Wireless Home Audio System

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Presentation Outline

- Project Planning & Organization
- Project Components
- System Integration
- Conclusion

2

Project Overview

- Why Bluetooth?
- Background information
- Expected Challenges

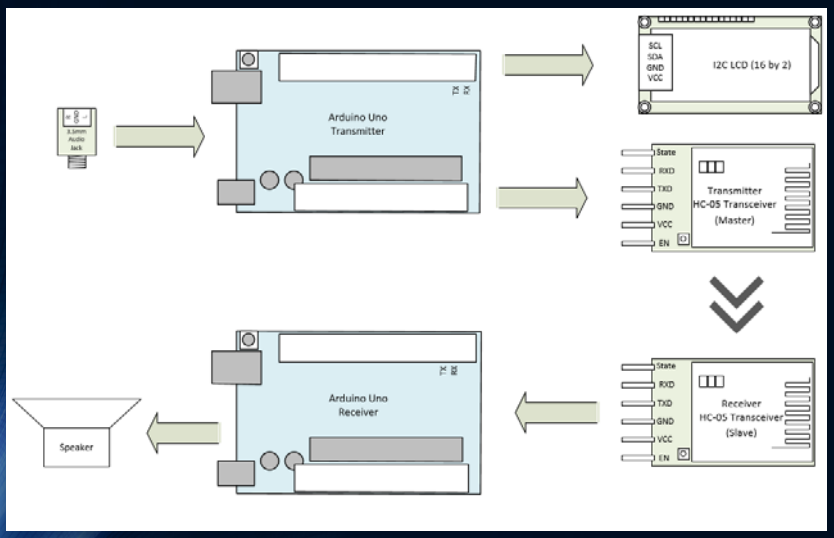
3

Project Criteria

- Shall Transmit over 5 feet
  →Tested
- Shall use 3.5mm Audio Input
  →Inspection
- Shall operate between 40-80˚F
  →Untestable
- Project Shall be under 5 pounds
  →Testable
- Project Should prioritize transmission to each other
  →Inspection
- Should be powered with wall outlet
  →Inspection

4

Overview



5

Schedule

Task	Duration	Start	End
Research	20 Days	8/21/17	9/15/17
Building prototype	27 Days	9/18/17	10/24/17
Troubleshooting	30 Days	10/25/17	12/5/17
Report writing	75 Days	8/28/17	12/8/17
Presentation	75 Days	8/28/17	12/8/17

6

Cost / Resource Management

Item	Quantity	Cost Each	Total Cost	Comments
Microcontrollers	2	$20.00	$40.00	Arduino Uno R3
Bluetooth components	2	$10.00	$20.00	HC-05 Modules
Wires/Misc. components	Many	Already Owned	$0	Capacitors, potentiometers resistors
Accessory's	na	na	$50.00	
		Total	**$110.00**	**Plus back up parts = $140.00**

7

Arduino Uno R3

Parts Used

- Widely Used
- Uses C/C++ to program
- Relatively inexpensive
- Has multiple power pins

8

HC-05 Bluetooth Transceivers

Parts Used

- Uses Integrated AT commands
- Options for high baud rates
- Low Power Device
- Only requires minimal extra hardware

9

I2C - 16x2 - LCD

Parts Used

- Only Requires 2 Bus lines, 4 pins total
- Backlit

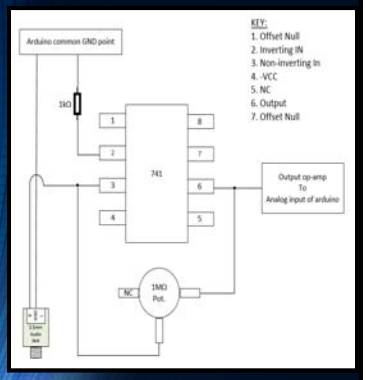
10

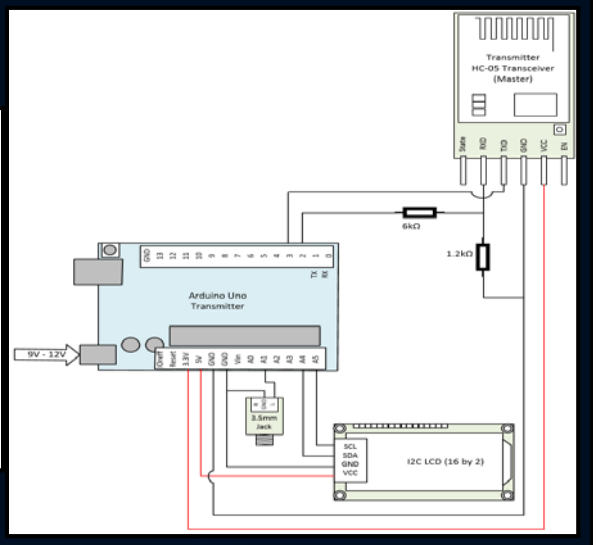
Architecture and Protocol

- Link Layer Protocol
- Link Control Protocol
- Service delivery protocol
- Audio Video Distribution protocol
- Low Energy Attribute Protocol

