Department of Electronics and Communications Engineering

Internship Report On

Microsemi Synchronization of FONS BD Ltd.

Submitted By:

Name: Farjana Tamanna

ID: 2011-2-55-011

Dept. of ECE

East West University

Submitted To:

Name: Iffat Alam

Lecturer

Electronics and Communications Engineering

Letter of Transmittal

13 April 2016

To

Iffat Alam

Lecturer

Department of Electronics and Communications Engineering

East West University

Subject: Submission of Project Report as Internship (ETE-498)

Dear Madam,

I am pleased to let you know that I have completed my Internship program at FONS BD Ltd, New Bialy Road, and Dhaka. The attaché contain of the internship report that has been prepared for your evaluation and consideration. The internship has given me a great opportunity to work with the networking system closely and also gave me the opportunity to apply the theoretical knowledge in real life situation which I have acquired since last four years from you and the other faculty of EWU, which would be a great help for me in future.

I am very grateful to you for your guidance throughout the internship period, which helped me a lot to acquire practical knowledge.

Thanking You.

Yours Sincerely

Farjana Tamanna

ID# 2011-2-55-011

Dept. of ECE

East West University

Declaration

I hereby declare that the internship report is done by me under the course "Research/Internship (ETE-498)". Requisite references are quoted to support my work. It has not been submitted elsewhere for the requirement of any degree or any other purpose except for publication.

Farjana Tamanna

ID: 2011-2-55-011

Dept. of ECE

Acceptance

This internship report is submitted to the Department of Electronics and Communications Engineering, East West University in partial fulfillment of the requirements for the degree of B.SC in ECE under complete supervision of the undersigned.

Iffat Alam

Lecturer

Electronics and Communications Engineering

East West University

Acknowledgement

At first I wish to convey my cordial thanks and gratitude to Almighty Allah for everything. I would like to thank my parents and everyone else who has supported me all the way through to complete the Internship program successfully and also to those who rendered their cooperation in making this report.

I would like to thank Iffat Alam Lecturer, Dept. Of ECE, EWU for guiding me with lots of effort and time to perform the internship program.

I want to convey my gratefulness to Md Jahirul Islam, Solution Engineer, FONS Bangladesh Ltd**,** who helped me greatly by providing valuable suggestion whenever required my internship report.

Abstract

This report is based on synchronization system of a telecom company. Microsemi is the world's leading sources of timing and synchronization solution. All clocks in a synchronization network must be referenced, or traceable. GPS can be used as a very accurate time base. The mobile components of the system obtain highly accurate timing information from the Global Positioning System which is used to synchronize their local clocks to UTC world time. This synchronization system connected to BSC and MSC. NTP Time Servers deliver a highly precise and stable clock for the system, and provide precise NTP time for the network.

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Chapter 1

Introduction

1.1 Introduction:

In the broadest terms, people like to view the Internet as a cloud, you put your data in one place, it comes out the place you want it to on the other side. In reality the internet is tens of thousands kilometers of fiber optic cable, hundreds of thousands to millions of kilometers of copper wire, and hardware and software connecting them all together in a redundant, fast, and self-sufficient network. But not to worry, it’s not that bad: you only have to worry about a very small portion of the network, you can let someone else worry about the rest, and you even get someone to yell at when things go wrong.

I had an opportunity to work with most leading IT and Optic Solution service provider that is FONS BD Limited. I consider myself lucky to get a chance to take a deep look into their development methods, working models, deals and industrial behavior. And I was intending to look into the Networking Industry and how it looks like practically, how they interact with their clients, how they design a system and what are their rules in their environmental work.

I got the chance to work in Microsemi project through FONS BD Limited. We know mobile networking is the principal part of our modern life. I decided to know about mobile networking and how does it work, how to set a synchronizer and backbone network, what are the important keys to design a beneficial network, how can I design cost effective network and how to mitigate downtime of a network.

1.2 About FONS BD LTD:

FONSBD (Fiber Optic Network Solutions Bangladesh Ltd) is the only manufacturer in Bangladesh to export Fiber Optic Products for last 18 years

It’s a Joint Venture with USA & Danish Fiber Company. It is Located at 143/1 New Baily Road, Dhaka-1000, Bangladesh.

FONSBD Specializes with the Following Network Products and Components:

- Fiber Optic Patch Cords and Pigtails
- All Types of Fiber Optic Connectors and Adapters

- Fiber Optic Cables
- ISP, NTTN, FTTX, FTTB Products
- Cable Management Products
- CATV Product
- Wireless & Wi-Il Products
- All Types of Switches & Routers
- OPGW Cable for Power sector
- Fiber Optic Signaling Products for Rail road
- After Sales Service
- Service & Installation
- LAN &WAN Products
- Test Equipments and tools (Splice machine, OTDR. Analyzers. Monitoring Systems, etc)
- Energy Storage

FONSBD emphasizes to PDCA (Plan, Do, Correct & Act) System to ensure all customers get the products with optimum cost efficiency and on time solutions of the highest quality of international standard by achieving zero defect in quality. It is an ISO9001:2004 certified company for Quality and Environmental Management.

FONSBD is exporting products to Australia, Denmark. France, Germany, Ireland, the Netherland, USA and other Countries.

Manufacturing capacity

- FC/LC/MTRJ/SC/ST/E2000/ Lx, 5 Termination/year 850 000 pcs
- Connector (ST/SC) Assembly/ year 2,184 000 pcs

- Adapter (ST) Assembly/year 1248 000 ocs
- Adapter (ST) Assembly/year 168 480 pcs
- Light Guide/year 40000 pcs

Chapter 2

Devices

2.1 PTP:

A point-to-point connection is a dedicated communication link between two systems or processes. In telecommunications, a point-to-point connection refers to a communications connection between two nodes or endpoints. An example is a telephone call, in which one telephone is connected with one other, and what is said by one caller can only be heard by the other. This is contrasted with a point-to-multipoint or broadcast communication topology, in which many nodes can receive information transmitted by one node. Other examples of point-to-point communications links are leased lines, microwave relay links, and two way radio. Examples of point-to-multipoint communications systems are radio and television broadcasting.

