Large Wireless LAN Deployment

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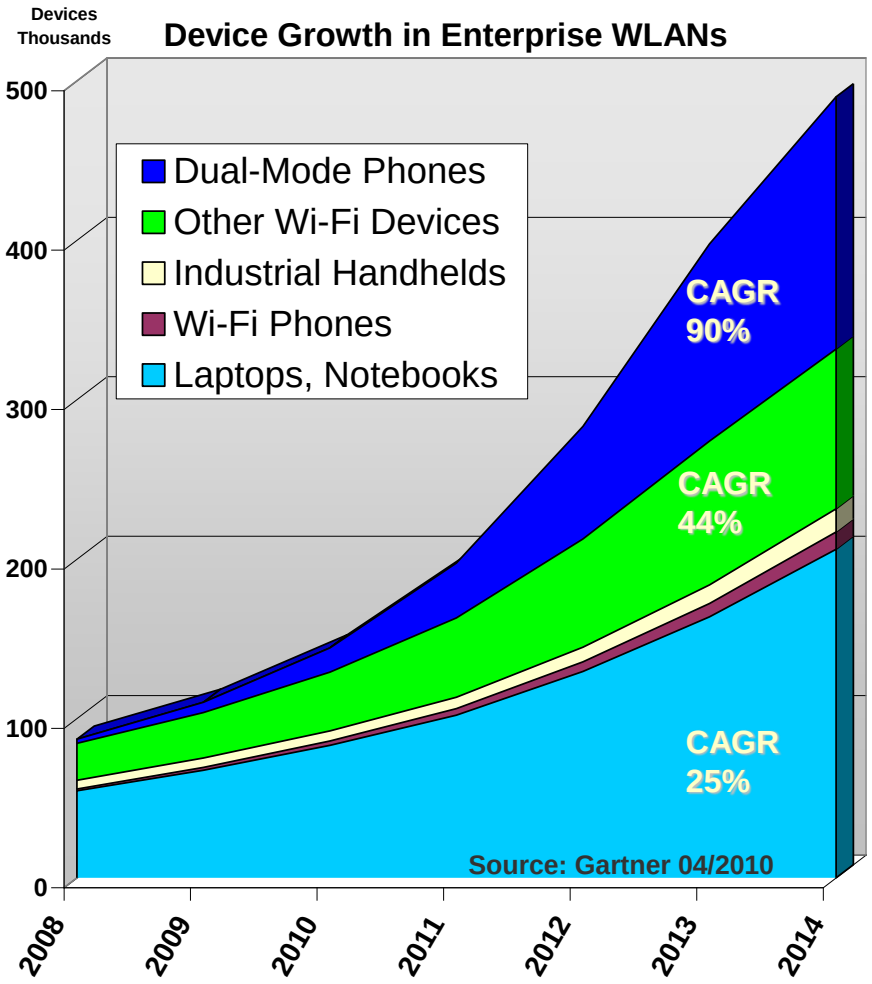
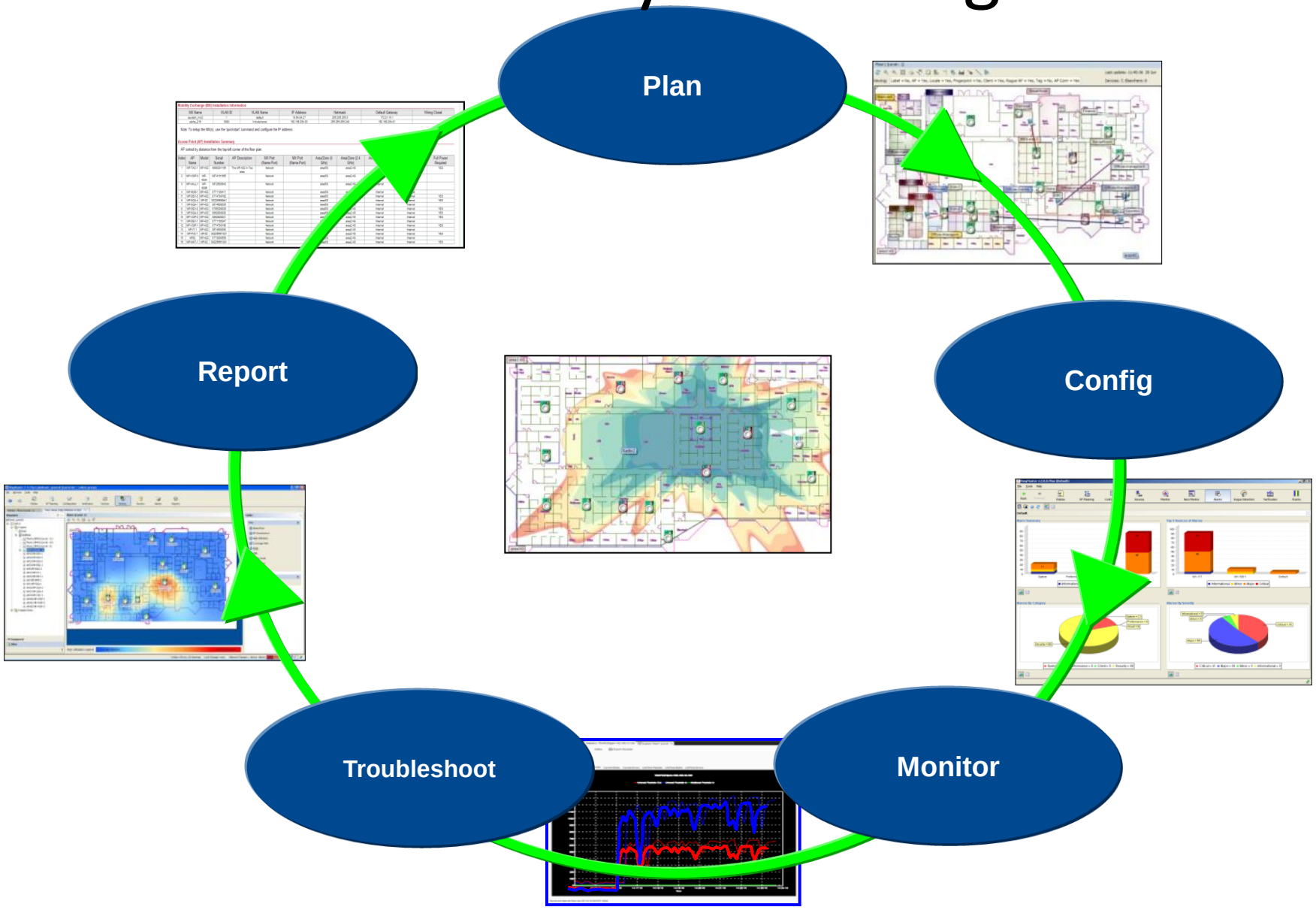
WLAN devices are growing fast…



