Telenor Powers its Next Generation Mobile Broadband Services with MySQL Cluster

Telecommunications and Internet Service Provider

Database: MySQL Cluster

OS: Linux

Hardware: Intel-based Servers

"Telenor has been using MySQL for fixed IP management since 2003 and are extremely satisfied with its speed, availability and flexibility. Now we also support mobile and LTE IP management with our solution. Telenor has found MySQL Cluster to be the best performing database in the world for our applications."

Peter Eriksson
Manager, Network Provisioning
Telenor

Telenor Overview

Telenor Sweden is a full service provider of mobile, fixed and broadband communications to both consumer and corporate markets. The group, which includes Bredbandsbolaget (B2) and Glocalnet, has some 1.9 million mobile subscribers and employs 2,400 people throughout Sweden.

Telenor is an international provider of high quality mobile communications services to customers in twelve markets across Asia and Europe. Telenor is also a leading provider of fixed-line and media services to the Scandinavian countries. In September 2007 Telenor was named the top performing mobile operator on the Dow Jones Sustainability Indexes. The Telenor Group is headquartered at Fornebu in Norway and its shares are listed on the Oslo Stock Exchange (TEL).

The Business Challenge

Telenor has always differentiated itself in the communications marketplace by delivering innovative and high quality voice, broadband and broadcast television services. To meet rapidly growing customer demand, and to provide continuous access to their fixed-line broadband services, Telenor deployed the "Nexus" IP (Internet Protocol) management and authentication platform, selecting MySQL Cluster as the underlying database. MySQL Cluster enabled Telenor to make their authentication and authorization services highly available and to support user access to the network in real-time.

Telenor's OSS (Operational Support Systems) handle three different ISP's (Internet Service Providers): Telenor, Bredbandsbolaget and Glocalnet, with each demanding different customer approaches and services optimized for their user base and target markets.

As Telenor began to extend their infrastructure and services to mobile offerings, including broadband internet access, VoIP and TV, they started development of their next generation Nexus platform.

A key function of the Nexus platform is to perform management of IP (Internet Protocol) addresses. After basic connection from a device (cell-phone, mobile broadband or fixed modem) is established, the next step is to retrieve an IP-address in order to be able to connect to the internet. Nexus supports DHCP (Dynamic Host Configuration Protocol) and RADIUS (Remote Authentication Dial-In User Service) interfaces to enable IP management for both mobile and fixed access connections. Additional protocols that have to be supported in real time by the Nexus platform include VMPS (VLAN Management Policy Server), DNS (Domain Name System) and SNMP v2 (Simple Network Management Protocol, Version 2)

With today's converged networks and highly competitive markets, customers demand 24 x 7 access to their subscribed services. As a result, the Nexus platform's IP management and user authentication functions are a mission-critical workload and must be able to achieve extremely high levels of availability and real-time performance. Failing to lease IP's for even a few seconds results in significant customer dissatisfaction.

In addition to continuous service availability, customers also demand personalized services. As a result, even the underlying IP addresses have to be personalized. For example, a customer with a pre-paid service should be assigned a regular IP address until their pre-paid credit has expired, after which they receive a special IP lease which routes them only to the pre-paid management web site where they can top-up their pre-paid account. An IP-TV customer should receive IP access through their modem only if that customer has subscribed to the IP-TV service.

Offering innovative and personalized services is only part of the total proposition for any Service Provider. Customer service is also critical. Telenor has received many awards over the past couple of years for providing the best ISP support in the Swedish market. Central to this is providing the support team with tools that can track each device and customer via their assigned IP address, and use this to view both their current status and trace historic activity. As services have evolved, the support tools have also been extended to access mobile support systems in addition to the existing fixed back-office services.

