

**RESPONSE TO
TRAI CONSULTATION PAPER
ON
NATIONAL BROADBAND PLAN**

SYNOPSIS

Although the National Broadband Policy enunciated in the year 2004, envisaged coverage of 20 million broadband connections by the year 2010, the performance so far has not been up to the expectations. In order to ensure continued economic growth of the country, rapid spread of broadband both in the urban and rural areas is imperative. The need of the hour is to evolve a National Broadband Plan, covering various aspects right from the definition of broadband to spread of infrastructure and various regulatory and other issues.

The power of Internet has brought greater awareness, skills and resources, helping markets reach to a diverse global audience. Broadband provides the opportunity to do things differently, to achieve better outcome for people, countries and to ensure continuous growth of economy and social development. The proliferation of the broadband enables growth of Information and Communication Technologies (ICT), content, applications and services which may help India to become a truly competitive knowledge based economy and leverage citizens to become healthier, better educated and more engaged in their community & society.

This paper considers the Broadband eco system for India and split in to three separate sections.

The First section addresses the challenges that the BB faces today.

The Second section analysis in detail the various sub system of BB ecosystem and mutual interaction.

The third section comes up with the recommendations to help the whole BB eco system to reach a new level of performance.

Agenda

1. Broadband Challenges:
 - 1.1. Business viability for Private Operator
 - 1.2. Infrastructure
 - 1.3. Suitable Terminal
 - 1.4. Content & Application
2. Broadband Ecosystem
3. Key Suggestions
 - 3.1. Wireless Broadband
 - 3.2. Creating Demand
 - 3.2.1. Surveillance of Public Activity
 - 3.2.2. Traffic Surveillance
 - 3.2.3. E-Governance
 - 3.3. Network Creation
 - 3.3.1. Obligation for Operator
 - 3.3.2. ROW
 - 3.4. User Friendly Terminal
 - 3.5. Content & Application

1. Broadband Challenges:

There are various challenges come underway to enhance the BB proliferation we have tried to mention all aspect whether it is related to regulatory or any other areas.

We have categorized all challenges under four subheadings:

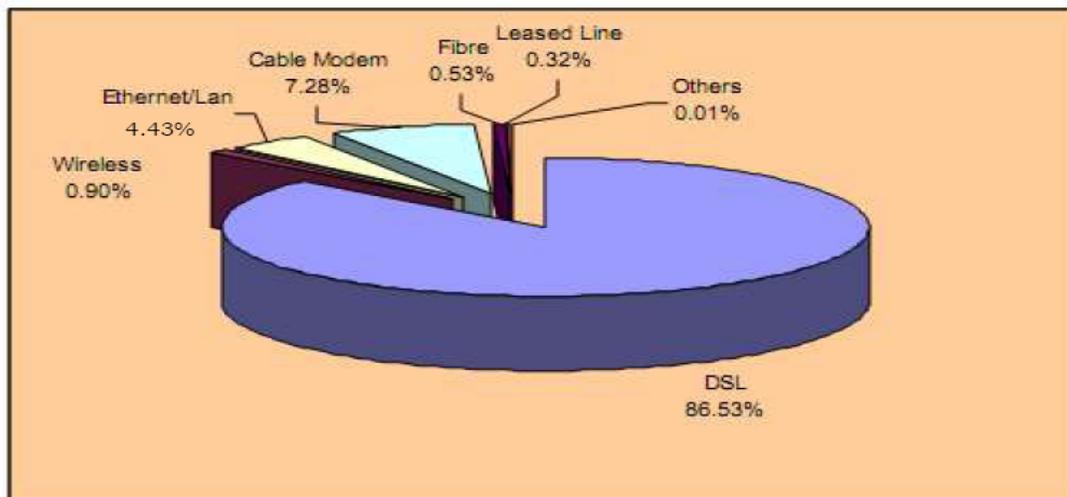
- Business viability for Private Operator
- Infrastructure
- Suitable Terminal
- Content & Application

1.1 Business viability for Private Operator:

Two kind of business method a telecom operator can do to enhance broadband.

One is Fixed Broadband (FBB) and another is Mobile Broadband (MBB).

In India we have more 638 Million (30th,April,2010) subscribers and out of that broadband subscribers are app 9 Million (30th,April,2010) only. If we see in below chart Wire line BB is the major contributor for enhancing broadband in India.



Source: TRAI

To enhance MBB government has already completed the much awaited auction for 3G and BWA and we hope that MBB will provide the broadband connectivity

much faster than Fixed Broadband due to some issues in FBB i.e. ROW, last Mile connectivity, much slower roll out, Time to Market etc .

- a) MBB(Mobile Broadband): The chicken and egg situation of broadband industry is going to extent to the MBB as well. High cost of 3G and BWA spectrum have changed operators plan to roll out and business cases. Operators may initially deploy 3G/4G in metros and mini metros i.e. top 100 -150 cities initially catering to high end customers. Low demand in other cities does not warrant the creation of infrastructure and lack of service availability, suppresses the demand. Therefore unless and external push is created the impasse will never resolve.

Month	Broadband Connections in Million	DSL Broadband Connections in Million	Wireline Connections in Million	% of wireline Connections having DSL Broadband
March-2010	8.75	7.93	36.96	21.45%

- b) FBB(Fixed Broadband): Current fixed broadband is heavily depend on existing copper which is running out of stream. Creating new infrastructure for just FBB is unviable with little ROI for more than 5 years and with lot of churn (high end customer is mobile and not stable and Quality is also a major factor) in the customer base, the fixed infra structure may result in to significant losses.

Infrastructure is the most costly component which is affecting the business case negatively. An infrastructure which is not shared among multiple operators may never result in to a viable business case hence will not support the proliferation of BB.

1.2 Infrastructure:

1. Creating an infrastructure is main bottleneck to enhance BB. Whether it will be a case of creating fiber roll out for last mile connectivity or utilization of existing DSL connection through existing copper.
2. Utilization of existing copper as 50 % of available cable loop is capable to deliver BB services and only 50 % of these capable connections exist with in range of 3 kms from the exchange so app 25 – 30% fixed line connection can be used for BB connection from DSL so in long run, DSL could not be suitable to satisfy futuristic subscriber bandwidth demand.
3. In India, major, wireless internet connection is done through 2G ie.. EDGE technology which can not meet the existing requirement of BB i.e. 256 Kbps. To enhance wireless infrastructure, new technologies like BWA and

3G,4G can be good solution. As already explain in above section that government has allotted the spectrum for 3G and BWA .Now to realize the real potential of broadband which can support high bandwidth application like mobile TV, VOD etc, much larger spectrum is required.

4. In case of fiber roll out, complicated ROW procedures and high ROW charges (1000 to 20,000 per meter depending on different areas and agencies) and ROW clearances have proven to be major hurdle in creating new infrastructure and caused delay in roll out plan. In spite of lots of discussion, no major guidelines have been formulated, to resolve this issue which became fundamental root cause against creating a robust infrastructure to provide BB connectivity and cater future demand of applications.
5. Infrastructure sharing is also not happening because of inherent operator interest.

For example: One operator has laid its fiber at some place. This operator does not want to share it with any other operator because in that case another one can steal his business from this area and affect the business case of existing player.

