



GREENLEE®
COMMUNICATIONS

FAST. ACCURATE. RELIABLE.

Quality of Experience Over Wi-Fi The Next Big Thing

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In conjunction with Heynen





Trends in Communications

- Wired → wireless,



9.5 BILLION
mobile subscriptions
by the end of 2020



8X
growth in smartphone traffic
between 2014 and 2020

10X
growth in mobile video traffic
between 2014 and 2020

- Cellular → Wi-Fi.



80%
OF DATA TRAFFIC IS INDOORS

By 2017, 60% of Cellular traffic
will be offloaded to Wi-Fi.

Wi-Fi has become the medium of choice.
2/3 of US consumers prefer Wi-Fi to Cellular. –
Deloitte



Wi-Fi - Drivers

70% of Consumer View **NETFLIX** over

80% of Consumer View **You Tube** over



TV

- TV Everywhere content grew 246% last year.

Mobile

- 70% of Smartphone Wi-Fi traffic is between 4pm-7am

81%

- 81% of users have technology-related issues.
 - Loading/buffering (24%) and crashing/freezing (23%).



Complex & Diverse Wi-Fi Environment



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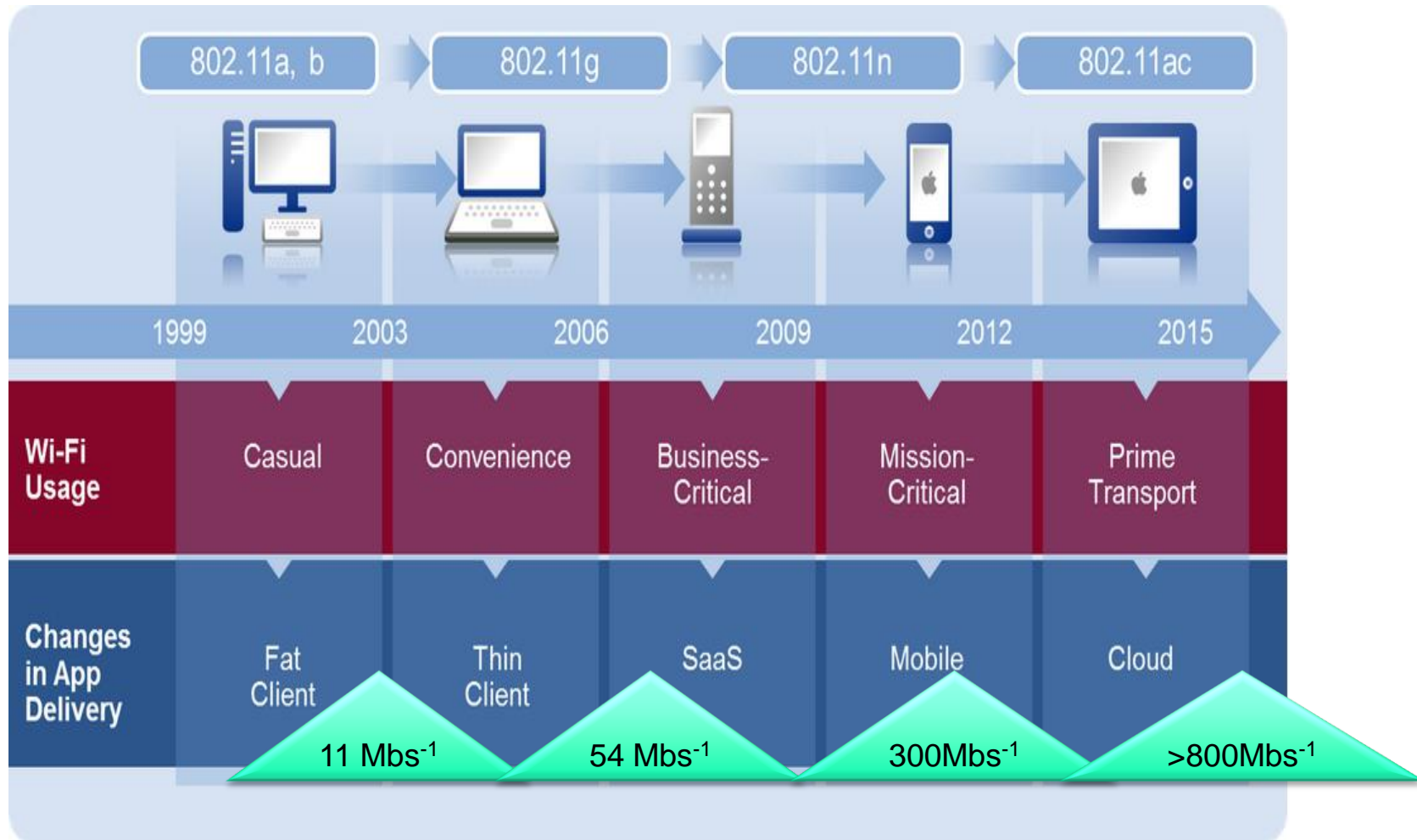
Average Number
of Apps /
Smartphone



