

Wireless Camera Node Network (WCNN)

CDR Presentation: March 11, 2015

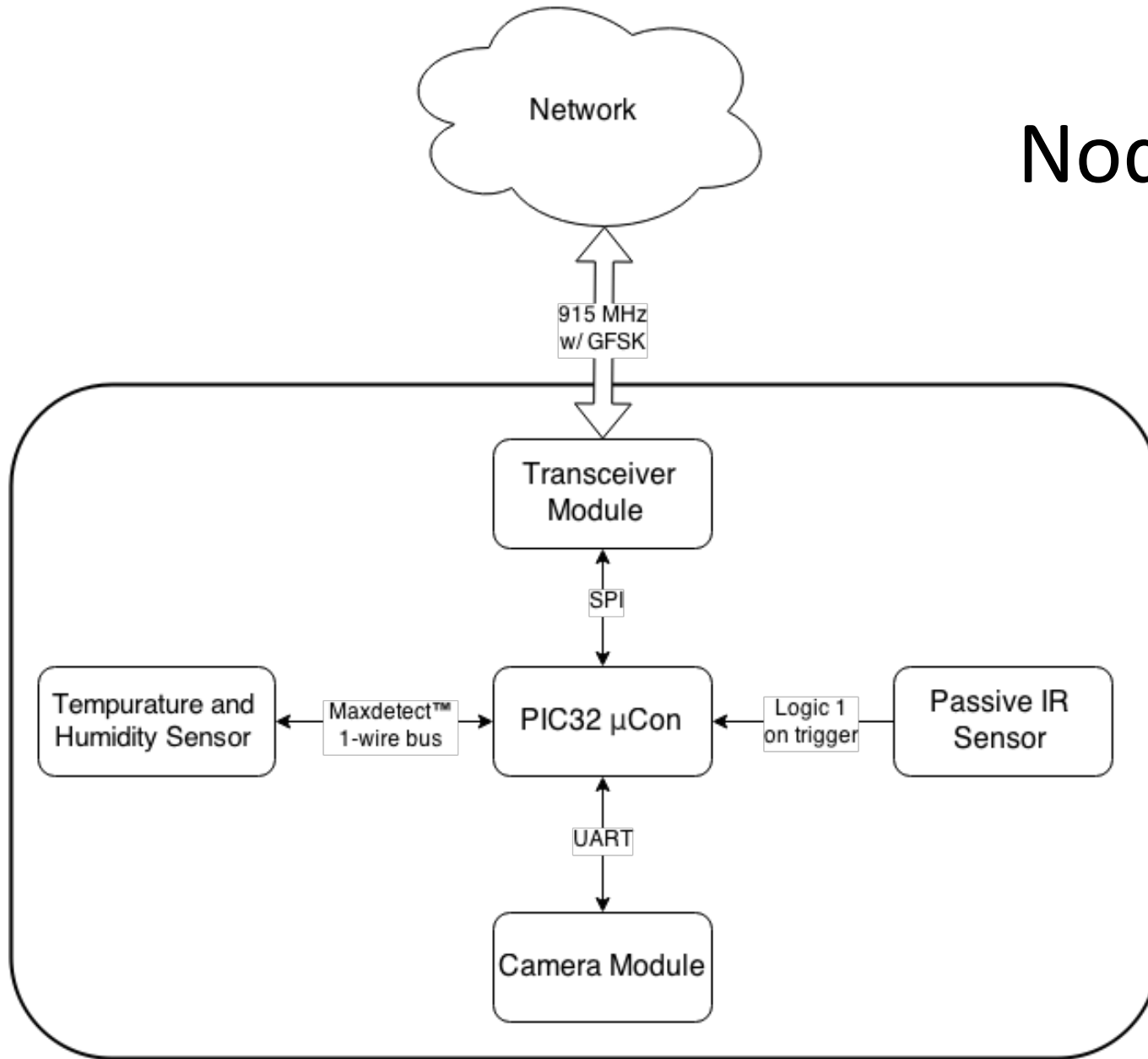
Team 6:

Alan Boguslawski

Andrew Flewellen-Gore

Ping Fung

Node Block Diagram

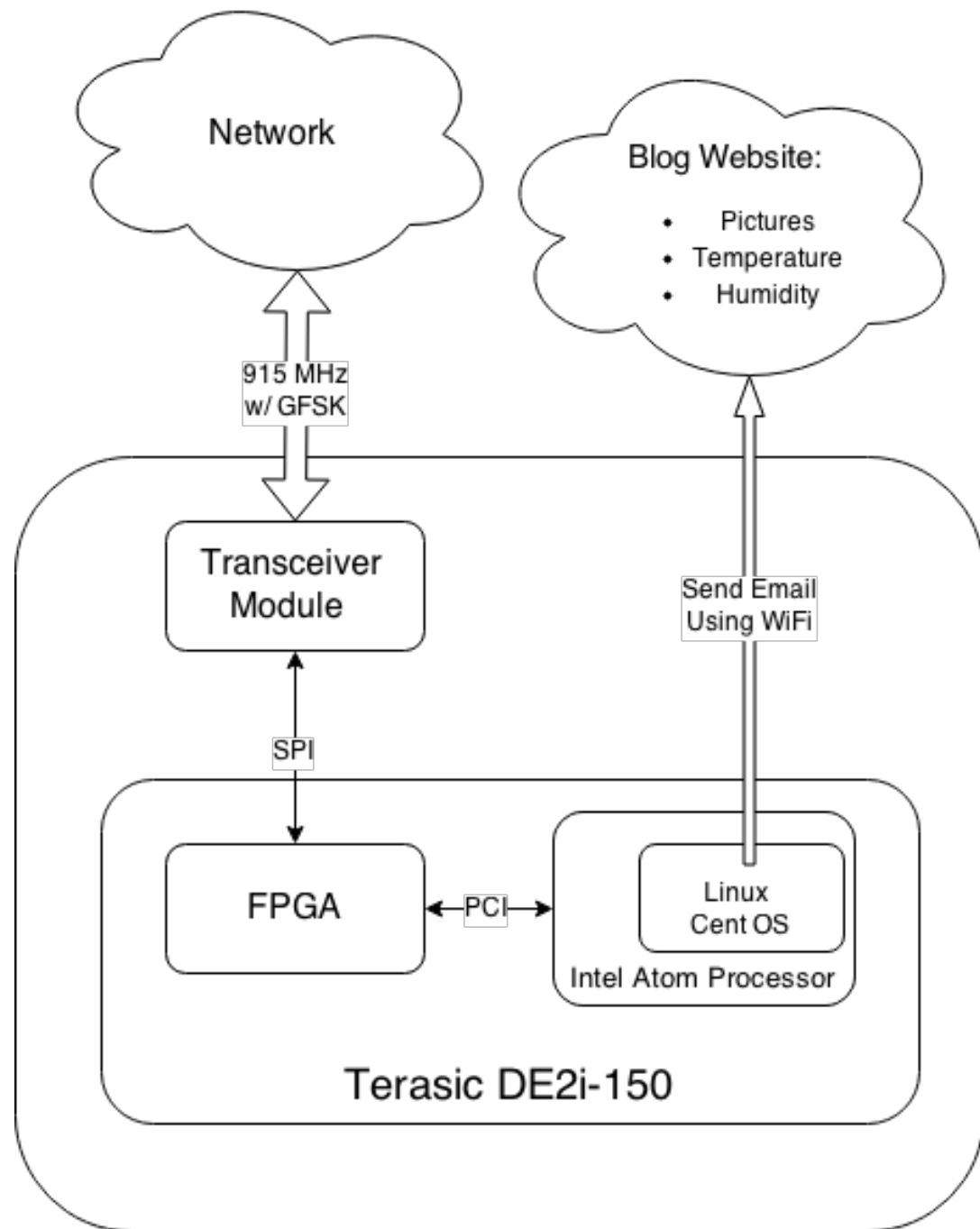


Node Functions:

- Take pictures and collect sensor data
- Send data to server
- Forward data from other nodes to the server

Node Details

- Each node has an 8-bit address. (address 0 is reserved for the server.)
- Each node has a parent node and a list of children nodes.
- When the PIR sensor detects motion, an interrupt will be generated to take a picture and read sensor data.
- When prompted for data by its parent node, the node will send data to its parent node.
- The node will also ask its children for data and propagate that data to the server.



Server Block Diagram

Server Functions:

- Determine which nodes have pictures
- Retrieve pictures and sensor data from nodes
- Upload data to a website blog

Next, we will explain these functions will in greater detail

Server Details

- The Terasic DE2i-150 development board consists of an Intel Atom processor and an Altera Cyclone IV FPGA.
- The FPGA contains a NIOS II soft processor, which runs a program to control the network.
- A transceiver module is connected to the FPGA to enable communication with nodes.
- When the server receives data from a node, data is sent to the Atom via PCIe.
- The Atom runs a program to post data to a website by sending an email.

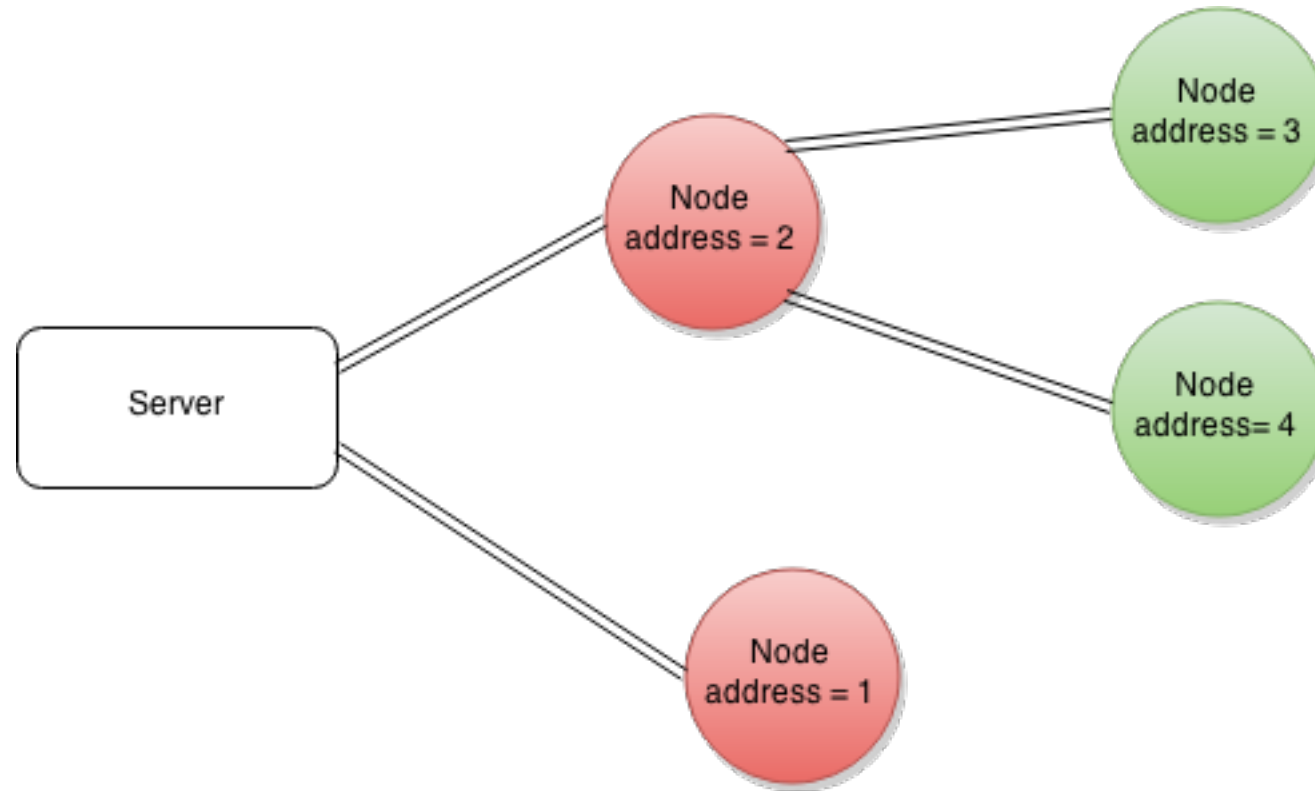
Finding and Pulling Pictures from the Network(1)

