology matured and the business environment changed, the solution requirements moved ahead as well. The most important technical evolution was the advancement of call processing capabilities into the Cisco IOS® router. This capability, known as Survivable Remote Site Telephony (SRST), underlies the Cisco IT strategy to centralize call processing. With SRST came the opportunity to transform the original E-Rack into a leaner solution and demonstrate Cisco adaptability in a dynamic business environment.

*Challenge:* Create a standard networking solution that can be deployed quickly in small offices to reduce costs and enable office site flexibility.

*Solution:* Cisco Small Mobile Office (SMO), a standardized set of infrastructure network and service components racked in a rugged shipping case and designed for easy installation by a third-party service provider.

*Results:* Putting Cisco SMO in seven offices has saved Cisco workplace resources group \$1.2 million, and Cisco IT has saved thousands of dollars in installation and maintenance costs.

### Challenge

In the late 1990s, Cisco IT had several problems: a growing number of sales offices, spread over the globe, that moved frequently and lacked proper IT support. IT employees spent more and more time on office moves, limiting their ability to deliver new technology solutions. Cisco IT needed to differentiate core competencies from context activities that could be out-tasked.



## **Business Challenges**

Physical constraints are common at small office sites. The production infrastructure environment must provide physical security, power conditioning, air conditioning, and, of course, floor space. One of Cisco IT's challenges was to minimize special power requirements and the footprint of required networking equipment while allowing flexible placement in environments where production infrastructure previously could not go: in ordinary office space or labs.

Another challenge was to make the network infrastructure more portable. Lease agreements for small offices typically run 12 or 24 months. Cisco IT needed to reduce the cost of infrastructure relocation, increase Cisco influence in lease negotiations, and provide the flexibility for offices to move to optimal locations. The Cisco workplace resources group estimated a period of 28 weeks to build out the technical infrastructure for a field sales office. Cisco IT wanted to help reduce this to eight weeks or less.

Over time, diverse infrastructure configurations tend to proliferate at remote offices, making management of repairs and inventory sparing more difficult. Cisco IT wanted to standardize the design and assembly of small office infrastructure, using a centralized assembly-line approach, reproducible configuration, and simplified onsite installation.

## **Technical Challenges**

To classify sites appropriately, Cisco IT had to consider several dimensions—WAN, LAN, telephony, file service, print service, and content networking—each of which has its own scaling increments. The emerging goal was to provide a self-contained solution for offices of 25 or fewer people, fulfilling service needs in all these dimensions and providing self-contained uninterruptible power supply (UPS) to provide backup power for at least two hours.

The solution had to be adaptable to evolving technical requirements. The rack height, UPS, and ventilation specifications had to accommodate change and allow for the use of discrete chassis components.

## **Project Challenges**

Simply changing the way things are done creates a set of project-level challenges. One challenge was proving that the solution would be viable economically. A second challenge was building on existing relationships. A significant challenge was coordinating cross-functional, cross-theater, and cross-company efforts during a time of "slimming down" within the industry itself.

## **Solution**

Initially, Cisco IT designed an integrated solution for sales offices, the E-Rack, and partnered with a service integration partner to begin deploying it throughout EMEA. This innovation was seen as key to solving a similar problem in the Americas theater. A project was formed and named Cisco SMO.

The Cisco SMO solution has two aspects: technical and operational. Technically, Cisco SMO is a standardized set of infrastructure network and service components racked within a rugged shipping case. Operationally, Cisco SMO is built centrally in an assembly-line fashion and delivered by common carrier to field sites, where installation and repair support can be provided under third-party agreements.

