

## **Introduction**

This chapter shows the technical specification, of the TDM as an interconnection approach, also this chapter discuss some of the countries that have migrated from TDM to NGN in addition to their implementation of MNP. More explanation of NGN will be in chapter3.

## **2.1 Technical Specifications**

Technical specifications may be applied in the order precedence set out in the relevant regulation as

- ITU Recommendations
- ETSI Recommendations
- National Standards/Specifications.(NTC Recommendations).

### **2.1.1 Point of interconnect (POIs) and Interconnection links**

This section defines the conditions for the actual connection of one network to another network, the connection at a point of Interconnection (POI).[ 4]

#### **2.1.1.1 Network Level of Interconnect**

This may be realised in a physical way or in a virtual way through a reference network.

Interconnection shall be available at the following levels

- Local level
- Transit level
  - International level

The POIs may be associated with the physical network of an operator at the networks design stage at particular points in time alternatively, the POIs may be associated with a system independent structure, that to access to the relevant service may be achieved without detrimental effects.

#### **2.1.1.2 Location of POIs:**

Each party manage that part of the interconnect link which is on its side of the POI. Interconnect links may be self-provided by the operators or procured from a third party.

Physical collocation enables housing on an operators premises of the equipment necessary for Interconnection, such operator grant the other

operator or its authorised representatives, access to the equipment at any time, subject to an agreed procedure. Access for routine or planned maintenance may require reasonable notice in advance, but this shall not restrict obtaining immediate access in case of emergency (network failure)

a) POI at One of the Operator's Sites

One of the operators is responsible for providing Interconnect links from their site to the other Operator's site

b) POI at other locations

Both operators jointly provide the interconnect links. The POI may be located at any point (mid points between sites of the two operators or on the site of third party).

c) Extension Circuits

This is an additional interconnect links that extends the interconnect from the point of interconnect to additional operator Switch at a site remote from the initial Switch, this facility uses the additional operator transmission plant to provide the access and is likely to be appropriate for Interconnection with physical network.

### **2.1.1. 3 Interconnect link**

Interconnect links will be established between the parties to provide the means by which calls and signalling can be passed between the two network. The transmission capacity may be provided by or for one or both interconnect operator.

Arrangement to permit access by one operator of equipment physically located on the premises of the second operator, and related issues of which operator supplies electrical power (AC power or Dc power with battery backup). [2]

### **2.1.2 Interface Standards:**

#### **2.1.2.1 Electrical and Physical Interface**

Physical transmission media (Optical, Electrical or Radio)

### **2.1.2.2 Transmission Interface**

The parties shall interface at 2Mbit/s level and in accordance with ITU-T Rec. G703 Plesiochronous Digital Hierarchy (PDH), Synchronous Digital Hierarchy (SDH) and Synchronous Optical Network (SONET)

Bandwidth 64Kbit/s, 2Mbit/s, 34Mbit/s or higher order bandwidth as required. (Multiple 2Mbit/s transmission circuit can be multiplexed, and brought into an operators switching centre at high level, 34Mbit/s or 140Mbit/s or more then de multiplexed into individual 2Mbit/s Streams. The agreement shall define the Ownership of the de multiplexed equipment

### **2.1.2.3 Signalling Interface**

Using R2 or SS No.7, Signalling System Numbers 7(SS No.7) is now widely used. SS No, 7 standards aim at defining Signalling procedures and architectures in circuit Switched networks: PSTN, ISDN, GSM and IN.

Telephony User Part (TUP), which defines the formats and signalling procedure to be used for Public Switched Telephone Network (PSTN) calls and integrated service user part (ISUP), which define the formats and signalling for the Integrated Service Digital Network (ISDN), and Global System for Mobile Communication (GSM) basic calls and supplementary services. These standards are appropriate for the Interconnection of different network in the same country for the provision of fixed or mobile voice telephony services.

#### **A. SS N.7 Layers:**

##### **a) Messages Transfer Part (MTP)**

The MTP shall conform to ITU-T rec. Q701---Q707

The MTP shall allow messages from all different users to be transferred on the same signalling data link

##### **b) Integrated Service Digital Network (ISDN) user part (ISUP)**

ISUP following ITU-T Rec. Q.761 to Q.766 is used to support basic bearer service and supplementary services for voice and non-voice applications.

#### **B. Signalling Inter working and Compatibility**

It should be ensured that networks with different signalling types (even within the same type of signalling) work together without any signalling failure or any other signalling problems. [5]

### **2.1.3 Network Synchronization:**

The need for synchronization arises with the introduction of digital techniques.