A telephone call is a circuit-oriented, point-to-point link between two phones. However, calls are usually multiplexed across telephone company trunks; so, while the circuit itself may be virtual, the users are engaging in a point-to-point communication session.

Figure 2.1: PTP

An end-to-end connection refers to a connection between two systems across a switched network. For example, the Internet is made up of a mesh of routers. Packets follow a hop-by-hop path from one router to the next to reach their destinations. Each hop consists of a physical point-to-point link between routers. Therefore, a routed path consists of *multiple* point-to-point links. In the ATM and frame relay environment, the end-to-end path is called a *virtual circuit* that crosses a predefined set of point-to-point links.

A shared LAN such as Ethernet provides a form of point-to-point communications. Keep in mind that on shared LANs, all nodes listen to signals on the cable, so broadcasting is supported. However, when one node addresses frames to another node and only that node receives the frames, one could say that the two nodes are engaged in point-to-point communications across a shared medium.

Point-to-multipoint connections are possible over multidrop links. A mainframe and its terminals is an example. The device that provides the multipoint connection is usually an intelligent controller that manages the flow of information from the multiple devices attached to it.

Point-to-point communications is defined in the physical and data link layers of the OSI protocol stack.

2.2 NTP:

Network Time Protocol (NTP) is a protocol that is used to synchronize computer clock times in a network of computers.

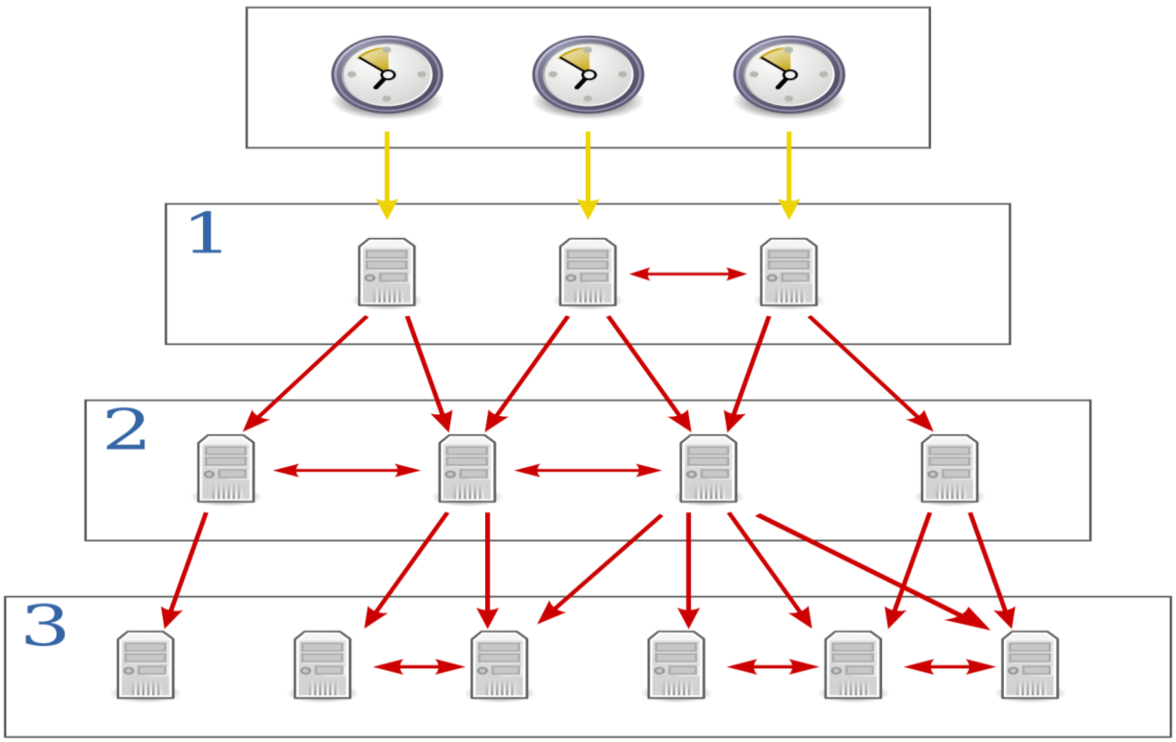

Figure 2.2:-Network Time Protocol Model

NTP uses Coordinated Universal Time (UTC) to synchronize computer clock times to a millisecond, and sometimes to a fraction of a millisecond. UTC time is obtained using several different methods, including radio and satellite systems. Specialized receivers are available for high-level services such as the Global Positioning System (GPS) and the governments of some nations. However, it is not practical or cost-effective to equip every computer with one of these receivers. Instead, computers designated as *primary time servers* are outfitted with the receivers and they use protocols such as NTP to synchronize the clock times of networked computers. Degrees of separation from the UTC source are defined as strata. A radio clock (which receives true time from a dedicated transmitter or satellite navigation system) is stratum-0; a computer that is directly linked to the radio clock is stratum-1; a computer that receives its time from a stratum-1 computer is stratum-2, and so on.

Accurate time across a network is important for many reasons; even small fractions of a second can cause problems. For example, distributed procedures depend on coordinated times to ensure that proper sequences are followed. Security mechanisms depend on coordinated times across the network. File system updates carried out by a number of computers also depend on synchronized clock times. Air traffic control systems provide a graphic illustration of the need for coordinated times, since flight paths require very precise timing (imagine the situation if air traffic controller computer clock times were not synchronized.

2.3 TDM:

Time-division multiplexing (TDM) is a method of transmitting and receiving independent signals over a common signal path by means of synchronized switches at each end of the transmission line so that each signal appears on the line only a fraction of time in an alternating pattern. It is used when the data rate of the transmission medium exceeds that of signal to be transmitted. This form of signal multiplexing was developed in telecommunications for telegraphy systems in the late 19th century, but found its most common application in digital telephony in the second half of the 20th century.

