NEXT-GEN CAMPUS DESIGN

Submitted by

CHIRAG THAKUR [RA2111003010071]
YASH CHAKRABORTY [RA2111003010073]
SWETHA M [RA2111003010097]
S RAHUL [RA2111003010099]
DIMPY SINGH [RA2111003010105]
ANUJ JHA [RA2111003010119]

Under the Guidance of

Dr. C. Vijayakumaran

Assistant Professor, Department of Computational Intelligence

In partial satisfaction of the requirements for the degree of

BACHELOR OF TECHNOLOGY
in
COMPUTER SCIENCE ENGINEERING

with specialization in Artificial Intelligence & Machine Learning

SCHOOL OF COMPUTING

COLLEGE OF ENGINEERING AND TECHNOLOGY

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

KATTANKULATHUR - 603203

May 2023

SRM INSTITUTION OF SCIENCE AND TECHNOLOGY KATTANKULATHUR-603203

BONAFIDE CERTIFICATE

Certified that this Course Project Report titled **"NEXT-GEN CAMPUS DESIGN"** is the bonafide work done by **CHIRAG THAKUR [RA2111003010071], YASH CHAKRABORTY [RA2111003010071], SWETHA M [RA2111003010097], S RAHUL [RA2111003010099], DIMPY SINGH [RA2111003010105], ANUJ JHA [RA2111003010119]** who conducted under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other work.

SIGNATURE

DR. C. VIJAYAKUMARAN
Associate Professor
Department of Computing Technologies

SIGNATURE

DR. PUSHPALATHA M
HEAD OF THE DEPARTMENT
Department of Computing Technologies

SIGNATURE OF INTERNAL

SIGNATURE OF INTERNAL

Department of Computing Technologies

SRM Institute of Science and

TechnologyOwn Work Declaration

Form

Degree/ Course **:** B.Tech in Computer Science and Engineering

Student Names **:** Chirag Thakur, Yash Chakraborty, Swetha M, S Rahul, Dimpy Singh, Anuj Jha

Registration Number: RA2111003010071, RA2111003010073, RA2111003010097, RA2111003010099, RA2111003010105, RA2111003010119

Title of Work **:** Next-Gen Campus Design

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ACKNOWLEDGEMENT

We express our humble gratitude to **Dr. C. Muthamizhchelvan**, Vice-Chancellor, SRM Institute of Science and Technology, for the facilities extended for the project work and his continued support.

We extend our sincere thanks to Dean-CET, SRM Institute of Science and Technology, **Dr. T.V.Gopal**, for his invaluable support.

We wish to thank **Dr. Revathi Venkataraman**, Professor & Chairperson, School of Computing, SRM Institute of Science and Technology, for her support throughout the project work.

We are incredibly grateful to our Head of the Department, **Dr. Pushpalatha M,** Professor, Department of Computing Technologies, SRM Institute of Science and Technology, for her suggestions and encouragement at all the stages of the project work.

We register our immeasurable thanks to our Faculty Advisor, **Dr. C. Vijayakumaran,** Associate Professor, Department of Computing Technologies, SRM Institute of Science and Technology, for leading and helping us to complete our course.

Our inexpressible respect and thanks to our guide, **Dr. C. Vijayakumaran**, Associate Professor, Department of Computing Technologies, SRM Institute of Science and Technology, for providing us with an opportunity to pursue our project under his mentorship. He provided us with the freedom and support to explore the research topics of our interest. His passion for solving problems and making a difference in the world has always been inspiring.

We sincerely thank the Computing Technologies Department staff and students, SRM Institute

of Science and Technology, for their help during our project. Finally, we wouldlike to thank parents, family members, and friends for their unconditional love, constant support, and encouragement.

Chirag Thakur [RA2111003010071]

Yash Chakraborty [RA2111003010073]

Swetha M [RA2111003010097]

S Rahul [RA2111003010099]

Dimpy Singh [RA2111003010105]

Anuj Jha [RA2111003010119]

CONTENTS

ABSTRACT

The next-gen campus design simulation project aims to showcase the potential of IoT technology to create a more sustainable, efficient, and secure campus environment. The project involves creating a complex network and IoT layout that allows for deeper interactions between IoT devices, providing more options for future expansion. The simulation features various IoT devices, such as RFID access control management and an intelligent sports field watering solution, which highlight the practical applications of IoT technology in a next-gen campus.

The project aims to provide us with a more comprehensive understanding of IoT technology and its potential applications in a larger-scale setting. By simulating a university campus environment, the project seeks to prepare us for the future of IoT technology, where the integration of different IoT devices and networks will become increasingly common.

The next-gen campus design simulation project also demonstrates the importance of security in IoT networks, particularly in an environment where access control management is essential. The project highlights the role of RFID technology in securing access to different areas of the campus, while also showcasing the potential of IoT technology in intelligent water management, which can help to conserve resources and reduce costs.

Overall, the next-gen campus design simulation project aims to provide us with a practical and comprehensive understanding of IoT technology and its potential applications in a larger-scale setting. By showcasing the benefits of IoT technology in a university campus environment, the project aims to prepare us for the future of IoT technology, where the integration of different IoT devices and networks will become increasingly prevalent.

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

PC	Personal Computer
WWW	World Wide Web
URL	Uniform Resource Locator
HTML	Hyper Text Markup Language
DNS	Domain Name System
HTTP	Hyper Text Transfer Protocol

OBJECTIVE

The objective of the next-gen campus design simulation project is to provide us with a more comprehensive understanding of IoT technology and its potential applications in a larger-scale setting by simulating a university campus where various IoT devices are connected through a network. The project will showcase examples of RFID access control management and an intelligent sports field watering solution to demonstrate the potential of IoT technology in creating a more sustainable, efficient, and secure campus environment. The project will also create a more complex network and IoT layout to allow for deeper interactions between IoT devices and provide more options for future exercise expansion. Overall, the objective of the project is to prepare us for the future of IoT technology by providing us with a practical and comprehensive understanding of its potential applications in a next-gen campus setting.

CHAPTER 1
INTRODUCTION

The development of the Internet of Things (IoT) has revolutionized the way in which devices interact with each other and has opened up a whole new world of opportunities for businesses and organizations to improve efficiency and productivity. The implementation of IoT technology in a university campus environment can help to create a more connected and intelligent campus, allowing for better resource management, improved security, and enhanced learning experiences.

The next-gen campus design simulation project aims to showcase the potential of IoT technology in a university campus setting by creating a complex network and IoT layout that allows for deeper interactions between IoT devices. The project demonstrates the practical applications of IoT technology through examples of RFID access control management and an intelligent sports field watering solution.

This project report outlines the process and results of the next-gen campus design simulation project, including the development of the network and IoT layout, the integration of various IoT devices, and the demonstration of the practical applications of IoT technology in a university campus environment. The report also provides insights into the potential benefits of IoT technology in a larger-scale setting and the importance of security in IoT networks.

The next-gen campus design simulation project offers a valuable opportunity for us to gain hands-on experience with IoT technology and its potential applications in a university campus environment. By creating a complex network and IoT layout and integrating various IoT devices, we can develop a practical understanding of how IoT technology can improve efficiency, resource management, and security on a larger scale. This experience prepares us for the future of IoT technology in next-gen campuses, where the integration of different IoT devices and networks will become increasingly essential.

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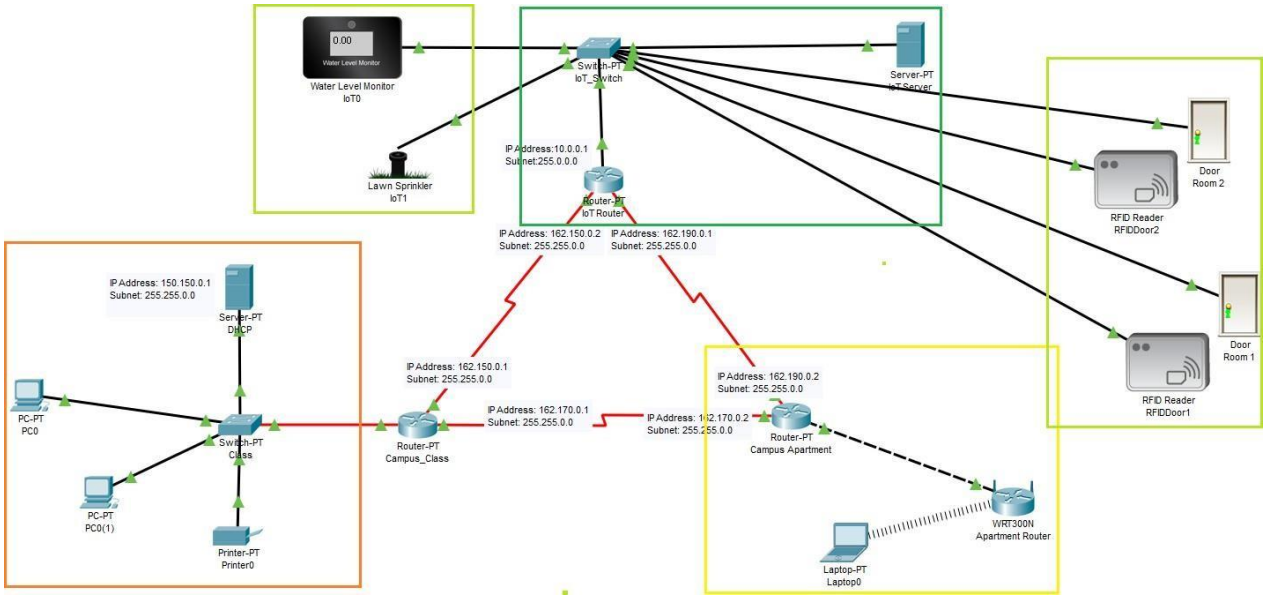
CHAPTER 2

