

BIF RESPONSE TO TRAI CP ON SPECTRUM, ROAMING & QoS REQUIREMENTS IN M2M COMMUNICATIONS

Q1: What should be the framework for introduction of M2M Service providers in the sector? Should it be through amendment in the existing licenses of access service/ISP license and/or licensing authorization in the existing Unified License and UL (VNO) license or it should be kept under OSP Category registration? Please provide rationale to your response.

BIF RESPONSE

BIF is of the opinion that there is need for identification of M2MSP as a separate entity to provide and manage end to end M2M horizontal IoT platform services based on the OneM2M standard.

In view of the fact that this is a new area where the market is just beginning to take off, the policy and regulatory framework should be such that it encourages competition and innovation rather than stifle it. Also keeping in view that M2MSP is not dealing with scarce, limited and precious resources viz. spectrum, there is perhaps no need to go for a licence. To ensure a level playing field and apply the conditions of 'same service same rules' for all, it is proposed to be introduced in the form of 'Registration'.

The current definition of the OSP Category covers all the applications that may be possibly used in M2M services and perhaps maybe the appropriate category to be kept for M2MSPs.

Department of Telecommunications (Carrier Services Cell) defines the OSP category vide Ref: No.18-2/2008-CS-I Dated: 5th August, 2008 Subject: - Revised "Terms and Conditions - Other Service Provider (OSP) Category". (a) "Applications Services" means providing services like tele-banking, tele-medicine, tele-education, tele-trading, e-commerce, call center, network operation center and other IT Enabled Services, by using Telecom Resources provided by Authorised Telecom Service Providers.

(b) "Other Service Provider" (OSP) means a company providing Application Services.

Since M2MSPs would be providing multiple services and applications across several verticals and segments, hence there would be a possible requirement to have separate registration for each application/service. DOT needs to be kept informed about all the services being provided by the M2MSP.

Also, since M2M Service Providers will be involved with millions of devices and there would be thousands of such Service providers across different verticals, it would be practically infeasible to administer and manage the process of licensing. Therefore, in the overall interest to promote M2M and IoT services, M2MSPs need to be simply 'registered'.

Q2. In case a licensing framework for MSP is proposed, what should be the Entry Fee, Performance Bank Guarantee (if any) or Financial Bank Guarantee etc? Please provide detailed justification.

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BIF RESPONSE

BIF is proposing a 'Registration' based approach and not a Licensing framework . Hence the question is redundant to the chosen approach.

Q3. Do you propose any other regulatory framework for M2M other than the options mentioned above? If yes, provide detailed input on your proposal.

BIF RESPONSE

No.

Q4. In your opinion what should be the quantum of spectrum required to meet the M2M communications requirement, keeping a horizon of 10-15 years? Please justify your answer.

Q5. Which spectrum bands are more suitable for M2M communication in India including those from the table 2.3 above? Which of these bands can be made delicensed?

BIF RESPONSE

Bandwidth requirements of different kinds of M2M Services have varying network requirements. For example some applications require very low bandwidth whereas some others require very high bandwidth. The applications could vary from Remote sensing to High bandwidth applications viz. Gaming, Digital Signage, Video Surveillance etc .

Therefore depending on the offtake of the services, the bandwidth requirement for each service, and the spectral efficiency of the access technology deployed , the overall spectrum requirement can be calibrated accordingly.

Various Spectrum bands which can be optimally used for M2M Communication could be in either licensed or unlicensed frequencies. However, the choice of the bands to be used would depend on the application viz. narrow band, to broadband and ultra broadband applications (ranging from remote sensing to bandwidth intensive applications viz. Video surveillance, etc .) and also on the wireless connectivity to the Internet viz. 2G, 3G, 4G/LTE, or UNB. Another factor that would decide the choice of the spectrum band is over what distances the devices need to communicate e.g. Devices communicating over few Kms need access from 300Mhz to 3Ghz spectrum , while centimetre or millimetre contactless transactions may use NFC (Near Field Communications), etc . Other examples The above may be construed as views of BIF barring Vodafone & Airtel

could be that of usage of sub-GHz band which are very useful for long range , deep penetration, low interference, low power consumption , low TCO. These bands are suitable for sensors, devices inside deep pockets, underwater or normally inaccessible areas.

ITU-R has reserved several frequency bands for ISM applications. These ISM bands are unlicensed and vary slightly from country to country. Studies by EC suggest that license exempt model is most effective for IoT since it avoids need for contractual obligations before devices are manufactured and used , thereby allowing production of large number of cheap devices . Also there is no need to have any roaming arrangements within the country or outside in such bands. There are number of different bands which have been designated as ISM bands in different countries.

