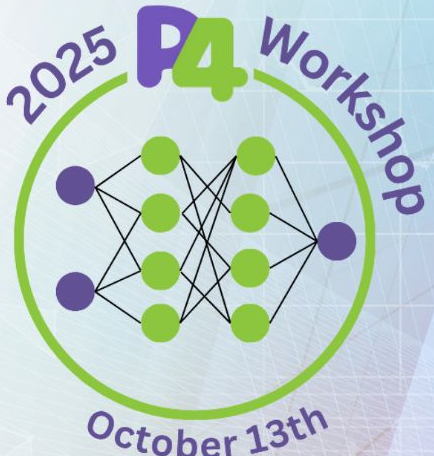


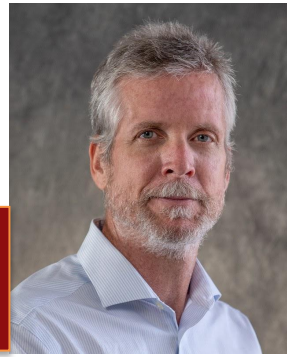
Unifying P4 with eBPF and DPDK via XDP2

Tom Herbert

XDPnet

THE LINUX FOUNDATION

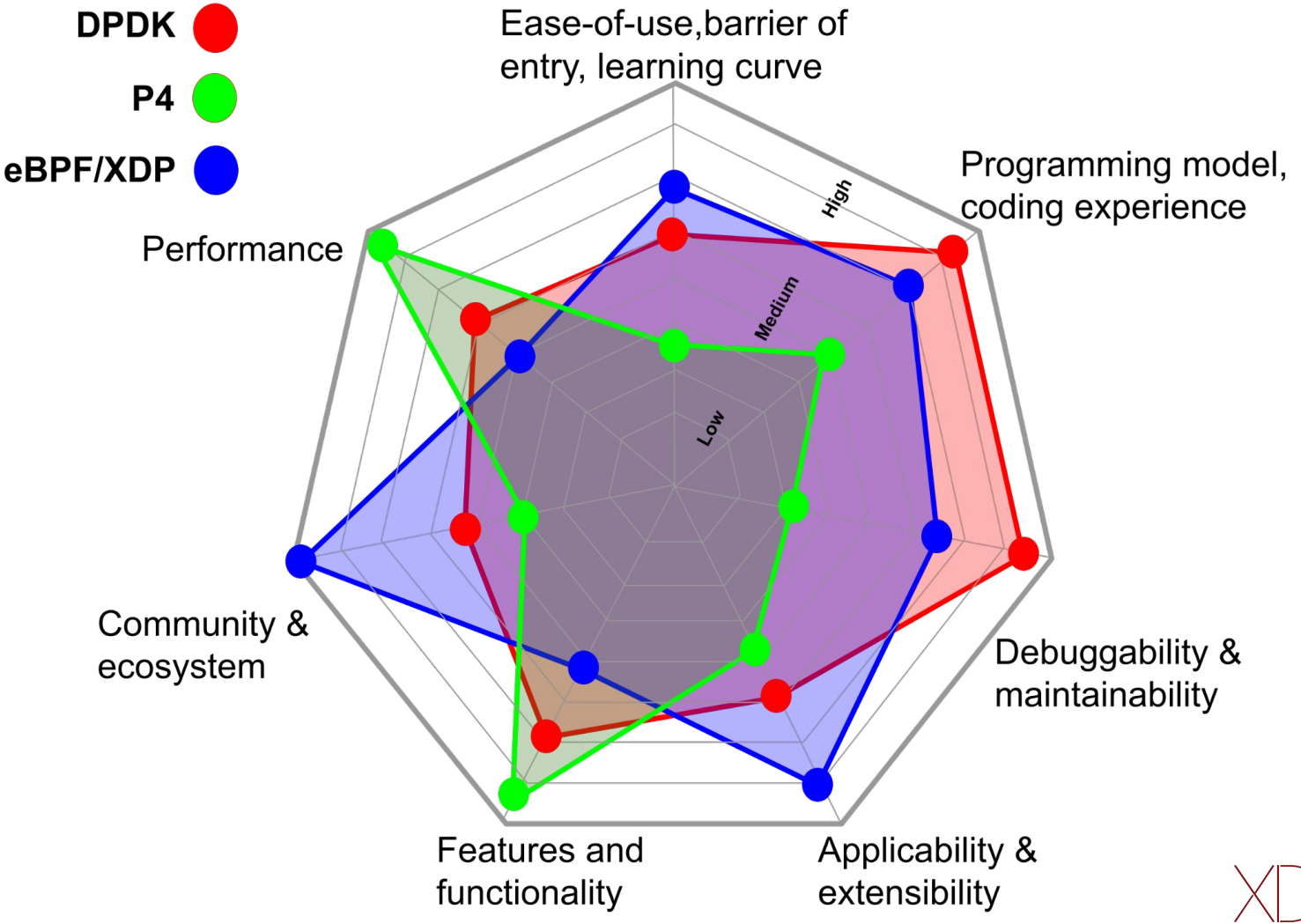
Tom Herbert



- Founder XDPnet
- Background in host data center networking– Intel, Facebook, Google, Nvidia
- Inventor of several industry transforming technologies including