# I2RS and SDN

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What Problem is I2RS solving?

- Control Applications Need To *Dynamically* Augment Routing, based on:
  - Policy
  - Flow & Application Awareness
  - Time & External Changes
  - Topology (active & potential)
  - Events
  - ...

- Make use of existing routing system, where possible, to facilitate new applications and services.

Network Application

Feedback Loop:
Control & Information

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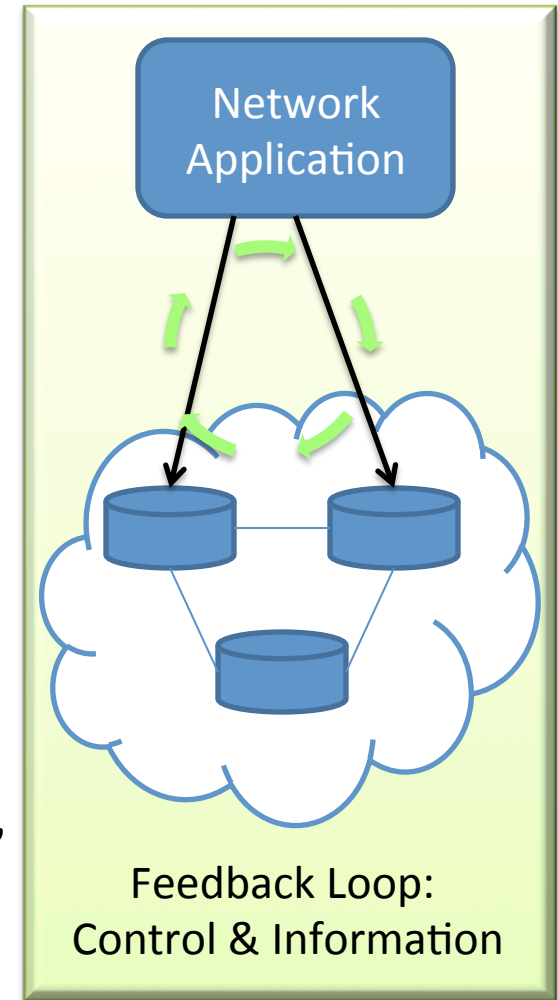
What will I2RS be?

- Standardized data models to communicate with Network Elements
  - Especially Routers
- Protocol(s?) allowing:
  - Reading operational state
  - Dynamic event notifications based on registration
  - Registering for/getting data streams of changes
  - Modifying routing state at various different routing layers.
- Understand and support *the need for speed*

Models for what Routing?
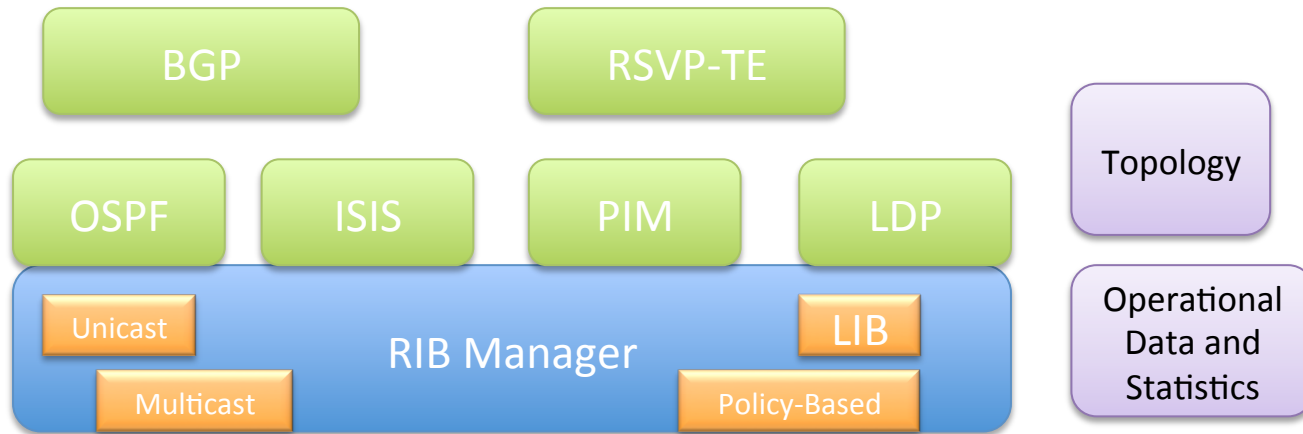
- Extensible models based on use-cases
- Topology from NE's perspective – can be grouped into network model

An On-Ramp to SDN

- I2RS Allows incremental deployment of SDN to routers
- SDN Controllers can use I2RS to:
  - learn topology gathered by distributed protocols
  - directly program ephemeral routing states via the RIB model
  - indirectly program ephemeral routing states via existing distributed protocols
    - Useful for communicating with Routers that don't yet support I2RS
- Use I2RS to support targeted use-cases
  - Model based protocol allows extensibility and speed of development

I2RS Enables Hybrid SDN

- I2RS lets the Network Element understand its forwarding plane and time-critical events
  - How to program ephemeral states
  - How to handle load-balancing (based on RIB information)
  - When and how to fast-reroute
- Make use of distributed routing protocols to distribute information
  - New prefixes in BGP/OSPF/ISIS
  - Pass in BGP FlowSpec for distribution
- Control system need not be co-located with forwarding plane.
- As part of the routing element, I2RS will interact smoothly with existing configuration and management on the routing element.

I2RS and PCE

- Stateful PCE can create LSPs
- I2RS may be used to:
  - Create FECs in a readily extensible manner
    - Natural use of RIB model
  - Load-balance between multiple LSPs

Open Work

- Pick a base protocol for I2RS: Examine and test extensions of different protocols

- Pick a data modeling language for I2RS:
  - Examine how proposed information models would work in it.
  - What extensions are needed?

- Correctness concerns for network state
  - Detection and resolution of indirect interactions
    - a problem for the network application users of I2RS

Summary

- I2RS is meeting on Thurs 13:00-15:00
- Useful drafts to read:
  - draft-atlas-i2rs-problem-statement-01
  - draft-atlas-i2rs-architecture-01
  - draft-nitinb-i2rs-rib-info-model-01
  - draft-keyupate-i2rs-bgp-usecases-00
  - draft-amante-i2rs-topology-use-cases-00
  - etc.
- Focus on practical use-cases and standard models
- Happy to engage with research community