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A SIP-SHIM6-Based Solution Providing Interdomain Service Continuity in IMS-Based Networks

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Introduction

- Wireless networks are largely deployed, and the number of smart phones has boomed.
- This has resulted in the emergence of multihoming
  - access to services anywhere at any time from any network, as predicated by the always best connected (ABC) concept,
  - consider using different access networks simultaneously through several interfaces
- It allows a user more flexibility and more services even when s/he is moving, such as ubiquitous access, resiliency, reliability, and bandwidth aggregation.

Cont.

- A solution for interdomain mobility management with end-to-end service continuity of communication. We combine
  - A Multihoming protocol (SHIM6), which ensures a seamless network change
  - IMS architecture, which allows the establishment of multimedia sessions with quality of service.
- Enables a mobile terminal to change its access network seamlessly, without any application disruption.
  - Implement a Proxy-SIP inside the terminal to manage the signaling procedures.

Site Multihoming by IPv6 Intermediation (SHIM6)

- Provides site multihoming management for IPv6 in a host centric view.
- SHIM6 introduces a sublayer in the layer 3 of a terminal, which splits the double function of an IP address as locator and identifier.
  - The first IP address a terminal uses to communicate is its identifier, called the upper layer identifier (ULID). The identifier or ULID of a SHIM6 terminal remains unchanged for upper layers, even if the active IP address changes.
  - The locators correspond to the remaining set of IPv6 addresses that are associated with the terminal.
- The mapping between ULID and locators is performed in the SHIM6 sublayer.

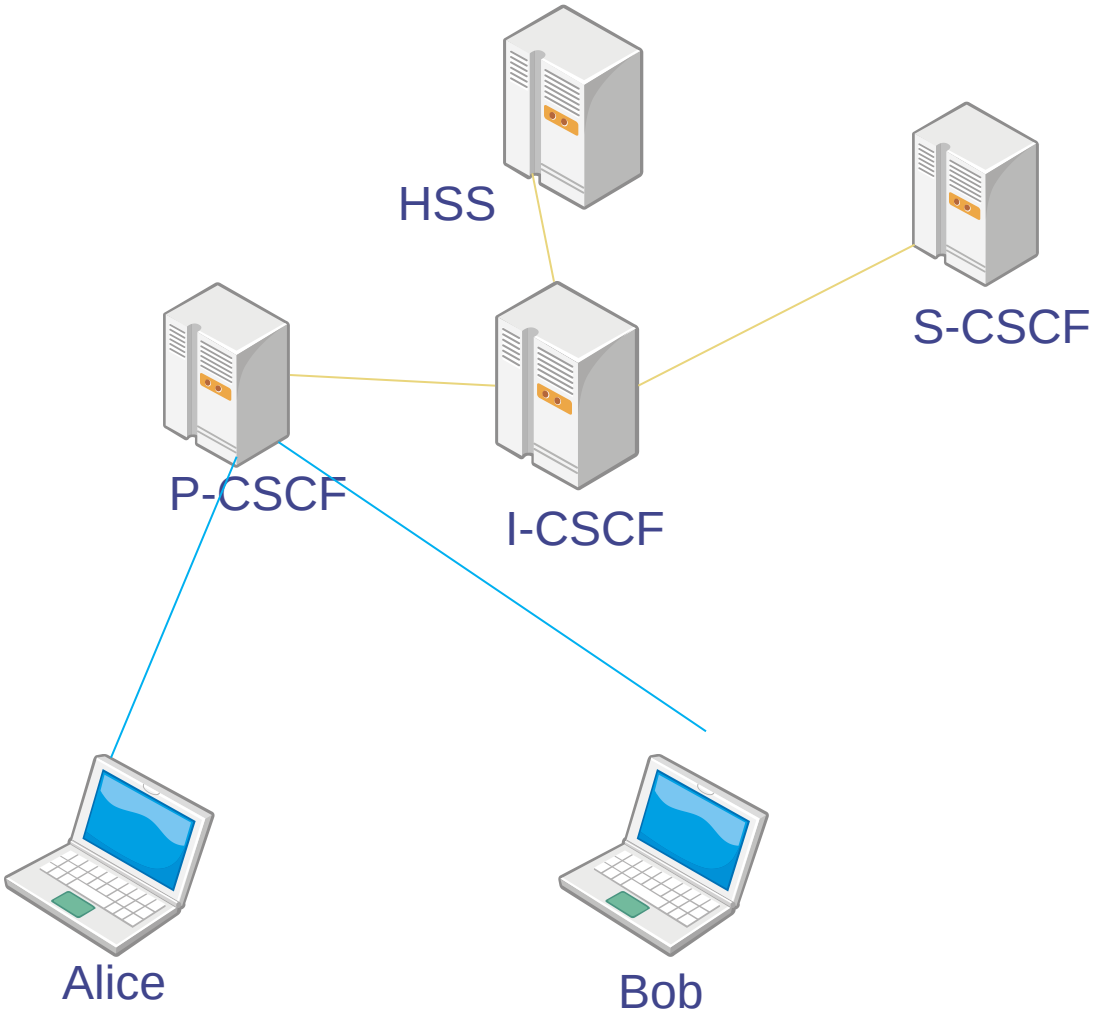
Cont.

