

NET

WORK

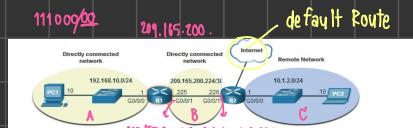
cinnee - pdy



# MODULE 8 : Introduction to Routing

## Route 3 Type

1. Directly Connected : នៅក្នុងបណ្តុះបណ្តុះ
2. Remote : សម្រាប់អាជីវកម្ម 2 របៀប → Manually : នូវការចាប់ផ្តើម  
→ Dynamically: router នៅក្នុងបណ្តុះបណ្តុះ
3. Default Route : នូវការសរាល់ក្នុងការ match នូវតម្រូវ



- A នៅ Directly Connected ឬ R<sub>1</sub> | A ឬ Remote ឬ R<sub>2</sub>  
 C នៅ Directly Connected ឬ R<sub>2</sub> | C ឬ Remote ឬ R<sub>1</sub>,  
 R<sub>1</sub> នៅ Directly Connected ឬ R<sub>2</sub>

● Directly-connected routes : នៅក្នុងបណ្តុះបណ្តុះ [C, L]

● Remote routes : នៅក្នុងបណ្តុះបណ្តុះ ឬ នៅក្នុងបណ្តុះ [A, D, etc]

● Default routes : នូវការសរាល់ក្នុងការ match នូវតម្រូវ [S\*]

● Show IP routes : command ដំឡើងពេលយក IP នៃ Route

↳ L: directly connected (local) interface IP address

↳ C: directly connected network

↳ S: static route Manually by admin

↳ O: OSPF

↳ D: EIGRP

● destination network : ទំនួរការស្ថាប់បណ្តុះបណ្តុះ

ex. pc នៃ h1 Network 192.168.10.0/24 → outgoing interface - interface នៃលានស្ថាប់បណ្តុះបណ្តុះ

● administrative distance : Protocol Find best part for Routing

● metric : ជារាង Router នឹងដឹងថាគ្នុង network នេះមានគ្មានៗ best part

● next-hop : ip នៃ interface នៃ next-hop router នឹងនាំ

● route timestamp : នៅពី route មានការចាប់ផ្តើម?

Static Routing ធនាគារភាពខ្លាត់: ក្នុងការស្វែងរកវាទេរងជាអំពី

- ឱ្យ configued Manually
- Manually by the administrator
- small non-redundant Network (បានប៉ុណ្ណោះ)
- ឬនិង Dynamic នៅក្នុងវាត់ដែលមានព័ត៌មានពីផ្ទាល់ខ្លួន

Dynamic Routing router ដែលការពារជាបាន best part on automatic

- maintain up-to-date information (ឱ្យផ្តល់ព័ត៌មានពីផ្ទាល់ខ្លួន)
- choose the best path
  - ↳ មុននាគំ Router
- Find new best path
  - ↳ admin (នៅលើមុខងារ)

can shared static default route with other routers

# MODULE 9 : ADDRESS RESOLUTION

MAC AND IP → L3 Logical Address (Network)

L2 Physical Address (Data link)

Layer 2: Physical Address (MAC Address) ឬ Network Interface Card (NIC)

ឧបករណ៍ពីលើកសម្រាប់ស៊ីតាត់រវាង Ethernet SAME Network (NIC to NIC)

Layer 3: Logical Address (IP Address) ឬ នៃការផ្តល់ព័ត៌មានពីផ្ទាល់ខ្លួន → destination

ផ្ទាល់ខ្លួន Network នៃស្ថាប់បណ្តុះបណ្តុះ { ផ្ទាល់ខ្លួន Network "Remote"

ផ្ទាល់ខ្លួន Directly Connected { ផ្ទាល់ខ្លួនភាគ GateWay

ឬតិច MAC source ឬតិច MAC DESTINATION និង ARP Resolution  
"ARP"

ARP និង MAC Destination នៃ IPx4

ICMPv6 និង ARP និង IPx4

Packet Tracer និង MAC, IP Address នៃប្រព័ន្ធ Local, Remote

ARP ⇒ Address Resolution Protocol និង MAC Address រវាង Destination (សង្គម IPv4 និង Destination)

ARP source និង Broadcast នៃ Network នៃ IP... ឬ នៅពី?

