EIIF DAS/RSD Replacement Prototype Initiative

Introduction

- The Data Acquisition System/Remote Status Display (DAS/RSD) system is an AOS initiative that brought together Monitor and Control (M&C) functions for various subsystems within the En Route domain into one common environment.
- Because of the DAS/RSD's outdated software and hardware architecture, an initiative to upgrade the system is underway.
- The EIIF, working with AOS-330, has developed a system architecture for a new DAS/RSD prototype that can provide the current DAS/RSD functionality using modern technology while also providing a platform that is extensible and flexible such that monitor and control for new En Route subsystems could easily be integrated into this system.

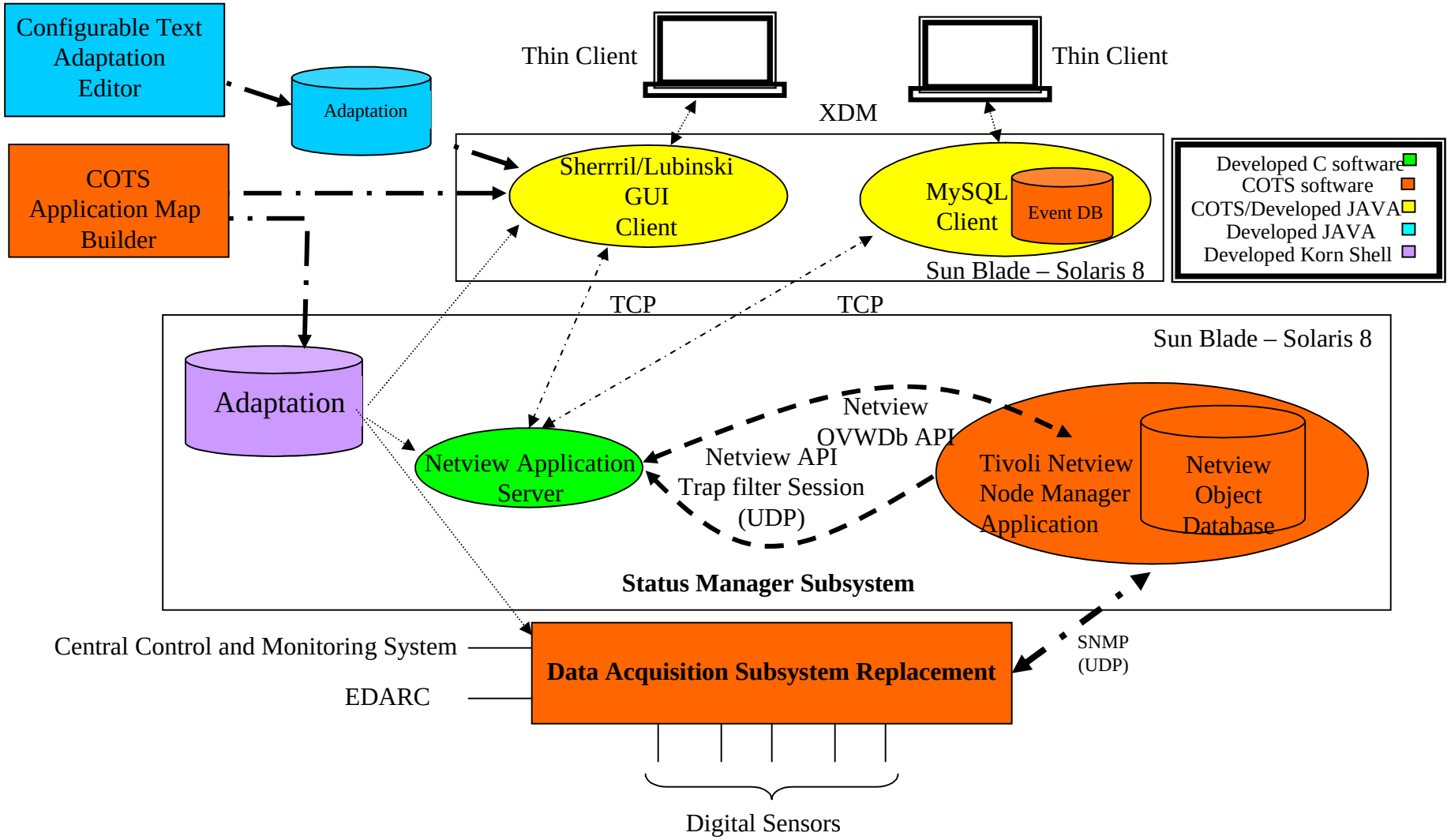
High Level Design

- The EIIF Integrated En Route DAS/RSD Replacement prototype is comprised of three independent components:
  - Graphical User Interface (GUI) Clients – These applications provide a mechanism for user interaction. They convey state changes, alarms, and nominal system messages to the end user.
  - Status Manager Subsystem (SMS) – Maintains a database of object status, accepts and processes status notification from system agents, and services GUI Clients by providing system status display information and accepting system control directives.
  - Data Acquisition Subsystem Replacement (DASR) – Extracts and provides status information to the SMS regarding the current status of all sensors. This portion of the system is essentially hardware with firmware that is adapted using configuration software.

High Level Design (cont.)

- The overall prototype design is modular such that any of the three parts of the system can be used within another design provided the interface requirements for that subsystem are met.

DAS/RSD Replacement High Level Design



Software Design Details

- GUI Application maps are constructed using a COTS graphical editor
- The graphical editor GUI Builder process provides object adaptation. The adaptation is used to create objects in the Netview Node Manager Object database upon SMS Application initialization. Object state for all map objects is then maintained within the Netview database. This adaptation is also used to configure the DASR data sensors
- The SMS implements a robust interface to Netview using various Netview API entry points. These include the Netview API trap filter session for notification of selected SNMP traps and a Netview Object Database connection for Object state manipulation

