

# AI-Driven Wi-Fi 7 引領企業永續發展

蘇俊銘 - Kevin Su  
RUCKUS 技術顧問

# Wi-Fi 7/6E : Tri-Radio

## Unlicensed Spectrum and Channel Allocations

2.4 GHz Channels		60 MHz		
ISM Band				
Qty	Channel	1	6	11
3	Center Freq	2.412	2.437	2.462

5 GHz Channels		500 MHz																								
Frequency		DFS Channels								DFS Channels																
Radio Band		U-NII-1				U-NII-2a				U-NII-2c (Extended)								U-NII-3								
Center Freq		5.180	5.200	5.220	5.240	5.260	5.280	5.300	5.320	5.500	5.520	5.540	5.560	5.580	5.600	5.620	5.640	5.660	5.680	5.700	5.720	5.745	5.765	5.785	5.805	5.825
20 MHz		36	40	44	48	52	56	60	64	100	104	108	112	116	120	124	128	132	136	140	144	149	153	157	161	165
40 MHz		38		46		54		62		102		110		118		126		134		142		151		159		
80 MHz		42				58				106				122				138				155				
160 MHz		50								114										165 was ISM, now U-NII-3						

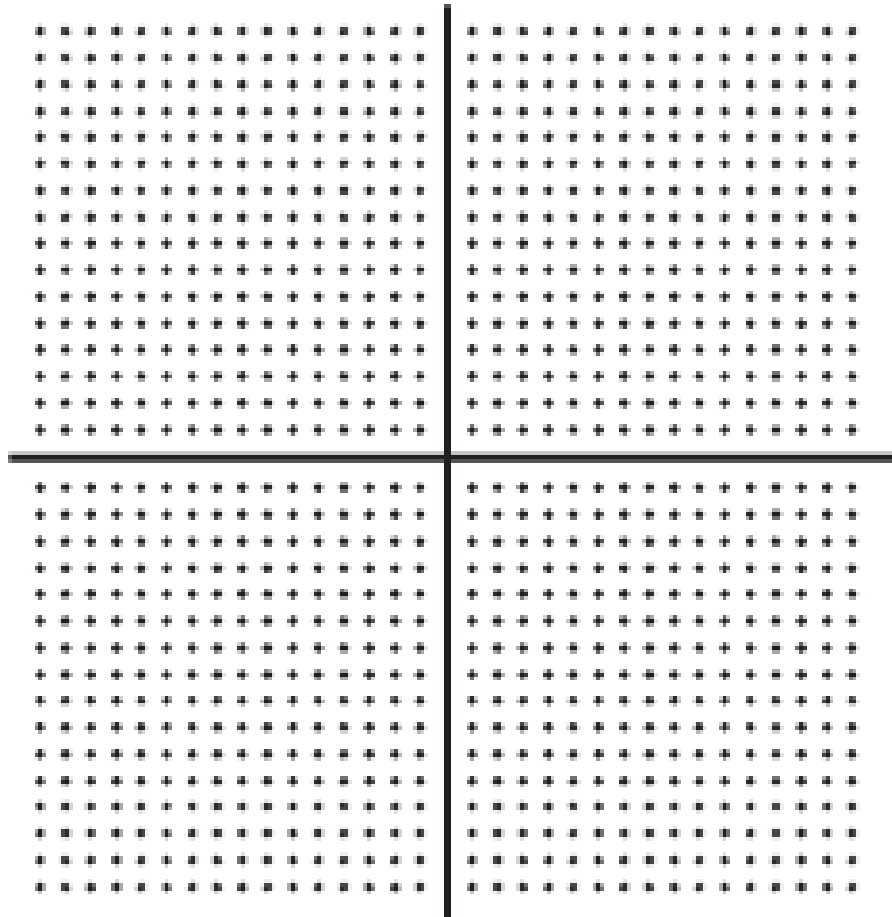
6 GHz Channels		480 MHz																																			
Low Power Indoor		5dBm/MHz - Net EIRP 18dBm																																			
Radio Band		UNII-5																																			
Center Freq		5.955	5.975	5.995	6.015	6.035	6.055	6.075	6.095	6.115	6.135	6.155	6.175	6.195	6.215	6.235	6.255	6.275	6.295	6.315	6.335	6.355	6.375	6.395	6.415												
20 MHz		1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93												
40 MHz		3		11		19		27		35		43		51		59		67		75		83		91													
80 MHz		7				23				39				55				71				87															
160 MHz		15												47												79											

