AFN2200 TECHNICAL SPECIFICATIONS

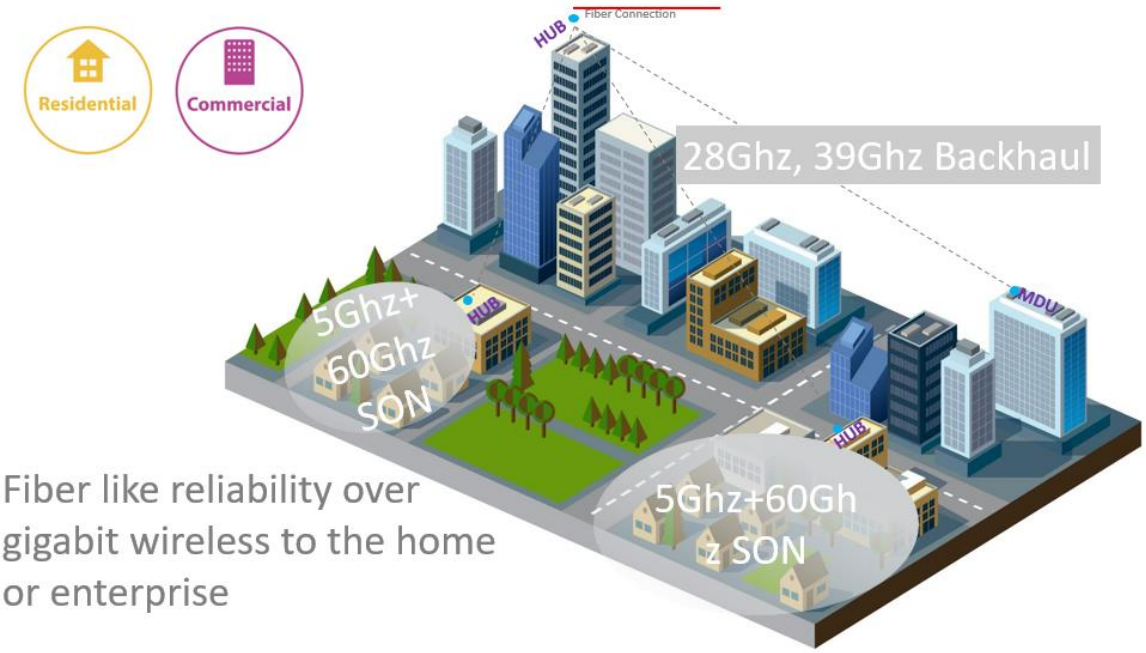
ARCHITECTURE

AFN2200 is a high performance dual band [60Ghz+5Ghz], dual concurrent, point to multi-point system. Typical applications are customer access and mid-haul.

AFN2200 KEY FEATURES

- Main Processor: Qualcomm QCA8068B, dual core, 1.4GHz
- Radios 4x4 dual band dual concurrent
- Radio 1: 4X4 2.4GHz or 60Ghz
- Radio 2: 4x4 to support MU-MIMO 5GHz
- Ethernet PHY: AR8035B*1 + AR8033B*1(Industrial grade components)
- Memory
  - Flash: Support 32MB Nor SPI flash and 512MBNAND flash (optional)
  - DDR3: Support 1GB (512MB*2)
- Available interfaces
  - 2* Gigabit Ethernet (RJ45)
  - 1 * Console (RJ45)
  - LEDs
  - Gore vent for pressure equalization
  - With N-type connectors for external antenna or built-in antenna with 5~6 dBi antenna gain
- IP-67 compliance enclosure design
- Ethernet surge protection support
- Optional to equip with Atmel TPM for data security protection
- Can be powered with 802.3at+ (60W) Power Source on the 1stLAN port (PD) and provide power to other device through the 2ndLAN port (PSE)
- Max power consumption is < 55W when operating as AP and providing 802.3af power on 2ndLAN.

AFN2200 USE CASES

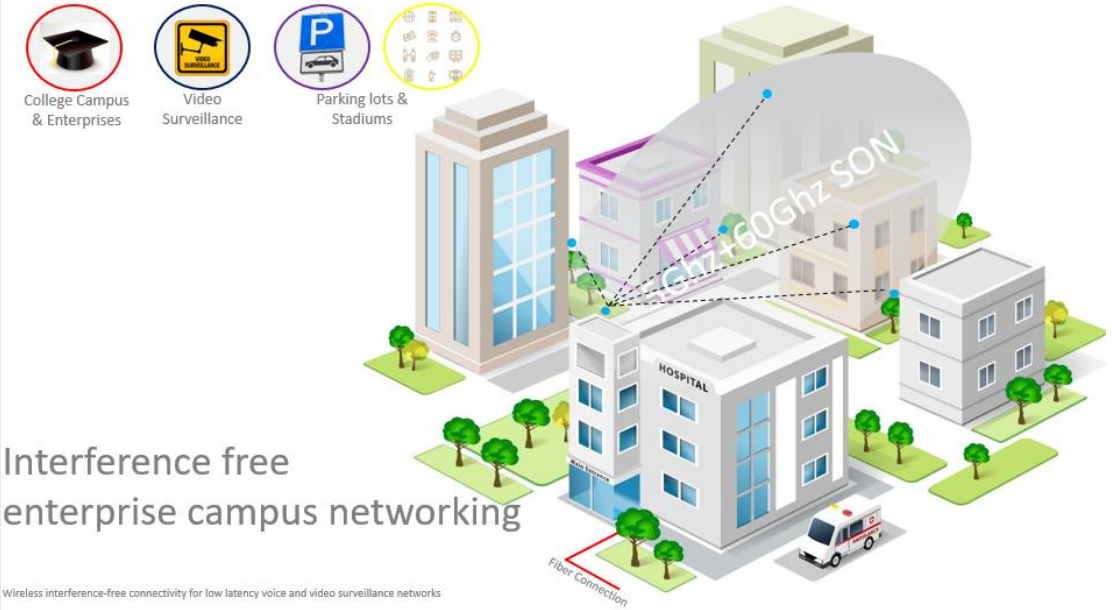


Fiber like reliability over gigabit wireless to the home or enterprise

5G technology is aimed to meet the 1000x more demand rates, 100x more connected Devices and 5x lower latency

Networks require smaller nodes to connect together in close proximity using mesh, ring, and tree topologies

Airfide dual-band, dual-concurrent solution improves reliability



Interference free enterprise campus networking

Wireless interference-free connectivity for low latency voice and video surveillance networks

Intra-building connectivity in campuses with fiber-like speeds – educational institutions, Healthcare organizations,

