IDC Vendor Spotlight

Leveraging Next-Generation HLR Solutions

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Analyze the Future

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The global telecommunications industry has evolved; today's service providers (SPs) face continuous pressure to win more profitable customers and maintain their competitiveness. One key challenge is subscriber management, due in part to the need to continuously offer differentiated and personal services to their subscribers.

SPs continue to work through both planned technology migrations and unplanned business events such as acquisitions, divestitures, natural disasters and spikes in usage. Simple voice communications and associated roaming are only the foundation expectations of consumer and business end users. The traditional role of home location registers (HLRs) in providing both access and roaming capability has broadened. Today, SP infrastructure includes a mix of fixed and mobile, 2G and 3G, connectivity and content. Amidst these complexities and changes in usage, subscribers increasingly rely on both data and voice connectivity. For the key enabling systems that deliver the kind of flexibility and access that an increasingly mobile society requires, effective management of the end user is essential to the long term success of the SP.

This paper examines IT-network convergence trends in subscriber management. It also looks at the significant role of next-generation HLR (NG HLR) vendor ZTE in this strategically important market.

Introduction

In the SP infrastructure, the subscriber management challenge is about managing profiles and their privileges. It is building upon existing identity management systems, primarily directories (LDAP and X.500). The only clear precedent for SP management of subscribers has sat within the BSS systems (billing and customer care), though in some cases the outbound marketing team has leveraged subscriber information for marketing campaigns. To a certain extent, SPs and vendors require a system for subscriber management that is broad enough to support everyday use. Technology migration, mergers and acquisitions, as well as convergence factor into this as well.

The inability to know and/or to act on knowledge of subscriber preferences and usage patterns creates both operational costs and market development limits that are largely self-imposed by the SP. In the race to compete with Internet players from content owners to advertisers to search, SPs must leverage their subscriber data assets.

Role of the HLR

The HLR is the crown jewel of the SP's competitive advantage. The subscriber registry of the HLR contains the most critical customer data and attributes. Such a system is what empowers mobile operators today.

What is an HLR?

The home location register (HLR) includes a variety of functions to designed to support mobile voice services:

- A database
- A high performance system
- A server
- A repository of subscriber information: Account status, User preferences, Services subscribed to (e.g. data), User location/address
- An authenticator of SIM cards (usually)
- A register of stolen/prohibited phones
- An adjunct system to the MSC (Mobile Switching Center)
- Connected via SS7 links

A visitor location register (VLR) is an "HLR" for visitors to the network. It temporarily holds information downloaded from the guest's HLR (in the home network of the guest).

HLRs are sold as integrated or standalone products. In the past, Intelligent Network (IN) investments and practices favored the implementation of HLRs that are integrated with the mobile switching infrastructure. The authorization and authentication functions were generally combined, resulting in HLR/AuC product offerings from the top telecommunications infrastructure vendors. The decline in IN popularity in the face of IP-based networks also plays a key role in the rise of standalone HLRs. Regardless, the implementation of HLR (and home subscriber server, or HSS) functions continue to be dictated by standards but governed by the vendor need to create differentiation. In this way all HLR vendors make it expensive for their customers to change suppliers.

**What information does an HLR hold?**

HLRs were designed to support mobile voice, which was understood to be an "application." In this sense, HLRs might be understood as an early approach to a telecommunications industry-specific application server, in keeping with broader IT industry concepts of application servers (and unlike today's telecommunications industry-specific application servers).

As shown in Figure 1, the HLR is a resource to other parts of the network infrastructure. It associates the charging process with the user profile as well as managing user rights to services. Specifically, HLRs store and provide SIM card data to the Multiple Systems Coupling (MSC). This includes:

- Telephone number (MSISDN for receiving voice and SMS; potentially second MSISDN for data calls)
- Services subscribed to
- Ability to access packet data services
- Current location