1.3 Suitable Terminal:

As per National readership survey, India is having 818 Million populations with 12 years age and above.

Total English literature population: 91 Mn

Total Computer Literate Population: 87Mn

25% population stay in cities out of that 32% is computer literate

So we can say that PC is not the terminal for BB proliferation. Tablet can be a good device but it is costly so it is not affordable.

In India, customer is nomadic and not requires all application on move but require on stationary. While stationary one of the main applications will be video communication.

Basic characteristic of suitable terminal:

1. Larger screen:
2. Ease of Browsing
3. Usability: Common man don't know how to use a simple 2G phone accept to press a button
4. Smart input.: Some voice and gesture recognition techniques will help to boost the usage for Broadband.
5. Unified terminal for various applications i.e. for data and voice

6. Dynamic IVR for various inputs (more elaborated in applications)

Various shortcoming/features as mentioned above in the available terminals is a prime reason for less penetration of BB

1.4 Content and Application:

Content and Application drives a major role in BB penetration. However there are quite a few challenges here as we do not have enough useful content and applications. Some of the challenges are listed below:

1. There is not enough content in local language. For example An illiterate person does not know how to fill a form which is available on government site and has to depend on intermediaries to do this small job. He has to spend significant time and money to complete these necessary but small jobs.
2. Lack of applications like crops mandi prices, health education, weather information, Astrology
3. Lack in the awareness of government policies, new initiatives in E governance plan
4. Voice over IP can not be terminated on PSTN and hence it is not really available through Broadband. Voice may be the killer application which can make the broadband popular.

2. Broadband Eco System:

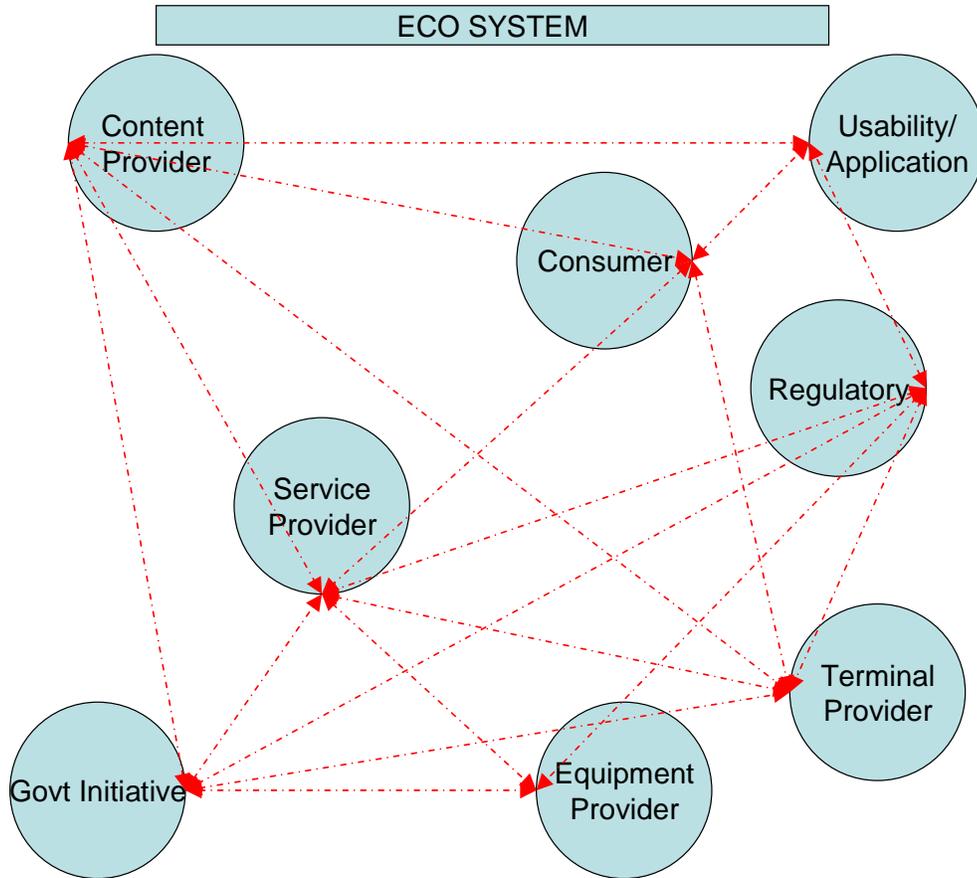
A healthy ecosystem needs to be developed and maintained whose main aim is to work together to promote BB connection. The current ecosystem is not self sustainable and has a lot of issues..

Various stakeholders of the ecosystem are interacting with each other in complex form to enhance BB.

The following section analysis the key stakeholders and their interactions.

There are several stakeholders as mentioned in the below figure, which are working independently and responsible for enhance BB connectivity:

1. Consumer
2. Terminal Provider
3. Service Provider/Operator
4. Applications/Usability
5. Regulatory Bodies like TRAI
6. Government Agencies
7. Content Provider
8. Equipment Provider



Consumer: It is one of the most important stakeholders who may use BB to fulfill his basic needs, and to enhance his lifestyle. He can use BB for basic needs such as take education, get the information related to various government plans, health related information etc as well as social needs such as interaction with friends and family and community at large.

Terminal Provider: A user friendly terminal with the capability of supporting basic features (as already explained above) in the right price bracket is a must. There are different technologies available like 3G ,4G BWA, to promote BB. A common handset need to be developed which can support voice and data both simultaneously using these technologies so that user need not depend on multiple devices.

Service Providers: It can provide different services to consumer using fixed network and Mobile network. Enough competition is there:13 operators are already existing per circle and more than 100 ISP providers are providing internet services In spite of various providers still the BB penetration is low.

Applications/Usability: In India voice is the killer application and widely accepted. As a BB service no killer application exists due to various reasons already mentioned above. New application need to be evolved which a user can use in an easy way and help to provide basic requirements on daily basis.

Regulatory Bodies like TRAI. Who recommend different policies and regulation so that different stake holders work together toward increasing the proliferation of Broadband.

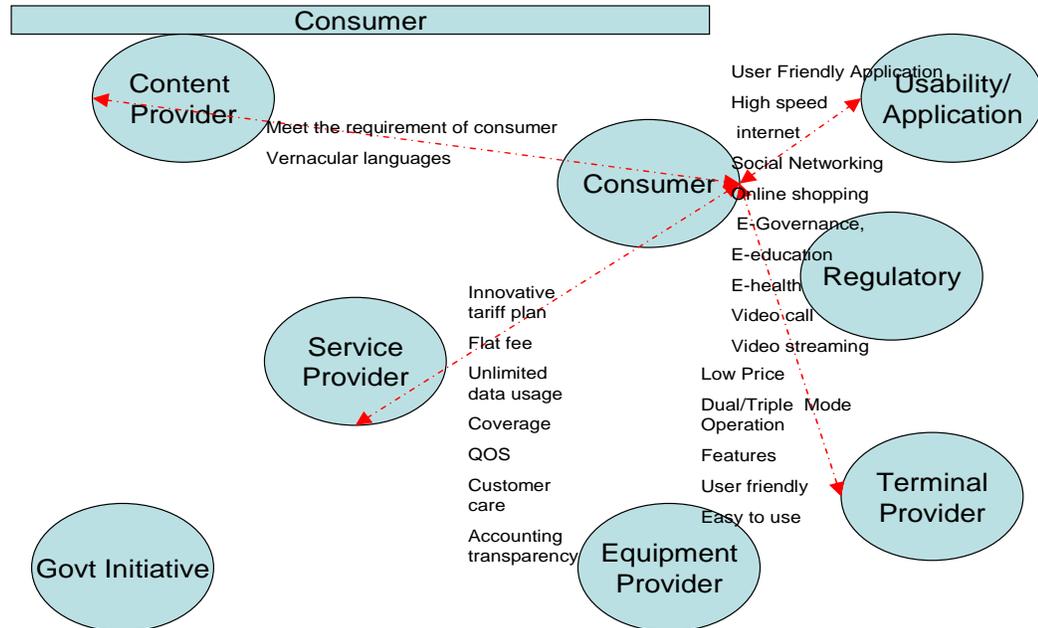
Government They formulate different telecom policies in different domain after taking recommendation of different stakeholders from the industry. Government also is the largest single customer for the BB and as such very much influence the whole market by creating demand.

