DPDK

Open vSwitch with P4

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DPDK Summit Userspace - Dublin- 2016

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Overview

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- ▶ P4

- ▶ Benefits of P4 with OVS

- ▶ Packet Processing in OVS

- ▶ OVS vs OVS + P4 Comparison

- ▶ Questions

▶ **P**rogramming **P**rotocol-Independent **P**acket **P**rocessors

▶ High-level Domain Specific Language

▶ Describes packet processing applications

▶ Open source

Protocol Independent/Reconfigurable   Target Independent

General Purpose CPUs

FPGAs

NICS

GPUs

Benefits of P4 with OVS

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| Change	OVS LOC	P4 LOC
TCP Flags	370	4
Connection Label	411	5

▶ Easy addition of new protocols

▶ Performance

    ▶ Match and parse only on the fields relevant to our switch. E.g. an L2 switch doesn't need to parse L3 headers

▶ Separation of concerns

▶ Bring OVS-DPDK Userspace Datapath on par with Kernel Datapath

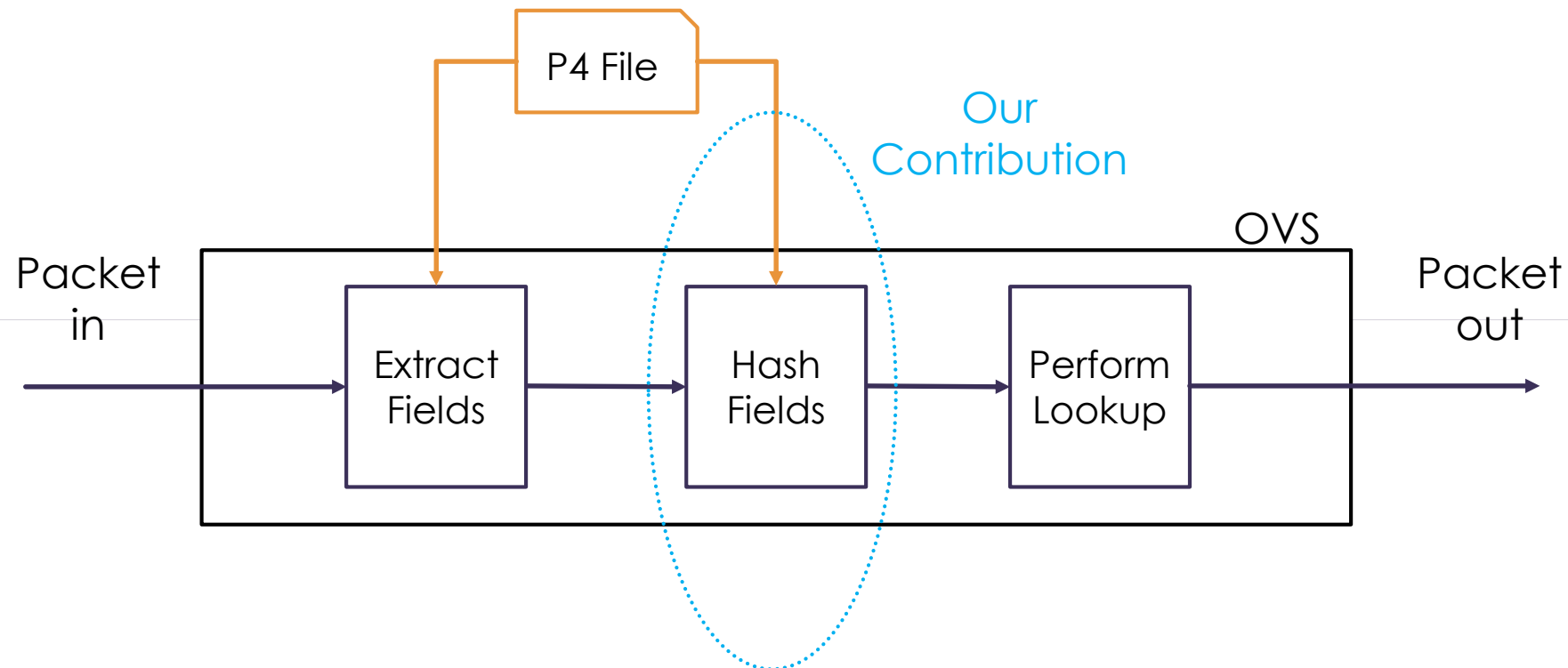   ▶ Datapath is implementation-agnostically defined in P4

