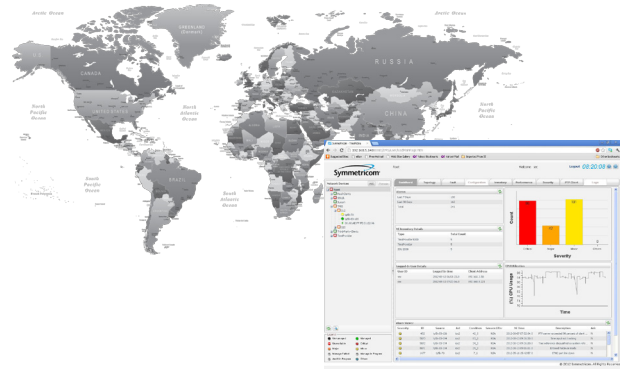


TimePictra®

Release 10.0

Next Generation Synchronization Management System



Key Features

- Web-based multi-tier software architecture
- Comprehensive FCAPS management functions
- Software options for advanced FCAPS features
- Geographical topology and domain navigation
- User preference dashboard customization
- 3rd party PTP client management
- SNMP and TeMIP northbound interface

Key Benefits

- Cost-effective deployment
- Intuitive Web GUI for easy management
- Scalable architecture for future expansion
- SNMP and TeMIP northbound OSS integration
- End-to-end PTP management
- PTP client performance monitoring

Applications

- Service Provider wireline and wireless networks
- Utility networks
- Enterprise networks
- Government networks

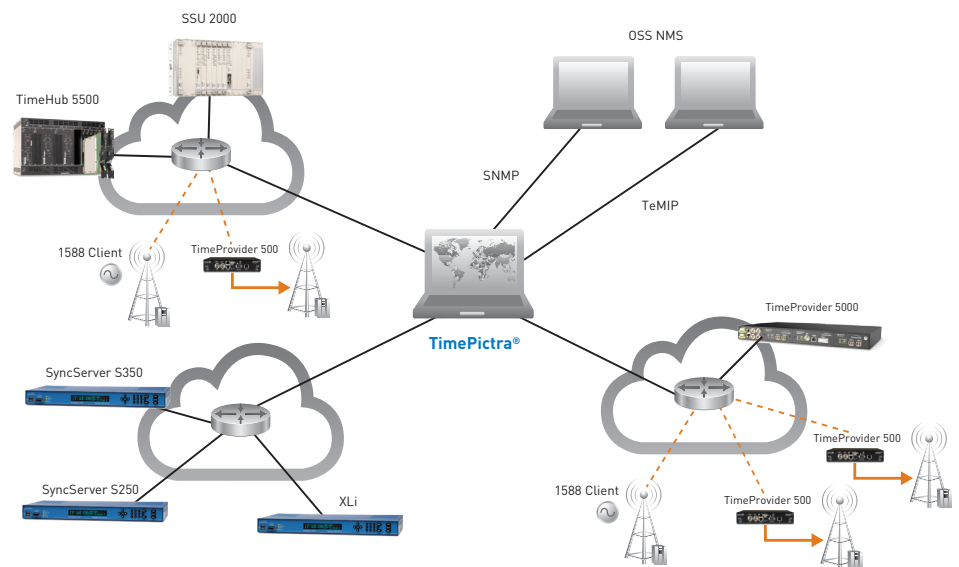
The Symmetricom® TimePictra® is a web-based management system for synchronization network elements. It features a modular architecture that will scale and evolve with operational requirements. As timing and synchronization grows in importance in critical infrastructure networks, centralized visibility and control of this vital function has become essential to network operations.

With a multi-tier architecture—server, client, and database—TimePictra can provide scalability and performance to meet growing network services and

business needs. The secure web browser client provides easy access and eliminates the complexity of client installation and VPN access. The Java application server, in conjunction with the database, provides comprehensive business logic to support management of network functions.

TimePictra is server platform and database independent—allowing cost-effective deployment of the management system using any server or database platform meeting the specified requirements.

