Body of European Regulators for Electronic Communications

BEREC

BoR (17) 170

# Report on BEREC

# International Mission to India

5 October 2017

## Introduction and acknowledgements

From 30th March to 4th April 2017, the BEREC Chair for 2017 Mr Sébastien Soriano (Arcep), and Vice-Chairs Mr Johannes Gungl (RTR), Dr Stephen Unger (Ofcom), Ms Alejandra de Iturriaga (CNMC), Mr Hrafnkell Gíslason (PTA), accompanied by Ms Anne Lenfant (Director for Europe and International – Arcep), Ms Julie Mamou (International Affairs Manager – Ofcom) and Mr Klaus Pendl (First Counsellor – ICT – Delegation of the European Union to India) travelled to India to meet institutional and industry stakeholders.

The meetings were held in New Delhi and Bangalore and covered several topics making the headlines in India that are of interest for BEREC and the evolution of the digital environment in India. The delegation were particularly interested in the 3 following topics: net neutrality issues, recent structural changes in the mobile market and mobile infrastructure sharing.

We would like to warmly thank all the persons we met in India, in particular Mr R.S. Sharma, Chairman of the Indian regulator (TRAI), Mr. N Sivasailam, Additional Secretary of the Department of Telecommunications (DoT), Mr Sunil Bharti Mittal, founder of Bharti Group, high representatives of Indus Towers, BT India, Beetel, Ozone WiFi, DEN, ARM, Qualcomm India, Eoxys, Internet Freedom Foundation, Mu Sigma, Solutions Infini and Price Waterhouse Coopers.

Ofcom deserves special thanks for its involvement in the organisation of the trip.
We would also like to extend this acknowledgement to UKIBC (UK India Business Council) and to the Delegation of the European Union to India who supported the organisation of the meetings.

## About BEREC

The Body of European Regulators for Electronic Communications (BEREC) was established by Regulation (EC) No 1211/2009 of the European Parliament and of the Council of 25 November 2009, as part of the Telecom Reform package. BEREC brings together 39 electronic communications regulatory authorities from EU Member States, candidate countries, as well as EFTA members. Its mission is to contribute to the development and better functioning of the internal market for electronic communications networks and services. In particular, BEREC develops and disseminates among NRAs regulatory best practices, such as common approaches, methodologies or guidelines on the implementation of the EU regulatory framework. BEREC also assists the European Commission and the national regulatory authorities (NRAs) in implementing the EU regulatory framework for electronic communications. It provides advice on request and on its own initiative to the European institutions, and complements at European level the regulatory tasks performed at national level by the NRAs.

BEREC has a system of rotating Chairmanship and the BEREC Chair of 2017 is Arcep, the French NRA. The Board of BEREC, the Board of Regulators (BoR) is composed of one member per Member State who is in general the President or a Board Member of the corresponding NRAs.

## BEREC's annual study trip

Each year, BEREC organises a visit to a non-member country to gain insights from the local electronic communications markets and digital ecosystem. In a typical study trip, the BEREC delegation meets representatives of the NRA, the relevant ministries, as well as incumbent operators, new entrants and other stakeholders in the industry. Past destinations include Japan, the USA and China.

## Preliminary considerations

India is the second largest electronic communication market in the world after China with around 1.2 billion subscribers (out of a population of 1.3 billion people).

The population is highly diverse with significant contrasts between the rural population, most of whom live below the poverty line, and an increasingly educated population in urban areas with relatively higher standards of living.

This contrast also influences the electronic communications market in terms of connectivity. Indeed, while some of the urban areas like Bangalore are well connected to the rest of the world with good IT and telecoms infrastructure, some rural areas are still not served very well, thereby excluding a significant segment of the population already impacted by other problems related to lack of general infrastructure.

Bangalore, visited by the BEREC delegation, attracts a lot of companies from Europe and other countries interested in outsourcing IT and business process solutions. This is thanks to a highly-educated population as well as a well-developed telecoms network infrastructure. The contrast between Bangalore and underserved areas embodies the telecom network infrastructure issue in India.

In addition to the various government efforts to tackle this issue through investing in infrastructure, the private sector has also tried to find solutions by mutualisation of some of the costs of different networks. The study trip looked at **voluntary mutualisation of mobile network infrastructure** costs and the business model of network sharing through tower operators. This joint venture model enables the tower company to focus on acquisition, deployment and operational efficiency, while mobile operators focus on market growth and customer service. The split between these activities helps the operators to both be more capital and operationally efficient whilst reaching out to a greater number of subscribers.

The efficiency, and more generally the focus on cost reduction is now the top priority of mobile operators, particularly since the **disruptive entry into the market of Jio (Reliance Industry) in the autumn of 201**6. With an aggressive marketing strategy (that included an initial free offer of both voice and data services), Jio has managed to gain an important share of the Indian market (more than 100 million subscribers) in around 6 months. This new entrant has been the catalyst for the consolidation and reshaping of the market structure that is still ongoing.

The BEREC delegation met various mobile market stakeholders, notably Bharti Airtel (current mobile market leader), who gave their views about the impact of a new and disruptive entrant into a relatively stable market.