Packet Processing in OVS

▶ In current OVS, the set of fields extracted and hashed is hardcoded

▶ Implementation has to support a lot different protocols
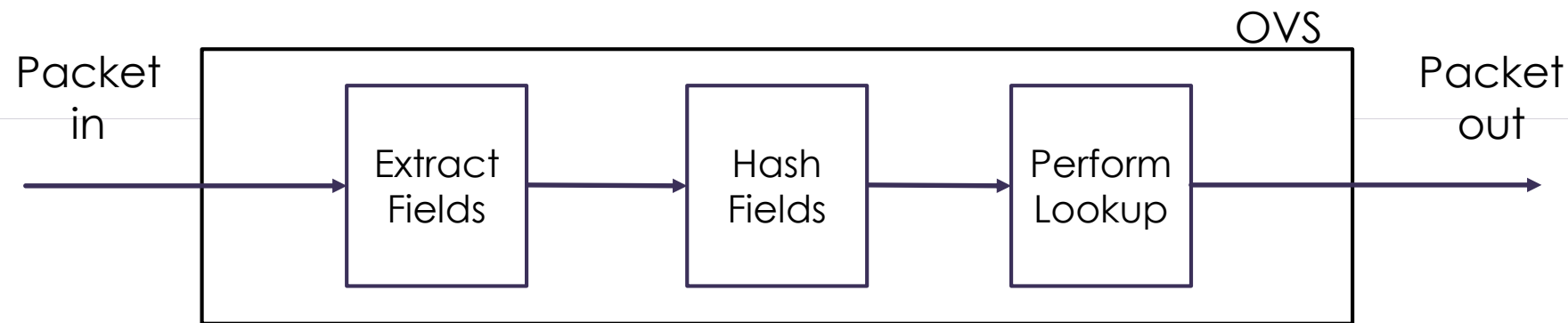
Packet Processing in OVS

- Extract and Hash stages dynamically generated
- OVS tuned to specific use case

OVS vs OVS + P4 Comparison

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Phy-Phy, L3 router case, 1 Core, 64Byte, 1 flow.

Relative Performance

1x   1.06x

■ OVS ■ OVS + P4
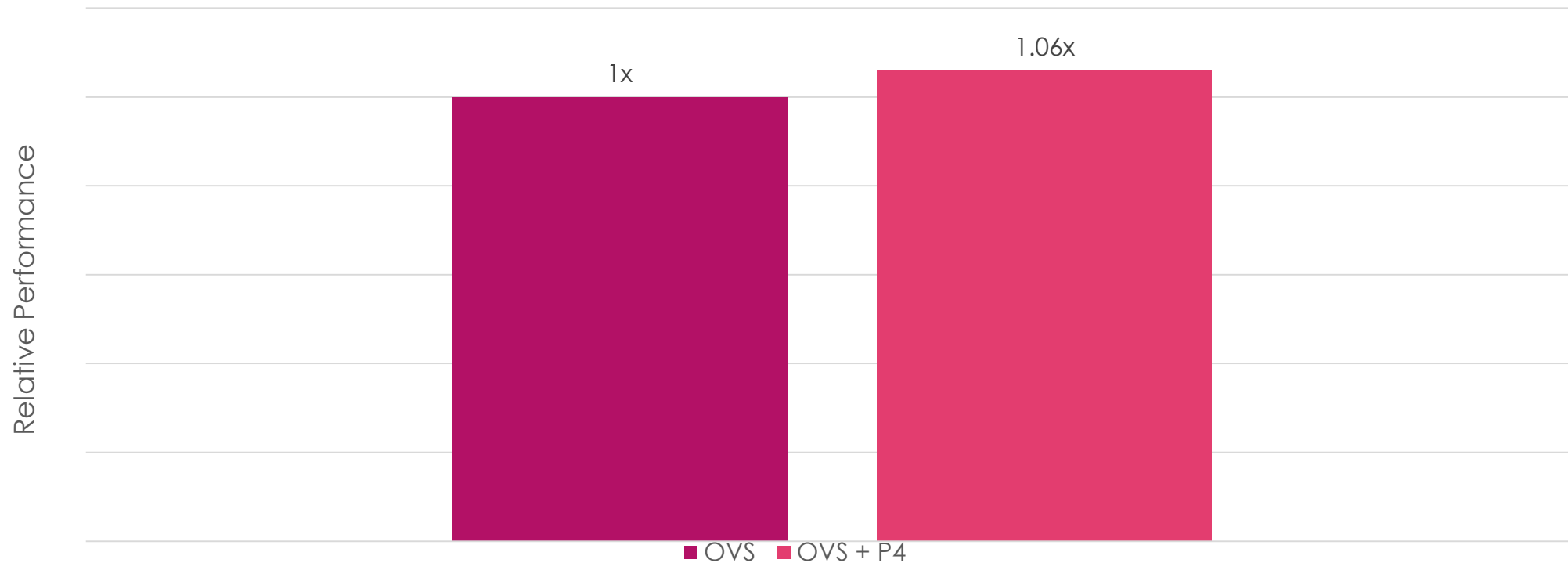
Test and System Configurations: Estimates are based on internal Intel analysis using Intel® Server Board S2600WT, Intel(R) Xeon(R) CPU E5-2695 v3 @ 2.30GHz, Intel® 82599ES 10 Gigabit Ethernet Controller

Questions?

