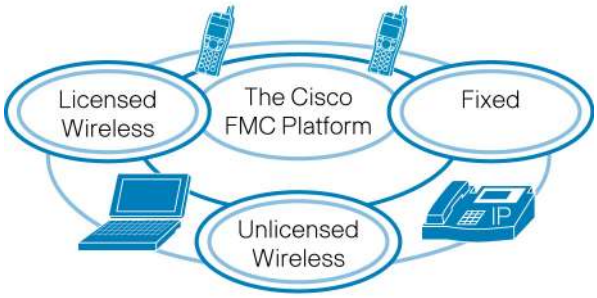
Fixed Mobile Convergence for Fixed-Service Providers



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Key Definitions Used in this White Paper

Integrated-service provider: An integrated-service provider provides both fixed and cellular services, in contrast to fixed-only or cellular-only providers. For the purposes of competitive analysis, this white paper compares integrated, fixed, cable, cellular, and satellite operators, and mobile virtual network operators (MVNOs). Fixed and cable operators for the most part have different capacity capabilities.

Unlicensed wireless (UW): Unregulated 802.XX wireless networks include networks that are often also referred to as Wi-Fi, WLAN, home Wi-Fi, metro Wi-Fi, and the emerging category of mobile Wi-Fi. Bluetooth and cordless DECT phones could also be included in this category.

Licensed wireless (cellular): Licensed cellular wireless networks include GSM and CDMA-based networks; subsequent extensions into data, most commonly 2.5G (EDGE) or 3G (EVDO, UMTS, HSPDA, HSUPA); and 4G networks such as LTE, satellite, fixed WiMAX, and mobile WiMAX.

Fixed networks: Generally refers to fixed-line-based networks such as ADSL, fiber to the home, fiber to the node, traditional telephone networks, and cable.

Executive Summary

Fixed service providers exist in a world where mobility is increasingly important. Mobility is about creating the connected life. FMC is about creating the connected life with choice and simplicity – the experience that users demand today. It's an emerging capability, providing end users with the freedom to continuously access and use content, applications, or services over their device of choice.

FMC represents the coming together of all networks, content, applications, services, devices, and management so that users do not have to manually toggle between the wireless and wireline divide. For businesses with an increasingly mobile workforce, FMC creates a unified workspace – one-number ring to all devices, call continuity across devices, consolidated fixed and mobile call history and voicemails, etc. – to boost employee productivity. For consumers, FMC creates the connected home where you can watch movie, sports, and news with continuity across TV, mobile phone, PC, and gaming console screens.

Fixed-service providers are challenged by declines in access lines and traditional voice revenue due to VoIP and mobile phone substitution. Both VoIP and mobile phones have transformed traditional telephony service and changed the role of fixed services from a top priority to a potentially optional one with customers. To combat these declines, fixed-service providers are pursuing triple-play bundling that combines IPTV and broadband data services with traditional voice. As video is the most bandwidth-intensive and latency-sensitive communications services, the existing fixed-line infrastructure can (often with some additional investment) support video, broadband data, and voice services. Fixed-service providers' bundling of broadband and voice services with video makes triple-play offerings a natural strategy. However, as customers also prize mobility, quad play and quad play plus are long-term strategic and competitive directions for fixed-service providers. Video, a potential competitive edge, is important in a triple play, quad play, and quad play plus.

To offer quad play or quad play plus, fixed-service providers need to acquire wireless spectrum either through acquisition, partnership, or becoming a Mobile Virtual Network Operator (MVNO). Furthermore, fixed-service providers can leverage the unlicensed wireless (UW) spectrum to lower the cost of providing mobile cellular services. Fixed-service providers that tap into the UW

spectrum can offer UW access where it is the fastest or least expensive choice for the user (Wi-Fi at public sites; Wi-Fi to connect to on-premises broadband) and divert cellular calls to UW/broadband networks in order to reduce the cost of valuable spectrum (owned or licensed from mobile operators) and just as importantly to create a better call experience in difficult-to-service indoor home and work locations. While the industry focuses on average revenue per user (ARPU), Cisco would like to introduce the new issue of average revenue per unit spectrum/square kilometer square (ARPUS/km2). As licensed wireless spectrum will always be finite and scarce, ARPUS/km2 measures the revenue efficiency of the wireless network. This paper presents a business case illustrating a gain of US$400 to 600 million per year revenue, when serving one million families using both unlicensed and licensed wireless infrastructure.

Cisco® FMC Platform solutions enable seamless data and application connections, seamless voice services, collaboration services, visual network services and video streaming services with industry leading, open standard FMC technologies. These services are supported by Cisco consulting and can be used to accelerate time to market, bringing in new revenues and relationships for service providers based upon converging different network infrastructures.

Introduction

In an un-converged world, individual applications were optimized for particular networks and devices. Voice was carried on voice networks. Data was transmitted on data networks. Video was provided by specialty video cable networks. Today, users access multiple networks, each of which carries converged services – voice, data, video, content, and applications. This creates more work for users as they switch between multiple networks and devices to reach applications, find and download content, or connect to multiple voicemail and messaging systems.

