Internet to a Field 2014

Or how we almost didn’t do it..

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* Preparations/setup/design
* Uplink : camp and internet end
* Core/Datacentre
* Wired
* Wireless

Attempting to prove line of sight

Hopefully we can see this from ~7km away

Can you see me yet?

Will be gone in a few days, honest.

Generating device configurations.

Automatically generate the Cisco IOS and Extreme XOS configs from a google docs spreadsheet with python scripts and Jinja2 templates.

scripts here:

https://github.com/emfcamp/emfnoc/tree/master/configbuilders

Also some scripts to (semi) automate wiping and reflashing switches:

https://github.com/emfcamp/cisco-wiper

Template example

```
{% if switch["Port-Prefix"] %}
{% for port in switch["camper"] %}
interface {{ switch["Port-Prefix"] }}{{ port }}
 switchport mode access
 switchport access vlan {{ switch["Camper-VLAN"] }}
 switchport nonegotiate
 switchport block unicast
 ip access-group camper_v4_in in
[snip]
no shutdown
{% endfor %}
{% endif %}
```

Diagram - Logical

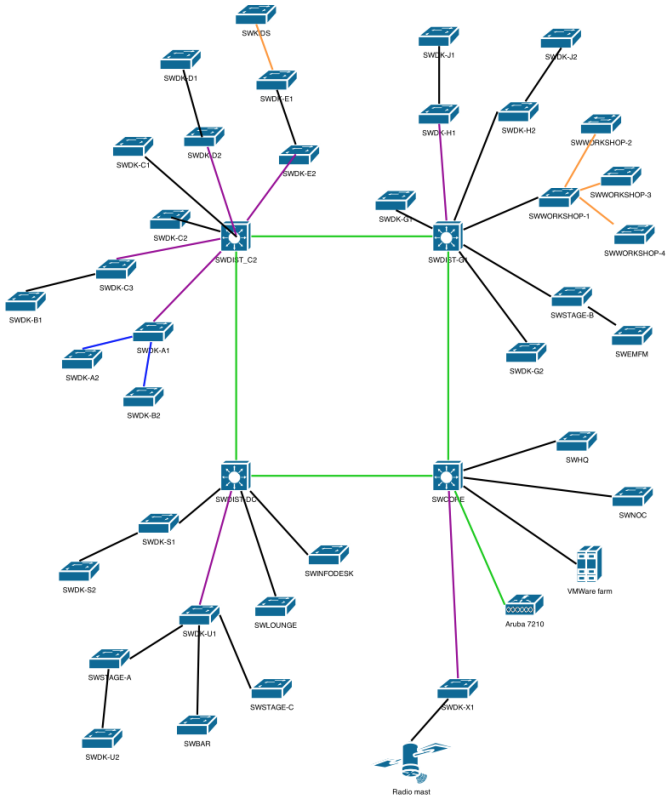
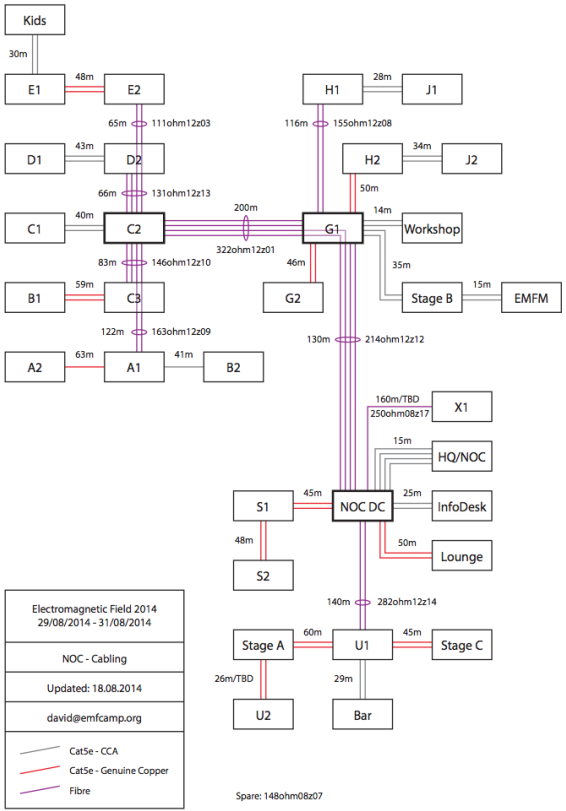


Diagram - Cabling



Doh.

