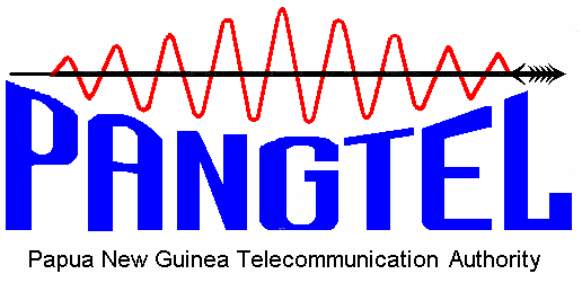

Multi-Carrier Interconnection Technical Code of Practice

Document Ref. 1410.2

FOREWORD

In a multi-operator, multi-technology, multi-service, competitive environment, interconnection of networks is essential for providing access to subscribers of one network to the subscribers and services of another network. In order to provide this end-to-end seamless interoperability of services for all users, an Interconnection Code of Practice comprising general framework and principles for interconnection to public telecommunications networks and publicly available telecommunications services, irrespective of the supporting technologies employed, is needed. Establishment of fair interconnection regime is the most critical step. Nowadays, interconnection is not only considered to be essential for network development but also regarded as a cornerstone of competition.

Fair, proportionate and non-discriminatory conditions for interconnection and interoperability are key factors in fostering the development of open and competitive markets. A new entrant needs interconnection to the already existing networks of incumbent and other service providers to allow its customers to communicate with their customers and access any services provided by them for which specific commitment is undertaken. Competing in this scenario for a new entrant with the established service providers is dependent on the terms and conditions of interconnection. Interconnection is thus critical for the success of a competitive environment and the key to effective competition.

Section 66B of the *Telecommunications Act 1996 (as amended)* ("the Act") mandates PANGTEL to determine, by writing, the Interconnection Codes of Practice for carriers dealing principally with engineering and related technical aspects of telecommunication networks, equipment and services including a code of practice for inter-carrier network connections and points of interconnect, connection of customer equipment, technical arrangements, standards, etc., in consultation with all licensed carriers, the Independent Consumer and Competition Commission ("the Commission"), and other interested parties.

This Code is written under this mandate and delineates the general framework, technical rules, guidelines and principles that shall be followed by carriers in negotiating technical aspects of interconnection agreements. Carriers shall maintain the specified Quality standards and no carrier shall provide lower interconnection standards to marginalise another carrier to gain unfair economic advantage.

This Code covers the technical aspects and lays down the principles, technical standards, network arrangements, etc., for efficient interconnection that fall under the purview of technical regulation for which PANGTEL has been designated by section 19C of the Telecommunications Act 1996 (as amended) to be the principal regulatory agency, in accordance with which the carriers may enter into Interconnection agreements. All other aspects of interconnection shall be governed by the Telecommunications Interconnection Code of Practice issued by the Independent Consumer and Competition Commission.

Sharing of facilities and other infrastructure *including but not limited* to ducts, manholes, towers, land, buildings, exchange space and ancillary installations such as

Main Distribution Frame (MDF) rooms, cable risers and cable entry points shall also be implemented in conformance to PANGTEL operational, regulations and specifications standards.

Telecommunications is a dynamic and rapidly developing sector. In order to keep pace with the emerging technological scenarios, changing needs of the industry, migration to Next Generation Networks, etc., the Code of Practice presented herein may be reviewed/amended as and when considered necessary by PANGTEL, in consultation with ICCC and other stakeholders.

Whereas in preparing the Interconnection Code of Practice as it relates to technical regulation, the PANGTEL has made every effort to maintain consistency and harmony with the ICCC Interconnection code of Practice, in case of any inadvertent overlap, the provisions of the Code prescribed by ICCC shall apply.

Charles Punaha
Director-General, PANGTEL

Port Moresby
January 31, 2007

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1. INTRODUCTION

1.1 Name of Code

This Code is called the Telecommunications Technical Interconnection Code of Practice (henceforth referred to as Code)

1.2 Index

This Code is divided in Chapters, Sections and Clauses

1.3 Contents of this Code

The Chapters and Annexes of this Code deal with the issues as indicated:

Chapter 1 : Introduction

Chapter 2 : Definitions

Chapter 3 : Interconnection Framework - Technical

Chapter 4 : Technical Requirements

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Schedule 6 – Interconnect Usage Charges

1.4 Making of Code

This Code has been made by PANGTEL pursuant to section 66B of the Telecommunications Act 1996. Section 82 of the Act confers the right to a Carrier to access any other Carrier's Network to interconnect its facilities. This Code provides guidelines and a general interconnection framework, principally in regard to engineering and related technical aspects of telecommunication network and services. For all other aspects, the ICCC Interconnection Code shall apply, as per the Act.

1.4.1 Consultation

PANGTEL has held due consultations with all parties in accordance with Section 66B(4) of the Telecommunications Act 1996 (*as amended*).

1.5 Application of this Code

The Code shall apply to all Carriers in the operation of their services. The Interconnection Agreements between Carriers shall follow this Code. The Code will take effect from the date on which it is published in the National Gazette or a later date as specified by PANGTEL in the Code and will operate until:

(a) a new Telecommunications Technical Interconnection Code is approved by PANGTEL and is prescribed to replace this Code; or

(b) when this Code is amended by PANGTEL. Any amendments will come into effect when such notification is published in the National Gazette.

1.6 Review of the Code

PANGTEL proposes to review the Code, generally, after three (3) years from the date on which the Code is first published but may do so earlier in consultation with stakeholders should the technological developments and innovations in services warrant it.

1.7 Legislative Background

This Code forms an integral part of the telecommunications regulatory regime in Papua New Guinea, the legislative framework for which is set out under the Telecommunications Act and the relevant provisions of the ICCC Act. This Code is made both as a code relating to the conduct or operations of a participating Carrier in a regulated industry under section 40 of the ICCC Act, and as a Carrier Code of Practice under section 66A of the Telecommunications Act.

The telecommunications industry is declared, by section 19A of the Telecommunications Act, to be a regulated industry for the purposes of the ICCC Act. Telikom PNG Limited has been declared to be a regulated entity under section 32 of the ICCC Act and is thus subject to a regulatory contract under section 40 of the ICCC Act.

1.8 Technical Interconnection Code of Practice

Part VIA of the Telecommunications Act relating to Codes of Practice mandates the licensees (Carriers) to interconnect in the course of their operations. Section 66B of the Act enables PANGTEL to determine the Code of Practice to be followed by carriers in the course of their operations, and specifically includes an Interconnection Code of Practice.

Accordingly, this Code has been determined in writing by PANGTEL under section 66B of the Telecommunications Act to be a Code of Practice to be followed by carriers in the course of their operations.

1.9 Statutory Right to Access

Part XI of the Telecommunications Act prescribes the rights of carriers to access other carriers' networks. PANGTEL's Code lays the principles and general framework and processes which are to be followed by carriers, in giving effect to those access rights.

1.10 Scope of the Code

This Code has been made by PANGTEL with the aim of encouraging a regulated relationship between Access Providers and Access Seekers on technical matters in the conduct of their operations within the telecommunications industry. The objective of this Code is to provide guidance to Access Providers when drafting Access Agreements and to Access Seekers when assessing the technical terms and conditions of an Access Agreement or a bilateral agreement proposed by an Access Provider. The Code may also be taken into account by the ICCC to the extent it considers it appropriate to do so, including in relation to Access Agreements or bilateral agreements in any arbitration determinations pursuant to Part XI of the Telecommunications Act. This Code applies to all different types of Access and Interconnection Services, as defined in Chapter 4.

The Code includes matters associated with the requesting of and agreeing to the supply of Physical Access to Telecommunications Transmission Towers, Buildings, Masts, Ducts, Manholes, Sites of Towers or Masts and Underground Facilities; in matters relating to technical standards and operational procedures.

Note**:** *This Technical Interconnection Code of Practice should be read together with the Interconnection Code of Practice developed by ICCC.*

2. DEFINITIONS

Definitions included in the Telecommunications Act, and Regulations, Directions and Orders published under the Act, and license agreements shall apply wherever available and shall take precedence. In addition, as used in this Code, the following terms shall have the meanings indicated hereunder:

Access Provider means a licensed carrier who provides access of its telecommunications facility for usage by another licensed carrier.

Access Seeker means a licensed carrier who applies for or intends to gain access of another licensed carrier's telecommunications facility for usage or carriage services

Act means the Telecommunications Act 1996 (as amended).

Agreement means the Agreement entered into by Interconnecting Carriers in accordance with the Code.

Apparatus means Telecommunication Apparatus**.**

Applicable Systems means all necessary equipment, systems, sub-systems engineered to provide the services in accordance with the operational, technical and quality requirements.

Authority means ICCC or PANGTEL as appropriate.

Basic Telephone Service means the collection, carriage, transmission and delivery of voice or non-voice messages over the Licensee's Network and includes provision of all types of services as defined by WTO, except those, which require separate licence.

Billing Information means information necessary to ascertain the charges payable by either party under the Agreement.

BHCA means Busy Hour Call Attempt

BSC means Base Station Controller of a Cellular Mobile System

BTS means Base Transciever Station of a Cellular Mobile System

Busy Hour means the continuous one-hour period lying wholly in a given time interval for which the traffic is highest.

Call Attempt means an attempt to achieve a connection to one or more devices attached to a Telecommunications Service.

CCS means Common Channel Signalling

CDMA means Code Division Multiplex System

CDR means Call Data Records

CLI means the process that identifies and transfers the identity (number) of the calling party from one network to the other.

Carrier(s) means, the holders of a valid carrier license. May include SMP operator, the access provider and access seeker.

Customer means, any person or company that agree to purchase telecommunication services.

