



校園網路管理實務

麟瑞科技 臺中辦事處
王光宜



麟瑞科技
RING LINE CORPORATION



校園網路管理實務



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- SNMP 原理概述
- MRTG 介紹
- Cacti 介紹及應用
- 告警系統





何謂 SNMP ?



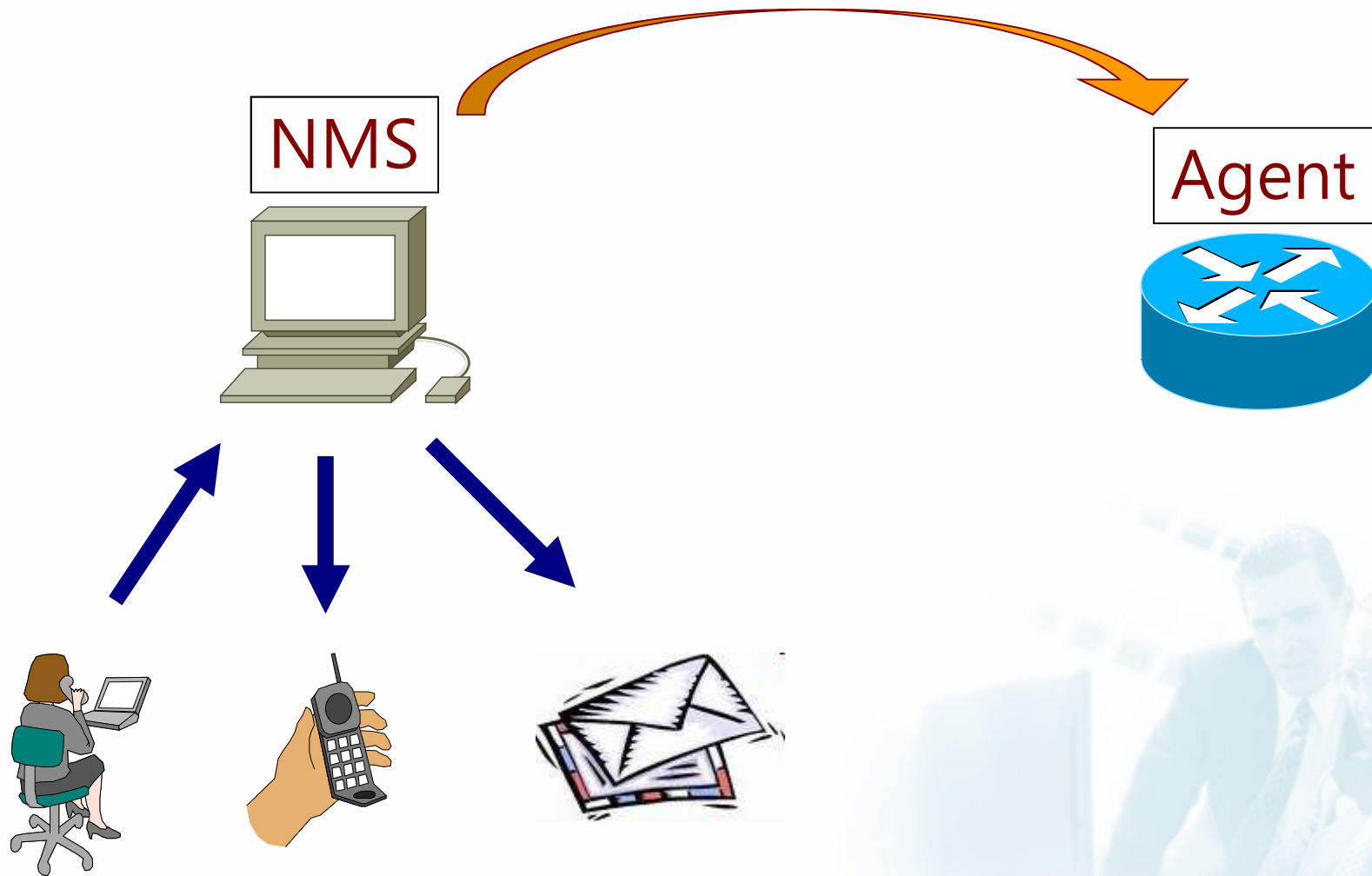
- SNMP
(Simple Network Management Protocol)
- UDP
UDP:161 UDP:162
- 常見名詞
NMS, Agent, Poll, Trap, MIB, OID...



NMS與Agent



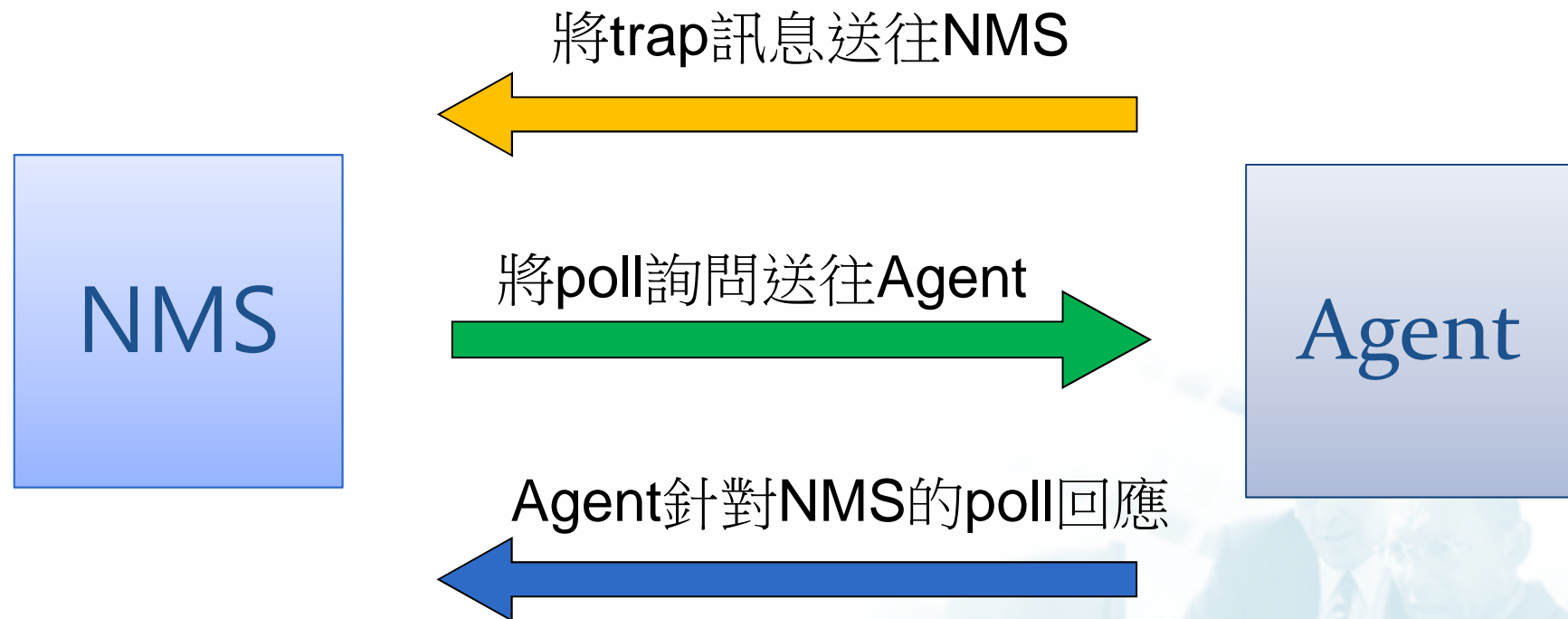
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NMS: Network Management Station



