Multicast Community Forum

Virtual RP in an ECN Feed Architecture

Cisco Systems

Central Engineering's Architecture & Design

- 05Dec06 -

Reed Streifthau

Reference Slide for Abbreviations

- ECN – Electronic Communication Network
- DR – Designated Router
- FHR – First Hop Router
- IIF – Incoming InterFace
- IGMP – Internet Group Management Protocol
- LHR – Last Hop Router
- MSDP – Multicast Source Discovery Protocol
- OIL – Outgoing Interface List

Reference Slide for Abbreviations

- PIM – Protocol Interdependent Multicast
- RP – Rendezvous Point
- RPF – Reverse Path Forwarding
- RPT – Rendezvous Point Tree, “shared tree”
- SM – Sparse Mode
- SPT – Shortest Path Tree, “source tree”
- SSM – Source Specific Multicast

Agenda

- ECN Feed Requirements
- Basic ECN Architecture
- Use of a Virtual RP
- Three Scenarios
  - Emitting
  - PIM
  - Mroute and IGMP Proxy

ECN Feed Requirements

- **ECN Feeds come in several flavors**
  - **Emit traffic**
    - **LSE, NASDAQ, SFTI**
  - **Require PIM joins**
    - **CME EMEA**
  - **Require IGMP Reports**
    - **CME USA**
- **Group/RP cache**
  - **Send Group/RP cache, SFTI**
  - **Static RP**
    - **ECN's RP**
    - **Proxy RP**

ECN Feed Requirements

- **A and B feeds; same content, different Streams**
  - **May require separate locations for each feed**
  - **May require compete server sets in separate locations with both feeds**
    - **Servers configured with keepalives**
  - **May not require failover within an "A" feed (or the "B" feed) due to redundancy of the feeds themselves**

ECN Feed Requirements

- **ECN Feed networks require Layer 3 infrastructure**
  - **Firewall requirements in the works**
  - **Static routes or BGP routes**
- **All require RPs for RPT in the ECN**
  - **SSM is not a current reality**
  - **BiDir is an option**
  - ***STP-threshold infinity*** **is a reasonably good workaround**

