



# ANM TECH DAY

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Bad WiFi is a  
Business Problem

John Gallow

# Make your Wifi better

What you might not be using to your full advantage

- **Design, Design, Design!**
  - What makes a good design
  - What type of antennas we use
  - Site Surveys
  - Wifi7
  - Mgid and PoE
  - Next steps for you
- **Optimize what you have**
  - 802.11k/r/v for optimal roaming
  - WPA3 and Opportunistic Wireless Encryption
  - SSID consolidation
  - AI Radio Resource Management
- **Wifi8**
- **How ANM can help**



# Who am I

## Quick Bio



**John Gallow**

**Solution Architect**  
Albuquerque. NM

- **Been with ANM 12 years today!**
- **Started in ABQ, moved to NC and now back in ABQ**
- **Started as service delivery, moved to pre-sales design ~6 years ago**
- **Specialize in route/switch/firewall/wireless**
- **Ekahau Certified Design Engineer**
- **General Wireless lead at ANM**



# The Rise of Wireless Technologies

You have more wifi devices than you think

**21.1B**  
Wireless Devices  
Worldwide in 2025

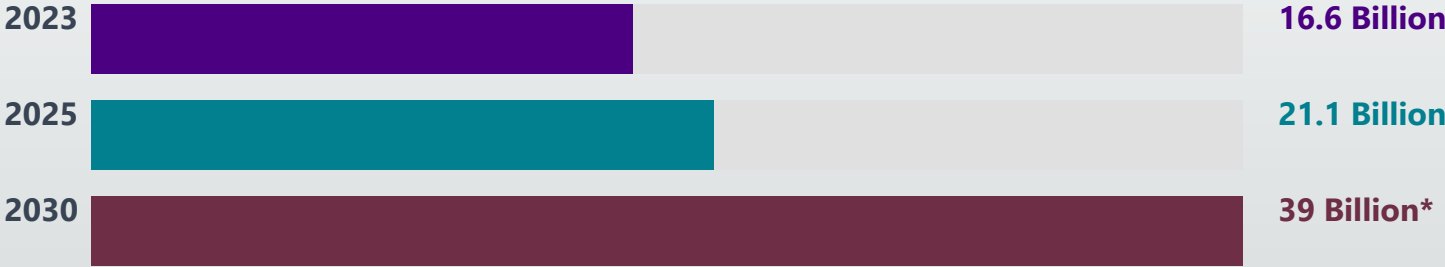
**39B**  
Projected Devices  
By 2030 (13.2% CAGR)

**32%**  
of IoT Uses Wi-Fi  
#1 Wireless Technology

**Key Growth Drivers**

- Wi-Fi 6E / 7 Adoption**  
Higher throughput, enterprise and IoT expansion
- 5G Cellular IoT**  
22% of IoT; 16% YoY growth in 2024
- AI Integration**  
AI demand drives real-time connected device growth
- Smart Industry**  
Manufacturing leads at 34% of all IoT deployments

Global Wireless Device Growth (Source: IoT Analytics 2025)

