Outsourcing Routing using SDN: 
The Case for a Multi-Domain Routing Operating System

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Motivation
1. Internet routing is complex and expensive:
   - Requires significant expertise and knowledge
   - Service requirements grow: IPTV, cloud computing
   - Misconfigurations can have widespread effects
   - Very difficult to change (BGP ossification)
   - Demanding in terms of man-hours and OPEX
2. Transit doesn’t pay:
   - Profits in pure transit drop ($/Mbps)
   - “Bit pipe” ISP model under revision
Routing is a layer of network functionality which is:
expensive, crucial for operations and difficult to get right.

Routing tasks from an operator’s point of view
- Map SLAs to high-level policies
- Map policies to network behavior
- Satisfy increasing network requirements
- Counter errors and scalability issues
- Secure the network
- Deal with the outside world via BGP
All-in-all: Satisfy multiple objectives, both operational + economic

New Techno-Economic Model: Outsourcing the Routing Control Logic
Outsourcing (“Routing as a Service”) contractor:
- Specializes in routing management
- Relieves the ISPs of the complex routing configuration process
- Offers better service to its clients in terms of efficiency, stability and availability
- Achieves an economy of scale
Outsourcing clients:
- “Buy” routing as an external service
- Reduce OPEX
- Form interactive business relationship

Centralizing beyond AS boundaries: towards a Multi-domain Routing System

Opportunities
- More efficient routing
- Novel routing protocols
- New inter-ISP services:
  - Collaborative security
  - Cooperative troubleshooting
  - Programmable transit
  - Global IPTV
- Contractor can mediate policy tussles

Challenges
- Privacy and Security
- Market models and issues
- Resilience
- Interoperability
- Scalability
- Extensibility
- Policy conflicts
  - Identification
  - Resolution

How to achieve?
- Identify the proper abstraction layer for routing control
- Define interface between client and contractor
- Define northbound API between OS and SDN routing services
- Define east-west interface between contractors
- Use algebraic frameworks for centralized routing algorithms
- Develop routing framework, test ([2]), compare with status quo

Summary of Key Ideas
- Internet routing is hard to manage and evolve
  - Our goal is to overcome these obstacles
- Outsource routing to external contractor
- Build on SDN to outsource routing control plane
- Centralize routing beyond AS boundaries
- Investigate market and identify win-win scenarios
- Provide technical + financial incentives ([1])

References

ONS 2013, Santa Clara, CA