# Introduction to P4-DPDK

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# Introduction to P4-DPDK

Lab activities are described in Lab 1, P4-DPDK lab series
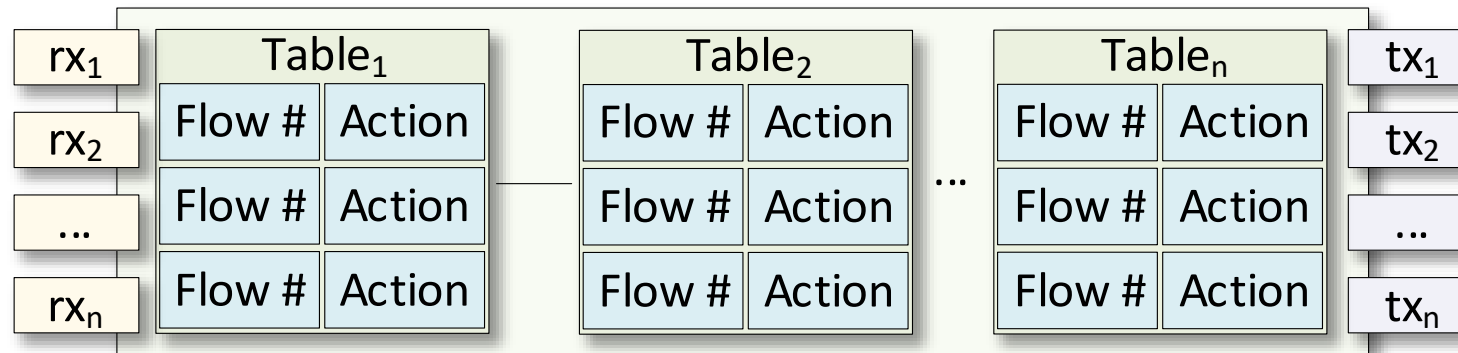
# P4-DPDK Lab series

- https://research.cec.sc.edu/files/cyberinfra/files/P4-DPDK_manuals.pdf

Lab 1      Introduction to P4-DPDK
Lab 2      P4 Program Building Blocks with the PNA Architecture
Lab 3      PNA Parser Implementation
Lab 4      Introduction to Match-action Tables (Part 1)
Lab 5      Introduction to Match-action Tables (Part 2)
Lab 6      Populating and Managing Match-action Tables at Runtime
Lab 7      Checksum Recalculation and Packet Deparsing

