ชื่อ-สกุล นายอภิรัตน์ เชาว์เครือ กระดาษแผ่นที่ 1 รหัสนักศึกษา 59017497

for Staples

network diagram
- อุปกรณ์แต่ละอันเชื่อมอะไร
2 Toplogy
Type Diagram
topology
physical Diagram
- บอกเป็นแผ่นๆ
logical diagram
เป็นภาพรวมทั้ง
Component
- End Devices
- Intermediary network devices
  - Network Access
  - Internetworking
  - Security
- Network Media
  - copper
  - Fiber Optic
  - wireless
Home office remote office
lan wan แยกกันด้วย Admin

Reliable Network
quality of Service
Security ผู้ใช้งานจริง
scalability เพิ่มขยาย
Fault Tolerance หมายความถึง
พร้อมเปลี่ยนทางสำรอง

application layer telnet FTP SMTP POP3 HTTP DHCP RDD
presentation
session LDAP DNS
transport TCP UDP BGP
network IP ICMP RIP OSPF NAT
Datalink Ethernet 802.3 802.2 LLC PAP CHAP PPP ARP HDLC
Physical COAX LAN & FIBER
FTP 20 data
FTP 21 command

Hub layer 1
CSMA/CD
Switches, Bridges 2
Learning Flooding Filtering
Forwarding / Aging
Router 3

D.MAC S.MAC SIP DIP SPort DPort
LAN 100 mps 100 bT
5+9015
BB B A
อุปกรณ์ต่างกันตรง / เหมือนกันcross
cross
switch-hub
computer-router

RJ-45
A T568A B T568B สลับ
1,3 2,6 V
DCE + clock rate

02 Basic Router
Port 2^{16} 0-65535
IANA → 0-1023
regis - 1024-49151
Port Random 49152-65535

20 FTP Data
21 FTP Command
23 Telnet
25 SMTP
53 DNS
80 HTTP
81 Host 2 Name Server

IP	High Order		
A /8	0	0-127	16,777,216
B /16	10	128-191	65,535
C /24	110	192-223	254
D IP multicast /28	1110	224-239	N/A
E research			

Private 10.0.0.0 /8
172.16.0.0-172.31.255.255 172.16.0.0/12
192.168.0.0/16

Time to Live

Version	IP Header Length	Differentiated Service	Total Length	
Identification			Flag	Fragment offset
TTL	Protocol		Header Checksum	
Source IP Address				
Destination IP Address				
Options (optional)			Padding	

phy Address MAC
6 byte 48 bit 12 digit xxxx.xxxx.xxxx
OUI 3byte 24bit
ARP

Cisco IOS
CLI-Based
Boost
- post
- Boot loader low-level
cpuinitialization
- " flash filesystem
- " locate and loads IOS
Image into memory

ภาษาทาง
Console port
Telnet
secure Shell (SSH)
Aux Port

Basic
Hostname,
Limiting Access
Addressing Divice
Verifying Connectivity
Saving Configurations

user >
Privileged #

user EXEC command Router >
Ping
show (limited
enable
Privileged Router#
configure terminal → Router(config)#
show running-config
show startup-config
ip route
interfaces
ip interface
ip interface brief
Traceroute
ping
copy running-config
startup-config

hostname
enable secrect
ip route
interface ethernet < Interface (config-if)# → enable secret class
serial
dsl
ip address 192.168.10.1 255.255.255.0
ipv6 address
shutdown / no shutdown
router rip
ospf
eigrp
network
version
auto summary
line vty
console
etc
password
login
modem comand

for Staples

for Staples

Router
- Characteristic Network
  - Topology
  - Speed
  - Cost
  - Security
  - Availability
  - Scalability
  - Reliability

RAM Volatile — Running IOS, Configuration file, IP routing and ARP tables, Packet buffer
ROM Non-V — Bootup instructions, Basic diagnostic software, Limited IOS
NVRAM NV — Startup configuration file (hostname, Routing Protocol)
Flash NV — IOS, other system files

- Test Router hardware
  - Power-on Self Test POST
  - Execute bootstrap loader
- Locate & load Cisco IOS software
  - Locate IOS
  - Load IOS
- Locate & load startup
  - Bootstrap program

