



CONSULTATION PAPER ON NATIONAL ROAMING

Nepal Telecommunications Authority (NTA)
5th Floor, Blue Star Office Complex
Tripureshwor, Kathmandu

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PREFACE

National roaming concept has not yet been developed in the country and there was no roaming agreement ever made between the operators for domestic call in Nepal. Similar to the international roaming, National Roaming can be realised at no significant extra cost. Even though it is technically possible to provide such facility for domestic roaming, appropriate legal and regulatory framework have to be in place in order to encourage as well as assist the operators in realising roaming arrangement between them without any uncertainty. Hence, the policies, rules and regulation to be adopted regarding national roaming shall be formulated in detailed discussion with the operators as they are main entity responsible for the successful implementation of the domestic roaming facility between the operators.

Nepal Telecommunication Authority (NTA), therefore, has issued this consultation paper and request concerned stakeholders, experts and any interested party to send their comments/suggestions or inputs either in electronic format or in written form on the various issues raised in consultation paper within 30 days from the date of notice publication. The comments and inputs provided by the stakeholders will enable the Authority in formulating a guideline on inter-operator roaming facility inside Nepal. The consultation paper shall be available on NTA's website (www.nta.gov.np). In case of any clarification or information, please write to ntra@nta.gov.np or contact Mr. Udaya Raj Regmi, Deputy Director, NTA (email: urregmi@nta.gov.np, tel: 977-1-4101030).

Mr. Bhesh Raj Kanel
Chairman, NTA

EXECUTIVE SUMMARY

Traditional GSM Roaming is defined as the ability for a cellular customer to automatically make and receive voice calls, send and receive data, or access other services, including home data services, when travelling outside the geographical coverage area of the home network, by means of using a visited network. Even though the term "roaming" originated from the GSM (Global System for Mobile Communications) sphere, it can also be equally applied to the CDMA technology. It is a different form of call forwarding feature available in telecommunication network. Likewise, roaming is encouraged by regulators around the world as a different form of Infrastructure sharing in order to discourage investment which do not make business sense, rather maximise the utilisation of the existing network.

Roaming, especially domestic roaming, as is the case with international roaming, can be realised at no significant extra cost. Although, scattered cases of inter-standard roaming are rolled out in few countries, efforts are being made to achieve seamless roaming facility between two different technologies. Prior agreement between operators enables the subscribers to roam into another network in case the home network is not available. Although international roaming is prevalent in almost all the GSM networks around the world, domestic roaming between intra-country operators is not so popular. However, roaming arrangements are in place in several countries at varying degrees facilitated by the policies, rules and regulations in order to facilitate new entrant until it has rolled out its network to significant number of places, avoid duplication of networks at less populated and remote areas, provide seamless service in areas where movement of people is significant such as highways, provide emergency communication when home network is not available etc.

Although it is technically possible to provide such facility for domestic roaming, appropriate legal and regulatory framework have to be in place in order to encourage as well as assist the operators in realising roaming arrangement between them without any uncertainty. However, policies, rules and regulation shall be meant to encourage the operators rather than binding on them. Even though such facility to post-paid subscribers can be provided without much hassle, to provide roaming facility for prepaid users, further addition/modification of software is essential. Furthermore, in view of the present legal and regulatory framework, roaming facility has to be encouraged between mobile operators for smooth implementation and can be gradually allowed for limited mobility operators, if allowed by the appropriate policy, rules and regulation. Roaming charges maybe generally above the normal call charges, however with regard to the

service the subscriber avails in cases of emergency and low quality of home network, which is worth the call being made. However, in some instances, extra roaming charges may be waived off depending on the agreement between the operators.

Hence, roaming facility can be strategically used to avoid duplication of network in less populated and remote areas, ensure seamless network availability at high mobility areas like highways, facilitate new entrant for pre-specified duration to minimise business disadvantage, and make sure the network of any mobile operator can be accessed by the subscriber of another network in case of emergency and when the quality of service of the home network is relatively low, thereby benefitting both the operators and subscribers that too at no additional or minimal investment.

