



6TiSCH



6 October 2017 Webex

Chairs:

Pascal Thubert

Thomas Watteyne

Etherpad for Minutes: <https://etherpad.tools.ietf.org/p/6tisch>

6TiSCH interim 6 October 2017

IPv6 over the TSCH
mode of IEEE 802.15.4

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Minutes are taken *

This meeting is recorded **

Presence is logged ***

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*** From the Webex login

Agenda bashing



| | | |
|------|---|------|
| 7:05 | Opening, agenda bashing (Chairs) <ul style="list-style-type: none">• Note-Well, Scribes, Agenda Bashing, Approval minutes from last meeting• Status of drafts (WGLC / forthcoming WGLC)• Last meeting todos | 10mn |
| 7:15 | Starting 6P shepherding (Pascal) | 5mn |
| 7:20 | 6P WGLC issues resolution (Xavi) | 15mn |
| 7:35 | SFx Readiness (Diego) | 5mn |
| 7:40 | SF0 what's the plan? (Thomas) | 5mn |
| 7:45 | Reroute for RPL (Pascal) | 15mn |
| 7:58 | AOB | QS |



6P Shepherding and WGLC issues resolution

6P shepherdding



- IPR

Status

- Last Call process
- Received some comments from Pascal and Diego
- Will produce v09 addressing the comments
 - 8 comments still to be addressed.

List of issues

| | | | |
|--|---|---|----------|
| #88: update normative references | ▣ | ⤴ | RESOLVED |
| #87: reference CCM* in Sec. Cons. | ▣ | ⤴ | NEW |
| #86: move to appendix | ▣ | ⤴ | NEW |
| #85: add appendix with guidelines | ▣ | ⤴ | NEW |
| #84: check the relation between SF and 6P in terms of redefinition of formats | ▣ | ⤴ | NEW |
| #83: verify inconsistency handling | ▣ | ⤴ | NEW |
| #82: suggest best solution to handle inconsistency? | ▣ | ⤴ | NEW |
| #81: verify timeout dependencies with transaction actions | ▣ | ⤴ | NEW |
| #80: introduce and verify all codes are defined | ▣ | ⤴ | RESOLVED |
| #79: verify version checking | ▣ | ⤴ | NEW |
| #78: Define EOL | ▣ | ⤴ | RESOLVED |
| #77: check the incorrect use of at least? | ▣ | ⤴ | RESOLVED |
| #76: Define NumCandidate before use | ▣ | ⤴ | RESOLVED |
| #75: check 'recommended' word use | ▣ | ⤴ | RESOLVED |
| #74: define what celllist is | ▣ | ⤴ | RESOLVED |
| #73: verify filtering table | ▣ | ⤴ | RESOLVED |
| #72: correct text on Other Fields description | ▣ | ⤴ | RESOLVED |
| #71: do not cite specific sections if not necessary | ▣ | ⤴ | RESOLVED |
| #70: In Fig4 and others when needed add ACKs | ▣ | ⤴ | RESOLVED |
| #69: state clearly why there are 2 transaction models | ▣ | ⤴ | RESOLVED |
| #68: Define dedicated cell | ▣ | ⤴ | RESOLVED |
| #67: ref the 6TiSCH architecture. | ▣ | ⤴ | RESOLVED |
| #66: introduce that the schedule indicates transmission cells in the [slotOffset,channelOffset] CDU matrix | ▣ | ⤴ | RESOLVED |
| #65: too much text about SF in the abstract | ▣ | ⤴ | RESOLVED |

Discussion

- Version Checking comment:
 - Do nodes need to advertise the supported version?
 -
- Proposal (as per Pascal suggestion):
 - When a VER_ERR code is returned the payload of the message contains the version number(s) supported by the responding node.
 -

Discussion

- Timeout dependency:
 - Is there a dependency on the value of a timer on one side vs. the other? Eg in a 3-step, do we want the requester to time out first and retry, or the responder to retry his response before the requester times out?
 -
- Response: We want that the timeout on one side enables all possible attempts from the other side to respond. This is, has to take into account the number of L2 retransmissions that are possible.

Discussion

- Inconsistency handling
 - 3.4.6.2. Detecting and Handling Schedule Inconsistency
Inconsistency may happen when L2 acknowledgment of the last packet in a transaction is lost, i.e. RESPONSE (in 2-step 6P transaction) or CONFIRMATION (in 3-step 6P transaction) have been received on one side while timeout happens on the other side. Take 2-step 6P transaction as example, i.e. timeout happens when node B is waiting for L2 acknowledgment to its Response message. **Upon the timeout, the SF running on the node that timeout (e.g node B) MUST take action to validate the schedule state on both sides.**
 -
 - Question: Should we suggest an action? e.g counting or listing cells to see if schedules still match?
 - Same for the case that one side has reset and INCO_ERR is returned. What should 6P do next?
 -



Scheduling functions

SFx Readiness

- Proposal: editorial discussion with Diego
- Moved SF0 to SFX as an experimental version of SF0.
- SF0 will follow when the parameter values and/or ranges are calculated from the required experiments
- Added an “Experimental Requirements” section to define which experiments are needed: Values for OVERPROVISION, PDR_THRESHOLD, SF0THRESH, Timeout and churn/stability analysis.

