

# CAMPUS NETWORKING

## QUICK REFERENCE GUIDE

Last update: February 2021

S-Series	Campus Core: PowerSwitch S4100 Series			
Overview	Next generation open networking switches for enterprise, mid-market and Tier2 cloud service providers with demanding compute and storage traffic environments			
Models (all sized 1RU)	S4112F-ON	S4112T-ON	S4128F-ON	S4128T-ON
<b>Performance</b>				
Switching capacity (full duplex)	840 Gbps	840 Gbps	960 Gbps	960 Gbps
Forwarding Capacity (Mpps)	625	625	714	714
Buffer size	12MB	12MB	12MB	12MB
<b>Ports</b>				
FC8/FC16	N/A	N/A	N/A	N/A
FC8/FC16/FC32	N/A	N/A	N/A	N/A
1/10GBase-T	N/A	12	N/A	28
10GbE	12	N/A	36	36
25GbE	12	12	8	8
40GbE	3	3	2	2
50GbE	3	3	4	4
100GbE	6	6	2	2
Expansion module slots (Modules support speed indicated)	3	3	N/A	N/A
<b>Power and cooling</b>				
Max. power consumption (W)	180 (max) / 90 (normal)	200 (max) / 120 (normal)	260 (max)/160 (normal)	300 (max)/250 (normal)
Power options	Fixed power supply		AC or DC	AC or DC
Redundant power supplies	Redundant fixed fans		2	2
Airflow	Normal or Reverse		Normal or Reverse	
<b>Features</b>				
Stacking	Not supported			
Operating system	Dell EMC SmartFabric OS10 and select 3rd party OS			
Industry-standard CLI	Dell EMC SmartFabric OS10 and several 3rd party OS			
iSCSI optimization storage features	iSCSI optimization and FSB			
Max L2 VLANs and L3 VLANs	4K/500		500 L3 VLANs	
Max MAC entries	272K		272K	
Link aggregation (groups/Members)	32 links per group, 128 groups		32 links per group, 128 groups	
Max routes (IPv4/IPv6)	200K/130K		200K/130K	
Jumbo frames (Bytes)	9216		9216	
IPv4 routing	OSPF, BGP		OSPF, BGP	
IPv6 routing	MP-BGP, OSPFv3		MP-BGP, OSPFv3	
Multicast routing	PIM-SM, PIM-SSM		PIM-SM, PIM-SSM	
VXLAN	Routing and Bridging			

S-Series	Campus Core: PowerSwitch S4100 Series			
Overview	Next generation open networking switches for enterprise, mid-market and Tier2 cloud service providers with demanding compute and storage traffic environments			
Models (all sized 1RU)	S4148F-ON	S4148T-ON	S4148FE-ON	S4148U-ON
<b>Performance</b>				
Switching capacity (full duplex)	1.76 Tbps	1.76 Tbps	1.76 Tbps	1.76 Tbps
Forwarding Capacity (Mpps)	759	759	759	759
Buffer size	12MB	12MB	12MB	12MB
<b>Ports</b>				
FC8/FC16	N/A	N/A	N/A	unified SFP+/SFP28
FC8/FC16/FC32	N/A	N/A	N/A	unified QSFP28
1/10GBase-T	N/A	48	N/A	N/A
10GbE	72	72	72	72
25GbE	16	16	16	16
40GbE	6	6	6	6
50GbE	8	8	8	8
100GbE	4	4	4	4
Expansion module slots (Modules support speed indicated)	N/A	N/A	N/A	N/A
<b>Power and cooling</b>				
Max. power consumption (W)	370 (max)/200 (normal)	440 (max)/320 (normal)	400(max)/240 (normal)	460 (max)/300 (normal)
Power options	AC or DC	AC or DC	AC or DC	AC or DC
Redundant power supplies	2	2	2	2
Airflow	Normal or Reverse			
<b>Features</b>				
Stacking	Not supported			
Operating system	Dell EMC SmartFabric OS10 and select 3rd party OS			
Industry-standard CLI	Dell EMC SmartFabric OS10 and select 3rd party OS			
iSCSI optimization storage features	iSCSI optimization and FSB			iSCSI optimization, FSB, NPIV Proxy gateway, F_Port, FCoE/ FC hosts, FC zoning
Max L2 VLANs and L3 VLANs	500 L3 VLANs			
Max MAC entries	272K			
Link aggregation (groups/Members)	32 links per group, 128 groups			
Max routes (IPv4/IPv6)	200K/130K			
Jumbo frames (Bytes)	9216			
IPv4 routing	OSPF, BGP			
IPv6 routing	MP-BGP, OSPFv3			
Multicast routing	PIM-SM, PIM-SSM			
VXLAN	Routing and Bridging			