Example Network configuration

Parent/Child relationships are hard-coded right now

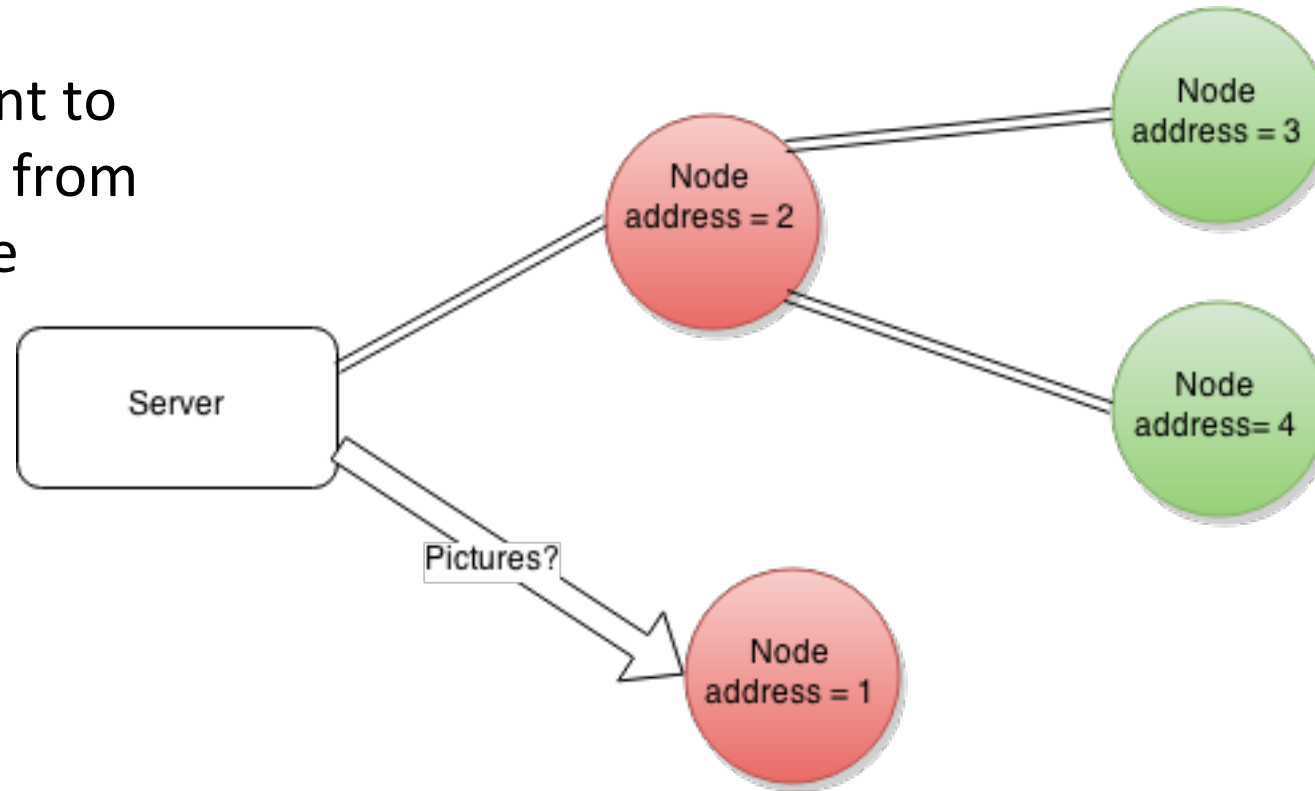
Nodes in green have stored pictures.

Nodes in red have no pictures

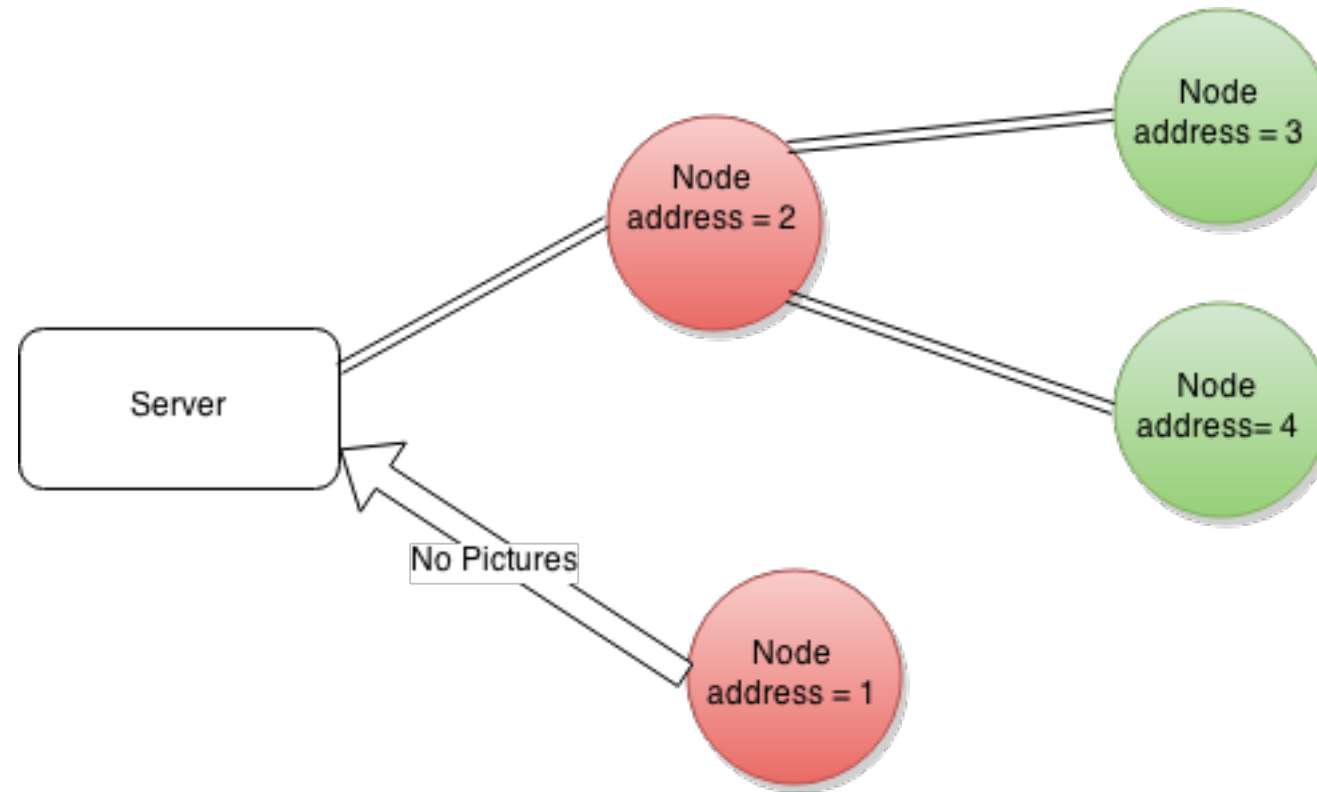


Finding and Pulling Pictures from the Network(2)

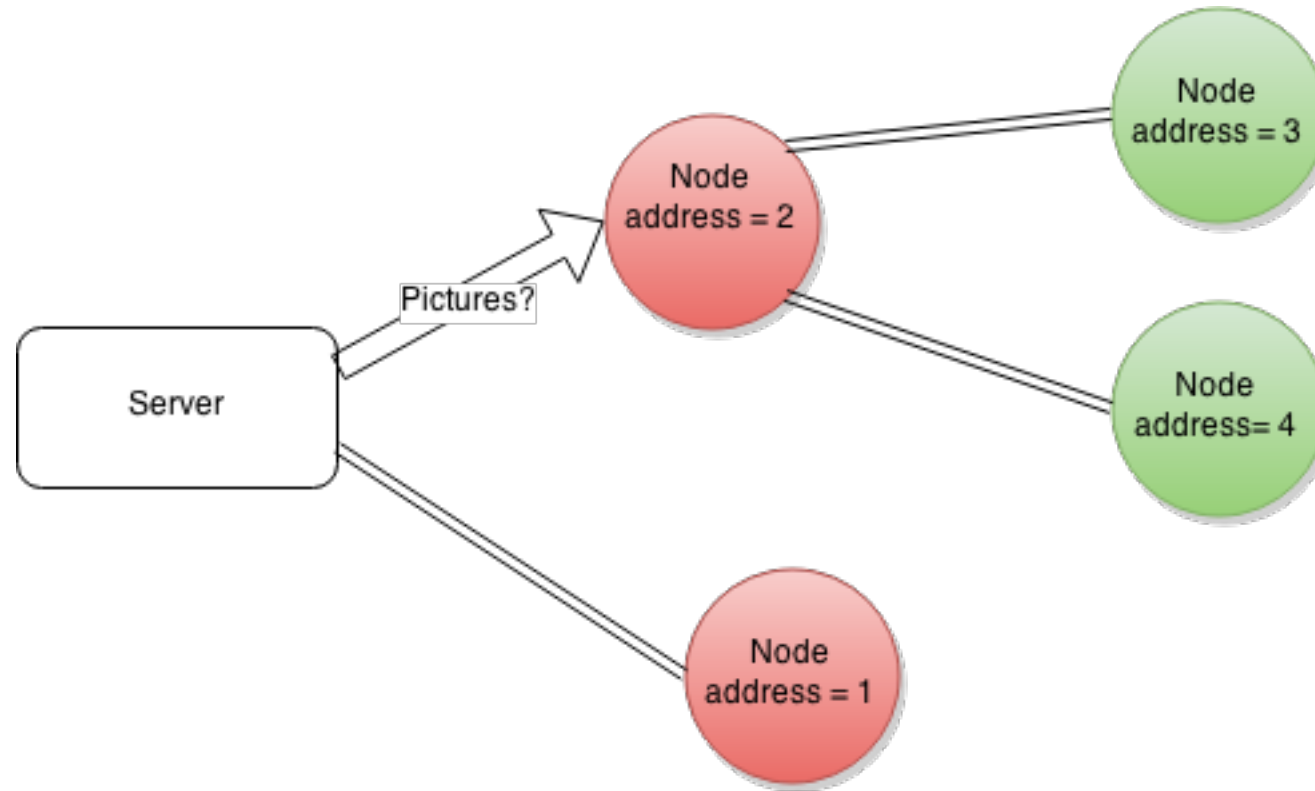
Suppose we want to get the pictures from the nodes to the website



