DISA'S IP SERVICES

DRIVING THE NEED FOR MASSIVE VOLUME MEDIATION

THE RISE OF IP SERVICES

In recent years, Communications Service Providers (CSPs) of all kinds, both commercial operators and government service providers like the Defense Information Systems Agency (DISA), have begun to use IP networks to provide advanced services for voice, video and data communications. CSPs are increasingly using IP-based or packet-switched infrastructure to deliver services across a broad range of networks, including wireless, wireline, satellite and cable networks. Many CSPs are also moving to converged networks, where end-to-end IP is used to unify wireless, wireline and other network domains. These IP networks bridge many physical access, transport and backbone technologies, which in some cases are owned and operated by only a CSP, while others are a hybrid of owned and leased infrastructure, as is the case for DISA.

Larger CSPs are building IP networks that span multiple geographies, like DISA's Global Information Grid (GIG), and some even use common network equipment for multiple in-country operating companies (or subsidiaries). And the most advanced CSPs are sharing network equipment across regions, and also with their competitors in a cooperative manner. In particular, 4G/LTE wireless access networks have been designed to simplify network sharing.

IP NETWORKS ARE EVOLVING

Industry standards bodies are leading the initiatives to define end-to-end IP services. Notably the 3GPP (Third Generation Partnership Project) has defined IP-based architectures for wireless networks and interoperability with other network domains. These standards are being used by CSPs deploying next generation networks like 3G/HSPA and 4G/LTE. Similarly the 3GPP has worked closely with other standards bodies like the IETF and TISPAN to define a roadmap for end-to-end IP infrastructure across all domains, in the IMS (IP Multi-media Subsystem) standards.

These new standards are being quickly deployed by CSPs. Considering commercial operators, HSPA (High Speed Packet Access) is the leading mobile broadband technology globally. By January 2011, HSPA networks were commercially available in more than 80 percent of the world's countries (416 networks in 161 countries)[1]. And by the same date, over 180 CSPs had invested in 4G/LTE infrastructure and 17 CSPs had launched commercial LTE networks[2].

[1]Global mobile Suppliers Association, "HSPA Operator Commitments", 24 January 2011
[2]Global mobile Suppliers Association, "Evolution to LTE", 12 January 2011

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DISA IP ROLLOUT CHALLENGE STATEMENT

As DISA continues its deployment converged routing solutions into an Everything-Over-IP (EOIP) environment, there is an emerging requirement to provide detailed IP record assurance data. Our understanding is that the mediation system will collect data from various IP sources, normalize, duplicate check, correlate and enrich the data with relevant information needed for the Service Quality Management System to provide accurate mission assurance situational awareness. This requirement must include an integrated solution with the current Service Quality Management tools to validate adherence to applicable Service Level Agreements (SLAs) between DISA and its customers. Through detailed IP record assurance data, DISA as a service provider, can validate existing Quality of Service (QoS) profiles on voice, video, and data networks around the world; thereby ensuring SLAs properly outline services and validate customer expectations. To meet these requirements, a data mediation solution is necessary to poll existing devices, normalize the ingested data, enrich or correlate the data as needed, check and eliminate duplicate data, and aggregate data for the purpose of SLA and QoS validation, network traffic metering, and network activity status reporting.

DISA's Two-Phased Spiral Design began with the following implementations as part of Spiral 1:

→ DOD DMZ, Web Content Filtering, Black Hole trapping, enhanced Domain Name Service, HAIPE Peer Discovery

→ Voice over IP, Video over IP

→ End-to-End Quality of Service, Layer 3 VPNs

→ Performance and Network Adaptation for Situational Awareness, Centralized Net Management

→ COTS-based Order Management and Provisioning Services

Spiral 2 consists of the following elements:

→ Unified Communications and Real-Time Services

→ Centralized Configuration Management Data Base

→ Metro Ethernet, Carrier Ethernet

→ Policy Based Enterprise Services

→ IP SATCOM Convergence, Everything over IP

By the end of Spiral 2, DISA's EOIP architecture will include the convergence of legacy IP networks, 3rd Generation IA sensors, JTRS, new HAIPE devices, and potentially DISN Data and Voice Centers. DISA customers will also increase reliance on IP based systems and are likely to demand validation of QoS from the DISN Edge into their respective enclaves. The mediation solution supporting this growing infrastructure is best suited for fielding at the Service Delivery Node at the DISN Edge as depicted in the diagram on the following page.