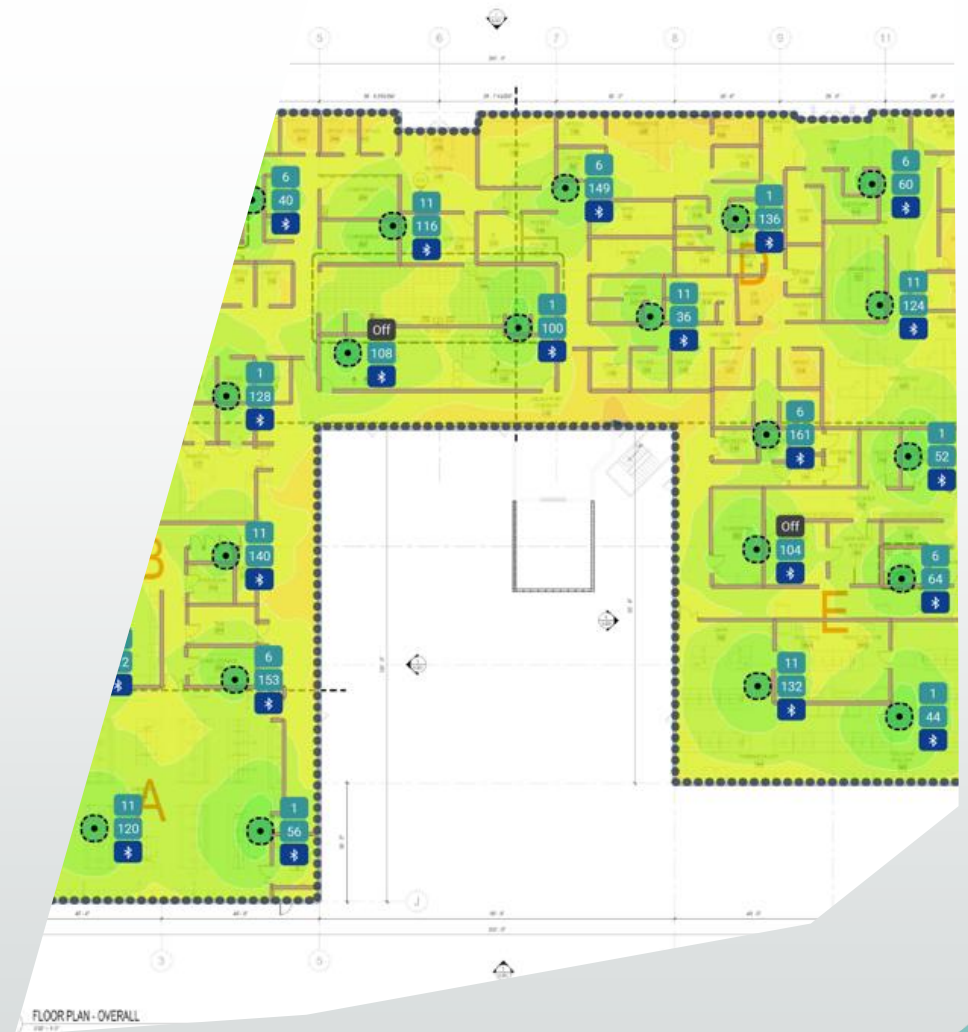


\* 2030 projection per IoT Analytics State of IoT 2025 (Oct 2025). Wi-Fi = #1 wireless technology at 32% of all IoT connections globally.

# It all starts with DESIGN

What to discuss when designing Wifi

- Design requirement identification
- Real Time Location Services Requirement
- User and device counts and density
- Client requirements, speeds, etc
- Unique requirements, auditoriums, high ceilings, dense areas like classrooms or training rooms etc
- No longer just APs down hallways



# What makes a good design

## Maps

- ✓ Accurate maps required for a good design
- ✓ Garbage in, garbage out
- ✓ Proper scale between floors
- ✓ Wall material noted
- ✓ CAD Drawings if possible

## Specific Locations

- ✓ Auditoriums
- ✓ C-Suites and high-visibility areas
- ✓ Classrooms and training rooms
- ✓ Medical areas such as X-ray or MRI

## Mounting

- ✓ Aesthetic requirements
- ✓ Drywall, red iron, etc.
- ✓ External antennas: directional mount

**Pro tip:** CAD drawings + accurate floor scale + wall material documentation = the foundation of every successful wireless design.

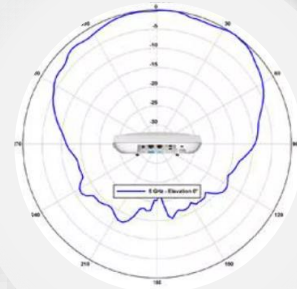
# Right Antenna for the Job

Choosing the right antenna for the situation



## Internal Omnidirectional

- Regular AP that most are familiar with
- Best for regular office spaces, ceiling height up to 15-20'
- Multiple models and radio configurations



## Internal Directional

- Used for higher ceilings to get signal to users
- Can be mounted facing down or facing horizontal to cover corridors



## External

- Directional or Omnidirectional
- Used in more challenging RF environments, such as warehouses and manufacturing facilities for very specific RF patterns