S-Series	Campus Core: PowerSwitch S5200 Series: 10/25/40/50/100GbE				
<b>Overview</b>	Build a high-performance, cost-efficient data center leaf/spine fabric with this spine fabric switch	Provide optimum flexibility and cost-effectiveness for demanding compute and storage traffic environments	Double the amount of direct 25GbE ports with a ToR switch that features 96 x 25GbE SFP28	Low-density 1RU, half-width switch ideal for high-performance HCI connectivity	Low-density 1RU, full-width switch ideal for high-performance HCI connectivity
<b>Models (all sized 1RU, S5296F-ON 2RU)</b>	<b>S5232F-ON</b>	<b>S5248F-ON</b>	<b>S5296F-ON</b>	<b>S5212F-ON</b>	<b>S5224F-ON</b>
<b>Performance</b>					
Switching capacity (full duplex) (Tbps)	6.4	4.0	6.4	2.16	2.16
Forwarding capacity (Mpps)	1.5 Bpps	1.9 Bpps	1.5 Bpps	892	954
Buffer size	32MB	32MB	32MB	32MB	32MB
<b>Ports</b>					
1/10GBase-T	N/A	N/A	N/A	N/A	N/A
1GbE (SFP)	128	80	128	12	24
10GbE	128	80	128	12	24
25GbE	128	80	128	12	24
40GbE	32	8	8	3	4
50GbE	64	16	16	6	8
100GbE	32	8	8	3	4
Expansion module slots	N/A	N/A	N/A	N/A	N/A
<b>Power and cooling</b>					
Max. power consumption (W)	635	647	893	304	455
Power options	AC or DC	AC or DC	AC or DC	AC or DC	AC or DC
Redundant power (hot-swappable)	2	2	2	N/A	2
Airflow	Normal or Reverse as orderable options, can be reversed in the field				
<b>Features</b>					
Operating Systems	Dell EMC SmartFabric OS10, Enterprise SONiC Distribution by Dell Technologies and select 3rd party OS				
Industry-standard CLI (Console, Telnet, SSHv1/v2)	Dell EMC Networking and several 3rd party OS				
iSCSI optimization	iSCSI optimization and FSB				
Max VLANs (Configured)	4K per port				
Max MAC entries	160K				
Link aggregation (Groups/Members)	16 links per group, 128 groups				
Max routes (IPv4/IPv6)	128K/64K				
Jumbo frames	9216 bytes				
IPv4 routing	OSPF, BGP				
IPv6 routing	MP-BGP, OSPFv3				
Multicast routing	PIM-SM, PIM-SSM				
VXLAN	Routing and Bridging				

Series	PowerSwitch N3200 Series								
Overview	Power-efficient and resilient 1GbE and 1/2.5/5/10GbE Multigig range of switching solution with 90W PoE options, for advanced Layer 3 distribution in large enterprise campus and retail networks.								
Models (all sized 1RU)	N3208PX-ON	N3224T-ON	N3224F-ON	N3224P-ON	N3224PX-ON	N3248TE-ON	N3248P-ON	N3248X-ON	N3248PXE-ON
<b>Performance</b>									
Switch capacity (Gbps)	88	528			1080	576		1560	
Forwarding capacity (Mpps)	122	733			1500	800		2167	
Buffer size	4 MB	8 MB						32 MB	
<b>Ports</b>									
1G Base-T	4	24			-	48		-	
5G Base-T Multigig (1/2.5/5G)	4	-							
10G Base-T Multigig (1/2.5/5/10G)	-	-	-	-	24	-	-	48	48
10G SFP+	2	4	4	4	-	4	4	-	-
25G SFP28	-	-	-	-	4	-	-	4	4
100GbE QSFP28	-	2 (Rear side) - Default for stacking							
Expansion module slots	-								
Power-over-Ethernet ports	8x 802.3bt Type-4 (90W) PoE	-	-	24x 802.3at (30W) PoE	24x 802.3bt Type-4 (90W) PoE	-	48x 802.3at (30W) PoE	-	48x 802.3bt Type-4 (90W) PoE
<b>Power and cooling</b>									
Max power consumption (watts)	827	201	224	944	2740	212	1677	480	5344
Power options	AC or DC*								
Internal power supplies	1 fixed	2 hot swappable redundant power supplies. 1 PSU included, 2nd PSU optional.							
External power supplies/adapters	Optional* (extends PoE budget)	-	-	-	Optional* (extends PoE budget)	-	Optional* (extends PoE budget)	-	Optional* (extends PoE budget)
Airflow	I/O to power supply. Fixed fans.	I/O to power supply; Power supply to I/O options available with non-PoE RJ-45 models. Supports field replaceable fans with N+1 redundancy.							
VLANs	4094								
VLAN support	Voice VLAN, Private Edge, Protocol and MAC-based, GVRP, 802.1x, Auto VLAN								
Layer 2 and 3	Layer 3 Advanced								
Jumbo frames	9216 bytes								
IPv4/IPv6 routing	IPv4 and IPv6 functionality including BGP, VRF, BFD, OSPFv2/v3								
Multicast routing	PIM-SM, PIM-SSM								
Rapid Deployment	Deploy switch configuration files, stacking commands, and firmware updates by simply inserting a USB device.								
<b>Management and security</b>									
Switch security	AAA authorization, TACACS+ accounting and RADIUS support for comprehensive secure access support.								
SNMP support	SNMPv1/2/3								
sFlow	Yes								
Management	GUI access via http/https. CLI via console, Telnet or serial connection.								

