

# Extreme Leveling: Network and System Knowledge

TPA Network 22-2

Take Home Case

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## Basic Instructions

### Instructions

- Create the physical or logical network design and configurations from scratch and based on requirements in Cisco Packet Tracer
- Understand what you have implemented, either network design or network configurations, is a must, also cheating is prohibited
- In purpose of easy-to-understand logical networks in Cisco Packet Tracer, you may use shapes provided in Cisco Packet Tracer to give a perimeter of specific network (e.g. use green rectangle shape as Jakarta branch network) or using clusters and do not forget to give a text or name for each clusters or shapes

### Story

Currently, you are working in a company, named ChainProject co. ChainProject co. is a software house company, where ChainProject co. provides service to develop a program for another business. This company is registered officially in 2019. The company had one physical office in Jakarta, but with simple network technology implemented. In that time, there are no one at that moment that has an expertise in network and system engineering. For your information, you are newly hired by ChainProject co. as an IT specialist in IT support department 2 days ago.

One day before, ChainProject co. had another physical office in Bandung and several employees has been transferred to Bandung. To make Bandung physical office able to operate and employees can start to work in new office, employees' data that has been saved are copied one by one and sent the copied file to Bandung physical office. The owner of company saw this as ineffective work between effort and result, because the effort is much higher than the result. Then, the owner asked your suggestion to make the work much efficient. You have suggested the owner to implement network and system technology in the office and you have explained about the SWOT of using technology in the company. Hearing your suggestion, the owner approved your suggestion and orders you to implement network and system technology with several current trends in network and system technology. This approval comes with another big plan, where the company will expand its services to network and system, also cyber security.

Owner of ChainProject co. realizes that you have minimal experience and need guidance such as configurations you need to implement based on business requirements. Because of this problem, owner of ChainProject co. hires Chris, an IT consultant that specializes in network and system temporarily. Chris

listed all network and system configurations you need to implement.

Now, your job is to **create the network topology** and **implement all configurations** listed in “**Technical Instructions**” using Cisco Packet Tracer, as a simulation on how you want to implement the configurations in ChainProject co. network and systems. When reaches the deadline, you should **submit** the **.pkt file** contains the network topology and required implementations listed in “Technical Instructions”. **When you and Chris available at the same time, present the result** to Chris and Chris will evaluate which part you need to focus on or need to be revised. When your work is done, you will work together with Chris to implement the configurations, whereas Chris will help you to configure the network and systems between local network and internet and you will configure the network and systems in local network.

Have a look at the next page to know what you should configure!

## Technical Instructions

### Special Instructions

- Use private internet address (RFC 1918) for local network (local network in Jakarta branch, Bandung branch, and Client LAN)
- Design the topology with best cost and best features provided to each of implemented devices
- Design the topology while preventing single point of failure problem (for network topology example, you can refer to this link), also reduce the impact if failure happens (e.g. if a network device is broken, make sure the impact does not make overall company's network is down)
- In between Core and Distribution network of each network site (Jakarta and Bandung), first-hop redundancy is needed to prevent single point of failure
- In purpose of ease-of-use LAN configuration in the future, use virtual LAN to define subnetworks in each network site
- Allocate IP addresses for hosts automatically, except network devices (routers, switches) and servers
- Configure each port that attached to end devices in network devices, which will instantly connected to ChainProject co. network without going through proper negotiation
- Configure spanning tree load balancing to balance the bandwidth between distribution network to access network
- Configure SSH for all network devices, so network engineers and administrators can configure the network devices by remote
- Configure 802.1x to enable users logged in to access points, also network engineers and administrators to network devices (routers and switches)
- Prevent the network from these vulnerabilities or attacks:
  - Broadcast storm
  - DHCP rogue
  - ARP spoofing / poisoning
- Make sure you have selected correct device with required features

## **Jakarta Main Office Requirements**

- Main office in Jakarta is the core operational of ChainProject co. business
- Jakarta Main Office is a 3-floored building and each floor consists of 1 layer 3 network device (router or L3 switch) to separate between floors (building layout can be seen in Figure 1, Figure 2, and Figure 3)

