SPBM Service Abstraction

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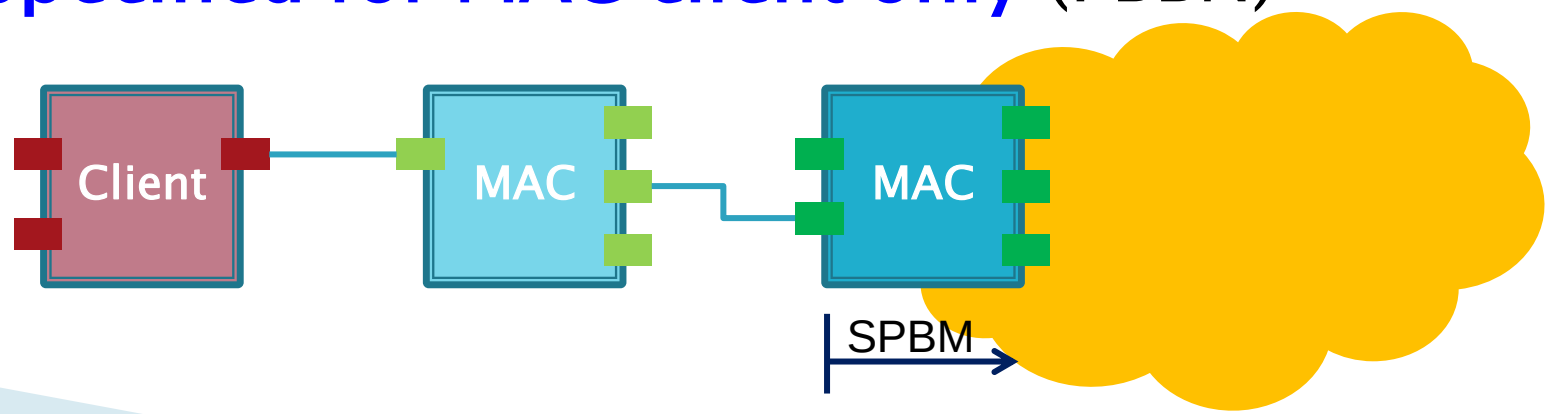
SPBM and ECMP

- SPBM
  - Shortest path VLANs
  - Rapid fault recovery
- ECMP adds multipath support
  - Unicast ECMP using per hop hash
  - Multicast load spreading on source trees or shared trees

- Both are **currently specified for MAC client only** (PBBN)



New applications

- Interest in Ethernet and Bridged LANs in **home**, **vehicle**, and **industrial** applications
- Comparatively small networks in many cases
- IP or application protocol directly over Etherent

- Want **deterministic routing** and to **avoid flooding**
- Want **multipathing** and **high availability***

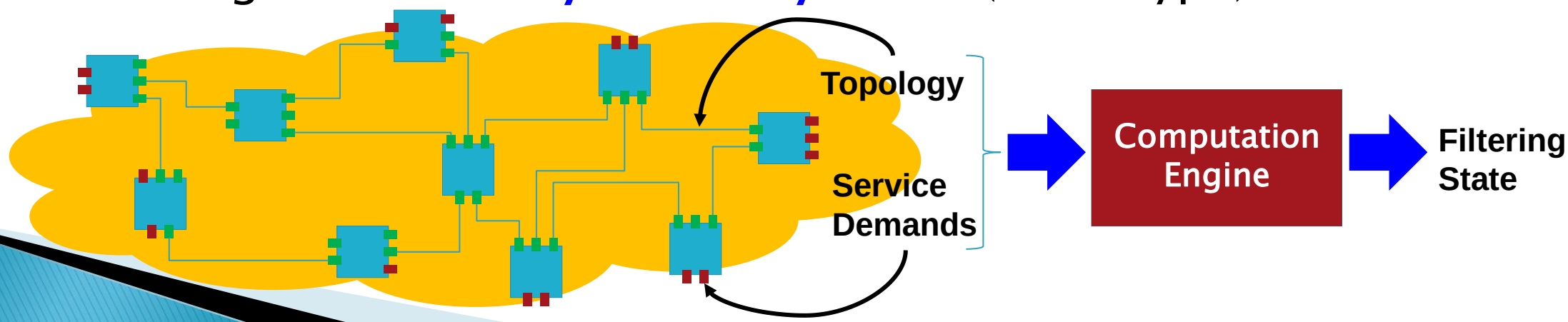
* Also called “redundant and alternate forwarding”

