

**Advanced Networking  
Voice over IP  
&  
Other Multimedia Protocols**

**Some SIP Advanced Topics**

Renato Lo Cigno  
Renato.LoCigno@dit.unitn.it

- Mobility
  - User mobility
  - Service mobility
  - 3GPP
- ENUM

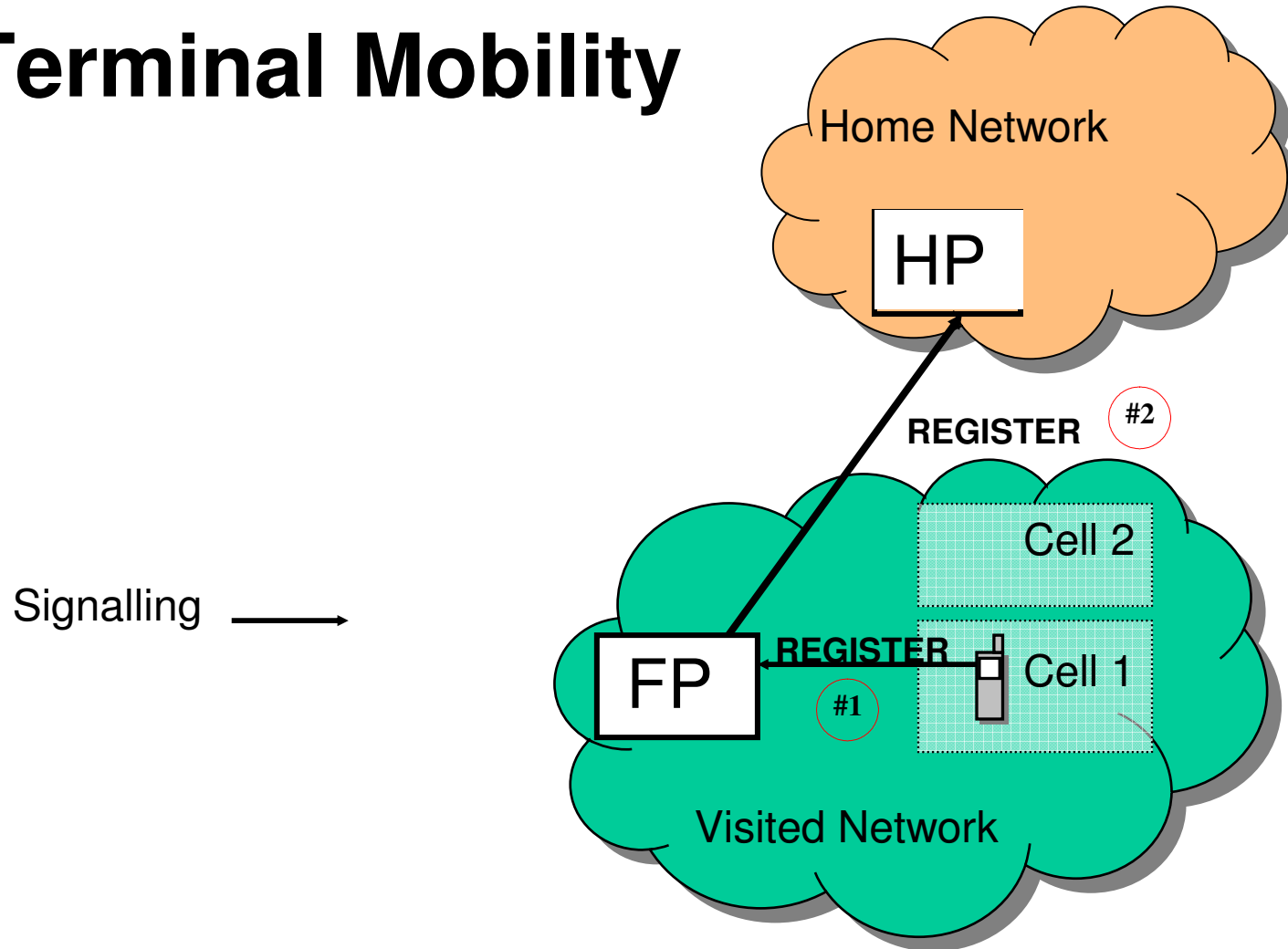


# SIP and Terminal Mobility

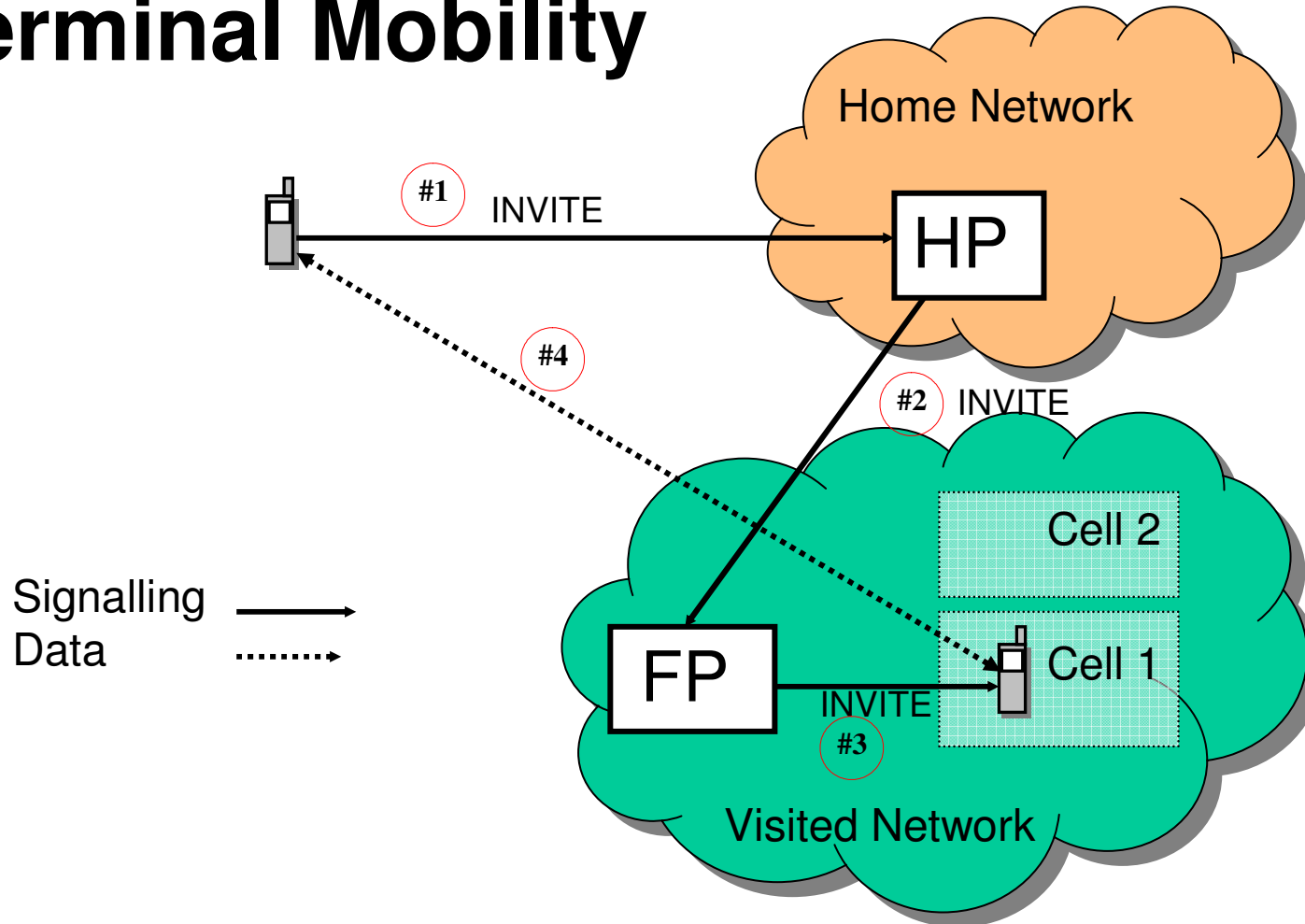
- Terminal can move between subnetworks
- Issues to consider:
  - Handoff performance
  - Redirection authentication
- Mobile hosts (MH) inform their home proxy about their new locations using REGISTER
- Mid-call mobility (Session mobility) is dealt with using reINVITE



