

# RSA® Conference 2015

San Francisco | April 20-24 | Moscone Center

SESSION ID: TECH-R02

## Six Things Security Professionals Need to Know About Wireless

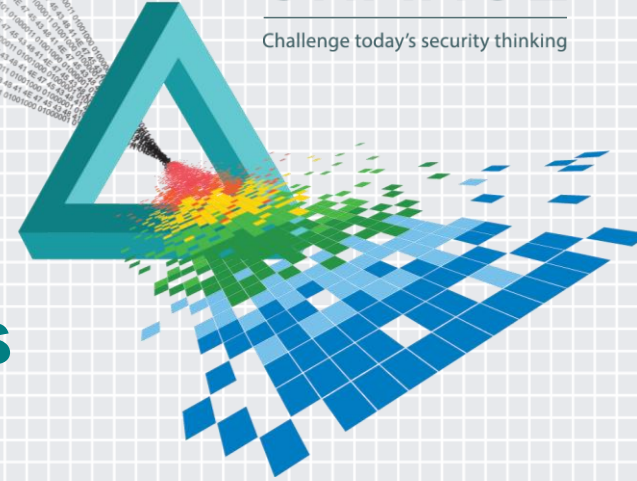
**Dr. Avril Salter, CCNP-W, CCNA-S**

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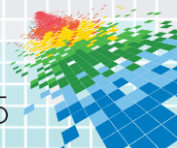
# CHANGE

Challenge today's security thinking



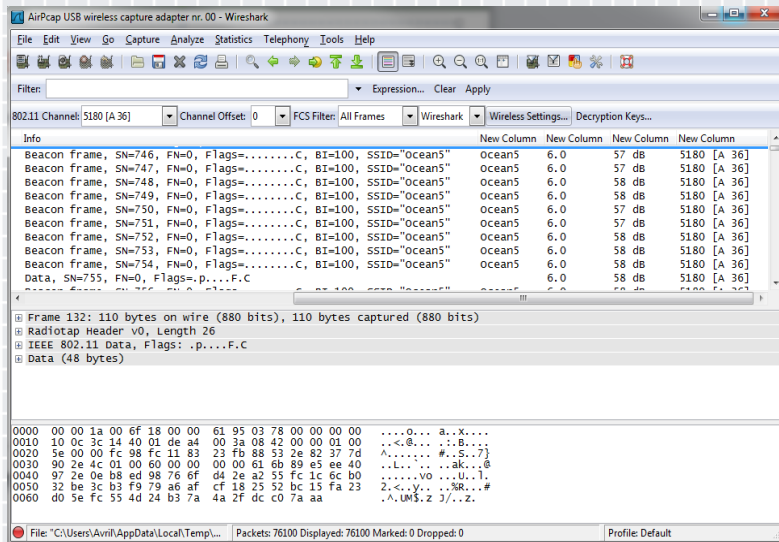
# What we are going to discuss

- ◆ New wireless mechanisms → Implication to analyzing wireless traffic and network security
- ◆ Illustrations are Wi-Fi → Concepts apply to Wi-Fi and mobile networks
- ◆ Wi-Fi operates in license-exempt spectrum  
Mobile networks operates in licensed spectrum → Regulations and laws on spectrum usage differ

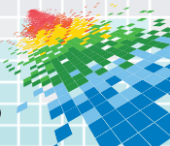


# Protocol and spectrum analyzers

## Protocol analyzer



## Spectrum Analyzer



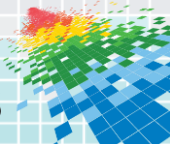
# Why you need both

## Packet Analyzer

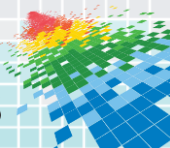
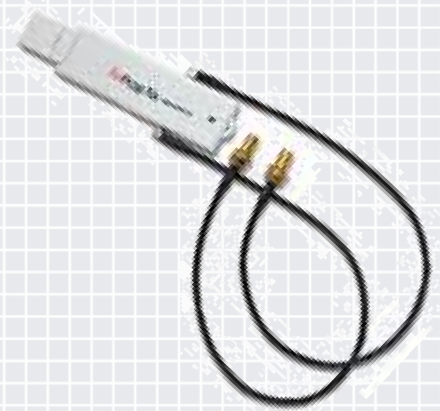
- ◆ Need to know what is on the network
- ◆ To see what exactly is going on with the network at a protocol level
- ◆ Inappropriate use of bandwidth
- ◆ Find potential intruders

