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White Paper

Wireless Mediation Comes of Age: Unlocking the True Value of Next Generation Networks

Executive Summary

The world's wireless and mobile operators are quickly realizing the critical nature of mediation. While next generation networks allow mobile operators to support new services and deliver new types of content and applications to subscribers, it is the operator's mediation platforms that will allow the services and content to be delivered profitably. *iGillott*Research believes that mediation is *the* critical capability that will decide which operators are winners and which are losers going forward.

The Importance of Mediation

Why is mediation so important? After all, the wireless and mobile industry seems to have developed without a separately defined mediation function. But the mobile operator's network environment is becoming more challenging with the addition of new IP networks, and the business model is becoming more complicated with data and content services. In addition to the call detail records (CDRs), networks now also output IP detail records, showing the activity for a data or Internet session. As the network complexity increases, so the operator's revenue is increasingly at risk, since there are many more opportunities for call and session detail to be lost.

The solution is to implement a more sophisticated mediation platform that is capable of accessing and accepting call and session detail records from multiple network elements on a real time basis. The mediation platform then passes call and session detail records to the billing and rating systems, as well as provide inputs to the operator's knowledge management systems. Furthermore, the mediation platform must ideally be able to filter, aggregate, and archive call and session information – this reduces the load on the back end billing and rating systems, as well as ensuring that the information available is consistent across all systems supported.

Mobile Operators' New Business Models

Subscribers are requesting new mobile data services that require higher-bandwidth networks and a variety of pricing and charging models. A sophisticated mediation platform is therefore required, allowing the operator to recognize the full value of the mobile event, rather than simply charge simply for usage or bandwidth. New business model examples include:

- Charging for the value of an event allows operators to divorce rate plans from directly measuring the usage of a particular network or service
- Supporting pricing models that include pay-per-view, pay-per-download, and pay-per-use
- Discounting airtime/bandwidth usage according to the content being accessed
- Supporting new prepay billing models.

The inclusion of prepay capabilities also allows the mobile operator to reduce their exposure to fraud and bad debt, since the prepaid account is decremented in real-time.

Critical Mediation Solution Capabilities

As may be expected, not all mediation platforms are created equal. System capabilities range from simply connecting multiple switches for voice service to supporting all IP network elements and business models for data. To be successful, major operators will need a comprehensive mediation

platform that supports not only the current environment, but also future network growth and business models. Mediation flexibility will be crucial. Critical capabilities that must be supported include:

- **Revenue Assurance:** Ensuring that all-revenue generating activities on the network are correctly and accurately reported. While this may seem trivial, in fact it is an extremely complex process when the network includes IP elements

- **Visibility and reporting**: Rather than just reporting on a few switches and billing systems, new mediation platforms must provide visibility into circuit and packet networks, partner networks, content sources, and application service provider resources

- **Network independence and flexibility**: Network independence and flexibility refers to two main issues: implementing a mediation platform that is not limited by the network's RAN or transport architecture; and the ability of the mediation platform to collect data passively, without negatively impacting network performance

- **Support for new business models:** The mediation platform must be extremely flexible in order to support any and all business models required by the market.

- **Scalability:** As new services generate large amounts of data, billing systems are required to process, filter, and aggregate giga bytes of information and process data from tens of thousands of active sessions simultaneously. The mediation solution should filter the incoming data as it is monitored and only pass on to the business support systems what is relevant. This cuts the amount of information processed, reduces the amount of storage required and improves the performance and response time of the business systems.

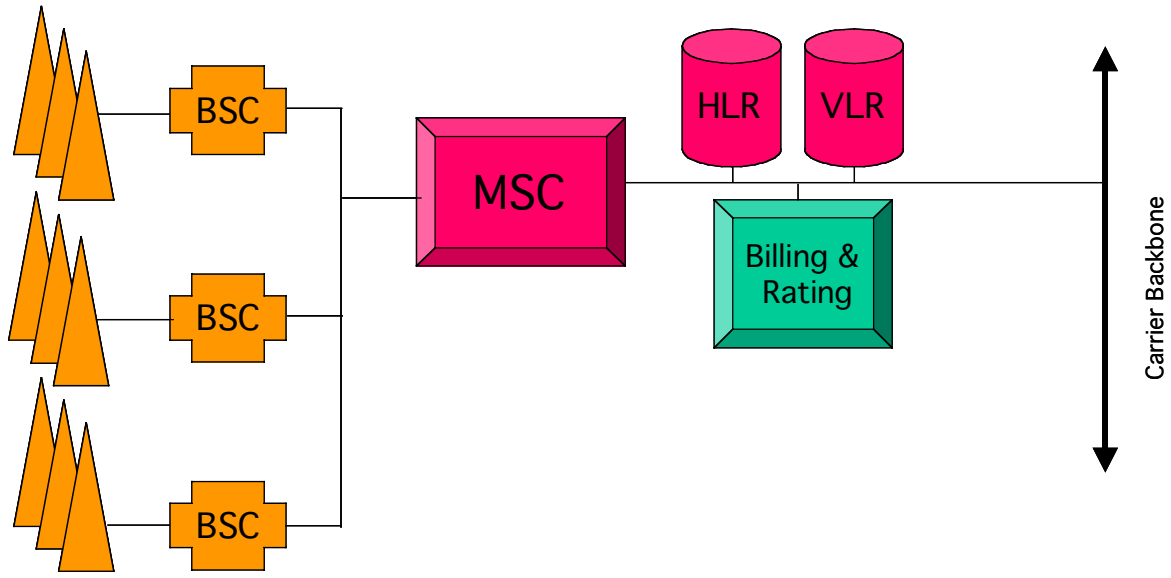
- **Support for prepaid:** The mediation platform is the obvious place from which to draw the necessary data for prepaid, if mediation is real-time based. The mobile operator must also be able to enforce a pre-established policy. Also, since rate plans may incorporate a variety of different services and content types, the prepaid system must be able to access customer usage information from all network elements.

