Forschungszentrum Telekommunikation Wien

IP Multimedia Subsystem

Johannes Stadler

Agenda:

- **Identification in IMS**
- ISIM
- Application Server
  - User Profile
  - Filter Criteria

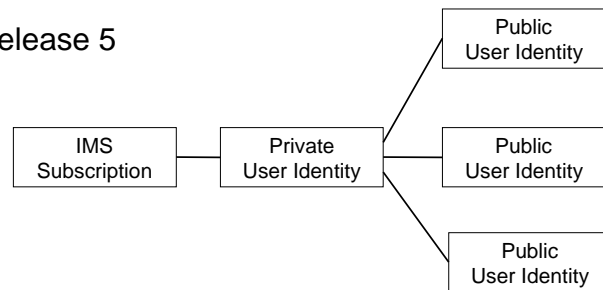## Identification in the IMS (1)

- Users have to be identified uniquely
- In IMS we distinguish public and private user identities
- Public User Identities
  - IMS user has one or more Public User Identity
  - Either a SIP URI or a TEL URI
    sip:+43-8323546@mobilkom.at;user=phone
    tel:+43-664-8323546
  - TEL URIs are required to make calls between IMS/PSTN
  - Endvision: at least one TEL URI and one SIP URI per user

Identification in the IMS (2)

- Private User Identities
  - IMS user has one Private User Identity
  - Have the format of a Network Access Identifier (NAI, RFC 2486)
    - stadler@mobilkom.at
  - Not used for routing SIP messages
  - Used only for subscription identification and authentication
  - Similar function for IMS as the IMSI (International Mobile Subscriber Identification) for GSM
  - Stored at the Subscriber Identity Module (SIM) card

Relationship Public- Private User Identification (1)

Release 5

```
┌──────────────┐     ┌──────────────┐          ┌──────────────┐
│     IMS      │─────│   Private    │──────────│    Public    │
│ Subscription │     │ User Identity│          │ User Identity│
└──────────────┘     └──────────────┘          └──────────────┘
                            │                   ┌──────────────┐
                            ├───────────────────│    Public    │
                            │                   │ User Identity│
                            │                   └──────────────┘
                            │                   ┌──────────────┐
                            └───────────────────│    Public    │
                                                │ User Identity│
                                                └──────────────┘
```
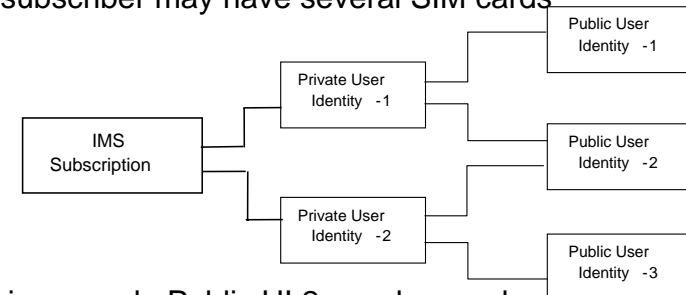
TS 23.228 V6.6.0

Relationship Public- Private User Identification (2)

Release 6
One SIM card includes only one private user identity
But subscriber may have several SIM cards

```
┌──────────────┐     ┌──────────────┐          ┌──────────────┐
│     IMS      │─────│ Private User │──────────│  Public User │
│ Subscription │     │  Identity -1 │          │  Identity -1 │
└──────────────┘     └──────────────┘          └──────────────┘
                            │                   ┌──────────────┐
                            │                   │  Public User │
                            │                   │  Identity -2 │
                            │                   └──────────────┘
                     ┌──────────────┐           ┌──────────────┐
                     │ Private User │───────────│  Public User │
                     │  Identity -2 │           │  Identity -3 │
                     └──────────────┘           └──────────────┘
```

In this example Public UI 2 may be used
from two different terminals simultaneously   TS 23.228 V6.6.0

Agenda:

- Identification in IMS
- **ISIM**
- Application Server
 - User Profile
  - Filter Criteria

SIM, USIM and ISIM in 3GPP

- UMTS terminals include a Universal Integrated Circuit Card (UICC)
- Stores subscription information, authentication keys, phonebook and messages
- Without UICC the user can make only emergency calls
- Contains several logical applications such as
  - Subscriber Identity Module (SIM),
  - Universal Subscriber Identity Module (USIM) and
  - IP Multimedia Service Identity Module (ISIM)

