



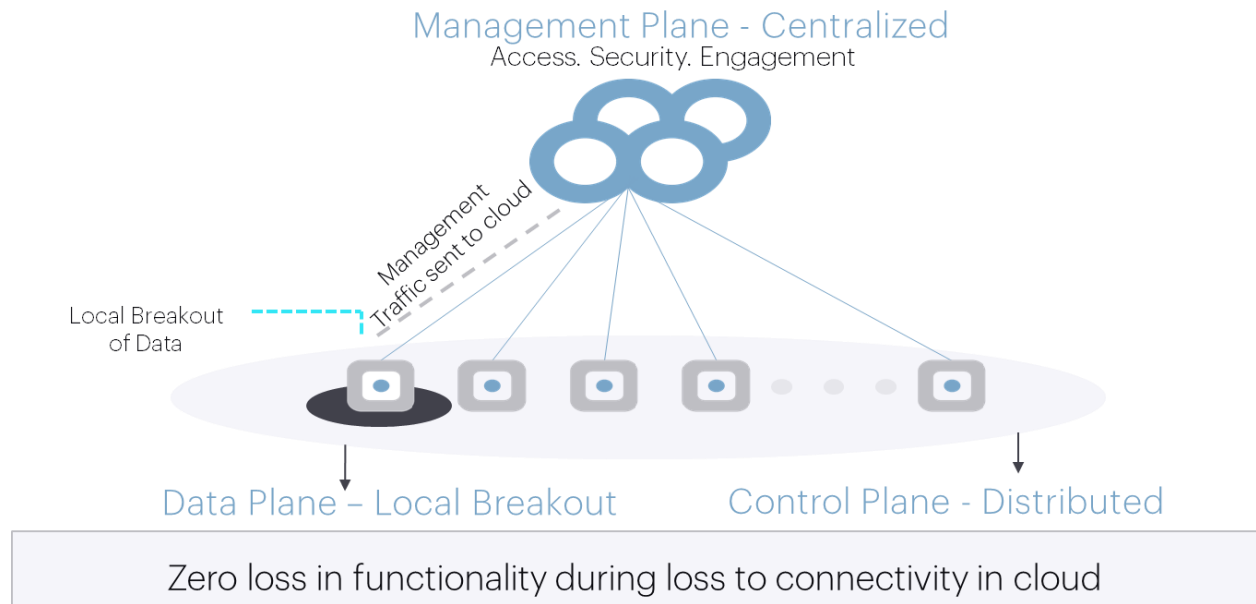
Response to TRAI Consultation  
Paper on  
Proliferation of Broadband through  
Public Wi-Fi Networks

# About Mojo Networks

Mojo Networks is a pioneer in delivering Next Generation Cloud Managed WiFi. The Mojo WiFi solution is built upon a highly scalable, reliable and secure cloud architecture, complemented by a suite of Carrier and Enterprise grade access points that deliver reliable, high-performance networks and proactively secure and optimize the air.

## Mojo WiFi Cloud Architecture

The Mojo WiFi solution is centered on the principle of separation between management, data and control planes. This approach simplifies network deployment, provisioning and management. It also provides robustness in the face of controller failures.



## Mojo WiFi: Key Differentiators

Capability	Description
Scalability	Massively scalable Cloud managed architecture Already deployed in accounts which will grow to Million+ APs in 2-3 years
Enterprise-grade functionality	Captive portal, guest management, social media login, Firewalling, content filtering, lawful interception Offline mode of operation, Mesh mode, Cellular Offload
Cost	Carrier & enterprise grade hardware at factory cost Zero touch, plug-n-play installation & provisioning
Manageability	Location based hierarchy; monitoring dashboards
Differentiated capabilities	APIs for 3 <sup>rd</sup> party application integration Cloud based platform for WiFi Analytics Built-in Wireless IPS
Unique	Nano based simplified AP management for promoting local WiFi service provider model

## Responses to questions posed by TRAI

Q2. What regulatory/licensing or policy measures are required to encourage the deployment of commercial models for ubiquitous city-wide Wi-Fi networks as well as expansion of Wi-Fi networks in remote or rural areas?

