CS6220 TERM PROJECT: NS-3

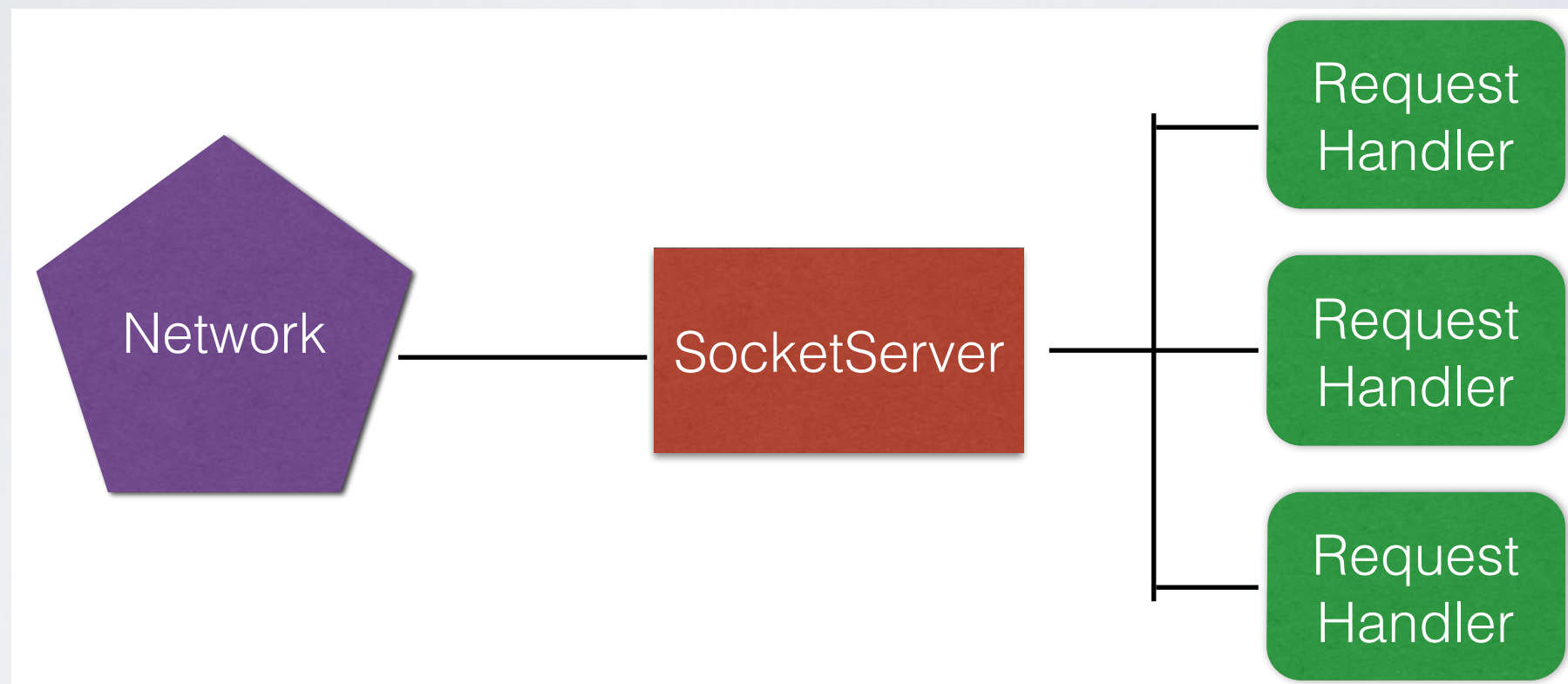Sudarshan S, Aditya Kamath, Bhargav Reddy