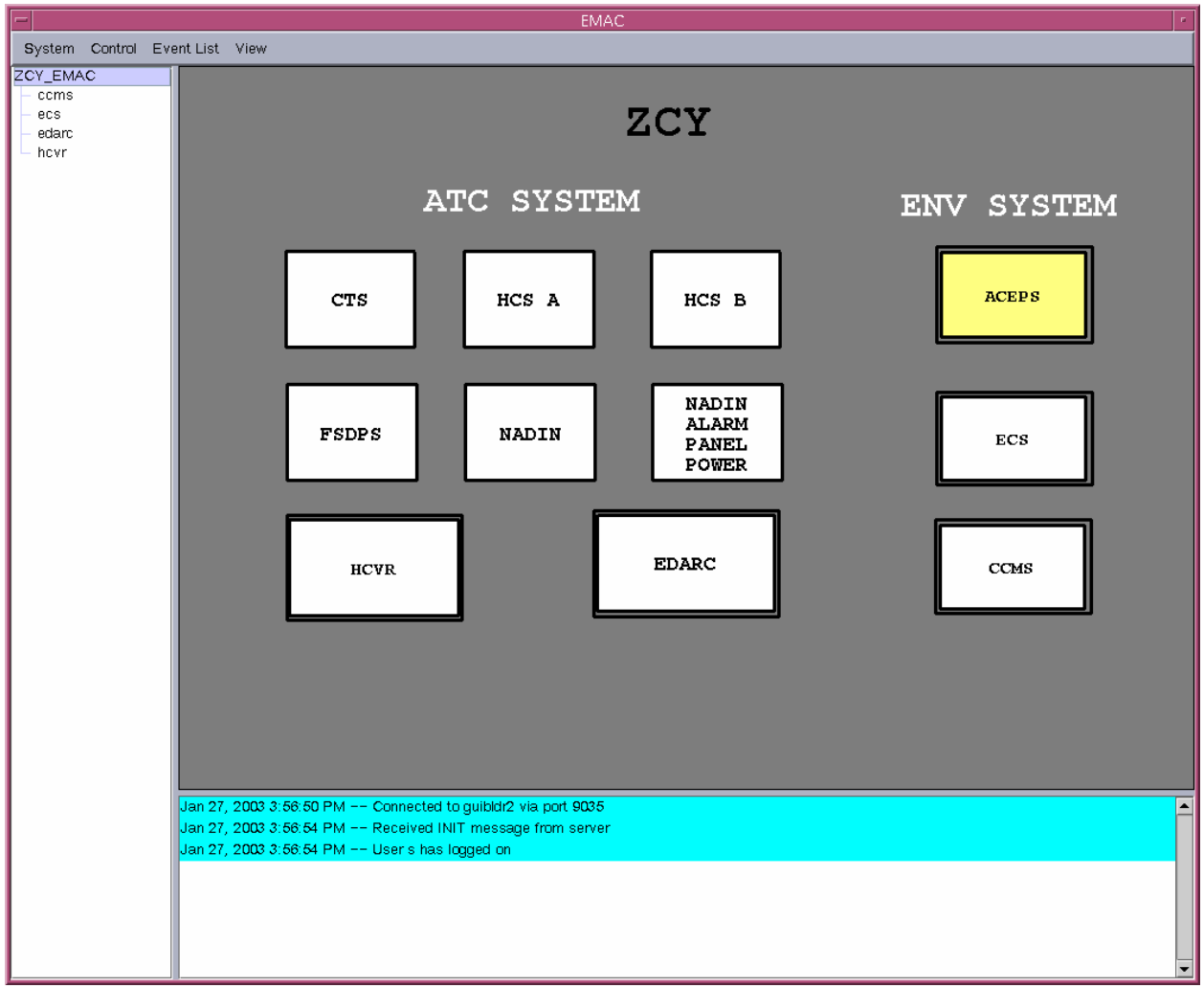
GUI Display Details

- Java Based - portable and extendable
- Objects easily created and modified using graphics editor
- Object status depicted by fill color
  - Green – Operational
  - Yellow – Degraded
  - Red – Down
  - Tan - Unmanaged (user directed)
  - White – Unknown
- Object status changes indicated by “blinking” functionality
- Object edge style change indicates object(s) is(are) selected
- Navigation tree provides direct access to children/grandchildren submaps
- Additional adaptation products allow for the manipulation of configurable text items. An application has been developed that provides an interface for configuring these items. The same application provides a user interface to view the map generated object adaptation as well

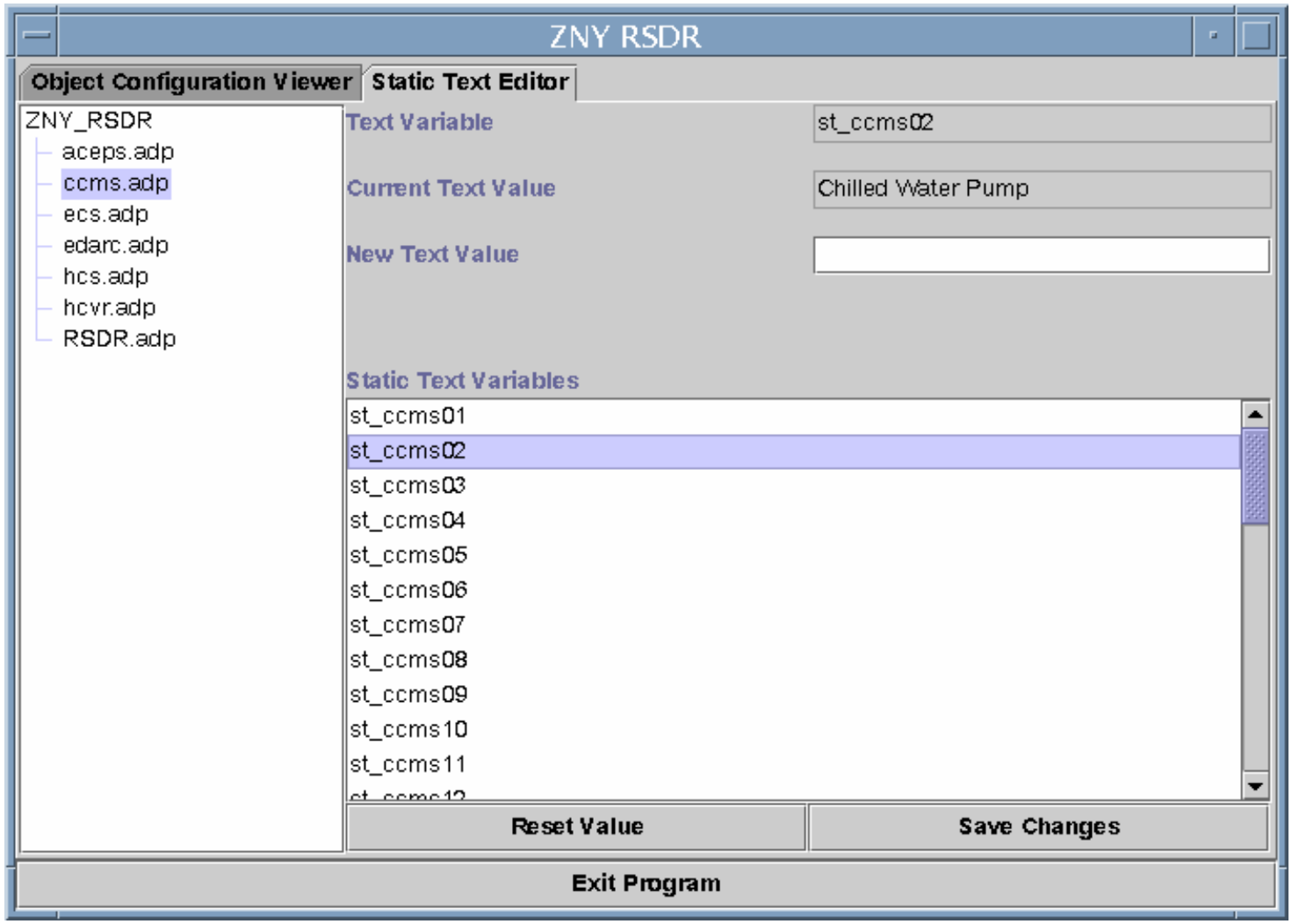
GUI Display Details (cont.)