Commission means the independent consumer and competition commission (ICCC).

Condition means, in relation to a license, a condition or restriction to which the license is subject to, or will be subject to, as the case requires.

Customer equipment means equipment that is or is intended to be connected to a telecommunications PTN operated by a carrier other than equipment that is used or intended for use within the boundaries of such a PTN.

Ceiling(s) mean(s) the upper limit(s) of charges for telecommunication services as may be specified by the competent Authority from time to time.

Cellular Mobile Telephone Service means Telecommunication Service provided by means of a telecommunication system for the conveyance of messages through wireless means where every message that is conveyed thereby has been, or is to be, conveyed by means of a telecommunication system which is designed or adapted to be capable of being used while in motion. The Cellular Mobile Telephone Service refers to transmission of voice or non-voice messages over licensee's network in real time only. This Service does not cover broadcasting of any messages voice or non-voice; however, Cell Broadcast is permitted only to the subscribers of the service.

Customer means any person who is, or wishes to be, provided with any relevant Telecommunications Service by a **Party** for which the party is licensed.

Directions means directions issued by the competent Authority under the Telecommunications Act

Dominant means a carrier which have significant market power in a telecommunication service or product as declared by ICCC from time to time.

E1 level means a primary PCM with bandwidth of 2.048 Mb/s.

Effective Call means an answered call.

Effective Date means the commencement date of the Agreement

Erlang means the unit of telephone traffic intensity defined by the International Telecommunication Union.

Equipment means, any apparatus or equipment hardware or software used or intended for use in or in connection with a telecommunications network but does not include a line.

Facility means, any part of the infrastructure of a telecommunications network, any line, equipment, tower mast antenna, tunnel, hole, pit, pole or other structure or thing used or intended for use in or in connection with a telecommunications network.

FAC means Fully Allocated Current Cost

Floor means the lower limit of charges for telecommunication services as may be specified by the Authority from time to time.

Forbearance denotes that the competent Authority has not, for the time being, notified any charge or revenue sharing arrangement for a particular telecommunication service and the service provider is free to fix a charge for such service.

Gateway means, the provision of an interface between two (2) networks.

Gateway Exchange means the Switch where networks of different Carriers are interconnected.

Gateway MSC means the MSC that interfaces with another Network.

GPRS means General Packet Radio Service

GOS means Grade of Service

GSM means Global Mobile System

ITU-T (formerly CCITT) means, the Standardisation Sector of the International Telecommunications Union, the international telecommunications standards-setting body.

ISUP means Integrated Service Digital Network (ISDN) User Part.

IUC means Interconnect Usage Charge (Note: charging matters to be dealt with by ICCC).

ISP means an Internet Service Provider.

Incumbent means a licensed carrier with established telecommunication infrastructure which shall be able to interconnect with new entrants carriers or interconnection seeking carriers or parties

International means, a telecommunications service between a place within PNG and a place outside PNG.

Interconnection means, the physical and logical connection of the services of one (1) telecommunications carrier to another and commercial and technical arrangements under which service providers connect their equipment, networks and services to enable their customers to have access to the customers, services and networks of other service providers.

Interconnection agreement means a technically negotiated and signed resolution between two interconnecting parties, usually and Access Seeker and Access Provider and/or other Service Providers in order to receive and/or provide all interconnection services between their networks. This agreement shall be arrived at in accordance with the Code.

Interconnection Charges mean the charges payable for interconnection and use of Network resources of one Service Provider by another Service Provider.

Interconnection Provider means the service provider to whose network an interconnection is sought for providing telecommunication services.

Interconnection Seeker means the service provider who seeks interconnection to the network of the interconnection provider.

International Long Distance Telecommunication Service means telecommunication services originating from within the territory of the country and terminating outside of it and vice versa.

International Subscriber Dialling (ISD) means facility for direct connectivity between an end user in the country with another end user in another country by means of direct dialling through licensed networks.

Leased Circuits means telecommunication facilities leased to subscribers or service providers to provide for technology transparent transmission capacity between network terminations points which the user can control as part of the leased circuit provision.

License Agreement means the Licenses issued by the ICCC under that Telecommunications Act.

License means, a license granted under the *Telecommunications Act 1996* as amended to authorise operation of a telecommunication service.

Licensee means, a person who is the holder of a license issued under the *Telecommunications Act 1996* and, for the avoidance of doubt, this includes a carrier

Line means, a wire, cable, optical fibre, tube, conduit, wave-guide or other physical medium used or intended for use as a continuous artificial guide for or in connection with carrying communications by means of guided electromagnetic energy.

Local Call is a call originating and terminating in the same local charging area, which is charged at local call rates.

Market means, the market for telecommunications service.

MSC means the switching centre that performs all switching functions needed for cellular mobile systems located in an associated geographical area.

National Long Distance National Long Distance Service means picking up, carriage and delivery of switched bearer telecommunication service over a long distance network i.e., a network connecting different Local Charging Areas.

National Standards means the standards set by PANGTEL.

Non-discrimination in interconnection charge means that service providers shall not, in the matter of interconnection discriminate between the similarly situated and similar class of service providers.

Network means, a telecommunications network to supply services between places within PNG, and from place within PNG to places outside PNG.

Order means the orders issued by the Government under the Telecommunications Act.

Originating Network means the network to which an originator of a telecommunication message is proximately connected to.

Originating/ Transit/ Terminating Service Provider means the service provider whose network is used for originating/ transit/ terminating a telecommunication message respectively.

PANGTEL means, the PNG Radiocommunications and Telecommunications Technical Authority, established under the *Telecommunications Act 1996*.

PCM means Pulse Code Modulation system to CEPT standard (ITU-T G.703).

PDH means Plesiochronous Digital Hierarchy

PNG means, the Independent State of Papua New Guinea.

PLMN means the Public Land Mobile Network

Point of Presence (POP)) means setting up of switching centre or/and transmission centre of appropriate capacity by Service Provider to provide, on demand, service of prescribed quality and grade of service in a non-discriminatory manner.

Port means an access point in equipment e.g. Exchange, that allows connection with other equipment or network with defined characteristics (impedance and bandwidth).

PSPDN means Packet Switched Public Data Network

PSTN means the Public Switched Telephone Network.

PTN means, Public Telecommunications Network.

Point of Interconnection (POI) means a mutually agreed upon point of demarcation where the parties networks interconnect and where the exchange of traffic between the two **Parties** takes place.

QOS means Quality of Service

RIO means Reference Interconnection Offer: It is an offer used internationally by Service Providers or Access Providers to other Service Providers including Access Seekers on its won network and the facilities in which interconnection can place. RIO is the document published by the Access Provider setting out the interconnection services to be offered and terms and conditions under which they will be offered. The RIO provides the basis in concluding an Interconnection Agreement.

Roaming means extension of cellular service when the user goes to another licensed area of the same licensee or to the area of operation of another licensee.

Regulations mean the regulations issued from time to time by the PANGTEL in exercise of its powers under the Telecommunications Act.

Reporting Requirement means the obligation of a carrier/service provider to report to the PANGTEL before implementing any new interconnection arrangement for telecommunication services

Signalling system7 means, international common-channel signalling (CCS7) system based on ITU-T Recommendation number Q7. An addressing protocol that speeds up call processing by operating out of band and includes fraud detection, caller ID, store and forward, ring back, etc.

Supplier or Service Provider means, a licensed telecommunication service carrier. Service Provider may also include both Access Seeker and Access for the situation where appropriately applicable in text provided.

Switch means an automatic telephone exchange.

SDH means Synchronous Digital Hierarchy

Telecommunications Act 1996 means, the Telecommunications Act 1996 including any amendments thereto and subsidiary legislation made thereunder.

Trunk Automatic Exchange means a toll Switch that connects trunks/transmission routes between Trunk/Local exchanges.

Service Impairment means any interference with or impairment of service over any facilities of a Party.

Set up Costs of Interconnection means the initial cost of engineering work needed to provide the specific interconnection facilities requested.

Service Area means the geographical area specified under the license throughout which the services are provided.

SLA means Service Level Agreement
SMS means Short message service
SMSC means Short message service centre
Subscriber includes any subscriber or any person or legal entity, which subscribes to/ avails of the service from a licensee.
System means a telecommunication network consisting of access network, switching nodes and transmission links, together with the operation and maintenance systems and network management systems.

Subscriber Trunk Dialling (STD) means facility for direct connectivity between two end users within the country by means of direct dialling through licensed networks.

Terminating Network means the network to which a receiver of a telecommunication message is proximately connected to.

Transit Network means the intermediate network through which telecommunication messages from originating networks or other transit networks are transmitted and delivered to terminating networks.

Usage Charge means the charge levied by a service provider for carriage of telecommunication traffic on its network.

Value-Added Services means such services as may be available over a Telecommunications System in addition to Voice Telephony or Data Services, and specifically those services listed as "Value-Added Services" in the Regulations or Orders or as defined by WTO.

Voice Telephony Service means the Telecommunications Service that provides subscribers with the facility for conducting real-time two-way speech conversation among them.

Working Day means any day from Monday to Friday, excluding holidays.

WLL (M) means the telephone service with mobility limited to the local area.

WTO means the World Trade Organization

3. INTERCONNECTION FRAMEWORK - TECHNICAL

3.1 General

By definition, interconnection is the physical and logical linking of public communication networks used by the same or different Carriers in order to allow the users of one Carrier to communicate with users of same or another Carrier, or to access services provided by another Carrier. Services may be provided by the Carriers or other Service providers too, who have access to the network.

Interconnection between Carriers refers to linking their networks in order to establish effective, efficient and any-to-any connectivity and allow users of one to access the users or services of the other.

