



White Paper

The Business Case for Cisco IP Solutions for Mobile Operators

Recent advances in mobile technology have made it possible to reduce capital and operational expenditures (CapEx and OpEx) while deploying networks with greater optimization, manageability, and ease of new service deployment. Cisco Systems® has dedicated global resources to the evolving mobile network market and understands the requirements for the move to optimized third-generation and fourth-generation (3G/4G) mobile network services and architectures. Cisco® IP and Cisco IP Multiprotocol Label Switching (IP/MPLS) solutions have been tested and are currently being deployed by leading mobile service providers worldwide. These IP-based solutions provide the intelligence and efficiencies behind growing volumes of mobile voice, data, and multimedia traffic moving through the backbone, transport edge, provider edge, and access layers of the most advanced mobile networks.

Collaborating with the most innovative leading mobile operators, Cisco is helping to transform the design, profitability, and cost-effectiveness of mobile networks with superior technology, combined development and marketing activities, and the expertise available from Cisco Advanced Services. Mobile operators can deploy innovative, converged architectures to deliver new mobile services while taking advantage of existing network efficiencies. The business cases behind network convergence over a Cisco IP/MPLS backbone and IP-based technologies for IP Transfer Point (ITP) Signaling System 7 (SS7), Short Message Service (SMS) messaging, and radio access network (RAN) optimization are clear. These and other solutions will appeal to mobile operators around the world who are seeking to optimize and modernize their networks.

THIS PAPER PRESENTS THE BUSINESS FACTORS BEHIND THE MOVE BY MOBILE OPERATORS TO END-TO-END IP AND IP/MPLS SERVICES. IT SUMMARIZES THE CISCO NEXT-GENERATION MOBILE PLATFORM FOR MOBILE OPERATORS – INCLUDING CISCO IP/MPLS BACKBONE, CISCO IP SIGNALING AND MESSAGING SOLUTIONS, AND CISCO RAN OPTIMIZATION SOLUTION – AVAILABLE IN CISCO IOS® SOFTWARE AND ON CISCO PLATFORMS. COMPLEMENTARY SERVICES AND MARKETING RESOURCES FOR SERVICE PROVIDERS WITH THE CISCO POWERED NETWORK DESIGNATION ARE ALSO DISCUSSED.

Summary

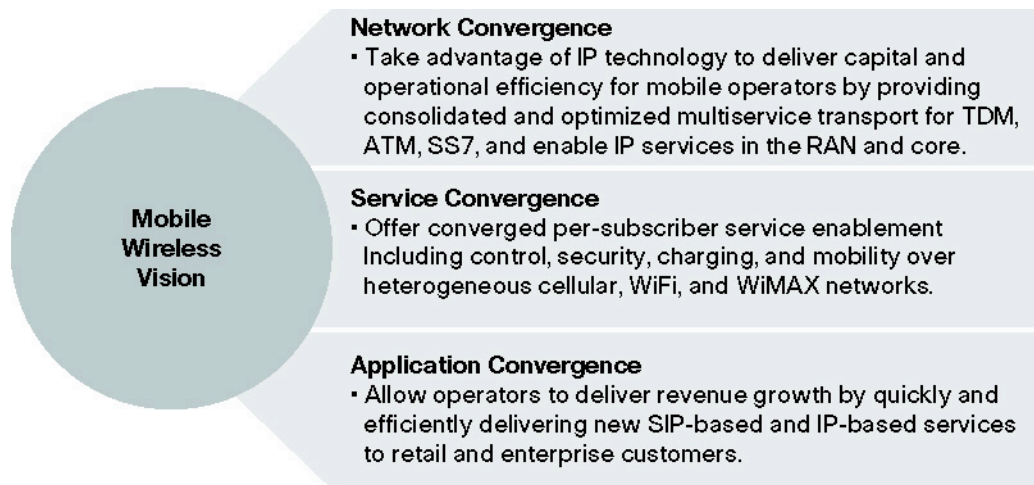
Cisco IP and IP/MPLS technologies help mobile operators to reduce costs, increase business agility, and provision IP next-generation services. The Cisco IP Next-Generation Network (IP NGN) vision and architecture for mobile operators provides a superior platform for converged services, support for flexible billing and service plans, a migration path to an IP foundation, interoperability with different radio access technologies, and open and distributed support for multiple-vendor implementations.