OVERVIEW

- Project 1: Python application support in NS-3

- Project 2: Policy based routing in NS-3

  - Approach 1: VirtualNetDevice

  - Approach 2: Adding hooks to NS-3's routing stack

PROJECT 1
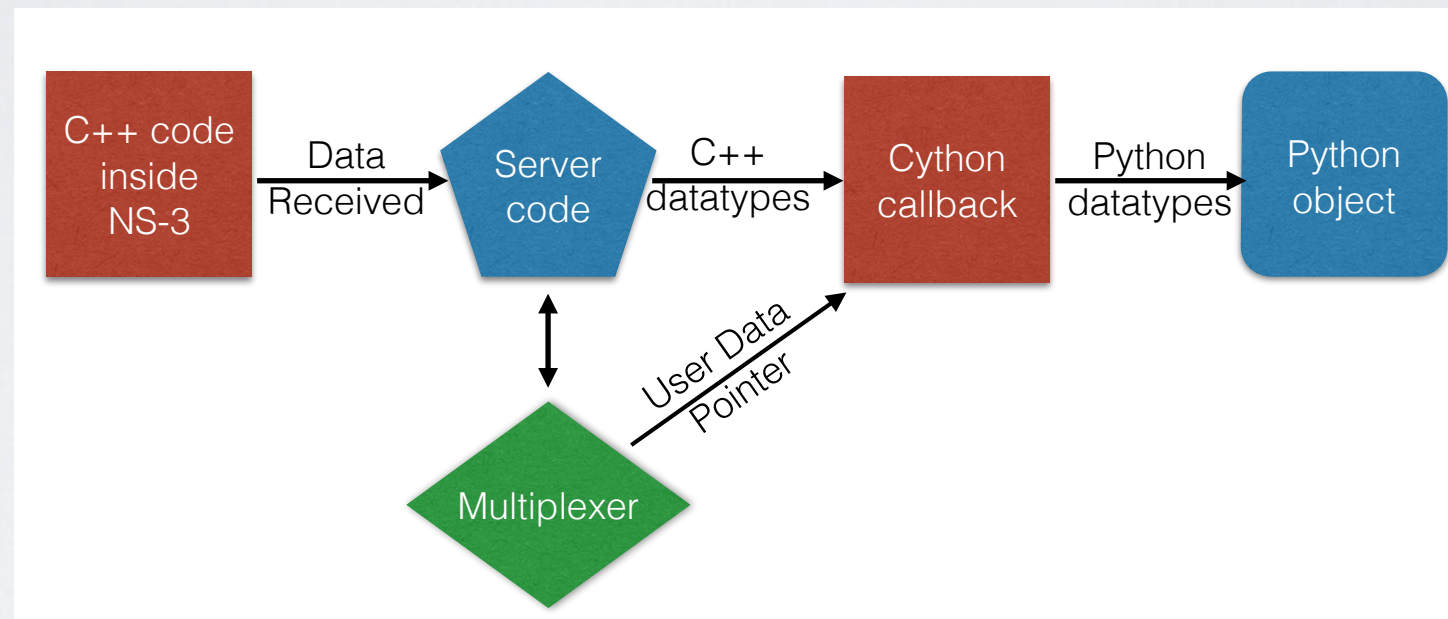Python application support in NS-3

PYTHON SOCKETSERVER API

Python provides a convenient API to create multi client applications- the user only has to implement request handler to handle one request and Python handles multiplexing automatically

