Mobility Network Representation in ALTO
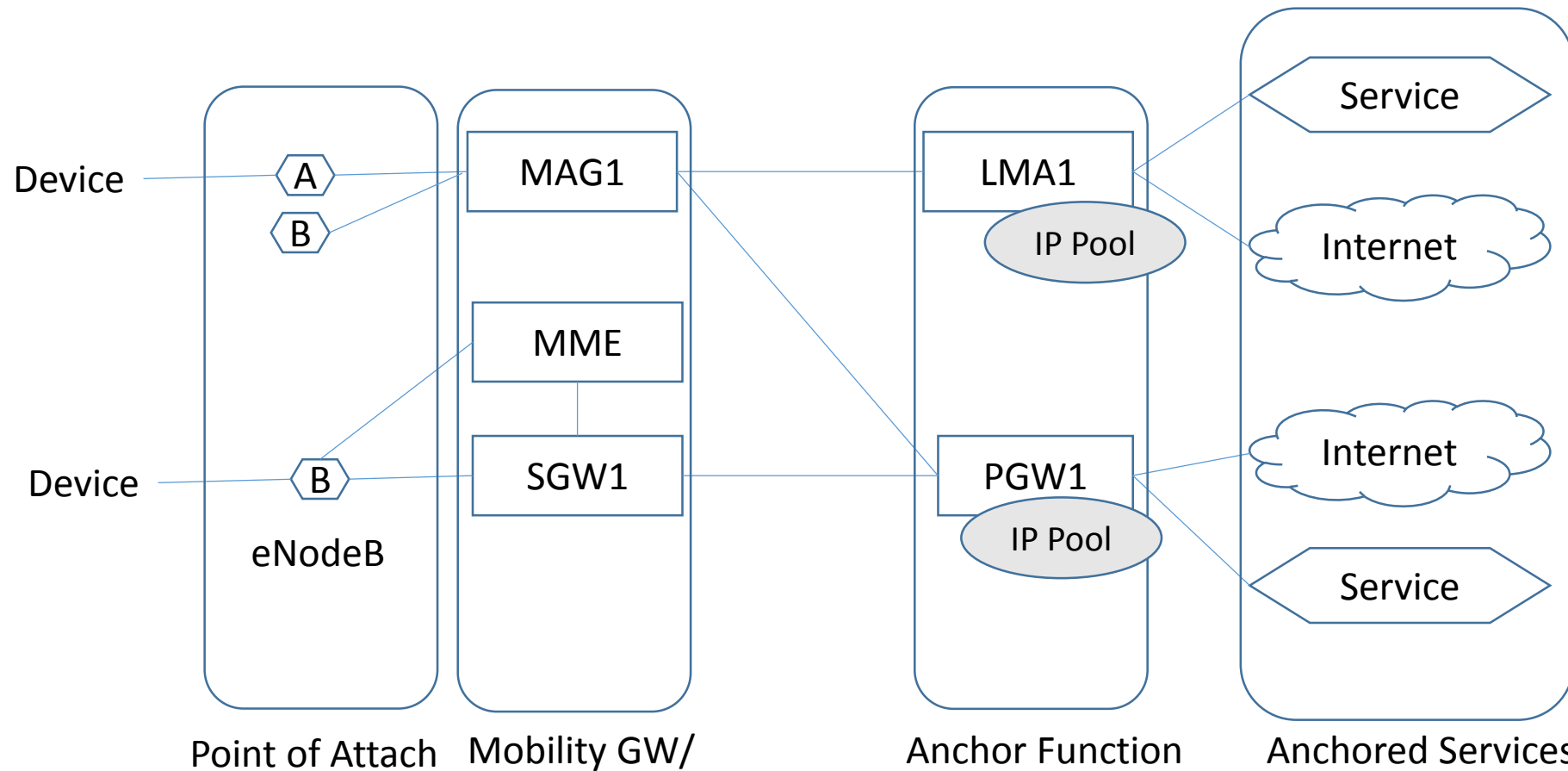
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draft-bertz-alto-mobilitynets-00

Mobile Networks (Any really)

