TECHNICAL STANDARDS

FOR

INTERCONNECTIVITY OF NETWORKS

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CHAPTER ONE

GENERAL PRINCIPLES

1. INTRODUCTION

1.1 Interconnection refers to the establishment of electronic linkages between service providers so that they can exchange traffic. It is the physical and logical linking of telecommunications networks used by the same or different service providers in order to allow the users on one service provider's network to communicate with the users on the same or another service provider's networks, or to access services provided by another undertaking. It comprises the commercial and technical arrangements under which service providers connect their equipment, networks and services to enable customers of one service provider to have access to the customers, services and networks of other service providers subject however to the provisions of paragraph 23 (11) of these Guidelines.

1.2 "The technical aspects of Interconnection" relate to the provision of physical facilities to enable two networks to communicate with each other and transfer intelligence seamlessly across their boundaries. Interconnecting networks need to closely co-operate on technical issues to ensure inter-operability, particularly in technical matters. There are basically two levels of interconnection:

- the horizontal level being the links between different telecommunication networks and
- the vertical level being the links between ISPs. This vertical level links customers to the Internet through any of the telecommunication networks.

2. OBJECTIVES

2.1.1 These standards deals only with technical issues in interconnection, that is, the physical connection of separate networks to allow users of those networks to communicate with each other. The objectives of the guidelines are to ensure;

2.2 Inter-Operability

Through interconnection, users can achieve interoperability of their applications. Interoperability is the ability of two or more systems to work in concert with one another to achieve a predictable result. It is the ability of diverse systems made by different vendors to communicate with each other so that users do not have to make major adjustments to account for differences in products or services. Interoperability calls for compatibility among systems at specified levels of interaction, including physical compatibility. It allows heterogeneity of technologies while allowing users to work together. The difficulty of interoperability with respect to interconnection is that different interconnection architectures may affect interoperability differently.

Therefore, when designing network protocols, network planners must consider the interoperability implications at the application layer.

2.3 The Commission wishes to ensure technical compatibility and effective inter-connection between different service providers. In pursuit of this objective, relevant information shall be made available to the public in order to facilitate competition, promote efficiency in the operation of telecommunication services and thereby facilitate growth. Information having bearing on the business plans, corporate perspectives, location of interconnection, architecture etc. for example or deemed to be commercially confidential shall not be made available for public scrutiny. But information relating to structural separation of the parties, quality standards of interconnection, facilitation of equal access shall be made available to all licensed operators as well as the general public.

2.4 These technical standards are aimed at accomplishing successful and easily operable interconnectivity regime without making private carriers into common carriers and establishing complex regulations.

3. SCOPE

3.1 In the telecommunications industry, interconnection is not just a way to make business relations easier. It is the key to competition.

- New entrants into telecommunications services provision need access to the networks of incumbents so that they can sell their services and/or resell the services of incumbents.
- Competitive voice, data, and wireless carriers need access to "last mile" facilities of interconnect partners to deliver services to the partner's end users.
- All carriers need access to each other's back-office systems to fulfil number portability mandates and to exchange the forms and messages involved in fulfilling customer orders.

3.2 Multiple networks have to be linked with each other through various interconnection arrangements involving multiple physical interfaces. If an operator offers another interconnection at a far-off point, little is resolved. Interconnection must therefore go hand in hand with the unbundling of network functionalities into "modules". Inter-operation is to be established with regards to technical standards, protocols, and boundaries.

3.3 Service Provider Obligations

Every network operator shall establish transmission links between two or more of its gateway nodes and the corresponding nodes of other operators' networks in order to send and receive traffic which does not originate and terminate in the same network.

Each operator shall, in fulfilment of the national policy on interconnectivity between service providers, be required to grant access to all other operators who desire to have interconnectivity with them. Where the capacity is not immediately available, it shall be provided on a negotiated cost sharing basis between the requesting party and the requested party.

3.4 'Access', in this context, means the making available of facilities and/or services, to another undertaking for the purpose of providing electronic communication services. It shall cover:

- access to network elements and associated facilities and services, which may involve the connection of equipment by wire or wireless means
- access to physical infrastructure including buildings, duct and masts
- access to number translation or systems offering equivalent functionally

3.5 Effective interconnection between telecommunications networks demands from each network, the provision of:

- Advanced physical platform for interconnection
- Complete quality index of communications between networks
- Scientific methods of communications quality supervision
- Strong technical support teams

3.6 Every network operator is obligated to increase it's interconnect facilities in proportion with traffic growth and at all times maintain the quality of service stipulated by the Commission not only across the POI but in its entire network.

3.7 The Commission shall monitor, detect and penalize discriminatory provision of interconnect facilities. Issues like providing insufficient network capacity to interconnecting operators as compared to an incumbent's own services, network congestion, is considered to be anti-competitive behaviour and shall be closely monitored. The Commission will at all times discourage discriminatory rationing of network access and transport facilities. It shall be mandatory on all operators to continuously increase interconnection capacity to adequately meet expected growing demand in the market as a service obligation

3.8 These guidelines shall be revised and updated at regular intervals and as the need arises so as to remain abreast of technological advancements in the industry and service delivery practices.

4. INTERCONNECTION PRINCIPLES

4.1 All Licensed telecommunications services providers are to offer and be offered interconnection at any technically feasible point. This is mandatory on all service

providers. No licensed service provider shall under any circumstances refuse or be refused interconnection.

4.2 Interconnection should be set up in such a manner that the terms do not discriminate unduly between operators or between any operators' own networks and services and those of other interconnecting parties. Interconnection should be effected at any technically feasible point.

4.3 Third Party Neutral Transmission which preserves interconnection, non-discrimination and free flow features of common carriage that are of major advantage shall apply to all interconnectivity matters in Nigeria. Once a party accepts traffic from another, such traffic must be transmitted, it cannot accept selected parts of that traffic but all of it irrespective of their origin. No party shall be permitted to discriminate against another by carrying its traffic selectively. It is also mandatory that all operators deliver any traffic destined for any numbering scheme approved by the Commission.

5. INTERCONNECTION ISSUES

5.1.1 Operators must make technical, procedural and operational arrangements to facilitate interconnection. The following issues must be agreed upon by service providers otherwise they shall be determined by the Commission;

5.1.2 Procedural arrangements must include;

- Roadmap for interconnection negotiations.
- Availability of interconnection capacity for various types of services by licensed operators.
- Access to standard interconnection terms of every licensed operator.
- Non-discriminatory access to interconnection facilities and services.
- Access to PSTN network specifications (including planned network changes)
- Treatment of emergency calls

5.1.3 Detailed and accurate technical information is the key to a successful interconnection regime. Interconnecting parties shall, on a continuing basis, provide each other with detailed and accurate technical and operational information about each other's network. The information sought may include planned changes in the incumbent's network. Technical and Operational arrangements must include;

- Open network standards and technical compatibility
- Location of Points of Interconnection (POI)
- Access to signalling systems, advanced digital features, operations support systems, call-related database and other software that provide advanced services.
- Access to unbundled network components, including local loops.

- Equality in ease of customer access to competitive networks (e.g. customer dialling parity).
- Access to number and implementation of number portability.
- Collocation and sharing of infrastructure (e.g. buildings, poles, conduits, duct, towers).
- Quality of interconnection, including availability of sufficient interconnection capacity to avoid congestion, and to ensure the timely provisioning of interconnection services and facilities.

