

Trigger management and handover constraint selection in Ambient Networks

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On behalf of AN P2 WP-B "Mobility Management"

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Ambient Networks Phase 2



Mobility, AN-style

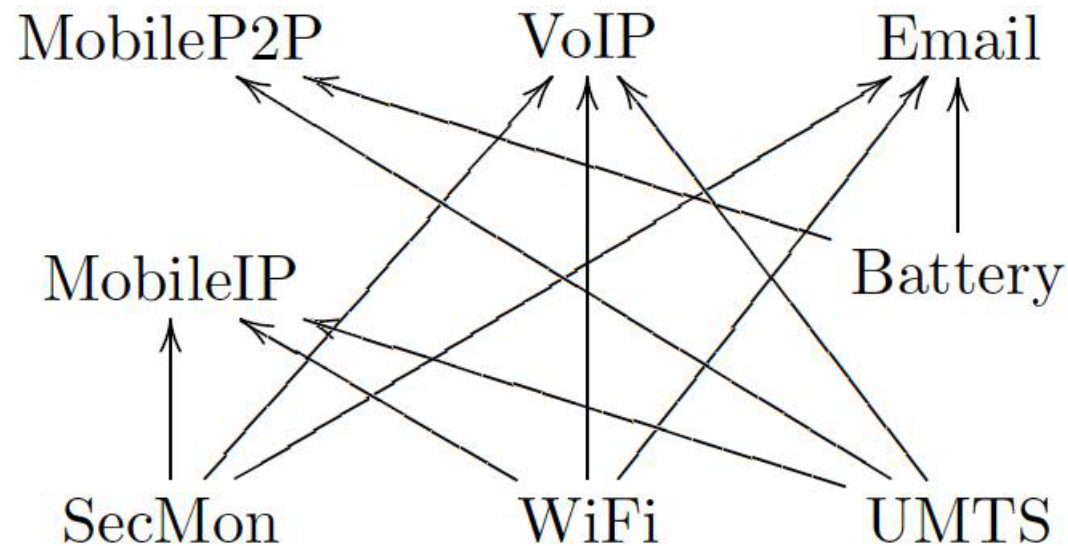
- ❖ Take advantage of many networks in parallel
- ❖ Communication becomes complex
 - Mobility for flows, sessions, groups of devices
 - Mobility patterns as a factor in forming networks
 - Composability and Security/Trust
 - Scalability and Reliability
 - Multi-radio resource management (MRRM)
 - Now: BT, WiFi, 3G/UMTS/HSDPA; next: WiMax,...
 - Multi-mobility management protocols
 - Now: MIPv4/v6/NEMO, HIP; next: Node ID, post-IP
 - User context, ad-hoc network formations

What is a Trigger?

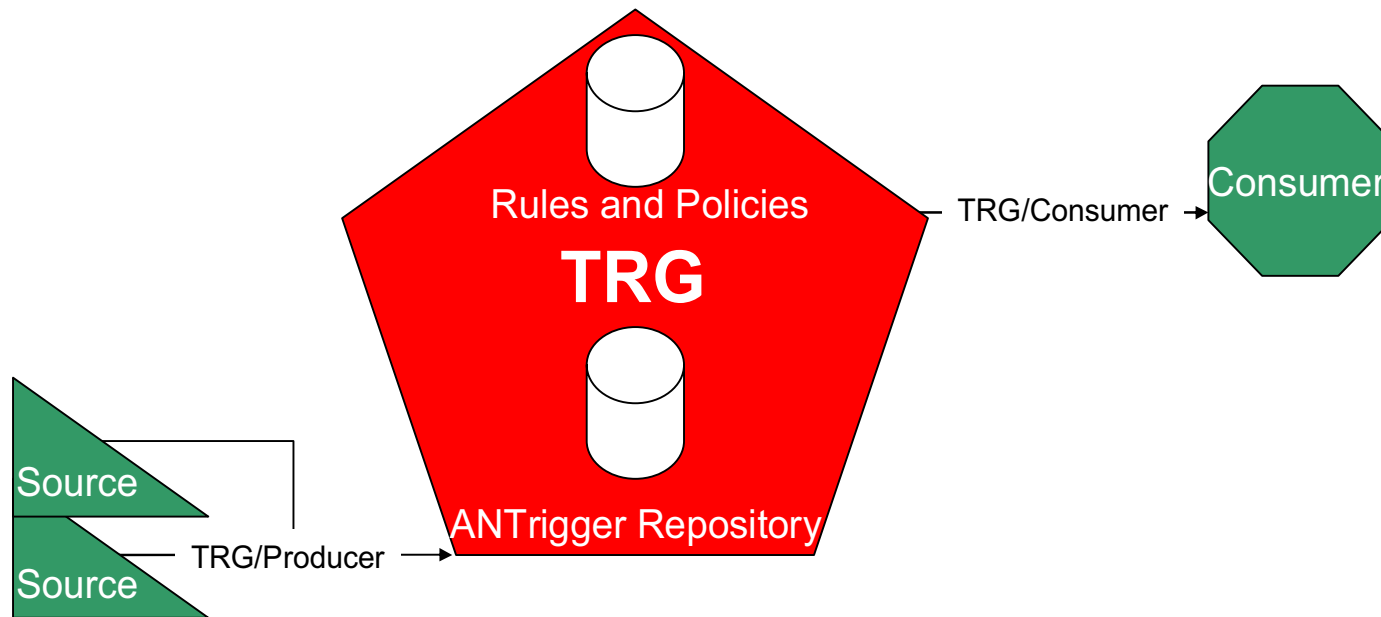
- ❖ Different event sources can provide information regarding mobility, for example
 - SNR, RSSI, cell load, utilization, drops
 - Processor load, storage quotas, battery SOC
 - Policy violations, security alerts
 - Changes in charging, cost
 - Routing updates, availability
 - Changes in user context/preferences
- ❖ The term *trigger* refers to a notification about such changes

