



# ***Transforming Telecommunications Business Intelligence***

**Real-Time, Comprehensive Analyses  
for Proactive Business Decisions**

**White Paper**

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## Introduction

In today's extremely challenging business environment, many telecommunications carriers are measuring their success by the size and growth of their profit margins. As a result, carriers are under intense pressure to reduce or eliminate the major threats to these slim margins:

- Revenue leakage, costing the industry \$100 billion annually<sup>1</sup>
- Inaccurate or missed inter-carrier billing
- Fraud, a \$12 billion annual industry problem<sup>2</sup>
- Churn, a multi-billion dollar problem exacerbated by the wireless number portability requirement
- Inefficient network usage and least cost routing plans

Carriers rely on analyses of their terabytes of CDR data to help them make business-critical decisions that will positively affect their bottom line. High-end data warehouses and powerful Business Intelligence (BI) solutions are essential tools to help carriers meet

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profit goals. Analyzing and integrating in-depth data from multiple departments enables carriers to reduce revenue leakage and churn, mitigate fraud, optimize network usage and increase profits.

Unfortunately, carriers struggle with their existing patchworks of general-purpose data warehouse solutions to store and analyze the mountains of data they create every day. Large networks and their associated switches, billing systems and service departments can generate hundreds of millions of individual CDRs daily. These terabytes of dynamic customer data will continue to grow exponentially as carriers add new services and as IP-based traffic increases. This ever-expanding volume of data puts strain on the performance capabilities of today's traditional relational databases, servers and storage systems that provide the foundation for BI.

With traditional technology it has been difficult and expensive to analyze large volumes of records at the CDR level within reasonable time frames, or at a reasonable cost. As a result, millions or even billions of CDRs must first be sampled and summarized to reduce the data being analyzed. Even so, it still takes many hours of processing to analyze aggregated data sets on today's platforms. This limits the effectiveness of customer relationship management (CRM), revenue assurance, fraud detection and network usage assurance programs that are crucial to improving the bottom line.

The Netezza Performance Server™ system (NPST™) is the first enterprise-class data warehouse appliance optimized for handling real-time, tera-scale analysis of databases at the CDR level. The NPS system is transforming the telecommunications industry by enabling carriers to comprehensively analyze billions of CDRs in real-time to make better informed and more proactive business decisions.

When used to power telecom BI applications from Netezza's software partners, including Business Objects and Vibrant Solutions, the NPS system brings unprecedented speed and performance—10-50 times that of other solutions—to data-intensive BI analyses. And it delivers all this at half the cost of existing data warehouse systems. With this powerful, easy-to-use new appliance, CRM, revenue assurance, fraud prevention and operations management programs can succeed in ways that were, until now, unimaginable.

### ***Telecommunications BI Challenges***

Many critical telecommunications functions rely on fast, complex analysis of CDR data. Key initiatives include analyzing behavioral data using CRM programs to optimally target services and reduce churn, ensuring complete and accurate billing and modeling call behavior with revenue assurance programs, and optimizing network operations using operations management programs. These initiatives all benefit from improved access to CDR-level data, access to large quantities of historical information for trend analysis and from the ability to quickly run complex BI queries.

