Management of Operations on Network Elements at Element management Layer based on CLOG Architecture

Nidhin Joy Alappatt, Dr. S Ravishankar

***Abstract* -- Centralized monitoring and management of operations on Network Elements (NEs) in a telecommunication management network (TMN) is very important. Various protocols like TL1,SNMP,CORBA etc. have been standardized to provide control and management of different types of NEs.But it is necessary to know the operations performed on NEs. In this paper, we present Command Log System Architecture for management of heterogeneous Network Element operations. The Network Elements are configured to maintain logs i.e. the NEs will be generating log files containing all the operations performed on them along with time stamps.But these log files will be in different formats depending on NE type and also not understandable. The Command Log framework processes these Log files in two levels, namely a Monitor and Collector and Parsing and Merging and displays the log information in a User Activity Log (UAL) window and also generates XML files.**

***Index Terms* – EML, TMN, CLOG, OMS, Network Elements, DOM Parsing**

I. INTRODUCTION

The Optical Network Management System (ONMS) provides seamless, end-to-end optical network management of an entire transport network and reduces the need for manual intervention in managing global networks. Circuits can be provisioned from a single-seat management location, without complex manual provisioning tasks. It provides network management functions for optical transport networks. Optical network technology provides prodigious capacity to transport data. It has led to the development of optical network elements. These elements are based on the fact that majority of the traffic that enters the node is being routed through the node en-route to its destination as opposed to being destined to the node.

Clients can access and monitor these network elements through OMS. Thus Element Management is handled. When the Element Management System (EMS) information is sent through the northbound interface, it serves as the input for Network Management Systems.

With respect to this, Telecommunications Management Network (TMN) provides a framework for achieving interconnectivity and communication across heterogeneous operations system and telecommunication networks. To achieve this, TMN defines a set of interface points for elements which perform the actual communications processing (such as a call processing switch) to be accessed by elements, such as management workstations, to monitor and control them. The standard interface allows elements from different manufacturers to be incorporated into a network under a single management control. An EMS consists of systems and applications for managing network elements (NE) on the element management layer of the TMN model. CLOG comes in EML Layer and does parsing of the Log files produced by NE into user understandable format.

A. TMN Architecture and CLOG

Telecommunication Management Network (TMN) provides aarchitectural framework for achieving interconnectivity and communication across various telecommunication networks.TMN approach is used in optical management system to send and receive information and to manage its resources.

The TMN Architecture has 5 layers with five purposes, Business Management Layer analyses quality issues and business aspects like accounting and financial matters. An element management system manages one or more of a specific type of telecommunications network element. Typically, the EMS manages the functions and capabilities within each NE but does not manage the traffic between different NEs in the network. To support management of the traffic between itself and other NEs, the EMS communicates upward to higher-level network management systems (NMS). It is capable of scaling as the network grows, maintaining high performance levels as the number of network events increase, and providing simplified integration with third-party systems. The Network Management Layer, or NML, provides the functionality that is needed to commission, provision, and supervise the network that is deployed in a customer premise. NML provides an integrated system for sharing device information across management applications, automation of device management tasks, visibility into the health and capability of the network, and identification and localization of network trouble. By using common centralized systems and network-inventory knowledge, an NML delivers a unique platform of cross-functional management capabilities that reduces network administration overhead.The Service Management Layer, or SML, provides the functionality that is needed to commission, provision, and supervise a Virtual Private Network (VPN) deploys to its end users or to its customers. NEs in the Network Element Layer (NEL) are the basic equipments in the network.All the layers provide management of Faults, configurations, Accounting,Performance and Security related matters known as FCAPS.

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Nidhin Joy Alappatt, Dept of Electronics &Communication, R.V College of Engineering, Bangalore, India,.
Dr. S Ravishankar, Dept of Electronics &Communication, R.V College of Engineering, Bangalore, India,

The CLOG System is present in EML as shown in Fig 1. The EML interacts with network elements with the help of an intermediate Smart Network Adaptor (SNA). SNA is a common software adapter application within the architecture to communicate with devices that support TL1 (Transaction Language One), SNMP (Simple Network Management Protocol) or CLI (Command Line Interface) mechanism. As TL1, SNMP and CLI are three completely different communication paradigms the SNA would have to provide separate communication layers for each.The EML also has the provision to control NEs using their GUI. Various control operations of network elements will be done from network element's graphical user interface. The example of the operations may be inserting of cards, start supervising of NEs.

