

新竹縣網導入 MikroTik 路由器 與結合 The Dude 建置 視覺化網路管理系統之經驗分享

新竹縣教育研究發展暨網路中心 辛文義



把世界帶進教室



新竹縣教育研究發展暨網路中心 鄭鏡澤題



我們遭遇的危機與困境

錢坑? 黑洞?

- 錢永遠不夠用
- 有錢卻不會買
- 花錢卻解決不了問題
- 無止盡的循環

採購、維護、
更新、汰舊.....

- 危機省思

我們忽略了什麼?

解決真正問題? 滿足真正需要嗎?

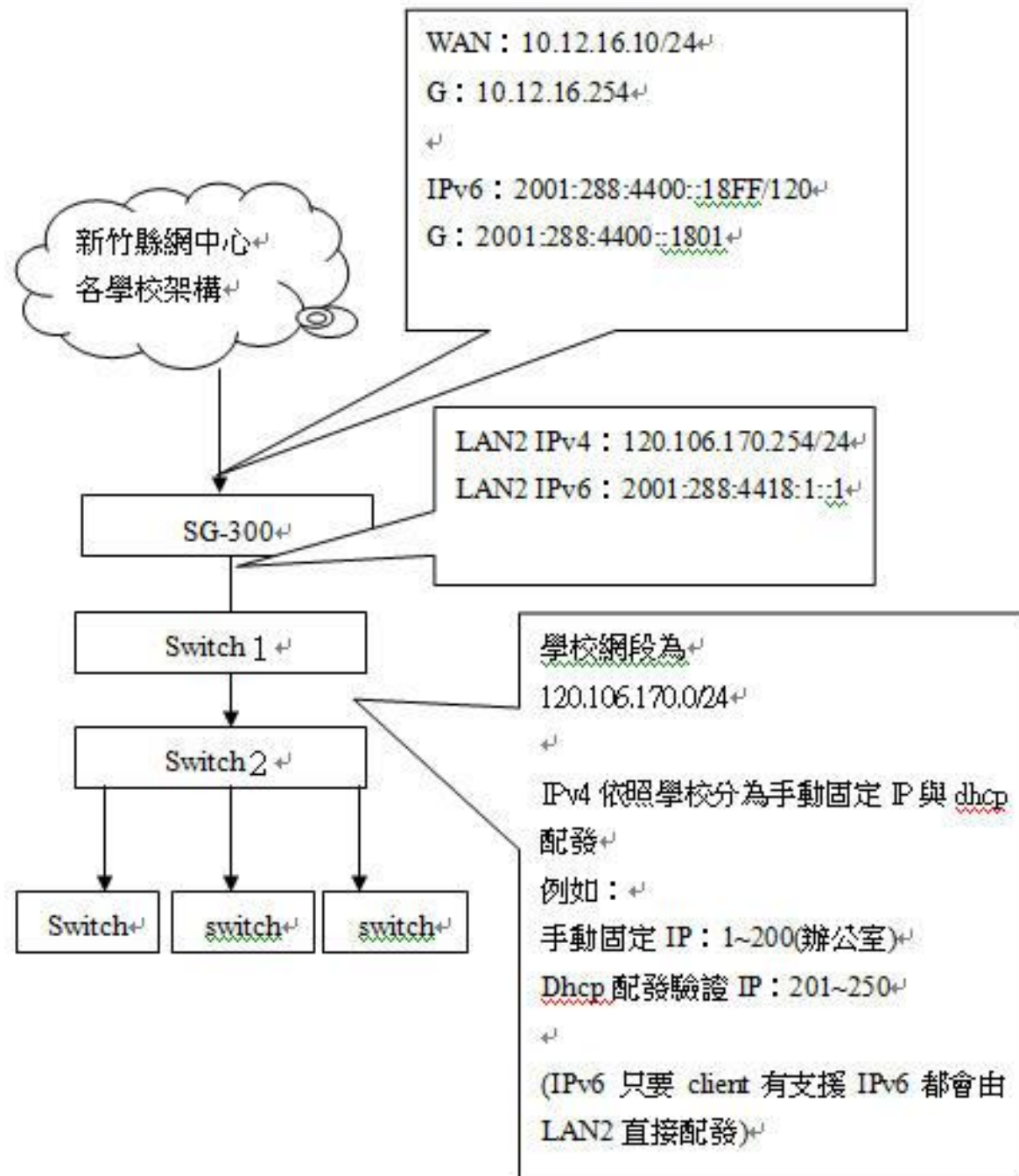


主觀的規劃與偶遇的機緣

• 尋找解決方案

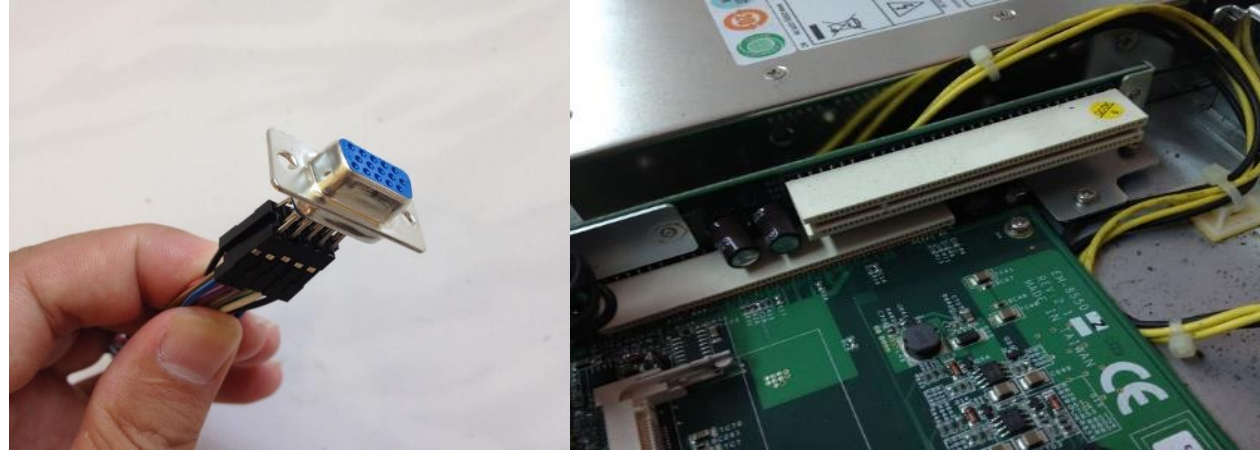
- 破解舊防火牆
- *Open Source*
- *pfSense...*
- 集中式 *Firewall*
- 黑盒子...

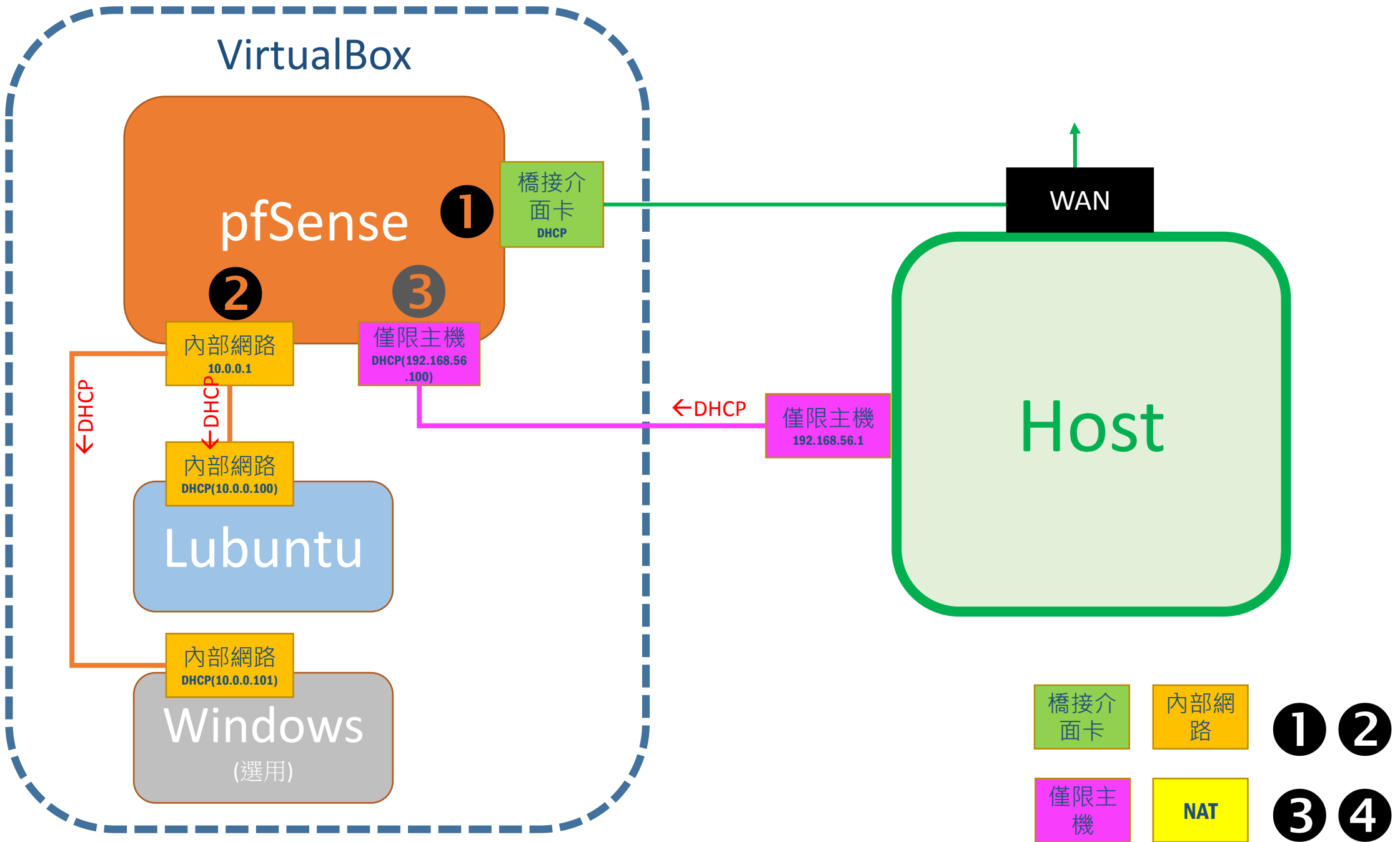






```
#!/usr/local/bin/php -f  
<?php  
    require_once("/etc/inc/config.inc");  
    require_once("/etc/inc/functions.inc");  
    $config['system']['root']['password'] = crypt("I am NOT ShowGirl300");  
    write_config("Root password changed from console menu");  
    system_password_configure();  
    sync_webgui_passwords();  
?>
```





