
cisco Live!
ALL IN

The bridge to possible

7 Ways to Fail on Wi-Fi 6E

Yes… you can also fail on new tech…

@Steven_Heinsius & @theJasonGrant
Leading the Global Solution Specialists team for Access Networking

BRKEWN-1742

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BRKEWN-1742

Cisco Webex App

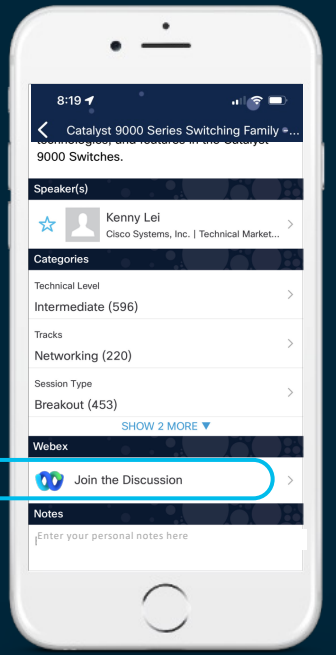
Questions?

Use Cisco Webex App to chat
with the speaker after the session

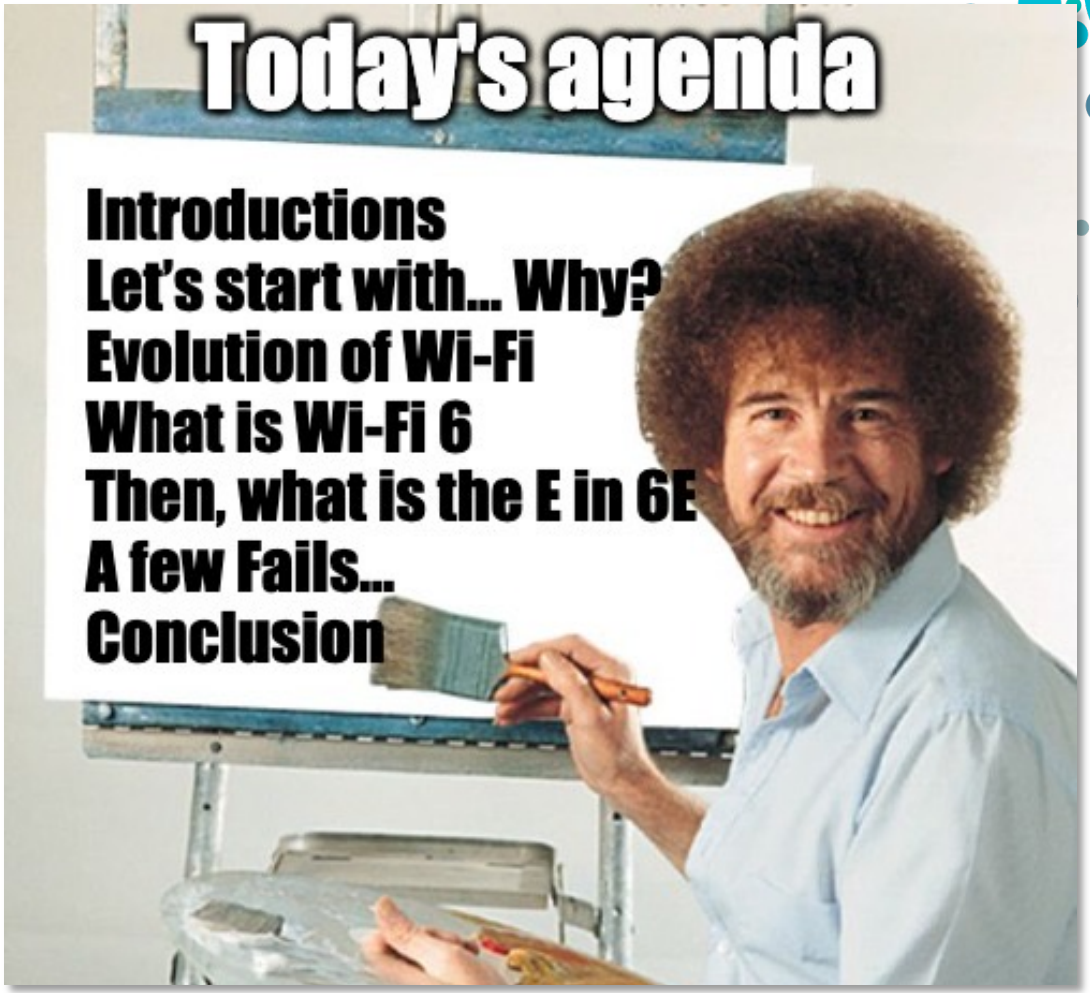
How

1. Find **BRKEWN-1742** in the Cisco Live Mobile App
2. Click “Join the Discussion”
3. Install the Webex App or go directly to the Webex space
4. Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 17, 2022.



https://ciscolive.ciscoevents.com/ciscolivebot/#BRKEWN-1742



About @Steven_Heinsius

3	Years as an End User
5	Years as a Partner
6	Years as a Distributor
12	Years at Cisco
17	Years Instructor

- Dad
- Runner
- Cook
- Mountain biking
- Scuba diving
- Snow boarding
- Singer
- Wi-Fi enthusiast

- YouTube Channel
  'The Basement Series'

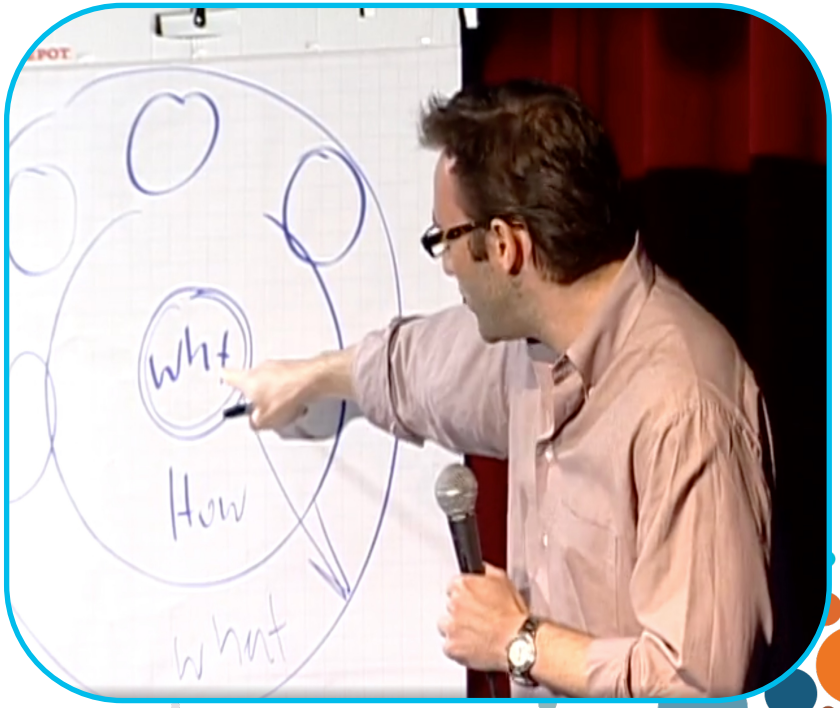
About @theJasonGrant

3	years end user
1	years as a Cisco SE
8	years security & wireless specialist
7	years EN (and DNA) specialist
6	years global sales enablement

- Dad
- Kung-fu
- Cook
- Soccer ref
- Road-tripper
- Wi-Fi enthusiast
- YouTube Channel ‘The Basement Series’

Simon Says…

“Let’s start with…



Cisco live!

February 15 – 19, 2016 · Berlin, Germany

How it all began…

There's 20 Ways to Fail

- Learn how *NOT* to #Fail
- It will be educational
- It will be interactive
- It will be fun

" I don't care *how* you remember it,
as long as you remember it"

Steven Heinsius

Applicable to Wi-Fi 6(E)?

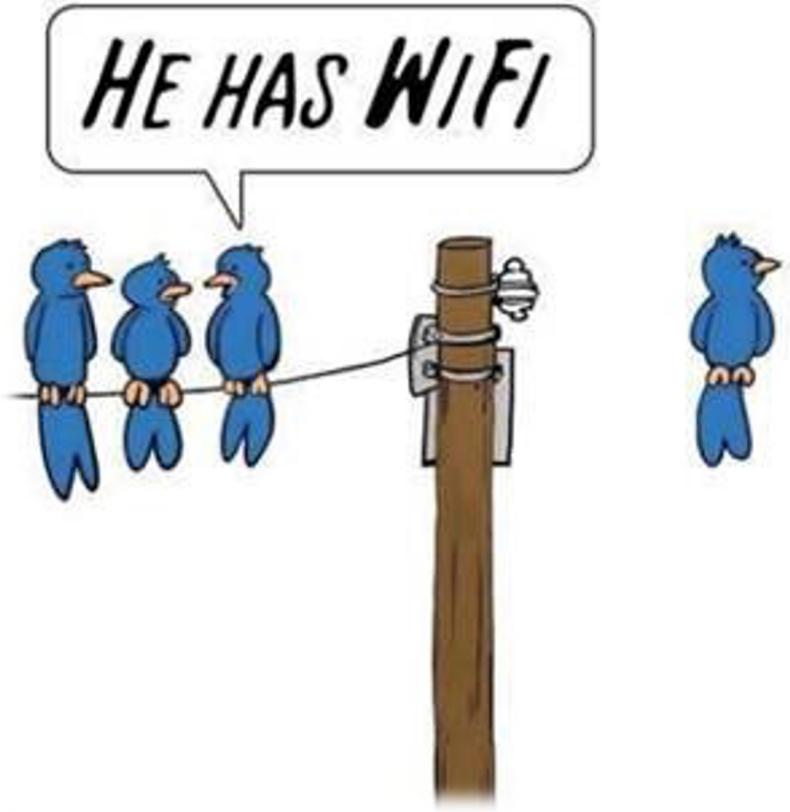
Contact us for the handout

@Steven_Heinsius

@theJasonGrant

The basics

- The history of Wi-Fi
- Evolution of Wi-Fi
- Frequency & Channels
- Understanding Modulation & DRS
- Wi-Fi 6



