

DEDICATION

To my lovely family

ACKNOWLEDGEMENT

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ABSTRACT

Traffic engineering is a technique to control path of traffic at the networks to improving utilization of networks resources to avoid the congestion, for cost issue and grantee a certain amount of bandwidth is available for a particular customer's traffic, both in the steady state and under failure conditions.

Using standard internet protocol routing all traffic between two points is sent over the shortest path even though multiple paths may exist. Especially during periods of high traffic volume, this can result in traffic congestion on certain routes while alternative routes are underused, even though traffic protection is not granted during link failure, the standard IP routing protocols don't give a chance to mark some traffic as important than others.

In this thesis Multiprotocol Label Switching Traffic Engineering modeled using Graphical Network Simulator and applied virtual private network routing and forwarding concept and Open Shortest Path First, Multiprotocol Border Gateway Protocol, Resource Reservation Protocol and Label Distribution Protocol protocols by assign the routes in Multiprotocol Label Switching network over Traffic engineering tunnels for each virtual private network routing and forwarding to ensure the traffic of each customer go through deferent route tunnel and share the only one route when the other route tunnel turn down or give specific user preemption to use the overall route and disconnect the other user.

The emulation results shown that the each user's traffic went through deferent path from head quarter to branch and the users' traffic shared the only one route tunnel when the main route tunnel for customer "A1" tear down with the same users' priorities and the route bandwidth enough for the two users tunnels, when

Customer “A1” was given high priority and the route bandwidth not enough for the two customers customer B1’s tunnel was disconnected.

المستخلص

هندسة المرور هي تقنية للتحكم في مسار حركة المرور في الشبكات لتحسين استخدام موارد الشبكات لتجنب الازدحام، لغرض التكلفة او لمنح كمية معينة من عرض النطاق الترددی هو متاح لحركة المرور لعميل معین ، سواء في حالة مستقرة وفي حالة فشل المسار .

باستخدام بروتوكول الإنترنط القياسي توجيه كل حركة المرور بين نقطتين يتم إرسالها عبر أقصر الطرق على الرغم من مسارات متعددة قد تكون موجودة . وخصوصا خلال فترات حجم ارتفاع حركة المرور ، وهذا يمكن أن يؤدي إلى ازدحام حركة المرور على طرق معينة في حين لا تستخدم بكثرة طرق بديلة ، على الرغم من حماية حركة عدم منح خلال فشل الارتباط ، و بروتوكولات التوجيه بروتوكول الإنترنط القياسي لا تعطي فرصة لاعطاء بعض الحركة اولويه على اخرى.

في هذه الأطروحة على غرار تطبيق تبديل متعدد البروتوكولات باستخدام المؤشرات التعريفية في هندسة الحركة باستخدام محاكي شبكة رسومي و تطبيق مفهوم الشبكات الخاصه الافتراضية لتوجيه والتمرير و بروتوكولات فتح أقصر مسار أولا، بروتوكول بروتوكولات بوابة الحدود، بروتوكول حجز الموارد و بروتوكول توزيع تسمية لتعيين الطرق في شبكة تبديل متعدد البروتوكولات باستخدام المؤشرات التعريفية عبر قنوات هندسة الحركة لكل الشبكات الخاصه الافتراضية لتوجيه والتمرير لضمان المرور لكل عميل ليذهب من خلال قناة و مشاركة الطريق الوحيد عند فشل الطريق الآخر أو إعطاء الاولويه لمستخدم معين لاستخدام الطريق الوحيد وقطع المستخدم الآخر .

نتائج المحاكاة أظهرت أن حركة المرور لكل مستخدم ذهبت من خلال مسار مختلف من الفرع الرئيس إلى الفرع و حركة مرور المستخدمين شاركت مسار واحد عندما المسار الرئيس للعميل "أ" " فشل مع نفس الأولويات للمستخدمين و عرض النطاق الترددی للمسار يكفي للمستخدمين، و عندما أعطى العميل "أ" أولوية عالية و عرض النطاق الترددی للمسار لا يكفي للمستخدمين تم قطع اتصال العميل "ب".

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ABBREVIATIONS

Abbreviation	Description
MPLS	Multiprotocol Label Switching
TE	Traffic Engineering
LSP	Label Switching Path
IP	Internet Protocol
FRR	Fast Reroute
Cisco	San Francisco
GNS3	Graphical Network Simulator
OSPF	Open Shortest Path First
VRF	Virtual Routing Forwarding Table
VPN	virtual private network
QoS	Quality of Service
PE	Provider Edge Router
P	Provider Router
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IPX	Internet Protocol
ATM	Asynchronous Transfer Mode
PPP	Peak to Peak Protocol
L	Label
LER	Label Edge Routers
LSR	Label Switching Routers
FEC	Forwarding Equivalence Class
BGP	Border Gateway Protocol
TTL	Time To Live
RSVP	Resource Reservation Protocol
TDP	Tag Distribution Protocol
LDP	Label Distribution Protocol
IS-IS	Intermediate System-to-Intermediate System
EIGRP	Enhanced Interior Gateway Routing Protocol

IGRP	Interior Gateway Routing Protocol
IGP	Interior Gateway Protocol
RIP	Routing Information Protocol
LFIB	Label Forwarding Information Base
CSPF	Computes Shortest Path First
ERO	Explicit Route Object
AS	Autonomous System
ASBR	Autonomous System Border Router
SLA	Service-level agreements
RD	Route Distinguishers
MP-BGP	Multiprotocol Border Gateway Protocol
CE	Customer Edge Router
RT	Route Target
HQ	Head Quarter
DiffServ	Differentiated Services
TCP	Transmission Control Protocol