MUM USA 2007
Tips and Tricks

Deploying and Managing a Wireless ISP with limited resources

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Starting Up

- Starting up a Wireless Internet Service Provider can be both challenging and costly
  - Equipment costs can run into tens or hundreds of thousands of dollars
  - Deployment will often be in difficult areas under challenging conditions

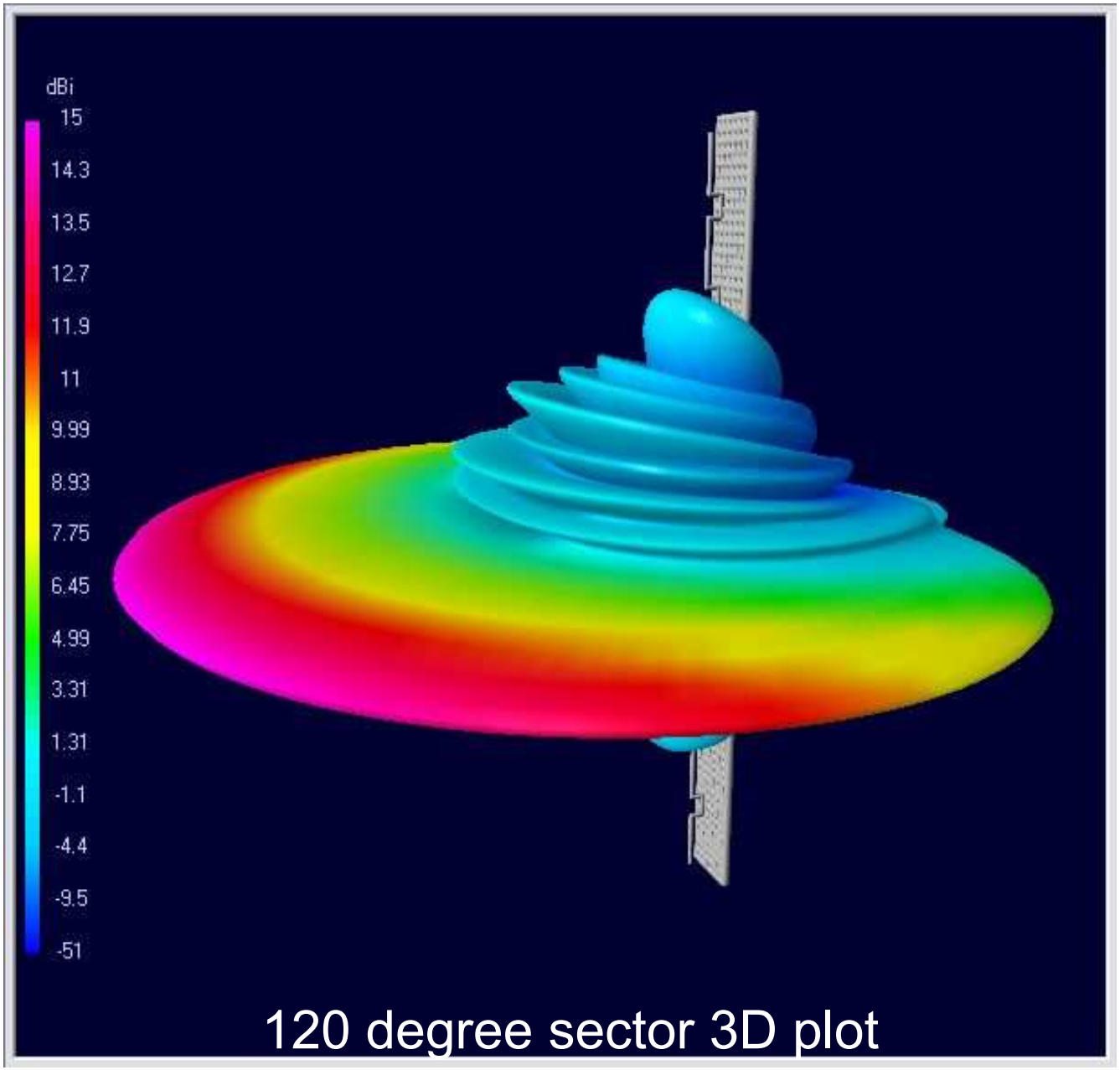
Challenges facing the average WISP

- Locating decent highsites
- Cost of equipment
- Installing and maintaining equipment
- Finding available spectrum
- Managing users and billing

