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NATIONAL IRANIAN OIL REFINING & DISTRIBUTION COMPANY
NATIONAL IRANIAN OIL ENGINEERING
& CONSTRUCTION COMPANY

NIOEC SP

NIOEC SPECIFICATION FOR PBX TELEPHONE SYSTEMS

SECOND EDITION

SEPTEMBER, 2017

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IN THE NAME OF GOD**FOREWORD**

By their very nature, technical Specifications are continuously subject to modifications and revisions. To strengthen their merit and usefulness, continuous improvements, addendum, deletion of disparate information and consequently provision of updated revisions are to be made in order to ascertain that such Specifications meet the current requirements, inclusive of Iranian Petroleum Standards (IPS) and the recognized and acceptable national and international Standards, as well as the optimal codes and practices based on the accumulated in-house know-how and plant knowledge and experiences.

However, in reality, due to several reasons, not to mention the complexity of the matter, the ultimate goal of continuous direct embedment of the required changes on the relevant Specifications may be far reaching. Therefore, in the interim periods between the officially issued revisions, the required changes will appear in other documents related to the engineering and design work of the ongoing projects.

In response to the initiative of the Design and Engineering Directorate, and considering that the task of the execution of several important and mega projects for the realization of the new oil refineries, pipelines and oil terminals as well as improvements of the existing facilities, has been assigned to NIOEC, it was decided to update the NIOEC Specifications and to issue new official revisions.

The Design and Engineering Directorate was itself entrusted to carry out this important task, and as such by forming several special technical committees, working in close co-operation and cohesion and sharing their expertise and knowledge, the updated and revised NIOEC Specifications were successfully prepared and complied.

These Specifications are intended to be used for Oil Refineries, Distribution Depots, Oil Terminals, Pipelines and Pump Stations within NIOEC's projects, and have been proven to be of high value for such purposes. It must however be appreciated that these Specifications represent the minimum requirements and should in no way be interpreted as a restriction on the use of better procedures, engineering and design practices or materials.

We encourage and highly appreciate the users and other clear sighted and experts to send their comments on the Specifications to the Design and Engineering Director of NIOEC for evaluation and approval.

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NOTES:

- 1) THIS SHEET IS A RECORD OF ALL REVISIONS TO THIS SPECIFICATION.
- 2) WHEN APPROVED EACH REVISION SHALL BE CONSIDERED AS A PART OF THE ORIGINAL DOCUMENT.
- 3) NUMBER OF PAGES EXCLUDES THIS SHEET AND THE COVER SHEET.

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1. SCOPE

This specification defines NIOEC's minimum requirements for the design, material and construction of PBX Telephone Systems.

Deviations from this specification will only be permitted on obtaining written approval from NIOEC.

Resolution on cases not explicitly stipulated in this Specification, or on cases where conflicts may arise among the requirements of the referenced IOPTC (Iranian Oil Pipeline and Telecommunications Company) Specifications and the international standards, shall be made through written consent and approval of NIOEC.

2. REFERENCES

The following standards, codes, and specifications, to the extent specified hereinafter, shall constitute a part of this NIOEC Specification. Latest edition of the undated referenced documents and the cited edition of the dated references shall apply. The applicability of changes made to the dated references, after the cited date shall be mutually agreed upon between NIOEC and the Vendor /Contractor.

BSI (BRITISH STANDARDS INSTITUTION)

BS 7799	“Code of Practice for Information Security Management”
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EIA/TIA (ELECTRONIC INDUSTRIES ALLIANCE/TELECOMMUNICATION INDUSTRIES ASSOCIATION)

EIA/TIA 568	“Commercial Building Telecommunications Wiring Standard”
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ETSI (THE EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE)