MODULES

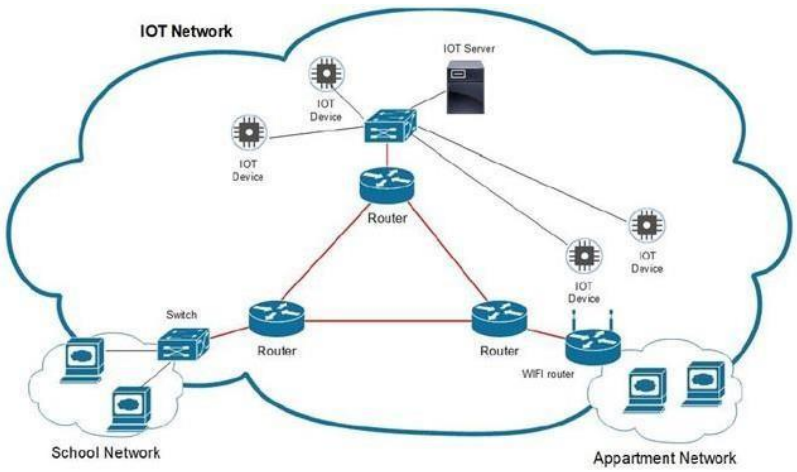
2.1 Next-Gen campus Topology



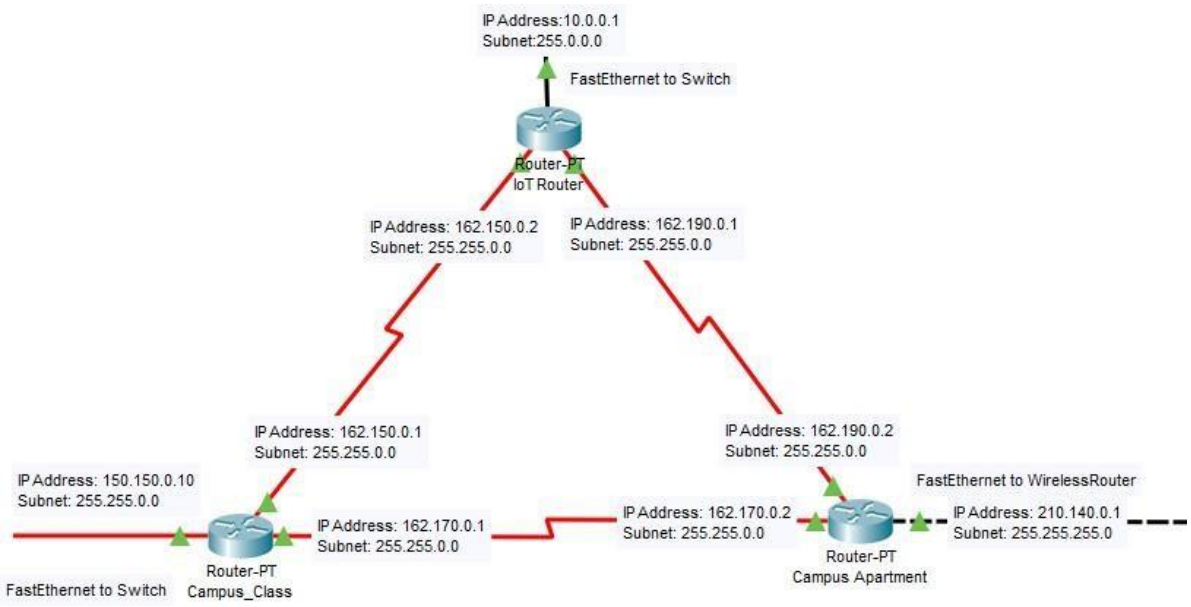
2.2 Network Layout

The network layout in this exercise is more complex compared to previous lab exercises. This network topology includes:

- Backbone router network
- Traditional switch-based classroom wired network
- Wireless LAN for the apartment buildings
- Dedicated IoT network based also on switch.



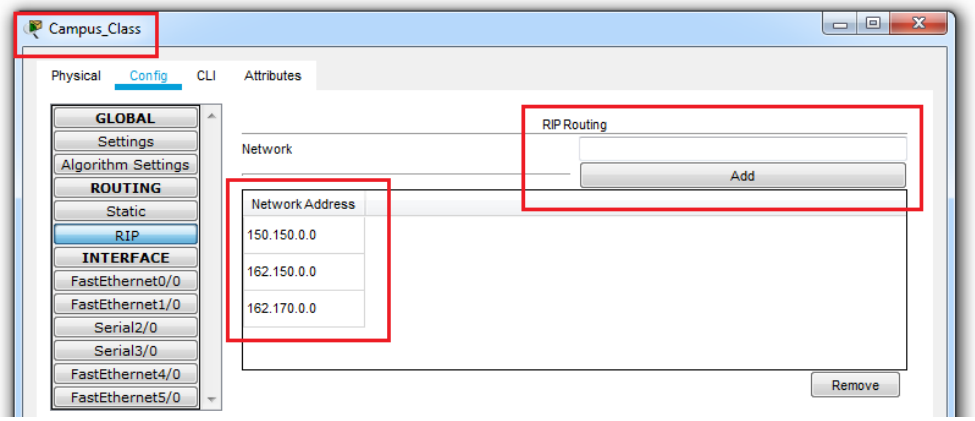
2.3 Part 1: Backbone Router Network

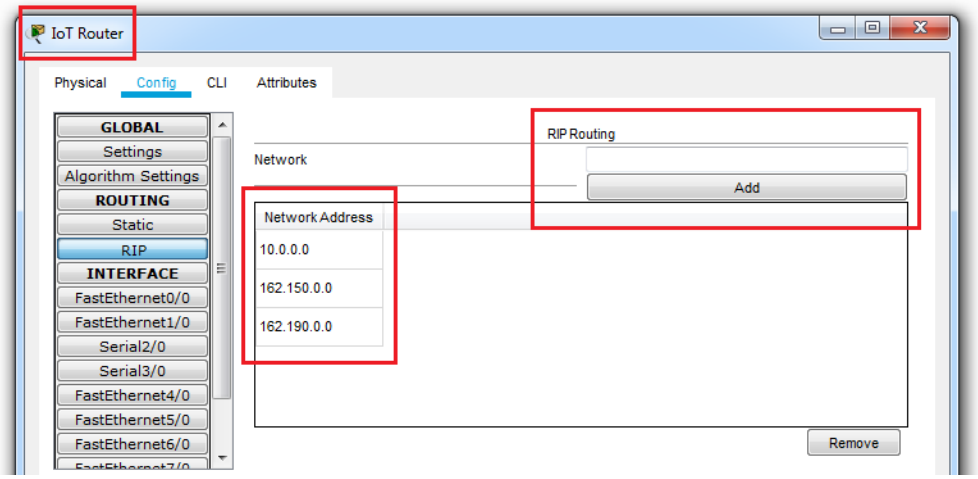


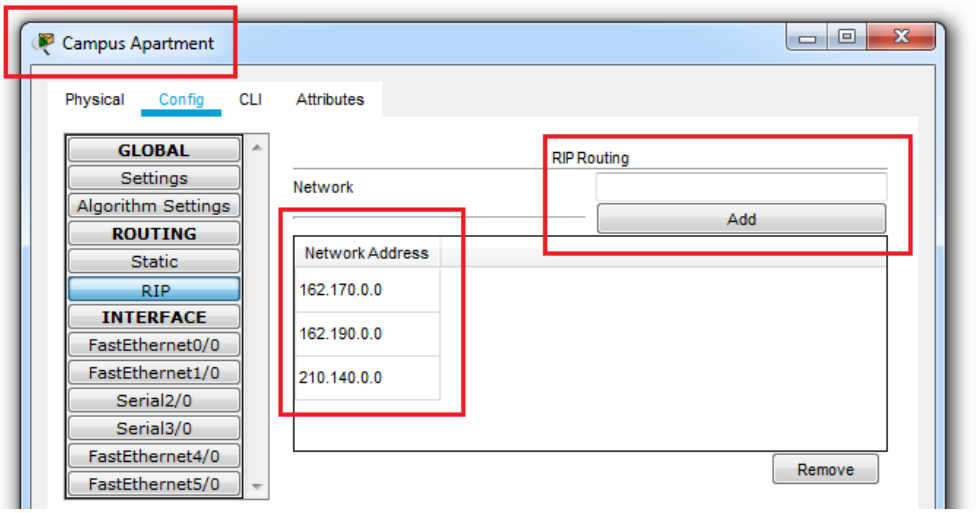
1. Set the router interface IP addresses as follows:

Router Name	Interface	IP Address	Subnet
Campus Class	FastEthernet to Switch	150.150.0.10	255.255.0.0
	Serial 2/0	162.150.0.1	255.255.0.0
	Serial 3/0	162.170.0.1	255.255.0.0
Campus Apartment	FastEthernet to Wireless Router	210.140.0.1	255.255.0.0
	Serial 2/0	162.190.0.2	255.255.0.0
	Serial 3/0	162.170.0.2	255.255.0.0
IoT Router	FastEthernet to Switch	10.0.0.1	-
	Serial 2/0	162.150.0.2	255.255.0.0
	Serial 3/0	162.190.0.1	255.255.0.0

2. Implement RIP protocol on all the three routers as shown below:



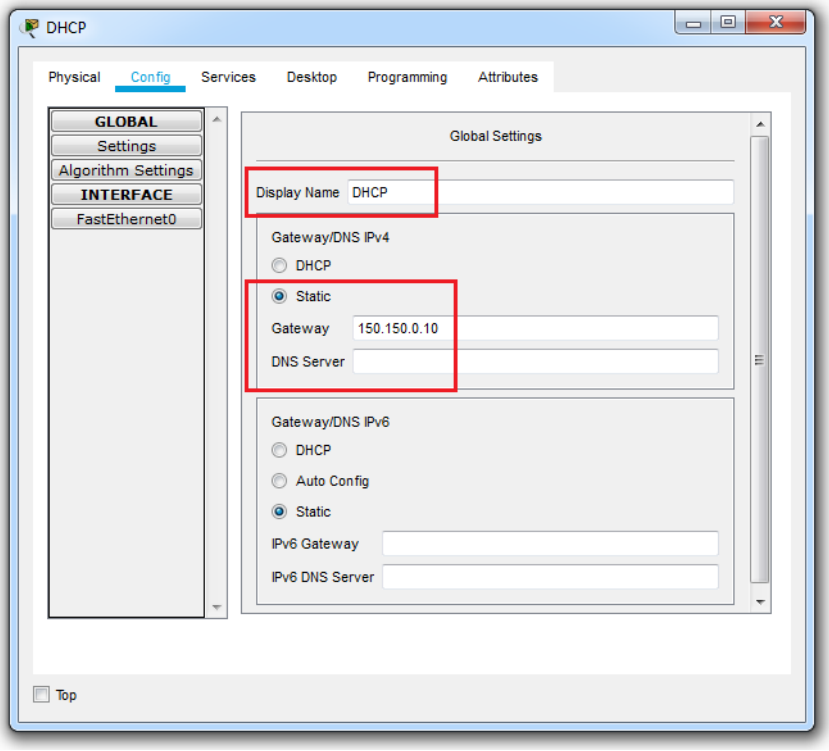

IoT Router
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
FastEthernet6/0
RIP Routing
Network
Add
Network Address
10.0.0.0
162.150.0.0
162.190.0.0
Remove

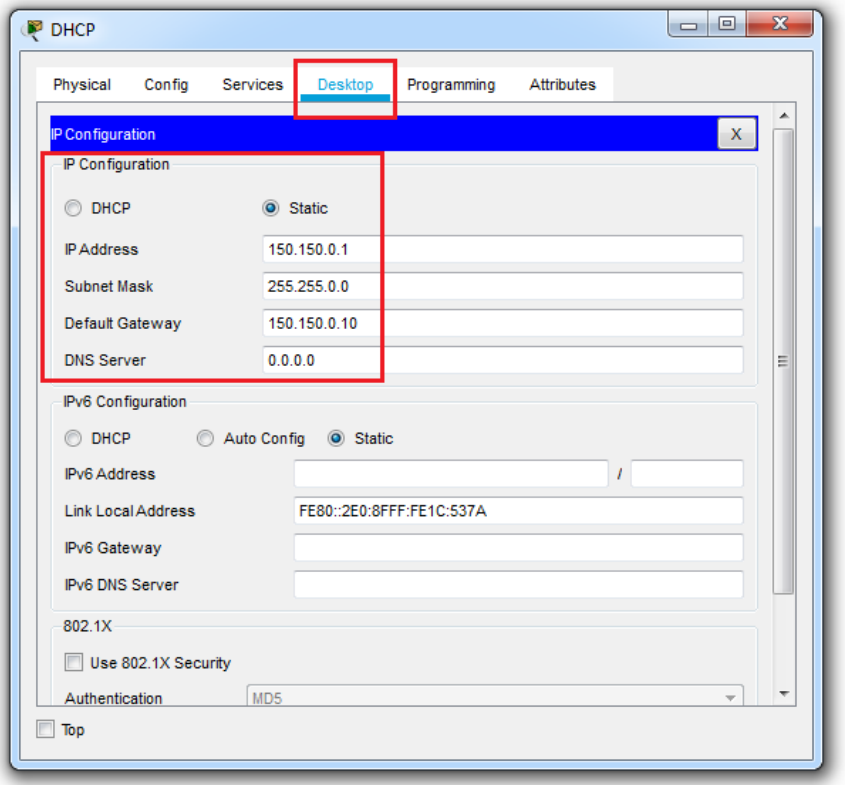

Campus Apartment
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
RIP Routing
Network
Add
Network Address
162.170.0.0
162.190.0.0
210.140.0.0
Remove

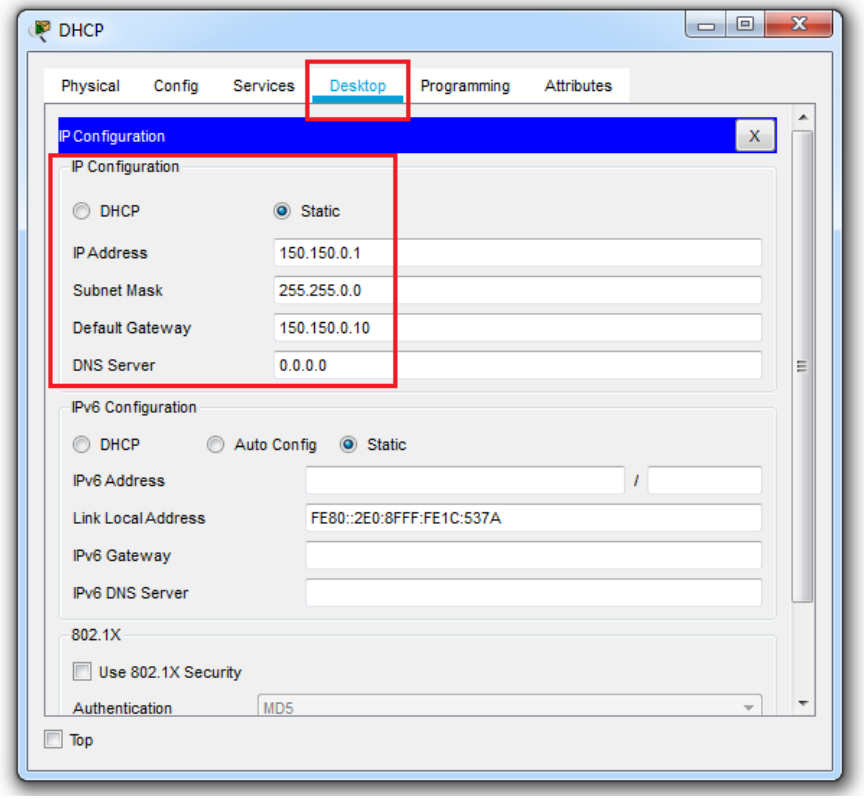
2.4 Part 2: Setting up Campus Class Network

