Rapid Feature Implementation on Edge-Routers With OpenFlow

Kirill Kogan ¹  Alejandro López-Ortiz ¹

¹University of Waterloo

December 4, 2012
Outline

1 Problem Statement

2 Solution
Problem Definition

Problem

Given a set of features that are proprietary or implemented on top of different types of controllers.

Our goal: provide a framework that allows to apply the desired features simultaneously on the same traffic.

Requirements:

- The framework should be transparent as possible to managing controllers.
- Coexistence with existing proprietary features.
- Minimal code changes of an existing proprietary SW.
- For simplicity, all OpenFlow controllers managing the same network element use the same version of the OpenFlow protocol.
Taxonomy of Implemented features

- Self-contained (no sharable state with the others)
- Producers (DPI)
- Consumers (e.g. QoS consumes DPI state)
- Producers-consumers (e.g. Netflow consumes DPI produces flow state)

Assumption
Sharing of a feature state is possible only between features that are implemented on top of the same controller.

- Proactive
- Reactive
Outline

1. Problem Statement

2. Solution
Question
How to define an appropriate part of a network element that should be registered to different instances of OpenFlow controllers?

- The interface between OpenFlow agent and OpenFlow channel is implementation-specific (we can define how to register a network element or its parts with OpenFlow controllers)
- OpenFlow supports OpenFlow-hybrid mode.
Attachment Model

Feature-Controller Cntr1
<feature definition>

Feature-Controller Cntr2
<feature definition>

......

Feature-Controller CntrN
<feature definition>

Interface virtual-OpenFlow 1
Feature-Controller Cntr1 in/out
Feature-Controller Cntr2 in/out

......

Feature-Controller CntrN in/out

Interface virtual-template-OpenFlow 1
Feature-Controller Cntr1 in/out
Feature-Controller Cntr2 in/out

......

Feature-Controller CntrN in/out
Controller configuration is defined as any other proprietary feature.

Execution order of the applied features is defined by the order of the applied features.

Execution order of the features implemented on top of the same controller is defined by OpenFlow controller.

Registration with OpenFlow controllers occurs during attachment.
Advantages of Interfaces

- Already existing entities (resource allocation in proprietary SW)
- Two types of interface provision: reactive and proactive.
- Clearly defined location for feature replication and high-availability.
- Capabilities are defined implicitly by interface location.
- By product slot-slot HA (if exists in proprietary SW).
- Minimal changes to existing configuration model.
- Transparent to data path.
- OpenFlow is used only as a standard way for data path provision.
Interface Context

![Diagram showing interface context with protocols and features](image-url)
Summary

- Simple way to enable new features in existing architecture
- Short development cycle.
- Potential opportunity to create new economical models.
Thank you for your attention!