WESTERN REGION TECHNICAL ATTACHMENT
NO. 96-08
MAY 7 , 1996

AWIPS UPDATE

Andy Edman - WRH, SSD - Salt Lake City, UT

Introduction

AWIPS is the last of the major systems scheduled to be deployed as part of the initial NWS Modernization. AWIPS will provide the capability to integrate datasets, run improved applications, and generally allow the forecaster to improve services through the use of better science. This Technical Attachment (TA) provides a quick update on the status of the AWIPS project. A thick set of documentation was sent to each NWSFO, NWSO, RFC and WR Division Chief from SSD on April 12, 1996. For more detailed information about AWIPS, refer to this documentation prepared by various NWS Headquarter groups.

I. Brief History

The AWIPS program began in 1983 when the NWS was given permission to create the project and to assemble a set of user requirements. A series of documents were generated and seven groups of companies bid on the project. In 1989, an award was made to two groups. One group of vendors was led by Computer Science Corporation and a second group was led by the Planning Research Corporation (PRC). This award marked the start of the Definition Phase where the two groups worked independently with the Government to demonstrate key capabilities and refine their designs. Toward the end of the Definition Phase, both groups submitted their best and final proposals. The AWIPS contract was awarded to PRC near of the end of 1992. The award marked the beginning of the Development Phase where PRC was tasked to develop the initial AWIPS system and prepare for deployment.

II. Where are we now....AWIPS Production Decision and the Deployment Phase

The AWIPS program is nearing the end of the Development Phase. PRC and the Government are working jointly on the initial AWIPS system. The Government will provide the bulk of the user applications. TDL and the Office of Hydrology are primary government organizations working on the applications. PRC is tasked with developing the basic system (i.e., hardware, communications database) and will integrate the government furnished applications. They are also tasked with developing a common user interface and developing the support structure.

The next major AWIPS milestone is the AWIPS Production Decision (APD), formerly called Key Decision Point IV (KDP IV). APD consists of deploying an initial AWIPS capability at seven field sites and demonstrating that the systems will have a positive impact on the field offices. The initial AWIPS system will consist of communications, workstations, and some of the applications. The Salt Lake City NWSFO and RFC are one of the initial seven national sites. An Operational Test and Evaluation (OT&E) and a Operational/Service Evaluation (OSE) will be conducted, and these evaluations will become the basis for a NWS APD report. Successful completion of the APD is important, since it essentially grants the NWS the authority to install AWIPS and commission the system at all of the remaining NWS sites scheduled to receive AWIPS. This authority requires approval by the Department of Commerce. The current schedule calls for the NWS to complete all of the necessary APD documentation by a target date of August 1.

III. What is AWIPS?

The key word to remember with AWIPS is **"Phased"**. AWIPS will consist of a:

Phased Deployment: AWIPS will be deployed at all WR sites based on the schedule provided in Fig. 1. It will take approximately two years to deploy AWIPS across WR. A list of the number of workstations and other equipment that will be installed as part of the initial AWIPS system was provided to each office in the April 12, 1996 set of documentation.

Phased Capability: While the hardware and system software will remain nearly the same during the deployment, the capability of the applications will vary dramatically during the deployment. Applications will be phased in as a series of builds. Figure 2 provides a comprehensive list of the applications and capabilities provided with each build. Each build will provide the office with a steady series of growing functionality. When AWIPS is deployed at a site, it will contain the latest build. Therefore, sites early in the deployment sequence will have receive a steady series of application software upgrades.

Phased Impact to the Operations: The initial AWIPS Build 1 system will not have sufficient capability to support all of the office's service programs. The offices will need to continue to use AFOS and WR systems to supplement AWIPS until later application builds are completed. As new software capabilities arrive, the office will need to decide which current systems can be decommissioned.

IV. AWIPS System Overview

The AWIPS system is essentially a Wide Area Network (WAN) connected to the office's Local Area Network (LAN) to which a number of workstations and other devices are interconnected. The AWIPS WAN consist of a satellite broadcast (called the Satellite Broadcast Network (SBN)) and a terrestrial network (which AWIPS calls the WAN). Most of the data (i.e., satellite and model data) is acquired by the office through a 3.7 meter satellite dish. The data stream consist of two channels, one running at a T1 rate and the other at a 128 Kbps rate (Fig. 3). Local data and forecasts are routed back through the RFCs to the Network Control Facility (NCF) through the terrestrial network.

