BIER
Bit Indexed Explicit Replication

Hackathon

IJsbrand Wijnands

Greg Shepherd

The BIER Epiphany

- Only encode the end-receivers in the packet header.
  - Not the intermediate nodes.
- Assign end-receivers a Bit Position from a Bit String.
  - The smallest identifier possible.
- Encode the Bit String in the packet header.
  - Using some sort of encapsulation.
- Create a Bit Forwarding Table on all BIER nodes to allow multicast packet forwarding using the Bit String in the packet.
  - Derived from the RIB, SPF based.
- Bit Indexed Explicit Replication (BIER).

IETF

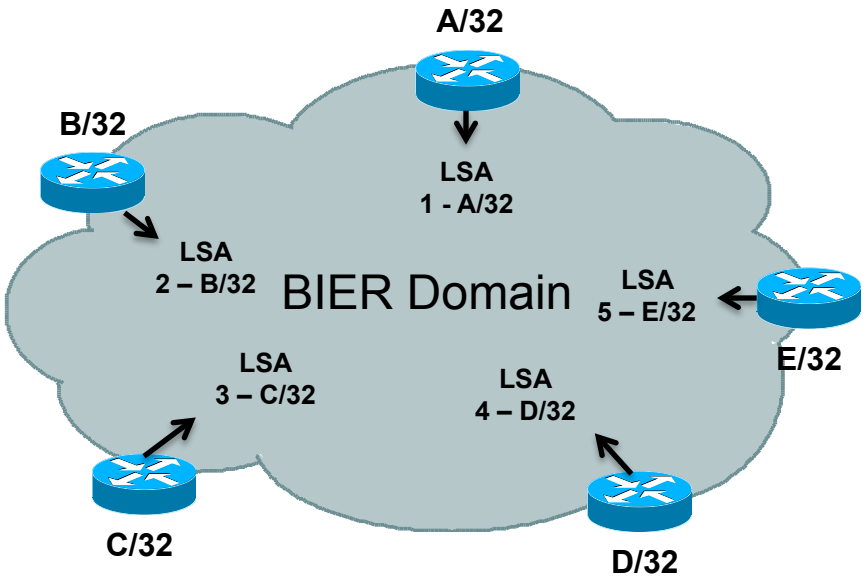
- The BIER idea was presented in a BOF at the IETF in Hawaii.
  November 2014.
- A BIER Working Group has been formed (bier@ietf.org)
- Vendors collaborating;
  Cisco
  Ericsson
  Alcatel-Lucent
  Juniper
  Huawei

IETF drafts

- draft-shepherd-bier-problem-statement-00
- draft-ietf-bier-architecture-01
- draft-ietf-bier-use-cases-00
- draft-ietf-bier-mpls-encapsulation-01
- draft-ietf-bier-mvpn-01
- draft-ietf-ospf-bier-extensions-00
- draft-ietf-bier-isis-extensions-00
- draft-eckert-bier-te-arch-00
- draft-xu-idr-bier-extensions-00

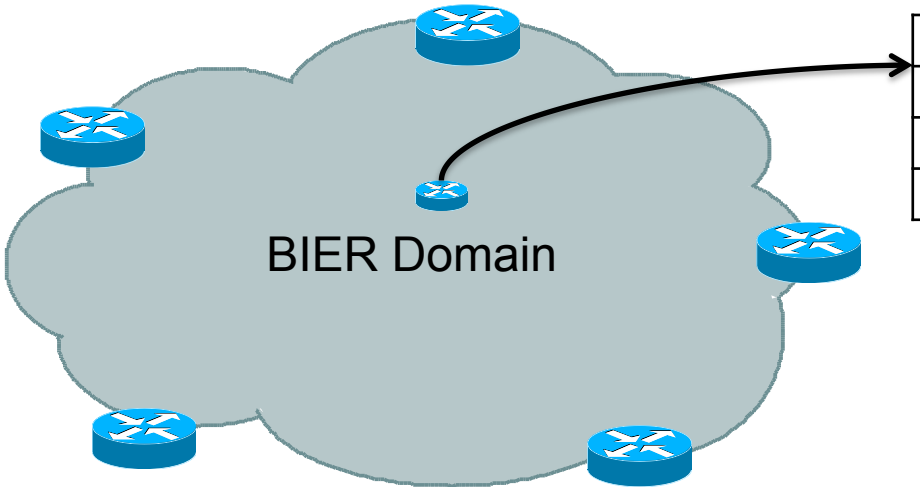
Solution Overview

Basic Idea BIER



1. Assign a unique Bit Position from a BitString to each BFER in the BIER domain.
2. Each BFER floods their Bit Position to BFR-prefix mapping using the IGP (OSPF, ISIS)