- Have different kinds of mobility
  - Fixed – IP address reachable from internet (reachability) and is the same when the mobile move (continuity)
  - Sustained – Has continuity but not reachability
  - Nomadic – Neither continuity nor reachability
- Where one attaches (Point of Attach) makes a difference
  - However, Point of Attach is often not an IP address which is a problem for ALTO
- How mobiles get addresses is dynamic and from IP pools
- Getting the right service, node, etc. is not difficult in ALTO but requires some discipline
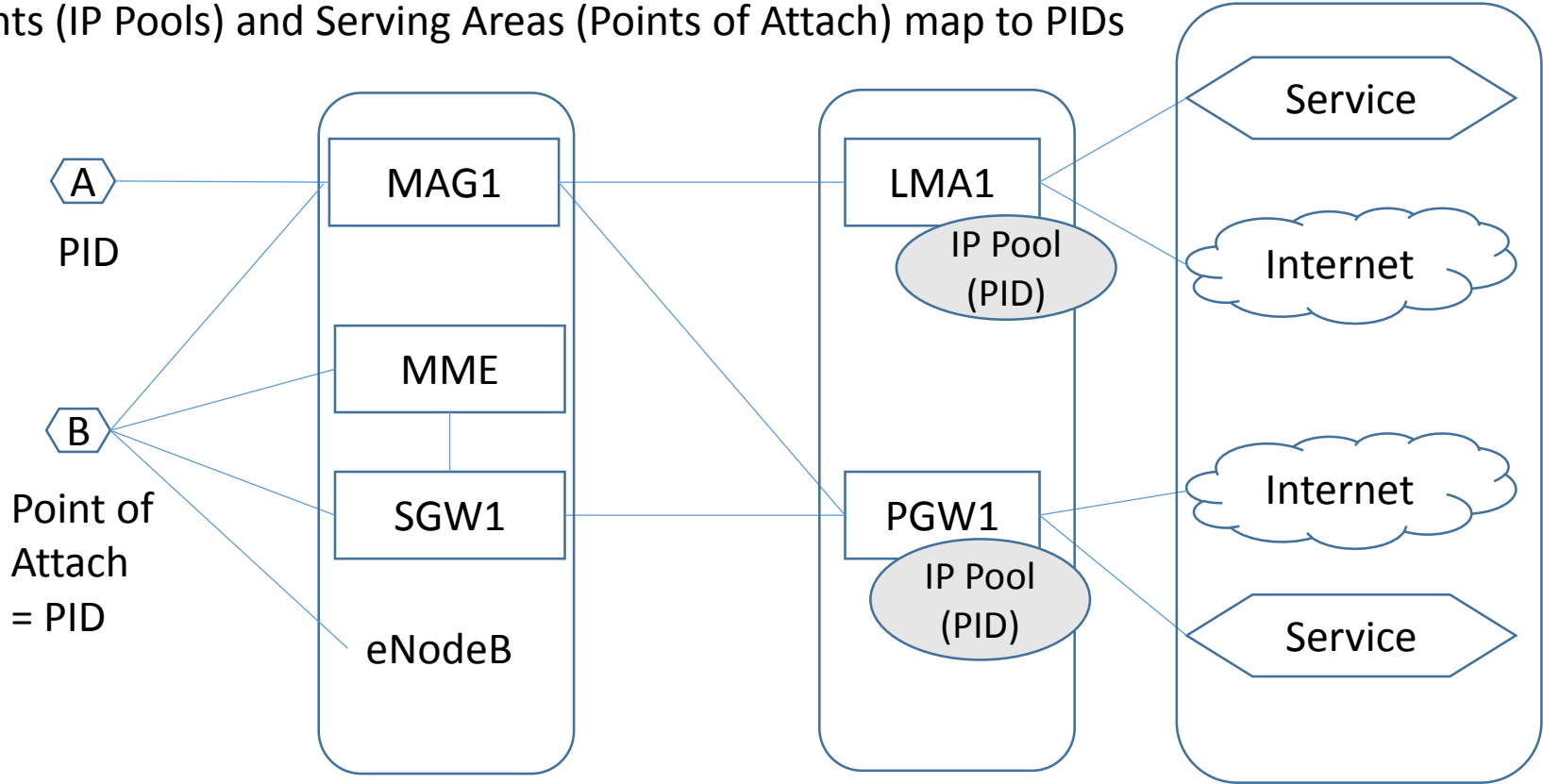
Example Network with 2 kinds of mobility