Where HLR Information Flows to and From
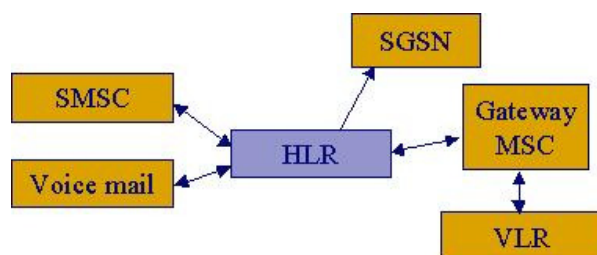
Source: IDC, 2007

Market Characteristics

HLRs have been deeply tied to IN strategies and solutions. The incumbent HLR vendors installed at SPs are often assumed to be the incumbent choice for many related systems. However, the heavy demands by SPs for highly reliable and responsive systems are putting the incumbent HLR vendors under pressure. In particular, the older computing technologies used by IN vendors is increasingly a competitive liability.

The scale, speed and performance of HLRs are top issues. With 10 million or 20 million subscriber records in a single system, volume and related issues are a top consideration. Likewise, the internal user of an HLR within an SP organization often perceives a single system. In practice HLRs are installed as geographically dispersed systems that have unified data architecture. These characteristics and essential attributes are as follows:

Product and Solution Characteristics

The following product attributes shape market competition in HLRs and the emerging HSS and subscriber management platforms:

- Transaction load
- Transaction speed
- System reliability
- System footprint
- Redundancy architecture
- Ease of upgrade and/or expansion

Certain attributes are critical to assessing the best HLR/HSS strategy for an SP. The size of the subscriber population, and its likelihood to grow, are the primary determinant. Some or most of these issues and choices can be pre-determined for the purchasing SP, making the vendor competition subject to these load and usage levels. Other attributes that vary by region or SP include:

- Subscriber population
- Geographic location
- Call model (regulatory)
- Pre/post paid proportions
- Database independence
- Business change factors: churn
- M&A
- Technology change factors: network, vendors

Definitions

Home location register (HLR): The HLR is a high performance database system, based on largely commercial server platforms. It is a repository of subscriber information including account status, user preferences, services subscribed to (e.g. data), and user location or address.

Home subscriber server (HSS): The HSS provides the user database information to the IMS infrastructure (which is IP-based) using the Diameter protocol for the interface. The HSS intention is to create a master user information repository that is of a distributed architecture and based on issues with the HLR (multiple databases, reliability/change management, etc).

Next-generation HLR (NG HLR): The NG HLR is an evolution of the traditional HLR products and technologies. The distinguishing characteristic of NG HLR solutions is the software architecture and can include hardware platform options. NG HLRs employ a distributed architecture based on IT database and directory principles.

Trends

The data structures and infrastructure platforms for the installed base of HLRs are aging. The software and hardware technologies in use are increasingly out of step with IT industry innovations. Likewise the network infrastructure assumptions embedded in legacy HLR systems is limiting the ability of SPs to fully capture revenue opportunities, improve customer satisfaction and contain costs. The resulting HLR systems and processes work against an SP's efforts to keep pace with user requirements. Anecdotal reports of systems that inappropriately contact the HLR, such as handsets, through unintended malfunctions suggest that HLRs are increasingly subject to issues from the subscriber side as well as the core network infrastructure.

Technology Acquisition Decisions

The buyer of the HLR/HSS today is still in the network operations team. The IN context remains essential to the investment and use (e.g. especially related to SS7 lines). However, the efforts around business intelligence, combined with the strategic importance of subscriber management mean that IT departments and senior management are more interested and involved in the buying decision.

Preparing for the Profusion of Services

Going forward, SPs are preparing to deal with a far greater number of services based on next-generation network (NGN), fixed/mobile convergence (FMC), IP multimedia subsystem (IMS) and service delivery platform (SDP) initiatives. As they consider the implications and enablers of future services, SPs are concerned about the number of databases that will reside in the network. This sentiment is driving SPs to ask (or force) application vendors to unbundle the database from the application, in order to begin to centralize or federate the user data. It is also prompting careful thought about HLR/HSS strategies for subscriber management.