Content Provider: Lots of work needs to be done on this area. Relevant content in different languages need to be developed which can be used by masses.

Equipment Provider: These stakeholders provide equipment to service provider who will create an infrastructure and provide services to the masses.

Now, we will explain each stakeholder in detail like what they want from other stake holders or how other stake holders depend on each other so that every body contribute their best and boost the BB proliferation in an effective way.

2.1 Consumer



As explained in the diagram , Consumer will depend on four stake holders i.e. Terminal provider, content provider, Usability/ Application provider and Service provider to enhance the BB proliferation.

A service provider can provide Innovative tariff plan depend on different segment of masses i.e. Flat fee and unlimited data usage which is quite popular and provide good coverage and different QOS , better call center who can resolve users query and accounting transparency, Which will help to enhance the BB proliferation.

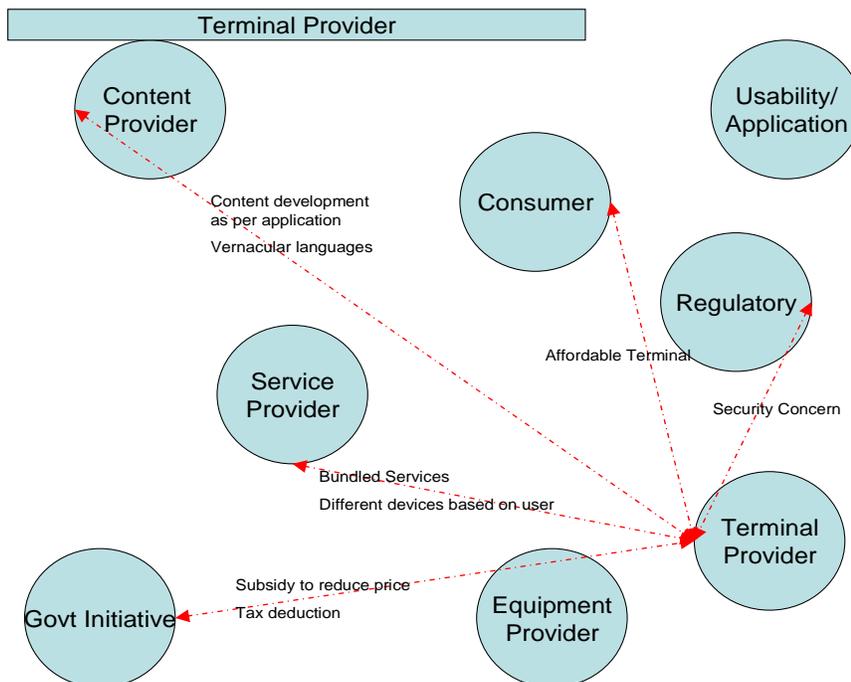
From terminal provider, consumer wants cheapest model terminal with different innovation features. Main thing is that it should be easy to use not so much complications. Only single handset/CPE for different service i.e voice and data. It should support future technologies also and have basic features already explained above.

Application and usability: Consumer want different user friendly applications which are easy to use like for example: internet browsing , user will click one button which will connect user to directly the site he does need to go different menus to search internet browser and than a small click will enable him to connect to internet. Mainly an application will be visual centric rather than

different analogy of going from one menu to another. A screen will display all search engines or tools for different application. Key application is video call with the help of that the whole life style of a common user will be change. For example He can talk to his relatives and see with video also, can get prescription from doctor etc. He can save time and money by avoiding the travel required for such purposes. The same way anybody can attend interview, business meeting etc.

Content Provider: Consumer want content provider to developed content in different local languages. Firstly in India, persons are illiterate they don't know English due to that they have to depend on other for their work which will increase brokery system and most of the earning will spend on the brockery system for their small needs. Application are available but due to language problem it can not be available to masses which become a major hurdle in BB penetration.

2.2 Terminal Provider:



A terminal provider depends on five different stake holder as mentioned in the diagram to enhance the BB connectivity.

Service provider can support terminal provider by using terminal as a bundled service in their tariff plan .Different devices for different services or different tariff. Different kind of devices like Data cards, handsets, CPE for different

segment of masses. It will support multi band for different technologies as per customer needs.

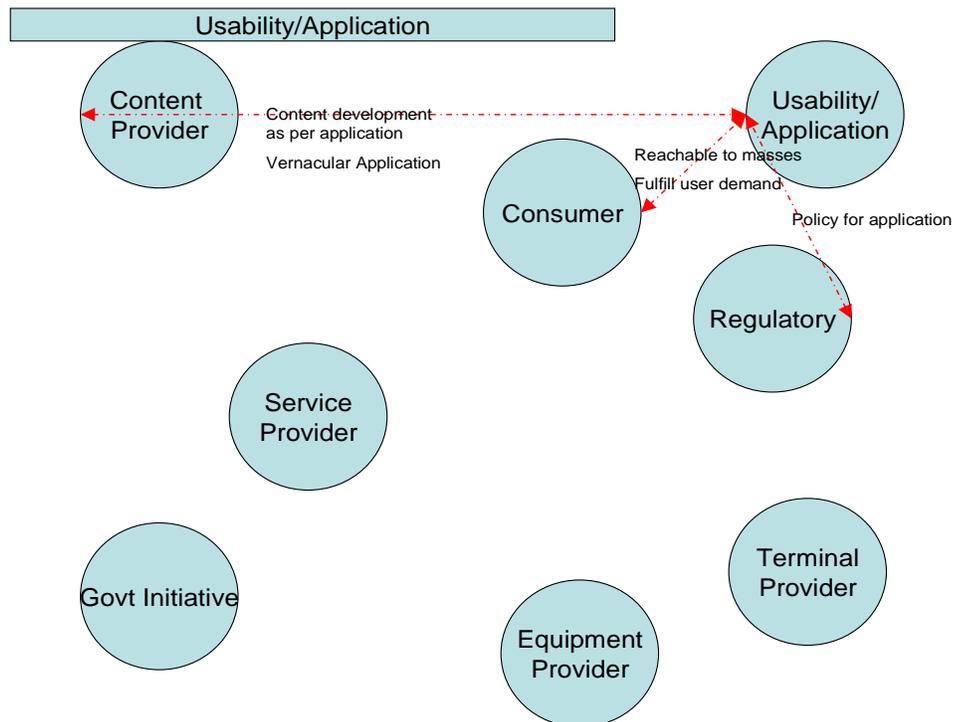
Content provider will develop content in local languages which will be supported by various terminals.