Especially SDH and SONET connection need clock synchronization

Loss of information is often caused by poor synchronization

Clock errors leads to slip I.e. loss of frames and repetition, which causes: Noise, Transmission losses, Bit error

A digital multiplexing and de multiplexing needs synchronization in order to distribute the single channels to the correct targets

A data packet signal doesn't need synchronization. Each packet contains information from one source and has information about the start of the packet.

There are many type of synchronization:

Distribution of the clock over special synchronization links,

Distribution of the clock by utilising traffic links,

Use an independent clock in each node,

Use an international navigation system in each node, and

Combine some of the upper four methods.

### **2.1.4 Services**

Interconnect call services are provided in order to allow any to any communication, where customers of one operator can call customers of another operator.

Interconnect services are provided in order to allow customers connected to operator's network to access services offered by another operator, possibly in competition with first operator. Furthermore, some interconnect services may be provided by an operator on a fully competitive basis as alternative to other ways of meeting demands.

The following is not an exhaustive list of services. For each service in the interconnect agreement, principle of charging and call handover shall be defined.

#### **2.1.4.1 Data Management Amendments**

Access to each other's telephone numbers will be achieved by implementing data management amendment in the networks. This is

necessary for access to both geographic and non-geographic numbers. Adequate testing shall be conducted to verify that access has actually been enabled.

#### 2.1.4.2 Conveyance

##### A. Local

Operator B will terminate in its network any calls passed from operator A customers where the terminating numbers belongs to operator B. The calls may originate in operator A network, or in another country with connection to operator A. Operator B charges operator A for the termination service, an example is shown below:

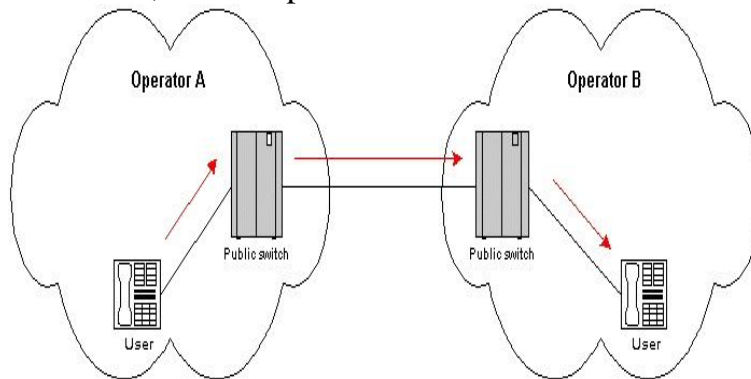


Figure 2.1 Traffic termination,, source: Interconnection Instructions[10]

##### B. International Conveyance

Operator (B) will convey across its network, any calls passed from Operator (A) customers, where the terminating numbers belongs to an international operator having a corresponding agreement with operator (B). Operator (B) charge operator (A) for the termination service, an example is shown below:

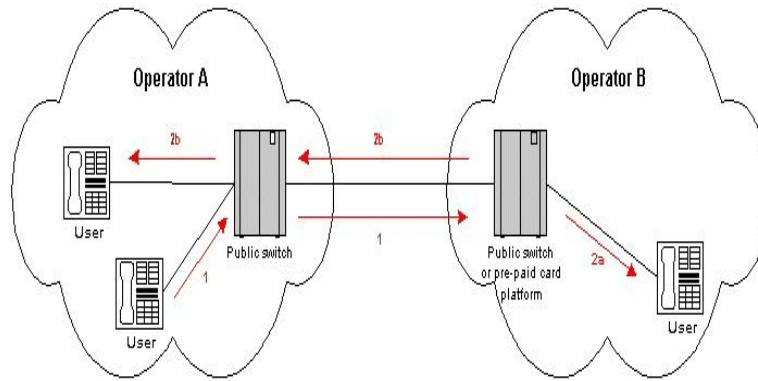


Figure 2.2 Traffic origination,, source: Interconnection Instructions[10]

### C. National / Transit

Operator (A) passes call to Operator (B), for termination in the network of Operator (C). The calls are terminated in a network other than operator (B).

an example is shown below:

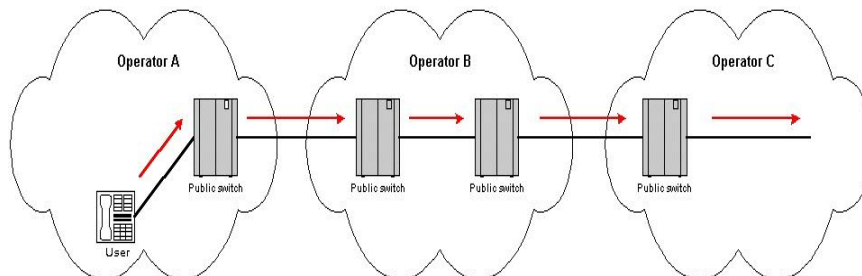


Figure 2.3 Traffic transit,, source: Interconnection Instructions[10]

