Hybrid Access Network (Bonding Two or More Accesses)

draft-lhwxz-hybrid-access-network-architecture

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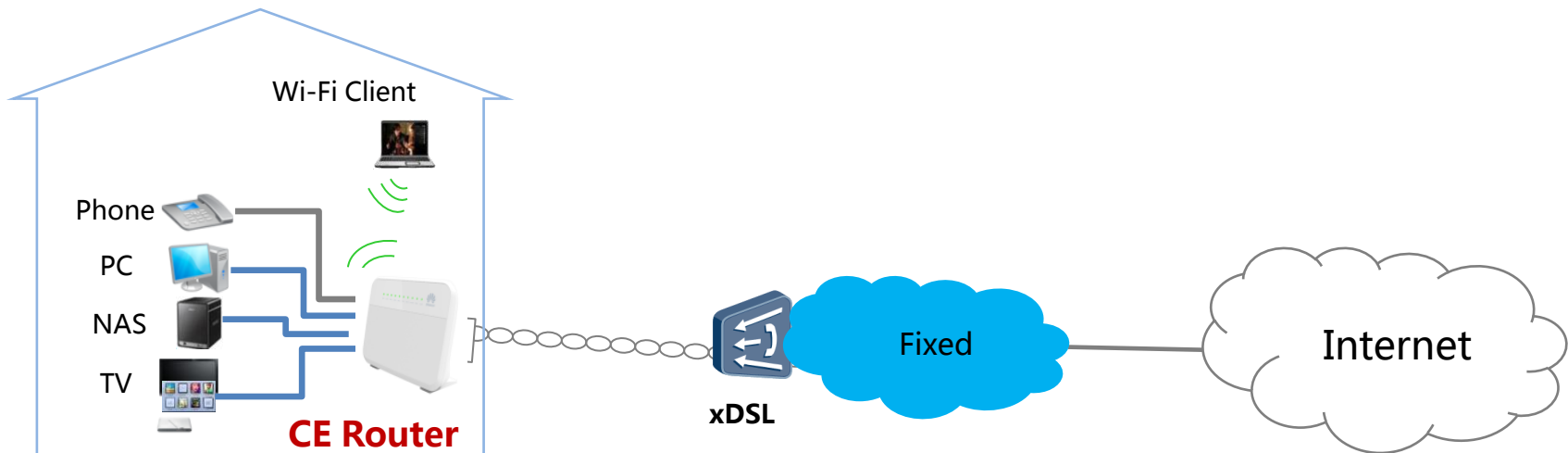
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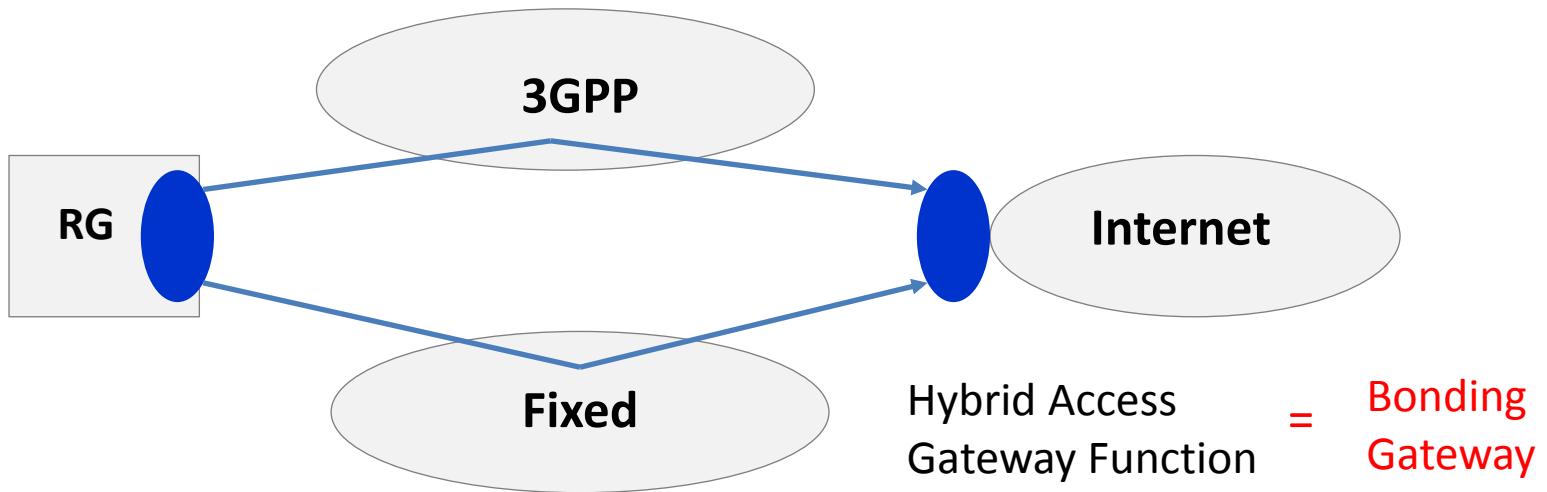
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Typical Customer Edge (CE) Router