IMPLEMENTING SUPPORT FOR SOCKETSERVER-ISH API IN NS-3

Key Architecture of our approach, depicting both C++ and Python side

IMPLEMENTING SUPPORT FOR SOCKETSERVER-ISH API IN NS-3

C++ Server Object

- Reference to request handler object
- NS-3 Socket
- Multiplexer (Map from Socket to its request handler)
- Callback Handler

Cython Callback

- Adjust reference count
- Convert datatypes
- Call appropriate bound method
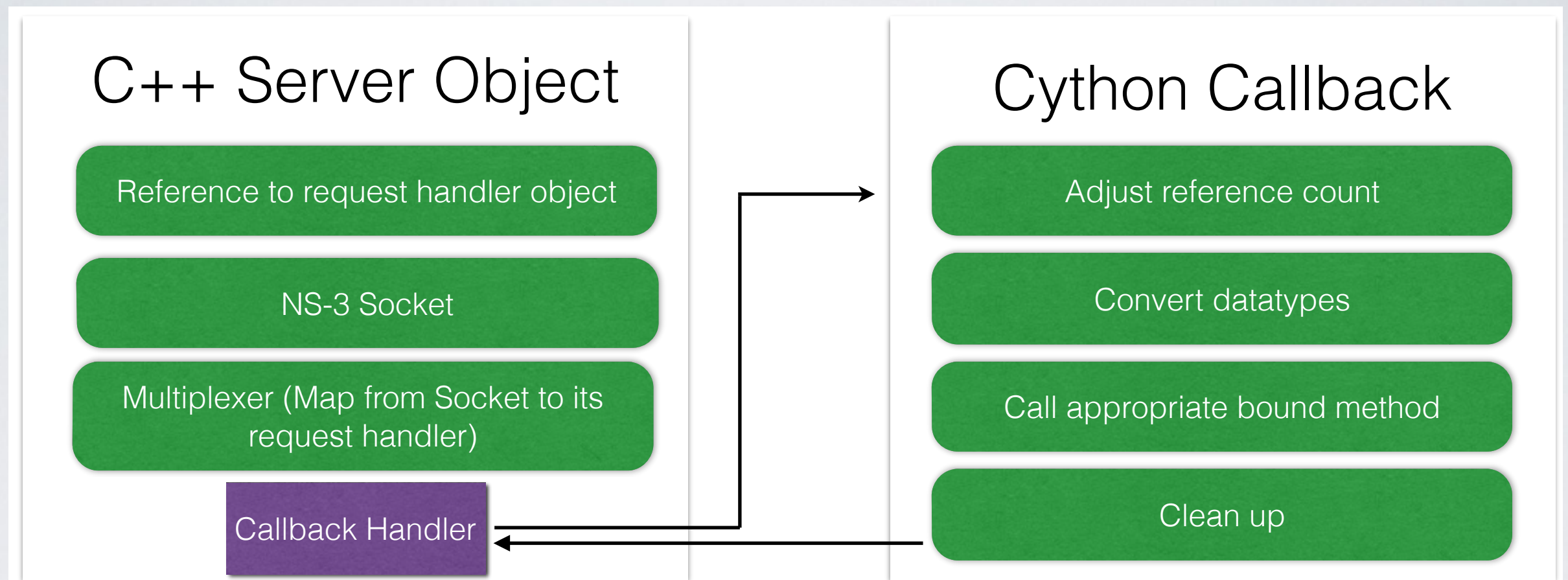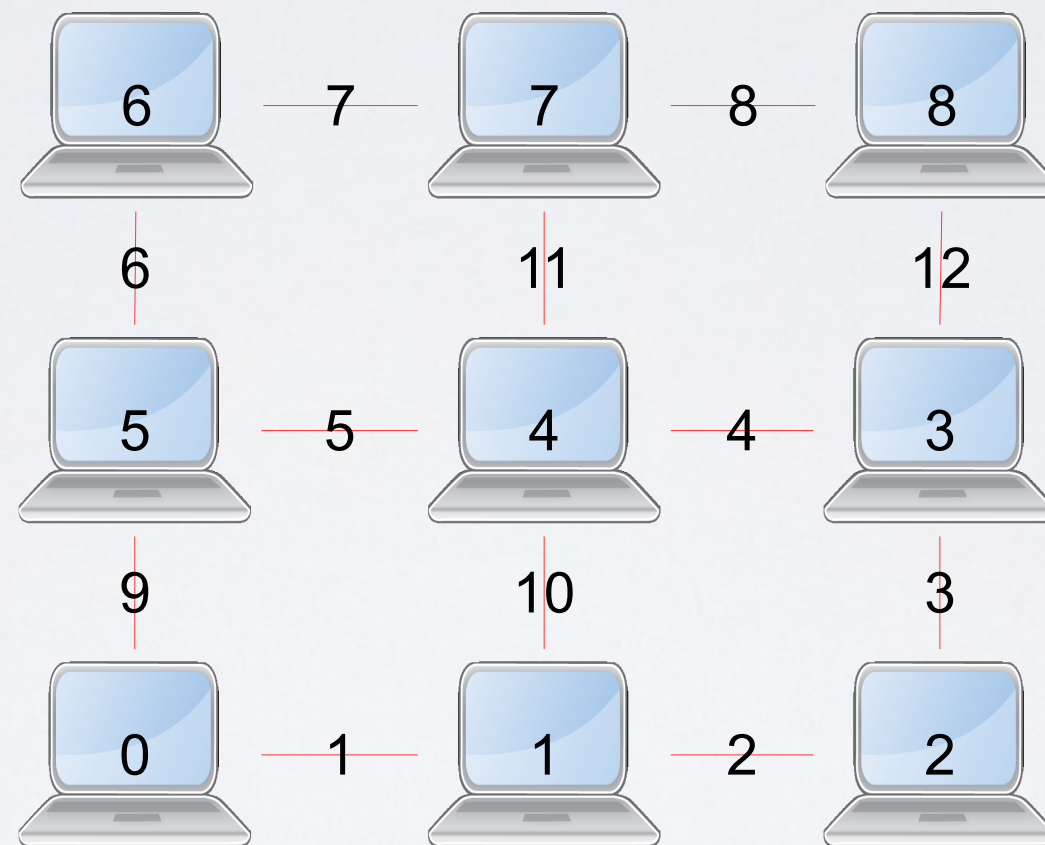- Clean up

