Network Systems

T3AS Performance Monitoring and Test System

Central to the implementation of Network Boundary Sectionalization is ADA's T3AS Performance Monitoring and Test System. T3AS is an integrated test and performance monitoring system that connects to the network at both the DS3 and DS1 transport rates. T3AS provides DS3 and DS1 continuous and non-intrusive performance monitoring. In addition, T3AS offers an impressive suite of testing for DS3, DS1, DS0 and subrate signals for services such as High-Capacity Digital Service (HCDS), Digital Data Service (DDS), and voice frequency service (VF).

T3AS is typically deployed at the Point-of-Presence where circuit handoffs occur between local exchange carriers and interexchange carriers. The implementation of T3AS at this strategic network boundary allows the system to provide fault sectionalization between these two entities.
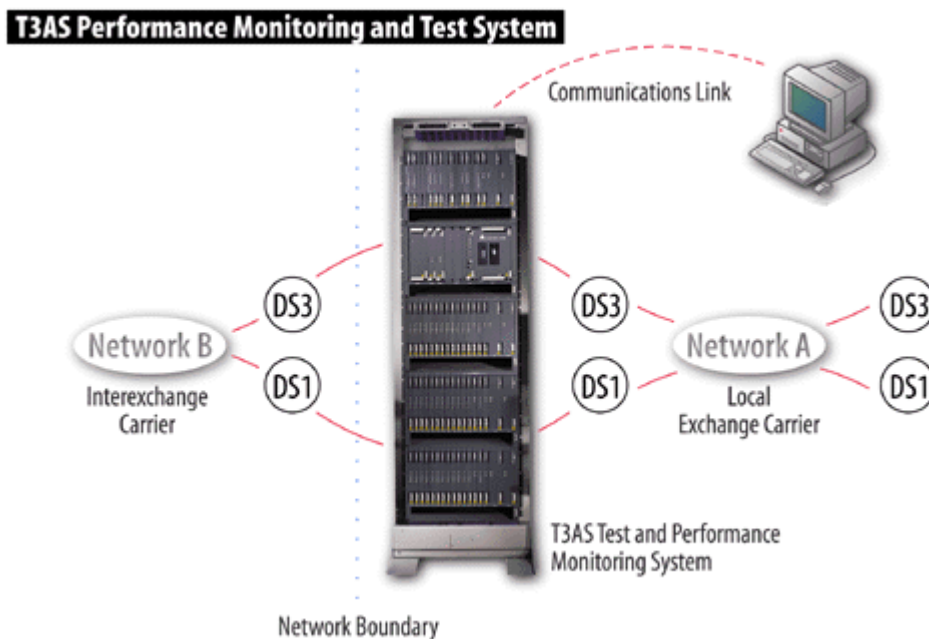
T3AS offers the following features:

- Extensive Suite of DS3, HCDS, VF, and DDS Testing-One integrated solution for all intrusive and non-intrusive testing needs.

- Fault Sectionalization- Provides rapid fault isolation between the Local Exchange

Carrier and Interexchange Carrier.

- Asynchronous Multiplexing Access- Hitless access to embedded DS1, DS0 and subrate channels without affecting adjacent channels.

- Continuous and Non-Intrusive Near/Far-End Performance Monitoring- Proactive maintenance approach improves customer satisfaction.

- One Second Resolution on DS1 Events- Provides superior granularity on circuit history.