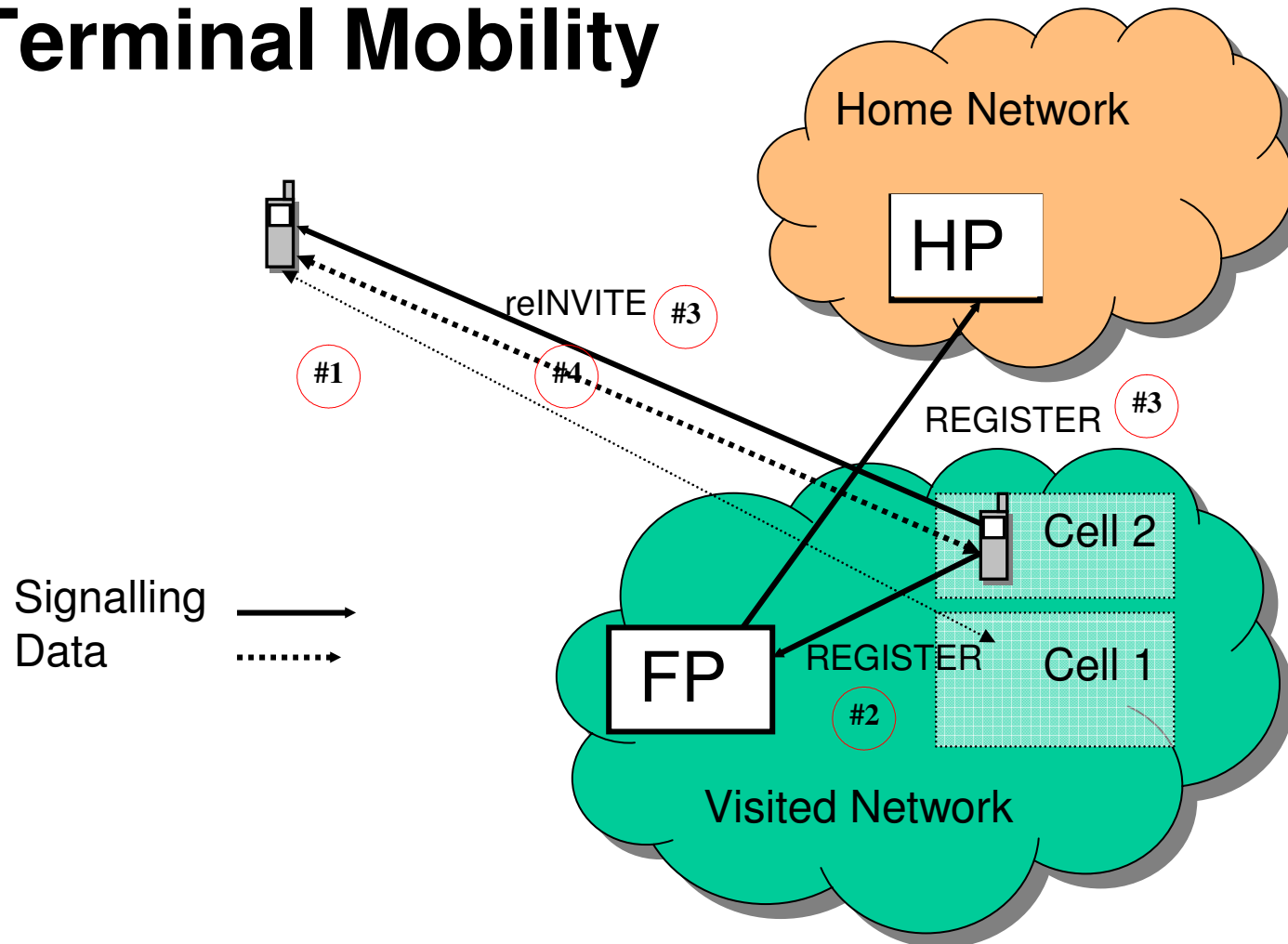
# SIP and Terminal Mobility



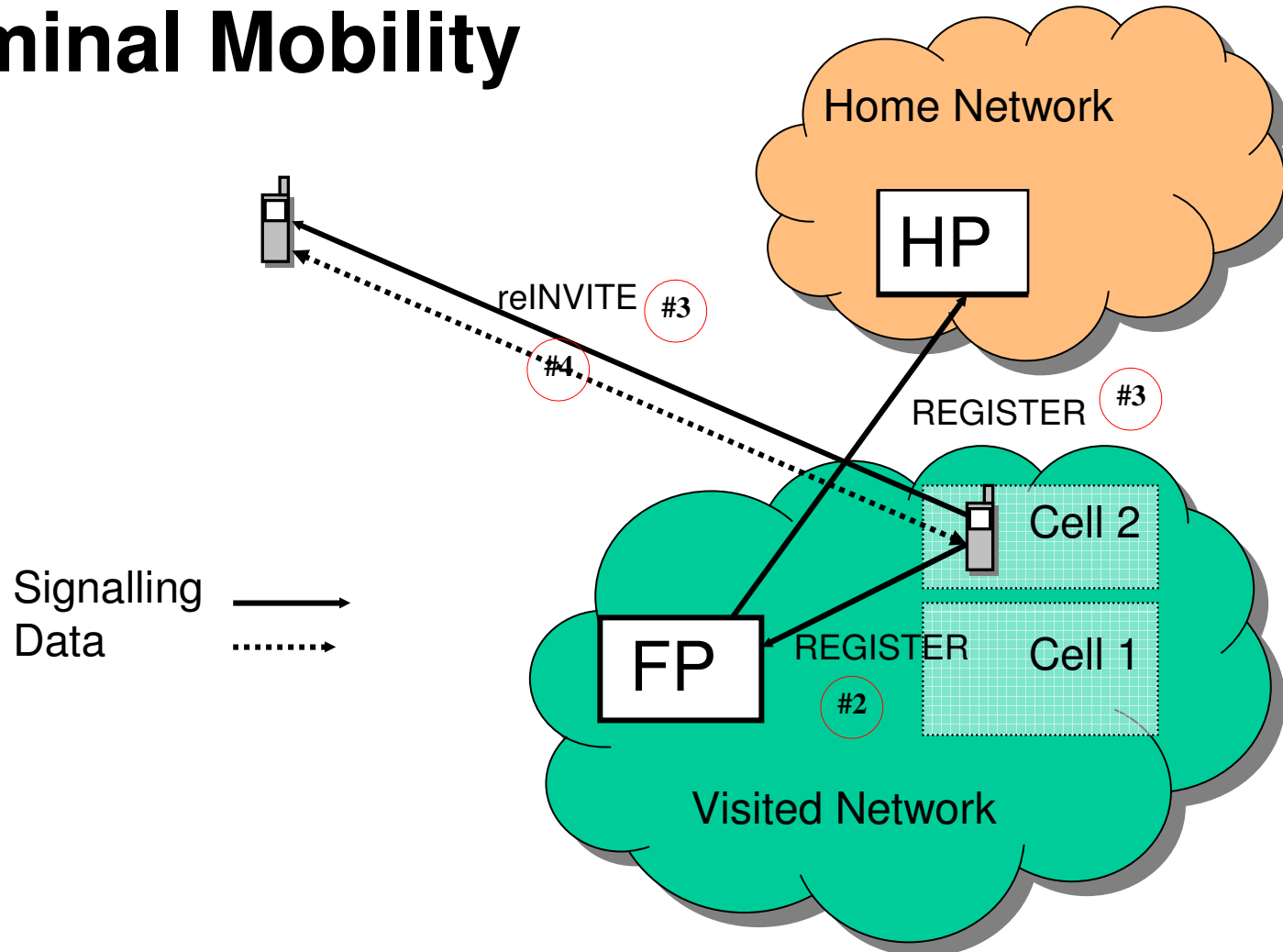
# SIP and Terminal Mobility



# SIP and Terminal Mobility



# SIP and Terminal Mobility



# SIP and Personal Mobility

- Person uses different devices
- REGISTER binds a person to a device
- Proxy and redirect translate address to location and device
- Issues to consider:
  - Authentication
  - Binding different addresses to single person:  
LDAP ...





# SIP and Service Mobility

- Use same services from different locations and devices
  - speed dial, address book, media preferences, call handling
- Services located at home server
  - RECORD-ROUTE home proxy to force calls to be processed by home servers
  - Services located at end systems
  - retrieve with REGISTER
- Issues to consider
  - services need to be device independent
    - standardised service description (CPL)
  - User recognition and authentication