Acronyms

ACCC	Australian Competition and Consumer Commission
ANSI	American National Standards Institute
CDMA	Code Division Multiple Access
CITC	Communication and Information Technology Commission
DHQ	District Headquarter
FBP	Facility Based Provider
GSM	Global Systems for Mobile
GSMA	GSM Association
HLR	Home Location Register
IFAST	International Forum on ANSI-41 Standards Technology
IMSI	International Mobile Subscriber Identity
IRM	International Roaming MIN
ITU	International Telecommunication Union
MIN	Mobile Identification Number
NDCL	Nepal Doorsanchar Company Limited
NTA	Nepal Telecommunications Authority
QoS	Quality of Service
SIM	Subscriber Identity Module
NCELL	Spice Nepal Private Limited
TRC	Telecommunications Regulatory Commission
UTL	United Telecom Limited
USSD	Unstructured Supplementary Service Data
VDC	Village Development Committee
VLR	Visitor Location Register
Wi-Fi	Wireless Fidelity
WiMax	Worldwide Interoperability for Microwave Access

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1. INTRODUCTION

1.1. Background

Currently, there are two licensed operators viz. NDCL and NCELL operating mobile service whereas United Telecom Limited (UTL) is operating Limited Mobility Service with roaming facility. Three more operators have also started to operate Voice Telephony services with Limited Mobility license using wireless technology.

The proliferation of the towers in the city areas by mobile operators to expand their services is a clear indication that they are keen on expanding their footprint but only in those places which make business sense. The rural and remote areas are always in the least priority of the operators to establish the network. Likewise, a new mobile operator has normally finds it difficult to establish its presence in the Telecommunication Industry owing to several factors like lack of sufficient Interconnection facility with existing operators, unseen hurdles in expanding their network, inability to increase customer base due to limited coverage etc. Furthermore, customers are deprived of the Telecom service when the network they have subscribed to becomes kaput.

NTA feels that apart from other initiatives, if roaming facility can be mandated between the operators, it will

- a) Help establish the availability of one or other telecom network at rural, remote and inaccessible areas by asking one operator to establish the network and have roaming agreement with other operator. The same can be repeated by asking next to operator to establish network at such places which are financially not sustainable thereby avoiding duplication of infrastructure.
- b) Facilitate communication by allowing using each other's facility when the network of competing operators is temporarily down.
- c) Allow the new entrant to offer coverage comparable to that of established operators by requiring the existing operators to allow roaming while the new entrant has time to build up its own network.

1.2. TECHNICAL DETAILS

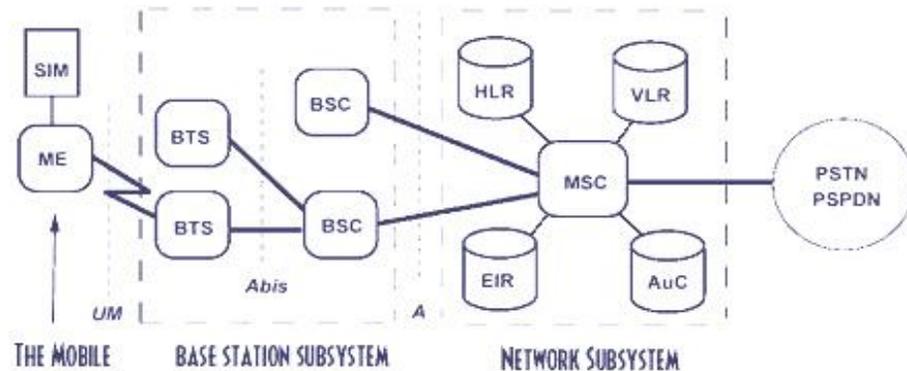
1.2.1. Roaming Definition

Traditional GSM Roaming is defined (cf. GSM Association Permanent Reference Document AA.39) as the ability for a cellular customer to automatically make and receive voice calls, send and receive data, or access other services, including home data services, when travelling outside the geographical coverage area of the home network, by means of using a visited network.

The term "roaming" originates from the GSM (Global System for Mobile Communications) sphere; the term "roaming" can also be equally applied to the CDMA technology.

1.2.2. How does roaming work?

Every network basically has two big databases, the HLR (home location register) and the VLR (visitor location register). When a service is "activated" for a subscriber, that means your International Mobile Subscriber Identity (IMSI, a unique identification encoded in the SIM card) is entered in the Home Location Register (HLR). The HLR also puts it in the Visitor Location Register (VLR). When the phone is switched on, the network queries the VLR, and it lets the phone connect if its record is in the VLR.



When one operator does a roaming agreement with another operator, their HLRs talk to each other. This does NOT happen over the public internet, but over the leased lines that connect telephone systems to each other.