\* Roadmap

Series	1/1/10GbE (Layer 2/3 Switching): PowerSwitch N3000 Series				
Overview	Power efficient and resilient 1/10GbE switches with advanced Layer 3 distribution and dense PoE+ for small to medium-sized businesses and office wiring closets.				
Models (all sized 1RU)	N3024ET-ON	N3048ET-ON	N3024EF-ON	N3024EP-ON	N3048EP-ON
<b>Performance</b>					
Switch capacity (Gbps)	212	260	212	212	260
Forwarding capacity (Mpps)	158	193	158	158	193
Buffer size	4MB				
<b>Ports</b>					
10/100/1000 Base-T	24	48	-	24	48
5G Base-T	-	-	-	-	-
1GbE (SFP)	2 combo	2 combo	24	2 combo	2 combo
10GbE	2 fixed SFP+ and 2 modular (auto-negotiate 1/10Gb)				
Expansion module slots	1 slot with 2 optional modules: 2 port SFP+, 2 port 10GBase-T				
Power-over-Ethernet ports	-			24 PoE+	48 PoE+
<b>Power and cooling</b>					
Max. power consumption (watts)	53.5	64.8	67.1	1287	2145
AC power supplies	2 hot swappable power supply bays, 1 PSU included				
Redundant power	Optional (internal)			Yes, dependent upon configuration	
Airflow	I/O panel to PSU				
<b>Features</b>					
Stacking	Stacks up to 12 using dedicated ports				
VLANs	4094				
VLAN support	Voice VLAN, Private Edge, Protocol and MAC-based, GVRP				
Layer 2 and 3	Layer 3 Advanced				
Jumbo frames	9216 bytes				
IPv4/IPv6 routing	IPv4/IPv6, OSPFv3, VRRP, VRF, BGP, BFD, static routing				
Multicast routing	PIM-SM, PIM-SSM				
Rapid Deployment	Ready rails, deploy switch configuration files, stacking commands and firmware updates by simply inserting a USB device into the port.				
<b>Management and security</b>					
Switch security	Strong passwords, password masking, management access control - privilege levels. RADIUS and TACACS+ support, 802.1x port-based authentication.				
SNMP support	SNMPv1/2/3				
sFlow	Yes				
Management	GUI access via http/https. CLI via console, Telnet, SSH				