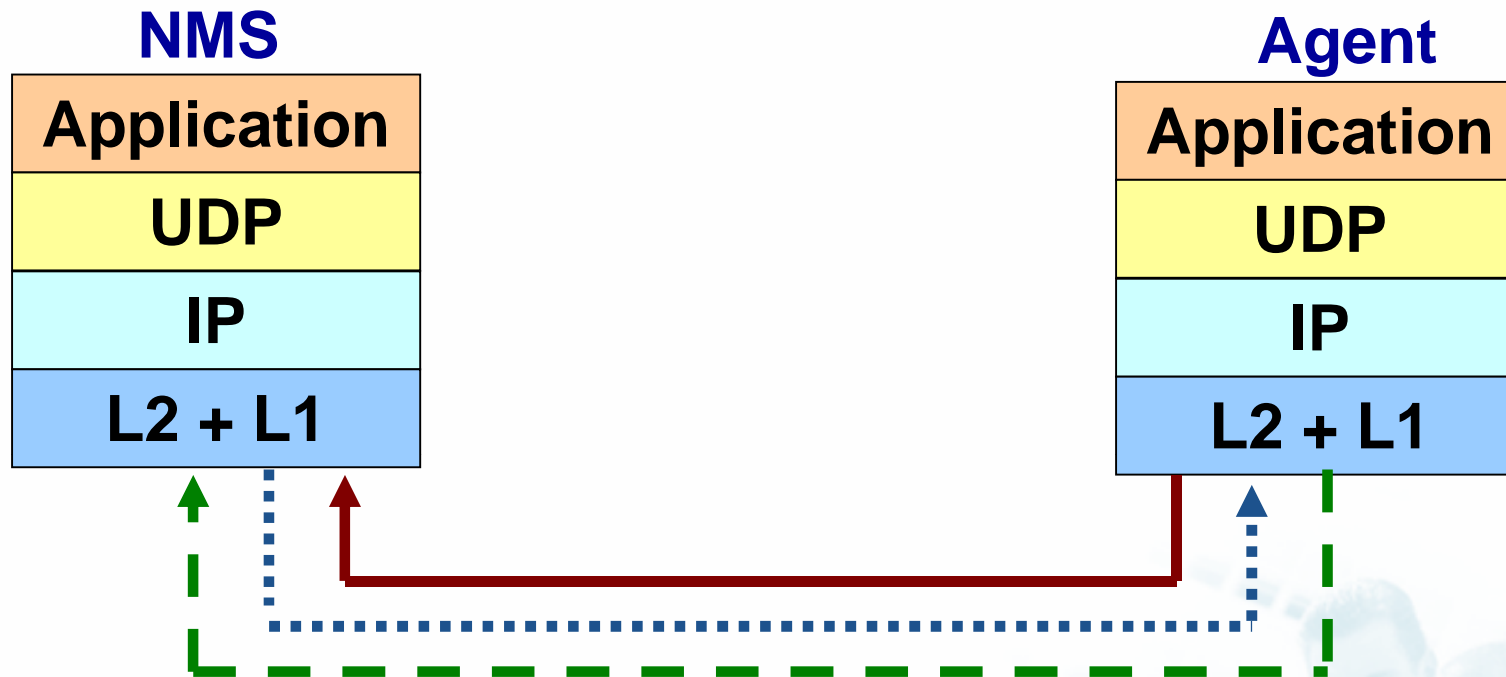
SNMP運作原理



NMS: Network Management Station



SNMP運作原理



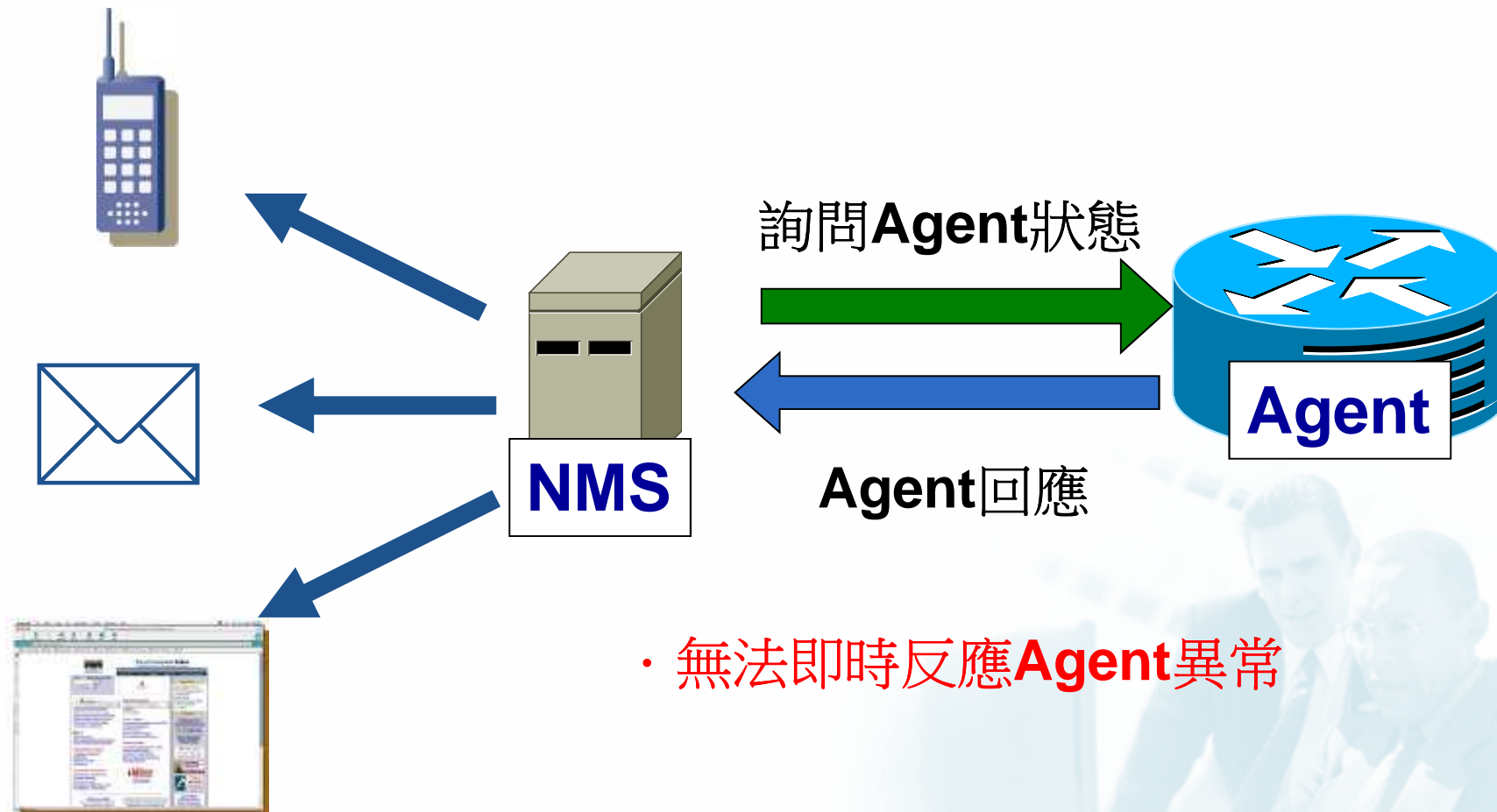
- Trap訊息由Agent送至NMS的162 Port
- SNMP請求訊息由NMS送至Agent的161 Port
- - - SNMP請求的回應訊息由Agent的161 Port送回NMS



POLL運作

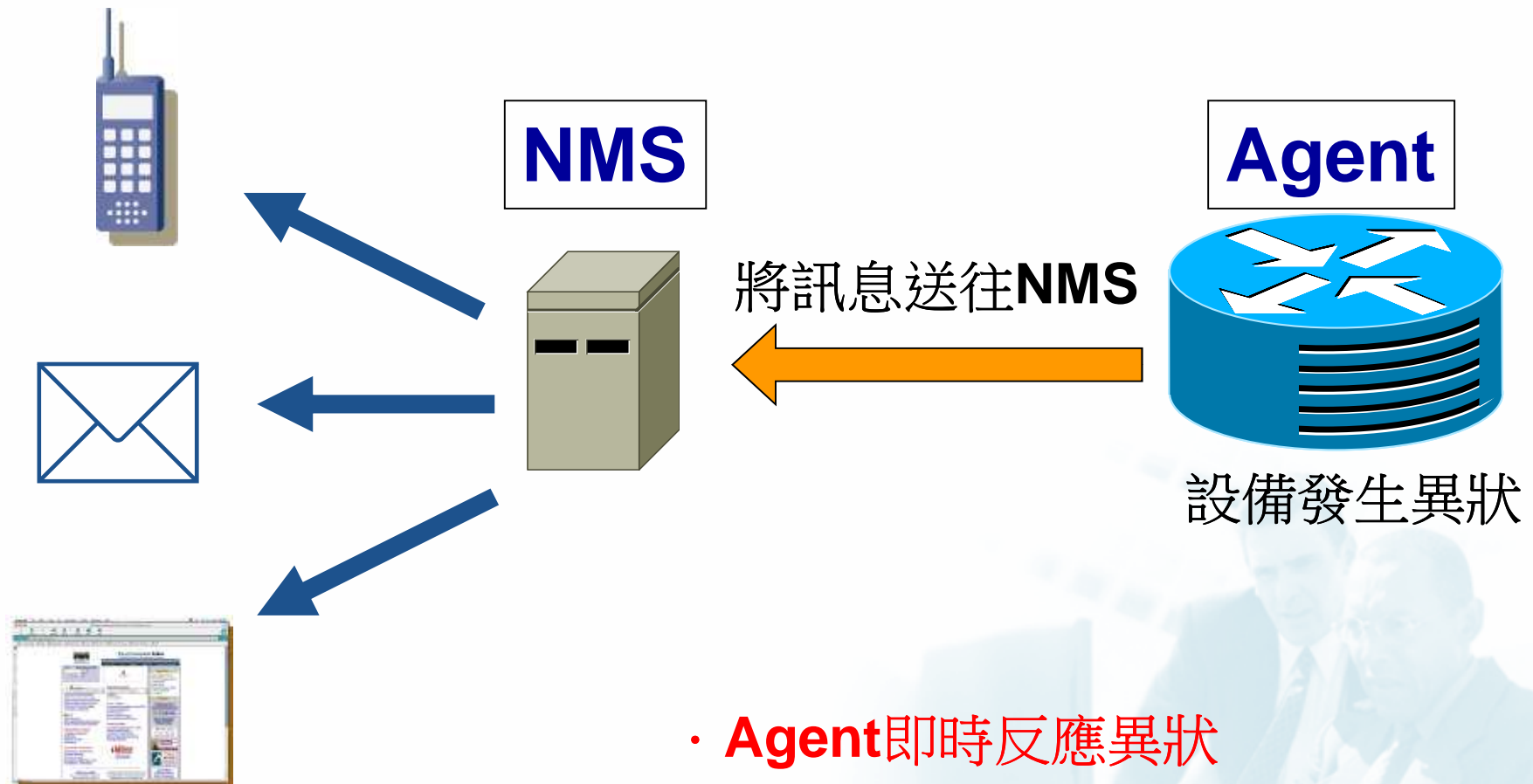


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TRAP運作





何謂MIB ?



