

# CLS Office/Beam line Data Storage System Specification

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## REVISION HISTORY

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## **1 INTRODUCTION**

### **1.1 Purpose**

This document will specify the requirements for the Data Storage System to be used at the Canadian Light Source (CLS) for the Beamline and Office environment.

### **1.2 Scope**

This specification covers the following aspects of the Data Storage System:

- functional requirements,
- performance requirements,
- safety and environmental considerations,
- applicable standards,
- QA/QC,
- inspection and testing,
- reliability and maintainability requirements,
- physical layout, and
- other requirements and constraints.

### **1.3 Background**

The Canadian Light Source, CLS, is a national facility in the final phase of construction on the University of Saskatchewan campus in Saskatoon, Saskatchewan. This facility is a 3rd generation synchrotron light source, which will produce a high intensity source of infrared, visible, ultraviolet and x-ray radiation.

Initially, CLS plans to use a storage system to provide centralized control of storage for all administrative functions of the facility. However, in operational mode (starting 2004) the storage system will also be used as the central store for all experimental data.

Figure 1 displays the layout of the main floor of the facility. The intention is to have the storage system located in the data centre (indicated by the "X"), where it must provide storage to servers running Windows and Linux in that room as well as other rooms. In operational mode, the storage system will also provide storage to the experimental beamlines, which are located throughout the large square building (indicated by the "Y") around the outside of the larger ring.