ISIM (1)

- Application on the UICC
- Standardized in TS 31.103
- Contains the IMS parameters for
  - User authentication
  - User identification
  - Terminal configuration
- ISIM can coexist with SIM, USIM or both of them

ISIM (2)

ISIM
- Private User Identity
- 1 to n — Public User Identity
- Home Network Domain URI
- Long Term Secret
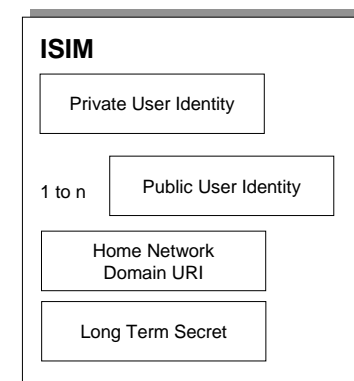
ISIM (3)

- Private User Identity
  - Only one private user identity
- Public User Identity
  - One or more SIP URIS allocated to the user
- Home Network Domain URI
  - SIP URI that contains the home network domain name
  - Used to find the address of the home network during registration procedure
  - Only one home network domain
- Long term secret
  - Used for authentication and for calculating CK and IK
  - IMS terminal uses IK to protect SIP messages to/from P-CSCF
  - IMS terminal uses CK to encrypt SIP messages to/from P-CSCF

Registration with USIM

- Maybe terminal is equipped with UICC without ISIM
  - E.g. acquired before IMS service came into operation
- User is nevertheless able to use IMS
- Problems
  - No Private User Identity, Public User Identity and Home Network Domain
- Terminal has USIM containing IMSI (15 decimal digits)
  - Identity of subscriber (including country and operator)
  - 3 digits Mobile Country Code (MCC)
  - 2 or 3 digits Mobile Network Code (MNC)
  - Remainder Mobile Subscriber Identification Number (MSIN)
- Solution: build the 3 missing parameters out of IMSI

Temporary Private User Identity

- Private User Identity: username@realm
- Username
  - Complete IMSI as username
- Realm:
  - First subrealm is the MNC
  - Second subrealm is the MCC
  - Remainder: fixed string: ".imsi.3gppnetwork.org"
- Example: IMSI: 2483235551235
- Temporary Private User Identity:
  - – 2483235551235@323.248. imsi.3gppnetwork.org

Temporary Public User Identity

- Public User Identity: sip: user@domain
- User
  - Complete IMSI as user
- domain:
  - First subdomain is the MNC
  - Second subdomain is the MCC
  - Remainder: fixed string: ".imsi.3gppnetwork.org"
- Example: IMSI: 2483235551235
- Temporary Public User Identity:
  - – sip: 2483235551235@323.248. imsi.3gppnetwork.org

Registration with USIM (contd.)

- Address and identity management
  - HSS stores user-profile for given Temporary Private User Identity
  - Several further Public User Identities (Aliases) may be provisioned at HSS
- Registration
  - Temporary Public User Identity recommended to be "banned" for public usage (TS 23.228 section E.3.1)
    - should be only used for Registration
    - should not be used for further actions due to hard readable syntax
  - Alias(es) of Public User Identity sent to terminal
  - Implicit Registration of Alias(es)

Home Network Domain URI

- For registering with the home network when only a USIM is available in the terminal:
- Make usage of the Temporary Public User Identity without user part
- Example:
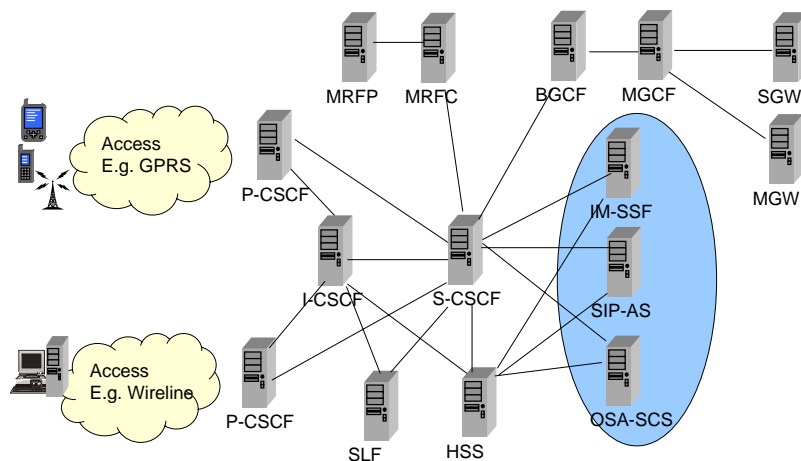 - sip: 323.248.imsi.3gppnetwork.org

