Hands-on Workshop on Network Technologies

Hands-on session 1: Introduction and Basic Configuration
Lab 3 - IPv6 Lab Series

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https://research.cec.sc.edu/cyberinfra/

Tuesday, Jul 15, 2025
Online

IPv6 Lab Series

- Lab 1 Introduction to Mininet
- Lab 2 Introduction to FRR
- Lab 3 IPv6 Address Configuration
- Lab 4 Enabling Stateless Address Autoconfiguration (SLAAC) in IPv6 Routers
- Lab 5 Configuring Devices using SLAAC and Stateless DHCPv6 Server
- Lab 6 Configuring Devices using Stateful DHCPv6
- Lab 7 Using IPv6 Static Routing
- Lab 8 Configuring Single Area OSPFv3 for IPv6
- Lab 9 Using BGP in an IPv6 network
- Lab 10 Configuring DNS and Web Servers in an IPv6 network
- Lab 11 Transitioning from IPv4 to IPv6 – tunnels
- Lab 12 Configuring Stateless NAT64
- Lab 13 Enabling IPv4 and IPv6 Coexistence with DN64
- Lab 14 Configuring IPSec Tunnel on IPv6
- Lab 15 Monitoring IPv6 networks using Zeek

Other Lab Libraries

Cybersecurity

- Virtual Labs on Cybersecurity Tools and Applications
- Virtual Labs on Zeek Intrusion Detection and Prevention Systems

Other Lab Libraries

SDN and P4 Programmable Data Plane Switches

- Cybersecurity Applications on P4 Programmable Data Planes
- P4 Programmable Data Planes: Applications, Stateful Elements, and Custom Packet Processing
- P4 Programmable Data Plane Switches based on BMv2
- P4 Programmable Data Plane Switches based on Intel's Tofino Chip
- Introduction to Software Defined Networking (SDN)
- Introduction to P4-DPDK

Other Lab Libraries

Routing and Switching

- Open Shortest Path First (OSPF)
- Introduction to Border Gateway Protocol (BGP)
- MPLS and Advanced BGP Topics
- Open vSwitch (OvS)

Other Lab Libraries

Network Monitoring and Management

- Network Management Tools (Netflow, IPFix, sFlow)
- Introduction to perfSONAR
- PerfSONAR 5.0
- P4-perfSONAR Lab Series

Other Lab Libraries

Network Fundamentals

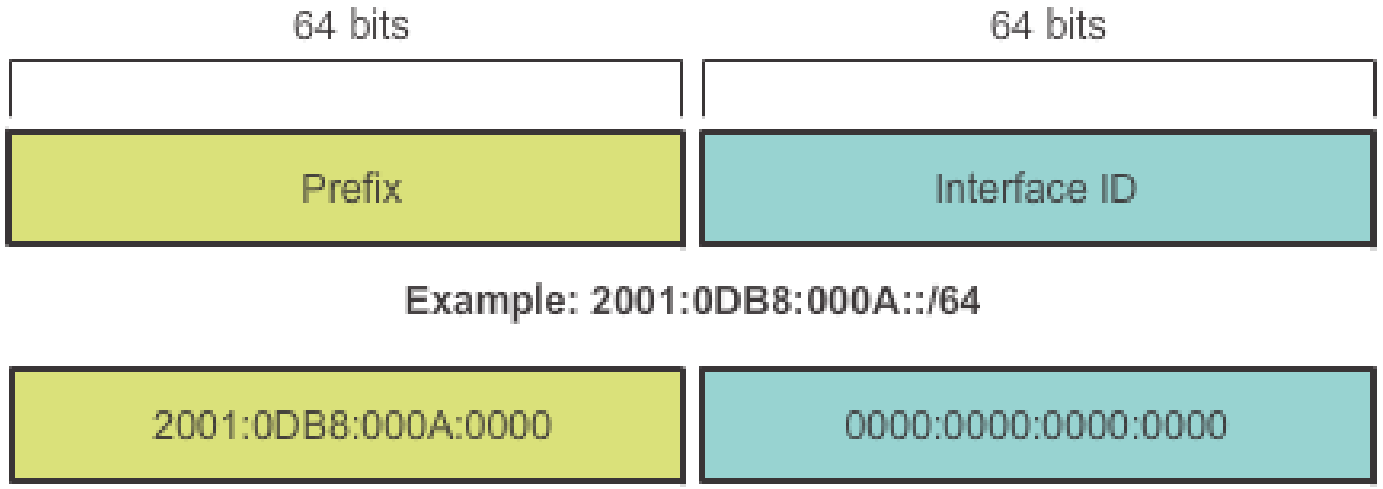
- Network Tools and Protocols (NTP)
- Introduction to IPv6

Objectives of this Session

- Understand the types of IPv6 addresses.
- Differentiate between IPv6 Link Local Address (LLA) and Global Unicast Address (GUA).
- Configure IPv6 LLA and GUA.

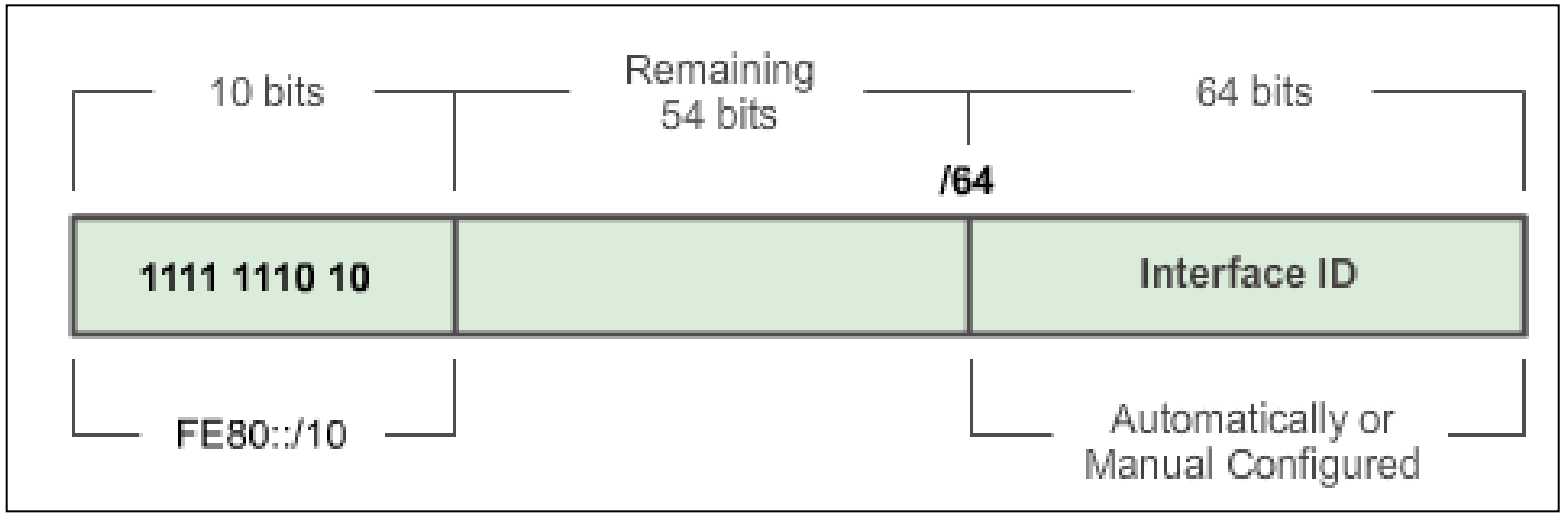
IPv6 Unicast Addresses

- Global Unicast
  - Similar to a public IPv4 address
  - Globally unique
- Link-local
  - Used to communicate with other devices on the same local link
  - Confined to a single link; not routable beyond the link



