

Creating innovative mobile services using IP networks

“THE GREATEST CHALLENGE MOBILE OPERATORS ARE FACING TODAY IS HOW TO GROW VALUE ADDED SERVICES PROFITABLY. BY INTRODUCING IP UP TO THE RADIO ACCESS SITE, WE HAVE CREATED AN ENABLING TECHNOLOGY TO BOTH OPTIMISE OUR ASSETS BETTER AND RESPOND TO CUSTOMERS’ NEEDS FOR NEW SERVICES VERY QUICKLY.”

Attilio Achler, Chief Technology Officer TIM (Telecom Italia Mobile)

Executive Summary

CUSTOMER NAME

- TIM (Telecom Italia Mobile)

INDUSTRY

- Mobile Service Provider

BUSINESS CHALLENGE

- Optimise network infrastructure costs
- Counter market saturation with development of new value added services
- Investment protection

NETWORK SOLUTION

- Cisco 3661 Multiservice Platform router in Base Transceiver Stations (BTS)
- Different generations of mobile traffic streams aggregated onto Cisco MGX 8230/8850 Edge Concentrators
- Cisco WAN Manager

BUSINESS VALUE

- Creation of a strategic infrastructure for new IP-based services
- Faster time to market
- Higher efficiency through bandwidth management

TIM and Cisco together have created the world’s first IP gateway to the radio access layer within a mobile operator’s live network. Installing an IP router into Base Transceiver Stations not only optimises cost and simplifies complexity in the network, it promises the development of new, innovative multimedia IP-based value added services.

TIM – Telecom Italia Mobile – operates one of Europe’s largest mobile networks with over 26 million lines in Italy alone (as of September 30th, 2004). With about 50 per cent of the total domestic market it is the leader in both the corporate and the small and medium-sized segments. Since TIM’s creation in July 1995, success has been based on innovation and today the company competes successfully in Europe, the Mediterranean Basin and South America, delivering a total of 52 million lines.

Innovative marketing continues to help drive TIM forward, supported by an equally far-sighted approach to technology. In 1993 it launched the ground-breaking Family tariff – the world’s first residential differentiated billing model that has been copied all over the world – and followed this in 1996 with another cutting-edge service: pre-paid.

In summer 2002, TIM was the first main operator in Europe to introduce and launch MMS, the new Multimedia Messaging Service, that represents an evolution of SMS (Short Message Service). Today, TIM’s network carries millions of MMS (27.2 million in the third quarter of 2004 alone), with about 5.8 million MMS handsets sold up to September 2004.

In May, 2004, TIM launched ‘TIM Turbo’, a new line of third generation services and the first in Europe to combine evolved 2.5G or ‘2.75G’ EDGE (Enhanced Data rates for Global Evolution) technology with UMTS (Universal Mobile Telecommunications System). In 2003 the company launched a mobile TV service across its GPRS and now EDGE-enhanced network: again, first among its peers and confirming its leadership in innovation.

But with success comes new challenges, underlined by the fact that active lines in Italy have reached 100 per cent penetration. Attilio Achler, TIM’S Chief Technology Officer, explains: “The big challenge for all mobile operators, particularly in Italy, is the saturation of the voice market. While there are still opportunities for voice services, the growth rate cannot reach the levels we have had in the past. The way forward, therefore, is to find ways to profitably grow value added services.”

To help it meet this challenge, TIM has turned to Cisco Systems.



Prepared by Cisco Systems, Inc.
Internet Business Solutions Group

TRUSTED ADVISOR

Cisco's relationship with TIM stretches back many years, but in the last four it has deepened as Cisco has been able to share with TIM its IP experience, particularly the e-enablement of business and processes. As TIM's Trusted Advisor, consultants within Cisco's Internet Business Solutions Group (IBSG) helped to guide the mobile operator through a range of successful e-enablement projects ranging from e-learning and company directory services, to workforce optimisation which included creating extranets for employees to order office supplies and ancillary services.

TIM was one of the first mobile service providers in the world to understand the potential of IP. In 2000, at a time when others were building ATM networks, the company took the bold step of being the first mobile operator in Europe to invest in building a Cisco IP transit network, named UNIGATE.

With the growing success of SMS and other mobile services, UNIGATE has since been upgraded with Cisco to support SMS over IP, SS7 signalling over IP, and MPLS with Voice over IP, to create both a key element of TIM's live core network and the foundation for exploring the benefits of IP, particularly for developing value added services.

One of the key challenges TIM is facing is how to best manage the evolution from 'yesterday's' analogue TACS (Total Access Communication System) service, through today's 2G GSM service, to tomorrow's 3G UMTS. TIM identified three key issues. They were the need to:

- match customers' expectations, especially for multimedia services, by providing those services anywhere, anytime – not somewhere, sometime
- identify and develop new value added services to increase the all important average revenue per user (ARPU)
- maximise available network and frequency assets; and enable a fast roll-out of value added services.