Agenda:

- Identification in IMS
- ISIM
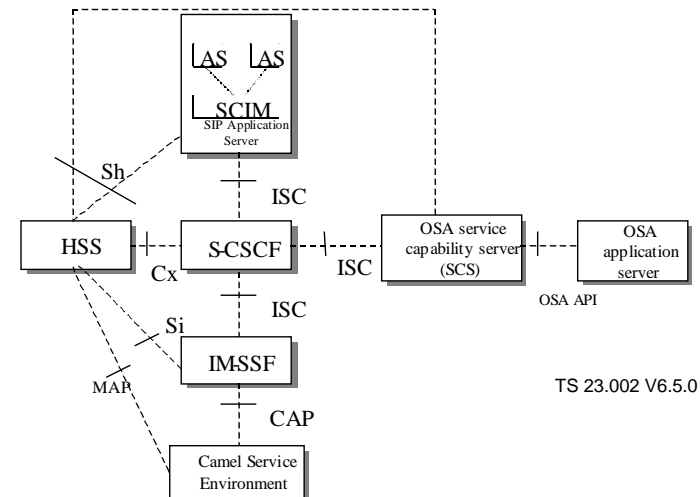- **Application Server**
  - User Profile
  - Filter Criteria

Application Server

- Networks may contain more than one application server
- Application server may be specialized to certain services
- In IMS all application servers have the same interface
- ISC (IMS Service Control)
- ISC makes use of SIP
- Currently ISC uses pure SIP like other IMS interfaces
- But: Future changes should not affect them
- Application server can be in the own network or in third party networks
- Additionally, AS can implement other protocols like HTTP or WAP (e.g. for configuration purposes)
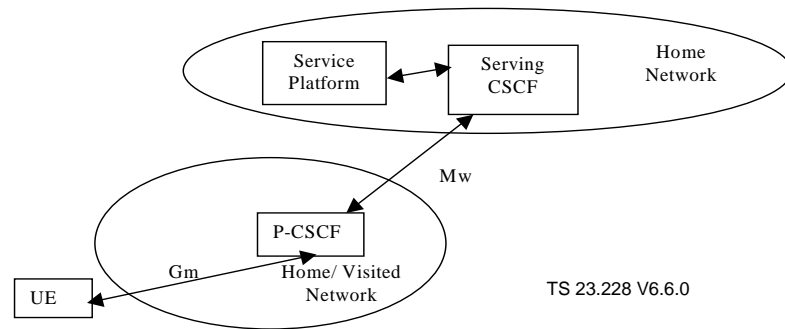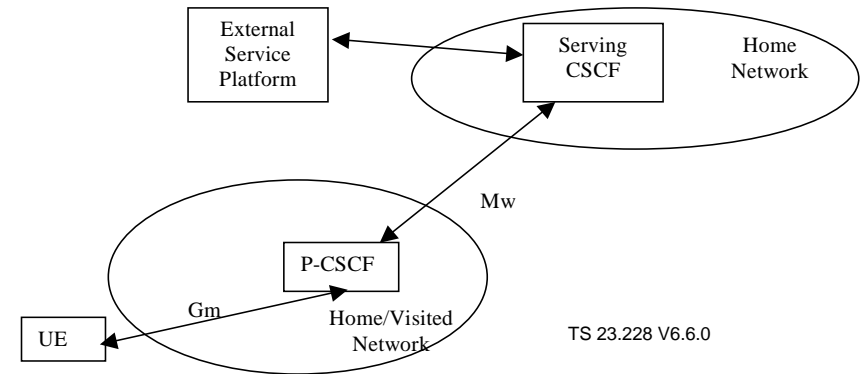
IMS Application Servers