Many users struggle to keep up with the inflow of messages and constantly changing queues of voicemails, each queue tied to individual devices. Service providers must design services that simplify the life of subscribers and enable the use of the network and device of choice. And users have and will continue to have multiple networked devices.

FMC changes the game for service providers and their customers. It reduces the number of devices that customers need to hold and the number of buttons to press to switch networks. The important benefits of FMC are easier access for users and a simpler interface, typically with access continuity and experience continuity across networks, enabling higher productivity for the end users.

Fixed-Service Provider Perspective

FMC Benefits

FMC changes the nature of the market for providers and users. Fixed-service providers have the opportunity to become market leaders by offering quad play plus services that tie all the options, services, and devices together easily. And FMC offers unprecedented flexibility to end users, who can now be reached at the same number on different devices, and have their mobile calls transparently handed off to free unregulated wireless (UW) network. Table 1 shows how an FMC service can provide three different classes of benefits: cost reduction, quality improvement, and services enablement for both the user and the fixed-service provider.

Table 1. Examples of FMC Benefits to Service Providers and End Users

	Improved Quality for End User	Lower Cost to End User	Improved Access For End User
Service provider reduces own costs	• Wi-Fi lowers costs and improves indoor call quality • WiFi provides least-cost delivery of high-speed Wi-Fi/cellular access (vs. 3G)	• Broadband penetration of price-sensitive buyers is made easier by lowering the cost of access with UW • Diversion of mobile minutes allows lower-priced mobile/wireless access (see business case for explanation)	• UW broadband and 3G are combined to create better coverage at lower cost
	SPs use lower cost fixed backhaul as substitute for cellular backhaul to base station or cellular network		
Service provider offers improved benefits to customers	• FMC provides improved indoor call quality • WiFi provides improved broadband speeds versus 3G	• Unlimited broadband access using unlicensed wireless reduces cost to end user	• Continuous availability of applications and content makes applications, Internet, and content more useful
Service provider gains new revenue opportunities and reduces turnover	• New broadband connectivity permits low-cost delivery of high-bandwidth services and business applications	• New higher-value content and services increase customer satisfaction • Redundant telecom services eliminated increasing perceived value and lowering cost to end user	• Being able to access new services in more places increases opportunities for service provider to sell and opportunities for users to use

FMC Trends: Your New Competition, Your New Strategies

For fixed-service operators, the major challenge is that consumers now have more choice in how they access content both in terms of technology and of pricing model. Over time, fixed-service operators have had to compete with terrestrial over-the-air broadcasters, satellite broadcasters, movie rental operations, and now Internet-based competition. (Wireless video downloads today appear to be primarily short clips and therefore a less direct form of competition.)

From a business model perspective, the increase in the variety of download and transmission approaches has also led to an ever-increasing number of business models. Content can be acquired by purchase, by rental, by purchased download, by rental download, by advertising supported media, by subscription, financed by a sponsor, or by product placement. There is pressure on traditional bundled content approaches to permit a-la-carte purchase of channels and content.

In this new competitive landscape, mobile cellular vendors will aggressively pursue fixed-line business with broadband wireless offerings (3G, mobile WiMAX, LTE). They will use femtocells or broadband routers to compete with traditional fixed-line voice services from fixed-service operators. In some markets (Portugal, Austria) new wireless broadband additions now exceed traditional fixed broadband subscriber additions.

Fixed-service operators will add mobile capabilities through partnering or spectrum acquisition. Disruptive new service providers will offer services supported by an advertising business model such as Google's. Integrated-service operators can pursue a first-mover advantage if they can integrate their fixed and (owned or rented) mobile business processes. Content mobile virtual network operators (MVNOs) will either need to partner or move to a portal-oriented strategy. Pre-paid MVNOs may need to consider adding additional prepaid services such as mobile broadband or content access.

The following chart outlines the potential competitive and partnering relationships between the five major carrier types:

Table 2. Individual Service Provider Strategies Against Competition

	Competitor				
Service Provider	**Fixed**	**Cellular**	**Integrated**	**Cable**	**Satellite**
Fixed (traditional PSTN without ability to deliver video)	Service provider that adds FMC has advantage over its fixed-line competitor	Potential partnering	Fixed service provider at disadvantage unless it discounts or partners	Cable service provider needs to add mobile services, but has an advantage due to video capabilities	Partnering by fixed service provider with satellite and cellular or Hotspot service providers turns offering into integrated offering
Cellular	Potential partnering	Mobile vendors adopting FMC can lower costs	Mobile company can pursue a mobile substitution strategy but cannot deliver video without partnering	Natural partners	Satellite vendor needs to partner with cellular operator to play in FMC
Integrated	Integrated vendor has initial advantage	Both have strengths	Bundling and pricing are likely key weapons for integrated provider. Choice of technology can influence quality of service	Cable needs mobile capabilities. Video may retain customers, but integrated-service provider IPTV and partnering with satellite threatens core advantage	Opportunity for partnership
Cable (or fixed with fiber to the home or node)	Both need a mobile partner or capability	Natural partners	Direct competitors	Little overlap between cable companies	Direct competitors
Satellite	Both need a mobile partner	Potential partnering	Direct competitors	Direct competitors	Bundling may help differentiate

As Table 2 shows, different service providers are likely to exploit FMC in different ways in order to improve their competitive position. But certain strategic trends are common.