# What is a Site Survey?

Different ways to ensure wireless coverage

- **Predictive Survey**
  - Done based on site maps
  - Predict proper AP locations before installation
  - Model different AP footprints and antenna coverage
  - Only as accurate as the maps/construction material
- **Passive Survey**
  - Walk the site with a tool to scan RF
  - Provides real time RF information of the building
  - Allows tuning of AP placement or power levels and identifies coverage gaps
- **Active Survey**
  - Used for the most complex environments
  - Carry an AP on a stick and place at prospective locations, then scan the actual area covered
  - Most accurate results, but also most time consuming



# Wi-Fi 7

802.11be • Multi-link operation • Up to 23 Gbps

6 GHz 5 GHz 2.4 GHz 320 MHz

- 6Ghz band
- Offers 320Mghz wide channels for up to 4x data rate over Wifi6
- Theoretical Speeds up to 23Gbps\*
- Enhanced security, such as WPA3 and Protected Management Frames required
- Similar footprint to 6E
  
- Higher PoE requirements (UPOE, up to 60W)
- Greater vendor adoption in 2026
- Some backwards compatibility issues with older devices such as barcode scanners and IoT devices

# 3 Different Vendors Wifi 7

What does each vendor give you and how does it handle PoE



Cisco 9176

- 4x4 radios flexible across 2.4, 5 and 6Ghz
- 10G Mgig
- Integrated GNSS/GPS
- 39W PoE for full functionality,
- 25.5W for 2x2 on 2.4G radios, 2.5G link speed



Aruba 740

- 2x2 2.4Ghz, 4x4 5 and 6Ghz radios
- 5G Mgig
- 30W+ required for full functionality
- PoE+ will disable the onboard USB



Juniper AP 47

- 4x4 flexible radios, 2.4, 5 and 6Ghz
- 2x10G RJ45 ports
- Integrated GNSS/GPS
- 30W+ for full functionality
- PoE+ radios in 2x2 mode

# mGig Networking Limitations

Cable Type	10G	5G	2.5G	1G	Key Limitation
Cat6A	100m	100m	100m	100m	Best choice; full 100m at all speeds
Cat6	55m	100m	100m	100m	10G limited to 55m; drops to 5G beyond that
Cat5e	30m	50m	100m	100m	Most limited; PoE voltage drops common
Cat5	Not Supported	Not Supported	Not Supported	100m	1G only; mGig not achievable

Green = full 100m run Gold = distance-limited Red = not supported

All distance values assume standard 23 AWG solid copper cabling in typical building temperatures. Actual results may vary with cable quality, patch cable count, and installation conditions. Source: IEEE 802.3bz standard.

## Key Limitations

### Cable Grade Matters

Cat6A required for full 10G at 100m. Cat5e tops out at 30m for 10G.

### PoE Voltage Drop

UPOE+ and 90W all have 100m ratings, but Cat5e is prone to voltage drops that can cause AP instability.

### Speed Auto-Negotiation

Links negotiate down to the highest supported speed for the cable run length.

### Audit Before You Deploy

Know your cable plant. Assume Cat5e unless proven otherwise.



# What's the future hold for you?

Trying to decide what your next Wi-Fi looks like?

UPGRADE PATH → → →



## Still on Wi-Fi 5?

ACTION REQUIRED

### → Upgrade to Wi-Fi 7

Skip Wi-Fi 6/6E — go directly to Wi-Fi 7 for the best long-term investment

### → Check Your Backbone

Consider switch/backbone capabilities when selecting APs — you might not benefit from higher-level APs on old infrastructure

### → End of Life Risk

You're probably at End of Life — support on existing equipment will be limited or nonexistent



## Already at Wi-Fi 6?

OPTIMIZE FIRST

### ✓ 6E Enables 6 GHz Band

Upgrading to 6E unlocks the 6 GHz spectrum for less interference and higher throughput

### ✓ Consider Waiting for Wi-Fi 8

Depending on your requirements, you can probably wait until Wi-Fi 8 for the next major upgrade

### ✓ Use Your Equipment Fully

Ensure you are using your existing equipment to its full potential before buying new gear



## Already at Wi-Fi 6E?

YOU'RE IN GOOD SHAPE

### ✓ Limited Need to Upgrade

Limited reasons to upgrade to Wi-Fi 7 right now — the incremental gains are small