eXpress DataPath (XDP) and a myriad of features in Linux networking
- My blog: medium.com/@tom_84912

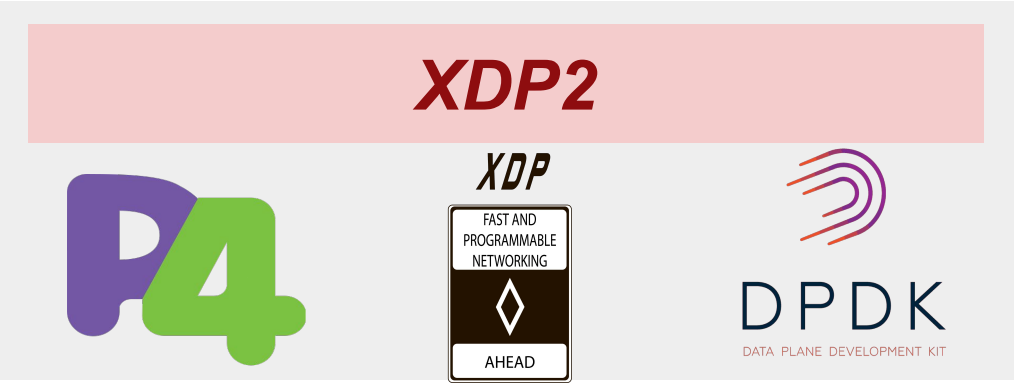
XDPnet

The Grand Unification



XDP2 is the programming model for the datapath

- User writes their datapath in a language that's convenient for them
- Their code compiles into a variety of target
- It's a type of convergence layer



