

June 8, 1981

TO: Art Shalloway

FROM: W. R. Burns

SUBJECT: Preliminary Specs on NRAO Computer Links Between Sites

GENERALAsynchronous Devices

All connections of CRT's to computer shall be full duplex, 1200 baud or greater, error correcting sufficient for error-free output (<1 error per 10^5 characters). Baud rates should be variable so devices requiring 300, 600, 1200 baud can also be run by simple switch selection.

CRT's use asynchronous transmission but because of the required error correction it is necessary to convert to synchronous transmission, to apply cyclic redundancy checks on each block and to reset blocks which fail.

Synchronous Devices

All connections of synchronous devices to computer (i.e. printers, card readers, etc.) shall be full duplex. The low level link protocol shall support IBM bisync or SNA/SDLC, as required, when the terminating computer is IBM and DDCMP when the terminating computer is DEC. The synchronous protocol sometimes does affect the transmission hardware and sometimes does not, depending on the particular hardware and manufacturer. Full error correction should again be supplied but this, in most cases, will be done in the computer hardware. There will, on occasion, be a choice as to whether to do this error correction

in the communications link or the terminating hardware. Allowable error rates here are very low (<1 in 10^6) because computer/computer is sometimes involved.

Multiplexing

Whatever multiplexing necessary should be done to make optimum use of the lines. For example, bandwidth not used by one device should be available to the other devices at the same location where attractive. Also, when one line goes out it should be possible to switch the full load to the remaining good lines. It may not be attractive to mix asynchronous and synchronous links on the same physical line, I am not sure.

Switchboard

In the near term (<1 year) these lines will not go through the switchboard. Our current switchboard cannot handle data with the possible exception of GB. After one year, in some cases they will. The details of which will and which will not depends on the capabilities of the phone equipment we buy. For example, the SL1 phone system being installed at the VLA site will not support synchronous devices. This capability may exist in a year or so.

We would eventually like a routing capability so that data from the VLA to Green Bank, for example, can be routed through Charlottesville. The switchboard is probably the best way to handle this. In cases where it cannot, we will install our own independent switching system.

Diagnostic Capabilities

On each link, we want the standard digital and analog loop back test capability. Remote tests are not required; as for example, doing a look back test between the VLA site and Socorro from Charlottesville.

We do not need the diagnostic subchannel capabilities that some manufacturers use. It would be nice but is probably too expensive. This is where you get continuous test on all channels all the time.

We do want a capability for a computer operator to test the lines to get information such as to retry, multiplexing balance, etc. The equipment should support this as a simple operation for that level of personnel.

We also want sufficient test equipment to enable us to make independent checks on the specification on the phone lines. This may only be needed at the VLA. I am not sure what level of testing is necessary here.

SPECIFIC LINK INFORMATION

CV-GB

Present Needs

2 CRT's in GB connected to IBM system in CV.

1 printer (synchronous) at least 7200 baud switch selectable to 4800 or 3600 baud also but not both, in GB connected to IBM in CV. A card reader is also attached but the modems see only one synchronous input/output. Here the error correction and retry is done in the terminating equipment.

Future Needs

Perhaps 2 additional CRT's.

Route through capability for synchronous or asynchronous line to route from Socorro to Green Bank through the VLA site and Charlottesville. The synchronous line shall be bisync protocol, operate at 2400 baud. It's error checking shall be done in the terminal equipment.

CV-VLA Site

Present Needs

1 DEC synchronous (DDCMP) line. This line should have a capability of 9600 baud but be switch selectable to 7200, 4800 and 2400 baud. This capacity can take care of the CRT needs on a 2nd priority basis.

1 CRT in CV connected to VAX at site.

1 CRT at site connected to VAX in CV.

1 CRT in CV connected to DEC-10 at site.

Future Needs

2 additional terminal links in addition to the sync/async route through capability described above.

VLA Site-Socorro

Present Needs

3 CRT lines - all terminals located in Socorro going into computers at site. Actually Socorro on the short term will have 2 CRT's and 1 printer but the latter will be asynchronous and look like a CRT but with data terminal (modem) control, i.e. start/stop control in DEC terms.

Future

6 CRT terminal lines and one asynchronous line. Also we want the capability to route a synchronous and asynchronous line from Socorro, through the VLA site, through CV to GB as described above.

The additional terminal lines will be used so a programmer at home can go into a particular computer at the site. The switching will probably be done in the phone system in Socorro and at the site.

Tucson-VLA Site and Tucson-CV

Present Needs

None

Future Needs

One dial-up asynchronous line but with error correction. This may require converting to synchronous line which may not be possible on dial-up network, I don't know. It may eventually be attractive to route Tucson traffic through the VLA site to CV. In the near future the traffic will be too light to worry about it.

Dial-Up to All Sites

All sites will have the capability to accept asynchronous dial at 1200 baud. This is used for remote diagnostics in CV and the VLA and is used for VLBI work at GB and the VLA. There is also some dial-up use by observers into the IBM system. This use will probably increase to a few concurrent users over the next year or so. There may be some similar dial-up use to the VAX in CV and the VLA site.

On the dial-up system we now use hardware made by Racal/Vadic. No error checking is used. For this type of use the Vadic equipment has done well. I think the only outstanding question is in which sites their capability is integrated into the digital phone system and to what extent the dial-up system should be integrated into the system described in the earlier parts of this document.

Packet Switching

In the future it may be more desirable to use packet switching VAN (value added networks) for asynchronous terminal traffic between sites instead of the leased lines. This will have to be decided on a case-to-case basis comparing the economics and data rates. This would be competition for example, between Tucson and Charlottesville or for terminal lines between Albuquerque and CV. We could route to Albuquerque by leased line. Some packet rates are not distant dependent.

Word Processing

At the VLA site and in Socorro we will probably interface the IBM word processors to the line routing the fiscal traffic between Socorro and GB. PO's then could go directly into the fiscal computer. If this works well we may add the IBM word processor in Tucson to the link.

Also, fiscal aside, I would like to connect the word processors at all sites, starting with the VLA and CV so that memos can be typed and distributed the same day. This data would make use of the synchronous link already specified connecting Socorro, the VLA site, CV and GB. I have to do some more work to find out what the software interface should look like.

Bell Compatable

Our current Racal/Vadic units are not Bell compatable which is OK because Bell is years behind everyone else. What we now have seems to be as standard as anything else; most people wanting to come into our system like it. Racal/Vadic, however, only covers the low data rates, <2400 baud. I don't know if there is a standard at the higher synchronous rates; it may well be necessary to use the same synchronous modem at each end of the line. Also, all multiplexers do not work with all modems, but there is a fair amount of interchangeability.

WRB/ap

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