A2.

### **Regulatory Measures**

#### **Spectrum**

The current licensing rules for indoor/outdoor WLAN in 5 GHz band is provided in the tables below [1].

Regulation code	NFAP2011-IND 67, GSR No 46E, 37E	NFAP2011-IND 69
Band (MHz)	5150-5350, 5725-5875	5570-5725
License Type	Unlicensed	Licensed
Maximum mean EIRP	200mW (23dBm)	1W (30dBm)
Maximum mean EIRP density	10 mW/MHz	50 mW/MHz
Band usage	Low power WAS including RLAN	Low power WAS including RLAN

Table 1: Summary of regulatory requirements for indoor deployment in India

Regulation code	NFAP2011-IND 68	NFAP2011-IND 69	NFAP2011-IND 71	NFAP2011-IND 72, GSR No 38E
Band (MHz)	5150-5250	5570-5725	5725-5825	5825-5875
License Type	Licensed	Licensed	Licensed	Unlicensed
Maximum transmitter output power			1 W (30dBm) in spread of 10 MHz or higher	1 W (30dBm) in spread of 10 MHz or higher
Maximum mean EIRP	200mW (23dBm)	1W (30dBm)	4W (36dBm)	4W (36dBm)
Maximum mean EIRP density	10 mW/MHz	50 mW/MHz		
Band usage	Low power WAS including RLAN	Low power WAS including RLAN	Low power WAS including RLAN and Dedicated Short Range Communications (DSRC) for Intelligent Transport Networks	Low power WAS including RLAN

Table 2: Summary of regulatory requirements for outdoor deployment in India

Compared to spectrum for indoor usage, we note that only 50 MHz of spectrum is currently license-exempt for outdoor use. In addition, the number of devices that support these frequencies is also very small. Given the need for deploying outdoor WiFi (for example in parks, streets, beaches etc.), there is a requirement to delicense more spectrum in the 5 GHz band for outdoor use.

### **Devices**

WLAN protocols have evolved considerably in terms of capabilities and features. However, the proportion of client devices that support the latest versions of 802.11 standard is very low in India. The vast majority of clients are capable of using only the 2<sup>nd</sup> generation of WiFi (i.e. 802.11b/g). As a result, spectrum utilization is very inefficient even though the access points can support the 3<sup>rd</sup> and 4<sup>th</sup> generation of WiFi (based on 802.11a/n and 802.11ac, respectively). Use of legacy devices also results in poor user experience. To alleviate these problems, a minimum protocol requirement of 802.11a/n must be specified for client devices. Furthermore, adoption of latest WLAN standards such as 802.11ac must be encouraged by mandating its support in public WiFi projects. This will also lead to greater usage of relatively less-congested 5 GHz band.

### **Services**

The advent of IP-based technologies such as VoLTE and VoWiFi has created the need for a

unified regulatory regime for voice services across all communication platforms including landline, cellular, wired/wireless broadband. This will not only incentivize the adoption of these newer technologies but also potentially lead to reduced cost for the end user.

### ***Policy Measures***

To enable rapid growth of WiFi, there is a need to separate infrastructure providers from WiFi service providers. Infrastructure providers can be assigned right-of-way to install and maintain WiFi equipment. Infrastructure providers can, in turn, lease capacity to WiFi service providers. This can significantly reduce the CAPEX burden for WiFi service providers, particularly entrepreneurs who want to provide WiFi services at a small scale.

BharatNet can trigger rapid proliferation of rural WiFi by providing easy and cheap access to high-speed fiber backhaul. However, the current licensing regime needs to be amended to allow small-scale entrepreneurs to operate a WiFi network in a village or a cluster of villages.

