# FAMIS 2020

## What's New In Networking:

### Wi-Fi 6E, AI/ML, Cloud, & Why Increasing Speed Isn't Enough

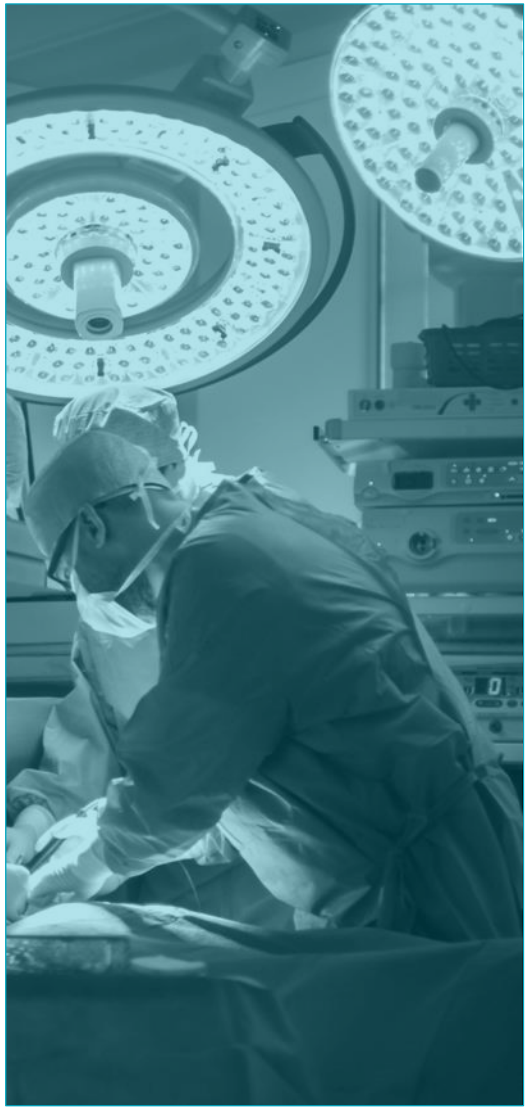
Alexandra Gates

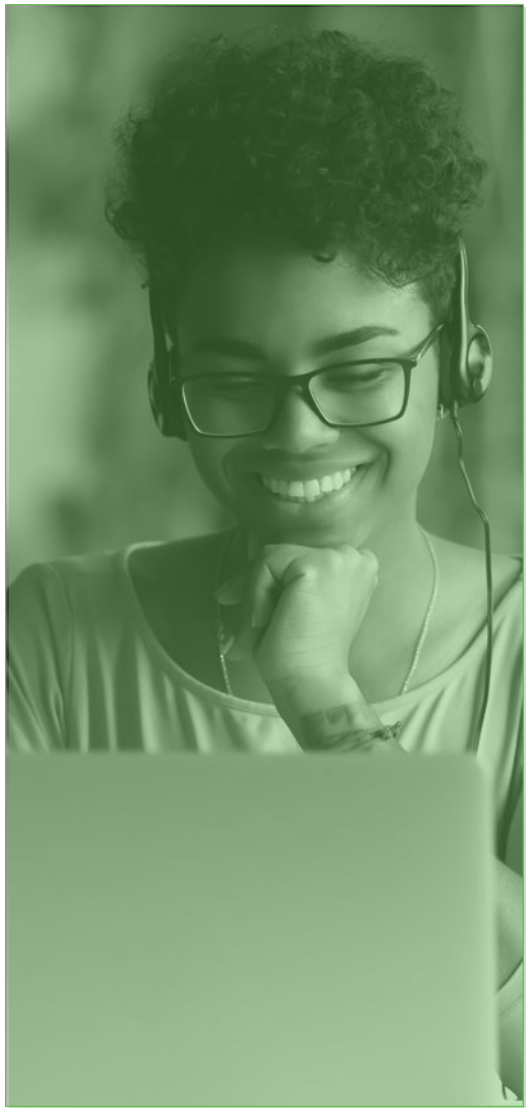
June 2020

# Agenda

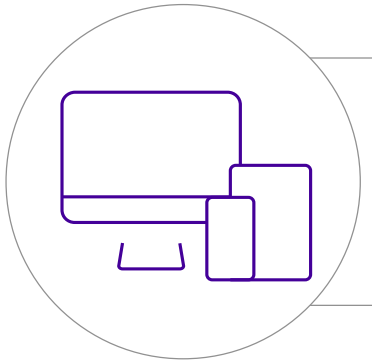
- Current & Future Networking Trends
- How to Prepare for an Influx of Wi-Fi Devices (IoT & others)
- Planning for Capacity, Visibility, & Control
  - 802.11ax & 6 GHz Deep Dive
  - AI/ML & Analytics Overview
- COVID-19 Remote Access Networking: Challenges & Solutions
- Cloud Networking Demo

# EFFORTLESS NETWORKING

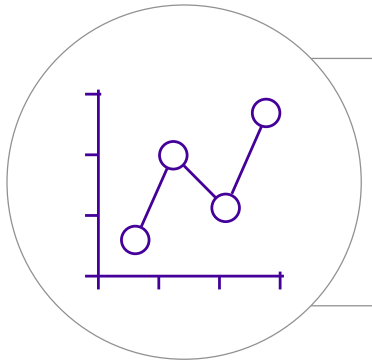




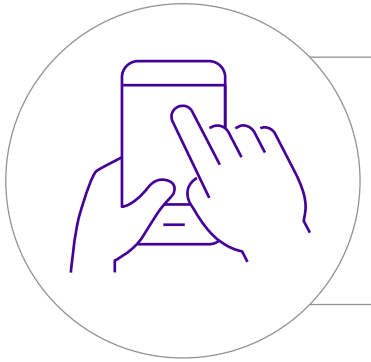
# EXPLOSIVE GROWTH IN DATA



**75B**
Devices by 2025
(10X the number of people)



**463EB**
Data generated
per day



**5.1B**
Mobile Users

Less than **1/2**
of IT teams will get more headcount

**68%**
of **TECHNOLOGY $**
is outside of the CIO's budget

**>100M**
number of IoT **ATTACKS** detected in 2019

**40%**
of CIOs state **SECURITY** is **their #1 investment**

Connected
**Users**

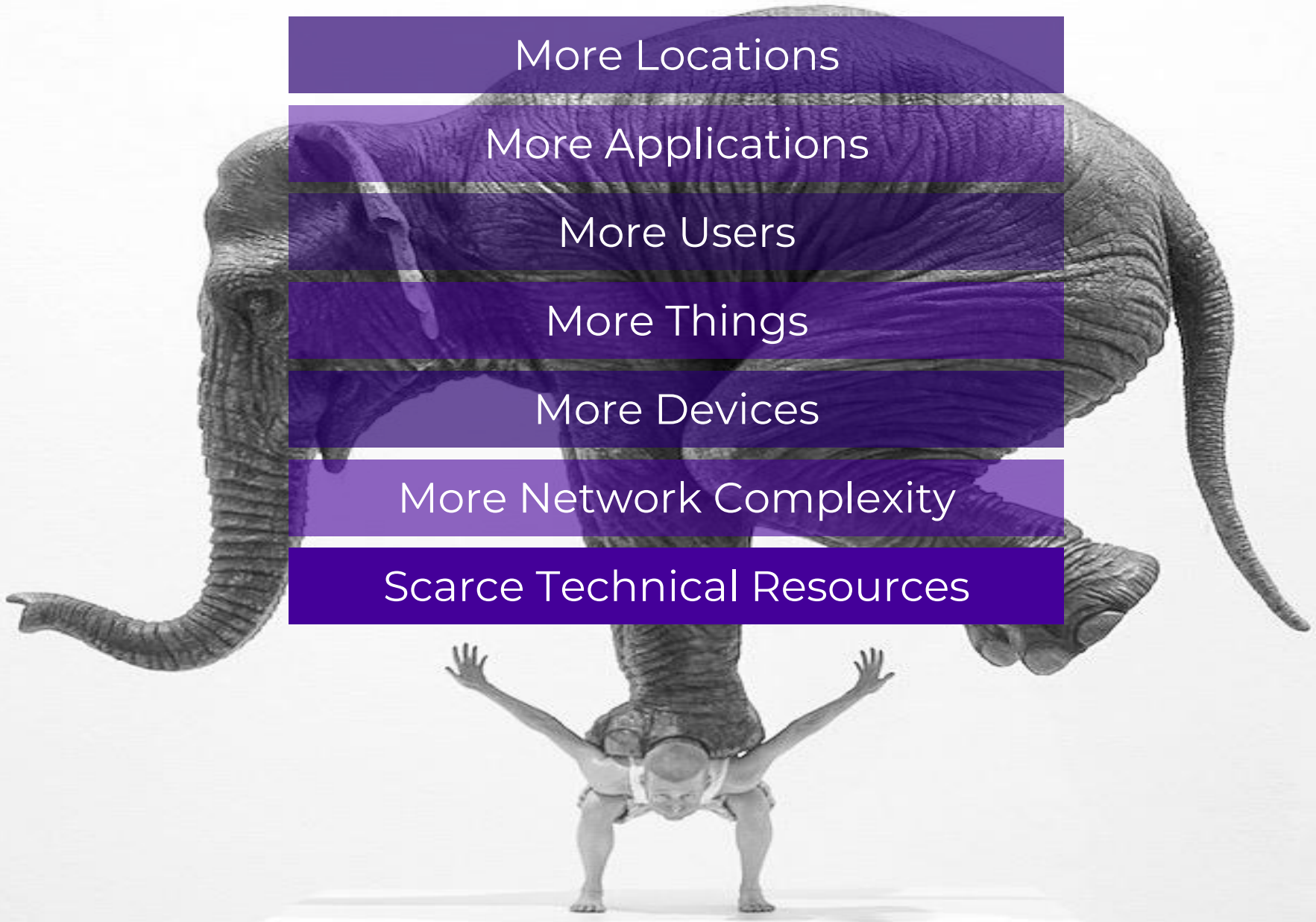
# Connected **Devices**

# Connected **Apps**

# *Connected Everything*

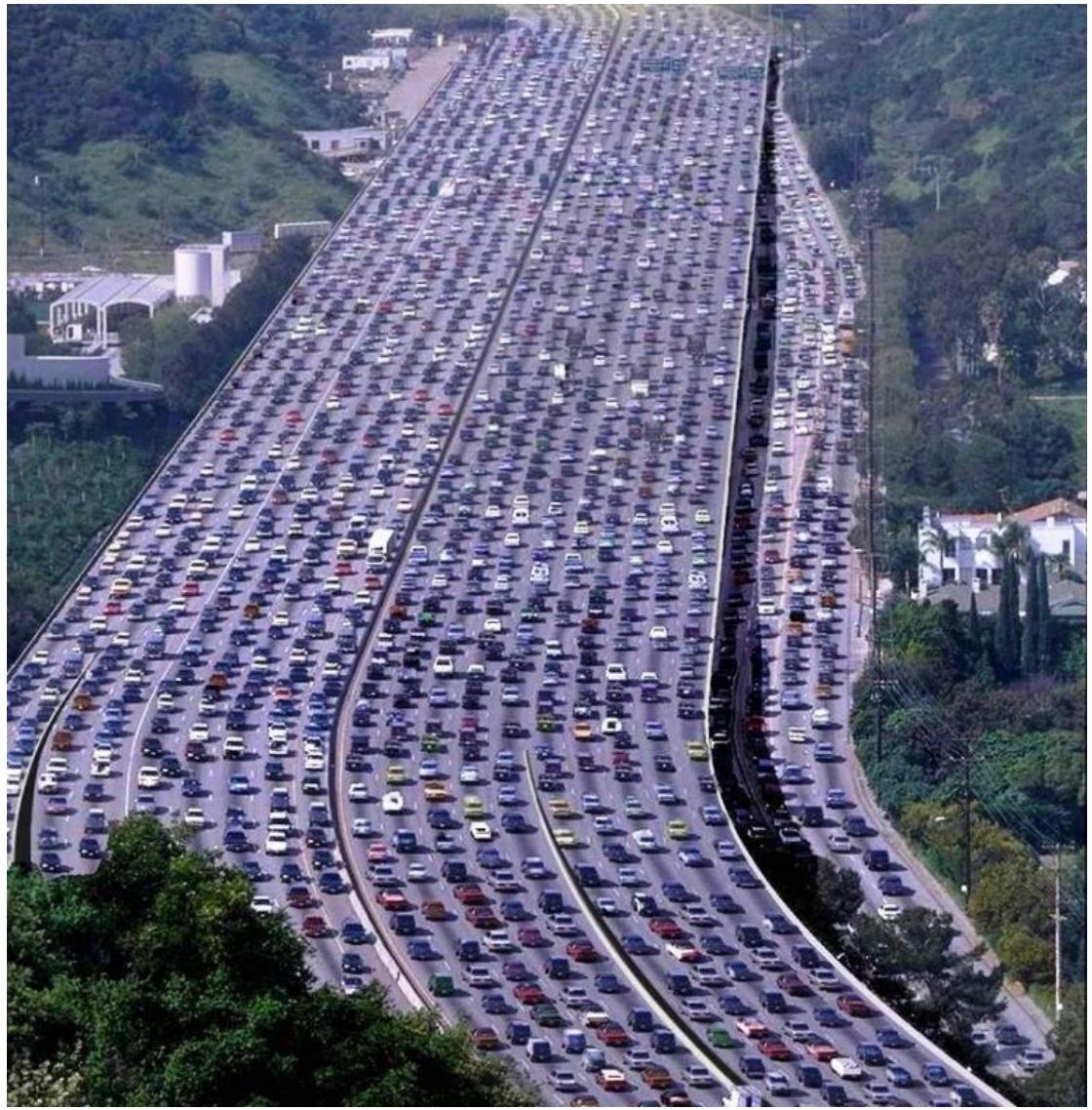
# YOUR NETWORK IS MORE DISTRIBUTED THAN EVER

## And you can't manage what you don't see


More Locations
More Applications
More Users
More Things
More Devices
More Network Complexity
Scarce Technical Resources