- **FMC demand forces heterogeneous network carriers to partner or expand their capabilities**. Most fixed and cable operators will add a mobile service component to their offering to match integrated-service providers. Surprisingly, it makes sense for fixed and cable operators to also offer broadband wireless as part of their quad play plus strategy. After all if a user is using licensed wireless broadband, the fixed broadband is probably at lower utilization. All service provider strategies will move in the direction of supporting heterogeneous fixed, UW, and cellular networks for voice, data, content, applications, and niche video applications.
- **Cable companies pursuing an FMC strategy will find it easier to sell to business users**. While consumers are strongly motivated by video content and the cost advantages of bundling, business buyers – a relatively new market for cable operators – are motivated by FMC's ability to increase productivity for key employees. FMC products such as unified communications, seamless data access across multiple networks, mobilizing of applications for seamless use across multiple networks, and seamless video conferencing and voice sessions are all emerging as important new services.
- **Video is important for triple and quad plays.** For cable companies the good news is that research suggests that most users still want "lean back" television (TV viewed in the home over a TV set rather "lean forward" viewing with a computer); it is likely that the video connection into the home represents a competitive advantage for service providers such as

cable or fixed providers with a broadband/IPTV/satellite-based video offering. If a consumer prioritizes video as a “must have” service, then dual-play bundling/pricing makes the video/broadband cable provider the most likely to offer a broadband connection. It is likely that voice services will increasingly be a minor incremental sale on top of a broadband relationship and FMC unified communications will be the higher-value service. A fixed broadband connection needs to be combined with a cellular offering for effective FMC. As users view more video on their broadband connection, it’s likely that providers of video services will tier their broadband offering to protect their video services, effectively forcing integration of video and broadband as bundled video offerings move to different pricing and purchase models.

- **VoIP transforms traditional telephony purchase priorities.** When a service provider offers the broadband connection to the consumer, it is well positioned to capture an FMC solution as long it has a mobile cellular network or mobile partner. While users will vary in how they evaluate traditional telephone service, VoIP telephone service running on broadband and mobile services clearly overlap in capability. Given adequate quality and convenience, consumers may perceive mobile and VoIP service as more valuable than a traditional dedicated phone line. Under any scenario, it is likely that the revenue from fixed phone service will continue to decline because of the increasing price pressure from cable companies and specialty Internet-based VoIP solutions offering fixed voice service at close to free pricing. In early 2008, U.S. VoIP voice services ran in the range of $240–480 per year, and disruptive competitors such as Skype and MagicJack offered services in the range of $20–60 per year, suggesting a continual erosion in traditional voice pricing. FMC represents a more defensible service offering for fixed-line or integrated-service providers. As broadband continues to improve, so will Internet-based voice service providers.
- **Video drives a need for more capacity and partnering**. Cable and fixed-line service providers are busy expanding their bandwidth delivery capabilities to support new services and HDTV. Mobile service providers are not well positioned for the emerging world of “long content” HDTV. In the near future, HDTV cannot be delivered on a large scale by current or proposed mobile standards, so it is likely that ownership of video/broadband pipe will give video-capable service providers an advantage over mobile vendors that fail to pair up with a video/fixed-line partner. This advantage, when combined with FMC, gives cable companies an opportunity for significant gain in market share with a quad play plus strategy (a strategy that includes FMC-based services). However, short clip viewing is very high in advanced mobile markets such as Europe with approximately 40 percent of cell phone users viewing clips.
- **FMC’s greater integration encourages service consolidation.** Mobile and VoIP phone services have introduced a significant change to telephony – the concept of location independence, which could encourage customers to abandon more traditional services. Unlike traditional telephony where the availability of numbers is determined by distance to a switch, mobile cellular phones and VoIP services separate the identity of users from their location. You can preserve your identity when you move, which simplifies tasks like remembering your phone number and reduces the need to update your friends, colleagues, and relations. FMC provides an additional reason for a customer to consolidate services with a single company. Benefits are easier to obtain from one vendor. Support for a more complex product is easier to obtain. The more competitive a market, the more likely it is that competitors will be forced to change their value-added profile. In most markets, high levels of competition force horizontal product expansion. While the individual price of an individual

service will drop in the future, the total revenue per client will increase, placing a huge strategic premium on being a full service (quad play plus) provider. Bundling of offerings in the market with competing quad play plus offerings is the likely result. These offerings may be delivered by integrated-service providers or by virtual networks of companies.

