



Service Overview

Generic Access Network Dual-Mode Services: The Business Case and the Cisco Solution

The introduction of dual-mode handsets, which support both Global System for Mobile Communications (GSM) and Wi-Fi, provides mobile operators with a new opportunity to accelerate their customers' conversion to mobile services. By extending GSM voice and data services over the wireless broadband connection in subscribers' homes, mobile operators can take advantage of the same favorable economics enjoyed by VoIP-over-broadband providers. This paper describes what mobile operators need to begin offering Generic Access Network (GAN) dual-mode services.

Executive Summary

Dual-mode (GSM and Wi-Fi) services are becoming attractive to mobile operators and their subscribers because of three trends: a growing population of mobile subscribers, the prevalence of home broadband connections, and the availability of low-cost, home wireless access points that support GAN (previously known as unlicensed mobile access or UMA) technologies, such as Wi-Fi and Bluetooth. The research firm In-Stat projects that consumers will use more than 66 million dual-mode handsets by 2009¹, and Senza Fili Consulting predicts that the addressable market for dual-mode services will reach 55 million subscribers worldwide by 2010.²

With dual-mode services, subscribers make calls from outside the home as they would ordinarily, using the GSM radio network at the standard tariff rate. But inside the home, the call travels over the subscriber's wireless broadband connection, thus the operator can enjoy the same economic structure as VoIP-over-broadband providers.

To offer GAN dual-mode services, mobile operators need handsets, network controllers, call control, the security to protect the mobile operator voice network from Internet-based threats, and wireless access points for their subscribers. Cisco Systems® meets these requirements with a scalable, flexible, highly secure multiservice IP architecture for GAN. It includes the Cisco® MGX® Media Gateway, Cisco IP Transfer Point (ITP), Cisco GAN Enhanced Security Gateway, and the Linksys® Wireless Router.

This paper, intended for mobile operator business executives, explores the dual-mode service opportunity using GAN. It explains the customer experience, briefly describes solution components, and summarizes the benefits of the service to subscribers and mobile operators.

GAN Dual-Mode Service Opportunity

GAN significantly changes the cost structure of in-home mobile voice and data coverage by making it possible for voice and data traffic to travel over the subscriber's own Wi-Fi network and broadband connection to the mobile operator's network, where it becomes indistinguishable from voice and data transported over the GSM radio network. GAN creates the following business opportunities for mobile operators:

- *Accelerating fixed-mobile substitution* – Mobile operators that offer dual-mode services can offer a new mobile-voice tariff structure that encourages customers to use their mobile handset at home. According to the In-Stat report, approximately 30 percent of cell phone calls are made from home. A call-from-home tariff plan helps differentiate mobile operators from their competitors. And unlike today's "home cell" approaches, which provide a home-rate tariff in an area measuring up to a few kilometers, GAN limits the home cell to an area measuring just tens of meters. This avoids loss of revenue from subscribers who call from locations near their homes. Analyst Senza Fili reports that 35

¹ In-Stat, "Wireless IP Phones Drive Future VoIP Markets," August 2005

² Senza Fili Consulting, "GAN and Beyond: Mobile Operators Benefit from Wi-Fi and Cellular Convergence," January 2005

to 92 percent of calls from home will be made over Wi-Fi by 2006, including customers who retain their fixed-line service as well as those who cancel it.

- *Providing opportunities for competitive pricing* – The cost structure for GAN-based services resembles that of commercial VoIP providers. Therefore, the mobile operator gains the flexibility to offer more competitive pricing in certain markets. With home cell approaches, in contrast, the cost structure resembles that of typical mobile networks.
- *Providing fixed-line services* – Some mobile operators are considering taking advantage of the low entry cost of GAN service to offer voice services to subscribers using ordinary telephones. From the subscriber’s perspective, the call behaves the same as it does over a fixed-line network although it travels first over Wi-Fi or Bluetooth, then over broadband, and finally over the GSM radio network. To offer this service, mobile operators need to provision subscribers with an analog telephony adapter (ATA) that connects to their wireless access point. Certain wireless access points from Linksys, a Cisco division, provide integrated ATAs.
- *Accelerating introduction of future services by building the infrastructure now* – Mobile operators that offer a GAN service gain an opportunity to develop and refine IP infrastructure and operational processes that they can reuse for future services, including bundled mobile-voice with data services such as remote video surveillance and mobile remote control of home appliances with IP Multimedia Subsystem (IMS). GAN also enables more precise presence information, a foundation for additional value-added services.
- *Strengthening customer loyalty* – Gartner reports that poor in-home coverage is second only to expensive rates as a reason for changing service providers in the United States.³ Mobile operators can extend coverage within the home at little cost by using the Cisco GAN solution in combination with Linksys Wireless Routers installed in customer homes.