The mobile market is characterised by the predominance of prepaid offers with a very low ARPU. Although it remains too early to make a definitive assessment of the impact of Jio on the second biggest mobile market in the world, BEREC can be kept informed of developments through the contacts established with TRAI. It will also be interesting to follow the investment trends of the mobile market, especially regarding the different technologies used by operators. In contrast to its competitors, Jio has invested in a LTE-only infrastructure. As a result, and in

spite of its current low market share (9%), Jio represents 40% of the mobile broadband market (by subscribers), well ahead of second placed Bharti Airtel (18%).

This issue of wireless broadband connectivity is of high importance in the context of the broader Indian electronic communications market because it represents the main method of access to the internet for the overwhelming majority of subscribers. For the Indian authorities, access to the internet is important in terms of economic and social development and is supported through initiatives such as Digital India (offering affordable access to the internet to the entire population is one of the Government's stated key objectives). This objective was recently presented by some stakeholders as being in conflict with net neutrality rules, and **the tension between the objectives of ubiquitous coverage and affordable access on one hand with that of net neutrality on the other hand** was in many ways one of the key insights and topics of interest for BEREC during the trip.

In February 2016, TRAI made a decision that resulted in online service providers having to withdraw several offers that were in contradiction with the principle of net neutrality such as Facebook's "Free Basics" offer which included the zero rating of its (exclusive) content. TRAI reiterated that "no service provider shall offer or charge discriminatory tariffs for data services based on content". The offer of "Free Basics" was consequently removed for violating "the basic principle of Internet as a neutral end-to-end carrier of information" although Facebook had presented it as a means to increase connectivity by offering free connections (but only within a Facebook digital environment).

After their offer was removed, Facebook reviewed its approach and in November 2016, it decided to launch a new programme called "WIFI-EXPRESS", in association with local operators. In contrast to the first offer, the latter is not free but "low-cost" thanks to hotspots which allow connections within a software environment made accessible by Facebook.

The BEREC delegation recognised this decision as both interesting and important in the context of a global debate regarding the scope and interpretation of net neutrality and was keen to stay tuned to developments in India on this issue. TRAI and the BEREC delegation agreed that experts would continue exchanging on net neutrality with a view to develop common understanding. On a more general basis, TRAI and BEREC will explore the possibility to sign a Memorandum of Understand (MoU) to cooperate in the future.

Finally, this study trip gave the delegation the opportunity take a close look at **the active and growing Indian digital environment**. Several Indian start-ups, including some unicorns (a digital/technology start-up company that reaches a $1 billion dollar market value) are developing services with a view to play an important global role in the digital environment and various national and local initiatives have been launched to stimulate their development in this area.

# Overview of the telecommunications market in India


**Figure 1 - Map of India**

| **Key country data** | |
|---|---|
| Area | 3,287,590 km² |
| Population 2015 (millions) | 1300 |
| Households 2015 (millions) | 264.6 |
| Capital | New Delhi |
| GDP 2015 (US Dollars) | 2,090.7 |
| GDP/ capita 2015 (USD thousand) | 1.6 |
| **Key Telecom data** | |
| Wireless subscribers (Dec 2016) | 1,127,373,438 |
| Mobile penetration rate/cap | 86.1% |
| Broadband subscribers (Dec 2016) | 18,265,000 |
| Broadband penetration rate/cap | 6.8% |
| PSTN lines (2015) | 26,520,000 |
| PSTN penetration rate | 10 % |

**Source: Telegeography**

India, the largest democracy in the world has a population of more than 1.3 billion and is a Federal Republic (28 states) headed by a president (Shri Pranab Mukherjee) who is indirectly elected. The executive power belongs to the Prime Minister (Narendra Modi) who is accountable to the Lok Sabha, (lower house of Parliament) which consists of 543 directly elected representatives. The upper house, Rajya Sabha, is composed of members indirectly elected or named by the President (12 out of 250).

India has a three-tier economy consisting of the agricultural, manufacturing and service sectors. Although the service sector makes the largest contribution to GDP, India is one of the biggest food producers in the world and agriculture represents a quarter of the country's GDP. According to Telegeography, half of the country's workforce is involved in agriculture. The government has launched several policies and initiatives to improve its telecoms infrastructure, especially in rural areas, e.g. it has allocated €975m to extend basic mobile coverage to rural areas in the North East where 20% of villages still lack mobile connectivity.

The government's Digital India initiative is an umbrella programme that aims to transform India into a digitally empowered society and knowledge economy and lays emphasis on a national e-Governance plan. Digital India includes nine work streams among which are Broadband Highways, Universal Access to Phones, Public Internet Access Program, and e-Governance. One of the programs under this initiative has been India Stack whose aim is to enable all citizens to participate in the formal economy by using a unique and universal biometric digital identity. This will enable users to participate in any service anywhere in the country and thereby boost growth by facilitating access to both public and private digital services. Technically, it

consists of a set of APIs that allows governments, businesses, start-ups and developers to utilise the unique digital infrastructure to facilitate presence-less, paperless, and cashless service delivery.

## A. Regulatory context in India

Like other infrastructure sectors in India, the government has a large role in the telecom sector. The Department of Telecommunications (DoT) sits within the Ministry of Communication and is responsible for all major policy changes, planning and supervision of the sector. It authorises licences and is responsible for spectrum management and allocation. The DoT also promotes investments and innovation for the sector through the policies it develops. It monitors the sector and can impose penalties if needed.

