



Spectrum MikroTik Network

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Spectrum Indonesia
On MikroTik User Meeting, Orlando
May 31 – June 1, 2007



- Establish since 1997 in Surabaya
- Specialist in IT Field
- Several Business Unit
 - Jupiter IX Jakarta (Network Access Provider)
 - D~Net Surabaya (Internet Service Provider)
 - MS-MDP (Microsoft Market Dev. Partner)
 - ***Spectrum Indonesia (Infrastructure Unit)***
 - DOMO (Online Game Publisher)



- New business unit since 2006
- Deals with many wireless device and installation since 2000
- Using MikroTik since 2003
- Specialized in wired and wireless Infrastructure
- Highly-trained “soldiers”
- 25 Commercial BTS over 9 cities and approximately 270 wireless clients



- 2nd largest city in Indonesia (after Jakarta)
- Capital of East Java Province
- Population is 5.3 million people over 34.3 km² area
- Over 20 ISP in town



- Difficulties in cable infrastructure
 - Coverage area
 - Service quality when trouble occurs
 - High cost
- Use low cost devices with high performance
- Rapid interference and many high buildings
- Provide commercial BTS to serve other ISP and Wireless Local Loop to serve company needs

- Similar to cable quality
- Wide service available
 - VoIP
 - Internet
 - Information Exchange
 - Headquarters – Branch Office connection
- Fast installation
- Quick response

- Rich-features AP and CPEs
 - Formerly we use Karlnet/Terabeam COR/ROR
- Powerful Backhaul Connection
 - Formerly we use Motorola Canopy and Microwave Connection
- Fail-over BTS with OSPF dynamic routing
- Tunneling mechanism
- Bandwidth Limiter
 - Formerly we use Packeteer
- Hotspots, VPN, and Office Gateway

- What device we use?
 - Microwave connection
 - Fiber Optics for Inter-Building
 - Leased line cables
 - Mikrotik Wireless (combined with Bonding)
 - Mikrotik Dual Nstreme (for main-backhaul)
- 80% of our backhaul is using MikroTik
- Bonding used to merge 4E1 Microwave Link (rather than using E1-mux)
- Redundant link for all the BTS (different frequency), create a ring topology with fail-over and (for some links) round-robin load balancing

- Load balancing
- OSPF failover

@192.168.100.193 (POP_Klampis) - WinBox v2.9.8

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Interface List

Name	Type	MTU	Tx Rate	Rx Rate
R 1_hyatt	Ethernet	1500	537.0 kbps	768.0 kbps
R 2_sda-ibm	Ethernet	1500	0 bps	260.2 kbps
R 3_wavelan_ras	Ethernet	1500	769.9 kbps	283.6 kbps
R vlan3-ras	VLAN	1500	24.0 kbps	396 bps
R vlan4-cor	VLAN	1500	474.8 kbps	226.3 kbps
R vlan5-metrofm	VLAN	1500	271.0 kbps	31.2 kbps
R vlan6-MGRJ	VLAN	1500	0 bps	0 bps

OSPF

Interfaces Networks Areas Virtual Links Neighbors

Router ID	Address	State	State Cha...
192.168.100.90	192.168.100.90	2-Way	0
192.168.100.204	192.168.100.204	Full	11
192.168.100.236	192.168.100.108	Full	4
202.148.11.248	192.168.100.89	Full	8