Highsite location

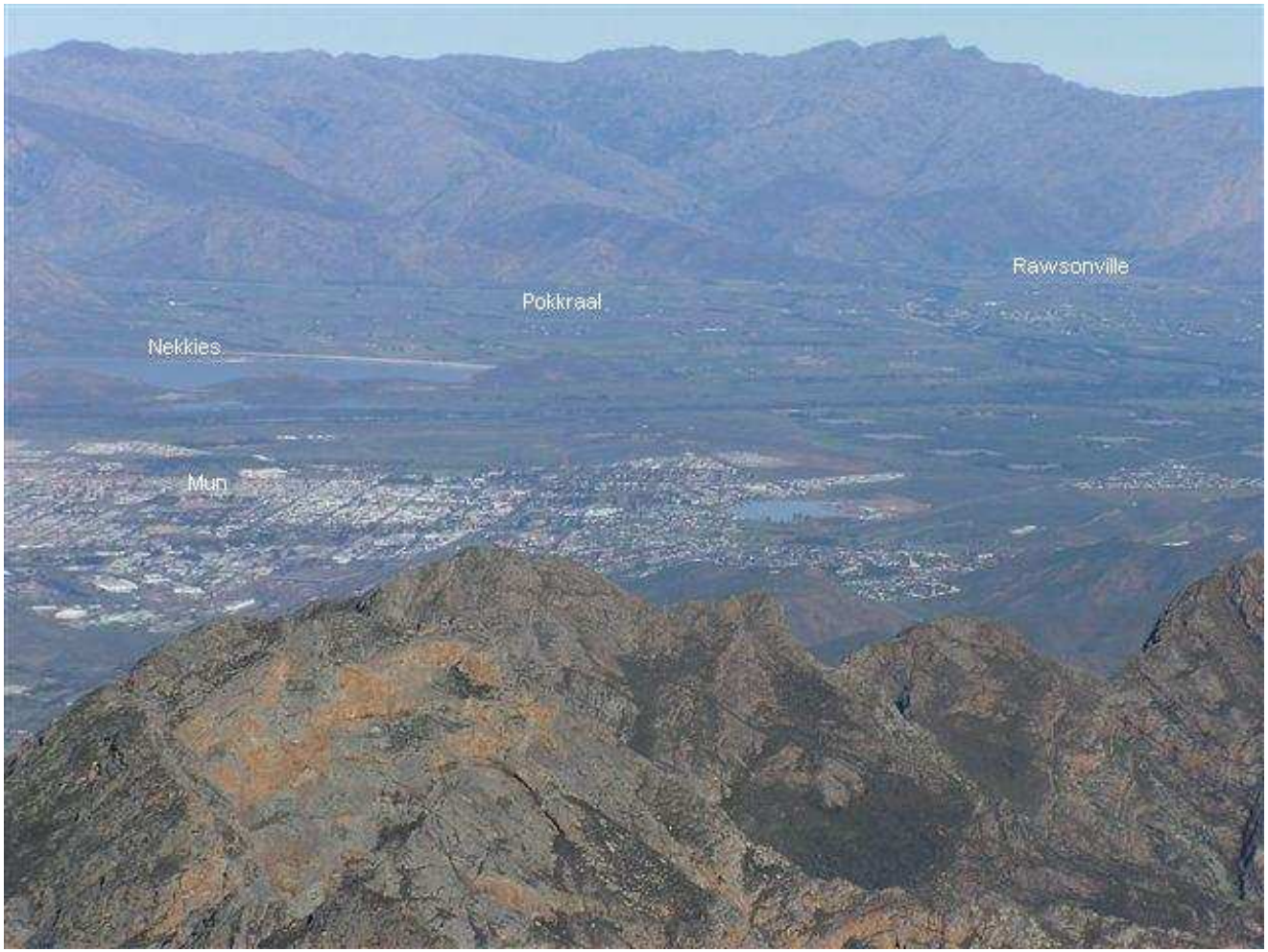
- Is higher always better?
  - Height is good for long distance PTP or ‘backhaul” links
  - This is not always true for PTMP or client side links – sector antenna’s have between 3 and 14 degrees vertical coverage
  - The best coverage in the horizontal plane should be the aim

Antenna output plots



120 degree sector 3D plot

The challenges facing WISPS



Difficult Access



Extreme Weather

Other Operators

Choosing your hardware

- Highly dependant on current and future client requirements
- Routerboard 532 is a great low cost solution for highsites handling around 20 clients
- For 20 - 50 clients consider the newer RB 300 series
- For 50+ clients consider using multiple RB532 (1 per sector) or consider the imminent RB600 series

Why not use PC based hardware?

