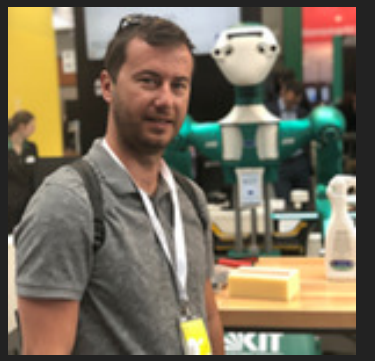

MUM
Budapest
31.May.2019
MikroTik
Industrial environment network

HELLO!

I'm Aldo Frashëri



- 2012 – Informatic Engineering Diploma
- 2004 – Founded my own ISP
- 2019 – MTCNA, MTCRE, MTCWE
- Experience in small to mid size wired and wireless networks, FTTH installations (GPON, EPON etc.

Projects

MOBILE VPN

15 ottobre 2004

Locomotore senza guida per 100 Km. Due inchieste.

Sembrava la scena di un film, ma era tutto reale. Un locomotore senza guida, ad una velocita' media di 70 chilometri orari ma con punte di circa 100 km/h in alcuni punti in leggera pendenza) ha percorso oltre cento chilometri prima di finire la sua corsa in un binario morto nella piccola stazione di Rutino, in provincia di Salerno...

Tutto ha inizio dopo le 7 di stamattina, quando Franco Siciliano, 48 anni, di Paola (Cosenza), macchinista dipendente di una ditta campana che si occupa della manutenzione di convogli ferroviari, la "Ventura", in servizio alla stazione di Longobardi (Cs), probabilmente in seguito ad un malore cade dalla motrice, forse azione la leva di partenza, tenta di risalire a bordo del mezzo ma non ci riesce. Il locomotore comincia lentamente la sua corsa, mentre Siciliano viene soccorso e trasportato in ospedale a Paola, dove viene ricoverato, con una prognosi di 15 giorni, per trauma cranico, contusion ed escoriazioni in diverse parti del corpo.

Scattato l'allarme, la societa' Rfi ha azionato il sistema di emergenza, bloccando o deviando i treni percorrenza sul tragitto del locomotore, che lentamente prende velocita', per controllare la situazio Nella stazione di Marina di Maratea, in Basilicata, viene effettuato un primo tentativo di fermare corsa del mezzo, ma fallisce. Tutto, quindi, si sposta a Rutino, dove, dove si prevede di sfruttare binario morto in salita, per rallentare il locomotore, Cosi' avviene, con il deragliamento del mezzo di quello che per alcune ore e' stato un vero e proprio incubo.

...ns, intervenuto in merito alla vicenda, ha chiesto che si faccia luce immediatamen ...oteva diventare una strage, ma sul fatto sono state gia' aperte due inchieste. La p della societa' Rfi e l'altra della procura della Repubblica di Paola.

line)

OmniTIK5

3G TIM Usb Key

SIEMENS PLC

- 2015 - Container Terminal Installation

Industrial environments have specific requirements for the equipment to be used and its reliability.

1.
Customer needs

What was requested

Specific needs

The client is a company that has:

- Field container storage and movement
- A covered warehouse
- Chrome field storage

8


Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length: 433.32 Meters
Ground Length: 433.32
Heading: 151.27 degrees
Mouse Navigation
Save
Clear
© 2018 Google
Image © 2019 DigitalGlobe
2002
Imagery Date: 3/31/2019 41°20'42.43" N 19°27'01.44" E elev -9 ft eye alt 1648 ft
Google Earth

Specific needs

- Surveillance System for all areas
- Wireless Coverage for Employees
- Phone Communication between different points (work undergoing)
- Fire Alarm system for the covered warehouse

108,000 m^2

Area to be covered

Specific needs

- Containers, 35000 m^2
- A covered warehouse, 3000 m^2
- Chrome storage fields, 47000 and 23000 m^2

All of this without WIRES!!

2.
Equipment

Wireless APs, Switches, Routers, etc

Equipment

Wireless

MikroTik equipment:

- SXTsq Lite5
- mANTBox 15s
- mANTBox 15s for handheld terminals
- 60GHZ Link
- CRS112-8P-4S-IN
- CRS328-24P-4S+RM
- RB4011iGS+RM

