ATAC

Advanced Trouble Analysis Center

Proactive Network Management

INTRODUCTION

Growing from regional to global, networks have become more complex which causes centralized data centers to require extensive data to maintain network performance and handle system failures. To predict the effects of system modification, designers require data and modeling to estimate future requirements and to determine the effects of upgrading the network.

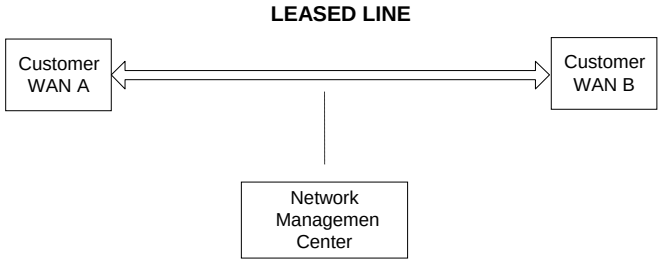
With Advanced Trouble Analysis Center (ATAC), network management gains the capability of remotely viewing the entire network: system operation is monitored and analyzed; noted disruptions from parameters are reported; trouble-shooting and problem solutions are dispatched. With modeling and real-time data for verification, ATAC accurately predicts the effects of increased traffic and system modification. These functions, including end-to-end views across Network to Network Interfaces (NNI), are deployed across multiple MCI network platforms.

Following is summary of ATAC:

- A multiple network platform tool, built on industry-standard components
- Additional components and features can be easily integrated
- Data is collected, analyzed, and stored
- Network errors are located
- When necessary, active data collection and notification are executed
- Advanced modeling characterizes problems and pre-analyzes system modifications and corrections
- Real data validates modeling data
- RAID7 enables data access for multiple hosts
- Information is visually displayed for technical end users (maintenance, support, administration, etc.)
- Customers and network planners can access data
- CD storage system maintains historical information
- *Proof of Concept* approach: test before deployment

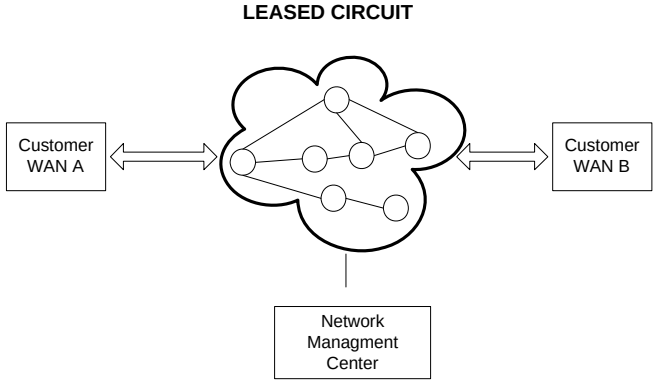
NETWORK GROWTH

Originally, networks expanded through the addition of Leased Lines, a permanent fixed route. The major issues of operation were *up*, *down*, and *garbage* (up—lines are up and running; down—lines are broken down; garbage—transmissions are clear). As the technology of networks evolved, the issues of operation expanded, including Committed Information Rate (CIR), Minimum Information Rate (MIR), Peak Information Rate (PIR), percent utilization, delay, and continuously monitoring up, down, and garbage.



The increase of issues occurred with the increase of the components that operate and interact within networks and customer requirements—Service Level Agreements (SLA). To maintain communication from Point to Point and to fulfill SLA, the Leased Circuit was created. The SLA and the Leased Circuit increased the complexity of network management. Within a *cloud* of multiple paths and components, there are many concerns: determine where to add bandwidth for increased traffic; how to monitor, repair, and upgrade Point-To-Point connections; determine the necessary upgrades for future system requirements.

With the lack of a global standard, ad hoc tools have been developed to monitor, analyze, and repair the internal segments of the network. Although effective, each tool is limited to a specific portion of the communications system. To monitor the global network—to track performance, to run diagnostics and repairs, to analyze potential problems and future upgrades—ATAC integrates the ad hoc industry standards into a proactive management system.



SLA MONITORING, DATA COLLECTION, AND ANALYSIS

One of the features of ATAC is network monitoring. ATAC is designed to supervise the entire communications system from the inside, out. ATAC's design, the integration of current applications (industry standards), simplifies the task of monitoring the global network. The application modules include NETSYS TECH, Nerve Center Pro, NETVIZ, StrataView Plus, HP OpenView, Cisco Works, and JYRA.