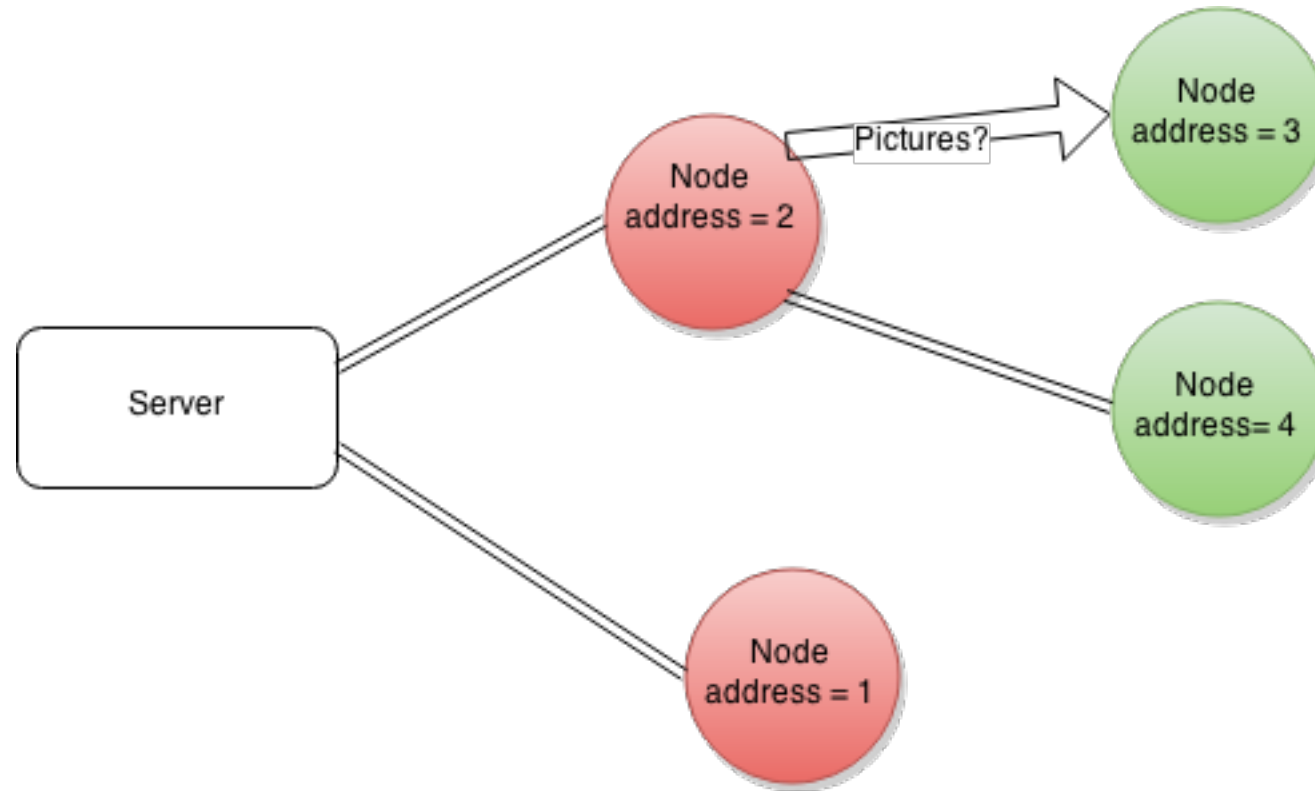
Finding and Pulling Pictures from the Network(3)



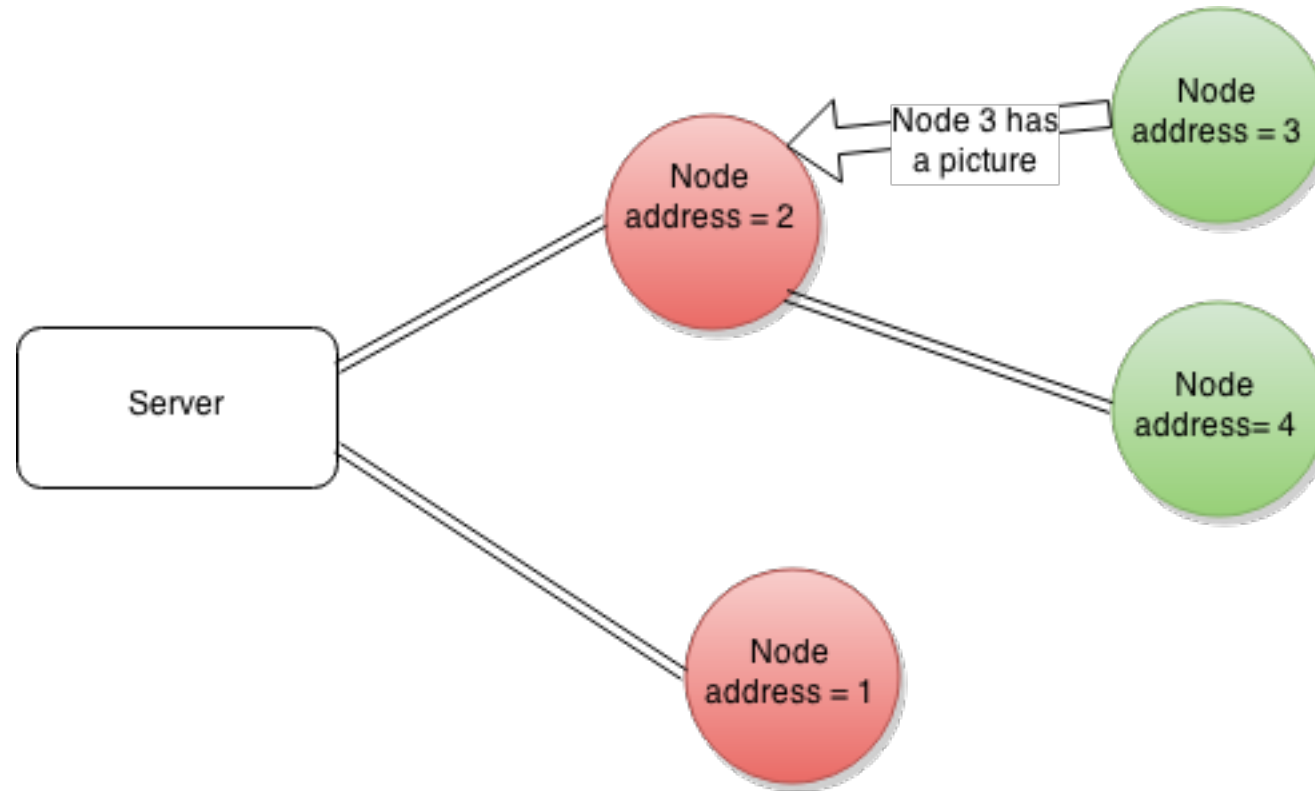
Finding and Pulling Pictures from the Network(4)



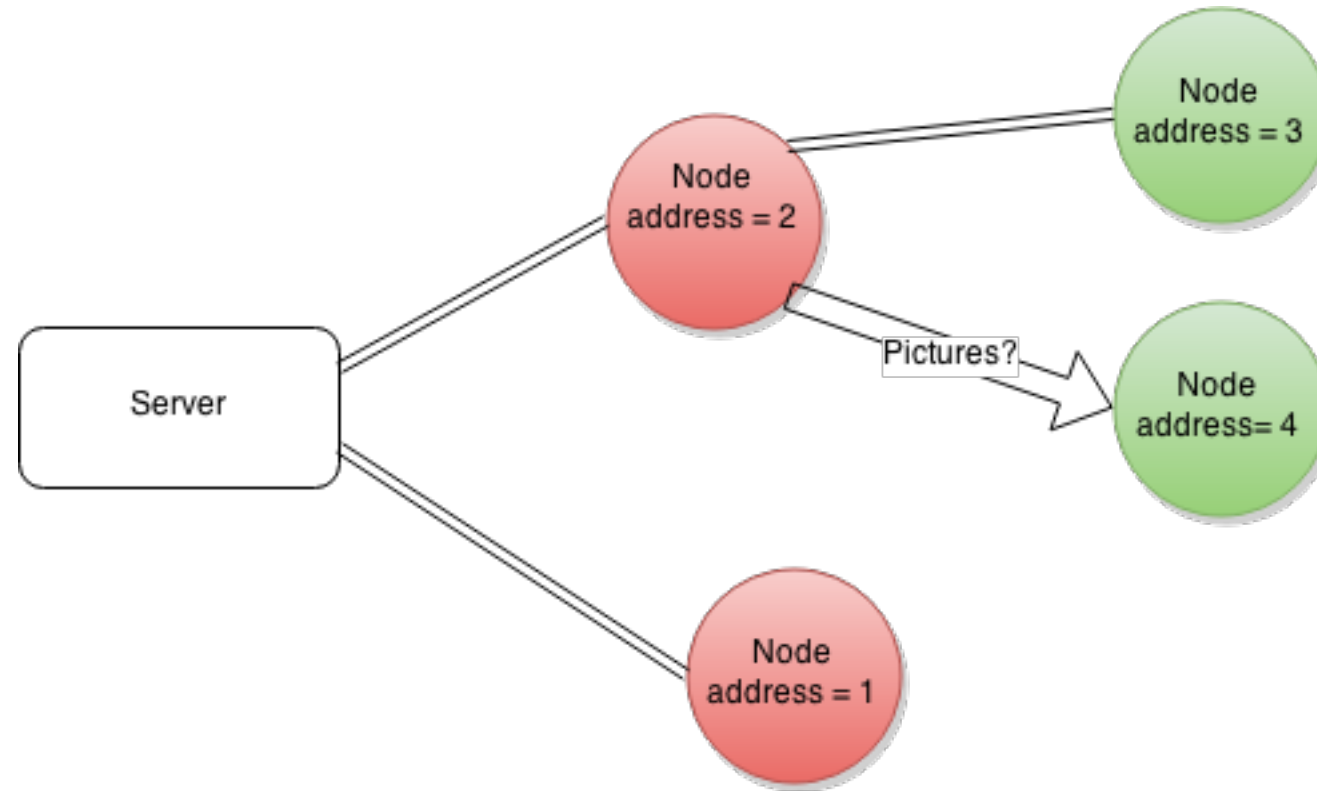
Finding and Pulling Pictures from the Network(5)