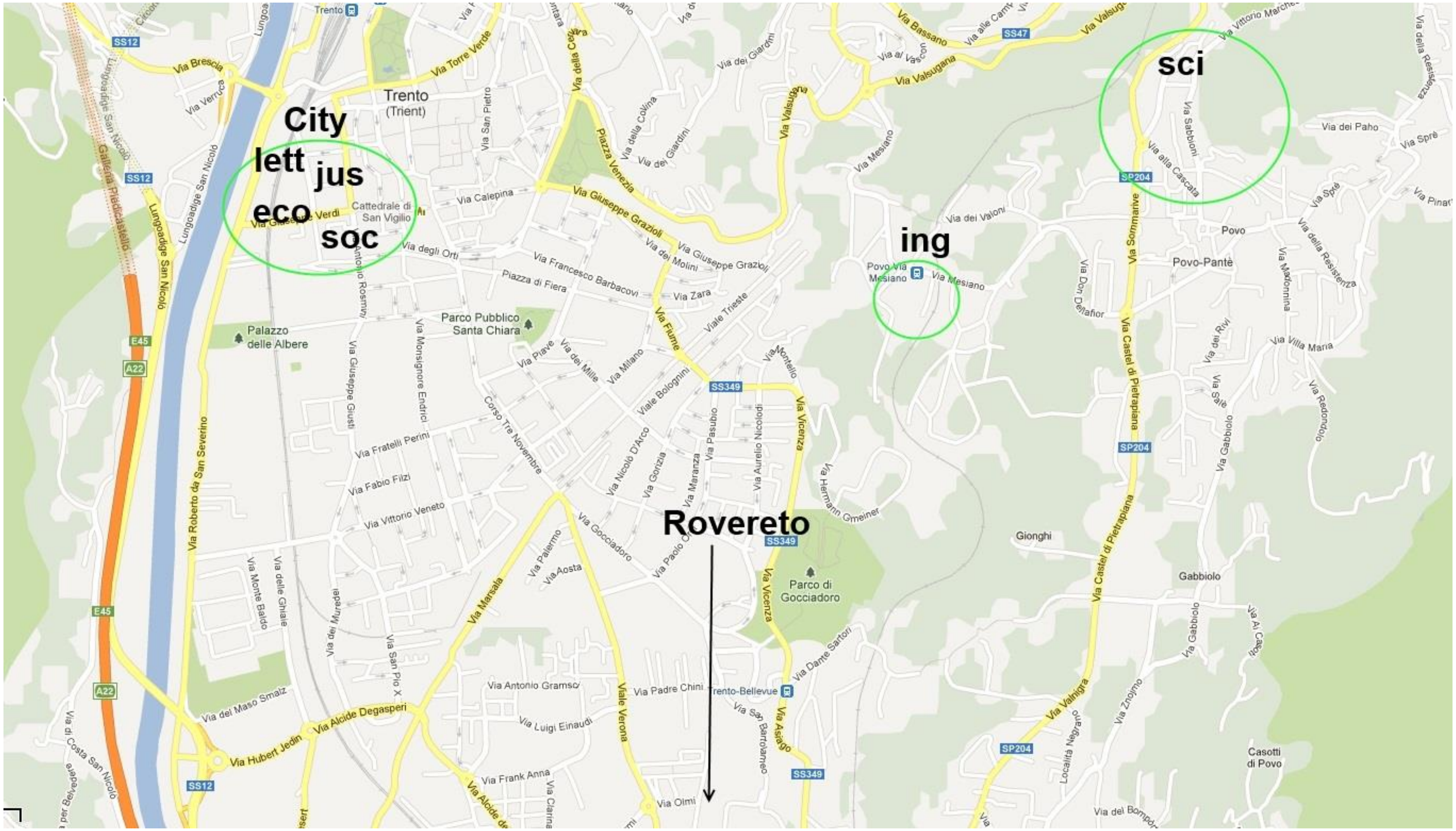
"Sales of smartphones… are set to outpace sales of desktop computers by 2012"