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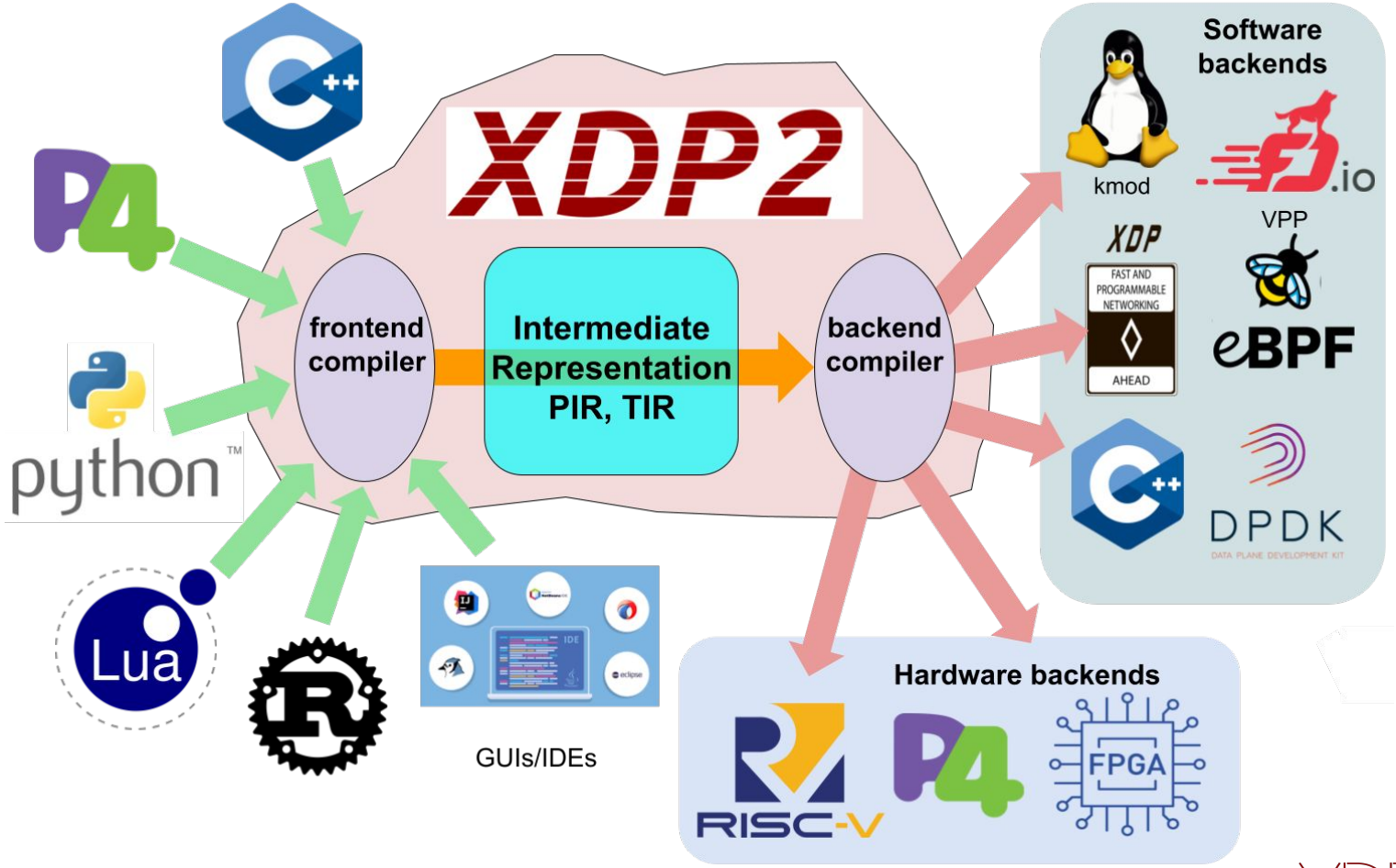
Write once, run anywhere, run well!



