

AI Driven 校園數位韌性

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TM
TW

校園面臨的挑戰

缺乏整體網路的可視性



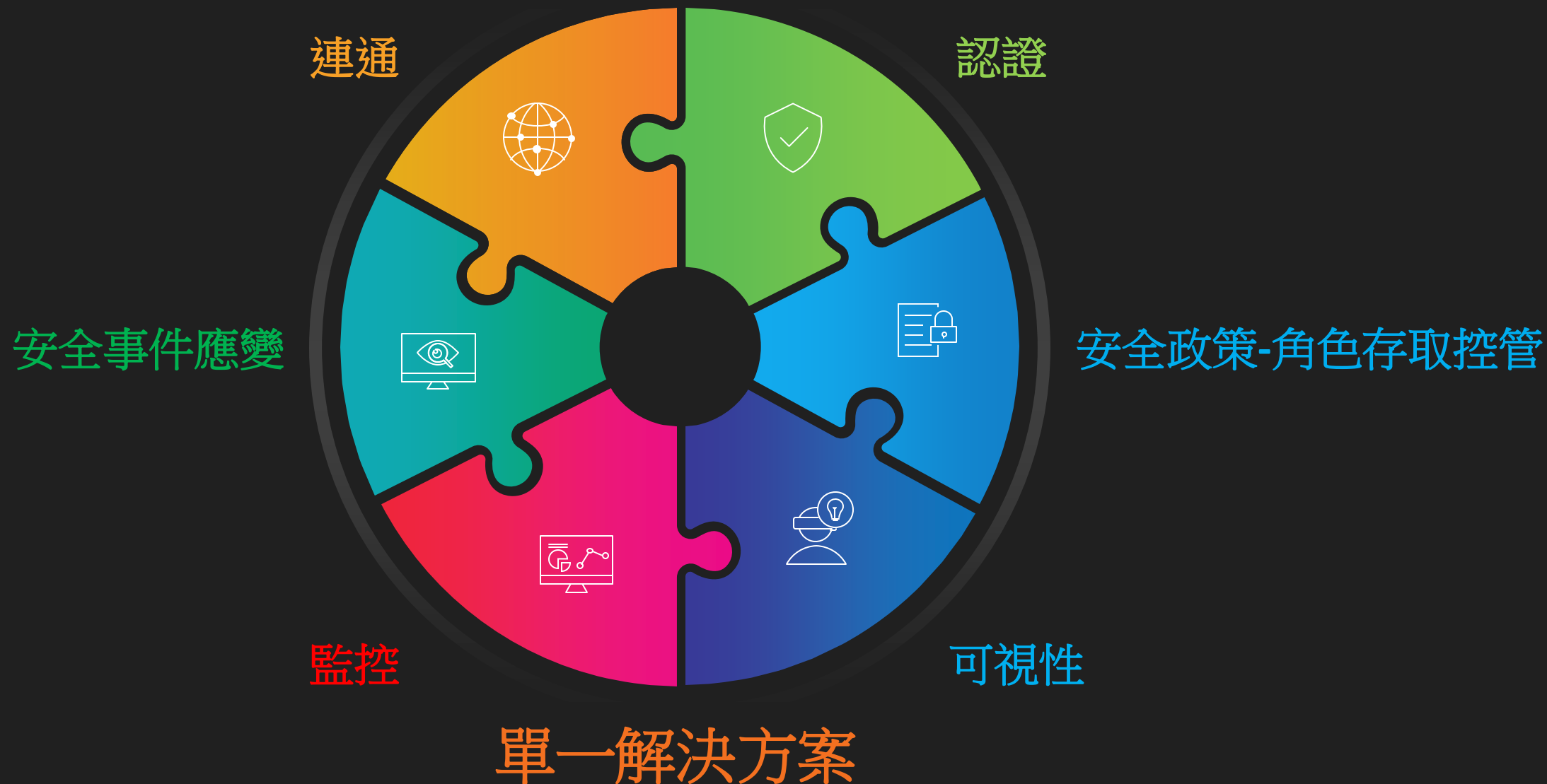
IT常被瑣碎的網路申告弄得焦頭爛額



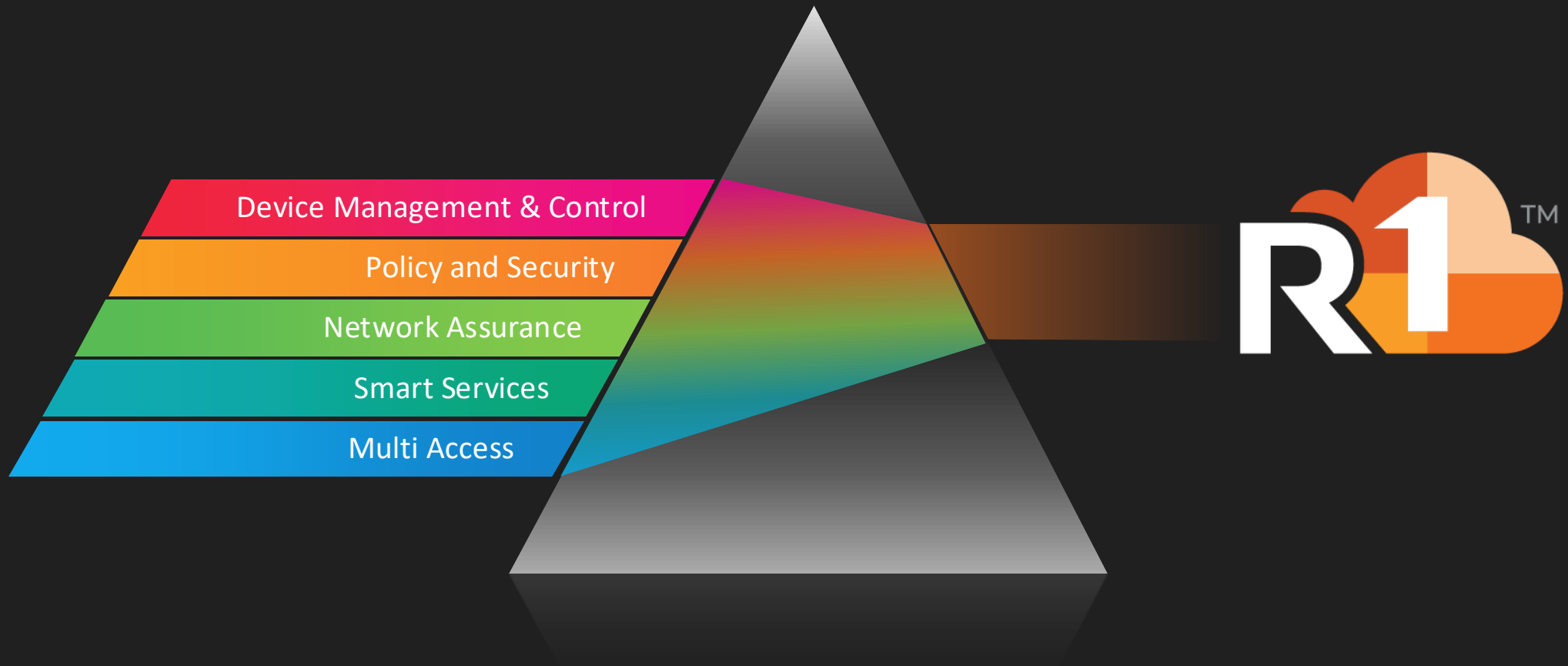
無法分類該優先處理的事件導致用戶體驗下降



不斷變化的需求



Simplified experience unifying our portfolio into
one software platform



Ruckus BeamFlex：提升連線效能和可靠度



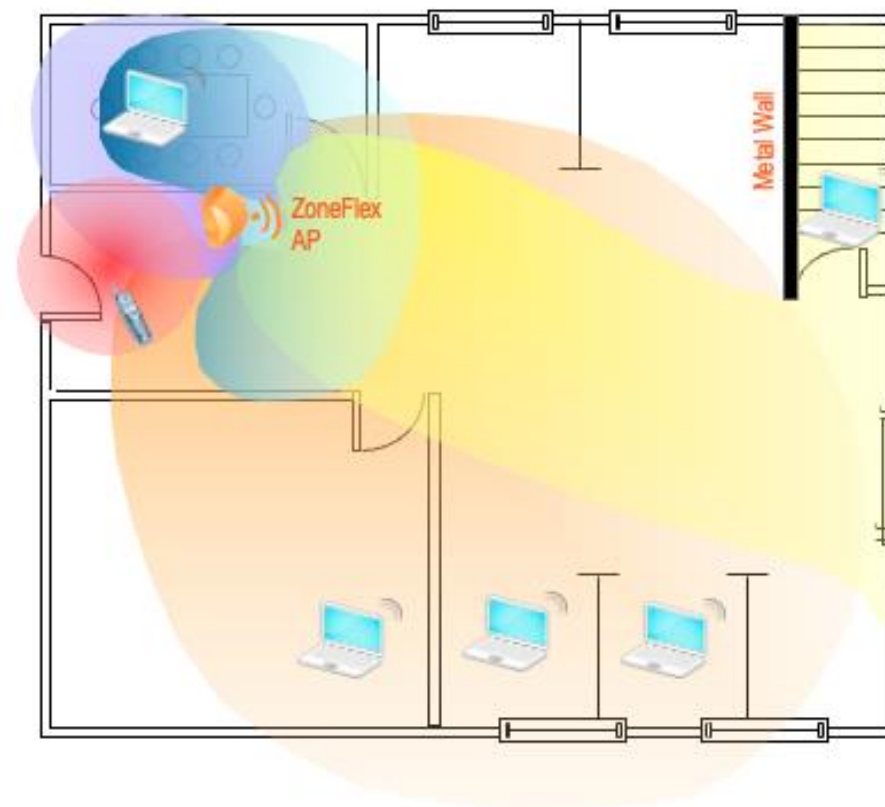
他牌



Ruckus



- 智慧天線將無線訊號指向用戶端設備
- 自動依據用戶端狀況（移動，加入，變化）進行最佳訊號調適
- 自動迴避干擾源
- 操控訊號繞過無法穿越的區域
- 智慧天線能夠讓基地台之間更加協調
- 自動化調整指定方向發射功率及頻道切換