Strategic Impact of FMC on Revenue and Costs

For service providers that offer both fixed and (owned or "rented") cellular mobile services, FMC appears from a short-term perspective to represent a dilemma. Fixed-service providers may experience erosion in minutes of cellular usage by making it easy for customers to move on-premises or at-home phone calls to a "free" or lower-cost, on-premises Wi-Fi connection. However, in addition to the FMC fees and new mobile revenue, there is significant multibillion-dollar upside for fixed-service providers: FMC can reduce the capacity that they need to purchase, or alternatively FMC can increase the productivity of their purchased spectrum. In some FMC deployment scenarios, not only can a fixed-service provider experience an increase in average revenue per user (ARPU) from charging for FMC features, it can also experience an increase in ARPUS/kilometer^2. (or average revenue per unit of scarce spectrum per square kilometer) – a particularly important issue in areas where spectrum productivity is a concern.

Fixed-service providers that don't offer FMC will find that their relative cost position suffers. FMC increases the utilization of existing infrastructure and maximizes the use of free unlicensed wireless spectrum. The following table lays out the benefits of FMC.

Table 3. Impact of FMC on Revenue Opportunities

Issue	Impact
Increased number of customers	Gain in customers from offering FMC.
Increased revenue per customer	More services per customer from quad play versus triple play.
Increased services per customer	FMC creates a new platform to sell to generate new service revenue to the continuously connected user.
Increased installation, managed, and hosted revenue	FMC creates new service opportunities for installation and managed/hosted services in particular for SMBs and enterprises.
Reduction in bucket of minutes purchased	Reduction in number of cellular minutes purchased. Reduced number of minutes that fixed operators must own or rent to provide quad play or quad play plus.
Expansion of number of customers that can be serviced by available spectrum, leading to increased ARPUS/sq. km. (average revenue per unit of spectrum per square km served by an individual base station.)	Reduced capital costs for service provider vs. adding more cell sites. Ability to offer less expensive cellular subscriptions relative to those service providers that lag on FMC deployment.
Ability to service high-bandwidth applications, leading to increased ARPU	Increased revenue from new services that can be sold, distributed or provided to a continuously connected customer.
Improved call quality	Important for inside use of cell phones for both voice and data. Higher customer satisfaction, more displacement of traditional phone service.
Reduced turnover due to improved call quality	Higher customer satisfaction due to fulfilled customer expectations on price, call quality, and innovative services. Lower marketing, sales, and configuration costs.

FMC Transforms the Value of Your Fixed and Wireless Infrastructure

An example case reveals a $400–600 million-per-year hidden opportunity for a group of one million households.

Consider, for example, a region or cell in which wireless spectrum is scarce or it is expensive or difficult to add cell sites to expand capacity. Examining the location of cellular calls may lead a cable service provider to discover that up to 50 percent of calls made on mobile devices are made on the business premises or at home – in an environment where a fixed line could have been

used. By providing a non-cellular-spectrum-consuming solution such as Wi-Fi unlicensed mobile access (UMA), providers can reroute wireless calls to the cheaper and more scalable fixed bandwidth that exits the premises via a fixed cable broadband connection.

Example consumer upside: Assume, for example, that you have an average per-family revenue of US$80 per month, and three phones sharing a pool of 700 minutes. With a dual-mode fee of $30 per home location, permitting free calls over Wi-Fi and assuming a reduction in minutes per plan of $20 per month (because at-home calls are now free over the Wi-Fi/broadband haul), the net increase in revenue per family is $10 or $2.50 per person (family plan of $80 + FMC family fee of $30 adjusted for the smaller 500 minutes program, which subtracts $20).

Assume that 66 percent of total cellular minutes move to the free Wi-Fi calling technology and you have freed up 231 minutes per month (66% x 50% x 700 minutes). Not only have you gained $10 per family per month in revenue, you have in addition freed up enough spectrum to support approximately $42 worth of spectrum per month (assuming the new family also adopts the FMC solution). This new capacity could translate into a $470 million opportunity over one million households. For the consumer, the free “at home minutes” plus data access via Wi-Fi increase the value of the mobile dual-mode phone (which has Wi-Fi and cellular capability) even from service providers without 3G networks. And both consumers and businesses like putting a cap on total costs.

Another way of thinking about the opportunity is that a given amount of spectrum changes from supporting $90 of revenue per family to $132 of revenue per month ($90 + $42) and additionally creates a better platform for high-bandwidth content downloads. Achievement of such ARPUs would place a service provider in the top ranks of performance.

FMC, in this example, delivered to 4 million customers (one million 4-person households) would add US$122 million per year of net incremental revenue from existing subscribers and the potential for an additional servicing ability of approximately $600 million before considering additional data or content services made possible by FMC broadband delivery to the cellular phone. Depending upon assumptions, this business case yields between a $400–600 million benefit per year and a net present value (NPV) of approximately $3.2 billion.