- A typical CE router today has one DSL link
  in future a CE router will have a 3G/4G Link

- A typical CE router today supports IPv4
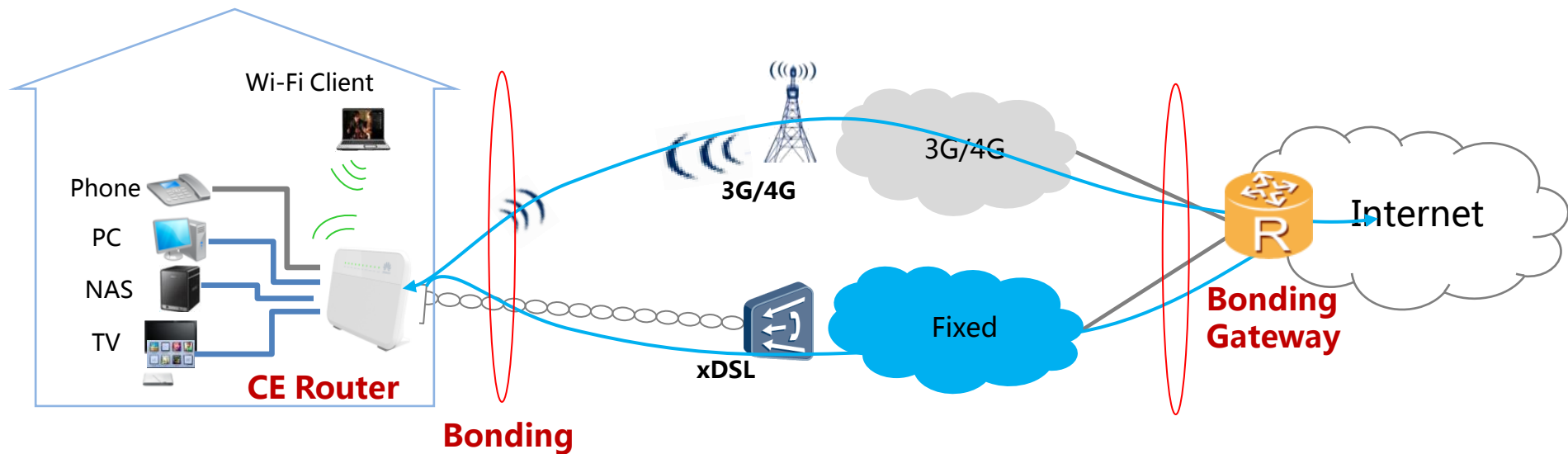 in future a CE router will support IPv6