Cables and Power

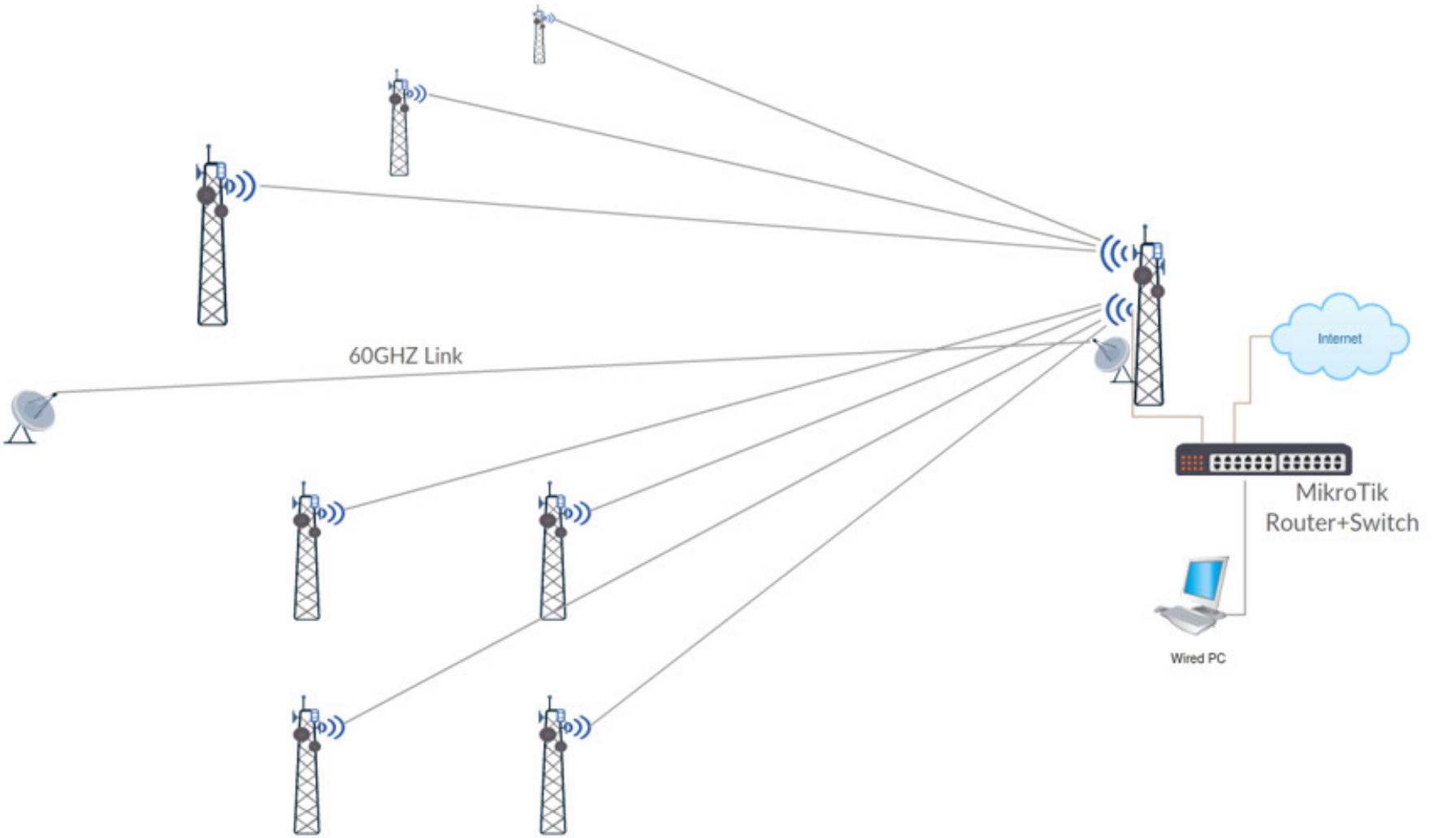
- Industrial Outdoor CAT5e
- Industrial UPS