(Media Access Control)

និងប្រព័ន្ធដែលបានប្រើប្រាស់បានប្រើប្រាស់ Unicast It's me Hi [MAC Address]!

នៃប្រព័ន្ធដែលបានប្រើប្រាស់បានប្រើប្រាស់ Broadcast និង Multicast

នៃប្រព័ន្ធដែលបានប្រើប្រាស់បានប្រើប្រាស់ Unicast និង Multicast

សម្រាប់ប្រព័ន្ធដែលបានប្រើប្រាស់បានប្រើប្រាស់ Broadcast និង Multicast

ARP (Address Resolution Protocol)

MAC (Media Access Control)

TABLE: show ip arp

arp -a: display table

or ARP Cache

## ARP ISSUE

Broadcasting & Spoofing: និងប្រាប់ប្រាស់បានប្រើប្រាស់ MAC Address Router / Gate Way

Virus: ធនាគាររួមឱ្យ Network និង ARP បុរាណឯក (ARP poisoning)

Network និងការសរាល់ស្ថាប់បណ្តុះបណ្តុះ Spoofing





## MODULE 12: IPv6 ADDRESSING

IPv6 សែរបានអេរ៉ា IPv4 មួយនៃការងារពេលវេលា  
 ↓ 128 bit ↓ 32 bit

Dual stack : IPv4+IPv6

Tunneling : IPv6 inside IPv4

IPv6 128 bit with Binary → 32 bit with hexadecimal

↓  
8 group groups: 4 នៅ

\*Omit Leading Zero\*: :: :: :: :: :: :: :: ::  
 ចំណាំដោយខ្លួន 2001:0db8:0000:1111:0000:0000:0000:0200  
 ចំណាំដោយខ្លួន → 2001:db8:0:1111:0:0:0:200

ការចូលរួមប្រើប្រាស់ 2001:db8:c0fe:1:0:0:0:1

\*Double Colon\* → 2001:db8:c0fe:1::1

IPv6 Address Type

- Unicast 1:1
- Multicast 1:Many
- Anycast 1:nearst devide

No! Broadcast Replace by "All Node MultiCast"

No! Subnet mask Replace by "Prefix Length"



\*សៀវភៅ\* subnet mask នរាយវា IPv6 និង IP address ស្ថិតនៅក្នុង

\*SLAAC\* stateless address autoconfiguration

\*Hextet\* : នីមួយទី 76

\*Link-Local address\* : ភាពពីរបានគ្នាបាន local link តិចម្នាវា

\*IPv6 Address\* : 128 bit with binary

32 bit with Hexadecimal) ចិត្តនៅលើ Double Colon, Omit Leading Zero  
 (Host in IPv4)

\*show ipv6 interface brief\* : Prefix + Interface ID /64

(Host in IPv4)

\*SLAAC\* : Stateless Address Auto Configuration មានឱ្យនា Address ពីរបានauto

GUA {  
 • Router advertise met: (RA) ផ្ទាល់នា ads ពីរបាន router ដ៏ចំណាំ Host ក្នុងការរំលែក IPv6  
 • Router solicitation : (RS) ស្ថាមការនា Host និង Router IPv6  
 • EUI-64 : សំណើនាំ Interface ID (Host in IPv4)  
 • Solicited node multicast : node នាំនាំនាំ ឬ multicast

MODULE 14: TRANSPORT LAYER (L.4) និងការបញ្ចូន DATA

Transport Layer moves data between application on device in network

↳ IP និង destination អាចសម្រេចឱ្យលើ Transport ឬ check នូវ destination អាចសម្រេចឱ្យសំដើរ

\*Tracking individual conversation\*

- ស្ថាមការនាំនាំនាំ segment និងវារាយនាំនាំនាំ reassembling segment (reassemble)
- adds Header+information (encap)
- ស្ថាមការ identify, separate, manage multiple conversation និងបញ្ជាក់ថាដែលមួយគឺណាត់ណាត់

\*Protocol\* នៃ L3 (TCP/IP) និង control

\*TCP\* : Transmission Control Protocol \*ព្រមទាំង\* Provides Same-Order, Flow control និង sequence data នៃការផ្តល់ឱ្យ

