
# Control of the DRNI

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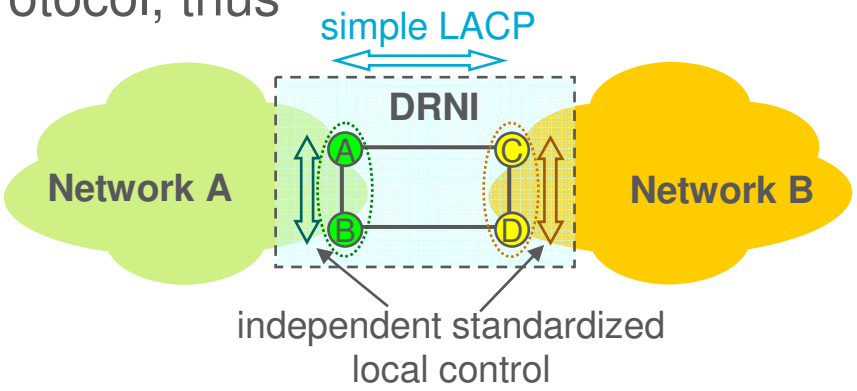
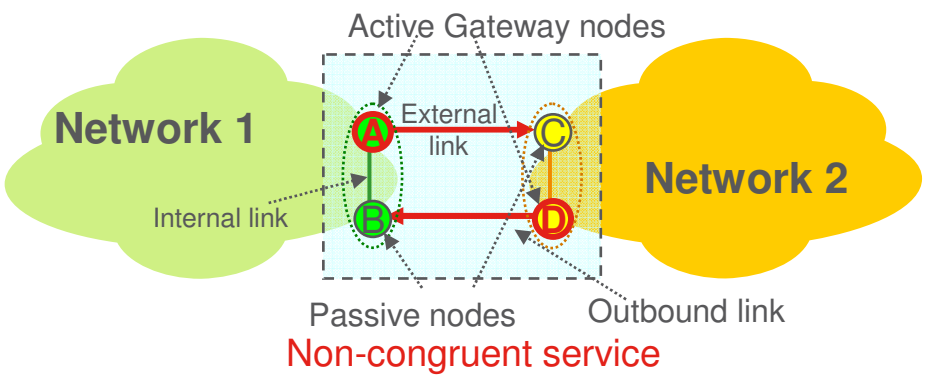
# Minimalist control for DRNI

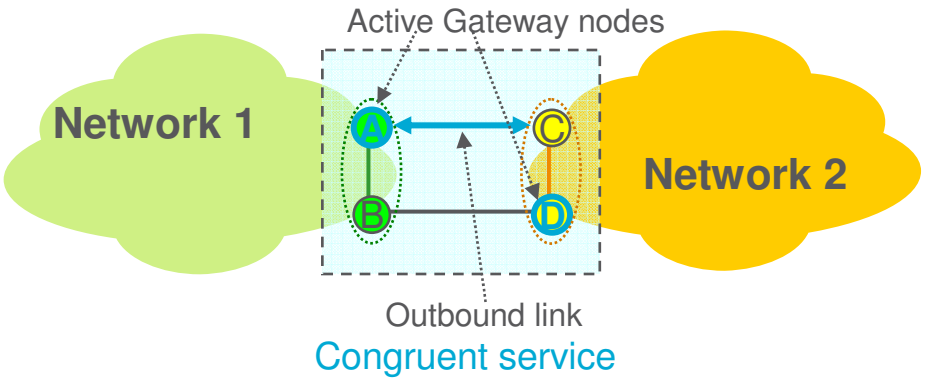
- Minimal coordination
  - Service ID is the absolute minimum
  - Congruency can be ensured by coordinated external link priorities
- Minimal communication
  - Providers do not like to share their network internal information
  - LACP (or CCMs) already provide the status of the external links to the peering parties
- Keep LACP as simple as possible
  - It is possible to provide control for DRNI with a simple LACP if
  - Portals run a standardized control protocol, thus
  - Portal controls can be run independently
  - Therefore, provider preferences are hidden from the peer



# Picking selects Gateway and external link

- Picking protocol selects:
  - Single Active Gateway node within a Portal for a service, (all other nodes are Passive)
  - Single outbound link for a service, the inbound is the same for congruent services



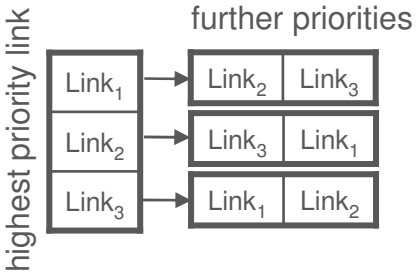




- Each Portal runs its own Picking protocol independently of the peer
- Picking is based on priority values
  - Configured by the operator (or set by its routing protocol)
  - If not set, then provided by auto-provisioning