- More costly
- Higher maintenance
- Too many moving parts
- No significant advantage when compared to the latest Routerboard hardware

Highsite Hardware

- DO use a IP65 rated metal enclosure with STP cable and sinewave PSU
- DON’T use plastic with switch mode power supply unless you enjoy have 2-way radio operators take an axe to your equipment!
- DO use multiple sector antenna’s to distribute the signal
- DON’T use omni-directional antenna’s on highsites unless you enjoy other WISP operators taking an axe to your equipment…

Remote Sites

- Consider alternate power sources in remote locations
- Wind and solar power are both valid alternate sources of power

Setting up the highsite - software

- Several factors are involved in setting up the RouterOS software
- The authentication that clients will use will determine how complex setup will be
  - The WISP standard is to use PPPOE for client authentication for easy management and tracking.
  - PPPOE also makes the most efficient use of IP addresses
  - Manual IP addressing can also be used – this will be easier to setup but less secure and manageable in the long run

Setting up the highsite - software

- Your IP addressing scheme will depend on how many sectors you have along with your backhaul and routing strategy
- DHCP can be used to assign IP addresses for both manual addressing and PPPOE
- Larger networks can use RADIUS to authenticate PPPOE clients and assign IP addresses
- Consider Mikrotik Usermanager as an easy to setup and configure RADIUS solution

Highsite Software Setup

- DO spend some time planning your IP and routing setup – get an expert to do it for you if necessary
- DON’T choose a random highsite IP layout – you will just have to redo it sometime in the future

Routing considerations

- Small networks can use static routing with careful IP planning
- Larger networks should consider OSPF for dynamic routing and failover
- Multihomed networks can employ both OSPF internal and BGP at the edge to distribute routes

Security 1/2

- Several methods are available to protect your investment
- Use wireless access lists to stop unauthorized users connecting to the highsite
- Considering using WPA to encrypt communication – this will place extra CPU load on the system
- Use PPPOE with MSCHAPv2 to encrypt username and password setting

Security 2/2

- Use firewall address lists to drop all outgoing traffic not listed as a registered client
- Use separate NAT rules per client as additional security
- Log attempts to access the internet from any clients not in your NAT list
- Static ARP or Reply-only can enhance security
- HotSpot can be used where you require clients to enter a username and password for internet access

Wireless

- Wireless setup depends on client side equipment
- Use technology like Nstreme if all clients run Mikrotik to more efficiently manage data transfer and also enhance security
- Disable Default Authenticate and Default Forward
- Use 6 channel spacing on 2.4Ghz for multiple sector layouts. Even better use 5.8Ghz for clients
- Use 5.8 Ghz on backhaul point to point links
- Use the Regulatory Domain feature of Mikrotik to keep within legal power limits

