IPv6 Roaming Behavior Analysis

draft-chen-v6ops-ipv6-roaming-analysis-02

IETF 88- Vancouver, November 2013

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Status

- The draft -00 was presented at IETF#87
- The IPv6 design team is tasked to polish the draft in order to proceed the work

Goals

- Identify the failure cases and list known solutions without providing recommendations
- Produce a more credible and solid document in IETF to share operational experience with other operators/SDOs

Roaming Architecture

- Roaming: a subscriber moves to another PLMN where different PLMN ID (equals MNC+MCC) is used

- Intra-PLMN Mobility: a subscriber moves to different network areas within the same PLMN, where subscriber registration profiles are not stored

Home routed
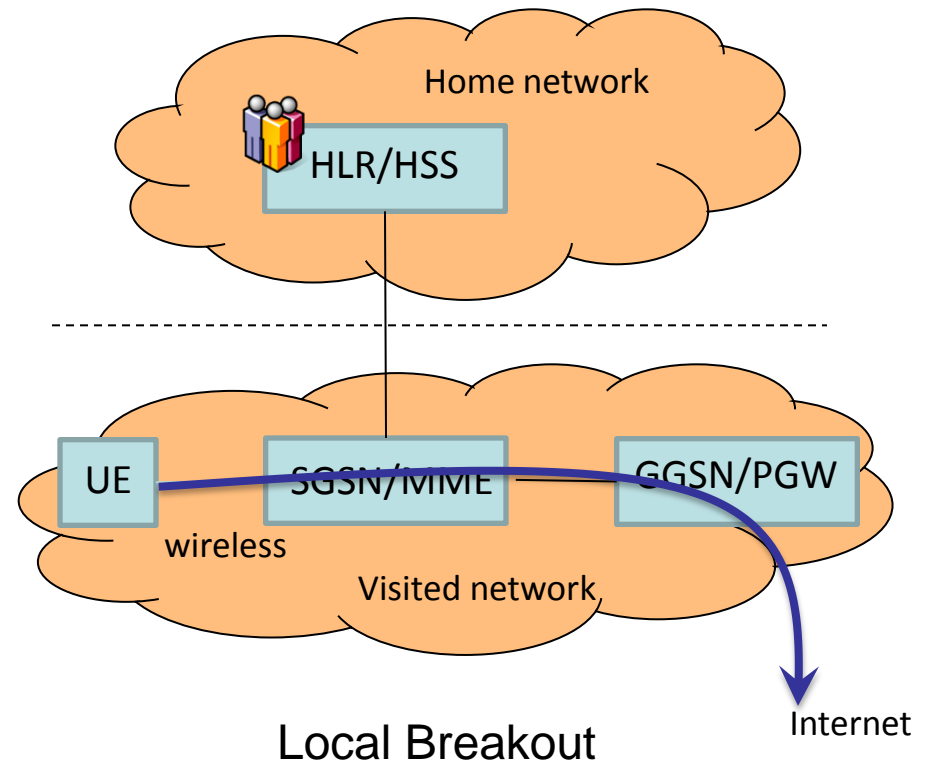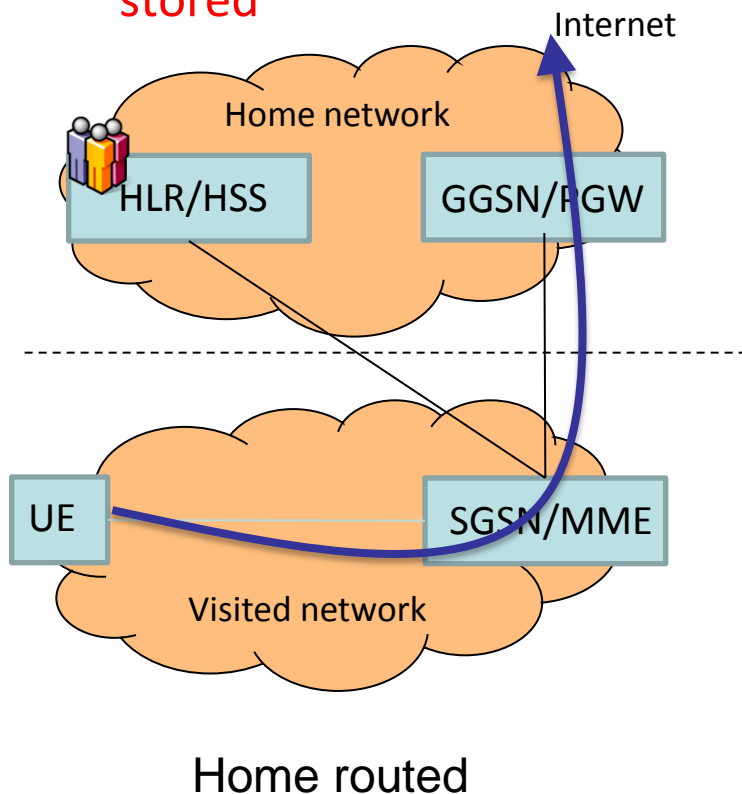
Local Breakout

Updates(1/3)

- Describe different roaming architectures

  - Home routed --- the most common case for international roaming

  - Local breakout --- the optimized architecture for 3G/4G data roaming (e.g. SIPTO, VPLMN-Dynamic-Address-Allowed, APN-OI-Replacement, ...)