Device

A
B

MAG1

MME

SGW1

eNodeB

Point of Attach
(First Decision
- decided by
user/device)

Mobility GW/
Local Router

Device

B

LMA1

IP Pool

PGW1

IP Pool

Service

Internet

Internet

Service

Anchor Function

Anchored Services

**Each subsequent decision of 'Next Element'
to use is based upon prior decisions.**

Example Mapped to ALTO

Footprints (IP Pools) and Serving Areas (Points of Attach) map to PIDs

A
PID

B
Point of
Attach
= PID

MAG1

MME

SGW1

eNodeB

LMA1

IP Pool
(PID)

PGW1

IP Pool
(PID)

Service

Internet

Internet

Service

Deciding Next Element is all about service footprint, Service Type and costs. The relationships (and how they are modeled in ALTO) is key.

Service Elements (endpoints) for each PID and/or PIDs if they have a pool of addresses (routes)

Anchor Functions that are assigned to serve PID Service Elements which contain the IP Pools

Anchored Services that serve the same PIDs as the anchor functions OR the IP pools they anchor

Relationships between Tiers

- Direct – Endpoint Property Service property, e.g. MAG1 has a property "lma" : "LMA1"
  - It is limiting – a direct mapping
  - If it is multi-valued (array) it can become hard to manage in JSON for small updates / queries
- Indirect – Use a low value metric already present, e.g. hopcount, or other metric Appears to be more work
  - Can be combined with non-local relationships that may be used when there is no local service
  - Direct relationship can be maintained as an extreme value (lowest or highest value depending upon how the metric is interpreted)

Relationship representation performance

- Example

  PID Y has property of "mag" : "mag1"

  PID Z has no "mag" property but the lowest "hopcount" value for any "mag" is "mag2"
  - Direct Method
    - For PID Y the EPS provides the value in question while a cost based query is required for PID Z.
  - Indirect
    - All direct relationships are given a "hopcount" of 0.
   - One cost query for PID Z or PID Y is sufficient
- PRIMARY ISSUE: The examples here talk about cost between and endpoint and a PID which is not supported in ALTO but
  - In reality, context will always be an endpoint and not a PID but representing the direct property is problematic when the element is NOT an obvious part of the PID.
  - Solution
    - If relationship is a PID property, quto-generate PIDs for each direct relationship and corresponding cost map entry.
    - If the relationship is an Endpoint Property, generate a corresponding endpoint cost value.
    - Use EPCS for all queries.

