



CONSULTATION PAPER ON ICT INFRASTRUCTURE SHARING

**Bhutan InfoComm and Media Authority
Royal Government of Bhutan
Thimphu: Bhutan**

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1. BACKGROUND

- 1.1 The infrastructure sharing in Bhutan is mandatory as per the Bhutan Information, Communications and Media Act 2006 (“the Act”). The Section 66 of the Act has mandated the Authority (“Bhutan InfoComm and Media Authority”) to mandate such infrastructure sharing through the prescribed Rules.
- 1.2 Even the Royal Government of Bhutan (Ministry of Information and Communications) vide their letter number PPD/55/ 862 dated March 19, 2009 has directed the Authority to enforce Section 66 of the Act in keeping with the International best practice to maximize/ optimize resource constrains. This directive has been issued with the objective to reduce duplication of ICT infrastructure build-up and maintaining aesthetic environment.
- 1.3 As the Infrastructure sharing has been mandated by the Act, this consultation paper will discuss on the best modalities of such sharing in our context.
- 1.4 Infrastructure sharing is applicable to both Fixed Wire-line Network and Mobile Networks.

2. OBJECTIVE BEHIND INFRASTRUCTURE SHARING

- 2.1 The main objective of Infrastructure sharing is to maximize the optimum use of existing resources through reduction of such duplication.
- 2.2 The concept of Infrastructure sharing gains its importance in this era of fast pace of technological developments. It helps in reducing financial burden on operators by reducing costs, encourages growth of new applications and services and promotes competition by reducing entry barriers.

3. WHY INFRASTRUCTURE SHARING IS NECESSARY?

- 3.1 Infrastructure sharing is viewed by most regulators as an efficient means of addressing access issues. Infrastructure sharing allows ICT operators to concentrate on core competencies, increasing efficiency and saving costs. The savings that the ICT operators make in building new ICT system and networks can then be used for the development of new and efficient telecommunication services in order to improve their competition situation.
- 3.2 According to International Telecommunications Union (ITU), “the single biggest reason for Infrastructure sharing is to lower the cost of deploying ICT broadband network to achieve widespread and affordable access to broadband services”.
- 3.3 ICT network deployment and development will cost huge money, especially in Bhutan context due to our rough terrains. Building separate and individual mobile base stations or fiber backbone networks to reach rural and unreached remote areas may be uneconomical for the service providers. However, sharing such infrastructures and competing on services offered would prove to be very realistic and beneficial to the customers.
- 3.4 Sharing of telecom infrastructure among telecom service providers has become the requirement and the way business is being done in the telecom sector. Reasons are:
- Promotion of competition
 - Optimization of capital investment
 - Promotion of New Value Added Services

3.3.1 Promotion of competition

Access to infrastructure is a critical element in promoting a competitive ICT environment. For example, for telecommunication operators, tower sites in

particular have a premium attached to them because they provide the highest point in a particular district or area. Given that tower sites exhibit strong bottleneck characteristics, being sites that are often held by incumbent telecommunication operators and that are unable to be easily duplicated, competition on the basis of coverage can be limited by refusal of these incumbent telecommunication operators to provide access to these sites.

More over, setting up new towers is highly time consuming and therefore sharing helps in bringing in competition much faster.

3.3.2 Optimization of capital Investment

Infrastructure sharing is considered as a way to reduce costs. Many jurisdictions mandate infrastructure sharing given that the unnecessary duplication of infrastructure is viewed both economically inefficient and socially wasteful. As a general concept, many regulators recognise infrastructure sharing as an essential element to fostering services-based competition and a means to limit adverse environmental impacts of network rollout. In fact, most regulators impose facilities-sharing requirements on the telecommunication operators that are not service-specific in order to facilitate economically efficient use and investment in infrastructure.

3.3.3 Promotion of New Value Added Services

As the infrastructure sharing leads to saving investments and helps in commissioning competition much faster, this relieves the competitor to invest in and concentrate on commissioning new value added services.

4. ADVANTAGES OF INFRASTRUCTURE SHARING

4.1 Reduce Investment Requirements

4.1.1 By sharing the total infrastructure investment between several operators, both the quantum of capital needed to be invested by each operator as well as the overall

risk to the business proposition is reduced. This will help in reduce financial burden on the operators by reducing cost and enables operators to address a larger market, facilitate growth of new applications and services, promotes competition, lower entry barriers, etc.