Millimeter waves with arrow beams electronically steered offer abundant spectrum

Airfide dual-band, dual-concurrent solution improves reliability

PRODUCT SPECIFICATIONS

Specifications	
CPU Technology	64 bit arm with A-53 core, 2 core, 1.4Ghz,
Data Rate	1.7gbps
Ports	
2 GbE RJ45	1 POE Port [IN] 1 POE Port[OUT]
PoE	
Standards	802.3 at; 25W power budget
PoE port count	2
Power	
Power Source	48V, POE
Cloud Management & Device Management	
AWS	Configuration, monitoring, machine learning
SNMP	V2 and V3
Radio	
WiGig/WiFi	IEEE 802.11ad/802.11ac, TDD, session layer

	bonding, scheduled access
Channel	57-64Ghz, 5.1-5.8Ghz; 2Ghz channels in 60Ghz, In 5Ghz, full range of UNII band choices including DFS in bandwidths supported [20Mghz, 40 MHz, 80 MHz]
Antenna	antenna-element array configuration +/- 45 deg azimuth, +/- 10 deg elevation
Beam Steering	Up to 256 element antenna array phased array antenna; beam forming coupled with diversity; Active phased array technology for both 5Ghz and 60Ghz
Interference Mitigation	Spectrum analysis, Scheduled Access, Cloud controlled channel and power control
Rate Adaptation	Adaptive modulation, coding across 11ad and 11ac rates

Link Budget	500 meters, 1gbps
Regulatory	FCC Part 15.255
Modulation	16QAM(60Ghz), 256QAM(5Ghz), Auto
EMS	
ESD	4KV Contact, 8KV Air
EFT	0.5KV for I/O ports
Surge	2KV L-G, 1KV L-L
Network topologies Supported	**Tree, daisy-chain, Ring, and mesh**
Architecture	PTMPT
Form Factor	IP67 , outdoor, single chassis
Alignment	Bluetooth assisted
Size & Weight	203mm X 203mm X 64mm; 3 Lbs
Operating Environment	-30C –to +60C, ambient

60GHZ SPECIFICATIONS

Parameter	Min	Typical	Max	Units
Frequency Range(Ghz)	57		65	Ghz
Gain Variation(dB)		3	5	dB
LO Leakage(dBc)		< -40		dBc
Spurs Emission (dBm)		< -40		dBm
Adjacent channel rejection		20		dB
Single Chain Tx Power(CW) Including antenna gain	9	11	13	dBm
Tx EIRP(CW) output Measured using beam forming and antenna gain	36	37	38	dBm
Tx EIRP(MCS8) output Measured using beam forming and antenna gain	34	35	36	dBm
Tx Linear gain (CW) Measured using beam forming and antenna gain	55	57	59	dB
Rx linear gain (CW) Measured using beam forming and antenna gain	52	54	56	dB

Receive NF per chain (including antenna connection)	7.5	8.5	9.5	dB
Receive maximum input power For Rx EVM, better than -23dB is good enough for 16QAM		-38		dBm
Sector coverage[Azimuth]	0		+/-40	Degrees
Vertical Steering[Elevation]	0		+/- 25	Degrees

MCS index	Modulation	Code Rate	PHY data rate (Mbps)
1	π/2 – BPSK	½	385
2	π/2 – BPSK	½	770
3	π/2 – BPSK	5/8	962.5
4	π/2 – BPSK	¾	1155
6	π/2 – QPSK	½	1540
7	π/2 – QPSK	5/8	1925

8	π/2 – QPSK	¾	2310
10	π/2 – 16 QAM	½	3080
11	π/2 – 16 QAM	5/8	3850
12	π/2 – 16 QAM	¾	4620

5GHZ SPECIFICATIONS

Parameter	Range	Units
Frequency Range(Ghz)	5.170 – 5.835	Ghz
Sensitivity	-83 dBm @ 80Mghz [per chain] -86 dBm @ 40 Mghz [per chain] -89 dBm @ 20 Mghz [per chain]	dBm
Maximum Output Power	18 per chain	dBm
MIMO & Modulation	4X4:4 MIMO OFDM up to 256 QAM	
Maximum throughput	1.7Gbps PHY	Gbps
Security	WPA2	
Sector coverage	OMNI	Degrees

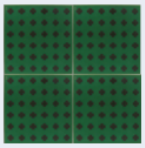
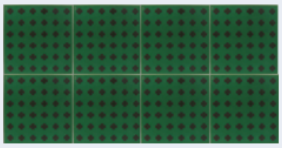
60GHZ MULTI MODULE ARRAY PERFORMANCE

Item	Unit	1X1	1X2	2X2	2X4
Chipout	dBm	4.0	4.0	4.0	4.0
Antenna Gain	dB	5.0	5.0	5.0	5.0
Feeding Loss	dB	1.5	1.5	1.5	1.5
Number of Chains	Ea	27	54	108	216
Transmit Array Gain	dB	28.6	34.5	40.7	46.7
Beamforming Loss	dB	0.8	0.8	0.8	0.8
Radome Effect	dB	1.0	1.0	1.0	1.0
TX EIRP(Available)	dBm	34.3	40.3	46.4	52.4
TX EIRP(Regulation)	dBm	34.3	40.0	40.0	40.0
Bandwidth	Ghz	1.76	1.76	1.76	1.76
Temperature	K	290.0	290.0	290.0	290.0
Noise Floor	dBm	-81.5	-81.5	-81.5	-81.5
NF	dB	7.5	7.5	7.5	7.5
Antenna Gain	dB	5.0	5.0	5.0	5.0
Feeding Loss	dB	1.5	1.5	1.5	1.0
Number of Chains	ea	25	50	100	200

Receive Array Gain	dB	14.0	17.0	20.0	23.0
SNR	dB	7.0	7.0	7.0	7.0
Beamforming Loss	dB	0.8	0.8	0.8	0.8
RX Sensitivity	dBm	-83.7	-86.7	-89.7	-93.1
Calculated Link Margin	dB	118	127	136	146
Measured Link Margin	dB	116*	125	127	130
Calculated Link Margin[FCC]	dB	1184.0	127	130	133

RF module tile combination

- 4 types of tile combinations

Tile combination	1 x 1	2 x 1	2 x 2	2 x 4	Remark
Antenna array gain	19.0dBi	22.0dBi	25.0dBi	28.0dBi	
EIRP(mean.)	35.0dBm	40.0dBm	40.0dBm	40.0dBm	Under Regulation
Link margin(MCS8)	116.0dB	124.0dB	127.0dB	130.0dB	
Link Distance (with Oxygen)	180.0m	330.0m	400.0m	490.0m	@MCS8
Link Distance (with Oxygen + Rain @ UK) 99.99% Availability	145.0m	275.0m	330.0m	390.0m	@MCS8
Link Distance (with Oxygen + Rain @ CA) 99.99% Availability	135.0m	250.0m	300.0m	350.0m	@MCS8
Scan angle	Az. : ±40° El. : ±25°	Az. : ±40° El. : ±25°	Az. : ±40° El. : ±25°	Az. : ±40° El. : ±25°	
Implementation					

L4 Protocol	Packet Length	Number of flows	Mode	Measured Throughput [Mbps]
TCP	1514	1x64	Bridging	1858
UDP	1514	1	Bridging	1973
UDP	1280	1	Bridging	1969
UDP	1024	1	Bridging	1961
UDP	512	1	Bridging	1924
UDP	314	1	Bridging	1639
UDP	146	1	Bridging	820
UDP	64	1	Bridging	441
UDP	IMIX	1	Bridging	1866