- Main Menu Bar provides direct access to rich set of functionality such as:
  - application control (login/logout)
  - security control (password requirements)
  - object status change acknowledgement
  - event list management (clear, freeze, etc), user log browse/entry capability and SOP documentation
  - OEM web site links
  - Event History Viewer
  - Re-Read configurable text adaptation directive
- Integrated Event List provides color coded text-based Information
  - includes entries for object status change messages
  - includes entries for user entered commands
- Events are also archived using a separate client that connects to the SMS and stores all events in an SQL relational database (MySQL)
  - The Event History Viewer connects to this database to extract event information based on a user request

GUI Display Details (cont.)



Configurable Text Adaptation Editor



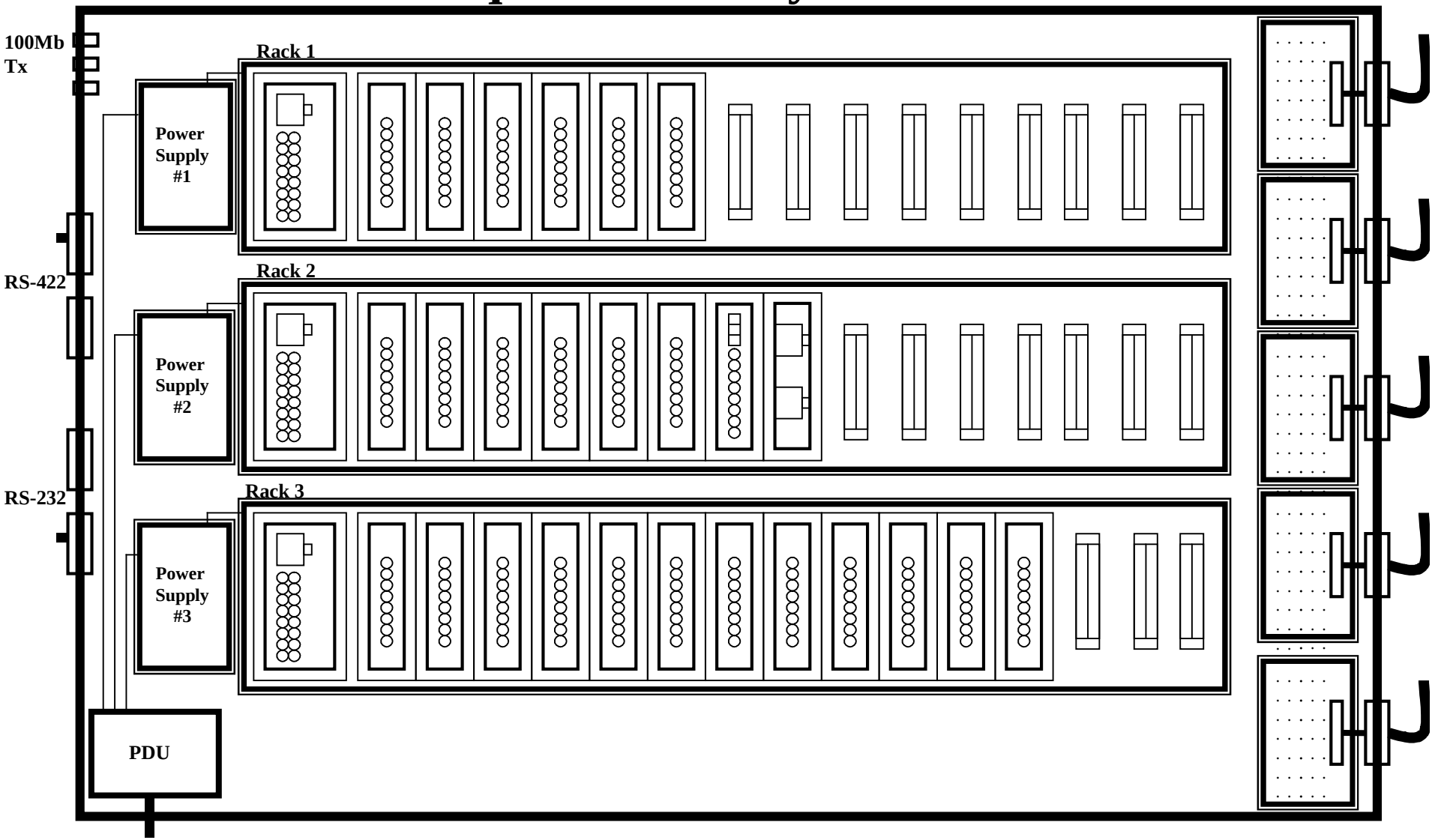
Status Manager Subsystem

- SMS Allows any TCP client to connect and receive Object information
- Uses object adaptation file to create Netview Objects
  - The Adaptation file is created during the map build process, making map changes easy to integrate into the SMS application
  - Current object status and acknowledged state is kept within the Netview database
- Status Propagation Engine
  - Standalone function separate from Netview propagation
  - Function can be customized based on user requirements
  - Includes an “exceptional propagator” function that allows state changes for critical objects to be propagated upward without consideration for current aggregate sub-map status.

Data Acquisition Subsystem Replacement

- Data Acquisition Subsystem Replacement (DASR) Obtains status from digital sensors and serial interfaces
- Subsystem is comprised entirely of modular hardware that is housed in small chassis's (racks).
- Racks are designed to support solely digital interfaces or digital and serial interfaces simultaneously
- Analog interfaces can also be supported with additional modules (not required for DAS replacement)
- To support current DAS/RSD operations, three racks are required: Two all digital racks and one digital/serial rack.
- All equipment is manufactured by The Opto 22 Corporation. Opto 22 was founded in 1974 and is a leading manufacturer of high-quality hardware and software solutions for connecting real-world hardware devices with computer networks. Opto 22 sensor gear is also a part of the current DAS
- This Subsystem is being designed to replace the DAS in a "plug and play" fashion (i.e. unplug the DAS from current sensors – plug in the DASR).

Status Acquisition Subsystem Hardware



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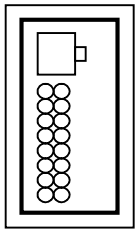
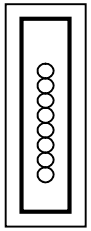
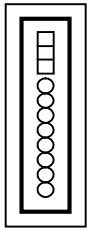
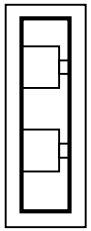
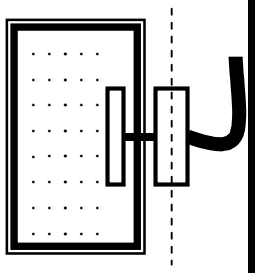
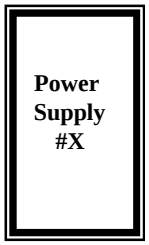
Status Acquisition Subsystem Hardware (Cont.)

	**Rack processor (brain) –** Maintains digital point state data (4 points per slot). Handles receipt of serial interface data by port (2 ports per module). Provides IP connectivity (SNMP) to network entities
	**Digital Module –** Capable of receiving status for up to 4 Digital sensors.
	**RS422 Module -** Capable of receiving data from up to 2 RS422 interfaces
	**RS232 Module -** Capable of receiving data from up to 2 RS232 interfaces

Status Acquisition Subsystem Hardware (Cont.)