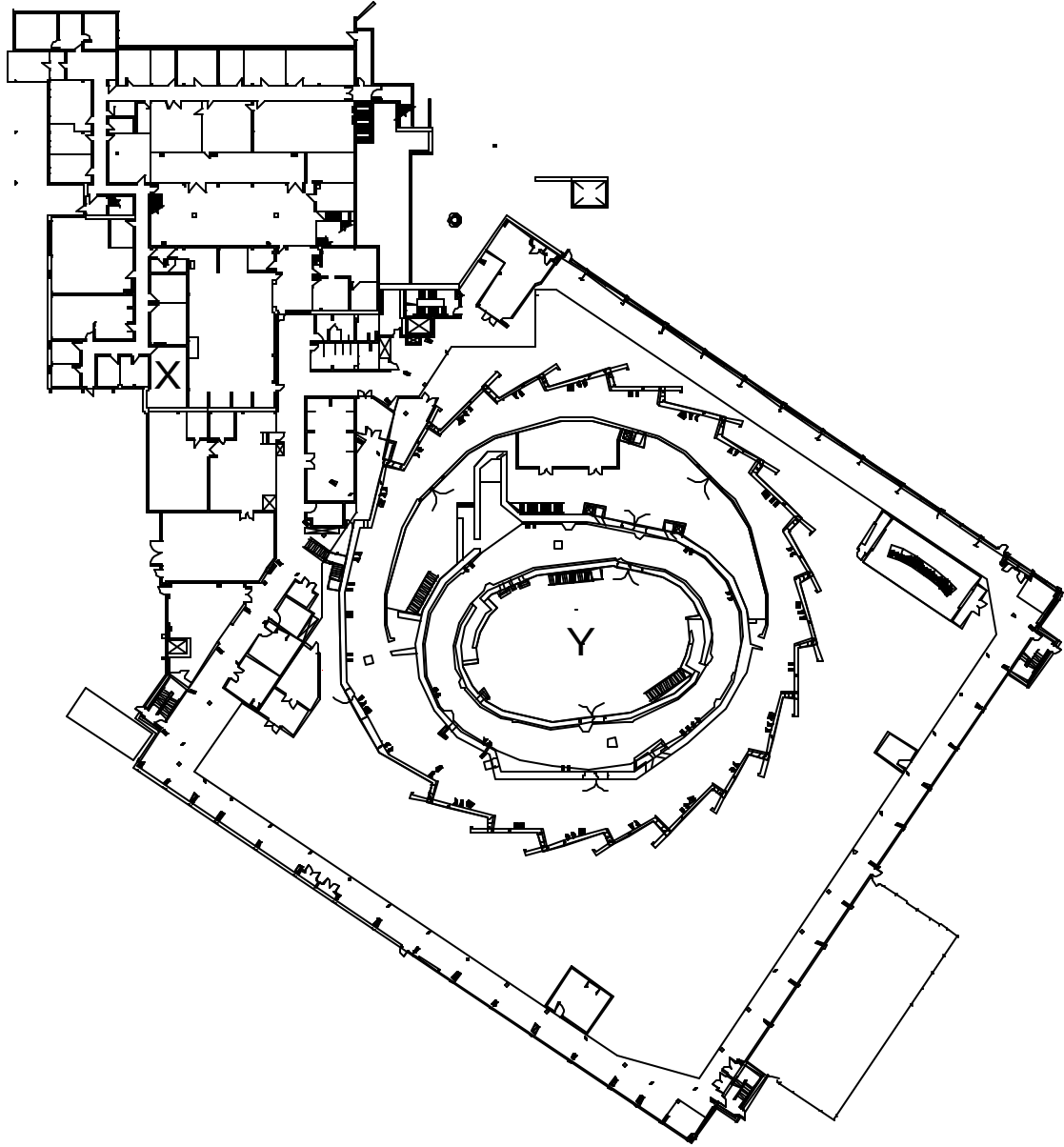


Figure 1, General Layout of Main Floor

## **2 STORAGE SYSTEM REQUIREMENTS**

### **2.1 Functional Requirements**

- 2.1.1 The storage system shall provide an initial storage capacity of at least 3.5 TB (terabytes). The system should be upgradeable to at least 45 TB. by adding only storage devices
- 2.1.2 The system shall provide enough fully redundant connections for a minimum of 32 servers running Windows 2000 or newer, Linux Kernel 2.4 or newer, and/or Solaris 8 or newer to have block level read/write access to the system. These connections shall be via Fiber Channel or Ethernet. If Fiber Channel, Host Bus Adapters (HBAs) shall be provided for the servers connecting to the storage system.
- 2.1.3 In addition to the direct connections, the system shall provide support for CIFS/SMB and NFS file sharing.
- 2.1.4 The system shall incorporate a backup and disaster recovery system.
- 2.1.5 The Proposal shall include a suite of administrative tools that shall provide the following features:
  - 2.1.5.1 Secured access limited to administrators only,
  - 2.1.5.2 On-line maintenance and tuning,
  - 2.1.5.3 Real-time monitoring and performance analysis of usage, capacity, and performance,
  - 2.1.5.4 On-line re-adjustment of storage allocation and dynamic partitioning, and
  - 2.1.5.5 Logging of performance in both graphical and textual format in peaks, averages, totals and percentages.
- 2.1.6 The administrative tools should also provide the following features:
  - 2.1.6.1 Remote management within the facility, and
  - 2.1.6.2 Automated monitoring and alarm systems in the event of problems.

### **2.2 Performance Requirements**

- 2.2.1 Any Fiber Channel connections shall provide data rates of a minimum of 2 Gbit/s.
- 2.2.2 Ethernet connections shall support 100BaseT, 1000BaseTX and 1000BaseFX Ethernet.
- 2.2.3 The backup system shall be capable of archiving all of the storage in the system within one 24-hour period. The backup system shall be upgradeable to scale with the storage capacity to maintain compliance. The intention is to be able to archive a minimum of one-third of the system within a single 8-hour period.
- 2.2.4 The system shall be able to remain on-line and fully functional while upgrades to capacity are being performed.

### **2.3 Safety**

- 2.3.1 Electrical and electronic equipment shall meet the requirements of the Saskatchewan Electrical Inspection Act, E6-3 [1], with special attention to Section 18 "Manufacture, Sale, etc." of electrical equipment. This requirement may be satisfied either by certification to the relevant CSA standard by an authorized inspection agency or by special inspection carried out by an authorized inspection agency.
- 2.3.2 All electrical installations shall comply with the Canadian Electrical Code, Part 1, 2002, and be CSA approved.

### **2.4 Environmental**

- 2.4.1 The environmental control in the data centre is limited. Solutions that generate minimal heat are preferred. The expected heat output under maximum capacity and load shall be provided.
- 2.4.2 CLS will provide power at 120V and/or 208V AC (single phase) via Uninterruptible Power Supply and, optionally, direct mains. Preference will be given to systems requiring less amperage. 20A and 30A plugs are available.

## **2.5 Applicable Codes, Standards and Procedures**

- 2.5.1 The system's CIFS services shall conform to Microsoft Networks/SMB File Sharing Protocol Extensions, Version 3.0, Document Version 1.11.
- 2.5.2 The system's NFS services shall conform to the NFS v2 and v3 specifications, and shall have support for NFS v4 when the official specification is finalized.

## **2.6 QA/QC**

- 2.6.1 Vendor shall be able to provide spare parts for a minimum of 3 years following final acceptance. The expected operational lifetime of components may be as much as 8 years.
- 2.6.2 The vendor shall maintain a quality assurance program consistent with the requirements of ISO 9001.

