System heartbeat

Purpose:

- To detect bridge failure
- To detect bridge manager failure

Function Description:

- Bridge manager does write transactions to each portal in the net periodically.
  Write destination - Portal register SYSTEM_HEARTBEAT.
  Content of write - a constant with no meaning attached to it.
- Bridge manager monitors heartbeat response packets to detect bridge failure, if a bridge fails to respond, bridge manager retries one time before initiating net setup procedure.
- Bridge portals monitors heartbeats, missed 2 consecutive heartbeats releases the bridge portal, i.e. OWNER_ID and BRIDGE_MANAGER_ID revert to reset value.
- Each bridge manager candidate monitors local bridges, when it sees a released bridge portal, it starts the net setup procedure to gain control of the net.

Heartbeat time-out value is adjustable by bridge manager:

- A new portal CSR or to use an 8 -bit or 16-bit field in PORTAL_CONTROL register, this field needs to be inside the broadcast window for the bridge manager to have access to before the Serial Bus net is set up completely.
- Time-out period expressed in 1/10 second units.
- During net setup, when the bridge manager first encounters a portal, it writes a large value as a bridge manager heartbeat time-out value into each portal, this is to keep each portal from checking heartbeat while the bridge manager is busy setting up the net. After net setup is complete, bridge manager will deposit a true time-out value into this field for portals to start monitoring heartbeat.

Reason for choosing bridge manager initiated heartbeat over portal initiated heartbeat:

1. For portals to initiate heartbeats means the bridge manager needs to maintain one timer for each portal in Serial Bus net to keep track of heartbeats from them. For bridge manager to initiate heartbeat, it needs only one timer to fire periodically to heartbeat all portals in the Serial Bus net.
2. For portals to initiate system heartbeats, the bridge manager still needs to respond to heartbeats coming from all portals, the workload for all nodes involved is not reduced.