Fair, transparent and consistent interconnection arrangements implemented in accordance with the PANGTEL operational, technical specifications and standards are essential for ensuring interoperability of networks and rolling out telecommunication services even to some of the remotest areas of PNG. This potential is in harmony with general government policies and the industry together with all stakeholders including the regulators have an obligation to fulfil its realisation in providing efficient communication services to the end users.

Interconnection arrangements in a multi-carrier environment are also vital for service expansion, improving the efficiency of the network, and enhancing the co-carrier relationship.

Network operators need to agree on the technical and commercial arrangements under which they decide to interconnect their networks. On technical side, among other things, such an agreement specifies the location where the two networks will be interconnected, how they will be connected, how calls will be handed-over from one network to the other, and how the quality of service will be maintained.

PANGTEL is responsible for formulating technical rules, specify standards, provide guidelines and codes of practice for all suppliers and consumers of telecommunications goods and services. In this code the principle aim is to outline the main technical aspects that are necessary in maintaining message and signal quality on end-to-end basis over the entire route traversed via interconnected carriers.

Point of Interconnection is where the networks of multiple competing telecommunication carriers interface, so that each carrier can provide telecommunications service to any part of the Public Telecommunication Network, irrespective of which carrier owns that particular network. This imposes the requirement of technical compatibility, necessitating compliance to ITU or National standards and avoidance of proprietary standards. To the customer the demarcation lines are invisible and the Public Telecommunication network is seen as a single entity. A call may pass from one telecommunication network to another and the customer will receive one charge for that call.

When two networks interconnect, each operator seeks to charge the other for resources provided. The most basic interconnection service provided is that of call

termination, i.e. delivering a call which originates on one network to its destination on another network.

As per Section 82 of the Act "right to access", any carrier has the right to interconnect its facilities to a network of any other carrier on agreed terms and conditions, failing which the ICCC may determine such terms and conditions under section 84.

All carriers have an obligation to maintain and adhere to recommended technical specifications, network and end-user quality of performance standards.

Subsequently and conditionally, any access provider 'may' disconnect any access seeker's facilities and infrastructure from its own network if the access provider believes and provides proven evidence and/or information to PANGTEL on the poor performance standards of the access seeker's network or facility or for violation of network integrity/ security considerations. However, disconnection or blocking of traffic at the point of interconnection cannot be done unilaterally by a carrier without giving sufficient notice and regulatory sanction. Interconnection agreements entered into by the interconnecting carriers should contain the provision for termination with conditions warranting such action.

In order to fully realize the multi-dimensional benefits of multi-carrier interconnection, the co-operation of all parties is very important in ensuring that internationally accepted and ITU-T recommended technical standards as adopted by PANGTEL are followed. In the absence of appropriate standards, such standards as may be agreed by the interconnecting Carriers through negotiations and ratification by PANGTEL may be adhered to.

3.2 Objectives

The objective of interconnection is to enable a customer to access customers, services and networks of other service providers (carriers) in the most efficient manner. The major and somewhat interrelated objectives of interconnection from policy angle are:

- To ensure fair competition among the incumbent dominant operator and new entrants;
- To ensure full network connectivity so that all customers may communicate with each other in a seamless manner;
- To meet the needs of customers by availability of a wide range of innovative services through interconnected competing networks;
- To ensure network efficiency by optimum utilization of network infrastructure resources of all competing carriers;
- To create an investor friendly business environment;
- To encourage provision of modern network and services; and
- To make the overall telecommunication service sector customer friendly.

- Technical and commercial[1] terms of Interconnections, to be non-discriminatory, proportional and transparent, and based on objective criteria.

3.3 Principles

In line with the principles enunciated in the WTO reference paper[2], Interconnection with a major supplier will be ensured at any technically feasible point in the network. Such interconnection is provided:

> (a) under non-discriminatory terms, conditions (including technical standards and specifications) and rates and of a quality no less favourable than that provided for its own like services or for like services of non-affiliated service suppliers or for its subsidiaries or other affiliates;
>
> (b) in a timely fashion, on terms, conditions (including technical standards and specifications) and cost-oriented rates that are transparent, reasonable, having regard to economic feasibility, and sufficiently unbundled so that the supplier need not pay for network components or facilities that it does not require for the service to be provided; and
>
> (c) upon request, at points in addition to the network termination points offered to the majority of users, subject to charges that reflect the cost of construction of necessary additional facilities.

The procedures applicable for interconnection to a major supplier will be transparent and made publicly available. A major supplier will make publicly available, the terms and conditions for interconnection in the form of a model agreement or a reference interconnection offer.

All carriers shall use ITU compliant technical standards. Some of the relevant ITU standards are indicated in the Annex. As a rule, to ensure full network connectivity and interoperability so that all customers may communicate with each other irrespective of the carrier and/or network they are subscribed to, non-proprietary, open standards shall be adopted.

All carriers shall provide information about network planning programs and changes to network architecture or configuration, to PANGTEL and amongst the interconnecting parties to ensure uninterrupted interoperability of networks.

In principle, bottlenecks in the access provider's network and/or any other

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[1] For economic and commercial aspects of Interconnection, reference may be made to ICCC's Interconnection Code of Practice.

[2] Telecommunications services: WTO Reference paper; 24 April 1996; Negotiating group on basic telecommunications.

carrier's network are not desirable. If, however, there are unavoidable bottlenecks in the network, appropriate and/or adequate redundancy and/or contingency plans shall be put in place to cater for internationally acceptable quality telecommunications services.

Interconnection principles are summarized as follows:

i. Interconnection should be permitted at any technically feasible point.
ii. Interconnection should be non-discriminatory i.e. there should be no discrimination between operators or between a dominant firm's own operations and those of interconnecting competitors. The access provider shall be required to provide access seekers or new carriers the same range of interconnection services on terms and conditions no less favourable as it would apply to itself or its own subsidiaries.
iii. Interconnection provided by the access provider to access seekers and/or service providers shall be of the same quality that the access provider provides for its own network.
iv. Interconnection arrangements and procedures should be transparent.
v. Network elements should be sufficiently unbundled and charged separately.
vi. Interconnection charges should be cost-oriented. (Refer to ICCC Interconnection Code).
vii. Charges relating to universal service obligations should be identified separately and not bundled with interconnection charges.
viii. Cost inefficiencies of incumbent operators should not be passed on through interconnection charges to other operators.
ix. Network integrity of each interconnecting network should be maintained under all circumstances meaning that any fault or network management action in one network should not in any way affect the functioning of other network(s).
x. Interconnection disputes between the interconnecting parties are to be reported by them to PANGTEL/ICCC for resolution.
xi. Interconnection and access arrangements should be:

- technically and administratively sound and efficient;
- promote greater efficiency in a competitive telecommunications environment;
- be transparent to users and independent from internal network characteristics;
- provide for customer choice and access to whichever carriers services regardless of the network or system to which the customer is directly connected; and
- be non-discriminatory in terms of overall functionality, quality and performance.

All licensees are required to establish a Point of Presence (POP) at an interconnection gateway switch (POI), which is normally a transit switch of the incumbent operator and mutually negotiate the technical and commercial arrangements for delivery of traffic to its destination.

Without limiting the generality of the above stated principles, fair, non-discriminatory, transparent and consistent technical interconnection arrangements shall be practiced by all parties.

The general principles of interconnection of Public Land Mobile Network (PLMN) to existing PSTN/ISDN as contained in ITU-T Recommendation E.220 shall be the guiding principles when such interconnection arrangement is imminent and/or negotiated between the interconnecting carriers.

3.4 Safeguards Against Unfair Engineering Practices

All carriers have the right to equal access to other carriers. PANGTEL shall undertake a review of interconnection agreements if interconnected carriers are treated unfairly in terms of engineering deficiency, substandard interconnection method or the poor quality of interconnected services.

Carriers shall not engage in any unfair practice or conduct that has the effect of discriminating, eliminating, deterring, reducing or inhibiting access to their network, or in any way prevent or hinder the entry of a new service provider or carrier.

Where quality of service may be impacted upon by the high take up of a promotion offered by a licensee, adequate safeguards must be implemented and PANGTEL can make directions on this aspect of quality of service.

A licensee must provide PANGTEL with all technical information that PANGTEL may require to carry out its functions under the Act.

A telecommunication carrier that is in a dominant position in terms of network infrastructure and/or for a particular kind of service shall not technically discriminate against other licensed carriers and/or service providers.

Except as otherwise provided hereunder, the equipment configuration and maintenance, location and associated costs of the network interconnection between the interconnecting carriers shall be decided through negotiation, and where an agreement is reached, a copy should be forwarded to PANGTEL as a regulatory requirement.

Further to the above aforementioned prohibition of discrimination, a licensee in a dominant position shall not:-

a) engage in unfair discrimination in relation to numbering, interconnection and sharing of facilities;

b) refuse to ratify interconnection agreements for no justifiable reason;

c) make improper use of information that is acquired from other carriers in association with interconnection;

d) engage in exclusive dealing practices such as restrictions on the licensee's customers or suppliers dealing with the licensee's competitors imposed in relation to the acquisition from or supply to another licensee of services or equipment;

e) supply false or misleading information or fail to or delay in providing information to licensed access seekers or make unjustified and adverse

public statements on interconnection access seekers or unjustified statements about itself;

f) bundle or require an interconnection access seeker to acquire other services or equipment of the licensee as a condition of acquisition of the desired service, capacity or equipment;

g) tamper with the services or equipment of other licensees;

h) disclose confidential information of other licensees;

i) intentionally lower the quality of their service, by providing low quality or unreliable interconnection.