VirtualBox

pfSense ①

橋接介面卡
DHCP

②

內部網路
10.0.0.1

③

僅限主機
DHCP(192.168.56
.100)

內部網路
DHCP(10.0.0.100)

Lubuntu

內部網路
DHCP(10.0.0.101)

Windows
(選用)

↑

WAN

Host

←DHCP

僅限主機
192.168.56.1

橋接介
面卡

內部網
路

1

2

僅限主
機

NAT

3

4

真實環境(以自強國中為例)

The screenshot shows the pfSense web interface with the following sections:

- System Information:** Name: pfsense.jcjh.local2, Version: 2.2.3-RELEASE (amd64), Platform: pfSense, CPU Type: Intel(R) Core(TM) i3 CPU 550 @ 3.20GHz, Uptime: 05 Hours 28 Minutes 32 Seconds.
- Interfaces:** WAN (100baseTX) with IP 10.12.29.10, LAN2 (1000baseT) with IP 163.19.58.254, and LAN3 (1000baseT) with IP 120.106.153.254.
- Services Status:** A table listing services like apinger, captiveportal, cron, dhcpd, dnsmasq, ntpd, and nut, all with green status indicators.

Three detailed configuration panels are shown on the right, each with a colored arrow pointing to its corresponding interface in the main screenshot:

- WAN Static IPv4 configuration:** IPv4 address: 10.12.29.10 / 24, IPv4 Upstream Gateway: WANGW - 10.12.29.254.
- LAN2 Static IPv4 configuration:** IPv4 address: 163.19.58.254 / 24, IPv4 Upstream Gateway: None.
- LAN3 Static IPv4 configuration:** IPv4 address: 120.106.153.254 / 24, IPv4 Upstream Gateway: None.

Each panel also includes a Static IPv6 configuration section with its respective address and upstream gateway.

情定 *Router B O.A.R.D*

• MikroTik 設備簡介

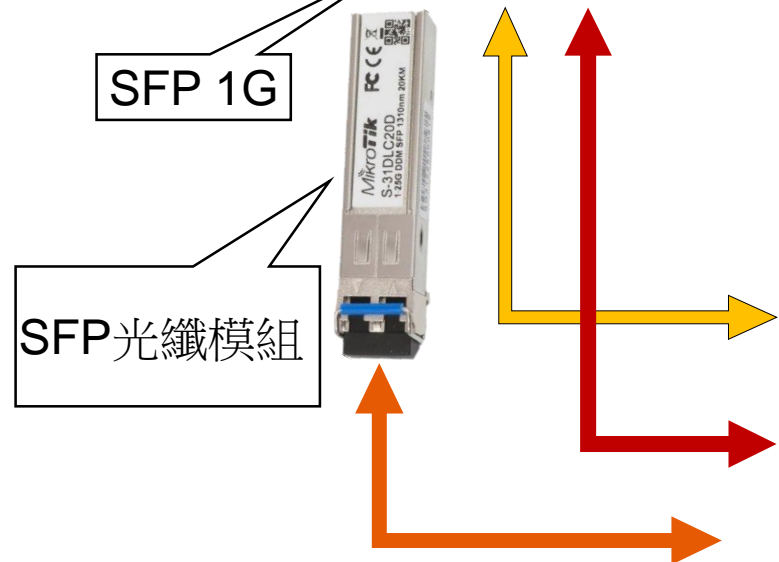
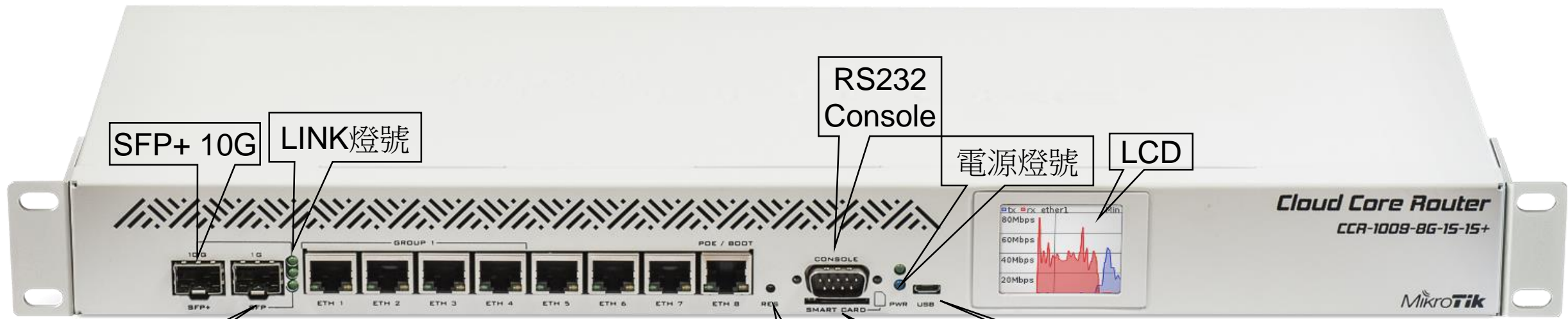
Router

