# DØ Run II Online Computing System

***Status and Schedule***

**DØ Note 3581**

Stuart Fuess

11-Jan-1999

## 1. Overview

This document is a companion to DØ Note 3580, "DØ Run II Online Computing System, An Introduction". It describes the current status of hardware and software preparations for the Online system and discusses the future schedule. The heading levels in this document match those in the "Introduction" document; refer to the associated item descriptions for details.

## 2. Hardware Systems

### *2.1 Introduction*

The status of the various hardware system components is summarized in the following sections.

### *2.2 Hardware Components*

#### *2.2.1 Gigabit Ethernet Network* *(Fuess)*

- Existing Run II Online host nodes are currently connected to the legacy Online FDDI ring.
- A few 100 Mb capable network devices are in hand:
  - 3COM 12-port 100 Mb hub
  - Allied Telesyn 16-port 10 Mb switch with 100 Mb uplink
- Requisitions are currently in Purchasing for 100 Mb network components for the Moving and Fixed Counting House areas:
  - (2) 3COM Model 3300 24-port 100 Mb switches with 100 Mb fiber interlink modules optional Gb uplinks
  - (3) Allied Telesyn 24-port 100 Mb switches
  - (7) Digi 16- and 24-port terminal servers, with fiber transceiver modules for 3 units to be located on the Platform.
- The single-mode fiber installation between DØ and FCC is complete and has been tested at 100 Mb speeds. The single-mode fiber will allow eventual Gb transmissions.

- The Computing Division / Network group will install in January a temporary Catalyst 2948 switch with 2 Gb ports and 48 100 Mb ports. This is a precursor to an eventual multi-port Gb switch purchase.
- Plans are being drawn for the network cabling infrastructure in the FCH and MCH areas. The general scheme is for a 100 Mb switch and a terminal server to be located in each floor of the MCH, in the Control Room, and in the FCH2 computer room areas. In the MCH, multi-UTP cables will run to several patch panels distributed throughout the equipment racks; individual devices will be connected to the patch panels.

#### *2.2.2 Central UNIX Host System* *(Fuess)*

A Host UNIX server has been purchased in each of FY97 and FY98. The nodes, associated peripherals, and installed software sets are:

- Node ***d0ola***
  - Digital AlphaServer 4000, 5/466, 512 MB
  - Digital UNIX V4.0b
  - FDDI NIC active, 100 Mb NIC installed
  - 1 local device shelf with approximately 13 GB of disk.
  - HSZ50 RAID controller (the eventual shared RAID set) with 2 device shelves and approximately 108 GB of disk.
  - PCI-based RAID controller with 3 device shelves and approximately 54 GB of disk (yet to be configured).
  - DEC C and C++, Fortran, and Kai C++ compilers
- Node ***d0olb***
  - Digital AlphaServer 4000, 5/600, 1 GB
  - Digital UNIX V4.0d
  - FDDI NIC active, 100 Mb NIC installed
  - 1 local device shelf with approximately 9 GB of disk.
  - PCI-based RAID controller with 3 device shelves and approximately 108 GB of disk (yet to be configured).
  - DEC C compiler

Both systems are licensed for TruCluster Available Server and have the SCSI interconnect adapters installed, but the software product is not yet configured.

#### *2.2.3 Control Room PCs* *(Fuess)*

There are 2 Pentium II / 450 MHz / WinNT PCs in the control room which are awaiting connection to the network. There are 2 older PCs purchased for the Online system available.

#### *2.2.4 Monitoring PCs* *(Snyder)*

One PC, node ***d0linux01***, has been established as our prototype Linux node. The UNIX host systems nfs serve software product disks for both Digital UNIX and Linux flavors.

#### *2.2.5 Front End Processors* *(Bartlett)*

All existing front end processors are of the Motorola 68K family. There are currently approximately 5 front end nodes installed in test stands at DØ and the detector test areas. A purchase order for 3 additional front end nodes is in process. We expect to order soon several PowerPC processor family nodes for development. We also expect to order soon nodes to be placed in the MCH.