The Application Servers - Interfaces

TS 23.002 V6.5.0

AS in Home Network

Service Platform ↔ Serving CSCF — Home Network

P-CSCF

Mw

Gm

UE — Home/ Visited Network

TS 23.228 V6.6.0

AS in Remote Network

External Service Platform ↔ Serving CSCF — Home Network
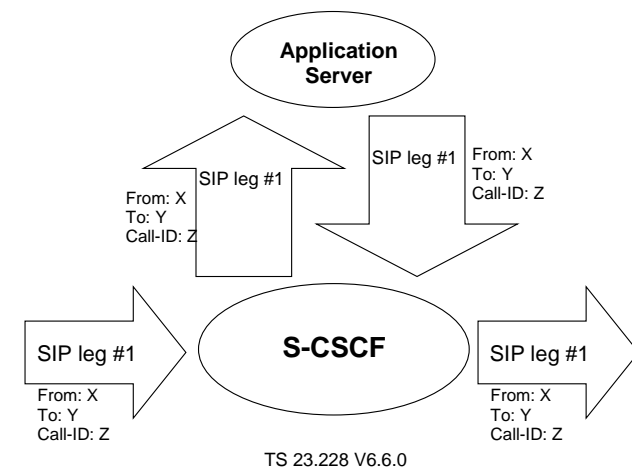
Mw

P-CSCF

Gm

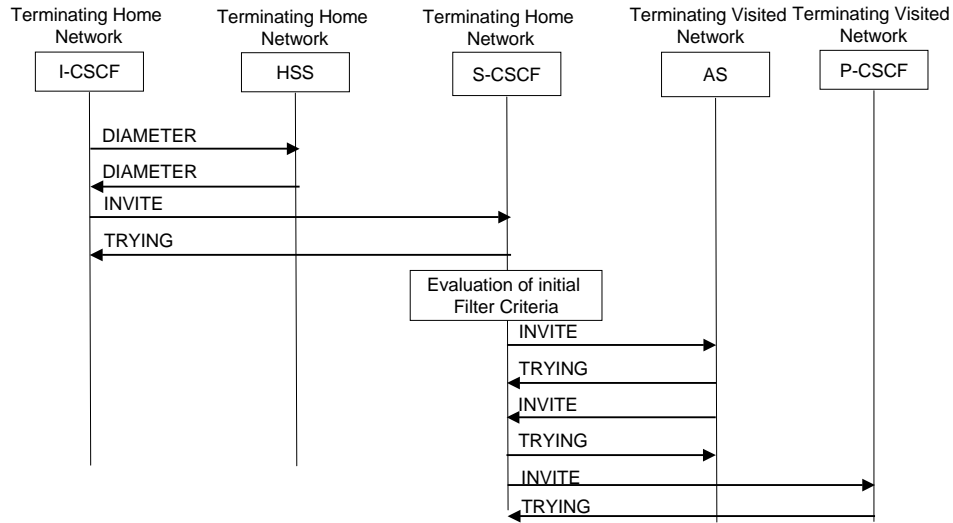UE — Home/Visited Network

TS 23.228 V6.6.0

Session Setup via Application Servers

- AS can either act as originating UA, terminating UA, SIP proxy, SIP redirect server or B2B UA.
- Functionality of proxy depends on situation, parameters and configuration as well as on application itself
- AS may or may not remain in signalling path (depending on situation too)
- Most important scenario is the proxy scenario (many applications and most important characteristic of signalling)
- AS interaction can take place either in the home network of the caller as well as in the home network of the callee

AS in Proxy Mode

Application Server

SIP leg #1

From: X
To: Y
Call-ID: Z

SIP leg #1

From: X
To: Y
Call-ID: Z

SIP leg #1

From: X
To: Y
Call-ID: Z

S-CSCF

SIP leg #1

From: X
To: Y
Call-ID: Z

TS 23.228 V6.6.0

AS in Proxy Mode – Terminating Network

Terminating Home Network	Terminating Home Network	Terminating Home Network	Terminating Visited Network	Terminating Visited Network
I-CSCF	HSS	S-CSCF	AS	P-CSCF

