



HEPiX Fall 2013

Mobility at CERN

Sebastien.Ceuterickx@cern.ch

IT/Communication Systems



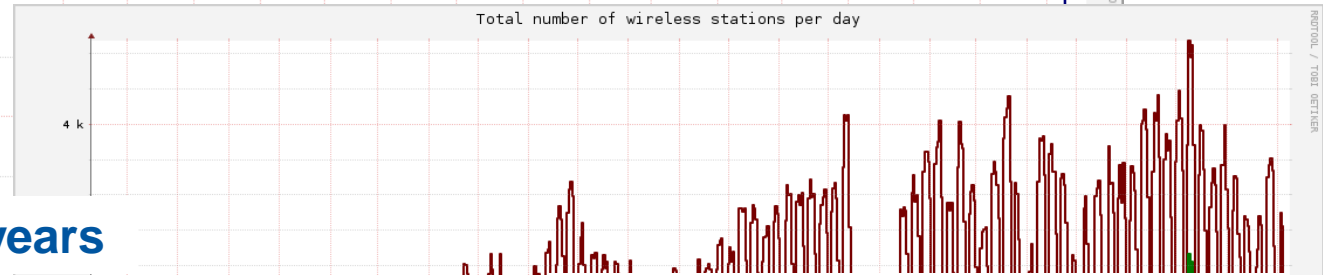
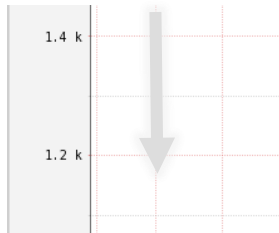
Agenda

- Evolution of Wi-Fi at CERN
- BYOD impact
- Special Wi-Fi deployments
- Eduroam@CERN

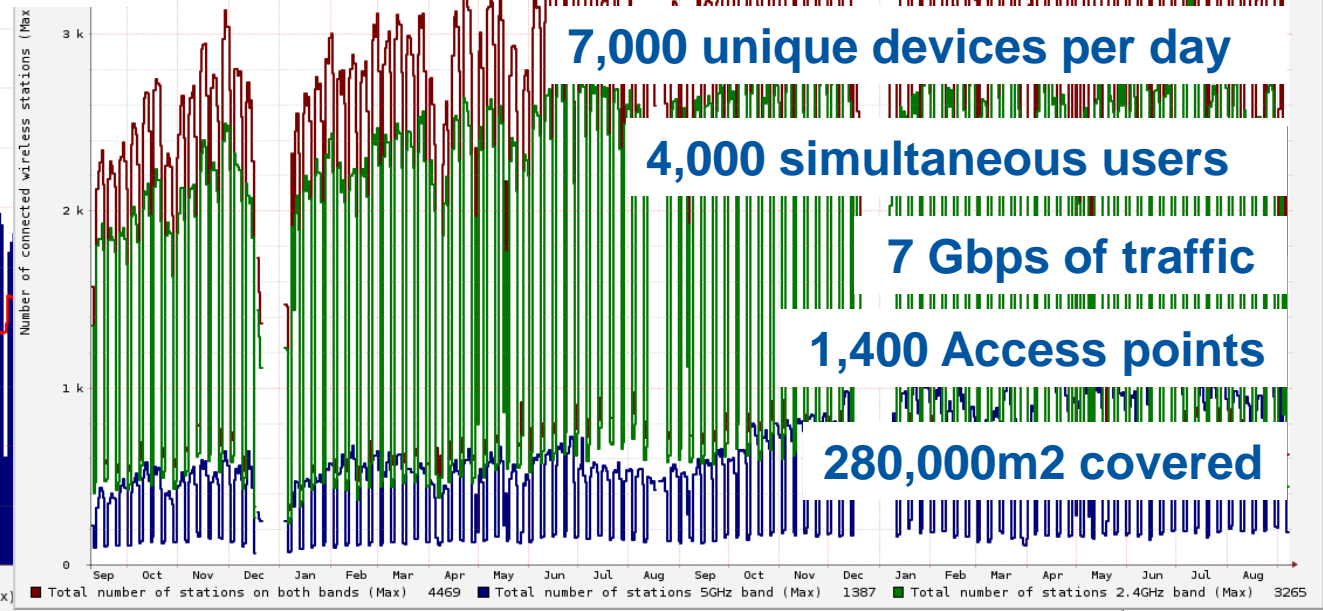
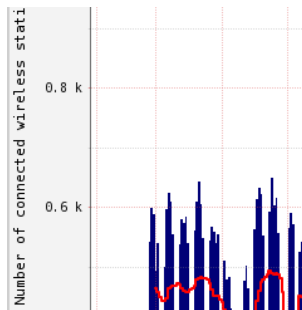
Development of the CERN Wi-Fi