So when the phone is at home network, and its account is good, it is both in the HLR and the VLR. But if it is suspended (but not cancelled), it is still in the HLR, but not the VLR. When roaming you are in the visited networks VLR, but not their HLR. The VLR controls who connect, the HLR contains the subscriber data.

1.2.3. Roaming Agreement

A roaming agreement is an arrangement between two mobile carriers which allows one carrier to extend its coverage by utilising the network infrastructure of the other mobile carrier. Roaming agreements are negotiated on a commercial basis and usually relate to a particular geographic area. That is, your carrier may have a roaming agreement with carrier X which allows you to access X's network in area A, where the roaming agreement applies. You will not be able to use carrier X's network in area B if the roaming agreement does not apply to area B.

1.3.Objectives

To prepare a concept paper on how roaming facility can be implemented in order to achieve the benefits associated with it.

1.4.Methodology

The study is carried out in informal consultation with the stakeholders, and studying the documents available at NTA, previous studies in the subject matter, and materials available in the Internet etc. taking into consideration the present regulatory and legal framework of the Telecommunication Sector.

2. STUDY/ANALYSIS

2.1.Technical Analysis

2.1.1. Roaming is the basic feature of a GSM network and there does not seem to be any technical difficulty in implementing it, either national or international. It is successfully being implemented throughout the world; the problem actually lies in the legal and regulatory framework whether to implement it or not within the national boundary.

2.1.2. The document IRMG version 5.4 contains the guidelines and procedures for the assignment and use of International Roaming Mobile identification numbers (IRM) in ANSI-41 based mobile systems. IRMs perform, internationally, the same function as the Mobile Identification Number (MIN) in domestic networks. The use of IRMs is a temporary solution for international roaming between or into ANSI-41 based systems. The long term solution is the evolution to and use of the International Mobile Subscriber Identifier (IMSI), a 15-digit identifier defined in the International Telecommunications Union's (ITU) Recommendation E.212 - The International Identification Plan for Mobile Terminals and Mobile Users.¹ Several issues regarding roaming of ANSI-41 network is listed in the website www.ifast.org.

2.1.3. Prepaid mobile phones and roaming² - In the early years, prepaid mobile phones could only be used within the operator's network that the customer purchased the phone from. It was not possible to roam onto other GSM networks when using the phone abroad. This was because the operator had no way to bill calls in real time from another network.

However, most prepaid phones now offer roaming using one of the following methods:

¹ IRM Guidelines v5.4

² http://en.wikipedia.org/wiki/Prepaid_mobile_phone#Prepaid_mobile_phones_and_roaming

- The prepaid mobile phone user dials a "trigger" number from the foreign location using a USSD message which is not charged for whilst roaming. Upon receipt of the USSD, the customer's operator will then return the call. When the service calls back, the user is being charged for the cost of the service from the credit available in the home network. The service will then prompt the user to enter the dialled number of the party to be called. The disadvantage of this method of roaming is that the user will not be able to dial numbers directly from the handset. The advantage is that it works in almost all locations around the world since USSD is ubiquitous and free.
- The user can direct dial from their handset if the network they are roaming in supports CAMEL (Customised Applications for Mobile networks Enhanced Logic)³. This allows real time billing by the home operator without having to dial the customer back. The advantage is that it is more natural and works seamlessly. The disadvantage is that not all networks support CAMEL so the list of countries where a prepaid customer can use their phone abroad is smaller than for post-paid mobile phones.

At present, NDCL is providing international roaming service to its post-paid customers only whereas NCELL is providing such service to both prepaid and post-paid subscribers.⁴

2.1.4. Services and applications of the 3G and 4G mobile communications technology are still evolving. Especially when national roaming agreements are made before networks are built, it seems plausible that contracts do not consider all possible contingencies.⁵

2.1.5. Instead of finding new methods for national roaming between operators it is worth adopting same technical procedures as adopted worldwide for the traditional international roaming. That means each and every incoming call to roamer shall be routed through home network and each and every call initiated by roamer shall be terminated directly by visiting network.

For example: If a NCELL network user of Kathmandu went to Phungling, DHQ of Taplejung, Mechi Zone, where there is no NCELL network except NDCL network. If s/he dial NDCL or NCELL user number of KTM, then NDCL network analyses the dialled number, and decides how best to route the call. His call will be connected directly to the destination number

³ Can be seen in detail at

http://en.wikipedia.org/wiki/Customised_Applications_for_Mobile_networks_Enhanced_Logic

⁴ Source: www.ntc.net.np; www.ncell.com.np

⁵ "National Roaming – An Incomplete Contracts Approach", Preliminary Version, Martin Jindra, University of Freiburg, Germany, October, 2004

without being informed to NCELL. NDCL eastern network will record the call.