Switch

- 最適方案
- 佈建架構
- 採購甘苦
- 教育訓練



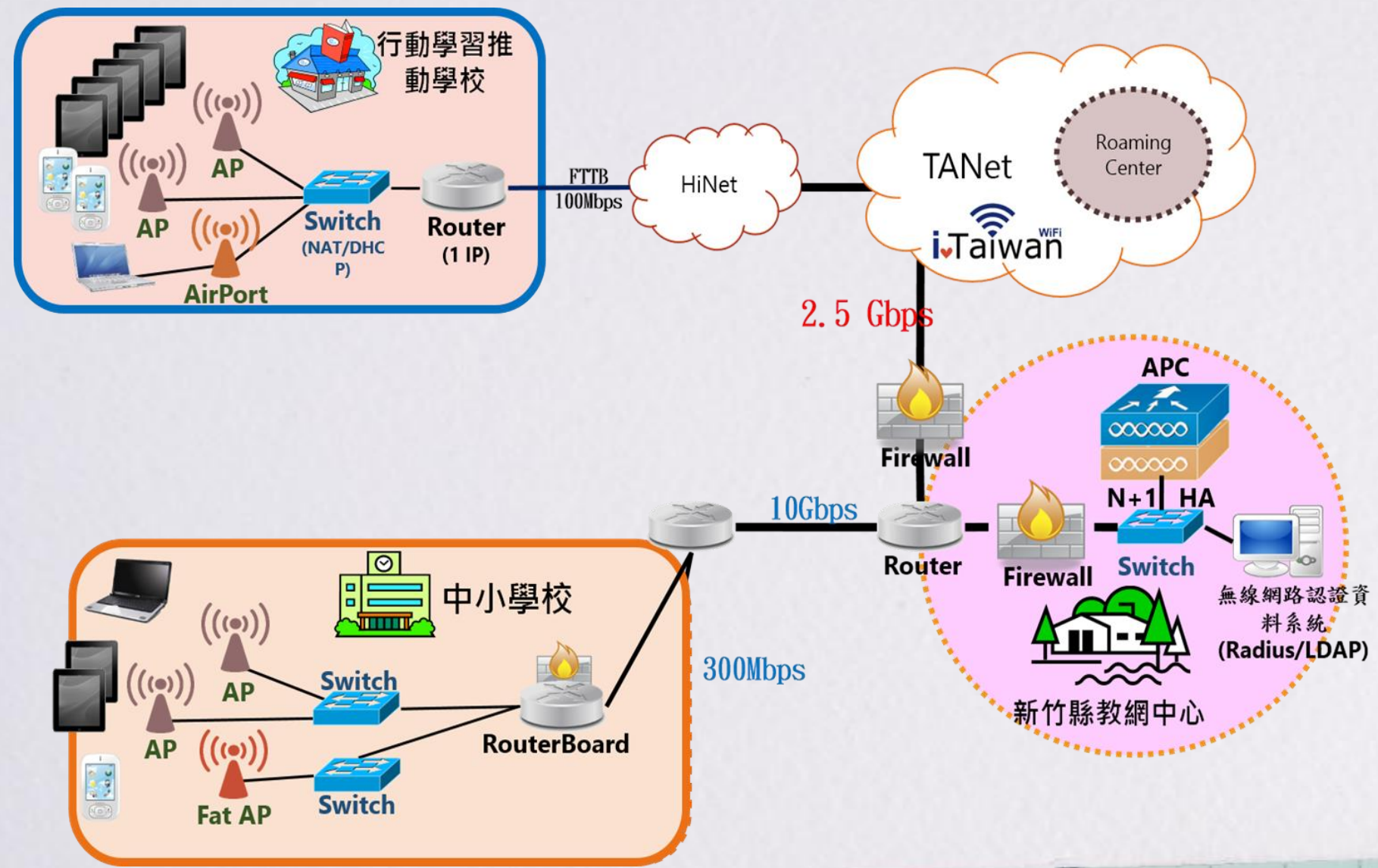
MikroTik CCR1009-8G-1S-1S+



ether 1 接 D-Link Switch 24 Port (163 網段)
ether 2 接 D-Link Switch 22 Port (120 網段)
SFP光纖模組 S-31DLC20D接至中華電信光纖端

(每所學校略有不同，依現場網路環境而定)

各校網路現況與無線網路架構圖



國民中小學資訊管理人才培訓

RouterBoard入門與應用



建置工作會議



初任資訊組長網管工作講習



分級 精進 不同類型

校園網路管理RouterBoard研討會議



RouterBoard智慧網管實務





課程類別: 教育訓練



搜尋課程

Go

 [資訊安全線上稽核系統之稽核人員工作會議](#)

 [資訊安全線上稽核與網路設備管理工作講習](#)  

 [新竹縣105年國民中小學校園網路電路及環境整備計畫設備採購案](#) 

 [98年度新竹縣國民小學校園網路語音話機](#)

 [105年度初任資訊組長研習](#) 

 [校園網路管理進階課程-RouterBoard智慧網管實務](#) 

 [校園網路管理基礎課程-RouterBoard入門與應用](#) 

 [中小學資通安全管理系統](#) 

 [104年學術網路電路升速整備案](#) 

 [校園雲端環境無線網路建置計畫](#) 



中小學校園 網路服務維運對策

• 穩固的網路警衛先生

- Firewall

• 校外處理公文

- VPN

• IP不夠用

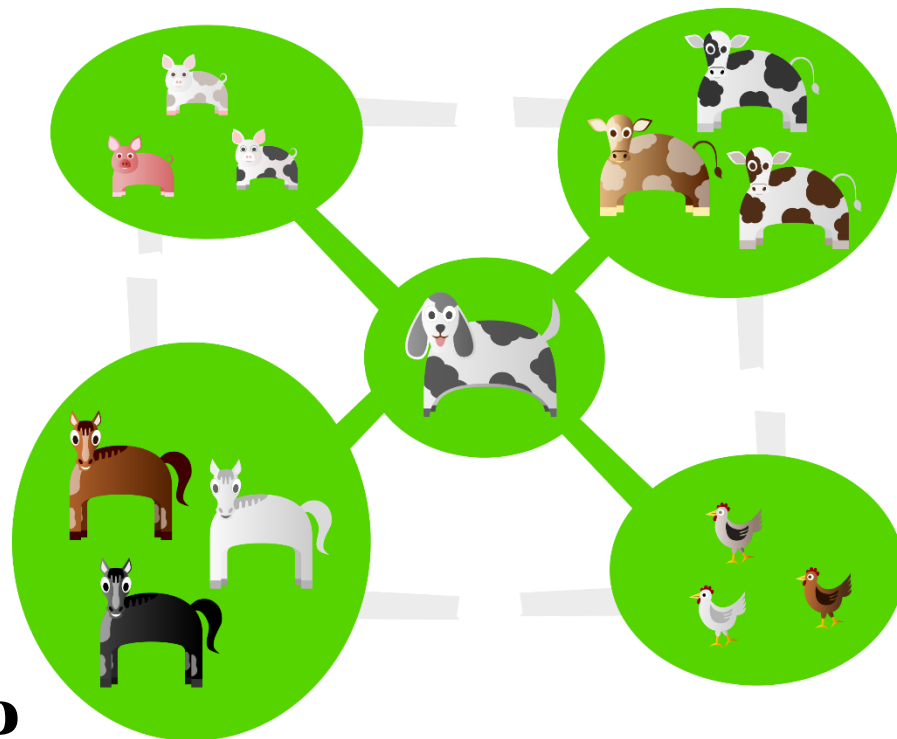
- NAT

- DHCP

• 盜用IP或私接AP

• 舊AP無法統一管理

• 資安事件暫時性封鎖



• 排程做事

- 定時開關設備

• 流量控管

• 網路使用認證與管制

- Hotspot

• 什麼時候發生事情?

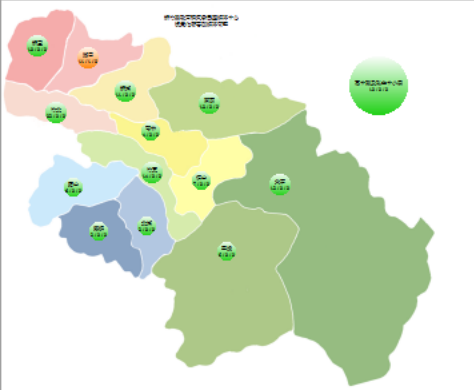
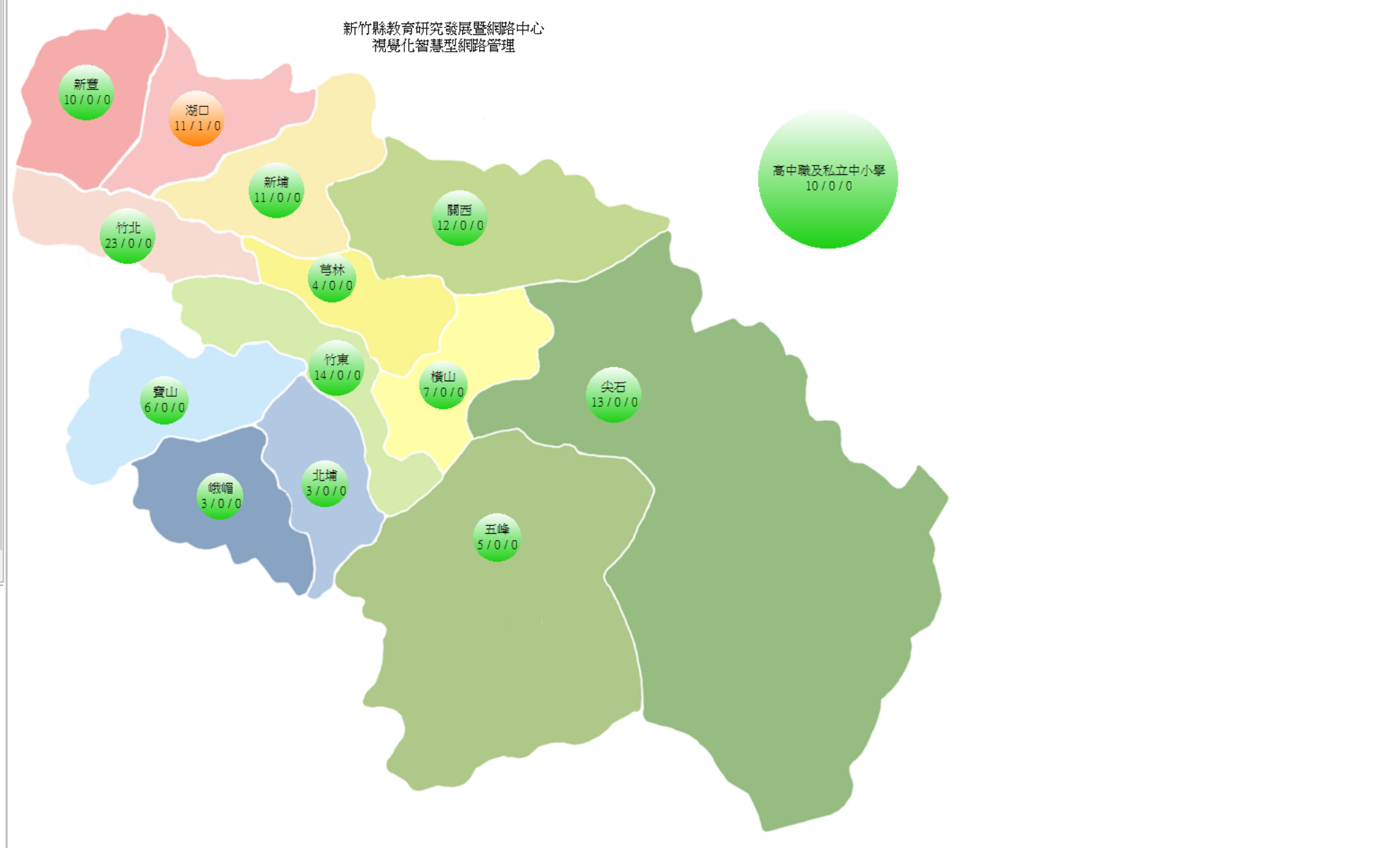
- Log

