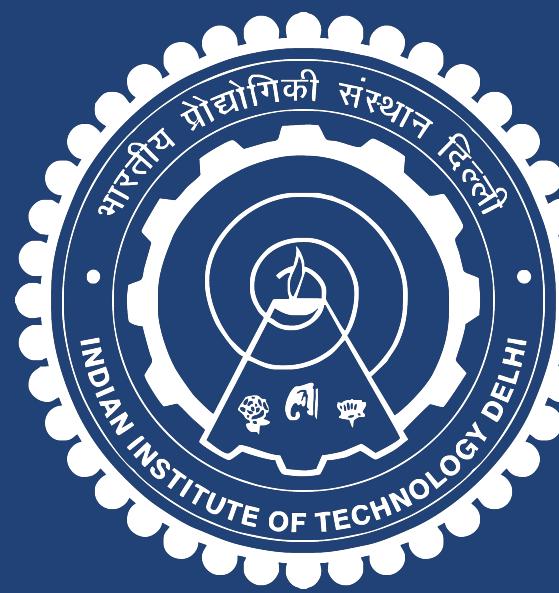


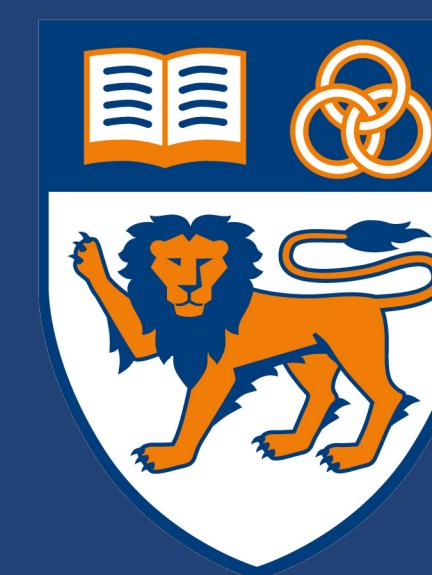
P4-TrafficTool

Automated Code Generation for P4 Traffic Generators and Analyzers

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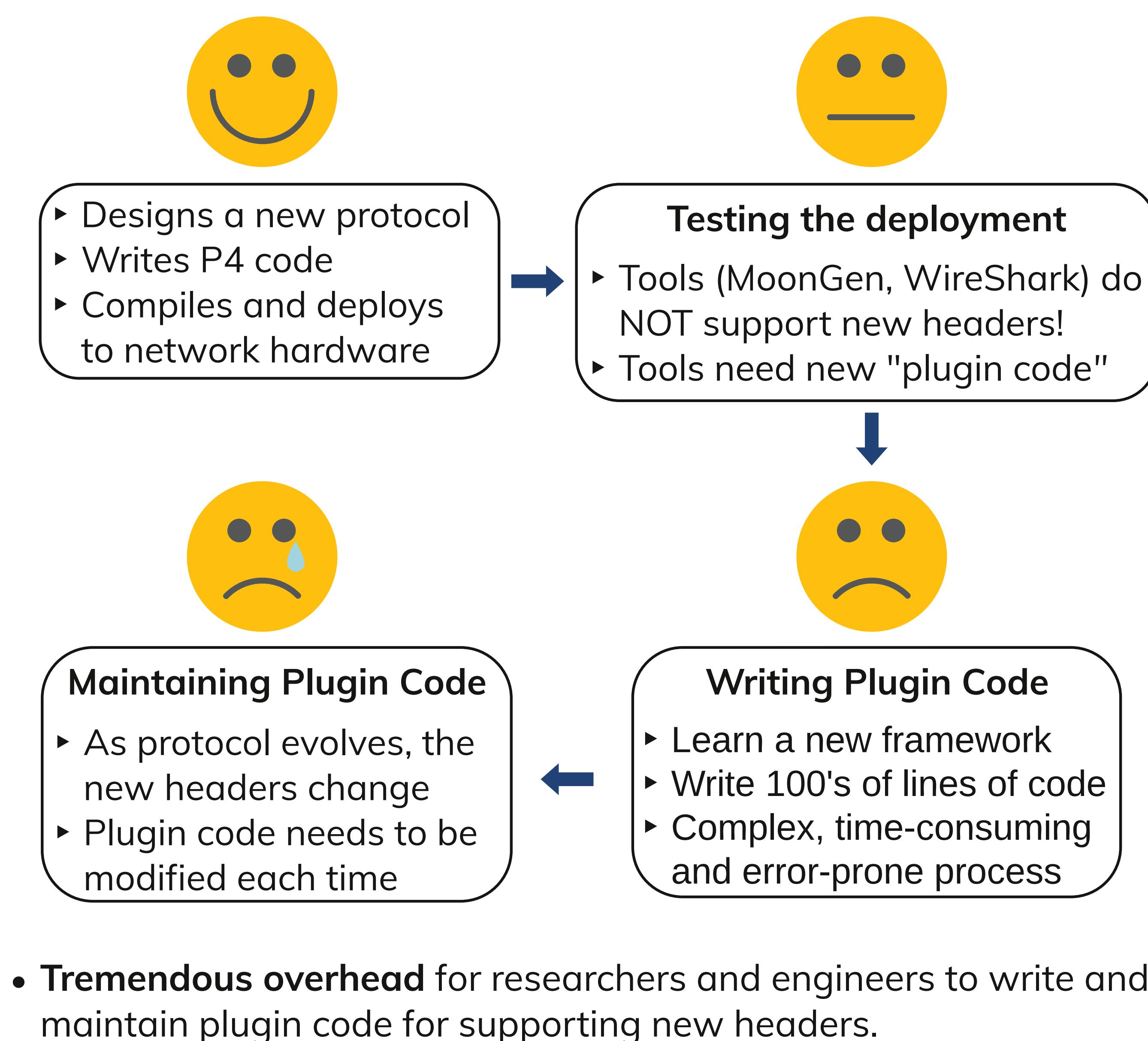


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Problem and Motivation

- The flexibility provided by P4 and programmable network hardware has enabled development of new protocols and applications that invariably introduce new packet headers.