Cisco is uniquely positioned to provide mobile operators with immediate network benefits and long-term business success with intelligent solutions and approaches that help service providers *connect customers with services, services with networks, and networks with each other.*

An important subcomponent of the Cisco IP NGN vision, the Cisco mobile wireless architecture involves IP-based convergences at three key network layers (Figure 1).

Figure 1

Cisco Mobile Wireless Vision: IP-Based Convergence



Mobile operators need an application layer that interfaces with the customer, a secure network layer that creates and delivers the services, and between them both, a service control and virtualization layer that orchestrates the delivery, operations, features, and billing of the service itself. Intelligent networking makes it possible to connect all three layers to make the resulting communications as efficient and productive as possible. Intelligent networking simplifies the complexity of operating such a network by making it more resilient, integrated, and adaptive – an IP Next-Generation Network for mobile operators.

Solutions discussed in this paper occupy the secure network layer and include:

Cisco IP/MPLS Backbone

Cisco IP/MPLS backbone technologies in Cisco IOS Software provide a common transport and integrated management platform for the convergence of packetized voice, video, and data services over existing ATM, time-division multiplexing (TDM), and Frame Relay networks.

Cisco IP Transfer Point Signaling and Messaging Technologies

As a key component of the Cisco IP NGN strategy, the Cisco IP Transfer Point (ITP) is the premier next-generation core signaling platform. The solution can also increase SS7 efficiency, lower circuit costs by moving signaling traffic from an older network to an IP-based Signaling Transport (Sigtran), and enhance a mobile operator's ability to manage high peak demand for SMS messaging. The Cisco ITP provides an industry-leading QoS capability to prioritize SS7 traffic according to destination, service, or message type. If used in conjunction with a Cisco IP/MPLS deployment, the Cisco ITP can also enhance the overall reliability of the signaling network.

Cisco Radio Access Network Optimization

The Cisco RAN Optimization solution supports the industry's accelerating migration to IP by taking it all the way to the cell site, helping the operator to reduce backhaul costs, improve cell site maintenance, and support additional services that can be provisioned from this valuable asset.

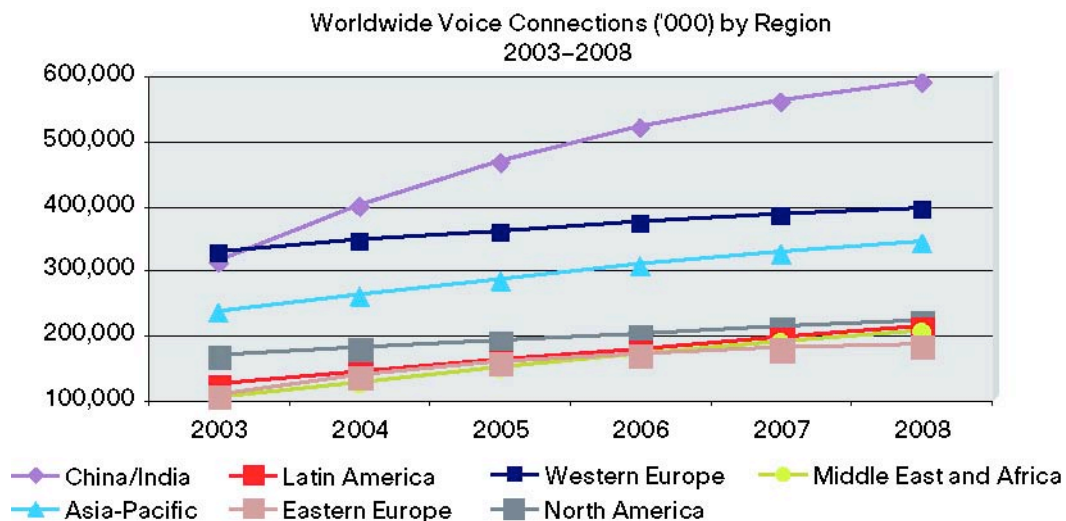
These solutions are components of the newest mobile service architectures and provide cellular and wireless LAN (WLAN) operators with significant operational cost savings, enhanced scalability, increased bandwidth optimization, and tremendous efficiency and flexibility in adding incremental services to stay ahead of customer demands and business requirements.

