ONF Protocol Independent Forwarding Open Source Project

Frequently Asked Questions

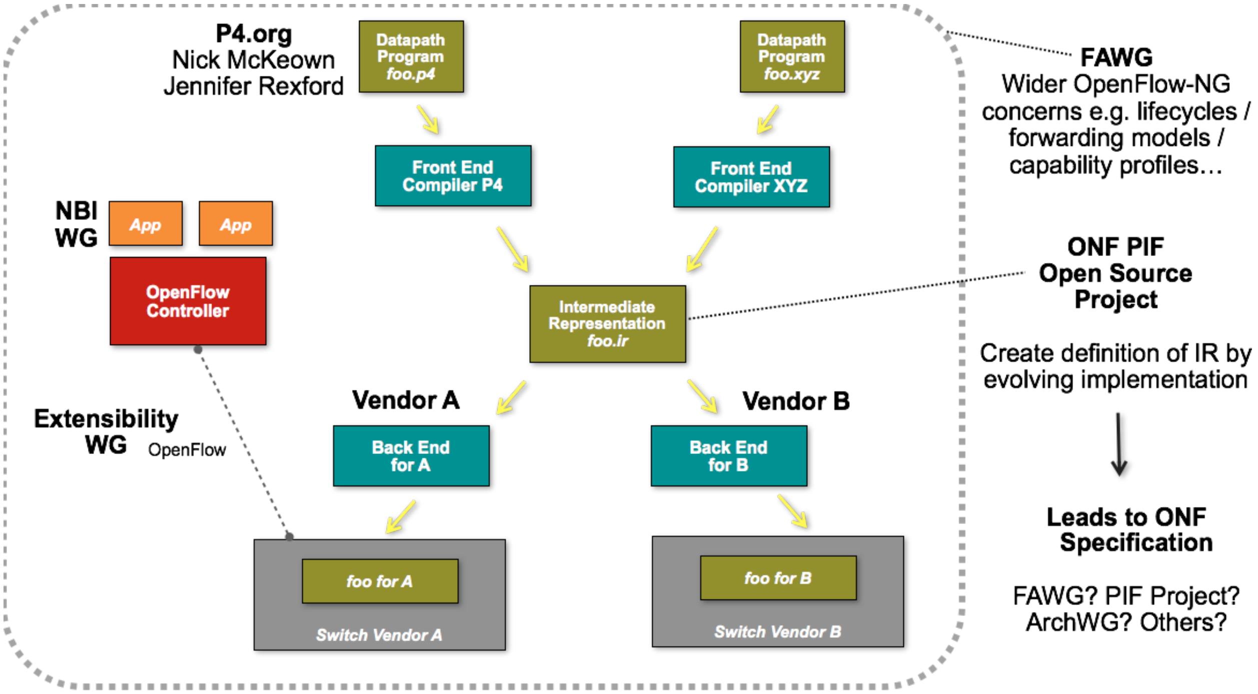
Q: What is Protocol Independent Forwarding?

A: This is in a nutshell a refactoring of the OpenFlow Software Defined Networking standards aimed at reducing the need to explicitly specify all supported protocols in the core specification. Additional flexibility is also provided w.r.t. parsing, matching, action processing, and traffic management (metering / QoS) elements (with desired behavior being expressed as a program). A run-time interface continues to permit SDN Controllers to interact with the dataplane (configuring parameters, populating tables, obtaining statistics, etc.).

Q: Which technology components are envisaged in the PIF ecosystem?

A: The envisaged components are depicted below.

- Software developers (e.g. vendors, operators, or new ecosystem players) write programs in various high level languages (e.g. P4).
- High level language specific front end compilers translate these into a standardized Intermediate Representation. These would typically run on developer’s workstations, controllers, or separate servers.
- Target platform specific back end compilers translate programs in the IR into whatever is required to install these programs on switches (using Just In Time, Ahead Of Time compilation or direct interpretation of the IR). These would typically run on switches or controllers, but they can also run on separate servers.



Q: How do the P4 language / the PIFL language / the PacketC language / (insert your favorite language) fit in?

A1: Most of these are high level datapath programming / configuration languages that are compiled to the Intermediate Representation ((IR) - refer to the diagram above.

