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A STUDY ON THE USE OF MPLS- TE IN IP CORE NETWORKS

A thesis presented by,
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Abstract

Keywords: Core network, NGN, MPLS, MPLS-TE, QoS, DSCP, differentiated services, SLA, SNMP, ICT

Today's demand for various applications like voice, data and real time video etc., are increasing in the consumer market and stakeholders mostly expect all services from a service provider. The tremendous growth in ICT adds more users and also traffic adds another dimension. NGN is expected to be the emerging IP network to transport converged services and MPLS and MPLS- TE plays an important role in this context. These new applications have increased demand for guaranteed bandwidth in the limited backbone capacity in the provider's network and the challenge is to provide differentiated class of services with required QoS and also to produce SLA performance reports to the end users when requested. Due to numerous benefits such as guaranteed end to end QoS, link protection and efficient use of core bandwidth MPLS- TE is being recognized and becoming popular among service providers. TE enables service providers to route network traffic in such a way that they can offer the best service to their users in terms of throughput and delay.

In this research MPLS- TE approach is used to implement end to end QoS for prioritized services and a SLA program is developed using SNMP to produce end to end reports on critical performance metrics like delay, round trip time, jitter and application aware services to customers. The study also investigates the process of steering traffic across the MPLS/IP core backbone to facilitate efficient use of available bandwidth between a pair of backbone routers to ensure the required service levels. Hence in a multilink environment where many links are available for routing we can avoid the shortest paths being congested. Since network can have different types of packets; packets were generated and marked based on DSCP for QoS which were routed in different TE tunnels in a lab environment. The lab results showed that, using, TE tunriels constrained routing can provide explicit paths to required destinations regardless of the paths calculated by the routing protocols thus

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bandwidth efficiency can be achieved in the core while ensuring end to end QoS for critical applications for a given IP SLA. Also, results obtained by the SLA program from a live operational network were acceptable in providing SLA performance reports.

DECLARATION

I do hereby declare that the work reported in this research project was exclusively carried out by me under the supervision of Eng. A.T.L.K. Samarasinghe. The work included in the thesis has not been submitted for any other academic qualification at any institution.

Signature: UOM Verified Signature Date: [illegible]

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ACRONYMS

MPLS	:	Multiprotocol Label Switching
GMPLS	:	Generalized MPLS
TE	:	Traffic Engineering
ICT	:	Information and Communication Technology
NGN	:	Next Generation Network
SLA	:	Service Level Agreement
ISP	:	Internet Service Provider
IP	:	Internet Protocol
UDP	:	User Datagram Protocol
TCP	:	Transmission Control Protocol
PDU	:	Protocol Data Unit
LIB	:	Label information base
LSP	:	Label Switched Path
LSR	:	Label Switch Router
LER	:	Label Edge Router
LSP	:	Label Switched Path
LDP	:	Label Distribution Protocol
CR-LDP	:	Constraint-based LDP
FEC	:	Forward Equivalent Class
PoP	:	Point of Presence
CoS	:	Class of Service
QoS	:	Quality of Service
PIM	:	Protocol Independent Multicast
DSCP	:	Differentiated Services Code Point
OSPF	:	Open Shortest Path First
ISIS	:	Intermediate System-to-Intermediate System
BGP	:	Border Gateway protocol
RIP	:	Routing Information Protocol
IGP	:	Interior Gateway Protocol
LSA	:	Link State Advertisement
TOS	:	Type of Service
PHB	:	Per Hop Behavior
ECN	:	Explicit Congestion Notification
CSCP	:	Class Sector Code Points
AF	:	Assured Forwarding
EF	:	Expedited Forwarding
WRED	:	Weighted Random Early Detection
WRR	:	Weighted Round Robin
CBR	:	Constraint Based Routing

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CSPF	:	Constrained Shortest Path Calculation
ATM	:	Asynchronous Transfer Mode
VPN	:	Virtual Private Network
VLSI	:	Very Large Scale Integration
ASIC	:	Application Specific Integrated Circuits
PE	:	Provider Edge
C	:	Core
RSVP	:	Resource Reservation Protocol
CIR	:	Committed Information Rate
OPEX	:	Operational Expenditure
CAPEX	:	Capital Expenditure
CSR	:	Cell Switch Router
SONET	:	Synchronous Optical Network
SDH	:	Synchronous Digital Hierarchy
DWDM	:	Dense Wavelength Division Multiplexing
LAN	:	Local Area Network
WAN	:	Wide Area Network
TTL	:	Time to Live
CPE	:	Customer Premises Equipment
ERP	:	Enterprise Resource Management
CRM	:	Customer Relationship Management
MRP	:	Material Requirements Planning
SNMP	:	Simple Network Management Protocol
MIB	:	Management Information Base
OID	:	Object Identifiers
VoIP	:	Voice over IP
MTTR	:	Mean-Time-To-Repair
FIFO	:	First In First Out

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