Customer Experience

Customers who want to take advantage of a GAN simply connect a wireless access point to their broadband connection and order a GAN-capable handset and service from their mobile operator. Linksys offers a low-cost Wi-Fi access point, the Linksys Wireless Router. Nearly 1.5 million ports have been shipped as of March 2005. The mobile operator can decide whether to provision wireless access points or allow customers to provide their own.

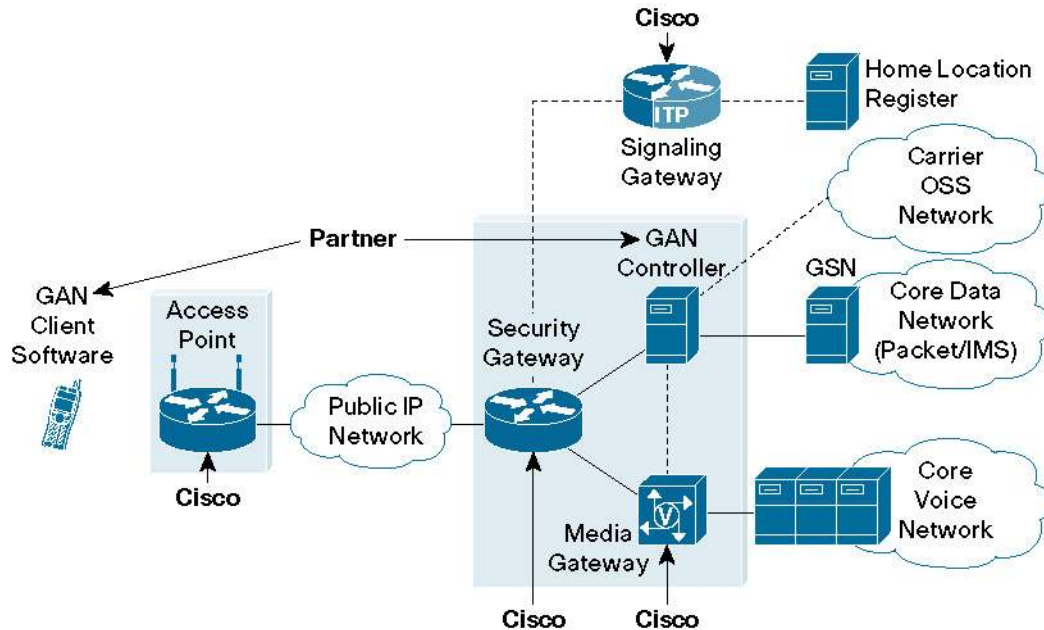
When customers make and receive calls, the experience is identical whether the connection is from the home through Wi-Fi or Bluetooth or from outside the home on GSM. If the customer leaves or enters the home during a call, the connection is handed off without interruption. Some operators might choose to include an icon on the mobile phone display that indicates the connection method, similar to the function of a roaming icon. The value of this approach is to remind customers using Wi-Fi in the home that they are taking advantage of lower-cost, in-home tariff rates, helping strengthen the customer relationship.

Cisco GAN Solution Components

All GSM voice traffic and call control traffic is encrypted and travels over the Internet through a highly secure tunnel, which extends from the edge of the mobile operator network, across the Internet, through the subscriber’s broadband connection, and over the user’s in-home wireless network to the handset (Figure 1).

³ Gartner, “User Survey: Personal Wireless, United States 2003,” June 2004

Figure 1
Cisco GAN Solution



The Cisco GAN architecture comprises the following major elements:

- *The GAN network controller* – This device connects the mobile voice network to the IP network. It performs the same function as a base station controller in the GSM/GPRS network. Cisco provides media gateway and signaling gateway components that can integrate with GAN network controllers available from numerous vendors.
- *The Cisco GAN Enhanced Security Gateway* – Multiple, integrated components secure the customer’s connection to the mobile operator’s network and protect the mobile operator’s voice network from intrusion and denial-of-service (DoS) threats from the Internet.
- *Linksys Wireless Router* – Installed at the customer’s home, the Linksys Wireless Router provides wireless access from the dual-mode handset to the customer’s high-speed cable or DSL connection.

