

Assignment 2

Message Repository

Due Date: Sunday, October 23, 2016 @ 23:55

ECE 4564 - Network Application Design

Learning Objectives

Message Broker

- AMQP Protocol
- RabbitMQ

Remote Procedure Calls

Callback Routines

Service Discovery

- Zero Configuration
- Avahi

Data Persistence

- noSQL Database

Serialization and Data Interchange

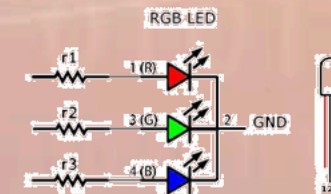
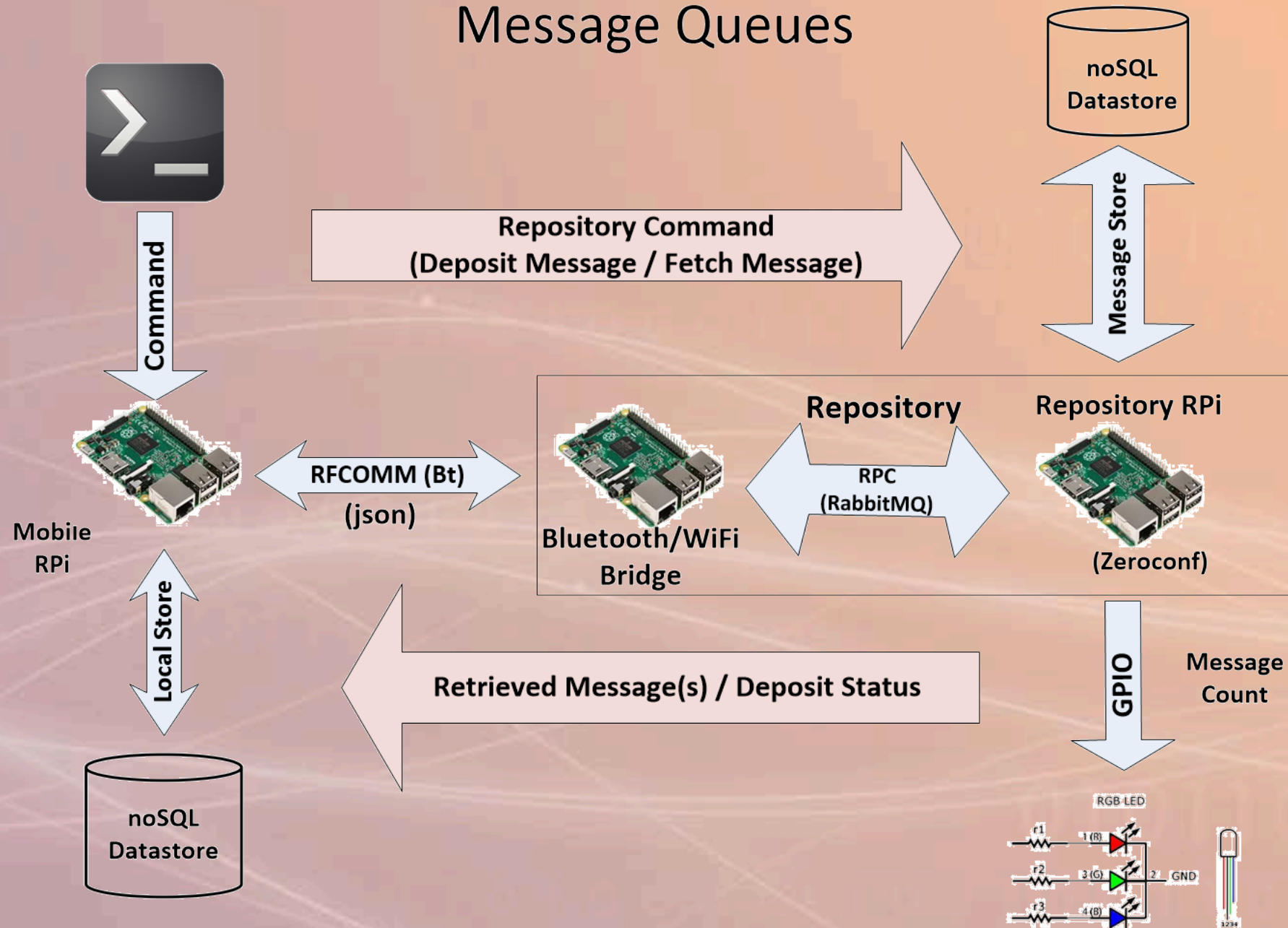
- JSON

