ROSKILDE FESTIVAL

Mikrotik at Roskilde Festival

Building a redundant city-sized network in less than two weeks

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What is Roskilde Festival?

- Largest music festival in Northern Europe
- 130.000+ guests over 8 days
- The festival area covers 2.500.000 m2 (about 350 soccer fields)
- More than 30.000 volunteers

..and more than 1 million liters of beers consumed!

By Bill Ebbesen - Own work, CC BY-SA 3.0

Holbækmotorvejen
12
23
Darupvej
Darupvej
Roskilde Dyrskue
Roskilde Dyrskue
Roskilde Tekniske Skole
Darupvej
Roskilde Festival
Vor Frue Hovedgade
Køgevej
Roskilde Fiskeland
Vor Frue
Kamstrupvej
Nunc A/S Plastfabrikation
Kamstrup
Vor Frue Fritidscenter

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IT volunteers

- A total of about 170 volunteers in the group
- Split into sub divisions, i.e.:
  - IT support
  - Network
    - Planning and design
    - Config
    - Deployment (physical)
    - Cabling (core network)
    - Cabling (bars, food stalls, etc.)
    - Free guest WiFi

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Network facts

- 35 kilometers of CAT5E installed in less than two weeks - *every year*
- 40 fiber POP's
- 1+ Gbps internet connectivity
- Most covered by redundant connectivity (fiber, CAT5E or wireless) using OSPF
- End-user connectivity separated into hundreds of individual VRFs
- Extremely dynamic backbone capable of offering "most network services" (for example: MPLS, public IP addresses, layer 2 between physical locations, etc.)
- Tens of thousands of users, for example the free public wifi, credit card terminals, press areas, ticket booths, etc.
- Wireless PTP and PTMP using **Mikrotik**

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Mikrotik products being used for:

- Wireless links for the existing core network
  - Mainly for redundancy
  - ..but also for difficult-to-reach-by-multiple-cables areas
- “Easy to install (dumb)”-internet access for bars and similar, located far away from core network areas

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Point-to-Point and Point-to-MultiPoint

- Three radio towers used with multipoint sector antennas:
  - East
  - West
  - “The police tower” (Orange scene, main stage - permanent)
- Many Point-To-Point links between core equipment, replacing (and supplementing) the more expensive fiber runs

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Sector antennas in the area

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Web-based overview of PTMP

Base plads-bsu-001

Client name	Base Interface	Signal Strength	Uptime	Registered Location	Update Location

Base plads-bsu-002

Client name	Base Interface	Signal Strength	Uptime	Registered Location	Update Location
client-43	wlan3	-63	2d23h11m1s		Update
client-56	wlan3	-59	2d23h11m1s	Indre plads - Artist Village - Artist checkin (55.623067;12.0831	Update
client-15	wlan4	-48	2d23h11m1s		Update
client-135	wlan2	-65	2d23h11m1s	Ydre Danisbo Container (55.61707;12.07583)	Update
client-16	wlan2	-49	2d23h10m59s	Indre plads - Trade zone syd øst (55.61933;12.07868)	Update
client-85	wlan4	-66	2d21h2m26s	Ydre Bycenter Oest Food (55.61366;12.08698)	Update
client-131	wlan2	-51	2d20h54m57s	Indre Apollo Oelbod (55.61753;12.07439)	Update
client-124	wlan3	-67	2d20h9m20s	Billetsalg East - Ydre - Entrance East (55.6182127;12.0914297)	Update
client-100	wlan2	-58	2d13h18m37s		Update
client-70	wlan4	-64	1d11h27m	Ydre plads :: Agora N (55.6160073;12.0891296)	Update
client-28	wlan2	-61	1d5h13m57s		Update
client-129	wlan4	-78	22h46m55s	Kenneths campingvogn? Vor Frue	Update
client-108	wlan2	-84	22h26m44s	Indre plads :: Handelsoen :: oelbod orange vest (55.621110;12.0	Update
client-49	wlan4	-55	22h7m45s	Ydre plads :: Agora L :: Madbod (55.617340;12.083900)	Update
client-133	wlan2	-46	15h42m36s	Indre plads :: Orange :: Tribune (55.620100;12.077120)	Update
client-41	wlan4	-54	6h57m2s	Ydre Agora L 3Reload (55.61720;12.08362)	Update
client-54	wlan2	-52	6h56m20s		Update

Base west-bsu-001

Client name	Base Interface	Signal Strength	Uptime	Registered Location	Update Location
client-137	wlan2	-27	3d1h29m23s		Update
client-140	wlan1	-47	2d22h28m55s	Ydre plads :: Bycenter Vest :: Check-in nord (55.622190;12.06923	Update