To deploy the solution, the mobile operator can work directly with Cisco or with the mobile operator’s GAN controller vendor.

Cisco GAN Enhanced Security Gateway

Security concerns for a GAN service offering are different from those for traditional mobile operator offerings because the mobile operator exposes part of its voice network to the public Internet. Other Internet-based services, such as WAP-based browsing and corporate VPN applications, do not expose the voice network. The Cisco GAN Enhanced Security Gateway provides the comprehensive, multilayer security needed to prevent revenue loss from service outages and protect the operator’s brand.

The Cisco Security Gateway Solution incorporates the three principles of the Cisco Self-Defending Network:

- *Integrated* – Every element in the solution, including Cisco Catalyst® switches and Cisco routers, acts as a point of defense.
- *Collaborative* – Multiple components of the network work together to provide new means of protection.
- *Adaptive* – The network automatically stops both known and unknown threats with signature-based identification (known threats) and detection of anomalous network or application behavior (unknown threats).

The Cisco GAN Enhanced Security Gateway provides comprehensive security capabilities needed for GAN dual-mode services in a modular architecture. Cisco VPN solutions provide highly secure *tunnel termination*. Cisco Firewall solutions and the Cisco Intrusion Prevention System (IPS) protect against threats originating *inside the tunnel*, from internal users. The Cisco Threat Defense System detects and mitigates threats originating *outside the tunnel*, such as DoS and distributed DoS (DDoS) attacks. The mobile operator can scale each capability separately, as needed. Table 1 shows the types of protection the solution provides.

Table 1. Comprehensive Security Solution

Type of Protection	What It Does	Cisco Products
Inside the tunnel	Prevents unauthorized activities by internal users	Cisco PIX [®] Security Appliance Cisco Intrusion Prevention System (IPS) Cisco Security Monitoring and Response System (MARS)
Outside the tunnel	Recognizes DoS and DDoS attacks and helps prevent service disruption during attacks	Cisco Threat Defense System, including Cisco Guard Anomaly Detector
Tunnel termination	Creates a highly secure connection from the subscriber's handset through the Internet to the mobile operator network	Cisco Secure Connectivity Solution, including Cisco 7600 Series Router IP Security (IPSec)-based VPNs based on IKEv2/EAP

The mobile operator can capitalize on its investment in the Cisco GAN Enhanced Security Gateway for future service offerings that expose the network to the Internet, including IMS. In fact, by gaining experience with the security processes and technology needed for GAN services, mobile operators position themselves for early IMS service introduction for subscribers using PCs or dual-mode handsets. Early service introduction can result in a potentially sustainable competitive advantage.

Media Gateway and Signaling Gateway

Cisco offers two media gateways that mobile operators can integrate into their GAN architecture: the Cisco MGX 8000 Series Carrier Voice Gateway and Cisco AS5000 Series Universal Gateway. The Cisco IP Transfer Point (ITP) provides a scalable signaling gateway for the GAN architecture. The Cisco solutions provide the density, scalability, performance, and high availability that mobile operators need for GAN dual-mode services.

Linksys Wireless Router

Deployed at the customer's home, the Linksys Wireless Router acts as a wireless access point, enabling dual-mode phones to connect to the customer's high-speed cable or DSL Internet connection. To protect voice privacy, the Linksys Wireless Router can encode all wireless transmissions with 256-bit encryption, and it supports both Wired Equivalent Privacy (WEP) and the stronger wireless security of Wi-Fi Protected Access (WPA). A Web-based interface enables customer self-service for configuration.

Service Benefits

Subscriber Benefits

The appeal of a GAN dual-mode service to new and existing customers includes:

- Mobile-device experience, including an address book and caller ID, at a lower tariff rate than fixed-line service
- Convenience of bundled mobile-voice and data services, including a single bill
- Better in-home coverage

Operator Benefits

Mobile operators that offer a GAN service experience the following benefits:

- Opportunity to capture fixed-line revenues
- Lower capital and operational expense, a result of offloading network
- Reduced subscriber turnover
- Establishment of two important prerequisites for IMS and third-generation (3G) services: security infrastructure and operational processes

Why Cisco

The Cisco GAN architecture provides several advantages for mobile operators that want to offer GAN dual-mode services.

