Router for Academia Research Education

RARE/freeRtr in a nutshell

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UKNOF 47
April 15th 2021
Public

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One familiar platform

Multiple solutions

Each solution addresses

R&E use case

Control plane software

P4 (not only P4) Programmable data plane

Interface them and the result is ...

Feature rich routing platform running at various hardware line rate

Flexible, DIY “hackable/extensible” router

Control plane independence ➔ that suits R&E use case
Why RARE now?

Starting from early 2010:
Several valuable Open Source control plane usage besides well know commercial vendor

Starting from 2020:
Dataplane solution reached maturity ready to implement production grade use case

NOS emergence
Technology convergence (Hypervisor/VM, K8s/Container, kernel bypass ...)

It’s a good time to tie Control Plane and Dataplane!
IPv4 and IPv6 compliant!
RARE for everyone in R&E

Routing (CP+DP) platform solution for the R&E context
  Open Platform
  Programmable

RARE for Research and Education connectivity
  Emerging NREN
  Or not …

RARE for R&E content provider
  IaaS owned by NREN
  IaaS owned by International Global Research project

RARE for R&E end user institution
  Primary/Secondary schools
  University campus
  MAN network for Regional network

RARE for International Global research project connectivity
  Network research
  Science research

Positive societal consequences !
RARE value proposition: 
Implement a solution to each R&E use case

RARE for R&E connectivity (nx100GE, Tbps)

- **Core** backbone node
- **Edge** backbone node

RARE for R&E content provider (1, 10, 25, 40, 50, 100GE)

- **ToR** node
- **Spine** node
- **Edge** node

RARE for R&E organization end user

- **CPE** for SOHO primary schools
- **MAN Router** for regional network
RARE latest news (Month 27 of 48)

RARE p4 targets

- bmv2 software switch
- Programmable Ethernet ASIC on WEDGE-BF100-32X
- under study

RARE p4 discussion emulation targets

- TCPDUMP & LibPCAP
- DPDK

RARE Network Programmable targets

- Broadcom under study
P4 LAB network management via **NMaaS**!
Network Management as a Service:
https://nmsaas.eu
https://wiki.geant.org/display/NMAAS
Monitoring at Network Element Level! (Prometheus agent)
Monitoring at EML! (Grafana dashboard)

https://grafana.com/grafana/dashboards?search=freeRouter
Key take-way – We are ready to roll into production

Automated testing
3rd party testing via Spirent usage
(thanks PSNC@WB team)
P4 profile calibration
DPDK currently in operation SOHO
Production deployment

Work in progress production deployment
And what about ISP and commercial network use cases?
Practical use case #001 SOHO router

DPDK flavor ideal for CPE
nx1GE
nx10GE small MAN ideal for small campus
Couple of 100GE (Depending on server generation)
Practical use case #002 BRAS router

DPDK and P4 dataplane

⇒ suitable for CAMPUS / EDGE BACKBONE router

nx1GE, nx10GE, nx100GE
Practical use case #003 LSR router

P4 dataplane fits perfectly pure LSR core router

NNI: 4 directions with (8x100GE) bundle
Practical use case #004 LER router

P4 dataplane fits perfectly pure LER use case
NNI: EST/WEST direction @ (8x100GE) bundle
UNI: 16x100GE left for end user connection!
Practical use case #005 high performance BGP RR

Recycling old server?

Ideal for **K8s** cluster using **BGP** as **CNI** network plugin

Taking advantage of server « huge » amount of RAM

No need specific high performance dataplane
Practical use case #006 « small » PE

Ideal for aggregation

- 2x10GE or 2x100GE NIC server side
- 2x10g+48x1g or 1x100g+48x1/10g switch
Practical use case #xxx The sky is the limit

Automation integration
IXP with MPLS core
ToR router combined to BGP aware network plugin
Spine/Leaf DC router
Global BGP monitoring for your entire BGP domain
Global IGP guard for your entire IGP domain
BGP flowspec aware anti DDOS
AAA servers (TACACS, RADIUS)

... 

We need YOUR creativity!
Key take-way – Room for improvement

Network Management
   Node monitoring
   Flow Monitoring

New Network Management Paradigm
   Streaming Telemetry
   INT

⇒ It is a good opportunity to rethink how Network Management is handled

« Closing the dots » with automation existing project
Key take-way – Final words – RARE vision

Open Network programming opportunity
  R&E small institution
  R&E global project (100GE is real, 400GE just landed)

Opportunity to define NGN NMS
  Scaling new NMS (horizontal scaling with K8s)
  Streaming Telemetry
  INT
  ➔ It is a good opportunity to rethink how Network Management is handled

Opportunity to integrate existing automation initiatives
  Instantaneous & Flexible
  Network Services for the users!
Key take-way – Private Peering Node

High resilient Packet CORE
2 direction @ 400Gb / 1,6 Tbps

User ports connection
24 ports left for 2x12 redundant Private peering
1:3 ratio with redundant scenario
Useful links

Project

freeRtr control plane’s home: freertr.net
more information on dataplanes: rare.freertr.net
Project members’ journey: blog.freertr.net
FreeRtr configuration guide: docs.freertr.net

Contact

For daring RARE/freeRtr users: rare-users@lists.geant.org
For RARE/freeRtr JEDI developer wanabbee: rare-dev@lists.geant.org
For RARE/freeRtr supporters ! https://twitter.com/rare_freerouter

We are interested to work with industry and ISPs!
Please get in touch if you are interested (contact above)
Useful links

Source code !!!!

- freeRtr core: sources.nop.hu/src/
- TOFINO ASIC: sources.nop.hu/misc/p4bf/
- P4Lang bmv2: sources.nop.hu/misc/p4lang/
- p4emu: sources.nop.hu/misc/native/p4*
- p4dpk: sources.nop.hu/misc/native/p4*
Special thanks ...

And others ... Who make this possible!
Thank you

Any questions?

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