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- MIB
(Management Information Base)
- 存放Agent所追蹤待管物件的資料庫
- MIB TREE
- OID
(Object Identifier)

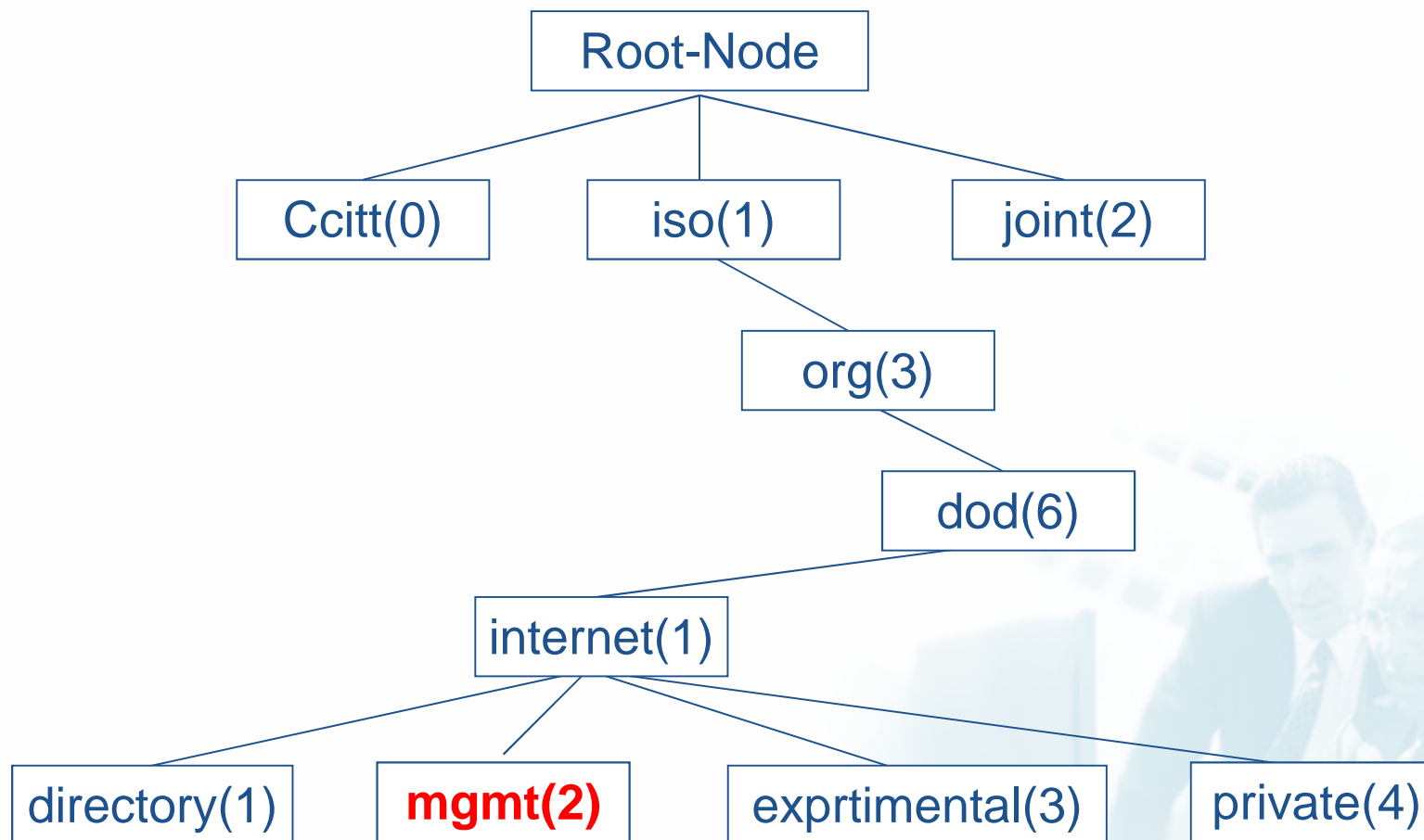




何謂MIB ?



MIB TREE



.Iso(1).org(3).dod(6).internet(1).private(4)



何謂MIB ?



- 各家原廠提出的Enterprise MIB
- {iso(1)
 identified-organization(3)
 dod(6)
 internet(1)
 private(4)
 enterprise(1)}
- 1.3.6.1.4.1



實用小工具



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- MibBrowser or ManageEngine_MibBrowser
- Snmpwalk.exe





MRTG概述



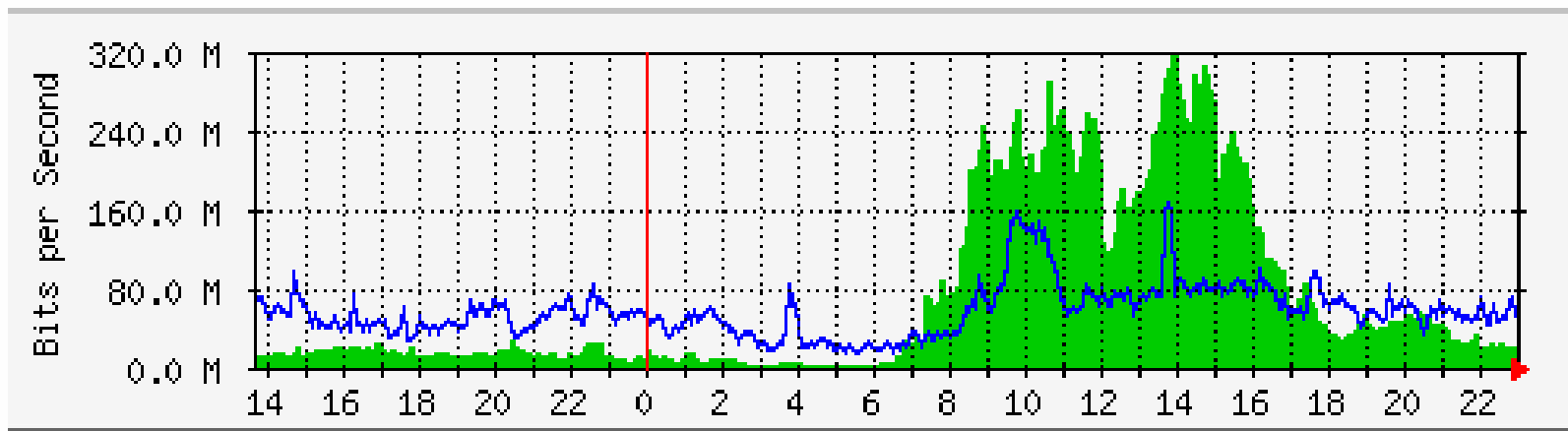
MRTG : Multi Router Traffic Grapher

MRTG為一個使用甚廣的網路流量統計軟體，
它神奇的地方在於能即時地繪出網路流量的統計圖。

利用SNMP協定，去偵測有SNMP協定的網路設備，
每五分鐘統計其設備之流量，再將統計結果繪成統計圖；
最大的功能在於能容易地由統計圖上觀察出實際網路的流量。



MRTG概述



報表格式：日、週、月、年

日報表：**5**分鐘平均

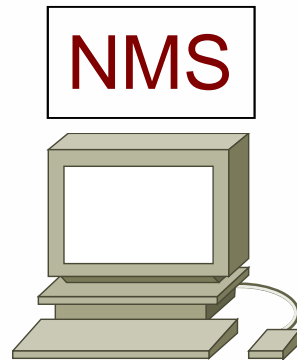
週報表：**30**分鐘平均

月報表：**120**分鐘平均

年報表：**1**天平均



MRTG運作－原理



5分鐘跑一次程式

程式讀取configure檔案

Agent回傳數值

寫入log檔並產生png圖檔





MRTG運作-configure



Target[lab1]: 1:ringline@192.168.1.126:.....2

Directory[lab1]: LAB

SetEnv[lab1]: MRTG_INT_IP="" MRTG_INT_DESCR="FastEthernet0/1"

MaxBytes[lab1]: 12500000

Title[lab1]: 即時流量分析 : MRTG Server 流量

LegendI[lab1]: switch ==> MRTG Server

LegendO[lab1]: MRTG Server ==> switch

PageTop[lab1]: <H1>即時流量分析 : MRTG Server 流量</H1>

<TABLE>

<TR><TD>Description:</TD>

<TD>即時流量分析 : MRTG Server 流量 </TD></TR>

<TR><TD>Max Speed:</TD>

<TD>100 Mbps</TD></TR>

</TABLE>



MRTG運作-檔案



Lab1-day.png
Lab1-month.png
Lab1-week.png
Lab1-year.png
Lab1.html
Lab1.log
Lab1.old



1271411701 25504425729 26109345088
1271411701 6750 10872 6750 10872
1271411401 6603 10677 6603 10677
1271411400 6603 10677 6603 10677
1271411100 6766 10764 6767 10765
1271410800 6655 10715 11035 11093
1271410500 11041 11093 12906 11253
1271410200 12886 11250 12906 11253
1271409900 3070 4723 6932 11311



MRTG優點與缺點



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優點

- 安裝簡單
- 管理容易
- 設定簡單

缺點

- 日報表以上資料不精準
- 圖形較不彈性
- Private MIB支援性弱
- SNMP V3設定困難



Cacti 概述



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- 改善RRD(Round Robin Database)語法困難
- 圖型化操作界面
- 軟體自由度及客制化
- OPEN Source!

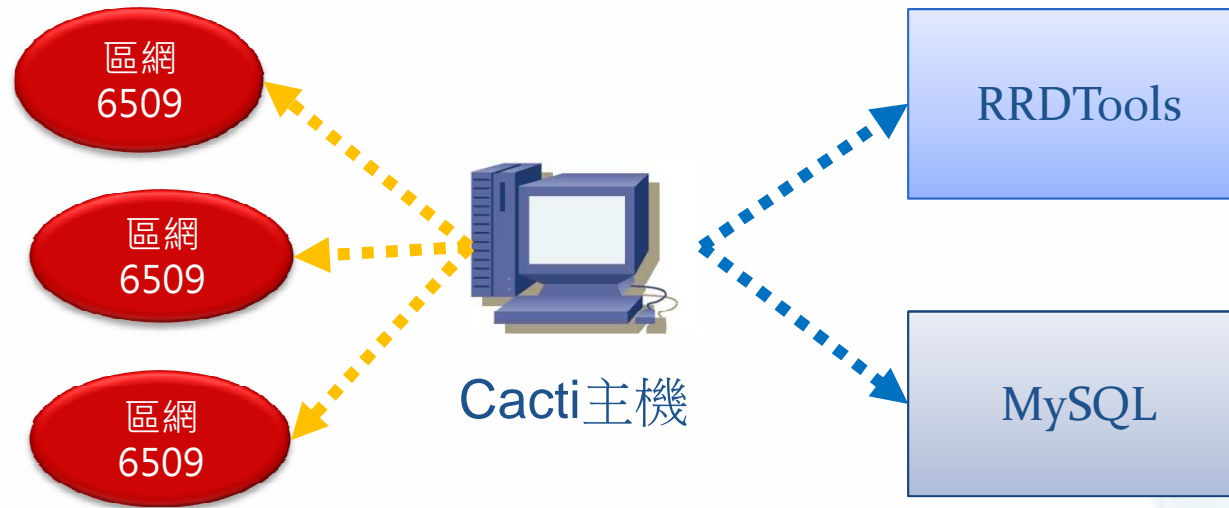




Cacti運作原理



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Polling 網路設備

儲存資料



Cacti運作原理



console graphs weathermap

Console -> Devices -> (Edit) Logged in as admin (Logout)

Create
New Graphs
Management
Graph Management
Graph Trees
Data Sources
Devices
Weathermaps
Collection Methods
Data Queries
Data Input Methods
Templates
Graph Templates
Host Templates
Data Templates
Import/Export
Import Templates
Export Templates
Configuration
Settings
Plugin Management
Utilities
System Utilities
User Management
Logout User

臺北區網1----臺灣大學 (192.192.0.112)

SNMP Information
System: Cisco IOS Software, s72033_rp Software (s72033_rp-IPSERVICESK9_WAN-M), Version 12.2(33)SX14s, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2010 by Cisco Systems, Inc. Compiled Fri 16-Jul-10 19:51 by prod
Uptime: 1160260930 (134 days, 6 hours, 56 minutes)
Hostname: IANET_NTU_CSK.ntu.edu.tw
Location:
Contact:

Devices [edit: 臺北區網1----臺灣大學]

General Host Options

Description
Give this host a meaningful description.