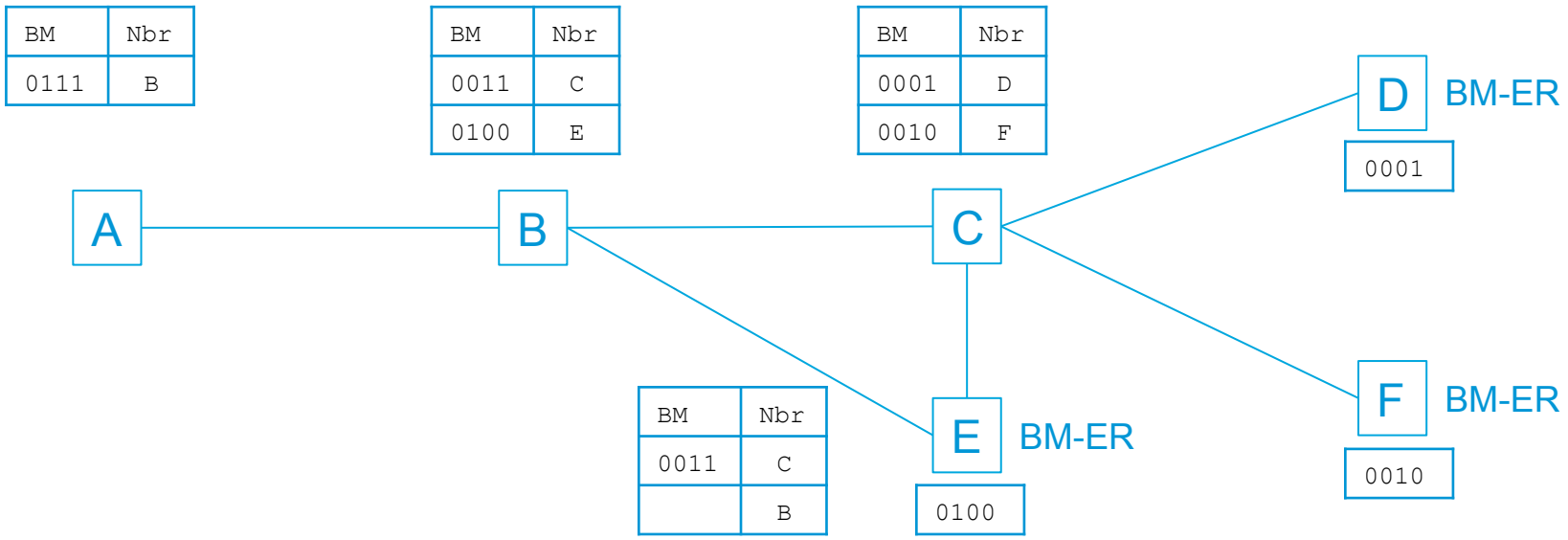
Basic Idea BIER



BitMask	Nbr
0011	A
0100	B
1000	C

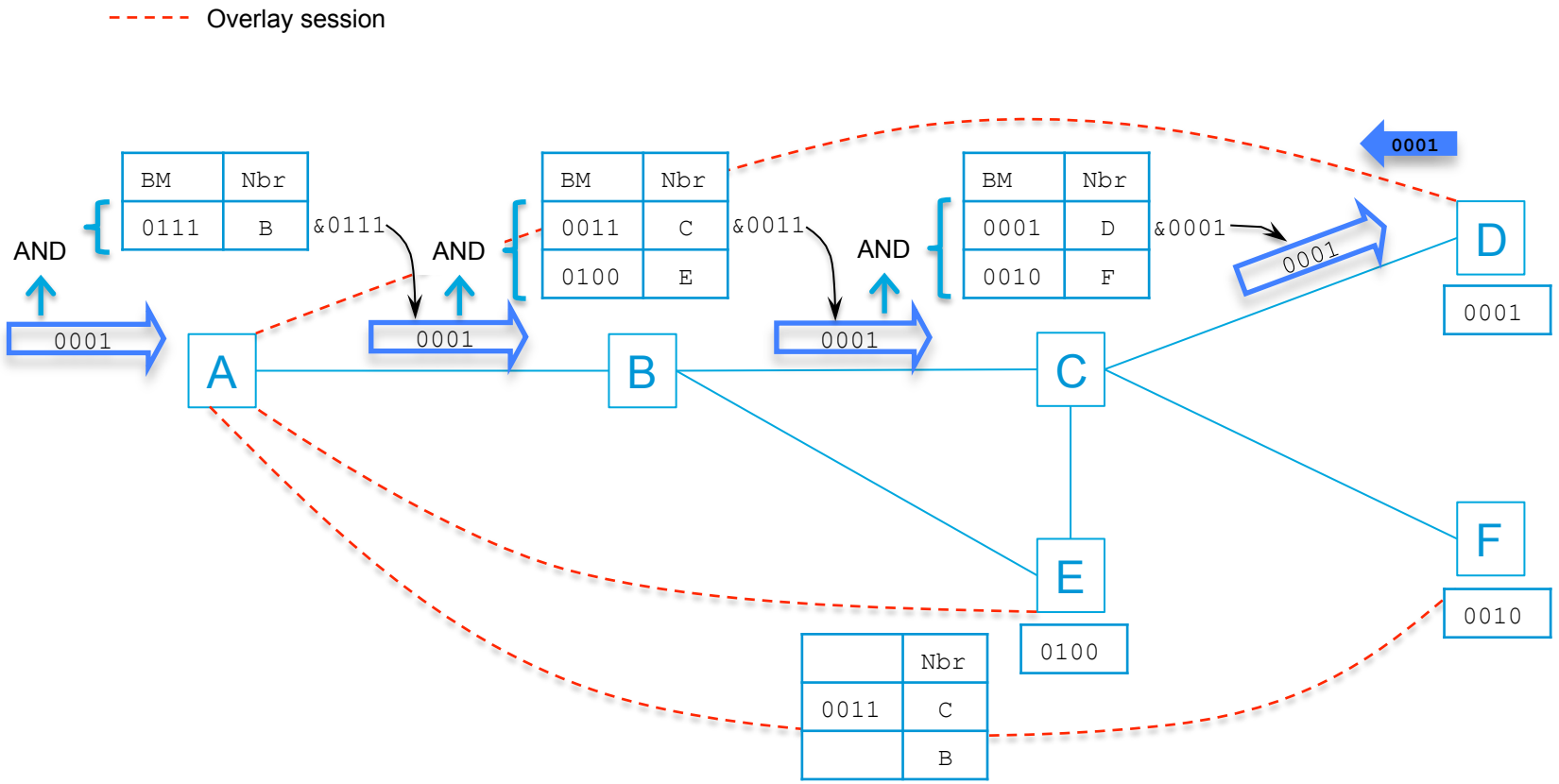
1. Assign a unique Bit Position from a mask to each edge router in the BIER domain.
2. Each edge router floods their bit-position-to-ID mapping with a new LSA – OSPF or ISIS
3. All BFR's use unicast RIB to calculate a best path for each BFR-prefix
4. Bit Positions are OR'd together to form a Bit Mask per BFR-nbr
5. Packets are forwarded and replicated hop-by-hop using the Bit Forwarding Table..

