Multicast to the Browser

Jake Holland, Akamai

draft-jholland-mboned-dorms

draft-jholland-mboned-ambi

draft-jholland-mboned-cbacc

WICG: https://discourse.wicg.io/t/proposal-multicastreceiver-api/3939

Goals

- Receive multicast in Javascript (W3C API)
  - Port receivers to WebAssembly
    - Including proprietary players & downloaders
  - So web pages can play video, download files, etc. with multicast
- Safely
  - Resist on-path packet injection/modification
  - Malicious pages/scripts can’t blow out the network

Specs

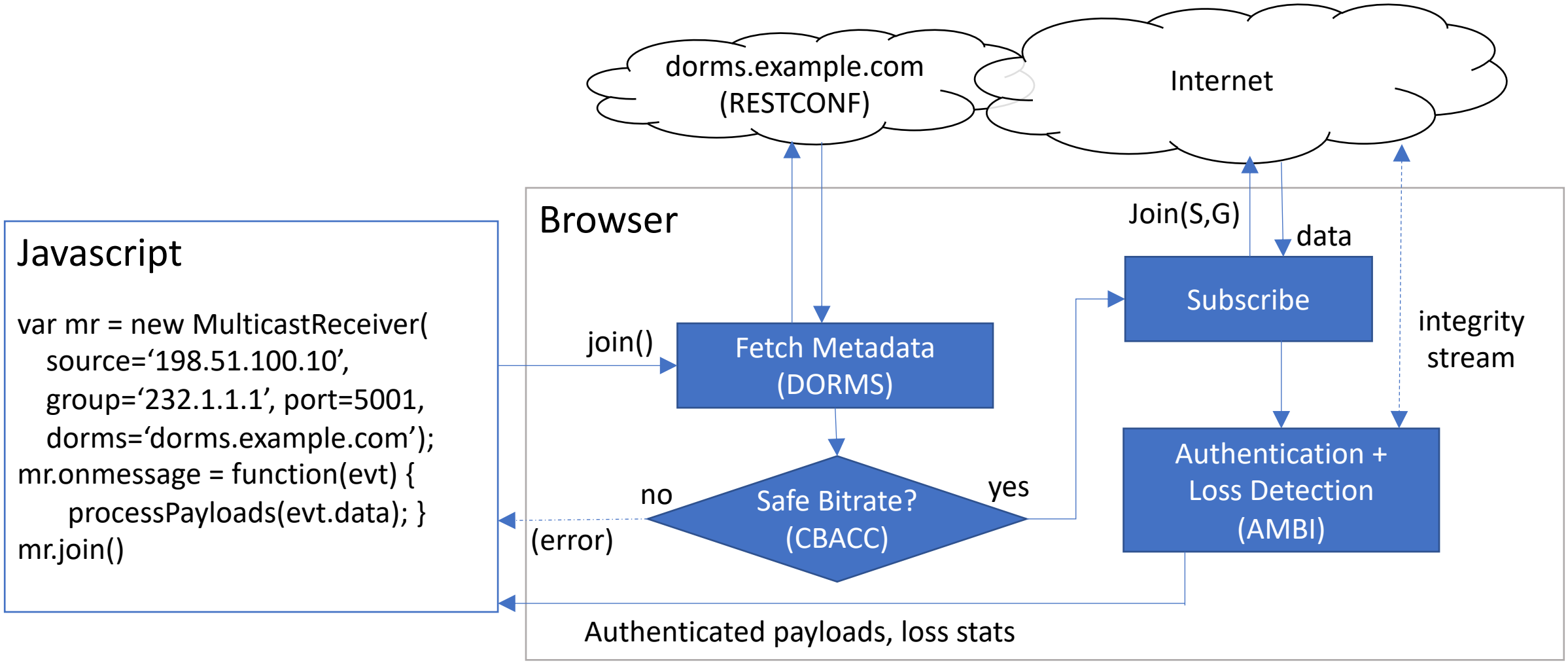
WICG (W3C):