## **Network**

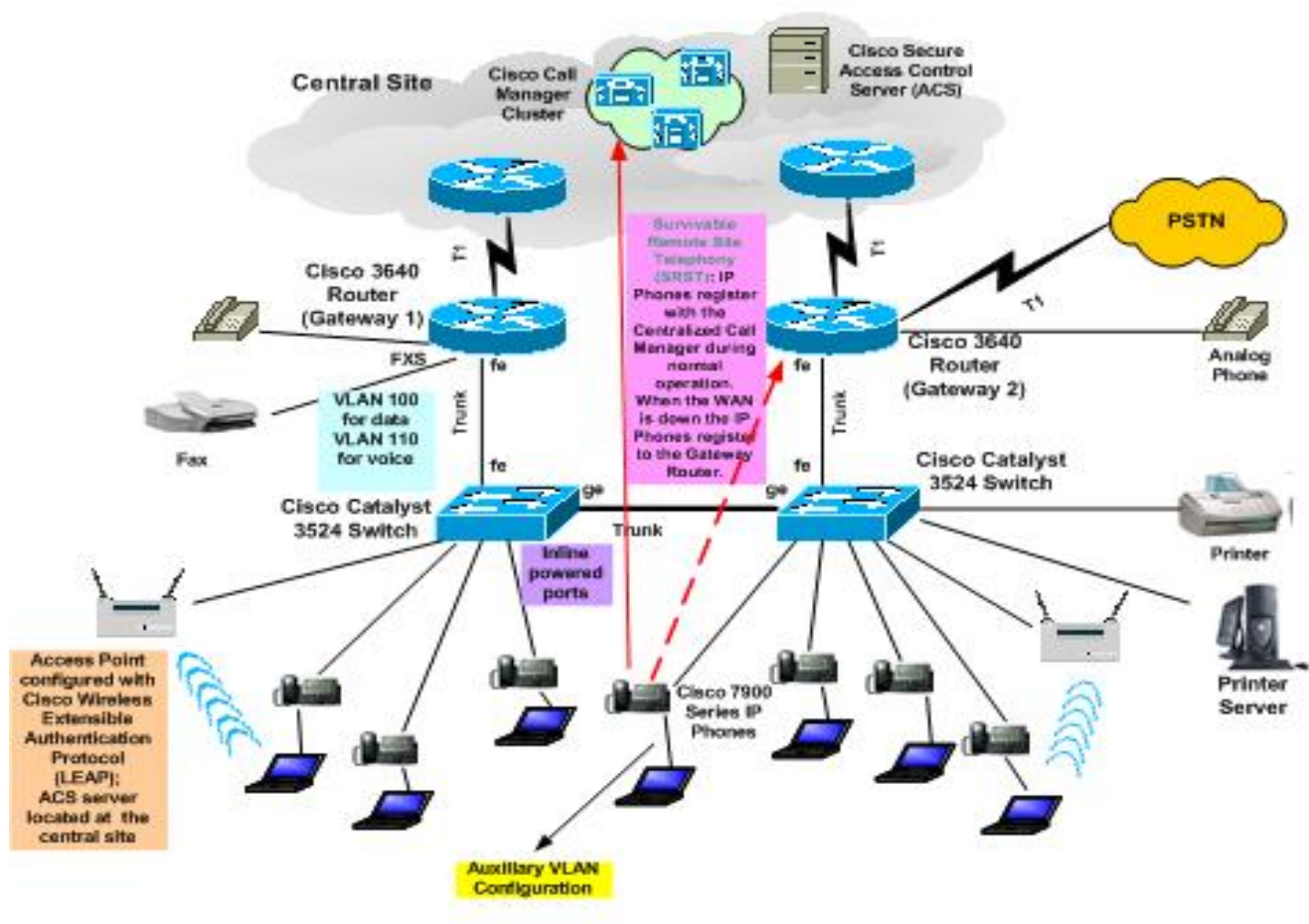
The Cisco SMO solution aligns with Cisco IT's developing network and call-processing architecture for the North America regions. In 2002 the Cisco production WAN was transformed from a long-haul hub-and-spoke architecture to a shorter-haul regional-hub architecture, based on the need to support latency-sensitive peer-to-peer applications such as Cisco AVVID, and taking advantage of distance-based pricing on T1 and DS3 circuits. The result was a 300 percent increase in available bandwidth to most sites with zero marginal cost.

