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## **Disruptive Analysis**

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*Don't Assume*

### **Enterprise FMC:**

**The benefits & challenges of converging fixed, wireless & mobile communications in business.**

## Introduction

Fixed-mobile convergence (FMC) is now arriving for the enterprise marketplace.

Whatever FMC actually is, that is. It has now joined the long list of “buzzwords” that sound important, but which are actually far too general and poorly-understood to be of much immediate relevance to enterprise technology decision makers. “E-Commerce”, “Multimedia”, “Voice/data Convergence” and “Enterprise Mobility” are all earlier examples of confusing “paradigm-shifting” marketing-speak, which didn’t actually explain very much at first. All of them ultimately turned out to be convenient “umbrella terms” for clusters of important sub-trends and niche technologies.

FMC is the same. You can’t just “buy an FMC solution”, or “implement an FMC strategy”. It is just a convenient catch-all term that relates the linking of traditionally-separate cellular services, with the fixed/IP universe. Often, WLAN is positioned as the “glue” which holds the two worlds together, but other alternatives exist as well. In general, the emergence of FMC represents the (belated) recognition that the communications world will never be “all wireless” and especially not “all mobile”. While the cellular world’s preferred acronym FMS (Fixed-mobile substitution) still has some potential for growth in certain areas, it runs into some severe practical deficiencies in the mainstream corporate telephony sector, where fixed-line communications are deeply entrenched, and increasingly integrated with IT systems.

Adding to the opacity of FMC has been the general focus on consumer, rather than business, solutions. BT’s Fusion offering is probably the best-known example, but the next 12 months will probably see a large number of similar services launched in the UK and around the world. But in amongst the residential broadband/cellular FMC razzmatazz, a number of more sober, but nonetheless important, corporate-focused developments are taking place. These offer businesses the possibility of controlling their spiralling cellular bills, improving coverage of wireless communications indoors, hooking existing mobile and PBX users together, and exploiting more innovative means of connecting employees and clients.

It is instructive to consider that, in many ways, one of the best early examples of enterprise FMC is actually the BlackBerry push email service. While it doesn’t include a voice component, some of its underlying philosophies point to “best practice” in more general FMC deployments. It combines a mobile device/service with an enterprise-owned and controlled platform. It integrates well with security infrastructure like firewalls, ties in with the same network used for fixed terminals (ie PCs and Exchange servers, in this case), gives a good user experience, generally works OK indoors, and is sold by people who understand businesses’ IT and telecom requirements. That said, it clocks up unnecessarily-high cellular data charges when the user is in-building or roaming. Nevertheless, it gives a good set of indicators of the key attributes that other, more voice-oriented, FMC architectures ought to emulate.

This white paper is intended for enterprise IT and telecoms personnel, and aims to give clarity on emerging FMC trends. It highlights the different manifestations of FMC in the corporate space, and digs into problems as well as benefits. It is not intended as a thorough technological discussion, although it touches on a number of the more important standards and enablers. For more detailed research and analysis, please contact [consulting@disruptive-analysis.com](mailto:consulting@disruptive-analysis.com).

## **Benefits of enterprise FMC**

### **Lower mobile costs**

Most enterprises have their fixed-line telecoms costs under control. On-net calls via a PBX are usually free, both onsite and between locations. Off-net fixed-line calls are generally inexpensive. Leased lines are being replaced with VPNs, often sharing a connection with the company's high-bandwidth data network. International call charges have fallen substantially in recent years. Fixed-to-mobile call charges, however, have often become a growing element of cost.

Conversely, cellular call charges are often poorly-controlled and spiralling – especially for companies with employees that roam internationally. While some firms issue handsets to employees and are billed directly, others work through reimbursement of expenses, which is time-consuming and administratively complex. In addition, a growing number of cellular calls are placed from within the building, often when the employee is within reach of a fixed-line phone. The convenience of the mobile handset's features - address book, call register, SMS, "personalisation" – outweighs any inclination the user might have towards thriftiness.

As a result, the enterprise ends up with an under-utilised (but economic) fixed-telephony system, and an over-utilised (but expensive) mobile service. This means duplication in devices, and paying more for both the "owned" telephony system and handsets (capex), and the connectivity services (opex). Combining the two systems potentially makes huge economic sense – especially if the business can also exploit its other "owned" network assets, such as its data network and WLAN infrastructure. Potentially, FMC approaches enable mobile users to have a single device and lower costs, and still benefit from the existing enterprise fixed telephony system.

### **Indoor coverage**

Indoor cellular coverage is often poor in office buildings and other large sites. Brickwork, steel, concrete – even tinted metallised windows – soak up or reflect the energy of cellular transmissions.