### D. Special Telephone Service

Operator (B) will terminate in its network any calls passed from operator (A) customers where the terminating numbers belongs to operator (B) service provider (can be a service provider business of Operator B or a third party service provider). The calls may originate in operator A's network, or in another country with connection to operator (A) networks, Calls may be specially tariff numbers translation service Calls, such as free phone and premium rate Calls, with services from both interconnecting parties.

## **E. Access to Local loop**

This enables access directly to the individual customer line, to permit conveyance of calls between the customer and the other operator.

### **2.1.4.3 Operator Assistance Services**

The call will be passed over to the operator assistance at a numbers of specified connection points, Service will not discriminate of different operator.

### **2.1.4.4 Directory Enquiry Services**

The call will be passed over to the directory enquiry provider. at a number of specified connection points. Service will be not discriminate between customers of different operators.

### **2.1.4.5 Emergency Services**

Customers of all operators can pass their customers emergency service calls to the emergency service provider. They will handle and pass to the correct authorities.

### **2.1.4.6 Numbers Information System and Services**

The numbers of all operators must be allowed in a numbers information system database. It is source of phone books and directory assistance information.

### **2.1.4.7 Phonebook and Directory listing**

Operator buys directories from the providing operator, for distribution to their customer. Nothing in the Interconnection agreement shall be read to require an operator to have a printed directory. It shall be possible for customers of one operator to have a listing in another operator's directory.

### **2.1.4.8 Calling Card / Charge Card Facilities**

This will enable all operators to provide their customers with access to another operator's charge card platform to enable calls to be made and charged to the calling card/charge card.

### **2.1.4.9 Numbers Portability**

The numbers portability is a facility, which allows a customer to keep his/her telephone numbers in circumstance where traditionally, the customer would have to change his/her numbers.

The introduction of numbers Portability is a major undertaking, which requires planning and co-ordination between operators, both for technical and commercial aspects.

Particularly, the recovery of any costs incurred by the parties involved shall be addressed at an early stage

### **A. Operator Portability**

Allow customers to keep their telephone numbers when changing the operator they buy their telecommunication service from when they remain at the same geographic location.

The facility can apply to all classes of numbers, PSTN, ISDN, free phone and specially tariff numbers, translation service numbers, personal numbers, and Mobil numbers.

#### **a) Call Forwarding**

It uses existing Switch software and is implemented by simply (data filling) the donor Switch with prefix code for the porting customer. It does however use two numbers and is inefficient in routing terms

#### **b) Code Prefix**

Code prefixing attaches a prefix to ported numbers, identifying the new host Switch, therefore using only one numbers per customer. It can be implemented in various ways.

#### **c) IN Solution**

Within solution, a Switch in the originating operator's network interrogates a shared database to discover the identification code of the terminating Switch early in the call set-up chain.

### **B. Geographic Portability**

This allows customer to keep their numbers when moving house or business premises could be done in combination with operator Portability.

The technical options for introducing of Geographic Portability are still being explored, though it is likely that an in solution would facilitate this.

#### **2.1.4.10 Access Service**

Access is the general service provided by the operator serving the calling customer, Operator (A) providing physical connection to the other party operator (B), enabling the calling customer to access services offered by operator (B).

#### **A. Carrier Selection (Indirect access)**

For indirect access, a directly connected customer of Operator (B) would use specific access code to access Operator (A). Operator (B) will implement data management amendments into their network so that whenever the code is dialled .it will be recognised and the call forwarded immediately to the operator (A)



Operator A will pay Operator B for the originating part of the call.

### **B. Carrier Pre-Selection**

Is required to allow end users to choose in advance their preferred default carrier on the networks of those local access providers designated as having Significant Market Power. Short access code shall be allocated.

Carrier Pre-Selection shall be available to all customers (PSTN, ISDN, Data and Local), National and international. According to the agreements the bills can send directly to customers

#### **2.1.4.11 ISDN/GSM Supplementary Services**

There are three types of ISDN/GSM Supplementary services  
First End to end ISDN supplementary services between fixed network,  
second End to End GSM supplementary services, third Common  
ISDN/GSM supplementary services between a fixed and a mobile  
network.