As an element management system, TimePictra provides comprehensive FCAPS



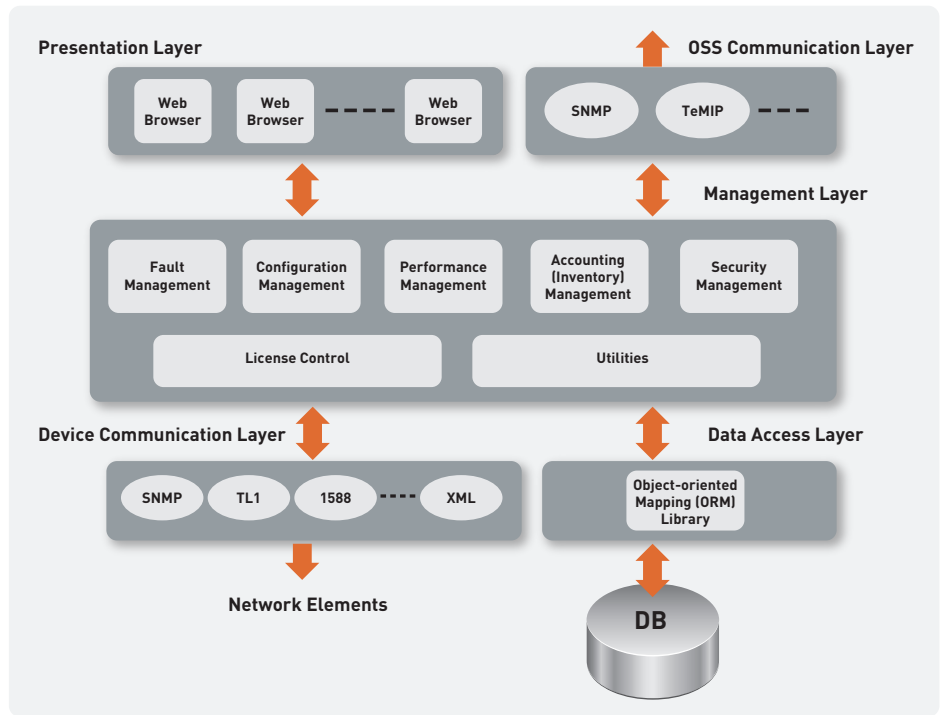
TimePictra Synchronization Element Management System

TimePictra

functions for managing your network including Fault Management, Configuration Management, Accounting (Inventory) Management, Performance Management, and Security Management.

TimePictra is comprised of basic software and software options. The basic software includes the standard FCAPS functions as well as, geographical topology map, navigation tree with domain hierarchy, dashboard reporting of alarms, inventory, user login, and license installation information.

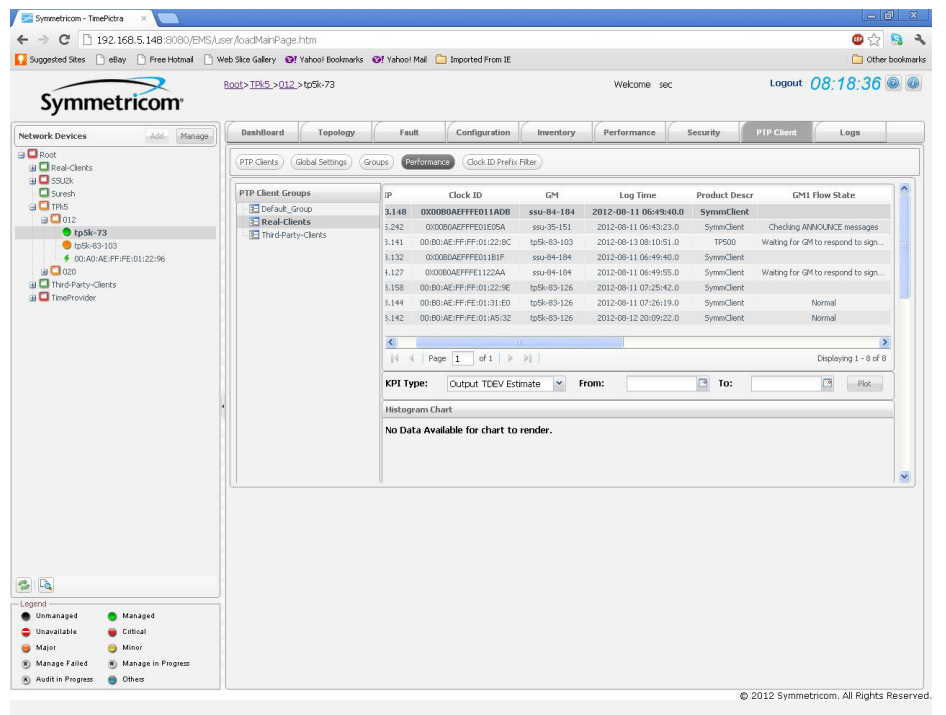
Software options include advanced FCAPS functions. Each option is enabled by a software license key with no additional installation required. This modular architecture allows network operators to easily deploy TimePictra and simplifies future upgrades to expand the system with advanced features as the network grows with future business requirements.