3.5 Scope of the Code

The Code covers primarily the technical aspects pertaining to provision, operation and maintenance of interconnection that facilitates passage of traffic and signalling information between networks. The technical standards and specifications stipulated in the relevant ITU-T Recommendations adopted by PANGTEL shall be reflected in the implementation of such arrangements.

The technical parameters, standards and arrangements covered in the Code to facilitate (i) physical interconnection between the two networks for telecommunications and other services as applicable; (ii) Sharing of infrastructure elements; (iii) interconnect Unbundled Network Elements; and (iv) network elements for origination, termination and transit traffic; inter alia, shall relate to the following:

(a) Point of Interconnection

- Traffic routing arrangements at POI;
- Interconnection Gateway Switch
- Co-location of Apparatus and Plant.

(b) Provisioning Procedures

- Initial demand and forecasts procedures;
- Provisioning, testing and commissioning of circuits.

(c) Network and Transmission requirements

(d) Signalling architecture

(e) Service Quality and Fault Repairs

(f) Technical Specifications and Standards

(g) Network Management, Maintenance and Measurements

(h) Network Integrity and Safety

(i) Operator-assisted-services (manual and special services)

(j) Access to International Gateway

(k) Technical requirements for Billing (Inter-carrier and customer)

(l) Fundamental Technical Plans

(m) Short Message Service

(n) Confidentiality, Liabilities and Indemnity

(o) Force Majeure

(p) Coordination mechanism

(q) Review, amendments and Termination of Agreement

(r) Disputes resolution

(s) Agreement Structure

(t) Administration of the Code

This Code has been developed generically for the purpose of interconnection between carriers of mobile to mobile networks, mobile to fixed networks and vice versa for both situations. PANGTEL shall therefore determine any other technical interconnection codes in relation to other telecommunication services and facilities, as and when necessary.

4.0 TECHNICAL REQUIREMENTS

4.1 Public Telecommunication Services covered

The Code shall apply to the technical requirements for interconnection required by Access Seekers licensed to provide any type of the telecommunication services such as:

- Public Mobile Telephone Services
- Public Data Telecommunications Services
- Fixed Public Voice Telephone Services (local and long distance)
- International Communication Services
- Satellite Communications Services such as GMPCS and VSAT
- Public Paging Services
- Public Pay Telephone Services
- Trunking Services
- Short Messages Services (SMS)
- Directory, Emergency and Operator Services

Interconnection of networks allows the use of different network resources for call origination, carriage over transport network i.e., national or international long distance networks, transit through switches and finally termination. For this purpose, the technical compatibility has to be ensured by adoption of internationally followed relevant ITU standards.

4.2 Provision of Information

Carriers are required to provide to each other information relevant to working out the technical arrangements and engineering of the networks to meet the demands of interconnection services.

Pursuant to section 195 of the *Telecommunications Act 1996* as amended, and where there is reason to believe that a carrier has information that is relevant to interconnection, PANGTEL may in writing request the carrier to make available that information which shall be supplied by it within 21 days of such request.

4.3 Access to Directory and Emergency Services

The Carriers shall ensure that the Directory Enquiry Service is accessible by all PTN customers irrespective of which carrier provides that customer with telecommunications service, i.e. Directory services are an integral part of the numbering plan. [See 4.11.3]

All carriers will provide access to Emergency Services and any other public Utility and Information services.

4.4 Provisioning Procedure

4.4.1 Request for Access to Interconnect

The interconnection access seeker shall explicitly state the type of interconnection that is requested to be negotiated and implemented including the preferred physical locations.

The interconnection access seeker shall also provide documents outlining the architecture and/or the detailed interconnection configurations for the interconnection of traffic and the interconnection of signalling networks simultaneously to the access provider and PANGTEL.

Details submitted on these documents shall be used to assess the technical compatibility and/or feasibility of the requested interconnection. Information derived from such documents shall form a major part of the interconnection agreement to be agreed and signed between the access provider and the interconnection access seeker.

The network interconnection between the access provider and the interconnection access seeker shall have a definite liability boundary, and equipment or adequate measures for demarcation shall be set up to separate the telecommunications equipment of the parties. The liability boundary, and equipment and adequate measures for demarcation alluded to shall be handled according to the agreement between both parties of the network interconnection.

4.4.2 Initial Demand

The party seeking Interconnection shall provide relevant information [normally 6 months in advance except in case of regulatory exigency where such period may be reduced] on the location of POI, estimated traffic in Erlangs, BHCA, type of signalling, and any other technical information required to facilitate planning.

A formal demand in writing indicating the number of ports and other facilities required, and the time schedule, shall be separately placed on the interconnection provider.

The Interconnection provider shall intimate within a period of 30 days from the date of receipt of such formal demand, either the acceptance or an alternative proposal for meeting this demand fully or partially as well as the approximate dates for meeting the demand. Relevant demand notes (bills) for the accepted part of the demand within 30 days of receipt of the formal demand shall be issued.

However, Interconnection with a minimum number of required E1 ports as ascertained by the interconnection provider, required for the launch of the service, shall be provided within [90 days] of payment of the demand note, unless found to be technically non-feasible. Subsequent increase of interconnection circuits should be

based on actual traffic flow and growth pattern for maintaining a grade of service (GOS) of 0.5% (loss probability: 1 in 200 calls).

The detailed payment procedure to be followed in this regard shall be as laid down by the ICCC.

4.4.3 Planning Action

For the balance requested capacity of ports not likely to be met within 6 months, planning action shall be immediately started by the Interconnection provider. This demand shall be treated, as firm demand for the next year and demand notes shall be issued accordingly.

4.4.4 Provisioning, Testing and Commissioning of Interconnect Circuits

4.4.4.1 The capacity made available within 90 days shall be taken up immediately for testing. The full 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 within 6 months of the firm demand.

4.4.4.2 If the demand is not met within the scheduled periods, the matter will be considered by the Joint Technical and Operations Committee for further necessary action under this agreement. Refer to Section 7.2 of this Code.

4.4.4.3 Number of Ports indicated in the firm demand for each POI will be the deciding factor for determining the port charges in terms of the Regulations.

4.4.4.4 The party installing the equipment and requiring inter-connectivity tests shall, notify to the other party indicating that such capacity is ready for testing as per National or ITU Standards. Both the Parties shall ensure that the testing is completed within 30 days of provisioning.

4.4.5 Augmentation

4.4.5.1 Traffic measurements shall be taken by both the Parties during agreed route busy hours for seven days, six months after commencement of service and every six months thereafter with a view to determine further capacity requirements.

4.4.5.2 Augmentation for additional capacity for the next 12 months shall also be initiated by either **Party** on the basis of such traffic observation.

4.4.6 Cancellation Charges [ICCC to consider]*

If the cancellation of demand is made within 15 days of the firm demand, cancellation charges payable for the capacity cancelled will be as specified by the ICCC. Penalty for cancellation of demand made after 15 days of the firm demand, will be as specified by ICCC.

4.4.7 Capacity Utilization

The Party seeking the interconnection shall undertake to use the capacity so made available for a minimum period of 3 years. Failure to use the capacity provided would entitle the access provider to compensation as may be determined by the ICCC.

4.5 Point of Interconnection

4.5.1 General

i. The Point of Interconnection (POI) is the physical point where the networks interconnection and where they terminate their facilities. Normally, POI in Telikom PNG's network shall be at a Transit/Tandem Switch.

ii. Interconnection shall be made at a technically feasible point in the network as specified in the interconnection agreement.

iii. The location of the POI shall be determined in accordance with economic considerations and fair and acceptable technical standards, compatibility and compliance. Once the location of the POI is agreed, unless otherwise agreed carriers shall construct and maintain their own connection links up to the POI.

iv. The equipment capacity and interconnected transmission circuits of the points of interconnection shall be adequate to achieve standard telecommunications quality and traffic flow. Test results of transmission signals shall be forwarded to PANGTEL as a regulatory requirement.

v Unless agreed otherwise, the carriers that are interconnected shall be responsible for maintaining their own linkage from each network terminal to the point of interconnection.

4.5.2 Location of POI

The location of the POI shall be any point that is technically and economically feasible and capable of maintaining the quality of the traffic and handling any unexpected short term, medium term and long term increase in traffic.

The location of the POI shall be at a technically feasible point and the POI shall be capable of accommodating the particular type of interconnection requested by a carrier.

The exchanges in the vertically integrated TPNG network, which have been agreed as POI shall be upgraded to the level technically capable of providing any of the aforementioned interconnection types as provided in the agreement.

4.5.3 Mandatory and Possible Points of Interconnection (POI)

TPNG LTD is currently a vertically integrated natural monopoly with various types of exchanges at different locations across PNG. The locations and/or places indicated below are mandatory and possible points of interconnection listed in order of priority and TPNG has an obligation to ensure that those locations that are agreed as POI

are technically upgraded and capable of providing quality interconnection to other carriers.

- All major centres in PNG, where the carriers or carrier maintains trunk/transit/tandem exchanges, Mobile Switching Centres and/or international gateway switches are deemed possible POI. The negotiation of these interconnection points shall be the responsibility of the interconnecting carriers. A minimum of two(2) POIs is technically recommended standard and therefore shall be implemented as an initial requirement.
- The number of POI shall be no less than five(5) nationwide including Boroko, Lae, Mt Hagen, Rabaul and Wewak exchanges [transit/trunk switches] as mandatory POIs, where certain minimum number of E1s shall be made available by PNG Telikom to interconnect the MSCs of the new entrants within 90 days of their initial demand. Other POIs may be negotiated by the access seeker and access provider.