This is being exacerbated by the move towards 3G, which is at higher frequencies than traditional 2G GSM, and can have notably worse in-building propagation. The growing use of cellular data applications, such as laptop wireless data cards, can make the situation worse still, as they need extra indoor network capacity, as well as coverage.

These are problems for both the enterprise customer and the cellular service provider. Users receive patchy and unreliable service, with dropped calls and "standing by the window" syndrome. Operators have to deal with both customer dissatisfaction and (especially with 3G) some rather unpleasant planning, operational and economic impacts on their wider outdoor radio networks. As demand goes up, they also have to spend large amounts on "backhauling" traffic to their core networks.

In some cases, enterprises have been able to persuade their service providers to install dedicated in-building systems to improve coverage. Based around various technologies like distributed antennas, such systems are often expensive to install, although they are relatively mature and becoming more fully-featured. Generally,

these take a cellular signal from outdoors (or perhaps a dedicated base station) and “spread it around the building” over fibre or cable. These are very much “special projects”, applicable only to the largest sites and most lucrative customers. Pico-cell-based alternatives are becoming popular, but face challenges in gaining acceptance from many operators’ conservative radio planning departments, and can cause difficulties in RF management with outdoor cells in the same spectrum.

Potentially, WLAN works better (or might be cheaper) than traditional in-building cellular coverage solutions, particularly for high-bandwidth applications like laptop-based VPNs and browsing/downloads. Furthermore, if WLANs are being deployed for other “local” applications like data connectivity anyway, cellular voice traffic can possibly ride on the same infrastructure “for free”. WLAN traffic can also be backhauled over inexpensive IP connections to an operator’s network core.

Another alternative use of cellular “picocells”, also connected to IP networks - is also emerging with the advent of new indoor-only low-power GSM operators. This is discussed later in this document.

### **New applications & functions**

The desire for lower costs and better coverage are clearly “hard” benefits of FMC. However, as time goes on, businesses may find that the combination of new cellular technologies, WLAN, fixed-IP networks and other elements offers additional benefits.

Some of the longer-term upsides relate to pushing new IP-based applications out to the previously-separate mobile workforce. Centralised management and monitoring of the whole network should be possible, as should more tightly-integrated messaging and “presence” functions. Options exist for location-based features to be added, along with tighter inter-working with enterprise IT systems.

In some vertical markets, additional industry-specific benefits are possible. Investment banks, for example, could route in-building calls on cellphones via their call-recording platforms, for regulatory compliance reasons. Local government organisations may be able to better exploit the WiFi “hotzones” they are building out for FMC purposes. Entertainment and hospitality companies could offer new services, or reduced-rate mobile/international calls, to their guests.

### **Integrated solutions providers and channels**

An interesting thing has happened in the communications markets in Europe and North America over the last two years. There has been a huge amount of telecom-sector merger and acquisition activity. Many providers now have both fixed and mobile telecoms arms. This trend is being further driven by new radio spectrum licences and the emergence of a new breed of enterprise-centric “virtual” operators (MVNOs). In two years’ time, mobile-only service providers may be unusual.

Consequently, enterprises can expect to get a great many innovative FMC solutions being presented by their suppliers. Particularly in cases where the operators also have competent integration and consulting services arms, it seems likely that the adoption of FMC will also be driven by “supplier push”. Given the huge competitiveness among carriers, it seems probable that the business customer will end up as a beneficiary.