4.1.2 Infrastructure sharing provides the highest savings in cases of low traffic demand and more efficiency is achieved by pooling resources.

4.1.3 Network sharing can provide CAPEX savings of 20-40%. OPEX savings fall within the same range. The amount saved will depend on the extent of infrastructure sharing, covered area, solution and traffic volumes, etc.

4.2 New Source of Revenue

4.2.1 For incumbents with totally or almost totally depreciated and amortized cost of existing infrastructure, a new source of generating revenues is created. Typically it can be as high as 15% of the turnover based on world wide statistics.

4.3 Decrease the Market Entry Barrier

4.3.1 Setting up infrastructure is a costly and time consuming process. Infrastructure Sharing such as national roaming permits new operators to start operations in a much shorter time frame over a wide area. Site infrastructure sharing likewise speeds up operationalization due to easier capital financial closure requirements.

4.3.2 Infrastructure sharing will be very useful in the initial stages of network rollout when the operator's main concern is extending coverage and thus compete with the incumbent operators at level playing field.

4.4 Expand services to Remote and Rural Areas

4.4.1 Infrastructure sharing helps in expansions and meeting of Universal Service objectives become due to the same total quantum of funds (which is limited with any operator) being spread over greater area. This will bring down the per area set up cost through sharing as building infrastructure constitutes a large portion of the total required investment.

4.5 Optimize the use of Scarce National resources

4.5.1 The two scarce national resources are right of way and the spectrum. Possession of both these national resources provides a reasonable strength to the new operators. A well designed and well engineered development plan can always be executed to derive consolidation strength.

4.6 Shift the focus to service innovation

4.6.1 Minimizing the pressure of financial resources generation and financial closure through infrastructure sharing could lead to greater attention being paid towards creation of service innovation.

5. TYPE OF INFRASTRUCTURE SHARING

5.1 Fixed Wired Line Network sharing

5.1.1 Usually it is the incumbent who owns most of the wire-line infrastructure in the form of buried cables. For a new operator it works out to be too expensive to lay fresh copper cables.

5.1.2 Local loops are particularly required for providing broadband connections which are usually on a hybrid optic fibre – copper cable combination

5.1.3 Fixed Wired Line network could be shared through un-bundling of local loop and this is possible in three ways:

5.1.3.1 **Full Local Loop Unbundling (Full Access)** – competitive providers have access to both voice and data on the line.

5.1.3.2 **Shared Unbundling (Line Sharing)** – competitive operators have access to either voice or data transmission on the line.

5.1.3.3 **Bit Stream Access** – The incumbent installs high speed access links to customers and allows competitive providers access to this link. In this arrangement the incumbent owns and maintains the link

5.2 Mobile Network sharing

In general, mobile network sharing can be classified either as active or passive. The active elements comprise of base station, radio equipment, switches, antennas and spectrum where as, the passive elements are towers, shelters, power supply and ducts.

5.2.1 Passive Infrastructure sharing

5.2.1.1 Passive infrastructure sharing means the sharing of non-electronic/electrical and civil engineering elements of the telecommunications network. This includes Right of ways (RoW), ducts, pylons, masts, trenches, towers, poles, equipments rooms and their related power supply, air conditioning and security.

5.2.1.2 The cost of passive infrastructure is 60 to 70 % of the total capital cost of a mobile network. Sharing obviously reduces this burden. Also, setting up the passive infrastructure is the most time consuming and sharing such network would greatly reduce the time frame. Besides, it also helps in ecological preservation.

5.2.1.2 The Authority proposes to make passive infrastructure sharing mandatory in Bhutan.

5.2.2 Active Infrastructure sharing

5.2.2.1 Active infrastructure sharing means the sharing of the active network elements or the intelligence in the network such as base stations and Node B for mobile networks and access node, antenna, transmission links, spectrum allocated to individual service provider and switches and management systems for fiber network.