Government Initiative: Government will give support in providing subsidies and tax benefit for mass production. Government can give extra benefit to terminal provider by promoting home production of terminal in India by exempted various taxes, import duty etc. Labs can be set up by government for testing and validation of equipment and terminal for security clearance.

Regulatory: Security is the major concern. It will give strict guidelines for terminal provider which will not caused any security threat and any body who is not fulfill the condition a heavy penalty has to be made .

Consumer want affordable and cheapest terminal and easy to use from terminal provider. Apart form that other basic feature already explain in earlier sections.

2.3 Usability/Application:



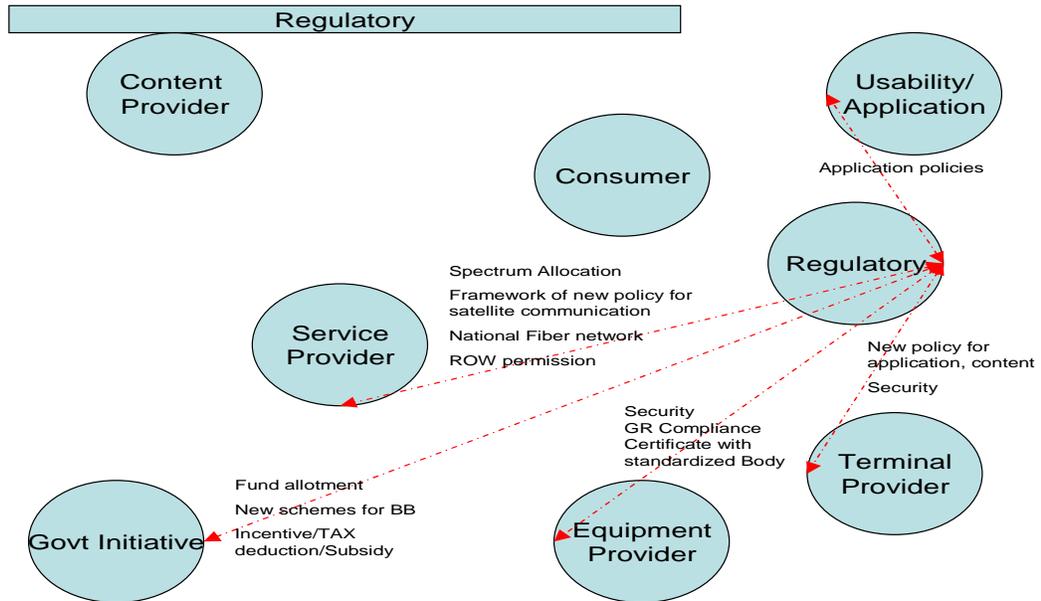
Usability/Application: It will depend on three main stakeholders as mentioned in the diagram.

Consumer: Any application which reaches to masses and which will improve their life style, fulfill their basic needs and improve literacy. Consumer Is illiterate he does not know how to read, how to use terminal, not know English. Due to all these he can not fully utilize various government schemes to improve their life style, basic needs and other government initiative. Various government plans, like e governance, e health, e education, internet browsing, mandi price, weather information, fish price, astrology, rail booking, air ticket, video call, all these application will change a common man life.

Regulatory: Trai should recommend a guidelines that every service provider should provide some basic application, which is must needed to enhance BB penetration, during creating a network. All information related to this services will be available in their website. Various customer care should be installed to give enough information on these services to customers. Regular check should be done by third party agencies, if any body fail to meet this, a penalty should be paid by respective service provider.

Content Provider: For an application, content should be provided in different languages and it should be easily accessible for masses.

2.4 Regulatory:



Regulatory depends on five stakeholders to enhance the broadband connectivity:

Service provider (SP): Spectrum allotment for different services like 3G/4G services. SP can get ROW permission easily than they can implement fiber roll out and penetrate BB penetration much faster..

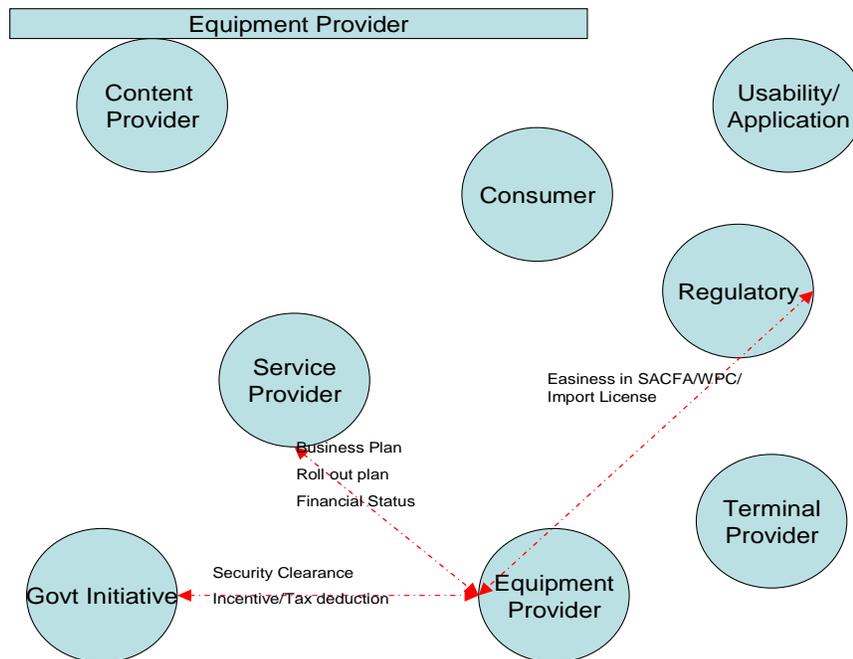
Usability / Application: Different application will be decided for masses which can easily access by common man so that regulator will make guidelines which will be implemented by all SP and all the information related to these application will be easily available on their sites.

Government Initiative: New schemes/plans will be initiated by government to enhance BB. Demand for BB should be created which will be done by government only in terms of defining various policies, like e governance, surveillance, e health, so that all recommendation wrt to schemes will be decided by regulatory.

Equipment provider; All equipment provider provide equipment which will be tested and compliance of all features as per generic requirement/ Interface Requirement recommended by TRAI. They should take care of all security guidelines so that it will not effect to operators roll out plan and get the permission of security clearance easily.

Terminal Provider: they should support all basic features and compliance with all recommendation given by TRAI.

2.5 Equipment provider:



Equipment provider is also the main stakeholder who can contribute much to enhance BB proliferation. They will help to industry including various Service providers and government agencies through sharing their experience in terms of latest industry trends, Global experience through various case studies to enhance BB.