	**Wiring break out –** Hardware that will interface with current DAS/RSD interface cables. Consist of a cable with a "D-shell" connector for connectivity to the DAS/RSD cabling with a DB50 connector on the opposite end. There is also a breakout board for a DB50 connector. Wiring from the breakout board will connect directly to rack module data points.
	**Power Supply –** Power supply to drive one Opto rack. Three Power supplies are Required and will be fed with a power conditioned distribution unit.

Data Acquisition Subsystem Replacement (Cont.)

- The DASR is configured using a PC application and a web-based application that are supported by opto 22.
- These applications allow the user to configure information regarding the digital points and the serial interfaces such that certain actions occur when a digital state changes or data is received on a serial port. The applications are used to configure the DASR to trigger IP-based Simple Network Management Protocol (SNMP) trap sends on state changes or upon receipt of data
- The configuration process is a simple process that marries all digital points or serial interfaces within the system to object adaptation obtained from the SMS adaptation set (derived from the map build process)
- The application also allows for small programs to be uploaded to the rack brain for execution. These programs can provide further event control

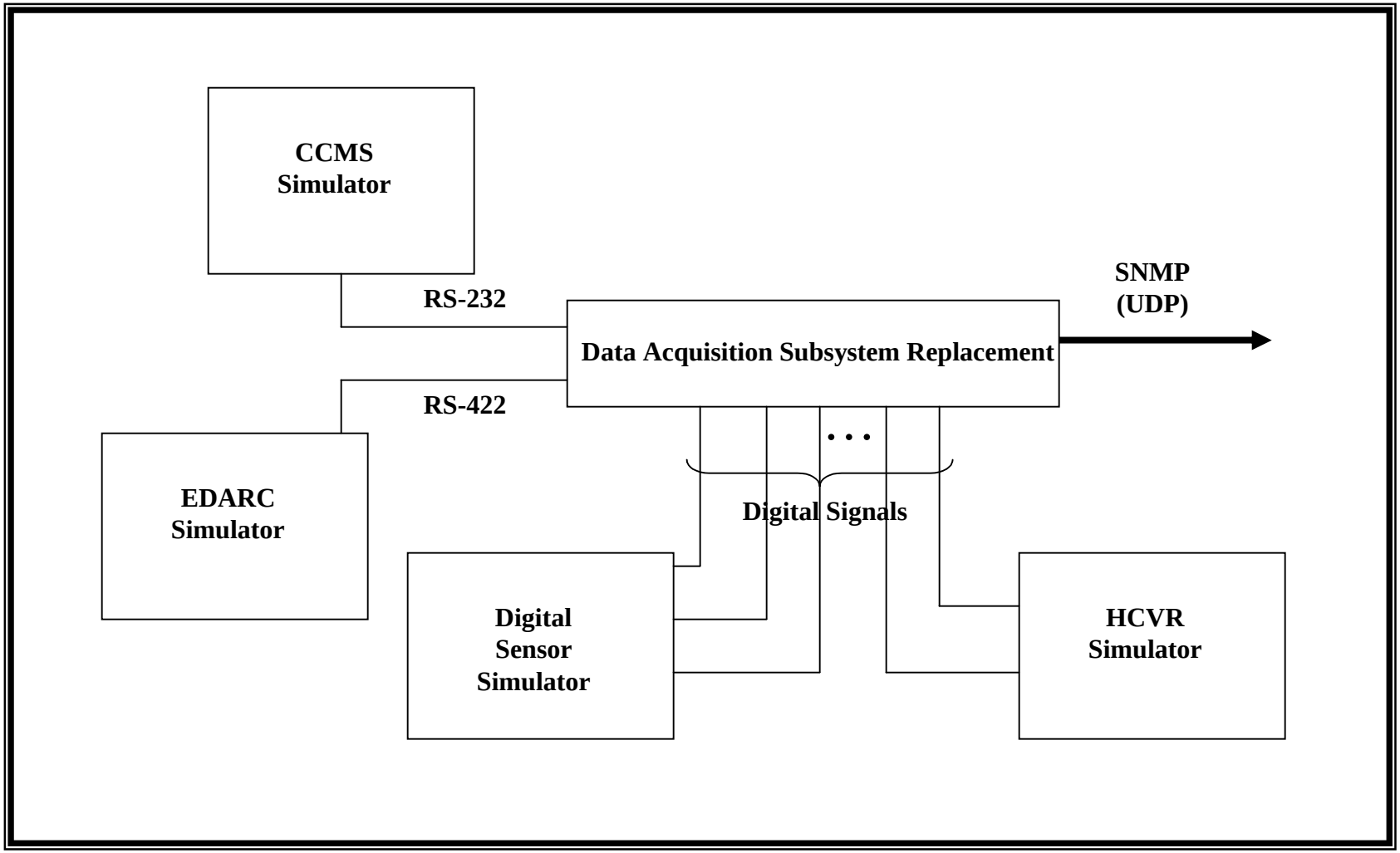
DAS/RSD Replacement Prototype Test Environment

- The test environment being developed here at the EIIF consists of the following:
  - Central Control Management System (CCMS) Simulator – This device simulates the RS-232 interface from CCMS.
  - EDARC System Simulator - This device simulates the RS-422 interface from the EDARC system.
  - High Capacity Voice Recorder (HCVR) – This device simulates Digital status signals from the HCVR systems. These digital signals are unique in that they are tri-state (up, down, and pulse).
  - Digital Sensor Simulator – COTS PC based application that drives digital state changes into the DASR
  - All of these simulators except the Digital Sensor Simulator are on loan from AOS-330 and are also used to test the current DAS Subsystem.

DAS/RSD Replacement Prototype Test Environment (Cont.)

- Each System simulator list above is wired to the DAS using the Back-plane that is house within the DAS rack.
- To maintain our “plug and play” status we developed a simulated Back-plane that the DASR would plug directly into as if it was the original DAS back-plane.

Status Acquisition Subsystem Test Environment



Sherril/Lubinski Graphical Modeling System Editor Overview

January 29, 2003

Sherril/Lubinski (SL)

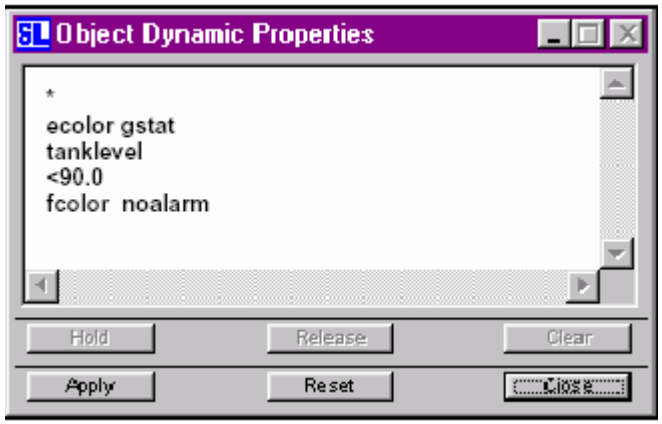
- The SL Corporation is a leading provider of graphic software applications and development tools for creating dynamic graphic displays.
- SL provides a full range of graphic development tools, software libraries and applications for a wide variety of industries including:
  - Network Management
  - Process Control
  - Intelligent Traffic Control
  - Aerospace & Telemetry
- SL-GMS is used worldwide in mission-critical applications ranging from Network Operating Centers to nuclear power plant control rooms and NASA's Space Shuttle Launch Control Center.

