

NORSAR Scientific Report No. 2-88/89

# **Semiannual Technical Summary**

**1 October 1988 – 31 March 1989**

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Kjeller, July 1989

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## VII.6 X.25-based communication link between NORSAR and AFTAC

A new communication link, based on the international Packet Switched Data Network (PSDN) and making use of the X.25 protocol, has been established between NORSAR and AFTAC. This new link enables AFTAC to extract raw data from ARCESS, NORESS and NORSAR in near real time.

The on-line processing of data from the NORSAR array is being conducted at the array data center at Kjeller. Processing results in the form of detection information are transmitted every 8 hours to AFTAC via telex. AFTAC requests raw data by mail and data are transmitted on 1/2" tapes from NORSAR to AFTAC. Both the transmission of processing results and data are delayed compared with what may be achieved with a direct computer access to Norway, and AFTAC has requested NORSAR to assist in implementing a direct computer access and build up necessary programs and routines for accessing NORSAR data. Main goals have been as follows:

- Better connection to NORSAR
- Faster access to detection lists
- Online access to raw data
- Binary file transfer of data

Both NORSAR and AFTAC are users of SUN workstations, and the decision was made to use SUN to set up the new communication link. In this way we can easily make use of efficient transmission protocols, and avoid the difficulties that result from the current lack of standards for communications between computers of different architecture.

In order to implement a reliable link, we considered the following options:

- Modem communication using UUCP or Kermit
- ARPANET connection using the TCP/IP protocol
- X.25 using the TCP/IP protocol on top of X.25.

Fig. VII.6.1 shows the option selected, corresponding to the third alternative above. The X.25 service is a commercially available service and was selected instead of ARPANET. Based on our previous experience with modems using ordinary telephone lines between the US and Europe, we have rejected this option. The GSE group in Geneva has also reached a similar conclusion, and will be using the X.25 service for the upcoming GSETT-2 experiment. X.25 is implemented in more countries than any other high-speed data communication medium.

The X.25 itself offers no more than reliable transport of packets. In addition to X.25, the X.29 protocol must be used for terminal access. Most computers with X.25 implemented have the X.29 protocol available. This protocol is implemented on SUN in a program called PAD (Packet Assembly Disassembly).

There are several ways to implement the file transfer protocol. The likely future solution will be based on OSI and FTAM. SUN offers file transfer by using the well-known TCP/IP protocol on top of the three X.25 layers. A logical link between two computers on X.25 is established and file transfer is done with ftp or rcp commands. Telnet, mail and other TCP/IP-based applications will also work while the link is established.

X.25, PAD and TCP/IP-based services over X.25 are available in SUN's product SUNlink together with a VME MCP board.

Access to information at NORSAR is achieved by using the National Data Center (NDC) program developed at NORSAR. The NDC program has the following functions available:

- Access to detection lists from NORSAR, NORESS and ARCESS
- Access to waveforms from NORSAR, NORESS and ARCESS
- Graphical display of data by using the X window protocol.

The NDC program is easy to use and has a set of well-documented man (manual) pages available online.

AFTAC has its own login account and logs in as a regular user. Thus, all the UNIX features will be available in addition to the NDC program. Fig. VII.6.2 shows how data and detection lists from NORSAR, NORESS and ARCESS are organized at the NORSAR data center. Detection lists from NORSAR, NORESS and ARCESS are accessed by using SUN's NFS (Network File System) protocol. The NDC program sends mail with a request for NORSAR data to a server on the IBM 4381 computer. The server forms a data file with the requested time interval and transfers the data segment to the SUN using ftp. The format of NORSAR data is equal to the original NORSAR tape format.

The first step, terminal access, is already installed and the file transfer functions will be available as soon as AFTAC obtains a direct X.25 connection.

The selected solution will make it possible for AFTAC to access any computer connected to X.25. It may not be possible to achieve file transfer from all installations, but terminal access will normally work. File transfer will be possible when the OSI standard is more commonly available at different computers.

