

Code and Usage Documentation

# C/LAN Network Map

**Doctolero, Angela Ronice A.**  
**Ignacio, Lester**  
**Pagtalunan, Abigail R.**  
**Ramos, Hannah Kathrina M.**  
**Veraña, Ann Christine A.**

University of the Philippines Baguio  
Department of Mathematics and Computer Science

Submitted to:  
**Computer LAN Office**

November 20, 2025

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# 1 Introduction

The University of the Philippines Baguio Network Diagram is a web application built to visualize and manage the university's network infrastructure. This documentation provides a comprehensive overview of the technologies used, code structure, and instructions for running and maintaining the system. The application is built using a modern tech stack, consisting of different tools that play a key role in supporting an interactive, scalable, and data-driven network diagram rendering and visualization experience. This document also aims to help developers, stakeholders, and users understand and operate the system properly.

## 2 Application Overview

### 2.1 Purpose and Features

The web application aims to provide a graphical overview of the physical and logical connections between the switches, routers, servers, and access points within the UPB premises. Given a data of nodes and connections, the web app should be able to automatically layout a comprehensive diagram.

### 2.2 Technologies Used

- Node.js: Runtime environment to run Javascript code outside of the web browser for server-side scripting
- npm: Node Package Manager
- Next.js: React web development framework
- D3Graph: Javascript visualization library
- Typescript: Superset language of Javascript which allows type safety capabilities in code.
- Tailwind CSS: Inline styling language
- Shadcn: Component repository

## 3 Codebase Structure

This section details the organization of the application's source code.

### 3.1 Root Directory

```
clan-network-map
|-node_modules      # Contains node packages used in the code
|-public            # Contains icons and svg files used
|-src               # Contains overall source code of the web app
| |-app              # Contains the routable pages of the web app
| |-components       # Contains reusable react components
| |-data             # Contains the node and edge data used for visualizing the network map
| |-lib              # Contains helper functions
|-components.json
|-package-lock.json # Auto-generated file for node packages
|-package.json       # Editable file for required node packages needed
|-tsconfig.json     # Typescript configuration file
```

### 3.2 Key Directories and Files

- `src/app/page.tsx`: Landing page of the web app. Renders the overview of all the connections between nodes.
- `src/app/[router]/page.tsx`: A dynamic routable folder which dynamically sets the url based on the id of the node clicked. Renders the detailed view of a node's connections towards other nodes

- `src/components/D3Detailed.tsx`: Contains the logic for layouting the port specific connections of a node towards other nodes.
- `src/components/D3Graph.tsx`: Contains the logic for layouting the overall connections of all nodes within the UPB System.
- `src/data/structs.ts`: Defines the data structure for each data entry for either a node or a connection. Also contains user defined enums for easier categorization of nodes and connections.
- `src/data/nodeData.ts`: Contains all the data entries for all the nodes, which is also to be edited by the user for new or updating node information.
- `src/data/edgeData.ts`: Contains all the data entries for all the connections between nodes. Also to be edited by the user for new or updated connections.

## 4 Installation and Setup

### 4.1 Prerequisites

The software/tools that are needed to install before setting up the application are listed below:

- Node.js (version 22.17.1) which can be downloaded in <https://nodejs.org/en/download>
- npm

### 4.2 Development Setup

#### 1. Clone the repository:

```
1 git clone https://github.com/KaiserAce/clan-network-map.git
2 cd clan-network-map
```

Listing 1: Cloning the Repository

#### 2. Install dependencies:

```
1 # For Node.js projects
2 npm install
```

Listing 2: Installing Dependencies

#### 3. Start the development server:

```
1 npm run dev
```

Listing 3: Starting Development Server

The application should now be accessible at <http://localhost:3000>.

### 4.3 Deployment

#### 4.3.1 Building for Production

```
1 npm run build
```

Listing 4: Building Production Assets

This will generate optimized static files in the `.next/` folder within the project folder.

```
1 npm run start
```

Listing 5: Starting production build

The application should now be accessible at <http://localhost:3000>.

## 5 Usage Guide

This section provides instructions on how to use the web application from an end-user perspective.