For example…

- Time sensitive networks need **multipath routing**, **resilience** and **stream reservation**
  - at-kleineberg-goetz-AVB-redundancy-1110.pdf
  - at-kleineberg-AVB-media-redundancy-0311-v02.pdf
  - at-phkl-SRP-Stream-Path-Selection-0311-v01.pdf
  - at-kleineberg-AVB-media-redundancy-1111-v02.pdf
  - etc.
- Norm Finn presented the potential for SPB
  - new-avb-nfinn-spb-tsn-0112-v01.pdf

SPB brings a new control model

- Link State Database
  - Data plane topology + service demands at edge
  - Can leverage database for new services/features
- Path computation policy flexibility
  - Can achieve a variety of traffic control results, e.g.
    - Shortest path, integrated multicast, recovery – done
    - Multipath under development (ECMP)
    - Path delay control, Traffic engineering, … possible
    - Converged **service layer for any client** (EtherType)



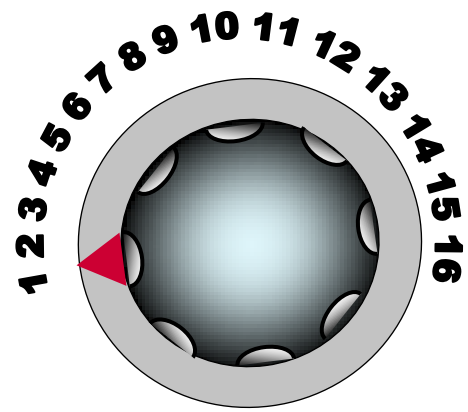
SPBM can address these needs…

- SPBM provides **some of the necessary features**
  - Deterministic shortest path routing
  - Efficient multicast support
  - ECMP multipath support
  - Rapid recovery