FRED NIEHAUS

AUTHOR OF

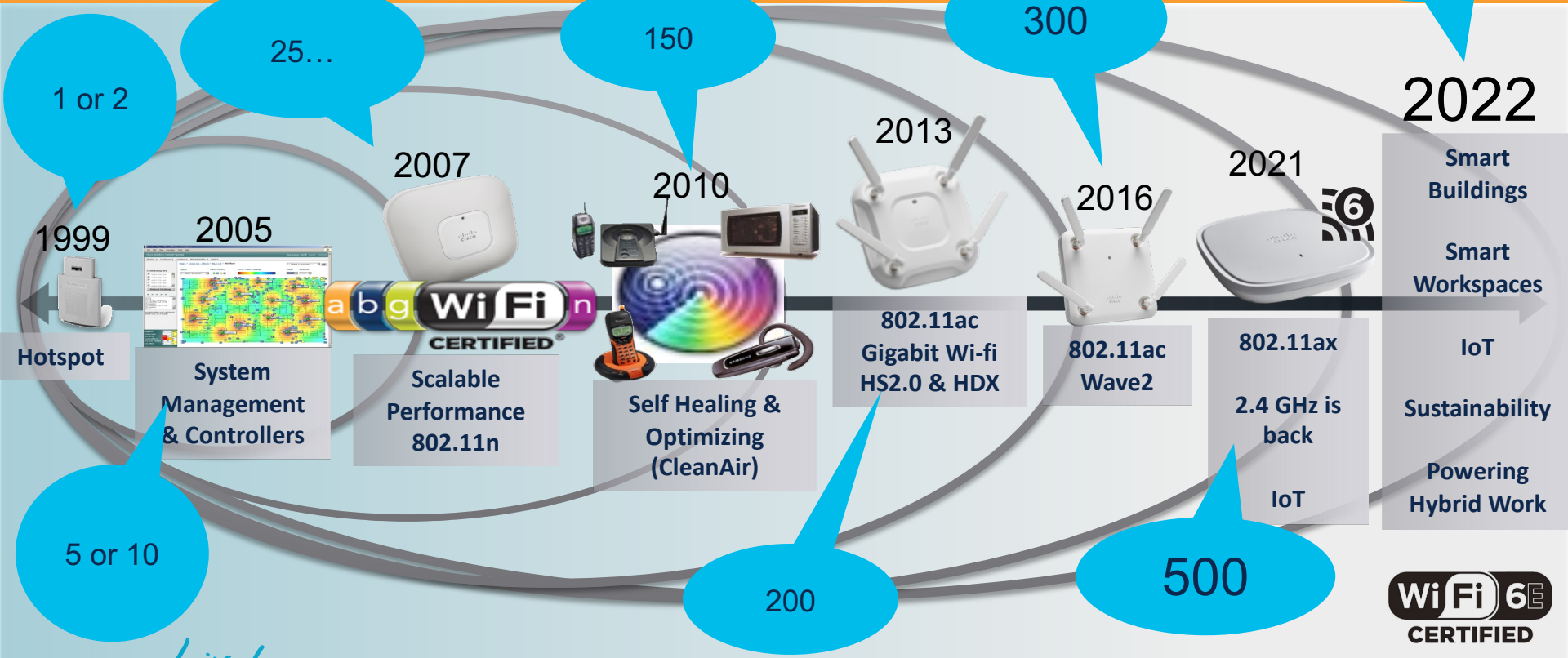
UNDERSTANDING RF FUNDAMENTALS
and the
RADIO DESIGN of WIRELESS NETWORKS

The History of Wi-Fi with Fred Niehaus
(parts 1 & 2)

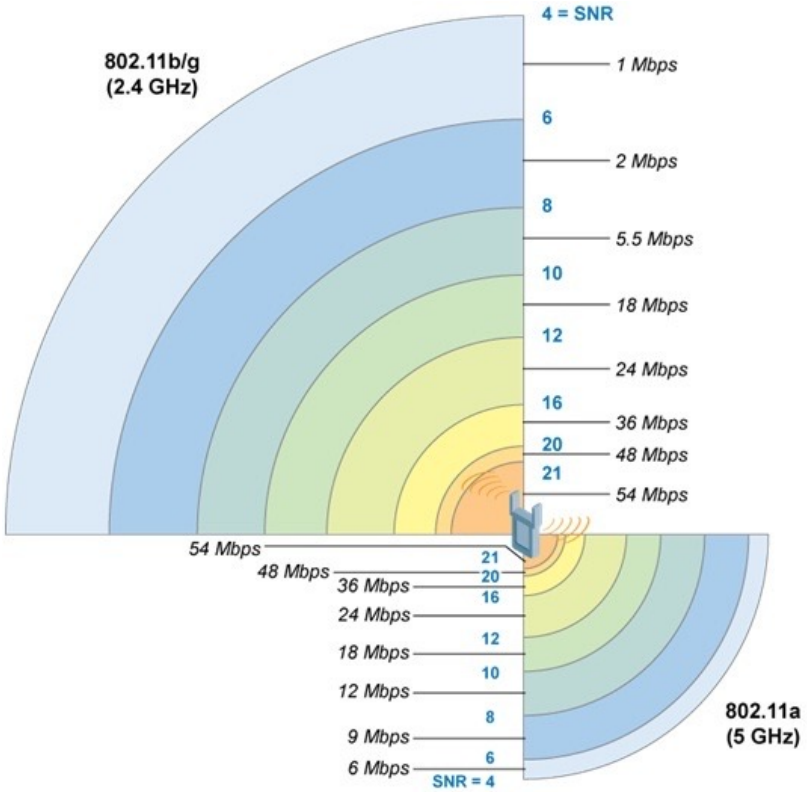
Evolution of Wi-Fi

cisco Live!

Let's say a 100 Employee Company… how many devices on the Wireless Netwo



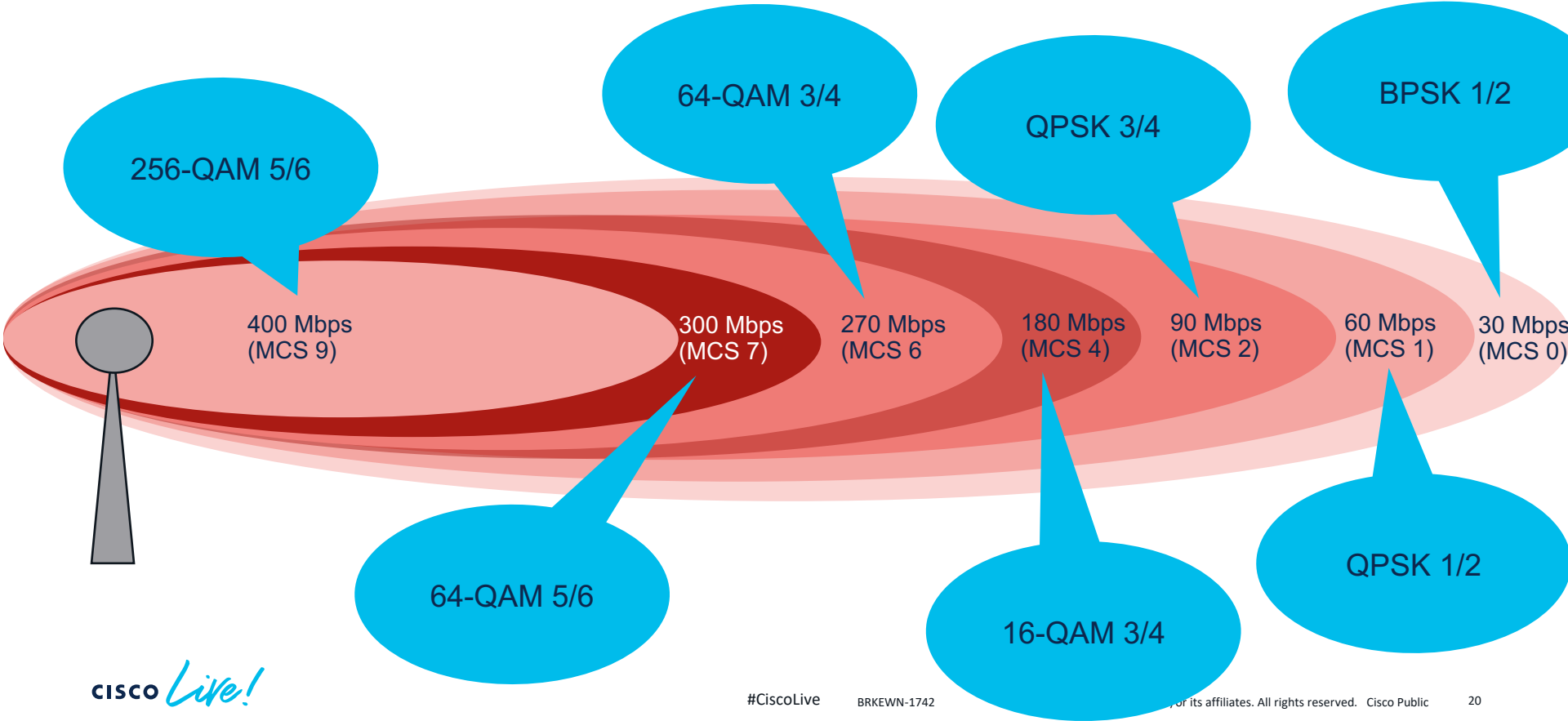

Ghz
Ghz
Ghz


802.11b/g
(2.4 GHz)
4 = SNR
1 Mbps
6
2 Mbps
8
5.5 Mbps
10
18 Mbps
12
24 Mbps
16
36 Mbps
20
48 Mbps
21
54 Mbps
54 Mbps
48 Mbps
36 Mbps
24 Mbps
18 Mbps
12 Mbps
9 Mbps
6 Mbps
21
20
16
12
10
8
6
SNR = 4
802.11a
(5 GHz)