- SHIM6 first initiates a context establishment exchange between these terminals to exchange their available sets of IP addresses. At this step, it also establishes a security association to identify these hosts safely.
- Reachability Protocol (REAP)
  - Detection : Detects disconnections in the current path by sending periodic keep alive messages
  - Locator pair exploration : represents the shortest path available between communicating hosts from the list of locators exchanged at the context establishment.

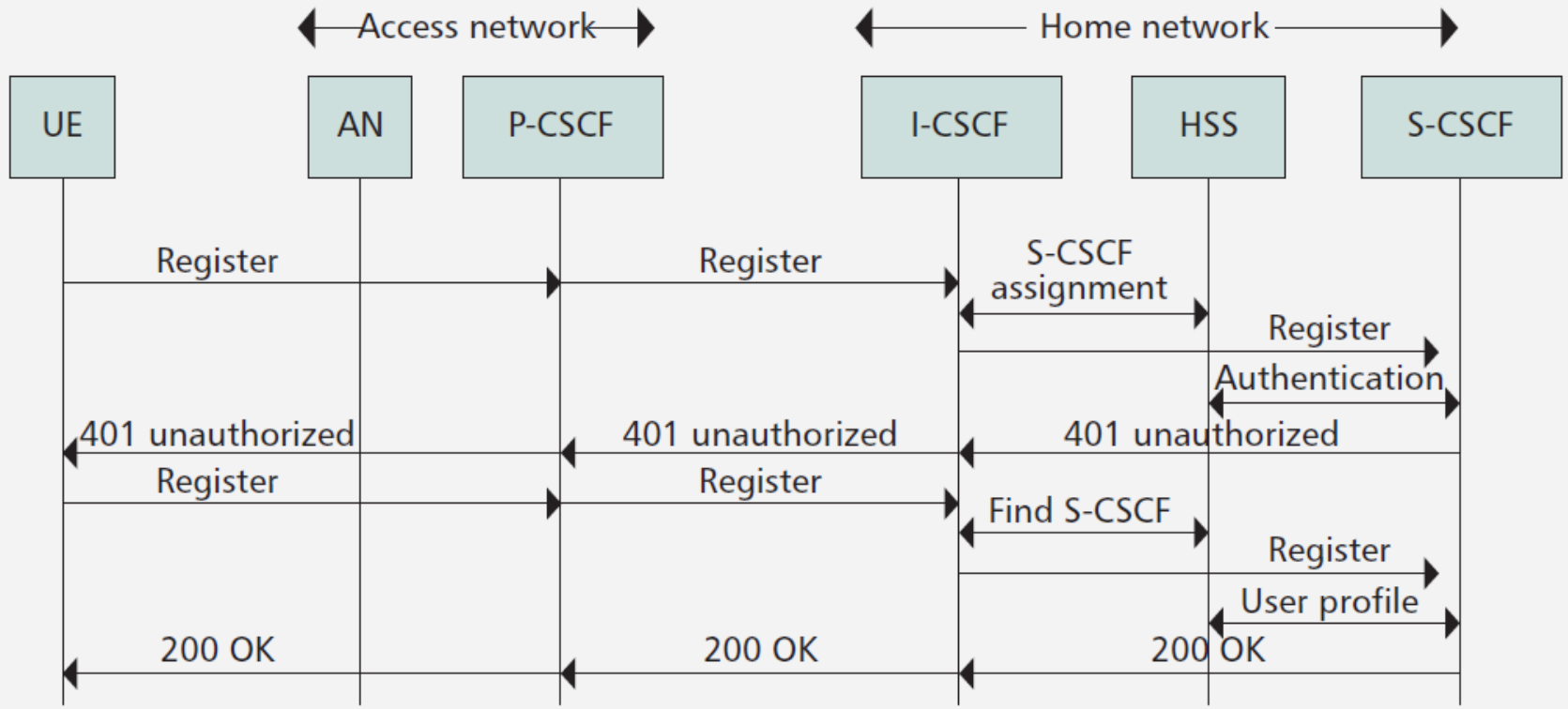
IP Multimedia Subsystem(IMS) Overview