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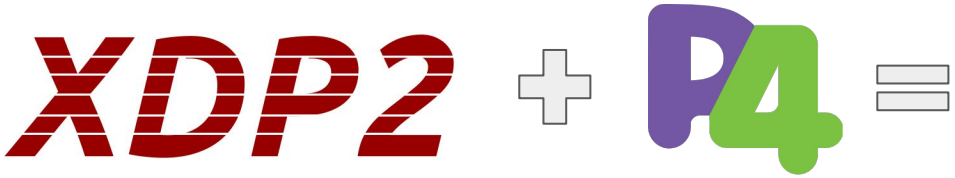
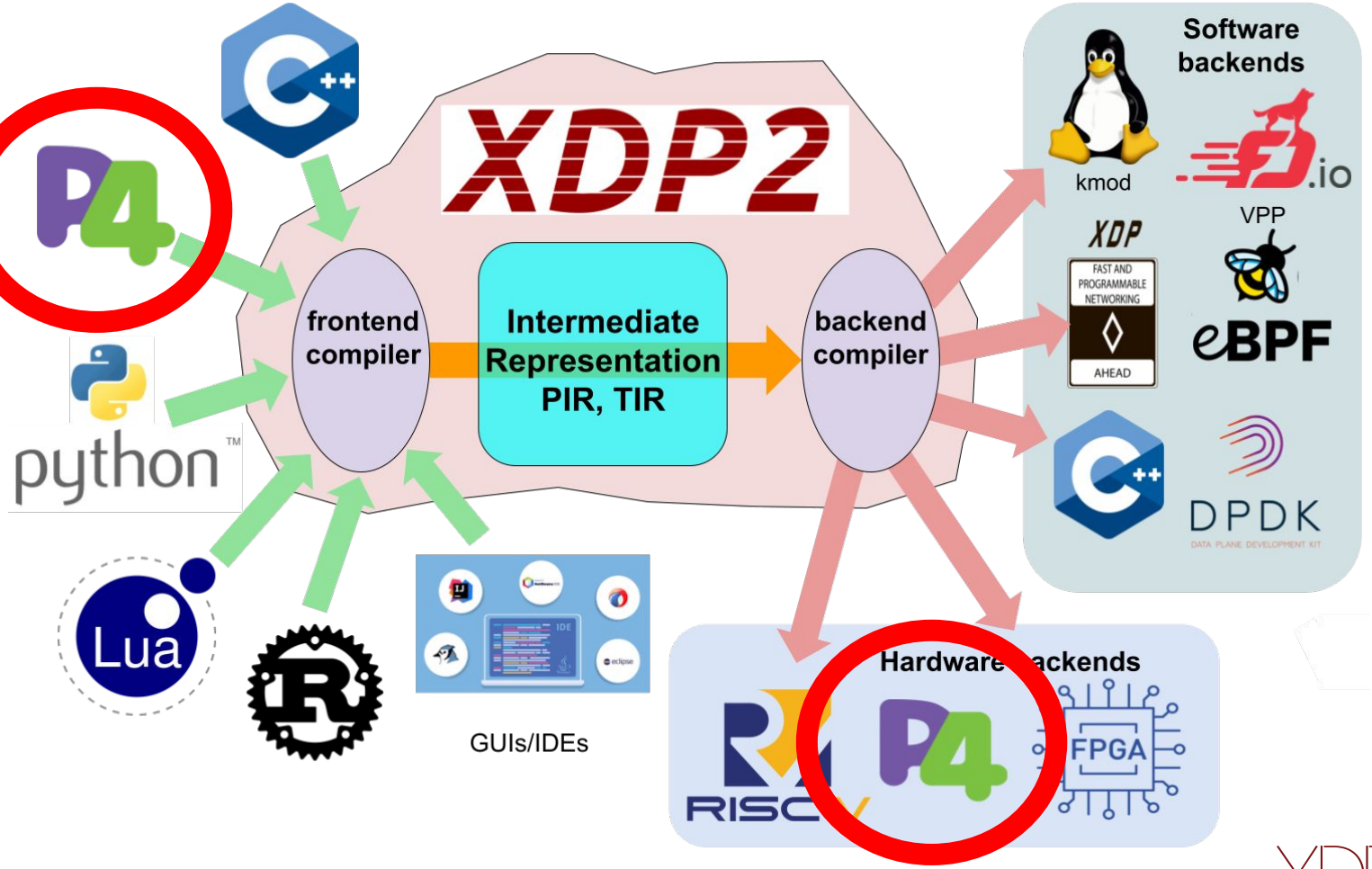
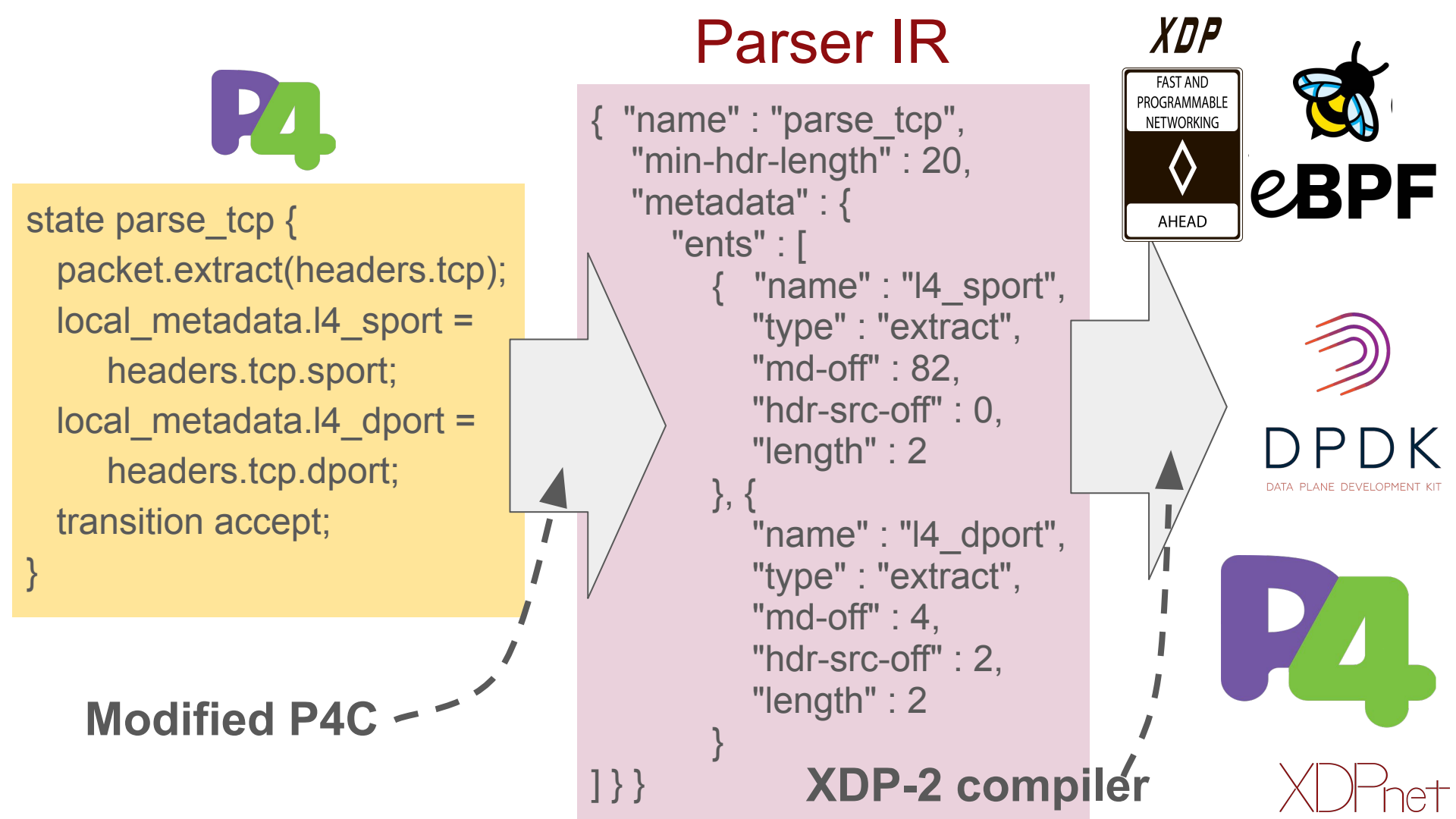


