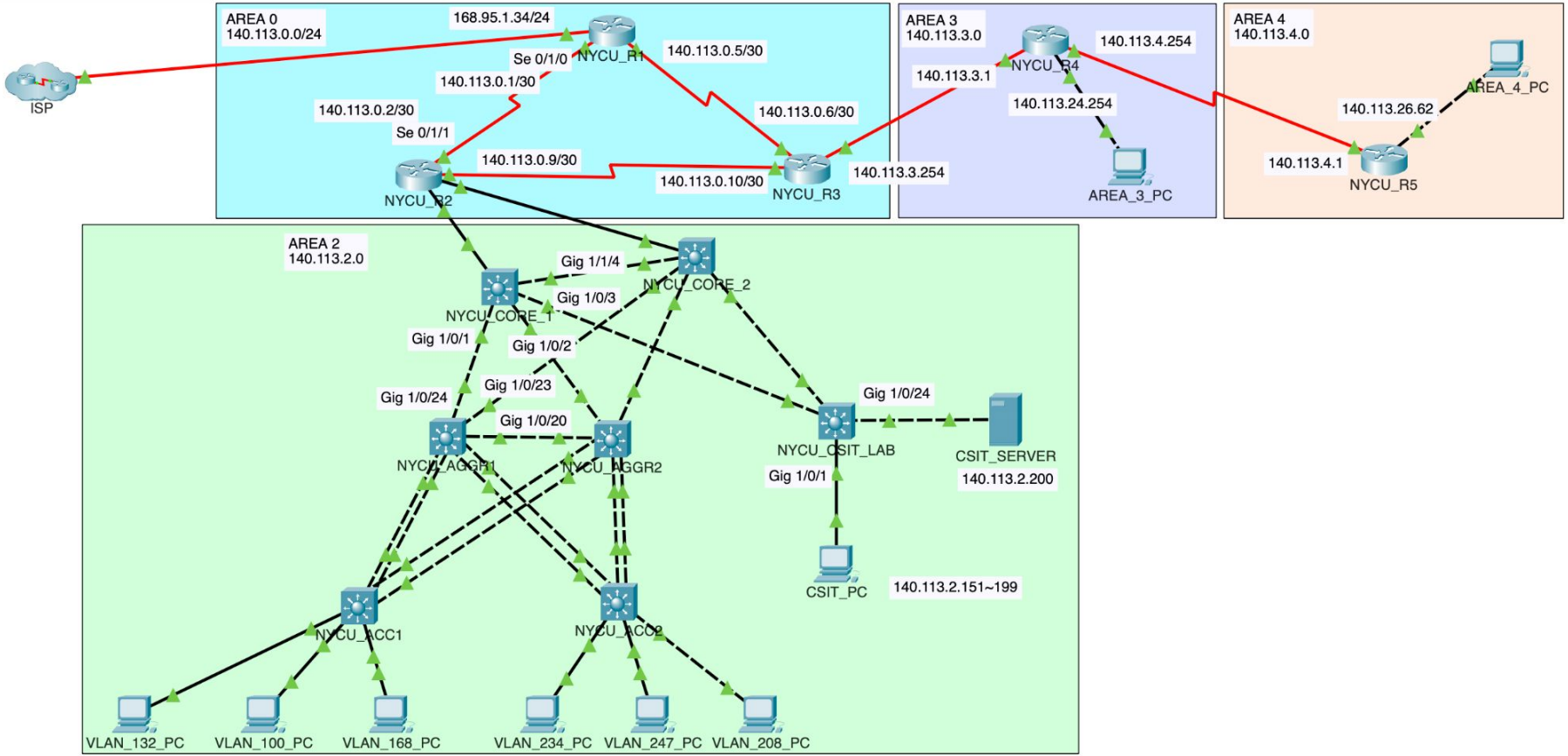
112B CCNA Final Exam

- 確保檔案存放在桌面，以免電腦出現異常後遺失！！
- 建議保留原檔，複製第二份檔案出來，當作作答檔案。
- 推薦 Packet Tracer 啟用 show port labels when mouse over in logical workspace 功能。
- 請隨手存檔。