• 警告廣播風暴來了

- Loop detection

運用 *The Dude*
建置視覺化網路管理系統

- Contents
- Charts
 - CPU
 - Flow Map
- Devices
- Files
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- History Actions
- Links
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- Mib Nodes
- Network Maps
 - 五峰
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 - admin 192.16...
 - go38 ::ffff:19...
 - nc 192.168.8...
 - ncadmin ::ffff...
- Probes
- Root
- Services
- Tools

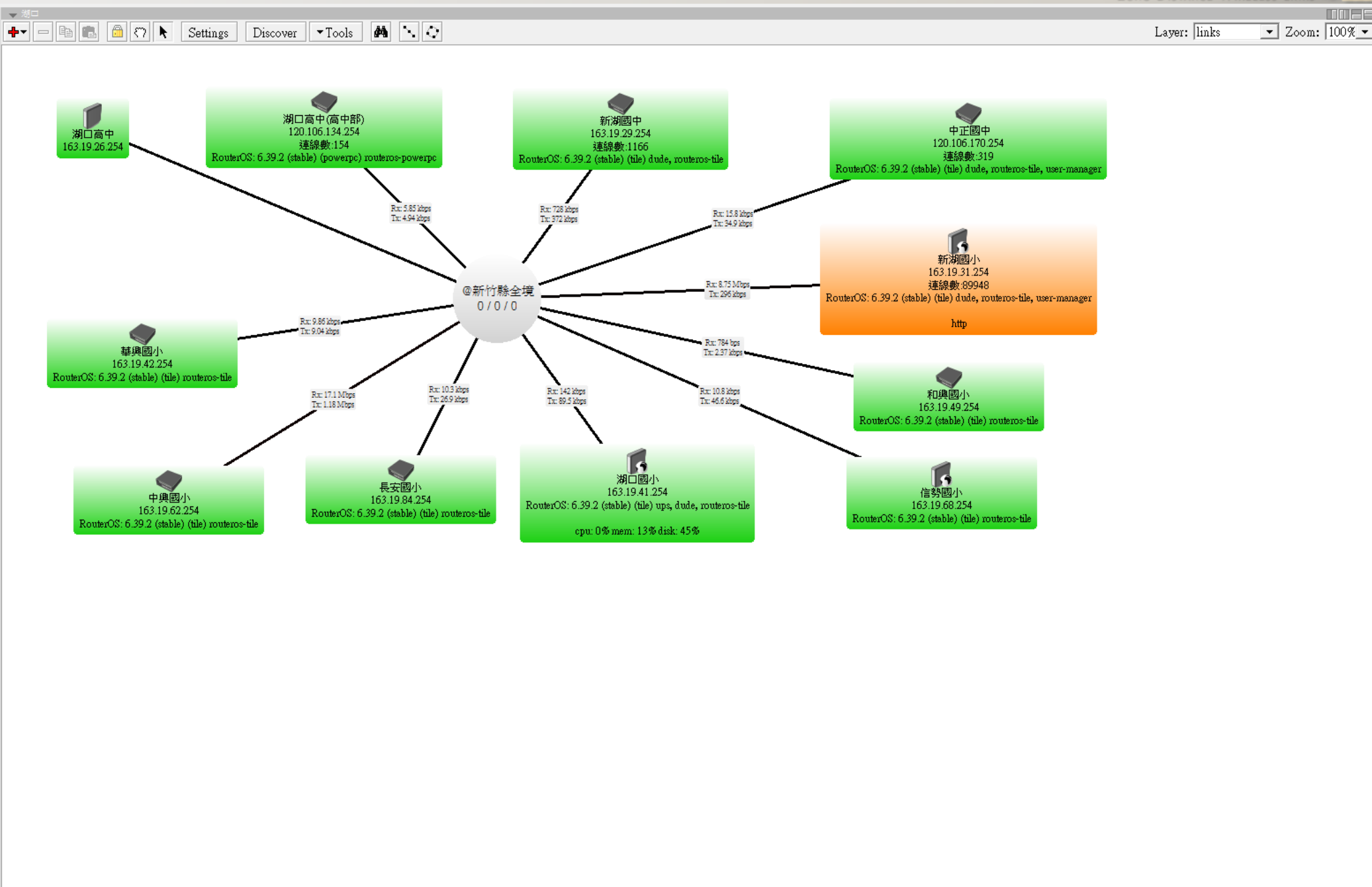


Preferences Help

Settings Discover Tools

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Settings Discover Tools

Layer: links Zoom: 100%

新湖國小 - Device

General Polling Services Outages Snmp RouterOS Dude History Tools

Contents

- Charts
- Devices
- Files
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- Network Maps
 - 10.12.67.10/24
 - 163.19.31.0/24
 - 163.19.32.0/24
 - 192.168.15.0/22
 - Core
- Networks
- Notifications
- Panels
 - admin 163.19...
 - ncadmin ::ffff...
 - schooladmin ...
- Probes
- Root
- Services
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Ok
Cancel
Apply
Notes
Remove
Tools
Reprobe
Ack
Unack
Reboot
Reconnect

General

From: 成功國中

Interface: sfp1

Average: 00:00:10



Filter

Eth Protocol: any

Vlan ID: any

IP Protocol: any

Src Address: 0.0.0.0/0

Dst Address: 0.0.0.0/0

Port: any

Dscp:

Cpu:

Start

Stop

Close

Table Pie Bar

Eth Protocol Ip Protocol Vlan ID Src Address Src Port Dst Address Dst Port



Total Bytes

0 - 25.1 M
icmp - 3.14 K
tcp - 24.4 M
udp - 653 K



Rx Bytes

0 - 23.3 M
icmp - 1.57 K
tcp - 22.7 M
udp - 504 K



Tx Bytes

0 - 1.81 M
icmp - 1.57 K
tcp - 1.66 M
udp - 149 K



Total Packets

0 - 4.62 K
icmp - 4
tcp - 4.15 K
udp - 454



Rx Packets

0 - 2.88 K
icmp - 2
tcp - 2.63 K
udp - 249



Tx Packets

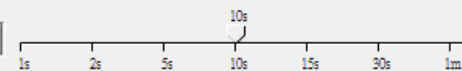
0 - 1.74 K
icmp - 2
tcp - 1.52 K
udp - 215

General

From: 成功國中

Interface: sfp1

Average: 00:00:10



Filter

Eth Proto

Vlan

IP Proto

Src Add

Dst Add

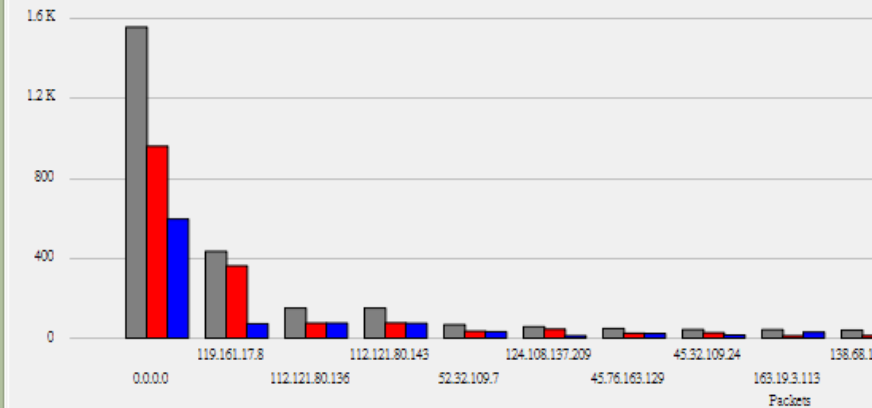
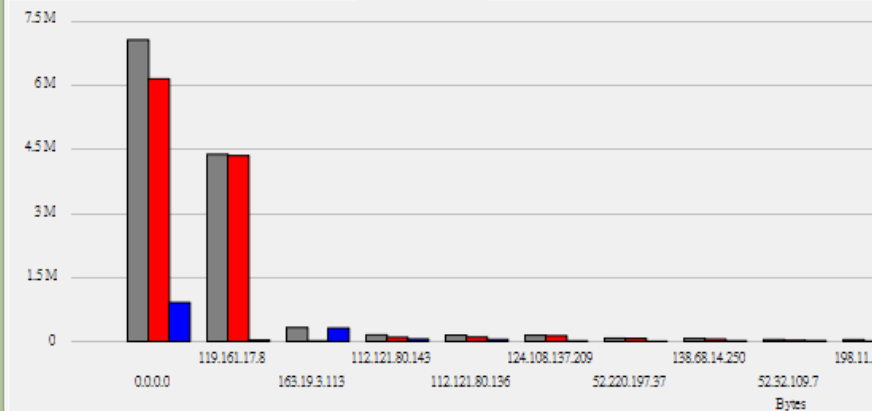
P