TimePictra Architecture

Web-Based Graphical User Interface

Authorized users can have secure access to TimePictra, and manage their sync network from anywhere at any time. It enables connectivity to the mission-critical sync network from remote locations. The low bandwidth requirements of a thin client web-based GUI implies no special client-side installation. The thin clients can be invoked over a dial-up connection or a Virtual Private Network.



TimePictra Performance Manager, PTP Sync Flow Monitoring

TimePictra

Dashboard

A user dashboard simplifies the display of network health, including alarm counts with severity, network element inventory, logged in users and license information. With the Group Pack option, the dashboard can be customized with user preferences.

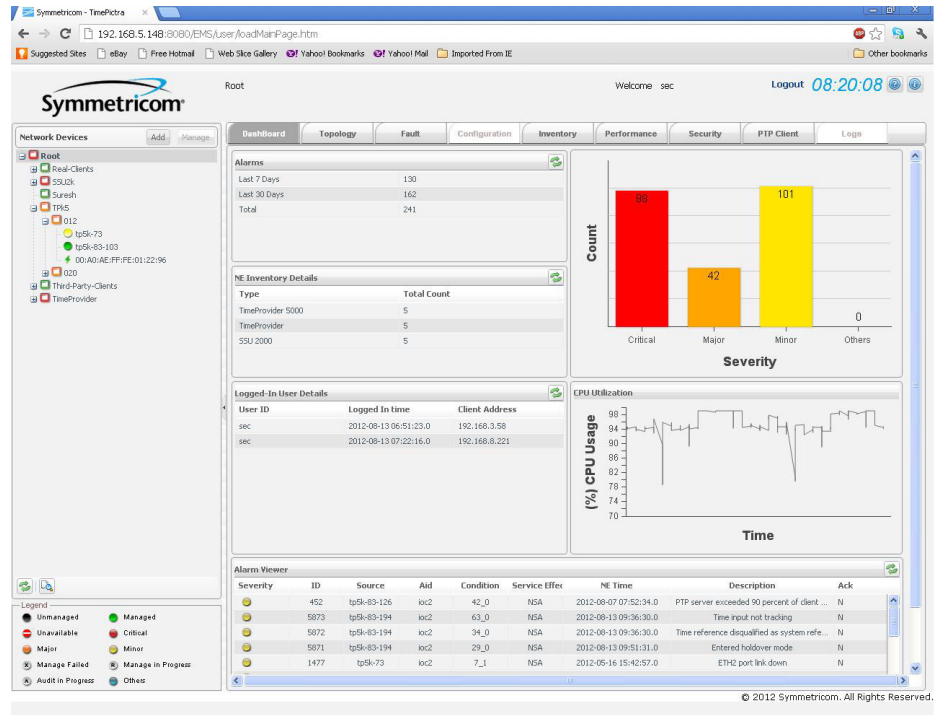
IEEE 1588-2008 (PTP) Network and Client Management

With increased reliance on accurate timing and synchronization in critical Ethernet networks such as in the communications, power utility and financial services industries, the IEEE 1588-2008 Precision Time Protocol (PTP) has emerged as the protocol of choice. TimePictra provides end-to-end PTP management including device auto discovery, navigation tree display with hierarchy domain, sync flow monitoring, and key performance index monitoring. This end-to-end management enables network operators to have full visibility of PTP timing.

TimePictra manages IEEE 1588-2008 (PTP) remote clients located at the edge of the network—including clients not supplied by Symmetricom. It can add or delete clients and monitor their status in terms of sync flow detected or not detected. TimePictra management functions include automatic client detection and reporting of alarms, events, status and performance metrics.

Network Operations Integration

Many network operators integrate element management with their operating systems for overall management of multi-vendor, diverse equipment environments. TimePictra enables integration of its northbound interface using SNMP for alarm integration and TeMIP northbound for alarm and topology integration.