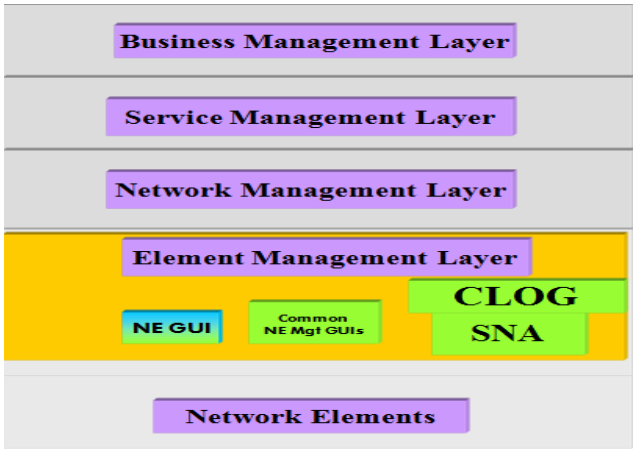

Fig. 1 Simplified five layered TMN Architecture showing CLOG System

I. CLOG ARCHITECTURE

The Command Log (CLOG) interacts with the other subsystems like PKT, SONET, SDH and WDM offering services located at Element Management Layer (EML) of a Network Management system. The Element Management Layer (EML) provides all the functionalities to access to the Network Elements (NE) deployed in the customer network and providing a single access point for the management of the NE.CLOG section provides a detailed view of log file contents of different NEs. CLOG converts the log file in different formats from different type of NEs to a common format(XML) and display it in viewable format in User Activity Log.

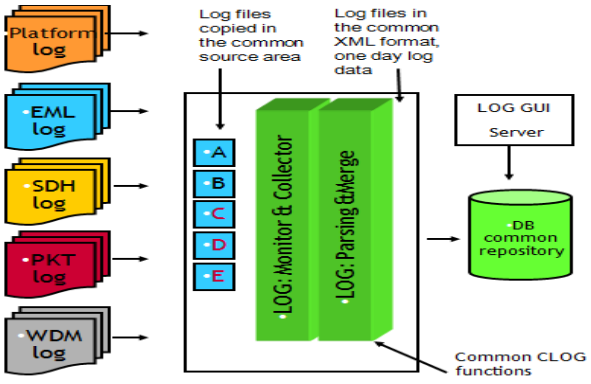

Fig. 2 CLOG Architecture

The log files from various subsystems like EML, SDH,PKT,WDM will be in different format. Forexample the Log files from EML contains all NE log files. CLOG has a stage called Monitor and Collector (MCOL) which collect the respective log files from all the subsystems and also from network elements /equipments and keep them in common source area. Now the second stage which is the Parser that pick up all the log files in parallel and performs parsing by suitable technology which is depended on the type of NE and its log. Now the parsed log files will be deleted from the source area keeping a 0 MB flag file back. After the second stage the system displays log information in GUI in User activity log window. Also we convert all the log files to a common xml format which is easily understandable.

A. Command Log File And Record Format

The operations being done on the network elements will be stored as log files. The log files includes data's like operator name, time at which action is performed, Subsystem name, Client host id etc.

1. User Activity Log file Format

The NE log files are compressed (via gzip) and named according with the following rule:
<Product>-<Release>-<Date>-<Time>.LOG.GZ
Example: xxxxx-R3.6-20140403-19-30-05.LOG.GZ

2. NE Label definition

The NE label is a mandatory field in XML UAL record that must be generated by the CLOG application.The NE label is not present into the UAL record generated from NE (ZIC) and is got from the UAL filename.According with the file transfer rules used , each NE file is stored in predefined directories, with a pathname depending form the managing Network Adapter (SNA instance number) and NE instance number.Correct definition of the filename, when transferred into the CLOG working area, and the following definition of the NE Identifier (Group ID and NE Id) are in charge to CLOG application.

3. Log record format

The Log record produced by one type NE is defined as following
<TimeStamp>,<HeaderType>,<UserID>,<UserPrivilege>,<SessionNumber>,<DestinationAddress>,<SourceAddress>,<EventType>,<Result>,<Command>,[<OMSID>],[<Verb>],[<Domain>],[<UserLabel>]
Example:
10-01-09-00-53-13,TL1,admin,CONF&NETADMIN&PROV&READ&SEC&DEBUG&NOTMOUT,10,3082,151.98.70.171,ECMR,COMPLD,'ENT-EQPT::EC320-1-1-20:T38259:::PROVISIONEDTYPE=EC320,AINSMODE=NOWAIT:IS',njo

II. CLOG IMPLEMENTATION

The implementation of the System is done to support log file parsing.Logs will be generated in a specified directory for each NE. These Log files from all the network elements will be picked up from NE location and will be placed in a common source area with the help of Monitor and collector system. So the common source area contains all the log files from all the subsystems. The parser will pick the log files from this location for parsing. Once Parsing is completed, the

log file in the source directory will be deleted leaving behind a 0MB flag file with same name of parsed log file indicating it as parsed.