In India, two bands viz. 2.4 and 5.8GHz bands have been defined as License exempt bands for Indoor & Outdoor applications . In addition, there are a number of delicensed bands viz. 5.15-5.25GHz and 5.725-5.825GHz bands which are also available for indoor usage in unlicensed bands . Besides, TRAI has also recommended for the V band to be delicensed which if permitted, can be considered for M2M Communication in line with Global harmonisation trends.

Despite the fact that there are other bands in sub-GHz band which have been identified for license exemption for indoor applications, albeit for low power usage viz. 433-434Mhz and 865-867Mhz . Though it is believed that 400 & 800Mhz bands have become preferred candidate bands for IoT worldwide, it is preferred that sub 700Mhz bands should not be delicensed/unlicensed for usage for M2M/IoT purposes. Detailed paper on the same is attached.(Annexure-I)

Q6. Can a portion of 10 MHz centre gap between uplink and down link of the 700 MHz band (FDD) be used for M2M communications as delicensed band for short range applications with some defined parameters? If so, what quantum? Justify your answer with technical feasibility, keeping in mind the interference issues.

BIF RESPONSE

Amongst the licensed bands,M2M can be deployed in any harmonised mobile network bands including 700,800 & 900Mhz. 700Mhz band is a sought after band for LTE deployment around the world due to its efficiency & propagation characteristics. However, there is a move to explore the technical feasibility of utilising a portion of the center gap spacing of 3Mhz (751-754Mhz) as a long term perspective as Unlicensed Band for M2M/IoT usage. BIF strictly opposes it. Reasons for the same are given in the Detailed Paper attached at Annexure-I

Q7. In your opinion should national roaming for M2M/IoT devices be free?

(a) If yes, what could be its possible implications?

(b) If No, what should be the ceiling tariffs for national roaming for M2M Communications?

BIF RESPONSE:

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BIF is in favour of permitting of Regulatory forbearance being followed for roaming tariffs to be decided by the Service providers under the ceiling tariffs being set by the Authority . The Ceiling Tariffs for National Roaming for 2M Communications should be aligned to the ceiling tariffs prescribed by the Authority for National Roaming Services through the Telecom Tariff Order (60th Amendment) 2015 dated 27/02/2015.

Q8. In case of M2M devices, should;

(a) roaming on permanent basis be allowed for foreign SIM/eUICC; or

(b) Only domestic manufactured SIM/eUICC be allowed? and/or

(c) there be a timeline/lifecycle of foreign SIMs to be converted into Indian SIMs/eUICC?

(d) any other option is available?

Please explain implications and issues involved in all the above scenarios.

BIF RESPONSE

a) Roaming should be permitted for certain category of services/verticals or segments that are deemed as Permanent Roamers. They may be permitted by use of eUICC (please refer to para given below)

b) No-it should be permitted for extra-territorial use for domestic SIMs and vice versa.

c) No-there need not be any pre-defined timeline but it should be incumbent upon the local partner service provider to convert the foreign SIM into either eUICC/Indian SIM as applicable

d) Another possible solution could be by having an International M2M Roaming Framework that enables use of home carrier's IMSI & MSISDN to provide services on global basis using Single SIM architecture.

On the basis of National Numbering Plan , MNC Codes assigned to TSPs & MSPs maybe established . TSPs or VNOs who have their own products and applications riding on TSP's networks for connectivity and network related arrangements . MNCs directly available with such Service Providers can be helpful for their branding and will also help to facilitate their roaming requirements efficiently. Such MSPs can have Universal Interconnect Card (eUICC) comparable with SIM card which describes physical characteristics of SIM. SIM or USIM software reside over eUICC as an application.

Q9. In case permanent roaming of M2M devices having inbuilt foreign SIM is allowed, should the international roaming charges be defined by the Regulator or it should be left to the mutual agreement between the roaming partners?

BIF RESPONSE

Commercial negotiations of the Rates of Roaming should be left to bilateral commercial negotiations between the TSPs . BIF believes that Commercially negotiated roaming agreements would be the best solution under regulatory oversight.

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Q10. What should be the International roaming policy for machines which can communicate in the M2M ecosystem? Provide detailed answer giving justifications.