ทั่วไป/แนบ
WIC

Device name
Interfaces
IP address/subnet
Default gateway

Gateway ส่วนมาก .1 ไม่ก็ .254
Fa 0/0
S0/0/0

DHCP
RJ-45 – DB9

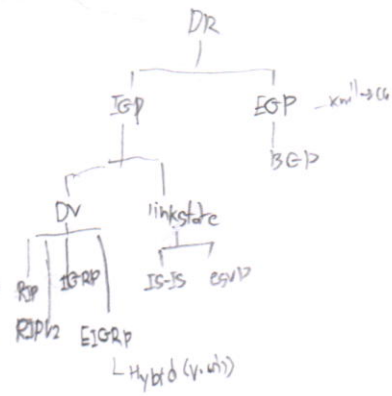
hostname name
enable secret password
banner motd # text #
interface type slot/port
ip address x.x.x.x y.y.y.y
DCE clock rate 56000

R2 to R3 serial
MAC control TYPE
PxSF 0x00 800
T1 1.5 Mbit/s

Dynamic routing protocols
- Best path
  - Routing Information Protocol (RIP) hop count
  - Open Shortest Path First (OSPF) bandwidth cost
  - EIGRP
    Enhanced Interior Gateway Routing Protocol
    Bandwidth, delay, load, reliability
- Load Balancing
- Administrative Distance (AD) ความน่าเชื่อถือ

Connected	0
static	1
internal EIGRP	90
OSPF	110
RIP	120

routing table in RAM
- Local interface config (L)
- Connected config and active (C)
- Static manually config
- Dynamic routing protocol EIGRP OSPF



ISIS Intermediate System-to-Intermediate System

D 10.1.1.0/24 [90/2170112] via 209.165.200.226 00:00:05 serial0/0/0
- how network learn by the router
- destination
- AD
- metric to reach the remote network
- next hop IP network
- เวลาที่ผ่าน
- interface

Static Route
+ เร็ว
  ปลอดภัย
  ไม่รู้ ไปอย่างอื่นทาง
- เวลาน้อย
  scalbility
- ใช้เมื่อเล็ก

Default static Route – ไม่ทราบปลายทาง
ip route 0.0.0.0 0.0.0.0 172.16.2.2
S*

router(config)# ip route 172.16.1.0 255.255.255.0 172.16.2.2 | ปลายทาง
S0/0/0 ออกทางไหน
172.16.2.2 Ge 0/1

C .0 network
L .1

classful ตามคลาส
CIDR แบ่งเองได้ /25/26
VLSM แบ่งอีกที
floating static ต้องสูงกว่า AD

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for Staples

DRP
Dynamic Routing Protocols
- หาทางที่ดีที่สุด
- share info.
- Auto update

	D	S
complex	independent	network size
ความรู้	Advance	ไม่ต้อง
topology change	Automatic	Admin
scaling	ง่ายต่อเติม	ง่าย
security	Less	more
Resource	CPU mem link Bandwidth	No extra
Predict	ไม่รู้	ทางในแบบนั้น ทางเดิม

Interior Gateway Protocols (IGP)
- Distance vector
- Link state

Metric
- Hop count
- Bandwidth
- Cost
- Delay
- load
- Reliability

AP
connect 0
static 1
OSPF 110
IS-IS 115
RIPv2 120

for Staples

Convergence ?

Distance Vector Routing Protocols
RIP, IGRP, EIGRP
- Distance to find
- Vector, direction

ลักษณะ
- periodic update
- Neighbors
- broadcast update
- routing table

เกณฑ์
- เวลา convergence
- Scalability
- Resource usage
- Implementation & maintenance

Network Discovery
- cold starts Rater Initial Start up
- Initial Exchange of Routing Info
- Exchange of Routing Info

Routing table Maintenance
- Periodic update RIP
- Bounded update EIGRP
- Triggered Update
- Random Jitter

Routing loop
- 16 hop unreachable
- Hold down Timer

for Staples

split Horizon Rule
ไม่อัปเดตในทางที่ส่งมา

Poisoning
mark unreachable
ใน update ที่ส่งไปอื่น

split horizon with poison reverse
interface unreachable

IP & TTL 8 bit

RIP v2 port 520
classful, DV routing Protocol
Metric = hop count hop > 15 unreach
update broadcast 30 sec
No subnet, No VLSM

Datalink Frame header	IP Packet Header	UDP head	section RIP message 512 Byte 25 routing