A2: It would also (on some target platforms) be possible to compile software written in a general purpose language like C/C++/Java to bytecode / directly executable code which is then invoked as an external function by the datapath (e.g. to perform exception path or other highly customized processing). These would not be compiled to the IR.

Q: What is the role of the ONF PIF Open Source Project?

A: This project collaboratively evolving an open source implementation of:

- An implementation of a PIF Intermediate Representation (IR), embedded in a softswitch (e.g. OVS modified to support PIF), either implemented as a direct interpreter of the IR, or as a back end compiler targeting the switch;

- A compiler from a high level language to the IR;
- Sample datapath applications - written in the IR or in a high level language;
- A run-time interface interacting with the interpreter + switch;
- Associated analysis tools;
- Supporting infrastructure.

Furthermore at least one hardware vendor should support compilation from the IR to whatever is required for execution on the hardware. This back end compiler may or may not be open source.

Multiple of the above may of course also be produced - this is a volunteer driven project, and volunteers are welcome to make contributions.

Once sufficient experience has been gained from this exercise, the intent is to create a formal specification for the resulting IR. (Other ONF working groups may be involved in the specification writing process.)

Q: What is the role of the Forwarding Abstractions Working Group?

A: This group is considering the wider implications of the next generation of OpenFlow in general (not just the implications of PIF), addressing concerns like:

- representing datapaths with varying capabilities / degrees of flexibility as Negotiable Datapath Models (NDMs), and negotiating NDMs / NDM parameters;
- required changes to the run time interface (southbound protocol) to support protocol independence (in collaboration with the Extensibility Working Group);
- permitting dataplane software (e.g. external packet processing functions) to interact with protocol independent datapaths;
- lifecycles / deployment concerns related to NDMs (e.g. support for and coexistence of both fixed protocol and protocol independent devices, as well as migration between versions of specifications and programs).

Q: What is the role of the Extensibility Working Group?

A: This group is chartered with the continuous evolution of the OpenFlow Switch protocol. It currently maintains a stable (long term support) release (currently 1.3.x) of the OpenFlow Switch protocol together with extensions (add-ons to the core specification) covering features that can be implemented as extensions. More fundamental changes to the specification are implemented in the latest feature introduction release (currently 1.5).

Q: What is the role of the Architecture Working Group?

A: This group considers the high level problems to be solved (i.e. requirements) for Software Defined Networking overall, as well as how they are to be solved at a high level. It is taking the implications of Protocol Independent Forwarding into account when contemplating the evolution of the SDN Architecture.

Q: Can the Extensibility Working Group merely introduce features supporting Protocol Independence into OF-Switch 1.x?

A: Supporting flexibly defined match fields is not too difficult because the OpenFlow Extensible Match (OXM) mechanism could be used to augment the existing predefined match fields with additional flexibly defined (even dynamically defined) match fields. Additional flexibility would need to be introduced to support arbitrary nesting of match fields (parse trees / graphs) as well as header insertion / removal at arbitrary nesting levels. Some of the issues involved are captured in the EXT-382 Jira ticket. These extensions would however not be equivalent to what is contemplated in the PIF project, as the notions of the dataplane behavior being expressed as a (potentially) target platform independent program in an intermediate representation (not merely as a sequence of match/action tables) as well as the separation between compile/configuration time and run time would not be addressed.

Q: Will the PIF project only deliver Open Source code, or will it also deliver a specification?

A: A specification needs to be delivered in order to permit interoperable implementations of the IR back end targeting various hardware platforms to be created. Which project(s) or group(s) will collaborate to create this specification has not been determined yet.

Q: Under which license(s) will the software be released?

A: Although this has not been finalized yet, the Apache license is typically preferred by ONF for new projects. Refer to http://opensourcesdn.org and http://www.apache.org/licenses/LICENSE-2.0 for more information.

Q: Where can I obtain more information, and how can I participate?

A1: Refer to the shared Google Drive at:
https://drive.google.com/folderview?id=0B_2T-rZM3pK9RmtlV25KeDF3MWM
This contains documents, presentations, meeting minutes, pointers to code, etc.

A2: Join the mailing list (pif@login.opennetworking.org) using the ONF ARO interface.

A3: Join the weekly call:

- Fridays 9AM-10AM Pacific
- VoIP / screen sharing: http://onfevents.webex.com - password 4Meeting
- Audio call (when not using VoIP): +1-650-479-3207, code 666 936 914