The impact of a comprehensive mediation solution on the operator's business can be profound. If the mediation platform is able to provide full revenue assurance, collecting information from all necessary network elements and monitoring multiple data inputs, the revenue leakage can be expected to fall 99 percent. Consider an operator that has 10 million subscribers, total annual service revenues of $7 billion and revenue leakage of 5 percent per annum ($350 million). Implementing a comprehensive mediation platform as discussed could therefore save $346.5 million per year.

What is Mediation?

With the advent of packet-based networks and services, many operators are quickly realizing the critical nature of mediation, a term that is little used, and less understood, in the wireless telecommunications industry. But *iGillott*Research believes that mediation is *the* critical capability that will decide which of the world's operators are winners and which are losers going forward. While 2.5G and 3G networks allow mobile operators to support new services and deliver new types of content and applications to subscribers, it is the operator's mediation platforms that will allow the services and content to be delivered profitably. To understand the critical role of mediation, it is important to know how the industry developed to this point. In a traditional circuit-switched, voice-centric wireless network (figure 1), the mobile switching center (MSC) generates call detail records (CDRs) that detail each call, with such information as MIN, length of call, originating cell, and destination. The CDRs are collected and passed (by tape or file transfer) to the customer care and billing system, which checks the CDRs for errors, rates the calls and then bills the appropriate subscriber. A paper bill is then mailed to the subscriber, who then pays with a check or credit card. In a prepaid environment, the CDRs are passed to a real-time rating engine, which 'prices' the call and debits the subscriber's prepaid account. Note that prepaid systems are usually adjunct from the switch and postpaid billing system.

Figure 1: Traditional Circuit-Switched Mobile Network Architecture



Source: *iGillott*Research, 2001

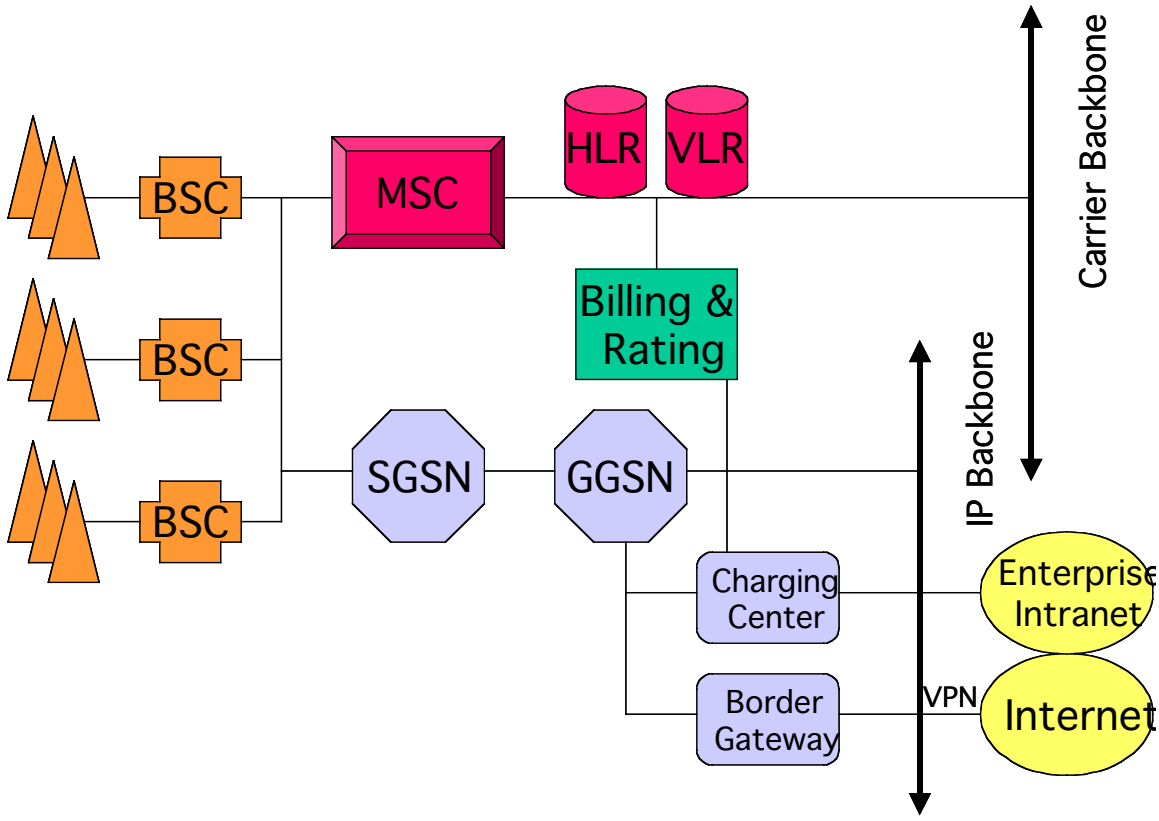
As the mobile operators' networks grew, so more equipment was required to handle the call volume. Consider that in the early 1990s, there were approximately 15 million cellular subscribers in the U.S. At the end of 2000, this number had grown to nearly 110 million. Obviously, the increased subscriber base has to be supported by larger networks and more MSCs.

