Mighty networks from little decisions grow

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On New Year's Day it will be exactly 25 years since the UK got its first cellular network. *E&T* looks at the way that small decisions shaped the growth of the UK and global cellular networks.

The UK wasn't the first country to have a cellular network. The Japanese launched their first network on 1 December 1979, and by 1983 the US had functioning AMPS networks in some cities. In Scandinavia, the NMT system was already offering roaming. But Margaret Thatcher's UK government, with its emphasis on enabling competition and encouraging entrepreneurship, created a febrile atmosphere in which people believed they could forge radical business and social change. Many of them went on to do just that, though few can have imagined that the decisions they made were going to reshape existing industries, create entirely new ones and alter how people communicated forever. In this necessarily partial history of the UK cellular industry, here's a few tales of moments when things changed for good.

Picking winners

BT's privatisation in the early 1980s ended its UK monopoly on providing communications services. In 1983 the government decided to license two cellular operators, one a BT subsidiary. Although a number of companies, including GEC, bid for the license, it was fast-growing Racal who won it in a joint bid with Millicom, a US company with cellular experience. According to Ted Beddoes, the second technical director of Vodafone, "Mrs Thatcher gave the license to the energetic boys".

The problem was, the Racal people were a bit nonplussed to have won the license (there were "unending" board meetings about whether to accept it, according to Beddoes) and didn't have a great deal of cellular engineering expertise. Rob Morland, then a consultant at PACTEL, the communications and computing arm of what would later become PA Technology, joined a team at Racal to work out how they could build a network. Their choice of switches to run it would reshape the equipment industry.

"There were two main contenders for the switches for the network, the AT&T 5ESS and the Ericsson AXE," says Morland. "We went to Chicago in March 1983 to see AT&T and they had a working network that could do hand-off between cells. I was able to go out in a car and make a call to my wife back in Royston."

But when Morland and his colleagues asked the AT&T people about the digital transmission standard the switches would use, they found out the Americans were using a 24-channel PCM system, while Racal was planning to use a 30-channel system working to CCITT standards.

"At that point we realised we couldn't buy from AT&T, because BT would use the standards issue to procrastinate on other decisions."

So the team went to see Ericsson in April 1983, visiting one of the first AXE systems, installed inside a mountain to keep communications going in the event of war. Ericsson's NMT cellular system already supported roaming, and it offered hand-portables. AXE was using the right signalling interface, too.

"So we chose Ericsson," says Morland, "and that decision is what made Ericsson what it is today. Its dominance in cellular switching all came from that decision."

Competing with BT

BT's Cellnet subsidiary, initially a joint venture with Securicor, was also working on its network, and it was soon realised that BT, Racal and Cellnet needed to work together on standards and interoperability. The Joint Radio Telephone Interfaces Group (JRTIG) was born to thrash out the standards. It wasn't entirely welcome.

"In 1983, the Post Office had only recently become BT. BT still had a monopoly and Oftel had only just been set up. Some of the BT old guard were totally stunned that anyone else could ever think they could provide communications services," says Morland.

And so began a slow dance in which BT tried to retain its position as sole national communications provider and Racal tried to wrest that exclusivity away from it. The problem lay with interconnections to the BT network. At first, BT wanted Racal to connect to its network at local exchange, rather than national backbone, level, making the cellular network a kind of direct-dial PABX on the 'real' network. When Racal pointed out that it would be impossible for cellular operators to meet BT's attenuation standards through this kind of interconnect, one objection fell away.

BT then objected to the signalling protocol the Ericcson AXE switches were using, saying it was open to fraud. Racal, BT said, would only be able to connect to the BT network using the System X exchanges BT was developing with partners. After one such meeting, a BT engineer pulled Morland aside and asked him to visit him at his office in London. When Morland arrived, the BT engineer told him that BT was already using an AXE switch, to route international traffic on to its network. At the next meeting, Morland used this information to overcome another BT objection. The upshot was that when the UK's TACS standard was finalised, it established that the cellular networks would be equal partners to incumbent telcos.

The JRTIG team made other decisions that lingered for years. For example, the reason that the first mobile phones had Send and End buttons, rather than Call and Hang Up, was because they were defined by signalling engineers who were thinking about signalling: "No-one realised that it would stick," says Morland.

Launching GSM

Even as the analogue networks were being defined and launched in the UK, a second-generation cellular standard was being developed, initially in Paris. Given that the European project was supposed to be about harmonisation, Europe's first-generation cellular network was an embarrassing patchwork of incompatible technologies. If you wanted to stay in touch as you drove across Europe, you'd need a bootful of equipment.

Steven Temple was director of technical affairs in the telecommunications department of the Department of Trade and Industry between 1984 and 1990, and was given responsibility for writing the GSM Memorandum of Understanding that defined Europe's commitment to the project. Later he would a take similar role in the introduction of a competing system in the UK.

Temple had some help. Back in 1982, European spectrum managers had agreed to set aside a block of spectrum at 900MHz for the potential standard. In 1984, the Commission had endorsed the idea of GSM - then standing for Groupe Speciale Mobile. In 1985, France, Germany and Italy had agreed to jointly develop the standard, and by 1986 the UK had joined them. The trick was to persuade equipment and terminal makers that the standard was going to take off.

"The real issue was how to get stuff to market," says Temple. "The network is only useful if there are handsets, and handsets are only useful if there is a network. So you had a double critical-mass issue to deal with in trying to create both networks and handsets at the same time and on a massive scale."