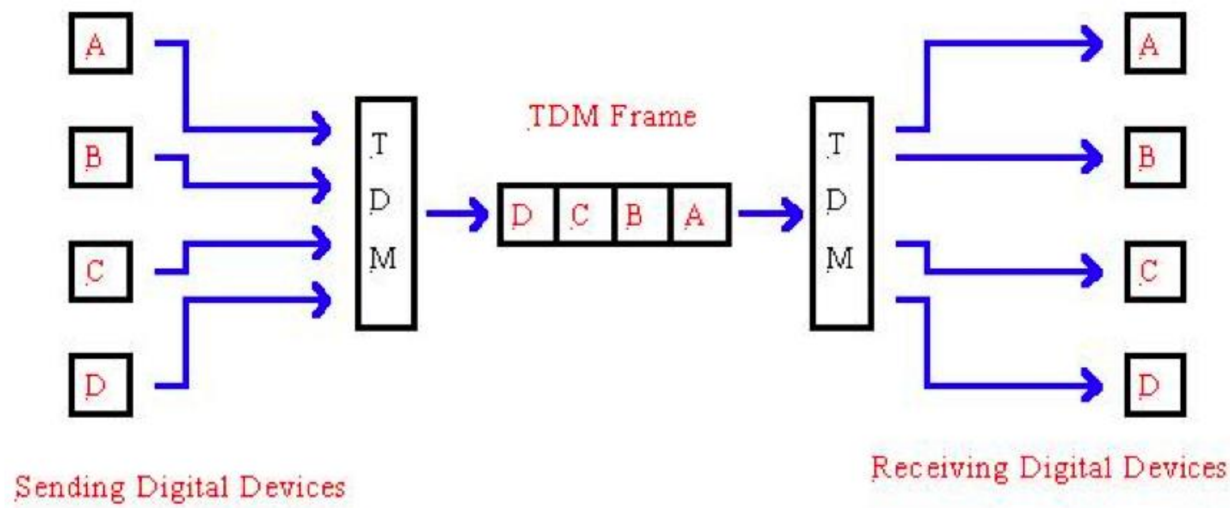

Figure 2.3: TDM

2.4 Patch Cable:

A patch cable or patch cord or patch lead is an electrical or optical cable used to connect ("patch-in") one electronic or optical device to another for signal routing. Devices of different types (e.g., a switch connected to a computer, or a switch to a router) are connected with patch cords. Patch cords are usually produced in many different colors so as to be easily distinguishable, and are relatively short, perhaps no longer than two meters. Types of patch cords include microphone cables, headphone extension cables, XLR connector, Tiny Telephone (TT) connector, RCA connector and ¼" TRS phone connector cables (as well as modular Ethernet cables), and thicker, hose-like cords (snake cable) used to carry video or amplified signals. However, patch cords typically refer only to short cords used with patch panels.

Figure 2.4: Patch Cable

Chapter 3

Synchronization Designing

3.1Time Pictra:

The TimePictra is a web-based management system for time, frequency and synchronization network elements. It features a modular architecture that will scale and evolve with operational requirements. As timing and synchronization grow 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.

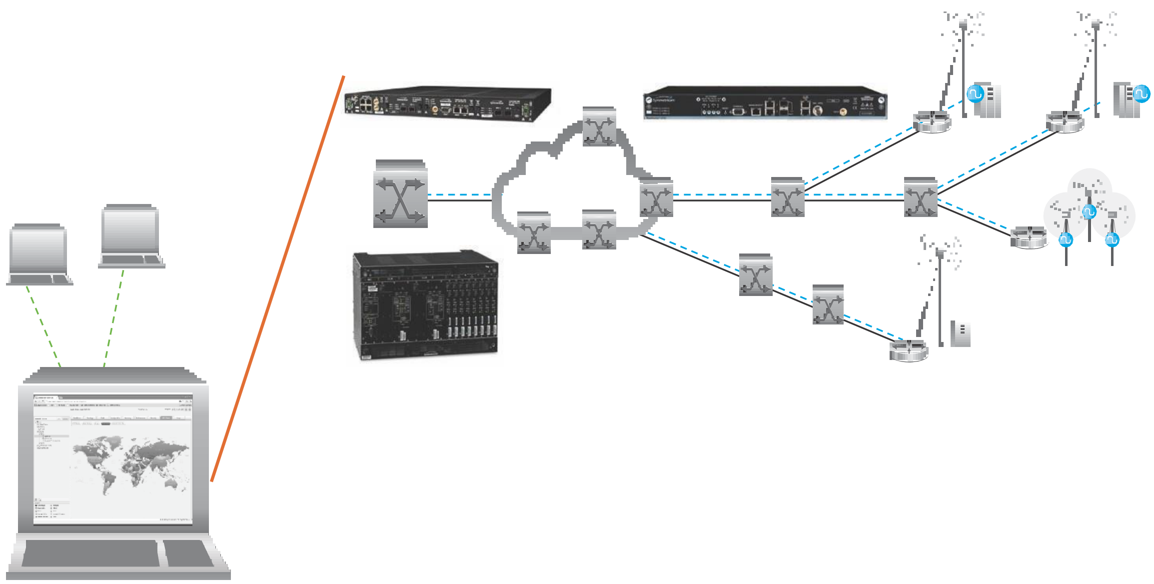

Figure 3.1: Time Pictra Synchronization Element Management System

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 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.

3.2Web–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

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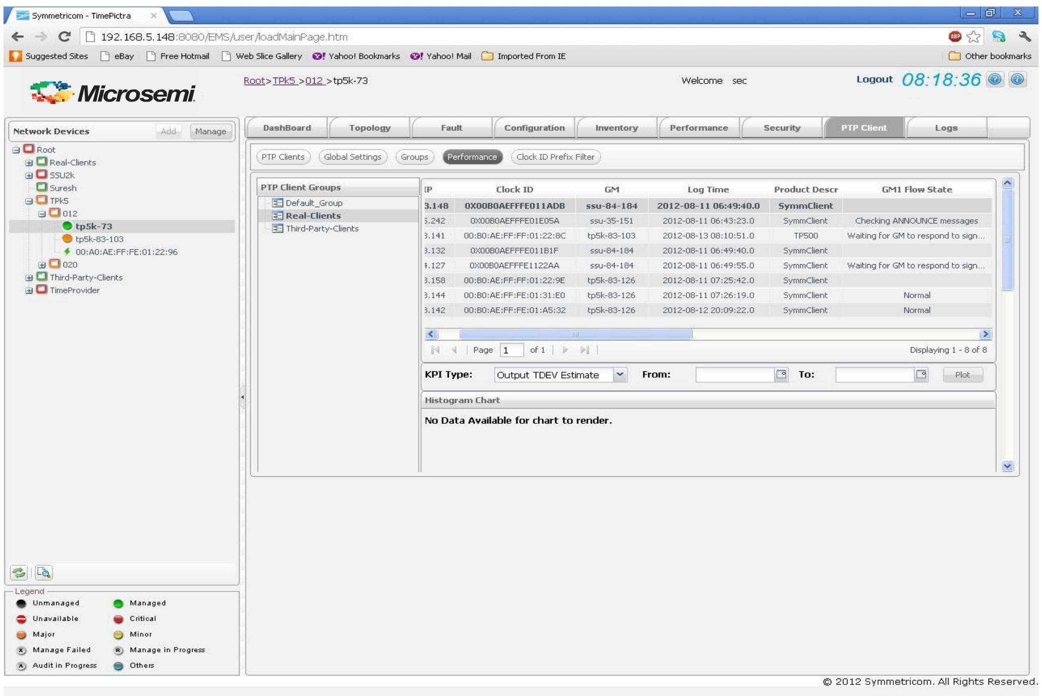

