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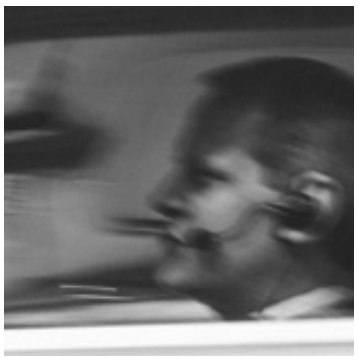

Roaming Hubs for CDMA: Rapid Roaming Expansion Made Possible

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CDMA and the Global Roaming Market

International roaming began as a GSM-only service. As CDMA networks expand beyond North America, however, the number of CDMA subscribers traveling internationally is rapidly increasing.

An estimated 13% of global mobile subscribers used roaming services in 2008 and projected to reach 600 million roamers globally by 2013. Africa and the Middle East will grow fastest, with the number of roamers doubling each year between 2008 and 2013.[1]

At the time of this writing, there are more than 250 CDMA mobile operators in 84 countries, serving 500 million subscribers, half of which reside in emerging markets (Latin America, Africa/Middle East, and Asia). CDMA subscriber growth continues rapidly: subscriber counts are projected to reach nearly 700 million by 2013.[2]

CDMA roaming implementations have doubled in the last three years, yet nearly half of all CDMA operators offer no roaming services at all. Annual growth for SMS roaming is greater than 180% but less than 15% offer SMS roaming and annual growth for packet data roaming exceeds 250% and fewer than 10% offer data roaming services.[3]

Why Pursue CDMA Roaming?

Roaming usage and consumption of new roaming services such as mobile data continue to grow rapidly and are forecast to nearly double over the next five years. Subscriber growth in developed markets is expected to slow over the same period while intense competition drives domestic prices lower, making revenue streams from roaming services increasingly significant to mobile operators.

Roaming is positioned pervasively as a premium service, and commands a premium price the world over. While domestic pricing has been subject to intense price pressure through competition, roaming price pressure has lagged considerably. Supported by the legacy perception that international calling is expensive and roaming is technically complicated, people expect to pay a heavy premium for making mobile calls abroad. Furthermore, business users continue to make up a large portion of the roaming population and business roamers are far less price-sensitive because they pass the roaming charges on to their companies.

"Roaming is positioned pervasively as a premium service, and commands a premium price the world over."

As such, roaming services can provide mobile operators with a reliable, high-margin revenue source. Moreover, since users tend to place a higher level of importance on roaming calls, subscribers will churn away from operators that do not provide adequate roaming coverage.

[1] Informa Telecoms & Media, Global Mobile Roaming: Operator Strategies and Market Trends 3rd Edition, August 2008

[2] Wireless Intelligence, 2008

[3] CDMA Development Group (CDG), June 2009. The CDG is an international consortium of companies who have joined together to lead the adoption and evolution of 3G CDMA wireless systems around the world. The CDG is comprised of CDMA service providers and manufacturers, application developers and content providers. By working together, members help ensure interoperability among systems, while expediting availability of 3G CDMA technology to consumers.

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The Challenges of Establishing Global Roaming using a Bilateral Framework

When roaming was first introduced and achieved within a bilateral framework, wireless carriers catered primarily to a small niche of business people and high-income consumers. Back then, an operator's roaming department had few partners to manage and relatively few subscribers used the networks for roaming. Those days are over. Roaming departments now face constant technological, business and regulatory changes, as well as the work load and resource requirements that come with negotiating with and serving many roaming partners.

Establishing national roaming is sufficiently complex but implementing international roaming is far more challenging. In addition to technological barriers as outlined below, there are language barriers, cultural barriers, work-ethic barriers and time differences.

Some target roaming partners an operator needs to work with are in time zones 12 hours apart. This complicates matters because an operator's intercarrier service operations generally aren't available around the clock, with the exception of trouble-resolution teams.

It's not surprising that negotiating a single roaming agreement can take as long as six months. Once CDMA operators have successfully established roaming agreements with network operators, they must then manage all aspects of implementing and maintaining them. This involves business development, provisioning international signaling links, testing, troubleshooting, and maintenance of connections in addition to deploying data clearinghouse services with each roaming partner. The same language, culture and time zone barriers continue to impede the process, so testing and successful implementation with a single roaming partner can take up to a further six months.

