East West University

Internship (Industrial Training) Report

On

Development of Core Networking System in Interconnection Exchange (ICX)

(VoiceTel)

By

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ID: 2012-1-55-025

Supervised by:

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East West University

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Has been approved by

Acknowledgement

I, Susmita Barman, would like to express my gratitude to almighty God for giving me strength to perform my responsibility as an intern and complete my report in time.

My special thanks go to **Mr. Sarwar Jahan,** Senior Lecturer of ECE department, East West University, who was my academic supervisor for the course ETE 498 (Industrial Training). He guided me to complete the report successfully by allocating his valuable time.

I would specially like to convey my gratitude to my company supervisor **Md. Rafat Zakiullah,** Manager of Core Department, Voicetel LTD., who gave me the opportunity to do intern under his department and guided me with lots of effort and time.

Disclaimer

This is to declare that this internship is based on the development of Core Networking System and NOC of ICX Company in Bangladesh. This report has not been submitted elsewhere as an Internship or a Project reportpurpose. Any altercation reproduced of this Internship has been properly acknowledged.

Acceptance

This internship report has been presented to the department of Electronics and Communications Engineering, East West University and submitted for the partial fulfillment of the requirement for degree of B.Sc. in Electronics and Telecommunication Engineering, under complete supervision of the undersigned.

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Abstract

New technologies are changing the way regulators need to manage interconnection. Thoughtful consideration of new ideas can greatly improve the efficiency in national/international level atmosphere. The formation of advisory groups in international, regional and national levels and national regulatory authorities could expedite the process of improving the ICX approach of interconnection in the respective markets. One of the emerging markets of Bangladesh has adopted the unconventional approach in its interconnection regime. Telecom regulators introduced an ICX based interconnection regime in 2007 and started a new era of interconnection in Bangladesh. ICX based interconnection regime can be the solution and the potential of such model is gaining in popularity. The current ICX based interconnection arrangement offers certain advantages like simplified network architecture, creation of new revenue opportunity, enhanced capacity, redundant data connectivity. These improvements in Bangladesh interconnection regime may encourage other countries to replicate the model in national/international service or operator complicated environment.

Chapter 1

Core Networking System of ICX

Introduction

Technologies are changing day by day with their new ideas and thoughtful consideration. The advisory groups in international, regional, national levels and national authorities could expedite the process of accommodating or improving the ICX approach of interconnection in the respective markets. One of the reputed markets of Asia – Bangladesh has adopted the unbelievable approach in its interconnection regime. As defined in the National Telecommunications Policy 1998and International Long Distance Telecommunications Services (ILDTS) Policy 2007, all mobile operators is to interconnect through Interconnection Exchange (ICX) and all international calls to be handled by International Gateway (IGW) which is to be connected to the mobile and fixed operators through the ICXs. The existing ICX regime can be a solution for the international and national level operators in ICT environment. ICX based arrangement can be beneficial to the overall interconnectivity scenario. International Telecommunications Union (ITU)'s recent publications recommend the concept of an 'Interconnect Gateway Exchange' for the national and international service and operator environment. The handbook suggests that countries setting up an 'Interconnect Gateway Exchange' in this environment can address the challenges of national and international levels which is more effective for interconnection environment. [1]

ICX Model in Bangladesh

Bangladesh Telecommunication Regulatory Commission (BTRC) has been empowered by and under the Bangladesh Telecommunication Regulate ACT 2001 with the prior approval of the government to issue License for the operation and provision of telecommunication services and to determine the eligibility criteria and other general terms and conditions of License.

Having these consideration to the principles of transparency, fairness, non- discrimination and all other relevant principles, the Licensing Procedure of Interconnection Exchange(ICX) services are being issued as envisaged in the International Long Distance Telecommunications Service Policy,2010(ILDTS,Policy 2010).[2]

From these conditions, government also gives some rules and limitations that are no share can be transferred to or new share can be issued for nor shall any merger/amalgamation be take place without the prior written permission of the Government or the Commission, as the case may be. To maintain balance flow of the traffic each of the ICX License must route 90 percent of outgoing international traffic equally distributed through each of the IGW Licenses. To maintain balance flow of the traffic each of the ANS Licenses must route 90 percent of its outgoing international traffic equally distributed through each of the IGW Licenses. ICX should support number portability, International Mobile Equipment Identification (IMEI) number service (EIR), ENUM and other Next Generation Network (NGN) as and when required.

This policy stipulates building a three-tier telecommunications infrastructure for international calls. Initially the government granted three International Gateways (IGW) and two Interconnection Exchange (ICX) Licenses to the private sector through auction. Introduction of ICX based Interconnection model brought in change in following three frameworks:

- Regulatory
- Technical
- Financial

Chapter 2

Frameworks

Regulatory Structure

Along with the ILDTS Policy 2007, the following is the suggested structure of Interconnectivity in Bangladesh:

- Bangladesh Telecommunication Regulation Act, 2001 (as amended)
- Interconnection Exchange (ICX) services are being issued as envisaged in the International Long Distance Telecommunication Services Policy,2010(ILDTS Policy,2010).[2]

Technical Structure

The three layers of network structure keep the provision of International Gateway, Interconnection Exchange and Internet Exchange. Services provided under these 3 layers can be translated in to following kinds of interconnection:

- Interconnection for Domestic telephone service
- Interconnection for International telephone service and
- Interconnection for International Data service.

With these three layers location and capacity of switch, interference, signaling/protocol/numbering plan and traffic delivery are also part of this structure. Connectivity, call detail record, data protection, performance monitoring, Quality of Service (QoS), Network security are the primary material for technical structure.

Financial Structure

Financial structure is included with technical operations and marketing plan. This shall include total project cost and cost financing pattern, assumptions for financial analysis, together with projected five years working capital, estimated total annual gross revenue, and cost of services. Previously revenue share for domestic off-net calls were done as per the pre-fixed termination rate and each operator used to bill the other for the total traffic volume (minutes) as per respective CDR. Total proposed investment for the operation, own financing and other sources are now amended in the ILDTS Policy. So a certain revenue sharing arrangement is now in place among all stakeholders for international calls. Domestic termination rate and revenue sharing of it are also determined by NRA (BTRC).

Conclusion

The creation of an Interconnect Exchanges is expected to replace the current traditional interconnect regime and will make interconnection regimes versatile enough to accommodate international and national level providers within the scope of licensing and regulatory structure. These improvements in Bangladesh Interconnection regime may encourage other countries to replicate the model in International-operators and services.

Chapter 3

What is ICX?

It is the switching center where many networks interconnect in order for offering easy access to other telecom operators. It enables the users of one network to communicate with those of other network. It allows monitoring and transparency.

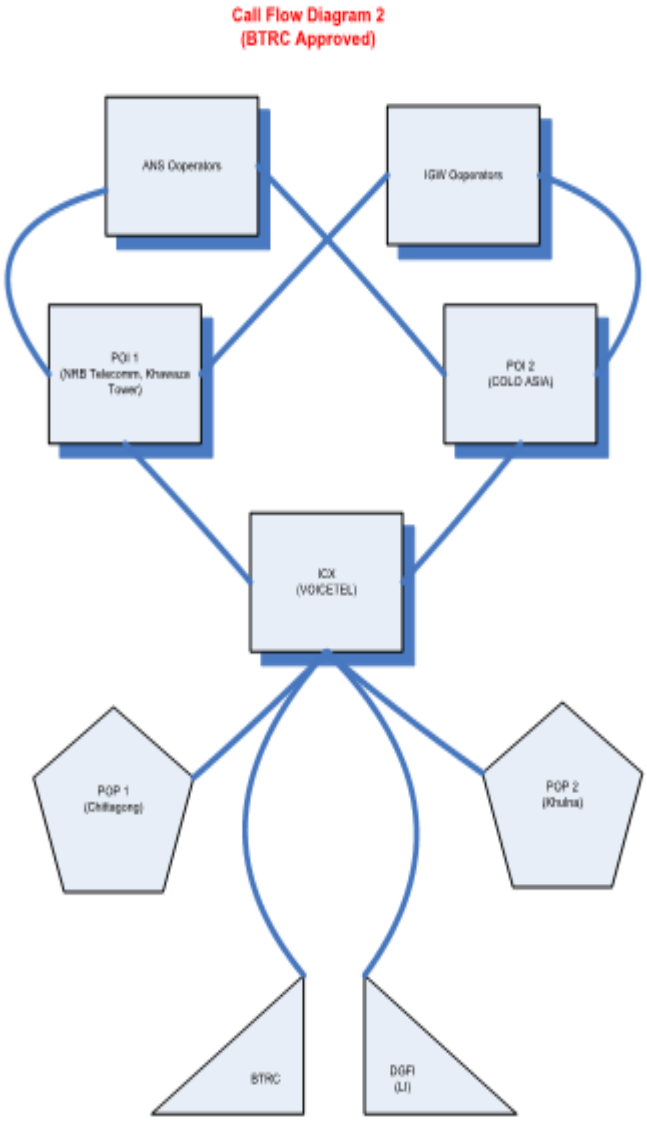


Fig: Call flow diagram of VoiceTel

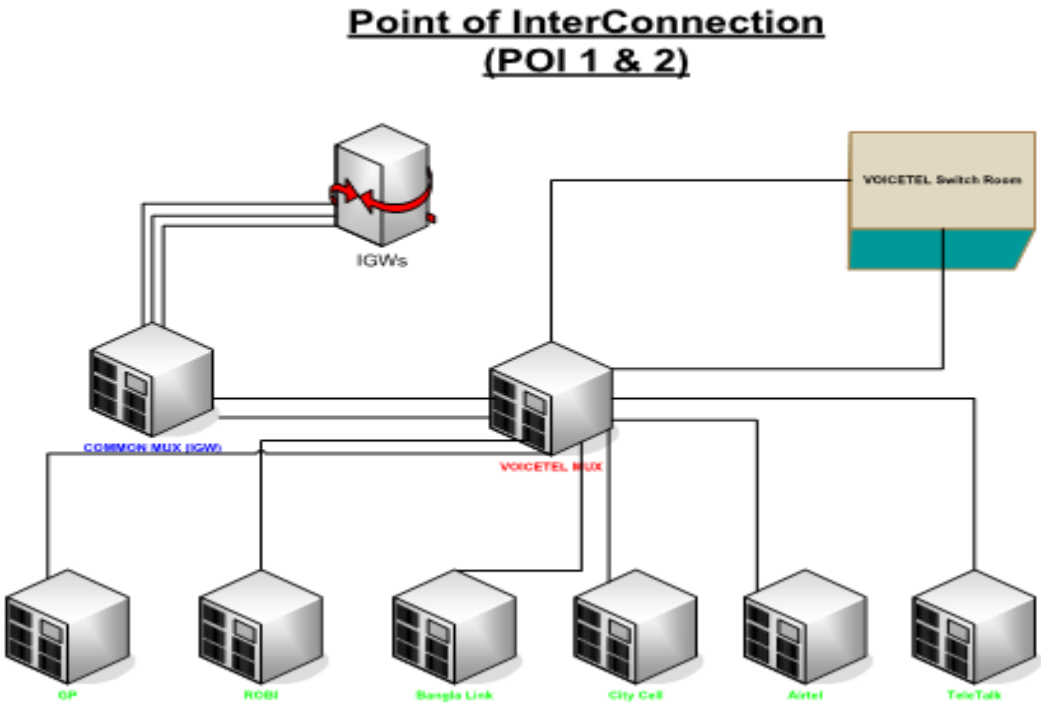


Fig: Point of Interconnection

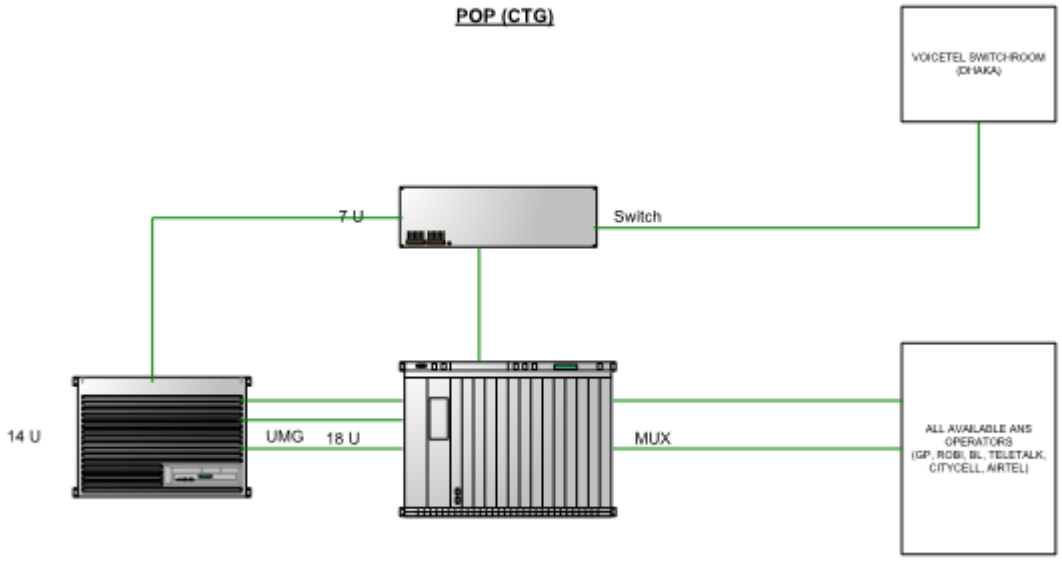


Fig: POP (CTG)

Network Evolution to an All IP Network:

Both traditional circuit switch and IP based services need to be supported by single network infrastructure simultaneously. So, Hybrid architecture may be the best solution. Transition to ALL-IP network may not be happening overnight.

