



White Paper:

An Overview of Telecommunications Packaging Requirements

Introduction

Convergence in the world of communications – from the Public Switched Telephone Network to the Internet – is a hot topic today. But a fundamental convergence has been taking place over the past decade as general-purpose computers have been integrated in the traditional telephone Central Office (CO) environment. This environment is characterized by its rigorous physical and electrical conditions and the requirements for personnel safety, protection of property, and operational continuity.

This white paper presents a computer vendor's perspective on the equipment-packaging requirements for the telecommunications Central Office as general-purpose computers are introduced to switched-network operations. It also presents examples of Digital Equipment Corporation platforms that are meeting the challenges posed by this fundamental convergence.

What is the Central Office?

The term "Central Office," or "CO," refers to the telecommunications physical location where subscribers' lines are joined to switching equipment for connecting subscribers to each other via the Public Switched Telephone Network (PSTN), both locally and long distance. This term is interchangeable with "public exchange" or "Public Network Operator" (PNO) locations. These terms are fundamentally equivalent so, for the purposes of this paper, we will use the term Central Office.

Defining the Central Office environment

The telecom Central Office environment is often quite harsh with the potential for temperature and humidity extremes, no provision for air conditioning or heating, and the requirement to limit susceptibility to disasters such as earthquakes and fires. The efficient use of building space is very important. The primary power is nominally –48Volts, Direct Current (VDC) supplied by wet-cell batteries.

Requirements for equipment

Survivability, uptime, network integrity, and equipment compatibility are of utmost importance for the equipment installed in the Central Office. Stringent environmental and physical packaging requirements were defined by Telephone Service Providers (TSPs) for Telecom Equipment Manufacturers (TEMs) to ensure that switches, transmission, and other Central Office equipment would continue to function in the face of drastic conditions such as fire and flood. TEMs have been testing their switching products to function in these situations for many years.

The computer comes to the Central Office

Over the past decade, the fact that switch Application Programming Interfaces (APIs) are proprietary has surfaced as an issue for TSPs and Telecommunications Network Operators (TNOs). New or enhanced services, or modifications to existing services, are difficult to implement given the long development testing cycles and the fact that the equipment needing modification may have been in place for up to 20 years. This has resulted in the loss of potential revenue-generating opportunities for TSPs/TNOs.

This spurred the introduction of general-purpose computers for use in voice processing (intelligent peripherals and service control points). Using computer equipment instead of switches for application development created a shorter development cycle and allowed TSPs/TNOs to create their own services at will. It also created a dilemma because they had a stringent set of standards for equipment installed in the CO environment that was never intended to apply to computer equipment. For lack of more updated standards, TSPs/TNOs require that the general-purpose computer equipment they purchase also meet CO environmental requirements to the same levels as switching equipment.

While TEMs had for many years developed their products to meet these standards, computer vendors were now faced with those requirements for the first time. The impact for computer vendors – and for the TSPs/TNOs – was in time and cost. What is more, certain components of a computer system – storage devices and media in particular – needed to be modified to meet thermal requirements.

As computer manufacturers comply with an increasing number of requirements, many observers feel that a level of subjectivity has emerged in describing what CO compliance really means. It has become essential for computer vendors and TSPs/TNOs to have an open dialogue about, and a common understanding of, CO packaging and testing requirements as they apply to general-purpose computing equipment.

Central Office standards

In North America, the CO packaging testing requirements are defined by the Bellcore (Bell Research Company) Network Equipment-Building System (NEBS) requirements. In Europe these requirements are defined by the European Telecommunications Standards Institute (ETSI) in what are known as Capability Sets (CS-1). Although similar, if not identical in many cases, there are some minor differences between them.

NEBS Overview

Bellcore's GR-63-CORE, *Network Equipment-Building Systems Requirements: Physical Protection*, and GR-1089-CORE, *Electromagnetic Compatibility and Electrical Safety – Generic Criteria for Network Telecommunications Equipment*, are often-referenced documents within the telecommunications industry . These documents are usually referred to as the “NEBS criteria.”