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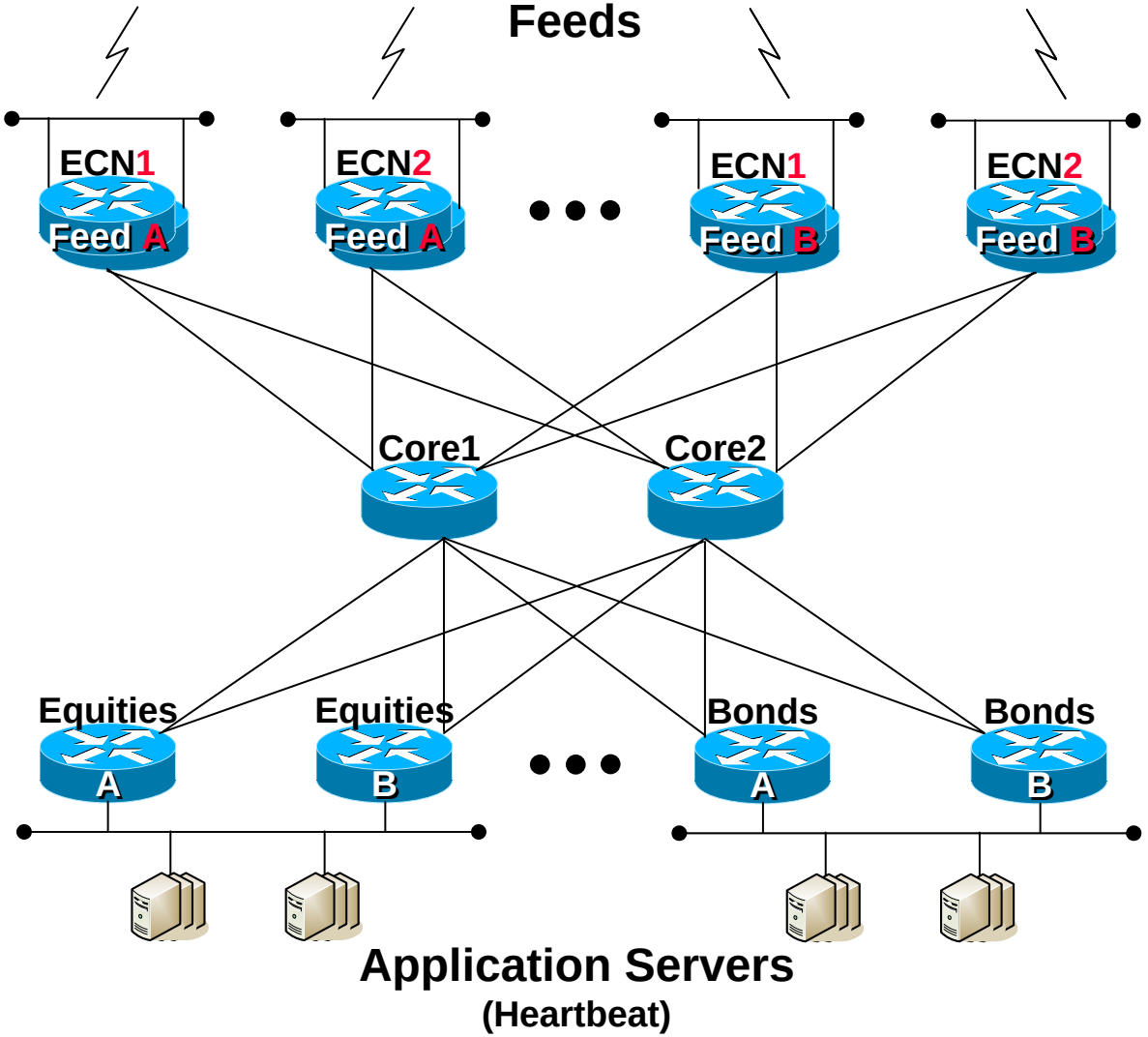
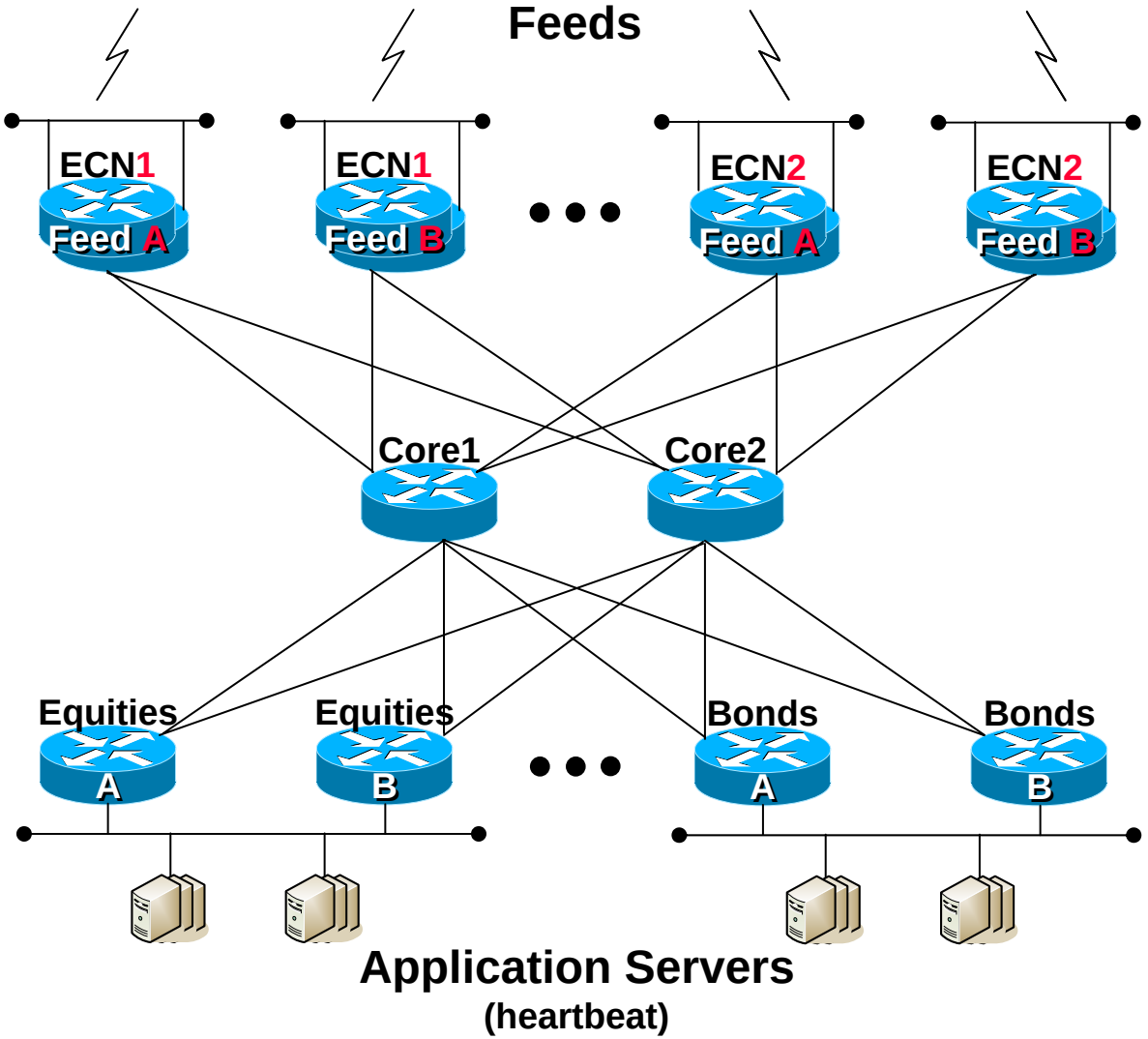
Basic ECN Architecture