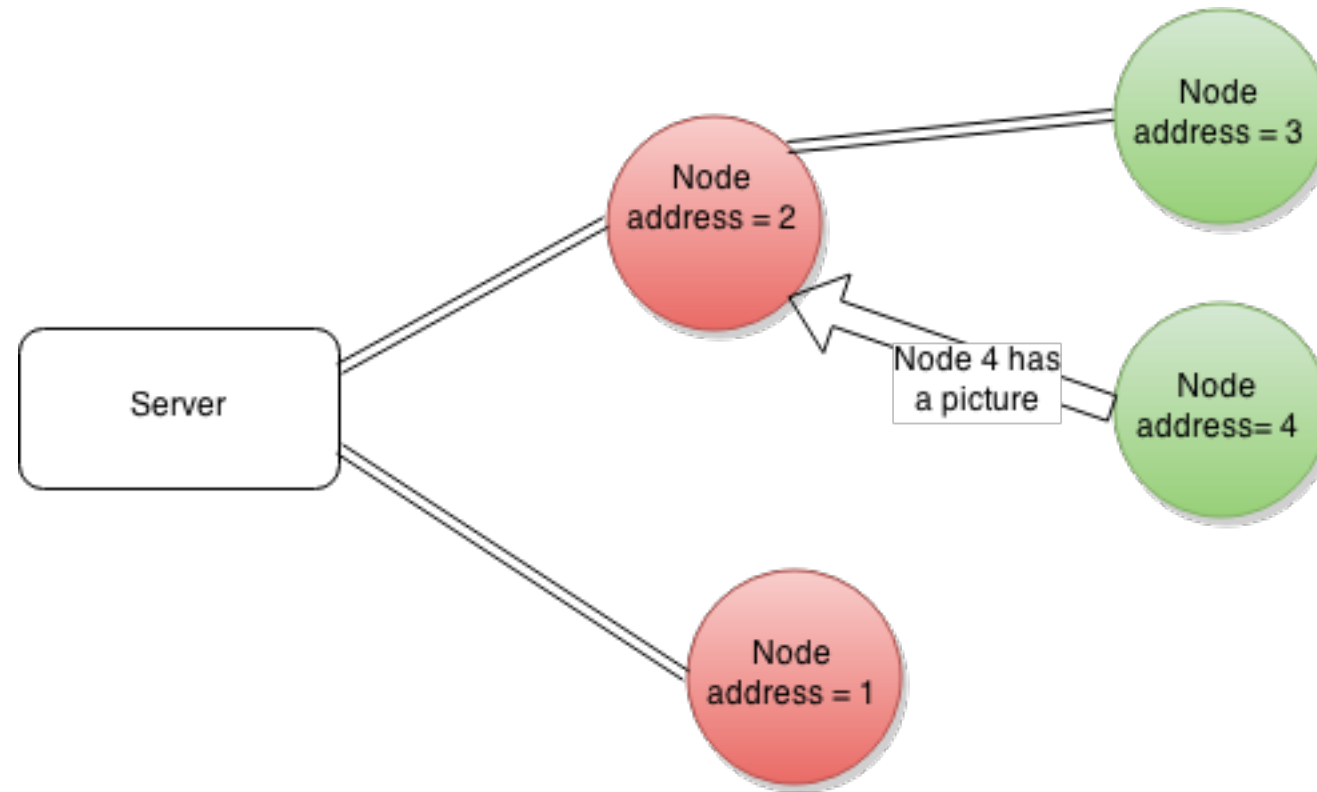
Finding and Pulling Pictures from the Network(6)



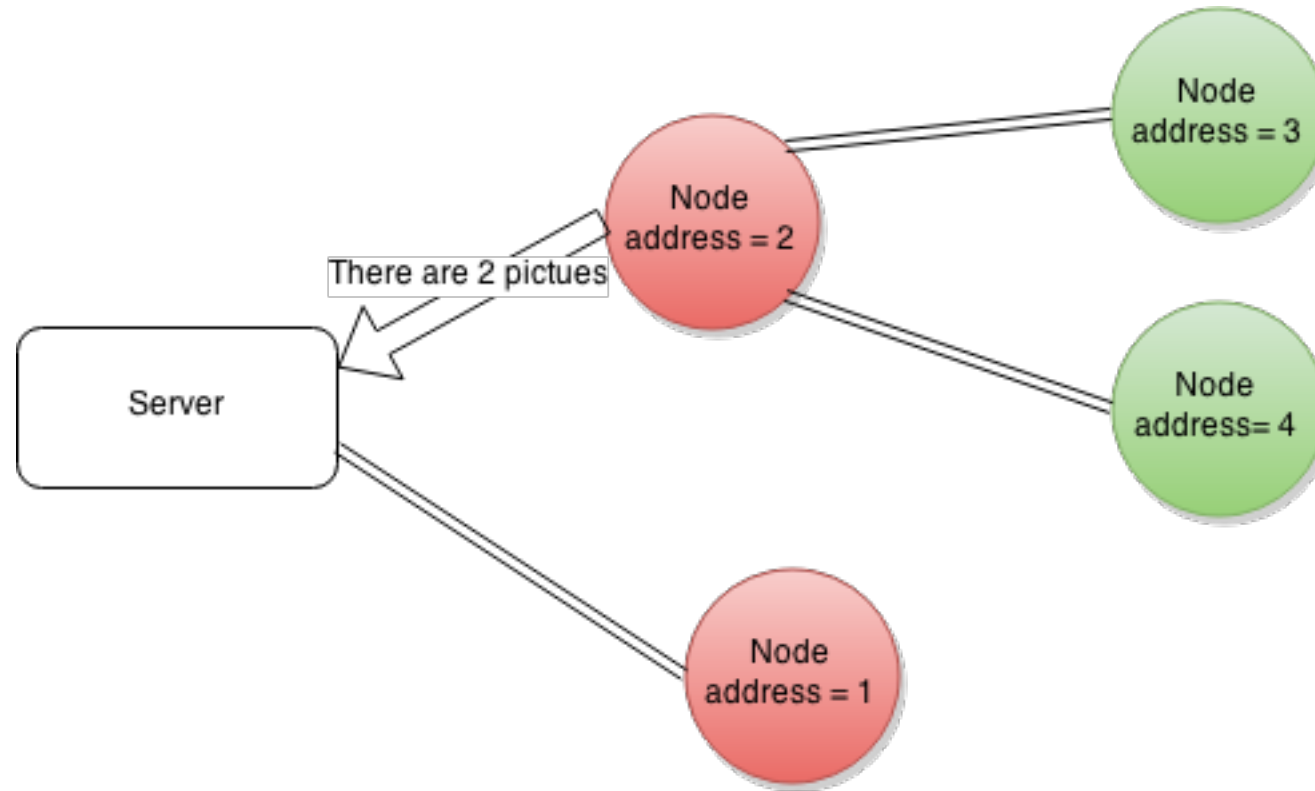
Finding and Pulling Pictures from the Network(8)



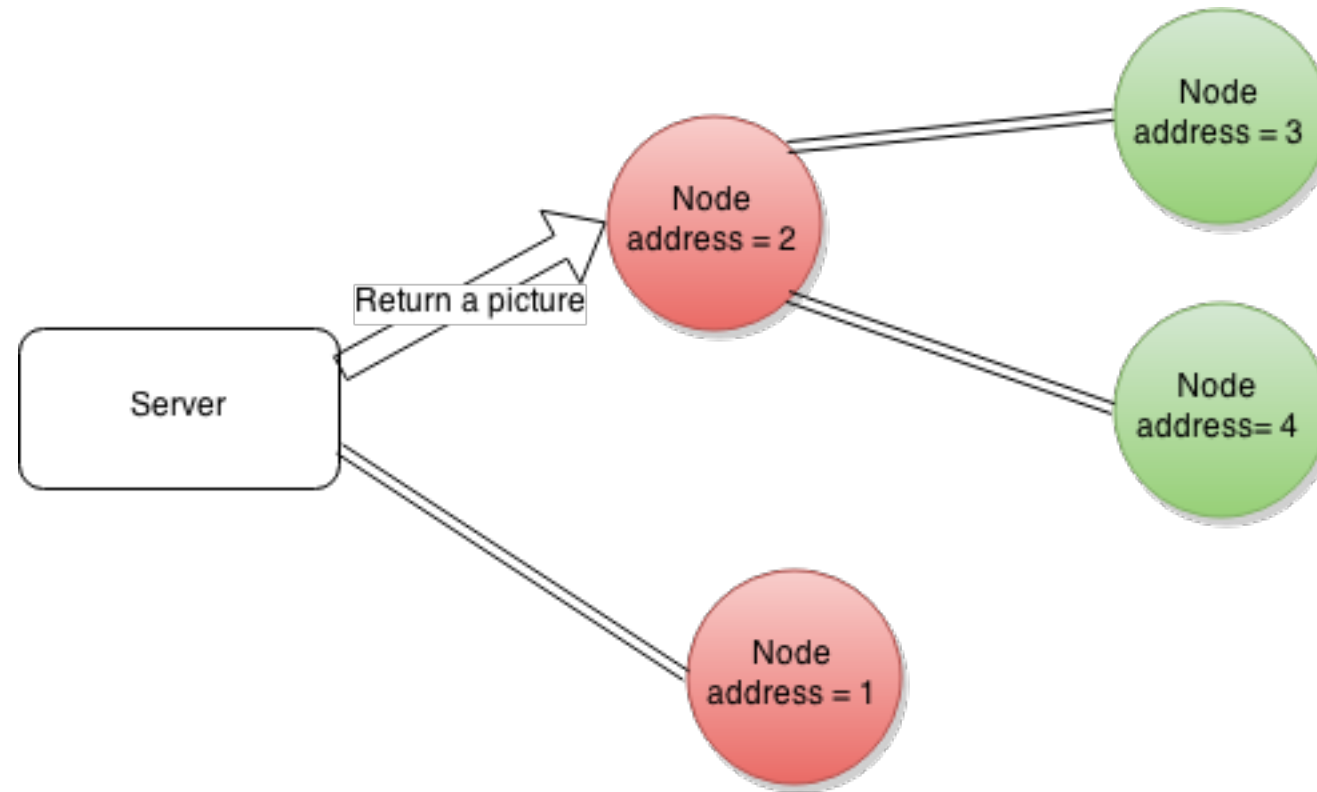
Finding and Pulling Pictures from the Network(9)



