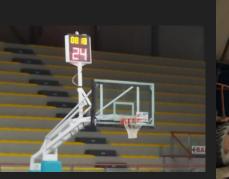
Adventures into Regional WISP

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About me

- Network engineer at Fastnet Spa since 2003
- Born in Mexico and living in Italy for 20+ years
- Previously worked for Telecoms in Mexico and Canada
- Enjoy to participate on projects related to Network Technologies and Open Source
- On ITNOG3 talked about Syslog Analysis
- As Hobbies I play Basketball and follow my kids on their sports activities







About Fastnet AS8265



- Fastnet Spa is Service Provider from Marche Region since 1995
- From last year, we are part of Fiberwide group of companies
- Network backbone with 100Gbps links to Rome and Milan
- Provider of cloud, colocation and backup services
- Managed Service Provider for different types of networking technologies and data centers

About the WISP project WIMARCHE

Disclaimer: The content of this presentation is based on my experiences and opinions. NOT my employers or other organizations involved.

- <u>http://wimarche.it</u> project promoted by all Province offices from Marche Region
- Project stared back in 2009 to provide Fixed Wireless connectivity to areas without Broadband Internet
- The network was deployed using public funds. The Province officers used a contest procedure for the contract assignment to build and manage the network.
- Fastnet participated as part of a group of 5 companies divided by Province
- The contest was awarded in 2011 but operations started in 2013 due to lawsuit from incumbent ISP
- There were 3 tasks assigned to Fastnet: Provide a Configuration plan, Manage Ancona Province Network sites and host the Network Monitoring Systems at our data centers.
- Ancona Network is near 50 sites, The entire network 200+ sites

Starting point for us

Site planning and system integration was already done by an external company.

Time consuming tasks were done: site surveys, permits, power supply contracts, site hosting agreements, and initial installation.

The site equipments consistent per site:

- 1 router
- 3 to 5 access point radios 5GHz
- 1 to 5 point point radios 5Ghz or 17GHz
- Batteries
- Power unit
- Power injectors
- Remote power control device



First Steps - Network design

- MPLS VPLS Overlay network for service delivery
- Naming convention for devices
- Single SSID for access
- SSID's for point to point links
- Addressing blocks per province with numbering per site ID
- OSPF/LDP multi-area (every Province 1 area)
- Every site has a /24 routed an /32 loopback for VPLS tunnels
- Backbone area at NOC, fiber links and license bands between provinces

First Steps - Network Configurations

- Network configured remote using MAC-Telnet to hop device by device
- Bridge multicast on point to point links to allow OSPF
- 2 redundant VPLS per site per provider
- Every provider has a VLAN assigned that is used on the CPE to send traffic over the SSID
- On the connected site the vlan is part of a provider bridge along with the corresponding VPLS
- The VPLS is terminated at the datacenter where the traffic is sent to providers access router in local or remote dedicated interfaces.

First Steps - Network monitoring

Noc systems at data center as part of OSP area 0

Noc systems deployment on redundant Debian Linux:

- Zabbix server for monitor
- Syslog servers
- DNS servers
- NTP servers
- Backup configs
- Authentication access with RADIUS+openLDAP

Network management and challenges

- The management of the network with a VPLS overlay provided stability and simplified the troubleshooting of point to point links.
- At that time of deployment, it was chosen MPLS for better switching speeds. As of today a similar solution would be BGP+VXLAN.
- Another advantage of the overlay network is the high security level of management infrastructure as not being exposed.
- During the last few years dealt with many ISSUES not related to networking

Power issues

- Battery lifetime
 - Battery replacements necessary every 2-3 years
- Site with solar panel power
 - Outages during winter season on low sunlight or snow
- Fuse and power injector failures
 - Electric supply instability





Site Access issues

Stressful issues due to inability to access sites for maintenance

- Municipality sites (limited working hours)
- Water towers (stringent requirements for safety)
- Cemeteries (Equipment access complicated, Bring Your Own Ladder)
- TV and RADIO towers (Access limited to few technicians)

Site Access Document requirements

Site access is complex, some organizations require some or all of this documents:

- DURC (Certificate of social security contributions)
- Chamber of commerce certificate
- Certificate of skills needed to perform the activities, article 47 DPR 445/2000;
- List of materials and tools
- Risk assessment document
- Safety training certificate
- Certificate of skills to work at high altitude
- Operating procedures of activities to be performed at site

Wireless Issues

- Replacement of 17 GHz free band links by frequency reassignments by AGCOM
- Imminent tear down of 24GHz free band links
- High frequency link degradation in events of heavy rain
- High saturation of 5GHz free band
- Remain as an alternative, the high cost license band or 6 Ghz if fully approved for outside usage

Strange Troubleshooting Outages

- Wind power
- Missing devices
- Cable cuts
- Ethernet Links flapping due to radio FM
- Fire by:
 - short circuit
 - caused by unknown
- Cable damaged by birds
- Insect nests inside racks
- Lightning





Alternative networks

- Increasing coverage of fiber access
- 5G tower installations (increasing complaints from citizens)
- Low-orbit satellites (lower cost, broadband bandwidth but to consider high jitter and delay)
- Alternative wireless service providers



Wimarche Use cases

- Currently the best use case is redundant Internet access to companies already connected in (FTTx/xDSL + FWA)
- FWA to rural areas where there are no alternatives
- Possibility to enable LORA Networks
- Backhaul public wifi where no broadband available

Conclusions

- Building and maintaining Wimarche has been an important investment in time and resources for the last 14 years. Most of the issues encountered are not related network engineering, but environment/procedural.
- The network requires technology upgrades and increase the number of use cases.
 6GHz free band for outside usage if approved would below

6GHz free band for outside usage, if approved would help greatly!

- Wimarche could be used by public offices to help develop economies of towns not covered by any other broadband. Enable small businesses, public libraries, museums, offices, ecc.
- Wimarche is also an alternative network that can be used for redundant access in the Marche region.





Thank you !

For any additional questions, please send me an e-mail at: o.melendres@fastnet.it