Dual-stack Mobile IPv6 as a transition solution

NOKIA

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Contents

- DSMIP6 Overview
- Advantages of using DSMIP6
- Issues and Concerns
- DSMIP6 in 3GPP Rel 8
- Summary

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Overview

- Dual stack Mobile IPv6 is specfied as RFC 5555
  - Published June 2009
- DSMIP6 is based on Mobile IPv6 (RFC3775) and NEMO (RFC3963)
- Is the protocol specified by 3GPP in Rel 8, for client based mobility between 3GPP and non-3GPP accesses, via the S2c reference point and S2b as well
- Objective of DSMIP6 is:
  - To enable IP mobility for dual-stack hosts while being agnostic to the IP version of the access network to which the host is attached to
- Reasons for development of DSMIP6:
  - State of IPv6 deployments and capabilities
  - Host stacks which are increasingly dual-stack
  - Transition models favoring a dual-stack approach
  - Long-tail expectation of IPv4 networks

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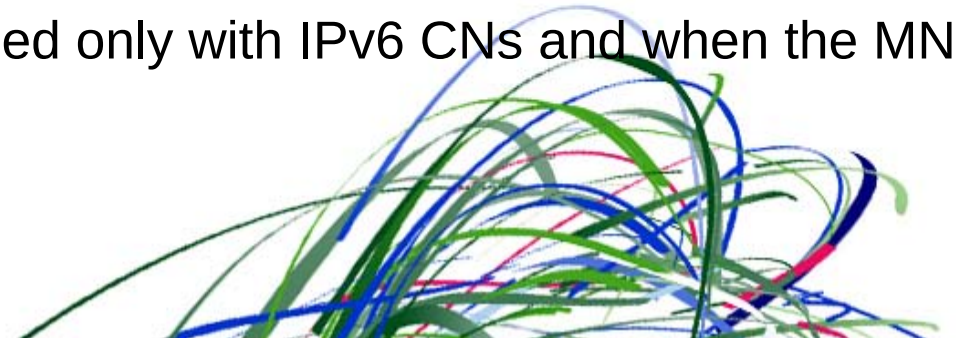
Dual Stack Mobile IPv6 capabilities

- Reuses the MIPv6 signaling between the MN and HA for creating and managing the bindings
- Enables the MN to obtain an IPv4 Home Address (HoA) from the HA
  - Mobility is provided to the IPv4 HoA by the DSMIP6 HA
- A DSMIPv6 HA is reachable via IPv6 and IPv4 prefix and/or addresses
- A DSMIPv6 MN is operational when attached to:
  - An IPv4 access network which assigns it a globally routable address as the CoA
  - A NATed IPv4 access network
  - An IPv6 access network
  - An access network which is dual-stack
- UDP encapsulation is used when attached via a NATed IPv4 access
- Security for signaling and optionally user traffic is thru IPsec
- Route optimization is enabled only with IPv6 CNs and when the MN has an IPv6 CoA



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Fundamental requirements

- MN has to be dual-stack capable
- The HA is also dual-stack and in addition to being reachable via an IPv6 address, it is also assigned an IPv4 address
- The access network to which an MN attaches has no implications to the successful operation of the protocol