Figure 3.2: TimePictra Performance Manager, PTP Sync Flow Monitoring

3.3Dashboard:

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.

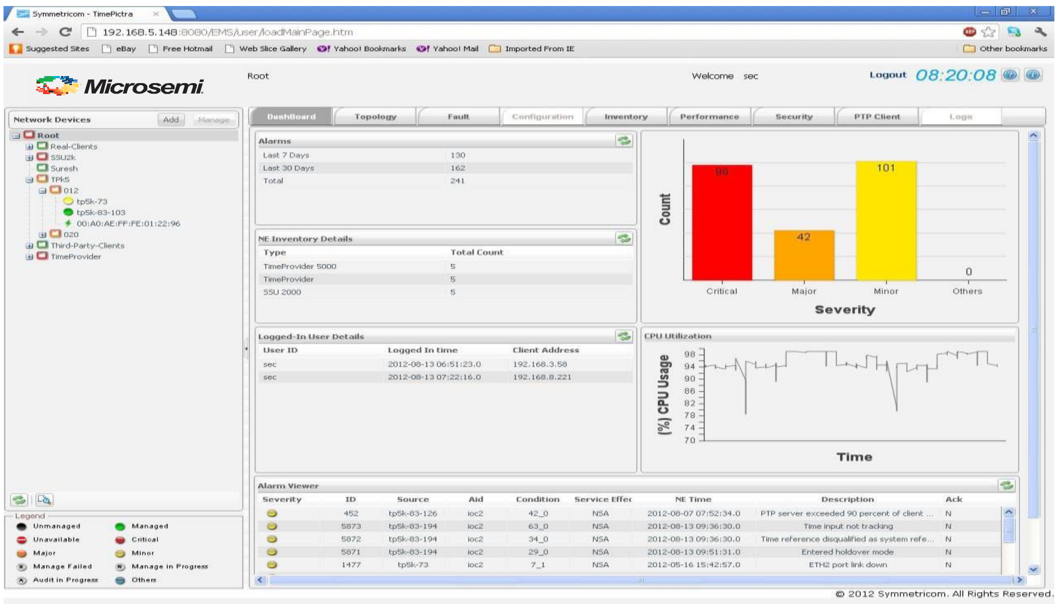

Figure 3.3: TimePictra Dashboard

3.4 IEEE 1588-2008 (PTP) Network:

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 monitors and trends IEEE 1588-2008 (PTP) remote clients and boundary clocks, located throughout the network—including clients not supplied by Microsemi. TimePictra will automatically add new PTP clients and ensure they maintain connection to a Grandmaster and with the possibility to collect PDV and performance statistics from every client in the Network, TimePictra provides to only end to end monitoring solution for PTP clients.

3.5 Network Operation 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 ASCII northbound for alarm and topology integration.

3.6 High Availability Option:

TimePictra High Availability option supports two geographically diverse servers to replicate the database and synchronization management functions; removing any single point of failure.

Chapter 4

Synchronization Manager

4.1 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.

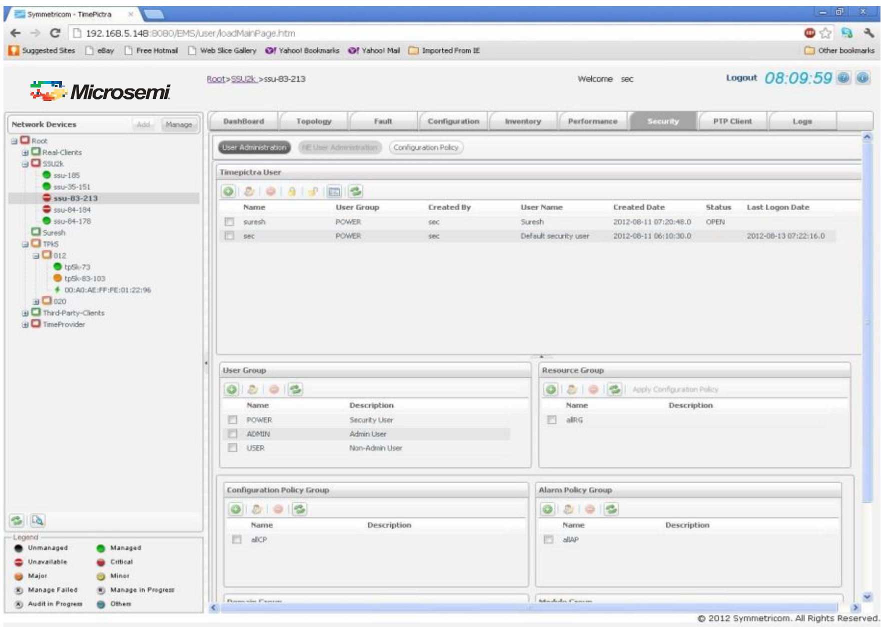

Figure 4.1: Time Pictra Fault Manager

4.2 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.

