

# Fault Management and Performance Management of Network Management System Based on Operation & Maintenance (O&M) Agent

Ankita Gupta<sup>1</sup> Swetha S<sup>2</sup>

<sup>1</sup>M.Tech Student <sup>2</sup>Assistant Professor

<sup>1,2</sup>Department of ISE

<sup>1,2</sup>R.V. College of Engineering, Bangalore India

**Abstract**— with rapid growth in networks and change in demands of network management causes data insufficiency and irrelevancy. For managing networks and demand of changing requirements from various customers, Network Management System (NMS) is technique to reduce overheads of the network. NMS will surely provide reliability, availability and relevancy for networks if demands change. The current SNMP network management system has not been able to meet requirements, Therefore new strategy and technique must be provided to meet reliability, availability and maintainability of network. A new Operation & maintenance agent (O&M agent) has been introduced to meet performance of the network management. This paper will discuss about various aspects of NMS in terms of O&M Agents improving SNMP network management system and will also discuss about fault management and performance management in NMS through O&M Agent.

**Key words:** O&M, SNMP, NMS

## I. INTRODUCTION

Network management is a process of monitoring and controlling the network to ensure that it is operational, works and provides value to the network administrator and its users [2]. Network management system is classified into functional areas, those are fault management, account management, performance management, configuration management, security management (FCAPS) [3] (Sidnie Feit, 1995). The network management system's functional areas are described below:

### A. Fault Management:

Faults in networks can cause downtime and degradation[4] of networks and can also affects its performance. Fault management is a way to detect faults in networks, notify them to users and resolve them.

### B. Configuration Management [2]:

The aim of configuration management is to monitor all software and hardware elements in network according to vendors requirements.

### C. Account Management:

The goal of account Management is to keep Usage information of network resources.[3]

### D. Performance Management:

The aim of performance management is to measure various aspects of performance parameters of network performance and maintain the network performance in terms of availability and reliability. Performance parameters can be throughput, utilization of band width etc.

### E. Security Management:

The aim of security management to have control over access of information to authorized users so that no information will leak to third party (unauthorized access).

## II. TRADITIONAL NMS ARCHITECTURE

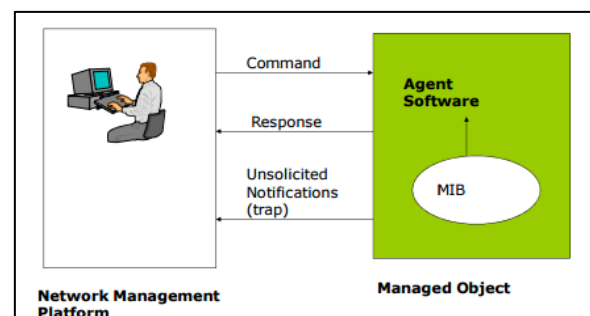


Fig. 1: Network Management System Architecture Based on SNMP

The network management system is a centralized network management model. This network management architecture consists of a centralized manager and a set of managed devices which consist of computer systems and other network elements. Central network can poll to each devices to know the status of each managed object, initially it should be user defined but software Agent in managed object will respond to each poll with trap (notification). All managed devices keep their information in database called as Managed Information Base (MIB). All managed devices run their software agents to communicate with master station to achieve all the functional areas FCAPS. This network System is based on SNMP Protocol so called as SNMP network Management System.

The SNMP network management system may not fully utilize the computing capacity of networks nodes like router due to its centralized management model [1]. Due to centralized in nature if network degrades, achieving availability and reliability can be a issue.

SNMP Network Management System work for FCAPS function area. Some servers like CiscoWorks2000 server [3] works on SNMP which helps to understand configuration management according to users need.

## III. OPERATION & MAINTAINANCE (O&M) AGENT

New generation NMS based on SNMP are capable to manage FCAPS function area but for testing networks, FCAPS are not only function area which should be achieved within networks, other various aspect must also meet like availability, reliability, scalability and maintainability. These other aspects can be achieved through Operation and Maintenance Agent. O&M agent.

O&M Agent helps to develop efficient operations & maintenance interface solutions for network elements. From Network Management System point of view O&M Agent:

- 1) Reduces testing and adaptation efforts.
- 2) Provides a network to introduce new O&M functionality.
- 3) Improves harmonization of O&M interfaces and release synchronization.