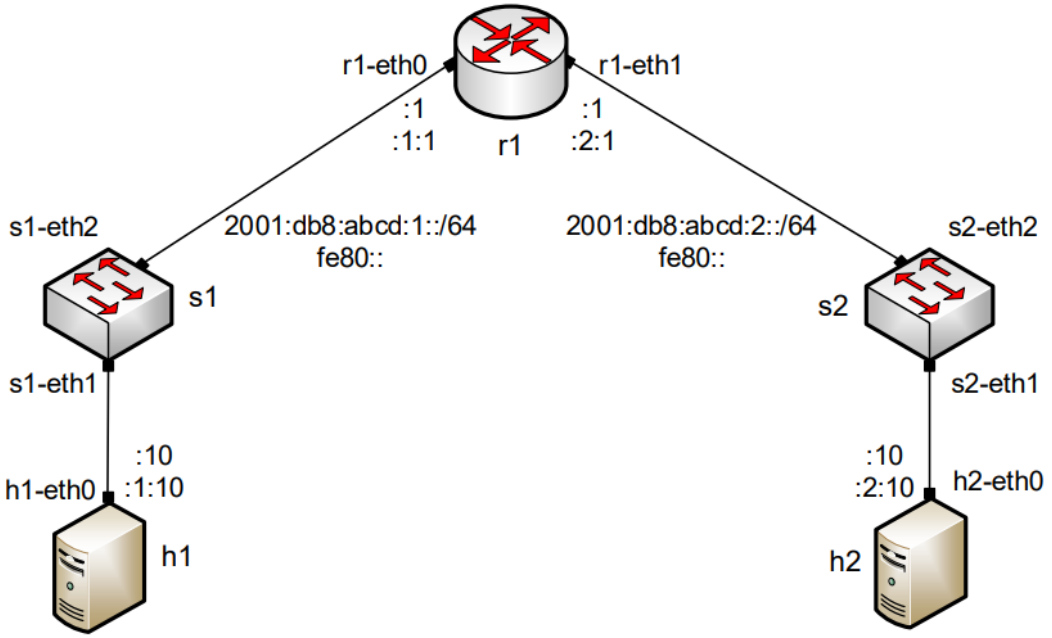
IPv6 Unicast Link Local Address

- Every IPv6-enabled network interface must have a link-local address
- It enables a device to communicate with other IPv6-enabled devices on the same link and only on that link (subnet)
- FE80::/10 range, first 10 bits are 1111 1110 10xx xxxx



Network Topology

- Lab 3



Network topology

Device	Interface	IPV6 Address	Subnet	Default gateway
Router r1	r1-eth0	2001:db8:abcd:1::1 fe80::1:1	/64 /64	N/A
	r1-eth1	2001:db8:abcd:2::1 fe80::2:1	/64 /64	N/A
Host h1	h1-eth0	2001:db8:abcd:1::10 fe80::1:10	/64 /64	2001:db8:abcd:1::1
Host h2	h2-eth0	2001:db8:abcd:2::10 fe80::2:10	/64 /64	2001:db8:abcd:2::1

Address information

Network Topology

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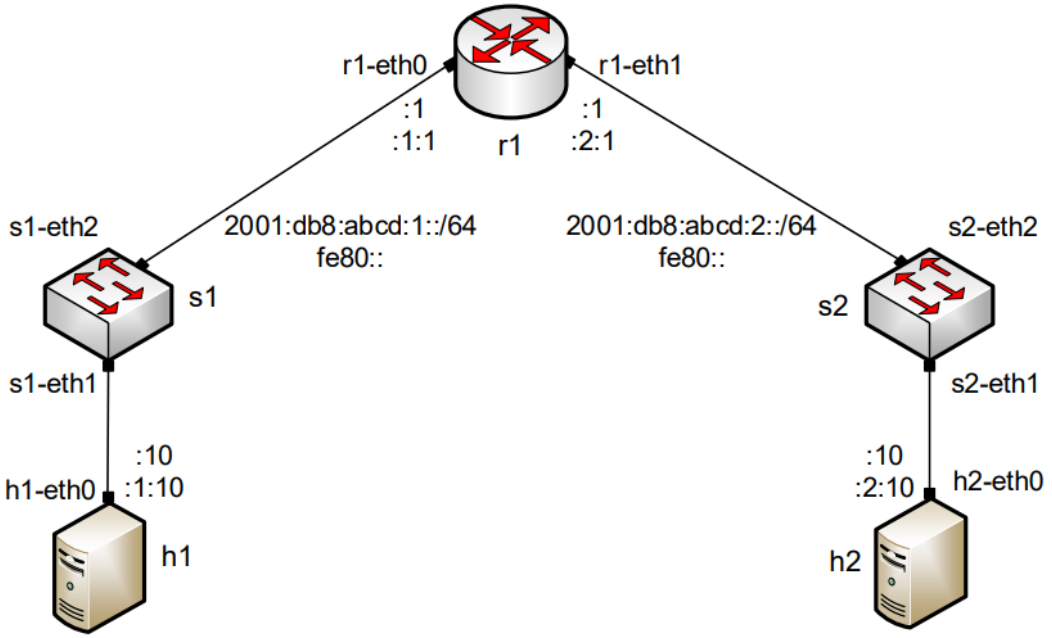

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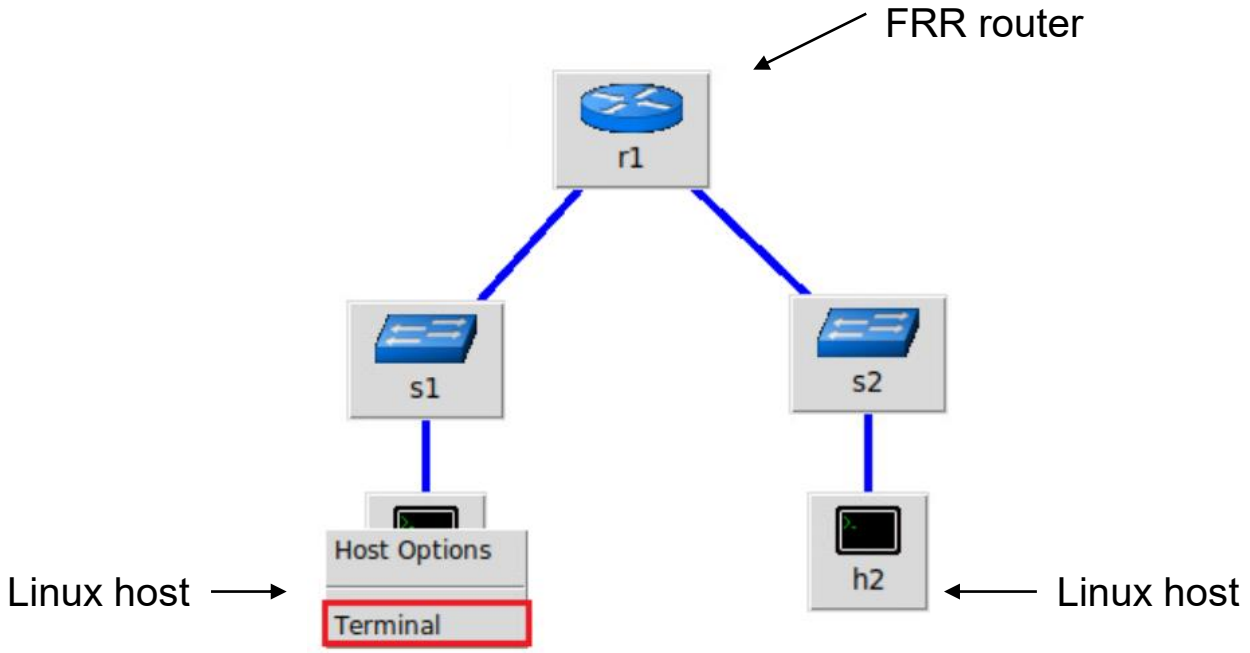

Mininet implementation

Network Topology

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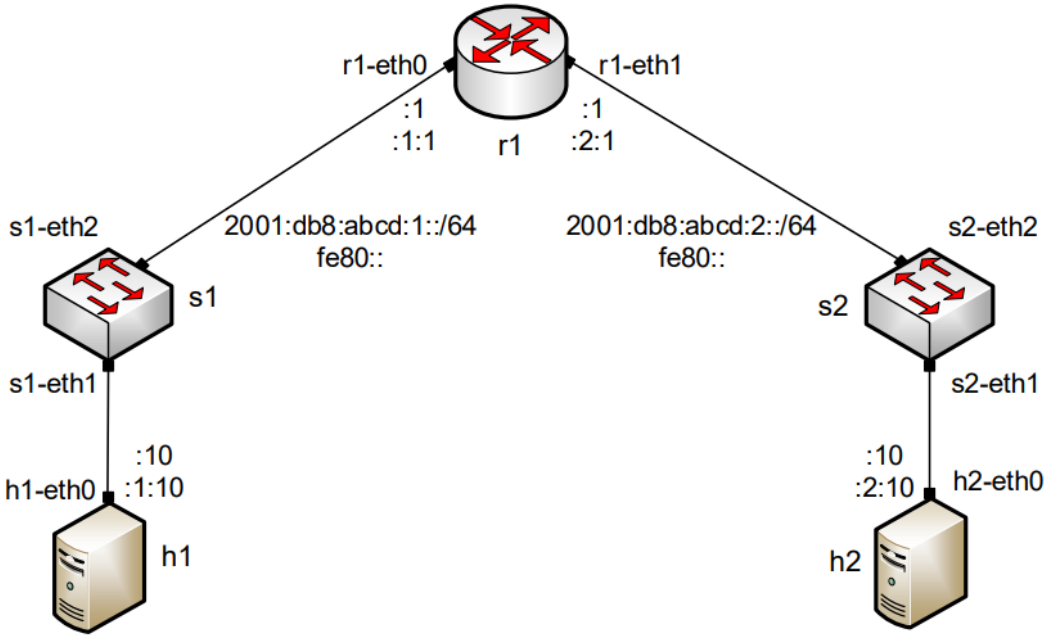