Tier 2 and 3 CDMA operators face a further obstacle to expanding their CDMA roaming footprint – they often struggle to gain the attention of Tier 1 network operators. These operators steer resources away from roaming deployments in low-traffic areas, and instead focus their attention on high-traffic areas and next-generation services. With nearly 60% of mobile subscribers affiliated with the top 10 mobile operators, smaller operators are challenged to find an entry point into Tier 1 networks[4].

"Roaming departments face constant technological, business and regulatory changes, as well as work load and resource requirements that come with negotiating with and serving many roaming partners."

Once roaming is established, serving and performing change management can become resource intensive. As an operator expands market share and subscribers demand higher quality roaming services, the number of required agreements grows rapidly, while the associated administrative and technical support overhead increases dramatically.

[4] Ibid

Technological Issues Complicate CDMA Roaming

In addition to administrative and strategic difficulties, operators must contend with technological issues that make it costly and complex to support CDMA roaming. Specifically, the protocol for CDMA, ANSI-41, was not designed for roaming. Different deployments of ANSI-41 still present a problem to both the home and serving networks, as different operators in different countries often use identical codes and numbers, resulting in conflicts and inhibiting seamless roaming service delivery. ANSI-41 also lacks a standard for dialing international numbers, leading to difficulty for subscribers as they navigate dialing patterns in foreign countries.

Many networks employing the ANSI-41 protocol utilize PC/SSN for routing while others utilize GT (e.212) for message routing. To complicate matters further, some networks use PC/SSN for mobility management messages, but use GT for SMDPP messages for SMS.

Complicating the task is the diversity of vendors' switch and network types. One carrier might have a Motorola switch, and one of its roaming partners might have a Lucent switch. The coordination between carriers can be a daunting task.

Interoperability issues often impede subscribers' international access to some of their home-market services. Operators want their subscribers to have access to features such as voice mail, caller ID, SMS and data services while roaming internationally, but, other than voice mail, these features are often unavailable.

Prepaid requires further consideration. Prepaid subscribers represent approximately 70% of mobile subscribers worldwide[5]. In emerging markets, that number jumps to nearly 90%[6]. To date, CDMA prepaid subscribers have had limited options for international roaming.

[5] Ibid

[6] Wang Wei and Zeng Rong, Huawei Technologies, Speeding up CDMA international roaming, October 2007

Learning from GSM Roaming Experiences

GSM operators seeking to offer international roaming were able to do so by establishing bilateral roaming relationships. This practice, however, quickly led to GSM operators becoming locked into complex arrays of agreements. In essence, separate agreements were needed with each GSM operator serving a given coverage area.

An overwhelming majority of GSM operators have more than 25 prepaid roaming partners, with over 40% having more than 50 roaming partners across at least 25 countries. The situation is even more complex when it comes to data-roaming partnerships. Nearly 70% of GSM operators have at least 50 such partnerships in place. In fact, 24% have more than 200 data-roaming partners.

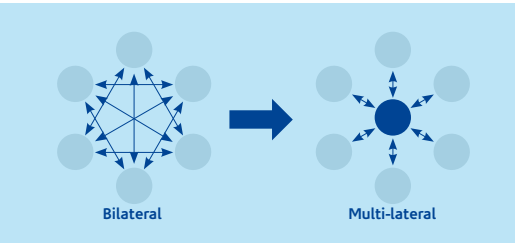
GSM consortium members decided to take action to alleviate the complexity and resource drain that each GSM operator faces in establishing, monitoring and maintaining bilateral roaming agreements. The result was the GSM Association's Open Connectivity initiative, the formation of GSM roaming hubs based on the Mobile Application Part (MAP) standard.

What is a Roaming Hub?