# Major Wi-Fi 7 Enhancements : 4K QAM

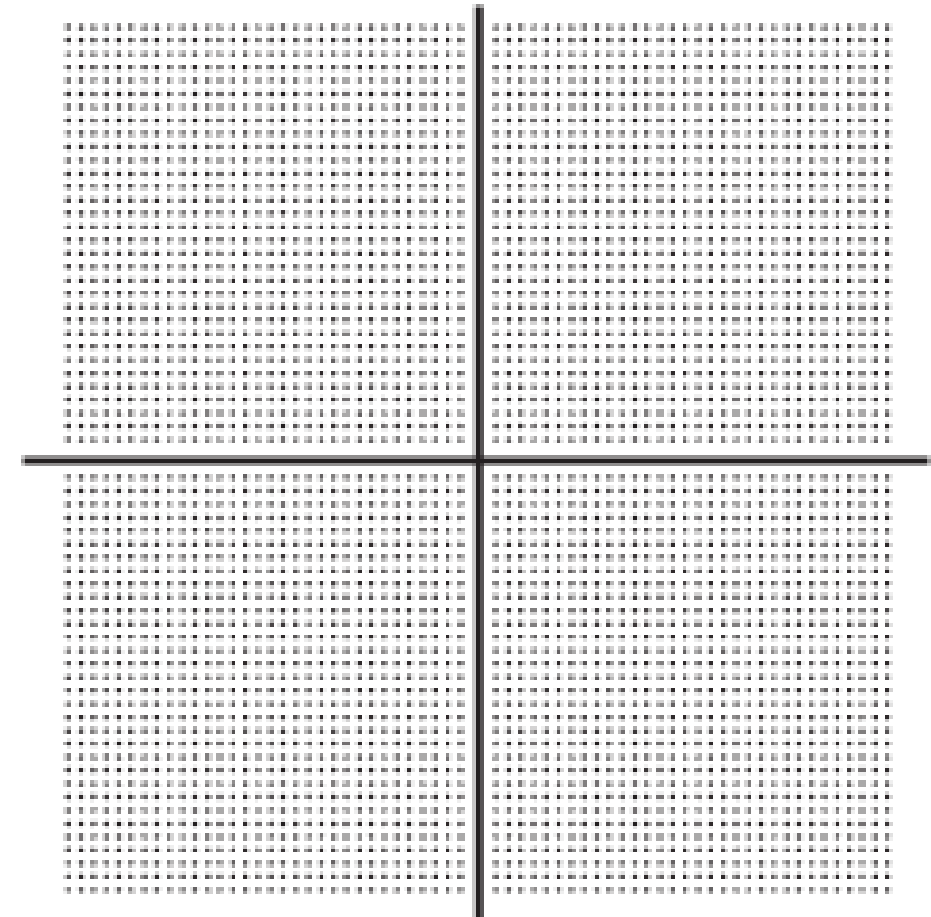
Extremely  
High  
Throughput

- 4K QAM

## 4096 Quadrature Amplitude Modulation



1024-QAM

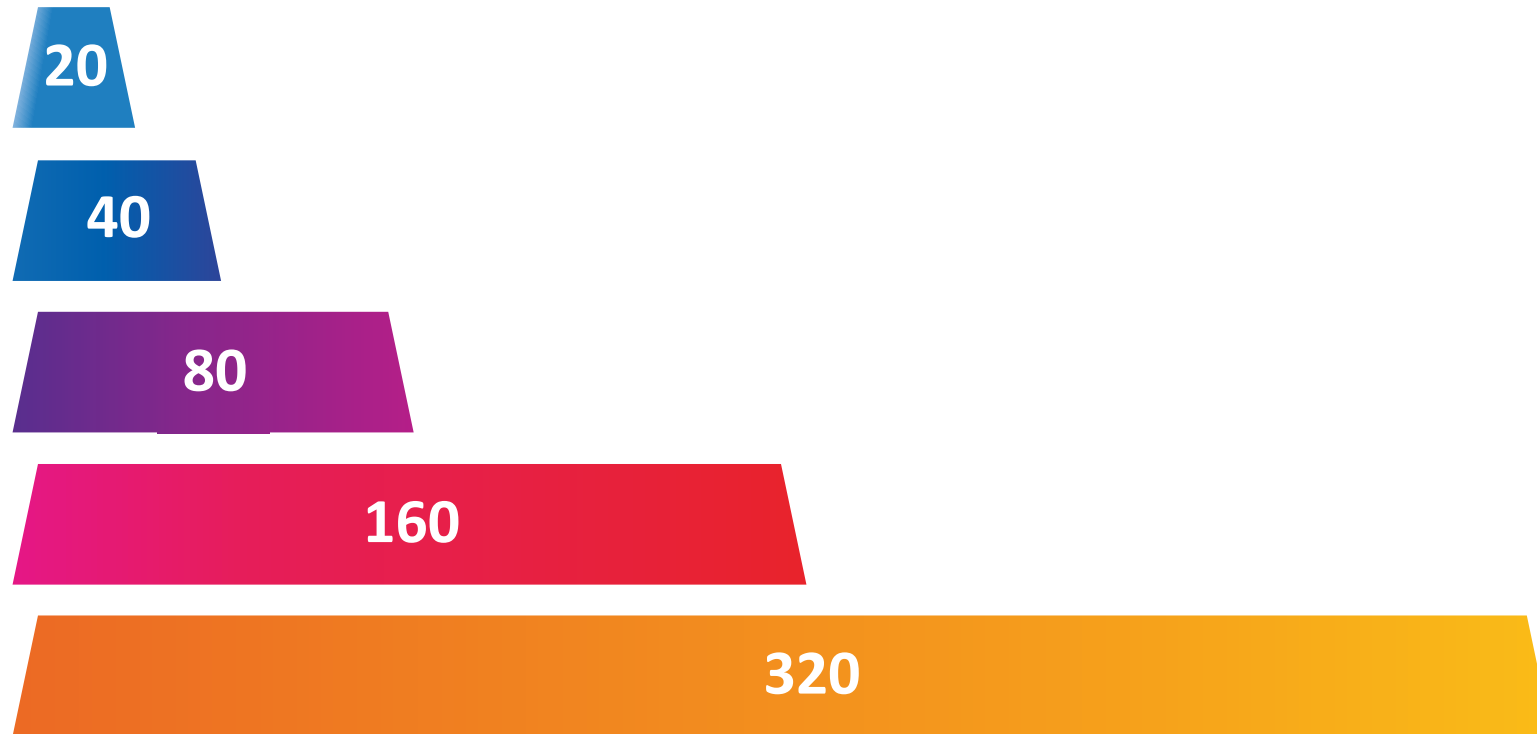


4096-QAM

# Major Wi-Fi 7 Enhancements : 320 MHz

Extremely  
High  
Throughput

- 4K QAM
- 16 spatial streams
- 320 MHz wide channels



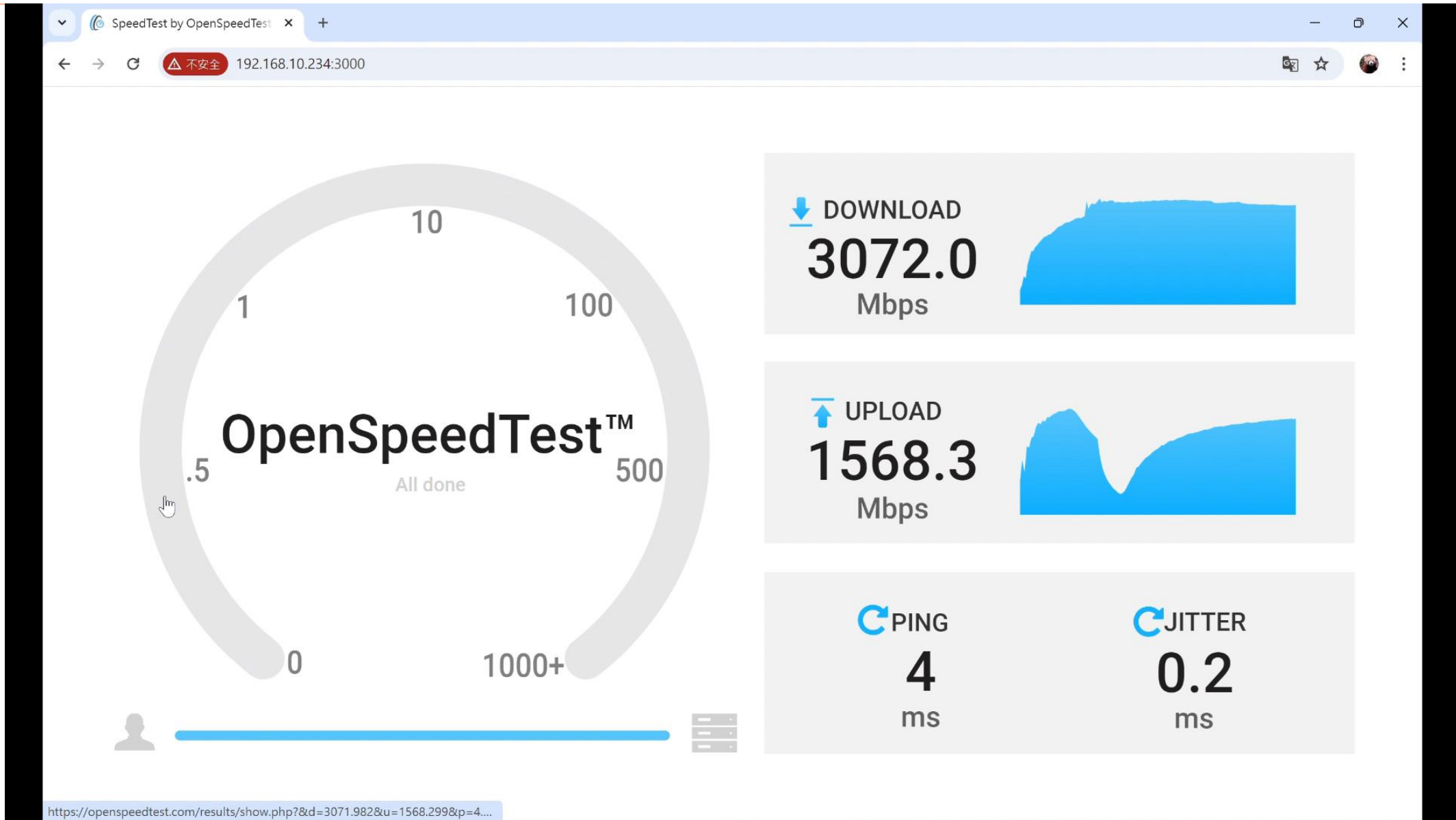
# Major Wi-Fi 7 Enhancements : EHT

Extremely  
High  
Throughput

- 4K QAM
- 320 MHz wide channels
- Max 16 spatial streams

<b>Standard</b>	<b>Wi-Fi 6/6E</b>	<b>Wi-Fi 7</b>
<b>Max Speed with 1 Spatial Stream</b>	1.2 Gbps	2.9 Gbps
<b>Max Speed with 2 Spatial Streams</b>	2.5 Gbps	5.8 Gbps
<b>Max Speed with Max # of Spatial Streams</b>	9.6 Gbps	46.4 Gbps

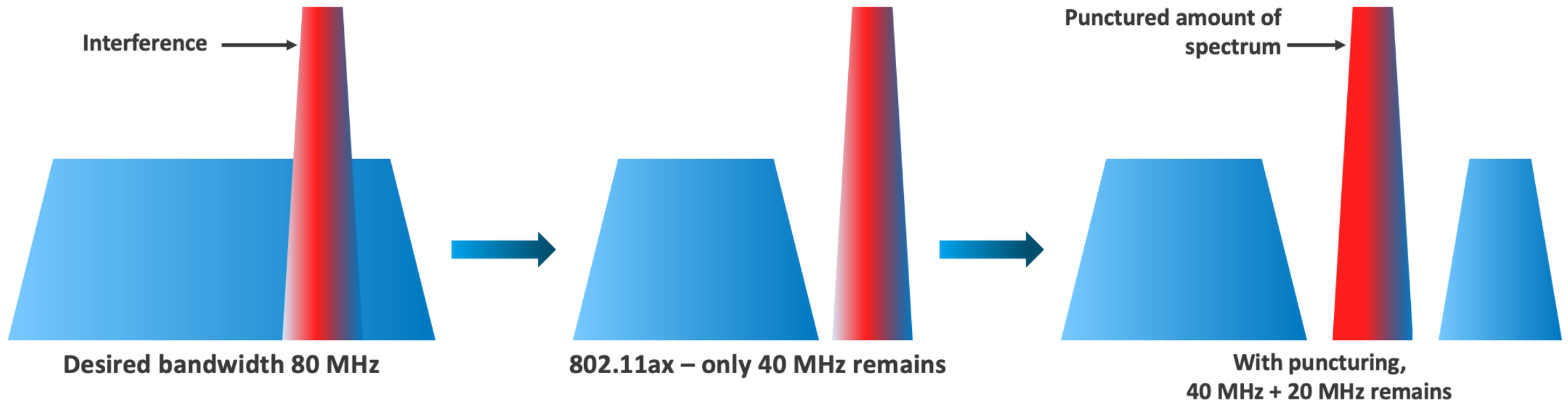
# R770 OpenSpeedTest



# Major Wi-Fi 7 Enhancements : Punctured Transmission

## Punctured Transmission

- Increased channel availability
- Better throughput
- Lower latency



# R770 Puncturing Demo



Untitled.ex - Ekahau AI Pro

File Edit Actions View Map Project Measurement Reporting Help

Design Inspect Survey Active: Disabled NIC -31 dBm RSSI (dBm) 2.4 -50 5 -40 6 -60 Spectrum (GHz) 2.4 5 6 Sidekick 2 80%

### 6 GHZ SPECTRUM LIVE | EKAHAU SIDEKICK

power (dBm)

ekahau channels

### 6 GHZ RADIOS

RADIO	SSIDS	TECH.	DATA RT.	CH.	SIG...
cc:1b:5a:f1:b2:57	RKS_TX_VAP	6		5@...	-60
cc:1b:5a:f2:43:47	RKS_TX_VAP	6		21...	-60

### 6 GHZ SPECTRUM HISTORY | EKAHAU SIDEKICK

5 seconds

LIVE

time

ekahau channels

### 6 GHZ SIGNALS, SPECTRUM & ACTIVE SURVEY

power (dBm)

channels

Not Associated on this Band

time

Spectrum Utilization (%)

Noise 0 20 40 60 80 100

NETWORK Any SSID BAND SELECTION 2.4 5 6 All

# Major Wi-Fi 7 Enhancements : MLO

系統上有 1 個介面：

Multi-  
Operat

```

名稱          : Wi-Fi
描述          : Killer(TM) Wi-Fi 7 BE1750w 320MHz Wireless Network Adapter (BE200D2W)
GUID         : 9d452e57-9794-4a24-8232-c6f58c946c7d
實體位址     : a0:02:a5:8f:c5:4b
介面類型     : 主介面
狀態         : 連線
SSID         : RKS-NexG
MLD AP BSSID : cc:1b:5a:b1:b2:50
  LinkID: 1, 本機 : a2:02:a5:8f:c5:4f, AP: cc:1b:5a:b1:b2:50, RSSI: -33, 通道 : 36, 頻帶 : 5 GHz, BW: 40
  LinkID: 2, 本機 : a2:02:a5:8f:c5:4e, AP: cc:1b:5a:f1:b2:50, RSSI: -22, 通道 : 5, 頻帶 : 6 GHz, BW: 320
網路類型     : 基礎結構
無線電波類型 : 802.11be
驗證         : WPA3-個人 (H2E)
加密方式     : CCMP
連線模式     : 自動連線
接收速率 (Mbps) : 5764.8
傳輸速率 (Mbps) : 5764.8
訊號         : 99%
設定檔       : RKS-NexG
已設定      QoS MSCS : 0
已設定 QoS 對應 : 0
原則允許的 QoS 對應 : 0

主控網路狀態 : 無法使用
  
```

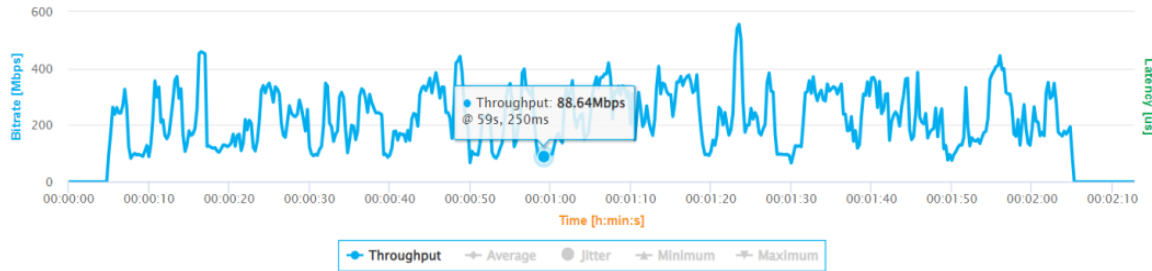
IP A

B

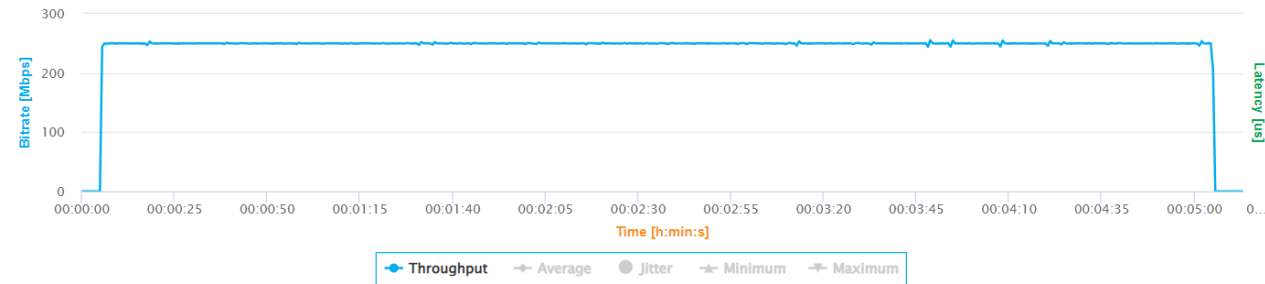
# RUCKUS Wi-Fi 7 MLO: THROUGHPUT DESPITE INTERFERENCE



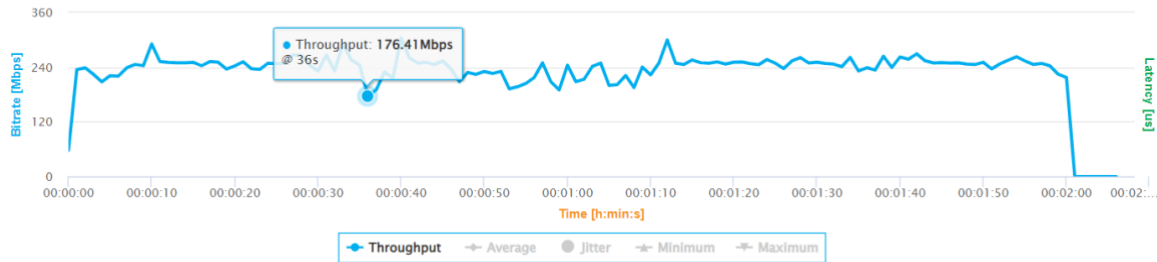
82\_ul\_be\_load\_8200: client\_82\_endpoint -> rks\_ota\_ap



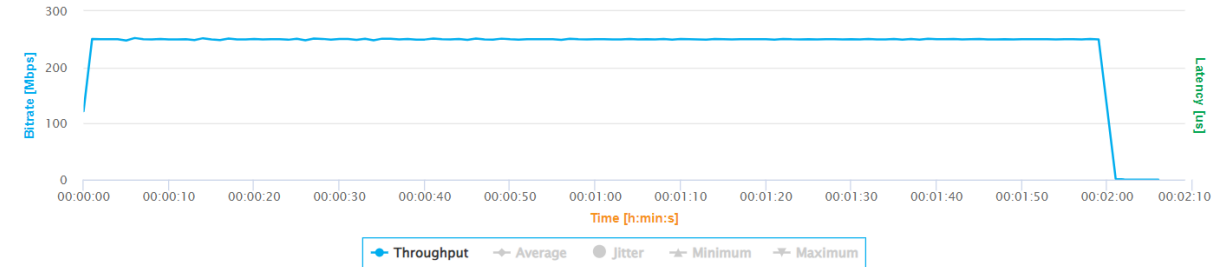
82\_ul\_be\_load\_8200: client\_82\_endpoint -> rks\_ota\_ap



82\_dl\_be\_load\_8200: rks\_ota\_ap -> client\_82\_endpoint



82\_dl\_be\_load\_8200: rks\_ota\_ap -> client\_82\_endpoint



MLO

MLO

# QoS Management : MSCS



Live Game or  
FaceTime call

Chariot  
Throughput Test



- Without QoS Mirroring / MSCS enabled FaceTime call freezes
  - OneDrive Video w MSCS disabled
- With QoS Mirroring / MSCS real time FaceTime traffic is better prioritized so call remains stable.
  - OneDrive Video with MSCS enabled

# RUCKUS Wi-Fi 6/6E/7 AP Portfolio



## Indoor



### R850

**Wi-Fi 6: 8x8 (5G) 4800Mbps + 4x4 (2G) 1148Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 5GE



### R750

**Wi-Fi 6: 4x4 (5G) 2400Mbps + 4x4 (2G) 1148Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 2.5GE



### R650

**Wi-Fi 6: 4x4 (5G) 2400Mbps + 2x2 (2G) 574Mbps**  
**IoT:** BLE & Zigbee concurrent **Ethernet:** 2.5GE



### R550

**Wi-Fi 6: 2x2 (5G) 1200Mbps + 2x2 (2G) 574Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 1GE



### R350 & R350e

**Wi-Fi 6: 2x2 (5G) 1200Mbps + 2x2 (2G) 574Mbps**  
**IoT:** No onboard IoT **Ethernet:** 1GE



### R760



**Wi-Fi 6E: 4x4 (6GHz) 4800Mbps + 4x4 (5GHz) 2400Mbps + 4x4 (2GHz) 1148Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 10GE  
 LPI and SP modes\* supported