BIF RESPONSE

BIF is of the opinion that the International Roaming Policy should be adopted based on best Global Practices followed. Globally, there are commercial models between TSPs that provide practical solution for accommodating and facilitating international use of IMSIs and MSISDNs on a bilateral commercial basis. Foremost among them is ' International M2M Roaming Framework ' that addresses the issue of transparency in international roaming for M2M services. This roaming framework enables use of home carrier's IMSI & MSISDN to provide services on global basis through single SIM architecture.

GSMA has developed a series of templates for roaming contracts which contain common industry accepted T & Cs that expedite negotiation of commercial roaming agreements. In 2012, they have adopted an M2M Annex template for international roaming. This Annex mandates transparency in provision of M2M services by requiring parties to agree to identify their M2M traffic separately from other wireless/cellular traffic.

To circumvent concerns of security & identity of roamer , there needs to be some mandatory clauses in roaming agreements of operators to define and neutralise threats arising out of permanent roamers.

Q11. In order to provide operational and roaming flexibility to MSPs, would it be feasible to allocate separate MNCs to MSPs? What could be the pros and cons of such arrangement?

BIF RESPONSE

BIF is of the opinion that opening up access to Mobile Numbering Codes (MNCs) could stimulate competition by enabling balanced negotiations that promote growth of M2M. Large MSP holding its own MNC could have more leverage when entering into negotiation with potential TSP partner over its roaming and other rates. This would enable the possibility of the user to be no longer dependent on a specific TSP but provide him the freedom/choice to change the SIM and other settings independently , thereby enhancing competition in the market for M2M.

Switching to new TSP at any stage would be much simpler & less expensive for an MSP because SIM cards that are installed in the M2M devices would not need physical replacement

Q12. Will the existing measures taken for security of networks and data be adequate for security in M2M context too? Please suggest additional measures, if any, for security of networks and data for M2M communication.

BIF RESPONSE

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M2M Communications would require additional measures to be taken for network and data security and privacy.

As per National Telecom M2M Roadmap for M2M services by DOT , data security and privacy issues are likely to arise at the following levels viz.

1. M2M data within the telecom operator's domain
2. M2M data within M2MSP's domain
3. Security at sensor/device level
4. Security at network level

From security perspective, the National M2M Roadmap prescribes for all M2M gateways and application servers including M2M Applications & data base servers (which are hosted on the cloud) and serving customers in India to be physically located

Q13. (a) How should the M2M Service providers ensure protection of consumer interest and data privacy of the consumer? Can the issue be dealt in the framework of existing laws?

(b) If not, what changes are proposed in Information Technology Act, 2000 and relevant license conditions to protect the security and privacy of an individual?

Please comment with justification.

BIF RESPONSE

a) As per DOT's " National Telecom M2M Roadmap " document for M2M Services, in general data breaches & privacy issues will arise at the following levels viz.

1. M2M data within TSP's domain
2. M2M data within M2M Service Provider's domain
3. Security at the level of the Sensor or Device
4. Security issues at Network level

The document further goes on to state that from data security and privacy aspect, there is a strong case for all M2M Gateways and application servers serving customers in India to be physically located in India . Hence to ensure data security and privacy, it may be critical for the M2MSP to ensure that it is stored & processed securely.

As per BEREC's Draft report on ' Enabling IoT' , Article 13a of Framework Directive

1. M2MSPs must take appropriate measures to manage risks posed to security of their networks and services, so as to minimise the impact of security issues on users and interconnected networks
2. M2MSPs must take all appropriate steps to guarantee integrity of Networks and thus ensure continuity of supply of services provided over these networks

In India , currently data services are governed by Information Technology Act, 2000 & IT Amendment Act, 2008. With some relevant sections of the IT Act, 2000, the Government made Information Technology Rules'2011 for Reasonable Security Practices & Procedures and sensitive personal data or information. However, service provision through M2M Communications involving Big Data may warrant modification of some provisions of these rules.

b) Rules are currently not applicable to Govt bodies and individuals collecting & using Big Data along with M2M Communications . Besides, various other rules related to purpose limitation security, data breach, opt in and out and ability to withdraw consent , disclosure of information, privacy policy, etc need to be deliberated in the context of application of Big Data

On 16th October, 2012, an Expert Group on Privacy constituted by the Planning Commission went into the international privacy principles along with national privacy principles including the entire rationale & emerging issues along with an analysis of relevant legislations and Bills from the perspective of privacy.

A set of recommendations were made for consideration while formulating proposed framework for Privacy Act viz.