TIM believed that IP could play an important role in managing the transition. Alberto Ciarniello, TIM's Network Planning Development Director (Architecture and Technologies), sets out some of the thinking: "A multimedia network is quite different from a single service voice network. We recognised that IP could be the glue for services on various platforms, enabling people in the future, for example, to show video clips to a distant friend while still talking to them.

"We also believed it was important to bring IP network access as close as possible to the customer and we asked Cisco if they would assist us in piloting the implementation of some innovations, including enabling new applications. Our initial thinking was also how to exploit our most valuable asset - the BTS sites – to enable new and innovative services at a marginal cost while making the most efficient use of transmission, particularly for the most expensive BTS sites," Ciarniello said.

The potential strategic value of the collaboration was such that the two companies signed a Non Disclosure Agreement in 2001. The fruit of that work has been the creation of a MultiAccess Network (MAN) that takes IP from the core right up to the Base Transceiver Station (BTS) to interface with the radio access network.

"We looked at the BTS in a new way – not only as a mobile communications access point, but also as a gateway for bringing innovative new services to the edge of TIM's network. That's why in the MAN project the BTS routers are called edge PoPs (Point-of-Presence). Services could include deploying IP webcams at remote sites for end user and operational services at marginal cost," explains Ciarnello.

DEVELOPING THE MULTIACCESS NETWORK

In order to provide TACS, 2G and 3G services, TIM essentially operates a discrete network for each radio service. The TACS network is based on some thousands of radio BTS sites, while there are about twice as many again GSM BTSs. Typically, these are co-located and the same places are being used to build out the company's new UMTS network of even more Node B sites which are due for completion in some years.

One of the consequences of operating all three networks simultaneously was inefficiency in the transmission network, that is, of linking each service at the BTS (or Node B in the case of UMTS) back to core Base Station Controllers and their associated Mobile Switching Centre (MSC) for TACS and GSM, or to UMTS Radio Network Controllers.

Typically each service required its own dedicated 2Mbps E1 circuits irrespective of traffic utilisation, resulting in a less flexible allocation of bandwidth as the circuits/packet links serving different systems could not be regarded as a single logical pipe to the Access Network.

With some thousands of BTSs throughout Italy, a highly efficient utilisation of leased lines represented scope for optimization, especially for remote BTS sites. The company knew, therefore, that the potential benefit of improving traffic transmission from BTSs through the improved utilization of leased line could be considerable.

Working according to TIM's system architecture indications and within stringent network parameter specifications, TIM and Cisco began work on a 'proof of concept' implementation. Within months TIM and Cisco carried out the first live test in TIM's network laboratory and then in the field, demonstrating the feasibility of a solution for aggregating analogue TACS and GSM over an ATM/IP link.

In stressing the system the team came face-to-face with the technical challenge they had set themselves. Compressing analogue TACS traffic via a Cisco High Density Voice Module within a Cisco 3640 and using a Catalyst 8510 Campus Switch Router resulted in a strong reduction of the bandwidth typically required for TACS. In a subsequent field test, the power of the solution was demonstrated by transmitting aggregated 2Mbps streams of compressed TACS, GSM and UMTS over two 2Mbps links without degradation. The next step lay in optimising the solution for field deployment, for example by reducing the routers at the BTS site to ensure cost-effectiveness.

One of the main issues required by TIM's network specifications was finding a solution to GPRS performance issues (throughput) by limiting system latency. Cisco traced the problem to the technique used to encapsulate data over the ATM network which investigations showed had introduced a 70ms delay. Whereas this was acceptable within TACS, the stricter requirements within the GSM/GPRS environment meant that a more challenging solution had to be found.

Drawing on all its resources, the Cisco team in Italy joined forces with the company's product development teams back in San Jose who were actively involved in determining a solution and writing new code. The answer was another world first – GSM encapsulation using ALL1, which brought delay down to TIM network parameters.

"Cisco spent a lot of effort in putting together the right team to solve the critical issues that could have blocked the progress of the project," recalls Ciarniello. "They created a multinational team, bringing people in day and night in order to solve the critical issues. I am not sure whether many other companies would have the teams and research capabilities to have done the same."

TIM identified around 300 sites for the deployment.

"Moving from proof of concept to a deployment project was obviously a challenge," explains Ciarniello. "Many of the BTSs are in remote areas and we needed a solution that could be optimised not only in terms of capacity, features, power requirements and so on, but also redundancy and reliability as it might take an engineer over two to three hours to visit a base station site. In the core we needed modularity, capacity and scalability."

Drawing on the lessons learned, the team created a standardised solution based on equipping each selected BTS with a Cisco 3361 Multiservice Platform router, linking back to carrier class Cisco MGX 8230 and MGX 8850 Edge Concentrators.

