INMS is scalable system which can support more than 10,000 nodes and 50 GUI concurrent clients logging into INMS server from local LAN or remote WAN. Workforce management is facilitated by multiple levels of login security, which provide the network manager great flexibility in work assignments. The hierarchical grouping featuring cities, buildings, and rooms allow rapid access to the desired network elements. Automatic detection of network elements and automatic creation of the network map facilitates the installation procedure.

All SNMP provided functions are available in CXR-iNMS. This includes the execution of all commands, the gathering of all statistics, and the display of all alarm conditions in real time. SNMP V1, V2c and V3 support are all included.

CXR-iNMS, Integrated Network Management System, is a set of intelligent software programs used for providing a GUI (graphical user interface) and management of circuits, alarms... for the Communications Network with CXR SDH/PDH equipments which can be categorized into 2 groups:

1. **ACCESS NETWORK** with TDM/ PDH Multiplexer DACS: QX3440, QX3440S, QX3440-D, IX4100, IX4200-9

2. **TRANSMISSION NETWORK** with optical SDH/SONET ADM Multiplex: HX9100, HX9400S, HX9400R, HX9416R, HX9500R;

Thanks to GUI running on PC/Window, operators can access to the management using a low-cost platform.
The CXR-INMS basic components are the Device Poller in relation with SNMP nodes as a Southbound interface, the iNMS core server with Oracle database, the iNMS GUI Clients for the operator access and the optional Northbound Interface including CORBA to adapt to and existing NOC. All Devices Poller, Servers can be secure per backup hardware and software and Disaster Recovery or High Availability options.

iNMS Main Core
- Runs Linux/Regular PC server or Solaris/SUN server. This datasheet describe only the Linux version.
- Self-sustaining iNMS core is the background engine supporting FCAPS services
- Optional Engine of advanced feature of “North-bound interface” is upon request
- Supports TCP/IP socket connections for DPs, iNMS server, Database server, and GUI clients running on different PCs and servers to manage a large network when required
- Redundancy option is supported

DP (Device Poller)
- Runs either on Linux/Regular PC server or Solaris/Sun server.
- Manages the South-bound interface to the NE using SNMP protocol
- Provide regular polling of the current status of every NE
- Presents all real-time status change to iNMS GUI client for display
- Supports regular polling of Performance data
- Management Protocols supported between NE and DP are: SNMPv1 or v3.

GUI Clients
- Runs on Windows PC installed with Windows 7 (32 or 64bits).
- Supports up to 50 concurrent GUI clients.
TXR-iNMS Basic Function

Topology Management
Offers topology view for:
- Optical cable connection topology
- Transmission NE connection topology
- PTN (Packet Transmission Network) NE connection topology
- Entire network NE connection topology
- Panel view of equipment (NE)
- Circuit Route view
- NE internal cross-connection view
- Menu tree view, Geographical Network topology view
- Supports zooming in and zooming out for topology views
- Allows users to create a desired layout to reflect the actual network
- Offers drag-and-drop approach for a user to create an NE icon

Configuration Management
Provides configuration collection
- Supports multi-condition query, adding, deleting, and modifying operation on configuration information stored in the iNMS database
- Supports configuration synchronization
- Provides remote control on NE's configuration
- General Parameters Setting
- Activation & Release of Cross-Connections
- Synchronization clock-source setting
- Remote download of firmware for upgrading or maintaining NE
- Remote upload and download of NE configuration through iNMS
- Provides NE-level cross-connection configuration

Circuit Management
Provides circuit management for:
- Creation
- Deletion
- Query
- Modification
- Display and Highlight on GUI topology
- Database commitment for circuit information
- Provides multi-condition query, adding, deleting and modifying operation on circuit information stored in the database.
- Provides circuit selection: options of shortest path, minimum hop, load balancing, and minimal cost
- Provides a list of un-finished fall-back plan for troubleshooting and rescue operation afterward
- Supports TDM Circuit rate including:
  - N x 64K
  - E1
  - T1
  - E3
  - DS3
  - STM-1/4 or OC-3/12
  - STM-1/4/16 or OC-3/12/48
  - N x VC12 (N=1 to 63 for Ethernet pipe)/VT15 (N=1 to 84)
  - N x VC3/STS-1 (N=1 to 3 for Ethernet pipe)
  - N x VC4/STS-3 (N=1 to 4 for Ethernet pipe)
- Supports circuit route discovery for existing circuits.
- Supports circuit deletion
**Alarm Management**
- NE alarm/ event collection
- Alarm filtering
- Circuit-level alarm
- Alarm display
- Alarm history
- Alarm notification