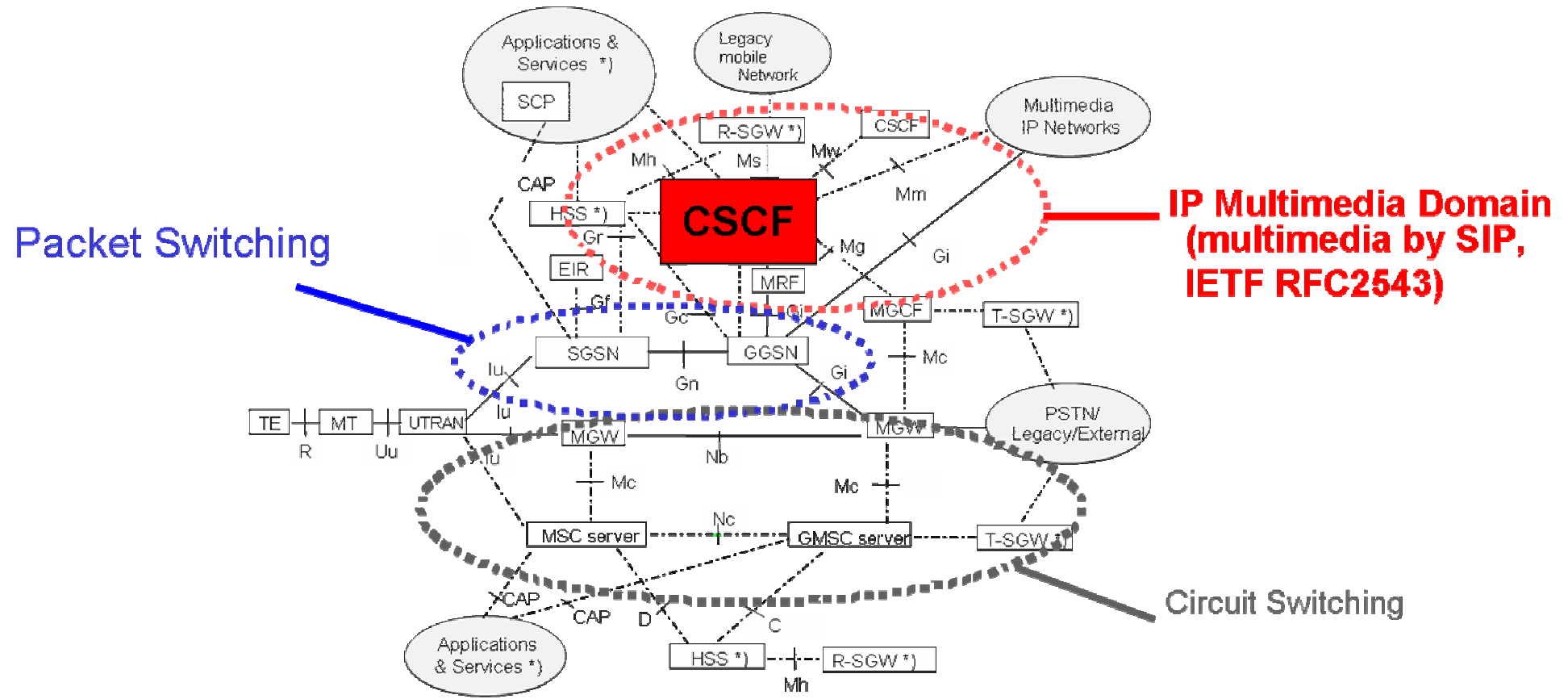


# SIP & 3GPP

- Può rappresentare una delle "alleanze" più promettenti per l'integrazione delle TLC (soprattutto fisso/mobile)
- Punta all'integrazione della mobilità con i servizi streaming in IP
- Introduce espressamente in 3G SIP ed un nodo di controllo della multimedialità su IP: CSCF (Call/Session Control Function)



# SIP & 3GPP



# What is the ENUM protocol?

- ENUM is part of a general framework whose goal is
  - **“How to find SIP services”**
- The preferred solution is DNS based: the answer tells the IP and ports associated to a SIP URI
- DNS supports two relevant records for this purpose:
  - SRV (Service) record
  - NAPTR (Naming Authority Pointer) record
- Both can be used in combination with ENUM to find SIP services



# How to find SIP services?

- Services must be separated from supporting machines
- Alice uses:
  - mailserver.atlanta.com (come mail server)
  - sip-proxy.atlanta.com (come SIP server)
- Correct URIs will only change the prefix for the different services:
  - mailto:alice@atlanta.com
  - sip:alice@atlanta.com
- And not
  - mailto:alice@mailserver.atlanta.com
  - sip:alice@sip-proxy.atlanta.com
- Service loc. is given by SRV records (RFC 2782, Feb. 2000)
  - A domain name is mapped on more services and more machines
- SRV records are used to
  - Differentiate services
  - Replication/Redundancy (multiple SIP proxy)
  - backup (SIP proxy)
  - Transport protocol differentiation (UDP, TCP, TLS over TCP)