P4-DPDK

dtap0

dtap1

h1

h2

Namespace h1

192.168.10.1/24

Namespace h2

192.168.10.2/24
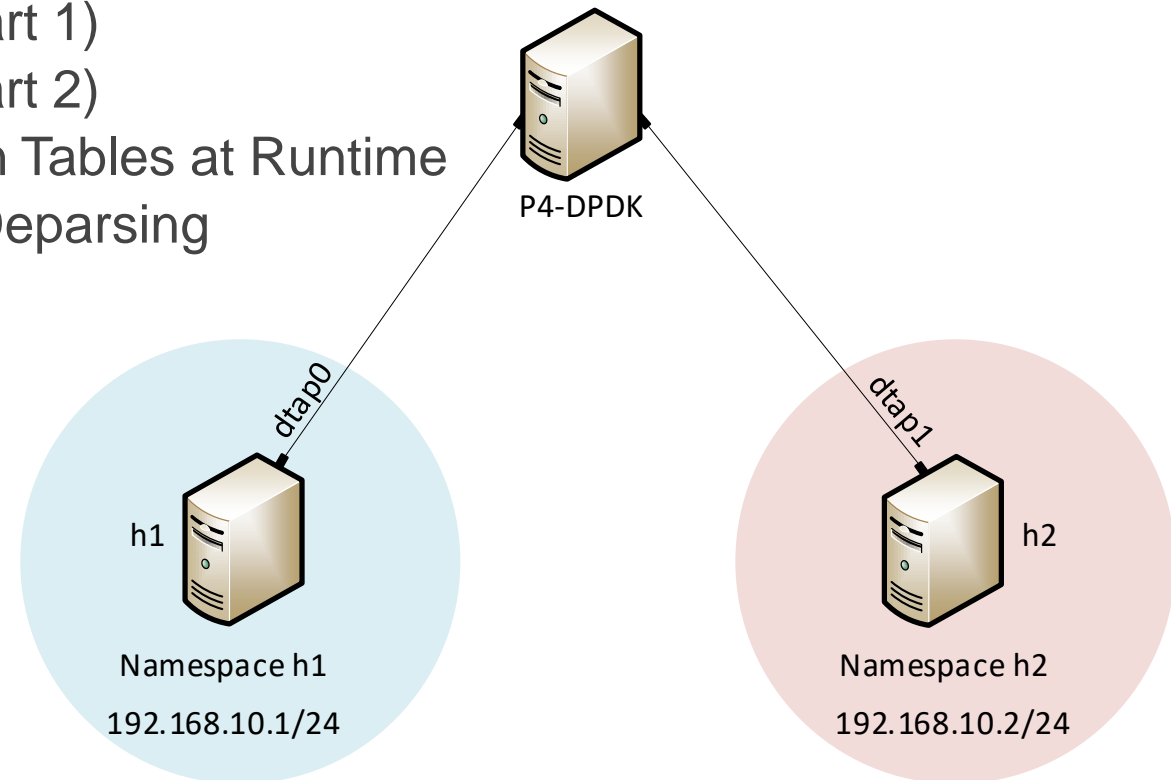
# DPDK Pipeline Model

- DPDK libraries are needed to build a programmable pipeline for user applications
- A DPDK pipeline is composed of three elements:
  - Input ports
  - Tables
  - Output ports

| rx$_1$ | Table$_1$ | | | Table$_2$ | | | Table$_n$ | | tx$_1$ |
|---|---|---|---|---|---|---|---|---|---|
| rx$_2$ | Flow # | Action | | Flow # | Action | ... | Flow # | Action | tx$_2$ |
| ... | Flow # | Action | | Flow # | Action | | Flow # | Action | ... |
| rx$_n$ | Flow # | Action | | Flow # | Action | | Flow # | Action | tx$_n$ |

# P4-DPDK Workflow

- Workflow used to program the P4-DPDK pipeline
- The labs use the p4c-dpdk compiler to compile the P4 code into a DPDK pipeline executable

.p4 → p4c-dpdk → .spec → DPDK pipeline library → .c → C compiler → .so
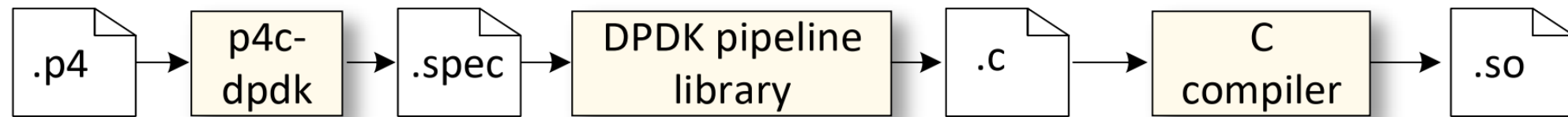
# p4c-dpdk Compiler

```
control MainControlImpl(
    inout headers_t         hdr,
    inout main_metadata_t user_meta,
    in    pna_main_input_metadata_t  istd,
    inout pna_main_output_metadata_t ostd)
{


    apply {

        if (istd.input_port == (PortId_t) 0){
            send_to_port((PortId_t) 1);
        }
        else if (istd.input_port == (PortId_t) 1){
            send_to_port((PortId_t) 0);
        }

    }
}
```

.p4

p4c-dpdk →

```
apply {
    rx m.pna_main_input_metadata_input_port
    extract h.ethernet
    jmpeq MAINPARSERIMPL_PARSE_IPV4 h.ethernet.etherType 0x800
    jmp MAINPARSERIMPL_ACCEPT
    MAINPARSERIMPL_PARSE_IPV4 : extract h.ipv4
    jmpeq MAINPARSERIMPL_PARSE_TCP h.ipv4.protocol 0x6
    jmp MAINPARSERIMPL_ACCEPT
    MAINPARSERIMPL_PARSE_TCP :  extract h.tcp
    MAINPARSERIMPL_ACCEPT : jmpneq LABEL_FALSE m.pna_main_input_metadata_input_port 0x0
    mov m.pna_main_output_metadata_output_port 0x1
    jmp LABEL_END
    LABEL_FALSE :    jmpneq LABEL_END m.pna_main_input_metadata_input_port 0x1
    mov m.pna_main_output_metadata_output_port 0x0
    LABEL_END : emit h.ethernet
    emit h.ipv4
    emit h.tcp
    tx m.pna_main_output_metadata_output_port
}
```