5.1.3 Interconnection Agreements – Technical Issues

Interconnecting parties shall enter into a formal agreement for the purposes of interconnection. Interconnection agreements and reference interconnection offers must have the following technical information specified in them except where any particular information is irrelevant to the specific form of the interconnection being dealt with:

- Scope and definition of interconnection services to be provided
- Interconnection and Points of Interconnection requirements and principles
- Provision of information and confidentiality of such information
- Interconnection provisioning procedures
- Network and transmission capacity requirements
- Technical service and capacity level commitments including remedies for failure
- Fault reporting and resolution procedures
- Network safety, protection and related matters;
- Call handling and operations procedures
- Access to interconnection facilities and sharing of infrastructure
- Transmission of calling line identification (CLI) information
- Operator assisted services, directory information and assistance
- Access to ancillary, supplementary and advanced services
- Geographical and technical characteristics and locations of the points of interconnection
- Procedures for the supply of other services that the parties agree to supply to each other, such as operation, administration, maintenance, emergency calls, operator assistance, directories, calling cards and intelligent network services
- Obligations and responsibilities of each party in the event that inadequate or defective equipment is connected to their respective networks.
- Measures put in place for avoiding interference or damage to the networks of the parties involved or third parties
- Intellectual property rights
- Appropriate national and international indices for service quality
- Procedures in the event of alterations being proposed to the network or service offerings of one of the parties

- Provision for any-to-any connectivity to allow end-user of that network to communicate with the other's end-user, regardless of whether the end-users are connected to the same, or different, networks.
- Provision for the suspension, termination or amendment of the agreement in the event of:
    - Conduct that is illegal or in conflict with the obligations of the services provider under his licence or the Act
    - Requirements that are not technically feasible
    - Public health or safety problems
    - Circumstances that pose an unacceptable risk to the integrity or security of the network or services of the any of the parties
    - Provision to allow for the temporary suspension of interconnection, where necessary, to deal with a material degradation of the telecommunications network or services.
    - Provision for measures to be employed to give priority to emergency services traffic particularly during peak periods.

CHAPTER TWO

INTERCONNECTION PROVISIONING

6. TECHNICAL AND OPERATIONAL ISSUES

6.1 In implementing successful interconnectivity between networks some key technical issues need to be resolved. Compatible technical standards must be established and maintained. An important category of substantive issues relates to service definitions, i.e., agreement on the levels and grades of service, the terms and conditions for offering the services to be interconnected. These technical issues are always in the form of:

- Technical compatibility of networks
- Signal quality
- Open Network Architecture / Open Network provisioning
- Shared facilities / co-location
- Cooperative network expansion
- Service Levels and quality
- access to unbundled network components
- network integrity
- equal access
- quality of service

6.2 Licensed telecom operators are obligated to employ open network provisioning (ONP) or open network architecture (ONA) in their network roll-out philosophy. The purpose is to provide non discriminatory access to services furnished by the local exchange providers to all interconnected parties, especially the Valued Added Services Providers (or ESPs) to enable them offer innovative, technically efficient and cost-effective enhanced services to consumers.

ONP/ONA makes it much easier to perform network intelligence, control and management functions outside the core service providers' networks. All Open Network Architecture service offerings will be made available for use with whatever access arrangements are lawfully available to the customer and technically compatible with the services. ONP/ONA shall be the acceptable technological standard for all new systems to be introduced and used in Nigeria.

7. INTERCONNECTION PROVISIONING PROCEDURES

7.1 The following procedures are set out as the standard to be followed by service providers wishing to interconnect their network. Modifications of this procedure shall be permitted if mutually agreed upon by the interconnecting parties.

7.2 Consistent with the Regulations, there shall be published a Model Interconnect Offer which will form the minimum set of service description, terms and conditions that must be offered by the parties seeking interconnection.

7.3 Any party seeking Interconnection shall provide sufficient details to the access provider in relation to Points of Interconnection and/or Points of Presence to enable the requested party to evaluate the nature and extent of network conditioning that may be required and to estimate the cost of establishing the POI/s and /or POP/s. Details to be provided shall include but may not be limited to geographical location of the desired POI, link and interface equipment proposed to be deployed, desired quality of service across the POI, ancillary services requirements, etc.

7.4 Any party seeking interconnection shall provide relevant information in advance on the location of POI, estimated traffic in Erlangs, BHCA, type of signalling, and any other technical information required to facilitate planning.

7.5 Increases in interconnection capacity shall be dynamic and based on actual traffic flow and growth pattern for a grade of service (GOS) of 0.5%.

7.6 Licensed operators shall provide for interconnection at any technically feasible point in the networks and at all mandatory points of presence stipulated by the Commission in this document. It can be at non-traditional interconnection points if the requesting party is willing to bear the costs of the physical link to the point of interconnection.

8 INTERCONNECTION FACILITIES

8.1 Each interconnecting party shall be responsible for the construction, operation and maintenance of interconnection equipment and facilities located or installed within its premises to ensure adequate, reliable, and efficient service to the public at all times. Any modification, substitution or addition of interconnection equipment and facilities required shall be mutually agreed upon by both parties.

8.2 Each interconnecting party shall take all necessary steps, precautions and safeguards in the location, construction and maintenance of its equipment, and ensure their safety from natural hazards, human vulnerability and other forms of interference and disruptions.

9 POINTS OF INTERCONNECTION (POI)

9.1 Sufficient points of interconnection shall be established at all times between parties to ensure a sufficient level of diversity of routing for interconnected traffic. Points of Interconnection (POIs) shall be established at any of the technically feasible points in the requested party's network.

9.2 The number and physical locations of the Points of Interconnection (POI) shall be mutually agreed upon by the interconnecting parties. The Commission reserves the

right to intervene when a dispute relating to the point of interconnection cannot be resolved by the parties.

9.3 Some points on the network determined as technically feasible for the purposes of interconnection are as follows:

- The trunk interconnection points of local and national tandem exchanges (most common point of interconnection or POI)
- The national or international circuit interconnection points of international gateway exchanges
- The trunk side of local exchanges
- The line side of local exchanges (e.g. at the main distribution frame (MDF) or Digital Distribution Frame (DDF)
- Cross-connect points of any exchange
- "Meet points" at which operators agree to interconnect
- Signalling transfer points (STF) and other points outside of the communications channel or band, where interconnection is required for CCS7 or other signalling to exchange traffic efficiently and to access call-related databases (e.g. a Local Number Portability (LNP) database)
- Access points for unbundled network components
- Transit exchanges provided by licensed clearing houses

9.4 Points of interconnection shall be located across the telecommunications space so as to ensure even spread relative to geographical distribution of subscribers. This way, interconnecting parties may not need to install far flung transmission lines to reach the nearest interconnection point. Table 2.1 below provides the minimum requirement for points of interconnection provision for each category of operator in the country.

Table 2.1 – Mandatory Provision of Interconnection Points (POI)

Operator Classification	Location of Points of Interconnection	Target Date
Operators with less than one million subscribers	One in each numbering area in which it operates	Six months after launch of service in a numbering area
Operators having between one and three million subscribers	The cities of Lagos, Ibadan, Port Harcourt, Enugu, Benin, Abuja, Kano, Bauchi or any combination of these where the service provider has established presence in	September 2007
Carriers and operators having more than three million subscribers	(a) 24 state capital cities (b)All state capitals within the Federal Republic of Nigeria	(a) March 2008 (b)December 2008

9.5 Where an operator does not have an interconnect point in the geographical locations designated above, it shall provide transmission facilities from the designated geographical location to its nearest interconnect point at no extra cost to any requesting party. In the event that a requesting party desires to be interconnected at a point outside these locations, it shall bear the cost of transmission and termination equipment required to effect the interconnection.

9.6 Service providers are also encouraged to avail themselves of the services provided by interconnect clearing houses because of the ease of technical achievement of reach to all parties requiring interconnection with a single implementation. Where the services of interconnection clearing houses are established, the peer-to-peer interconnection arrangement shall still be encouraged in order to provide traffic routing diversity. But where these transit service providers have not established service, the interconnecting operators shall implement interconnection on a peer-to-peer arrangement as the primary interconnection strategy. In such cases, the minimum set of five recommended technically feasible points at which interconnection is to be provided are:

- the line side of a local switch (for example, at the main distribution frame)
- the trunk side of a local switch
- the trunk interconnection points for a tandem switch
- central office cross-connect points
- out-of-band signalling facilities, such as signalling transfer points, necessary to exchange traffic and access call-related databases.