Distributed Architecture

In addition to deploying T3AS at the point-of-presence, the user can also implement T3AS in a Distributed Architecture. This architecture allows the user to install DS3 or DS1 facility subsystems in locations separate from the base T3AS, thus providing a cost-effective solution for smaller office and end-user locations.
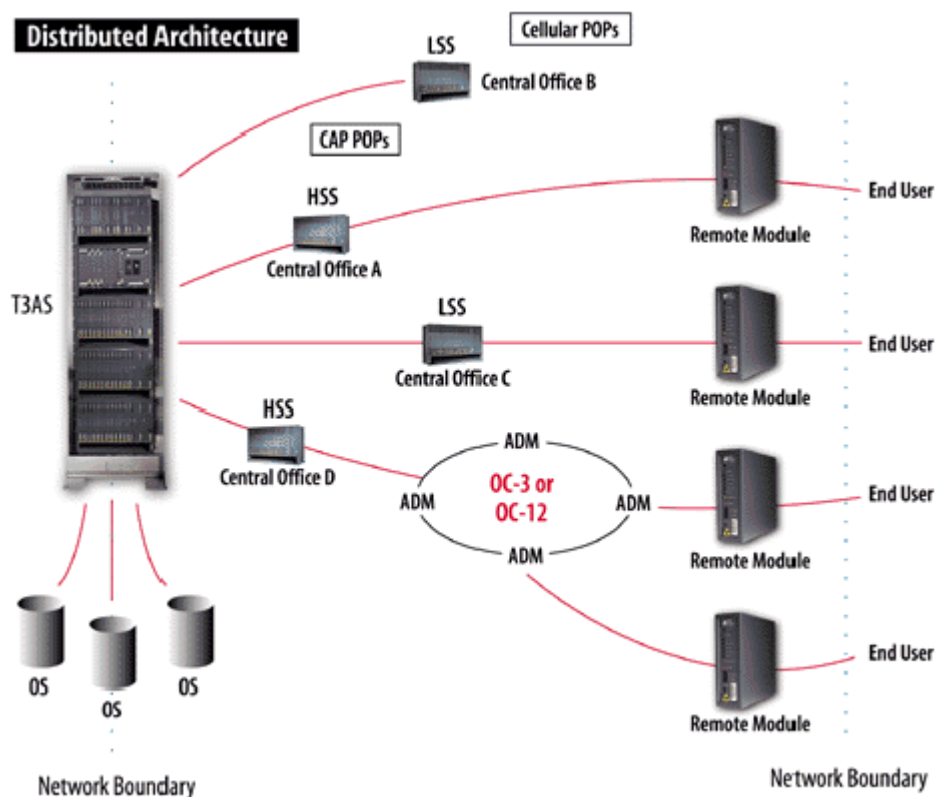

T3AS capabilities that are available in a distributed configuration are identical to those available when DS3 and DS1 facility subsystems are collocated at the base T3AS. All DS3 and DS1 performance monitoring and testing is performed at the distributed facility subsystem, and all DS0 testing is done at the Base T3AS. A T1 control link from the base T3AS to a distributed subsystem is used to transport DS0 channels for DS0 testing at the base. In addition, this link is used to transport performance monitoring data from the distributed subsystem to the base T3AS, where it is then passed to the Operations System (OS). This link also eliminates the need to connect a separate OS link to the remote site.

T3AS Distributed Architecture is the ideal solution for small central offices or end-user installations that support a modest number of DS3 or DS1 circuits. Additional benefits of Distributed Architecture are:

- Cost-Effective- The cost of the base T3AS common equipment is spread over multiple remote sites.

- Leverages T3AS Investment-Facility subsystems are readily converted from base to distributed subsystems and distributed subsystems can be upgraded to a base T3AS.

- Single OS Link- Multiple remote sites have a single OS link through the base T3AS.

Centralized Test System
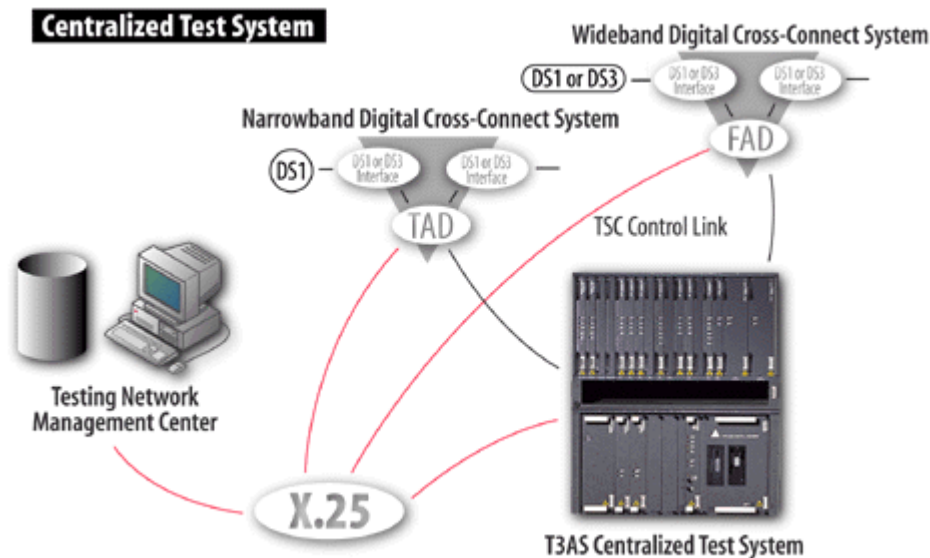
The T3AS Centralized Test System (CTS) is a highly flexible and scalable platform that functions as a Test System Controller (TSC) and a Remote Test Unit (RTU) to circuits which transit through Digital Cross-connect Systems (DCS). CTS tests Voice Frequency (VF), Digital Data System (DDS) and High Capacity Digital Services (HCDS). Performance monitoring is also provided for the period the circuit is selected.

