Active vs. Re-Active Alarming in Wireless Network Monitoring

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ABSTRACT

The varied complexity of fielded wireless networks from multiple vendors and multiple technologies offered by a single wireless network operator require a novel way of monitoring that network. Services such as Voice and Data place huge demands on network operators to monitor Key Performance Indicators (KPI's) in Real Time (RT).

This paper discusses some of the key requirement that is necessary to implement a RT tool. The solution should utilize counters and measurements that react to predefined KPI' to inform key personnel of subpar performance so that quick corrective action can be taken to resolve faults. A brief discussion of CELLAPPS is also presented which address this need for a RT network monitoring tool

1.0 INTRODUCTION

Network monitoring in today's complex wireless networks is challenging due to multiple vendors and technologies being employed. The architecture design should take into account the maximum delay that is acceptable before a warning is issued to network operator teams for corrective action. Typically the shorter the time frame the better the network operator has in controlling and maintaining network availability and therefore customer satisfaction.

An important consideration for the design of a monitoring tool when deployed should be to actively inform the operator of faults in network nodes, or base stations, as appose to hunting for problems that may be there. The former is very time efficient or active alerting while the later is re-active and is time consuming and unreliable.

Current alarm management tools use built in triggers that are designed to inform operators of catastrophic hardware faults that affect network performance. These triggers are necessary but not sufficient to obtain a complete picture of network integrity. A system that employs network service measurements or counters can have added benefits by incorporating user experience such as high drop call rates or accessibility problems for voice services. For data services, an operator may also choose to monitor cell or sector level low data throughput rates or low data payloads. With backhaul reliability and capacity becoming a key part of the data network, forward or reverse error rates can also be monitored to detect faulty T1/E1 lines or microwave shots.

2.0 REQUIREMENTS

The foremost key requirement for network monitoring would have to be that all the data processing and paging logic must occur in real time or near real time. If data is being aggregated over a 60 minutes period for example, the delay for alarming should not be greater than 50% or 30 minutes. Data that is available at the top of the hour would be processed and key indicators sent out at the bottom of the hour. This single requirement will then dictate the architecture that is employed for a RT tool.

Of course there are many other requirements such as: multi level thresholds, threshold overrides to a cell or sector level, dynamic auto tuning of threshold levels to reduce false alarming, flexible alarm delivery mechanism and robust Graphic User Interface (GUI), all play a big role in tool design.

The design must also be scalable to handle rapid network growth. Also the user interface must be such that all levels of the organization use the same interface.

3.0 CELLAPPS

CELLAPPS is a second generation application that incorporates novel web 2.0 functionality for the user interface and utilizes open source software for the backend. Software such as MYSQL for the database, Apache for the web service, PHP and EXTJS for the GUI insures simple reliable architecture and insures scalability. In one deployment CELLAPPS is being used with measurement data from two vendors and two technologies with 15,000 three sector nodes.

The user interface is composed of four applications: CellBase, CellPage, CellMap and CellGraph as shown in Figure 1. Each application can either be used in a standalone configuration or as a suite.

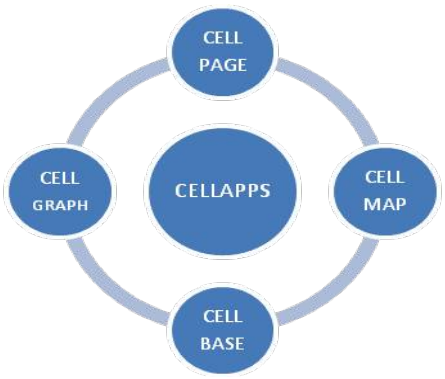

Figure 1 - CELLAPPS Applications

CellBase and CellPage form the main application and comprise the network monitoring RT tool. CellGraph adds data trending functionality while CellMap displays KPI data on a map. This is a major benefit when analyzing wireless data since faults affecting one cell will impact the operation of the surrounding cells as well. All tools utilize measurements such as Accessibility, Retainability, Mobility, Traffic, Throughput and hardware Utilization and all may be used for alerting.

Figure 2 shows a block diagram of some of the modules that CELLAPPS employs. Data from an Element Management System (EMS) is extracted on an hourly basis via sftp and are parsed with specialized parsers to filter the incoming data. Parser performance is critical to maintain the key requirement of RT. Then a set of KPI scripts is employed to extract useful measurements. This data is then loaded into databases. The heart of the RT tool is the Page Engine (PE). Here Stored Procedures (SP) is used with trigger points or thresholds to alert on deviant pre-defined KPI's. A robust GUI then connects to the databases and displays the alarms and warnings and ties the four applications together.

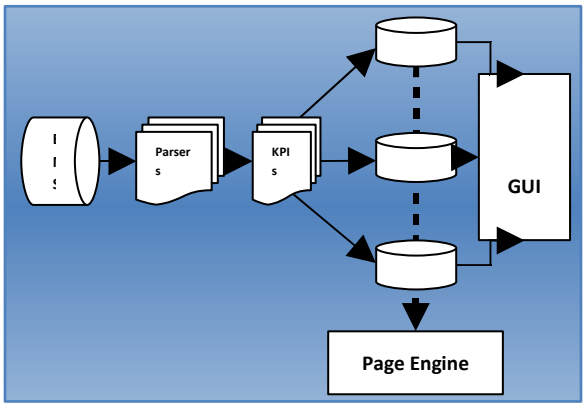

Figure 2 - CELLAPPS key Modules

3.1 CELLPAGE

Some key features of CellPage are:

- Levels of Pages
  - Alert
  - Warning
- Metric Data Types
  - Voice
  - Data
- Levels of Site Classifications
  - Normal
  - High Visibility
  - High MOU
- Cluster Level Paging
  - Operations Clusters
  - Engineering Clusters

3.2 CELLGRAPH

Some key features of CellGraph are:

- Aggregation
  - Site
  - Cell/Sector
  - Daily/Hourly
- Metric Data Types
  - Voice
  - Data

3.3 CELLMAP

Some key features of CellMap are:

- Aggregation
  - Daily/Hourly
- Metric Data Types
  - Voice
  - Data
- Modes
  - Real Time
  - Non-real time

4.0 SUMMARY

Today's complex wireless network implementation requires novel ways of monitoring and maintaining network quality. CELLAPPS is one application that addresses these challenges to help network operation and engineering teams to stay ahead and be in an active vs. re-active mode of operation.