    --- the GSMA recommended solution for IMS services (e.g. VoLTE,..)

Updates(2/3)

- Intend to make a concise structure to highlight potential and probable failure cases

  - Case #1: PDP/PDN Type IPv4v6 not supported
  - Case #2: Single IPv4v6 PDP/PDN request is split into two separated PDP contexts/bearers
  - Case #3: Lack of IPv6 support in applications
  - Case #4: No possible fallback for UE requests with PDP/PDN Type IPv6
  - Case #5: 464XLAT implementation differences (mostly intra-PLMN mobility)

Updates(3/3)

| Cases	Conditions	Possible solutions
Case #1	HLR/HSS contains PDP/PDN IPv4v6 in subscription profile + vSGSN is pre-R9	1. Review roaming agreement 2. HLR/HSS deliver different profiles according to vPLMN capability
Case #2	1. dual-stack mobile device roams to pre-R8 networks 2. SGSN/MME does not set the Dual Address Bearer Flag	1. Disable local breakout 2. Configure a roaming Access Point Name (APN) type for IPv4-only on mobile device
Case #3	Dual-stack mobile device roams to IPv6-only network (mostly IMS scenarios)	1. Ensure full IPv6 support in operator applications/services 2. Enable 464xlat function
Case #4	Device request PDP/PDN type IPv6 when it roams to IPv4 only network	1. Disable local breakout 2. Configure a roaming Access Point Name (APN) type for IPv4-only on mobile device
Case #5	464xlat device roams to an IPv6 only network without NAT64 deployment (mostly intra-PLMN case)	1. Disable local breakout 2. Configure a roaming Access Point Name (APN) type for IPv4-only on mobile device

Next Steps

Comments?

Adopted as a WG Item?

Backup Slides

Case #1
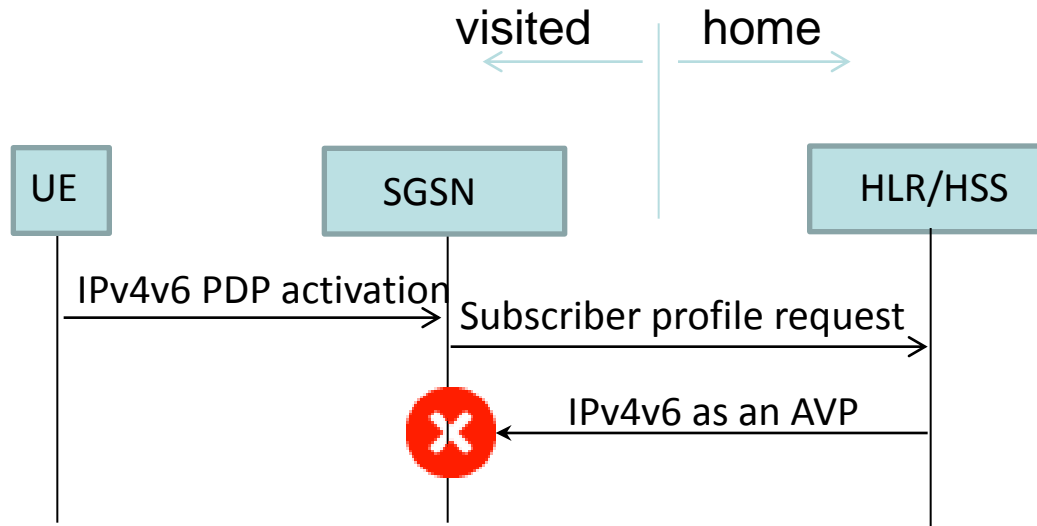
- The visited pre-R9 SGSN doesn't understand the IPv4v6 PDP attributes for dual-stack, thus it refuse the subscriber registration
- Resolving the issue may require removing the IPv4v6 PDP attributes in home HLR/HSS or limiting the PLMNs where it is sent; That may restrict UEs to only initiates IPv4 or IPv6 PDPs
- IPv4v6 PDP requires more recent 3GPP release than IPv4 PDP/IPv6 PDP. The visited SGSN can be upgraded to support the DS feature

Case #2

- From LTE or R9+ 3G to pre-R9 3G networks
  - a single IPv4v6 PDP has to be split into two separate PDPs, which increase resource consumption
  - Operators may only allow one concurrent PDP per subscriber. IPv6 bearer is likely to be lost

- Known Solutions
  - Option 1: Only IPv4 PDP is initiated during roaming
  - Option 2: Do not enable local-breakout/SIPTO

Case #3

- Dual stack UE roams to an IPv6-only networks
  - The applications that are IPv4-specific can't work
  - Known solutions
    - Option 1: Do not enable local-breakout/SIPTO
    - Option 2: Enable 464xlat or BIH in mobile terminals

Case #4

- IPv6-only UE roams to an IPv4 network
  - No 3GPP mechanism for fallback to IPv4 in that situation
- Known solutions
  - Option 1 : Do not enable local-breakout/SIPTO
  - Option 2: Configure roaming APN type to IPv4

Case #5

- 464xlat terminals may roam to a IPv6-enable network, in which DNS64 or NAT64 isn't deployed.
  - NAT64 prefix can't be discovered
  - WKP and manual configuration may cause mistake
- Known solutions
  - Option 1: Do not enable local-breakout/SIPTO
  - Option 2: Disable 464xlat within the visited network and only perform IPv4 PDP activation