Since an operator's revenue depends on their ability to correctly process all call records, the loss of CDRs between the switch and the billing system is a serious problem that can cost millions of dollars in lost revenue. To ensure that no CDRs were lost, and hence assure their revenue, operators implemented mediation platforms to transport the call detail information from all the switches to the centralized rating and billing systems.

A critical function of these mediation platforms was their ability to accurately report on the status of the CDRs and confirm that everything sent from the switch was correctly received by the billing system. 'Visibility' is the term used to describe the ability of the operator to inquire and report on the mediation process.

2.5G and 3G systems mean the addition of new IP network elements to the traditional infrastructures (figure 2). In the case of GSM/GPRS, a number of SGSNs and GGSNs are added to route the packet data traffic. The charging center provides session detail records that are processed by a billing system, and the border gateway provides information to enable roaming between GPRS networks. As a result of the new network architectures, not only do the sources of information increase, the amount of data produced rises significantly. The IP elements also pass data at different times from the circuit-switched networks (IP is usually real time) and the frequency with which information is passed and collected is also increased.

Figure 2: GSM/GPRS/WCDMA Mobile Network Architecture



Source: *iGillott*Research, 2001

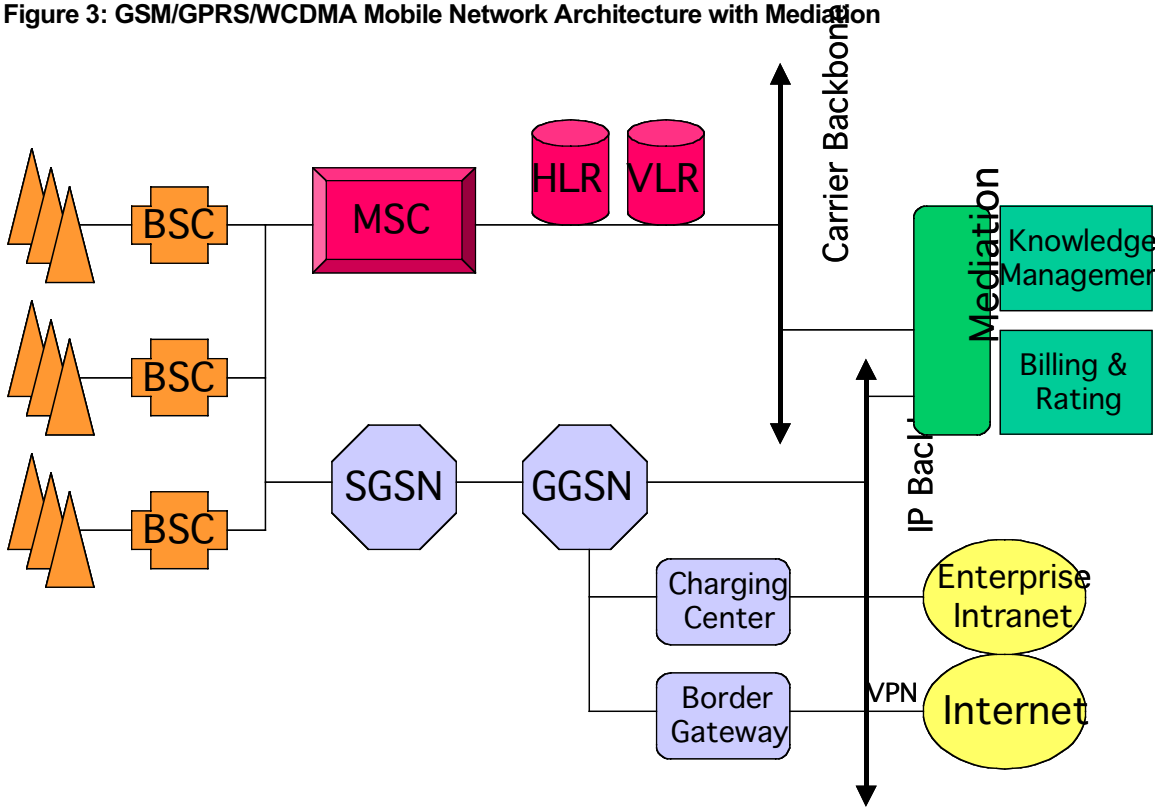
The billing and rating system now has multiple inputs in addition to the MSC and may receive information in different formats. Furthermore, the new network elements will deliver information at different times from the MSC. The result is that as the network complexity increases, so the operator's revenue is increasingly at risk, since there are many more opportunities for call and session detail to be lost.

