IP Calculator for Subnet Design

Submitted By
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1. Motivation:

In today's digital ecosystem, computer networks form the backbone of every enterprise. Designing efficient subnets is crucial for ensuring optimized IP address allocation, network scalability, and security. This project aims to provide an intuitive and automated solution for subnet design through a web-based IP calculator. The idea emerged from our academic learning in computer networks, combined with a need for practical tools that simplify the process of subnet planning, particularly for students and network professionals.

2. Overview:

2.1 Significance of the Project:

Subnetting is a foundational concept in networking with high academic and real-world significance. Manual subnet calculation is time-consuming and error-prone. This project offers a reliable, automated subnet calculator through a user-friendly web interface using Flask. It reduces human error, helps students learn faster, and can support professionals in quick subnet planning during deployments.

2.2 Description of the Project:

Our project allows users to input an IP address and subnet mask (or CIDR notation), and returns vital network information like subnet mask, network ID, broadcast address, host range, total hosts, and class. The backend is built using Python and Flask, with a wellstructured application factory pattern, and the frontend is enhanced using Bootstrap. An optional toggle allows viewing extended details, making it flexible for both beginners and advanced users.

2.3 Background of the Project:

This project builds on concepts learned in the Computer Networks course. Background research involved topics from RFC 950 (subnetting), CIDR techniques, and usage of Flask for web development. References also include official documentation from Flask, Bootstrap, and academic sources on IP addressing. This tool simulates the logic of subnet calculators but adds interactivity through web technologies.

2.4 Project Category:

Product Based – Educational / Academic Tool

3. Features / Scope / Modules:

- CIDR to Subnet Conversion – Converts shorthand /24 to full subnet mask.
- Network ID Calculation – Derives network address from IP and mask.
- Broadcast Address – Calculates end of usable IP range.
- First & Last Host – Identifies usable host range.
- IP Class Detection – Displays class (A/B/C).
- Toggle for Extended Info – User can choose to display advanced subnet details.
- Flask-based Web UI – Clean responsive design using Bootstrap.
- Error Handling – Invalid inputs are caught and user is notified.

4. Project Planning The project was planned across 5 weeks as follows:

- Week 1: Project research, subnetting logic prototyping
- Week 2: Flask app base structure, form handling setup
- Week 3: Result rendering and subnet calculation
- Week 4: UI enhancements, Bootstrap integration, toggle logic
- Week 5: Testing, debugging, documentation Responsibilities:

Izza Farhat – Flask architecture, subnet logic, UI integration.
Khadeeja Haider – Form validation, testing, documentation, error handling.

5. Project Feasibility:

● Technical Feasibility: The project is technically feasible using Flask, which is supported on most machines. No external APIs or services are required.
● Economic Feasibility: The entire software stack (Python, Flask, Bootstrap) is open-source, making this a zero-cost solution.
● Schedule Feasibility: Project was planned and completed over a 5-week duration, ensuring submission within deadlines.