### R770



**Wi-Fi 7: 2x2 (6GHz) 5765Mbps + 4x4 (5GHz) 5765Mbps + 2x2 (2GHz) 689Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 10GE  
 LPI and SP modes\* supported  
 GA: Q4, 2023



### R670



**Wi-Fi 7: 2x2 (6GHz) 5765Mbps + 2x2 (5GHz) 2882Mbps + 2x2 (2GHz) 689Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 5GE  
 LPI and SP modes\* supported  
 GA: Q4, 2024

\* Contingent on AFC rule ratification

## Indoor Wall Plate



### H550

**Wi-Fi 6: 2x2 (5G) 1200Mbps + 2x2 (2G) 574Mbps**  
**IoT:** BLE & Zigbee concurrent **Ethernet:** 1GE



### H350

**Wi-Fi 6: 2x2 (5G) 1200Mbps + 2x2 (2G) 574Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 1GE

## Outdoor



### T750 & T750se

**Wi-Fi 6: 4x4 (5G) 2400Mbps + 4x4 (2G) 1148Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 2.5GE



### T350 & T350se

**Wi-Fi 6: 2x2 (5G) 1200Mbps + 2x2 (2G) 574Mbps**  
**IoT:** BLE & Zigbee selectable **Ethernet:** 1GE  
 (No onboard IoT for T350se)

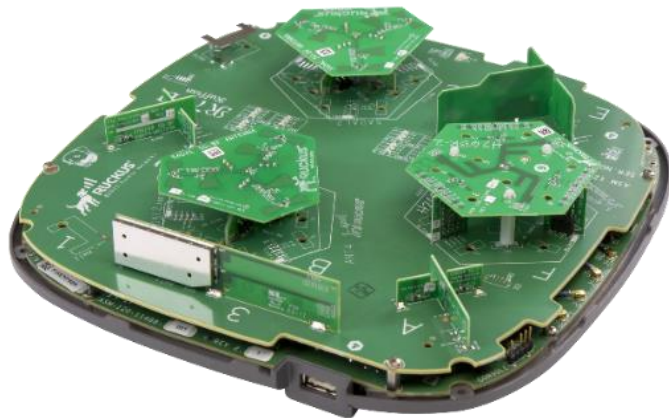


### T670



**Wi-Fi 7: 2x2 (6GHz) 5765Mbps + 2x2 (5GHz) 2882Mbps + 2x2 (2GHz) 689Mbps**  
**Ethernet:** 5GE  
 SP modes\* supported  
 GA (Omni): Q3 2024

# First Wi-Fi 7 Indoor AP – R770



## 核心技術

- **三頻運作 (2+5+6): 2x2 (2.4GHz) + 4x4 (5GHz) + 2x2 (6GHz)**
  - 三頻皆支援 Wi-Fi 7
  - 理論最大資料傳輸能力: **12.218 Gbps**
- **6GHz 頻段:** LPI, SP and AFC; GPS 室內定位, 802.11mc
- **RUCKUS 優勢:** Tx BeamFlex 在所有的頻段都支援; PD-MRC; Smart Mesh
- **乙太網路埠:** 1x 100M/1G/2.5G/5G/10Gbps PoE-In 埠 及 1x 10M/100M/1Gbps 埠
- **供電支援:** PoE-in (802.3bt) 或 48V 外接 DC 電源供應器
- **IoT:** 內建 IoT Radio: BLE 或 Zigbee; 具備 USB 2.0 提供外接IoT擴充支援
- **資安保護:** TPM 2.0; Secure Boot; DPSK3; FIPS 140-3
- **運作環境:** 運作溫度 -10 – 50 C
- **控制管理:** RUCKUS SmartZone 7.0; RUCKUS One; RUCKUS Unleashed

# RUCKUS R670

High Density, High Throughput, Low Latency Tri-band Wi-Fi 7 Indoor AP with 5Gbps Backhaul



# RUCKUS R670



High Density, High Throughput, Low Latency Tri-band Wi-Fi 7 Indoor AP with 5Gbps Backhaul

## Highlights

### RF Configurations

- **Tri-band (2+5+6): 2x2 (2GHz) + 2x2 (5GHz) + 2x2 (6GHz)**
  - Support Wi-Fi 7 in all three frequency bands
  - Max PHY Data Rate: **9.336 Gbps**
- **Dual-band (2+5): 2x2 (2GHz) + 4x4 (5GHz)**
  - Support Wi-Fi 7 in both frequency bands
  - Max PHY Data Rate: 6.454 Gbps

**6GHz Band:** LPI, SP and AFC; Indoor geolocation with 802.11mc and Mobile App

**RF Performance:** Tx BeamFlex in all three frequency bands & PD-MRC

**Ethernet Ports:** One 5Gbps Ethernet backhaul & one 1 Gbps Ethernet auxiliary port

**Power Supply:** PoE-in (802.3bt and 802.3at) on the 5G Ethernet port & 48V external DC power

**IoT:** Onboard new IoT Radio: BLE or Zigbee with "Matter" and "Thread" capable; one USB 2.0 port for additional IoT radio

**Security:** TPM 2.0 security, Secure Boot, DPSK3, FIPS 140-3

**LED:** Single multi-color LED

**Environmental:** Operating Temperature 0 – 50 C

**Dimension:** 220 mm x 220 mm x 49 mm

**Control and Management:** SZ 7.0; RUCKUS One; Unleashed

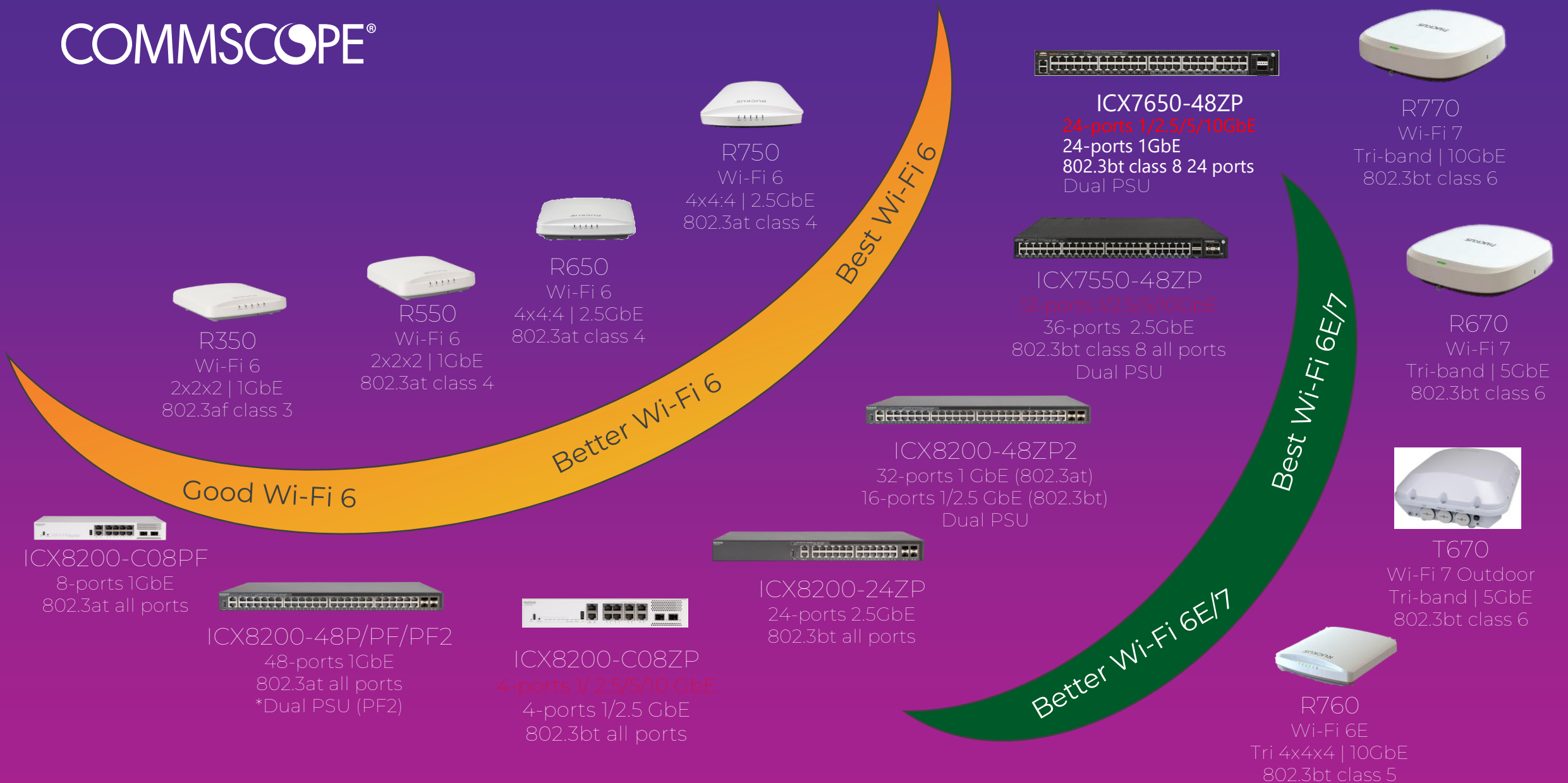


**R670 GA Target:**

R670 Beta: End of May 2024

# T670 Wi-Fi 7 Outdoor AP





**R350**  
Wi-Fi 6  
2x2x2 | 1GbE  
802.3af class 3

**R550**  
Wi-Fi 6  
2x2x2 | 1GbE  
802.3at class 4

**R650**  
Wi-Fi 6  
4x4:4 | 2.5GbE  
802.3at class 4

**R750**  
Wi-Fi 6  
4x4:4 | 2.5GbE  
802.3at class 4

**ICX7650-48ZP**  
24-ports 1/2.5/5/10GbE  
24-ports 1GbE  
802.3bt class 8 24 ports  
Dual PSU

**R770**  
Wi-Fi 7  
Tri-band | 10GbE  
802.3bt class 6

**ICX7550-48ZP**  
12-ports 1/2.5/5/10GbE  
36-ports 2.5GbE  
802.3bt class 8 all ports  
Dual PSU

**R670**  
Wi-Fi 7  
Tri-band | 5GbE  
802.3bt class 6

**ICX8200-48ZP2**  
32-ports 1 GbE (802.3at)  
16-ports 1/2.5 GbE (802.3bt)  
Dual PSU

**ICX8200-24ZP**  
24-ports 2.5GbE  
802.3bt all ports

**T670**  
Wi-Fi 7 Outdoor  
Tri-band | 5GbE  
802.3bt class 6

**ICX8200-C08PF**  
8-ports 1GbE  
802.3at all ports

**ICX8200-48P/PF/PF2**  
48-ports 1GbE  
802.3at all ports  
\*Dual PSU (PF2)

**ICX8200-C08ZP**  
4-ports 1/2.5/5/10 GbE  
4-ports 1/2.5 GbE  
802.3bt all ports

**R760**  
Wi-Fi 6E  
Tri 4x4x4 | 10GbE  
802.3bt class 5

Good Wi-Fi 6

Better Wi-Fi 6

Best Wi-Fi 6

Better Wi-Fi 6E/7

Best Wi-Fi 6E/7

# Wi-Fi 7應用案例

- 擴增實境/虛擬實境 (AR/VR)
- 視訊會議
- 高密度場域 – 會議中心/運動場
- 8K串流媒體播放
- IoT/Operational Technology