# What is ENUM useful for?

- Internet URIs:
  - `mailto:saverio.niccolini@mymaildomain.org`
  - `sip:callme@mysipdomain.com`
- E.164 telephone numbers:
  - +39 050 2217678
  - +49 6221 563423
- ENUM role is mapping the two addressing schemes
- ENUM (E.164 Number Mapping) is a standard
  - E.164 numbers are mapped on URI
  - IETF RFC 3761, Apr. 2004
    - The E.164 to Uniform Resource Identifiers (URI) Dynamic Delegation Discovery System (DDDS) Application (ENUM)



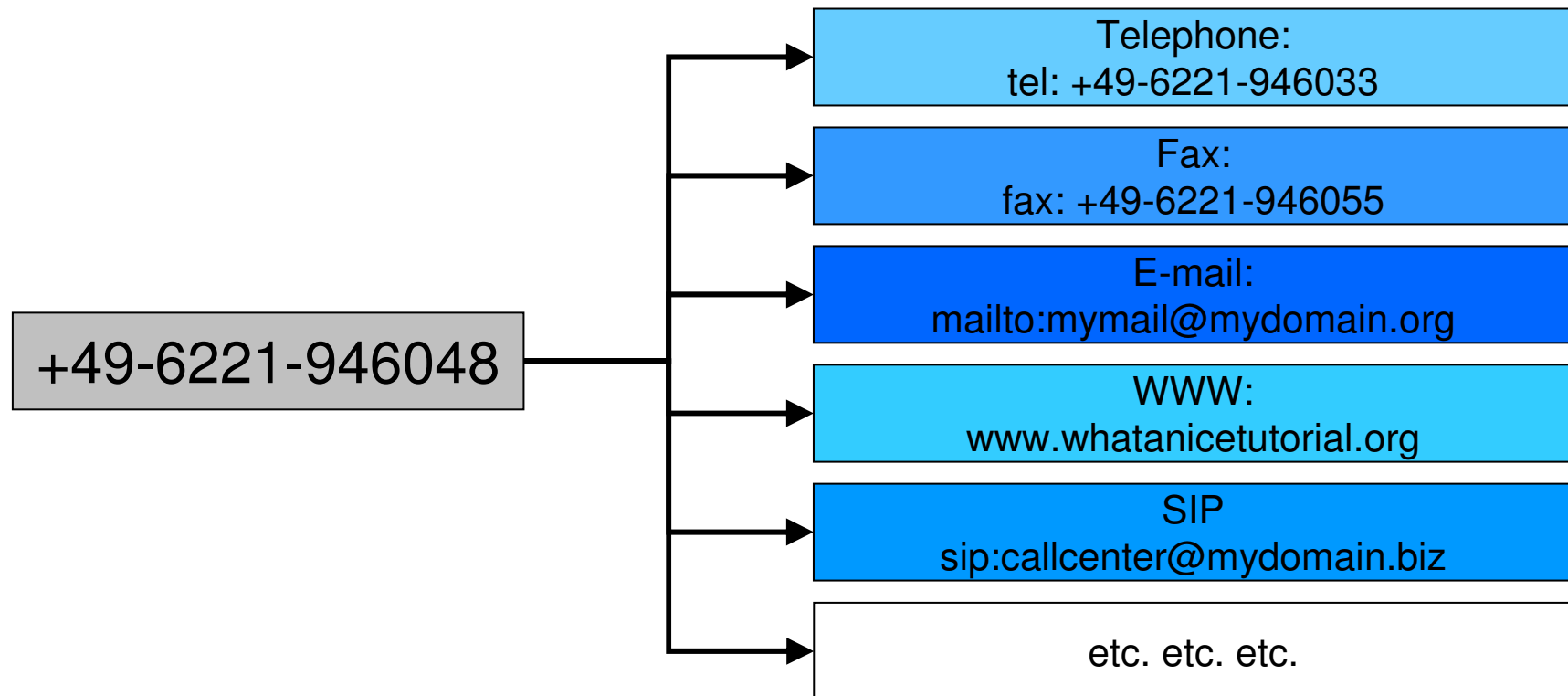
# ENUM basics

- Start from the plain number
  - +44-207-9460-148 → 442079460148
- Dot-separate numbers
  - 442079460148 → 4.4.2.0.7.9.4.6.0.1.4.8
- Reverse the order
  - 4.4.2.0.7.9.4.6.0.1.4.8 → 8.4.1.0.6.4.9.7.0.2.4.4
- Add ".e164.arpa"