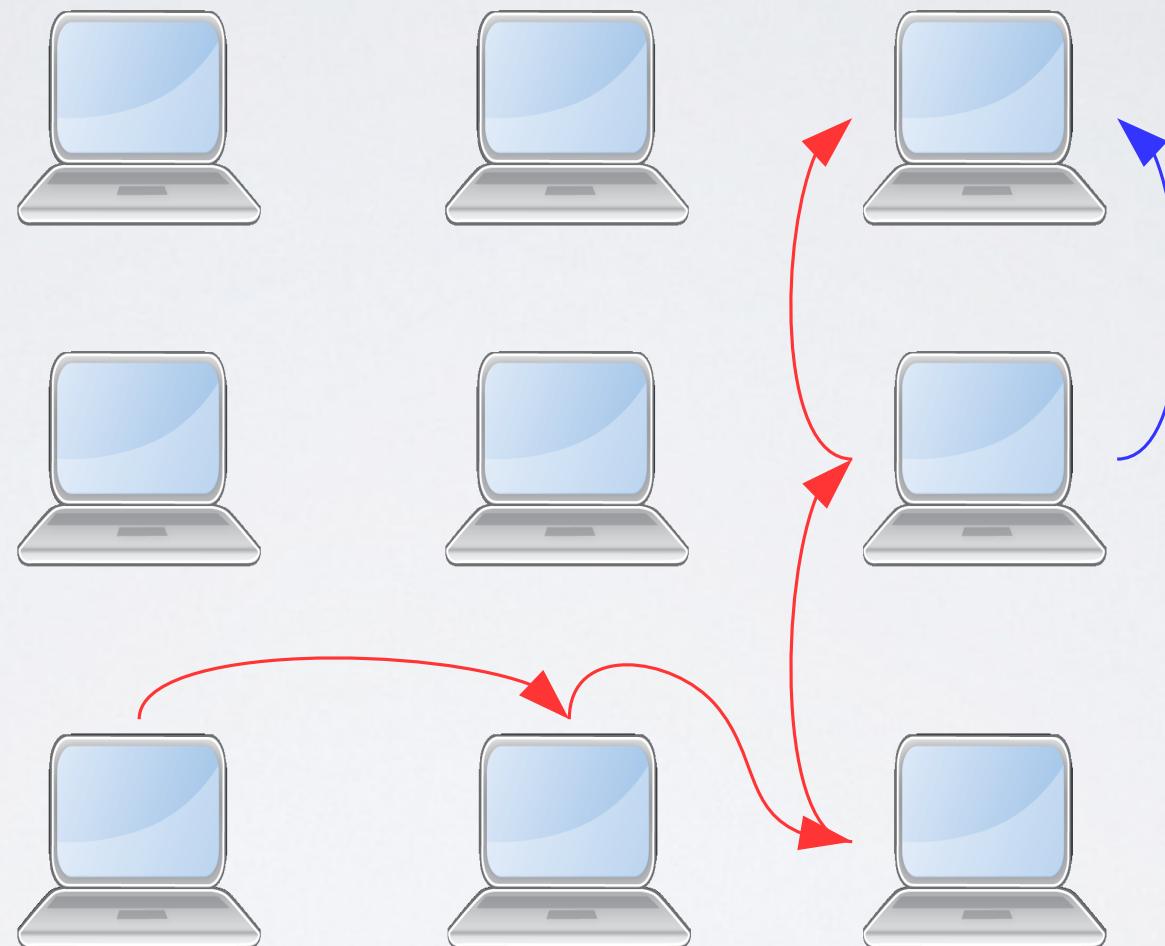Diagram illustrating key functionality of both C++ side and Python side