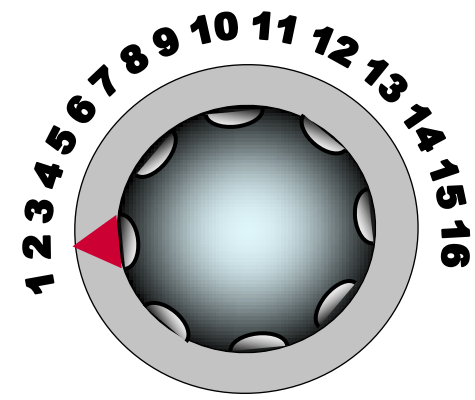
SPBM Per I-SID Controls

Replication

SPT Number

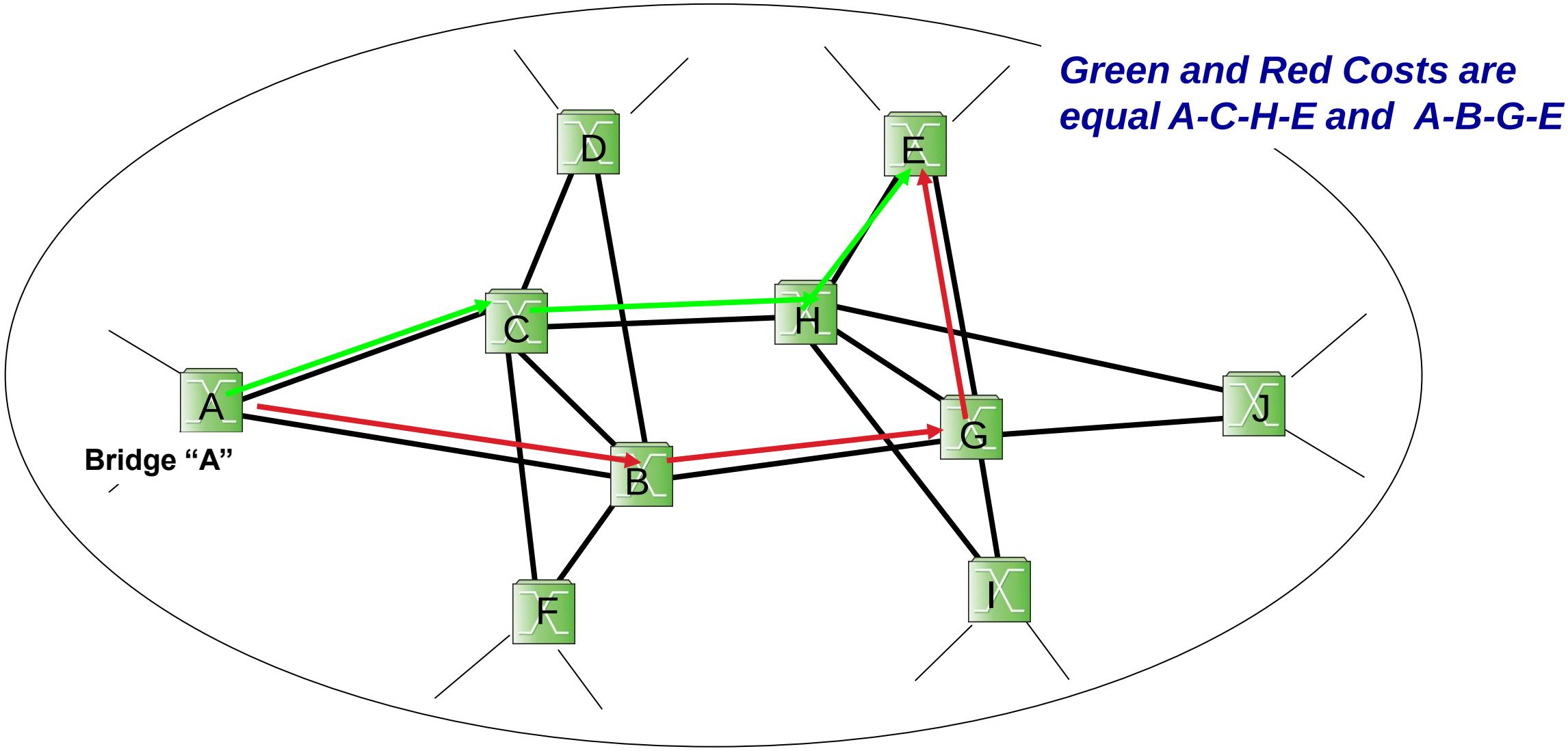