Basic ECN Architecture (continued)



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Use of a Virtual RP

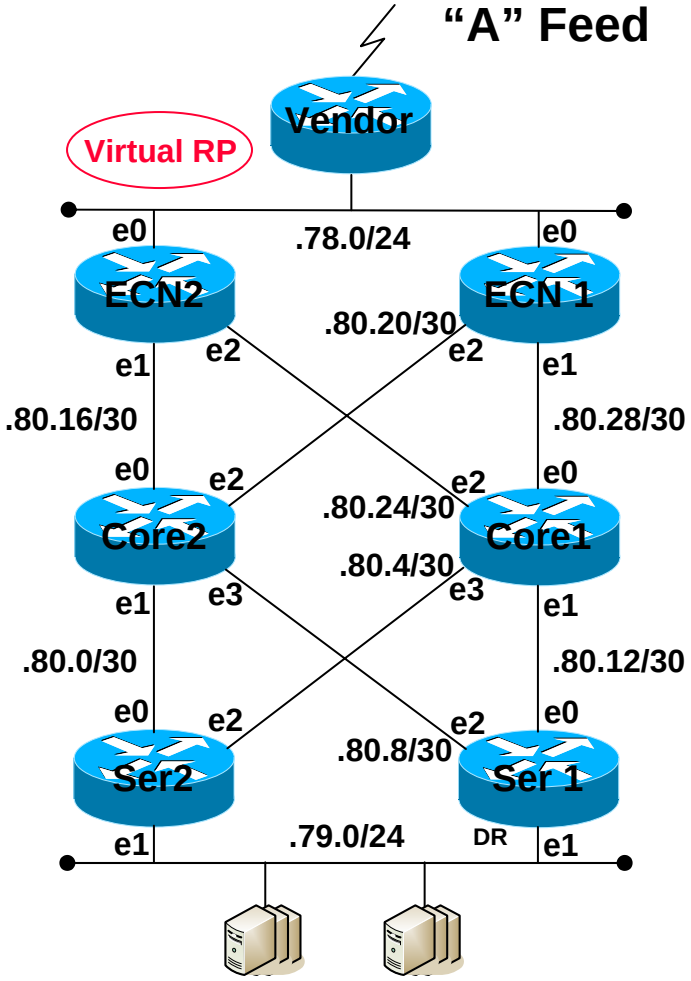
- Useful in the ECN environment to implement RP redundancy
- Virtual RP is an RP Vector
  - No source proxy-register
- Anycast-RP functionality
  - Control Plane path built via metric on “vendor network”
- MSDP is not configured
  - There is no source registration

