Functional Analysis of I2RS: What Are We Putting in the Mixture?

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Refining I2RS: the Feedback Loop

- Keep it reasonably scoped
- Don't rush to the technology (but proto-typing could be useful)

- Use-cases justify and clarify the need for functionality
- New Functionality triggers ideas for new Use-Cases

It's Just Like $foo Except…

- Trying to capture what is new/different/ critical
- Concepts pulled from:
  - draft-ward-i2rs-framework-00
  - draft-atlas-i2rs-policy-framework-00
  - draft-rfernando-irs-framework-requirement-00
  - Other discussions

The Basics

- The ***NEED*** for ***SPEED***
  - ability to react in sub-second time
  - Handled 100s, 1000s, etc. of operations

- Reasonable Programmatic Interface for Network Applications
  - Asynchronous
  - Not >5 different protocols to accomplish a thing
  - Pub/Sub model for Events

Multi-Headed Control (motivation)

- Multiple Clients (or Client + CLI) may want to write or modify the same state
  - CLI comes in to override client application state
  - Client application wants to override CLI (e.g. to enforce a policy)
  - Use-Case: Large-flow router and DoS mitigation both identify the same flow/destination to route.
- Depending on timing of processing of requests leads to *unknown* router state (which socket read first in a select, latency from an application)

Multi-Headed Control (implications)

- I2rs agent-based arbitration: enforce policy as to which client gets to modify contested state
  - Store if not best (like RIB policy)
- Client ownership: determines who can modify vs. delete/replace
- Notifications on subscription when state is changed by another client
- Optional garbage collection ephemeral state when client goes away

Different Operation Models

- Three characteristics to an operation:
  - Start-Time (immediate, temporal, triggered)
  - Persistence across reboots (permanent, ephemeral)
  - Duration/State-expiration (unbounded, temporal)

- CLI and Netconf generally give:

  Immediate, Permanent, Unbounded

Subscriptions and Notifications

- To be responsive to uncontrollable events, network applications learn via notifications
  - Has state been overwritten?
  - Has a next-hop changed?
  - Has a threshold been passed?
  - Has a route been installed?
- Ability to filter and specify thresholds per subscription request.
- Events and data-publication streams

Multiple Transport Sessions

- Different communications have different requirements
  - Reliability, secrecy, replay, etc.
- Clients and agents part of distributed systems
  - A network application may be distributed to different locations.
  - A network element may provide services via different system elements, want to distribute notifications and analytics from where they are learn or measured

Role-Based Client Identity

- An application can identify as a client even with:
  - Different IP address
  - Different TCP session
  - Etc.

- Supports distributed applications, standby for applications, etc.

Client Limited Authorization

- Ability to limit client ability to read and write based upon role.
  - Can learn subset of topology
  - Define write-scope in terms of values/ranges as well as data objects in model

Client-Specific Priority

- Client can specify a priority for each operation
  - Allows in-flight and ASAP operations
  - Operations across multiple channels can be put into desired order

Standard Information and Data Models

- RIB interactions:
  - Static routes, redistribution into other protocols, varying admin-distance
  - Variety of next-hop types
  - Unicast, multicast, LFIB, etc.
- BGP policy:
  - Actions, etc.
- IGP local policy
- PIM local policy

