Wi-Fi Trek Technical Recap

Webinar Begins at 1 PM EST

@CWNP
@carpentertom

#CWNPwebinar

Wi-Fi Trek
Orlando

October 8-10 · CWNP Training Classes
October 11-13 · Conference
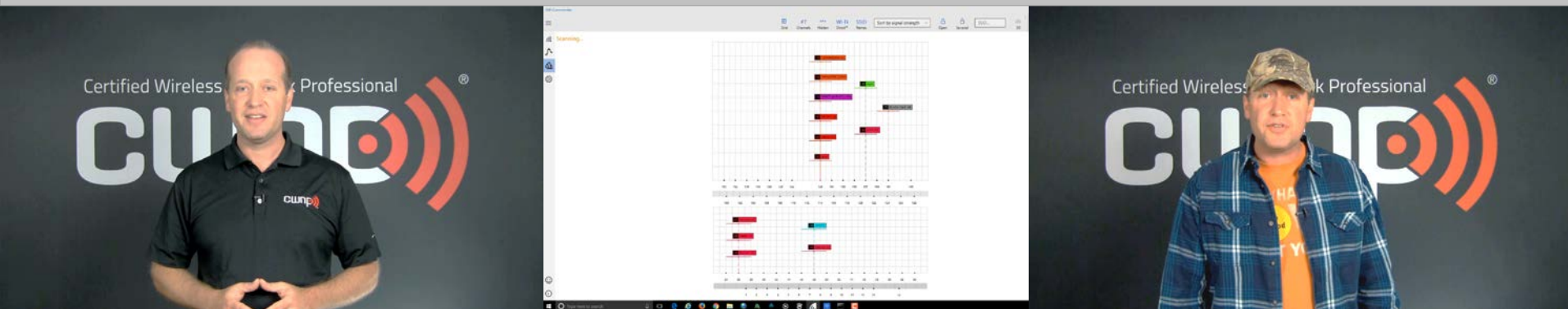
cwnp)) | Certified Wireless
Network Professional

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CWNP News

- CWS (Certified Wireless Specialist) and CWT (Certified Wireless Technician) release date: December 1, 2017

- CWAP/CWDP both being updated during first half of 2018
  - Refocus of technical content
  - Recreation of materials (exam, courseware, study guides, elearning)

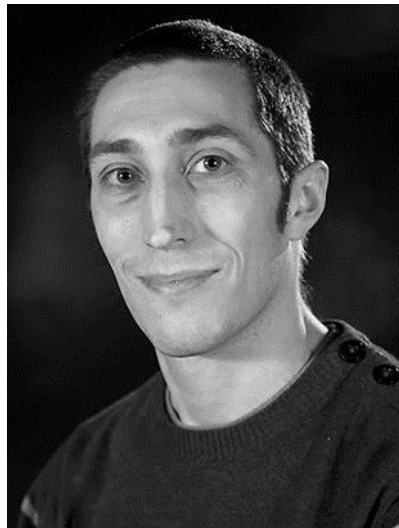## CWS eLearning Teaser

Pre-Conference Training

CWNA
Tom Carpenter
CWNE
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CWSP
Robert Bartz
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CWNA
Peter Mackenzie
CWNE
@MackenzieWiFi

CWDP
Keith Parsons
CWNE
@KeithRParsons

Certified Wireless Network Professional

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Glenn Cate: Data Rates

- The speed at which bits are transferred across the wireless medium
  - The rate of the modulated bits
  - Not the rate of TCP or UDP throughput
- Data rate is constrained by the capabilities of the client/AP and the signal quality
- Actual throughput is constrained by wired capacity, wireless medium time available and network service utilization

Protocol	Frequency	Signal	Maximum data rate
Legacy 802.11	2.4 GHz	FHSS or DSSS	2 Mbps
802.11a	5 GHz	OFDM	54 Mbps
802.11b	2.4 GHz	HR-DSSS	11 Mbps
802.11g	2.4 GHz	OFDM	54 Mbps
802.11n	2.4 or 5 GHz	OFDM	600 Mbps
802.11ac	5 GHz	256-QAM	1.3 Gbps
802.11ax	2.4 or 5 GHz	1024-QAM	9.6 Gbps