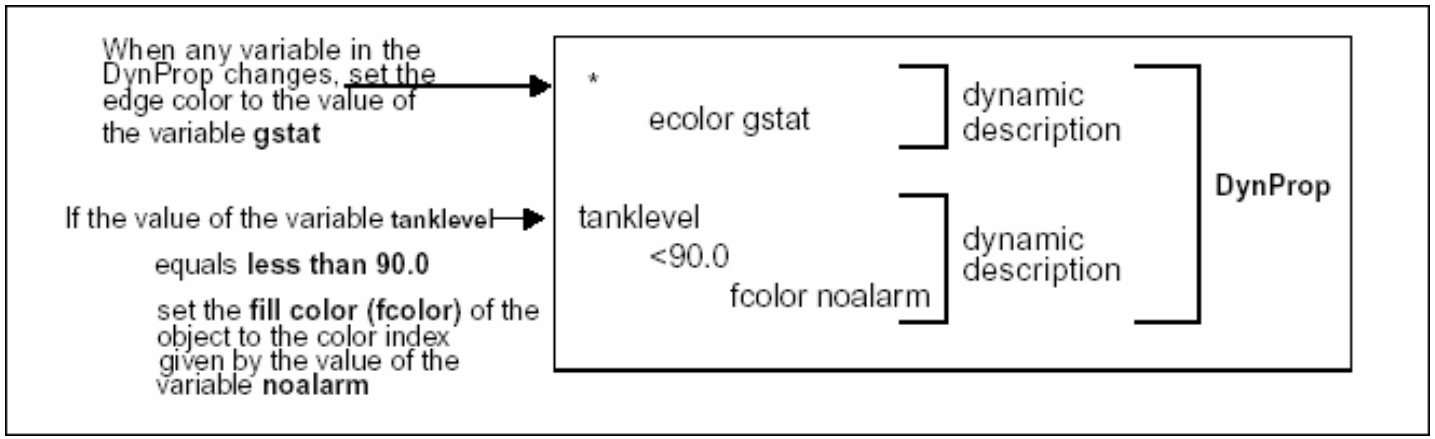
SL-Graphical Modeling System (GMS) Draw Tool

- The SL-GMSDraw editor is a graphical development tool available from the SL Corporation.
- The tool can be used to create interactive graphical screens with colorful dynamic components.
- The tool allows the user to create and edit models. Within these Models, you can draw any screen object, attach dynamic behavior to the object, and preview the dynamic behavior without leaving the graphical editor
- The models can then be converted and compiled into classes that can be utilized in user application software.

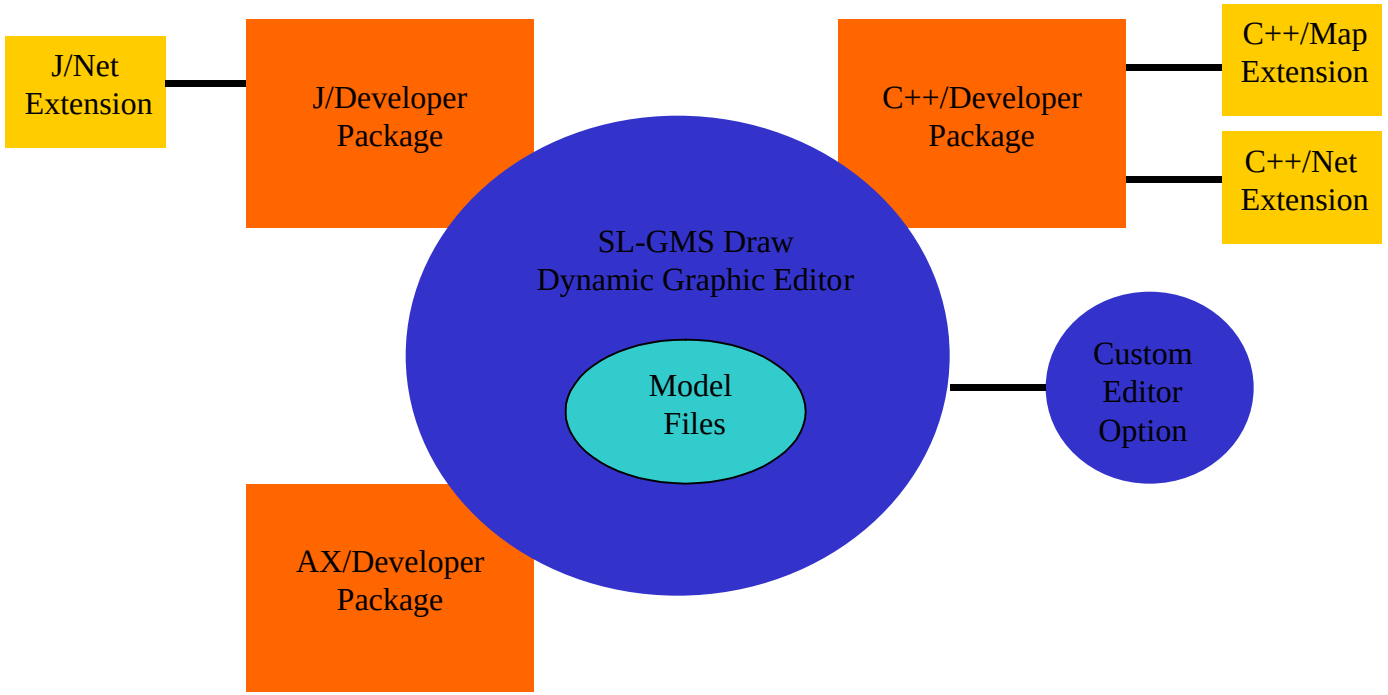
SL-GMS Dynamics Scripting Language

Dynamics are attached to an object within the editor using SL-GMS dynamics scripting language