\* with external power supply

Series	PowerSwitch N2200 Series				PowerSwitch N1500 Series				N1100
Overview	Power-efficient and resilient 1/2.5G Multigig switching solution with 30/60W PoE support, for mid-to-large enterprise access deployments.								
Models (all sized 1RU)	N2224X	N2224PX	N2248X	N2248PX	N1524	N1548	N1524P	N1548P	N1108EP-ON
Performance									
Switch capacity (Gbps)	480		600		128	176	128	176	24
Forwarding capacity (Mpps)	667		833		128	164	128	164	18
Buffer size	4MB				1.5MB				1.5MB
Ports									
10/100/1000 Base-T	1 Out of Band Management Port				24	48	24	48	8
1GbE	-				-				2
2.5G Base-T	24		48						-
10GbE	-	-	-	-	4 SFP+ (auto-negotiate 1/10Gb)				-
25GbE (SFP28)	4								-
40GbE (QSFP+)	2								-
Power-over-Ethernet ports	-	12x30W, 12x60W	-	24x30W, 24x60W	-	-	24 PoE+	48 PoE+	8
Power and cooling									
Max. power consumption (watts)	238	1318	326	2486	30.2	44.6	871*	1704*	19.51
AC power supplies	1								1
Redundant power	550W AC	1050W internal pluggable and/or external MPS-1S or MPS-3S power shelf	550W AC	1600W internal pluggable and/or external MPS-1S or MPS-3S power shelf	External RPS-720		External MPS-1000		-
Airflow	IO/PS, PS to IO	IO to PS	IO to PS, PS to IO	IO to PS	I/O panel to PSU				I/O to power supply; Pass through POE
Features									
Stacking	Stacks up to 12 using 40Gb user ports				Up to 4 using SFP ports				N/A
VLANs	4094				512				
VLAN support	Voice VLAN, Private Edge, Protocol and MAC-based, GVRP				Voice VLAN, Private Edge, Protocol-based, Auto VLAN				
Layer 2 and 3	Layer 3 Standard				Layer 2 + L3 static routing and RIP				Layer 2 only
IPv4/IPv6 routing	IPv4/IPv6, OSPFv2/v3				IPv4/IPv6				-
Multicast routing	PIM-SM, PIM-SSM				PIM-SM, PIM-SSM				
Rapid Deployment	Deploy switch configuration files, stacking commands and firmware updates by simply inserting a USB device into the port				Yes				
Management and security									
Switch security	Strong passwords, password masking, management access control - privilege levels. RADIUS and TACACS+ support, 802.1x port-based authentication.								
SNMP support	SNMPv1/2/3				SNMPv1/2/3				
sFlow	Yes				v1.3 draft 5				
Management	GUI access via http/https. CLI via console, Telnet, SSH				GUI access via http/https. CLI via console, Telnet, SSH				

\* with external power supply

## CAMPUS WIRELESS

### Ruckus Wireless Solutions

Dell EMC Ruckus Wireless product portfolio includes access points, wireless controllers, network controllers and software solutions to meet industry-specific needs and to address the most demanding use cases for large, medium and small enterprises and service provider segments. Find the Quick Reference Guide and more at [DellTechnologies.com/Networking](http://DellTechnologies.com/Networking).



### Dell EMC Ruckus Wireless Access Points

Models	Overview
<b>R750 / R750 Unleashed</b>	Built-in 8 spatial streams (4x4:4 in 5GHz, 4x4:4 in 2.4GHz) 802.11ax (Wi-Fi 6) Indoor Access Point for ultra-dense environments with built-in 2.5GbE port and IoT radios
<b>R730</b>	Built-in 12 spatial streams (8x8:8 in 5GHz, 4x4:4 in 2.4GHz) 802.11ax Indoor Access Point for Ultra-high-density performance with built-in 2.5GbE/5GbE port and IoT radios
<b>R720</b>	802.11ac Wave-2 (Wi-Fi 5) 4x4:4 spatial stream IoT ready Indoor Wi-Fi Access Point with built-in 2.5GbE port for High - Dense Device Environments
<b>R710</b>	802.11ac Wave-2 (Wi-Fi 5) 4x4:4 spatial stream IoT ready Indoor Wi-Fi Access Point with built-in 2x1GbE ports for High - Dense Device Environments
<b>R650</b>	Built-in 6 spatial streams (4x4:4 in 5GHz, 2x2:2 in 2.4GHz) 802.11ax Indoor Access Point for high to medium dense environments with built-in 2.5GbE port and IoT radios
<b>R610</b>	802.11ac Wave-2 (Wi-Fi 5) 3x3:3 spatial stream IoT ready Indoor Wi-Fi Access Point with built-in 2x1GbE ports for Medium - Dense Device Environments
<b>R510 / R510 Unleashed</b>	802.11ac Wave-2 (Wi-Fi 5) 2x2:2 spatial stream IoT ready Indoor Wi-Fi Access Point with built-in 2x1GbE ports for Medium to low Dense Environments
<b>R320 / R320 Unleashed</b>	Indoor 802.11ac Wave 2 Wi-Fi Access Point with Multi-Gigabit Backhaul for Ultra-Dense Device Environments
<b>Unleashed</b>	802.11ac Wave-2 (Wi-Fi 5) 2x2:2 spatial stream Indoor Wi-Fi Access Point with built-in 1x1GbE port for Low - Dense Device Environments
<b>M510</b>	802.11ac Wave-2 (Wi-Fi 5) 2x2:2 spatial stream IoT ready Indoor Wi-Fi Access Point with built-in 2x1GbE ports and LTE Backhaul
<b>H510</b>	Wall-Mounted 802.11ac Wave 2 (Wi-Fi 5) 2x2:2 spatial stream Indoor Access Point and Switch with 5x1GbE ports
<b>H320</b>	Wall-Mounted 802.11ac Wave 2 (Wi-Fi 5) 2x2:2 spatial stream Indoor Access Point and Switch with 1x1GbE and 2xFE ports
<b>T750 Omni</b>	Built-in 8 spatial streams (4x4:4 in 5GHz, 4x4:4 in 2.4GHz) 802.11ax Outdoor Access Point for ultra dense environments with built-in 2.5GbE port, GPS, IoT radios; IP-67 rated
<b>T710</b>	802.11ac Wave-2 4x4:4 SS Outdoor Wi-Fi Access Point with built-in 2x1GbE ports and fiber interface for High - Dense Environments; IP67 rated
<b>T610</b>	802.11ac Wave-2 4x4:4 spatial stream IoT ready Outdoor Wi-Fi Access Point with built-in 2x1GbE ports for High - Dense Environments; IP67 rated
<b>T310 / T310d Unleashed</b>	Entry-level 802.11ac Wave-2 2x2:2 spatial stream Outdoor Wi-Fi Access Point with built-in 1x1GbE port; IP67 rated; Integrated Antennas
<b>P300-Pair</b>	802.11ac Wave-2 2x2:2 SS Outdoor Wi-Fi Access Points pair with built-in 1GbE port designed for point-to-point/multipoint bridge for long range backhaul
<b>E510</b>	Small form-factor 802.11ac Wave-2 2x2:2 spatial stream Outdoor Wi-Fi Access Point with built-in 1x1GbE port; IP67 rated; External Antennas

