CE CE Strawman discussion

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Focus: $Fr$ Plane

- CEM
- CE1
- CEn
- FEM
- FE1
- FEn
- Fe
- Fr
- Fp
- Ff
- Fi
Desires

- **KISS principle whenever possible**
  - Not very ambitious on CE set
    - 1 Active and N backup CEs at a time
      - As defined in protocol document section 8
  - Avoid changes to ForCES architecture
    - Unchanged protocol
      - Use existing protocol constructs such as transactions
    - Unchanged model
      - Any CE configuration/state to be held in an LFB
        - Define a CE Object LFB if needed
What happens of CECE plane?

- Updates of NE state and config to backup CEs from master CE
- Fault detection by backup CEs in case master CE goes down
  - Election to select new master CE
CE Object LFB

• Store operational config and state of Fr plane
  • The NE CE set, for each CE
    – What type (eg master/slave)
    – Status (connected etc)
  • Connectivity parameters
    – Dead intervals etc
    – Do we need a CE Protocol Object LFB for this?
Operational Approach

- Each CE on bootup knows the NE CE set
- Each backup CE associates to listed master CE
- Master CE updates backup CEs with config
CE set discovery alternatives

- Simple approach
  - Retrieve the CE state and types from CEM interface
    - Very static CE list (including initial master)

- Slightly complex approach
  - Bootstrap as in simple approach above
  - Allow master CE to update CE Object of backup CEs with any other CEs it knows of
    - Backup CE connects to master CE

- Preference is for simple approach for now
FE participation

- Defined in protocol draft section 8
  - Fault detection and recovery
- We have a set of CEs to which an FE connects
- An FE associates to all CEs
  - Slightly different from what is defined in section 8
- An FE is dumb
  - It responds to any CE that requests it to do anything
- Events and redirects are sent to only listed Master CE
  - Alternate: send to CEID ALLCES
CE master election

- Very simple and static
  - The lowest CEID wins
- If master CE dies
  - All CEs associate to the next lowest CEID
    - Easy since the static list never changes
Challenges on CECE

- Master CE update/sync of backup CE
  - Async vs sync updates
- Protocol referencing affected LFB component to backup CEs
- Which CE associates to what CE?
- Avoiding split brain
Challenge: CE update sync

All FEs  |  Master CE  |  Backup CEs

- config
- success
- Update config

All FEs  |  Master CE  |  Backup CEs

- config
- success
- Update config: phase 1
- Please go ahead
- Update config: phase 2

Advantage:
* no update to FE if backup CEs can't take over
  --> Use PL transactional operations

Disadvantage:
* more messages exchanged per config
Challenges: Referencing update component

- FE-w/LFB-x/instance-y/component path-z is unique NE-wide

- Direction is from CEID
  - Therefore, config operation applies to hierarchy:
    - FE-w/LFB-x/instance-y/component path-z

- No clean message to CEn from CE1 “this is a config set on FE-w/LFB-x/instance-y/component path-z”
  - Hierachy in message header is between two points
Solutions: Referencing update component

- CEs keep a translation table for re-mapping
  - FE-w/LFB-x/instance-y/component path-z to something they negotiate and store in CEOBJECT
  - So then message from CE1 -> CEn translates
    - Dst = FE-w/LFB-x/instance-y/component path-z
    - to: dst = CEn/LFB-x/instance-y`/component path-z
- Limits use of LFB instances
- Adds complexity of maintaining a map
Solutions: Referencing update component

- Use multicast IDs to map the FE to which it applies to
  - Update message to CE is sent to multicast address + FEID
    - Eg FEID 1 becomes 0xC0000001
  - Limits the total number of FEs in an NE to about $2^{30} - 16$
    - 16 less than what we specify as upper bound
  - Limits the use of multicast ID space in case needed for other things
Solutions: Referencing update component

- Introduce a new TLV at the same hierarchy level as LFB selector
  - Call it “applies to” it will encompass the FEID on which update happens
    - Message now is from CEIDx to CEIDy “applies to” FEIDz on LFB-a/instance-b/path-c
  - This seems to be the cleanest solution but requires a small change to add a new TLV
CECE association

- Simple approach is that each CE associates to the known master
  - Avoids too many connections
- Upon failure of known master, election process is simple
  - Connect to next lowest CEID
  - Optimize
    - Master CE always updates the CEOBJECT Ces table of all backup Ces with connection status of each CE
CE master split brain

• If master CE dies
  • All CEs associate to the next lowest CEID
    – Repeat until success
  • Possible that some CEs may only be able to connect to others
    – We need to make sure we survive in such a scenario