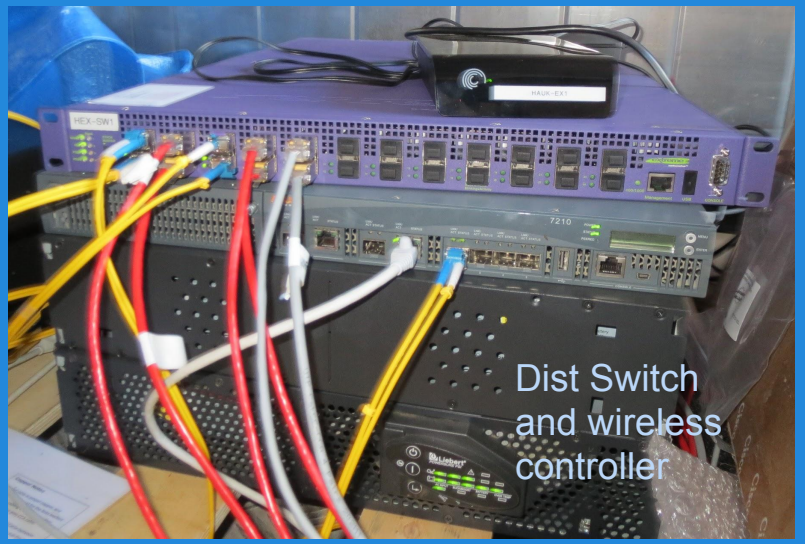
Not dodgy at all.

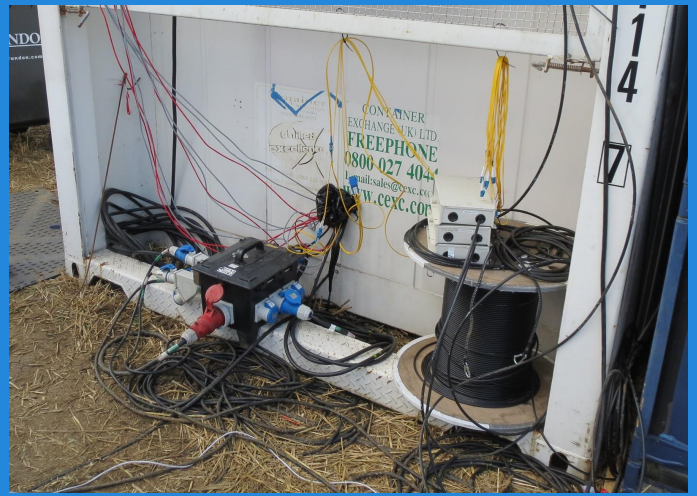
Zoom and enhance

This DK gets a bit lonely

Racks? what are they?

Keeping cool.





Mess of
Cables

Wireless - Hardware/software

Hardware:

- Aruba 7210 controller (max 512 APs, 4x 10GE)
- 50 dual-radio 802.11n Aruba APs
- 10 dual-radio 802.11ac Aruba APs

Software:

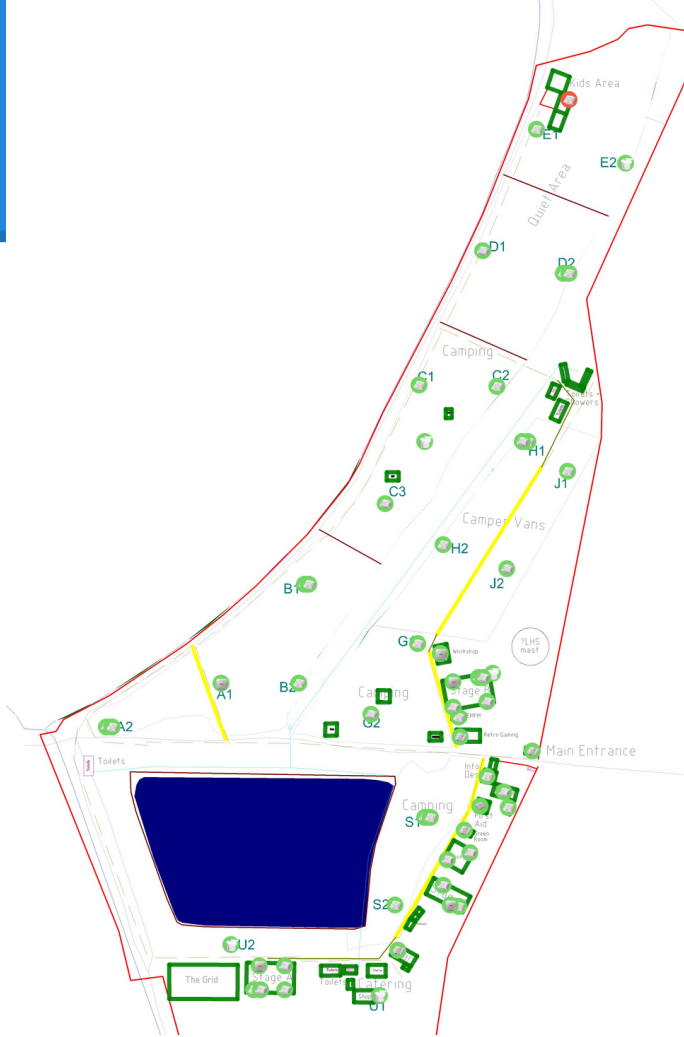
- FreeRADIUS
- Aruba AirWave (mgmt)
- Graphite

Wireless - Config

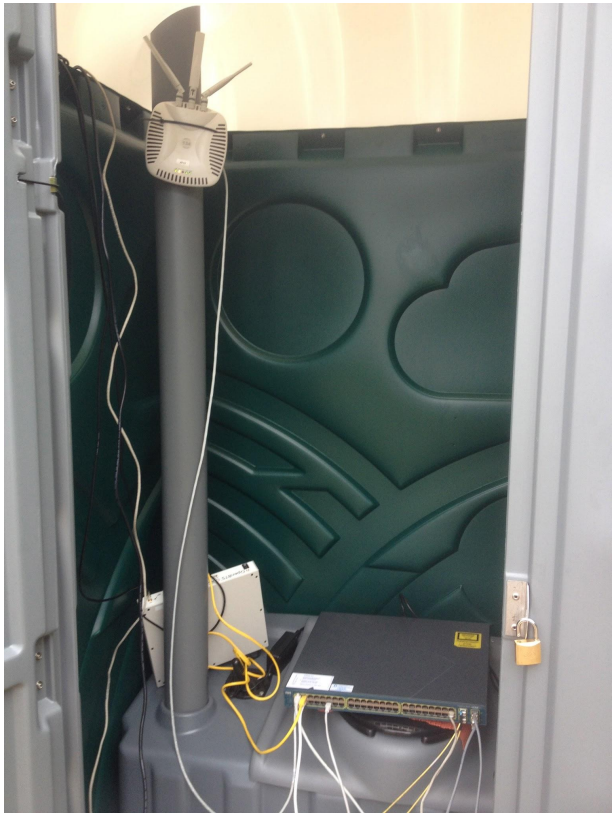
- Seperate SSID's for 2.4GHz/5GHz for “emfcamp”-SSID (no band-steering)
- WPA2-enterprise 802.1X for encrypted WiFi, authentication against FreeRADIUS.
- Also offering WPA2-enterprise SSID's: spacenet (for hackerspaces) and eduroam (for educational organisations). Both serve the same purpose: federated authentication for 802.1X. Better experience for end-users because devices are already pre-configured.
- Tunnel all traffic through controller: Easier AP deployment, no side-wide VLANs, broadcast-filtering possible with ARP/NDP-proxy.
- 20MHz channels on both 2.4GHz and 5GHz. 4-channelplan on 2.4GHz and 19 channels on 5GHz.
- Dedicated APs for AirMonitoring (about 10 of them), not serving clients, but doing background scanning for rogue detection, auto-channel (ARM) and IPS/IDS.