@192.168.100.193 (POP_Klampis) - WinBox v2.9.8

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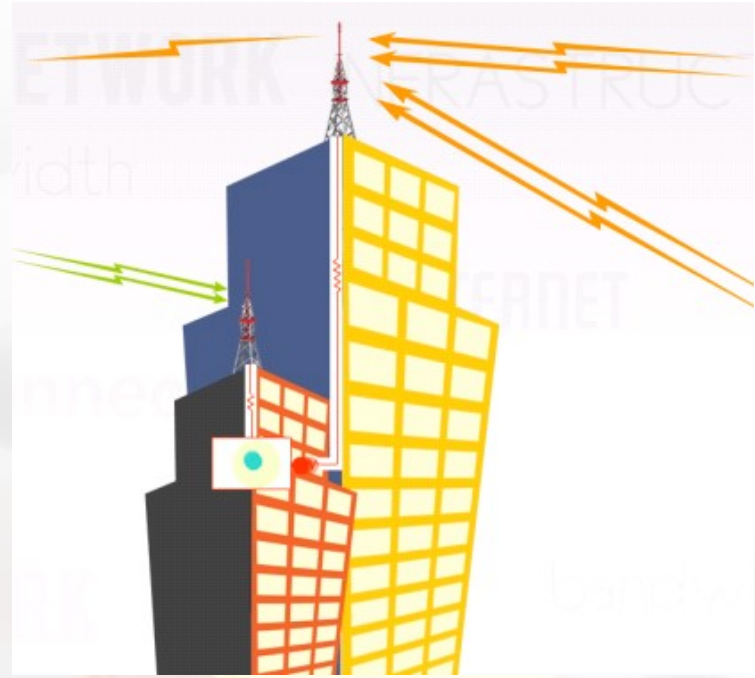
Interface List

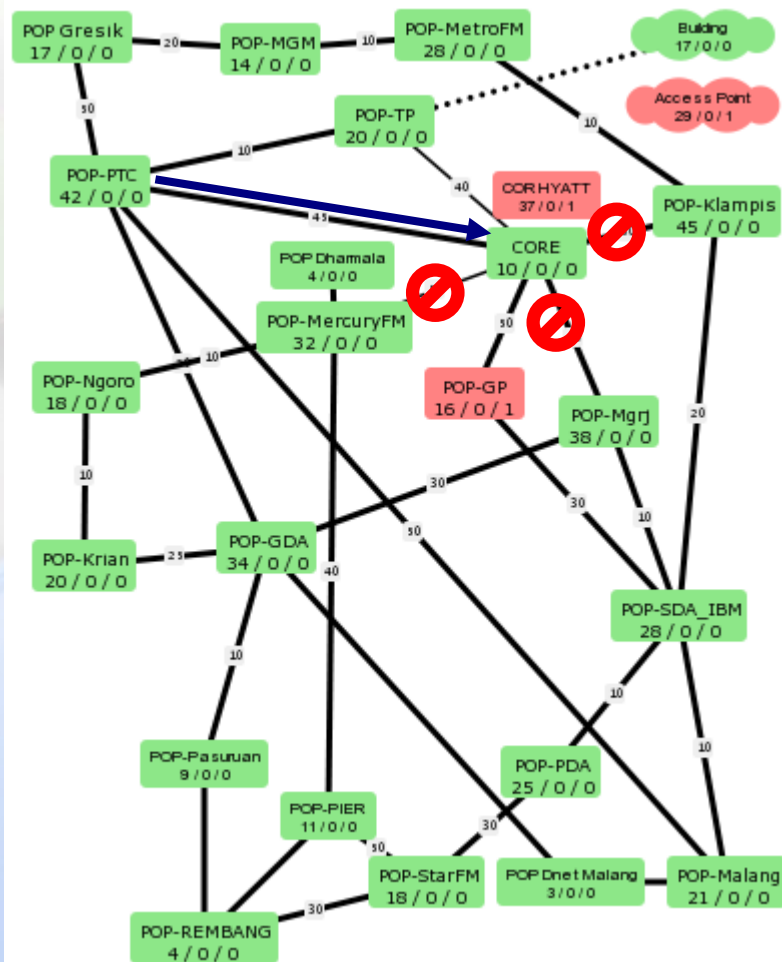
Name	Type	MTU	Tx Rate	Rx Rate
R 1_hyatt	Ethernet	1500	0 bps	0 bps
R 2_sda-ibm	Ethernet	1500	401.1 kbps	795.7 kbps
R 3_wavelan_ras	Ethernet	1500	807.1 kbps	434.5 kbps
R vlan3-ras	VLAN	1500	62.9 kbps	7.6 kbps
R vlan4-cor	VLAN	1500	695.8 kbps	401.0 kbps
R vlan5-metrofm	VLAN	1500	48.3 kbps	0 bps

