Symmetricom

Synchronization for Next Generations Networks

Improve Revenue Assurance Processes and Increase ARPU by Deploying Carrier Class NTP

NGN SERIES

- **Reduce Revenue Leakage**
  Problems with Internet Protocol/Call Detail Record reconciliation will result in unpredictable and unacceptably high revenue leakage. IP/CDR generation and reconciliation relies on time distribution services supplied by NTP.

- **Increase ARPU**
  Reduction in revenue loss will lead to an increase in Average Revenue per User, a standard metric used to measure the performance of Mobile Service Providers.

- **Billing and Logging Servers Rely on NTP**
  Nothing is more fundamental to Service Provider operations than a well engineered back office billing and logging system – and this in turn will rely on a well structured NTP service.

- **Industry leading NTP services**
  Symmetricom delivers the most precise, accurate and reliable NTP servers available today. Using Symmetricom NTP time services Carriers will benefit from the carrier class attributes already available on Symmetricom synchronization platforms.

Terminology

SSU:	Synchronization Service Unit
NTP:	Network Time Protocol
CDR:	Call Detail Records
SIP:	Session Initiation Protocol
BITS:	Building Integrated Timing Supply
AAA:	Authentication, Authorization, & Accounting
IPDR:	Internet Protocol Detail Records

Introduction

Next Generation Networks are being designed to carry a mix of services that range from the most stringent real-time encrypted voice and video services to time insensitive data applications.

The common theme for such services is the control and distribution of time. Moreover, there is no doubt that efficient management of time on Next Generation Networks can reduce revenue leakage, enable additional revenue generation, and reduce churn in a customer base.

The distribution of time across a network is the domain of Network Time Protocol (NTP), and the key for Next Generation NTP is the ability to deliver a reliable and accurate timestamp and the generation of consistent metrics over time.

To implement the robust deterministic NTP service that is more appropriate for the stringent requirements of real-time services, major Service Providers are now deploying Symmetricom next generation carrier class NTP blades into their existing SSU and BITS platforms. This case study outlines the compelling reasons why this is a preferred option for NTP on the NGN.

NTP and Billing and Logging Services

When an Internet Protocol Detail Record or Call Detail Record (IP/CDR) is generated by an event such as a voice call, or access to a paid service, there are many elements that can potentially generate timestamps associated with that call. These elements include VOIP phones, mobile phones, and PCs generating or receiving a call, the servers in the network used to log, collate, and manage the IP/CDR, the SIP servers used to signal service requests, AAA servers that authenticate users onto the network, network elements that manage and route voice bearer packets, and media gateways that encode and decode the voice stream. Even a simple call will have many different timestamps associated with it. There is a need, therefore, for a robust NTP baseline service that can deliver a consistent and accurate time service to the different instances on the network. Of all these elements, complex Billing and Logging database systems lie at the heart of the Service Provider accounting system. Any database discrepancy will have a revenue generation or collection impact. Table 1 below lists some of the critical elements that use NTP in such an environment.

Equipment Category	Elements/ Applications Requiring NTP	Operational/Service Requirement
Network Elements	Routers/Switches/Access Gateways Transmission Equipment - PON, DWDM, ROADM Platforms Wireless Base Stations VoIP Switches/Gateways Media Servers	EMS, event logging, alarms, etc. EMS, event logging, alarms, etc. Base station timing, billing, location services Call logging, CDR generation Call logging, CDR generation
Databases/Servers	Radius/TACACS, AAA, Kerberos, SNMP Billing SS7	Access, security, accounting, CDR generation CDR generation CDR generation
Measurement and Monitoring Probes/Equipment	IP Traffic Monitoring Systems VoIP Probes IPTV Measurement Systems	QoS measurement data Event logs CDRs
Customer Premises	Customer Prem Routers/Switches, VoIP Gateway IPTV Residential Gateway IPTV STB/DVR	Measurements, policy/QoS Measurements, policy/QoS Initialization, measurements, DRM

TABLE 1 Next Generation Network elements and servers that typically use NTP

Problems in IP/CDR Reconciliation

The potential ramifications of a mismatch in IP/CDR logging functions are huge, ranging from the inability to generate consistent billing records, the inability to demonstrate control to tax authorities, the inability to reconcile differences with suppliers or end users of services, and the inability to demonstrate reliability to partners. The net result is the same: potential loss of revenue. Eventually this loss may impact Average Revenue per User (ARPU), and therefore the financial performance metrics and global value of the Corporation.

Service Providers world-wide have now realized to their cost that when billing and logging complexes are distributed around a network for redundancy and resiliency purposes then there is a potential for drift between the timestamps logged during and after call set up and the eventual timestamp used by the billing servers to process the IP/CDR. Moreover, they have also found that these differences can be made much worse by a poor overall Network Time Protocol architecture, for example the use of NTP servers that are synchronized to different arbitration sources, or that have deployed servers that, as the traffic load on the server varies, suffer from deterioration in CPU performance and as a result deliver inconsistent timestamps to the servers.