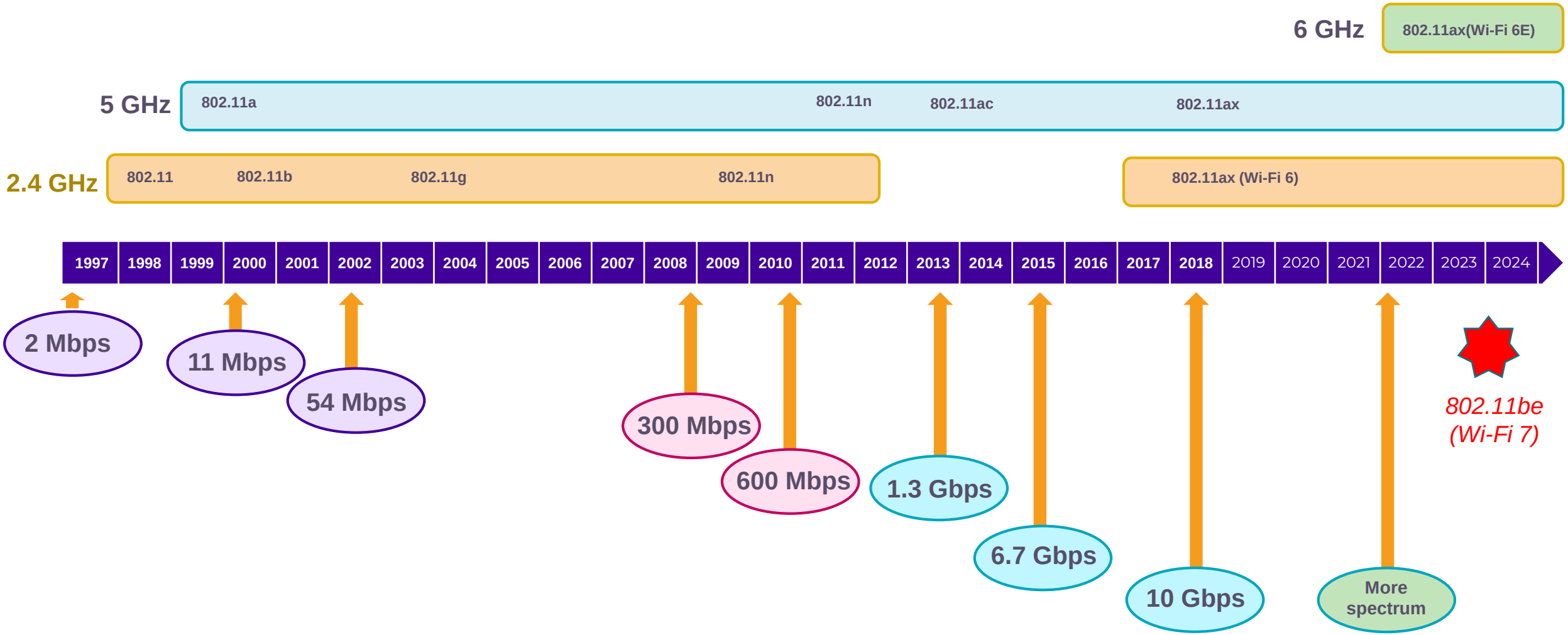
# How to Prepare
## More Capacity

# This Is The Current Problem



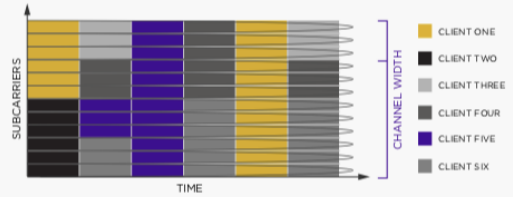
# 802.11ax & 6 GHz

# WI-FI Technology Evolution



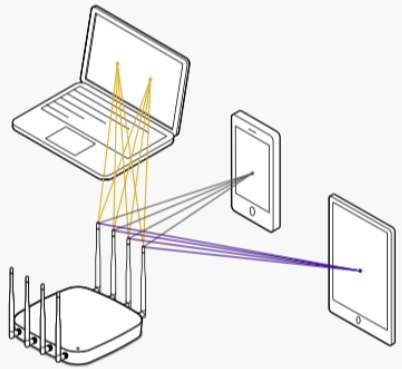
# IEEE 802.11ax FEATURES

## OFDMA (ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS)



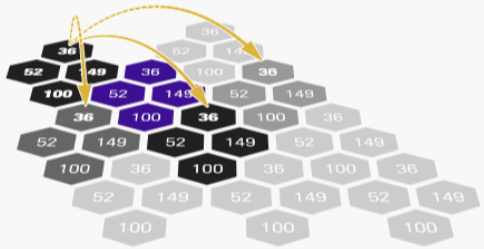

Multi-user version of OFDM enabling concurrent AP communication (Uplink/Downlink) with multiple clients by assigning subsets of subcarriers, called Resource Units (RUs) to the individual clients. Based on client traffic needs, the AP can allocate the whole channel to only one user or may partition it to serve multiple users simultaneously.

## MU-MIMO (MULTI-USER MULTIPLE INPUT MULTIPLE OUTPUT)



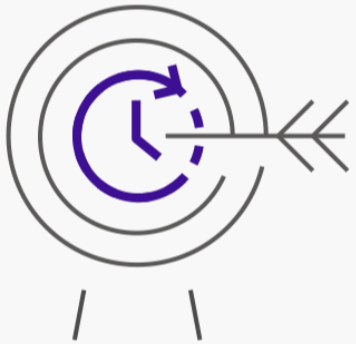
Introduced in 11ac, MU-MIMO technology allows the simultaneous transmitting of multiple frames to different receivers at the same time on the same channel using multiple RF streams to provide greater efficiency. 11ax adds 8x8 and Uplink MU-MIMO services to provide significantly higher data throughput.

## OBSS (OVERLAPPING BASIC SERVICE SET)



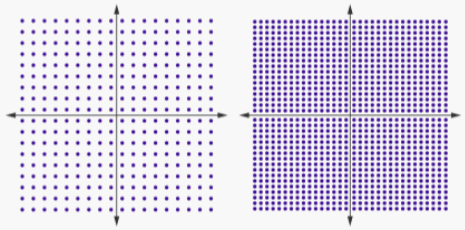
To improve spatial reuse efficiency and performance, 11ax adjusts the carrier sense operation based on the 'color' of the BSS. Depending on the BSS the traffic is generated from, the station can use different sensitivity thresholds to transmit or defer. This results in higher overall performance.

## TARGET WAKE TIME



TWT allows the AP to schedule a series of times for a station to 'wake up' at scheduled intervals to exchange data frames. This allows the station to 'sleep' longer and reduces energy consumption. It's a key capability for IOT devices.

## QAM 256 TO 1024



Modulation techniques are used to optimize throughput and range. The number of points in the modulation constellation determines the number of bits conveyed with each symbol. 802.11ac uses 256 QAM which transfers 8 bits/symbol. 802.11ax supports 1024 QAM, using 10 bits/symbol for a 25% increase in throughput.

## LONGER OFDM SYMBOLS


4x larger OFDM symbol times increase efficiency and also improves robustness, especially for transmission in outdoor scenarios.

## PREAMBLE UPDATES


Modified frame formats provide High Efficiency (HE) and legacy information to support new advanced capabilities as well as information required to support legacy stations and backward compatibility.

## 802.11AX OVERVIEW

The 802.11ax IEEE standard, essentially the sixth generation of Wi-Fi, addresses some of today's biggest Wi-Fi challenges – high density, and performance – by increasing capacity by up to 4x, and improving spectral efficiency to benefit both 2.4 GHz and 5 GHz bands in high density environments.

**Components:**

- OFDMA UL/DL
- MU-MIMO 8x8 & UL/DL
- 1024 – QAM modulation
- Long OFDMA Symbol
- New Frame Formats
- OBSS (BSS coloring)
- TWT – Power Saving
- Increased range
- 5 GHz & 2.4 GHz support

## GLOSSARY

**MU** – Multi User (OFDMA or MIMO)
**UL / DL** – Uplink/Downlink
**TWT** –Target Wake Time
**HE** – High Efficiency
**OBSS** – Overlapping Basic Service Set
**MIMO** – Multiple-Input and Multiple-Output
**OFDM** – Orthogonal Frequency-Division Multiplexing