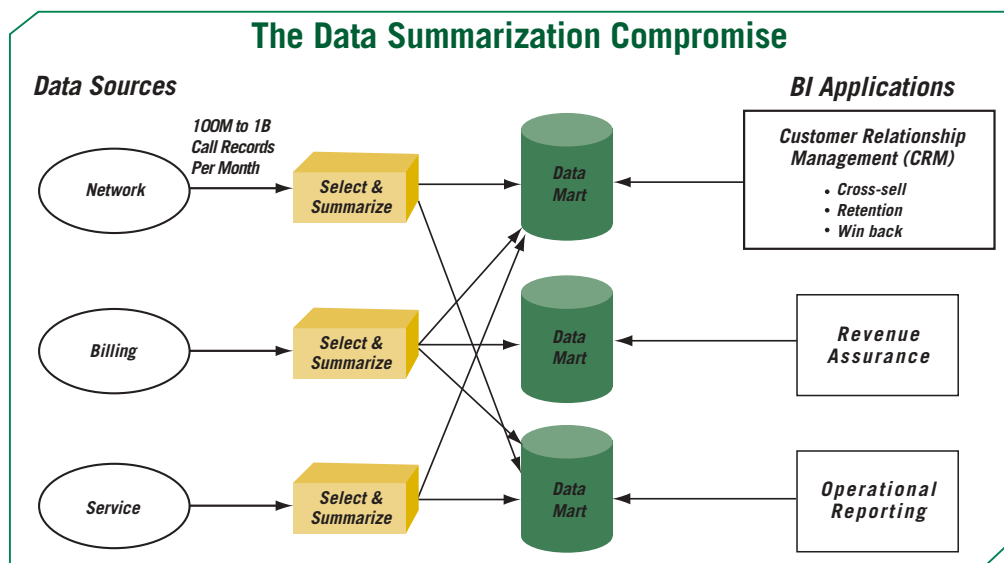
Unfortunately, acquiring and managing large volumes of data is costly and time-consuming. What's more, even when tera-scale storage costs are justified, these costs are not as great a barrier as the lengthy processing time it takes to analyze so much data with legacy servers and RDBMS systems. Performing a single complex BI query against billions of records using traditional systems takes hours or days. This is a serious impediment to the adoption of CDR-level analysis and prevents real-time proactive responses by carriers.

These significant performance limitations force carriers to make a choice. They must either summarize or filter the data for analysis, or create a massive, complex and often custom CDR warehouse to analyze call detail information. Both of these options pose serious limitations and challenges, resulting in incomplete information for decision-making, or costly and time-consuming system development and maintenance.

### **The Data Summarization Compromise**

Telecom networks and associated switches, billing systems and service departments typically generate from 100M to a half-billion CDRs per day. Carriers must use this data to gauge service offering traction, to monitor service and billing activity and to drive sales and marketing initiatives. Complex analysis of the combined historical data from these sources drives CRM, revenue assurance, fraud prevention and operational reporting programs. Storing and accessing all of this data is highly valuable but technically challenging. On the other hand, sampling and summarizing CDRs may hide changes in calling patterns and the relationships between data.

Analyzing the cause and effects of network events is difficult with a subset of data. Aggregate data may reveal that call volume went down and service levels went up, but with limited data it would be impossible to analyze which event occurred first. When there is a reduction in call volume, managers need to know causes and effects, such as whether users are waiting for repair, or if they moved to an alternative service.



**Figure 1.** Today's mainstream BI projects must select and summarize the avalanche of data that is brought together from disparate data sources (switches, billing systems, service records, etc.) to create data marts for analysis. Summarizing the data means the CDR level of details is lost. The sampling process for data is also hard-coded and is thus very difficult to change without major reprogramming effort.

In addition, the aggregation approach is inflexible from an analytical standpoint because fixed data sampling formats are hard to change. For example, a marketing manager may discern that including holiday calling patterns in an analysis skews the results. Thus, it may be desirable to eliminate certain periods. This implies changing the sampling criterion. Changing the summarization logic, however, is complex and requires time-consuming and costly end-to-end reprogramming. If selective changes are made, the summarization variables and logic eventually become so complex and inter-dependent that it becomes difficult and expensive to change them.

### Consolidated Warehouses: Scale, Depth and Flexibility at High Cost

Rather than sample and store the data, many Tier 1 carriers have chosen to create consolidated warehouses because it is faster and more accurate to store all the CDR data and much easier to maintain. Although this approach is cumbersome and costly to implement, the benefits are compelling.

First, complete information from multiple disparate sources is stored in a single database, not in several data marts. Integrated information improves analysis, and is easier to maintain. The ability to look at detailed records going back months and years is a major benefit because, with a historical view of data, trends can be analyzed. Without the historical view the consolidated warehouse enables, less can be understood about success factors and what actions need to be taken to improve the efficiency and profitability of the business. The consolidated warehouse approach also provides a high degree of flexibility, which is missing when data summarization is used. With the consolidated warehouse, analytical methods can change as the business changes.