16 32

comd. = 1 or 2	V = 1/2	Zero
Add. family 2 = IP		zero ; Route Tag
IP Address		
Zero : subnet mask		
zero : Next Hop		
Metric (hop)		

Route Entries

multiple Route Entries, max 25
- request
- response

\# (config)# router rip
\# (config-router)# network 192.1.1.6

show ip protocol
debug ip rip

\# (config-router)# passive-interface s 0/0/0

Automatic Summarization
ไม่ subnet mask
boundary router

not support discontiguous network
คือ แยกออกจากกัน

Default Route
ip route 0.0.0.0 0.0.0.0 S0/0/1

(config-router)# default-information originate

propagate default route

IGP : RIP, IGRP, EIGRP
OSPF IS-IS
EGP : BGP

	RIPv1	RIPv2	IGRP	EIGRP
speed convergence	S	S	S	fast
scal	S	S	S	S
VLSM	×	✓	×	✓
Resource Usage	L	L	L	M
Implemen & maint	simple	S	S	complex

RIP V2

V2
- classful
- not sup discontiguous subnet
- —"— VLSM
- —"— no subnet
- Routing update broadcast

V2
- classless
- next hop adress include in update
- Routing update multicast
- use authentication

CIDR classless Routing Protocol
+ supnet
support Variable Length Subnet Masking (VLSM

— same —
- timer prevent routing loop
- split horizon / poison reverse
- triggerd update
- Max hop 15

RIP v1 Limitations
- Loop back interface
- Null Interfaces
- static route and null interface
- Route redistribution / [illegible]
- Verify and Testing Connectivity
show ip interface brief, ping, traceroute
- Examining the routing tables
- not VSLM / subnet
- no CIDR

RIP v2
(config-router) version 2
~ no auto-summary

VLSM & CIDR

CIDR use supernetting

Troubleshooting
- Check the status of all links
- Check cabling
- Check IP address & subnet mask
- remove unneed

show ip interfaces brief
show ip protocols
debug ip rip
show ip route

Access Control List

last statement implicit deny

- standard 1-99, 1300-1999
check source all protocol
access-list 10 permit 192.168.3.0 0.0.0.255

- Extended ACLs 100-199 2000 2699
Check source, des
access-list 103 permit tcp 192.168.30.0 0.0.0.255 any eq 80

wild card ตรงข้ามกับ subnet mask
255.255.255.255 ไม่เอาทุกบิต
ยอมผ่านได้ทั้งหมด

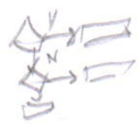
Guild line for ACL
- ใช้ ALC บน firewall
- config บน border router

- 3 P
  - 1 ACL per Protocol
  - 1 ACL per direction
  - 1 ACL per interface

Extend ใกล้ source
standard ใกล้ destination
เพราะระบุแค่ต้นทาง [illegible] src

---

standard
(config) # access-list number deny | permit | remark source [wildcard] [Log]
กรณีไม่มี If ตรงกับเงื่อนไข ก็จะ Deny



config # access-list 1 deny host 192.168.10.10
access-list 1 permit any
interface g0/0
(if) ip access-group 1 in
number/name

ip access-list standard 1 (extended)
15 deny ~
no 10
no access-list 1

show access-lists 1
show running-config

Extend
access-list 114 permit tcp 192.168.20.0 0.0.0.255 any eq 23 (telnet)
permit any any

access-list number {deny | permit | remark} protocol src [wildcard] [operator] [port portname] des [des-wild] [operator] [port ~] [established]

R2# debug ip packet 101

Inbound [illegible]

outbound [illegible]

interface ~
)# ip access-group 101 in

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for Staples

Linkstate Routing Protocol
- complete map network Topology
- link state information
- large network
- Fast convergence
  OSPF standard
  IS-IS provider network
- ใช้ Dijkstra's algorithm
  หรือ shortest path first (SPF)

Process
- learn own link
- Say Hello
- Build state link Packet
- Flooding LSP & Building Database
- Building the SPF Tree & Routing Table

ประโยชน์
- shortest Path
- flood LSP faster convergence
- LSP เมื่อเปลี่ยน Topology
- hierachical