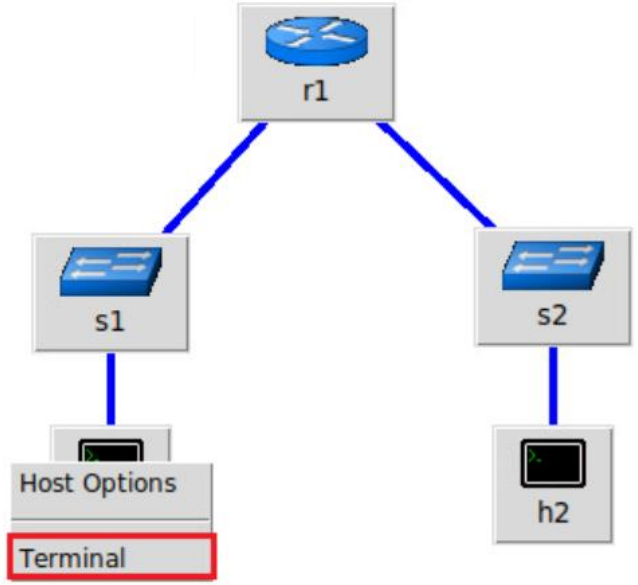

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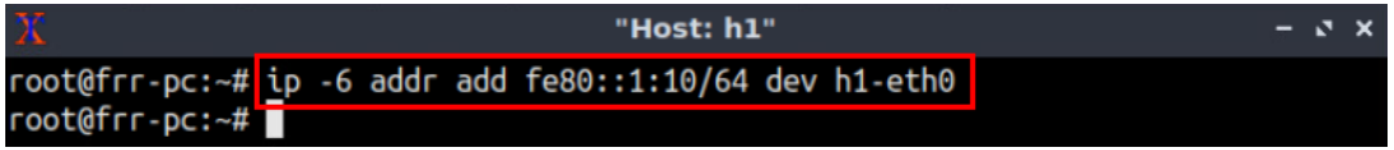

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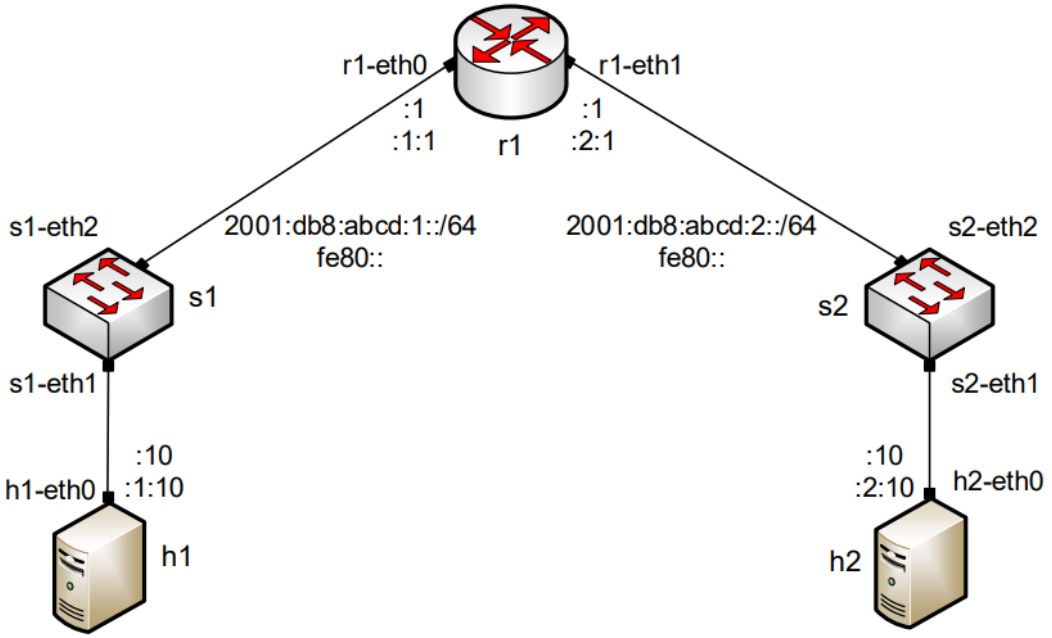

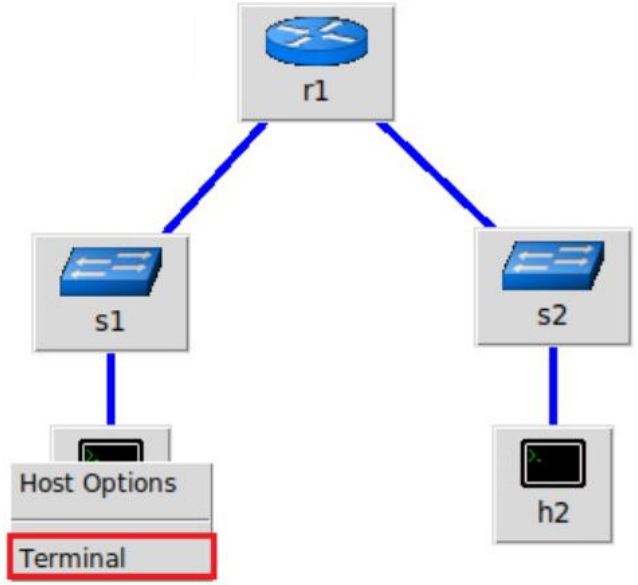

Network topology

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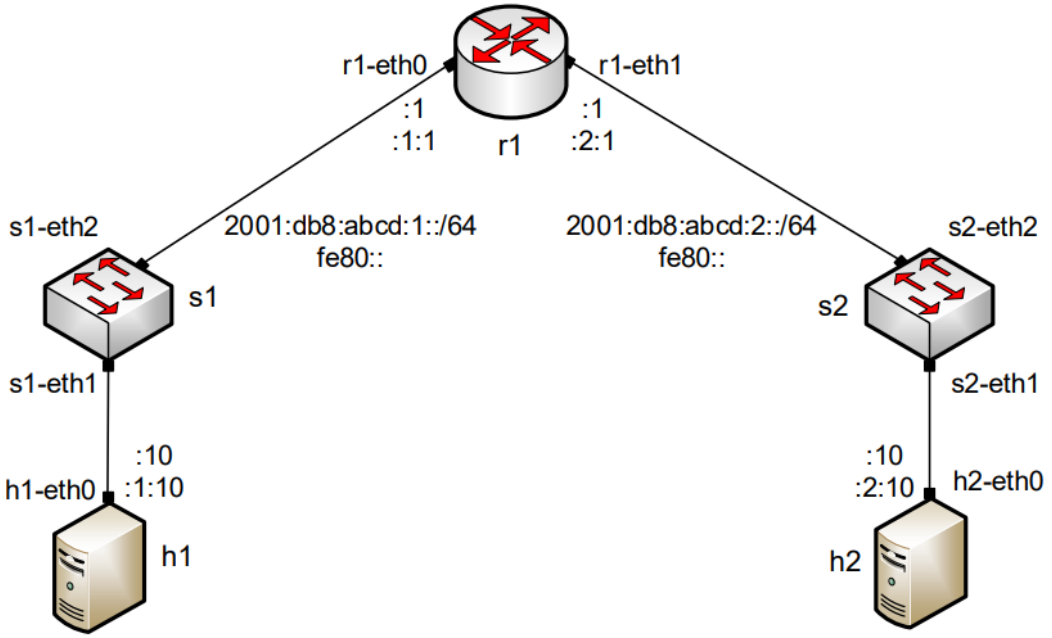