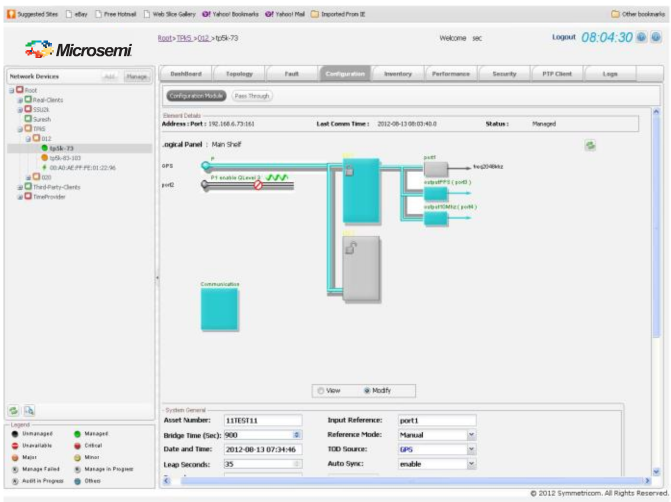

Figure 4.2: TimePictra Configuration Manager

4.3 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.

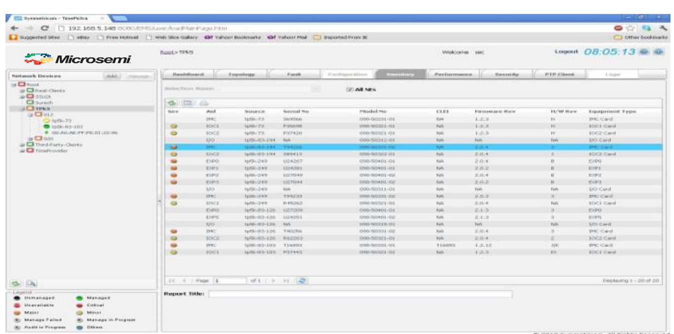

Figure 4.3: TimePictra Accounting Manager

4.4 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.

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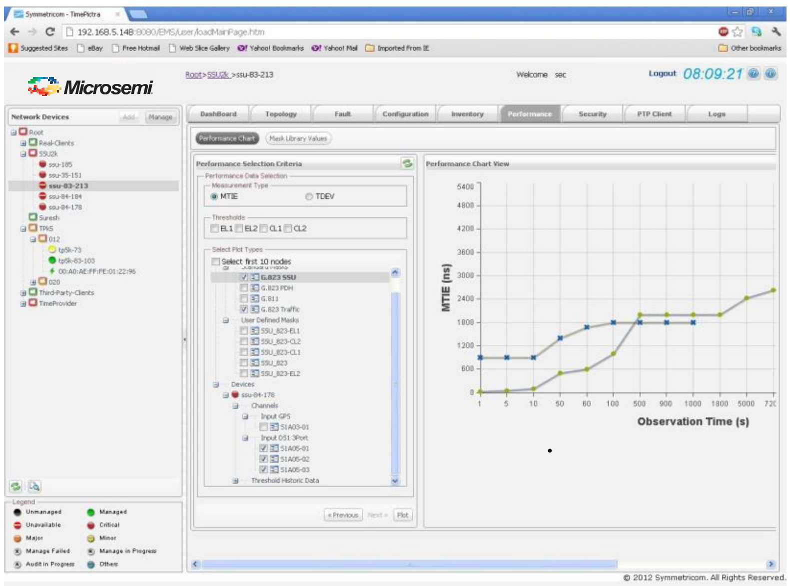

Figure 4.4: TimePictra Perfomance Manager

4.5 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 Microsemi 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.

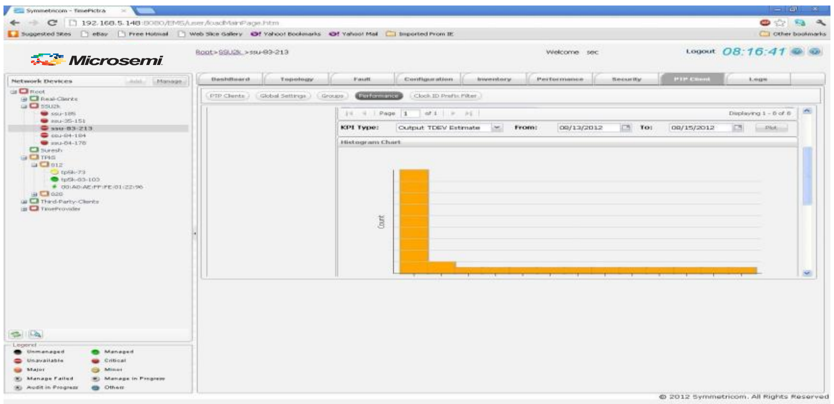

Figure 4.5: Performance Manager PTP client visibility

4.6 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.

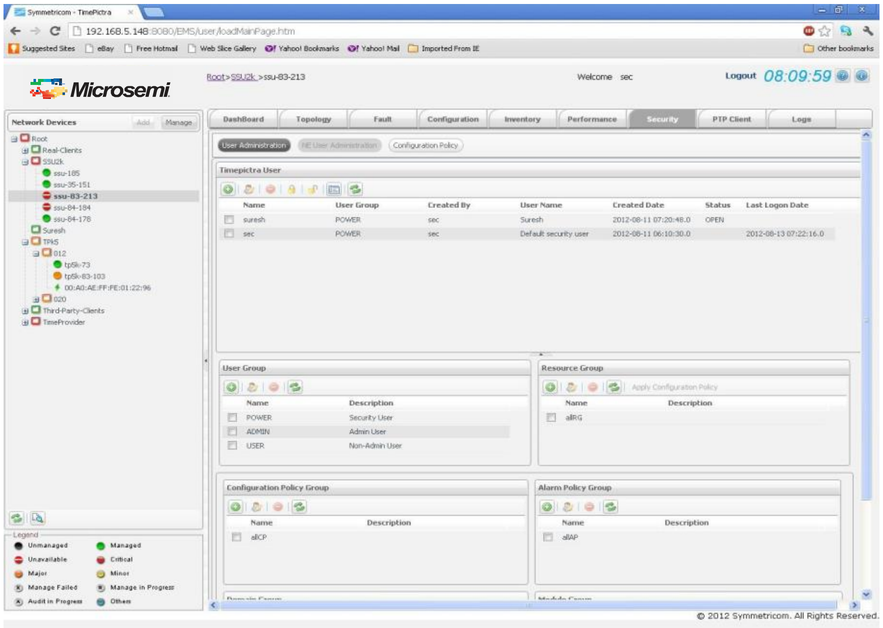

Figure 4.6: Time Pictra security manager

Chapter 5

Power Supply Unit

5.1 Synchronization Supply Unit (SSU) for Carrier-Grade Networks:

The Microsemi SSU 2000 and SSU 2000e are fully manageable synchronization systems used by communications network operators to generate and distribute superior synchronization signals for their networks. The SSU 2000 conforms to ANSI standards and is NEBS certified, while the SSU 2000e is ETSI certified. Both systems use the same plug-in cards.