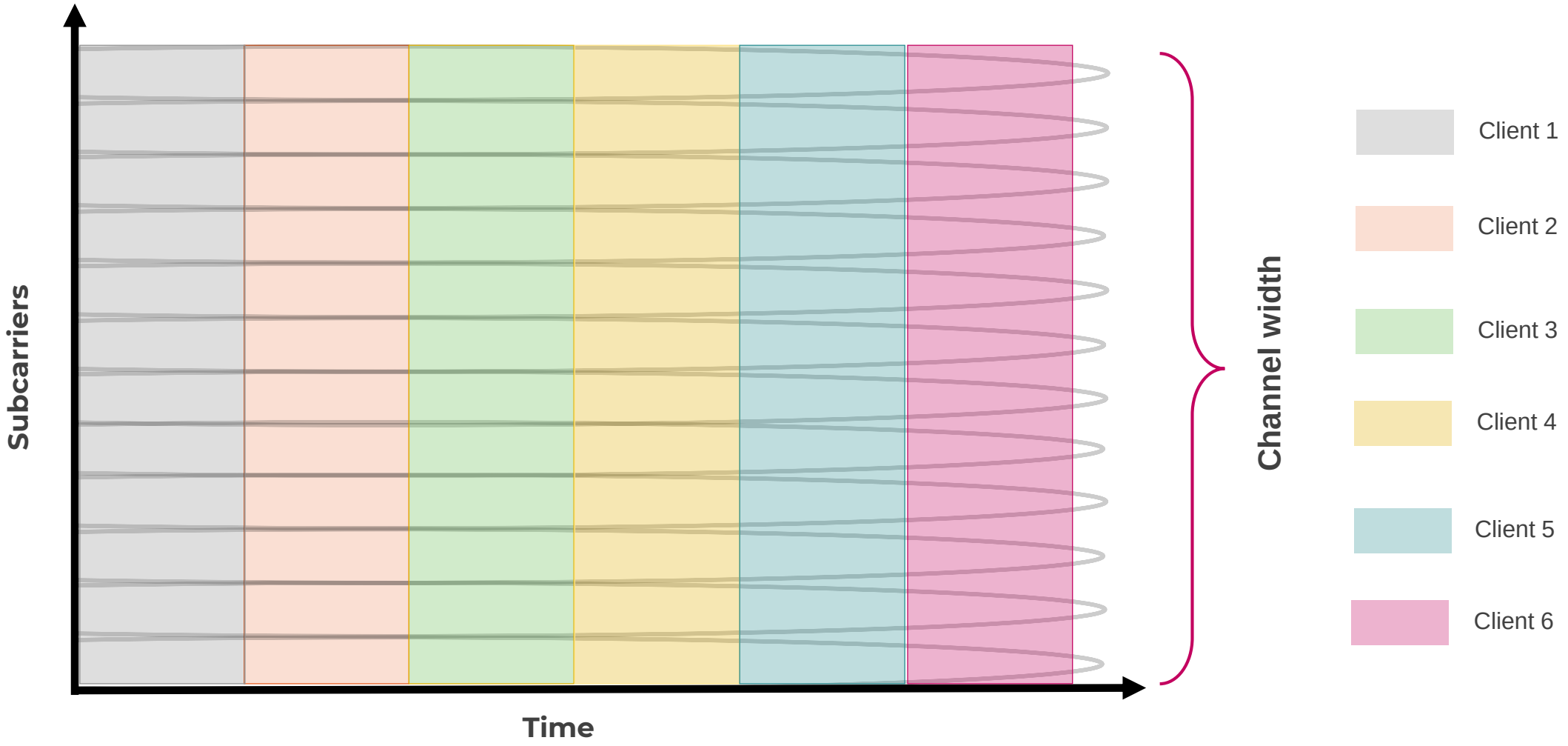
Extreme™
Customer-Driven Networking



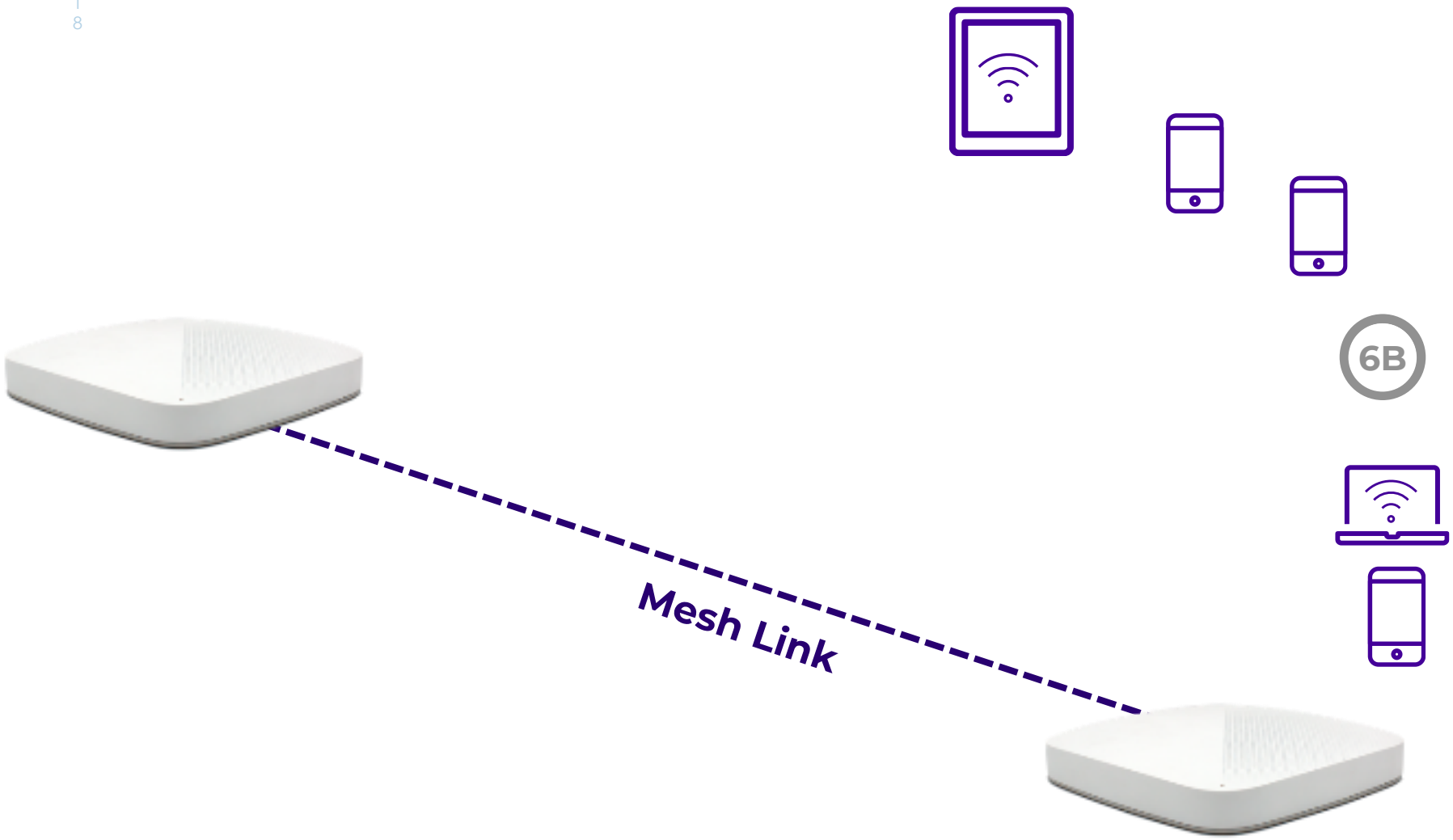
27032-1119-13

# OFDMA Technology Review

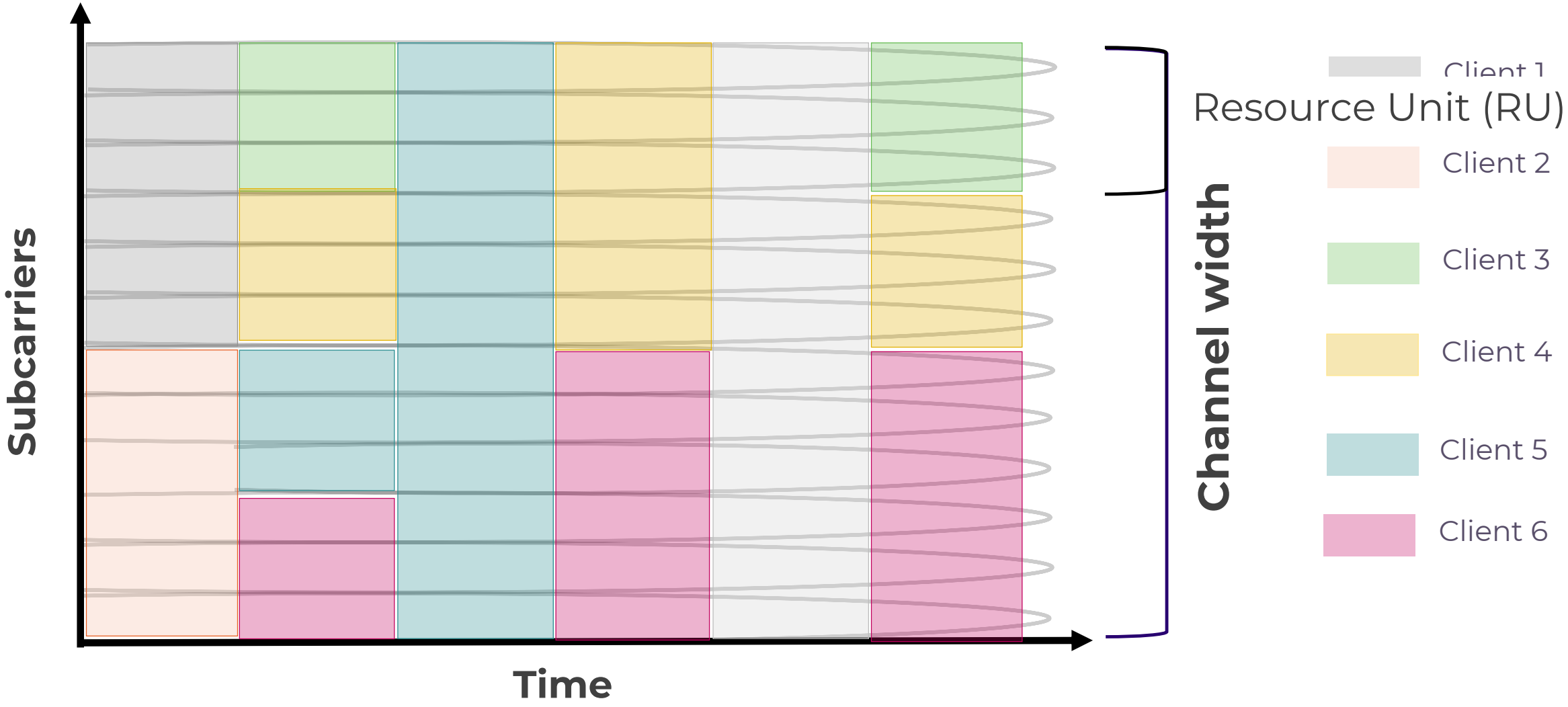
# OFDM – Existing Wi-Fi Operation



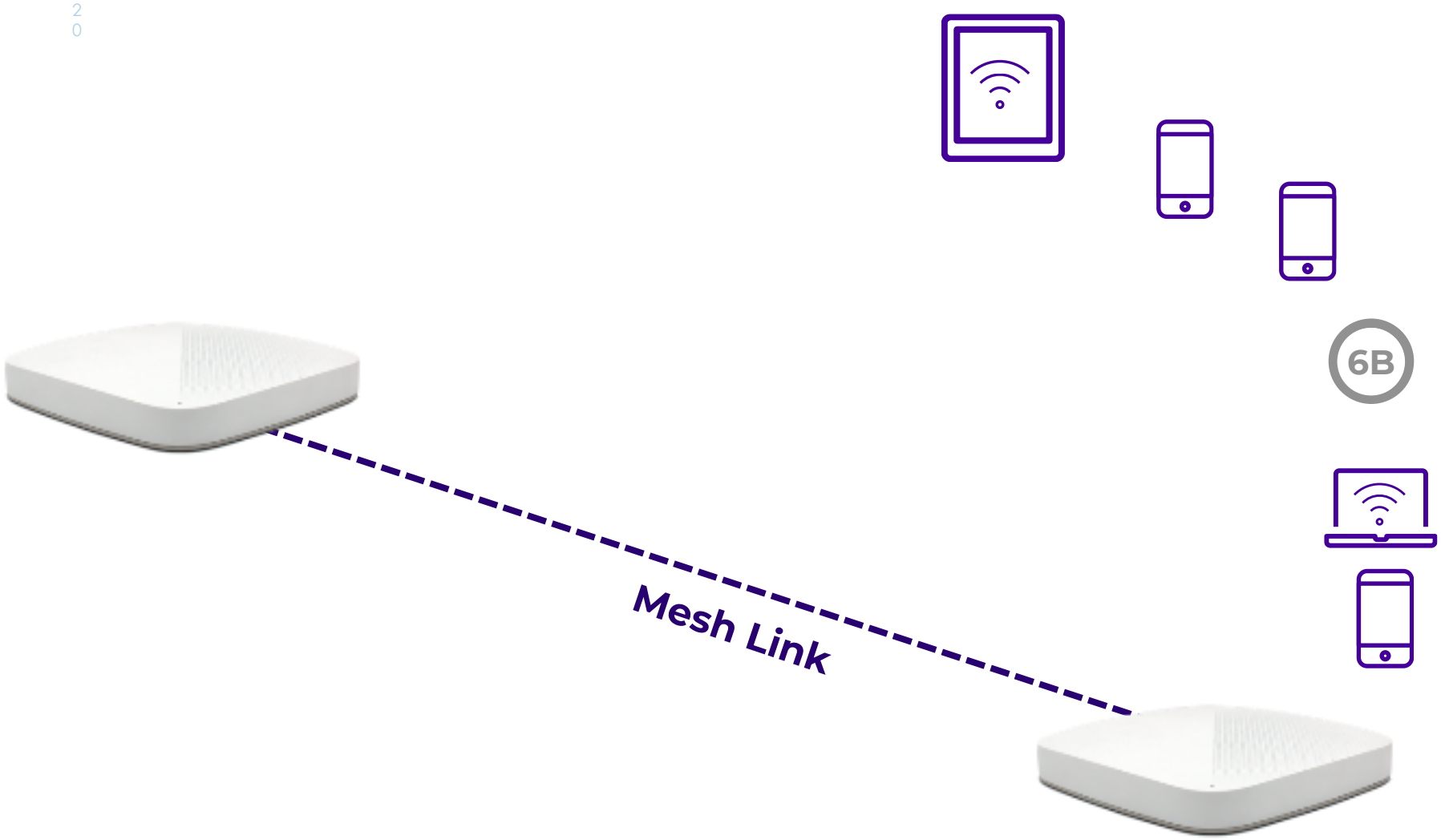
# OFDM – 802.11 a/g/n/ac



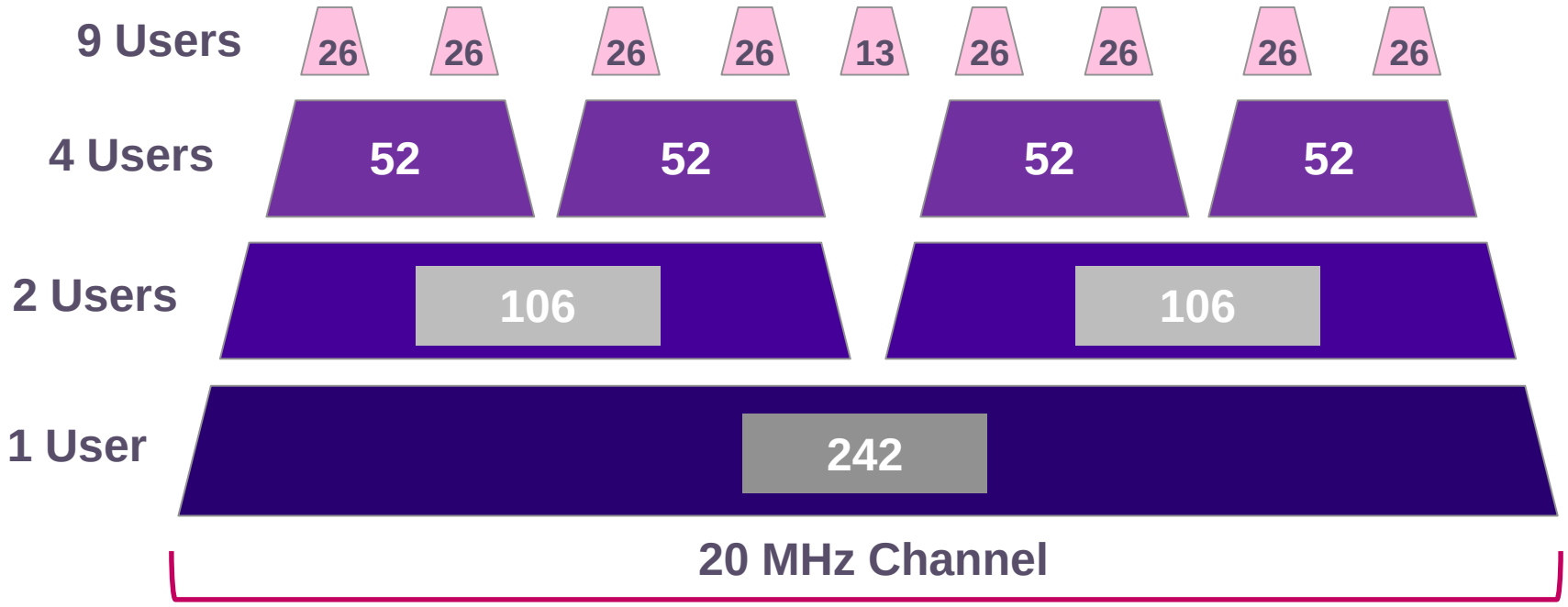
# OFDMA – 802.11ax



# OFDM – Another View



# OFDMA – Resource Units




Based on multi-user traffic needs, the AP may allocate the whole channel to one user or partition it to serve multiple users simultaneously