Early 2007

number of wireless stations per day for the 442 CERN monitored Proxim access point
update: Fri Sep 19 11:36:23 2008



x 6 Devices in 6 years



Wi-Fi is complex

The challenges:

- client related issues



- infrastructure issues:
 - deployment challenges
 - sources of interference



- (high) density issues



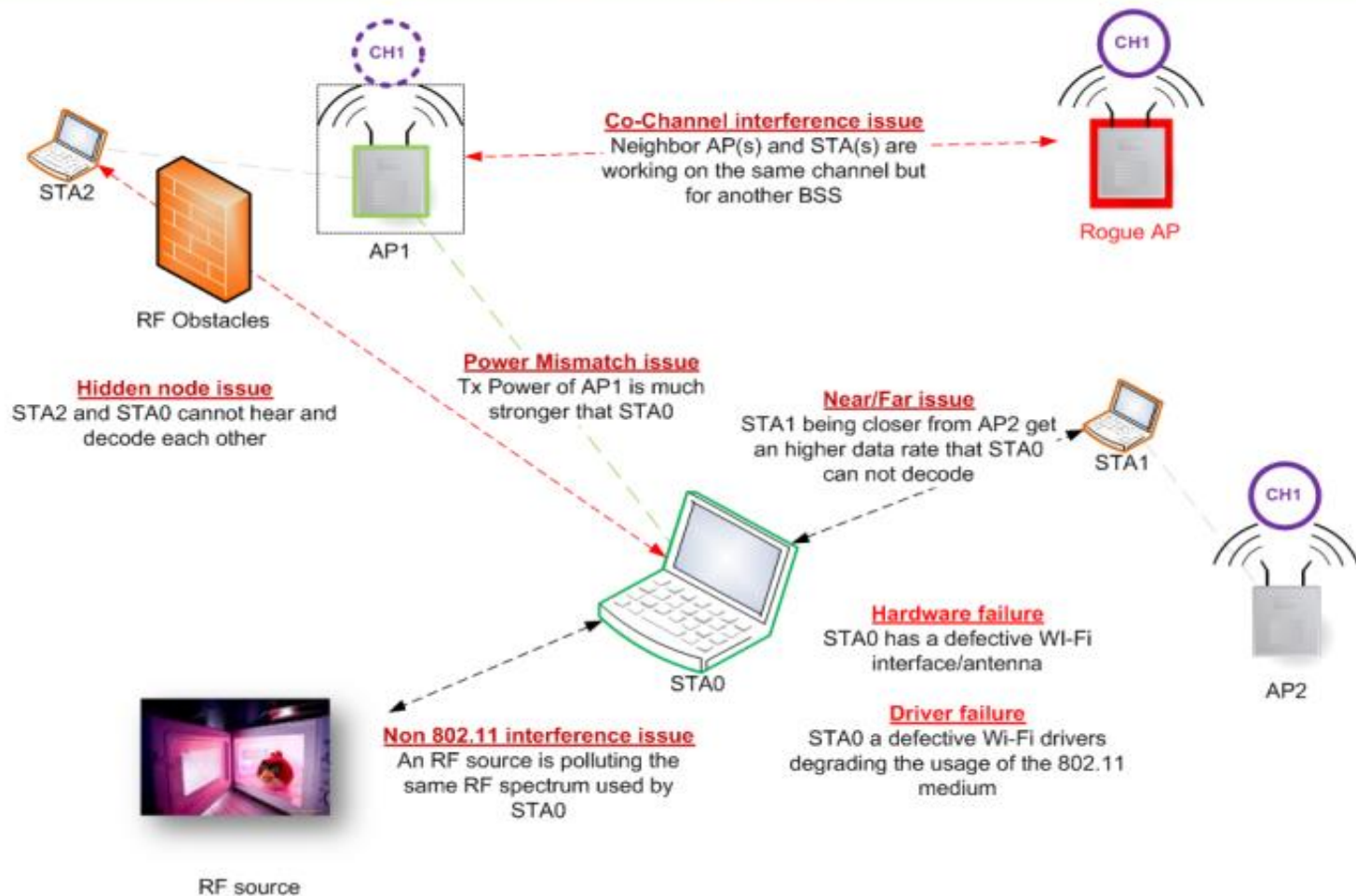
- expected QoS from the user's point of view



- a combination of all factors

Challenges: client issues

What can disturb my Wi-Fi connection when my wireless signal is good?