Sector antennas configuration snippets

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/interface wireless
set 0 band=5ghz-a/n channel-width=20/40mhz-ht-above country=denmark disabled=no frequency=**5700** l2mtu=2290 mode=ap-bridge mtu=**1586** nv2-preshared-key=veryDog nv2-security=enabled radio-name=RF-west-sector-5 rate-selection=legacy ssid=RF-wifi wireless-protocol=**nv2**
set 1 band=5ghz-a/n channel-width=20/40mhz-ht-above country=denmark disabled=no frequency=**5640** l2mtu=2290 mode=ap-bridge mtu=**1586** nv2-preshared-key=veryDog nv2-security=enabled radio-name=RF-west-sector-6 rate-selection=legacy ssid=RF-wifi wireless-protocol=**nv2**
set 2 band=5ghz-a/n channel-width=20/40mhz-ht-above country=denmark disabled=no frequency=**5280** l2mtu=2290 mode=ap-bridge mtu=**1586** nv2-preshared-key=veryDog nv2-security=enabled radio-name=RF-west-sector-7 rate-selection=legacy ssid=RF-wifi wireless-protocol=**nv2**
set 3 band=5ghz-a/n channel-width=20/40mhz-ht-above country=denmark disabled=no frequency=**5320** l2mtu=2290 mode=ap-bridge mtu=**1586** nv2-preshared-key=veryDog nv2-security=enabled radio-name=RF-west-sector-8 rate-selection=legacy ssid=RF-wifi wireless-protocol=**nv2**
/interface **bridge** port
add bridge=wlanbridge interface=ether1
add bridge=wlanbridge interface=wlan1
add bridge=wlanbridge interface=wlan2
add bridge=wlanbridge interface=wlan3
add bridge=wlanbridge interface=wlan4
/interface vlan
add interface=wlanbridge l2mtu=1596 name=wlanbridge.110 vlan-id=110
/routing **ospf** instance
set [find default=yes] router-id=10.0.255.203
/ip address
add address=10.11.0.2/24 interface=wlanbridge.110

“Core-bridge” SXT snippet

```
/interface wireless
set 0 band=5ghz-a/n bridge-mode=enabled \
   channel-width=20/40mhz-ht-above country=denmark \
   mode=station-bridge nv2-preshared-key=veryDog \
   nv2-security=enabled ssid=RF-wifi wireless-protocol=nv2 \
   radio-name=client-123 disabled=no
/ip address
add interface=lo0 address=10.10.0.123/32
add interface=ether1 address=10.10.123.1/24
/snmp
set contact="RFIT" enabled=yes location=“Backstage Village {55.673115;12.590205}“
/routing ospf instance
set default router-id=10.10.0.123
/routing ospf interface
add interface=wlan1.110 network-type=broadcast
add interface=ether1 passive=yes
/routing ospf network
add network=10.0.0.0/8 area=backbone
```

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Automated deployment of configurations

- Had some great ideas for how to do it the past couple of years
- ..what works in the lab, some times does not work in the field
- Some times, theres special cases that needs special treatment
- Ended up rolling back to some semi automated way of creating configuration files and pasting them in via Winbox

Lessons learned

- Radio frequencies and planning can be difficult
  - Works fine to begin with..
  - ..breaks when 100.000 guests suddenly enter the area, often bringing their own noisy equipment
- "Dumb internet connectivity" still requires equipment tracking for physical location (SXT's with GPS, PLEASE?!)
- Automated deployment of configuration might not need to be fully automated :-)
- NV2 (TDMA) is awesome! Low latency and reliable links
- mac-telnet can, and will, save your a**
- PoE injectors and power supplies can be tricky..

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Behind the scenes


oadband Wireless Solutions

Google Chrome

Roskilde Map

librenms.netmon02.rf.local/livemap/

P1 P2 P11 P5 P10 P9 P8 P7

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Leaflet | © OpenStreetMap contributors

Grafana - Monitor D

grafana.netmon01.rf.local/dashboard/db/monitor-dashboard

Monitor DashBoard

Zoom Out | 12 hours ago to a few seconds ago refreshed every 1m

Wifi Users connected to your access points (right now)	Wifi users accepted terms of usage	DHCP active leases
1455	8596	19420