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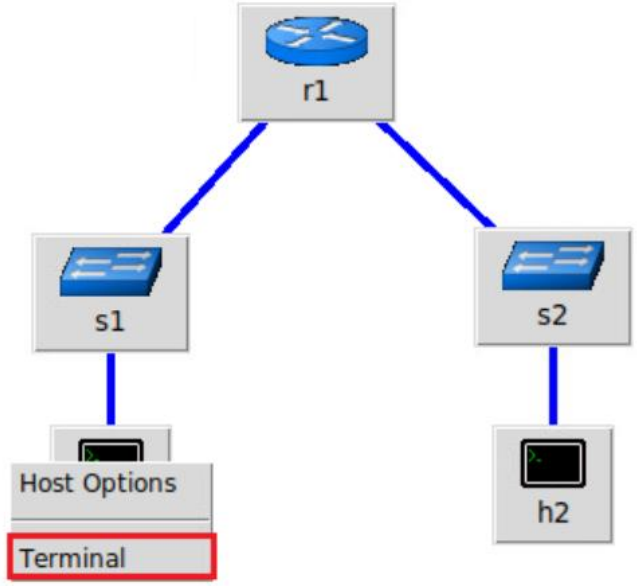

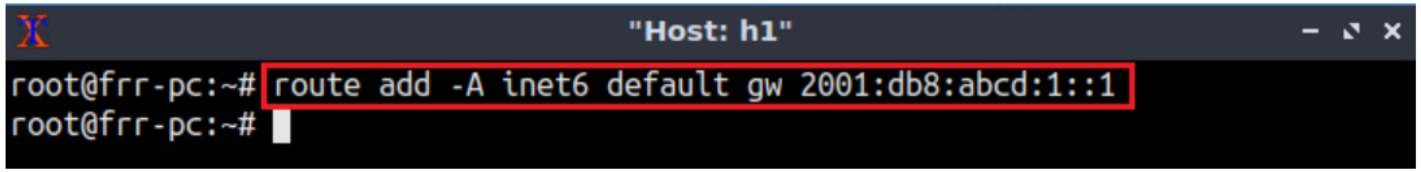

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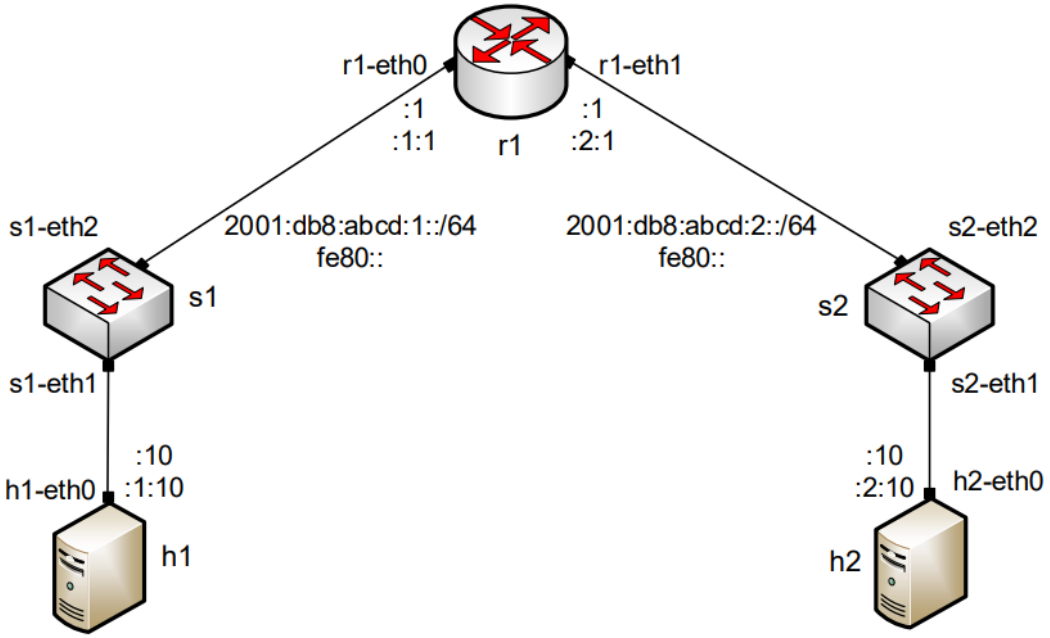

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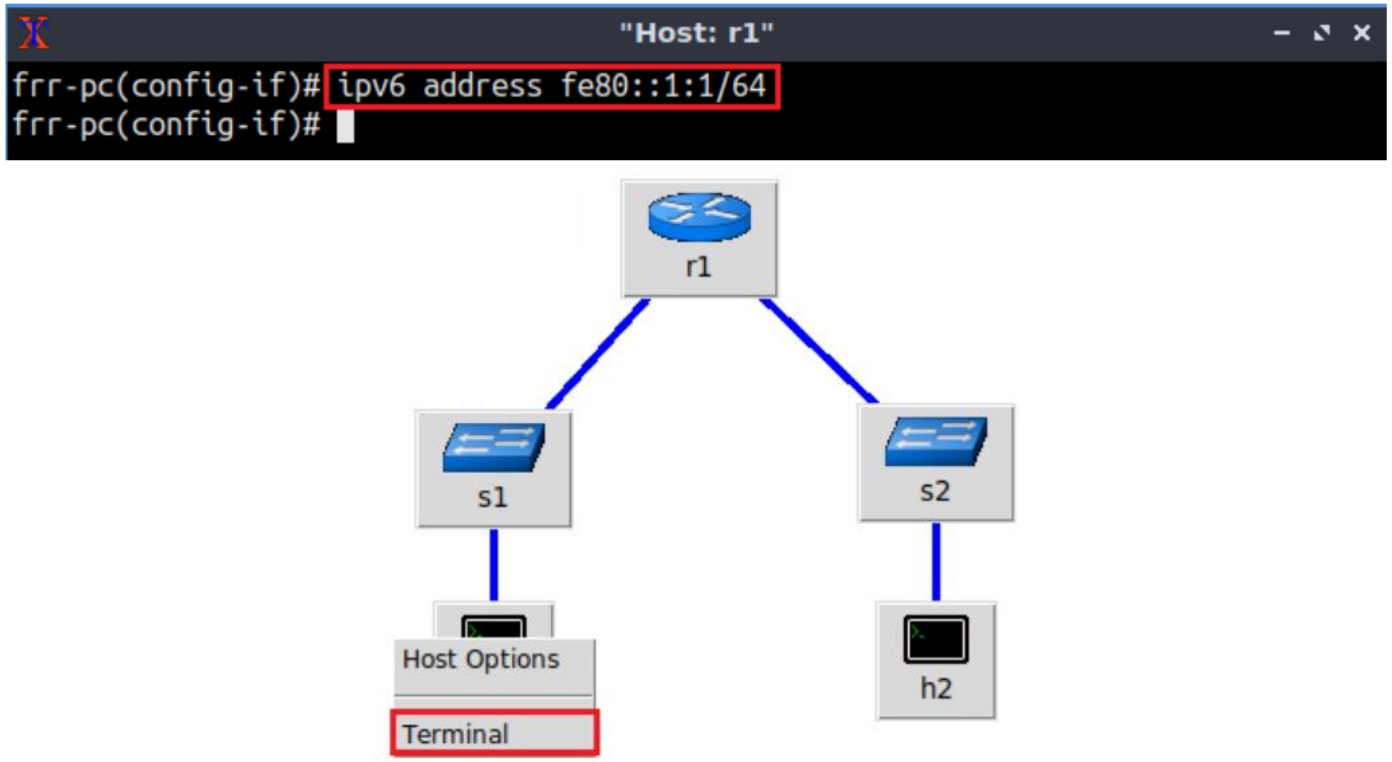

Mininet implementation

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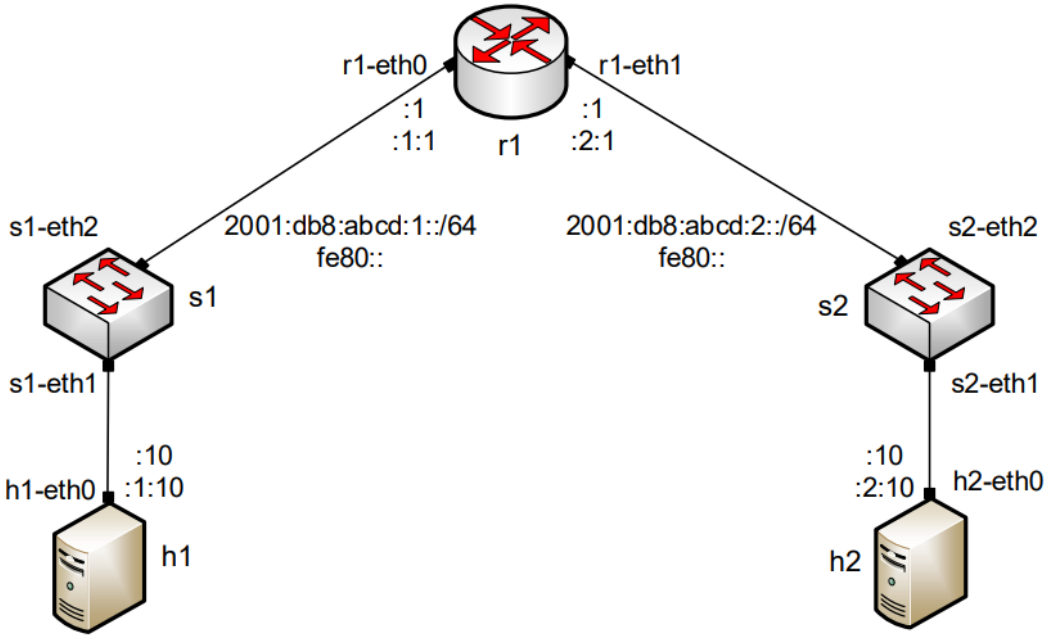