Today: Convoluted Info Flows

Different components, applications may be interested in the same information



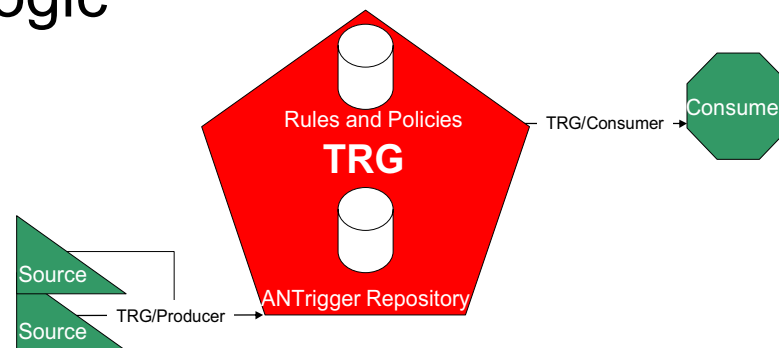
TRG: The Big Picture



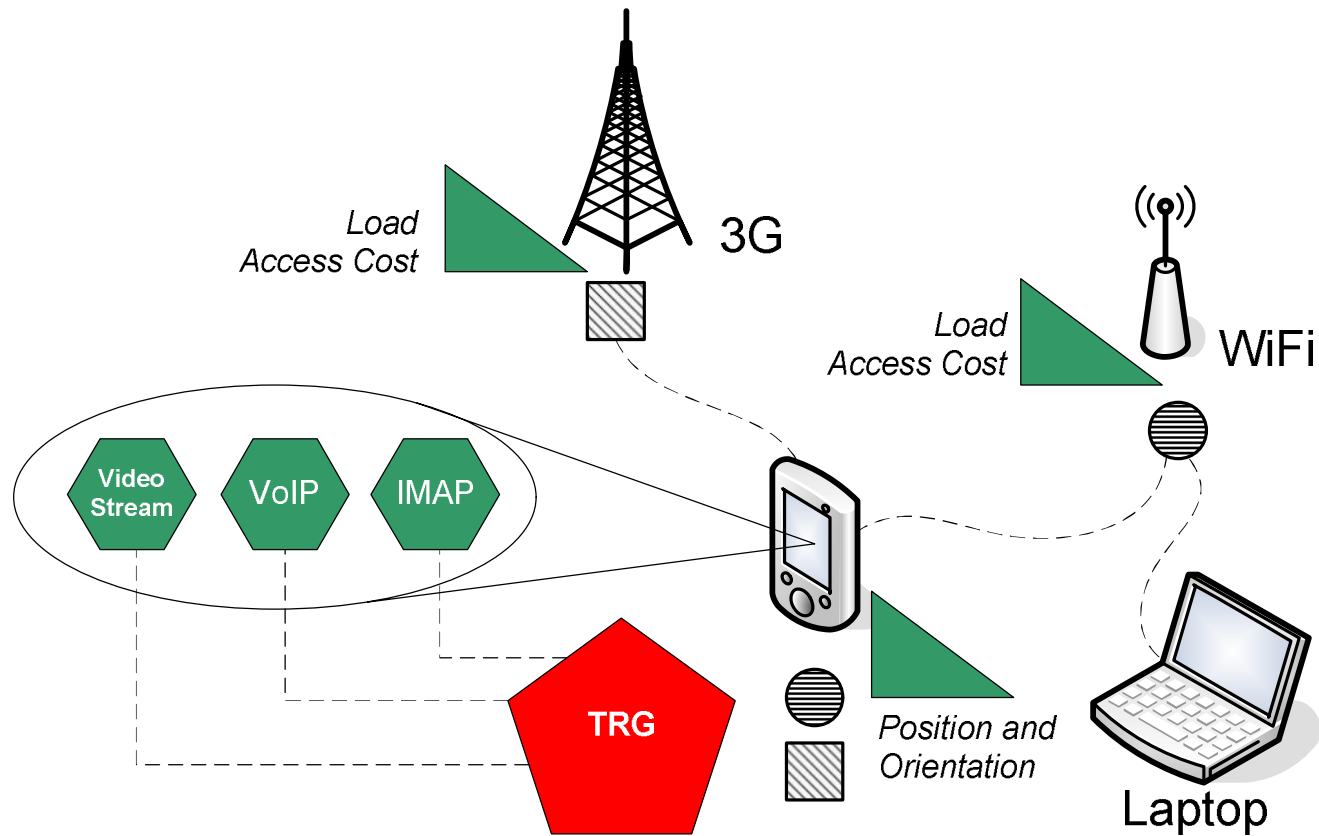
Trigger Management

❖ TRG comprises

- the event sources, which feed TRG with relatively fast-changing information
- the trigger consumers, which receive notifications in the form of standardised triggers about events they are interested about
- TRG itself with its associated data stores and internal logic



TRG in Practice



Ambient Networks Handover and Resource Management

- ❖ Several functional entities are responsible for resource management
- ❖ Multi-radio resource management (MRRM)
 - Keeps track of radio flow requests
 - Manages local radio resources
- ❖ Handover and Locator Management (HOLM)
 - Manages mobility protocols (MIP, HIP) and tools
 - Keeps track of dependencies between packet flows and routing information
 - Handles mobility updates