Two LANs provide the basic communication backbone for the office. One is a redundant high speed LAN operating at 100 Mbps and the other is a low speed 10 mbps LAN. HP Series K processors are connected to the LANs and are used as database and application processors. The database system is both redundant and mirrored. The K computers come equipped with two processors and can be expanded to four processors. The forecaster workstations will be initially configured as a two-monitor system support by a HP J-200 computer. The J computer will contain one processor but can be upgraded to two processors. NWS headquarters is evaluating upgrading the workstation to a three-monitor system to support future applications. The HP J and K series computers are significantly faster than a HP755 or HP715 computer (Fig. 4).

Most of the system software will consist of commercial Off-the-Shelf (COTS) packages. While still subject to final testing and approval, the system is basically UNIX, TCP/IP and SQL based using packages such as HP-UX, Informix , WordPerfect, and other common system software.

As mention above, the applications will be developed primarily by the NWS and integrated into AWIPS by PRC. Most of the applications are being written in either Fortran or C. After APD, the plans call for the forecast office to be able to develop and integrate local applications. NWS headquarters is currently working on security and a configuration management plan for this process. Access to local datasets will be through an AWIPS-defined firewall. For more information on the firewall, refer to the April 12 set of documentation.

V. Pre-AWIPS Installation and Training

AWIPS is a relatively easy system to deploy compared to the WSR-88D. The biggest challenge is where to locate the 3.7 meter satellite antenna and the workstations. Figure 5 provides a summary of the pre-installation activities that will occur during the preceding 12 months.

Training will consist of a series of resident and local on-site training. The following was adopted from a draft report prepared by Brent Bower (OM).

Pre-Installation Orientation Material. The training will begin with pre-installation orientation material to introduce the AWIPS system.

Centralized User's Training (CUT). Three WFO/RFC personnel (SOO, DOH, ESA, AWIPS Focal Point (AFP)) will attend the NWS Training Center (NWSTC) for CUT courses. This course will provide AWIPS operator and system administration training. The training will expand from five to thirteen days in length as AWIPS software builds are deployed. Trainees will receive instructional material for use in training at their sites.

On-site User's Training (OUT). After AWIPS is installed, OUT courses for AWIPS operator training will be given at the WFOs for the rest of the staff. The OUT courses will expand from 12 hours to 20 hours, given multiple times over 5 to 10 days.

AWIPS Upgrade Training (AUT). For the AWIPS Build 2 upgrade, two days of on-site training on the differences from the previous build will be given to the SOO, DOH, ESA, and AFP. For each additional AWIPS upgrade, PRC will develop Computer Based Instruction (CBI) training for each WFO.

VI. Other Training

WFO Operational Hydrologic Forecasting (WOHF) System : A NWSTC course will be provided for three WFO people (i.e., Service Hydrologist and two WFO staff) on WFO Operational Hydrologic Forecasting applications, including the Site-Specific River Stage Forecasting and the Area Wide Hydrologic Prediction System. The Office of Hydrology will also provide a "tiger team" to help each Service Hydrologist set up the hydrological applications on site.

Interactive Forecast Preparation (IFP). The deployment of a IFP application will cause a profound impact on how forecasters create a forecast product. The initial system to be deployed will be the Interactive Computer Worded Forecast System (ICWF). A second generation system called the Advanced Forecaster Preparation System (AFPS) will be deployed in a later build. Training will consist of a number of forums including videotapes, CBIs, IFP, Internet Homepage, and a NWSTC course.

UNIX Training: UNIX training (ESAs, ETs) is being made available via

a) NWSTC videotapes on UNIX Operating System and System Administration from the AWIPS Lending Library,

b) the NWSTC courses "Introduction to UNIX" and "UNIX System Administration",
c) support for other locally obtained training courses or training material, and
d) future PDW module "The Learning Kit" which was given to all future WFOs.