In roughly the same time frame, Cisco IT began centralizing call processing, with about 25 smaller sites relying on WAN-connected Cisco CallManagers provided at regionally central locations (Figure 1). SRST ensures continued telephone service at the remote sites should the



WAN go down. WAN, LAN, telephony, content networking, Cisco IP/TV®, file services, and print services are provided for each Cisco SMO site. For high network availability, Cisco SMO provides local sites with redundant circuits, routers, and switches.

Figure 1 Centralized Cisco CallManager Architecture



## Product Evolution

Products naturally evolve, and so the rack and UPS are amply sized to accommodate change. In the early deployment of Cisco SMO, the Cisco 3640 Multiservice Platform initially specified was succeeded by the Cisco 3745 Multiservice Access Router. In addition, the Cisco Catalyst® 3524 XL Switch was succeeded by the Cisco Catalyst 3550 Switch. Because Cisco IT has several Cisco 3640 platforms and Cisco 3524 switches in reserve, rotating in and out of deployment from various locations, the first wave of Cisco SMO installations has used the originally specified gear. But now Cisco SMO will be built on the Cisco 3745 router and Cisco Catalyst 3550 Series switches.

## Centralized or Distributed

Service provision is either centralized or distributed as appropriate for the target site classification of 25 users or less, with sensitivity to cost and bandwidth tradeoffs. Call processing is centralized, with SRST for continued telephone service on the rare occasions when the WAN is down between the office and the Cisco CallManager. File service for Cisco SMO-class offices is provided by centralized network attached storage (NAS) arrays. This provides for robust data integrity and backup and restore without the high cost of providing NAS at each small office.



In North America, the relatively low cost of WAN bandwidth has made it practical for small offices to rely on content servers at WAN hub locations. In the future Cisco IT is considering deploying a Cisco 565 Content Engine for the Cisco SMO rack.

Access control lists (ACLs) prevent the transport of bandwidth-intensive Cisco IP/TV streams across the Cisco enterprise terrestrial WAN. For Cisco IP/TV, Cisco SMO includes a digital-video-broadcasting-based IP Multicast satellite receiver. Under contract, a third party provides antenna installation and onsite service.

Because the cost is low and the bandwidth savings are significant, Cisco SMO provides the small office with a local print server. Print service in Cisco worldwide is provided through the Cisco Enterprise Print System (EPS), an internally developed Cisco tool based on open-source software. Cisco EPS enables a handful of Cisco IT employees to manage more than 6000 printers across the globe.

### **Environment**

Cisco IT worked with several vendors to design a padded flight case for protection and rigidity during transport. The rack is integral with the flight case and remains onsite, allowing the whole assembly to be easily positioned, relocated, and secured. The case is equipped with heavy locking casters. Hatches, which are open for cabling and ventilation, can be latched shut for transport. UPS-powered ventilation fans allow the Cisco SMO gear to run with the case closed and locked, enabling flexible rack placement, reducing the need for a closet. The Cisco SMO rack doors are secured with built-in combination locks to eliminate the problem of lost keys.



Figure 2 Cisco SMO in Flight Case

Power for the entire set of Cisco SMO components is provided by a UPS and a battery mounted in the bottom of the case. The weight of the battery makes the case resistant to tipping. Based on UPS readouts, the Cisco SMO configuration should run for nearly five hours on battery power. Cisco internal testing in an 80°F (26.6°C) ambient environment showed that all Cisco SMO components ran well within their temperature ratings with the rack doors secured and the UPS inverter providing power from the battery for two hours. Line power for the UPS is a single 30-amp 110-VAC circuit. Environmental monitoring is provided by sensors connected to the UPS. The sensors, the UPS, and all the components of Cisco SMO are monitored remotely through Simple Network Management Protocol (SNMP).