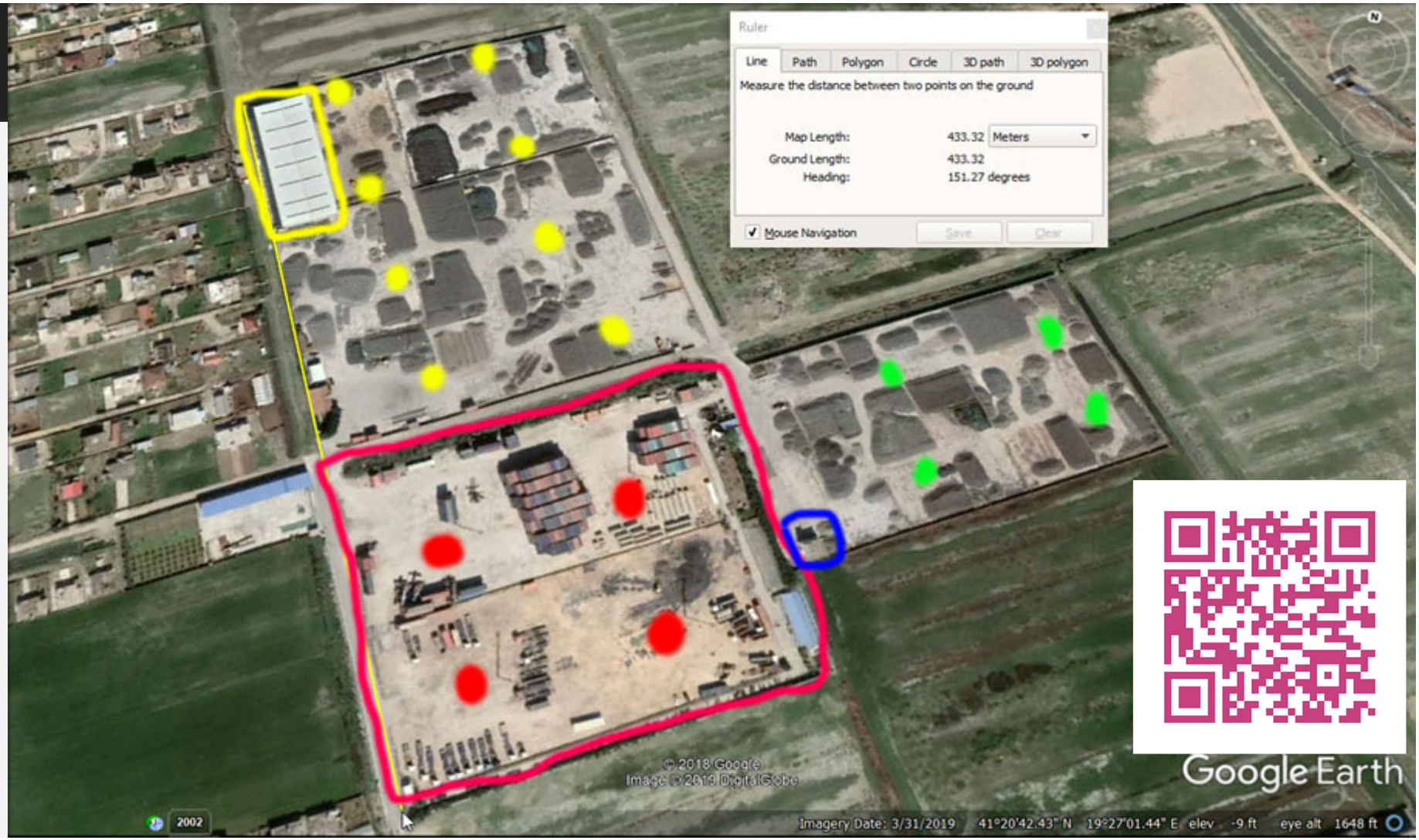
Surveillance

- HikVision 5MP IP Cameras
- Network NVR

Fire Alarm

- Siemens Fire Alarm


60GHZ Link
Internet
MikroTik
Router+Switch
Wired PC


Ruler
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151.27 degrees
Mouse Navigation
Save
Clear
© 2018 Google
Image © 2018 DigitalGlobe
2002
Imagery Date: 3/31/2019
41°20'42.43" N
19°27'01.44" E
elev
-9 ft
eye alt
1648 ft
Google Earth

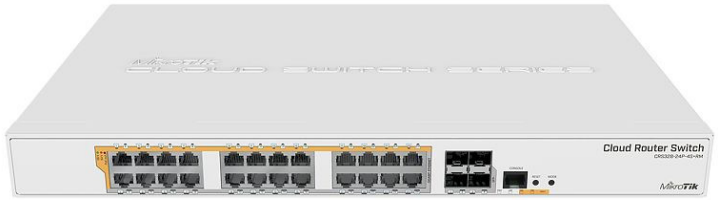

IVECO


CMA CGM
tex
tex
Touax
tex

Equipment, Main Rack

Main Rack

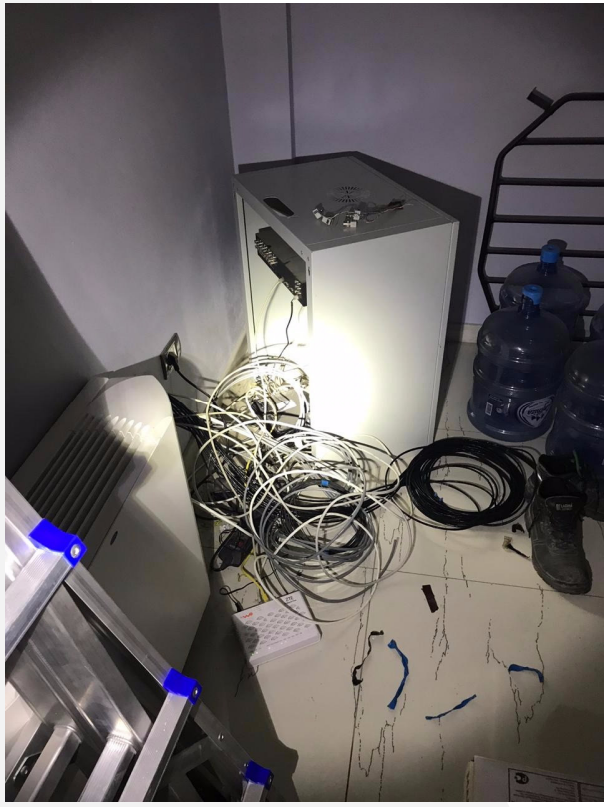
- CRS328-24P-4S+RM
- RB4011iGS+RM
- UPS



24PoE Gigabit, 4SFP+

ARM 32bit, 1.4GHZ 4 Core, 1GB Ram, 512MB NAND,
10 Gigabit Ethernet, 1 SFP+

Equipment, Main Rack



Equipment, Main Tower

Main Tower

- Wireless Wire Dish 60GHZ
- mANTBox 15s = Total 3

2 Gb/s aggregate link up to 1500m+

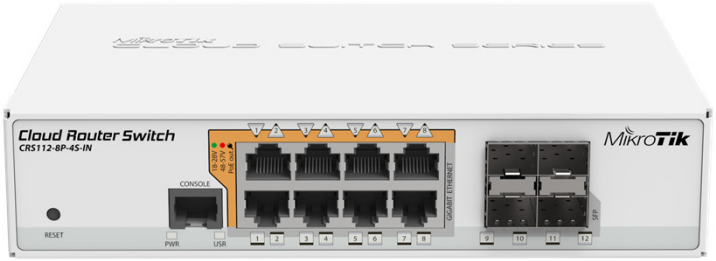
5GHz 120 degree 15dBi dual polarization sector
Integrated antenna with 720Mhz CPU, 128MB RAM, SFP