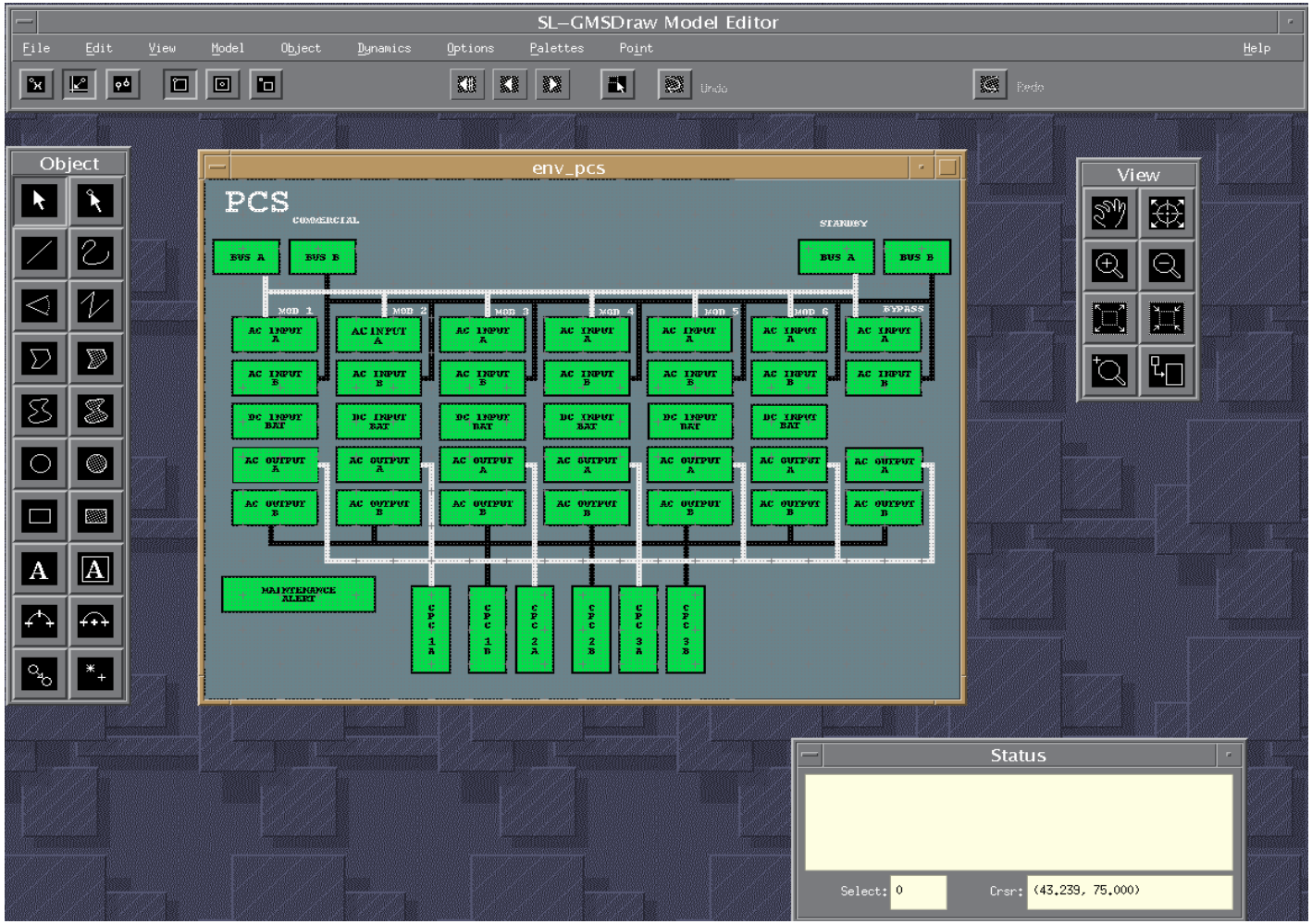




SL-GMS Family of Products



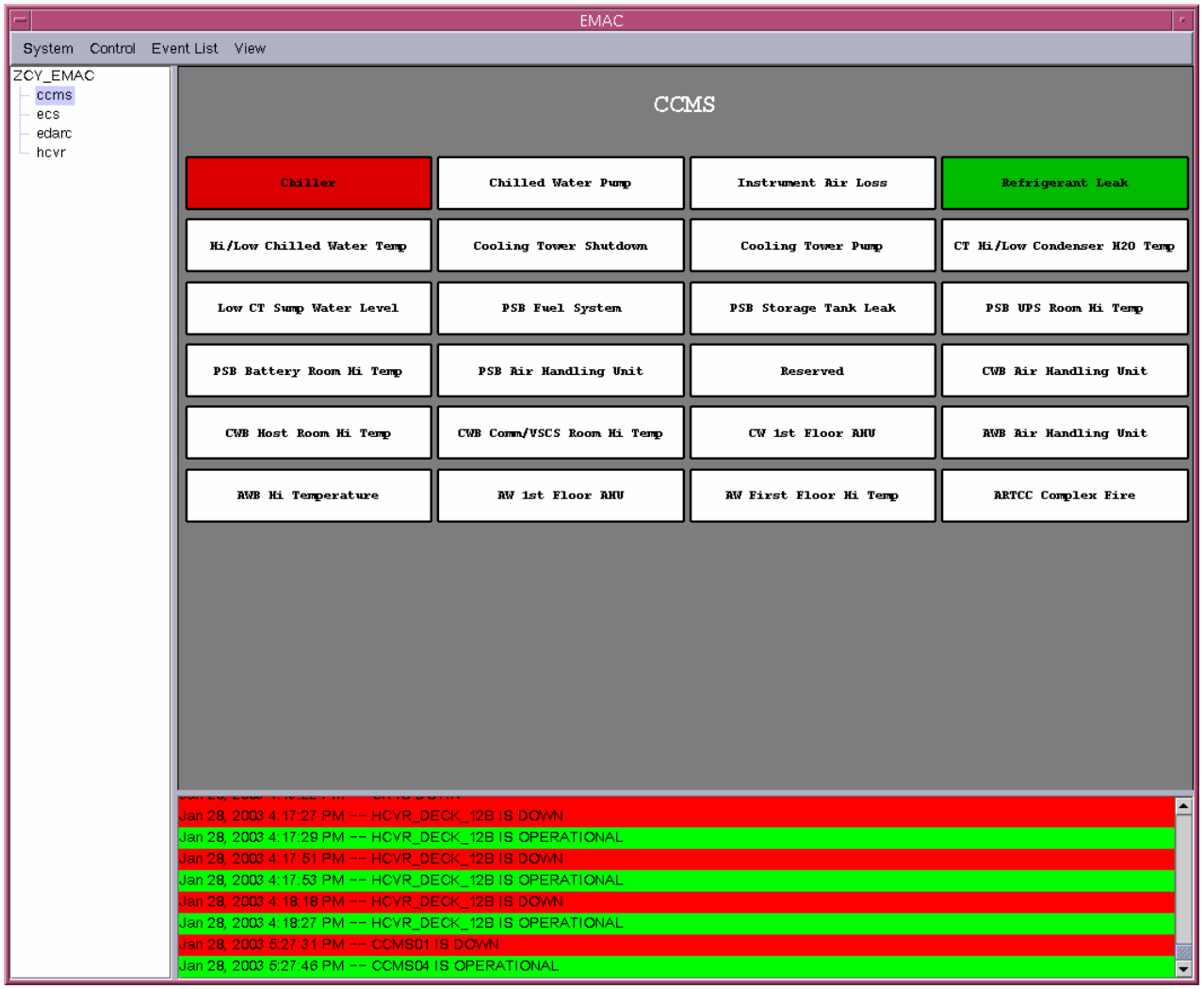
SL-GMSDraw User Interface



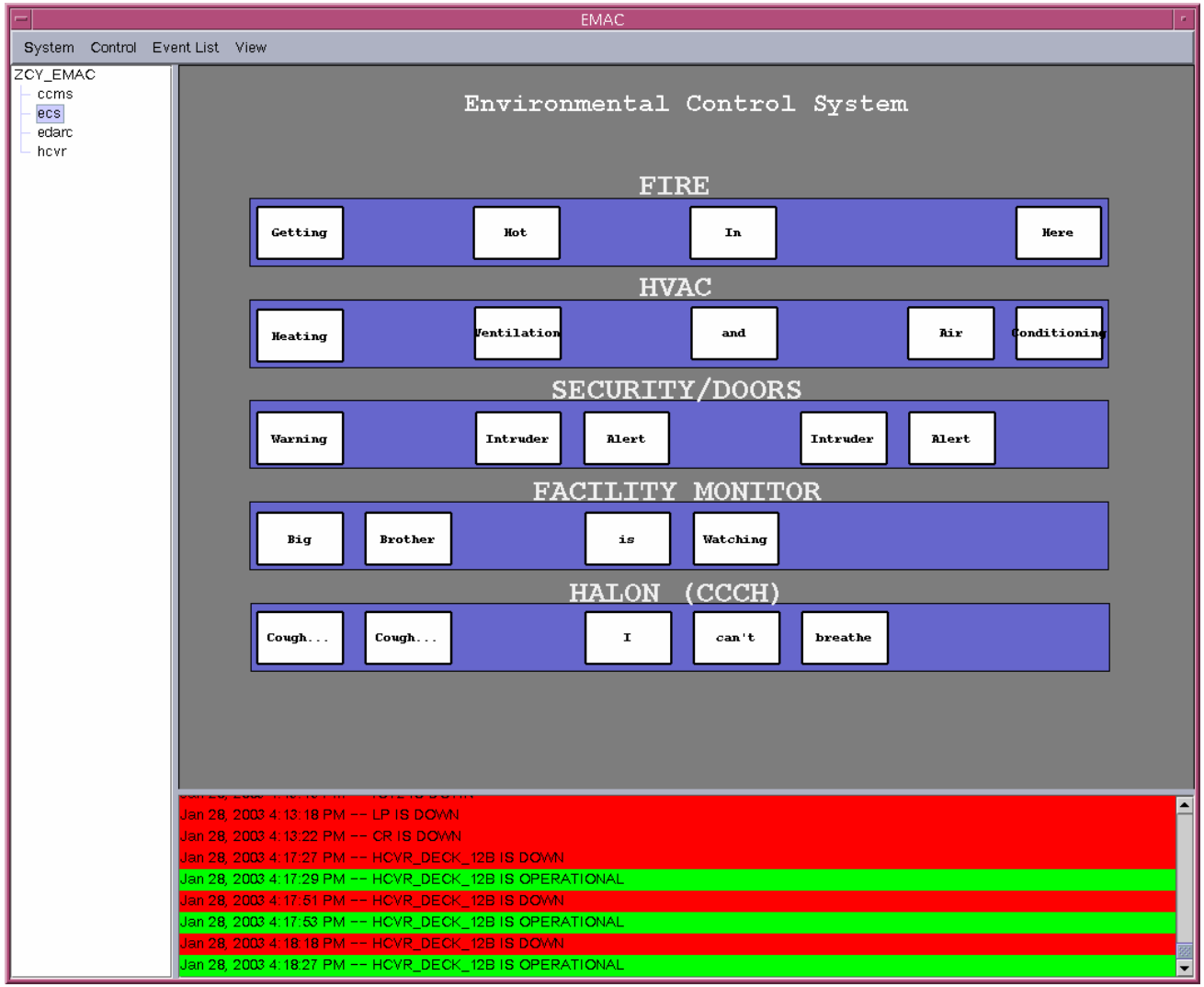
Additional Slides

January 29, 2003

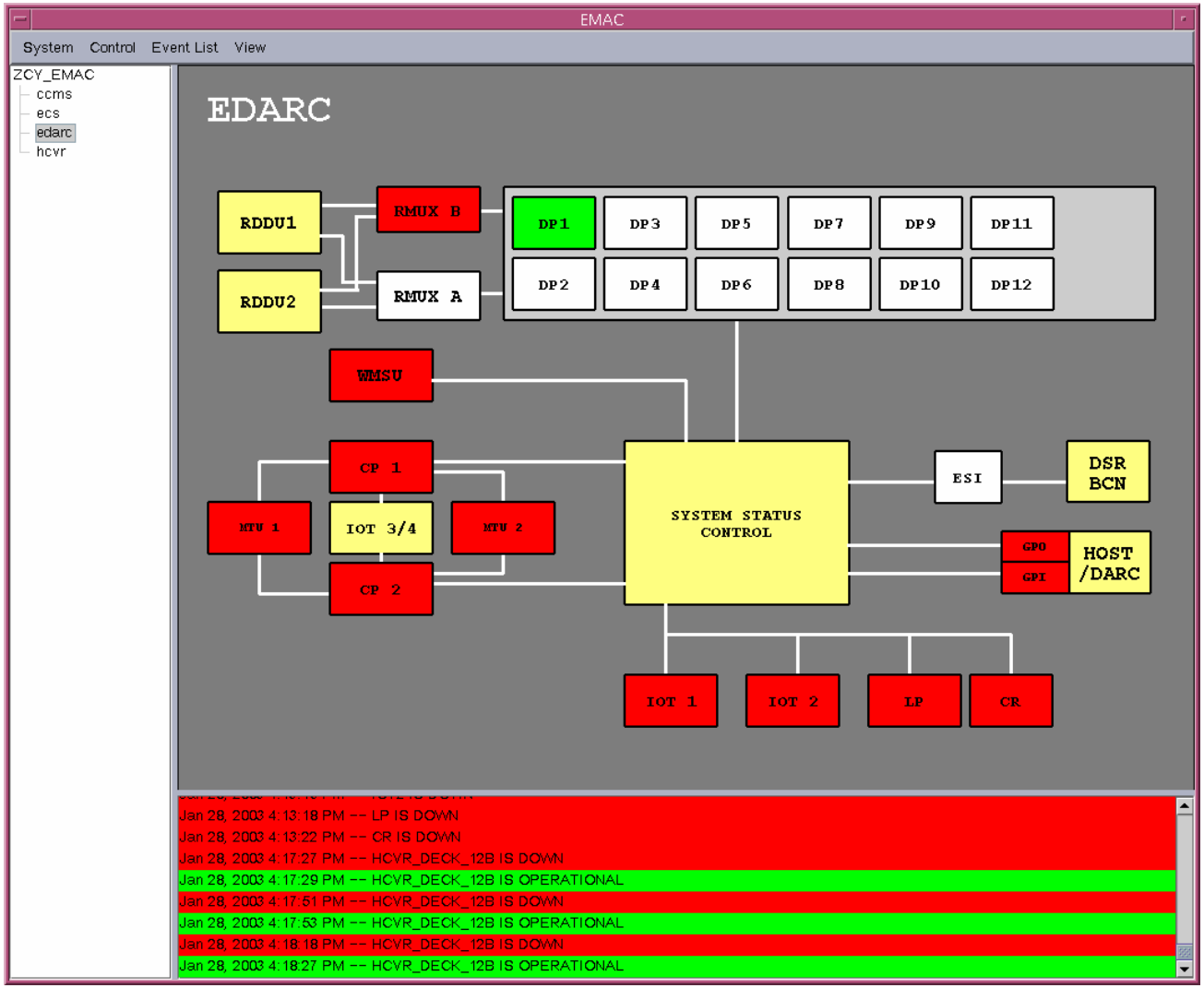
CCMS Submap


EMAC
System
Control
Event List
View
ZCY_EMAC
ccms
ecs
edarc
hcvr
CCMS
Chiller
Chilled Water Pump
Instrument Air Loss
Refrigerant Leak
Hi/Low Chilled Water Temp
Cooling Tower Shutdown
Cooling Tower Pump
CT Hi/Low Condenser H2O Temp
Low CT Sump Water Level
PSB Fuel System
PSB Storage Tank Leak
PSB UPS Room Hi Temp
PSB Battery Room Hi Temp
PSB Air Handling Unit
Reserved
CWB Air Handling Unit
CWB Host Room Hi Temp
CWB Comm/VSCS Room Hi Temp
CW 1st Floor AHU
AWB Air Handling Unit
AWB Hi Temperature
AW 1st Floor AHU
AW First Floor Hi Temp
ARTCC Complex Fire
Jan 28, 2003 4:17:27 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:17:29 PM -- HCVR_DECK_12B IS OPERATIONAL