9.7 The points of interconnection between any two parties shall be clearly spelt out in a document which shall be an attachment to the Interconnection Agreement. The issues that will be clearly stipulated in such a document include:

- the physical address of every point of interconnection
- the party responsible for setting up and maintaining the point of interconnection (POI) - its name and address
- the description of the physical interconnection facility employed at each POI like cable (type, gauge, etc), channel interface equipment (type, make, etc), air interface equipment (type, make, size).

9.8 The document shall be updated bi-annually and anytime a new point of interconnection is added to the network or a change in the capacity of an existing interconnect point is effected. The complete description of all classes of POI covering location, physical and electrical properties, transmission definitions, signalling type and direction of traffic across the POI, quality of service and other significant parameters shall also be indicated in this document.

10 PEER-TO-PEER INTERCONNECTION POINTS

The points of interconnection (POI) between different types of telecommunications services providers (peer-to-peer interconnection) shall be as follows:

10.1 Local Exchange Service Provider to Local Exchange Service Provider (LESP). A local exchange service provider is an operator licensed by the Commission to offer telecommunications services in a defined contiguous local community. Such operators are granted the Private Network Links (Local Exchange) Licence.

(a) Single-switch LESP to Single-switch LESP within the same service area – the LESPs shall interconnect their local switches directly.

(b) Single-switch LESP to Multi-switch LESP within the same service area. - the switch of the single-switch LESP shall be interconnected to at least one tandem switch of the Multi- switch LESP. Where the multi-switch LESP does not operate a tandem switch, the single switch LESP shall interconnect to any of the switches of the multi-switch LESP.

(c) Multi-switch LESP to Multi-switch LESP within the same service area - at least one tandem switch of both LESPs shall be interconnected. Both shall also interconnect at any of their switches where no tandem switches are in use.

10.2 LESP to Long Distance Operator (LDO)

The LESP network shall be interconnected to the nearest point in the Long Distance Operator's network. The point of interconnection shall be established within the LESP's service area.

10.3 LESP to International Gateway Operator (IGO)

The LESP network shall be interconnected to the International Gateway Operator's network directly or indirectly through a long distance operator's network, provided that the point of interconnection is established within the LESP's service area.

10.4 LESP to Public Land Mobile Network (PLMN)

(a) Single-switch LESP to PLMN – the switch of the LESP shall be interconnected directly to the PLMN network or through an long distance operator at the nearest point in the PLMN network, provided that the point of interconnection is established within the LESP's service area.

(b) Multi-switch LESP to PLMN - the tandem switch of the multi-switch LESP shall be interconnected directly to the PLMN network or through a long distance operator at the nearest point in the PLMN network, provided that the point of interconnection is established within the LESP's service area.

10.5 LESP to Trunk Radio Network (TRN)

(a) Single-switch LESP to TRN - the LEC shall be directly interconnected

to the TRN or through a long distance operator at the nearest point in the Trunked Radio Network, provided that the point of interconnection is established within the LESPs service area.

(b) Multi-switch LESP to TRN - the tandem switch of the multi-switch LESP shall be interconnected directly to the TRN network or through a long distance operator at the nearest point in the TRN network, provided that the point of interconnection is established within the LESP's service area.

10.6 LDO to LDO

Long Distance Operators shall interconnect their networks in all the regions where their service areas intersect. Regions in this context shall refer to telecommunications services regions as delineated by the Commission.

10.7 LDO to International Gateway Operator (IGO)

The International Gateway Operator shall be interconnected to the nearest point in the long distance network.

10.8 PLMN to PLMN

The PLMN networks shall be interconnected at all technically feasible points in their networks or through a long distance operator.

10.9 Value Added (or Enhanced) Service Providers and Content Providers

Value Added Service Providers and Content Providers shall be interconnected at the local switch nearest their operational areas provided that the local switch has the capability to handle the type of services they demand. Where the nearest local switch lacks the capability, they shall be interconnected at any other convenient technically feasible interconnect point. Local Exchange Services Providers (LESP) shall therefore provide their services in an ONP/ONA technical platform and in an unbundled basis to facilitate interconnection of Enhance Services and Content Providers. They shall make available to the ESP, references to documents that provide the technical specifications of their interface equipment that has the potential of adversely affecting customer premises equipment or the functionalities provided to ESP for the purpose of providing enhanced services.

Services that shall be mandatorily provided on ONP/ONA basis shall be:

- unbundled products or services (such as Calling Number Identification) provided by a local exchange services provider which an ESP may require to configure an enhanced service
- switching and transport services that allow an ESP to communicate with its customers through the local exchange provider's network such as basic local exchange service, private line service and switched access

- unbundled basic products and services (such as stutter dial tone) that an end user or an ESP may require for provision on an end user's line in order to access or receive an enhanced service

10.10 Interconnection of IP Networks

IP networks shall be interconnected with the PSTN through the SS7 networks. The interface for signalling and control data shall be the signalling gateway whilst for bearer information it shall be media gateway. Signalling gateway equipment shall support various SS7 variants and be highly scalable.

Router-based local access networks using TCP/IP in the network and transport layers (OSI layers 3 and 4) shall be interconnected with the public switched telephone network using gateways that comply with ITU-T Recommendation H.323.

Wireless IP phone systems shall be interconnected with public networks through transit gateways (TGW) installed at the local exchange.

All signal conversions shall be performed at the TGW. The security risks in IP operations must be clearly identified and appropriate techniques employed to ensure that the interconnected networks are protected from attack.

10.11 Interconnection through Independent Parties

Interconnection may also be effected through Interconnect Exchange Licensees. Operators may employ interconnection through operational exchange Licensees and the peer-to-peer platform to provide redundancy of traffic routing demanded by the Commission's quality of service for interconnection.

10.12 For all cases not specifically mentioned above, any two service providers operating in separate or non-overlapping service areas shall be interconnected through the facility of a long distance operator (LDO) at shared cost of transmission facilities from LDO.

11 INTERCONNECTION LINKS

11.1 The physical links between interconnecting operators include transmission lines or radio links and ancillary structures required to accommodate the interconnected +circuits. Many times some upgrades may be implemented on these links to cope with expanded traffic offerings consequent upon the implementation of interconnection. The requesting party's responsibility shall be limited to the provision of the required transmission links from its network to interconnect provider's network at the interface points, as well as for its augmentation from time to time.

12 PROVISIONING, TESTING AND COMMISSIONING OF INTERCONNECT FACILITIES

12.1 Circuits

Both parties to an interconnection arrangement shall appoint a technical coordination committee to oversee the interconnection process.

12.2 The capacity required shall be provided and made available for testing in accordance with the time schedule indicated in the acceptance of demand or demand note, but shall in all cases be within fifty-six (56) days of the request for interconnection. If the demand is not met within the scheduled period, any of the parties shall bring the matter to the Interconnection Coordination Committee for resolution.

12.3 It shall remain the responsibility of the party installing the equipment and requiring inter-connectivity tests to notify the other party in a timely manner that such capacity is ready for testing. The proforma for such notification and subsequent procedures shall be mutually agreed. Both the Parties shall ensure that the testing is completed within 30 days of provisioning.

12.4 Circuit provision shall be made on the basis of the specified GoS of 0.5% on the Network - Network Interface allowing for adequate overload safety protection. Interconnecting network providers are encouraged to utilize industry-proven interconnection standards.

12.5 Three months after commencement of service and every three months thereafter, traffic measurements shall be taken by both the parties during agreed route busy hours for seven days with a view to determine further capacity requirements.