In practice, its pivotal role in the telecoms sector has passed on to the independent Telecom Regulatory Authority of India (TRAI) which is a statutory body formed by an Act of Parliament. It was created in 1997 and although it is independent, its funding depends on the Ministry and some competencies are shared with the DoT.

The Telecom Disputes Settlement and Appellate Tribunal (TDSAT) was created in 2000 and was given adjudicatory and dispute settlement responsibilities that previously resided with TRAI to enable TRAI to focus on strengthening the regulatory framework.

**The Ministry of Electronics and Information Technology**

**(MeitY)** is responsible for policies related to information technologies and the internet. It was carved out of the Ministry of Communications and Information Technology in 2016 and is responsible for the promotion of internet and IT as well as the Digital India programme which includes the Unique Identification Authority of India (UIDAI) initiative.

**The Telecom Regulatory Authority of India (TRAI)**

Created in 1997 by the *"Telecom Regulatory Authority of India Act 1997"*, the Telecom Regulatory Authority of India (TRAI) has the necessary powers to regulate the networks and services of the telecommunications sector, except for spectrum management. TRAI also advises the DoT on the allocation of licences and frequencies.

The authority of TRAI is a collective and shared between five members: a Chairman, two permanent members and two others in a part-time basis. They are all selected by the Indian government for a three year term. Mr Sharma, the current Chairman, was selected in 2015.

TRAI's main mission is to favour competition to obtain better consumer services. It is responsible for authorising new service providers and ensuring the fulfilment of universal service obligations, and supports the introduction of new services into the Indian telecoms market.

One of its first tasks consisted of determining the technical and tariff conditions to ensure interconnection efficiency between the various service providers.

### The Telecom Disputes Settlement and Appellate Tribunal (TDSAT)

Created by the *"Telecom Regulatory Authority of India (Amendment) Act"* in 2000, the Telecom Dispute Settlement and Appellate Tribunal (TDSAT) began its activities in January 2001 in Delhi.

Three permanent members and two part-time members of the court are selected by the Government for a three year limited term. The President is selected from the Supreme Court whilst the other four members are usually taken from the Civil Service. The TDSAT arbitrates conflicts between operators and it can judge any appeal against decisions made, or obligations issued, by TRAI. TRAI can appeal in front of the Indian Supreme Court on the decisions of TDSAT.

Various national initiatives supporting the digital economy also deserve to be mentioned, including programs for start-ups and smart cities. Digital India and Make in India have been created to assist the development of ICT services.

## B. The telecommunications market in India

According to TRAI figures[1], the overall telecommunications market is overwhelmingly dominated by the mobile market with 1.17 billion subscribers, far beyond the fixed market's 24 million subscribers. As a result, most consumers access the internet through wireless networks (284 million wireless internet access connections in April 2017 vs 18 million internet wireline subscribers).

Another characteristic is that mobile operator revenues are still largely driven by calls and SMS. However, this will probably change in the future due to the aggressive rollout of 4G services boosted by the arrival of Jio in the market, as well as due to the use of OTT services that come in direct competition with services like voice and SMS.

The revenues of mobile operators have been affected by a decrease in ARPU at a time when they are having to invest in next generation infrastructure, not least in order to compete with Jio. One way that operators have tried to tackle this problem is through reduce network infrastructure costs through network sharing initiatives. In fact, the mutualisation of costs has long been a characteristic of the Indian mobile market - 28% of India's 400,000 telecom towers are owned and managed by independent tower companies.

In the last 1-2 years, traditional telecom operators have been raising their concerns regarding the increasing popularity of instant messaging apps like WhatsApp and Viber as these have been cannibalising their main revenue streams – voice calls and SMS. In 2016, there were some proposals from operators to remove regulatory imbalance. Earlier in December 2014, the then market leader Bharti Airtel had announced an extra charge on VoIP calls but later retracted its decision following protests and objections.

[1] Released in June 2017

TRAI is in process to formulate recommendation on net neutrality. Although there are no laws directly enforcing net neutrality, TRAI guidelines promote net neutrality and ISPs have adhered to the principle of net neutrality in India. There was a cause celebre for net neutrality advocates concerning Facebook's "Free Basics" service that led to a decision in 2016 that has more clearly set out the net neutrality guidelines in India (see below).

**The mobile market**

The Indian mobile market is the second biggest after China's with more than one billion subscribers. The market is divided into 22 zones or circles and spectrum and licences are allocated separately for each circle. This approach facilitated market access to a lot of players and made the market one of the most competitive in the world.