VII. Summary

SSD is now beginning to examine the AWIPS SBN data stream and provide feedback. One issue that has arisen is the lack of the GOES-9 FOG/Low stratus digital image data. Since WR has demonstrated the positive impact that this dataset has on services, SSD will continue to work to move up the scheduled implementation of this dataset. AWIPS is meant to be modified and improved through its entire planned program life. Once the capabilities of the applications become better known, a more comprehensive update will be provided since it directly impacts both sciences and services. WR will continue to provide updates through the WR Staff Notes and direct cc:Mail messages to offices. **A new AWIPS icon has been added to the WR SSD homepage (http://ssd.wrh.noaa.gov) that is linked to a NWS headquarters homepage where the latest AWIPS schedule information will be posted.**

WESTERN REGION AWIPS SCHEDULE

Station	ID	Date
Salt Lake City WFO	SLC	7/96
Colorado Basin RFC	STR	7/96
Western Region Hq	SLCU1	6/97
Northwest RFC	PTR	6/97
Portland OR WFO	PQR	6/97
Boise WFO	BOI	6/97
Great Falls WFO	TFX	9/97
Missoula WFO	MSO	9/97
Seattle/Tacoma WFO	SEW	9/97
Spokane WFO	OTX	9/97
California/Nevada RFC	RSA	10/97
Sacramento Valley WFO	STO	11/97
San Francisco WFO	MTR	11/97
Flagstaff WFO	FGZ	2/98
Phoenix WFO	PSR	2/98
Tucson WFO	TWC	3/98
Eureka WFO	EKA	5/98
Las Vegas WFO	VEF	5/98
Reno WFO	REV	5/98
Los Angeles WFO	LOX	7/98
San Diego WFO	SGX	7/98
San Joaquin WFO	HNX	7/98
Elko WFO	LKN	9/98
Medford WFO	MFR	9/98
Pendleton WFO	PDT	9/98
Billings WFO	BYZ	11/98
Glasgow WFO	GGW	11/98
Pocatello/Idaho Falls WFO	PIH	11/98

Fig. 1

DRAFT

AWIPS BUILD DESCRIPTIONS AND ACTIVITIES		BUILD 1	BUILD 2	BUILD 3 (P^3I1)	BUILD 4 (P^3I2)	BUILD 5 (P^3I3)	BUILD 6 (P^3I4)
CAPABILITIES	DATA ACQUISITION	SBN for data distribution Terrestrial frame relay network for limited multipoint-to-point and point-to-point Ingest, sectorizing, & display of GOES 8 & 9 Acquisition & display of RUC, Eta, & other NCEP model data Text may be viewed in COTS word processing AFOS connectivity for access to Digital Precipitation Analysis (DPA) Increase suite of WSR-88D products by adding radar graphics products Acquisition and display of WSR-88D image and graphic products	Acquire WSR-88D data from non-associated radars Display and edit undecoded text products Acquire and decode precip for return to WSR-88D RPG for bias estimation Frame relay network message handling system in place	Lightning data decoded using proprietary decoder ASOS hourly and special observations accessed and decoded All observational data decoded Colocated WSR-88D connected on 56 Kbps line All radar products available Communication support for local acquisition and dissemination of data	Intersite coordination procedures allow transmission of 'briefing packages' to participating sites Data necessary for service backup of neighboring sites available Complete command and control function of PUP available	Access to local ASOS 5-min data and Daily and Monthly Summary Reports Complete access to Geospatial Data Set to modify and tailor map backgrounds.	
	DATA ANALYSIS AND PROCESSING	Gridded model data and some derived parameters data can be contoured WSR-88D Stage 2 and Stage 3 Precip Processing at RFC Executes NWS River Forecast System (NWSRFS) Storage of data (except hydrologic data) in common AWIPS databases Selection of defined set of derived gridded data for display	WSR-88D Stage 2 (WFO or RFC) and Stage 3 (RFC) Precip Processing Storage of data in common AWIPS databases Executes WFO Site Specific Hydrologic Model using Soil moisture conditions from RFC	Combined Reflectivity / Velocity images produced Point data contoured using objective analyses Parameters derived from point or gridded data using equation building capabilities Analysis of forecast fields with Interactive Computer Worded Forecast (ICWF) * Area-Wide Hydrologic Model evaluates Flash Flood probabilities	Combined images including satellite /radar combinations are available Local MOS Predictor Model (LAMP) can be executed Interactive Skew-T Initial forecast verification statistics can be computed NWSRFS Snow Update, Calibration, and Extended Steam Flow Prediction (ESP) components added Dam Break model available	Quality control provides wide range of data validation options Forecast monitoring compares forecasts to observations, guidanace, or adjacent forecasts	Automated Forecast Preparation System (AFPS) provides enhanced analysis and product generation tools * Climate monitoring compare observations to climate records Verification Statistics

Fig. 2 (a)