The solution is to implement a more sophisticated mediation platform (figure 3), one that is capable of accessing and accepting call and session detail records from multiple network elements. The mediation platform then passes call and session detail records to the billing and rating systems, as well as provide inputs to the operator's knowledge management systems. Furthermore, the mediation

platform must ideally be able to filter, aggregate, and archive call and session information – this reduces the load on the back end billing and rating systems, as well as ensuring the information available is consistent across all systems supported.

Since prepaid business models require real-time information, the mediation platform must also be able to process information as soon as it is available from the network elements.

Figure 3: GSM/GPRS/WCDMA Mobile Network Architecture with Mediation



Source: *iGillott*Research, 2001

As the mediation platform collects and accesses information from all network elements, it also plays an important role in defining new operator services and products. For example, the operator may need to offer a rate plan that comprises postpaid voice service, prepaid packet data airtime, and content that is priced according to the source. This cannot be accomplished with a traditional billing and rating system that is separate from the prepaid or content rating engines. But a comprehensive mediation platform is able to present the necessary information to the correct subsystems to support this type of rate plan.

The role of the mediation platform can therefore be summarized as:

- Revenue assurance for current and future operator services
- Enabling the design and deployment of new services, including data, content and application services
- Providing management controls for pre- and postpaid services.

It is important to understand that the mediation process is not a new development but has been growing for some time. What is changing is the importance and complexity of mediation. In addition to

providing information to the operator's billing systems, mediation platforms are also providing critical data for other business systems, such as service-level management and decision support.

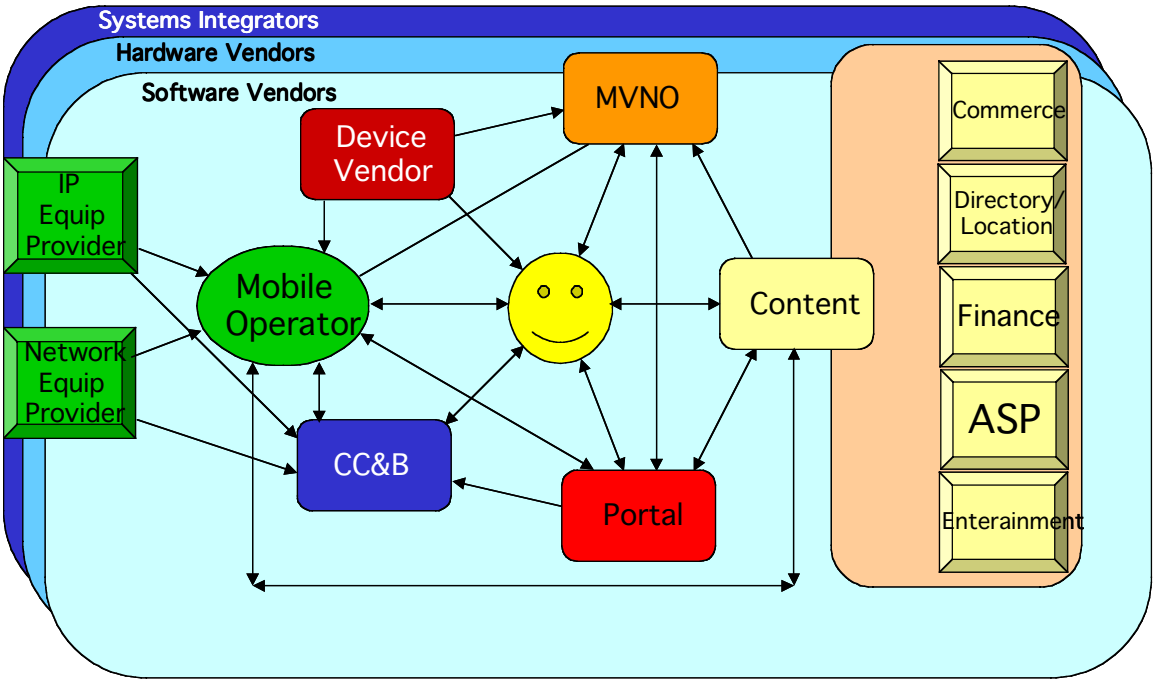
If an operator does not have an effective mediation platform supporting its 2G, 2.5G and 3G systems, then it will simply be unable to build an effective business model. Events will have to billed according to network use, revenue will potentially be lost, and the deployment of new services and applications will be limited by the capabilities of the customer care and billing system. It is no exaggeration to say that mediation allows the operator to unlock the inherent value of the networks.

