PROPOSED COMMUNICATION

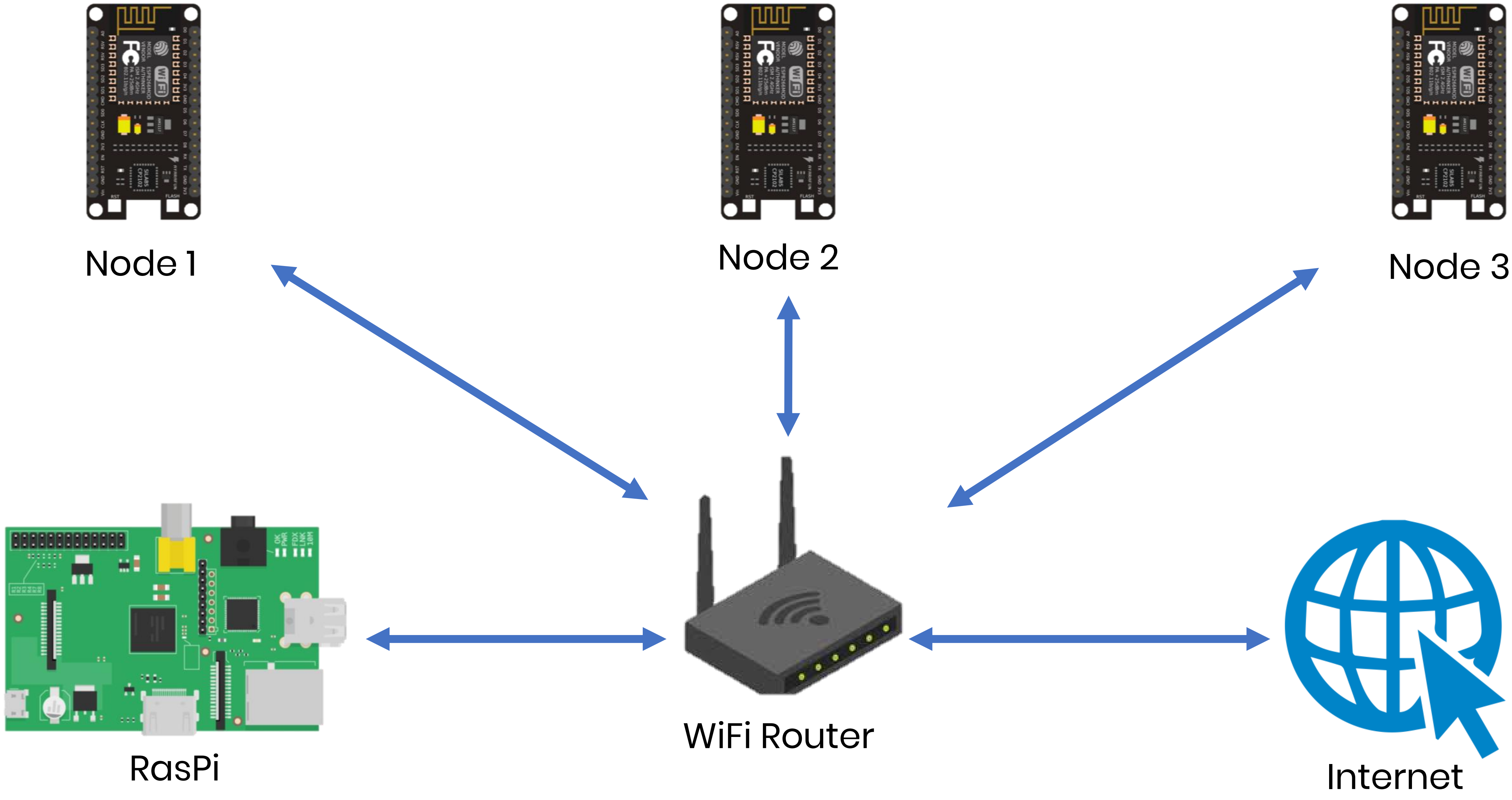
- Since it’s a WiFi based communication, hence TCP/IP protocol will be used for communication.

- **TL;DR** data will be sent in form of packets from client’s IP addr. to server’s IP addr.

