



NAWIPS Integration with AWIPS II General System Topology

Training Module 2

NCEP Central Operations

May 2011

General System Topology (NCO) – this training component covers the general architecture of the system from an NCEP perspective and gives an overview of each specific component's role or function within the system – non-technical.



Topics

- Hardware
 - AWIPS Network
 - Node Configuration
 - Firewall / LDAD
- Software
 - Client-Server (SOA)
 - Servers and Workstations
- Data Flow
- Differences from NAWIPS
- Summary





Hardware AWIPS Network



- Network Control Facility (NCF)
- Satellite Broadcast Network (SBN)
- Wide Area Network (WAN)
- Weather Forecast Office (WFO)
- River Forecast Center (RFC)
- National Center (NC)
- NOAAPORT Receive System (NRS)

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There are several parts that comprise the entire AWIPS System and Network. The NCF is the central hub of information and support. This slide and the next show the major components of AWIPS. Later slides will go into detail about the components of a particular site, or node.

The NCF is the main data source for the AWIPS sites. The AWIPS helpdesk and system support team are also located in the NCF.

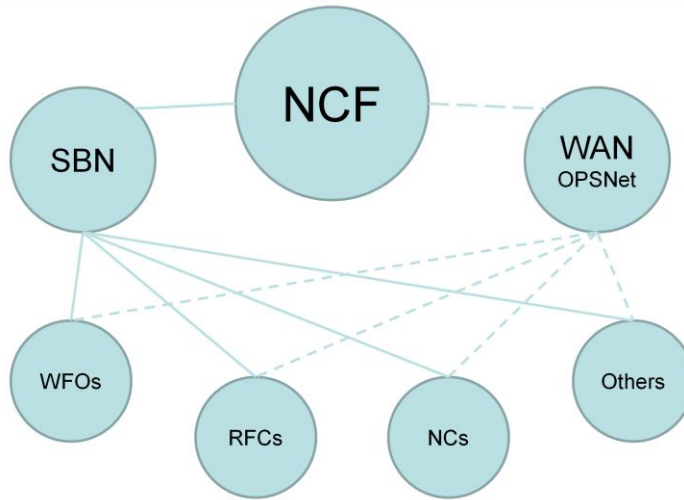
The main mechanism for distributing the data is the SBN. The NRS is the receive end of the communications at each site.

All AWIPS sites are connected via the WAN – which is currently OPSNet, run by NOAA.

The nodes are at all WFOs, RFCs, Regional HQs and NCs; as well as at NWSHQ, NWSTC and other test and management locations.



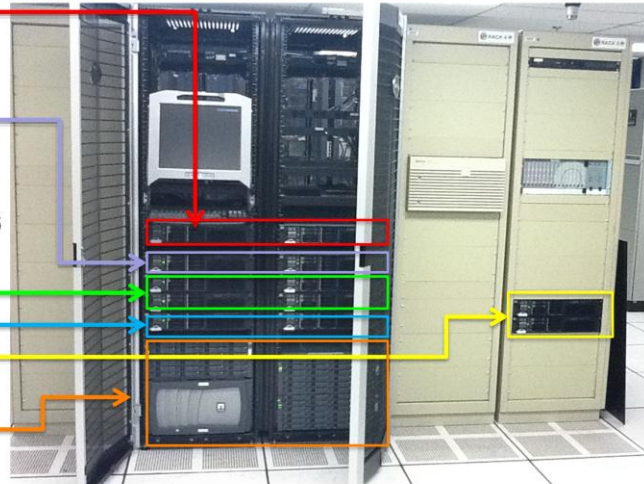
Hardware AWIPS Network





Hardware Node Configuration

- CPSBN1, CPSBN2
- DX1
- DX2
- DX3, DX4, DX5, DX6
- PX1, PX2
- LS2, LS3
- NetApp storage



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The servers are installed in a set of racks in a server room with controlled access. This is the same configuration for all NCEP centers. The actual rack positions may vary depending on space and cooling resources.



Hardware Node Configuration



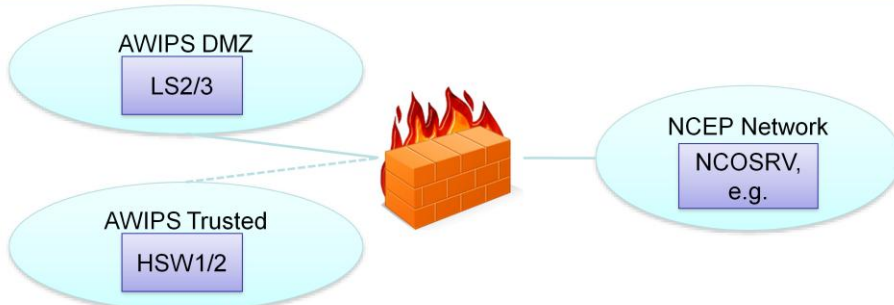
- LX workstations
 - 2, 3, or 4 monitor configurations

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The workstations at the National Centers will be installed with 24-inch and/or 30-inch monitors. The configuration of the LX workstations allows for 2, 3, or 4 monitors.