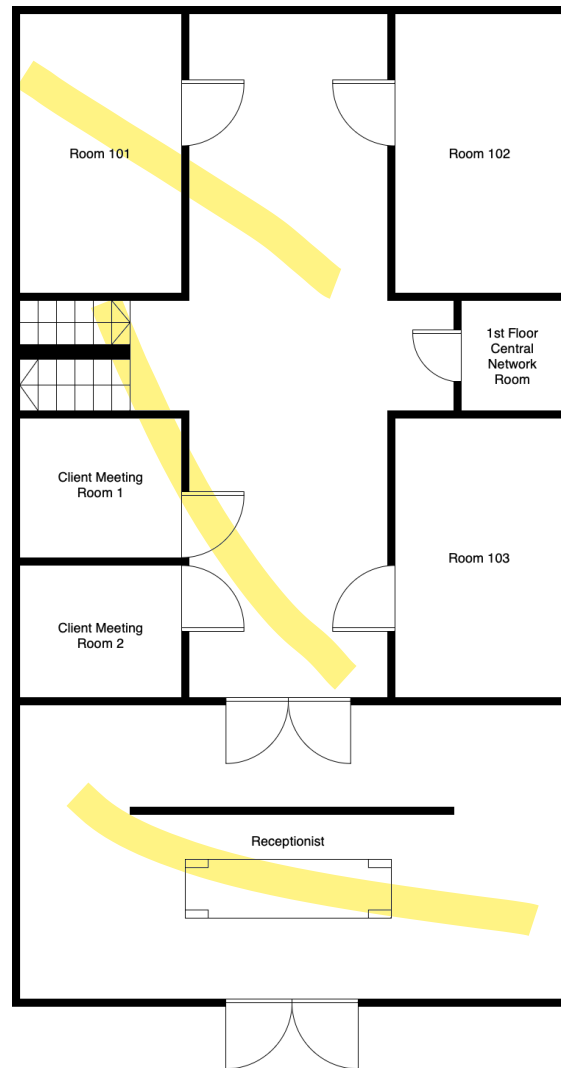


Figure 1: Jakarta Main Office building layout - 1st floor

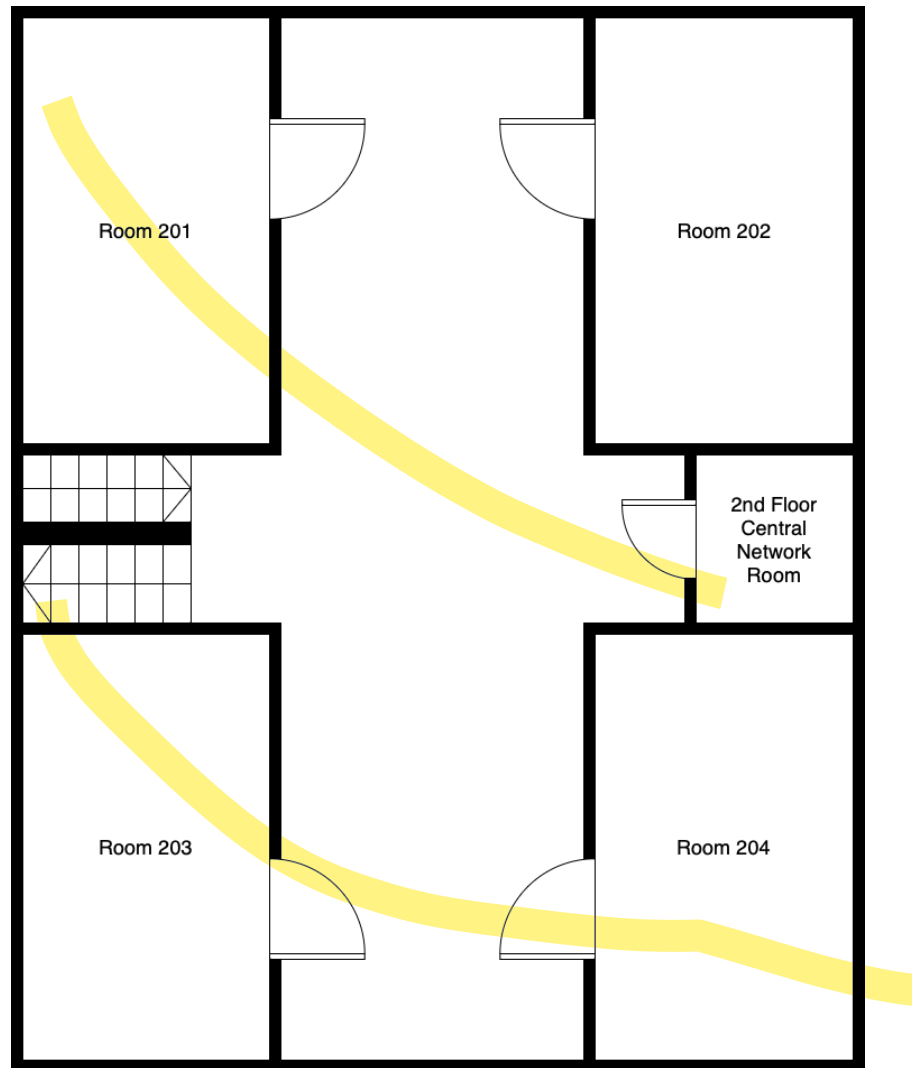


Figure 2: Jakarta Main Office building layout - 2nd floor

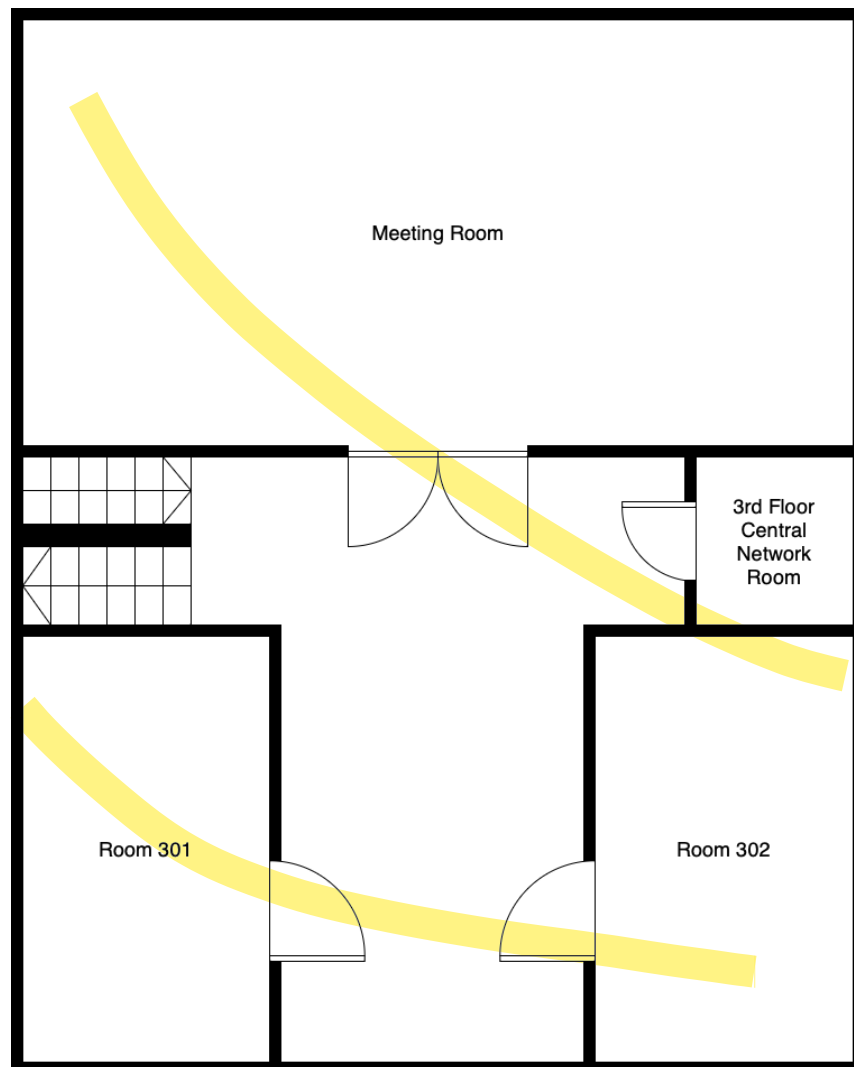


Figure 3: Jakarta Main Office building layout - 3rd floor



- Estimation of network users in Jakarta Main Office can be referred to Table 1

Table 1: Jakarta Main Office network users - part 1

Business Unit	Headcounts (Estimation)	Details
Board of Directors	7	CEO, CTO, COO, CFO, CMO, CCO, Secretary of Board
Product Solutions – Web and Mobile	19	1 VP, 3 Principals, 15 Software Engineers
Product Solutions – Network and System	12	1 VP, 1 Principal of Network Engineer, 1 Principal of System Engineer, 5 Network Engineers, 4 System Engineers
Product Solutions – Cyber Security	9	1 VP, 1 Principal of Security Engineer, 1 Principal of Penetration Tester, 3 Security Engineer, 3 Penetration Tester
Marketing Department	8	1 Director of Marketing Research, 1 Director of Public Relations, 3 staffs of Marketing Research, 3 staffs of Public Relations
IT Support Department	7	1 Director, 6 staffs of IT Support
Customer Support Department	8	1 Director, 7 staffs of Customer Support
Finance Department	10	1 Director, 3 staffs of Internal Auditor, 3 staff of Purchasing, 3 staff of Financial Accountant
Human Capital and Resources Department	10	1 Director, 1 Head, 4 staffs of Human Capital, 4 staffs of Human Resources
Receptionist	3	3 staffs of Receptionist

- The building room's occupation are allocated for specific position and division, as shown in Table 2

Table 2: Jakarta Main Office room occupations