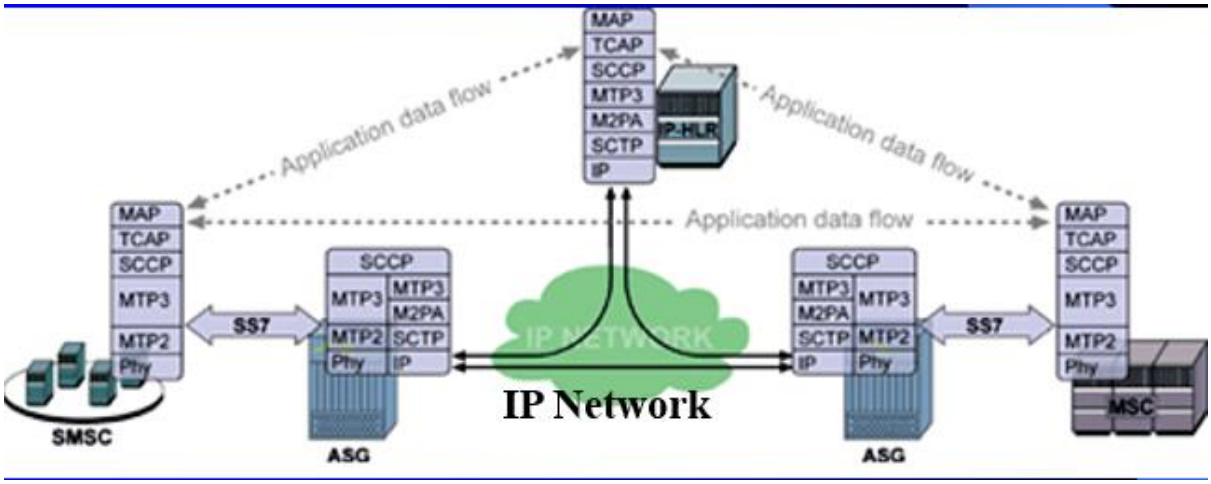


Fig: All IP Network

Network Topology:

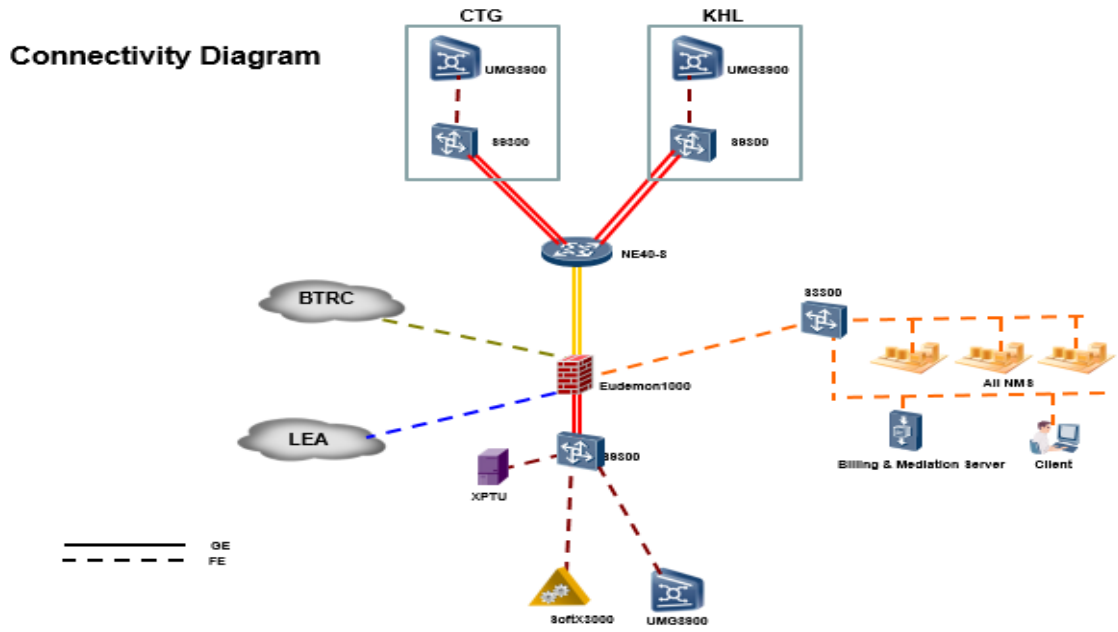


Fig: Network Topology of ICX [4]

Chapter 4

Core Networking System

What is core network?

Introduction

A core network, or network core, is the central part of a telecommunications network that provides various services to customers who are connected by the access network. One of the main functions is to route telephone calls across the PSTN.Typically the term refers to the high capacity communication facilities that connect primary nodes. Core/backbone network provides paths for the exchange of information between different sub-networks. For enterprise private networks serving one organization, the term backbone is more used, while for service providers, the term core network is more used.

Core/backbone network usually has a mesh topology that provides any-to-any connections among devices on the network. Many main service providers would have their own core/backbone networks that are interconnected. Some large enterprises have their own core/backbone network, which are typically connected to the public networks.

The devices and facilities in the core / backbone networks are switches and routers. The trend is to push the intelligence and decision making into access and edge devices and keep the core devices dumb and fast. As a result, switches are more and more often used in the core/backbone network facilities. Technologies used in the core and backbone facilities are data link layer and network layer technologies such as SONET, DWDM, ATM, IP, etc. For enterprise backbone network, Gigabit Ethernet or 10 Gigabit Ethernet technologies are also often used.

Core networks typically provide the following functionality:

Aggregation: The highest level of aggregation in a service provider network. The next level in the hierarchy under the core nodes is the distribution networks and then the edge networks. Customer-premises equipment (CPE) does not normally connect to the core networks of a large service provider.

Authentication: The function to decide whether the user requesting a service from the telecom network is authorized to do so within this network or not.

Call Control/Switching: Call control or switching functionality decides the future course of call based on the call signaling processing. E.g. switching functionalitymay decide based on

the "called number" that the call be routed towards a subscriber within this operator's network or with number portability more prevalent to another operator's network.

Charging: This functionality handles the collation and processing of charging data generated by various network nodes. Two common types of charging mechanisms found in present-day networks are prepaid charging and postpaid charging.

Service Invocation: Core network performs the task of service invocation for its subscribers. Service invocation may happen base on some explicit action (e.g. call transfer) by user or simplicity (call waiting). It's important to note however that service "execution" may or may not be a core network functionality as third party network/nodes may take part in actual service execution.

Gateways: Gateways shall be present in the core network to access other networks. Gateway functionality is dependent on the type of network it interfaces with.

Physically, one or more of these logical functionalities may simultaneously exist in a given core network node.

Since the inception of Bangladesh, the nationwide telecommunications services were deficient in both quality and quantity. Bangladesh had a ratio of less than1 telephone per 1000 people, one of the lowest telephone densities in the world.

Development of Core Network of VoiceTel

Interconnection Exchange (ICX) operator provides the following services:

- Routing/Switching Inter operator Domestic Voice Calls
- Routing/Switching International Calls between ANS and IGW operators
- SMS, VMS and VAS services
- ENUM, IMEI and Number portability Services
- Special Code Number, Emergency Number, Call Center Number Routing.

For Core Network solution Interconnection Exchange (ICX) operator has selected SOFTX3000 and UMG8900 from the soft- switch pioneer Huawei Technologies. Present Busy Hour Call Attempt (BHCA) is 5.6 million, expandable up to 16 million. 3 Media-Gateway with initial trunk facility of 1260 E1 in Dhaka, 504 E1 in Chittagong and 504 E1 in Khulna which is further expandable. They are currently capable of carrying 34,020 concurrent call. All parts of the systems both in the soft-switch and Media Gateway are redundant at the card level.

Call Flow in Core Networking System:

In core networking system call flows in two levels. First level is software to software and second level is in hardware level.

In software level call will flow from the following ways:

- SS7
- SIGTRAN
- ISUP

SS7

Signaling System No. 7 (SS7) is a set of telephony signaling protocols developed in 1975, which is used to set up and tear down most of the world's public switched telephone network (PSTN) telephone calls. It also performs number translation, local number portability, prepaid billing, Short Message Service (SMS), and other mass market services. [5]

The Internet Engineering Task Force (IETF) has defined level 2, 3, and 4 protocols compatible with SS7 which use the Stream Control Transmission Protocol (SCTP) transport mechanism. This suite of protocols is called SIGTRAN.

SS7 Protocol Stack:

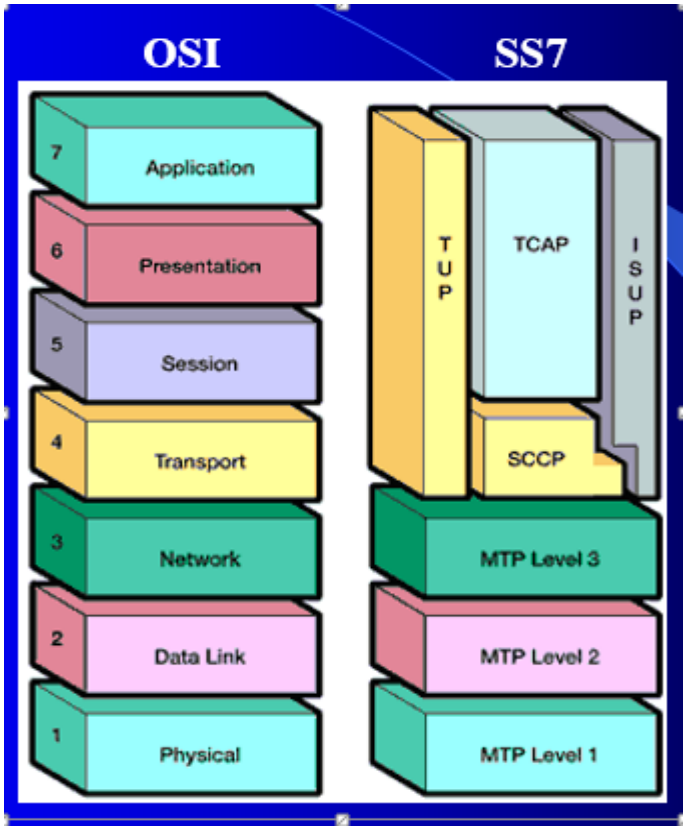
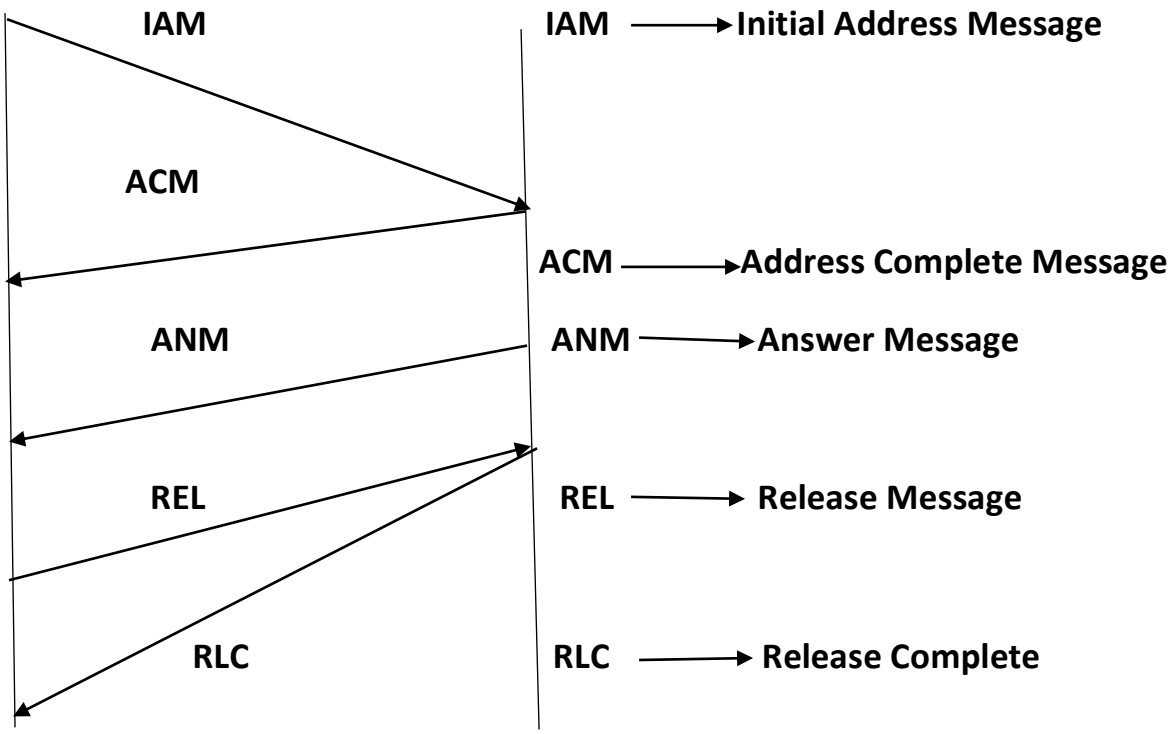


Fig: SS7 Protocol

Application Layer of SS7:



Initial Address Message (IAM) contains all the necessary information for a switch to establish a connection.

Address Complete Message (ACM) acknowledge to IAM. The required circuit is reserved and the "phone is ringing".

Answer Message (ANM) occurs when the called party picks up the phone.

Release Message (REL) sent by the switch sensing that the phone hangs up.

Release Complete (RLC) each exchange that receives REL, sends an RLC message back (this acknowledge receipt of the REL).

SIGTRAN

SIGTRAN is the name, derived from signaling transport, of the former Internet Engineering Task Force (IETF) working group that produced specifications for a family of protocols that provide reliable datagram service and user layer adaptations for Signaling System 7 (SS7) and ISDN communications protocols. The SIGTRAN protocols are an extension of the SS7 protocol family. It supports the same application and call management paradigms as SS7 but uses an Internet Protocol (IP) transport called Stream Control Transmission Protocol (SCTP).Indeed, the most significant protocol defined by the SIGTRAN group is SCTP, which is used to carry PSTN signaling over IP. [7]

The SIGTRAN group was significantly influenced by telecommunications engineer's intent on using the new protocols for adapting VoIP networks to the PSTN with special regard to signaling applications. Recently, SCTP is finding applications beyond its original purpose wherever reliable datagram service is desired.

SIGTRAN protocols:

The SIGTRAN protocols specify the means by which SS7 messages can be reliably transported over IP network.