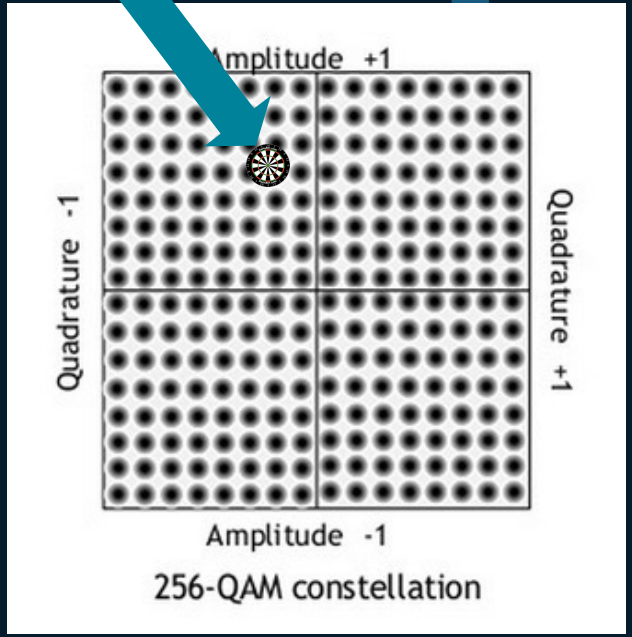
Modulation

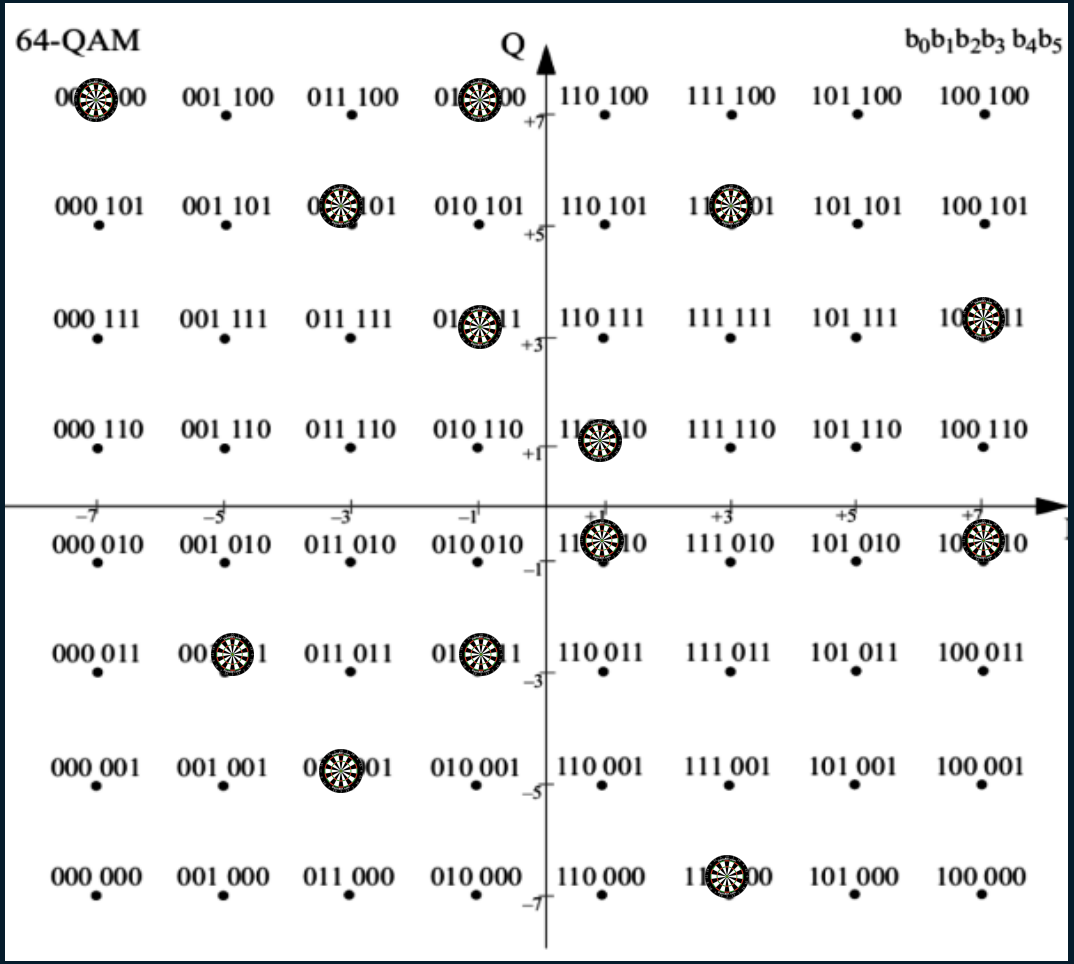
Dynamic Rate Switching (DRS) & Modulation

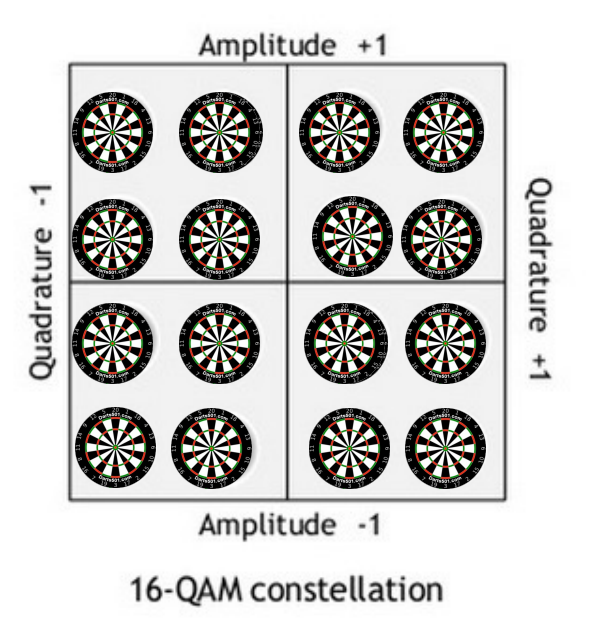
(given 802.11ac / VHT - 2 spatial streams, 40 MHz channels & 400 MS GI)



Modulation



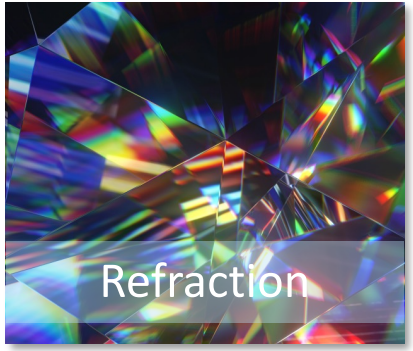


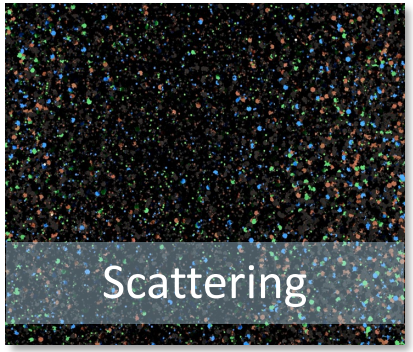


Get It?


AWESOME!
betfair

What else happens in the air?



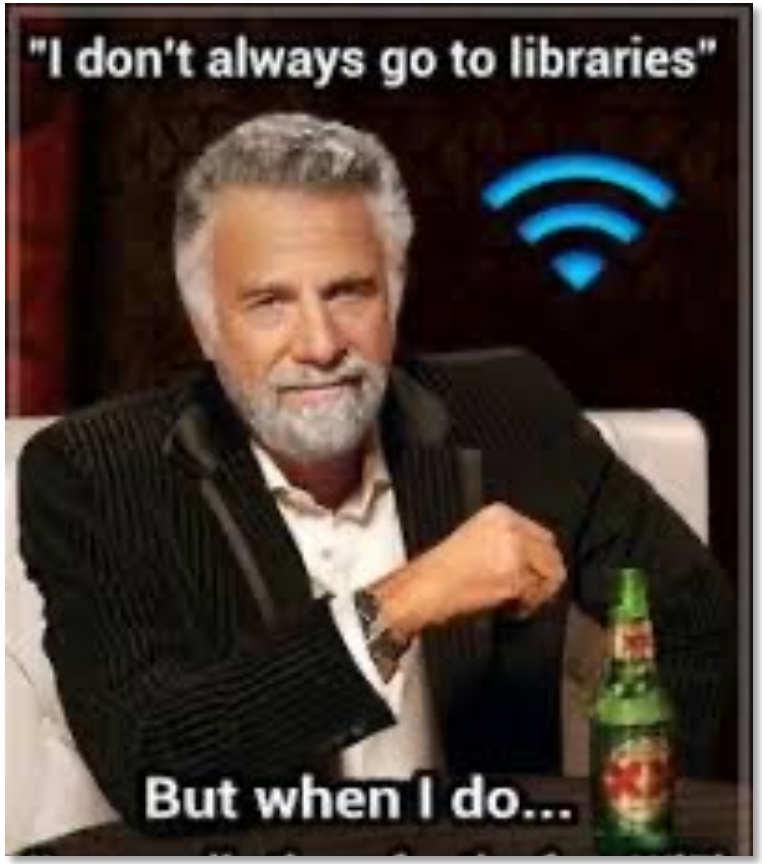


More challenges in Wi-Fi

- Slow
- Can’t connect
- Can’t roam
- Not secure
- BYOD
- Guest networks

- Coverage
- Interference
- Changing environments
- Internet of Things
- 99.999% of availability
- Primary access method

What is Wi-Fi 6



802.