Equipment, towers

Towers, in total 17

- SXTsq Lite5, **17pcs**
- mANTBox 15s, **17pcs**
- CRS112-8P-4S-IN, **17pcs**
- 2-4 IP Cameras for each tower

Low-cost small-size 16dBi 5GHz dual chain integrated CPE/Backbone



8PoE Gigabit, 4SFP

Equipment, Warehouse

Warehouse

- Wireless Wire Dish 60GHZ, **1pc**
- mANTBox 15s **4pcs**
- CRS328-24P-4S+RM, **1pc**
- 8 IP Cameras

3. Configuration

Putting all together

Configuration

- The network was configured in Bridge mode so all the cameras could connect to the NVR in the main offices
- Sector Antennas for Staff connectivity were added to a CAPsMAN configured in the RB4011

Configuration, Very important first steps

- Upgrade all devices to latest RouterOS version
- Input Identity to them
- Create another user with admin rights and delete the default admin user
- Disable all un-needed services in IP -> Services

Configuration, APs in main Offices

- A bridge will be created that will have as ports wlan1 and ether1
- AP configuration in wireless with SSID and security profile

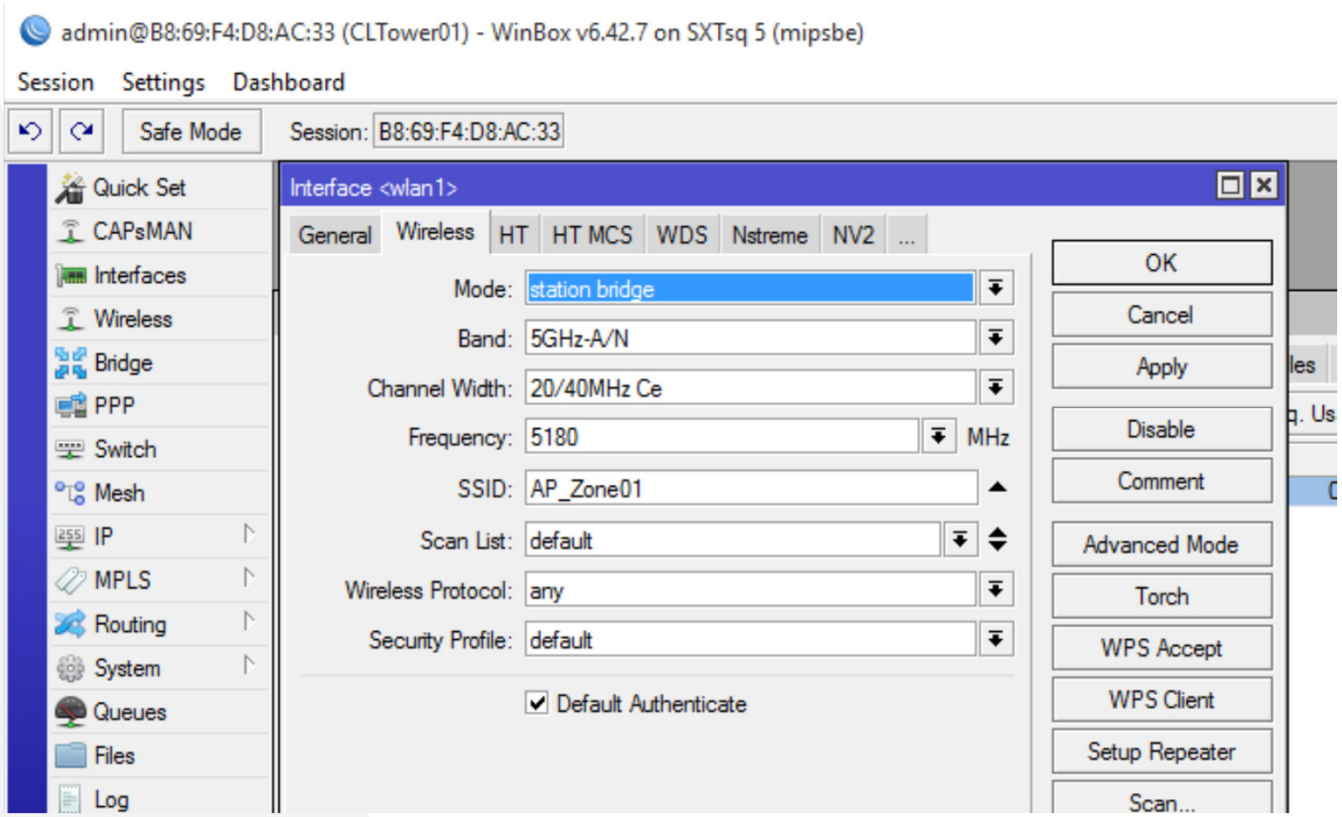
```
/interface bridge add name=bridgeMAIN
/ip address add address=192.168.1.101/24 interface=bridgeMAIN
/interface bridge port add interface=ether1 bridge=bridgeMAIN
/interface bridge port add interface=wlan1 bridge=bridgeMAIN
/interface wireless set ssid=AP_Zone01 wlan1 mode=ap-bridge
/interface wireless enable wlan1
/interface wireless security-profiles set default authentication-types=wpa2-psk
wpa2-pre-shared-key=xxxxxxxx mode=dynamic-keys
```