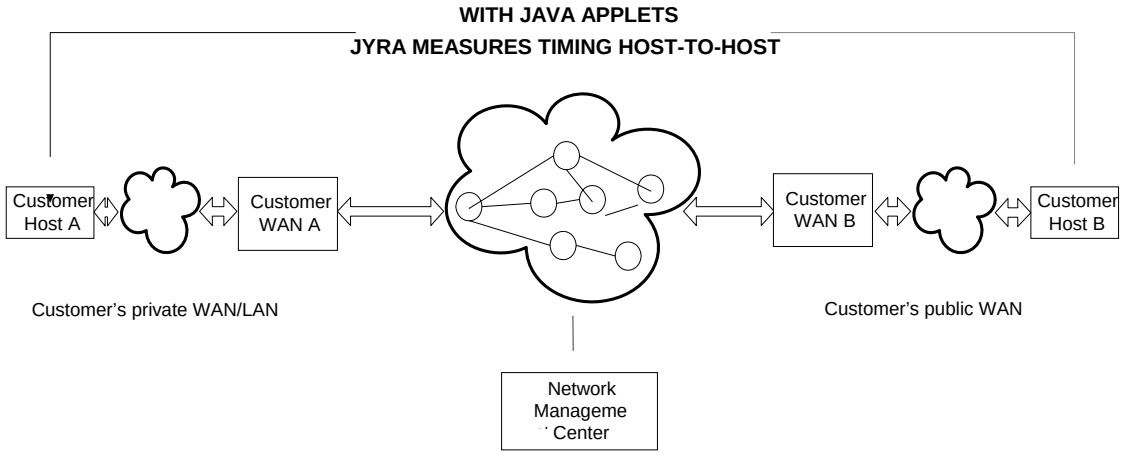
Individually, applications are tightly focused—*LAN-centric*. In ATAC, applications are interactive—*WAN-centric*. The integration of modules expands the overall view from separate segments within a regional network, to interactive segments that connect throughout the global network: ATAC combines the modules into a WAN-centric process. Properly integrated, the modules generate the necessary data for the network management control centers.

A summary of the interactions:

- StrataView Plus, Cisco Works, and HP OpenView function as the front end for NETSYS TECH.
  - Collect data from multiple platforms. NOTE: NETSYS TECH also extracts data. NETSYS TECH communicates with Bay Network Routers, Cisco Routers, and StrataCom Switches.
  - Extracted information includes topology, configuration, device identification, firmware, errors, traffic patterns, hot link, saturation, and system modification.
- NETSYS TECH employs the information to evaluate the status of the system.
  - Compare real-time data to parameters.
  - Observe the performance trend.
  - Evaluate if traffic patterns under- or over-utilize the routed paths.
  - NETSYS TECH includes extracted data in modeling.
  - Determine potential problems.
  - Resolve existing problems.
  - Determine requirements for optimization.
  - Generates automated WEB reports (HTML).
- NETVIZ performs network analysis and network mapping, and generates graphical information for the WEB.
  - Utilization: link types, speed.
  - Inter-connections.
- Nerve Center Pro filters and correlates network Traps and Alarms.
  - Analyze errors.
  - Focus to the point of the cause of errors.
- JYRA verifies and distributes the processed data.
  - Checks the modeled data with real-time data.

- Conducts physical time measurements:
  With JAVA applets, measurements are host-to-host
  To confirm modeling, measurements are employed.
- When necessary, generates reports to distribute via WEB.

When errors occur, notification reports are generated and delivered.



NOTIFICATION

The Simple Network Management Protocol (SNMP) captures and delivers data to a Management Information Base (MIB). The data lists the location of the action and describes the action: error, change of state, etc. Device oriented, SNMP sends out alarms for every failure cascading from the point of origin. This method affects network performance: management traffic consumes a significant percentage of network capacity (approximately 23%), and the list of data becomes excessive. ATAC provides an alternate process.

To reduce management traffic, ATAC generates problem reports that are restricted to the origin of the error. To locate the source of the error, ATAC analyzes the data from its *front end* modules, and employs modeling and verification to determine the origin of the alarms. After determining the location, the problem is analyzed, the solution is developed, and a report is produced and delivered. This method of reporting errors does not add to the extensive *alarm traffic* that SNMP and many other network management systems create.

