Secure data from MITM (Man in the Middle Attack) with SSTP Mikrotik

MuM Kuta,Bali 2019

MY PROFILE

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PROFILE POLITEKNIK CITRA WIDYA EDUKASI

- Program (Diploma 4)

  - Teknologi Produksi Tanaman Perkebunan

- Program (Diploma 3)

  - Manajemen Logistik

  - Tekhnologi Pengolahan Kelapa Sawit

  - Budidaya Perkebunan Kelapa Sawit

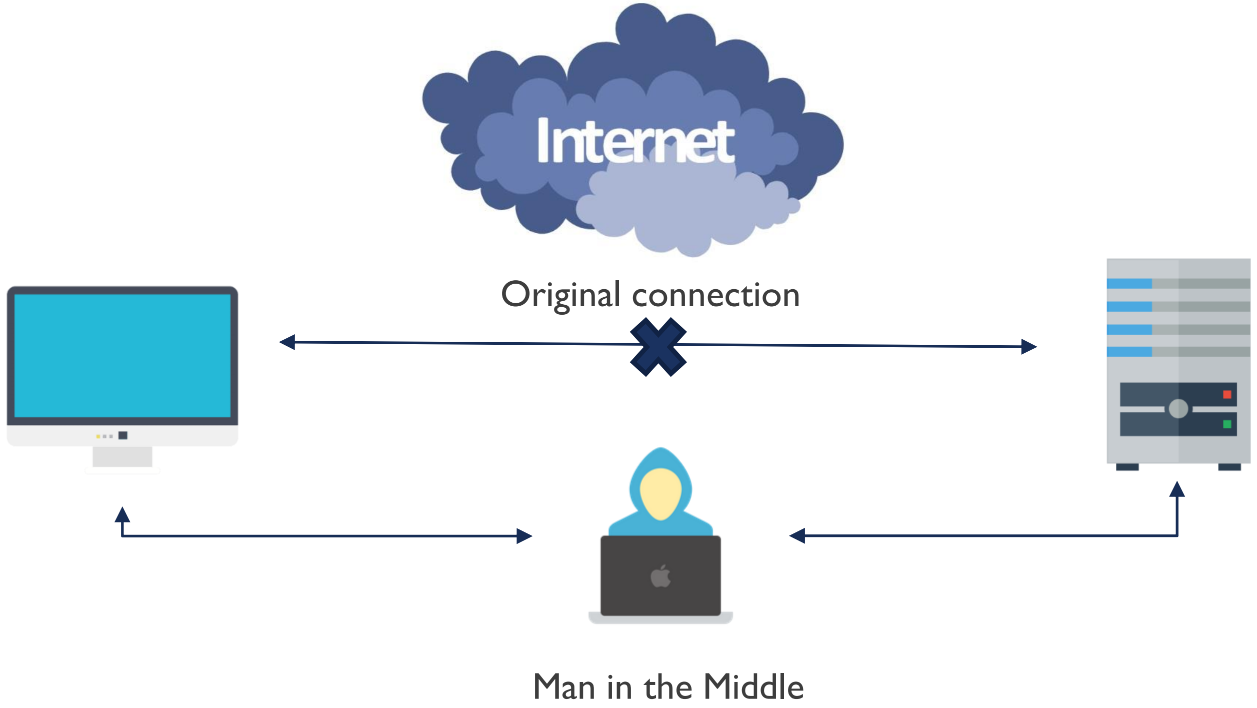
POLITEKNIK CITRA WIDYA EDUKASI
TANGGAP TANGGON TRENGGINAS

NETWORK TRAINING POLTEK CWE

NETWORK BASIC HOST

MITM (MAN IN THE MIDDLE ATTACK)

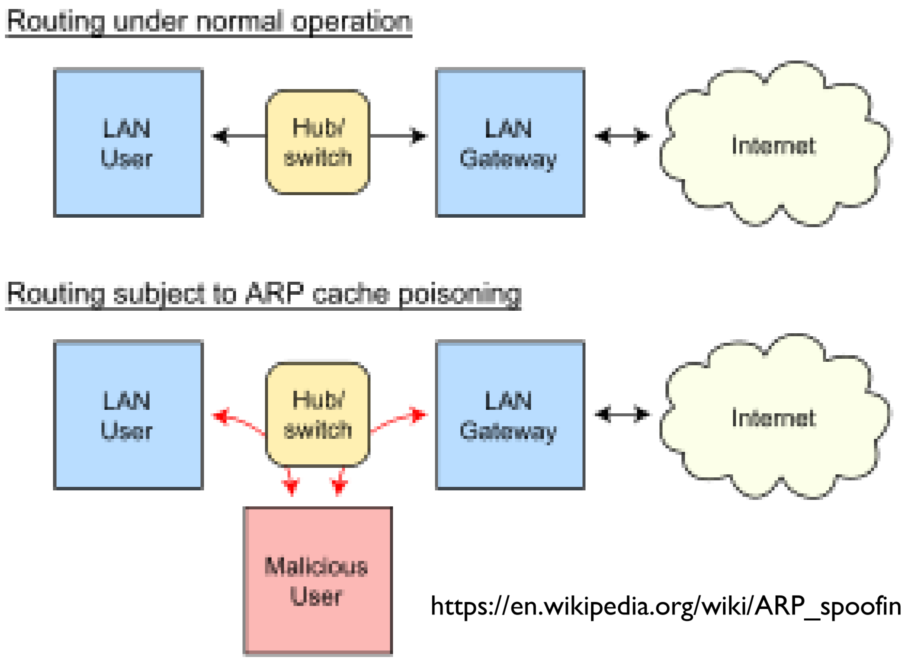
- Suatu serangan yg berada diantara posisi client dan server
- MITM biasanya terjadi karena kelalaian dalam proses otentikasi oleh pengguna.



WHAT ATTACKED ?

- ARP

Mengirimkan pesan ARP palsu kepada client, penyerang akan menggambil frame data lalu memodifikasinya dan mengirim ke user (Arp Spoofing)



https://en.wikipedia.org/wiki/ARP_spoofing

Solution?

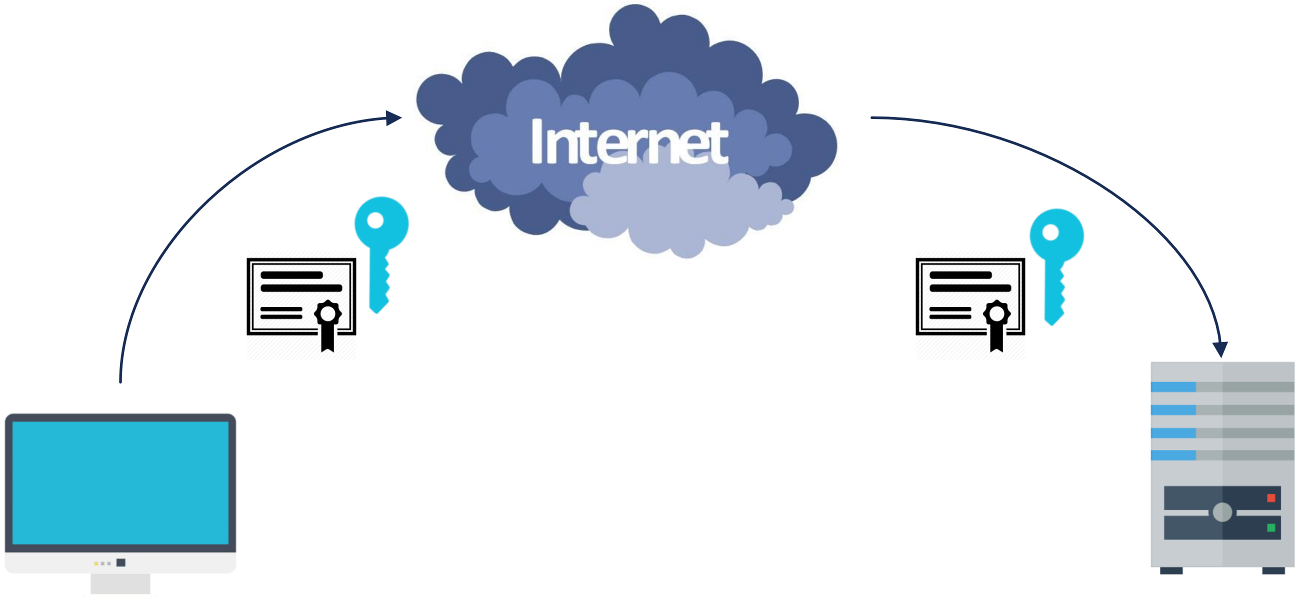
WHAT IS SSTP

- Secure Socket Tunneling Protocol (SSTP)

- SSL memvalidasi sertifikat server.
- Memungkinkan server untuk memeriksa apakah koneksi aman.

TLS / SSL

- Transport Layer Security (TLS) , Secure Socket Layer (SSL)
- Protokol SSL / TLS menggunakan kriptografi public-key dan sertifikat publik key, yg digunakan untuk memastikan identitas dari pihak yang dimaksud.



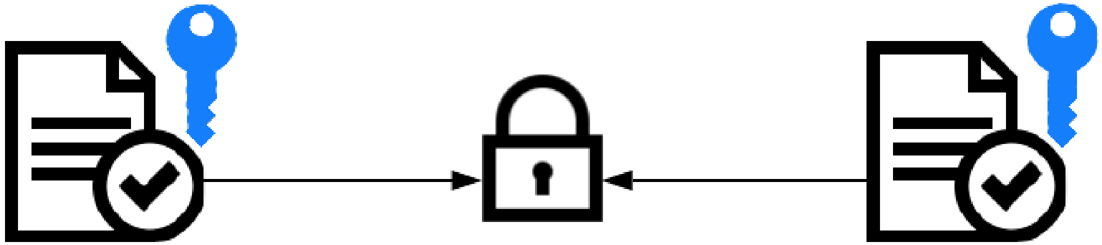
- TLS / SSL

  - **- Enkripsi**

  - **- Otentikasi**

  - **- Integritas**

  - **- Kriptografi security**

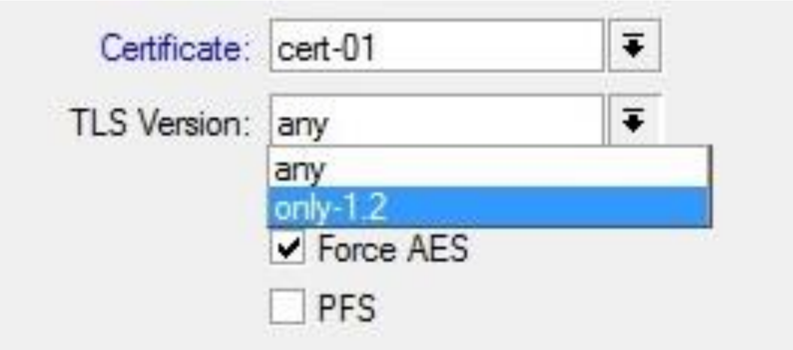


SSTP - TLS 1.2 VERSION

- Protokol ini menyediakan authentikasi akhir dan privasi komunikasi di Internet menggunakan cryptography.

Langkah dasar TLS / SSL

- Negosiasi
- Public key, *encryption-based-key*, dan *certificate-based authentication*
- Symmetric - Asymmetric cryptography



Certificate: cert-01

TLS Version: any

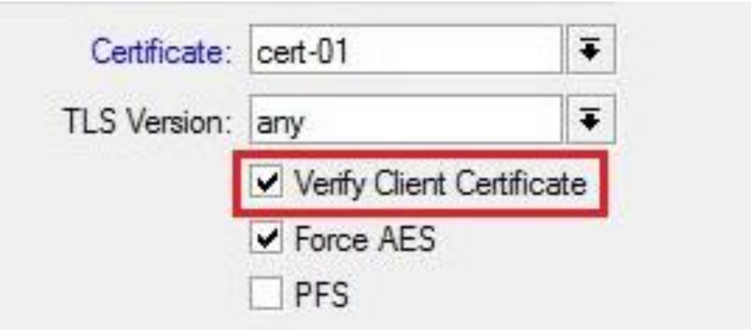
any

only-1.2

☑ Force AES

□ PFS

- RouterOS mengimpor sertifikat CA dan mengaktifkan opsi verifikasi-server-sertifikat. Dalam skenario ini, serangan Man-in-the-Middle tidak dimungkinkan.



Certificate: cert-01

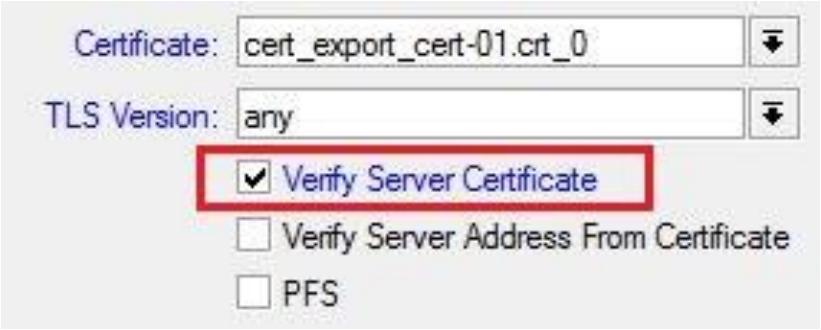
TLS Version: any

☑ Verify Client Certificate

☑ Force AES

□ PFS

SSTP Server



Certificate: cert_export_cert-01.crt_0

TLS Version: any

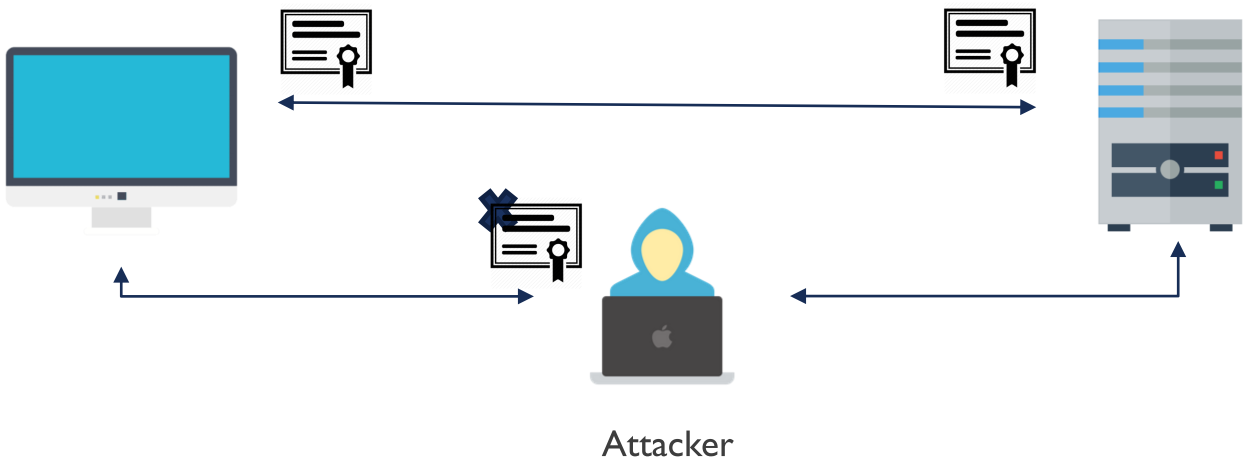
☑ Verify Server Certificate

□ Verify Server Address From Certificate

□ PFS

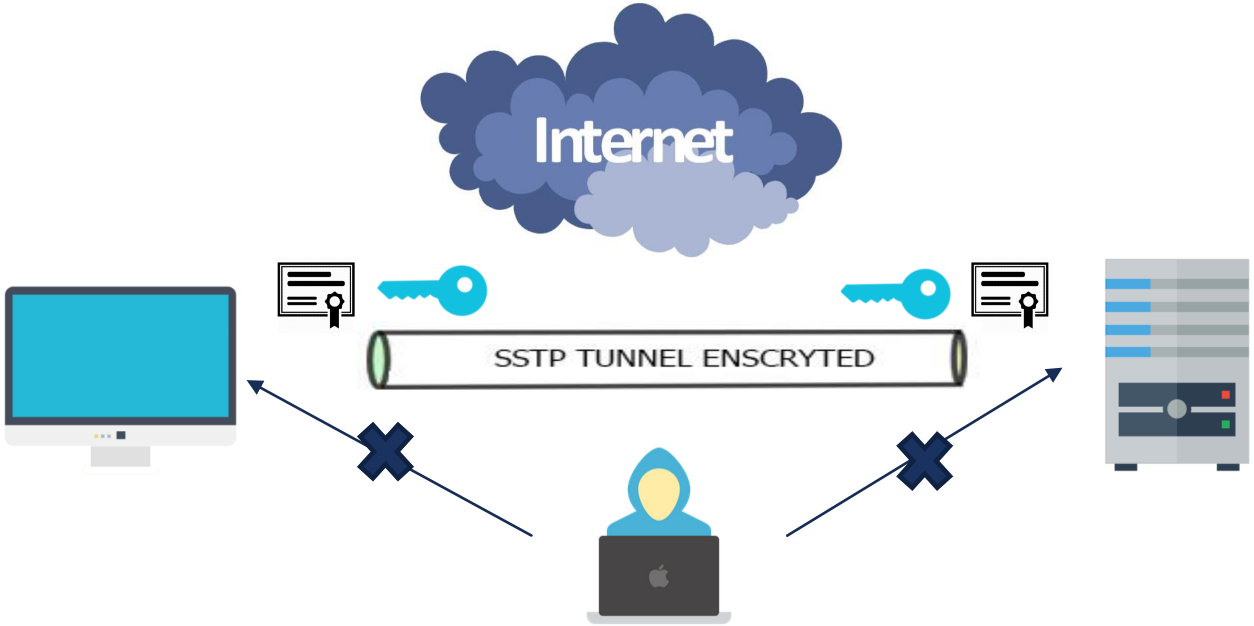
SSTP Client

- Configuration requirements are:
  - Sertifikat di server dan klien
  - Opsi verifikasi diaktifkan di server dan klien