Challenges: a diverse infrastructure



Challenges: A large and dynamic environment

- 600,000m² indoor area (+20% in 6 years)
- 650 surface buildings (+15% in 6 years)
- 2,100,000m² outside area (stable)
- New experiments
- Building refurbishment



Challenges: intensive usage

- From an extension of the structured cabling to fundamental service

The primary connection for an increasing number of devices



How do we address this?

Optimizing RF spectrum!

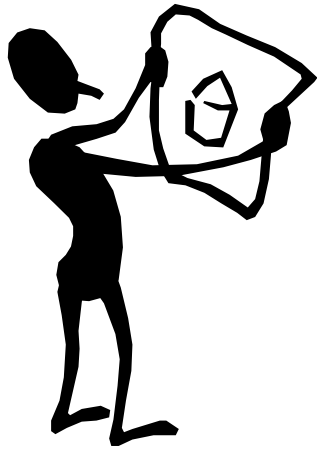


- Migration from 802.11bg to 802.11n 5GHz
- Up to 240Mbps half-duplex shared
- From 200m² per AP to 120m² (-40%)
- Increase the density of APs

Turning ON is not enough

- Band steering
- Load balancing
- Auto-channel selection
- Auto-power control

Might not work out of the box



RF planning and site survey still required

Wi-Fi tuning necessary



Automation for scalability

Integrated within global NMS

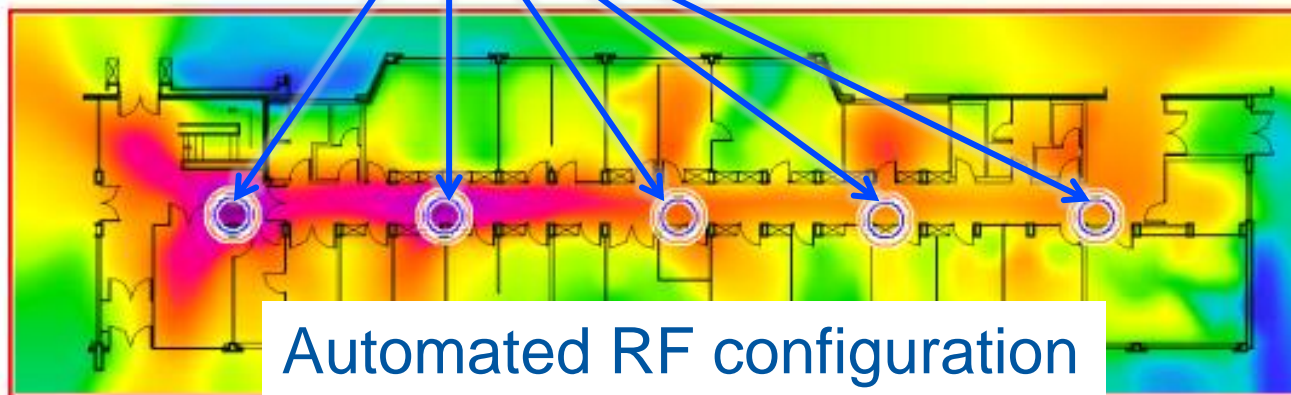
Data Base

Network Management System

Simplify

Increase reliability

Save resources



Automated RF configuration

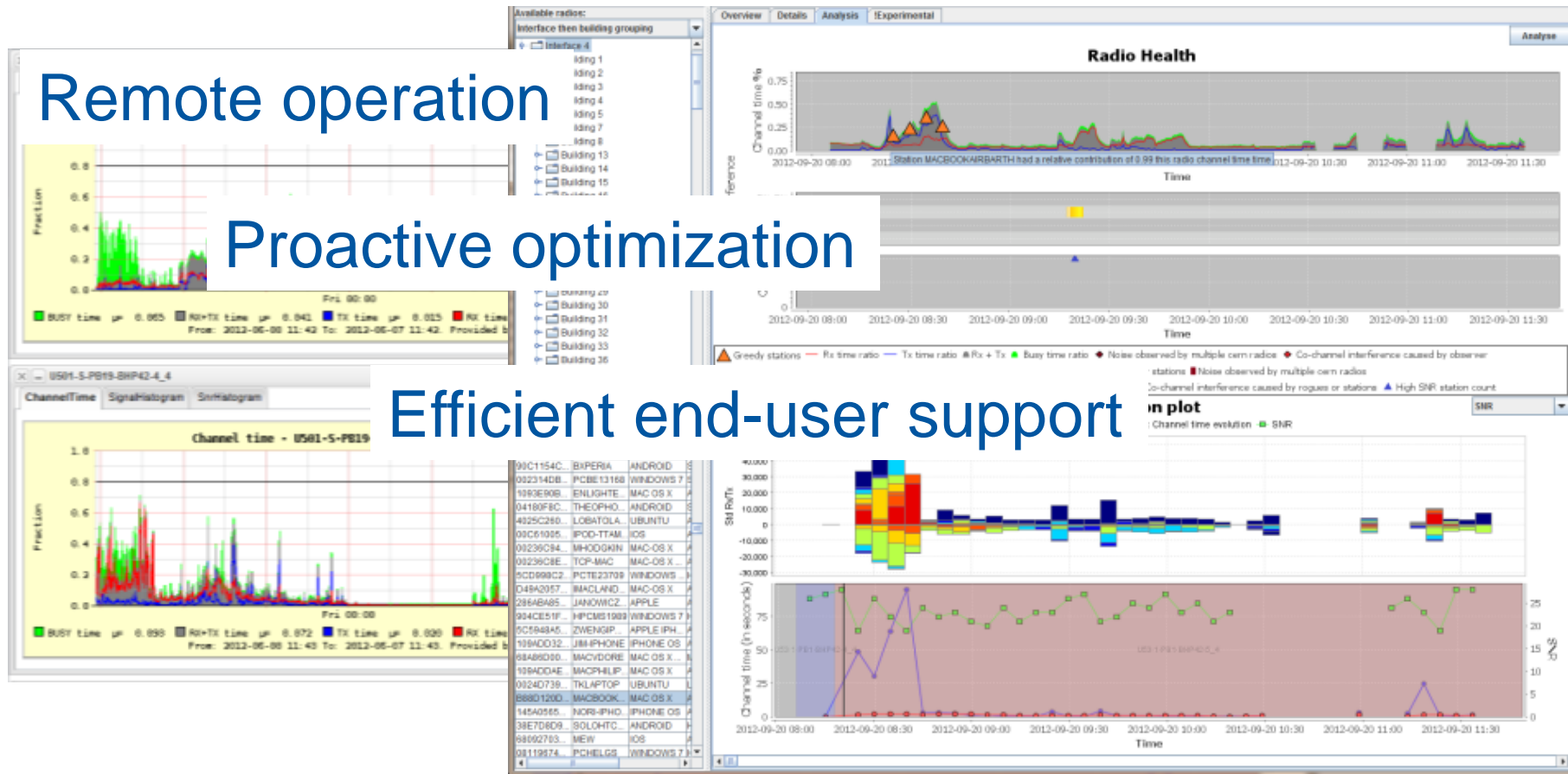
Control, act and support

Efficient monitoring and analysis system deployed

Remote operation

Proactive optimization

Efficient end-user support



BYOD: The impact



802.11n compliant BUT...

1 spatial stream (75Mbps max)
Reduced Wi-Fi performance

Ban them ??

Ban (very) poor connectivity
Optimize RF planning
Increase AP density

Special deployments

Conference rooms



Capacity is the key concern.

- Efficient RF planning for
 - Minimizing interference