In addition to traditional frequency network timing capabilities for SDH/SONET networks, the SSU 2000/SSU 2000e supports packet network synchronization with carrier-grade Network Time Protocol (NTP) server and IEEE 1588 Precision Time Protocol (PTP) Grandmaster capabilities. The platform supports the seamless introduction of SyncE output capabilities elements into your network through the optical Ethernet port on the PTP grandmaster card. The SSU 2000 and SSU 2000e use the latest hardware and software integration technologies to provide a complete synchronization system for current and future network needs.

The SSU 2000/SSU 2000e is a key element in the Microsemi synchronization distribution architecture (SDA) for LTE networks, synchronizing frequency for backhaul networks with SyncE, supplying PTP sync for the 4G/LTE mobile stations, and providing NTP sync for residential small cells.

Figure 5.1: SSU 2000 and SSU 2000e

5.2 High Capacity, High Availability Architecture:

The SSU 2000/SSU 2000e architecture is designed to integrate intelligent, functional cards into a flexible, fully redundant system to satisfy current capacity and synchronization technology requirements and allow incremental capacity growth and deployment of new capabilities with additional plug-in cards as they are needed. The SDU 2000/SDU 2000e Synchronization Distribution Unit (SDU) expansion shelves connect to a corresponding SSU 2000/ SSU 2000e main shelf to provide additional output signals. The expansion shelves use the framing and synchronization features of the main shelf to drive an array of output cards. Any combination of T1, E1/2048 kHz, Composite Clock and RS-422 output cards, as well as NTP and PTP server cards may be installed.

T1 and E1 output cards may be configured in redundant pairs providing 20 1+1 fully protected outputs per pair. A fully configured SSU 2000 system provides T1/E1 output total capacity of up to 1280 unprotected ports or 640 protected ports. A fully configured SSU 2000e system supports up to 460 protected or unprotected ports. Both shelf systems support high capacity NTP and PTP cards in single server or 1:1 protected configurations. Additional server cards grow total system client capacity. SyncE is available as an option on the PTP cards.

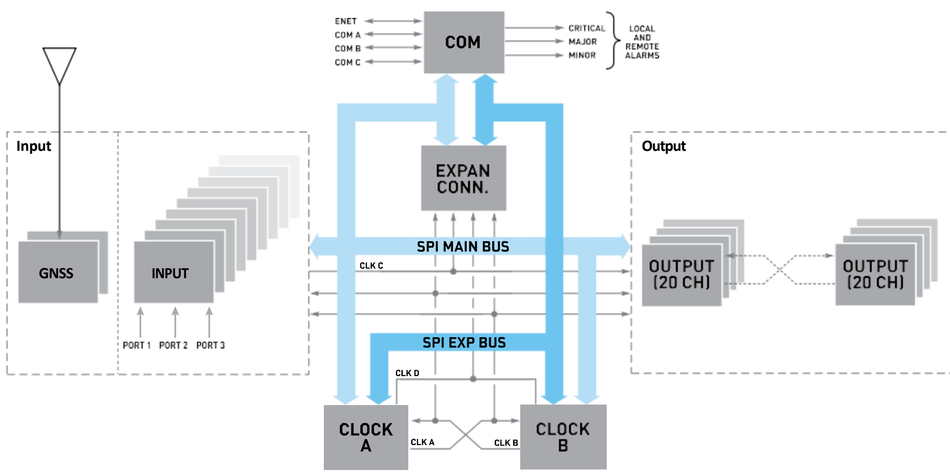

Figure 5.2: SSU 2000/2000e block Diagram

Chapter 6

Synchronization Card

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6.1 Intelligent Cards:

Each card has an integrated CPU with software for superior reliability, flexibility and functionality. Cards can be hot-swapped while the unit is operating without any degradation of the output signals. Each intelligent card supports the management of critical, major and minor alarms. Powerful management can be performed to and within each card through the communication card, including in-service upgrades of software and programmable logic devices. Auto-reconfiguration: If a card is removed and a like card installed in the same slot, the new card will be automatically configured to the same settings as the previous card.

6.2 GNSS Cards:

The SSU 2000/SSU 2000e integrates single or dual satellite system receiver cards to meet primary reference clock requirements. Integrated capability delivers these key benefits:

1. Flattens the number of levels in the synchronization distribution hierarchy

2. Improves the overall performance of the network

3. Lowers the overall OAM&P costs (Opera- tion, Administration, Maintenance, and Provisioning).

4. Single unit PRS

5. UTC traceable time source for integrated PTP grandmaster clocks and NTP servers

Two cards are available: The GNSS card supports GPS and GLONASS signals and can be locked to either one or both simultaneously. Also available is a dedicated GPS-only card.