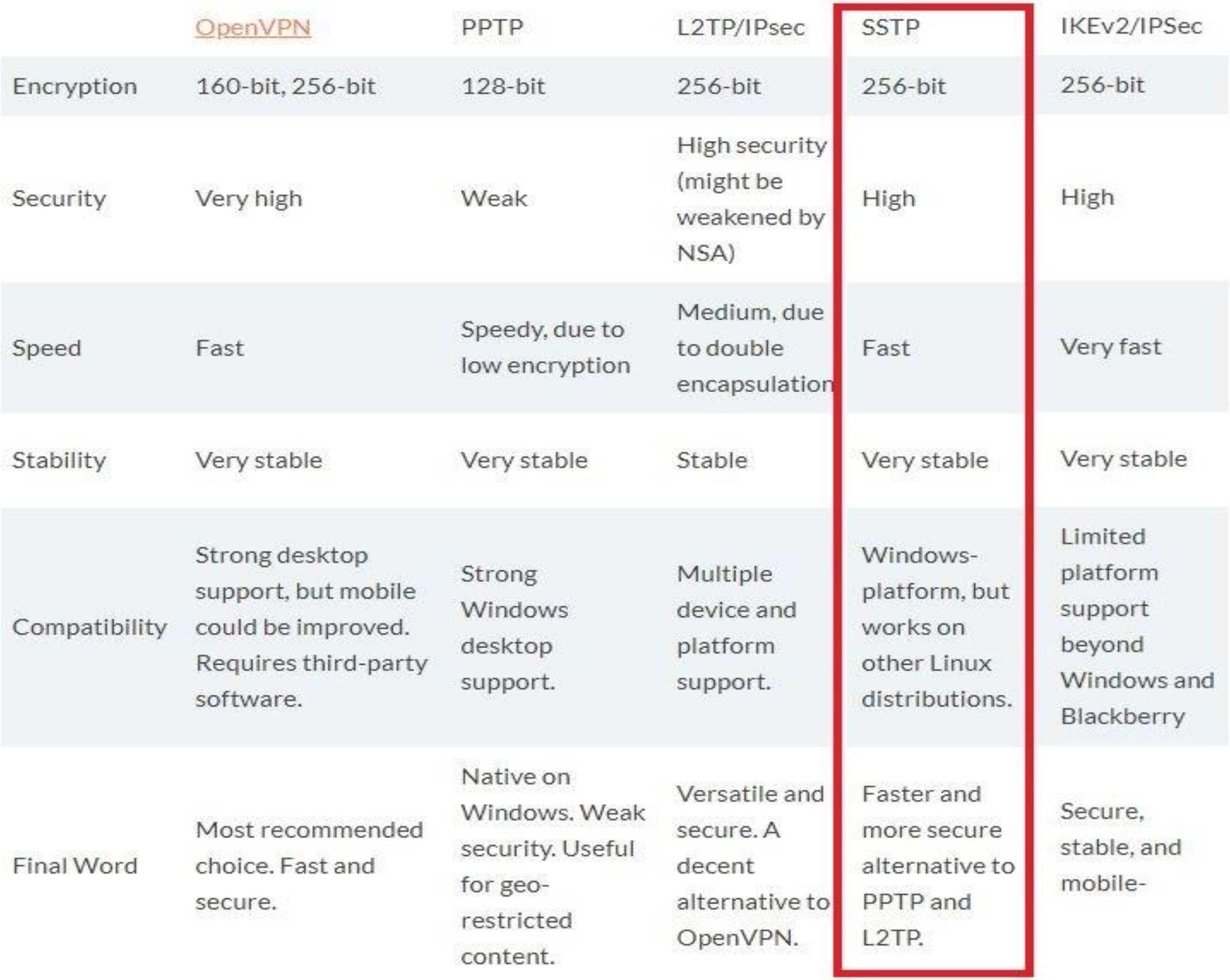


- Ini tidak hanya dilakukan dengan username dan password, tetapi pada client-server juga diautentikasi menggunakan sertifikat server.

  this means that the servers to check if both channels are secure.



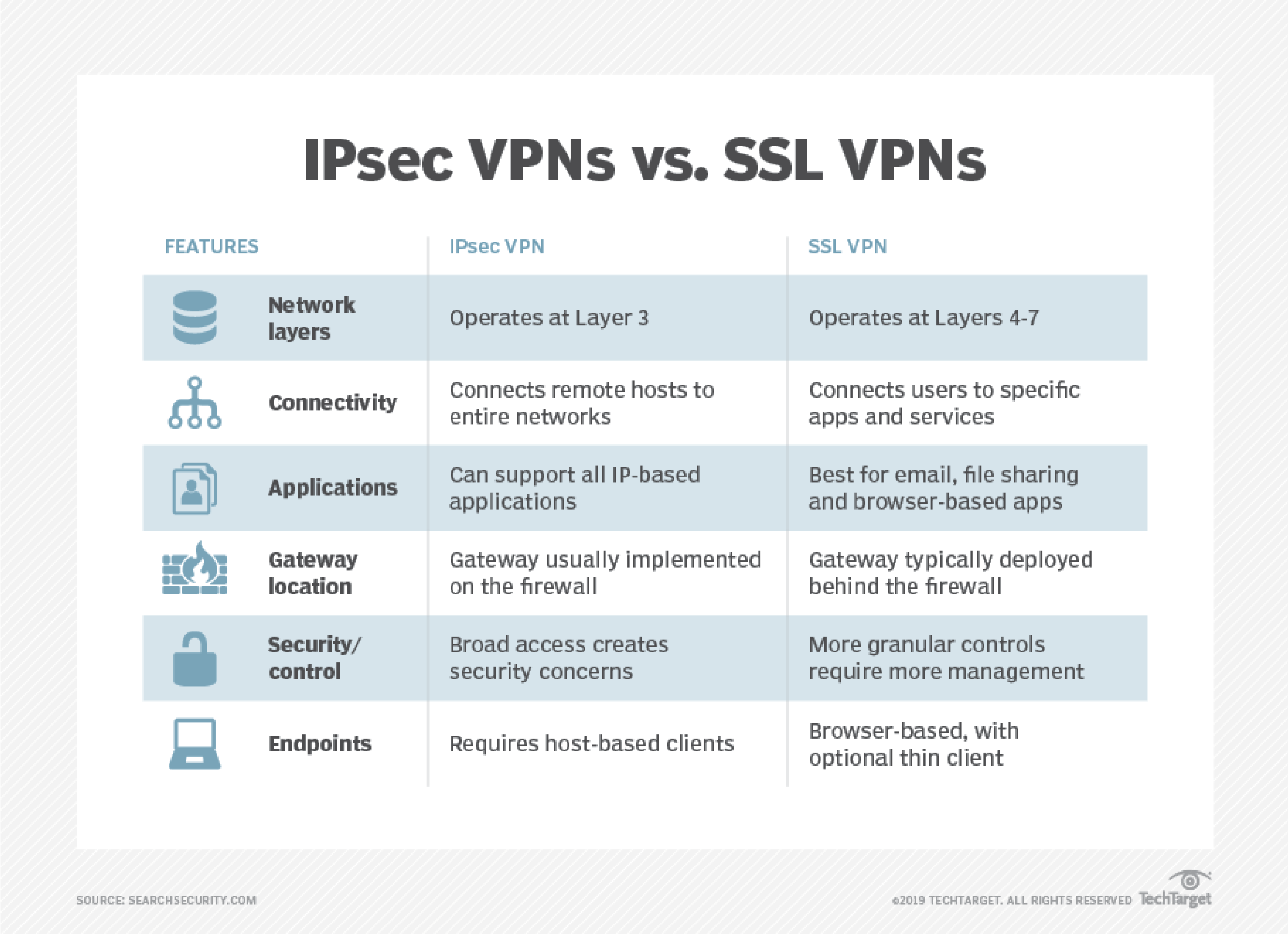
WHY SSTP ?



	OpenVPN	PPTP	L2TP/IPsec	SSTP	IKEv2/IPSec
Encryption	160-bit, 256-bit	128-bit	256-bit	256-bit	256-bit
Security	Very high	Weak	High security (might be weakened by NSA)	High	High
Speed	Fast	Speedy, due to low encryption	Medium, due to double encapsulation	Fast	Very fast
Stability	Very stable	Very stable	Stable	Very stable	Very stable
Compatibility	Strong desktop support, but mobile could be improved. Requires third-party software.	Strong Windows desktop support.	Multiple device and platform support.	Windows-platform, but works on other Linux distributions.	Limited platform support beyond Windows and Blackberry
Final Word	Most recommended choice. Fast and secure.	Native on Windows. Weak security. Useful for geo-restricted content.	Versatile and secure. A decent alternative to OpenVPN.	Faster and more secure alternative to PPTP and L2TP.	Secure, stable, and mobile-

https://thebestvpn.com/pptp-l2tp-openvpn-sstp-ikev2-protocols/

NOT USE IPSEC?



IPsec VPNs vs. SSL VPNs

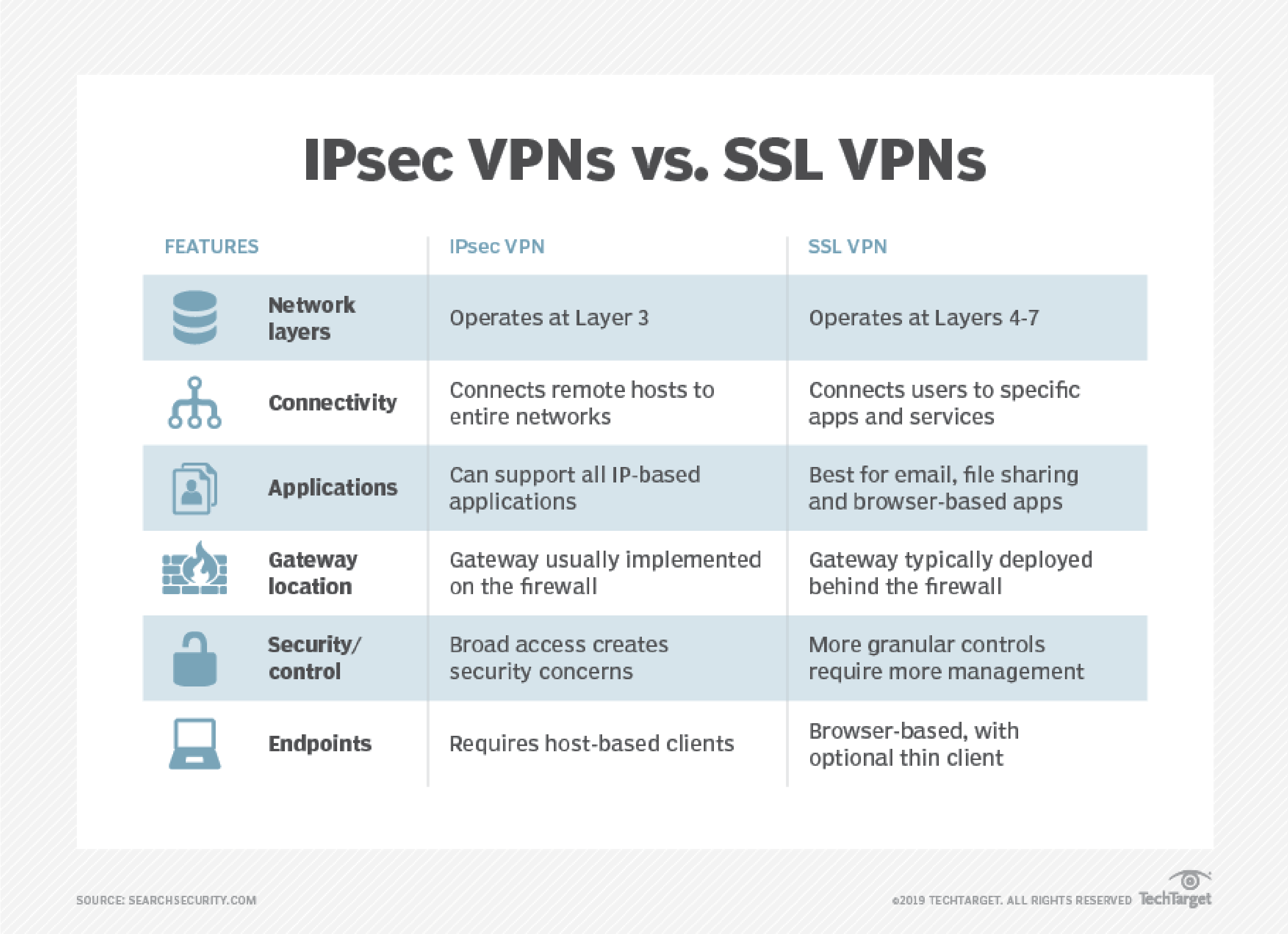
FEATURES	IPsec VPN	SSL VPN
Network layers	Operates at Layer 3	Operates at Layers 4-7
Connectivity	Connects remote hosts to entire networks	Connects users to specific apps and services
Applications	Can support all IP-based applications	Best for email, file sharing and browser-based apps
Gateway location	Gateway usually implemented on the firewall	Gateway typically deployed behind the firewall
Security/ control	Broad access creates security concerns	More granular controls require more management
Endpoints	Requires host-based clients	Browser-based, with optional thin client

SOURCE: SEARCHSECURITY.COM

https://searchsecurity.techtarget.com/tip/IPSec-VPN-vs-SSL-VPN-Comparing-respective-VPN-security-risks

"TLS menjaga konteks antara pengirim dan penerima dan pembaruan yang menyatakan (seperti nomor urut)"

"Dengan IPsec, semua itu perlu dibuat eksplisit (karena tidak ada jaminan bahwa penerima akan mendapatkan paket yang sama dalam urutan yang sama dengan yang dikirim pengirim)"