Carrier-Class Stability and Security

The Cisco Secure Gateway Solution provides carrier-class stability and security for every network element: IPSec VPNs, DDoS-attack mitigation, firewall, intrusion detection and prevention, network monitoring, and attack correlation. Other solutions limit their carrier-class stability and security to only some of these elements. Other unique benefits of the Cisco GAN Enhanced Security Gateway include:

- *Proven platform* – The Cisco GAN security architecture employs components currently in use at some of the world's largest DSL, cable, and mobile operators. Security services modules are deployed in the Cisco 7600 Series Router, among the most widely deployed edge routers.
- *More effective DoS-attack detection* – In addition to the IKDev2-based DoS mechanisms that other vendors support, the Cisco GAN Enhanced Security Gateway also supports anomaly-based DoS protection, which is more flexible and accurate.
- *Ability to support multiple services* – One physical security gateway can support multiple virtual gateways, one for each application. Therefore, mobile operators can capitalize on the same infrastructure investment to introduce additional fixed-mobile convergence applications in the future.
- *High availability* – Advanced load balancing techniques enable more efficient use of physical resources and higher service availability.

Scalability

GAN-based services require a highly scalable security solution, potentially creating a tunnel for every handset. For a large operator, this can add up to millions or even tens of millions of sessions. Most of today's security gateways, designed for enterprise applications, scale to only a few thousand sessions.

The Cisco GAN Enhanced Security Gateway provides scalability in multiple dimensions. For example, the Cisco load-balancing solution enables the threat defense systems – both outside and inside the tunnel – to scale to provide more throughput. Tunnel termination, in contrast, scales to accommodate more subscribers. As the subscriber base grows and usage patterns change, these dimensions do not always grow at the same rate. Therefore, the ability to scale each dimension separately helps the mobile operator support more subscribers and more minutes without unnecessary capital expense.

Industry Leadership in Encryption and Authentication

Cisco Systems is an industry leader in several important respects:

- Cisco is among the largest network security vendors in the world and has shipped IPSec solutions for more than 10 years.
- Cisco is one of the charter members of the ICSA IPSec Consortium, a group involved in defining IPSec interoperability testing, and participated in both their Feb 2005 and Oct 2005 IPSec/IKEv2 initial interoperability workshops. ICSA Labs, an independent division of Cybertrust, sets standards for information security products and certifies over 95 percent of the installed base of antivirus, firewall, IPSec, cryptography, and PC firewall products in the world today.
- Cisco is coauthor of the original EAP-SIM framework, used for subscriber authentication.

Industry-Leading Linksys Wi-Fi Access Points

Linksys Wireless Routers provide networking speeds up to five times faster than wireless-B routers. Mobile operators and their subscribers benefit from advanced, easy-to-configure, proven technology. Linksys began shipping the routers in August 2004 and had shipped more than 1.5 million ports as of March 2005.

Cisco Advanced Services

Through Cisco Advanced Services, mobile operators gain access to certified experts' in-depth technical knowledge, specialized tools and methodologies, industry-leading research labs, and a network of certified partners to help ensure the delivery of high-quality mobile wireless services. Cisco consultants and engineers help minimize the risk to valuable business assets by working with the mobile operator to plan, design, implement, operate, and optimize mobile wireless networking solutions. Contact your Cisco representative to find out more about how Cisco Advanced Services experts can help improve staff productivity and reduce the total cost of ownership for your network.

Conclusion

GAN dual-mode services to the home give mobile operators the opportunity for a significant competitive advantage by accelerating fixed-mobile substitution, increasing penetration, and reducing turnover. The Cisco GAN architecture provides an essential prerequisite for dual-mode services, which is protecting the mobile operator's voice network from threats originating from the Internet. Because the security infrastructure used to offer dual-mode services can be reused for other services, including IMS, the investment in the Cisco GAN solution provides a competitive advantage for tomorrow's services as well as today's.

For more information on the Cisco GAN architecture and the Cisco GAN Solution, visit: <http://www.cisco.com/go/mobile/sef>.

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