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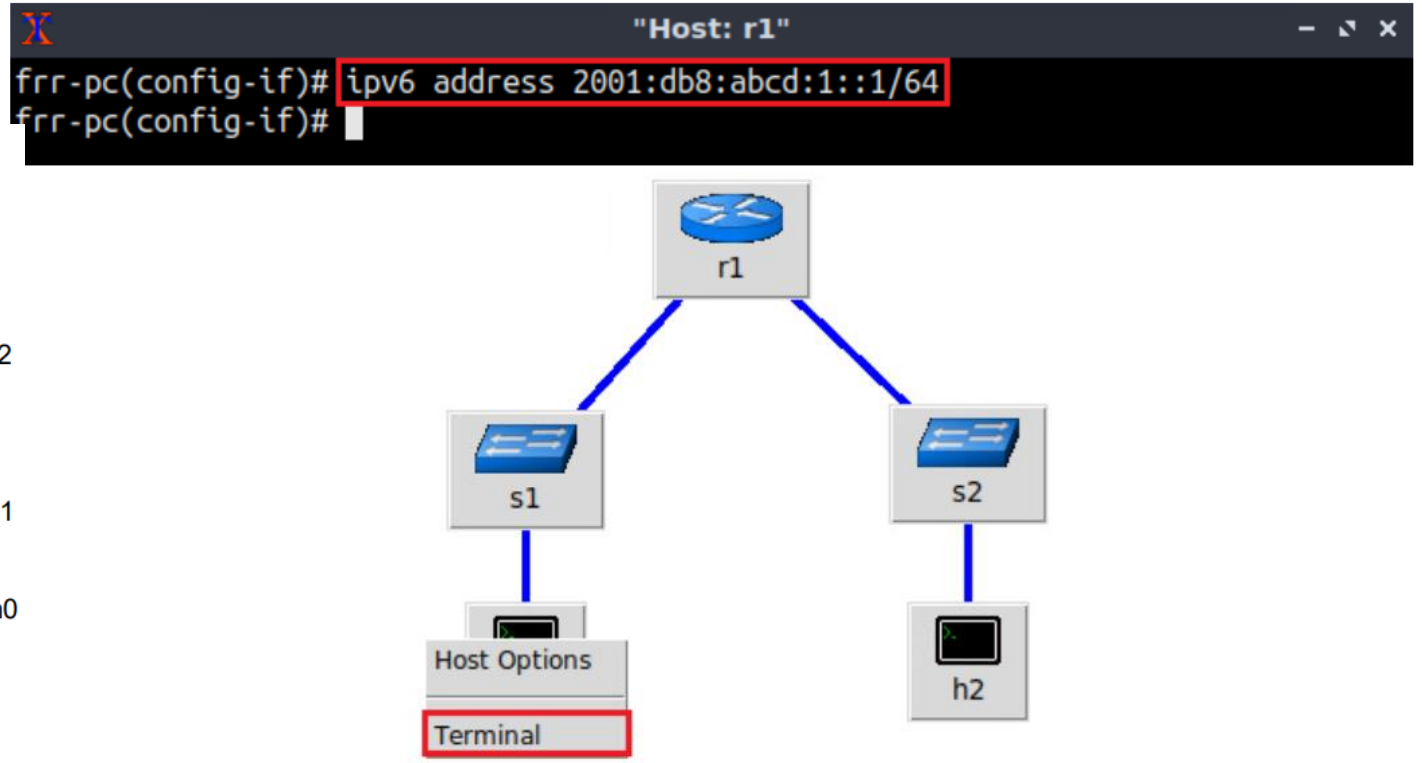

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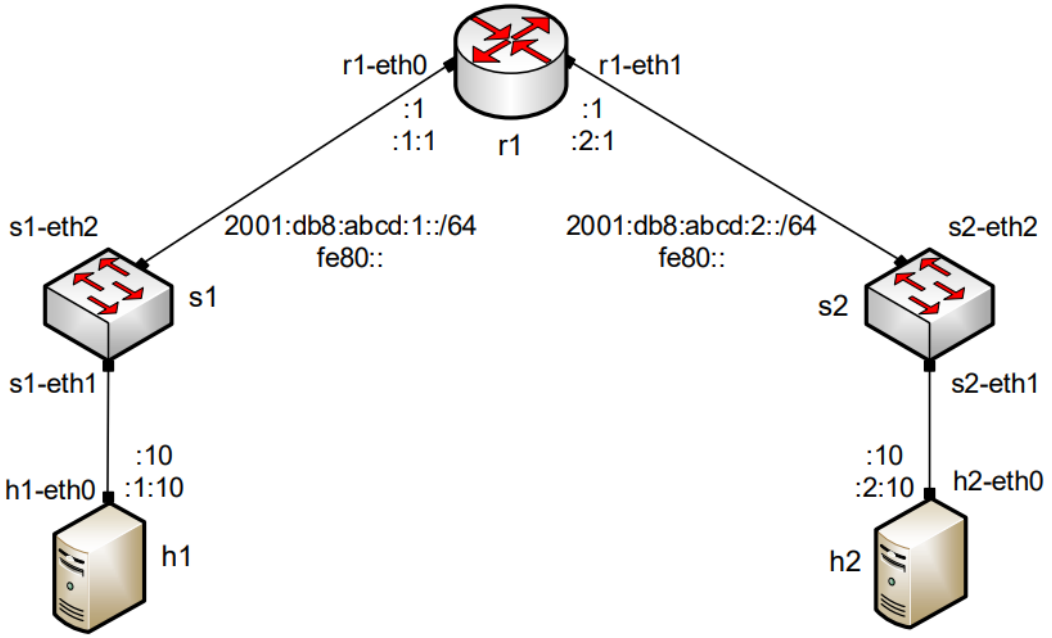

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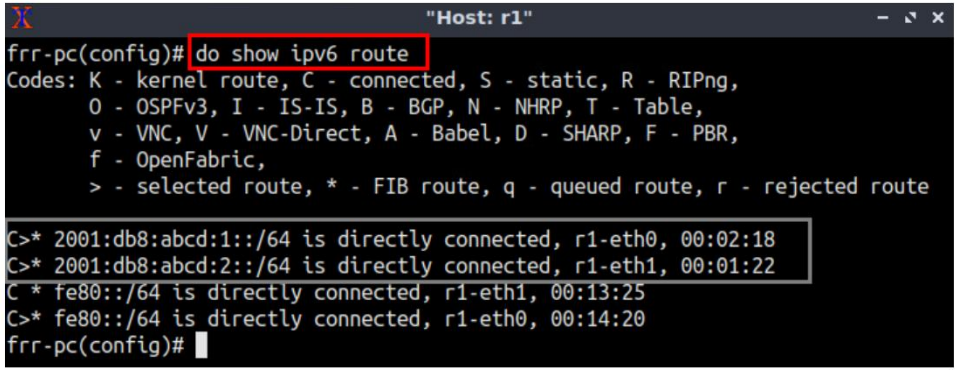

