

TMC'S ADVISOR

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Cellular Developments

By Peter Aggus

Rogers AT&T recently announced their plans to migrate to 3rd generation GSM technology. What does this mean to their customers and the rest of the industry?

Analog Cellular Technology

In the 1980s, we were all using analog cellphones. North America standardised on AMPS, allowing fairly easy roaming throughout Canada and the USA. Europe never standardised on a single analog system. Some countries simply imported the AMPS standard, whilst others improved on it and developed other non-compatible standards.

There is no worldwide standard cellular frequency band. This has meant that a whole variety of cellular phones needed to be built which were all region-specific and non-interchangeable.

This never bothered North America because users roamed within the region but only rarely outside it. In Europe, however, there was a strong desire to have a European standard 2nd generation system that would allow the same phones to roam anywhere across the continent.

Digital Cellular Technology

The major manufacturers in Europe agreed to migrate to a single 2nd generation standard, based on digital technology. This is now known as the *Global System for Mobile communications* (GSM).

Two interesting features were a part of the GSM standard.

Firstly, the user identity was stored not in the phone but on a removable "smart card" memory chip. This was to permit travelling users to carry their phone "identity" with them while not needing to carry the phone itself. One application of this vision was that rental cars would all have phones and the users would either rent a smart card, or use their own.

Secondly, the digital technology was based on ISDN – a standard much more widely used in Europe than in North America. The vision was that the GSM cellular phone radio unit would act like a landline ISDN NTU, with the handset being a separate unit rather like an ISDN

phone.
Users with
ISDN



terminal equipment, such as fax machines or computers, could simply plug into the ISDN bus and use them just as they would on an ISDN landline.

The initial GSM standard never managed to achieve the 64kBit/s data rate needed to provide full compatibility with landline ISDN, but the signalling systems were compatible and GSM offered digital data transmission as an integral part of its specification.

North America, meanwhile, rejected the GSM standard in favour of a digital upgrade to AMPS, using simple TDM technology. Cantel in Canada was a part of that early roll-out, along with many US carriers. Whilst the TDM upgrade to AMPS was technically fairly straightforward, there were serious performance issues that only became apparent in service. Users began to find that the system could not hand off between cells reliably when the network was congested. This was

caused by difficulties in synchronising when the handoff cell signal had deteriorated in quality. The service improved a little as digital cell density increased, but users of the Rogers AT&T service in Canada still experience handoff problems and poor fringe area performance which are intrinsic to the technology.

The competing carriers (Canada's Mobility group) opted for a more bold approach using unproven CDMA technology. On paper, its fringe area performance should be significantly better because of the way the radio systems handled signals close to the noise threshold. In practice there were very serious timing problem and CDMA did not get off to a good start – giving the TDMA competition a real advantage.

When Microcell entered the market with their Fido service, they joined a number of US operators who had rejected basic TDM in favour of the more advanced GSM standard. Clearnet, however, opted to back CDMA technology on the basis that it was a more widely accepted standard in the US, giving access to more carriers via roaming agreements.

CDMA eventually cracked the timing issues and lived up to its promise of better quality and more robust performance – leaving Rogers AT&T and their US partners with the least attractive technology.

Towards Third Generation

Gradually, the world standards

organisations began to grasp the issue of developing a single standard for the next generation cellular technology.

It was agreed that the standard, known as the *Universal Mobile Telecommunications System* (UMTS) would build on GSM. The phones would have to be frequency agile, because there was no internationally available set of frequencies that could meet all needs (although the ITU is working on that). However the phone technology had improved to the point where that was no longer a major issue.

The new standard also incorporated CDMA technology and supported higher data rates, ultimately up to a staggering 2Mbit/s in certain cases – getting back to that original GSM goal of being a mobile ISDN service.

Microcell, and the other North American GSM operators, declared their intent to migrate to UMTS, but will likely do so in a phased way to minimise impact on their existing customers.

Rogers AT&T surprised the industry by declaring that they would move “rapidly” to adopt the new standard. Their plan is to first roll out GSM technology during 2001 in selected markets, followed by a migration to full UMTS in 2003. This is a challenge as great as that facing Europe when GSM was originally adopted there. However, it can be done and the challenge has been accepted. Once completed, Rogers AT&T will once again be at the forefront of cellular technology in North America.

The Future

What of everyone else? Well, the Mobility group (now split into two with the break between Telus and Bell) has always known that a move to 3rd generation technology would eventually be needed. The adoption of CDMA as the networking technology means that their existing cell site infrastructure should be easy to adapt. Perhaps Telus will leverage their recent acquisition of Clearnet to speed up their technology upgrade.

Microcell may well be the key to speeding up the Rogers A&T migration. *TMC* has often predicted that the Rogers AT&T service and the Fido service are good candidates for a merger in the same way that Telus and Clearnet were.

What will all this mean for the end users? Well, 3rd generation technology supports higher data rates (necessary as we have noted before to make mobile data really useful) and gives access to a broad base of multi-media services. It is also the bridge between private wireless data (such as LAN cards and even Bluetooth technology) and public wireless. It may well prove the way forward for an explosion in wireless data use, with low power LAN-type services in airports etc – perhaps even in the planes themselves.

No wonder Rogers AT&T sees this as the way forward. We wish them good fortune in their bold step and challenge the other carriers to join the race. The *Advisor* will keep you

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