Hostname
Fully qualified hostname or IP address for this device.

Host Template
Choose the Host Template to use to define the default Graph Templates and Data Queries associated with this Host.

Number of Collection Threads
The number of concurrent threads to use for polling this device. This applies to the Spine poller only.

Disable Host
Check this box to disable all checks for this host.

Availability/Reachability Options

Downed Device Detection
The method Cacti will use to determine if a host is available for polling.
NOTE: It is recommended that, at a minimum, SNMP always be selected.

Ping Timeout Value
The timeout value to use for host ICMP and UDP ping. This host SNMP timeout value applies for SNMP pings.

Create Graphs for this Host
Data Source List
Graph List

臺北區網1----臺灣大學
192.192.0.112
Cisco Router
1 Thread (default)
Disable Host
SNMP
400

設備資料存放在MySQL之中



Cacti運作原理



```
mysql> show tables;
```

```
+-----+
| Tables_in_cacti |
+-----+
| cdef              |
| cdef_items        |
| colors            |
| data_input        |
| data_input_data   |
| data_input_fields |
| data_local        |
| data_template     |
| data_template_data |
| data_template_data_rra |
| data_template_rrd |
| graph_local       |
```

```
mysql> show columns from cdef;
```

```
+-----+-----+-----+-----+-----+-----+
| Field | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| id    | mediumint(8) unsigned | NO   | PRI | NULL    |      |
| hash  | varchar(32)          | NO   |     |         |      |
| name  | varchar(255)         | NO   |     |         |      |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)
```



Cacti運作原理



```
console graphs weathermap
Graphs -> Tree Mode -> 教育部區網 6509-N - CPU Usage -> Properties

/usr/local/bin/rrdtool graph - \
--imgformat=PNG \
--start=1382867752 \
--end=1382954152 \
--title='教育部區網 6509-N - CPU Usage' \
--rigid \
--base=1000 \
--height=120 \
--width=500 \
--alt-autoscale-max \
--lower-limit=0 \
COMMENT:"From 2013/10/27 17:55:52 To 2013/10/28 17:55:52" \
COMMENT:" \n" \
--vertical-label='percent' \
--slope-mode \
--font TITLE:12: \
--font AXIS:8: \
--font LEGEND:10: \
--font UNIT:8: \
DEF:a="/home/www/data/cacti/rra/_6509n_5min_cpu_11.rrd":5min_cpu:AVERAGE \
AREA:a#FF0000FF:"CPU 使用率(%)" \
GPRINT:a:LAST:"目前\:%8.01f" \
GPRINT:a:AVERAGE:"平均\:%8.01f" \
GPRINT:a:MAX:"最大\:%8.01f"
```

設備回應Poller的值存放在RRDTools之中



Cacti運作原理



```
mrtg# pwd
/home/www/data/cacti/rra
```

```
mrtg# ls
```

| | | |
|------------------------|----------------------------|---------------------|
| ----1_mem_free_586.rrd | _5min_cpu_59.rrd | _traffic_in_362.rrd |
| ----1_mem_free_588.rrd | _5min_cpu_62.rrd | _traffic_in_364.rrd |
| ----1_mem_free_602.rrd | _5min_cpu_66.rrd | _traffic_in_365.rrd |
| ----1_mem_free_604.rrd | _5min_cpu_78.rrd | _traffic_in_368.rrd |
| ----1_mem_free_614.rrd | _5min_cpu_90.rrd | _traffic_in_369.rrd |
| ----1_mem_free_616.rrd | _6509-n_mem_free_582.rrd | _traffic_in_373.rrd |
| ----1_mem_used_587.rrd | _6509-n_mem_free_584.rrd | _traffic_in_374.rrd |
| ----1_mem_used_589.rrd | _6509-n_mem_used_583.rrd | _traffic_in_398.rrd |
| ----1_mem_used_603.rrd | _6509-n_mem_used_585.rrd | _traffic_in_405.rrd |
| ----1_mem_used_605.rrd | _6509-n_traffic_in_479.rrd | _traffic_in_493.rrd |



Cacti基本操作



console graphs **Y /**weathermap

Console -> Devices Logged in as admin (Logout)

Create
New Graphs
Management
Graph Management
Graph Trees
1 Data Sources
2 Devices
Weathermaps
Collection Methods
Data Queries
Data Input Methods
Templates
Graph Templates
Host Templates
Data Templates
Import/Export
Import Templates
Export Templates

2 Add

Devices

Type: Any Status: Any Search: Rows per Page: 30 Go Clear

<< Previous Showing Rows 1 to 30 of 30 [1] Next >>

| Description** | ID | Graphs | Data Sources | Status | In State | Hostname | Current (ms) | Average (ms) | Availability | |
|---------------|----|--------|--------------|----------|--------------|-----------------|--------------|--------------|--------------|--|
| 6509-ISP | 2 | 33 | 29 | Up | 42d 2h 55m | 192.192.0.111 | 3.39 | 19.31 | 99.27 | |
| ASR@TW | 26 | 14 | 14 | Up | 28d 21h 20m | 203.72.43.10 | 1.93 | 132.29 | 99.78 | |
| ASR@USA | 27 | 5 | 5 | Up | 219d 19h 20m | 203.72.43.200 | 127.83 | 258.56 | 99.91 | |
| ESXi-51 | 41 | 0 | 0 | Unknown | - | 192.83.166.51 | 0 | 0 | 100 | |
| Localhost | 1 | 5 | 6 | Disabled | - | 127.0.0.1 | 0 | 0 | 100 | |
| MOE3 | 30 | 19 | 19 | Up | 50d 10h 15m | 203.72.43.22 | 4.03 | 2.92 | 91.57 | |
| TANet SCE 8K | 29 | 52 | 51 | Up | 219d 19h 20m | 192.83.166.118 | 3.77 | 3.6 | 62.34 | |
| 中部區網----中興大學1 | 11 | 30 | 31 | Up | 10d 22h 30m | 192.192.0.120 | 11.14 | 13.28 | 98.58 | |
| 中部區網----中興大學2 | 35 | 5 | 5 | Up | 18d 20h 34m | 140.128.251.221 | 8.16 | 10.29 | 99.88 | |
| 南投區網----暨南大學 | 19 | 9 | 10 | Up | 30d 1h 20m | 192.83.196.108 | 11.42 | 11.08 | 99.88 | |

增加新設備: Devices >> Add



Cacti基本操作



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console graphs weathermap

Console -> Devices -> (Edit) Logged in as admin (Logout)

Create

New Graphs

Management

Graph Management

Graph Trees

Data Sources

Devices

Weathermaps

Collection Methods

Data Queries

Data Input Methods

Templates

Graph Templates

Host Templates

Data Templates

Import/Export

Import Templates

Export Templates

Configuration

Settings

Plugin Management

Utilities

雲嘉區網----中正大學 (192.192.0.123)

SNMP Information

System: Cisco IOS Software, s72033_rp Software (s72033_rp-IPSERVICESK9-M), Version 12.2(33)SXI7, RELEASE SOFTWARE (fc1) Technical Support: <http://www.cisco.com/techsupport> Copyright (c) 1986-2011 by Cisco Systems, Inc. Compiled Mon 18-Jul-11 05:50 by prod_rcl_
Uptime: 2659931161 (307 days, 20 hours, 41 minutes)
Hostname: TANET_OCU_C6K.edu.tw
Location:
Contact:

Devices [edit: 雲嘉區網----中正大學]

General Host Options

| | |
|--|---------------------------------------|
| Description Give this host a meaningful description. | 雲嘉區網----中正大學 |
| Hostname Fully qualified hostname or IP address for this device. | 192.192.0.123 |
| Host Template Choose the Host Template to use to define the default Graph Templates and Data Queries associated with this Host. | Cisco Router |
| Number of Collection Threads The number of concurrent threads to use for polling this device. This applies to the Spine poller only. | 1 Thread (default) |
| Disable Host Check this box to disable all checks for this host. | <input type="checkbox"/> Disable Host |

Availability/Reachability Options

| | |
|--|------|
| Downed Device Detection The method Cacti will use to determine if a host is available for polling. | SNMP |
|--|------|

- * Create Graphs for this Host
- * Data Source List
- * Graph List

增加新偵測介面



Cacti基本操作



麟瑞科技
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Console -> Create New Graphs Logged in as admin (Logout)

Create
New Graphs
Management
Graph Management
Graph Trees
Data Sources
Devices
Weathermaps
Collection Methods
Data Queries
Data Input Methods
Templates
Graph Templates
Host Templates
Data Templates
Import/Export
Import Templates
Export Templates
Configuration
Settings
Plugin Management
Utilities
System Utilities
User Management
Logout User

雲嘉區網----中正大學 (192.192.0.123) Cisco Router

Host: 雲嘉區網----中正大學 (192.192.0.123) Graph Types: All [*Edit this Host](#) [*Create New Host](#)

Graph Templates

| Graph Template Name |
|---|
| Create: Cisco - CPU Usage |
| Create: Cisco Memory Used |
| Create: Cisco Memory Used% |
| Create: (Select a graph type to create) |

Data Query [SNMP - Get Mounted Partitions]

This data query returned 0 rows, perhaps there was a problem executing this data query. You can [run this data query in debug mode](#) to get more information.

Data Query [SNMP - Get Processor Information]

This data query returned 0 rows, perhaps there was a problem executing this data query. You can [run this data query in debug mode](#) to get more information.