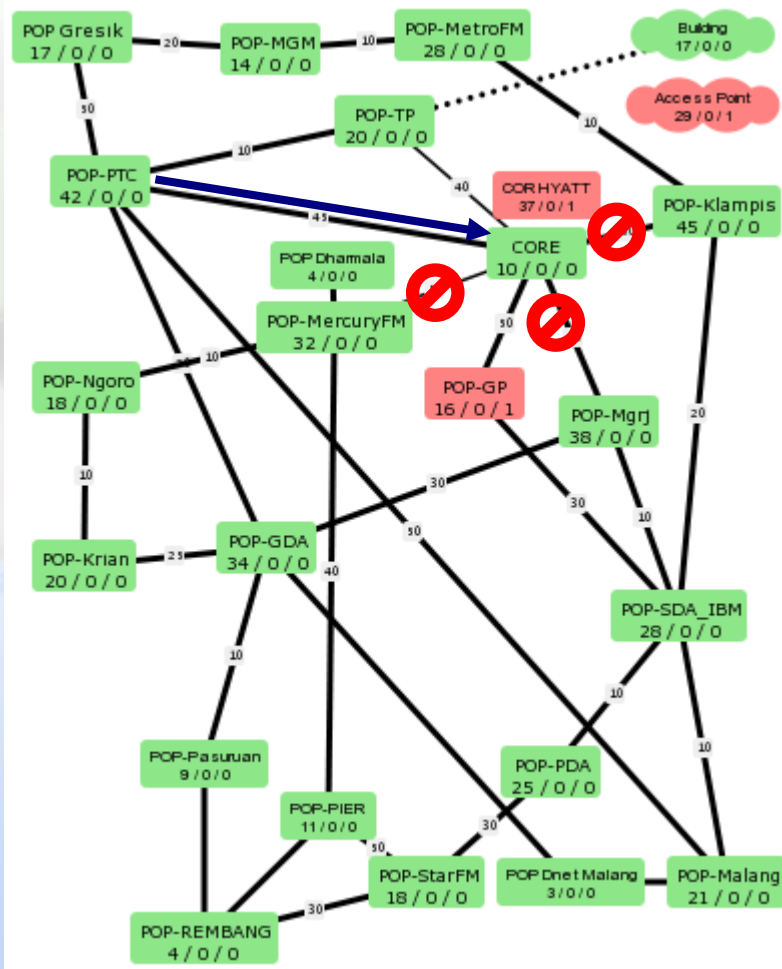
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