.spec

# Lab Topology and Objectives

- Two network namespaces, h1 and h2, are linked to the host running the P4-DPDK pipeline

- Lab Objectives:
  - ➢ Implementing a DPDK pipeline from a P4 code
  - ➢ Building and running the pipeline
  - ➢ Building a network topology
  - ➢ Testing and verifying the P4 program

P4-DPDK

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dtap1

h1

h2

Namespace h1

192.168.10.1/24

Namespace h2

192.168.10.2/24
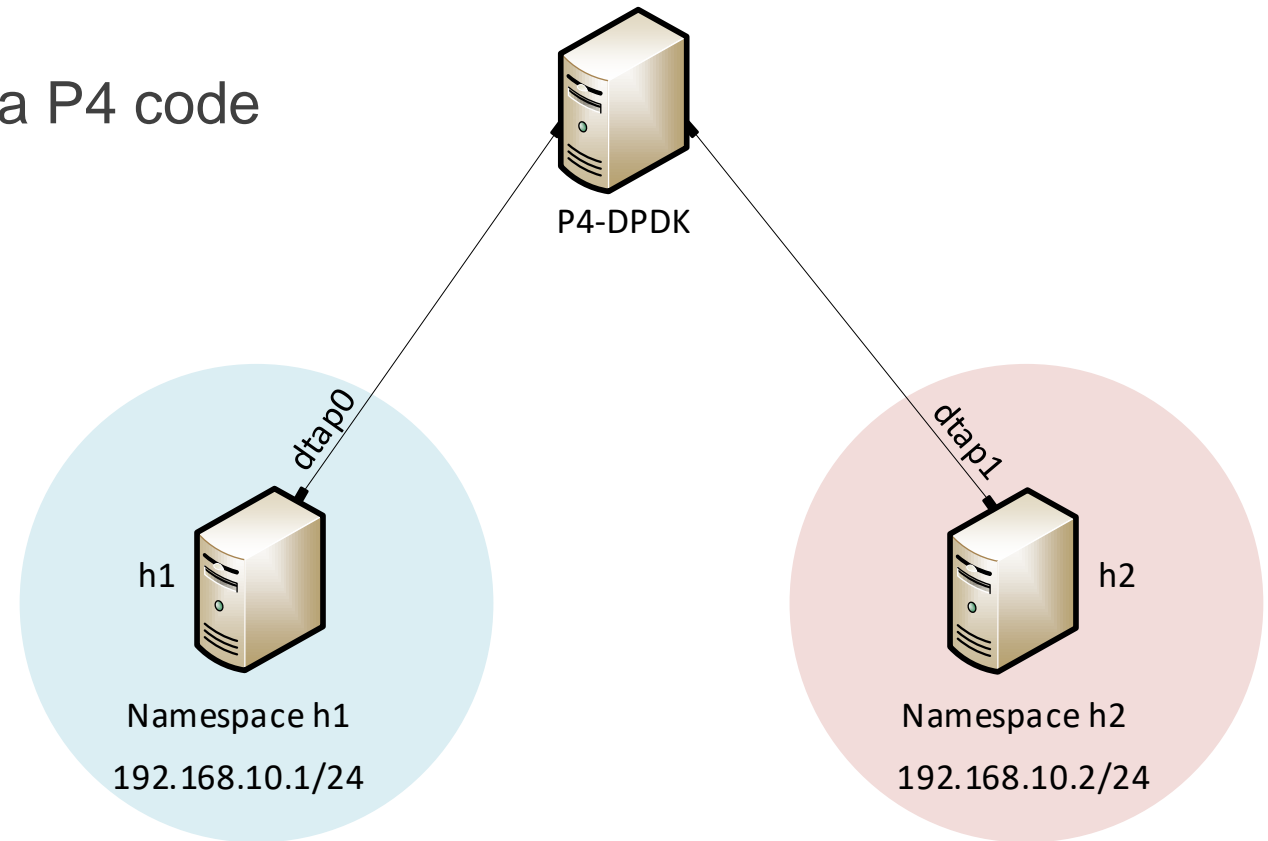
# Access Platform

- **URL:** [https://netlab.cec.sc.edu/](https://netlab.cec.sc.edu/)
- **Username:** <Email address used for registration>
- **Temporary Password:** nsf2024