A roaming hub, as defined by the CDMA Development Group (CDG) is a one-stop-shop service that offers client operators accelerated global roaming through simplified implementation and reduced operating costs. The hub enables roaming among all clients of the hub and is an alternative to the current model of effort-intensive bilateral roaming agreements and implementations. The roaming hub provides the client operator with:

- A single agreement with the hub
- A single connection point to the hub
- Provisioning, testing and troubleshooting support
- Consolidated/Cascade billing (currently being evaluated for future requirement)
- Prepaid signaling support
- Fraud prevention and mitigation mechanisms

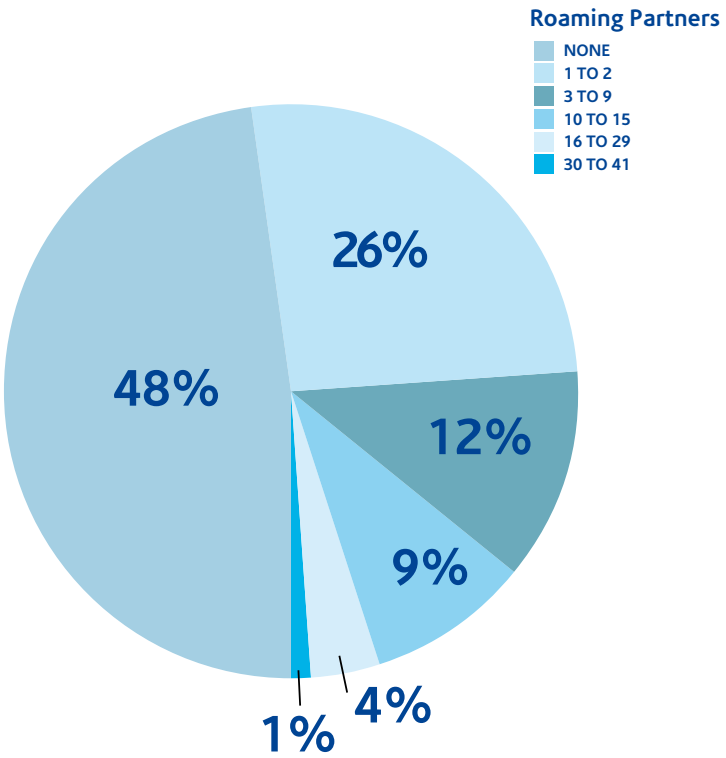
Hub model simplifies roaming relationships



"A roaming hub is a managed service that enables mobile operators to offer international roaming coverage with only a single roaming agreement and a single connection."

The need for roaming hubs is even greater for CDMA mobile operators than for GSM operators. As shown in figure 1, nearly half of all CDMA operators, have no international roaming agreements in place and one quarter have roaming agreements established with fewer than two countries. Contrast that with the tremendous number of agreements in place among GSM operators, and there is little doubt that CDMA operators would benefit greatly from a CDMA roaming hub. Mobile operators could forgo the time, expense, and effort required to establish global roaming agreements, and instead, begin generating global roaming revenues almost immediately.

70% of CDMA carriers have roaming with less than 2 countries



Source: Federico Nienstadt, CDMA Development Group, 2009

Figure 1: CDMA roaming coverage segmented by number of countries covered

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Advantages of a Roaming Hub Over a Bilateral Roaming Strategy

Small mobile operators frequently pursue roaming strategies that do not align with those of large network operators. For example, a Tier 2 mobile operator in Africa may struggle to serve foreign-based companies because it lacks a roaming agreement with the foreign companies' home service providers. Yet large network operators have little incentive to strike a roaming agreement with small operators that produce relatively little revenue. While the Africa-based operator loses out on a substantial, high-margin revenue opportunity, it can do little to address the situation. This is a typical scenario that drives mobile operators to join a roaming hub.

An established roaming hub provides mobile operators access to many of the world's largest roaming networks, and can pursue specific non-member networks on behalf of its member operators. New members enjoy rapid expansion of a roaming footprint, while existing members benefit from lower aggregate costs to expand roaming access to new markets and regions with smaller operators (e.g. Africa, Central Asia, Europe and CDMA450 operators).

In all cases, the risk/reward ratio is extremely low for hub members.

Cost and Resource Savings

A third party managed CDMA hub service offers an economical way for CDMA operators to provide expanded roaming services through one roaming agreement and one connection. Because the hub provider manages all agreement negotiations, members are spared the time and legal expense to negotiate roaming agreements with other members.

> ***"An established CDMA roaming hub delivers global roaming coverage with a single roaming agreement and a single connection."***

Reduced Time to Market

A roaming hub enables faster rollout of roaming services by reducing lead time required for agreement negotiation, implementation, testing, data provisioning, and signaling/network design. An efficient and established hub provider can usually complete end to end implementation within 30 days. As a result, CDMA operators can quickly launch new services without major capital expense or administrative drain.