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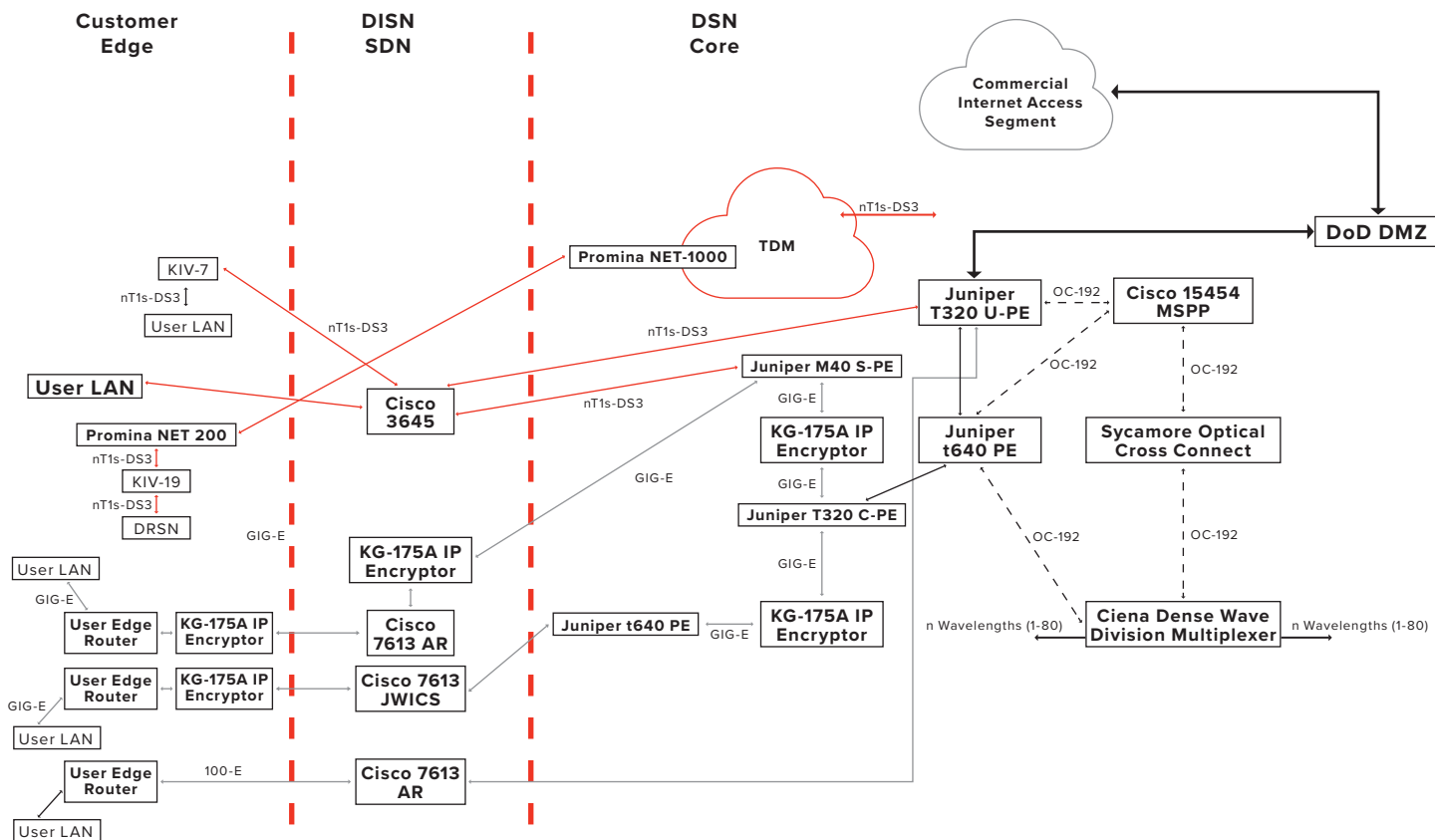
CHALLENGES OF TREMENDOUS GROWTH IN CUSTOMER DEMAND FOR IP SERVICES