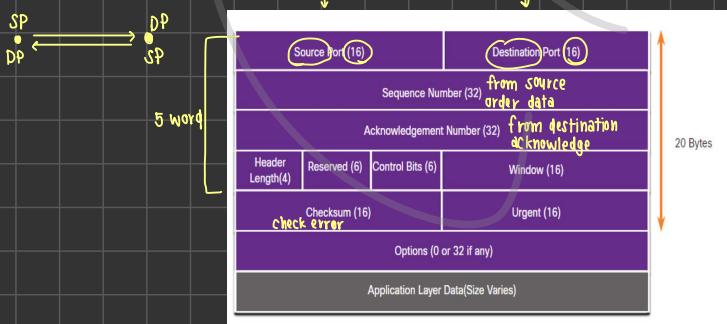
នៃ reliability, flow control, sequence data (order) Established (connection-oriented protocol)

តារាង connected នៃជាមុន destination អាចសម្រេចឱ្យ destination must be acknowledge back to source

if not acknowledge source must be retransmit, resend lost data

(ប្រហែល 20 byte)

TCP Header - communicate between 2 Port



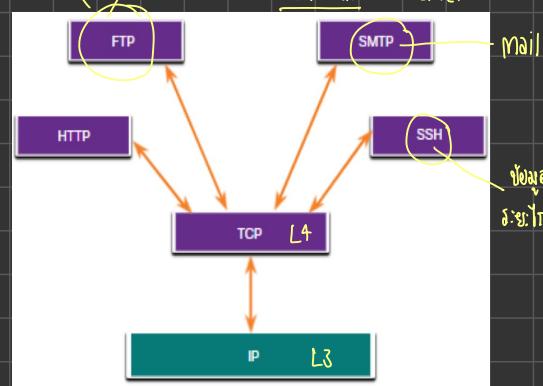
SMTP = Simple Mail transfer protocol

transfer protocol

FTP → file transfer protocol

Upload : Client up File to Server

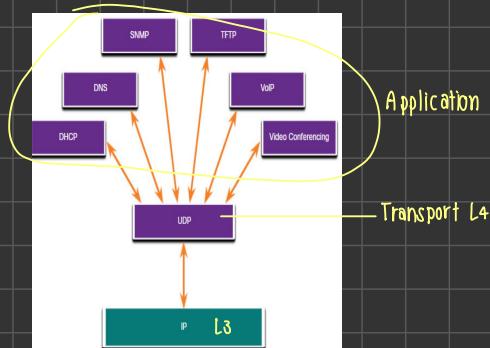
Download : Client request data  
 Server sent data to server



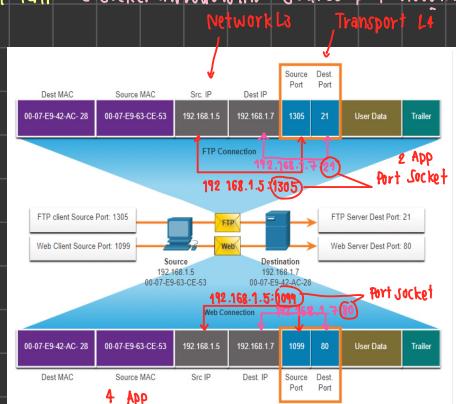
## TCP Connection Establishment

UDP : User Datagram Protocol ទេវការពី Data ទិន្នន័យ 8 bytes

- doesn't require acknowledgement
- not resend lost data
- low overhead
- fast
- not sequence order



Socket Pair : 2 socket សម្រាប់បង្កើតពី (source port នូវគែ destination port)



❖ Conversation Multiplexing : ការចំណែកផ្លូវបែងចែកជាមុនការបញ្ចូលទិន្នន័យដោយស្ថិតិថ្នាក់

❖ Segments : ការចំណែកផ្លូវបែងចែកជាមុនការបញ្ចូលទិន្នន័យ by TCP

❖ Data grams : ក្រុមបែបបែងចែកជាមុនការបញ្ចូលទិន្នន័យ by UDP

❖ Connection-Oriented Protocol : protocol នៃការ connect ទូទៅ destination ហើយកែតាំងសំណង់សំណង់  
+ ព័ត៌មានពី destination acknowledge ការបញ្ចូលទិន្នន័យ គឺចុងចាយ