Wireless - AP placement

- Placement in datenklos.
- Placement in track/stage tents: deployed multiple APs in one stage-tent for capacity.
- Also added dedicated AirMonitor in each stage-tent

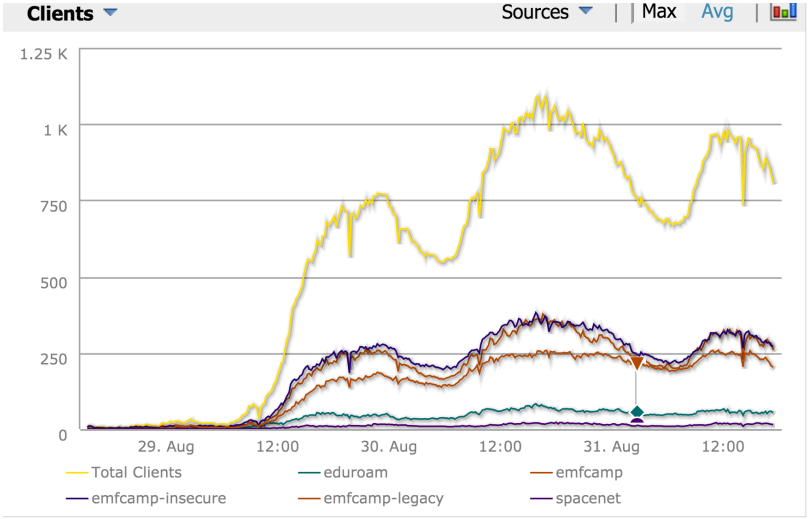


Wireless - AP placement (2)



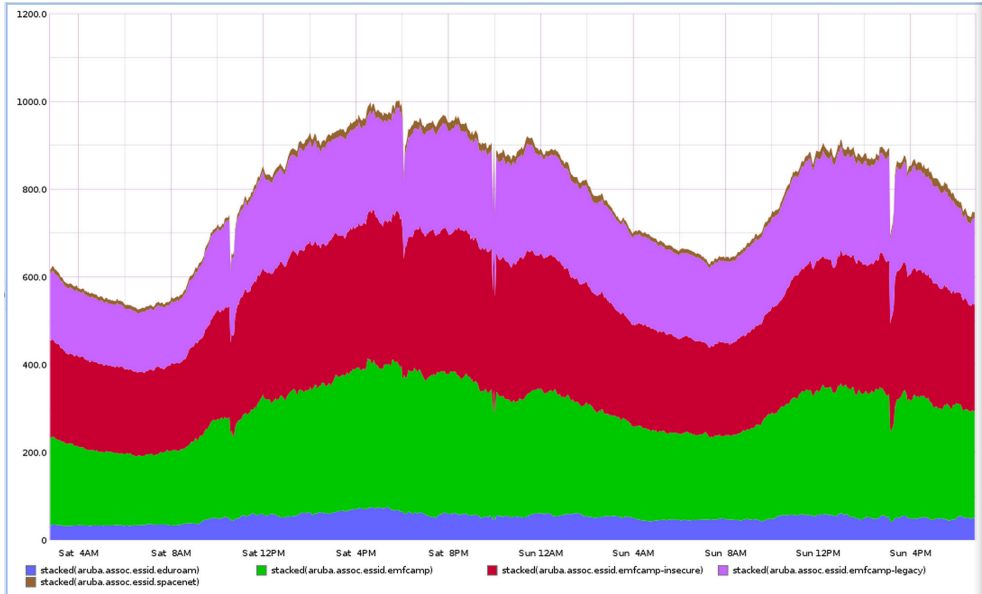
Wireless - Stats (1)