Multi-radio Resource Management

- ❖ MRRM can consider radio parameters and decide to handover
- ❖ Why handover? Because of changes
 - in radio link quality
 - in QoS requests
 - User initiates a video stream, VoIP call, bank transaction
 - in cell load and other network-related events
 - Congestion in active cell and routing path
 - in user preferences/context
 - User initiated handover

Handover & Locator Management

- ❖ Manages handover tools and execution
- ❖ Can influence the MRRM handover decision and ensure a successful handover
- ❖ Constraints on HO decision
 - Admission Control, Composition, Security
 - Subscription and compensation relationship
 - (User and Operator) Preferences and Policies
 - Availability of HO Tool and handover latency
 - Suitability of end-to-end route

*Mobility support for the Node ID architecture**

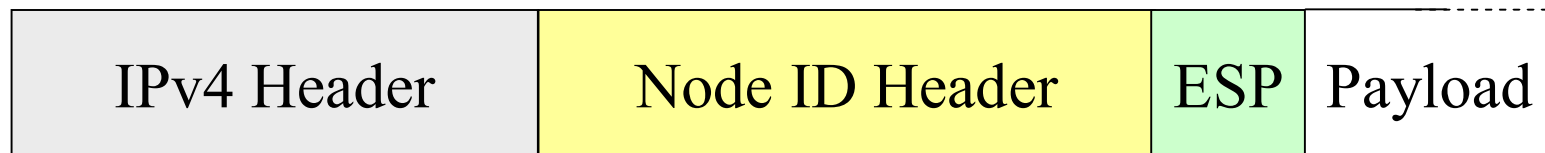
* Based on work by Bengt Ahlgren, Jari Arkko,
Lars Eggert, Jarno Rajahalme, et al.