D

C

Table Pie Bar

Eth Protocol Ip Protocol Vlan ID Src Address Src Port Dst Address Dst Port

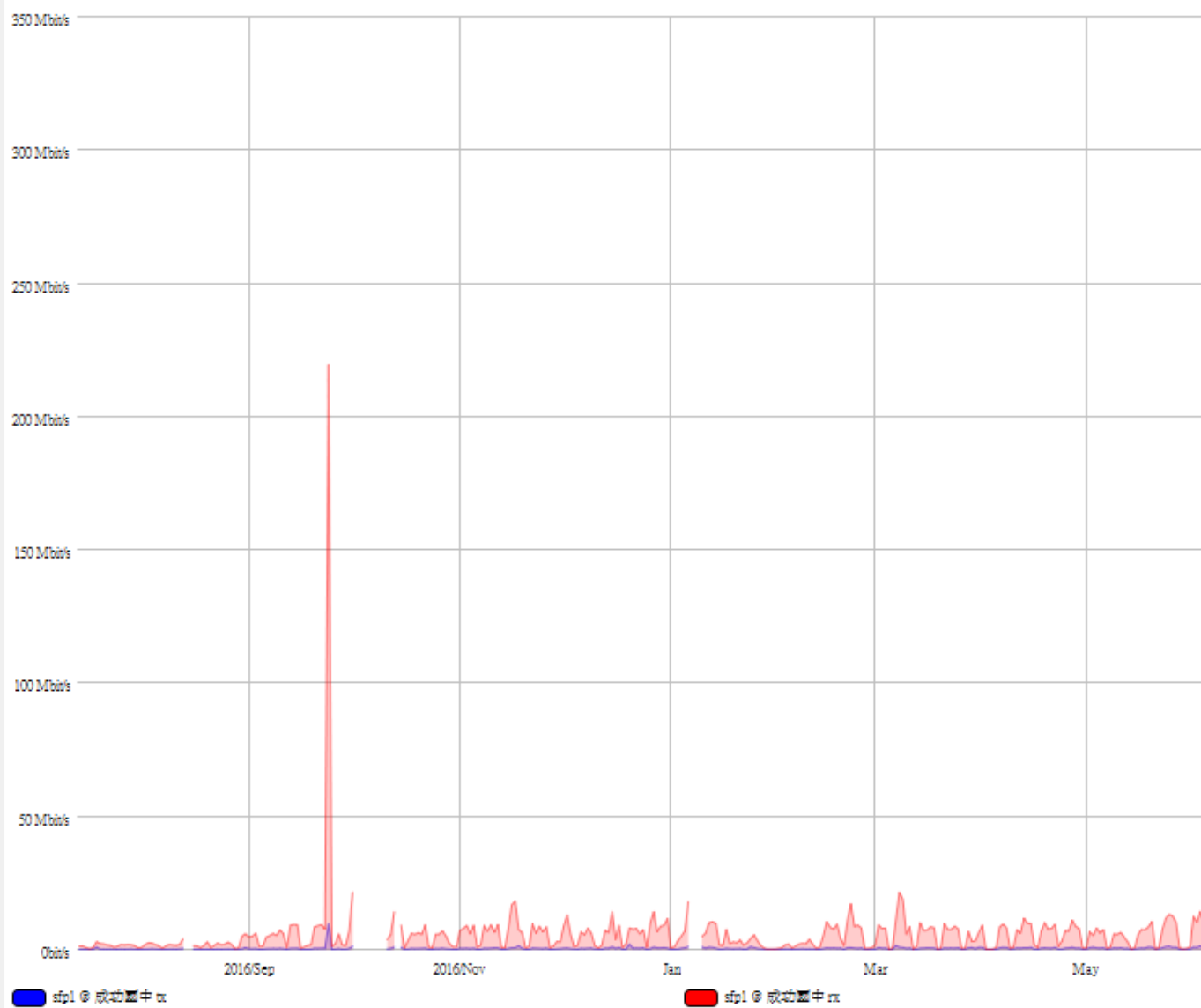


General History

 Graph Bit Rate

Export

Zoom: 36

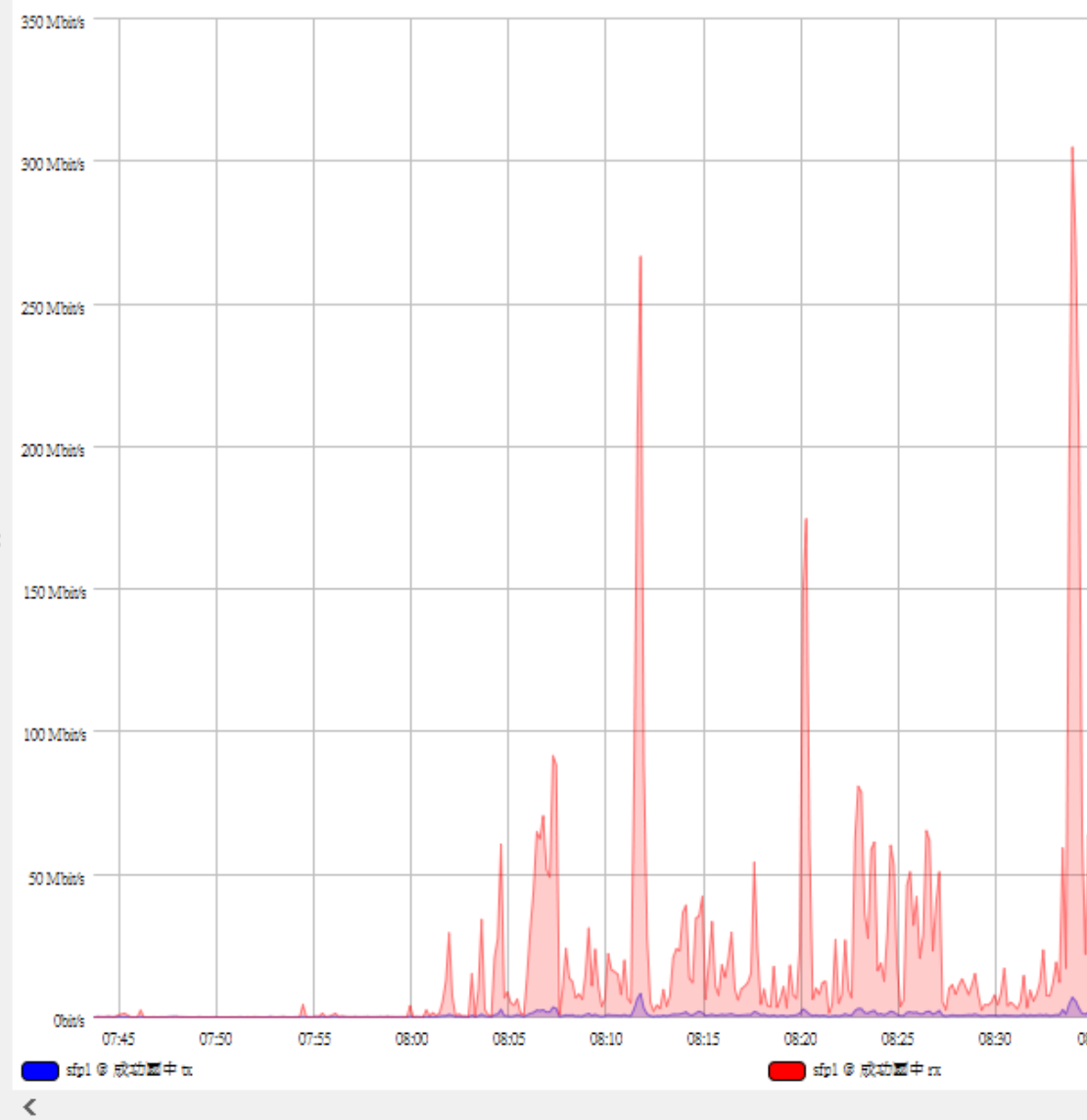