### ✓ Enable 6 GHz Band

Ensure the 6 GHz band is enabled and functional on your APs and controller

### ✓ Verify PoE & Full Functionality

Ensure switch PoE is sufficient and APs are running at full functionality





**Use what you have!**

# Roaming Technologies

802.11k • 802.11r • 802.11v — The trio that makes seamless roaming possible

## 802.11k

Radio Resource Management



- **Neighbor Reports**

APs share a list of nearby APs so clients can identify the best roam target without scanning every channel

- **Faster Roaming**

Reduces discovery time from seconds to milliseconds by pre-populating the candidate AP list

- **Load Balancing**

Helps steer clients toward less congested APs for better overall network balance

## 802.11r

Fast BSS Transition (FT)



- **Pre-Authenticated Keys**

Security keys are established before the roam, eliminating the full 4-way handshake on transition

- **Critical for VoWiFi**

Voice calls and video streams stay connected during AP transitions with no perceptible gap

- **Requires WPA2 / WPA3**

Must be enabled on the SSID and supported by both AP and client device

## 802.11v

BSS Transition Management



- **AP-Initiated Steering**

The AP can suggest or request a client move to a better AP — the client decides whether to comply

- **Reduce Sticky Clients**

Prevents clients from clinging to a distant AP when a closer, stronger one is available

- **Power Savings**

Supports WNM Sleep Mode, letting devices reduce radio activity and extend battery life

**Pro tip:** Enable all three together — 802.11k feeds targets to r, and v steers stubborn clients. Together they cut roam latency from seconds to milliseconds.



# Opportunistic Wireless Encryption

Help protect open networks

## What OWE Does

### ✓ **Encrypts Guest Networks Without Passwords**

Provides encryption on open/guest networks with no authentication required — users connect like normal with zero setup

### ✓ **Per-Session Encryption**

Each user session gets its own unique encryption key — even on a shared open network, one user cannot sniff another's traffic

### ✓ **Transparent to End Users**

No additional configuration, certificates, or passwords needed — connect exactly like any open SSID

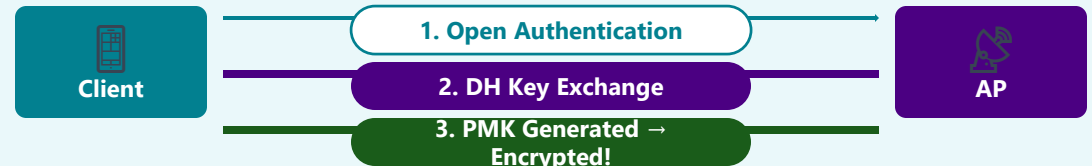
### ✓ **Transition Mode Compatible**

Transition mode on SSIDs allows both OWE-capable and legacy devices on the same network name

### ✓ **Required for 6E / Wi-Fi 7**

OWE is part of the WPA3 framework — mandatory for 6 GHz operation where open SSIDs are not permitted

## How OWE Works



### Traditional Open SSID vs. OWE

#### **✗ Traditional Open**

No encryption at all  
Anyone can sniff traffic  
Not allowed on 6 GHz

#### **✓ OWE Enabled**

Per-session encryption  
Traffic protected from sniffing  
6 GHz / WPA3 compliant

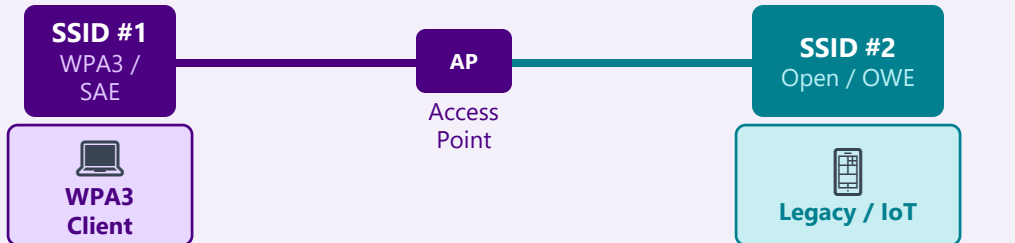
### **6 GHz / Wi-Fi 7 Requirement**

OWE is mandatory for 6E/7 operation as part of the WPA3 framework. Open SSIDs without OWE are not permitted on the 6 GHz band.