Notice

- No need to configure **ISP, CSIT_SERVER**
- Do not remove any physical connection
- Do not remove descriptions
- Save what you have done to startup-config at anytime
  - Make sure you have saved your configuration to both switches and Packet Tracer
  - We will reboot all network devices before judging
- Raise your hand if you encountered any questions
- Change file name to 112B_Final_{your student id} and submit to E3

Topology


AREA 0
140.113.0.0/24
168.95.1.34/24
ISP
Se 0/1/0
NYCU_R1
140.113.0.5/30
140.113.0.1/30
140.113.0.2/30
Se 0/1/1
140.113.0.6/30
140.113.0.9/30
140.113.0.10/30
NYCU_R2
NYCU_R3
AREA 3
140.113.3.0
140.113.3.1
NYCU_R4
140.113.4.254
140.113.24.254
140.113.3.254
AREA_3_PC
AREA 4
140.113.4.0
AREA_4_PC
140.113.26.62
140.113.4.1
NYCU_R5
AREA 2
140.113.2.0
Gig 1/1/4
NYCU_CORE_2
Gig 1/0/3
NYCU_CORE_1
Gig 1/0/1
Gig 1/0/2
Gig 1/0/24
Gig 1/0/23
Gig 1/0/20
Gig 1/0/24
NYCU_AGGR1
NYCU_AGGR2
NYCU_CSIT_LAB
CSIT_SERVER
140.113.2.200
Gig 1/0/1
CSIT_PC
140.113.2.151~199
NYCU_ACC1
NYCU_ACC2
VLAN_132_PC
VLAN_100_PC
VLAN_168_PC
VLAN_234_PC
VLAN_247_PC
VLAN_208_PC

Guideline

- **L3 Interface Setup（Router, Switch, PC）**
- VLAN
- SVI Setup
- EtherChannel
- SwitchPort
- STP
- OSPF Routing
- HSRP
- AAA
- SSH Server
- NTP
- ACL
- Connectivity

L3 Interface Setup: AREA 0 Router

Device	Interface	IP	Dst. Device
NYCU_R1	Gig 0/0/2	168.95.1.34/24	ISP
	Se 0/1/0	140.113.0.1/30	NYCU_R2
	Se 0/1/1	140.113.0.5/30	NYCU_R3
NYCU_R2	Gig 0/0/0	140.113.2.1/30	NYCU_CORE_1
	Gig 0/0/1	140.113.2.5/30	NYCU_CORE_2
	Se 0/1/0	140.113.0.9/30	NYCU_R3
	Se 0/1/1	140.113.0.2/30	NYCU_R1
NYCU_R3	Gig 0/0/2	140.113.3.254/24	NYCU_R4
	Se 0/1/0	140.113.0.6/30	NYCU_R1
	Se 0/1/1	140.113.0.10/30	NYCU_R2

L3 Interface Setup: AREA 2 Router

Device	Interface	IP	Dst. Device
NYCU_CORE_1	Gig 1/1/1	140.113.2.2/30	NYCU_R2
	Gig 1/1/4	140.113.2.9/30	NYCU_CORE_2
NYCU_CORE_2	Gig 1/1/1	140.113.2.6/30	NYCU_R2
	Gig 1/1/4	140.113.2.10/30	NYCU_CORE_1

L3 Interface Setup: AREA 3 Router

Device	Interface	IP	Dst. Device
NYCU_R4	Gig 0/0/0	140.113.24.254/24	AREA_3_PC
	Gig 0/0/2	140.113.3.1/24	NYCU_R3
	Se 0/1/0	140.113.4.254/24	NYCU_R5

L3 Interface Setup: AREA 4 Router

Device	Interface	IP	Dst. Device
NYCU_R5	Gig 0/0/0	140.113.26.62/26	AREA_4_PC
	Se 0/1/1	140.113.4.1/24	NYCU_R4