Backhaul

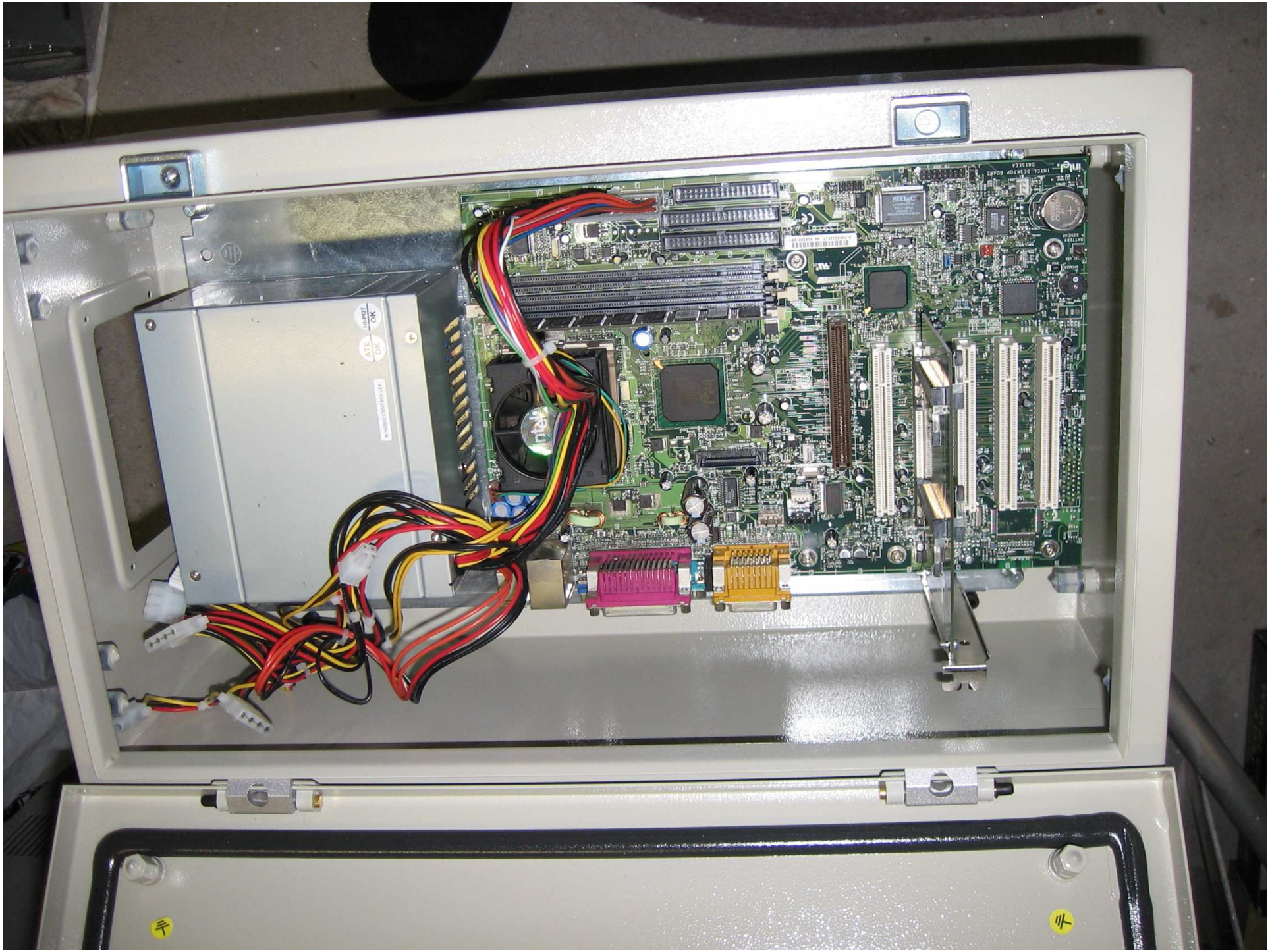
- The backhaul link will carry all the traffic for your clients
- Trying to save money on your backhaul is not a good idea
- Use 5.8Ghz only to ensure a solid link
- Use ptp addressing and good security between backhaul links
- Consider active routing technology such as OSPF to maintain redundancy and load balancing on your network

Backhaul

- DON’T use /30 addressing unless combined with additional security – it is very easy to hack
- DO use multiple paths for redundancy on the network

Client Hardware

- Use MikroTik as your CPE solution – pricing is comparable to other units and offers far more power
- Many suppliers offer low cost intergrated CPE's based around Mikrotk
- Use local resources for building and assembling CPE's if you don't have local suppliers