Wi-Fi 7適用於下列三大需求：

- 低延遲 – (影響延遲的因素如下：)
  - 距離 - FSPL
  - 速度 - MCS Rate
  - 頻道競爭 - CCI
- 高可靠
- 高傳輸

Remote Research



Collaborative 3D design



Arena gaming



Operational Technology - IoT



Operational Technology - Manufacturing



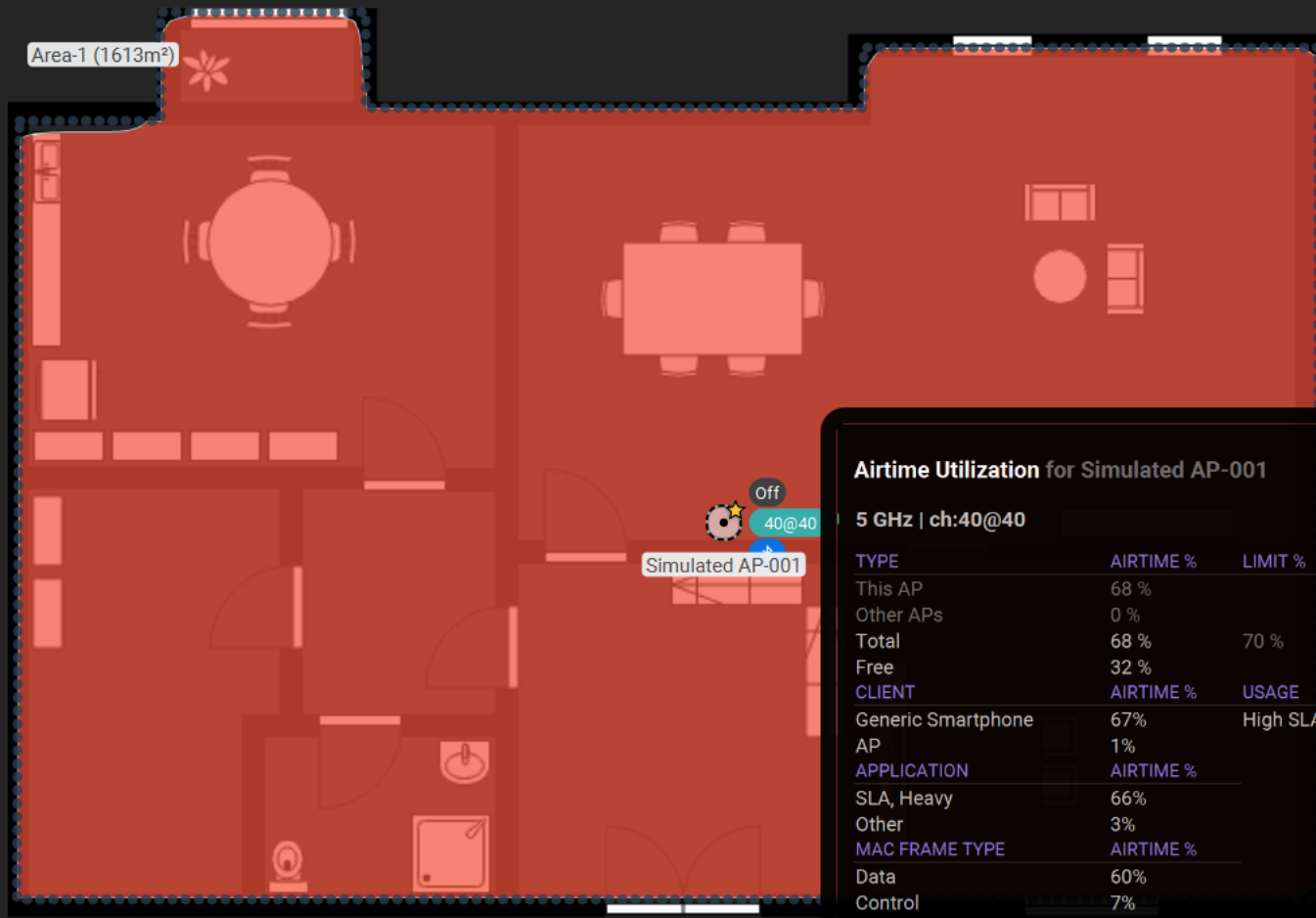


ACCESS POINTS (1)

Home (1)

**Simulated AP-001** Ruckus ZoneFlex R750

OFF 40 (40) | 13dBm BT | 0dBm



**Airtime Utilization for Simulated AP-001**

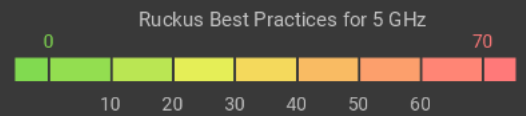
5 GHz | ch:40@40

TYPE	AIRTIME %	LIMIT %
This AP	68 %	
Other APs	0 %	
<b>Total</b>	<b>68 %</b>	<b>70 %</b>
Free	32 %	

CLIENT	AIRTIME %	USAGE
Generic Smartphone	67%	High SLA (4 Mbps)
AP	1%	

APPLICATION	AIRTIME %
SLA, Heavy	66%
Other	3%

MAC FRAME TYPE	AIRTIME %
Data	60%
Control	7%
Management	1%



Share

Design
Inspect
Survey
Live

No Adapters Connected

Ruckus Best Practices
90
Advanced



**AREA OPTIONS FOR AREA-1 (1613M²)**

Options Notes (0)

Name

Coverage profile

Total 90 devices, total bitrate 360.0 Mbps [Add devices](#)

VISUALIZATION MAP NETWORK BAND SELECTION

2.4
5
6
All



ACCESS POINTS (1)

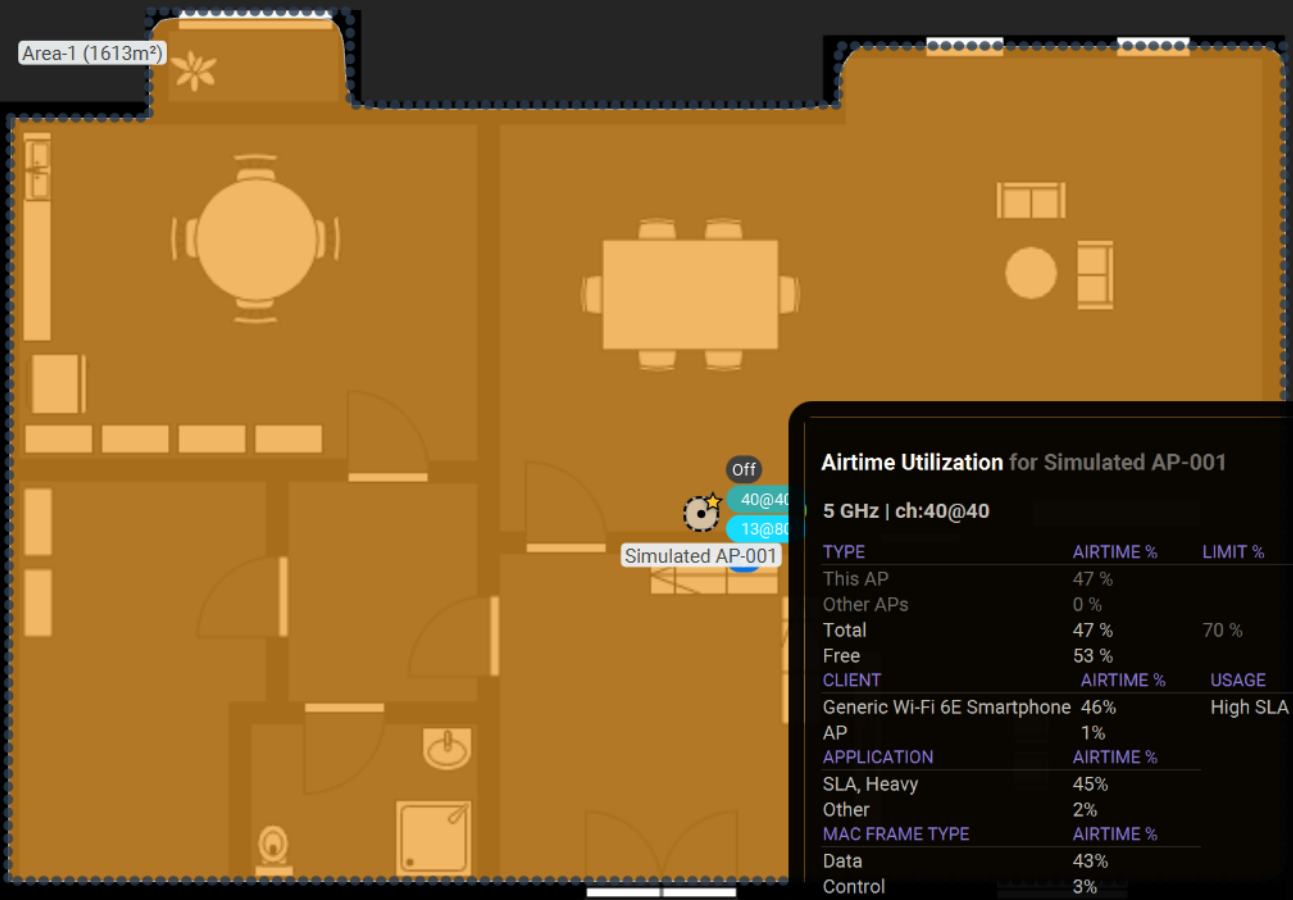
Title (a...) Search, Refresh, More icons

Home (1)

**Simulated AP-001** Ruckus ZoneFlex R770

OFF 40 (40) | 13dBm 13 (80) | 17dBm Show more (+1)

Area-1 (1613m<sup>2</sup>)



**Airtime Utilization for Simulated AP-001**

5 GHz | ch:40@40

TYPE	AIRTIME %	LIMIT %
This AP	47 %	
Other APs	0 %	
<b>Total</b>	<b>47 %</b>	<b>70 %</b>
Free	53 %	

CLIENT	AIRTIME %	USAGE
Generic Wi-Fi 6E Smartphone	46%	High SLA (4 Mbps)
AP	1%	

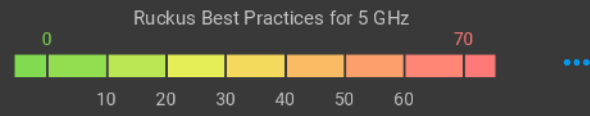
APPLICATION	AIRTIME %
SLA, Heavy	45%
Other	2%

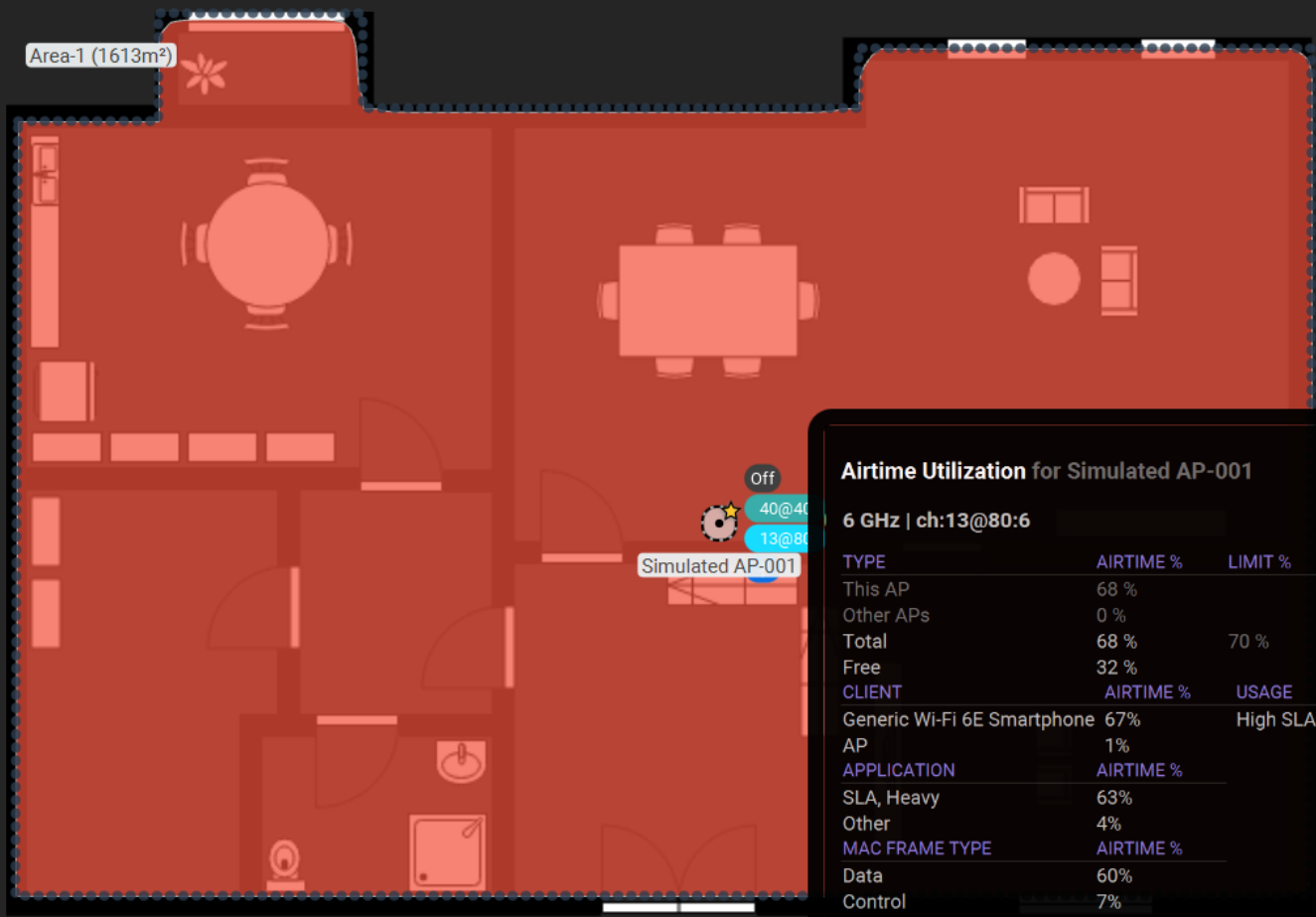
MAC FRAME TYPE	AIRTIME %
Data	43%
Control	3%
Management	1%

**Capacity: Clients per AP for Simulated AP-001**

5 GHz | ch:40@40

COUNT	CLIENT	USAGE	BITRATE
27	Generic Wi-Fi 6E Smartphone	High SLA (4 Mbps)	108Mbps
<b>27 (Total)</b>			





ACCESS POINTS (1)

Home (1)