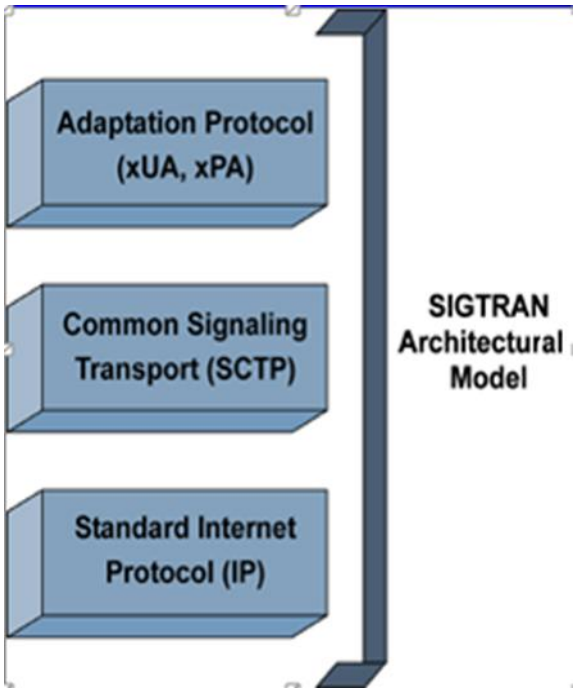


Fig: SIGTRAN Protocol

The following architecture identifies three components:

- A Standard IP.
- A common signaling transport protocol for SS7 protocol being carried.
- An adaptation module to emulate lower layers of the protocol.

ISUP

The ISDN (Integrated Services Digital Network) User Part or ISUP is part of the Signaling System No. 7 (SS7) which is used to set up telephone calls in the public switched telephone network (PSTN). It is specified by the ITU-T as part of the Q.76x series.

When a telephone call is set up from one subscriber to another, several telephone exchanges could be involved, possibly across international boundaries. To allow a call to be set up correctly, where ISUP is supported, a switch will signal call-related information like called party number to the next switch in the network using ISUP messages. The ISUP messages are IAM, ACM, ANM, REL, RCL and so one.

The telephone exchanges may be connected via E1 or T1 trunks which transport the speech from the calls. These trunks are divided into 64 Kbit/s timeslots, and one timeslot can carry exactly one call. Regardless of what facilities are used to interconnect switches, each circuit between two switches is uniquely identified by a circuit identification code (CIC) that is included in the ISUP messages. The exchange uses this information along with the received signaling information (especially the called party number) to determine which inbound and outbound circuits should be connected together to provide an end to end speech path.

In addition to call related information, ISUP is also used to exchange status information for, and permit management of, the available circuits. In the case of no outbound circuit being available on a particular exchange, a release message is sent back to the preceding switches in the chain.

To establish a call, there are two sections:

- Establishing Link and
- Selection Mode.

To establish a link:

Optical port no:

E1 T1 no: 0

SPF band no: 0

Link Set no: 136

BSGI (Broadband Signaling Gateway) no: 136

Int-type. Interface ID: 33

E1 + 1 type: E1

Start time slot: 16

End time slot: 16

SPF sub board no: 1

Link type: A64 K (MTP2 64 LNK)

Here, 1 STM = 1 E1 or 2E1

2 signaling link is stablished in one STM. More than two STM (63E1+63E1) can connect in one route.

In one STM, Synchronization link: 63

Signaling link : 2

Voice link : 1951

Routing: For routing configuration we need following parameters

CNACLD: It is a call terminated party. It terminates a call with a prefix number.

CNACLD RSC (Root Selection Code)

017 → 17 → DOM

018 → 18 → DOM

RT: For terminating a call we need Route Number (RT)

RSSC: Route Selection Source Code

RTANA: Route Analysis

SRT: Every route number has some sub route number (SRT).

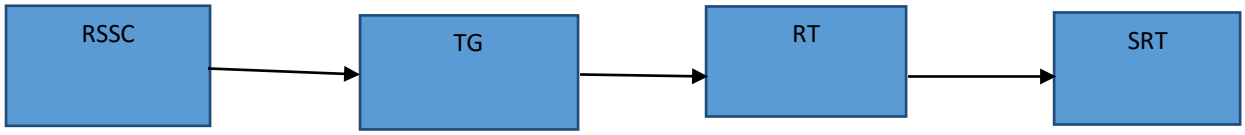


Fig: Routing Configuration

Here, we consider two party one is A party and another one is B party. A party is call originated party and B party is call terminated party. Call terminated party give the prefix number to CNACLD. The group of trunk circuit is called Trunk Group (TG). In one route two STM circuit is connected.

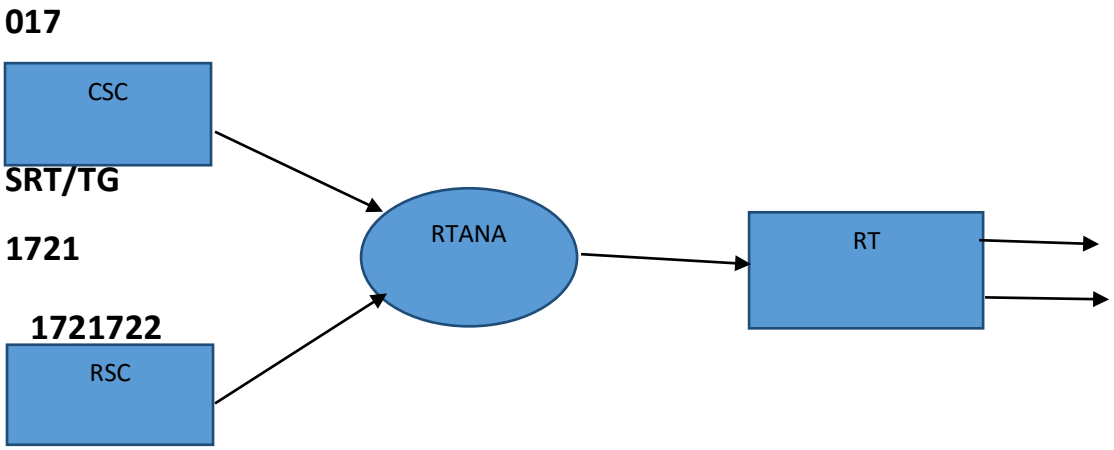


Fig: Routing Protocol

Selection Mode: For selection mode SOFTEX3000 is run by three steps.

- Circuit Selection Mode
- Point Code Selection
- Capacity.

Circuit Selection Mode

Each and every operation is originated by some predefined circuit, where Circuit Identification Code (CIC) and Signaling Link Code (SIC) is connected.

To avoid conflict, any operator like GP will pass call/signal in ascending form and VoiceTel will pass call/signal in descending form.

Point Code Selection

Here operator will be connected through MSC.

Capacity

How many circuits will be connected with operators that will be measure by its capacity.

Core Network has two parts:

- Universal Media Gateway(UMG8900)
- SOFT Switch

Universal Media Gateway (UMG8900)

This Universal Media Gateway helps us to migrate the GSM-R services from TDM to all IP communications, reduce TCO and protect ROI.

The UMG, together with Huawei's Mobile Switching Center (MSC) server, collaborates with other devices to support various basic, supplementary, and value-added mobile services on a traditional GSM-R network. Its simplified network structure also contains built-in video networking and signaling link gateways. The UMG architecture enables fast and flexible introduction of new services.

UMG8900 Board Information

- OMU: Operation and maintenance unit responsible for the management of the whole UMG8900. And its power consumption is 61Watt.

- MPU: Providing switching functions at the FE control plane to exchange control information between all boards with FE control interfaces in the presence of a single frame, and exchange control information between frames and manage interfaces in the case of multi – frame cascading case. And power consumption is 60 Watt.

- CMF: Front connect management unit Interworking with packet service boards, TDM service boards and service resource boards to implement service bearer conversion and service stream formats conversion. It consumes power 14.8Watt and board capacity is up to 64(H.248) links on each board and 128 links in the system.

- CMB: Black connect management unit Interworking with packet services boards, TDM service boards and service resource boards to implement service bearer conversion and service stream formats conversion. Board capacity is up to 64(H.248) links on each board and 128 links in the system and power consumption is 15.7 Watt.

- NET: Providing packet service switching channels in a frame to exchange service data between all packet service boards in the frame. Power consumption is 38.4 Watt.

- CLK: Receiving one 2048 Kbit/s or 2048 kHz signal input from the external synchronization interface, two line clock inputs from the TDM interface board, and one satellite positioning signal input from the GPS/GLONASS system. Power consumption is 13 Watt.

- SPF: The sub boards that attached on the MSPF, receives signaling from TDM switching boards and then deals with it at TDM level, and then the MSPF adapts TDM signaling to IP type. The MSPF implements M3UA/M2UA/V5UA/IUA adaptation on signaling based on SIGTRAN protocol, and forward IP signaling to the MGC. Board capacity is up to 23 64 Kbit/s MTP2 links. Or up to one 2 Mbit/s MTP2 link. And power consumption is 33.9 Watt.

- HRU: High speed routing unit, processing IP routes, converging and distributing IP services. Power consumption is 36.2 Watt.

- G10: Being equipped with the pluggable interface module and providing one GE interface or electrical interface in conformity with the IEEE8002.3zstandard. Its power consumption in Optical module 7.6 Watt and Electrical module -1 Watt.

G10 Card:

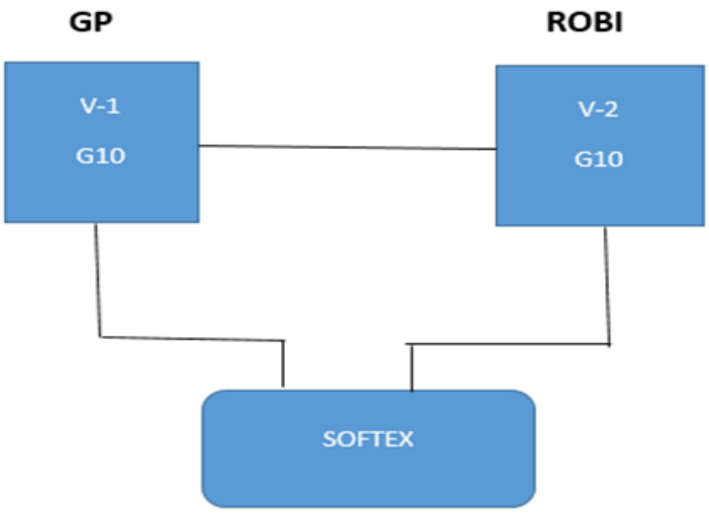


Fig: G10 Card

- TNB: Establishing and releasing TDM time slots in cooperation with TDM service interface boards, and providing 8K or 2K or 1K switching capacity for each interface board. And it consumes power 49 Watt.

- E32: 32E1 port TDM interface board. And consume 19.2 Watt power.

- S4L: Extracting clock signals and forming frames at the two 155M optical interfaces. Processing overheads of regenerator section and multiplex section of optical signals and checking communication over optical channels. Implementing SDH mapping, de-mapping and processing overheads of high- order path and low-order path. Forming 4*63 E1/2 *84T1 frames and performing DSO switch. Power consumption is 25 Watt.

- FLU: The MFLU corresponds to the MBLU in the back slot. Providing one 8 K TDM data cascading channel for the MBLU. Power consumption is 3.4Watt.

- BLU: Back cascading board, providing four 8 K TDM narrowband data channels to connect frames directly through multi-mode optical fibers that are no more than 50 m spaced. And power consumption is 19.4 Watt.

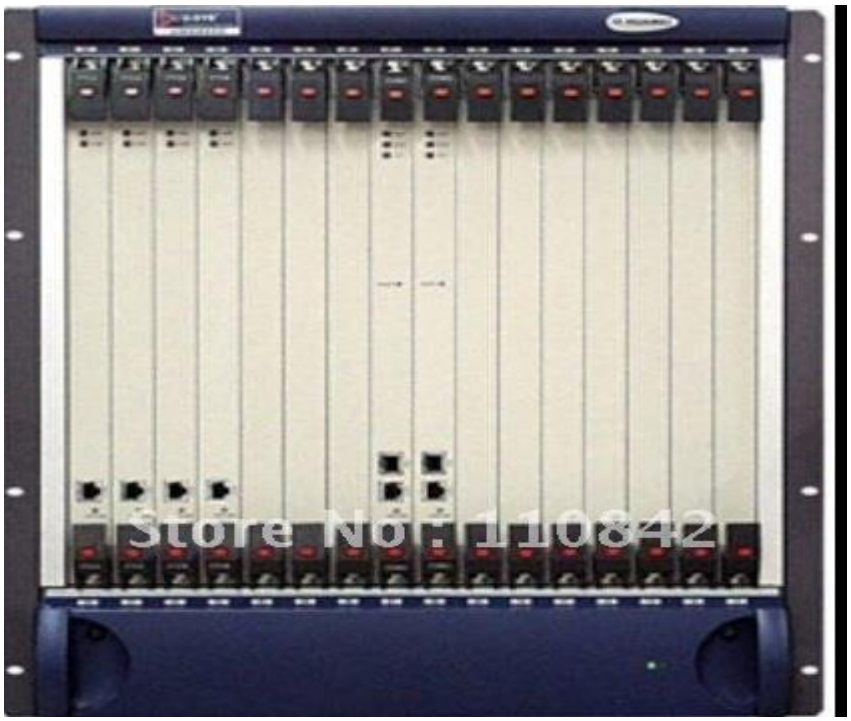
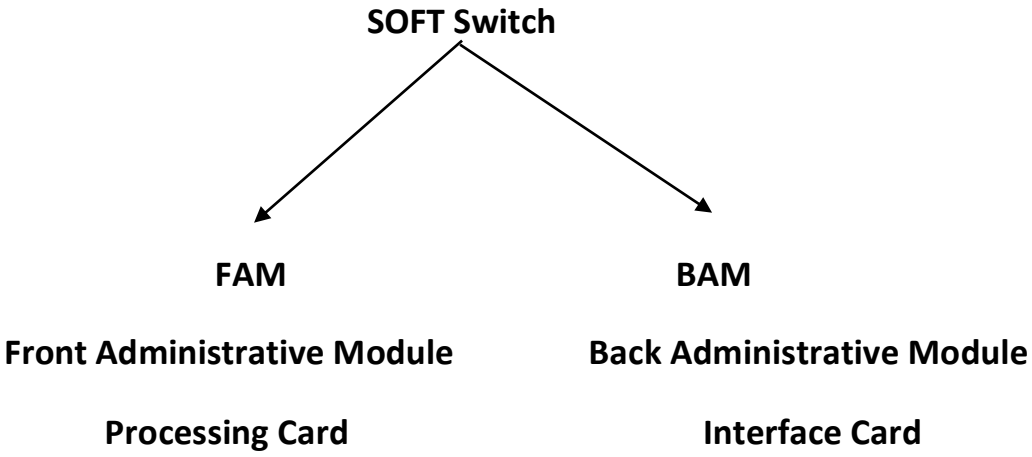


Fig: UMG8900 Board [6]

Fig: UMG8900 Huawei [6]

SOFT Switch or SOFTEX3000

It is called the brain of ICX. Its main work is to create routing. That's why it is also known as Media Gateway Controller.