Configuration, PtMP clients in the towers

- The only differences are in red color

```
/interface bridge add name=bridgeMAIN
/ip address add address=192.168.1.xx/24 interface=bridgeMAIN
/interface bridge port add interface=ether1 bridge=bridgeMAIN
/interface bridge port add interface=wlan1 bridge=bridgeMAIN
/interface wireless set ssid=AP_Zone01 wlan1 mode=station-bridge
/interface wireless set wlan1 radio-name=xxxxxxx
/interface wireless enable wlan1
/interface wireless security-profiles set default authentication-types=wpa2-psk
wpa2-pre-shared-key=xxxxxxxx mode=dynamic-keys
```

Configuration, PtMP clients in the towers



Configuration, APs in main Offices

- Clients connected to the first AP

Wireless Tables

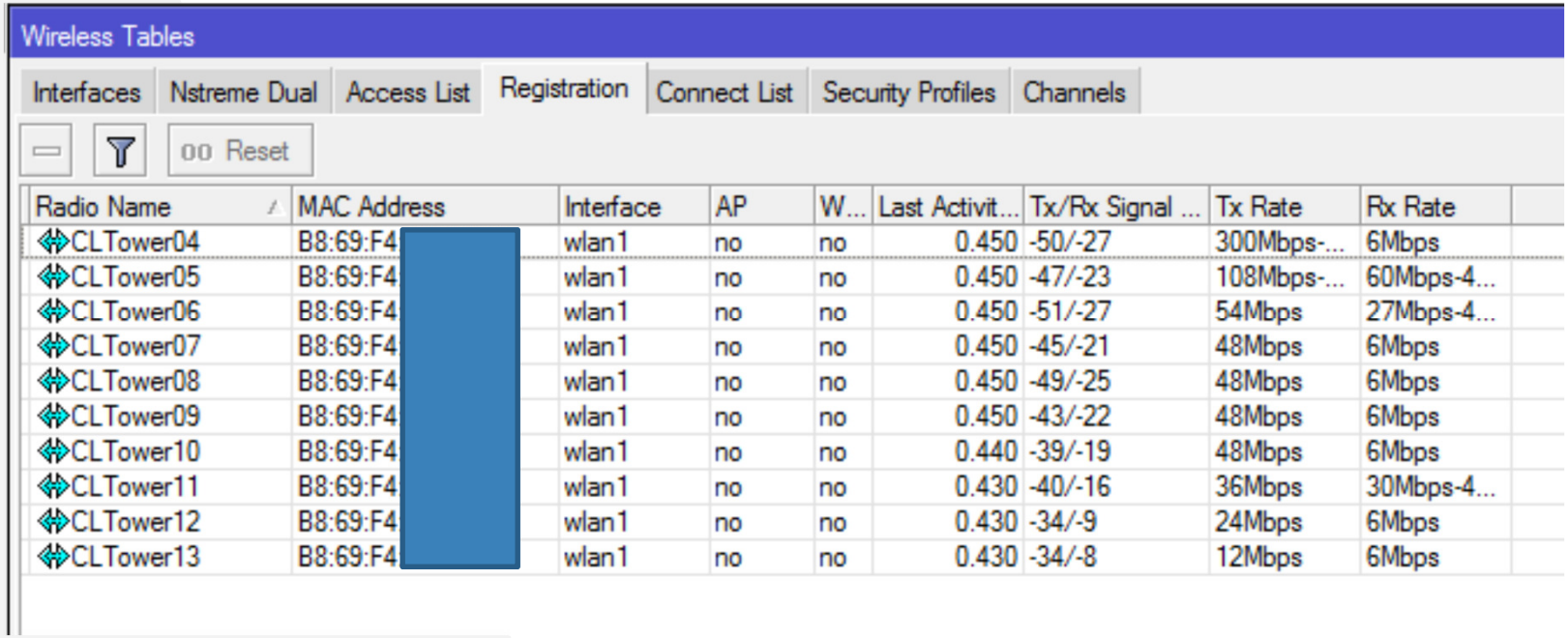
Interfaces | Nstreme Dual | Access List | Registration | Connect List | Security Profiles | Channels

Reset

Radio Name	MAC Address	Interface	Uptime	AP	W...	Last Activit...	Tx/Rx Signal ...	Tx Rate	Rx Rate
CLTower01	B8:69:F4:	wlan1	00:00:05	no	no	0.980	-50/-29	6Mbps	6Mbps
CLTower02	B8:69:F4:	wlan1	00:00:05	no	no	0.990	-50/-27	6Mbps	6Mbps
CLTower03	B8:69:F4:	wlan1	00:00:05	no	no	0.980	-51/-35	6Mbps	6Mbps
CLTower04	B8:69:F4:	wlan1	00:00:05	no	no	0.980	-54/-26	6Mbps	6Mbps