- 2012 unique devices
- 1090 max concurrent associations
- 75% of the clients are smart-devices: 50% Android, 25% iOS
- 7% is Linux, 7% MacOS, 3% Windows

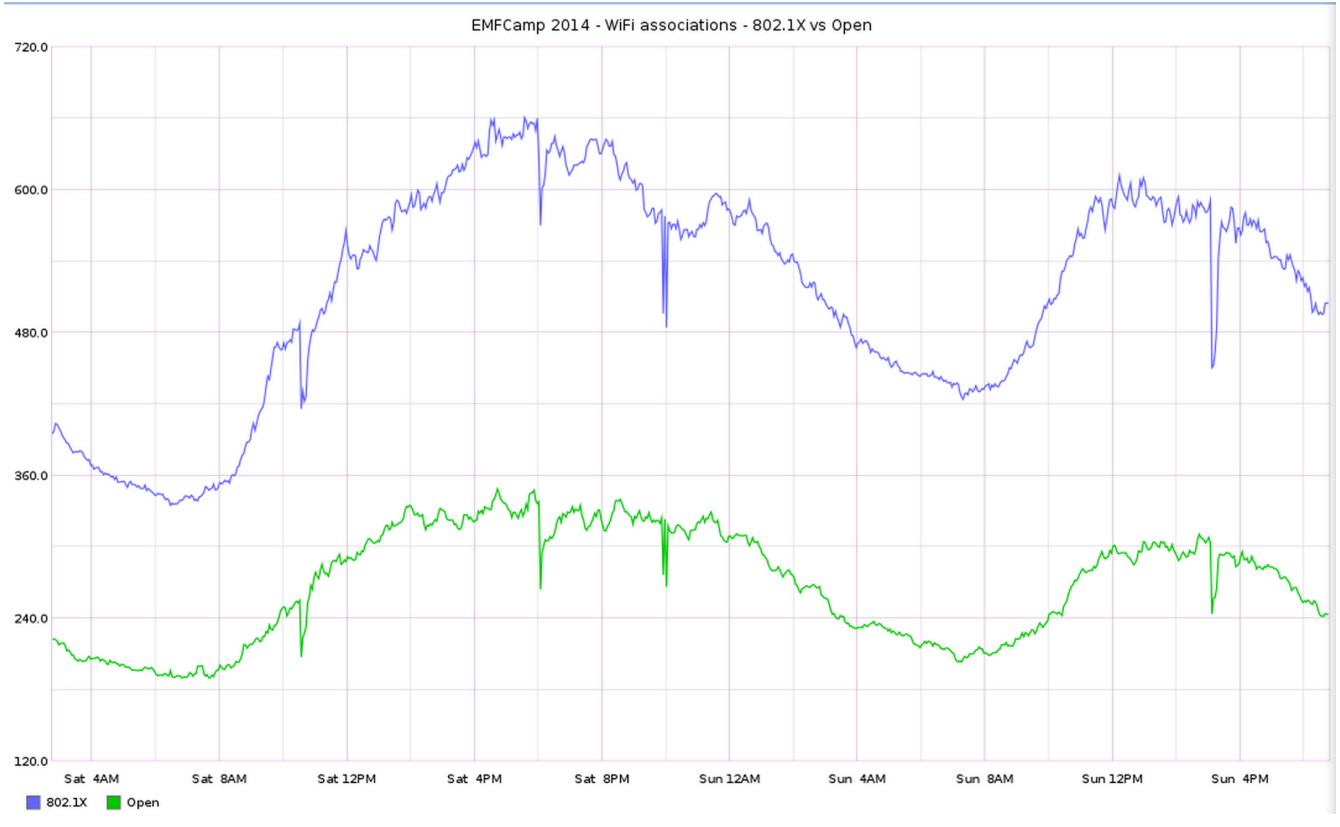


Wireless - Stats (2)