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Node Identity Architecture

- ❖ The NodeID architecture interconnects different networks
- ❖ Connections are bound to identities rather than locations
- ❖ Identity based on asymmetric cryptography
- ❖ Implemented as an overlay network (L3.5) on top of any networking layer (IPv4, v6)



Node Identity

❖ Each node has an identity

➤ Private key → identity

- Node Identifier (NID) is a one-way hash of the public key
- Currently using 128 bits (looks like IPv6 address)

➤ Public key → identity identifier

- Generated using private key

❖ No distinction between end hosts and routers

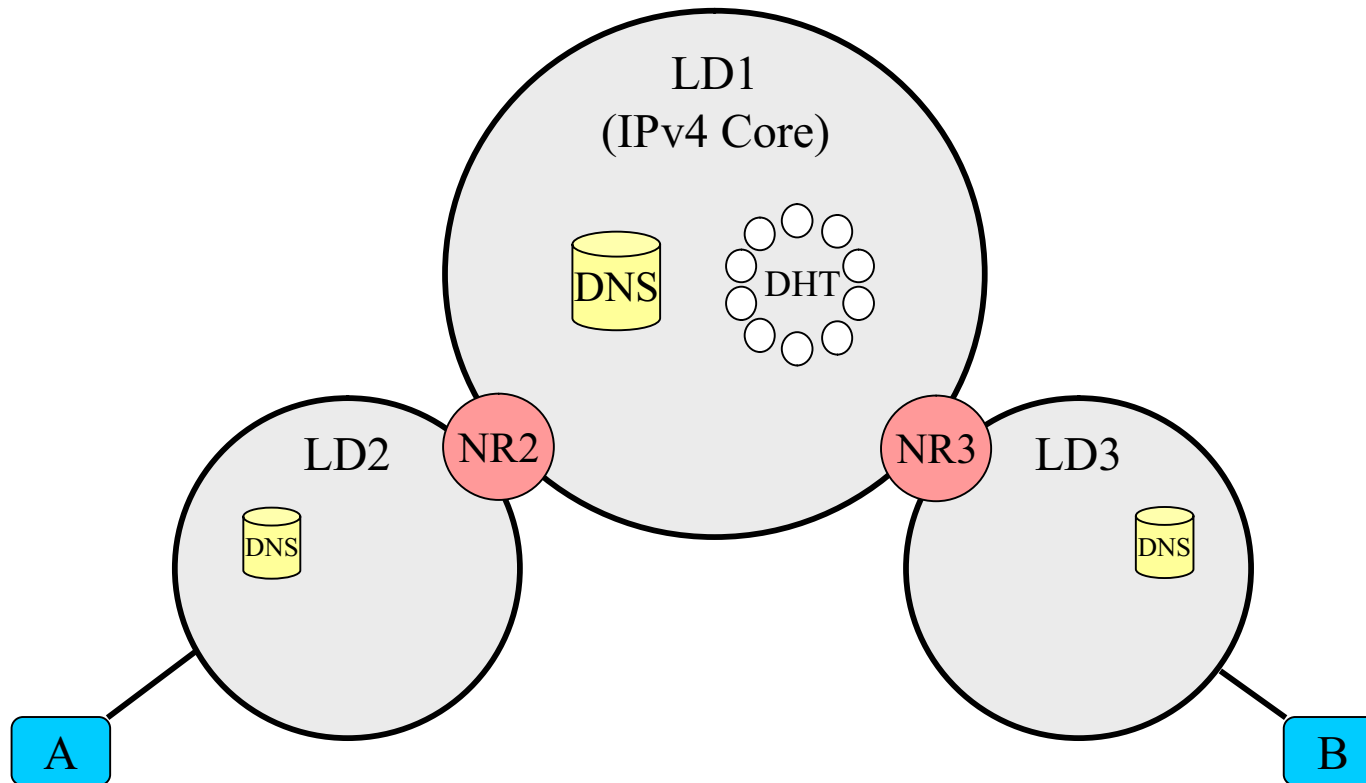
➤ Examples

- 3G/UMTS phone serves as router for its attached PAN
- Sharing broadband connection with other nodes
- Servers acting as forwarding agents for mobility purposes

Locator Domain

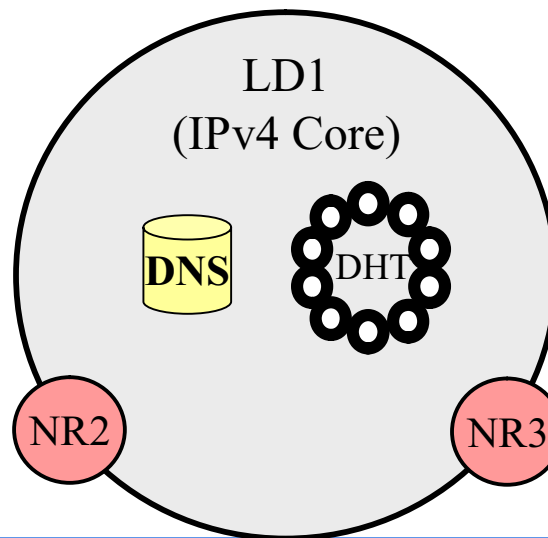
- ❖ Independent network with consistent routing and addressing system
 - Similar to autonomous systems in current Internet
 - Within an LD, nodes can freely communicate, without relying on external mechanisms
- ❖ NID "router" = LD border node
 - Acts as a gateway
 - Can perform address/protocol translation between LDs
 - Maintains reachability state for nodes in its LD