# Transition Mode SSID

Supporting legacy devices that don't speak WPA3

## How Transition Mode Works



Both SSIDs share the same network name — clients connect to the best one they support

### Requirements to Enable Transition Mode

- ✓ AP must support WPA3 and OWE simultaneously
- ✓ Network must operate on 2.4 GHz or 5 GHz band
- ✓ Controller / management platform must support WPA3 transition configuration
- ✓ Open SSID (OWE) must be broadcast alongside the WPA3 SSID

## ⚠ Limitations

**Airtime Overhead** Broadcasting two SSIDs doubles beacon overhead and management frames

**Reduced Security** Legacy clients still connect over open/OWE — no WPA2/WPA3 protection for those devices

**Client Roaming** Mixed WPA3 / Open clients on the same SSID name can cause roaming inconsistencies

**Vendor Variation** Not all vendors implement transition mode the same way — verify your controller supports it

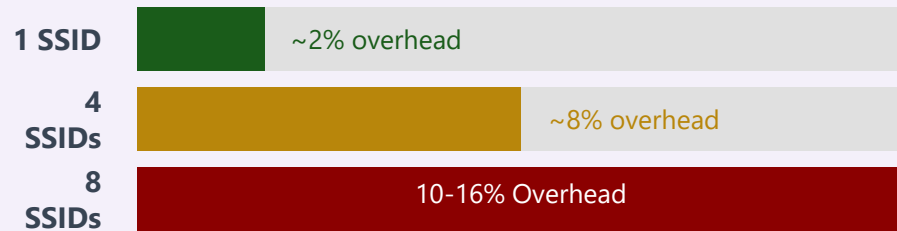
### 🚫 6 GHz / Wi-Fi 7 Incompatibility

6 GHz requires WPA3 — open SSIDs are not permitted. Transition Mode cannot run on 6 GHz. Legacy clients without OWE support will NOT connect.

# How many SSIDs are you using?

## ⚡ Airtime Is Not Free


### Beacon overhead per AP (every 102ms, per SSID)



✓ **Recommendation:** Keep SSIDs to 4 or fewer per AP radio  
Use MPSK / IPSK or VLAN tagging to consolidate instead of adding SSIDs


*Each SSID broadcasts a beacon frame every 102ms per AP. On a busy 5 GHz radio, 8 SSIDs can consume 10–16% of available airtime in management overhead alone.*

## ⊖ Problems Caused by Too Many SSIDs

 **Beacon Pollution** Each SSID adds management frames that consume shared airtime on every connected client

 **Hidden Node & Co-Channel Issues** More SSIDs increase the likelihood of overlapping transmissions causing collisions

 **Client Confusion & Roaming Issues** Devices scan all visible SSIDs during roaming, increasing probe traffic and latency

 **Operational Complexity** Every SSID is another policy, VLAN, and firewall rule to maintain and troubleshoot

**Better alternatives:** MPSK / IPSK • 802.1X with dynamic VLAN • Multi-purpose SSIDs with VLAN steering

# AI-Driven Radio Resource Management

How AI analytics optimize your wireless environment automatically

## What AI RRM Does

### ✓ **Automatic Channel Selection**

AI learns your RF environment and dynamically assigns optimal channels to minimize co-channel interference

### ✓ **Dynamic Power Adjustment**

Transmit power levels adapt in real time based on client density, neighbor APs, and interference patterns

### ✓ **Channel Width Optimization**

AI can adjust channel width dynamically (20/40/80/160 MHz) to balance throughput vs. interference

### ✓ **Predictive Analytics**

Identifies trends before they become problems — proactively adjusts before users notice degradation

## Real-World Benefits

### ✓ **Reduced Manual Tuning**

Eliminates the need for constant manual RRM adjustments — AI handles it 24/7

### ✓ **Better User Experience**

Fewer dropped calls, smoother video, less buffering — the network adapts to usage patterns

### ✓ **Faster Troubleshooting**

AI-powered dashboards pinpoint issues before they escalate — shift from reactive to proactive