EXPERIMENTAL SETUP FOR DEMO CODE

Subnets are of the form
192.168.x.0/24

All links between nodes are point to point links

FLOWS CREATED DURING DEMO

All flows are created using our code
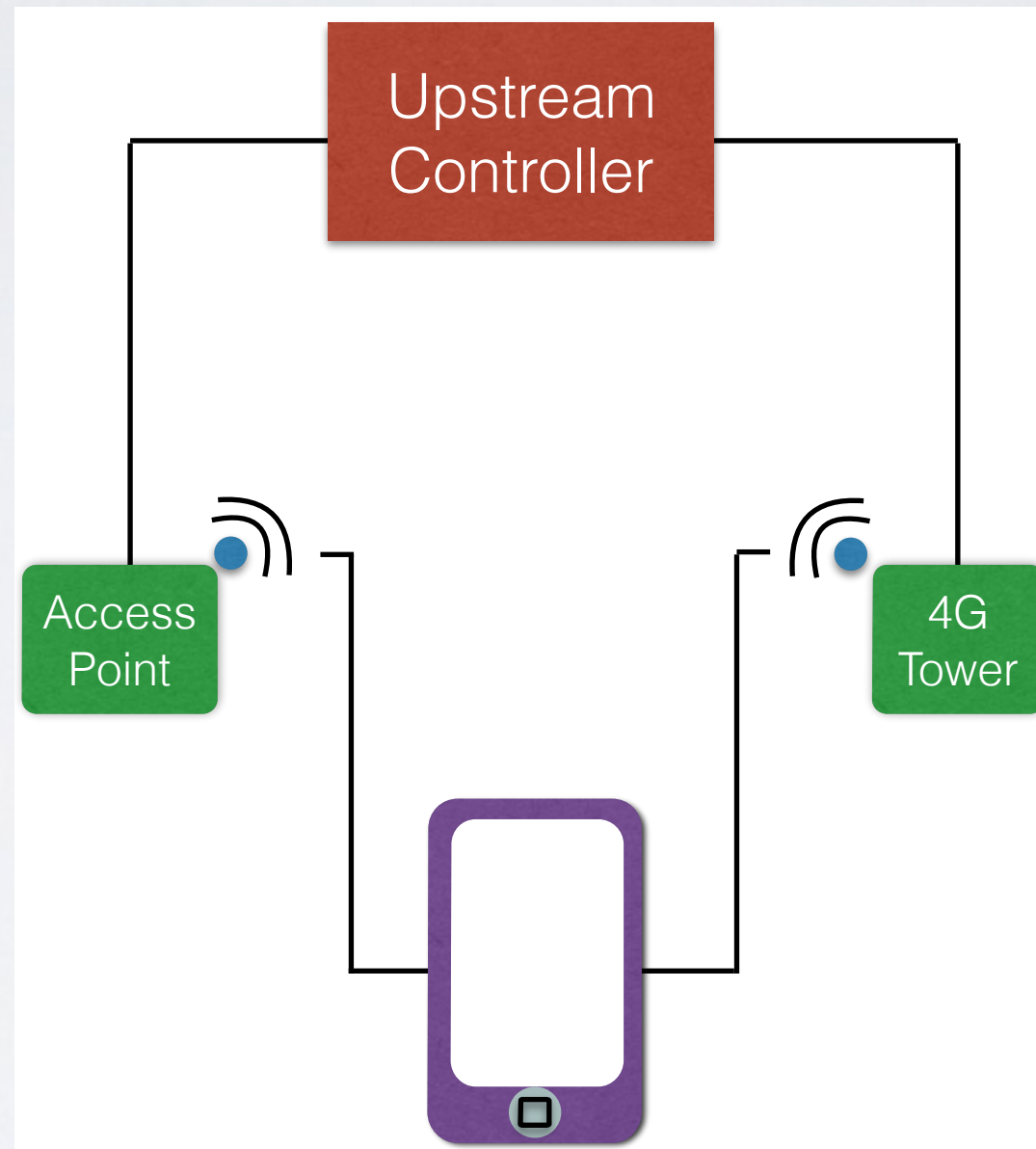
DEMO