ข้อเสีย
- ใช้ memory
- ใช้ CPU
- เปลือง Band width

for Staples

OSPF
show ip ospf neighbor
database

Data link Frame Header	IP Packet Header	OSPF Packet Header	OSPF Packet Type-Spec Data Base
Mac Des, Mac Src	IP source, ip Des, Protocol Field	type, Router ID, Area ID	01 Hello, 02 DBDes, 03 link state Req, 04 Link state update, 05 Link ackn

7/8	16	24	31
version	Type=1	Packet length	
Router ID			
Area ID			
Checksum		Autype	
Authentication			
Authentication			
Network Mask			
Hello Interval	Option	Router Priority	
Dead Interval			
Designated Router DR			
Backup Designated Router BDR			
List of Neighbor(s)			

OSPF Packet Header

OSPF Hello packet

number of adjacencies = n(n-1)/2
(n number router)

for Staples

8	16	24	32
opcode	Hardware Type	Hard. add. length	Hops

OSPF initial
- Create adjacencies
- Exchange routing info
- calculate the best routes
- Reach convergence
- OSPF progresses through several states while attempting to reach

Establish Neighbor Adjacencies: Down State → init state → Two-Way State

Synchronize OSPF Database: Exstart State → Exchange State → Loading State → Full State

คำสั่ง
(config) router ospf process-id
1-65535
(~ -)# router-id 1.1.1.1
end

หรือ →
interface loopback 0
ip address 1.1.1 255.255.255.255
clear ip ospf process
(~ router)# network add. wild area id
network 172.1.1.1 0.0.0.255 area 0

Cost = reference banwidth / interface banwidth
10^8 bps หน่วยเป็น bit
auto-cost reference-banwidth 1000
Gigabit Ethernet

BW 1544 kbit/s
if banwidth ...
if ip ospf cost

DHCP
Dynamic Host Configuration Protocol
- IP Address
- subnet mask
- Default gateway address
- DNS sever address

DHCPv4
- Manual
- Automatic เลือกจาก pool ถาวร
- Dynamic

second = 2 byte	Flags
Transaction identifier	
client ip address	4
Your IP Address	4
server IP Address	4
Gateway IP Address	4
Client Hardware Address	16
Server name	64
Boot Filename	128
DHCP Options - variable	

Discover Mess

Src MAC, Des MAC FFFFFFFFFFFF	ip src, ip Des 255.255...	udp 67	CIADDR 0.0.0.0, GIADDR 0.0.0.0, Mask 0.0.0.0, CHADDR MAC A

Config
- Exclude add from pool
- set DHCP pool name
- config range

Config# ip dhcp excluded-address 192.168.10.1 192.168.10.9
ip dhcp excluded-address 192.168.10.254
ip pool LAN-POOL-1
(dhcp-config)# network 192.168.10.0 255.255.255.0
default-router 192.168.10.1
dns-sever 192.168.11.5
domain-name example.com
end

show running-config
show ip dhcp binding
server statistics

ip config /all

Basic switch Address Resolution Protocol
LAN - 2 Admin
borderless switch - ออกแบบ ...
ให้มี Hierarchical Modularity Resiliency
Flexibility

Access Layer switch A ...
Distribution Layer switch B ECC
core Layer switch C ...

Port security A
VLANS A
Fast Ethernet / Gigabit Ethernet A, D, C
Power over Ethernet (PoE) = A
Link aggregation ADC
Quality of service (QoS) ADC
Layer 3 support D, C
High forwarding rate D, C
security policy / AC control D

ปัจจัยเลือกซื้อ switch
- cost ราคาและความต้องการของ interface
- port density จำนวน port
- Power PoE
- Reliability
- Port speed
- Frame Buffer
- scalability

to maximize LAN bandwith perform
- function and placement Server
- collision detection issue
- segmentation issue
- boadcast domain issue

MDF : Main Distribution Facility
IDF : Intermediate Distribution Facility
VCC : vertical cross-connect
HCC : Horizontal cross-connect

switch Operation
- Learning = เก็บ src MAC
- Aging = อายุ MAC Add
- Flooding = unknow unicast
  musticast
  broadcast
- forwarding = ส่งไปรู้ทาง
- Filtering = ลงกรองแพ็กเก็ตที่ไม่ต้องการ

Receive Frame
↓
Learn Sourse address or refresh aging
↓
unknow
N | ↘ Y Flood Packet
source and Des same interface
N ↓ ↘ Y Filter Packet
Forward unicast to correct port