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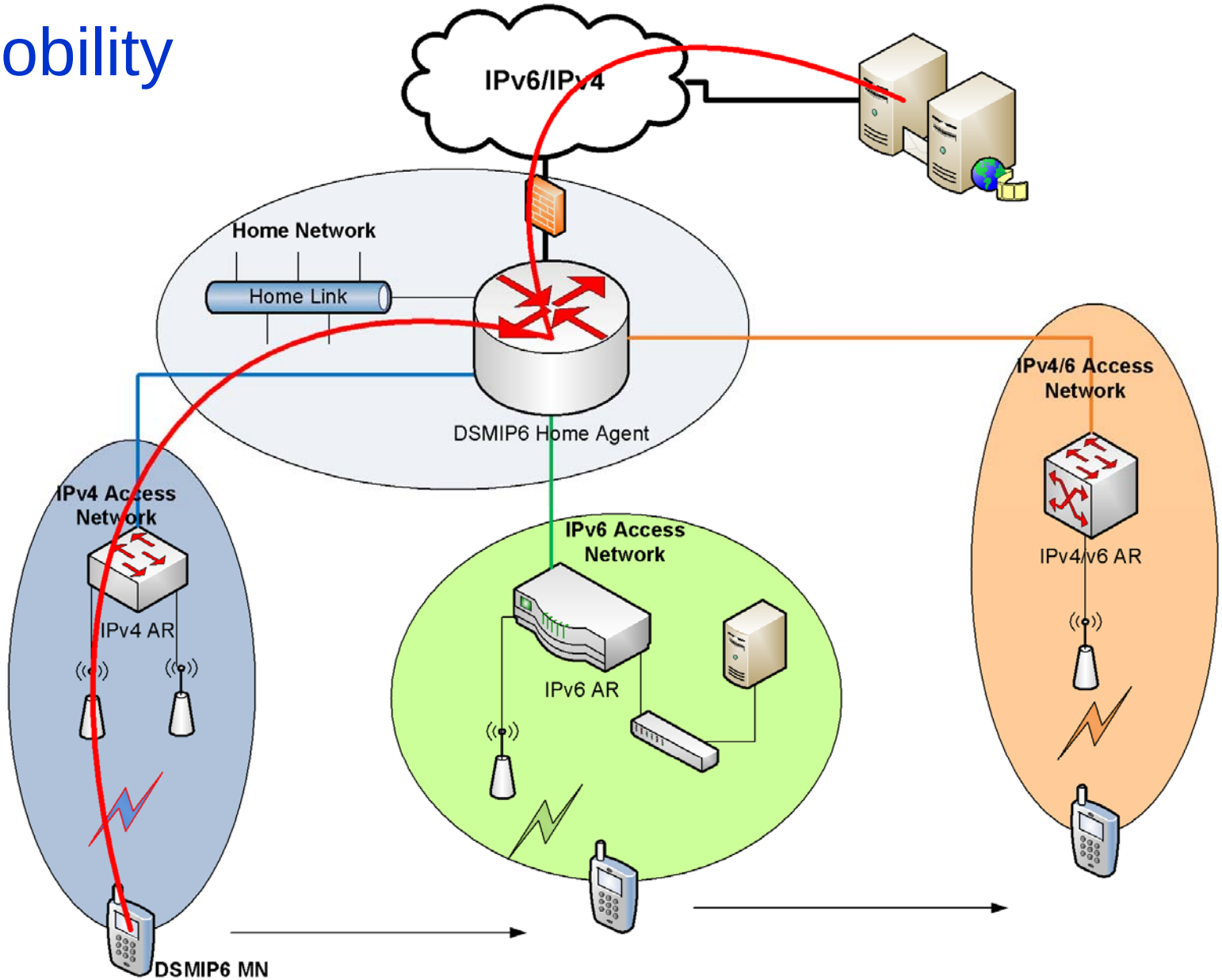
IP Mobility



Advantages of DSMIP6

- A **single IP mobility protocol on the host**, which is based on Mobile IPv6 (RFC3775), and provides mobility for IPv6 and IPv4
- Is access network agnostic
  - Does not require enhancements to access routers or additional capabilities in deployed networks
- Designed to handle NATs and firewalls on the MN-HA path
- Enables route-optimization for IPv6 addresses when attached to an IPv6 or DS access network

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Issues and concerns

- The overhead of tunnelling between the MN and HA is generally viewed as a concern by many cellular operators
  - Header compression can be used to address this issue
- DSMIP6 is a client based solution and hence requires host support
  - Concern is about availability on different platforms and interoperability
  - Note that when support isn't on host it needs to be in lower layers / core network nodes, which is potentially more expensive
- Signaling overhead in order to maintain the binding and keep-alives in the case of NATed IPv4 networks
  - Only required when the UE is attached on a non-3GPP access