ETS 300 175	“Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT) Common interface”
ETS 300 444	“Digital Enhanced Cordless Telecommunications (DECT); Generic Access Profile (GAP)”
ETS 300 755	“Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications (DECT); Data Services Profile (DSP); Multimedia Messaging Service (MMS) with Specific Provision for Facsimile Services; (Service type F, class 2)”
ETS 300 757	“Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications (DECT); Data services profile; Low Rate Messaging Service; (Service type E, class 2)”
ETS 300 824	“Digital Enhanced Cordless Telecommunications (DECT); Cordless Terminal Mobility (CTM); CTM Access Profile (CAP)”
D/EN020128	“CTM SMS Point to Point Profile”

IEEE (INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS)

IEEE Std. 802.1	“IEEE Standard for Local and Metropolitan Area Networks”
IEEE Std. 802.3	“IEEE Standard for Ethernet”

IOPTC SP (IOPTC SPECIFICATION)

IOPTC-SP-0001	“Request for Proposal for IP PBX”
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ITU (INTERNATIONAL TELECOMMUNICATION UNION)

ITU-T H.323	“Packet-based Multimedia Communications Systems”
ITU-T G.711	“Pulse Code Modulation (PCM) of Voice Frequencies”

NIOEC SIP (NIOEC SHOP INSPECTION PROCEDURE)

NIOEC-SIP-70-01	“Shop Inspection procedure for Instruments”
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NIOEC SP (NIOEC SPECIFICATIONS)

NIOEC-SP-00-10	“Standard Specification for Units”
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3. UNITS

International System of Units (SI) shall be used in accordance with NIOEC-SP-00-10, unless otherwise specified.

4. ABBREVIATIONS

Throughout this document the following abbreviations and acronyms are used:

CCITT: Consultative Committee on International Telephone and Telegraph

DID: Direct Inward Dialing

DOD₂: Direct Outward Dialing Two

DTMF: Dual Tone Multi Frequency

FAT: Factory Acceptance Test

IP PBX: Internet Protocol Private Branch Exchange

MDF: Main Distribution Frame

PABX: Private Automatic Branch Exchange

PBX: Private Branch Exchange

SAT: Site Acceptance Test

UPS: Uninterruptable Power Supply

5. PABX TELEPHONE SYSTEM

5.1. General

Traditional PABX systems are allowed to be used in expansion projects.

System design and construction shall be of the telephone engineering latest state of the art telephone engineering as follows:

- All-electronic, microprocessor-controlled digital system with non-blocking time-division multiplex network.
- Cabinet design with plug-in modules (PC boards) and plug-in connecting cables.
- Integrated and discrete components of a high level of reliability, so that system availability of at least 99.9% can be guaranteed.
- Integrated security system which optimizes system availability when faults occur, simplifier cutover and system maintenance and enables an automatic restart to take place if there is a power outage or disconnection and automatic trouble recovering or alarm indication for major fault, etc.
- The system shall be expandable with minimum (if possible without any) interruption of service.
- Systems not requiring supplementary cooling fans are preferred.

Supplier shall provide a complete listing of station, attendant and system features clearly indicated which ones are standard and which ones are optional. All optional features or optional feature packages shall be individually described and quoted.

5.2. PABX Telephone System Constituents

The system, which shall be a digital processor controlled PABX, shall comprise:

- Switching System (Exchange)
- Attendant Console with common answering facility as follows:
 - o Exterior line, status display of extension
 - o Manual dial without lifting
 - o Transfer exterior line
 - o Outside connections withhold
 - o Communicate with inserting
 - o Set up night service
 - o System check
 - o System program
- Power Supply Unit equipped with UPS with connection facility for a standby battery (1 phase, 230V, 50Hz)
- Main Distribution frame of floor standing or wall mounting type with solder-less connections terminal equipment

5.3. Power Supply

Power supply arrangement shall comprise of power supply unit designed for the required final configuration with interrupt free changeover to battery mode 1 phase, 230V, 50Hz.

Power supply shall comprise:

- One set of Battery charger
- One set Standby battery of 48V to provide 8 hours autonomy at peak traffic required.
- Maintenance and administration facilities including the PC,
- Main Distribution frame.