Data Query [SNMP - Interface Statistics]

<< Previous Showing Rows 1 to 30 of 190 [1,2,3,4,5,6,7] Next >>

| Index | Status | Description | Name (IF-MIB) | Alias (IF-MIB) | Type | Speed | Hardware Address | IP Address | |
|-------|--------|--------------------|---------------|----------------|-------------------|------------|-------------------|------------|-------------------------------------|
| 1 | Up | GigabitEthernet1/1 | Gi1/1 | [J -FW] | ethernetCsmacd(6) | 1000000000 | 00:0D:28:CB:53:90 | | <input checked="" type="checkbox"/> |
| 2 | Up | GigabitEthernet1/2 | Gi1/2 | [APTG CYC] | ethernetCsmacd(6) | 1000000000 | 00:0D:28:CB:53:91 | | <input type="checkbox"/> |
| 3 | Up | GigabitEthernet1/3 | Gi1/3 | [APTG-CY] | ethernetCsmacd(6) | 1000000000 | 00:0D:28:CB:53:92 | | <input type="checkbox"/> |
| 4 | Up | GigabitEthernet1/4 | Gi1/4 | [APTG YLC] | ethernetCsmacd(6) | 1000000000 | 00:0D:28:CB:53:93 | | <input type="checkbox"/> |
| 5 | Up | GigabitEthernet1/5 | Gi1/5 | caac(j j) | ethernetCsmacd(6) | 1000000000 | 00:0D:28:CB:53:94 | | <input type="checkbox"/> |

勾選新偵測介面



Cacti基本操作



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In/Out Bits
In/Out Bits (64-bit Counters)
In/Out Bits with 95th Percentile
In/Out Bits with Total Bandwidth
In/Out Bytes
In/Out Bytes (64-bit Counters)
In/Out Bytes with Total Bandwidth
In/Out Errors/Discarded Packets
In/Out Non-Unicast Packets
In/Out Unicast Packets
In/Out Bits

CDEF's [edit: Turn Bytes into Bits]

Name
A useful name for this CDEF. Turn Bytes into Bits

`cdef=CURRENT_DATA_SOURCE,8,*`

Cancel

| CDEF Items | | | Add |
|------------|--|-----|-----|
| Item | Item Value | | |
| Item #1 | Special Data Source: CURRENT_DATA_SOURCE | ↓ ↑ | × |
| Item #2 | Custom String: 8 | ↓ ↑ | × |
| Item #3 | Operator: * | ↓ ↑ | × |

流量偵測請選In/Out Bits (64-bit Counters)



Cacti 進階操作



新增一個Templates:

取得設備及偵測項目OID(Cisco Memory):

MemoryFree: 1.3.6.1.4.1.9.9.48.1.1.1.6.1

MemoryUsed: 1.3.6.1.4.1.9.9.48.1.1.1.5.1

圖形呈現方式:

MemoryFree與MemoryUsed使用情況

MemoryUsed百分比

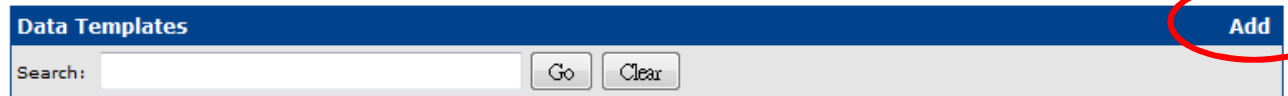
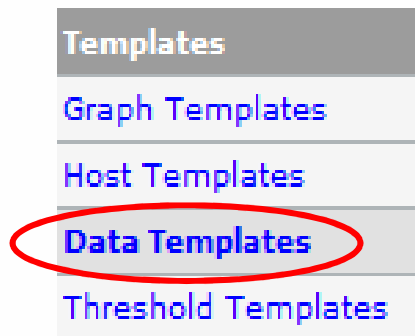


Cacti 進階操作



步驟1. 製作兩個OID的Data Templates

Console >> Templates >> Data Templates >> Add





Cacti進階操作



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填寫Data Templates相關資訊

| Data Source | |
|--|--|
| Name | host_description1 - MemoryFree |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | |
| Data Input Method | Get SNMP Data |
| <i>This field is always templated.</i> | |
| Associated RRA's | Hourly (1 Minute Average) 日報表 (每5分鐘平均) 週報表 (每30分鐘平均) 月報表 (每2小時平均) |
| <i>This field is always templated.</i> | |
| Step | 300 |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | |
| Data Source Active | <input checked="" type="checkbox"/> Data Source Active |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | |

| Data Source Item [mem_free] | | New |
|--|----------|-----|
| Internal Data Source Name | mem_free | |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | | |
| Minimum Value ('U' for No Minimum) | 0 | |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | | |
| Maximum Value ('U' for No Maximum) | 0 | |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | | |
| Data Source Type | GAUGE | |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | | |
| Heartbeat | 600 | |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | | |

| Custom Data [data input: Get SNMP Data] | |
|--|----------------------------|
| OID | 1.3.6.1.4.1.9948.1.1.1.6.1 |
| <input type="checkbox"/> Use Per-Data Source Value (Ignore this Value) | |



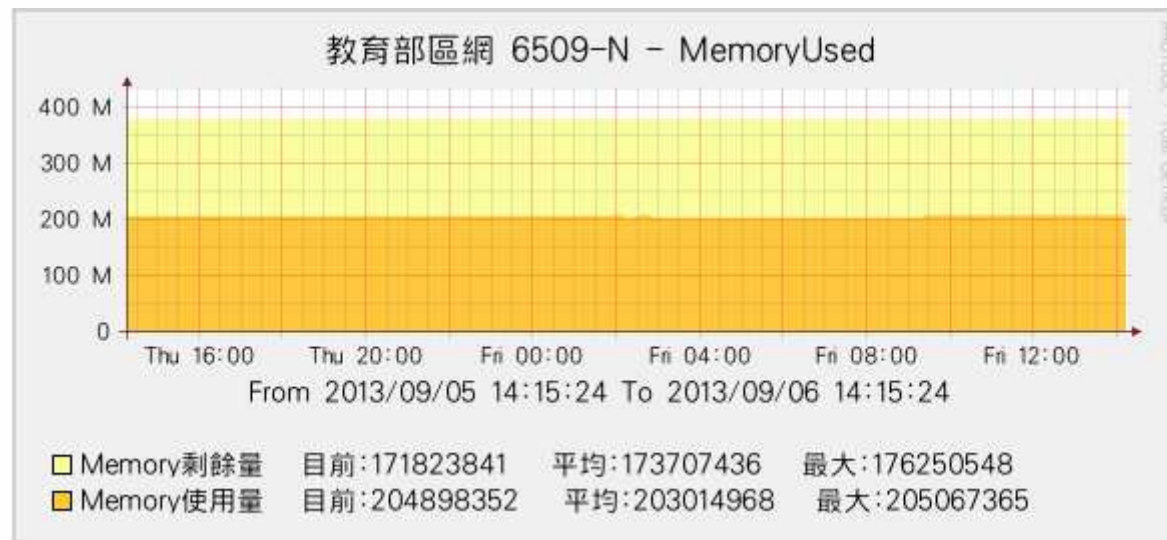
Cacti進階操作



步驟2. 製作運算式 (CDEFs)

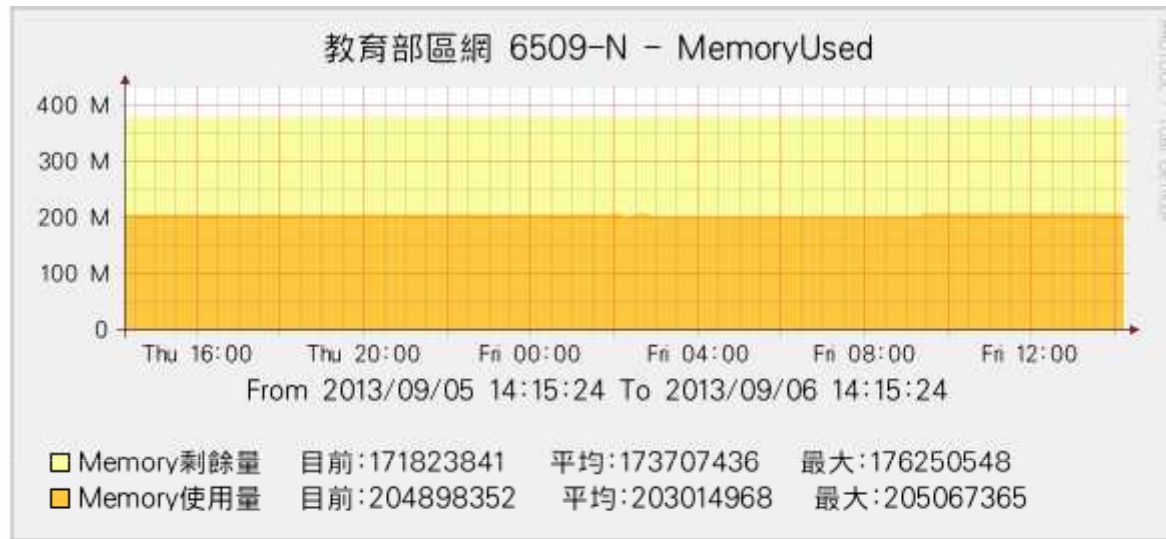
RRDtools是使用(RPN)運算逆波蘭表示法(Reverse Polish notation form)。

相關的運算需要在CDEFs中定義運算公式。





Cacti進階操作



a = Memory使用量
b = Memory剩餘量
Memory總量 = a + b

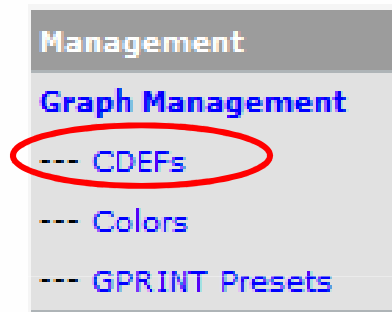
a + b 若用RPN表示，應該為a,b,+



Cacti 進階操作



Console >> Management >> Graph Management >> --- CDEFs



| CDEF Items | | | | Add |
|------------|------------------|---|---|-----|
| Item | Item Value | | | |
| Item #1 | Custom String: a | ↓ | ↑ | × |
| Item #2 | Custom String: b | ↓ | ↑ | × |
| Item #3 | Operator: + | ↓ | ↑ | × |