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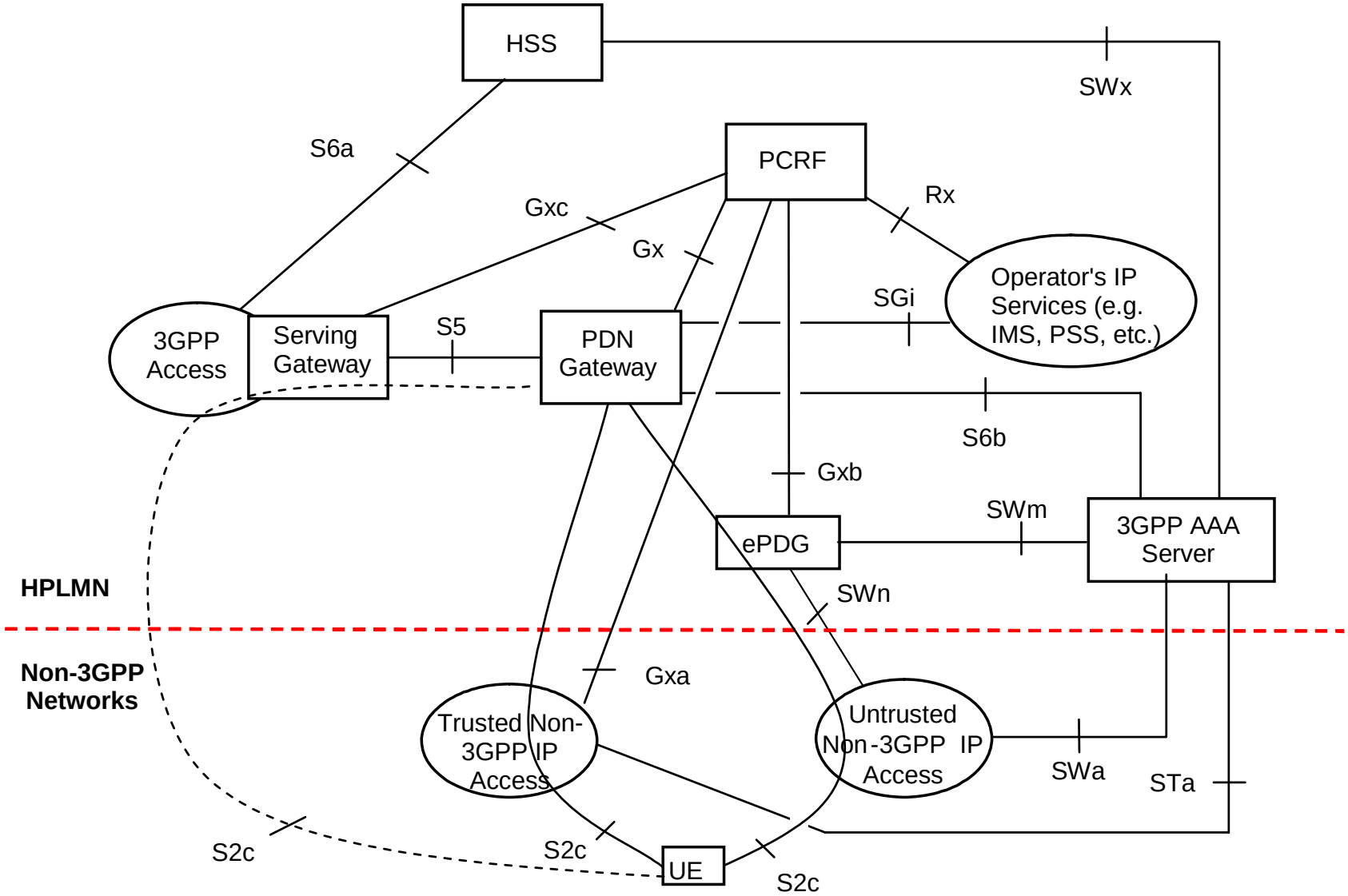
DSMIP6 in 3GPP Rel 8