Bluetooth

Raspberry Pi GPIO

System Overview

Message Queues



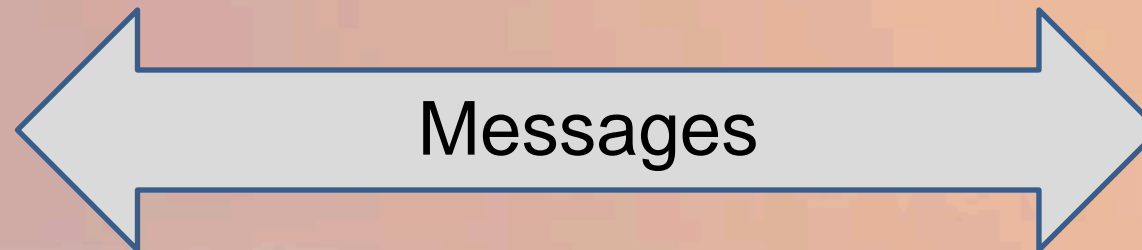
Assignment Overview

- Mobile Rpi (client)
 - Places a message in or removes a message from a repository RPi
 - Stores and maintains local messages in a persistent datastore
- Bt / WiFi Bridge
 - Receives message instruction from mobile Rpi
 - Issues a RPC request to repository RPi
 - Processes request and reply via message broker

Assignment Overview

- Repository Rpi (server)
 - Service that manages
 - message requests from a Mobile Rpi
 - message replies to a Mobile RPi
 - Processes request and reply via message broker
 - Maintains messages in a persistent datastore
 - Indicates current number of messages in repository using RGB LED
 - Advertises service using Zeroconf

Mobile RPi



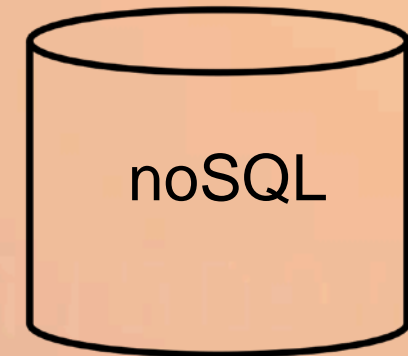
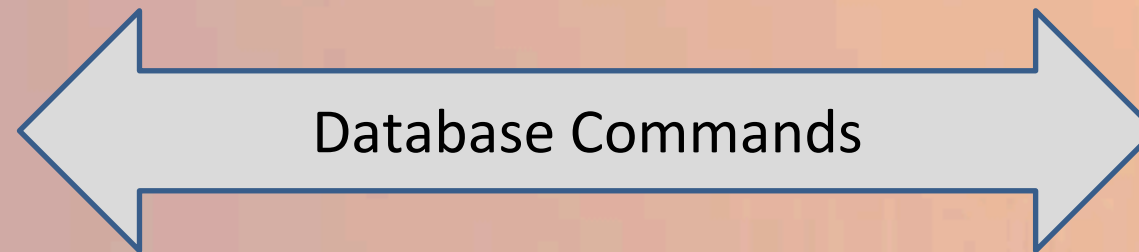
- File name : mobile.py
- The mobile client sends requests and receives replies from the Bluetooth/WiFi Bridge via Bluetooth sockets
- Message client operations
 - push – send a message to the repository Rpi via Bt/Wifi bridge
 - pull – retrieve a message/reply from the repository Rpi via the Bt/WiFi bridge
- Messages pushed or pulled are stored in a noSQL datastore
- The message is in JSON format

Bt/WiFi Bridge RPi



- Filename : bridge.py
- Obtain Repository RPi info using Zeroconf
- Receive message instruction from Mobile RPi via Bluetooth
- Sends message instruction to the Repository Rpi via a shared message queue
- Receives replies from the repository RPi via a shared message queue
- Sends reply to Mobile Rpi via Bluetooth

Repository RPi



- Processes message command
 - Place message in repository (noSQL datastore)
 - Retrieve message(s) from repository (noSQL datastore)
- Sends reply to Bt/WiFi Bridge RPi via shared message queue
- Displays message count on RGB LED
- The repository service advertises its identifying information using Zeroconf.

