Flexible Data Plane Programming

PURDUE UNIVERSITY

Challenges

How to make data plane programming more flexible?

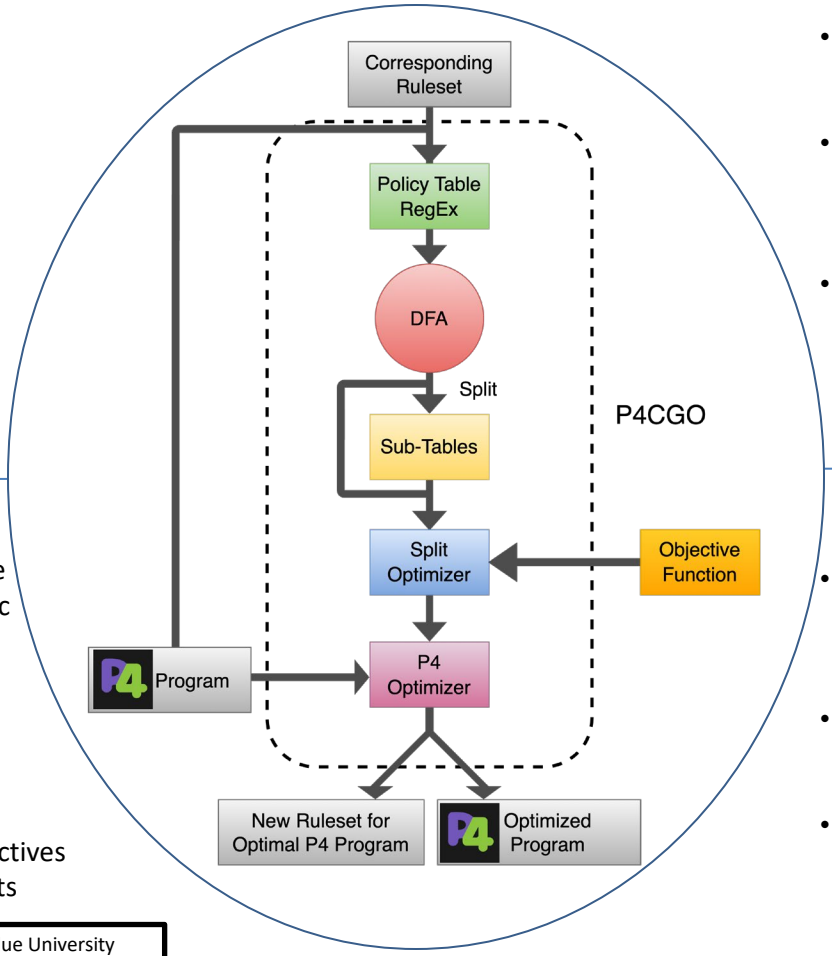
- Describe control plane and hardware assumptions
- Describe global optimization targets

How can formal methods help achieve efficient compile-time optimizations?

- Leverage domain knowledge
- Enhance generic synthesis techniques

Solution

- Developed P4CGO prototype to optimize P4 programs based on control policy spec *[FMANO Workshop with SIGCOMM'24]*
- New algorithm for determining optimal table design given user objective
- Results:
  Meet diverse memory and latency objectives
  2.8x reduction in table size requirements



Scientific Impact

- Advance formal methods and program synthesis
- Contribute to syntax-guided synthesis, quantitative synthesis, and specification mining
- Simplify data plane programming, make formal reasoning and optimization easier and tractable

Broader Impact and broader Participation

- Promote the broader adoption of programmable hardware, benefiting the networking and IT industries
- Create new course material on programmable networking at Purdue
- Has provided valuable training for students (four graduate; one undergraduate)

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