Frame Forwarding
- store and Forword Switching
  - check for error CRC
  - ถ้า frame ครบแล้ว → ไป
- cut-through-switching
  - No FCS check
  - Fast-forward 12 byte src, des MAC
  - Fragment-free 64 byte

Collision Domain
- ทุก port ของ hup
- แต่ละ port ของ switch

Broadcast Domain
switch same board cast
แยกด้วย router

switch Boot seq
- post
- Run boot loader Software
- Boot loader does low-level CPU initial
- Boot loader initialize flash
Boot loader locate and load default IOS

Basic Switch Management
- IP information (addr, subnet mask, gateway) is to be assigned to switch SVI (switch virtual interface)
SSH operation (TCP 22)
- secure shell (SSH) encrypted command line ใช้ unix

switch Port security
- static secure MAC add
switchport port-security mac-address mac-address
- Dynamic secure MAC
switchport port-security mac-address sticky
- sticky secure อาจเป็น dynamically หรือ manually configured

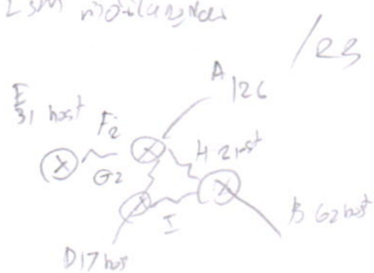
Address Resolution Protocol

ARP Address Resolution Protocol
- Mapping IP to MAC address
- destination Outside the Local Networks
- removing addr. Mapping
cmd > arp -a
ARP request:
Dest addr : FFFF.FFFF.FFFF
opcode 0x0001
ARP reply
opcode : 0x0002

IPV4 — classful
— classless
classless Inter-Domain Routing
- Fixed Lenght Subnet Masking

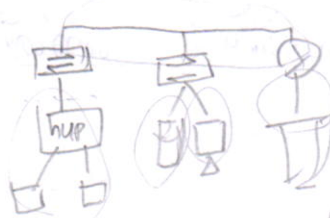
- VLSM ทำต่อไม่เท่ากัน

/23



Network	Req Host	max Host	Subnetwork	Sub
A	126	128	161.206.6.0 -127	.128
B	62	62	.128 - 191	.192
C	30	30	7.0 - .31	.224
D	17	30	32 - 63	.224
E	31	62	192. - 255	.192
F	2	2	7.64-67	252
G	2	2	7.68-71	252
H	2	2	.72 .75	252
I	2	2	76 - 76	252

หา subnet E
อาจ เกิน 256 ได้ 64



Collision 5
Boscast 2

configure switch แบบเหมือน switch
S1 (config)# interface vlan 99
if)# ip addres 172.17.99.11
255.255.0.0
no shutdown
end

Default Gateway
config)# ip default-gateway
172.17.99.1
end

config static secure MAC addr
config-if # switchport mode access
~~~~ port-security
# switchport port-security mac-addr
MAC-ADD / sticky
static dynamic

security Violation mode

| violation mode | Forward Traffic | Send Syslog Message | Display Error Message | Increase violation counter | shutdown Port |
|---|---|---|---|---|---|
| protect | ✗ | ✗ | ✗ | ✗ | ✗ |
| Restrict | ✗ | ✓ | ✗ | ✓ | ✗ |
| shutdown | ✗ | ✗ | ✗ | ✓ | ✓ |
~~~~

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for Staples

ปัญหา
- Mac database instability
- Broadcast storms
- Multiple frame transmission

ใช้ Spanning Tree Algorithm
- แก้ไขไม่ให้มี loop

find
Root Bridge
Root Port
Designated port
Non-Designated ports
Alternate and backup port

Root Bridge
Bridge Priority ; Extend System ID ; MAC
4 bit ; 12 bit ; 48 bit

ดู Priority ก่อนค่อย MAC

Bridge ID Priority > MAC > port number (ตามลำดับ)

Link Speed	Cost Revised	cost
10 Gb/s	2	1
1 Gb/s	4	1
100 Mb/s	19	10
10 Mb/s	100	1000