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Jerry Olla: Wi-Fi Engineer's Toolkit Reinvented

Tablet or Laptop Device
- Light weight
- Touch screen
- All-day battery life

All-in-one Measurement Device
- Battery powered
- Built-in spectrum analyzer
- Single cable connection

Common Method

Laptop

Something to attach the USB hub

USB Hub

Multiple Wi-Fi Adapters

Cables

Spectrum Analyzer
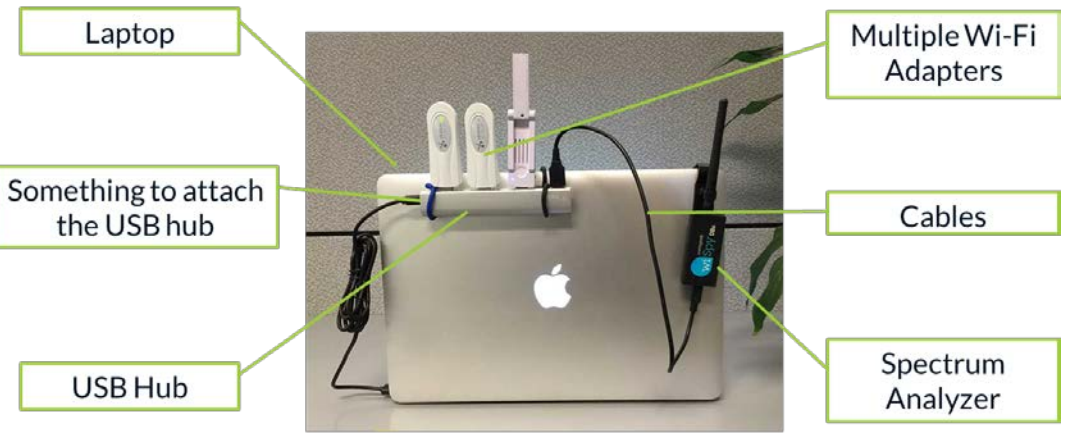
Ekahau Sidekick™ Method

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Kimberly Graves: Aruba AOS 8.x

- Clustering
  - Controller and AP Redundancy
  - AP and Client Load Balancing
  - Client Mobility and seamless roaming
- Cluster Roles
- Cluster upgrade
  - Loadable Service Modules
  - Apps upgrade without firmware upgrade
  - No reboot required