## Spectrum Analyzer

- ◆ Need to know what is using the physical medium
- ◆ To see what is exactly going on with the network at the physical layer
- ◆ Find interference
- ◆ Find potential rogue devices

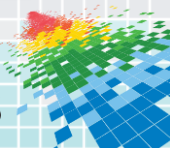


# Tools for analyzing traffic over-the-air

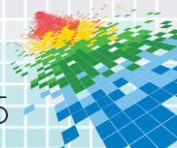
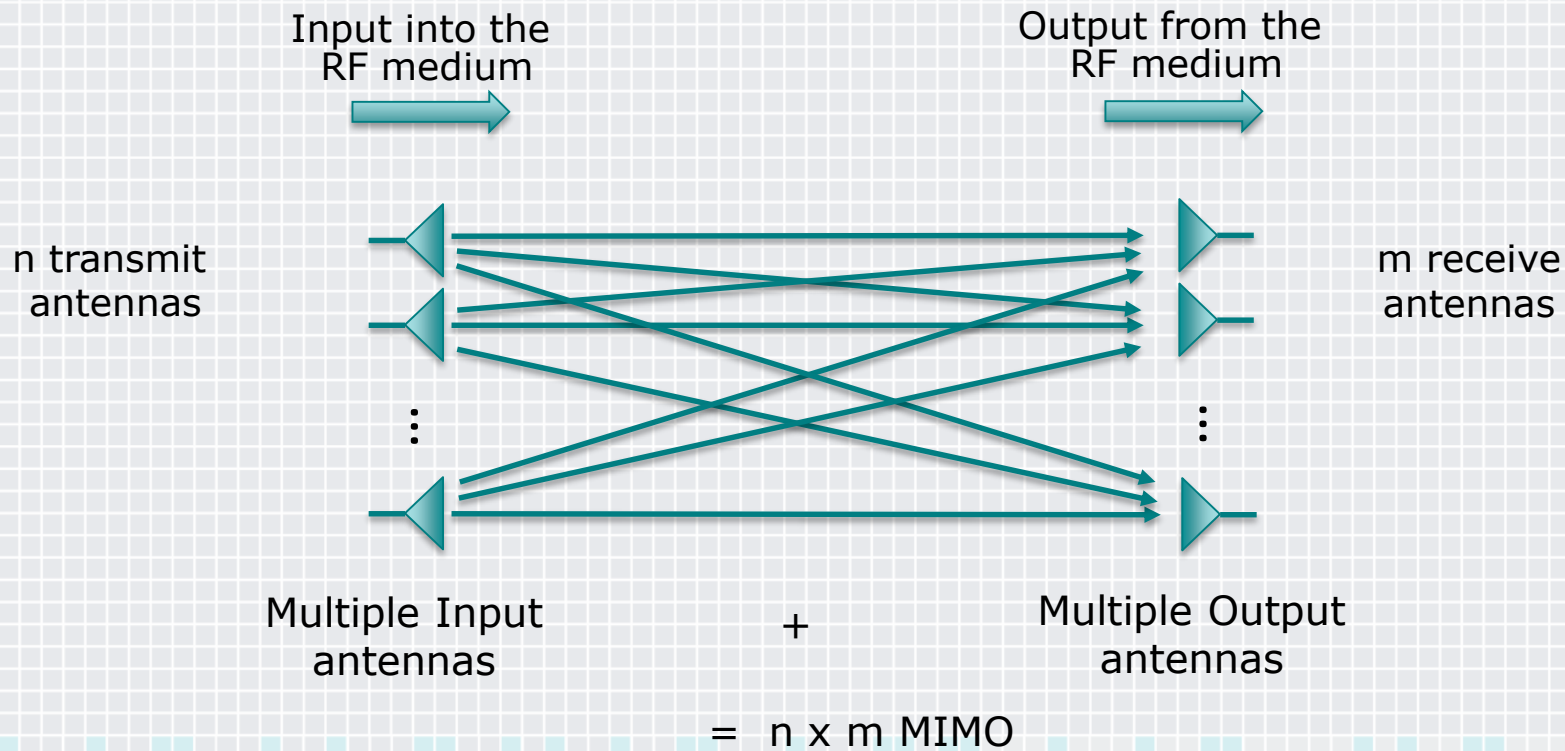