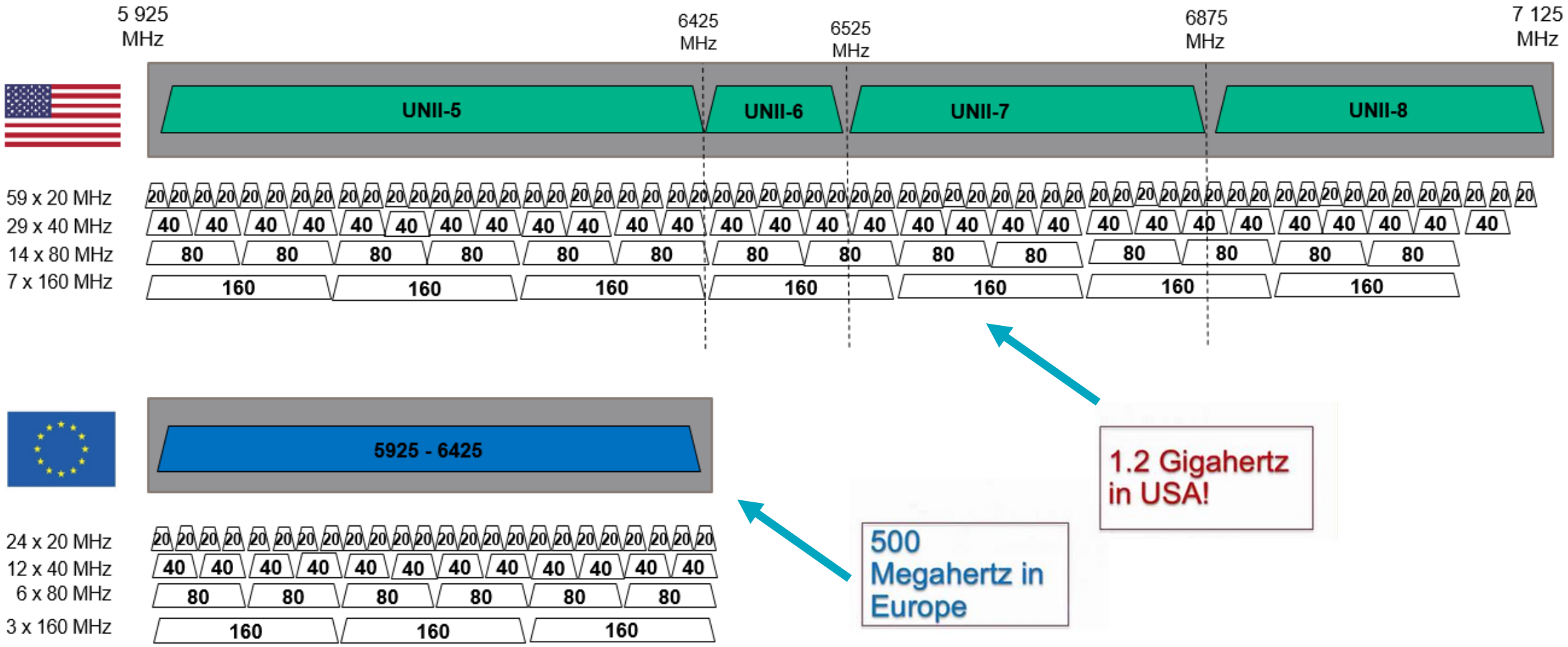
21

# Wi-Fi Technology

| Technology | Wi-Fi 4 (802.11n) | Wi-Fi 5 (802.11ac) | Wi-Fi 6 (802.11ax) | Wi-Fi 6E (802.11ax in 6GHz) |
|---|---|---|---|---|
| Available Channels | Up to 3 Channels in 2.4 GHz<br>Up to 25 Channels in 5 GHz | Up to 25 Channels in 5 GHz | Up to 3 Channels in 2.4 GHz<br>Up to 25 Channels in 5 GHz | Up to 3 Channels in 2.4 GHz<br>Up to 25 Channels in 5 GHz<br>**Up to 59 in 20 MHz** |
| Available Bandwidth | 60 MHz in 2.4 GHz<br>500 MHz in 5 GHz | 500 MHz in 5 GHz | 60 MHz in 2.4 GHz<br>500 MHz in 5 GHz | **1200 MHz in 6GHz** |
| Frequency Bands | 2.4GHz & 5GHz | 5GHz | 2.4GHz & 5GHz | **6GHz** |
| Channel Size (MHz) | 20 & 40 | 20, 40, 80, 80 + 80, and 160 | 20, 40, 80, 80 + 80, and 160 | 20, 40, 80, 80 + 80, and 160 |
| Frequency Multiplexing | OFDM | OFDM | OFDM & OFDMA | OFDM & OFDMA |
| Multi-User Technology | N/A | MU-MIMO (UL) | OFDMA (DL & UL)<br>MI-MO (UL) | OFDMA (DL & UL)<br>MI-MO (UL) |
| Security | Open<br>WPA2<br>WPA3 (optional) | Open<br>WPA2<br>WPA3 (optional) | Open<br>WPA2<br>WPA3 (Mandatory) | **Enhanced Open (Mandatory)**<br>**WPA3 (Mandatory)** |
| Backwards Compatibility | Yes | Yes | Yes | **No*** |

*AP will be backwards capable, but only 6E clients (802.11ax) can associate to 6E radio

# 6 GHz Wi-Fi Channels



# 6 GHz Value Proposition


## 2x Bandwidth

- 1200 MHz of new spectrum
- More than double 2.4 & 5 GHz combined

## Cleaner Spectrum

- No DFS to worry about

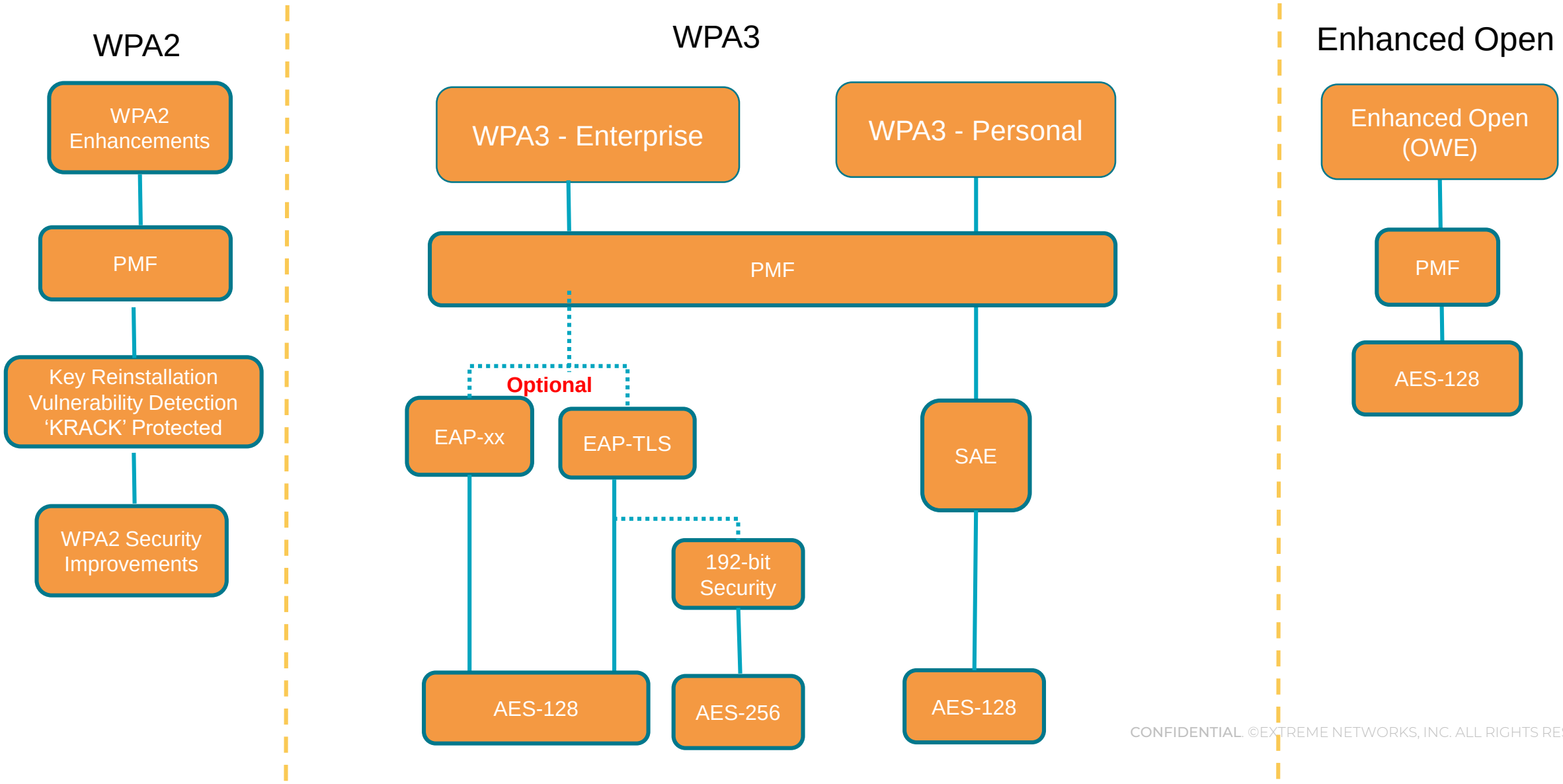
## 2x Channels

- Up to 59 non overlapping channels in 20 MHz
- Up to 29 non overlapping channels in 40 MHz
- Up to 14 non overlapping channels in 80 MHz
- Up to 7 non overlapping channels in 160 MHz
- *More than double 2.4 & 5 GHz combined*

