EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

MATHEMATISCH-
NATURWISSENSCHAFTLICHE FAKULTÄT

Kommunikationsnetze

Fast ReRoute (FRR) Extensions for BIER-TE draft-eckert-bier-te-frr

Toerless Eckert, Gregory Cauchie, Wolfgang Braun, Michael Menth

http://kn.inf.uni-tuebingen.de

EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

BIER-TE Drafts Since Buenos Aires

- Requested in IETF 95
  - Remove FRR from BIER-TE draft
- Update from bier-te-arch-03 to bier-te-arch-04
  - Removed FRR method and put into a new draft-eckert-bier-te-frr-00

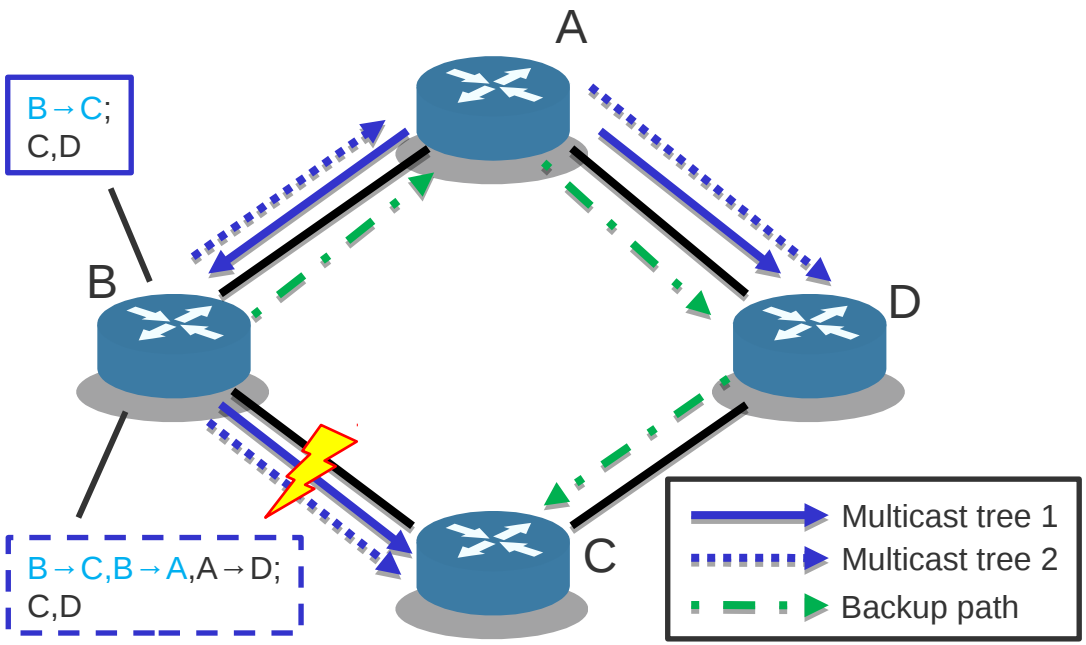
BIER-TE FRR Idea

- Failures are detected by BFR component and local detour for packets will be initiated

- FRR modifies bitstring to implement the detour
  - Backup path is encoded by adding bits
  - Some bits must be removed to prevent duplicates or even loops
  - The Add- and ResetBitmasks are dependent of the failed element but are applied to all multicast flows using the failed segment
    - Highly scalable