**User & Security Management**
- Supports adding, deleting, and modifying operation on user account and a group of users
- Provides operation privilege and scope assignment
- Provides history command log for 3 to 12 months
- Supports multi-condition query on history command log records
- Supports Command Log

**Diagnosis Management**
- Supports three (3) types of diagnosis:
  - NE level diagnosis
  - Circuit level quick diagnosis
  - Circuit level advanced diagnosis
- Supports diagnosis report generation

**Performance Monitor**
- Supports two (2) types of performance monitoring:
  - Performance monitoring at NE level
  - Performance monitoring at circuit level

**NE-Level Performance**
- Port-based performance task creation, deletion, display and query
- Port-based performance data display, query and report generation in tabular and graphical form. Report can be exported and saved in Microsoft Excel (Microsoft Excel 2010 or later).
- Performance counter collection in 15 minute or 24 hour intervals

**iNMS Self-management**
- Supports real-time monitoring on iNMS software processes
- Supports real-time monitoring on the status of connection between NEs and DPs
- Supports database backup and recovery
- Supports server disk usage monitoring
- Provides on-line help for OAM&P operation
- Provides Time & Date Synchronization mechanism between iNMS and NEs
3rd-Party NE Management (3rdNE)
Manages entire network with one software platform
Provides capability to manage devices from 3rd-party equipment vendors and others
devices, which is not fully supported by iNMS
Shows network element (NE) connectivity and alarm status
Accesses to telnet and SSH to a NE. Provide URL to bring up 3rd-party equipment web-based management system

Circuit Group & Circuit Alarm (CGCA)
User-defined circuit group and group category
Default category for hybrid multi-segment circuit to support TDMoE and conference applications.
Alarm status monitoring and display by category, group and circuit.

Pseudowire Circuit Management (PWCKT)
As part of the management solution for Loop pseudowire products to provide emulated Ethernet services over a packet-switching network (PSN).
Provides TDMoE solution supported by QX3440, HX9500 and IMX-6700, including pseudowire resource management.
Supports PTN solutions.
Pseudowire circuit sub-module for IP switching based, per UDP number bundling circuit.
Hybrid circuit sub-module coming with pseudowire circuit management over a PSN network and multi-segments circuit management over TDM and PSN network.

Circuit-Level Performance
Circuit-based performance task creation, deletion, display and query
Circuit-based performance data display, query and report generation in tabular and graphical form. Report can be exported and saved in Microsoft Excel (Microsoft Excel versions 2010 or later).
Performance counter collection in 15 minute or 24 hour intervals

DS0 SNCP Circuit Management
PDH DS0 SNCP circuit creation, deletion, query, modification and display
Enable, disable and view PDH SNCP link
Support quick/advanced diagnosis and diagnosis reports

PDH ULSR Circuit Management
PDH ULSR circuit creation, deletion, query, modification and display
Enable, disable and view PDH ULSR link
Support quick/advanced diagnosis and diagnosis reports
INMS Advanced Components

Docket Manager (DM)
- Provides Alarm Docket, Resource Docket and Circuit Docket and General Docket
- Provides Docket Management system resembling email system
- Supports Docket export as a trouble ticket
- Offers Docket tracking system with open date and closing date
- Offers Statistics of Dockets closed, open and pending

SNMP-based Northbound Interface (SNMPNBI)
- Supports SNMP v1/v3 NBI

Report Management (RMG)
- Supports generation of automatic & periodical report and on-demand report
- Supports report export to MS. Excel format (2010 or later)
- Supports pre-defined & fixed Report template

Root Cause Analysis (RCA)
- User-defined Fault Policies.
- Root Cause Analysis based on Fault Policies

Clock Distribution Map (CDM)
- The Clock Distribution Map for TDM Network (both 64k Access and SDH transmission)
- Manual or scheduled clock loop detection