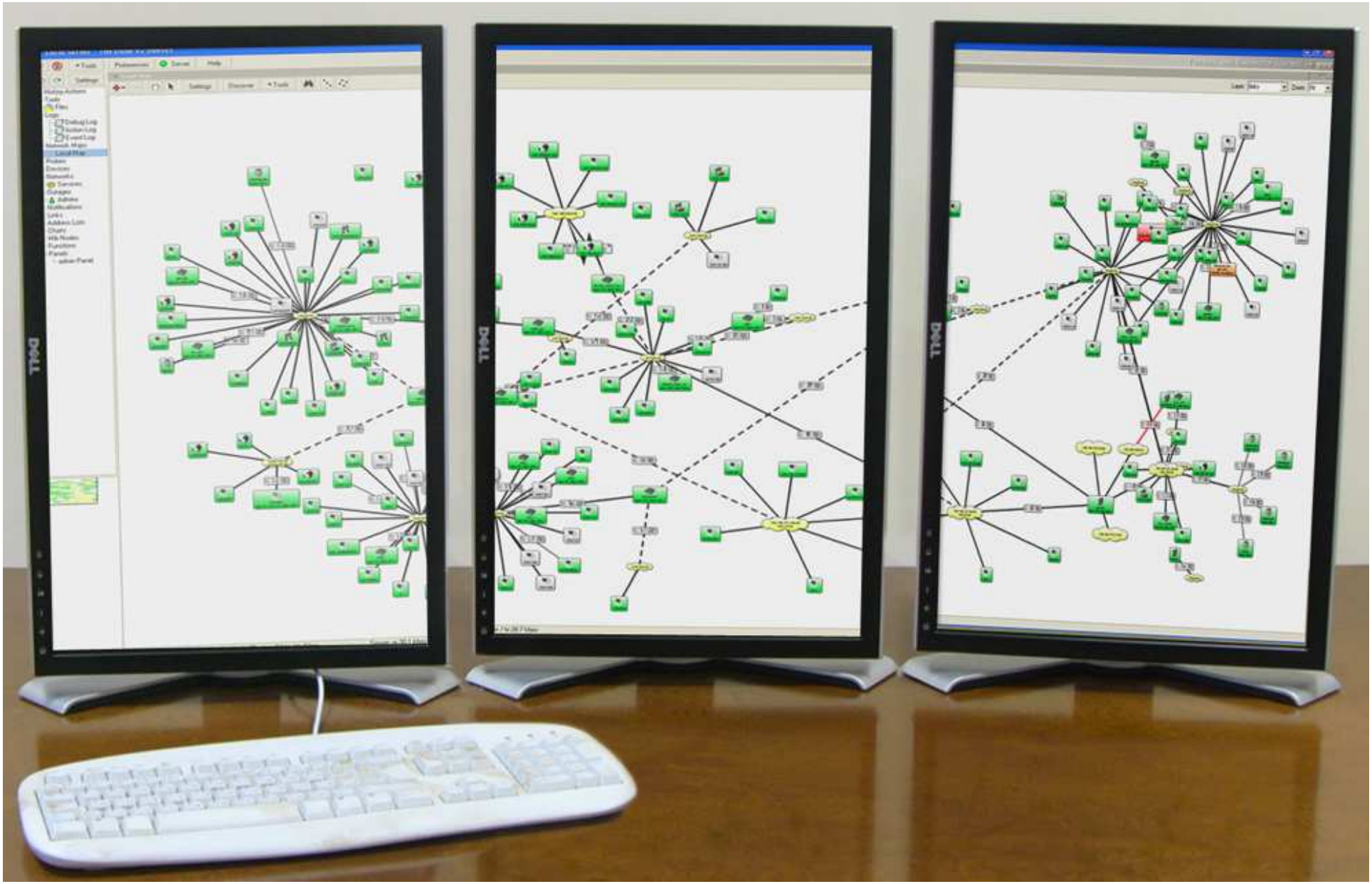


Tracking the Client

- User Manager is a low cost RADIUS server that can be installed on a router
- It allows client authentication for HotSpot, PPPOE and PPTP
- It allows accurate tracking of all data transferred by the client
- It allows bandwidth limitation via the RADIUS system
- It offers easy use and configuration via a web interface

Monitoring the Network

- The DUDE is a very low cost (free) utility to manage and monitor the network
- Even though it is free it offers very powerful features


DELL
DELL
DELL

More enhancements

- Mikrotik transparent proxy is a great way to save bandwidth with no additional cost and minimal configuration
- Consider other Open Source projects to enhance your network even further
  - Squid Proxy can be combined with Mikrotik proxy to further enhance performance
  - Cacti provides an Open Source MRTG graphing system