Customer demand for near ubiquitous broadband, whether delivered via wireless or wireline, is driving the roll-out of IP based networks. The increasing demand for mobile data services is widely publicized in both the general media and telecom press. It is in part due to the popularity of smartphone devices like the iPhone, and demand for interesting applications on the move like iPhone and Android Apps, Facebook, Spotify and YouTube. Cisco forecasts global mobile traffic will increase sevenfold between 2016 and 2021, and estimates that 75 percent of mobile data traffic will be video by 2021.[3].

However, CSPs face a significant business challenge, because revenues for such services are not expected to grow as quickly as customer demand, as illustrated by analysts Analysys Mason in the chart on the next page[4].

Furthermore, it is widely recognized that the cost of building and operating networks is rising, while revenues are falling. In fact, a study by Tellabs predicted that network costs would surpass revenues, and that if CSPs maintained their traditional operating model they could see an end to profit within a four-year-window[5].

[3]Cisco, "Global Mobile Data Traffic Forecast Update, 2016-2021", March 2017
[4]OSS Observer, part of Analysys Mason, CEO Digest, January 2010
[5]Tellabs, "End of Profit study, Executive Summary", February 2011

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120% CAGR

16% CAGR

Data
Revenue

Source: Analysys Mason 2010
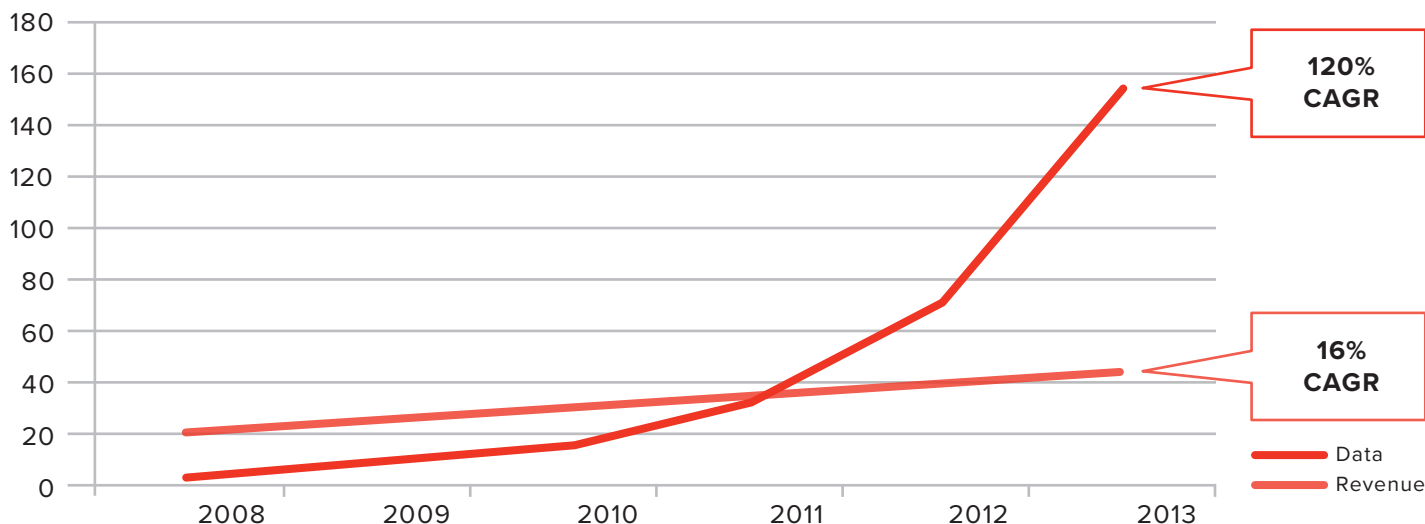
As a result, CSP executives responsible for Business Support Systems (BSS) are being tasked with improving revenues, but also lowering costs. In fact, managing operating expenditure (OPEX) for BSS was ranked as a top priority in 2010 and for 2014 in a survey of 240 CSP executives by industry analysts Yankee[6].