6. Hardware and Software Requirements:

● Hardware:
- Minimum 4GB RAM

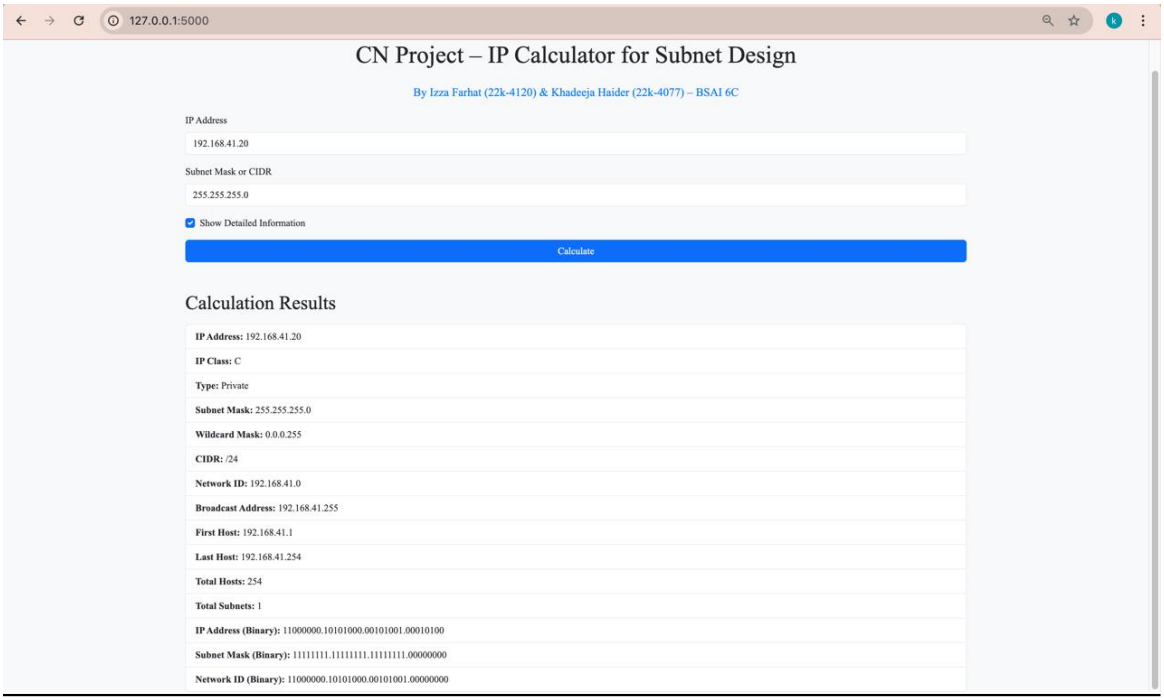
- Standard Windows PC or Laptop

● Software:

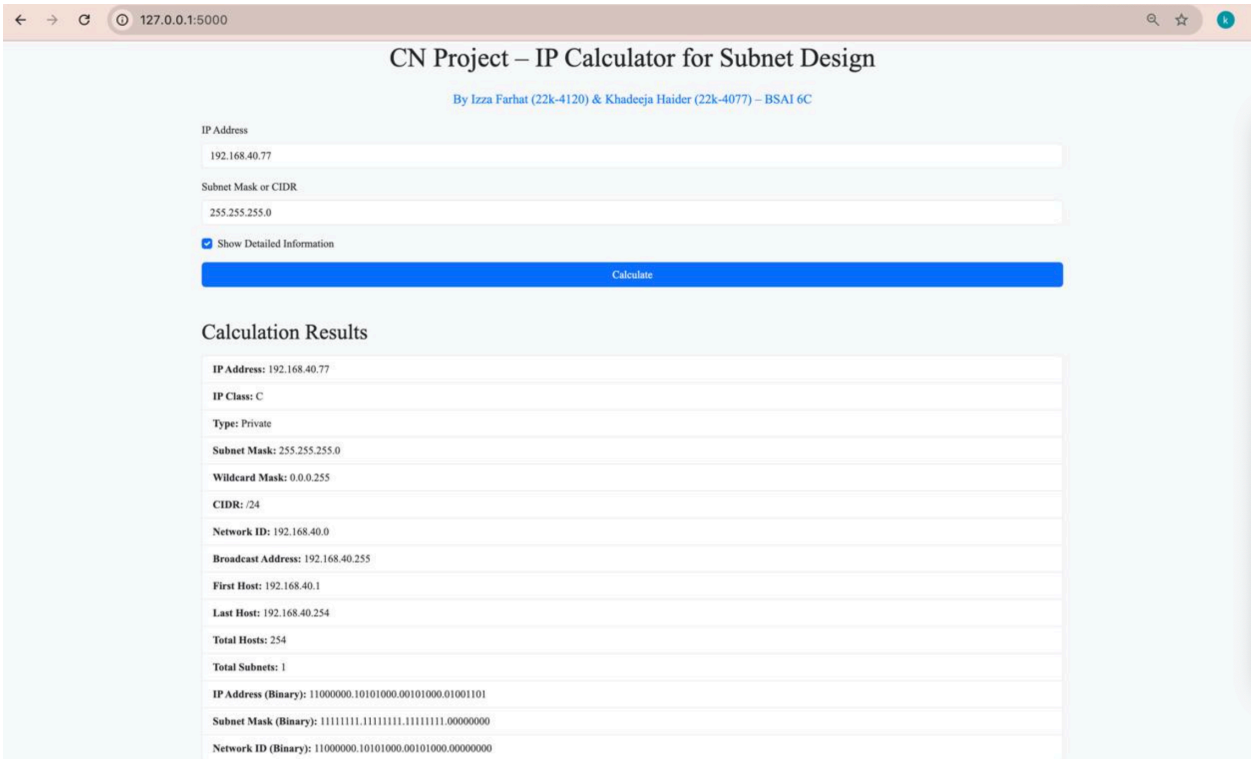
- Python 3.10+
- Flask, Flask-WTF
- Web Browser
- Code Editor (VS Code recommended)