Improved Competitive Positioning

Fierce competition for local services has led to a gradual reduction in profits and so many operators tend to compete in the differentiated service field by providing an international roaming service. A major concern for all mobile operators is identifying methods to attract and retain customers with this service in order to maximize competitiveness and profits.

Roaming Agreement Flexibility

Within the hub framework, new members sign a single roaming agreement with the hub provider declaring default serve rates with consortium members. An advanced hub provider will allow members to negotiate lower bilateral rates with other members that override the default rate. An effective hub provider will maintain all roaming agreements for all members.

Streamlined Network Connections

Rather than establishing and maintaining SS7 links with every partner network, CDMA operators can establish a single connection with the CDMA hub provider. In turn, the hub provider maintains connectivity to – and enables data exchange between – all members.

> ***"Solutions that enable seamless roaming both for postpaid and for prepaid will become central to retail success for mobile operators."***
>
> ***– Informa, Global Mobile Roaming: Operator Strategies and Market Trends 3rd Edition.***

Prepaid Roaming Support

As previously noted, prepaid subscribers represent more than half of worldwide mobile subscribership and an even greater proportion in emerging markets. Prepaid support via a roaming hub doubles the addressable market for roaming services.[8]

Faster Access to Incremental Revenue Streams

In addition to delivering voice roaming through a simplified framework, CDMA operators that offer global roaming services through a roaming hub can offer their subscribers a faster access to number of advanced services and features. These include data and SMS roaming, interstandard roaming between CDMA and GSM, SMS roamer greeting, and more. Today's subscribers expect their CDMA service providers to seamlessly offer calling and data services where ever they travel.

[8] CDG, What is the CDMA Roaming Hub, September 2009

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Spectrum and Mobile Device Considerations

In addition to their business strategies and the local cultural environment, CDMA operators must consider device issues when it comes to supporting global roaming, specifically those associated with CDMA 450 spectrums.

Compatibility Issues with CDMA 800 and 450

The CDMA 450 coverage area is nearly three times larger than that covered by the 800 MHz spectrum. According to the CDMA Development Group (CDG), "CDMA450 is the most mature and widespread solution for providing mobile and fixed telecommunication services economically to both urban and underserved rural markets"[9]. In fact, as of July 2009, 125 operators in more than 65 countries have deployed or are planning to deploy CDMA450. Over 110 CDMA450 devices have been introduced to the market.

To ensure the development of seamless roaming between frequencies, the CDG is working to resolve incompatibility issues and working with handset manufacturers to develop multi-band 450-capable handsets. There are already several multi band devices commercially available. For status and progress reports, please visit www.cdg.org.

The TNS Roaming Hub for CDMA

The Transaction Network Services (TNS) Roaming Hub for CDMA is the first and only established Roaming Hub for CDMA[10]. Members of the TNS Roaming Hub are a group of CDMA operators offering extensive coverage, connectivity, fair roaming rates and policies designed to support the streamlined delivery of global roaming services for wireless operators. Through a single international roaming contract and single network connection to TNS, members gain access to roaming privileges, discounts, and packaged roaming services with other members throughout the world.

"The TNS Roaming Hub for CDMA is the first and only established CDMA roaming hub."

The TNS Roaming Hub for CDMA represents an evolution from the first roaming hub to offer CDMA international roaming outside of North America. The original CDMA hub, operated by TNS since 1999 and known as the Pan-American Roaming Consortium, or PARC, launched ANSI-41 roaming services in Latin America and the Caribbean. Today, the TNS Roaming Hub supports a wide range of services and technologies, including data, and SMS. Current and target members of the TNS Roaming Hub for CDMA span the globe, from the United States and Caribbean/Latin America (CALA) region to Africa, Asia and the Middle East.[11]

TNS offers a single point of contact for the management of multiple roaming agreements, international signaling, data and financial clearing services, and troubleshooting. As a result, operators can expand roaming coverage for voice, SMS and data services quickly and easily.

The TNS Roaming Hub for CDMA provides the most flexible arrangements possible for its members. Members can choose flexible service bundles to suit their unique requirements and environment. Members can also supplement their TNS Roaming Hub relationships with ad hoc bilateral relationships to achieve their unique strategic goals.