North-bound Interface (NBI)
- Supports CORBA NBI per TMF.814
- Detailed CORBA NBI components and NRE costs are per-project based. Please contact us for details
### THIRD-PARTY HARDWARE SYSTEM RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Mandatory/Optional</th>
<th>Suggested Model</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 1    | PC Server with Linux                      | M                  | Small network (50 nodes)  
Intel Quad Core PC server  
Medium network (200 nodes)  
Dual Intel Quad-core PC server  
Large network (500/800 nodes)  
Dual Intel Six Core PC server  
Dual Intel Eight Core PC server  
With CD drive | Used as the INMS main server  
And eventually INMS backup server |
| 2    | PC Server with Linux  
0 less than 200 nodes | M                  | Medium network (200 nodes)  
Dual Intel Quad-core PC server  
Large network (500 nodes)  
Large network (800 nodes)  
Dual Intel Six Core PC server  
With CD drive | Used as the INMS Device Poller  
Used as the INMS backup server |
| 3    | Desktop PC  
19”/23” LCD  
Windows 7 Pro 32 or 64b | M                  | Intel Dual Core PC  
With CD drive, 8GB Ram mini SSD hard disk | Used as the INMS GUI client(s) |
| 4    | Safeguard system                           | R                  | Tape or hard disk backup system                                                  | Optional for INMS Server backup of the database. |

### THIRD-PARTY SOFTWARE SYSTEM RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Mandatory/Optional</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 1    | Microsoft Excel                           | M                  | One license Microsoft Excel (2010 or later) for each GUI client | MS Excel is required for various report functions on INMS.  
The report function will NOT work without MS Excel. |
| 2    | Oracle Database                           | M                  | One license Oracle Standard Edition One (SE1) bundled with CXR INMS  
Oracle Enterprise Edition (EE) bundled with CXR INMS | Applicable to database server with 1 or 2 processor card  
For large system please contact us for optimization of Oracle database licence |

### MAINTENANCE AND SERVICE

**Mandatory Yearly Software Maintenance Agreement**
CXR provide the support of Linux, Oracle Database and INMS software including the patches, upgraded version with same level of features and number of nodes.  
This include e-mail, phone and VPN consulting, remote diagnosis, remote patching/upgrade, remediation and planning suggestion. Different level of services are proposed.  
This contract is mandatory and must be order together with the IMNS system.

**Installation / Training / On site support Services**
CXR provide the installation of the Linux, Oracle Database and INMS software in hardware supply by CXR or by the customer.  
We provide also the to integrate the existing network in INMS management and the training of teams;  
Please contact CXR for quotation.
## Integrated Network Management

### PC Server Specifications
Note: This recommendation is for reference only. Please consult with CXR representative for precise hardware spec and quantities.
For project needing more than 100 NEs, please consult with Loop FAE for recommendation.