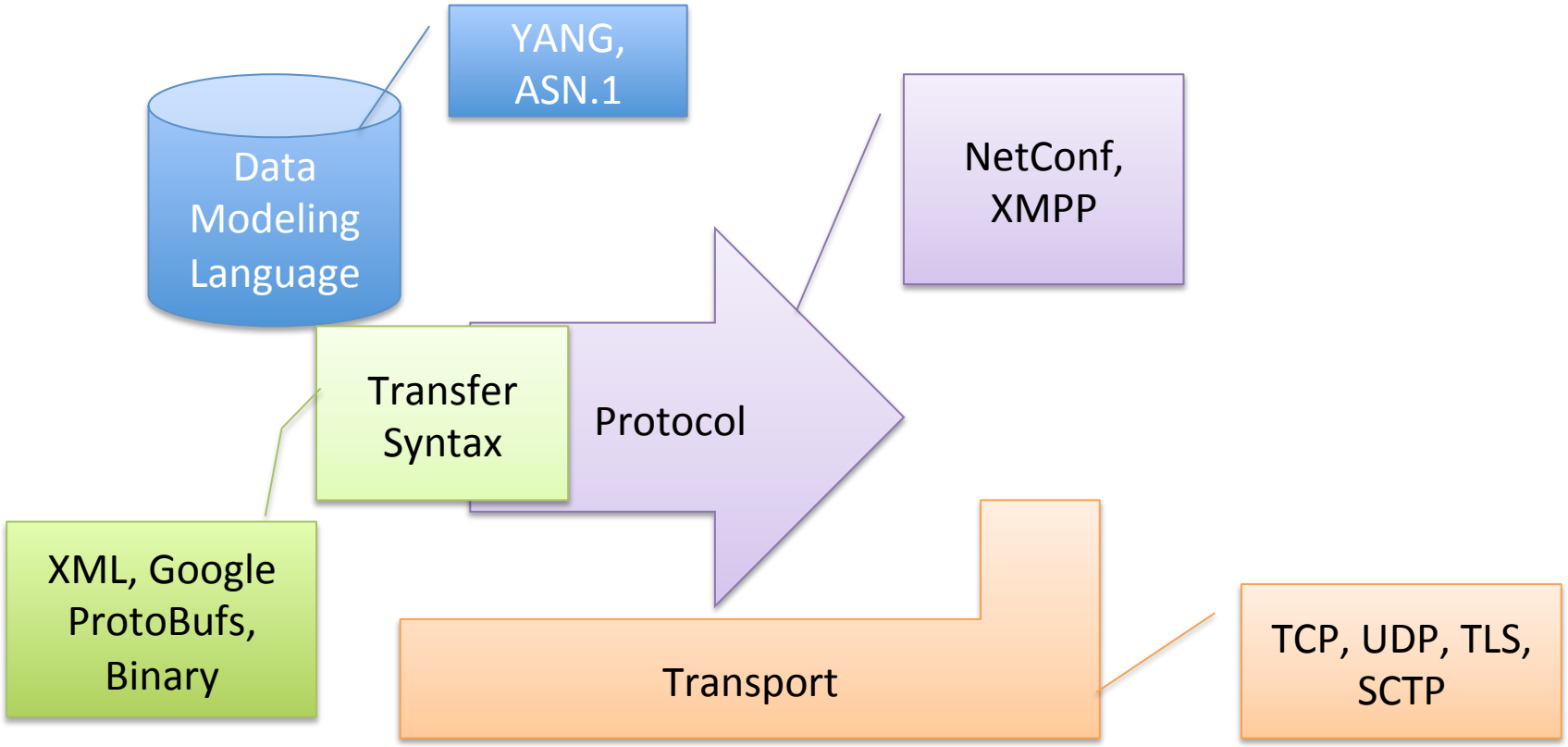
Topology

- Varieties of Data
  - Active IGP topology
  - Active components (e.g. customer or peer links)
  - Passive components (can be detected)
  - Passive components (undectable)
  - Minimal historical (last up, last peer, etc.)
- Network Abstractions
  - Service points-of-presence
  - VPN topologies
  - unsummarized topology

Motherhood and Apple-Pie: Pick Your Recipe

- Atomic Operations
- Preemptable Locking: take ownership at precedence for blocking changes or to write
- Rollback by client
- Capabilities
- Optional garbage collection

Flexible Components to Consider



What to keep?

- Some functionality drives and determines the architecture…
- Some can be added later…

- Need to justify with use-cases and consensus

TIME to DISCUSS