Challenge

In countries with market penetration approaching saturation, mobile operators are focusing on 3G mobile data services to increase revenues. The once rapid growth of new mobile voice services is peaking in some areas (Figure 2), with North America and Western Europe experiencing low, single-digit growth. To enhance their competitiveness, efficiency, and profitability, many mobile operators are therefore looking at new data and multimedia services to differentiate themselves and improve customer retention while increasing average revenue per user (ARPU). The costs for deployment and operation of new services and their time to market are important factors because intense competition is forcing mobile operators to find new ways of achieving major operating cost reductions, even as new services are being added. However, other parts of the world, such as China and India, are experiencing immense network expansion at the same time as data services are being introduced, providing operators with the opportunity to bypass older technology layers and invest now in current technologies that address immediately available and future services.


Figure 2

Mobile Voice Subscriptions Slow in Some Countries



Source: Ovum, July 04

Most mobile operators are faced with a complex, diverse array of networks and applications already in place. With more networks and services being added, mobile operators have seen their capital and operational costs grow. Deploying and maintaining multiple networks makes new services more difficult to engineer, requiring labor-intensive and complex multilayer connections between different



networks, redundant management duties across networks, availability problems, and an increasingly difficult and expensive environment to grow and support.

Cisco has a better way: a single, converged mobile IP/MPLS backbone, a streamlined ITP solution for SMS-type applications, and an optimized RAN to reduce operational costs and voice-backhaul costs.

Solution

Cisco IP and Cisco IP/MPLS Solution Overview

IP and IP/MPLS are technologies available in the Cisco IOS Software family and they provide significant advantages in deploying new applications such as mobile 3G services, as well as VPNs, traffic engineering, and network management. Cisco IP and IP/MPLS technologies help mobile operators to offer many network services to customers at lower costs than by using Frame Relay, leased line, or ATM.

IP, the underlying language of the Internet and private networks, has become a universally accepted transport for data and now increasingly for voice and multimedia applications. All-IP networks have fewer layers and network elements because different networks and services can be collapsed into one IP-based multiservice network. IP/MPLS complements IP technology and is designed to take advantage of the intelligence associated with IP routing and the switching characteristics of ATM. First developed by Cisco as “tag switching” in the 1990s, IP/MPLS is now an international industry standard.

MPLS uses labels to forward traffic across the IP/MPLS-enabled backbone much more efficiently. Thus, IP/MPLS is rapidly emerging as a core technology for next-generation networks. Implementation of IP/MPLS allows for the consolidation of multiple disparate networks into one, and provides a way to use multiple Layer 2 technologies simultaneously, providing a tremendous cost saving.

Cisco IP/MPLS helps enable established services such as Layer 2 transport for ATM, Frame Relay, and Ethernet and newer services such as Layer 3 VPNs, IP Version 6 (IPv6), multicast, and traffic engineering. These can all be supported over a QoS-enabled, fast-converging infrastructure capable of supporting the Second- and Third-Generation Partnership Project (2GPP and 3GPP) standard traffic classes along with voice and video.

While impressive, these services and technologies also make good business sense for mobile operators today for a variety of compelling reasons.

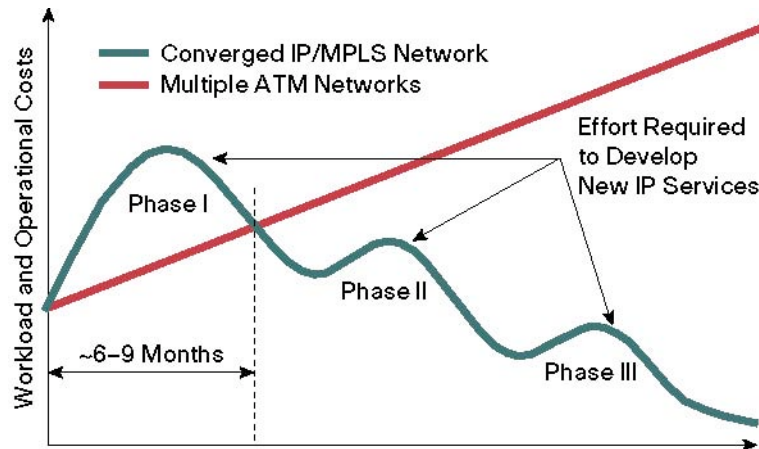
Why Cisco IP/MPLS Backbone Convergence Makes Good Business Sense

Building multiple network infrastructures to offer discrete solutions is costly, inefficient, and difficult to manage. That is the conclusion of a growing number of wireline and mobile operators, noted corporate enterprises, and industry groups including the ATM Forum and the MPLS and Frame Relay Alliance. It has compelled mobile operators and Cisco to find a smarter and more cost-efficient way to grow networks as the mobile market focus shifts to 3G services.