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Support Slides

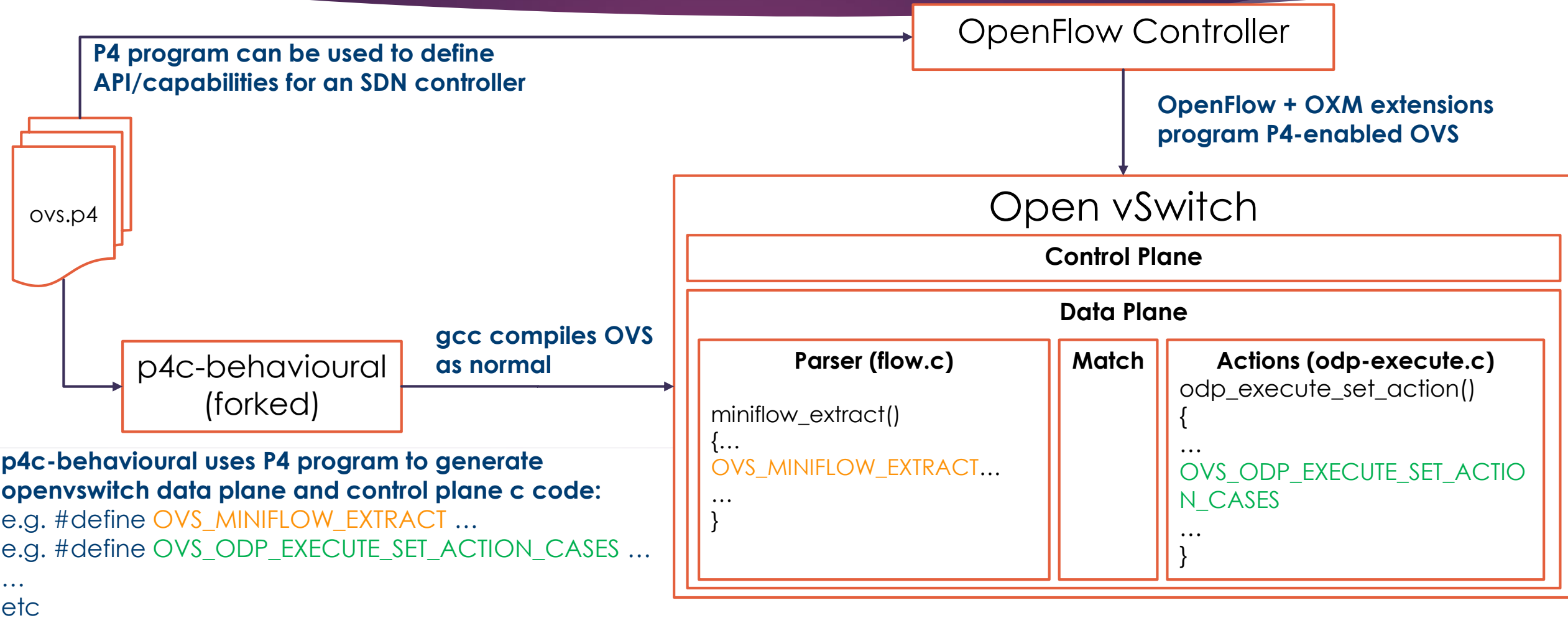# OVS P4 Detailed Architecture

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OpenFlow Controller

P4 program can be used to define API/capabilities for an SDN controller

OpenFlow + OXM extensions program P4-enabled OVS

ovs.p4

gcc compiles OVS as normal

p4c-behavioural (forked)

p4c-behavioural uses P4 program to generate openvswitch data plane and control plane c code:
e.g. #define OVS_MINIFLOW_EXTRACT …
e.g. #define OVS_ODP_EXECUTE_SET_ACTION_CASES …
…
etc

Open vSwitch

Control Plane

Data Plane

Parser (flow.c)	**Match**	**Actions (odp-execute.c)**

miniflow_extract()
{…
OVS_MINIFLOW_EXTRACT…
…
}
		odp_execute_set_action()
		{
		…
		OVS_ODP_EXECUTE_SET_ACTIO N_CASES
		…
		}

References

- Main web portal
  - http://pisces.cs.princeton.edu/
- Pisces Papers
  - http://pisces.cs.princeton.edu/papers/sigcomm16-pisces.pdf
- OVS Trees
  - https://github.com/mshahbaz/ovs/tree/p4
  - https://github.com/mshahbaz/p4c-behavioral/tree/ovs
- OVS Patches
  - http://openvswitch.org/pipermail/dev/2016-September/079647.html
  - http://openvswitch.org/pipermail/dev/2016-September/079647.html