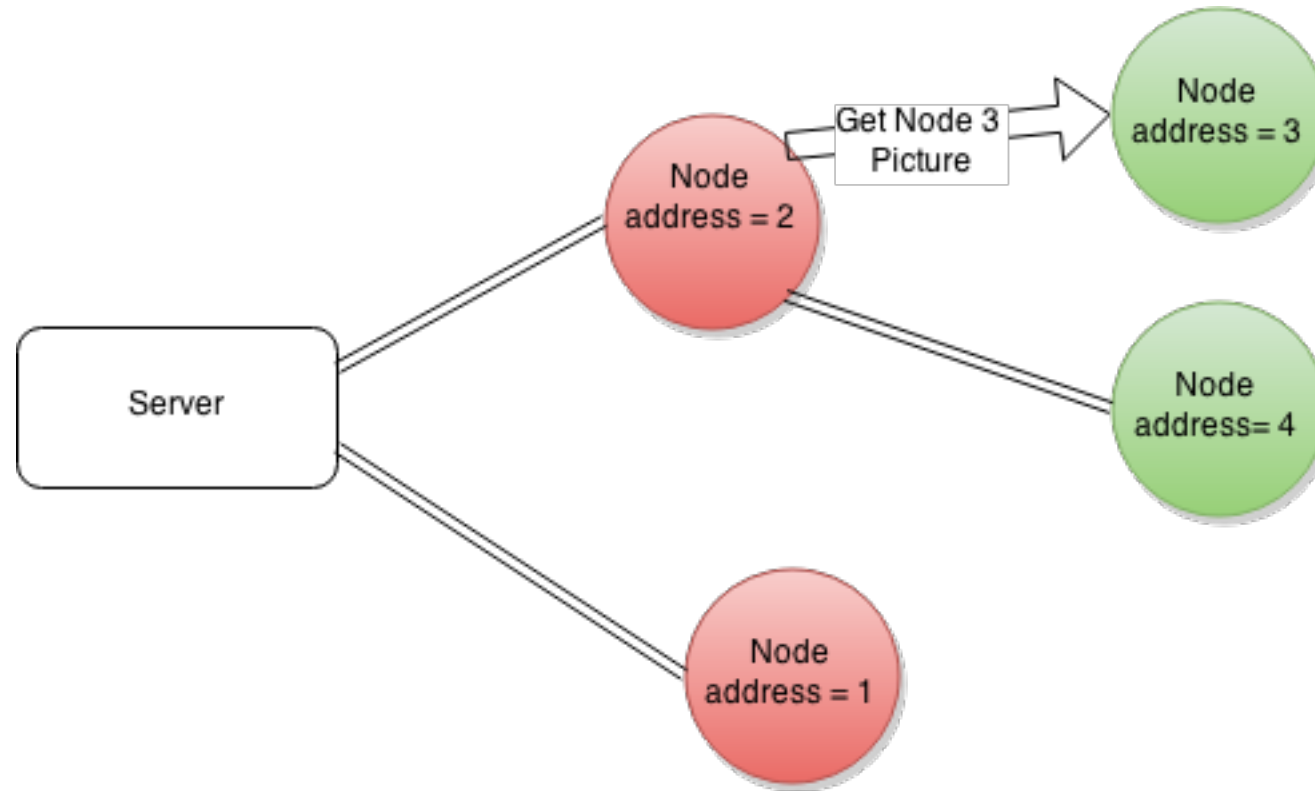
Finding and Pulling Pictures from the Network(10)



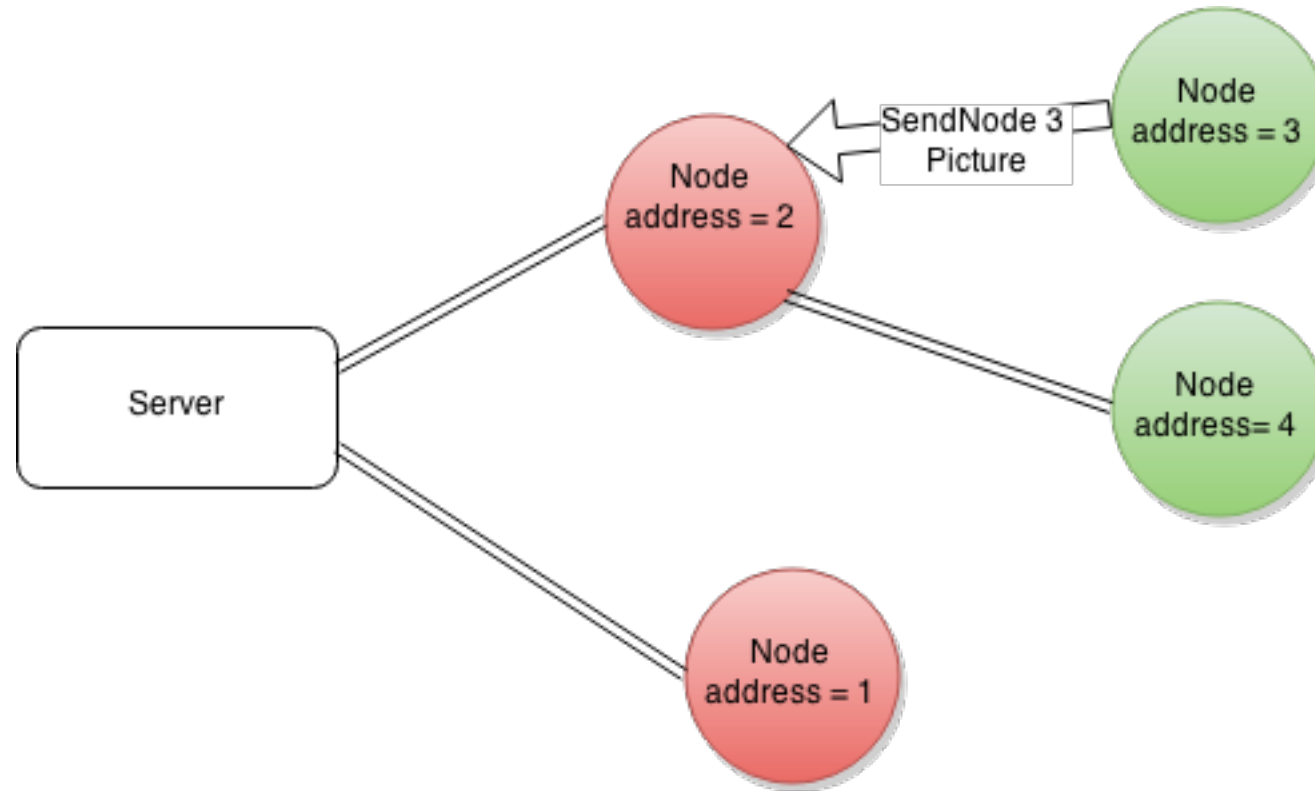
Finding and Pulling Pictures from the Network(11)



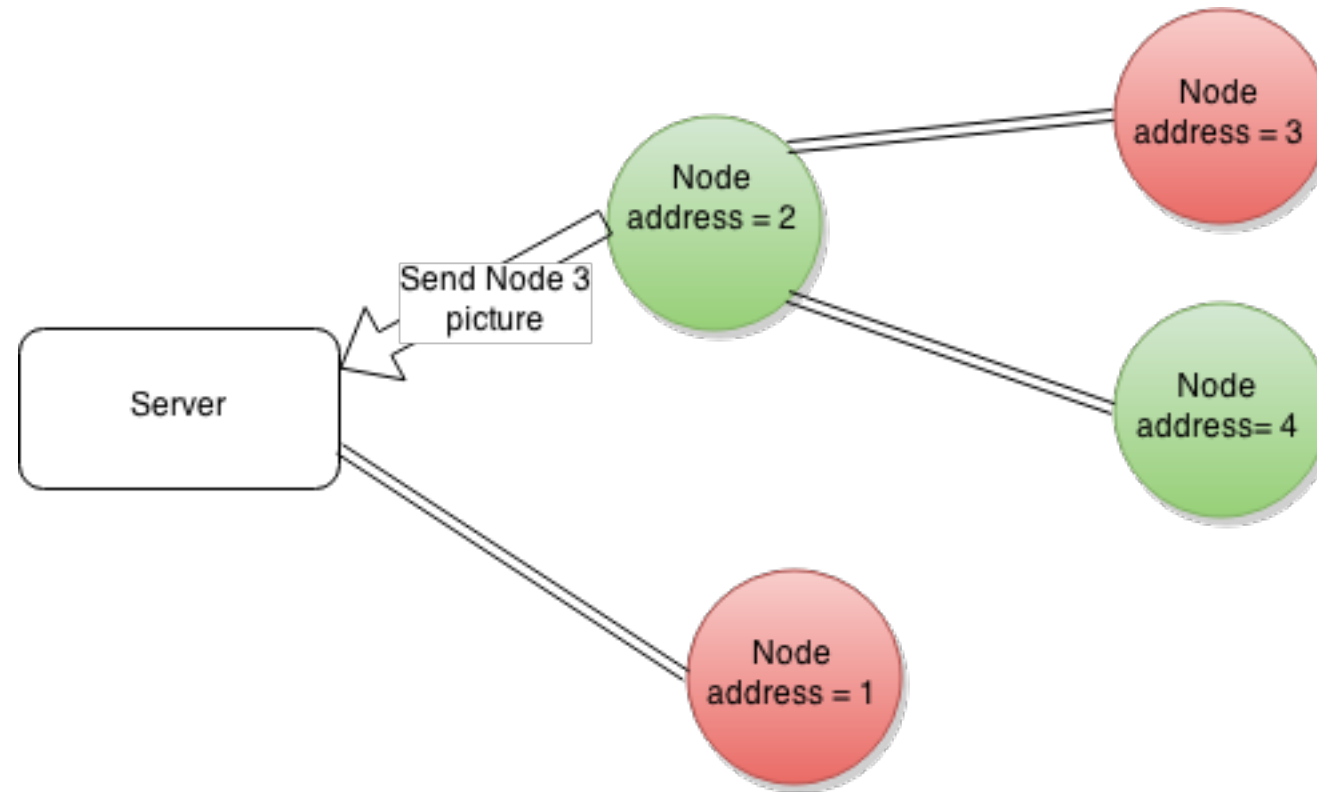
Finding and Pulling Pictures from the Network(12)