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1. Establishment of the office of Privacy Commissioner at both Central & Regional levels. The Privacy Commissioner be the primary authority for enforcement of provisions of the IT Act.
2. The Report recommends a system of co-regulation with equal emphasis on Self Regulating Organisations (SROs) being vested with the responsibility of autonomously ensuring compliance with the Act, subject to regulatory oversight by the Privacy Commissioners. The SROs apart from possessing industry specific knowledge will be better placed to create awareness about right to privacy & explaining sensitivities of privacy protection both within industry and to the public to promote investment and innovation concurrently in M2M Communications.

Q14. Is there a need to define different types of SLAs at point of interconnects at various layers of Heterogeneous Networks (HetNets)? What parameters must be considered for defining such SLAs? Please give your comments with justifications.

BIF RESPONSE

A M2M Communication Network consists of large number of different communication networks which converge into one large heterogeneous network that is used to establish end to end communication. However, the challenge lies in providing end-to-end communication with guaranteed QoS. A common QoS framework will be required to be adopted say from a Network perspective. Some of the parameters that may be taken into account while defining the SLAs would include among others latency, packet delays, reliability of packet transmission, packet loss, data rate, etc. QoS parameters can also be defined separately for different types of services also.

Q15. What should be the distributed optimal duty cycle to optimise the energy efficiency, end-to-end delay and transmission reliability in a M2M network?

BIF RESPONSE

In an M2M environment, concurrent & massive access of devices may often lead to performance degradation associated with intolerable delays, packet loss and packet loss & interference and congestion.

This is one of the main design challenges for M2M communication networks to effectively manage massive access of energy constrained devices while satisfying different Quality of Service requirements. One possible solution could be by having distributed and optimal duty cycle control to improve end to end network performance by optimisation of energy efficiency, end-to-end delay and transmission reliability

Q16. Please give your comments on any related matter not covered in this consultation paper.

BIF RESPONSE

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We wish to submit two other points for kind consideration by the Authority

1. There should be no restriction on cross border data flow when machine is communicating to another machine or a server anywhere in a controlled API environment.
2. ITU has come up with a M2M Service specific Numbering scheme of 15 digits. India should follow a 15 digit M2M Numbering Series which should be notified by DOT to have global uniformity.

Annexure - 1

Sub 700 MHz Spectrum

TRAI in its consultation paper has raised the issue of provisioning of spectrum for M2M (NB-IoT) in other sub-700 MHz spectrum bands. In India we have a single broadcaster – “Doordarshan” and therefore do not have the issue of TV White Spaces unlike US and other markets where users moved from analog to digital and there by white spaces were created. During the preparations of WRC-15, India had decided to identify 470-698 MHz band for IMT.

High power Doordarshan TV transmitters will be in and around populated areas, which could cause significant UL interference to such NB-IoT operation, which are operating in the broadcasting band. Unlike India, this spectrum is mostly utilized for other services US, Europe and number of other countries. As a result, device and infra ecosystem development specifically for India will be challenging.

The closest scenario for the use of this band is with the US, where 600 MHz band (most likely frequencies DL: 617 to 652 MHz & UL: 663 to 698 MHz), is being auctioned in a licensed and FDD mode, which might be a good target for NB-IoT in future. (http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db1025/DA-16-1213A1.pdf).

Licensed vs. Unlicensed

Primarily the propagation characteristics of the sub-UHF band are very difficult to manage especially in unlicensed manner. Since Doordarshan would have high powered transmitter in all key areas, it is unlikely that one will get good coverage because of the interference from unlicensed shared spectrum; QoS will vary significantly based on the interference. On the other hand licensed bands of the lower band spectrum (700, 800, 850 & 900 MHz bands i.e., Bands 28, 20, 5 & 8) are suitable for NB-IoT applications due to its good propagation/coverage properties and fast evolving ecosystem. Some of the points need to be considered are -

- a. Typically unlicensed spectrum used for broadband is above 1 GHz.
 - 2.4 GHz, 5 GHz and 60 GHz as globally harmonized unlicensed bands
- b. Unlicensed sub 1 GHz spectrum is not ideal for wireless systems because interferences between networks make operations highly challenging.
- c. Results in potentially unpredictable performance and the QoS cannot be guaranteed.
- d. Unlicensed spectrum is not exclusively owned, so there is no central entity managing the effective use of this spectrum.
 - There is a need to manage Interference (to support unlicensed mode) which undermines the advantages of the low-frequency spectrum.
 - Firstly, transmission power needs to be lowered significantly - therefore, signals cannot travel far compared to if used in a licensed manner - which can transmit at normal power (defeating the whole purpose)
 - Secondly, only a fraction of the total spectrum can be used for supporting traffic at a time, as most will end up being consumed as a backup resource to support "frequency hopping" as we do in case of conventional WiFi (In 2.4 GHz band which is used by conventional WiFi, 1/10th of the spectrum is used as any time to total available and assigned).
- e. Therefore, NB-IOT (M2M) in sub 1 GHz band in unlicensed mode may be detrimental for everyone including other existing Licensed FDD allocations/operation.