In 2012, a Supreme Court decision annulled the award of 122 mobile licences in 2008 on the basis that their award by the then government was 'totally arbitrary and unconstitutional". Corruption charges were subsequently levied against senior government officials and the trial is expected to conclude in 2017. The cancellation of the licences resulted in several operators leaving the market as they struggled to boost margins amid a price war among the 15 operators who were active in the market in 2012. This in turn triggered a wave of consolidation that resulted in 10 active operators on the market at the beginning of 2017. This consolidation was also facilitated by the introduction of clear new rules concerning the secondary market of spectrum licences. It allowed smaller operators to sell the frequencies they had acquired at a high cost and to exit the market. These rules were introduced to ensure that number portability and customer transfers could be operationally effective following potential mergers. Prior to this change, in 2014, TRAI had decided that transferring subscribers from one operator to another violated customers' freedom to choose their operator in the context of Bharti's acquisition of another operator. On relation to the same case, the DoT reached the opposite conclusion. Confronted with the absence of consensus and the uncertainty this created, Bharti was obliged to remove its offer.

The number of operators active in the market is expected to fall further as a result of a second consolidation phase that is in progress following the disruptive entry of Reliance Jio into the market. In only a few months, Jio, thanks to an aggressive retail offer, reached 100 million subscribers. Jio relies on the financial power of the Reliance Industries group (not to be confused with Reliance Communications that was previously in the Market[2]).

This has resulted in a wave of mergers and announcements:

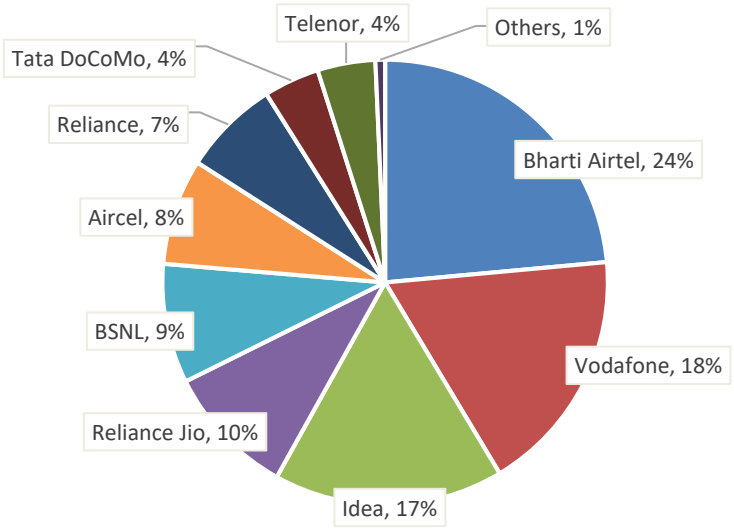
- March 20th, 2017: Vodafone and Idea Cellular (previously the second and third largest operators) announced an agreement to merge - the merged entity will become India's largest operator.
- March 17th, 2017: recommendation of a merger of the two public operators BSNL and MTNL by a parliamentary report.

[2] Reliance Industry and Reliance Communications are two different companies and competitors in the electronic communications sector. They used to be part of a same group that was split after the death of the founder. Reliance Communications now faces a hard competition in the mobile market from Reliance Industry through Jio.

- February 23rd, 2017: The current market leader, Bharti Airtel agreed to acquire Telenor (Telenor exiting the Indian market).
- September, 2016: Agreement between Reliance Communications and Aircel to merge their operations. Reliance has also agreed to acquire another operator, NMTS India and there is talk that Tata DoCoMo may also be joining the merged group.
- Separately, Reliance Communications has agreed to a strategic partnership with Reliance Jio (a new disruptive operator that is a separate operator) to share spectrum to provide LTE services.

The outcome of this second phase of consolidation (pending approval by merger authorities) could result in the number of operators coming down to four of five players with two dominant groups (Bharti Airtel and Vodafone/Idea), one state-owned player (BSNL/MSNL) and perhaps two other operators (Reliance Jio and Reliance/Aircel) who some commentators expect to merge to form a third dominant group.

**Figure 2 - MNOs' market shares, Apr 2017**




Reliance Jio, despite launching in September 2016, has already emerged as the fourth largest operator (with the second and third largest providers advanced in merging their operations) due to its aggressive launch promotional offers which let users make free voice calls to all other networks. Because of this promotional offer, Airtel saw a 5% decline in its Q2 2016 profit after slashing its data tariffs (and its prepaid tariffs by 80%) and Idea saw an even larger fall in its data revenue of 19% in the same period. Demand for VoLTE handsets has also surged since Jio launched its 4G (only) services and 80% of handsets that were shipped during Q3 2016 were estimated to be VoLTE enabled compared to only 30% in Q1 2016.

The other operators in the market tried to appeal against the aggressive sales offers of Jio, in particular against the "New Year Offer" considered by them as an extension of the "Welcome Offer" that Jio had initially proposed (TRAI rules prevented any single promotional offer from being offered for more than 3 months). This led to an appeal before TDSAT with TRAI expressing an opinion in favour of Jio, arguing that the two offers were different. On March 16th, 2017, TDSAT asked TRAI to review Jio's offers. Despite these appeals, Jio continues its

aggressive marketing strategy thanks to the considerable financial backing of the Reliance Industries group. The group also announced important investments to enlarge its network, in particular its LTE network.

For Jio's competitors, the economic equation is particularly complicated in a market where more than 95% of the subscriptions are prepaid. In addition, the average revenue per user (ARPU) is among the lowest in the world (estimated by the GSMA to be less than $4 per unique subscriber in Q2 2016) and it is continuing to decline.