Project 1- demo

PROJECT 2

Policy based routing support in NS-3

POLICY BASED ROUTING

- Routing is usually based on destination IP address alone

- Policy based routing- routing is based on arbitrary combination of TCP and IP headers
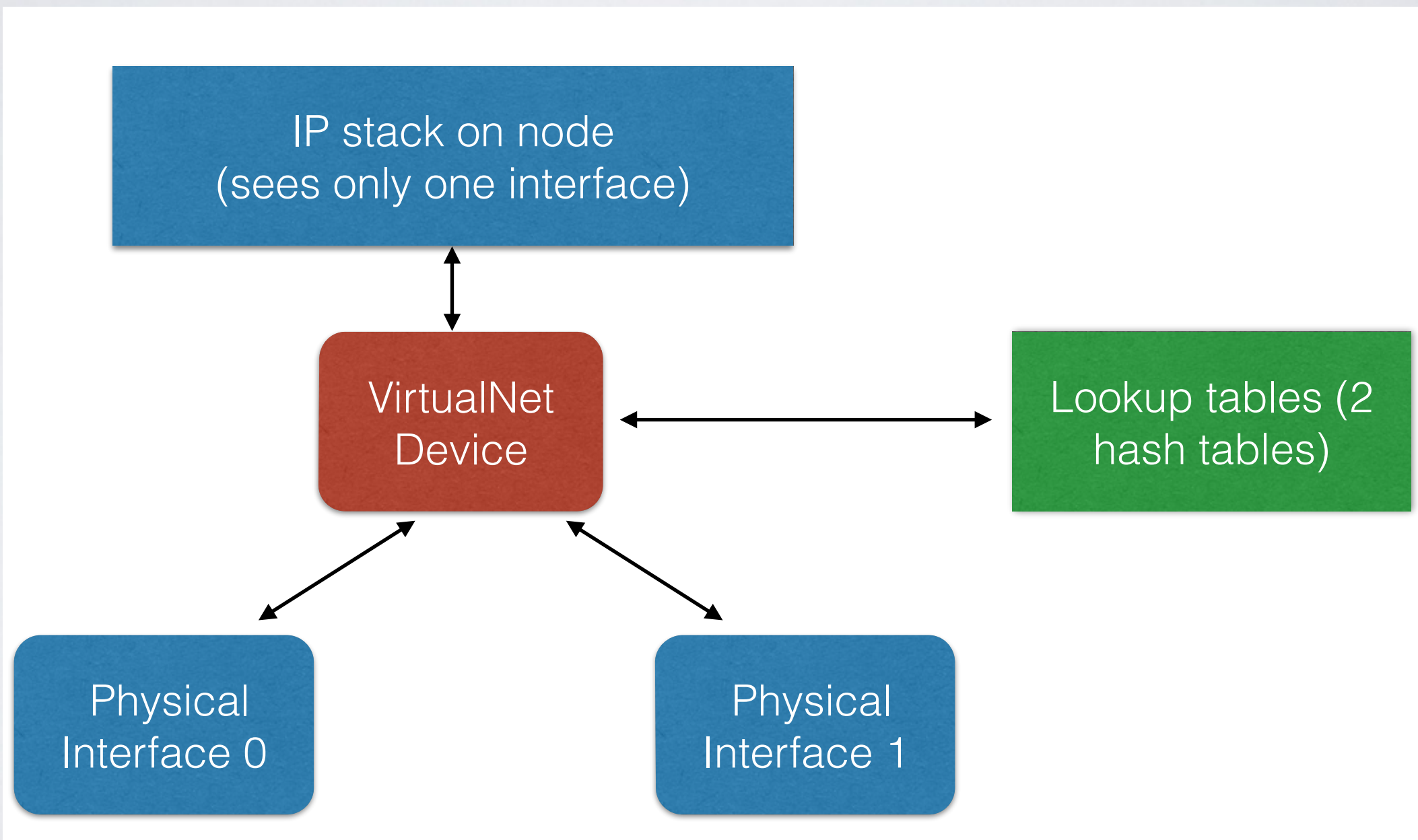
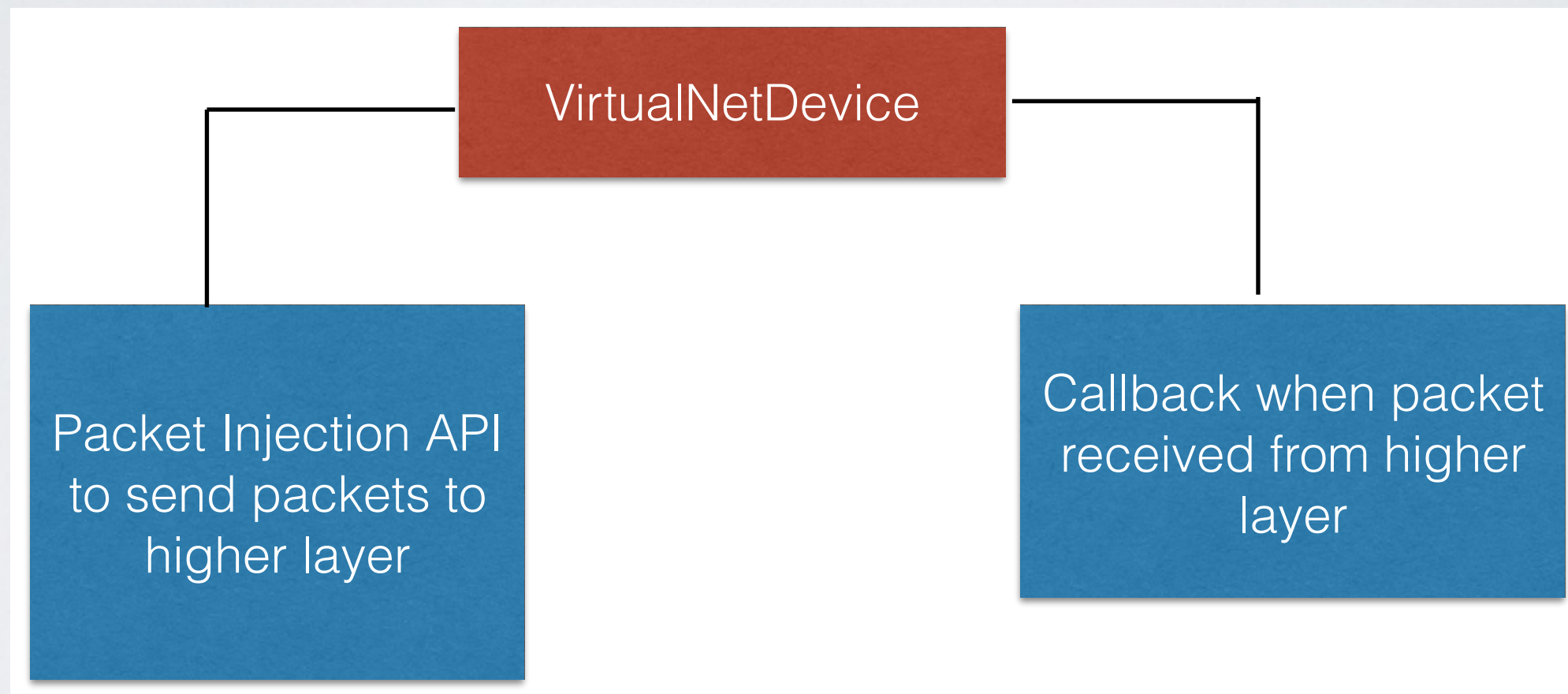# USE CASES- FLOW MOBILITY IN SMARTPHONES