DIAMETER →

DIAMETER ←

INVITE →

TRYING ←

Evaluation of initial Filter Criteria

INVITE →

TRYING ←

INVITE ←

TRYING →

INVITE →

TRYING ←

Procedure

- S-CSCF checks filter criteria
- Once the AS has been identified..
- S-CSCF creates Route header to forward message to AS
- Additionally, the S-CSCF places itself to the Route header to get back the message afterwards
- In the user part of the SIP URI of this own Route entry the S-CSCF may enter some state information to understand, that it already received and processed this message (other ways of providing state are possible)
- Example:
  Route: <sip: as22.home2.com;lr>,
  <sip: state112@scscf1.home2.net;lr>

Filter Criteria (1)

- Contain collection of user related information
- Help S-CSCF to decide about AS interaction
- Most important filter criteria are so called "Initial Filter Criteria"
- They are evaluated when receiving initial request in a dialog (INVITE, SUBSCRIBE) or a standalone request (MESSAGE, OPTIONS…)
- S-CSCF does not evaluate on PRACK, NOTIFY, UPDATE or BYE
- Filter criteria for subscriber are stored in HSS => in user profile
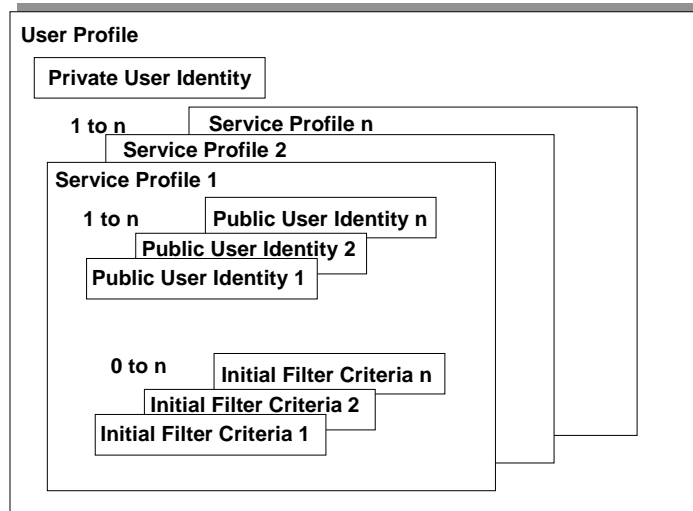
Filter Criteria (2)

- On registration the S-CSCF receives user profile from HSS
- Filter criteria determine the services that are applicable to the collection of Public User Identities of the profile
- S-CSCF assesses the criteria in the order of their priority
- Filter criteria contain trigger points, which are boolean conditions
- If the trigger point fires the request goes to the corresponding AS
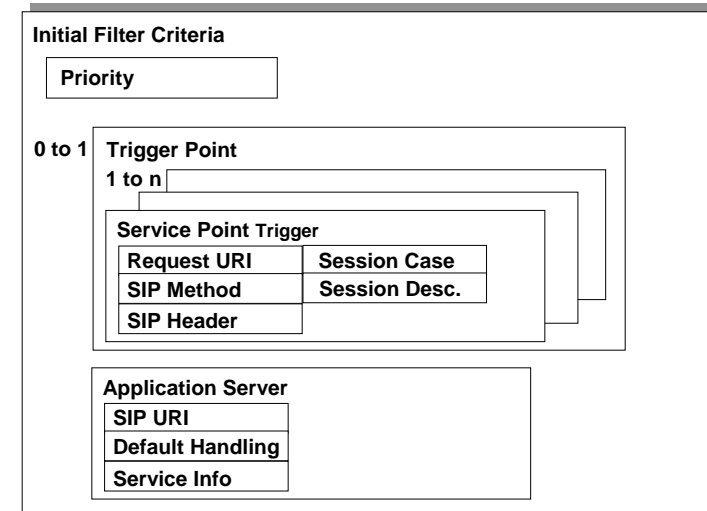- After receiving back the request the next criteria is checked

User Profile

User Profile

Private User Identity

1 to n — **Service Profile n**
Service Profile 2
Service Profile 1

1 to n — **Public User Identity n**
Public User Identity 2
Public User Identity 1

0 to n — **Initial Filter Criteria n**
Initial Filter Criteria 2
Initial Filter Criteria 1