SF0



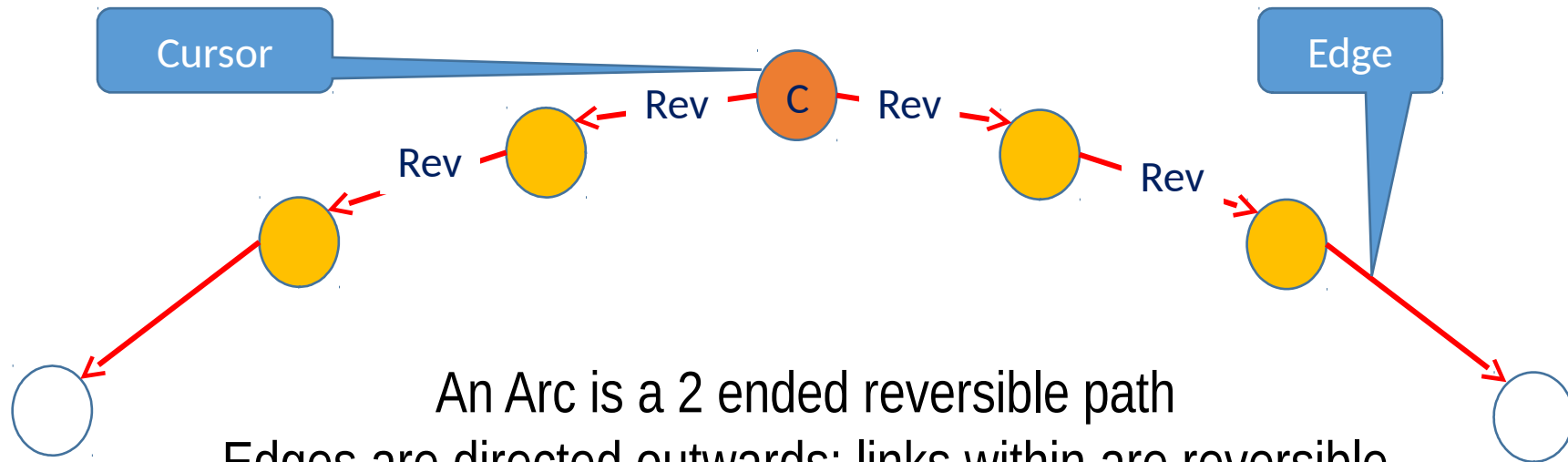
- internal discussions ongoing, not finalized yet



Fast reroute for RPL

Using central computation for non-congruent routes to root

Arc concept



An Arc is a 2 ended reversible path

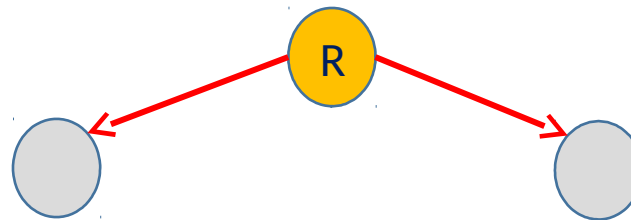
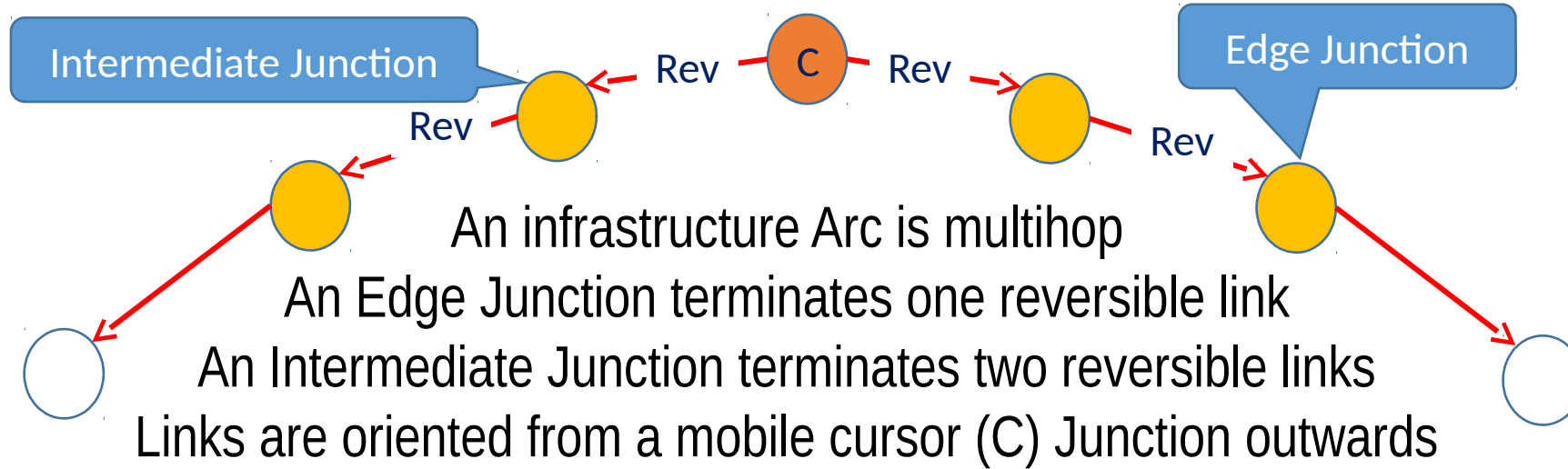
Edges are directed outwards; links within are reversible

An arc is resilient to any link or Junction break by returning links

Links are oriented from cursor to edges and returned by moving the cursor.