BBF Activity

Hybrid Access for Broadband Networks Work project was approved in June 2014 BBF meeting
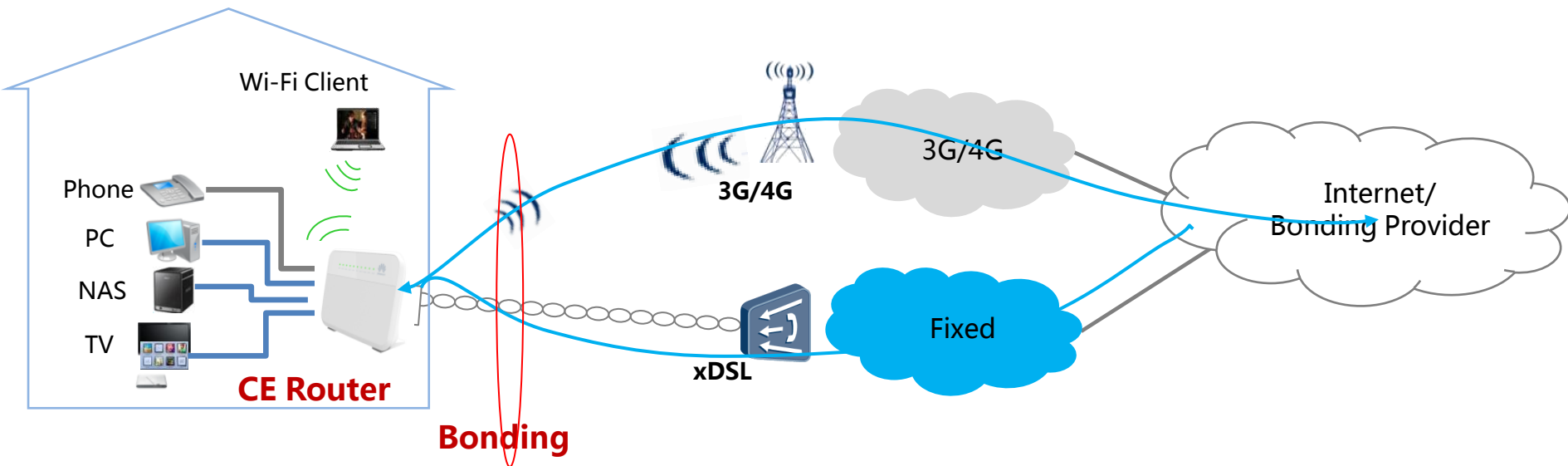 - 2014.546.03

RG

3GPP

Internet

Fixed

Hybrid Access Gateway Function = Bonding Gateway

Hybrid Access with Bonding Gateway

Wi-Fi Client

Phone

PC

NAS

TV

CE Router

Bonding

3G/4G

3G/4G

xDSL

Fixed

Bonding Gateway

Internet

Multiple Interfaces (Physical or Logical) on the CE Router

Hybrid Access without Bonding Gateway

Multiple Interfaces (Physical or Logical) on the CE Router
The 3G/4G and fixed networks may belong to the same operator or to different operators

Hybrid Access Requirements (1)

- Cost effective way to provide higher bandwidth

    - Leverages existing network deployments

- Bandwidth on demand

    - If the fixed access network is fully utilized or reaches a certain congestion threshold, some bandwidth of the wireless access network can be added on demand

- Improved service reliability

    - If one access network fails or is degraded, the service can still be provided without interruption through the other access network

Hybrid Access Requirements (2)

- Decouples the life cycle for fixed and mobile access networks

  – Supplements the DSL network that may be difficult to upgrade, especially in certain areas

- Faster provisioning

  – A customer can receive early service through the mobile access network while the fixed access network is being provisioned

- Application based Path Selection

  – Traffic of specific applications may be statically associated with a specific access network

- No software updates required on host

Traffic Distribution Schemes
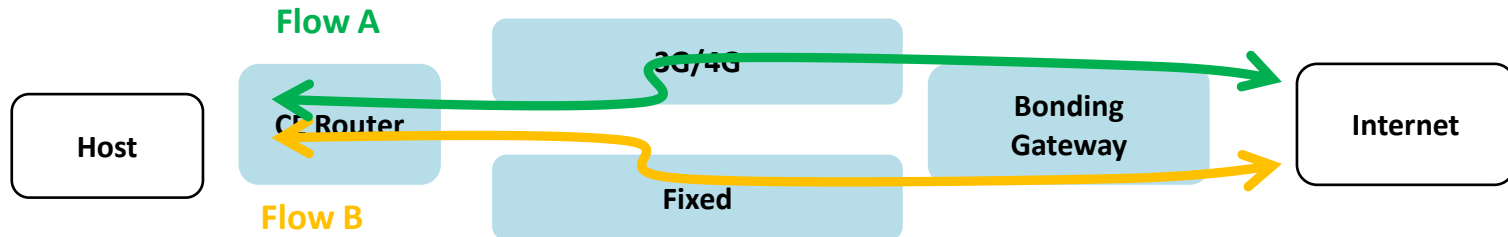
Flow-Based Distribution
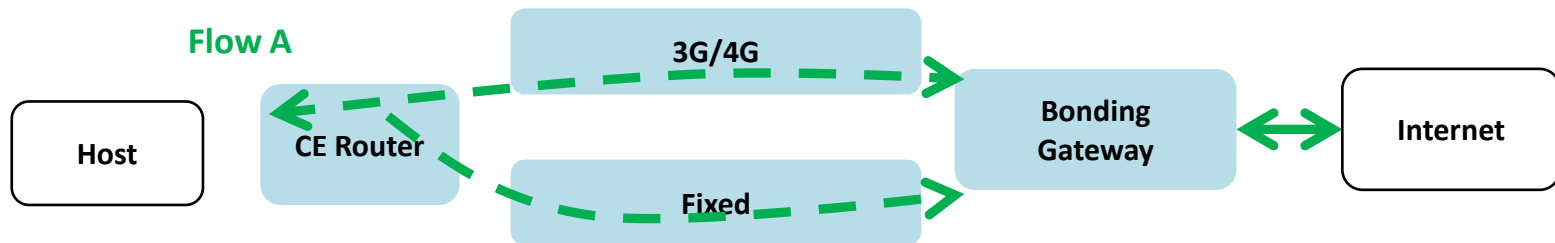