12.6 Augmentation for additional capacity shall also be initiated by either party on the basis of such traffic observation.

12.7 If the capacity made available for interconnection remains unused for six months, that capacity is deemed to have been surrendered. The interconnect provider shall be free to withdraw such capacity if it is needed to serve another interconnect request.

12.8 If within ninety (90) days, the requested party is unable to make available the interconnect capacity that has been requested of it or the requesting party is unable to put in place the necessary infrastructure to utilise the interconnection that has been made available to it in response to its request, then the interconnection arrangement shall be deemed to be frustrated and may be abandoned by either party. The injured party is at liberty to seek redress and may apply to the Commission for intervention.

13 DISPUTES

13.1 The Commission shall at all times determine technical disputes based on the following considerations:

- Network operators should at all times operate their interconnect interfaces in accordance with relevant internationally accepted standards and recommendations.
- Network operators should offer technical and operational interconnection on an unbundled basis.
- The technical quality of interconnection, the interconnection capacity and supporting services, are to be provided on non-discriminatory basis and shall, to the technical extent feasible, be of the same type and quality as that provided for the network operator's own facilities and services.
- Network operators should provide in their switching and transmission facilities reasonable capacity to afford interconnection with other networks.
- Network operators should at all times provide resources and service elements in their networks to support all the numbering plans granted by the Commission
- Network operators should at all times provide reasonable network resources and service elements to support services which are offered by interconnecting parties
- Network operators should at all times provide access to ancillary facilities, for example, equipment room space, radio sites and other facilities necessary to establish technically efficient and cost effective interconnection

CHAPTER THREE

NETWORK AND SYSTEMS SPECIFICATIONS

14 NETWORK AND TRANSMISSION REQUIREMENTS FOR INTERCONNECTION

14.1 Networks shall be required to meet minimum technical conditions for interconnection. Switching and transmission systems must be designed on the internationally accepted Open Network Architecture specifications and installed to the Open Network Provisioning standards.

14.2 Traffic Forecast

Planning for sufficient switching and transmission capacity shall be based on traffic forecasts prepared and supplied by the requesting party to the requested party on the following basis:

- for each type of traffic - the busy hour outgoing traffic for all routes to the other party's network for a period of one year at intervals of six months for each point of interconnection (POI).
- first forecast shall be provided within thirty days of the Effective Date and thereafter bi-annually.
- all traffic forecasts shall be in terms of Busy Hour Call Attempts and Busy Hour Erlangs.

14.3 Diversity and Alternate Routing

Diversity may be provided by either party in accordance with standard network engineering practices. No party shall allow any failures on its side of the point of interconnection to persist as to affect the stipulated QoS. In the case of partial network/route failure, each party shall extend the same priority to the traffic of the other party as it gives to its own traffic.

14.4 Network Changes

The parties shall give each other, 4 months prior notice of changes to network configuration and facilities that may have significant impact on the engineering of the other's network.

14.5 Interconnection must be provided by every party under terms and conditions that are no less favourable than those provided for its own similar services. The quality of interconnection services provided by any party must be no less favourable than that provided to the party’s subsidiaries or its affiliates. The Commission shall treat discriminatory practices involving the provision of more favourable interconnection arrangements by dominant service providers to their own operations or their affiliates than to competitors as anti-competitive behaviour.

14.6 Quality of Service

Interconnecting parties shall ensure that interconnect facilities delivered at each point of interconnection (POI) conform to the applicable Quality of Service (QoS) standards set by the Commission in this document.

14.7 It is the responsibility of every service provider to ensure that its customer enjoys end-to-end service quality irrespective of who he interconnects with. The service provider therefore needs to negotiate acceptable performance levels needed to support end-to-end quality delivery of the service with his interconnection partner.

14.8 The following service level quality shall be put in place and maintained at all points of interconnection. It shall be the responsibility of each interconnecting partner to ensure that his side of the interconnect point is operated in such a way as to maintain this minimum stipulated quality of service.

- Link availability should be 99.999%
- Bit error rate should be better than 10^{-9}
- Receive Signal level :
    a. Optical link: 8 dB better than threshold
    b. Radio link: 40 dB better than threshold.
- Clock synchronization should be within ITU – T recommendations
- Slip criteria of the clock should be within ITU – T recommendations
- GoS should be within 0.5%
- Maximum Loading per channel 0.7 Erlang
- Maximum Loading of a signalling time slot 0.2 Erlang
- MTTR : 2 hrs
- Group Delay should be within ITU – T recommendations
- All other parameters should be within ITU –T recommendations.
- Traffic Quality
    a. Busy Hour traffic Per line: between the values of 0.4 and 0.7 Erlang
    b. Busy Hour Call Attempt (BCHA) Ratio shall be at 95%
- Transmission delay - ITU-T recommendation G114
- Transmission loss
    a. loudness - ITU-T recommendation P76
    b. Noise and distortion - ITU-T recommendations Q551-554, G123, G232, G712, and P11.
- Digital services
    a. bit errors and timing - ITU-T recommendation G821,
    b. voice coding - ITU-T recommendations G113
- Analogue and Digital services
    a. echo and loss of stability - ITU-T recommendations G122
    b. crosstalk - ITU-T recommendations P16

14.7 The types of traffic to be carried across the POI shall be indicated and shall include Intelligent Network (IN) services. Interconnection shall be based on SS7signalling system.

15 CALLING LINE IDENTIFICATION (CLI)

15.1 CLI of the call originating party shall be transmitted to the receiving party in the course of the signalling procedure. This requires that the identity of the origin of a call should never be masked but transmitted right through to its destination operator even where it has to be masked from the called party at the request of the calling party. Intermediary or transit networks shall preserve the identity of the origin of traffic. Each party to an interconnection shall ensure its network is adequately equipped to handle this function.

15.2 The requirement is mandatory for all calls (Local, National, International and IP traffic).

16 INTERCONNECTION IN WIRELESS MOBILE NETWORKS

16.1 Changes in interconnectivity adversely affect interconnection in mobile wireless networks because of the existence of the two inherent significant challenges to effective and efficient adaptive protocols for user data communication and network control viz:

- Volatility of network state
- Scarcity of network resources.

The combined effects of these two inherent challenges have several important implications for the distributed control problems encountered in mobile networks. Mobile network operators are therefore required to implement adequate mitigation techniques to ameliorate these effects and help error free interconnection.

17 CONFORMITY TO TECHNICAL STANDARDS

17 Interconnection of Networks shall conform to National Standards and Regulations applicable to Telecommunications Services in Nigeria as set by the Commission. In the absence of such Standards and Regulations, they shall conform to the relevant Recommendations of the ITU as follows:

- Signalling and Synchronisation
  Inter-network signalling shall be on the basis of SS 7 in the standardised format. The SS7 offers the ability to create and support sophisticated applications. The signal interchange points shall be those associated with the Points of Interconnection. Signals, derived from a synchronisation system which is time traceable to a source complying with the requirements of ITU-T G.811 shall be used for synchronisation of the networks of both the interconnecting parties at the network-network interface. The

performance of the synchronisation clocks shall comply with the slip rate characteristics given in ITU-T recommendations G.811 and G.822.

- Interface Equipment

  At the point of interconnection, each party must be able to understand the technical operation of the other in order for services to interoperate across the interconnection boundary. The technical platform that permits that understanding is the Network Interface. Each network must therefore provide a compatible interface at the point of interconnection to ensure interoperability. In addition, all equipment employed for interconnection purposes must be only those that have been Type-Approved by the Commission.