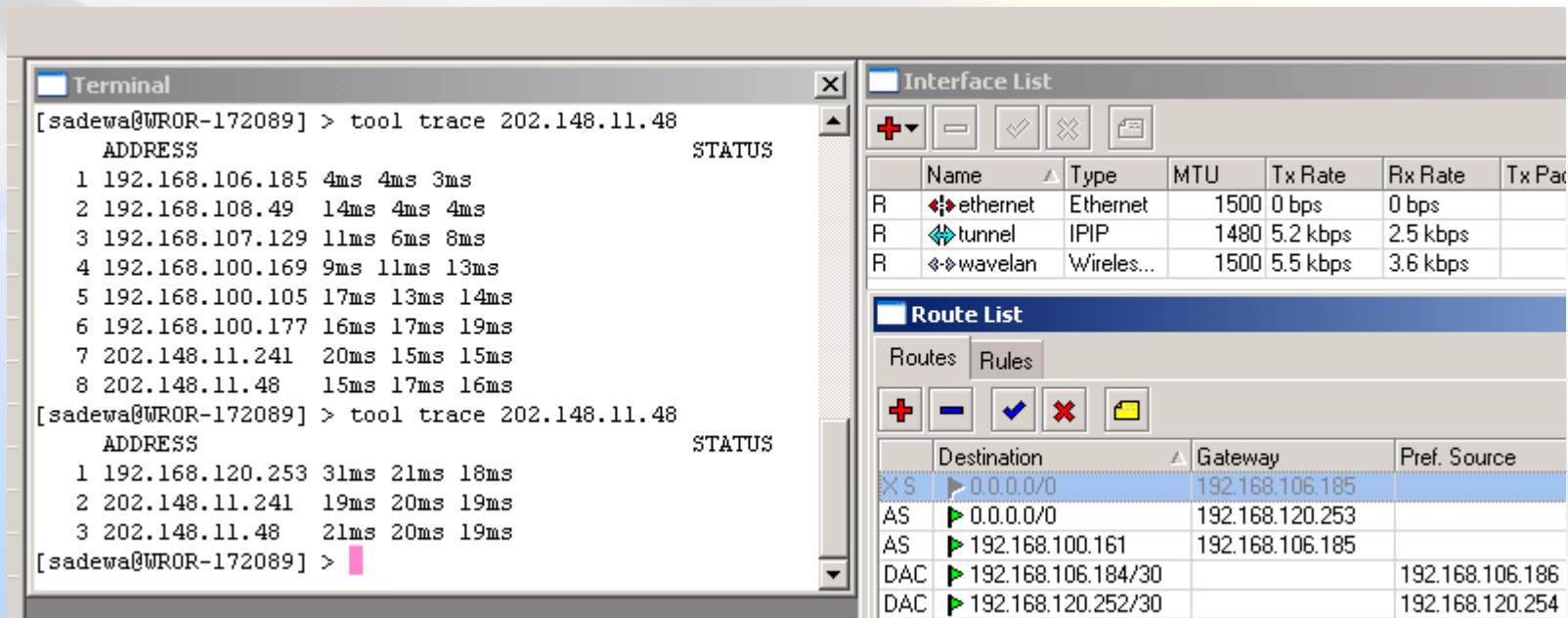