L4 Protocol	Packet Length	Number of flows	Mode	Measured Throughput [Mbps]
TCP	1514	1x64	Routing + NAT	1865
UDP	1514	1	Routing + NAT	1973
UDP	1280	1	Routing + NAT	1969
UDP	1024	1	Routing + NAT	1961
UDP	512	1	Routing + NAT	1924
UDP	314	1	Routing + NAT	1639
UDP	146	1	Routing + NAT	820
UDP	64	1	Routing + NAT	441
UDP	IMIX	1	Routing + NAT	1845

WIRED ROUTED AND WITH QOS PERFORMANCE

L4 Protocol	Packet Length	Number of flows	Mode	Measured Throughput [Mbps]
TCP	1514	1x64	Routing + NAT	1864
UDP	1514	1	Routing + NAT	1973.99
UDP	1280	1	Routing + NAT	1969.23
UDP	1024	1	Routing + NAT	1961.68
UDP	512	1	Routing + NAT	1424.07
UDP	314	1	Routing + NAT	733.34
UDP	146	1	Routing + NAT	367.57
UDP	64	1	Routing + NAT	212..8

STORAGE PERFORMANCE

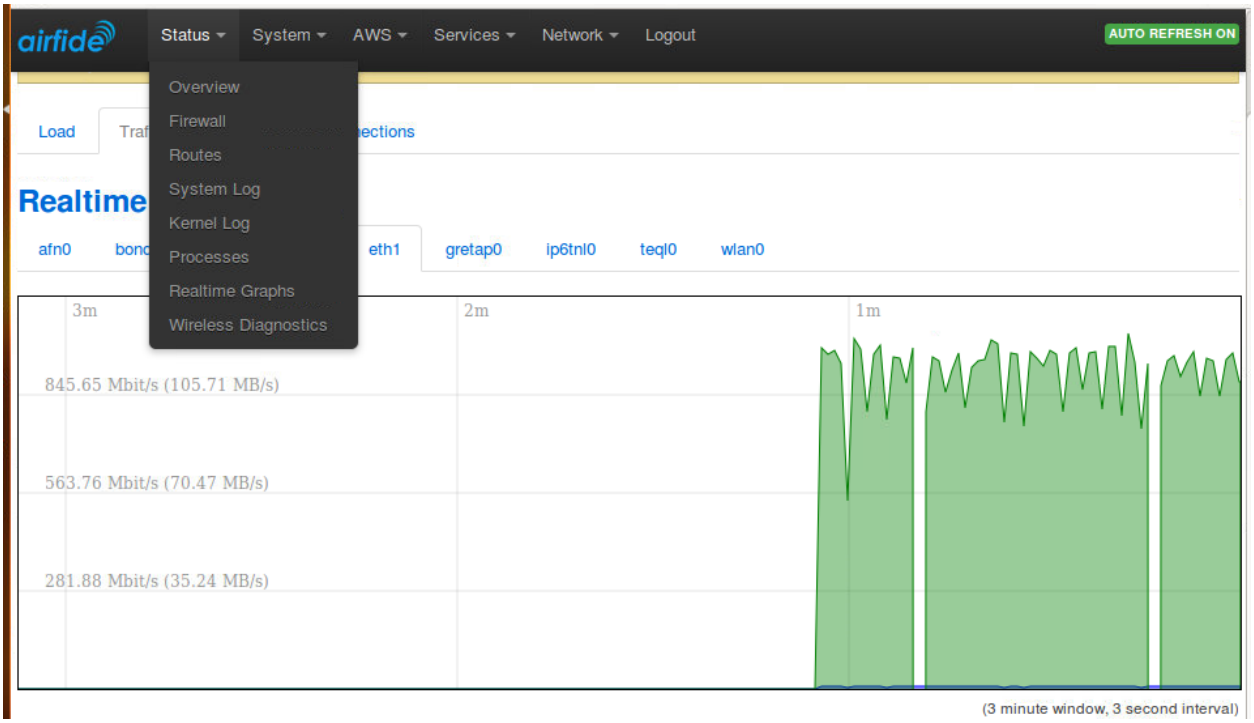
Storage Client	File System	Operation	Device	Throughput [Mbps]	Core Utilization [% SMP] CS	Core 0	Core 1
Samba Linux Client	FAT32	Read	USB3	102	42.16	19.55	59.83
Samba Linux Client	FAT32	Write	USB3	63	65.05	74.23	56.86
Samba Linux Client	NTFS	Read	USB3	71	61.13	62.67	59.73
Samba Linux Client	NTFS	Write	USB3	15	57.88	23.55	88.75
Samba Linux Client	EXT4	Read	USB3	81	37.5	27.4	45.73
Samba Linux Client	EXT4	Write	USB3	70	63.01	62.76	64.78
Samba Win Client	FAT32	Read	USB3	96	11.08	9.95	12.09
Samba Win Client	FAT32	Write	USB3	36	48.96	78.4	20.56
Samba Win Client	NTFS	Read	USB3	75	17.52	19.01	16.15
Samba Win Client	NTFS	Write	USB3	14	58.43	26.31	86.88
Samba Win Client	EXT4	Read	USB3	77	11.26	5.81	16.12
Samba Win Client	EXT4	Write	USB3	46	38.18	29.07	46.62

