

A fast and secure wireless network paradigm using VLC

### **Current wireless standards**

Pros:

Convenience

Accessibility

Cons:

Speed

Interference



# **Visual Light Communication**

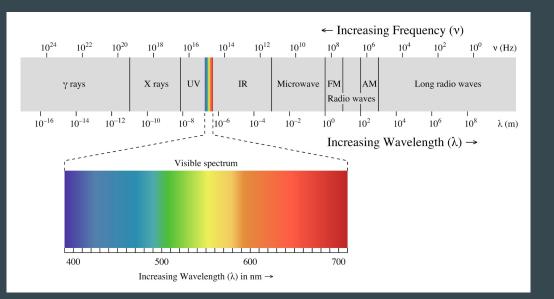
Security

Speed

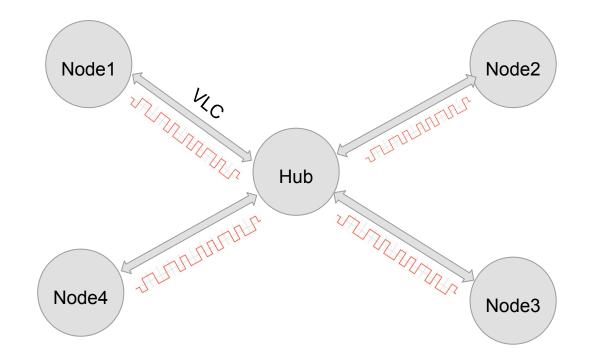
Bandwidth

Range

Special use cases



## Our project



# Technology used

We plan to set up a star-network topology with 4 nodes connected to a central hub

Each node consists of an FPGA with an LED transmitter and a photodiode receiver

The nodes will be connected to IO devices (monitors, keyboards, laptops, etc.) to show the working of the network.

#### **Proposed demo**

Set up a multiplayer game (Bomberman) where 4 players can play with each other from separate nodes

Transfer a large file multiple times between different nodes in the network and provide statistics on the data transfer rates

Aim to obtain a data transfer rate of approximately 100 Mbps

#### Verification and Metrics

Multiplayer game

- full-duplex communication between multiple nodes concurrently
- correctness (no loss of data between nodes)

File Transfer Test

• speed

# Testing

- Creation of test benches for unit testing
  - One way comms between node and hub
  - One way comms between hub and node
  - $\circ$   $\;$  Two way comms between hub and node
  - Multi-way comms between hub and nodes
  - Speed tests
- Test working of game
- Test correctness and speed of file transfer

## Task list

- Identify photodiodes and LEDs that can be used
- Test basic circuit using arduino and check to see if bits are properly sent and received
- Research TDMA and CDMA (time division multiple access and Channel division multiple access) methods
- Research protocols for error correction and to avoid data loss
- Design and implement single node to hub duplex comms. protocol
- Perform correctness tests by sending packets back and forth and measuring data loss

# Task list (contd.)

- Tweak protocols and implementation as necessary to achieve speed goals
- Design and implement multi access methods to connect all nodes to hubs
- Perform correctness and speed test
- Implement multiplayer game on network
- Perform tests to ensure game works
- Implement performance test UI to show speed of network

# **Initial Gantt chart**

A	A	В	J K L M N O P Q R S T U V W X Y Z AAAEACALAEAFACAFAIAJAKALANANACAFACAFASATALAVAVAXAYAZBABEBCBLBEBFBCBFBIBJBKBLBNB
	Skv	i Initial Design Plan	
23	[Com	any Name]	
4		Project Start Date 24/2019 (Monday)	Week 1 Week 2 Week 3 Week 4 Week 5 Week 6 Week 7 Week 8
5		Project Lead	4 Feb 2019 11 Feb 2019 18 Feb 2019 25 Feb 2019 4 Mar 2019 11 Mar 2019 18 Mar 2019 25 Mar 2019
6	100		4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 1 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
	WBS	TACK	M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S
7	WBS		M I W I F 3 3 M I W I F 3 5 M
8		Bhuvan	
9		Research protocols for error correction and to avoid data loss	
10		Design single node to hub duplex comms. protocol	
11		Implement single node to hub duplex comms. protocol	
2		Design and Implement TDMA/CDMA	
13		Implement multiplayer game on hub and slave nodes	
13 14 22 23		Testing	
22		Dhruva	
		Identify photodiodes and LEDs that can be used	
24 25 26		Build and test basic circuit using arduino and check to see if bits are properly sent and received	
25		Perform correctness tests by sending packets back and forth and measuring data loss	
26		Perform speed tests by sending packets back and forth	
27		Implement multiplayer game on hub and slave nodes	
28		Final Presentation	
28 29 36		Testing	
86		Raziq	
87		Research TDMA and CDMA (time division multiple access and Channel division multiple access) methods	
38		Design multi access methods	
89		Implement multi access methods	
10		Connect all nodes to hubs	
11		Implement performance test UI to show speed of network	
12		Design Presentation	
13		Testing	

# **Anticipated challenges**

Loss of data during transmission

Interference when transmitting and receiving from multiple LEDs

Researching/designing and implementing the necessary protocols for communication

# Questions?

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