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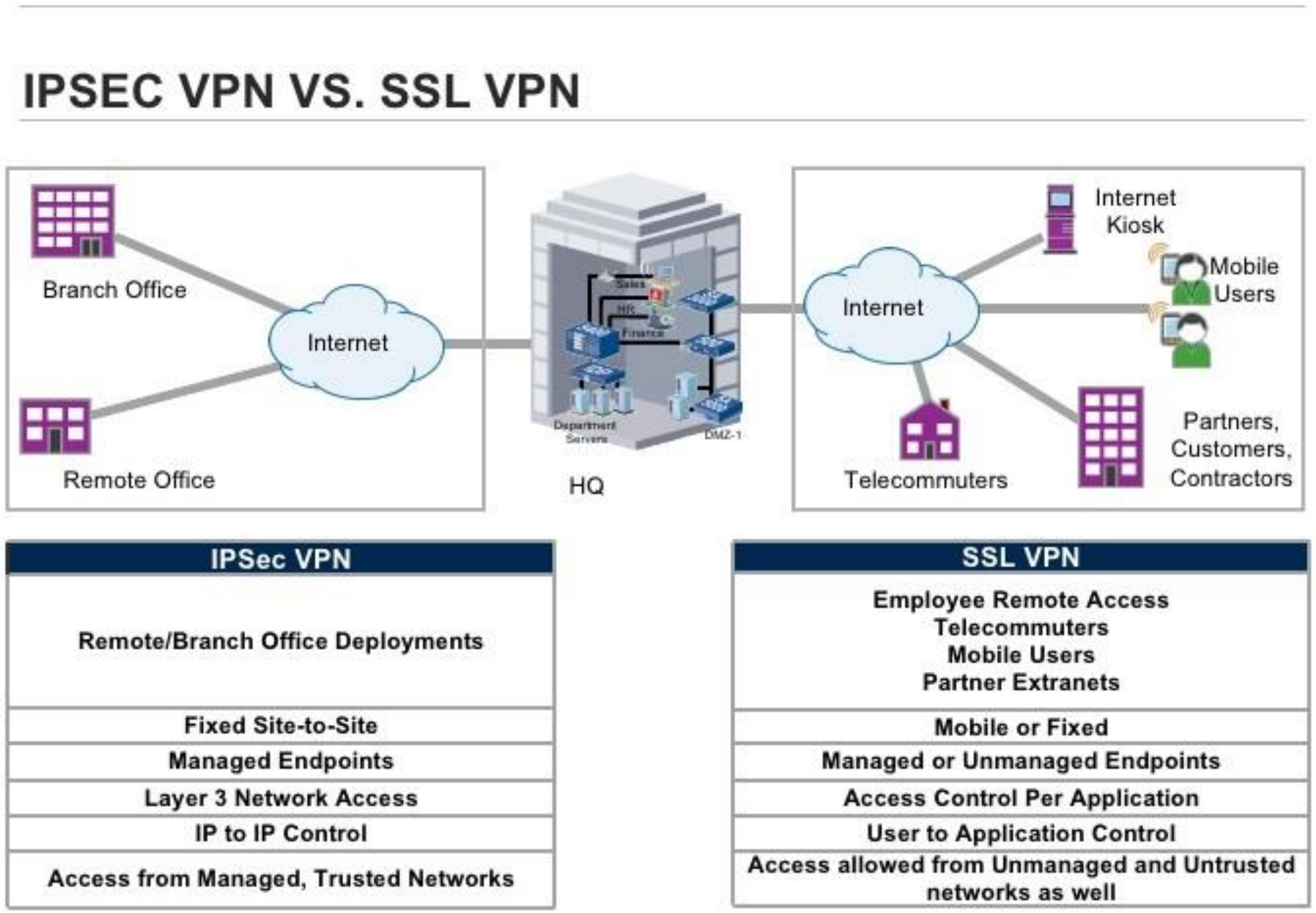
SOURCE: SEARCHSECURITY.COM

- SSL VPN that operates through a web browser will usually be able to manage connections faster than ip sec.

- SSTP support mobile connection, IPSEC not support



IPSEC VPN VS. SSL VPN

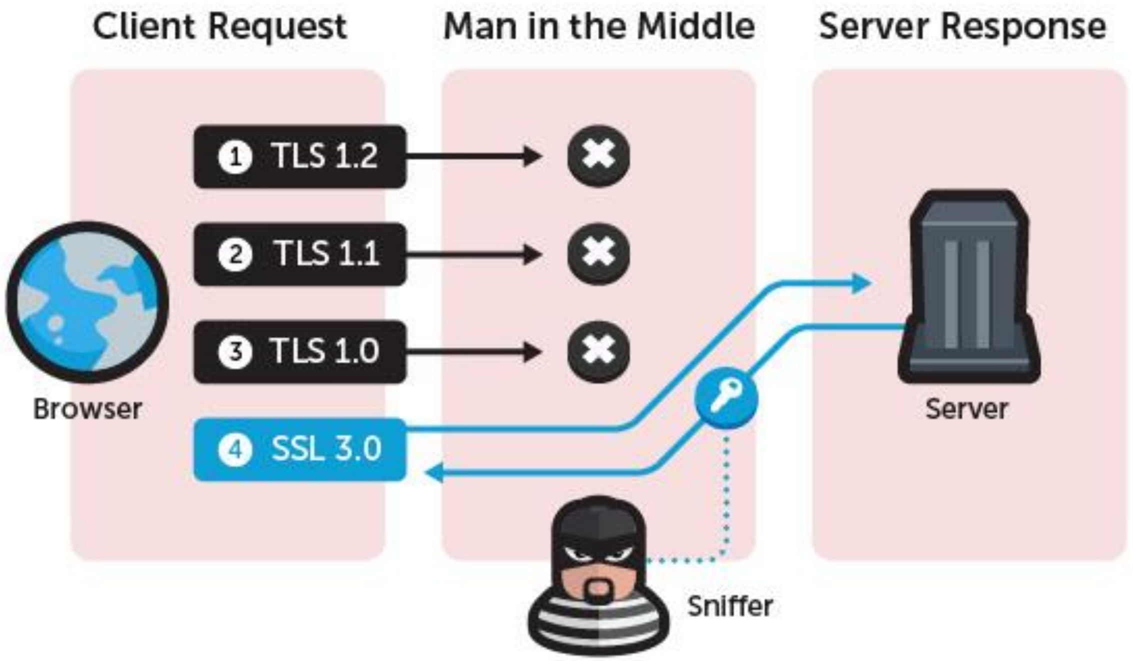
IPSec VPN
Remote/Branch Office Deployments
Fixed Site-to-Site
Managed Endpoints
Layer 3 Network Access
IP to IP Control
Access from Managed, Trusted Networks

SSL VPN
Employee Remote Access Telecommuters Mobile Users Partner Extranets
Mobile or Fixed
Managed or Unmanaged Endpoints
Access Control Per Application
User to Application Control
Access allowed from Unmanaged and Untrusted networks as well

- Network administrators who operate VPNs tend to find client management a lot easier and less time-consuming with SSL than with IPSec.

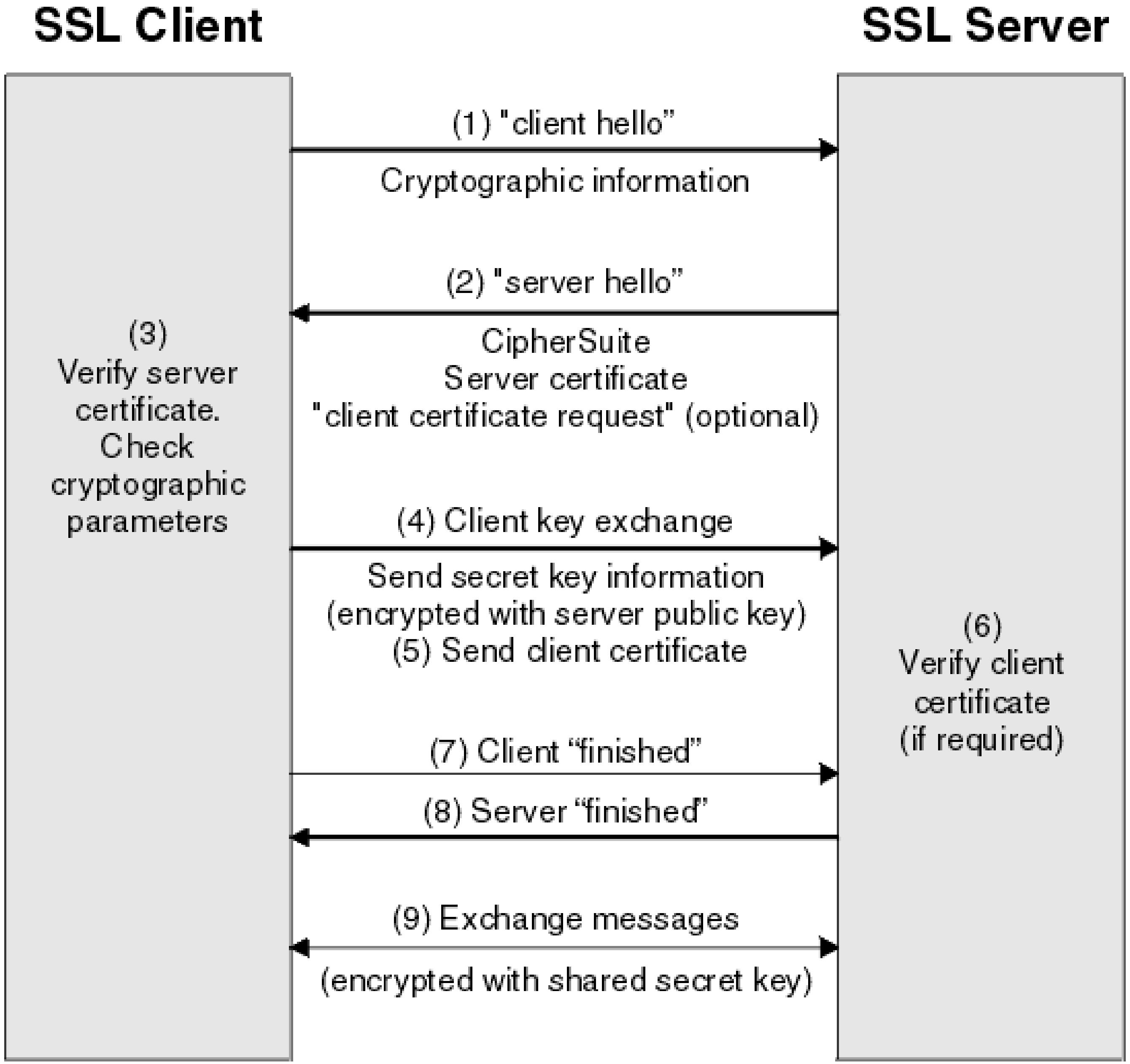
- SSTP uses TLS 1.2
  - Server & Client Certificate

    Publik key Disertifikasi oleh Sertifikat dengan Kepercayaan dari client.



https://blog.trendmicro.com/trendlabs-security-intelligence/poodle-vulnerability-puts-online-transactions-at-risk/

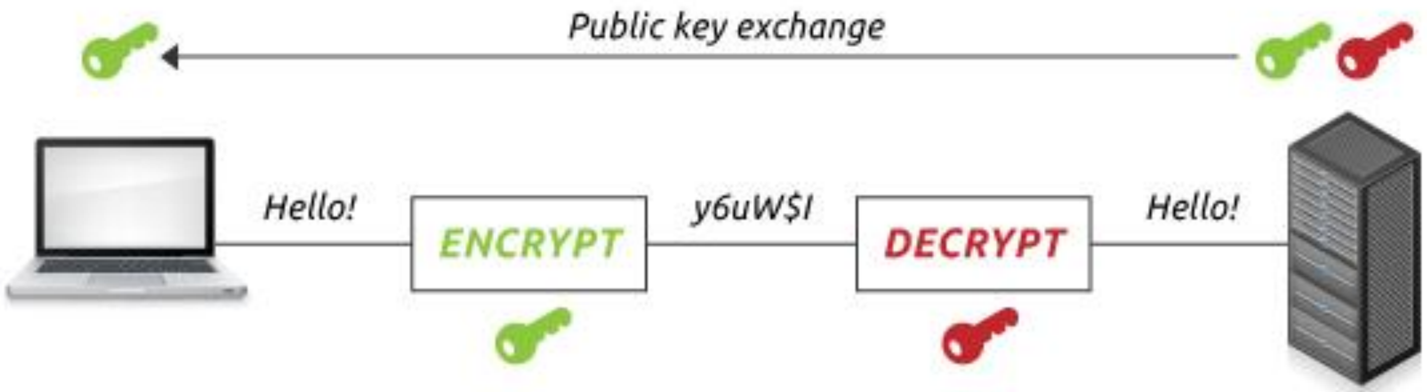
PROSES HANDSHAKE SSL/TLS


SSL Client
SSL Server
(1) "client hello"
Cryptographic information
(2) "server hello"
CipherSuite
Server certificate
"client certificate request" (optional)
(3)
Verify server certificate.
Check cryptographic parameters
(4) Client key exchange
Send secret key information
(encrypted with server public key)
(5) Send client certificate
(6)
Verify client certificate
(if required)
(7) Client "finished"
(8) Server "finished"
(9) Exchange messages
(encrypted with shared secret key)

https://www.ibm.com/support/knowledgecenter/en/SSFKSJ_7.1.0/com.ibm.mq.doc/sy10660_.htm

ASYMMETRIC

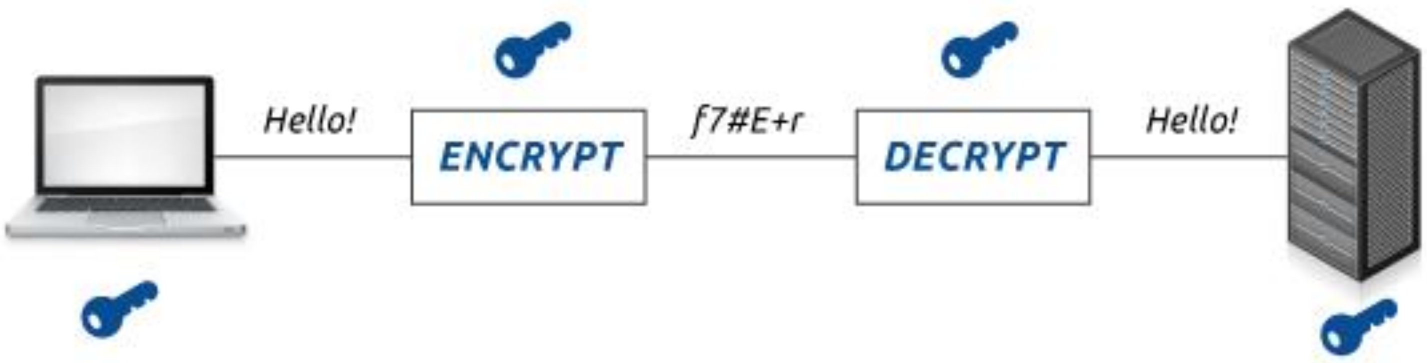
- SSTP It uses 2048 bit encryption and authentication certificates.



https://www.digicert.com/ssl-cryptography.htm

Enkripsi asimetris (atau kriptografi kunci publik)
menggunakan kunci terpisah untuk enkripsi dan dekripsi

SYMMETRIC

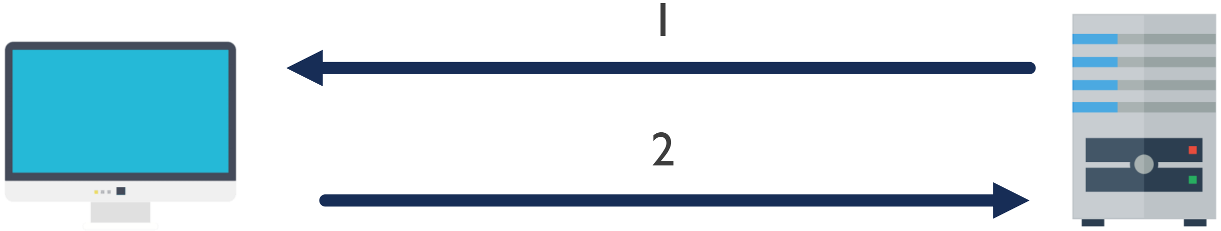


Enkripsi simetris (atau enkripsi kunci yang dibagikan sebelumnya) menggunakan kunci tunggal untuk mengenkripsi dan mendekripsi data.

