



**A Solution for Application Rich
Private Mobile Networks**

White Paper

Abstract

TeleWare's core competence is Telecommunications Software, hence the name. The company has been developing vendor-neutral, intelligent communications applications since 1991 and we have always believed in the separation of telephony software from telephony hardware. This enabled the development of a flexible model that delivered state-of-the-art applications to virtually all mainstream PBXs. Thus, it was an open model long before the term was applied to telephony.

This model is also intrinsically future-proof. Telephony applications that are software based can be provided over any network infrastructure, so we were able to extend the reach of those applications to include IP as well as a mix of TDM and IP infrastructures.

The latest development allows companies to bring cellular telephony into the same model, which enables the creation of private mobile networks and the investment in legacy 2G/2.5G devices is protected, i.e. there is no need to add a wireless LAN infrastructure and employ new phones having multiple wireless interfaces.

Private Mobile Networks and the unique functionality of TeleWare's solution is the subject of this white paper.

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A Telephony Snapshot

We have transitioned from an economy based on information to one that is communications centric. As a result, we employ different devices that access different networks in order to employ different services and applications. It's a confusing way of working but it's one we take for granted.

The preferred communications device is the mobile phone and, today, employees even call each other on their mobile when they are in the same office building or campus, so companies are looking at ways of cutting the cost of internal communications. The Mobile Network Operators (MNO) are introducing pricing plans and cost arrangements to try to address the issue, but these solutions will only go part way to resolving the problem since the operation costs for the MNO remain and, in the final instance, they still leave enterprise with no control mechanisms. One way enterprises have considered entails the use of mobiles that have Wi-Fi interfaces. These devices bypass the operator's network, i.e. they enable Voice over the corporate intranet, but they need to be purchased, along with a wireless infrastructure that delivers the requisite quality of service. The business case is, therefore, problematic.

Most companies and organisations have mobile users as well as legacy TDM PBXs and desktop phones and many are examining the case for migrating to IP, which will entail investing in IP PBXs and new IP phones. The business case for this transition includes the perception that the benefits of intelligent communications applications, such as presence, personal numbering and unified communications, can only be realised in an IP environment. However, this is a misrepresentation. Telephony applications that are software based can be provided over any network infrastructure, TDM, IP, GSM or Hybrid. The constraint does not come from the technology, but the commercial agenda of PBX vendors and the proprietary constraints of products they introduced.

So: where are we heading? Do companies really need to invest in the new 'smartphones' and engineer their LANs for VoIP? Do they really need to replace their TDM systems and phones? If they do, will this investment help control their mobile phone cost issues and integrate these into their corporate network? The fact that we pose these questions indicates that the answer is a resounding No!

TeleWare has the proven ability to deliver the functionality associated with IP Telephony to regular TDM phones and now the company's 'do-it-in-software' solution set includes an additional ground-breaking development. Replicating the core functionality of a mobile network in software enables the creation of mobile networks that: employ legacy 2G/2.5G phones; allow these devices to function within a fixed/mobile convergence environment; employ a VPN and/or the Net for toll bypass.

When a mobile employee walks into this environment, the phone becomes an extension of the PBX: TDM or IP. This is a simple, secure process; no complicated log-in is needed and only registered mobile phones can access the private network. Once registered, all the functionality of IP Telephony can be employed on these devices.

So, given the fact that virtually all the benefits of smartphones and IP-centric communications can be enabled on legacy systems and phones, why replace them? Why invest further in wireless IP to enable mobility on the network? Why not derive the benefits now by implementing intelligent communications software and integrating the mobile phones into the enterprise communications

system as feature-rich members of a TeleWare private mobile network? Then you can make the transition to an all-IP infrastructure for mobile and desktop usage in a graceful, cost-effective way.

