XORP: An eXtensible Open Router Platform

International Computer Science Institute

The Project

- Started January 2001
- Sponsors
  - Intel
  - National Science Foundation (Award ANI-0129541)
  - DARPA (Control Plane)

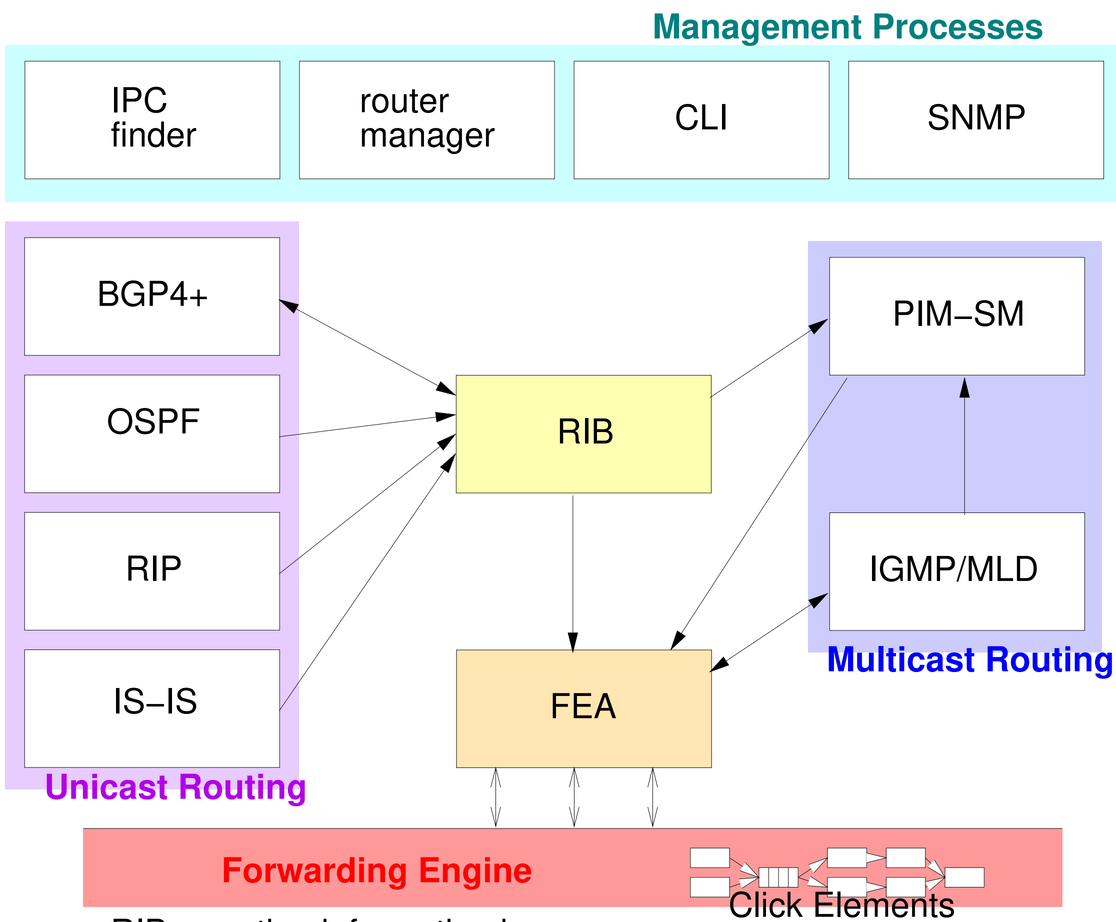
Objective

- To replace edge routers with commodity PCs running XORP thus enabling innovation and research.
  - A low end router (350Mhz MIPS processor) performing software forwarding. Will only forward 4000 packets per second.
  - A high end PC with dual PCI busses can forward 700000 packets per second.

Deployments

- PlanetLab testbed for DARPA control plane project (June - September 2004)

Architecture



RIB = routing information base
FEA = forwarding engine abstraction

Design 1

- Object oriented design in C++.

- Each routing protocol is a separate process.

- XORP's own interprocess communication (XRLs).
  - Processes can be run on any host.
  - Routing protocols under development can be isolated on separate host.
  - XRLs can be invoked from scripting languages allowing easy testing.

Design 2

- All routing/forwarding interactions with the operating system are performed through the Forwarding Engine Abstraction(FEA).
  - Allows distributed or offboard forwarding.
  - Simplifies porting to new operating systems.
  - Eases construction of a XORP simulation environment.

- The router manager is a fully configurable entity that is responsible for process management.

Extensibility

- One of the major goals of the project is extensibility.
  - Allowing deployment in testbeds such as PlanetLab.
  - Enabling Research in new or current protocols.

Suported Platforms

- FreeBSD
- Linux
- Mac OS X 10.3 (no FEA)

Completed Components

- BGP4+, Full AFI/SAFI support (IPv6 - Multicast), missing route filters

- PIM-SM, IGMP (v1 and v2) / MLD (IPv6) v1

- RIPv2 and RIPng

- SNMP using net-snmp
  - BGP-4 mib (RFC 1657).

Expected end of 2004

- Integration with Click and Planetlab for DARPA control plane project.
- Route filters.
- Porting of John Moy's OSPF code completed.
- IS-IS implementation with basic functionality.

Possible Future Work

- Firewall integration (forwarding filters)
- Intel network processor (IXP2400) port.
- Distributed router.

Possible Future Research

- Security (integration with intrusion detection systems)
- XORP Simulation environment.
  - An environment that allows the development of new protocols or features. With the added benefit that the same code will work with a real XORP router.
- Next generation routing protocols.

Why choose XORP?

- 1.0 Release Candidate (June 3rd)
- Full IPv6 and Multicast support
- Designed for extensibility
- Ideal research platform
- Multiprocess architecture allows construction of distributed routers
- Architecture supports high performance network processors

Summary

A XORP based PC router will out perform low end routers. The proprietary router market will be opened up enabling innovation and research.

www.xorp.org