

# Information Systems

## NTU Networking Standards

# NTU Communication Rooms Specification

### **Purpose of this Document**

This document sets out the specification required for NTU communication rooms

*This document will be reviewed every 6 months*

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## 4 Introduction

### 4.1 Preface

This document governs the design and installation of the Communications Rooms required to support the data and voice infrastructure for Nottingham Trent University (NTU) and is mandatory for contractors and others employed by the University. This document does not detail how to install that infrastructure; that is covered by the Standards of the BSI (British Standards Institute) and other bodies (refer to Section 5). This document forms part of the University Networking Standards, and should be read in conjunction with the other parts covering Cabling and Wireless Standards.

This document is issued by Information Systems (IS) with the authority of the University.

This document lists the standards that the University considers applicable with any local exceptions. It is essential that contractors follow both the published standards and this document. All relevant health and safety laws, regulations and University standards must be followed.

The University has approved manufacturers and products that must be used in any installation. Specific details can be found in Section 7.

If there are any doubts as to what action should be taken or what product used based on this document, the matter must be referred to IS for a decision.

### 4.2 Abbreviations used

BMS	Building Management Systems
CCTV	Closed Circuit Television
CR	Communication Room
FT	Fibre Tray
IP	Internet Protocol
IS	Information Systems
LSZH	Low Smoke Zero Halogen
OTDR	Optical Time Domain Reflectometer
PoE	Power over Ethernet
PVC	Polyvinyl Chloride
UTP	Unshielded Twisted Pair
AP	Wireless Access Point
UPS	Uninterruptable Power Supply

### 4.3 Information systems contacts

The following IS staff can be contacted for further information:

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## 5 Standards

### 5.1 British and international standards

All cabling work for the University must be undertaken to the most recent version of the following standards:

- **BS 6701**: Telecommunications equipment and telecommunications cabling – Specification for installation, operation and maintenance
- **BS EN 50173-1**: Information technology – Generic cabling – General requirements
- **BS EN 50173-5**: Information technology – Generic cabling – Data centres premises
- **BS EN 50174-1**: Information technology – Cabling installations – Specification and quality assurance.
- **BS EN 50174-2**: Information technology – Cabling installations – Installation and planning and practices inside buildings
- **BS EN 50310**: Application of equipotential bonding and earthing in buildings
- **BS EN 50346**: Information technology – Cabling installations – Testing of installed cabling

All designers, architects, consultants and installers must be wholly conversant with these standards as they are the criteria by which work will be judged.

### 5.2 Health and safety standards and documentation

It is expected that the contractor will comply with all the relevant health and safety laws and regulations whilst working on University premises. However, attention is particularly drawn to the following University's policies:

- Safe Use of Electricity Policy
- Personal Protective Equipment Policy
- Risk Assessment Policy

## 6 Design

IS are the design authority for all IT cabling and related facilities within the University and are to be included in the design stage of any installation. The network design must be agreed and signed-off, and will include the size and location and number of communication rooms (CR) and the required quantity and capacity of cabinets and containment.

The CR will be dedicated for the use of housing IS network equipment, and will not be shared with other services and/or equipment, or used as storage area for any purpose. The following points highlight important issues that need to be considered and addressed:

### 6.1 General design principles

- a) The University employs a structured cabling infrastructure. Within buildings there will be one or more CR, each of which will serve defined catchment areas, and from each of these there will be links both to the backbone network and to outlets in the user areas.
- b) The general aim is to limit the number of CRs to the minimum necessary to meet the constraints of structured cabling.

- c) Design life for a CR is between 10 – 15 years, with a typical active equipment life of 4-6 years. Allowance should be made for expansion and re-equipment.
- d) Room design needs to consider physical access for staff and equipment, illumination, temperature and humidity, sound isolation, floor loadings and physical security.
- e) Drawings and specifications must be submitted to the IS project manager, for comment, prior to the work commencing and as revisions are made. All drawings etc. must have unique identification and be dated with version numbers.
- f) All CRs should be directly accessible without requiring access via occupied rooms. Typically this will be off a public corridor. External access is permitted providing security cameras monitor the entrance and the door is a heavy duty security door.
- g) The preferred floor covering is vinyl, but concrete is acceptable as long as it is sealed and dust free. Carpeting is not acceptable.
- h) Each main CR should be served by two physically separate and diverse cable routes for optical fibre. The routes will be agreed at the design stage with the IS project manager.
- i) Piping systems other than those providing necessary services to the space (e.g. sprinkler systems and cooling systems) shall not pass through the space.