1 RootBridge per Network
1 Root port per non-Root Bridge
1 designated per segment

Bridge ID 8 Bytes

B Priority	Mac Address
2 Byte	6 Byte

BP Extend
4 Bit 12 Bits
Vlan

VSTP

Protocol	Stand	Resources Need	Convergence	Tree Calculation
STP	802.1D	Low	slow	All VLANS
PVST+	Cisco	High	slow	Per VLAN
RSTP	802.1w	Medium	Fast	All VLANS
Rapid PVST+	Cisco	Very High	Fast	Per VLAN
MSTP	802.1S Cisco	Med/H	Fast	Per Instance

PVST+ vlan เยอะกว่าได้

Rapid PVST+
ไม่มี Block port เปลี่ยนเป็น Alternate Port (DIS)

RSTP BPDU

Flag Field	Field Bit	Bit
	Topology Change	0
	Proposal	1
	Port Role	2-3
	Unknown port	00
	Alternate/Backup port	01
	Root port	10
	Designated Port	11
	Learning	4
	Forwarding	5
	Agreement	6
	Topology Change Acknowledgment	7

EdgePort - ไม่ต่อสวิตช์เพื่อ

Link Types

spanning-tree VLAN 1 root primary
spanning-tree VLAN 1 priority 24576
spanning-tree VLAN 1 root secondary
show spanning-tree
config-if)# spanning-tree portfast
~~~ bpduguard enable
4096 lowest posible
~~~ active
↳show mac

spanning-tree mode rapid-pvst
int fa 0/0
spanning-tree link-type point-to-point
end
clear spanning-tree detected-protocols

Analyzing
show cdp neighbors
show spanning-tree vlan

virtual Router
first-hop redundancy protocol
HSRP Hot Standby Router Protocol
Active / standy
virtual IP MAC share
show standy

Gateway Load Balancing Protocol

for Staples

for Staples

VLAN virtual LAN

Layer 2

1 broadcast domain [illegible]

1 router [illegible]

[illegible]

[illegible]

- improved security
- Reduce cost
- Better Performance
- Smaller Brodcast Domains
- IT Efficiency
- Management Efficiency

show vlan brief

VLAN Trunk carries more than one VLAN

802.1q

VLAN [illegible]

[illegible]

Ethernet Frame

Dst MAC SrcMAC Type/Length Data FSC

802.1Q Frame ↑ Tag — FSC change

Ethernet Type(0x8100) Pri C VLAN Identifier

2 Byte 3Bit 1Bit 12 Bit

Tag [illegible] Trunk

Native VLAN ไม่แท็ก

Catalyst switches 2960, 3560

มี 4000 VLANs

normal 1-1005

Config in vlan.dat (flash)

VTP learn in normal range

Extended Range VLANs

1006-4096

เก็บ → running-config NVRAM

VTP don't learn

```
config ter
) vlan vlan-id
) name vlan-name
) end

Interface fa0/8
  switchport mode access
  switchport access vlan 20
  end
or int range fa0/11-20

(config-if-range)

no switchport access vlan
```

[illegible] vlan [illegible]

แต่ถ้า,
no vlan 20
interface [illegible]

```
sh vlan brief
sh vlan name ....
sh vlan summary
sh int vlan 20
```

Trunk

```
int ...
a. switchport mode trunk
b. switchport trunk native vlan 99
   switchport trunk allowed vlan vlan-list
                                 10,20,30
```

(a, b: ใช้พร้อมกัน)

Reset

```
no switchport trunk allowed vlan
no ———— native vlan
switchport mode access
```

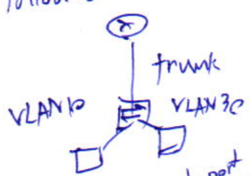
Inter-VLAN

[illegible] VLAN [illegible]

[illegible] Router [illegible]

[illegible]

[illegible]



SW switchport mode trunk

Router

```
int g0/0.10
(config-subif)
encapsulation dot1q 10
ip address 172.17.10.1 255.255.255.0
int g0/0.30
~~~~~ 30