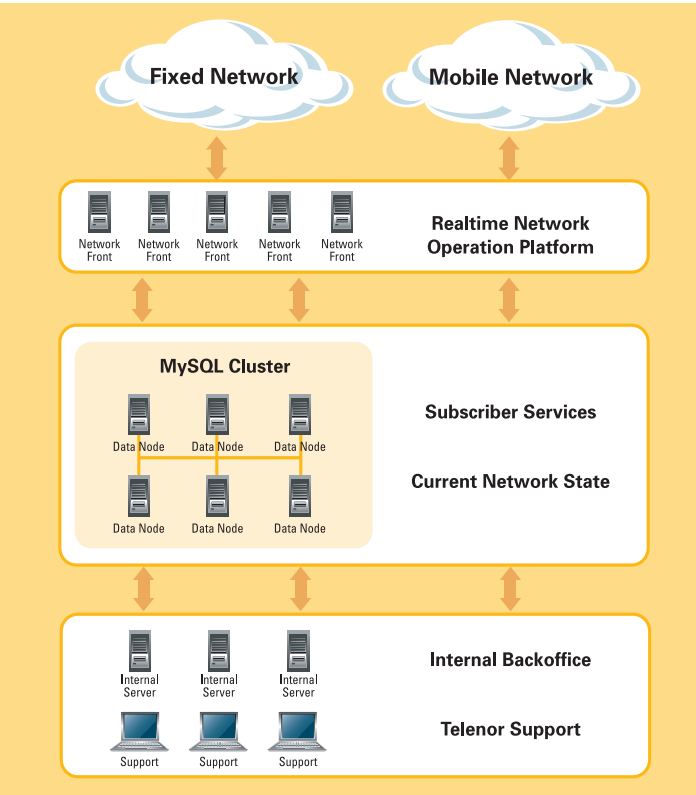


Figure 1: The Telenor Nexus platform, powered by MySQL Cluster

"Telenor believes that with MySQL Cluster, we are very well positioned to take advantages of rapid developments in mobile internet technology today and in the future"

Anders Sundquist
Senior Systems Designer. Telenor

Nexus has also been designed to be extensible, so as Telenor accelerates its adoption of the LTE (Long Term Evolution) 4th generation mobile communications standard, it will also enable IP management and authentication over LTE networks and devices. Telenor has one of the most aggressive LTE strategies in the Swedish market, planning to deliver coverage to 99% of the population with much higher speed and stability than today's mobile broadband internet.

The MySQL Solution

Telenor had selected MySQL Cluster for their original Nexus platform. The reasons for selecting MySQL Cluster were based upon:

- 99.999% availability enabled as a result of MySQL Cluster's distributed architecture, serving to eliminate any Single Point of Failure (SPOF).
- Automatic sub-second failover to guarantee continuous service.
- Failed database nodes were able to dynamically restart and re-configure themselves without manual intervention from operations staff.
- The ability to distribute the database across multiple, low cost commodity systems enabled MySQL Cluster to deliver leading price/performance and reduce cost-per-subscriber.

Based on these experiences, Telenor had no hesitation in developing their new Nexus platform on the MySQL Cluster database.

Using MySQL Cluster's distributed architecture and its ability to perform maintenance and upgrade operations on-line, Telenor has been able to launch a range of new mobile services without any network service interruption to their customers. To further enhance availability, Telenor uses MySQL database replication to a secondary site, ensuring seamless failover in the event of a site failure.

Telenor is the first ISP in Sweden to offer mobile services without any usage limits. As a result, MySQL Cluster has had to support a rapidly growing subscriber base accessing the Nexus platform, while maintaining very high levels of read and write performance, with very low levels of latency to ensure real-time user authentication and access. MySQL Cluster has been able to keep pace with these performance demands due to its ability to optimize index and data access in-memory of each database node.

All IP leases for all networks and devices across all of Telenor's Swedish ISPs are powered with MySQL Cluster. As the same IP management system and MySQL Cluster database is used independently of the network or devices, Telenor can optimize the IP-scope and make support and troubleshooting more effective.

In addition to IP assignments, MySQL Cluster also stores service configuration, entitlements and provisioning for each user, along with service routing selections.

By consolidating all IP Management and user data into the MySQL Cluster database, Telenor knows exactly which services each customer has access to, and from which location. With multiple OSS services each accessing a centralized database, Telenor are able to generate different views of the data for each application, enabling an efficient solution for Subscriber Data Management.

To further complement this deployment, Telenor's customer support tool can connect to a large number of ISP management servers and access data-warehouses which are also implemented with the MySQL Servers using the InnoDB and MyISAM storage engines.

Telenor and MySQL Cluster Solution Overview

- Telenor provides mobile broadband, VoIP and TV services to 1.9m mobile subscribers in Sweden
- Nexus platform provides IP management and authentication for user access
- MySQL Cluster is used to store all IP leases, subscriber service configurations, entitlements and provisioning
- MySQL Cluster's distributed architecture and ability to perform upgrades on-line enables Telenor to launch new services with no downtime
- Consolidated database supports Subscriber Data Management initiatives within Telenor
- MySQL Cluster selected due to 99.999% availability, real time performance and linear scalability on commodity hardware

The Future with MySQL

Telenor's IP Management and authentication platform based on MySQL Cluster has proven to scale very efficiently, easily supporting a vast number of IP addresses and users.