DRAFT

AWIPS BUILD DESCRIPTIONS AND ACTIVITIES	BUILD 1	BUILD 2	BUILD 3 (P^3I1)	BUILD 4 (P^3I2)	BUILD 5 (P^3I3)	BUILD 6 (P^3I4)
DATA DISPLAYS	Integrated display of image (satellite or radar) and time-matched graphic (contoured model data) products in multiple windows Preliminary AWIPS Graphical User Interface (GUI) COTS word processing for text display and editing Display of precip maps and hydrographs Animation, zooming, roaming in multiple windows RFCs / WFOs can display point precipitation and stage data in separate Hyroview window	Integrated display of satellite, radar, or combined radar image products and time-matched graphic products in multiple windows Revised AWIPS GUI COTS word processing and text widgets for display and editing of text products Intrasite mail	Image and graphic data (including hydrologic data) displayed in common windows Fade between combined Z/V images Point data display on station model plots or contoured geographical display Updated GUI On-line HELP function populated	Fade between any combined image Time series, cross sections, and geographic presentation provide integrated displays in each format Mosaic of WSR-88D reflectivity based products ——————— Additional Capabilities: AWIPS Development Framework completed including the development database; Application Programming Interfaces (API) defined and documented		
PRODUCT GENERATION	Text products may be generated using COTS word processing if distribution and dissemination are not time critical (no direct local dissemination of forecast products) River product formatters help generate draft flood warnings and statements	Text products may be generated using text widgets or COTS word processing if distribution and dissemination are not time critical RFCs generate gridded Flash Flood Guidance and River Forecast Guidance for use by models and formatters at the WFOs	Thunderstorm Product Generated Draft watches, warnings, advisories or statements (W/W/A/S) generated using interactive graphics capabilities with image products Draft forecast products and Quantitative Precipitation Forecast (QPF) generated using ICWF Dissemination of products through NWWS and Console Replacement System (CRS)	Generation and transmission of coordination briefing packages for watches, warnings, forecast, and QPF Generation of drafts of most routine products and warning products through use of ICWF and interactive graphics interface		Generation of drafts of most routine products and long range forecasts through use of AFPS

Fig. 2 (b)

DRAFT

AWIPS BUILD DESCRIPTIONS AND ACTIVITIES	BUILD 1	BUILD 2	BUILD 3 (P^3I1)	BUILD 4 (P^3I2)	BUILD 5 (P^3I3)	BUILD 6 (P^3I4)
LIMITATIONS	Primarily intended for display of modernization data sets Limited calculations on gridded data Incomplete suite of WSR-88D products No point observational data available for display No direct local product dissemination Only predefined calculations for gridded derived parameters WFO Hydrologic Forecast System not integrated with other WFO applications	Hydrology package not fully integrated Limited calculations on gridded data No point observational or derived data available for display No direct local product dissemination On-line HELP available but not populated	ICWF requires change in paradigm	Data Quality Control and Forecast Monitoring remain labor intensive activities		
OPERATIONAL ADVANTAGES	Limited set of derived model parameters available for display Display of radar, satellite, and model data on multiple windows at each workstation Overlay of image data and model graphics Components of WFO Hydrologic Forecast System Execution of River Forecast Models to generate river forecast guidance and forecasts	Computation of quality control precip estimates from multiple radars Execution of River Forecast Models to generate river forecast guidance and forecasts	Local acquisition and dissemination of data Ability to disseminate watches, warnings, advisories, and forecast through local communications	Automated processing of incoming data Integrated display of image & graphical data as geographic plots, time series, or cross sections Generation of draft ICWF & interactive graphic and digital database manipulation Intersite coordination & service backup support		Continuous monitoring of forecast and climate data Automated quality control of incoming data and products Productivity tools complete

Fig. 2 (c)