7. Diagrammatic Representation of the Overall System:

Izza’s roll.no



Khadeeja’s roll. No:


127.0.0.1:5000
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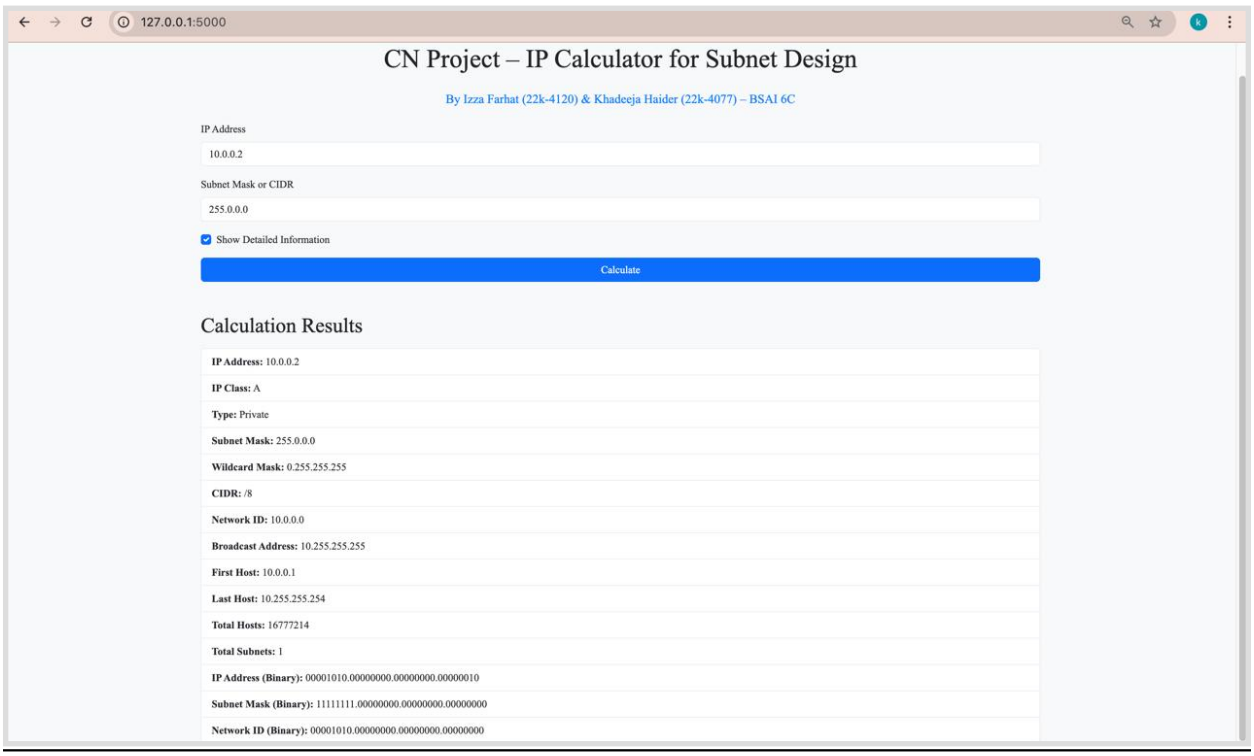
By Izza Farhat (22k-4120) & Khadeeja Haider (22k-4077) – BSAI 6C
IP Address
192.168.40.77
Subnet Mask or CIDR
255.255.255.0
Show Detailed Information
Calculate
Calculation Results
IP Address: 192.168.40.77
IP Class: C
Type: Private
Subnet Mask: 255.255.255.0
Wildcard Mask: 0.0.0.255
CIDR: /24
Network ID: 192.168.40.0
Broadcast Address: 192.168.40.255
First Host: 192.168.40.1
Last Host: 192.168.40.254
Total Hosts: 254
Total Subnets: 1
IP Address (Binary): 11000000.10101000.00101000.01001101
Subnet Mask (Binary): 11111111.11111111.11111111.00000000
Network ID (Binary): 11000000.10101000.00101000.00000000