4.5.4 Interconnection Rules

The interconnecting carriers (parties) shall agree:

a) to connect and keep connected their Systems at mutually agreed feasible Points of Interconnection, a trunk/transit switch that would serve as the Interconnection Gateway Switch. For interconnection of a cellular mobile system with a fixed network, the MSC shall be connected as far as possible to the nearest Transit Exchange, in accordance with the Provisioning procedure detailed in Section 4.4. The agreed POIs for each class of service shall be recorded as per Schedule 1 (see Annex), which shall form part of the Interconnection agreement. This may be amended from time to time on mutual agreement.

b) to supply the requested telecommunication services, facilities and information, relating to interconnection, to the other Party as may be mutually agreed. Such facilities shall only be used for the agreed purpose and shall not be resold to other Parties. These services and facilities are indicated in Schedules 2 and 3 (see Annex).

c) Cellular Mobile Service Operators may interconnect directly with each other at MSC level.

4.5.5 Arrangements at the POI

Interconnection shall be based on CCS System No. 7. Other facilities such as CLI that are required to be provided, shall be indicated in Schedule 2. The transmission and electric conditions at the POI shall conform to the Standards recommended by the ITU or as specified by PANGTEL. The types of traffic to be carried across the POI shall be indicated in Schedule 1.

4.5.6 Traffic Routing Principles

Each Party shall carry the traffic offered at the POI by the other Party through its network for delivery to the designated subscribers. In case a call cannot be so carried due to temporary network conditions, suitable tones or announcements shall be provided as agreed to between the two Parties.

The Interconnection agreement shall specify the levels and points at which interconnections may be provided for various classes of traffic and details on various interconnection and delivery of inter operator traffic/services.

4.5.7 Co-location of Apparatus and Plant

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. When a **Party** uses the premises and/or uses facilities of the other **Party, such as power etc.,** it shall pay a rent to the other **Party.** Principles for deriving such rents shall be included in Schedule 3.

4.5.8 Port Identification

Wherever a separate charging regime is applicable, the ports shall be separated accordingly and so identified.

4.5.9 Damages for default

If within 6 months, the Provider fails to make available the interconnect capacity as per firm demand or the seeker is unable to put in place the matching infrastructure to utilise the interconnection as per firm demand, the Party failing shall pay Damages to the other Party as may be specified by ICCC.

4.6 Network Switching & Transmission Requirements

The interconnection access seeker shall make available technical specifications including clearly drawn, marked and labelled engineering interconnection diagrams for all concerned parties. These diagrams shall include the Network diagram for interconnection of traffic; and the network configuration for the signalling scheme.

The access provider shall readily provide information regarding the readiness of its network for interconnection including the signalling scheme that is deployed in its network.

The access provider shall have the primary responsibility and opportunity of upgrading its network to a standard that is required for non-discriminatory access by interconnection access seekers.

4.6.1 Switching Network Interconnection

Optimum interconnection at the switching level is the most significant aspect of network interconnection. The Access Provider shall:

- address the approach for meeting the switching capacity requirements for interconnection traffic;
- identify the rules governing the level at which switching interconnection will take place, e.g. at International Gateway, MSC, Trunk/Transit/Tandem Exchange or Local Exchange;
- identify interconnection measures to provide switch diversity, if feasible.

The Access Provider shall require other service providers including access seekers to interconnect at more than one location or to particular location or at particular switching network hierarchy level. Any such requirements must be based on reasonable engineering principles and a justified need to provide switch diversity for network resilience.

4.6.2 Network Interconnection Links and Routing

The Network Interconnection Links connect the networks of Access Provider & Access Seeker and facilitate the conveyance of traffic between them. Routing considerations for Network Interconnection Links should include route capacity, route direction, route diversity and segregation. The Interconnection Agreement shall identify the rules for determining capacity requirements in terms of bandwidths in nx2.048 Mbps or higher in PDH or SDH and increments in which capacity may be provisioned. Network Interconnection Links should not be less than 1 E1. Internet Service Providers' demand for bandwidth may be in terms of leasing nx64 Kbps.

4.6.3 Transport Network Interconnection – leasing long distance circuits

An Access Seeker shall require interconnection links not only to the network of the dominant Access Provider but also to the networks of other service providers or for interconnection of its own network equipment, e.g. mobile network base stations.

The Access Provider shall provide interconnection to its Access and/or Core Transport networks to meet the requirements of other licensed access seekers.

4.6.4 Transport Network Technologies

The Interconnection Agreement shall specify the transmission technologies (PDH/SDH) of the Access and/or Core Transport networks to be used for interconnection.

4.6.5 Traffic Forecasts

Traffic forecasts are used for the planning of sufficient switching and transmission capacity. Traffic forecasts shall be prepared and supplied by one Party to the other **Party** on the following basis:

The Parties shall forecast all outgoing traffic of each type, to the other Party's System for a period of one year at intervals of six (6) months for each POI. These forecasts shall be made for the route busy hour. The first forecast shall be supplied within ninety (90) days of the Effective Date and thereafter on the 1st January and 1st July every year.

All traffic forecasts shall be in terms of Busy Hour Call Attempts and Busy Hour Erlangs. For these forecasts, time consistent busy hour of the exchange and routes shall be determined.

4.6.6 Network Engineering

4.6.6.1 Diversity and Alternate Routing

Diversity may be provided by either **Party** in accordance with standard network engineering practices. 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.

4.6.6.2 Circuit Provision

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. Bandwidth for interconnection may be provided in terms of nx2.048 Mbps (E1 level) or at SDH level, except for small ISPs.

4.6.6.3 Network Changes

The Parties shall inform each other, wherever possible, 12 months in advance of changes to network configuration and facilities that may have significant impact on the engineering of the other's network.

4.6.6.4 Calling Line Identification

CLI of the caller shall be transmitted to the receiving (incoming) network whenever requested by that network in the course of the Signalling procedure and wherever technically possible.

4.6.6.5 Carrier Selection

Both Parties shall handle calls in accordance with the Regulations issued in this connection by PANGTEL and procedures and guidelines laid down by the Licensor (ICCC) in relation to Carrier Selection. Carrier selection establishes a level playing field to provide equal ease of access.

Call-by-call selection

To facilitate a subscriber to select the long distance/international carrier of his choice by dialling on call-by-call basis, the numbering plan provides for carrier identification codes allocated to the two Parties are:

a) Party A XX Party B XY

On request from any Party, the other shall supply information relating to its subscribers, who have opted for a service offered by the former, or have requested for termination of such service.

Pre-selection

Carrier Pre-Selection; where the originating Access Provider shall be instructed by the calling subscriber, which Long Distance service provider should carry the call. In this case there shall be no requirement for the calling subscriber to enter a prefix.

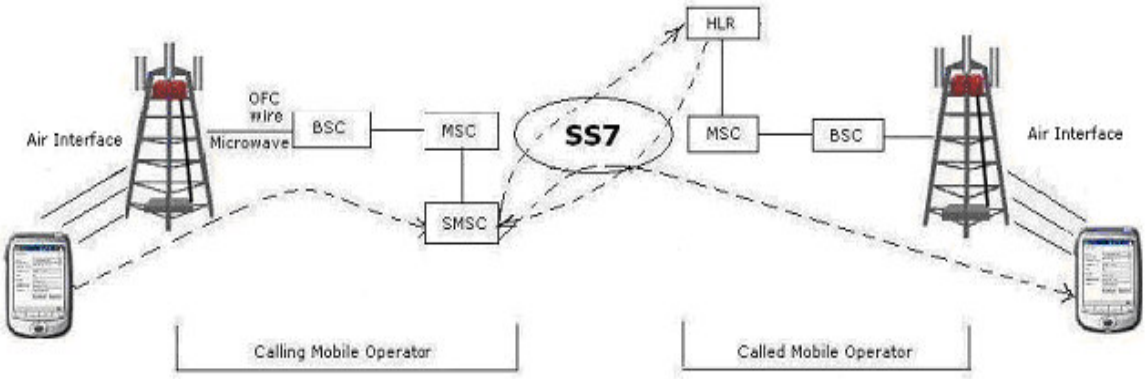
4.6.7 Short Message Service, abbreviated as SMS, is the transmission of short text messages to and from a mobile phone, or any other device capable of generating the SMS. Once a message is sent, it is received by a Short Message Service Centre (SMSC) of the calling subscriber's network, which then delivers it to the appropriate destination device.

In Global System for Mobile (GSM), an SMS originated from the mobile subscriber of operator A is directly sent by the SMSC to the mobile subscriber of operator B. To determine the status of the customer, the SMSC sends a request to the home location register (HLR) of the network to which the recipient is a subscriber. Once the HLR receives the request, it will respond to the SMSC with the subscriber's status: 1) inactive or active 2) location where subscriber is roaming. If the response is inactive, then the SMSC holds on to the message for a fixed period. When the subscriber accesses her or his device, the HLR sends a SMS Notification to the SMSC, and the SMSC attempts delivery.

There are three steps to routing an SMS from one operator to another. First, the SMS is stored in the SMSC of the calling party's operator. Then, the SMSC of the calling party' network queries the HLR of the called party's network, in order to locate the Mobile Switching Centre (MSC) to which SMS is to be delivered. Once the request has been made and authorisation received, the SMS is routed via the MSC of the called party's network.

The SMSC transfers the message in a Short message delivery Point to Point format to the serving system. The system pages the device, and if it responds, the message gets delivered. The SMSC receives verification that the end user received the SMS, then categorizes the message as sent and does not attempt to send it again. Thus, SMS uses a store and forward method of transmitting messages to and from mobiles.

Figure: SMS Travel Path



Normally in the GSM SMS delivery, SMS termination does not require the SMSC of the network of the recipient's operator. However In some cases like Code Division Multiple Access (CDMA) network or GSM to CDMA SMS transfer, or in case of some services like Push SMS, the recipient SMSC is also used for terminating the SMS to the recipient. In all these types of SMS transfer, the air interface-signalling channel is extensively used for terminating the SMS traffic.