The Emerging NG HLR Market

A small group of vendors has developed NG HLR solutions to meet these emerging requirements. IDC believes that the current players in NG HLR solutions include ZTE as well as Blueslice, HP, Nokia Siemens Networks (Apertio), and Xeround. What distinguishes the NGHLR vendors is the level of innovation based on IT technologies and approaches. A further characteristic of the NG HLR market, in contrast with the legacy HLR market, is the presence of venture funded start-up players: Blueslice and Xeround, and previously Apertio, which was acquired by Nokia Siemens Networks in early 2008. This emerging class of vendors is collectively helping their service provider customers to address the concept of subscriber management in the context of increased focus on business KPIs and evolving mobile network and service technologies.

The emerging NG HLR is composed of FE (Front End) and BE (Back End), as shown in Figure 2. The FE provides multiple applications, such as HLR, HSS, GUP Server, Mobile Number Portability (MNP), and AAA Server; the BE is a distributed architecture that is designed for real-time performance and resiliency. In the NG HLR model, distributed processing, load sharing and N+K geographical redundancy is supported by the split HLR of FE and BE, which is designed for scalability.

Figure 2

NG HLR Architecture
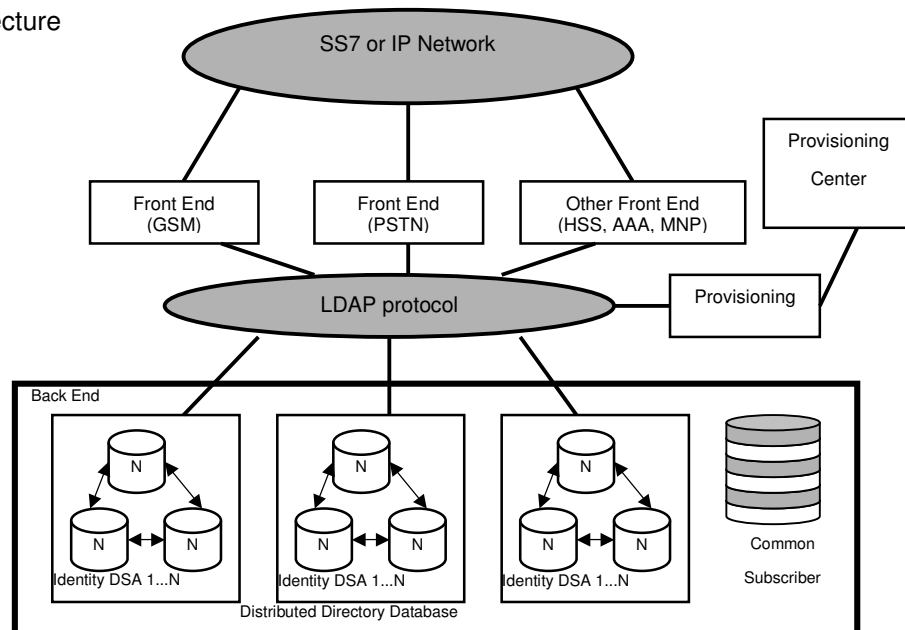
Source: IDC and ZTE, 2009

Profile of ZTE

ZTE is a provider of telecommunications solutions to global service providers. From its headquarters in Shenzen, China, ZTE's 50,000 employees in over 100 offices worldwide, the company delivers products and services ranging from access to transport and handsets. The company cites over 500 customer relationships today. For its significant installed base of HLR customers – on both traditional HLRs and NG HLRs – ZTE cites over 1 billion subscribers in over 115 SPs that are using HLR functionality. The ZTE NGHLR solution is part of the company's wireless solution set. The company reports the current installed base population supported on the ZTE NGHLR as 340 million subscribers in over eight SPs. The supported subscriber population is principally within China Mobile operating companies but also other Asian, Middle Eastern and European SPs.