In addition, Centralized Test System (CTS) and the Protocol Analysis Access System (PAAS) are two very cost-effective applications of the T3AS platform for accessing and testing circuits that transit Digital Cross-connect Systems (DCS). CTS functions as a Test System Controller/Remote Test Unit for narrowband, wideband, and SONET wideband DCS providing economical access for testing HCDS, VF and DDS circuits. PAAS expands upon the physical layer testing and monitoring of CTS by providing remote test access and protocol analysis for frame relay, ATM, and SMDS services that are provisioned by overlay networks and are managed independently of the core telephone network.

CTS interfaces to narrowband, wideband and SONET wideband DCS via Test and Facility Access Digroups (TAD and FAD) to cost-effectively monitor and test intermediate points in the network. In addition, on-demand fault sectionalization is performed by CTS at intermediate points in the network where DCS are located.

- Concentrated and Concurrent Circuit Testing- Economical access for centralized testing of VF, DDS, and HCDS circuits collected from multiple remotely located DCS.

In addition, tests of multiple DS0 and DS1 circuits can be performed concurrently. Circuits are accessed via multiple TAD or FAD ports and allocated to the common pool of test resources.

- Fault Sectionalization- Provides rapid fault isolation upon demand at intermediate points in the network where DCS are located.

- DS3 FAD Port- CTS supports DS3 FAD ports on a 3/1 DCS which is an economical means for test access allowing DS1 ports to be used for revenue generating services rather than for test access.

- Supports a Wide Variety of DCS and OS- CTS is interoperable with Lucent Technologies' SARTS, Bellcore's ITS, ADC's LOGIX ™, Hekimian's REACT-2000, and other OS. CTS also controls all popular 3/1 and 1/0 DCS, and communicates with network elements and OSs through asynchronous or X.25 communications interfaces.

Protocol Analysis Access System

ADA's Protocol Analysis Access System (PAAS) is deployed in integrated or overlay data communications networks to test and monitor X.25, Frame Relay, SMDS, ATM and other data services. PAAS accesses these circuits as they pass through a T3AS or Test Access Digroups (TAD) and Facility Access Digroups (FAD) on digital cross-connect systems (DCS). The system tests the physical layer of the circuit before passing test access to a protocol analyzer for service layer testing. Full-time performance monitoring and fault sectionalization are available, as an added benefit.
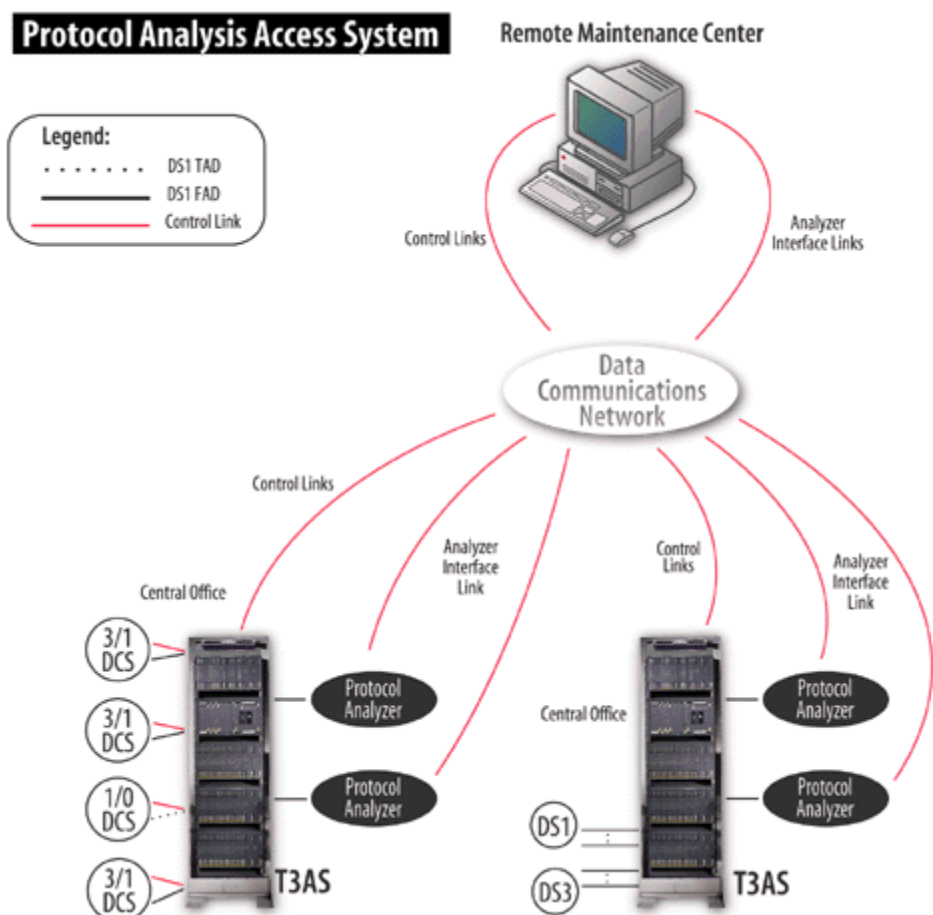
The Protocol Analysis Access System enhances the capabilities of T3AS by offering an improved method of monitoring and testing data services like frame relay and ATM.