Executive Summary

The new paradigm for enterprise telephony that TeleWare introduced in Q1 2006 has three core components. The first is the architecture, which allows intelligent communications applications to be employed on TDM and IP devices. The second is the replication of a cellular network in software. This allows the same applications to be used on regular mobiles. The third is the ability to create private mobile networks where mobile devices function as fully-featured PBX extensions and where intra-office calls will bypass the operator's network using the IP VPN or Intranet. Calls are transported as VoIP traffic. This means that the network has the functionality of an enterprise-wide, private mobile network.

The first component, the architecture, is a core competence. TeleWare's architecture has a runtime engine - a hardware abstraction layer - that decouples the application software from the switching resources. This approach ensures that any device can communicate over any telephony infrastructure - TDM, IP or Hybrid - wireline and/or wireless. This is a proven ability; development started in 1991 and since then functionality has been continuously refined and extended. Additional information is given in a separate white paper titled "TeleWare Applications Architecture" available at http://tes.teleware.com/white_papers.htm.

Replicating a cellular network in software is a logical extension of that core competence. It's logical because mobiles on the public network were already seen as part of the architecture and this extension could, therefore, bring them into a private mobile network. Mobile phones are widely employed and, for many employees, they are the preferred devices, so they are often used inside office buildings instead of the regular PBX extension. This development, therefore, gives businesses control of in-house usage, i.e. they enable GSM-in-the-office solutions that minimise the cost of internal communications.

In-house VoIP and hot spots have impacted on the revenue streams of mobile network operators and the ability to offer free/low cost mobile-to-mobile calls within the office environment is being used by mobile network operators (MNOs) as a way of retaining business customers. And in the UK new GSM spectrum is being auctioned to niche players who have different agendas. This will create opportunities for operators who wish to establish or expand their presence in the UK. Competition is, therefore, set to intensify and 'GSM-in-the-Office' solutions are an attractive niche to fill.

However, TeleWare's private mobile network concept goes further; it's much more than a niche solution. The company's software-centric approach to business communications allows companies to create unified fixed/mobile environments that leverage the current infrastructure. The investment that delivers the functionality associated with IP Telephony is obtained via the runtime engine and the TeleWare suite of intelligent communications applications. This software runs on regular servers. If the environment is extended because of a merger or acquisition, the new sites and their communications systems, both TDM and IP, can be incorporated and the same intelligent applications employed.

The Foundation

Innovative, intelligent telephony applications did not arrive on the scene because of VoIP and SIP. Internet technologies and standards are obviously important, but the foundation of today's communications-centric economy comes as a result of the transition from solutions based on proprietary hardware to those based on open-standards software. The balance has shifted and we are now at the tipping point, but TeleWare anticipated this development back in 1991 and it led to the creation of an open application architecture. However, in those early days, TeleWare's applications and the engine were 'bundled' in the offer of several mainstream TDM PBX vendors.

The application architecture has been developed continuously since that date and is the foundation on which TeleWare's private mobile networks are built. We, therefore, need to examine the structure in order to see how the company is able to create and deliver solutions that are innovative, pragmatic and intrinsically different to virtually everything else on today's market.

New Paradigm for Enterprise Networks

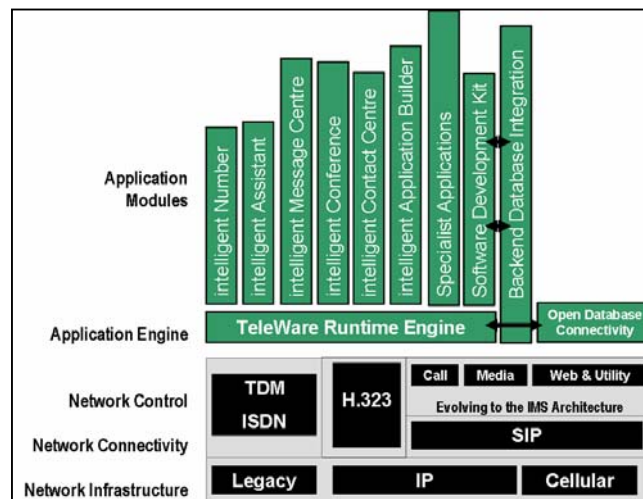
The network paradigm provides seamless IP, TDM and GSM communications over an IP / SIP core network that has three components. The first is the architecture. This allows intelligent communications applications to be employed on both TDM and IP devices. The second is the replication of a cellular network in software. The third is the ability to deliver this communications intelligence within private mobile networks.

