

**ATU Donegal**  
**ASSIGNMENT COVER SHEET**

Lecturer's Name: John O'Raw

Assessment Title: Electric-petrol Network Infrastructure - Layer1 Project

Work to be submitted to: John O'Raw

Date for submission of work: 25 - 01 - 2026

Place and time for submitting work: Blackboard

**To be completed by the student**

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Course & Year: NETW\_IT902 - LY ICTEC G: Networking (2025/26)

Subject/Module: Networking

I confirm that the work submitted has been produced solely through my own efforts.

Student's signature: Melissa Araujo      Date: 28 - 01 - 2026

**Notes:**

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**Plagiarism:** Presenting the ideas etc. of someone else without proper acknowledgement (see section L1 paragraph 8).

**Cheating:** The use of unauthorised material in a test, exam etc., unauthorised access to test matter, unauthorised collusion, dishonest behaviour in respect of assessments, and deliberate plagiarism (see section L1 paragraph 8).

**Continuous Assessment:** For students repeating an examination, marks awarded for continuous assessment, shall normally be carried forward from the original examination to the repeat examination.

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# Electric-petrol Network Infrastructure – Layer1 Project

## Project Summary

This project presents the design and documentation of a Layer 1 (Physical Layer) network infrastructure for a multi-building campus, with a particular focus on the forecourt building. Following an initial client meeting, a standard site layout, building locations, and functional requirements were agreed and documented using scaled drawings. Based on this information, a complete physical network design was developed.

The project scope includes the planning of campus-wide containment, the placement of campus, building, and floor distributors, and the specification of all physical cabling systems. Structured cabling principles are applied throughout, using Cat6/Cat6a copper cabling for horizontal runs and multimode fibre for backbone connectivity. The forecourt building design accommodates a high user density, point-of-sale systems, wireless access points, printers, and CCTV, ensuring adequate capacity and future scalability.

Two detailed marked-up drawings are produced as part of this project: a campus layout showing ducting and distributor locations, and a forecourt building layout illustrating cabinets, cableways, connection points, wireless access points, and security devices. In addition, a fully costed Bill of Materials (BOM) is provided, detailing all required Layer 1 components, labour costs, VAT, margins, and final customer pricing.

Overall, this project demonstrates a structured and standards-based approach to physical network design, delivering a scalable, resilient, and cost-effective solution suitable for real-world deployment.

## Layer 1 Network Design Project

### Campus & Forecourt Building

#### 1. Introduction

This project documents the design of the **Physical Layer (Layer 1)** network infrastructure for a multi-building campus, including a **forecourt building** with two floors.

The objective of the project is to design, document, and cost the **physical network components**, including containment, cabling, cabinets, and connection points, based on a standardised site layout agreed with the client during the initial meeting.

The design follows industry best practices and aligns with structured cabling standards to ensure scalability, resilience, and ease of maintenance.

#### 2. Project Scope

The scope of this project includes:

- Campus-wide containment and distributor layout
- Building distributor (BD) and floor distributor (FD/IDF) locations
- Cable pathways and containment systems
- Physical cabling points for users, POS systems, printers, wireless access points, and CCTV
- Backbone cabling between floors

- A fully costed Bill of Materials (BOM) for all Layer 1 components

The project excludes logical configuration (VLANs, IP addressing, routing, security rules), which are Layer 2/3 concerns.

### 3. Standards and Assumptions

- Each grid block on the drawings represents **10 m × 10 m**
- All horizontal cabling is **Cat6 / Cat6a**
- Backbone cabling uses **multimode fiber (OM4)**
- Cabinets are **19-inch standard racks**
- Structured cabling follows a **star topology**
- Spare capacity is included for future expansion
- Carrier services enter the site via **separate demarcation points**

### 4. Campus Network Design (Layer 1)

#### Campus Distributor

The **Campus Distributor (CD)** is in the **Forecourt Building**, within a dedicated communications area close to the vertical riser.