### Ruckus Controllers

Models	
<b>ZoneDirector 1200</b>	Manages up to 150 APs and 4000 Clients per controller
<b>SmartZone 100</b>	Manages up to 1024 APs and 25000 Clients per controller
<b>SmartZone 300</b>	Manages up to 10000 APs and 100000 Clients per controller
<b>Virtual SmartZone</b>	Manages 1K-10K APs and 25K-100K Clients per vSZ controller

### Virtual SmartZone - Data Plane (vSZ-D)

Enables forwarding of user data traffic from Ruckus APs on a per WLAN basis through secure tunnels with support for NAT traversal. vSZ-D supports local breakout of traffic as well as packet forwarding to 3rd party wireless gateways with support for L2oGRE and QinQ tunnels. It also supports the services like DHCP, L3 Roaming and Lawful Intercept.

Key Features	System Requirements
Hypervisor support	VMware, KVM
Dynamic data plane scaling	Supports 1Gbps, 10Gbps or even higher throughput capacities
Integration with vSZ controller	10 vSZ-D instances per vSZ instance 40 vSZ-D instances per vSZ cluster of 4 instances Each vSZ-D runs as an independent VM instance that is managed by the vSZ controller
Redundancy	Up to 4 instances in N+1 Active - Active mode
Flexible Configuration	Encrypted tunnel aggregation from all types of WLANs (Captive portal, 802.1x, HS2.0), VLANs, DHCP Relay, NAT traversal
Services	DHCP Server / NAT, Layer 3 Roaming, Lawful Intercept (CALEA)
Northbound Tunnels	L2oGRE, QinQ
Hypervisor support	VMWare Esxi 5.5 and later OR KVM (CentOS 7.0 64bit)
Processor	Intel Xeon E55xx and above
Number of cores	Minimum 3 cores per instance dedicated for data plane processing
Memory	Minimum 6 Gb memory per instance
HDD	Hard Disk 10 Gb per instance

### Ruckus Software

Software	Description
<b>SmartCell Insight (SCI)</b>	Big Data Wi-Fi analytics and reporting engine purpose built to help Enterprises make informed business decisions regarding the operation of their Wi-Fi networks
<b>Geo Redundancy</b>	Access Point management license for high availability. Supported products (Standby mode only)
<b>Split Tunnel</b>	Manage corporate and local traffic by sending only corporate traffic to the controller and ensure that local traffic does not incur the overhead of the round trip to the controller, which decreases traffic on the WAN link and minimizes latency for local application traffic
<b>CloudPath</b>	SaaS platform that delivers secure wired and wireless network access for BYOD, guest users and IT-owned devices
<b>Virtual SmartZone Data Plane</b>	Offers secured tunneling of user data traffic that encrypts payload traffic, maintains flat network topology, enables mobility across L2 subnets, supports POS data traffic for PCI compliance, and offers differentiated per site policy control and QoS, etc.
<b>URL Filtering**</b>	URL filtering feature is used to block access to inappropriate websites. The Web pages available on the internet are classified into different categories, and those identified to be blocked can be configured based on available categories. Administrators can also create policies based on these categories, to allow or deny user access.