- 33% on emfcamp (5GHz, encrypted)
- 33% on emfcamp-insecure (unencrypted, both 2.4GHz/5GHz)
- 25% on emfcamp-legacy (2.4GHz, encrypted)
- 7% on eduroam (2.4GHz+5GHz, encrypted)
- 2% on spacenet (2.4GHz+5GHz, encrypted)

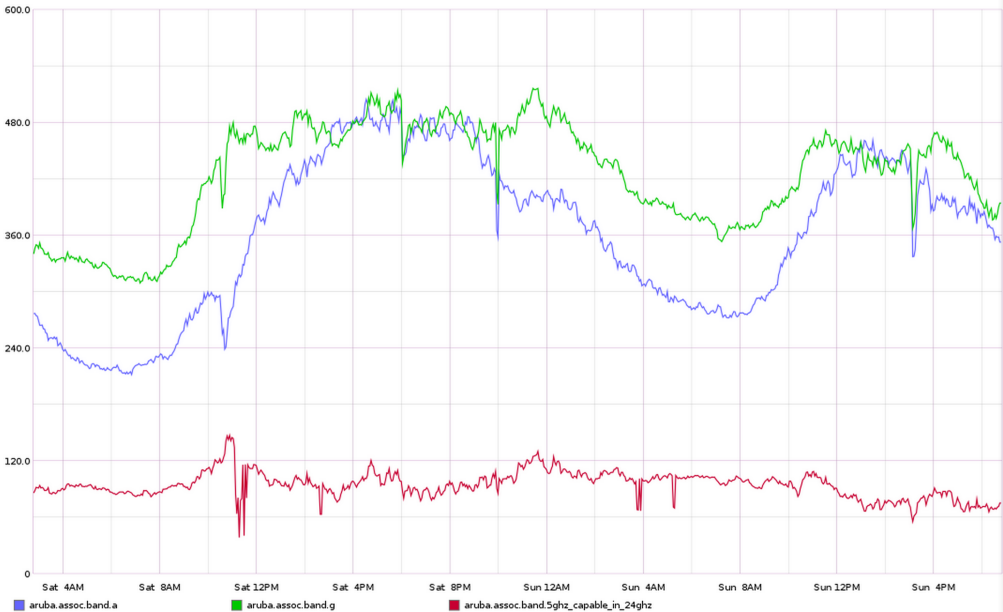


Wireless - Stats (3)



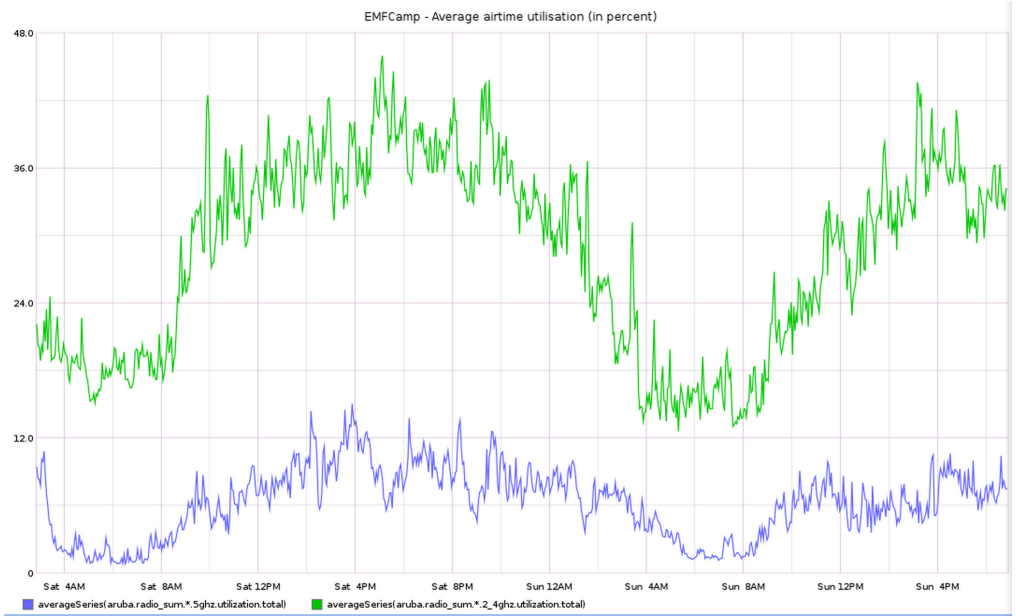
Wireless - 2.4GHz vs 5GHz (1)

