FlowForwarding Warp: How is JVM running SDN Controller

presented by Dmitry Orekhov
SDN: Concept

Control Plane contains rules for packet forwarding.

Data Plane forwards packets according to rules.

Controller installs rules in Control plane.

Control Plane contains rules for packet forwarding.

Data Plane forwards packets according to rules.
SDN: Big Picture

Application Layer
- Business application

Control Layer
- SDN Control Software

Infrastructure Level
- Network Device
- Network Device
- Network Device
- OpenFlow Switch

OpenFlow
- OpenFlow Controller
- OpenFlow protocol
- OpenFlow protocol
- OpenFlow protocol
- Control Data Plane interface

API
NFV: Customize Software
NFV and SDN
SDN: Other Cases

[1] Service Insertions;
[2] Dynamic WAN rerouting;
[3] Bandwidth On Demand;
SDN Controller tomorrow

[−] Bad: Each Controller will handle thousands sessions with Switches

[+] Good: Sessions are fully independent. Sessions are Stateless.
Spawn and Let’em Crash
Spawn and Let’em Crash
Actors Model
Why JVM?

[1] Easy to build Libs and API


Apache Avro

Java code

Yes

No

Compile?

JSON

Parse your JSON In Run-time
Apache Features

• You can serialize Data as is, no encoding, no Metadata

• You can do it in Run-time

• Lazy initializations + Caching makes it faster

• Java, C++ and Python API
Warp OpenFlow Driver

- JVM
  - Warp
    - OpenFlow Driver
  - Avro JSON
    - OpenFlow 1.0
    - OpenFlow 1.3

- Erlang VM
  - LINC Switch
    - Logical Switch
    - Logical Switch
    - Logical Switch
Akka: Erlang on JVM

**High Performance**
50 million msg/sec on a single machine.

**Small memory footprint**
~2.5 million actors per GB of heap.

**Elastic & Decentralized**
Adaptive load balancing, routing, partitioning and configuration-driven remoting.
Akka: and Event Bus
Preliminary Testing

Environment: 3 workstations, 4 core per one

Running: 500 Logical LINC Switches on two workstations;
1 Warp controller on the 3rd

Results: Warp holds all 500 connections
(1 hb/10 sec)
500 sessions for 15 sec
1000 OpenFlow message/minute
Team

- Dmitry Orekhov <Dmitry_Orekhov@epam.com>
- Vitaliy Savkin <Vitaliy_Savkin@epam.com>
- Igor Bocharov <Igor_Bocharov@epam.com>
- Yaroslav Ulanovich <Yaroslav_Ulanovich@epam.com>

- https://github.com/FlowForwarding
Thank you!