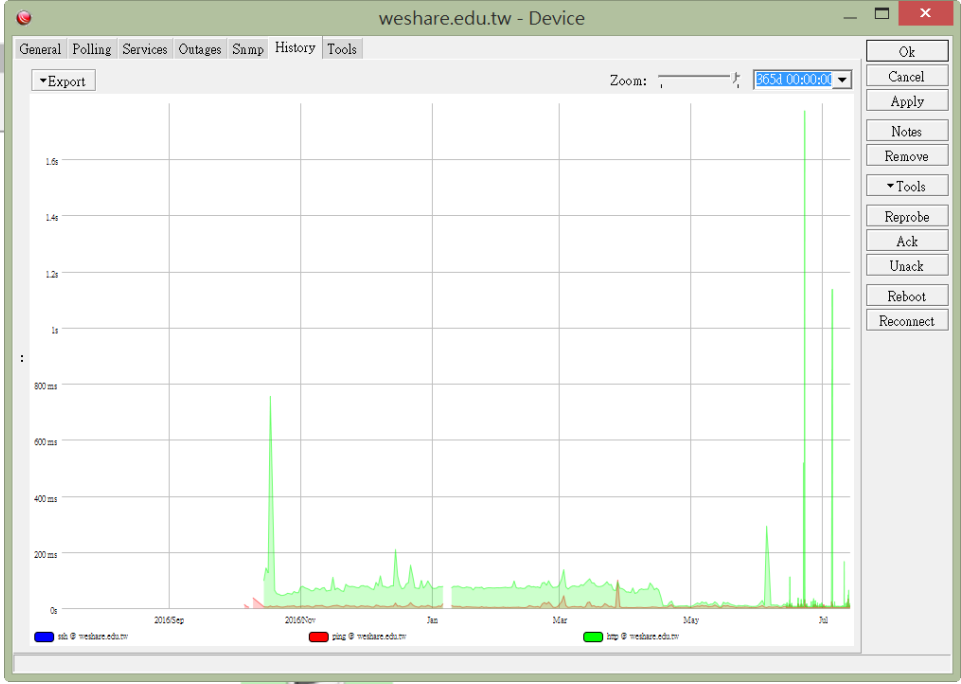
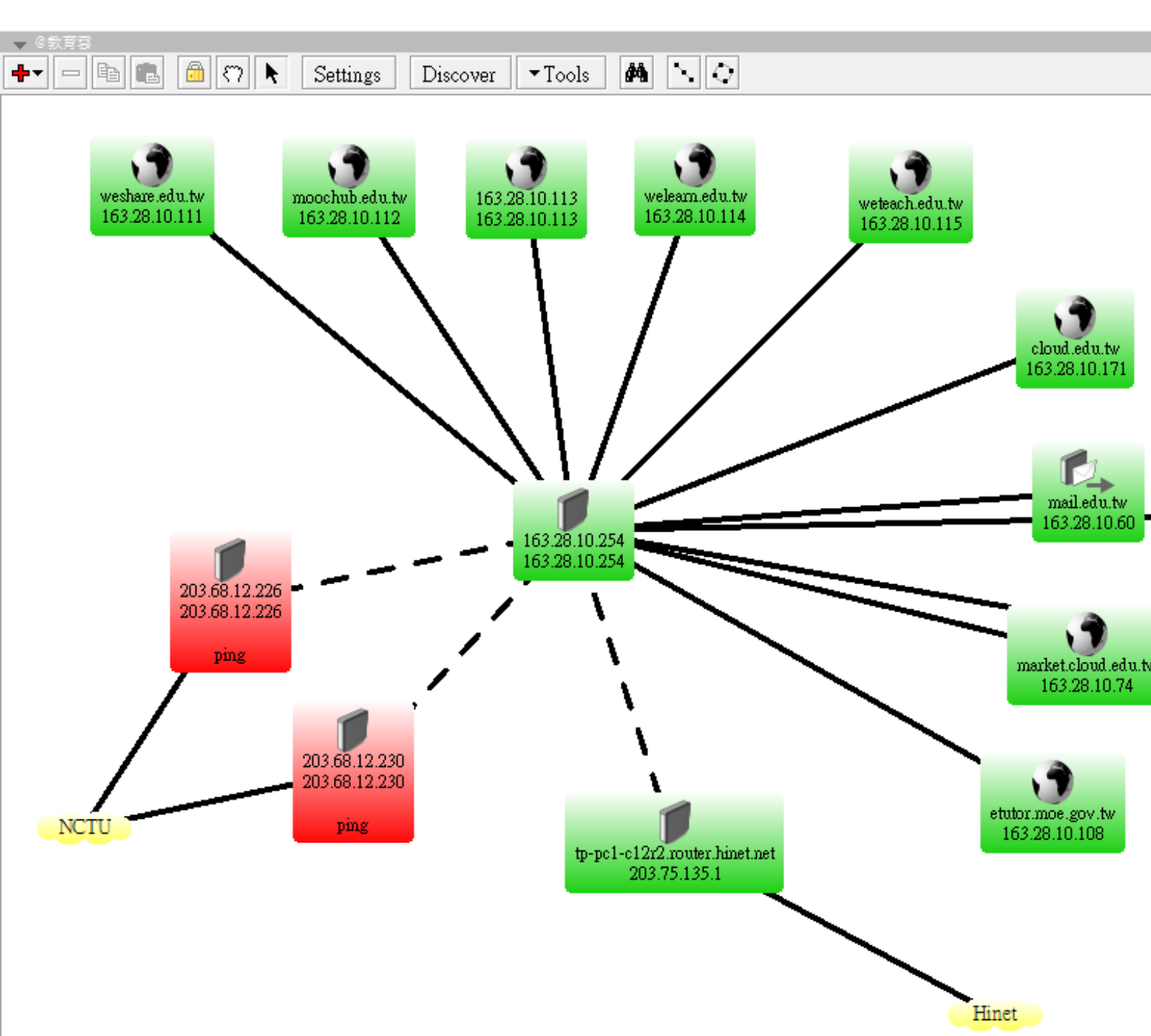
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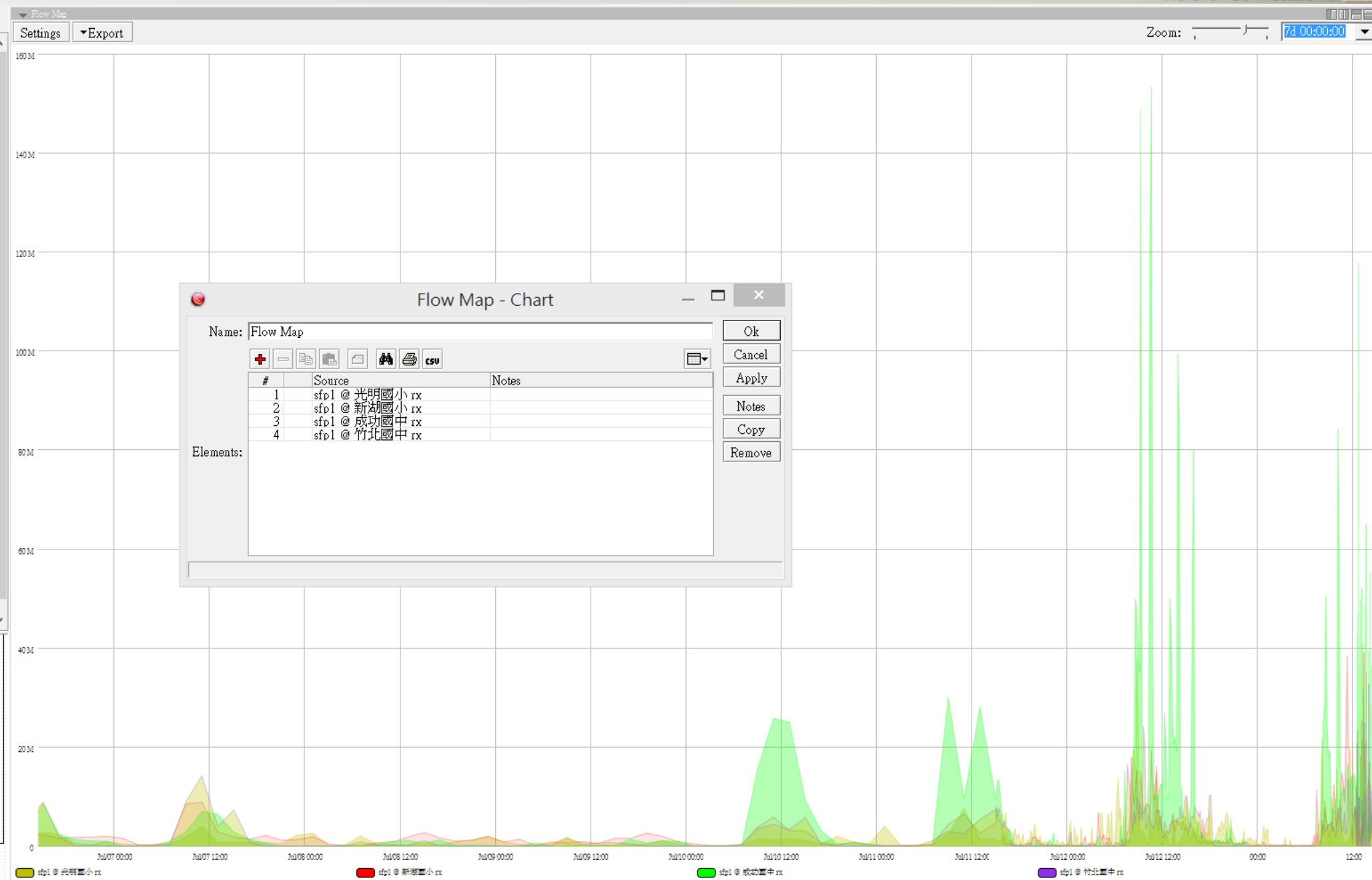
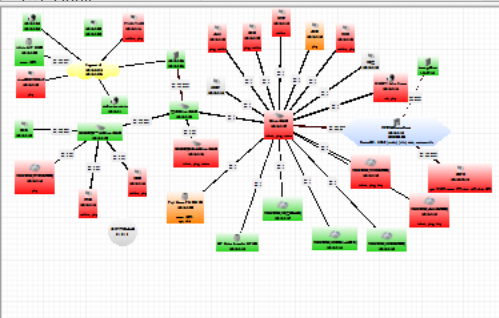
Export