#### **2.1.4.12 Access to Service providers**

For new service introduced by a third party operator, or service provider, where the operator with significant market power it is usually the first to be able to reach commercial agreement for access an issue to consider is interconnect access to a transit service offered by the operator with significant market power to access the new service of the relevant third part.[2]

#### **2.1.4.13 Advanced Services**

There are two types of Advanced Services  
Virtual Private Networks (VPN) services, and IN advanced services  
(Free phone, premium rate, Virtual calling card, UPT)

#### **2.1.5 Intelligent Network Interconnection (IN)**

This section deals with the Interconnection of advanced services such as Cashless Calling, Call Forwarding, Credit Card Calling, Prepaid Calling Card, Prepaid Account Telephony, Numbers Portability, Universal Access Distribution, Universal Personal Numbers, Wake Up Service, Conference, Voice Mail, Prepaid Internet Access, Split Charging service and any other related Value added service, to offer such service to Customers of other operators. [2]

### **2.1.6 Numbering**

The allocation of numbers is matter for the National Regulatory Authority. In Sudan the National Telecommunication Corporation (NTC), the implementation of allocated numbers is a matter for the Interconnection negotiations:

Common and non-discriminatory geographic codes, Common and non-discriminatory use of key non-geographical codes eg. Free phone ,Short access codes for indirect equal access, Allocation of signalling points where appropriate, the Procedure for implementing numbering changes required as a result of decision of the national regulatory authority also transfer of numbers and numbers series. [2]

### **2.1.7 Calling line Identification (CLI)**

This section shall define condition under which an operator will convey CLI to another operator

The purpose for which the receiving operator (billing, call routing, display and validation may use the CLI Possible restrictions on the use of CLI including (Numbers Presentation) (CLR)

Free use of (CLI) for signalling and billing purposes.

The dummy CLI for mobile operators must be specified. [2]

### **2.1.8 Quality of Services (QOS)**

This section defines the Quality of Service parameters that the parties shall meet, the way to measure the actual performance and the consequences of not meeting the agreed figures.

Quality of service provision shall be in the agreement, stating a minimum standard service that is applied to the operators. This shall subject to strict contractual terms and condition. Interconnection traffic shall not be discriminated in relation to other comparable traffic in the network of an operator and alternative routing shall be available in the event of equipment failure in either failure of a particular. [2] Interconnect link.

#### **2.1.8.1 QOS for Telephony**

Calls passed across POI shall be conveyed in the receiving network and routed in accordance with the same routing principals and to the same quality of service as comparable Calls originating within that network, measuring the percentage of successful relevant calls for ingress traffic. Calls are defined as being unsuccessful if they fail due to network problems such as congestion. Where calls failure is due to customer behaviour such as engage numbers and no answer numbers

they will not be consider unsuccessful. In cases of network failure, procedure for alternative routing shall be agreed and utilised.

#### **2.1.8.2 QOS for Interconnect links**

May be specified in Interconnection agreement or in other agreement (e.g. leased line contract) depending on the way the links are arranged, The measure chosen shall include an average measure with an index that takes into account the times in cases, which are significantly better or worse than the average.

#### **2.1.8.3 QOS for Data Management**

Target times for implementation of numbers order to and similar, Measured from the date of receipt of valid order to service provision, consistent with the terms of the interconnect agreement. Each operator must follow the ITU standard for quality of services ITU-T (E820, E.830, E845, E846.P48 and D2048)

#### **2.1.9 Network Design**

This section shall describe, or make reference to relevant network structures of the interconnecting operators and define principles for Call routing.

This section shall also define principles for interconnecting SS no.7. [2]

##### **2.1.9.1 Speech Routing**

Interconnection link may comprise different types of circuit groups. The circuit in each circuit group will convey traffic in a specific direction according to the agreements: One way (Incoming, Outgoing) or both way architecture .

Operators shall switch network configuration about its network to the extent necessary to perform network planning and planning of POIs. This includes a full listing of the Switches and associated numbers ranges where physical network Interconnection is used. The addresses of POIs, shall be made available .In both cases, the information shall include information on the technical interface, Switching technology (digital or analogue) and Signalling system and etc.

##### **2.1.9.2 Call Routing**

Normal call routing shall be such that Calls passed from another operator are conveyed in accordance with the same routing principals as comparable traffic within the network .the parties shall define the

rules for routing traffic in normal and abnormal situations including dealing with overflow, congestion and network management.

### **2.1.9.3 Signalling Routing**

The direct signalling routing and alternative routing whether using Signalling transfer points or not

### **2.1.9.4 Information**

Where charges for service are based upon zones or Switch's boundaries the parties shall switch the relevant data without charge.