- Background
 - Customers compared the hops with competitors
 - Hops usually assumed as link quality (more hop is assumed more latency)
 - Local networks is opened to access
- Use IPIP
 - Compatible with cisco
 - No username/password needed
 - No need any encryption and compression

- Reduce hops
- Use no longer see our local backbone IP
- No loops occurred when client disconnected



The screenshot shows a network configuration interface with three main panels:

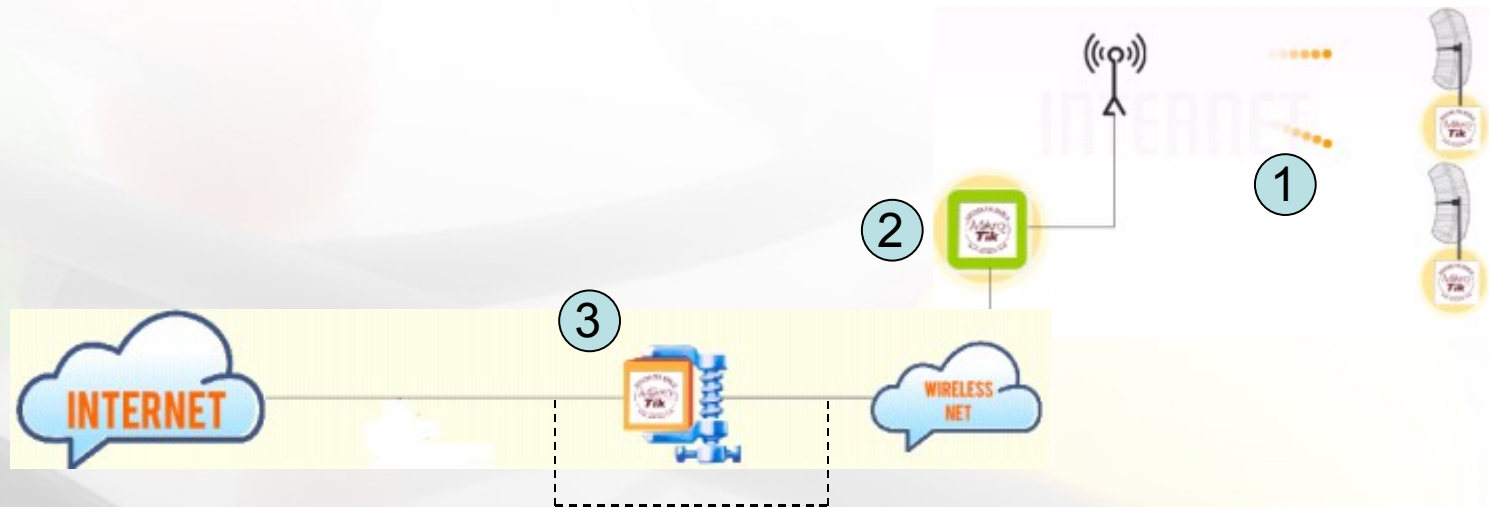
- Terminal:** Displays two traceroute commands and their results.


```
[sadewa@WROR-172089] > tool trace 202.148.11.48
ADDRESS                                STATUS
1 192.168.106.185 4ms 4ms 3ms