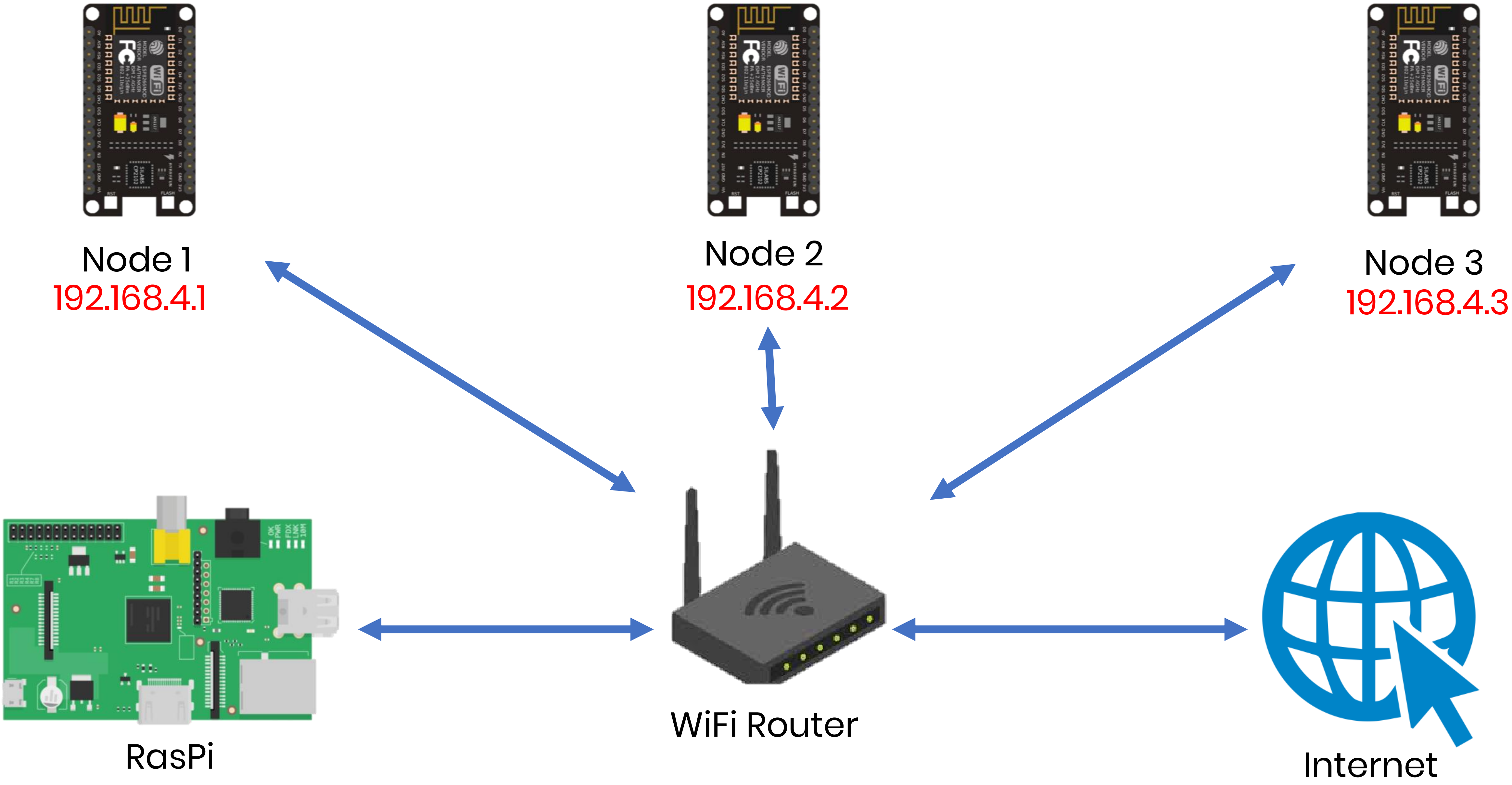
- Hence, each ESP module (node) will be acting as server (when receiving data), client (when sending data to).

- Also, all nodes will be connected to a common WiFi network (having internet access) so that ThingSpeak IoT cloud can be accessed in order to log our data.

- One raspberry Pi (or a dedicated computer system) will also be connected to the same WiFi network for ports forwarding and for running Neural network.