- MulticastReceiver API

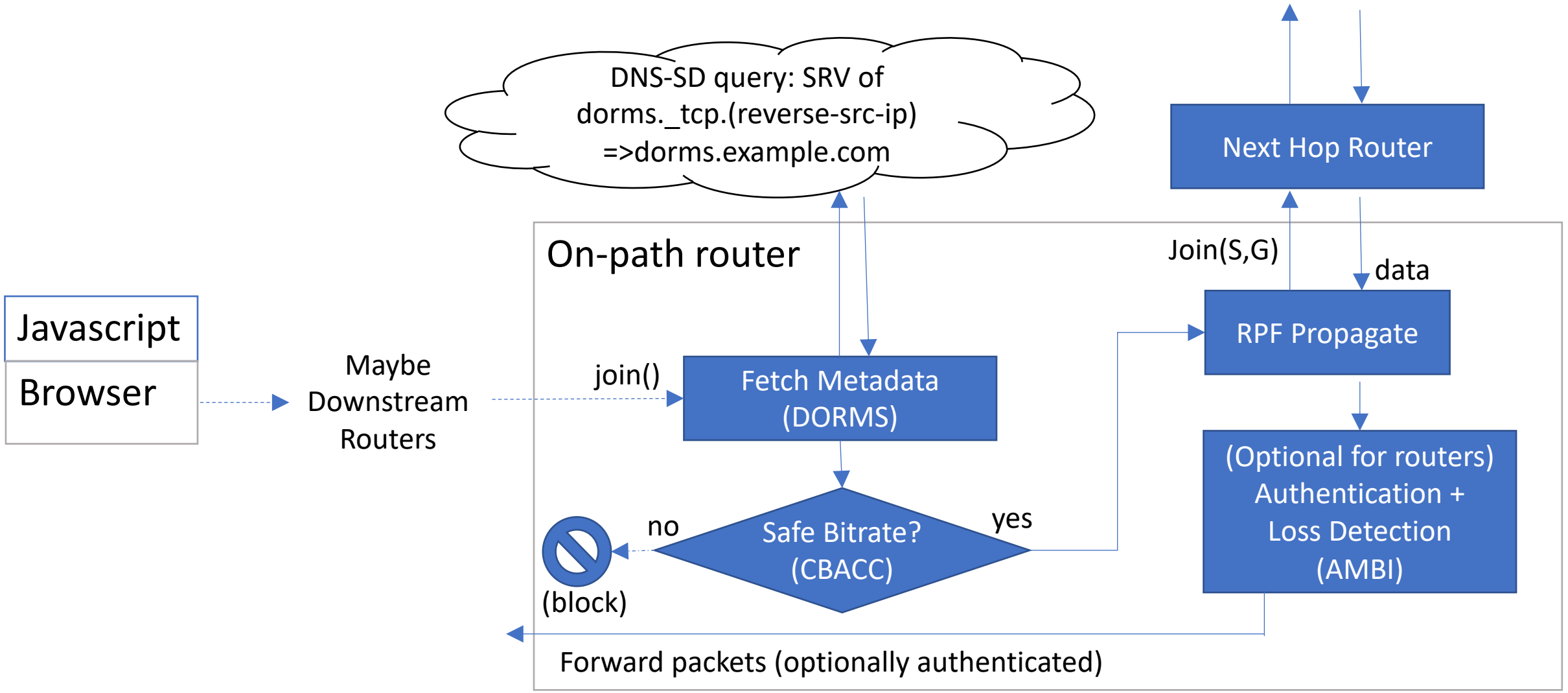
IETF:

- DORMS: Discover and fetch extensible (S,G)-specific metadata
- AMBI: Authenticate packets with out-of-band manifests
- CBACC: Circuit-break streams if oversubscribed

Browser as Gatekeeper



Network as Gatekeeper



DORMS -- Discovery Of RESTCONF Metadata for SSM

- RESTCONF: YANG-based HTTPS Restful API
- Authentication Hostname
  - DNS Reverse IP -> DNS-SD provides hostname (for network)
  - Known hostname provided by client (for browser API, pending wider DNSSEC/DoH)
- Bootstrap from hostname via standard RESTCONF (RFC 8040):
  - /.well-known/host-meta
  - /restconf/data/ietf-yang-library
- CORS
  - Browser inserts origin header, server refuses unauthorized requests
  - Network uses reverse IP as origin, optional client auth from server

- dorms.yang => Indexed fetch of (S,G)-specific metadata

DORMS

```
GET /top/restconf/data/
      ietf-dorms:metadata/
      sender=203.0.113.15/
      group=232.1.1.1
Host: dorms-restconf.example.com
Accept: application/yang-data+json
```

```
HTTP/1.1 200 OK
Content-Type: application/yang-data+json
{
 "ietf-dorms:group": [
   {
     "group-address":"232.1.1.1",
     "udp-stream":[
       {
         "port":"5001”
       }
     ]
   }
 ]
}
```

