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WHITEPAPER

Matrix Structure for Broadband Network

Supermatrix-project

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CHALLENGE

A 100 megabit per second Internet connection for every home has been declared a national goal for Finland. However, insufficient attention has been paid to the bottlenecks created by the backbone network. This level of point-to-point connection speeds will not in fact be achieved, because the existing hierarchical network structure isn't capable of supporting the traffic created by the users. According to recent study by VTT¹, the current switching capacities and network structure in Finland can only support 100 ... 1000 simultaneous HDTV-level Video on Demand (VoD) -users.

The on-going trend of providing services through network (Software as a Service, SaaS) relies heavily on the Wide Area Networks (WANs) to connect customers to data centers. This is also placing strict requirements on security, Quality of Service (QoS) and especially reliability.

SOLUTION: MATRIX NETWORK

The architecture of the Supermatrix network is based on two principles:

- 1) The Supermatrix service platform is located in telecom operator's premises near to the customer. User premises are connected to service platforms mainly by fiber access (FTTx). Guaranteed 100 Mbit/s bandwidth is allocated for each terminal. VTT's study concludes that IPTV VoD appears realistic and economically feasible when cache storage is placed in distribution nodes sufficiently close to user premises.
- 2) Multi Protocol Label Switching (MPLS) technology is utilised in the network, and its functionalities are extended to as near to the customer as possible. Label Switch Routers (LSR) form a *matrix based network* between customers and service platforms (Figure 1), with duplicated hardware inside network equipment as well as duplicated physical connections. QoS/CoS enables prioritisation of mission-critical and real-time traffic by establishing Label Switched Paths (LSP's) for carrying traffic along the shortest path, or any other explicit path which can be different from the normal IP-based routing path. The traffic of data intensive services is routed to avoid congestion between operators. Finnet Group's MPLS network is already designed along these principles.

Benefits of this architecture are:

- Reliability and consistency
- Significant increase in network and service throughput
- Guaranteed bandwidth availability
- Support for mission-critical and real-time applications like IPTV and PC virtualization

¹ Capacity Estimate for the Internet within Finland — in Connection with a Public Video on Demand Service for High Definition Video Content, VTT, Atte Kortekangas & Jorma Kilpi, October 2009

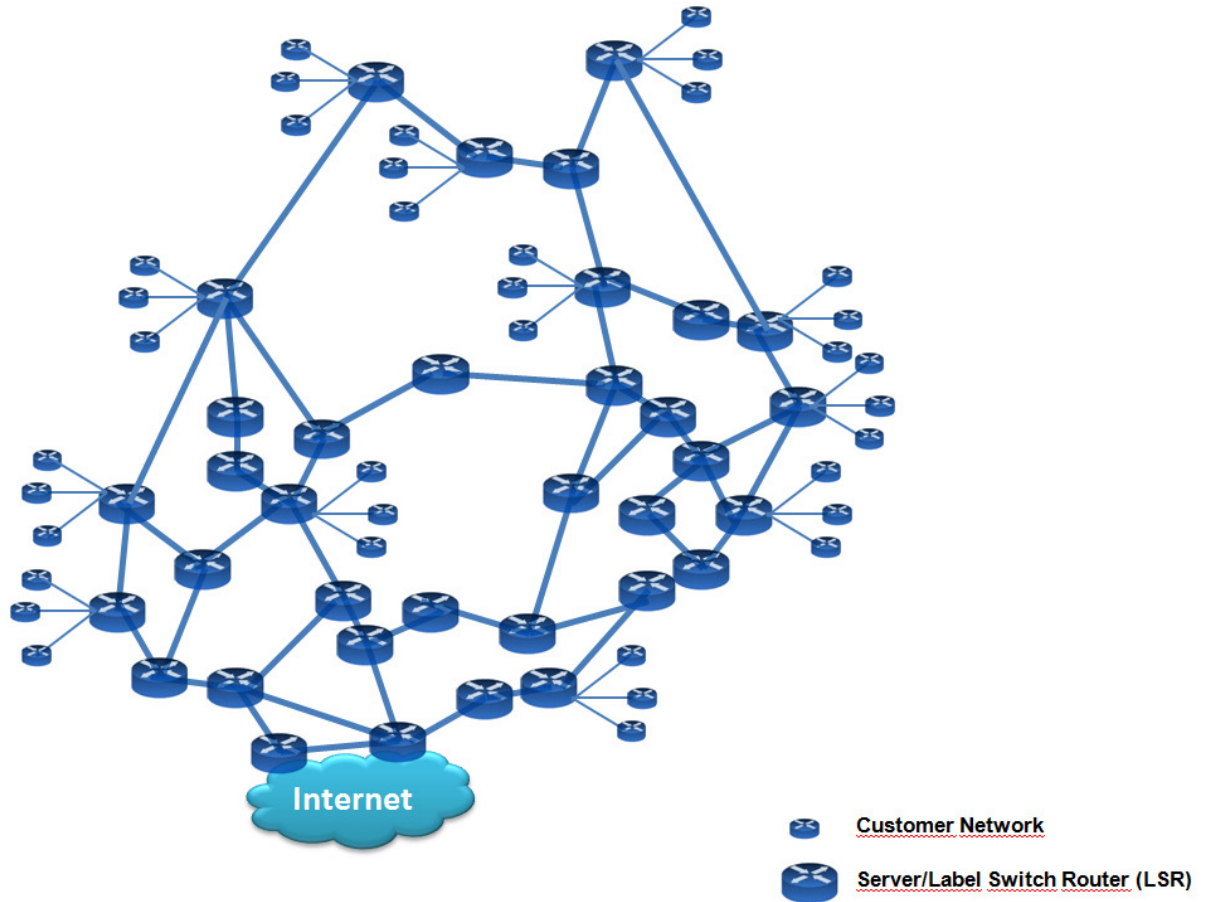


Figure 1. The MPLS Matrix Network.

CONCLUSION

IPTV, PC virtualization and other new data-intensive Internet user services are emerging in Supermatrix-project and elsewhere, requiring constant high bandwidths. To meet these demands, the operators of Finnet association are implementing a *MPLS-based matrix network architecture* where both MPLS functionality and service platforms are extended to as near to users as possible.

Glossary and Abbreviations

| | |
|------|--|
| FTTx | Fiber Access, Fiber to the (Home, Distributor, etc.) |
| HDTV | High Definition TV |
| IPTV | TV over Internet Protocol |
| LSP | Label Switched Path |
| LSR | Label Switch Router |
| MPLS | Multi Protocol Label Switching |
| QoS | Quality of Service |



| | |
|-----|-------------------|
| CoS | Class of Service |
| VoD | Video-on-Demand |
| WAN | Wide Area Network |