- A framework designed and standardized by the 3GPP
- Offers an all-IP based network, and can support real-time application sessions and non-real time ones.
- Proxy-call state control function (PCSCF)
  - All messages transmitted by or to the terminal pass through the P-CSCF.
- Interrogating-CSCF (I-CSCF)
  - which is an interdomain gateway
- Serving-CSCF (S-CSCF)
  - which maintains the sessions
- Home Subscriber Server
  - the database where a user's data and the services to which they have subscribed are stored

Cont.

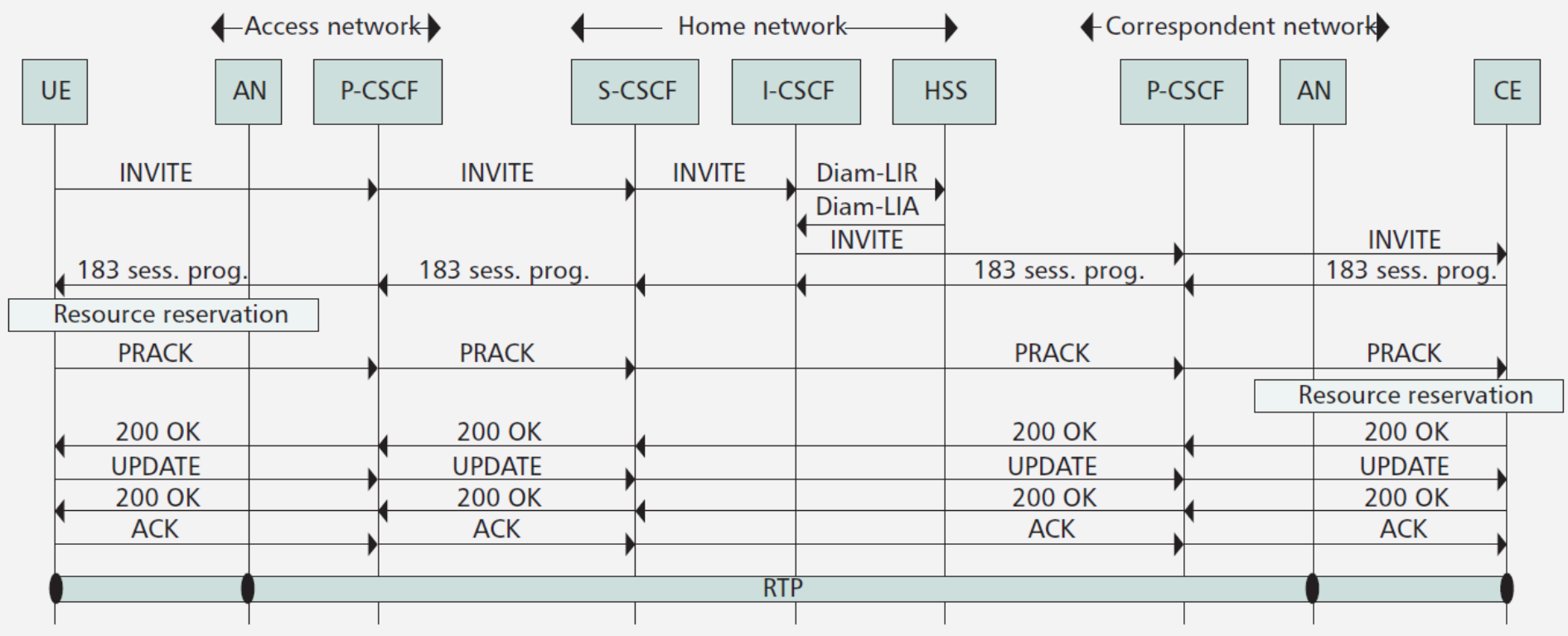


Registration Procedure



(a)