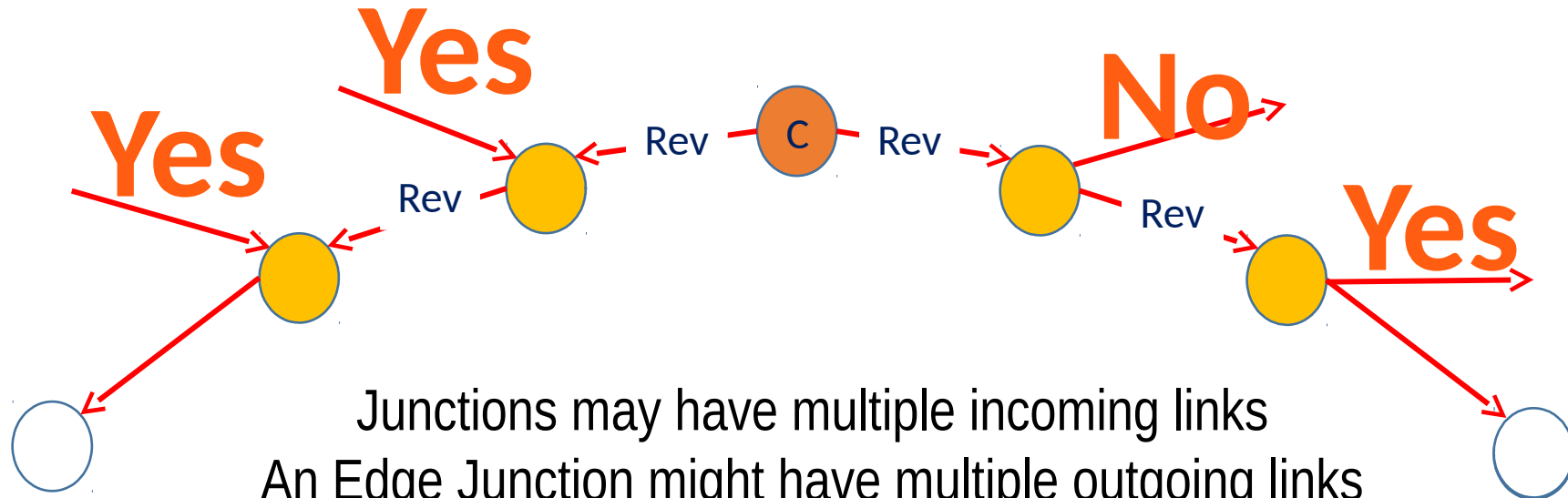
We build Arcs between Junctions

Arc concept (cont'd)

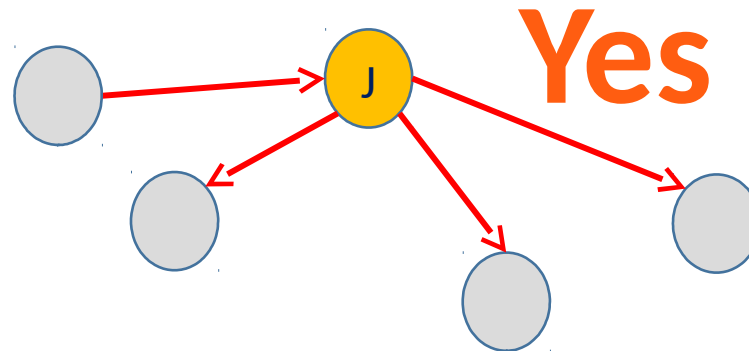


A collapsed Arc does not have an Intermediate Junction
An Edge Junction may belong to multiple collapsed Arcs

Arc concept (cont'd)



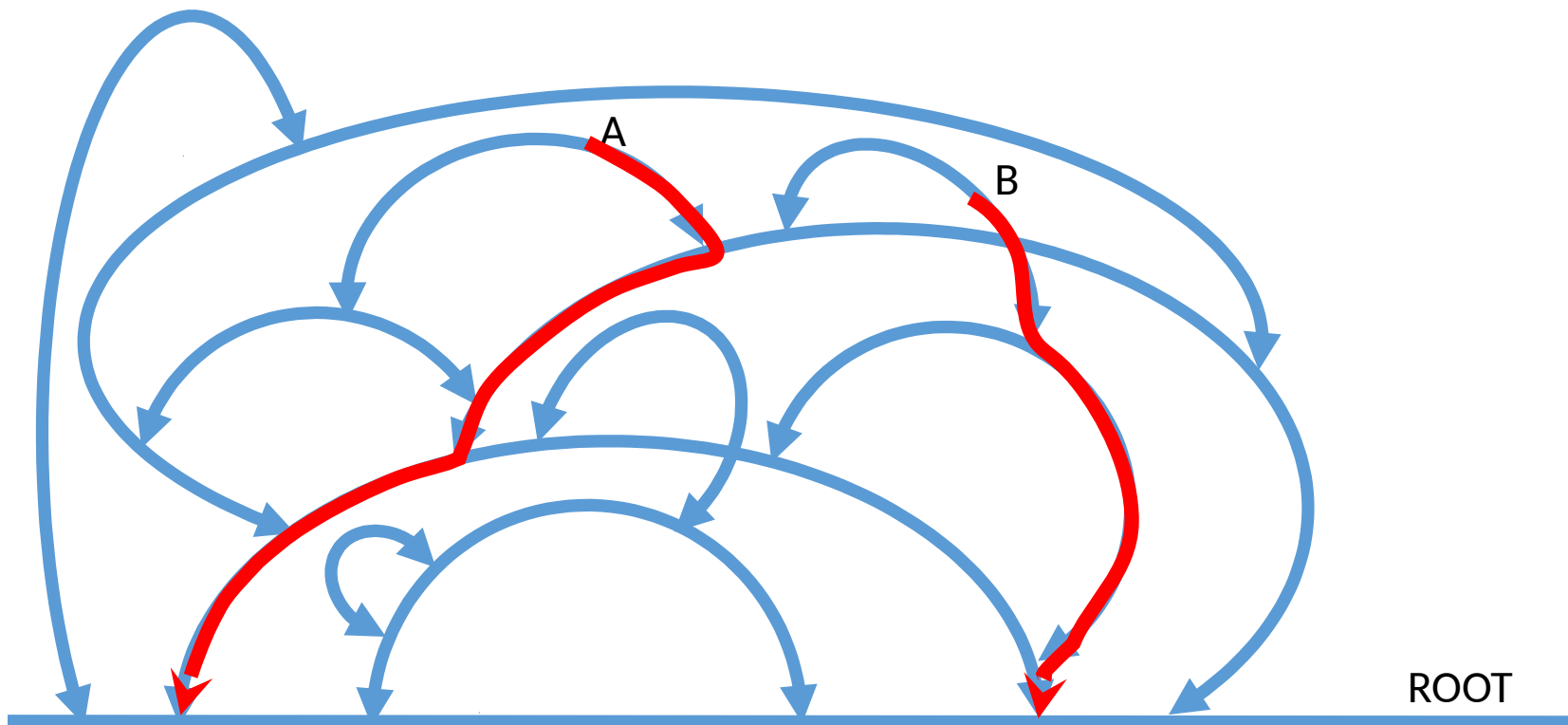
Junctions may have multiple incoming links
An Edge Junction might have multiple outgoing links
An intermediate Junction has no outgoing link but along the Arc