But if someone calls him from NCELL/NDCL user number, NCELL/NDCL can't directly connect the roamer, which is at the moment roaming in NDCL network but the call will usually be routed to NCELL network first. NCELL knows where he is roaming, and will then forward the call to the NDCL eastern network. The eastern network will then connect the call to him.

This initial routing back to home operator happens regardless of where the call originates, as only home operator has the information about roamer location.

2.2. Economic Analysis

2.2.1. Mobile carriers provide coverage for their customers in two ways. Traditionally, each carrier has built its own infrastructure in order to provide service to its customers. Some carriers have also been extending their coverage through national 'roaming agreements'. National roaming has also been used by new entrants into the mobile market to allow them to establish a national network presence; and by current mobile carriers to facilitate an expansion of network coverage.

For example in Australia,

- Hutchison provides CDMA coverage (marketed under the brand name Orange) outside its license area of Sydney and Melbourne, through a roaming agreement with Telstra's CDMA network.
- Hutchison increases coverage beyond Melbourne, Sydney, Adelaide, Brisbane and Perth for its 3G users (marketed as '3'), through a roaming agreement with Vodafone's GSM network.
- Vodafone increases its GSM coverage along selected highways in Victoria and Tasmania through a roaming agreement with Telstra's GSM network.

Likewise, under the Mobile Phones on Highways Project, the Federal Government supported Vodafone to improve GSM coverage along 16 major highways. Under the Agreement between Vodafone and the Government, Vodafone is required to offer national roaming to other mobile operators, where this is requested. Vodafone is involved in on-going dialogue with mobile operators regarding commercial roaming agreement associated with the project.

2.2.2. In order to offer their services, network operators are required to invest in network capacity. Alternatively usage rights on a competitor's network might be purchased through national roaming agreement. Buying network capacity instead of building up a network might be cost reducing for a less experienced or new operator, but comprises

the risk of losing full control over an elementary input which is necessary for operator's services. This problem will be reflected by an option given to the roaming offering operator to retreat from the agreement, after first irreversible investments have already been made. Irrespective whether the holdup problem occurs, both operators will be given second investment round to increase their network capacity.⁶

- 2.2.3.** Though the incoming calls are free in the country, it is worth noting that while roaming, roamer has to pay for both inbound and outbound calls, typically higher than inter-network calls.

Here the call charge according to the published tariff rate of both-operators will be minimum of NRs. 3.50 (1.50 NDCL to NDCL call + 2.00 NDCL to NCELL) +additional roaming fee and NRs. 4.52 (1.99 NCELL to NCELL+ 2.53 NCELL to NDCL) +additional roaming fee /minute for making a call excluding service charges and local tax.

Principally the charge of this call has to be paid by roamer but so far incoming calls are free in the country the charge is accumulated on call initiator's bill. Visited network Operator can't deduct the charge of a call from the available balance of the user. In such case facility shall be allowed only for the post-paid users.

2.3.Social Analysis

- 2.3.1.** While overseas visitors to Nepal can roam in any cellular mobile network, Nepalese users can't. Apart from the inconvenience, this can also mean that, in an emergency, customers may actually be within reach of another network, yet be unable to make contact.
- 2.3.2.** Furthermore, even though the networks are built by any operator, private or government owned, general public are the real owner. Allowing the access to subscribers of other networks into their networks, they not only fulfil some sort of corporate social responsibility as well as generate extra revenues typically at no extra cost.

2.4.Regulatory Analysis

- 2.4.1.** In situation where separate 3G licenses are issued in addition to the existing 2G service, it is obvious that the new 3G operator will face difficulty in achieving expected market penetration in absence of

⁶ "National Roaming – An Incomplete Contracts Approach", Preliminary Version, Martin Jindra, University of Freiburg, Germany, October, 2004

limited network roll-out in the beginning. Hence, 3G operator might look for roaming access into the existing 2G network until it reaches certain minimum network roll out.