With the growing convergence of networks and services, a person can send an SMS from a mobile phone, fixed phone, or even via the Internet. Since SMS uses the signalling channel as opposed to a dedicated channel, these messages can be sent/received simultaneously with the voice/data/fax service over a network. SMS supports national and international roaming. With the mobile networks based on all the technologies like GSM, CDMA etc. supporting SMS, SMS is more or less a universal mobile data service and can reach any other mobile user around the world.

Customers find it convenient but the resources used of the other mobile carrier gives rise to demands for revenue sharing of SMS Calls (Note: within the purview of ICCC)

4.7 Technical Service Commitments and Fault Repairs

4.7.1 General Commitments

Each Party shall:

4.7.1.1 Be responsible for operating its own system and ensuring its safety.

4.7.1.2 Ensure that the Services it provides to the other party are of the quality comparable to what it provides to itself and to its affiliates.

4.7.1.3 Maintain and repair faults on Interconnection Links in the same manner as it maintains plant and repairs faults within its own Network.

4.7.1.4 The performance standards that shall apply for the various types of interconnecting links between two Networks shall be as indicated in Schedule I.

4.7.2 Quality of Service

The Carriers shall ensure that the respective interconnect facilities delivered at each Point of Interconnection (POI) conform to the applicable Quality of Service (QOS) standards and Technical Specifications set out by PANGTEL. The agreed QOS (including GOS) shall be indicated in Schedule I.

4.7.3 Fault Reporting

4.7.3.1 Fault reporting mechanism for interconnect operational problems will be worked out jointly by both Parties and upgraded from time to time.

4.7.3.2 Each party shall advise its customers to report all faults to its own Fault Reporting Centre. If a fault report is received at an incorrect Centre, the complainant shall be directed to the correct Centre.

4.7.3.3 The party who first becomes aware of the fault shall promptly notify the fault to the other.

4.7.3.4 If one party identifies a fault occurring in its system or if a major fault occurs, that may have adverse effect on the other party's system; the first will promptly inform the other party of the actions being taken to resolve the problem.

4.7.4 Network Restoration:

The Parties will manage their Networks to minimise disruption to Services and, in the event of interruption or failure of any Services, will restore those Services as soon as is reasonably practicable in accordance with the schedule jointly set. Each Party shall manage, notify and rectify faults arising in its Network, which affect the provision of any Services by the other party, as it would in the ordinary course for similar faults affecting the provision of Services by itself.

4.7.5 Operating Instructions:

The Parties will develop and record in the form of operating instructions, a series of agreed response times for different network fault conditions on the basis of following principles:

(a) Clearance of faults affecting the network will take priority over the clearance of individual faults.

(b) They will automatically bring in any standby capacity available and/or carry out network management actions to restore service.

(c) They will observe equipment alarms and carry out testing to identify the nature and location of the fault in co-operation, as deemed necessary, with the other party.

(d) They will keep each other continually informed of progress on restoration of faults during a breakdown.

(e) If temporary repairs are made by one, the other party must be informed of this fact. Other party shall also be informed of service impact of temporary repair and the estimated time of full restoration.

4.7.6 Planned Maintenance works:

4.7.6.1 Each party will give at least 7 days notice of any planned maintenance work that may affect the other's system.

4.7.6.2 Each party shall make its best efforts to minimise disruption and where possible alternative routing will be provided. Equipment design and link engineering should have such redundancy that for any planned work the prescribed quality of service is maintained.

4.8 Technical Specifications and Standards

4.8.1 National Standards

Interconnection of Networks and Systems shall conform to National Standards as set by the PANGTEL and Regulations applicable to Telecommunications Services. In the absence of National Standards, they shall conform to the relevant Recommendations of the ITU. References to typical standards have been indicated in Schedule 4 given in the Annex.

4.8.2 Signaling and Synchronization

Inter-network Signalling shall be on the basis of CCS 7 (ISUP) in the format standardised for the country. The signal interchange points shall be those associated with the POIs.

The systems shall be synchronised in a manner required to meet National Standards. Signals, derived from the National Master Clock or GPS shall be used for synchronisation of the network of both the parties at the Network-Network interface.

4.8.3 Interface Approval

Neither Carrier shall connect or knowingly permit the connection to its System of any equipment that does not conform to ITU standards or not approved by PANGTEL for attachment to such Carrier's System. Both Carriers shall ensure that the equipment at the POI has been approved by the competent authority in accordance with the relevant Standards.

4.8.4 Transmission and Performance Standards

4.8.4.1 Transmission Interface

The normal interface for network interconnection shall be at the E1 level. However, higher order interfaces may also be used by mutual consent. In case of interconnections involving ISPs, nx64 kbit/s interfaces may also be used by mutual consent. National standards and ITU-T G. Series Recommendations shall apply.

4.8.4.2 Switching

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

4.8.4.3 Packet Network

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

4.8.4.4 Speech Performance

Speech over the National network shall conform to the ITU-T P. Series Recommendations. Allocation of impairments shall be as prescribed in the National standards.

4.8.4.5 PSTN/ VOIP Interoperability Standards:

For Interoperability between Circuit switched and Packet switched IP based networks, the interface will conform to relevant national standards or guidelines of PANGTEL. Media gateway, Signalling Gateway and Gatekeeper shall conform to relevant ITU-T Recommendations and Internet Engineering Task Force (IETF) standards, as applicable.

4.9 Network Management, Maintenance & Measurement

4.9.1 The Parties shall provide, install, test, make operational and maintain all interconnection facilities on their side of Point of Interconnection (POI) unless otherwise mutually agreed. The parties shall take full precautions to keep operational the equipment of other party installed in their premises for interconnect purpose and shall

also allow access to duly authorised representative of the other party to such equipment for provisioning, maintenance or monitoring purposes.

4.9.2 All measurements of calls and traffic and interconnect charges shall be related to the POI. Where such measurements cannot be made at the POI, a mutually agreed procedure shall be followed.

4.9.3 Each **Party** shall employ its own network-specific, Network Management System, with a view to efficient traffic and facility management of its own network. In particular, each party shall make arrangements to prevent overload of other interconnecting systems.

4.9.4 The Network Management System employed shall be non-intrusive.

4.9.5 Each **Party** shall prevent any signal from its network or the Network Management system from interfering with the other Operator's network, so as to maintain network integrity.

4.9.6 Each **Party** shall make traffic and link measurements, and inform the other about any foreseen degradation in traffic performance, before it manifests through deterioration of QoS, to allow the other operator to initiate any viable action for diversion or rerouting of traffic through the network of a third operator.

4.9.7 At every Point of Interconnect between the two networks, congestion signal will be conveyed through CCS7, wherever available.

4.9.8 IP Platforms

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

4.10 Network Integrity, Safety & Protection

4.10.1 General Principles:

4.10.1.1 The two Parties shall agree to maintain network integrity and to take measures for adequate protection and safety.

4.10.1.2 Integrity of a network refers to the ability of its systems to preserve and retain their original operational states and remain unaffected by interconnection with other networks

4.10.2 Maintenance of Network Integrity.

Each 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 interworking national specification;

- that efficient arrangement for screening functions and rejection of non-compliant messages are established to detect signals outside the Interworking national specification.

4.10.3 Safety and Protection.

4.10.3.1 Each Party is responsible for the safe operation on its side of the Network, and shall, so far as is reasonably practicable, 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; and
- do not 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 first mentioned Party's Network.

4.10.3.2 It shall be ensured that in case the transmission of traffic to either party's network requires power feeding, then not only the safety of the equipment shall be ensured but also that of the personnel maintaining it. In this regard, safety requirements of accidental human touch of feeding voltage as prescribed in ITU Directives.

4.11 Operator assisted, Directory Enquiry and other Services

4.11.1 Assisted Calls

When the services of a **Party** are used for completion of a special service call or for supply of information, the **Party** supplying the service shall be entitled to a fee for such service. This fee shall be mutually negotiated if it is not specified in the ICCC Regulations.

4.11.2 Other Facilities

Each **Party** shall agree to provide access to its services/facilities to the other **Party** and its customers at fees/charges prescribed by the ICCC for such service or otherwise mutually negotiated. All such fees for services and facilities shall be placed in Schedule 2 and 3, which may be amended from time to time.

4.11.3 Directory Enquiry

Each **Party** shall provide access to its Public Directory Services for the other **Party's** subscribers at the specified or mutually agreed terms. Each **Party** shall include the other **Party**'s information on Directory Services access numbers in their respective telephone directories and Directory Inquiry Services.

4.11.4 Customer Services

Each **Party** shall be responsible for making arrangements to provide prescribed Customer Services to its Customers.

4.12. Access to Interconnection Gateway Facilities

4.12.1 Interconnection Gateways

Any switch that is used for transiting traffic, from one network to another network in a Multi-operator environment may be termed as an Interconnection Gateway. The functionality of such Switches should conform to the relevant national specification.

Operational and Planning requirements of the Interconnect Gateway shall be as laid down in the Regulations.

4.12.2 Access to International Gateway

The Cellular Mobile Operators may interconnect their respective MSCs directly to the International Gateway of the International Service Provider (PNG Telikom) for handling the originating and terminating international traffic of their subscribers.

4.13 Charging Mechanisms, Billing and Settlement

4.13.1 Subscriber Billing

Party A shall be responsible for billing its subscribers and Party B shall be responsible for billing its subscribers.

Billing and revenue collection services to be provided by one party to another shall be carried in accordance with Licensing conditions as detailed in Schedule 2. The description and charges for such services are also contained in the same schedule.