**Simulated AP-001** Ruckus ZoneFlex R770

OFF 40 (40) | 15dBm 13 (80) | 17dBm Show more (+1)

**Airtime Utilization for Simulated AP-001**

6 GHz | ch:13@80:6

TYPE	AIRTIME %	LIMIT %
This AP	68 %	
Other APs	0 %	
<b>Total</b>	<b>68 %</b>	<b>70 %</b>
Free	32 %	

CLIENT	AIRTIME %	USAGE
Generic Wi-Fi 6E Smartphone	67%	High SLA (4 Mbps)
AP	1%	

APPLICATION	AIRTIME %
SLA, Heavy	63%
Other	4%

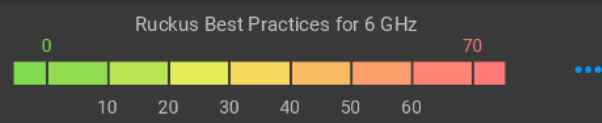
  

MAC FRAME TYPE	AIRTIME %
Data	60%
Control	7%
Management	1%

**Capacity: Clients per AP for Simulated AP-001**

6 GHz | ch:13@80:6

COUNT	CLIENT	USAGE	BITRATE
63	Generic Wi-Fi 6E Smartphone	High SLA (4 Mbps)	252Mbps
<b>63 (Total)</b>			

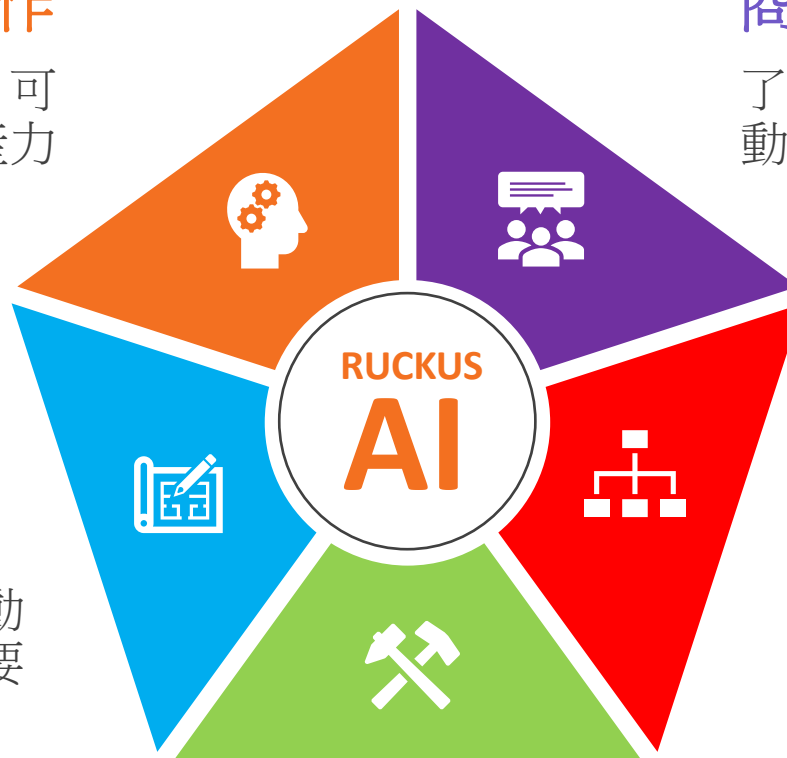


## 智能協作

日常和重複性工作的協作與自動化，可大幅地減少人為錯誤並提高生產力

## 商業意圖認知

了解商業意圖並將業務需求和策略轉化為自動化網路配置



## 網路優化

隨著無線技術日益複雜，人工智能驅動的網路優化對於網路效能至關重要

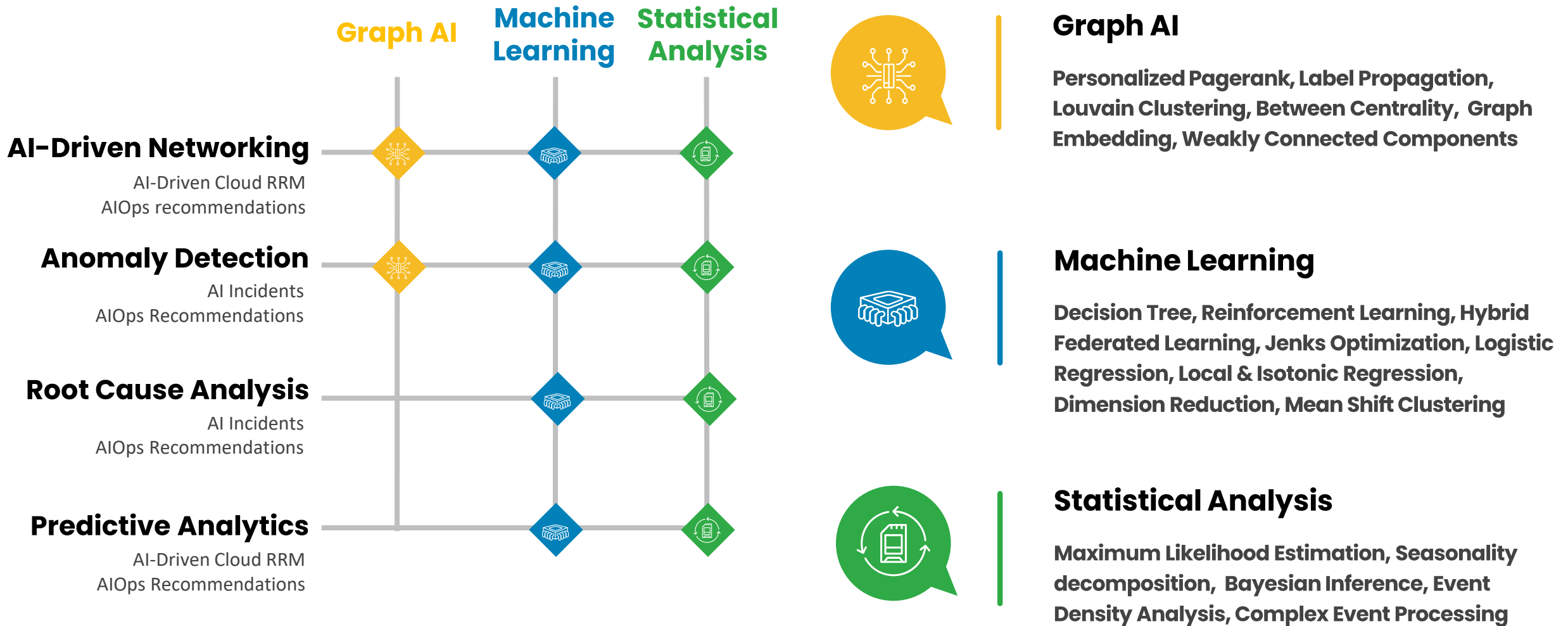
## 動態網路管理

動態網路配置，可依網路使用、流量模式和 RF 環境來調整網路

## 網路故障排除

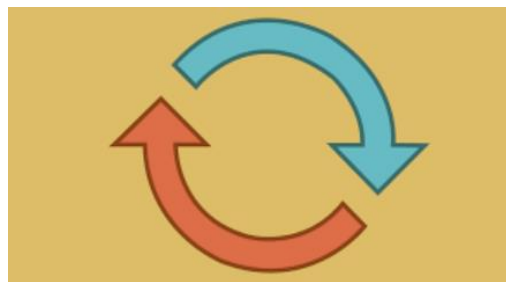
自動辨識、分析根本原因和建議補救措施

# RUCKUS 關鍵的 AI 技術



# 更智慧動態的網路管理

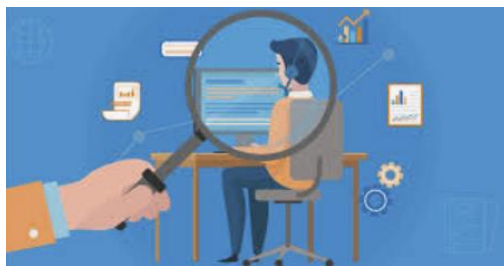
AI-Driven RRM 會即時分析所有 Wi-Fi 頻段（2.4 GHz、5 GHz 和 6 GHz）的數據，並自動調整以獲得最佳效能。這種基於雲端的系統簡化了維護工作並最大程度地減少了人為錯誤，從而實現更快、更可靠且覆蓋範圍更廣的 Wi-Fi 7 網路。



還原



預測

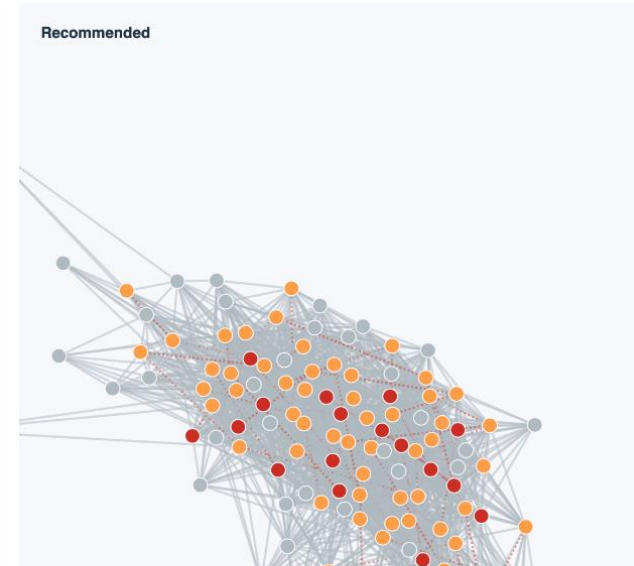
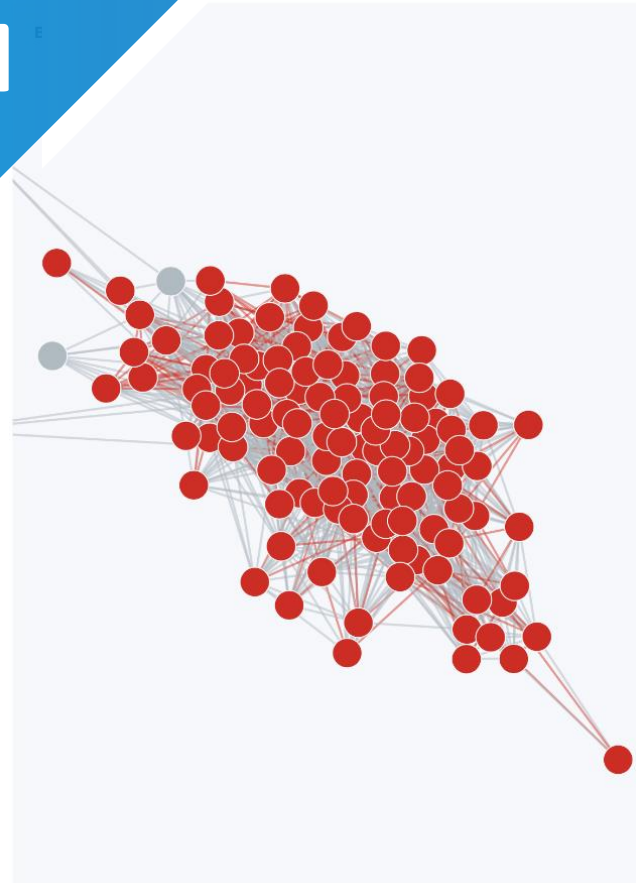


監控



排程

# AI-Driven Cloud RRM Visualize



Channel Bandwidth

- 80 MHz
- 40 MHz
- 20 MHz

Transmit Power

- No interfering links
- Has interfering links
- Reduction in transmit power

[RRM Comparison](#)

## AI-Driven RRM **5**

There are 5 recommendations for 5 zones covering 379.2K possible RRM combinations. Currently, 0 zones are optimized.