## High Performance Clients

- No Legacy clients to hog airtime
- All Wi-Fi 6E+; Gigabit capable

# WFA Security Related Programs



# How to Prepare
## Increased Visibility & Control

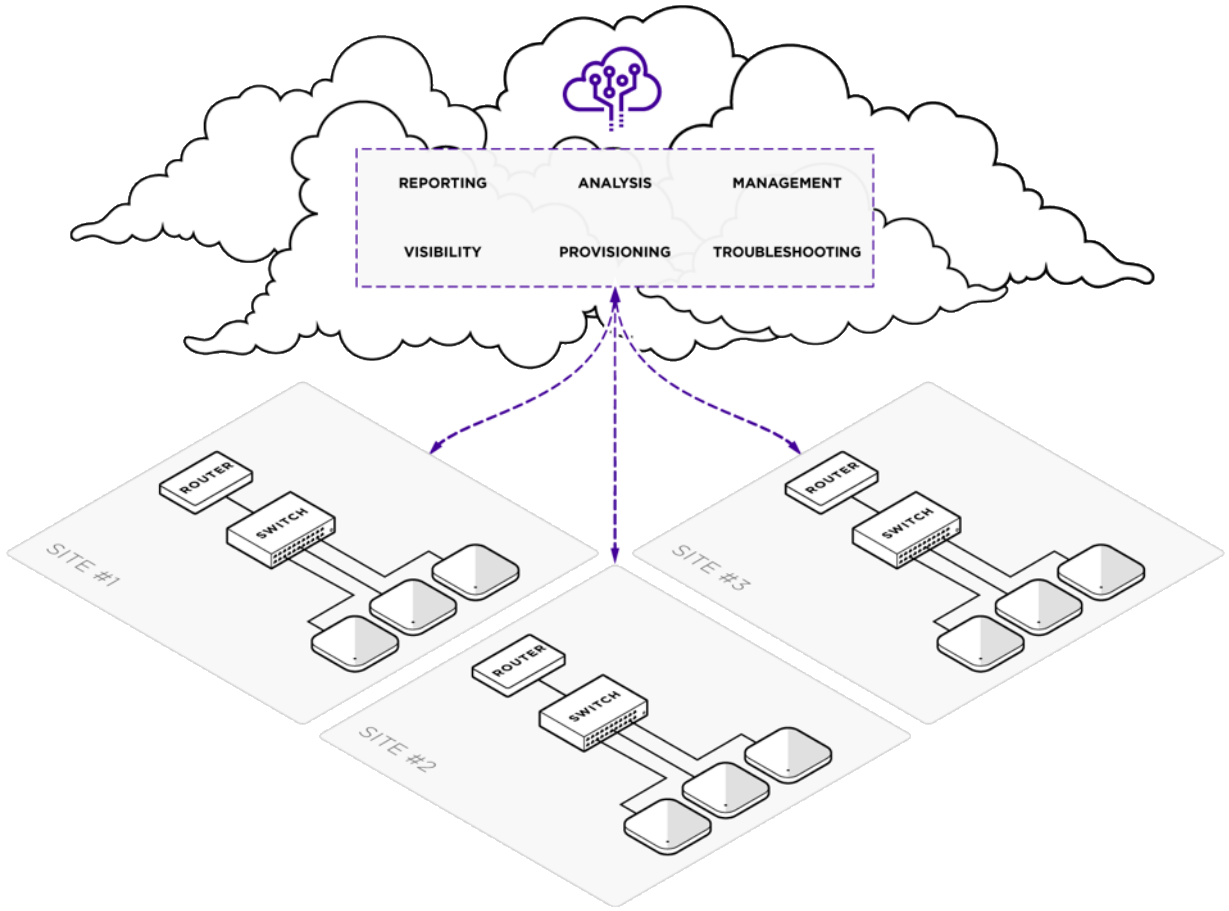
# END-TO-END CLOUD-DRIVEN NETWORKING

CENTRALIZED MANAGEMENT

VISIBILITY AND ANALYTICS

NEW AUTOMATION TOOLS

# DISTRIBUTED CONNECTIVITY REQUIRES CENTRALIZED MANAGEMENT AND VISIBILITY

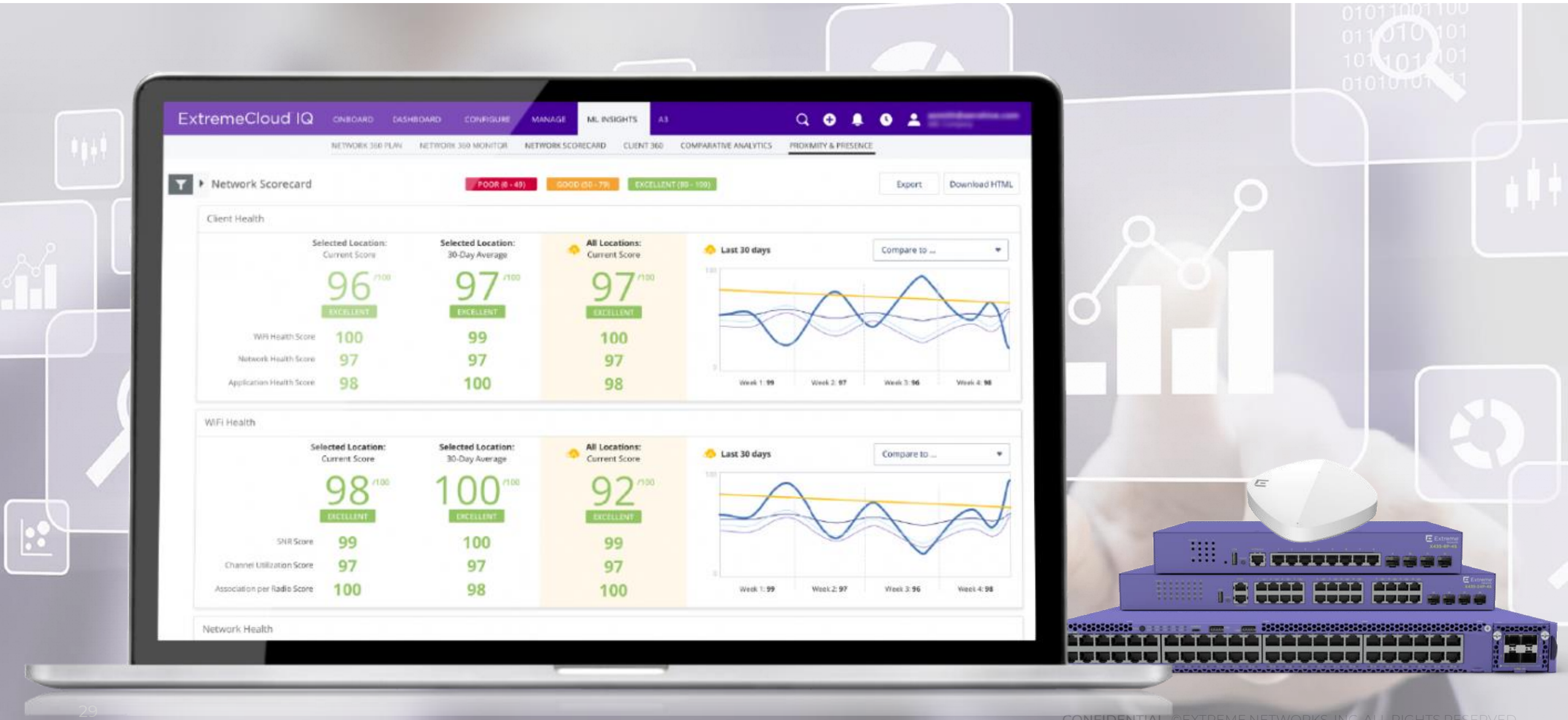



**SIMPLE** way to deploy and scale complex networks

**SMART** delivery of new insights and analytics using ML and AI

**SECURE** assurance of user, device, and IoT access

# MORE CONTROL. MORE INSIGHTS. MORE ANALYTICS



# CLOUD DRIVES EFFORTLESS DISTRIBUTED NETWORKING

SIMPLICITY
From provisioning to support, ExtremeCloud™IQ powered by cloud networking data intelligence makes all of your network operations effortless

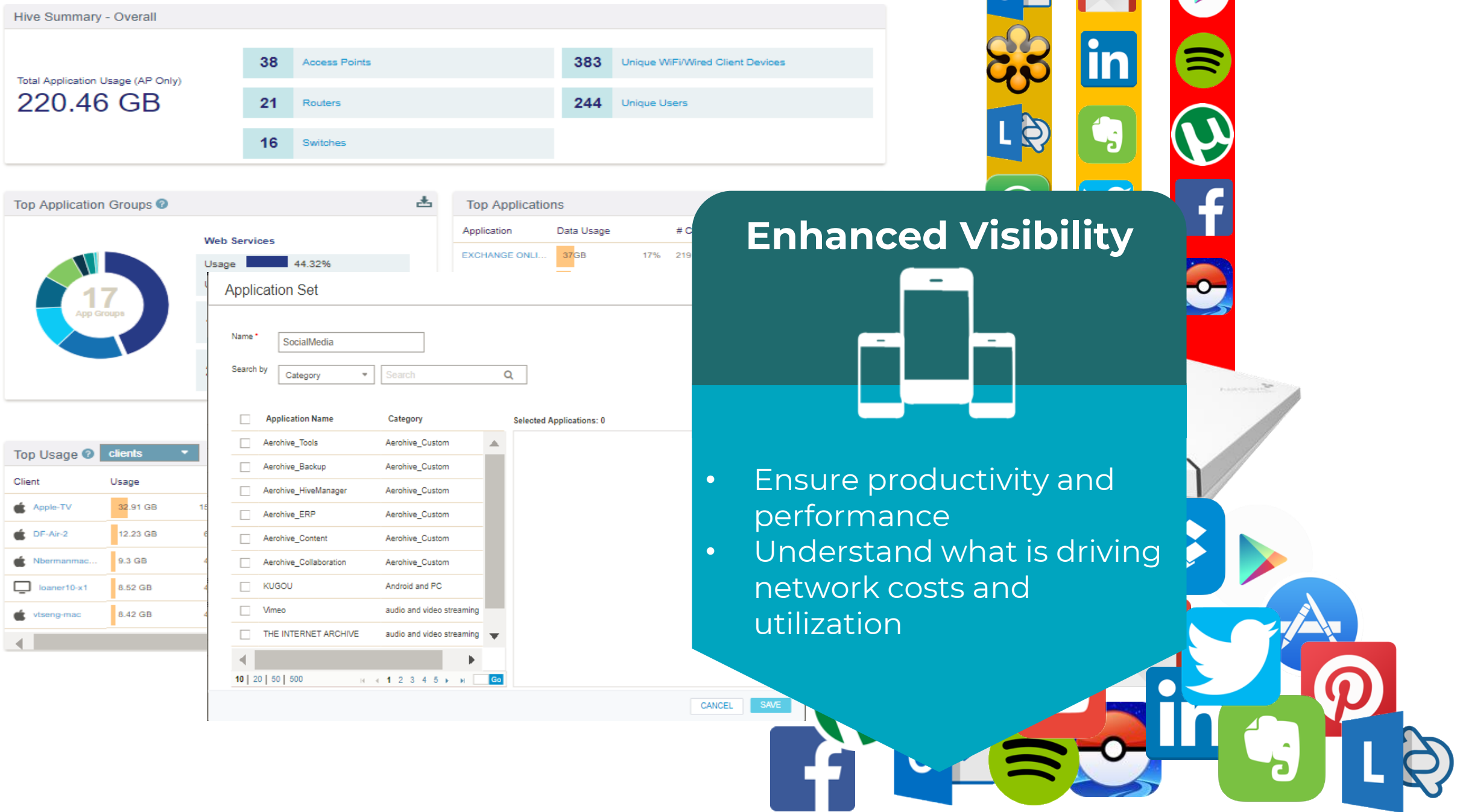
SPEED
Continuous innovation and delivery ensures that your network is equipped with the latest technology and solution enhancements


SERVICE
With API-accessible data insights and actions, integrate your network with business, partner, and technology provider ecosystems

SCALE
Unlimited growth scaling from a single device to millions supported by multiple-tier, multi-tenant network management

SECURITY
Protected from the client to the cloud, our platform ensures the highest levels of regulation, compliance, and data privacy


SAVINGS
Flexible deployment options and licensing, along with reduced operational expenses make distributed management less costly


Hive Summary - Overall
Total Application Usage (AP Only)
220.46 GB
38 Access Points
21 Routers
16 Switches
383 Unique WiFi/Wired Client Devices
244 Unique Users
Top Application Groups
17
App Groups
Web Services
Usage
44.32%
Top Applications
Application
Data Usage
EXCHANGE ONLI...
37GB
17%
Application Set
Name *
SocialMedia
Search by
Category
Search
Application Name
Category
Selected Applications: 0
Aerohive_Tools
Aerohive_Custom
Aerohive_Backup
Aerohive_Custom
Aerohive_HiveManager
Aerohive_Custom
Aerohive_ERP
Aerohive_Custom
Aerohive_Content
Aerohive_Custom
Aerohive_Collaboration
Aerohive_Custom
KUGOU
Android and PC
Vimeo
audio and video streaming
THE INTERNET ARCHIVE
audio and video streaming
CANCEL
SAVE
Top Usage
clients
Client
Usage
Apple-TV
32.91 GB
DF-Air-2
12.23 GB
Nbermanmac...
9.3 GB
loaner10-x1
8.52 GB
vtseng-mac
8.42 GB
Enhanced Visibility
• Ensure productivity and performance
• Understand what is driving network costs and utilization

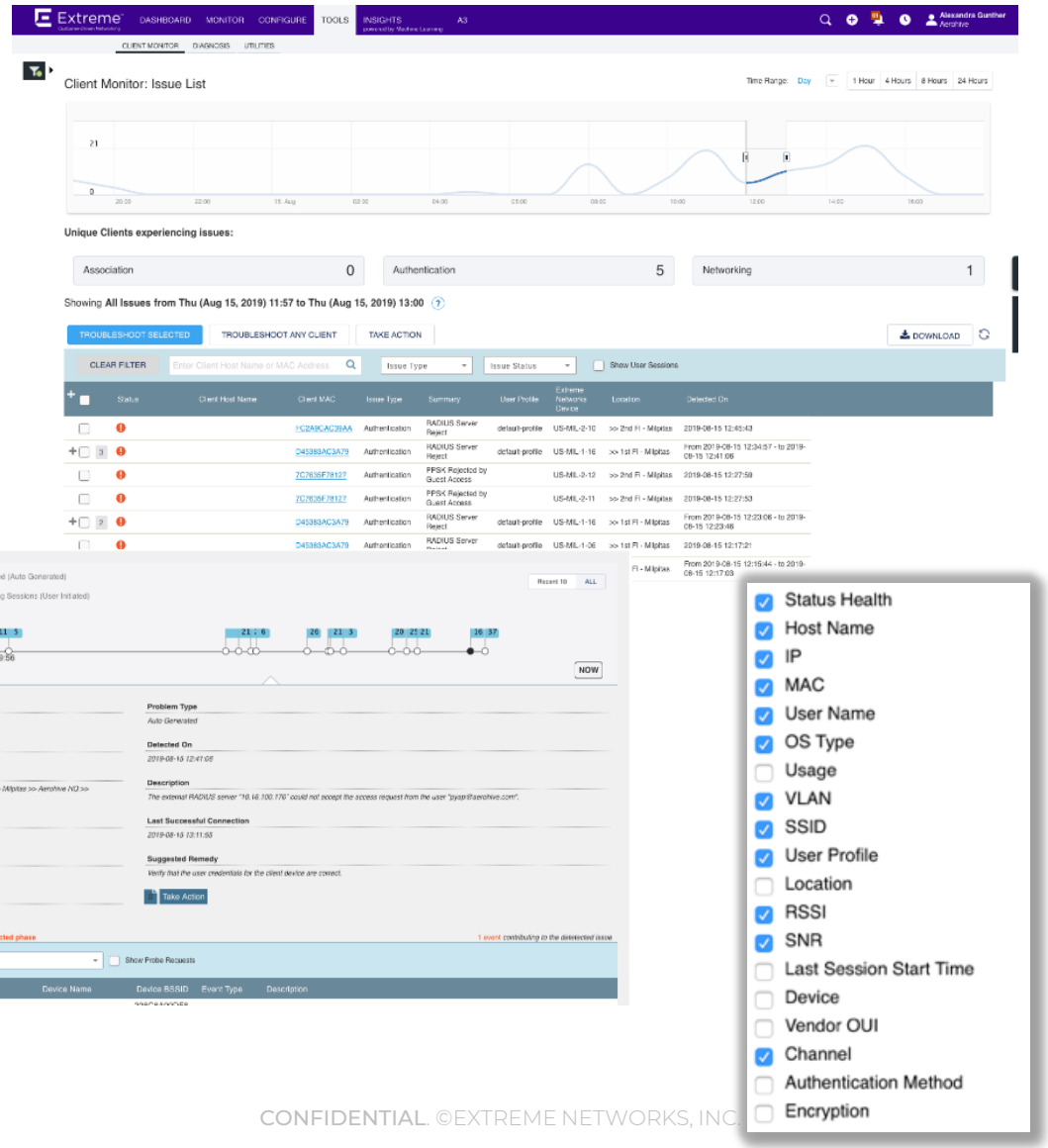
# Client Monitoring Across the Campus

**Client Monitor** provides automatic troubleshooting and diagnosis to aid Admins in detecting and resolving network issues as quickly as possible. Client Monitor **automatically monitors the network in the background and reports back any issues that are detected including failed authentication attempts and IP address misconfigurations.**

## Client Monitor Value

- Identify and troubleshoot **client association Issues**
- Identify and troubleshoot **client authentication issues**
- Client Trail info identifies **roam times and any issues**
- Ability to monitor and detect issues with DHCP, DNS or DG access
- Provide a high-level view of the **type and number of issues**

"The Client Monitor diagnostic tool timeline is extremely useful to see multiple occurrences of the same issue. Each occurrence is identified and flagged allowing faster issue resolution"

