Protocol Independent Multicast (PIM) Examples

Acknowledgments:
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PIM Dense Mode (DM) Actions

- *Prune* used to remove links not on the reverse shortest path (i.e., shortest path back to source)
- *Asserts* used to determine the forwarder for network with two routers
- *Grafts* used to join existing source tree
PIM-DM(1)
Initial flood of data

Source

S

Receiver 1

Receiver 2

R1

R2

A

B

C

D

E

F

I

G

H

CS 640
PIM-DM(2)
prune non-RPF p2p link

Source

IGMP PIM-Prune

Receiver 1

Receiver 2

R1

R2

CS 640
PIM-DM(3)

C and D Assert to Determine Forwarder for the LAN, C Wins

Source

IGMP PIM-Assert with its own IP address
PIM-DM(4)

I, E, G send Prune
H send Join to override G’s Prune
PIM-DM(5)

I Gets Pruned
E’s Prune is Ignored (since R1 is a receiver)
G’s Prune is Overridden (due to new receiver R2)
PIM-DM(6)
New Receiver, I send Graft

Source

IGMP PIM-Graft

Receiver 1

Receiver 2

Receiver 3
PIM-DM(6)

new branch

Receiver 1

Receiver 2

Receiver 3
PIM Sparse Mode (SM) Actions

• Create routing tree for a group with Rendezvous Point (RP) as a root for the tree
  – Receivers send Join towards the RP
  – Sender send Register towards the RP

• Transition from going through RP to using shortest path tree (SPT)
PIM-SM(1)
PIM-SM(2)

Receiver 1 Joins Group G
C Creates (*, G) State, Sends (*, G) Join to the RP
PIM-SM(3)

Source

RP Creates (*, G) State

RP

C

E

Receiver 1

Receiver 2

CS 640
PIM-SM(4)

Source Sends Data
A Sends Registration to the RP
IP tunnel between A and RP since multicast tree is not established

Source

Register

Data

Source Sends Data
A Sends Registration to the RP
IP tunnel between A and RP since multicast tree is not established

Receiver 1

Receiver 2
PIM-SM(5)

Source

RP decapsulates Registration
Forwards Data Down the Shared Tree
Sends Joins Towards the Source

S

join

A

join

B

RP

D

C

E

R1

Receiver 1

R2

Receiver 2

CS 640
PIM-SM(6)

Source

RP Sends Register-Stop Once Data Arrives Natively

S

Register-Stop

A B RP D

C E

R1 Receiver 1

R2 Receiver 2

CS 640
PIM-SM(7)

SPT Switchover

C Sends (S, G) Joins to Join the Shortest Path Tree (SPT)
PIM-SM(8)

Source

C starts receiving Data natively

A

B

RP

D

C

E

R1

Receiver 1

R2

Receiver 2

CS 640

18
C Sends Prunes Up the RP tree for the Source. RP Deletes \((S, G)\) OIF and Sends Prune Towards the Source.
PIM-SM(10)

Source

B, RP pruned

A
B
RP
D

C
E

R1
Receiver 1

R2
Receiver 2

CS 640
20
PIM-SM(11)

New receiver 2 joins
E Creates State and Sends (*, G) Join
C Adds Link Towards E to the OIF
List of Both (*, G) and (S, G)
Data from Source Arrives at E