5.4. Connection Facilities

The following types of connections shall be possible:

- Incoming trunk traffic with DID
- Outgoing trunk traffic DOD2

5.5. System Structure

The system design shall meet the following requirements:

- The system shall be an absolutely non-blocking single switch.
- Automatic restart in the event of a power failure.
- Capable of multi-media facility, call logging, call accounting, auto routing.
- Capable of billing and maintaining an electronic directory.
- Supervision and control of the entire system as in integral part of the operating software.
- Maintenance shall be possible with a minimum cost and effort.

5.6. Software

Software should be written in a CCITT High Level Language. The vendor shall submit all the manuals, documentation and electronic files of the utilized language.

5.7. System Flexibility

The flexibility of the system shall enable the following:

- Flexible assigning of call numbers/services codes 1-4 digit call numbers and codes.
- Alerting tone of a non-existent call number or code is dialed, or interception by the attendant console.
- Flexible connection of station line circuits with telephone sets of different methods (dial pulsing / DTMF signaling)

5.8. Main Distribution Frame

The MDF shall be sized for the maximum capacity of the exchange as specified, plus 10% spare to cater for direct subscriber lines, other line-based systems etc. All conductors of the cables shall be terminated at the MDF (no loose hanging conductors). All cable pairs leaving the building shall be protected by lightning arresters. Attention shall be paid to the matching of the conductor diameter and the terminal size.

5.9. Documentation

Documentation must include:

- Technical description of the PABX tendered.
- Service manual for maintenance personnel.
- Operating instructions for station users.
- Operating instructions for the attendant console.
- System engineering and manual of the PABX.
- Circuit drawing of all the PABX cards and the auxiliary equipment such as battery chargers, inverters, printers, etc.
- Installation manuals

5.10. Training

5.10.1. Maintenance Personnel

The successful bidder shall train the end user's personnel in the operation and maintenance of the switching and auxiliary equipment as part of the purchase order.

5.10.2. Attendants

Personnel operating the attendant console shall be trained in operation and monitoring of the PABX offered.

5.11. Installation

Installation and commissioning and cutover are to be provided by the supplier for the initially equipped system as part of the purchase order.

5.12. Spare Parts and Tools

- Construction, Pre-commissioning and Commissioning Spare Parts

Vendor shall recommend the spares for construction, pre-commissioning, commissioning and construction allowance, which will be purchased together with the equipment, and include the cost of spares in the quotation.

- Spare Parts for Two Years of Operation

Vendor shall recommend the spares required for 2 years of operation and provide a price list.

- Tools

Vendor shall supply 2 sets tools for installation and maintenance of the PABX.

- Accessories and Special Tools

Vendor shall recommend a complete set of accessories, including special tools for operating, maintaining and testing of the equipment.

5.13. Interfacing

Supplier shall guarantee power interfacing and operation of the offered trunks with the existing switches and signaling systems. In this respect purchaser will provide assistance in the form of supplying descriptions and relevant drawings and discussions with technical personnel but responsibility for proper operation of the trunks shall rest upon the supplier.

6. IP PBX

To satisfy the requirements of IP PBX system, Iranian Pipeline and Telecommunication Company Specification IOPTC-SP-0001(attached) shall be strictly followed.

7. INSPECTION AND TEST

7.1. General

The system shall be fully tested and inspected at vendor's shop to ensure satisfactory operation before packing and shipping. A schedule for inspection and testing shall be detailed in the manufacturing quality Plan. The purchaser's inspectors will witness the tests. All tests and inspections shall be performed in accordance with the relevant NIOEC inspection and test procedures including Shop Inspection Procedure (NIOEC-SIP-70-01).

7.2. Factory Acceptance Test (FAT)

The vendor shall submit test procedures for purchaser's approval prior to the FAT. The vendor shall satisfactorily test the equipment prior to the Factory Acceptance Tests, and submit test procedures to purchaser prior to the FAT.

The vendor shall notify the purchaser a minimum of 45 days in advance of his intention to carry out tests so that arrangements can be made to witness the event.

For FAT, the vendor shall make available time, space and assistance to ensure the purchaser is given all possible assistance. Vendor shall provide all goods, materials and services for all the tests.