Room Number	Occupations
Room 101	Occupied by IT Support Department
Room 102	Occupied by Customer Support Department
Room 103	Occupied by Marketing Department
Room 201	Occupied by Product Solutions of Cyber Security
Room 202	Occupied by Product Solutions of Network and System
Room 203	Occupied by Product Solutions of Web Development
Room 204	Occupied by Product Solutions of Mobile Development
Room 301	Occupied by Finance Department and Human Capital and Resources Department
Room 302	Occupied by Board of Directors

- Each meeting room need a wireless connectivity to enable users connect to Internet
- Each business unit can call each other internally using telephone, but special case for Board of Directors and Customer Support Department, each person has their own internal telephone
- To support employees working from home and anywhere, ChainProject co. needs a virtual private network to establish a connection between host outside ChainProject co. network and internal ChainProject co. network
- Each employee in Product Solutions, IT Support Department, and Customer Support Department need 1 PC (in minimum) in their office

- In Jakarta Main Office, there are several services provided in office's network, as shown in Table 3, Table 4, and Table 5

Table 3: Jakarta Main Office services - functionality - part 1

Service Name	Service Type	Other Details
Business-related web application	Web application	– Can be accessed in public
Helpdesk web application	Web application	– Limited access for Customer Support Department and Product Solutions Division
Finance web application	Web application	– Limited access for Finance Department