# 3. Software Systems

## *3.1 Introduction*

The status of the various hardware system components is summarized in the following sections.

## *3.2 Shared software infrastructure*

#### *3.2.1 Database* *(Krzywdzinski, Simmons)*

The Run I `HDB` RDB database has been imported into an `ORACLE` database on the *fnalu* cluster, and some ORACLE operational experience is being obtained. `ORACLE` has not yet been installed on the Online UNIX hosts, but there is a machine now available at the appropriate OS version level.

#### *3.2.2 Inter-task Communication* *(Genser, Paterno, Rasmussen, Snyder)*

The `d0me` Client / Server package has been through several iterations of release and evaluation, and is generally available for use. The user-level API is expected to be stable within a week. Example applications are distributed as part of the package, and several applications have been built to date. A Python wrapper for `d0me` has been created, though needs slight modification to match the latest `d0me` changes.

## *3.3 Hardware Control and Monitoring* *(Bartlett)*

Control and Monitoring effort has been centered on test stands, either specifically for use in software development or in support of detector test activities in Labs B/D/3.

#### *3.3.1 Hardware Database* *(Krzywdzinski)*

The `EPICS` control system uses a distributed database to define devices and records. To date, these flat files have been created by hand. The goal is to create these automatically by extracting the information from an `ORACLE` database. As noted in 3.2.1, the Run I database has been imported into `ORACLE`. Efforts are in progress to define `ORACLE` tables with the relevant information for `EPICS` and to load specific device information into the database.

### *3.3.2 VME Downloading* *(Bartlett, McDonald, Savage)*

EPICS controlled access to registers within the VME address space has been demonstrated.

### *3.3.3 Rack Monitors* *(Gilmartin)*

A Python based GUI making EPICS calls to display a Rack Monitor properties has been written and demonstrated.

### *3.3.4 Low Voltage Power Supply Control* *(Bartlett, Gilmartin, Krzywdzinski)*

En EPICS based prototype LV PS control program exists. Work is in progress to enter database information for test devices, and a GUI application is being developed.

### *3.3.5 High Voltage Power Supply Control* *(Bartlett)*

Design of an EPICS based HV PS control system is progressing.

### *3.3.6 Clock Control*

Software utilities to be accessed within a front end for control of the Clock are being developed and debugged. Once available, they will be incorporated into an EPICS device definition. A GUI application for Clock control will follow.

### *3.3.7 Alarm System* *(Fuess, Savage)*

An early version of a requirements document has been produced. The design of the Alarm system will closely follow that used in Run I.

### *3.3.8 Secondary Data Acquisition* *(Guglielmo, Krzywdzinski, Moore)*

The DART based Secondary data path is in common use in the detector test stands. Plans are being developed for extensions allowing multiple-crate readout and for merging the DART run control and event data paths with the Primary data path components.

### *3.3.9 EPICS Extensions* *(Bartlett, Savage)*

A preliminary examination of requirements has been made.

## ***3.4 Data Acquisition***

The efforts relative to the event data acquisition needs have been centered on prototype development. The integrated working of the data acquisition system is one of the major near-term goals.

### *3.4.1 Configuration and Run Control* *(Snyder)*

A Python based prototype of COOR has been created. Some of the protocols for communication with Trigger system components have been established.

### *3.4.2 Download Manager* *(Jonckheere)*

Work on a Run II version of `COMM_TKR` awaited the availability of both the Client / Server framework and hardware control via `EPICS`. With both now available, development of a prototype will soon proceed.

### *3.4.3 Collector / Router* *(Fuess)*

The role of the Collector / Router in the event data flow scheme has been examined, but no application design or coding has begun.

### *3.4.4 Data Logger* *(Genser, Guglielmo)*

A prototype `Data Logger` has been created. The next step is to integrate the prototype with the other components of the data acquisition path.

