Lagopus Router

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#DPDKSummit
Develops SDN/NFV software node for carrier networks to realize

- Differentiate services
- Time-to-Market
- Cost-efficiency

Supported by

- The Ministry of Internal Affairs and Communications of Japan (April, 2013 - March, 2016)
- NTT (April, 2013 -)

Release

- Lagopus software OpenFlow 1.3 switch (July, 2014 - )
  - [https://github.com/lagopus/lagopus](https://github.com/lagopus/lagopus)
- Lagopus software router (Aug., 2017 - )
  - [https://github.com/lagopus/lagopus-router](https://github.com/lagopus/lagopus-router) (alpha version)

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Lagopus Switch

- Pure OpenFlow 1.3 Software Switch with Tunnel Extensions
  - Open source under Apache v2 license ([https://github.com/lagopus/lagopus](https://github.com/lagopus/lagopus))
  - High Performance with DPDK (over 20Mpps, over 1M flow entries)

- Provides good programmability for stateless network functions (e.g. SDN-IX)

- Difficult to handle stateful/complicate protocols such as
  - VRRP, ICMP (e.g. reply too large), IPv4 fragmentation, IPsec
Modular architecture OSS router

- https://github.com/lagopus/lagopus-router
- Apache 2.0 License
- Written in C + golang
  - High performance packet processing by C + DPDK
  - High extensibility of protocol handling by modular architecture and golang
- Configuration is based on OpenConfig
- Supports protocols
  - L2: VLAN
  - L3: IPv4/v6, ICMP, VRF, VRRP
  - Tunneling: IP/IP, GRE, VxLAN, IPsec(IKE v1/v2, AES256/SHA-2))
  - Other: Match-Actions tables module (like OF or P4)

※ under developing
Design

- Loose coupled modular-based design (like a microservice architecture)
- Unified configuration datastore
  - Configuration defined by yang
  - Pub/Sub-like APIs, config datastore as a broker
- Using existing routing agents
  - Slightly modified for APIs
- High performance/extensibility dataplane
  - Fast path written in C + DPDK
  - Slow path written in go

SDN controller/Orchestrator

CLI

Lagopus Router

![Diagram of Lagopus Router with SDN controller/Orchestrator and CLI connections, networking layers (Network Interface, L2 (Bridging), L3 (Routing), IPsec (crypto)), Dataplane framework, and routing agents: Routing agent, VRRP agent, IKE agent, MAT agent. Connections are labeled gRPC or NETLINK.]
Architecture of a dataplane module

- Written in C + golang
- Packet Processing
  - Written in C with DPDK for the performance
- Module managing and Handle control packets
  - Written in golang
  - Subscribe configuration from the config datastore
  - Protocol handling, likely ARP, ICMP, BGP with router agens.
- More details
  - Takanari Hayama, Using DPDK with Go, 2016 Dublin DPDK userspace
Openconfigd

- https://github.com/coreswitch/openconfigd
- Commit & Rollback support configuration system in Zebra2.0
- Configuration is defined by YANG model
- Automatically generates APIs
  - gRPC
  - CLI with completion/show/config

Routing agent

CLI

Orchestrator

Commits /Results

Show/Config /Completion

OpenConfigd

APIs

DB

Yang

Auto generate

Subscribe config subtree with two-phase commit

Router agent

gRPC
For the most simple rules (two routing rules)
  - Over 10Gbps (for long packets)
  - About 1 Mpps

Performance tuning and detail performance measurement and tuning future works.
Roadmap

Aug. 2017
- Alpha release
- Simple L3 module with VRF and VRRP

2018.1Q
- Beta release
- L2 module
- L3 Tunnel module (IP/IP)
- Match and Actions Tables
- Stats module
- Performance tuning

2018.2Q
- IPsec module (IKE v1/v2, AES256/SHA-2)
- L2 Tunnel module (VxLAN)

Future works
- NAT
- IPv6
- MPLS
- BGP Flowspec
- ACL
- xFlow
Lagopus Router

- Modular architecture OSS router
  - https://github.com/lagopus/lagopus-router
- Written in C + golang
  - High performance packet processing by C + DPDK
  - High extensibility of protocol handling by module architecture and golang
- Supports many protocols including OF like tables
Lagopus
- [https://lagopus.org](https://lagopus.org)

Github
- OF1.3 Switch: [https://github.com/lagopus/lagopus](https://github.com/lagopus/lagopus)
- Router: [https://github.com/lagopus/lagopus-router](https://github.com/lagopus/lagopus-router)

Lagopus books
- Router: Under working

Mailing list

Slack
- [https://lagopus-project-slack.herokuapp.com/](https://lagopus-project-slack.herokuapp.com/)