11b

11a

11g

11n
Wi-Fi 4

11ac
Wi-Fi 5

11ax
Wi-Fi 6

High Efficiency
4x Capacity
IoT Scale

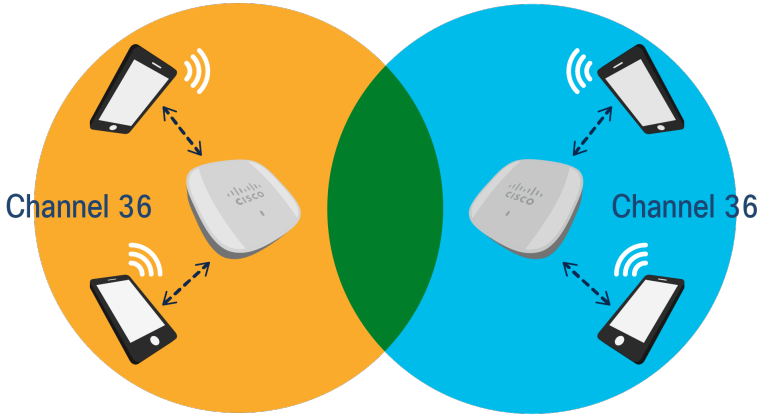
- Much more efficiency for getting on- and off the medium
- Higher power efficiency benefits clients including IoT
- Greater IoT Coverage
- Better app. performance in high density deployments

- 802.11ax
- BSS Coloring
- OFDMA
- Multi-user MIMO
- 1024 QAM
- Target Wake Time

802.11ax

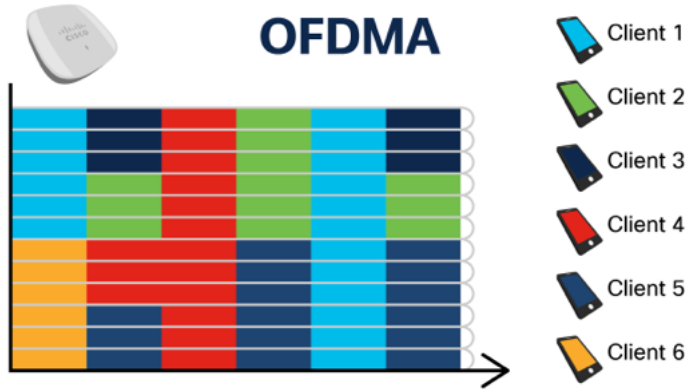
- The **Art** known as Wi-Fi 6
- Latest Generation of Wi-Fi
- 2.4 GHz is back
- 5 GHz is leading
- Expanded to 6 GHz
- Fastest ramping tech so far
- Not about more speed
- **It's about More Efficiency**

BSS Coloring



- It’s a numbering bit
- Not actually a color
- Reduce co-channel interference
- Increase channel re-use factor of 8

Orthogonal Frequency Division Multiple Access

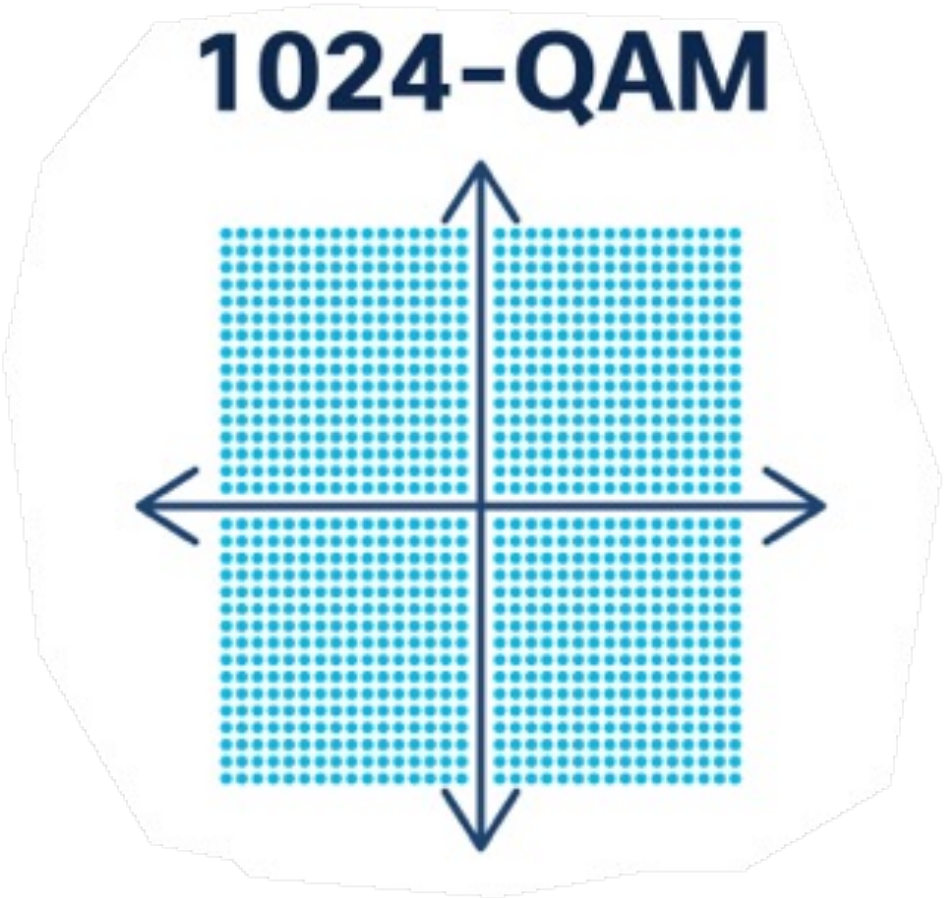


- Multiuser version of OFDM
- Developed for LTE (4G / 5G)
- Channel is divided in smaller allocations called Resource Units

- Thanks to these smaller frames an *AP can send data to many more clients* at the same time

Multi-User

Multiple In Multiple Out



TWT

More efficiency & Better Battery Life

Then… what is the **E** in 6**E**?

The E is for

Evolution
Efficiency
Experience
Extra Bandwidth

It's all the goodness of 802.11ax
Now available on a dedicated 500 MHz (ETSI) or 1200 MHz (!!!) (US) 6 GHz Spectrum

Time for some Fails…

So,
20 Fails...

But only 45 minutes…

so we decided to focus on the Wi-Fi 6(E) important

Fail 1:

You missed all the previous episodes…

Watch us grow!

#7WTF –
The Work from Home Edition
can be found here…

Simple Rule:

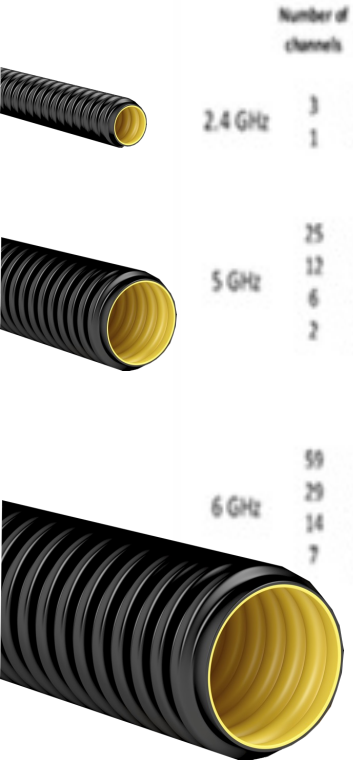
“Never stop learning,
But make sure you have fun”

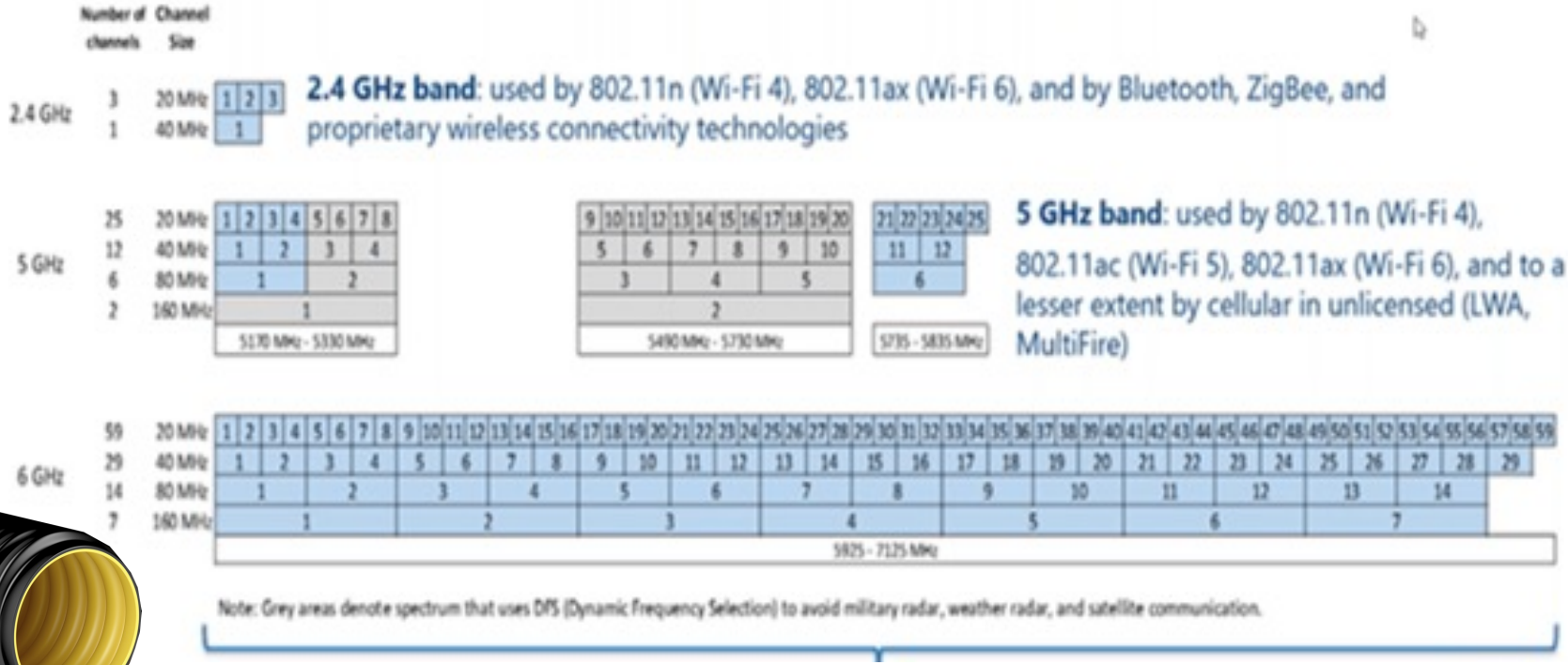
Fail 2:

Give me
Wider Channels

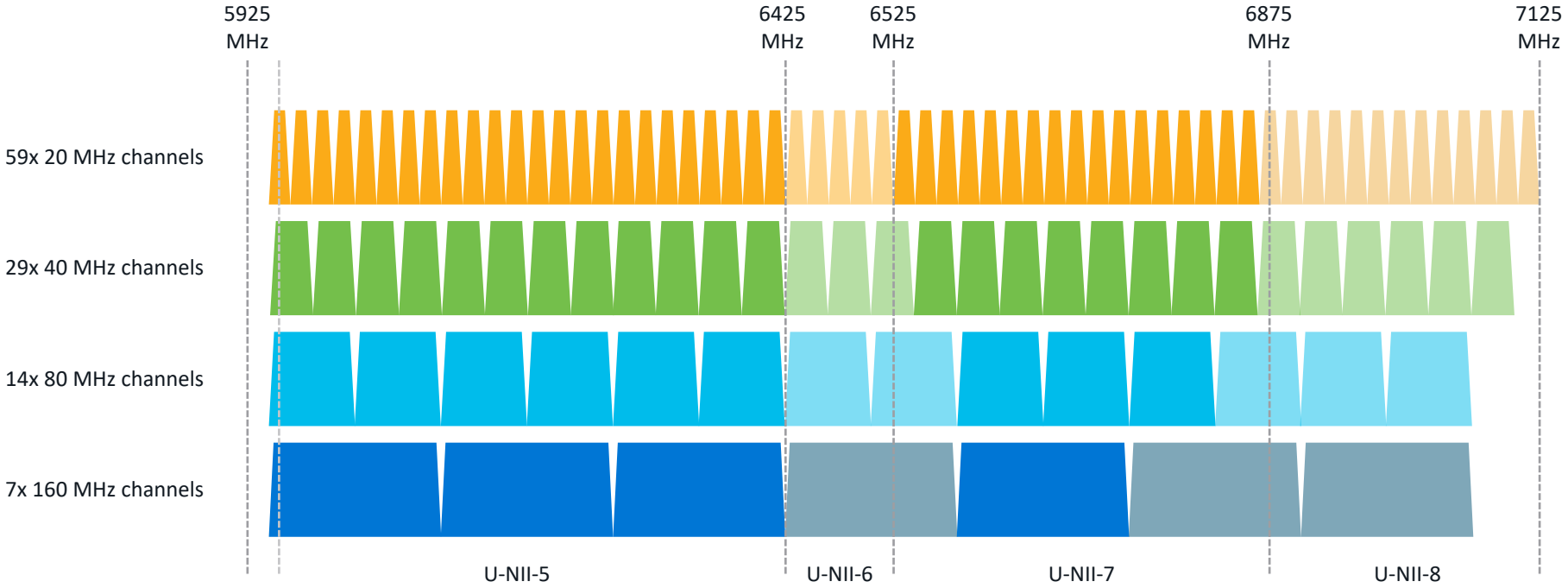
Wider Channels

Unlicensed Spectrum Used by Wi-Fi





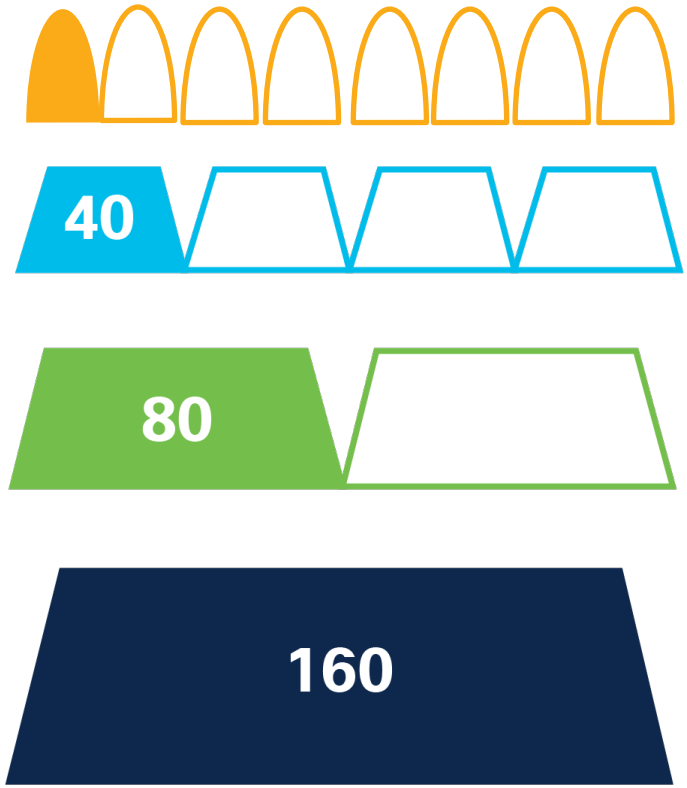
The new 6 GHz band… !!!



Standard for 2.4 GHz

Standard for 5 GHz

Standard for 6 GHz



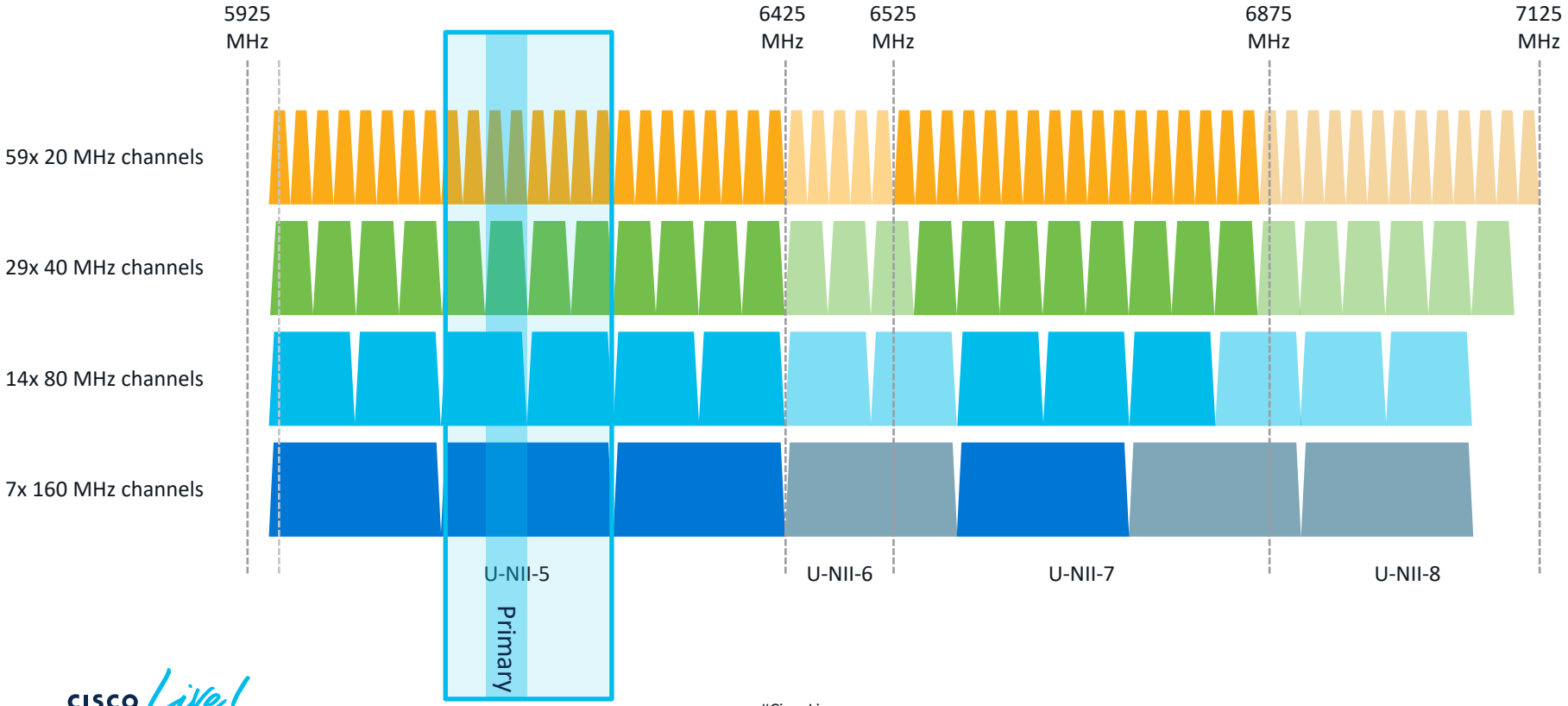
Simple Rule:

“40 for 5, 80 for 6,
But whatever you do, never mix”