The Nexus system was deployed by Telenor in Norway last year to serve fixed IP services to their customers. Following these successful deployments in Sweden and Norway, more countries have shown an interest in using the system.

Looking to the future, Telenor sees that the number of customer devices accessing the internet and mobile networks will grow dramatically, with many demanding 24 x 7, always-connected access. Many of these devices will look very different from the cell phones, PDAs and laptops we use today to include the most basic household appliances and entertainment systems.

Even today, Telenor Connexion in Sweden offers a mobile kilowatt / hour meter that automatically manages electricity consumption for its customers.

M2M (Machine-to-Machine) communications between devices is a market that is growing rapidly and which will in turn, require a large number of IP addresses in the future.

"Telenor believes that with MySQL Cluster, we are very well positioned to take advantages of rapid developments in mobile internet technology today and in the future" said Peter Eriksson, Manager of the Network Provisioning Group at Telenor.

MySQL Cluster

The Leading Open Source, High Availability Database for Real-Time, Mission Critical Applications

MySQL Cluster is the industry's only true real-time database that combines the flexibility of a high availability relational database with the low TCO of open source.

Carrier Grade Availability

MySQL Cluster features a "shared-nothing" distributed architecture with no single point of failure to assure 99.999% availability, allowing you to meet your most demanding mission-critical application requirements.

High Throughtput and Low Latency

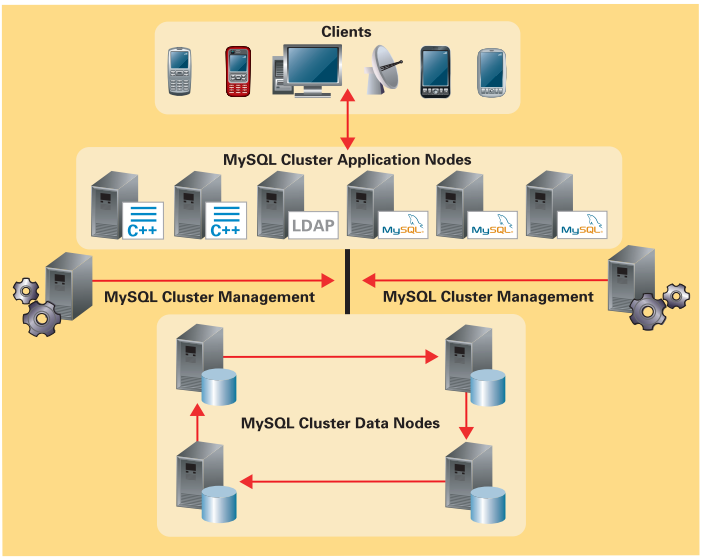
MySQL Cluster's real time design delivers consistent, millisecond response times with the ability to service tens of thousands of transactions per second.

Linear Scalability

Support for disk based data, automatic data partitioning with load balancing and the ability to add nodes to a running cluster with zero downtime allows almost unlimited database scalability to handle the most unpredictable web-based workloads.

MySQL Cluster Target Applications:

- AAA / RADIUS / Diameter Data Stores
- Application Servers
- Data Store for LDAP Directories
- DNS/DHCP for Broadband
- eCommerce
- Mobile Content Delivery
- On-Line application stores and portals
- Payment Gateways
- Service Delivery Platforms
- Subscriber Databases (HLR/HSS)
- VoIP, IPTV & Video on Demand
- Web Session Stores



The MySQL Cluster architecture has been designed for 99.999% availability and delivers massive read/write scalability

About MySQL

MySQL is the most popular open source database software in the world. Many of the world's largest and fastest-growing organizations use MySQL to save time and money powering their high-volume Web sites, critical business systems, communications networks, and commercial software. At **www.mysql.com**, Sun provides corporate users with premium subscriptions and services, and actively supports the large MySQL open source developer community.

For more information, go to **www.mysql.com/cluster**

To learn more about MySQL in the Telecommunications industry, go to **www.mysql.com/communications**

MySQL Sun microsystems

The World's Most Popular Open Source Database

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