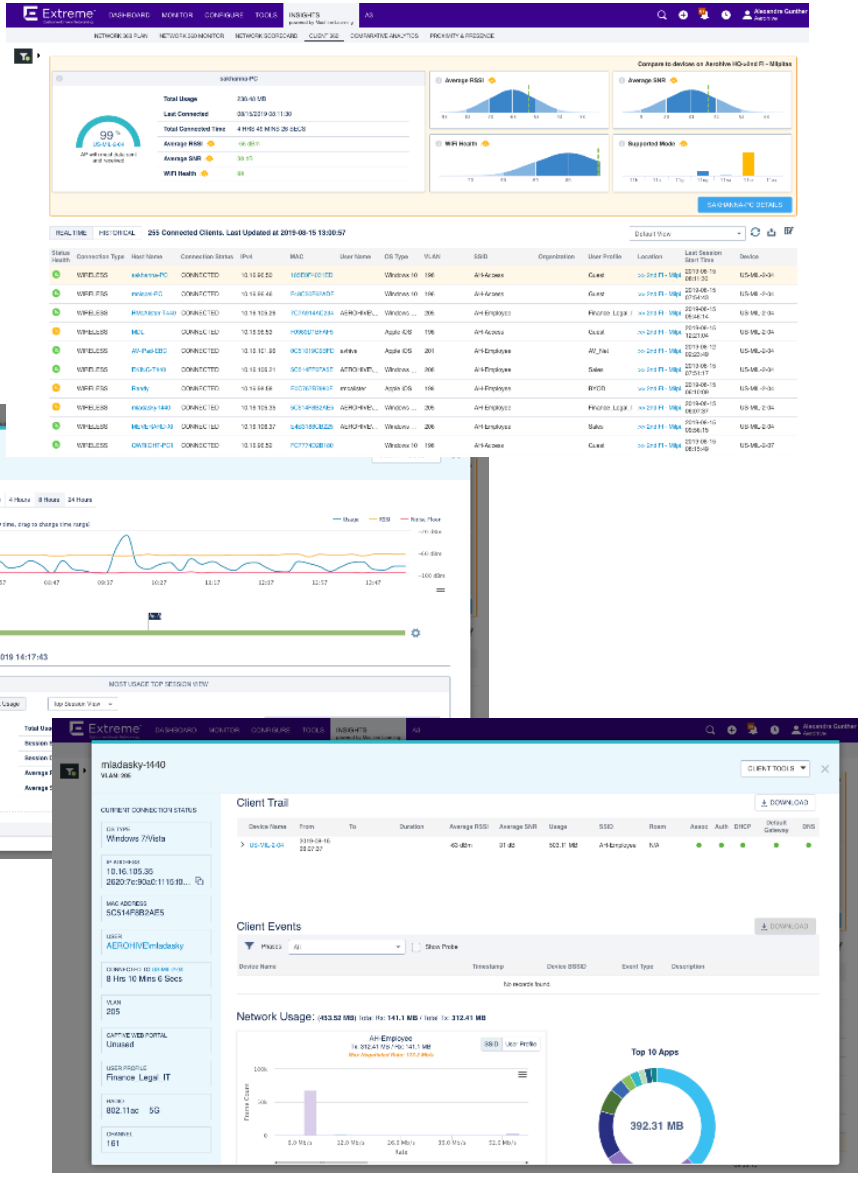


# Client Performance & Optimization

**Client 360** is derived using Extreme's true microservices Cloud architecture, API-driven Cloud-Management, and native machine learning capability **to securely collect, process, and rapidly analyze vast amounts of client data from a customers' network to accurately depict the "total client experience" in both real-time and historical views.**

## Client 360 Value

- Real-time **"total client experience"** in a single view
- Historical **"total client experience"** in a single view
- Machine Learning calibrated **client health metrics**
- Single source of "truth" for **client trouble-shooting**
- 30 Days of auditable **client experience data**




**"Client 360 is the single source of truth and ultimate tool for IT administrators to quickly track down and prove false, or validate and troubleshoot a past or real-time client experience issue."**

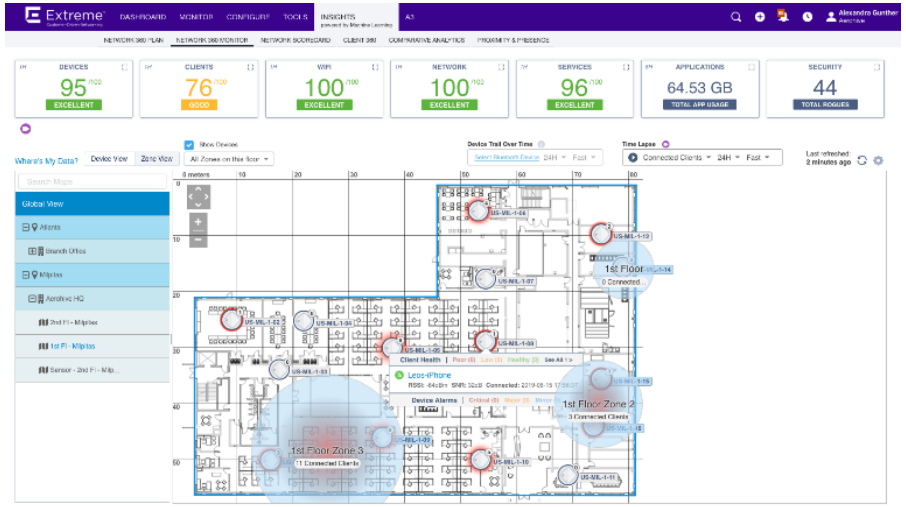
# Network Management Insights

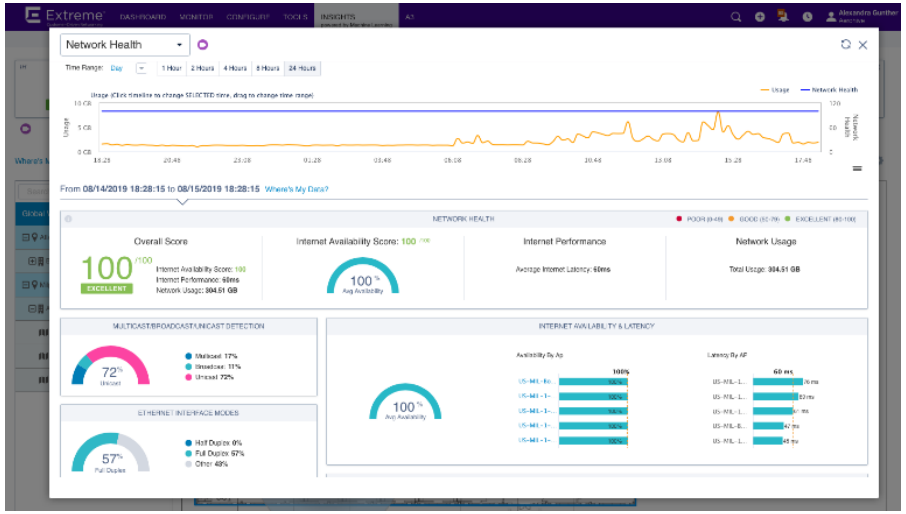
**Network 360** is derived using Extreme's true microservices Cloud architecture, API-driven Cloud-Management, and native machine learning capability **to securely collect, process, and rapidly analyze vast amounts of data from a customers network to accurately depict the "network health" in both real-time and historical views.**

## Network 360 Value

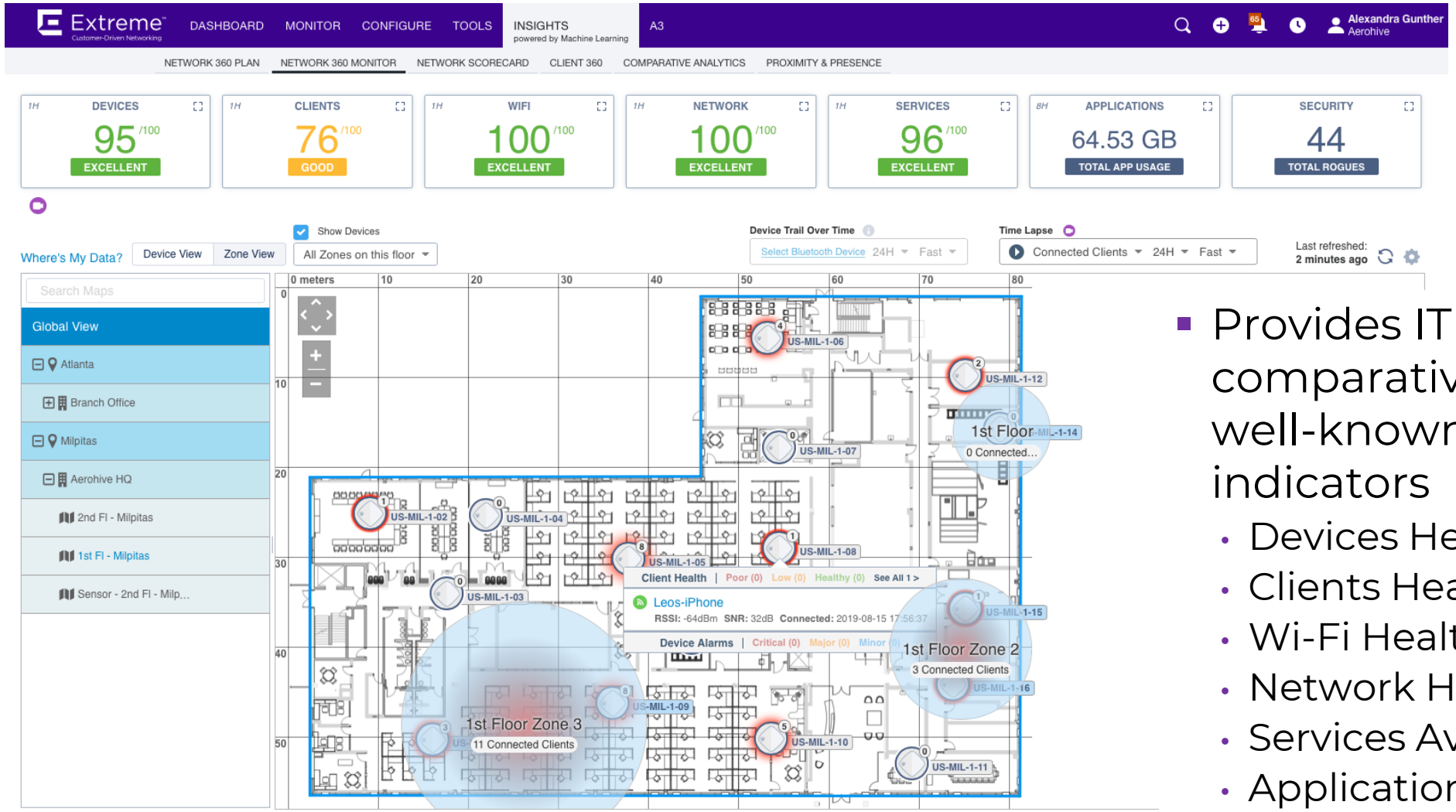
- Real-time **"access network health"** in a single view
- Historical **"access network health"** in a single view
- Machine Learning calibrated **network health metrics**
- Single source of "truth" for **access network health**
- 30 Days of auditable access **network health data**

"Network 360 is the single source of truth and ultimate tool for IT administrators to quickly track down and prove false, or validate and troubleshoot a past or real-time network issue."



# Network Health Scores

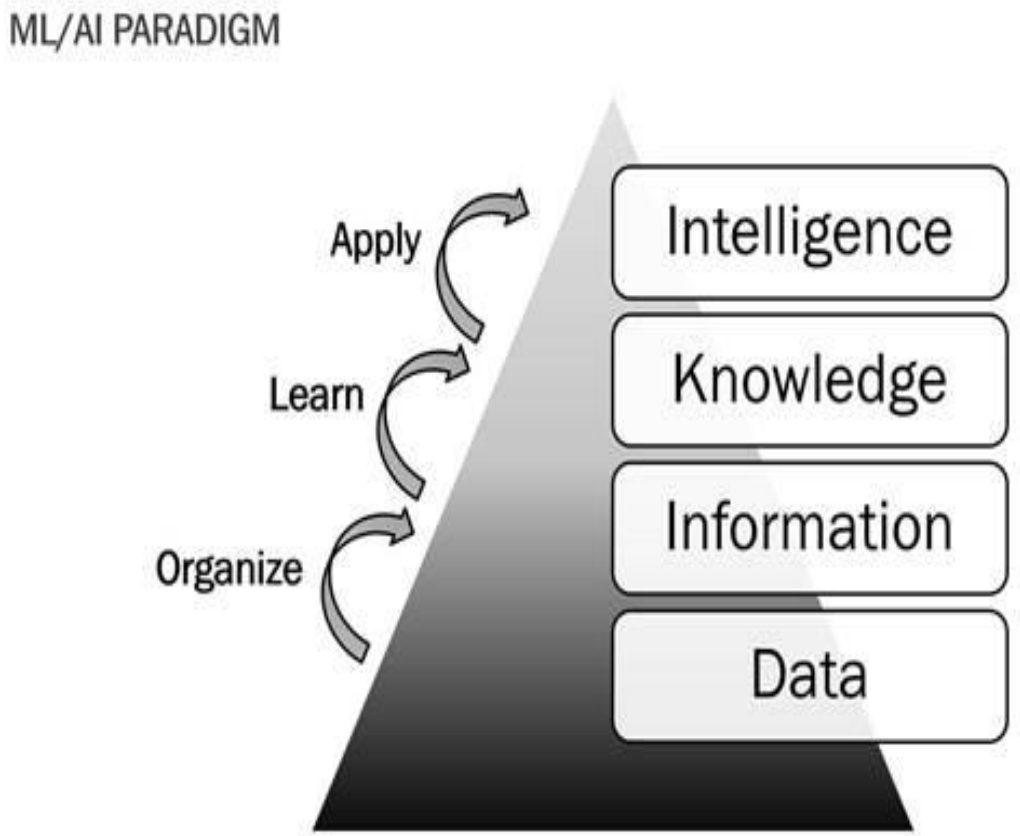



- Provides IT with network comparative analytics using well-known key performance indicators
  - Devices Health
  - Clients Health
  - Wi-Fi Health
  - Network Health
  - Services Availability
  - Applications
  - Security

# ML/AI & Analytics Overview

# Key Terms to Know

| Machine Learning (ML) |
| --- |
| **Acquire** knowledge |
| Process data sets |
| **Maximize data accuracy** |
| Subset of AI |
| **Artificial Intelligence (AI)** |
| Intelligently **apply** knowledge |
| Mimics **cognitive functioning** |
| Make informed decisions |
| Broader concept than ML |