HOW SSL USES ASYMMETRIC AND SYMMETRIC

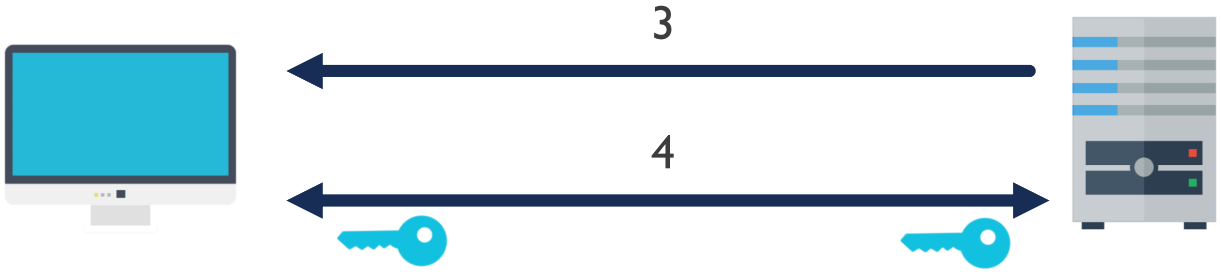
- Server mengirimkan salinan kunci publik asimetrisnya.

- Browser membuat kunci sesi simetris dan mengenkripsinya dengan kunci publik asimetris server. Kemudian mengirimkannya ke server.

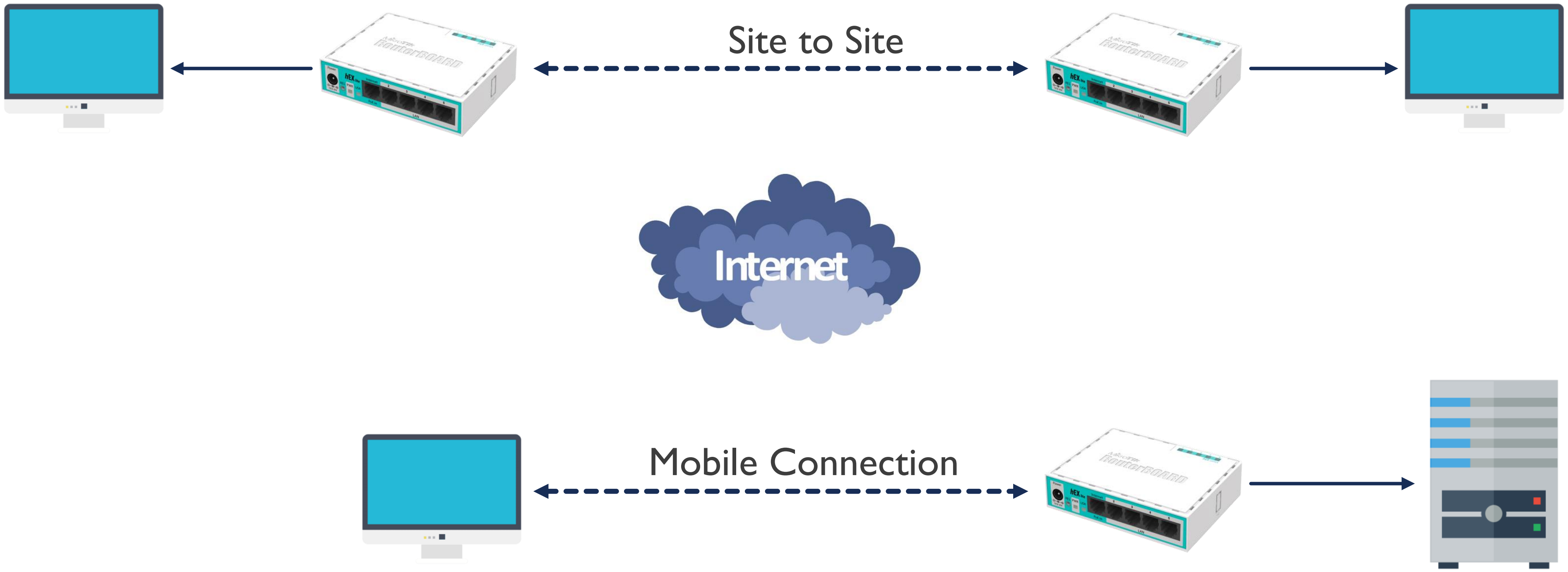


- Server dan Browser sekarang mengenkripsi dan mendekripsi semua data yang dikirimkan dengan kunci sesi

"This allows for a secure channel because the browser and the server know the session key"

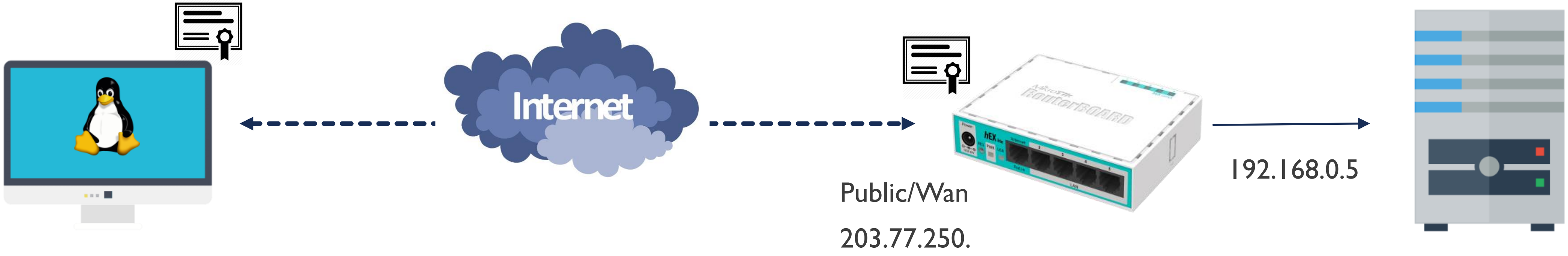


TOPOLOGI

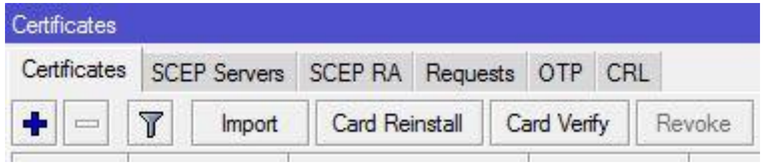


SSTP CLIENT ON LINUX

- Currently, SSTP clients exist in Windows Vista, Windows 7, Windows 8, Linux and RouterOS.



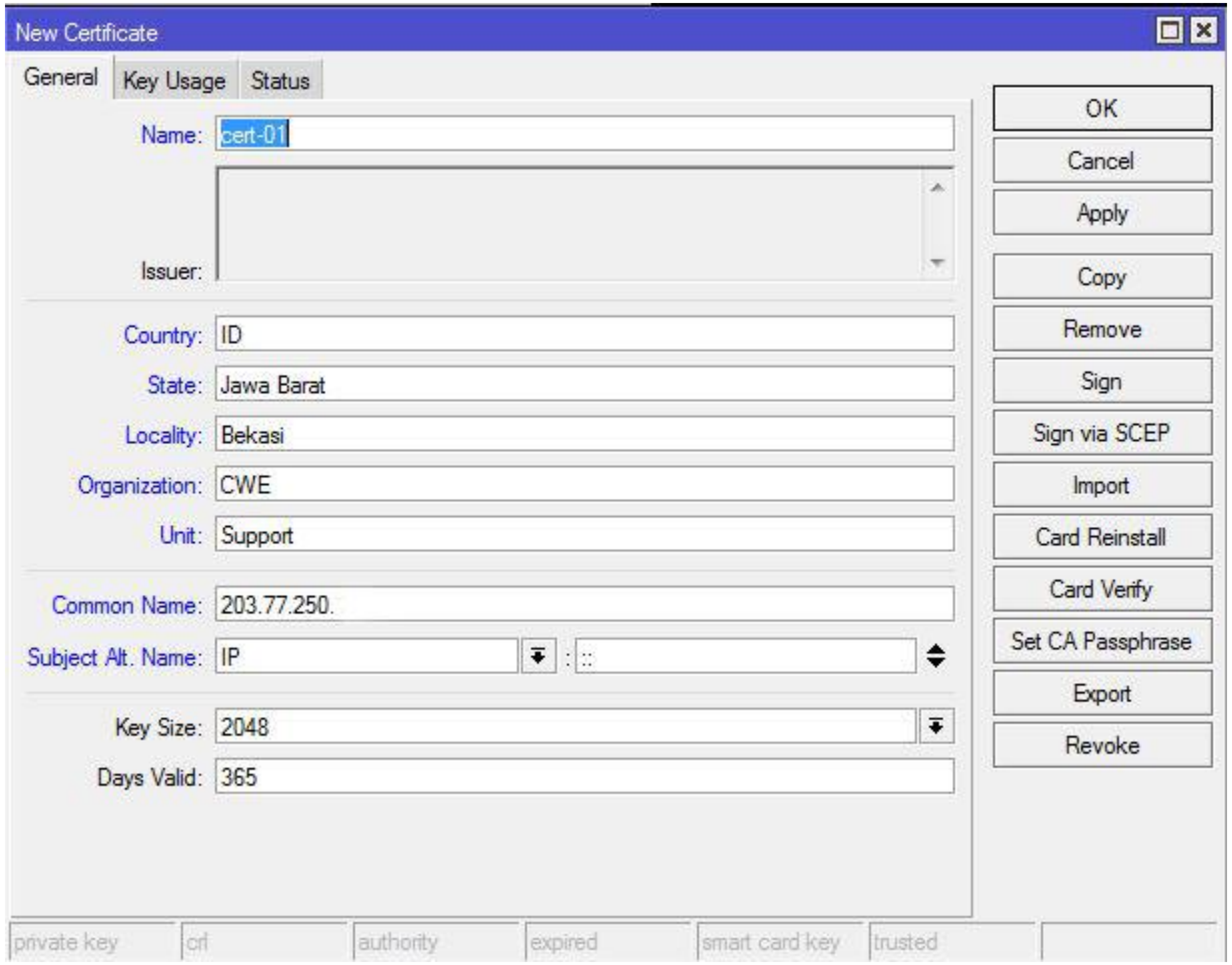
CONFIG MOBILE CONNECTION



- Membuat Certificate

Disini kita akan membuat 3 Certificate

1. CA Template
2. Server
3. Client



Name: cert-01

Issuer:

Country: ID

State: Jawa Barat

Locality: Bekasi

Organization: CWE

Unit: Support

Common Name: 203.77.250.

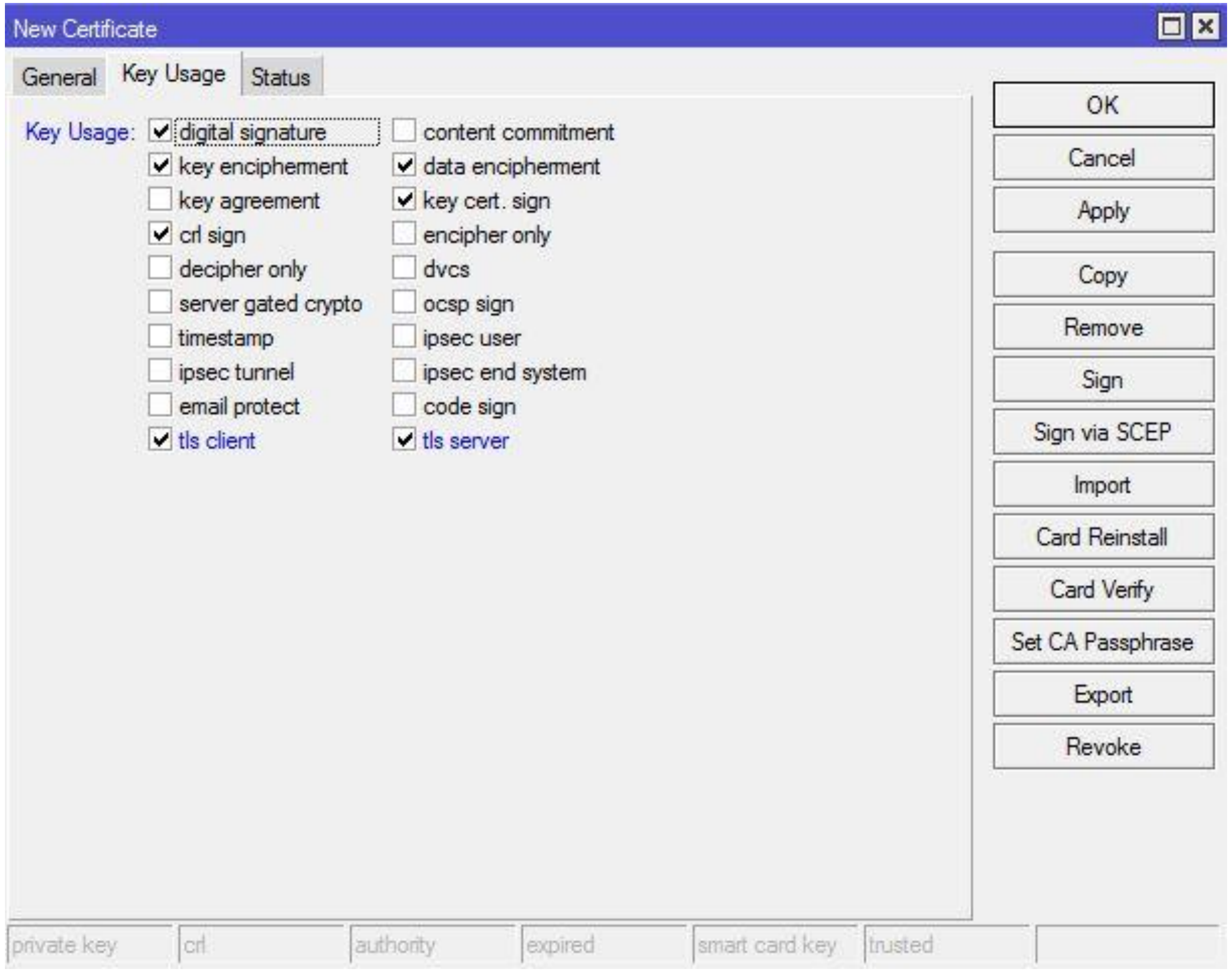
Subject Alt. Name: IP : ::