If we want to add extra card then it will be added in FAM. Otherwise only one BAM can run with a soft switch.

There are also three backup systems: a. IGBB0; b. IGB1; c. XPTU

IGWB (International Gateway of billing server)

This server is saved by two files. First one is .bil file and second one is .dat file. Each and every Call Detail Record (CDR) is saved by .bil file and .dat file read the billing server.

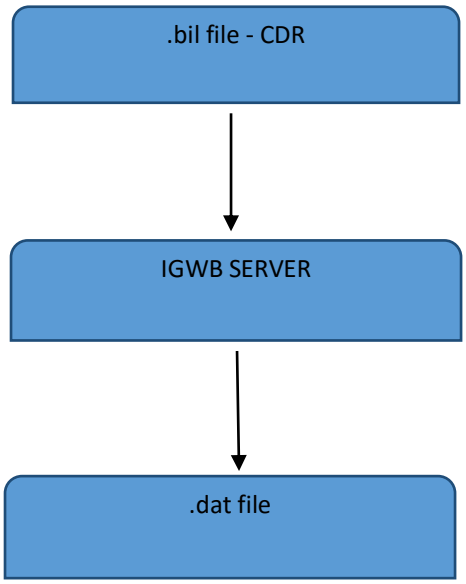


Fig: IGWB Server

XPTU used for lawful interception. For lawfully monitoring a server.

Board Information:

This section introduces some basic knowledge of the boards in the SOFTEX3000, including their functions, explanation of their indicators, Dual-in- line package, jumper explanations and technical indices.

Classification of Boards:

ALUI(Alarm Unit)

ALUI controlled by SMUI, which indicates the system status and reports, the alarm information obtained by other means.

Technical Specifications:

The technical specifications of ALUI covers two aspects

- Interfaces
- Power consumption

When J5 andJ7 in the board are shorted, this serial port issues RS422 serial port to connect with the SMUI.Interfaces RS232 serial port is 1.

When J6 andJ8 in the board are shorted, this serial port issues RS232 serialportprovidedonthe fontanel.

Power consumption is 2W.

BFII(Back Insert FE Interface Unit)

The Back insert FE interface unit (BFII) is the back interface board of the IFMI. It is used to implement FE driver processing and enable the external physical interface of the IFMI. The BFII is configured in pair with the IFMI.

Technical Specifications:

The technical specifications of BFII covers two aspects:

- Interfaces
- Power consumption
  10 Or 100 Mbps Ethernet interface. And power consumption is 2W.

BSGI(Broadband Signaling Gateway)

The Broadband Signaling Gateway (BSGI) is used to process the IP packets after the IFMI level-1 dispatch. It processes the packets based on UDP, SCTP, MTP layer-2 User Adaptation (M2UA), M3UA, V5UA, IUA, MGCP, and H.248.

Technical Specifications:

- Functions
- Interfaces
- Power consumption

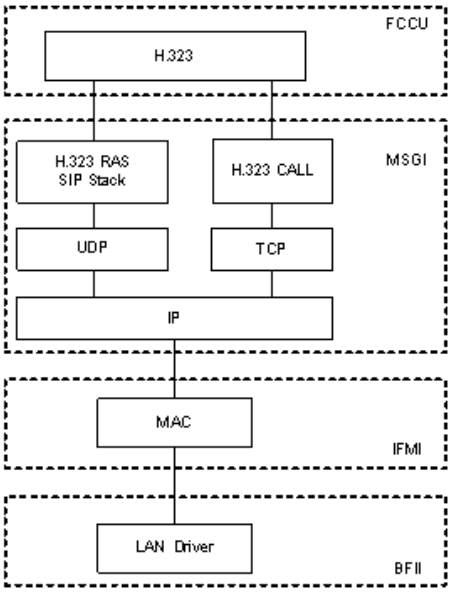
Interfaces: RS232 is used for commissioning and providing RJ45 sockets on the panel with hot- swappable protection.

Consumer Power: 16 W

MSGI(Multimedia Signaling Gateway)

The Multimedia Signaling Gateway Unit (MSGI) processes UDP, TCP, H.323 (including H.323 RAS and H.323 Call signaling) and SIP protocols. Its power consumption is 16 W.

The figure below shows the protocol stack of the MSGI.



The MSGIs work in active/standby or load sharing mode. Select the working mode according to the actual situation. The alarm information generated by the MSGI is reported to the SMUI through the shared resource bus.

Fig: MSGI Protocol stack

SMUI(System Management Unit)

The System Management Unit (SMUI) is the main control board of a frame. The SMUI is used to:

- Configure shared resource buses and manage their status.

- Manage all boards in the frame, report their status to the BAM and control the status of the indicators on the front panel of the ALUI through serial port bus and shared resource bus.
- Load and manage system program and data.

Technical Specifications:

- Interfaces.
- Power Consumptions.

Interfaces: RS232 serial port is used for commissioning and providing RJ45 sockets on the panel with hot-swappable protection. RS422 master/slave serial port is used to provide physical interfaces together with the SIUI. Asynchronous serial port for TTL level is used to connect with the monitoring board in the fan frame.

Power Consumption: 14W

SIUI(System Interface Unit)

Provide the SMUI with Ethernet interface. Identify frame ID through the setting of the DIP switches.

Technical Specifications:

- Interfaces.
- Power Consumptions.

Interfaces: 10/100 –Mbps Ethernet interface connected with the HSCIs in slot 7 and 9. RS485serial port is used to implement RS485 level conversion for the asychronous serial port signals from the system board and providing two physical interfaces for the asychronous serial port to connect with the power distribution monitoring system.

Power consumption: 4W

HSCI(Hot Swap Control Unit)

Ensure the switching of Ethernet buses in the Frame. Conduct board hot swap control. Provide six external FE interfaces.

Technical Specifications:

- 10/100 –Mbit/s Ethernet interface, which provided on the front panel.
- Power consumption is 16W.

UPWR(Universal Power)

It provides power supply for all the other boards in the frame.

Technical Specifications:

- Functions
- Interface
- Power Consumption.

Functions: Input voltage -76V to -36V. The output currents for the voltages are 50A,40A,8A and 4A respectively. Output voltage 3.3V,5V,12V,-12V.

Interfaces: Indication interface for power output failure and in-position power unit.

Power Consumption: 20W.

IFMI(IP Forward Module)

The IFMI is used to receive and transmit IP packets. It processes Media Access Control(MAC) layer messages and distribute IP messages. It provide IP interface together with the BFII.

Technical Specifications:

- Functions
- Interfaces
- Power consumption.

Functions: IP packets forwording capability in 32000bits/s per pair.

Interfaces: RS232 serial port is used for commissioning and providing RJ45 sockets on the panel with hot-swappable protection.

Power Consuption: 16W.

Board Capacity: 500,000 equivalent subscribers(Maximum 4 pairs).

FCCU(Fixed Call Control Unit)

The Fixed Calling Control Unit(FCCU) controls calls and processes the following protocols: MTP3,ISUP,MGCP,H.248,H.323,SIP,R2,Digital signaling system No.1(DSS1). Generates and stores bills in its bill pool.

Technical Specifications:

- Functions
- Interfaces
- Power Consumption.

Functions: Call processing capability SIP and H.323 terminals: 500 KBHCA/pair, MGCP and H.248 terminals 300 KBHCA/pair.

BHCA is the acronym for Busy Hour Call Attempt.

Maximum number of trunks 9000/pair. Maximum number of subscribers, POST subscriber's 50000/pair, V5 subscriber's 50000/pair, SIP subscriber's 50000/pair, H.232 subscriber's 25000/pair, maximum number of IP supermarkets 90/pair.

Interfaces: RS232 serial port is used for commissioning and providing RJ45 sockets on the panel with hot-swappable protection**.**

Power Consumption: 16W

Board Capacity: 50000 equivalent subscriber's (Max 40 pairs), 400K BHCA.

CDBI(Central Database Board)

As the database of the equipment, the CDBI stores all data of call location, gateway resources management, outgoing trunk circuit selection.
Board Capacity: Maximum 2 pairs in one system. One pair of CDBI serves for 1000,000 equivalent subscribers.

Technical Specifications:

- Functions
- Interfaces
- Power Consumption.

Functions: Fixed subscriber locating 9000 times per second. Gateway resource management 5500 times per second. Outgoing trunk circuit selection of local office 6300 times per second. Tandem call circuit selection 4300 times per second.

Interfaces: RS232 serial port and power consumption is 16W.

MRCA(Media resource Control Unit)

Each MRCA can functions as an independent media resource server. The MRCA is used to process the audio signals in real time. It collects and generates DTMF signals, play and record audio clips. MRCA provide multi-party conference function.
Board Capacity: 240 channels per card.

Technical Specifications:

- Functions: Processing capacity 240 channels/board.
- Interfaces: RS232 serial port

Power Consumption: 40W

MRIA(Media Resource Interface Unit)

It is used to provide 10/100Mbit/s interface for the external media streams.
Technical Specifications:

- Functions: 10/100-Mbit/s Ethernet interface used for transmission media streams.
- Interfaces: RS232 serial port
- Power Consumption: 2W.

Call establishment in Hardware Level:

Processing Path for ISUP over M2UA:

This section describes the uplink path and downlink path for ISUP over M2UA.

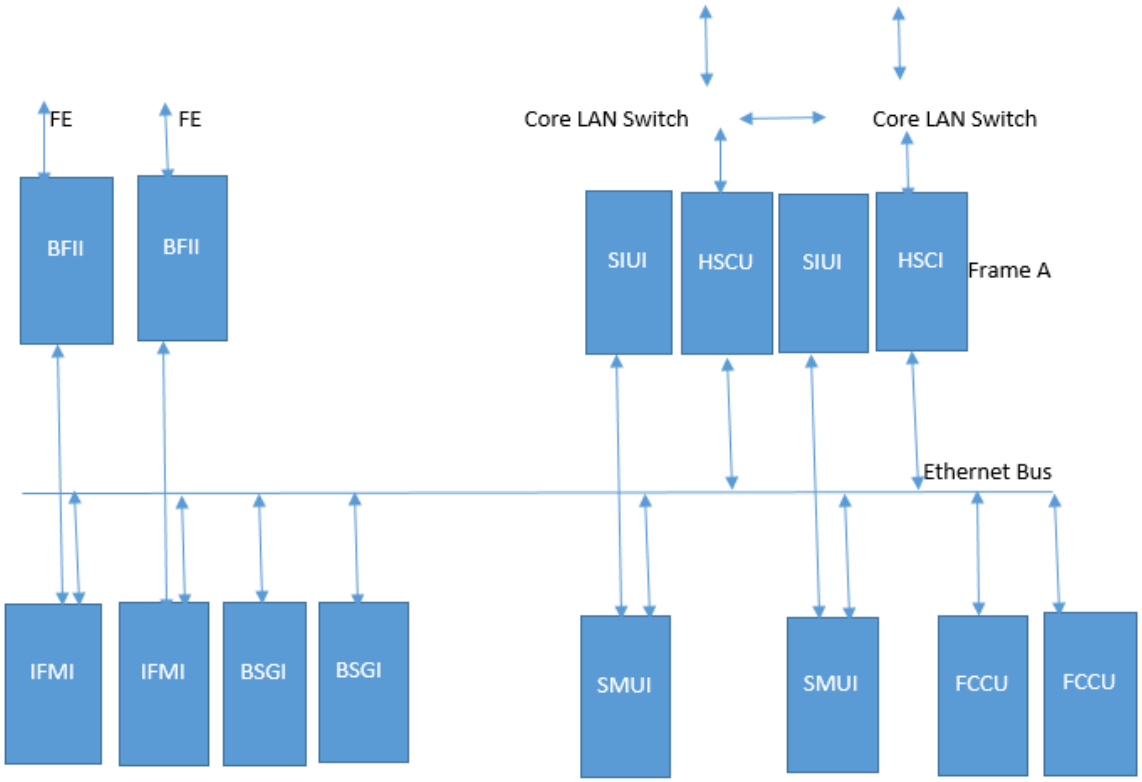


Figure: Uplink path for ISUP OVER M2UA

If the destination BSGI and FCCU are resident in a different frame, the uplink path passes:

- HSCI in the local frame.
- Core LAN Switch in the local frame.
- HSCI in the destination frame with the destination FCCU.
- Destination BSGI.
- Destination FCCU.

1. The BFII performs the following steps:

- Provides an external IP interface to receive IP packets.
- Processes messages of the physical layer.
- Transfers the packets to an IFMI through a fixed connection.

2. The IFMI processes the MAC messages, and dispatches the messages to a designated BSGI through the Ethernet switching plane for further processing. The dispatch is based on the following:

- IP protocol type.
- Local IP address.

- Peer IP address
- Peer SCTP port number.

The mapping between the BSGI board number and the combination of the following items must be configured manually:

- IP protocol type
- Local IP address
- Local SCTP port number
- Peer IP address
- Peer SCTP port number

3. The BSGI processes IP, SCTP, M2UA and MTP3 messages, and then transfers the messages to the ISUP and SCCP dispatch modules of the board itself. The ISUP dispatch module dispatches the received messages to the FCCU that is responsible for their CIC through the Ethernet switching plane based on the NI, OPC, DPC and CIC in the messages. The SCCP dispatch module dispatches the messages to the FCCU that is responsible for their transactions based on the TCAP/INAP transaction ID.
4. The FCCU processes the ISUP messages.

Downlink Path for ISUP over M2UA:

The downlink path in the SoftX3000 for ISUP over M2UA is as shown in Figure 2.