PROJECT 2: APPROACH 1
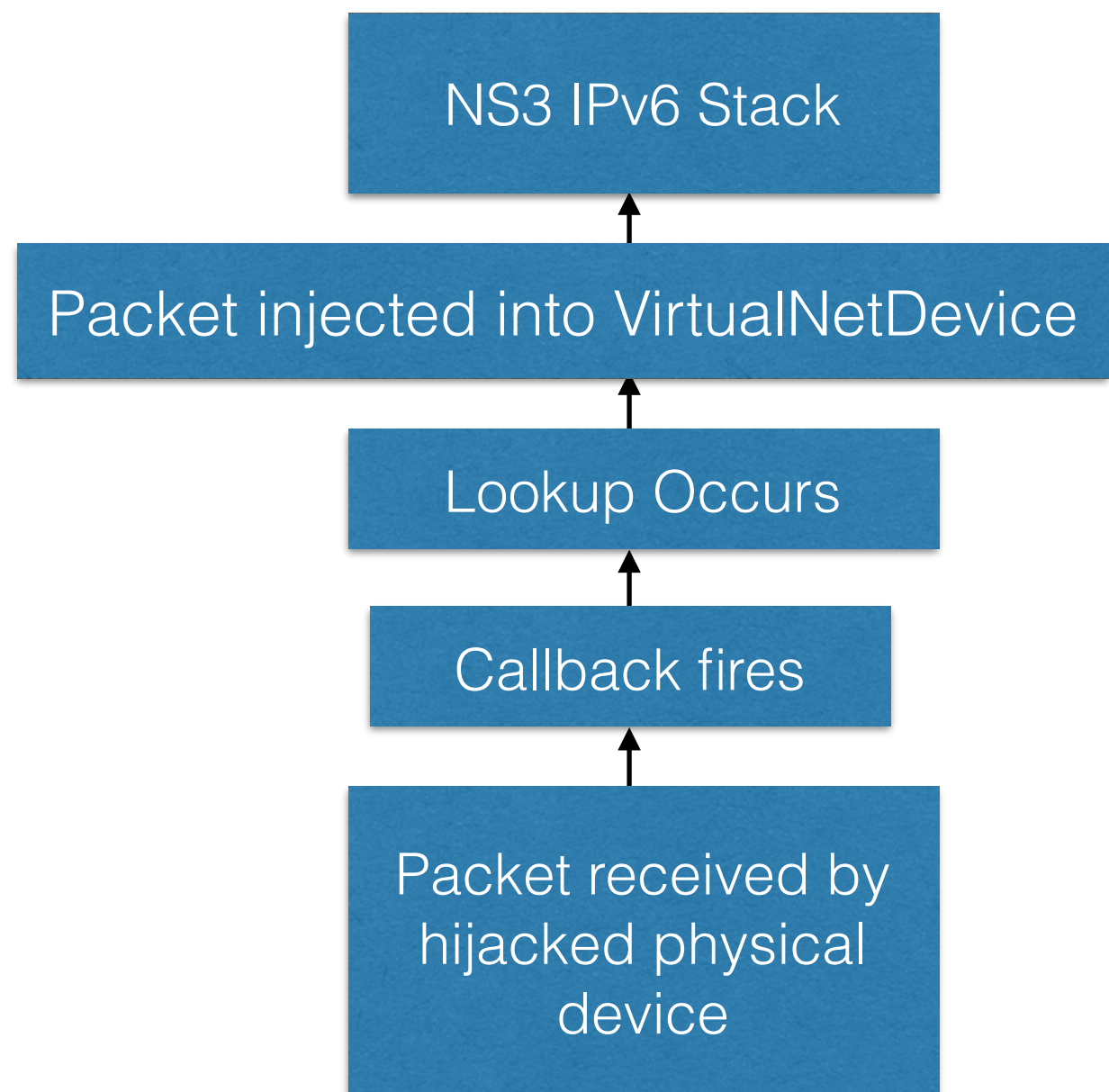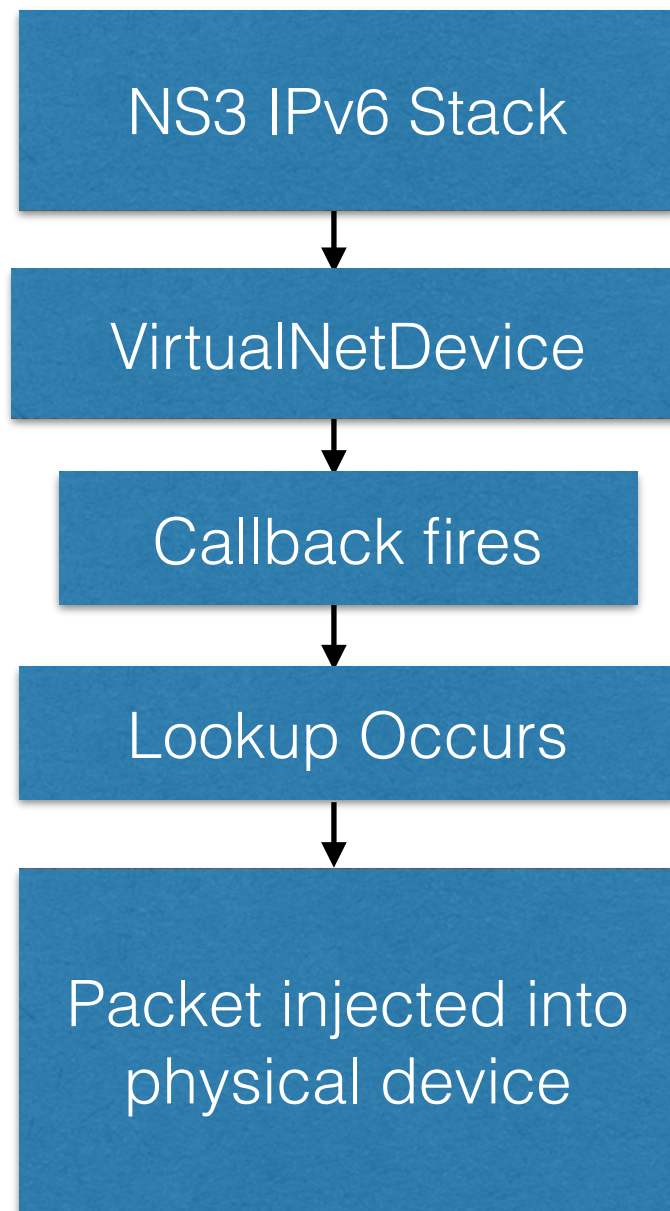
Virtual Net Device