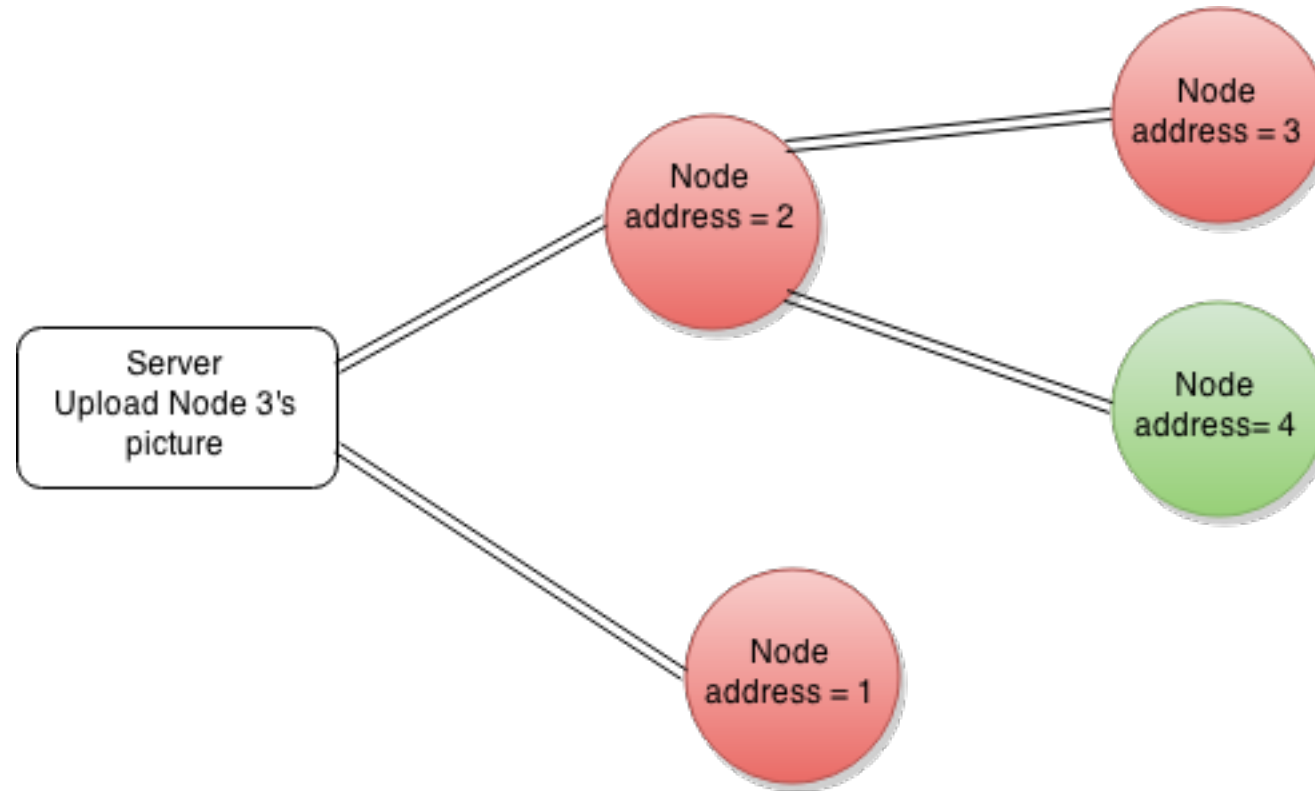
Finding and Pulling Pictures from the Network(13)



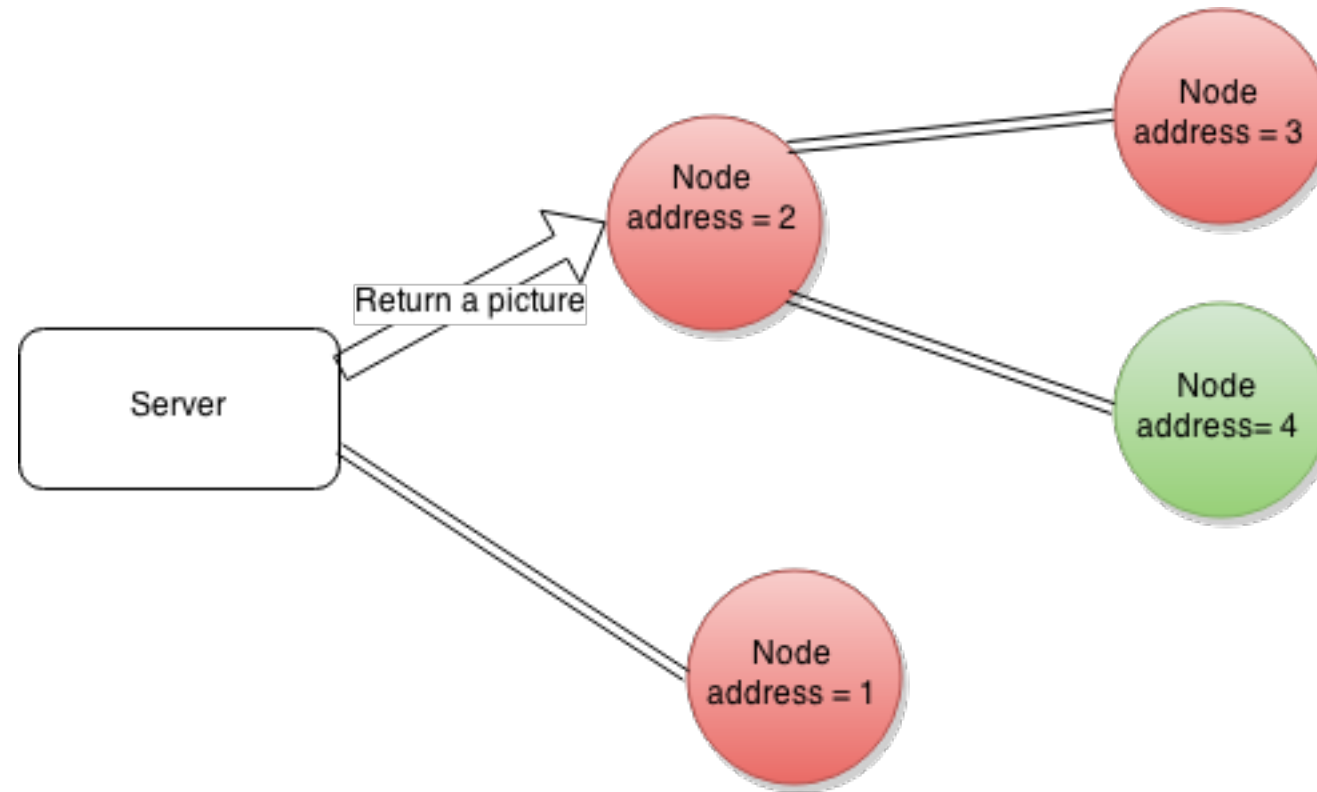
Finding and Pulling Pictures from the Network(14)



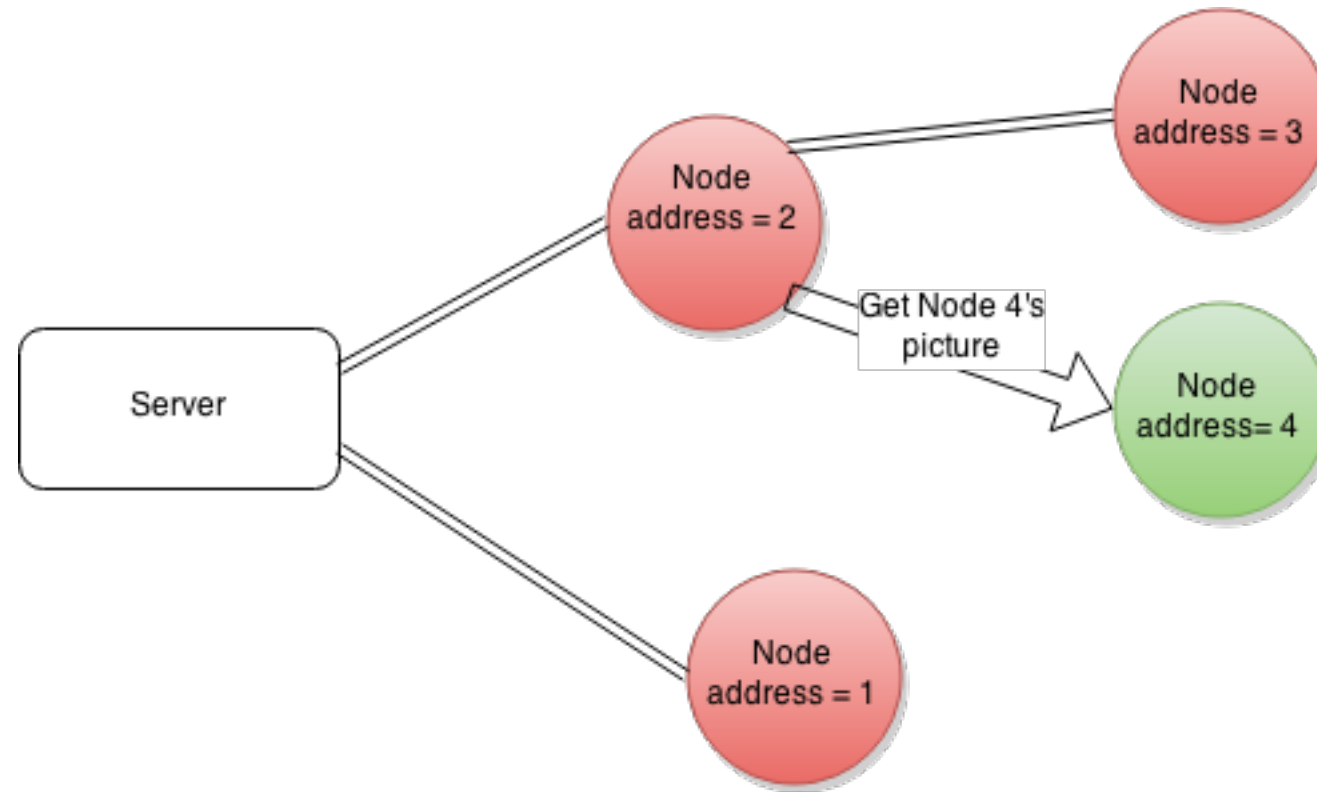
Finding and Pulling Pictures from the Network(15)