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S2c interface for inter-access mobility management

- User-plane and control-plane for inter access mobility management between 3GPP accesses and non-3GPP accesses.
- The S2c reference point is implemented over:
  - trusted and untrusted non-3GPP accesses (both control plane and user plane)
  - 3GPP accesses (only control plane)
- DSMIPv6 used only over the S2c interface

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DSMIP6 as a transition solution

- DSMIPv6 provides a MN attached to an IPv6 and/or IPv4 access network with an IPv6 and/or an IPv4 HoA

- Transition scenarios considered on the following slides consider the 3GPP Rel 8 EPC as the baseline

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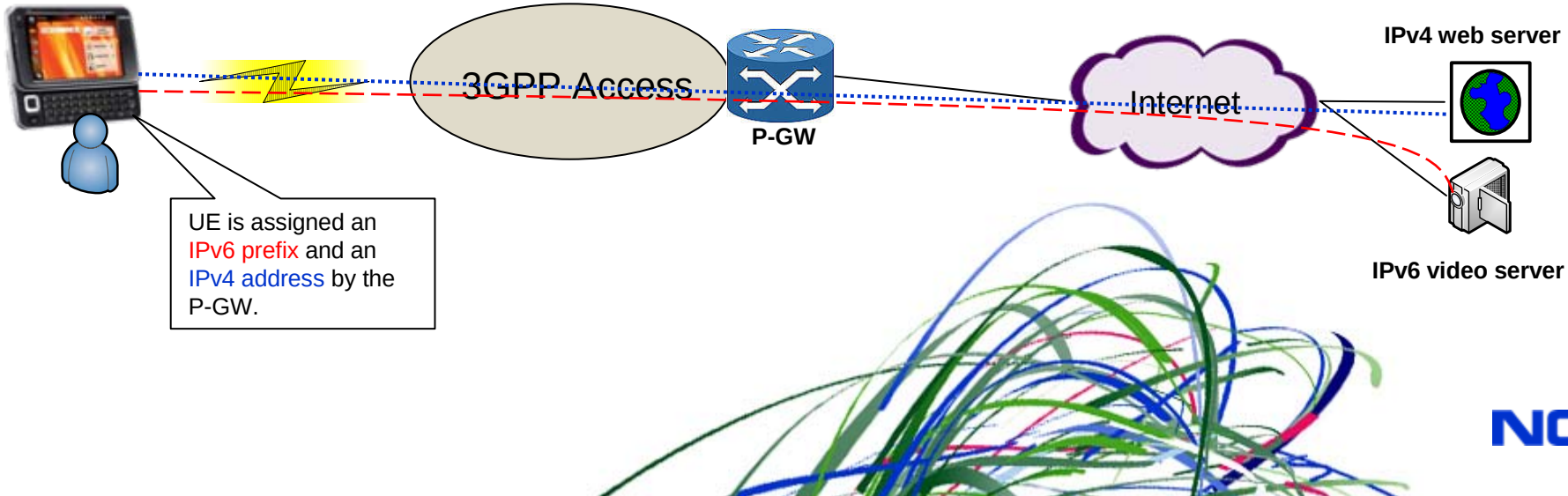
3GPP Rel-8 Evolved Packet Core (EPC)

- The 3GPP Rel-8 EPC is the packet core network for
  - New LTE radio technology
  - Legacy accesses (e.g., HSPA, WCDMA, EDGE)
  - Non-3GPP accesses (e.g., WiFi)
- UE attached to 3GPP access uses network based mobility (GTP or PMIPv6)
- A Dual-stack MN can request a dual-stack PDN bearer from the P-GW
  - The MN is assigned an IPv6 prefix as well as an IPv4 address
  - Applications can use v6 or v4 via the same PDN bearer