Today, building a tera-scale consolidated data warehouse is a capital-intensive project that requires the construction of a large network of high-end servers, and integration of tera-scale storage systems. It also requires the development of RDBMS software that can analyze millions or billions of CDRs. Such projects can cost tens of millions of dollars using today's off-the-shelf solutions—let alone projects that involve custom-built systems—and require the effort of large development and maintenance teams. Even when these massive data warehouse projects are completed, they often have performance limitations that constrain their effectiveness. As data volume grows, and is compounded by the complexity of historical, pattern-analysis queries and growth in the user community, many warehouses are unable to keep up with business demand.

## ***The Netezza Alternative***

The Netezza Performance Server system is the first enterprise-class data warehouse appliance to solve the tera-scale data warehouse challenge without compromising on performance, ease-of-use or on the level of data being analyzed. The NPS appliance gives carriers a platform for performing complex BI queries against billions of CDRs within minutes or seconds, versus hours or days. The NPS system is a fully-integrated data warehouse appliance that consists of a host computer and arrays of hot-swappable mirrored storage, custom chips and network switches that act as a powerful unit to manage data flows and process queries at the disk level.

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Based on Netezza's Asymmetric Massively Parallel Processing™ (AMPP™) architecture, the NPS system is designed for high performance and scalability to dramatically reduce the latency of complex BI analysis. Because data can continue to be loaded without interrupting query performance, it is always completely current. The NPS appliance delivers 10-50 times performance benefits, resulting in a huge leap in performance for data warehouse/BI applications. Data analysis that previously took hours to process with legacy database, server and storage solutions can be cut down to minutes or seconds, opening the door to more in-depth and profitable real-time business analysis.

In addition, the NPS system uses open standards such as ODBC, JDBC and SQL to ensure full compatibility with carriers' existing tools, applications and data. Powerful BI applications from companies including Business Objects and Vibrant run out of the box on the NPS system, but now deliver response times and scalability that make possible detailed, complex analyses of CDR data that were previously unimaginable.

Beyond its breakthrough performance, the Netezza system offers the lowest Total Cost of Ownership (TCO) for large integrated data warehouses and intensive BI analysis, so deploying the NPS appliance results in huge savings in capital and operating expenditures. At half the cost of existing, general-purpose enterprise data warehousing systems, the NPS data warehouse appliance lowers TCO by dramatically reducing the upfront acquisition costs. And by combining an appliance packaging, off-the-shelf components and a standards-based architecture that doesn't require carriers to restructure data, tools or applications, the NPS appliance greatly reduces ongoing time- and labor-intensive administration activity.

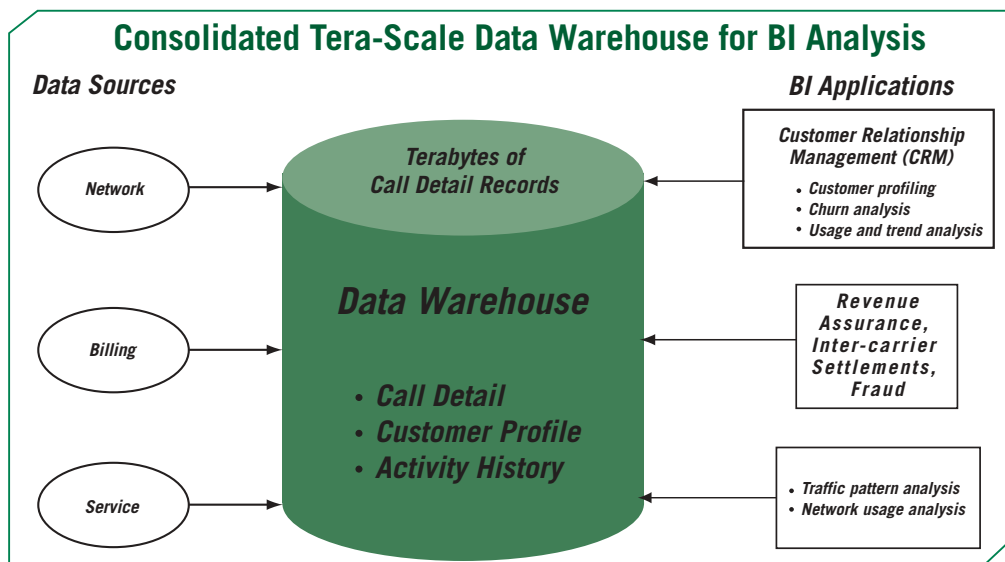


*Figure 2. Capable of scaling to hundreds of terabytes of data, the Netezza Performance Server system also scales in processing performance to power critical BI applications. Shown is the four-rack NPS 8450 system.*

