Pre-Studies for Wi-Fi service enhancement at CERN
Agenda

- Modern Wi-Fi infrastructure
- Wi-Fi planning and validation
Outline

• Modern Wi-Fi infrastructure
  • Current infrastructure
  • Overview: autonomous AP vs controller-based
  • Goals and challenges for modern Wi-Fi infrastructure
  • General rules for campus coverage

• Wi-Fi planning and validation
Current Wi-Fi infrastructure

- Service is provided in all conference/meeting rooms
- Service was provided in an “on demand” way
- Only some of buildings across campus are fully covered with Wi-Fi
- Infrastructure was planned from a coverage point of view
- No possibility of roaming between buildings, nor often between floors in a single building
- Wi-Fi coverage is provided by Autonomous APs
Direction of changes

Moving from here:

To here:
How to achieve this?

• Dense access-point deployment in all our office buildings

• Migrate to a controller-based Wi-Fi solution
  • Centralise the configuration
  • Simplify monitoring
  • Support advanced RF features
  • Support enhanced services (Guest, Rogue Access-point detection)

• Rely on the 802.11ac standard (Wave1 and Wave2)
## Autonomous Access-Point vs Controller based setup

<table>
<thead>
<tr>
<th>Feature</th>
<th>Autonomous AP</th>
<th>Controller based AP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wi-Fi service</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Configuration of a group of APs</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Overview of the infrastructure</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Global management of radio</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Differentiation of users and traffic</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Global roaming</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Scalability</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>
Modern Wi-Fi – challenges

- The World is going mobile
- Wi-Fi connectivity starts to be mandatory
- Wi-Fi becomes the primary way of connection
- High demands for performance
- Big differentiation of client devices
Modern Wi-Fi – challenges

Wi-Fi infrastructure – demands and goals

- Full coverage of all office buildings across CERN campus
- High density coverage
- High performance network with the latest 802.11ac standard
- Seamless roaming inside buildings
- Guest Wi-Fi
- Global overview and management

HEPIX Fall 2016 – Wi-Fi Planning – Adam Sosnowski
Wi-Fi infrastructure – rules for planning

- Dedicated APs for meeting/conference rooms
- APs installed inside offices
- Density of ~1 AP per 3 offices
- Providing roaming between floors inside single building
- Providing roaming between selected buildings
Outline

- Modern Wi-Fi infrastructure

- Wi-Fi planning and validation
  - RF simulation
  - Site survey
  - Deployment
Wi-Fi planning and validation

- RF planning and simulation
  - Preparation of plans: AutoCAD & WallMAN
  - RF Simulation: ProMAN

- Site survey
  - Planning meets reality!

- Deployment
  - Post deployment site survey
RF simulation

- Computer simulation of RF propagation based on an accurate model of a building
- Saves time, as accurate planning can be prepared without measurements on site
- Reduces impact on building occupants as on-site measurements are made only at the end of the process
  - Initial on-site visit necessary to gain some knowledge of building structure, but this is less intrusive
- It is not perfect…but it works for most of cases!
RF simulation tools

- AutoCAD
  - process and adapt building plans

- WallMAN
  - Create 3D building model to give a realistic (but not perfect) view of the RF transmission characteristics

- ProMAN
  - Model Access Point placement and simulate propagation of the RF signals within a building
RF simulation – AutoCAD preparation
RF simulation – modelling a full building
RF simulation - positioning the APs
RF simulation – predicted coverage
RF simulation – map with AP positions
RF simulation – on site validation

• The planned AP positioning needs to be validated on site

• Visit is made with the deployment specialist who will be responsible for the future work

• Goal: ensure there are no physical obstacles to install APs in the proposed places
Site survey

- Measurements of signal quality with a real device
- Validation of a planning in a real environment
- Validation if signal/service level will be high enough to fulfill performance requirements
Site survey – validation path
Site survey – results
Deployment

- Cabling
- AP installation
- Post deployment site survey
Thank you!