[9] CDMA Development Group, CDMA450: Providing Affordable Connectivity, July 2009

[10] At the time of this writing, October, 2009.

[11] The TNS Roaming Hub for CDMA is currently experiencing a period of rapid growth; for a list of current membership and coverage, please contact tsdsales@tnsi.com.

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Simplifying Roaming Agreements

TNS Roaming Hub for CDMA members dramatically speed their time-to-market strategies by establishing a single one-to-many (i.e. multi-lateral) agreement with the TNS Roaming Hub. TNS establishes and maintains roaming agreements with Hub members and manages related technical data. In addition, the TNS Roaming Hub for CDMA provides members with the flexibility to override the default serve rates and establish more favorable, bilateral rates between members.

TNS also offers Roaming Hub members the necessary network, monitoring and back-office functions, relieving CDMA operators of the administrative overhead required to execute and manage traditional roaming agreements.

Roaming Strategies and Priorities

The goal of the TNS Roaming Hub for CDMA is to provide a foundation for the fast and efficient launch of roaming relationships. As a TNS Roaming Hub member, an operator will have pre-established roaming relationships, suggested inter-carrier rates, protection against fraudulent usage, maintained and supported roaming management tools, and mechanisms for accurate, simple, and timely collection of roaming revenue. If a member has bilateral agreements with non-TNS Roaming Hub members, TNS can support the tests and open the gateway with those providers for the non-hub member.

"The TNS Roaming Hub for CDMA provides mobile operators access to many of the world's largest roaming networks, or can pursue those networks on behalf of its member operators."

While TNS Hub members gain instant access to an immediate roaming footprint across multiple countries, member operators may want to pursue strategic target regions not yet associated with the TNS Roaming Hub for CDMA. As the only established CDMA hub provider, TNS will leverage its growing membership, market clout, and expertise to pursue new roaming agreements on behalf of Hub members.

Roaming Beyond the Hub

TNS is connected globally to hundreds of mobile operators and roaming service providers through the TNS SS7 Network and extensive peering arrangements. With so many connections, TNS helps members maximize roaming coverage with complete flexibility. Membership in the TNS Roaming Hub in no way restricts an operator's freedom to establish bilateral agreements with non-members.

Additionally, TNS offers a complete suite of CDMA Roaming Services designed to meet the specific needs of each CDMA Operator. This suite of services is available in a single contractual bundle designed so an Operator can select only the services it needs from an a la carte menu. This tailored approach to service selection helps ensure all the roaming needs of an Operator can be supplied in a straightforward manner.

"TNS is connected globally to hundreds of mobile operators and roaming providers through the TNS SS7 Network and extensive peering connections."

TNS CDMA Roaming Services Bundle Overview

Network Functionality

The TNS Network Services solution set provides the following key functionality:

- SS7
- Intelligent Message processing and protocol conversion
- SMS roaming
- IS-826 signaling support for prepaid roaming
- Testing, troubleshooting, and network monitoring

SS7 Signaling

Underpinning the TNS Roaming Hub for CDMA is the TNS SS7 signaling network, the largest independent signaling network in the world with direct access to wireless operators and networks around the globe. The TNS SS7 network is designed for maximum diversity and routing efficiency, with minimal hops between regional networks, multiple points of entry, and transparent re-routes in the event of emergencies. One connection to the TNS SS7 network provides access to intelligent network, advanced message processing, and database services that enable seamless roaming between national and international operators.

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Intelligent Message Processing

Enabling global roaming requires a number of capabilities. Unfortunately, a number of issues complicate attempts to provide the necessary services. These issues include disparity of numbering schemes, signaling systems, network elements, protocol variations, and message routing requirements.

The TNS Intelligent Message Processor, or IMP, is a premium signaling service that performs CDMA roaming gateway services for TNS customers. The service provides protocol conversion and intelligent message processing to address switch, signaling, routing and numbering issues linked to international roaming services.
As a result, subscribers can access the same features and security when roaming as they can when in their home areas.

"The TNS Intelligent Message Processor is a premium signaling service that addresses switch, signaling, routing and numbering issues linked to international roaming services."