Hardware Firewall and LDAD



- LS2/3 are the LDAD Servers and can receive data from the external NCEP network
 - Connections are allowed through the firewall to LS2/3 in the DMZ area
- HSW1/2 are the switches that manage connections among the local AWIPS hardware
- NCEP also has Port 388 open through the firewall to allow PDS/LDM access from the NCEP network to one of the AWIPS servers in the Trusted area



Software Service Oriented Architecture

- SOA is a type of client-server design
- The server side is composed of a collection of services that communicate with each other to accomplish a task or set of tasks
 - Each service is well-defined, self-contained and does not depend on the state of other services
 - The services communicate via messages through a message broker
- The client makes requests to the services for data and information, usually through the message broker



Software



- DX1
 - Database – The AWIPS II database is Postgres. All read/write actions to the database go through DX1 to encapsulate the access into a single service.
 - Radar – This service collects data from a local radar and injects it into the system for further processing
 - PyPIES – Python Process Isolated Enhanced Storage – This service is like a database application for HDF5 files. It is used to read and write to the HDF5 storage area, encapsulating this action so that there is only one way to access the data.

- DX2
 - LDM(D) – The LDM (Downstream) is receiving data from the upstream LDM. The LDM running on DX2 has been modified from the Unidata baseline version.

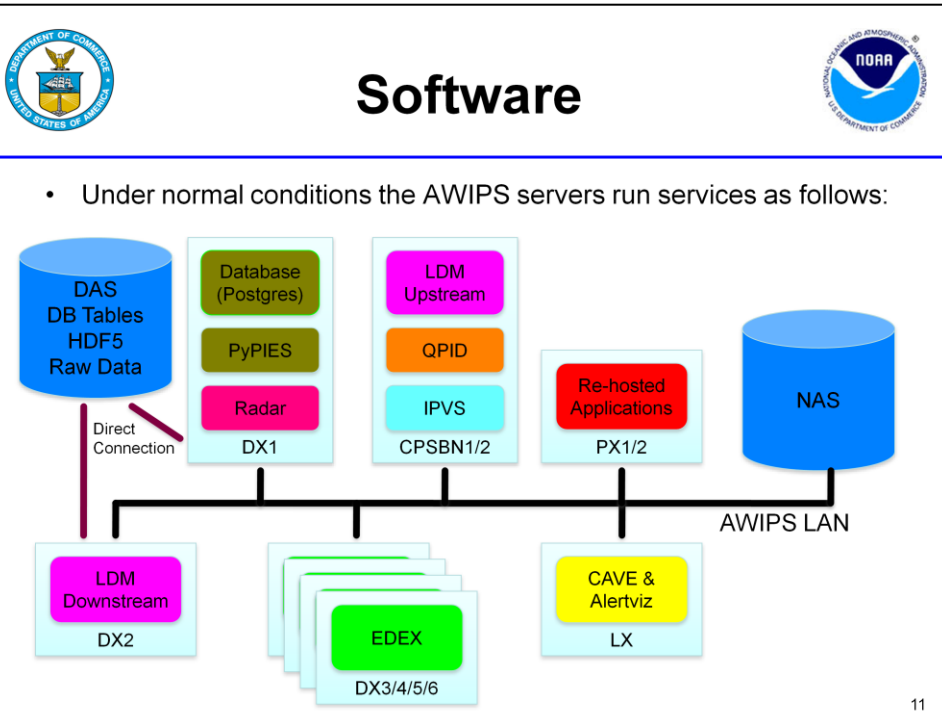
- DX3/4/5/6
 - EDEX – The Environmental Data Exchange (EDEX) is the main driver of AWIPS II. It ingests and decodes data, communicates with the database and pypies to store the data, and fulfills requests from all clients (CAVE) for data. There is no failover for these servers. All of the servers are always running in a load-balanced configuration.



Software



- **CPSBN1/2**
 - LDM(U) - The LDM (Upstream) is receiving data from the NOAA Port ingest processes, which in turn receive the data from the satellite broadcast converter.
 - QPID – This is the message broker. All messages are put into queues managed by QPID. Various processes register with QPID to listen to certain queues.
 - IPVS – This is the process that manages the request load balancing for the EDEX servers.
- **PX1/2**
 - Re-hosted Applications – These are AWIPS I applications that need to run in the AWIPS II environment. These include, but are not limited to, the Message Handling System, the Internal LDAD processing, etc.
- **LX Workstations**
 - CAVE – CAVE is the main client application. It has many "perspectives" that give the user different interfaces depending on the mode invoked.
 - Alertviz – All user notifications are displayed via the Alertviz monitor interface.



This figure shows the normal configuration. The individual processes are defined on the next slide.

There is a failover strategy that pairs some of the servers.

DX1 and DX2 are clustered – either server can run all of the processes associated with both servers.