DORMS + AMBI

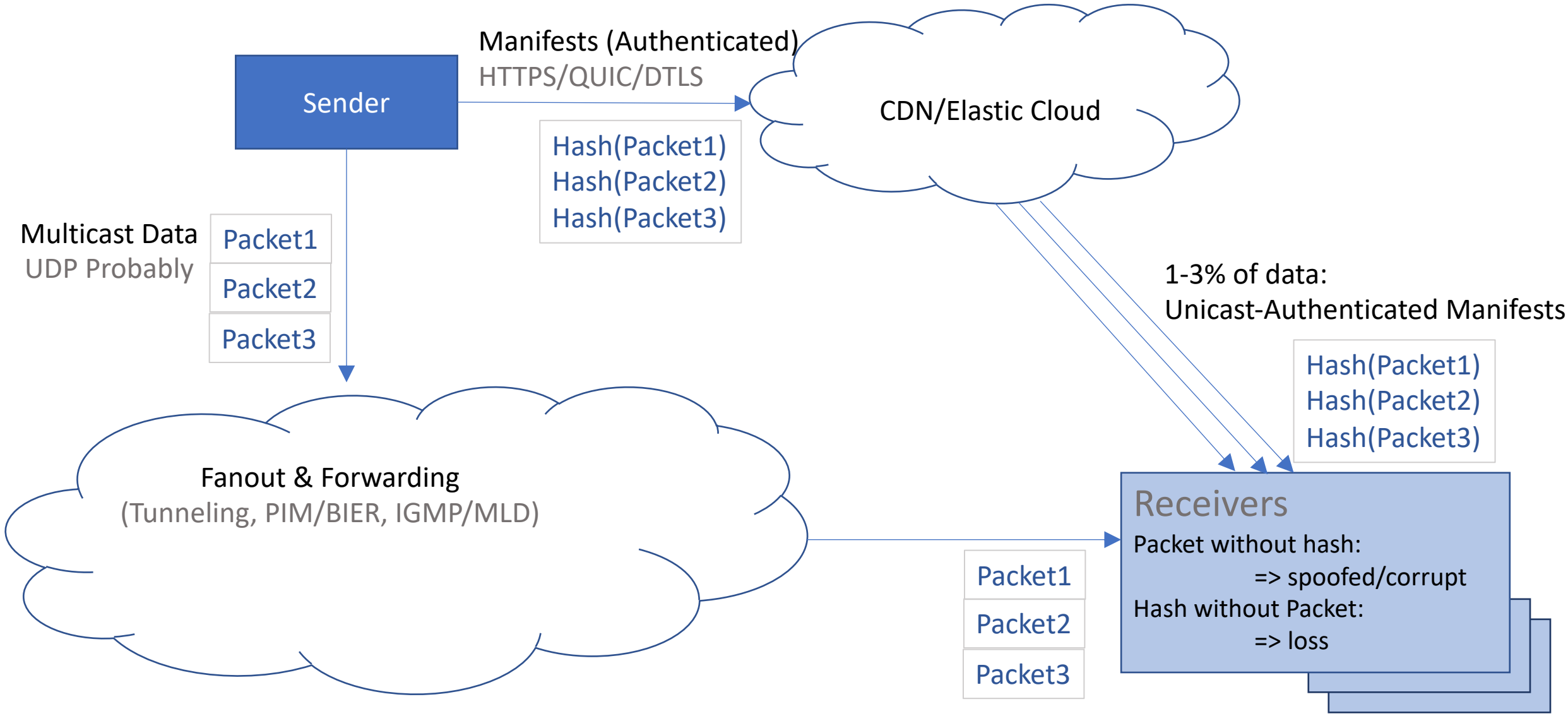
```
GET /top/restconf/data/
      ietf-dorms:metadata/
      sender=203.0.113.15/
      group=232.1.1.1
Host: dorms-restconf.example.com
Accept: application/yang-data+json
```

```
HTTP/1.1 200 OK
Content-Type: application/yang-data+json
{
 "ietf-dorms:group": [
   {
     "group-address":"232.1.1.1",
     "udp-stream":[
       {
         "port":"5001”,
         "ietf-ambi:manifest-stream": [
            "manifest-transport":[
              "https://example.com/manifest1"
            ],
            "hash-algorithm":"shake-128"
         ]
       }
     ]
   }
 ]
}
```