Use of a Virtual RP (continued)

- **RPF interface via static routes**
  - **Static route to RP address pointed to “vendor net”**
  - **Static route to Source address to “vendor net”**
  - **Auto-RP *can* be used . . . and use directly connected***
- **RP Address**
  - **Use IP address that fits your ECN environment;**
    - **For IGMP proxy and Emitting requirements**
  - **Use IP address given by the Feed Provider;**
    - **For PIM requirements**
      - **RPT is checked for correct RP against the Group/RP cache on the ECN Provider router**

*** Needs CSCea86440 for directly connected IP address and fix CSCek17265, 12.2(18)SXF5, 12.4.8, 12.4.8T**

Use of a Virtual RP; Closer View



Notes

- IP addressing structure is organized to create and maintain flows on the Ser 1, Core 1, and ECN 1 routers.
- The Virtual RP "lives" on the Vendor Network (.78.0/24), it is implemented in these slides as a separate network statically pointed to the .78.0/24 net to facilitate flexibility in expanding the design to include multiple ECNs/RPs on the same architecture.

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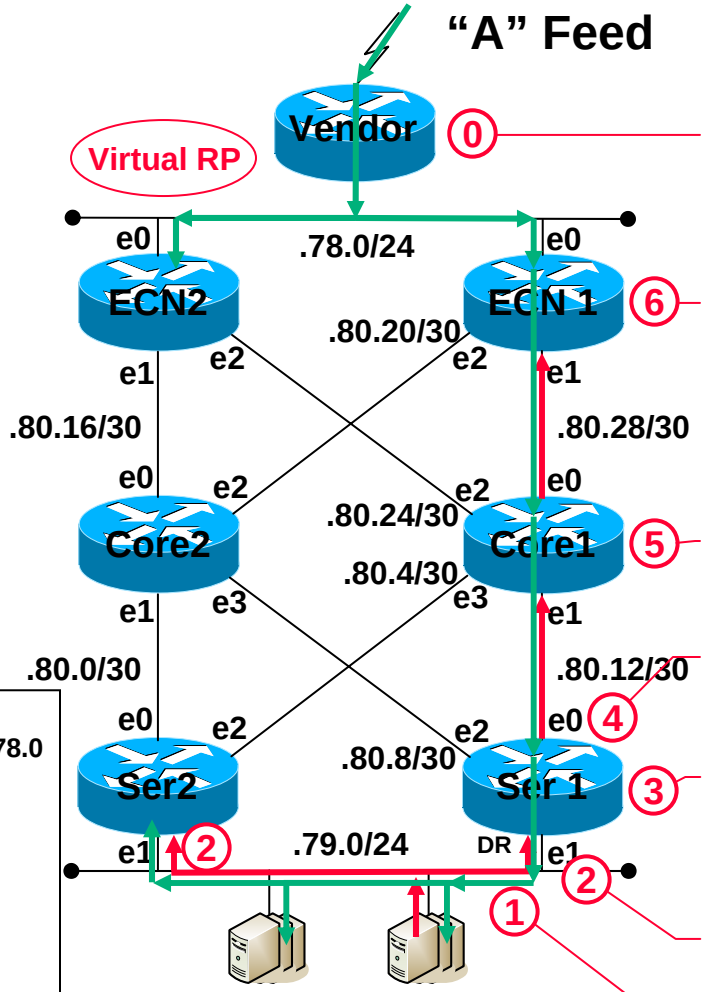
ECN; Traffic Emitting Control Plane