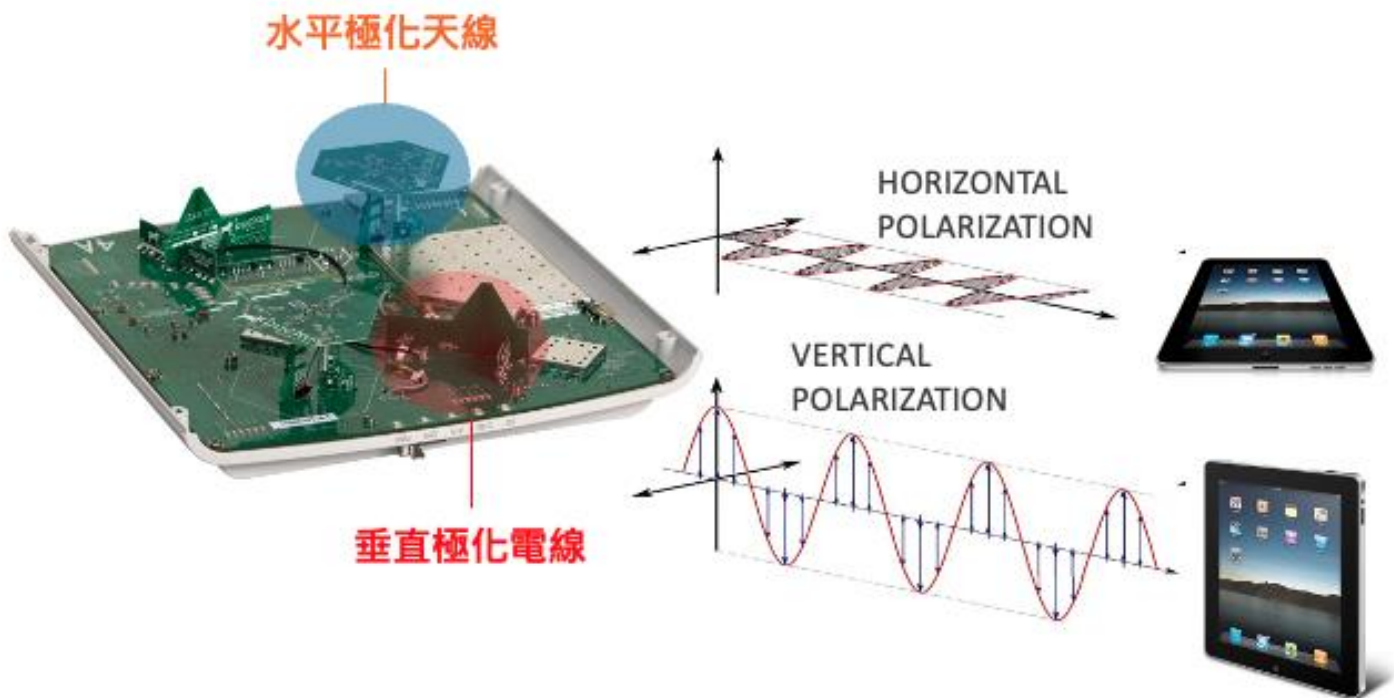


多極化陣列天線 (BeamFlex+)

多極化陣列天線
自動對應用戶設備方向,以達最佳傳輸效率



Device orientation accounts for
up to **5x performance**
differential among products



IEEE 802.11 wireless LAN standards



- 擴增實境/虛擬實境 (AR/VR)
- 視訊會議（線上課程與直播教學）
- 高密度場域－會議中心/運動場
- 全校高密度線上測驗
- 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

新世代無線的來臨優化頻道愈趨重要

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																												
Qty	Radio Band	Center Freq	DFS Channels				DFS Channels																					
			U-NII-1				U-NII-2a				U-NII-2c (Extended)								U-NII-3									
			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	
			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	
			38	46		54		62		102		110		118		126		134		142		151		159				
5	80 MHz				58				106				122				138				155				165 was ISM, now U-NII-3			
2	160 MHz				50				114																			

6 GHz Channels					500 MHz																					
Low Power Indoor																										
Qty	Radio Band	Center Freq	5dBm/MHz - Net EIRP 18dBm																							
			UNII-5																							
			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
			1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93
			3	11		19		27		35		43		51		59		67		75		83		91		
6	7				23				39				55				71				87					
3	15								47								79									

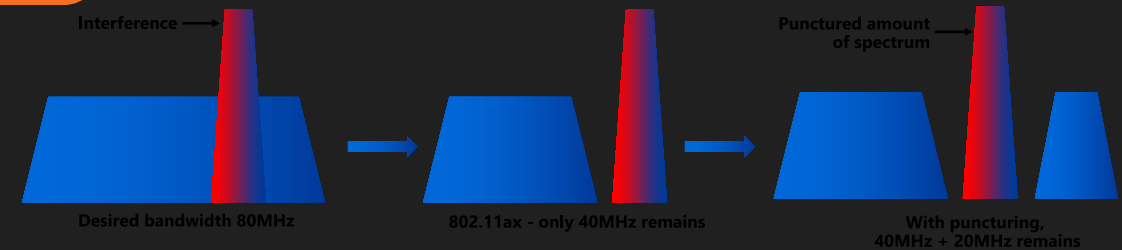
WiFi 7 的重要技術

Extremely High Throughput

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

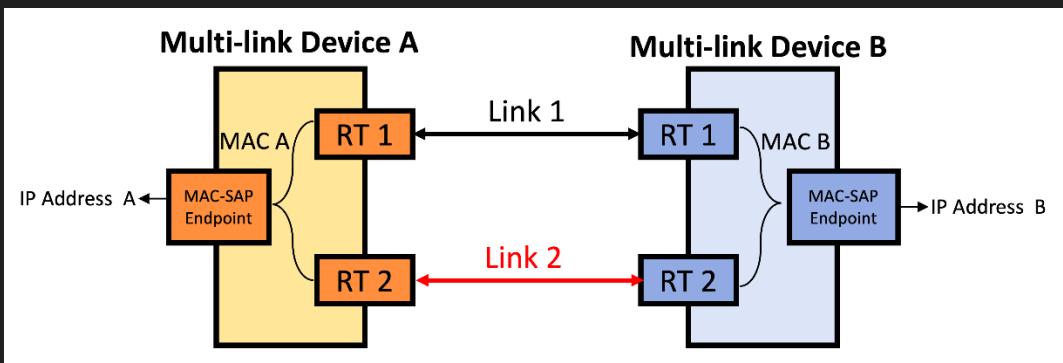
Punctured Transmission

- Increased channel availability
- Better throughput
- Lower latency



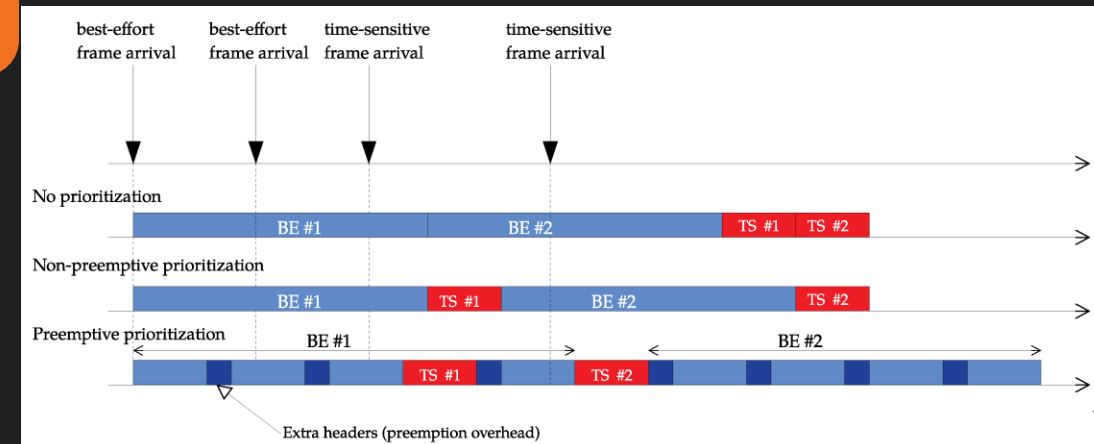
Multi-Link Operation

- Link redundancy (resilience)
- Link aggregation (throughput)
- Link selection (latency)