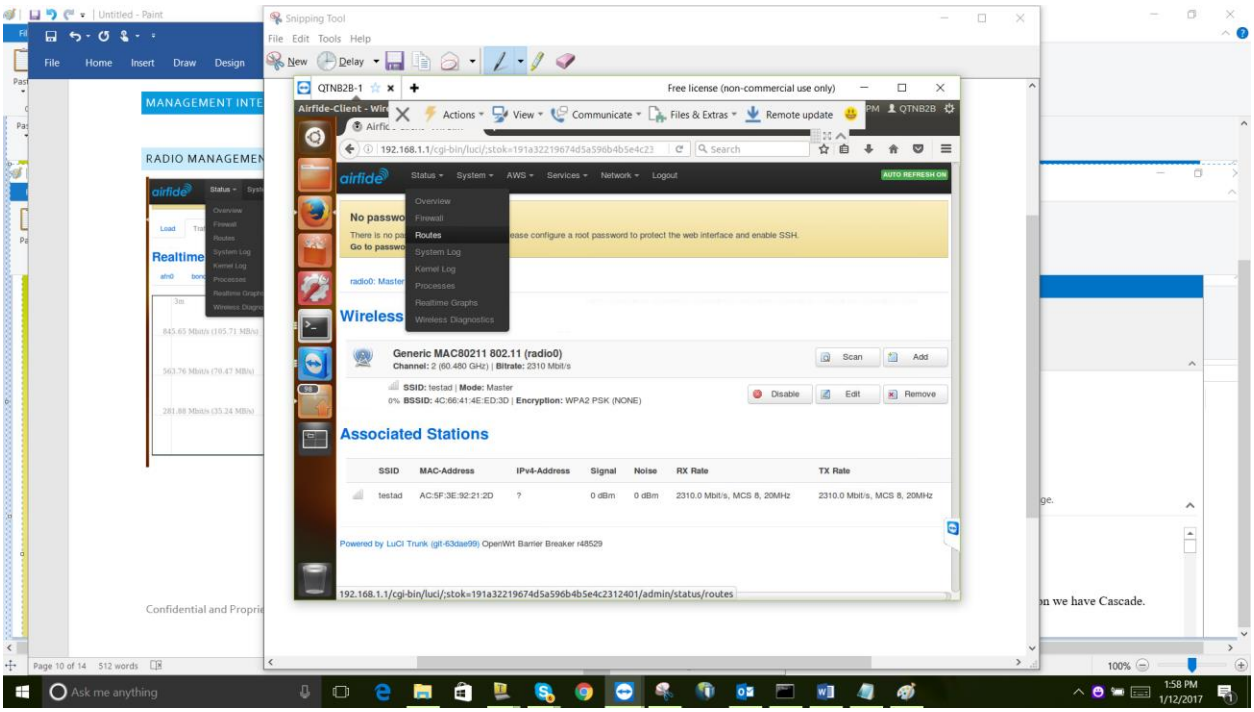
IPSEC PERFORMANCE

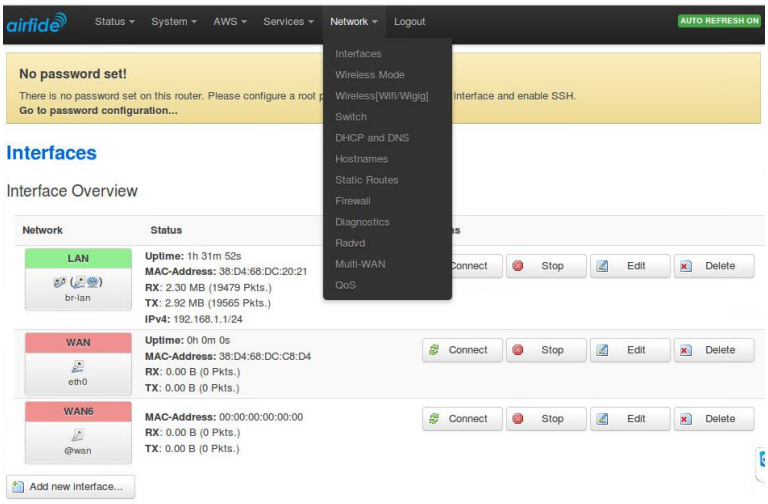
Storage Client	File System	Operation	Device	Throughput [Mbps]	Core Utilization[% SMP) CS	Core 0	Core 1
IPsec LAN to WAN[Bi-Di]	SHA1	AES128	UDP	1631	4.25	4.73	3.81
IPsec LAN to WAN[Bi-Di]	SHA1	AES128	TCP	1443	3.95	4.40	3.81
IPsec LAN to WAN[Bi-Di]	SHA1	AES256	UDP	1591	3.83	3.52	4.11
IPsec LAN to WAN[Bi-Di]	SHA1	AES256	TCP	1426	3.87	3.51	4.25