Session Initiation Procedure



SHIM6 and IMS integration for seamless service continuity

- SHIM6 protocol
  - Manages interface switching in a seamless and secure way
- IMS architecture
  - Supports real-time session negotiation and management, guaranteeing an end-to-end quality of service level to the ongoing sessions.
- With such a combination and the fact that SHIM6 makes the interface change transparent, the implementation of a proxy is needed to handle the session renegotiation procedure.
- With the SHIM6 protocol offering an end-to-end solution, we choose to implement the P-SIP inside the terminal because, from our point of view, it is important to keep this feature.

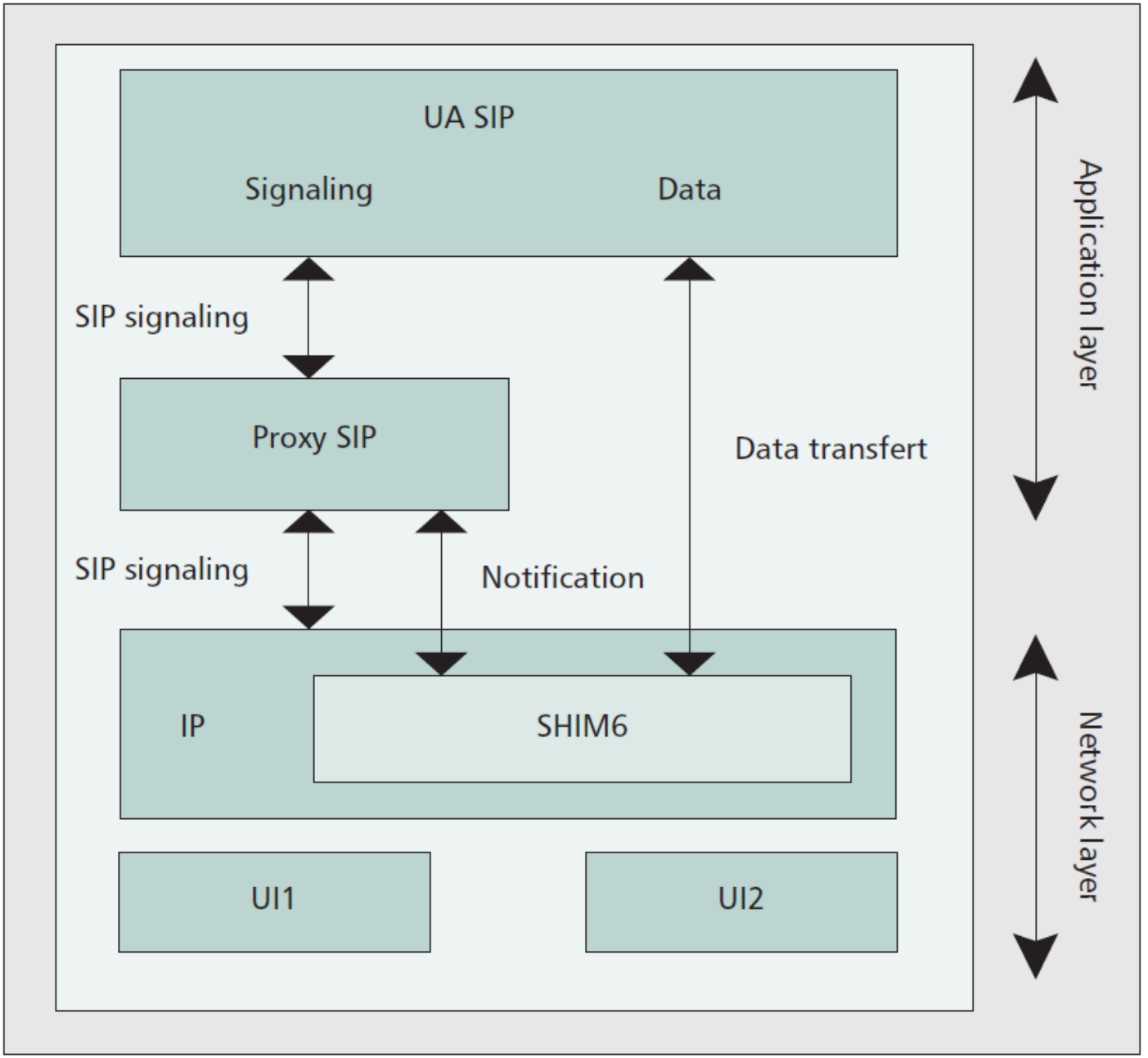


Figure 2. *SHIM6/Proxy-SIP integration architecture.*

Interdomain IMS Session Management

- Session management considering that the access networks belong to independent IMSs
- terminal has a subscription with independent operators for each access network
- Reactive mode and Proactive modes.