FAT shall be as complete as practicable with all interfacing equipment available from other systems, and shall be a detailed function test covering all stages of the equipment's operation.

7.3. Site Acceptance Test (SAT)

The vendor shall submit SAT Procedures for purchaser's approval prior to the test. Vendor specialists shall then perform Site Acceptance Test (SAT) for purchaser's approval. Full functional test shall be carried out at this stage.

The vendor shall specify the need for any special test equipment and site support required for installation and commissioning.

8. GUARANTEES

Vendor shall guarantee to support and supply spare parts for the supplied hardware, software and firmware for at least 10 years from the date of shipment.

If it is expected that parts of the system will be withdrawn from sale after 10 years, vendor shall provide a statement detailing the equipment to be withdrawn, the timing and how updated parts can replace the withdrawn parts.

The vendor shall also guarantee that the equipment supplied is free from fault in design, workmanship and material, and is of adequate design and proper material to fulfill satisfactorily the specified operating conditions.

Should any failure or defect in design, material, workmanship or operating characteristics develop under the start-up and commissioning periods or during the first 12 months of operation, but not later than 24 months from the date of shipment, the vendor shall make all required repairs, alterations or replacements of the defective equipment, free of charge, and shall pay transportation fees involved to and from NIOEC's site.

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Request for Proposal for IP PBX

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Request for Proposal

For

IP PBX

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1. Introduction

Implementing Voice over IP involves a number of business and technical decisions. These decisions related to the initial objective of integrating internal or external voice traffic with existing data infrastructure in an organization.

The widespread cost impact of a substantial change throughout an organization requires careful examination of reasons for introducing VoIP and IP Telephony.

A number of justifications have emerged in support of this change:

- VoIP allows several cost savings to be gained
- VoIP satisfies a new business need
- VoIP gives a competitive advantage to the organization, as one which is able to visibly leverage rapid technology change
- VoIP provides a management tool for driving organizational change

Most organizations have a formally stated or hidden reasons for deploying VoIP which covers at least several of these justifications. For example, a distributed call centre may be much more cost effective, as staff from lower cost regional or international centres may be effectively utilized. This option has staff management issues, as the staff are no longer centralised. Similarly, from a voice perspective, working from home or on the road can be quite practical. The customer ideally has no idea of the customer facing staff's actual location. Finally, suppliers or business partners can become part of the wider Enterprise voice network.

The exact network technologies chosen to implement the IP Telephony system with VoIP need consideration. Can the organizations LAN switches support quality VoIP. The type of protocols can also have impact. For example, a common voice over IP protocol called H323 may be used which makes the use of third party "phone" clients possible. These types of non-PABX clients may provide VoIP of a particular quality but may be missing many features required for an Enterprises business, which an IP Telephony system can deliver.

Other factors that require consideration include the integration with other business processes within the enterprise. The business processes may involve a work flow implemented with workgroup products, integrated with voice mail and messaging. Reliability may be a critical issue. It may be justified to use high availability servers to provide these one or more of the network applications. This type of server application is required to implement a comprehensive VoIP solution in many instances.

2. Scope of Work

The scope of work for the vendor is divided into three main categories

- **Engineering:**
 - Project Control
 - Detail design (IP Addressing Plan, Routing Plan, Numbering Plan, etc)
 - Security Plan
 - Configuration design
 - Deployment Plan
 - Change Over plan
 - Maintenance Plan
- **Procurement:**
 - Data
 - Voice
 - Spares, passive, test equipment and installation Material, etc and Training
- **Installation and Commissioning and change over**
 - Site modification & Preparation
 - Installation & Commissioning
- **Acceptance Test**
- **Training**
- **Documentation**
- **Maintenance and Transfer**
- **Guarantee and After Sales Support**

Following systems, equipments, materials and services shall be provided as the data and voice part of the tender:

- **Data**
 - Routers

- **Core Routers**
- **Core edge Routers**
- **Distribution edge Routers**
- **Access Routers**
- **Remote access Routers**
- Layer 3 Switches
- Firewall
- IDS (Host & Network)
- Antivirus systems
- DNS Server
- Mail Server
- Cache Engine
- VPN Server
- **Voice**
 - IP PBX
 - Call manager server (may be embedded in IP PBX)
 - IP Phones
 - Digital Phones
- **Hard Phones**
- **Soft Phones**
- **Operator Consoles**
 - DECT Phones
 - IVR (may be embedded in IP PBX)
 - UMS (may be embedded in IP PBX)
- **Billing System**
- **Network Management System**
- **Accessories**
 - Racks
 - Cables
 - Connectors
 - Assembly Materials
 - Test Materials

3. Technical Requirement Specification

3.1 Basic Voice Requirement

Voice service is one the most important applications which this company intends to deploy in this project. The tenderer guarantee that the equipments provider in this tender will fulfill all the traffic requirements for voice.

3.1.1 Hot Line Requirement

The system should be capable to deliver the hot line functionality for every subscriber. maximum of 30% of subscribers will have the hot line functionality requirement.

Note: Internal hot lines will be used for fire alarm system in each location . All the conversations on the hot lines should be recorded.

3.1.2 Numbering Plan Requirement

voice network numbering plan requirement is as follows:

- There should be a globally uniform five digit numbering plan as the subscriber telephony numbers.
- 0, 1,8 & 9 are the special purpose numbers which should not be used for ordinary subscribers numbering plan.
- requires the full support of global number portability in this solution.
- There must be separate numbering for the service codes changeable by MML commands as well.
- The dialed digit length must be enough to make all various types of traffic calls (Internal, Local, National and International calls).

3.1.3 Value Added Services Requirement

The voice value added services requirement of The Voice & Data network is as follows:

- Voice Messaging Service and unified messaging system
- Email Management
- Voice messaging for 30 percent of subscribers and Unified messaging for 2 percent of subscribers is required.
- Call Recording Solutions & Call Monitoring Solutions
- Automatic Call Distribution Capability & Automatic Network Call Distribution Capability
- Integration with Instance Messaging
- Workforce Mobility

3.1.4 Handset Requirement

The subscribers will use four different categories of handsets in this network which are:

- Analog phones
- Digital phones
- IP Phones and PC based soft phones
- Wireless handsets

- The Operator consoles should be able to receive calls from the outside and transfer those to respective locations and to make local, national, and international calls based on the requests received.
- Digital telephone should be stylish, intuitive, user friendly, provides a range of advanced features and functionality, communications productivity and customer care, integrates with the Network Communications Platforms allowing quick access to the entire spectrum of phone system features and applications. and easy and comfortable to use by all system telephone users.
- Three different IP Phone categories for different users which are: Manager IP phone, Medium level IP phone and Video IP phone
- This company will use the current analog handsets for its future analog subscribers and will acquire just IP hard and soft phones Digital Phone and DECT phones in this project. There are some analogue telephone sets which are supposed to be used in network. Those are working based on analogue signaling systems as used in conventional telephony with rotary dial pulse and/ or DTMF push button.
- This company intends to install the necessary DECT (Digital Enhanced Cordless Telecommunication) equipments enabling its users to make and accept calls at any location moving in/around the building areas as part of its voice network. It is required that the voice and signaling channels over the air interface would be encrypted preventing any security vulnerability. Location registration procedure has to be executed before a DECT subscriber can make an outgoing call or receive an incoming call. Therefore the handsets which are out of radio range, switched off, or not located, are marked as unavailable in the system. The system should be designed and delivered based on the latest ITU-T and ETSI recommendations i.e. ETS 300 175, ETS 300 444, ETS 300 824,

D/EN020128, ETS 300 757, and ETS 300 755. The following items are the mandatory standards which should be met by the proposed solution.