4.13.2 Inter-Carrier Billing

All Carriers shall make arrangements for collection, storage and transfer of data relating to traffic passing through their network to facilitate inter-carrier charging and settlement.

Billing System may be based on Call Data Records (CDRs) on Call-by-call basis where not feasible on Bulk Billing basis. The transit switch generates CDRs, which is inputted to the Billing Systems.

For such CDR based systems, typically the following information is required:

a) Carrier Related Information

   i) Identity of Originating Carrier
   ii) Identity of Terminating Carrier
   iii) Identity of Transit Carrier, if any.

b) Geographical Information

   i) Originating Charging Area Code
   ii) Terminating Charging Area Code.

Apart from transfer of information during the call, data may also be stored in appropriate CDRs.

4.13.3 Settlement

The interconnect usage charges (IUC) for originating, terminating and transit traffic payable by one party to the other shall be cost based. These charges shall be subject to the ICCC Regulations.

4.13.4 Inter-carrier billing

Each party shall send to the other a bill / invoice in respect of the previous month for the amount due for all effective traffic sent to or received from the other party. Effective Traffic for this purpose would mean answered calls. This bill / invoice shall be sent within the period specified by ICCC after the close of the month for which the bill / invoice is made. The determination of the amount due shall include the amount of POI wise traffic in minutes or call units as is applicable, handled during the month, broken down by the type of traffic (local, long-distance, international etc. as feasible).

4.13.5 Errors and Reconciliation

4.13.5.1 If either Party discovers an error in the reports, it shall promptly notify the other Party, but not later than 3 months from the date of issue of the Bill, and the Parties shall make such adjustments in accounts as are necessary to correct the error.

4.13.5.2 If the Parties dispute the accuracy of the traffic information or any related matter, the same shall be referred to the joint Technical and Operations Committee for reconciliation and settlement, after which settlement of accounts shall be done as specified by ICCC.

4.13.6 Security Deposits

Incumbent shall be entitled to demand Security Deposits/Bank Guarantees in accordance with the Government procedures and as safeguard against commercial risk (Note: ICCC* to decide).

4.13.7 Fraud and Default

The **Parties** shall cooperate with one another to investigate, minimise and take corrective action in cases of fraud. Subject to applicable laws, information concerning defaulting customers may be supplied to the other **Party**.

4.14 Fundamental Technical Plans

4.14.1 General

All Carriers shall adhere to the [National Fundamental Technical Plans] to the extent applicable to their networks subject to conditions stipulated in the License Agreements. These plans for PTN comprise:

- Switching & Routing Plan;
- Numbering Plan;
- Transmission Plan;
- Charging Plan;
- Signalling Plan; and
- Synchronization Plan.

Traditionally, in a government monopoly environment, the government operator formulated these plans based on ITU recommendations. This function now is that of PANGTEL.

5. CONFIDENTIALITY, LIABILITY AND INDEMNITIES

5.1 Each **Party** may disclose to the other **Party** such proprietary and confidential (technical or business) information in written, oral, graphic or any other forms, as may be agreed to, for the purposes of this agreement only.

5.2 Each **Party** shall guarantee that the equipment / systems and other articles of the service commissioned / provided by it for the purpose of interconnection or usage by the other Party in terms of this agreement, does not infringe any copy-right or trademark or on intellectual property rights of any third party.

5.3 Either **Party** must not use a trademark, service marks or trade names belonging to another **Party** as a trademark, service marks or trade names without the prior written consent of the other **Party**.

5.4 The conveyance of information between the Parties which shall take place, shall not constitute or imply the granting of any rights under any copy right, patent, trademark or any other Intellectual property rights either at the time of conveyance or subsequently.

5.5 Except as otherwise provided in this agreement, either **Party** may not disclose the confidential information except in the following circumstances: -

(a) the disclosure is authorised in writing by the **Party,** to the extent so authorised; or
(b) the disclosure is made to any arbitrator or expert appointed to resolve disputes under this agreement; or
(c) the disclosure is made pursuant to any applicable laws, rules, regulations or directions of a statutory or any authority or order of a court of law of competent jurisdiction.

5.6 Each **Party** to the agreement shall inform the other **Party** of any disclosures made to third Party prior to any such disclosure.

5.7 Each **Party** to the agreement shall ensure that the information provided by one **Party** to the other is used solely for the purposes for which it is disclosed.

5.8 In order to protect such confidential information from improper disclosure, both **Parties** agree to limit access to such confidential information to authorised employees/agents who have a need to know the confidential information for performance

of the Agreement and to use such confidential information only for purposes of fulfilling work or services relating to this agreement.

The authorised employees/agent to whom all or any confidential information is disclosed shall hold it strictly confidential and shall not disclose it to any other person. Each **Party** shall be liable for any disclosure by the authorised person(s) to any other person.

5.9 Neither **Party** shall be liable to indemnify the other for any claim, demand or proceeding by any third party asserting that the use of any circuit, apparatus, or system or software, or the performance of any service by either **Party** under the agreement constitute infringement, or misuse of any patent, copyright or any other proprietary or intellectual property right of any third party.

5.10 All written confidential information or any part thereof (including, written information incorporated in computer software or held in electronic storage media) together with any analysis, compilations, studies, reports or other documents or materials prepared by the receiving **Party** or on its behalf, that reflect or are prepared from any of the confidential information provided by the disclosing **Party** shall be returned to the disclosing Party or destroyed by the receiving **Party**, when requested by the disclosing Party at any time, or when this agreement expires or is terminated, whichever is earlier. In the event of destruction, the receiving **Party** shall certify in writing to the disclosing **Party** within thirty (30) calendar days, that such destruction has been accomplished. The receiving **Party** shall make no further use of such confidential information nor retain such confidential information in any form whatsoever.

5.11 The **Parties** shall acknowledge that the provisions of this part shall continue in full force and effect regardless of variations, assignments or termination of other provisions of this agreement. The obligation to maintain confidentiality of the confidential information provided hereof and the undertakings and obligations in this part shall continue for two (2) years upon the expiry or termination of this agreement.

5.12 Notwithstanding any provision in the agreement and unless otherwise provided the **Parties** shall not reveal, make known or divulge to any third party in any manner howsoever the contents of those aspects of this agreement (in full or in part) which the PANGTEL or ICCC has withheld from publication.

5.13 Save as provided under the agreement, no news releases, public announcements or any other form of publicity concerning the agreement or the terms of agreement shall be conducted or released by the either **Party** without the prior written consent of the other **Party**.

5.14 Each **Party** shall acknowledge that a breach of any provision of this section may cause the other **Party** damage.

5.15 The agreement shall contain the entire understanding between the **Parties** with respect to the safeguarding of the confidential information and supersede all prior communications and understandings with respect thereto.

6. FORCE MAJEURE

Neither party shall be liable for any breach of the Agreement (other than a breach for non payment) caused by an act of God, insurrection or civil disorder, war or military operations, national emergency, fire, flood, lightning, explosion, subsidence, industrial dispute of any kind. The Party affected by such force majeure shall promptly notify the other Party of the conditions and the details thereof.

If as a result of force majeure, the performance by other Party of its obligation under this agreement is only partially affected; such Party shall nevertheless remain liable for the performance of those obligations not affected by such force majeure.

If the force majeure lasts for more than the continuous period of 90 calendar days from the date of the notification, and continues to prevent the affected Party from performing its obligation in a whole or in material part, the affected Party shall be entitled to, but not be obliged to, terminate its agreement by giving not less than 30 calendar days written notice to the other Party. This will be subject to the Articles on Termination.

7.0 LIAISON AND COORDINATION

7.1 Services Management

Access Providers offering or providing interconnection services shall designate a Services Manager to deal with other Service Providers requiring interconnection and other services. The role of the Services Manager is to facilitate communication between Service Providers on commercial and technical aspects of interconnection and the provision of other services to Service Providers.

Access Providers should agree to meetings with other Access Seekers within five (5) working days of the meetings being formally requested.

7.2 Joint Technical and Operational Committee

Interconnected Service Providers should establish a joint technical and operational committee. The joint technical and operational committee should facilitate discussion to reach mutually acceptable agreements on technical, operational, planning, billing and other service aspects of interconnection.

The composition of the joint technical and operational committee should be agreed upon by the Carriers and could be reconstituted as and when required.

The joint technical and operational committee should meet at regular intervals with an agenda agreed in advance and may cover one or more of the following areas:

- New Points of Interconnection
- Analysis of traffic levels
- Service quality
- Capacity requirements
- Fault analysis
- Billing processes
- Network and/or service changes
- Any other technical and operational issues associated with interconnection.

Service Providers should establish working groups of project managers, operational staff and technical personnel where required to coordinate all mutual activities relating to implementation of interconnection, amendment of schedules, reconciliation, etc., and lay down the detailed procedures required for smooth implementation of the agreements and address specific issues as they arise.

8. TERMINATION AND REVIEW

8.1 Termination

The Agreement shall be valid for the period as indicated therein, unless:

(a) either **Party** ceases to hold a licence under the Act.

(b) an order is entered by a court of competent jurisdiction mandating the winding-up or dissolution of a **Party**, or appointing a receiver or liquidator for such **Party** or having a comparable effect; in which case this Agreement shall immediately be terminated.

8.1.1 The Agreement also may be terminated by either **Party** giving 30 days notice to the other in the event that either **Party**:

(a) breaches any provision of the Agreement; provided, however, that the breaching **Party** has been notified in writing of its failure by the non-breaching **Party** and the breaching **Party** has not remedied its failure within twenty (20) Working Days; and the approval of PANGTEL and the licensor (ICCC) has been obtained for such termination. In the event, the approval is accorded with conditions, regard being had to the general interest of the customers, the same will be fully complied with before the final act of disconnection of interconnection arrangements becomes effective.