Command Line Parameters

```
mobile.py -a push -s "subject" -m "text"
```

```
mobile.py -a pull <query expressions>
```

- a : Action – push, pull
- s : Message subject
- m : Message text

```
mobile.py -a push -s "chairs" -m "I like the comfortable chairs on 3rd floor"
```

Query:

```
mobile.py -a pull -s "weather" -m "*football*"
```

```
mobile.py -a pull -s "concert"
```

DB queries honor regular expressions

Message Instruction (json)

```
{
  "Action": "push",
  "MsgID": "02$1476123693.1855621",
  "Subject": "weather",
  "Message": "It is raining"
}
```

```
{
  "Action": "pull",
  "Subject": "weather",
  "Message": "*burgers*"
}
```

```
MsgID : "team_" + "$" + ticks
        ticks = time.time()
```

Repository Reply (json)

```
{
  "MsgID": "msg0001",
  "Message": "It is raining",
}
```

•
• < multiple responses possible >
•

- OR -

```
{
  "Status": "success" | "fail"
}
```


Message Counter

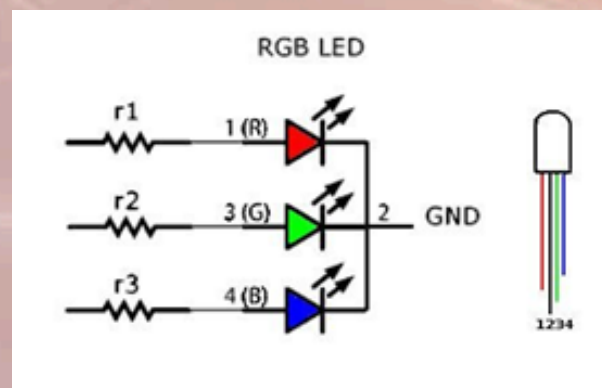
Indicates number of messages in the message repository.

Red – Hundreth's

Green – Tenth's

Blue – One's

Count:253 – Flash Red 2 times, Green 5 times, Blue 3 times



Grading

GTAs will provide grading rubric

Report

You must document the design, and outcomes in a brief written report. Your report should contain the following items.

- At the top of the first page of your report, include: your names (as recorded by the university); your email addresses; your team number; and the assignment name (e.g., “ECE 4564, Assignment 2”). Do not include your Virginia Tech ID number or your social security number.
- The body of the report must contain the following sections. Use section numbers and headings to organize your report.
 - Section 1 – Objectives: Provide a description of the design objectives and general approach to the design. Include a system diagram showing your system’s end-to-end function.
 - Section 2 – Team member responsibilities
 - Section 3 – Conclusions: Discuss the outcome of your design and any problems encountered and resolutions; what you learned by doing this project; and any experiences that were particularly good or bad.

Python Style

Follow style guide PEP0008 when writing and commenting
your code

<https://www.python.org/dev/peps/pep-0008/>

What You Turn In

All assignments must be submitted through Canvas, no later than the due date of Oct 23 2016 @ 23:55

Your assignment should be a single zip or tarball (i.e. tar.gz, tar.bz) which contains the following:

- All source code you wrote for this assignment
 - Python code running on mobile, Bt/Wifi bridge, and repository Rpi's
 - mobile.py
 - bridge.py
 - repository.py
- Report
 - PDF file

Assignment References

RabbitMQ Tutorials

- [RabbitMQ - RPC Tutorial](#)

Python Docs

- Pymongo

MongoDB

Zero Configuration

Academic Integrity

- For this assignment, it is expected that a team's work is their own.
- The code you turn in must be your own (i.e. you need to have written your assignment).
- You are allowed to copy and paste example code from other websites, but you must include a comment in your code that attributes the website you copied the code from (i.e. original author's name and URL to the original code).
- You can discuss the assignment with other teams.
- However, you cannot just tell another team the answer to a particular problem.

Final Thoughts

In many cases, engineers are expected to just make things work given a particular design constraint (e.g. software package to use or are limited to a particular hardware platform).

You will likely run into similar situations in this class while designing and implementing your assignments and project.

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When you're stuck, try searching online for a solution. Many times others have tried something similar and documented their experiences for others to learn and benefit from

Do not publically post answers to assignments, or example code until after the assignment due date.

Contact your instructor or GTA's as soon as you encounter a problem you're unable to solve.

Don't wait until right before the assignment is due.