Reuters quoting Gartner March 2010

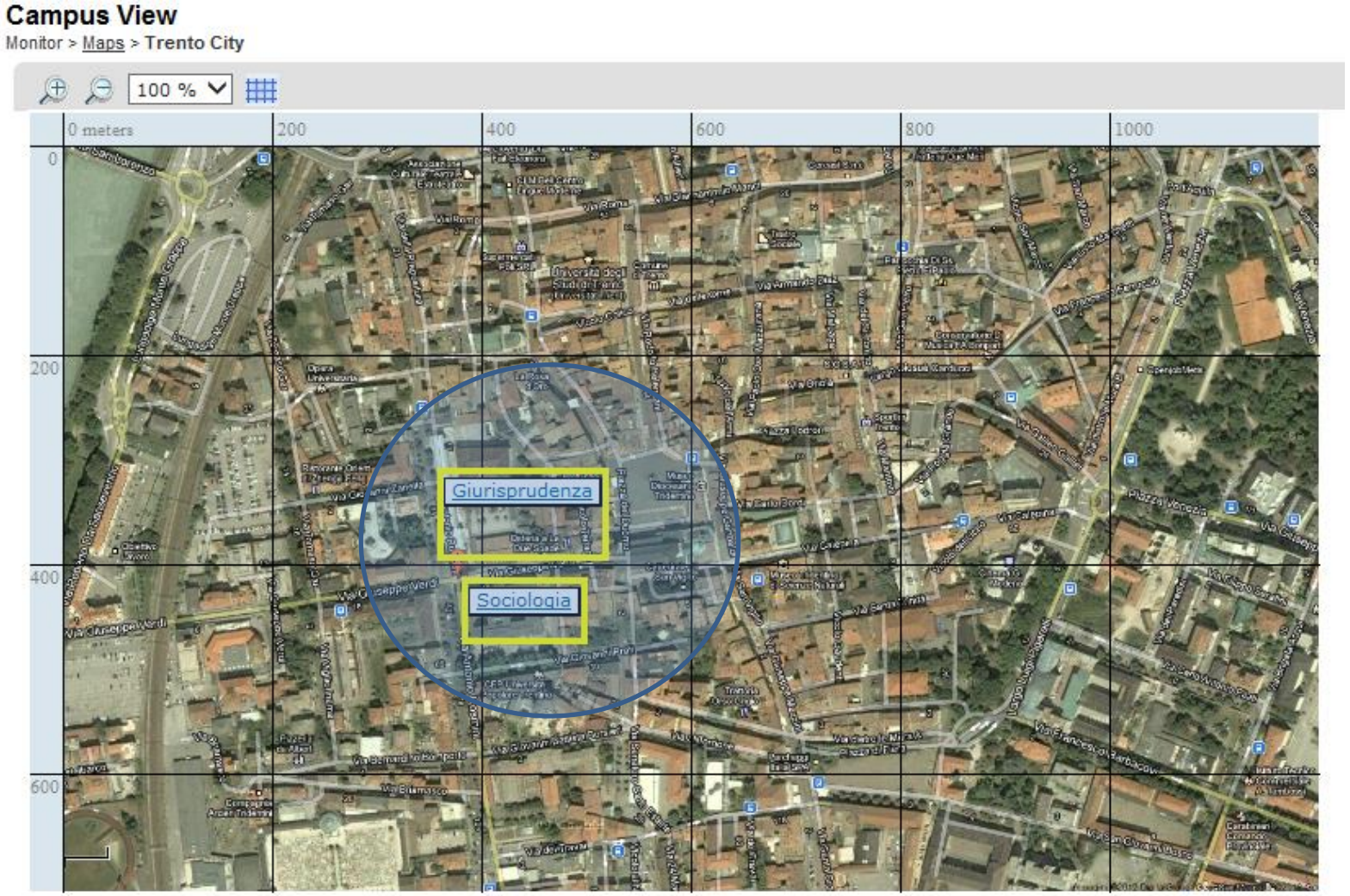
WLAN Full Life-Cycle Management



Large Wireless LAN Deployment UniTN - Campus View



Large Wireless LAN Deployment Buildings

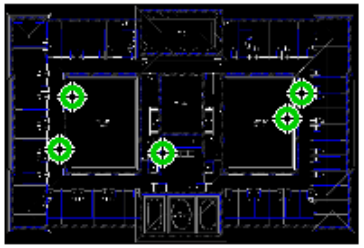


Large Wireless LAN Deployment
Floors with maps

Trento City

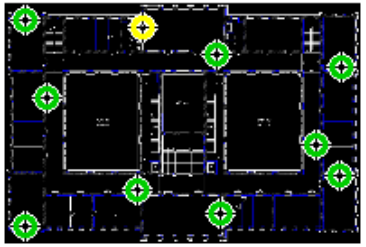
Floor	Map	Details

5



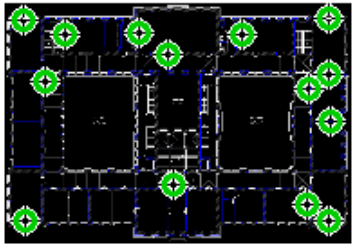
Floor Area	Terzo Piano (Sottotetto)	**Total APs**	5
Floor Index	5	**a/n Radios**	5
Contact		**b/g/n Radios**	5
Status		**Critical Radio Alarms**	0
a/n Clients	0	**b/g/n Clients**	1

4



Floor Area	Secondo Piano	**Total APs**	10
Floor Index	4	**a/n Radios**	10
Contact		**b/g/n Radios**	10
Status		**Critical Radio Alarms**	0
a/n Clients	0	**b/g/n Clients**	37

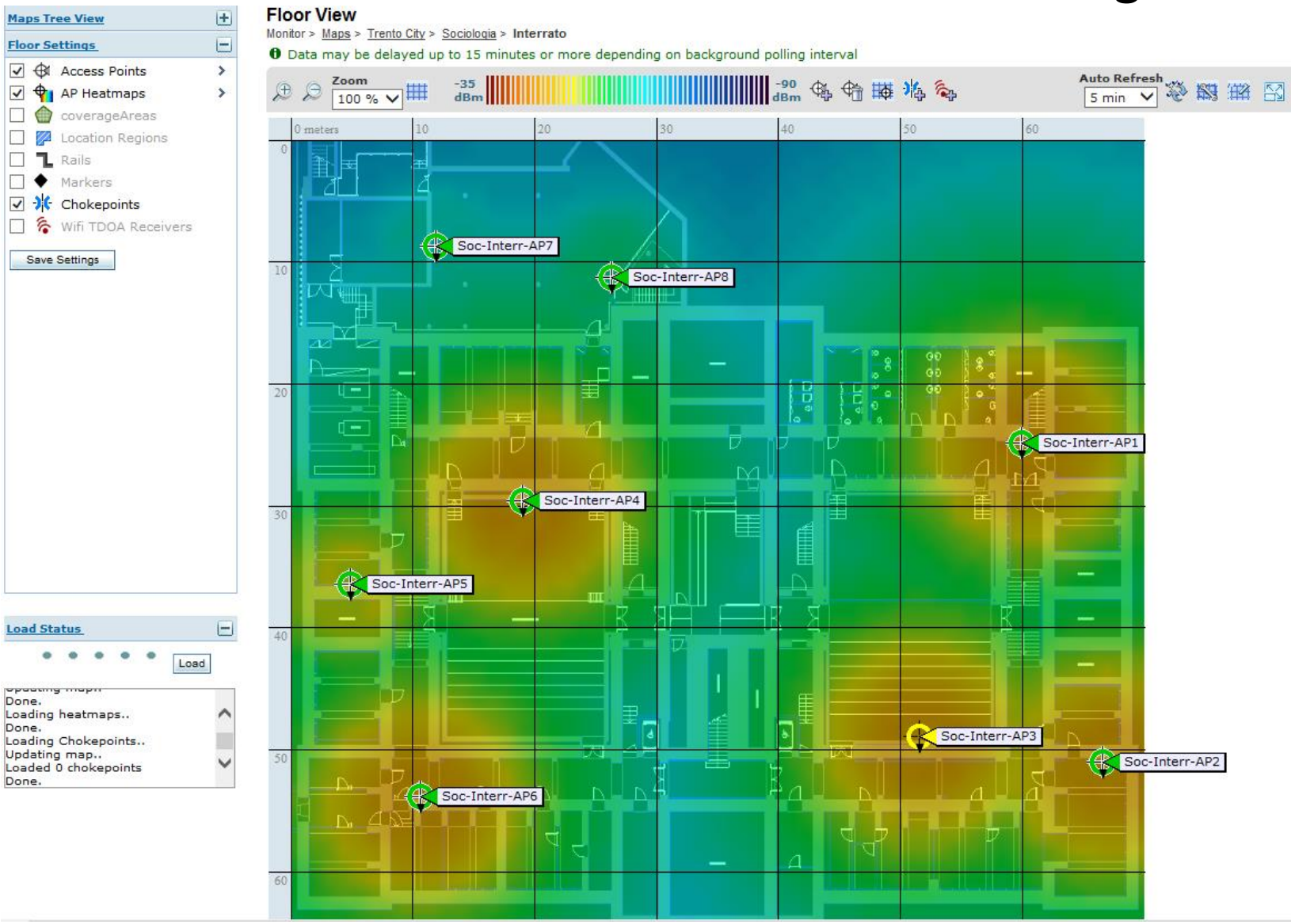
3



Floor Area	Primo Piano	**Total APs**	14
Floor Index	3	**a/n Radios**	14
Contact		**b/g/n Radios**	14
Status		**Critical Radio Alarms**	0
a/n Clients	0	**b/g/n Clients**	18