**Q3. What measures are required to encourage interoperability between the Wi-Fi networks of different service providers, both within the country and internationally?**

**A3.**

The major challenge in WiFi interoperability across service providers lies in roaming. The Hotspot 2.0 standard has been specified to address this issue. To ensure frictionless roaming across service providers, HS2.0 should be mandated for all public WiFi deployments. HS2.0 support should be made mandatory for client devices.

To facilitate roaming service between service providers, a WiFi Roaming Exchange is needed. This could, for example, be based on the Wireless Roaming Intermediary eXchange (WRIX) standard proposed by the Wireless Broadband Alliance. The regulator may specify WiFi roaming interconnect charges as is currently done in the case of voice interconnect. This will insulate the end user from trying to setup separate accounts for accessing WiFi services provided by different operators.

**Q4. What measures are required to encourage interoperability between cellular and Wi-Fi networks?**

**A4.**

Interoperability between cellular and WiFi networks has been standardized to a large extent by

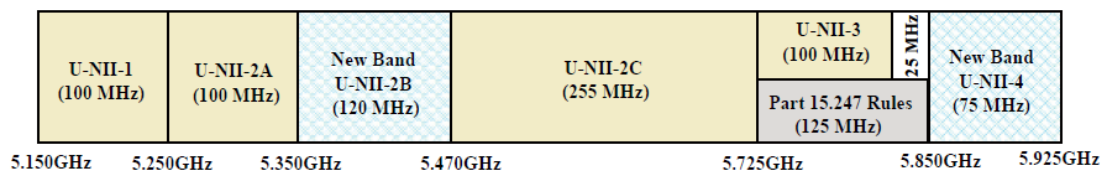
bodies such as 3GPP. The industry should follow the same so that end users can seamlessly roam between 3G/4G and WiFi networks.

Another issue is co-existence between LTE and WiFi. This has become critical because of the emergence of technologies such as LTE-U, MulteFire, LAA which are designed to provide LTE services in unlicensed bands. The regulatory framework needs to ensure fair co-existence between the WiFi and these technologies.

**Q5.** Apart from frequency bands already recommended by TRAI to DoT, are there additional bands which need to be de-licensed in order to expedite the penetration of broadband using Wi-Fi technology? Please provide international examples, if any, in support of your answer.

**A5.**

There is a need to delicense more spectrum in the 5 GHz band. As WiFi usage is expected to explode over the next few years, the current allocations will not suffice. Furthermore, the IEEE802.11ac standard allows the use of 80 and 160 MHz channels but the current spectrum allocation in India is not enough to leverage high bandwidths. The figure below shows Summary of existing and proposed new FCC part 15 rules for 5GHz unlicensed spectrum usage [1].



More channels can be delicensed in India such as U-NII-2C & U-NII-3 bands, which are allowed internationally. e.g. in US.

**Q13.** Any other issue related to the matter of Consultation.

**A13.**

A number of public WiFi initiatives are being planned by at city and state level. There is a need to have a minimum technical requirement specification for these networks to ensure that these networks adhere to global standards and best practices. It will ensure that upcoming public WiFi networks will provide consistent end user quality of experience by leveraging the latest

developments in WiFi technology. In particular, the following aspects are of critical importance in public WiFi deployments:

<b>Functional Requirements</b>	Dual-band, MIMO-capable radios with Advanced Radio Resource Management Guest management system with support for multiple login mechanisms Centralized EMS and NMS Roaming Lawful Interception Wireless IPS, Firewall and content filtering WiFi Analytics
<b>Non-Functional Requirements</b>	Scalability Resilience Robustness

Another important aspect to consider is the cost of deployment. In this context, it is pertinent to look at recent developments in the networking industry such as Open Compute which have leveraged the power of collective minds to drive new ideas and lower costs. A similar 'Open AP' approach for WiFi can lead to fast innovation, new business models and reduced cost of deployment [2].

**References**

1. 3GPP TR 36.889, Feasibility Study on Licensed-Assisted Access to Unlicensed Spectrum
2. The Future of WiFi Starts Here, <http://blog.mojonetworks.com/the-future-of-wifi-starts-here>