# Complexity vs. Capability

**Choices for Distributed Resilient Network Interconnect**

**Rev. 1**
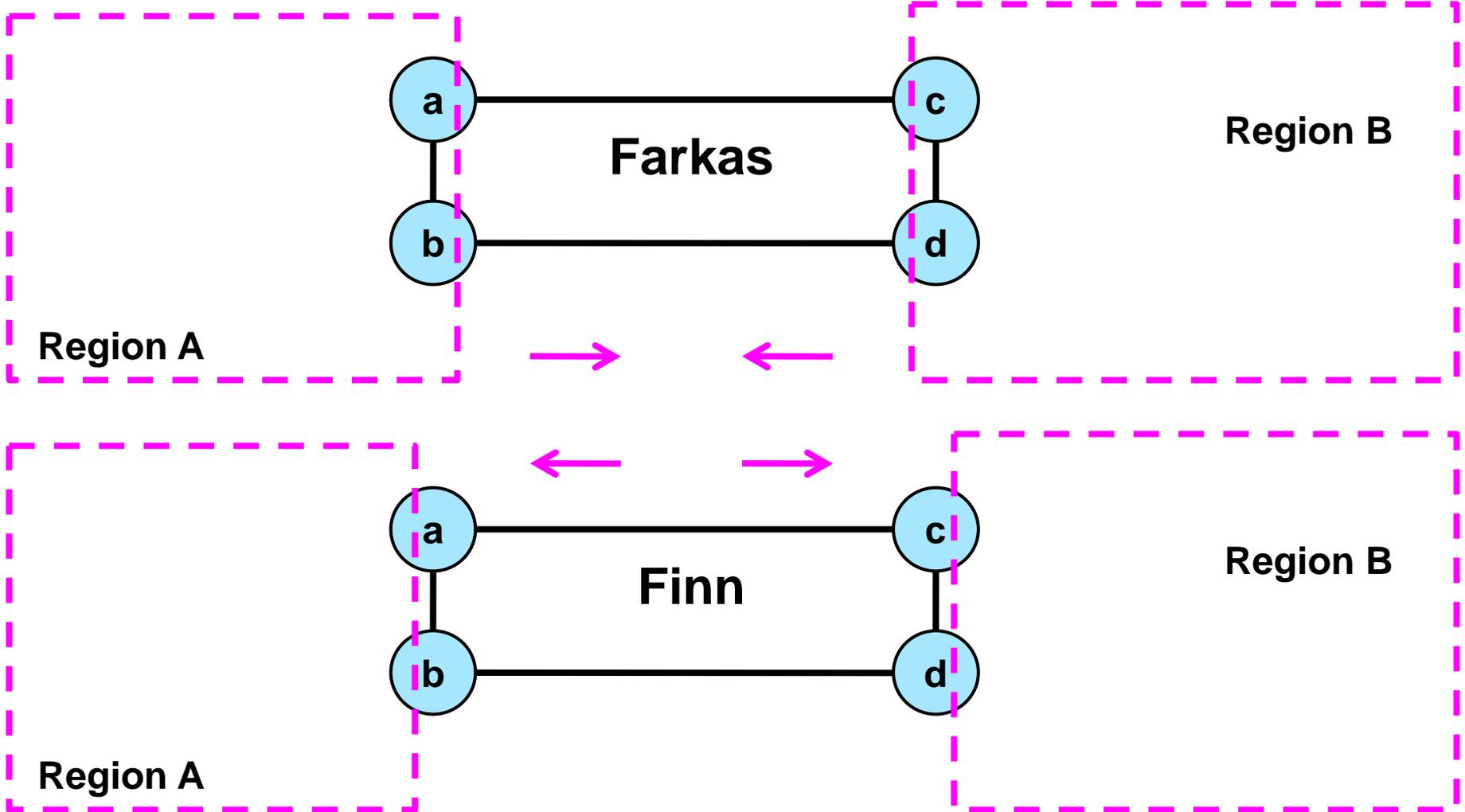
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# A Choice

- Janos Farkas (new-farkas-DRNI-control-0311.pdf) offers one approach for accomplishing the task taken on by the 802.1AXbq.

- This work (axbq-nfinn-complex-capable-0311-v01.pdf) offers another approach.

- The difference is an engineering tradeoff between a solution that is simpler and less capable (Farkas) and a solution that is more complex and more capable (Finn).