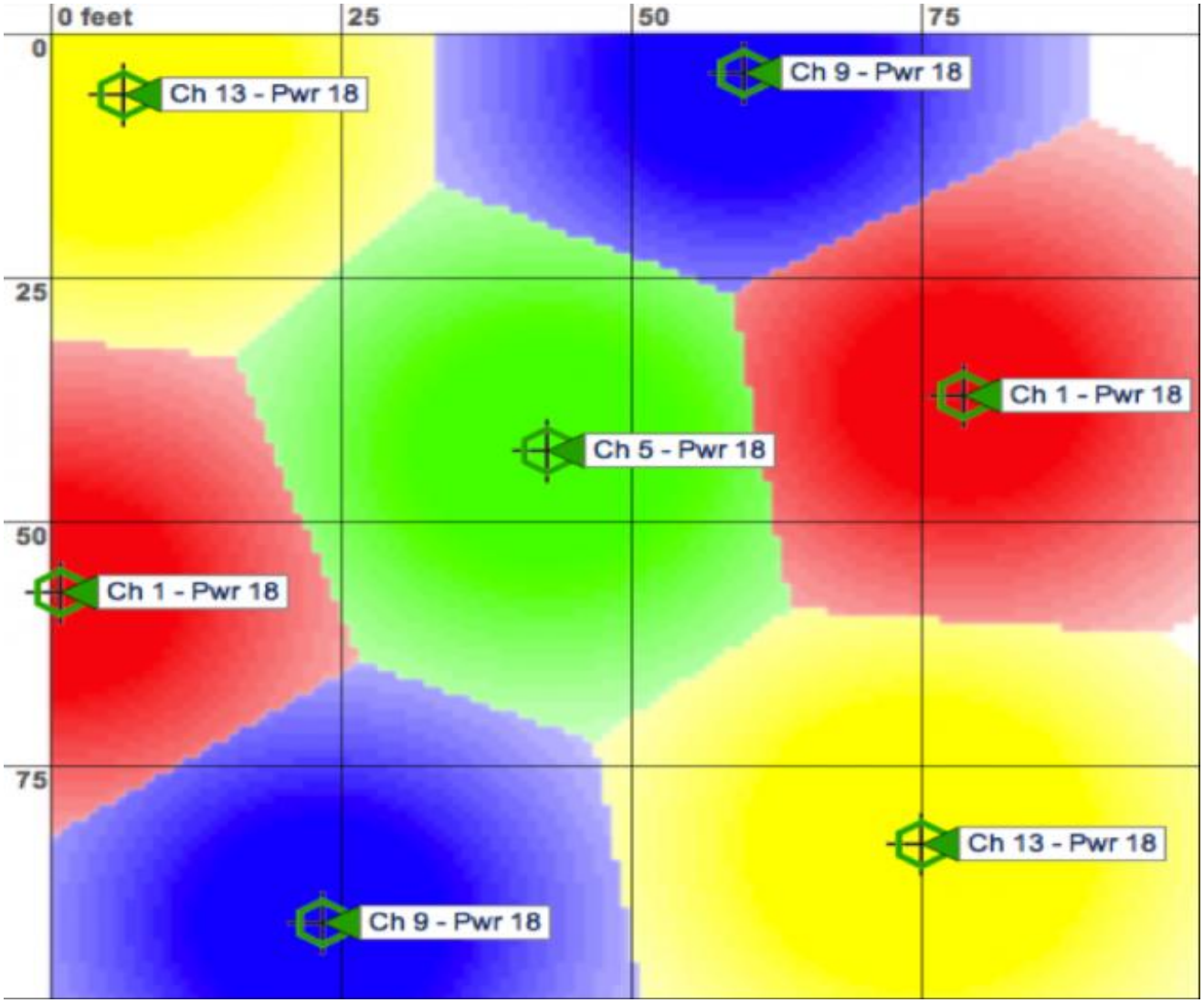
Large Wireless LAN Deployment

Floor View with estimated coverage



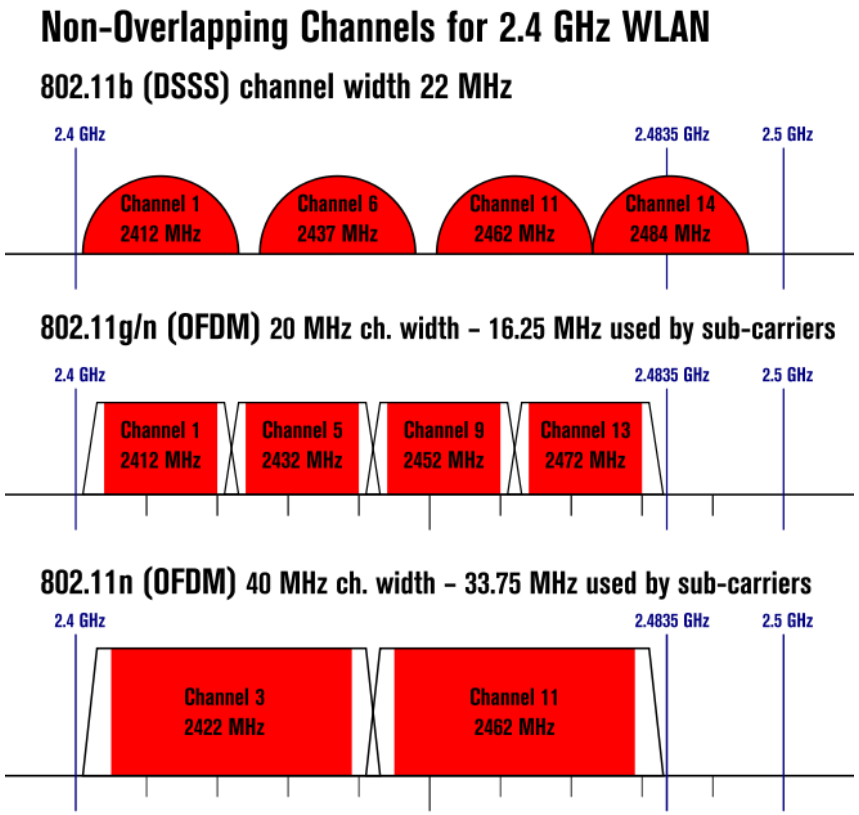
Wireless RF Planning
cells, coverage areas and channel allocation