Jan 28, 2003 4:17:51 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:17:53 PM -- HCVR_DECK_12B IS OPERATIONAL
Jan 28, 2003 4:18:18 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:18:27 PM -- HCVR_DECK_12B IS OPERATIONAL
Jan 28, 2003 5:27:31 PM -- CCMS01 IS DOWN
Jan 28, 2003 5:27:46 PM -- CCMS04 IS OPERATIONAL

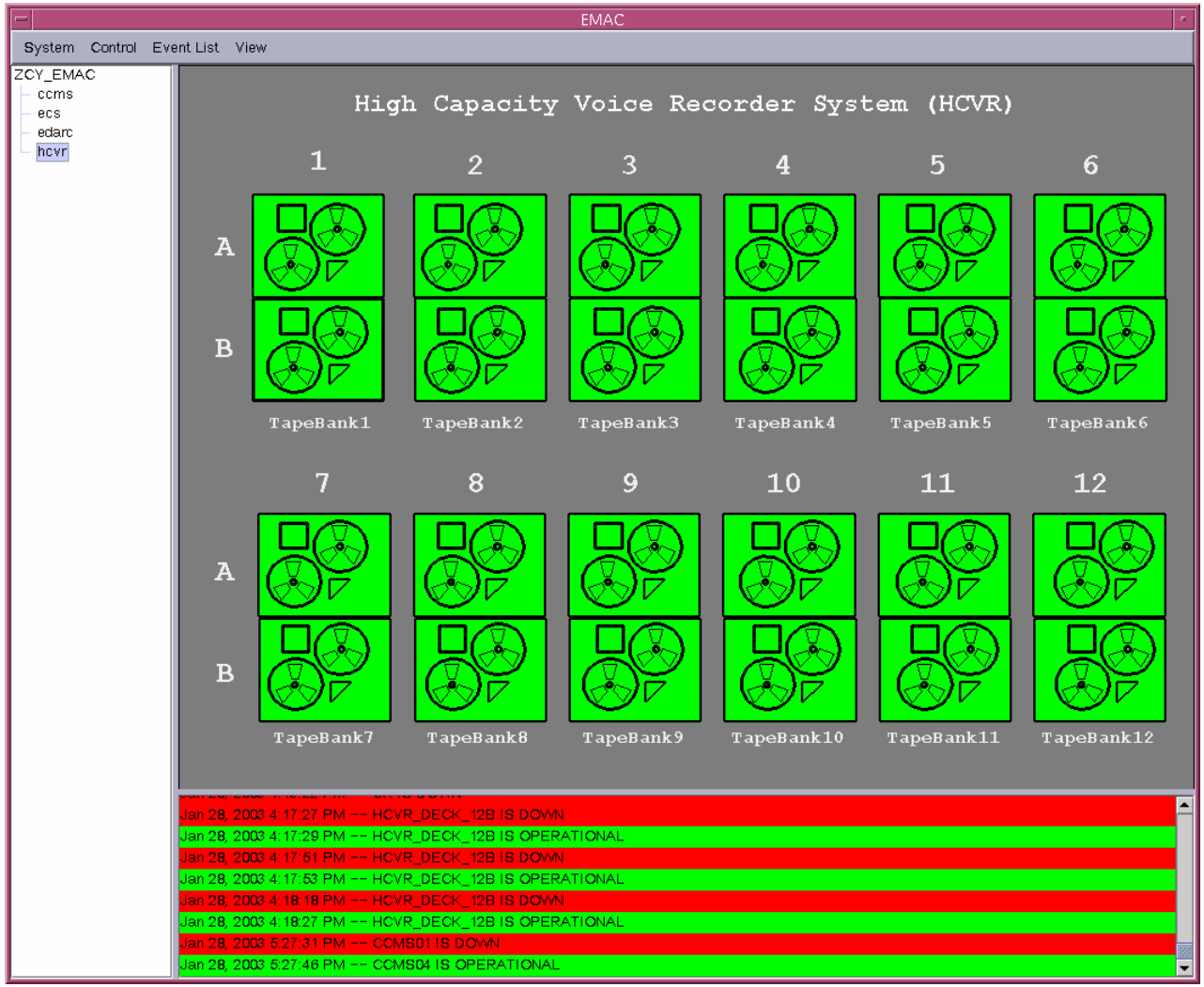
ECS Submap


EMAC
System
Control
Event List
View
ZCY_EMAC
ccms
ecs
edarc
hcvr
Environmental Control System
FIRE
Getting
Hot
In
Here
HVAC
Heating
Ventilation
and
Air
Conditioning
SECURITY/DOORS
Warning
Intruder
Alert
Intruder
Alert
FACILITY MONITOR
Big
Brother
is
Watching
HALON (CCCH)
Cough...
Cough...
I
can't
breathe
Jan 28, 2003 4:13:18 PM -- LP IS DOWN
Jan 28, 2003 4:13:22 PM -- CR IS DOWN
Jan 28, 2003 4:17:27 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:17:29 PM -- HCVR_DECK_12B IS OPERATIONAL