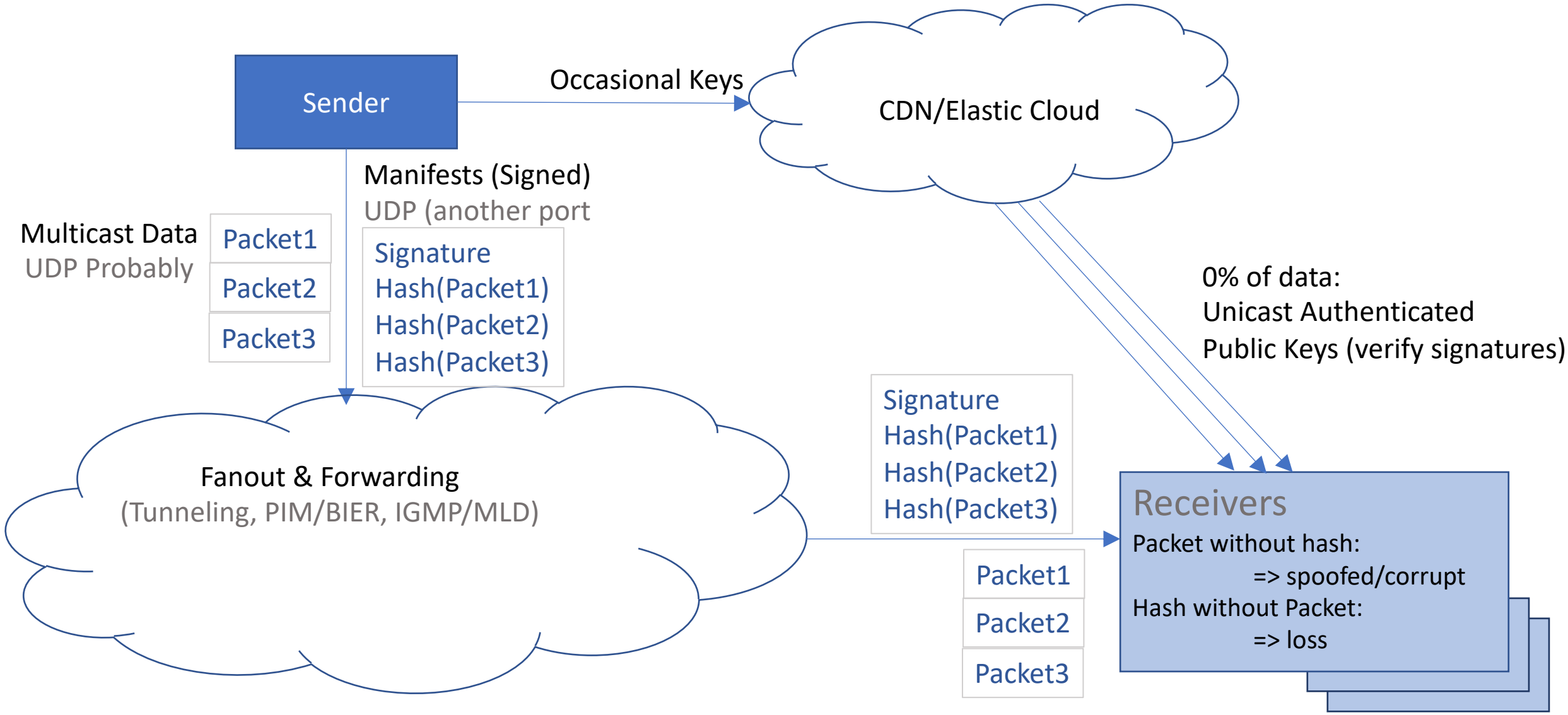
AMBI – Asymmetric Manifest-Based Integrity

- YANG augmentation of DORMS
  - Adds yang data to the (S,G) nodes
- Out-of-band Stream of Manifests
  - HTTPS Chunked Encoding (prototype at Hackathon)
  - QUIC (H3 version of same)
  - DTLS+FECFRAME (future work—reduce HOL blocking?)
  - ALTA+FECFRAME (after DTLS–fate-sharing, better timing window, scalable)
- Manifests:
  - List of sent packet digests (hash of contents)

AMBI (Asymmetric Manifest-Based Integrity)



Also AMBI (phase 2, with ALTA)