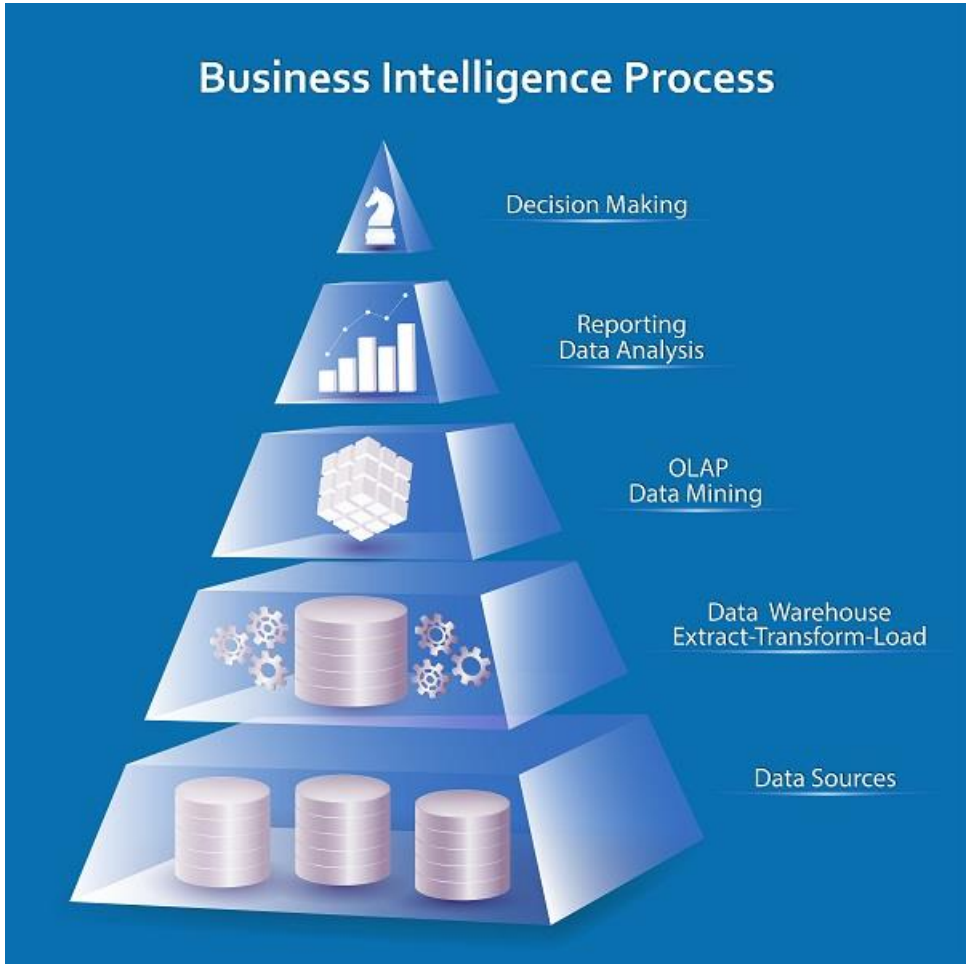


# Machine Learning vs Artificial Intelligence

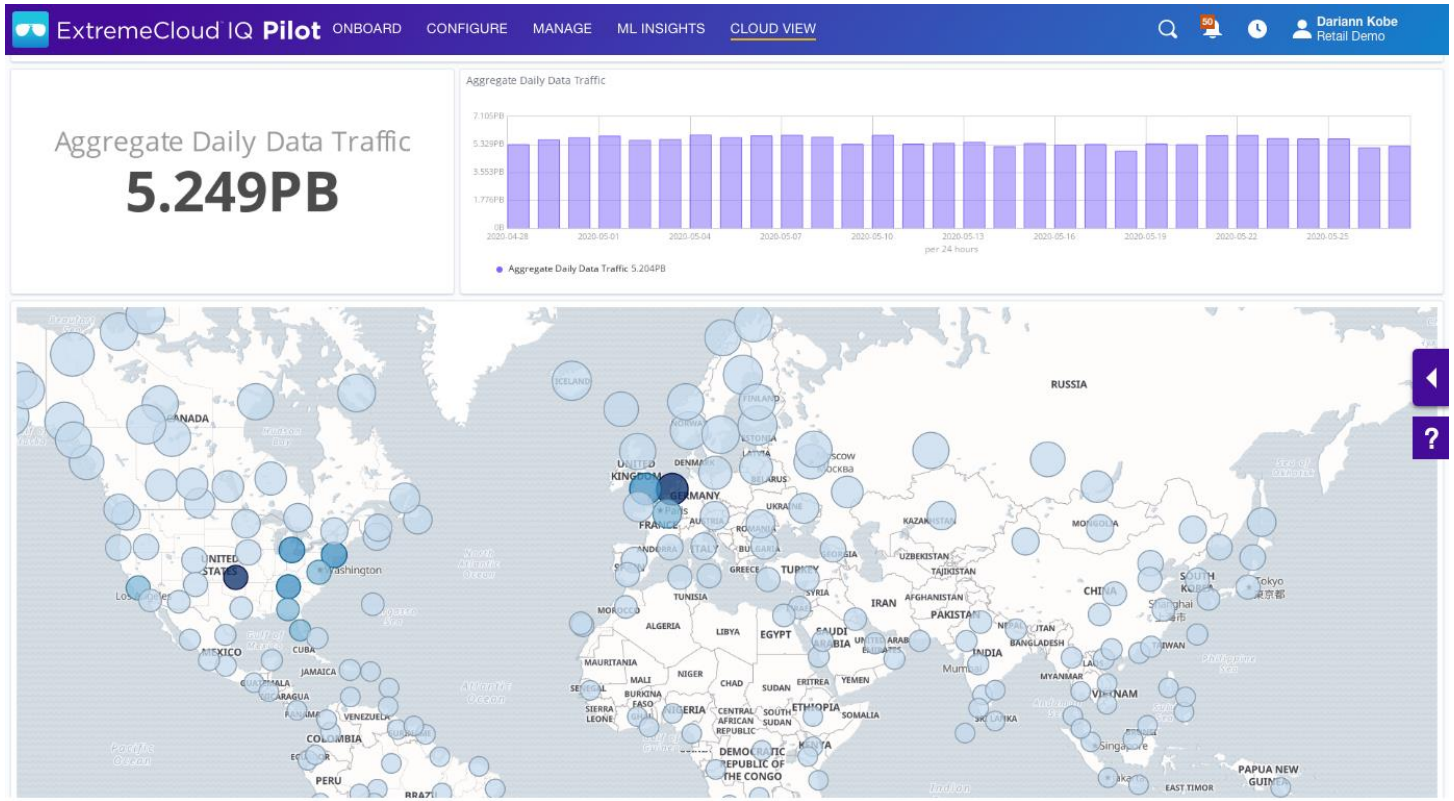
- Example of an AI problem:
  - Is this a puppy or muffin?

# Why Does ML/AI Matter?

- Make smarter decisions based on a wide and diverse data set
- A self-optimizing and self-healing network
- Problems are solved automatically before they become wide spread
- Quicker ROI since administrators are able to focus their time elsewhere instead of monitoring or tuning the network
- Easier interaction with the network management system
- Verbally ask questions to the system and receive quick and concise answers
- Intelligently built dashboards utilizing various data sets providing easy to read and understand reports



# AI & ML Require Massive Amounts of Data




Customer network devices in our ecosystem send an average of 6 Petabytes of data daily

1 Petabyte of data is equal to 13.3 years of HD video

Every day, ExtremeCloud IQ processes the data equivalent of 40 years of HD video

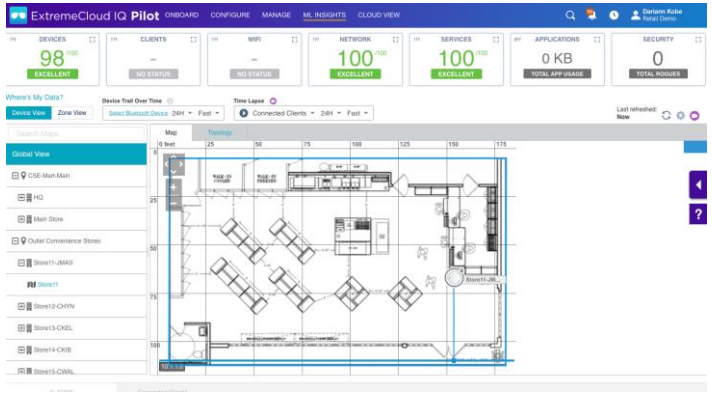
# Data Analytics

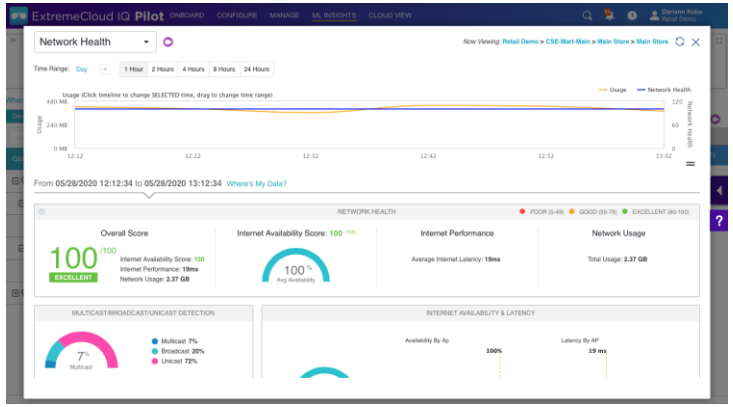
Valuable network data about devices, clients, applications, etc. can:

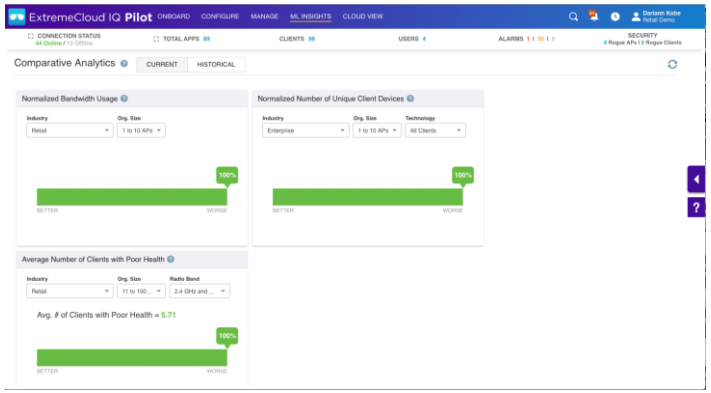
- Help with network management
- Lead to new insights to reduce costs, increase revenue, and improve user experiences

Some value added use cases:

- Insights into customer behavior can allow for quicker and easier engagement with customers
- Gain info to support a variety of decisions from promotions to employee scheduling
- Simplified on-boarding of personal devices
- Insights about your employees and office buildings with Time and Attendance analytics