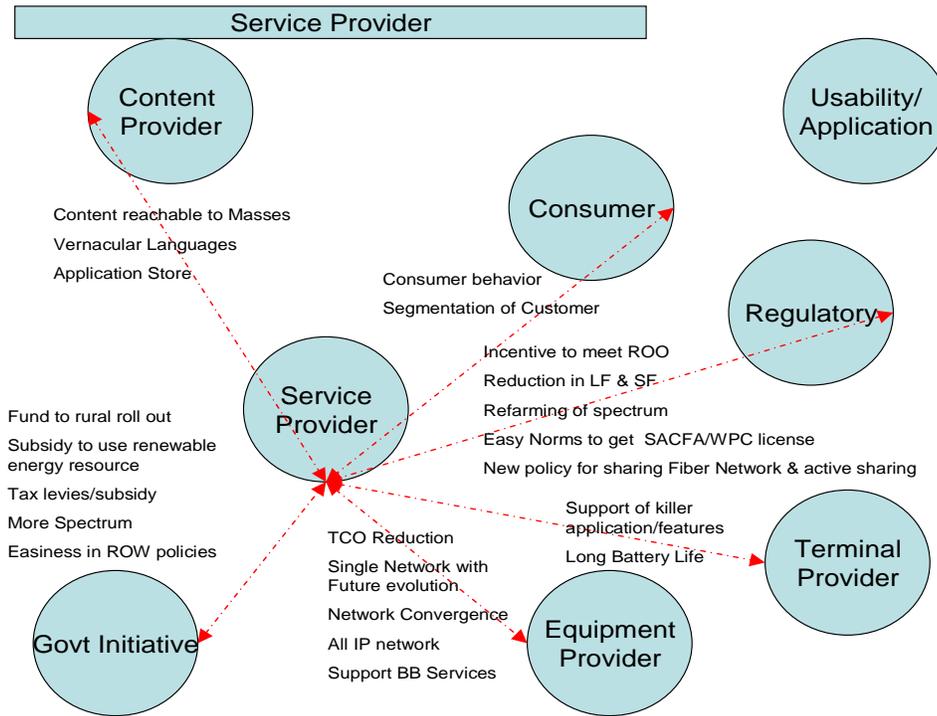
There are 3 stakeholders for Equipment Provider:

Government initiative : Issuance of new guidelines of security clearance which has large effect on operators roll out plan

Service provider (SP): SP should share their strategy for roll out an business plan so that equipment provider can provide customized solution which will help operators to reduce network's TCO, implement roll out faster and provide environmental friendly solution.

Regulatory: New guidelines for equipment manufacturing in India, various levies on import duty especially for BB proliferation.

2.6 Service Provider



Service Provider(SP) depends on 6 stake holders to enhance BB connectivity:

Consumer : Its behavior, likes , dislikes, different segmentation of consumers so that service provider can offer different services, affordable tariff plan for masses.

Content Provider: Mainly different content in local languages, easy to access these content, these are the main thing which a service provider wants form Content providers. Different application platform / store need to be developed by them according to users needs.

Government Initiative: Government can support by allotment of different fund like USOF, various schemes to promote BB. Subsidies to enhance renewable energy resource, Tax exemption, incentives if SP have an interest to boost BB connectivity. Spectrum allotment is also important. Already 3G ,BWA spectrum is allotted but more spectrum is required to experience the real meaning of BB for different applications like VOD, Mobile TV, video streaming, IP TV etc.

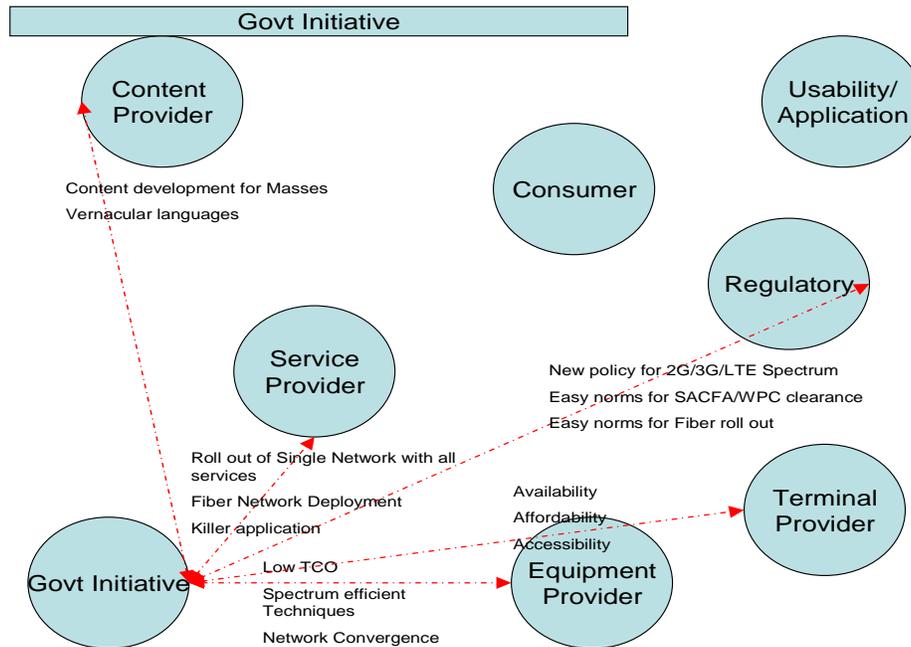
Equipment provider: Due to high bidding price of 3G and BWA , which has changed Service provider roll out and investment plan, in result of that nobody got Pan India 3G license Which make pressure on operators

financial's and Due to heavy cost of roll out, return of investment is also difficult to achieve within 5 years. Operators don't want to invest much now .so they want cheap equipment rather than single equipment which can support multi technologies and upgradeable to future technologies. Every body wants network convergence and ALL IP network which can accommodate future heavy bandwidth needed applications. Low TCO is basic requirement from equipment provider to roll out its network faster and reduce opex and capex .

Terminal Provider: Apart from basic features for terminal, operators want different features for different killer applications.

Regulatory: SP wants support from regulatory in terms of new guidelines for infrastructure sharing specially for fiber network sharing, easy norms of SACFA , WPC clearance (It will take long time to clear all this clearance which delay the implementation of network). Various incentives to meet roll out obligation in terms of deduction in License Fees and Spectrum Fees. ROW policy need to be amended in terms to penetrate fiber roll out nation wide.

2.7 Government Initiative:



Government initiative depends on 4 stakeholders to enhance BB penetration:

Service provider: It will roll out BB services by implementation of single network (different network for different technologies based on different user segment) and roll out its services as per telecom policy. They should provide services on cheapest rate with flexible tariff plan, good coverage, QOS and good customer support. Implementation of network to provide BB services with a concept of **Anytime - Anywhere**.

Equipment provider: Equipment provider provide various spectrum efficient technologies to use spectrum efficiently as spectrum is scarce resource. , Equipment provider should promote network convergence by sharing of different innovative plan which need to be implemented to enhance BB services.