2.4.2. As stated in Malaysia Broadband news, U Mobile Sdn Bhd and Celcom Axiata Berhad [formerly known as Celcom (Malaysia) Berhad] have extended their partnership on domestic roaming arrangement for another 3-year duration. This arrangement made effective 1 July 2010, and is an enhancement of the existing agreement. The Domestic Roaming agreement was signed by the Chief Executive Officer of U Mobile, Dr. Kaizad Heerjee, on behalf of U Mobile while the Chief Executive Officer of Celcom, Dato' Sri Shazalli Ramly, signed on behalf of Celcom. The existing domestic roaming agreement between the two parties was first signed in year 2007 and was a landmark agreement, being the first such agreement of its kind in the country that allowed customers to enjoy complete nationwide mobile coverage at no additional cost to the users. Through this renewed domestic roaming arrangement with Celcom, U Mobile customers will continue to enjoy nationwide coverage and improved user experience, with seamless hand-over of voice calls from U Mobile's 3G network to Celcom's 2G network. Later in the year, U Mobile subscribers roaming on Celcom's 2G network will also be able to access data services such as Mobile Internet, MMS and Content Downloads. Dr. Kaizad Heerjee, the CEO of U Mobile said, "The seamless integration between U Mobile's 3G network and Celcom's 2G network will deliver an unparalleled level of mobile communications to the end users who constantly need to stay connected." "This move demonstrates the industry's ability to arrive at a commercial agreement that helps meet the objective of the Ministry of Information Communication and Culture to benefit the consumers by providing nationwide coverage," he added. "We are pleased to continue the working relationship with U Mobile on the domestic roaming front. Through this collaboration, Celcom can carry on empowering U Mobile's customers, offering them the convenience of the widest and the best coverage in Malaysia," said Dato' Sri Shazalli. With the new commercial arrangement with Celcom, U Mobile will maximize the benefits for its customers by offering competitive products and value added services riding on its 3G network which provides fast, smooth and stable connection.⁷

⁷ <http://www.mybroadbandnews.com/2010/09/u-mobile-and-celcom-extended-domestic.html>
(accessed on 20 October, 2010)

2.4.3. Canada is mulling on implementing mandatory roaming on cellular, PCS and AWS licensee's networks.

2.4.4. The paper "National Roaming Pricing in Mobile Networks" develops a practical model of optimal and competitive neutral national roaming access prices. This method takes account of the geographical cost structure of networks, and thus allows for the "cream-skimming" effect whereby a new entrant will concentrate its own network build in low cost (higher traffic density) urban areas, especially when it uses a technology that has a cost advantage in these areas. Both incumbent and new entrant networks will invest in more geographic coverage when the national roaming access price is set higher – the incumbent will do so because of the extra revenue it will get from roaming charges, and the new entrant will do so in order to avoid paying roaming charges to the incumbent. The paper provides an illustration of how the method could be applied to a situation where the host incumbent is restricted to GSM 900 against a new entrant deploying WCDMA 2.1 GHz. Under realistic assumptions we have calculated that **a competitively neutral national roaming access price will be about 38% above the average cost on the host incumbent's network**, although this result will depend on the specific distributions of traffic against geography in the country concerned. An access price set at this level will ensure competitive neutrality between networks, and provide efficient investment signal for the new entrant network.⁸

2.4.5. In Jordan, specific section on mobile licenses stated that, "entering into domestic roaming agreements with other licensees shall be subject to the mutual agreement of the parties concerned; such agreements shall be deposited with the TRC for approval. The obligations of the Licensee under such Section shall be interpreted by the TRC so as to ensure that so far as is reasonably possible in the circumstances, they are competitively neutral and non-discriminatory. "Accordingly, any proposed national roaming agreements must be submitted to the TRC for review and approval "on a case by case basis", and mobile Licensees shall submit to the TRC any information it may require to evaluate the proposed national roaming agreement. Hence, TRC concluded that the provisions in the existing mobile licenses are adequate at that point in time and has determined it is

⁸ Abstract from the book "National Roaming Pricing in Mobile Networks" by Jonathan Sandbach, Head of Regulatory Economics, Vodafone Group, UK

impractical to publish an exhaustive set of rules with respect to National Roaming matters.⁹

2.4.6. Impact of regulation on Roaming:¹⁰

- Investment decisions
- ACCC Inquiry 1997 “declaring roaming may have an adverse impact on investment incentives”.
- Impact on commercial negotiations

2.4.7. Regulatory Framework on National Roaming for Mobile Facility Based Providers (FBP) in place in Saudi Arabia has following considerations for having such regulation in effect.¹¹

- Provision of National Roaming helps to establish a level playing field for new Mobile FBP entrants and to maximize consumer benefit. Guaranteeing access to an existing Mobile FBP's network for a predetermined period of time will allow the new entrant to compete on a more equal footing with existing Mobile FBP's while providing the necessary commercial incentive to roll out its network.
- Regulation of National Roaming is also necessary to ensure the benefits of the new entrant's services are available at realistic and affordable prices to the end users.
- National roaming may require changes to the host Mobile FBP network which may in turn impose costs on the host Mobile FBP.
- The Communication and Information Technology Commission (CITC) has issued a Decision (No. 48/1425) dated 12/07/1425H (12/07/2004) which directed the incumbent to offer national roaming to the new Mobile Service Provider.