Initial Filter Criteria

Initial Filter Criteria

Priority

0 to 1 — **Trigger Point**
1 to n

Service Point Trigger

Request URI	Session Case
SIP Method	Session Desc.
SIP Header	

Application Server
SIP URI
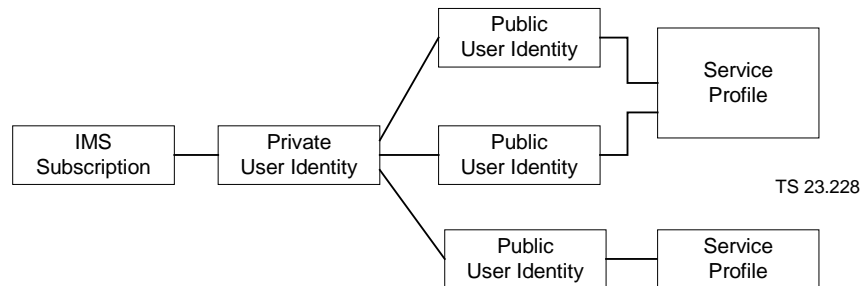**Default Handling**
Service Info

Terms (1)

- Priority: the lower the number the higher the priority
- Trigger Point: Boolean expression => to AS (y/n)
- Service Point Trigger: a logical condition based on a characteristic of a SIP message (e.g. method…)
- Trigger Point: a collection of a number of service point triggers
- Boolean operators: AND, OR, NOT
- E.g.: (Method=INVITE) AND (Request-URI=fred@home.at)….two SPT=> one TP
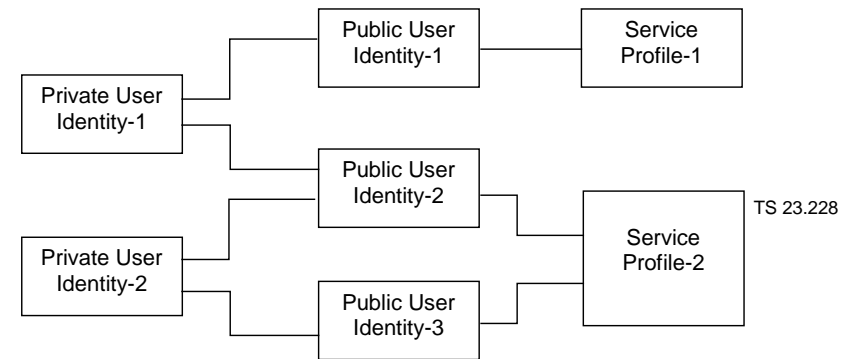- When no trigger point is defined => unconditional forwarding

Terms (2)

- After trigger points the AS is expressed
- SIP URI: SIP address of the application server
- Default Handling: action to take when contact to AS is not possible
- Service Information: contains transparent data (transparent to HSS and S-CSCF), only allowed when S-CSCF acts as SIP client (e.g. REGISTER) because info is added to message in body (not allowed for proxies)
- User profile is encoded as XML File
- XML scheme is defined in TS 29.228

Relationship: Subscription, Identity, Service (1)

IMS Subscription — Private User Identity

Public User Identity — Service Profile
Public User Identity — Service Profile
Public User Identity — Service Profile

TS 23.228

Relationship: Subscription, Identity, Service (2)

Private User Identity-1 — Public User Identity-1 — Service Profile-1

Private User Identity-2 — Public User Identity-2 — Service Profile-2

Public User Identity-3

TS 23.228

Summary

- Private & Public User Identity definition
- More than one Private User Identity per IMS Subscription
- ISIM contains User Identification, Network Reference and Security Parameters
- ISIM can be substituted by USIM
- Flexible AS concept
- Application Provisioning via User Profile on HSS
- Filter Criteria define the applications to deal with, the sequence and the trigger conditions
- Service Profile belongs to Public User Identity

---

ftw.

ALCATEL

Dr. Johannes Stadler

Presales Manager
Network Systems

Alcatel Austria AG
Scheydgasse 41
A-1211 Vienna - Austria
phone: +43-1-27722-5647
mobile: +43-664-8323546
fax: +43-1-27722-75647
johannes.stadler@alcatel.at