CONNECTIVITY



Node 1
192.168.4.1

Node 2
192.168.4.2

Node 3
192.168.4.3

RasPi
192.168.4.100

WiFi Router

Internet

After IP Assignment

COMMUNICATION FOR NEURAL NETWORK DATA EXCHANGE

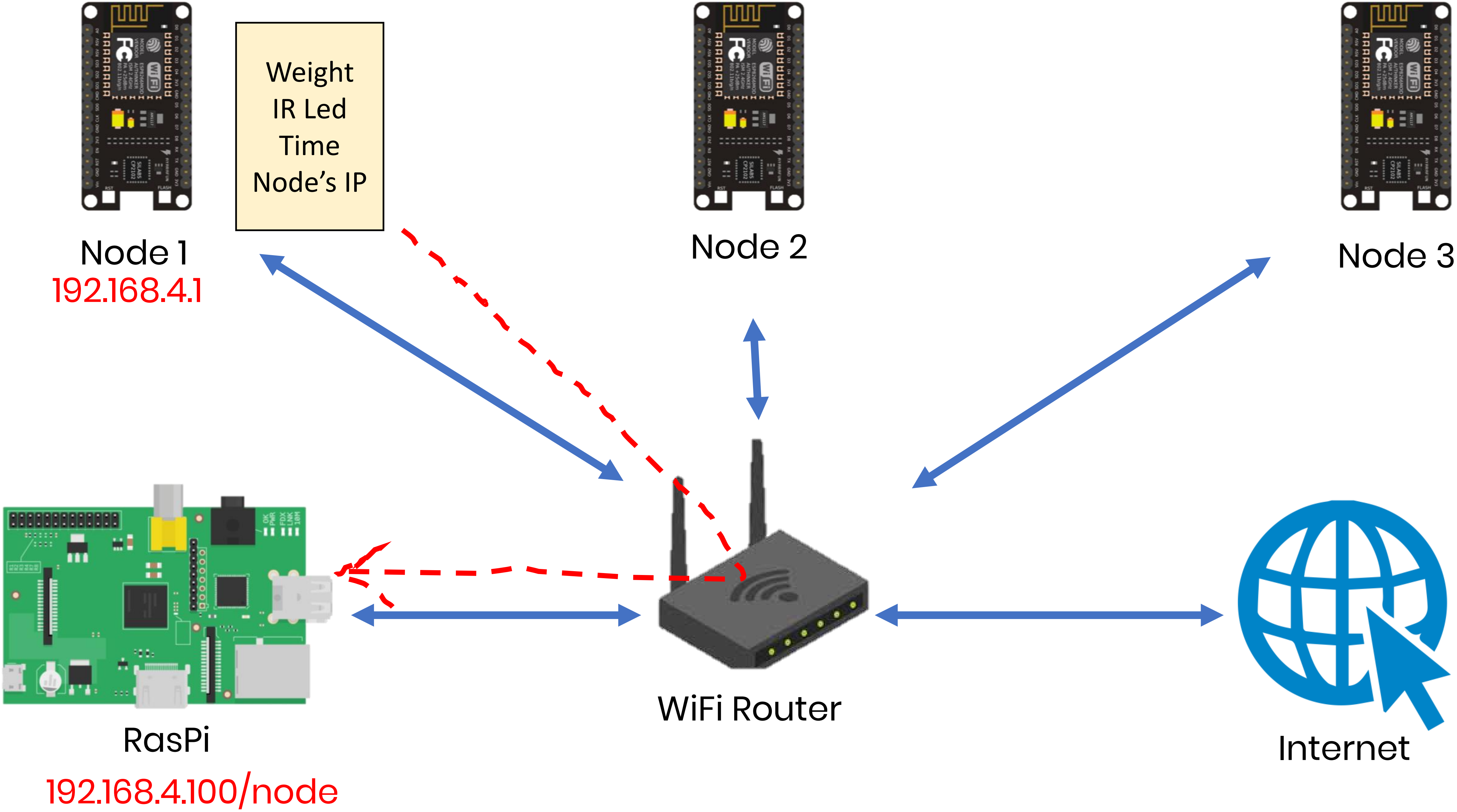
- Let on the default IP (192.68.4.X) each node and Raspi will be serving a static welcome page which is not used for exchanging data related to neural network.

- Assume on **/raspi** route, each node will receive data from the raspi. And on the route **/node** raspi will receive data from the node.

- Node x wants to send data to raspi. From node (now this node will act as client), 192.68.4.100/node will be hit with the data packet. And via this raspi will receive the data. Here, in the packet which node sent the data(IP address of it) will also be sent along with other data variables.