No Two Devices are the same

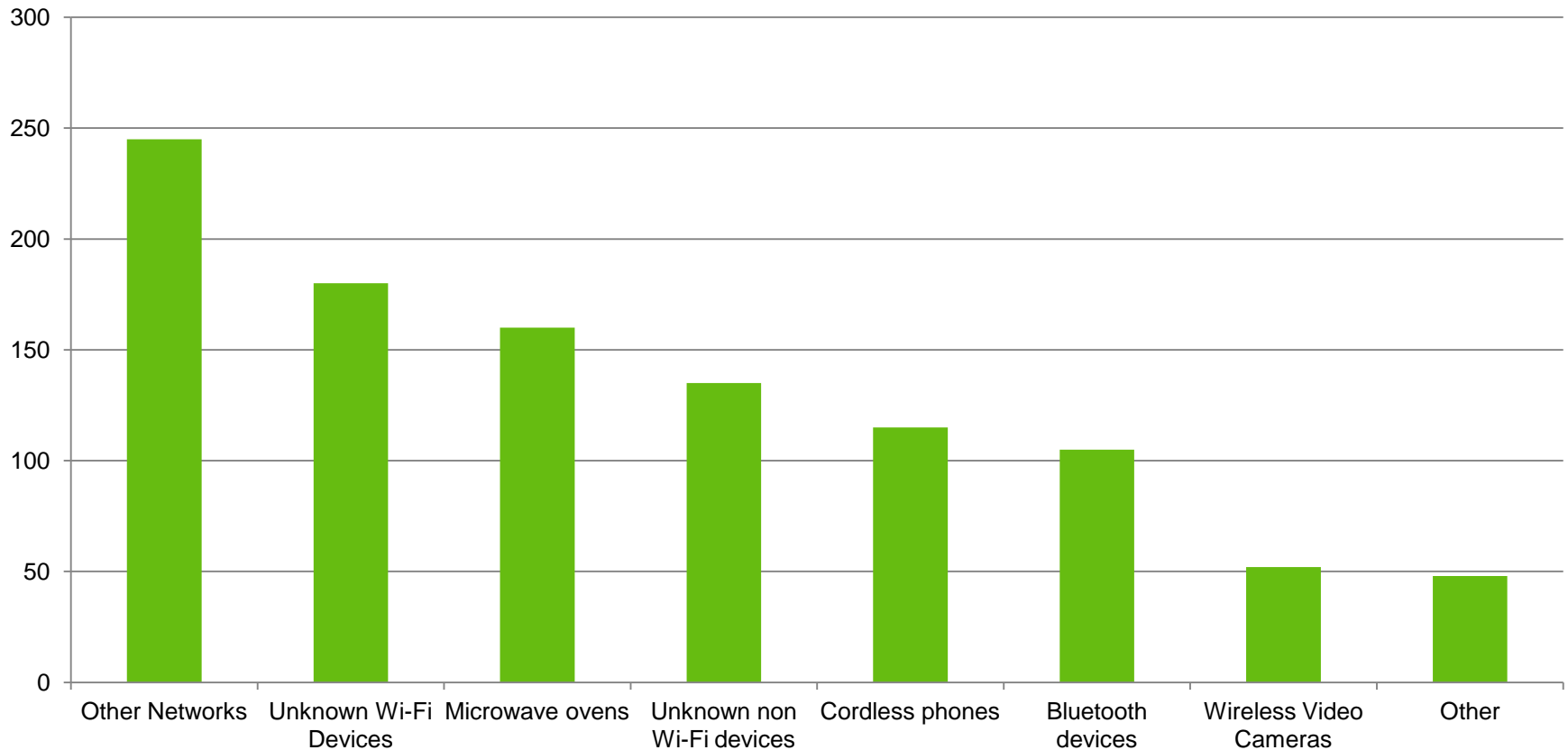


History of Wi-Fi





Primary Sources of Wi-Fi Interference





Physical Barriers to Wi-Fi

Material	Attenuation Level
Wood	Low
Plaster	Low
Synthetic (plastic)	Low
Glass (plain)	Low
Water	Medium (2.4 GHz)
Bricks	Medium
Concrete	Medium to high
Metal and mirrors	High





