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C O V E R S T O R Y

International Roaming Has A 'Number' Of Problems

Telephone numbers and other numeric identifiers act as the oil that greases the wheels of wireless communications. Without unique numbers to identify mobiles, define routing and name HLRs and MSCs, the wireless world would stop rotating. However, all is not well. Too many wheels are squeaking when international roaming is attempted, and new lubricants are needed.

A Number of Problems

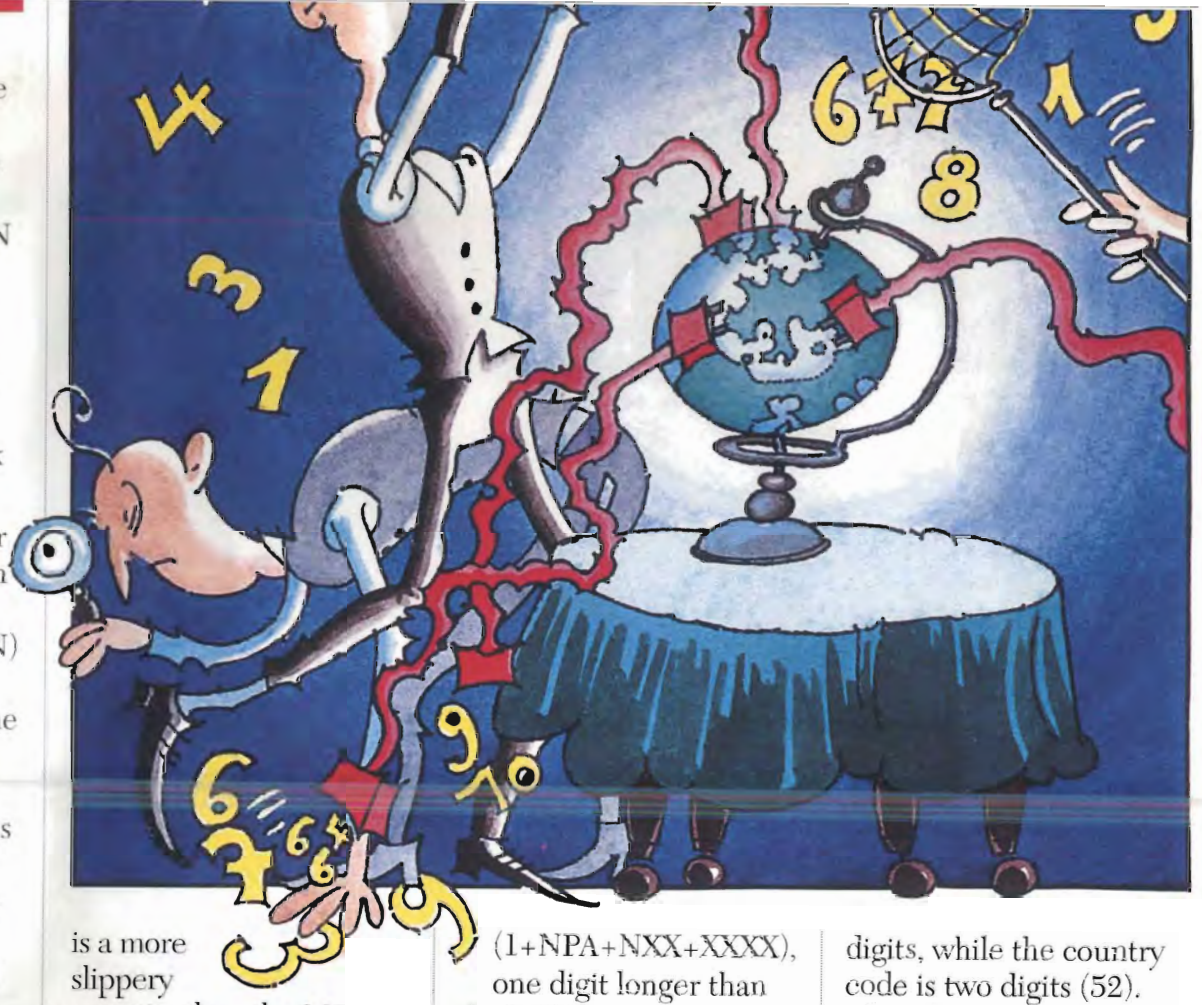
format, changing the first two digits from 52 to 05. This was the birth of the International Roaming MIN (IRM).

The International Roaming MIN

The IRM is a way for wireless carriers outside North America to guarantee that each of their mobiles can be uniquely and unambiguously identified. By using a zero or one as the first

Wireless systems require a unique telephone number for all (well, most) phones, a separate identifier for radio communications, an ESN for fraud prevention, Temporary Local Directory Numbers (TLDNs) for routing to roamers and SS7 point codes to identify network elements.