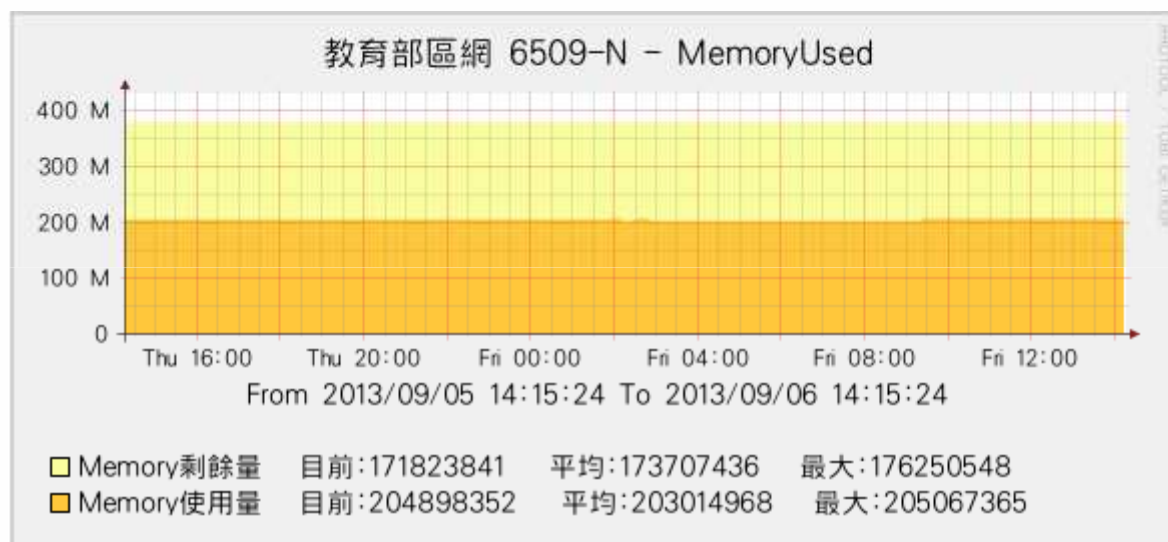


Cacti進階操作



麟瑞科技
RING LINE CORPORATION

步驟3. 製作圖形範本 (Graph Templates)





Cacti進階操作



Console >> Templates >> Graph Templates

| Graph Template Items [edit: Cisco Memory Used] | | | | | Add |
|--|-----------------------|-----------------|---------|------------|-----|
| Graph Item | Data Source | Graph Item Type | CF Type | Item Color | |
| Item # 1 | COMMENT: | COMMENT | AVERAGE | | ↓↑✖ |
| Item # 2 | COMMENT: | COMMENT | AVERAGE | | ↓↑✖ |
| Item # 3 | COMMENT: | COMMENT | AVERAGE | | ↓↑✖ |
| Item # 4 | (No Task): Memory剩餘量 | AREA | AVERAGE | FAFD9E | ↓↑✖ |
| Item # 5 | (mem_free): 目前: | GPRINT | LAST | | ↓↑✖ |
| Item # 6 | (mem_free): 平均: | GPRINT | AVERAGE | | ↓↑✖ |
| Item # 7 | (mem_free): 最大:<HR> | GPRINT | MAX | | ↓↑✖ |
| Item # 8 | (mem_used): Memory使用量 | AREA | AVERAGE | EA8F00 | ↓↑✖ |
| Item # 9 | (mem_used): 目前: | GPRINT | LAST | | ↓↑✖ |
| Item # 10 | (mem_used): 平均: | GPRINT | AVERAGE | | ↓↑✖ |
| Item # 11 | (mem_used): 最大: | GPRINT | MAX | | ↓↑✖ |



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Memory使用百分比的做法？

a = Memory使用量

b = Memory剩餘量

Memory的使用百分比公式為： $a/(a+b)*100$

換成RPN表示為？





Cacti 進階操作

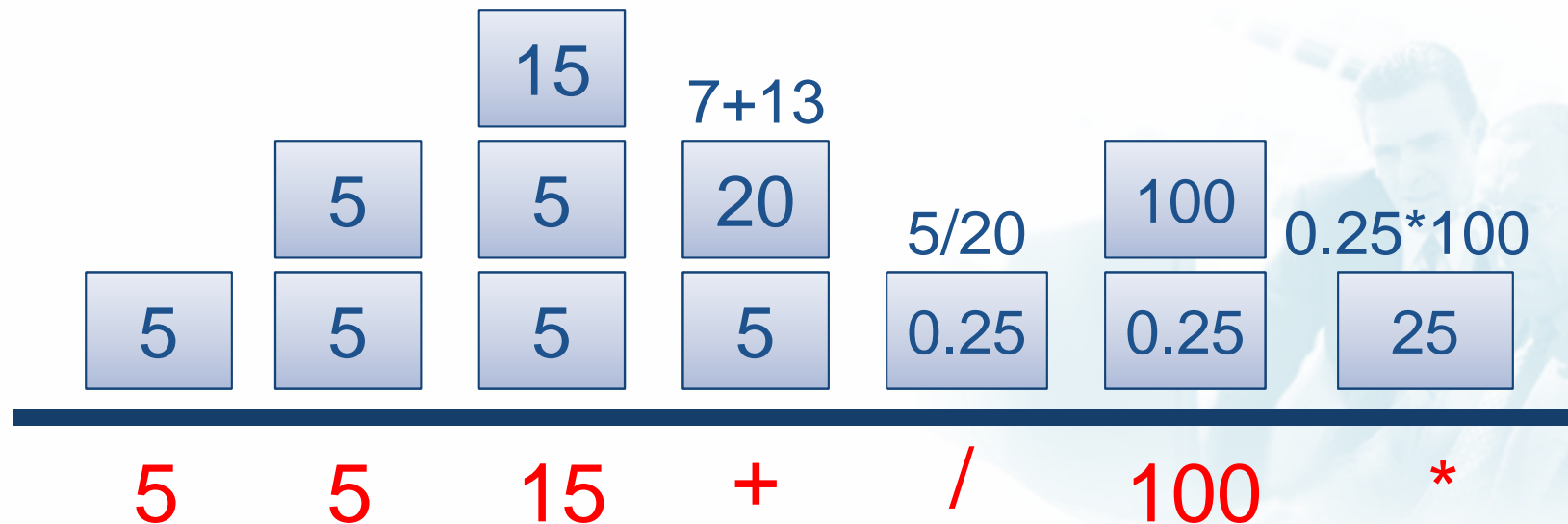


Memory使用百分比

換成RPN表示為： $a, a, b, +, /, 100, *$

RPN運算思維：由左向右閱讀算式，遇到數值向上堆疊；遇到運算子時，從兩個堆疊數值中取出運算後再堆疊。

例： $5, 5, 15, +, /, 100, *$





Cacti 進階操作



有沒有更簡單的方法？

<http://www.cacti.net/index.php>

latest version: **0.8.8b**

cacti the complete rrdtool-based graphing solution.

Latest Files
[cacti-0.8.8b.tar.gz...](#)
[cacti-0.8.8b.zip...](#)

Information
[What is Cacti?](#)
[Features](#)
[Changelog](#)
[Screen Shots](#)

Downloads
[Download Cacti](#)
[Official Patches](#)
[Additional Scripts](#)

About Cacti

Cacti is a complete network graphing solution designed to harness the power of **RRDTool's** data storage and graphing functionality. Cacti provides a fast poller, advanced graph templating, multiple data acquisition methods, and user management features out of the box. All of this is wrapped in an intuitive, easy to use interface that makes sense for LAN-sized installations up to complex networks with hundreds of devices.

[Get more details about Cacti.](#)



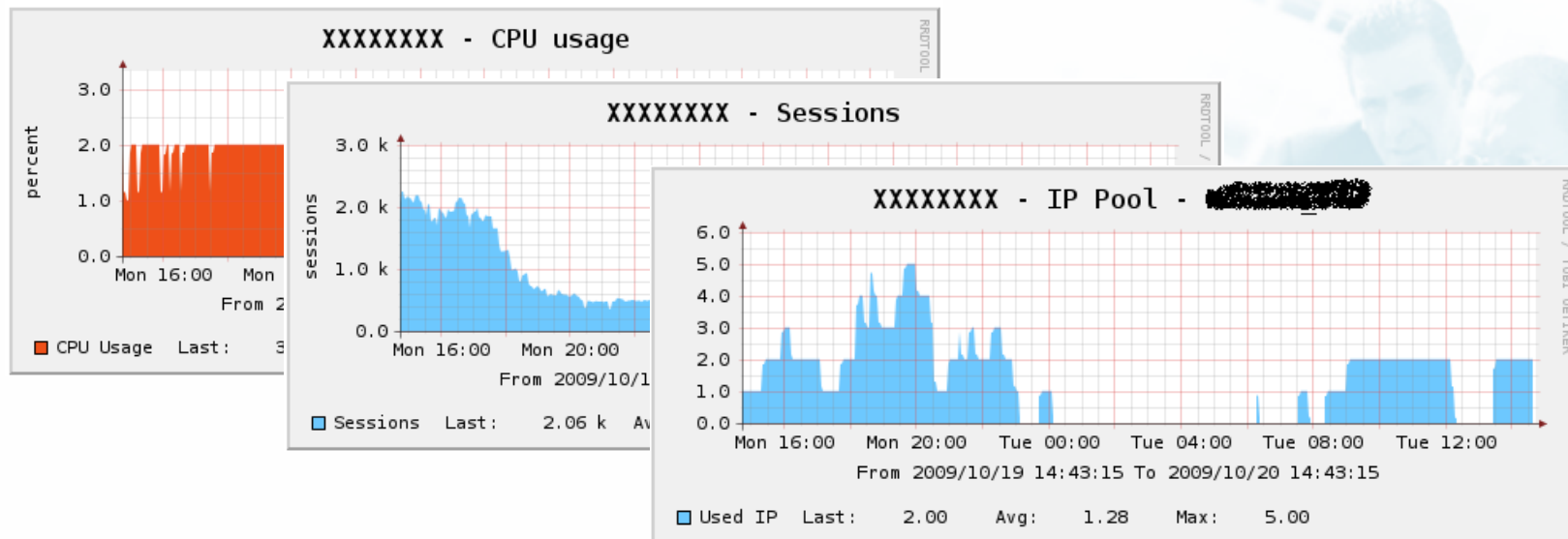
Cacti進階操作



documentation >> Templates

| Name | Description | Version | Date | Includes Dependencies | Author | Tags |
|--------------|--|---------|------------|-----------------------|----------|---------|
| isg | Juniper ISG Firewall (based on Netscreen ScreenOS) | 0.8.7b | 2009/10/05 | yes | yreddy | juniper |
| ive | Juniper IVE / VPN SSL | 0.8.7e | 2010/06/09 | yes | yreddy | juniper |
| junipermx960 | Juniper MX960 | 0.8.7g | 30.05.2012 | notrequired | nica_dan | juniper |