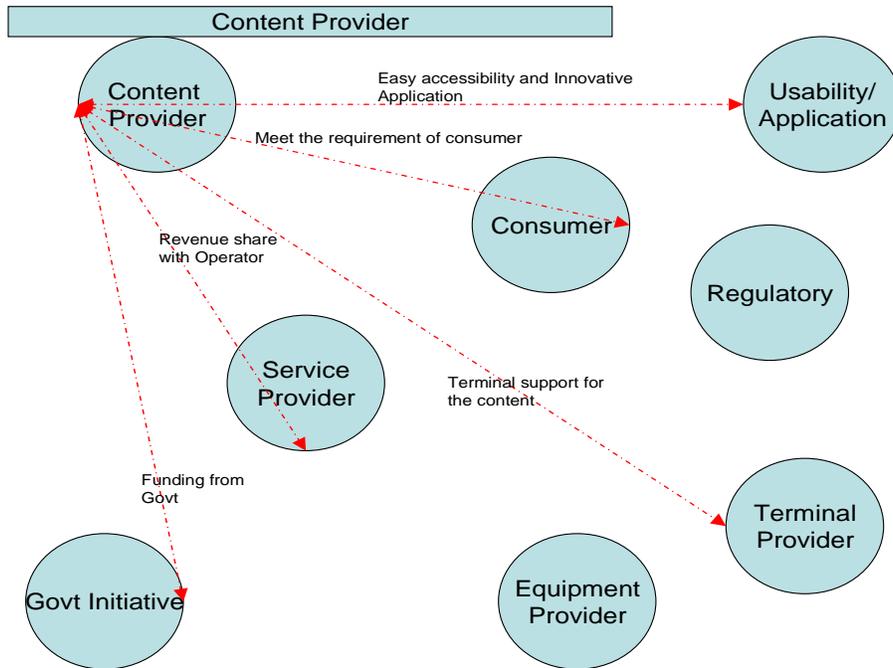
Terminal Provider: Single device which can support voice and data service simultaneously. **Easy Accessible, Affordable and Available**. All other aspects are already explained earlier.

Regulatory: Formulation of new policy for the spectrum of 2G/3G/ 4G technologies, which will help to roll out BB service and help to create new applications/services much faster which benefit large scale of subscribers. New formulation of Fiber roll out plan and easy norms of SACFA and WPC

clearance, security clearance (which delay operators roll out plan) also helps to enhance BB penetration.

Content provider: Same as explained above in earlier section.

2.8 Content Provider:



Content Provider depends on five stakeholders mentioned below:

Government initiative: Government can fund for different content provider for developing basic content which can easily accessible and usable by common man. Initiating different schemes on large scale like E-Governance, E-Health, E-Education, E-Learning. New applications like mobile banking, weather forecasting, Mandi price etc.

Service provider: New business model like revenue share model for different providing different content for different application and development of application store.

Terminal provider: Development of different tools by terminal provider to support different content.

Consumer: User friendly content development which will meet the requirement of masses like size of content , easy to operate , easy to use. Visual/gesture recognition features.

Usability / Application: Already explained above

BB Ecosystem Summary

As per above defined in detail about various stakeholders role and contribution which can effect and boost BB penetration drastically if they can work together.

Currently, Whole system pushing it down in negative fashion and it is going in downward spiral which is against BB proliferation. As there is not enough demand, not available of sufficient infrastructure, Roll out is costly and less return of investment, availability of services which is not reachable to user and fulfill user demand so there is less interest in BB requirement and less proliferation.

If everybody work together in above ecosystem demand can be created, policies can be made by regulatory. Enough infra will be implemented with various content in different languages will be available , and different terminal can be made for masses which can support different and affordable services which will change total life of human in terms of getting education increase literacy rate, getting information through various government plans like E-Governance, E-Education, E-Telemedicine.

In short we can say overall economic development will be created by working together by various stakeholders, which will boost Indian economy and contribute for the development of India.

3. Key Suggestions:

We have studied various factors which are causing less penetration of broadband and concluded that a healthy eco system need to be developed where every stakeholders of the industry work together with a common aim to enhance BB proliferation drastically.

This chapter will consider the factors which if implemented could provide sufficient incentives for BB ecosystem so that it will reach to critical mass and a positive spiral is created.

3.1 Wireless Broadband:

To enhance the BB to the masses, we recommend that government has to take various step for promoting Wireless BB as compared to Fixed Broadband, which is the right method as compared to fixed BB which have various issues to roll out the network as already mentioned above.

To proliferation of Mobile Broadband, government has to provide sufficient spectrum and enable enough competition which will reduce the tariff and provide affordable service to the masses.

Government has to decide the level play field among operators to distribute spectrum and operators who have already large spectrum and not utilized the spectrum efficiently, all the spectrum should be taken back and distributed to other operators who need the spectrum.

Spectrum available for Telecom Service Providers in different frequency bands						
S.No.	Frequency Band (in MHz)	Total available spectrum in the Band (in MHz)	Telecom	Spectrum currently available (in MHz) with		Total available for Telecom by 2014
				Govt. Agencies	Commercial	
1	450-470	20	-	8-9	11-12 (State Police, Security Organisations, Captive Users)	
2	698-806	108	-	24-48	36 (Others)	
3	806-824	18	-	-	18 (CMRTS & PMRTS)	
4	824-844	20	20	2.5 (only in Jammu)	-	20
5	869-889	20	20	2.5 (only in Jammu)	-	20
6	890-915	25	18.6-21.8	1.2-6.4	-	18.6-21.8
7	935-960	25	18.6-21.8	1.2-6.4	-	18.6-21.8
8	1710-1785	75	35-75	0-40	-	55-75
9	1785-1805	20	-	20	-	-
10	1805-1880	75	35-75	0-40	-	55-75
11	1880-1900	20	0-20 (after coordination)	0-20	-	0-20 (after coordination)
12	1900-1910	10	-	10	-	-
13	1920-1980	60	0-60	0-60	-	60-25
14	2010-2025	15	-	-	-	-
15	2110-2170	60	60	-	-	60
16	2300-2400	100	40	24	36 (other)	60
17	2500-2690	190	40	150	-	40
18	3300-3400	100	100 (ISPs)	-	-	100 (ISPs)
19	3400-3600	200	-	200	-	-
	Total	1161	287.2-453.6			85

Total Spectrum identified in all band – 1161MHz
Spectrum allotted to telecom –
Minimum – 287MHz
Max – 454 MHz (only available for commercial usage)
As per projection total spectrum required include all technology
– 582MHz:
GSM : 75*2MHz to 100*2MHz
CDMA : 2*37 MHz
3G – 100 MHz (Assuming 5 operators each of 2x10 MHz)
BWA – 100 MHz (20MHz each for 5 operators)
LTE – 108 MHz