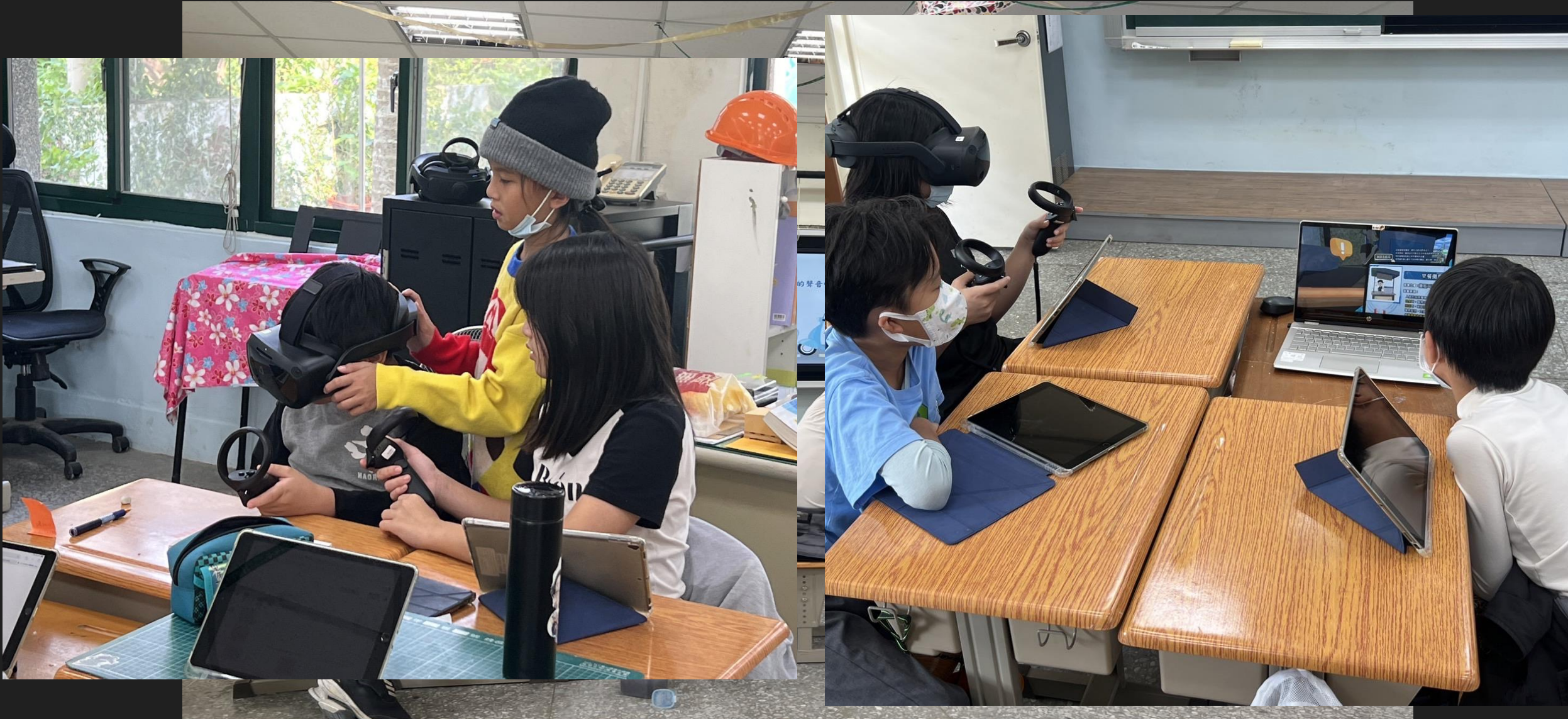


Enhanced Quality of Service

- Time Sensitive Networking (TSN)
- Deterministic Low Latency



未來就在你眼前



AR / VR 的需求

- 720P 每秒 7~8 mbps

AR/VR -> 28 ~ 32 mbps

AR/VR -> 56 ~ 64 mbps

- 1080P 每秒 10~11mbps

AR/VR -> 40 ~ 44 mbps

AR/VR -> 80 ~ 88 mbps

- 4K 每秒 25mbps

AR/VR -> 100 mbps

AR/VR -> 200 mbps



RUCKUS WiFi 7 結合 Vision Pro 教學



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: Q3, 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

RUCKUS One – All in One Manage



Wi-Fi and Switching

SmartZone | RUCKUS Cloud | Unleashed



IoT

Solutions and Services | 3rd Party



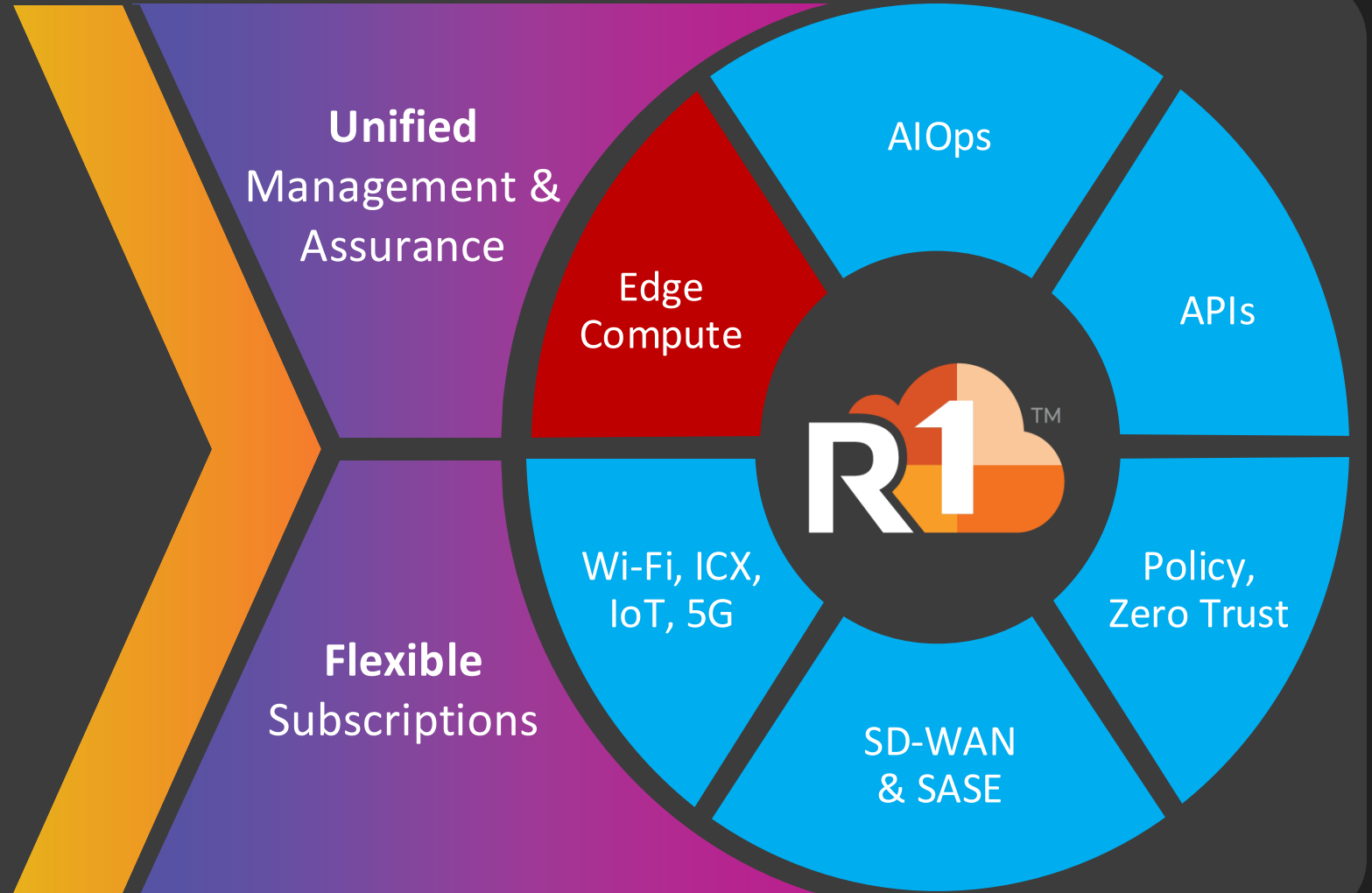
Security & Policy

Cloudpath | Edge solutions



AI & Analytics

RUCKUS AI



RUCKUS 全系列解決方案



Software & SaaS

Security & Policy



Cloudpath

Network Intelligence



RUCKUS AI

Location



SPoT

Tools for partners



Intangi / Yagna

Control & Management

Physical Appliance



SmartZone
ZoneDirector

Virtual Appliance



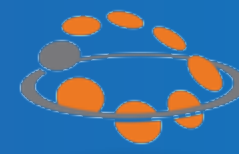
SmartZone

Cloud-managed



RUCKUS ONE Converged

Controllerless



RUCKUS Unleashed

IoT Controller



IoT Suite

Switches

Access



ICX 8100



ICX 8200

Aggregation



ICX 7550

Core



ICX 7850

Access Points

Outdoor



T Series

Indoor



R Series

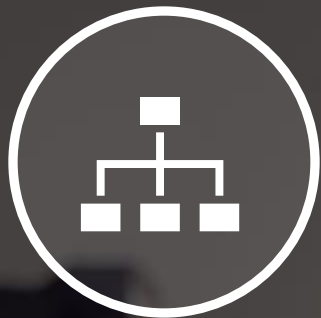
Specialty



H Series

AI專家輔助您翻轉成主動管理式網路

網路所產生的資料



- 計數器、績效指標、事件以及執行
- 透過API串流傳送

資料、事件、組態處理

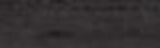
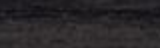
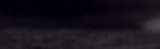
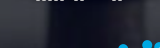
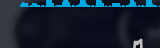