AI-RRM tried **380K** combinations for optimizing RF channel plan before selecting

**Proactive, Tx Power  
Management**

**Optimized, Network  
Performance**

# Wireless Digital Twin - AI-RRM and AIOps

- **Harness AI power available in the cloud**

- Make a **digital copy** of the physical RF network- 'Digital Twin'
- Run AI-RRM **simulations** on the **Digital Twin**
- Leave the physical network **unchanged**
- Make new RF channel plan - ch, width, tx power - available
- Show potential improvements in the network **visually**

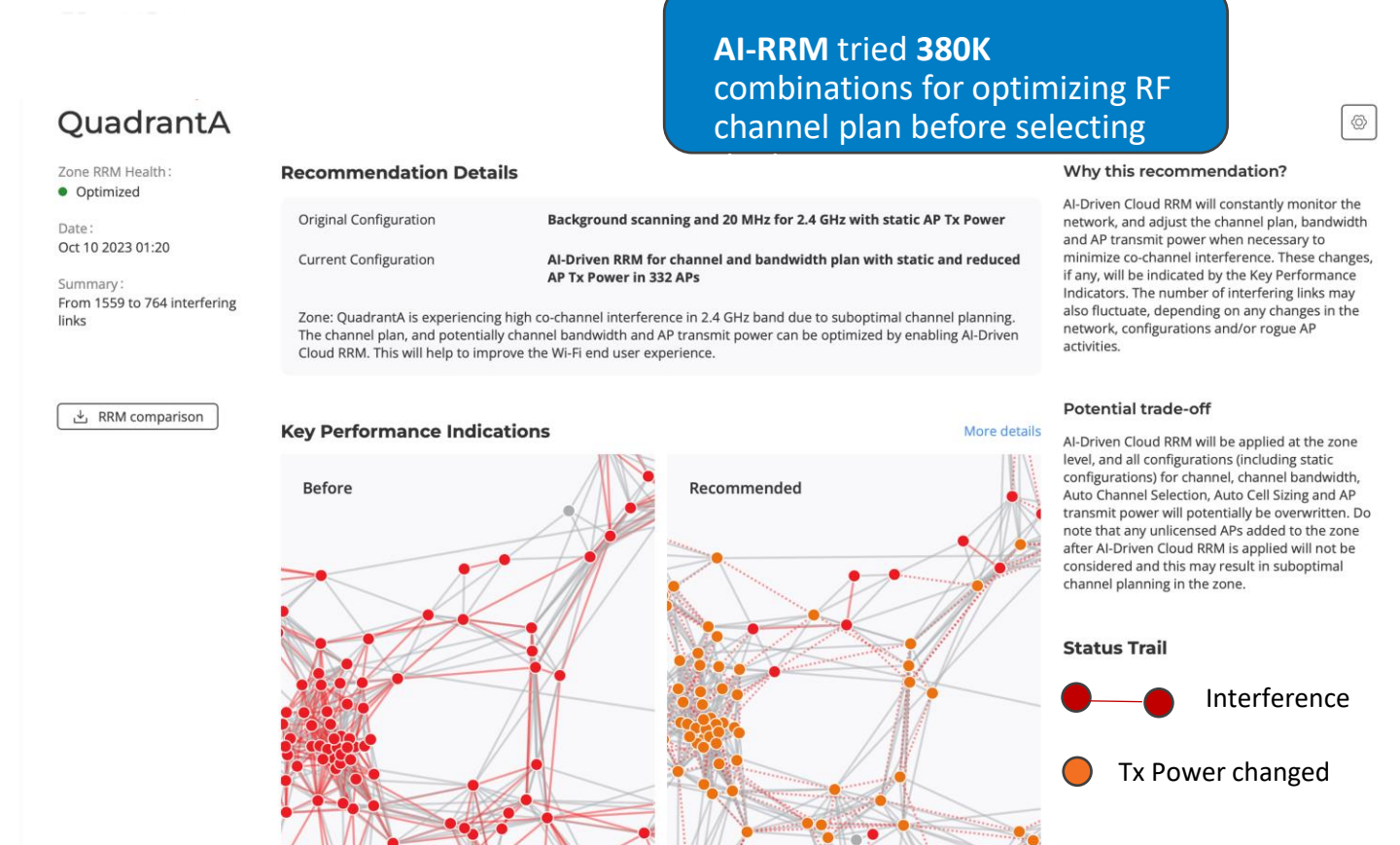
- **Read the RRM summary and apply**

- **Automate** applying the configuration from the **Digital twin** to the **physical network** using **AIOps**
- **Predict, Schedule, Monitor** and **Revert** Options

## AI-Driven RRM 5

There are 5 recommendations for 5 zones covering 379.2K possible RRM combinations. Currently, 0 zones are optimized.

AI-RRM tried 380K combinations for optimizing RF channel plan before selecting



**QuadrantA**

Zone RRM Health:  
● Optimized

Date:  
Oct 10 2023 01:20

Summary:  
From 1559 to 764 interfering links

[RRM comparison](#)

**Recommendation Details**

Configuration	Details
Original Configuration	Background scanning and 20 MHz for 2.4 GHz with static AP Tx Power
Current Configuration	AI-Driven RRM for channel and bandwidth plan with static and reduced AP Tx Power in 332 APs

Zone: QuadrantA is experiencing high co-channel interference in 2.4 GHz band due to suboptimal channel planning. The channel plan, and potentially channel bandwidth and AP transmit power can be optimized by enabling AI-Driven Cloud RRM. This will help to improve the Wi-Fi end user experience.

**Key Performance Indications**

Before | Recommended

**Why this recommendation?**

AI-Driven Cloud RRM will constantly monitor the network, and adjust the channel plan, bandwidth and AP transmit power when necessary to minimize co-channel interference. These changes, if any, will be indicated by the Key Performance Indicators. The number of interfering links may also fluctuate, depending on any changes in the network, configurations and/or rogue AP activities.

**Potential trade-off**

AI-Driven Cloud RRM will be applied at the zone level, and all configurations (including static configurations) for channel, channel bandwidth, Auto Channel Selection, Auto Cell Sizing and AP transmit power will potentially be overwritten. Do note that any unlicensed APs added to the zone after AI-Driven Cloud RRM is applied will not be considered and this may result in suboptimal channel planning in the zone.

**Status Trail**

- Interference
- Tx Power changed

# 快速排除問題

- 藉由 AI-Driven Wi-Fi, Try and Error 網路問題已成為過去式。先進的演算法可以識別和排列任何事件的優先順序，如 P1 ~ P4，無論是傳輸異常到潛在的安全威脅。使管理者可以立即採取正確行動，防止網路中斷並確保關鍵應用程式（如視訊通話或大型下載）正常運行。



1 Incident Details P1 | High AP-Controller connection failures in AP Group: Jeanne-Lajoie Secondaire

2

### INSIGHTS

#### ROOT CAUSE ANALYSIS

System has detected high number of AP-controller connection failures. This can occur due to following reasons:

1. Intermittent or permanent loss of connectivity between AP and controller. Losing consecutive heartbeat/keepalive messages from the AP will result in AP-controller connection failures.
2. Improperly configured Firewall or NAT device or a network switch can cause the AP-controller communication.
3. Lack of reachability from AP to controller over a WAN connection or cloud would cause APs to disconnect from controller.
4. In rare cases, AP certificate is invalid which forces controller to deny the incoming connection from the AP.

#### RECOMMENDED ACTION

To remediate the problems identified above, follow the corresponding recommended actions:

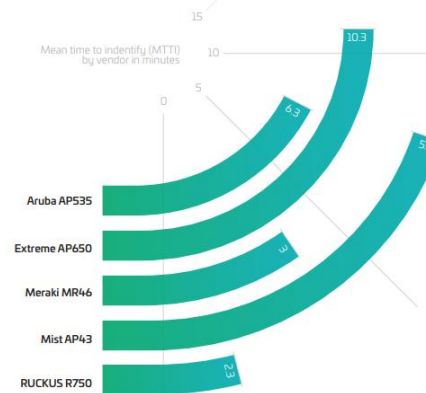
1. Test network connection between AP and controller.
2. Ensure that there is clear communication on all required ports.
3. Test WAN connection health to ensure there is a route from AP to the controller and there is no or acceptable loss.
4. Ensure that AP certificate is valid. Work with Ruckus customer support to identify and resolve this condition.

3

#### INCIDENT INFO

AP Impact Count	36 of 36 APs (100%)	<a href="#">view details</a>
Incident Category	Infrastructure	
Incident Sub-Category	Service Availability	
Type	AP Group	
Scope	Jeanne-Lajoie Secondaire	
Duration	23h 54m	
Event Start Time	Jun 21 2022 08:39	
Event End Time	Jun 22 2022 08:33	

## Troubleshooting with network analytics tools



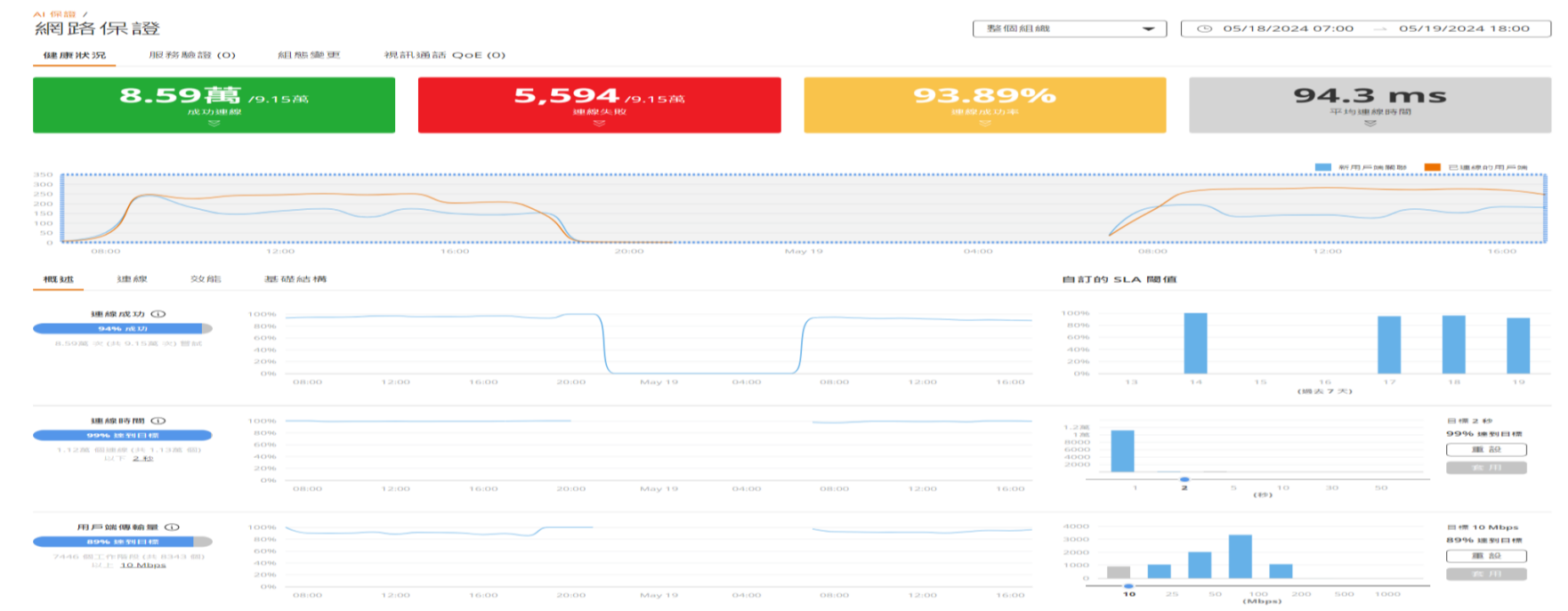
### Mean time to identify

Mean time to identify (MTTI) is the time a network administrator needs to determine the root cause of a network issue or incident. A shorter average MTTI reduces the troubleshooting burden on IT while improving user experience by allowing IT to more effectively limit incident duration and impact.

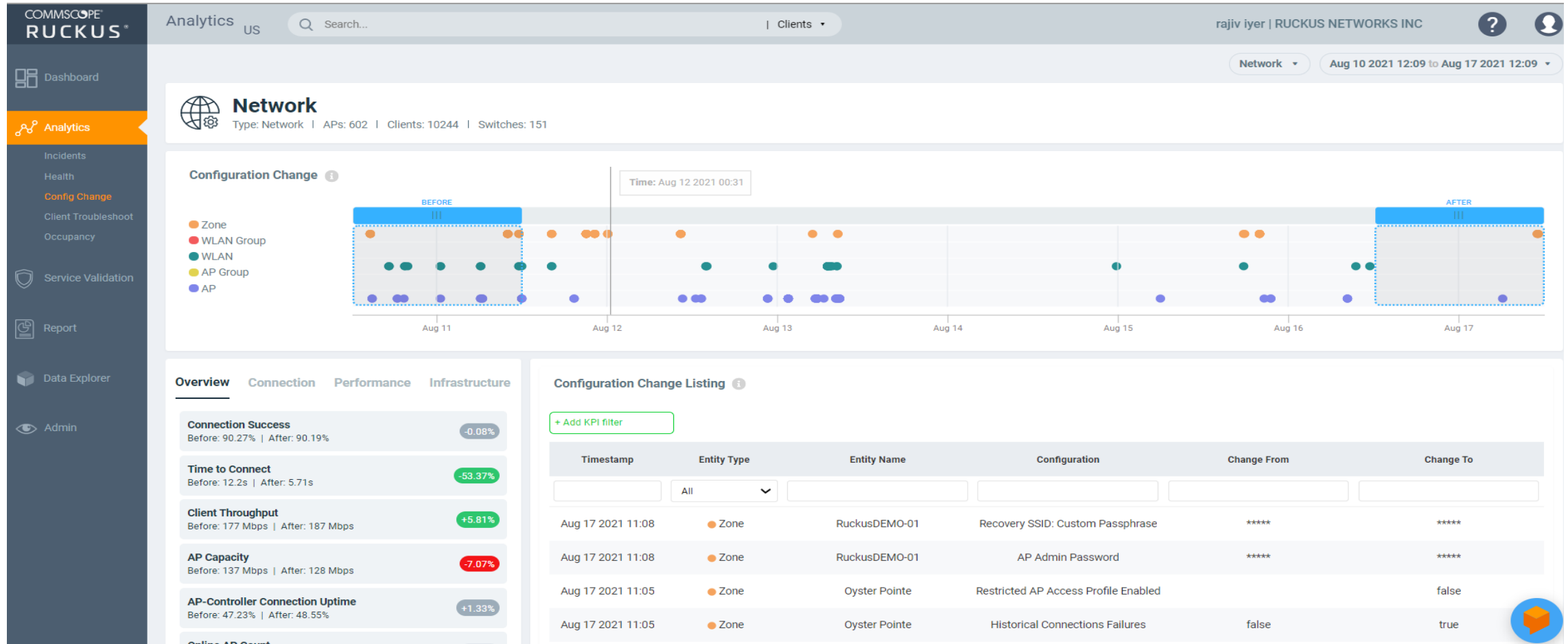
# 持續監控確保網路正常運行

AI-Driven Wi-Fi 網路會持續監控網路健康狀況，可以更快地識別和解決問題。確保服務等級協定 (SLA) 的遵守，並提供有關網路使用方式的寶貴建議，以進行網路優化。隨著 Wi-Fi 7 功能的增強，AI-Driven 的網路健康監控變得更加重要，以確保無虞的網路基礎設施和最好的用戶體驗。