### **2.1.10 Network Planning**

This section shall define principals for the continuous planning process that must take place between the interconnecting parties. The planning process shall include:

New POIs, Planning and design of the interconnect link.

Type of circuit group (Unit-directional or Both way directional)

Changes the topology of the networks, Changes to the transmission capacity at each POI during an appropriate planning period ,Detailed rules for call routing (principles defined in (network design) ,Change on the signalling network, New numbering blocks

New services.

The process shall define timing requirements and information Switch requirements. Contingency arrangements will also be established in cases of network failure. First and second choice routing will be agreed including the provision of redundancy between the relevant Switch connections. [2]

Methods of network management (such as call gaping) will take place.

Provisioning time scales shall be included.

Signalling point codes (SPC) and the numbers of signalling links must be specified. [13]

### **2.1.11 Forecasting**

The parties must forecasts the amount of traffic expected over all interconnect links. Based on this forecasts and the QoS requirements, the capacity for the different routes shall be planned.

They must be sufficient time for forecasts capacity to be implemented (6 month or more) depend on the agreement forecasts delivery time.

If any party seeks interconnect capacity at a level other than the forecast or on forecast delivery date other than the agreed forecast delivery date, it may make request to other party to study the feasibility of such a request

Delivery of interconnect capacity is taken to occur on the forecast delivery date or on such other date as may be agreed.

Capacity orders placed will be contractually binding on both parties, though some flexibility shall be built in, during the early days of interconnect.

The actual usage of the interconnect capacity must be greater than or equal to ninety (90) % of its forecast, no over forecasting charges shall apply. If the actual usage is less than ninety (90) % the requested party shall pay for the unused capacity

The parties shall use their reasonable endeavours to ensure that its network

Facilities on its side of the relevant POI are provisioned on the forecast delivery date (or as otherwise agreed) and maintained in accordance with forecasts.

### **2.1.12 Network Protection and Safety**

The parties shall define their respective obligations to protect each other's networks and define measures to prevent endangering people.

[2]

#### **2.1.12.1 Network Integrity**

Network integrity is a question of network management and the ability of the network to maintain certain characteristics with regard to performance and reliability.

The interfaces between the networks must conform to national/international standards. Those standards shall be open and monitored by an independent body.

Compatibility measures shall ensure that networks or systems with different levels of performance work together correctly.

Testing procedures shall be carried out before Interconnection and possibly after Interconnection but before bringing into Service.

Special national/international technical solutions might be introduced for the Interconnection of networks

All testing shall carry out within a reasonable period of time and subject to mutually –agreed principles so as not to delay Interconnection.

#### **2.1.12.2 Operation**

Each party shall be reasonable for the safety and operation of its own system

There shall be points of contact and escalation procedure to guarantee a rapid, non-discriminatory response in case of faults.

Do not damage, interfere with or cause any deterioration in the operation of the other's party network.

### **2.1.12.3 Monitoring**

Every network operator shall be informed at all times about the condition, status of his network and shall pass on relevant information to other interconnected operators in order to be able to identify and clear faults and overload rapidly.

Do not endanger the safety or health of any person, including the employees and contractors of other party.

Each party shall ensure that its network and operating procedures comply in all respects with this agreement.

Nothing in the agreements shall oblige either party to do any thing, which would cause it to be in breach of any statutory, regulatory or contractual obligation of confidentiality or any code of practice on the confidentiality of information issued by the Authority or pursuant to their respective licences. [3]

### **2.1.13 Installation and Testing**

This section shall define procedures for installation and testing for initial Interconnection, as upgrading Interconnection facilities .It shall also define the principles for continuous operation of the Interconnection, including network and traffic supervision, fault and disturbance reporting and fault recovery action.

The need for testing interconnection hardware and software results from the common interest of both networks in maintaining network integrity, testing also help to verify the interoperability of services as well as to ensure a reasonable quality of service and continuous service provision to the customer.[2]

#### **2.1.13.1 Testing**

The purpose of the interconnect Testing is to provide reassurance the party's network can inter-work correctly.

Prior to the conduct of interconnect testing each party shall fully tested its network

#### **A. Testing Items**

First Interconnection of networks

A new POI

Introduction of new Interconnection Switching system type, hardware, software are change with the interface relevance, introduction of new supplementary services,

Introduction of additional capacity to existing Transmission system, Signalling links, Signalling route, Switches.

Test and monitor the performance of the network.

## **B. Types of testing for SS No. 7**

### **a) Validation or Conformity Testing**

The goals are to ensure conformity of hardware, software with national & international standards. The system is testing in isolated operation according to standards test specifications (national and/or ITU Q specifications ETSI).