FMC Market Size

FMC is not just about unified communications or seamless data connection. From a strategic perspective, FMC provides a new, more powerful business platform on which to develop new revenue-generating services and to transform user experiences. Many of the analyst forecasts tend to be based upon a single existing application – unified communications. These single-product forecasts underestimate the opportunities for the creation of new FMC services. Complicating the forecasting problem is the availability of different technologies for supporting FMC (such as IMS, UMA, SIP, and single-mode versus dual-mode phones).

As evidence of this forecasting uncertainty, the next section shows a significant gap in 2010 between Informa’s estimate of FMC users (60 million) and Infonetics’ forecast of dual-mode phones (288 million). If we were to assume for simplicity that all FMC services will be based on dual-mode phones, the difference, if both consulting firms are right, suggests that there is a large untapped opportunity of at least 228 million consumers who have dual-mode phones and no FMC services. In reality, the opportunity is probably larger, because FMC can be achieved with a variety of handset types. As is most markets, people buy applications and services before they buy the enabling technology. A flurry of applications and content innovation can be anticipated by this new

dual-mode handset installed base availability and the low cost of developing Internet applications and services. These innovations will increase demand for dual-mode handsets.

Narrower Market-Size Estimates

The FMC market is projected by most analysts as being predominantly a consumer market with an approximately 7:1 ratio between consumer and business-user subscribers.

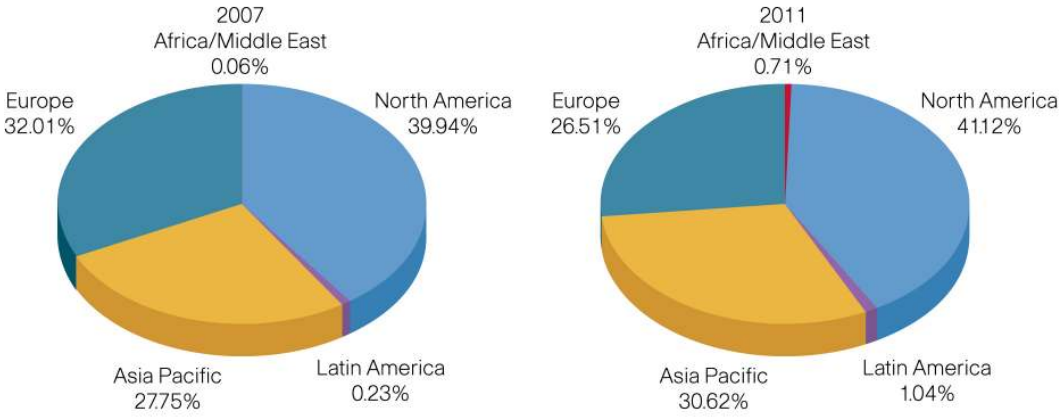
Consulting firm Infonetics projects that dual-mode Wi-Fi handsets (required for some approaches to FMC) represent a market of approximately 591 million handsets in 2008–2010, growing from 119.5 to 288 million handsets (forecast as of July 2007).

Table 4. Infonetics Forecast

$28B FMC Revenue by 2011

Scenario 2 – Combined Regional Revenue 2007 to 2011

FMC Revenue (US$ Millions)					
	2007	2008	2009	2010	2011
North America	579.15	1,954.84	4,452.15	8,019.45	11,563.82
Latin America	3.38	17.99	57.74	149.42	291.84
Asia Pacific	402.32	1,476.36	3,412.19	6,150.22	8,612.12
Europe	464.15	1,616.58	3,225.83	5,315.89	7,455.64
Africa/Middle East	0.93	8.24	34.77	92.00	198.85
Total	1,449.93	5,074.00	11,182.68	19,726.99	28,122.27



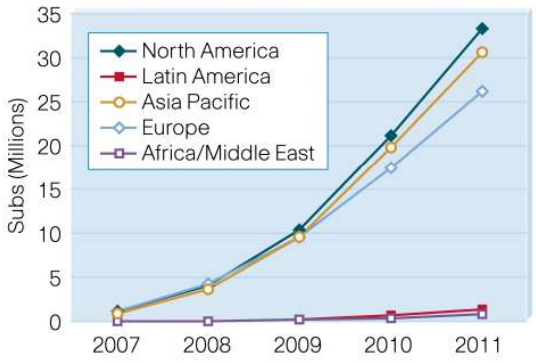
Source: Informa Telecoms & Media

Different scenarios for FMC growth developed by Informa UK suggest a market with service revenue of between US$13 billion and US$37 billion by 2011 depending upon assumptions about the aggressiveness with which FMC services are promoted. FMC's forecast number of subscribers reaches between 35 and 112 million consumers by that date. The enterprise forecast varies from 10–14 million subscribers by 2011. In other words, 20–27 percent of the revenue will be enterprise-based and enterprises will spend more on FMC per capita.