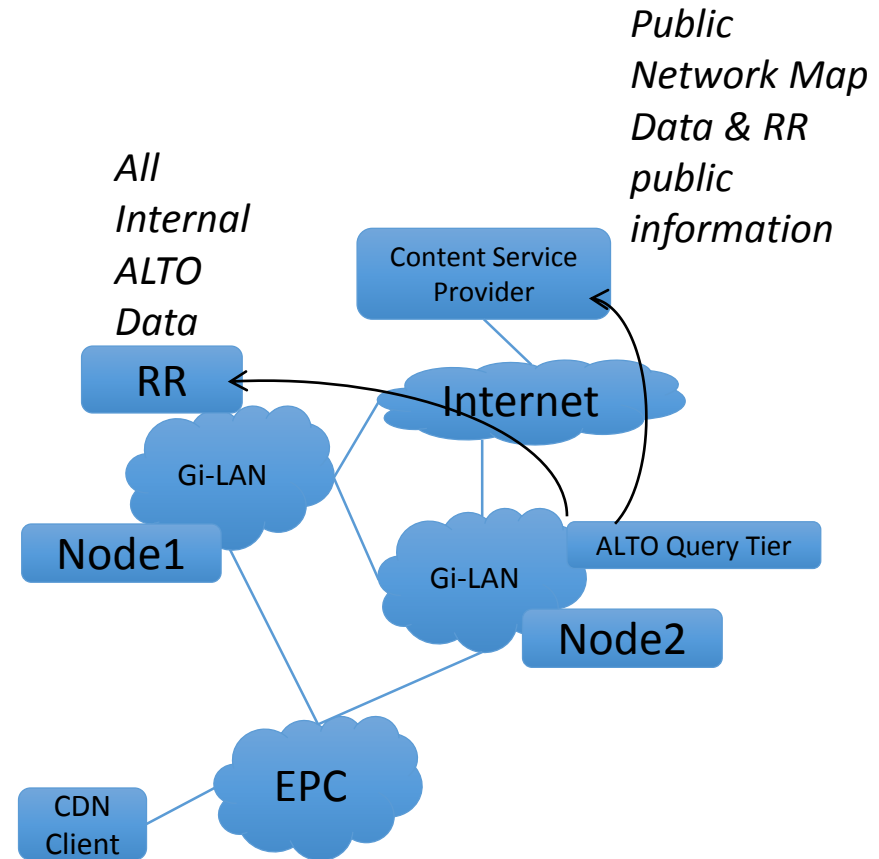# Additional Consideration: Speed State / Address Type
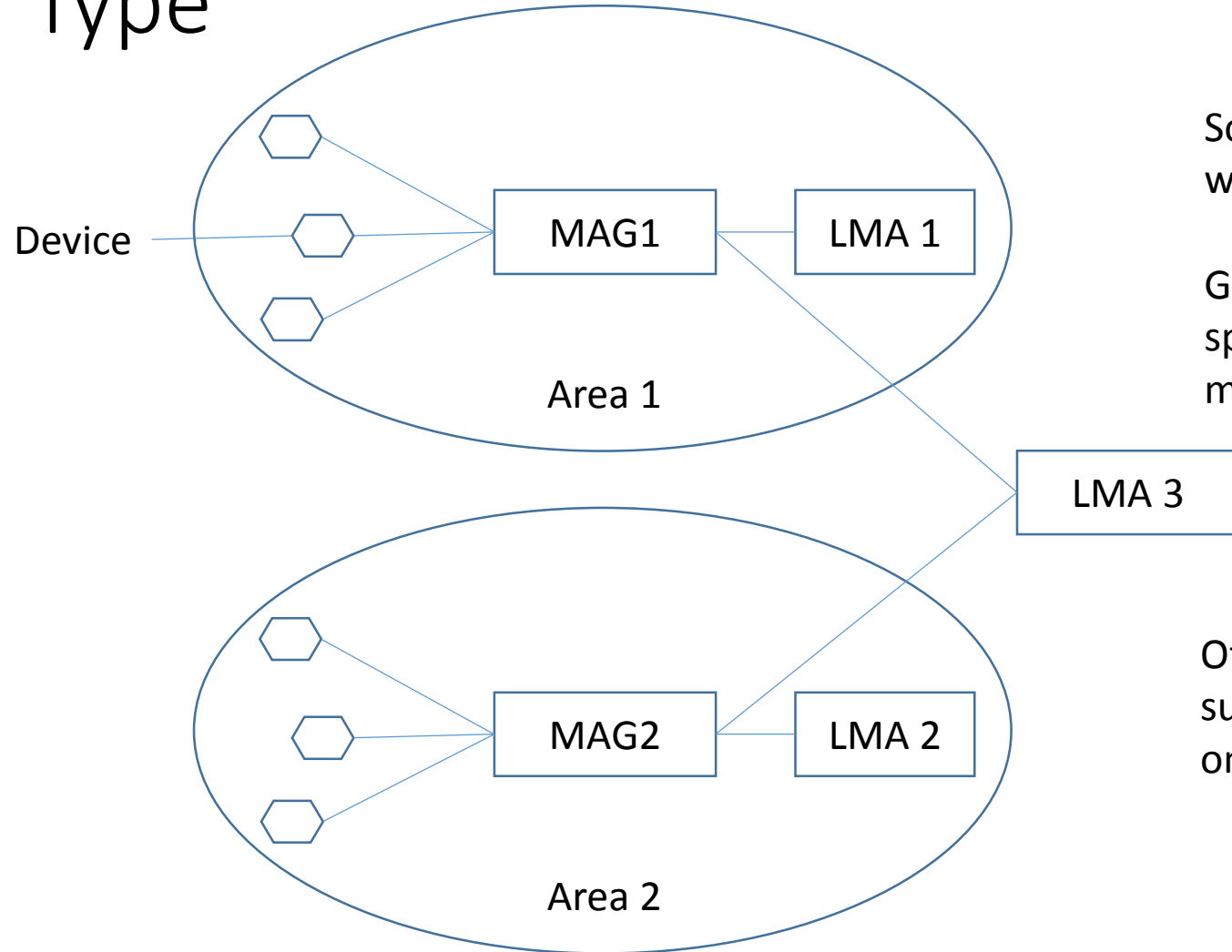
Some LMAs intended for fixed or local use while others or not.