2.4.8. UAE has policy on “National Roaming Services” in place since 30th April, 2005.¹²

2.4.9. National roaming is a form of infrastructure sharing in mobile communication networks, where an operator opens his network for a competitor's customers and is compensated by usage based charge. Arguments in favour of national roaming include the reduction of network investments or faster network rollout. This paper examines the effects of national roaming on competition, network investments

⁹ Statement on the implementation of Infrastructure sharing and national roaming For mobile telecommunications operators in Jordan Amman by Telecommunications Regulatory commission, the Hashemite Kingdom of Jordan, March 15 2005

¹⁰ ACCC Mobile Services Review National and International Roaming, Vodafone Australia, Brian McDonnell, 29 August 2003

¹¹ Regulatory Framework on National Roaming for Mobile Facility Based Providers, Communications and Information Technology Commission, Kingdom of Saudi Arabia

¹² Policy, National Roaming Services, Version 1.0, Issue date 30th April, 2005, Telecommunications Regulatory Authority, United Arab Emirates

and welfare. Using an oligopoly setup with ex-ante capacity investments and incomplete contracts, it is shown that cooperation might increase production efficiency but does not affect total network capacity.¹³

2.4.10. In Sweden, Vodafone and “3” compete in urban areas with separate networks, while coverage in rural areas is provided by a jointly owned company 3GIS, which is building and operating a single network for both operators. In the UK, T-Mobile and O2 have closed a similar agreement, with the difference that coverage of less populated areas will be split between the two operators, who will grant each other roaming rights on these parts of their networks (Gabathuler and Sauter, 2003).¹⁴

3. KEY FINDINGS

3.1. Technical Findings

3.1.1. The concept of roaming is to facilitate its subscribers for making and receiving voice and data calls beyond its network coverage area. For this purpose an internationally accepted standard agreement format normally has been used after some modifications to suit to both operators for international roaming arrangement. NDCL has made such agreement with 172 operators worldwide and likewise NCELL has also made with 166 operators worldwide for international roaming.

3.1.2. NDCL has its own three separate networks each for GSM and CDMA technology and has already installed BTSs at 70% of the VDC locations of the country according to a study conducted by NTA in 2010. Obviously the coverage might be more than 70% but the exact figure is not publicly available. Nationwide intra-operator roaming has been allowed to its subscribers (both Pre-paid and Post-paid) without charging any additional fee recently. NCELL has one network endeavouring to cover whole country at one rate. It has installed BTSs at 2% of the VDC locations, 67% of municipality and 47% of the district headquarters across the country. The Table 1: Network coverage by operators in the country as of October 2010, shows that all operators are endeavouring to increase their coverage area.

¹³ Abstract from “National Roaming – An Incomplete Contracts Approach”, Preliminary Version, Martin Jindra, University of Freiburg, Germany, October, 2004

¹⁴ “National Roaming – An Incomplete Contracts Approach”, Preliminary Version, Martin Jindra, University of Freiburg, Germany, October, 2004

The study reflects that most of the operators have their BTS nearly at same site as that of NDCL. **Hence national roaming seems to be of much use to the users other than NDCL users at present.**

Table 1: Network coverage by operators in the country as of October 2010

Operator	District	Municipality	VDC
NDCL GSM	75 (100%)	58 (100%)	594 (15%)
NDCL CDMA	75 (100%)	57 (98%)	2755 (70%)
NCELL GSM	35 (47%)	39 (67%)	85 (2%)

3.1.3. Research and development work on inter-standard roaming concept has still been in progress. Provision of dual SIM in a user set is already commercialized in the market. It is seen that Brazil and Nigeria has successfully implemented Inter-Standard Roaming service. NDCL has both mobile technology (GSM & CDMA). Enormous benefit like bandwidth utilization, network efficiency, load balancing, improved QoS, avoiding duplication of network and high revenue generation can be achieved if NDCL is able to introduce such technique.

