Development of a World-Class Network Infrastructure for uThukela District Hospital

IT situation/description and computer network infrastructure and mapping

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02 August 2024

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Scenario-Based Case Study: IT Situation and Network Infrastructure for uThukela District Hospital

# **1. Overview of the IT Situation**

The uThukela District Hospital in KwaZulu-Natal is one of the most remote medical facilities in South Africa, with limited access to modern IT infrastructure. The hospital employs 2,000 staff, serves 100 patients daily, and operates in an area where technological connectivity has historically been lacking. The facility currently suffers from several ICT challenges:

* Outdated Equipment: There are 20 outdated computers and only five printers, none of which can handle the demands of modern operations effectively.
* Limited Network Coverage: The network infrastructure is inadequate, with poor connectivity and limited bandwidth, impacting patient care and daily operations.
* Lack of Cybersecurity: Critical security measures are missing, leaving the hospital vulnerable to data breaches and cyberattacks.
* Data Management Issues: Missing patient files and disorganized data storage pose significant risks to both patient care and hospital operations.
* Insufficient Training: The hospital’s ICT team consists of only five staff members, who lack sufficient training in managing and troubleshooting modern network infrastructure.

The hospital needs a world-class IT infrastructure model to address these deficiencies. Openserve has been identified as the only network carrier available in the area, and the project must be rolled out within one year.

# **2. Business Functions and Processes**

To develop a comprehensive solution, it is vital to identify the hospital’s key business functions and processes. These include:

## **A. Human Resources (HR)**

* **Function:** Manages staffing, payroll, employee scheduling, and compliance with health and safety regulations.
* Process:
  + **Staffing and Recruitment**: Hiring medical staff, administrative personnel, and contractors.
  + **Payroll Management:** Administering salaries, leave, and benefits.
  + **Scheduling:** Allocating shifts to doctors, nurses, and other staff (Microsoft, 2024).

**IT Components:**

* + Microsoft Dynamics 365 Business Central – HR Module: Manages employee records, schedules, and payroll.
  + Integrated HR Management Software: Automates employee scheduling, attendance tracking, and payroll administration.
  + Database Integration: Ensures seamless access to employee information for both HR and payroll (Microsoft, 2024).

## **B. Finance**

* **Function:** Responsible for budgeting, patient billing, supplier payments, and financial reporting.
* **Process:**
  + **Budgeting and Forecasting**: Allocating resources and planning future expenditures.
  + **Patient Billing:** Managing patient payments, invoicing, and insurance claims.
  + **Vendor Payments:** Handling financial transactions with suppliers and service providers (TechTarget, 2022).

**IT Components:**

* + **Microsoft Dynamics 365 Business Central – Financial Module:** Tracks financial transactions, manages patient billing, and integrates with the hospital’s procurement system.
  + **Invoicing and Payment Platforms:** Automates patient billing and payment collection, while linking to vendor payment systems (Microsoft, 2024).

## **C. Supply Chain Management (SCM)**

* **Function:** Manages procurement, inventory control, and supplier relationships.
* **Process:**
  + **Procurement:** Ordering medical supplies, equipment, and pharmaceuticals from suppliers.
  + **Inventory Management:** Tracking stock levels and restocking supplies as needed.
  + **Supplier Coordination:** Communicating with external suppliers for timely deliveries (Cisco, 2023).

**IT Components:**

* + **Microsoft Dynamics 365 Business Central – Supply Chain Module**: Automates procurement and inventory control, ensuring stock availability and reducing waste.
  + **Inventory Management System:** Tracks and manages hospital inventories, including pharmaceuticals and medical equipment.
  + **Supplier Portal Integration:** Allows suppliers to access Intralink services, enabling seamless order management and delivery tracking (Elev8me, 2024).