That way is network convergence using IP and IP/MPLS. Convergence brings new flexibility and economies of scale that are not feasible with multiple, single-purpose networks. Research among network service providers conducted by the Cisco Internet Business Solutions Group (IBSG) showed that if providers deploy a converged backbone and operating model, the workload for deploying new services can be reduced dramatically over time (Figure 3).

Figure 3

Reduced Development Effort with Converged Network Backbone



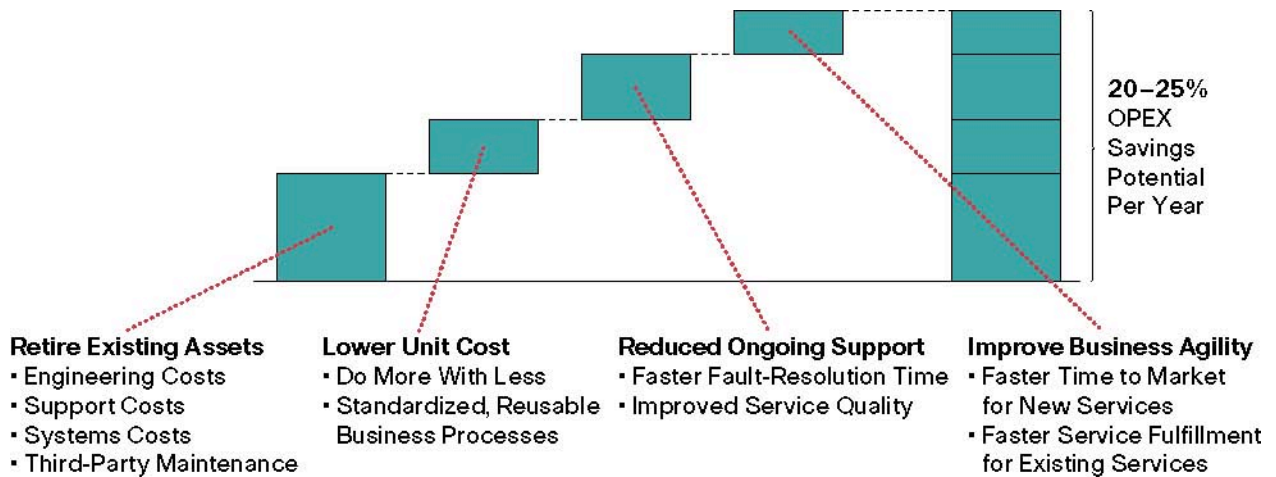
In Figure 3, the blue line represents unit production costs over time for new IP-based mobile service components implemented in an IP/MPLS network using a service-centric operating model. The red line represents the same service components deployed in a traditional, network-centric ATM environment. As an increasing number of service components are produced by a converged IP/MPLS network, complexity is reduced as overlay network infrastructures are reduced and eliminated. This translates to savings in both time-to-market and operational costs.

Cisco IP/MPLS solutions in the Cisco IOS Software family provide a realistic migration path when moving from a traditional Frame Relay, ATM, or TDM-based network environment to an IP/MPLS-enabled, converged network. The proven Cisco multiservice architecture has been deployed in service provider environments worldwide.

A global mobile operator in partnership with Cisco decreased its time to market for new mobile services by 50 percent, or six months, by moving to a converged Cisco IP/MPLS backbone. This increased speed of delivery is expected to add 16 percent to revenues over a five-year period.

Working with the Cisco IBSG's modular approach to converged packet network operations, called the Cisco IP Factory, and using the TeleManagement Forum's Enhanced Telecom Operations Map (eTOM) industry-standard business process framework, a global mobile operator converged 15 separate, disparate networks into a single Cisco IP/MPLS backbone. The operator expects to trim more than 20 percent off of its operating expenditures over the next five years, an estimated savings of tens of millions of Euros (Figure 4).