Future
ECMP/Shared Tree



Behaviors are per I-SID

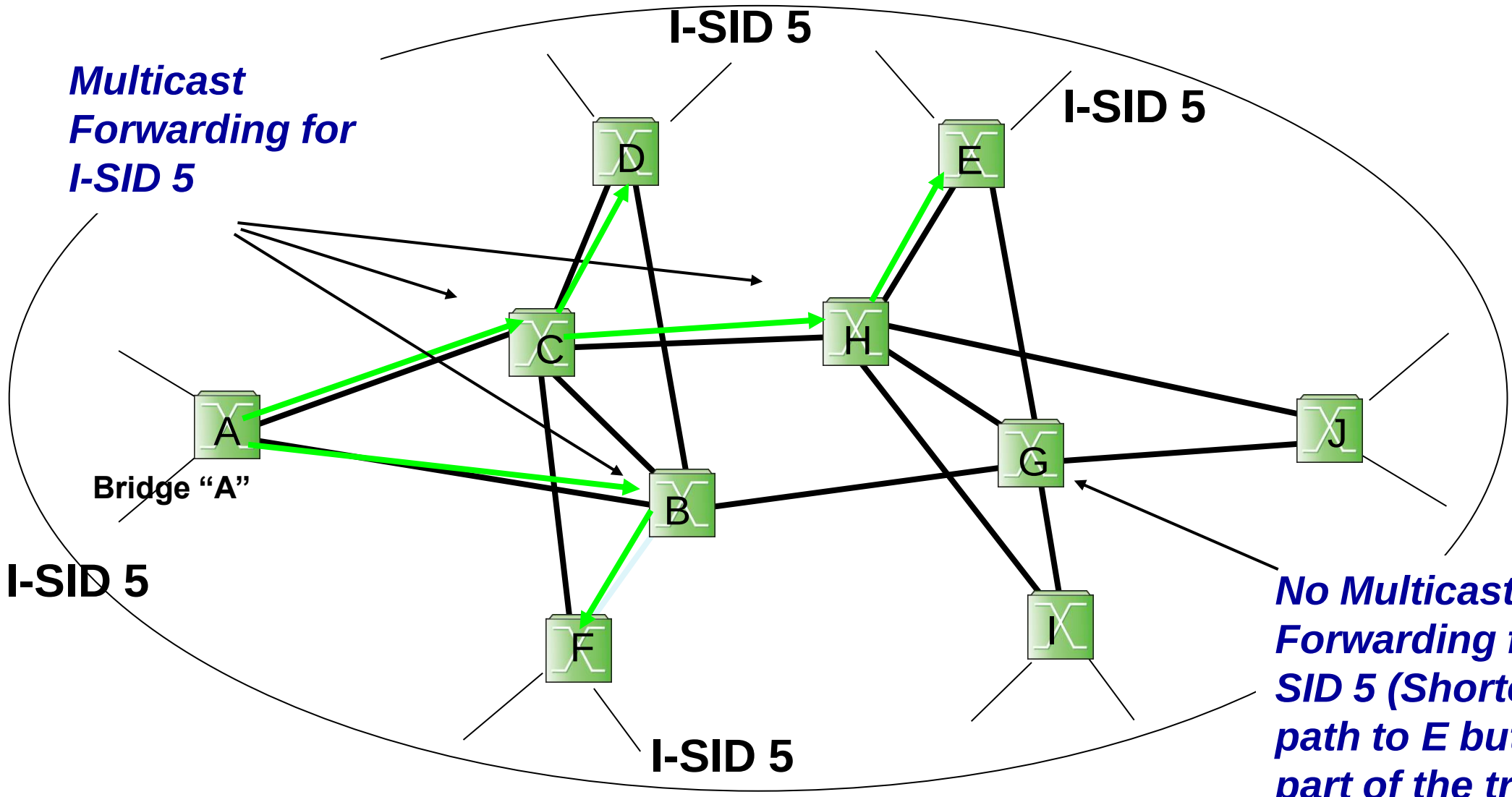
Equal Cost Tree or ECMP