## **2.7 Inspection and Testing**

- 2.7.1 The storage system shall be tested by the Proponent to verify and demonstrate compliance with these and any other specification(s) before final acceptance, using tests and methods approved by the CLS.

## **2.8 Reliability and Maintainability**

- 2.8.1 The system shall provide a minimum reliability of 99.99% (not more than 53 unscheduled minutes of downtime in any 365 day period).
- 2.8.2 Replacement parts shall be available within 4 hours.
- 2.8.3 All offline time required for maintenance and upgrades shall occur within CLS-scheduled maintenance windows. No single occurrence shall exceed 8 hours. Total offline time required shall not exceed 24 hours in any 96 hour period, or 48 hours in any 365-day period.
- 2.8.4 The vendor shall specify a maintenance program sufficient to achieve the required reliability.
- 2.8.5 It shall be possible to perform upgrades to software, firmware, and/or hardware while the system is running. Hardware components (hard drives, switches, power supplies) shall be hot-swappable.
- 2.8.6 The system shall have no single point of failure.

## **2.9 Layout**

- 2.9.1 The layout of the room is shown in Figure 2. The storage system shall be placed in the highlighted region.

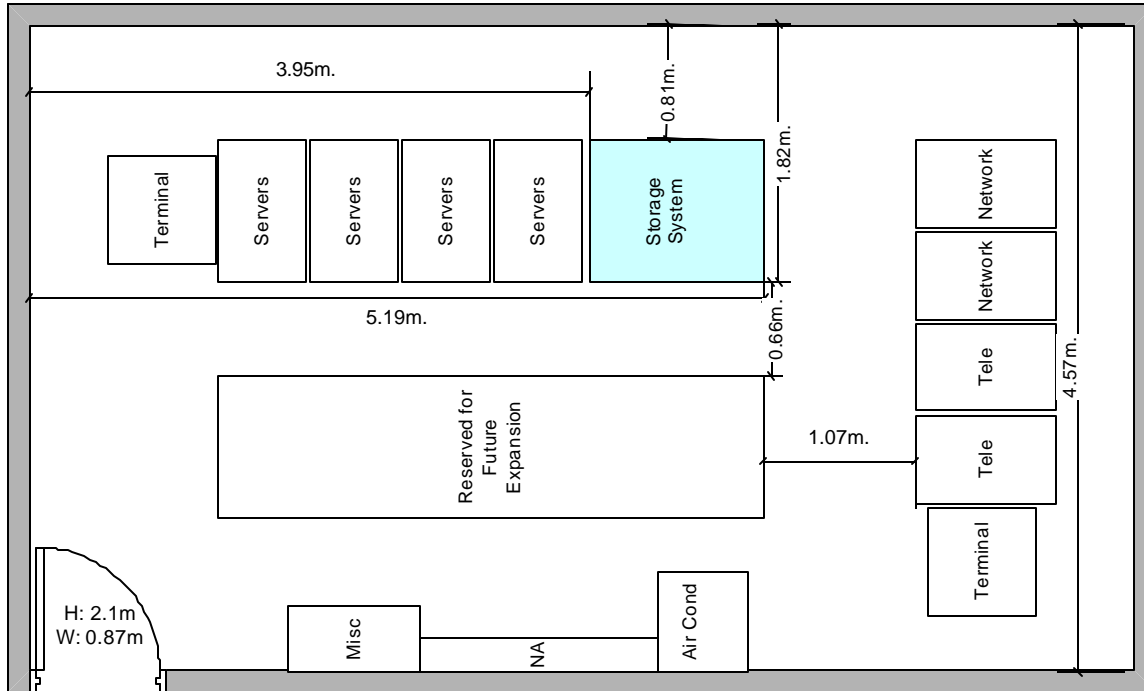


Figure 2, Room Layout.

## 2.10 Other Requirements and Constraints

2.10.1 The storage system's components may fit into as many as two (2) standard Dell racks. Preference will be given to space conserving solutions. If this is not possible, racks shall be provided by the Proponent with industry-standard 19" mountings, and the total dimensions for the system, including racks, should not exceed those specified in Table 1.

Height:	200cm
Width:	125cm
Depth:	100cm

Table 1: Maximum Rack Dimensions

2.10.2 Power feeds shall enter the rack from the floor of the data center, from below the false floor. All non-power cabling (i.e. network) that must leave or enter the rack shall be routed through the top of the rack into cable trays provided by CLS.