Packet-Based Distribution

- Packet-based and flow-based distributions can be applied together
  - Flow-based: jitter sensitive flows (e.g., real-time VoIP)
  - Packet-based: higher bandwidth and jitter insensitive flows (e.g., data download)
- Certain traffic types may be routed directly over a specific network, rather than through the bonded network

Flow-Based Distribution
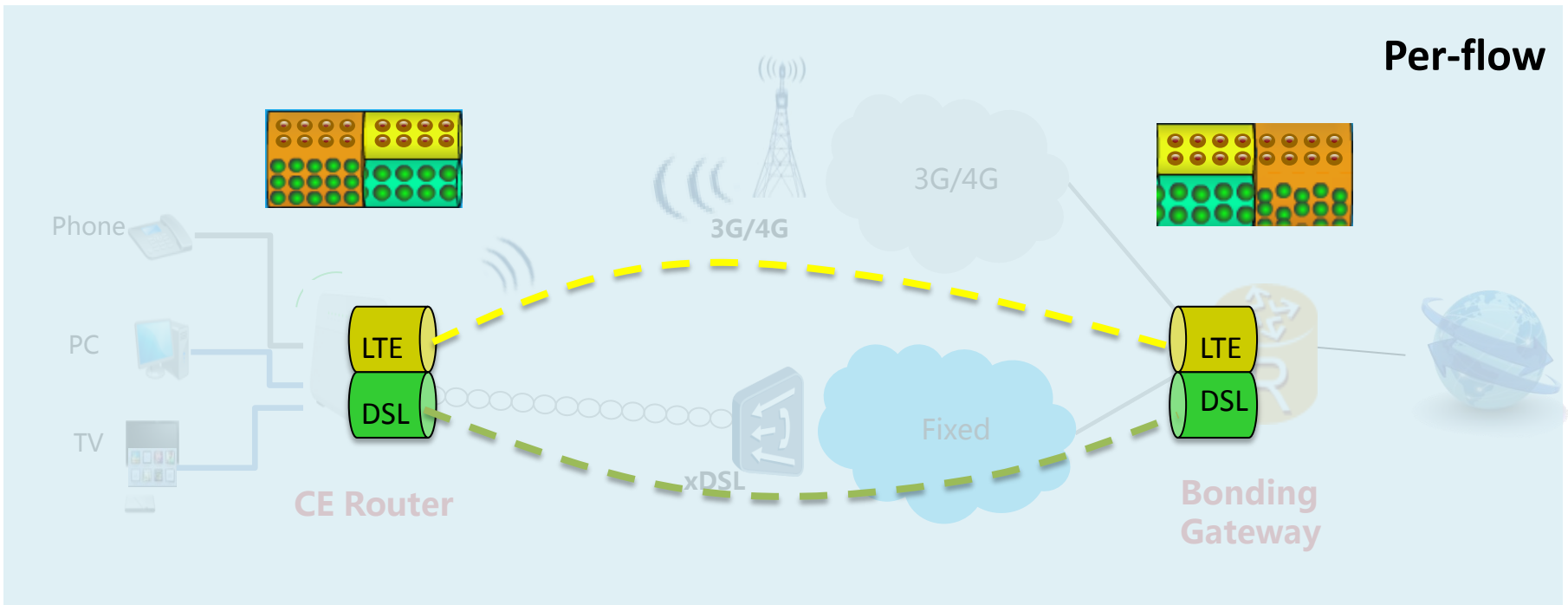
- Each traffic flow is carried over the 3G/4G network or over the fixed network
  - Not over both networks