### Enhance Strategic Capabilities with the NPS System

Optimized for enterprise-level BI analyses of CDR data, the NPS system empowers wireless and wireline carriers to make better informed and more timely business decisions. With the NPS system, carriers can accomplish new bottom-line-enhancing analytical tasks in real-time, such as:

- Finding revenue leakages and enhancing revenue assurance by uncovering billable interconnect services that previously "fell through the cracks", detecting improper switch behavior early and tightening switch-to-billing management
- Improving churn avoidance by navigating through daily CDRs to identify profitable customers, then modeling customer behavior to spot usage trends that can predict churn
- Enhancing CRM initiatives for more targeted marketing and services and more profitable pricing plans
- Performing in-depth traffic and usage pattern analysis to reduce operational failures and costs associated with them
- Using auditing and analytics to detect fraudulent activities by comparing rules and profiles and finding new patterns quickly to prevent revenue erosion
- Comparing day-to-day, week-to-week and month-to-month activity to detect trends that impact network utilization and profitability
- Performing analysis of historical data based on months of network operation data at the CDR level to identify trends that enable carriers to detect service problems and bottlenecks



*Figure 3. Ideally, carriers could store and analyze CDR-level data, along with data from all other sources, in a consolidated tera-scale data warehouse. Netezza's data warehouse appliance makes this possible for billions of records. The breakthrough performance of the NPS system allows complex queries to be processed in minutes or seconds instead of hours or days.*

### **Case Study: Large Wireless Carrier Uses the NPS System to Perform Real-Time CRM Analyses and Reduce Churn**

Customer churn is a multi-billion dollar telecom industry problem and one of the largest that wireless and wireline carriers continue to face. The combination of fierce competition, high service-oriented customers and fleeting customer loyalty makes the situation particularly challenging. The wireless number portability requirement compounds the problem—over a quarter of U.S. wireless users (potentially 39 million people) said they would switch providers as soon as they receive a better offer<sup>3</sup>.

In order to prevent customers from churning, carriers use CRM analytic applications to build highly accurate churn prediction models that:

- Find customer call patterns and usage habits. To be most effective, these analyses should be based on at least 12 months of customer data.
- Perform financial analyses to define customer profitability (typically 20% of the customers represent 80% of revenues)
- Execute customer analyses to determine the impact of price/offering changes on customer usage behavior
- Find key triggering events in the carrier-customer relationship that have had dramatic impact on the customer call patterns and usage behavior





Running these analyses through a customer churn model helps the carrier identify those customers who are more likely to churn. The carrier can then make decisions on what measures to take, and what marketing programs to use and services to offer, to retain these at-risk customers. But current BI solutions don't have the processing power or database capacity to run these CRM analyses quickly enough, or with enough historical data, for the carriers to make proactive, well-informed decisions and mitigate churn.

One Netezza customer, a major wireless carrier, uses Business Objects to conduct comprehensive CRM analyses. The carrier's CDR data warehouse is comprised of 1.4TB of data, with 72GB of daily updates, and they had been using Informix XPS as their data warehousing platform. Their longest query time against this database was 12 hours and, because of the database capacity, they could only run queries against three months of data. With the lengthy query times, this carrier couldn't respond proactively to at-risk-customer activity. And, because they could only look at three months of data, they didn't have a statistical sample large enough to let them see a true trend view.

***The Netezza system is 20 times faster than the carrier's existing system, allowing them to quickly and proactively identify churn threat, customer service problems, trends and up-sell opportunities in minutes versus hours.***

This carrier has now implemented the Netezza Performance Server system to handle complex CRM analyses of its CDRs. With the NPS data warehouse appliance, they can now perform comprehensive customer and financial analyses against 24 months of data, and the longest query time has been dramatically reduced to just 15 minutes. The Netezza system is 20 times faster than the carrier's existing system, allowing them to quickly and proactively identify churn threat, customer service problems, trends and up-sell opportunities in minutes versus hours. This will translate into substantial savings in retained customer revenues.