  No party shall connect or knowingly permit to be connected to its system, any equipment that has not been Type-Approved by the Commission. Both parties shall ensure that the equipment at the Point of Interconnection have been Type-Approved by the Commission for use in Nigeria in accordance with National Standards. Any new equipment brought in by any one party for interconnection purposes shall, as of necessity, be backward compatible with the existing equipment of the other party. The responsibility for ensuring that the new equipment is backward integrable shall rest with the party implementing an upgrade to its network.

- Transmission Interface

  The interface for network interconnection shall be at the E1 level. This shall be the standard. The functional characteristics of the E1 interface shall be in accordance with ITU-T Recommendations G.704 and G.706.

  (i) Physical Interface (Coaxial Cable Interconnect)

  The interconnection between parties shall be by a 2 mbits/s digital path that terminates on a Circuit Termination Unit (CTU) that presents a G703 interface on two 75 ohm coaxial cable connectors. The Point of Interconnection shall be the coaxial cable connector at the end of the cables connecting the CTU to the other party's switch (or DDF). The coaxial cables used shall have a loss not exceeding 6dB at 1024 kHz.

  (ii) Electrical interface

  The 2Mbit/s interface using the coaxial cable pair option shall conform to the following specific sections of ITU-T Recommendation G.703:

  - General Characteristics - shall conform to section 6.1
  - Output Ports - shall conform with section 6.2
  - Input Ports - shall conform with section 6.3
  - Earthing of screen:

    (a) At the Output Ports the cable screen shall be bonded to the equipment metalwork at the equipment boundary or as near as possible to it.

(b) At the Input Ports the cable screen shall be earthed to the equipment via a capacitor (typically 0.1 µF). Provision shall be also made at this point for providing a DC connection to earth. A suitable ferrite tube ferrule should be threaded onto the cable so as to be located at a point between the bonding point and the equipment circuitry

(iii) Interference Tolerance

The input ports shall tolerate, without error, interference from a non synchronous standard test signal at a level 18dB lower than the wanted signal (ITU-T Recommendation O.151).

Higher order interfaces may also be used. For interconnections involving digital networks, the n x 64 kbit/s interfaces may also be used. The Commission shall also permit interconnection via 64 Kps^{-1} subscriber lines. In all cases, the ITU-T G Series Recommendations shall apply.

- Packet switches and interfaces shall conform to the national performance standards and to ITU-T (H Series) Recommendations.

- Switches shall conform to the National performance standards and ITU-T Q Series Recommendations.

- Network Engineering shall be in accordance with National Standards, ITU Recommendations ITU-T E.750 and E.751

- Traffic grade of Service and target values shall be in accordance with national Standards and the ITU Recommendations ITU-T E.770 and E.771 and its particular indicators shall conform as follows:
    a. Transmission delay with ITU-T recommendation G.114
    b. Transmission loss with ITU-T recommendation P.46
    c. Noise and Distortion with ITU-T recommendation Q.551 – 554, G.123, G.232, G.712 and P.11
    d. Echo and stability with ITU-T recommendationG.122
    e. Cross-talk with ITU-T recommendation P.16
- Speech Performance - Speech over the National network shall conform to the ITU-T (P Series) Recommendations and all national standards set by the Commission. Allocation of impairments shall be as prescribed in the National standards

- PSTN/ VOIP Interoperability
  Interfaces (Media gateway, Signalling Gateway and Gatekeeper) shall conform to ITU-T Recommendations H.323.

- Terms and Definitions

  All terms and definitions used in these specifications shall bear the ordinary meanings assigned to then in the Act and these standards. Where such do not exist, they shall have the ordinary meanings assigned to them in the ITU-T Recommendation B.13

3.9 Summary of Standards and Specifications

1	Switching Interface	ITU-T E770
2	Transmission Interfaces	ITU-T G.703/ G.707/G.782/ G.783
3	Signalling SS 7	ITU-T Q.703/Q.704/Q.708/Q.712/ Q.713/ Q.716/ Q.734/ Q762/Q.763/ Q.764/Q.772 Q.773/Q.774 /Q.775
4	Synchronization	ITU-T G.781/G.810/G.811/ G.812
5	Junction Testing	G/LLT01/04
6	Higher Layer Protocols	ITU-T G.776
7	Interface with IP Network	ITU-T H.323
8	Broadband Interface	ITU-T G.992.2
9	Electrical safety	National Electrical Installation Safety Regulations
10	Quality of telecom services	NCC Regulations
11	Terms and Definitions	ITU-T B.13

18 NETWORK MANAGEMENT

18.1 Each party shall provide, install, test, make operational and maintain all interconnection facilities on its side of Point of Interconnection (POI) unless otherwise mutually agreed. Each party shall take due care to keep operational the equipment of other party installed in its premises for interconnect purposes and shall also allow access to duly authorised representative of the other party to such equipment for provisioning, maintenance or monitoring purposes.

18.2 Each party shall deploy its own Network Management System for efficient traffic and facility management of its own network and shall make arrangements to prevent overload of other interconnecting systems.

18.3 All Network Management System employed shall be non-intrusive.

18.4 Each party shall maintain network integrity by preventing any signal from its network or the Network Management system from interfering with the other Operator's network.

18.5 Each party shall make traffic and link measurements regularly and inform the other about any noticeable degradation in traffic performance, before it manifests through deterioration of the quality of service (QoS).

18.6 Congestion signal will be conveyed through SS-7 signalling system.

18.7 Any party using IP based networks shall have a Network Management System based on the Open System Protocol (OSP) for Interoperability of Multi-operator networks.

18.8 Information sharing should be utilized by all interconnected parties as a maintenance tool to minimize recurrence of service disruptions.

19 NETWORK INTEGRITY

19.1 Interconnecting parties shall maintain network integrity and take measures for adequate protection and safety personnel and interconnect equipment. Network integrity here refers to the ability of the systems to preserve and retain their original operational states and remain unaffected by interconnection with other networks. Parties shall maintain networks that are resilient to failures, have the ability to restore a failed service and apply preventive fault migration techniques. The SS7 current "firewall" techniques should be used to ensure network messaging integrity.

19.2 To maintain Network Integrity, each interconnected party shall ensure that:

- Adequate measures are taken to prevent the transmission of any signalling message across the connecting network, which does not comply with inter-working national specification
- Efficient arrangement for screening functions and rejection of non-compliant messages are established on its own side of the POI to detect signals outside the inter-working national specification. Screening arrangements may include rejection of communications or discarding information fields, which do not comply with specifications.
- Technical and operational Interconnection facilities are provided on the basis of unbundled Network elements (UNE)
- Puts in place, network surveillance and monitoring to control overflow traffic conditions from adversely affecting interconnected networks.

19.3 Reasons of network integrity and security would, however, not be acceptable arguments for denying interconnectivity to another operator. Where this argument arises, the requested party would have to demonstrate that the activities of the requesting party would degrade the network and the requesting party would have to demonstrate otherwise. The Commission shall ensure that fair and reasonable interconnection regime exists as well as maintaining system technical standards, national technical requirements and specifications.

19.4 Interconnecting parties may mutually appoint a third party to verify claims of threat to network integrity if that is seen as an impediment to effecting or continuing to maintain an interconnection. The Commission shall as a last resort mediate in such cases if the parties are unable to resolve them. Where the Commission gets involved, the decision of the Commission shall be final.

20 NETWORK SAFETY AND PROTECTION

20.1 Each interconnecting party shall be responsible for the safe operation on its side of the network, and shall take all necessary steps to ensure that its side of the Network and its network operations do not:

- endanger the safety or health of any person, including the employees and contractors of the other party
- cause physical or technical harm to the other party's network, including but not limited to causing damage, interfering with or causing deterioration in the operation of the other party's network

20.2 In cases where the transmission of traffic to either party's network requires power feeding, safety of the equipment and that of the personnel maintaining it shall be ensured. In this case, national electrical safety requirements for accidental human touch of feeding voltage must be strictly adhered to.