DRAFT

AWIPS BUILD DESCRIPTIONS AND ACTIVITIES	BUILD 1	BUILD 2	BUILD 3 (P^3I1)	BUILD 4 (P^3I2)	BUILD 5 (P^3I3)	BUILD 6 (P^3I4)
WFO APPLICATION DEVELOPMENT BY AWIPS BUILDS	Contouring Gridded Data GRIB Decoder NEXRAD Image Display Generation (Build 1 Products) NEXRAD Graphics Overlay Display Generation (Build 1 Products) Upper Air and Surface Paramaters on Grids (Build 1 Paramaters) Hydrologic Data Management System (HDMS) (stand alone) Hydrologic Data Viewing System (HDVS) (stand alone) River Forecast Product Formatter (stand alone) SHEF Decoder (stand alone) Stage II precipitation (stand alone) Stage III precipitation (stand alone) AWIPS Communication Server	Encode Gage Reports in SHEF for NEXRAD Hydrologic Data Management System (HDMS)(Integated) Hydrologic Data Viewing System (HDVS)(Integrated) NEXRAD Graphic & Alpha Displays (Build 2 Products) NEXRAD Image Display Generation (Build 2 Products) River Forecast Product Formatter (Integrated) SHEF Decoder (Integrated) Site-Specific River Stage Forecasts Stage II precipitation Dam Catalogue (stand alone)	Agricultural Forecast Formatter Area Forecast Formatter Arithmetic Operations on Grids BUFR Decoder Coded Cities Forecast Decoder Coded Cities Forecast Formatter Equation Builder and Editor (Arithmetic Ops) GRIB Encoder Geographic Data Plots Hazardous Weather Statement Formatter Image Enhancements Insert W/W/A Headline into Forecast Interactive Modification of Digital Forecast Data Interactive Modification of Gridded Fields Interface for W/W/A/S Composition LAMP Statistical Guidance System Lightning Decoder and Display Load and Unload Digital Data METAR and SPECI Reports Decoder	Agricultural Observations Formatter Area Weather Update Formatter Area-Wide Hydrologic Prediction System Arithmetic Operations on Points Assemble and Collate Verification Data Cross Section Plots Daily Forecast Critique Fire Weather Forecasts Formatter Image Combinations Image Comparison Interactive Skew-T Displays Isentropic Parameters Local Storm Reports Formatter Marine Observation Formatter Monthly and Seasonal Verification Scores NEXRAD Composite NFDRS Forecast Formatter NWR CRS Products Formatter Quality Control of Official Text Products Quality Control of Point Data Retreive Information at Cursor (Full Capability) River Stage & Rainfall Summary Formatter Dam Break Forecast Model	Decode ASOS Summaries and FFWM Forecast Monitoring Displays Grids to Images Generation Image Feature Extrapolation NGWLMS Decoder Quality Control of Gridded Data SLOSH Display Tide Table & Water Lvl Departure Parameters Tide and Water Level Displays	AFPS Advanced Quality Control Techniques Aviation Decoder Climatological Record Monitoring Climatological Reports Formatter Equation Builder and Editor (Verif, QC, Monitor) Forecast and Guidance Monitoring NEXRAD Plate Stack Displays Pilot Weather Briefing Record Report Formatter Weather Event Monitoring

Fig. 2 (d)

DRAFT

AWIPS BUILD DESCRIPTIONS AND ACTIVITIES	BUILD 1	BUILD 2	BUILD 3 (P^3I1)	BUILD 4 (P^3I2)	BUILD 5 (P^3I3)	BUILD 6 (P^3I4)
WFO APPLICATION DEVELOPMENT BY AWIPS BUILDS			Monitor Digital Forecast Data for Hazard Weather NEXRAD Graphic & Alpha Displays (Build 3 Products) NEXRAD Image Display Generation (Build 3 Products) Objective Analysis of UA & Surface Variables Public Weather Zone Formatter Quality Control of Digital Forecast Data RDF Product Rawinsonde Decoder Redbook Decoder Retrieve Information at Cursor Position (W/W/A sup) Supplementary Data Reports Decoder Synoptic Decoder TAF Decoder TAF Formatter TWEBS Formatter Thunderstorm Product Time Interpolation Transform Zone Forecasts into Products Upper Air and Surface Parameters on Grids (Build 3 Parameters) Upper Air and Surface Parameters on Points Watch, Warning, and Advisory Formatter	Streamline Display Temperature & Precipitation Table Formatter Time Sections Plots Trajectory Forecast Plot Watches/Warnings/Advisories/ Statements Monitoring Weather Round-up Formatter		

Fig. 2 (e)