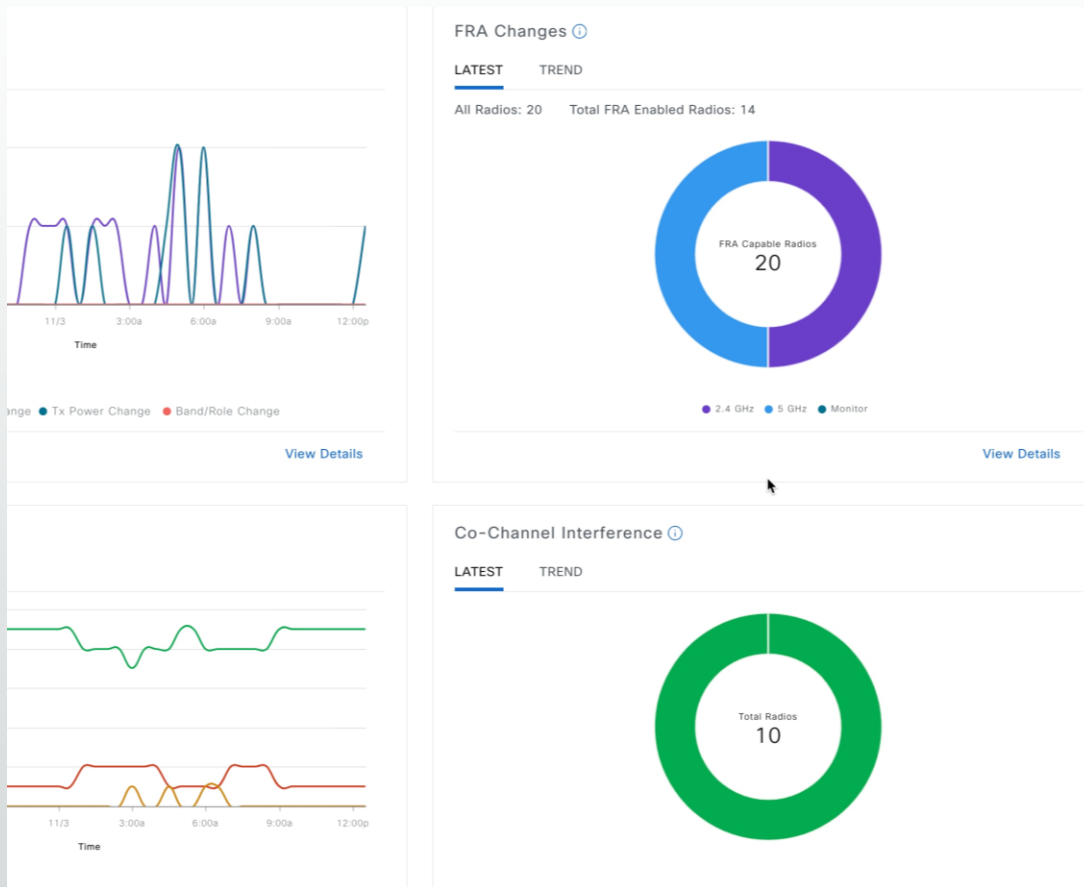
### ✓ **Vendor Implementations**

Cisco Catalyst Center, Aruba Central, Juniper Mist AI — every vendor has their own AI-powered RRM



# AI Channel and Power Selection

## AI-Enhanced Radio Resource Management



- **One thing AI is really good at is analytics**
- **AI Assisted channel and power metrics can learn your environment and provide an even better experience by selecting proper channels and transmit levels**
- **For Cisco, requires Catalyst Center. Every vendor has its own flavor of AI powered RRM**
- **Can change broadcast channel, transmit power, and even channel width dynamically for best performance**

# Wifi 8?

Ultra-high Reliability 802.11bn

- **Expect to see chipsets and devices Wifi8 capable in 2027. Ratification is not expected until 2028**
- **Focuses more on reliability than speeds and feeds**
- **Seamless Roaming Domain aims to facilitate better roaming between APs and less latency**
- **Extended Range – Enhanced Long Range (ELR) unit format is designed to improve performance at further distances**