Bit Index Forwarding Table

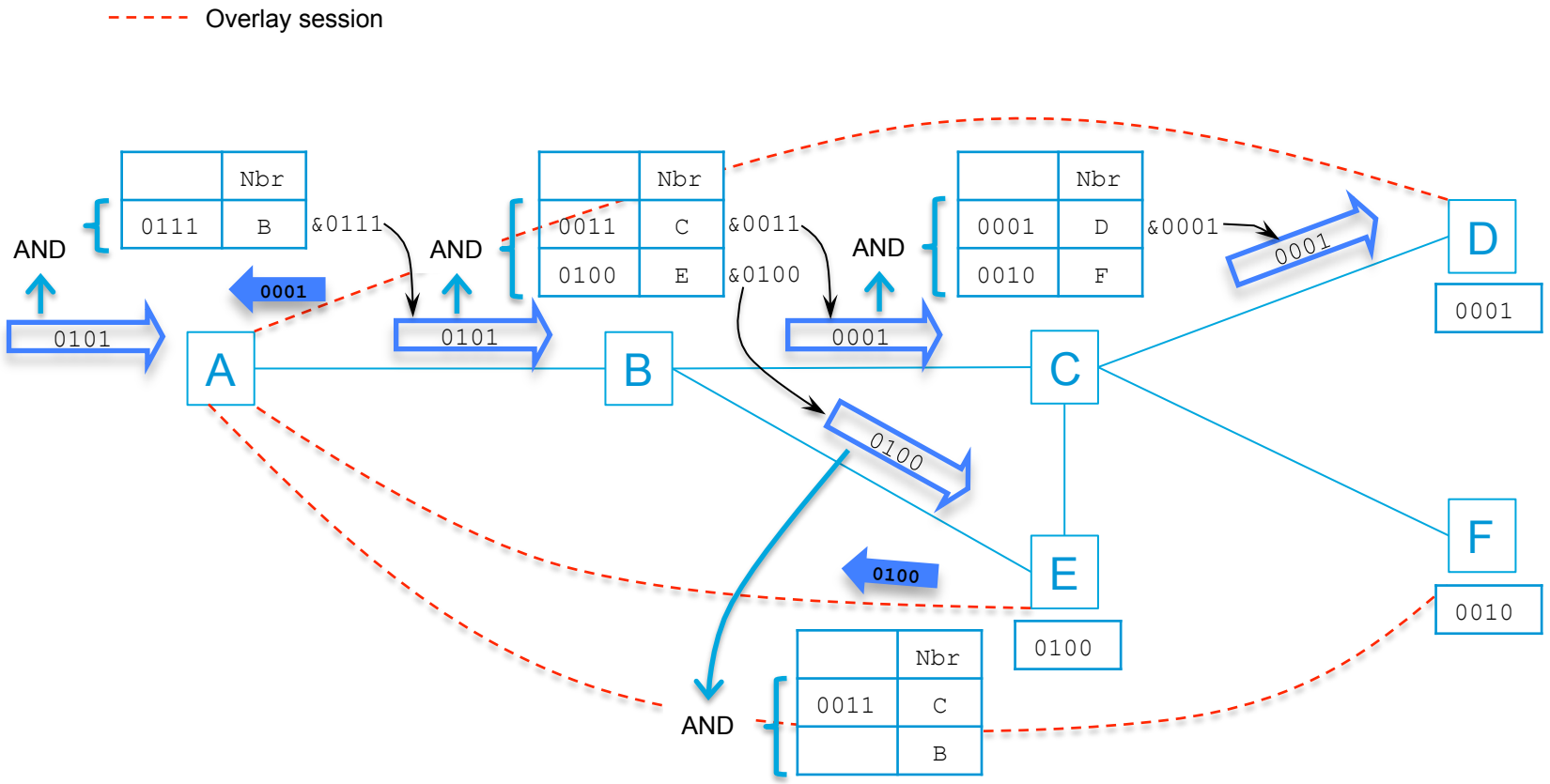


- D, F and E advertise their Bit positions in the IGP (flooded).
- A, B and C know the mapping between the Bit and RID,
- Based on shortest path route to RID, the Bit Mask Forwarding Table is created.