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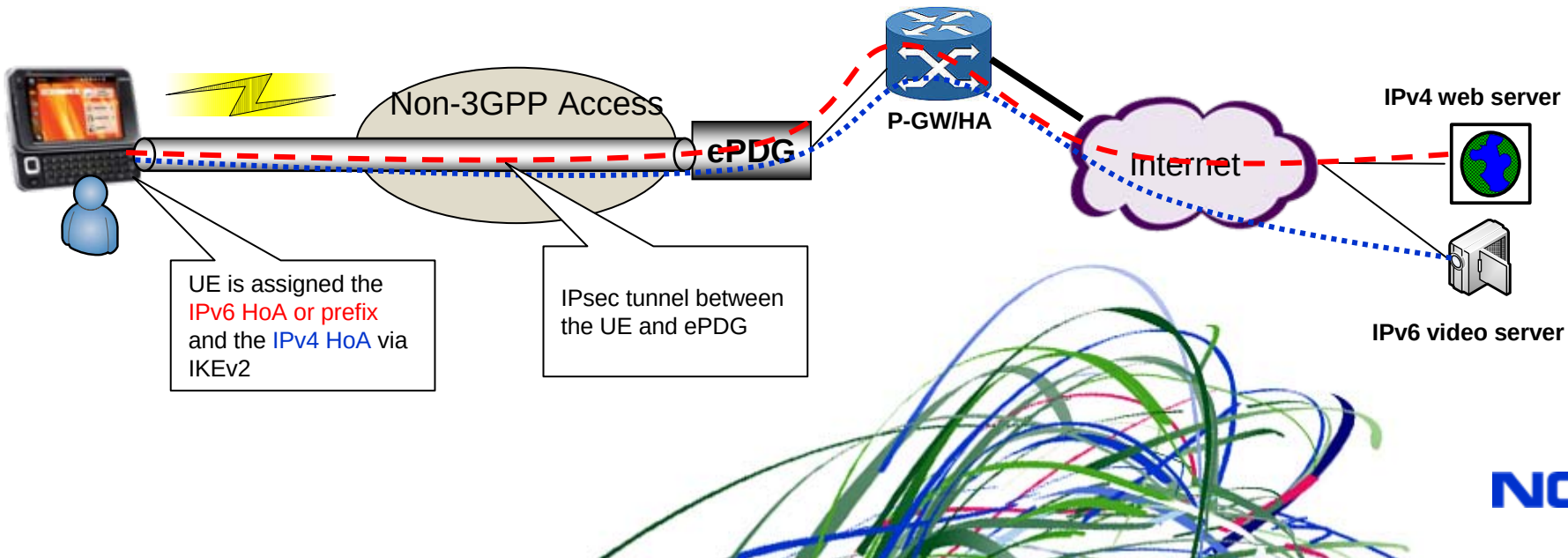
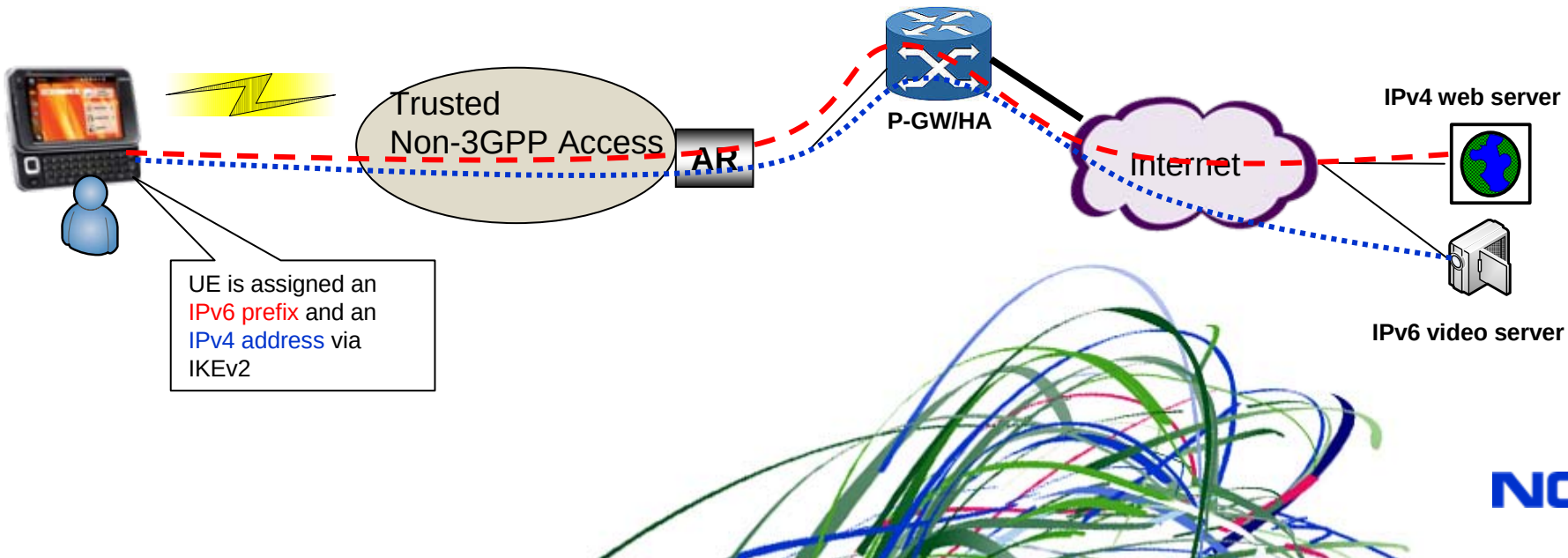
Scenario 1: MN attaching via untrusted non-3GPP access