# Covid-19 Remote Access Networking

## Challenges & Solutions

# ESTABLISHING A NEW NORMAL

## Networking is the Foundation for Post-COVID-19 Operations

*Organizations will need more:*

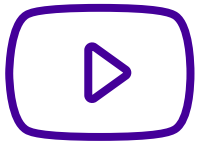

Mobile Devices


BYOD Devices


IoT Connections


Agile Workers


Cloud Applications

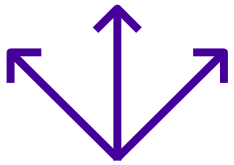

Video


Security Measures

## As organizations require more distributed connectivity, they need even better centralized management

*Organizations will need:*

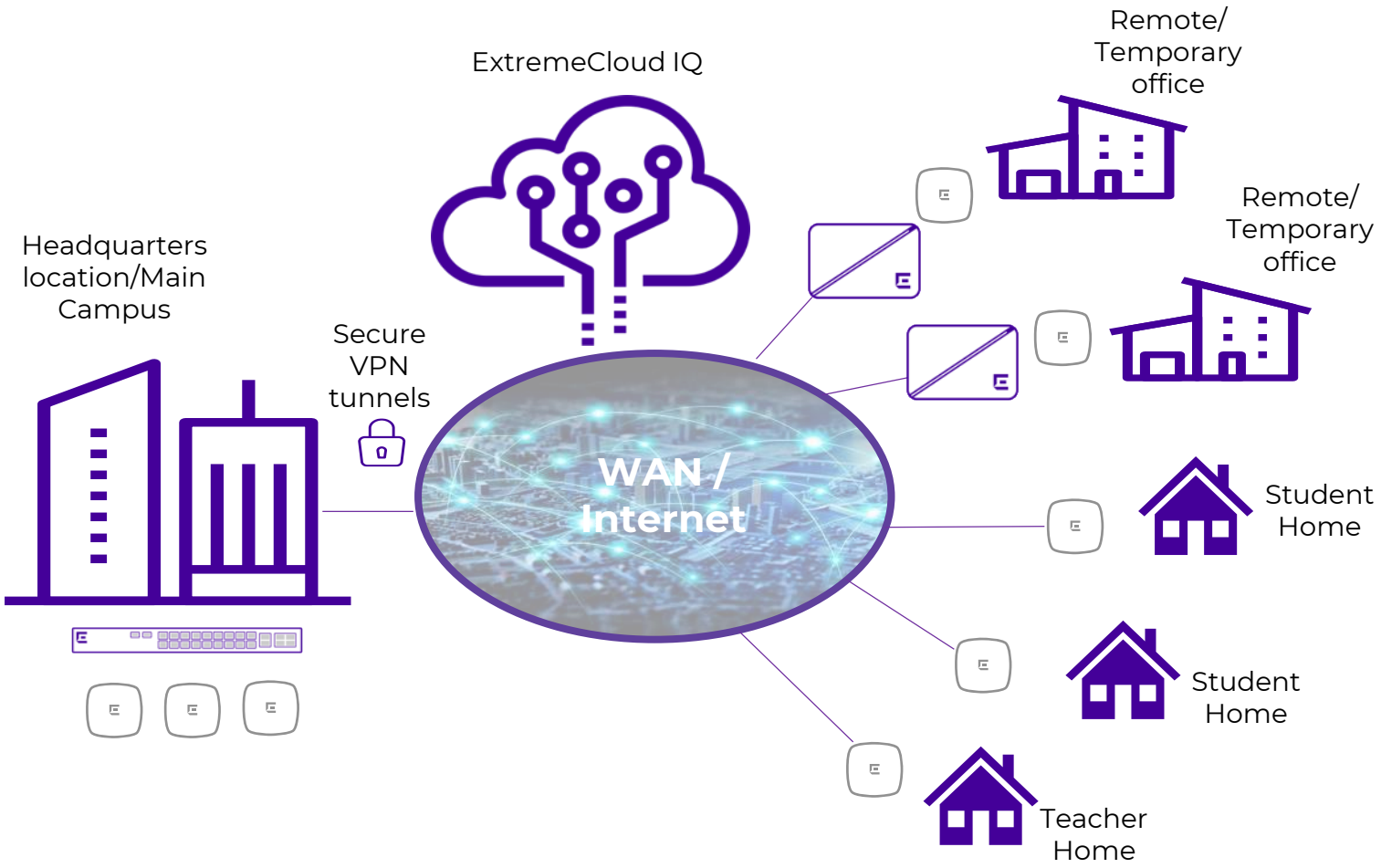

More Insights, More Control


Effectively Scale

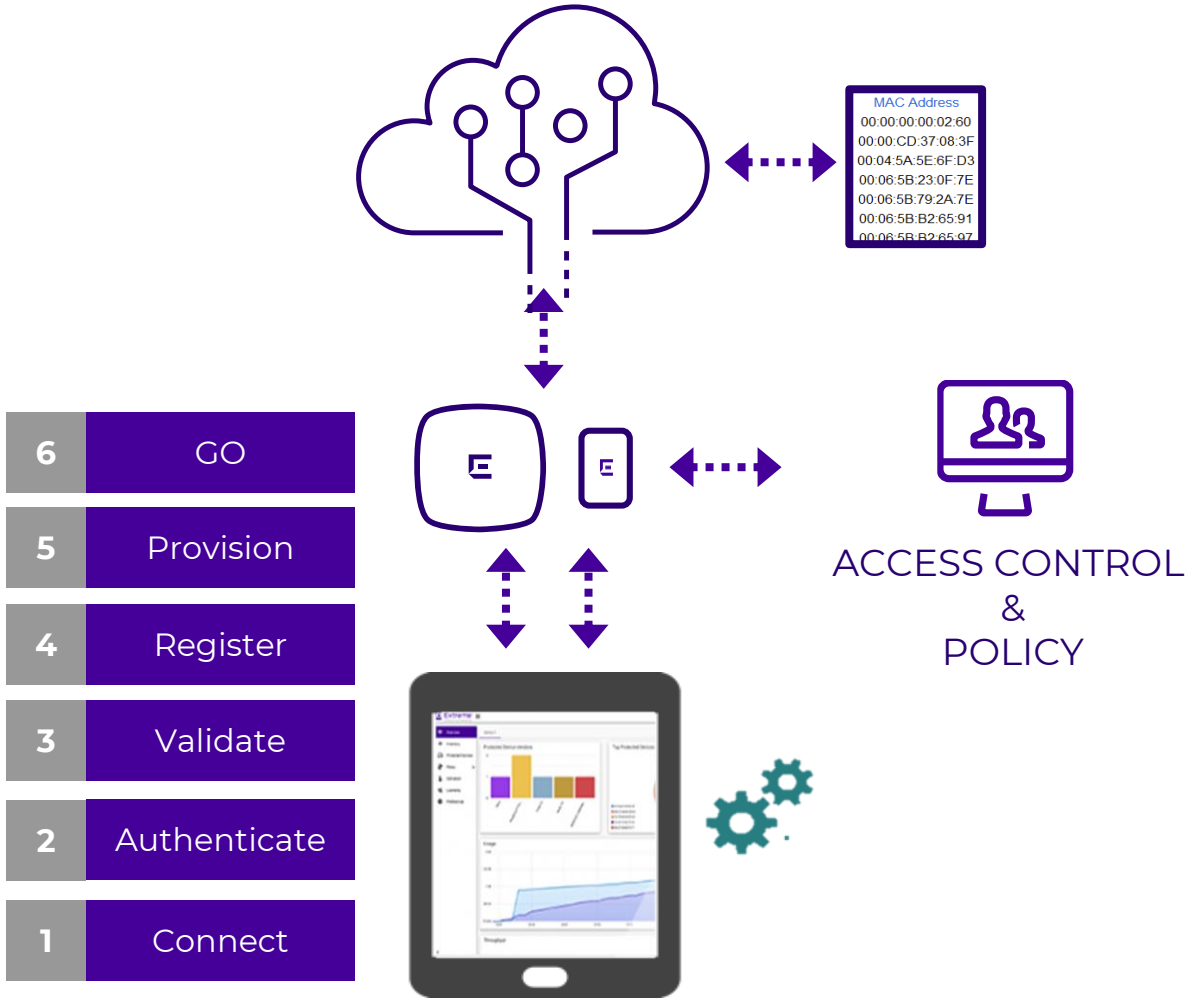

Dependable, Secure Cloud


4th Generation Cloud (Extreme)

# AGILE WORKING SOLUTIONS



# IoT & ROBOTICS AUTOMATION MANAGEMENT SOLUTIONS

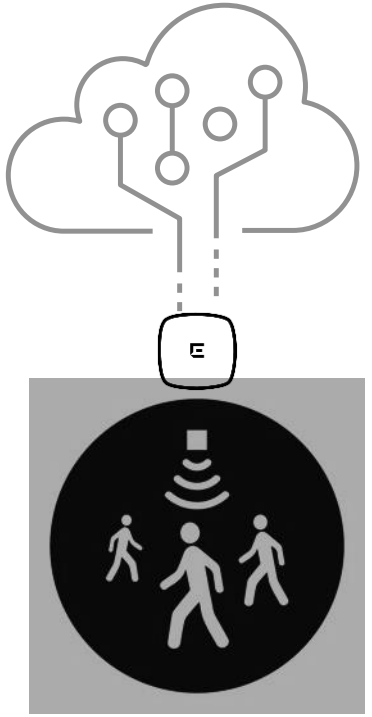


# OCCUPANCY MANAGEMENT

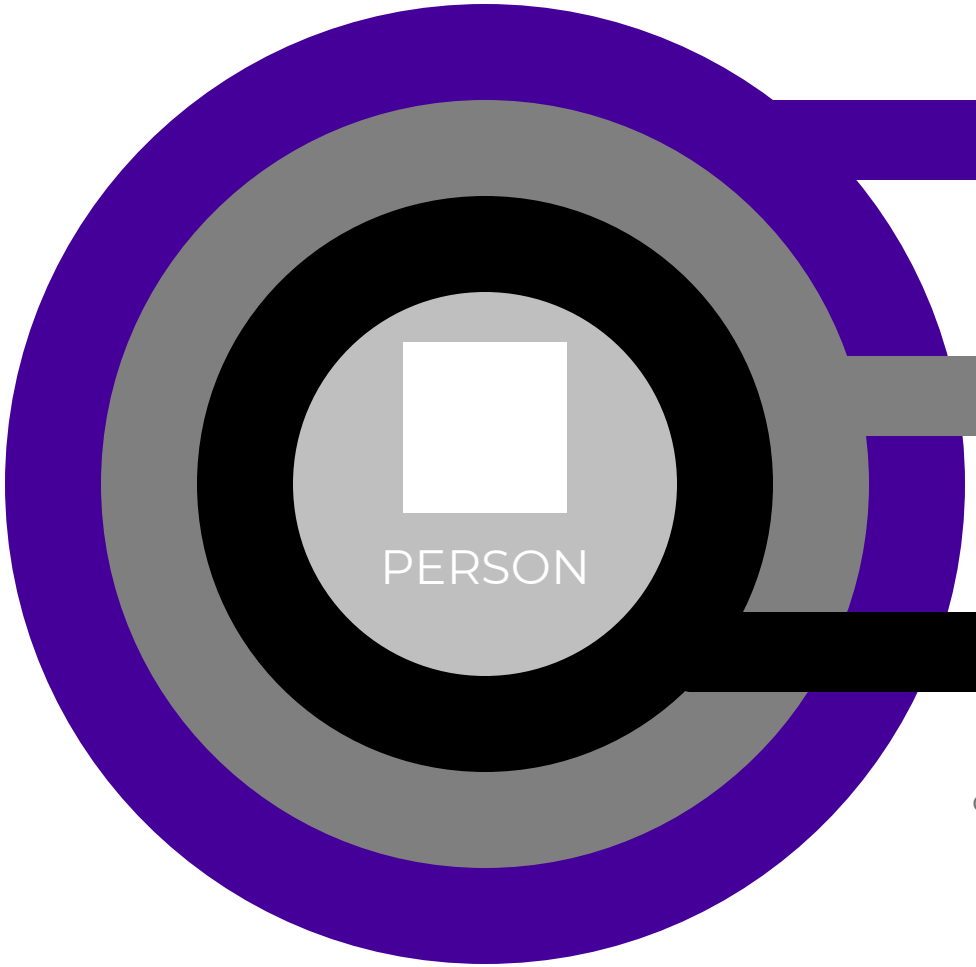
Identify Associated Users & Devices

Track Congregation Areas

Integrate with Notification Apps



# CONTACT TRACING SOLUTIONS




## COMMUNITY

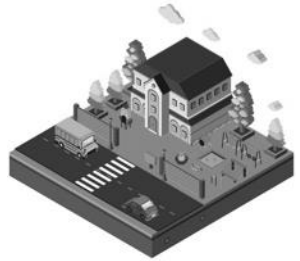
Global tracing of users and devices with specialty apps focused on user opt-in

## CAMPUS

Tracking movement of staff and visitors as they traverse a defined campus

## BUILDING

Using the network to deliver analytics and insights about connected users and devices



# ALL OF THIS STARTS WITH A BETTER CLOUD

## AVAILABILITY

100% uptime with rapid feature and bug fix availability using CI/CD

## DURABILITY

With over 1 million bits of data stored per day, we might lose one every 659,000 years. You are about 411 times more likely to get hit by a meteor

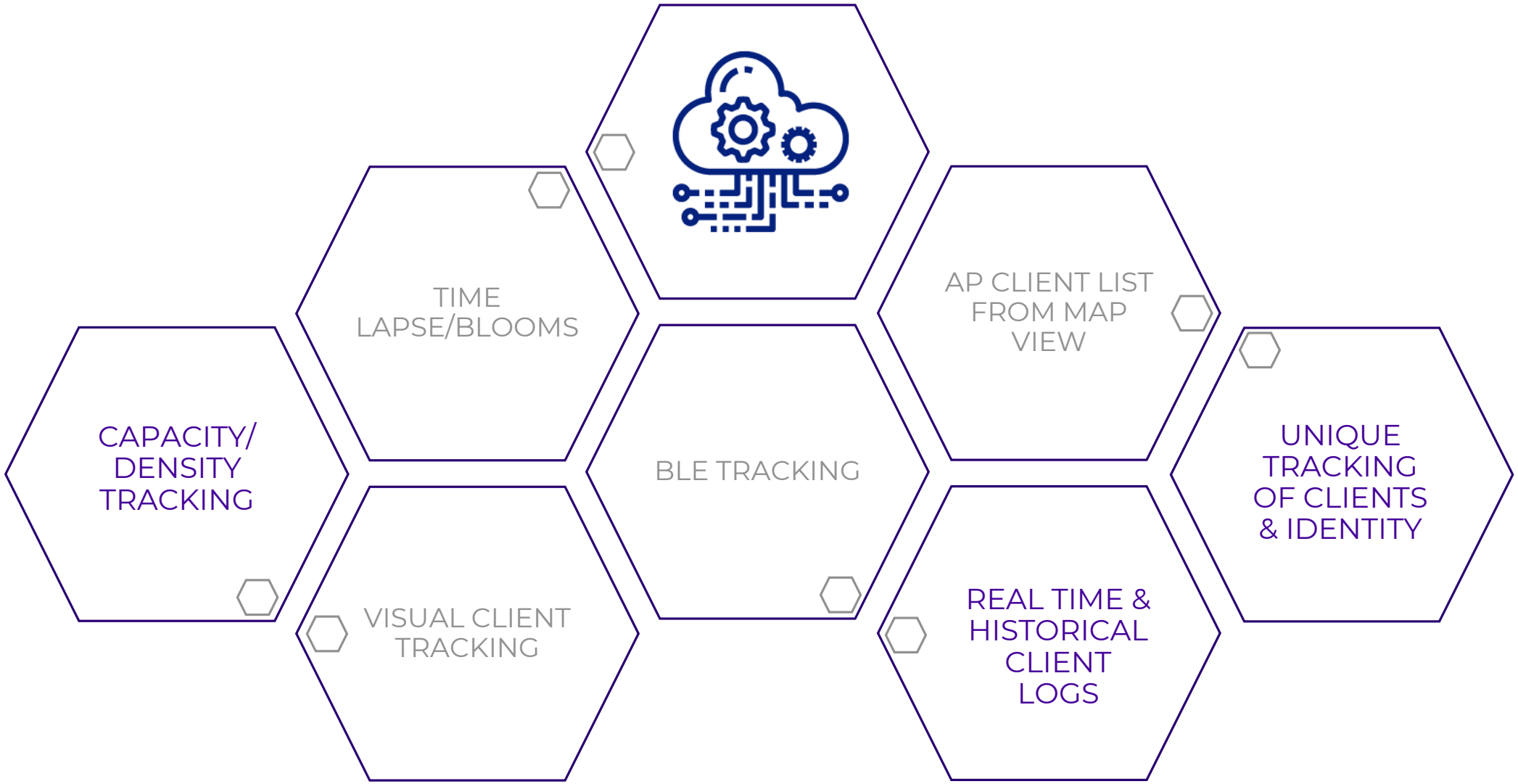
## DURATION

90 days of visibility delivers the longest data perspective in the industry

## SECURITY

Industry's only ISO27001 certified cloud, supporting GDPR and CCPA

# DEMO



# Questions