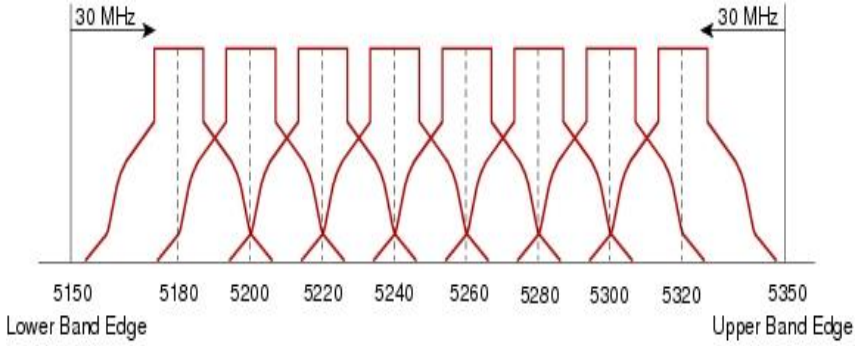
http://blogs.aerohive.com/blog/the-wireless-lan-training-blog/wifi-back-to-basics-24-ghz-channel-planning

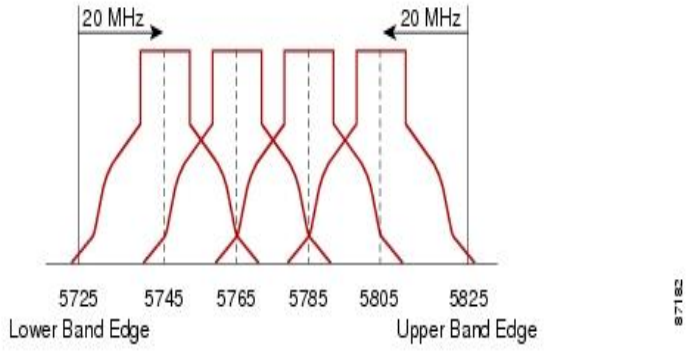


Non overlapping Channels

avoid co-channel interference





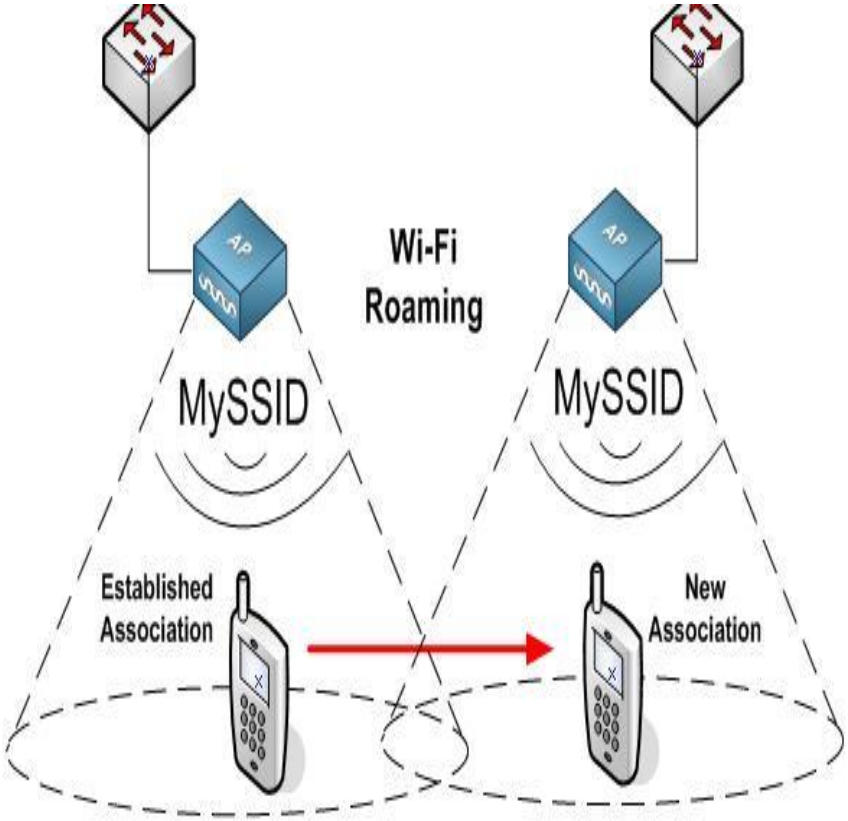


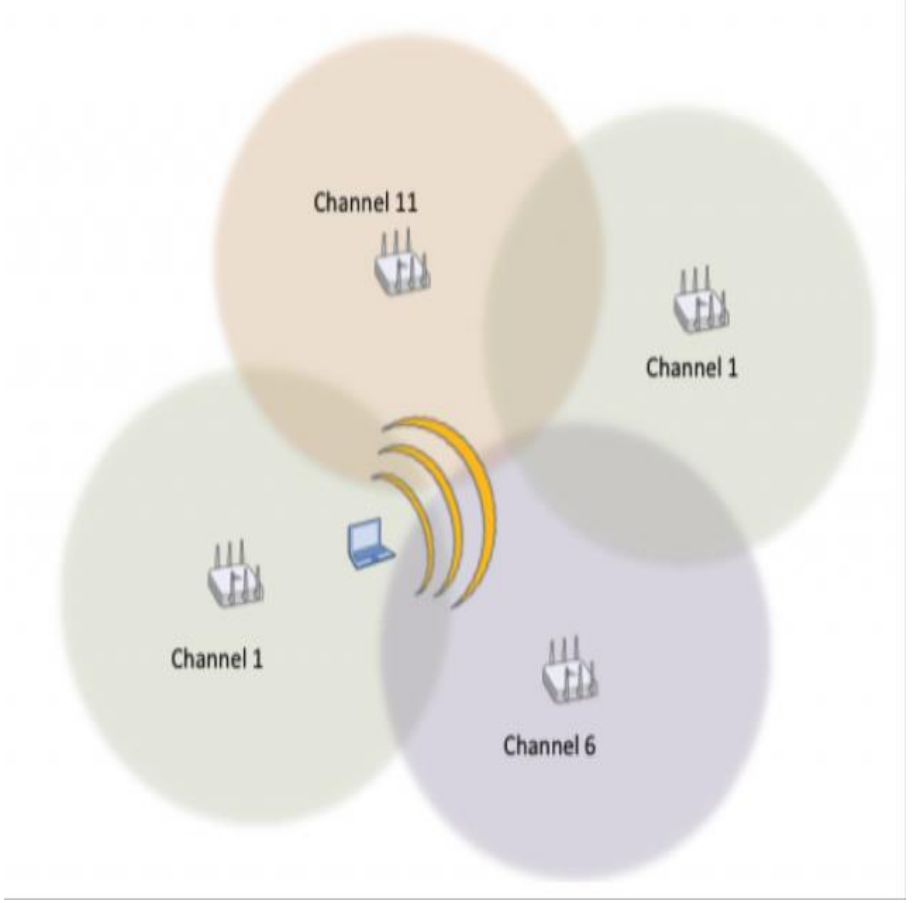
http://www.cisco.com/en/US/docs/solutions/Enterprise/Mobility/emob30dg/RFDesign.html#wp1000227

http://www.cisco.com/en/US/prod/collateral/wireless/ps9391/ps9393/ps9394/prod_white_paper0900aecd807395a9_ns736_Networking_Solutions_White_Paper.html

Wifi Roaming

the client decision





http://revolutionwifi.blogspot.it/2011/12/wi-fi-roaming-analysis-part-1.html

Centralized vs Distributed design

- The evolution of WiFi system architecture saw competition between centralized and distributed designs.
- In a centralized WiFi architecture, a controller is required to manage “dumb” access points (AP) whereas in a distributed WiFi architecture, no controller is required as the access points (AP) have “intelligence” built-in.