Reactive Handoff Mode

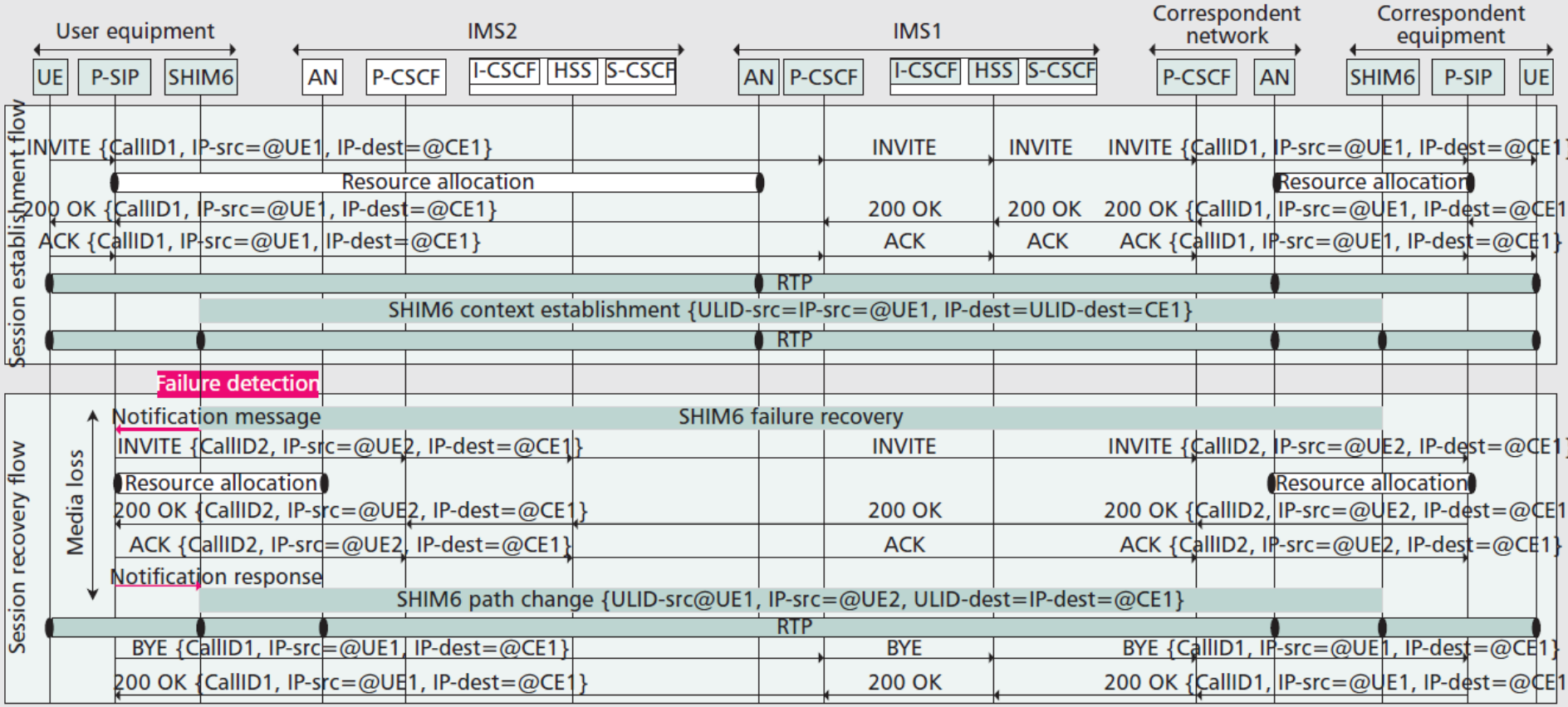
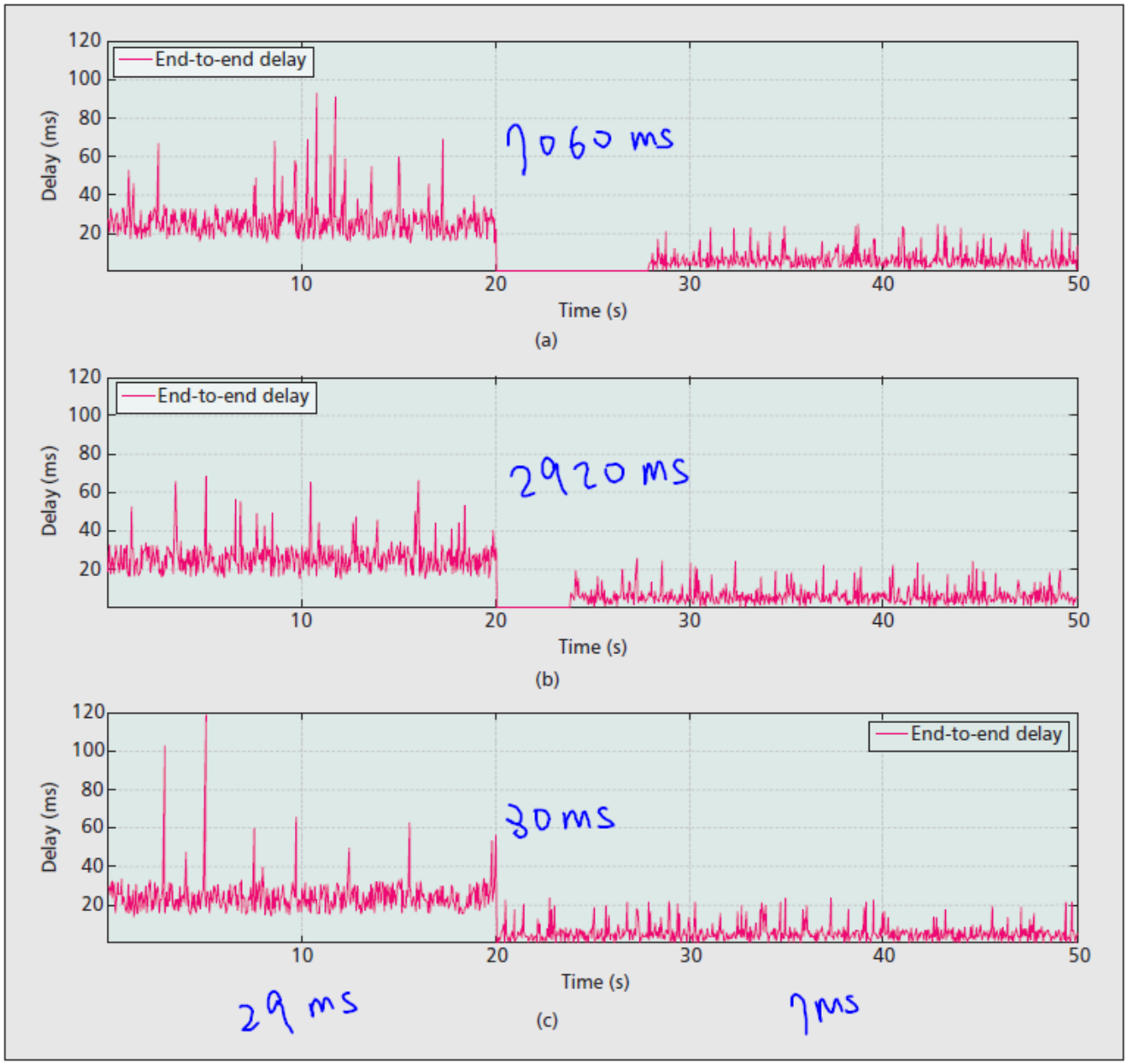


Figure 3. *Session establishment and session recovery flows in a reactive handoff mode with two independent IMSs*

Proactive Handoff Mode

- In this mode, a decision function has been added to anticipate the interface switching.
- The resource allocation and establishment of the new session are realized while the terminal is still using its old network.
- The P-SIP has enough time to initiate the session establishment according to the new location.
- Once the new session is established, a notification response is sent back to SHIM6. At this point, SHIM6 enables the use of the new locators, so the traffic is redirected to the new location, IMS2.
- In the proactive mode, the media loss is reduced to the duration of the SHIM6 path change.