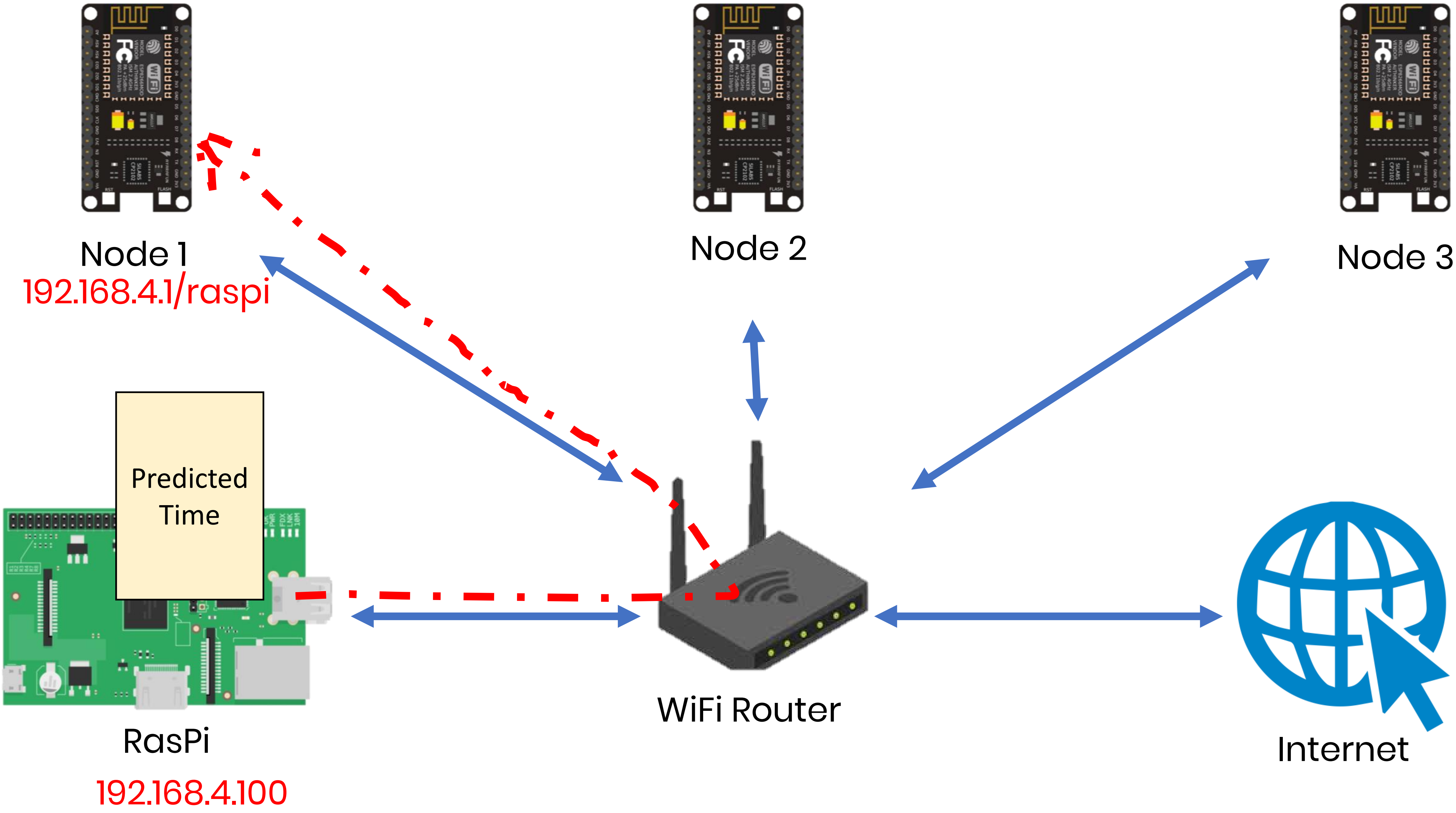
- Now when neural network predicts the output, after that raspi will send the result back to the same node (raspi acts as client). Hence, raspi will hit [IP address is received]/raspi and the intended node will receive its result back.

- Similarly, other nodes will communicate via same logic.



