P-HEVOR - Use Cases

by NGMN Alliance

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Document History

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14/12	V1.13	Patrick Marsch, NSN	Clean version, as agreed in call
3/12	V1/12	Patrick Marsch, NSN	Changes as agreed in call
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	V1.3	DK Lee	Multilink transfer
10/05/2012	V1.1	Ellsberger, Jan – Ericsson Henrik Voigt - Ericsson	Definitions, WiFi use cases and some high-level system requirements added
19/03/2012	V1.0	WAELS, Orange – FT	
16/03/2012	V0.2	WAELS	Format few transitions

1 INTRODUCTION AND SCOPE

Increasing complexity and heterogeneity of mobile networks may result in increasing operations divergence. This leads to a low level of end-to-end control of the system (policy enforcement) which finally results in low user experience (reselection, mobility, battery lifetime, automatic customer premises equipment configuration).

The result of the project on Heterogeneous Networks Evolution and Operations is the definition of use cases and related requirements for fast and appropriate operation of heterogeneous networks.

This deliverable is defining the use cases and high level requirements for WiFi interworking and interoperation with LTE networks.

2 DEFINITIONS

Operator Integrated Wifi (HetNet)

WiFi access fully integrated in the cellular operator radio access network, the cellular operator is in full control of user device RAT selection. The end-user is getting equivalent user experience as in current cellular networks.

Operator/shared WiFi

WiFi access not fully integrated in the cellular operator network. Reasons for not fully integrating the WiFi access can either be a deployment road map issue, lack of manageability or due to that a separate business set-up and roaming partner is preferred (e.g. different tariff for WiFi access).

Independent WiFi

WiFi access provided by another service provider than the cellular operator

Managed Wi-Fi (carrier grade Wi-Fi)

Cellular operator has control of the whole infrastructure, including the WiFi Access Point. SLA regulated services (= trusted partner) are assumed to be equal to the cellular operator provided services. It is also assumed that managed WiFi Access over time will become Operator Integrated.

Unmanaged Wi-Fi

(Parts of) the WiFi infrastructure is out of operator control and without SLA regulated service WiFi access can either be Operator/Shared WiFi or Independent WiFi

Real-Time Communication (RTC)

Includes all services where real-time characteristics are mandatory from the nature of media used

First line RTC (FL-RTC) communication

1st line telephony (voice) requires and provides real-time characteristics. QoS is guaranteed, addressing is E.164 based, and supplementary services offering is at least equivalent to circuit switched services offering. 1st line telephony also requires telco-grade availability. It is noted that legislation level is currently higher than for other RTC.

Real-time video communication

Defined by GSMA in IR.94, primarily defined to run over a 3GPP secured QoS bearer, but can also be distributed over other accesses

Best Effort RTC (BE-RTC) delivery of voice and video communication

Service delivery without guaranteed QoS. BE voice has currently lower legislation level than 1st line telephony.

User might expect media delivered with real-time characteristics, but may not be met in service delivery.

Bundled operator data service – data usage included in service fee, mainly in home network. E.g. Video offering.

3 OPERATOR WIFI DEPLOYMENT SCENARIOS

We distinguish different levels of integration in the operator network:

- Independent
- Operator managed/shared
- Fully integrated

We also distinguish between different types of deployment:

- Uncoordinated hotspot
- Operator coordinated hotspot

Different types of connectivity (to internet) may be distinguished according the role of the EPC in the connectivity

- break out to internet/intranet ("Non Seamless WLAN Offload")
- Connected to EPC + break out to internet/intranet ("Non Seamless WLAN Offload")
- Connected to EPC only

4 USE CASES

Use cases are defined from the end-user perspective, the operator perspective and operations and management perspective. The use cases identify drivers for WiFi usage, and are used to derive system requirements (documented in D3). Different mobility scenarios are not considered as use cases themselves, but rather a consequence of the service usage requirements and will therefore be included in D3.

4.1 End-user use cases

4.1.1 Cost savings while roaming or in home network

Data offload to Wi-Fi when still in good macro coverage. FL-RTC communication remains on macro.

Note: in this use case where user is in control session continuity is not mandatory.

High level system requirements:

- There shall be a high level of end-user access network visibility and control. (e.g. the end-user can see all the service providers available and select which one to access, but the user should also be able to switch to an automated mode). With current UE policies, Independent WiFi access points are expected as default choice before Operator Integrated WiFi access points.
- RTC:
  - FL-RTC roaming not required.
  - BE-RTC in WiFi required.
- Best effort data
  - Session continuity is desirable, implemented in a way to ensure end user maintained cost control
- Operator bundled services, in home network
  - Service continuity required

4.1.2 Coverage extension

WiFi instead of macro cellular network for data and voice when in poor/no coverage.