TimePictra Dashboard

TimePictra

FCAPS Capabilities

Fault Manager

The Fault Manager provides access to all of the network elements. Events and alarms are displayed using a color-coded format compliant with ITU-T standards; notifications are easily intelligible. Whether in an office or in the field, network personnel have the ability to readily access the entire suite of information about any of the synchronization Network Elements (NEs).

| Alarm Details | Sort | Filter | Hide Ack Alarms | Show Ack Alarms | Discharge | | | | |
|--|-------|----------|-----------------|-----------------|-----------|----------------|-----------------------|-----------------------|-----------------|
| Total Alarms : 126 | | | | | | | | | |
| Acknowledged : 3, Critical : 23, Major : 19, Minor : 81 | | | | | | | | | |
| Time Period : 2003-01-21 16:34:12.0 - 2012-03-02 01:48:10.0 | | | | | | | | | |
| Ack | ID | Severity | Source | AID | Condition | Service Effect | NE Time | Server Time | |
| <input type="checkbox"/> | 40805 | Minor | tp-190 | INP1 | INPFRQ | NSA | 2010-02-21 13:15:04.0 | 2012-02-26 19:09:13.0 | FREQUENCY |
| <input type="checkbox"/> | 40191 | Critical | TP101 | IOC1 | CLKHOLD | NSA | 2012-03-02 01:48:10.0 | 2012-02-25 18:25:01.0 | CLOCK ENTR |
| <input type="checkbox"/> | 39757 | Critical | TP101 | GPS | INPOISQ | NSA | 2012-03-01 01:23:08.0 | 2012-02-24 18:09:59.0 | INPUT DISQUALIF |
| <input type="checkbox"/> | 39755 | Critical | TP101 | GPS | GPSSTRK | NSA | 2012-03-01 01:23:01.0 | 2012-02-24 18:09:52.0 | GPS NOT TRU |
| <input type="checkbox"/> | 39712 | Critical | TP101 | IOC2 | BTBOULP | NSA | 2012-02-29 23:08:53.0 | 2012-02-24 15:45:44.0 | BESTTIME BACKUP |
| <input type="checkbox"/> | 39710 | Critical | TP101 | IOC1 | BTBOULP | NSA | 2012-02-29 23:08:53.0 | 2012-02-24 15:45:44.0 | BESTTIME BACKUP |
| <input type="checkbox"/> | 39708 | Critical | TP101 | RTMC-1 | S1LOS | NSA | 2012-02-29 23:08:47.0 | 2012-02-24 15:45:38.0 | SIG |
| <input type="checkbox"/> | 39706 | Critical | TP101 | PRS | INPLOS | NSA | 2012-02-29 23:08:47.0 | 2012-02-24 15:45:38.0 | PG |
| <input type="checkbox"/> | 39466 | Critical | TP101 | GPS | FFPOFF | NSA | 2012-02-29 09:42:59.0 | 2012-02-24 02:19:50.0 | FFOFF TH |
| <input type="checkbox"/> | 38467 | Critical | TP101 | IOC2 | CLKHOLD | SA | 2012-02-28 23:24:49.0 | 2012-02-23 18:01:40.0 | CLOCK ENTR |
| <input type="checkbox"/> | 38400 | Critical | TP101 | GPS | GPSPOS | NSA | 2012-02-28 23:24:49.0 | 2012-02-23 18:01:40.0 | GPS ANTENR |
| <input type="checkbox"/> | 38387 | Critical | TP101 | SYS | PWRB | NSA | 2012-02-28 23:08:49.0 | 2012-02-23 15:45:41.0 | PG |
| <input type="checkbox"/> | 38383 | Critical | TP101 | INP1 | INPLOS | NSA | 2012-02-28 23:08:47.0 | 2012-02-23 15:45:38.0 | PG |
| <input type="checkbox"/> | 38379 | Critical | TP101 | PRS | INPOISQ | NSA | 2012-02-28 23:08:45.0 | 2012-02-23 15:45:36.0 | INPUT DISQUALIF |
| <input checked="" type="checkbox"/> | 37503 | Minor | tp-102 | GPS | ANTCOMM | NSA | 2012-02-23 14:33:16.0 | 2012-02-22 18:15:55.0 | GPS ANT |

TimePictra Fault Manager

Configuration Manager

The Configuration Manager allows network personnel to access NE data and update their configurations from within this single application. Information is provided graphically at system, port and card levels. The optional Group Management Pack increases efficiency by defining groups with common users, resources and policies for such things as configurations and alarm mapping.