KEY IDEA

NS3 VIRTUALNETDEVICE

SEQUENCE OF EVENTS

NS3 IPv6 Stack

↓

VirtualNetDevice

↓

Callback fires

↓

Lookup Occurs

↓

Packet injected into physical device

NS3 IPv6 Stack

↑

Packet injected into VirtualNetDevice

↑

Lookup Occurs

↑

Callback fires

↑

Packet received by hijacked physical device

ISSUES FACED

- IP stack sees only one device- either broadcast (ARP not required) or unicast (ARP required)

- Virtual device has a different MAC address from the physical devices- wrong IPv6 address

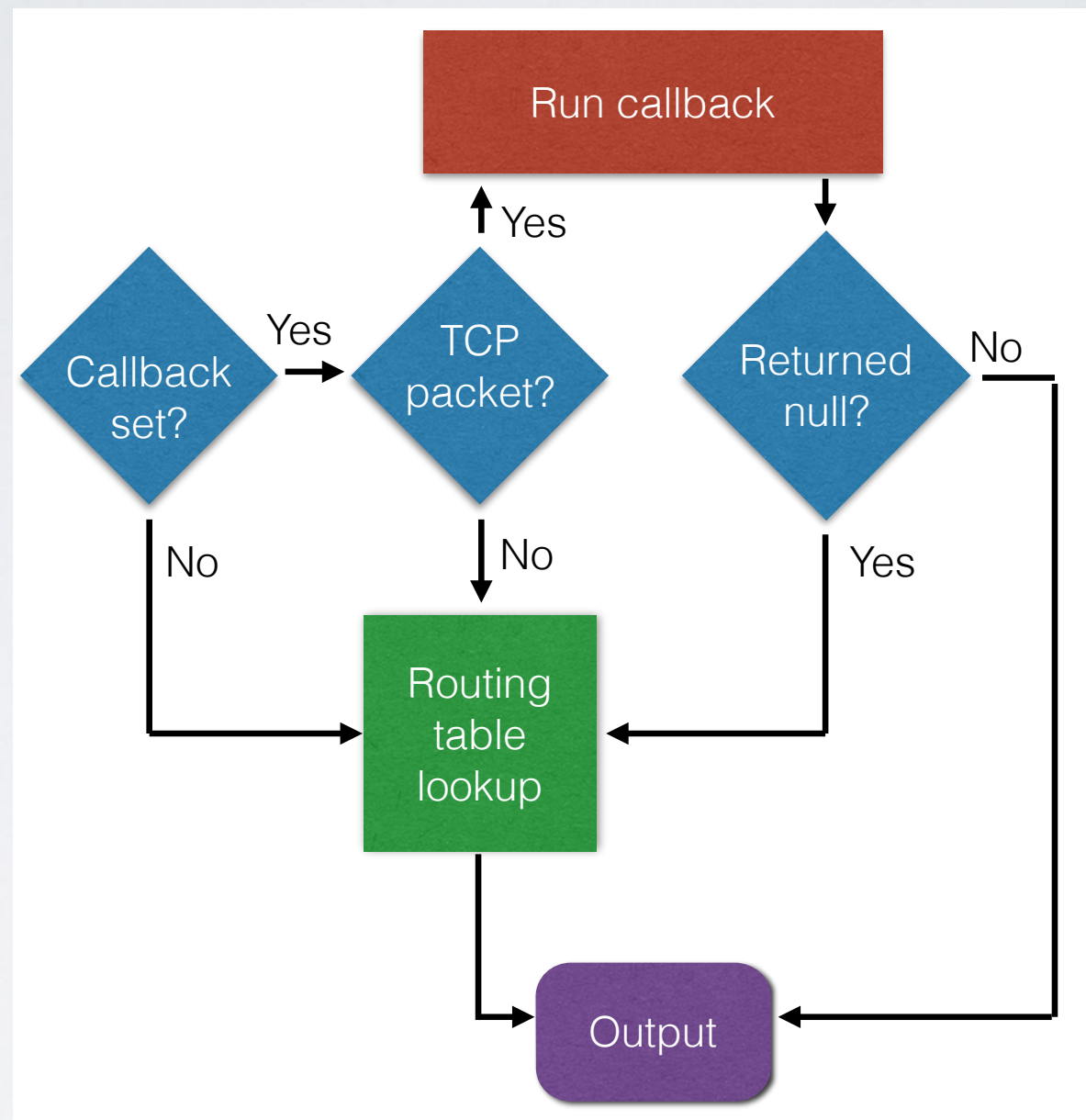- Neighbour and router solicitation packets not auto generated on all devices

PROJECT 2- APPROACH 2

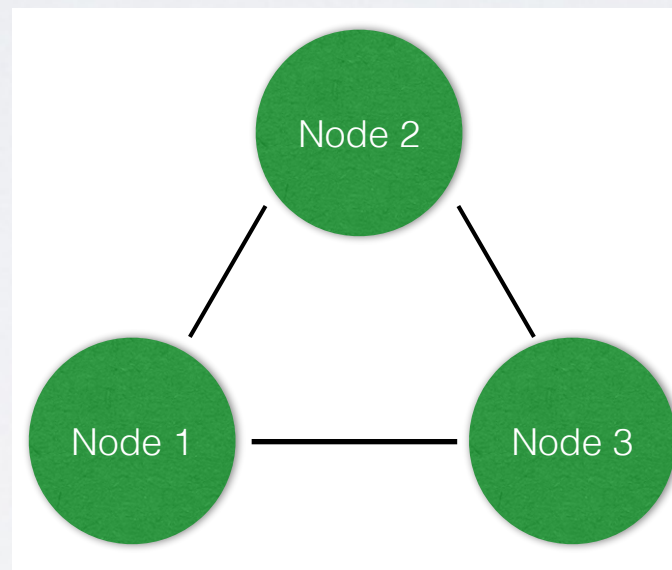Adding hooks into NS-3's routing stack

TECHNIQUE

- NS-3's routing table lookup occurs in ipv6-static-routing.cc

- User callback stored along with routing table, will be called before looking up route in table

FLOWCHART

EXPERIMENTAL SETUP

All links between nodes are point to point links.
Initially there is a flow from Node 1 to Node 3 via Node 2
At 10.0 seconds this flow is migrated to flow directly to Node 3

DEMO

Project 2- implementing policy based routing in NS-3

THANK YOU