  - 8.4.1.0.6.4.9.7.0.2.4.4 → 8.4.1.0.6.4.9.7.0.2.4.4.e164.arpa
- 8.4.1.0.6.4.9.7.0.2.4.4.e164.arpa is now the DNS entry of the original number
- The DNS entry is used to ask the NAPTR record and SRV records to the DNS service and realize the proper final mapping



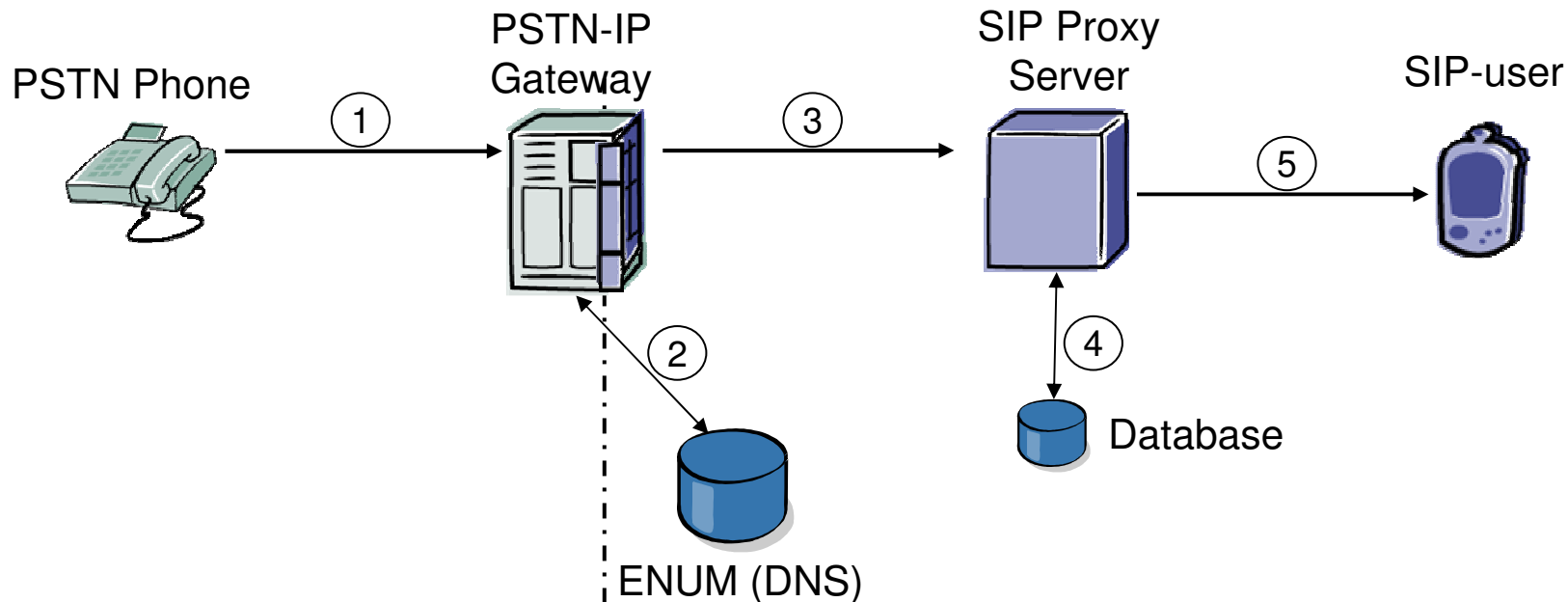
# ENUM: from a number to a set of services

- ENUM can associate to a single number multiple URI based on the actual service required





# ENUM example: from PSTN to a SIP



1. The call queries the PSTN-IP Gateway (GW)
2. GW searches the ENUM records on DNS and gets the SIP URI of the callee
3. GW forwards the call to the SIP Proxy Server
4. The SIP Proxy server finds the actual location of the callee
5. The call is forwarded to the user