Configuration, APs in main Offices

- Clients connected to the second AP, etc



Radio Name	MAC Address	Interface	AP	W...	Last Activit...	Tx/Rx Signal ...	Tx Rate	Rx Rate
CLTower04	B8:69:F4	wlan1	no	no	0.450	-50/-27	300Mbps-...	6Mbps
CLTower05	B8:69:F4	wlan1	no	no	0.450	-47/-23	108Mbps-...	60Mbps-4...
CLTower06	B8:69:F4	wlan1	no	no	0.450	-51/-27	54Mbps	27Mbps-4...
CLTower07	B8:69:F4	wlan1	no	no	0.450	-45/-21	48Mbps	6Mbps
CLTower08	B8:69:F4	wlan1	no	no	0.450	-49/-25	48Mbps	6Mbps
CLTower09	B8:69:F4	wlan1	no	no	0.450	-43/-22	48Mbps	6Mbps
CLTower10	B8:69:F4	wlan1	no	no	0.440	-39/-19	48Mbps	6Mbps
CLTower11	B8:69:F4	wlan1	no	no	0.430	-40/-16	36Mbps	30Mbps-4...
CLTower12	B8:69:F4	wlan1	no	no	0.430	-34/-9	24Mbps	6Mbps
CLTower13	B8:69:F4	wlan1	no	no	0.430	-34/-8	12Mbps	6Mbps

Configuration, APs in the towers

- The access points in the towers are connected via the switches with the SXT connecting to the main offices AP so we need to just enable CAP configuration on them

```
/interface wireless cap set discovery-interfaces=ether1
/interface wireless cap set interfaces=wlan1
/interface wireless cap set enabled=yes
```

Configuration, RB4011 main router

On the main core router we create:

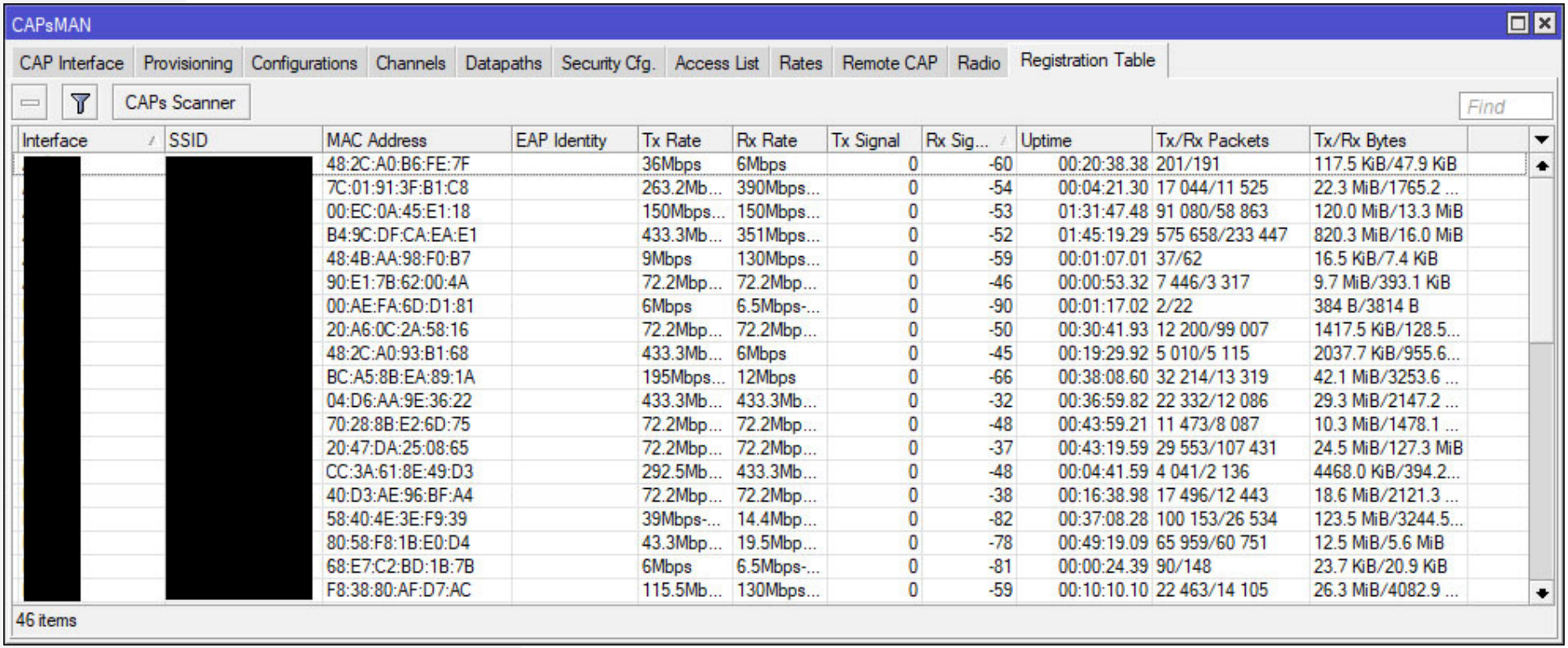
- One bridge for ethernet connected network
- One bridge called bridgeWirelessClients for CAPsMAN wireless clients
- Add IP for both bridges
- (optional) Add dhcp-server for both bridges
- Configure CAPsMAN in it (***next slide***)