Surveillance and testing capabilities in broadband networks may not be as automated as they are in traditional telephony networks. Diagnosing problems within the network often requires coordination between multiple organizations and dispatches to customer sites. The Protocol Analysis Access System improves performance monitoring and test capabilities found in the telephony network to broadband networks by allowing technicians to remotely troubleshoot faults.

The Protocol Analysis Access System leverages T3AS capabilities to provide enhanced capabilities for data communications networks through:

- Remote Protocol Analysis- Allows network technicians to test the physical and service layers of data circuits from centralized maintenance centers. Costly dispatches of technicians may only be necessary after the source of the fault is determined.

- Concentrated Testing- PAAS reduces the quantity of protocol analyzers by concentrating test access across several circuits providing cost-effective protocol analysis.

- Secure Test Access for Overlay Networks- PAAS protects the network from any possible service interruptions by only allowing data technicians to access circuits for which they have privileges. Non-data traffic is protected since PAAS (not the technician) executes the commands on the DCS.

Remote Module

ADA's Remote Module is an intelligent network interface unit installed at the network boundary between a service provider and end-user. The Remote Module performs autonomous, non-intrusive and continuous circuit testing, performance monitoring, and fault localization and transmits this information in real-time to ADA's T3AS for processing by Sectionalizer expert system software and other operations systems. The result is reduced dispatches, more accurate information when dispatches are necessary, and improved service restoral times - all of which translate to reduced network management expense for telecommunication service providers.

The Remote Module represents a significant advancement in the development of network interface units. Application Specific Integrated Circuits (ASIC) and sophisticated firmware was used to embed "intelligence" into the unit. By non-intrusively testing the signals from both the service provider's and end-user's side of the network, Remote Module alerts the operator where the fault is located. Furthermore, telephony alarm signals due to end-user equipment are enhanced by the Remote Module. The enhanced alarm informs the operator that the trouble is due to a customer installation problem rather than a network problem. Since up to 56% of troubles originate in end-user equipment, this information from Remote Module is critical in assisting the system operator to reduce dispatches on problems outside their network.

Performance monitoring data, test results, fault localization information and alarm data are

relayed continuously and in real-time to ADA's T3AS without the use of a separate communications link. Sectionalizer expert system software then processes testing and fault location information from Remote Module to take a proactive approach to network maintenance and to determine if the problem lies in the network or in the end-user's equipment.

Remote Module offers the following key features:

- Continuous and Non-Intrusive Performance Monitoring- Provides a proactive approach to network maintenance.

- Fault Sectionalization- Provides rapid fault isolation between the service provider and end-user.

- Separate Communications Link or Dispatch is Not Required- Competing network interface units require a dispatch or separate communications link to transport the circuit performance data to the point-of-presence. Remote Module eliminates these costs by transporting the monitoring and fault location data transparently over the T1 signal line.

- Alarm Enhancement- Modifying end-user alarms to indicate a "customer installation" problem reduces dispatches.

Sectionalizer

ADA systems and sensors installed at the boundaries of the local telephone network provide fault location and circuit performance information without affecting the end-user's payload. All of this monitoring, test, and fault isolation is necessary, but not sufficient to provide responsive network management. The service provider requires answers rather than raw data in order to manage its networks.
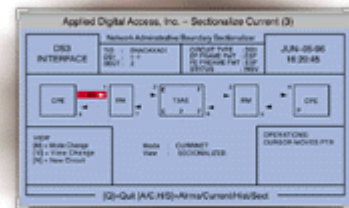
The key to Network Boundary Sectionalization is the Sectionalizer expert system software technology. This software analyzes data from T3AS, Centralized Test System and Remote Module to automatically determine where the cause of degradation is in the network. Sectionalizer then displays a graphical end-to-end view of the circuit, pinpointing the fault to a specific leg in a circuit and provides a circuit history of that leg. This enables service providers to immediately determine whether a problem is in their network or if it is the responsibility of another service provider or the end-user. This information is extremely valuable, since the majority of all reported circuit problems are not in the service provider's network. In addition, if the fault lies in the service provider's network, the ability to display in real-time the faulty circuit's history saves valuable troubleshooting and diagnostic time.