Until availability of such facility with ease and is a global phenomenon, traditional common standard roaming concept can be the better option to adopt in the country.

3.1.4. Likewise, the new emerging technology for the mobile communication might not be other than WiMax or Wi-Fi. This technology covers larger area than GSM and CDMA technology. It is obvious that more the new technology comes into picture, the demand of roaming becomes more. The roaming requirements will became rather more if limited service/area licenses are issued.

3.1.5. Post-paid roaming can be implemented with ease without causing any major modification in the existing network. However, due to inability of the existing network to calculate the usage charge of the prepaid customer at real time, it is not possible to implement roaming for prepaid subscribers. However, with the addition of new software at both the home and guest network, roaming for prepaid subscribers can also happen.

3.2. Economic Findings

3.2.1. Normally systems are designed for certain number of users. While designing the capacity of the system, type of services to be offered, quality of service, traffic flow at busy hour, bandwidth requirements and others should be taken into consideration. All the features of the system are configured before commercialization. No such additional equipment is needed especially for the roaming arrangement between

the operators. However, depending on the flow of traffic, up gradation of certain entities might have to be carried out in future.

3.2.2. It is mandatory for service providers to maintain transaction account while selling and purchasing the product in the business. Hence, the main cost involved in realizing roaming arrangement between the operators is the cost involved in administrative management which is typically done by automatic billing system.

3.2.3. Communication itself is a lucrative business and roaming makes it more lucrative. It is an optional business with zero additional investment. In other words, roaming enables revenue generation scheme from users of other network, which would otherwise have been impossible.

3.2.4. Absence of roaming can lead to expensive network overbuild, as well as to customer inconvenience and higher prices. So, it might be cost effective for the operators to mutually agree to have roaming facility in those areas where it is cost effective to have single network rather than duplicate network. In other words, it can also save duplicate investment, which could otherwise have been used to serve people at other disadvantaged locations.

3.2.5. Roaming tariff can be judged in three ways:

- Average revenue per port generated by host operators.
- Mutual agreement for Account sharing basis
- Whole sell tariff rate basis.

Even though roaming charges can be slightly higher than normal inter-operator charges, they should not be exorbitantly high.

3.3. Social Findings

3.3.1. It is believed that one of the most striking feature for the success of GSM based mobile service is the roaming feature available in this technology throughout the world, thereby benefitting the large mass of people who is moving from one country to another. Another competing technology is also aspiring to have inter-standard as well intra-standard roaming available in its cache of services. So, it is believed that where people are benefitting and aspiring to have roaming service, albeit internationally at present, it seems socially justified to have domestic roaming as well.

3.3.2. At present, subscribers of competing network are accessing each other's network through point of interconnection (PoI). Roaming also allows access to another network but through different technical arrangement. Hence, it seems justifiable to have access to another network by the subscriber whenever s/he wants regardless of the technical arrangement being made.

Regulatory Findings

- 3.4.1. In some countries, roaming agreement has been done to avoid duplicate investment in areas with less revenue generation such as less populated and remote areas. Same has been done to provide continuous service in highways.
- 3.4.2. Independent studies being carried out have outlined the reduction of network investments or faster network rollout in case there is roaming service in place.
- 3.4.3. Roaming regulations in some developed countries are intended to facilitate the new entrant for a pre-specified time until they are able to have their own significant network in operation, thereby eradicating the disadvantaged position new entrants have in the beginning. Thereafter, it was left open to the operators to decide on their own to continue the agreement or not. This was also the case when the new entrant was a 3G operator as they might have difficulty in reaching all parts of the country in comparison to 2G operators.
- 3.4.4. Some countries have even concluded that the existing rules, regulations and license conditions do not bar any operator into having roaming arrangement with any operator. Hence, instead of having elaborate roaming guidelines in place, they have opted for getting such roaming agreement between the operators verified by the regulator.
- 3.4.5. Each country's requirement is different from another country. Same regulation may not work across other countries. Hence, it is better to formulate a regulation that best suits the country's need at present.

4. CONCLUSIONS AND RECOMMENDATIONS

Taking into account of several perspectives, NTA has planned to coordinate in this regard and shall take following steps in the beginning:

- Make the stakeholders aware the concept of domestic roaming,
- Prepare standard agreement format in consultation with the operators,
- Formulate the rules and regulations,
- Develop arbitration mechanism in case there is dispute between operators,
- Justify tariff rate,
- Collect and update users' opinion regularly etc.