Software-defined Projected ARROW

Arcs for RPL Routing Over Wireless

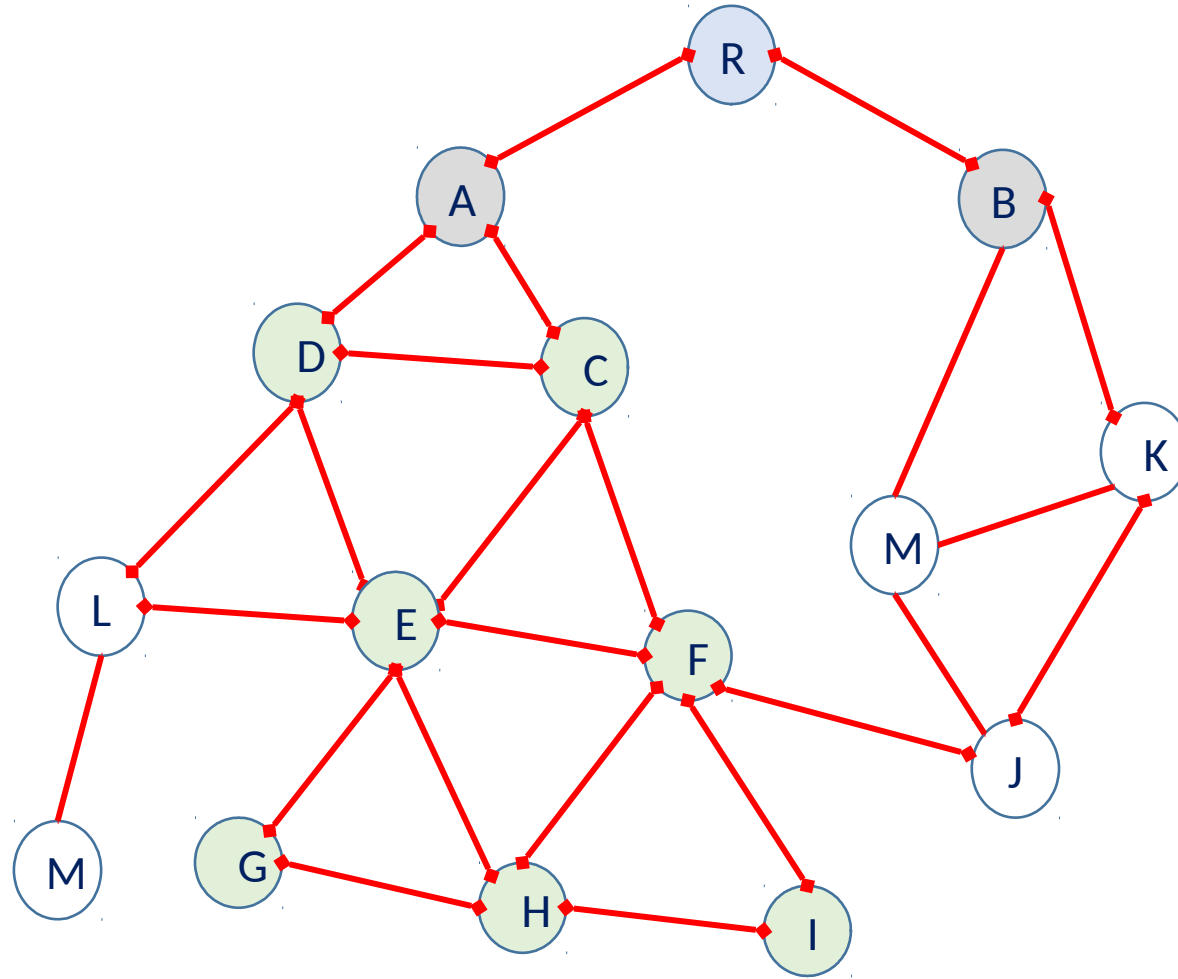
- Metrics are accumulated as usual in RPL (separated from Rank)
- Siblings are allowed (all ARC members have the same Rank)
- Rank of ARC members defines ARC height