2 192.168.108.49 14ms 4ms 4ms
3 192.168.107.129 11ms 6ms 8ms
4 192.168.100.169 9ms 11ms 13ms
5 192.168.100.105 17ms 13ms 14ms
6 192.168.100.177 16ms 17ms 19ms
7 202.148.11.241 20ms 15ms 15ms
8 202.148.11.48 15ms 17ms 16ms
[sadewa@WROR-172089] > tool trace 202.148.11.48
ADDRESS                                STATUS
1 192.168.120.253 31ms 21ms 18ms
2 202.148.11.241 19ms 20ms 19ms
3 202.148.11.48 21ms 20ms 19ms
[sadewa@WROR-172089] >
```
- Interface List:** Shows a table of network interfaces.

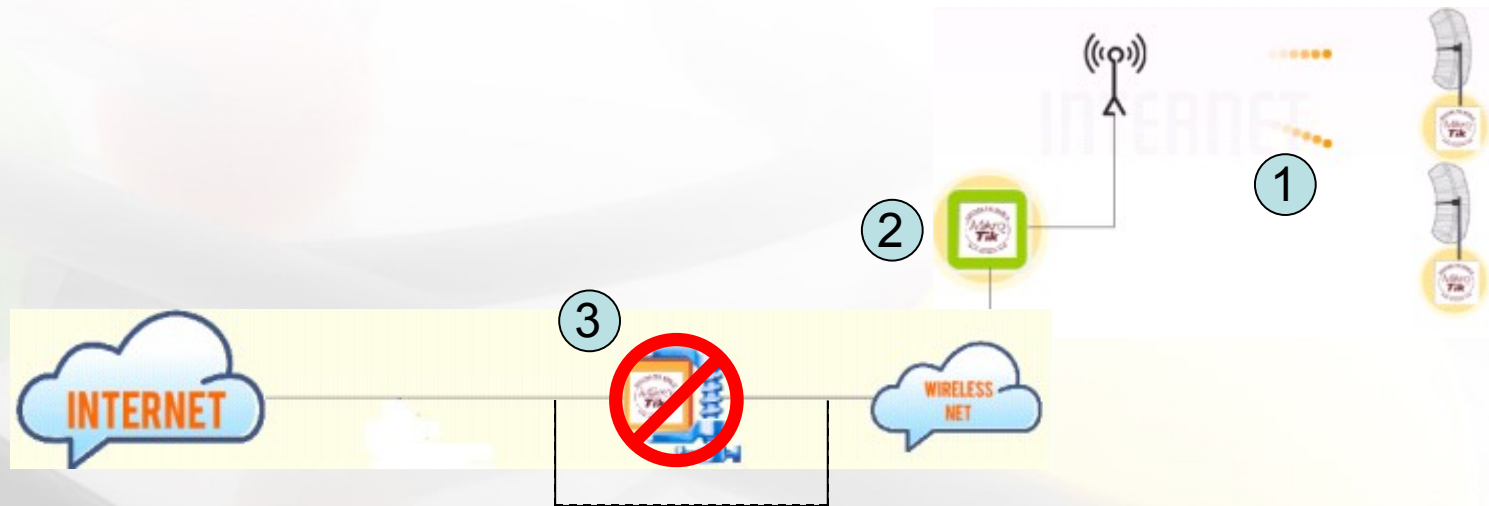
Name	Type	MTU	Tx Rate	Rx Rate	Tx Pac
ethernet	Ethernet	1500	0 bps	0 bps	
tunnel	IPIP	1480	5.2 kbps	2.5 kbps	
wavelan	Wireles...	1500	5.5 kbps	3.6 kbps	
- Route List:** Shows a table of routes.