Giving a sense of how mobile a device is, e.g. speed state in LTE, better decisions can be made.

Other criteria such as the address type, e.g. fixed, sustained or nomadic as defined in draft-ietf-ondemand-mobility can be used.

CDN Integration

- Discovery
  - Nodes are configured with RR (Request Router) locations
  - RRs are configured with other RR locations AND/OR can discover other RRs via ALTO

- ALTO
  - Network Maps
    - Internal with PIDs representing
      - Location of Nodes / RRs
      - Location of Customer's Anchor Gateway
    - External shared with other CDNs for interworking (this is the proposed standard – NO CLEARING HOUSE / INTERCHANGE REQUIRED)
  - Cost Maps
    - Internal is most important
  - Endpoint Properties
    - Location of CDNI signaling points for Nodes and RRs
  - Endpoint Cost Service
    - Fine grained between Nodes is desired
    - Coarse grain is all we get for Client to Node

Public Network Map Data & RR public information

All Internal ALTO Data

Content Service Provider

Internet

RR

Gi-LAN

Node1

Gi-LAN

ALTO Query Tier

Node2

CDN Client

EPC

DMM

Dynamic Mobility Management (DDM)

- Use to separate Control and Data Plane
- Control Plane (DMM Clients) talk to Agents that configure Nodes
- DMM Client uses

1. ALTO Endpoint Costmap to map locations of the Access Network Point of Attachment, e.g. WIFI AP, eNodeB, etc to the Data Plane Nodes that it can use

2. ALTO Endpoint Property Service to find the DMM Agent(s) for the Data Plane Nodes for communication

ALTO Queries
1. Point of Attach to DPN Costs (locates DPNs local to the Customer)
2. DPN Agent Property Query (locates agents)
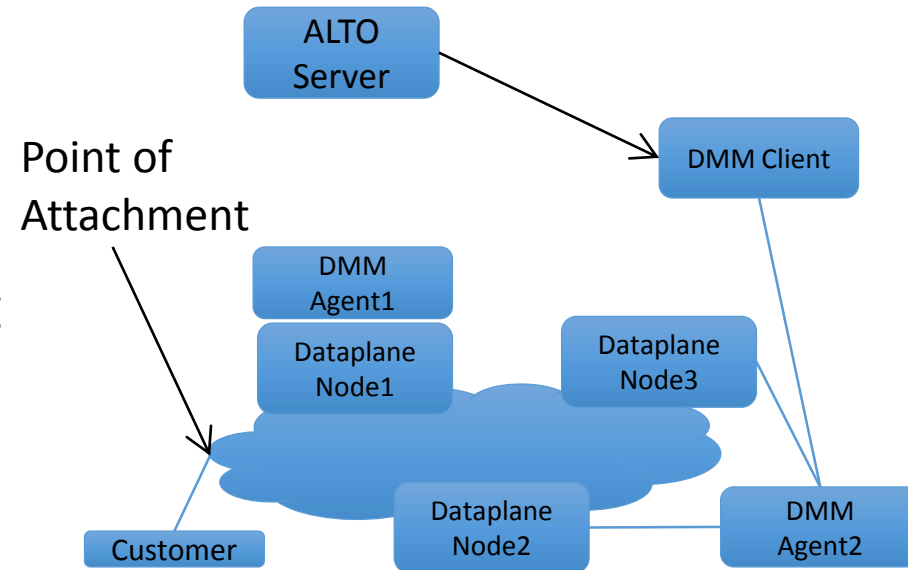
Summary

- We can provide an EPCS based mechanism for various applications (DMM, CDNI internal routing) for many mobility based networks
    - Direct and Indirect mapping
    - Represent one relationship type as another
- Generalizing Point of Attach, especially as a PID, allows the network topologies to change w/o re-computing each service.