Its not all about Signal Strength

Signal Strength



Good User Experience



Signal Strength is an unreliable measure



Avoid Using Repeaters



Throughput



Range



**2 Access Points
Instead**



Use Multiple Access Points to fill the coverage Gaps



Look at the Numbers



Single Client Testing is not Realistic

Wi-Fi Testing requires multiple clients testing at the same time



Speak the Customers Language



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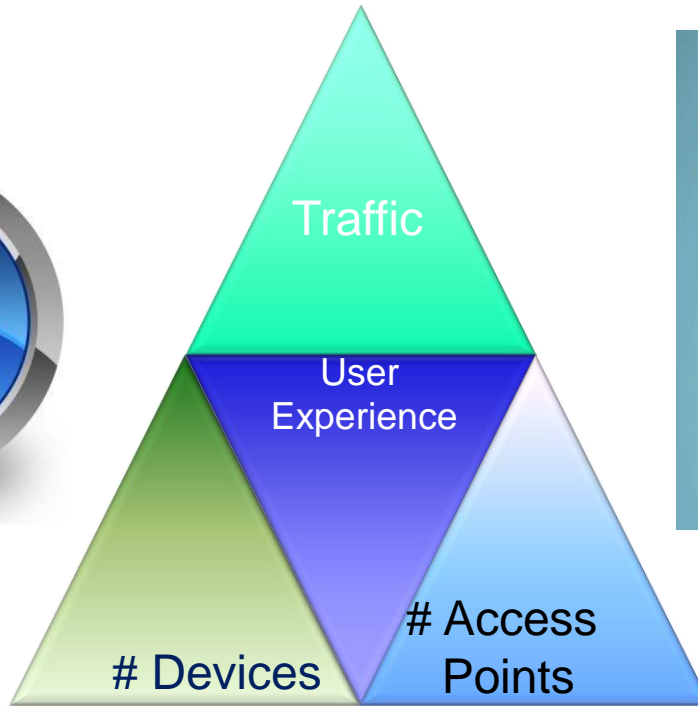
Average Number
of Apps /
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Will HD-Video Streaming work in the bedroom

Will online gaming work in the kids play room



Stress It then Measure It.



Simultaneous Stress Testing



Identify the Optimal...



Optimal Channel

- More APs isn't always bad.
 - Almost all Apps imply it is.
- What APs are doing is more important

