# Routing – Introduction

- In small layouts, sending every message to every node is not a problem since the message-traffic volume is not enough to saturate the network.

- In larger layouts with multiple network-segments traffic volume may enough to overwhelm slower or bandwidth limited segments.

Routing – What is it?

- The term <u>routing</u> refers to the technique of not distributing every message to every network-segment and every node, but rather filtering that traffic so that only that required by a segment is forwarded to it.

- Routing is a responsibility of Routers – special nodes that connect more than one network-segment together.

Router diagram

A Router connects multiple network-segments, here we label them 1 … N:
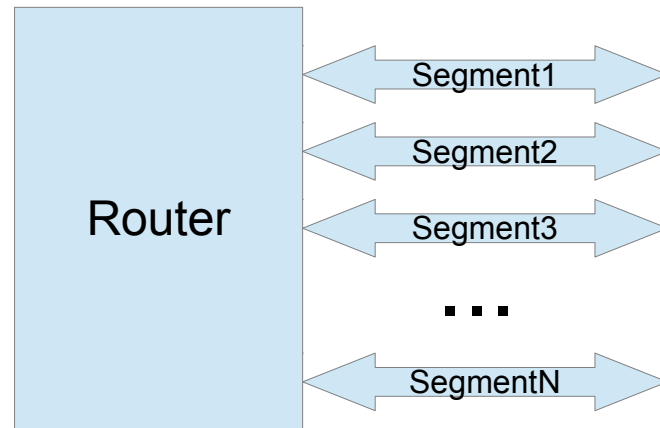
What Messages can be Routed?

OpenLCB/LCC routing use several filtering techniques on:

- Addressed messages

- special cases of Global messages:
    - Event messages
    - Simple Protocol messages

Addressed Messages

- Addressed messages, by definition, are only directed to one node, and one network-segment.

- A router follows all message traffic, and using that information, it builds a routing-table to determine which of its connected segments it should forward each specific addressed message using the destination Node ID.

Addressed Messages

Here is a made-up example of such a routing-table. The destination Node ID is matched to the table entry, and the message is forwarded to the appropriate connected network-segment.

Destination NodeID	Segment
01.00.00.23.44.12	1
01.00.00.23.E3.22	1
01.00.00.35.02.01	2
01.00.00.8F.E3.E2	3
01.00.01.00.1A.77	4
01.00.04.1A.34.5E	N
...	

Global Messages

- By definition, global messages must be distributed to every node and network-segment.

- However, there are exceptions to this, namely:
    - Event-messages;
    - Simple protocol segments.

Events – Interest-based Routing

- While Event messages are normally considered to be global, they really only need to be sent to network-segments that have nodes that consume them, or rather have an <u>interest</u> in them.

- Routers can use interest-based routing to send Event messages to only those few segments with interested nodes.
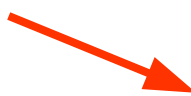
Events – Who's interested?

- Routers need to know which nodes are interested in each Event.

- On start-up each node publishes a set of their Consumer- and Producer-Events with *ConsumerIndentified* and *ProducerIdentified* messages.

- A Router then uses the contained information to build a routing table.

Events – Routing Table

A routing table may look something like this. The x's indicate to which network-segment a specific Event-message should be forwarded.

Event 01.00.10.22.A2.00.00.25 would be matched in the table and forwarded to segments 2, 3, and N, but not to 1.

| Eventid	Net1	Net2	Net3	...	NetN
01.00.00.02.3E.34.00.01	X	X			X
01.00.00.02.3E.34.00.02			X		
01.00.0E.01.45.01.02.88	X		X		
01.00.10.22.A2.00.00.25		X	X		X
01.00.10.22.A2.00.00.26	X				X
01.00.23.23.9B.00.00.77		X	X		
...					

Simple Protocol

- Some nodes are less capable, and only need to respond to an essential subset of messages. They are often considered to be leaf-nodes or 'Simple' nodes.

- They self-identify at start-up by announcing that they implement the Simple Protocol.

Simple Protocol - routing

- <u>If</u> a Router determines that a network-segment <u>only</u> <u>contains</u> <u>Simple</u> <u>Nodes</u>, it can thenlimit the message traffic to that segment by using the Simple Protocol.

- The Simple Protocol messages include:
  – Addressed messages to them
  – Verify Node ID Number
  – Verified Node ID Number
  – Identify Consumer and Producer
  – Identify Event Global
  – Learn Event
  – PC Event Report

Summary

Routing reduces network-segment traffic by allowing segments to only carry needed messages. These include Addressed, Global, and interest-based Event messages.
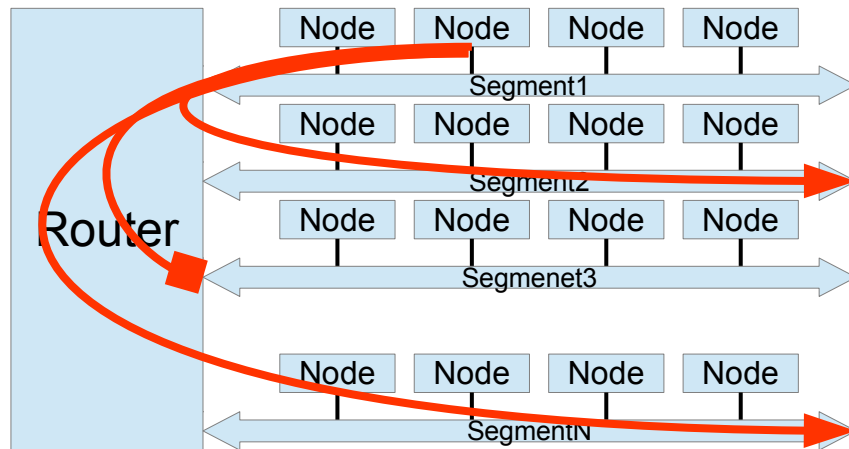
A message is forwarded to segments 2 and N, but not 3.