The log file format varies from one type NE to another. The type difference can be the family type it belongs or protocols like TL1 or SNMP. The log file name indicates which type of NE its generated. Depending on the type of NE different parsing techniques are used. For example the log file format provided in above section is parsed by using pattern matching in Perl script. The individual log record contents were split and different parameters are assigned based on position in the record. The command is selected using pattern matching where the command will be always be in between single quotes.

Some log files will be having XML format which are parsed using DOM Parsing. The design is based on DOM model (Document Object Model) to alter or change the parameters of the network devices through the parser. DOM is a tree-based interface that models an XML document as a tree of various nodes such as elements, attributes, texts, comments, entities, and so on. A DOM parser maps an XML document into such a tree rooted at a document node, upon which the application can search for nodes, read their information. From the DOM tree we identify various fields based on node name.

Whatever is the parsing technology used the CLOG System obtains the following parameters/values from log records and write them to database to be displayed in ual. the values are Action,Application,Subsystem,Operator,Time,UtcTime,Status,ClientHost,RequestId,InvolvedObject,Details,XmlDetails .These values are used to convert non xml log files to log files using SAX Parsing. A SAX parser only needs to report each parsing event as it happens, and normally discards almost all of that information once reported. Thus, the minimum memory required for a SAX parser is proportional to the maximum depth of the XML file (i.e., of the XML tree) and the maximum data involved in a single XML event.

III. RESULT ANALYSIS

The log files were picked up from respective NE locations and got dumped into source area. Parallel parsing of different type of Log files was done successfully and the respective parameters like Action, Application, Subsystem, Operator, Time, Utc Time, Status, Client Host, Request Id, Involved Object, Details, xml Details are updated in UAL. The snapshot of UAL displaying with successful output is shown below.

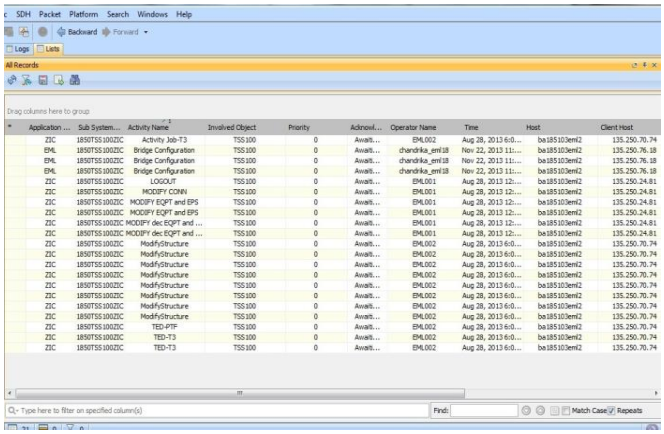

Fig 3. UAL output

Also all the log files are converted into a common xml file format and is placed in a new log directory. The xml file is updated with proper contents that is obtained after parsing of non xml log files. The result snapshot of xml contents is shown below.

```
<logger>
<log act="MODIFY EQPT and EPS">
<app>ZIC</app>
<subsys>1850TSS100ZIC</subsys>
<operator>EML001</operator>
<host>eml107</host>
<utc_time>2013-08-20 07:00:53</utc_time>
<client_host>135.250.24.81.64745</client_host
<status>SUCCESS</status>
<neList>
<ne>
<neLabel>TSS100-BA-01</neLabel>
</ne>
</neList>
```

Fig 4.XML output generated

IV. CONCLUSION

This paper proposed architecture of CLOG System that operates with any type of Network Element, equipped with its proprietary protocols.The developed framework assures a seamless communication and management of multiple heterogeneous NEs. The Log files generated from NEs will be parsed for informations like operator name, user id, client ip address, involved NE name, Application etc and will be displayed in User Activity Log window. Also the log files from different type NEs in different formats are converted into a unique XML format so that it become user friendly. Thus implementation of the proposed framework ensures total network management solution for any set of heterogeneous NEs making the user to know the operations on all associated NEs in the network at a single location with the help of a computer.

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