TIM and Cisco also worked with other departments and vendors to resolve operations and maintenance issues. "We were installing equipment that had never been integrated into a mobile environment before," recalls Ciarniello. "We spent a lot of time with our operations and management colleagues and Cisco developing the right solution. There was a lot of process driven work to ensure that we created not just a working solution, but a truly effective one." That solution included creating advanced operations and maintenance centres that are able to remotely reconfigure links and assign bandwidth.

AN IP GATEWAY TO NEW SERVICES

While the technological issues were being explored, TIM's Marketing Department and Cisco IBSG were looking at the range of services that can be enabled by having IP on the 'mobile edge'.

Sergio Cozzolino, TIM's Executive Customer Integration Vice President (Corporate, Enterprise and SMB) sets the business context: "Innovative marketing means bringing to market solutions that our customers want. This focus is one of TIM's key assets and has helped us to differentiate ourselves from competitors. Today the consumer market is completely saturated, with customer churn a concern for many operators."

In the business sector, companies are looking to optimise their own resources, for example by providing higher speed data access to CRM (Customer Relationship Management) applications, or even through a customised solution that supports new business processes. Mobile data enabled devices such as laptops and PDAs (Personal Digital Assistants) are also improving productivity by providing access, for example, to email and the ability to interrogate corporate systems and place orders directly from a customer's premises.

By exploring how customers might benefit from providing an IP router in a BTS, the team realised that it could offer a solution to what is a thorny problem for many companies – the cost of access to company resources as workers connect back using mobile devices.

Traditionally a leased circuit would provide access back to a company from the nearest MSC, with costs rising with the distance between the two. Creating an IP-router gateway at the BTS back to the core mobile network, however, would provide the opportunity for some companies to link the applications on TIM's network, not via a few central sites, but to a nearby BTS – which would require a much shorter and, therefore, cheaper local loop via leased line.

This would effectively lead to a service that would not have been feasible to provide using leased line for business customers and small enterprises located in rural areas far away from central switching sites. Also importantly for TIM, using the BTS for corporate data services would result in capacity from the IP router to the core being better utilised.

Perhaps even more exciting were the opportunities for the MultiAccess Network to deliver new multi-media based services – for customers and even for TIM's own people. Installing one of the new generation of low-cost, remotely controlled webcams could enable a range of video surveillance services to be provided either to monitor the area around the BTS or even within the BTS itself to improve security. Similarly, the facility could enable the development of services for environmental monitoring and protection, for example by spotting forest fires or checking pollution levels.

In working through the services that the technology might enable, Cozzolino highlights the value Cisco's IBSG consultant brought. "It was very helpful to have someone who understood the IP environment and IP services; who could help us work through the possible implications and the opportunities offered by creating a MultiAccess Network infrastructure."

The solution could be applied in all cases when multi-DS0 bandwidth is required cost effectively in 'remote' locations, for example, to provide IP PABX access to the carrier backbone.

Taking care to involve other departments such as sales, finance, security and network operations, Cozzolino and Cisco together prepared a strategic presentation to TIM's most senior managers. The audience included TIM's former Managing Director, Mauro Sentinelli, who is widely considered to be one of the most influential – and far-sighted – people in the industry. The impact of that presentation can be glimpsed by Sentinelli's reported reaction to it: 'I feel through my body, right down to the tips of my fingers, that we should go forward with this.'

DELIVERING STRATEGIC ADVANTAGE

The significance of this ground-breaking project lies in how it will enable TIM to better manage the evolution of its three networks and develop new services.

In 2003 the company started to introduce EDGE technology providing a fast track to high-speed data services up to 200 kbps to complement the build-out of higher-speed UMTS which will typically offer those on the move services at 384 kbps. Enabling EDGE at 100 per cent of TIM's GSM BTSs throughout Italy is a comparatively simple and very cost-effective upgrade. By December 2004 TIM achieved national EDGE coverage enabling it to offer high-speed data services throughout Italy. Importantly, where there is an overlap with UMTS coverage, customers' handsets automatically use the best connection.

Cozzolino summarises TIM's strategy: "We are currently building our UMTS network, but EDGE provides us with the opportunity to deliver high speed data services to our customers today. We believe that customer demand for broadband services will mean that network operators are likely to discover that they need both a UMTS and EDGE enabled network. After all, it is the services our customers enjoy that is important to them, not the technology we use."

The ability of the MultiAccess Network to create what is effectively an IP Point-of-Presence (PoP) on the edge of the mobile network therefore gives TIM the ability to create a uniquely 'capillary' network, especially valuable in remote areas and areas outside main urban centres.

Mr Achler explains: "The lifecycles of services are shorter and shorter so it's important to correctly recognise early in advance the revenue opportunities for each service. This recognition has to be correctly measured both in terms of the direct revenue it may generate, and by the customer loyalty it may generate among high spenders. In other words, some value added services may not be particularly profitable *per se*, but they may be key to retain and to enhance the loyalty of big spenders. It's an evolutionary path.