- ETSI DECT Generic Access Profile (GAP)
- ETSI DECT CTM Access profile (CAP)
- ETSI DECT CTM SMS point to point profile
- ETSI DECT LRMS E2 profile
- ETSI DECT MMSP F2 profile

Also the bidder should consider other factors (i.e. call traffic, the style of the buildings and surroundings, the used materials in the area to detect different ways of signal absorption and reflection) in order to design a high performance DECT system. The bidder could receive the maps and specification sites and the coverage area which is needed in each site. Then they may do the site survey with the aid of site survey tools to reach to the exact number of the base stations and their real spots for giving the correct planning.

3.2 Reliability Requirement

Since there are some extremely mission critical applications network like emergency voice calls, any major single point of failure should be eliminated by the following mechanisms:

- **Module level redundancy**

Since there are valuable resources like routers and IP PBXs in this network it is required to have redundancy for their common parts (i.e. power supply, switching fabric, CPU, network interfaces etc.)

- **Equipment level redundancy**

It is required to deploy redundant network components in critical intercommunion points. (I.e. router level redundancy, switch level redundancy, Firewall level redundancy)

- **Route redundancy**

Since there are alternative routes, it is possible to make redundancy on the physical interconnection routes between edge to core locations and important end offices to edge locations through network.

3.3 Expandability Requirement

The network should be expandable enough to carry future internal applications as well as external usages. This company requires its network to be expandable according to the following items without adding any common part to the network. Therefore the expandability figures should be met just by adding modular components.

- **Expandability on the number of Network users.**
- **Expandability on the number of Subscribers & Subscribers Load.**

3.4 Management Requirement

The network management system will be an important part of the whole infrastructure. This company requires an end to end network management system with user friendly environment and the capability of managing fault, configuration, accounting, performance, and security for data and voice part of the network.

The bidders are required to provide their proposal in order to make the Management System in an integrated environment as an optional item:

- Voice Management
 - PBX Management
 - Phone Set Management
 - Value Added Services Management
- IP/MPLS Management
- IP/Routing Management
- QOS Management
 - Management of QOS configuration at Layer 3 and 2
 - Ability to send alarms in case a particular QOS is not met
- Security Management
 - Firewall /IDS/IPS Management
 - Filtering Management
 - Antivirus Management
- AAA Management
- Traffic Monitoring & Management
- Network Services Management
- Billing Management
- Logging Management
- Change Management
- Integrated Fault Management
- Network Performance Management & Reporting
- Hardware Monitoring & Management (i.e. Routers, Switches, PBXs , Call Managers, Voice Mail and Unified Messaging servers)
- Umbrella management for fault management

The following items are some required key features network management system. Any additional functionality which is required to have full end to end centralized control over its network shall be suggested by the bidder.

- View how the network looks like, on a topology map, and where traffic bottlenecks occur
- Group faults together for simpler troubleshooting
- Keep track of devices deployed in the network (inventory management)
- Automatic device & phone discovery
- Threshold monitoring
- Service Level Agreements (SLA) based responses (if applicable)
- Service-quality alerting
- Endpoint status and endpoint status change reports
- Northbound interfaces using SNMP traps, sys logs, and e-mail notifications with context-sensitive links to more detailed information
- Historical alert, event, and service-quality reports
- Support for traffic measurement capability at least for the following network objects based on the Traffic Engineering rules according to ITU-T Recommendations.
 - Voice extensions
 - Hunting groups
 - Routes
 - External lines
 - PABX operators
 - Tone receivers
 - Dial tone delay
 - Code receivers
 - Multi-party units
 - System PCM lines

- Paging
- Cordless extension
- Digital extension
- IP extension/IP Trunks
- User Categorization Capabilities
 - Segment management domains based on IP address ranges
 - Assign users to specific ENMS Views and have access control
 - Match users to IP services that need to be monitored
 - Greater control over subnet level discovery

Note: The NMS system should be designed & implemented in such a way the every particular network elements can be monitored & managed by its appropriate district center NMS node.

3.5 Billing and Accounting Requirement

Billing & Accounting System should be designed based on the following requirements & capabilities:

- Ability to generate detail reports for voice application usage of different users and user groups.
- Ability to generate detail accounting reports for data application usage of different users and user groups.
- Ability to generate the accounting reports on utilization factors for shared network resources like transmission lines by different application/user groups.
- Billing services for usage of voice applications by external users/user groups
- Billing services for external VPN customers.