The Architecture

As illustrated in figure 1, the foundation architecture has three layers. The first layer comprises a suite of intelligent telephony applications, such as IVR, Voice Mail and Unified Messaging. These applications employ the functions provided by the Runtime Engine in order to communicate with TDM and/or IP switching systems.

Figure 1.

TeleWare's architecture is software centric. This concept allows virtually all TDM and IP devices, both wireline and wireless, to access any intelligent application over the relevant PBX. The products of all mainstream vendors are supported. Note that the network control element in layer three is evolving towards the IMS architecture.



The second, the Runtime Engine, is a hardware abstraction layer. It decouples the application software from the switching resources and provides shared access. This approach ensures that any device that can communicate with the telephony switching system can access any application. The engine also provides low-level management of switching resources. The third layer provides the plug-in capability for systems hardware (PBXs) and external interfaces, such as connectivity to backend databases. It makes these resources available to any application that runs via the runtime layer.

The runtime engine is the key that unlocks the full potential of real-time communications. Runtime provides a cross communication platform and a set of programming interfaces allow applications to perform a range of telephony tasks without having to talk natively to the telephony hardware, port or corresponding protocols. It also enables interoperability between these platforms, which in turn reduces port and license costs. Without the runtime, each application would need to be fine-tuned for different permutations of hardware and protocols.

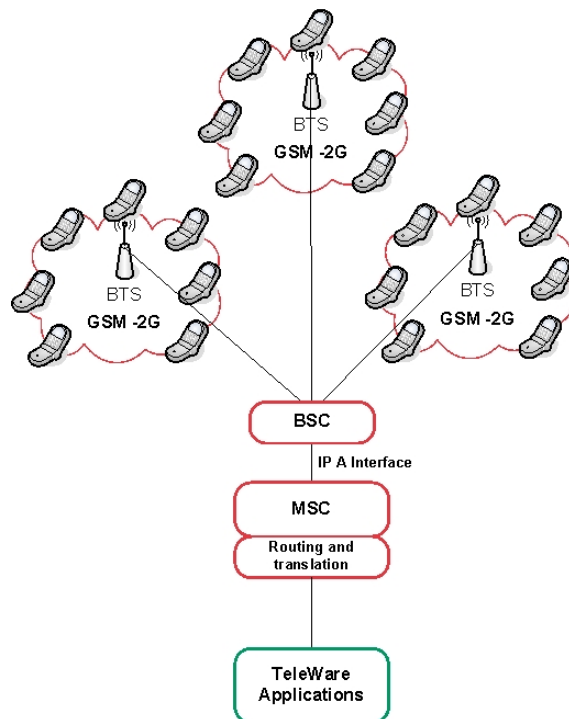
Cellular Network Replicated in Software

The Private Mobile Network (PMN) enables the creation of privately owned and managed mobile networks based on GSM protocols. These networks form part of an enterprise's communications infrastructure, i.e. they have the same functionality as the other devices and are managed in the same way.

The wireless access points connect to and are powered by the LAN. In the case of small offices they can function as a wireless LAN and the connection to the enterprise network is made over the VPN. Each private mobile network is made up of one or more GSM cells depending on the number of users, coverage area and call volumes required. A single BTS access point supports seven concurrent calls and they can be clustered to support up to 31 concurrent calls.

Figure 2.

This software-centric solution allows GSM calls to be processed by the softswitch and mobile phones to have the same functionality as the other devices.