Green and Red Costs are equal A-C-H-E and A-B-G-E

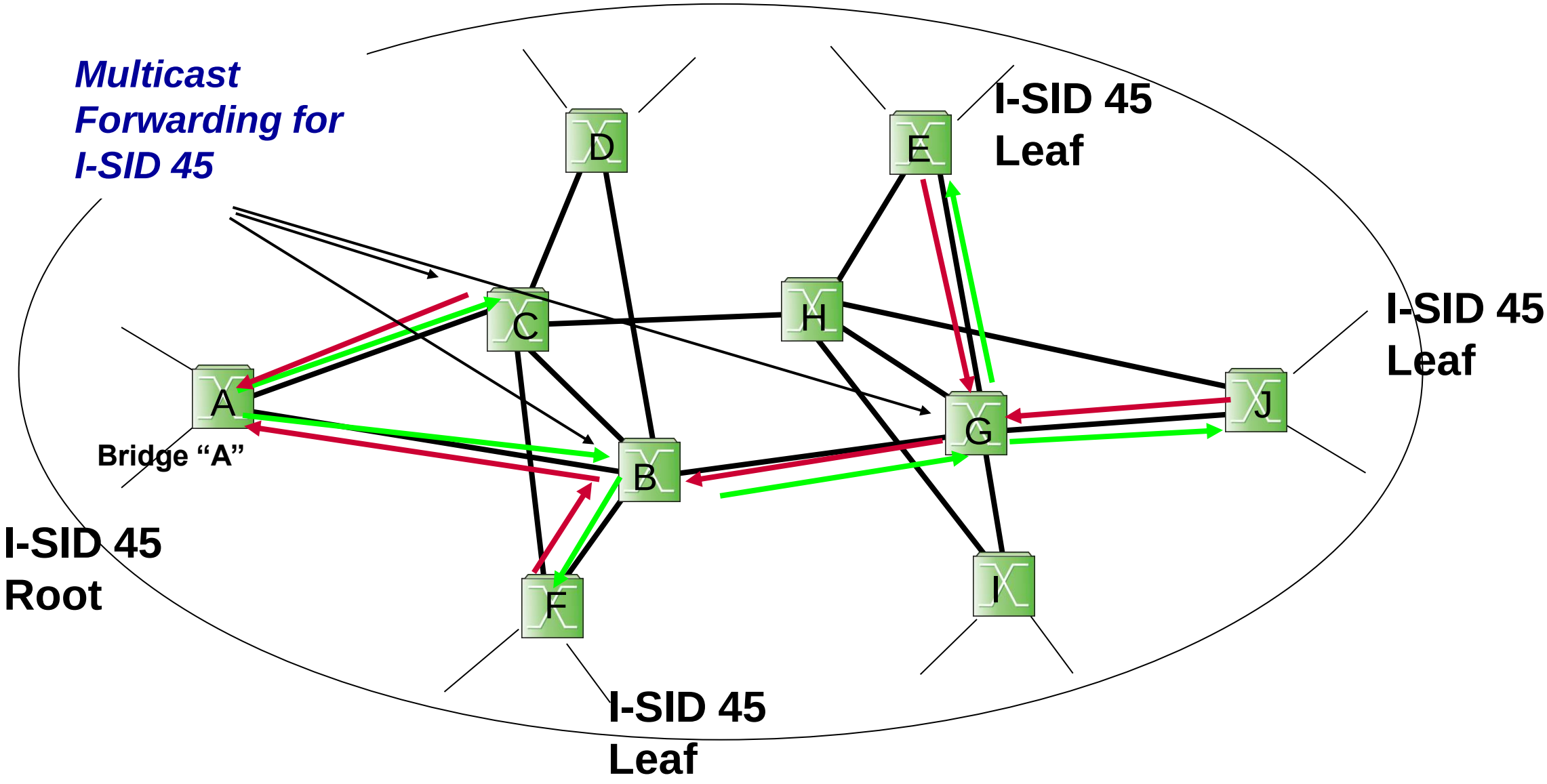
Multipath Load Balancing different services