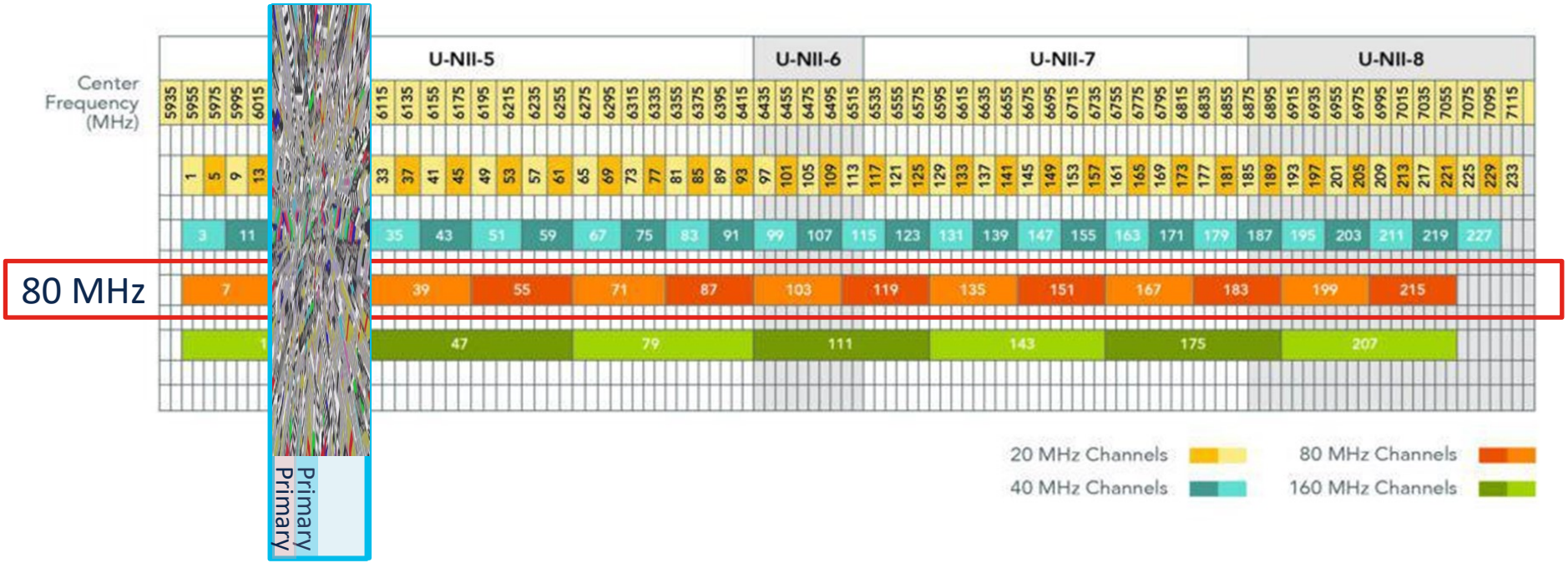
Fail 3:

Not aligning
Primary and Secondary

The new 6 GHz band : Wi-Fi 6 and later



Agenda



Simple Rule:

“Don’t mess with the defaults”

Fail 4:

Placements…
Really ?

Does it still matter
where you put those AP's?

Source: www.bad-fi.com
& Twitter & Personal observations

Channel bonding…

Wireless Stacking

Low & Slow…

Who needs brackets…

Who needs brackets…

When you did the survey…

When they go live…

Outdoor Wi-Fi…

Placement & Positioning best practices

- ✓ AP Horizontal (vertical Polarization)
- ✓ Below obstructions
- ✓ Minimal one meter (3ft) away from obstructions (Fresnel zone)
- ✓ The correct antennas, only 1 type of antenna
- ✓ Access Points minimal three meter (10ft) away from each other
- ✓ Not too high (after 4 meter (14ft) high special implementations)
- ✓ Don't put behind a metal cage
- ✓ Use Outdoor AP's for Outdoor Coverage…

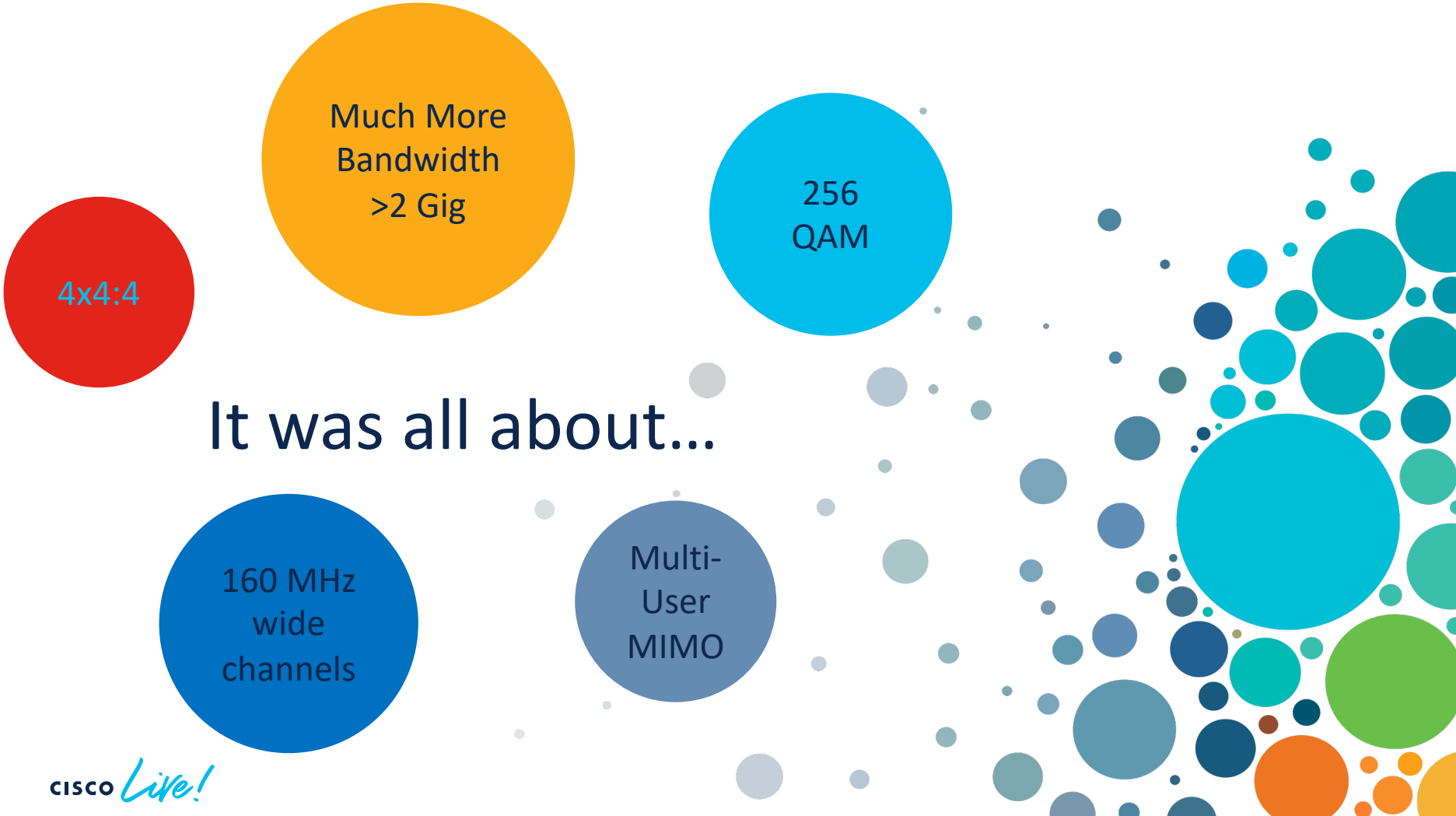
Simple Rule:

“Like in Real Estate
– Location, Location, Location”

Fail 5:

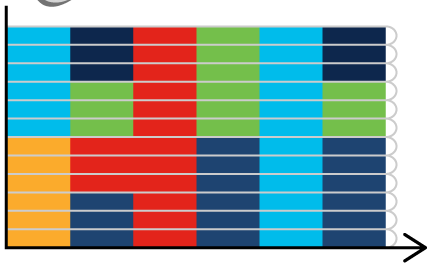
Hype versus Reality

When 802.11ac Wave 2 was announced…


Much More Bandwidth >2 Gig
256 QAM
4x4:4
It was all about…
160 MHz wide channels
Multi-User MIMO

But now…

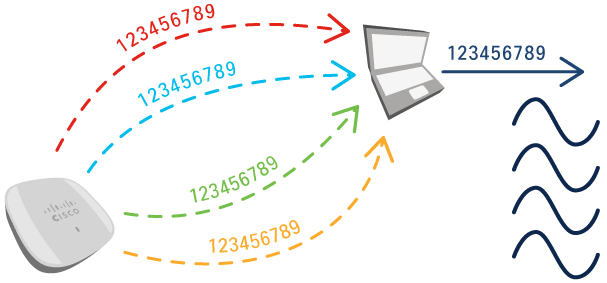
OFDMA



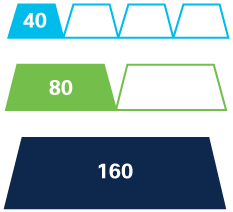
Client 1
Client 2
Client 3
Client 4
Client 5
Client 6

MU-MIMO

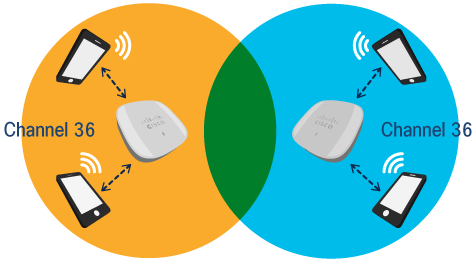
Beamforming



160 MHz Channels

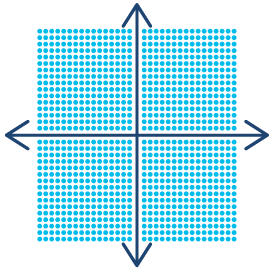


BSS Coloring

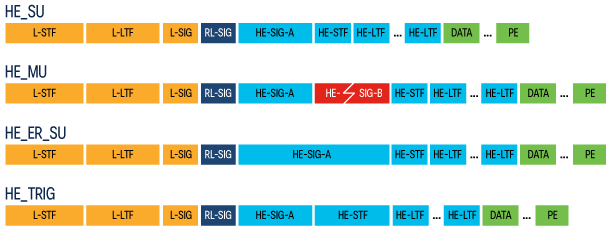


Target Wake Time

1024-QAM



Longer Symbol Time



Cisco Catalyst 916x portfolio

Catalyst 9162

	Tx	Rx
2.4 GHz	2	2
5 GHz	2	2
6 GHz	2	2

- 2.5Gbps mGig Uplink
- PoE+ and UPoE compliant
- IoT Radio
- CleanAir Pro Radio

Catalyst 9164

	Tx	Rx
2.4 GHz	2	2
5 GHz	4	4
6 GHz	4	4

- 2.5GGbps mGig Uplink
- PoE+ and UPoE compliant
- IoT Radio
- CleanAir Pro Radio

Catalyst 9166

	Tx	Rx
2.4 GHz	4	4
5 GHz	4	4
6 GHz	4	4

- 5Gbps mGig Uplink
- PoE and UPoE+ compliant
- IoT Radio
- CleanAir Pro Radio
- XOR radios (low band/high band)
- Environmental sensors


STOP!