## 5.1 Accessing the Application

As the user installs all the necessary dependencies and starts the development server, the console will then return the following:

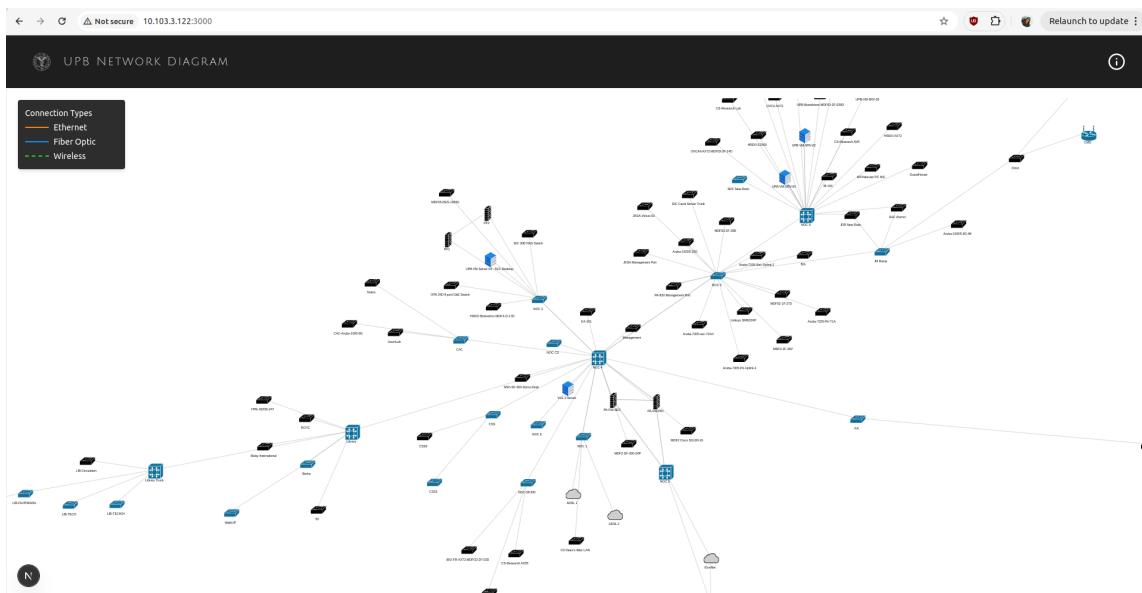
- Local: http://localhost:3000
- Network: http://10.103.3.122:3000

Listing 6: Terminal output when running either a development or production build.

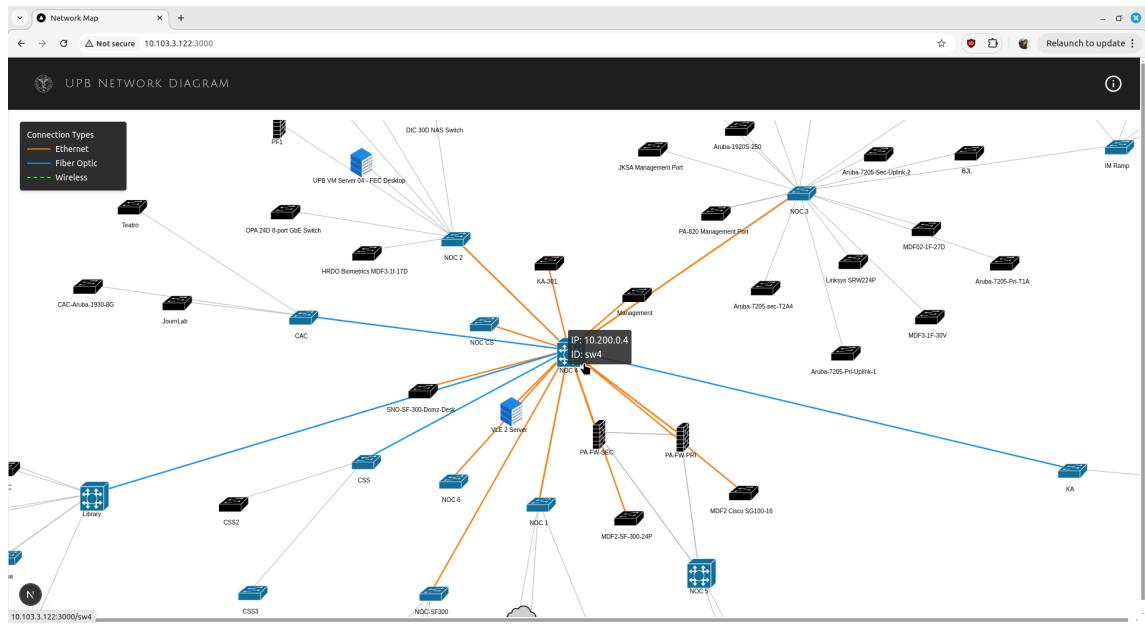
The user can access the web application through the local machine by selecting the link for local or through a different device over the network by navigating the given IP link.