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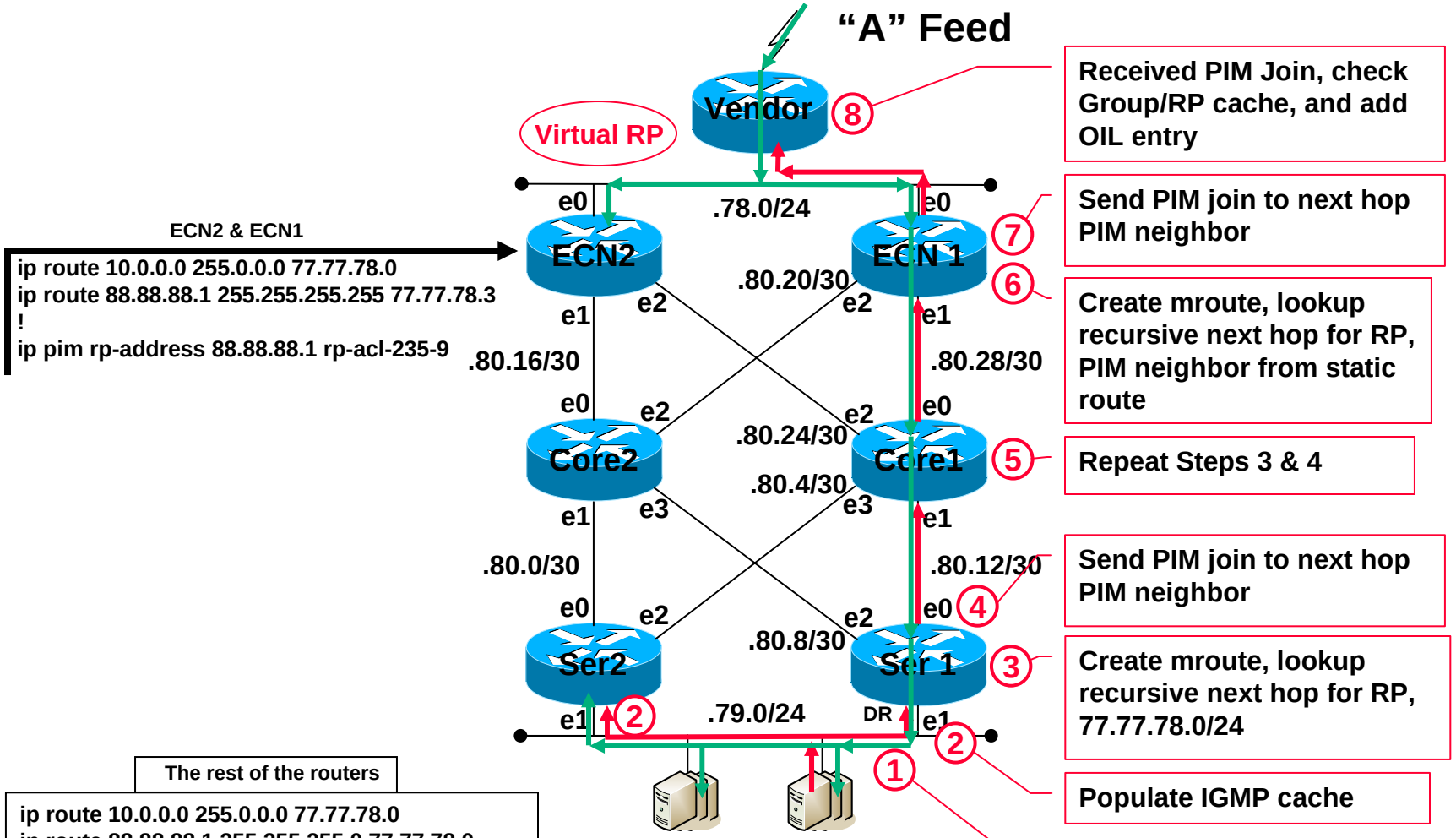
ECN; Traffic PIM Control Plane



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Mroute and IGMP Proxy

In this scenario, we need to source an IGMP report to the ECN feed router and the server is 1+ router hops removed.