1 Active AP Anchor Controller (A-AAC)

2 Active User Anchor Controller (A-UAC)

3 Standby AAC   (S-AAC)

4 Standby UAC   (S-UAC)

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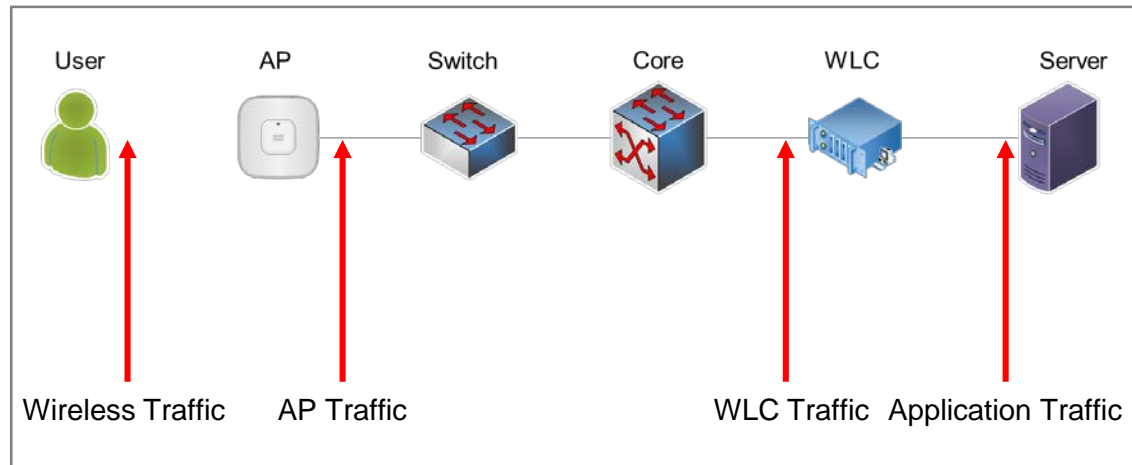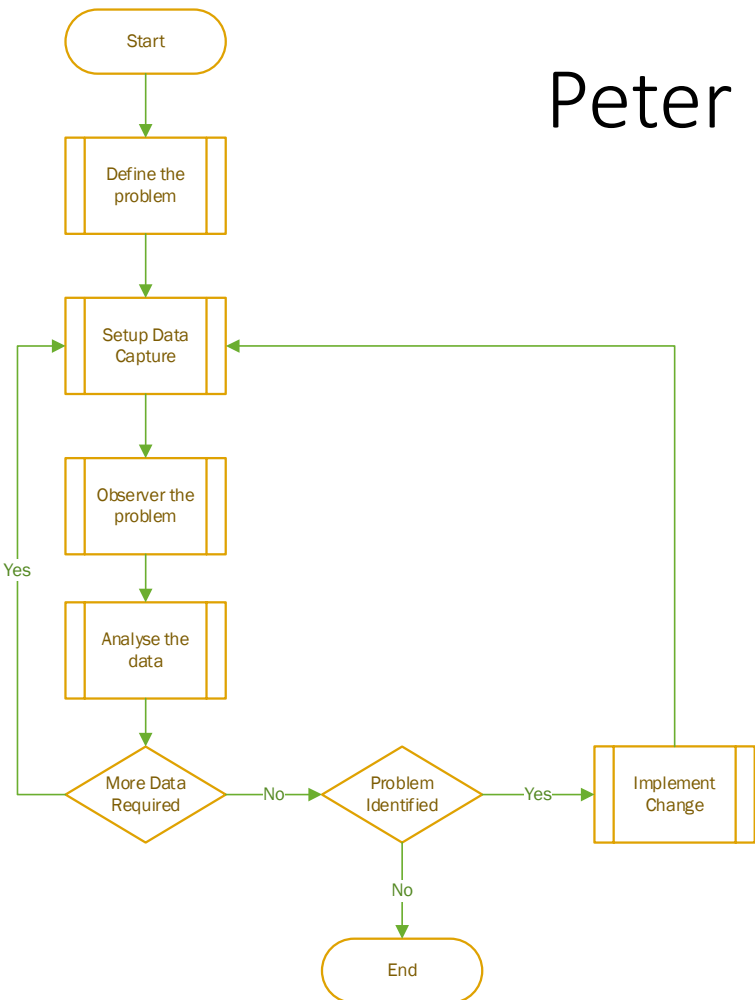# Heather Williams: **black hat** Wireless

- 2 GB backhaul
- Ruckus APs and Switches
- SLAs
  - Don't get hacked
  - Five 9s all the time
  - Co-existing with other Wi-Fi networks
- Network details
  - 500,000 unique MACs
  - 80% Apple
  - 10,000 BSSIDs
  - 17% mobile hotspots

Heather "Mo" Williams

Peter Mackenzie: Real-World Analysis

- Make no assumptions
- Talk to the end users
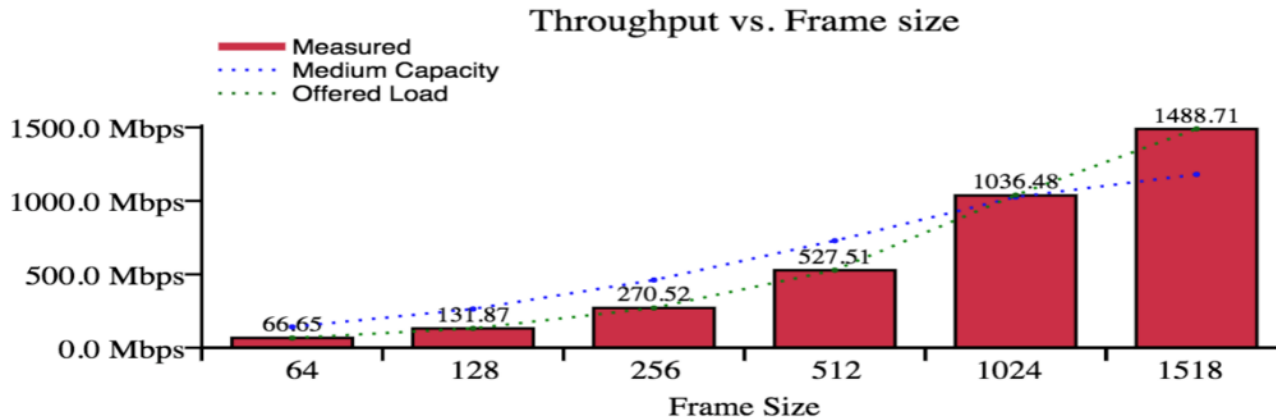- What, Who, Where, When?