The Product

The ZTE NGHLR solution is designed to be a distributed system. It includes both a front end and a back end. The front- and back-end architecture is designed to serve multiple locations in a cost-efficient manner. The system is based on an Advanced Telecom Computing Architecture (ATCA) server platform. The solution has been deployed as an integrated 2G/3G HLR/AAA solution at Zapp in Romania and as a high-capacity multi-function HLR (with AAA, EIR, mobile number portability and HSS capability) in ZONG of China Mobile. Key additional benefits cited by ZTE include scalability, reliability, speed of deployment, evolution potential, convergent capability. The solution design reflects the on-going load sharing and geographic redundancy and call model

flexibility requirements of today's SPs. It also addresses the need of SPs, as detailed above, to leverage the innovations of the IT industry where appropriate. Figure 3 summarizes ZTE's positioning of its NGHLR solution.

F i g u r e 3

ZTE NGHLR Positioning
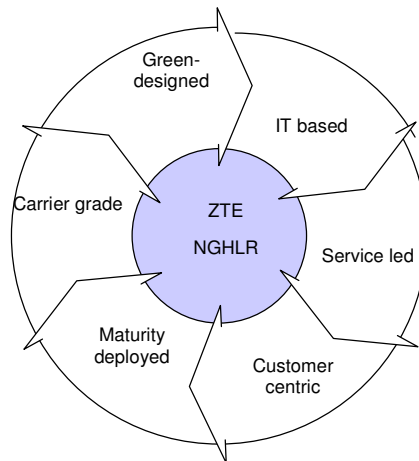
Source: ZTE, 2009

Opportunities

In the design and delivery of its NG HLR solution, ZTE is making subscriber management a strategic part of the company's portfolio of offerings. In the past, the HLR has been simply a piece of an overall mobile infrastructure solution. Today, expertise in subscriber data management can become a critical foundation to a services-led and customer-centric infrastructure. ZTE's solution is in step with the business goals of many top SPs who are working to increase customer satisfaction, loyalty and spending.

Efficiencies within products and processes are a top priority for today's SPs. IT technologies such as service-oriented architecture (SOA) and business intelligence are being used to drive integration of business processes and key business performance metrics. Likewise the commercial nature of IT technologies can speed the time to market while lowering the price point of both infrastructure equipment and infrastructure services. For SPs looking to streamline processes, increased commonality in the operational infrastructure can be a compelling solution.

For many SPs, the need to consolidate existing functions into a cost-effective footprint is essential. The age of many HLR systems, especially those associated with early mobile network deployments and even 2G HLR systems, can drive great expense. Most commonly, the sheer size of the legacy HLR systems within the datacenter can cost the SP precious space and environmental resources. However, in the effort to drive for green solutions, the lower power consumption associated with both newer and IT-industry platforms can provide a compelling contribution to the corporate goals of the SP.

Challenges

For SPs, upgrading or transitioning their HLR systems to the NGHLR product model a new supplier entails a complex set of business, technology and procurement decisions. These choices include embracing IT industry technologies and a customer based approach to operations.

For many SPs, the past experience of working with IT technologies can cause hesitation. Today IT technologies can still require significant extensions and integrations to become "carrier grade." More importantly, for SPs, the selection of commercially available IT industry technologies may not provide sufficient competitive advantage in key technology metrics.

Although customer service and attention is a top goal for many SPs, the network operations – for efficiency and reliability – often are discussed from a technology perspective rather than a business perspective. The decision to adopt network solutions with appropriate capacity and technology compatibility tends to be separated from issues of managing services offerings to customers. This on-going disconnect between operations, or network-facing, and marketing, or customer-facing processes will limit the ability of ZTE to effectively push adoption of the full set of features in its NG HLR.

Conclusion

The migration to NG HLRs is just the beginning. SPs are increasingly eager to explore the improved features and benefits of the NG HLR. As many SPs begin to work through the details of their plans to migrate to 3G, long-term evolution (LTE) and WiMAX technologies, the operational infrastructure requires an increasingly pragmatic approach. However, with the growth of mobile data traffic, many SPs cannot afford to wait to add subscriber capacity until the planned generational upgrade in the network. Consequently, IDC views the NG HLR space as a key segment for spending by SPs. IDC believes that, to the extent that ZTE can address the challenges described in this paper, the company has an opportunity for much success.