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Y. Zhang, Ed.
X. Zhang, Ed.
China Unicom

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Application assistance based mobile network user-plane evolution draft-zhang-app-assistance-upe-00

Abstract

This document analyzes the problems and necessity for evolution of user-plane in mobile networks. In addition, the use cases and requirements are discussed.

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This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

Driven by emerging applications such as autonomous driving and immersive communications, 6G system is moving toward full-scene intelligence with ultra-low latency, high reliability, and differentiated demand assurance. However, the mobile core network and IP bearer network were developed independently. There are information gaps in the forwarding of tunnels such as N3, N9, and N19 between the base station and user plane, as well as between user plane functions. Specifically, the mobile user plane lacks awareness of the IP bearer network status, while the IP bearer network does not perceive the differentiated service requirements of the mobile network. This leads to some uncertainties in tunnel forwarding across IP bearer network (e.g., N3/N9/N19), which poses a key challenge to achieving fine-grained and differentiated service quality assurance in 6G.

Therefore, as a critical network function bridging the mobile network and IP bearer network, the future 6G user plane should support cross-domain coordination with end-to-end application awareness and service assurance capabilities. It is recommended that the design of the 6G user plane should considers information interaction with the IP bearer network based on application assistance, especially to establish the interaction of wireless bearer between AN-UPFs and the interaction of N9/N19 wide-area networks between user-plane nodes.

2. Conventions and Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here. Abbreviations and definitions used in this document:

*IFIT: In-situ Flow Information Telemetry. 6G: The Sixth Generation Mobile Communication System QCI: QoS Class Identifier DSCP: Differentiated Services Code Point QoS: Quality of Service

3. Use Cases

3.1. High-value users guarantee

High-value mobile subscribers, such as VIP users of ICP (Internet Content Providers), require enhanced quality assurance when initiating specific services. However, these users can currently only be identified by the mobile core network. The path selection for traffic forwarding over N3/N9/N19 interfaces relies primarily on coarse-grained mappings between QCI and DSCP. The IP bearer network lacks real-time awareness of session-level information from the core network (e.g., QoS Flow Identifier, data flow priority), and can only allocate resources based on a fixed policy, with a high cross-domain path adjustment latency.

3.2. Security traceability

When network equipments or data center are maliciously attacked, a large volume of messages are generated and propagated within the network. These messages take up substantial bandwidth resources during forwarding, interfering with or even blocking legitimate service flows, and severely degrading network performance and user experience. Therefore, the coordinated security traceability across the mobile network and IP bearer network is required. By interaction between mobile network and IP bearer network, it can locate the real initiator of abnormal traffic and block the traffic into the network port in time to protect users and network security.

4. Requirement

The 6G user-plane protocol stack needs to be optimized and reconfigured to support path programmability, bidirectional delivery of mobile and IP bearer network information, resulting in cross-domain collaboration capabilities for end-to-end intelligent sensing and intent delivery development.

4.1. User plane path programmability

For IP packets outside the GTP-U tunnel, 6G UP supports modifying the IP packet header information and inserting the information to encapsulate the IP packet and pass it to the WAN, which can execute the relevant policies based on the IP packet header information.

4.2. Cross-Layer Interworking Capability

The 6G user plane is able to bring information such as application demand and application status into the IP bearer network based forwarding path. Through the interaction of mobile network and IP bearer network, it forms the cross-layer collaboration capability of end-to-end service awareness and information delivery..

5. Work flow

TBD

6. Security Considerations

TBD

7. IANA Considerations

TBD

8. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

Authors' Addresses

Yaomin Zhang (editor)
China Unicom
Beijing
China
Email: zhangym2533@chinaunicom.cn

Xuebei Zhang (editor)
China Unicom
Beijing
China
Email: zhangxb170@chinaunicom.cn