بسم الله الرحمن الرحيم

قال تعالى:

(وَمَا أُوتِيتُمْ مِنَ الْعِلْمِ إِلَّا قَلِيلًا)

[الإسراء: 85].

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ABSTRACT:

A Virtual Private Network (VPN) is a packet switching network technology that creates a secure network connection over a public network such as the Internet or a private network owned by a service provider. Large corporations, educational institutions, and government agencies use VPN technology to enable remote users to securely connect to a private network.

Quality of service is one of the important issues for this type of service in order to offer different classes of service for data transfer since it is carried over public, shared network.

VPN service is implemented via various technologies with different Quality of service and security aspects; the most well known technologies are (**FR**) **F**rame **R**elay, **ATM** (Asynchronous **T**ransfer **M**ode) and the latest technology is **MPLS** (Multi-**P**rotocols **L**abel **S**witching).

This thesis studies and compares the different VPN models, technologies that provide this service, and the required Quality of Service parameters to guarantee the class of service for critical data transfer through the public network.

Sudanese Banks connectivity with their Branches and Central Electronic Banking System is taken as a case-study and recommendations to improve this important connectivity are made.

الخلاصة:

الشبكة الإفتراضية الخاصة هي تقنية تقوم بإنشاء شبكة آمنة عبر شبكة packet switching عامة مثل شبكة الإنترنت أو شبكة خاصة مملوكة من قبل مقدم الخدمة. الشركات الكبيرة، المؤسسات التعليمية والهيئات الحكومية تستخدام تكنولوجيا الشبكات الإفتراضية الخاصة لتمكين المستخدمين البعيدين من التواصل بشكل آمن مع الشبكة الخاصة.

جودة الخدمة هي واحدة من القضايا الهامة لهذا النوع من الخدمات من أجل تقديم فئات مختلفة من الخدمة لنقل البيانات نظرا لأن هذا النقل يتم عبر الشبكة العامة المشتركة.

يتم تقديم خدمة الشبكات الافتراضية الخاصة عبر تقنيات مختلفة من ناحية جودة الخدمة والأمن، والتقنيات الأكثر شهرة هي Frame Relay ، ATM وأحدث التقنيات هى MPLS.

في هذه الرسالة ندرس ونقارن نماذج الشبكات الافتراضية الخاصة المختلفة ، التقنيات التي توفر هذه الخدمة و العوامل اللازمة لضمان جودة الخدمة لنقل البيانات الهامة من خلال الشبكة العامة.

تم أخذ ربط البنوك السودانية مع فروعها و النظام المصرفي الالكتروني كنموذج للدراسة ووضع توصيات لتحسين هذا الربط المهم.

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List of abbreviations:

Abbreviation	Description
ABR	Available Bit Rate
ACL	Access Control List
ATM	Asynchronous Transfer Mode
ATM	Automated Teller Machine
BCS	Behavior Class Selector
BECN	Backward Explicit Congestion Notification
BGP	Border Gateway Protocol
CAC	Call Admission Controls
CAN	Campus Area Networks
CBR	Constant Bit Rate
CDV	Cell Delay Variation
CDVT	Cell Delay Variation Tolerance
CE	Customers' Edge routers
CIR	Committed Information Rate
CLLM	Consolidated Link Layer Management Protocol
CLR	Cell Loss Ratio
C-network	Customer Network
CoS	Class of Service.
CPE	Customer Premises Equipment
CR-LDP	Constraint-Based Routing/Label Distribution Protocol
DE	Discard Eligibility
DiffServ	Differentiated Services
DLCI	Data Link Control Identifier
DNS	Domain Name Server
DSCP	Differentiated Services Code Point
EBS	Electronic Banking System
ECN	Explicit Congestion Notification
EIGRP	Enhanced Interior Gateway Routing Protocol
ELSR	Edge Label Switch Routers
Exp field	Experimental field
FEC	Forwarding Equivalence Class
FECN	Forward Explicit Congestion Notification
FR	Frame Relay
FTP	File Transfer Protocol
GRE	Generic Routing Encapsulation
HQ	Head Quarter
HR	Human Resources
ICN	Implicit Congestion Notification
IGP	Interior Gateway Protocol
IGRP	Interior Gateway Routing Protocol
Intserv	Integrated Services

IPSec	IP Security
ISDN	Integrated Services Digital Network
LAN	Local Area Network
LDP	Label Distribution Protocol
LER	Label Edge Router
LFIB	label Forwarding Information Base
LSP	Label Switching Path
LSR	Label Switch Routers
MAC	Media Access Control
MAN	Metropolitan Area Networks
MaxCTD	Maximum Cell Transfer Delay
MBS	Maximum Burst Size
MCR	Minimum Cell Rate
MFS	Maximum Frame Size
MPLS	Multiprotocol Label Switching
OSPF	Open Shortest Path First
P Router	Provider Routers
PAN	Personal Area Networks
PBX	Private Branch Exchange
PCR	Peak Cell Rate
PE	Provider Edge Router
PHB	Per Hop Behavior
P-network	Provider Network
POP	Point Of Presence
PoS	Packet over SONET
PSTN	Public Switched Telephone Network
PVC	Permanent virtual Circuits
PVC	Permanent Virtual Circuit
QoS	Quality-of-Service
RD	Route Distinguishers
RIP	Routing Information Protocol
RM	Resource Management
RSVP	Resource Reservation Protocol
RT	Route Targets
RTGS	Real Time Gross Settlement systems
SCR	Sustainable Cell Rate
SDH	Synchronous Digital Hierarchy
SMDS	Switched Multimegabit Digital Service
SONET	Synchronous Optical Network Technologies
SP	Service Provider
SVC	Switched Virtual Circuits
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TCP	Transport Control Protocol
TDM	Time Division Multiplexing

TDP	Tag Distribution Protocol
TE	Traffic Engineering
ToS	Type of Service
UBR	Unspecified Bit Rate
UDP	User Datagram Protocol
UNI	User Network Interface
VBR	Variable Bit Rate
VC	Virtual Circuit
VCC	Virtual Channel Connections
VCI	Virtual Channel Identifier
VoIP	Voice over IP
VPC	Virtual Path Connections
VPDN	Virtual Private Dial-up Network
VPI	Virtual Path Identifier
VPLS	Virtual Private LAN Services
VPN	Virtual Private Network
VRF	Virtual Routing Forwarding
WAN	Wide Area Networks