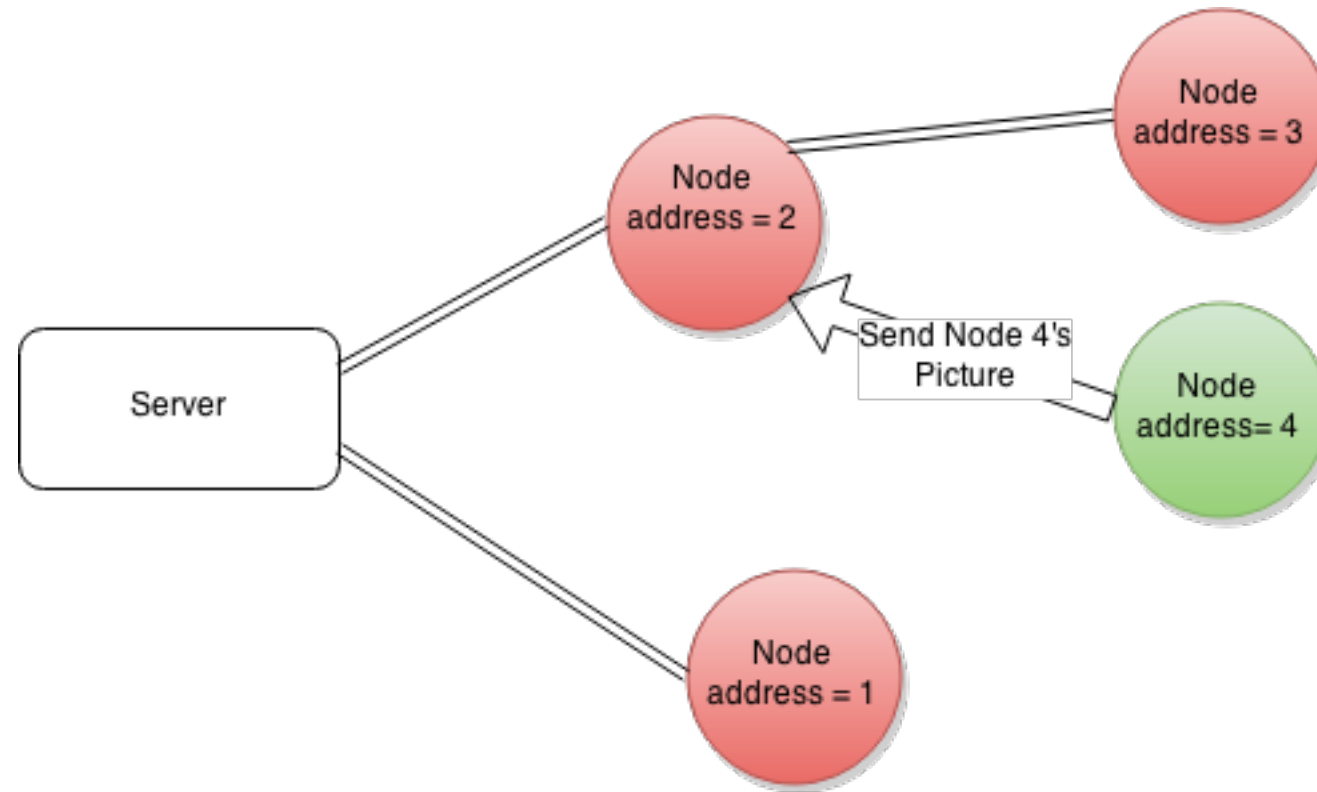
Finding and Pulling Pictures from the Network(16)



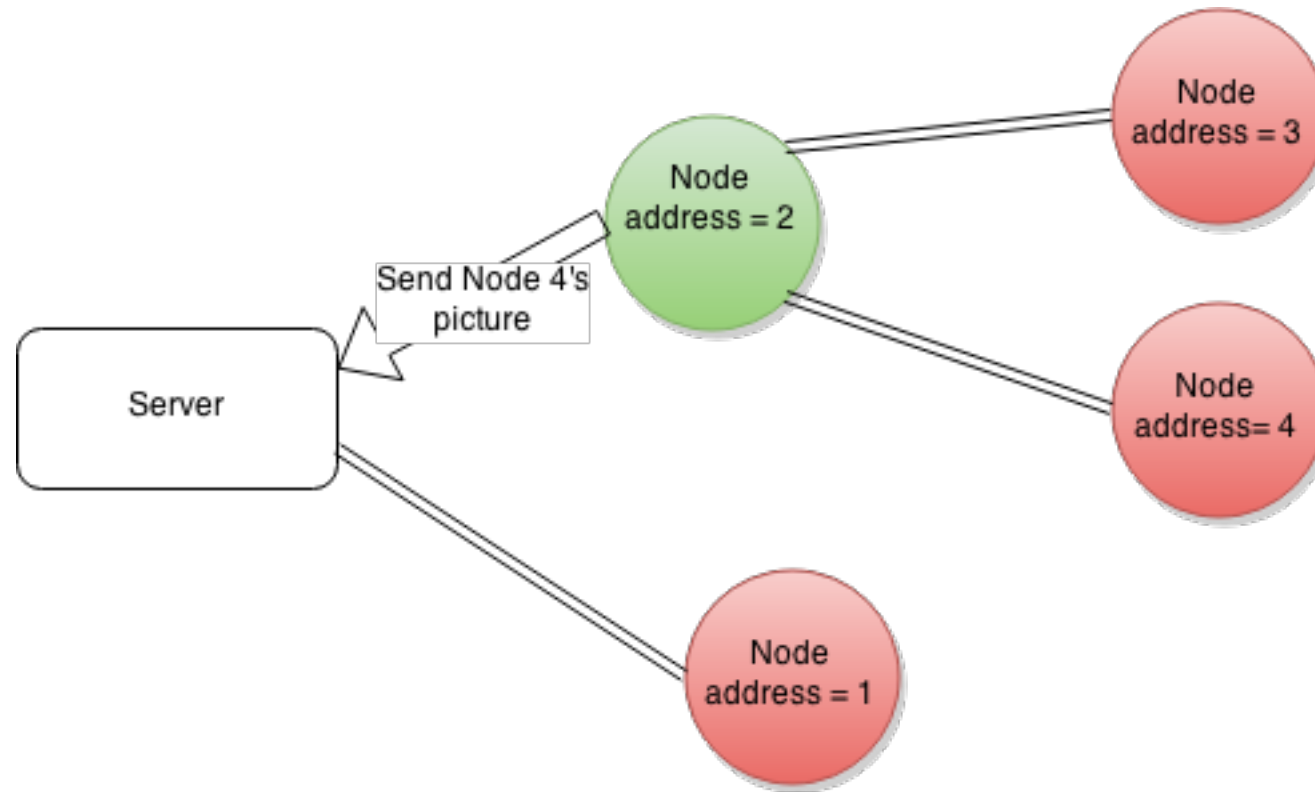
Finding and Pulling Pictures from the Network(17)



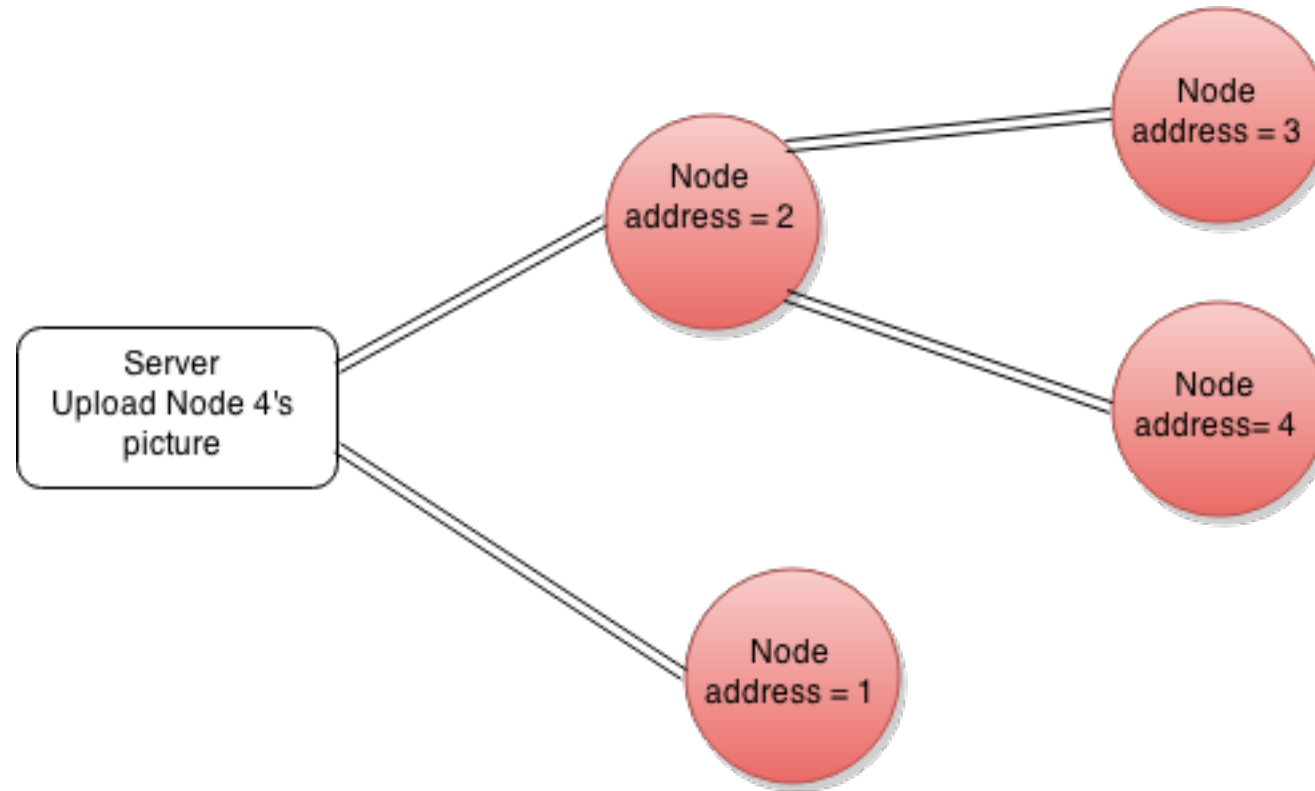
Finding and Pulling Pictures from the Network(18)



Finding and Pulling Pictures from the Network(19)



Finding and Pulling Pictures from the Network(20)



Determining Which Nodes Have Pictures (16)

Areas for improvement in this function:

- If one link is impeded the function might not work. We will add timeouts and error checking.
- Parent/Child functions are hard coded. We will add functionality to make the network easily expandable.