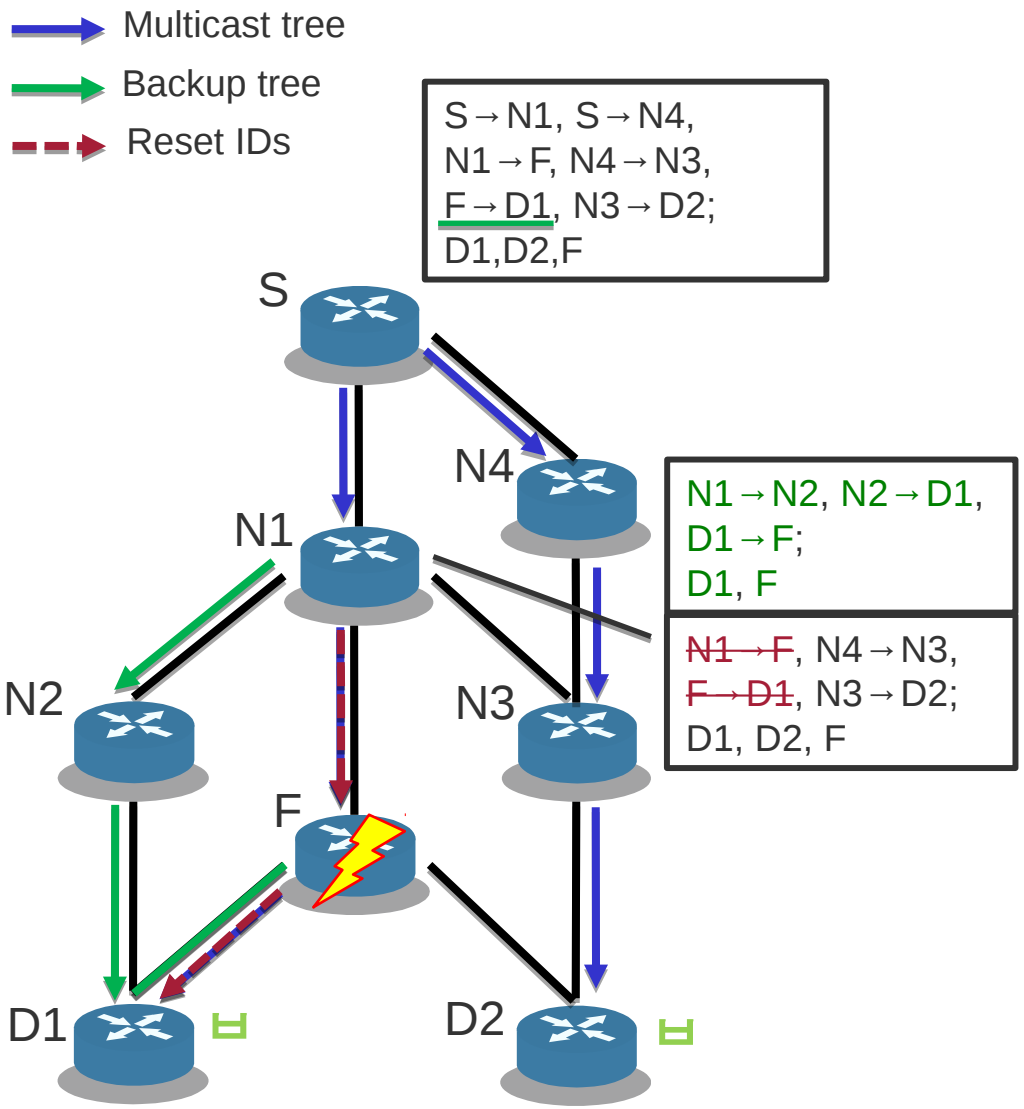
- Backup/detour paths have to be computed depending on the failure policy (link or node)

Link Failure Protection



- Packet must be redirected at B
- Multicast tree 1 delivers packets to C and D because A sends a packet directly to D
  - Local_decap(D) must be reset to avoid duplicate
- Multicast tree 2 with reset local_decap(D) does not deliver at D
- Tunneling can avoid reset bits at the backup path