- 機器學習資料基準線
- 透過大數據擷取、索引、聚合、儲存

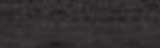
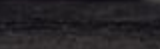
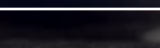
機器智能



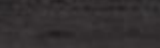
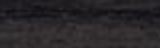
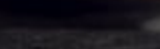
整體異常檢測



獨家機器學習演算法



複雜的洞察邏輯



持續變化分析

主動可視



- 全時人工智能助理
- 根據用戶影響對事件自動分類
- 依需求通知



網路健康狀態



事件等級分類



故障排除

Switch Function :

- VLAN 錯誤偵測
- High Switch Memory Utilization 偵測
- PoE 狀態



報表、儀錶板、資料瀏覽

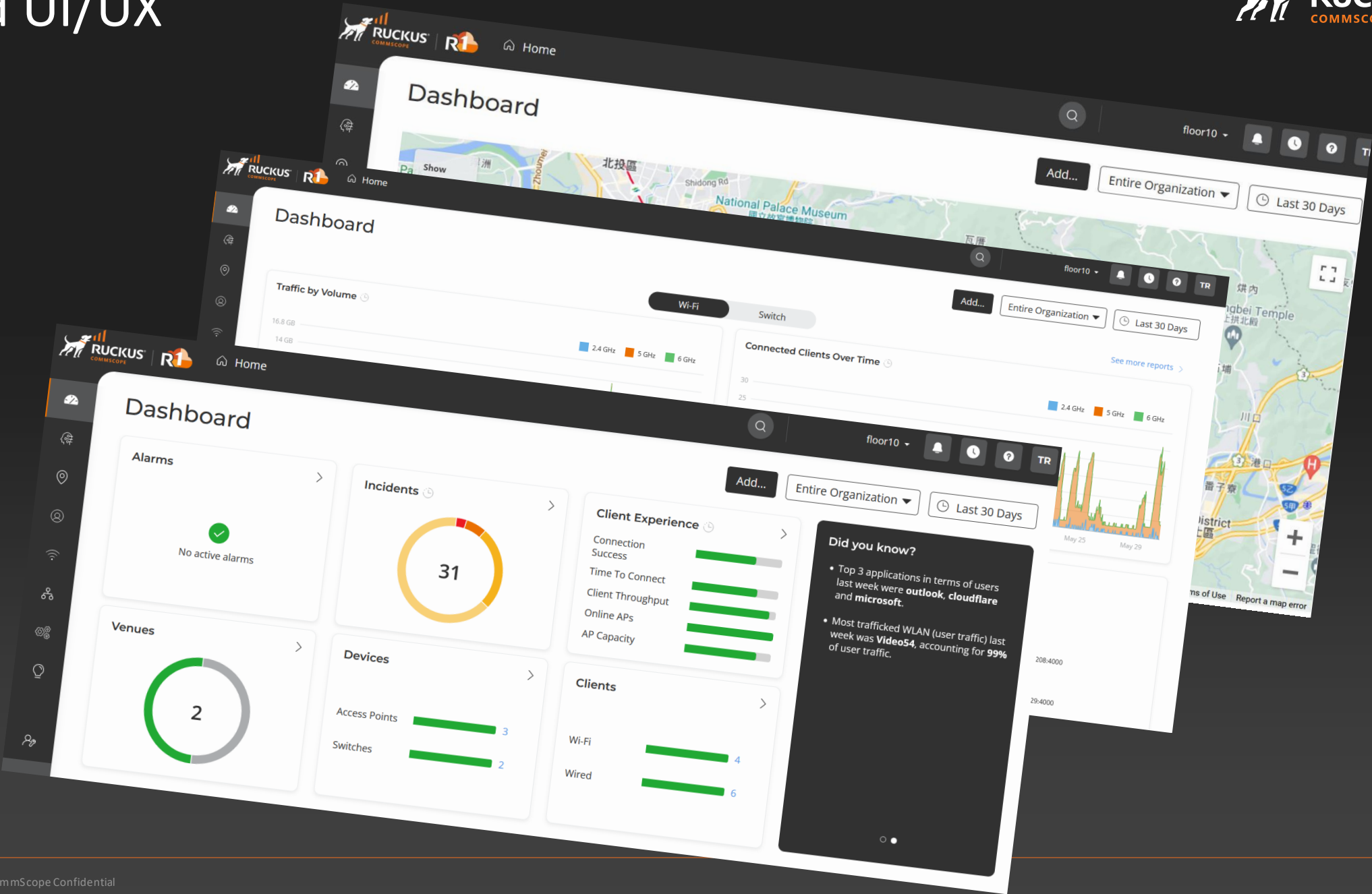


網路拓樸結構

RUCKUS One – 獨一無二的價值主張



Unified UI/UX



Dashboard

Add...

Entire Organization

Last 30 Days

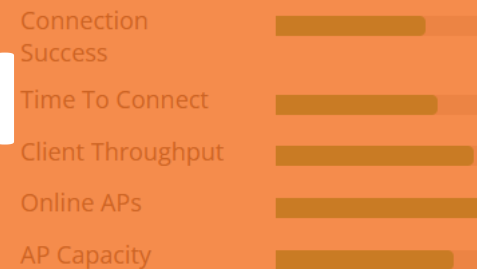
Alarms

No active alarms

Incidents

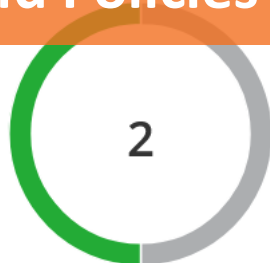


Client Experience



Security and Policies

Venues



Devices



Clients



Did you know?

- Top 3 applications in terms of users last week were outlook, cloudflare and microsoft.
- Busiest WLAN in terms of users last week was Video54, accounting for 90% of total users.
- Average daily airtime utilization last week was 2.4 GHz: 65.3%, 5 GHz: 24.54%, and 6(5) GHz: 0%, which is a change of 2.4 GHz: 0.89%, 5 GHz: 7.03%, and 6(5) GHz: 0% compared to the previous week.
- Most trafficked WLAN (user traffic) last week was Video54, accounting for 99% of user traffic.

IoT Management and Assurance



Stacked screenshots of the RUCKUS COMMSCOPE IoT Insights interface showing various solutions and data visualizations.

Safety Solution

DoorSafety Solution

Building Management

Occupancy Service

Office Time Occupancy

Utilization for 24Hour Day

Utilization by Hour

LOCATION

Device Name	Site ID	Building	Floor	Location	Since Midnight
Rigado BLE-RS40	RKSUK01	101LB	1	Office	39%

TODAYS UTILIZATION

39%

STATUS

occupied

Occupancy: 100% (Peak: 11:00), 60% (Average), 0% (Low: 8:00)