console graphs settings

Graphs -> Tree Mode

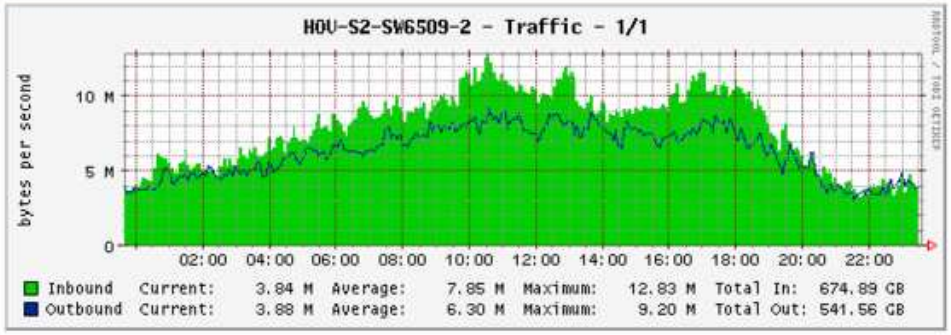
Logged in as **admin** (Logout)

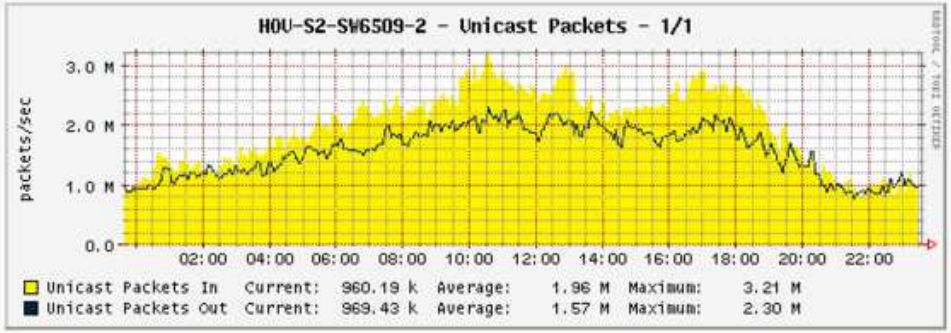
- Arlington, MA
- Charlotte, NC
- Charlottesville, VA
- Columbus, GA
- Dallas, TX
  - Switches
    - **Host:** HOU-S2-SW3548-1
    - **Host:** HOU-S2-SW6509-2
  - Data Center Core
    - **Host:** HOU-A4-ATM-1
    - **Host:** HOU-A4-ATM-2
    - **Host:** HOU-A4-ATM-3
    - **Host:** HOU-A4-ATM-4
- Dayton, OH
- Detroit, MI
- Harrisburg, PA
  - Web Hosting Farm
    - **Host:** HAR-CUST-WWW0
    - **Host:** HAR-CUST-WWW1
    - **Host:** HAR-CUST-WWW2
    - **Host:** HAR-CUST-WWW3
    - **Host:** HAR-CUST-WWW4
    - **Host:** HAR-CUST-WWW5
- Houston, TX
- Miami, FL
  - Public Peering
    - **Host:** MIA-R8-C7200-3
- Phoenix, AZ
- Salt Lake City, UT
- San Diego, CA
- San Francisco, CA
- Santa Fe, NM
- Syracuse, NY
- Tampa, FL
- Trenton, NJ

Tree: Dallas, TX-> **Host:** HOU-S2-SW6509-2

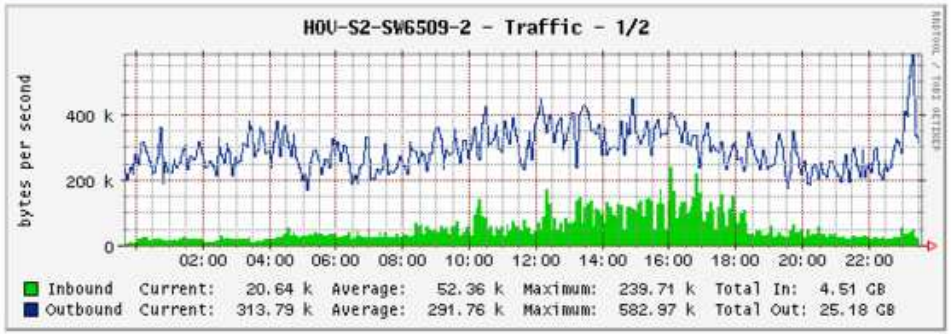
Data Query: SNMP - Interface Statistics

Port 1/1





Port 1/2



Done

Questions?

- Mikrotik support in South Africa
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- Mikrotik Global
  http://www.mikrotik.com