127.0.0.1:5000
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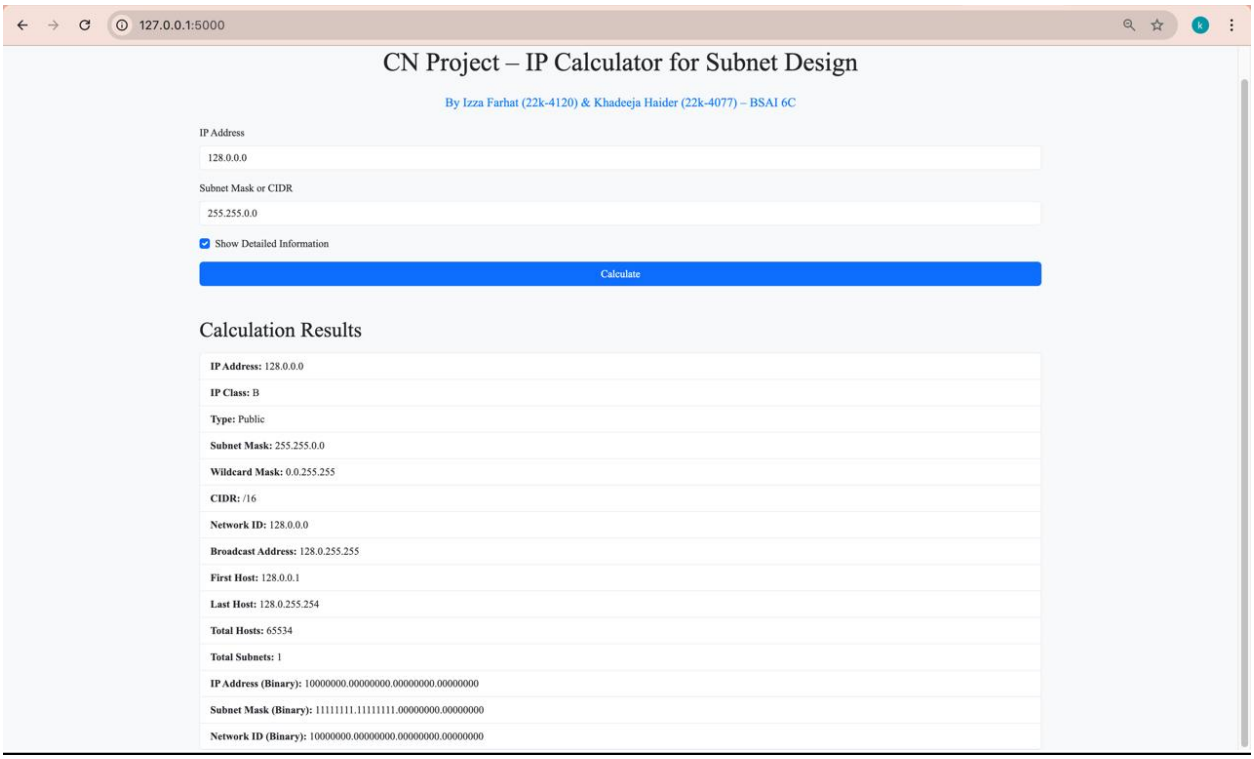
IP Address
10.0.0.2
Subnet Mask or CIDR
255.0.0.0
Show Detailed Information
Calculate
Calculation Results
IP Address: 10.0.0.2
IP Class: A
Type: Private
Subnet Mask: 255.0.0.0
Wildcard Mask: 0.255.255.255
CIDR: /8
Network ID: 10.0.0.0
Broadcast Address: 10.255.255.255
First Host: 10.0.0.1
Last Host: 10.255.255.254
Total Hosts: 16777214
Total Subnets: 1
IP Address (Binary): 00001010.00000000.00000000.00000010
Subnet Mask (Binary): 11111111.00000000.00000000.00000000
Network ID (Binary): 00001010.00000000.00000000.00000000



8. References:

[1] Flask Documentation – https://flask.palletsprojects.com/

[2] Bootstrap Framework – https://getbootstrap.com

[3] Python IPAddress Module – https://docs.python.org/3/library/ipaddress.html

[4] RFC 950: Internet Standard Subnetting Procedure – https://tools.ietf.org/html/rfc950