While the market has historically been driven largely by voice, the mobile market is now characterised by a fast growth in data usage. The need for investment to upgrade the networks to 4G will probably lead operators to find new sources of revenue or reduce costs. By the end of June 2017, Reliance Communications was believed to be about to return a certain amount of spectrum in the 1800 GHz band to reduce the fees related to those frequencies. It is worth noting that the fees are often judged to be relatively costly while ARPU is relatively low.

Another solution to reduce costs has been to mutualise mobile network infrastructures via initiatives like Indus Towers, the first tower company in India. Indus Towers resulted from a joint venture between Bharti Group, Vodafone India and Aditya Birla Telecom. Indus Towers' network is open to all operators without discrimination. As well as reducing costs, network sharing enables mobile operators to concentrate on other customer facing activities like marketing or customer service.

TRAI regularly reports on the quality of service in the mobile market and it is currently undertaking a review on this area. Recently, as well as providing information to the public, TRAI also decided to obtain feedback from the public by launching several mobile applications. The 'My Call' app is one of TRAI's apps used for crowdsourced mobile QoS monitoring. The app is designed to be user friendly and sends a pop up request at the end of a call to ask users to rate their previous call. Data speeds are also collected through another app called "My Speed".

The above initiatives of TRAI are designed to improve the information for consumers on mobile operators' QoS but can also be an incentive for mobile operators to upgrade their services where needed.

**Fixed broadband market**

The Indian market for fixed broadband is the tenth biggest globally with more than 18 million subscribers at the end of April 2017. However, this market is extremely small given India's size and equates to a penetration rate of around 6.5%, less than Senegal (6.9 %) or Uzbekistan (8.4 %) for example.

According to TRAI's figures, in April 2017 there were more than 280 million internet users in India, including narrowband and mobile users. Mobile remains the main means to access the internet in India, mainly through 2G (EDGE and GPRS) until Jio's entry into the market using a 4G only business model.

The Government launched the *"Digital India"* programme to improve the broadband situation in India, in particular through optical fibre deployment, including in rural areas, while implementing new rules to allow VNO (virtual network operators) market entry. The introduction of the VNOs was made following the recommendations of TRAI.

Another characteristic of the Indian market for fixed broadband is that competition is very low. Indeed, there are a lot of ISPs (more than 130) but they have very low market shares compared with the incumbent government-owned operator (BSNL) which had 55% of the market in June 2016. The second biggest ISP hardly reaches 10% market share. The total market share of state-owned players is even stronger when the 6.5% market share of MTNL is factored in (a parliamentary report has recommended the two state-owned operators be merged). The lack of competition is linked to the lack of unbundling in India – as mobile is the overwhelming means of accessing online services, unbundling was never a regulatory priority.

The introduction of VNO licences is aimed at remedying this situation. However, in the absence of regulation, the potential VNO must negotiate agreements with the infrastructure owners, allowing them to impose unacceptable conditions for the competitors. However, the two state owned actors, BSNL and MTNL, have announced their intention to make acceptable proposals to potential competitors.

More than two thirds of the fixed broadband connections are made on DSL (about 13 million). High speed broadband levels are relatively low but this situation is being improved with the rollout of fibre networks (2 million subscribers) and modernized cable networks (1 million).

**Net neutrality in India**

In the last couple of years, several events have put net neutrality issues into the spotlight in India. With the emergence of the internet as a major way to access information as well as for communications, concerns were raised regarding the need to preserve net neutrality, notably in relation to commercial projects like Facebook “Free Basics”.

In 2015, the DoT created a committee on net neutrality and issued a report in May 2015 where it sought recommendations from TRAI. In parallel, confronted with the issue of Facebook’s “Free Basics” platform, TRAI issued a Regulation on the prohibition of discriminatory tariffs for data services which led to the withdrawal of the “Free Basics” service. Free Basics had offered free access to the internet, with a local mobile operator partnership, but in a digital environment controlled exclusively by Facebook. Following that decision, TRAI initiated a series of consultations:

- 19 May 2016: Consultation on free data.
- 30 May 2016: Pre-consultation on net neutrality.
- 19 Dec 2016: Recommendations on provisioning of free data.
- 4 Jan 2017: Consultation Paper on net neutrality.

The two-stage consultation process was designed to first identify all the issues related to net neutrality in a first consultation and then a second consultation to issue the final views of TRAI on net neutrality.

The second consultation closed in April 2017 and TRAI is still analysing the numerous contributions published on its website. In this second consultation paper, TRAI clarified the scope of the analysis, with a focus on OTT service provision, and took a position regarding the definition of net neutrality.

TRAI also stated that although the net neutrality debate is taking place at a global level, several variations that are specific to the Indian market such as the legal situation, the level of digital development, adoption rates of internet services, justify a specific approach adapted to the Indian context.

## Key Insights from meetings with Indian stakeholders in the ECS and IT sectors

During the study trip to India, the BEREC delegation met with a range of stakeholders representing ECS operators, IT/IoT ecosystem including both start-ups and established service providers, the analyst/consultancy sector as well as representatives from the industry regulator and from the relevant government ministry.

In this section the report summarises the key insights and facts about the Indian ECs and IT sector with a view to both inform the BoR about developments in the Indian market as well as to help identify areas which can form the basis of keeping communications ongoing between BEREC and Indian stakeholders to aid a better understanding of common industry issues and to share best practices.