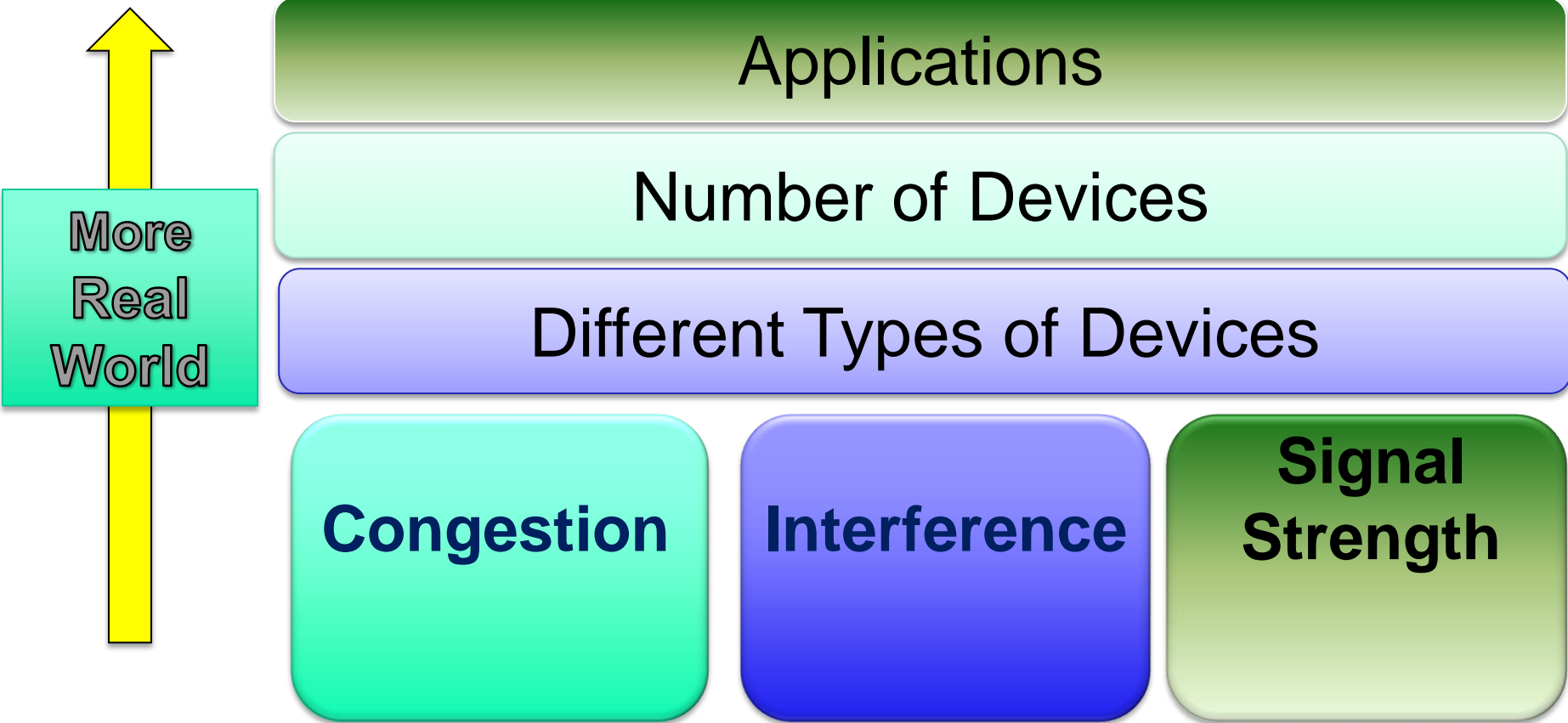
Optimal AP Location

- Need One shot Location Tools
- Use Multi-dimensional tools for fast accurate location.

Need More Intelligence in Optimal decisions



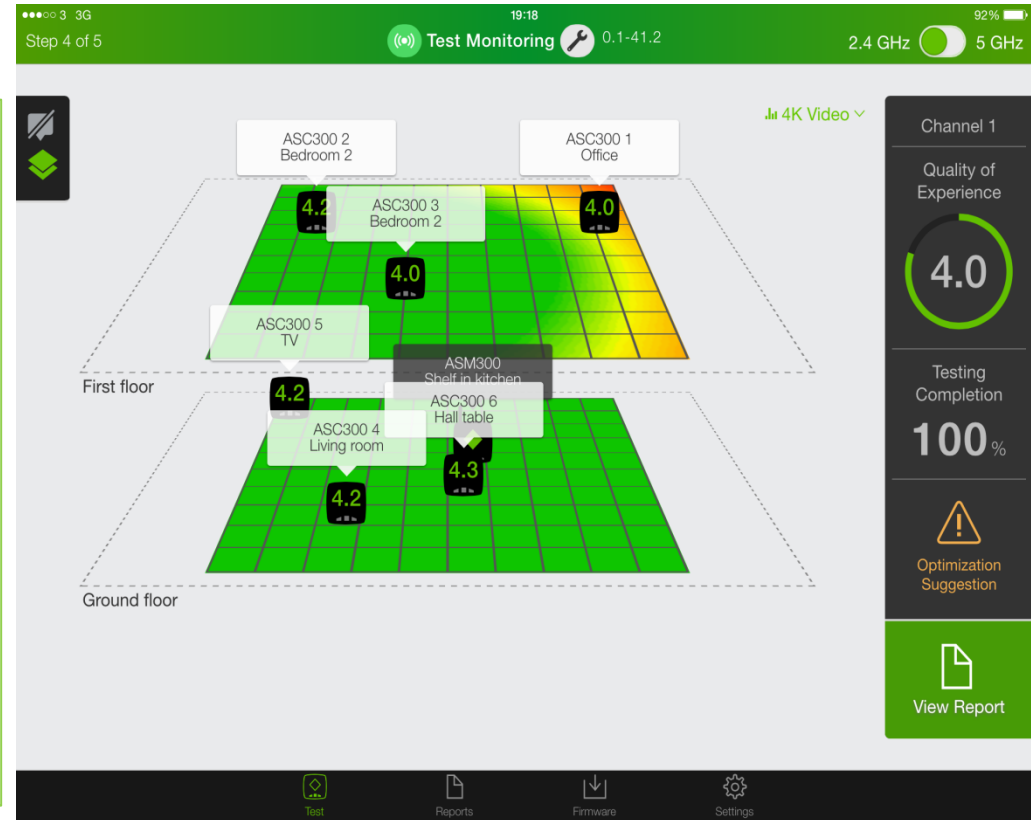
Dimensions of Wi-Fi “Quality Of Experience”





Multi-Dimensional Testing

- **Measure congestion in all locations**
 - Use a Congestion Heat Map
- **Measure interference in all locations**
 - Use an Interference Heat Map
- **Measure Signal Strength in all locations**
- **Pick an Application, will it work in all locations**
 - e.g. Check if HD-Streaming will work everywhere



Gain Confidence in your Findings

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Summary

Steps

- **Identify Wi-Fi dead zones** within the premises
- **Optimize the In-Premise Configuration**
- **Assess the User Experience over Wi-Fi** before finishing an install.
- **Identify Up-Sell Opportunities** to fix coverage gaps and bad user experience

Using

- **Real world stress testing**
- **Distilling Complex measurements into Wi-Fi Readiness**
- **Solving the Problem, not just finding the problem**
- **Use Automated tool that is already integrated into the Contractors workflow**



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