End-to-End Delay Performance



Handoff result analysis

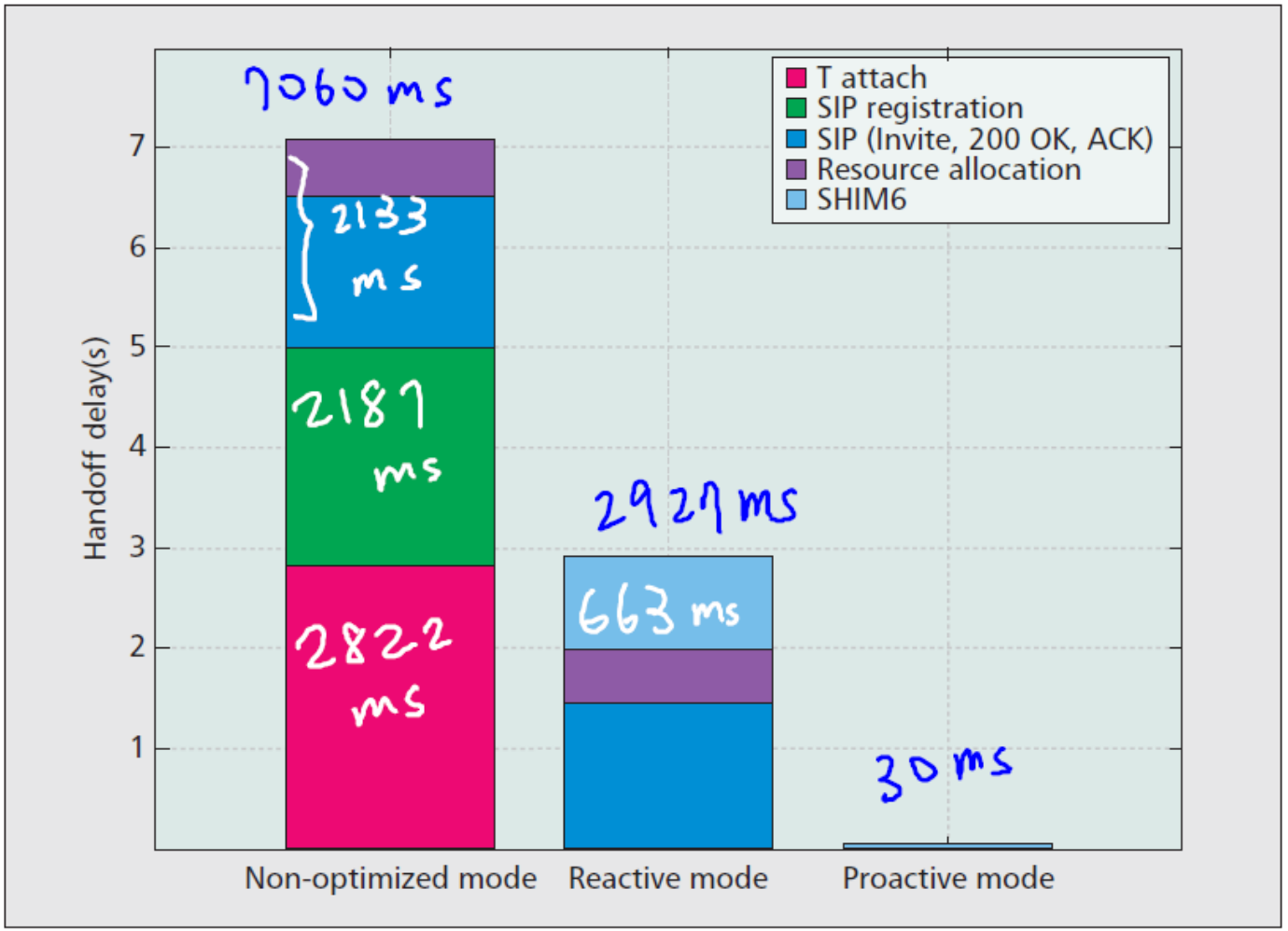


Figure 5. *Handoff result analysis for non-optimized, reactive and proactive handoff modes.*