5.2.2.2 Active infrastructure sharing is of great value to operators whose main strength lies in the creation of value added services. Some times these operators may not own much equipment at all and ride on the network of some other operator. Advantage to an infrastructure owner may accrue from utilization and therefore revenue from the spare capacity or in some cases such as spectrum sharing, better optimization of network may become feasible

5.2.2.3 Active infrastructure sharing is not popular across the globe. There are various reasons, the most important being the increased inter dependency between service providers. This interdependence may reduce competitive edge of the service providers. This could also lead to situation where collusion on prices or service offering will take place and thus eliminating consumer choice.

6. LEVEL OF MOBILE INFRASTRUCTURE SHARING FOR BHUTAN

The Authority proposes the following six (6) levels of sharing of mobile infrastructure;

6.1 Level-1: Sharing of sites and passive elements

6.1.1 These forms of sharing consist of common use by multiple operators of all or part of the passive elements of the infrastructure. This would include towers and

masts, building space, ducts, power supply, transmission equipments and environmental services (such as light, ventilation and air-conditioning, etc.).

6.1.2 Site sharing is very useful for :

- Congested areas where sites are not easy to come by or are very expensive.
- Remote areas where neither the traffic justifies heavy investment in towers, etc. nor setting up of new transmission links is justified.
- Site sharing is relatively simple and easy but the owning entity (often the incumbent) may not want to do it. Regulatory intervention may become necessary at least initially.

6.2 Level -2: Antenna Sharing

This level is defined as pooling of an antenna and all related connections (coupler, feeder cable, etc.) in addition to passive radio site elements. Since an antenna is an active element, antenna sharing can be included in the more general issue of active infrastructure sharing.

6.3 Level -3: Network Sharing

6.3.1 Network sharing is possible as long as each operator is able to operate the frequencies assigned to the carrier, fully independent from the partner service provider. In this way, each operator retains control over active base station equipment, such as, transmitters, receivers, etc., which control reception, transmission of radio signals. The common equipment of base station is shared and thus the cost of base station equipment is also shared among various service providers.

6.3.2 Network sharing includes sharing of Base stations and Common networks. Common network implies sharing of Radio Network Controller (RNC) or Base Station Controller (BSC) or even the Mobile Switching Centre

(MSC). Here each Operator has his/her own home network with suitable data base, services, billing and connection to other networks and by joint planning and complementing, savings can be achieved for both operators.

6.3.3 Sharing of BSC is possible since it represents logical control over the radio network of each service provider independently. This retention of logical control over each service provider's traffic provides the service provider with a guarantee of control over its equipment. The service provider, therefore, retains full control over allocation and optimisation of radio resources, mobility management and control over handover parameters.

6.4 Spectrum Sharing or Spectrum Trading

6.4.1 This implies leasing of spectrum by one operator to another on negotiated terms.

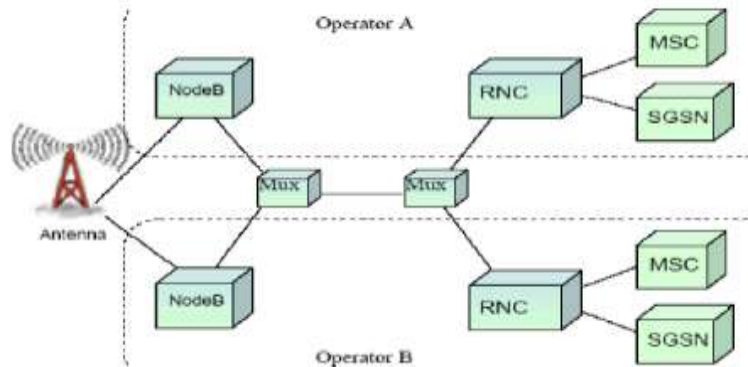
6.4.2 Here advantage accrues to spectrum owner because spectrum acquisition costs are high and all spectrum may not be utilized in all areas

6.4.3 This could also provide advantage to user operator as it could have access to those spectrums which was already awarded to other at reasonable cost for launching new specific services.

6.4.4 This is a relatively new approach and this might need regulatory interaction as well as intervention before sharing gets formalized.