FDD vs TDD for NB-IoT

At this point of time it is not clear that how the development of M2M device ecosystem grows. Will they be deployed in FDD or TDD configuration? Today only FDD is standardized in 3GPP Rel13 and TDD may be considered in future releases. It is important to know how FDD/TDD deployment of NB-IOT might impact the requirements of the guard band to protect existing services. Lower frequencies are not very conducive for TDD (Time division duplex) mode of transmission which is typically used in unlicensed technologies like WiFi.

- a. The reason is that the receivers and transmitters of towers share the same blocks of spectrum and therefore need to offset themselves in time to block transmissions from nearby towers arriving at a delay due to a larger time taken (though is fractions of seconds) by the signals to travel to nearby towers which are spaced apart by larger distance

compared to those at higher frequencies (where the towers are packed close to each other, and hence travel time is less).

- b. This ends up wasting a lot of spectrum resources (reducing spectral efficiency). Hence, the lower frequency spectrum is best used in an FDD manner where transmitters and receivers use different blocks of exclusive spectrum.
- c. If the spectrum is used for TDD then best case scenario for such deployment for these NB-IoT devices will be collocated deployment, which may not work out as different types of services will be using NB-IoT devices in same unlicensed spectrum band.

- d. Significant spectrum is required at both ends of this unlicensed spectrum band as guard band so that other services above and below this unlicensed spectrum band are not adversely impacted.
- e. Unlicensed spectrum for IoT will lead to additional guard band in lower frequency bands as there will also be a need to manage their second and third harmonics and will be a wastage of national resources.

NB-IoT in 10 MHz Band Gap of 700 MHz APT Band Plan

One of the question from TRAI is regarding 10 MHz center gap between uplink and down link of the 700

MHz band (FDD) for using it for M2M communications as de-licensed band for short range applications. At this stage of consultation process, it is not clear whether TRAI is planning about using this spectrum portion for NB-IoT (M2M) in unlicensed FDD mode or TDD mode. It may not be possible to use the duplex gap (748 to 758 MHz) of Band 28 for NB-IoT applications because this band has a dual duplexer and filter design that would essentially need at least 10 MHz of clear duplex gap to avoid any uplink- downlink type of interference issues. Any unlicensed use of this centre gap will drastically de-value the entire 700 MHz band due to fear of interference in licensed usage from unlicensed usage.

Another issue which may come up if centre gap of this band is used for unlicensed deployments is that there will be no global harmonization as different regions/countries have different band plans in this band. ITU-R Recommendation M.1036-5 contains details of these different frequency arrangements. As per this recommendation arrangements A4 (USA, Canada), A6 (China), A8 and A10 (Europe) and A11 (Iran) will overlap with the center gap of frequency arrangement A5 (APT 700 band plan). Therefore, de-licensing of part/entire center gap of APT 700 MHz band will not have global or even regional support for creating a M2M ecosystem and there will be no economies of scale.

Recommendations:

Following is recommended –

- a. Use primarily licensed spectrum for IoT (technologies such as NB-IOT and LTE eMTC) to ensure guaranteed QoS.
- b. Use existing unlicensed spectrum for short range (e.g. Bluetooth, WiFi, 802.11ah...) M2M systems
- c. Create more licensed spectrum in sub-GHz spectrum bands for ensuring optimum penetration of M2M.
- d. Do not disturb the current APT700 MHz band plan (Band 28) by de-licensing any portion of the center gap spacing (748-758 MHz) as it may have undesirable consequences in a premium 4G band.

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- e. Spectrum, which is not globally/regionally harmonized for NB-IoT should not be identified for NB- IoT.
- f. Global/Regional harmonization of all spectrum bands be the basic principle so as to ensure economies of scale and a better growth path for the government's "Make in India' project.
- g. Any de-licensing in sub_1 GHz spectrum should be done only after carrying out intensive co-existence studies with the existing services. If required, the issue may be taken up at ITU-R for global/regional alignment.