

Mobile Network Elements Quad Play
Real-Time IP Multimedia Subsystem
Provisioning
Umbrella Network Management TriplePlay NGN
Fixed Network Elements Soft Switch
Packet-based IP
Converged IP 4G
UMTS GPRS 3G
Element Management Call Data Records
Accounting & Billing
99.999%
GSM

3G /4G INTELLIGENCE NEEDS
NEXT GENERATION BRAIN POWER

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CARRIER-GRADE DATA MANAGEMENT

Intelligent systems and state-of-the-art equipment in 3G/4G networks place new demands on data management. Interoperating and connecting diverse networks, services and protocols make up for a dramatically complex information network. Data must be represented in a detailed yet flexible format, efficiently stored and read in real-time, and provided with great reliability to carrier class networks. All of this in an environment that – unlike any other – is characterized by constant change and new rules.

Conventional relational database technologies struggle to keep pace with these new and constantly growing demands because they simply cannot provide high-performance representation of the new intelligence in 3G and 4G environments. A solution can be found either in expensive hardware upgrades and never ending development efforts or – more reasonably – in future-proof database technology. Technology that doesn't stand in the way of intelligent NGN, Mobile and Triple Play solutions, but rather unconditionally accelerates them. Technology that enables fast data access. By providing reliable 24/7 high-availability solutions, fast adaptability and high performance in complex network structures, the Versant Object Database offers superior functionalities for data management in telecommunications solutions such as

- **Element Management**
- **Accounting & Billing**
- **Provisioning**
- **Converged Networks and Services**
- **Fixed Network Elements**
- **Mobile Network Elements**

Element Management

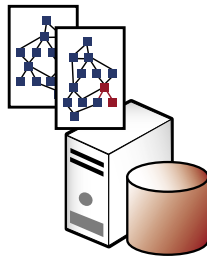
ELEMENT MANAGEMENT

Network Management Systems, Access Networks Management Systems

- Increasing data complexity due to increasing subscriber numbers and network convergence
- Complex interrelationships
- QoS-oriented technologies
- Access equipment such as xDSL devices

Versant Object Database

- High-Performance Data Management
- Designed to handle navigational access
- Optimized data retrieval through unparalleled query capabilities
- Geographic Redundancy



Nowadays highly developed, complex technologies are at work where Network Elements (NE) host a range of services such as integrated use of voice, high-speed data, and video. Ongoing technology development, increasing subscriber numbers and network convergence will continue to drive data complexity. A critical role falls to the Network Management System (NMS). The management and control of Quality of Services (QoS)-oriented technologies need to be guaranteed real-time transparent to the increasing complexity. This applies to a great extent to access equipment such as xDSL devices (ADSL, HDSL, VDSL), where information on the Access Network needs to be consolidated into the holistic Network Management System.

The Versant Object Database enables high-performance data management in the NMS. Complex interrelationships and dependencies within routers and switches can be graphically modeled and stored directly as objects in the database – without troublesome mapping into flat table structures. This reduces software development time, guarantees complete flexibility for future enhancements and expansions and delivers better runtime performance. For maximum performance, the retrieval of data is optimized through unprecedented query capabilities.

Smart management and reliable real-time control is made possible in Network Management Systems, independent of the increasing complexity of the systems. That becomes even more important when you integrate into a complex Umbrella Network Management.

Accounting & Billing

Accounting & Billing Solutions

- Tracking of integrated access to voice, fax, broadcasting and other high-speed data services
- GAAP environments
- Individual operator service plans, customer specific subscriptions, parallel usage and real-time foreign host network access

Versant Object Database

- Fault-tolerant Data Management
- High Availability add-on modules
- Fine-grained concurrency control
- Seamless data distribution across multiple databases



The convergence of various 3G network technologies permits integrated access to voice, fax, broadcasting and other high-speed data services. It's good to offer all these services, but it's just as important to accurately track and reliably invoice subscriber usage. Generation of Call Data Records (CDR) not only requires a carrier-grade, fault-tolerant data management system, but also flexible tariff considerations such as individual operator service plans, customer specific subscriptions, parallel usage and real-time foreign host network access.