This location was selected because it:

- Minimises backbone cable lengths
- Allows easy access to carrier services
- Provides centralised management of campus infrastructure

#### Campus Containment

- **Green ducting** is used for **data/LAN services**
- **Grey ducting** is reserved for **carrier services**
- Main data ducting specification:
  - 120 mm duct
  - 4 × subducts
  - Draw rope installed
- Access pits/handholes are installed:
  - At changes of direction
  - At maximum cable pull distances

This approach ensures separation of services, reduces interference, and allows future carrier or capacity expansion.

#### Forecourt Building – Physical Network Design

The forecourt building consists of **two floors**:

- Ground Floor
- First Floor

Each floor has its own **Intermediate Distribution Frame (IDF)**.

## 6. First Floor Network Design

### User Density

The first floor contains:

- 10 workstation pods
- 8 users per pod
- Total users: 80 people

Each pod is provisioned with:

- 8 Cat6 data ports
- Terminated at wall outlets
- Home-run cabling to the first-floor IDF

### First Floor Cabinet (IDF-1)

The first-floor cabinet contains:

- Modem
- Firewall
- 2 × Cat6 patch panels
- 2 × repeaters
- 5 × access switches
- Power distribution unit (PDU)
- UPS for power protection

### Additional Devices

- 1 network printer at the far end of the floor
- 1 CCTV camera located in the left corner near the coffee area
- 2 wireless access points to provide full floor coverage

## 7. Ground Floor Network Design

### POS and Office Areas

The ground floor includes:

- 4 POS terminals on the counter (1 computer per POS)
- Office:
  - 1 computer
  - 1 printer
- Store:
  - 1 computer
  - 1 printer
  - 1 POS terminal

### Ground Floor Cabinet (IDF-2)

The ground-floor cabinet contains:

- Modem
- 2 × Cat6 patch panels
- 1 × access switch
- UPS and PDU

### **Additional Equipment**

- **1 repeater** on the POS counter segment
- **2 wireless access points** for public and staff areas

## **8. Backbone Cabling**

- A **12-core OM4 multimode fibre** backbone connects IDF-1 and IDF-2
- Terminated using LC connectors
- Fiber patch panels installed in both cabinets
- Supports:
  - 1 Gbps and 10 Gbps uplinks
  - Future expansion without recabling

## **9. Layer 1 Responsibilities**

The physical layer is responsible for:

- Transmission of bits (0s and 1s)
- Voltage levels and signal timing
- Cable types, lengths, and pinouts
- Physical connectors and media
- Supported data rates (1 Gbps / 10 Gbps)

This design ensures compliance with these responsibilities while maintaining flexibility and reliability.