#### IV. ARCHITECTURE OF NMS BASED ON O&M AGENT

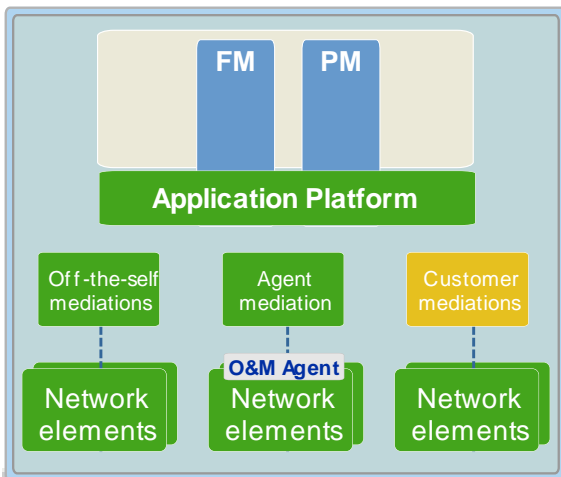


Fig. 2: Architecture of NMS based on O&M Agent

The NMS based on O&M Agent includes all the functionalities required for efficient telecom as well as IT level Network Element integration to it. It provides ultimate O&M interface implementation for reliable fault management over SNMP and efficient performance management functionality over bulk data exchange. This enables network element to concentrate on the business logic of the network element instead of detailed O&M interface implementation towards the management system. O&M Agent supports Adaptation concept that is introduced in NMS. O&M Agent offering the O&M implementation in the network element is easily verifiable without having management system communicating with the element. By this it reduces the debugging and integration effort of the solution. In addition to powerful fault management event and performance measurement transmission from network element applications, O&M Agent is out-of-the box capable of monitoring most frequently needed statistics from operating system resources. Also bringing reliability and scalability to 3<sup>rd</sup> party SNMP agents found in the system is supported.

#### V. FAULT MANAGEMENT OF NMS BASED ON O&M AGENT

A NMS is composed of a various network elements and the essential functionality of an O&M Agent and O&M interface is the capability for the detection of faults and the generation of alarms.

Examples of faults that may occur in the network are for instance:

- 1) Hardware failures, i.e. the malfunction of some physical resource within a NE
- 2) Software problems, e.g. software bugs, database inconsistencies

- 3) Communication failures between two network elements

Beside the Alarm reporting functions, O&M Agent and O&M interface must:

- 1) Provide means to synchronize the alarm situation in the NE and the Management System
- 2) Fulfil high reliability requirements

Above requirements can be refined to following main functions that the O&M Agent is implementing:

- Online-Alarm events
- Reliable Notification Mechanism
- Alarm Log
- Alarm Synchronization
- Co-operative Acknowledgement

Functionality of O&M Agent Fault Management in more detailed covers following features:

- Reliable alarm sending to Network Management Server using SNMP traps
- Alarm clearing by network element application
- Alarm severity changing mechanism
- Alarm acknowledgement by management system or network element application
- Sending of alarm notification to Network Management Server when alarm is cleared or changed
- Supporting reliable notification mechanisms (alarm ID, notification ID, alarm log)
- Fulfils the acknowledge concept (Network Management Server uses SNMP set method to acknowledge an error)
- Alarm synchronization
- Alarm history accessible to network element applications
- Alarm filtering based on severity, managed object classes or specific problem
- Web based User Interface

The network element reports the alarms to O&M Agent through the integrated O&M Agent application and O&M Agent sends the FM-notification to the manager.

- 1) Creating An Alarm Object

mo\_batch (master object database) object must be available in which the alarm object needs to be created or added.

- Use the following API to create an alarm object:  
P\_alarm\_object=OMA\_mo\_batch\_create\_alarm (app\_mo\_batch);

- 2) Fault Management notifications using APIs

- Create notification batch using the following API:  
P\_mo\_batch batch = OMA\_create\_notification (agent,fragment\_fm);

#### VI. PERFORMANCE MANAGEMENT OF NMS BASED ON O&M AGENT

Performance Management of O&M Agent and O&M interface provides functions to evaluate and report upon the behaviour and effectiveness of the network or network element. Its role is to gather and analyze statistical data for the purpose of monitoring and correcting the behaviour and effectiveness of the network (optimizing), network elements or other equipment /resources and to aid in planning, provisioning, maintenance and the measurement of quality.

O&M Agent uses the Simple Network Management Protocol in performance management for notifying NMS of availability of new measurements.

Functionality of O&M Agent Performance Management in more detailed covers following features:

- Measurement Result file generation for Management System in a form of XML files
- SNMP notification on availability of measurement data
- Data collection based on Measurement Schedule and Adaptation
- Alarm triggering based on measured data
- Measuring indicator values using SNMP from external SNMP agents

#### A. Creating A Measurement Interval:

mo\_batch object must be available in which the measurement interval needs to be created or added.

- Create the measurement interval using the following API:

```
p_measurement_interval interval =  
OMA_mo_batch_create_measurement_interval  
(p_mo_batch);
```

- 1) Set the interval using the following API:

```
OMA_measurement_interval_set_interval  
(p_measurement_interval object, Int value);
```

- 2) Add the measurement result to measurement interval using the following API:

```
p_measurement_result result =  
OMA_measurement_interval_create_measurement_result  
(interval);
```

#### B. PM notifications using APIs:

- 1) Create notification batch using the following API:

```
P_mo_batch batch = OMA_agent_create_notification  
(agent, FRAGMENT_PM);
```

- 2) Use the following API to send the notification:

```
void COMA_agent_indicate_change(p_agent agent,  
p_mo_batch batch)
```

## VII. CONCLUSION

As discussed in this paper SNMP Network Management System based on O&M agent has been able to meet requirements in terms of fault management and performance management. Other features from FCAPS like security management, configuration management and account management can be taken in to account and could be further enhancement for this O&M Agent.

## REFERENCES

- [1] Xin Huang, Yan Ma, Juhua Zhang "Study of the Active Network Management System Model based on Agent," IEEE-2008.
- [2] "Network Management System: Best Practices ," White Paper, CISCO.
- [3] Umesh Hodeghatta Rao "Challenges of Implementing Network Management Solution,"