# Auto-provisioning

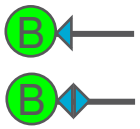
- Non-congruent services
  - Auto-provisioning may be independent as no coordination is required
- Congruent services
  - Auto-provisioning has to provide coordination
  - Standardized algorithm can ensure that peering parties determine the same external link priorities for a particular service
  - No need for message based coordination
- Auto-provisioning should distribute the load for normal operation
  - (Providing connectivity is the main goal after failures, not load distribution)

- A simple example algorithm for congruent services
  - Input parameters
    - S = Service ID
    - N = number of external links
    - L = sorted list of external link IDs (determined by LAG)
  - Highest priority link: H
    - P = S modulo N
    - H = P-th element of L
  - Further priorities are relative to the highest one in a pre-defined manner, e.g. as shown in the figure

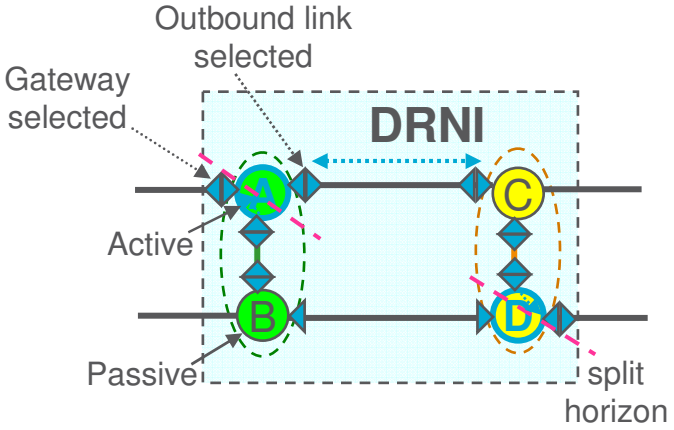


# Implications of Picking on forwarding

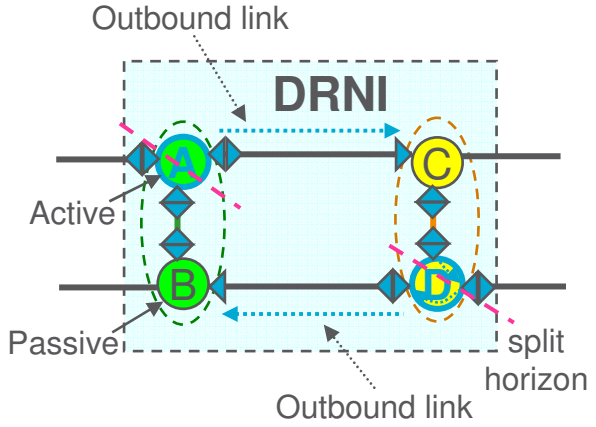
- Data plane properties (new-farkas-RNI-data-plane-0111-v02)
  - Each external port is prepared to receive data frames:
  - Transmission is only on the outbound port (able to receive too):
  - Active Gateway node splits horizon




- Picking and link status determine forwarding
- Congruent service
  - Inbound link = Outbound link
  - Coordinated external link priorities
  - Picking selects
    - Highest priority node
    - Highest priority external link



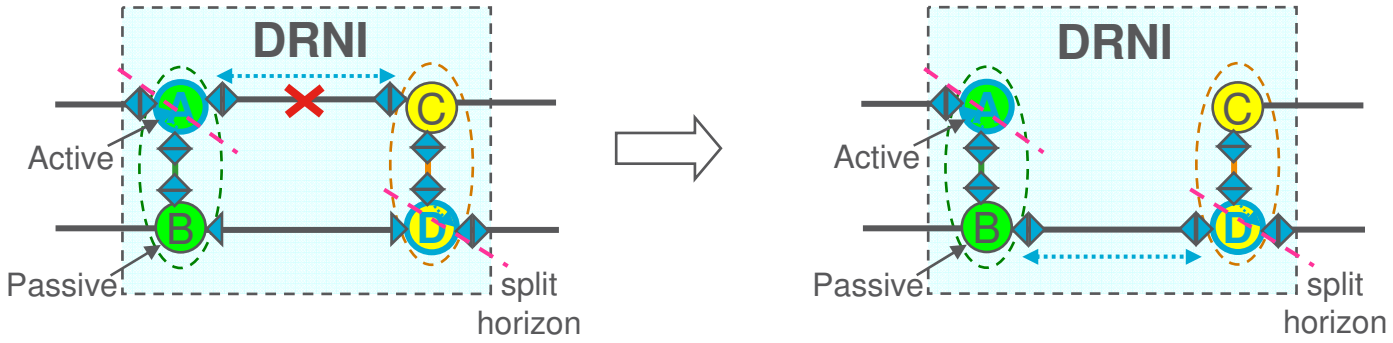

- Non-congruent service
  - Either link can be the inbound link
  - Outbound link is connected to the Gateway
  - Picking selects
    - Highest priority node
    - Highest priority external link of the highest priority node