Since its conception, the Versant Object Database was designed with a strong focus on high performance and reliability. It therefore fulfills all requirements for fault-tolerant, accelerated accounting & billing solutions in GAAP (Generally Accepted Accounting Principles) environments. Integrated high-availability add-on modules such as Fault Tolerance Server or Asynchronous Replication provide a reliable solution for 5x9 call data management without downtime. A highly developed Concurrency Control Mechanism permits efficient multiple parallel accesses and greatly increases throughput. Even if the complexity of data and number of access attempts increase with Converged Accounting and Triple Play, no data is lost – the Versant Object Database enables seamless data distribution across multiple databases.

Provisioning

PROVISIONING

End-to-End Services, Self-Provisioning

- Fast integration of new services is the key to success
- Smooth updates in heterogeneous environments
- Running system cannot be limited in any way

Versant Object Database

- Transparent persistence accelerates development: Logic persisted in the database as is, no mapping required
- Dynamic schema evolution
- Various replication scenarios for full support of hot-standby operations



Customer satisfaction and loyalty strongly depend on the timely deployment of new services. Integrating and launching these new services quickly in Network Elements (NE) is the key to success – no easy task in a heterogeneous environment made up of different technologies. Crucial momentum for efficient activation of new services is provided by a powerful database in the provisioning system. Updates of the NE configurations have to be carried out quickly and smoothly. Regardless of the extent of the update or the frequency, the running system cannot be limited in any way.

The Versant Object Database provides all the tools for accelerated development, be it a quick modification of a graph-oriented modeling implementation or the direct storage of object-oriented logic in the database. In addition, the unique “Lazy Update” schema change offers dynamic version management – the data logic is automatically directed into a new schema as soon as it is changed. A labor-intensive adjustment from the old to new schema is not necessary. Lazy Updates are carried out online – a critical advantage for provisioning systems. Especially with a self-provisioning functionality.

In addition, the Versant Object Database provides a backup utility for complete or incremental backups and for different replication scenarios for full support of hot-standby operations. Combined with dynamic schema evolution and automatic disk space optimization, these functionalities guarantee smooth 24/7 operations.

Converged Networks

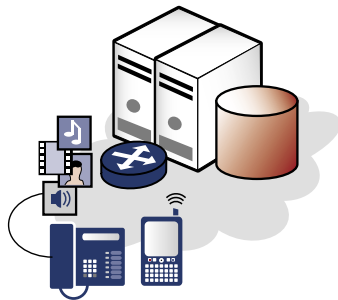
CONVERGED NETWORKS & SERVICES

Packet-based Networks, IP-Multimedia Subsystems

- Future of networks is packet-oriented
- Increasing software intelligence with corresponding greater data complexity
- Best representation with object-oriented models

Versant Object Database

- Objects end-to-end architecture
- Low (or no) administration
- Seamless data distribution across multiple databases
- Carrier Grade high availability options



Network operators – be it mobile or fixed – face a dual challenge these days. More and more services need to be integrated quickly into an already growing network without compromising the integrity.

The future of networks is packet-oriented. IP-based networks allow operators to utilize their networks more effectively and expand them more rapidly, without a compromise in quality. The network's software intelligence increasingly takes on more and new tasks – with corresponding greater data complexity. A Softswitch, for example, can act as an H.323 Gatekeeper, Media Gateway Controller, Call Agent and/or SIP Server.

The intelligence of such systems, which is best represented with object-oriented models, can be stored directly in the highly available Versant Object Database, eliminating labor-intensive and time-consuming mapping in flat, relational tables.

New service architectures such as IP Multimedia Subsystem (IMS) generally build on horizontal models. Application Servers, that used to run on dedicated vertical platforms, can now be integrated horizontally on top of predefined application interface, such as IMS' Service Capability Interaction Manager (SCIM). In order to assure a smooth co-existence between services and data, system designers increasingly turn to object-oriented models. This approach dramatically improves run-time performance because complex queries can be processed directly without requiring access to two-dimensional table structures. Logic enhancements are also extremely simple to implement.