## 5.2 Key Features and Workflow

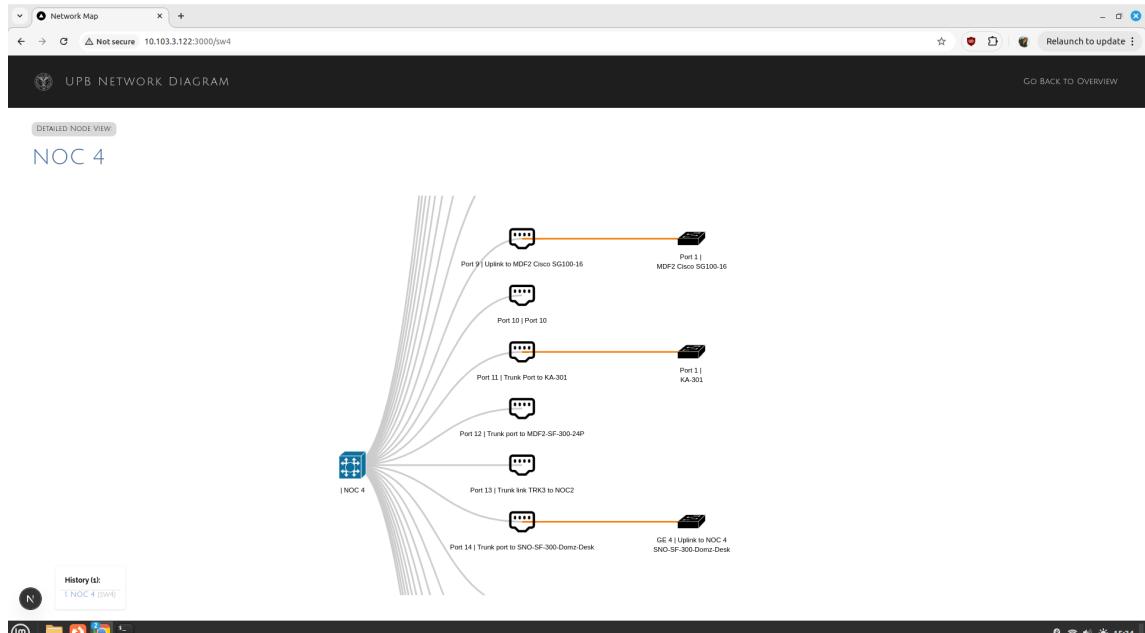
- Network Overview



As the user access the web application, it will be directed to the homepage where the overview of the network diagram is displayed. In this page, the user can see the overview graph of the connections of various devices in the network. As the user hovers over a device (node), its respective IP address and assigned ID will appear, and the connections and its type with other devices can be identified. Each connection type is visually represented using different color and line type, as shown in the legend found on the upper left side of the page.



### • Detailed View



By clicking a device (node), the user can view its detailed connection where all ports and the connections of each ports to the port of other devices are displayed. The connection types in the detailed view also follow the same assignment as in the overview page. In this page, devices (nodes) are also clickable, so the user can check the detailed connections of other devices. For easier navigation, the name of the current device (node) is shown in the upper left, and the history of the node visited is stored and can be viewed in the panel located at the bottom right.

## 5.3 Adding data entries

### 5.3.1 Configuring data structure and adding Device and Connection types

```

1 export enum Connection {
2   Ethernet,
3   FiberOptic,
4   Wireless,
```

```

5   Dual,
6   None,
7 }
8
9 export enum Device {
10  Firewall,
11  MainRouter,
12  WirelessRouter,
13  Router,
14  Switch,
15  CoreSwitch,
16  AccessSwitch,
17  DistributionSwitch,
18  Hub,
19  ISP,
20  Server,
21  None,
22 }

```

Listing 7: src/data/structs.ts.

These are the enum declarations classifying the node types for devices, as well as the connection types between nodes and ports. If the need arises to include other device and connection types, simply append them to appropriate enum declarations.

```

1 export interface Node {
2   id: string,
3   label: string,
4   ip: string,
5   type: Device,
6   ports: Port[],
7 }
8
9 export interface Port {
10  id: string,
11  port_num: string,
12  label: string,
13  type: Connection,
14 }

```

Listing 8: src/data/structs.ts.