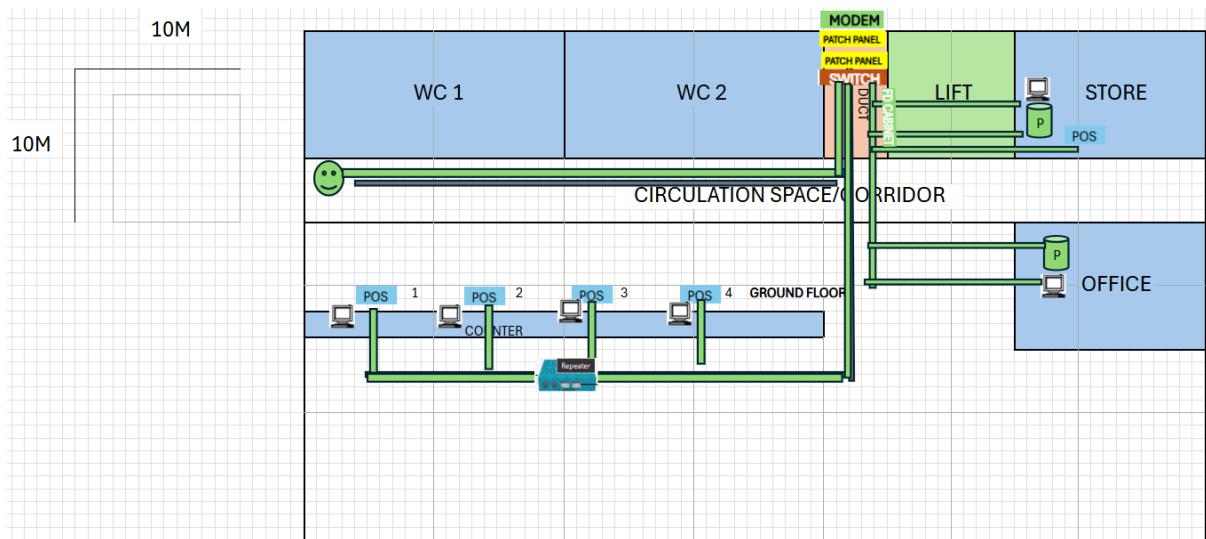
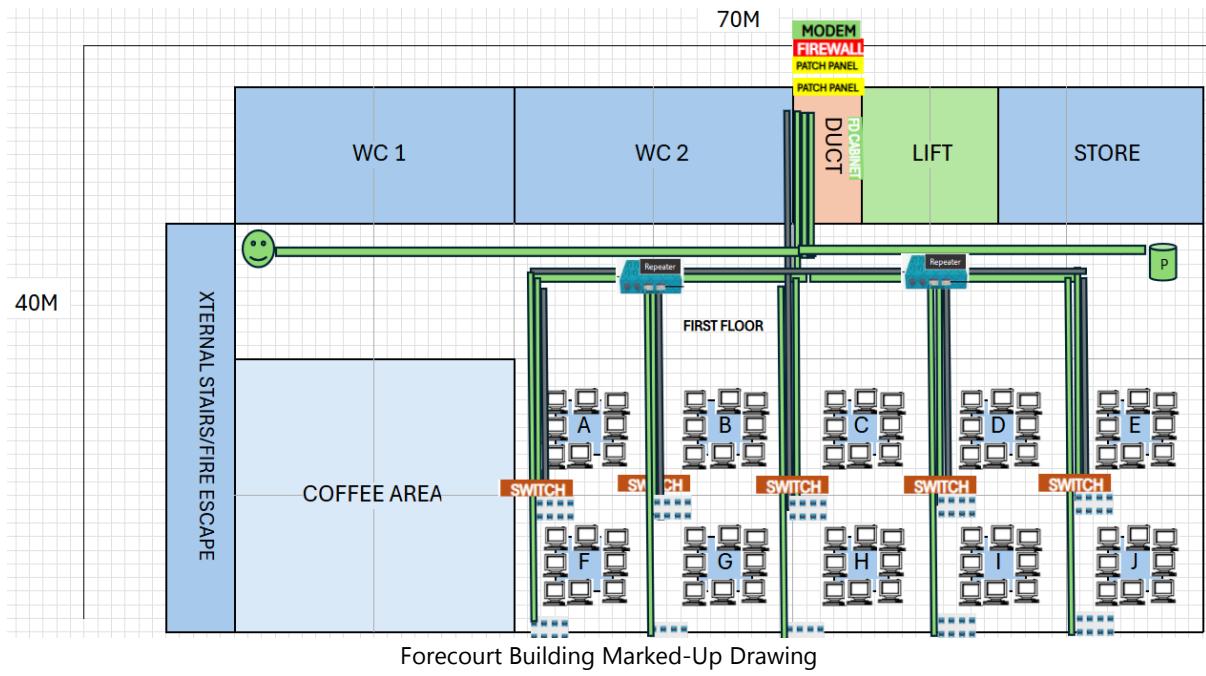
## **11. Conclusion**

This project delivers a complete **Layer 1 network design** for the campus and forecourt building, meeting the client's operational requirements while following structured cabling best practices.

The design supports:

- High user density
- Secure and resilient connectivity
- Clear separation between carrier and internal networks
- Scalability for future growth

All deliverables — drawings and BOM — provide a clear and professional foundation for installation and future network expansion.



#### NOTES:

1. Buildings are 40m x 70m
2. Grid is 10m x 10m
3. Primary function: Customer-facing + office + amenities

A  
**CABINET**  
**SWITCH**  
**PATCH PANEL**  
**FIREWALL**  
**MODEM**  
**POS**

8 Persons seated  
40 13A sockets  
20 TO CAT6  
Cabinet

Floor Distributor

Building Distributor

Firewall

Modem

13A socket

POS-4X13A,2TO

Cable Tray

**CCTV**  
**Printer**

**Repeater**