- Alarm Indication Signal (AIS)
  In the presence of an error ratio as high as 1 in 1000, an AIS must be detectable.

- Dangerous Voltages
  In order to protect personnel and equipment on both sides of a Point of Interconnection, it is necessary to provide protection against the transmission of excessive voltage across the interface. For equipment which uses or generates excessive voltages the interface shall be electrically isolated from those voltages. 1500Vrms isolation and 2MO of insulation resistance shall be the mandatory electrical safety requirements of insulation at the Network Points of Interconnection (POIs).

- Radiation Hazards
  Where radio equipment is used, arrangements shall be made to protect all personnel from levels of radiation exceeding 1 milli-watt per square centimetre.

21 MAINTENANCE, FAULT REPORTING AND CLEARANCE PROCEDURES

21.1 Interconnecting parties shall draw up and implement mutually agreed maintenance procedures that comply with the service performance standards prescribed by the Commission and the internationally accepted performance standards. The mechanism for resolving operational problems shall be worked out jointly by both parties and upgraded from time to time.

21.2 Interconnecting parties shall maintain the interconnection facilities in efficient working order and repair the same in prompt and effective manner. Maintenance of interconnection facilities includes, but is not limited to, routine meter readings, minor repairs, minor technical adjustments and observance of proper cleanliness of the equipment/radio stations. A minimum of seven days notice is recommended for planned maintenance works that may affect the other party's system. Equipment design and link engineering should have such redundancy that for any planned work, the prescribed quality of service is preserved.

21.3 All fault reports that may affect traffic flow must be exchanged between the parties. The party who first becomes aware of a fault shall promptly notify the fault to the other. All faults must be dealt with promptly in accordance with procedures agreed by the parties. Clearance of faults affecting the interconnection links will take priority over the clearance of faults on the individual networks. Available standby capacity shall be immediately brought in to restore service. The parties shall coordinate with and assist each other in the identification and clearing of faults on interconnect links. Updates of fault clearances shall be made available to either party upon request. Each party shall manage and correct faults arising in its network, which affect the provision of any services by the other party, as it would ordinarily do for similar faults affecting the provision of services to it.

22 REDUNDANCY OF INTERCONNECTION PROVISIONING

22.1 Interconnection shall be effected between interconnection services providers in such a manner that it permits re-routing of calls from the facilities of one service provider to another if its operations become inoperative whether in whole or in part in the event of strikes, lockouts, disasters, calamities and similar causes.

22.2 Local exchange carriers shall be required to program and activate in their switches the access codes of all long distance carriers and enable their subscribers to access any long

distance carriers of their choice. The subscriber at the time of his call shall be availed of the freedom of selection of any inter-exchange or international gateway operator.

22.3 All service providers shall be required to program and activate on their networks, all the numbering plans granted by the Nigerian Communications Commission to all other operators with whom they share the same service areas, which numbering plans have been activated. No service provider is permitted to reject traffic on account of there being no direct interconnectivity with certain other operators. Such a service provider must seek an alternative transit route and deliver such traffic.

23 ARCHITECTURE OF INTERCONNECT LINK

23.1 Transmission Systems

All transmission systems shall be digital, asynchronous and compatible with 2/8/34/140 Mb/sec hierarchy as per ITU-T G 703 Recommendation. SDH systems as per ITU-T G.708 Recommendation are also permitted. Exceptional cases involving connectivity to smaller exchanges in rural networks requiring other media shall be considered on case-to-case basis to encourage telecommunications services penetration.

23.2 Where bandwidth compression techniques, which reduce voice channel bit rate to less than 64 Kb/s are used, conversion equipment for 64 Kb/s per voice channel shall be provided at the interface points between switching and transmission systems. It is most desirable however that bandwidth compression techniques be not used on interconnection transmission links.

23.3 Network Interface

Analogue interfaces shall not be permitted. All interconnection shall be based on E1 (2 Mb/s) and optical interfaces. Interconnection on Digital subscriber Lines (DSL) shall be permitted.

23.4 Signalling

The signalling standard for interconnection shall be the SS7. The Commission will allocate Signalling Point Code for the signalling nodes that will be used for Points of Interconnection. The coding of Originating Point Code (OPC) and Destination Point Code (DPC) and Signalling Link Selection (SLS) shall be based on the national SS7 signalling plan developed by the Commission as revised from time to time. Messages on SS7 links shall be limited to those that relate to call set up and release except for signalling data for automatic roaming purposes and SMS Services.

SS 7 performance parameters and circuit selection protocols shall conform to the National SS7 specifications as revised from time to time. All transmission parameters apportioned for the network operator portion of the call shall comply with National

Transmission Plan. Parameters not specified in Transmission Plan shall comply with ITU recommendations.
Both way trunks (BWT) shall be used.

23.5 System Synchronisation

To ensure synchronisation, each interconnecting party shall employ a synchronisation system which is time traceable to a source complying with the requirements of ITU-T recommendation G.811. The performance of digital clocks, which derive synchronisation, shall comply with the objective slip rate characteristics given in ITU-T recommendations G.811 and G.822 for the purpose of minimising timing perturbations particularly slip rates.

23.6 Testing of Junctions

Each interconnected party shall be responsible for measuring and monitoring the traffic and the quality of service across the POI in real time. Every point of interconnection must be equipped with capability for testing. When an interconnection capacity is ready for testing, both parties shall commence joint testing of interconnect circuits within 10 working days after notification. Both parties shall design and agree on the Test format. The joint testing results shall be recorded by authorized representatives of each party and shall be binding on both the parties. If the tests results are satisfactory, both parties will issue a joint certificate confirming that the interconnect circuits have been satisfactorily tested and are ready for putting into service. Such certificate will be worded as mutually agreed by both parties.

23.7 Testing of an interconnection joint shall be required in all of the following cases:

- Initial interconnection of networks
- Introduction of new network elements that may have any effect on the interconnection performance or quality
- Hardware and/or software changes that have a bearing on interconnection interface
- Introduction of new or supplementary services
- Changes in interconnection capacity

23.8 Diversity

All traffic routes shall be supported by at least two SS7 links. Each link shall be provided in a separate 2 Mb/s system. The number of interconnection links in any direction shall be dimensioned for the grade of service specified in this document as may be modified from time to time by the Commission.

23.9 Every licensed operator shall ensure that any traffic available on its network is delivered to its destination whether the destination operator is directly interconnected to it or not. In cases where there is no direct interconnectivity between the destined

operator and the originating customer's operator, the originating customer's operator must seek alternative routes to deliver the traffic. All traffic destined to all active numbering plans approved by the Commission must be delivered. Operators must ensure that they continuously update themselves with all approved numbering plans.
The Commission shall intervene in all cases where operators are believed to be rejecting traffic on account of no direct interconnectivity.

23.10 Traffic Routing

Each interconnecting party shall carry calls offered by the other party through its network up to the designated point. The traffic so carried shall be handed over at that point of interconnection (between the operators) which is nearest the designated customer. Mobile network operators are not permitted to accept traffic destined for an interconnected fixed network operator's customers who are at the far end and hand over that traffic at the near end. Mobile service operators shall hand over traffic to their interconnected fixed services operators at the far end, i.e. at that interconnect point nearest the customer for whom the traffic is destined. Where the mobile operator is not interconnected with the fixed services operator, it shall route such traffic through a long distance operator. Fixed services operators shall however hand traffic over to mobile services operators at the near end. In case any traffic cannot be carried due to temporary network conditions, suitable tones or announcements shall be provided.

23.11 No party to an interconnection relationship shall directly or indirectly, extend any type of service to the other party's subscribers through the access provided for interconnection except for those services which are mutually agreed between both the parties.