The meetings notes have been grouped into the following areas:

- Indian ECS sector – snapshot
- Indian ECS sector - developments
- Indian ECS sector – networking equipment and devices
- Regulation of ECS

Indian ECS sector - snapshot

| | |
|---|---|
| The Indian mobile sector is characterised by a tough operating environment… | • Overwhelmingly prepay (95%) and characterised by users having multiple SIMs.<br>• Relatively low ARPU of $2.30. Voice call rate is less than 1c per minute.<br>• Churn is relatively high – 59% in 2017 (this is reflective of a market dominated by prepay users). |
| …and growth in new services has yet to take off… | • ARPU is still dominated by voice services (65% of revenue) although this is down from 82% in 2015 as data usage rises.<br>• 3G and 4G services make up 20% and 15% of revenues respectively. |
| …while economic fundamentals remain challenging… | • Very competitive market with 10 national operators.<br>• Disruptive new entrant in Sep 2016 (Jio) that has pursued a data centric 4G strategy gaining 100m customers (9% market share) and 90% of data traffic by volume since launch.<br>• Relatively high costs of spectrum (per MHz per customer). |
| …but it is still a profitable sector with high EBITDA margins | • No handset subsidies and the price of devices has halved with quality smartphones available from $70.<br>• High volumes of customers.<br>• Innovative features such as network sharing, TowerCos and IT outsourcing. |
| Both active and passive infrastructure network sharing is expected to increase… | • Indus towers is a JV between the three largest operators (Airtel, Vodafone, Idea) that controls 282,000 towers (base stations) and voluntarily offers infrastructure to the operators on a non-discriminatory basis.<br>• The voluntary JV model enables the TowerCo to focus on deployment/ operational efficiency while the operators can focus on market growth and customer service.<br>• Driver for JV is the need to reduce costs in the face of new investment requirements and downward pressure on prices – the business model is based on payment per site/antenna and these costs come down the more operators there are per site. |
| … and market consolidation is expected by some to reduce the | • The long-established market leader, Bharti Airtel has acquired Telenor. Some market players foresee a reduction in the number of operators by half by the end |

| | |
|---|---|
| number of operators to 4-5 operators | of 2017 (from 10) and think it is vital considering the competition from OTT providers and the need to invest in networks.<br>• Vodafone and Idea, the second and third largest operators, are merging to create a new market leader<br>• A three-way and possibly four-way merger between several mid-scale and sub-scale operators is currently underway. |
| Potential new sources of revenue | • Aadhar is the largest biometric project in the world and although it is currently only used for financial services, it can be used for wider m-commerce services. The ability to enable customers to make transactions using their mobile devices is expected to offer a new source of revenue and increase customer fidelity.<br>• The new entrant Jio is pursuing a data centric strategy and is part of a group with media interests – future revenue growth may come from bundles including content. Currently, in India, the two main broadcasters provide content to all service providers on the same conditions.<br>• Although data use is increasing, many customers don't have data access and so SMS, which is faster and more efficient than OTT services, remains a reliable choice for consumers and service providers. Telemarketing has a low registration fee of €250 for providers and remains the best way to comply with regulations such as sending confirmation messages to customers for banking transactions. |

Indian ECS sector - developments

| | |
|---|---|
| Reliance Jio has been a very disruptive new entrant since it launched in Sep 2016 | • It launched with a six-month free voice and data promotional offer and a 4G network whose coverage extended to 80% of major Indian cities.<br>• Its estimated costs to data since launch are $50bn.<br>• 50% of its towers are connected to fibre backhaul compared to 20% across the rest of the market (low fibre connectivity is a major challenge for the industry). |
| Ambitious government digital agenda initiative that will require major investment | • Digital India serves as an anchor for innovation on smart cities and IoT and in particular it aims to include rural areas in digital developments.<br>• The programme aims to bring fibre to 250K villages (in a deal with Microsoft) and to cover 100 cities in its Smart Cities initiative.<br>• The Smart Cities initiative was concentrated on three corridors that linked Mumbai, Chennai and Bangalore. This has attracted FDI from Japan, Spain and the UK.<br>• IoT is likely to be software oriented and data analytics will bring great opportunities. India is well positioned in this area – the government is seeking to leverage this and attract more FDI.<br>• Despite the benefits of data driven activities and IoT, connectivity is expected to be more important for operators than innovation in the near future. |
| The TowerCo model will evolve to include active infrastructure and 5G deployment | • In 2016, the government has changed the terms of the Unified Licence (UL) to allow active infrastructure sharing although it has yet to take place.<br>• Advances in battery and electronics technology are resulting in lower costs (less reliance on diesel and on air conditioning - energy is the second largest cost for mobile sites after lease/rents).<br>• The TowerCo model will be relevant to realising the government's Smart Cities initiative and it is expected that most 5G deployment will happen in cities. Recent DoT mandates regarding rights of way are also seen as positive development to facilitate 5G |
| There is no LLU and very little competition in serving the fixed consumer market… | • Fixed line coverage is less than 5% and declining due to ubiquitous mobile coverage. Network sharing arrangements as exist in the mobile sector were mentioned as a possible desirable option for NGA fixed networks. |