Zoom



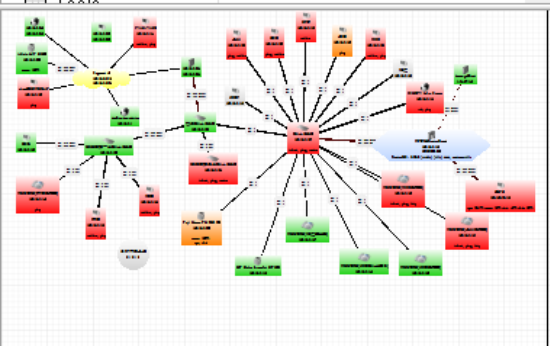


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Devices

List Tree RouterOS Types Mac Mappings

Device Group Wireless Registration Simple Queue

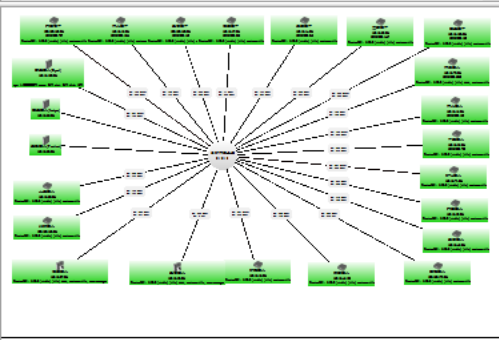
csu Upgrade

Name	Status	Version	Architect...	Board	Upgrade Status	Packages
上館國小	std failure: not allowe...	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile, user-manager
中山國小	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile, user-manager
中正國中	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile, user-manager
中正國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
中興國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
二重國中	could not authenticat...	6.39.2 ...	tile	CCR1009-8G...		ups, dude, routeros-tile, user-manager
二重國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
五峰國中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
五峰國小	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile
五龍國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
仁愛國中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
信勢國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
光明國小	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile, user-manager
內灣國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
六家國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
六家高中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
北埔國中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
北埔國小	ok	6.39.2 ...	tile	R1009-8G...		dude, routeros-tile, user-manager
北平國小	ok	6.39.2 ...	tile	R1009-8G...		routeros-tile
十興國小	ok	6.39.2 ...	tile	R1009-8G...		routeros-tile
南和國小	ok	6.39.2 ...	tile	R1009-8G...		routeros-tile
博愛國中	ok	6.39.2 ...	tile	R1009-8G...		routeros-tile
博愛國小	ok	6.39.2 ...	tile	R1009-8G...		dude, routeros-tile, user-manager
和興國小	ok	6.39.2 ...	tile	R1009-8G...		routeros-tile
員峯國小	ok	6.39.2 ...	tile	R1009-8G...	6.39.2	routeros-tile
員東國中	ok	6.39.2 ...	tile	R1009-8G...		routeros-tile
嘉興國小	ok	6.39.2 ...	tile	R1009-8G...		routeros-tile
嘉興國小-義...	ok	6.39.2 ...	tile	R1009-8G...		routeros-tile
坪林國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
埔和國小	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile, user-manager
大同國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
大坪國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
大肚國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
太平國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
富光國中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
富興國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
富山國中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
寶山國中-甚...	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
寶山國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
寶山國小-山...	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
寶石國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
尖石國中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
尖石國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
山崎國小	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile
峨眉國中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
峨眉國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
忠孝國中	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile, user-manager
成功國中	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
文山國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
新光國小	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile
新光國小-司...	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
新城國小	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile, user-manager
新埔國中	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile
新埔國小	ok	6.39.2 ...	tile	CCR1009-8G...		routeros-tile
新豐國小	ok	6.39.2 ...	tile	CCR1009-8G...		dude, routeros-tile, user-manager

- Device Settings
- Show On Map
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- Upgrade 6.39.2
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- 湖口
- 竹北
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Session Settings Dashboard

Safe Mode Session: 163.19.93.254

Quick Set

CAPsMAN

Interfaces

Wireless

Bridge

PPP

Switch

Mesh

IP

IPv6

MPLS

Routing

System

Queues

Files

Log

Radius

Tools

New Terminal

LCD

Partition

Make Supout.rif

Manual

New WinBox

Exit

Firewall

Filter Rules NAT Mangle Raw Service Ports Connections Address Lists Layer7 Protocols

Reset Counters Reset All Counters

#	Action	Chain	Src. Address	Dst. Address	Protocol	Src. Port	Dst. Port	In. In...	Out. I...	Bytes	Packets
0	D	jump	forward							2418.3 MiB	21 229 ...
1	D	jump	forward							1700.3 MiB	17 646 ...
2	D	jump	input								
3	D	drop	input								
4	D	jump	hs-input								
5	D	ac...	hs-input								
6	D	ac...	hs-input								
7	D	ret...	hs-unauth								
8	D	ret...	hs-unauth								
::: HCC Wireless Controller											
9	D	ret...	hs-unauth								
10	D	jump	hs-input								
11	D	ret...	hs-unauth								
12	D	ret...	hs-unauth...	163.19.1.12							
13	D	ret...	hs-unaut...	163.19.1.1							
::: HCC Wireless Controller											
14	D	ret...	hs-unaut...	163.19.1.214							
15	D	ret...	hs-unauth								
16	D	ret...	hs-unaut...								
::: place hotspot rules here											
17	X	pa...	unused...								
18	D	ac...	input								
::: wan to winbox											
19	D	ac...	input								
20	D	ac...	input								
21	D	ac...	input								
22	D	drop	input								
23	D	ac...	forward								
::: ipphones											
24	D	ac...	forward								
25	D	drop	forward								
26	D	drop	forward								
27	D	drop	forward								
28	D	drop	forward								
29 items											