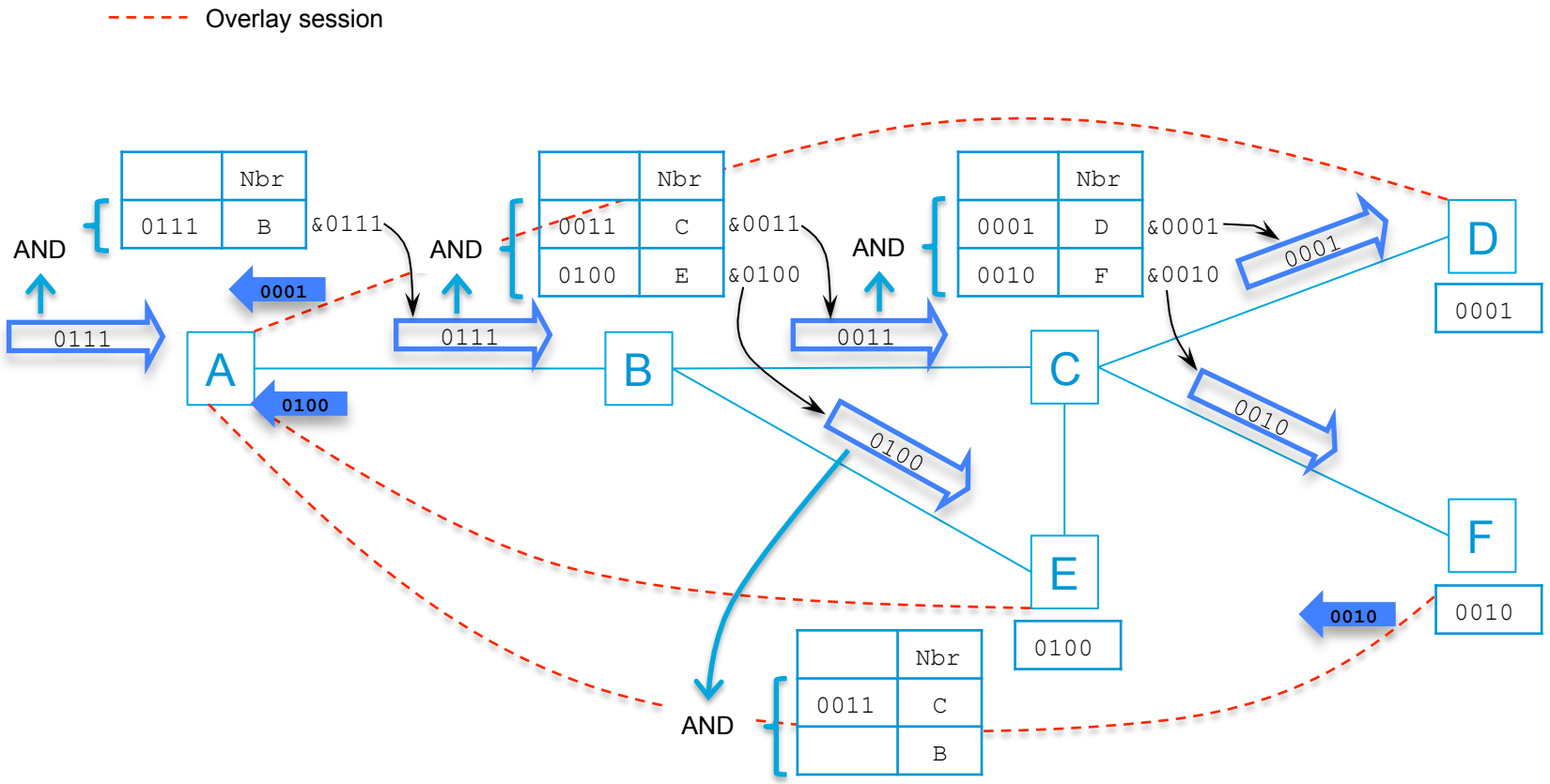
Forwarding Packets



Forwarding Packets

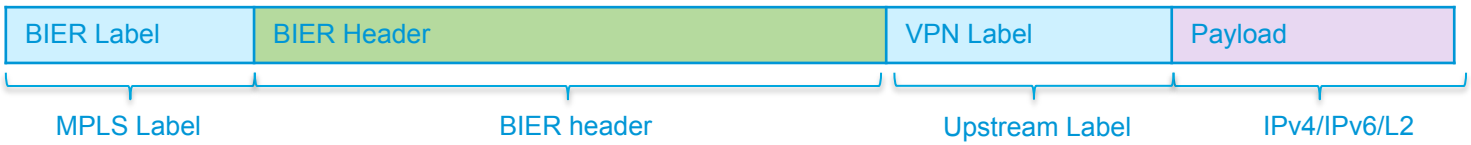


Forwarding Packets



How many Bits and Where?

- The number of multicast egress routers that can be addressed is depending on the number of Bits that can be included in the BitString
- The BitString length is depending on the encapsulation type and router platform.
- Current focus is on MPLS.



Hackathon idea’s

Not limited to ☺

BIER areas to explore

- Methods to encode the BitString
  - Dallas, IETF 92 BIER encoding in IPv6 for HomeNet
- Provider
- Enterprise
- HomeNet!
  - See above
- IOT
  - Resource discovery over BIER
- SDN integration, ODL, etc..
  - Central bit assignment, flow membership, policy, etc..
- LISP control plane for BIER membership

Thank you.