| | |
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| | • There is competition in the fixed enterprise sector - publicly owned BSNL/MSNL, Airtel and Reliance are active in this market and Vodafone is also investing.<br>• The main products in the enterprise sector are IP transmission, data centres and cloud computing.<br>• There is no perceived need for a harmonised wholesale enterprise product or even harmonised SLAs as infrastructure in different countries is different and technological changes and user preferences will dictate wholesale products.<br>• A new law requiring in-building wiring for new buildings has yet to deliver results. Expensive rights of way were seen as a big issue inhibiting deployment. |
| …and cable coverage is also very low and limited to the big cities | • DEN Networks is the largest cable TV operator and reaches 13m households spread over 200 cities, offering TV and broadband with speeds of 10-100Mbps.<br>• Although there is competition between cable providers in urban areas (including public providers), coverage in rural areas is low.<br>• Most last mile cabling is overhead rather than underground due to the costs and difficult climate conditions and for the same reasons, there are considerable challenges for FttX solutions. |
| There are fewer regulatory barriers for ISPs but challenges remain for the last mile | • Only a simple notification is required for ISP providers to provide services – they tend not to own infrastructure but instead rent from cable operators (using wireless services in rural areas where the quality is poorer).<br>• For backhaul, mobile operators are deploying small cells and using WiFi offload. |
| The ministry is developing the ecosystem for 5G but it is at the nascent stages | • India is the world's third largest start-up hub and 43% of start-ups in India are technology based.<br>• With a well-developed private equity sector, developments have started to move from ICT to design; Cisco, Intel and Qualcomm carry out R&D in India.<br>• The DoT does not see driverless cars soon but thinks other applications such as undersea mining are promising.<br>• Qualcomm sees B2B industrial applications such as agro-tech as promising rather than B2C applications which require scalability and currently lack a compelling user case.<br>• Scalability will be easier if features are in the cloud but this requires good quality links from the devices to the gateway. |

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| | • No decision has yet been taken regarding availability of unlicensed spectrum, small cells or shared frequency use. |
| Biometric identification project (Aadhar) | • Aadhar is the largest biometric project in the world and although it is currently only used for financial services, it has great potential for wider m-commerce services. |
| Tax reform | • Appropriate taxation and fee regimes were seen by some as crucial to enable infrastructure investment in developing countries.<br>• In addition, taxes should be applied fairly, i.e. similar services such as OTT services should operate under the same rules. In India, a call made via an OTT service bears no tax and pays no spectrum fee unlike for VoLTE. This is currently subject to consultation in India.<br>• The BEREC delegation noted that in Europe, competition law applies equally in different sectors. |

Indian ECS sector – networking equipment and devices

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| WiFi growth is expected to grow fast although the business model is still not clear | • Interesting operator-neutral model by Ozone offering free WiFi in high demand locations, such as airports, main hotels, cafes, fast food chains and shopping malls (verticals with whom they have exclusive agreements), as well as a paid, seamless WiFi connectivity (without passwords) package across multiple WiFi hotspots<br>• Massive shortage of VDSL and WiFi equipment with most equipment coming from China.<br>• Diverse needs with Google investing in WiFi for wealthier households and in railway stations and Vodafone investing in the enterprise market.<br>• The number of WiFi hotspots is forecast to increase from the current 40K to around 1m by 2020 (by comparison, China currently has about 2m hotspots). |
| Data Analytics and WiFi offloading are expected to be the main sources of revenue | • Although video advertising provides some revenues, offload agreements with mobile operators is expected to be the main source of revenue, especially as 5G will face the same difficulties as 3G/4G regarding in-building penetration.<br>• Data Analytics from data collected from stores and shopping malls which can be packaged as a B2B service will be available and this is why Google is investing in railways.<br>• TRAI (the NRA) has been relaxed about WiFi providers collecting customer data and most consumers care more about getting free data than about their personal data.<br>• The Internet Freedom Foundation (an open internet advocacy group) praised data protection regulation in Europe and hoped an Indian version would evolve. |

Regulation of ECS

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| The role of regulators is changing | • The chairman of TRAI felt that a few years ago, NRAs were primarily concerned with licensing and being limited to managing national networks.<br>• With the advent of online services, regulation is more global and is concerned with matters such as privacy and security on cloud based services, net neutrality and IoT. |
| Net neutrality has been a big discussion topic… | • TRAI received 2m responses on its NN consultation. It subsequently decided to prohibit discriminatory tariffs, relying on its competence on price discrimination.<br>• TRAI is currently consulting on a second NN paper concerning traffic management practices (which are not prohibited but subject to transparency and objectivity conditions) and on the treatment of specialised services.<br>• There was a debate with the BEREC delegation on the applicability of NN rules depending on whether the cache was located locally or in the network.<br>• TRAI is also considering mandating speeds for certain services and told the BEREC delegation that they are enabling a comparison of actual QoS with advertised speeds to enable the assessment of complaints.<br>• TRAI and the BEREC delegation agreed that experts would go on exchanging on net neutrality with a view to develop common understanding |
| …and the Internet Freedom Foundation played a big role in the campaign that led to the prohibition of Facebook's Free Basics product | • The Internet Freedom Foundation (IFF) aims to defend online freedom, privacy and innovation. It is staffed by volunteers and played a major role in the NN debate, often citing decisions of BEREC and European NRAs.<br>• It led a successful campaign against Facebook's 'Free Basics' product (a closed Facebook platform that provided free access). |
| Nuisance Calls | • TRAI explains that 230m people have registered on its "do not call" registry.<br>• It has also introduced rules that marketing calls can only come from registered numbers although this does not apply to SMS. This enables better enforcement of its rules, requiring operators to investigate and potentially disconnect numbers from which nuisance calls are being made.<br>• A provider is blacklisted after 6 infringements although some providers have found workarounds using multiple SIMs using so called SIM farms. |