Key Size: 2048

Days Valid: 365

- Key Usage

  - TLS Server & Client

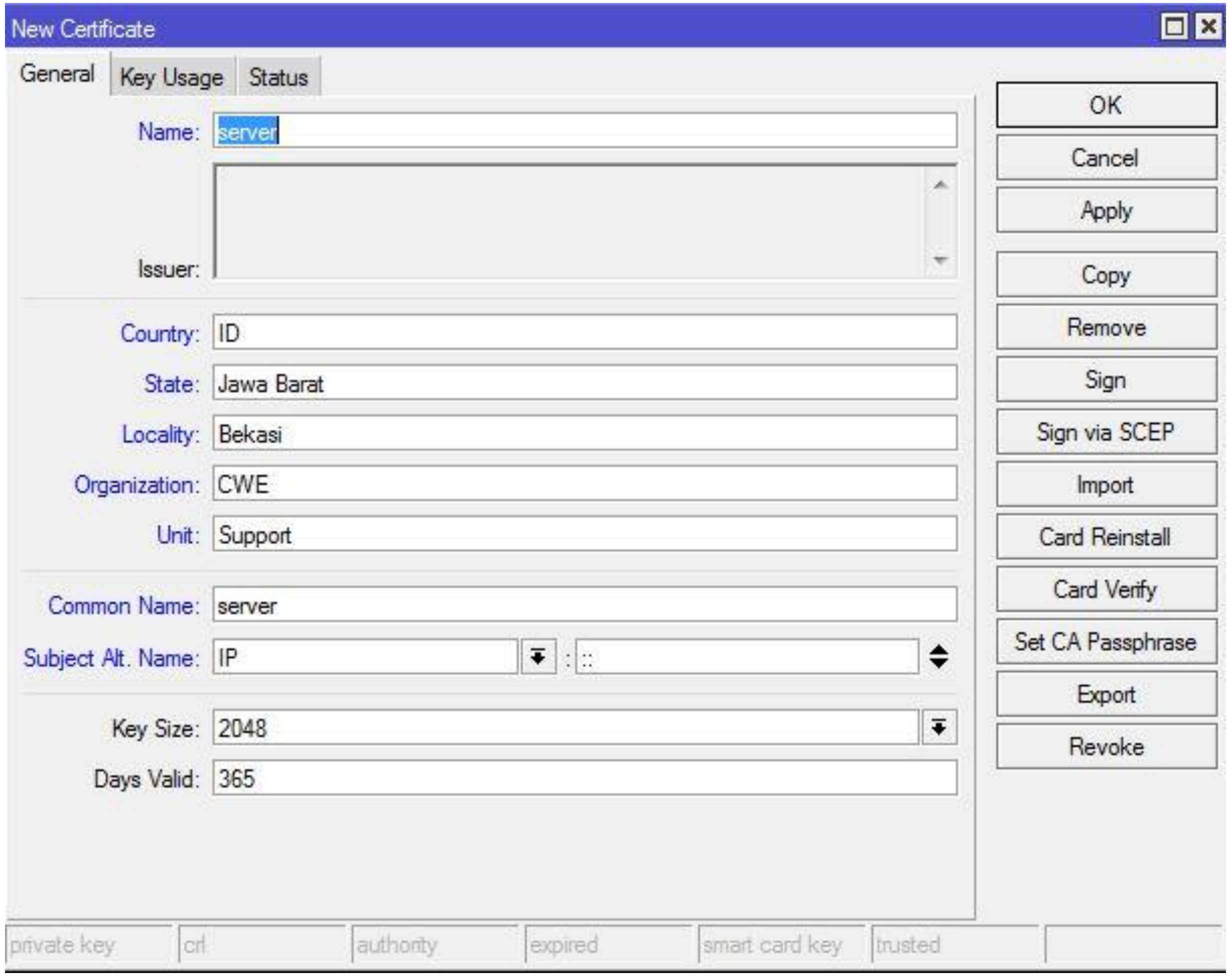


Key Usage:

☑ digital signature
☑ key encipherment
□ key agreement
☑ crl sign
□ decipher only
□ server gated crypto
□ timestamp
□ ipsec tunnel
□ email protect
☑ tls client

□ content commitment
☑ data encipherment
☑ key cert. sign
□ encipher only
□ dvcs
□ ocsp sign
□ ipsec user
□ ipsec end system
□ code sign
☑ tls server

- Lakukan settingan yg sama , yang membedakan hanya common name dan name nya saja



New Certificate

General | Key Usage | Status

Name: server

Issuer:

Country: ID

State: Jawa Barat

Locality: Bekasi

Organization: CWE

Unit: Support

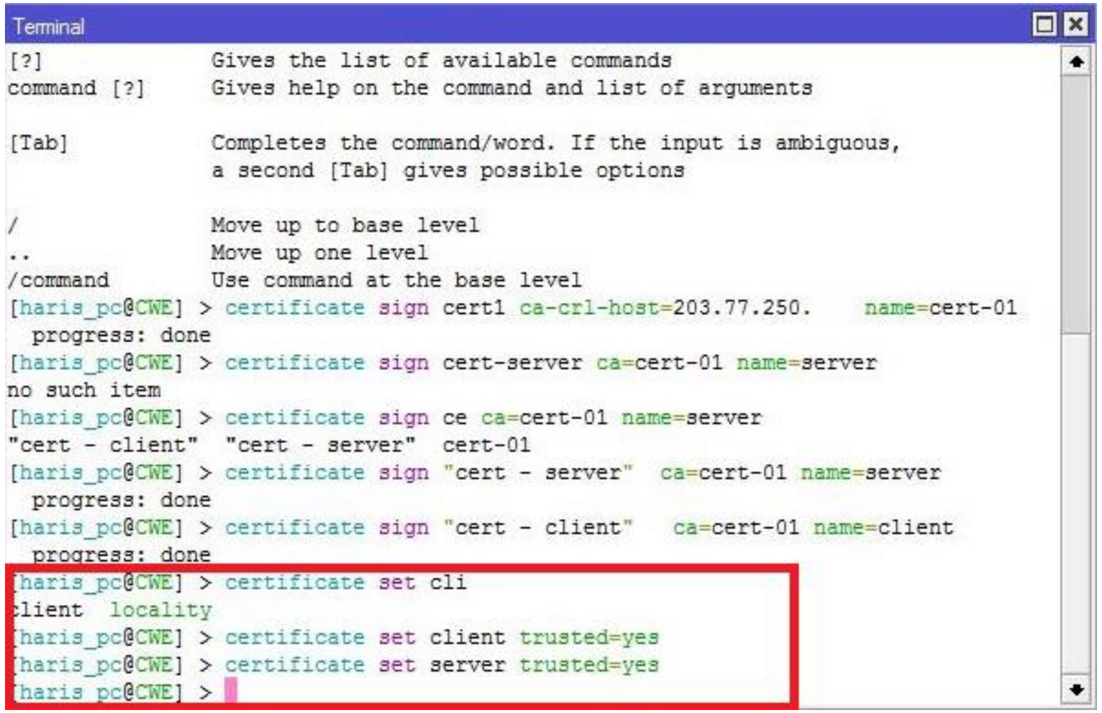
Common Name: server

Subject Alt. Name: IP : ::

Key Size: 2048

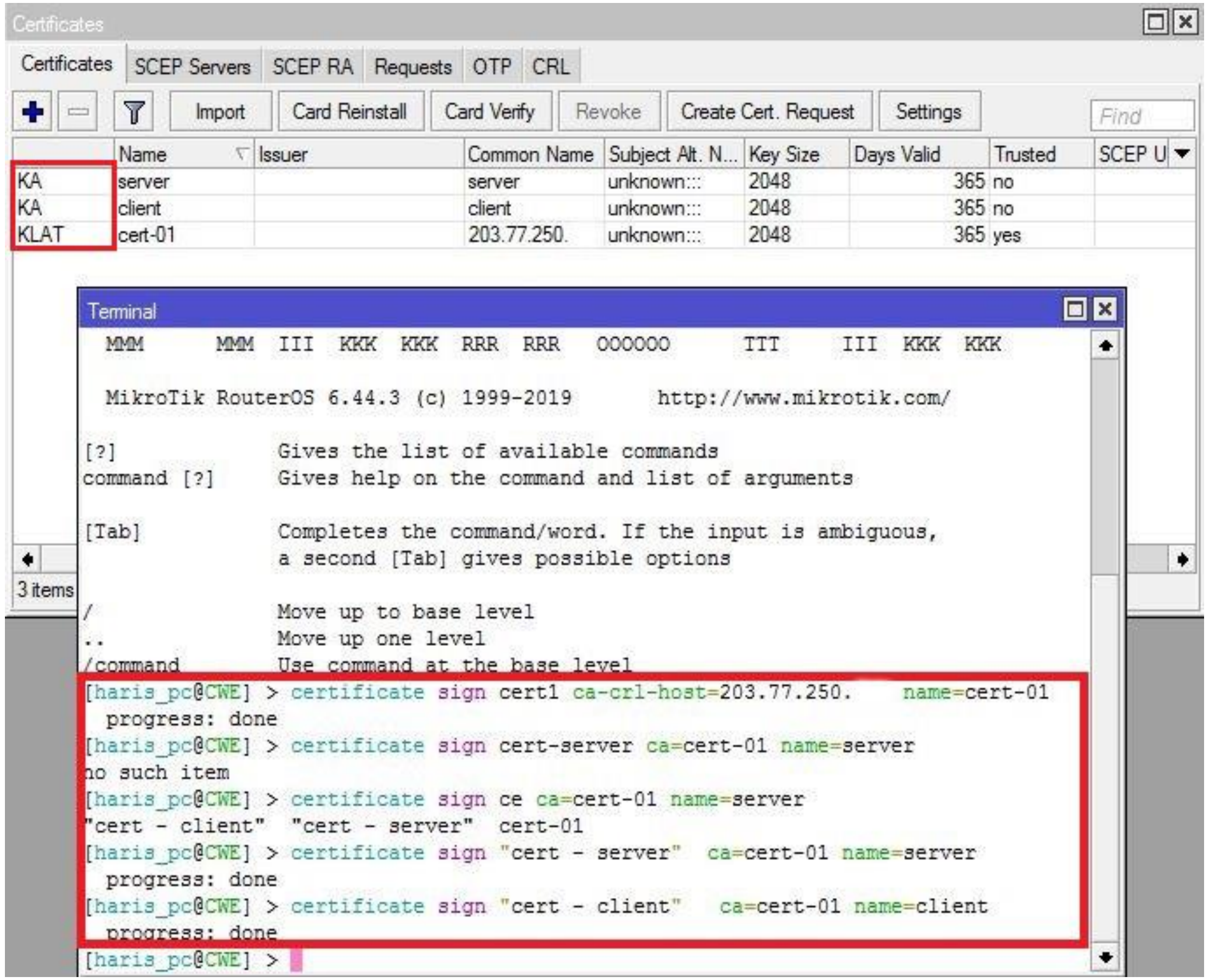
Days Valid: 365

- Kita tanda tangani (sel-signed) server dan client nya dan jangan lupa trusted



Terminal

```
[?]             Gives the list of available commands
command [?]     Gives help on the command and list of arguments

[Tab]           Completes the command/word. If the input is ambiguous,
                a second [Tab] gives possible options

/               Move up to base level
..              Move up one level
/command        Use command at the base level
[haris_pc@CWE] > certificate sign cert1 ca-crl-host=203.77.250.    name=cert-01
  progress: done
[haris_pc@CWE] > certificate sign cert-server ca=cert-01 name=server
no such item
[haris_pc@CWE] > certificate sign ce ca=cert-01 name=server
"cert - client"  "cert - server"  cert-01
[haris_pc@CWE] > certificate sign "cert - server"  ca=cert-01 name=server
  progress: done
[haris_pc@CWE] > certificate sign "cert - client"   ca=cert-01 name=client
  progress: done
[haris_pc@CWE] > certificate set cli
client  locality
[haris_pc@CWE] > certificate set client trusted=yes
[haris_pc@CWE] > certificate set server trusted=yes
[haris_pc@CWE] >
```



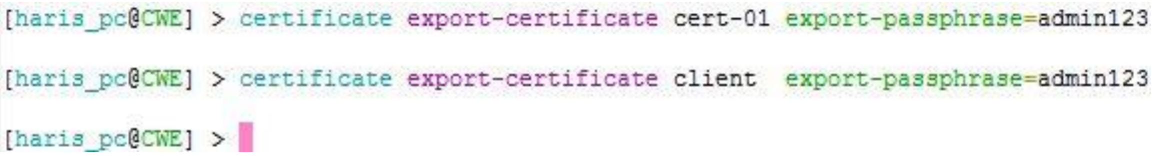
	Name	Issuer	Common Name	Subject Alt. N...	Key Size	Days Valid	Trusted	SCEP U
KA	server		server	unknown:::	2048	365	no	
KA	client		client	unknown:::	2048	365	no	
KLAT	cert-01		203.77.250.	unknown:::	2048	365	yes	

3 items

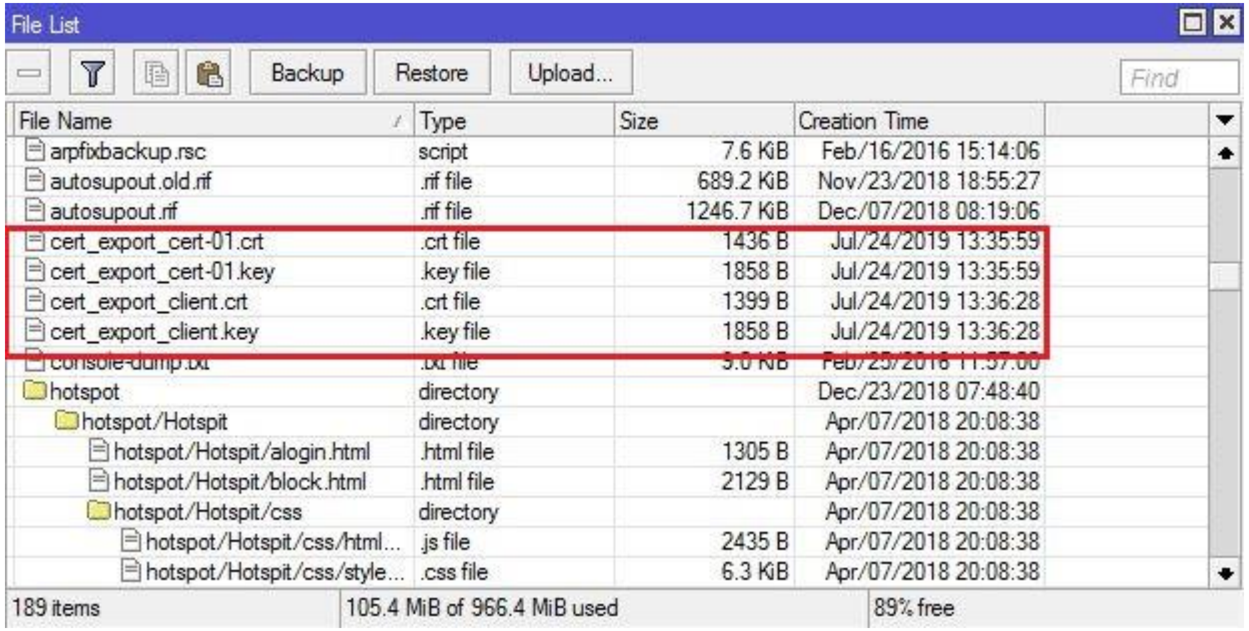
Terminal

```
  MMM      MMM  III  KKK  KKK  RRR  RRR  OOOOOO     TTT     III  KKK  KKK

  MikroTik RouterOS 6.44.3 (c) 1999-2019       http://www.mikrotik.com/

[?]             Gives the list of available commands
command [?]     Gives help on the command and list of arguments

[Tab]           Completes the command/word. If the input is ambiguous,
                a second [Tab] gives possible options

/               Move up to base level
..              Move up one level
/command        Use command at the base level
[haris_pc@CWE] > certificate sign cert1 ca-crl-host=203.77.250.    name=cert-01
  progress: done
[haris_pc@CWE] > certificate sign cert-server ca=cert-01 name=server
no such item
[haris_pc@CWE] > certificate sign ce ca=cert-01 name=server
"cert - client"  "cert - server"  cert-01
[haris_pc@CWE] > certificate sign "cert - server"  ca=cert-01 name=server
  progress: done
[haris_pc@CWE] > certificate sign "cert - client"   ca=cert-01 name=client
  progress: done
[haris_pc@CWE] >
```