Weight
IR Led
Time
Node’s IP

Node 1 to Raspi



Raspi to Node

OTA Portal Access via Internet

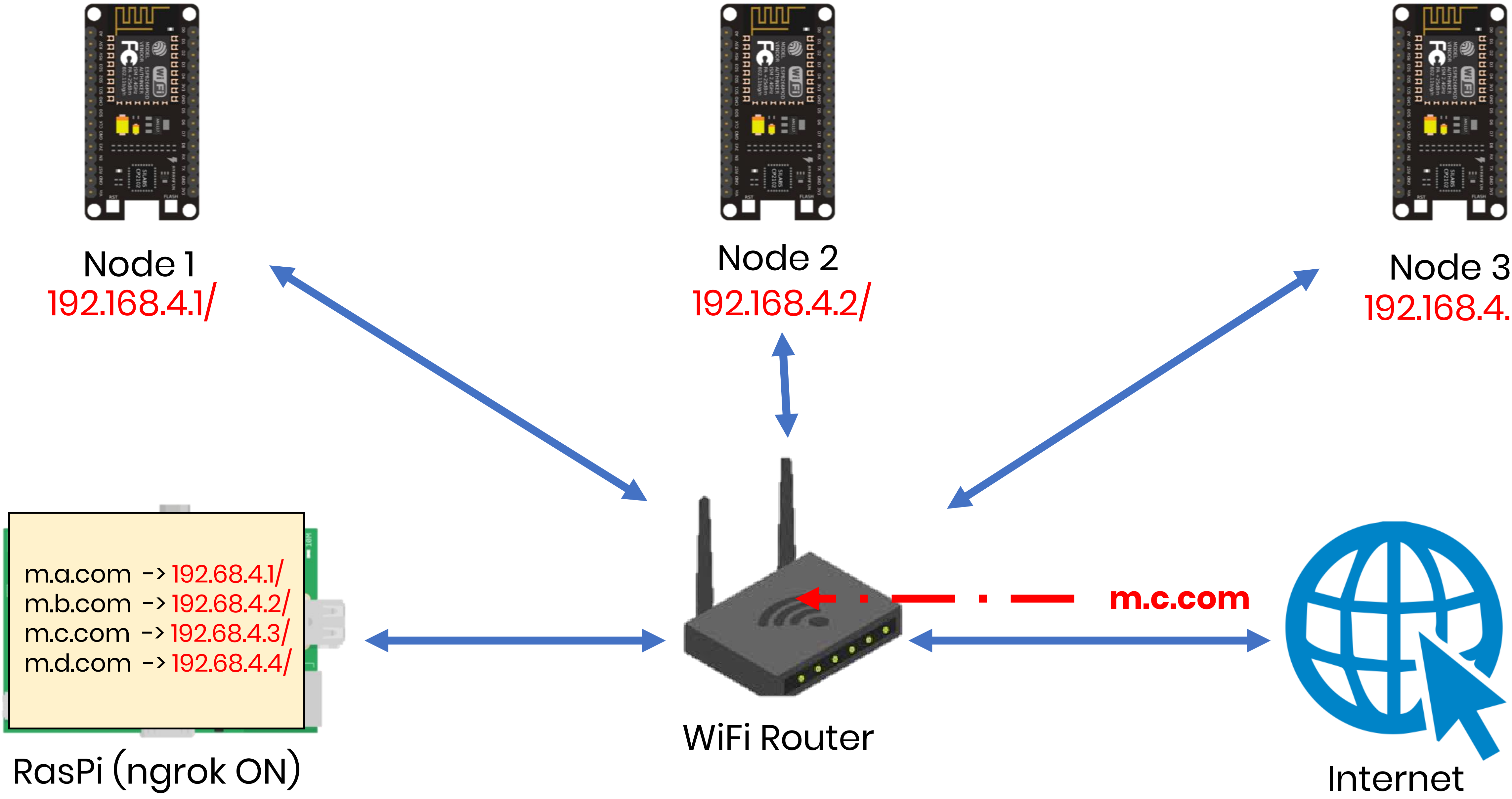
- On the default IP (192.68.4.X) each node will be serving a static page having option to choose the file(source code in HEX format) and a button (Upload Button).

- The Upload button will route to /update which will accept the incoming file, process it, and then transfer it to the FLASH of uC.

- Those IP's can be accessible by anyone in the same WiFi network. But to access those pages from internet we will have to use something call as **PORT forwarding.**

- To do this we will setup **NGROK** on raspi. We have IP addr. of each node with us. We will setup port forwarding on each IP route.