3.6 Connectivity to PSTN

All the subscribers of all PBXs should have caller ID and all the connections through PRI should have caller ID service

3.7 QoS Requirement

This company requires the network to have comprehensive end to end traffic engineering in order to assure the quality of services for different types of applications. It is essential to have strong traffic identification, traffic prioritization, traffic queuing, congestion avoidance and management and resource reservations in the network. Applications traffic can be categorized in the following items:

- Network Control Traffic (Routing Protocol, signaling, etc.)
- Mission critical voice traffic (Hot lines, manager phones, etc.)
- Ordinary voice Traffic
- Video streaming traffic

The Codec used for voice will be G.711, which carries uncompressed 64kbps voice payload. In case of congestion in the network there should be mechanism to compress the voice with different compression techniques. Following specifications are desired for voice QoS for uncompressed voice payload

- Speech samples packets = 20 ms
- Voice payload = 160 Bytes
- Packet per second = 50 pps
- Total bandwidth per call = 80 Kbps
- Delay $\leq$ 150 ms

- Jitter ≤ 30 ms
- Packet loss $< 1\%$

3.8 Security Requirement

The fundamental objectives of the security design are to provide:

- Availability - ensuring that authorized users have access to information and associated assets when required
- Confidentiality - ensuring that information is accessible only to those authorized to have access
- Integrity - safeguarding the accuracy and completeness of information and processing methods

The following items are stating the high level security requirements of network:

- Protecting valuable resources like servers, routers, IP PBXs with access limitation and intrusion detection and prevention mechanisms
- Isolation of voice network from other applications
- Deploying a comprehensive virus protection mechanism through the whole network
- Protecting internal network from external accesses i.e. Internet, PSTN, Remote Access
- Controlling access to network shared resources by centralized AAA
- Dynamic security policy management
- Devising the ISMS mechanism for Converged Voice and Data Wide Area Network including:

- Security Checklists
- Security Procedures
- Security Instructions
- Devising Security Risk Management Plan
 - Security risks should be identified, classified, analyzed and evaluated
 - The risk response should be notified for each identified risk
 - The risk acceptance criteria should be established
 - The method of risk reduction should be established
 - The method of risk transfer should be established
 - The method of risk avoidance should be established
- Implementing an Information Sharing & Analysis Centre (ISAC)
 - Installation of Security Sensors & Log Analyzer
 - Installation of Protocol Scanner
 - Installation of Traffic Analyzer
- Devising development plan for making CERT, CSIRT & NIRT groups for incident management and handling
- Implementation of Physical Security Mechanisms for network facilities
- Implementation of System/OS Security Mechanism
- Implementation of Application Security for Voice Services
- Implementation of Information Security for Network Management Subsystem
- Implementation of Organizational Security for Network Operation Department
- Compatibility of Security Mechanism with an industry proven security standard like BS7799

3.9 Interoperability Requirement

The proposed solution should have the following interoperability features:

- All vendors should use open protocols avoiding any dependency on a particular brand.
- All IP network equipments should be compatible with existent transmission network equipments.
- All IP network equipments should be compatible with other major IP equipment brands for future expandability.
- The IP PBX should be compatible with other major IP PBXs brands for future expandability.
- The IP PBX should be compatible with other major handset equipments for future expandability.
- The IP PBX should be compatible with current analog phones.
- All gateway equipments should be compatible with TCI network signalling for PSTN connectivity.

3.10 LAN Requirement

3.10.1 Passive equipment

1. The Local Area network should be capable to full support of converged Voice & Data services.
2. The structured cabling should be designed and implemented based on the EIA/TIA568A &B and ISO 11801 recommendations .
3. There will be atleast two Ip terminal (one for voice and one for data) per 2.5m in each room .
4. Horizontal Cable type is CAT 5e or higher
5. Vertical Cable (Backbone Cable) type is CAT 6 or Multimode fiber.