- Export certificate untuk nanti di pindahkan ke client



```
[haris_pc@CWE] > certificate export-certificate cert-01 export-passphrase=admin123

[haris_pc@CWE] > certificate export-certificate client  export-passphrase=admin123

[haris_pc@CWE] >
```

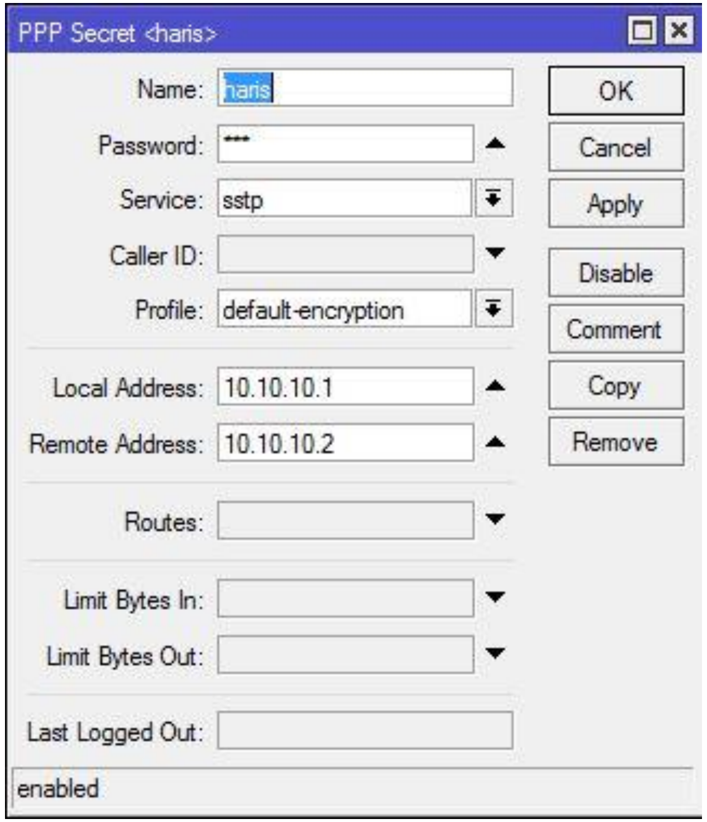


File Name	Type	Size	Creation Time
arpfixbackup.rsc	script	7.6 KiB	Feb/16/2016 15:14:06
autosupout.old.rif	.rif file	689.2 KiB	Nov/23/2018 18:55:27
autosupout.rif	.rif file	1246.7 KiB	Dec/07/2018 08:19:06
cert_export_cert-01.crt	.crt file	1436 B	Jul/24/2019 13:35:59
cert_export_cert-01.key	.key file	1858 B	Jul/24/2019 13:35:59
cert_export_client.crt	.crt file	1399 B	Jul/24/2019 13:36:28
cert_export_client.key	.key file	1858 B	Jul/24/2019 13:36:28
console-dump.txt	.txt file	3.0 KiB	Feb/25/2018 11:57:00
hotspot	directory		Dec/23/2018 07:48:40
hotspot/Hotspit	directory		Apr/07/2018 20:08:38
hotspot/Hotspit/alogin.html	.html file	1305 B	Apr/07/2018 20:08:38
hotspot/Hotspit/block.html	.html file	2129 B	Apr/07/2018 20:08:38
hotspot/Hotspit/css	directory		Apr/07/2018 20:08:38
hotspot/Hotspit/css/html...	.js file	2435 B	Apr/07/2018 20:08:38
hotspot/Hotspit/css/style...	.css file	6.3 KiB	Apr/07/2018 20:08:38

189 items | 105.4 MiB of 966.4 MiB used | 89% free

- Aktifkan SSTP Server dan buat secret untuk akses login client

TLS/SSL validates server certificate.



PPP Secret <haris>

Name: haris

Password: ***

Service: sstp

Caller ID:

Profile: default-encryption

Local Address: 10.10.10.1

Remote Address: 10.10.10.2

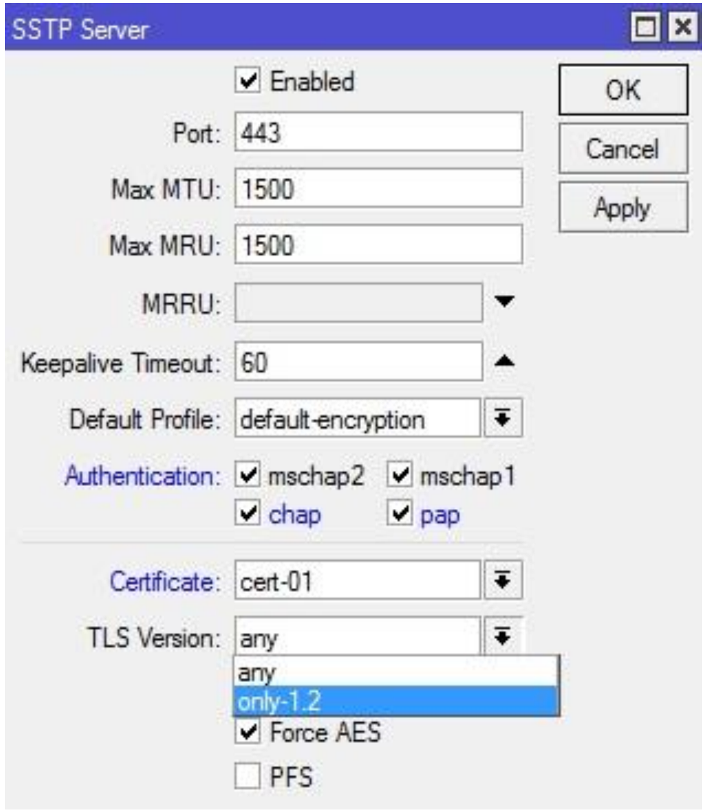
Routes:

Limit Bytes In:

Limit Bytes Out:

Last Logged Out:

enabled



SSTP Server

☑ Enabled

Port: 443

Max MTU: 1500

Max MRU: 1500

MRRU:

Keepalive Timeout: 60

Default Profile: default-encryption

Authentication: ☑ mschap2 ☑ mschap1 ☑ chap ☑ pap

Certificate: cert-01

TLS Version: any

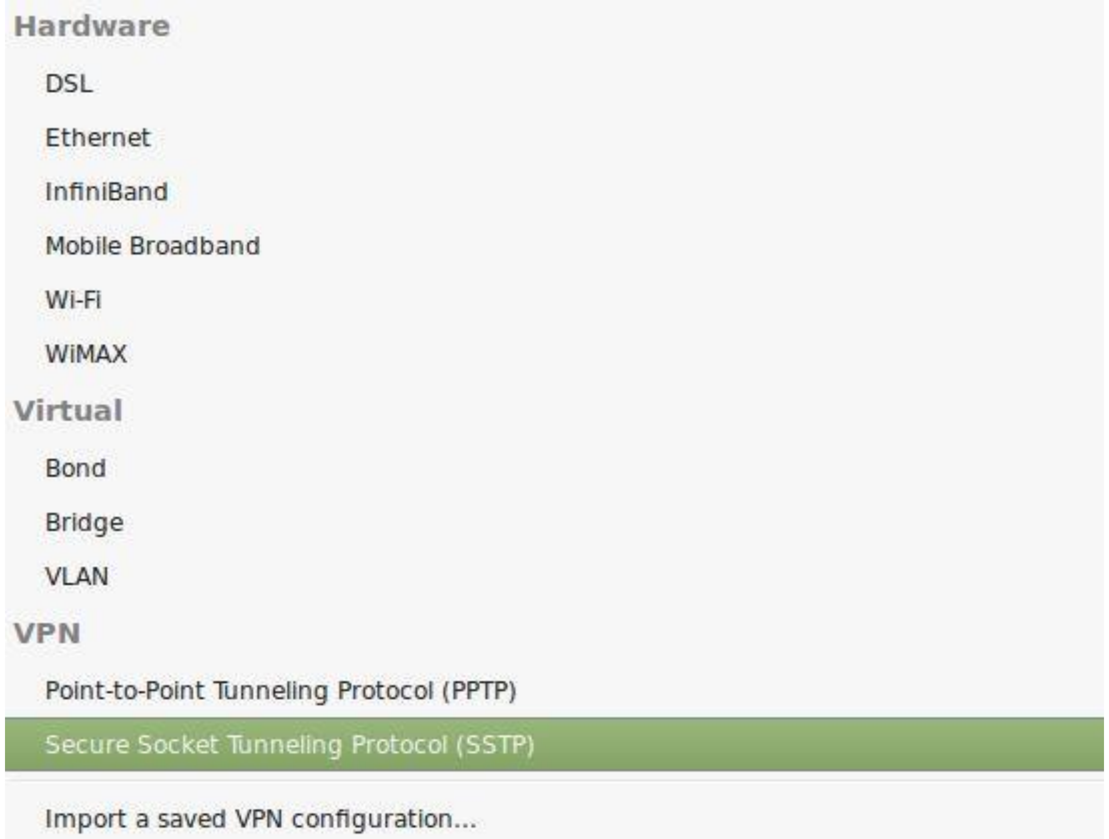
any
only-1.2

☑ Force AES

□ PFS

- Disini kita pilih TLS version 1.2

- Sekarang kita aktifkan VPN connection nya



Hardware

DSL

Ethernet

InfiniBand

Mobile Broadband

Wi-Fi

WiMAX

Virtual

Bond

Bridge

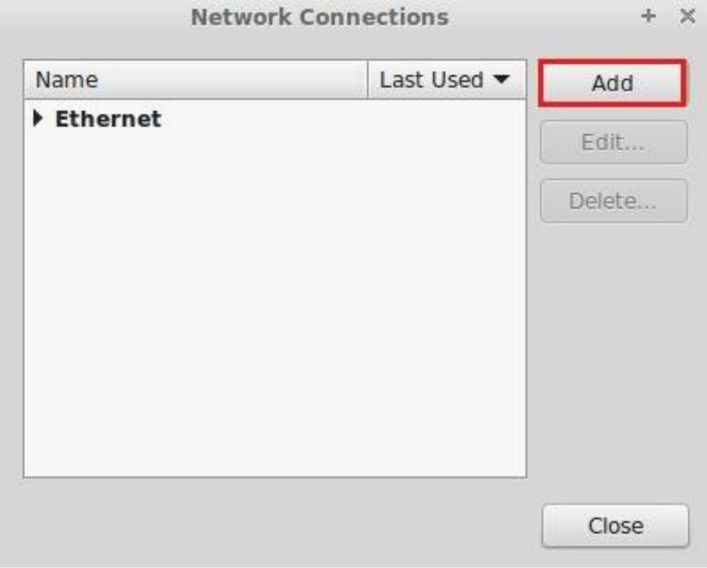
VLAN

VPN

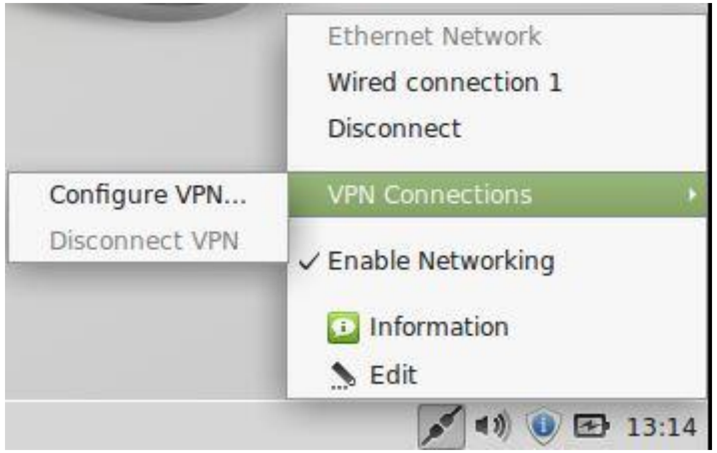
Point-to-Point Tunneling Protocol (PPTP)

Secure Socket Tunneling Protocol (SSTP)

Import a saved VPN configuration...

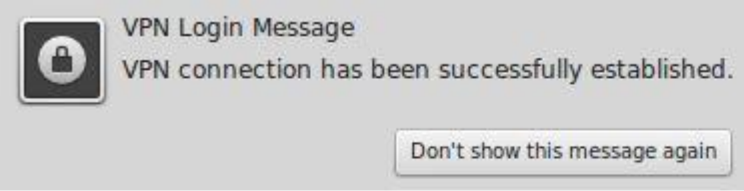


- Buat koneksi vpn baru



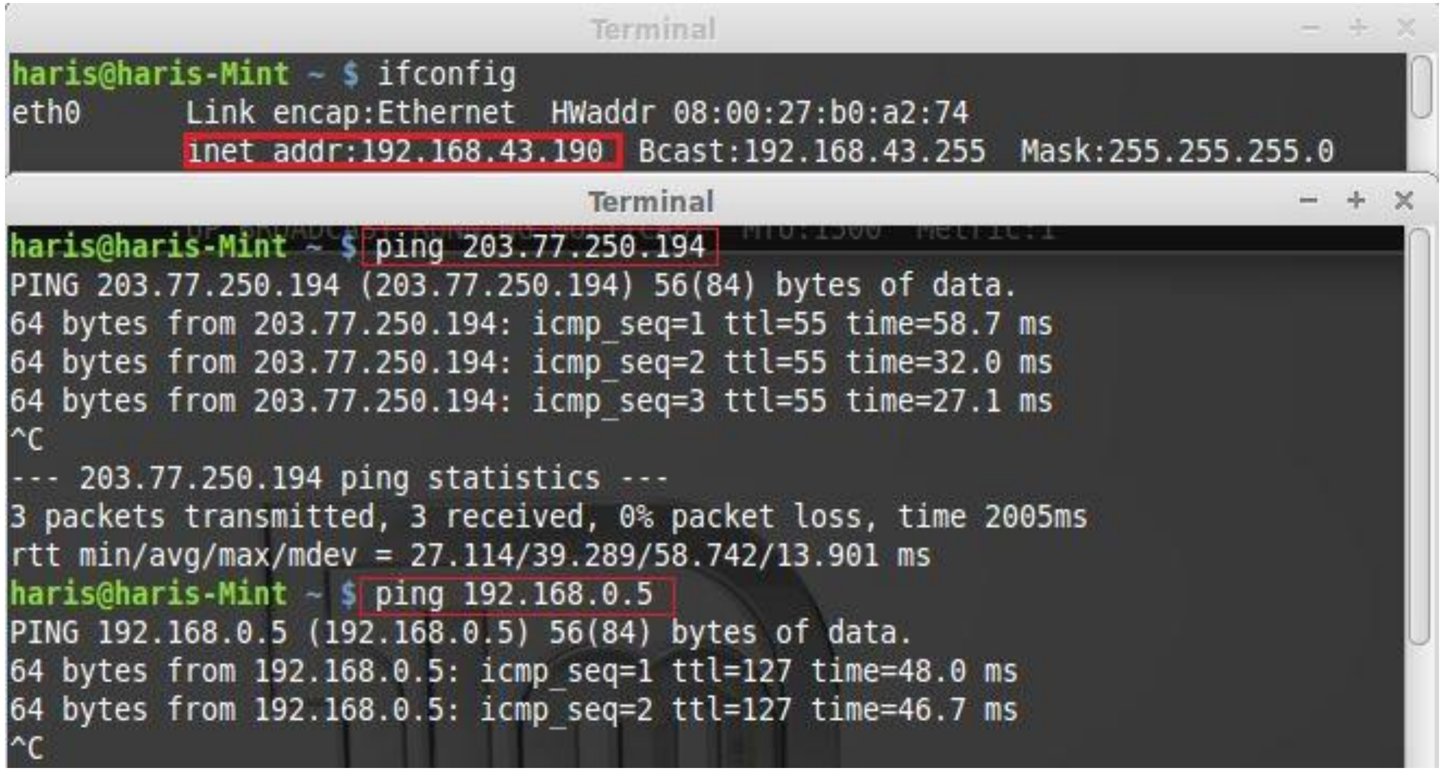
CONNECTED ON LINUX

- Jika VPN berhasil terhubung ke SSTP Server , coba test ping ke ip public router
- Dan coba ping ke ip private yang ada di router



VPN Login Message

VPN connection has been successfully established.