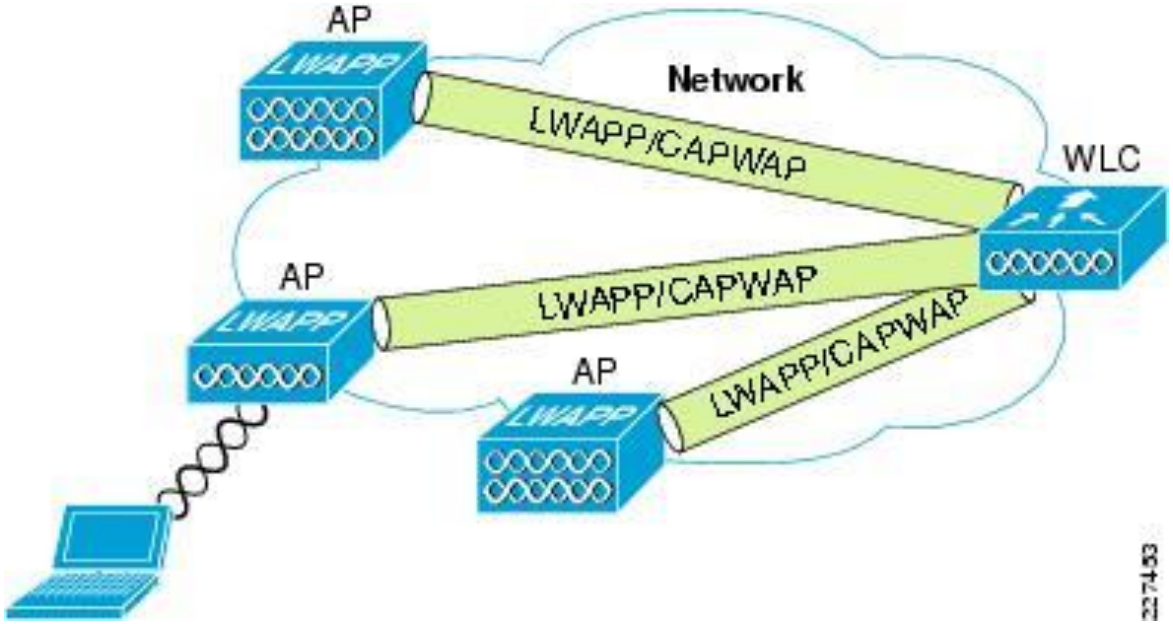
So which is better?

- It all depends on which approach is able to meet the most of the requirements of its intended functionality.
- The main advantage of a centralized architecture over a distributed architecture is the ability to manage multiple APs from a single point of control. This is extremely helpful especially when one has to manage hundreds of access points. Installation can be done quickly by simply plugging “dumb” access points without configuring them beforehand (assuming DHCP IP address are assigned). Network administrators can then at a later stage configure them all at one time. This simplifies the installation process compared to deploying “intelligent” APs whereby network administrator has to configure them one by one.

- A single point of management for hundreds of APs does sound good but what if this single point can also be a single point of failure. This single point of failure can bring down the entire wireless network while a single AP failure in a distributed environment will not impact the rest of the network. Centralized architecture also poses scalability issue whereby adding a new AP may require an additional controller if the existing controller’s capacity limit is reached. Without a centralized environment, “intelligent” APs can be added to the network with no consideration of a controller’s limit. Deploying wireless APs in a distributed manner has other advantages too. By having the “intelligence” built into the APs, features like Quality-of-Service (QoS) and access control policies can be enforced on the “edge” of the network instead of routing the traffic back to a controller, reducing any chance of delay and jitter introduction to the traffic.

CAPWAP/LWAPP Protocols

- based on LWAPP (Lightweight Access Point Protocol)
- differentiates between Control Traffic & Data Traffic
  - control traffic for configuration management and device management
  - (DTLS) tunnel establishment between Controller and AP for control traffic
  - unencrypted data channel



CAPWAP Protocol

- Control And Provisioning of Wireless Access Points
- protocol specification is described in RFC 5415 and RFC 5416
- based on LWAPP (Lightweight Access Point Protocol).
- Lightweight Aps
- OpenSource basic implementation:

  http://open-capwap.sourceforge.net/

Enterprise-grade Access Points (Juniper)

- **Access Point Family**
  - *High performance*
  - *Indoor or outdoor*
  - *Mesh & Local Switching*

WLA371
Single Radio
Low Cost AP

WLA422
Dual Radio
(Plenum)