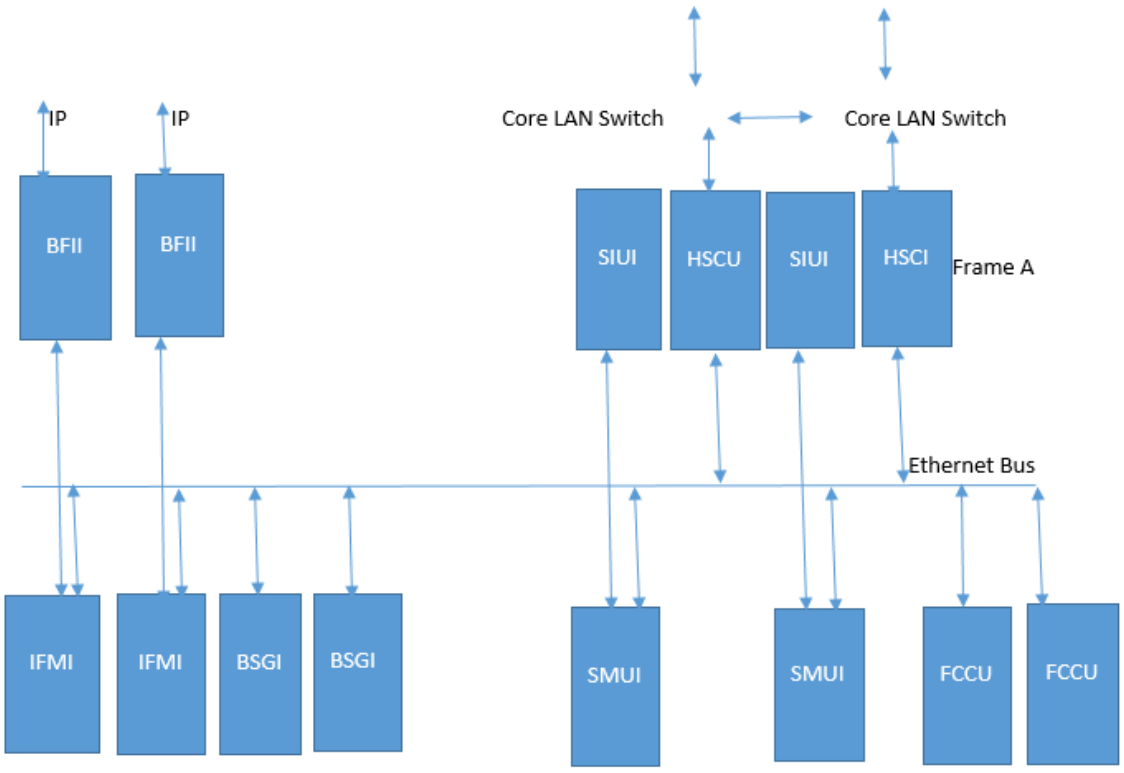


Figure: Downlink path for ISUP over M2UA

The FCCU transmits received messages to a BSGI through the Ethernet switching plane based on the BSGI module of the associated M2UA link.

1. The BSGI performs the following steps:
- Processes the M2UA and MTP3 messages.
- Determine an IFMI based on the source IP address of the IP packets.
- Dispatches associated messages to the designated IFMI through the Ethernet switching plane.
2. The IFMI processes the MAC-layer messages and then transfers the IP messages to a BFII through a fixed connection.
3. The IP signaling packets are driver by the BFII then distributed out of the SoftX3000 through the network cable connected to the BFII.

Configuration:

Example:

GP INTERNATIONAL 29/09/2012

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UMG CONFIGURATION UMG LOC: 1/3/0 Board No. 0 & UMG LOC: 1/3/2 Board No. 0

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ADD MTP2LNK: LNKNO=711, LNKNAME="GP-1152-INT1", IFBT=S4L, IFBN=0, OPN=0, E1T1N=0, STRTTS=16, ENDTS=16, SPFBN=0, SUBBN=0, BITREVERSE=OFF, LNKTYPE=M2UA64K, LKS=136, BINIFID=711;

ADD MTP2LNK: LNKNO=712, LNKNAME="GP-1152-INT2", IFBT=S4L, IFBN=0, OPN=0, E1T1N=1, STRTTS=16, ENDTS=16, SPFBN=1, SUBBN=0, BITREVERSE=OFF, LNKTYPE=M2UA64K, LKS=137, BINIFID=712;

ADD MTP2LNK: LNKNO=713, LNKNAME="GP-1152-INT3", IFBT=S4L, IFBN=0, OPN=2, E1T1N=0, STRTTS=16, ENDTS=16, SPFBN=0, SUBBN=0, BITREVERSE=OFF, LNKTYPE=M2UA64K, LKS=136, BINIFID=713;

ADD MTP2LNK: LNKNO=714, LNKNAME="GP-1152-INT4", IFBT=S4L, IFBN=0, OPN=2, E1T1N=1, STRTTS=16, ENDTS=16, SPFBN=1, SUBBN=0, BITREVERSE=OFF, LNKTYPE=M2UA64K, LKS=137, BINIFID=714;

SOFTX CONFIGURATION

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ADD N7DSP: DPX=71, DPC="1152", OPC="11FD", DPNAME="GP-1152-INT";

ADD N7LKS: LSX=71, ASPX=71, LSNAME="GP-1152-INT";

ADD N7RT: LSX=71, DPX=71, RTNAME="GP-1152-INT";

ADD N7LNK: MN=136, LNKN=2, LNKNAME="GP-1152-INT1", LNKTYPE=M64K, M2LSX=136, BINIFID=711, LSX=71, SLC=0, TID=2064;

ADD N7LNK: MN=137, LNKN=2, LNKNAME="GP-1152-INT2", LNKTYPE=M64K, M2LSX=137, BINIFID=712, LSX=71, SLC=1, TID=2096;

ADD N7LNK: MN=136, LNKN=13, LNKNAME="GP-1152-INT3", LNKTYPE=M64K, M2LSX=136, BINIFID=713, LSX=71, SLC=2, TID=6160;

ADD N7LNK: MN=137, LNKN=12, LNKNAME="GP-1152-INT4", LNKTYPE=M64K, M2LSX=137, BINIFID=714, LSX=71, SLC=3, TID=6192;

ADD OFC: O=170, ON="GP-INT", DOT=INTT, DOL=LOW, DPC1="1152";

ADD SRT: SRC=1711, O=170, SRN="GP-INT-1711", RENT=URT;

ADD RT: R=171, RN="GP-INT", IDTP=UNKNOWN, NAMECFG=NO, SNCM=SRT, SRST=SEQ, SR1=1711, STTP=INVALID, REM=NO;

ADD CALLSRC: CSC=171, CSCNAME="GP-INT", LP=0, RSSC=171;

ADD N7TG: TG=1711, TGN="GP-INT-1711", EID="10.0.10.3:2944", G=INOUT, SRC=1711, SOPC="11FD", SDPC="1152", CSC=171, CSM=MINCIC, RCHS=0, PRTFLG=ITUT_Q767, NOAA=FALSE, ISM=FALSE, EA=FALSE;

ADD RTANA: RSC=2517, RSSC=23, TM=TMM, R=170;

// ADD RTANA: RSC=25, RSSC=170, TM=TMM, R=25;

// ADD CNACLD: LP=0, PFX=K'23017, CSTP=BASE, CSA=NTT, RSC=171, MINL=13, MAXL=13, CHSC=0, EA=NO;

// ADD CNACLD: LP=0, PFX=K'25017, CSTP=BASE, CSA=NTT, RSC=2517, MINL=13, MAXL=15, CHSC=0, EA=YES, DEST=2517, ASF=NO, QCDN=NO, OBDTMFFLAG=NO, VPNF=NOVC;

ADD 1 STM-1 UMG LOC: 1/3/0 Board No. 0

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ADD N7TKC: MN=24, TG=1711, SC=0000, EC=0319, SCIC=0000, TID="2048";

ADD N7TKC: MN=24, TG=1711, SC=0320, EC=0639, SCIC=0320, TID="2368";

ADD N7TKC: MN=24, TG=1711, SC=0640, EC=0959, SCIC=0640, TID="2688";

ADD N7TKC: MN=24, TG=1711, SC=0960, EC=1279, SCIC=0960, TID="3008";

ADD N7TKC: MN=24, TG=1711, SC=1280, EC=1599, SCIC=1280, TID="3328";

ADD N7TKC: MN=24, TG=1711, SC=1600, EC=1919, SCIC=1600, TID="3648";

ADD N7TKC: MN=24, TG=1711, SC=1920, EC=2015, SCIC=1920, TID="3968";

ADD 1 STM-1 UMG LOC: 1/3/2 Board No. 0

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ADD N7TKC: MN=23, TG=231, SC=6048, EC=6367, SCIC=2016, TID="6144";

ADD N7TKC: MN=23, TG=231, SC=6368, EC=6687, SCIC=2336, TID="6464";

ADD N7TKC: MN=23, TG=231, SC=6688, EC=7007, SCIC=2656, TID="6784";

ADD N7TKC: MN=23, TG=231, SC=7008, EC=7327, SCIC=2976, TID="7104";

ADD N7TKC: MN=23, TG=231, SC=7328, EC=7647, SCIC=3296, TID="7424";

ADD N7TKC: MN=23, TG=231, SC=7648, EC=7967, SCIC=3616, TID="7744";

ADD N7TKC: MN=23, TG=231, SC=7968, EC=8063, SCIC=3936, TID="8064";

Command of SOFTEX3000:

- To see how many calls are running then, we have to put command in command input and write the command “DSP OFTK”, then device type “ISUP”. Here, we observe the busy call, free call, block call, unknown/locked, fault, circuit installed number etc.

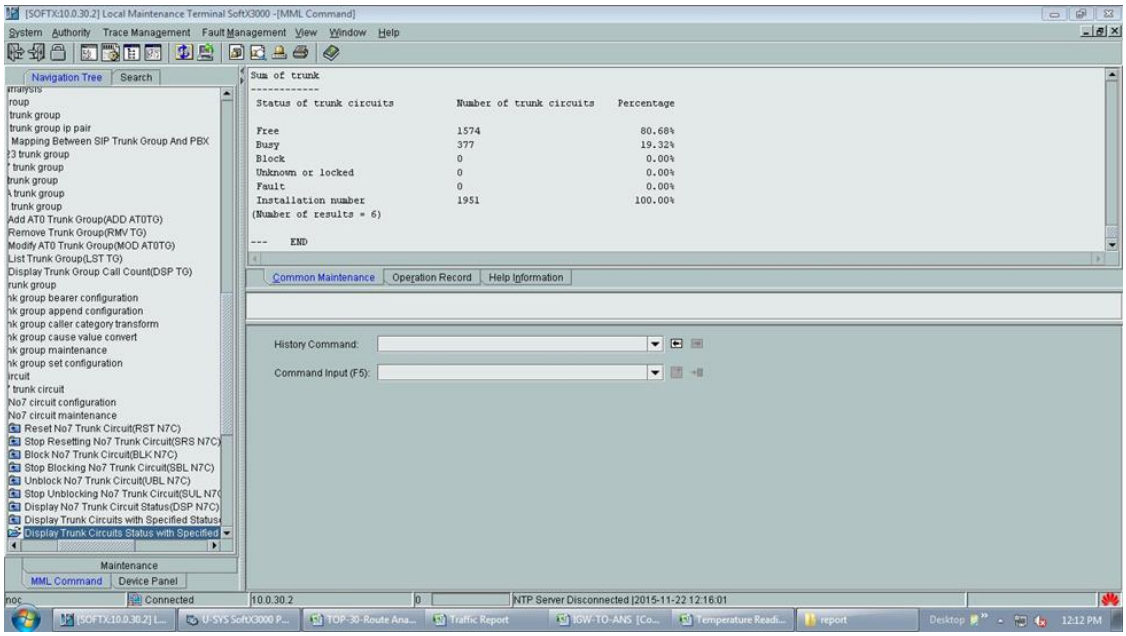


Fig: 1

- To see incoming/outgoing call of IGW we have to put command “DSP OFTK” then device type “ISUP” and location type “ONO (By Official Number)”.

Example: Office Numb: 12 (Bangla Track)

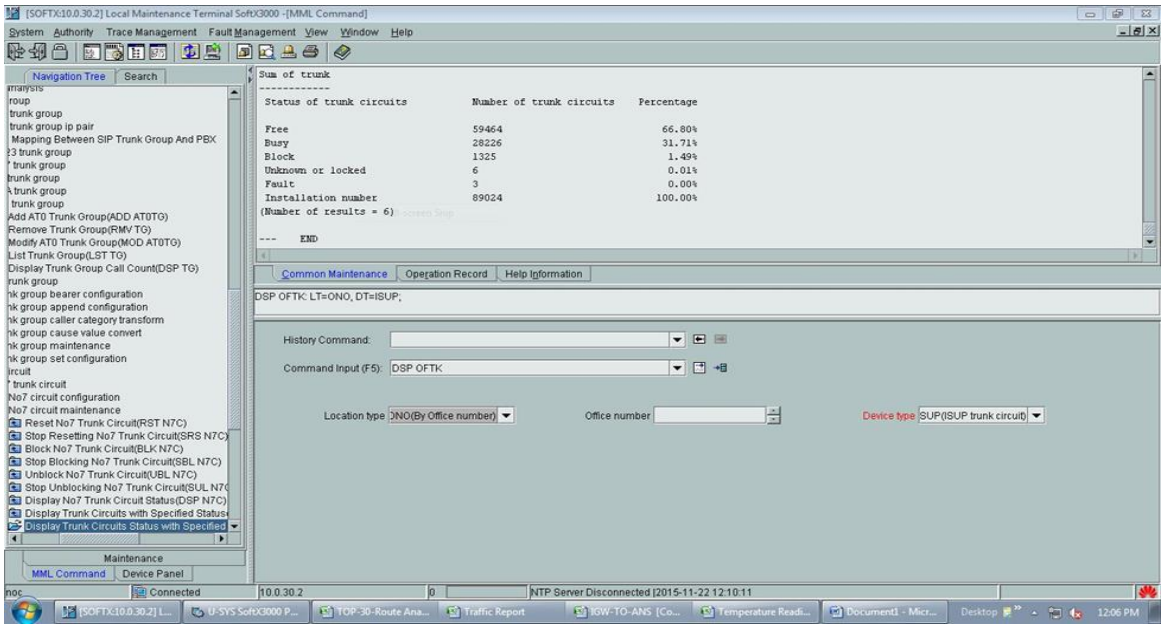


Fig: 2

- To see information of any IGW's specific link, we have to put command "DSP OFTK" then "device type ISUP" , location type "By Trunk Group" then "Trunk group number"