Log

Freeze

Jul/13/2017 16:09...	memory	dhcp, info	dhcp1 deassigned 163.19.94.185 from 90:C1:15:83:E0:FA
Jul/13/2017 16:12...	memory	dhcp, info	dhcp1 assigned 163.19.94.111 to 48:DB:50:84:0A:E0
Jul/13/2017 16:15...	memory	dhcp, info	dhcp1 assigned 163.19.94.159 to D0:FC:CC:8A:B6:A3
Jul/13/2017 16:19...	memory	hotspot, info, deb...	hs0018 (163.19.94.87): trying to log in by http-pap
Jul/13/2017 16:19...	memory	hotspot, account, ...	hs0018 (163.19.94.87): logged in
Jul/13/2017 16:21...	memory	dhcp, info	dhcp1 deassigned 163.19.94.216 from 90:E7:C4:86:5B:BC
Jul/13/2017 16:22...	memory	hotspot, info, deb...	hs2222 (163.19.94.112): logged out: keepalive timeout
Jul/13/2017 16:22...	memory	dhcp, info	dhcp1 deassigned 163.19.94.203 from 88:AD:D2:41:67:20
Jul/13/2017 16:25...	memory	dhcp, info	dhcp1 deassigned 163.19.94.140 from 90:E6:BA:8F:FB:4B
Jul/13/2017 16:25...	memory	hotspot, info, deb...	hs1462 (163.19.94.98): logged out: keepalive timeout
Jul/13/2017 16:27...	memory	hotspot, info, deb...	hs1462 (163.19.94.98): trying to log in by http-pap
Jul/13/2017 16:27...	memory	hotspot, account, ...	hs1462 (163.19.94.98): logged in
Jul/13/2017 16:30...	memory	dhcp, info	dhcp1 assigned 163.19.94.187 to 1C:1B:0D:A8:5F:A0
Jul/13/2017 16:32...	memory	hotspot, info, deb...	hs10554 (163.19.94.137): logged out: keepalive timeout
Jul/13/2017 16:32...	memory	hotspot, info, deb...	hs0018 (163.19.94.87): logged out: keepalive timeout
Jul/13/2017 16:33...	memory	dhcp, info	dhcp1 assigned 163.19.94.163 to 70:8B:CD:1D:0B:9B
Jul/13/2017 16:33...	memory	dhcp, info	dhcp1 deassigned 163.19.94.155 from 20:2D:07:D7:4A:1F
Jul/13/2017 16:34...	memory	dhcp, info	dhcp1 assigned 163.19.94.83 to 64:CC:2E:A1:CE:6F
Jul/13/2017 16:34...	memory	dhcp, info	dhcp1 deassigned 163.19.94.213 from F4:09:D8:E8:AE:B8
Jul/13/2017 16:34...	memory	dhcp, info	dhcp1 assigned 163.19.94.203 to 88:AD:D2:41:67:20
Jul/13/2017 16:35...	memory	dhcp, info	dhcp1 deassigned 163.19.94.63 from 54:4E:90:A8:63:1F
Jul/13/2017 16:35...	memory	hotspot, info, deb...	hs12018 (163.19.94.187): trying to log in by http-pap
Jul/13/2017 16:35...	memory	hotspot, account, ...	hs12018 (163.19.94.187): logged in
Jul/13/2017 16:36...	memory	hotspot, info, deb...	hs1462 (163.19.94.98): logged out: keepalive timeout
Jul/13/2017 16:39...	memory	dhcp, info	dhcp1 assigned 163.19.94.74 to AC:37:43:C7:67:AA
Jul/13/2017 16:39...	memory	dhcp, info	dhcp1 deassigned 163.19.94.195 from 4C:1A:3D:5C:AA:1C
Jul/13/2017 16:39...	memory	dhcp, info	dhcp1 assigned 163.19.94.195 to 4C:1A:3D:5C:AA:1C
Jul/13/2017 16:40...	memory	dhcp, info	dhcp1 deassigned 163.19.94.67 from 60:F4:45:6E:0F:48
Jul/13/2017 16:40...	memory	dhcp, info	dhcp1 deassigned 163.19.94.203 from 88:AD:D2:41:67:20
Jul/13/2017 16:40...	memory	dhcp, info	dhcp1 assigned 163.19.94.203 to 88:AD:D2:41:67:20
Jul/13/2017 16:43...	memory	dhcp, info	dhcp1 deassigned 163.19.94.169 from 10:BF:48:19:AE:8D
Jul/13/2017 16:43...	memory	dhcp, info	dhcp1 deassigned 163.19.94.112 from 74:E5:43:0A:AD:4C
Jul/13/2017 16:44...	memory	dhcp, critical, error	dhcp alert on ether2: discovered unknown dhcp server, mac E4:8D:8C:35:11:1A, ip 192.168.88.1
Jul/13/2017 16:45...	memory	dhcp, info	dhcp1 deassigned 163.19.94.122 from 00:EE:BD:A3:BC:90
Jul/13/2017 16:47...	memory	dhcp, info	dhcp1 deassigned 163.19.94.70 from 34:AB:37:61:08:83
Jul/13/2017 16:48...	memory	dhcp, info	dhcp1 deassigned 163.19.94.72 from 38:D5:47:30:57:AB
Jul/13/2017 16:49...	memory	system, info, acc...	user ncadmin logged in from 163.19.3.113 via winbox
Jul/13/2017 16:49...	memory	system, info, acc...	user ncadmin logged in from 163.19.3.113 via telnet
Jul/13/2017 16:49...	memory	system, info, acc...	user ncadmin logged in from 163.19.3.113 via telnet

未竟之路

< 未竟之路 >

THE ROAD NOT

兩條路在黃色的樹林間叉開，

Two roads diverged in a yellow wood,

可惜我不能走兩條路。

And sorry I could not travel both

我這個過客久久徘徊，

And be one traveler, long I stood

極目望去，一條路在遠處，

And looked down one as far as I could

蜿蜒地進入樹林荒蕪；

To where it bent in the undergrowth;

我向另一條路望去，同樣平坦，

Then took the other, as just as fair,

也許它更值得行走，

And having perhaps the better claim,

因為它長滿茸茸綠草，等待人們的踐踏；

Because it was grassy and wanted wear;

雖然它也已紛亂，

Though as for that the passing there

行人在這裡過往奔沓。

.....

雖然我知道條條路相接，

Yet knowing how way leads on to way,

我仍懷疑是否仍能走回原路。

.....

樹林中有兩條岔道，

Two roads diverged in a wood, and

而我走的那條路行人稀少，

I took the one less traveled by,

這就造成了一切的差異。

And that has made all the difference.

成立網路服務實驗室

獲得Juniper授權JNAA成為 網路學術聯盟

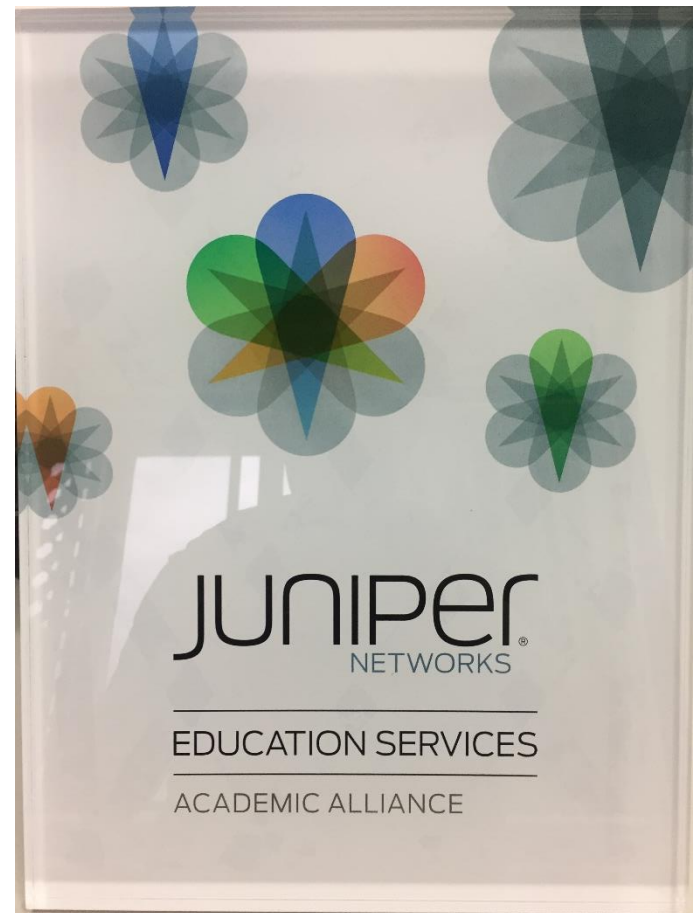
- 提供所有連線學校參加線上課程(網路概論等)
- 所有老師及高中職學生可參加認證考試
- 本中心可任意使用教材及技術文件

成為各校MikroTik維護與創新測試中心

- 研究應用Routerboard新的功能
- 提供校園整合與問題解決方案
- 提供初級維修與備品更換
- 測試新的網路產品

獲Ruckus提供設備建立無線網路檢測與實驗環境

- 協助學校規劃無線網路
- 檢測無線網路品質
- 提供初級維修與備品更換
- 新的無線網路設備效能測試



JUNIPER
NETWORKS

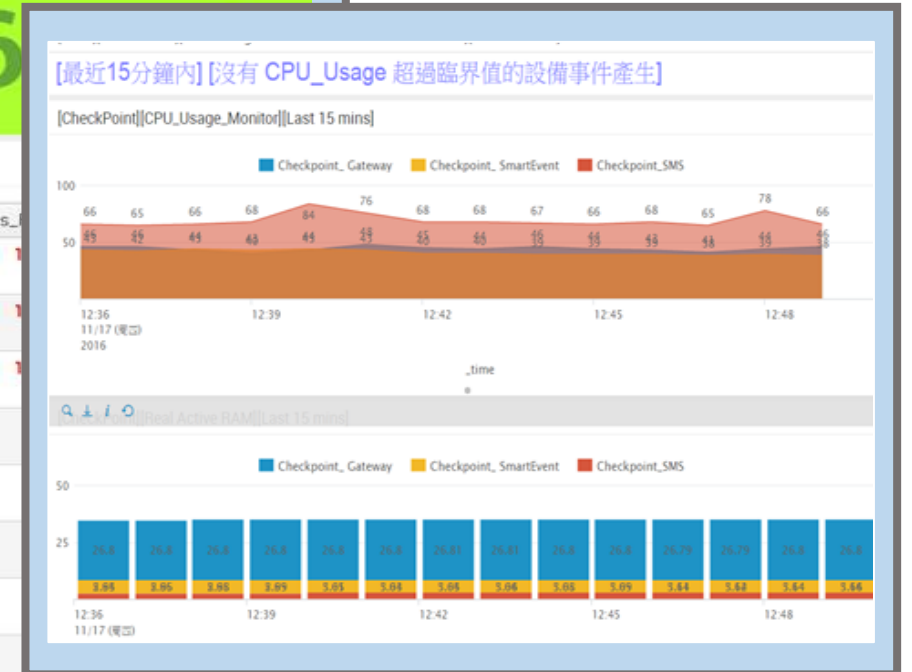
MikroTik

RUCKUS
WIRELESS

Sense

校園智慧網管v2.0

視覺儀表板與大數據分析





敬請指教