\*\* Available in Q4/CY2020

## Comparison: Ruckus Wireless Indoor APs

Part Number	R750	R730	R650	R720	R710	R510 / R510 Unleashed	R320 / R320 Unleashed	R610
<b>Category</b>	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor
<b>Description</b>	Very High Performance Wi-Fi 6 4x4:4 Indoor Access Point with 3.5 Gbps HE80/40 Speeds and Embedded IoT	Ultra High Performance Wi-Fi 6 8x8:8 Indoor Access Point with 5.9 Gbps HE80/40 Speeds and Embedded IoT	High Performance Wi-Fi 6 4x4:4 Indoor Access Point with 3 Gbps HE80/40 Speeds and Embedded IoT	Indoor 802.11ac Wave 2 Wi-Fi Access Point with Multi-Gigabit Backhaul for Ultra-Dense Device Environments	Indoor 802.11ac Wave 2 Wi-Fi Access Point for Ultra-Dense Device Environments	Indoor 802.11ac Wave 2 Wi-Fi Access Point for Dense Device Environments	Indoor 802.11ac Wave 2 Wi-Fi Access Point	Indoor 802.11ac Wave 2 Wi-Fi Access Point for Dense Device Environments
<b>General Specifications</b>								
<b>Antenna Patterns, per band</b>	4000+	4000+	4000+	4000+	4000+	64	64	512
<b>Antenna Gain</b>	Up to 3 dBi	Up to 2 dBi	Up to 3 dBi	Up to 3 dBi	Up to 3 dBi	Up to 3 dBi	Up to 3 dBi	Up to 3 dBi
<b>BeamFlex</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>ChannelFly</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Concurrent Users</b>	1024	1024	512	512	512	512	256	512
<b>Controller Support</b>	SmartZone, ZoneDirector	SmartZone, ZoneDirector	SmartZone, ZoneDirector	SmartZone, ZoneDirector	SmartZone and ZoneDirector	SmartZone, ZoneDirector, Unleashed	SmartZone, ZoneDirector, Unleashed	SmartZone, ZoneDirector
<b>Ethernet Ports</b>	1 x 1GbE and 1 x 2.5GbE	1x 1/2.5/5 Gb/s   1x 10/100/1000 Mb/s	1 x 1GbE and 1 x 2.5GbE	1 x 1GbE and 1 x 2.5GbE	2 x 1GbE	2 x 1GbE	1 x 1GbE	2 x 1GbE
<b>IoT Ready</b>	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
<b>PD-MRC</b>	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
<b>PHY Rate at 2.4 GHz, maximum</b>	1148 Mb/s	1148 Mb/s	574 Mb/s	600 Mb/s	600 Mb/s	300 Mb/s	300 Mb/s	450 Mb/s
<b>PHY Rate at 5 GHz, maximum</b>	2400 Mb/s	2400 Mb/s	2000 Mb/s	1733 Mb/s	1733 Mb/s	867 Mb/s	867 Mb/s	1300 Mb/s
<b>Radio Chains:Streams</b>	4x4:4 SU-MIMO & MU-MIMO	8x8:8 SU-MIMO & MU-MIMO	4x4:4 (5 GHz)   2x2:2 (2.4 GHz)	4x4:4 SU-MIMO & MU-MIMO	4x4:4 SU-MIMO 4x4:3 MU-MIMO	2x2:2	2x2:2	3x3:3
<b>Rx Sensitivity at 5 GHz</b>	-102 dBm	-101 dBm	-98 dBm	-104 dBm	-104 dBm	-103 dBm	-101 dBm	-100 dBm
<b>Rx Sensitivity at 2.4 GHz</b>	-102 dBm	-103 dBm	-93 dBm	-104 dBm	-104 dBm	-103 dBm	-101 dBm	-100 dBm
<b>SmartMesh</b>	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
<b>USB</b>	USB 2.0	USB 2.0	USB 2.0	USB 2.0	USB 2.0	USB 2.0		USB 2.0
<b>Wi-Fi Interface Standard</b>	IEEE 802.11a/b/g/n/ac/ax	IEEE 802.11a/b/g/n/ac/ax	IEEE 802.11a/b/g/n/ac/ax	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2
<b>Wi-Fi Interface Standard at 2.4 GHz</b>	802.11ax	802.11ax	802.11ax	802.11n	802.11n	802.11n	802.11n	802.11n
<b>Wi-Fi Interface Standard at 5 GHz</b>	802.11ax	802.11ax	802.11ax	802.11ac	802.11ac	802.11ac	802.11ac	802.11ac
<b>Environmental Specifications</b>								
<b>Operating Temperature</b>	0 °C to +50 °C (+32 °F to +122 °F)	0 °C to +50 °C (+32 °F to +122 °F)	0 °C to +40 °C (+32 °F to +104 °F)	-10 °C to +50 °C (+25 °F to +122 °F)	-4 °C to +60 °C (-14 °F to +140 °F)	0 °C to +50 °C (+32 °F to +122 °F)	0 °C to +40 °C (+32 °F to +104 °F)	0 °C to +40 °C (+32 °F to +104 °F)