DRAFT

AWIPS BUILD DESCRIPTIONS AND ACTIVITIES	BUILD 1	BUILD 2	BUILD 3 (P^3I1)	BUILD 4 (P^3I2)	BUILD 5 (P^3I3)	BUILD 6 (P^3I4)
RFC APPLICATION DEVELOPMENT BY AWIPS BUILDS	NWSRFS OFS Stage III Processing	Flash Flood Guidance Model GIS Utilities	NWSRFS Data Extraction RFC QPF Assimilation	Historical Data Access Historical Data Analysis Model Calibration NCCF Model Support Snow Updating Model		
HYDROMET APPLICATIONS TRAINING **(Medium - High Tasks)**	Hydroview Hydrobase		Objective Analysis Image Enhancement WWA/S Area Wide Hydro Prediction System ICWF Site-Specific River Stage Forecast	NEXRAD Composites Isentropic Analysis Image Combination Dam Break QC for Points and Grids Image comparison	Image Feature Extrapolation? Grids to Images? Data QC - Hydro? Verification - Hydro?	Advanced QC Time Interpolation Plate Stacks Event Monitoring Pilot Wx Briefing AFPS
TECHNOLOGY INTERFACES	AFOS 9.6Kbps w/local associated WSR-88D	Non - associated WSR-88D WSR-88D RPG (Rain Gauge)	ASOS Obs LDAD 56Kbps w/local associated WSR-88D NWWS CRS		ASOS 5-min data/Summary Reports	
SYSTEM DEACTIVATIONS		SWIS / MICRO SWIS		AFOS--Processing & Displays NEXRAD PUPs	AFOS---Comms	

THIS CHART IS FOR PLANNING PURPOSES ONLY. ITS INTENT IS TO HIGHLIGHT WHAT IS IN A BUILD.

IT REPRESENTS A SNAPSHOT IN TIME AND DOES NOT CONSTITUTE AN OFFICIAL SCHEDULE.

* NOTE: Plans for operational implentation of Interactive Forecast Preparation (IFP) capabilities (i.e., ICWF / AFPS) in the field are being reevaluated

Fig. 2 (f)