Sending the required IGMP report can be accomplished using a combination of:

- ***ip igmp mroute-proxy***
- ***ip igmp proxy-service***
- ***ip igmp helper-address*.**

IGMP mroute-proxy

- Enables IGMP report forwarding of proxied (*, G) mroute entries,
- Applied to the interface on which a RPT Join is received
  - When the OIL entry is populated for this interface, IGMP reports will be sent to the configured Loopback.

ip igmp mroute-proxy interface-type interface-number

- First released in 12.1(5)T

IGMP proxy-service

- Configured on the Loopback interface
- Based on the IGMP query interval (of the loopback interface), the router periodically checks the mroute table for (*, G) forwarding entries that match interfaces configured with the *ip igmp mroute-proxy* command. Where there is a match, one IGMP report is created and received on this loopback interface

ip igmp proxy-service

- First released in 12.1(5)T

IGMP helper-address

- Configured on the Loopback interface
- The command allows the router interface to helper IGMP reports received from *igmp proxy-service* to an upstream router, the ECN feed router.

ip igmp helper-address <address>

- First released in 12.1(5)T

ECN; IGMP Required Control Plane

```
interface Loopback1
 description ** igmp proxy-service **
 ip address 77.77.11.1 255.255.255.255
 ip pim sparse-mode
 ip igmp helper-address 77.77.78.5
 ip igmp access-group filter-igmp-helper
 ip igmp proxy-service
```

```
interface Ethernet1/0
 description ** To Cisco2 **
 ip address 77.77.80.18 255.255.255.252
 ip pim sparse-mode
 ip igmp mroute-proxy Loopback1
```