With fine-grained object-level locking to maximize concurrent user access, high performance, and reliable high-availability solutions, the Versant Object Database is the ultimate solution to give the new generation of systems and services the high-capacity, intelligent and failsafe brain that it deserves.

Fixed Networks

FIXED NETWORK ELEMENTS

Soft Switch Systems in NGN

- Increasing diversity in NGN's
- Powerful high-speed data transport management
- Intelligent routing-and-switching algorithms

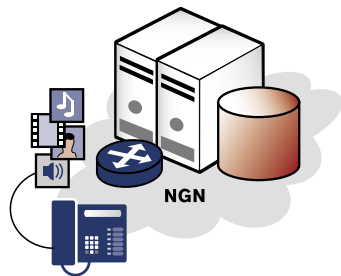
Versant Object Database

- Designed for fine-grained architectures of intelligence
- Easy implementation of changes and enhancements to the logic
- Real-time performance

Just as broadband, content, and service diversity in NGN IP-based networks increase, the supporting infrastructure has to be equipped – not only physically but also conceptually – to handle the resulting higher traffic. Powerful high-speed data transport management delivers decisive real-time quality advantages. The overall capability of Class 5 Softswitch Systems highly depends on intelligent routing-and-switching algorithms and even more so – especially considering increasing traffic and access requests – on the performance of the database backend managing this intelligence.

The intelligence of Softswitch systems, which is best represented in object-oriented models, can be stored directly using Versant Object Database. Because complex queries can be processed directly without requiring access to rigid table structures, both time-to-market and run-time performance are dramatically improved. The intelligence of telecommunications networks is always fleeting, with new services and new equipment integrated into the network almost daily. A consistently utilized object-oriented architecture of intelligence, from modeling to storing, makes it extremely easy to implement changes and enhancements to the logic.

With its combination fine-grained concurrency control, real-time performance, and reliable high-availability solutions, the Versant Object Database is unique in its ability to provide the new generation of systems and services with the efficient, intelligent and fail-proof brain it deserves.



VERSANT

Mobile Networks

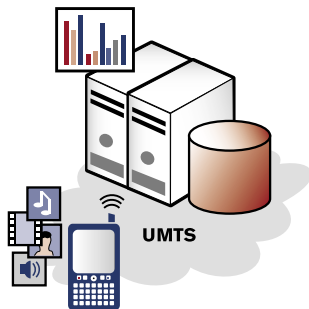
MOBILE NETWORK ELEMENTS

GSM, GPRS, UMTS and WiMAX

- Increasing services variety with increasing data volume
- Intelligent, real-time data transport management is critical success factor

Versant Object Database

- Real-time performance
- Optimization for high concurrency
- Reliable high-availability solutions



Mobile network operators and providers consider protecting their investments in UMTS licenses to be of the utmost importance. A return on this investment can be ensured with broadband applications in which content and service variety take on special significance, especially revenue-increasing services like IP-TV or DVB-H.

To that end, the mobile network has to reliably support broadband services, which, in turn, require an efficient high-speed data transport management – in real time. The selection of the right database for transport management is therefore a critical success factor.

The Versant Object Database provides a database backend that exceeds the challenge of meeting new network intelligence requirements. Complex transport management intelligence is depicted in object-oriented models. In turn, these complex models can be stored directly and completely into Versant Object Database without time-consuming mapping into flat two-dimensional tables. Not only is the development time reduced significantly (and therefore also time to market), but also your run-time performance of processing complex queries.

Given its optimization for high concurrency, the Versant Object Database allows the design of powerful high-speed data transport networks, which can efficiently and effectively implement the best use of broadband services.

THINK OUTSIDE THE GRID. NON-SQUARE DATA MANAGEMENT.