## Dual-mode WiFi/cellular & SIP – great in theory, but.....

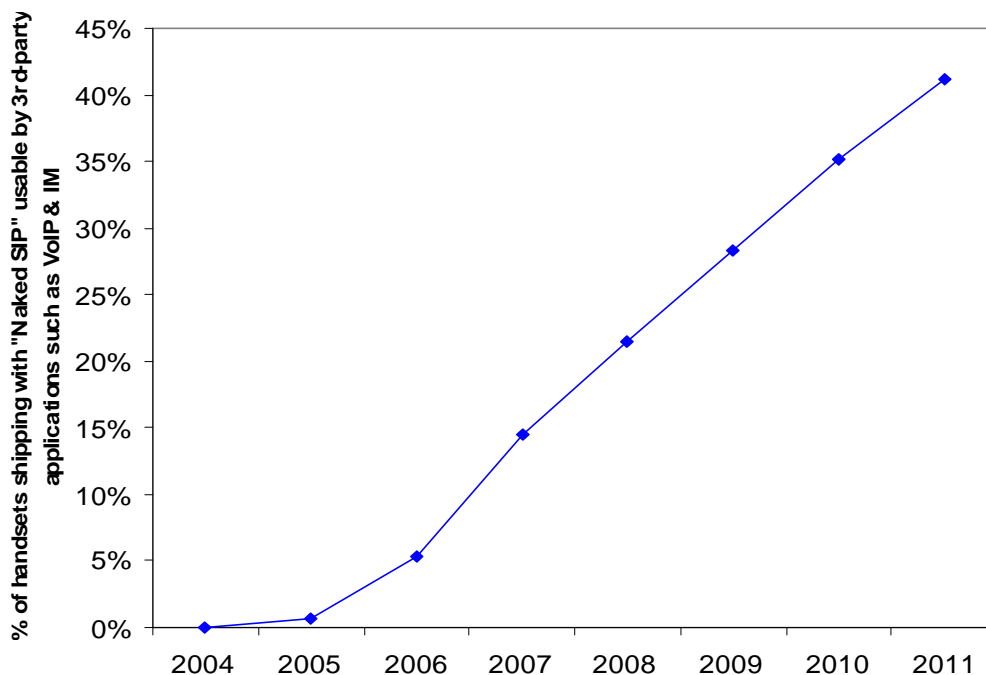
Undoubtedly one of the most exciting manifestations of enterprise FMC lies in the promised vision of dual-mode solutions, coupling WLAN and cellular voice platforms in a single device. This bridges the fixed/PBX-centric world of corporate telephony with the ubiquity, productivity and user experience of cellular. In theory, such devices ought to be able to connect “outdoor” telephone calls via the ordinary mobile network, and “indoor” calls via the WLAN infrastructure.

At first sight, it provides a perfect crystallisation point for FMC. Two birds killed with one stone – better indoor coverage, and potentially lower costs, from reduced numbers of devices and lower/zero call charges when the device is “on net”.

Various solutions have already been announced – Cisco and Avaya have both said they are working with Nokia and Motorola on devices, BT has selected Alcatel as a system integrator for its solution (due in 2007), while in Japan, NEC and NTT DoCoMo have been selling a dual-mode product for some time. Numerous niche players and startups are targeting the space as well.

More generally, an increasing number of handsets are supporting “naked” SIP, and therefore the possible installation of 3<sup>rd</sup>-party VoIP and messaging clients. These raise the very attractive proposition of bypassing expensive operator calls, and making a direct connection to an IP-PBX or corporate server over WLAN. In the future, it should also be possible to run SIP/VoIP over a 3G data channel, as cellular data “pipes” become progressively cheaper.

**Figure: Growing penetration of SIP-capable mobile phones**



Source: Disruptive Analysis, SIP- and IMS-capable Mobile Phones Report, May 2006

However, it is worth bearing in mind that this form of enterprise FMC is still at a very early stage. There remain some significant near-term technical and implementation challenges, despite its conceptual elegance and longer-term potential.

### **Handset issues**

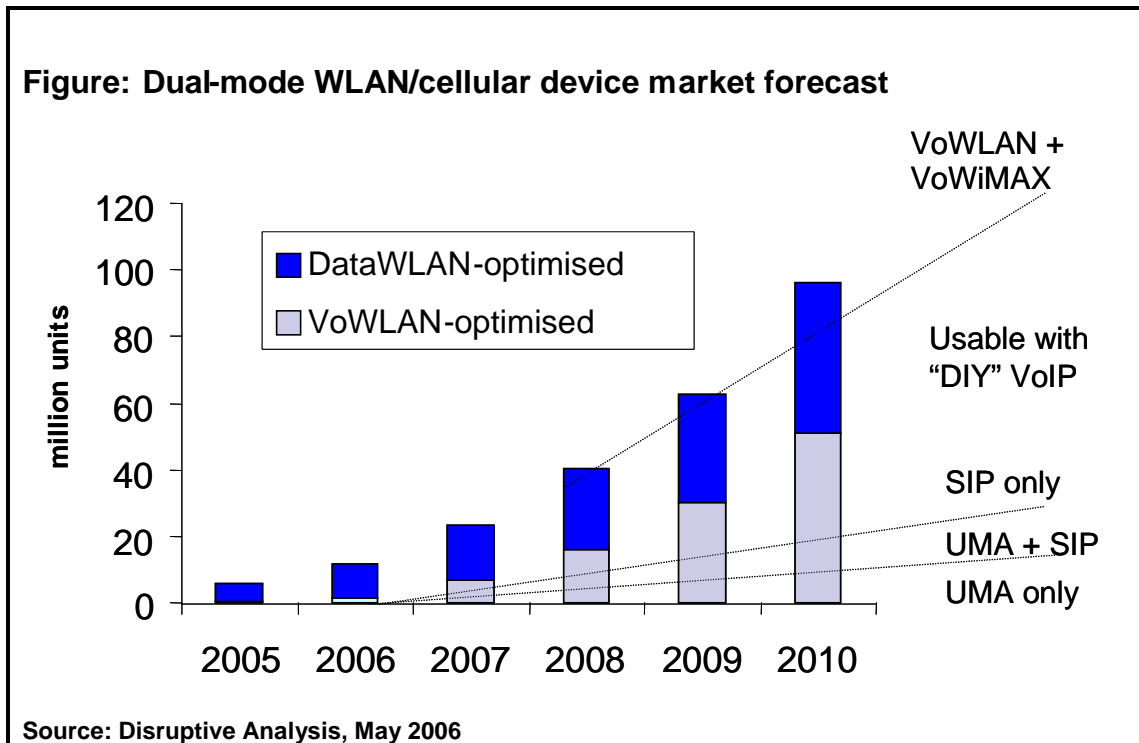
Probably the most important set of stumbling-blocks surround the handset. Although there is a growing number of cellular devices available that include WLAN, these are predominantly oriented towards data usage, not voice. True “FMC phones” face several challenges:

- Battery life on WLAN-capable devices, although improving, is still notably worse than that on cellular-only phones. The extra processing need for VoIP calls over WLAN exacerbates this. To accommodate larger batteries, many dual-mode devices are larger and “clunkier” than normal handsets.
- WLAN-equipped devices typically cost considerably more than “single-mode” cellphones. Despite WLAN chip prices falling, the complexity of the extra software in the phone means that the devices need considerably more development effort by the manufacturers.
- The “user experience” on WLAN-equipped phones is, at best, patchy. There are no real standards about how dual-mode devices ought to work in the hands of the user, and so consequently each one behaves in a different fashion. This represents a significant problem, unless a company is happy to issue identical devices to all employees – and is also happy with a typical handset’s 6-12 month lifecycle.
- The handsets will usually require specific 3<sup>rd</sup>-party “client” software to be installed. This increases the setup, configuration and device-management complexity involved.
- The devices need to be able to support the enterprise’s standard security mechanisms for WLAN devices. The same security software used on laptops and PDAs may be difficult to install on a handset.
- Almost all dual-mode enterprise-class devices are “smartphones”, using a fully-open operating system such as Windows Mobile, Symbian OS or Linux. Although some corporations are already issuing these to staff, there remain many unanswered questions over the implications for support costs, security and device-management. It is not obvious that the requirements of FMC deployment should themselves determine the enterprise’s overall mobile device strategy.
- Simply adding a VoIP client to a data-centric WLAN-equipped phone may not be as easy as it appears. There may be complexities related to the phone’s internal software design – such as whether the VoIP software can use the embedded echo-cancellation functions used on ordinary cellular voice calls.

Even when these issues are ironed out, there remains the central issue of whether a company wants to issue all its mobile staff with new dual-mode phones. What happens with employees that currently use their personal (non-WLAN) phones for work calls? What about staff that already have BlackBerries or other PDAs – do these need to be replaced as well?

The ideal scenario is that the company can use a mix of devices – some dual-mode, some cellular-only, some fixed, and possibly some WLAN-only as well. This would

reflect the typical mix of mobility within an organisation – from true “road warriors” through to deskbound call centre operatives.



## Network issues

While many companies are installing WLAN access points (APs), and often more complex switched-WLAN solutions, these are not necessarily optimised for voice, or FMC integration with service providers' networks. Among the more important issues are:

- Whether the WLAN has sufficient coverage for telephony usage, as well as “hotspot”-style data connectivity. Ideally, users would be able to use their FMC dual-mode devices in areas like stairwells, elevators, and possibly outdoor on the corporate campus grounds.
- Whether the WLAN has voice-capable “quality of service” (QoS) abilities, including 802.11e.
- Whether the infrastructure supports fast roaming and handoff between APs, necessary when a dual-mode user expects uninterrupted calls while walking through the building. An IEEE standard for this, 802.11r, is on the way, although at the moment most approaches are proprietary and vendor-specific.
- Security issues are paramount, and become especially complicated where the call transits the WLAN, and then goes on into an operator's network. Network transitions, where the handset goes from cellular to WLAN mode, will be complicated by the need to switch authentication technologies “on the fly”.
- WLAN capacity may well become an issue. Although voice calls from dual-mode devices do not need a huge amount of bandwidth, they are very delay-sensitive. In many cases, any more than 6-10 simultaneous users per AP may be the limit, before QoS is adversely affected.