Source TRAI

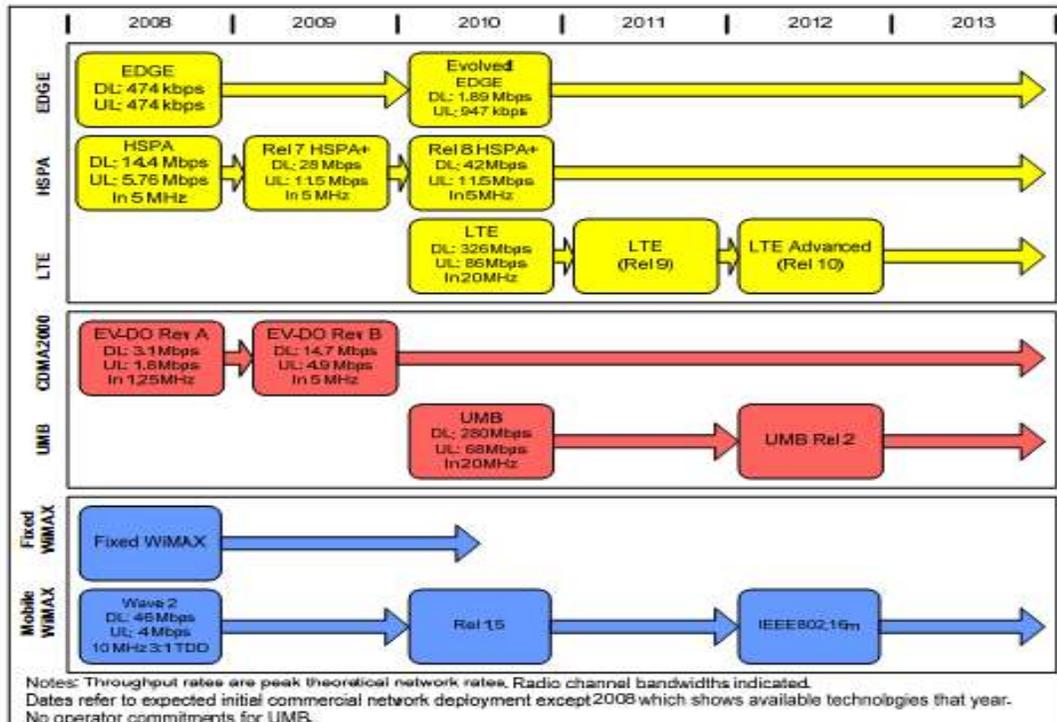
As mentioned above, nearly 308 MHz spectrum is required in future for 3G, BWA or LTE technologies.

Government should initiate refarming of 900 MHz which is most economical band as compared to 2.1 GHz.

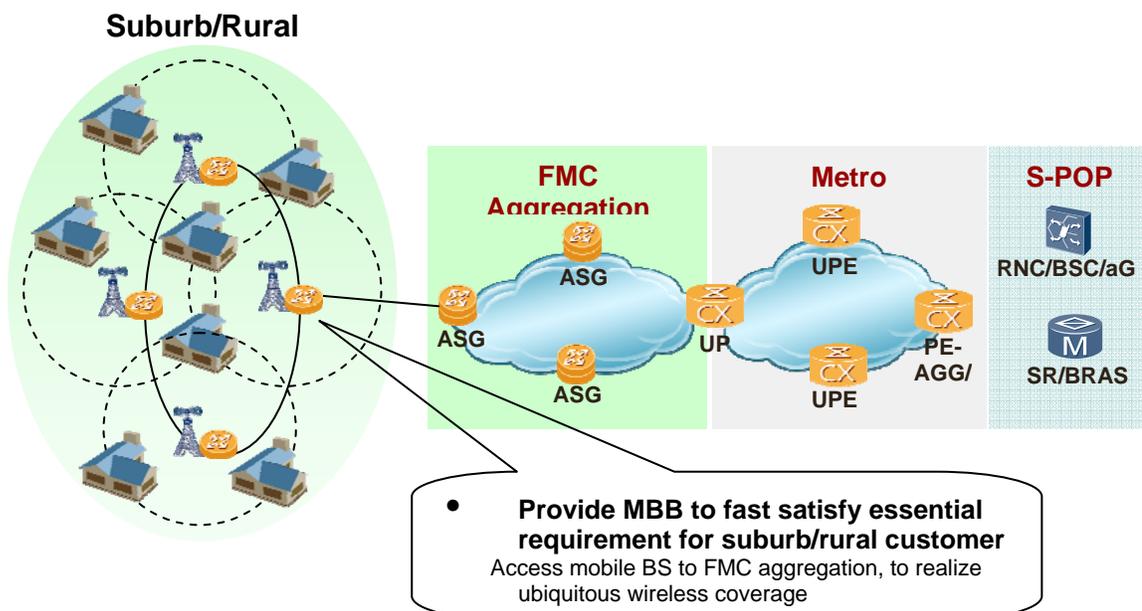
700MHz band which is most suitable band for providing for BB services.

Currently, to enhance wireless BB , main thing is to provide sufficient spectrum for 3G and BWA technologies. Government has already issued spectrum management framework which is under study by various stakeholders. Government has to finalize a spectrum framework not only for 2G but also for 3G and BWA technologies.

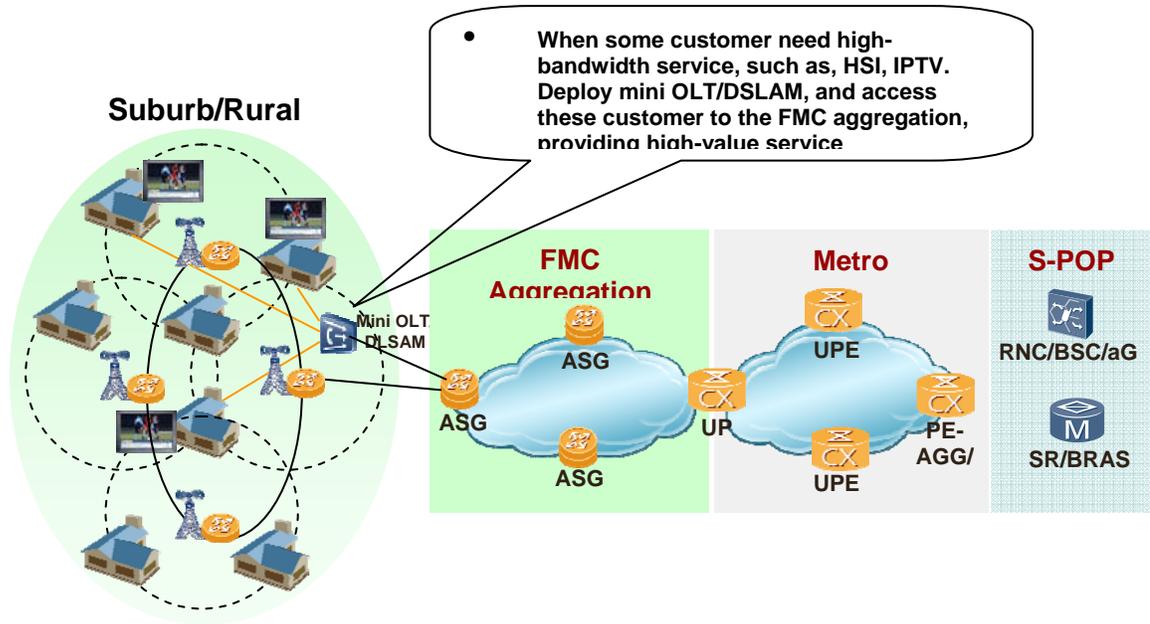
As shown below the evolution path of technologies. all technologies meet to LTE whether current system is deployed by WiMAX or 3G technologies so spectrum framework for LTE shall also be decided by government either by vacating the spectrum from defense or taking extra spectrum from operators if they are not utilizing the spectrum efficiently or not meeting the roll out obligations.



Promoting MBB also helps to enhance fixed broadband. As Firstly, the main requirement is to reach the broadband to masses including suburban & rural area, which can be possible by MBB only. By enhancing the Broadband coverage to masses initially with mobile broadband, fulfill the basic needs which enhance the life style and social development of users in these area.