1. Add devices as shown in the above diagram.

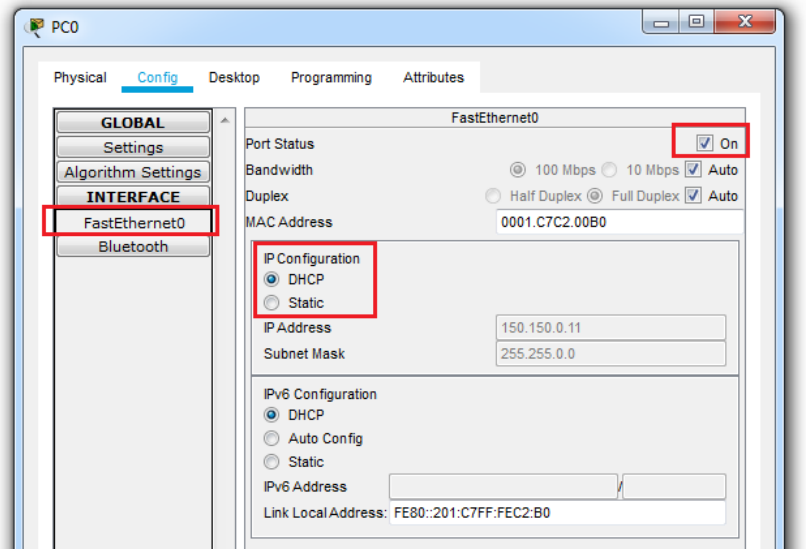
2. Setup a DHCP server. A DHCP Server is a network server that automatically provides and assigns IP addresses, default gateways and other network parameters to client devices. Therefore, once a DHCP server is configured, there is no need to add IP Addresses to the remaining client devices.



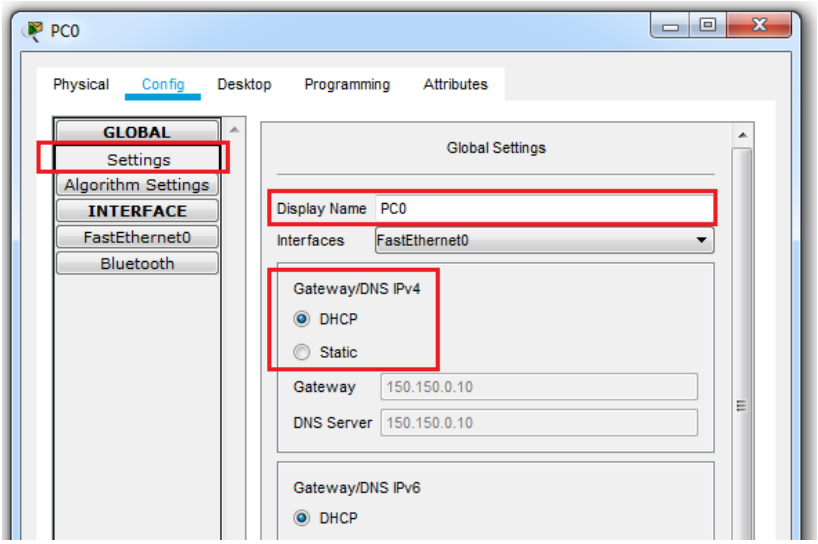




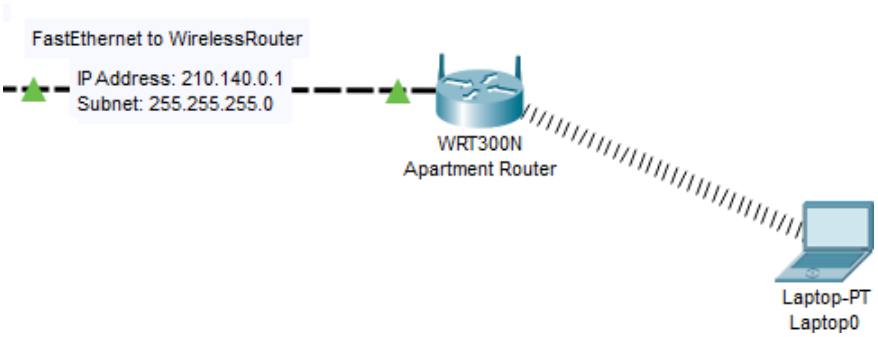
3. For all the devices, turn on the connected port and refresh the DHCP option. The port is allocated an IP address by the server.



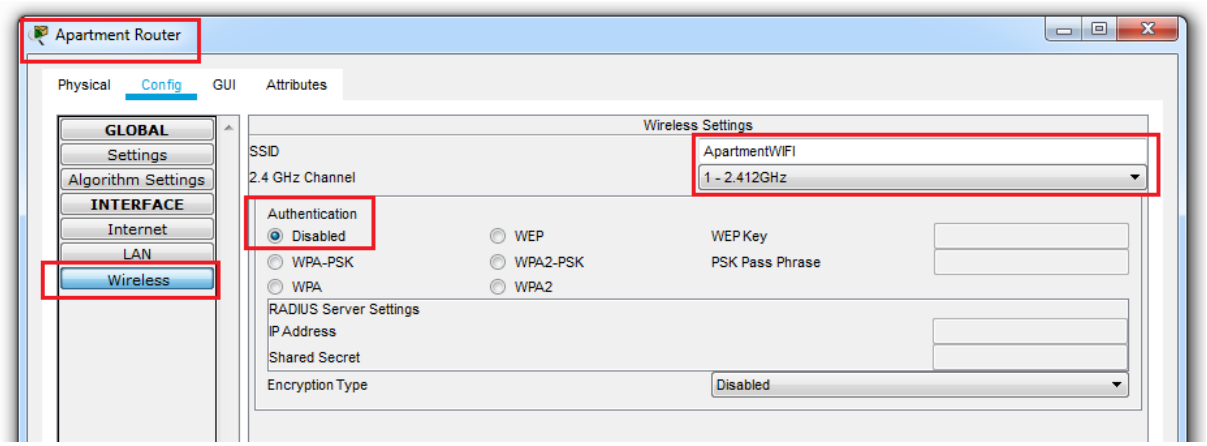
4. For all the devices, refresh the DHCP option in the settings. The Gateway and DNS IP Address configured in the DHCP server will appear.