Other related issues involve the integration with the PBX or IP-PBX. How does numbering work? Does the phone have both a fixed and mobile number? How does the handset best exploit “least cost routing” and use the company’s fixed-line network and VPN for calls if necessary? What happens with SMS’s when the phone is in WiFi mode?

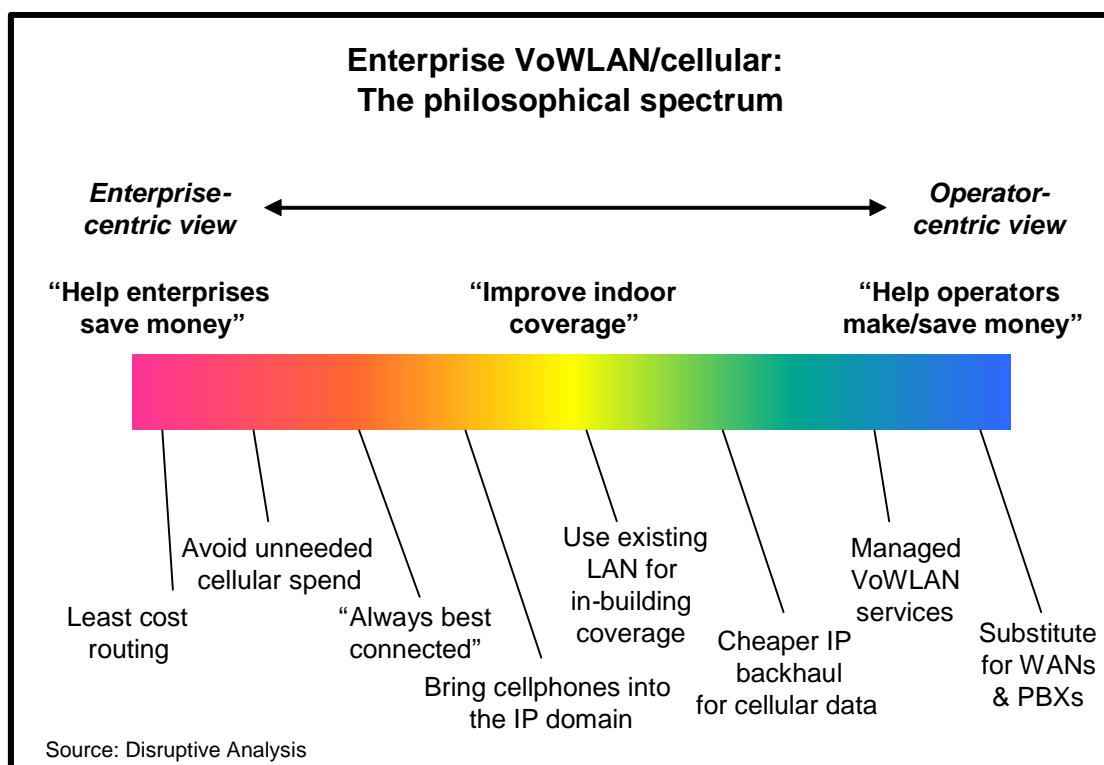
### **Integration and control issues**

A key question for dual-mode enterprise FMC is who controls “mobility management” and handover. It is critical to remember that “dual-mode” does not just mean cellular vs. VoWLAN. The two most important “modes” are actually public vs. private. A converged device has two “personalities” – a “public, service-oriented” face, where it hooks into an operator’s network and billing system and authentication platform. And a “private, owned” side, where it is part of the enterprise’s in-house IP infrastructure, outside the control of a service provider.

This needs some form of control platform, and within it, a “roaming algorithm”. Simplistically, this could mandate general policies like “use private WLAN for free calls where you can, especially in the company’s overseas offices - and cellular only where you really have to”, or “use cellular services everywhere, except regions of particularly poor coverage, or pre-determined international WLAN hotspots”.