 - Optimizing load sharing
- Reduce Tx Power
- Ban slow stations & low data rates
- Enable band steering and airtime fairness
- Use external antennas

Underground caverns



Coverage is the key concern.

- Efficient RF planning for
 - Minimizing co-channel interference
 - Maximizing coverage
- Disable band steering
- Enable RTS/CTS
- Use external antennas and power dividers
- Use a leaky feeder

eduroam @ CERN



Travelling?

Take Internet access with you!

- A secure international roaming service
- Based on a federation of RADIUS servers



How do we deploy it?

- *free***RADIUS**
- certificate based for CERN user (EAP-TLS)
- No additional hardware
- Fully automated
- Pilot version running
- end 2013 : 80% of the infrastructure



Conclusion

- WLAN at CERN will continue to grow.
- Wi-Fi has become a (highly) popular and fundamental service which requires a significant investment to work properly in a professional environment.
- 802.11ac will bring new opportunities
--- and new challenges.

Thank you!

Question?



Future

802.11ac

- 5 GHz only
- New higher rate modulation
- Will be release in 2 “waves”



Wave 1 (2013)	Wave 2 (2015)
Up to 80MHz	Up to 160MHz
Up to 3 spatial streams	Up to 4 spatial streams
Single-User MIMO	Multi-User MIMO
Up to 650Mbps	Up to 1732Mbps

New opportunities...

...new challenges

- Higher throughput
- Better performance at the same range

- Impact on infrastructure ?
- Impact on RF planning ?

- Higher rate only at short range
 - (-55dBm = same room)



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