SBN

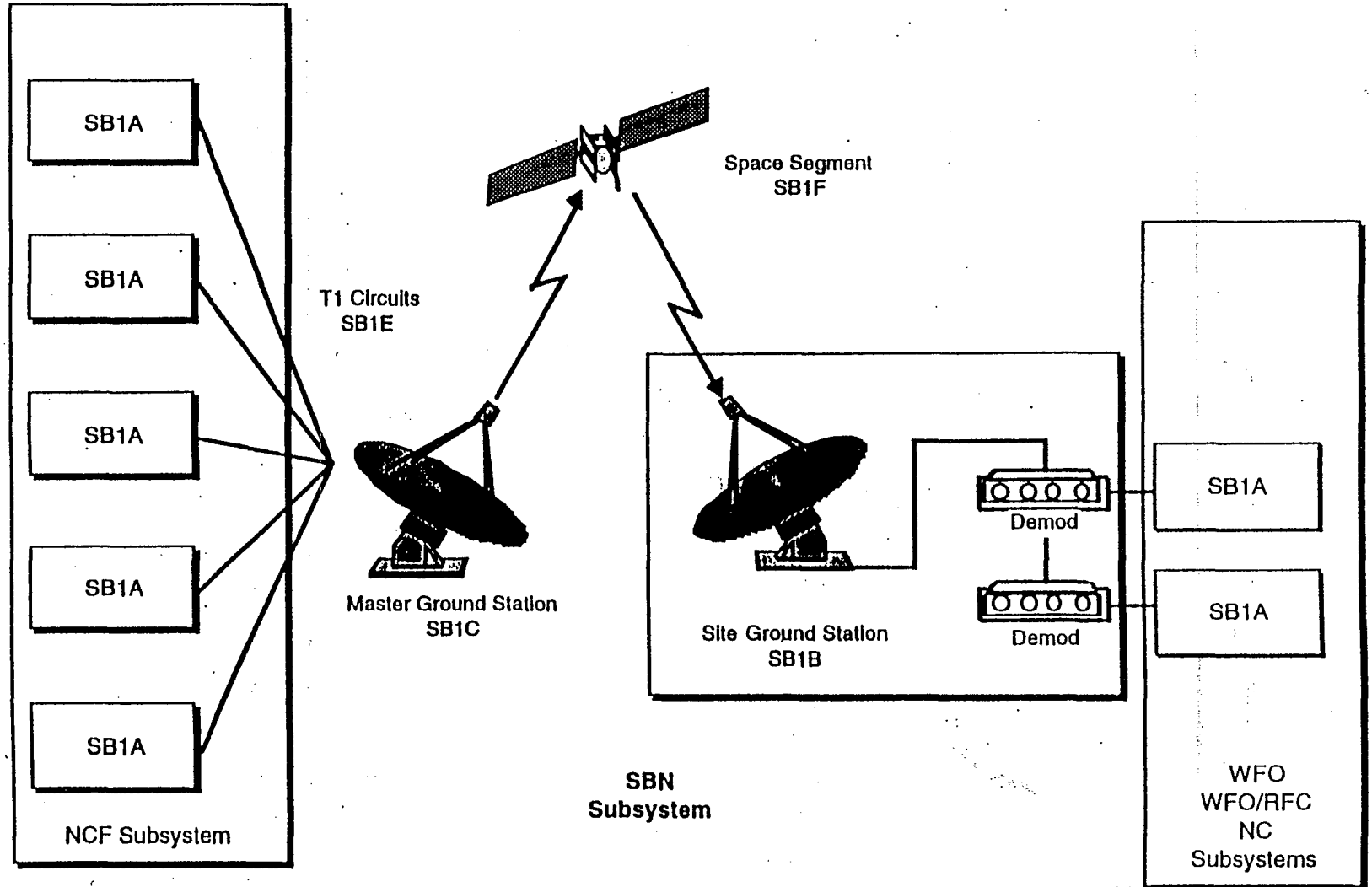
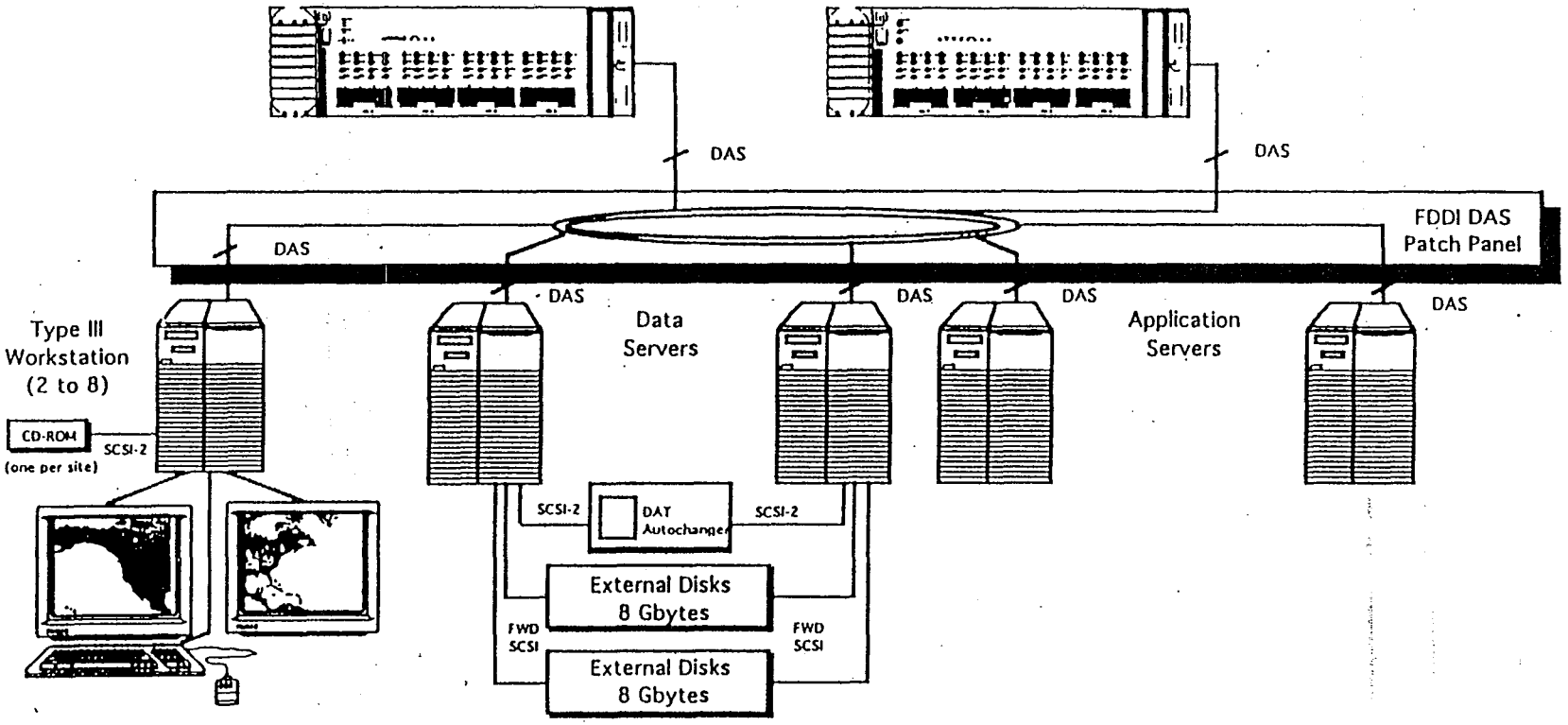