Typical Workflow for New Protocol Development



Evaluation and Impact

Lines of code generated by P4-TrafficTool

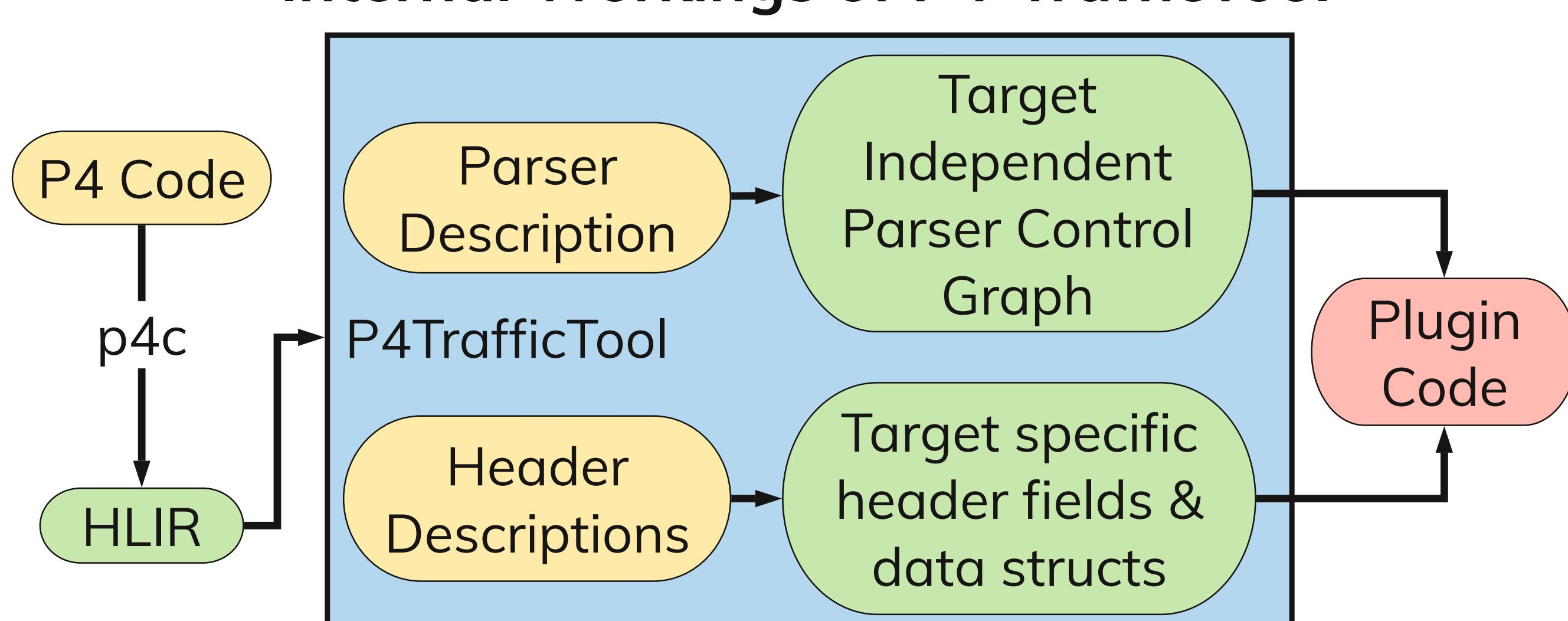
P4 Program	Scapy (Python)	Wireshark (Lua)	MoonGen (Lua)	Pcap++ (C/C++)
basic_postcards	33	116	360	274
basic_tunnel	22	79	150	101
hula	47	150	304	211
linear_road	120	411	1805	1317
mri	47	144	450	303
netcache	100	189	1691	1221
netchain	42	195	340	239
p4paxos	26	118	207	152
qmetadata	47	172	450	338
src_routing	29	83	151	101

- P4-TrafficTool takes the overhead off from the P4 developer:
 - automatically generates hundreds of lines of plugin code.
- Significant savings in case of MoonGen and Pcap++
- Works with P4 programs for proprietary hardware (Barefoot Tofino).

Our Solution: P4-TrafficTool

- Input:** The P4 code that contains the new headers
- Output:** Plugin code for different traffic generation & analysis tools
- Currently Supported Tools:** WireShark, MoonGen, Pcap++, Scapy

Internal Workings of P4-TrafficTool



- Uses the open-source P4 reference compiler p4c to obtain a HLIR.
- Uses the parser description to generate a target independent Parser Control Graph which encodes the header bindings.
- Transforms the header descriptions into target-specific data structures. Chooses right data-types (e.g. uint8) for the header fields.
- The Parser Control Graph is used to generate target-specific representation of header bindings and transition tables.
- Final combined output: Set of files containing the plugin code for each tool.

Related Tools

- P4pktgen
 - Generates input packets to cover all paths of a P4 program.
 - Doesn't provide any plugin code for traffic generation or analysis tools to support packets with new headers.
- P4 WireShark Dissector
 - Generates plugin code only for Wireshark (traffic analyzer).
 - Allows only a single new header at the end of header stack.

Limitations & Future Work

- Non-byte aligned header fields not supported for MoonGen/Pcap++
 - Currently, users are required to add appropriate padding.
 - Patches for MoonGen and Pcap++ are underway.
- Header transitions based on multiple header fields are not supported.
- Calculated header fields (e.g. checksum) are not auto-computed.
 - Users need to add appropriate post build functions inside the generated plugin code.
- A packet is assumed to start with an Ethernet header.

Find the tool at <https://git.io/fhnVe>
or scan the QR code