Destination	Gateway	Pref. Source
0.0.0.0/0	192.168.106.185	
AS 0.0.0.0/0	192.168.120.253	
AS 192.168.100.161	192.168.106.185	
DAC 192.168.106.184/30		192.168.106.186
DAC 192.168.120.252/30		192.168.120.254

- Improve Quality-of-Service
- Use HTB with our own burstable system
 - Groups some same customers with burstable and let them compete each others
- Real-time monitoring
- Graphing and traffic recording
- Other Queue implementation
 - We even use PCQ to detect and limit the session of flooding attack



- Implement 3 layer bandwidth protection
 - CPE bandwidth limiter
 - BTS bandwidth limiter
 - CORE bandwidth limiter

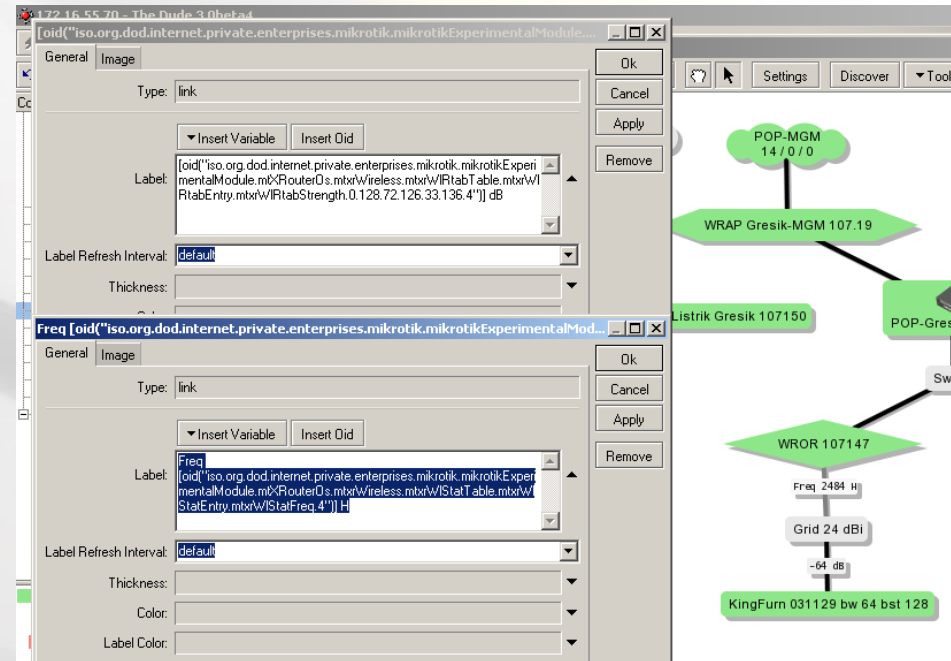
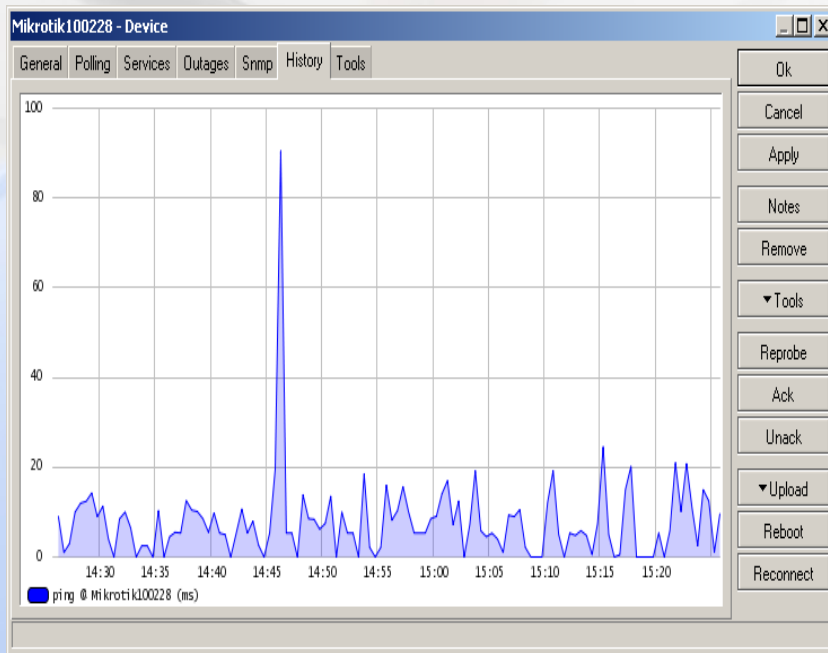
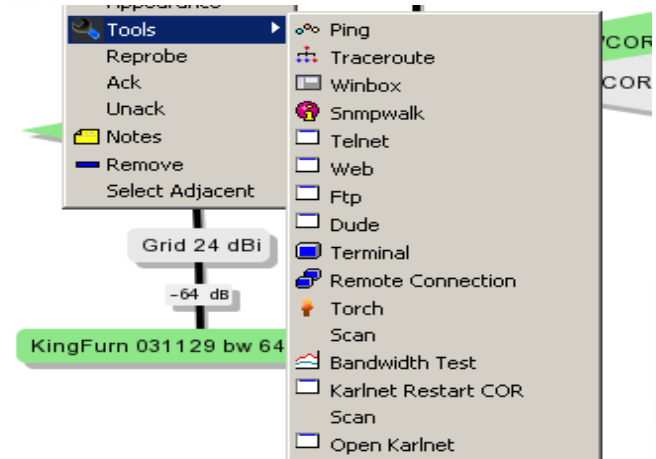


- Spanning-tree Failover
- Will it makes the traffic unlimited?