The following graph are global to all Juniper firewalls running ScreenOS:



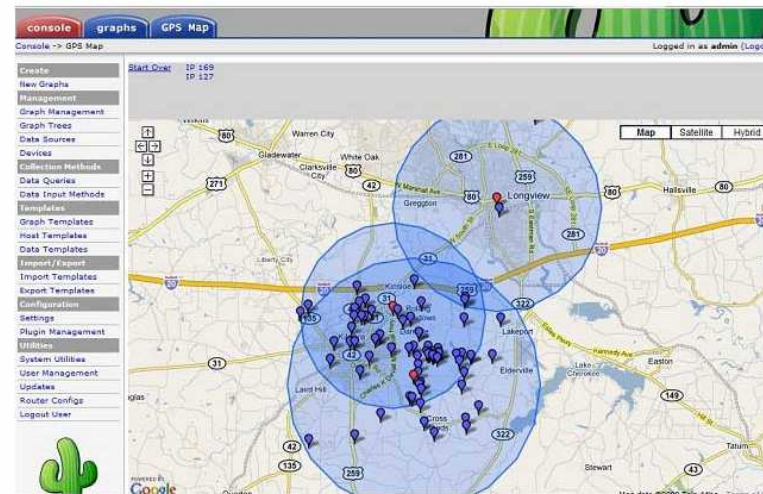
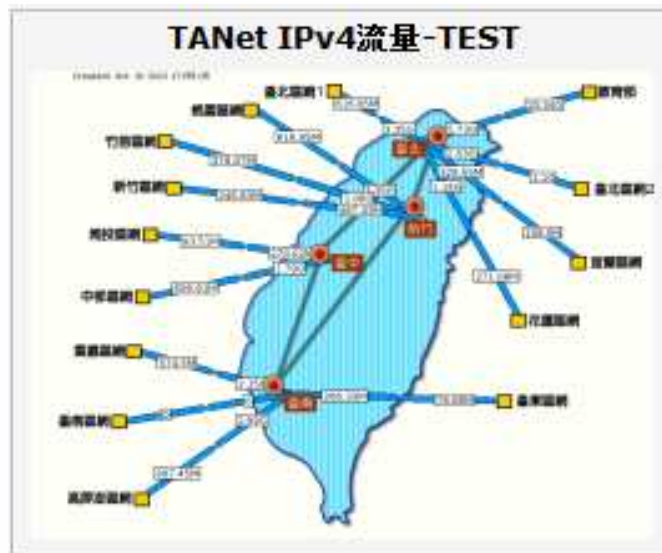


Cacti應用



利用Cacti Plugins 整合套件

64bit access control alarming analysis audit auth autom8 automation availability banner cluster config control coordinates csv customization dashboard database device diagrams discovery error events export extjs file google gps graph graphs groups gui interface inventory ip management ipsubnet jquery json ldap login logs mail manage map mapping maps mib misc multipoller mysql nectar netflow ntop overview pdf performance phpip poller polling portlets ports predict prediction processes radius report reportit resource rrd scan script security slow smokeping snmpt soap ssh stats syslog tabs telnet template thold threshold timespan trap tree ui url users web2 webservice website

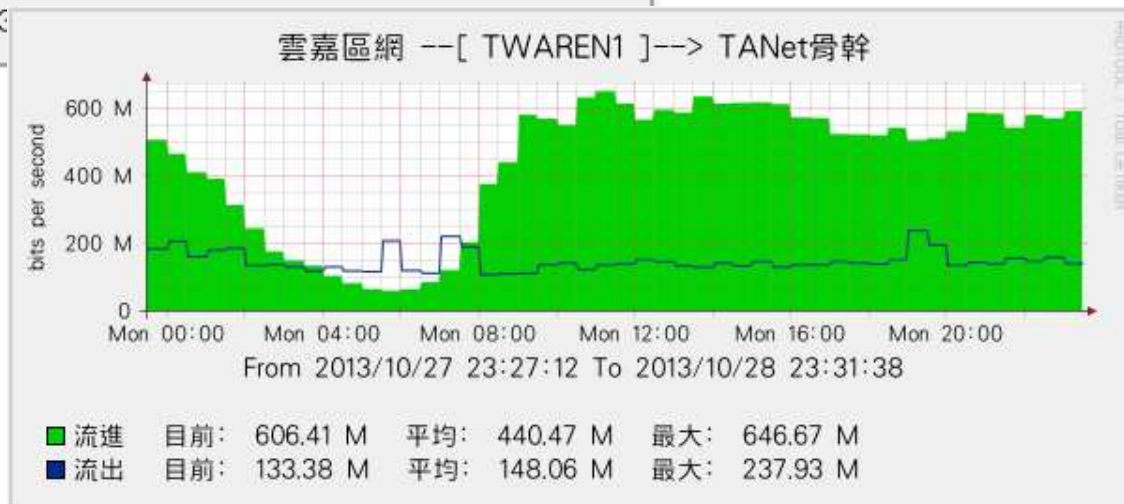
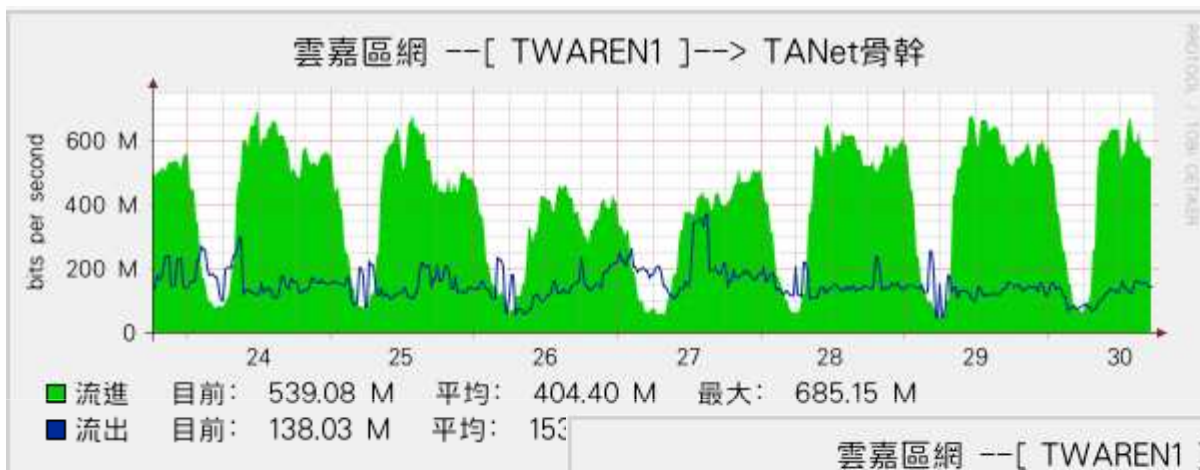




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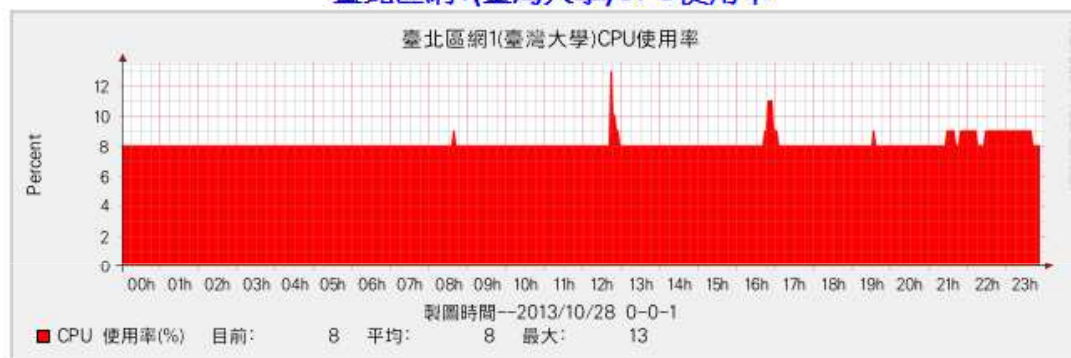


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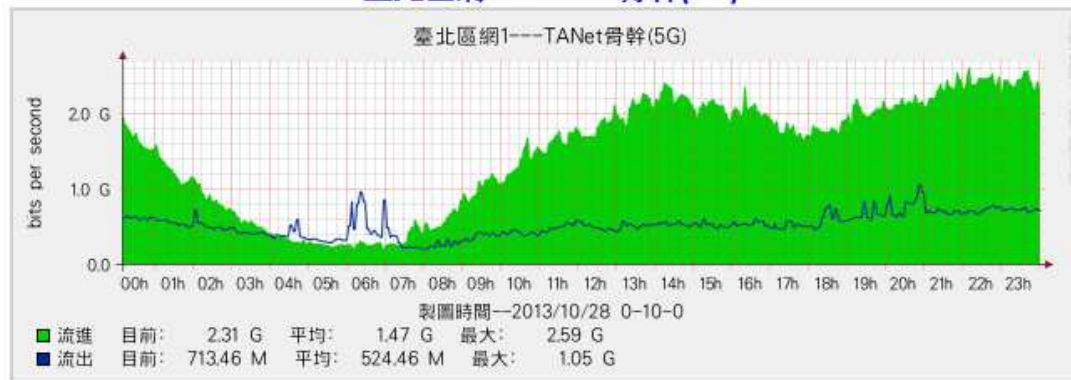
TANet流量偵測-定期報表