### *3.4.5 Reconstruction Input Pipeline (RIP)* *(Computing Division)*

Work on RIP proceeds as part of the joint CDF / DØ / Computing Division project.

### *3.4.6 Trigger and DAQ Monitoring* *(Yasuda)*

Little has been done to date, but work should now proceed rapidly with the recent hire of a physicist to be dedicated to this task.

## ***3.5 Event Data Monitoring***

Much progress has been made in examining existing analysis tools and understanding the expected analysis program framework.

### *3.5.1 Data Distributor* *(Guglielmo)*

Requirements and design documents have been created and coding has begun.

### *3.5.2* `EXAMINE` *(Yu)*

We have studied both `HistoScope` and `ROOT` as the underlying analysis and display tools. `HistoScope` will be used in the short term, with an expected straightforward migration to `ROOT`. Demonstrations of both products on the Online computing platforms have been made. Prototype analysis programs using the DØ Offline analysis framework have been written, but integration into the real-time environment awaits improvements to the framework.

### *3.5.3 Express Line*

A future activity.

## ***3.6 Calibration*** ***(Bertram)***

Preliminary studies of calibration needs have been completed, and a preliminary calibration system structure has been designed. Some work has been completed on understanding calibration within front end nodes and how the resultant information is communicated to the host databases.

# 4. Schedule

The Upgrade management keeps the complete MS-Project schedule for the Online Computing sub-project of the DØ Upgrade Project. A version of the schedule is available on the Online web pages (see reference in the Conclusion section).

The Online system is expected to be available for commissioning of the DØ detector elements beginning in the Spring of 1999. Many of the software components will be commissioned at the same time, as only with hardware present can the software be exercised. Most of the later (late 1999 and beyond) effort on Online software will center on the specific needs of the detector groups, and will require extensive input and programming contributions from members of the hardware groups. Such effort is not expected until the bulk of the detector construction and installation efforts are nearing completion.

The major near-term Online milestones are shown in Table 1.

| ***Date*** | ***Milestone*** |
|---|---|
| 2/99 | Network installation |
| 2/99 | Cluster software installation |
| 2/99 | ORACLE installation |
| 2/99 | ICD commissioning: Integrated power supply control; hardware downloading; single-crate readout over primary data path; data logging; data monitoring |
| 4/99 | Muon PDT commissioning: Multi-crate readout over secondary data path |
| 4/99 | Calorimeter commissioning: Multi-crate readout over primary data path; prototype calibration; integrated run control |
| 6/99 | Alarm system commissioning |

**Table 1** ***Near-term Online Computing milestones***

## 5. Manpower

Table 2 lists the number people who are currently active, or will soon be active, on DØ Online Computing projects. The table is divided into organizational unit categories.

| ***Category*** | ***FTE available*** | ***FTE shortfall*** |
| --- | --- | --- |
| FNAL/PPD/DØ Physicists | 3.25 | - |
| FNAL/CD/DØ Physicists | 1.0 | - |
| University Physicists | 1.5 | 4.75 |
| FNAL/PPD/DØ Computing Professionals | 4.0 | 1.0 (position open) |
| FNAL/CD/ODS Computing Professionals | 2.5 | 0.25 |

**Table 2** ***Manpower Status***

The obvious large shortfall of physicists (independent of affiliation) is a result of the need for people from the detector groups to begin participation in configuration, calibration, and monitoring activities specific to the detectors. The detector groups in some few cases have already identified individuals to participate in these activities, but their efforts are for the most part not yet coordinated with the Online group. The timing of the participation of detector experts is dependent upon the detector installation and commissioning plans. This shortfall figure is representative of the peak need if all efforts are simultaneous, but is indicative of the number of people and fraction of effort which are eventually needed.

## 6. Conclusion

This document gives the current status of the components of the DØ Online Computing system. The "Introduction" document to which this document references, and any updated version of this document, can be found on the Online web pages:

http://d0server1.fnal.gov/www/online_computing/online_computing.html