Christian Estes: Site Survey and High-Density

- 18% misconfiguration
- 3% defects
- 79% poor RF design
  - 67% didn't perform a pre-deployment survey of any kind
  - 12% performed only a predictive survey
- Common errant assumption: clients that "see" a good signal strength from the AP can transmit at the highest possible data rate

Ravi Kiran Gundu: Wi-Fi Don't Let Me Down

- Typical throughput from a 4X4 AP configured at 80MHz with 10 synthetic clients.

- Downstream UDP traffic.

- Lab reports have indicated that with addition of 10 clients, the performance drops 3-5%.

Throughput vs. Frame size

Legend:
- Measured
- Medium Capacity
- Offered Load

Frame Size	Measured (Mbps)
64	66.65
128	131.87
256	270.52
512	527.51
1024	1036.48
1518	1488.71

Tom Carpenter: Wi-Fi Channel Access Models

"How long should I wait for an ACK before I assume the frame was not delivered?" asked the client device.

The 802.11 standard responds, "I have a formula for that."

```
RxPhyStartDelay (from 20 microseconds to 192)
How long to wait for an ack
    SIFS + SLOT + RxPHYStartDelay
    Don't receive it in that time? Failed.

Slot times
    DSSS and HR/DSSS — 20 microseconds
    OFDM — 9 microseconds
    ERP — 9 or 20 microseconds
    HT — 9 or 20 microseconds
    VHT — 9 microseconds

SIFS times
    DSSS and HR/DSSS — 10 microseconds
    OFDM — 16 microseconds
    ERP  — 10 microseconds
    HT — 10 (2.4 GHz) or 16 (5 GHz) microseconds
    VHT — 16 microseconds

DIFS = SIFS + 2 x SLOT
AIFS = AIFSN x SLOT + SIFS
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Keith R. Parsons: WLANs May Be Counter-Intuitive

- Common misconceptions
  - The latest wireless driver is all you need to fix the problem
  - The wireless network is responsible for clients deciding to roam
  - PoE is just PoE – they're all the same
  - APs are like wireless switches
  - -90 dBm is stronger than -40 dBm