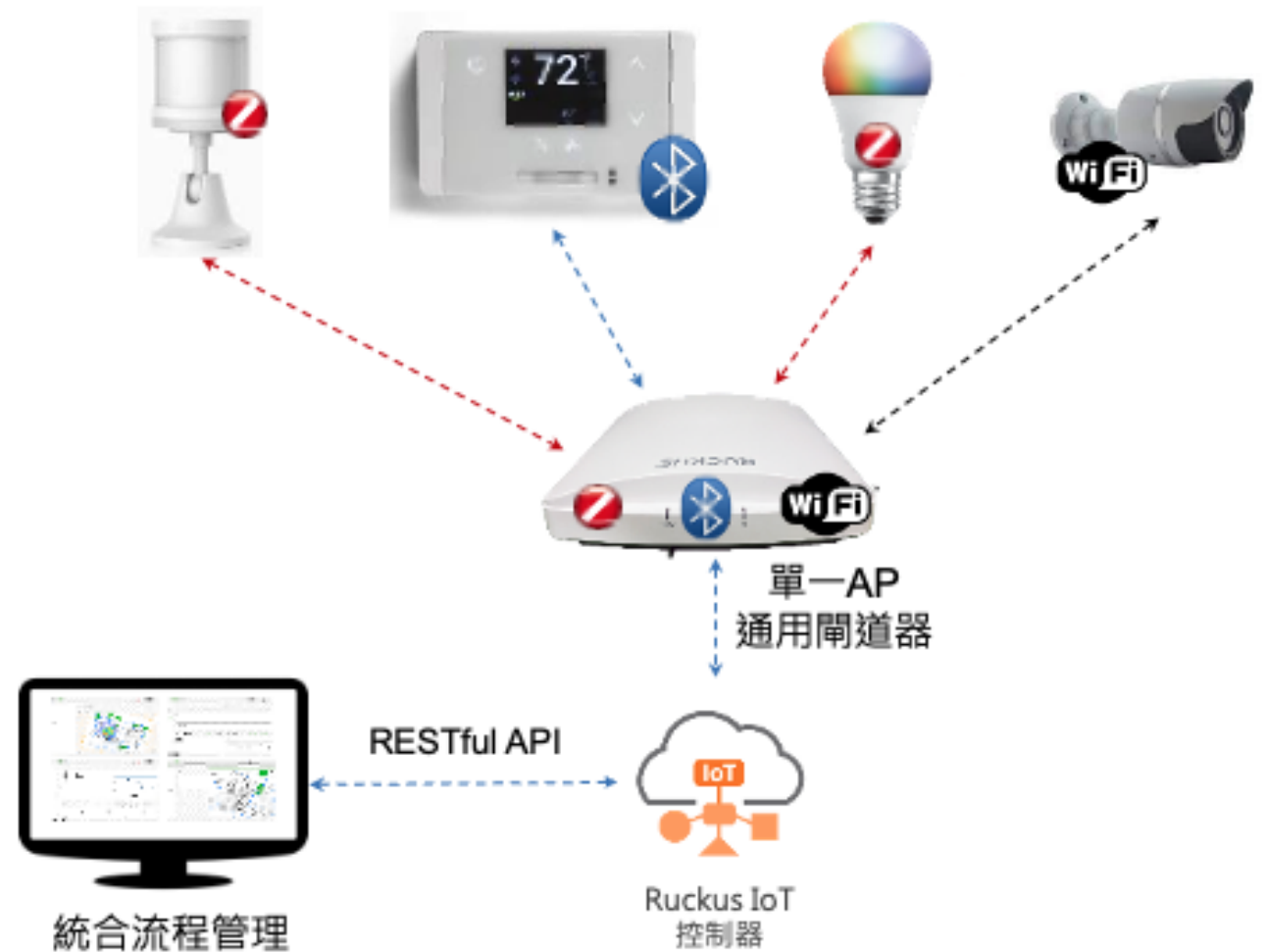
Office Time Occupancy

Start Date: 06/02/2022, End Date: 14/02/2022, Rigado BLE-RS40 Office

Line graph showing occupancy over time with Average and Peak lines.

Ruckus IoT整合架構簡化網路

- AP 同時支援WiFi + IoT
- 單一通用閘道器，連接各廠商IoT設備
- 減少佈線 = 減少交換器數量
- 統合管理，整合容易
- 節省總體持有成本



安全監控環境-事件與規則引擎整合

傳感器事件與監視器連動整合記錄

COMMScope®

RUCKUS IoT Suite

version_4.0.2b

Sensors Reading

溫度

23 C

濕度

55 %

氣壓

101 KPa

IOT Events

Vape

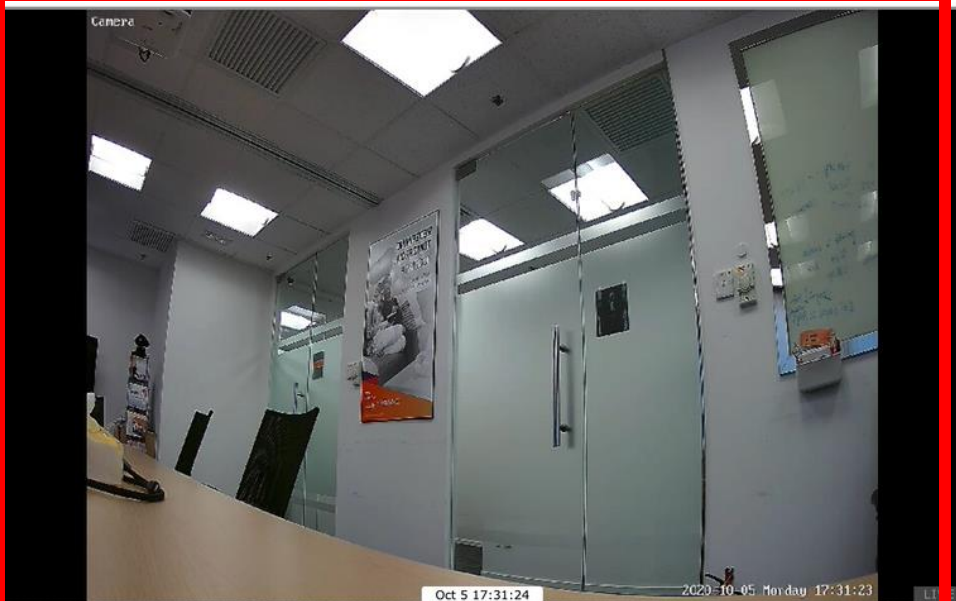
Door Sensor

Motion Sensor

Flood Sensor

Event Playback

General



Oct 5 17:31:24

2020-10-05 Monday 17:31:23

PLAY VIDEO

END PLAYBACK

Database Report

I...	Event	Time	Device	Camera
755	Motion	2020-10-05 17:42:41	AMS001	Office
754	Motion	2020-10-05 17:39:24	AMS001	Office
753	Motion	2020-10-05 17:37:47	AMS001	Office
752	Motion	2020-10-05 17:35:25	AMS001	Office
751	Motion	2020-10-05 17:34:03	AMS001	Office
750	Open/Closed	2020-10-05 17:31:54	SDS001	ConferenceR...
749	Motion	2020-10-05 17:31:29	AMS001	Office
748	Open/Closed	2020-10-05 17:31:11	ADS001	ConferenceR...
747	Motion	2020-10-05 17:30:04	AMS001	Office
746	Open/Closed	2020-10-05 17:29:44	ADS001	ConferenceR...
745	Open/Closed	2020-10-05 17:29:34	SDS001	ConferenceR...
744	Open/Closed	2020-10-05 17:28:17	SDS001	ConferenceR...
743	Open/Closed	2020-10-05 17:27:18	SDS001	ConferenceR...
742	Motion	2020-10-05 17:26:54	AMS001	Office
741	Motion	2020-10-05 17:21:47	AMS001	Office
740	Motion	2020-10-05 17:20:07	AMS001	Office
739	Motion	2020-10-05 17:14:57	AMS001	Office
738	Motion	2020-10-05 17:13:46	AMS001	Office
737	Motion	2020-10-05 17:03:33	AMS001	Office
736	Open/Closed	2020-10-05 16:59:48	SDS001	ConferenceR...
735	Open/Closed	2020-10-05 16:58:39	SDS001	ConferenceR...
734	Motion	2020-10-05 16:52:44	AMS001	Office

LOAD VAPE EVENTS

LOAD ALL EVENTS

Event Query

Select Event

Event ID 748

Door

Select Location

Select Device

Event Summary

Event Counter

24 |

Incident Analytics



Incidents

Network Assurance

Health

Service Validation

31 +15

P1 1

P2 2

P3 8

P4 20

Search Description, Scope

Severity	Date	
P1	05/08/2023 19:30	4
P2	05/03/2023 04:00	1
P2	05/03/2023 02:06	1

Dashboard

AI Assurance

Venues

Clients

Wi-Fi

Wired

Network Control

Business Insights

floor10

Entire Organization

Last 30 Days

New Client Associations

Connected Clients

Impacted Clients

Incidents /

Incident Details P3

Sub-optimal WAN throughput - speed mismatch between AP and peer device: Access Point: Video54-R730_10F-Pantry (8C:FE:74:27:B5:20)

AP Impact Count:
1 of 1 AP (100%)

Incident Category:
Infrastructure

Incident Sub-Category:
WAN

Type:
Access Point

Scope:
Video54-R730_10F-Pantry
(8C:FE:74:27:B5:20)

Duration:
2 mo 7 d

Event Start Time:
03/15/2023 05:30

Event End Time:
05/22/2023 05:30

Insights

Root Cause Analysis

System has detected the AP(s) are underperforming due to low WAN bandwidth availability. This can occur due to following reasons:

1. Upstream peer device configuration is wrong and not matching as per AP Ethernet WAN port capacity.

2. Upstream peer device cannot support multi gig throughput needed by APs.

3. Faulty cables and incorrect cable types can lead to Ethernet link not negotiated properly.

Recommended Action

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

1. Check the peer device configuration. It should match with AP WAN Port capacity.

2. Check the peer device capacity for supporting multi gig throughput.

3. Check the cable for good Ethernet link negotiation.

Network Impact

AP Model

1

100% of failures impacted R730

AP Firmware

1

100% of failures impacted 6.2.0.103.513

Configuration Change Analysis



- Analytics
- Incidents
- Recommendations
- Health
- Config Change
- Occupancy
- Timeline
- Reports
- Venues
- Devices
- Networks
- Services
- Policies
- Collapse

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

Search

8 Notifications

Calendar

Help

JS

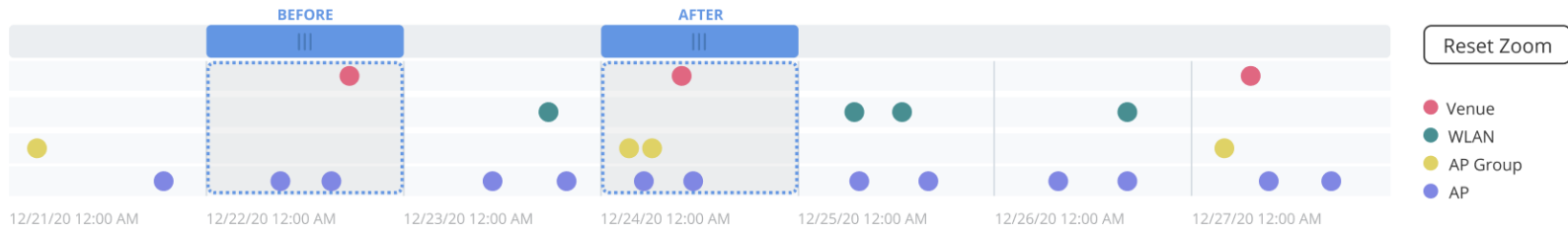
AI Analytics /

Config Change

Type: Network | APs: 451 | Clients: 551 | Switches: 33

Entire Organization

Last 24 hours



Overview | Connection | Performance | Infrastructure

Connection Success Before: 98% After: 95%	-3%
Time to Connect Before: 8s After: 9s	+1s
Client Throughput Before: 96% After: 96%	=
AP Capacity Before: 50 Mbs After: 50 Mbs	=
AP-Controller Connection uptime Before: 60% After: 80%	+20%
Online AP Count Before: 234 After: 212	-9%

Configuration Change Listing

+ Add KPI filter

Date	Entity Type	Entity Name	Configuration	Change from	Change to
May 01 2022 12:00	AP	34:20:E3:2D:29:60	Wlan Service (6 GHz)	True	False
May 01 2022 12:00	AP	34:20:E3:2D:29:60	Wlan Service (6 GHz)	True	False
May 01 2022 12:00	AP	34:20:E3:2D:29:60	Wlan Service (6 GHz)	True	False
May 01 2022 12:00	AP	34:20:E3:2D:29:60	Wlan Service (6 GHz)	True	False
May 01 2022 12:00	AP	34:20:E3:2D:29:60	Wlan Service (6 GHz)	True	False
May 01 2022 12:00	AP	34:20:E3:2D:29:60	Wlan Service (6 GHz)	True	False
May 01 2022 12:00	AP	34:20:E3:2D:29:60	Wlan Service (6 GHz)	True	False

AI Recommendations

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



JS



Analytics

Incidents

Recommendations

Health

Config Change

Occupancy

Timeline

Reports

Venues

Devices

Networks

Services

Policies

< Collapse

AI Analytics /

Recommendations

Type: Network | APs: 451 | Clients: 551 | Switches: 33

Entire Organization ▾

Last 24 hours

0 selected






















Mute | Unmute

Search...

All Categories ▾

All Types ▾

All Status ▾

<input type="checkbox"/>	Priority ▾	Summary ▾	Date ▾	Category ▾	Venue ▾	Status ▾	Actions ▾	
<input type="checkbox"/>	● High	Tx Power: Same for 2.4 GHz and 5 GHz	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	New	 	
<input type="checkbox"/>	● High	Tx Power: Same for 2.4 GHz and 5 GHz	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	Applied	 	
<input type="checkbox"/>	● High	Tx Power: Same for 2.4 GHz and 5 GHz	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	Failed	 	
<input type="checkbox"/>	● Medium	Tx Power: Same for 2.4 GHz and 5 GHz	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	Reverted	 	
<input type="checkbox"/>	● Medium	Tx Power: Same for 2.4 GHz and 5 GHz	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	New	 	
<input type="checkbox"/>	● Medium	Channel Selection Mode and...	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	New	 	
<input type="checkbox"/>	● Medium	Channel Selection Mode and...	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	New	 	
<input type="checkbox"/>	● Low	Channel Selection Mode and...	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	New	 	
<input type="checkbox"/>	● Low	Channel Selection Mode and...	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	New	 	
<input type="checkbox"/>	● Low	Channel Selection Mode and...	May 01 2022 12:00	Wi-Fi Client Experience	Ruckus-Public	New	 	

AI Recommendations



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



AI Analytics / Recommendations /

Tx Power: Same for 2.4 GHz and 5 GHz

Mute

Apply

Priority

● High

Date

May 01 2022 12:00

Category

Wi-Fi Client Experience

Venue

Ruckus-Public

Status

New

Recommendation Details

2.4 GHz TX Power Adjustment

Current Configuration

Full

Recommended Configuration

-1dB

What is the recommendation?

Venue: Ruckus-Public is configured with the same transmit power on both 2.4 GHz and 5 Ghz. Reducing the transmit power on 2.4 GHz will reduce co-channel interference and encourage clients to use 5 GHz.

Why is the recommendation?

Encourages client association to 5 GHz and reduces co-channel interference.

What is the potential trade-off?