6.5 Level – 5: Radio Access Network

- 6.5.1 This is the simplest type of Active sharing. Here antenna, feeder cable and transmission equipment is shared. Figure below illustrates this model:



- 6.5.2 This type of sharing may have adverse effect on QoS due to reduction of the signal strength. This has been raised by most of the service providers during consultation initiated by regulators around the world, including India and Pakistan. The use of common antenna pose problem as the strength of signal may be reduced by at least 3 db by combining the signals and will result into poor coverage and reduction of signal strength. Moreover, RAN sharing service provider will have full control of the frequency allocated to them.

6.6 Level-6: Sharing of backhaul, air time and local loop

6.6.1 Backhaul

- 6.6.1.1 Sharing of common back-haul will be very useful, especially in the rural environment where traffic from BTS to BSC is very low. This will reduce the cost of providing service and also the maintenance of the system.

6.6.1.2 The ICT operator with the back haul service will share the same (resale such services) with other service providers on commercial basis. The rate charged for such sharing will be determined by the operators and endorsed by the Authority.

6.6.2 Mobile Virtual Network Operators (MVNOs)

6.6.2.1 MVNO is another concept of sharing the network. MVNOs do not own any infrastructure and they are like whole sale customers of air-time from the service providers who owns the infrastructure. MVNOs offer the services under their brand name and basically by reducing the capital costs and operating expenses and also by developing innovative applications, they are able to attract the customers and thus provide a very effective competition to the service providers who own infrastructure and offer telecom services in the market. For example Virgin Mobile is MVNO in U.K. who purchases airtime in millions of minutes from T-Mobile (a mobile service provider owning infrastructure in U.K).

6.6.2.2 MVNOs are one type of shared spectrum operator who do not possess any spectrum of their own but rather utilize the spectrum and several network components of another operator at appropriate commercial terms. Value Added Services is the key strength of MVNOs.

7. ISSUES FOR CONSULTATION

The Authority would like to seek views and comments from the stakeholders on some of the issues related to Infrastructure sharing. Such views and comments would be a great asset to us in deciding and developing Rules on Infrastructures that would meet the objective of the Royal Government as well as the interest of the stakeholders.

- 7.1 Should fixed wired line network sharing be made mandatory? If so, which sharing model (full access or line sharing or bit stream access) would one prefer.
- 7.2 Do you agree the proposal of BICMA to make passive infrastructure sharing including the tower mandatory for the existing and new sites of Mobile Cellular Service Providers?
- 7.3 Will the infrastructure sharing bring in faster and better ICT service deployment within the country? Please explain.
- 7.4 Should BICMA invest on building infrastructure (tower) in collaboration with other ICT facility provider(s) through the use of USF and allow ICT facility/service providers share such infrastructure at a price determined by the BICMA.
- 7.5 Can the sharing of existing antenna(s) of any ICT facility /service provider(s) be possible? Please explain
- 7.6 Should Base Station and Base Station Controller be also included for sharing?
- 7.7 Can the existing Radio Access Network be shared? Please explain.
- 7.8 Should spectrum sharing be allowed in Bhutan?
- 7.9 Suggest which type of infrastructure sharing will be useful in present scenario and what role BICMA could play to promote such sharing?
- 7.10 Will there be any potential competition concerns arising due to this infrastructure sharing? If so, how should BICMA address such concerns to ensure that there is no adverse impact to the consumers who will benefit in terms of choice of service providers, access and availability of services with better quality of service and prices?

- 7.11 What monitoring and enforcement mechanism be adopted by BICMA to ensure effective infrastructure sharing? If there are any other criteria to be followed by BICMA, please specify?
- 7.12 Should BICMA determine the terms of conditions for sharing such infrastructure or should this be left to the market to determine?
- 7.13 Should BICMA make it mandatory for ICT facility providers to list down all those infrastructures, including towers to be shared and make such information available to public along with the rates endorsed by the Authority?
- 7.14 Any other comments and views.