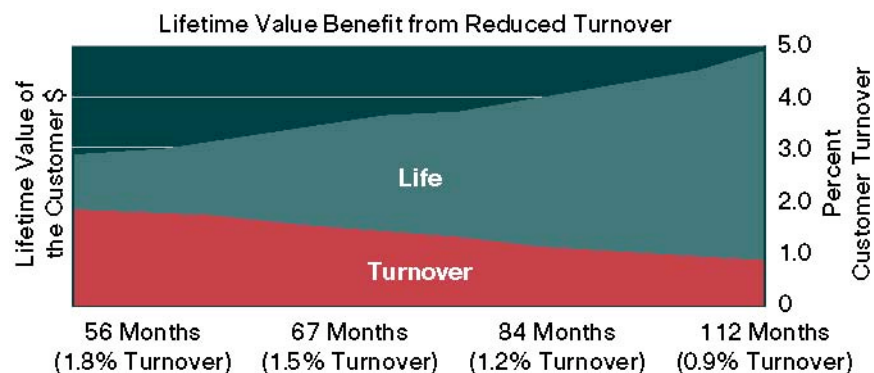
Figure 4
Reduced Operational Costs with Converged Network Backbone



Savings in operational expenses are the result of reduced staff, consolidated network management and operation, simplified business processes, reduced costs for fewer transmission lines, savings of physical rack space for infrastructure, and various other factors.

IP/MPLS convergence also helps mobile operators reduce customer turnover and increase ARPU. As shown in Figure 5, the more services customers buy as a bundle, the higher ARPU and the lower the customer turnover rate. For example, if a mobile operator is able to reduce turnover from 1.8 percent to 1.5 percent due to a better customer experience and service bundling enabled by a converged IP/MPLS core, the lower turnover rate increases the average customer relationship by 11 months for a 15 percent increase in lifetime value.

Figure 5
Reduced Customer Turnover and Higher Overall Customer Value with Converged Network Backbone

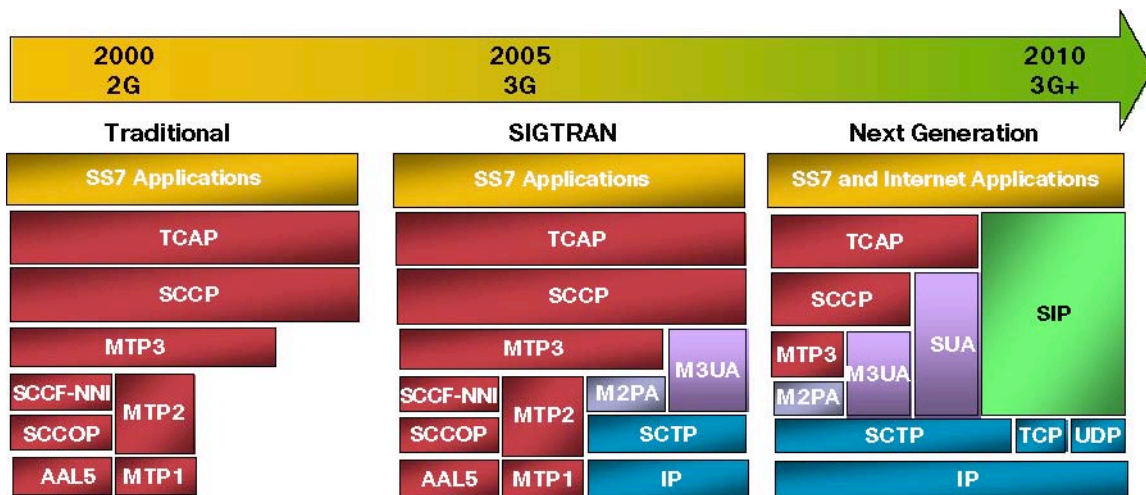


Cisco ITP Solution Overview

Cisco IP Transfer Point (ITP) is a comprehensive solution for transporting Signaling System 7 (SS7) traffic over traditional TDM networks or next-generation SS7-over-IP (SS7oIP) networks that use Sigtran protocols. Because the Cisco ITP supports any-to-any routing between traditional, next-generation, and combined traditional-over-next-generation networks, operators can completely control their migration to next-generation networks and ensure that this migration is aligned with business needs and goals.

As shown in Figure 6, signaling networks will continue to evolve over time to become more IP-centric. Operators must transform their networks from TDM to IP to allow for the deployment of next-generation services. The Cisco ITP allows operators to adapt to network changes at their pace.