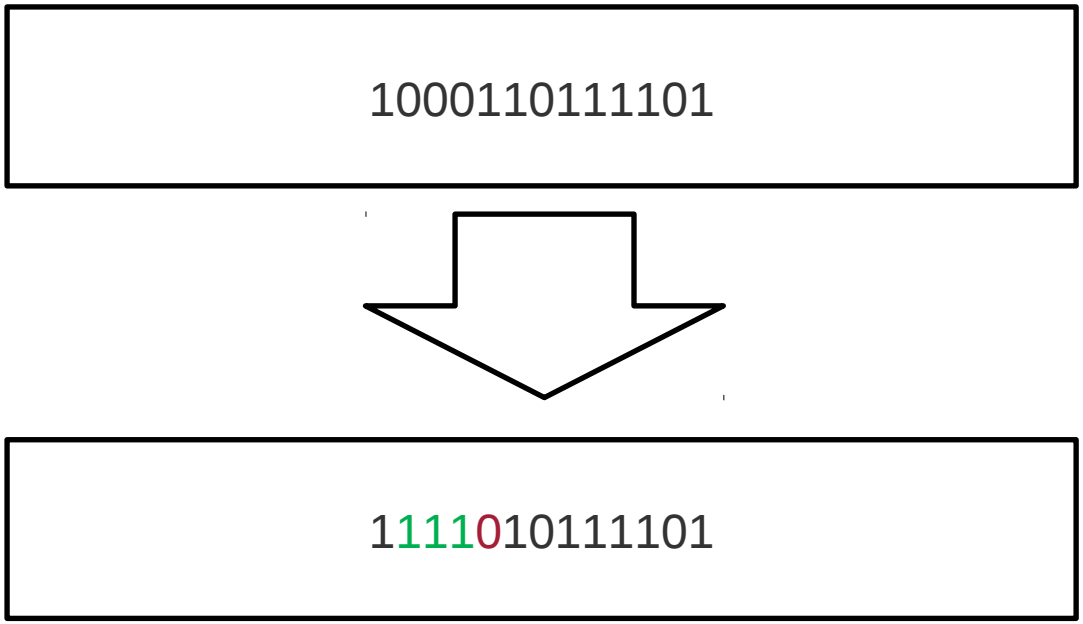
Node Failure Protection



- Improved creation of backup paths using tunnels
- Send packet only to DS-NNH
  - DS-NNH is identified by the DS-NNH-BOI: F → D1
  - Reset contains failed interface and incoming adjacencies of DS-NNHs
  - Add contains only the path to the NNH D1 but not D2 because F → D2 is not set
- No duplicates or losses!
- Additional entry for NNH adjacency necessary in BTAFT!

Backup Path Options (1)

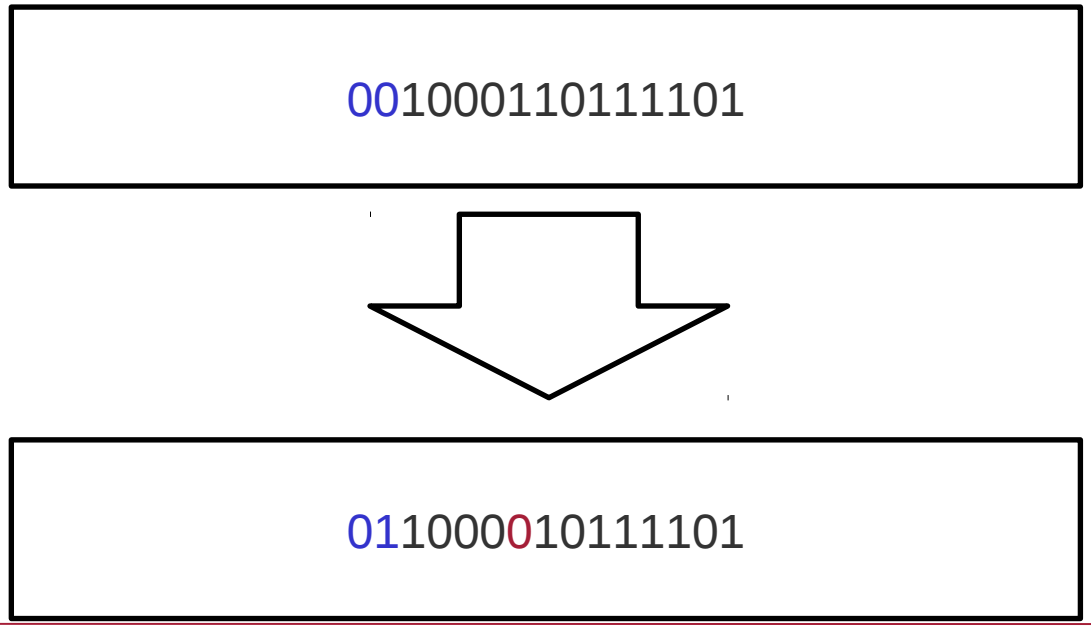
- Simply add the backup path and reset necessary bits
  - Simple to implement but lots of adjacencies have to be reset to avoid duplicates
  - Does not provide full (or rather low) coverage