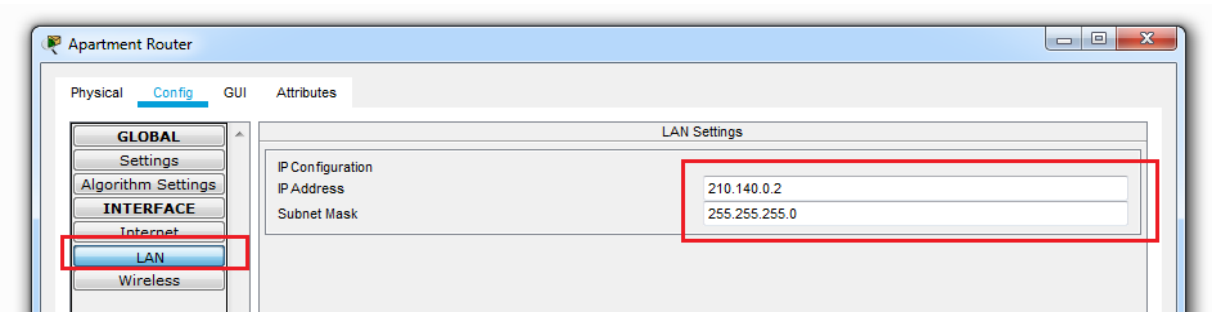


2.5 Part 3: Setting up Campus Apartment Network



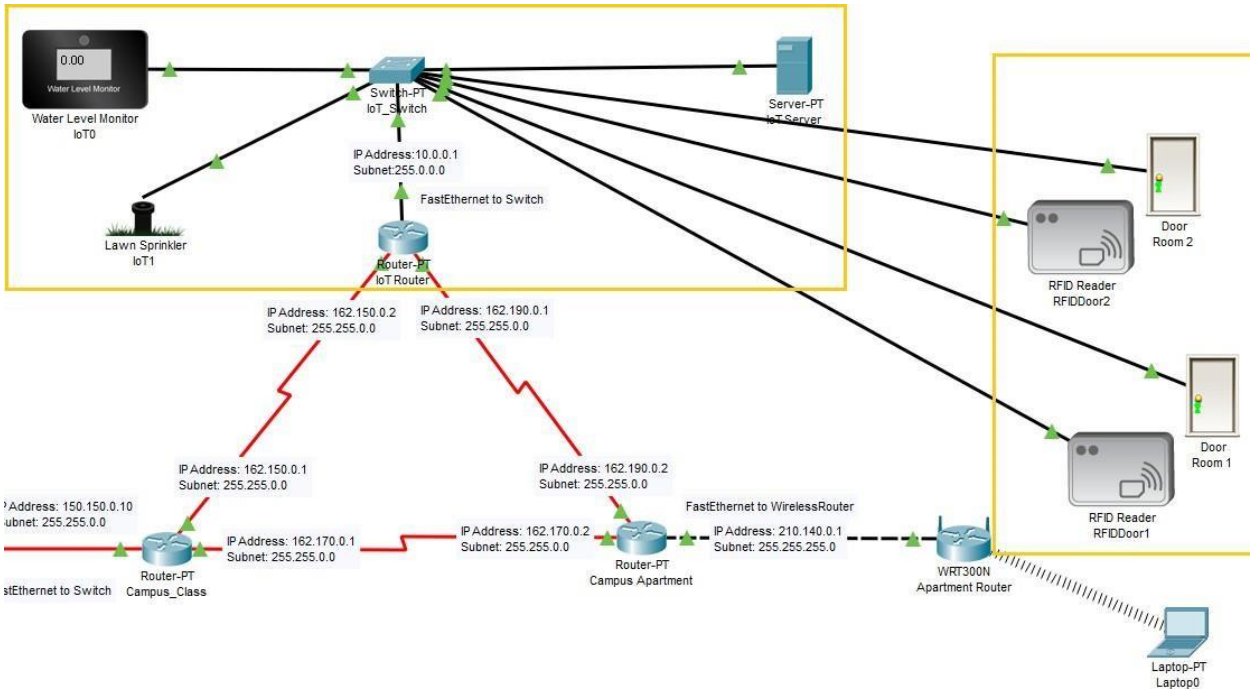
1. Setup the wireless router WRT300N as shown below. We set up a wireless network through whichvarious devices can connect.





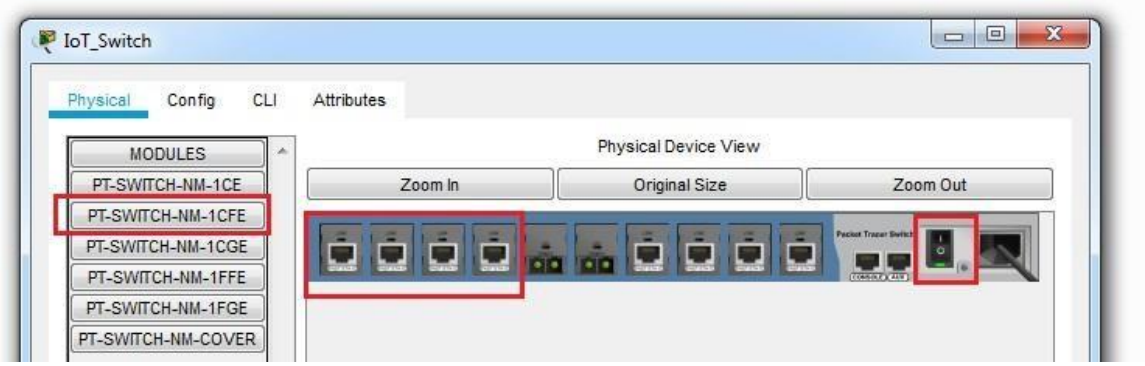
2.6 Part 4: Setting up IoT Network

Setup the wireless router WRT300N as shown below. We set up a wireless network throughwhich various devices can connect.

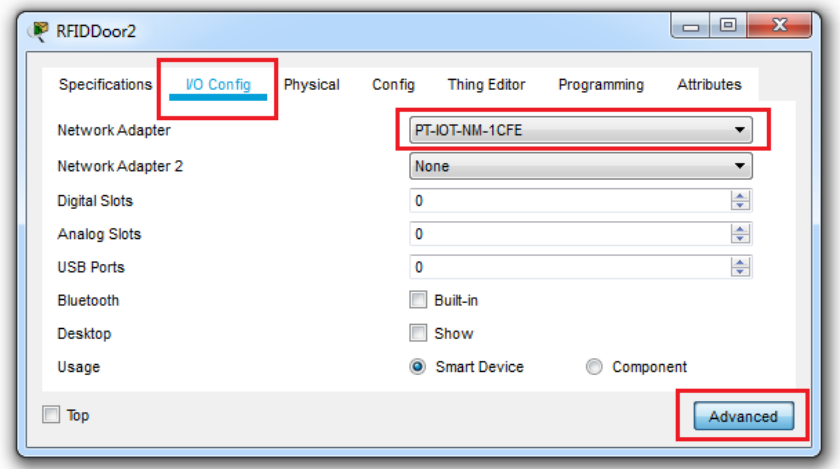


However, you will find that the switch does not have enough FastEthernet port to connect all devices. Therefore, we add the ports to the switch as follows:

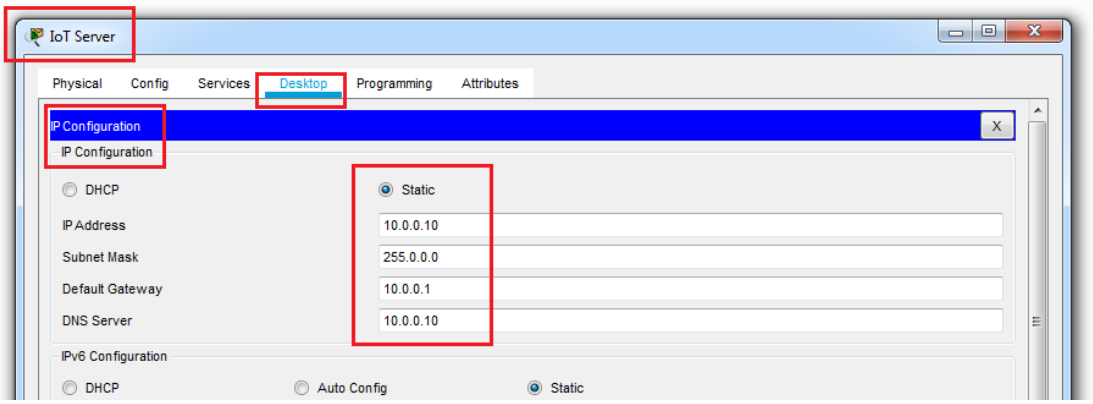
1. Shut down the switch. Drag the PT-SWITCH-NM-1CFE to the empty slots on the right side of diagram.



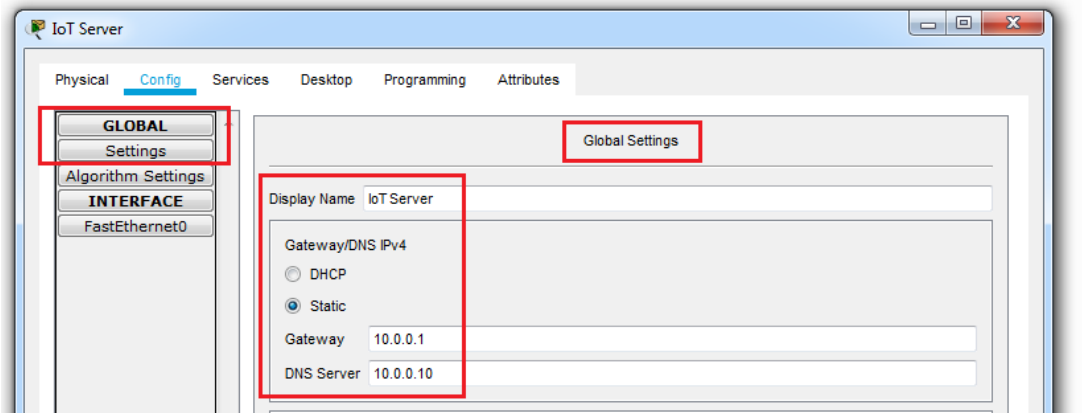
2. Make sure the IoT devices have FastEthernet ports. If not use the Advanced button on every IoT device. That will provide an I/O Config option, where you can change the port connectivity type.



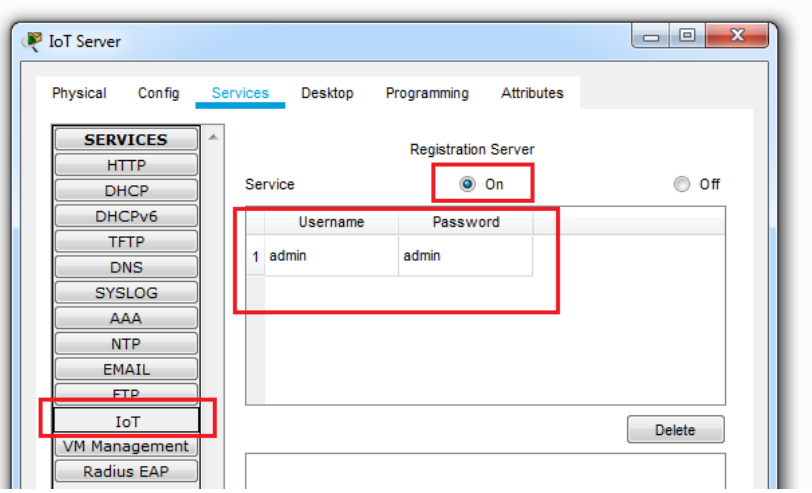
3. After adding all the devices and auto cabling them, we start with configuring the devices.
4. First, we configure the IoT Server. Add IP Address to the IoT Server as shown below.