The Importance of Mediation

Why is mediation so important? After all, the wireless and mobile industry seems to have developed without a separately defined mediation function. But the industry is now getting far more complex. Not only is mobile operator's network environment is getting more challenging, but also the business models are becoming more complicated.

Figure 4 shows the basic value chain for the wireless and mobile industry as it moves to supporting content services, Mobile Virtual Network Operators (MVNOs), portals, and a range of hardware and software vendors.

Figure 4: Wireless and Mobile Internet Content Value Chain



Source: *iGillott*Research, 2001

The needs of the subscriber base drive network evolution. And since the investment required in new networks is considerable, the operators do not want to charge simply for usage or bandwidth, but need to recognize the full value of the content to the subscriber. This is important not only for the mobile operator, but also for the content provider. The days of Internet content being delivered free to subscribers in exchange for viewing a banner advertisement are over. Content that can be made available anytime, anywhere needs to generate real revenue and real profits for the sources and the operators.

And in the case of next generation mobile, 'content' does not simply refer to information, data, or knowledge, but includes multimedia (such as MP3, JPEG or MPEG) and applications.

Many new devices support Java and allow small applications to be run locally. An example could be a construction contractor who downloads an application that allows him to quickly and easily price up a job, prepare a list of the required materials and place the order with the local Home Depot. Home

Depot could provide the application to its business customers – Home Depot may also pay the airtime for the contractor to download the application.

If subscribers, or sponsoring businesses, are to be charged for content, the mobile operator must be able to recognize the value of the content. This means being able to identify, among other things, the type of content, format, source, destination, size, time of day, and type of subscriber.

Charging for the value of an event allows operators to divorce rate plans from directly measuring the usage of a particular network or service. For example, if an operator associates a quality of service metric with their videoconferencing offering, they can charge not only for the actual transmission, but also for the quality achieved. Thus the operator may increase profits from a basic service.

Other pricing models supported will include pay-per-view, pay-per-download (especially relevant for multimedia), and pay-per-use (for example, for mobile applications that may be used for a few days for a specific fee). Airtime may also be discounted according to the content being accessed, or if the subscriber has a business account with the operator or even according to the type of device being used.

Prepay billing models also play a critical part in fully recognizing the full value of wireless events and allow operators to bill subscribers according to their needs and wishes, rather than according to the operator's billing capabilities. For example, a subscriber may wish to have a postpaid rate plan for voice, prepay for data airtime (to control costs) and a prepaid arrangement for content accessed and downloaded. For price-sensitive segments of the market, such as teenagers and small business users, *iGillott*Research expects pre- and postpaid combination plans to be common. The inclusion of prepay capabilities also allows the mobile operator to reduce their exposure to fraud and bad debt, since the prepaid account is decremented in real-time.

Mediation platforms therefore allow the operators to collect the necessary information to support new value-based pricing models. Inputs are taken not only from the operator's own network, but also from business partners activity, such as content providers or application service providers sessions.

Critical Mediation Capabilities

As may be expected, not all mediation platforms are created equal. System capabilities range from simply connecting multiple switches to supporting all network elements and business models for data. To be successful, major operators will need a comprehensive mediation strategy that supports not only the current environment, but also future network growth and business models. Mediation flexibility will be crucial.

Support for New Business Models

Perhaps the most significant set of capabilities required by mediation platforms surround their ability to support future business models. As already discussed, mobile operators can no longer simply charge for airtime or network connectivity, but must recognize the full value of the event in their pricing models.

The mediation platform must be extremely flexible in order to support any and all business models required by the market. While some of these models can be predicted today, the majority cannot, simply because the market segments have not defined them yet. As users become more experienced with mobile content services, so their behavior will start to influence pricing, marketing and business models.

An example of the flexibility required is provided by Narus, whose mediation platform can identify, filter, and categorize Web site usage. This then allows the mobile operator to decide which sites are free and which are charged for, and how to price the content on these specific sites. This is an important feature that is likely to be employed by many operators, since it allows increased revenues using existing network infrastructure.