Configuration, RB4011 main router

- CAPsMAN config

```
/caps-man datapath
add bridge=bridgeWirelessClients client-to-client-forwarding=no name=datapath1
/caps-man security
add authentication-types=wpa-psk,wpa2-psk encryption=aes-ccm name=security1
passphrase=xxxxxxxx
/caps-man configuration
add datapath=datapath1 mode=ap name=cfg1 security=security1 ssid=ContainerField
/caps-man manager
set enabled=yes
/caps-man provisioning
add action=create-enabled master-configuration=cfg1 name-format=identity
```

CAPsMAN


CAPsMAN
CAP Interface
Provisioning
Configurations
Channels
Datapaths
Security Cfg.
Access List
Rates
Remote CAP
Radio
Registration Table
CAPs Scanner
Find
Interface
SSID
MAC Address
EAP Identity
Tx Rate
Rx Rate
Tx Signal
Rx Sig...
Uptime
Tx/Rx Packets
Tx/Rx Bytes
48:2C:A0:B6:FE:7F 36Mbps 6Mbps 0 -60 00:20:38.38 201/191 117.5 KiB/47.9 KiB
7C:01:91:3F:B1:C8 263.2Mb... 390Mbps... 0 -54 00:04:21.30 17 044/11 525 22.3 MiB/1765.2 ...
00:EC:0A:45:E1:18 150Mbps... 150Mbps... 0 -53 01:31:47.48 91 080/58 863 120.0 MiB/13.3 MiB
B4:9C:DF:CA:EA:E1 433.3Mb... 351Mbps... 0 -52 01:45:19.29 575 658/233 447 820.3 MiB/16.0 MiB
48:4B:AA:98:F0:B7 9Mbps 130Mbps... 0 -59 00:01:07.01 37/62 16.5 KiB/7.4 KiB
90:E1:7B:62:00:4A 72.2Mbp... 72.2Mbp... 0 -46 00:00:53.32 7 446/3 317 9.7 MiB/393.1 KiB
00:AE:FA:6D:D1:81 6Mbps 6.5Mbps-... 0 -90 00:01:17.02 2/22 384 B/3814 B
20:A6:0C:2A:58:16 72.2Mbp... 72.2Mbp... 0 -50 00:30:41.93 12 200/99 007 1417.5 KiB/128.5...
48:2C:A0:93:B1:68 433.3Mb... 6Mbps 0 -45 00:19:29.92 5 010/5 115 2037.7 KiB/955.6...
BC:A5:8B:EA:89:1A 195Mbps... 12Mbps 0 -66 00:38:08.60 32 214/13 319 42.1 MiB/3253.6 ...
04:D6:AA:9E:36:22 433.3Mb... 433.3Mb... 0 -32 00:36:59.82 22 332/12 086 29.3 MiB/2147.2 ...
70:28:8B:E2:6D:75 72.2Mbp... 72.2Mbp... 0 -48 00:43:59.21 11 473/8 087 10.3 MiB/1478.1 ...
20:47:DA:25:08:65 72.2Mbp... 72.2Mbp... 0 -37 00:43:19.59 29 553/107 431 24.5 MiB/127.3 MiB
CC:3A:61:8E:49:D3 292.5Mb... 433.3Mb... 0 -48 00:04:41.59 4 041/2 136 4468.0 KiB/394.2...
40:D3:AE:96:BF:A4 72.2Mbp... 72.2Mbp... 0 -38 00:16:38.98 17 496/12 443 18.6 MiB/2121.3 ...
58:40:4E:3E:F9:39 39Mbps-... 14.4Mbp... 0 -82 00:37:08.28 100 153/26 534 123.5 MiB/3244.5...
80:58:F8:1B:E0:D4 43.3Mbp... 19.5Mbp... 0 -78 00:49:19.09 65 959/60 751 12.5 MiB/5.6 MiB
68:E7:C2:BD:1B:7B 6Mbps 6.5Mbps-... 0 -81 00:00:24.39 90/148 23.7 KiB/20.9 KiB
F8:38:80:AF:D7:AC 115.5Mb... 130Mbps... 0 -59 00:10:10.10 22 463/14 105 26.3 MiB/4082.9 ...
46 items