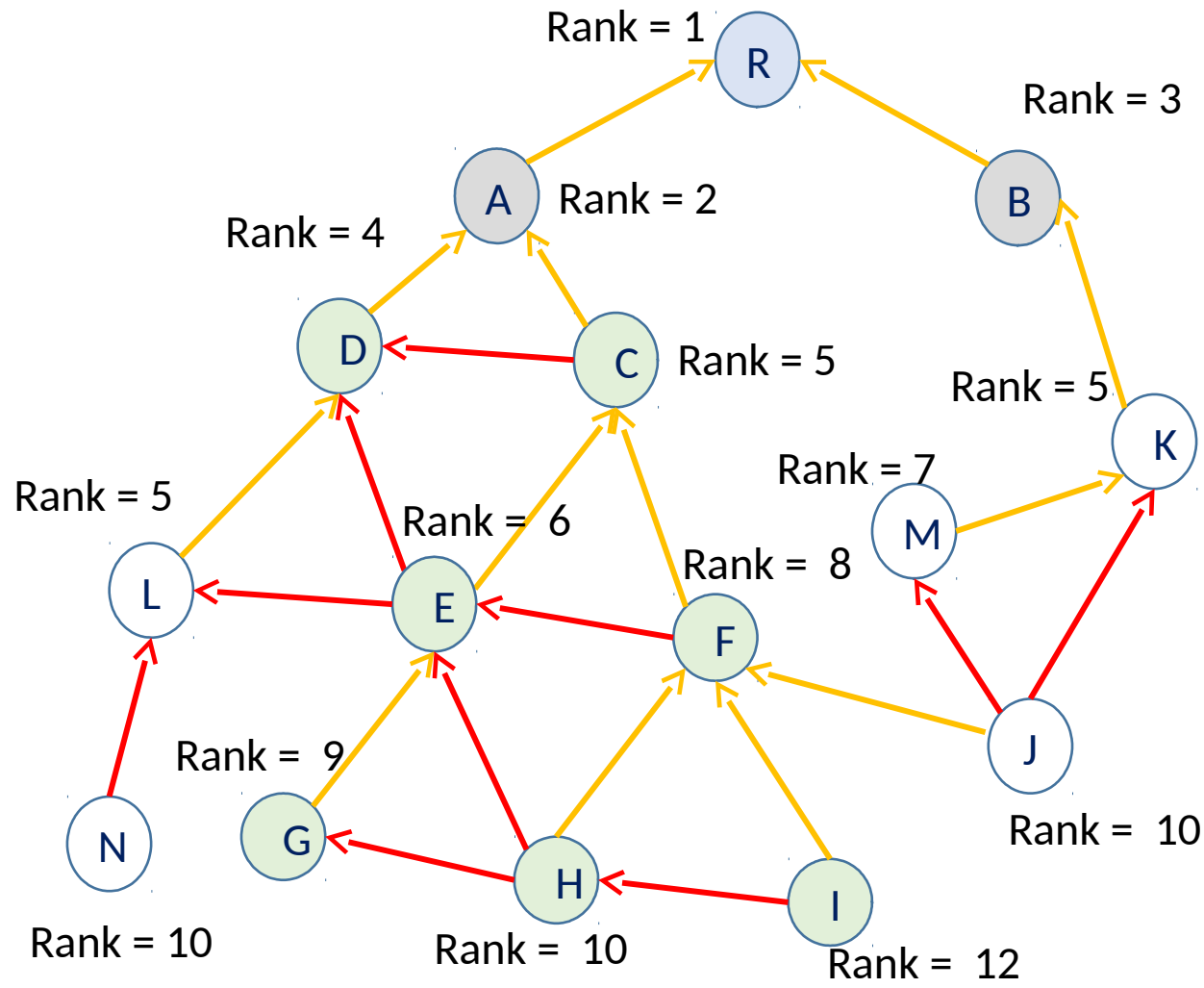
Conditions on RPL operation

- Sparrow requires non storing mode (NS-mode).
- Nodes must advertise at least 2 parents and report metrics
- Root computes ARC Set based on NS-mode DAO

ARROW Example: Initial topology



Say standard RPL gives:



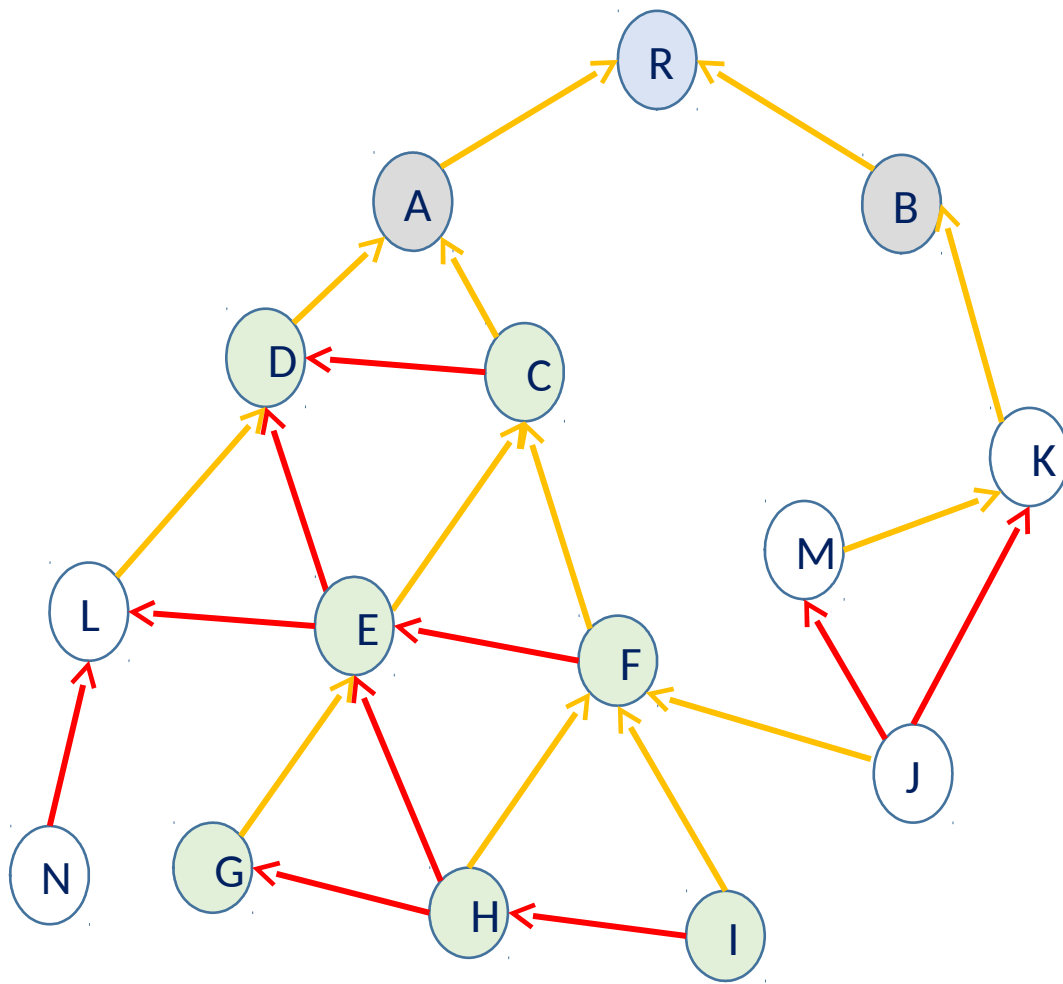
In blue the preferred parent path

In red the alt path as RPL computes them based on Rank relationship.