- An access network which is not operator owned or does not have a roaming relationship for example is viewed as an untrusted access
- UE connects to the P-GW via the ePDG
  - The ePDG assigns an IPv4 and/or an IPv6 address to the UE via IKEv2
- UE uses the addresses assigned by the ePDG by the ePDG as its CoA(s)
  - The HA assigns to the UE an IPv6 HoA (or prefix) and/or IPv4 HoA via IKEv2



Scenario 2: MN attaching via a trusted non-3GPP access

- Operator owned wifi access networks or other cellular networks can be viewed as a trusted non-3GPP access
- UE connects directly to the HA/P-GW
- UE uses the addresses assigned by the access (v4 or v6) as its CoA(s)
  - The HA assigns to the UE an IPv6 HoA (or prefix) and/or IPv4 HoA via IKEv2



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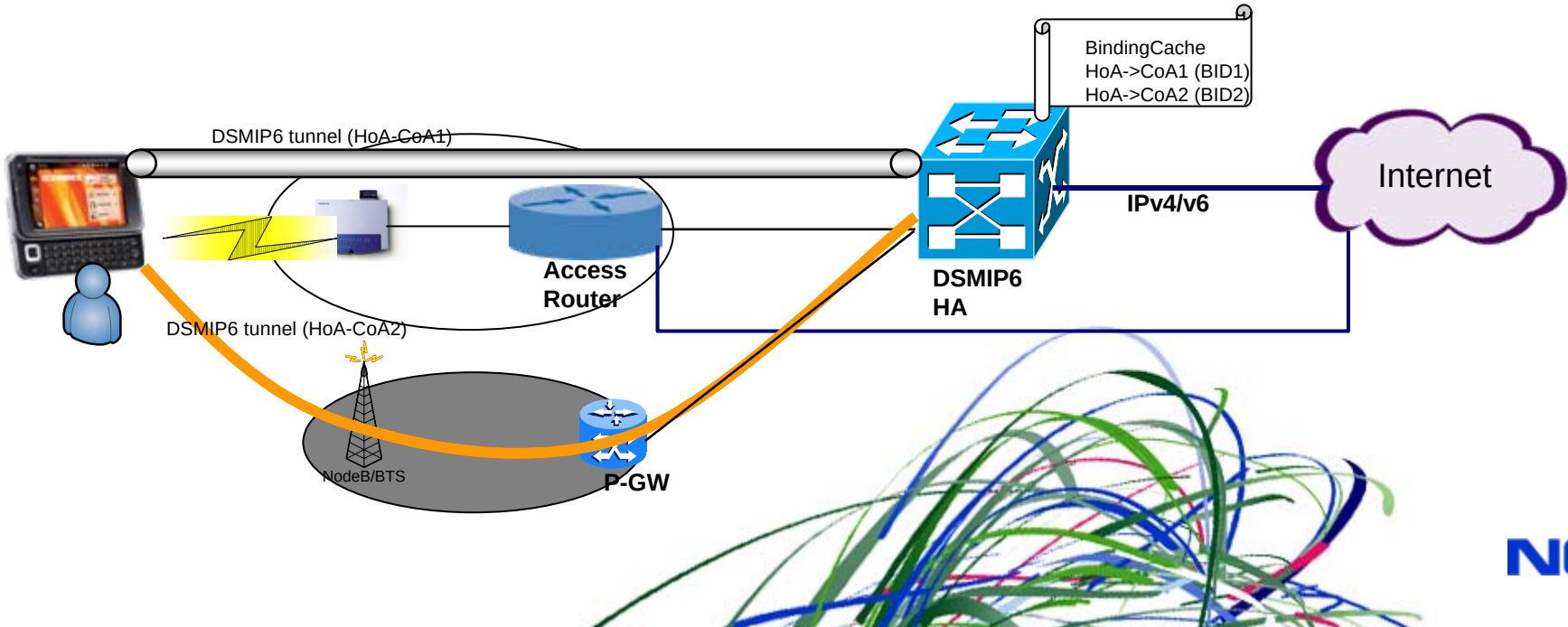