Human capital web application	Web application	– Limited access for internal ChainProject co. network
Development web application	Web application	– Limited access for Product Solutions - Web and Mobile network
Internal file sharing storage	File sharing application	– Limited access for internal ChainProject co. network – Each business unit has 1 account to access this file sharing

Table 4: Jakarta Main Office services - functionality - part 2

Service Name	Service Type	Other Details
Internal centralized log storage	Centralized log	<ul style="list-style-type: none"> <li>– Limited access for internal ChainProject co. network</li> <li>– Each log record in network devices will be recorded in this centralized log storage</li> </ul>

Table 5: Jakarta Main Office services - domain list - part 1

Service Name	Domain Name
Business-related web application	chainproject.com
Helpdesk web application	helpdesk.chainproject.local
Finance web application	finance.chainproject.local
Human capital web application	human-capital.chainproject.local
Development web application	dev.chainproject.local
Internal file sharing storage	fs.chainproject.local

- If client outside ChainProject co. network accessed edge router's public IP address from web browser, client's web browser will be shown chainproject.com web application
- Services' ethernet connectivity in ChainProject co. network needs reliable connection and high-speed bandwidth

## Bandung Branch Office Requirements

- Branch office in Bandung is an academy to train newcomers that will be placed in Product Solutions business unit in Jakarta
- Bandung Branch Office is a 1-floor building (building layout can be seen in Figure 4)