Table 5. Informa Forecast

92 Million FMC Users by 2011
Scenario 2 – Combined Regional Subscriber Numbers

FMC Subs (Millions)	2007	2008	2009	2010	2011
North America	1.17	4.10	10.39	21.12	33.17
Latin America	0.01	0.07	0.24	0.67	1.39
Asia Pacific	0.90	3.68	9.70	19.83	30.59
Europe	1.21	4.30	9.63	17.39	26.16
Africa/Middle East	0.00	0.02	0.11	0.34	0.80
Total	**3.30**	**12.17**	**30.07**	**59.35**	**92.12**



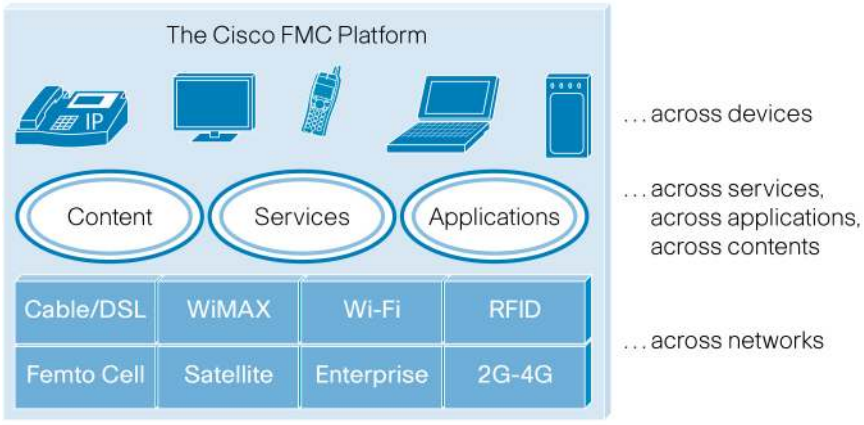
Source: Informa Telecoms & Media

Cisco FMC Platform and Services

The Cisco FMC Platform as shown in Figure 1 consists of Cisco's products and service management, best-in-class partner offerings, and Cisco Professional and Support Services. These include building blocks as well as complete solutions for service provider FMC services.

Figure 1. The Cisco FMC Platform

The Cisco FMC Platform Enabling
"The Connected Life" with Choice and Simplicity



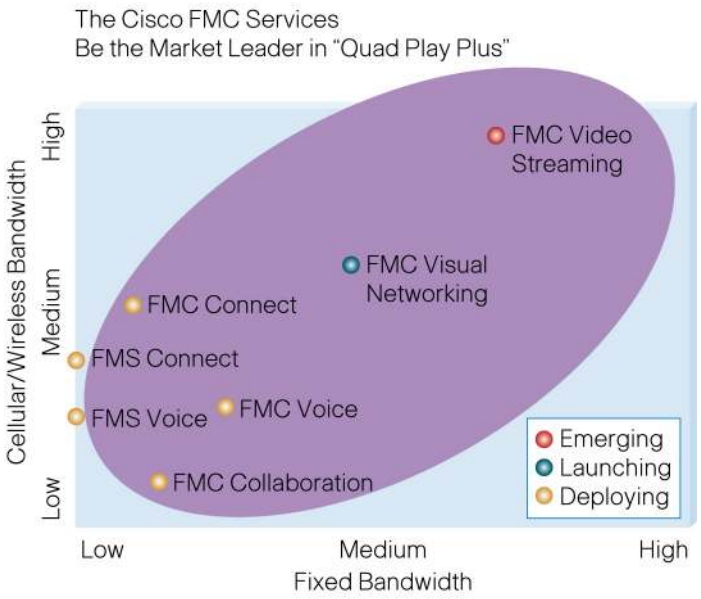
With today's rapidly evolving FMC standards, technologies, and markets, the Cisco FMC Platform, based on a high level of R&D, delivers industry-leading, open-standard FMC innovations. Cisco's vast knowledge of its enterprise installed based; leadership in enterprise voice, unified communications, and WLAN; and momentum in enterprise FMC deployments bring experienced staff, best practices, and test beds to lower service providers' FMC deployment risks and time to

market. Cisco has long been bridging global networks of same kind. With the Cisco FMC Platform, Cisco is bridging disparate networks of fixed, unlicensed wireless, and licensed wireless.

Figure 2 illustrates the FMC services supported by the Cisco FMC platform:

- FMC Connect Service
- FMC Voice Service
- FMC Collaboration Service
- FMC Visual Networking Service
- FMC Video Streaming Service

Figure 2. Cisco FMC Services



FMC Connect, FMC Voice, and FMC Collaboration Services are low fixed, Wi-Fi, and cellular bandwidth services that are readily deployed today. Fixed Mobile Substitution (FMS) occurs when the mobility service completely eliminates the need for fixed-line service. FMC Visual Networking (multi-party video conferencing) is at the launch stage in Figure 2. FMC "3-Screen" Video Service requiring high fixed, Wi-Fi, and cellular network bandwidth will emerge in the near future.

These FMC services have varying degrees of readiness for hosted, dedicated, shared, or managed deployment models. At minimum, service providers can look toward being a channel partner to enterprises and offer bundled voice, data, and professional and support services. As FMC services are turnover-resistant, service providers can immediately enjoy new levels of stickiness for the enterprise voice, data, and professional and support services associated with the initial wave of FMC deployment today.