New flexibility, options, and extensibility for users

P4: frontend and/or backend in XDP2



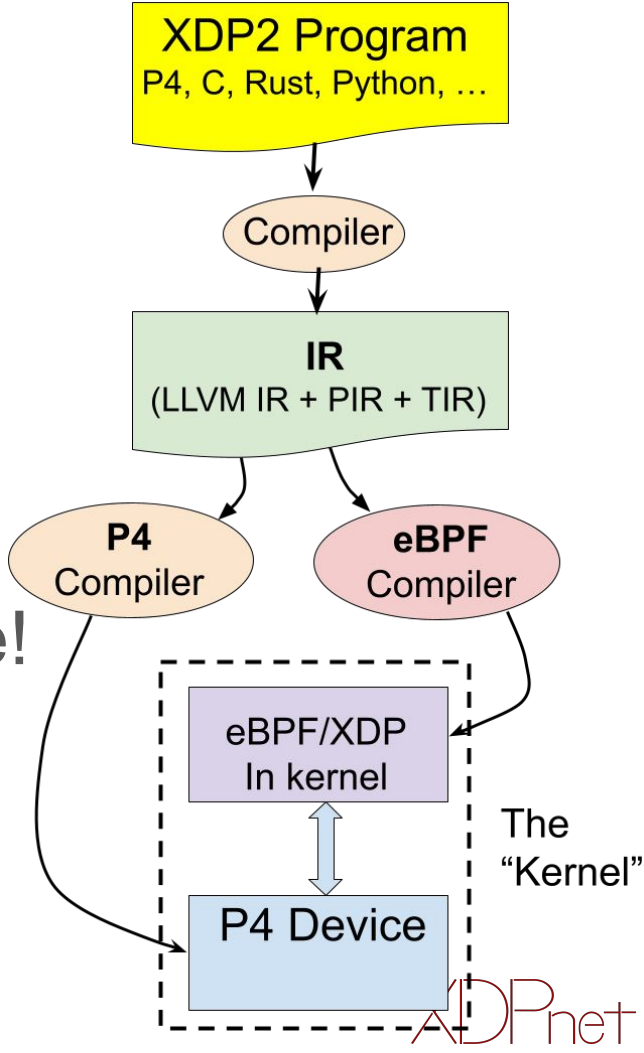

Parser IR
XDP
FAST AND PROGRAMMABLE NETWORKING
AHEAD
eBPF
state parse_tcp {
packet.extract(headers.tcp);
local_metadata.l4_sport =
headers.tcp.sport;
local_metadata.l4_dport =
headers.tcp.dport;
transition accept;
}
{ "name" : "parse_tcp",
"min-hdr-length" : 20,
"metadata" : {
"ents" : [
{ "name" : "l4_sport",
"type" : "extract",
"md-off" : 82,
"hdr-src-off" : 0,
"length" : 2
}, {
"name" : "l4_dport",
"type" : "extract",
"md-off" : 4,
"hdr-src-off" : 2,
"length" : 2
}
] } }
DPDK
DATA PLANE DEVELOPMENT KIT
Modified P4C
XDP-2 compiler
XDPnet

Opportunity: Fixing kernel offloads

- Kernel offloads are a major disappointment
  - Only checksum offload, RSS, TSO are ubiquitous
  - Problem: kernel doesn't trust NIC
- P4TC: valiant effort, but long shot from start
  - 10K LOC, shunned eBPF

Solution: “P4 in the kernel”

- User write one program
- Compile to XDP/eBPF and P4
  - Run eBPF in kernel
  - Run P4 in device
- Kernel and NIC running same code!
  - Trust can be established
  - Complex offloads are viable
  - Effect: extend kernel to P4 HW



Futures

- XDP2 is on GitHub: xdp2-dev/xdp2
- POC of P4C and backend compilers
- xdp2-dev/p4c: Early development
- Seeking collaborators for “P4 in the kernel”
  - Couple 100 LOC in kernel
  - Everything else compilers outside of kernel

Thank you!

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