- Client distribution is about 50/50
- Still about 10-15% of 5GHz-capable clients not actually connecting in 5GHz-band (either due to user-error, failing band-steering or devices is not capable of using DFS-channels)



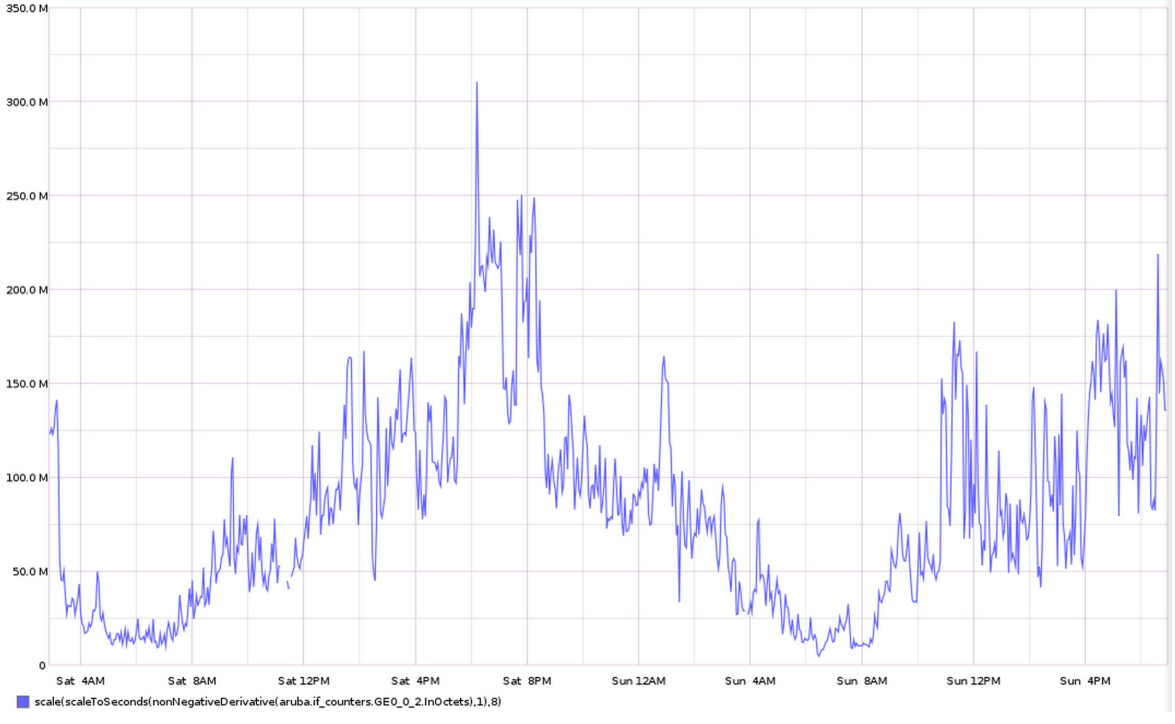
Wireless - 2.4GHz vs 5GHz (2)

2.4GHz-band sometimes extremely crowded (peaking to 100%) due to low number of channels available and bigger cell-size. Average utilisation around 40% on 2.4GHz and 10% on 5GHz.