2.4 GHz clients at the edge of Wi-Fi coverage may receive poor signal or lose connectivity.

Key Performance Indications

Co-channel Interference ⓘ

9.12%

Session time on 2.4 GHz

64.13%

Status Trail

Jul 27 2021 04:00 New

Jul 28 2021 22:00 Apply Trigger

Jul 28 2021 22:01 Applied

Jul 20 2021 21:00 Revert Trigger

Jul 20 2021 21:01 Reverted

Incidents

Analytics

Recommendations

Health

Config Change

Occupancy

Timeline

Reports

Venues

Devices

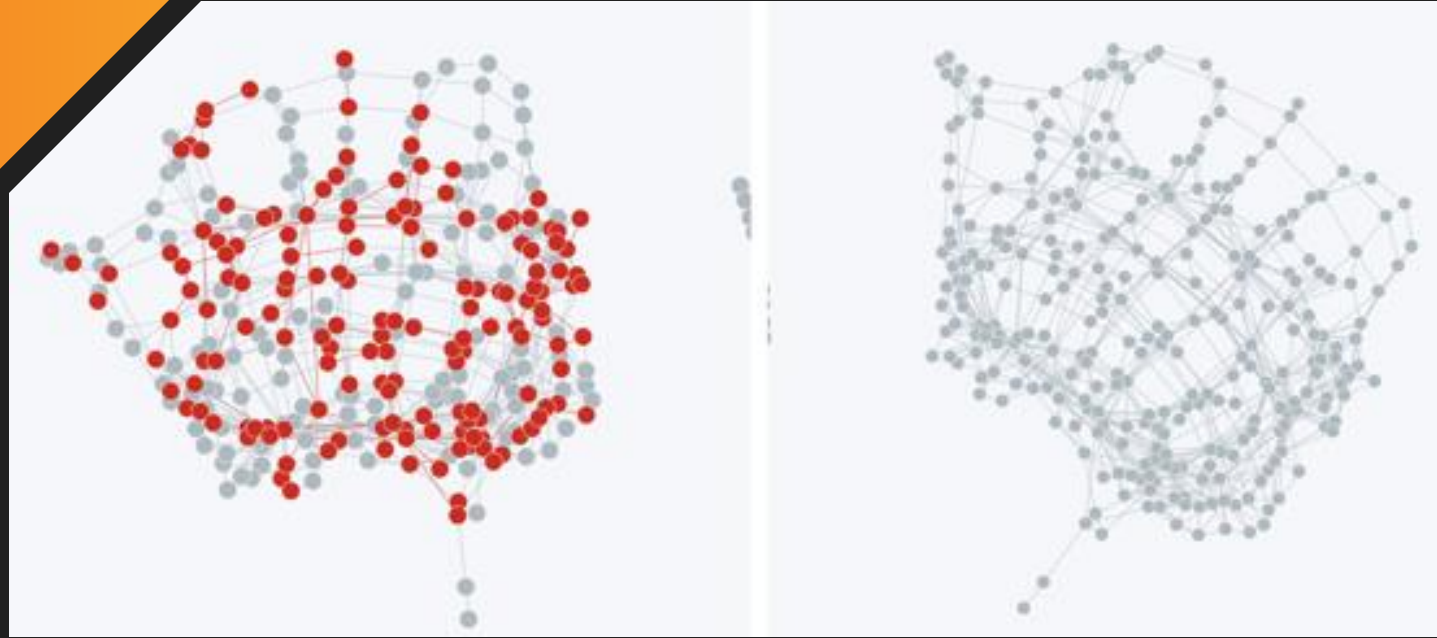
Networks

Services

Policies

< Collapse

AI-Driven Cloud RRM



**Greater AP
Capacity**

**Higher client
throughput**

**Lower Airtime
Utilization**

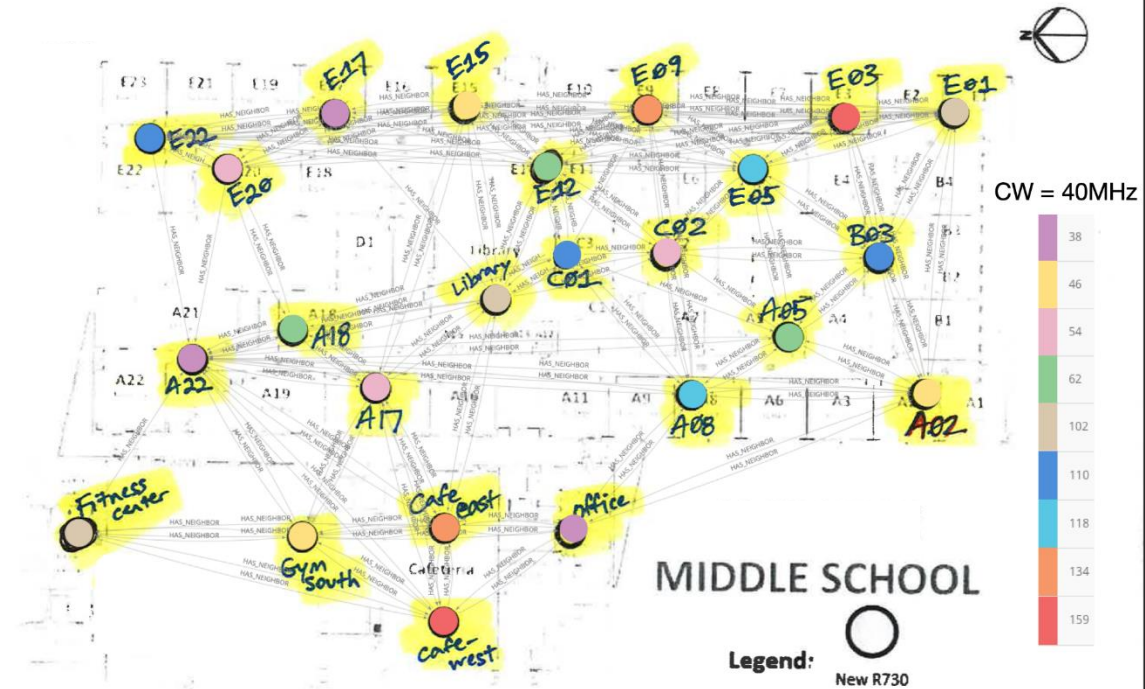
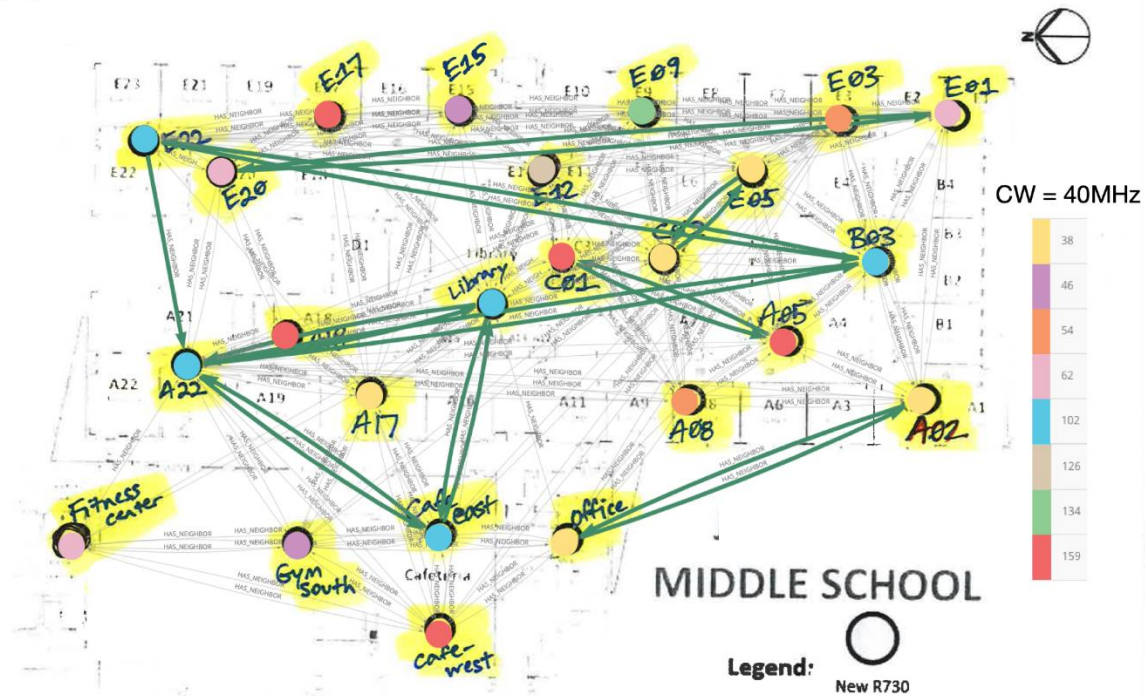
**Higher
Reliability**

Operate APs at
MAX capability

Proactive, Network
Performance Optimization

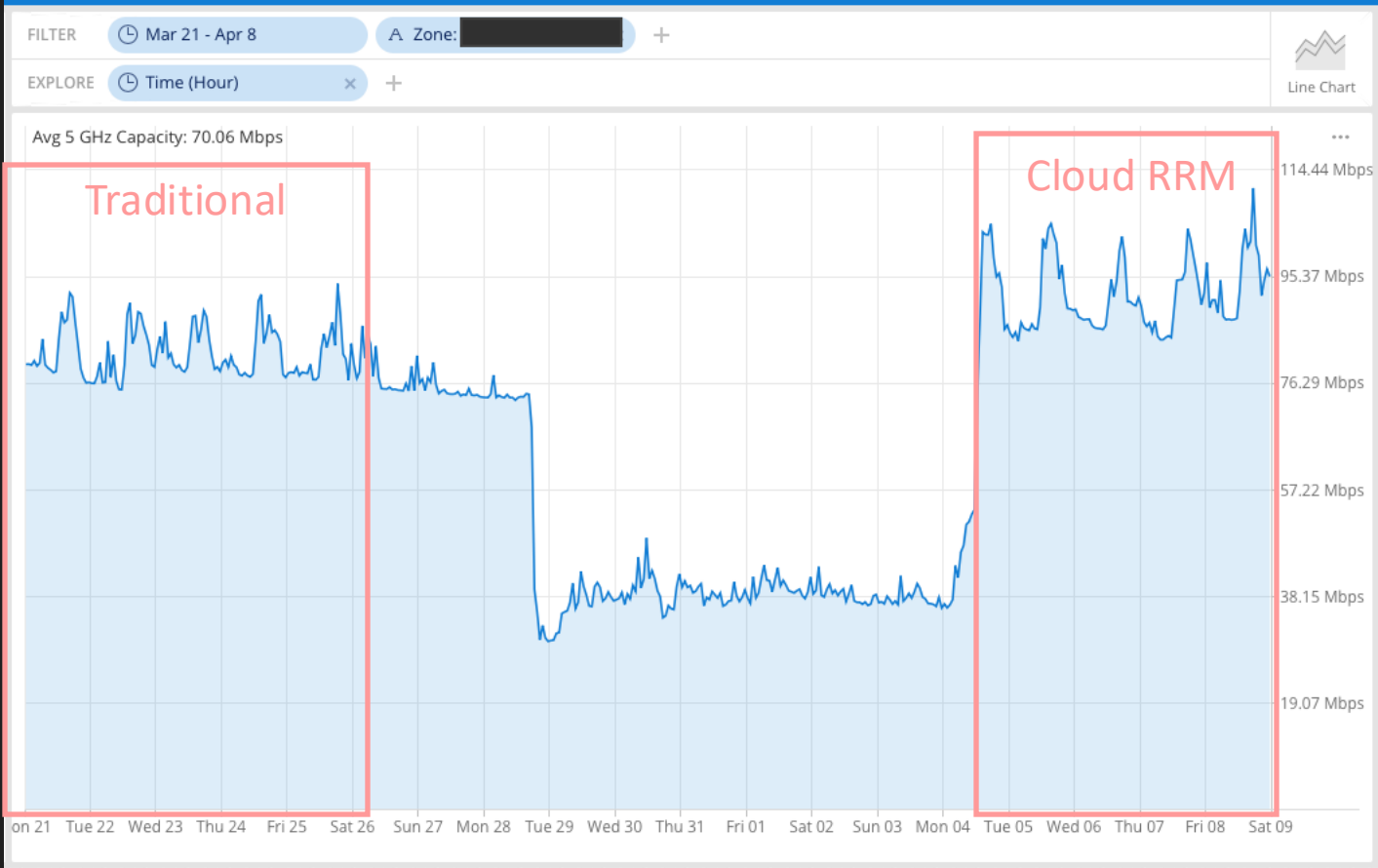
Biggest advancement in Radio
Management since BeamFlex!