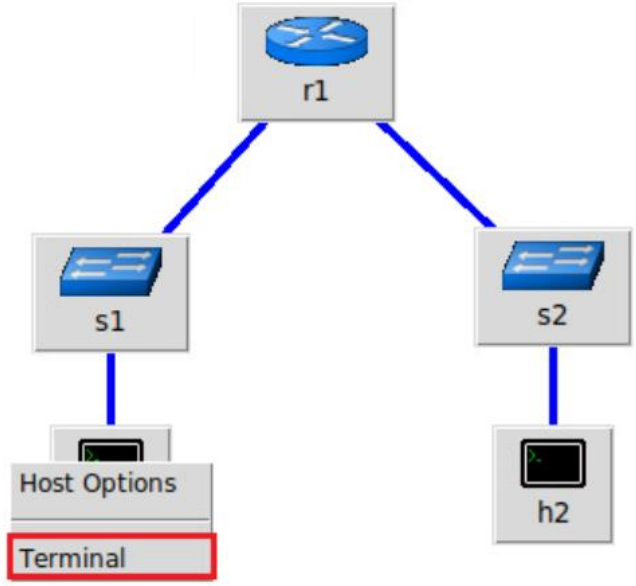

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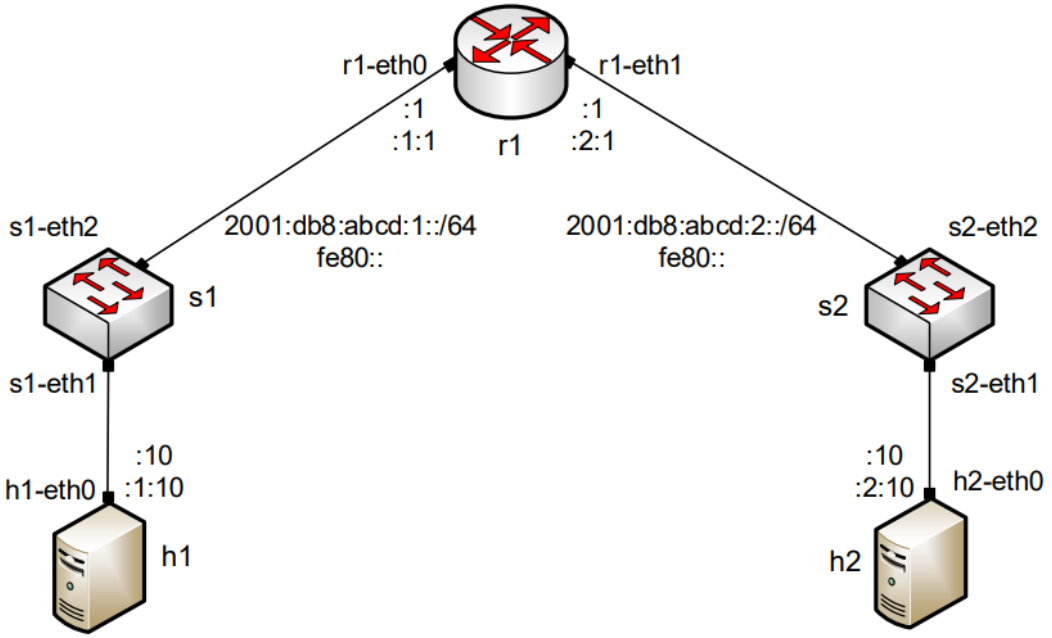

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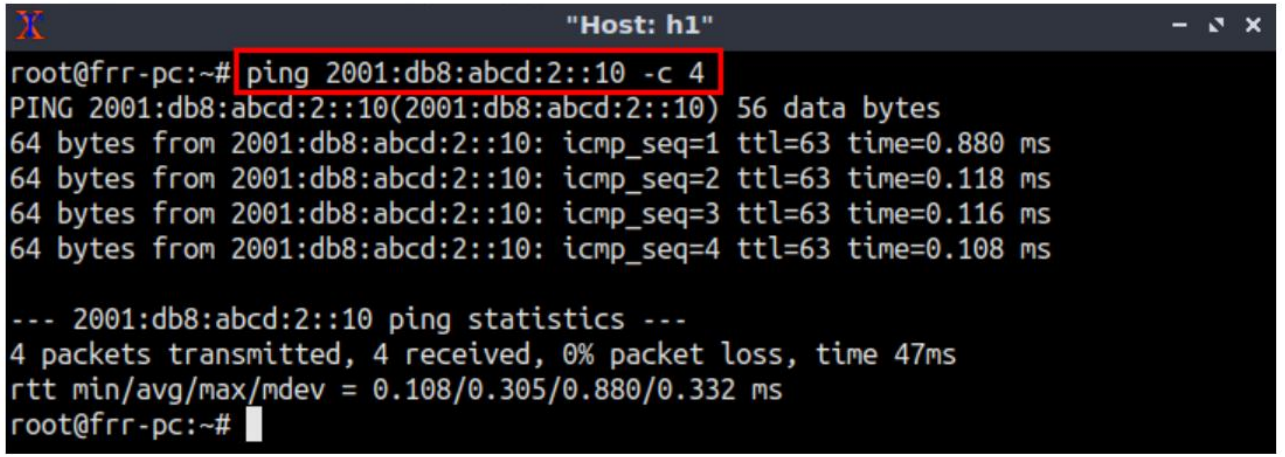

Testing connectivity from host h1 to host h2

Accessing the Platform

- Please use the following link to access the platform: https://netlab.cec.sc.edu/
- Login using the following credentials:
- **Username:** email used for registration
- **Temporary Password:** nsf-2025

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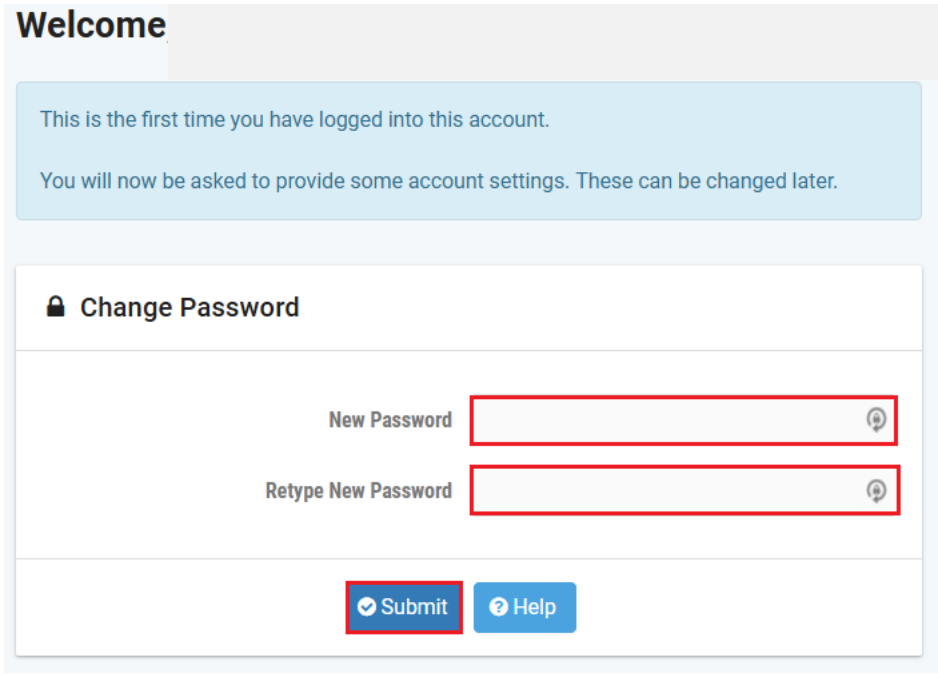