The screenshot shows the Symmetricom Configuration Manager interface. It features a navigation menu on the left with options like 'Network Devices', 'Fault', 'Configuration', 'Inventory', 'Performance', 'Security', 'FTP Client', and 'Logs'. The main area displays a network diagram with nodes and connections. Below the diagram, there are configuration parameters such as 'Asset Number: 1175111', 'Bridge Time (Sec): 500', 'Date and Time: 2012-09-13 07:34:05', and 'Leap Seconds: 35'. The interface is clean and professional, with a clear layout for managing network configurations.

TimePictra Configuration Manager

Accounting (Inventory) Manager

This manager provides inventory information on any of the managed elements in the synchronization network. Information is provided down to the lowest level of granularity, including such information as location, serial number, part number, type of equipment, software and hardware revision levels.

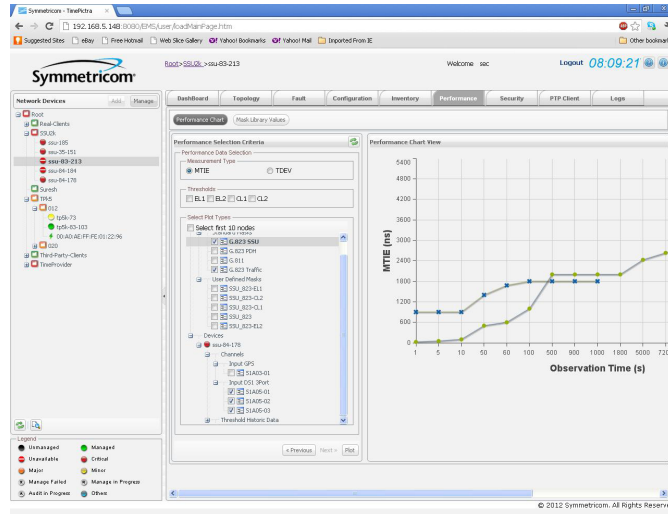
| Sev | Aid | Source | Serial No | Model No | ELI5 | Firmware Rev | H/W Rev | Equipment Type |
|-----|------|------------|-----------|--------------|--------|--------------|---------|----------------|
| | IOC | us8-73 | 50566 | 090-50311-01 | NA | 1.2.3 | H | IOC Card |
| | IOC1 | us8-73 | P5066 | 090-50321-01 | NA | 1.2.3 | H | IOC1 Card |
| | IOC2 | us8-73 | P57420 | 090-50321-01 | NA | 1.2.3 | H | IOC2 Card |
| | IO | us8-45-194 | NA | 090-50322-01 | NA | NA | NA | IO Card |
| | IOC | us8-45-194 | 589413 | 090-50322-01 | NA | 2.0.4 | J | IOC Card |
| | EXP0 | us8-249 | 124267 | 090-50401-01 | NA | 2.0.4 | B | EXP0 |
| | EXP1 | us8-249 | 124262 | 090-50401-01 | NA | 2.0.2 | B | EXP1 |
| | EXP2 | us8-249 | 127099 | 090-50401-02 | NA | 2.0.4 | B | EXP2 |
| | EXP3 | us8-249 | 127094 | 090-50401-02 | NA | 2.0.2 | B | EXP3 |
| | IO | us8-249 | NA | 090-50311-01 | NA | NA | NA | IO Card |
| | IOC | us8-249 | 194233 | 090-50311-02 | NA | 2.0.3 | J | IOC Card |
| | IOC1 | us8-249 | 846262 | 090-50321-01 | NA | 2.0.4 | NA | IOC1 Card |
| | EXP0 | us8-45-128 | 127099 | 090-50401-01 | NA | 2.0.3 | J | EXP0 |
| | EXP1 | us8-45-128 | 124261 | 090-50401-02 | NA | 2.1.3 | J | EXP1 |
| | IO | us8-45-128 | NA | 090-50311-01 | NA | NA | NA | IO Card |
| | IOC | us8-45-128 | 140204 | 090-50311-02 | NA | 2.0.4 | J | IOC Card |
| | IOC2 | us8-45-128 | 862283 | 090-50321-01 | NA | 2.0.4 | J | IOC2 Card |
| | IOC | us8-45-103 | 116893 | 090-50311-01 | 116893 | 1.2.12 | JK | IOC Card |
| | IOC1 | us8-45-103 | P59743 | 090-50321-01 | NA | 1.2.3 | DT | IOC1 Card |