2013年10月27日--日報表

臺北區網1(臺灣大學)CPU使用率



臺北區網1---TANet骨幹(5G)



<http://mrtg.tanet.edu.tw/Report/>

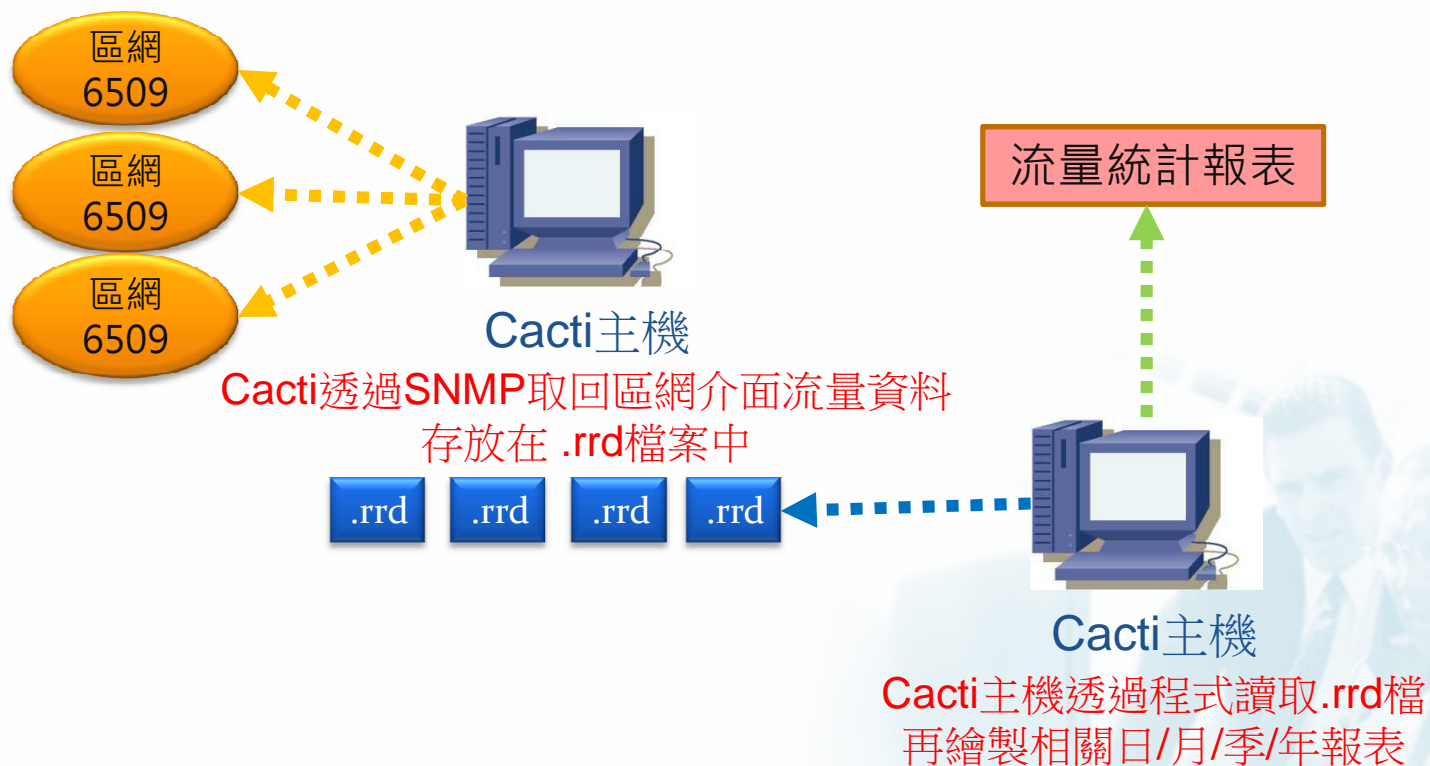


Cacti應用



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運作原理





Cacti 應用



RRDTool 支援程式

1. PHP 函式：

<http://pecl.php.net/package/rrd>

2. Perl 模組：

RRDs 以及其他。

<http://search.cpan.org/search?query=rrdtool&mode=all>



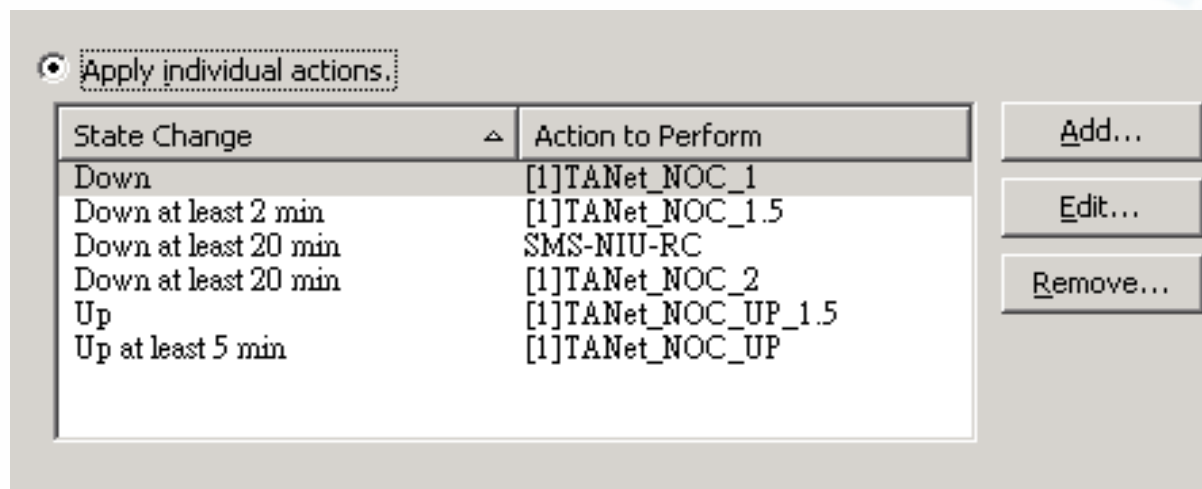
告警系統



Whats up Gold

主動告警、簡訊機

What's UP在偵測時斷線，可自動發出告警信件以及手機簡訊以提醒維運人員注意骨幹網路狀況。



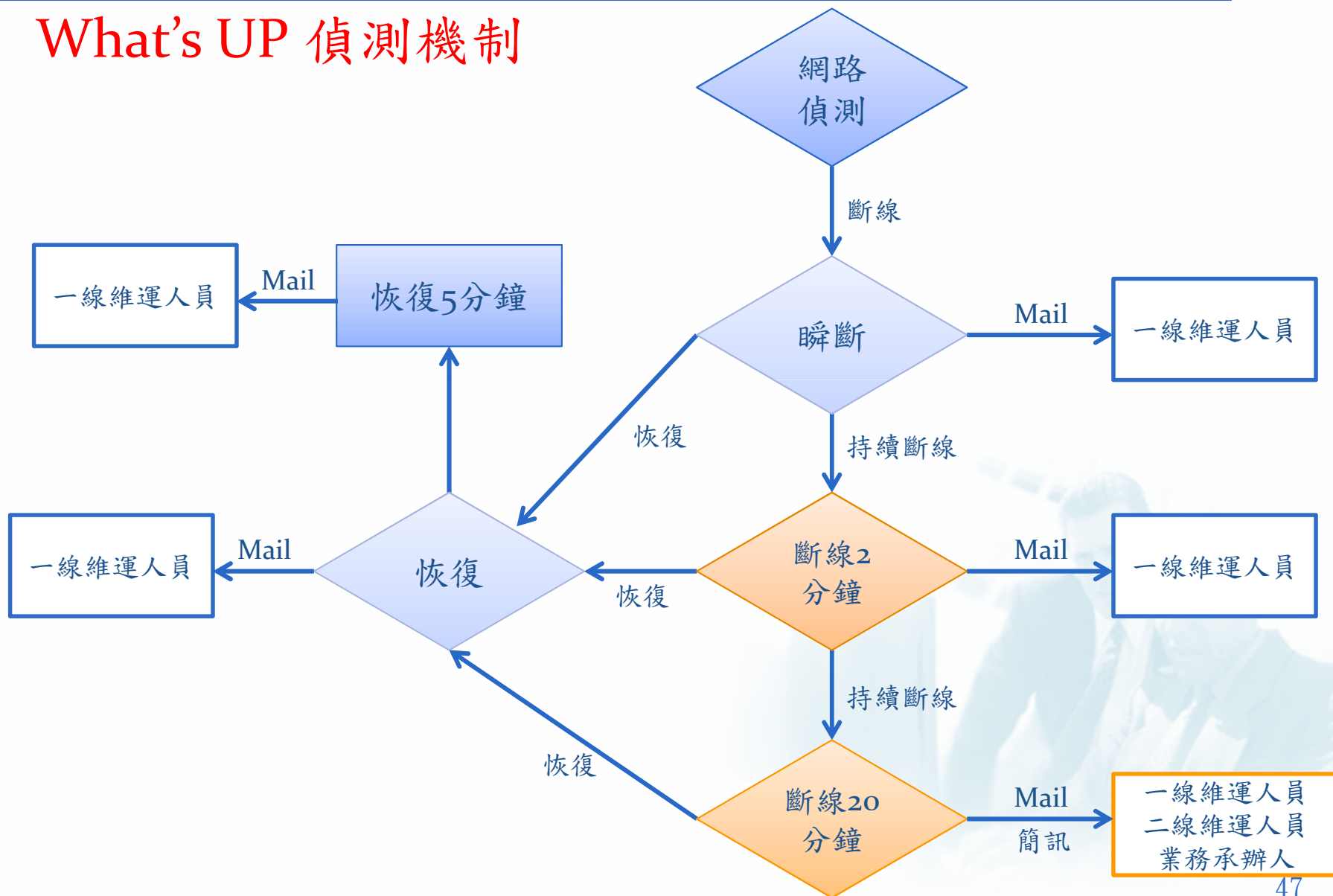


告警系統



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What's UP 偵測機制





結論



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網路管理的目的？
網路管理的效能？
網路管理的成本？

