SMOKE DETECTION AND FIRE PREVENTION USING CISCO PACKET TRACER

A Project Report Submitted by,

JAGADEESH R

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INTRODUCTION:

In our envisioned system, we leverage **Internet of Things (IoT)** technology along with a smoke sensor to notify different household appliances to take appropriate actions in the event of a fire. This system is valuable as it not only triggers an alarm but also instructs household appliances to respond accordingly.

We have implemented this solution using **Cisco Packet Tracer,** a network simulator that offers a diverse range of Cisco switches, routers, and wireless devices. Cisco Packet Tracer not only supports physical simulation but also serves as an assessment tool, enabling the creation of practical networking models.

PROBLEM DESCRIPTION:

The goal of this project is to establish an intelligent smoke detection system with built-in fire prevention features. Unlike traditional smoke detectors that only identify smoke without the ability to take immediate preventive actions, this initiative aims to create a sophisticated system. The objective is to accurately identify smoke in various environments and activate proactive measures to minimize or eliminate fire risks. The system will seamlessly integrate with other devices and systems, including fire suppression and emergency services, ensuring a well-coordinated and swift response during fire emergencies. The primary aim is to enhance safety, prevent property damage, and save lives by efficiently detecting and preventing fires before they escalate.

PROJECT IDEA:

Our system, incorporating a smoke sensor, is configured with a threshold of 0.5. This signifies that appropriate measures will be taken if the sensor detects smoke levels surpassing the predefined threshold. The setting can be adjusted based on individual preferences, specific circumstances, or environmental conditions. In the event of a fire, the sprinklers activate to curb the spread of flames within the house.

METHODOLOGY:

Our Smoke detection and fire prevention project was implemented on Cisco packet tracer for testing.

Components used for our project are as follows:

1) **Home Gateway:** A router that forwards the data to the server and the control information to the connected devices for alerting purposes and hence allows it to take necessary actions to extinguish the fire.

DLC100
Home Gateway1

2) **Door/Garage Door:** Affects Argon, Carbon Monoxide, Carbon Dioxide, Hydrogen, Helium, Methane, Nitrogen, O2, Ozone, Propane, and Smoke. When the door is opened, those gases will decrease to a maximum of 2% in total change. When the door is opened, the rate of transference for Humidity and Temperature is increased by 25%. The rate of transference for gases is increased by 100%.
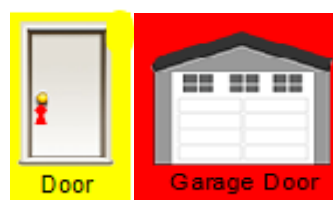
3) **Smoke Detector:** Detects Smoke. Alarm will go off when it detects the environment variable SMOKE at the level of 40%.

Smoke Detector

4) Fire Sprinkler: Raises the water level. Affects Water Level at a rate of 0.1 cm per second. This is connected to the smoke detector.

Fire Sprinkler

5) Siren: Siren buzzes warning when the fire is detected.

6) Smartphone: This is the user interface that allows the user to know that a fire occurred at their place with the help of the application running on their smartphone and the amount of smoke generated and hence take necessary steps.

SMARTPHONE-PT

7) Window: A window is an opening in a wall, door, roof or vehicle that allows the passage of light, sound, and sometimes air.

PROCEDURE:

1) Utilization of a home gateway for LAN-to-WAN connectivity.
2) Dynamic allocation of IP addresses through DHCP for all devices.
3) Wireless connectivity to the home gateway for each device.
4) Implementation of a predefined threshold for the smoke detector; activation of components such as the siren and fire sprinkler occurs when the threshold is exceeded.
5) The smoke detector threshold is set at 0.5; surpassing this level triggers actions including activating the siren, fire sprinkler, locking doors, and opening windows and the garage door, effectively reducing smoke intensity.