### **b) Interworking or Interoperability testing (in a test network environment)**

The system of both operators are interconnected and tested for interoperability at the network interface. The basis for the test is standardised national/international specifications ITU/ETSI (ITU-T REC.Q763, ITU-T Rec. Q764 and ITU-T Rec. Q767

### **c) Interoperability or Stability testing (in the operational network)**

The interoperability of services (e.g. billing) is observed for certain time period to determine stability. Using a limited numbers of systems and possibly a limited numbers of customers carries this out.

Each party shall be reasonable to test and monitor the performance of its own network. Testing of the Interconnection link and signalling links shall be kept to a minimum and shall avoid the busy hour periods and this test must be carried out under the agreement between the parties.

Both parties shall agree upon the details of the testing required. Test numbers and contact point shall be switched to facilitate the testing.

### **d) Commissioning Testing**

This test consists of simple functional testing of hardware and software to identify any faults with specific equipment, software or data fill. This may be carried out when new interconnect routes are introduced, or capacity on a route is augmented.

Interconnect testing between the operators shall be carried out as speedily as possible and in accordance with transparent testing costs applicable to all operators.

The required test date and the duration of the test must be specified in details and agreed by both party.

The parties shall act in a good faith and make reasonable endeavours to complete all test items within the estimated testing period.

The party, which is responsible of the delay in completing testing, shall pay to the other party for that delay.[3]

### **2.1.14 Decommissioning**

When one party decide to decommission any POI must notify the other party about the reason and at a sufficient time before the date of decommissioning.

The decommissioning party shall bear all direct costs incurred by both parties in charring out the decommissioning.

Upon the happing of an event which causes or is likely to cause significant

damage to the network of the other party or is likely to endanger the health or safety of any person (Emergency Event), that party may close or replace its SGS or a POI or decommissioning an interconnect link without prior written notice to the other party, provided that it notifies the other party as soon as practicable that the emergency event exists and that emergency relocation work is being or will be performed. The costs incurred as a result of or in connection with, a closure or replacement of an SGS or a POI or decommissioning of an Interconnection link under this sub-clause shall be borne as follows: Where the occurrence of the emergency event was caused as a result of the negligence or wilful act or omission of the first- mentioned party, its employees, agents or contractors that shall bear the costs associated with the closure, replacement or decommissioning incurred by both party. Otherwise each party shall bear its own costs associated with the closure, replacement or decommissioning.

### **2.1.15 Operation and Maintenance**

An operation and maintenance manual shall be drawn up by the parties detailing the responsibilities, methods, and the procedures for the operation and maintenance system at the required quality of service.

#### **2.1.15.1 Fault Reporting**

If either party identify a fault in its network may have an adverse effect on the other party's system, the party which first becomes aware of the fault shall promptly inform the other party. The party in whose system the fault has arisen shall promptly inform the other party of the actions being taken to resolve the problem.

The parties shall develop and record in the operations and maintenance document a series of agreed response times for different fault conditions.

Service restoration shall take priority over the clearance of faults not affecting service.



The party in whose network the fault arises shall, if possible, rectify the fault immediately. If not. The other party shall be notified and kept informed of progress on a regular basis.

Each party shall provide sufficient notice of any planned maintenance which may affect the other party's system and also each party shall try to minimise disruption.

Both parties shall co- operate in any investigation and follow up actions and keep each other informed on the status of the progress of the fault

Clearance in timely manner, also both parties shall establish 24hour contact Points.

#### **2.1.15.2 Type of Fault**

Transmission fault, Signalling fault, Gateway Switch fault and any fault in the local network, which may affect the traffic between the operators.

#### **2.1.16 Change in the Network**

This section shall define the principals for dealing with changes in the system of one operator that may be an impact on the system of the other operator. Issues that may need to be specified are:

The altering party shall notify the other party as soon as is reasonably practicable of a propose network change. The period of notice must be at least Six (6) months or an any agreed period unless a shorter notice period is agreed between the parties in writing such notice shall as far as possible, see out details of the nature, effect, technical details and potential impact on the other part's network of the proposed network change, as such other information as the other party shall reasonably require. The altering party shall be reasonable for the reasonable and direct cost of such change in the other party's Network, and shall pay to the other party such costs, exception to this would be in case where the change is agreed or where the alteration is part of a planned upgrade program.

This will apply in four general circumstances: Physical network Change, Software change, Signalling Change, Signalling and Software upgrade. [2]

### **2.1.17 Provision of Information**

This section shall define rules for providing information on the existing network e.g., network structure and interface. Information shall be provided on planned

Changes to the network structure or hierarchy, as well as planned changes to transmission and signalling systems that may impact other operators.