SPBM Per Source Trees



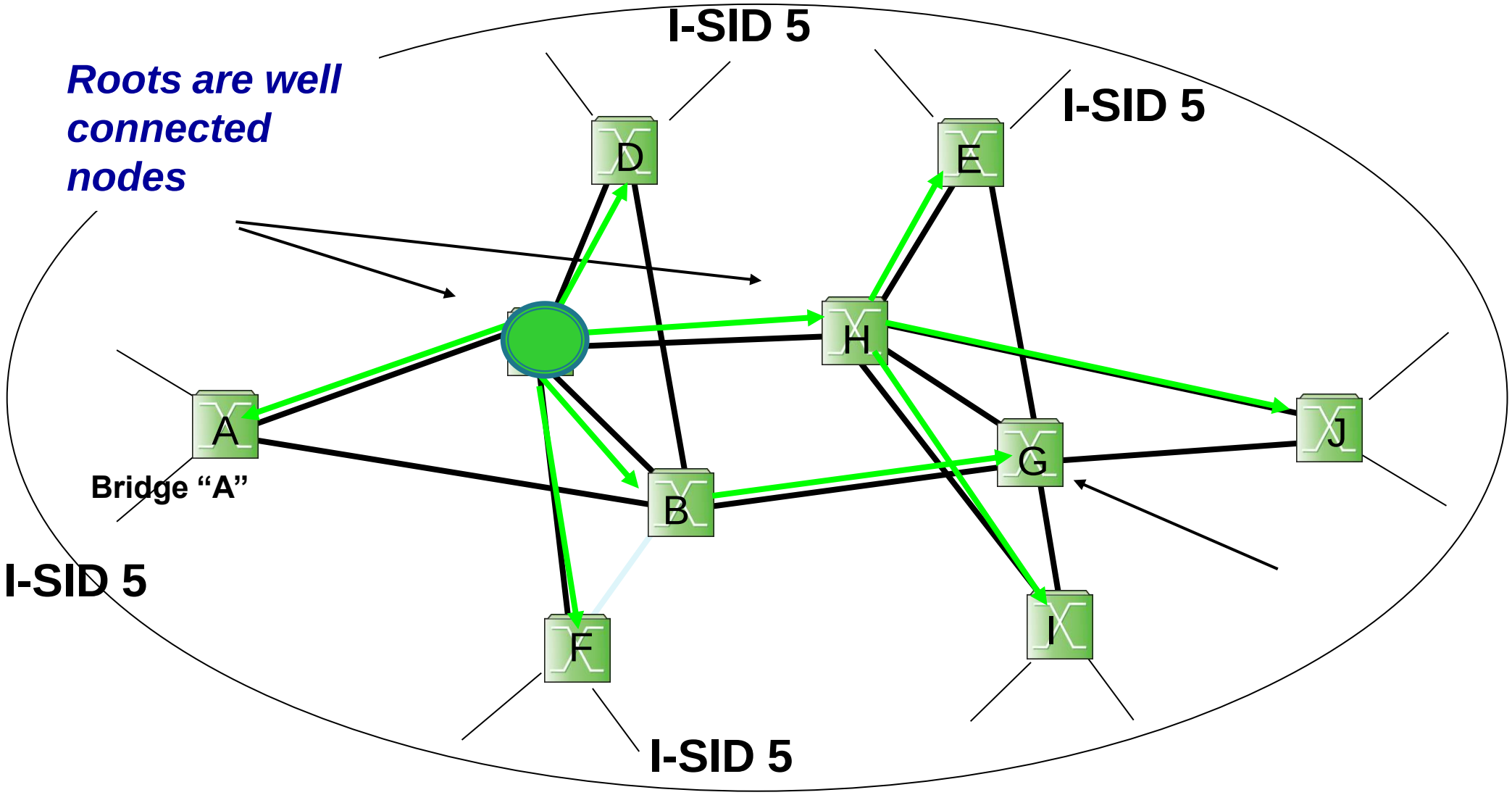
I-SIDs define efficient subsets

SPBM Multicast P2MP



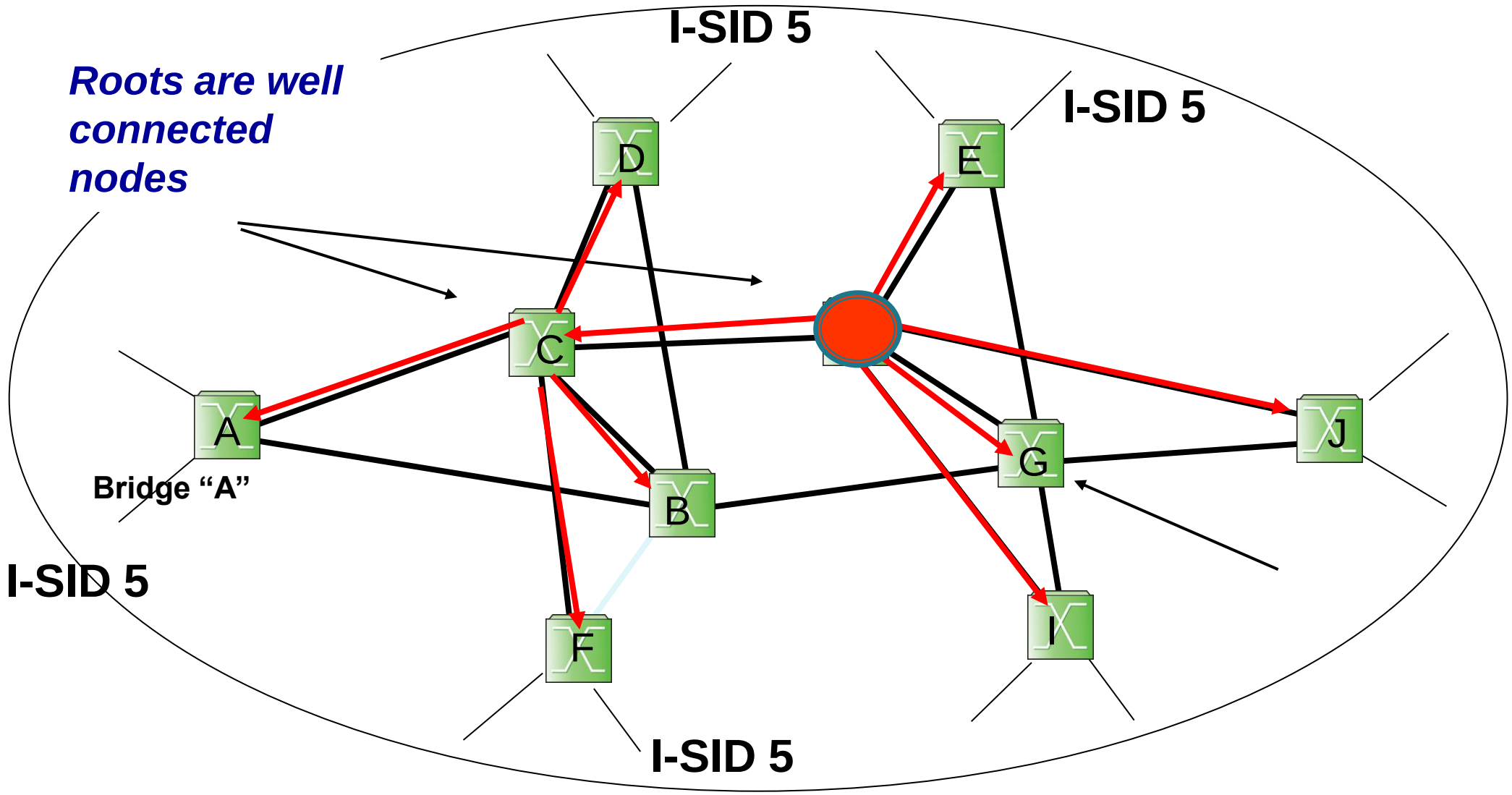
E-TREE I-SIDs Root to/From Leaf only

SPBM ECMP with Shared Trees



Up to 16 different Roots

Future SPBM ECMP with Shared Trees



Up to 16 different Roots

SPBM can address these needs…