○



# 監控網路設定異動風險



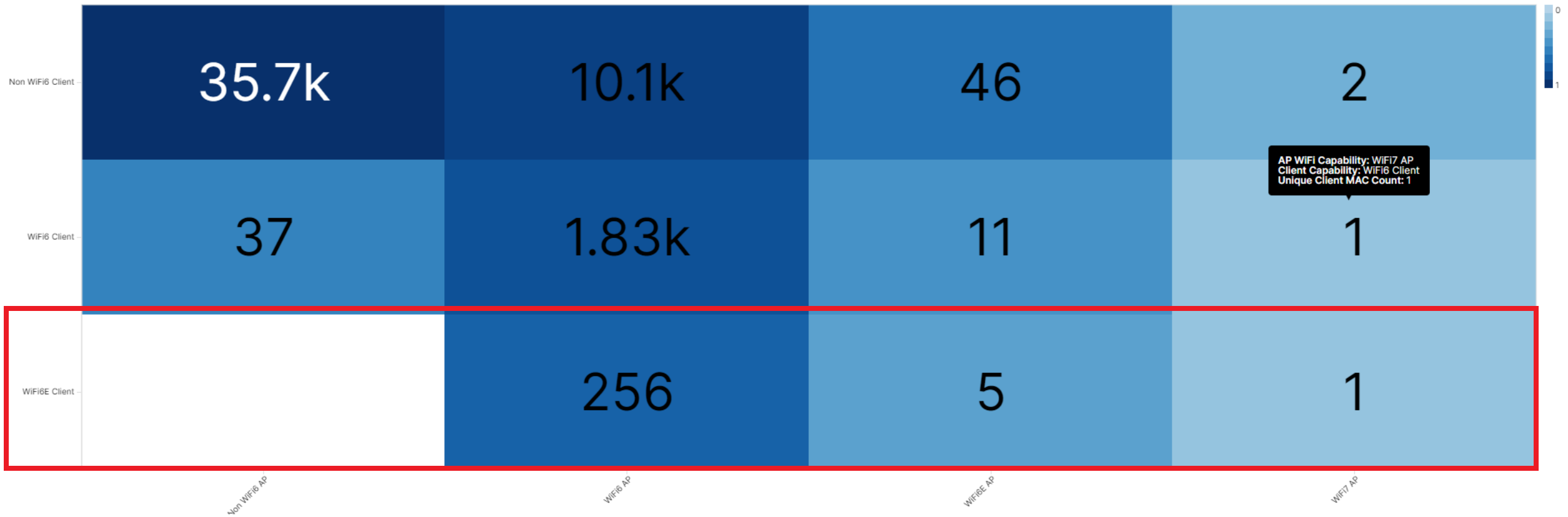
KPIs across connection, performance and infrastructure categories

# 客製化報表協助企業做出正確的決策




Client distribution vs AP Wi-Fi capability ☆

11 rows 00:00:01.09 .JSON .CSV



What is our NEXT.

# Intent AI – EcoFlexAI



License for 20 APs will expire in 25 days  
Ensure service level, Act now

Search | Dog Company | ? | JS

- Dashboard
- AI Analytics**
- App Experience
- Clients
- Wi-Fi
- Wired
- Business Insights
- Administration

< Collapse

AI Analytics / IntentAI /

## EcoFlexAI

Intent: Energy Footprint vs Mission Criticality | Zone: SPS-Hospitality-BLR

Entire organization | Last 7 days

- Introduction**
- Trade-off
- Setting
- Summary

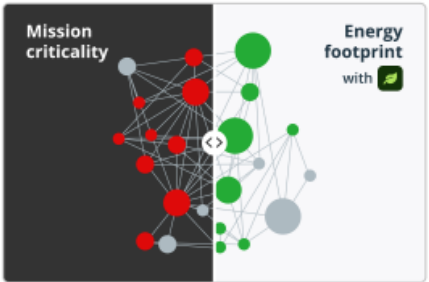
### Introduction

Intent: Energy footprint vs Mission criticality  
Zone: SPS-Hospitality-BLR  
Date: May 20 2024 14:45

**Wireless network design involves balancing different priorities:**

**Energy footprint:** This approach prioritizes energy efficiency and sustainability, aiming to minimize overall energy consumption. It is ideal for environments where reducing environmental impact and optimizing resource usage are paramount.

**Mission Criticality:** This approach focuses on maintaining uninterrupted operation and ensuring reliability for essential services. It is ideal for environments with critical consequences for downtime, like infrastructure or emergency services.



Cancel | Next


### Side Notes

#### Why the recommendation?

This recommendation aims to reduce power consumption in RUCKUS WIFI systems during off-peak hours, conserving energy and reducing costs while maintaining essential connectivity for clients.

#### Resources

- [EcoFlexAI Video Demo](#)
- [IntentAI User Guide](#)



License for 20 APs will expire in 25 days  
Ensure service level, Act now

Search: Dog Company JS

Dashboard  
AI Analytics  
App Experience  
Clients  
Wi-Fi  
Wired  
Business Insights  
Administration  
Collapse

## AI Analytics / Intent Details

Actions: Stop [dropdown] [gear]

### EcoFlexAI

Reduce energy footprint for efficiency and sustainability, or operate mission-critical services for reliability and continuous operation.

Intent: Throughput vs Client Density  
Date: May 20 2024 14:45  
Zone: SPS-Hospitality-BLR  
Hours not applied for EcoFlexAI  
Mon-Fri 09h00-19h00  
Sat-Sun 09h00-13h00  
Excluded AP Groups / APs  
AP Group 1 (AP Group) — 3 APs  
AP Group 2 (AP Group) — 5 APs


[EcoFlexAI comparison](#)

#### Benefits


<b>Projected power consumption</b> <b>9014 kWh</b> /month -20% vs normal mode	<b>Projected monetary benefits</b> <b>\$250</b> /month -20% vs normal mode
---	--

#### Key Performance Indications

**Before**  
As of May 20 2024 14:45



**Recommended**  
As of after Activation



**Legend**  
● Full Power  
● Green Efficient  
● Deep Sleep

[View More](#)

RUCKUS = 節能

# Wi-Fi 6 Indoor 2 x 2 AP 比較試算

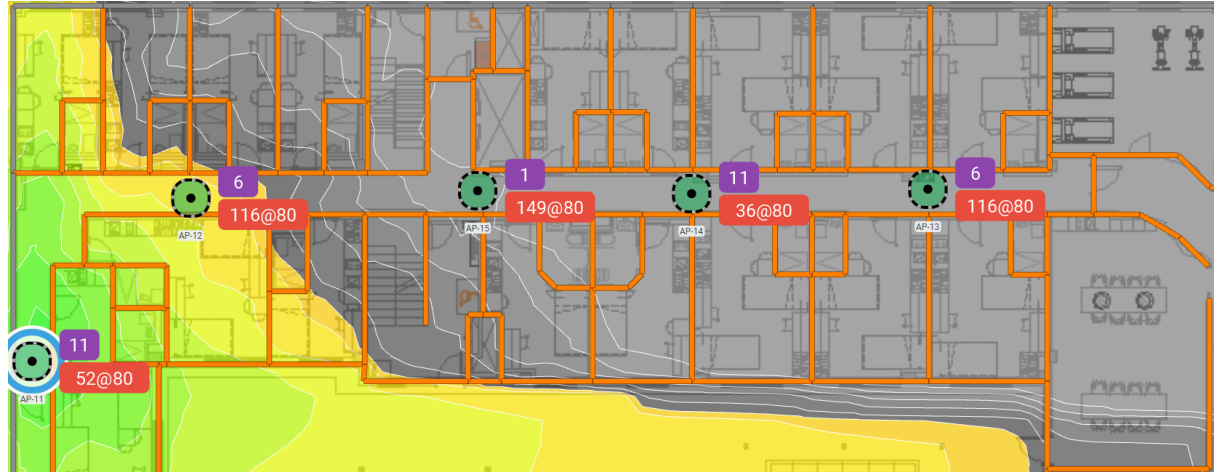
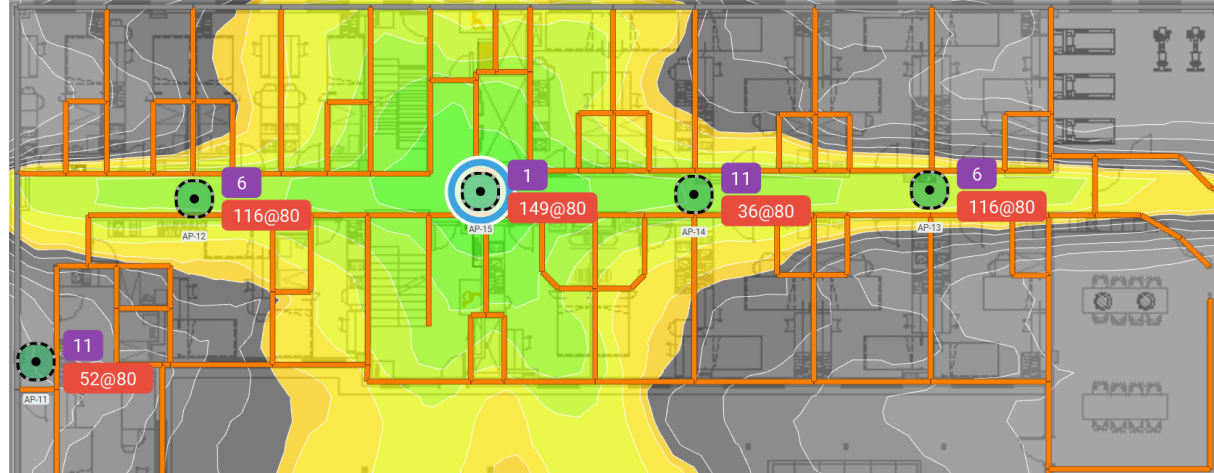
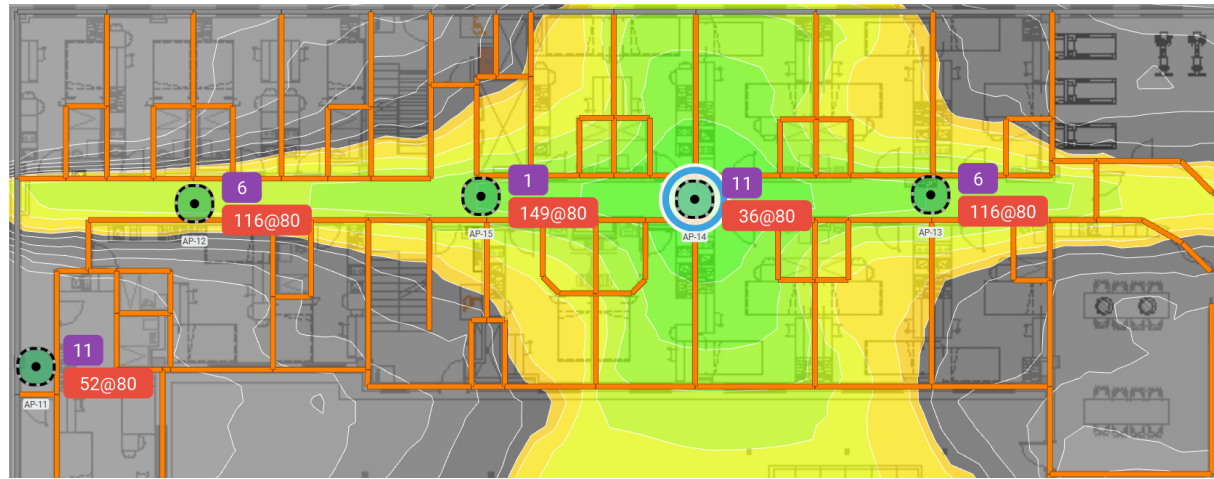


	RUCKUS R350	它牌同級品
Idle PoE (Wh)	7.1	6.2
Maximum PoE (Wh) *Full Functions	12.62	16.5
Average of Max PoE + Idle PoE (Wh)	9.86	11.35
最少 AP 用電量/Hour (kWh)	0.00986	0.01135
最少 AP 用電量/Day (kWh)	0.23664	0.2724
最少 AP 用電量/Year (kWh)	86.3736	99.426
用電量差異	-15%	