“Many years ago most of our customers were not aware of SMS. Thanks to continuing education, some started at least to read SMS and nowadays even grandparents routinely send SMSs to their grandchildren. The key is to find a sustainable way to create and deliver value added services and new services in general. Operators must always trade off investments and ‘nice to have’ technology.”

Importantly, such a scenario complements another key element of TIM’s strategy, which is ‘the SIM at the heart of everything’. Cozzolino explains: “The SIM is a key asset because it is a powerful device that today not only allows the customer to access the network by enabling the necessary authentication and authorisation, it can also be used to store data or dynamically change the services available to the user.”

TIM has discovered, for example, that using a SIM card to store a user interface designed to support a specific service can increase the usage of that service from 20 to 80 per cent. Each day TIM carries out an amazing 100 million authentications and in an increasingly mobile world that figure will increase as the SIM can also be used to authenticate other services and support network roaming. In June 2004 TIM launched a SIM-based WLAN (Wireless Local Area Network) authentication service.

PREPARING FOR THE FUTURE

One of the highlights of the MultiAccess Network project was a live demonstration of a remotely controlled IP webcam positioned on a BTS in a small village in Tuscany. A mobile telephone was used to control an externally mounted webcam that transmitted pictures back to the phone of the nearby church and zoomed in on grazing cattle.

Another important demonstration, using a webcam inside a base station, proved the feasibility of using the technique for TIM’s operations staff to remotely visually inspect the site equipment in order to manage the site better. That demonstration also proved the feasibility of installing Cisco CallManager Express on the router to provide IP telephony to the site. This would be particularly useful for engineers who needed to make telephone conversions from a BTS that was off air and therefore could not support mobile calls. By firing up a IP telephony softphone connection via their laptop the engineer would be able to make calls over the MultiAccess Network.

Importantly, combined with motion sensors, the solution will provide an effective security system enabling a fast response to any unauthorised visitors and, consequently, reducing insurance premiums. Not surprisingly, it was an application that was immediately appreciated by TIM’s internal security staff when they saw the demonstration.

TIM is also in the final stages of discussions aimed at developing new webcam-based services. “While I foresee a niche market for security-type solutions for businesses, there is potentially a huge range of applications for the business to consumer market.” explains Cozzolino. Ideas range from being able to view local traffic conditions by subscribing to a webcam service from a mobile phone, to being able to monitor local weather at a harbour overlooked by a BTS where the subscriber’s boat might be moored.

“The only issues we need to resolve are the commercial need and agreement between parties to establish the right service proposition – there are no technical constraints regarding implementation,” says Cozzolino.

The ability to respond to such opportunities has another important benefit – the ability to grow the network directly in response to customer needs, thereby pinpointing investment where it will provide a guaranteed return. Such is the ‘plug and play’ modularity of the IP router concept that it would be feasible to connect a new BTS to the MultiAccess Network whenever customers need it.

“We are already working with our salespeople and with our International Network colleagues to identify needs,” says Ciarniello. “And this could be one of the drivers to opening up new gateways also in the network of our affiliate companies abroad.” Importantly these new devices could be integrated into the network very efficiently – with different features uploaded to the routers to ensure a large degree of pre-configuration.”

The ‘plug and play’ concept is even being extended to major new service offerings in new markets. Ciarniello explains: “Our strategy for developing the network is based on integrating different platforms – GSM, UMTS and IP – with the introduction of next generation technology according to our assessment of its availability and maturity. Allied to this is a desire to centralise control and to distribute traffic switching and processing in general. Our networks are becoming more IP centric, not only to optimise resources but also to optimise time to market. We have found that one of the benefits of this IP strategy is that we can be very quick to integrate new services.”

UNLOCKING THE TRUE VALUE OF THE ACCESS NETWORK

“The greatest challenge mobile operators are facing today is how to grow value added services profitably. By introducing IP up to the radio access site, we have created an enabling technology to both optimise our assets better and respond to customers’ needs for new services very quickly,” points out Achler.

“The MultiAccess Network project has allowed us to unify the access network so that we could multiplex the traffic of the three radio networks onto a single transport access network, without having three times the waste capacity. This allows us to migrate our customers from one radio network to the other without losing any efficiency or increasing our transport costs.”

Summarising the bigger picture, Achler continues: “Moreover, we have deployed IP points of access in many parts of our networks. This allows us to use spare bandwidth for additional services today for operation and maintenance, but in the future we could use the same infrastructure to quickly deploy new IP-based services, like WiFi, and so on. This could prove very useful in terms of the time-to-market needed to introduce new services, thanks also to the availability of the IP-based backbone network deployed years ago.”

MORE INFORMATION

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