DEMO TIME!
imgflip.com

And let me show you what happens in the Air…

"If you can't understand the RF, if you can't understand what's going on in your environment, then you can't get to this next generation of applications and services. And in fact, even as we develop the next technologies, ***the visibility that Ekahau gives us is fundamental to taking us into the future.***"

Matthew MacPherson
Wireless CTO, Cisco

Simple Rule:

“Now more than ever,
you need the smartest Chipset”

Fail 6:

Listen
to the Architect

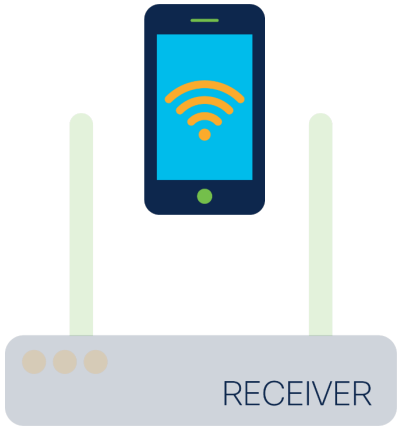
So I was told…

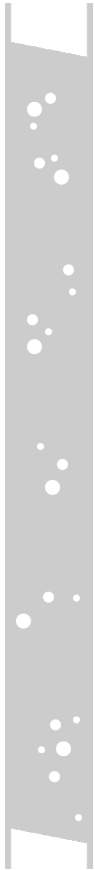
Access Points are ugly….

And what do you do with things that are Ugly?

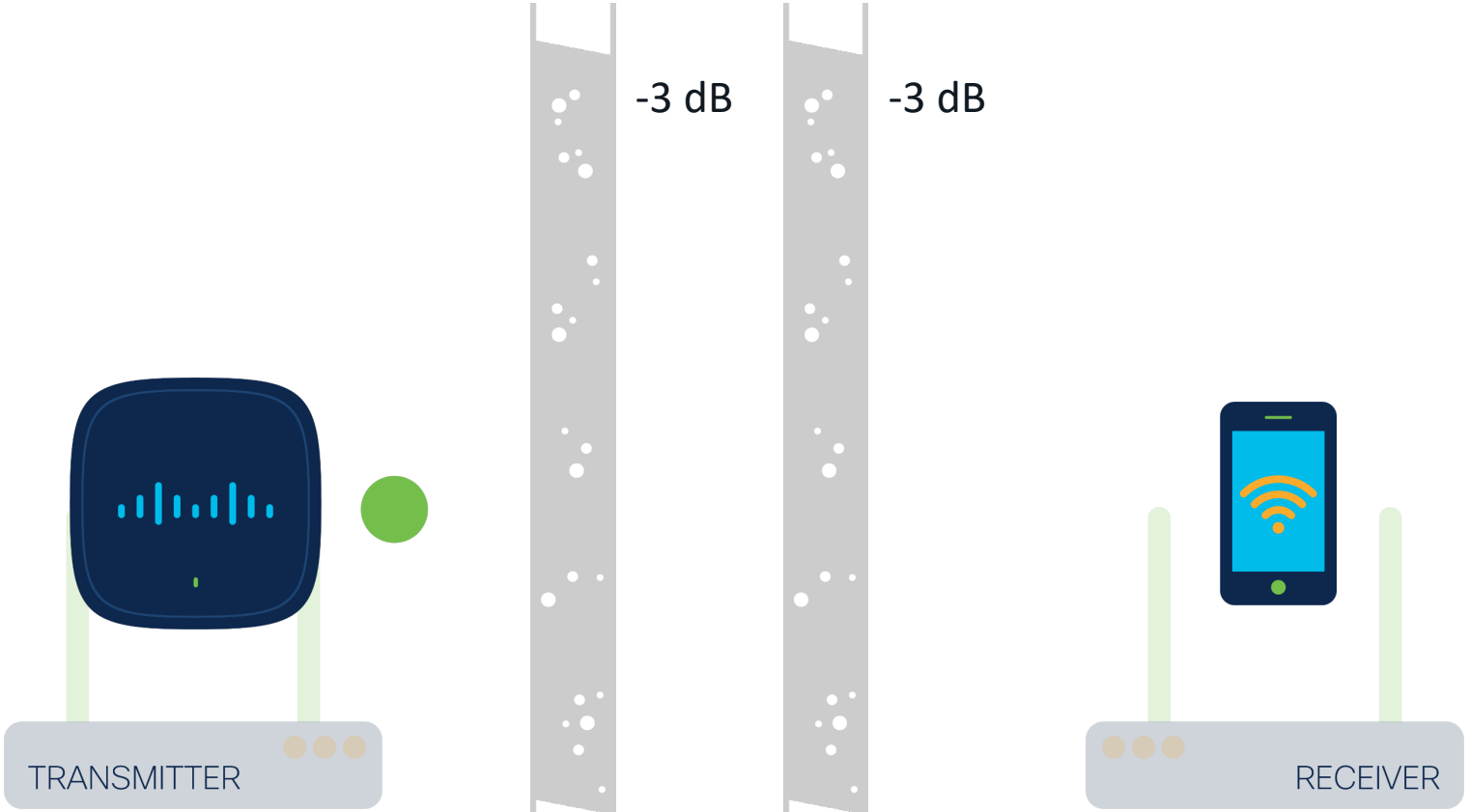
With Wi-Fi…

Put your AP’s where your clients are





-3 dB

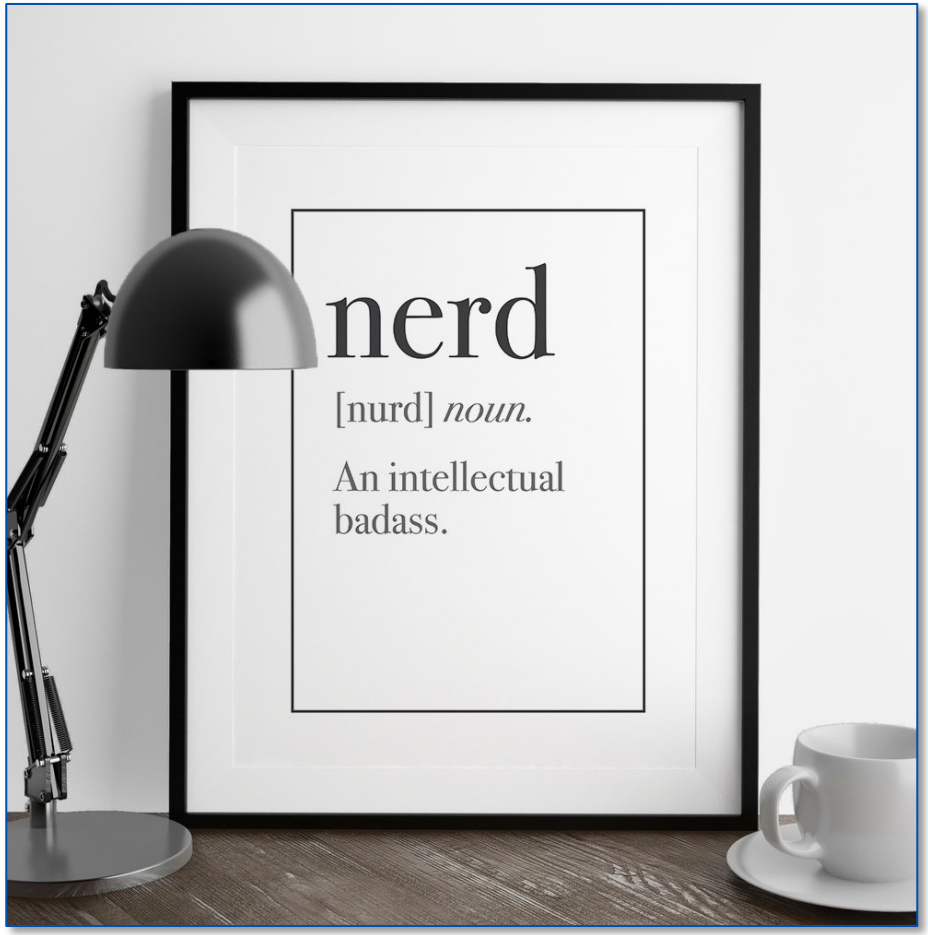


RF Mathematics

Rules of 10 and 3

- 3 dB gain = mW * 2
- 3 dB loss = mW / 2

- 10 dB gain = mW * 10
- 10 dB loss = mW / 10



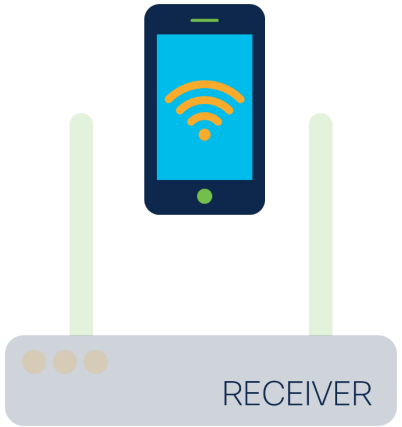
70% of the clients in your network are?