R. Paulsen

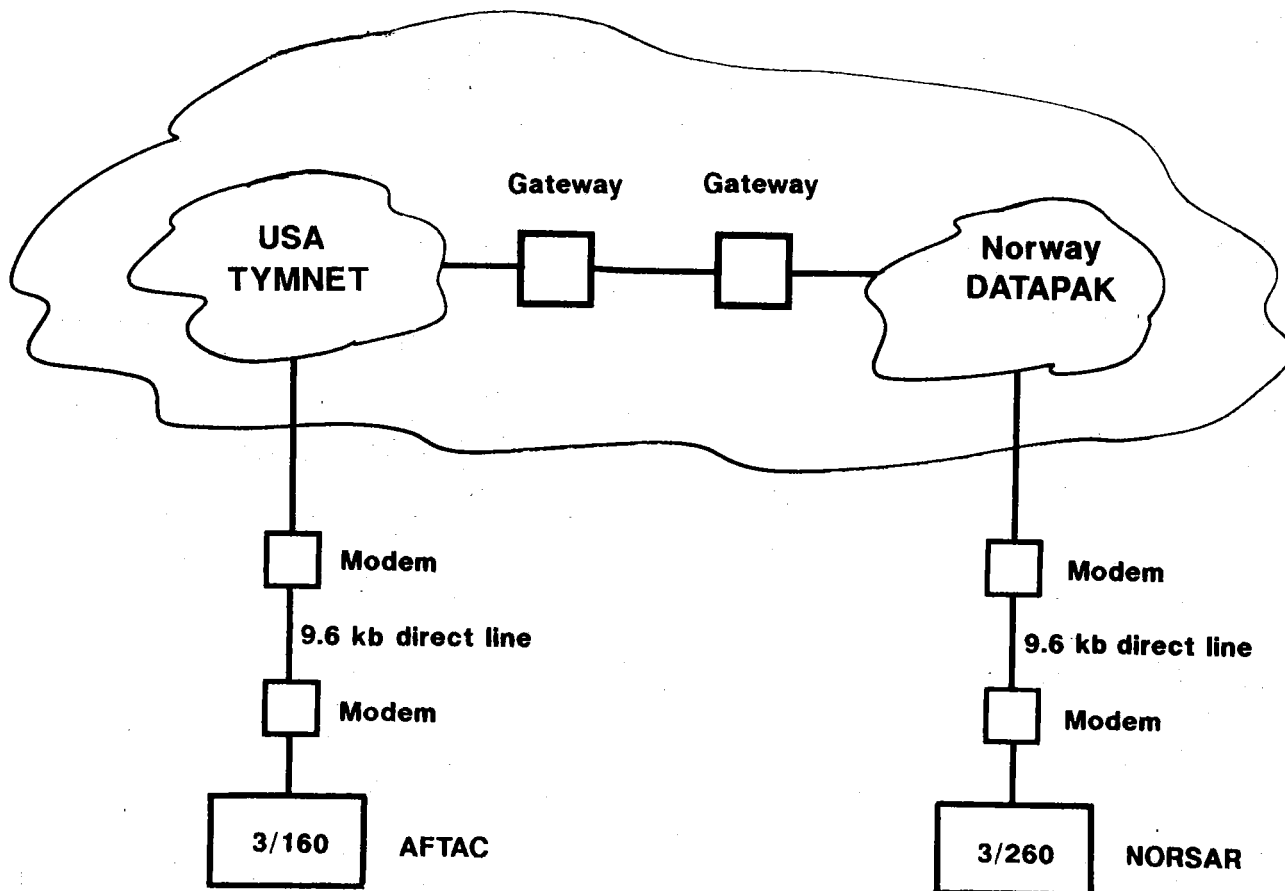
**PSDN (Packet Switched Data Network)**

Fig. VII.6.1. Communication implemented for the new link between AFTAC and NORSAR.

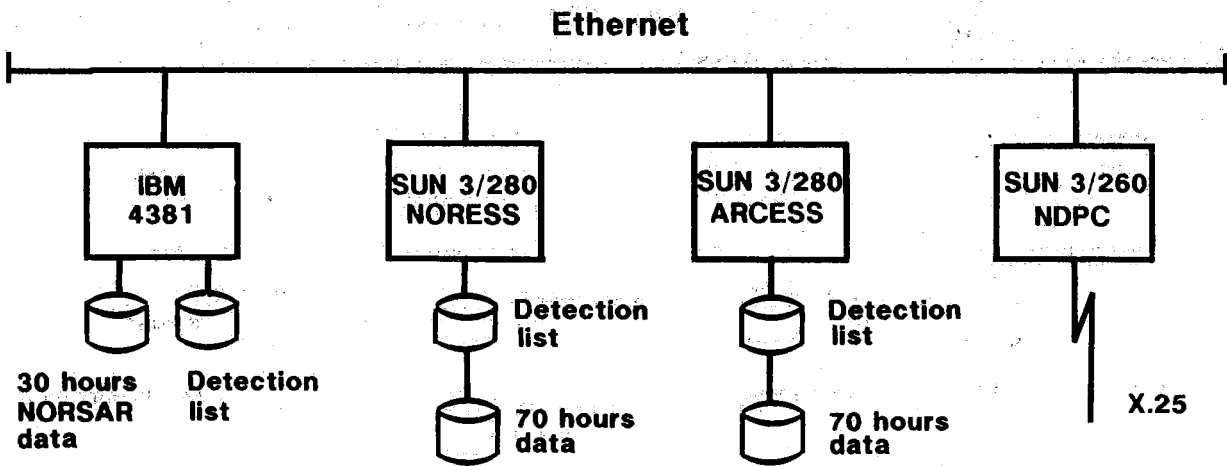


Fig. VII.6.2. Available data and detection lists.