To maximize revenue opportunities, managers are evaluating sophisticated real-time charging and policy management solutions; while on the cost side of the equation they are trying to minimize the Total Cost of Ownership (TCO) of currently deployed systems. This places particular emphasis on controlling the costs to run and operate mediation systems.

INCUMBENT MEDIATION SYSTEMS UNABLE TO COPE WITH NEW DEMANDS

Many incumbent mediation systems cannot scale to meet the volume growth anticipated. In particular, for offline mediation, the processing of data records is taking too long. For one CSP in Western Europe, each day's post event mediation processing was taking until 3a.m. to complete. This was slowing the time to billing and creating revenue assurance risks as fraud

systems were not seeing processed charging records on time; for example, high usage inbound roaming users were not being identified quickly enough.

In the context of mobile broadband, another CSP working with CSG estimated that event volumes would double within a four-year window with their commercial launch of LTE.

Many CSPs anticipate that the current mediation systems will reach capacity limits in less than a year. Some even calculate that incumbent systems can only support demand for the next few months, without intervention.

FAST-GROWING VOLUMES IMPACT MEDIATION COSTS

In the short term, CSPs are being forced to do three things to cope with enormous volume growth. First, CSPs are required to spend more systems administration effort to ensure charging data is reliably processed. This diverts the time of skilled resources from contributing to strategic value-building programs to working on repetitive tactical tasks that are error-prone.

[6]Yankee Group, survey of 240 Network, Operations and Marketing Directors, October 2010
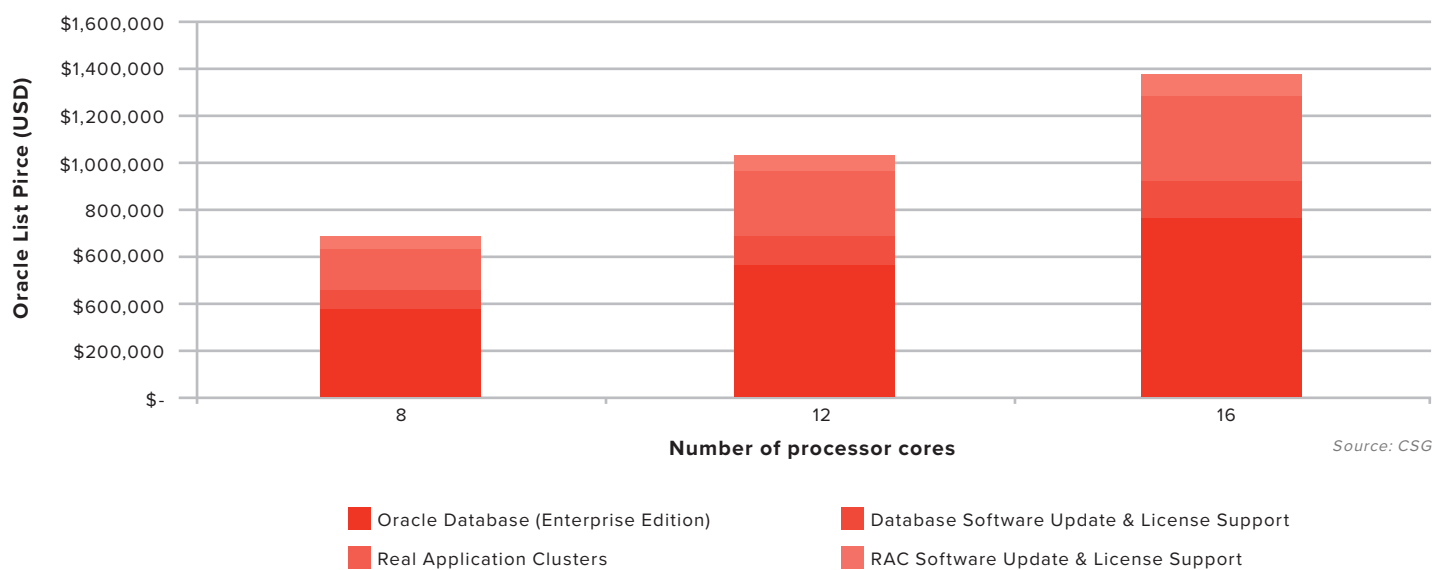
Ultimately, supporting such administrative activities increases the burden of mediation on OPEX.