<table>
<thead>
<tr>
<th>Item</th>
<th>(Rack Mount) Low Capacity Dell PowerEdge R320</th>
<th>(Rack Mount) Medium Capacity Dell PowerEdge R420</th>
<th>(Tower) Low Capacity Dell PowerEdge T320</th>
<th>(Tower) Medium Capacity Dell PowerEdge R420</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Application</td>
<td>Up to 50 NEs*</td>
<td>Up to 100 NEs*</td>
<td>Up to 50 NEs*</td>
<td>Up to 100 NEs*</td>
</tr>
<tr>
<td>Processor</td>
<td>1 x Intel® Xeon® E5-2407 4C (2.20GHz or above)</td>
<td>1 x Intel® Xeon® E5-2430 6C (2.20GHz or above)</td>
<td>1 x Intel® Xeon® E5-2403 4C (1.80GHz or above)</td>
<td>1 x Intel® Xeon® E5-2430 6C (2.20GHz or above)</td>
</tr>
<tr>
<td>Memory</td>
<td>8GB RDIMM** 1333 MHz</td>
<td>8GB RDIMM** 1333 MHz</td>
<td>8GB RDIMM** 1333 MHz</td>
<td>8GB RDIMM** 1333 MHz</td>
</tr>
<tr>
<td>Hard disk</td>
<td>500GB 7.2K SATA 3.5 &quot;</td>
<td>500GB 7.2K SATA 3.5 &quot;</td>
<td>300GB 15K 6Gbps SAS 3.5 &quot;</td>
<td>300GB 15K 6Gbps SAS 3.5 &quot;</td>
</tr>
<tr>
<td>DVD R/W</td>
<td>DVD R/W</td>
<td>DVD R/W</td>
<td>DVD R/W</td>
<td>DVD R/W</td>
</tr>
<tr>
<td>RAID Controller</td>
<td>Embedded SATA</td>
<td>Embedded SATA</td>
<td>PERC H310</td>
<td>PERC H310</td>
</tr>
<tr>
<td>NIC</td>
<td>Dual Port 1GbE</td>
<td>Dual Port 1GbE</td>
<td>Dual Port 1GbE</td>
<td>Dual Port 1GbE</td>
</tr>
<tr>
<td>Operating System</td>
<td>Linux / CentOS-6.3 (or RHEL-6.3)</td>
<td>Linux / CentOS-6.3 (or RHEL-6.3)</td>
<td>Linux / CentOS-6.3 (or RHEL-6.3)</td>
<td>Linux / CentOS-6.3 (or RHEL-6.3)</td>
</tr>
</tbody>
</table>

* Based on high capacity NE, like QX3440-A. Dual-Core or 3-Core processor machine is only good for network less than 50 NEs. It is strongly recommended to separate iNMS application server from database server to a network with more than 100 nodes.
** Memory requirement = (4GB system minimum + number of nodes x 8MB) x 1.4

### Desktop PC Specifications for GUI client

<table>
<thead>
<tr>
<th>Item</th>
<th>Desktop PC for GUI Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Application</td>
<td>For all numbers of NEs</td>
</tr>
<tr>
<td>Processor</td>
<td>Intel Core i5 (3.2 GHz) or above</td>
</tr>
<tr>
<td>Memory</td>
<td>Memory/8GB DDR3 or above</td>
</tr>
<tr>
<td>Hard disk</td>
<td>SSD (Solid State Disk) Flash 128G (500MB/s read, 450MB/s write) or above HardDisk SATA3 500GB/7200rmp or above</td>
</tr>
<tr>
<td>DVD R/W</td>
<td>DVD R/W</td>
</tr>
<tr>
<td>Sound card &amp; Speaker</td>
<td>Sound interface and Speakers</td>
</tr>
<tr>
<td>NIC</td>
<td>10/100/1000M</td>
</tr>
<tr>
<td>Graphics</td>
<td>ATI Radeon Xpress 200 graphics or above</td>
</tr>
<tr>
<td>Mouse</td>
<td>USB Wheel or Optical Mouse</td>
</tr>
<tr>
<td>Monitor</td>
<td>22&quot; LCD (1024*768) or above</td>
</tr>
<tr>
<td>Operating System</td>
<td>Microsoft Windows 7 OS shall be installed inside the SSD above.</td>
</tr>
</tbody>
</table>
To order the CXR-iNMS products, you must select one Main Core and then the options you require for that Main Core. If you are ordering several Main Cores, they must be ordered individually in separate orders.

### iNMS Main
Please Select the iNMS Main Core if desired. If you’re purchasing additional options for an existing network, leave this off of the order form.

<table>
<thead>
<tr>
<th>iNMS Main Core</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>INMS-MAIN-L</td>
<td>CXR-iNMS Main Core Server Software for Linux</td>
<td>Order maximum of 1</td>
</tr>
<tr>
<td>INMS-MAIN-50-L</td>
<td>CXR-iNMS Main Core Light Server Software for Linux, support maximum 50 Network elements.</td>
<td>Order maximum of 1</td>
</tr>
</tbody>
</table>

### iNMS Backup
Please Select the Backup if desired. If a Backup Core is not desired, leave it off of the order form.

<table>
<thead>
<tr>
<th>NMS Backup Core</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>INMS-BACKUP-L</td>
<td>CXR-iNMS Backup Core Server Software for Linux</td>
<td>Order maximum of 1</td>
</tr>
</tbody>
</table>