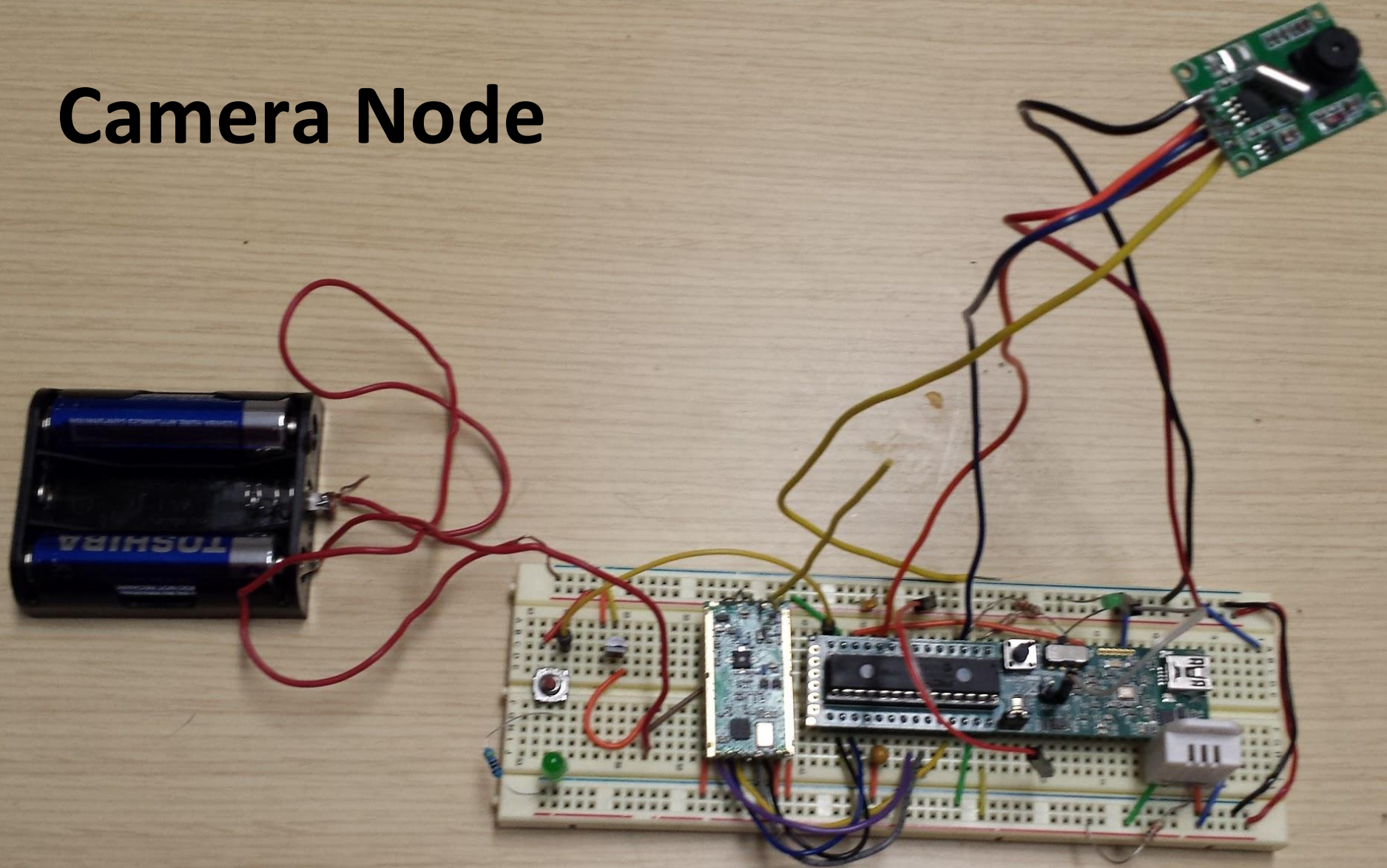
Upcoming Tasks

- Add more functionality to network (Ping and Alan)
 - Make it expandable
 - Account for possible packet loss
- PCB design & enclosures (Andrew)
- Optimize power consumption (all)
 - Put devices in sleep mode and wake them up when necessary
- Test Performance (all)
 - Find average power consumption
 - Find usable ranges over different terrains
 - Test/calibrate picture triggering with different sized IR-emitting objects

Demo (We are setting up now)

The next slides will explain the demo step by step

Camera Node



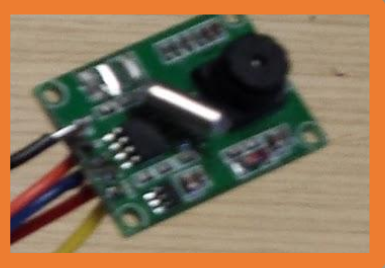
Power Supply



PIC32 on a programmer



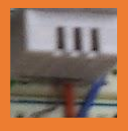
Camera Module



Transceiver Module



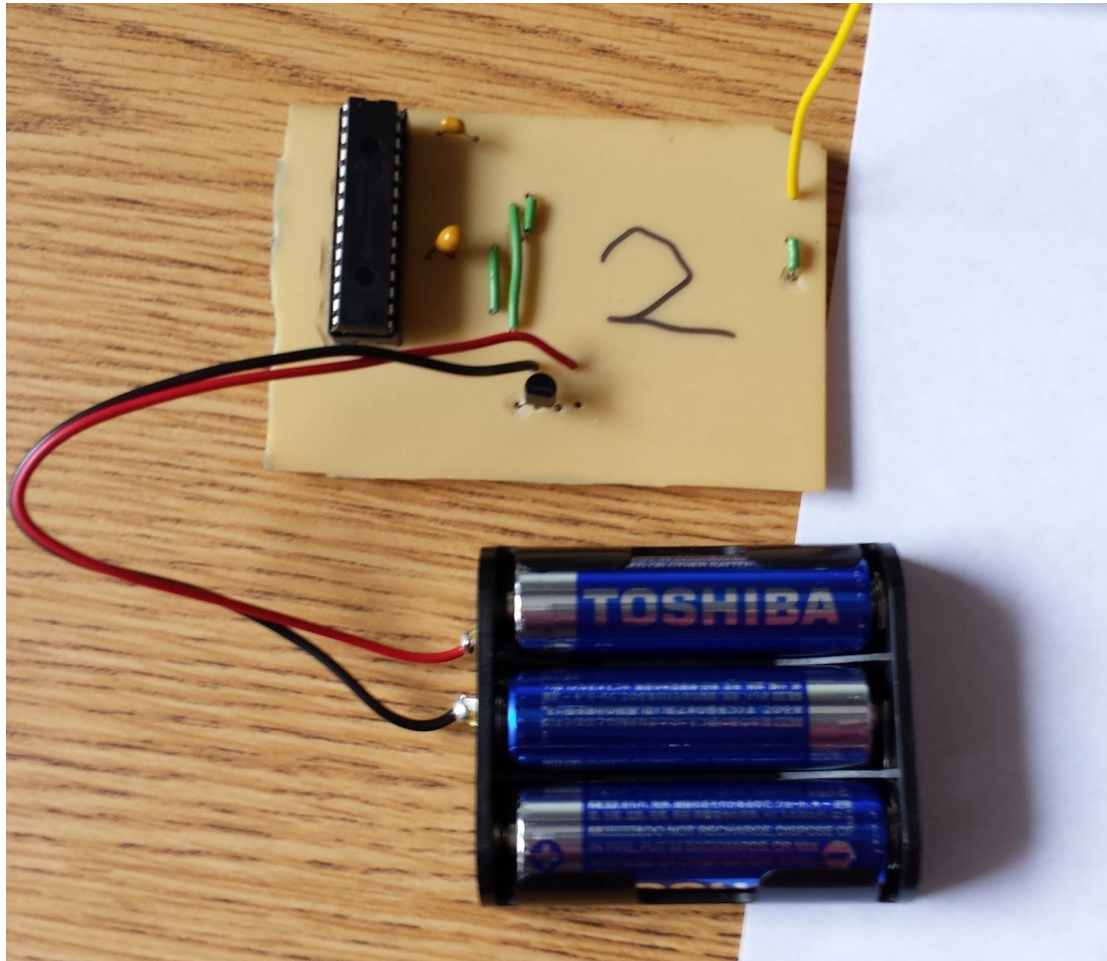
Temperature and Humidity Sensor



Trigger Switch

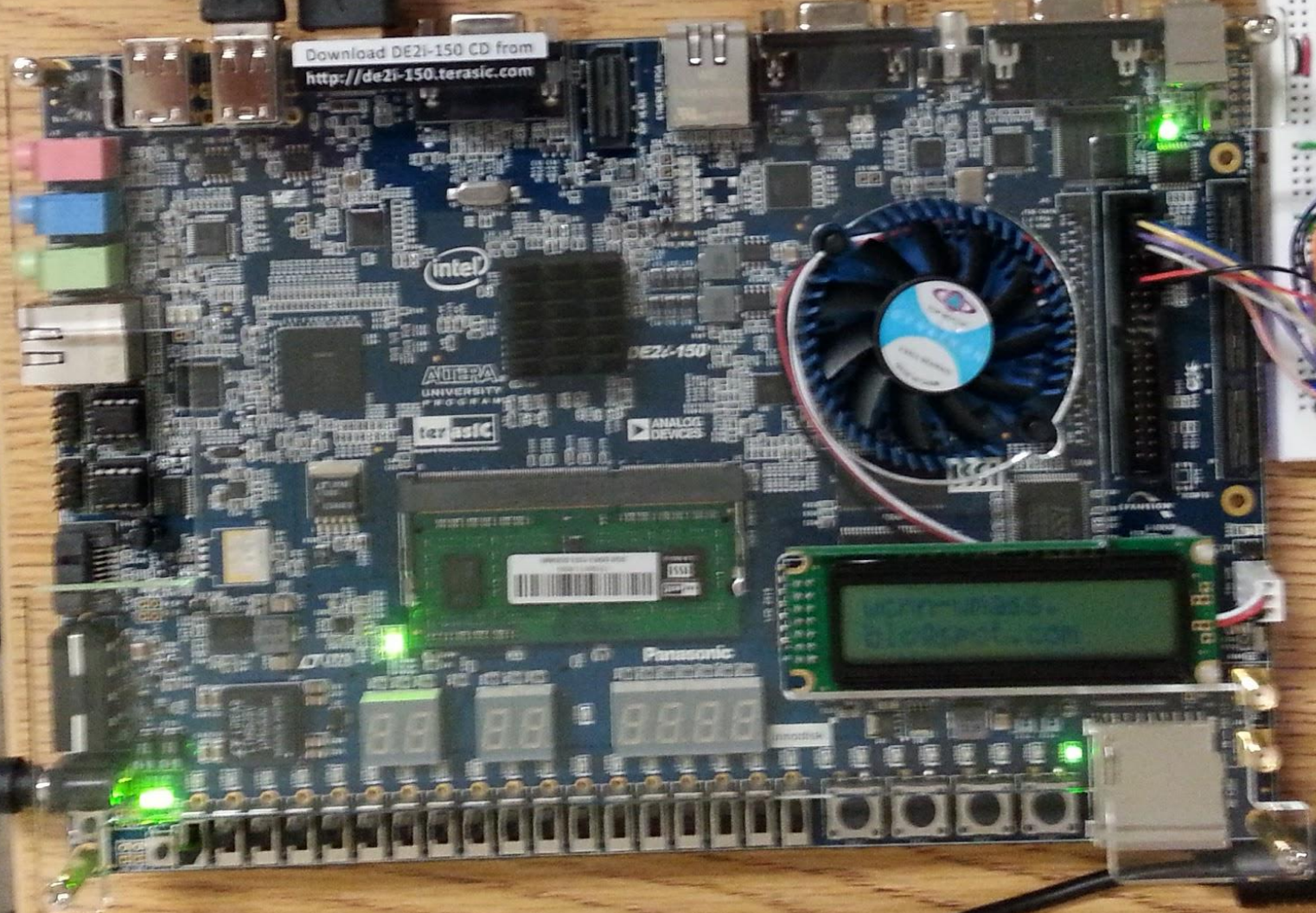


Camera-less Node



In our final project, every node will have identical hardware. In order to demonstrate the functionality of the network, we have some nodes that do not have a camera or sensors. These nodes always report back to the server that they do not have any pictures.

Server



Demo

1. PIR sensor triggered (a switched is used to simulate the trigger; this is done to prevent unwanted image captures caused by our IR light).
2. Picture is taken and stored.
3. Temperature and humidity data is obtained and stored.
4. Server periodically asks nodes if they have new pictures.
5. If a node has a picture, the picture and sensor data are transmitted through the network to the server.
6. Data is uploaded to the website via email .

Questions & Answers