L3 Interface Setup: PC

Device	Interface	Domain	IP	Gateway	DNS Server	Dst. Device
VLAN_132_PC	Fa 0	140.113.132.0/25	The first available IP address in the subnet	The last available IP address in the subnet	8.8.8.8	NYCU_ACC1
VLAN_100_PC		140.113.100.96/27				NYCU_ACC1
VLAN_168_PC		140.113.168.224/28				NYCU_ACC1
VLAN_234_PC		140.113.234.32/27				NYCU_ACC2
VLAN_247_PC		140.113.247.160/27				NYCU_ACC2
VLAN_208_PC		140.113.208.56/29				NYCU_ACC2
AREA_3_PC		140.113.24.0/24				NYCU_R4
AREA_4_PC		140.113.26.0/26				NYCU_R5
CSIT_PC		140.113.2.128/25	DHCP			NYCU_CSIT_LAB

Guideline

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VLAN

VLAN should be set on NYCU switches:

L3 Switch: **NYCU_CORE_1,NYCU_CORE_2,**

NYCU_AGGR1, NYCU_AGGR2, NYCU_ACC1, NYCU_ACC2

- Create L2 VLAN (VLAN 100, 132, 168, 208, 234, 247, 999 and 1000)
  - Rename VLAN 999 to native
  - Rename VLAN 1000 to management

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- **SVI Setup**
- EtherChannel
- SwitchPort
- STP
- OSPF Routing
- HSRP
- AAA
- SSH Server
- NTP
- ACL
- Connectivity

SVI Setup

- Create NYCU_CORE_1 SVI for VLAN 100, 132, 168, 1000
- Create NYCU_CORE_2 SVI for VLAN 208, 234, 247, 1000
- Create NYCU_CSIT_LAB SVI for VLAN 1000
- Set SVI IP addresses
  - NYCU_CORE_1 VLAN 1000: 140.113.2.129/25
  - NYCU_CORE_2 VLAN 1000: 140.113.2.130/25
  - NYCU_CSIT_LAB VLAN 1000: 140.113.2.131/25
  - VLAN 100, 132, 168, 208, 234, 247: The **last available** IP address in the subnet
- Allow different VLANs to communicate with each other

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- **EtherChannel**
- SwitchPort
- STP
- OSPF Routing
- HSRP
- AAA
- SSH Server
- NTP
- ACL
- Connectivity

EtherChannel: NYCU_ACC1

- Set EtherChannel **NYCU_ACC1** <-> **NYCU_AGGR1** and **NYCU_AGGR2**
  - All the links between the devices must be used
  - Use LACP active mode
  - Only allow VLAN 100, 132, 168, 999, 1000
  - Set group number to
    - Po1 on NYCU_ACC1 for the links to NYCU_AGGR1 (Po1)
    - Po2 on NYCU_ACC1 for the links to NYCU_AGGR2 (Po1)
- Make sure the connections work properly between the devices

EtherChannel: NYCU_ACC2

- Set EtherChannel **NYCU_ACC2** <-> **NYCU_AGGR1** and **NYCU_AGGR2**
  - All the links between the devices must be used
  - Use LACP active mode
  - Only allow VLAN 208, 234, 247, 999, 1000
  - Set group number to
    - Po1 on NYCU_ACC2 for the links to NYCU_AGGR1 (Po2)
    - Po2 on NYCU_ACC2 for the links to NYCU_AGGR2 (Po2)
- Make sure the connections work properly between the devices

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- EtherChannel
- **SwitchPort**
- STP
- OSPF Routing
- HSRP
- AAA
- SSH Server
- NTP
- ACL
- Connectivity

SwitchPort

- The links between two switches should set trunk mode
- Set Native VLAN 999 on trunk port (Po1, Po2)
  - Only set on **NYCU_ACC1, NYCU_ACC2**
- Trunk port should only allows VLANs that are used by the end devices (PC)
  - Hint: native VLAN and management are also required
- The interfaces on switch which connect to end devices should be configured with the correct VLAN ID

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- EtherChannel
- SwitchPort
- **STP**
- OSPF Routing
- HSRP
- AAA
- SSH Server
- NTP
- ACL
- Connectivity

STP: Global

The following settings should setting on NYCU Switches:

- Please use **Rapid PVST** as STP mode
- Applied to All Edge Switches
  - Ensure CDP is disabled by default.
  - Enable Portfast on interfaces which connected to end devices
  - Activate BPDU Guard on relevant interfaces.
  - Add storm control with a rate limit of 60.