# Base diagrams

# Load sharing the horizontal links



- We can create a set of link assignment priorities that will balance any number of horizontal links under any combination of horizontal failures or static gateway choices (even/odd or low/high).
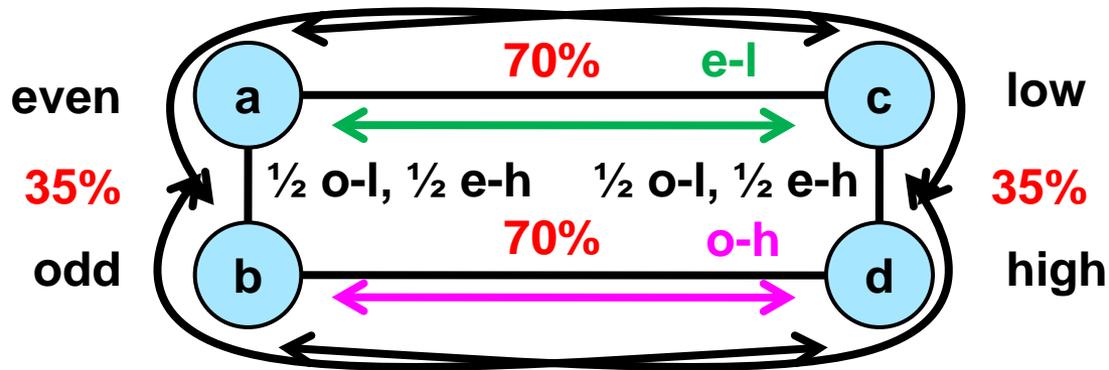
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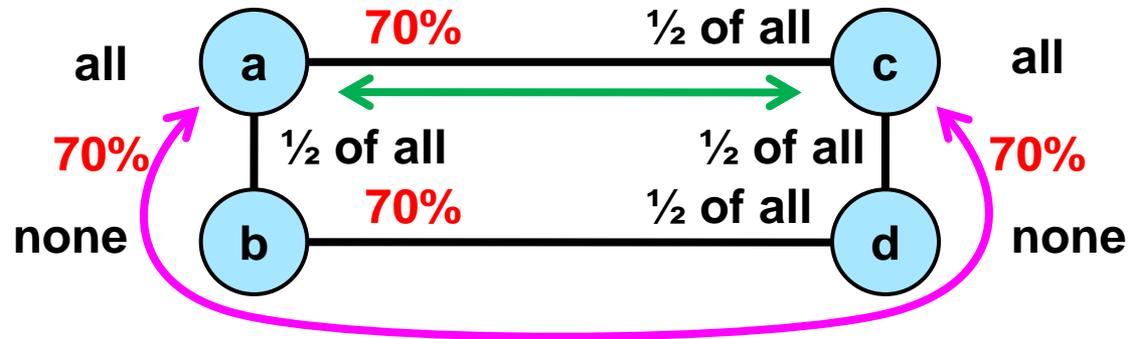
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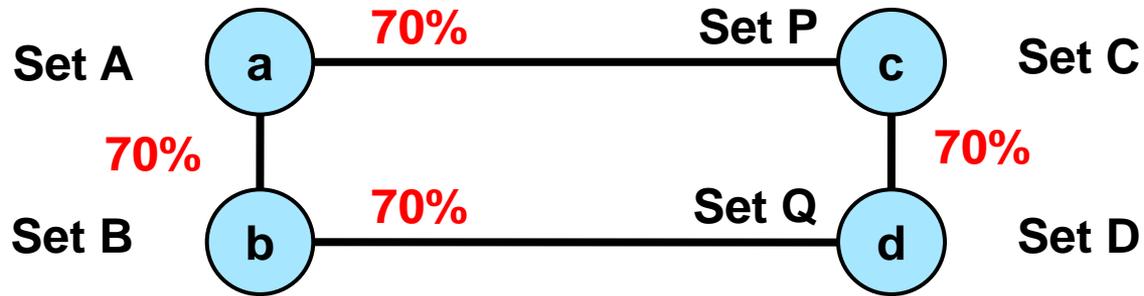
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- **But, the gateway selection can always change so that we require > 100% of a vertical link's capacity to meet our contract.**