All routers

```
ip route 10.0.0.0 255.0.0.0 77.77.78.0
ip route 88.88.88.1 255.255.255.255 77.77.78.0
!
ip pim rp-address 88.88.88.1 rp-acl-235-9
!
ip access-list standard filter-igmp-helper
 permit 239.1.1.1
ip access-list standard rp-acl-235-9
 permit 235.0.0.0 0.255.255.255
 permit 236.0.0.0 0.255.255.255
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 permit 238.0.0.0 0.255.255.255
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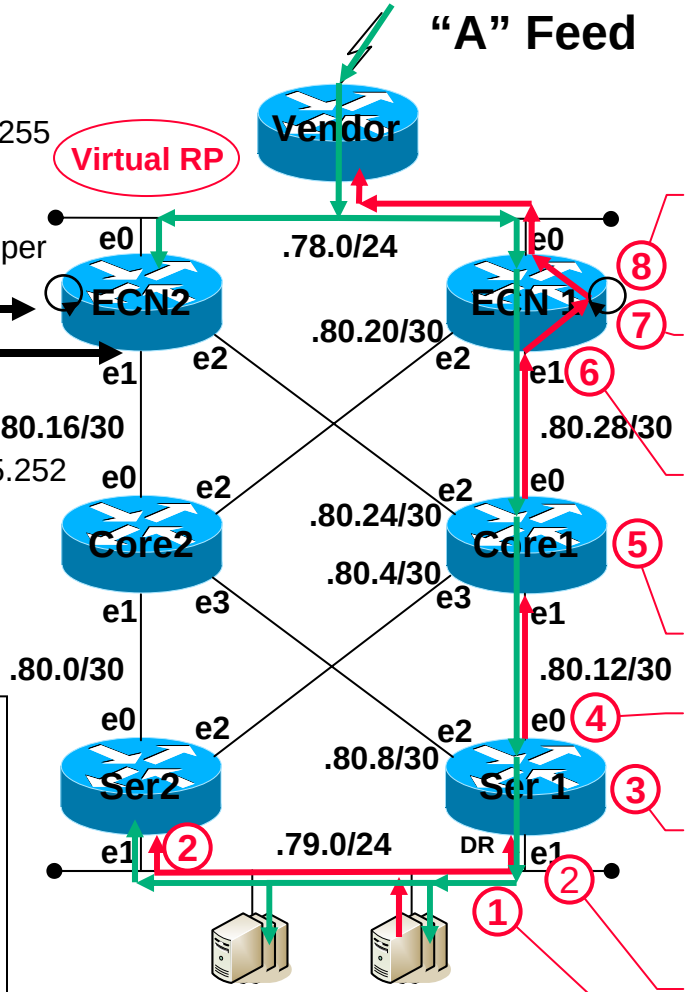
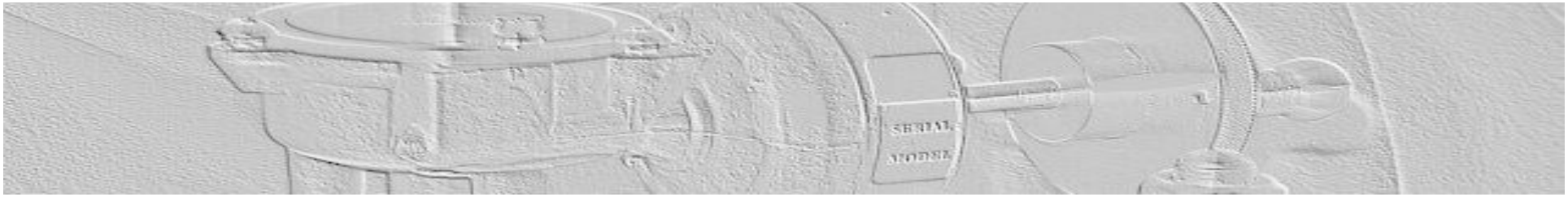


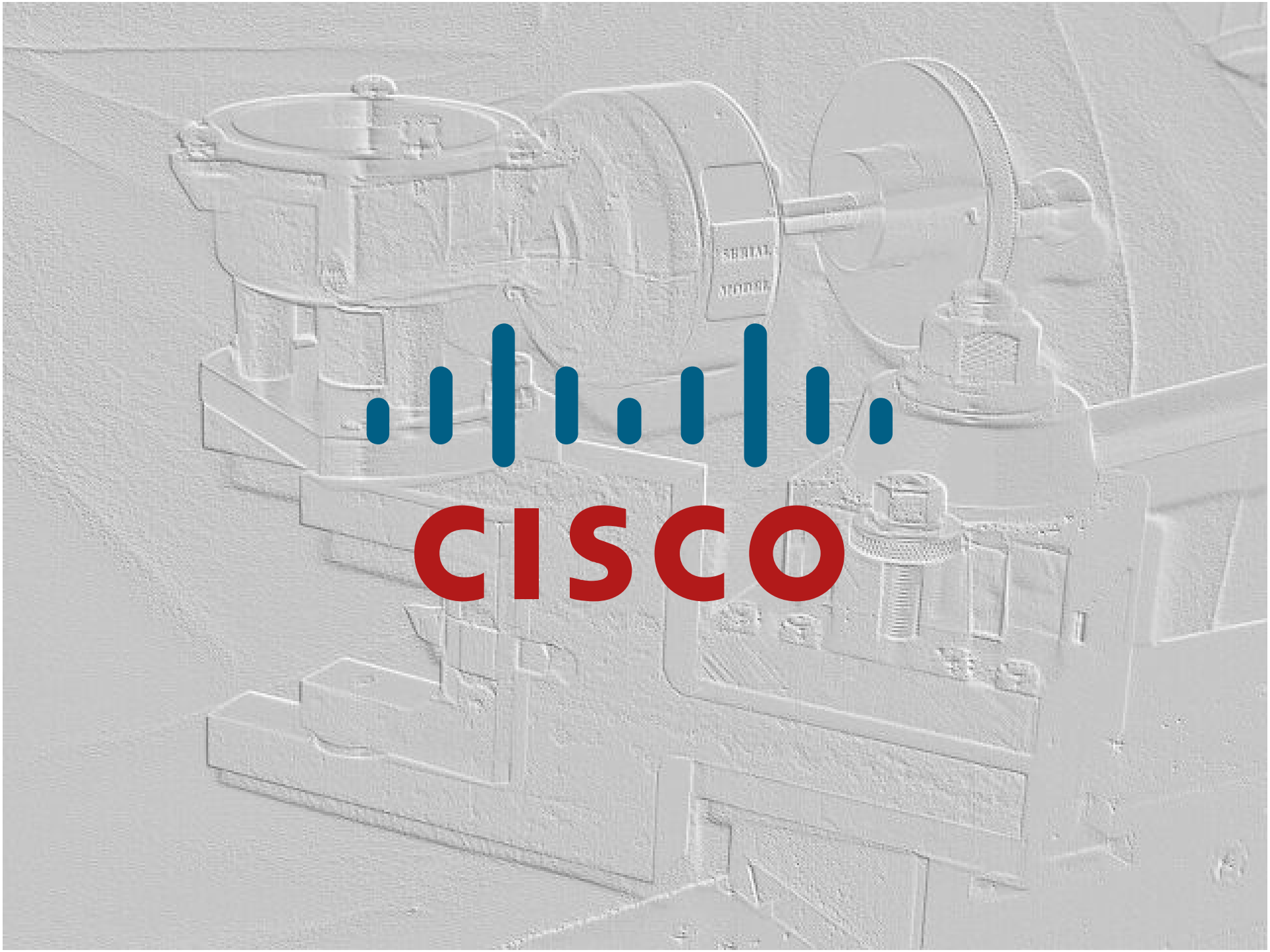
1. IGMP Report
2. Populate IGMP cache
3. Create mroute, lookup recursive next hop for RP, 77.77.78.0/24
4. Send PIM join to next hop PIM neighbor
5. Repeat Steps 3 & 4
6. Create mroute, populates the OIL, and an Unsolicited IGMP Proxy Report to Loopback 1
7. IGMP Report is added to IGMP cache, mroute entry OIL is *not* incremented, and "C" flag is set
8. IGMP Report is "helpered" to Ethernet 0
   ** no PIM join sent **



- Control Plane Flow Sequence
- **The following sequence illustrates the flow of control plane packets within the ECN customer's network and across the Administrative Boundary. Data is flowing opposite the control plane arrows. Please refer to *Figure 1, Control Plane Flow Topology*.**
- **The simple sequence of control plane operation is:**
- **Server is configured to join the ECN feed(s)**
- **Server sends out an IGMP Report for the group(s)**
- **FHR receives IGMP Report and caches it**