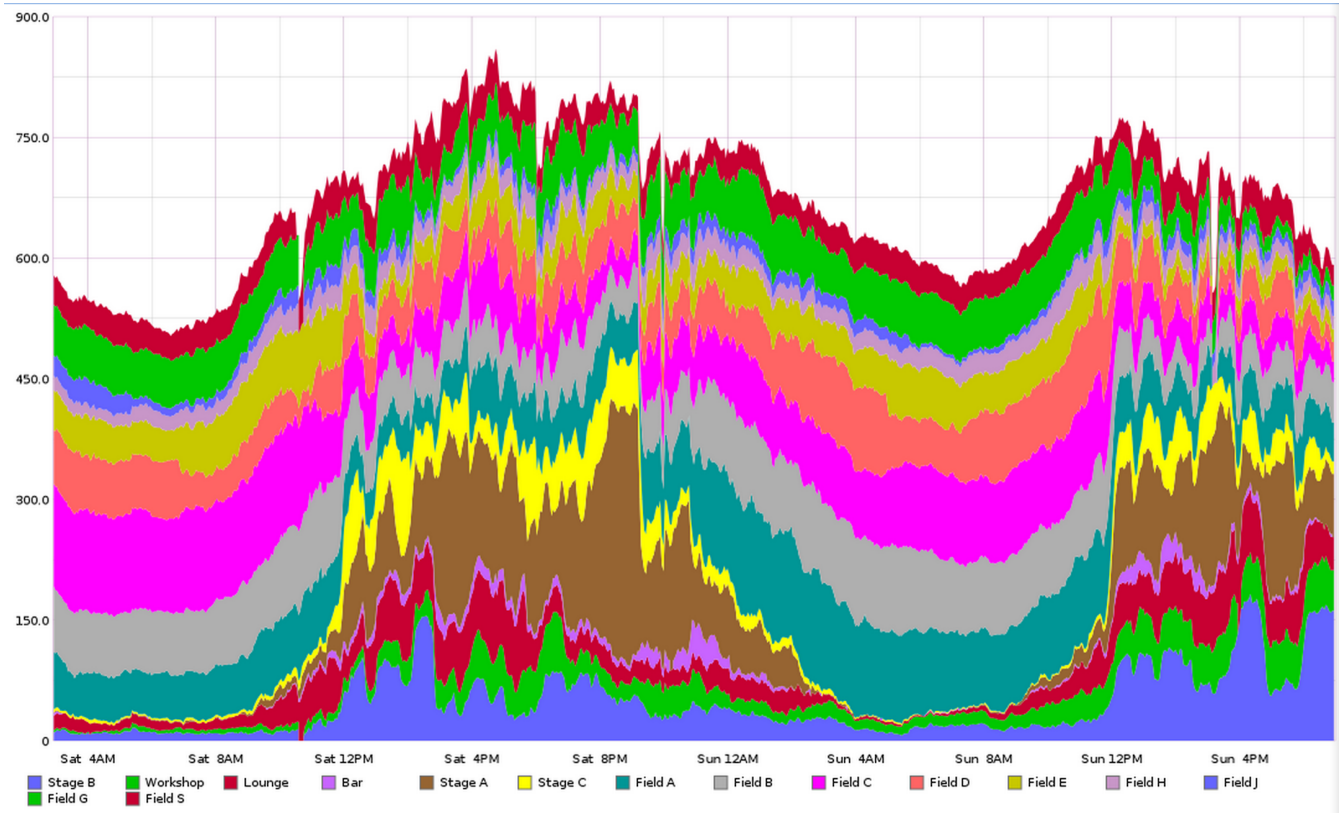


Wireless - Traffic

Peak 300Mbit/s total downstream+upstream



Wireless - Client locations



Thanks to

* Bytemark - loan of kit
* Comtec - loan of kit and server hosting
* Rapid Wireless - wireless link kit hire and deployment
* Colocker - internet link and datacenter access
* Flexoptics - SPF's and GBICS
* Aruba - WiFi kit
* LONAP: uplink
* Sargasso: uplink