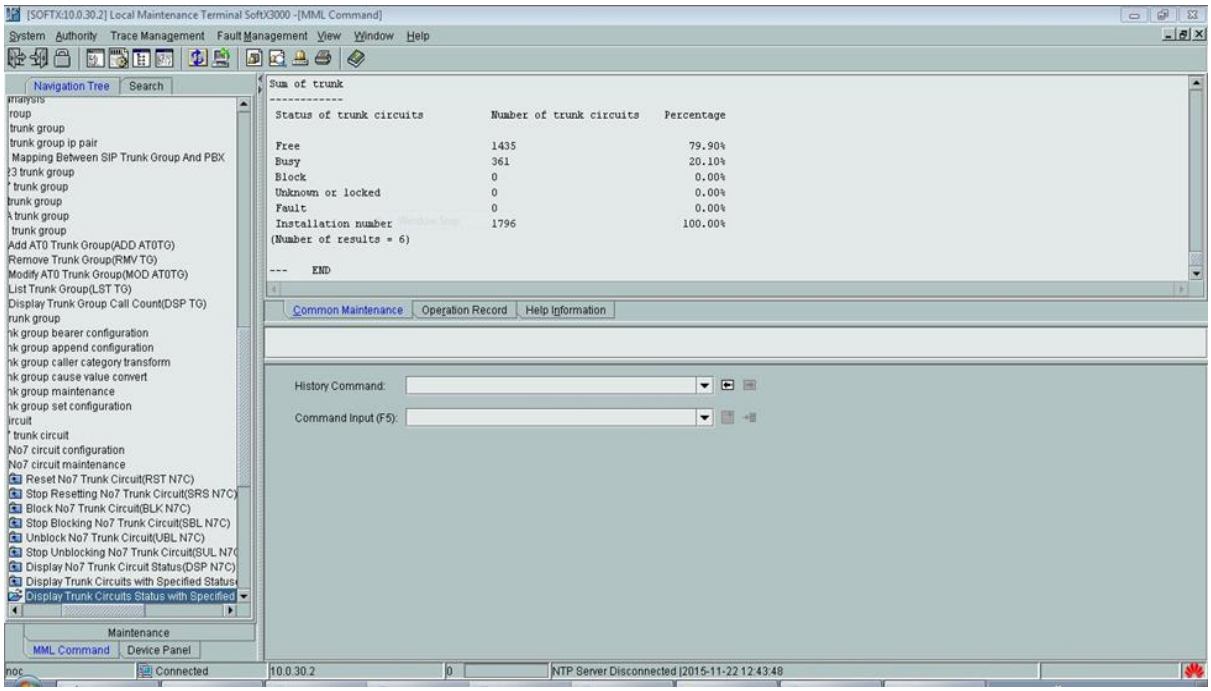


Fig: 3

- To identify the specific IGW's Trunk Group Number, we have to put command "LST

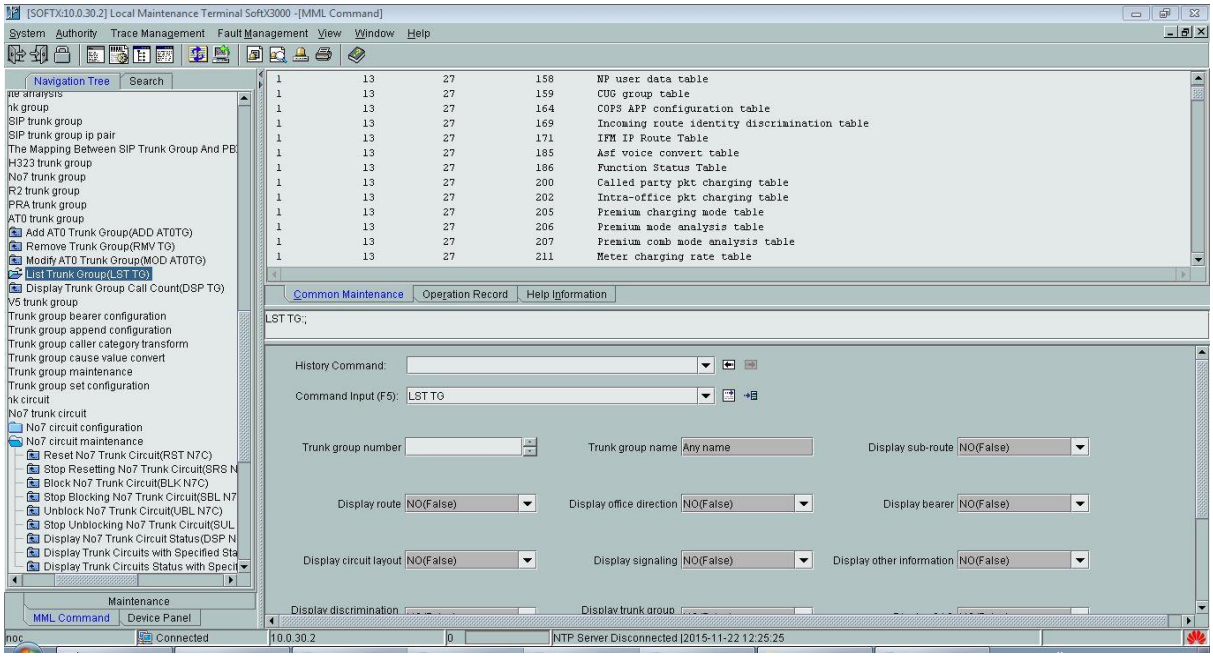


Fig: 4

- To see the start circuit, end circuit and trunk group number we have to put command "LST CIC".

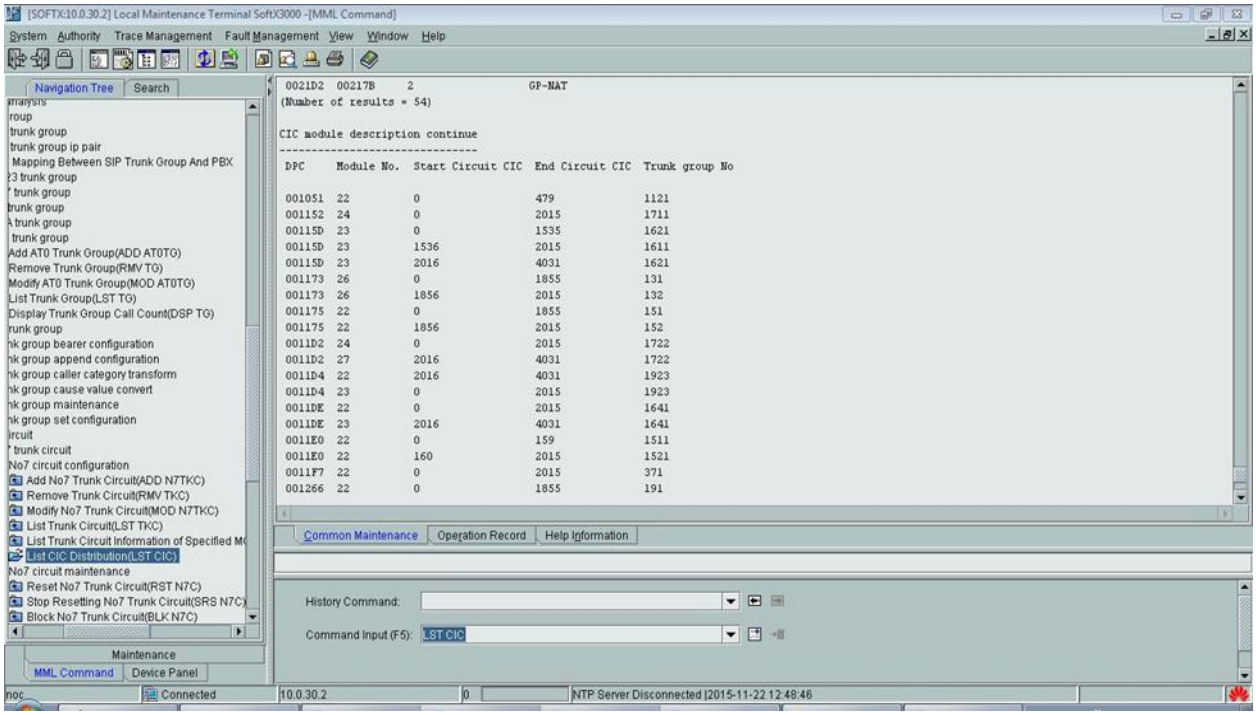


Fig: 5

- To see the summary of total link, we have to put command "LST N7LNK" and execution we can find the summary of the link.