  - If you point your antenna right at the signal source or receiver it will work better
  - Using wireless range extenders will share our throughput more

Alexandra Gates: The Power of 5 GHz

- In 2.4 GHz, channels 1, 6, and 11 are really all you've got

- 25 channels are in 5 GHz and 8-9 of them can be used practically everywhere with no other DFS

- Many are now recommending design for coverage in 2.4 GHz and capacity in 5 GHz

  - Tom: I don't fully accept this recommendation. We should design 2.4 GHz as best as we possibly can for the capacity we need.
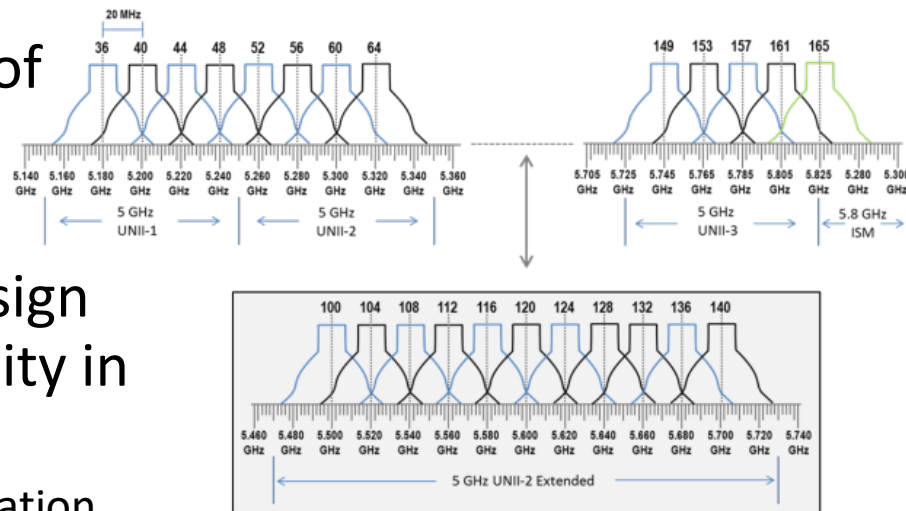
Jaromir Likavec: Security Challenges in R&D Environments

- High security requirements

- Private and corporate equipment

- Need for BYOD and remote access

- New uses cases constantly

| Users	Mobile Devices	Permissions
Trusted user	Trusted Device	Full Access
Trusted User	Untrusted Device	Limited Access
Untrusted User	Trusted Device	Limited Access
Untrusted User	Untrusted Device	No Access

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Luiz Eduardo Dos Santos: Enterprise Class Deployments for Hostile Environment Guest Access

- **No control over client devices**

- **802.1X introduces challenges**
  - RADIUS config
  - Endpoint compatibility
  - Certificate verification
  - Band allocation

John Imperial: Wireless Factors for Outdoor Environments

- Powering the APs or bridges
- Outdoor mesh deployments
- Fresnel zone analysis is hard
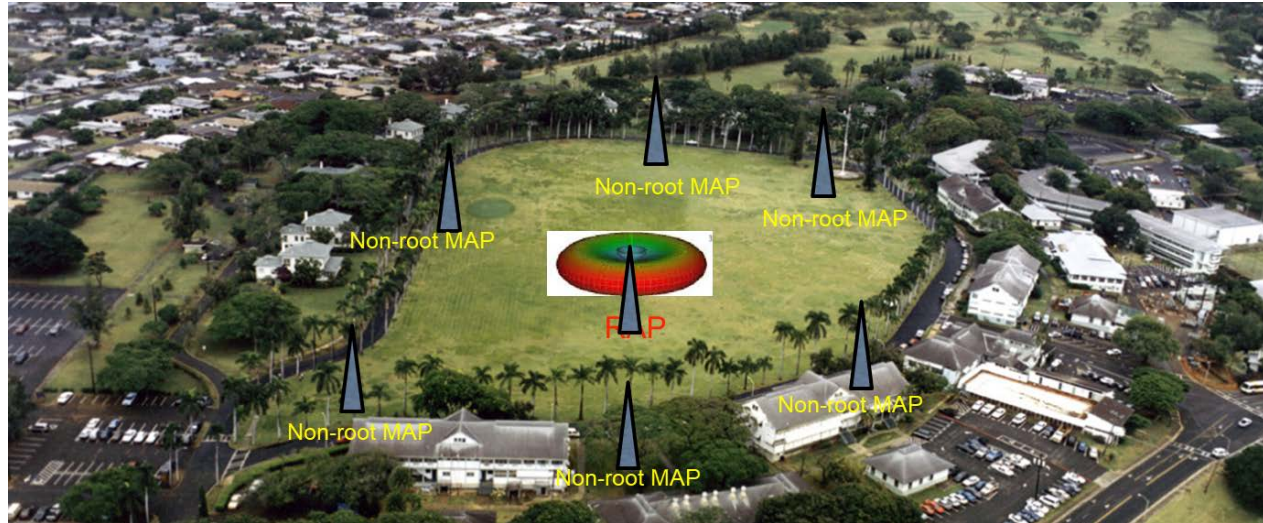
Bryan Harkins: Make Wi-Fi Great Again

- Site Surveys ---- Do them!
- Predictive Design
- Capacity Planning
- Application Planning
- Predicted Growth
- SSID Usage
- Use the strongest security possible
- Avoid the over populated 2.4 GHz space when possible
- Use channel bonding wisely in low density areas or not at all!
- Train the users and set proper user expectations
- Build around the capabilities of the clients and the environment