Cisco Professional Services

Cisco Professional Services provides FMC planning, design, deployment, and optimization services. Clients include many of the largest network operators in the world. Cisco provides leading-edge and highly experienced staff with skills in assembling the right FMC architectures, designing optimal FMC networks, and testing FMC-specific solutions.

In addition, Cisco network consulting engineers have access to critical internal resources that will help to streamline the identification and resolution of problems and ensure the smoothest possible implementation. Cisco has also established IP Next-Generation Network (NGN) labs around the world to help customers with proof of concept, lab validation, interoperability testing, and certification.

Table 6. Summary of Cisco Support Capabilities and Tools

People	Process	Tools	Partners
• Largest collection of certified IP experts (2400+) • Breadth and depth of IP NGN experience • Leadership in patents and standards contribution	• Program management methodology • Knowledge transfer • Over 600 best practices • ISO 9000, TL9000, Six Sigma	• Technical Assistance Center (TAC)/customer portal • $30 million annual investment in tools • $200 million in labs • Knowledge repository of over 600 leading practices	• Specialized and globally scalable • Shared methodology and practice • Comprehensive SLAs

Cisco's people, tools, processes, and partners are key factors in the successful launch of new FMC services, and they combine to help ensure that service providers can meet the challenges of designing and scaling their network to reduce time to market, risk, and cost and to achieve operational excellence.

Compared with its competitors, Cisco holds an **advantage** in each of the four categories:

- **Comprehensive global IP infrastructure:** Thirteen centers of excellence worldwide are designed to meet the needs of any service provider, anywhere.
- **Superior expertise across broad range of technologies:** Cisco brings a multitude of tools and assessments for every phase of a carrier's network lifecycle. Cisco's projects include work with major firms worldwide. Projects delivered or in process include IP/MPLS backbone, voice and signaling, IP RAN, WiMAX, service mesh, PWLAN, mobile IP convergence, UMA and femtocell projects, security, network management, and the Cisco Service Exchange Framework (SEF).
- **Industry-leading partner network:** Cisco has a global partner network that extends Cisco Technical Support Services to help provide optimal support and maintenance of service provider networks.
- **Award-winning service framework:** Cisco's lifecycle approach to services has been recognized as the most developed in the industry. With more than 600 best practices recorded and with the largest collection of tools and processes, refined and proven over time, Cisco customers benefit from the experience Cisco has gained working with a wide variety of service providers worldwide.

Appendix 1 describes three commercial deployments: FMC Connect by Swisscom, FMC Voice based on the UMA approach by T-Mobile, and FMC Voice based on the Service Exchange Framework (SEF) approach by MTS.

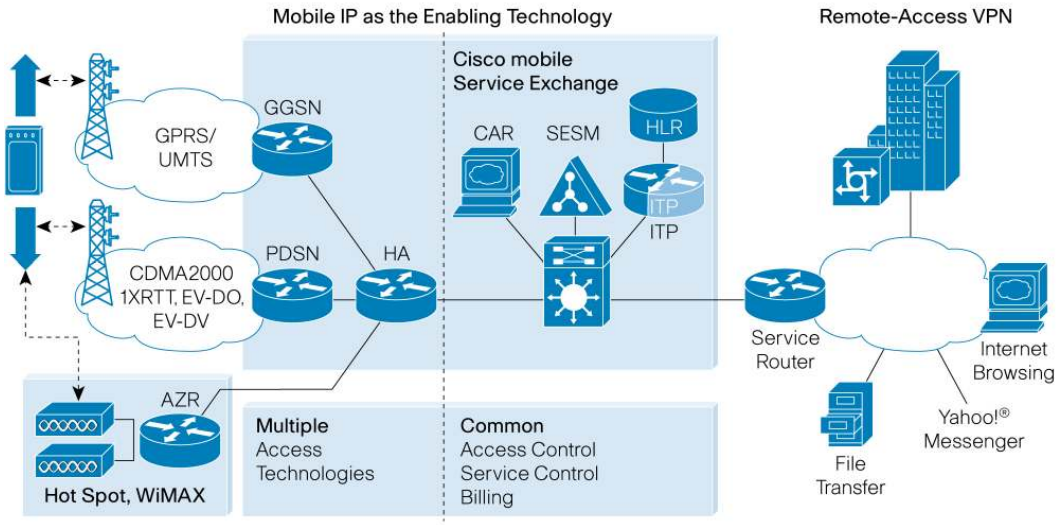
Appendix 1: Examples of Cisco FMC Success Stories

FMC Connect: Swisscom Simplifies Connectivity

Businesses and consumers have embraced mobile data services as a way to stay connected while on the move. However, success in the mobile Internet market is not just about providing access, it is also about delivering desirable content and applications to users. Businesses want to enable mobile VPN access to corporate intranets to access e-learning, e-mail, and workforce-optimizing applications, to name just a few. Consumers are looking for services such as web-based shopping and Internet gaming. Cisco Mobile IP Networking – an industry wide technology, also referred to as "transparent roaming" – helps mobile operators to efficiently deploy these applications and services to the mobile user and gain a powerful advantage in this highly competitive market.