### ***Case Study: The NPS System Enables a Major Carrier to Proactively Address Revenue Leakage***

With the downturn in the economy, carriers are keenly focused on maintaining profitability. Revenue leakage is an ongoing profitability threat and a \$100B industry problem. Inter-carrier settlements, one of the primary sources of revenue leakage, are an essential aspect of the telecom business. For most carriers, inter-carrier settlements represent one of their largest sources of revenue, but can also account for up to 50% of their operating costs. It is therefore crucial that carriers make sure that they are correctly billing other carriers for usage and termination rights on their network, as well as verifying that other carriers are correctly billing them.

The revenue assurance process compares delivered transactions with invoiced transactions, and identifies missing or lost revenues to recoup much of this lost revenue. Carriers are implementing these solutions to reduce operational costs and ensure accurate billing and inter-carrier settlements. It is critical that carriers have the information when they need it and can respond immediately to inaccurate or missed billing. Seemingly small errors in billing can quickly become very significant, so carriers must continually monitor and correct their inter-carrier billing as it is happening. But the volume of data that needs to be analyzed quickly paralyzes most BI systems.



Another Netezza customer, also a leading wireless carrier, collects an average of 250 million CDRs daily. The carrier had struggled with a six-hour query time for summarizing a single day's worth of vital CDRs for revenue assurance analysis and more than 23 hours for a traffic pattern analysis. They knew they needed to be more proactive with their decisions on network and interconnect usage. But they couldn't even imagine conducting the detailed analyses of months of historical data they needed to identify important trends.

*As this carrier's data continues to grow, the NPS system's scalability will eliminate the need for expensive upgrades of existing general-purpose servers and storage.*

With the NPS system installed, however, the carrier was able to reduce both query times to just minutes, producing results on complex queries of 120 days of data and revenue analysis in less than 30 minutes. For the traffic pattern analysis, the NPS system reduced the query time to less than 50 minutes. The carrier is now able to automate its revenue assurance programs to improve inter-carrier billing and maximize profitable network utilization. With their new scalable solution they expect to save millions of dollars in previously missed billings.

And as this carrier's data continues to grow, the NPS system's scalability will eliminate the need for expensive upgrades of existing general-purpose servers and storage. For this wireless carrier, reduced revenue leakage and enhanced performance means increased revenue and lower ongoing database administration costs.

## ***The NPS System Powers Critical New Applications: Vibrant Solutions' Network Usage Assurance***

The NPS system is powering a new application from Vibrant Solutions called Network Usage Assurance (NUA) to revolutionize revenue assurance efforts. Vibrant Solutions' NUA application identifies lost usage event records by capturing and processing event records and analyzing patterns across the entire network in near real-time. NUA helps carriers improve revenue management by analyzing all the usage along the switch-to-bill path to determine when and where leakage occurs. NUA allows carriers to take corrective action and quickly minimize the amount of lost revenue from their operations.

The processing acceleration provided by the NPS system is critical to perform such complete detailed network auditing and analysis. The NUA solution allows carriers to tighten the switch-to-bill loop. Faster response times give them the ability to audit network operations and run other complex BI queries—valuable new capabilities that require the horsepower provided by the NPS system.



### ***The Bottom Line Advantage***

Effective BI programs for telecommunications put heavy demands on data warehousing and BI systems. There is tremendous value latent in call detail information for CRM, revenue assurance, fraud detection and network usage analysis. Performing real-time analysis on voluminous call detail data with complex queries requires much more performance than legacy general-purpose systems can provide.

Netezza opens the door for increased profitability with the first high-performance enterprise-class data warehouse appliance that maximizes the impact of BI. The Netezza Performance Server system eliminates the barriers to accessing and analyzing dynamic, detailed information, and offers carriers performance, value and simplicity in a data warehouse system. For the first time, carriers can leverage their terabytes of CDR data for real-time, better informed and more strategic business decisions.

<sup>1</sup> Deloitte & Touche

<sup>2</sup> Communications Fraud Control Association (CFCA)

<sup>3</sup> Wireless Number Portability Study, The Management Network Group (TMNG), May, 2003

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