A Simple Solution

A typical example of such a problem is exemplified by a G8 Mobile SP that was experiencing revenue leakage eventually traced to a problem in the billing/logging server database synchronization process. The main data centers were widely geographically distributed and pointed at UTC for NTP services, but also at internet based backup time servers. The NTP architecture used enterprise class NTP servers that delivered a perfectly viable best-effort time service originally put in place to support IT level services in a controlled LAN environment and not necessarily designed to support a mission-critical revenue service. Using this architecture the service provider was not able to perfectly reconcile the IP/CDR stored on the billing and logging servers in each location. The cause of the problem was determined to be the high percentage of mismatch between the IP/CDR generation, IP/CDR termination, and IP/CDR duration models for a given call.

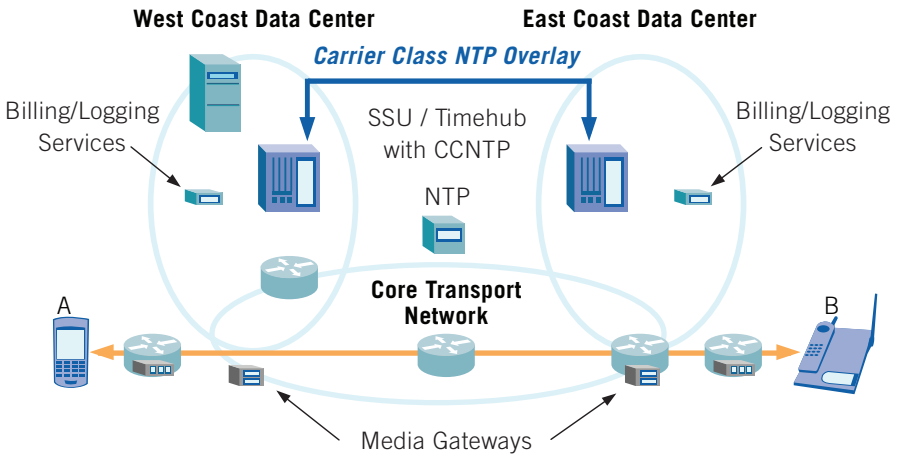

FIG 1 Typical Service Provider NTP Architecture for distributed Billing and Logging Servers

The revenue impact of the poor NTP implementation was significant, with a detrimental effect on ARPU. The percentage of mismatch was high enough to cause the service management and accounting departments to demand an examination of the root cause of the problem, and to require network engineering deliver a solution rapidly in order to forestall more revenue leakage. The analysis determined that the simplest solution was to re-engineer the NTP service. The existing NTP servers were replaced by Symmetricom carrier class NTP blades deployed into Symmetricom synchronization platforms that were already providing BITS service to the network elements in the data centers, thus re-using the existing infrastructure and current investments. The Billing and Logging server complexes were then pointed at the high performance NTP. In addition the NTP architecture was flattened, with the billing and logging servers only a stratum layer from the UTC time source. The cost of re-engineering was therefore low and reducing the number of stand-alone NTP servers had the effect of reducing OPEX by removing elements in the network that needed to be separately managed and accounted for.

The new NTP architecture not only delivers a high quality low stratum time service at the Data Centers where the billing servers were deployed, but is also deterministic in terms of NTP service availability, with a guaranteed and consistent performance whatever the load on the NTP servers themselves. This ensures high quality reference points for the generation and the collection of IP/CDR by the service elements such as the signaling gateways, and for the collection entities such as the servers. The improvement in predictability is not just in the operation of the billing and logging servers therefore but is system wide.

Positive ROI

The overall effect for the Service Providers that adopted the Symmetricom NTP model was a radical reduction in the percentage of IP/CDR reconciliation failures. The net effect on revenue was immediate and visible. The service provider representatives questioned about the Return on Investment of the purchase of Symmetricom NTP blades were quite clear - the ROI is quite literally measured in days.

TYPICAL MOBILE SERVICE PROVIDER REVENUES

$50b per annum

POTENTIAL REVENUE LEAKAGE DUE TO IP/CDR MISMATCH

@ 0.05% = $25,000,000 per annum

The Return on Investment in Symmetricom Carrier Class NTP can be measured in days.

Symmetricom Carrier Class NTP Blade

System Specifications

Network Protocol:	NTP v3 – RFC1305 compliant
	IPv4
Time Stamping:	Hardware Time Stamping
Server Accuracy:	10 ns rms typical
Inputs:	Stratum 1: Time-of-Day feed from Time Source
	Stratum 2: Full NTP client
NTP Traffic Ports:	2 Ethernet: 1000 Base-X Optical or 100/1000 Base-T Electrical,
	Small Form-factor Pluggable (SFP)
Transaction Rate:	2000 NTP transactions per second
Authentication:	MD5 (RFC1321)
Protection:	1:1 protection (IP address take-over)
Management:	Integrated into TimeHub system management

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