WLA522/522E
802.11n
2x2 MIMO
Dual Radio
Best fit for High Density Deployments

WLA432
3x3 MIMO
Dual Radio
Best fit for Larger Coverage Radius Deployments

WLA632
802.11n
3x3 MIMO
Dual Radio
Rugged Package

Functionality

Indoor 802.11a/b/g APs

Indoor 802.11n APs

Outdoor AP

Note: WLA Series formerly known as Mobility Point (MP) starting Feb 2011

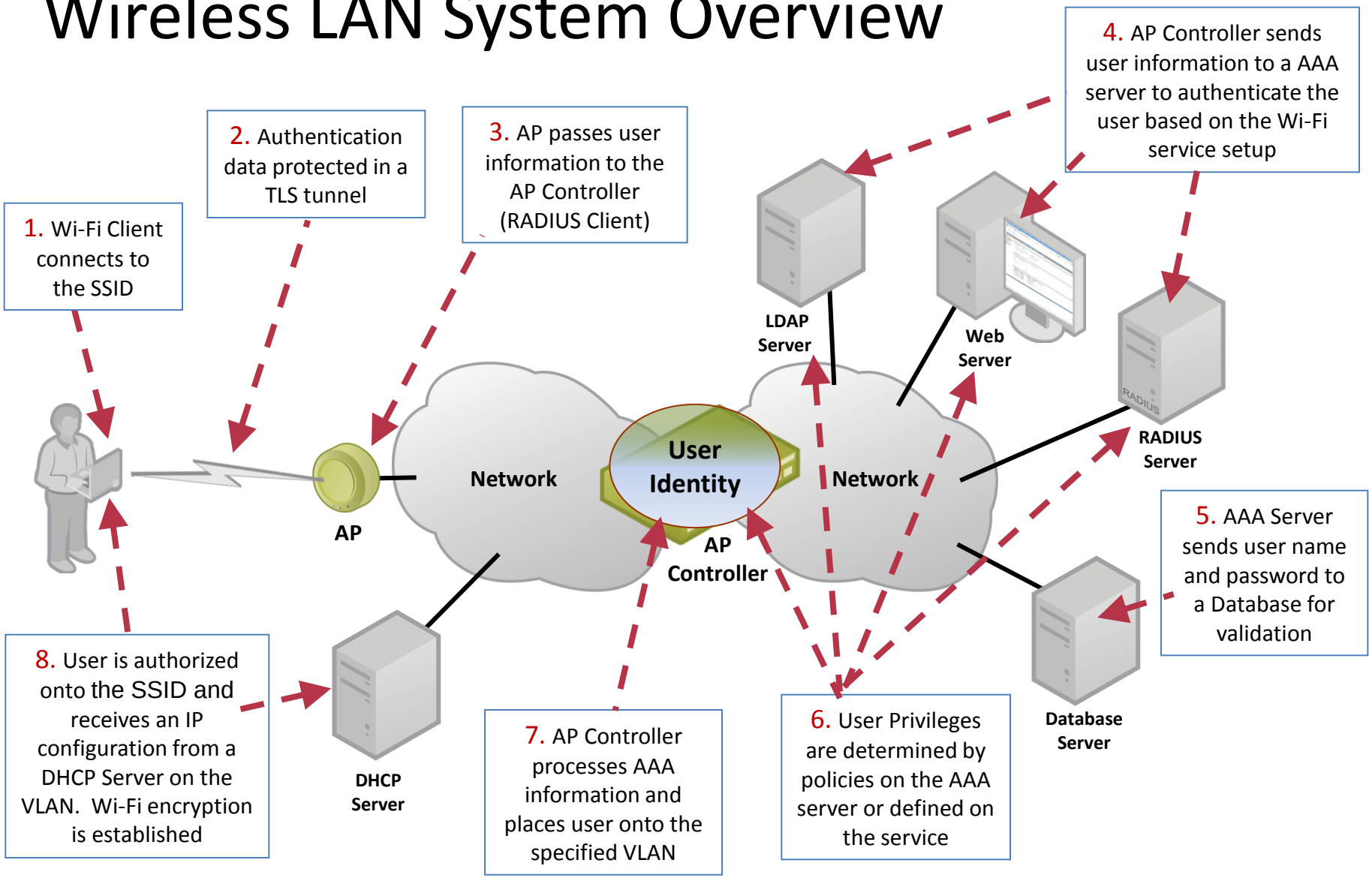
Access Point Comparison

Model	Form Factor	Radios	Ethernet Ports	Antennas	Advanced Features
WLA371 (a/b/g)	Smoke Detector	1 (2.4GHz or 5GHz)	2 (10/100Mbps, 802.3af)	▪ Internal diversity ▪ External (SMA)	
WLA422B (a/b/g)	Smoke Detector	2	2 (10/100Mbps, 802.3af)	▪ Internal diversity ▪ External (RP-SMA)	▪ Mesh ▪ Distributed forwarding
WLA522 (a/b/g/n)	Low Profile / Smoke Detector (non-Plenum)	2	1 (GigE, 802.3af)	▪ Internal diversity ▪ External (AP522E RP-SMA)	▪ Mesh ▪ Distributed forwarding ▪ Spectrum-ready
WLA432 (a/b/g/n)	Smoke Detector (Plenum)	2	2 (GigE, 802.3af/af+/at)	▪ Internal diversity	▪ Mesh ▪ Distributed forwarding
WLA632 (a/b/g/n)	Ruggedized Weatherproof Casing	2	1 (GigE, 802.3af+/at, waterproofed)	▪ External (N-type)	▪ Mesh ▪ Distributed forwarding

802.11n summary

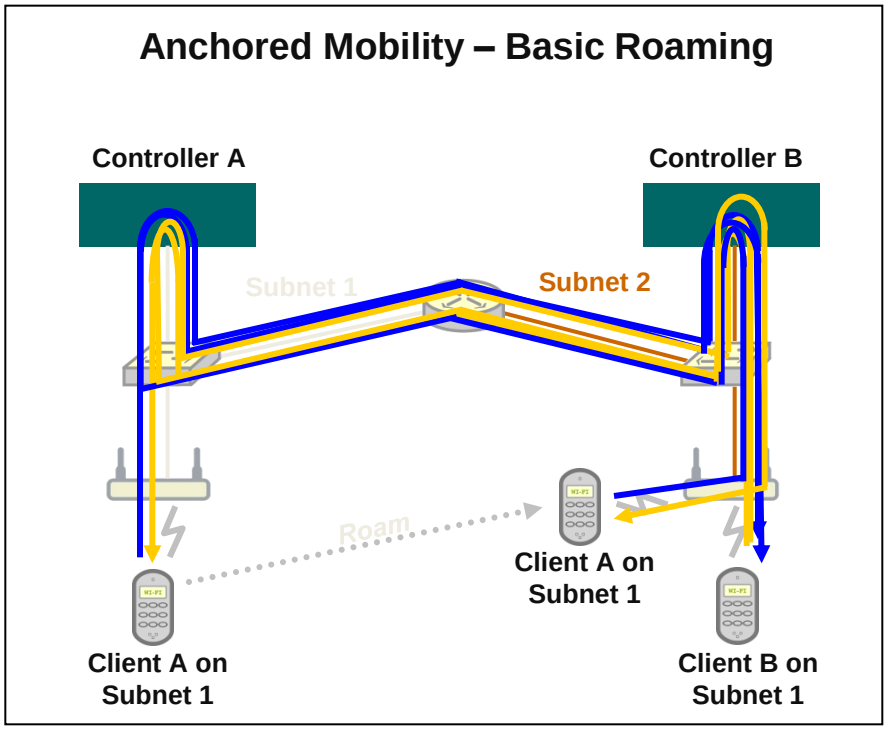
	Antennas (Tx*Rx)	Spatial Streams	Maximum Link Speed	Band Support
Single Stream	1 x 1	1	72 Mbps	2.4
Dual Stream	1 x 2	2	150 Mbps	2.4
Dual Stream	2 x 2	2	150 Mbps	2.4
Dual Stream	2 x 3	2	150 Mbps	2.4
Dual Stream	2 x 2	2	300 Mbps	2.4 & 5
Dual Stream	2 x 3	2	300 Mbps	2.4 & 5
Multi Stream	3 x 3	3	450 Mbps	2.4 & 5