# Transition to MIMO

<b>Mechanism</b>	<b>Performance advantage</b>
Spatial Multiplexing	Higher data rates
Space Time Coding	Improves SNR - Coverage
Beamforming	Extends the range where higher data rates can be attained
Multi User-MIMO	Increases throughput

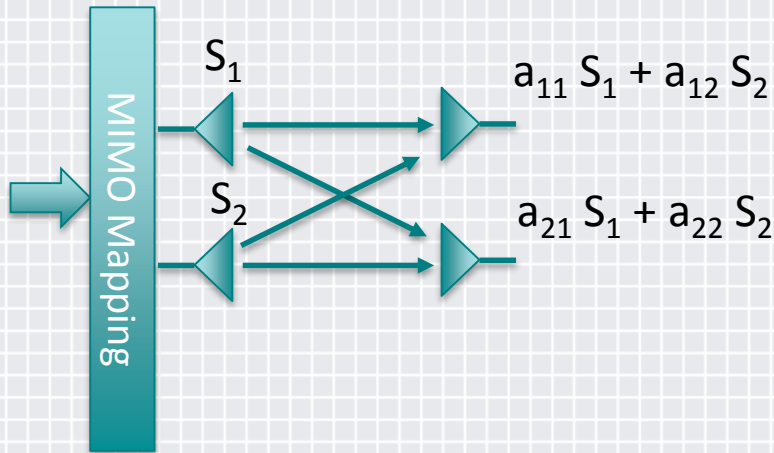


# Defining MIMO

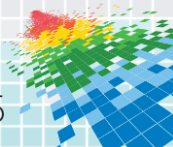
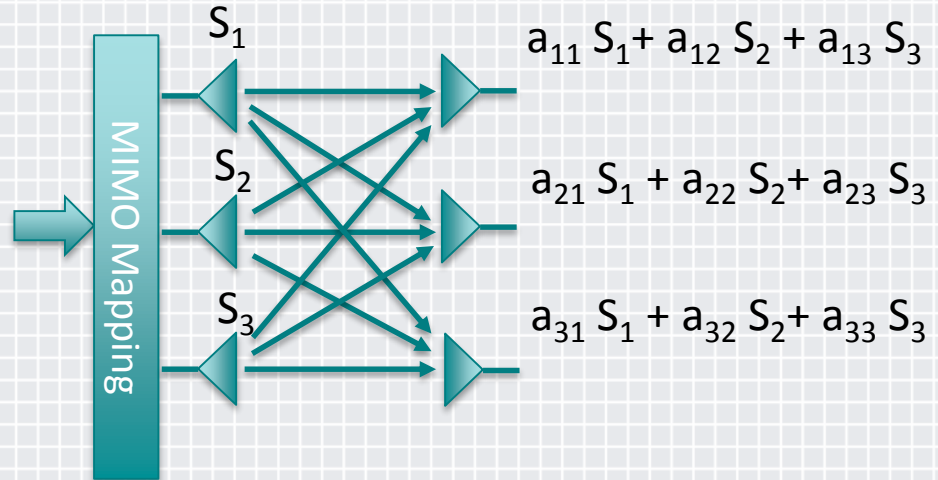