Example Network



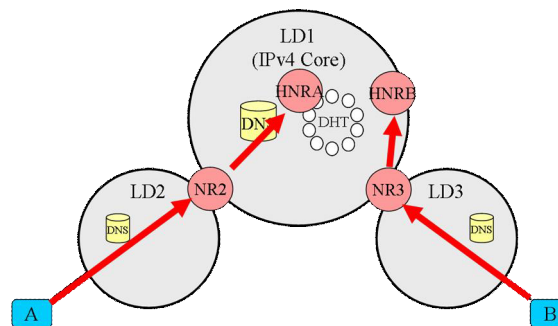
Global Reachability

- ❖ DNS and DHT provide necessary name resolution
 - DNS provides name-to-NID and rendezvous locator mapping
 - DHT provides lookup for locators of the NID routers



Global Reachability (2)

- ❖ Rendezvous servers in core LD provide assistance with initial contact
- ❖ Tree-like routing structure with all default routes pointing towards the core LD (upward routing)
- ❖ Nodes register at all NID routers on the path to the core LD (downward routing)



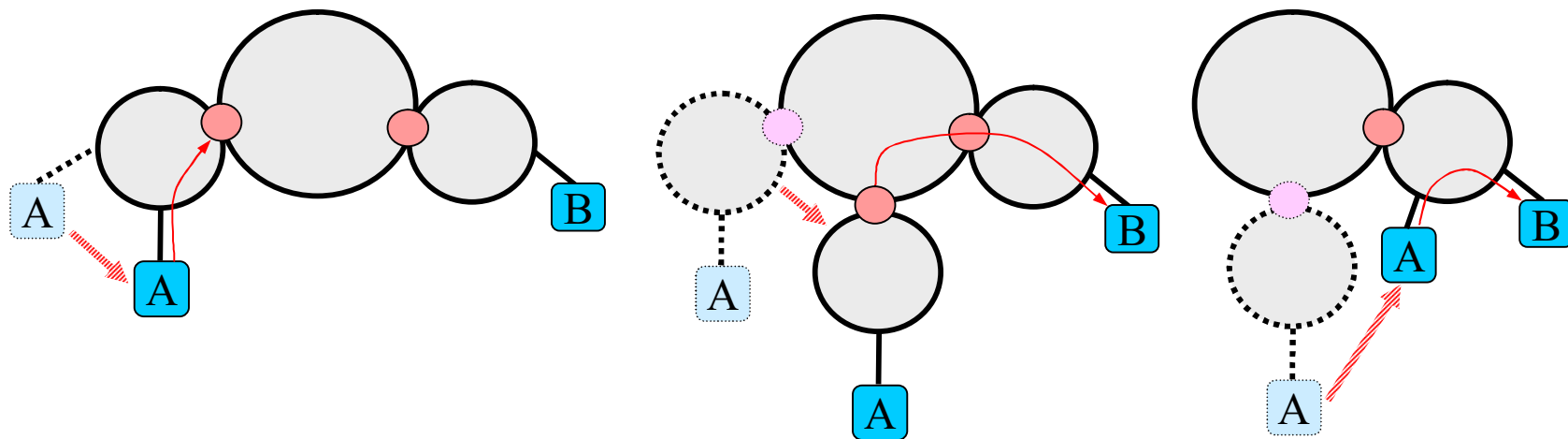
Mobility

- ❖ Different requirements than in the current Internet
 - Traffic routing based on identities and IPsec SPIs at NID routers
 - Applications bind to identities which are static
 - Mapping between identities and locators done automatically and is invisible to the applications
- ❖ Intra-LD mobility is hidden from the outside world
 - local mobility management
 - mobile networks

Mobility and Multi-homing

NodeID

- integrates local mobility, end-to-end mobility, and network mobility
- Makes network-based multi-homing possible



Thank You!