Compliance is important for network integrity. Assuring compliance, however, can be complex. In addition, the implications of noncompliance depend on the nature of the criteria and the intended application of the equipment. Grouping the criteria in levels clarifies the impact of noncompliance. Grouping also allows the broad range of requirements to be judiciously applied to specific classes of equipment (e.g., switches versus general-purpose computers), based on the equipment's application and impact to operation of the network.

Arranging requirements into levels of compliance helps simplify and expedite product analyses by focusing on the most critical areas first, resulting in faster product deployments. Here is an overview of NEBS compliance levels.

Level 1

Level 1 defines the level of environmental compatibility needed to preclude hazards and degradation of the network facility and hazards to personnel. Conformance to level 1 does not assure equipment operability or service continuity. Operability criteria are assessed only in Levels 2 and 3.

Level 2

Level 2 defines the level of environmental compatibility needed to provide limited assurance of equipment operability within the network facility environment. This assurance of operability is limited to controlled or normal environments as defined by the criteria.

Level 3

Level 3 defines the level of environmental compatibility needed to provide maximum assurance of equipment operability within the network facility environment. Level 3 criteria provide the highest assurance of product operability and Level 3 are suited for equipment applications which demand minimal service interruptions over the equipment's life.

ETSI Overview

ETSI sets standards for Europe in telecommunications in cooperation with the European Committee for Standardization (CEN) and the European Committee for Electro Technical Standardization (CENELEC) in the related fields of office information technology.

Within ETSI, the "Technical Committee for Environmental Engineering" (EE) concerns itself with areas of interest that most closely correspond to Bellcore NEBS criteria. EE is responsible for defining all the environmental and infrastructure aspects for telecommunication equipment including those installed at subscriber premises. ETSI divides this general area into three categories:

- Environmental Conditions and Environmental Testing
- Power Supply
- Mechanical Structure

Comparing NEBS and ETSI

NEBS and ETSI documents contain criteria for personnel safety, protection of property, and operational continuity. Both document sets cover physical and electrical requirements. In some categories, NEBS criteria are more rigorous, while in others, ETSI requires a higher level of compliance.

Physical criteria include:

- Cabinet dimensions
- Cabinet weight
- Floor load limit
- Cabling entry
- Heat dissipation
- Heat load limit
- Fire resistance
- Alarms
- Maintenance
- Documentation and drawings
- Labeling codes
- Humidity limits
- Locking doors and bolt-down kit
- Earthquake and office vibration
- Handling and transportation
- Acoustic noise
- Air quality and illumination

Electrical criteria include:

- Electromagnetic interference (EMI)
- System electrostatic discharge (ESD)
- Electromagnetic compatibility (EMC)
- Lightning and AC power fault
- Steady state power induction
- Power distribution
- Corrosion
- DC potential difference
- Electrical safety
- Bonding and grounding

DIGITAL Standards

In addition to industry standards, DIGITAL has internal standards for environmental tolerance based on the type of equipment and environment in which the product is likely to be placed. For the most part, the general categories of requirements (e.g., temperature, vibration, emissions, and so on) called for by TSPs exist for DIGITAL products.

DIGITAL Environmental Categories

DIGITAL has defined three classes of environments within which its equipment may be deployed.

- Class A: Computer Rooms
- Class B: General Offices and Workspaces
- Class C: Unconditioned Environments

DIGITAL Class C most closely corresponds to the Central Office environment.

DIGITAL solutions for the Central Office

For over twenty years, DIGITAL has been a reliable supplier of computing equipment to the telecommunications industry. Since the early 1980s, DIGITAL has produced and deployed Service Control Points (SCPs) throughout the United States where greater than 95% of all the 800-number calls have been handled without a single outage. Since the early 1990s, DIGITAL has tested its telecom-specific equipment to meet the Level 2 range of NEBS/ETSI standards and marketed a variety of solution sets including the AlphaServer Intelligent Peripheral Platform, the Intelligent Network Services Platform, the Internet Thruway, and the Highly Available Central Office (CO) Platform.