## Comparison: Ruckus Wireless Indoor APs

Part Number	H510	H320	M510
Category	Indoor	Indoor	Indoor
Description	Wall-Mounted 802.11ac Wave 2 Wi-Fi Indoor Access Point and Switch for Dense Environments	Wall-Mounted 802.11ac Wave 2 Wi-Fi Indoor Access Point and Switch	Mobile Indoor 802.11ac Wave 2 2x2:2 Wi-Fi Indoor Access Point (AP) with LTE Backhaul
<b>General Specifications</b>			
Antenna Patterns, per band	4	4	64
Antenna Gain	Up to 1 dBi	Up to 3 dBi	Up to 3 dBi
BeamFlex	Yes	Yes	Yes
ChannelFly	Yes	Yes	Yes
Concurrent Users	100	100	512
Controller Support	SmartZone, ZoneDirector	SmartZone, ZoneDirector	SmartZone, ZoneDirector
Ethernet Ports	5 x 1GbE	1 x 1GbE   2 x 10/100MbE	2 x 1GbE ports   RJ45
IoT Ready	Yes	No	Yes
PD-MRC	Yes	Yes	Yes
PHY Rate at 2.4 GHz, maximum	300 Mb/s	150 Mb/s	300 Mb/s
PHY Rate at 5 GHz, maximum	867 Mb/s	867 Mb/s	867 Mb/s
Radio Chains:Streams	2x2:2	2x2:2 MU-MIMO 1x1:1 SU-MIMO	2x2:2 SU-MIMO 2x2:2 MU-MIMO
Rx Sensitivity at 5 GHz	-96 dBm	-96 dBm	-95 dBm
Rx Sensitivity at 2.4 GHz	-99 dBm	-99 dBm	-101 dBm
SmartMesh	Yes	No	Yes
USB	USB 2.0		USB 2.0
Wi-Fi Interface Standard	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2
Wi-Fi Interface Standard at 2.4 GHz	802.11n	802.11n	802.11n
Wi-Fi Interface Standard at 5 GHz	802.11ac	802.11ac	802.11ac
<b>Environmental Specifications</b>			
Operating Temperature	0 °C to +40 °C (+32 °F to +104 °F)	0 °C to +40 °C (+32 °F to +104 °F)	-40 °C to +65 °C (-40 °F to +149 °F)