SMS Roaming

SMS service has become an essential wireless service, and subscribers expect SMS to work seamlessly, even when roaming internationally. However, ANSI-41 was not designed for international roaming, nor does it enable proper billing for international SMS. In many cases, ANSI-41 routing incompatibility makes SMS roaming impossible. The TNS SMS Roaming services have been designed to overcome ANSI-41 compatibility issues, enabling mobile operators to enter roaming relationships that require the enablement of international SMS via SS7.

Optional SMS roaming service functionality include carrier-to-carrier wholesale reporting and billing for SMS services and the ability to retail rate the SMS Message Detail Record (MDR) based on the serving carrier. SMS Roamer Greeting enables an operator to send customized SMS messages to its roaming subscribers automatically upon roaming into a new region or country.

By providing all the routing and translations required, the TNS SMS Roaming Service alleviates CDMA operators from having to maintain point code or translations tables for each roaming partner. In other words, it reduces the overall complexity of managing a roaming program.

IS-826 Signaling Protocol

As noted above, prepaid subscribers represent a large proportion of the global subscriber base yet CDMA prepaid subscribers have had limited options for international roaming.
TNS employs IS-826 to enable CDMA prepaid international roaming.

IS-826 leverages the Wireless Intelligent Network (WIN) framework put forth by the Telecommunications Industry Association. Because WIN can handle service logic running in separate locations from the switching equipment, it works well for international roaming situations in which the home (service logic/call control) and serving (switching) equipment are widely separated. TNS' support for WIN-based IS-826 messaging enables CDMA operators to tap into the huge prepaid subscriber market for additional revenue.

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Testing, Troubleshooting, and Network Monitoring

TNS employs methodologies that ensure rapid deployment and smooth operation for its members. The intelligent server platform used to mediate ANSI-41 roaming traffic – the Intelligent Message Processor or IMP – normalizes the traffic processing configurations for each of the TNS Roaming Hub members.

Once a new member joins the TNS Roaming Hub for CDMA, they gain the benefit of TNS network monitoring. TNS monitors network performance 24x7x365 to protect against outages and maintain network integrity. The state-of-the-art, network-wide monitoring system provides early warning in case of potential problems. At the same time, in-house engineering tools monitor and control link utilizations and perform trending to identify the need for link augmentation.

Roamer Visibility and Reporting

With visibility into failed roaming attempts and roamer activity, roaming departments can quickly troubleshoot to correct a roamer's problem and activate the roamer's service on the roaming network. TNS Roamer View enables operators to monitor subscribers' roaming activity in visited markets as well as visiting roamers on the operator's own network. Roamer View can query by subscriber-specific information or service provider information. In addition, mobile operators can validate the figures that arrive from clearing and settlement activities. Equally important, they can leverage the data to develop and hone their roaming strategies.

Clearing and Settlement

Clearing and Settlement represent critical processes for making international roaming a success. TNS Settlement and Exchange Service (SES) for CIBER® provides operators a single point to exchange roamer billing data and settle with roaming partners. TNS Roaming Hub members can access the business intelligence needed to build and protect their roaming business, including tracking financial positions with roaming partners, performing roaming market analysis, and forecasting roaming revenue and expenses. TNS Settlement and Exchange service is compatible with all leading financial clearing providers.

If desired, TNS can refer operators to financial clearing providers to ensure complementary and appropriate services for CDMA, including complete and automated accounts payable and receivable processes, automated dispute and debt age management, as well as knowledge of local legislation specific to an operator's serving area.

"The TNS Roaming Hub for CDMA supports critical business processes required to enable international roaming."

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Interstandard Roaming

TNS Interstandard Roaming enables subscribers with dual-mode phones to roam from CDMA to GSM markets. TNS manages billing and signaling conversion across a variety of protocols. As a result, wireless service providers can extend international roaming to Europe, Asia, Africa, and most GSM regions. Because TNS Interstandard Roaming includes activation processing, international customer care, end-user billing, and fraud protection, CDMA operators are relieved of the technical, administrative, and resource burdens associated with enabling interstandard roaming.

Wireless Data Roaming

The number of wireless data devices available globally will continue to increase as people discover the convenience of accessing the Internet and enhanced network features via mobile devices. Yet users are not satisfied with enhanced features that only work within their network – they want to use them while roaming across networks and service providers.