6.3 Input Cards:

The SSU 2000 accepts up to nine input cards; the SSU 2000e accepts up to three input cards. The platform supports the following input signals:

1. T1 (framed)

2. E1 (framed)

3. SSM quality

4. JSW JCC (Japan)

5.1 MHz (sine or square)

6.1.544 MHz (sine or square)

7.2.048 MHz (sine or square)

8.5 MHz (sine or square)

9.10 MHz (sine or square)

In the SSU 2000e each input slot supports connections for termination, bridging, monitoring and traffic pass-thru. These connectors provide performance monitoring, impedance termination and traffic pass through to network elements and input references. Various input impedance panels are available for the SSU 2000 to support the following balanced or unbalanced signal impedances:

. 50 ohms (sine)

• 75 ohms (T1/E1)

• 100 ohms (T1)

• 120 ohms (E1)

.133 ohms (CC)

.High impedance for timing extraction only

.(bridging mode)

.Panel/adapter connection interfaces:

.Wire wrap

.BNC

.Siemens

.DE-9

6.4 Intelligent Clock Cards, Superior Holdover Performance:

The SSU 2000/SSU 2000e accepts single or dual clocks. Three clock cards are available to meet different international standards and specific holdover requirements: ITU-T Type 1 (ETSI Slave Clock, enhanced quartz oscillator), Type II (Stratum 2E, enhanced rubidium oscillator), and Type III (Stratum 3E, enhanced quartz oscillator). Redundant configurations may use a mix of technologies. In case of loss of GNSS and input references, the SSU 2000/SSU 2000e use intelligent software to provide enhanced output performance beyond the required holdover stability. Its superior holdover capability retains stratum G.812 performance for three weeks during holdover conditions with Microsemi rubidium technology.

6.5 Output Cards:

Any output card can be removed or inserted while power is applied without affecting the operation of any other card or the system. Various output cards are available to meet specific signal and interconnection requirements including T1, E1, CC, JSW, JCC, RS-422, NTP, and IEEE 1588 PTP. The activation of the output ports are fully user controllable.

Figure 6.5: Output Cards

6.6 E1/2.048 MHz Output Card:

The E1/2.048 MHz output card has 20 ports that are software-selectable for either E1 or2.048 MHz output signals. The E1 signal has a multiform format, with selectable Channel Associated Signaling (CAS) or Common Channel Signaling (CCS).

6.7 T1 (DS1) Output Cards and Capabilities:

The T1 output card has 20 ports. The T1 output card generates phase-locked output signals of 1.544 MHz

6.8 E1 and T1 Line Retiming Units (LRU):

The SSU 2000 supports both E1 and T1 line retiming units (LRU). The LRU is comprised of a Line Re-timing Module (LRM) and a Cut-Through Assembly (CTA). The LRU is a four-port (quad) card. The LRU inserts E1 or T1 signals on both sides of a cross connect panel in a central office. Side 1 of the re-timer provides "3R" (Re-shape, Re-amplify, and Re-time) for the signal to a client network element. When the LRU receives a data stream, it re-times the data with the transmit clock signal. The clock signal is inserted into the line route between two path-terminating elements. Side 1 is the direction in which timing is applied, and contains the line performance reporting and AIS generator. Side 2 provides "2R", which Re-shapes and Re-amplifies the signal from the client network element.

NTP Performance	Enterprise Class	SSU 2000
Time Stamping Precision	Software (10µs)	Hardware (10ns)
Scalability	Fixed	Card based
Holdover	√	√
Redundancy		√
TL1 Management		√
. NEBS		√

Figure 6.7: SSU 2000/SSUe carrier –grade NTP meets high QoS requirements for NGN telecommunications network.

6.9 Composite Clock Output Card:

The Composite Clock output card generates 20 signal pairs (TIP and RING signal pairs). Each output is a transformer- coupled symmetrical pair. Each output pair can be turned off independently of other channels. Relays on each output allow for disconnecting the driver output from the output pins.

6.10 RS-422 Output Card:

The RS-422 output card generates 10 balanced square-wave outputs (TIP and RING signal pairs on ports 1-10) and 10 single-ended (RING) TTL square wave outputs on ports 11-20. Each output can be turned off independently of other ports. Relays on each output disconnect the driver output from the output pins.

6.11 NTP Server Card:

NTP requirements in telecommunication networks have rapidly evolved from a "best effort" utility to mission critical. With high performance NTP server cards the SSU 2000/SSU 2000e platform delivers carrier-grade NTP to meet demanding next generation network requirements. The NTP server cards provide the performance, scale, availability and security that assure high QoS delivery of advanced services such as IPTV, multimedia content delivery and residential small cells, as well as distributed BSS/OSS operations. The NTP server cards are fully integrated into the SSU 2000/SSU 2000e platform. NTP cards can be installed as single servers or redundant pairs in any available master or expansion shelf output slot. NTP capacity scales up at a rate of up to 1000 fully authenticated transactions per second (TPS) or up to 1500 unauthenticated TPS for each added card. Front-access NTP traffic ports utilize Small Form-factor Pluggable (SFP) modules for flexibility to support 100/1000BaseT electrical or 1000Base-X optical interfaces.

Figure 6.10: NTP server card

6.12 PTP Grandmaster Card:

With high-performance PTP Grandmaster server cards the SSU 2000/SSU 2000e platform delivers carrier-grade PTP to meet demanding NGN packet timing requirements. PTP cards provide the performance, scale, availability and security to deliver carrier-grade synchronization to remote PTP clients over Ethernet networks.

Chapter 7

Synchronization Management

7.1 Synchronous Ethernet:

The IEEE 1588 PTP card offers an option for SyncE physical layer frequency synchronization through the 1000Base-X optical Ethernet output port. Ethernet Synchronization Message Channel (ESMC) per the OSSP protocol is supported. Fully standards compliant SyncE with PTP makes the SSU 2000/SSU 2000e platform an excellent solution for next generation 4G/ LTE and mobile backhaul networks.