Jan 28, 2003 4:17:51 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:17:53 PM -- HCVR_DECK_12B IS OPERATIONAL
Jan 28, 2003 4:18:18 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:18:27 PM -- HCVR_DECK_12B IS OPERATIONAL

EDARC Submap



HCVR Submap


EMAC
System Control Event List View
ZCY_EMAC
ccms
ecs
edarc
hcvr
High Capacity Voice Recorder System (HCVR)
1 2 3 4 5 6
A
B
TapeBank1 TapeBank2 TapeBank3 TapeBank4 TapeBank5 TapeBank6
7 8 9 10 11 12
A
B
TapeBank7 TapeBank8 TapeBank9 TapeBank10 TapeBank11 TapeBank12
Jan 28, 2003 4:17:27 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:17:29 PM -- HCVR_DECK_12B IS OPERATIONAL
Jan 28, 2003 4:17:51 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:17:53 PM -- HCVR_DECK_12B IS OPERATIONAL
Jan 28, 2003 4:18:18 PM -- HCVR_DECK_12B IS DOWN
Jan 28, 2003 4:18:27 PM -- HCVR_DECK_12B IS OPERATIONAL
Jan 28, 2003 5:27:31 PM -- CCMS01 IS DOWN
Jan 28, 2003 5:27:46 PM -- CCMS04 IS OPERATIONAL

Object Adaptation Viewer