❖ Connectionless Protocol : protocol នៃការ connect ទូទៅ destination គឺចុងចាយ

❖ Stateless Protocol : protocol នៃការបញ្ចូលទិន្នន័យ ការបញ្ចូលទិន្នន័យ គឺចុងចាយ

❖ Flow control : គុណភាពរវាងមុនគីឡូនីធីនៃការបញ្ចូលទិន្នន័យ

❖ Same-Order Delivery : ក្រុមបែបបែងចែកជាមុនការបញ្ចូលទិន្នន័យ

❖ Socket Pair : socket 2 port សម្រាប់បង្កើតពី សំណង់សំណង់

❖ netstat : command តារាងបែងចែកទូទៅបែងចែក

❖ Three way Handshake : TCP (transport control) protocol

និង connection Establish នឹង acknowledgement មួយប្រកាស

• SYN : Synchronize sequence number និង acknowledgement

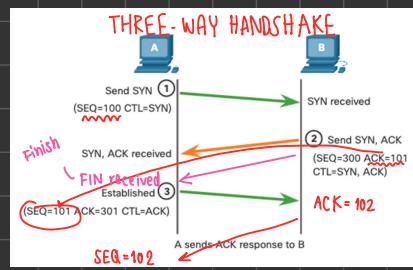
• ACK : Acknowledge

• FIN : Finish ដែលបានបញ្ជាក់

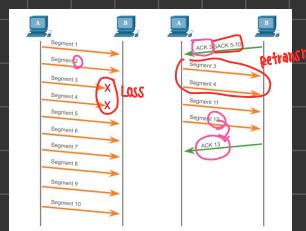
• URG : Urgent pointer និងថ្មីនូវព័ត៌មានដែលត្រូវបានបញ្ជាក់

• PSH : Push function និង

• RST : Reset the connection when time out or error

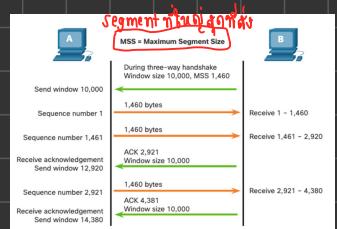


## TCP Reliability (Data Loss & Retransmission)



SACK មួយអង្គភាពនិងការបញ្ចូលទិន្នន័យ

## TCP Flow control - window size & acknowledgement



ដែល data segment មានវិនិច្ឆ័យ

និងការបញ្ចូលទិន្នន័យ Window size

MTU: maximum transmission unit

MSS : maximum segment size

## Initial Sequence Number (ISN)

ការចូលរួមឱ្យលាត់ចំណែកបែងចែក

## Selective Acknowledgement (SACK)

ការចំណែកផ្លូវបែងចែកសំណង់សំណង់ (ប៉ុណ្ណោះមានការបញ្ចូលទិន្នន័យ)

## Sliding Window: Algorithms និងការគាំទ្រ

និងប្រើបាន array

❖ MSS Maximum Segment Size : រាយការណ៍សំណង់សំណង់ដែលបានបញ្ចូលទិន្នន័យ

គឺត្រូវដោយ

## MTU Maximum Transmission Unit

និងការបញ្ចូលទិន្នន័យនៃការបញ្ចូលទិន្នន័យ

## Congestion Avoidance : ការគាំទ្របែងចែកគោលចាយ និងការបញ្ចូលទិន្នន័យ

គឺជាអំពី Algorithms, timers, ភាពការការងារ

## MODULE 15: APPLICATION LAYER

รุ่นบูรณา convention Model  $\hookrightarrow$  Application + Presentation + Session  
OSI model

OSI Model

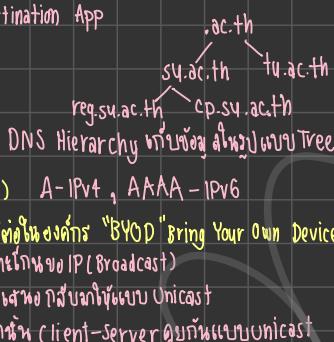
• Presentation layer → Formatting รูปแบบ data

→ Compressing เป็นไฟล์ ex. zip file

→ Encrypting รหัสผ่าน - decrypting รหัสผ่าน

• Session layer → create + maintain dialogs between source & destination App

ex. App รูป photo เป็น file.pdf



Protocol หรือ Application  
(or service)