Second, CSPs are resorting to upgrades of the hardware on which incumbent mediation systems are running. Typically this involves adding extra system resources (processors, memory) to legacy server platforms. This can be expensive when hardware is reaching de-support dates or the end of its useful lifespan, as the costs of upgrades and extensions to support contracts can be disproportionately high.

Third, CSPs are also forced to upgrade third-party product licenses in line with hardware upgrades. This is particularly significant for mediation applications that require the use of an Oracle database. Extending Oracle licenses and support can cost as a much as $680,000 when upgrading a small five-year-old server cluster from eight to sixteen processor cores[7].

Source: CSG

Legend:
- Oracle Database (Enterprise Edition)
- Database Software Update & License Support
- Real Application Clusters
- RAC Software Update & License Support

[7]Price for upgrading two HP Integrity rx7620 servers from four to eight Itanium 2 processors (single core 1.5 GHz with 6 MB cache), with Oracle Enterprise Edition and Real Application Clusters, according to Oracle Technology Global Price List, 20 January 2011. Source: Intec

Because incumbent systems are running out of capacity so fast, many CSPs have to allocate CAPEX budget to mediation in an unplanned manner. This has deeper implications because obtaining emergency funding distracts BSS managers from long-term strategic programs.

IP SERVICES BRING UNIQUE CHALLENGES TO MEDIATION AND OFFLINE CHARGING

At the same time as reducing mediation costs, CSP executives must support new networks. Services delivered over IP networks create a number of specific challenges for mediation, or Offline Charging, as mediation is known in the 3GPP specifications for next generation charging[8].

HIGH PERFORMANCE AND SCALABILITY

Unlike circuit switched networks, which typically generate a single charging record per event or session, packet switched networks typically generate at least twice as much data. When delivering an IP-based service, such as a VoIP call or broadband data session, packet network devices typically generate a separate start event and stop event. They commonly generate mid-session events as well.

Not only must Offline Charging and Mediation systems be able to cost effectively support this volume step change, they must also efficiently correlate the event records together and manage real-time reference data to produce meaningful charging information.