MANAGEMENT INTERFACES

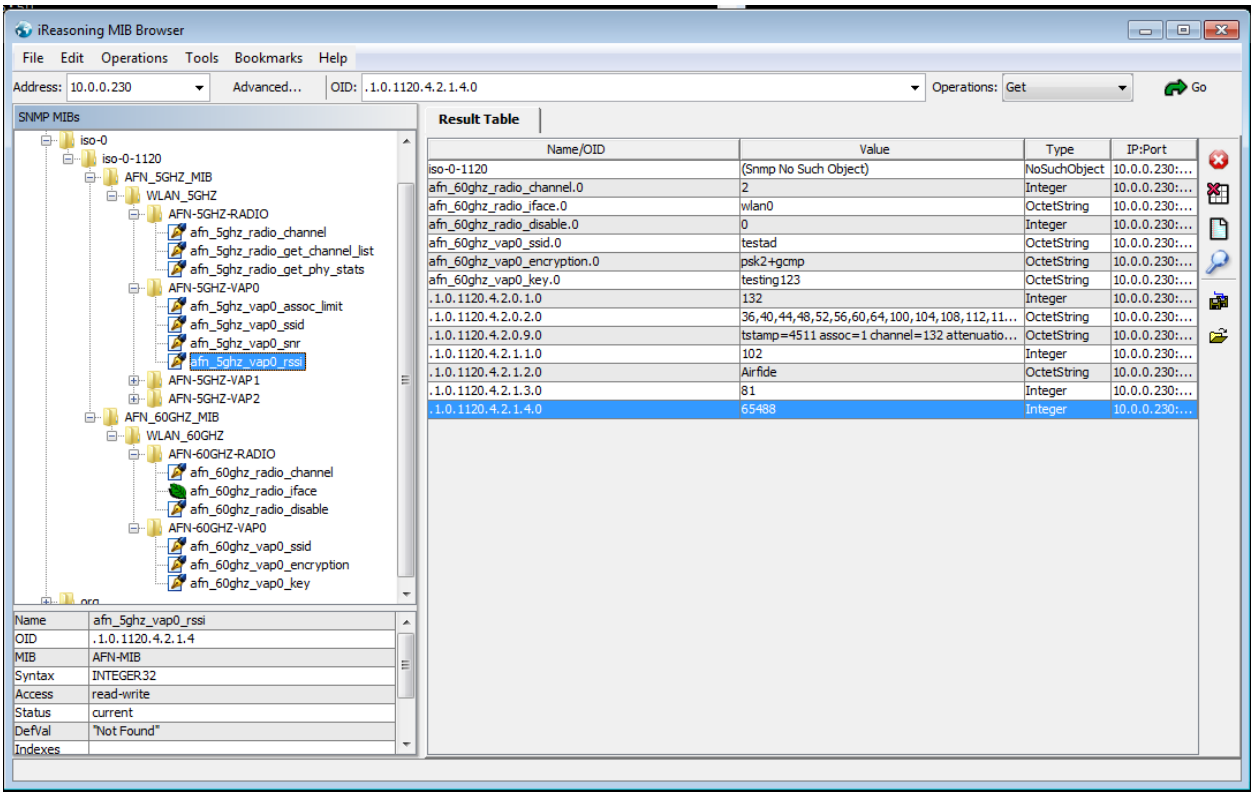
RADIO MANAGEMENT INTERFACE



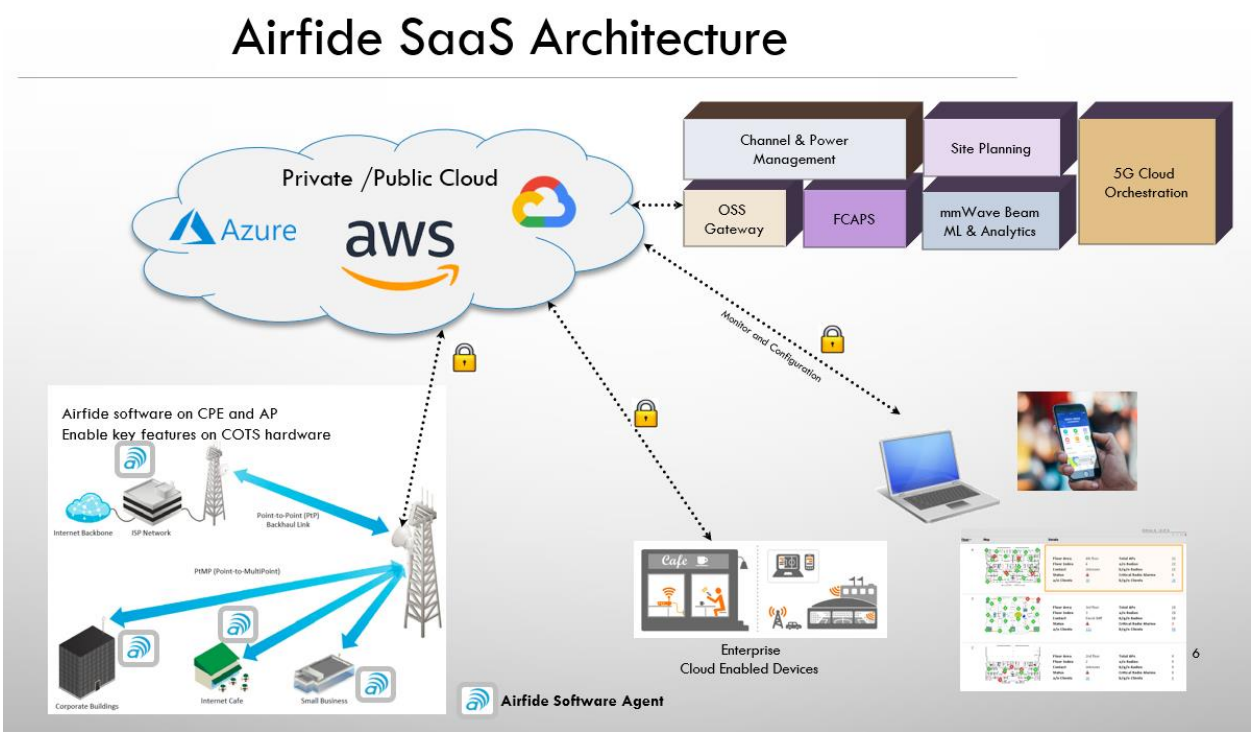


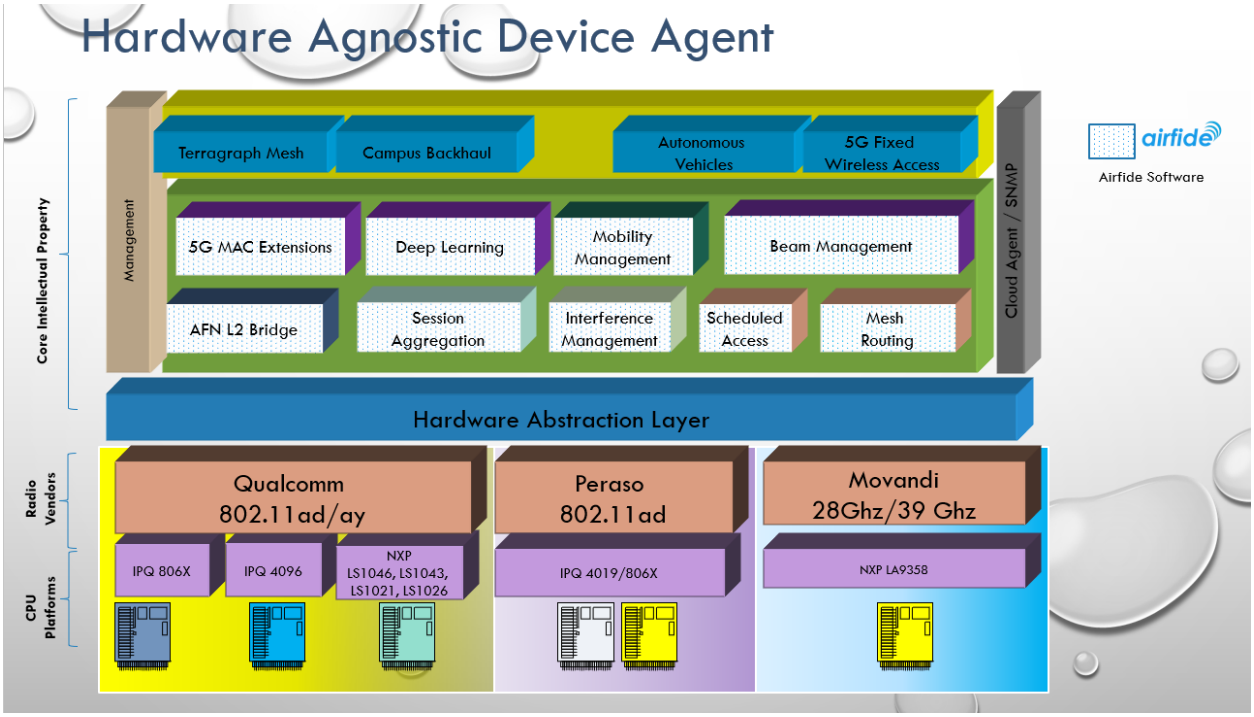


SNMP INTERFACE

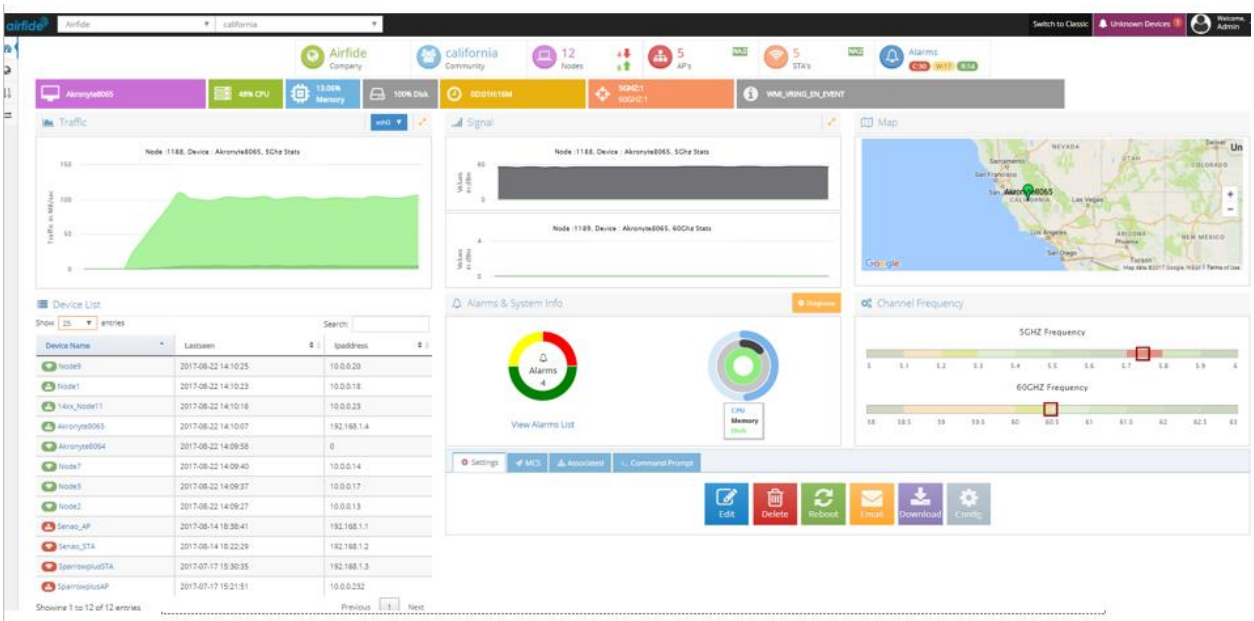


CLOUD ARCHITECTURE

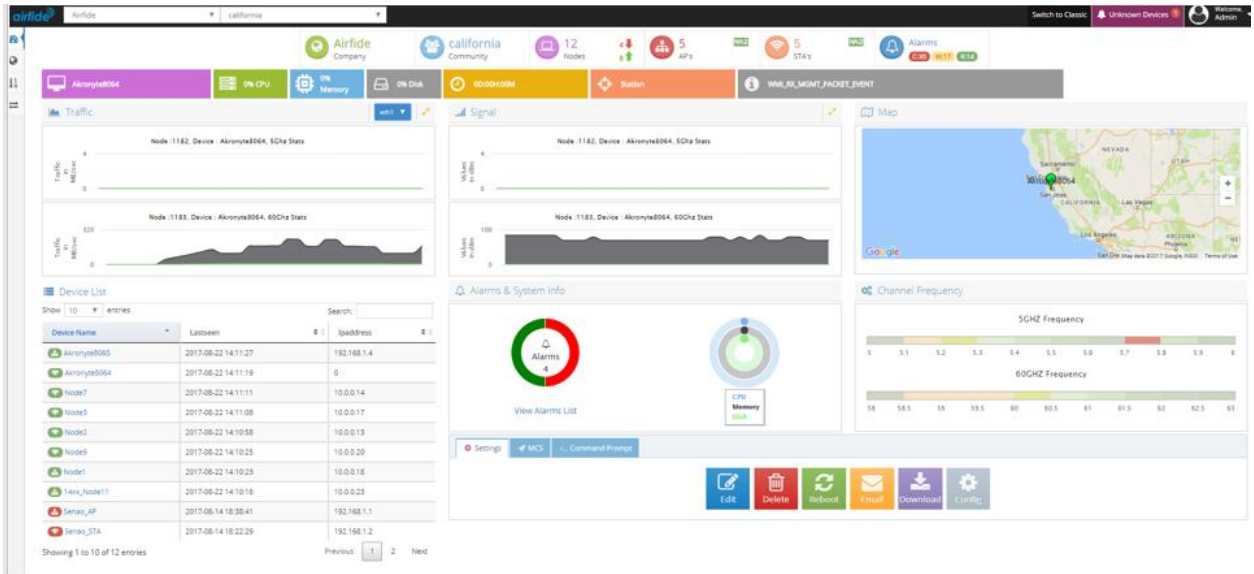




