P1394.1 Virtual Node IDs

Peter Johansson
Congruent Software, Inc.

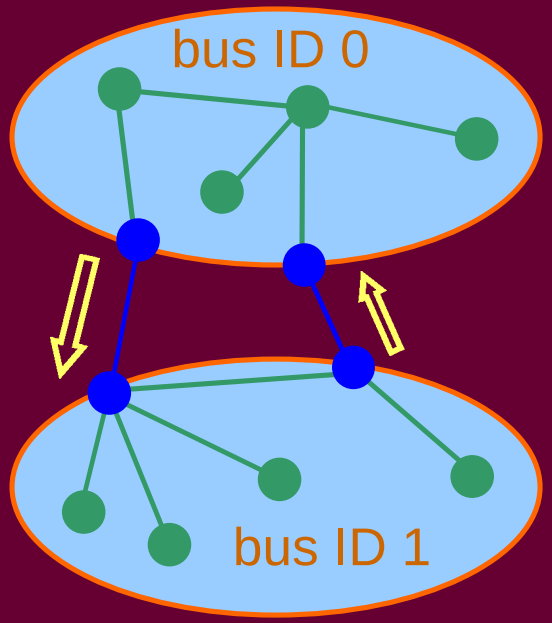
June 9, 1998

Virtual node ID's (handles)

- Bridge portals monitor local bus topology
  - Map EUI-64 to physical ID
  - Enumerate bus after each bus reset
- Remote users request "handle"
  - Behaves like 16-bit node ID
  - Invariant across bus resets
- Virtual node ID has "time of death"
  - Necessary to free limited resource
  - Remote users must periodically refresh

Separate request / response paths

- Share traffic by one-way flow on each bridge
- Request packets and response packets take different routes
- Path-dependent virtual node ID's don't work
- Bridge portals must share common virtual node ID database



Synchronization

- Central virtual node ID assignment by the bridge manager?
- Distributed assignment by bridge portal on the access path
  - Synchronize with other bridge portals on the same bus before sending response
  - Lock transactions on distributed database
  - Or locally centralized assignment by one (dominant) bridge portal?

Bus reset

- Bridge portals freeze inbound queues
- Reexamine topology of just reset bus
  - Disconnected nodes: place virtual node ID (if any) into limbo
  - Newly connected nodes: update EUI-64 directory
- Thaw inbound queues once this is done
  - Bridge portal processes inbound queue for invalid virtual node ID’s

Virtual node ID life cycle

- Assignment
  - Automatic, on request or both?
- Valid for remote access
  - Periodic refresh required
- Limbo
  - Neither valid nor available
- Release
  - Free to be reallocated

Virtual node ID assignment

- Remote requester asks for virtual node ID
  - Remote bus ID
  - EUI-64
- Automatic?
  - Remote request needs virtual node ID for *source_node_ID* so that response packet may be routed
- Potential race conditions or queue problems with automatic assignment

Virtual node ID assignment (cont.)

GetHandle(bus_ID, eui_64, handle)

- Parameters
  - Target (remote) bus ID
  - Target 64-bit unique ID
  - Requested virtual node ID
    - Used by other bridge portals, only
- Implemented by bridge portal
- Returns a valid handle or else an error (resources unavailable)

Directory services

GetEUI_64Directory(bus_ID)

- Parameters
  - Target (remote) bus ID
- Returns a list of EUI-64 for all nodes with readable configuration ROM
  - Optionally return valid virtual node ID's (if any)

Keeping a virtual node ID active

- Periodic access *via* virtual node ID
  - Reference node every *n* / *k* seconds, where *n* is time-to-live and *k* is some constant fixed in the standard
- Not necessary to access remote node by all possible paths
  - Bridge portals synchronize virtual node ID databases amongst themselves
- Responses insure that requester's virtual node ID remains valid

Limbo

- Virtual node ID invalid if *n* seconds elapse without reference across a bridge
- Invalid after bus reset if node vanishes
- Not yet safe to reassign the virtual node ID to another device
- Secondary time-out of *q* seconds
  - Choose *q* in relation to SPLIT_TIMEOUT
  - Address error for any references during this period, but restart the timer

Release to pool of free ID's

- After quiescent period in limbo, mark virtual node ID available
- References to unassigned virtual node ID's generate an address error
- Is explicit release desirable?
  - Remote bus enumeration could reuse the same virtual node ID
  - User counts required to prevent premature release of a virtual node ID

Reset notification

- Not necessary to invalidate requests or responses “in flight”
  - Virtual node ID’s are stable across reset
- Still required to trigger enumeration of remote bus
- Bridge portals could suppress when nothing has changed on the reset bus
- RESET_NOTIFICATION register optional (but recommended)