- So, after setting things up:
  - m.a.com will forward to 192.68.4.1/
  - m.b.com will forward to 192.68.4.2/
  - m.c.com will forward to 192.68.4.3/
  - m.d.com will forward to 192.68.4.4/



Node 1
192.168.4.1/

Node 2
192.168.4.2/

Node 3
192.168.4.3/

m.a.com -> 192.68.4.1/
m.b.com -> 192.68.4.2/
m.c.com -> 192.68.4.3/
m.d.com -> 192.68.4.4/

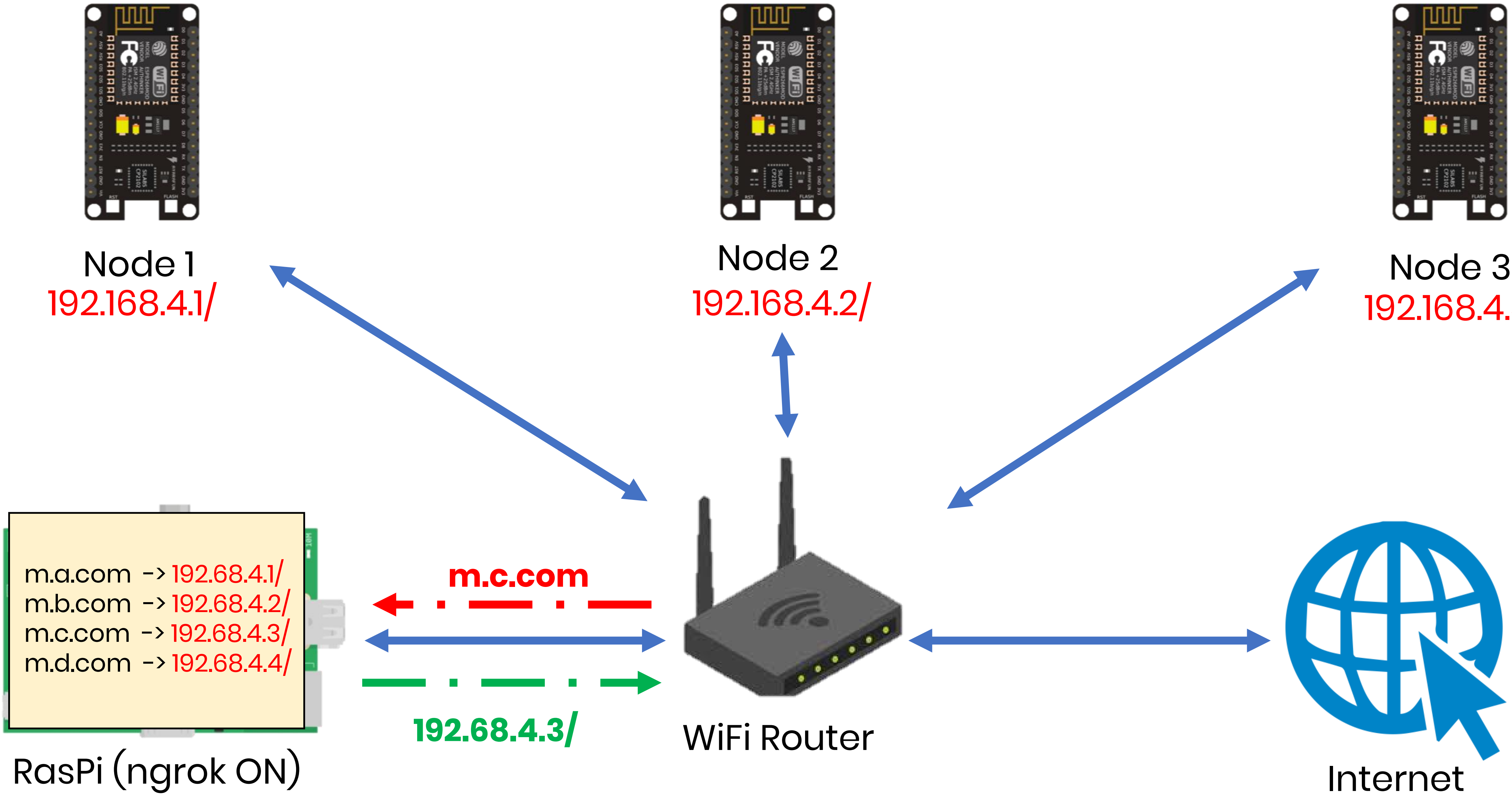
RasPi (ngrok ON)