Therefore, cost effective scalability and high performance mediation processing are critical to managing service usage delivered on IP infrastructure, particularly where huge Offline Charging volumes are expected.
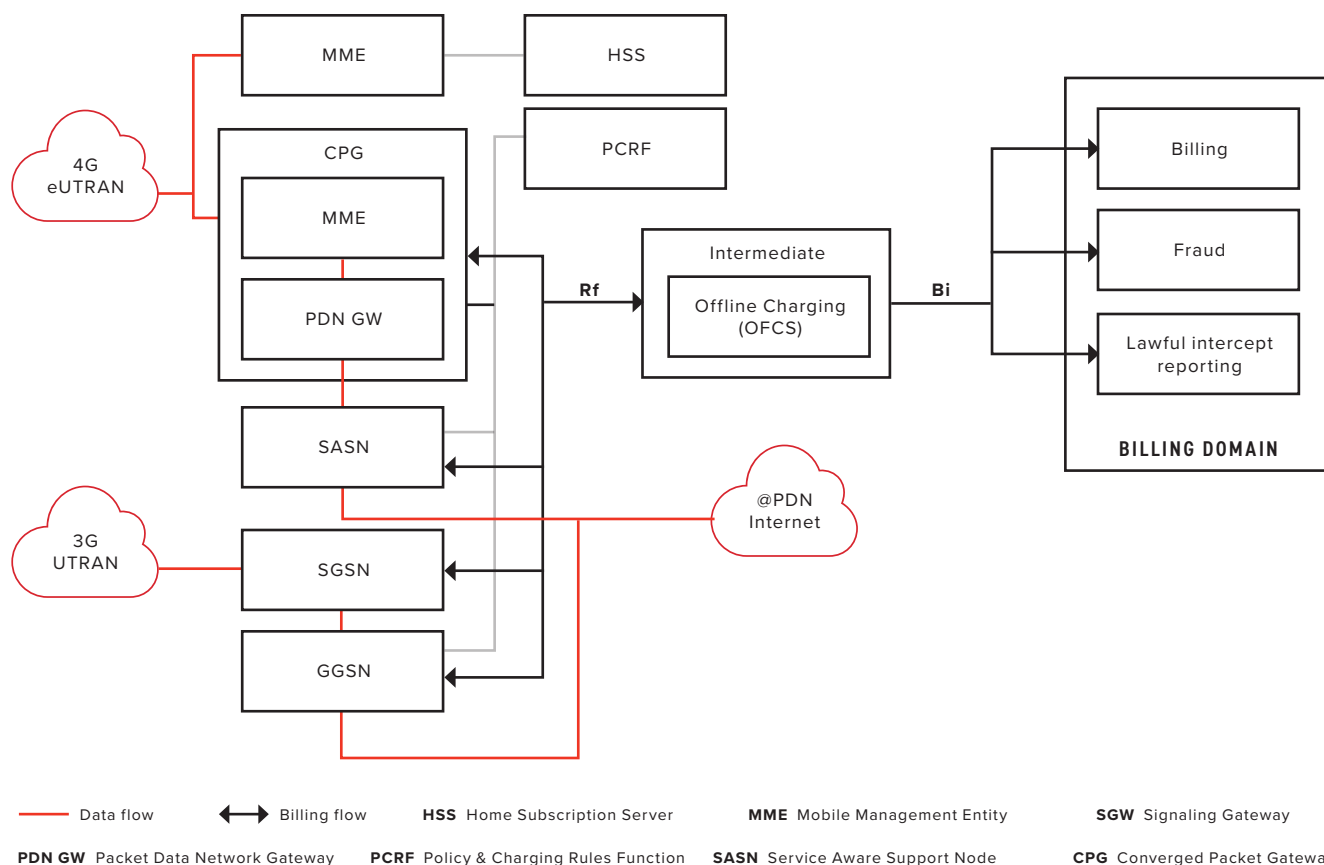
FAST INTEGRATION OF NEW DEVICES

Unlike circuit-switched network elements that conveniently store charging data as CDR files in local directories, IP network devices often push charging records out as real-time events or data packets. If mediation or Offline Charging does not reliably capture these events they are not stored, so the data is lost.

Depending on the architecture and packet network equipment deployed, post event mediation (Offline Charging) and online mediation (playing 3GPP OCF role for the Online Charging Function) must quickly support real-time charging protocols such as DIAMETER or RADIUS accounting requests, and other protocols such as SNMP, Cisco NetFlow and GTP'.

Fast time to deployment for next generation network equipment is critical to enable CSPs to quickly launch new services. Considering next generation mobile networks for broadband as an example, not only must Offline Charging support existing 3G network devices, but it must be quickly integrated into next generation 3GPP architectures for LTE.

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[8] 3GPP, "TS 23.203 Policy and charging control architecture"

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— Data flow	← → Billing flow	**HSS** Home Subscription Server	**MME** Mobile Management Entity	**SGW** Signaling Gateway
PDN GW Packet Data Network Gateway		**PCRF** Policy & Charging Rules Function	**SASN** Service Aware Support Node	**CPG** Converged Packet Gateway

ALWAYS-ON AVAILABILITY

Massive volumes of volatile charging data means Offline Charging must always be available to reliably produce charging data for packet networks. To reliably support revenue assurance Offline Charging must have proven capabilities for continuous service availability and redundancy to ensure that any hardware component failure does not impact the mediation function.