High level system requirements:

- For operator integrated WiFi:
  - Full data access with session continuity.
  - FL-RTC over Wi-Fi capabilities. VCC capability (in UE and Home network) and Full QoE over WLAN are required
- For operator/shared WiFi:
  - Full data access
  - FL-RTC with VCC and full QoE.
  - QoE and tariffs will determine expected service seamlessness
- For un-managed WiFi
  - Nomadicity, but user-cost controlled/limited seamlessness
  - BE-RTC.

4.1.3 Capacity (including reaching higher throughput)

WiFi is used to complement cellular network for increasing capacity. End user wants optimal capacity/throughput.

High level system requirements, The same requirements as for coverage extension with the following differences:

- FL-RTC roaming is not required (enough capacity in macro network assumed)
- Integrated network: Operator expected to choose access to reach optimal capacity/throughput
- For shared and unmanaged WiFi : Capacity/throughput information is expected

4.2 Operator use cases

4.2.1 Wifi offload to increase capacity/throughput/coverage

- Integrated and shared WiFi: Optimal QoE and network utilization
- Independent WiFi:
  - Cost savings by offloading best effort

High level system requirements:

- Operator Discovery support to help end-users off-load also to independent and shared WiFi. (e.g. means for the operator to provide discovery information as location, name, etc for shared Wi-Fi networks)
- Dynamic and cperator controlled per service access technology selection, e.g. to steer operator service as FL-RTC Video Call or bundled data services towards independent/shared WiFi instead of the cellular network.
- Static policies (in addition to and aligned with dynamic operator-controlled access technology selection), i.e. certain applications or users always redirected to WiFi, if it is clear that this will not lead to reduced QoE.

Specific high level system requirements for operator integrated WiFi,:

- Discovery function, as described in high level system requirements above, provided by the Operator to support the detection of available Operator's deployed Wi-Fi accesses
- Operator policy transmission to the UE to control the parameters to determining the switch over conditions between the access technologies.
- SIM-based authentication shall be performed in order to link user's traffic to the subscribed profile
- IP address preservation moving from/to Wi-Fi accesses shall be guaranteed –

4.2.2 Multilink transfer over LTE and WiFi to improve network speed/capacity/reliability

Multilink data transfer over LTE and WiFi instead of single link transfer improves network speed, capacity and reliability (or fault-tolerance.)

When a user downloads big data such as high-resolution video streaming the Multilink data transfer over LTE and Wifi feature takes care that associated IP flows may be sent over LTE and WiFi concurrently. The user benefits from increased network speed (*i.e.,* aggregated throughput of LTE and WiFi) and reliability; LTE complements shortcomings of WiFi such as limited coverage and unmanaged QoS.

- Integrated and shared WiFi
    - Optimal QoE is guaranteed.
    - Operator also can maximize the multi-network utilization.
- Independent WiFi:
    - Cost savings by WiFi offloading
    - Operator bundled services (e.g., VoLTE) will not be provided with independent WiFi where the operator cannot control QoE.

High level system requirements:

- Traffic multiplexing and de-multiplexing are performed by operator gateway(s) and client software, respectively.
- Operator gateway provides dynamic traffic striping policy based on the wireless environment; For example, the policy divide the traffic equally if the LTE and WiFi performs similar. When the WiFi connection is unstable, send out traffic to LTE only.
- The client software provides packet reordering mechanism., whether the operator Gateway ensures also packet re-ordering in FFS.

The “Multilink data transfer over LTE and WiFi” feature is an advanced system improvement that is not foreseen for short term standardization and deployment. Before this feature can be deployed it is first needed to make sure that

- the operator has all the tools (ANDSF) to properly steer 3gpp UE on relevant AP / SSID
    - including when there is congestion over WLAN and/or 3GPP coverage
- the relationship of the feature with IP address preservation at 3gpp <---> WLAN mobility and with Policy Control are clarified
    - if different addresses are used over WLAN, over 3GPP and at application level, how these addresses are mapped is to be solved.

4.3 Operations and Maintenance related use cases

- Coordinated WiFi hotspot and small cell deployment
- Policy coordination among access technologies

5 APPENDIX