NETWORK DESIGN:
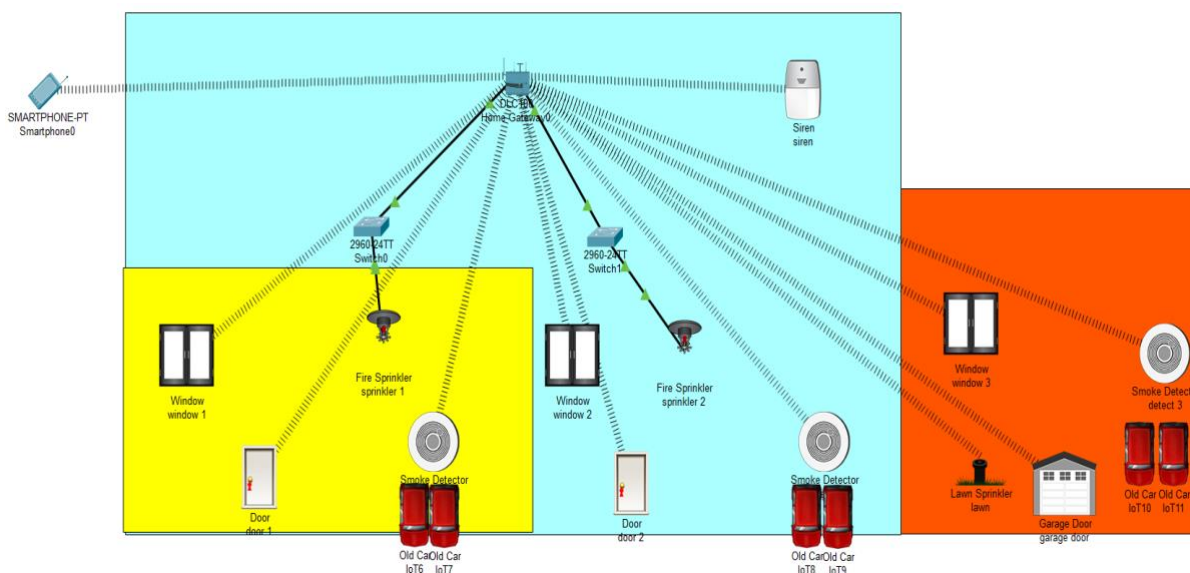
CONFIGURATION:

1. DLC Home Gateway:

- Web page with login credentials for system control.
- Registration functionality available on the router.
- Dynamic IP assignment (192.168.25.1).

2. Smartphone:

- Connects via web browser using the registration server's IP.
- Dynamic IP assignment (192.168.25.120).

3. **Smoke Detector:**
   - Detects smoke; triggers actions when level exceeds 0.5.
   - Connected to Home Gateway via network adapter.
   - Dynamic IP assignment using DHCP.

4. **Window:**
   - Opening for light, sound, and air passage.
   - Connected to Home Gateway via network adapter.
   - Dynamic IP assignment using DHCP.

5. **Door:**
   - Entry/exit point; connected to Home Gateway via network adapter.
   - Dynamic IP assignment using DHCP.

6. **Garage Door:**
   - Essential for air release during fire; connected to Home Gateway via network adapter.
   - Dynamic IP assignment using DHCP.

7. **Fire Sprinkler:**
   - Activated by Home Gateway when smoke level surpasses 0.5.
   - Connected via network adapter.
   - Dynamic IP assignment using DHCP.

8. **Siren:**
   - Emits loud emergency sound when smoke level exceeds 0.5.
   - Connected to Home Gateway via network adapter.
   - Dynamic IP assignment using DHCP.

9. **Car:**
   - Represents smoke generation during a fire scenario in Cisco Packet Tracer.

CONDITIONS:

        To execute the project, specific conditions must be defined for activating and deactivating all devices. The state of the devices will vary based on the dynamic changes in these conditions. Cars are employed to simulate smoke in the simulation. The critical conditions outlined above for this simulation include:

IoT Monitor				X
IoT Server - Device Conditions			Home | Conditions | Editor | Log Out	

Actions	Enabled	Name	Condition	Actions
Edit Remove	Yes	smoke on	detect 1 Level >= 0.5	Set window 1 On to true Set door 1 Lock to Unlock Set sprinkler 1 Status to true Set siren On to true
Edit Remove	Yes	smoke on 2	detect 2 Level >= 0.5	Set window 2 On to true Set door 2 Lock to Unlock Set sprinkler 2 Status to true Set siren On to true
Edit Remove	Yes	smoke on 3	detect 3 Level >= 0.5	Set window 3 On to true Set garage door On to true Set lawn Status to true Set siren On to true
Edit Remove	Yes	smoke off	detect 1 Level <= 0.4	Set siren On to false Set window 1 On to false Set door 1 Lock to Lock Set sprinkler 1 Status to false
Edit Remove	Yes	smoke off 2	detect 2 Level <= 0.4	Set siren On to false Set door 2 Lock to Lock Set window 2 On to false Set sprinkler 2 Status to false
Edit Remove	Yes	smoke off 3	detect 3 Level <= 0.4	Set siren On to false Set garage door On to false Set window 3 On to false Set lawn Status to false

Add

RESULT ANALYSIS:

CONCLUSION:

In summary, the project "Fire Prevention and Smoke Detection with Cisco Packet Tracer" effectively demonstrated a reliable system for prompt smoke detection and fire prevention. Utilizing Cisco Packet Tracer, the project showcased accurate network infrastructure design, simulation, and testing. Its scalability and modular design allow easy adaptation to diverse building layouts, providing a valuable foundation for enhancing fire safety systems.