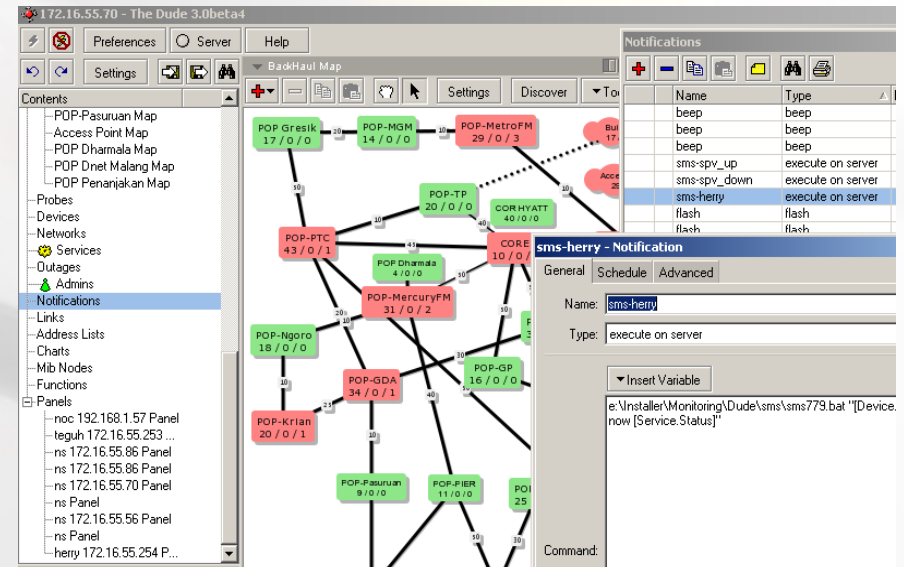
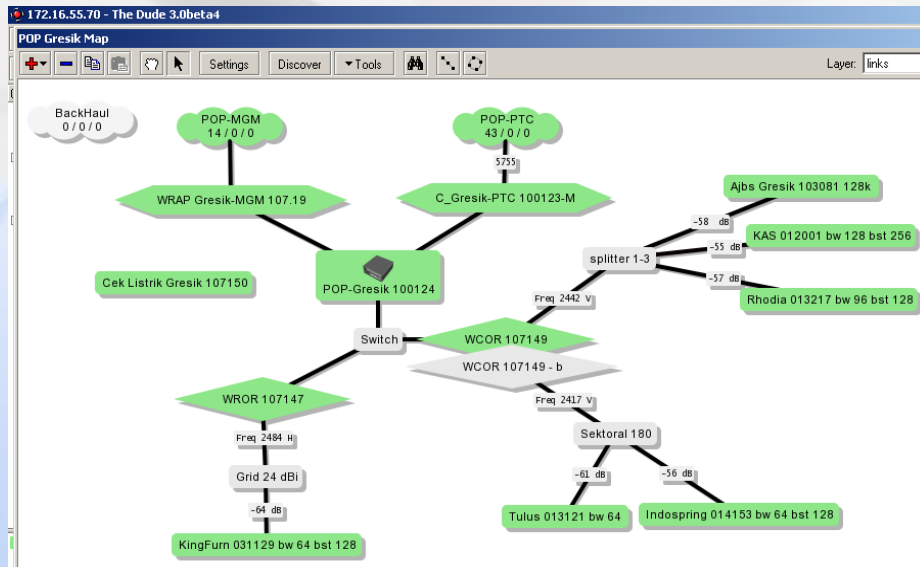
- We support the Hotspot infrastructure for D~Net Surabaya (one of our sister company)
- Cover 2 biggest Shopping Mall in Surabaya, one Government Area, several schools, and many Internet Café
- Use MikroTik for Hotspot Management
 - use FreeRadius for commercial users and IAS Server for our internal staff with different domain used
- MikroTik for Access Points
 - Can avoid other DHCP servers to harm the network by blocking it from connecting

- Configuration
 - Fast backup and restore
 - We use SSH and FTP to backup and store the configuration on our server daily
 - Save the *.backup and *.rsc files.
- Hardware backup-unit
 - Always have enough stand-by-unit
 - We always prepared as if one BTS is going to be down

- Why Dude?
 - Easy to use
 - The graphing (traffic, latency, etc)
 - SNMP for the signal, etc
 - Customizable (with several program)
 - FREE... 😊



- Real-time Signal and frequency monitoring
 - Using SNMP for grab the OID
 - Get real-time communication
- SMS alert (with additional devices)



- Powerful and feature-rich Wireless AP and CPE
 - Limit the wireless traffic and easy monitoring suspicious traffic
 - Scalable with many options of Wireless Cards
 - Tunneling client support for CPE
 - Secure wireless mechanism
- Full support for Dynamic Routing (OSPF and BGP)
- Support many tunneling mechanism
- Scalable and easy monitoring of Queue techniques
- Complete monitoring tools
- Powerful firewall
- Neighbor and MAC Connection features
- And many more.....



Thank You

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