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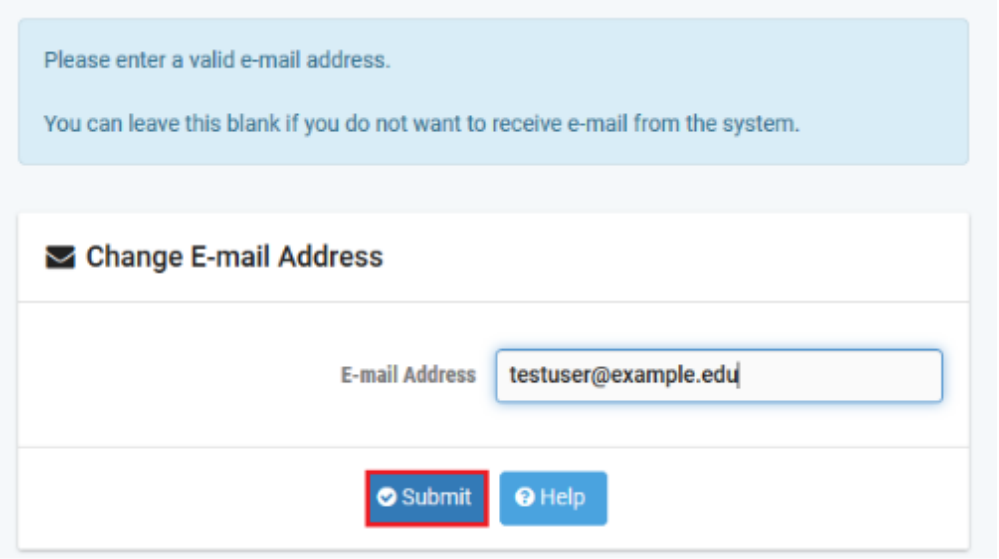
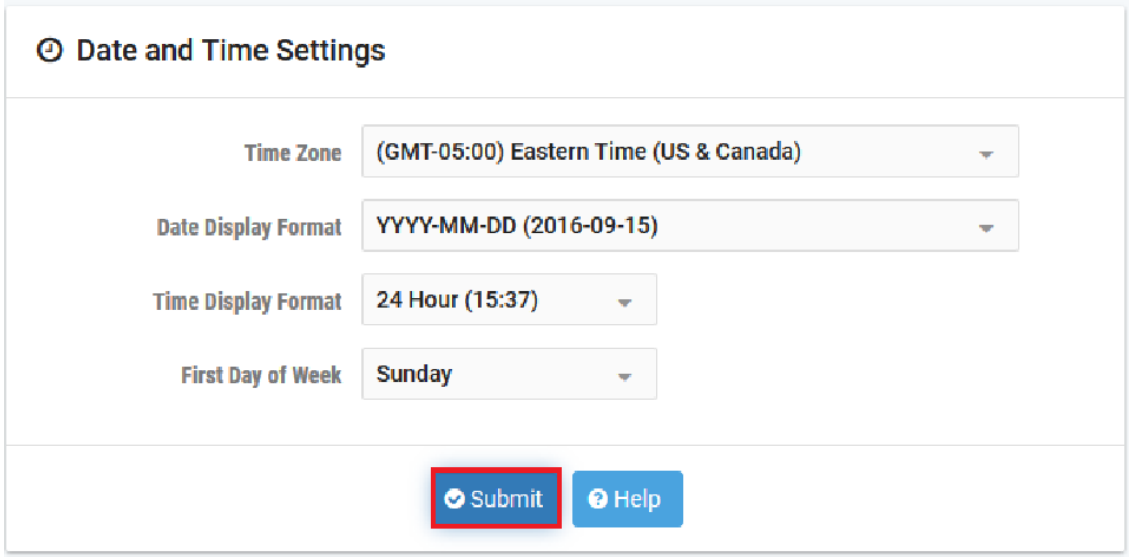
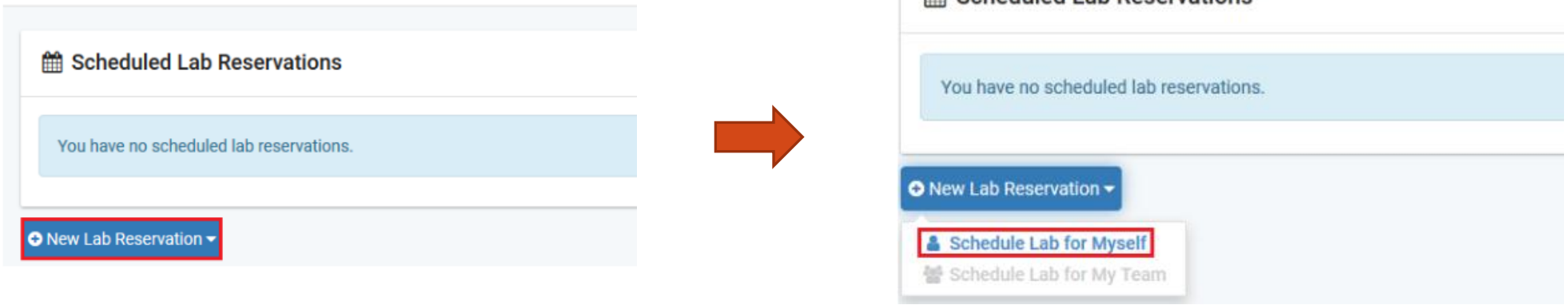