For the avoidance of doubt, the information that is proprietary, Confidential or commercially sensitive must not be provided.

### **2.1.18 New Requests for Interconnection Services**

Three categories of new Interconnection service have been identified as follows:

Any Interconnection service already provided

Any service already provided by an operator to itself

Any service not provided at all by the operator to whom the request is made

This shall apply to both parties, as it is relevant at least to all new interconnect Services, regardless of initiator, and could be widened to recover all new interconnect services .It covers the process of implementing a new service where full commercial agreement may not yet have been reached.

The aim of negotiation is to incorporate an additional service into the interconnect agreement, The parties shall negotiate in good faith and use efforts to reach agreement as soon as possible. Within agreed time scales, after a request for interconnect has been accepted or is obligatory, if agreement is not reached temporary prices shall be applied, to prevent unnecessary delay to the launch of new services., These prices shall be retrospectively adjusted when the price is finally agreed or determined.

Given the early stage of liberalisation of some markets, it is not clear whether these illustrative timescales can be met; the timescales shall be reviewed in the light of experience.

### **2.1.19 Implementation Time**

Detailed contractual time scales.

Any non-contractual time scales shall be clearly defined.

Time scales may be dependent on the capacity ordered and the amount of associated planning.

Additional capacity on existing routes must be provided more quickly than capacity on new routes. Reasonable flexibility in capacity

ordering shall be permitted in the early stages of planning a new Interconnection link.

It is common and desirable for the operators to provide periodic forecasts of circuit requirements for Interconnect links. Joint planning is necessary to ensure acceptable schedules quality.

### **2.1.20 General**

The ITU-T Recommendations for Interfacing between Equipment Types and for Common Channel Signalling System Number 7 (CCS 7) provide the framework for adherence to the standards contained herein. The Parties are committed to conform wherever practicable with the ITU-T and ETSI GSM/DCS 1800 Recommendations as amended from time to time. The present form of reference will be the ITU-T Recommendations as published in the ITU-T Blue Book (the recommendations endorsed by the 1988 Plenary Assembly) and the Grey Book Recommendation Q.767 . Notwithstanding the above ITU-T Recommendations, for Calls that are originated in one PCMTN and terminated on another, the originating PCMTN will be entitled to block backward signals that modify the originating tariff structure. Such backward signals will be discarded and the Call will be force released. And also both Sudatel and Zain are now using different types of switches and signaling, which lead to many technical problems (Incompatibility).

Seen the multiple and complex situation caused by the absence of an Interconnection agreement and in case of any conflict between the two companies, it is not at all clear how they are going to address it. Usually it is the role of the National Telecommunication Corporation (NTC) to device Mechanisms and rules that govern the inter-relationship between the telecommunication operators

However, it seems that NTC has so far not exerting its full power of authority that obliges the telecommunication operators to put forward such agreements.

recently, 2004, the government liberalized the telecommunication market and immediately two more companies (MTN ,Canartel and Sudani- Sudatel) will become operational. Under such competitive market situation, the absence of an Interconnection agreement will lead to more problems and conflicts between these companies.

Also NTC must have a dedicated interconnection team to put the general outlines of the interconnection specifications.

### **2.1.21 Transition to IP Interconnection and NGN in USA:**

The FCC go ahead and forward on the path to a modern 21st Century broadband world and technology by agreeing to oversee industry. These transition will convert legacy Plain Old Telephone Service (POTS) networks to an all-IP broadband architecture.

The team who authored the National Broadband Plan and the TAC both recognized that creating a path for incumbent providers to retire legacy POTS technology was a necessary step towards achieving universal broadband connectivity in the United States. Also both understood that the cost of maintaining the legacy architecture, with its rapidly declining subscriber base, was unsustainable for any company, and was pulling significant dollars away from broadband investment. That decline has only accelerated over the past fifteen months – AT&T's consumer POTS access lines decreased from 15.7 to 12.4 million lines between 2012 and 2013, proving the truth of the FCC's conclusions in stark numbers.