## **6.2 Detailed design principles**

### **6.2.1 Size of communication room**

The size and location of any CR should be agreed with the IS project manager who will provide CR floor plans detailing the rack location and quantity within the room.

Each CR needs to accommodate floor mounted rack cabinets to house:

- Category copper patch-panels (24 outlets per 1U)
- Optical fibre patch-panels (16 or 24 cores per 1U)
- Access layer switches (48 ports per 1U)
- Cable management bars (1U)
- UPS equipment. This will be either floor mounted free standing or cabinet mounted.

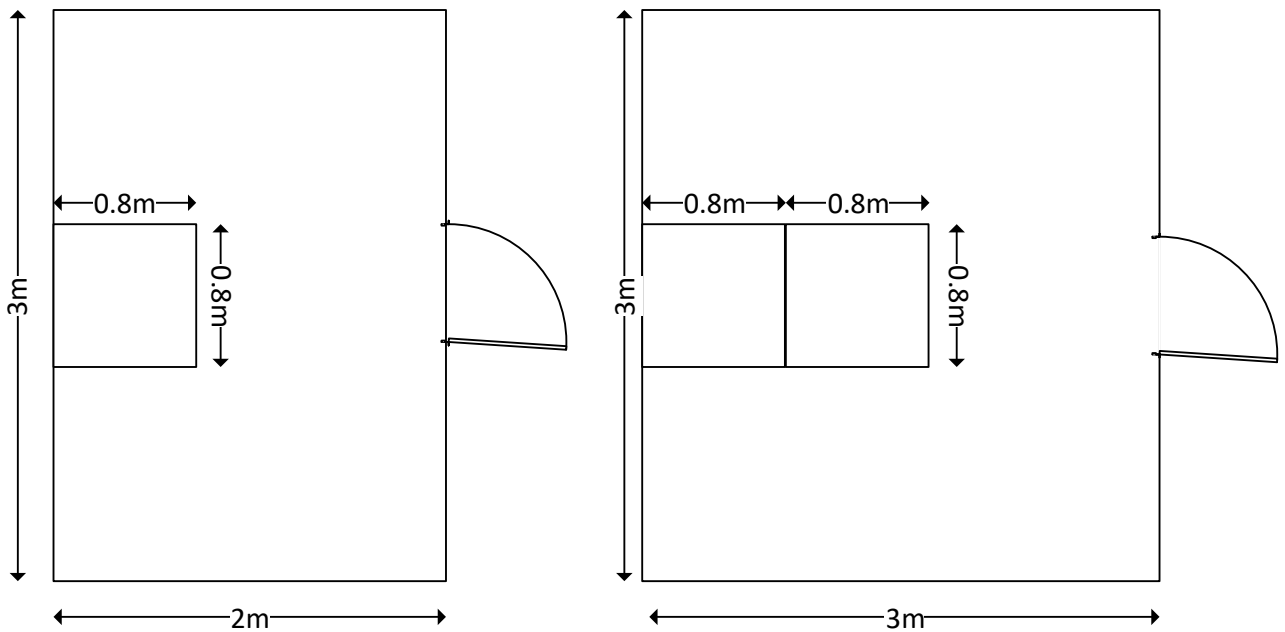
The following room requirements must also be met:

- The minimum clearance to front and rear of cabinets where access is required is 1m.
- Allowance is required for wall mounted security equipment, 200 mm deep covering approx. 2m<sup>2</sup>.
- Access to room provided by a door(s) of minimum 1000mm x 2130 mm
- Ceiling height to be a minimum of 2600 mm, other than under cable tray.

The size of a typical main CR will be in the order of 3.0 x 3.0 metres. This is based on data cabinet sizes of 800x800mm. The smaller 3.0m x 2.0m only allows for one data cabinet. The matrix below (6.2.2) attempts to give basic guidelines based upon the number of outlets concentrated in a particular CR.