23.12 Traffic Handover

(a) Normal Traffic hand-over Scheme

A normal traffic handling scheme involves an originating local area, a transmission network and a terminating local area. This scheme is of general applicability. In many instances one or more of these three areas may not be involved in particular call completion processes.
This traffic hand-over scheme shall be applicable to fixed network operators who shall of necessity route their traffic through long distance operators.

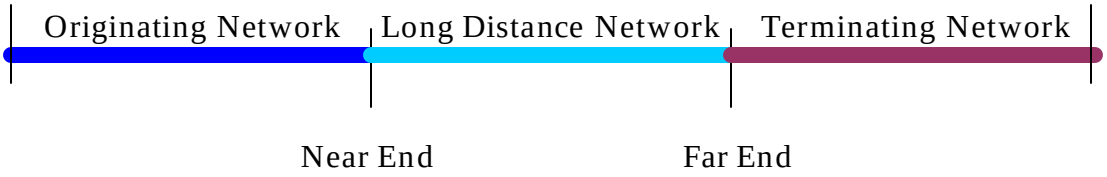


Figure 3.1 Schematic of Normal traffic hand over

(b) Handover of Mobile service traffic terminating on fixed networks (Far end hand-over)

Mobile network operators shall hand over traffic originated in their networks to fixed service operators at the local area of the subscriber to whom the traffic is destined (i.e. at the far end). It is the responsibility of the mobile network operator to route that traffic through long distance operators, if need be, and hand them over only at the local area of the destined fixed service network operator.

Figure 3.2 Schematic of Far End Handover

(c) Handover of Fixed service traffic terminating on Mobile network(Near end hand-over)

A fixed service operator shall hand over traffic, originated in its network and destined for a mobile service subscriber, to the mobile service operator at the local area of the fixed service operator (i.e. at the near end)

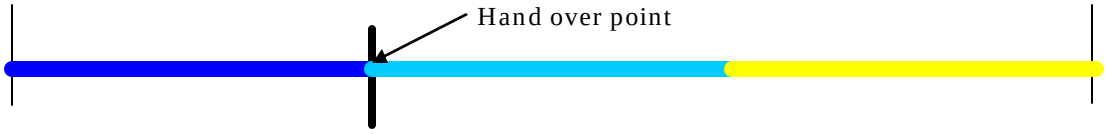


Figure 3.3 Schematic of Near - End Handover

23.13 Every interconnected operator shall, when handing any traffic over to another, ensure that it does not engage in any activity which may:

- result in concealing or misrepresenting the origin or nature of such traffic. The right to conceal caller identity rests with the subscriber only. It is illegal for a network operator to conceal the identity of a caller
- be inconsistent with any directives or guidelines issued by the Commission from time to time as regards traffic hand over or bypass control measures
- amount to avoiding or minimising any liability in respect of payments due from such a party

24 INTERNATIONAL TRAFFIC

24.1 Inbound international traffic shall be terminated by a licensed international gateway (IGW) operator. Outbound international traffic shall be routed through an IGW.

It shall be the responsibility of the service provider terminating international traffic in Nigeria to ensure that Nigeria's international obligations are met. Likewise, it shall also be the responsibility of the service provider from whose network international traffic is originated to ensure Nigeria's international obligations are met. An international inbound call transmitted into Nigeria utilising internet protocol format, shall not be handed over by an External Gateway Operator to an access provider without having it translated to switched minute format.

OTHER INTERCONNECTION MATTERS

INTERCONNECTION SERVICE PROVIDERS / INTERCONNECT EXCHANGE OPERATOR LICENCE

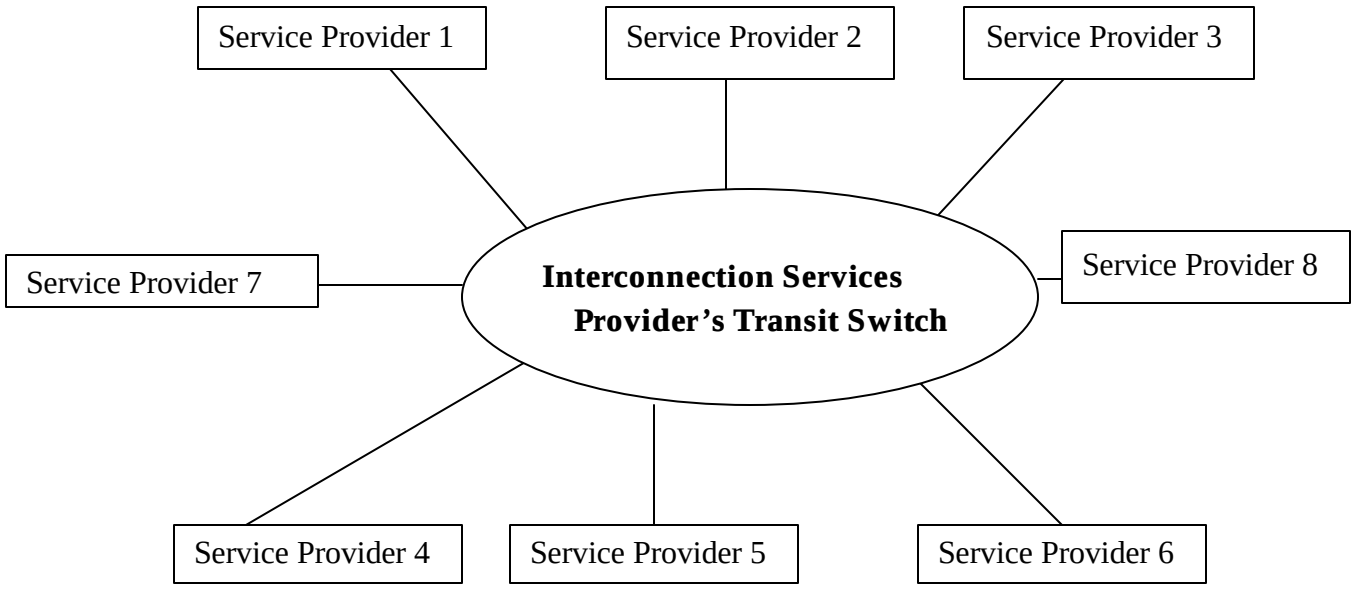
25.1 A major problem in interconnection arose as a result of the entry of multiple service providers into the telecom space. Initial approach has been to have operators negotiate interconnect arrangements with one another on a one-on-one scheme.
The Commission has also decided to license Interconnection Service Providers whose basic contribution to the telecom industry is the provision of interconnectivity platforms to multiple operators through the establishment of transit gateway switches. The operational requirements of the Interconnect Gateway have been laid down by the Commission in the licences of these operators.

25.2 The interconnect gateway shall receive all messages and order and pre-order information, automatically translate them to the right protocols, and then route them to the appropriate carriers. If upgrading and/or modification of interconnecting networks at the gateway is required in order to meet the service requirements, any associated costs shall be met by the Clearing House. The recommended guiding principle is for each party to bear the incremental costs incurred for the additional circuits on its own side of the interconnection so as to meet the QoS standards relating to the interconnect traffic.

25.3 The interconnection services provider shall serve as centralized, automated clearinghouses for carrier communications and transactions. They shall provide these services through the operation of transit switches. They shall operate such switches in conformity with the relevant ITU specifications for transit gateways. All transit switches must be optimally dimensioned in terms of switching capacity, trunk traffic and signalling network capacity to support the projected traffic expected from the various networks logically and physically connected to it. They must have reserve capacity to accommodate additional capacity during traffic overload condition. They must have high reliability and availability.

25.4 The Interconnection Licensees are licensed telecommunications service providers. No operator shall deny them, or any other licensed operator for that matter, interconnection. The Commission regards interconnection as a right of every licensed operator and shall treat any denial of interconnection to any provider as an anti-competitive practice. Where an Interconnect Exchange Licensee establishes presence, licensed operators shall have the option to route their traffic much more efficiently through them but shall under any circumstances deny them interconnection. The added combination of clearing house services and peer-to-peer interconnection shall provide the redundancy of traffic routing which the Commission seeks to achieve.

