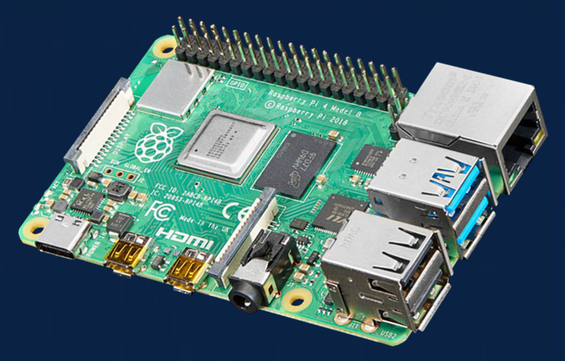
Florida International University

Spring 2022 Senior Design Project

Network Outage Call Home



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PROBLEM

- As an MSP owner, I need visibility into my environments even when internet issues occur.
- Build and connect a small device (Raspberry Pi) to a network that upon losing connection will phone home to the user over a cellular network.
- The end user should then be able to remotely access this device over a cellular connection.

CURRENT SYSTEM

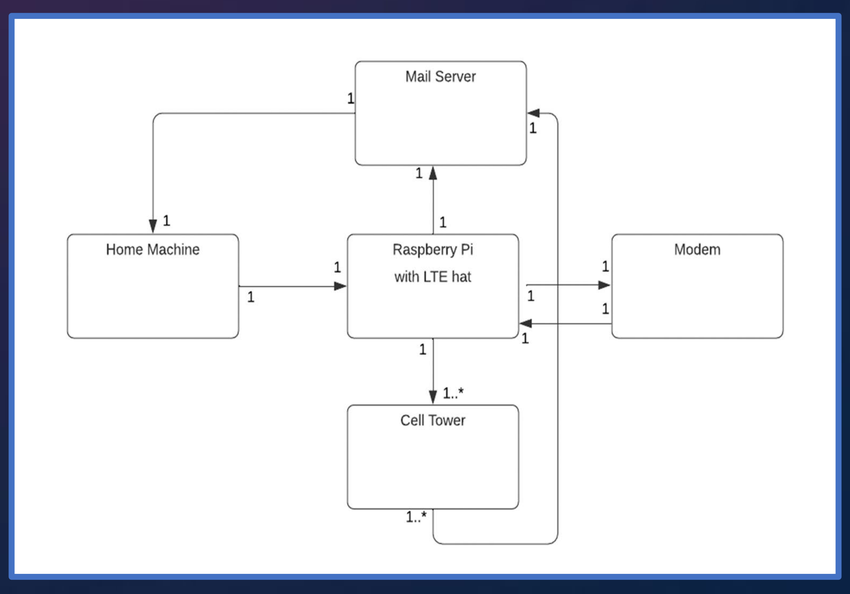
- In the case of an outage there is currently no automated system in place to notify technicians of down time.
- When an issue does arise, it would be up to someone on site to notice the issue and then contact technicians accordingly.

REQUIREMENTS

Hardware:
- Arduino R3 (Early Concept)
- Raspberry Pi 3 (Current Concept)
- Sixfab 4G/LTE Base Hat
- Sixfab IoT Simcard

Software:
- Python 3.10.4
- Visual Studio Code
- Raspberry Pi OS
- Raspberry Pi Terminal
- Sixfab Dashboard

SYSTEM DESIGN



The above diagram represents the layout of a successfully deployed device

SAMPLE CODE

```python
import os
import time
import phone_home

def eth_ping():
    # Recipient of ping test
    hostname = "8.8.8.8" # 8.8.8.8 = Google DNS
    # Specifies interface to conduct ping from
    interface = "wlan0"
    # This will run the linux ping command from the wlan0 interface
    response = os.system("ping -c 4 -I " + interface + " " + hostname)

    # If a response of 0 is received than the ping was successful and the network in up
    if response == 0:
        status = 'Up'
    # Else the ping has failed and the phone_home function will be called.
    # The phone home function will then alert the end user of the outage.
    else:
        status = 'Down'
        phone_home.phone_home()
    return status

# Function called in the run.py script to automate this script
def run():
    while(True):
        # Prints the results of the script for debugging purposes
        print(eth_ping())
        # As the script is automated, this will set a delay to run every half hour
        time.sleep(3000)
```

The above script showcases the code behind the primary function of the device

IMPLEMENTATION

- Python 3 - Primary Scripting language used for device tests/alerts
- Sixfab Dashboard - Used to configure network interface metrics
- Trello - Service used for tracking the development of user stories.
- Linux Terminal - Necessary for running test scripts and detecting outages.
- Raspberry Pi OS - The operating system deployed on the device.
- VNC Viewer - Software that allowed multiple users to access and manipulate the device remotely.

VERIFICATION

```
PING 8.8.8.8 (8.8.8.8) from 192.168.1.113 wlan0: 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=118 time=8.70 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=118 time=9.08 ms

--- 8.8.8.8 ping statistics ---
4 packets transmitted, 2 received, 50% packet loss, time 3033ms
rtt min/avg/max/mdev = 8.697/8.889/9.081/0.192 ms
Up
```

```
ping: connect: Network is unreachable
To: mbeal006@fiu.edu
From: mikephonehome@gmail.com
Subject: Python Test
Network outage detected
Down
```

SUMMARY

- Created a simple automating system for running test scripts:
  - General outage script.
  - Phone Home Script (Email)
- Assisted in the testing process for supplementary scripts.
- Obtained the necessary hardware to build the device:
  - Conducted research into the controller used (Raspberry Pi)
  - Configured the Raspberry Pi
  - Set up the LTE hat w/ cellular connection.
- Provided the network in which the device tests were performed.

REFERENCES

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