Figure 6
Signaling Network Evolution



Networks based on specifications ratified by the IETF Sigtran Working Group are a reality today, with operators efficiently transporting increased volumes of core SS7 traffic over core SS7oIP signaling networks. Operators are also offloading the traditional TDM network at the edge through signaling gateways to an SS7oIP Sigtran network. Mobile operators see dramatic decreases in the costs of providing applications like SMS, mobile number portability, custom ring tone downloads, and other resource-intensive new capabilities. The Cisco ITP positions the mobile operator for enhanced return on investment (ROI) and profits by providing the infrastructure for IP-enabled Service Control Points (SCPs) and revenue-generating IP services.

The Cisco ITP has the flexibility to offer both a reliable core signaling-platform function and a robust signaling-gateway function that connect traditional SS7 nodes or IP-enabled signaling nodes and offload SS7 traffic to reliable and cost-efficient IP networks. This allows the operator to free capacity and ports on the existing and costly SS7 network or simply replace the existing SS7 network.

Older STPs require a large footprint, have large power requirements, and are expensive to upgrade. Additionally, older STPs do not provide a seamless migration path to IP next-generation networks. They typically require a separate edge router to connect to an IP network, a “two-box solution.” The Cisco ITP is the only “one-box solution” for both traditional and next-generation signaling networks. The Cisco ITP is a native IP device that gives the operator maximum flexibility and reliability by providing SS7, Sigtran, and IP routing capabilities in one device.

The Cisco ITP provides an industry-leading QoS capability to prioritize SS7 traffic according to destination, service or message type, and can also be used in conjunction with an IP/MPLS deployment to enhance the overall reliability of the signaling network.

Why the Cisco IP Transfer Point Solution Makes Good Business Sense

The Cisco ITP provides operators with industry-leading value in core STP, next-generation STP, and signaling gateway deployment scenarios. There are two specific applications:

The Cisco ITP solution provides compelling value as a core next-generation STP. When the mobile operator is ready to migrate the traditional core signaling network to IP, the Cisco ITP provides a simple transition to IP signaling while the older STP requires the deployment of routers in front of their platforms.

The Cisco ITP solution provides a traditional core STP replacement that can significantly reduce CapEx and OpEx for mobile operators. As shown in Figure 7, CapEx required to install Cisco ITP is less than half of the traditional core STP solution, and it results in a 50 percent savings in OpEx for ongoing maintenance. Costs are calculated in U.S. dollars.

Figure 7

STP versus ITP as a Traditional Core STP Replacement

Option 1	Option 2
<ul style="list-style-type: none"> ▪ Add Capacity on 4 STPs – STP Costs: \$4,256,000 – Maintenance per Year: \$426,000 (10%) ▪ First Year Cost: \$4,682,000 ▪ Cost Every Additional Year: \$426,000 	<ul style="list-style-type: none"> ▪ Install 4 ITPs – Cost of 4 New ITPs: \$2,028,000 – Maintenance per Year: \$202,840 (10%) ▪ First Year Cost: \$2,231,840 ▪ Cost Every Additional Year: \$202,840

In IP-based ITP deployments used as STP replacements, there are additional CapEx and OpEx savings. Mobile operators will save additional CapEx by moving from the traditional “two-box” solution to the single-box Cisco ITP solution. Another added benefit of the Cisco ITP solution is that by using shared IP bandwidth, the Cisco ITP reduces bandwidth requirements by 50 percent as compared to the traditional TDM leased line.

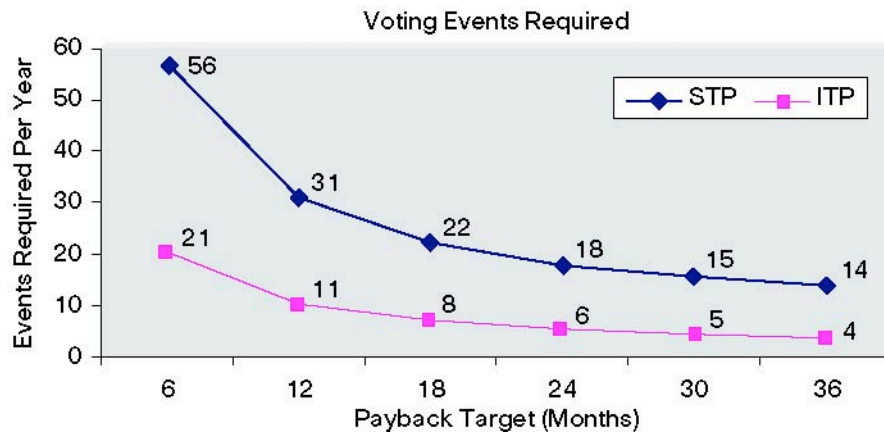
While Cisco ITP as a core STP replacement has compelling business benefits, the business case for the other application of Cisco ITP is equally attractive. When deployed as a signaling gateway, the Cisco ITP can reduce capital and operational costs by allowing mobile operators to realize as much as a 200 percent improvement in price and performance and as much as a 50 percent reduction in ongoing costs by offloading SS7 traffic to an IP network.