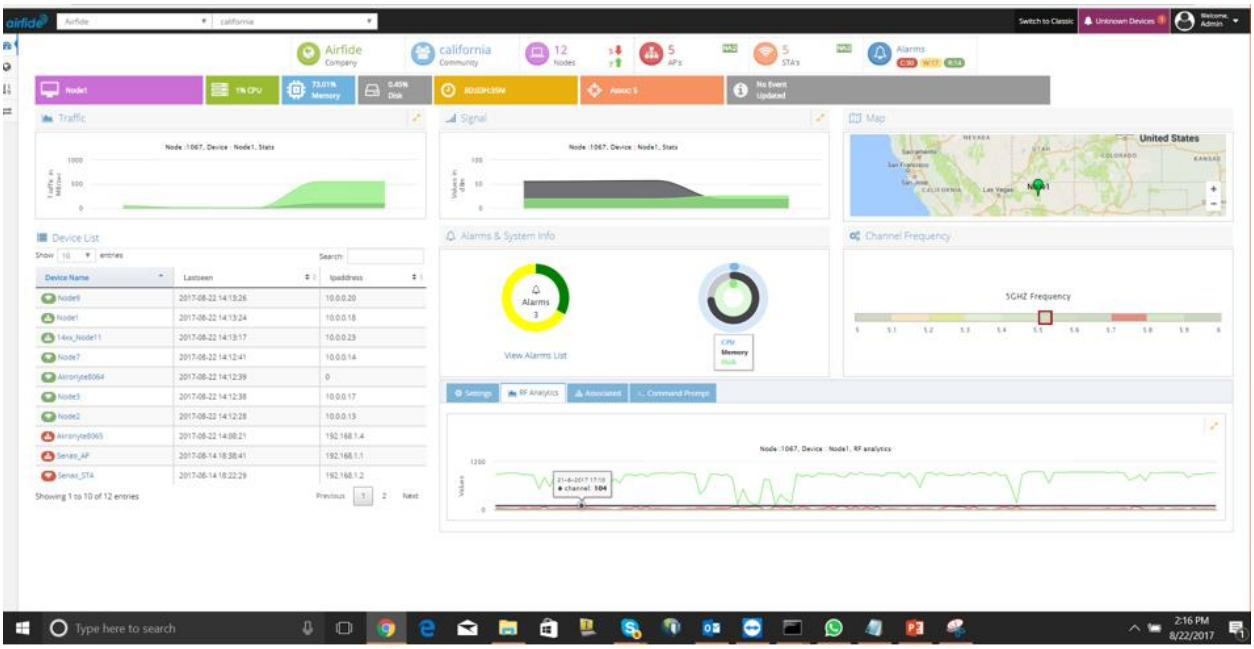
CLOUD INTERFACE



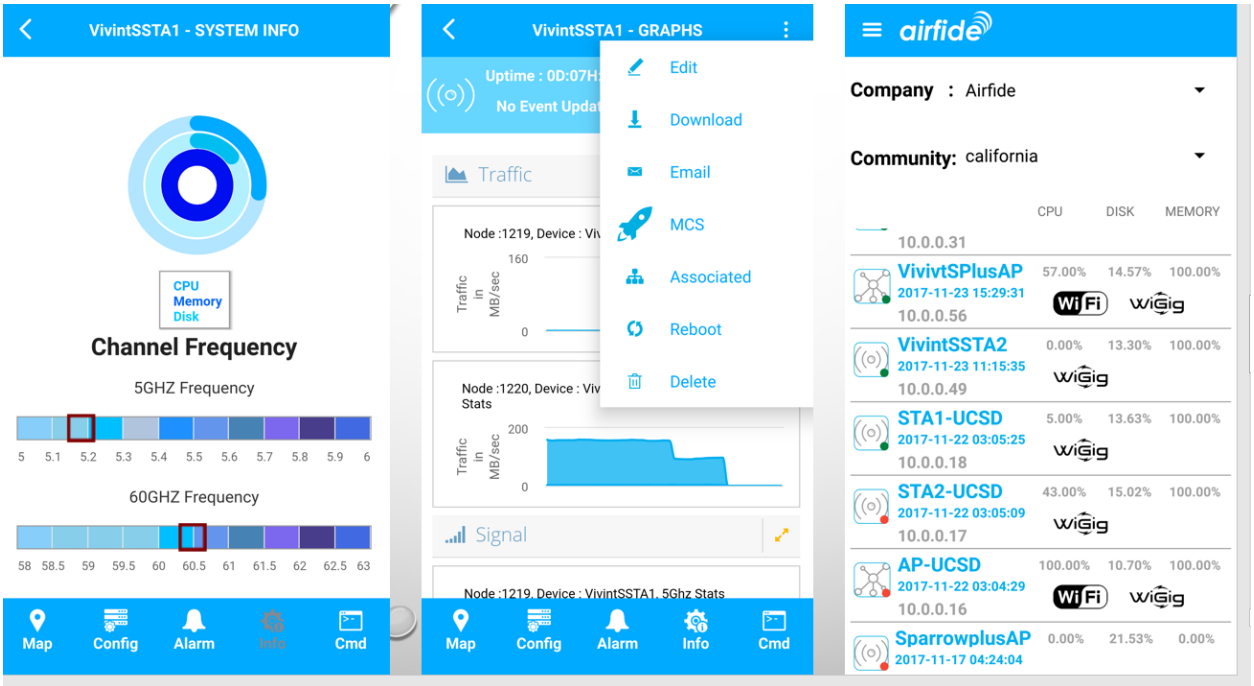
Radio performance monitor and provisioning, spectrum analysis and SON control plane routing is AWS based. AP and STA location can be mapped and timing between adjacent cells synchronized based on GPS and TDMA protocol