TimePictra Accounting (Inventory) Manager

TimePictra

Performance Manager

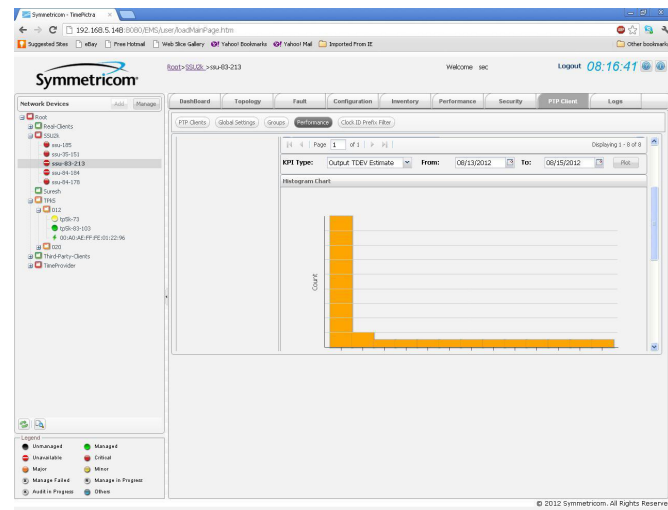
The Performance Manager graphically displays a variety of standard performance data such as MTIE, TDEV and phase, in order to proactively identify and correct problems in the synchronization network. TimePictra enables users to compare current readings to stored industry standard masks and previously stored data. With the Performance Pack option TimePictra will also display PTP performance metrics and PTP sync flow monitoring.



TimePictra Performance Manager, Sync Monitor

Performance Manager, PTP client visibility

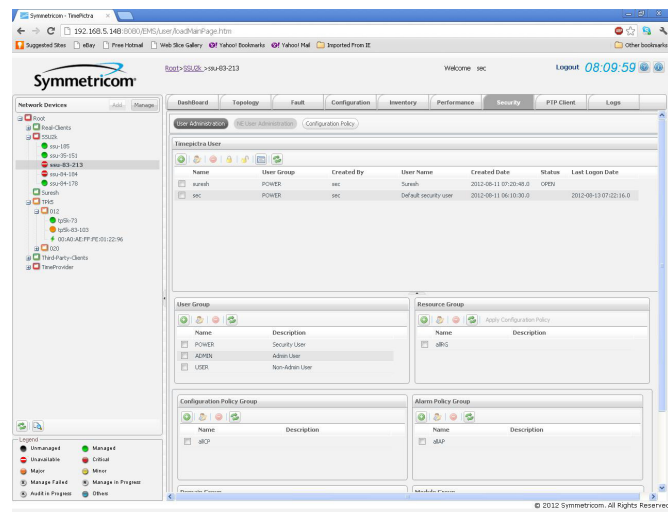
TimePictra end-to-end PTP management includes visibility of slave clocks distributed throughout the network. When the slave is a Symmetricon product, TimePictra will provide PTP performance metrics—delivering an advanced end-to-end value. Slaves from other vendors will also be monitored. If their sync flow disappears, an alarm will notify network administrators. These unique and valuable tools are included in the Performance Pack option.



TimePictra Performance Manager, PTP Performance Metrics

Security Manager

TimePictra offers several modes of security for managing synchronization networks. Multi-level, role-based access enforced by passwords and login requirements guarantees only authorized users can access the system. Securely administered permissions control access to domains and functionality. These management domains add both a level of security and organizational structure. SSL and data encryption communications ensures secure access over the Internet. Transaction logs ensure all activities by users are documented and logged. Encrypted TL1 communications (when supported by the sync NEs) ensure that events, alarms and commands are protected and secure, even from remote locations.