Hence, NTA has prepared this consultation paper with some recommendations for the operators to follow.

- 4.1. Roaming can strategically be used to facilitate arrangements as stated below:
 - i. To avoid duplication of network in areas where there is less possibility of return on investment. Such arrangement can be made in those areas

where competing operators establish their network avoiding duplication and allow roaming access to each other's subscribers at mutually agreeable tariff applicable to both the operators.

- ii. To ensure seamless network availability at highways where the operators can agree between themselves to provide roaming in selected mutually exclusive highways.
 - iii. To allow new entrant to have access to other network operator for a pre-specified time. This will do away with the disadvantage the new entrants have when they are yet to roll-out their network. However, such arrangement shall not be allowed for longer duration which might adversely affect new entrant's network roll out.
 - iv. To ensure the subscribers are able to communicate when their subscribed network is temporarily down or the signal is not present due to adverse geographical setting.
- 4.2. Roaming should not be allowed between operators at those areas where the population is large and which are easily accessible, such as Metropolitan cities, Municipalities, District Headquarters etc. Such places can be chosen at first which can be updated at pre-specified interval at later dates.
- 4.3. At sites, where signal other than subscribed network is available but the quality of signal of home network is of unacceptably low quality, it is suggested that roaming should be permitted upon network selection by the subscriber. However, such arrangement shall not mean that the operator has fulfilled the license obligation regarding network roll-out, if any.
- 4.4. Roaming shall not occur on the basis of signal strength of any network.
- 4.5. Roaming shall ensure that the specified quality of service of both normal call and roaming calls shall be same. In order to maintain the quality of service for their own customers, hosting network shall have the flexibility to bar the roaming service to the subscribers of other network for limited period of time with due reason.
- 4.6. Roaming facility shall be available between operators who are licensed to operate throughout Nepal at present. However, providing such facility to Limited Mobility operators cannot be ruled out at this moment.
- 4.7. It is recommended that Inter-standard roaming between operators should not be mandated at this point of time as technology has not matured and they are still in experiment phases wherever this has been implemented. So, it's better to contemplate upon this when inter-standard roaming is accepted globally.
- 4.8. Roaming facility is typically provided to post-paid subscribers, for national as well as international. Even though there are few cases of prepaid roaming available with additional software and hardware at both host and guest network, it is recommended that such facility be provided to post-paid subscribers only in the beginning. This might encourage the subscribers to move from prepaid to post-paid scheme. With addition in software and hardware by the operators, which cannot be mandated, prepaid roaming can also take place in the future.

- 4.9. Recommendations set by International bodies such as GSMA, IFAST etc. Shall be implemented in existing cellular networks so that issues related to roaming such as fraud, technical difficulty to provide roaming etc. can be sorted out.

5. ISSUES FOR CONSULTATION

- 5.1. In principle, do you agree with the concept of inter-operator national roaming as proposed and recommended in this consultation paper? If not, suggest any other techno-commercially viable alternative to ensure seamless movement of a subscriber of a service provider to an area where its network does not exist but other operator's network exists.
- 5.2. If National Roaming is agreed as mandatory provision for the service providers using the same technical procedures as adopted worldwide for traditional international roaming, at within what time frame will you be technically ready for providing service to the subscribers of other domestic operators?
- 5.3. To make this arrangement economically viable and attractive for the service providers while not giving excessive burden to the roaming subscriber, what kind of commercial agreement can be entered into between operators?
- 5.4. Since the operators' subscriber base and geographical presence are different, do you favour any kind of preferential/ non-reciprocal treatment or the agreement should be similar irrespective of the subscriber base and geographical coverage of the operator?
- 5.5. Do you think national roaming shall partially serve as an alternative to infrastructure sharing? Give your opinion.
- 5.6. As incoming calls are free in the country the inter-operator charge is accumulated on call initiator's bill and Visited network Operator can't deduct the charge of a call from the available balance of the user, how would you manage to deduct the balance of a roaming pre-paid subscriber?
- 5.7. Are you open to enter into national roaming agreement with other operators in technologies other than GSM such as CDMA, WiMAX, 3G, LTE, etc.
- 5.8. Provide any other relevant comment/suggestions on this consultation paper on National Roaming.

“The Authority shall formulate the Guidelines after receiving the comments, suggestions and feedback from all the stakeholders”.