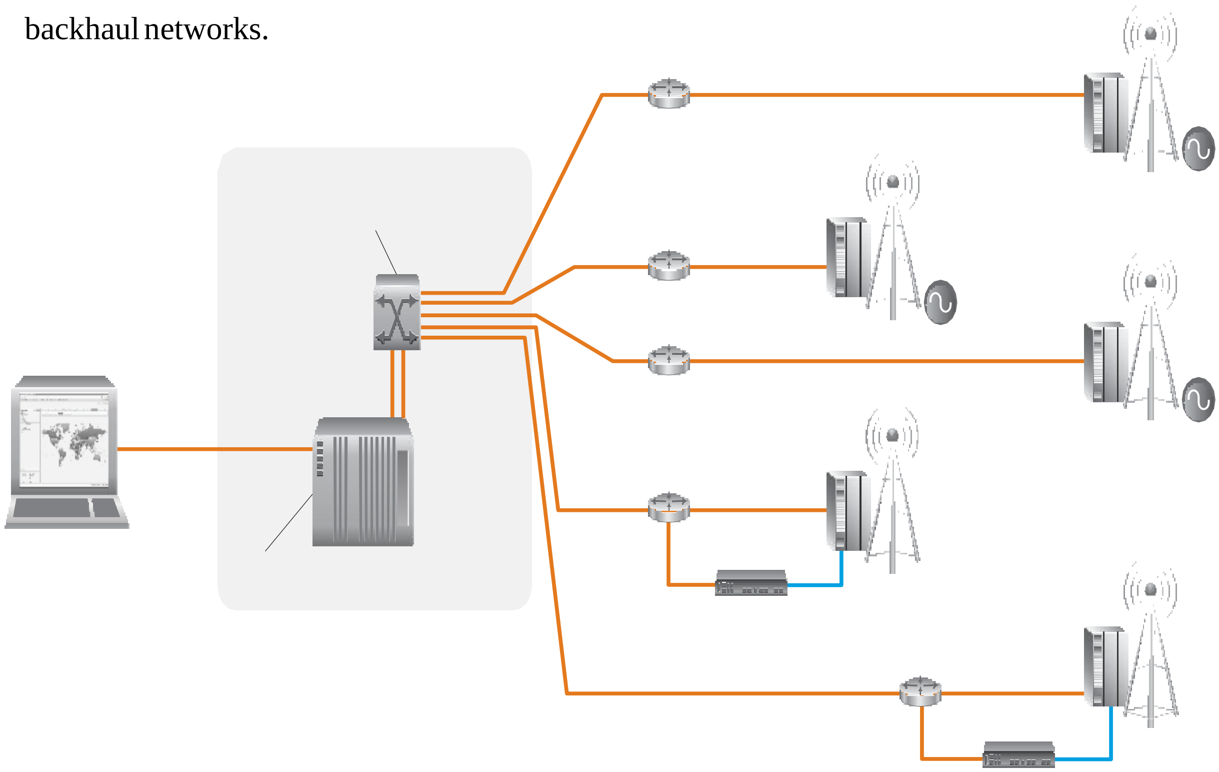

Figure 7.1: IEEE 1588 (PTP) Grandmaster Server Cards provide synchronization traceability over Ethernet to PTP clocks in remote base station.

7.2 Synchronization Status Messages (SSM):

The input card reads and processes SSM in accordance with ITU-T and ANSI standards to determine the traceability of inputs. This traceability information is then used by the clock cards in selecting a reference signal, and is embedded into the system's outputs. An embedded, editable table allows upgrades as standards evolve.

7.3 Communications, Management and Security:

The SSU 2000/SSU 2000e operates with a single communications card, available with basic features or with an enhanced security and SNMP option. The communications card supports TL1 and the Interactive Command Set (ICS), ASCII management interfaces. Coupled with Microsemi's advanced management software solutions, the communication module provides powerful fault, configuration, accounting/ inventory, performance, security, and other optional management functions.

7.4TimeCraft:

Available to support the SSU 2000/SSU 2000e, TimeCraft is an easy-to-use Graphical User Interface (GUI) management tool that reduces the complexity of using TL1 or CLI commands. Its intuitive GUI allows the operator to supervise and control a network element either remotely or locally through icons and simple point and click operations. TimeCraft capabilities include support for remote firmware upgrades and provisioning to the port level, event- driven fault management, physical and logical configuration management, and performance and security management.

7.5 TimePictra:

The SSU 2000/SSU 2000e is fully supported by Microsemi's TimePictra advanced Synchronization Management System. TimePictra provides full FCAPS capabilities (fault, configuration, accounting/inventory, performance and security) as well as an array of advanced management features, including the ability to monitor PTP clients. With a multi-tier architecture (server, client, and database) TimePictra provides 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.

7.6 Microsemi Global Services:

Microsemi provides synchronization services that assist customers with the planning, deployment and maintenance of synchronization infrastructure. Services are designed to help lower costs, streamline processes, ensure quality, and deliver the highest level of performance from your synchronization network. The Platform Maintenance service bundles together Microsemi's industry leading technical support along with all software maintenance. As part of Platform Maintenance, customer will receive all updates as well as all upgrades including all patches, point releases, maintenance releases and related documentation for your purchased version of software during the contract period.

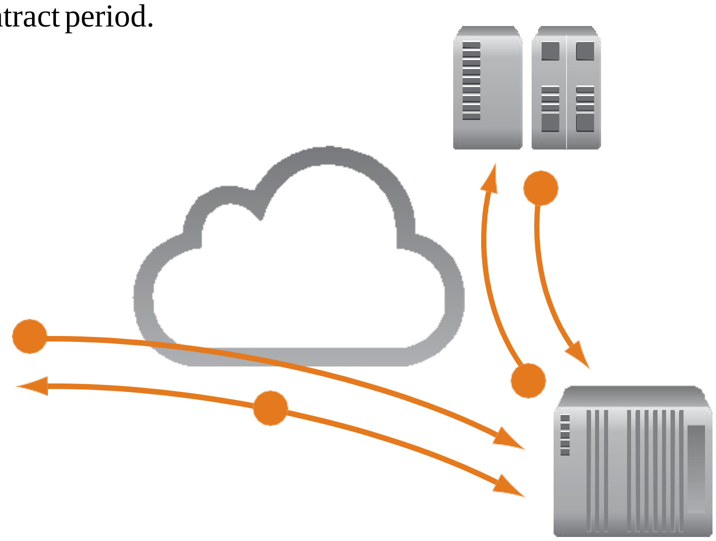

Figure 7.6: SSU 2000 with Radius Capable Communication Card

Chapter 8

8.1 Conclusion:

This Internship provides the opportunity to test interest in a particular career before permanent commitments are made. It gave me proper scope to gain experience and knowledge which co-relate with the theoretical background that we learned in university courses. I have learnt to be dedicated to the job. Dedicative mindset is the most important thing to work in such a sophisticated environment. It is beyond mere official matter. For working in FONS BD Ltd microsemi project I learnt about working process of multinational company and their rules and regulation. Experience of this internship will help me to make a better career in telecommunication field. I also learned new concept and new way of working. I have learned how to work in a team, and I often needed to meet expert person to resolve some problems. This whole experience such as network monitoring, survey and field operation has been very helpful for my future life.

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