Background

• Research growing to split P4 program to run on heterogeneous nodes

• E.g., distributed computing (UPenn’s Flightplan) splits P4 program to run on network switch, FPGA in NIC, and server machine
  - split uses cost of compute, latency, data rate, etc.

• DARPA (U.S.) has $30 million fund to shake out 5G cellular network - Aether and Pronto projects also split P4 program to run on heterogeneous nodes (https://prontoproject.org/#vision)
More Background

• Other research in disaggregation, especially, 5G cellular CUPS moving certain control-plane functions to data plane for performance

• See TurboEPC, https://www.cse.iitb.ac.in/~mythili/research/papers/2020-turboepec.pdf
  - moves stateless/local state functions to run in switch data plane
  - uses P4 in data plane (Netronome NIC)
Need Requirements doc

• Avoid

• Flightplan did not consider requirements listed in our draft

• Doc also guides DARPA’s Pronto and Aether projects

• Doc guides future disaggregation of network nodes

• IRTF/IETF is appropriate body for requirements doc
Requirements Deep Dive

• If features runs on switch, do not split following functions to run elsewhere
  - ARP and IPv6 ND
  - ARP and IPv6 ND Proxy
  - BGP table

• Switch has TCAM but FPGA on NIC does not
  - how does ternary P4 table using TCAM move to NIC?
  - algorithms for ternary match using hashes are required on FPGA
  - user input is desirable for what hash to use

• Automated tool splitting program should provide manual override
  - e.g., code doesn’t fit in switch data plane initially, but manual editing of code may be able to fit
Other Details

• A switch has 32, 100G ports, each port supports 4 25G hosts
- how does code split to NIC with 2 100G ports for only 8 hosts?
- more NIC needed but hosts in single link-local domain on switch are now in other link-local domains using different NICs
• How is punt path affected? Also define what is punt path for data plane running in Linux user space
• draft proposes new P4 table property atomic to block splitting table and associated P4 actions and control body
• Questions/Comments?