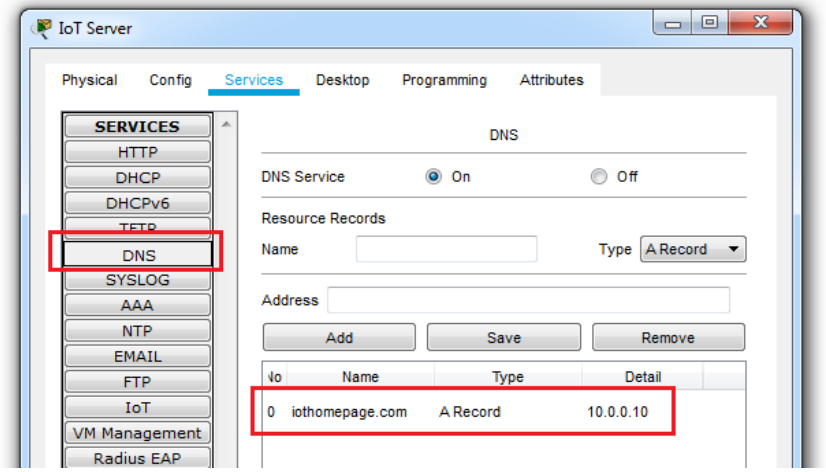
5. In Global Settings, configure the Name, Gateway IP and the DNS IP.



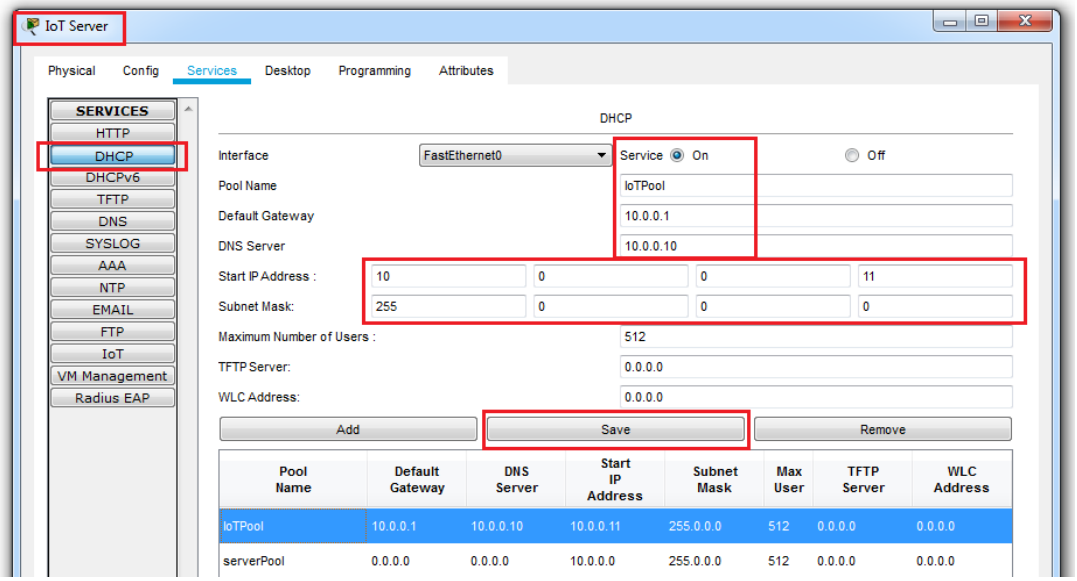
6. Add IoT Registration services as performed in previous labs.



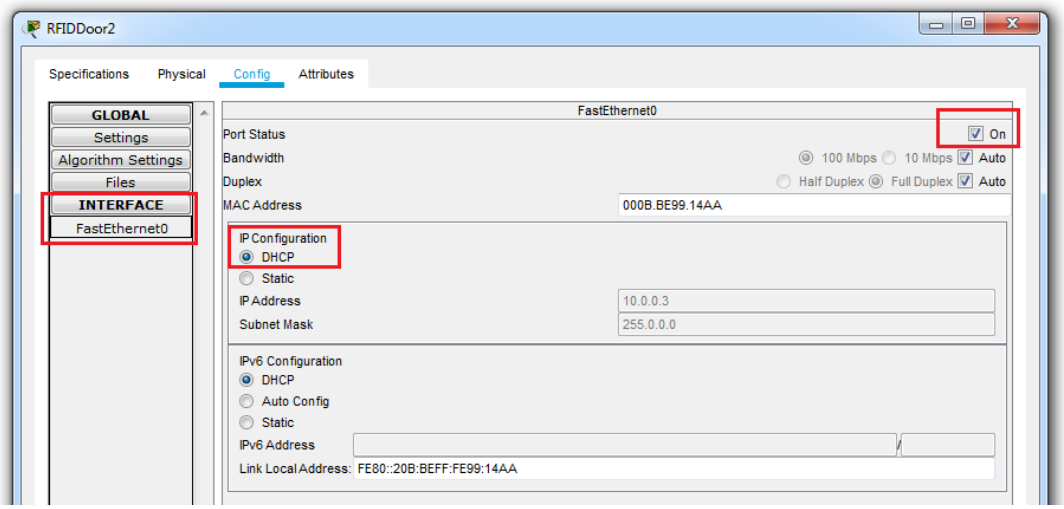
7. Add DNS services on the IoT Server.

