

## Annexure I

### TECHNICAL SPECIFICATIONS OF IP PHONE

S.No	Feature description	Compliance (Yes/No)
1	The phone should support at least 1 line.	
2	It should support the following codec G.711a/μ, G.729a	
3	It should have graphical display with a minimum resolution of 128 x 32 pixels	
4	The phone should support QoS mechanism through 802.1p/q.	
5	Should have built-in high-quality full-duplex speakerphone	
6	Should include audio controls for the full-duplex speakerphone and handset.	
7	IP address Assignment by DHCP or statically configured	
8	The Phone should support the ability to provide different ringtones for internal and external calls.	
9	Should have volume control button for easy decibel-level adjustments for the speakerphone, handset and ringer.	
10	The phone should support mounting against a wall	
11	The phone should support IPv4 and IPv6 from day1.	
12	The phone should support Power over Ethernet IEEE 802.3af class 1/2/3 and should also have AC power adapter option	
13	The phone should be a SIP based Phone i.e. session Initiation protocol (SIP) supported	
14	The phone should provide basic 3-way conferencing	
15	The phone should support at least 50 entries for call history i.e. missed, received, placed etc.	
16	Should have keys for specific functionalities such as – Redial, settings, transfer, speakerphone, mute on/off, hold/resume	
17	Should have 4 MB flash memory and 30 MB or more SDRAM.	

## Indoor AP Specifications

<b>Indoor AP with 802.11ac</b>		
<b>Features</b>	<b>Specifications</b>	<b>Compliance (Yes\No)</b>
<b>Hardware</b>	1. Access Points proposed must include radios for 2.4 GHz and 5 GHz with 802.11 ac.	
	2. Must have a robust design for durability, without visible vents	
	3. Must include dual band <b>external antennas</b> to support both the 2.4GHz and 5GHz operations simultaneously from single antenna.	
<b>Support</b>	4. Must support 3x3:3 multiple-input multiple-output (MIMO) with three spatial streams. 4x4:3 multiple-input multiple-output (MIMO) with three spatial streams will be preferred.	
	5. Must support simultaneous 802.11 n on both the 2.4 GHz and 5 GHz radios.	
	6. Must support 802.11ac on the integrated 5-GHz radio	
	Access Points should support all versions of 802.11 a, 802.11b, 802.11n	
	The Access Point should be modular and hence field upgradable to next version of 802.11 ac where bandwidth support will be more than 2.3 Gbps. It should not be a case that Access Point will need to be rip and replaced incase of upgrading to next version of 802.11 ac that supports >2.3 Gbps bandwidth throughput.	
	Should support BPSK, QPSK, 16-QAM, 64-QAM and 256-QAM modulation types	
	Access point should support 802.3at POE+ standard.	
	WPC certificate needs to be submitted along with the AP Specification Compliance	
	7. Must support data rates up 450 mbps on 802.11 n and 1.3 Gbps on 802.11ac. Must support up to 23dbm of transmit power in both 2.4Ghz and 5Ghz radios incase of Wave 1. Incase of upgradation to next version of 802,11 ac requirement in future, same AP should support data rate more than 2.3 Gbps.	
	<b>RF</b>	
9. Should support detecting and classifying non-Wi-Fi wireless transmissions while simultaneously serving network traffic		
10. Should support configuring the access point as network connected sensor to access any network location covered by the access point to get real-time Spectrum analysis data.		
11. Must support AP enforced load-balance between 2.4Ghz and 5Ghz band.		
12. Should support and incorporate radio resource management for power, channel, coverage hole detection and performance optimization		
13. Should support spectrum analysis and security scanning using a dedicated hardware separate from the radio serving the clients, with four, four multiple-input multiple-output (MIMO) technology		
14. Should be able to detect at least 20 sources of non 802.11 interference		
<b>Roaming</b>	15. Must support Proactive Key Caching and/or other methods for Fast Secure Roaming.	
<b>Security</b>	16. Must support Management Frame Protection.	
	17. Should support locally-significant certificates on the APs using a Public Key Infrastructure (PKI).	

	18. Must operate as a sensor for wireless IPS	
	19. Should support Off-Channel Rogue Detection and Containment for both radio	
<b>Encryption</b>	20. Access Points must support a distributed encryption/decryption model.	
	21. Access Points must support Hardware-based DTLS encryption on CAPWAP Standard	
<b>Monitoring</b>	22. Must support the ability to serve clients and monitor the RF environment concurrently.	
	23. Same model AP that serves clients must be able to be dedicated to monitoring the RF environment.	
<b>Flexibility</b>	24. AP model proposed must be able to be both a client-serving AP and a monitor-only AP for Intrusion Prevention services.	
	25. Should support mesh capabilities for temporary connectivity in areas with no Ethernet cabling.	
	26. Mesh support should support QoS for voice over wireless.	
	27. Must support 16 WLANs per AP for SSID deployment flexibility.	
	Must support minimum of 16 SSID's per AP.	
	28. Must continue serving clients when WAN link to controller is back up again, should not reboot before joining	
	29. Should support Local authentication at the AP level in case of WAN outage	
<b>Operational</b>	30. Must support telnet and/or SSH login to APs directly for troubleshooting flexibility.	
<b>Power</b>	31. Must support Power over Ethernet, local power, and power injectors.	
	32. Must operate at 3x3 or higher with 802.3af PoE is the source of power	
<b>Quality of Service</b>	33. 802.11e and WMM	
	34. Wi-Fi Alliance Certification for WMM and WMM power save	
	35. Must support Reliable Multicast Video to maintain video quality	
	36. Must support QoS and Call Admission Control capabilities.	
	37. Access Point should 802.11 DFS certified	