Depending on the specific requirements, some communication rooms may need to accommodate larger IS equipment such as servers which have a deeper footprint. In that

case this equipment will require cabinets of 800x1000mm. This will be identified at the start of the project.



### 6.2.2 Communications Room guidance matrix

The table below shows **typical** CR configurations. Information Systems will provide detailed designs for each actual room. For more detailed UPS specification see section 8. Normally each CR will be designed for expansion. The table below is only for indicative calculations. Power requirements should be discussed with Information systems.

Data Points	Room Size	Network Equipment	Cabs	UPS	Power (typical requirements but refer to Information Systems before installation for actual requirement)	Max/Avg. Heat Output
96	2.0m x 3.0m	3 x C3850-48PS	1	3KvA UPS	1 x 13A mains socket for UPS 2 x 13A mains for other	<3.0/1.6 kW
<192	2.0m x 3.0m	4 x C3850-48PS 1 x C4500X	<1	2 x 3KvA UPS 2 x battery packs	2 x 13A Commando socket for UPS system 2 x 13A for other power	3.0/1.6 kW
<624	3.0m x 3.0m	14 x C3850-48PS 2 x C4500X	<2	8KvA UPS 4 x battery packs	1 x 63A Commando socket for UPS system 2 x 13A for other power	5.9/3.5 kW
<960	3.5m x 3.0m	21 x C3850-48PS 2 x C4500X	<3	10KvA UPS	1 x 63A Hardwired for UPS system 2 x 13A for other power	8.0/4.6 kW

				4 x battery packs		
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Depending on the design multiple smaller KVA UPS' may be used rather than one larger one

### 6.2.3 Communication Rooms for small buildings

There will be occasions where typically one data switch is all that is required for a building. A pragmatic approach is needed and here a wall mounted cabinet specific for these purposes may suffice provided the necessary power, security, heating dissipation and Health and Safety (e.g acceptable safe working heights) aspects are in place.

Ask IS for suitable cabinets for this purpose.

### 6.2.4 Electrical Requirements

The equipment located in each of the CRs will be powered via UPS(s).

As a general rule for main CRs, the UPS is required to give up to 4 hours of runtime in the event of a power failure. If the main CR is generator backed then this can reduce to 30 mins if the generator is designed to automatically takeover should mains power be lost.

Satellite CRs will require up to 1 hour runtime.

A suitable UPS Bypass panel should be installed.

Any circuit breakers in the system must allow for a surge on power up.

For more detailed UPS specification see section 8. Mains power connection to the UPS should be done in such a way the electrical lead does not present a trip hazard. Typically fed from above the cabinet.

### 6.2.5 Lighting

The room should be provided with adequate lighting to provide 500 lux at floor level. Fittings should be positioned parallel to the front and rear of the rack so as to provide good working illumination. If the lights are controlled by motion sensors the number and position should be such that full room coverage is provided for a single person working at any position or elevation within the room. Manual light switches should be located adjacent to the entry door; they must not be located to the hinge side of the door opening. Emergency lighting should be provided within the room.

### 6.2.6 Air conditioning

Air conditioning must be installed in a way to avoid any potential for leaks to affect the communications equipment. Typically this will require a permanent drain for any condensation collection and that the units must not be install above any equipment.

Piping carrying water should not traverse above the data cabinets.

### 6.2.7 Heat output

Clearly the heat output from the equipment will depend upon the number and type of devices employed. The matrix at section 6.2.2 attempts to give basic guidelines based upon the number of outlets concentrated in a particular CR. The air conditioning requirements of each CR needs be calculated individually once the number of outlets and network devices is known.

The cooling system should maintain a nominal ambient temperature of 21°C (+/- 4°C)

A relative humidity level between 40% and 60% should be maintained

### 6.2.8 Security and environment

Access to the CR during the build can be open until IS or IS contractor begins to install equipment, it is then the responsibility of the main contractor to keep the room secure until it is operational. Once operational, access should be via the University's SmartCard system or a unique IS-specific key.

Ideally, IS will have sole access to the room once it is operational. In the event of the room containing non-IS equipment, i.e. Security systems, then the IS equipment should be housed in separate lockable cabinets.

Each Central campus CR should be protected by an intruder alarm with a local control panel.

Each Central campus CR/Server room must be covered by a fire suppression system.