- **PIM is triggered by the entry in IGMP cache to create a *,G Mroute entry.**
- **The mroute's OIL entry is populated and a PIM join message is built.**
- **The PIM join message is addressed to the upstream neighbor towards the RP, Intermediate Router, and sent.**
- **Intermediate Router receives PIM join message, creates mroute/OIL, and builds PIM Join message addressed to the next upstream router to the RP. This step may repeat for additional Intermediate Routes.**
- **Cisco1 receives the *,G PIM Join message, creates state, and populates the OIL.**
- **Cisco1 sends an Unsolicited IGMP Proxy Report to Loopback interface via mroute-proxy with target Loopback's IP address.**
- **IGMP Report is added to IGMP cache.**
  - **mroute entry OIL is *not* incremented**
  - **"C" flag is set**
- **IGMP Report is "helpered" to interface connected to the ECN Feed router.**
- **Subsequent IGMP Reports are sent in response to IGMP Query on Loopback interface.**
- **The time interval for the "helpered" IGMP Reports can be effectively set by setting the IGMP Query Interval.**

Summary

- ECN feeds come in several flavors depending on the Market Data Vendor
- Reliable ECN feed networks require understanding of the requirements
- Each ECN feed should be on a separate set of routers to serve its unique requirements
- Core routers serve as the common infrastructure point between ECN feed routers and the application routers
- Virtual RP technique can be used to incorporate redundancy and fast recovery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