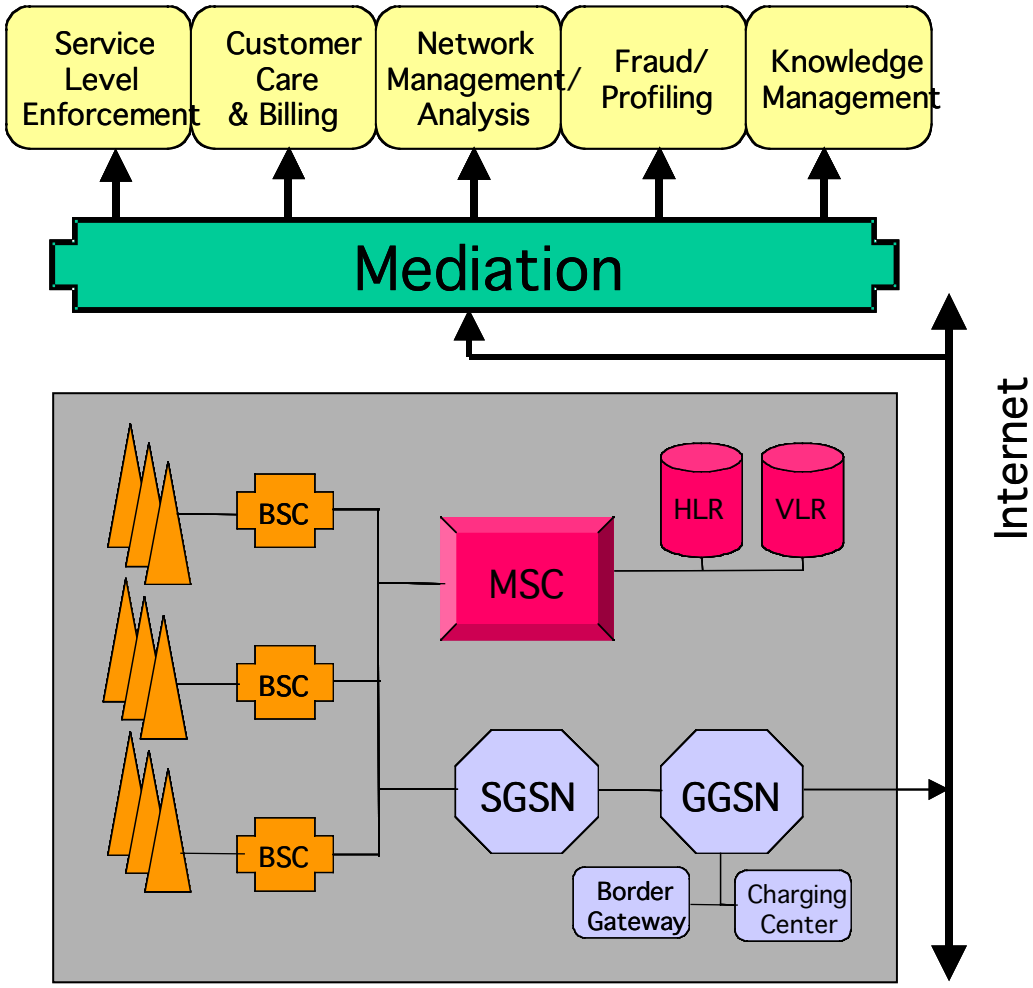
An extension of the previous capability is the need to bill for premium applications, in addition to recognizing the value of content from specific sites. Examples include premium email capabilities, file transfer, and enhanced voice-based applications. Operators must be able to differentiate these services from their basic packages and hence price and bill for additional services, generating new revenues.

Revenue Assurance

Revenue assurance is simply ensuring that all-revenue generating activities on the network are correctly and accurately reported. While this may seem trivial, in fact it is an extremely complex process when the network includes IP elements.

Since IP infrastructure does not create a CDR as a conventional MSC does, a detail record must be built. The industry standard format is the IPDR (IP detail record), which is constructed from information obtained from the network elements. Use of the IPDR eases, and reduces the cost of, implementation. Depending on the type of network, data for the IPDR may be pulled from the link between network elements or directly from the elements themselves, such as border gateways, WAP gateways, AAA, and/or PDSN. The mediation platform must therefore be able to interface with any number of transport technologies (i.e. Ethernet, ATM, Packet-Over-Sonet) at a variety of speeds (100BaseT, GigE, OC3, OC12) or directly with each of these elements, even though multiple manufacturers provide the infrastructure (see figure 5).

Figure 5: Mobile Operator Architecture with Mediation and Management Systems



Source: *iGillott*Research, 2001

Revenue assurance extends not only to the type of network being monitored, but also to the data points that are collected. The more accurate the data collected, the more accurate the IPDR and hence the greater the revenue assurance. Data points should include, but not be limited to: traffic volumes; time; mobile subscriber identification; source, type and format of content; and service protocol and network used. Data also needs to be collected in real-time to support prepay business models and provide visibility into the network.