LOWERING THE TOTAL COST OF OWNERSHIP FOR MEDIATION AND OFFLINE CHARGING

There are five fundamental components of TCO for mediation systems: 1) software and support; 2) hardware; 3) third party products; 4) data center; and 5) staffing costs. Each cost component is affected by different aspects of the mediation solution.

First, software and support costs are determined by mediation vendor pricing policies. For example, some vendors charge an additional license for adding new network interfaces.

The next three (hardware, third party products and data center expenditure) are predominantly based on the cost of servers, storage, database licenses, power (including UPS), air conditioning and rack space. The biggest factor affecting these costs and the overall TCO of mediation is performance.

High performance mediation can be defined as mediation application software that uses the lowest amount of hardware system resources (processors, memory, disk), while meeting the performance criteria necessary in terms of event volume throughput and latency.

Higher performance means lower hardware costs, as mediation requires fewer processors, less memory, and reduced costs for third party products licensed against hardware (such as Oracle).

Performance also impacts the energy costs for running mediation. Higher performance means less rack space is needed and less power consumption is required for operations. It also reduces the heat dissipation and thus lowers the costs of server room cooling (air conditioning). Lowering energy consumption also helps CSPs to reduce carbon emissions. In particular, the Department of Defense sought to reduce electricity consumption from the 30,000 gigawatt hours (GWH) reported to have been used in 2006, at a cost of almost $2.2 billion.

Finally, staffing costs are affected by how easy the mediation application is to use, and also by the system architecture. Mediation software should be designed to optimize the efficiency of mediation operations. And it should have tools which enable the fast implementation of new services.

Mediation applications requiring Oracle will typically need expensive database administrators (DBAs) to maintain and tune the system. This task is more complex when deploying the continuously available configurations needed for next generation IP services. Similarly, deploying mediation on open, commodity hardware to support such configurations reduces the burden on hardware specialists and administrators.

SERVICE PROVIDERS TAKING A LOW RISK, PHASED APPROACH TO IP SERVICES MEDIATION

CSPs are commonly finding that incumbent mediation systems were not designed to support the IP service mediation challenges needed for Offline Charging. As a result, many CSPs are replacing legacy mediation systems. They are typically taking a phased approach to replacement projects, by initially deploying next generation mediation for high growth data streams alongside existing systems. This approach has a four of advantages:

1. It reduces the load on existing mediation systems, and so avoids costly upgrades (legacy mediation software, hardware and third party products).

2. It lowers the revenue assurance risk for business functions served by mediation, such as postpaid billing, settlements and fraud, as it give the legacy systems "breathing room" to support projected growth volumes reliably.

3. It allows CSPs to maximize the value obtained from existing mediation investments, or "sweat" these assets.

4. The reduced scope limits the deployment interfaces, and so minimizes the project duration and project implementation risks.

After the successful deployment of next generation mediation for the "offload" of high volume IP services, many CSPs go on to fully replace or consolidate legacy mediation systems to the new platform in order to gain further cost savings.

STRATEGIC SUPPLIER REQUIREMENTS FOR MEDIATION OF IP SERVICES

So what should CSP executives take into consideration when selecting a next generation mediation vendor for Offline Charging?

Because mediation is critical to enterprise revenue assurance, CSPs are looking for long-term strategic partners that can help them overcome the challenges of IP services today and in the future. The following lists some typical questions CSPs are asking of mediation vendors today:

→ What is the processing volume of the vendor's ten largest mediation implementations for IP services?

A credible vendor will have experience supporting several deployments with volumes exceeding 1 billion records daily

→ What are the estimated platform costs for these deployments (hardware, third-party products, energy)?

It is desirable for a vendor to be able to support various hardware platforms, including commodity x86-based blade technology

→ What experience and domain expertise does the vendor have in DISA's specific network environment?