SCHEMATIC DRAWING SHOWING INTERCONNECTION BY INTERCONNECTION SERVICES PROVIDER AND EIGHT TRADING PARTNERS



25.5 Dimensioning the Transit Switch

Transit switches shall be dimensioned with the GoS which the connected networks offer the subscribers in mind. The following should be taken into consideration:

- the average number of subscribers on the different switches
- the projected average of the switching capacity of the subscriber switch which will be routed in and out of the transit switches.
- the busy hour call attempts (BHCA) capacity of the transit and connected switches.
- the maximum number of ports of the transit switch (live ports and spare ports/ capacity)
- the rate of traffic growth and reserve capacity to accommodate unexpected traffic demands during overload conditions.
- networks must be dimensioned to have mostly high usage trunks and to minimize the numbers of low usage trunks. It is recommended to set traffic limit at between 20-35 erlangs, to save on hardware costs.

COLLOCATION AND INFRASTRUCTURE SHARING

26.1 An important issue that aids interconnection is co-location and sharing of resources especially infrastructure. Co-location can be either physical or virtual. It is physical when one network installs its own equipment in the premises of the other. In virtual co-location, a network does not bring in its own equipment into the premises of the

other but buys into the equipment of the other. The Commission encourages both types of co-location.

26.2.1 Wherever it is possible, physical co-location should take place of the apparatus and plant owned or leased by one party and used for interconnection, at the premises of the other party. Wherever such co-location has been mutually agreed, essential accommodation and auxiliary infrastructure shall be made available for this purpose within the time schedules for interconnection.

26.2.2 Extensive infrastructure is required to build telecommunications networks. Key supporting infrastructure includes poles, ducts, conduits, trenches, manholes, street pedestals and towers. Sharing of such infrastructure significantly increases the efficiency of supply of telecommunications services in the economy. This is also true in the case of sharing building space in exchanges to permit two or more operators to co-locate their cable and radio transmission facilities and related equipment. Co-location permits direct access to exchange switches and local access lines. Availability of infrastructure sharing and collocation significantly decreases barriers to competitive entry into the telecoms service provision industry. Two regulatory covenants that are aimed at facilitating collocation and infrastructure sharing are as follows:

a. Operators shall be required to permit infrastructure sharing and collocation.
b. Operators are to plan and implement all their network resources in such a manner and in such a capacity as to make co-location and network resource sharing possible. This caveat is mandatory for all infrastructure that are conceived as being environmentally degrading or obtrusive. Ready examples are towers, underground ducts, etc.

26.4 Guidelines on Co-location and Infrastructure Sharing

It is the policy of the Commission to encourage and facilitate infrastructure sharing and collocation in order to limit environmental degradation, eliminate waste and thereby encourage the freeing of resources towards telecom penetration. Towards this goal, the Commission requires that:

- Each new tower shall be designed to handle a minimum of twice the maximum amount of loading that the tower owner can ever put on it
- Rooms for switching and transmission equipment shall have a minimum of 30% of its useable space available for the use of potential co-locating operators, i.e. equipment rooms shall be dimensioned and built to a minimum size of 130% of the maximum space anticipated to ever be used by the owner
- Underground ducts are designed and constructed for a 100% excess capacity over and above the duct owner's anticipated ultimate requirement
- Operators publish and make public, standard offers for access to their key infrastructure - poles, ducts, conduits, tower space ,etc

- Operators seeking co-location show evidence of reciprocity of shared infrastructure provision - issues like new facilities sized and built to permit sharing will be considered
- Operators maintain and have readily available for inspection, information on location of infrastructure and capacity available for sharing
- Local authorities such as state and local governments support and facilitate infrastructure sharing by asking new applicants for environmentally degrading or obtrusive infrastructure development to first seek sharing options in established ones.

26.5 The Commission has already issued and published the guidelines on collocation and infrastructure sharing and expects that all participants in the industry will abide by the guidelines.

SUPPLEMENTARY SERVICES

27.1 In addition to the many dimensions of providing effective interconnection of one or more additional operators, there is a range of supplementary services which should be supplied by dominant operator who are adjudged to have significant market power. These include automatic number identification (ANI), billing, operator services, directory back-up, route diversity, and others. Dominant operators shall not deny interconnected parties any of these supplementary services if demanded as part of the interconnect services suite.

27.2 Network and Service unbundling

A local exchange operator shall be expected to provide unbundled network elements and services to an interconnected party if so demanded. These shall include:

- Network access lines (local loops and related functions)
- local and tandem switches (including all vertical switching features provided by such switches)
- inter-exchange transmission facilities
- network interface devices
- access to signalling links and signal transfer points
- signalling and call-related database facilities
- operations support systems functions
- operator and directory assistance facilities
- access to rights of way
- co-location of equipment
- local number portability
- operator and directory assistance services
- Operations support systems (OSS) functions

GLOSSARY

BHCA:	Busy Hour Call Attempt.
Call Attempt:	An attempt to achieve a connection to one or more devices attached to a Telecommunications Service.
E1 level:	The primary PCM bandwidth of 2.048 Mb/s.
Erlang:	The ITU telephone traffic intensity unit
GoS:	Grade of Service
Interconnection	Physical and logical linking of telecommunications networks to permit movement of intelligence between both networks
Interconnection Services	Services that may flow between interconnected parties in accordance with the interconnection agreement between the parties
Requested party:	The service provider into whose network an interconnection is sought
Originating Network:	A network to which an originator of a telecommunication traffic is connected to
Point of Presence (POP):	A point in a service provider's network at which it has the capability to provide, on demand, service of prescribed quality and grade of service.
Party	A legal person licensed by the Commission to offer telecommunications services
PSTN:	Public Switched Telephone Network.
Point of Interconnection (POI):	Point of demarcation where the exchange of traffic between the two networks takes place.
QoS:	Quality of Service
Service Area:	The geographical area in which an operator is licensed to offer services
Terminating Network:	The network to which a receiver of telecommunication traffic connected to.
Transit Network:	The intermediate network through which telecommunication traffic pass through to terminating networks
Commission:	The Nigerian Communications Commission
LESP	Local Exchange Services Provider – a service provider licensed to provide telecommunications services within a defined geographical area through a switch or a group of switches
LDO	Long Distance Operator – a service provider licensed to provide national transmission facilities for intercity and/or inter region traffic

IGO	International Gateway Operator – a service provider licensed by the Commission to provide in-bound and out-bound facilities for international telecommunications traffic
PLMN	Public Land Mobile Network – a network that provides mobile telecom services
TRN	Trunked Radio Network
Open System	A portable, scaleable and interoperable system that is based on publicly available standards for subsystem interaction. It facilitates multi-operator and multi-technology integration.
ONA	Open Network Architecture – A network architecture that is provided within an open system concept
ONP	Open Network Provision - A set of technical interfaces and usage conditions adopted by the EU for the interconnection of networks based on the open systems concept.
SS7	Common Channel Signalling System No. 7 - A technology compatible with, but independent of Integrated Services Digital Network (ISDN); used for conveying call set-up and related information through data channels separate from the intelligence content channels
Enhanced Service	A service offered over common carrier transmission facilities employing computer processing applications to handle the format, content, code, protocol, or similar aspects of the customer's transmitted information; provide the customer with additional, different, or restructured information; or involve customer interaction with stored information
Enhanced Service Provider (ESP)	Provider of enhanced services, also addressed as Value Added Services Provider
CPNI	Customer Proprietary Network Information - Customer information accumulated by the local exchange provider as a result of providing basic network services
TGW	Transit Gateway
QoS	Quality of Service
Traffic	Intelligence moved over a telecommunication channel