- SPBM provides **some of the necessary features**
  - Deterministic shortest path routing
  - Efficient multicast support
  - ECMP multipath support
  - Rapid recovery

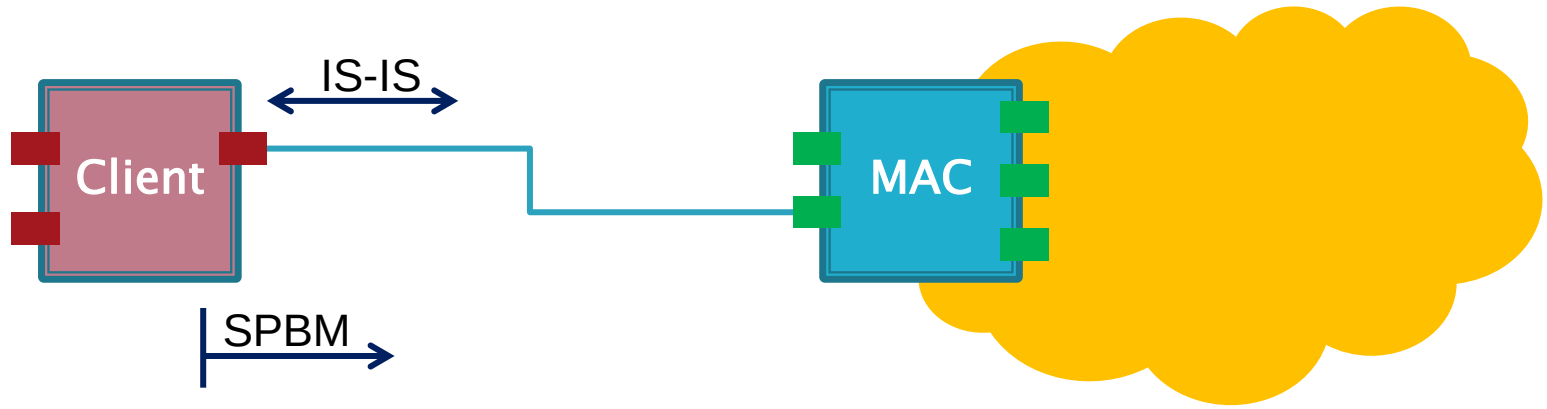
- However, there are some **new aspects**
  - Client directly over B-MAC layer
  - Endpoint address registration
  - Client virtualization
  - Stream reservation