WiFi Router

m.c.com

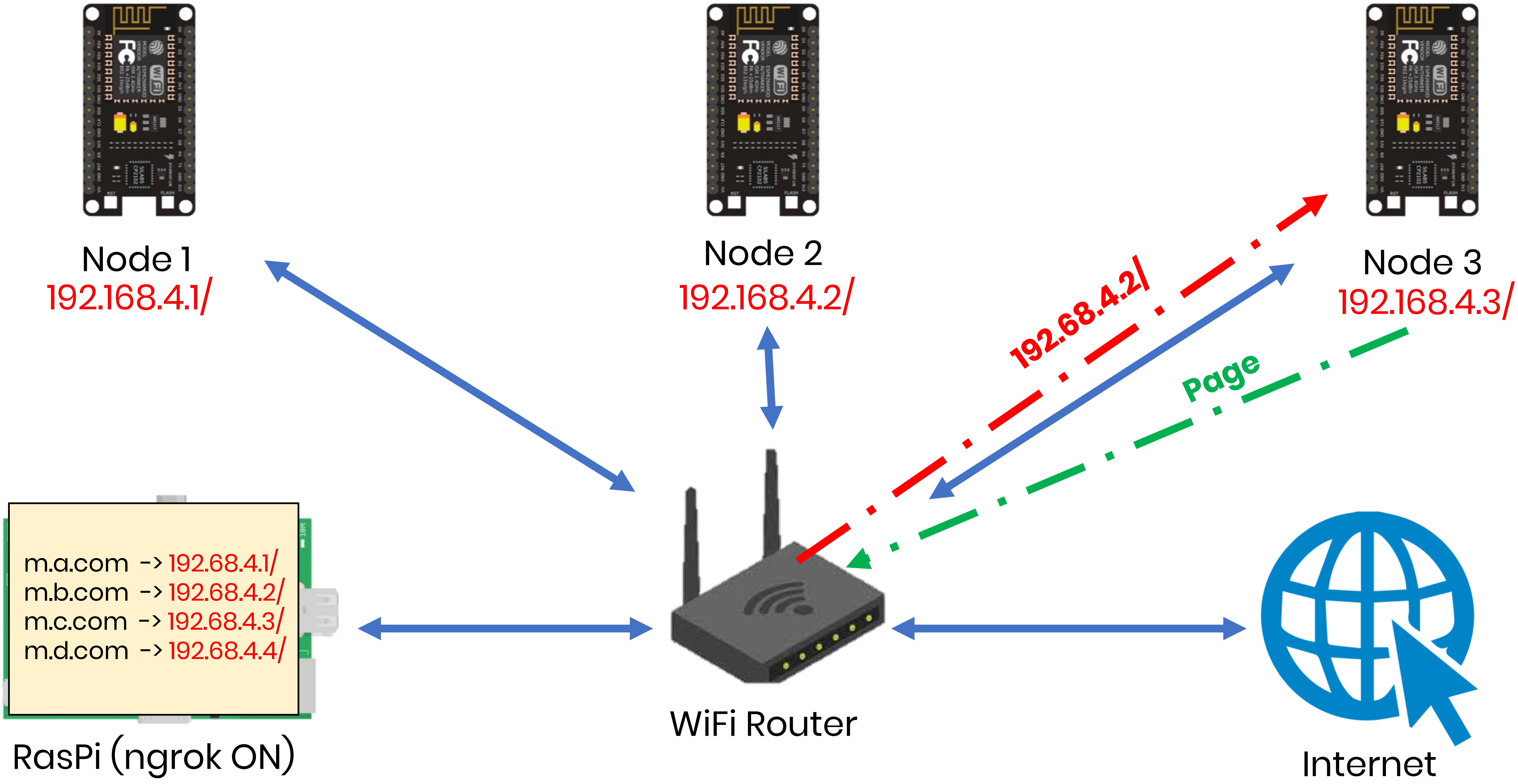
Internet

User hits m.c.com from Internet. Router accepts it

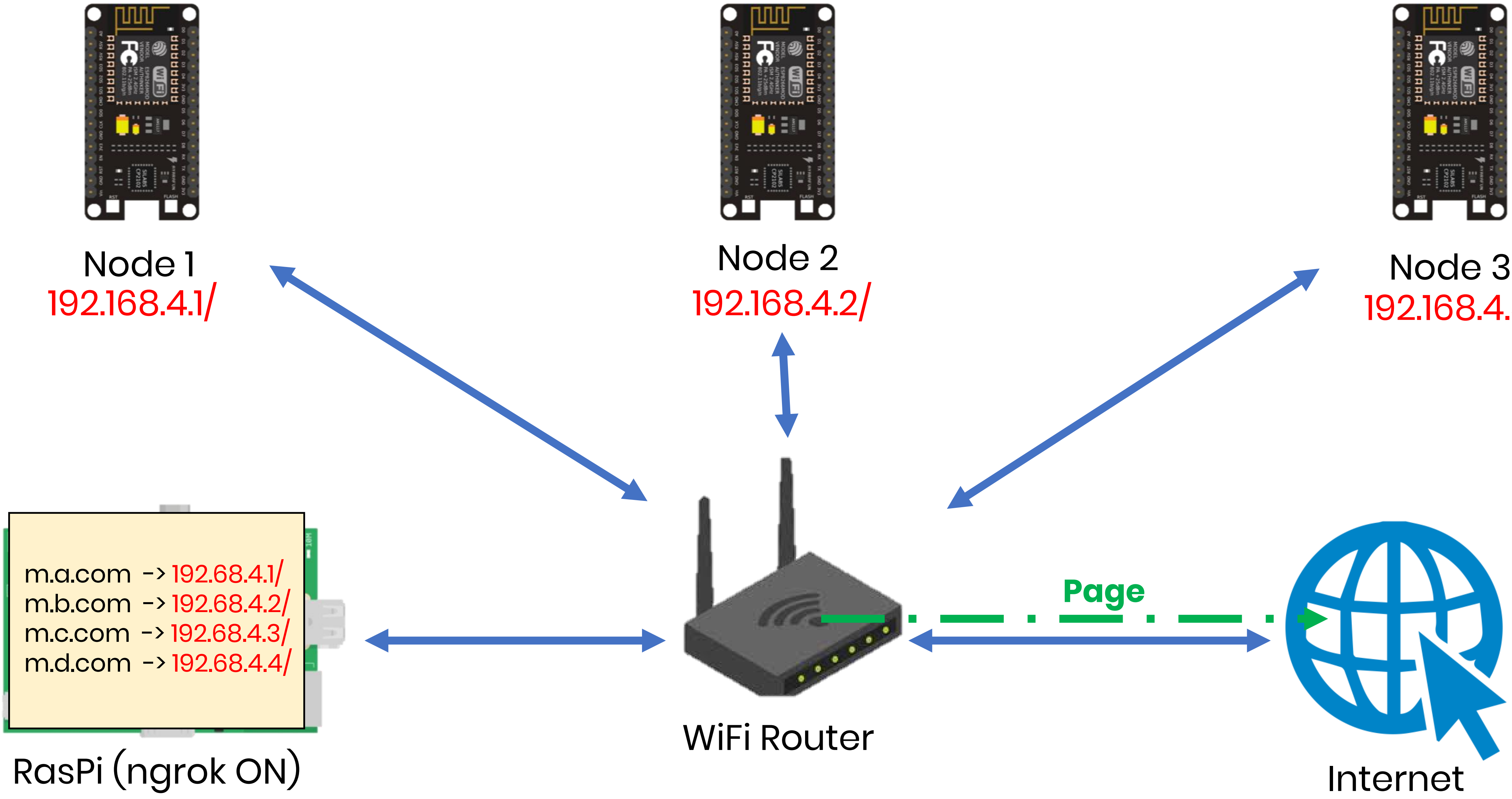


m.a.com -> 192.68.4.1/
m.b.com -> 192.68.4.2/
m.c.com -> 192.68.4.3/
m.d.com -> 192.68.4.4/

ngrok accepts the request, forward to the node IP



Node accepts the request and send the page back



Node 1
192.168.4.1/

Node 2
192.168.4.2/

Node 3
192.168.4.3/

m.a.com -> 192.68.4.1/
m.b.com -> 192.68.4.2/
m.c.com -> 192.68.4.3/
m.d.com -> 192.68.4.4/

RasPi (ngrok ON)

WiFi Router

Page

Internet

Router finals routes back the page to the requester