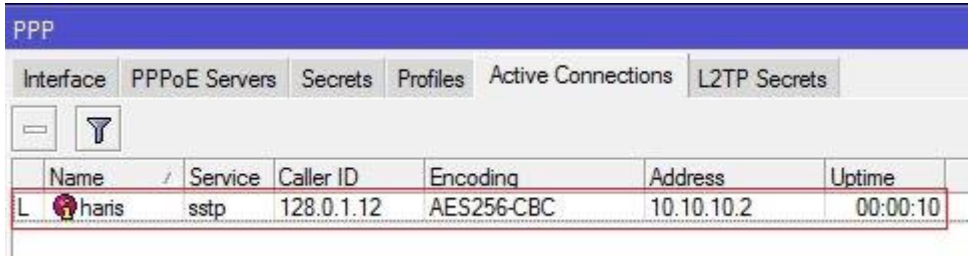


```
haris@haris-Mint ~ $ ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:b0:a2:74
          inet addr:192.168.43.190  Bcast:192.168.43.255  Mask:255.255.255.0
```

```
haris@haris-Mint ~ $ ping 203.77.250.194
PING 203.77.250.194 (203.77.250.194) 56(84) bytes of data.
64 bytes from 203.77.250.194: icmp_seq=1 ttl=55 time=58.7 ms
64 bytes from 203.77.250.194: icmp_seq=2 ttl=55 time=32.0 ms
64 bytes from 203.77.250.194: icmp_seq=3 ttl=55 time=27.1 ms
^C
--- 203.77.250.194 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 27.114/39.289/58.742/13.901 ms
haris@haris-Mint ~ $ ping 192.168.0.5
PING 192.168.0.5 (192.168.0.5) 56(84) bytes of data.
64 bytes from 192.168.0.5: icmp_seq=1 ttl=127 time=48.0 ms
64 bytes from 192.168.0.5: icmp_seq=2 ttl=127 time=46.7 ms
^C
```

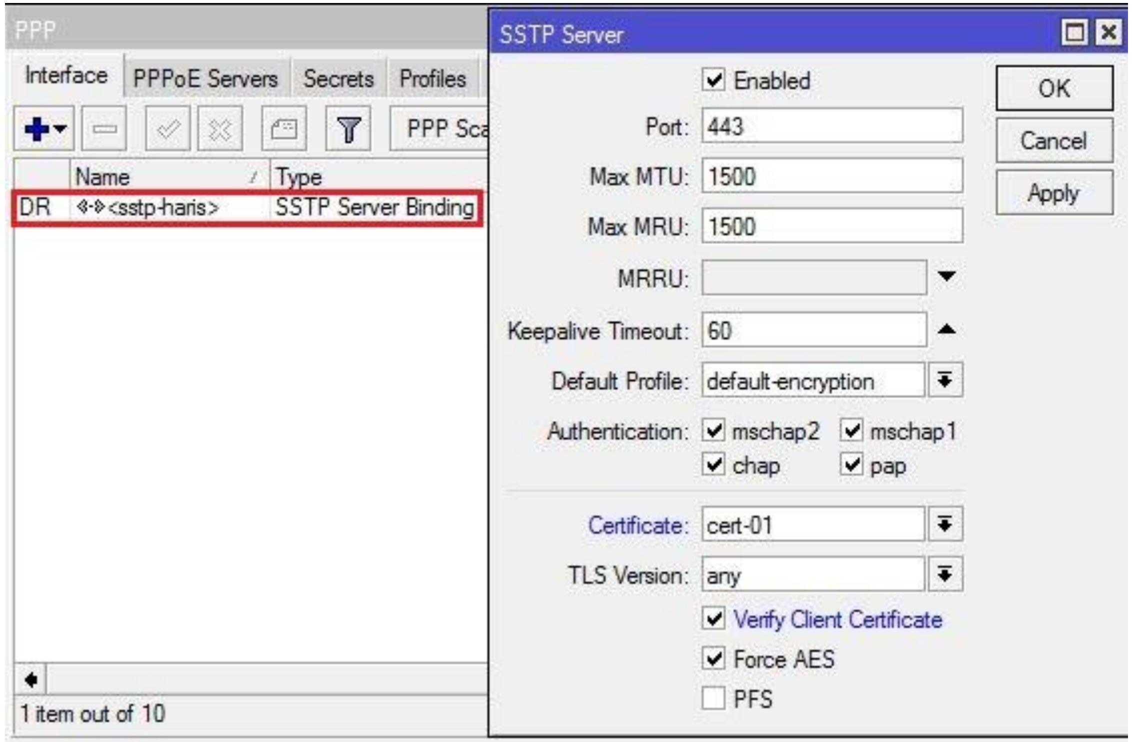
CONNECTED ON MIKROTIK

- Cek apakah user sudah terhubung pada server di ***“Active Connections”***



	Name	Service	Caller ID	Encoding	Address	Uptime
L	haris	sstp	128.0.1.12	AES256-CBC	10.10.10.2	00:00:10

- Jika user terhubung pada server , maka di menu interface akan muncul

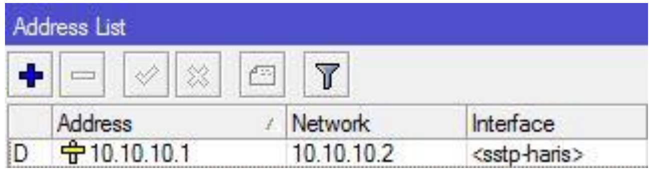


	Name	Type
DR	<sstp-haris>	SSTP Server Binding

1 item out of 10

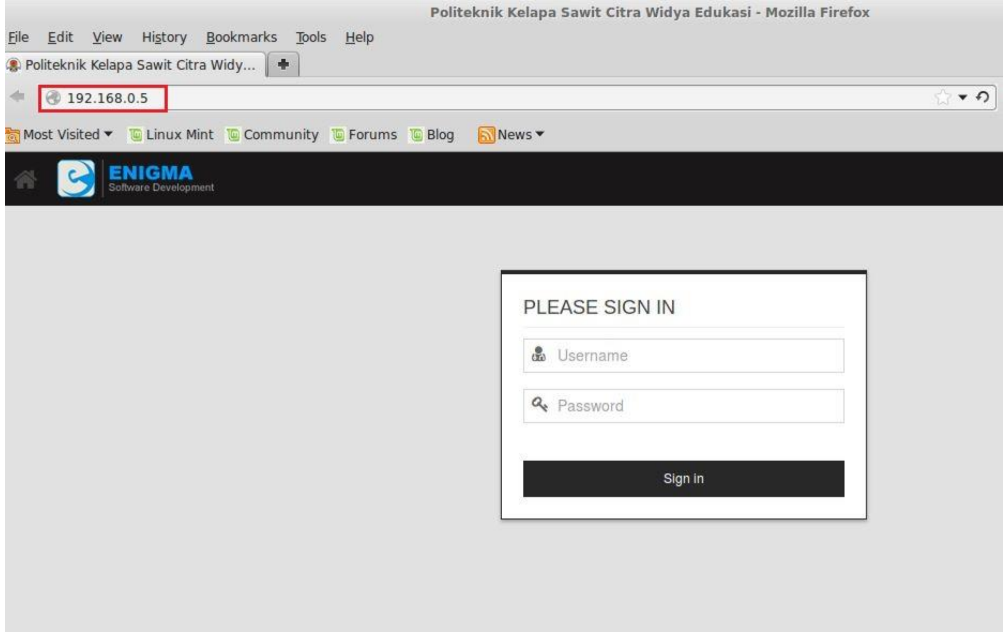
☑ Enabled
Port: 443
Max MTU: 1500
Max MRU: 1500
MRRU:
Keepalive Timeout: 60
Default Profile: default-encryption
Authentication: ☑ mschap2 ☑ mschap1 ☑ chap ☑ pap
Certificate: cert-01
TLS Version: any
☑ Verify Client Certificate
☑ Force AES
□ PFS

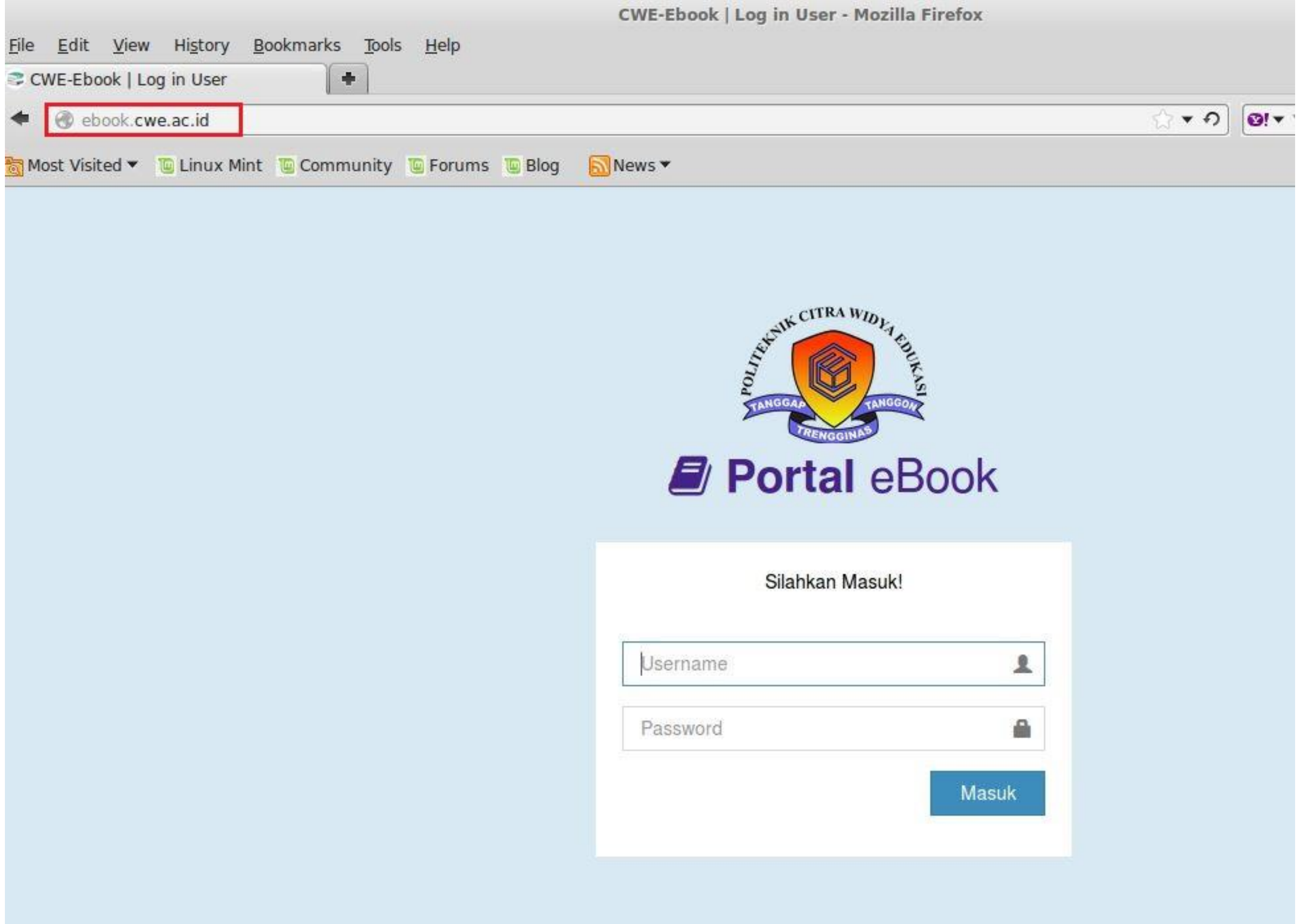
- IP yang di dapatkan otomatis



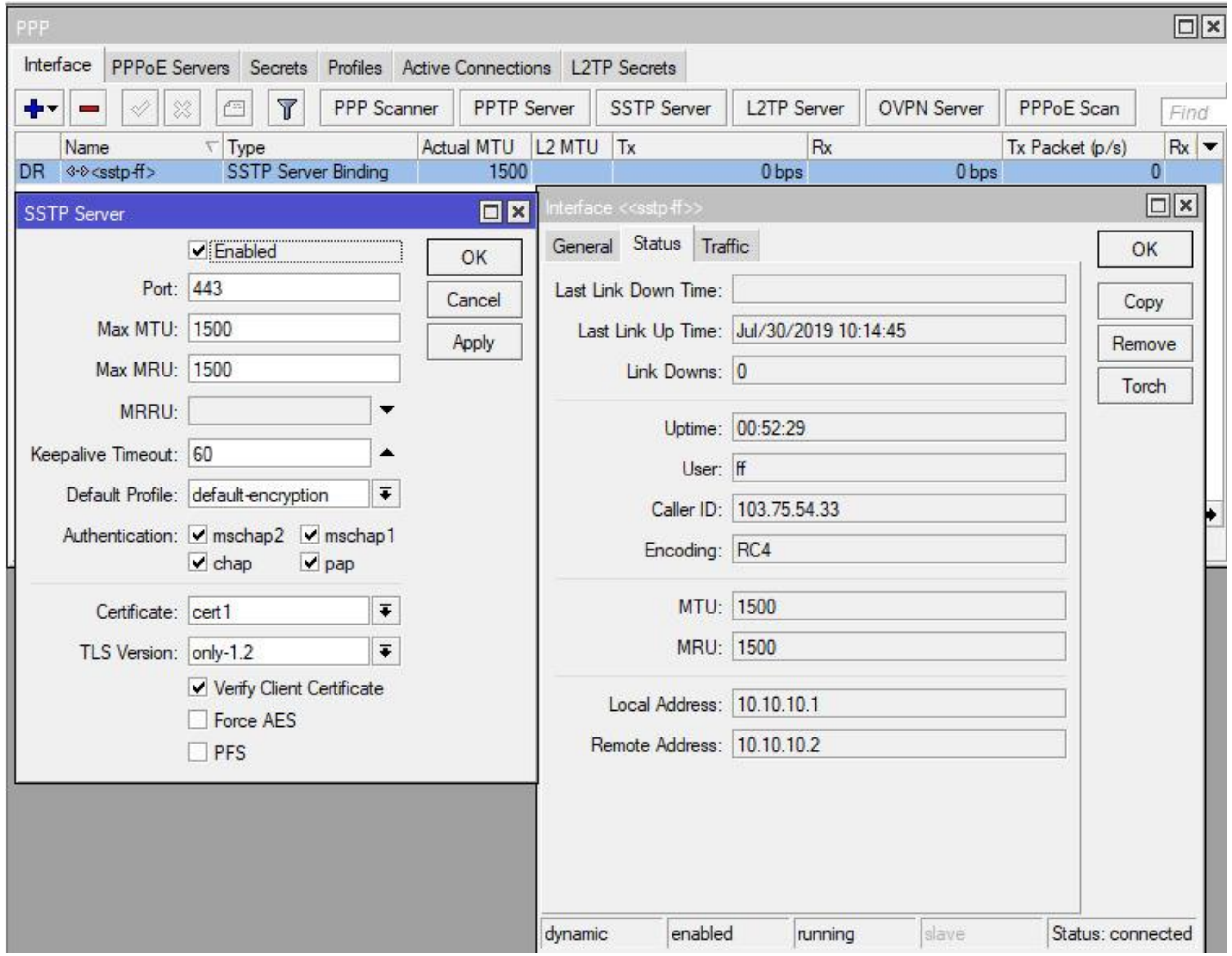
	Address	Network	Interface
D	10.10.10.1	10.10.10.2	<sstp-haris>