STP: Set VLAN Priority

- Set VLAN 100, 132, 168, 999 STP priority on **NYCU_CORE_1** to **0**
- Set VLAN 208, 234, 247, 1000 STP priority on **NYCU_CORE_2** to **0**

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- EtherChannel
- SwitchPort
- STP
- **OSPF Routing**
- HSRP
- AAA
- SSH Server
- NTP
- ACL
- Connectivity

OSPF: AREA 0

- Advertise correct networks on itself in area 0
- Assign OSPF Process ID
  - Use the process ID as 1.
- Declare router-id
  - the smallest IP address among the router's interfaces.
  - For example NYCU_R2, given area 0 140.113.0.2/30 and area 2 140.113.2.5/30, choose **140.113.0.2** as the router ID.
- Only use “network” command to advertise subnets
- The setting "log-adjacency-changes" does not affect the scoring.
- Set up an static route on the ISP-facing router (via exit-interface)
  - ensures that OSPF routers within the network learned the route and use it as the default route
- Make all routers could ping each other successfully

OSPF: AREA 2

- Advertise correct networks on itself in area 2
- Assign OSPF Process ID
  - Use the process ID as 2.
- Declare router-id
  - the smallest IP address among the router's interfaces.
  - For example NYCU_CORE_1, given area 2 140.113.2.2/30 and area 2 140.113.2.9/30, choose **140.113.2.2** as the router ID.
- Only use “network” command to advertise subnets
- The setting "log-adjacency-changes" does not affect the scoring.
- To simplify routing and improve efficiency
  - This will reduce routing table size by limiting external route advertisements.
  - Summarize default route be configured on ABR to reach external routes.
- Make all routers could ping each other successfully

OSPF: AREA 3

- Advertise correct networks on itself in area 3
- Assign OSPF Process ID
  - Use the process ID as 3.
- Declare router-id
  - the smallest IP address among the router's interfaces.
- Only use “network” command to advertise subnets
- The setting "log-adjacency-changes" does not affect the scoring.
- Make all routers could ping each other successfully

OSPF: AREA 4

- Advertise correct networks on itself in area 4
- Assign OSPF Process ID
  - Use the process ID as 4.
- Declare router-id
  - the smallest IP address among the router's interfaces.
- Only use “network” command to advertise subnets
- The setting "log-adjacency-changes" does not affect the scoring.
- To simplify routing and improve efficiency
  - This will reduce routing table size by limiting external route advertisements.
  - Summarize default route be configured on ABR to reach external routes.
  - All summary network link states should be dropped, except for the default route.
- Make all routers could ping each other successfully
  - Hints: configure the virtual link between ABRs

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- EtherChannel
- SwitchPort
- STP
- OSPF Routing
- **HSRP**
- AAA
- SSH Server
- NTP
- ACL
- Connectivity

HSRP

- Set up HSRP on both **NYCU_CORE_1** and **NYCU_CORE_2**
- to provide gateway redundancy for the networks below **NYCU_CSIT_LAB**
- Ensuring they can utilize a 140.113.2.254 as their gateway.

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- EtherChannel
- SwitchPort
- STP
- OSPF Routing
- HSRP
- **AAA**
- SSH Server
- NTP
- ACL
- Connectivity

AAA

- Set RADIUS on **NYCU_CORE_1, NYCU_CORE_2 and NYCU_CSIT_LAB**.
  - Set 140.113.2.200 as RADIUS server name.
  - RADIUS server IP address: 140.113.2.200
  - RADIUS server port: 1645
  - Radius key: final
  - Authentication auth-list: ccna group radius local
  - Login info
    - user name: ccna_mid password: midterm
    - user name: ccna_fin password: final

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- EtherChannel
- SwitchPort
- STP
- OSPF Routing
- HSRP
- AAA
- **SSH Server**
- NTP
- ACL
- Connectivity

SSH Server

- Set up SSH connection
  - On **NYCU_CORE_1, NYCU_CORE_2** and **NYCU_CSIT_LAB**.
  - Version 2
  - Modulus Bits: 2048
- Domain name
  - cs.nycu.edu.tw
- Set up vty connection
  - SSH setting should be configured on all vtys (0-15)
  - Authentication method list-name ccna