# Load sharing the horizontal links

Set A — a — **70%** — Set P — c — **Set C -> Set Q**

**70%** (a–b vertical) **140%** (c–d vertical)
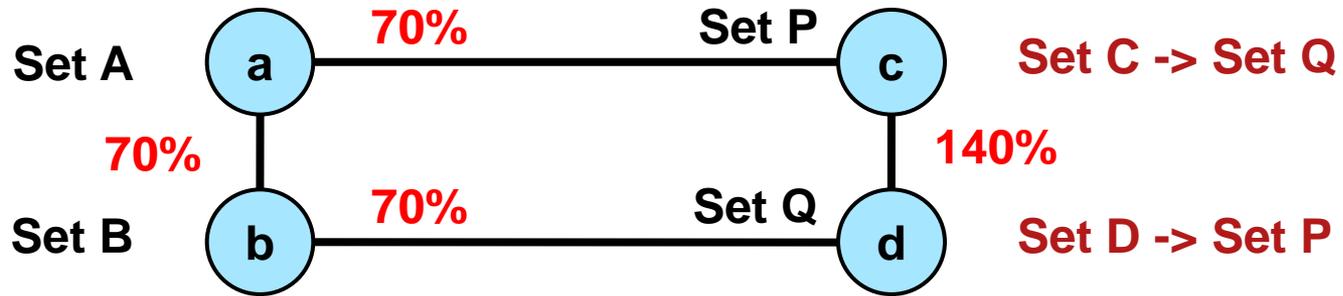
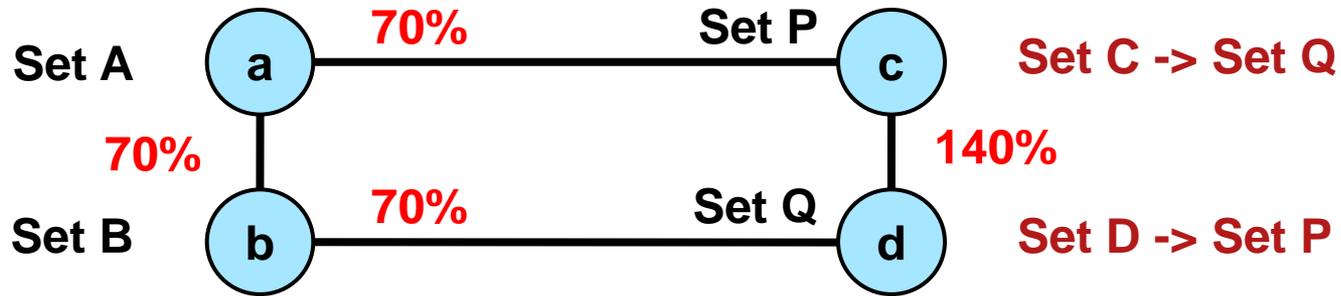Set B — b — **70%** — Set Q — d — **Set D -> Set P**

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- **To avoid this we must include gateway selection in the horizontal protocol exchange.**

# Rationale for ultra-reliable links

- The **up** side: If I have an ultra-reliable link, then I can achieve my goals with a simpler protocol.

- The **down** side:  If my ultra-reliable link fails, then I fail to meet some significant goal (at least convergence time, perhaps temporary loops) for some period of time.

# Rationale for **no** ultra-reliable links

- The **up** side: If I include all links (horizontal and vertical) in the "routing" protocol, then I meet my goals no matter what happens.

- The **down** side:  My protocol is more complex, because it is a "routing" protocol, not a "hot standby" protocol.

# Do ultra-reliable links exist?

- The usual means for building an ultra-reliable intra-Portal link are:

    1. Use a network for a "soft" link.

    2. Use multiple physical links (e.g. Link Aggregation).

# Soft intra-Portal links

- The members of the Portal must select a carrier.
  - Layer 2?
  - Layer 3?
- Arrangement of carrier.
  - Multipoint or multiple point-to-point?
  - How are endpoints defined?
    - Multicast address?
    - L2 or L3 unicast address?
    - Configuration or discovery?
- **Discovering the loss of the intra-Portal link can happen no faster than the recovery time of the underlying network.**
- The exact impact of this on DRNI recovery time must be determined.

# Multiple physical intra-Portal links

- The most common cause of failures in a provider network is human error.

  - Usually misconfiguration.

  - Sometimes wiring changes.

  - Sometimes bad software updates.

- Such errors are likely to affect both physical links.

- So, only "more-reliable" links are possible.

# Summary

- Including the vertical links in the protocol will yield a more capable solution in terms of vertical load sharing and failure resiliency.

- But, including vertical links in the protocol makes the protocol more complex.