This location and “ownership” of this control point, encompassing policy and session management is therefore highly important. Disruptive Analysis believes that this will lead to the evolution of three main architectures for enterprise VoWLAN/cellular FMC:

- Mobile-operator centric, typically offering “cellular over WLAN” services, using the enterprise WLAN (or PWLAN hotspots) as a backhaul mechanism for in-building reach and tariff/service differentiation, and the existing back-office and billing infrastructure to deal with VoWLAN calls. Over time, as operators move to IP platforms and network cores like IMS, services will become gradually richer, but will protect “billability” and generally be service-centric.
- Fixed-operator centric, aimed at reducing corporate spend on cellular. This may leverage existing fixed inter-site enterprise communications services, or hook into the service provider’s own SIP/VoIP infrastructure. Using handsets connecting via VoWLAN, these can be packaged together with cellular airtime, perhaps provided by sister mobile carriers in the same group, or bought wholesale and resold as an MVNO offering. Again, this would use back-office and network signalling intelligence to offer combined bills and unified services.
- Enterprise-centric, whereby a corporation (or an integrator/outsourcer acting on its behalf), sources both fixed and “vanilla” mobile services from carriers, implementing intelligence within the PBX and/or dual-mode handsets to switch between wireless networks, according to its own preferences and administration policies. This would use “commodity” network services, but would incur much higher levels of internal complexity to manage, greater numbers of external purchase relationships and likely make “one-number” services more difficult.



Vendors and service providers make much is made of the virtues of “seamlessness” in the context of FMC. Much of this is nonsense. While voice calls should (ideally) never drop or require re-dialling, it is important to recognise that different networks have different characteristics, and “seamlessness” should not mean “carelessness”. Much changes at the boundary between, say, the outdoor cellular domain and an indoor WiFi network - bandwidth, quality, ownership, security, liability, monitoring, latency and, above all, price.

In addition, “seamlessness” usually implies very close integration with a provider’s network, which tends to work against the more enterprise-centric / cost-saving approaches based on mobility management in the handset or PBX domain. Businesses need to decide whether 100%-perfect handoff (which, let’s face it, probably only occurs on a tiny fraction of calls) is a “must have” or a “nice to have”, when weighed against the benefits and downsides of inhouse vs. operator control.

## How do you buy dual-mode solutions?

At the moment, there is a significant push-back from the mainstream cellular carriers against dual-mode solutions, especially in the enterprise. Many are unwilling to support solutions that threaten to assist businesses in reducing their cellular bills – and, especially, they view subsidising dual-mode handsets as tantamount to commercial suicide.

In the residential market, some cellular firms are looking at dual-mode solutions based around a more “controllable” technology called UMA (unlicensed mobile access), but this does not work in the context of more complex corporate WLAN networks (and it has assorted other limitations which are not appropriate to discuss in this document). In a business context, more complicated (and currently less-standardised) alternatives based on SIP technology are needed. As well as being wary of the business models, most mobile-only operators lack the necessary skills to

provide such solutions – their knowledge of corporate WLANs, IP networks, SIP, PBXs and systems integration is typically very patchy.

This means that the corporate dual-mode customer will need to find another avenue for supply. At present, traditional voice channels and integrators for enterprise telephony also have only limited skills in WLAN, and, especially, cellular devices. For some companies, it should be possible to source SIM-only handsets, and WLAN and mobility-management infrastructure separately. This, however, has its own internal issues around learning-curves and integration costs.

### **What about WiMAX and similar broadband technologies?**

WiMAX, WiBro, UMTS-TDD, Flash OFDM, 802.20, WiFi Meshes, UWB.... The list of new acronyms in the wireless industry is phenomenal. The good news for enterprises is that most of these can safely be ignored for at least two or three years, especially for voice telephony. Most of them don't yet have suitable devices on vendors' roadmaps, rollout plans for service providers, or reference sites. In addition, many of them are expected to operate in higher-frequency parts of the spectrum than WiFi or conventional cellular networks – and will therefore struggle with indoor coverage.

Disruptive Analysis's recommendation for mainstream enterprises is to keep a watch on these innovations, and maybe considering deploying trials at some point, but don't expect city-wide high capacity mobile broadband coverage too soon - unless you've got a subsidiary in Seoul or Tokyo.

## **Enterprise cellular 2.0**

The previous section examined some of the possibilities for WiFi-based FMC, using dual-mode handsets to switch between cellular and corporate WLAN networks. While these solutions are clearly intended to hand more control over costs (and the network) back to the enterprise telecoms manager, they are not quite as straightforward to implement as they first appear. Solutions are now emerging – but relatively slowly, and they will no doubt take some time to mature.

In the past, the cellular industry's approach to corporations has tended to be relatively simplistic. FMS (fixed mobile substitution) has been achieved by providing cheap and subsidised handsets, together with shared pools of "minutes". The sales and marketing process has often been shaped around the idea of selling a basic commodity – more like selling stationery suppliers than selling complex "solutions".

There are now early signs that the cellular industry is starting to recognise its deficiencies, and re-engineer itself to give better service and pricing to its corporate customer base. It is adopting some of the techniques of the WLAN industry, exploiting IP connectivity, and offering better in-building coverage solutions. Some are also using other tools to achieve the same results – such as "office zone" tariffs, with lower-priced calls within a defined cell surrounding the company's site.