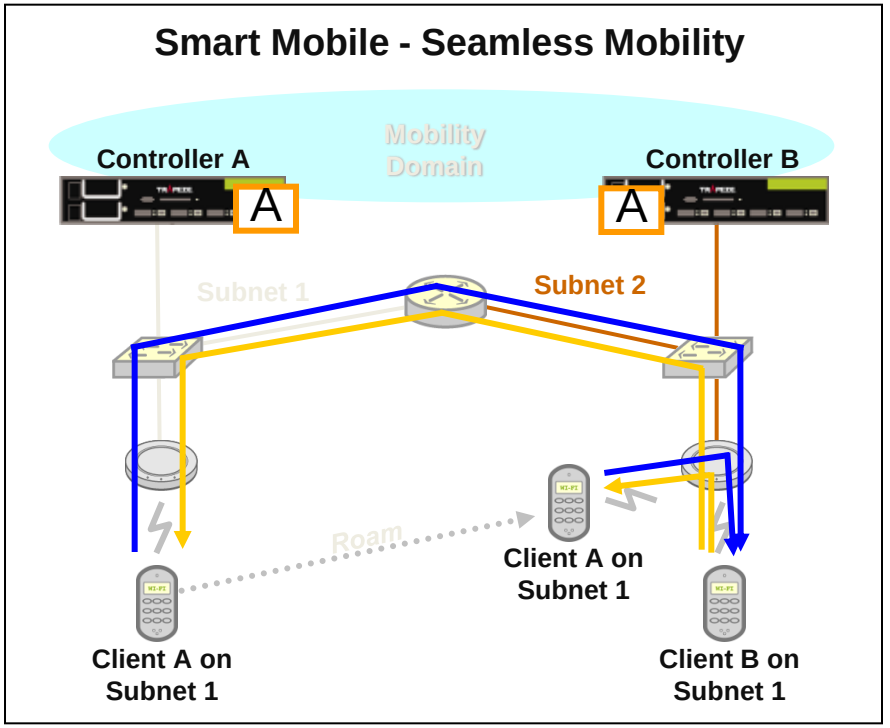
Wireless LAN System Overview



Local Switching Improved Performance

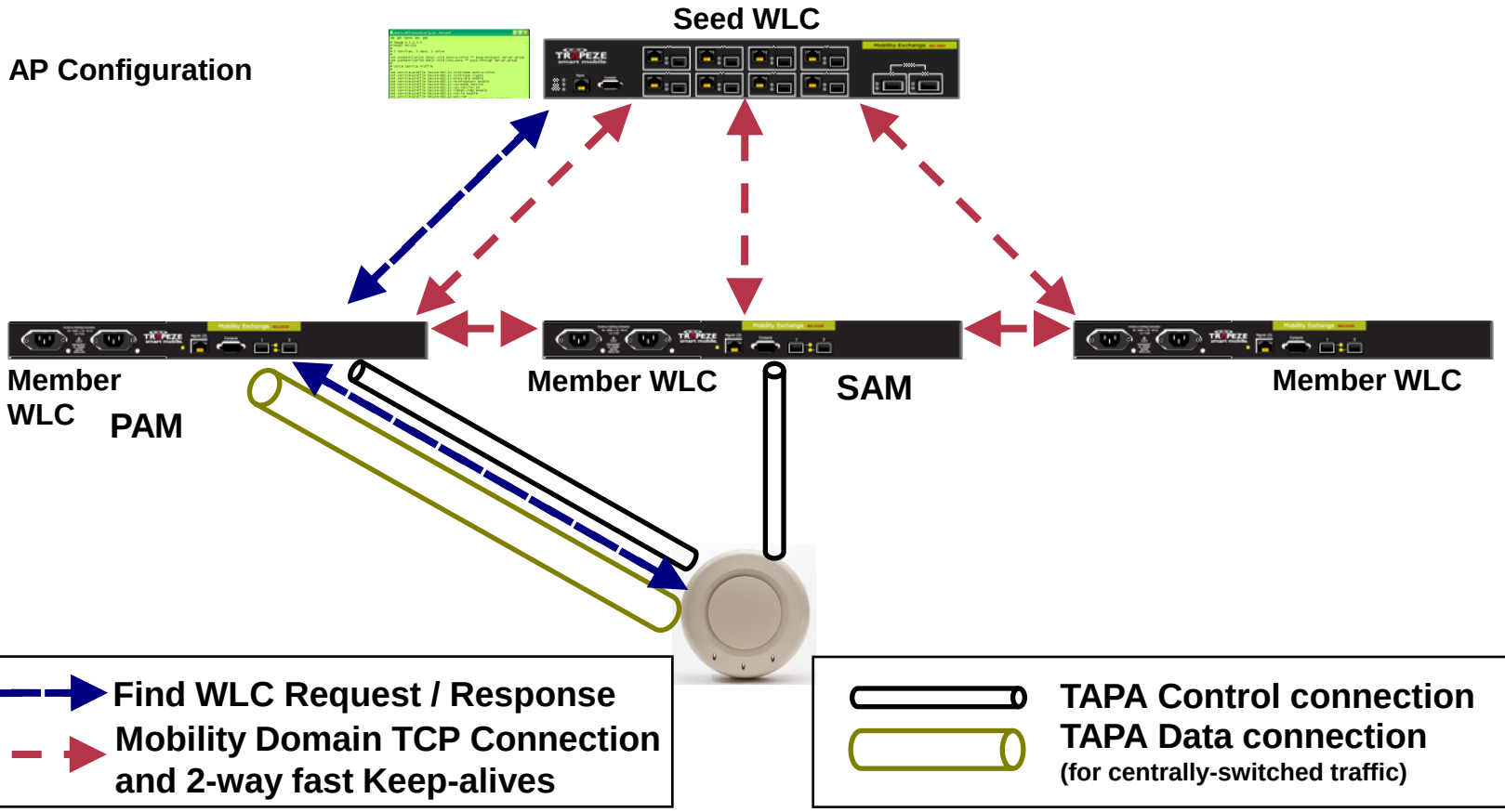
- centralized management
- distributed switching





Cluster AP Boot Process (how it works)
plug'n play AP deployment

1. The *'Find WLC'* message is forwarded to the Seed WLC, which then:
   - Specifies a cluster member WLC to be the *'Primary AP Manager'* (PAM)
   - Specifies a cluster member WLC to be the *'Secondary AP Manager'* (SAM)
2. AP configuration settings are distributed to both PAM and SAM



Cluster AP Boot Process

3. Primary and back-up TAPA control connections established by the AP and maintained to allow a hitless failover if necessary