The rising popularity of televoting, which has irregular high peak usage patterns, provides an excellent business case for the Cisco ITP signaling gateway solution. The popularity of reality television has opened up a business opportunity for mobile operators to provide a channel for viewer feedback. Game shows such as *Pop Idol*, *American Idol*, and *Big Brother* invite viewers to vote for their favorite singers through SMS text messaging and other methods.

These voting events can be very lucrative for mobile operators, generating premium SMS revenue, with participation potentially exceeding 10 percent of a carrier’s subscriber base. For consumers, using SMS to vote may be the low-cost option when compared to placing a toll call. Such SMS traffic, all occurring in the same relative timeframe, is extremely bursty. Because most televoting events occur infrequently, mobile operators require infrastructure to support the application that is highly scalable, but at a cost that allows payback with infrequent use.

The Cisco ITP solution is ideally suited for this application. By enabling SMS connectivity through IP, ITP eliminates an additional layer of SS7 ports and stack licensing fees, reducing infrastructure costs by two-thirds. This creates a corresponding drop in time to payback or of the number of events required to make a profit (Figure 8). Payback on televoting can be achieved using Cisco ITP with an average of less than one event per month.

Figure 8
Televoting Events Required for Payback over Time with STP vs. Cisco ITP



Cisco RAN Optimization Solution Overview

Cisco RAN Optimization is an integral part of Cisco IP NGN strategy and offerings for mobile operators. It extends Cisco IP expertise from the network core to cellular sites. Cisco RAN Optimization is an efficient and flexible RAN transport solution that applies a radio vendor-independent technology and integrates easily into an existing Radio Access Network. This Cisco RAN Optimization solution optimizes traffic on Global System for Mobile Communications (GSM) and the Universal Mobile Telecommunications Service (UMTS) architectures by delivering increased backhaul bandwidth within the existing RAN infrastructure, significantly reducing operating costs, supporting higher capacity alternative backhaul options for both 2G and 3G operators, and enabling new revenue-generating IP services at cellular sites.

The Cisco RAN Optimization solution not only optimizes GSM and UMTS traffic backhauling, it also delivers IP services to the cellular site, allowing mobile operators to enhance cell-site capability.

To achieve backhaul savings, Cisco RAN Optimization solutions can be deployed in three different scenarios:

- Leased-line backhaul optimization for GSM and UMTS networks
- Satellite backhaul optimization for GSM and UMTS networks
- High-Speed Downlink Packet Access (HSDPA) traffic-offload optimization for UMTS networks

Whether a mobile wireless operator needs to optimize a GSM network for future expansion, to reduce OpEx expenses in a UMTS rollout, or to provide a data offload for 3G services over alternative backhaul solutions, Cisco RAN Optimization can be a solution for various network scenarios, each with a compelling business case.

Why Cisco RAN Optimization Solution Makes Good Business Sense

Today's mobile wireless operators face multiple challenges within their RANs. Mobile operators are under competitive pressure to expand their GSM networks for additional coverage or for innovative services and data connectivity, including deployment of applications such as General Packet Radio Service (GPRS) and Enhanced Data Rates for GSM Evolution (EDGE). Deploying a UMTS 3G network increases OpEx for additional E1 lines but provides low return in the short term because the customer base is initially small. High OpEx for RAN backhaul makes up 20 to 30 percent (in some cases up to 70 percent) of total OpEx. Long lead times for deploying additional E1 lines may slow down business growth and impact customer satisfaction.

In the leased-line backhaul scenario, Cisco RAN Optimization achieves GSM traffic compression efficiencies of up to 50 percent. Therefore, an optimized backhaul network only needs half the number of E1 links to transport the same level of GSM traffic. It also eliminates idle cells and unused padding in UMTS Iub traffic, resulting in a compression efficiency of up to 30 percent. Compressed GSM and UMTS traffic is then dynamically aggregated over a single E1 trunk, sharing bandwidth and reducing wasted network resources.