Impact of the SHIM6/P-SIP Combination on the Performances

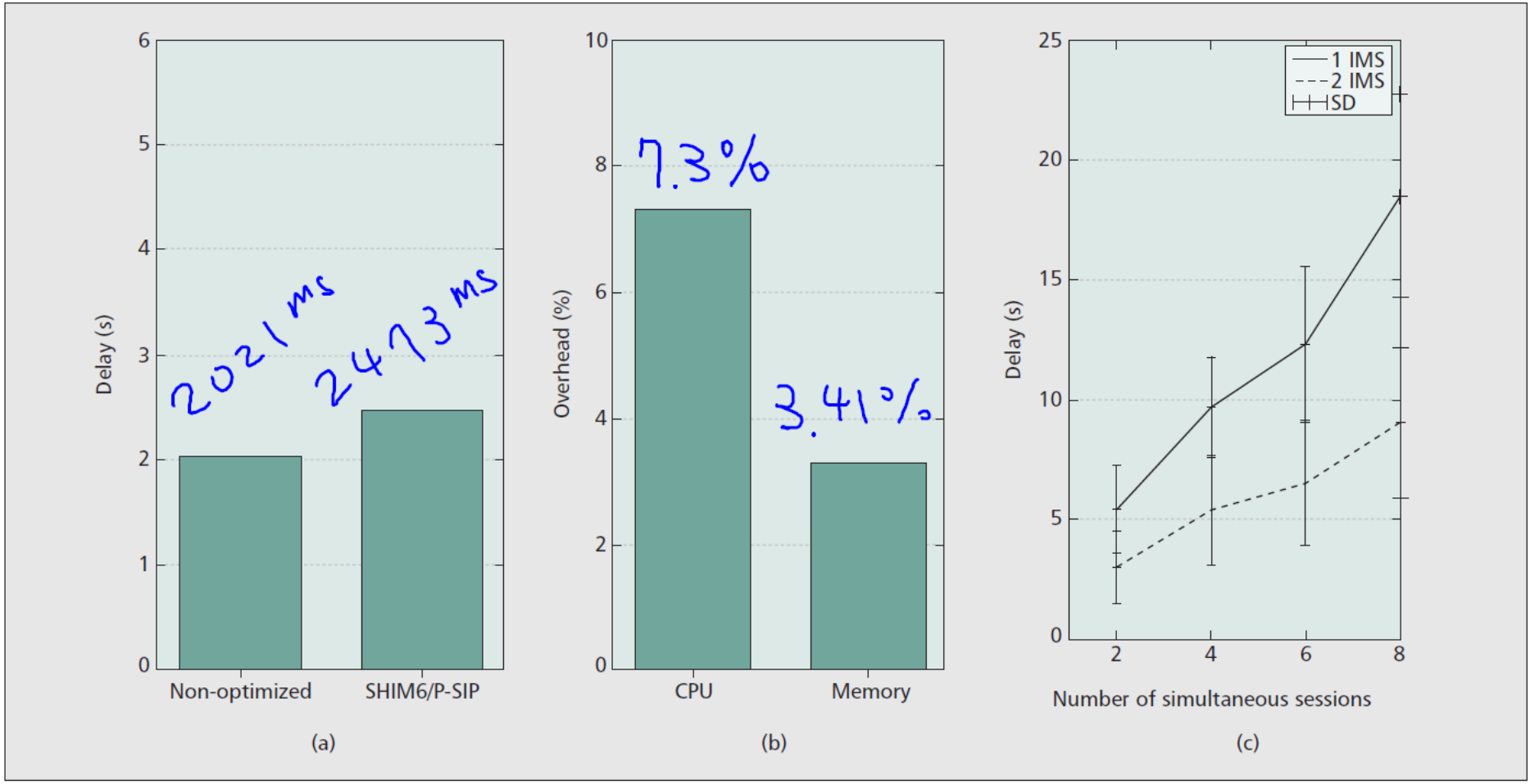


Figure 6. *Impact of the SHIM6/P-SIP combination on the terminal performances: a) session establishment delay; b) resource consumption overhead; c) the handover delay function of the number of simultaneous sessions.*

CONCLUSION

- An interdomain mobility management scheme for multihomed mobile terminals with QoS guarantee.
- This solution is implemented in the terminal and does not involve any change in the network components.
- Demonstrate its effectiveness to reduce significantly the handover delay, especially in a proactive mode.
- It would be interesting to investigate more sophisticated criteria such as user preferences or application needs and study their impact on the protocol performance.