The impact of a comprehensive mediation solution on the operator's business can be profound. If the mediation platform is able to provide full revenue assurance, collecting information from the network while monitoring multiple data inputs, the revenue leakage can be expected to fall 99 percent. Consider an operator that has 10 million subscribers, total annual service revenues of $7 billion and revenue leakage of 5 percent per annum ($350 million). Implementing a comprehensive mediation platform as discussed could therefore save $346.5 million per year.

Visibility and Reporting

As the complexity of the networks increases, the operator's ability to monitor customer usage on the network decreases. Rather than just reporting on a few switches and billing systems, new mediation platforms may be required to provide visibility into circuit and packet networks, partner networks, content sources, and application service provider resources. Visibility is needed for new service

development, effective customer care, accurate management reporting, and accounting, as well as for network managers to correctly balance the load on the network near real-time.

Fraud systems are also being expanded to include inputs from IP networks, to provide a complete picture of the subscriber activity for accurate profiling. To be as effective as possible, fraud analysts and managers require rated data as quickly as possible after the event, activity linked to the subscriber (not just the IP address), and extensive security controls. The mediation platform is ideally placed to provide the required data to the fraud systems, although the mediation platform is itself not involved in the analysis or detection of fraud.

One important aspect of network management is the ability of business managers to accurately determine which types and sources of content are generating the most traffic. New mediation platforms are able to report on the level of service usage by each protocol, which subscribers are generating the most traffic, how network traffic varies by time, and which content sources are being accessed most frequently. This information, together with rate plans and pricing data, is then used to accurately determine the most profitable services, sites and applications, allowing the operator to promote specific content or change the pricing on less active sites.

Network Independence and Flexibility

Network independence and flexibility refers to two main issues: implementing a mediation platform that is not limited by the RAN or IP network element network's architecture or capabilities; and the ability of the mediation platform to collect data passively, without negatively impacting network performance.

Mobile operators around the world are deploying new IP networks to provide additional services to their subscriber bases. Unfortunately, each operator's network is different, each uses a different combination of vendors, and is implementing IP networks at different times using different methodologies. So while it may appear from the outside that each operator is moving along the same path with the same technology and infrastructure, nothing could be further from the truth. The mediation platform must therefore be able to support collection on all transport and links at all speeds.

Collecting data from a network can be relatively straightforward, but doing so as not to negatively impact the performance of the network is very difficult. Passive mediation platforms monitor the parent network without impacting performance in any way. If the performance of the network is reduced as a result of the mediation process, the operator will be required to add more equipment to improve performance. Thus the effective cost of the mediation platform is significantly increased.

Scalability

Scalability is also critically important for the mediation platforms when new business models are considered. As new data services generate large amounts of data to be monitored, the business systems are required to process, filter, and aggregate giga bytes of information and process data from tens of thousands of active sessions simultaneously.

The solution is for the mediation solution to filter the incoming data as it is monitored and only to pass relevant information to the business support systems. This cuts the amount of information processing stored, reduces and the amount of storage required, and hence reduces the cost of the business platforms. But, most importantly, it also improves the performance and response time of the business systems supported by mediation.

Support for Prepaid

In the past, prepaid voice services have been viewed by many operators as services designed for and marketed to users who are potential or known financial risks – this sentiment has been especially prevalent in North America and parts of Northern Europe. However, many operators around the world are now taking the view that prepaid is simply an alternative payment method that can be used to provide an additional level of flexibility to a portfolio of products. For example, prepaid may be used to support temporary use applications, for subscribers who require direct control over the service costs, or to penetrate new market segments. Combination rate plans with pre- and postpaid services and content will also be popular, as well as the option of postpaid airtime combined with prepaid content for specific destinations only. But applying prepaid across the operator's product range requires a high degree of complexity and expertise to accomplish successfully.

Aside from the obvious benefits for the subscriber, prepaid models also support the operators' ability to compete. Since revenues are collected prior to providing the service or before the content is delivered, the operator's cash flow is improved with a prepaid business model. Bad debt exposure is also reduced significantly, assuming that effective checks and controls are in place to correctly authenticate credit and debit card payments.

With the more complex wireless infrastructures described earlier, the problem is where to get the required information for prepaid products. Whereas traditional prepaid systems have been adjunct to the MSC, information needs to be pulled from several sources when IP networks are implemented. The mediation platform therefore becomes the obvious place from which to draw the necessary data for prepaid.

The next issue to be considered is the impact on the customer care and billing system. Most existing systems are designed to support postpaid business models. Keeping the prepaid component in the mediation system separate reduces the potential load on the existing system, assuming that many products will incorporate options for prepaid payment. The operator is able to keep the necessary credit balances locally for active sessions, without the need to continually reference information in the CC&B system (note that the CC&B system still keeps the account information and other balances). This further reduces the load on the CC&B system, while also reducing the traffic (and the impact on response time) between the two systems. A major requirement for the mediation-driven prepaid system is that the operator must be able to enforce a pre-established policy. For example, the operator may define a plan that allows for $50 of content to be prepaid and then downloaded. The prepaid system must therefore continually monitor the usage and act quickly when the $50 threshold is reached. A system that does not act until $55 of content has been downloaded, or cuts the subscriber off before reaching the limit, is not acceptable. Note that significant revenue leakage can occur by not suspending the prepaid service immediately the limit is reached. Also, since rate plans may incorporate a variety of different services and content types, the prepaid system must be able to access information, passively, either directly off of the wire or from the network elements themselves.