New operators are also emerging, targetting the corporate space with specific offerings – and some have a more enlightened attitude towards linking their area with fixed/WLAN systems, rather than just simplistically pursuing substitution in all cases. A common theme is the ability to use standard mobile handsets, rather than much more complex and expensive dual-mode WiFi/cellular devices.

## **PBX/cellular integration**

While there are still some narrow-minded “mobile only” religious zealots, a growing number of companies are taking a more pragmatic view of enterprise communications, recognising that both mobile devices and PBX-type platforms have roles to play in a typical company. Various approaches are being taken to integrate these, perhaps with dual-mode and VoWLAN as a longer-term Phase 2 strategy.

Some similar tactics have been around for a while – mobile closed-user groups with private numbering ranges, or VPNs connecting a PBX directly into the cellular infrastructure for lower-cost calls. However, various newer approaches are emerging, which take advantage of the capabilities of modern handsets and smartphones. These enable a range of more corporate-friendly applications to be ported as a special software client onto the phone, making them work more as “good telephony citizens”, connected to the PBX. Even without WLAN, this means that functions like presence, group calling, conferencing and attendant services can be enabled on an ordinary mobile device. They can also be used to give mobile employees a “fixed” number – useful where there is a shared pool of handsets, or where companies want to ensure a consistent experience for inbound sales/customer service calls. However, these solutions some come with additional costs of “tromboning” traffic, where the handset has to dial-in via a PBX (or vice versa), before connecting the call.

Operators and various vendors are also looking at assorted means of offering hosted “mobile centrex” services, although Disruptive Analysis is sceptical of their massmarket appeal, especially where companies require integration with other IT/telecom systems. This approach might work for an 11-person software company – but not so easily in a large enterprise which already has some IP-PBXs, legacy TDM-based phone systems, and complex telephony-dependent IT applications like CRM.

Perhaps more interesting still are some of the innovations around low-power indoor cellular networks, which potentially enable a handset to function directly with a PBX, with the aid of a local mobile network switch. This could essentially enable forms of FMC based around “private cellular” networks, offering much lower costs to the corporation than conventional services.

## **Low-power GSM**

With remarkably little fuss, Ofcom licensed a small new slice of GSM spectrum in the UK in April/May 2006, intending it for innovative uses, at much lower power levels than traditional “outdoor” networks. 12 companies, from diverse backgrounds, were awarded licences – and these may offer wholesale services to their own MVNOs, as well. Starting with a “clean sheet” in terms of legacy infrastructure, and new spectrum, these licensees now have the flexibility to create new and innovative services. As a result, GSM-based competition is likely to ratchet up several notches.

Several of the possible use cases could be deemed to be types of “enterprise FMC”. Some will choose to deploy small “private cellular” networks over IP-based connections. They may create customisable, site-specific services, using smaller, dedicated GSM switching platforms, coupled to low-cost IP-connected picocells. Using standard mobile phones, they could offer a different type of FMC approach to those described above. They could also leverage roaming relationships, or

capabilities of other related divisions in the firm, such as PBX system integration. Among the possible benefits of low-power picocell/GSM-based FMC solutions are:

- Closed user groups of employees, between which cheap/free calls are possible. This can either be offered on a single-site basis, or extended across a wider number of corporate locations.
- Favourable rates for calls to mobile, fixed or international destinations.
- Management consoles for the telecom department, enabling easier adds/moves/changes, and reducing the administrative burden for the operator
- Ability to create new “mobile communities” among employees of more than one company on the same location – for example, creating a shared, private, cellular network for various participants on a major construction site.
- Ability to create new and innovative tariffing plans on a company/site-specific basis – ideal for custom plans for customers that may also take other services from the operator’s group.
- Ability to leverage the system for data applications, such as site-specific SMS, or even well-defined location-based solutions.
- Optional connectivity to the local PBX, with standard extensions and features.
- Possibility of providing wireless coverage with far fewer base stations / access points than is the case with WLAN.

That said, it is also worth noting that many low-power GSM business models are still unproven, while the installation of IP-connected picocell networks is also a non-trivial task. Companies will need RF site surveys, and make various architectural decisions about coverage, capacity, IP network design, security and so forth. Nevertheless, the next two years should see an increasing range of “indoor cellular” FMC solutions emerging for businesses in the UK.

### **The role of enterprise MVNOs**

The UK has five main mobile operators. While three of them (O2, Orange, T-Mobile) are owned by groups that also include fixed-line operators, there is still limited integration in terms of services, especially fully-integrated offers for enterprise customers. While this is likely to change over time, it will probably be 2007 or 2008 before full FMC solutions are proposed.