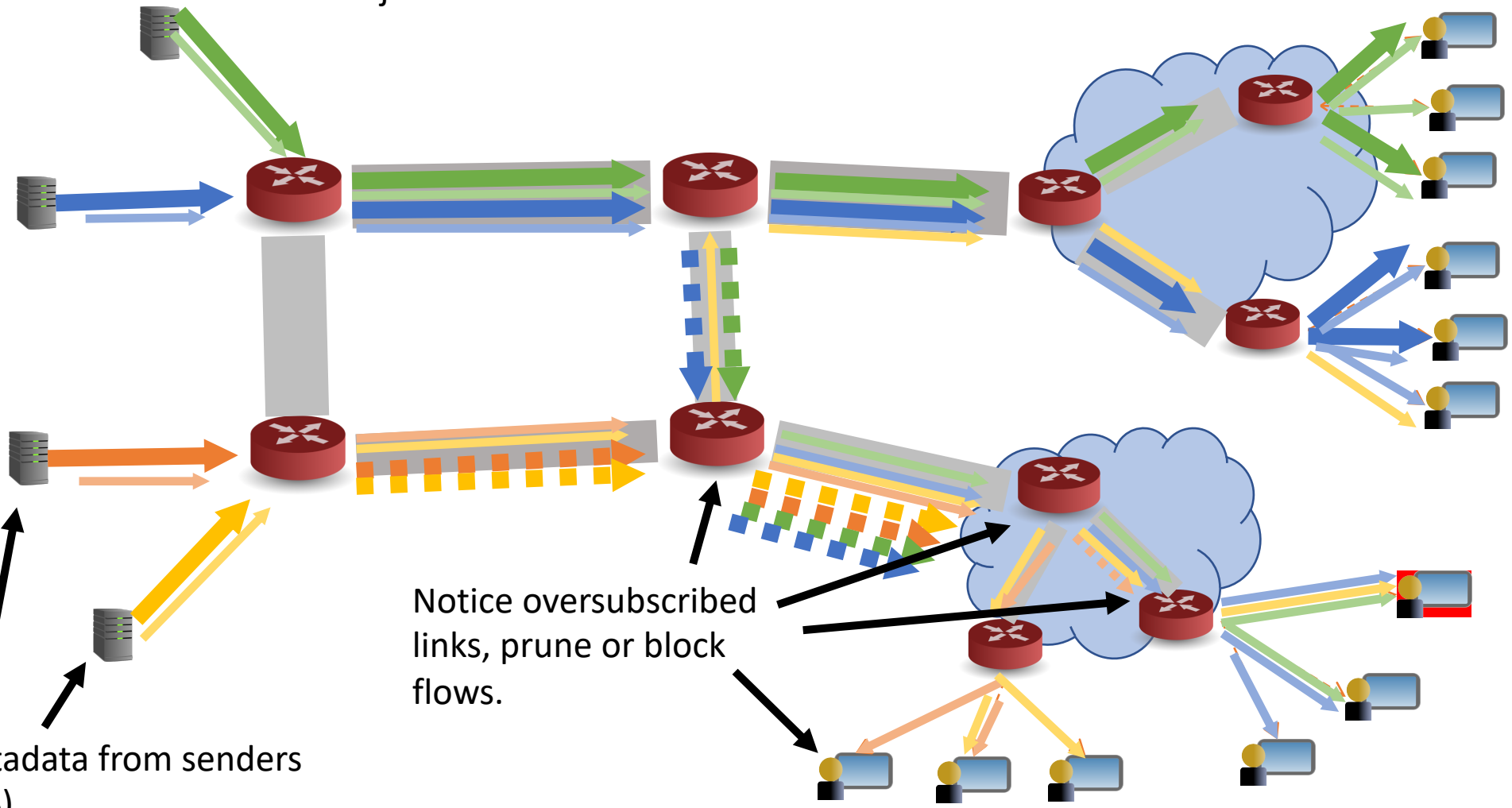


CBACC – Circuit-Breaker Assisted Congestion Control

- YANG augmentation of DORMS
  - Adds yang data to the (S,G) nodes
- Provides max-bitrate and priority metadata for (S,G)
- Defines circuit-breaker behavior
  - Prune when oversubscribed
- Oversubscription threshold
  - Static — typical for routers
    - (default: X% interface capacity)
  - Dynamic — typical for browser:
    - Loss (shrink when there’s loss, grow when there’s not)
    - History
    - BW detection techniques (chirping/packet dispersion)

Circuit Breaker Assisted Congestion Control

draft-jholland-mboned-cbacc:



Notice oversubscribed links, prune or block flows.

Bit-rate metadata from senders (via DORMS)

+ optional PIM population count for fair pruning decisions (RFC 6807, experimental)

Implementation status

- Receive API (just basic join so far; to be extended)
  - https://github.com/GrumpyOldTroll/libmcrx
- Hackathon AMBI implementation (POC; just the transport)
  - https://github.com/GrumpyOldTroll/ambi
- Chromium with libmcrx & API (POC; do not use for browsing, not up to date)
  - https://github.com/GrumpyOldTroll/chromium/tree/multicast

TBD:

- DORMS (with both CBACC and AMBI)
- CBACC
- AMBI ported to libmcrx
- Tunneling (AMT)

Next Steps

- Adoptions/dispatch?
  - DORMS?
  - CBACC?
  - AMBI?

- WICG proposal
  - Also needs support, please read and comment ☺ https://discourse.wicg.io/t/proposal-multicastreceiver-api/3939