Reset bits
Backup path

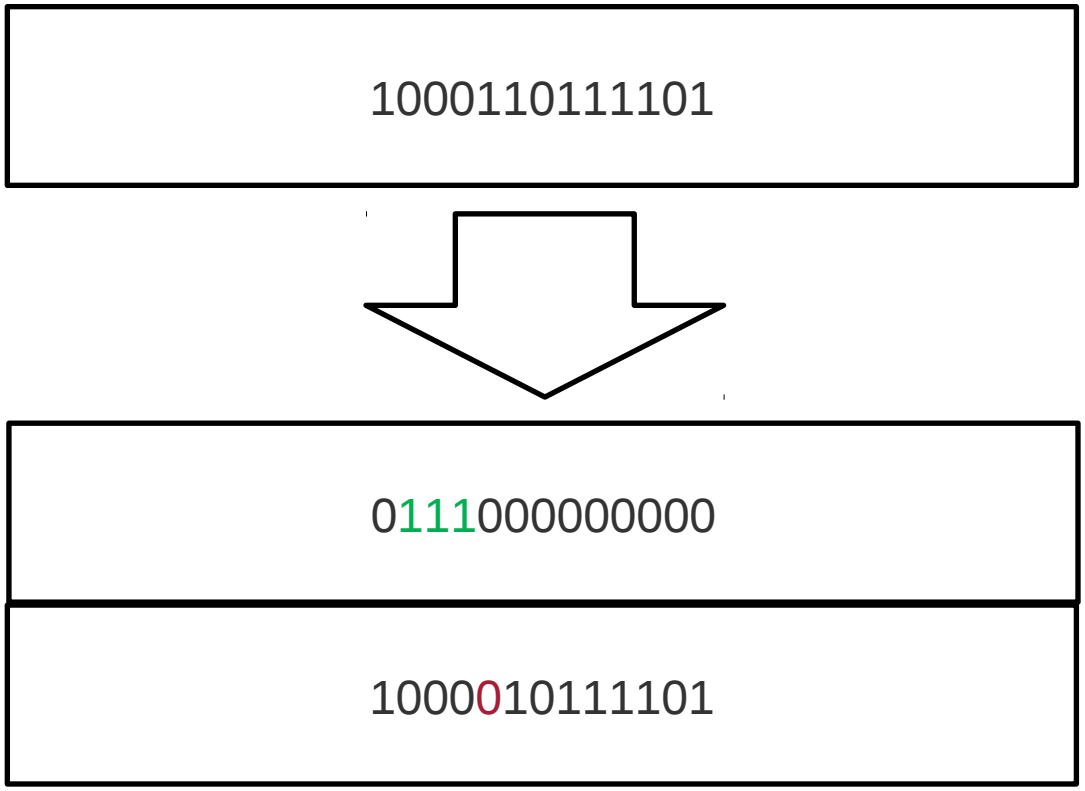
Backup Path Options (2)

- Use forward_routed() adjacencies to tunnel the packet to avoid intermediate BFRs to look at the bit string and cause duplicates
  - Requires additional bits in the bitstring to encode tunnels; bit space is already limited
  - Routing underlay must provide the tunnels; state requirements?
  - P2MP tunnels? Unicast tunnels can cause high loads for node



Backup Path Options (3)

- Use BIER-in-BIER tunneling to form the tunnel
  - Additional BIER header may cause large overhead because bitstring varies in size (64 – 4096 bits)
  - Supports P2MP detour paths for node failures



Ongoing Study on BIER(-TE) FRR

- Currently we study BIER-TE FRR
  - Different detour implementation options
  - Failure policies (link or node)
  - Failure scenarios (single link and node failures)
- Compare BIER-TE with 1+1 (live-live) protected BIER (MoFRR/MRTs)

- Preliminary results
  - Full coverage for BIER-TE cannot be achieved without tunnels; coverage is rather low or does more harm than good
  - Hop lengths are mostly lower for BIER-TE than for MoFRR
  - Unicast detour paths cause high link loads when node protection is active
  - BIER-TE generally requires less capacity than 1+1