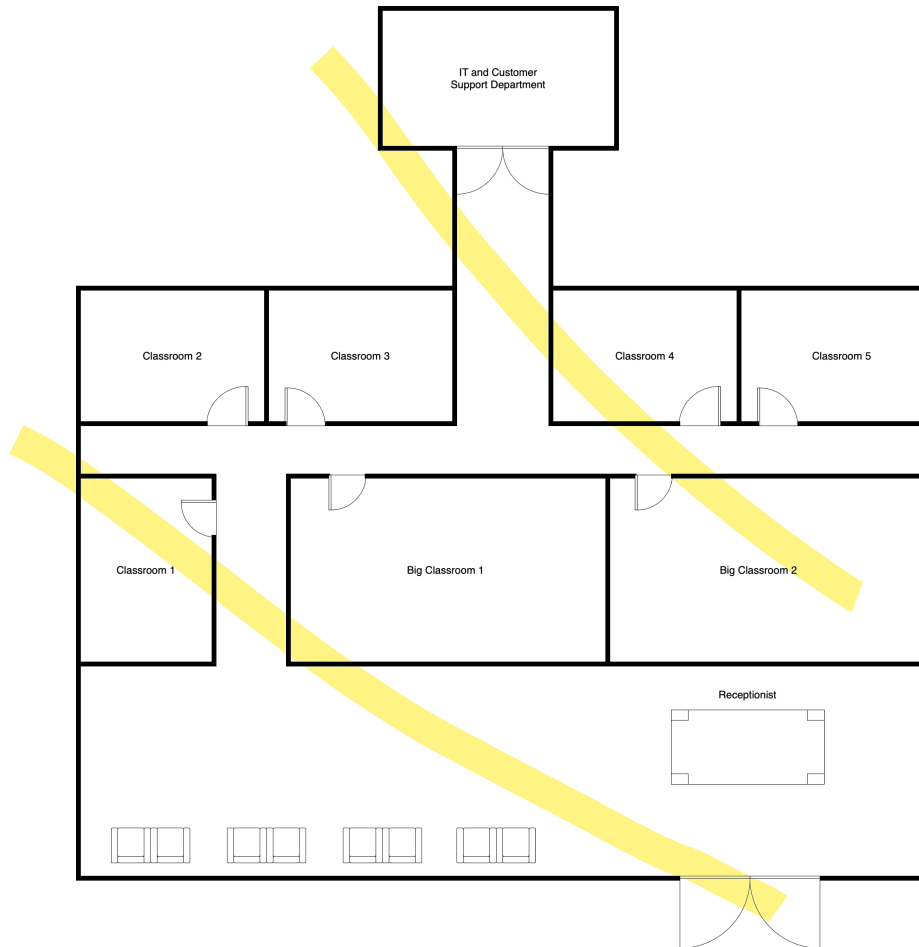


Figure 4: Bandung Branch Office building layout

- Estimation of network users in Bandung Branch Office can be referred to Table 6

Table 6: Bandung Branch Office network users

Business Unit	Headcounts (Estimation)	Details
Services Academy	224	7 classrooms, each class contains of 2 trainers and 30 trainees (at most)
Customer Support Department	5	1 Director, 4 receptionist staffs
IT Support Department	7	1 Director, 6 staff of IT Support

- Each business units, except Services Academy business unit, can call each other internally using telephone, including business units in Jakarta Main Office
- Each classroom need a wireless connectivity to enable users connect to Internet
- Each employee in Customer Support Department and IT Support Department need 1 PC (in minimum) in their office

## Client LAN Requirements

- When client PC wants to connect to ChainProject co. internal PC, they can connect using IPsec VPN in ChainProject co. network

## Internetwork Connections Between Client Network and Enterprise Networks

- The allocated public internet address between client LAN network and ChainProject co. network are specified in Table 7

Table 7: Internetwork network addresses

Network Segment	Network Address
Jakarta Main Office site to Internet	222.90.90.64/27
Bandung Branch Office site to Internet	222.90.91.0/27
Client LAN to Internet	222.51.51.0/24

- In purpose of simulate connection to Internet, use Router-PT or Router-PT-Empty in Cisco Packet Tracer as Internet
- Connection between ChainProject co. network to Internet and client LAN network to Internet are established using exterior gateway protocol
- Jakarta Main Office site network and Bandung Branch Office site network are connected virtually using IPSec VPN
- If one of the host in ChainProject co. network sent packets/messages to any client outside the ChainProject co. network, packets' source IP address will not be shown as coming from host's internet address in ChainProject co. network, but from public internet address of edge router each site (if it comes from Jakarta Main Office site network, then the source IP address will be shown as coming from edge router of Jakarta Main Office site network)

**Hard work and extraordinary effort make success comes closer  
- Bluejackets 18-1**