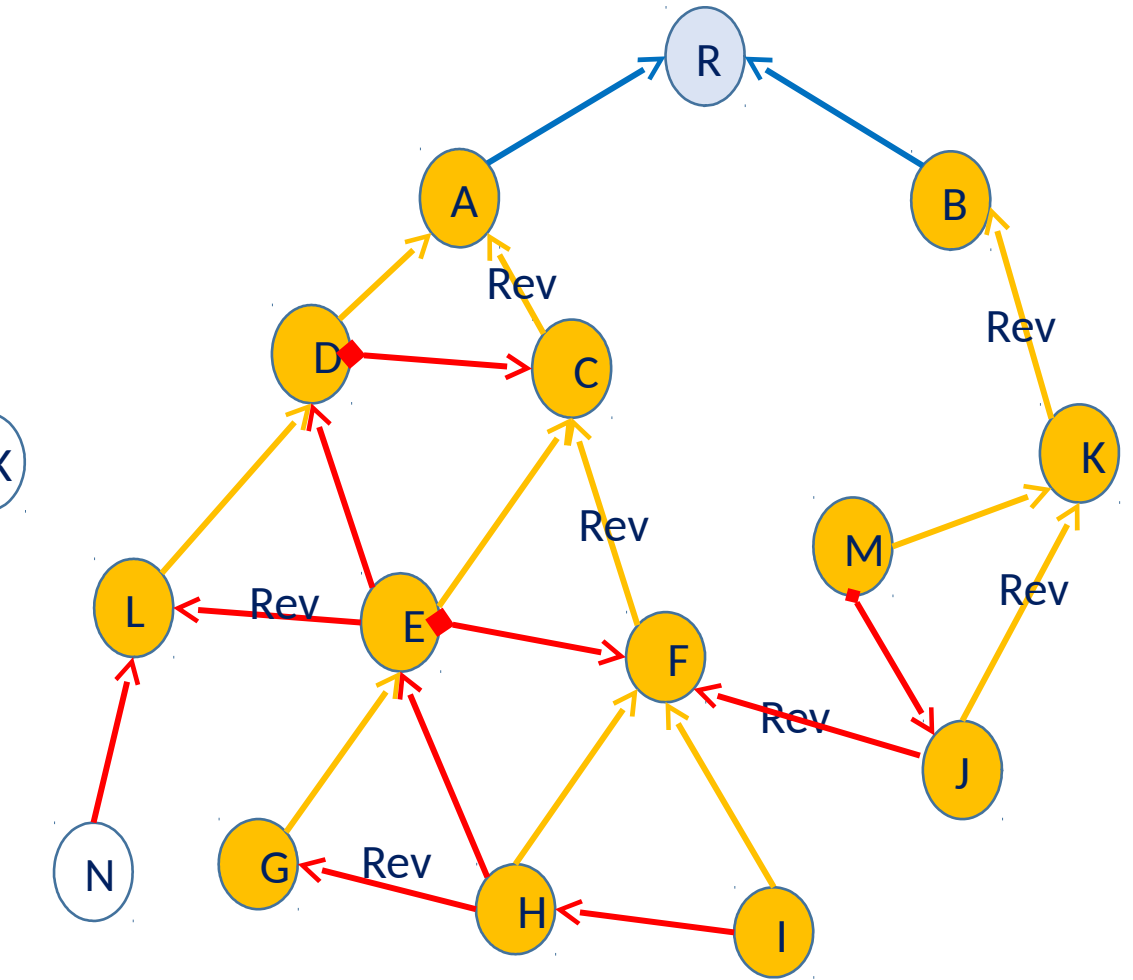
These « arrows » are advertised to the root using NS-Mode

We see that most nodes do not have 2 non-congruent solutions (in fact, only J does!)

Result of the ARC algorithm:



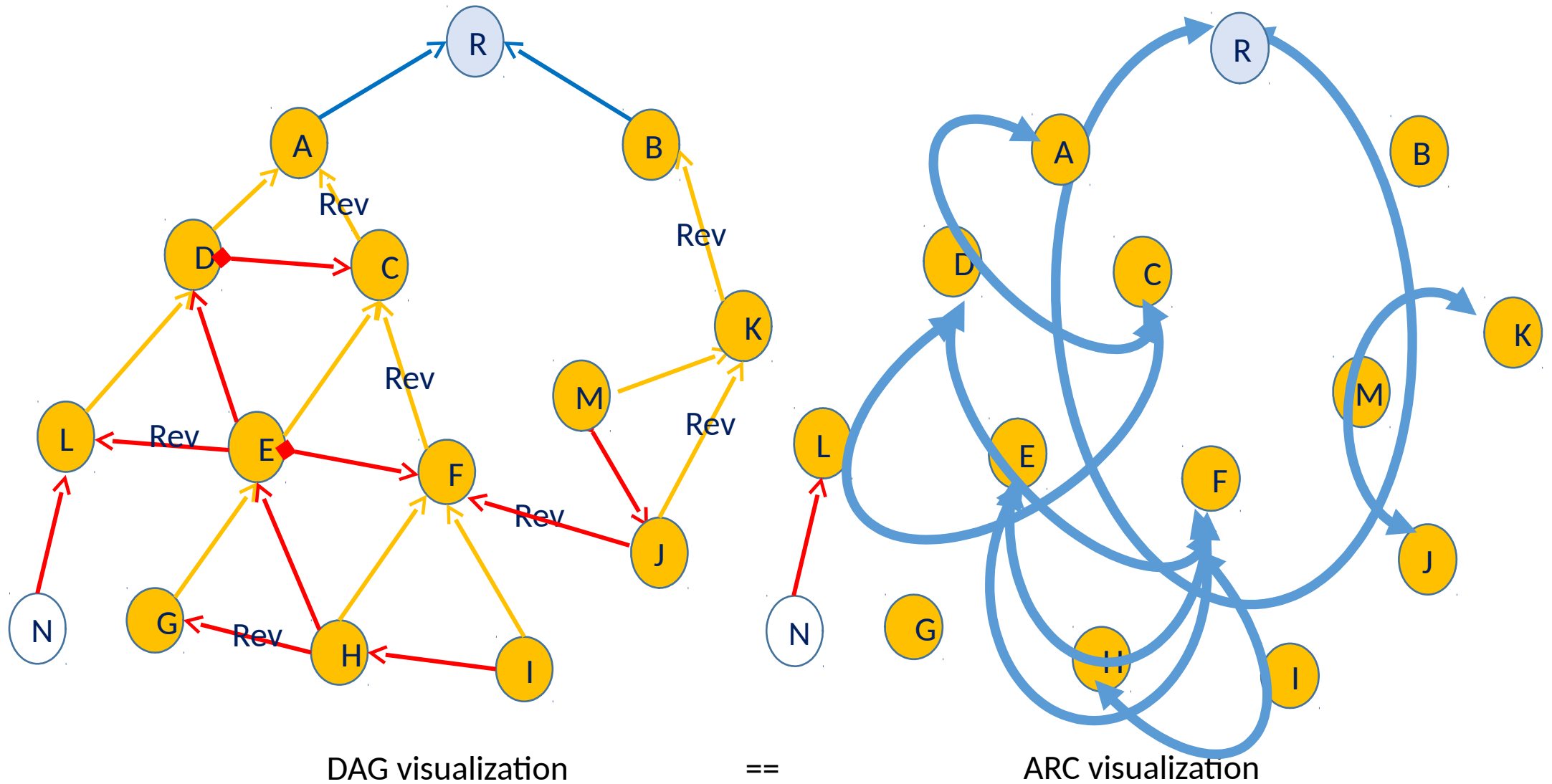
Original RPL DAG



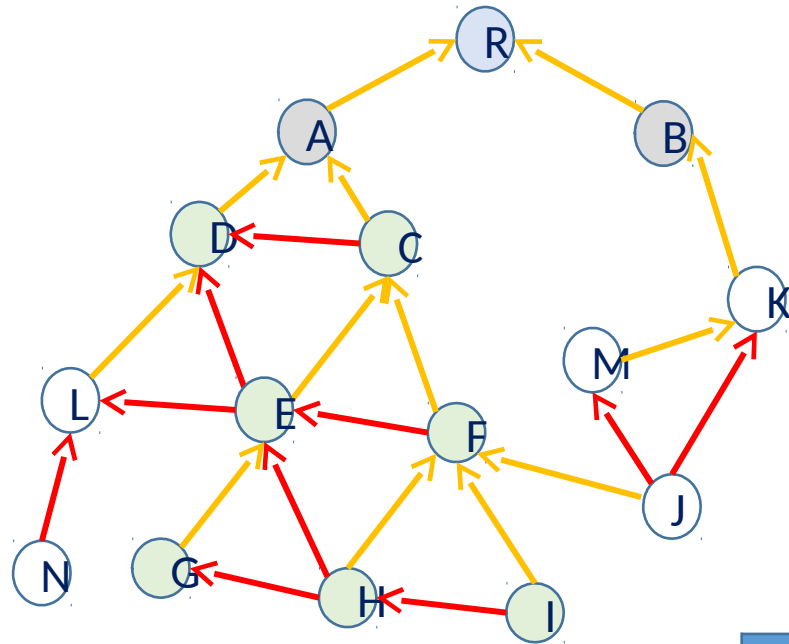
ARC Re-organized DAG

≡

Result of the algorithm:

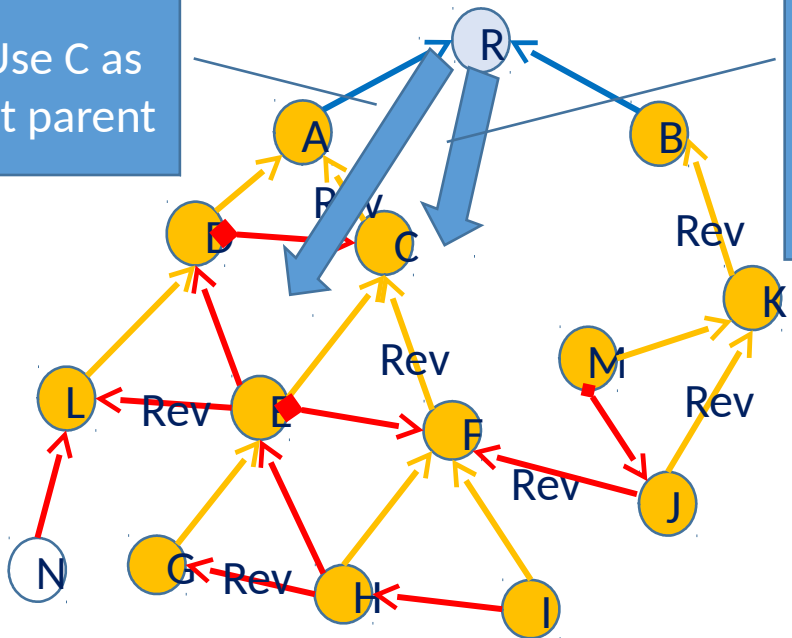


Adapting to RPL

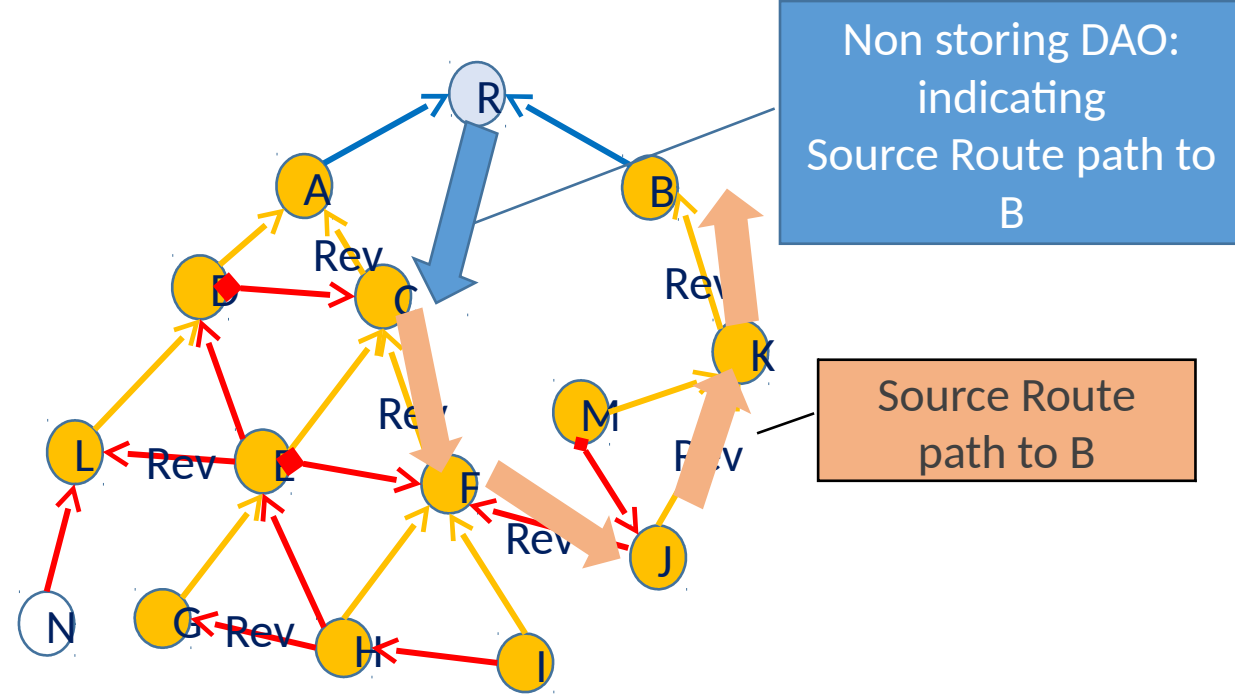


Use C as alt parent

Do Not Use D as alt parent

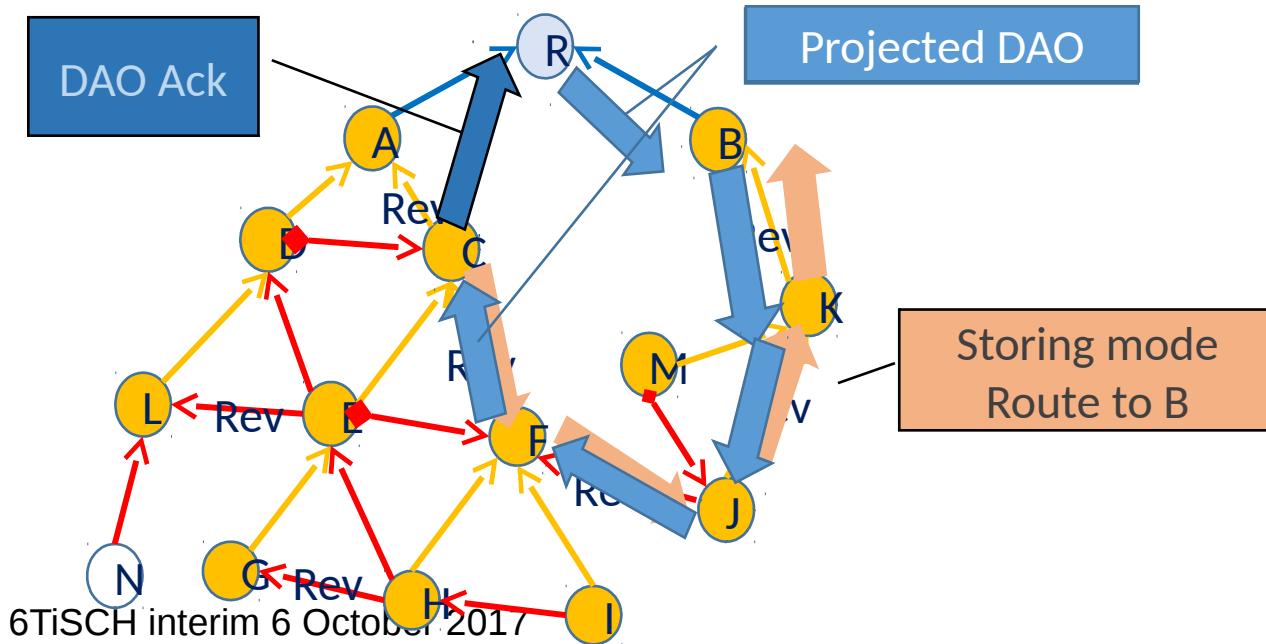


- 1) Root considers changes made on DODAG and notifies nodes, e.g. it tells C that D is not more a feasible successor and it tells D that C is a feasible successor. Same goes between E and F. This can be done with a novel variation of the DAO projection
- 2) For collapsed ARCs, e.g. D, we are all set
- 3) For other nodes that are not on collapsed ARCs, the root computes a path along the ARC towards the other exit of the ARC. For Node C that is Node B.



Cont...

- 1) The path to B is installed as either storing or non storing projected DAO
- 2) In NS Mode the source route path from the node to the other ARC edge is indicated to each node
- 3) In Storing Mode, a route is created from both ends of the ARC allowing each edge (a,d all nodes in between) to route to the other edge
- 4) If C loses connectivity to A, it uses a tunnel to B till RPL completes local repair. Tunnel has a routing header in NS mode.
- 5) When the Edge decaps, it must forward outside the ARC; it cannot reinject in the ARC.





Any Other Business?

PANID compression bit

Table 7-2—PAN ID Compression field value for frame version 0b10

| Destination Address | Source Address | Destination PAN ID | Source PAN ID | PAN ID Compression |
|---------------------|--------------------|--------------------|---------------|--------------------|
| Not Present | Not Present | Not Present | Not Present | 0 |
| Not Present | Not Present | Present | Not Present | 1 |
| Present | Not Present | Present | Not Present | 0 |
| Present | Not Present | Not Present | Not Present | 1 |
| Not Present | Present | Not Present | Present | 0 |
| Not Present | Present | Not Present | Not Present | 1 |
| Extended | Extended | Present | Not Present | 0 |
| Extended | Extended | Not Present | Not Present | 1 |
| Short ^a | Short ^a | Present | Present | 0 |
| Short ^a | Extended | Present | Present | 0 |
| Extended | Short ^a | Present | Present | 0 |
| Short ^a | Extended | Present | Not Present | 1 |
| Extended | Short ^a | Present | Not Present | 1 |
| Short ^a | Short ^a | Present | Not Present | 1 |

^aIf both the destination and source addressing information is present and either is a short address, the MAC sublayer shall compare the destination and source PAN IDs and the PAN ID Compression field shall be set to zero if and only if the PAN identifiers are identical.

- src addr: short
- dest addr: short ?
- No PAN address

- src addr: short
- dest addr: short
- single PAN address