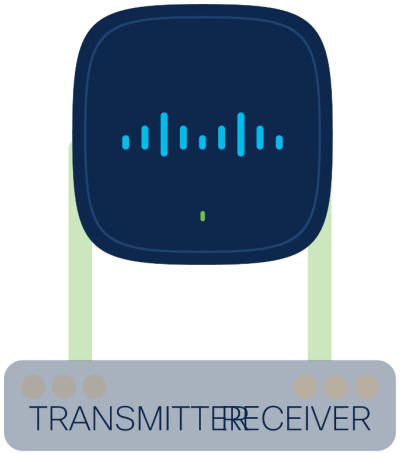
So…

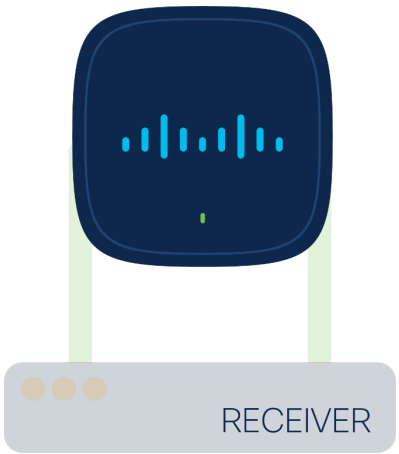
(RF Mathematics continued…)

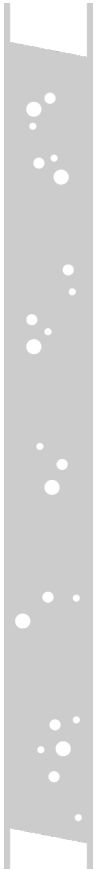
Max ETSI transmission is 100 mW.
that is 20 dBm

20 dBm	100 mW
17 dBm	50 mW
14 dBm	25 mW
11 dBm	12.5 mW
8 dBm	6.25 mW
5 dBm	3.12 mW
2 dBm	1.6 mW
0 dBm	1 mW









-3 dB

So…

AP

…

What about these?

Why don’t you hide them?

“Then they don’t work…”

AHA!

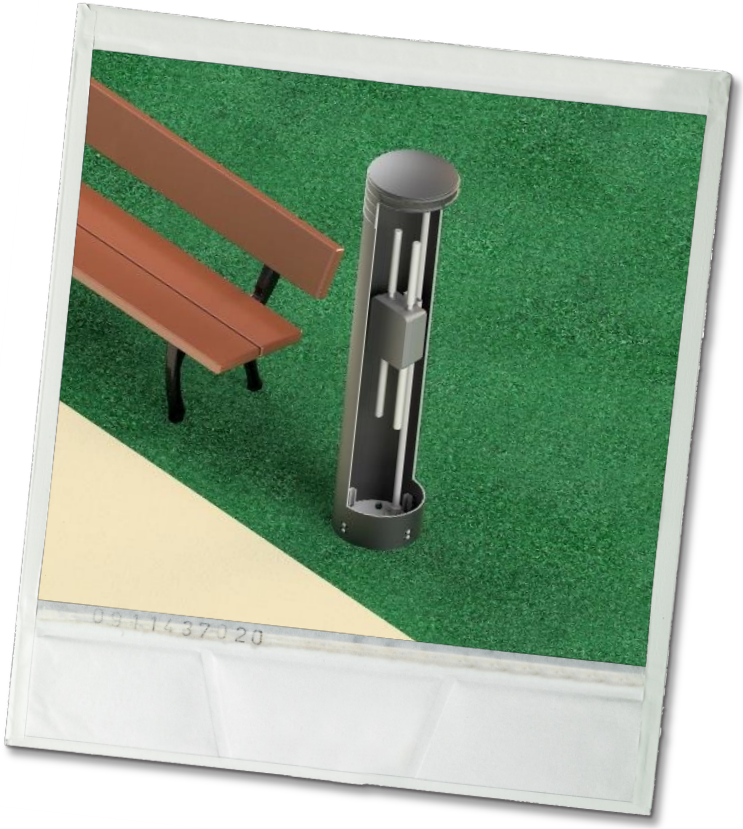
Introducing…

The “Peep Hole AP”

So …

Visit Oberon at #2337 on the World of Solutions

Oberon Model 3032 NetPoint™ Wi-Fi Bollard



Visit Oberon at #2337 on the World of Solutions

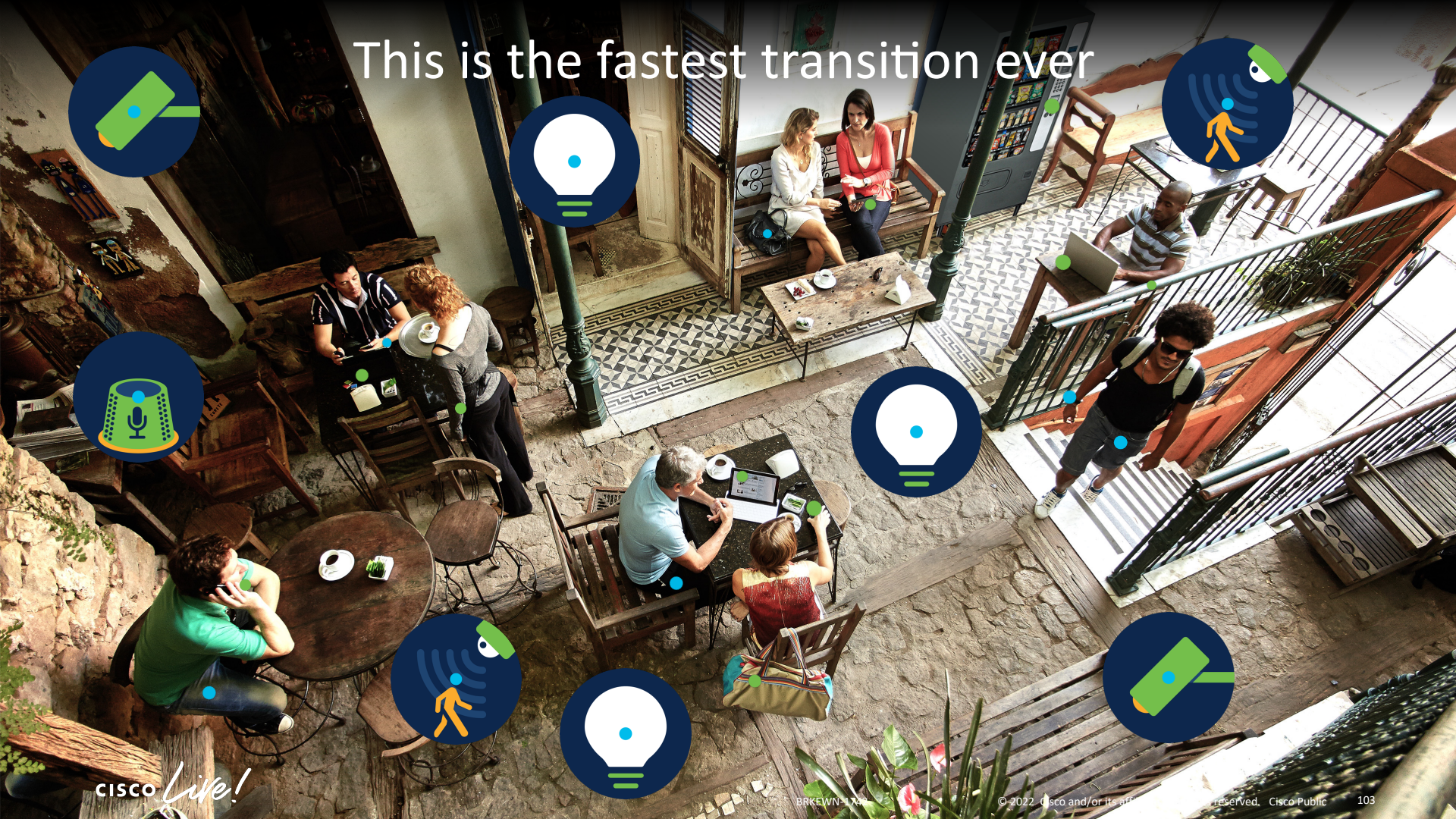
Simple Rule:

“Can you read the Logo?
Then you are probably good to go”

Fail 7

I’ll wait
for the next upgrade

This is the fastest transition ever



Simple Rule:

"Don't wait till tomorrow, with what you can do today"

Conclusion

Wi-Fi 6E is here

It’s real

It’s happening

And it benefits us all

Thank you

Steven Heinsius

Jason Grant

&

Rick axLey

Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.
- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.

Cisco learning and certifications

From technology training and team development to Cisco certifications and learning plans, let us help you empower your business and career. www.cisco.com/go/certs

Pay for Learning with Cisco Learning Credits

(CLCs) are prepaid training vouchers redeemed directly with Cisco.

Learn

Cisco U.
IT learning hub that guides teams and learners toward their goals

Cisco Digital Learning
Subscription-based product, technology, and certification training

Cisco Modeling Labs
Network simulation platform for design, testing, and troubleshooting

Cisco Learning Network
Resource community portal for certifications and learning

Train

Cisco Training Bootcamps
Intensive team & individual automation and technology training programs

Cisco Learning Partner Program
Authorized training partners supporting Cisco technology and career certifications

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