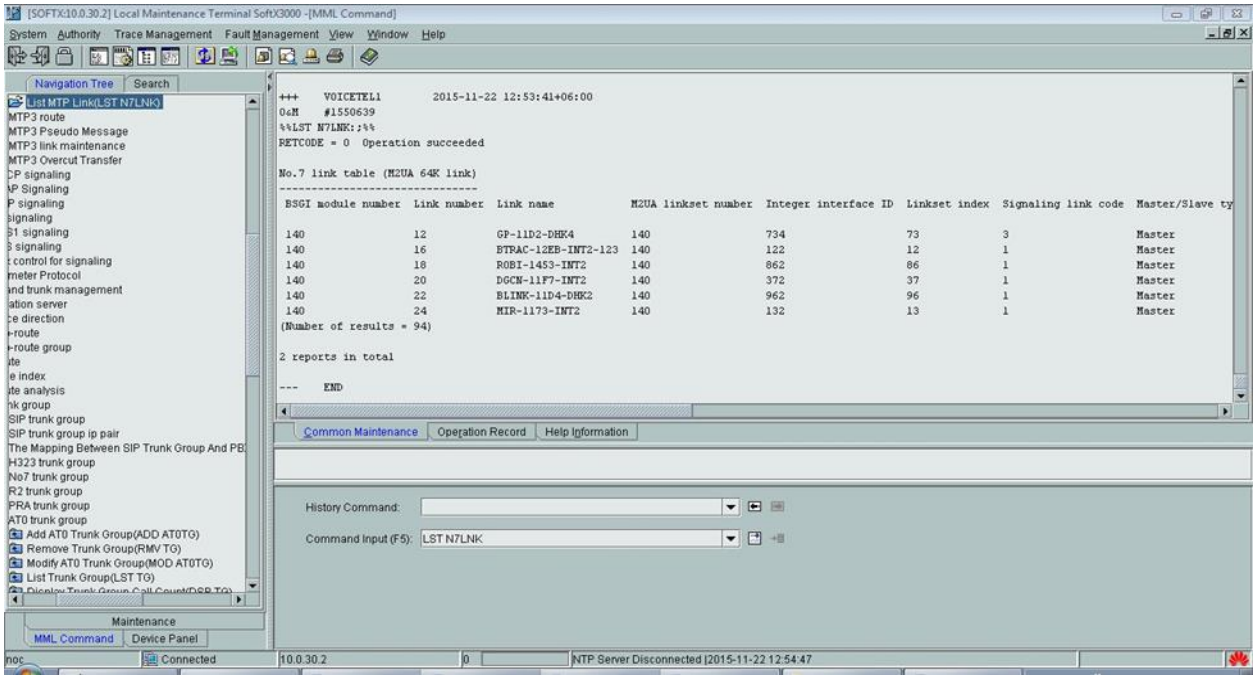


Fig: 6

- For List Route

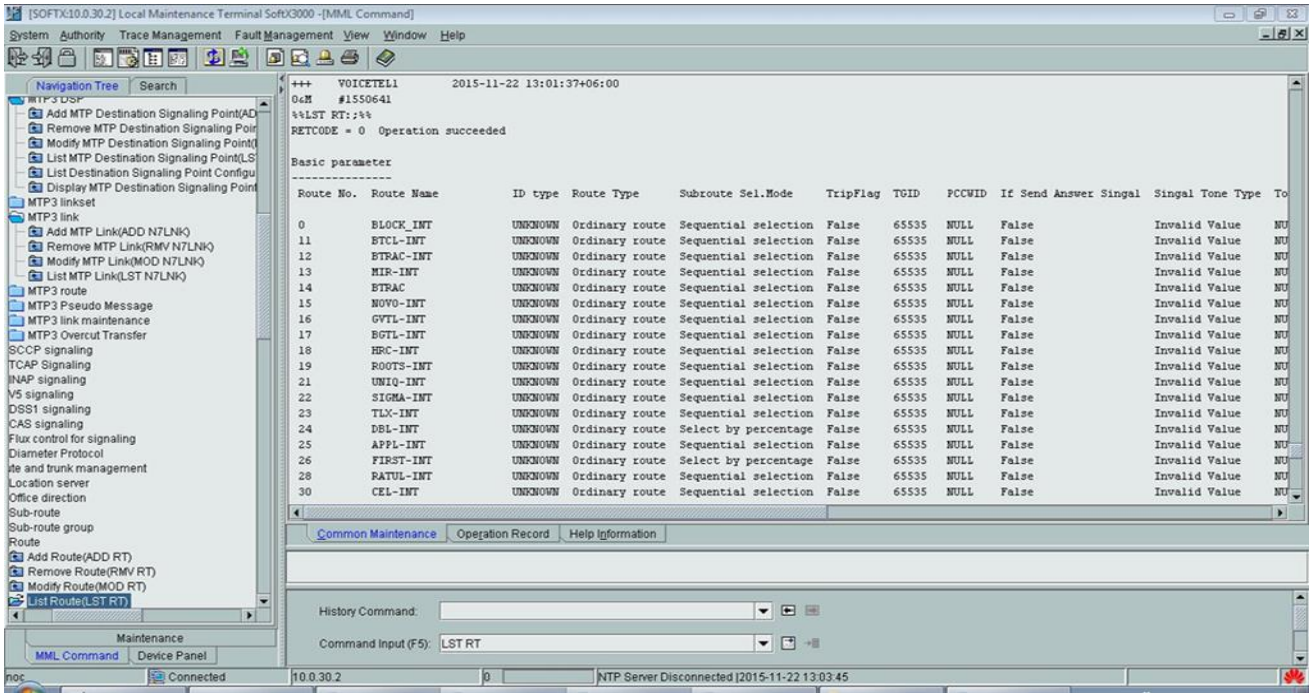


Fig: 7

- **For List Route Analysis**

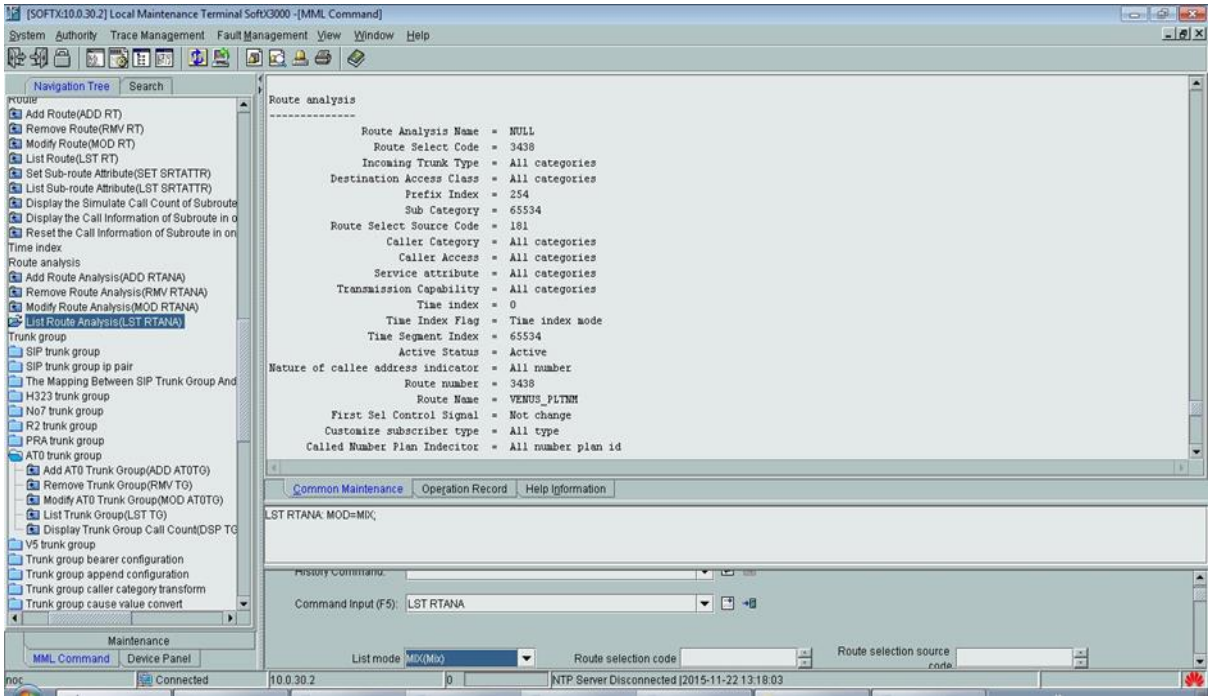


Fig: 8

Chapter 5

Network Operation

Network Operations Center

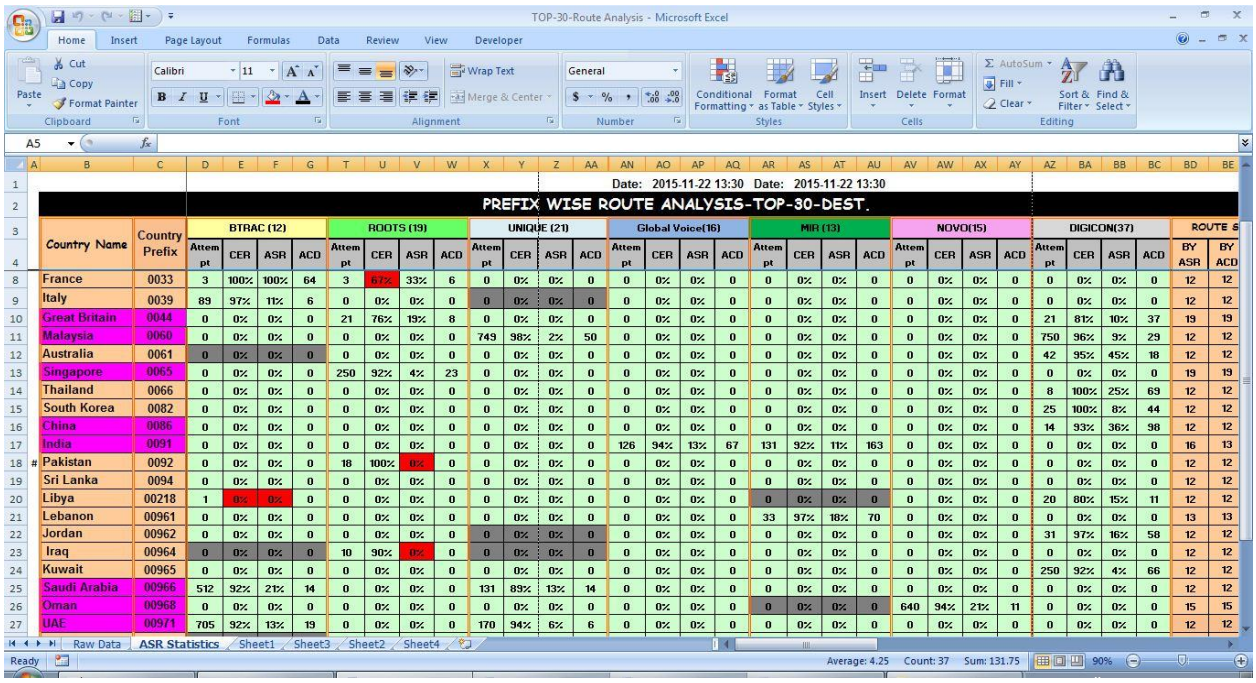
A network operations center (NOC) also known as a "network management center", is one or more locations from which network monitoring and control, or network management, is exercised over a computer, telecommunication or satellite network.

NOCs are implemented by business organizations, public utilities, universities, and government agencies that oversee complex networking environments that require high availability. NOC personnel are responsible for monitoring one or many networks for certain conditions that may require special attention to avoid degraded service.

Functions:

NOCs analyze problems, perform troubleshooting, communicate with site technicians and other NOCs, and track problems through resolution. When necessary, NOCs escalate problems to the appropriate stakeholders. For severe conditions that are impossible to anticipate, such as a power failure or a cut optical fiber cable, NOCs have procedures in place to immediately contact technicians to remedy the problem.

Example: 1.These is the ‘top 30’ reports of different countries using 7 routes.

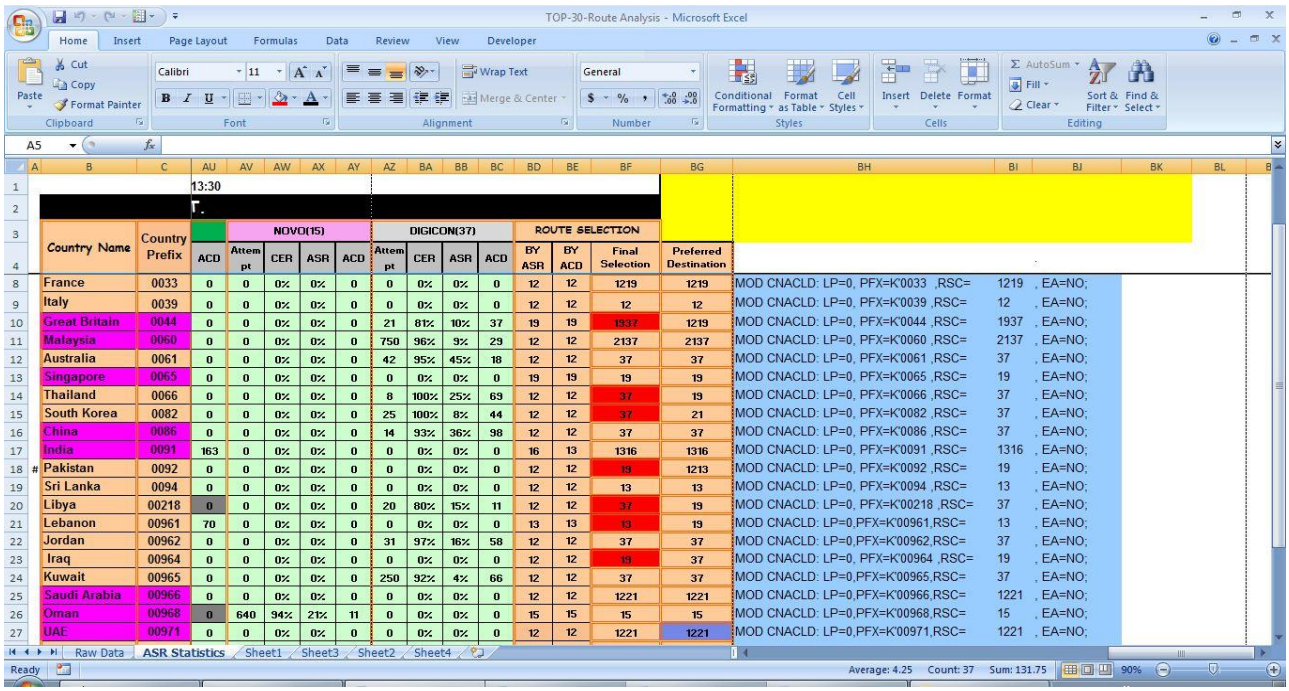


Date: 2015-11-22 13:30 Date: 2015-11-22 13:30

PREFIX WISE ROUTE ANALYSIS-TOP-30-DEST.

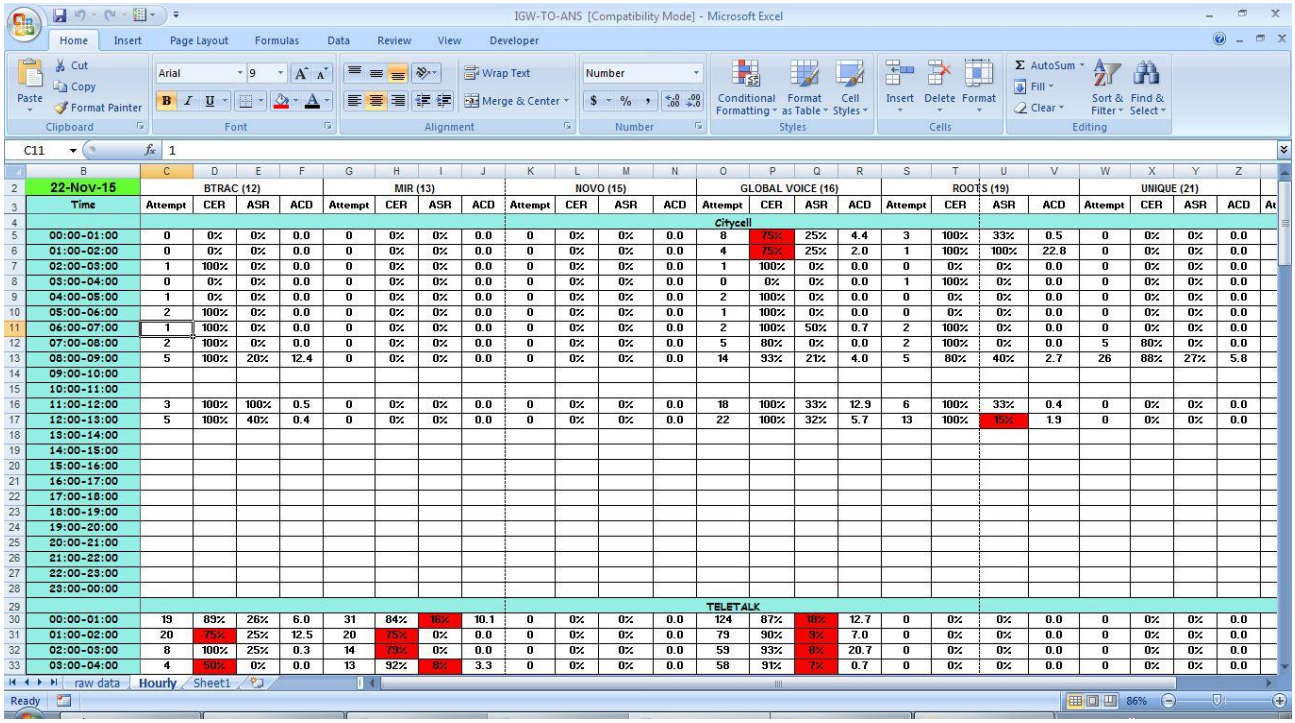
Country Name	Country Prefix	BTRAC (12)				ROOTS (19)				UNIQUE (21)				Global Voice(16)				MIR (13)				NOVO(15)				DIGICON(37)				ROUTE S	
		Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	BY ASR	BY ACD
France	0033	3	100%	100%	64	3	67%	33%	6	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	12	12
Italy	0039	89	97%	11%	6	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	12	12
Great Britain	0044	0	0%	0%	0	21	76%	19%	8	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	21	81%	10%	37	19	19
Malaysia	0060	0	0%	0%	0	0	0%	0%	0	749	98%	2%	50	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	750	96%	9%	29	12	12
Australia	0061	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	42	95%	45%	18	12	12
Singapore	0065	0	0%	0%	0	250	92%	4%	23	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	19	19
Thailand	0066	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	8	100%	25%	69	12	12
South Korea	0082	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	25	100%	8%	44	12	12
China	0086	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	14	93%	36%	98	12	12
India	0091	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	126	94%	13%	67	131	92%	11%	163	0	0%	0%	0	0	0%	0%	0	16	13
# Pakistan	0092	0	0%	0%	0	18	100%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	12	12
Sri Lanka	0094	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	12	12
Libya	00218	1	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	20	80%	15%	11	12	12
Lebanon	00961	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	33	97%	18%	70	0	0%	0%	0	0	0%	0%	0	13	13
Jordan	00962	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	31	97%	16%	58	12	12
Iraq	00964	0	0%	0%	0	10	90%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	12	12
Kuwait	00965	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	250	92%	4%	66	12	12
Saudi Arabia	00966	512	92%	21%	14	0	0%	0%	0	131	89%	13%	14	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	12	12
Oman	00968	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	640	94%	21%	11	0	0%	0%	0	15	15
UAE	00971	705	92%	13%	19	0	0%	0%	0	170	94%	6%	6	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%	0	12	12

Each and every call is shared with two routes. And if any of one route’s performance is poor, then we can terminate it with other route. Here, 60% performance is average rate for all routes.