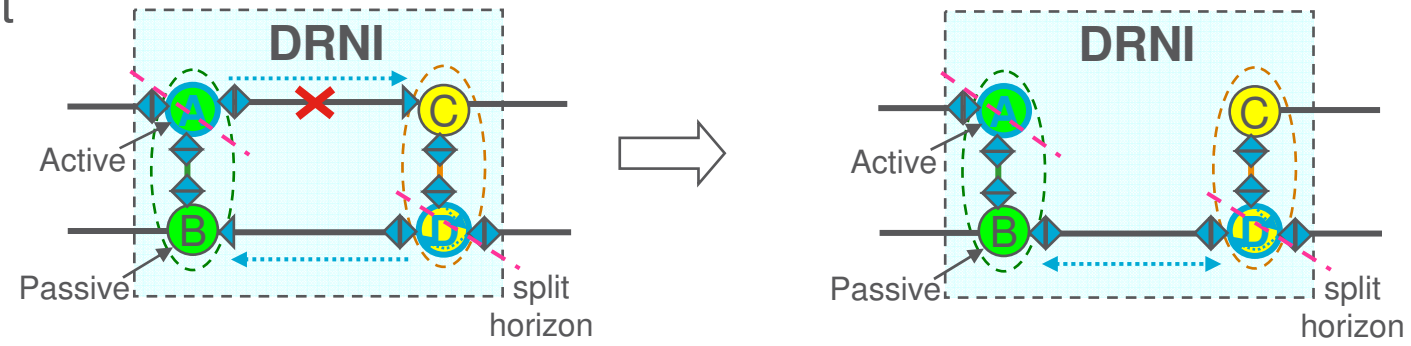
# Fault Management: External link failure

- External link failure has to be hidden from the attached networks
- New outbound link is selected instead of the broken one