LibreNMS devices	DHCP wifi active leases	Rack A	Rack B
150	18036	34 °C	36 °C

DHCP Types

last 1h

	current
srv01 ack	5
srv01 inform	2
srv01 offer	3
srv01 request	6
srv02 ack	3
srv02 inform	2
srv02 offer	1
srv02 request	5

reqps

40 30 20 10 0

17:20 17:30 17:40 17:50 18:00 18:10

+ ADD NOW

SAMSUNG

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Carlsberg
KILDEVÆLD
Udsmid / Reserve

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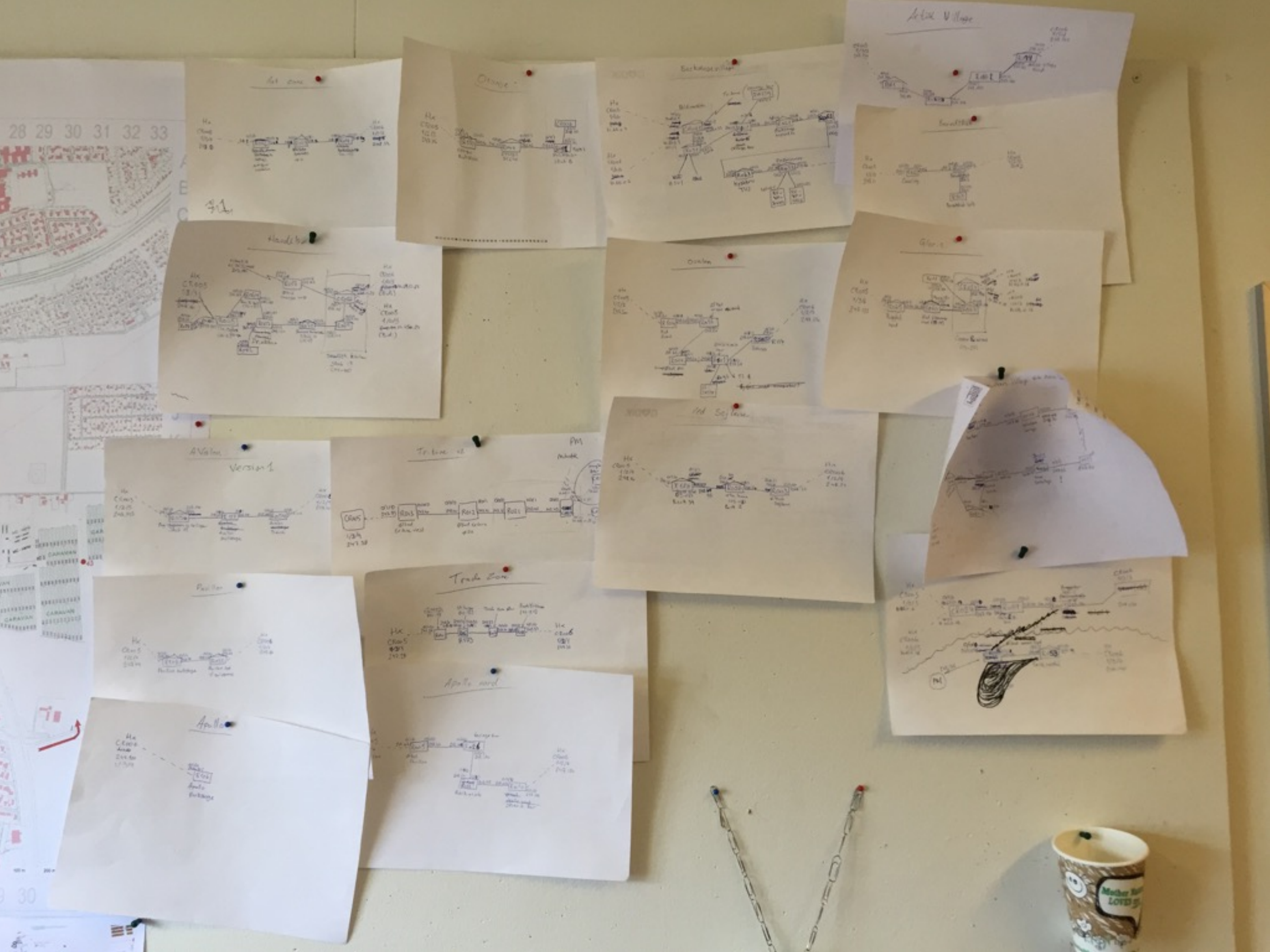
Trade Zone
Apollo word
Version 1

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Why volunteer?

some reasons:

- It's 2 weeks of **fun work**!
- Meet a lot of cool and talented people
- A great way to learn new while doing
- Lots of social stuff going on - all the time
- Great for your professional network

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TAK!

Questions?

Feel free to drop by and ask for more details about our setup and volunteering :)