MODELING AND VERIFICATION

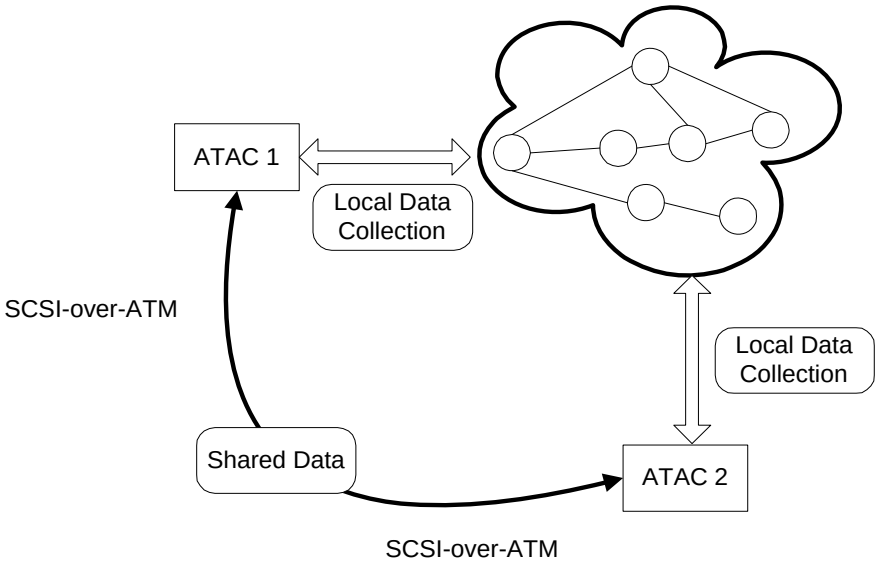
Modeling is a vital tool for managing large, globally interactive networks. Modeling can accelerate these issues: resolve problems; estimate of the effects of various traffic patterns; predict the network response to Network Growth Engineering. For the pre-analysis of changes, modeling provides a notable advantage. Saturation, underload, versions of code, required delay, system upgrades, etc., can be tested without interrupting the activity of the network. However, by itself, modeling can be inaccurate. If modeling is strictly an abstract function, averaging calculated data without factual information, error components tend to develop which produces ineffective results.

In ATAC, modeling is based on real-time data. To correct and verify the modeling, the calculated data is iterated with real data until the results converge. The actual data includes direct measurement, a history of the monitored performance, and the configuration of the network system.

This method of modeling is useful for testing modifications—system upgrades, maintenance, configuration corrections, etc. – prior to implementation. ATAC has a successful history of correctly determining the required changes and the expected results, through modeling, to optimize system performance.

RAID7

Redundant Array Inexpensive Drives, 7th Generation (RAID7) provides data storage for UNIX and NT-based systems. With SCSI-over-ATM, data can be replicated and delivered to another ATAC.



RAID7 allows multiple hosts to simultaneously link to the same data. This feature is efficient. One host is not required to copy the data to deliver it to another, or to engage in data collection, which allows the host's CPU to be devoted to processing data. Costly mainframes are not required for maximum data handling.

GRAPHICAL USER INTERFACE

Graphics delivers complex, real-time information more comprehensible and faster than text. This visual information can be presented at multiple sites, simultaneously. This method of communicating information is very useful for technical support. Extensive data is readily available, it's clear what the issues are, and it's easier to communicate with the customer.

The utilization of video cameras is in development. Video cameras can be used for separate data centers to communicate, to demonstrate the aspect of the problem they're working on, and to provide training.

DATA STORAGE

Currently, a tape array is utilized to archive historical data, and to store information for emergency backup. Considering the brief shelf life of tape, the plan is to have compact disks (CD) save the accumulated data. With 3:1 compression, 1.8Gbyte is stored per CD. The CDs will be stored in a "jukebox", a mechanism that searches for and delivers the data to the ATAC system that requests it. This plan is in process.

Currently, read-only CDs provide on-line historical information for SLA support and verification.

PROOF OF CONCEPT

The Proof of Concept, Test Before Deployment, is two-fold: verify the network modifications before deploying them; verify modifications before incorporating them into ATAC.

The features of ATAC are based on industry standard software applications and released components. The features are incorporated as separate modules which simplifies upgrading ATAC. As necessary, functions can be removed, replaced, or added to the main system, without affecting other components. This reduces the necessary effort to advance the tools of ATAC to match the advancement of the network.

ATAC is a two-fold cost-effective process.

For advancing ATAC:

- The labor to develop applications "from scratch" is eliminated.
- Upgrading the ATAC hardware platform, and adding tools and features are simplified.
- The added in components, industry applications and devices, are pre-tested.
- During improvement, the operation of ATAC is not interrupted.

For managing the network:

- Monitor the global network: Collect, analyze, and store data.
- Deliver useful error reports: Assist front level support.
- Faults are located before system failure: Comparing performance to parameters, errors are located at an early stage.
- Display extensive data in a comprehensible, visual format to multiple sites and end-users.
- Evaluate system modification before implementation.
- Estimate future system requirements.

For network management and for the necessary continuous upgrades to continue network management, ATAC is proactive. Requirements are analyzed and deployed before the performance of the network, and the system of network management, can degrade. With this proactive method, optimal performance is maintained on both sides.