11

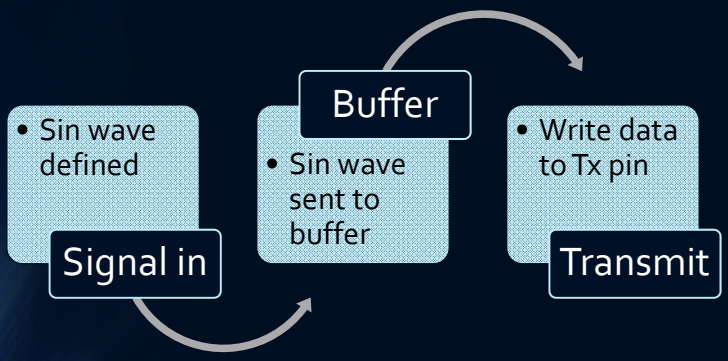
Transmitter Circuit





12

Transmitter Software Architecture



13

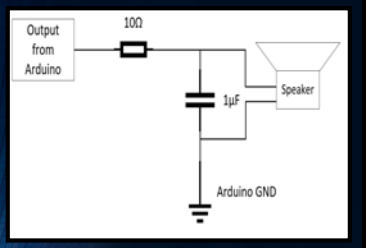
Transmitter Code

```
#include <SoftwareSerial.h>

SoftwareSerial BTSerial(10,11);

void setup()
{
  pinMode(A0, INPUT);
  pinMode(5,OUTPUT);
  //digitalWrite(9, HIGH);
  Serial.begin(230400);
  BTSerial.begin(230400);
}
```

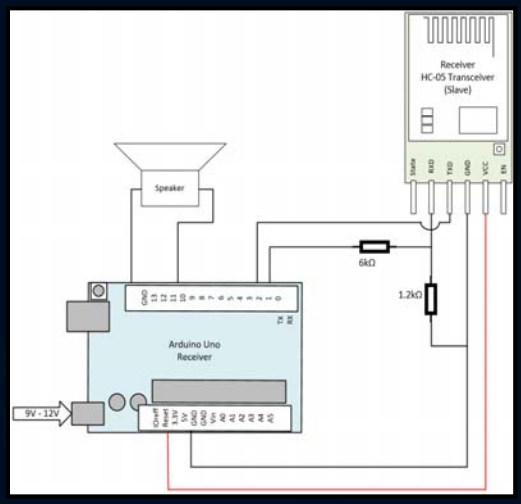
```
int Signal;
float t = 0;
int Buffer1, Buffer2;
float f=1000.0;

void loop()
{
 //Buffer1 = analogRead(A0);
 //Buffer1 += 500;

 Buffer1 = 50 * sin(2.0*3.14159*f*t) + 50;
 t += 0.00005;
 delayMicroseconds(10);

 BTSerial.write(Buffer1);
 delayMicroseconds(10);
 Serial.println(Buffer1);
 delayMicroseconds(10);
 analogWrite(5,Buffer1);
 delayMicroseconds(10);
}
```

14

Receiver Circuit

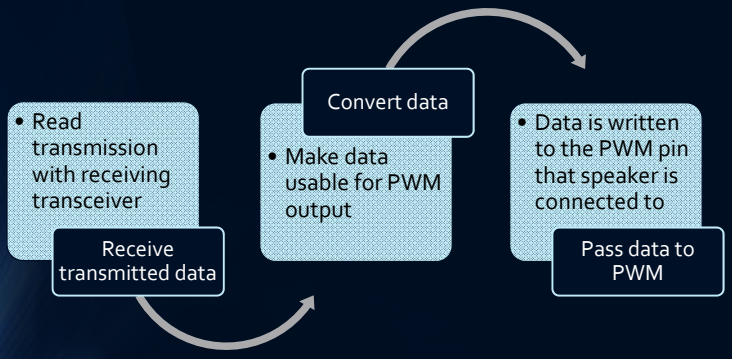


Filter Cutoff frequency = 15.9kHz



15

Receiver Software Architecture



16

Receiver Code

```
#include <SoftwareSerial.h>

SoftwareSerial BTSerial(10,11);

void setup()
{
  pinMode(5, OUTPUT);
  //digitalWrite(9, HIGH);
  Serial.begin(230400);
  BTSerial.begin(230400);
}
```

```
int Signal, k;
int M = 10;
int X[10]={0, 0, 0, 0, 0, 0, 0, 0, 0, 0}; //,0,0,0,0,0};

void loop()
{
 Signal = BTSerial.read();
 delayMicroseconds(2);


 for (k = 0; k < M; k++)
     Signal = Signal + X[k];

 for (k = M; k >0 ; k--)
    X[k] = X[k-1];

 Signal = Signal / (M + 1);
 X[0] = Signal;



 Serial.println(Signal);
 delayMicroseconds(2);
 analogWrite(5, Signal);
 delayMicroseconds(2);
}
```

17

SoftwareSerial

```
#ifndef SoftwareSerial_h
#define SoftwareSerial_h

#include <inttypes.h>
#include <Stream.h>

/******************************************************************************
* Definitions
******************************************************************************/

#ifndef _SS_MAX_RX_BUFF
#define _SS_MAX_RX_BUFF 64 // RX buffer size
#endif

#ifndef GCC_VERSION
#define GCC_VERSION (__GNUC__ * 10000 + __GNUC_MINOR__ * 100 + __GNUC_PATCHLEVEL__)
#endif
```

18

Lessons learned

- Project Scope
- Parts selected
- Scheduling

19

Questions

20