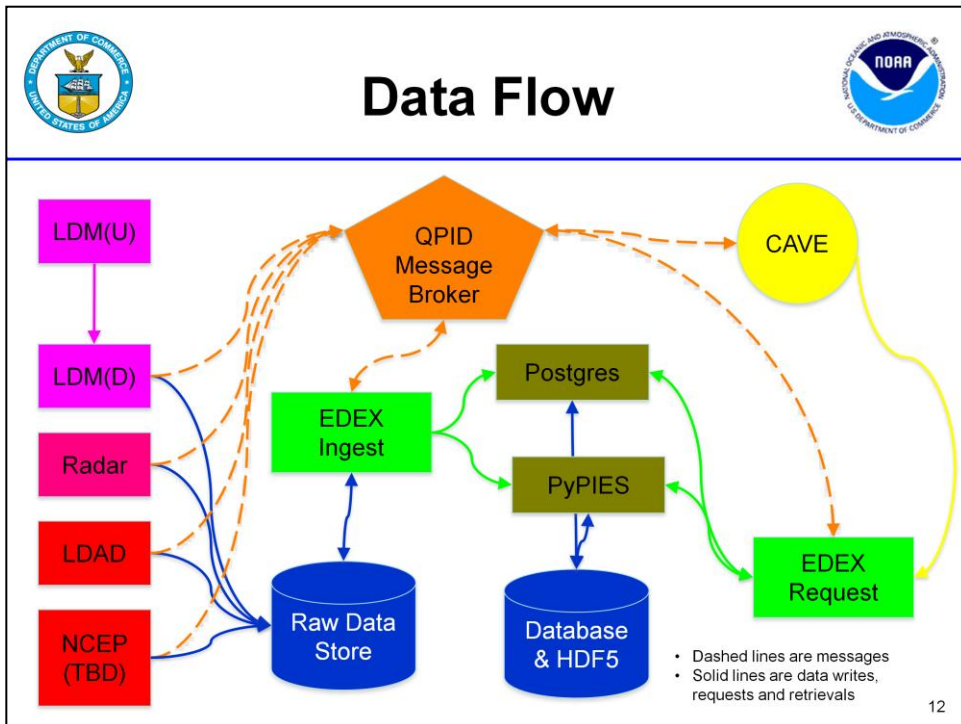
CPSBN1 and CPSBN2 are clustered – both are running the Upstream LDM, but QPID and IPVS are only run on the primary server.

PX1 and PX2 are clustered – the applications are grouped together. One group runs on PX1 and the other runs on PX2. Either server can run all applications, if necessary.

DX3, DX4, DX5 and DX6 – all servers run the EDEX all the time. There is no failover between these servers. If one goes down, the others pick up the processing as needed.

The DAS is Direct Access Storage for the database and hdf5 file storage. It is connected to only DX1 and DX2.

The NAS is Network Access Storage for everything else that needs to be shared among all servers and workstations.



1. Data arrives at a few different points
 - a. SBN data comes into the LDM(U) and is passed to the LDM(D)
 - b. Radar data comes from the local WFO radar system and is ingested directly
 - c. The LDAD in the DMZ collects data from external sources, the LDAD process on the trusted side retrieves that data and ingests it
 - d. The NCEP mechanism to ingest data from NCEP-unique sources still needs to be finalized
2. The data is written to the Raw Data Store and a message is sent to QPID
3. The EDEX ingest/decode process gets the message from QPID, reads the data from the Raw Storage, decodes the data and sends the results to Postgres and PyPIES for storage in the database and the HDF5 files
4. The EDEX then sends a message to QPID that new data is available
5. For CAVE there are two situations
 - a. When the user selects data to load, a request is sent to the EDEX. EDEX then queries the Postgres and PyPIES for the data and returns it to CAVE
 - b. When new data arrives for an already selected data type, CAVE gets the message from QPID and makes a request to EDEX for the data



Differences from NAWIPS



- **Development Languages**
 - AWIPS II uses Java, Python and some wrapped C libraries
 - NAWIPS uses C and Fortran
- **Data Decoding**
 - EDEX manages all decoding by executing various plug-in processes
 - GEMPAK decoders are run directly from the LDM
- **Data Storage**
 - AWIPS II uses the Postgres database and HDF5 files to store the metadata and data
 - NAWIPS uses flat files, in a directory tree, that contain both the metadata and data
- **User Applications**
 - CAVE is a single Java application with many plug-ins to do specific tasks
 - NAWIPS has numerous applications written to accomplish single tasks



Summary

- The AWIPS network has two parts
 - The SBN for one-way data delivery to all sites
 - The WAN for two-way communication between the sites and the NCF and among the sites
- The AWIPS II hardware consists of rack-mounted servers and user workstations
 - Each server has a specific set of services and processes to run
- AWIPS II implements a Service Oriented Architecture
- The differences between AWIPS II and NAWIPS are mostly architectural and will not affect the user experience
 - There are user-level differences that will be covered in another training module