Configuration, other equipment

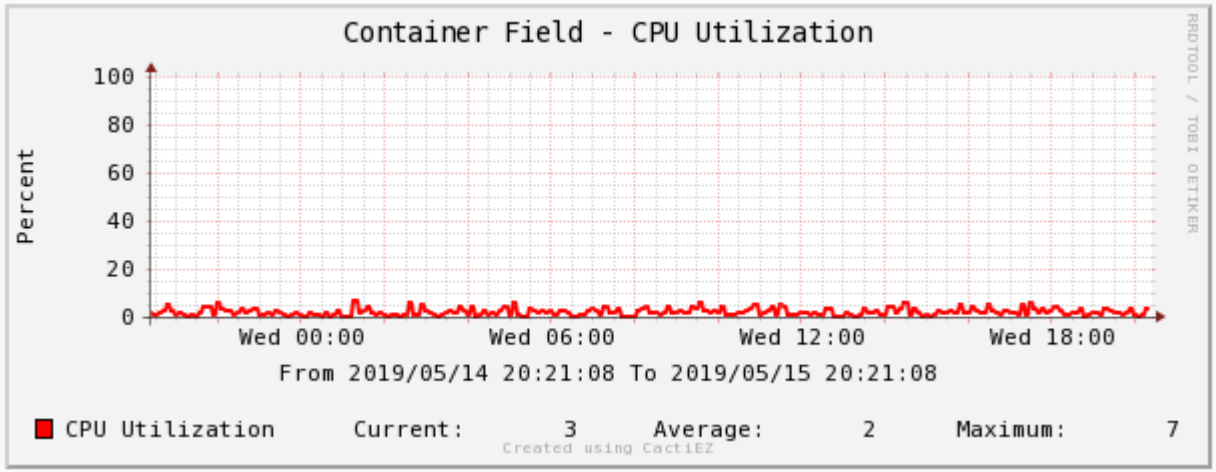
- Wireless Wire Dish 60GHZ comes by default with bridge configuration, so we don’t have really anything to do there, except creating username/pass for secure login, upgrade, etc
- All IP cameras and NVR are vendor specific operations to put them in the same subnet so the NVR can get video signal from the cameras
- Fire Alarm equipment also gets configured to connect via the network for remote notification alarms

Equipment

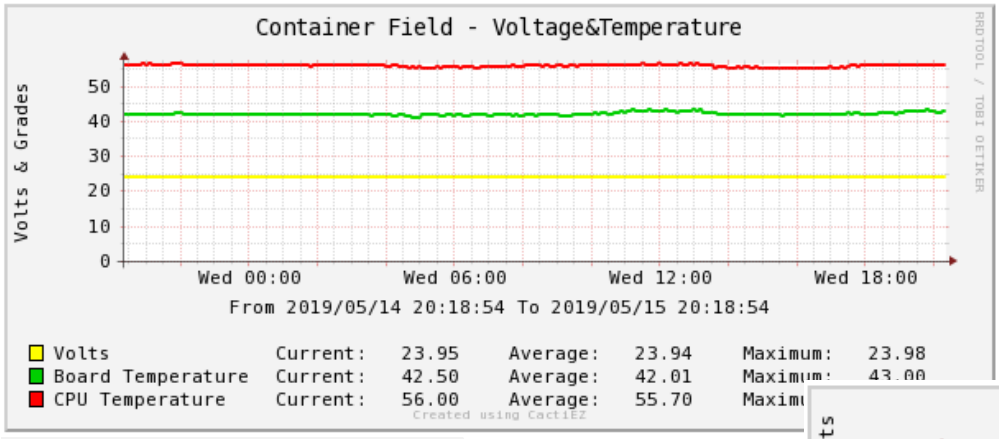
- Other equipment, that includes: **cables**, **UPS**, **boxes** to mount equipment in the towers, and even **bolts** and screws, should be industrial grade and as much resistant to the harsh environments as possible.

Monitoring

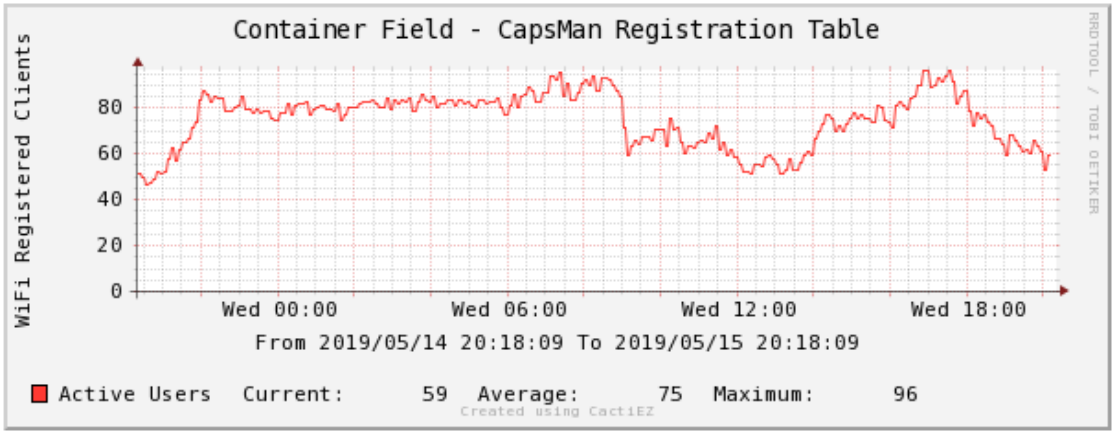
- Because of the production critical nature of the setup, it is always advised to put up a monitoring server for the equipment



Monitoring



- Voltage, Board and CPU Temperature



- Wireless Registered Clients

4. Conclusion

Conclusion

- MikroTik equipment has proven itself as the right choice for industrial installations
- When in production critical and harsh environment, carefull selection of equipment must be done
- Monitoring is a must

That is all.
Thanks for your attention!

Any question?

aldo.frasheri@gmail.com