(b) ceases to carry on business.

8.1.2 Each **Party** shall provide assistance as is necessary for recovery by the other **Party** of any equipment supplied by that other **Party**.

8.1.3 Termination of the Agreement shall be without prejudice to a **Party**'s rights, liabilities or obligations that may have accrued prior to such termination.

8.1.4 Withdrawal of Interconnection for non-payment

In case of default in payment, the creditor Party may immediately approach the /Licensor for withdrawal of services, provided that the remedy to appropriate the security deposit has been exhausted or there exists some such circumstances, which warrant immediate suspension. This will be in addition to other remedies available under the contract.

8.2 Review

Apart from changes to Schedules and Annexes that may be made at any time by mutual agreement, the Agreement may be taken up for Review by mutual consent whenever a material change in License Conditions, Regulations or otherwise etc., takes place.

9. DISPUTES

9.1 Settlement of Disputes

The **Parties** shall carry out the Agreement in the spirit of mutual co-operation and good faith and shall seek to resolve amicably any disputes arising between them.

The settlement of disputes shall take place in accordance with the Telecommunications Act. It is, however, desirable that before a matter is formally established as a dispute, reconciliation is attempted in the Joint Technical and Operations Committee referred to in article 4.13.5.2. The Committee shall resolve the matter within 30 days. The Authority may intervene at the request of either of the parties.

During any period of dispute, before or until resolution, a **Party** shall not disrupt services being provided to the other **Party**, or take any other actions, which might materially and adversely affect that **Party**'s service

10 – NOTICES

Unless otherwise provided in the Agreement, any notifications, service of process, petitions, claims and other Communications requested or permitted pursuant to this Agreement, shall be made in writing and shall be considered validly made when delivered by hand or by courier, telex or facsimile once receipt is verified.

11. AGREEMENT STRUCTURE

11.1 General

i. The technical aspects of interconnection in conformity with those indicated in Chapter 4 must be explicitly stated in a comprehensive interconnection agreement.

ii. The type of equipment that will be interconnected, terminal point, and related technical arrangements, will be stated in the Schedules, including but not limited to:

- Switches (location, type and function);
- Interconnecting circuits (location, number, speed/capacity and type);
- Signalling routing and synchronisation; and
- Telecommunications services provided via the interconnected networks.

iii. The following will also be stated :-

- the agreed capacity of the interconnection and the obligation of the access provider to provide that capacity;
- dates, time periods and deadlines for establishing interconnection;
- testing arrangements and protocols;
- technical conditions, including interconnection parameters:
  - the procedure for settling interconnection;
  - a procedure for amending the interconnection agreement;
  - arrangements for common access to emergency calls;
  - engineering details of access to operator assistance; and
  - Call Line Identification data exchange.

11.2 Terminal Points at the POI

The interconnection agreement shall contain a specific description of the physical location and implementation of the POI and shall adhere to the parameters stipulated in the Fundamental Plans for:-

- Transmission Plan – Network Levels;
- Call Routing
- Synchronisation Plan; and
- Signalling Plan.

11.3 Physical Points of Interconnection

i When carriers are required to provide network interconnection service, the physical interconnection points shall be established as required through negotiations.

ii When a carrier offers network interconnection services, the interconnection points shall be set up at any points that are compatible in technology subject to clause 4.5.1(vii) & 4.5.2. When a carrier is unable to set up interconnection points, it shall provide reasons therefore in writing to the party that demands network interconnection and copy to PANGTEL.

iii The physical interconnection points may take place at any of these points:

- Local switches
- Local tandem switches
- Toll switches
- International switches
- Dedicated tandem switches

It is reemphasized that the following principles shall be followed in evaluating the physical point of interconnection:

(a) whether the network interconnection affects the security and/or the reliability and technical performances of telecommunications networks, such as the ratio of trunks or number of exchange lines to the POI.

(b) Space and location shall not be allowed to be used as reasons for technical unfeasibility.

12. ADMINISTRATION OF THE CODE

12.1 Consistency of the Code

This Code is premised on the Act and should be read with the general carrier "Telecommunication Interconnection Code of Practice" which is developed by the ICCC.

All carriers and service providers shall comply with this Code and PANGTEL may penalize violators of this Code in accordance with the Act.

12.2 Change to the Code

PANGTEL may review the Code as stated in Section 1.6 and make changes it feels necessary and appropriate as and when required. All stakeholders including the Commission, all licensed carriers and other telecommunications industry players shall be consulted before any changes to the Code are proposed and confirmed.

12.3 Enforcement and Compliance of the Code

PANGTEL is responsible for administering this Code and shall consult the Commission as and where appropriate.

Any party that feels unfairly marginalised by the access provider vis-à-vis technical interconnection arrangements may notify PANGTEL at the earliest possible opportunity.

12.4 Availability of the Code

a) The updated versions of the Code can be accessed from the PANGTEL website: www.pangtel.gov.pg or enquiries may be send to the following :

The Director General,

PANGTEL,

P O BOX 8444,

BOROKO,

National Capital District(NCD),

PAPUA NEW GUINEA(PNG)

Telephone: + (675) 300 4009 or Fax: +(675) 325 6868

Email: cpunaha@pangtel.gov.pg

ANNEX

SCHEDULE 1

POINTS OF INTERCONNECT

List of POIs

Station/Area	Type of Traffic	POI	QOS

Note 1: Type of Traffic means local, domestic trunk, international trunk, special services etc.

Note 2: Outgoing, Incoming and Transit Traffic should be shown separately

Note 3: For each POI, a physical description should be prepared, separate from the main interconnect agreement

Each POI should be described in the following format:

Item	Description	Remarks
Location of the POI	Address:	
Party responsible for setting up and maintaining the POI	Name and address	
Physical description of POI	Ex: Physical cable (gauge) or channel interface (ITU-T specification	

Note: Both the parties will update Schedule I, at intervals of 6 months or when ever new POIs are added in a licensed service area.

Performance Standards

	Type of Network		
	Local	Trunk	International
1. System Availability a. Group Down Time b. MTTR 2. Answer/Seizure ratio			
2. Bit Error Rate			
3. Slip			
4. Others			

For Consideration of ICCC*

SCHEDULE 2

DIRECTORY, EMERGENCY & MISCELLANEOUS SERVICES

TYPE OF FACILITY	CHARGE	DETAILS

Note: The types of facility may include billing and revenue collection, access to special services, advertisement etc.

SCHEDULE 3*

SHARING OF INFRASTRUCTURE ELEMENTS & CHARGES

TYPE OF FACILITY	CHARGE	DETAILS

Note: The types of facility may include space for locating apparatus & plant in buildings, sharing of towers, leased capacities etc.

SCHEDULE 4

TYPICAL SCHEDULE OF STANDARDS AND SPECIFICATIONS

S. No.	Item	Specification	Remarks
1	Switching Interface	ITU-T E770	(PSTN and Mobile) (PSTN & Private basic operators)
2	Transmission Interfaces	ITU-T G.703/ G.707 3/96) G.782/ G.783 G/VAN-02/01 Sept, 96	2/8/34/140/ 155 Mbps For V 5.2 interface
3	Signalling CCS 7	ITU	CCS 7 Plan MTP & ISUP SCCP STP
4	Synchronization		As per National Synchronization Plan
5	Junction Traffic		Maximum loading = 0.7 Er
7	Junction Testing		
8	Higher Layer Protocols		
9	Interface with IP Network		Remote Access Server TCP/ IP Internet user devices
10	Electrical safety requirements		
11	Quality of telecom services	Regulations	ITU-T E 800
12	Terms and definitions	ITU-T B.13	All the definitions shall be considered as per B series of ITU-T Recommendations

For Consideration of ICCC*

SCHEDULE 5

Unbundled Network Elements (UNEs)

involved in carriage of various types of calls for working out Interconnect Usage charges (IUC)

No.	Network Elements	Total OPEX per DEL	Mean Capital Employed per DEL	Cost of Capital (%)	Annual CAPEX	Annual CAPEX+OPEX per DEL	Minutes of Usage	Av. Cost per minute
1.	Wireline/ Wireless Access Loop							
2.	Local Exchange							
3.	Tandem							
4.	TAX Switch							
5.	Local Exchange – Tandem/TAX transmission Link Equipment							
6.	Local Exchange – Tandem/TAX transmission Link Equipment							
7.	Inter-TAX transmission Link length							
8.	Inter-TAX Transmission link Equipment.							

NOTES:

1. Based on the above average cost per minute/per unit indicated in the Table, it should be possible to calculate carriage/ access charges involving various types of switching and transmission elements such as Double TAX call for transit, Single TAX/tandem call for originating and termination.
2. The element costs may be different for different network sizes/ configurations.
3. This Schedule shall be submitted by both the Parties to the PANGTEL and ICCC and will be treated as confidential.

For consideration of ICCC*

SCHEDULE 6

INTERCONNECT USAGE CHARGES DERIVED FROM SCHEDULE 5

TYPE OF ACCESS/ CARRIAGE	NETWORK ELEMENTS INVOLVED	CHARGE/ MINUTE
Originating	Local Loop-Local Exchange- Tandem Exchange plus Transmission Link & Length	
Transit	Single TAX –Transmission Link & Length	
Transit *	Two TAXs –Transmission Link & Length	
Terminating	Tandem exchange plus Transmission Link & Length - Local Exchange – Local Loop	

Notes:

1. Usage charges are generally derived from the costs of traffic sensitive network elements, such nodes & links of the core network excluding Local Loop.

2. In case of two or more TAXs are involved, the Charges per minute shall be computed in multiples of 100 Kms or part thereof.

3. Where distance insensitive transmission system like Satellites are used, then separate distance independent charges shall be specified.