Country Name	Country Prefix	NOVO(15)					DIGICON(37)				ROUTE SELECTION				
		ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	BY ASR	BY ACD	Final Selection	Preferred Destination	
France	0033	0	0	0%	0%	0	0	0%	0%	0	12	12	1219	1219	MOD CNACLD: LP=0, PFX=K'0033 ,RSC= 1219 , EA=NO;
Italy	0039	0	0	0%	0%	0	0	0%	0%	0	12	12	12	12	MOD CNACLD: LP=0, PFX=K'0039 ,RSC= 12 , EA=NO;
Great Britain	0044	0	0	0%	0%	0	21	81%	10%	37	19	19	1937	1219	MOD CNACLD: LP=0, PFX=K'0044 ,RSC= 1937 , EA=NO;
Malaysia	0060	0	0	0%	0%	0	750	96%	9%	29	12	12	2137	2137	MOD CNACLD: LP=0, PFX=K'0060 ,RSC= 2137 , EA=NO;
Australia	0061	0	0	0%	0%	0	42	95%	45%	18	12	12	37	37	MOD CNACLD: LP=0, PFX=K'0061 ,RSC= 37 , EA=NO;
Singapore	0065	0	0	0%	0%	0	0	0%	0%	0	19	19	19	19	MOD CNACLD: LP=0, PFX=K'0065 ,RSC= 19 , EA=NO;
Thailand	0066	0	0	0%	0%	0	8	100%	25%	69	12	12	37	19	MOD CNACLD: LP=0, PFX=K'0066 ,RSC= 37 , EA=NO;
South Korea	0082	0	0	0%	0%	0	25	100%	8%	44	12	12	37	21	MOD CNACLD: LP=0, PFX=K'0082 ,RSC= 37 , EA=NO;
China	0086	0	0	0%	0%	0	14	93%	36%	98	12	12	37	37	MOD CNACLD: LP=0, PFX=K'0086 ,RSC= 37 , EA=NO;
India	0091	163	0	0%	0%	0	0	0%	0%	0	16	13	1316	1316	MOD CNACLD: LP=0, PFX=K'0091 ,RSC= 1316 , EA=NO;
# Pakistan	0092	0	0	0%	0%	0	0	0%	0%	0	12	12	19	1213	MOD CNACLD: LP=0, PFX=K'0092 ,RSC= 19 , EA=NO;
Sri Lanka	0094	0	0	0%	0%	0	0	0%	0%	0	12	12	13	13	MOD CNACLD: LP=0, PFX=K'0094 ,RSC= 13 , EA=NO;
Libya	00218	0	0	0%	0%	0	20	80%	15%	11	12	12	37	19	MOD CNACLD: LP=0, PFX=K'00218 ,RSC= 37 , EA=NO;
Lebanon	00961	70	0	0%	0%	0	0	0%	0%	0	13	13	19	19	MOD CNACLD: LP=0,PFX=K'00961,RSC= 13 , EA=NO;
Jordan	00962	0	0	0%	0%	0	31	97%	16%	58	12	12	37	37	MOD CNACLD: LP=0,PFX=K'00962,RSC= 37 , EA=NO;
Iraq	00964	0	0	0%	0%	0	0	0%	0%	0	12	12	19	37	MOD CNACLD: LP=0, PFX=K'00964 ,RSC= 19 , EA=NO;
Kuwait	00965	0	0	0%	0%	0	250	92%	4%	66	12	12	37	37	MOD CNACLD: LP=0,PFX=K'00965,RSC= 37 , EA=NO;
Saudi Arabia	00966	0	0	0%	0%	0	0	0%	0%	0	12	12	1221	1221	MOD CNACLD: LP=0,PFX=K'00966,RSC= 1221 , EA=NO;
Oman	00968	0	640	94%	21%	11	0	0%	0%	0	15	15	15	15	MOD CNACLD: LP=0,PFX=K'00968,RSC= 15 , EA=NO;
UAE	00971	0	0	0%	0%	0	0	0%	0%	0	12	12	1221	1221	MOD CNACLD: LP=0,PFX=K'00971,RSC= 1221 , EA=NO;

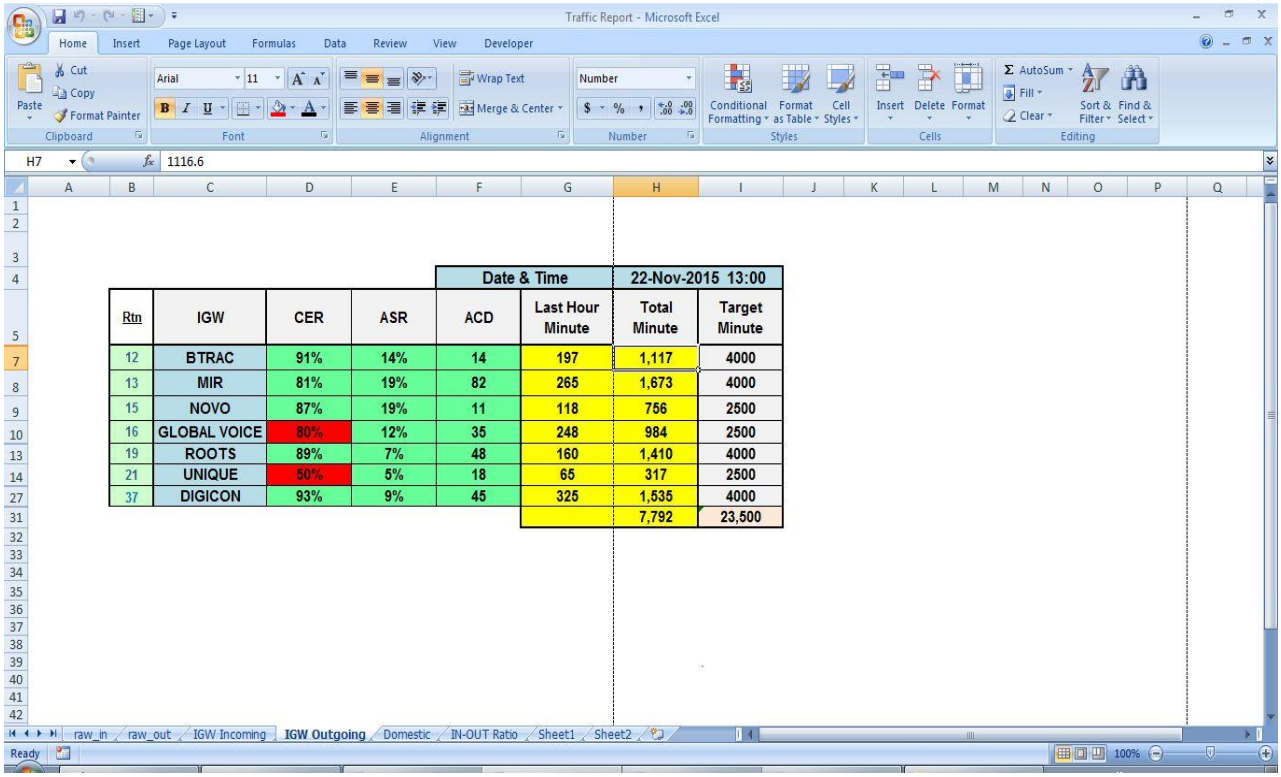
2. The following are the performance of IGW to ANS of different operators.



IGW-TO-ANS [Compatibility Mode] - Microsoft Excel

22-Nov-15	BTRAC (12)				MIR (13)				NOVO (15)				GLOBAL VOICE (16)				ROOTS (19)				UNIQUE (21)			
Time	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD	Attempt	CER	ASR	ACD
													Citycell											
00:00-01:00	0	0%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	8	75%	25%	4.4	3	100%	33%	0.5	0	0%	0%	0.0
01:00-02:00	0	0%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	4	75%	25%	2.0	1	100%	100%	22.8	0	0%	0%	0.0
02:00-03:00	1	100%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	1	100%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0
03:00-04:00	0	0%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	1	100%	0%	0.0	0	0%	0%	0.0
04:00-05:00	1	0%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	2	100%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0
05:00-06:00	2	100%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	1	100%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0
06:00-07:00	1	100%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	2	100%	50%	0.7	2	100%	0%	0.0	0	0%	0%	0.0
07:00-08:00	2	100%	0%	0.0	0	0%	0%	0.0	0	0%	0%	0.0	5	80%	0%	0.0	2	100%	0%	0.0	5	80%	0%	0.0
08:00-09:00	5	100%	20%	12.4	0	0%	0%	0.0	0	0%	0%	0.0	14	93%	21%	4.0	5	80%	40%	2.7	26	88%	27%	5.8
09:00-10:00																								
10:00-11:00																								
11:00-12:00	3	100%	100%	0.5	0	0%	0%	0.0	0	0%	0%	0.0	18	100%	33%	12.9	6	100%	33%	0.4	0	0%	0%	0.0
12:00-13:00	5	100%	40%	0.4	0	0%	0%	0.0	0	0%	0%	0.0	22	100%	32%	5.7	13	100%	15%	1.9	0	0%	0%	0.0
13:00-14:00																								
14:00-15:00																								
15:00-16:00																								
16:00-17:00																								
17:00-18:00																								
18:00-19:00																								
19:00-20:00																								
20:00-21:00																								
21:00-22:00																								
22:00-23:00																								
23:00-00:00																								
													TELETALK											
00:00-01:00	19	89%	26%	6.0	31	84%	16%	10.1	0	0%	0%	0.0	124	87%	18%	12.7	0	0%	0%	0.0	0	0%	0%	0.0
01:00-02:00	20	75%	25%	12.5	20	75%	0%	0.0	0	0%	0%	0.0	79	90%	9%	7.0	0	0%	0%	0.0	0	0%	0%	0.0
02:00-03:00	8	100%	25%	0.3	14	79%	0%	0.0	0	0%	0%	0.0	59	93%	8%	20.7	0	0%	0%	0.0	0	0%	0%	0.0
03:00-04:00	4	50%	0%	0.0	13	92%	8%	3.3	0	0%	0%	0.0	58	91%	7%	0.7	0	0%	0%	0.0	0	0%	0%	0.0

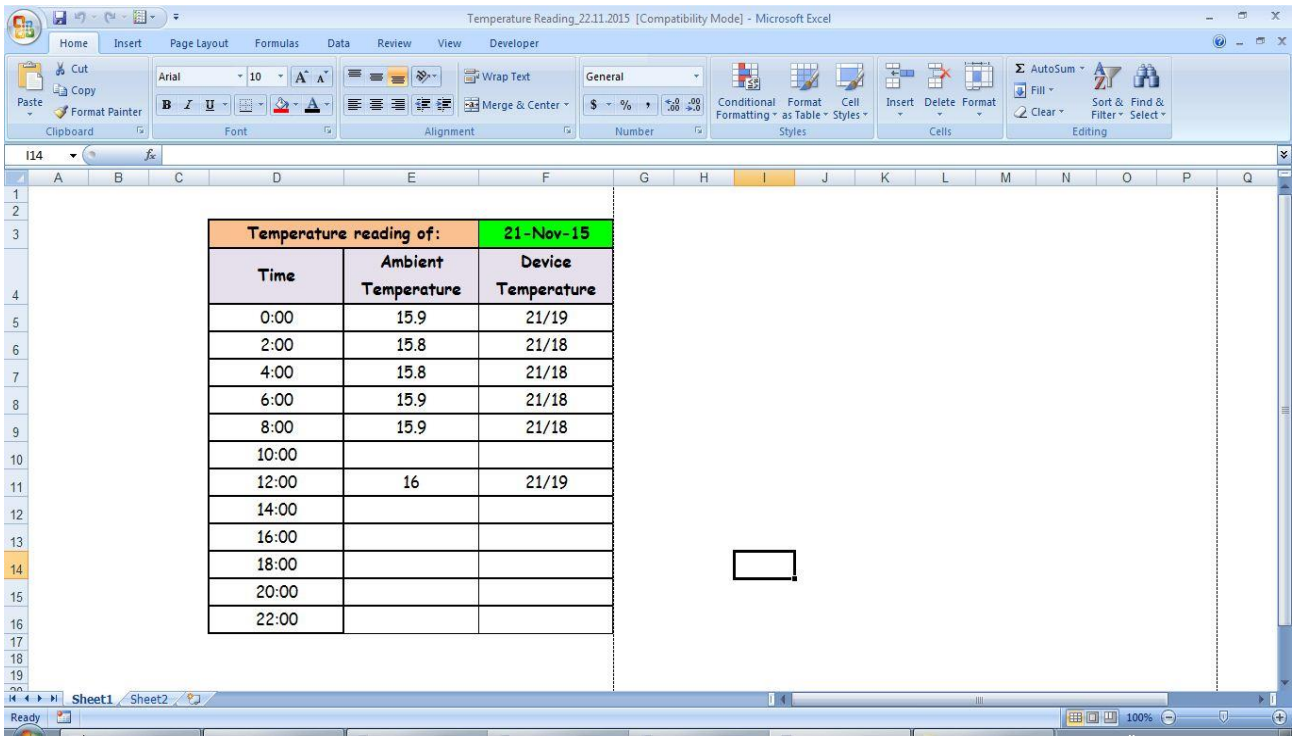
3. These are the average traffic report of all IGW



Traffic Report - Microsoft Excel

				Date & Time	22-Nov-2015 13:00	
Rtn	IGW	CER	ASR	ACD	Last Hour Minute	Total Minute	Target Minute
12	BTRAC	91%	14%	14	197	1,117	4000
13	MIR	81%	19%	82	265	1,673	4000
15	NOVO	87%	19%	11	118	756	2500
16	GLOBAL VOICE	80%	12%	35	248	984	2500
19	ROOTS	89%	7%	48	160	1,410	4000
21	UNIQUE	50%	5%	18	65	317	2500
37	DIGICON	93%	9%	45	325	1,535	4000
						7,792	23,500

4. It is necessary to check out the temperature of SOFTEX3000.



Temperature reading of:		21-Nov-15
Time	Ambient Temperature	Device Temperature
0:00	15.9	21/19
2:00	15.8	21/18
4:00	15.8	21/18
6:00	15.9	21/18
8:00	15.9	21/18
10:00		
12:00	16	21/19
14:00		
16:00		
18:00		
20:00		
22:00		

Besides these, there are some alarms in a physical transmission

- Critical alarms.
- Major alarms.
- Minor alarms
- Warning alarms.

Chapter6

Conclusion

Convergence has led to a rise in the number of operators and consequently to increase in the number of interconnect links. The creation of an interconnect clearing house is expected to replace the current traditional interconnection regime and will make interconnection regimes versatile enough to accommodate national and international providers within the scope of licensing or regulatory frameworks.

Reference:

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6. http://e.huawei.com/en/products/wireless/gsm-r/core-network/umg8900
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