ANNEX A: ADVANTAGES AND DISADVANTAGES OF INFRASTRUCTURE SHARING

Advantages	Disadvantages
<ol style="list-style-type: none"> 1. Renting frees up capital 2. Significantly reduce operating cost 3. Reduce time to market 4. Reduce tower proliferation, which makes towers more acceptable to the community and the authorities. 5. Makes it possible to use only available sites or unique sites 6. Minimize capital requirement 7. Makes long term costs predictable 8. Net coverage of one operator will be as good as its competitors. 	<ol style="list-style-type: none"> 1. Loss of control over the network's elements. 2. RF interference issue. 3. Equipment placement or loading limitations. 4. Coordination issue may delay time to market. 5. Carrier may not get priority in disaster recovery. 6. Security facilities at the site may be suspect

ANNEX B: INTERNATIONAL PRACTICES ON INFRASTRUCTURE SHARING

1. Some recent decisions have been in favour of 3G infrastructure sharing, but only of antennae sites. For example, the European Commission gave permission for a 3G site-sharing agreement with specified safeguards between T-Mobile and mmO2 in the United Kingdom in April 2003, and in July 2003 it approved a plan by mmO2 and T-Mobile to share 3G infrastructures in Germany. In the EU, for example, a wide discretion has been given to National Regulatory Authorities (NRAs) to impose Infrastructure Sharing arrangements. The Interconnection Directive (Directive 97/33/EC) encourages the sharing of facilities and properties, although compliance with competition law is still required. The Directive grants NRAs the power to intervene and resolve disputes relating to agreements for co-location, or facility sharing. It also indicates that EU member states may impose facility and property sharing arrangements, including rules for apportioning the costs of sharing. In the case of the United Kingdom it was stressed that there were no competition concerns on the proposed infrastructure sharing because it is restricted to smaller cities and rural areas. Furthermore, this arrangement may also avoid competition concerns since it is restricted to sharing basic network infrastructure such as masts, power supply, racking and cooling. In Germany, the regulator stated that each 3G license holder would be required to build its own network, each of which needed to ensure its 'competitive independence' during the lifetime of the license. This means that operators would not be allowed to share backbone facilities such as switching centers even though they could share network elements such as masts and antennas. In France, the regulator ART indicated in December 2001 that sharing of mobile infrastructure (site, base station, and controllers) was possible provided that the frequencies are managed independently by each operator. In Spain, the government agreed to permit 3G infrastructure sharing between operators in January 2004. In Finland, operators are allowed to share 3G networks from April 2004. License holders will be able to deploy part of their networks together, although each license holder must still have their own network covering 35% of the population.

2. Some countries placed conditions on infrastructure sharing. In Ireland, for example, infrastructure sharing, with the exception of site sharing, will only be permissible when each operator has established a 3G radio access network infrastructure capable of serving at least 20% of the population using infrastructure which is wholly under the control or ownership of that operator. In the Netherlands, NMA (Netherlands Competition Authority), OPTA (Independent Post and Telecommunications Authority), and the V&W (Ministry of Transport, Public Networks and Water management) issued a joint memorandum that provided comprehensive clarification on collaboration in the deployment of 3G networks in September 2001. They agreed to allow 3G operators to collaborate in the construction of 3G network components on the condition that competition between operators continued to exist and that operators compete against one another in providing 3G services. While they shared the opinion that collaboration in 3G network deployment could contribute to a more rapid 3G rollout, they clarified that collaboration must be limited to the joint construction and use of the 3G network infrastructures such as masts, aerials and network operation. On this basis, they did not permit the joint use of frequencies and core networks. In Sweden, network infrastructure sharing is allowed under the present 3G licensing regime as long as each operator has 30% of the population covered with its own infrastructure, the 70% remaining being sharable. The radio infrastructure includes antennas, transmission equipment and other intelligent parts of the network, while leaving aside masts, power supply, sites and so forth.
 - a. Some countries do not intervene in infrastructure sharing issues. The policy of the United States is an example. Although the US regulator has not issued regulations specifically addressed to 3G infrastructures sharing, in recent years, the regulator has been called upon to scrutinize on a case-by-case basis several infrastructure sharing joint ventures between various mobile operators. Based on this experience, the US approach generally has been not to intervene in infrastructure sharing issues, but the regulator has the authority to do so if issues of competitive

harm are raised. The same general approach would be applicable to 3G infrastructure sharing should the issue arise. There is also a proposal by the FCC which examines whether infrastructure sharing is promoted or not as a means of bringing competition to rural areas.