- DNS - Domain Name System : แปลง IP Address (TCP+UDP client 53) A-IPv4, AAAA-IPv6
- DHCP - Dynamic Host Configuration Protocol : เสนอ IP ให้ device ใหม่ที่ไม่รู้ว่าตัวคือ "BYOD" Bring Your Own Device (UDP client 68, server 67)
- HTTP - Hypertext Transfer Protocol บริการ web (TCP 80, 8080)
- HTTPS (TCP 443)

Peer-to-Peer Network ต้องมี server/client ทั้งสองฝ่าย

ข้อดีของ P2P  
⇒ Client-Server "P2P"  
Request Response/Reply

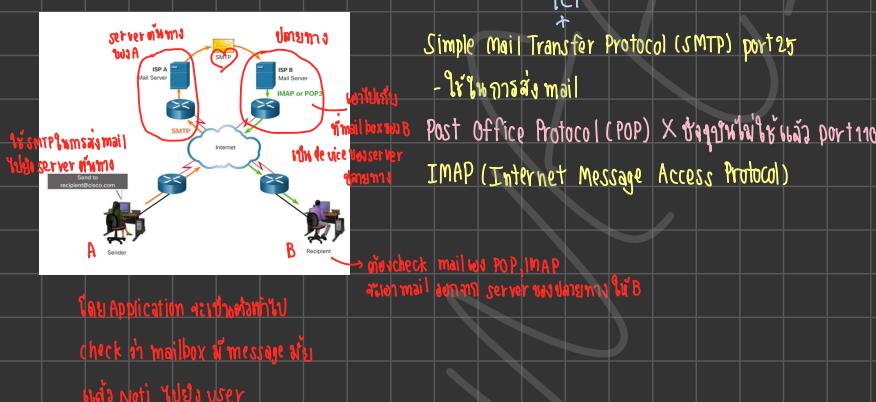
1 device ทั้ง hybrid system

Web Protocol

HTTP-HTTPS มีมาใน computer อยู่แล้ว ที่ GET- ขอรับ data POST- browser ส่งไปที่ server PUT- user ต่อสู้กับ server

HTML: Hyper Text Markup Language

Email Protocol (Electronic messages)



File Sharing Services (File Transfer Protocol "FTP") บน port 21 (ดูข้อ 17)

File Server - Shared File ต่อไปยัง Server

FTP client โหลด File

copy file ถึง Y เลย

Server Message Block (SMB)

ใช้ใน windows

• การเข้าถึง File ตาม Disk (C,D)

Client ต้องร่วมกับ Server อยู่ด้วยกัน

Application layer รับข้อมูลจาก User ต่อไปยัง service

Presentation Layer : OSI model รับข้อมูล, แปลง成, ต่อไปยัง Application

Session Layer: OSI model เตรียม dialog สำหรับการสื่อสาร

Client-Server Model

Peer to Peer: device ที่เป็นเพื่อนกับ client/server  
example กรณี situation  
ex. printer

URL (Uniform Resource Locator): ระบุชื่อ Protocol ที่ต้องการ  
ที่ต้องการเว็บไซต์

URI (Uniform Resource Identifier): ระบุชื่อตัวอย่าง: บุคคลที่ต้องการ  
ที่ต้องการเรียก

HTTP / HTTPS บริการ Web  
port 80 port 443

GET ต้องการจาก server

POST browser ต้องการส่ง server

PUT user ต้องมี server

SMTP Simple Mail Transfer Protocol (port 25)

: protocol ที่รับไฟล์รับ mail

POP (port 110) same as SMTP แต่ลักษณะไปกลับ

IMAP (Internet Message Access Protocol)

DNS (Domain Name Service) ต้องมี IP Address

FQDNs (Fully-Qualified Domain Name)

: ชื่อ Domain แบบเต็ม

nslookup : Command ต้องหา name server

DHCP (Dynamic Host Configuration Protocol)

: protocol ที่รับ ต้องมี IP ให้ client

DHCP DISCOVER: Client Broadcast ขอ IP

DHCP OFFER: Server unicast กลับ แนะนำ Dhcp

DHCP REQUEST: Client ตอบกลับ unicast to server ต้อง ip

DHCP ACK: Server ดู ip (ACK) กลับให้ client

FTP (File Transfer Protocol) : protocol ที่ต้องมี shared File

SMB (Server Message Block):

Client ต้องร่วมกับ server