Packet-Based Distribution

Per-Packet

DSL first

DSL offload On 3G/4G
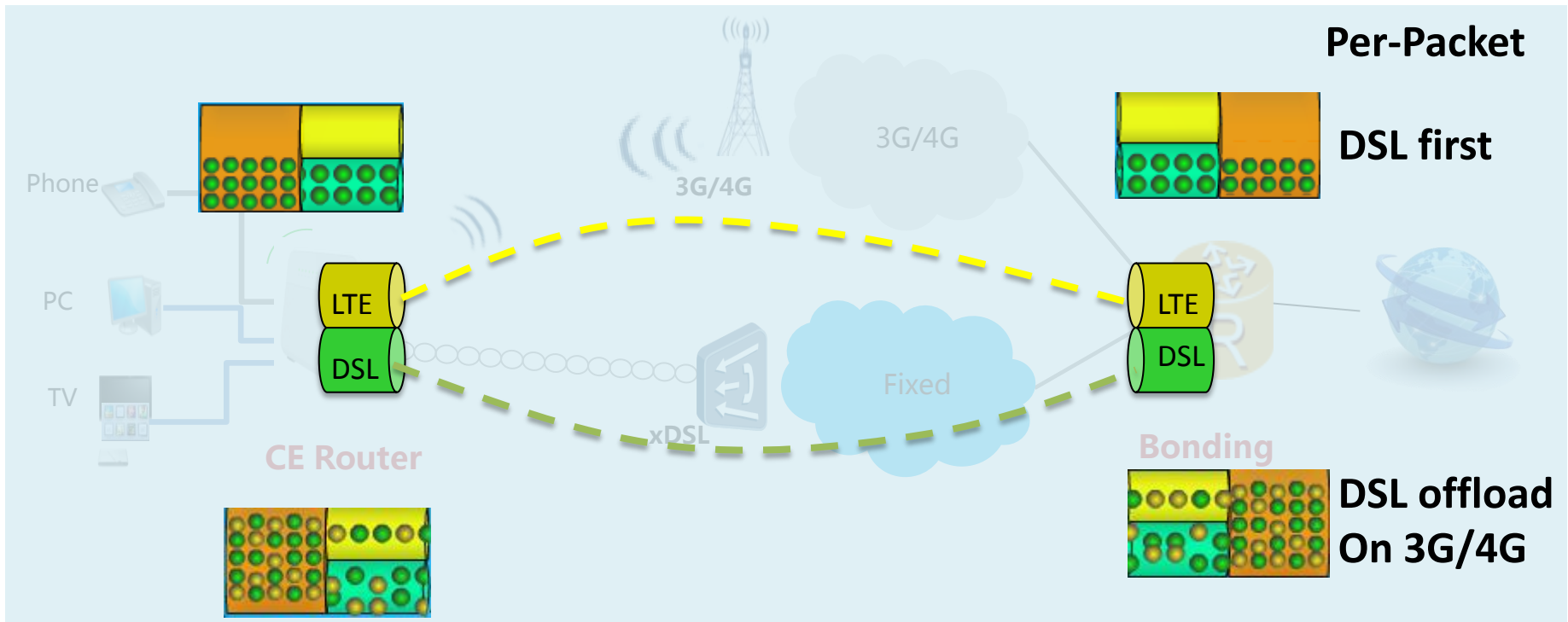
- If the traffic volume is lower than the fixed network bandwidth, all the traffic is carried on the fixed access network
- If the traffic volume is higher than the fixed network bandwidth, the overflow packets are carried on the 3G/4G network

Path Failure

- If the 3G/4G path is down, the traffic is carried on the fixed network
- If the fixed path is down, the traffic is carried on the 3G/4G network

Possible IETF Work

- A mechanism to setup and bond multiple paths together
- A mechanism to negotiate a traffic distribution for specific types of traffic (per-packet and/or per-flow)
  - Distributed solution: control plane
  - Centralized solution: centralized control entity
- A mechanism to describe the traffic distribution policy
  - E.g., for flow-based distribution, flow A goes to 3G/4G, flow B goes to DSL, etc.
- A mechanism to enable dynamic traffic distribution adjustments
  - To account for latency, bandwidth, MTU, etc.
- A mechanism to monitor the state of each of the multiple paths
- Support for both IPv4 and IPv6
- An example of an address assignment for bonding

Discussion

- Any clarification question?

Thank You