As and when the requirement for more services (much high bandwidth driven application like IPTV) will increase to concerned area, by introducing a small box i.e. Mini OLT DSLAM as show below in figure Fixed broadband can be enhance and deliver high speed and better experience to the users.



3.2 Creating Demand:

Government as the single largest customer for the BB can create demand through initiatives like e-governance, e-health, e-education and take the step to mandate all these schemes.

Surveillance is an important application which can improve the governance and help improve the standard of living India. This application can create demand and enhance BB proliferation.

- a) Government should mandate surveillance in all government office where public dealing takes place which shall be handled centrally by government authority. It will reduce the bribery, enhance quality of work.
- b) Traffic is among the major problem which everybody is facing in metros. It shall also come under surveillance

All the forms (for different requirement like getting a license, passport, income tax return, gas connection, voter id card so many other things) must be available online. No paper work should be required, which will not only save lots of time, money but also provide green environment by reducing the wastage of paper.

Network of Postal department i.e. post offices are widest network through which persons used to communicate with each other. Anybody can find a post office even in remote areas whether electricity or basic needs are available in that area or not. So all post offices should be connected by BB, which will be an important step which should be taken by government to enhance the BB connectivity to masses.

3.3 Network creation:

To provide BB to masses, we suggest two kind of requirement to roll out the network much faster.

3.3.1 Obligation for Operators

3.3.2 Right of Way (ROW)

3.3.1 Obligation for operators:

Already gone through various method stated in the document we want to propose an alternative method for creation of network infrastructure for BB delivery.

Fiber roll out is the only alternative which can help to provide an infrastructure to experience the real meaning of BB to masses. As it can support much high bandwidth hungry application and provide BB service **Any time, Anywhere and Affordable** for Masses.

Regulatory condition should be modified in terms of extending the fiber to at least 10 % of BTS location. It will be mandatory and applicable for all operators who got UASL/CMTS license.

In case the operators required assistance to create this infrastructure he can talk to government with his plan and borrow the money from USOF with a condition however, in such case, this infrastructure created by operator shall be available on sharing basis for other operators also.

This will automatically create alliances between operators and helps speed up creation of nation infra.

In addition to this policy, in case operator can create fiber more than 10 % there could be incentives created in terms of waiving of License Fees & Spectrum Fees and others.

Apart from fiber roll out, government has to push renewable energy resource to extend the mobile coverage form cities to rural. For that an infra sharing is allowed in terms of active sharing and use of solar energy as a media of power should be promoted. It can be mandatory for operators who want to enhance coverage in rural areas.

3.3.3 Right of WAY (ROW):

3 : Estimated cost to cover villages with Optical fibre cable

Total number of inhabited villages (Population >500)	374552
Total single connectivity roads to villages having population more than 500*	1146000 Km
Total optical fibre requirement (in Km) for connecting villages having population more than 500	1146000 Km
Estimated cost of digging OF cable laying	Rs 18565 crores
Estimated cost of the material (OF cable, HDD pipe & end equipment)	Rs 13730 crores
Total estimated cost of covering all villages (population >500) with Optical fibre connectivity (Without Right of Way (ROW))	Rs 32295 Crores

*As per information given by National Rural Road Development Agency (NRRDA)

Creation of optical fibre network involves digging of trenches, laying of HDD pipes, pulling the optical fibre cables in the ducts, their jointing and finally connecting to the optical fibre terminal equipments. It is estimated that labor component for digging the trenches accounts for Rs.18,565 crores while other costs including material would be of the order of Rs. 13,730 crores . This also includes Rs. 5937 crores as cost of end equipments. Careful analysis of this indicates that material cost accounts for just 42% of project cost and big portion of 58% is the unskilled labor cost.

Apart from this there will be ROW charges which is an extra burden because of lots of issues to get clearance from state clearance bodies. Appx it will be Rs. 1000 to 20000 per Km, depends on different areas and agencies. If we assume an average of Rs. 10000 per Km then there will be $1146000 \times 10000 = \text{Rs. } 11460000000$ is the cost of ROW which could be the major issue to roll out the fiber network.

So we suggest that it should be free for license holder and it should be pre Approved by regulatory and concerned guidelines will be issued to various State's ROW clearance bodies which will not affect the roll out of fiber network.

An operator needs to just submit an application in advance and share the fiber roll out plan, all state bodies will give all permission pertaining to fibre roll

out with in a time frame decided by DOT/TRAI and with a condition that any damage cause during roll out should be taken care by operator within certain time line otherwise heavy penalty or license cancellation should be done.

3.4 User friendly terminal:

As already explained various issues/concern related to user friendly terminal which can easily accessible, usable and provide sufficient needs to common masses.

PC is also not the suitable for the proliferation of BB.

As we know Television is the only source for common man for entertainment and is already reached to the masses in India where there is telephone/ mobile connection is available or not.

By developing an ecosystem or device like set top box, which can integrate with TV , will help to do a major change in the life of masses.

Using TV as a mobile screen (TAAMS) can create tremendous growth in BB Penetration in India. App 150 Mn users are existing whose main source of Entertainment is TV.

For this, from technology point of view , a device like set up box with 3D camera has to be developed ,which can accessible through Bluetooth or cable from mobile and can be connected to TV through cable.

Some voice recognition software need to be developed so that a common person who is illiterate and does not know to operate a mobile can utilize the BB effectively and do his lots of daily work through voice recognition system.

With a big screen with 3D camera, user experience shall be enhanced for lots of applications like watching a movie, filling up forms, email reading, giving an interview. business meeting.

For different applications like web browsing, social networking sites, Government sites (forms for Driving License, Voter ID card, Passport),social network sites, Music /movies download , there should be a specific icon displayed on the screen. So that any body can just click it and access it with out any difficulty and take a good experience.

Users can not afford two terminals for separate application i.e. for voice and Data so unified Terminal should support both voice and data application along with basic features already explained in earlier section.

3.5 Content & Application:

Content generation in local languages is the key requirement to boost BB Penetration.

All information related to:

- E- Governance plan i.e. various government policies and new initiatives , issue of Driving License , voter ID card , Passport , Rail booking, Income Tax Return, and other information.
- E- Telemedicine & E-Health i.e. Various add campaigns like polio program, Anti malaria campaign., HIV awareness programs, Doctors consultation,
- E-education i.e. English learning
- Environmental awareness, Weather forecast information, road safety, car driving, Mandi price

shall be available on government sites in local languages so that any user can access this information anytime

Two modes of accessing information:

For educated person, where anybody can access this information by accessing various sites

For illiterate person, in this mode, Dynamic Online IVR system shall be launched with various help lines shall be deployed for accessing the information, user can just connected through IVR and get all relevant information.

Regarding application, Voice is most common application in India for any user and as elaborated above, Voice should be allowed over internet connection as VoIP. Currently which is not allowed so certain amendment in regulatory guidelines should be done for the VoIP to boost the BB penetration.

Video Calling is the prime application under BB services which can help BB proliferation immensely

With video calling several basic needs of a common man can be fulfilled.

Like he can consult a doctor, for that he does need to go again and again for check up or some small consultation, doctor can see his condition and give his advice . By this several money will be saved by common man. Apart from money, his time is also saved and which he can use for other important task and enjoy his life.