# Spatial Multiplexing

## 2x2 MIMO

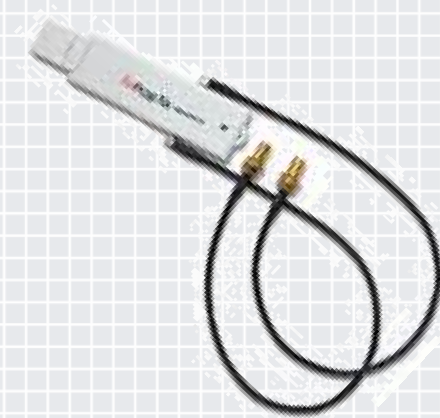


## 3x3 MIMO

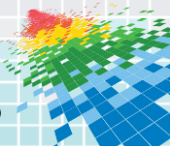




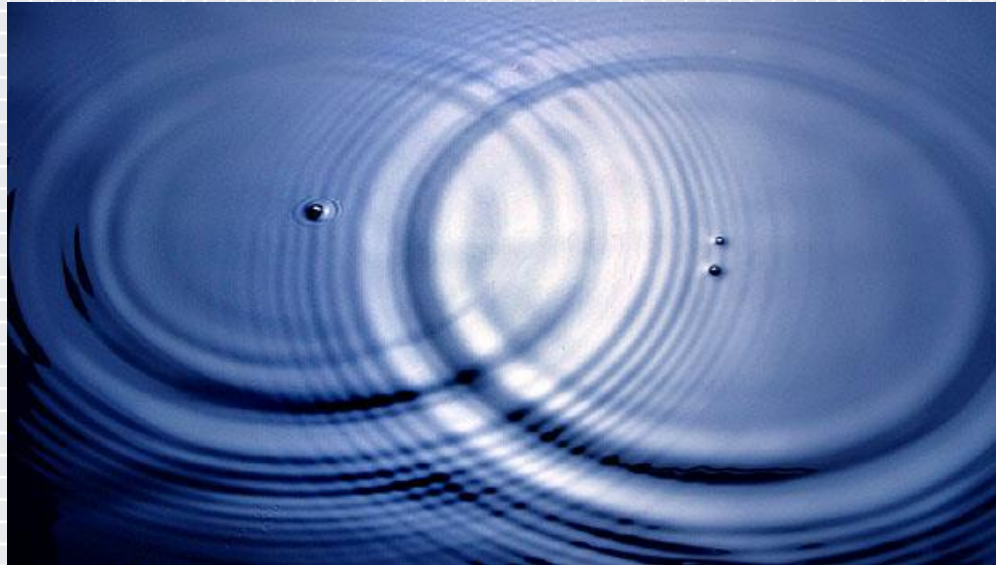
# Implications to security professionals



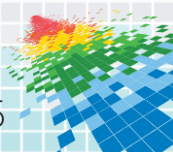
How many receiving antennas do you have?



# Defining beamforming

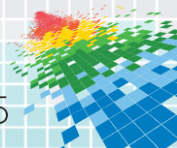
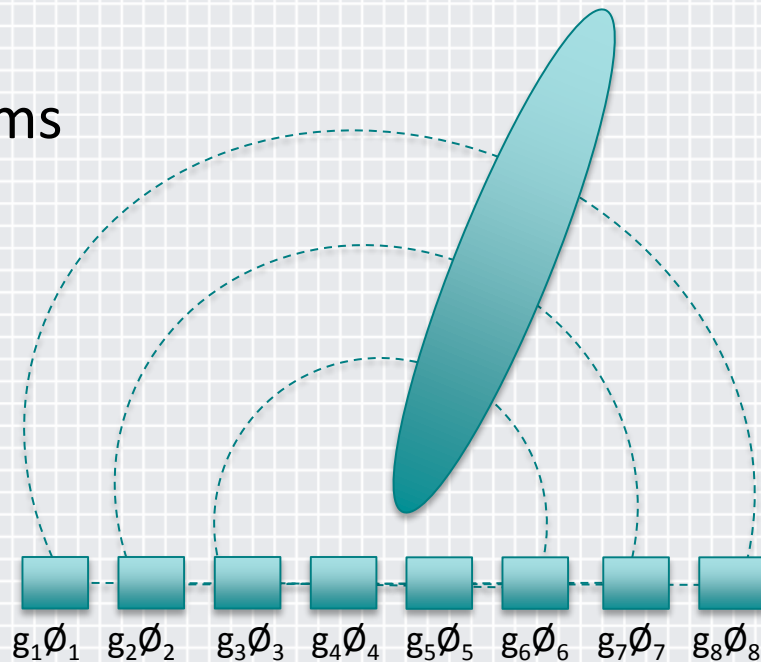