# 一般天線



當AP佈放的位置設計不正確時容易產生同頻干擾。同一AP也會受到其他頻道AP的Inter-Channel的干擾，造成底噪增加。

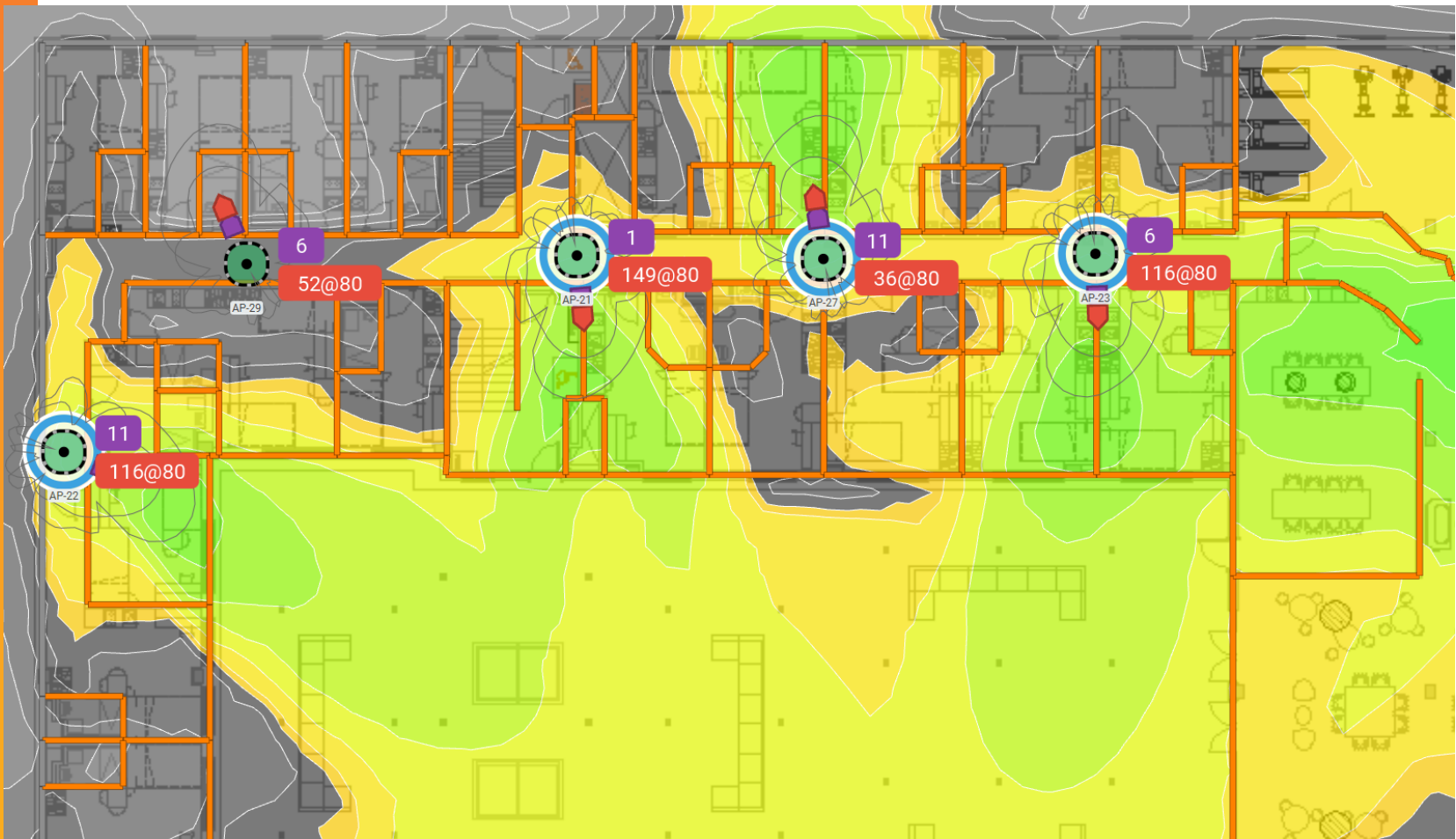


# RUCKUS BeamFlex+

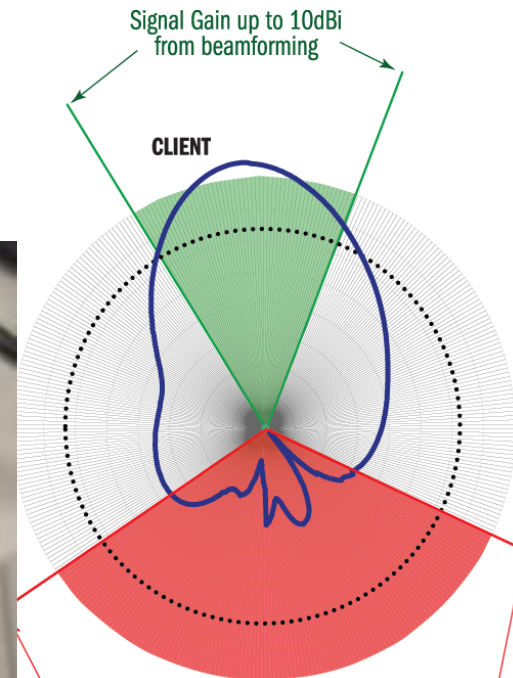
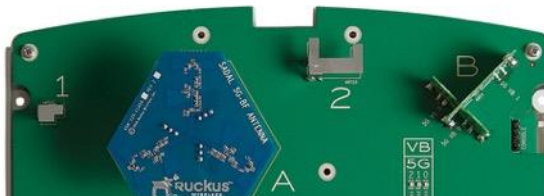


每個 AP 將訊號集中到其終端裝置的方向，降低對前一個 AP 產生的干擾。大幅減少同頻道和頻道間干擾。

無線規劃與佈建，通常RUCKUS需要的AP數量也比其他友商來的少。



# RUCKUS BeamFlex+



Better individual and global performance

# 交換器啟動EEE – 802.3az



```
c08PF(config)#eee
EEE Feature Enabled
c08PF(config)#show eee
```

Port	EEE-State	RxLpIdleReceived	TxLpIdleReceived
1/1/1	Enable	0	0
1/1/2	Enable	0	0
1/1/3	Enable	0	1
1/1/4	Enable	0	0
1/1/5	Enable	1	1
1/1/6	Enable	1	1
1/1/7	Enable	1	1
1/1/8	Enable	1	1

```
c08PF(config)#show eee
```

Port	EEE-State	RxLpIdleReceived	TxLpIdleReceived
1/1/1	Enable	0	0
1/1/2	Enable	0	0
1/1/3	Enable	0	1
1/1/4	Enable	0	0
1/1/5	Enable	1	1
1/1/6	Enable	1	1
1/1/7	Enable	1	1
1/1/8	Enable	1	1

```
c08PF(config)#no eee
EEE Feature Disabled
c08PF(config)#show eee
```

Port	EEE-State	RxLpIdleReceived	TxLpIdleReceived
1/1/1	Disable	N/A	N/A
1/1/2	Disable	N/A	N/A
1/1/3	Disable	N/A	N/A
1/1/4	Disable	N/A	N/A
1/1/5	Disable	N/A	N/A
1/1/6	Disable	N/A	N/A
1/1/7	Disable	N/A	N/A
1/1/8	Disable	N/A	N/A



# 無線網路排程自動啟閉

Time Schedule:  Always On  Always Off  Specific

\* Schedule Profile: Working Hours + ✎

## Edit WLAN Schedule Table [Working Hours]

General Options

\* Schedule Name:

Schedule Description:

Schedule Table

Time Zone: (GMT+8:00) Asia/Taipei

Time	AM											PM											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
Sun																							
Mon							█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Tue							█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Wed							█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Thu							█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Fri							█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Sat																							

Apply Cancel

## R550 working power consumption

```
c08PF(config)#show inline power
Power Capacity: Total/Reserved/Unconsumed is 124.0/0.0/116.6 Watts.
Power Allocations: Requests Honored 11 times
```

Port	Admin State	Oper State	---Power(mWatts)---		PD Type	PD Class	Pri	Fault/Error
			Consumed	Allocated				
1/1/1	On	Non-PD	0	0	n/a	n/a	3	n/a
1/1/2	On	Off	0	0	n/a	n/a	3	n/a
1/1/3	On	On	7392	28850*	2P-IEEE	Class 4	3	n/a
1/1/4	On	Off	0	0	n/a	n/a	3	n/a
1/1/5	On	Off	0	0	n/a	n/a	3	n/a
1/1/6	On	Off	0	0	n/a	n/a	3	n/a
1/1/7	On	Non-PD	0	0	n/a	n/a	3	n/a
1/1/8	On	Non-PD	0	0	n/a	n/a	3	n/a
Total			7392	28850				

(\* ) Allocated power being dynamically managed.

## R550 Schedule Radio Disabled power consumption

```
c08PF(config)#show inline power
Power Capacity: Total/Reserved/Unconsumed is 124.0/0.0/119.7 Watts.
Power Allocations: Requests Honored 11 times
```

Port	Admin State	Oper State	---Power(mWatts)---		PD Type	PD Class	Pri	Fault/Error
			Consumed	Allocated				
1/1/1	On	Non-PD	0	0	n/a	n/a	3	n/a
1/1/2	On	Off	0	0	n/a	n/a	3	n/a
1/1/3	On	On	4924	28850*	2P-IEEE	Class 4	3	n/a
1/1/4	On	Off	0	0	n/a	n/a	3	n/a
1/1/5	On	Off	0	0	n/a	n/a	3	n/a
1/1/6	On	Off	0	0	n/a	n/a	3	n/a
1/1/7	On	Non-PD	0	0	n/a	n/a	3	n/a
1/1/8	On	Off	0	0	n/a	n/a	3	n/a
Total			4924	28850				

(\* ) Allocated power being dynamically managed.

# PoE交換器啟動Dynamic PoE



```
c08PF(config)#show inline power

Power Capacity: Total is 124000 mWatts. Current Free is 7450 mWatts.

Power Allocations: Requests Honored 14 times
```

Port	Admin State	Oper State	---Power (mWatts)---		PD Type	PD Class	Pri	Fault/Error
			Consumed	Allocated				
1/1/1	On	Non-PD	0	0	n/a	n/a	3	n/a
1/1/2	On	Off	0	0	n/a	n/a	3	n/a
1/1/3	On	On	5692	28850	2P-IEEE	Class 4	3	n/a
1/1/4	On	On	6521	30000	4P-IEEE	Class 5	3	n/a
1/1/5	On	On	6079	28850	2P-IEEE	Class 4	3	n/a
1/1/6	On	On	7605	28850	2P-IEEE	Class 4	3	n/a
1/1/7	On	Non-PD	0	0	n/a	n/a	3	n/a
1/1/8	On	Non-PD	0	0	n/a	n/a	3	n/a
Total			25897	116550				

無法再接第五台PD

```
c08PF(config)#show inline power

Power Capacity: Total/Reserved/Unconsumed is 124.0/0.0/84.7 Watts.

Power Allocations: Requests Honored 14 times
```

RUCKUS ICX8200 / ICX7550 / ICX7650 PoE Switch支援Dynamic PoE功能。

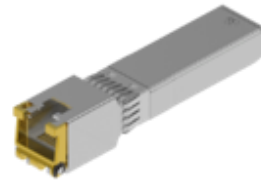
當啟動Dynamic PoE後PoE Budget是以Pool的方式來使用，這表示某些情境下您也許可以省下購置第二台PoE Switch。

Port	Admin State	Oper State	---Power (mWatts)---		PD Type	PD Class	Pri	Fault/Error
			Consumed	Allocated				
1/1/1	On	Non-PD	0	0	n/a	n/a	3	n/a
1/1/2	On	On	9604	30000*	4P-IEEE	Class 5	3	n/a
1/1/3	On	On	5583	28850*	2P-IEEE	Class 4	3	n/a
1/1/4	On	On	10005	29532*	4P-IEEE	Class 5	3	n/a
1/1/5	On	On	6136	28850*	2P-IEEE	Class 4	3	n/a
1/1/6	On	On	7905	28850*	2P-IEEE	Class 4	3	n/a
1/1/7	On	Non-PD	0	0	n/a	n/a	3	n/a
1/1/8	On	Non-PD	0	0	n/a	n/a	3	n/a
Total			39233	146082				

(\*) Allocated power being dynamically managed.

# 低耗電的光纖模組

- 新型 10G BASE-T光電轉換模組不需要強迫使用者空出 1 個SFP+埠無法使用。
- 消耗較少的Switch供電。
- 降低模組產生的發熱。



SKU	Max Power Consumption
10G-SFPP-TX-A (EOL)	2.5W
10G-SFPP-TX-LP-A	1.5W

Others

1	3	5	7
2	4	6	8

RUCKUS

1	3	5	7
2	4	6	8

Q: Is the heat generated when the 10GBASE-T is working?

A: The calorific value is very high. The designed power consumption of the 10GBASE-T is 2.5w. Its heat generation is very high, and the high temperature can be obviously felt during use. The switches with multiple SFP+ interfaces cannot be fully equipped with 10GBASE-T. As for the maximum number of 10GBASE-T that can be equipped with, it depends on the switch availability.

# 太陽能供電給戶外型AP T350d

當兩種電源輸入都接上，  
直流電源輸入會優先於  
PoE 輸入。



Mesh APs.

太陽能供電



# Thanks