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| | • Such a policy stands a good chance of success in India due to the absence of internet telephony. |
| Spectrum Allocation | • Spectrum is awarded in India through auctions and licences are awarded for 20 years.<br>• There is a current consultation on licensed shared access (LSA) and on unlicensed spectrum use.<br>• Spectrum trading and sharing is allowed. |

## List of meetings held by the BEREC delegation

### 1. Price Waterhouse Coopers (PWC)

PWC provides a range of professional services in India, including accountancy advice, business consulting and tax and regulatory services. It has offices in Ahmedabad, Bengaluru, Chennai, Delhi NCR, Hyderabad, Kolkata, Mumbai and Pune.

### 2. Indus Towers

Indus Towers is the largest Tower company in India. It resulted from a joint venture between entities of Bharti Group, Vodafone India and Aditya Birla Telecom. The objective of the company is to offer a shared telecom infrastructure to the operators on a non-discriminatory basis.

### 3. Department of Telecommunications (DoT)

The DoT, reporting to the Ministry of Communications (MoC), is one of the key bodies for policy and regulation of the telecoms sector. It was formed in 1985 and has also acted as a provider of basic services in the sector. It is also responsible for granting licences for various telecom services and for spectrum management.

### 4. British Telecom (BT)

BT has been present in India since 1995. It provides networked IT services to businesses operating in India, in particular in sectors such as IT, IT enabled service (ITES), banking and financial services, manufacturing and pharmaceuticals.

### 5. Beetel

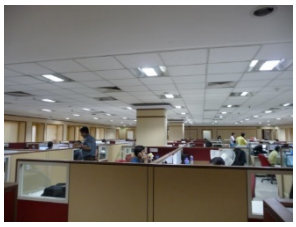
Beetel (of Brightstar Telecommunications) is a leading distribution and manufacturing company in India offering a wide range of innovative products in mobile handsets and accessories, fixed line telephone, enterprise solutions and IT accessories.

### 6. Ozone WiFi

Ozone is a leading WiFi service provider in India. It has entered an agreement with search giant Google for joint initiatives around public WiFi in India, as well as talking to telecoms operators, such as Reliance Jio, for data offloading.

### 7. DEN

DEN Networks Limited is India's leading cable TV distribution company reaching an estimated 13 million households in over 200 cities across India. It also offers cable broadband connectivity, with speeds of 10 - 100 Mbits/s.



### 8. Bharti

Bharti Airtel is a leading telecoms service provider, offering mobile and fixed broadband, TV and enterprise services.

### 9. Telecom Regulatory Authority of India (TRAI)

TRAI is a statutory body, established under the *Telecom Regulatory Authority of India Act*, 1997. TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace which will enable India to play a leading role in the emerging global information society. One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

### 10. Vodafone

Vodafone provides a range of telecoms services across India. It has recently merged with Idea Cellular, creating the country’s largest telecoms company.

### 11. ARM

ARM is an international company involved in semiconductor manufacturing and software design. ARM's Indian subsidiary notably work on marketing and research and development.

### 12. Qualcomm ventures and Ideaspring capital

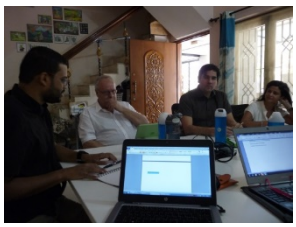
Qualcomm Ventures is the venture capital arm of Qualcomm, a provider of telecoms products and services, and was formed in 2000 to make investments in start-ups that are operating in sectors with future potential for growth. For instance, it directly invests in several Indian mobile and internet start-up companies. Ideaspring Capital invests in early stage technology product companies in India. They fund ideas and help them achieve commercial viability and scalability.

### 13. EOXYS

EOXYS is a fast-growing company which focuses on product engineering of IoT devices, sensors, controllers and servers.

### 14. Internet Freedom Foundation

The Internet Freedom Foundation (IFF), born out of the SaveTheInternet.in movement for net neutrality, works on a range of issues including net neutrality, free expression, privacy and innovation. IFF try to gather volunteers that supports research and advocates free and open internet.



### 15. Mu Sigma

Mu Sigma is a management consulting firm that primarily offers support for decision-making based on ‘big data’ analytics.

### 16. Solutions Infini

Solutions Infini Technologies Ltd. founded in Bangalore is an enterprise and bulk messaging solutions provider. Its solutions allow companies to reach their prospects all around the world through more than 1000 network operators.