int g0/0 .30.1
no shutdown

show vlans
```

ชื่อ-สกุล นาย[illegible] [illegible] กระดาษแผ่นที่ 5 รหัสนักศึกษา [illegible]

for Staples

VTP VLAN Trunking Protocol

Layer 2 addition, deletion and renaming

ISL , IEEE 802.1Q ผ่าน trunk

0 - 4294927295 32 bit

	Server	Client	Transparent
Source Msg	✓	✓	✗
Listen Msg	✓	✓	✗
Create VLAN	✓	✗	✓
Remember	✓	✗	✓

server save in NVRAM

(config) vtp version 2

- vlan database

(vlan) vtp V2-mode

vtp domain cisco 1-32

vtp password ... 8-64

- vtp mode server / client / transparent

for Staples

- vtp server

config ter

vtp version 2

vtp md server

vtp domain cisco

vtp password mypassword

#show vtp status

show vtp counters

หัวข้อแก้เสีย

delete vlan.dat

erase startup-config

VTP Pruning

vlan} vtp pruning

int fa 0/1

switchport trunk pruning vlan remove vlanId

for Staples

NAT

SA DA

inside Local outside Local

SA DA

inside Global outside Global

Static NAT

one to one

Dynamic NAT

มี pool ของ [illegible]

Port Address Traslation

PAT

NAT overload

port number

ประโยชน์ของ NAT

- ประหยัด Address

- [illegible]

- [illegible]

- [illegible] Network

ข้อเสีย

- [illegible]

ent to end ลดลง

end to end traceability ลดลง

[illegible]

[illegible] TCP [illegible] Disrupted

Static NAT

(config) # ip nat inside source static localip globalip

interface ...

If# ip nat inside

if) ip nat outside

show ip nat translations

verifying

clear ip nat statistics

show ip nat statistics

Dynamic NAT

- ip nat pool name startip endip {netmask netmask | prefix-length prefix-length}

- access-list acclistnumber permit source [source-wildcard]

ip nat inside source list access-listnumber pool name

→ int inside outside

show ip nat translation verbose

PAT pool

[illegible]

[illegible]

pool name overload

Single

access-list access-list-number permit source [source-wildcard]

ip nat inside source list number interface fa 0/1 overload

int ... ip nat inside

... ... outside

EIGRP
เพิ่มเติมจาก IGRP
+classles

Diffusing Update Algorithm
DUAL
สำรองเส้นทาง

RTP Reliable Transport Protocol
Partial and Bounded updates
Equal and Unequal cost.
Load balancing

Packet type
- Hello
- update
- Acknowledment
- Query
- Reply

Autonomous System (AS)
16 bit 0-65535

router eigrp AS-#
Process ID

eigrp router-id 1.1.1.1
- มา loopback สูงสุด
- มา interface physical สูงสุด

network net-number [wildcard-mask]

router)# passive-interface fa0/1

show ip eigrp neighbors
show ip protocols

K_1 bandwidth
K_3 delay
K_4 load
K_5 reliability

สูตรเต็ม
metric = [K1 * ban + K3 * delay] * 256

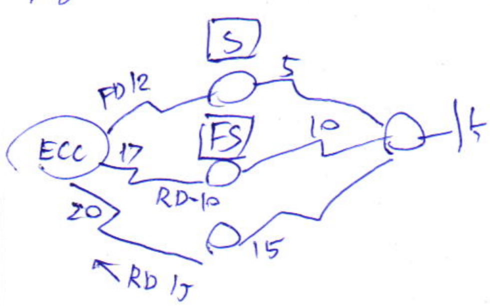
Media	delay
GE	10
FE	100
FDDI	100
16M Token Ring	630
Ethernet	1000
T1	20000
DS0 64Kps	20000
1024 Kps	20000
56KPS	20000

$$\left(\frac{10{,}000{,}000}{\text{bandwidth}} + \frac{\text{sum of delay}}{10}\right) \times 256 = \text{metric}$$

bandwidth ที่น้อยที่สุด delay รวม

Successor
cost น้อยที่สุด

FS
Feasible Su ตัวสำรอง
RD Reported
FD



if (RD < FD)
FS

show ip eigrp topology

IPV6
128 bit
340 undecillion

Dual stack ใช้ร่วมกัน
Tunneling ห่อหุ้ม IPV4
Translation IPV6 คุยกับ IPV4 ได้

~~AAAA:AAAA~~
AAAA:□:□:□:□:□:□:□
ถ้าเลขศูนย์ติดกันใช้ :: ได้ครั้งเดียว

64 prefix | 64 id

/64

2001:0DB8:0000:0000:ABCD:0000:0000:0100
→ 2001:DB8::ABCD:0:0:100

ipv6 route nnn /64 fa0/1
ipv6 route ::/0
default route