## **D. Patient Care Management**

* **Function:** Facilitates patient diagnosis, treatment, and medical recordkeeping.
* **Process:**
  + **Patient Registration and Admission**: Recording patient details, medical histories, and admissions.
  + **Medical Record Keeping:** Maintaining up-to-date patient health records.
  + **Diagnostics and Lab Results:** Communicating test results and prescriptions (TechTarget, 2022).

**IT Components:**

* + **Electronic Health Record (EHR) System:** Digitally stores patient information and medical histories, accessible by authorized personnel.
  + **Lab Information System (LIS):** Tracks test results and integrates them into patient files.
  + **Radiology Information System (RIS):** Links radiology images and reports to patient files.
  + **Microsoft Dynamics 365 – Patient Care Module:** Manages patient care processes, ensuring that medical staff have easy access to relevant information (Microsoft, 2024).

## **E. ICT (Information and Communication Technology)**

* **Function:** Manages the hospital’s overall IT infrastructure, including network systems, cybersecurity, and data storage.
* **Process:**
  + **Network Management**: Maintaining the hospital’s internet and intranet systems.
  + **Cybersecurity:** Implementing firewalls, encryption, and access control to secure the hospital’s data.
  + **Data Storage and Backup:** Managing patient data storage, retrieval, and backup solutions (Elev8me, 2024).

**IT Components:**

* + **Local Area Network (LAN):** Connects the hospital’s 45 wards and 5 offices, allowing staff to communicate and share data securely.
  + **Fibre-optic Internet Connection:** Provided by Openserve, this will ensure high-speed connectivity to support data transfer and communication.
  + **Firewall and Cybersecurity Solutions:** Implementing advanced security measures to protect sensitive patient data from cyberattacks.
  + **Cloud Backup Solutions:** Cloud-based storage ensures data is securely backed up and accessible in case of emergencies (Microsoft, 2024).

# **3. Computer Network Infrastructure Requirements**

To ensure that the hospital's business functions and processes run efficiently, a modern network infrastructure must be implemented. The following network components are essential:

## **A. Core Network Infrastructure**

* **Fibre-optic Backbone:** The hospital will be connected via Openserve's fibre-optic network to provide fast, reliable internet. This will support video consultations, large data transfers (such as imaging files), and general communication.
* **Local Area Network (LAN):** A comprehensive LAN will be established using Cat6 cables to ensure high-speed, stable connectivity within the hospital premises. This will connect all computers, printers, and other devices.
* **Wireless Access Points:** Enterprise-grade Wi-Fi access points will provide wireless coverage in patient wards, administrative offices, and other areas of the hospital.
* **Network Switches:** Managed switches will control and segment the network, ensuring that different departments (HR, Finance, Patient Care) are isolated but can communicate securely when needed.
* **Firewalls and Cybersecurity:** A next-generation firewall (NGFW) will provide comprehensive protection against external threats. This includes monitoring for intrusion, enforcing access controls, and securing communications with external systems (Cisco, 2023).

## **B. Cloud Integration**

* **Microsoft Dynamics 365 Business Central:** This ERP system will be hosted in the cloud and integrated with all hospital functions. It will centralize HR, finance, supply chain, and patient care management, enabling seamless data sharing and process automation across departments.
* **Cloud Storage Solutions**: Cloud-based services (e.g., Microsoft Azure) will be used for offsite data storage and backup, reducing the risk of data loss due to hardware failure or cyberattacks (Microsoft, 2024).

## **C. Training and Support**

* The ICT staff will need thorough training on network infrastructure, including managing the new fibre-optic connection, securing the hospital's network with firewalls, and maintaining cloud services. Additionally, hospital staff will be trained in basic troubleshooting for network devices to minimize downtime (Elev8me, 2024).

# **4. Conclusion**

The integration of this new IT infrastructure at uThukela District Hospital will modernize the hospital’s operations, improve patient care, streamline administrative processes, and secure data. By leveraging a fibre-optic network, cloud-based services, and Microsoft Dynamics 365 Business Central, the hospital will bridge the digital divide and ensure long-term sustainability for its IT infrastructure.

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