Swisscom Mobile offers fixed and mobile data services in a challenging, mountainous geographic landscape. To optimize its service to customers, it has deployed a new generation of converged data services. For the first time ever, users can roam across fixed-line DSL and mobile GPRS, UMTS, EDGE, HSDPA, and wireless LAN hotspot networks with service automatically switching to the best possible connection. Based upon the Cisco Unlimited Connection technology platform, this solution simplifies life for users and allows Swisscom to maximize its utilization of existing infrastructure.

Figure 3. Swisscom Unlimited Service Deployment Architecture



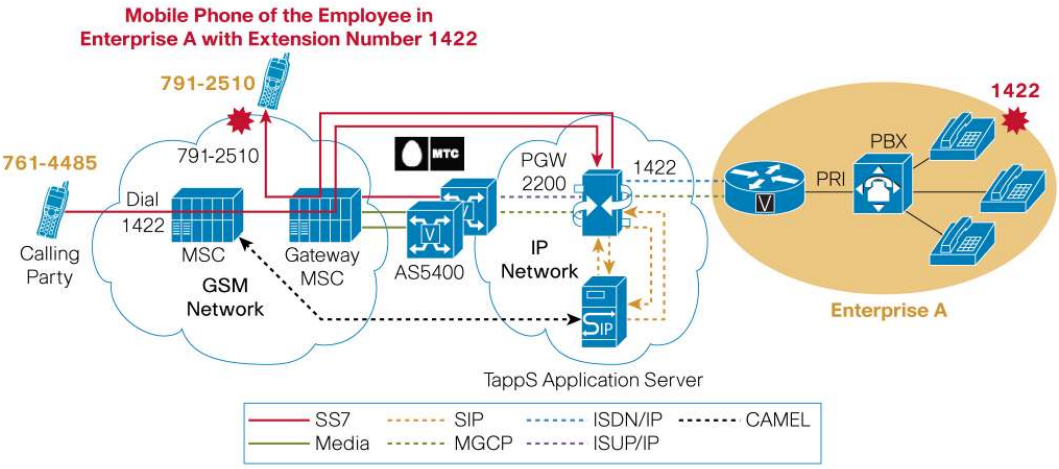
FMC Voice: Mobile TeleSystems Outpaces the Competition

Mobile TeleSystems (MTS) operates multiple networks for 50 million customers in Eastern Europe and Russia. MTS saw an opportunity to increase its revenue opportunities with larger business by offering an FMC solution. It believed it could surpass a competitor's FMC offering that was costly to operate and unreliable. The Cisco solution provided a carrier-grade, comprehensive service-creation and delivery environment that allowed customers to use the web for self-service provisioning, which represented a major convenience and cost advantage over the competitor's offering.

Features available include directory search, contact synchronization, presence, and availability with calendar integration, text messaging, voicemail download and playback, dial via office, log synchronization, simultaneous ring, and short-code dialing from mobile phones (matching the use

of extensions with a traditional PBX). The Cisco solution was deployed rapidly and reduced MTS' cost of operations and development by avoiding the need to invest in equipment to support a traditional TDM PBX. (This solution can have a deployment cycle of approximately 3 months.)

Figure 4. Mobile TeleSystems (MTS) FMC Voice Deployment Architecture



FMC Voice: T-Mobile Changes the Rules for Voice

T-Mobile is a major mobile-only service provider with approximately 27 million customers. In June of 2007, it launched its T-Mobile HotSpot@Home service designed for consumers and small businesses. The service, priced at US$29.95 per month for five lines and $19.95 per month for one line, uses a dual-mode cellular/Wi-Fi handset that works with the standard cellular network and smoothly hands off calls to a co-developed Linksys FMC Optimized Router with extensions for managing QoS and minimizing drain on the handset's battery life. A significant benefit to T-Mobile is the freeing up of cellular spectrum by having on-premises/at-home calls that are placed using UMA Wi-Fi spectrum connect to the fixed broadband link. A significant benefit to users is unlimited phone calling from home or the small business office, which means no billing surprises for the customer and higher perceived value from the relationship.

Any revenue loss from fewer cellular minutes purchased is offset by the fixed fee for the HotSpot@Home service. (And much of the substitution between cellular minutes and Wi-Fi minutes is actually the replacement of free evening, weekend, or "FaveFive" minutes, making the economics even more favorable.) In-building call quality is improved. Faster-than-3G downloading is facilitated. External hotspots are made more useful to customers. And mobile regulated spectrum is freed up to service more customers and to enable more value-added services. A platform for delivering bandwidth-intensive services is now available to T-Mobile without multibillion dollar wireless spectrum purchases. Easy handover of calls between the Wi-Fi and cellular networks simplifies usage of this service. (This solution can have a deployment cycle of approximately 4-6 months.)

Figure 5. T-Mobile Service Architecture