As shown in figure 2, the PMN solution comprises separate intelligent software components that, together, create a Private Mobile Network. This capability can be embedded in TeleWare's intelligent eXchange (iX) SIP-compliant softswitch and it can also be enabled when the softswitch(s) is that of a mainstream third-party vendor. This feature illustrates the flexibility of the company's software architecture.

The software MSC (mobile switching centre) controls access to the private mobile network and it enables interoperability with PBXs and/or IP-PBXs, thereby extending the reach of the SIP-based telephony applications. There is a separate component that provides standard PBX features such as call routing and number translation. These components provide connectivity to the IP network as well as the BSC (base station controller). As illustrated, the BSC connects locally or remotely to one or more BTSs (base transceiver stations) in order to create wireless access points. One BSC can manage up to 100 GSM access points, thereby creating an extensive local, private wireless network that can cover a number of different sites or buildings.

PMN - the business benefits

Mobile phones are so convenient that colleagues end up using them to call one another even when they are in the same office building. This can result in an unnecessarily high telephone bill. TeleWare's intelligent Number (iN) application, which can be integrated into the private mobile network, will intercept a call made to a mobile if the relevant party has registered him/herself at a PBX extension. A more complex and expensive 'solution' involves phones having both Wi-Fi and GSM air interfaces and a system that ensure that a VoIP call is made over the wireless LAN infrastructure when both parties are in the same location.

Early attempts at GSM-in-the-Office solutions were based on small, in-house base stations and predicated on a zoned service offer. The proposal was that the network operator should offer a significant discount on calls made between mobiles when they are in that zone, a zone being a defined area such as an office building or campus. However, at the time the mobile operators were not willing to lose revenue, even when it would have helped cement the relationship with large customers. As a result, the solutions did not achieve any significant level of acceptance. The current business environment is different and zoned services are starting, but only for large enterprises and availability is patchy. Competition is, therefore, set to intensify and 'GSM-in-the-Office' solutions are an attractive niche to fill. These operators do not have a legacy agenda and this is a market niche — a very large niche when one adds up the number of SMEs - that they can fill. The new spectrum can be used for low-tariff or even free internal calls because revenue will be generated via TeleWare's suite of intelligent applications.

The resulting offer could hardly be more attractive:

1. low-cost internal calls using legacy mobiles, no need to invest in new devices having Wi-Fi interfaces
2. intra-office calls made over VPNs and/or the Internet
3. the ability to use a mobile phone as a PBX extension - TDM or IP.

When a mobile employee walks into the office environment the phone becomes an extension. In other words the transition from private to public networks is totally seamless: there's no Wi-Fi to cellular issue.

Creating a Private Mobile Network

PMNs can be provided as a standalone mobile switch solution or, as illustrated in figure 3, the mobile network can be fully integrated with the corporate voice-data infrastructure. The service benefits of a converged wireline/wireless network were highlighted in the previous paragraph and they are significant. However, the biggest benefits come from ubiquitous access to business communications applications from virtually any communications device.

TeleWare's suite of office applications includes, personal numbering, team working, call recording, voice mail, unified messaging, conferencing, wide area call centres and manager / secretary working. In addition, there are business application tools for creating Auto Attendant and Interactive Voice Response (IVR) systems as well as customised voice portals. Details of the intelligent Office product suite are available at <http://tes.teleware.com/products/>