Temple's response was to write an industrial strategy, and then look for the political will to get it adopted. Thatcher was persuaded that GSM could be good for Britain, and so when the UK took its turn at the European presidency in 1986, the issue was put on the summit agenda and a decision was made that Europe would commit to GSM. This gave the Commission the power to reserve the necessary frequencies. Temple had also written into the Memorandum of Understanding a requirement that all the networks involved in the first phase of GSM would announce their equipment needs at once, synchronising the procurement of 15 countries and demonstrating to network equipment, handset and chipset vendors that this was going to be a market worth investing in.

"It caused the mobile equivalent of the cosmic Big Bang," says Temple.

Building networks

Ted Beddoes helped build Vodafone's network upon the basis created by Mike Pinches, the company's first technical director, from a couple of TACS switches and 10,000 subscribers, to 40 GSM switches and millions of subscribers. But the roll-out could be hectic, to say the least.

"In weekly board meetings we would have a score of how many networks we could roam to, how many basestations we had and how many subscribers," he says.

There were two problems with the roll-out. The first was that the switches were on a nine-month lead-time and Vodafone was installing one a month. The second was that subscriber numbers were growing so fast it was hard to predict how much capacity would be needed, and where to put it.

"We mainly got it wrong, in that we should have ordered two switches at a time," explains Beddoes.

Subscriber numbers grew so fast that by 1996, in certain areas of London the demand for network capacity reached the equivalent of 20,000 subscribers all making a call during the network's busiest hour - from an area of one square kilometre.

"This was a time when you could install a basestation in London and it would be paid for within a month from the extra subscriber traffic."

Another form of traffic was emerging to run alongside voice. According to Beddoes, he and a number of others had come up with the idea of SMS, but it didn't find much favour in the GSM standards group. Eventually it was included because it didn't cost much.

Tony Wiener, then part of the team that defined the GSM standards and now head of technology strategy for T-Mobile, says: "We thought at the time - why on earth would you want a paging system in a mobile phone?"

Turning up the competitive heat

Although Vodafone and Cellnet were growing fast, the UK government was keen to see even more competition in mobile communications, so that the services could be used by consumers as well as the mainly business audience they had served to date. The answer was 'phones on the move', a plan to let a number of 'personal communications network' (PCN) licenses for mobile services at 1,800MHz.

Because the propagation of 1,800MHz signals was more limited than that of 900MHz signals, it would take four times as many basestations to achieve the same coverage as GSM. To offset the capital cost, the government offered relatively large blocks of spectrum to the potential licensees. The other advantage was that a denser basestation network would mean the handsets needed

less power, so they could be smaller.

“When I was in GSM, we had an uphill battle to include a mobile handset in the specification,” says Temple. “With ‘phones on the move’ we tried to create a consumer product.”

Wiener, who was on the bid team for a consortium called Unitel, including EMI, STC, US West and Deutsche Telecom, says the point of getting the license was to create a personal, not business communication device. Once Unitel, along with Mercury and Microtel, had their licenses, they jointly defined what became DCS1800, a lower-power variant of GSM working at 1,800MHz.

The cost of rolling out the basestations soon began to tell, with Unitel and Mercury PCN agreeing to share the network but compete commercially, before finally merging.

The competitive spur to GSM still worked though.

“When we launched as one2one we suddenly saw Vodafone and O2 start reacting very quickly and the costs started tumbling,” says Wiener. And handsets started getting smaller too.

Structuring for influence

For Mike Short, now vice president of Telefonica Europe, some of the key decisions in the development of the UK cellular industry were commercial rather than technical or regulatory.

“The key decision in 1983 for the analogue network launch in 1985 was to ensure that the network operators were separate from the service providers,” he says. “This split provided the kind of competition and innovation that BT and Cable & Wireless hadn’t offered in the fixed-line market, so there was a lot of innovation on things such as customer care.”

Short argues that this commercial innovation helped strengthen the UK’s influence in the global mobile market.

“The UK was the second-largest market in terms of subscribers worldwide, after the US, until 1992. We were never going to overtake the US, but we were ahead for the first seven years.”

This also gave the UK extra weight when it came to defining the GSM digital standard. Short says that the Nordic countries brought their experience of roaming with the NMT system, the rest of the operators were mainly incumbents, but the UK was the only country in the group offering experience of running a mobile network in a highly competitive environment with open distribution channels.

Short highlights other significant moments that changed the industry, such as when GSM was renamed from Groupe Speciale Mobile to Global System for Mobile Communications.

“It showed our aspiration that we could cover the globe with technology,” says Short. When subscriber demand began to run ahead of handset supply, Short says GSM was sometimes said to mean ‘God send mobiles’. Later, when Short was involved in developing the third-generation standard, the standards-makers formed a group called the Third Generation Partnership Project (3GPP), where the G was also meant to imply ‘global’ and so stand as bulwark against excessive European Union influence.

This kind of symbolism had other uses. When the US was choosing between GSM, digital AMPS and CDMA for its digital cellular standard, Short, as deputy chair of the GSM Association, would go to US meetings and explain GSM’s reach by telling them that it was “in more countries than McDonald’s”. When GSM’s global dominance later became clear for all to see, some industry stalwarts started saying that the acronym actually stood for ‘game, set and match’.

Short points to other pivotal moments in the industry’s history, such as the introduction of SMS interoperability, in which he had a hand, the rise of Bluetooth connectivity, and the arrival of colour screens, which turned handsets from a verbal to a visual medium. He also highlights the arrival of mobile data, which began in 1992 with SMS, but started to take off with the arrival of GPRS services. And companies such as Intel did good work acting as a neutral forum in which operators and equipment makers could thrash out enabling issues, such as how to connect a computer to a mobile network.

“The thank-yous for making this industry work should be spread quite widely,” he said.

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What do you think? Do you agree or disagree with our choice of key moments and key handsets? Got a Cellular 25 story of your own to tell? Email communications.editor@theiet.org.

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