In the meantime, Disruptive Analysis believes that another trend is starting. The practice of “virtual operators” (MVNOs) is well-known in the consumer space, where brands like Virgin, Tesco, Disney and others develop mobile propositions around other (infrastructure-based) operators’ wholesale services. This is now starting to occur in the enterprise sector as well, where new service providers will start to target corporate customers with tailored offerings.

Over the next 12 months, it seems highly likely that a number of MVNO newcomers will start to offer enterprise-focused packages, geared around FMC. Such firms may come from fixed-line or system integrator backgrounds. As they do not own spectrum or physical cellular infrastructure assets, they are much more “agnostic” to using cellular vs. WLAN or fixed connectivity – they don’t have to “shoehorn” traffic onto unsuitable networks to get maximum capacity utilisation. Instead, they will offer a variety of hybrid services, perhaps leveraging dual-mode services or other innovative approaches to FMC. BT (which wholesales Vodafone’s network capacity) is the most obvious example of this, but recent announcements of the availability of venture funding for this type of proposition suggests that many others may emerge as well.

## Conclusions and recommendations

Fixed-mobile convergence is a searingly-hot. Telecom managers at companies of all sizes are faced with the challenges of reducing and controlling cellular spending, tying in mobile users to the corporate IT/communications environment, improving indoor coverage, and leveraging investments in devices, WLANs and PBXs.

At the same time, competition between fixed and mobile operators is getting more complex – M&A, new spectrum, new technologies – and this is driving service providers to deliver better value, coverage and flexibility to their business customers.

Overall, enterprises will benefit from the increased levels of competition and innovation, as various forms of FMC start to become practical. However, it is important to understand that the term is not a single, monolithic technology. Instead, it encompasses a rapidly-expanding range of different approaches and architectures. Some are service-centric, some based on “owned and controlled” infrastructure. Some are cellular-only, others incorporate WLAN. In the future, others may bypass the mobile network entirely, using next generation wireless broadband.

Taken overall, these corporate FMC approaches have diverse benefits. However, they will not explode in uptake overnight, but will continue to face strong competitive and practical pressures at both technical and commercial levels. Enterprises should bear in mind the following recommendations:

- When implementing new in-building WLANs, ensure that possible future voice traffic and coverage is considered upfront.
- 3G in-building coverage is generally worse than 2G. Consider hiring an RF specialist to do a site survey, and look for the best way to support the widest set of future technologies, providers and applications.
- Be wary of any vendor that gives over-simplistic arguments about “seamlessness”, or paints a picture of one single technology versus all alternatives. The best approaches will be hybrids.
- Where IP-oriented vendors promise alternatives to cellular telephony, ensure they support familiar features that employees will expect – especially SMS.
- Consider very carefully what devices you want to deploy or support among your users, both now and in the future. Do you want to issue more company-specific mobile phones? Do you want everyone to have a smartphone, and have you thought through the cost/support/security implications of that?
- Look at the typical usage profile of your mobile workers. Are they mostly on one site, multiple locations, “on the road”, or roaming to a handful of locations like overseas sites? Are most of their calls internal or external? Are they using data services a lot? These factors have a huge bearing on the types of FMC implementation that may be appropriate.
- What is your general strategy around voice telephony? Are you favouring IP-PBXs? Do you buy into the notion of hosted/centrex-based services?
- Carefully watch the emergence of new in-building low-power GSM solutions, which are currently “under the radar”, but which will emerge in force over the next 12 months.
- Be very wary of subsidised handsets from operators, especially smartphones. Although these may be cheaper than the same handsets bought through non-operator channels, they may have custom software that “locks down” access to features like SIP and VoIP, needed for future FMC implementation.

## About Disruptive Analysis

Disruptive Analysis is a technology-focused advisory firm. Founded by experienced analyst Dean Bubley, it provides critical commentary and consulting support to telecoms/IT vendors, users, investors and intermediaries. Disruptive Analysis focuses on communications and information technology industry trends, particularly in areas with complex value chains, rapid technical/market evolution, or labyrinthine business relationships. Currently, the company is focusing on fixed-mobile convergence, IMS, SIP, mobile handsets and wireless broadband technologies.

Disruptive Analysis attempts to predict - and validate - the future direction and profit potential of technology markets - based on consideration of many more "angles" than is typical among industry analysts. We take into account new products and technologies, changing distribution channels, customer trends, investor sentiment and macroeconomic status.

Disruptive Analysis' motto is *"Don't Assume"*.

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