The TNS CDMA Roaming eXchange Service (CRX) opens a new revenue stream and makes it possible for wireless subscribers to access data services when roaming. A variety of wireless broadband networks are supported including, CDMA1x/EV-DO, WiFi, and WiMAX. Peering with other CRX providers ensures maximum coverage and interoperability. And, robust settlement and reporting on the mobile data traffic round out this solution.

Fraud Prevention

Around the world, telecom fraud losses continue to rise – up 34% between 2005 and 2008. Globally, roaming fraud losses are estimated at $1.6 billion[12]. Sophisticated criminals have developed repeatable roaming fraud methods that exploit gaps in the fraud prevention procedures adopted by mobile operators.

Minimizing fraud exposure allows operators to negotiate more favorable roaming rates and/or become the preferred partner in a country, bringing more roamers to a network and increasing inbound roaming revenues.

TNS Call Data Delivery (CDD) – is a roamer data exchange service provided in concert with RoamEx™ that helps operators respond to roaming fraud activities in a timely fashion, substantially reducing the risk of fraud-related losses. CDD/RoamEx enables CDMA operators to exchange completed roaming call detail records (CDRs) in near real-time, which facilitates monitoring of fraudulent network usage, prepaid billing, account spending limits and data collection. With extensive worldwide coverage and a multitude of participants, the CDD/RoamEx network has become an integral part of effective and comprehensive fraud control platforms for wireless operators worldwide.

Business Processes of the TNS Roaming Hub for CDMA

The TNS Roaming Hub supports the following critical business and service processes required to enable international roaming:

- Agreement Management
- Voice and Data Roaming
- Opt-In and Opt-out
- Default and Negotiated Rates
- Expanded Rate Plans
- Technical Data Solution (Working with CDMA Development Group's CREIT tool)
- Fraud Management

Synopsis

By providing international roaming services for voice, data, and SMS, CDMA mobile operators are better positioned to compete with other service providers, combat churn and increase their base of high-value roaming subscribers. Establishing a global roaming service was once a difficult and risky proposition for CDMA operators. With the development of its solution, TNS is able to provide mobile operators with an efficient means of pursuing international roaming strategies: the TNS Roaming Hub for CDMA.

The TNS Roaming Hub eliminates administrative and technological issues so mobile operators can provide seamless international roaming to their subscribers. With its expertise and growing hub membership, TNS possesses the leverage and required market clout to act as an intermediary between smaller operators and Tier 1 networks. The end result is smaller operators gain access to large networks via the Roaming Hub for CDMA. At the same time, large networks can expand their CDMA roaming participation without assuming the technical and administrative burdens.

With proven success expediting roaming for a number of operators, including previous roaming hub services, TNS is well-positioned to deliver a CDMA roaming hub. Plus, by providing the necessary business services and functionality, the TNS Roaming Hub for CDMA enables CDMA operators of all sizes to profitably offer international roaming services.

"TNS is able to provide CDMA operators with an efficient means of pursuing international roaming strategies: the TNS Roaming Hub for CDMA."

[12] Communications Fraud Control Association, 2009 Global Fraud Loss Survey

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Learn More

To determine if a roaming hub can help you satisfy your roaming strategies and priorities, contact TNS by calling +1 360 486 3326 or email tsdsales@tnsi.com

About TNS

Since 1990, TNS has provided signaling, roaming, and intelligent network services to fixed, mobile, broadband and VOIP operators all around the world. The first to offer nationwide ISUP coverage and SIGTRAN over SS7, the TNS network has grown into the largest independent SS7 network in the world by delivering execution excellence and continuously meeting our customers' needs.

We are a leading provider of fast, reliable and secure transaction-oriented services for the world's leading retailers, banks/processors, telecommunications companies and the financial markets. We combine innovation, advanced technology, experience and expertise to offer complete end-to-end solutions, allowing merchants of all types to maximize their communications investment and increase efficiency while reducing overhead and cost.

Visit us at:
www.tnsi.com
for more information.

Glossary

ANSI-41	American National Standards Institute
CDG	CDMA Development Group
CDR	Call Detail Records
CIBER	Cellular Intercarrier Billing Exchange Record
CDMA	Code Division Multiple Access
GSM	Global System for Mobile Communications
GT	Global Title
MAP	Mobile Application Part
PC	Point Code
SMDPP	Short Message Service Delivery Point-to-Point
SMS	Short Message Service
SS7	Signaling System 7
SSN	Sub-system Number

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