An aspect of the operator's expanded networks and products is that since one or two services may be prepaid, while the others are postpaid, then once the prepaid threshold is reached, only the prepaid services should be suspended. Consider a subscriber with postpaid voice, $25 for prepaid premium email and $50 for prepaid content: once the $25 of email has been used, only the premium email service should be suspended. Voice service should never be suspended, even when both prepaid thresholds have been reached.

This is an important point that is often missed, since current prepaid systems simply suspend the subscriber's network identifiers, without regard for the type of service. The mediation platform must therefore be selective enough to provide the necessary data to the prepaid system to make these

distinctions. Policy enforcement should therefore be based on service protocol. Mediation vendors such as Narus can monitor, collect, and enforce prepaid policy by protocol.

Finally, once the subscriber has reached, or is close to reaching, a prepaid threshold, the subscriber needs to be notified so they can replenish their accounts. A verbal message or simply forwarding the next call to customer service is no longer acceptable, since the subscriber may be using a data-only device or has the prepaid option for data or content services and not voice. The mediation-driven prepaid system must therefore be able to support a variety of notification options, including SMS, email, voice, and directing the Web-enabled device's browser to an operator replenishment site.

Checklist

To compare mediation platforms from different vendors, *iGillott*Research has prepared the following checklist of critical capabilities:

	Vendor A	Vendor B	Vendor C
Revenue Assurance			
Passive network monitoring through the IP backbone			
Interface with any number of transport technologies (i.e. Ethernet, ATM, Packet-Over-Sonet) at a variety of speeds (100BaseT, GigE, OC3, OC12)			
Data points monitored: traffic volumes; time; mobile subscriber identification; type and format of content; and service protocol: websites visited, # of events (ie e-mails sent); QoS fields			
Link the mobile subscriber identity with the IP session			
Support for multiple, concurrent, valid IP sessions for a single subscriber			
Real time data collection by protocol events			
Support for IPDR			
Non-intrusive data collection allows data logging on network elements			
Visibility and Reporting			
Visibility into customer usage on packet networks, partner networks, content sources, and application service provider resources			
Real time interface to fraud systems			
Activity linked to the subscriber and IP address (not just the phone number)			

Ability to determine which types and sources of content are generating the most traffic

Ability to report on the level of service usage by each protocol, which subscribers are generating the most traffic, how network traffic varies by time, and which content sources are being accessed most frequently

Network Independence and Flexibility

Mediation platform not limited by the network's architecture or capabilities

Ability to collect data passively, without negatively impacting network performance

Support for the complete range of wireless network elements from multiple manufacturers

Scalability

Ability to filter incoming data streams to reduce load on business systems

Generate millions of IPDRs in minutes

Monitor and collect data for tens of thousands of simultaneous active sessions

Support for New Business Models

Identify and filter multiple Web sites, allowing the mobile operator to decide which sites are free and which are charged for

Support billing for premium applications:

Premium email capabilities

Applications

Enhanced voice-based applications

Support for Prepaid

Support for real-time metering

Support for combination rate plans with pre- and postpaid services and content

Support for options such as postpaid airtime combined with prepaid content for specific destinations only

Prepaid module architecturally separate from billing system

Ability to keep credit balances locally for active sessions, without the need to continually reference information in the CC&B system

Ability to enforce pre-established policy for prepaid services and content

Ability to suspend designated services and protocols when the prepaid threshold is reached, rather than the entire subscriber account

Replenishment notification through multiple channels including SMS, email, voice, and directing the Web-enabled device's browser to an operator replenishment site

Vendor Qualifications

Established vendor with wide range of telecom and wireless mediation experience

Currently supports multiple mobile networks using different standards

Alliances with established customer care and billing vendors

Supports carrier-grade solutions

Ability to support large implementations for international operators

Financially -viable

About *iGillott*Research

*iGillott*Research is a market strategy consultancy *focused* on the wireless and mobile communications industry. Founded by Iain Gillott, one of the wireless industry's leading analysts, we research and analyze the impact new wireless and mobile technologies will have on the industry, on vendors' competitive positioning, and on our clients' strategic business plans.

Our clients typically include service providers, equipment vendors, mobile Internet software providers, wireless ASPs, mobile commerce vendors, and billing, provisioning, and back office solution providers. We offer a range of services to help companies improve their position in the marketplace, clearly define their future direction, and, ultimately, improve their bottom line.

A more complete profile of the company can be found at www.igillottresearch.com.

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