- Disini saya mencoba mengakses salah satu web server yg saya setting dengan ip local yaitu 192.168.0.5


Politeknik Kelapa Sawit Citra Widya Edukasi - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Politeknik Kelapa Sawit Citra Widy...
192.168.0.5
Most Visited Linux Mint Community Forums Blog News
ENIGMA
Software Development
PLEASE SIGN IN
Username
Password
Sign in


CWE-Ebook | Log in User - Mozilla Firefox
File Edit View History Bookmarks Tools Help
CWE-Ebook | Log in User
ebook.cwe.ac.id
Most Visited Linux Mint Community Forums Blog News
POLITEKNIK CITRA WIDYA EDUKASI
TANGGAP TANGGON TRENGGINAS
Portal eBook
Silahkan Masuk!
Username
Password
Masuk

EXAMPLE SITE TO SITE



	Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx
DR	<sstp-ff>	SSTP Server Binding	1500		0 bps	0 bps	0	

SSTP Server

☑ Enabled

Port: 443

Max MTU: 1500

Max MRU: 1500

MRRU:

Keepalive Timeout: 60

Default Profile: default-encryption

Authentication: ☑ mschap2 ☑ mschap1 ☑ chap ☑ pap

Certificate: cert1

TLS Version: only-1.2

☑ Verify Client Certificate

□ Force AES

□ PFS

Interface <<sstp-ff>>

Last Link Down Time:

Last Link Up Time: Jul/30/2019 10:14:45

Link Downs: 0

Uptime: 00:52:29

User: ff

Caller ID: 103.75.54.33

Encoding: RC4

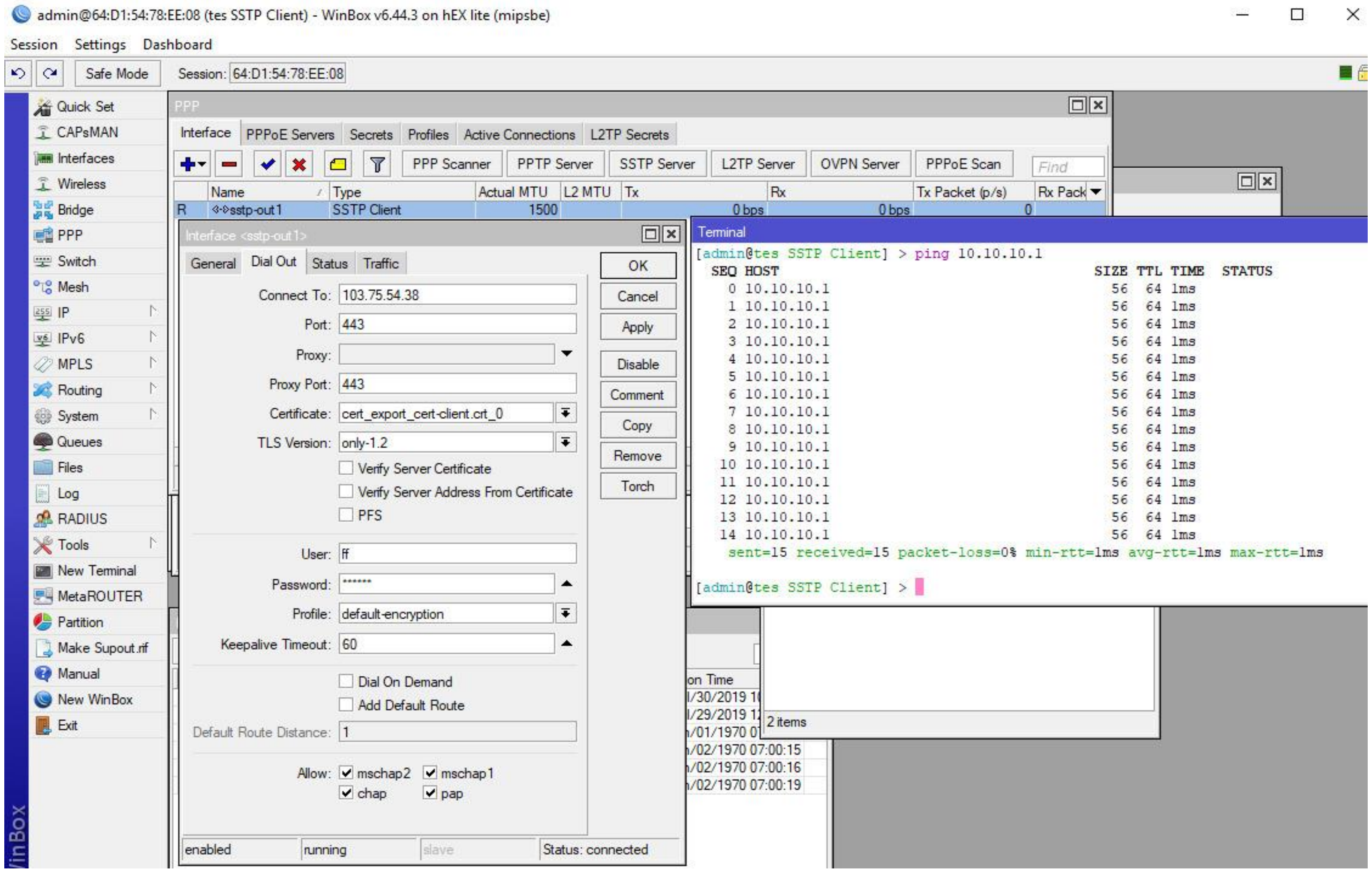
MTU: 1500

MRU: 1500

Local Address: 10.10.10.1

Remote Address: 10.10.10.2

dynamic | enabled | running | slave | Status: connected



Session: 64:D1:54:78:EE:08

	Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Pack
R	sstp-out1	SSTP Client	1500		0 bps	0 bps	0	

Connect To: 103.75.54.38

Port: 443

Proxy:

Proxy Port: 443

Certificate: cert_export_cert-client.crt_0

TLS Version: only-1.2

□ Verify Server Certificate

□ Verify Server Address From Certificate

□ PFS

User: ff

Password: ******

Profile: default-encryption

Keepalive Timeout: 60

□ Dial On Demand

□ Add Default Route

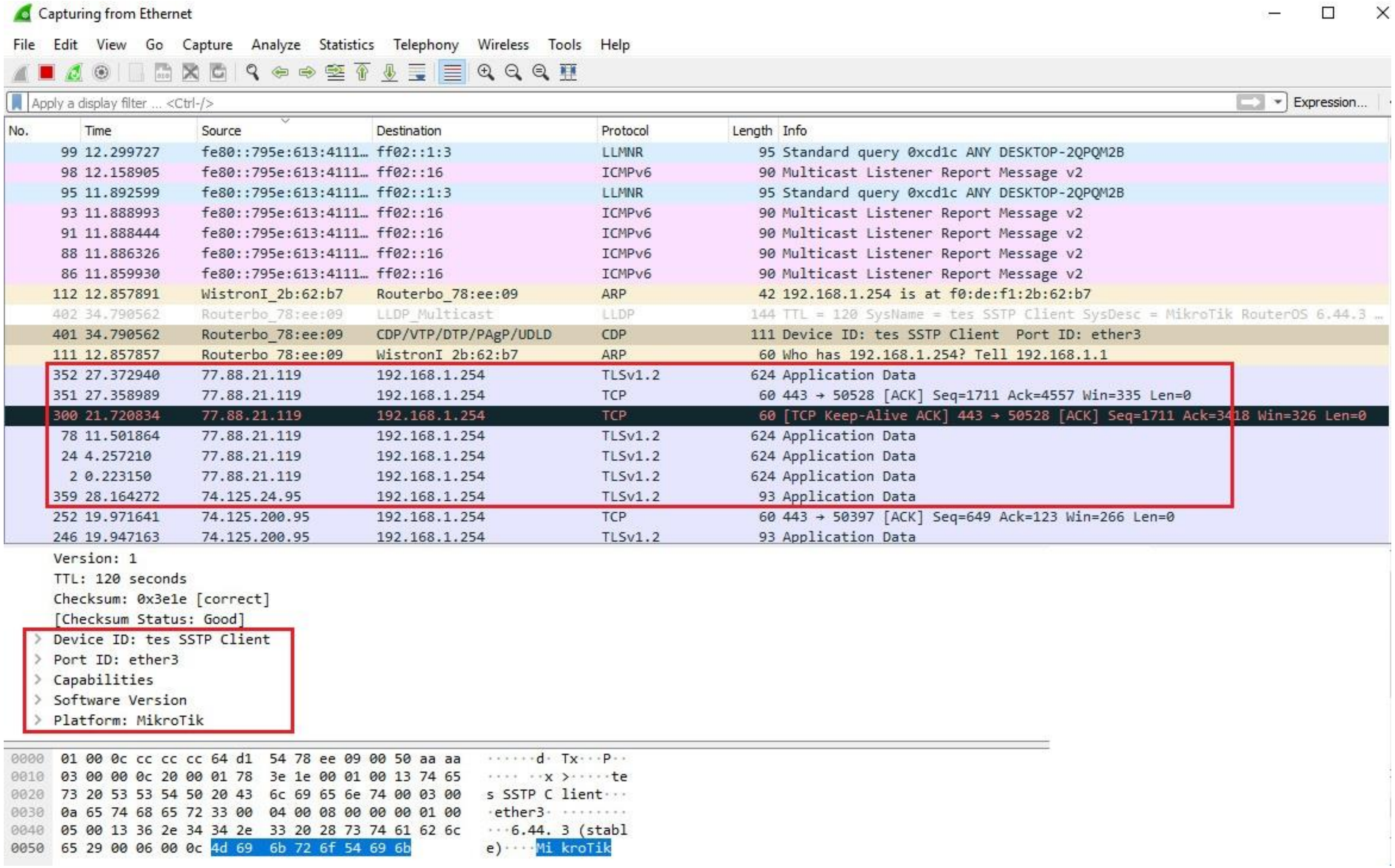
Default Route Distance: 1

Allow: ☑ mschap2 ☑ mschap1 ☑ chap ☑ pap

enabled | running | slave | Status: connected

```
[admin@tes SSTP Client] > ping 10.10.10.1
  SEQ HOST                                     SIZE TTL TIME  STATUS
    0 10.10.10.1                                 56  64 1ms
    1 10.10.10.1                                 56  64 1ms
    2 10.10.10.1                                 56  64 1ms
    3 10.10.10.1                                 56  64 1ms
    4 10.10.10.1                                 56  64 1ms
    5 10.10.10.1                                 56  64 1ms
    6 10.10.10.1                                 56  64 1ms
    7 10.10.10.1                                 56  64 1ms
    8 10.10.10.1                                 56  64 1ms
    9 10.10.10.1                                 56  64 1ms
   10 10.10.10.1                                 56  64 1ms
   11 10.10.10.1                                 56  64 1ms
   12 10.10.10.1                                 56  64 1ms
   13 10.10.10.1                                 56  64 1ms
   14 10.10.10.1                                 56  64 1ms
    sent=15 received=15 packet-loss=0% min-rtt=1ms avg-rtt=1ms max-rtt=1ms

[admin@tes SSTP Client] >
```

```
/30/2019 1
/29/2019 1
/01/1970 0
/02/1970 07:00:15
/02/1970 07:00:16
/02/1970 07:00:19
```



Capturing from Ethernet
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Expression...

```
No.     Time        Source                  Destination              Protocol  Length Info
    99 12.299727   fe80::795e:613:4111… ff02::1:3                LLMNR       95 Standard query 0xcd1c ANY DESKTOP-2QPQM2B
    98 12.158905   fe80::795e:613:4111… ff02::16                 ICMPv6      90 Multicast Listener Report Message v2
    95 11.892599   fe80::795e:613:4111… ff02::1:3                LLMNR       95 Standard query 0xcd1c ANY DESKTOP-2QPQM2B
    93 11.888993   fe80::795e:613:4111… ff02::16                 ICMPv6      90 Multicast Listener Report Message v2
    91 11.888444   fe80::795e:613:4111… ff02::16                 ICMPv6      90 Multicast Listener Report Message v2
    88 11.886326   fe80::795e:613:4111… ff02::16                 ICMPv6      90 Multicast Listener Report Message v2
    86 11.859930   fe80::795e:613:4111… ff02::16                 ICMPv6      90 Multicast Listener Report Message v2
   112 12.857891   WistronI_2b:62:b7    Routerbo_78:ee:09        ARP         42 192.168.1.254 is at f0:de:f1:2b:62:b7
   402 34.790562   Routerbo_78:ee:09    LLDP_Multicast           LLDP       144 TTL = 120 SysName = tes SSTP Client SysDesc = MikroTik RouterOS 6.44.3 …
   401 34.790562   Routerbo_78:ee:09    CDP/VTP/DTP/PAgP/UDLD    CDP        111 Device ID: tes SSTP Client  Port ID: ether3
   111 12.857857   Routerbo 78:ee:09    WistronI 2b:62:b7        ARP         60 Who has 192.168.1.254? Tell 192.168.1.1
   352 27.372940   77.88.21.119         192.168.1.254            TLSv1.2    624 Application Data
   351 27.358989   77.88.21.119         192.168.1.254            TCP         60 443 → 50528 [ACK] Seq=1711 Ack=4557 Win=335 Len=0
   300 21.720834   77.88.21.119         192.168.1.254            TCP         60 [TCP Keep-Alive ACK] 443 → 50528 [ACK] Seq=1711 Ack=3418 Win=326 Len=0
    78 11.501864   77.88.21.119         192.168.1.254            TLSv1.2    624 Application Data
    24 4.257210    77.88.21.119         192.168.1.254            TLSv1.2    624 Application Data
     2 0.223150    77.88.21.119         192.168.1.254            TLSv1.2    624 Application Data
   359 28.164272   74.125.24.95         192.168.1.254            TLSv1.2     93 Application Data
   252 19.971641   74.125.200.95        192.168.1.254            TCP         60 443 → 50397 [ACK] Seq=649 Ack=123 Win=266 Len=0
   246 19.947163   74.125.200.95        192.168.1.254            TLSv1.2     93 Application Data
```

```
    Version: 1
    TTL: 120 seconds
    Checksum: 0x3e1e [correct]
    [Checksum Status: Good]
  > Device ID: tes SSTP Client
  > Port ID: ether3
  > Capabilities
  > Software Version
  > Platform: MikroTik
```

```
0000  01 00 0c cc cc cc 64 d1  54 78 ee 09 00 50 aa aa   ······d· Tx···P··
0010  03 00 00 0c 20 00 01 78  3e 1e 00 01 00 13 74 65   ···· ··x >·····te
0020  73 20 53 53 54 50 20 43  6c 69 65 6e 74 00 03 00   s SSTP C lient···
0030  0a 65 74 68 65 72 33 00  04 00 08 00 00 00 01 00   ·ether3· ········
0040  05 00 13 36 2e 34 34 2e  33 20 28 73 74 61 62 6c   ···6.44. 3 (stabl
0050  65 29 00 06 00 0c 4d 69  6b 72 6f 54 69 6b         e)····Mi kroTik
```

THE CONCLUSION IS

- SSL dan IPSec keduanya memiliki silsilah keamanan yang kuat dengan kecepatan throughput, keamanan, dan kemudahan penggunaan yang sebanding untuk sebagian besar pelanggan layanan VPN komersial.
- Sstp bisa menjadi alternatif yang mudah diimplementasikan untuk mencegah MITM, Otentikasi dengan sertifikat akan membuatnya aman
- Jadi, keduanya memiliki pro dan kontra, sehingga tidak boleh dilihat sebagai lebih baik atau lebih buruk tetapi lebih seperti alat yang digunakan untuk menyelesaikan pekerjaan.

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PERTANYAAN ?

?

THANK YOU

- Mikrotik & MuM Bali 2019
- Politeknik Citra Widya Edukasi
- Fullstack Team
- NBH Team

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