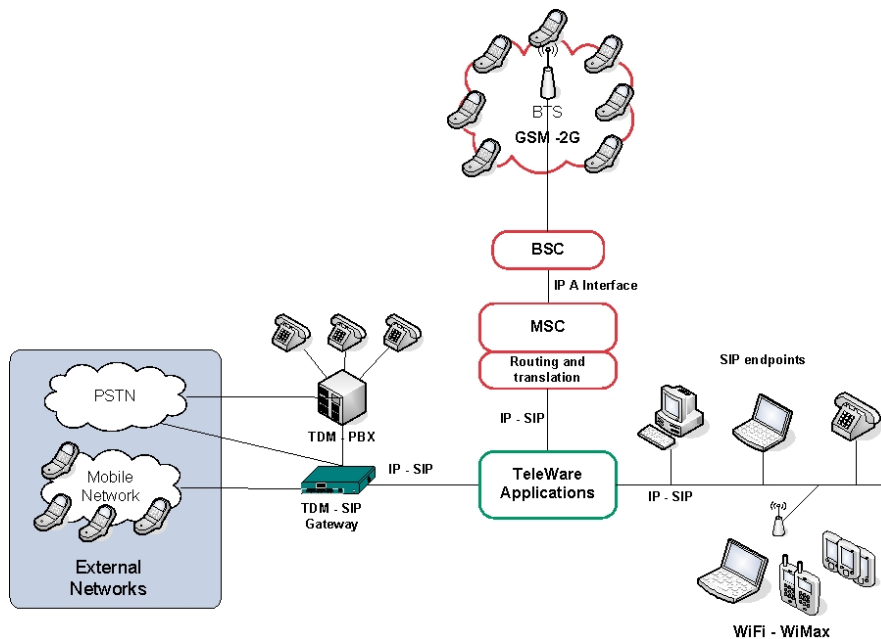


Figure 3. Devices in the private mobile network have the same functionality as those in the corporate domain. This is a fully converged, seamless fixed-mobile environment.

Enhancing the Private Mobile Network Solution

The private mobile network is provided with open industry standard interfaces and so can be built based on any PBX - either TDM or IP. Two options exist to enhance this standard functionality: (1) use of TeleWare's iX softswitch; (2) use of the intelligent Number application.

Soft Switching

Intelligent eXchange (iX) is the TeleWare SIP based Pureplay softswitch that is embedded in the TeleWare platform, which means that there is a sharing of resources between the IP PBX, iMN

and the intelligent applications. This optimises use of processing resources and creates a telephony switching solution for both mobile and desktop usage without the need for multiple, disparate devices. For more information on iX and Pureplay visit <http://tes.teleware.com/products/ixchange.aspx>

Personal Numbers

The private mobile network can be enhanced by the use of personal numbers. In a regular TDM environment, 'dumb' telephony numbers are assigned to devices, i.e. desktop phones. When the user moves for whatever reasons or when a new employee joins the company there is an associated 'moves, adds and changes' cost. In an intelligent Number solution, virtual numbers are assigned to people, without being tied to any particular switch extension and calls are directed to the relevant device and location. This means that telephony calls follow people around the network in the same way as email.

In an enterprise environment, a TeleWare intelligent Number user registers "here and now" to a mobile handset on a mobile provider's network and calls to the personal number will be routed out over the public network. When the user's phone is part of the private mobile network, the capability is enhanced. The TeleWare platform automatically updates the "here and now" registration and calls will be routed over the private network. This removes the need for the user to call into the platform and perform a separate "here and now" registration to receive calls on the mobile phone. A similar process operates in reverse when the user leaves the private mobile network.

Conclusions

TeleWare has always believed in the separation of telephony software from telephony hardware. This enabled the development of a flexible model that delivered and continues to deliver state-of-the-art applications to virtually all mainstream TDM PBXs. It was an open model long before the term was applied to telephony. This model is also intrinsically future-proof. This enabled the creation of a brand-new network paradigm for enterprise networks and the proven ability to deliver solutions that are innovative, pragmatic and intrinsically different to virtually everything else on today's market.

The paradigm provides seamless IP, TDM and GSM communications over any core network and intelligent communications applications to be employed on both TDM and IP devices. In addition, TeleWare has replicated the functionality of a cellular network in software - a ground-breaking development that enables the creation of private mobile networks. In the UK, new spectrum allows these networks to be established using the TeleWare spectrum licence leveraging investments in 2G and 2.5G devices and minimise internal and intra-office communications costs.

The combination of these developments is a fully converged, seamless fixed-mobile environment. Moreover, devices in the private mobile network have the same functionality as those in the corporate domain. wp070901

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