### iNMS GUI Clients
Please specify the number of GUI clients you will be serving.

<table>
<thead>
<tr>
<th>GUI Clients</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>INMS-GUI</td>
<td>One additional CXR-iNMS GUI client software license</td>
<td>Order from 1 to 50</td>
</tr>
</tbody>
</table>

### iNMS Feature

<table>
<thead>
<tr>
<th>iNMS Feature</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>iNMS-RCA-L</td>
<td>Root Cause Analysis Subsystem for Linux</td>
<td>Order 1 if single Server.</td>
</tr>
<tr>
<td>iNMS-RMG-L</td>
<td>Report Mgmt Generic Subsystem for Linux</td>
<td>Order 2 if Server and Backup</td>
</tr>
<tr>
<td>iNMS-DM-L</td>
<td>Docket Management Subsystem for Linux</td>
<td></td>
</tr>
<tr>
<td>iNMS-CDM-L</td>
<td>Clock Distribution Map Subsystem for Linux</td>
<td></td>
</tr>
<tr>
<td>iNMS-CPERF</td>
<td>Circuit-Level Performance (CPL)</td>
<td></td>
</tr>
<tr>
<td>iNMS-DSO-SNCP</td>
<td>Mgmt ckt SNCP DS0 with QX3440/HX95xx-3E1 card</td>
<td></td>
</tr>
<tr>
<td>iNMS-PDHRING</td>
<td>Mgmt ckt ULSR with QX3440/HX95xx ULSR CPU RING</td>
<td></td>
</tr>
<tr>
<td>iNMS-PSW</td>
<td>Pseudowire mgmt for TDMoIP, TDMoE and MPLS-TP</td>
<td></td>
</tr>
<tr>
<td>iNMS-CGCA-CIRCUIT</td>
<td>Ckt Group &amp; Ckt Alarm mgmt.</td>
<td></td>
</tr>
<tr>
<td>iNMS-SNMP-NBI-L</td>
<td>SNMP North Band Interface</td>
<td></td>
</tr>
</tbody>
</table>

### iNMS Feature Options
Please specify which iNMS types you need. You may choose any or all of the available features.

<table>
<thead>
<tr>
<th>INMS GENERIC-NE</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>INMS-HX9100-L</td>
<td>NE management license for HX9100-3U</td>
<td>Order the quantity of licenses per node under control.</td>
</tr>
<tr>
<td>INMS-HX9400S-L</td>
<td>NE management license for HX9400S</td>
<td></td>
</tr>
<tr>
<td>INMS-HX9400R-L</td>
<td>NE management license for HX9400R/HX9416R</td>
<td></td>
</tr>
<tr>
<td>INMS-HX9500-6U</td>
<td>NE management license for HX9500-6U</td>
<td></td>
</tr>
<tr>
<td>INMS-HX9550-5U</td>
<td>NE management license for HX9550-5U</td>
<td></td>
</tr>
<tr>
<td>INMS-QX3440-L</td>
<td>NE management license for QX3440</td>
<td></td>
</tr>
<tr>
<td>INMS-QX3440S-L</td>
<td>NE management license for QX3440S</td>
<td></td>
</tr>
<tr>
<td>INMS-QX3440D-L</td>
<td>NE management license for QX3440D</td>
<td></td>
</tr>
<tr>
<td>INMS-MX-E3T3-L</td>
<td>NE management license for MX-E3T3</td>
<td></td>
</tr>
<tr>
<td>INMS-I4100-L</td>
<td>NE management license for I4100</td>
<td></td>
</tr>
<tr>
<td>INMS GENERIC-NE</td>
<td>Simplified SNMP INMS support for one generic</td>
<td></td>
</tr>
</tbody>
</table>

### INMS NE Management Licenses
Please specify how many network elements your are managing for each device.

<table>
<thead>
<tr>
<th>INMS Feature</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>INMS-DR-L</td>
<td>Disaster Recovery Option for INMS Server and Device Poller</td>
<td>One per servers and backup server</td>
</tr>
<tr>
<td>OracleSE1-iNMS-L</td>
<td>Oracle Standard Edition One (SE1) for CXR iNMS (per CPU price)</td>
<td></td>
</tr>
</tbody>
</table>