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- EtherChannel
- SwitchPort
- STP
- OSPF Routing
- HSRP
- AAA
- SSH Server
- **NTP**
- ACL
- Connectivity

NTP

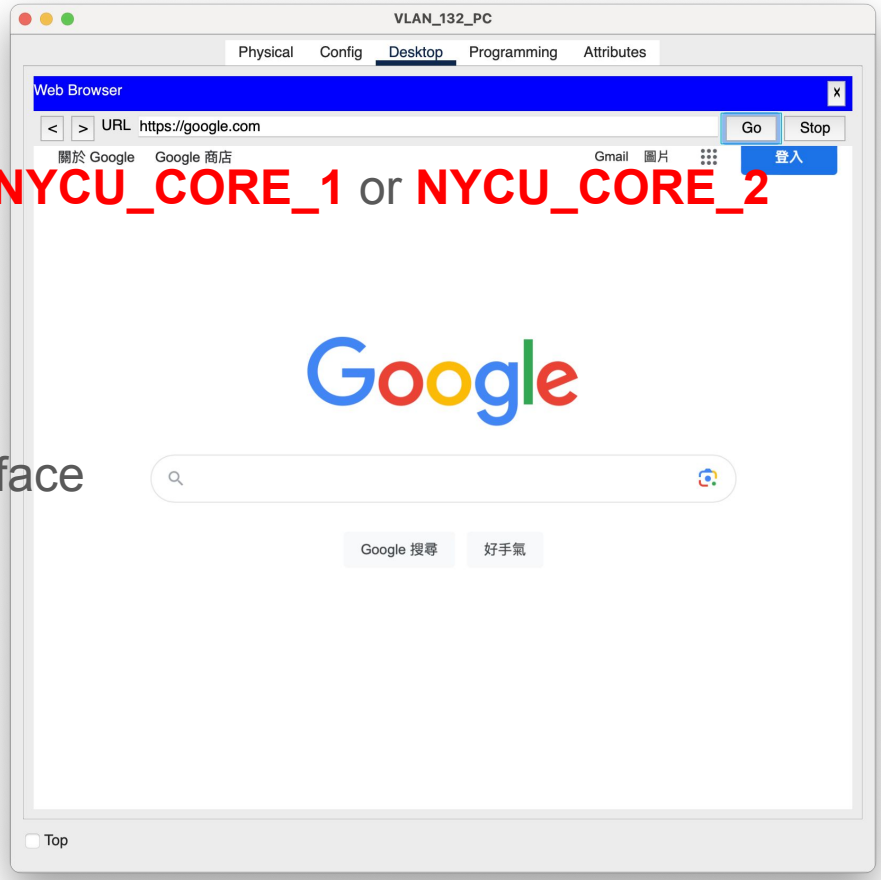
- NTP should setting on **NYCU_CORE_1**, **NYCU_CORE_2** and **NYCU_CSIT_LAB**.
- NTP server: 140.113.2.200

Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
- SVI Setup
- EtherChannel
- SwitchPort
- STP
- OSPF Routing
- HSRP
- AAA
- SSH Server
- NTP
- **ACL**
- Connectivity

ACL

- Set up access control lists (ACLs) on **NYCU_CORE_1** or **NYCU_CORE_2**
- Following restrictions:
  - Allow All Traffic from 140.113.132.0/25
  - Restrict HTTP Access
  - Block all connections from other subnets
- Apply this ACL on the inbound of interface



Guideline

- L3 Interface Setup（Router, Switch, PC）
- VLAN
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- AAA
- SSH Server
- NTP
- ACL
- **Connectivity**

Connectivity

Checking network connectivity should pass:

- VLAN_132_PC to VLAN_100_PC
- VLAN_168_PC to VLAN_234_PC
- VLAN_100_PC to AREA_3_PC
- VLAN_234_PC to AREA_3_PC
- VLAN_208_PC to CSIT_PC
- VLAN_208_PC to VLAN_132_PC
- AREA_4_PC to CSIT_PC
- AREA_4_PC to VLAN_100_PC
- AREA_4_PC to VLAN_247_PC