# How to get good wireless

## Design

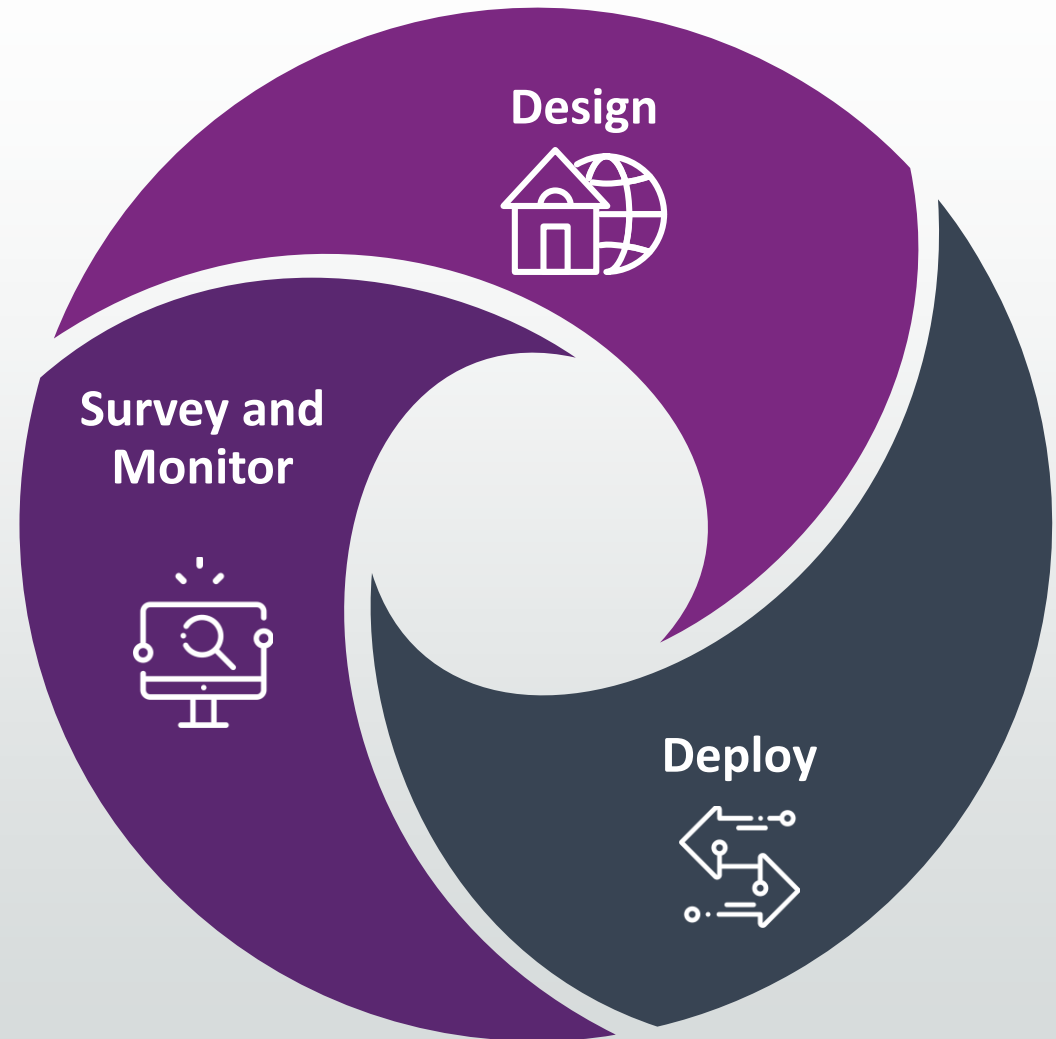
- Start the engagement with a good design
- Utilize good maps and a knowledgeable design engineer
- Identify the specific requirements for the site
- Build to the plan

## Deploy

- Deploy the design
- Stick to the design and review any changes
- Utilize the tools and technologies that you already have to improve performance and reliability

## Survey and Monitor

- Conduct a post installation Passive survey
- Utilize the vendor monitoring tools, and ensure the user experience matches what is required



# How ANM can help



## Design

- Deep experience with general design as well as challenging RF situations
- Industry leading tools and certified engineers



## Surveys

- Passive, active and predictive surveys
- Know before you commit to what your wireless coverage will look like
- Assistance with problematic deployments, know where your gaps are



## Assessment

- Is the wireless environment operating at optimal performance
- Review best practices and get the most out of what you already have



## Configuration

- Enable the technologies we talked about today
- Create a better wireless experience by collapsing SSIDs, adjustment RRM or highlight performance capabilities



# Questions?

John Gallow

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Please feel free to reach out with any follow-up questions!

# Thank you!