Mobile operators in regions with high leased-line pricing can achieve significant backhaul cost savings with the Cisco RAN Optimization solution. In regions lacking leased-line infrastructure or experiencing very high leased-line pricing, mobile operators often have to lease expensive satellite bandwidth to provide connectivity to remote areas. Cisco RAN Optimization allows these operators to reduce GSM and UMTS backhaul traffic, ultimately reducing the required bandwidth and satellite backhaul costs.

In addition to GSM and UMTS RAN optimization, mobile operators with High-Speed Downlink Packet Access (HSDPA) deployment may also consider the Cisco RAN Optimization solution for the benefits of OpEx reduction and flexibility for bandwidth increases. 3G data services, such as HSDPA, require large bandwidth backhaul links to the cellular site, which cause an increase in OpEx for E1 leased lines and operation and maintenance costs. The Cisco RAN Optimization solution allows Iub traffic to be optimized and transported over E1 links together with GSM traffic, and HSDPA traffic to be transported over a separate IP network used as an alternative backhaul such as Metro Ethernet, Cable, WiMax, or xDSL. This data offload solution allows for OpEx saving, bandwidth flexibility, and easier expansion.


Conclusion

Converging multiple disparate networks into a Cisco IP/MPLS backbone makes good business sense for mobile operators. It results in lower operational costs, heightened efficiencies, and an easier and faster environment for deploying new mobile IP services. The Cisco ITP platform increases signaling efficiency and lowers circuit costs. It can help mobile operators dramatically decrease the costs of services like SMS, mobile number portability, custom ring-tone downloads, and other resource-intensive new applications. The Cisco RAN Optimization solution supports the industry's accelerating migration to IP by taking it all the way to the cell site, helping the mobile operator to reduce backhaul costs, improve cell-site maintenance, and support additional services.

By partnering with Cisco, mobile operators have access to a variety of strategic services and resources. Cisco offers four advantages to the mobile operator: 1) Industry-leading and superior technology and solutions; 2) Strategic vision and e-enablement methodologies from Cisco IBSG, 3) Cisco Customer Advocacy (CA) Advanced Services, which extend beyond the traditional support model by reaching across the customer's network lifecycle; and 4) Joint marketing resources from the Cisco Powered Network Program.

Secure network-layer solutions from Cisco to converge the mobile network backbone, provide ITP efficiency, and provide RAN Optimization have been presented in this paper.

To help operators realize the full business benefit of a converged IP infrastructure, Cisco IBSG works with executive teams from mobile operators as trusted advisors to improve the profitability of mobile networks by accelerating top-line revenue growth through new IP services, go-to-market strategies, and operating cost reduction through productivity initiatives. With some of the largest mobile operators in the world, Cisco IBSG has created a factory-based service production approach, called IP Factory, which brings together all



internal elements of the service production value chain – including service design, fulfillment, and assurance – into a single integrated team. Cisco IBSG brings a wealth of other consulting skills to projects along with internal research and development initiatives on important mobile operator industry issues.

The Cisco CA Advanced Services organization spans accounts and regions to offer mobile operators worldwide the expertise and assurance needed to quickly and successfully converge traditional networks and deploy new IP services. Strategic partners complement and extend the reach of Cisco CA to help ensure scalable bandwidth and measured success. Cisco Advanced Services adds value and differentiates by offering mobile operators access to Cisco product business units for up-to-date product and interoperability testing information.

The Cisco Powered Network Program is the primary Cisco membership program for wireline and mobile operators that deliver services over networks built end-to-end with Cisco technology. There are more than 375 global members that take advantage of Cisco marketing and technical expertise and utilize Cisco market recognition in the promotion of their network services. The goal of the program is to assist service providers in the marketing and promotion of IP services, allowing them to develop new revenue streams faster and easier.

Since 1997, the Cisco Powered Network Program has helped businesses find high-quality, reliable service providers. Cisco allows program members to use the industry-leading Cisco brand in the promotion of their services. In return, program members agree to maintain high levels of network quality and a minimum annual investment in Cisco equipment.

For More Information

For more information about Cisco IP/MPLS: <http://www.Cisco.com/go/mpls>

For more information about wireless mobility solutions for service providers:
http://www.cisco.com/en/US/netsol/ns341/ns396/ns177/networking_solutions_packages_list.html

To learn more about the Cisco Powered Network Program for mobile operators:
http://www.cisco.com/en/US/applicat/cpnapply/applications_overview.html

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