- b. **Norway** – The different networks in Norway can share most of the infrastructure. Masts, antennas, power supplies, housing, transmission routes, etc. can be shared. Base Station Equipment and Base Station Controllers can be shared except from the intelligent control of the frequency resources. The core network can not be shared. The frequencies can not be shared. The licensing process specifically required the networks to meet the coverage requirements by using the licensee’s own frequencies. This requirement could have been relaxed by allowing frequency sharing in parts of the country, especially in rural areas.

- c. **Singapore and Malaysia** - In the case of Singapore, the regulator’s infrastructure sharing approach is guided by the primary policy goal of encouraging facilities-based competition. Under the current regulatory framework, licensees are generally not required to share any infrastructure that it controls with its competitors. Each licensee is expected to build or lease the use of the infrastructure it requires. Notwithstanding this however, infrastructure sharing is mandated in areas where there are clear space and operating constraints. For 2G and 3G licensees, such matters relate to infrastructure in the Mass Rapid Transit and underground road tunnels. The regulator has also allowed the co-location of base stations and sharing of transmission towers and masts to reduce the impact on the environment and to minimise the inconvenience to building owners and residents. Taking a different approach, in Malaysia operators owning network facilities have been encouraged by the regulator to share infrastructure as a means of lowering costs and expanding coverage as well as to avoid a duplication of resources. To this effect, a Memorandum of Understanding to share infrastructure has been executed between the mobile operators. To further catalyze infrastructure sharing, the concept of a third party provider of facilities is also

being promoted in Malaysia. Under this concept of a third party will build the infrastructure and lease capacity or space to existing service providers. This concept, not only provides ready-made sites, but will also help reduce the numbers of telecommunication towers that have to be dealt with by local authorities.

- d. **India** - Regulator has not issued any Regulation on infrastructure sharing. The service providers themselves are doing infrastructures sharing as per mutually agreed terms & conditions. Independent infrastructure providers (third party) are providing Infrastructure like towers and building space to various operators. This practice is also prevalent in some service areas. TRAI in its recommendations on Growth of Telecom Services in Rural areas dated 3rd October, 2005 has emphasized the promotion of sharing. In fact, support from Universal Service Fund is linked to sharing of infrastructure. The details are available on TRAI's website (www.traai.gov.in).

- e. **Pakistan** – Pakistan Telecommunications Authority (PTA) has included a section on infrastructure sharing in their “Interconnection guidelines 2004”. Infrastructure sharing was also covered in their Cellular Mobile Policy 2003 under clause 6.4 which states, “All licensees are encouraged to implement infrastructure sharing in accordance with the guidelines issued by PTA and FAB”. The main rationale behind encouraging infrastructure sharing, especially amongst the mobile cellular operators, is due to environment issues related to mast and towers.

The Infrastructure sharing would include the requirement to lease out facilities on a principle of neutrality, non-discrimination, equal access to other service providers and such facilities includes, space, electrical power, air conditioning, security, cable ducts, space on antenna masts or towers, room etc. Infrastructure sharing also includes co-location. This information could be found on their website (www.pta.gov.pk)

- f. Bangladesh** – The Bangladesh Telecommunication Regulatory Commission (BTRC) has issued guidelines on infrastructure to encourage telecommunications service providers to remove all uncertainty and create framework for better cooperation in infrastructure sharing. Infrastructure, according to them, includes requirement to lease out /rent out or swapping infrastructure on a non-discriminatory basis to other service providers.

The guidelines are applicable for sharing of passive infrastructures, that is, sharing of optical fiber / wired access and backbone transmission network, amongst all existing and future telecommunications operators having licence from the Commission. The licensees are only permitted to share infrastructure within their respective licensing zone/area. It also specifies that telecommunication operators shall jointly develop, build, maintain and operate new passive infrastructure for providing telecommunications services to the subscribers. However, an individual operator may build passive infrastructures with the permission of the Commission¹. Except, Nationwide Telecommunications Transmitter Network operator, other licensees are not permitted to build optical/wired backhaul transmission network if such networks of other operators are already available for sharing.

- g. Nepal:** They are still in the process of developing regulation on infrastructure sharing.

¹ BTRC, “ Guidelines on Infrastructure sharing”, (www.btrc.gov.bk)