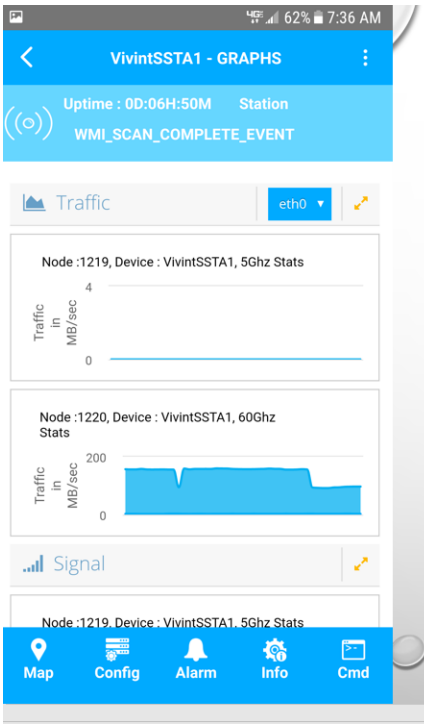


Traffic flows on 60Ghz and 5Ghz can be monitored to employ these radios in either load balancing or in failover mode

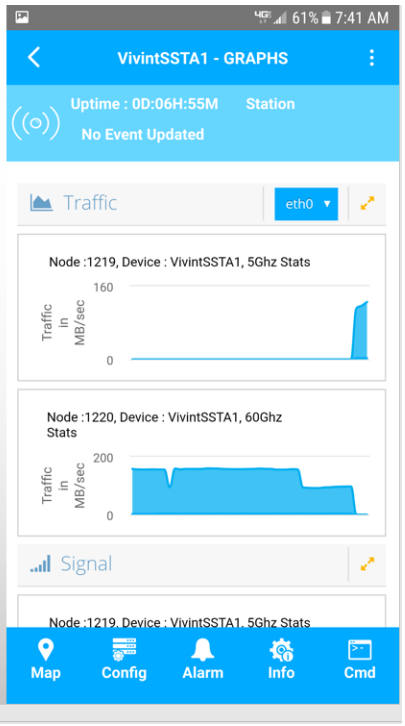


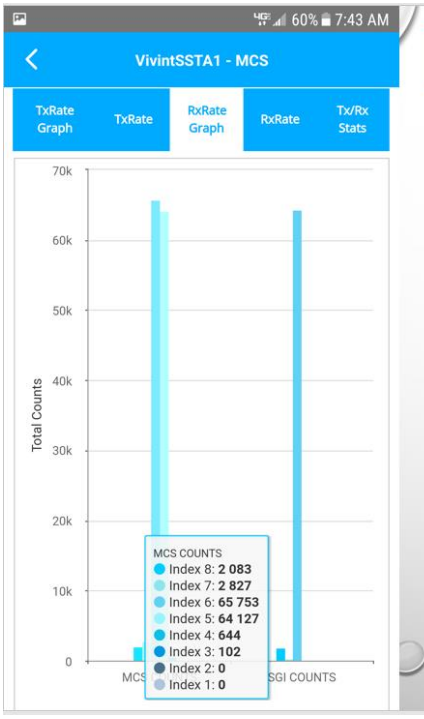
Spectrum analysis and RF machine learning algorithms can determine duty cycle up/down stream And applications using the channel. CCA, FFTs originating from the radio devices are historically maintained in the cloud

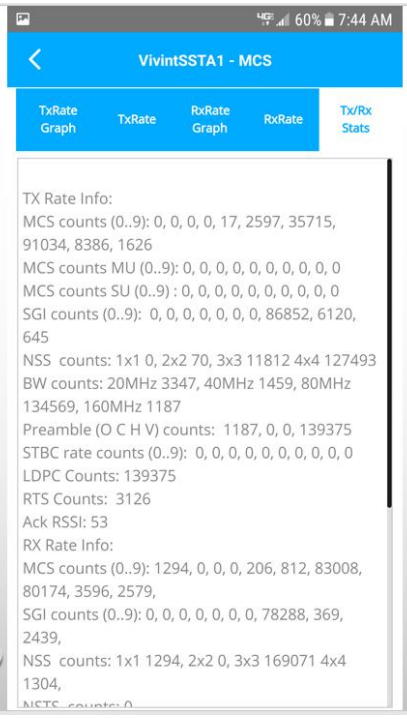


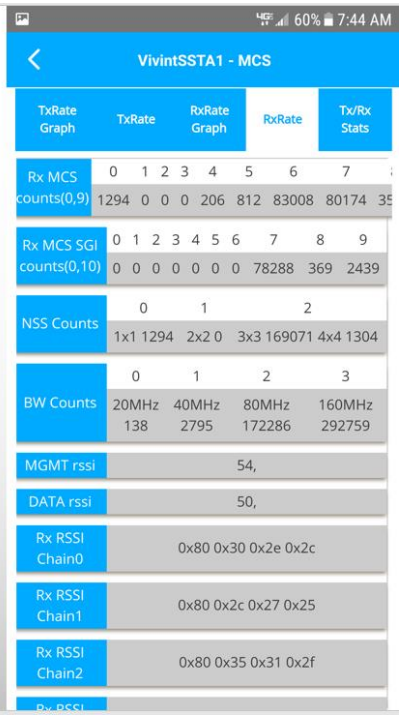

62% 7:36 AM
VivintSSTA1 - GRAPHS
Uptime : 0D:06H:50M Station
WMI_SCAN_COMPLETE_EVENT
Traffic
eth0
Node :1219, Device : VivintSSTA1, 5Ghz Stats
Traffic in MB/sec
4
0
Node :1220, Device : VivintSSTA1, 60Ghz Stats
200
0
Signal
Node :1219, Device : VivintSSTA1, 5Ghz Stats
Map
Config
Alarm
Info
Cmd