Source: <http://people.rit.edu/andpph/photofile-c/splash-water-waves-4565.jpg>



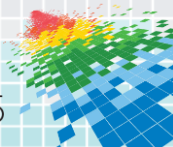
# Creating radiation patterns

- ◆ In theory
  - $N * (N - 1)$  beams
  - $N - 1$  nulls



# Antenna reciprocity

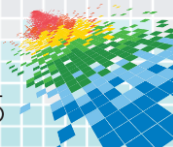
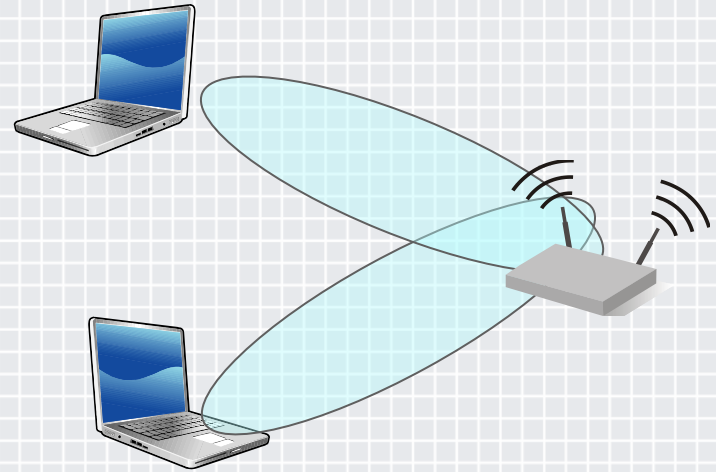
It is common practice to describe antenna characteristics from the perspective of the transmitter



# Multi-User MIMO

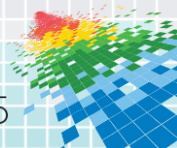
- ◆ If subscribers are spatially separated
  - ◆ Create two beams using the same channel
  - ◆ Increases capacity

Users can hear their signal,  
can you!



# Implications to security professionals

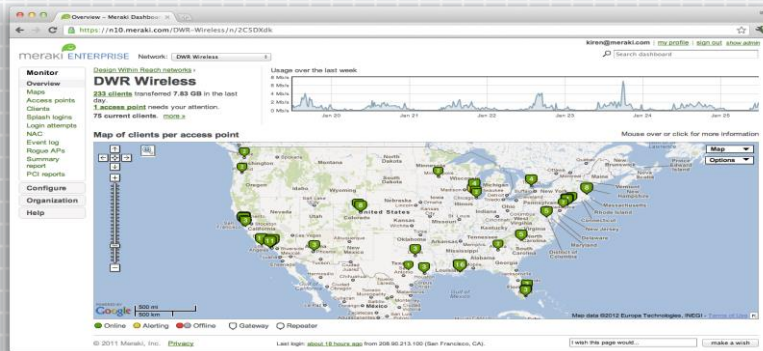
- ◆ Over-the-air captures are significantly more complex
  - ◆ Arguably wireless is more secure
  - ◆ Hackers would need techniques that minimize use of MU-MIMO
    - ◆ E.g. Disruptive interference
- ◆ Spectrum and packet captures shift to the network
  - ◆ Access Point (AP) / Base Station (BS)



# Transition to cloud computing

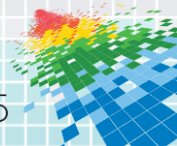
## Cloud managed WLANs

- ◆ Eliminates specialized equipment
- ◆ Configure and manage thru a browser interface