AlphaServer Intelligent Peripheral Platform

The AlphaServer Intelligent Peripheral Platform provides TEMs, TSPs, and system integrators with tools and turnkey applications such as unified messaging, voice-activated dialing, follow-me (one-number service), pre-paid (debit card), and others.

Intelligent Network Services Platform

The Intelligent Network Services Platform is an online, realtime, high-availability Advanced Intelligent Network (AIN) element that runs Bellcore Intelligent Services Peripheral node software. The Bellcore software supports integrated multimedia mailboxes, user-controlled conference calling and privacy and screening control.

Internet Thruway

The Internet Thruway provides TSPs and Internet Service Providers (ISPs) with a cost-effective solution to enable the integration of traditional enhanced telephony services with new Internet-enabled services combining voice and data.

DIGITAL Highly Available Central Office (CO) Platform

Today, to meet the needs of Independent Software Vendors and Enhanced Service Value Added Resellers who must deploy applications in a Central Office, DIGITAL has developed a Highly Available Central Office platform. Tested to NEBS Level 3, this platform consists of building blocks for Central Office compliant Intelligent Peripherals (IP), Service Nodes (SN), and Service Control Points (SCP).

This CO platform fulfills the requirement for nearly non-stop application availability (99.95% up-time) while providing a hardware platform which can coexist in a telephone switching-equipment environment. Modular components provide customers maximum flexibility while the systems integration capabilities of DIGITAL

Custom Systems ensure functionality. These solution platforms are factory pre-configured so there is no need for local experts to craft a solution on site. Each DIGITAL High Availability Central Office solution comes with a complete documentation package. What is more, the solution platforms can be serviced worldwide by the DIGITAL Multivendor Service and Support organization. Components carry the same warranty as their commercial off-the-shelf counterparts and comprehensive service packages will also be available.

Based on the DIGITAL AlphaServer 4100, the system offers second generation Alpha EV5 processing power. Scaling from 1 to 4 CPUs and 128 MB to 4 GB of main memory, the platform offers an attractive entry-point without limiting the high-end potential. The system features 12 PCI I/O expansion slots, redundant hot swap -48VDC power, CD-ROM and floppy, and provisions for two in-chassis system disks and DAT tape. I/O options include high performance data paths such as UltraSCSI and FibreChannel, communications interfaces include FDDI, FastEthernet, Token Ring, ATM, SS7, and Dialogic's DM3 architecture. The platform supports DIGITAL UNIX, OpenVMS, and Windows NT.

Data storage for the platform is implemented with DIGITAL StorageWorks modular storage systems featuring redundant hot swap -48VDC power and hot swap disk bays. StorageWorks can be configured in striped or mirrored sets and, with the addition of the HSZ70 RAID controller, it is possible to configure RAID 5 sets with up to 256 MB of battery-backed-up cache. The modular nature of StorageWorks components supports several terabytes of data storage in a Central Office environment.

Other CO-ready options include Memory Channel hubs for high bandwidth/low latency communications interconnect, and a system management station, which consolidates multiple-system control into a single monitor, keyboard, mouse connection. Both options feature -48VDC power.

An alarm system is also available. Called the Intelligent Peripheral Fault Manager (IPFM), it provides audio and visual alarms for minor, major, and critical faults of cabinet components. Components are connected together and faults are displayed on alarm panels. An operator interface allows setting, clearing, and logging of faults either remotely or on a system console. APIs allow applications to send alarms to the operator interface and set alarms. IPFM is SNMP compliant and works with any SNMP agent.

All equipment is housed in a NEBS 2000/ETSI compliant seismic cabinet with dual feed -48VDC distribution panel and optional hot-swap active cooling fans. The cabinet features lockable, see-through front and rear doors, removable side panels, lifting eye bolts, and CO bolt-down kit. Joiner panels are also available for multiple cabinet solutions.

Conclusion

Convergence in communications is opening up new opportunities for manufacturers and service providers around the world. The integration of computing equipment in the Central Office environment is playing an important role in these developments. It is essential that all involved parties continue to work towards a common understanding of Central Office requirements for computing equipment. DIGITAL will continue to advance this understanding as it pursues its commitment to provide high-quality platforms for telecommunications Central Office environments.

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