TimePictra Security Manager

TimePictra

Specifications

MANAGEMENT CAPACITY

(requires 5 GB database or higher)

- Up to maximum of 2,000 network elements
- Up to maximum of 50,000 PTP client elements

INDUSTRY STANDARD

- ITU-T M.3400 (FCAPS)
- ITU-T X.733 and X.734

MANAGEMENT PROTOCOL

- SNMP v1, v2c, v3, HTTP, HTTPS, TCP/IP

SYMMETRICOM PRODUCT SUPPORT

TimePictra supports these Symmetricom timing and synchronization products

- SSU 2000
- TimeProvider® 5000
- TimeProvider® 1500
- TimeProvider® 1000/1100
- TimeProvider® 500
- TimeSource® 3000/3100/3500/3600
- SyncServer® S250/S350 (alarms only)
- XLi (alarms only)

SERVER REQUIREMENT RECOMMENDATION

HARDWARE

- 64-bit PC server
 - Minimum 4 core 8 Thread 3 GHz Server
 - 8 GB RAM
 - Minimum 500 GB Disk Mirrored with local DB
- HP Itanium server

OPERATING SYSTEM

- PC server: Redhat 6.2 Linux 64 bit
- HP server: HP/UX 11v3 11.31 version

DATABASE

- Oracle 11g standard edition with suggested latest patch
- MySQL 5.1.62 (open source)

WEB-BASED CLIENT

- Firefox 8.0 or above
- Chrome
- Internet Explorer 9 (not recommended due to browser performance limitation)

BASIC SOFTWARE

FAULT MANAGEMENT

- Alarm viewer
 - Ack and discharge
 - Alarm detail
 - Auto alarm sync
 - Show/hide ack alarms
 - Sort
 - Alarm tool tip description
- Event history viewer
 - Event detail
 - Sort
 - Hide ack/cleared alarms
 - Event tool tip description
- Fault analysis
 - Active alarm/historical event analysis (bar or pie chart)
 - Active alarm / historical event details
- Worse offender alarm

CONFIGURATION MANAGEMENT

- Network element
 - Creation and deletion
 - Manage and un-manage
 - Detail status and configuration view
- Domain and device navigation tree
- Device front panel display (physical view with LED display)
- Device logical view and modification
- Real-time alarm display in logical view panel
- Pass through (direct communication to NE)

ACCOUNTING (INVENTORY) MANAGEMENT

- Device inventory information retrieval
- Inventory detail
- Filtering display
- Device type
- Firmware & hardware revisions
- Serial number
- Others

PERFORMANCE MANAGEMENT

- MTIE and TDEV collection and calculation
- Current MTID and TDEV plot
- Performance plot
 - Input channel
 - MTIE with threshold
 - TDEV with threshold
 - Up to 10 lines plot simultaneously
 - Up to 15 days of historical data plot

SECURITY MANAGEMENT

- TimePictra user administration
- Standard user group
- User login access control
- Default and customized user profiles
 - Password failed login attempt
 - Change password on initial login
 - # of concurrent sessions
 - Password expiration days
- Network element user administration

ADDITIONAL BASIC FEATURES

- Topology maps and navigation tree
- System dashboard
 - Alarm, inventory, login users, license installed, alarm severity
- Alarm sync scheduler
- IP ping

SOFTWARE OPTIONS

Performance Pack option

- Auto collection on 24 hour interval
- Up to 1 year historical performance plot
- Symmetricom PTP client KPI monitoring (PTP client license required)
- PTP client sync flow monitoring (3rd party PTP or PTP client license required)
- Mask library (standard and user-defined masks)
- Threshold crossing alarm

SECURITY PACK OPTION

- HTTPS secure client and server communication
- Local Oracle DB
- Remote Oracle DB using SSL communication (requires Oracle enterprise edition and Oracle advanced security option)

GROUP PACK OPTION

- User preference Dashboard customization
- Full customization on user and resource groups
 - Domain, alarm policy, configuration policy, performance mask library
- Navigation tree drag & drop

REPORT PACK OPTION

- Various file formats: XML, PDF, HTML, CVS
- Print report function on
 - Activity log
 - Current and historical alarms and events
 - Inventory
 - Alarm policy audit (Group Pack license is also required)
 - Configuration policy audit (Group Pack license is also required)

SNMP NORTHBOUND OPTION

- Active alarms and events forwarding
- SNMP v2c and v3 traps

TeMIP NORTHBOUND OPTION

- Active alarms and events forwarding (ASCII format)
- Send topology once per day (ASCII and MD5 checksum files)
- Heartbeat to OSS system on one minute interval