Features

- Dynamic schema evolution
- Seamless data distribution across multiple databases
- Concurrency control
- Transparent C++ object persistence
- Transparent Java object persistence
- OODBMS application architecture
- High-Availability

Carrier Grade Add-on Modules

- Fault Tolerant Server
- Asynchronous Replication
- High Availability Backup
- Online Reorganizer
- Monitoring & Administration Console

Get rid of rigid row and column structures when it comes to storing and retrieving complex data. Release the full power of a consistently object-oriented software application design. Non-square data management with Versant's object database technology – rapid development, high performance and massive scalability.

It is difficult, time consuming, expensive in development, and expensive at run time, to map the objects into a relational database and performance can suffer. Using the Versant Object Database for data storage brings powerful advantages to applications that use complex C++ and Java object models, have high concurrency requirements and large data sets.

For many telecommunication applications, the most challenging aspect is controlling the inherent complexity of the subject matter itself – the complexity of telecommunications infrastructure must be tamed. And tamed in a way that enables continual evolution of the application as the environment and needs change. The primary focus for these applications must be on the domain and the domain logic, and complex designs should be based on an object model. Architectures that mix technical needs such as persistence (and SQL) with the domain model are an invitation to disaster.

The Versant Object Database lets you develop using objects that need only contain the domain behaviour, freeing you from persistence concerns. At the same time it enables seamless data distribution across multiple databases, high concurrency, fine-grained locking, top performance, and high availability through replication and other techniques. Modern O/R mapping tools in Java simplify many mapping problems, however they don't provide seamless data distribution or the performance of Versant.

Speed Time to Market by Reducing Development Time

Object-relational mapping code can be 40% or more of your application. With Versant, mapping code is no longer required.

Dramatically Increase Performance and Throughput

When applications have complex in-memory object models with predominantly navigational access, object databases provide higher performance than mapping to relational databases. As an example, when an application needs to retrieve an object from an object database, a single query to the datastore retrieves the object. When mapping to a relational database, if the object is an object with many-to-many associations, one or more joins will be required to access the references stored in the association table. Objects with moderate complexity are typically 3x faster in an object database, objects with high levels of complexity, such as many-to-many associations are 30x faster when using an object database. For collections of collections and recursive relationships, a 50x speed advantage is possible.

Quickly Evolve Your Application as Requirements Change

Today's rate of change in business process and structure, and application requirements, makes the ability to change very valuable. Object-relational mapping and other methods that adapt to rigid storage structures make changes difficult. The Versant Object Database greatly facilitates the ability of your application to meet current and future business needs.

ROI

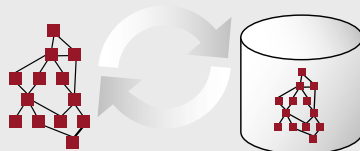
Object databases are the preferred solution when you have complex object models and large data sets. The main benefits are reduced code size, lower development costs, faster time to market, low or no administration requirements, and reduced cost of hardware and server software licenses. The performance advantage can lower the costs dramatically for high workload applications. Large relational databases are expensive and require costly hardware.

Feature Highlights

- Transparent object persistence from C++ and Java
- Support for standards JDO & J2EE
- Low (or no) administration
- Seamless data distribution across multiple databases
- Objects end-to-end architecture
- Fine-grained concurrency control
- Multi-threading, multi-session
- International character sets
- High-speed data capture
- Enterprise-class high availability options
- Dynamic schema evolution
- Logical object ID to reference objects seamlessly in memory

Benefits

- Fast storage, retrieval, navigation of object hierarchies and graphs
- 10x performance of relational databases
- Cut development time



Non-square Data Management: Objects End-to-End

3G/4G Intelligence is based on complex object models. The Versant Object Database dramatically improves run-time performance because storage, retrieval and queries can be processed directly – without requiring access to two-dimensional table structures.

In 1988, Versant's visionaries began building solutions based on a highly scalable and distributed object-oriented architecture and a patented caching algorithm that proved to be prescient. Versant's initial flagship product, the Versant Object Database Management System (ODBMS), was viewed by the industry as the one truly enterprise-scalable object database.

Having benefited from Versant's unique object-oriented architecture, leading telecommunications companies such as Verizon, AT&T, Ericsson and Alcatel rely on Versant – instead of traditional relational database systems – to solve some of their most complex data management issues.

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