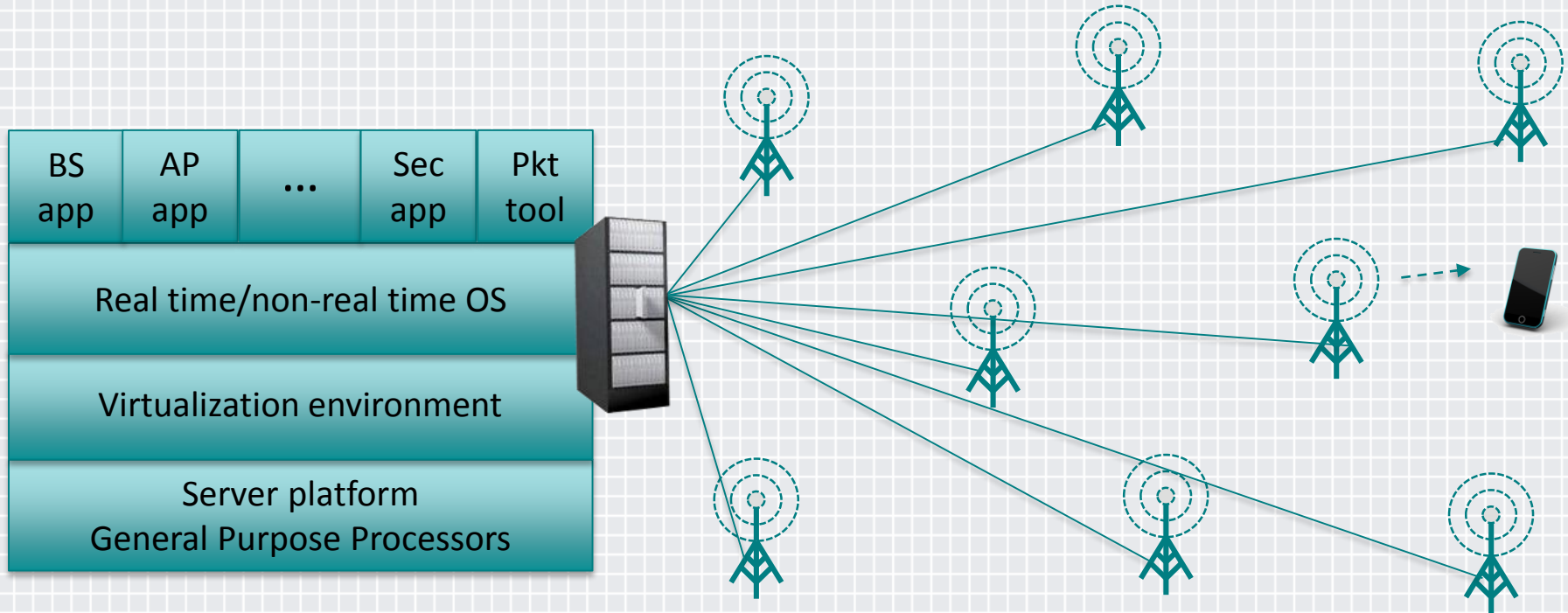


## Cloud radio access networks

- ◆ Virtualization of the base station
- ◆ Enables new deployment scenarios
- ◆ Benefits of the data center realized at the network edge
  - ◆ Shared resources
  - ◆ Leverage general purpose processors
- ◆ Moves content and applications closer to the end user



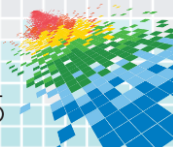
# Cloud Radio Access Network (C-RAN)





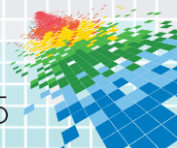
# Six things you need to know

- ◆ You need both a packet and a spectrum analyzer
- ◆ You need to know how many receiving antennas you have
- ◆ Beamforming is happening, and will impact your ability to eavesdrop
- ◆ MU-MIMO enables multiple transmissions in the same frequency channel
  - ◆ Making eavesdropping over-the-air extremely difficult
- ◆ Wireless networks are transitioning to a cloud / virtualization based architecture
- ◆ Wireless spectrum and packet traffic analysis on the wireless AP/BS is of increasing importance

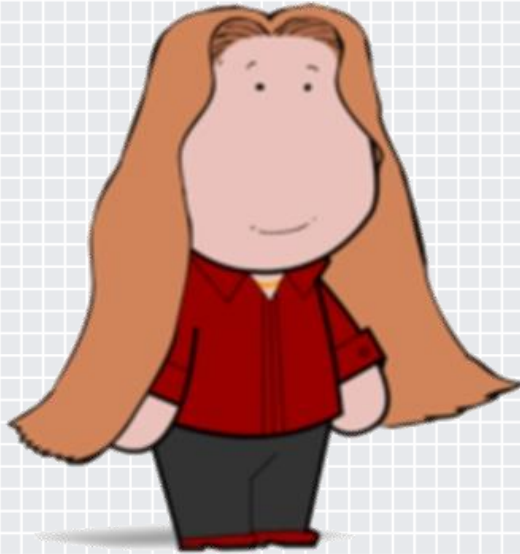


# What you should do now

- ◆ Get and become familiar with using spectrum and packet analyzers
- ◆ Understand the limitations of the antenna technologies you are using for analyzing over-the-air traffic
- ◆ Check to see if your organization is implementing wireless cloud based solutions



# Thank you for listening 😊



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