- Congruent



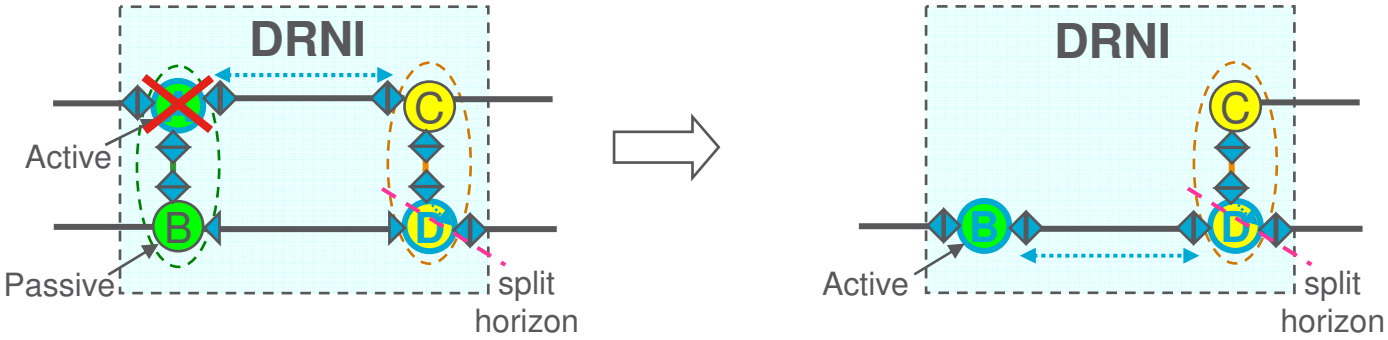

- Non-congruent



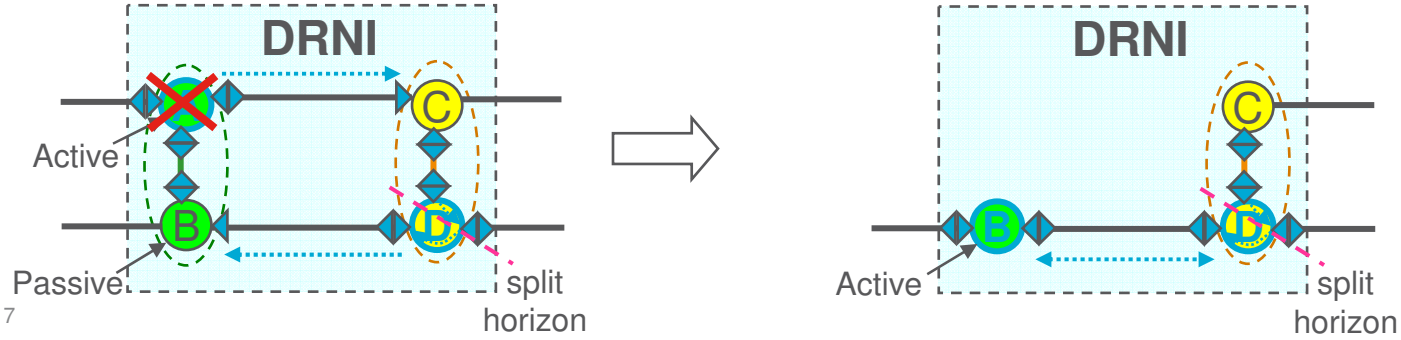
# Fault Management: Node failure

- DRNI node failure has to be hidden from the peering network
  - New Gateway is selected in the affected Portal
    - In principle, the network selects the Gateway, re-selection may be affected by the convergence of the control protocol(s) of the network,
    - The gateway is probably not reachable from a remote network node until the end of network convergence
    - 50 ms should not be required for Portal node failure
  - New outbound link is selected in both networks

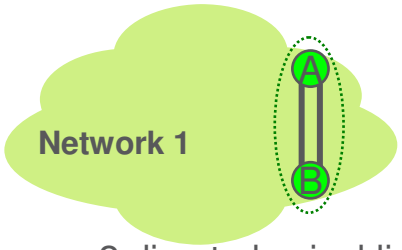
- Congruent



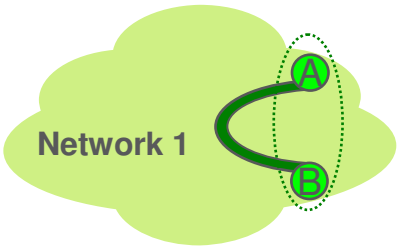

- Non-congruent



# Portal Internal link: physical link and/or overlay tunnel




2 direct physical links
protecting each other

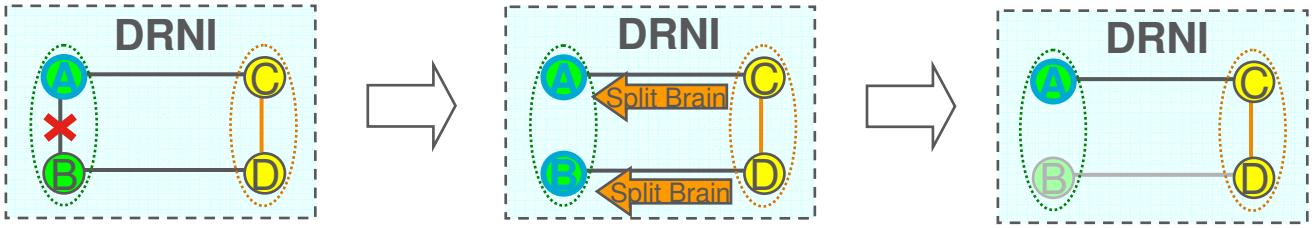



overlay tunnel
protected by network protocol

- Direct, protected physical link is preferred
- Sometimes, it is not possible to have a direct link
  - Geographically dislocated Portal nodes
- A solution covering overlay tunnel covers direct link too
- Protection for portal internal link is not a DRNI task
  - Protected by other means in case of protected physical link
  - Protected by the control protocol of the network in case of an overlay tunnel, thus
    - Overlay tunnel breakdown = split network

# Fault Management: Internal link/tunnel failure

- Internal link/tunnel failure is perceived as node failure
  - It is caused by multiple failures as the internal link/tunnel is protected
- It is not a node failure → Split Brain handling




- Due to Split Brain treatment
  - The disconnected Portal node is excluded from the DRNI
  - Split network (=overlay tunnel breakdown) is not aimed to be connected by the peering partner
- Portal control if overlay tunnel breakdown is perceived
  - If the other portal node is up, then Split Brain handling
  - If the other portal node is down, then node failure handling (page 7)
  - Portal control should wait the end of network convergence before declaring node breakdown
  - 50 ms should not be required for handling of multiple failures causing split network
- **Having monitoring through the peering network too could help to distinguish Portal node and Portal internal link failures**

# Bundling for an S-tagged interface

- What is worth to bundle?
  - Data plane bundling
    - The forwarding decision is based on S-VIDs, see e.g. new-farkas-RNI-data-plane-0111-v02
  - Control plane bundling
    - S-VIDs may be bundled to reduce control plane complexity
- Control plane bundling may be useful
- Independent control allows for independent bundles
  - Bundles are network internal
  - No need for coordination of bundles

# Summary

- DRNI control should be Portal internal
  - Portals run the same standardized control independently of each other
    - Standard auto-provisioning provides the coordination necessary for congruent services
  - Simple LACP
- Portal internal control allows for network internal bundles
- Fault management can be based on the status information and on the results of Picking