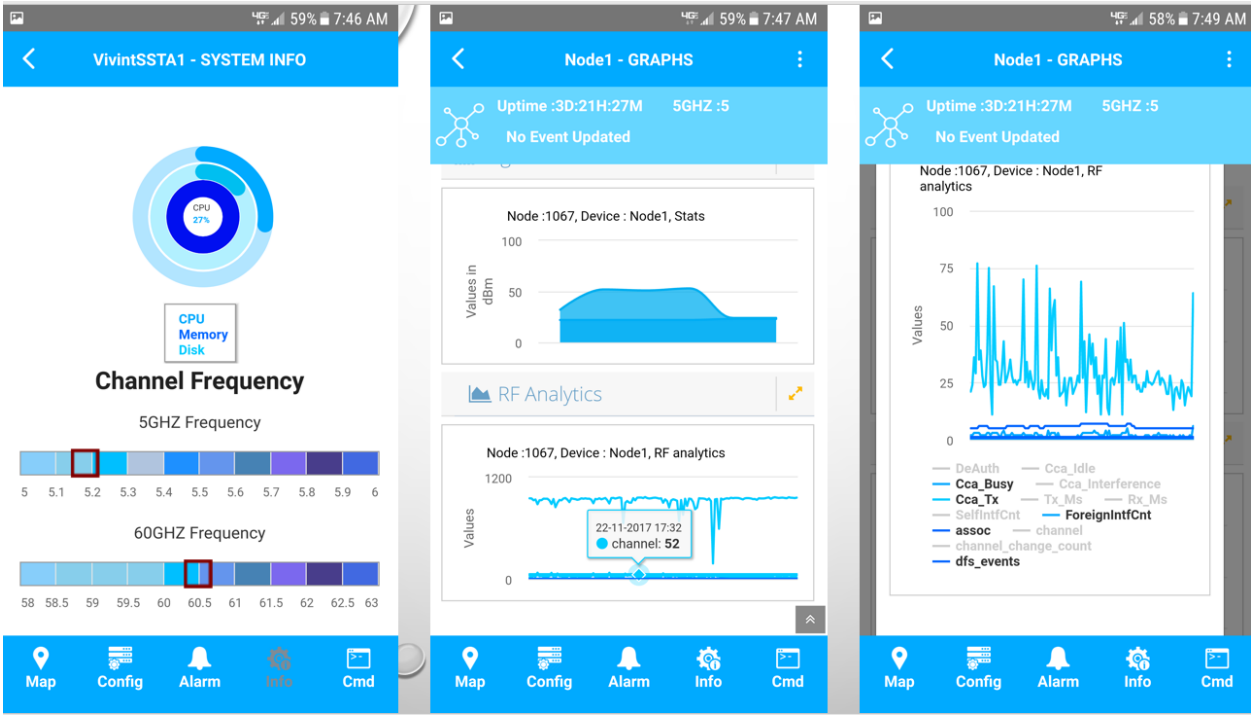

62% 7:36 AM
VivintSSTA1 - GRAPHS
Uptime : 0D:06H:50M Station
WMI_SCAN_COMPLETE_EVENT
Traffic
eth0
WiFi
WiGig
SWITCH
Signal
Node :1219, Device : VivintSSTA1, 5Ghz Stats
Map
Config
Alarm
Info
Cmd


61% 7:41 AM
VivintSSTA1 - GRAPHS
Uptime : 0D:06H:55M Station
No Event Updated
Traffic
eth0
Node :1219, Device : VivintSSTA1, 5Ghz Stats
Traffic in MB/sec
160
0
Node :1220, Device : VivintSSTA1, 60Ghz Stats
200
0
Signal
Node :1219, Device : VivintSSTA1, 5Ghz Stats
Map
Config
Alarm
Info
Cmd


60% 7:43 AM
VivintSSTA1 - MCS
TxRate Graph
TxRate
RxRate Graph
RxRate
Tx/Rx Stats
Total Counts
70k
60k
50k
40k
30k
20k
10k
0
MCS COUNTS
Index 8: 2 083
Index 7: 2 827
Index 6: 65 753
Index 5: 64 127
Index 4: 644
Index 3: 102
Index 2: 0
Index 1: 0
SGI COUNTS


60% 7:44 AM
VivintSSTA1 - MCS
TxRate Graph
TxRate
RxRate Graph
RxRate
Tx/Rx Stats
TX Rate Info:
MCS counts (0..9): 0, 0, 0, 0, 17, 2597, 35715, 91034, 8386, 1626
MCS counts MU (0..9): 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
MCS counts SU (0..9) : 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
SGI counts (0..9): 0, 0, 0, 0, 0, 0, 0, 86852, 6120, 645
NSS counts: 1x1 0, 2x2 70, 3x3 11812 4x4 127493
BW counts: 20MHz 3347, 40MHz 1459, 80MHz 134569, 160MHz 1187
Preamble (O C H V) counts: 1187, 0, 0, 139375
STBC rate counts (0..9): 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
LDPC Counts: 139375
RTS Counts: 3126
Ack RSSI: 53
RX Rate Info:
MCS counts (0..9): 1294, 0, 0, 0, 206, 812, 83008, 80174, 3596, 2579,
SGI counts (0..9): 0, 0, 0, 0, 0, 0, 0, 78288, 369, 2439,
NSS counts: 1x1 1294, 2x2 0, 3x3 169071 4x4 1304,


60% 7:44 AM
VivintSSTA1 - MCS
TxRate Graph
TxRate
RxRate Graph
RxRate
Tx/Rx Stats
Rx MCS counts(0,9)
0 1 2 3 4 5 6 7
1294 0 0 0 206 812 83008 80174
Rx MCS SGI counts(0,10)
0 1 2 3 4 5 6 7 8 9
0 0 0 0 0 0 0 78288 369 2439
NSS Counts
0 1 2
1x1 1294 2x2 0 3x3 169071 4x4 1304
BW Counts
0 1 2 3
20MHz 138 40MHz 2795 80MHz 172286 160MHz 292759
MGMT rssi
54,
DATA rssi
50,
Rx RSSI Chain0
0x80 0x30 0x2e 0x2c
Rx RSSI Chain1
0x80 0x2c 0x27 0x25
Rx RSSI Chain2
0x80 0x35 0x31 0x2f


59% 7:46 AM
VivintSSTA1 - SYSTEM INFO
CPU
27%
CPU
Memory
Disk
Channel Frequency
5GHZ Frequency
5 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6
60GHZ Frequency
58 58.5 59 59.5 60 60.5 61 61.5 62 62.5 63
Map
Config
Alarm
Info
Cmd
59% 7:47 AM
Node1 - GRAPHS
Uptime :3D:21H:27M
5GHZ :5
No Event Updated
Node :1067, Device : Node1, Stats
Values in dBm
100
50
0
RF Analytics
Node :1067, Device : Node1, RF analytics
Values
1200
0
22-11-2017 17:32
channel: 52
Map
Config
Alarm
Info
Cmd
58% 7:49 AM
Node1 - GRAPHS
Uptime :3D:21H:27M
5GHZ :5
No Event Updated
Node :1067, Device : Node1, RF analytics
Values
100
75
50
25
0
DeAuth
Cca_Idle
Cca_Busy
Cca_Interference
Cca_Tx
Tx_Ms
Rx_Ms
SelfIntfCnt
ForeignIntfCnt
assoc
channel
channel_change_count
dfs_events
Map
Config
Alarm
Info
Cmd