## Comparison: Ruckus Wireless Outdoor APs

Part Number	T750 Omni	T710	T610	E510	T310 / Unleashed T310d	P300
Category	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
Description	High-end Wi-Fi 6 (802.11ax) dual concurrent AP with MU-MIMO and BeamFlex+	High-end 802.11ac Wave 2 dual concurrent AP with BeamFlex+	Mid-range 802.11ac Wave 2 dual concurrent AP with BeamFlex+	Embedded 802.11ac Outdoor Wave 2 WiFi AP with External BeamFlex+ Antennas	Entry-level 802.11ac Wave 2 outdoor AP series with integrated BeamFlex+	Outdoor 2x2:2 5GHz 802.11ac point-to-point/multipoint bridge for long range backhaul
<b>General Specifications</b>						
Antenna Patterns, per band	4000+	4000+	4000+	64	64	NA
Antenna Gain	Up to 3 dBi	Up to 3 dBi for Omni	Up to 3 dBi for Omni	Up to 3 dBi	Up to 3 dBi for Omni	Up to 14 dBi
BeamFlex	Yes	Yes	Yes	Yes	Yes	No
ChannelFly	Yes	Yes	Yes	Yes	Yes	No
Concurrent Users	1024	512	512	512	512	NA
Controller Support	SmartZone, ZoneDirector	SmartZone, ZoneDirector	SmartZone, ZoneDirector	SmartZone, ZoneDirector	SmartZone, ZD, Unleashed for T310d	WebUI/CLI
Ethernet Ports	1 x 1 GbE, 1 x 2.5 GbE	2 x 1GbE	2 x 1GbE	1 x 1GbE	1 x 1GbE	1 x 1GbE
Fiber Interface	Yes	Yes	No	No	No	No
IoT Ready	Yes	No	Yes	Yes	Yes	No
PD-MRC	Yes	Yes	Yes	Yes	Yes	No
Max PHY Rate at 2.4G	1148 Mb/s	600 Mb/s	600 Mb/s	300 Mb/s	300 Mb/s	NA
Max PHY Rate at 5 G	2400 Mb/s	1733 Mb/s	1733 Mb/s	867 Mb/s	867 Mb/s	867 Mb/s
Radio Chains:Streams	4x4:4	4x4:4	4x4:4	2x2:2	2x2:2	2x2:2
Rx Sensitivity at 5 GHz	-103 dBm	-104 dBm	-104 dBm	-101 dBm	-101 dBm	-96 dBm
Rx Sensitivity at 2.4G	-103 dBm	-104 dBm	-104 dBm	-101 dBm	-101 dBm	NA
SmartMesh	Yes	Yes	Yes	Yes	Yes	No
USB	USB 2.0		USB 2.0	USB 2.0	USB 2.0	NA
Wi-Fi Standard	IEEE 802/11a/b/g/n/ac/ax	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/b/g/n/ac Wave 2	IEEE 802.11a/n/ac
Wi-Fi Standard at 2.4G	802.11ax	802.11n	802.11n	802.11n	802.11n	NA
Wi-Fi Standard at 5G	802.11ax	802.11ac	802.11ac	802.11ac	802.11ac	802.11ac
<b>Environmental Specifications</b>						
Operating Temperature	-40 °C to +65 °C (-40 °F to +149 °F)	-40 °C to +65 °C (-40 °F to +149 °F)	-40 °C to +65 °C (-40 °F to +149 °F)	-40 °C to +70 °C (-40 °F to +158 °F)	-40 °C to +65 °C (-40 °F to +149 °F) -20 °C to +65 °C for T310c	-40 °C to +65 °C (-40 °F to +149 °F)
Ingress Protection	IP67					

## Comparison: Ruckus Wireless Controllers

Feature	SmartZone 100	SmartZone 300	Virtual SmartZone-E	Virtual SmartZone-H	ZoneDirector 1200	Unleashed
<b>Number of APs supported</b>	Up to 1,024 / 3,000 cluster	Up to 10,000 / 30,000 cluster	1,024 / 3K with cluster	10K / 30K with cluster	Up to 150	Up to 128
<b>Clients</b>	Up to 25,000 / 60,000 cluster	Up to 100,000 / 450,000 per cluster	25K / 60K per cluster	100K / 300K per cluster	Up to 4,000	Up to 2,048
<b>Ethernet ports</b>	1GE Model: 4 GbE ports	6 x 1GbE ports, 4 x 10GbE ports	1 vNIC	1 or 3 vNIC	2 Ethernet ports, auto MDX, autosensing 1GbE	Refer to selected AP data sheet
<b>Authentication support</b>	802.1X, MAC address	802.1x, Local database, Active Directory, RADIUS, LDAP	802.1x, Local database, Active Directory, RADIUS, LDAP	802.1x, Local database, Active Directory, RADIUS, LDAP	802.1X, Local database, Active Directory, RADIUS, LDAP	802.1X, Local database, Active Directory, RADIUS, LDAP
<b>Guest networking/captive portal</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>DHCP server</b>	External or Assigned	External or Assigned	External or vSZ-D assigned	External or vSZ-D assigned	Yes	Yes
<b>AP discovery and control</b>	L2 / L3	L2 / L3	L2 / L3	L2 / L3	L2 / L3	L2
<b>SSID/WLAN support</b>	2,048 / 2,048 cluster	6,144 per SZ-300	2,048	6,144	256	16
<b>Management Interface</b>	Web GUI, CLI	Web GUI, CLI	Web GUI, SCI	Web GUI, SCI	Web GUI	Web GUI, CLI
<b>Management protocol(s)</b>	SNMP v3, RESTful JSON	SNMP v3, RESTful JSON	SNMP v3	SNMP v3	SNMP v3	SNMP v3
<b>VLAN support</b>	Dynamic VLANs	Dynamic VLANs	Dynamic VLANs	Dynamic VLANs	Dynamic VLANs	Yes
<b>Data Plane</b>	Tunneling or local breakout	Tunneling or local breakout	Tunneling or local breakout	Tunneling or local breakout	Tunneling or local breakout	Local breakout
<b>Power supply</b>	DC or AC	DC or AC	NA	NA	DC or AC	PoE
<b>Fans</b>	Redundant	Six redundant, field swappable fans in three sets	NA	NA	NA	NA

Learn more at [DellTechnologies.com/Networking](https://DellTechnologies.com/Networking)