The code block represents the data structure of a node entry to be read by the web app. All entries within the `nodeData.ts` file must follow this structure, or else the diagram will fail to render. Each node entry also has the `port` trait which is an array of ports whose structure is also defined. To determine which device type a node is, simply use one of the choices from the `Device` enum declaration, for ports, use the `Connection` enum.

```

1 export interface Node {
2   id: string,
3   label: string,
4   ip: string,
5   type: Device,
6   ports: Port[],
7 }
8
9 export interface Port {
10  id: string,
11  port_num: string,
12  label: string,
13  type: Connection,
14 }

```

Listing 9: src/data/structs.ts.

```

1   {
2     id: "ict",
3     label: "ConvergeICT",
4     ip: "",
5     type: Device.ISP,
6     ports: [
7       {
8         id: "p1",
9         port_num: "Port 1",
10        label: "Converge Port",
11        type: Connection.FiberOptic,
12      },
13    ],
14  },
15

```

Listing 10: src/data/nodeData.ts.: Sample node data entry.

```

1   {
2     node: ["ict", "r1"],
3     port: ["p1", "p1"],
4     type: Connection.FiberOptic,
5   },

```

Listing 11: src/data/nodeData.ts.: Sample node data entry.

## 5.4 Configuring icons displayed

### 5.4.1 Uploading icons

Icons used for the web app are located in the `public/` directory in the project folder. To add or change icons being used, simply place them in the mentioned folder.

### 5.4.2 Icon rendering logic

```

1 linkHandler
2   .append("image")
3   .attr("xlink:href", (d) => {
4     if (d.type === Device.ISP) return "/cloud.svg";
5     if (d.type === Device.MainRouter) return "/router.svg";
6     if (d.type === Device.WirelessRouter) return "/wireless-router.svg";
7     if (d.type === Device.Firewall) return "/firewall.svg";
8     if (d.type === Device.CoreSwitch) return "/programmable-switch.svg";
9     if (d.type === Device.DistributionSwitch)
10       return "/workgroup-switch-blue.svg";
11     if (d.type === Device.AccessSwitch) return "/workgroup-switch.svg";
12     if (d.type === Device.Server) return "/server.svg";
13     return "/no.svg";
14   })
15   .attr("x", -25)
16   .attr("y", -25)
17   .attr("width", 60)
18   .attr("height", 60);

```

Listing 12: src/app/components/D3Graph.tsx

The code snippet shows the rendering logic for the different types of nodes within the dataset. Given an enum parameter, it chooses the appropriate icon to visualize the node, and returns a default icon if it encounters a type which is not handled by the current logic. To add a case handler for a new type, simply append it at the end of the last if statement.

```

1   nodeGroup
2     .append("image")
3     .attr("xlink:href", (d) => {
4       if (d.data.node === Entity.Device && d.data.type === Device.ISP)
5         return "/cloud.svg";
6       if (d.data.node === Entity.Device && d.data.type === Device.MainRouter)
7         return "/router.svg";
8       if (
9         d.data.node === Entity.Device &&
10        d.data.type === Device.WirelessRouter
11      )
12        return "/wireless-router.svg";
13       if (d.data.node === Entity.Device && d.data.type === Device.Firewall)
14         return "/firewall.svg";
15       if (d.data.node === Entity.Device && d.data.type === Device.CoreSwitch)
16         return "/programmable-switch.svg";
17       if (
18         d.data.node === Entity.Device &&
19         d.data.type === Device.DistributionSwitch
20       )
21         return "/workgroup-switch-blue.svg";
22       if (
23         d.data.node === Entity.Device &&
24         d.data.type === Device.AccessSwitch
25       )
26         return "/workgroup-switch.svg";
27       if (d.data.node === Entity.Device && d.data.type === Device.Server)
28         return "/server.svg";
29       if (d.data.node === Entity.Port && d.data.type === Connection.Ethernet)
30         return "/ethernet.svg";
31       if (
32         d.data.node === Entity.Port &&
33         d.data.type === Connection.FiberOptic
34       )
35         return "/fiber.svg";
36       if (d.data.node === Entity.Port && d.data.type === Connection.Wireless)
37         return "/wireless.svg";
38       return "/no.svg";
39     })
40     .attr("x", -25)
41     .attr("y", -25)
42     .attr("width", 50)
43     .attr("height", 50);

```

Listing 13: src/app/components/D3Detailed.tsx

The same can be applied for the icons in the detailed node view.

## 6 Contact Information

For any questions or support, please contact:

- Email: lignacio@up.edu.ph
- GitHub: <https://github.com/KaiserAce/clan-network-map.git>

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