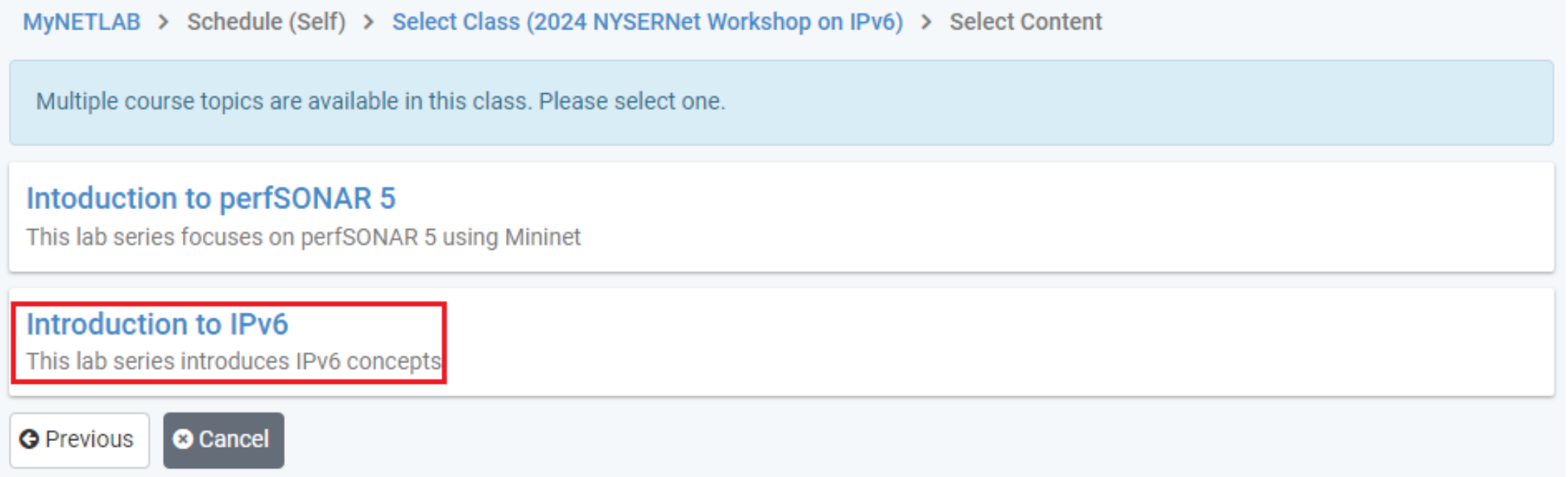
Accessing the Platform

- Click on New Lab Reservation
- Click on Schedule Lab for Myself



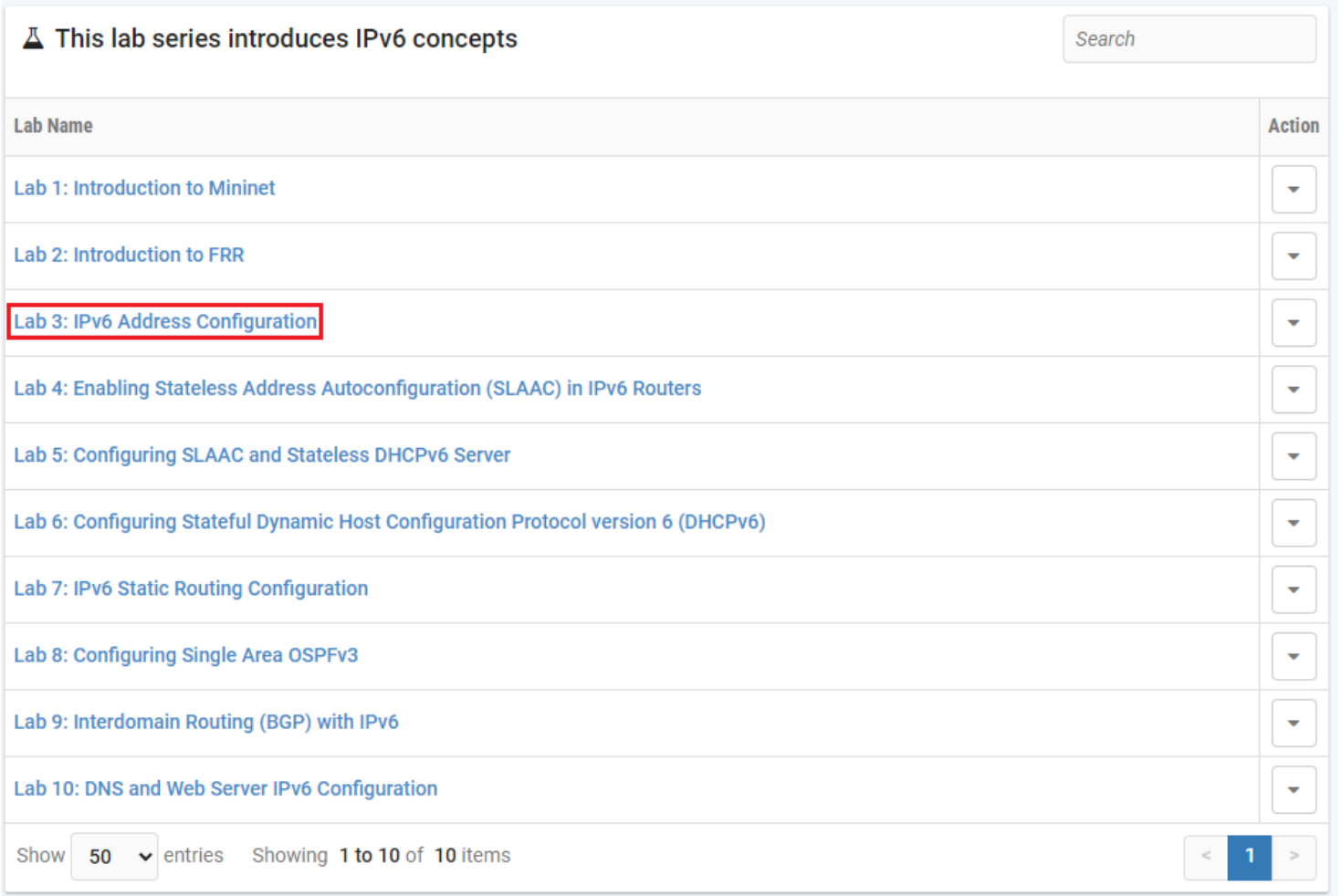
Accessing the Platform

- Select the course
- For this session, we will use “Introduction to IPv6”



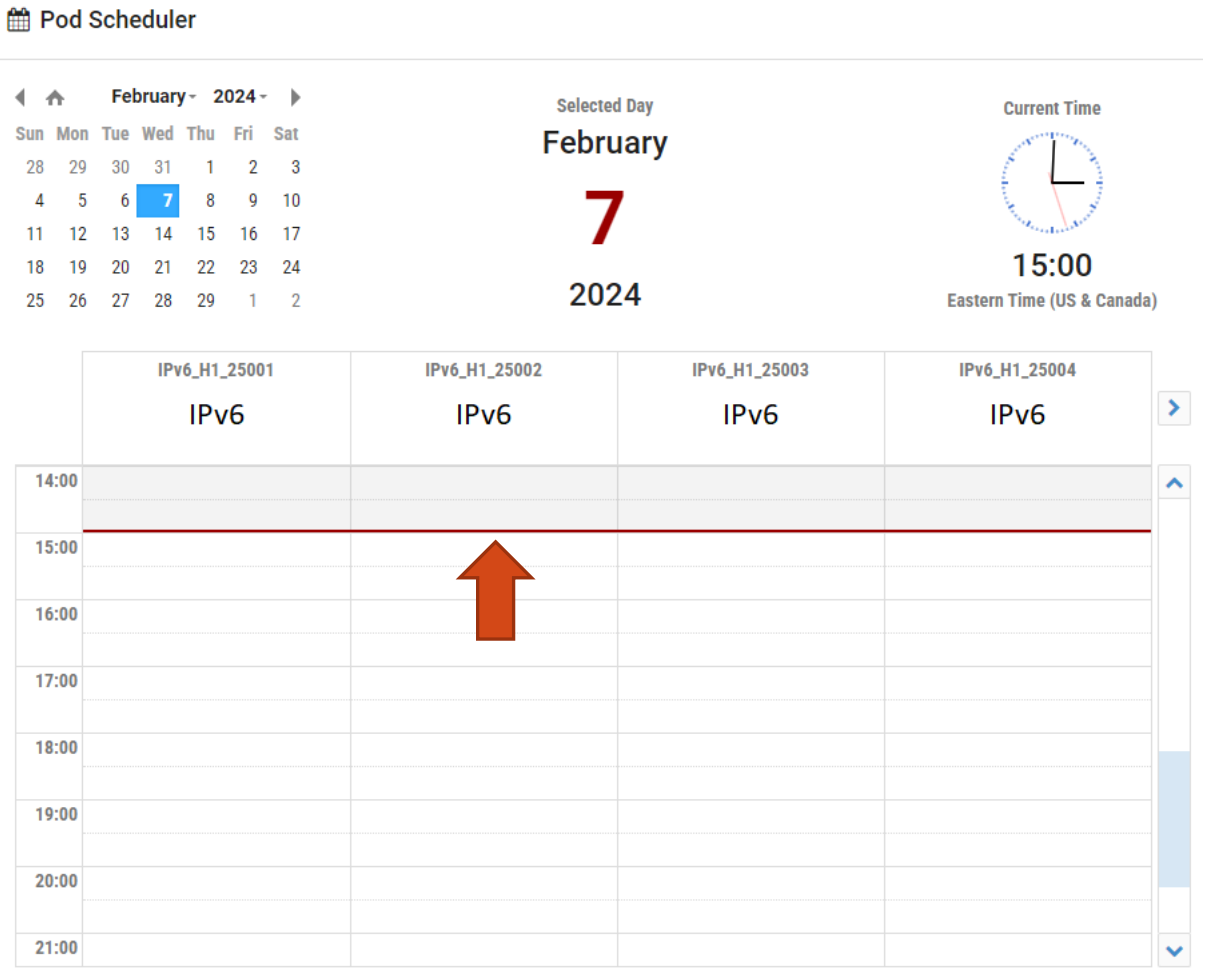
Accessing the Platform

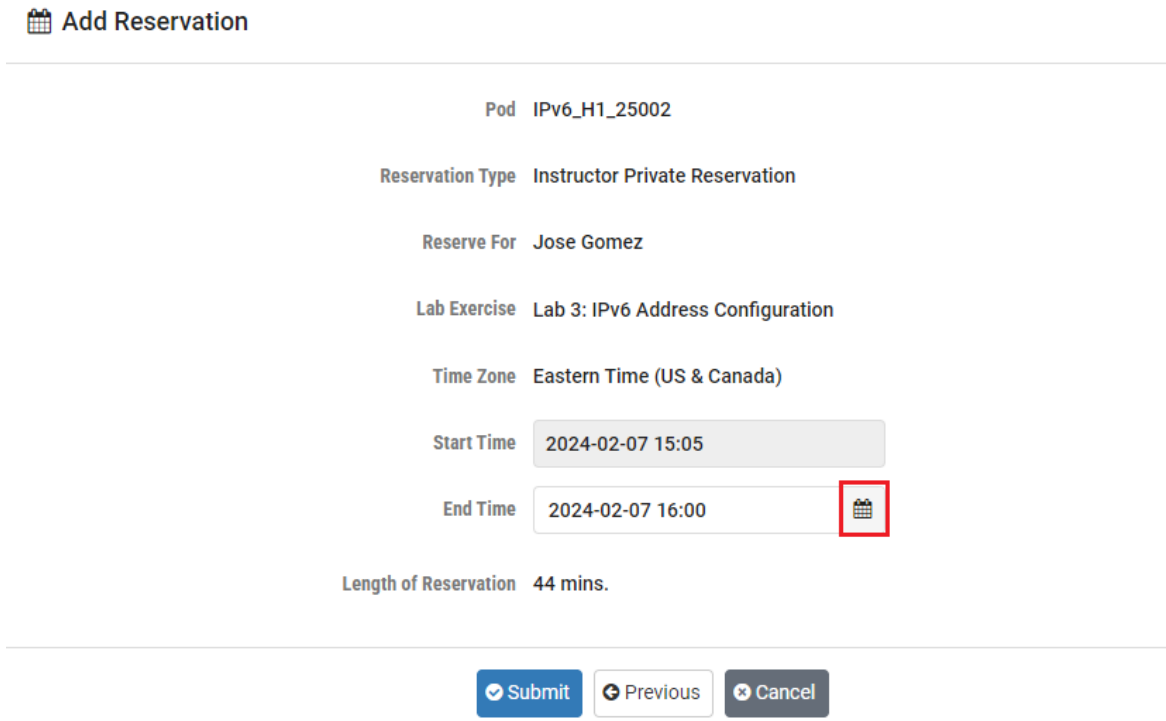
- Select the Lab
- For this session, we will run:
  - Lab 3: IPv6 Address Configuration



Accessing the Platform

- Select the next available POD and allocate time





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Network Topology

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