學校無線網路案例

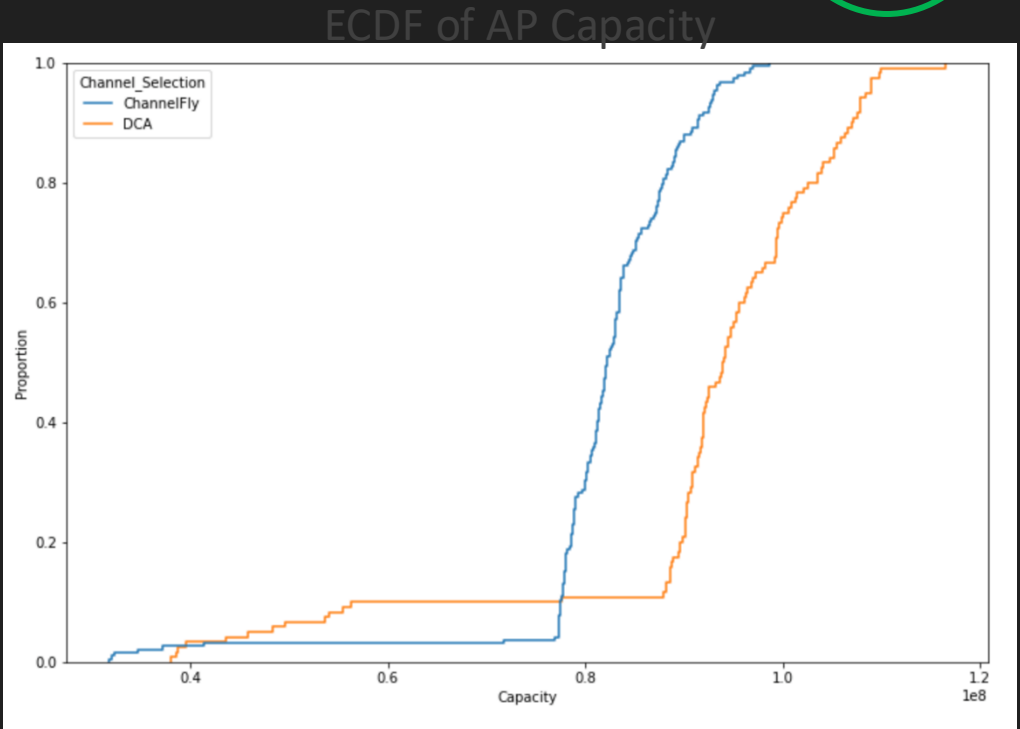


CCIR= Co-Channel Interference Ratio

AP Capacity: 18% Boost From AI-Driven Cloud RRM



	Traditional	Cloud RRM	Improvement
Average	85.11Mbps	91.68Mbps	7.72%
Max	98.68Mbps	116.58Mbps	18.14%



Flexible Deployment Options



Pure Cloud



Hybrid





ESG 節能控管

大數據分析 結合智慧能源管理

EcoFlexAI : 節能 or 極重要 Mission Critical



- ESG – Green networking
- **EcoFlexAI** 節能和永續發展的一步 (Sustainability)
- **Energy Efficiency:**
 - 根據網路流量動態調整用電量，顯著降低低活動時段的能耗
- **Cost Savings:** 透過減少網路設備的能耗來降低營運費用

Benefits

Projected power consumption

9014 kWh/month

-20% vs normal mode

Projected monetary benefits

\$250/month

-20% vs normal mode

Key Performance Indications



Indoor 2 x 2 AP 比較表(500 x AP + 3年使用)



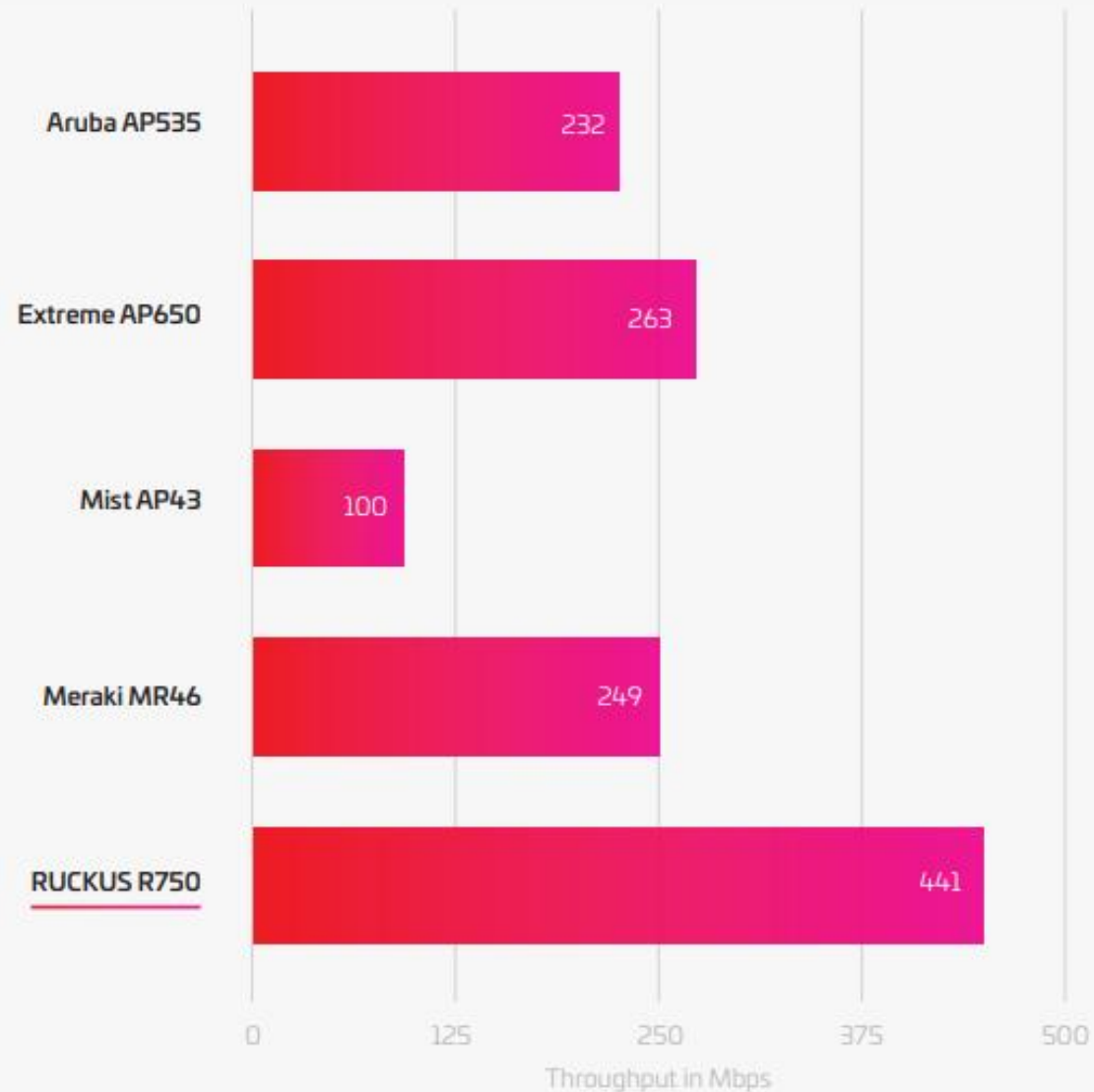
	RUCKUS R350	友商A	友商E
Minimum POE	9.07	13.5	12
Average Idle Minimum	7.1	6.2	-
Maximum POE	12.62	16.5	15
最少 AP 耗電量/Hour	0.00907	0.0135	0.012
最少 AP 耗電量/Day	0.21768	0.324	0.288
最少 AP 耗電量/Year	79.56	119.6	105.12
最大 AP 耗電量/Hour	0.30288	0.396	0.015
最大 AP 耗電量/Day	0.30288	0.396	0.36
最大 AP 耗電量/Year	110.5512	144.54	131.4

節省 15% - 23%

優秀的傳輸速率

Network throughput

Throughput is a measure of the aggregate data traffic flowing between the AP and all of the clients in the network. A higher number is better, as it indicates that the AP can accommodate more users, devices and applications.



RUCKUS 地端 + 雲端 讓您達成數位韌性

Hardware



Wi-Fi 7& ICX

BeamFlex+ | ChannelFly

WiFi 7

Auth

Forwarding

AI-Driven Software

RUCKUS Intelligent Net



(training in the cloud)

AI-driven RRM

Intent AI

ESG AI

Assurance AI

AI Driven 校園數位韌性

Thank You