Subject matter expertise within the collection and mediation environment is key to timely delivery. The vendor should be currently supporting classified networks in the US Government and have an understanding of the support and accreditation requirements of DISA

→ How will the platform support Network Virtualization?

It is critical that the mediation platform be part of an overall environment that can support future requirements around charging and activation related events as virtualized services mature at DISA

→ What are the daily correlation volumes for these deployments (events per day)?

→ What is the largest mediation reference implementation in terms of mediation processing volumes (events per day)?

→ What experience does the vendor have supporting LTE in a production environment?

→ How many mediation implementations are processing over 1 billion events per day?

→ How many implementations are supporting high volumes with a distributed architecture for horizontal scalability?

→ What experience does the vendor have taking advantage of commodity hardware?

→ Does the vendor require third party products, like Oracle Enterprise Edition or Real Application Clusters?

→ How many off-the-shelf integrations with network elements does the vendor have available?

→ What experience does the vendor have with next generation network equipment for wireless (PDN GWs, SGWs, xGSNs, PDSNs, MRFCs, P-CSCFs, SIP GWs), data/broadband (AAA servers, BRAS, routers, switches) and application servers (VOIP GWs, Video GWs, content servers, web servers)?

→ What auditing capabilities does the vendor have to ensure packet network revenue is protected?

→ How long was the vendor's fastest IP services implementation?

→ How many professional services staff does the vendor have?

→ How many new mediation contracts has the vendor won in the last three years? Is mediation still core to their business?

→ How big are these new contracts in terms of mediation processing volumes (events per day)?

SUMMARY

In response to fast-growing customer demand for advanced voice, video and data services, CSPs are deploying new evolutions of IP networks. However, the demand and costs for these new services is widely anticipated to outstrip the revenues.

Consequently CSP executives responsible for BSS are identifying ways to reduce the total cost of mediation ownership, while at the same time supporting new IP networks.

The tremendous volume growth means that many legacy mediation systems cannot cost effectively scale and are reaching capacity limits. This combined with the challenges of IP services means that many CSPs are replacing legacy mediation systems.

To reduce risk, many CSPs are opting for a phased implementation of next generation mediation for IP services, before the full consolidation of legacy platforms to a new lower cost base.

When selecting a new mediation solution, the three most critical considerations for CSP executives are:

→ First, to minimize the total cost of mediation ownership today;

→ Second, to cost effectively support considerable future volume growth for tomorrow;

→ Third, to ensure the supplier selected has proven industry experience, and customer references with massive volumes and next generation IP networks.

Following these best practices, CSP executives can meet the challenges of supporting huge volume growth and new IP services, while at the same time lowering the Total Cost of Ownership for mediation.

CSG TOTAL SERVICE MEDIATION PROVEN TO REDUCE COSTS FOR HIGH VOLUME IP SERVICES

For operators with mediation systems reaching capacity because of data growth, CSG has the most complete mediation solution, with the lowest total cost of ownership. In some deployments CSG customers have lowered total mediation costs by a factor of ten. Just considering hardware, one CSP working with CSG found that implementing new blade server architectures reduced the anticipated costs of upgrading legacy hardware by more than 65 percent. CSG has more than a dozen data mediation clients processing over one billion events per day, evidence that our experience in high volume data management is unrivaled.

ABOUT CSG

CSG simplifies the complexity of business transformation in the digital age for the most respected communications, media and entertainment service providers worldwide. With over 35 years of experience, CSG delivers revenue management, customer experience and digital monetization solutions for every stage of the customer lifecycle. The company is the trusted partner driving digital transformation for leading global brands, including Arrow, AT&T, Bharti Airtel, Charter Communications, Comcast, DISH, Eastlink, iFlix, MTN, TalkTalk, Telefonica, Telstra and Verizon.

At CSG, we have one vision: flexible, seamless, limitless communications, information and content services for everyone. For more information, visit our website at csgi.com and follow us on LinkedIn, Twitter and Facebook.