### **2.1.21 Jordan and Malaysia experiences in IP Interconnection:**

Jordan telecommunication interconnection transformed from circuit-switched networks interconnection to packet-switched Internet Protocol (IP) interconnection, those specialists need to understand the nature and technical aspects of IP networks and the new mode of their interconnection. TRC telecom regulatory corporation enforced IP interconnection to improve their network efficiency by implemented IP interconnection .[10]

IP interconnection in Malaysia launched an in partnership with Malaysian ICT provider to enable Telco's in the region to roll out interconnected IP services. The transition from legacy TDM networks to IP interconnection is development of IP services and we believe that with a partner make a lasting impact on ICT in the region. Located in Malaysia, IP interconnection Asia Interconnect Exchange (AIX) will make IP interconnection simple, secure and accessible for service providers across Malaysia and Indonesia.[14]

As the name suggests an IP interconnection, or IPX as they are called, facilitates the secure, carrier-grade exchange of IP traffic between operators, providing the basis for interconnected IP services like VoIP, unified communications, and video conferencing, among others.

VoIP traffic in Malaysia is expected to see a compound annual growth rate of 18% to 2015, while mobile broadband connections will grow at a CAGR of 11% to reach 44 million.

With such high growth from IP-based communications there will be an increasing demand for interconnection from both legacy and IP networks and at a cost base that supports new business models, Federated or hub solutions represent an effective way of meeting both the technical and business.

### **2.3 Mobile Number Portability overview:**

Number Portability allows consumers and businesses to keep their existing telephone numbers when they switch operators. It, literally, means that numbers are portable from operator to operator - whether that operator is a mobile, wire line, or VoIP service provider.

Number Portability benefits everyone.

It gives subscribers the freedom to choose operators based on criteria like services, price, and customer service. Their freedom of movement is not influenced by the inconveniences and costs that come with changing numbers.

It also makes it easier for operators to compete for customers, precisely because it eliminates a major barrier to churn - that is, reluctance to change numbers. Although this increased risk of churn is a concern among some operators, number portability has been a huge success around the world, because it helps to level the playing field, giving all operators more opportunities to grow their subscriber bases and revenues.

#### **2.3.1 Benefits of Number Portability:**

Mobile number portability (MNP) enables mobile subscribers to retain their mobile number when changing from one mobile network operator to another. Thus, you can shift your services from your

existing mobile service provider to a new and a better mobile service, keeping your mobile number unchanged.

### **2.3.2 Advantages to Subscribers:**

It empowers the consumer to be a lifelong owner of his phone number and fosters additional choice and convenience in communication services and providers with whom they do business, Increased competition amongst mobile service providers for customer retention, ensuring better service quality, Competitive pricing, better services, improved and innovative VAS, Better addressing of grievances to retain subscribers Affordable and convenient money by choosing the best plan that suits your requirement, No need to panic to inform family and friends of a change in number due to a change in the service provider. Short-term monetary benefits to the Subscribers, as operators willing to offer free talk time and data usage.

### **2.3.3 Advantages to Operators:**

Benefits to new operators due to the innovative service offerings, better services, relatively uncongested network Operators will no longer have to pay the price to reserve a specific number series in a particular zone, even if there are very few Subscribers using that series.

Fewer struggles for newcomers: If an operator is entering a new telecom zone, he will not have to struggle for getting enough number of subscribers to keep itself in business. Usually, new telecom operators offer better price to value ratio for the Subscribers. It will play a significant role in getting new operators a good number of subscribers.

Increasing numbers of countries require mobile telephone network operators to offer mobile number portability (MNP). This facility

allows customers who wish to switch mobile operator to keep the mobile numbers originally assigned to them, avoiding the costs of switching to new numbers. Since MNP regulation was first mooted, policymakers have asked whether it can produce positive net benefits. Ex ante evaluations of MNP carried out in several countries have produced detailed estimates of expected costs and direct benefits (e.g. the savings accruing to customers from lower switching costs). While for me I have suggested MNP should have a range of potentially important effects, such as strengthened competition and reduced prices

The quality of MNP, as peroxide by the target maximum porting time, helps explain its impact on switching and average prices. For countries in our sample that required porting to be completed in five or fewer days, MNP was associated with increased customer switching and lower prices. The sub-sample of countries with less stringent porting time standards experienced no significant churn or revenue effects.

The costs associated with the MNP service depend upon the technology used to deliver it. The technology, in turn, determines the “quality” of MNP, including dimensions such as porting time and reliability. Previous research,[15]

Has emphasized the importance that the choice of number portability technology has in determining the likely effects of the measure. Our results provide empirical support for this view. Jurisdictions conducting ex ante assessments of MNP in the future should consider the likely trade-off between achieving positive market outcomes and cost of implementation. Measuring the Benefits of Mobile Number Portability, Sean Lyons.[ 6]

In this part of the research provides a brief classification of the potential benefits of MNP, including both ex ante cost-benefit studies and other empirical research. We ask what effects MNP should be expected to have on operator's economics. And set out econometric models of switching and retail prices, respectively, and we discuss our conclusions and for future research.