All CRs will have an IS installed temperature and humidity monitor (this maybe inherent of the UPS)

All CRs should have a smoke detector installed.

Positive air pressure systems (including appropriate filters) should be used to prevent ingress of dust and other contamination to the space.

Floors, walls and ceilings should be selected and treated to minimise the generation of dust.

### 6.2.9 Floor loadings

Floor loading capacity shall be sufficient to bear both the distributed and concentrated load of the installed equipment with associated cabling and media. The minimum distributed floor loading capacity shall be 5,0 kPa.

Consideration shall also be given to the floor loadings generated through the transit of equipment and associated infrastructure.

### 6.2.10 Other considerations

Active equipment can generate substantial amounts of noise. Consideration should be made of construction techniques where the room is adjacent to quiet areas such as teaching rooms or offices.

## 6.3 Cabinets

### 6.3.1 Rack Mount Cabinets

General purpose free standing rack cabinets to be:

- 800 mm wide x 800 mm deep, normally 42U high, the front door type to be specified by IS prior to installation (800x1000mm when specified)
- Cabinets of an equivalent standard may be installed if given prior approval by IS. For preferred manufacturer and model see Section 7

The following points detail specific requirements that must be followed:



- a) Each cabinet should be fitted with side panels except where several cabinets are arranged in bays together, then side panels should only be fitted to the outer most cabinets.
- b) Front and rear lockable doors.
- c) Each cabinet should be fitted with heavy duty castors and/or screw jacks appropriate to the expected loading. Multiple cabinets should be bayed together to prevent movement using a suitable baying kit.
- d) If on a solid floor, the units to be plinth mounted to allow easy cable access. If on a suspended floor, the units to be mounted on 50mm jack screws.
- e) Each cabinet should be supplied with, 2 x 10 way power distribution bar, with C13 or C19 connector, and earth bonding kit.
- f) 1u cable management bars should be supplied and fitted in accordance with the cabinet layout drawing at a ratio of one per patch panel. Colour to be black unless otherwise stated.
- g) Data cabling should be supplied to the cabinet from the top

### **6.3.2 External Cabinets**

Where there is a requirement to house communications equipment which is exposed to the external environment and at risk from the weather then a suitable IP rated cabinet is to be used. The rating will be selected to suit the environment in which the cabinet will be installed.

### **6.3.3 Earthing of Cabinets**

The following instructions shall apply:

- a) A green/yellow insulated earth cable should be installed from the nearest suitable distribution board and terminated under the instruction of the university's electrical engineers.
- b) All cabinets to be fitted with proprietary earthing kits. Each cabinet should be earth bonded to a suitable earthing point. Where more than one cabinet is installed within a CR, each cabinet should be individually earthed back to the earthing point. Earthing in the form of a daisy chain is not acceptable.
- c) Each earth cable connection is to be accessible for maintenance, inspection and testing purposes.

## **7 Manufacturers and products**

The following are preferred manufacturers for the equipment required for the CR. Deviations are to be approved by the IS Project Manager before being purchased or installed.

### **7.1 Communication Room cabinets**

- U Systems or equivalent (Check with IS)

## 7.2 UPS equipment

- Eaton (<http://www.eaton.com>)

## 8 Requirements for installation of UPS

### 0.5-3KVA

- Normal 13amp plug and socket supply. Can be plugged into convenient outlet.

### 4.0-6KVA

- Dedicated single phase supply, 32amp type D curve MCB protection.
- BS EN 60309-2 2P+E angled switched socket outlet commando style positioned adjacent to UPS.
- Plug to UPS to be BS EN 60309-2 2P+E with glanded cable entry.
- Flexible cable to equipment to be a 4.0 mm<sup>2</sup> 3-core toughened rubber or SY flexible cable wired to UPS utilising proprietary cable gland.

### 6.1-8KVA

- Dedicated single phase supply, 63amp type D curve MCB protection.
- BS EN 60309-2 2P+E angled switched socket outlet commando style positioned adjacent to UPS.
- Plug to UPS to be BS EN 60309-2 2P+E with glanded cable entry.
- Flexible cable to equipment to be a 10 mm<sup>2</sup> 3-core toughened rubber or SY flexible cable wired to UPS utilising proprietary cable gland.