Client directly over MAC

- The new applications are **not PBBNs**
  - IP or application directly over MAC network (No MAC-in-MAC encapsulation)
  - Need to advertise endpoint addresses
  - Need to resolve client-to-MAC address

Direct ISIS-SPB participation

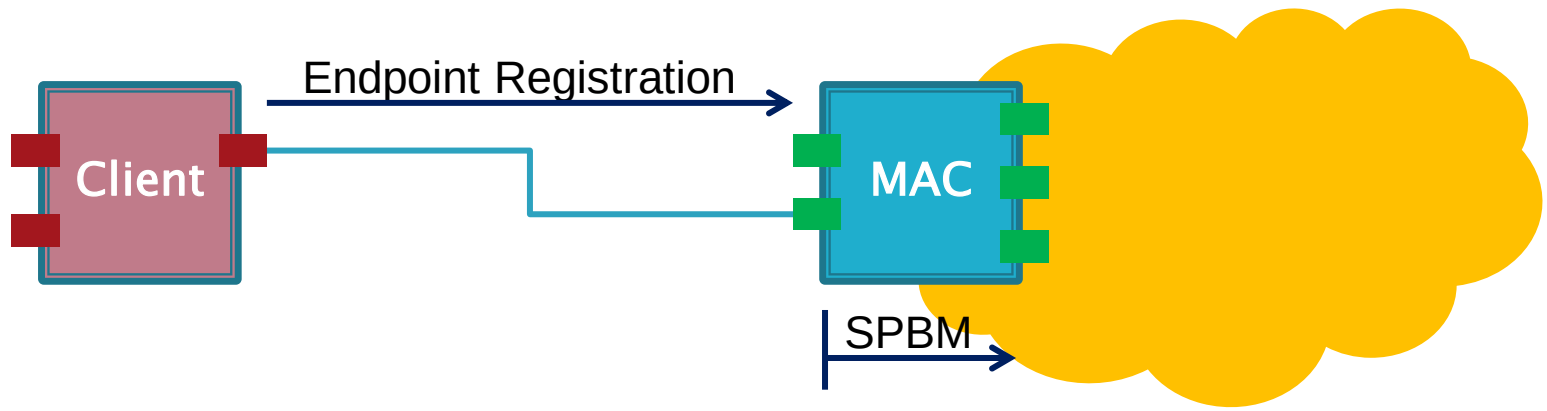
- SPBM can support arbitrary clients*
  - Advertise client address reachability in ISIS-SPB
  - Client to B-MAC address resolution in LSDB
  - No need for ARP broadcast if in LSDB
  - No need to flood on unknown address



*For example, all necessary information for IP client is already supported in IS-IS

Endpoint address registration

- Clients should not be required to run IS-IS
  - Register client and MAC endpoint addresses
    - VDP (VSI Discovery Protocol)?
    - ES-IS?
    - LLDP?



Client virtualization

- Some applications require virtualized clients (higher layer VPN)
  - Client traffic associated with VPN identifier
  - Need sufficient VPN ID space for effective management
  - Good to be compatible with existing implementations

Client virtualization support

- Client VLANs use I-TAG (S-TAG optional)
- Non-MAC clients could use: (options)
  - Current I-TAG with no C-MAC information
  - Short I-TAG
  - New Service TAG

Stream reservation

- QoS is supported (priority), but currently no bandwidth reservation
  - Bandwidth reservation can be added…
    (as noted in new-avb-nfinn-spb-tsn-0112-v01.pdf)

Stream reservation support

- Stream bandwidth reservations
  - Advertise service requirements
    - E.g., SRP Talker and Listener parameters
  - Enhance path computation to include SRP constraints and decision rules
- But…
  - Need TE info in LSDB (link capacity)
  - How to manage data plane conflicts?
    - E.g., streams to same address on disparate paths
    - Or is conflict avoided by stream address assignment?

Complexity is in the eye of the beholder

- Essential complexity in problem space
- Solutions may address complexity differently
  - With SPB much is possible with relatively small (and well understood) extensions
  - LSDB provides a common base for traffic control

- Need to evaluate solution attributes
  - Behavior
  - Stability
  - Performance