The two most familiar phone numbers are often confused. A mobile directory number (MDN) is dialed to terminate a call to a mobile, while the mobile identification number (MIN) is rarely used outside the wireless network. Worse yet, in the past, these numbers have artificially been kept the same, but local number portability and international roaming are forcing them apart. The 10-digit MIN identifies not only your individual mobile, but also the system to which you subscribe, usually with the first six digits. This is the number that is transmitted, along with the ESN, across the radio interface to identify a mobile to the base station. The MDN



is a more slippery quantity than the MIN, and varies in length, depending on the context of a call to a mobile. Within your office, it might be a three- to five-digit number; in your home town, seven digits; within your home country, 10 digits; and elsewhere, 11. The full international MDN is actually 11 digits long for North America, (1+NPA+NXX+XXXX), one digit longer than the MIN.

This slight discrepancy between the length of the MDN and the MIN causes a big, big problem. North American mobiles are almost always programmed with the last 10 digits of the MDN, not including the country code 1. In Mexico, on the other hand, national phone numbers are eight digits, while the country code is two digits (52). Therefore, Mexican wireless carriers programmed phones with the MDN, including the country code (i.e., 52 + eight digits). Imagine their shock when they realized that the area code 520 had been allocated to Arizona, right on their doorstep. After considerable analysis, their response was to convert all mobiles in Mexico to a new MIN

North American MINs, which never have these as the first digit. Obviously, international carriers have to coordinate their use of IRMs, otherwise several countries might choose 05. This job is performed by the organization known as International Forum on AMPS Standards Technology (IFAST). Unfortunately, more than half of this resource has been used, and most wireless carriers have not yet applied for an IRM. In another few years, this resource will be completely exhausted. This is not solely because of a high demand for wireless voice services around the world. IRMs were already heavily used by data-over-cellular companies, even before IFAST existed.

GUEST COLUMN
DAVID CROWE

The IMSI

The knight in shining armor that is going to rescue the IRM from being completely consumed is the International Mobile

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Continued from page 1.

Station Identifier, known as IMSI. This is a 15-digit mobile identifier that is already in use in GSM systems. Because IMSI contains a mobile country code in the first three digits, international coordination and the size of the number ensures there will be lots of identifiers for everybody. The problem with the IMSI is that it is not yet implemented in any wireless systems. Wireless carriers are going to have to take the IMSI seriously or the international roaming train will suddenly derail.

Another numbering resource is the TLDN, used for roaming. In North America, the TLDN is a 10-digit directory number assigned to a wireless carrier, but not to an individual mobile. It is used to route a call from the home system to the system that currently serves the roamer.

Note that 10-digit numbers traditionally have been used as TLDNs. What happens when a Mexican mobile roams to Arizona and 520-555-1234 is sent to the home system in Mexico to aid in routing the call? Well, chaos breaks out because the Mexican system thinks it has been sent a local Mexican number and mishandles the call. Special patches or complex digit translations can be placed in these switches to work around this problem, but the long-term solution is to use full international numbers as TLDNs. While this is supported by the TIA/EIA-41 standard, most switch or HLR vendors do not yet support it, and there are transitional problems in moving from 10-digit TLDNs to the international version.

And Then There Are Point Codes...

Our last numbering problem concerns the SS7 network. Wireless communications depends heavily on this network telecommunications signaling. This network is not used to transmit user data, but to transmit the messages that control calls. Within North America, every node on the SS7 network is identified by a unique numeric point code. The same is true in other countries, and there's the rub. Point codes from one country cannot be used in another country. They are often different sizes, and the same point code number could be used simultaneously in several different countries' SS7 networks. Communication across an international boundary requires the use of a more complex type of SS7 address, known as a global title. Yet the global titles needed for seamless international networking have not even been standardized yet!

You are probably wondering how international roaming can possibly work. Well, in a fast-paced, solution-oriented industry, there is always a workaround. But all of these short- to medium-term solutions have a finite lifetime. Eventually, the long-term solution must be implemented. Carriers, equipment vendors and service providers owe it to their customers to get educated now so they can determine the direction to move in, when to get started and how fast to move.

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KITCHEN'S VIEW

FIXING AN OUTDATED NUMBERING SYSTEM

PLACING UNFOUNDED BLAME ON WIRELESS WON'T FIX NUMBERING PROBLEMS

We have reached a crossroads in our industry. Looking back over the

remains the system under which today's burgeoning, competitive telecom

unified, nationwide numbering system that ensures all carriers a

issues at the upcoming Personal Communications Showcase '99 (PCS '99),