Fig. 3

WFO Detailed Design - High Speed LAN



AWIPS SITE INSTALLATION SCHEDULE

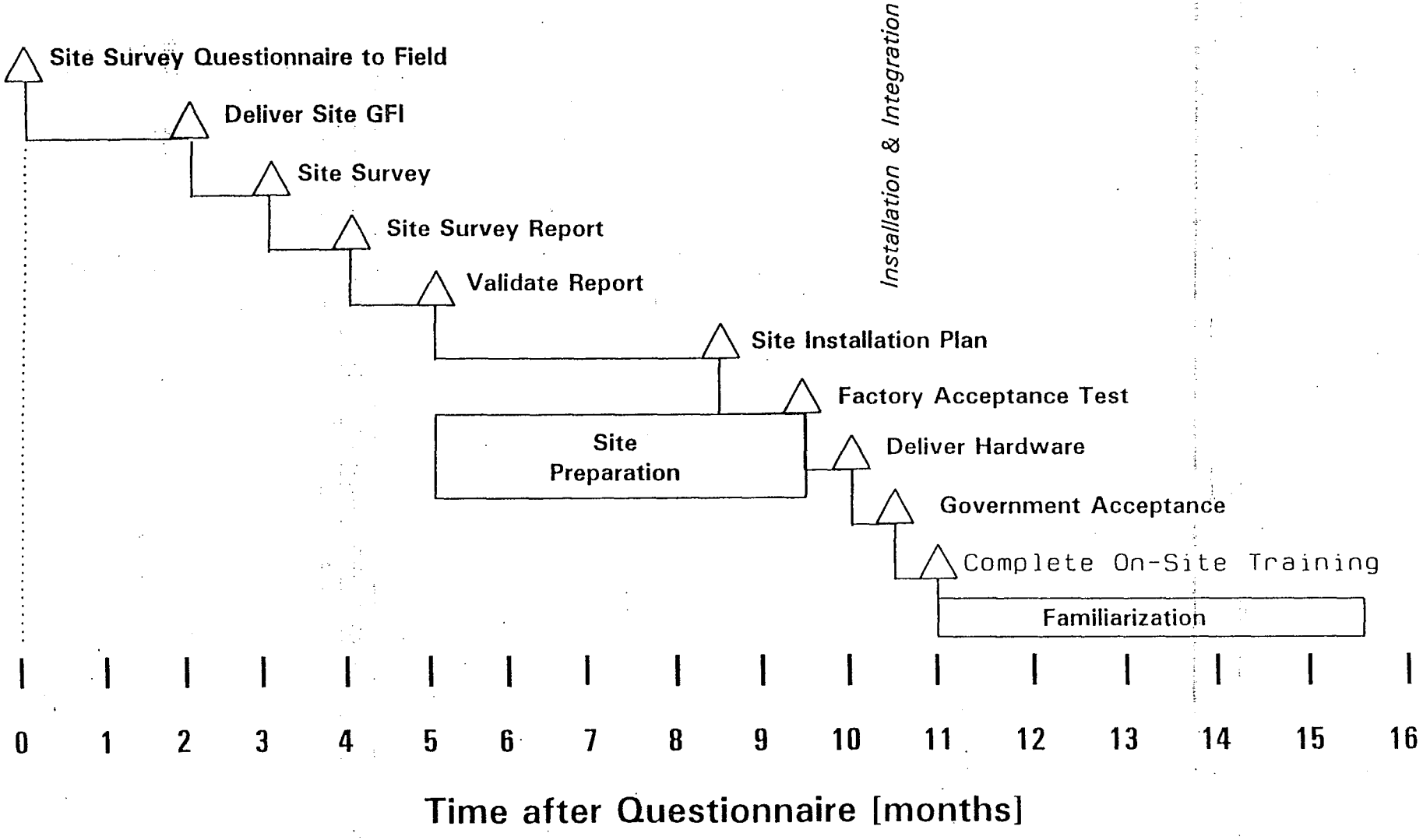


Fig. 5

install.ppt
wtj 09/19/95