Overall, the Cisco SMO solution encompasses all the infrastructure technical components required by a small office, delivering a truly flexible all-in-one small office solution.



## Results

By May 2003, the Cisco SMO solution had been deployed in seven locations: Greenville, South Carolina; Virginia Beach, Virginia; Huntsville, Alabama; Tucson, Arizona; El Paso, Texas; Boston, Massachusetts; and Louisville, Kentucky. More deployments are planned, including some in Latin America.

Cisco Work Place Resources (WPR) collaborates with Cisco IT in the choice of Cisco SMO sites and has actively encouraged the transformation of traditionally racked installations into the more flexible Cisco SMO configuration. Each decision is reached considering technical factors such as WAN topology and business factors such as the need for real estate flexibility.

## Savings

Cisco Work Place Resources recognizes \$175,000 in up-front costs saved for each new site where Cisco SMO eliminates the costs of a fixed UPS and building distribution frame. Further tangible value is added because Cisco SMO extends the useful life of infrastructure equipment by making it easier to redeploy. Ongoing business value is added because Cisco SMO drives down the cost of being flexible to allow more optimal office sizing, location, and lease negotiation.

Although Cisco IT and Work Place Resources recommend ample cabling, cabling is a major cost at any site. In Tucson, Cisco ran only two cables per cubicle, a 50 percent reduction in normal cable density. With the overlay of the Cisco Aironet® wireless network, this trial approach is working well.

Cisco IT saves thousands of dollars by avoiding the costs of sending a network engineer to each new site to install and test the equipment and to stand by on site during the next few days to respond to any issues that arise. Moving this equipment from one site to another will be equally easy. In addition, the Cisco SMO EPS server now used to monitor local printers reduces time and expense for onsite personnel.

## Lessons Learned

Among the lessons learned from project inception to date:

- Streamline deployment by doing as much assembly as possible in one location before shipping
- Minimize shipment and customs transitions by choosing your assembly site(s) carefully
- Understand the customs rules as they apply to assembled solutions, as distinct from prepackaged manufactured goods

With these lessons learned, Cisco IT now routinely builds and delivers the Cisco SMO solution within eight weeks, including product ordering time and transit to the destination site.

Originally, the Cisco SMO solution included a rack-mounted keyboard-video-mouse shelf for support convenience. The shelf was eliminated because support personnel typically have laptop computers, and the Cisco EPS server can be accessed online after it starts using BOOTP (bootstrap protocol).

The variety of printers at remote offices is one aspect of the configuration diversity challenge. Cisco SMO provides the office with a Cisco EPS print server, but occasionally the office will have already spent money for a printer that is not supported by Cisco EPS. The cost of acquiring a new Cisco EPS-compatible printer is offset by the improved service, maintenance, and monitoring provided.

## Next Steps

With significant experience in deploying the Cisco SMO solution and lessons learned, Cisco recommends the following next steps:



- Cisco IT is evaluating the Content Engine network module (NM-CE) on the Cisco 3745 Multiservice Access Router as a platform for hosting the Cisco EPS server.
- The Cisco 3745 Multiservice Access Router and Cisco Catalyst 3550 Series Switch will be integrated in succeeding Cisco SMO deployments.
- Onsite installation under the current Global Service Delivery arrangement needs to be made routine.
- When a DS3 blade is available for the Cisco 3745 Multiservice Access Router, consideration can be given to scaling Cisco SMO to larger site classifications.
- Gather feedback from site users about Cisco SMO to further optimize this solution.
- Current sizing considered, the move to an all-wireless solution lies ahead using advances in the Cisco Aironet product line and the wireless LAN IP telephone.

This publication describes how Cisco has benefited from the deployment of its own products. Many factors may have contributed to the results and benefits described; Cisco does not guarantee comparable results elsewhere.

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