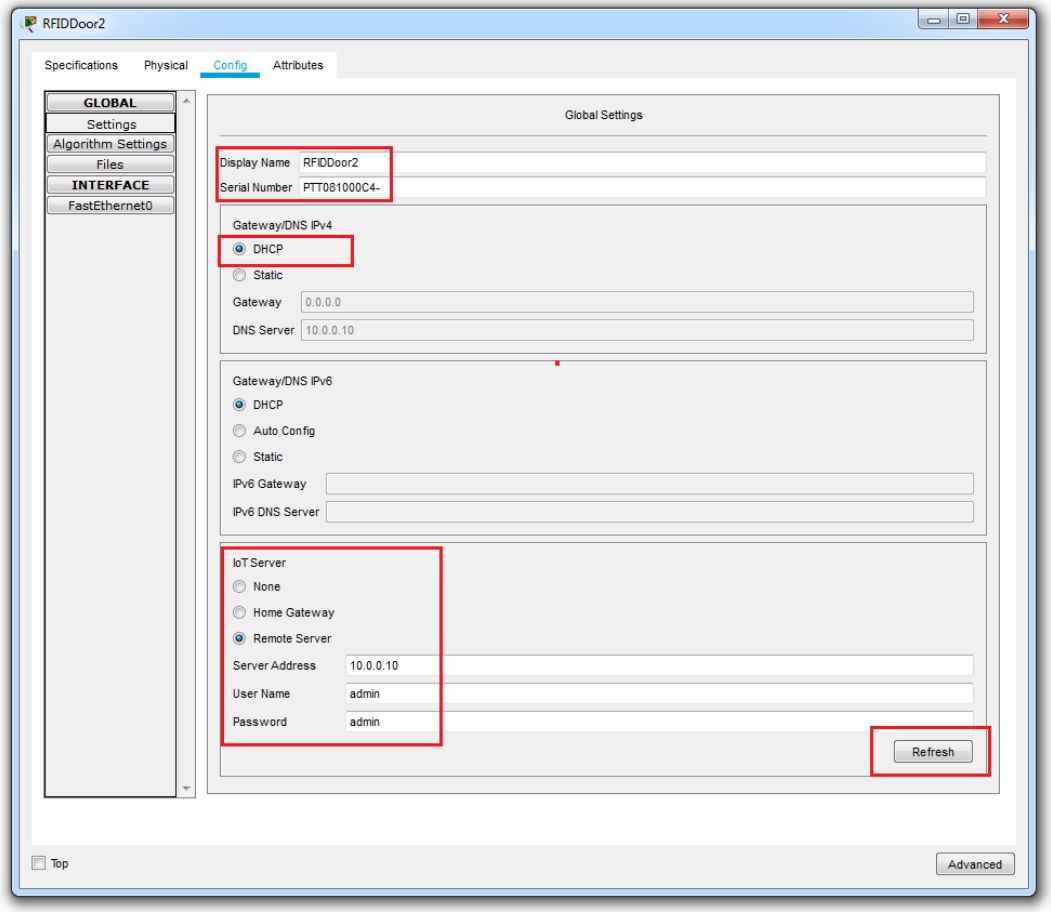


8. Add DHCP service on the IoT Server so it can assign IP addresses to IoT devices.

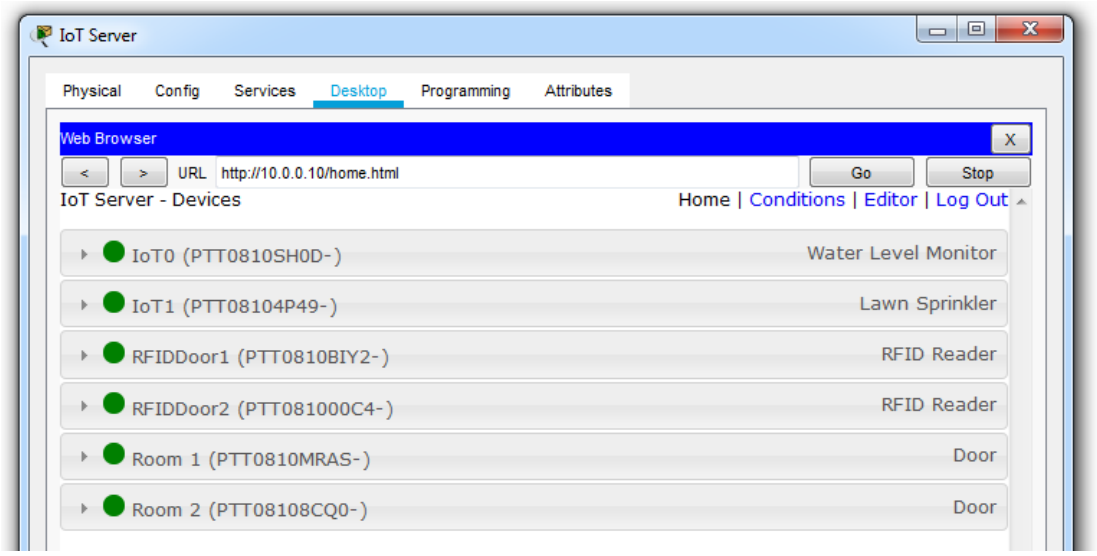


9. Add DHCP service on the IoT Server so it can assign IP addresses to IoT devices.





10. When all the devices are properly connected, the devices will show up in the IoT Registration Service. The Registration service can be accessible using the Web Browser and IP address 10.0.0.10

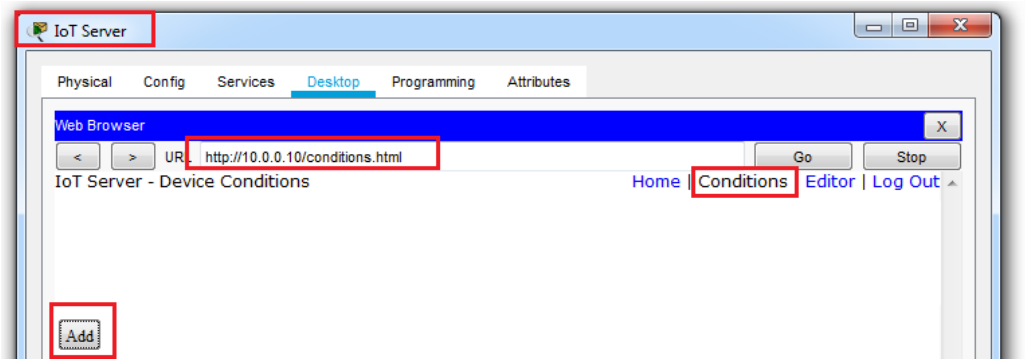


2.7 Part 5: Adding IoT Device Conditions

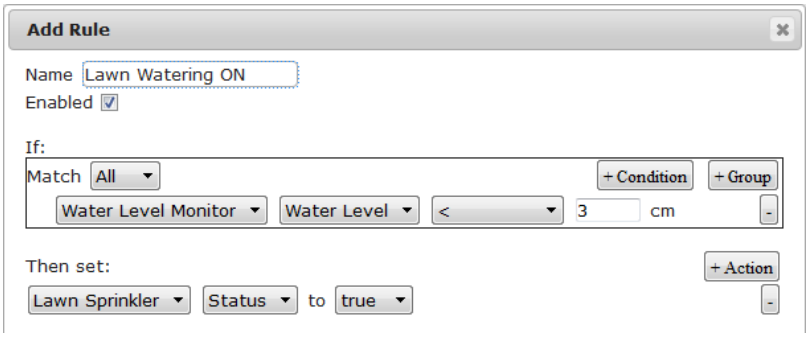
There are 2 ways to add IoT Conditions.

- Add a micro-controller, connect the devices, and program the conditions.
- Add the conditions in the IoT Registration Server.

We will use the second approach as we do not need to change the topology.

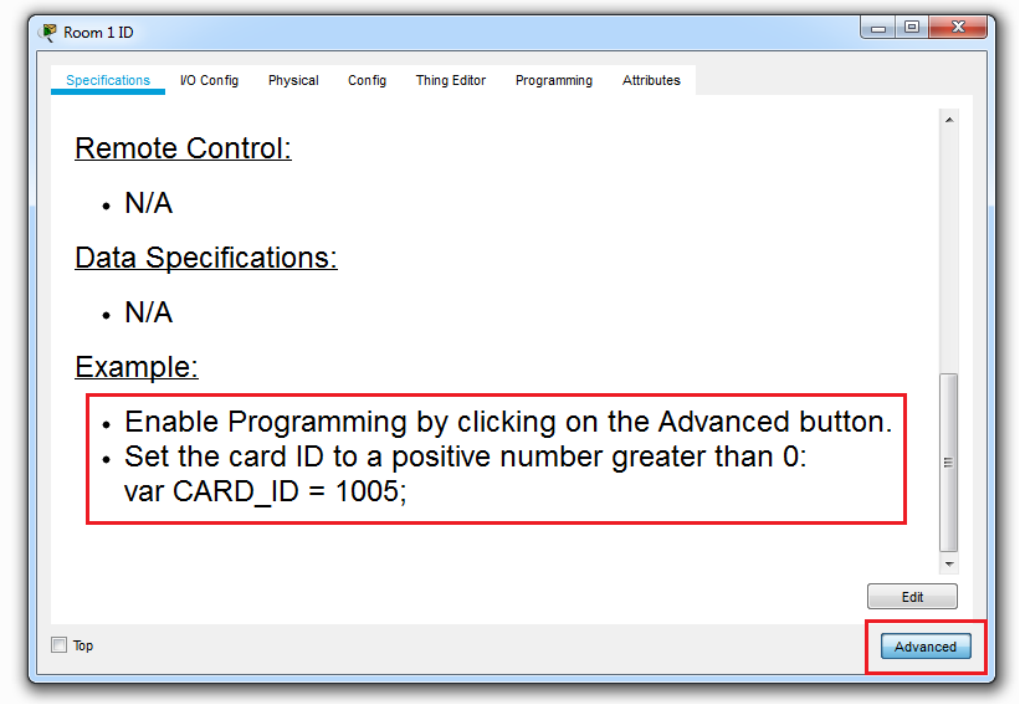


1. Add conditions for Lawn Sprinkler ON and OFF.

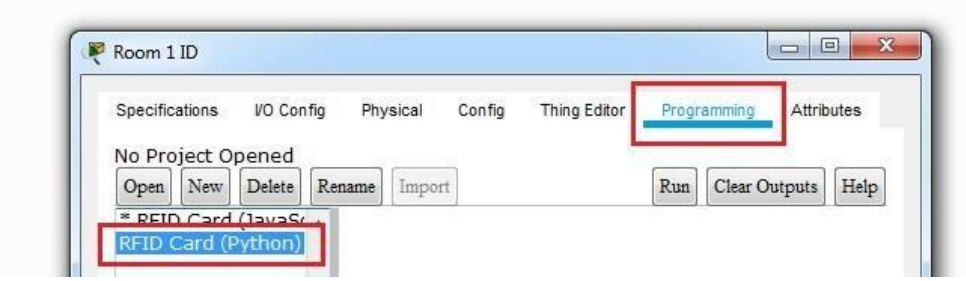


2. We now add RFID cards for the Apartment Doors

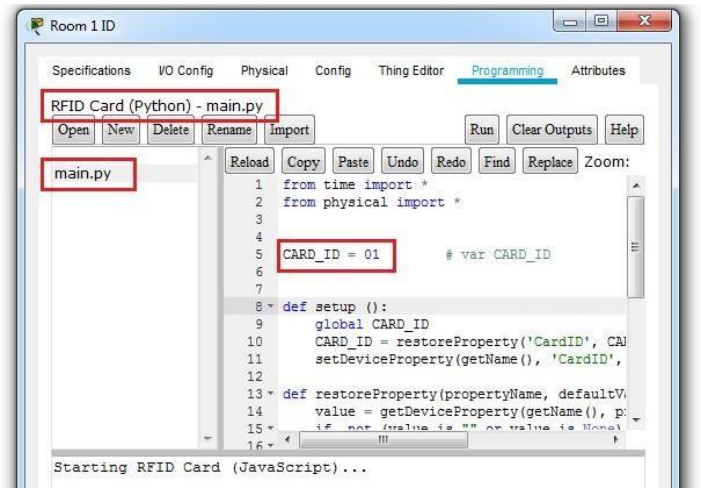
3. Configure the above RFID cards as follows:



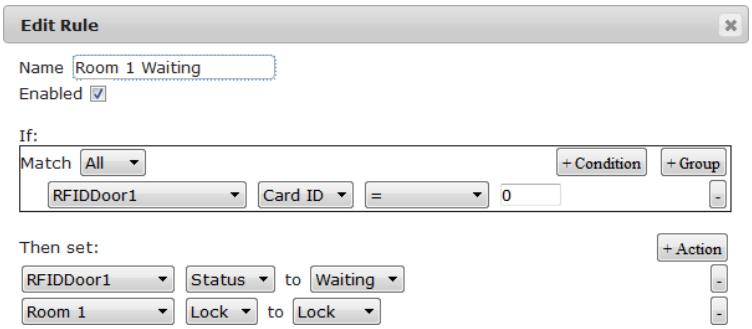
4. Select the Programming option and double click on RFID Card (Python)



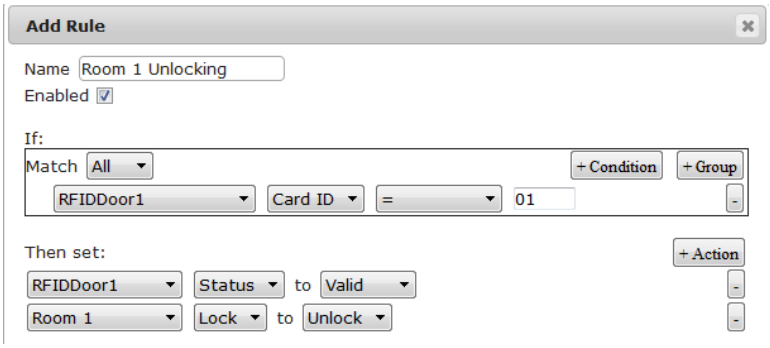
5. Double click on the main.py. And change the value of Card_ID to 01. Click Run. Similarly add 02 and 03 to RFID Card 2 and 3 respectively.



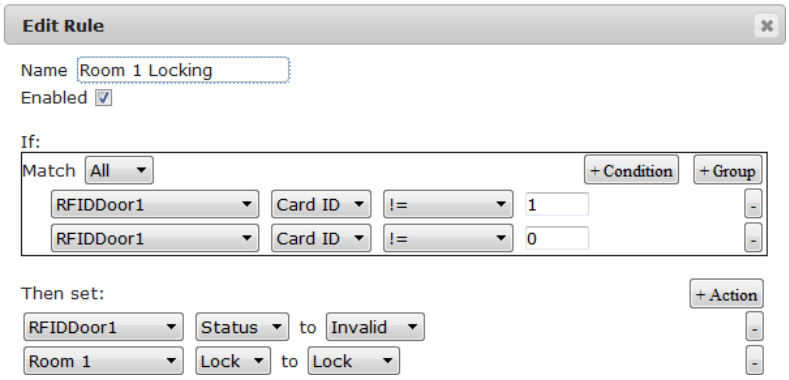
6. We now configure the RFID Reader. Add the following conditions in the Condition section in the IoT Registration Service website. Perform the following for all the RFID readers:
    - We first set all the RFID into a waiting mode and set room doors to lock status.



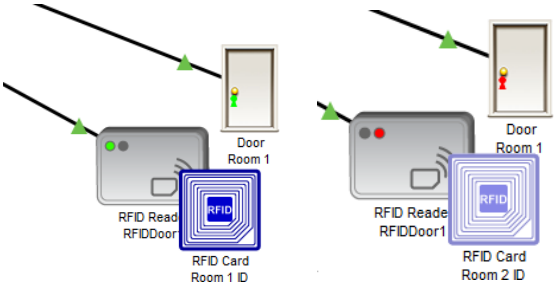
    - We set the unlocking conditions for the door.



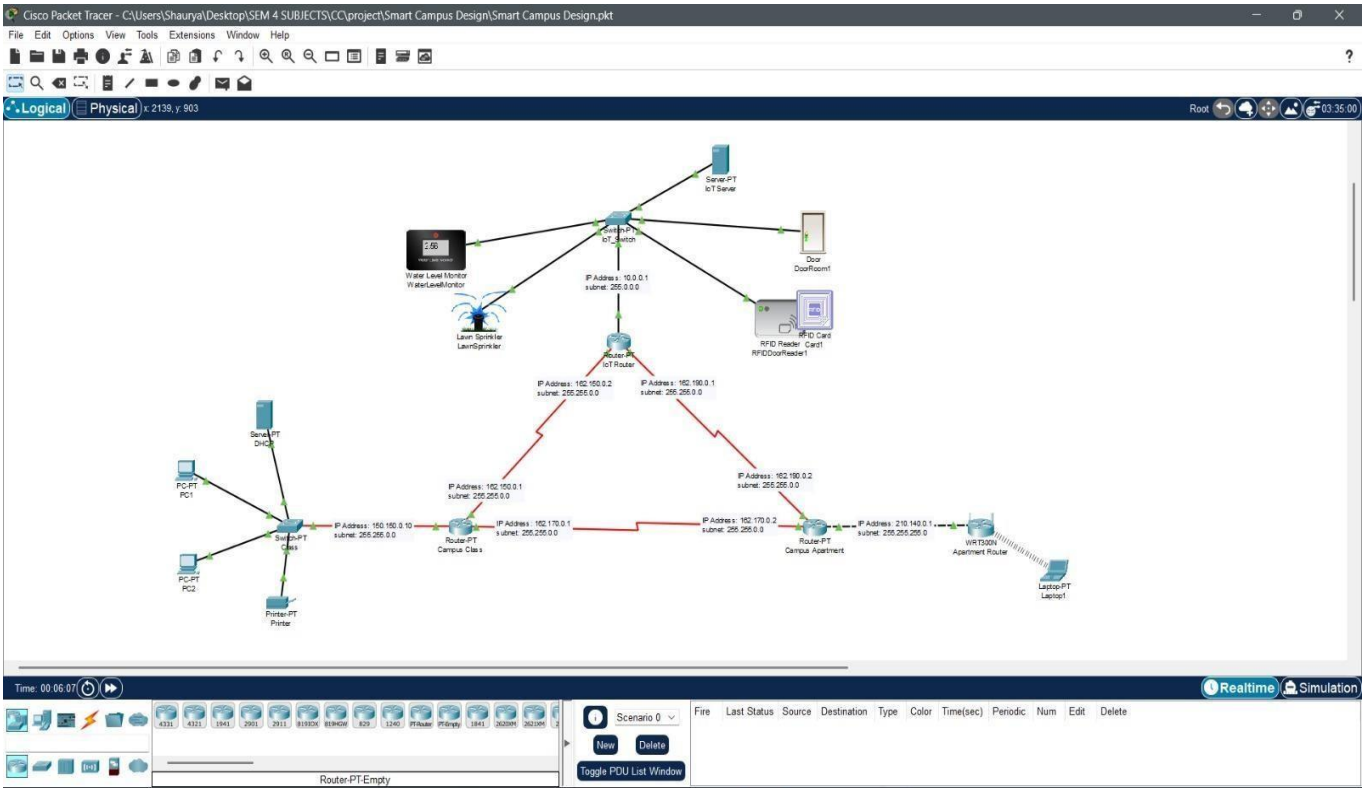
    - We set the locking conditions for the door.



    - The door will unlock with proper RFID Card



Chapter 3
IMPLEMENTATION



Chapter 4

INFERENCE

The next-gen campus design simulation project serves as a practical and valuable learning experience for us to gain a comprehensive understanding of IoT technology and its potential applications in a larger-scale setting like a university campus. By simulating the integration of various IoT devices and networks, we can develop practical skills in creating complex network layouts and understanding how IoT devices interact with each other. The project also highlights the importance of security in IoT networks and demonstrates the practical applications of IoT technology in improving efficiency, resource management, and security. Overall, the next-gen campus design simulation project provides us with a valuable opportunity to prepare for the future of IoT technology and its integration in next-gen campuses and various industries.

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