Simultaneous connectivity

- The UE can be attached via multiple accesses in some scenarios
- DSMIPv6 has been extended to support multiple CoAs via RFC 5648
- The UE can register CoAs from multiple accesses (3GPP and non-3GPP)
- A simultaneously attached MN can continue to use the IPv6 HNP/HoA and IPv4 HoA via the multiple access networks
- 3GPP IFOM WID, to be standardized in Rel-10



Conclusion

- With DSMIPv6, the MN has IPv4 and IPv6 connectivity via the P-GW
  - The P-GW includes the DSMIPv6 HA functionality
  - No support required from the access network

- S2c/DSMIPv6 standardized in 3GPP 23.402 Rel-8.

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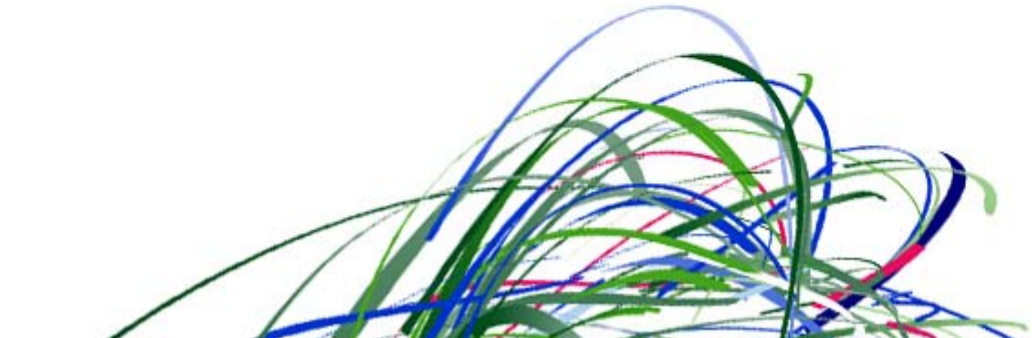

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