

Network level mobility

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Abstract

This talk will give an overview of network level mobility issues and protocols covering address, ad-hoc and network mobility. Continuous services in ad-hoc environments require new or improved routing protocols.

Mobility aspects

user mobility - the user changes terminal and receives the same personalized service (VPN)
(a service aspect more than a network aspect)

terminal mobility - the terminal moves between access point (roaming) (mobile phone, WLAN access)

service mobility - the service is asynchronous available from different places (email, web, SIP, messaging)



IP mobility - the IP address is kept between access points (Mobile IP)

network mobility - The IP network moves with the user (BGP multi homing, Mobile IP)

batch mobility - the user works in batches with the same network access point (laptop)

continuous mobility - The user has continuous contact with a service (mobile phone)

ad-hoc mobility - network anywhere even with poor infrastructure

Link level mobility

- Mobile phones(GSM) roam on the link layer
 - changing base stations transparently
 - limited to one operator
- WLAN roams between base stations in the same domain (IAAP)
 - typically a building and part of campus coverage

eduroam

- Terena Task Force on Mobility
- Same secure way of accessing campus networks in Europe (Essid 'eduroam')
- Use home credentials via Radius infrastructure
 - scales technically and administratively - locally and globally
- Gives semi-permanent i.e. batch mobility (laptop)

Mobile IP

- IP address is kept constant by using a tunnel from home location
- support near continuous IP mobility
 - slow handover - worked on in IETF
- suboptimal traffic pattern via home in IPv4
 - home addresses may be filtered (RPF check)
- integrated and optimal in IPv6

- authentication servers not well supported (scaling issue)
- few implementations available - part of CDMA-2000

Mobile networks

- Mobile router may use mobile IP for access to prefix home network transparent to hosts
- Mobile hosts may be nested on top to another home
- IETF is working on improving solution in nemo WG
- Applicable for personal networks, to car networks ..

Boeing Mobile BGP

- Boeing has onboard WLAN/LAN solution (SAS, Lufthansa, Singapore ..)
- DHCP from /24 per flight
Sattellite connection to ground stations
BGP re-announcement of prefix when changing ground station
 - + Transparent to users
 - + No HA roundtrip increase
 - Global routing table pollution - does not scale

ad-hoc networks

- Manet - Mobile ad-hoc networks - IETF working group
- Dynamic changing radio conditions
More survivable alternative to cell-based (WLAN)
Limited quality and power budget
Need more adaptable and cheaper routing
development routing protocols : OLSR, AODV, TBRPF, DSRP, DYI
...
UNINETT experimented with OLSR on PDA/WLAN

IPv6 shim layer

- Separation on host id and routing
- Transport layer bind to host-id address
- Transparent change of network address
- The side that changes address will update other end
- Could be a replacement for mobile IP

Transport protocol

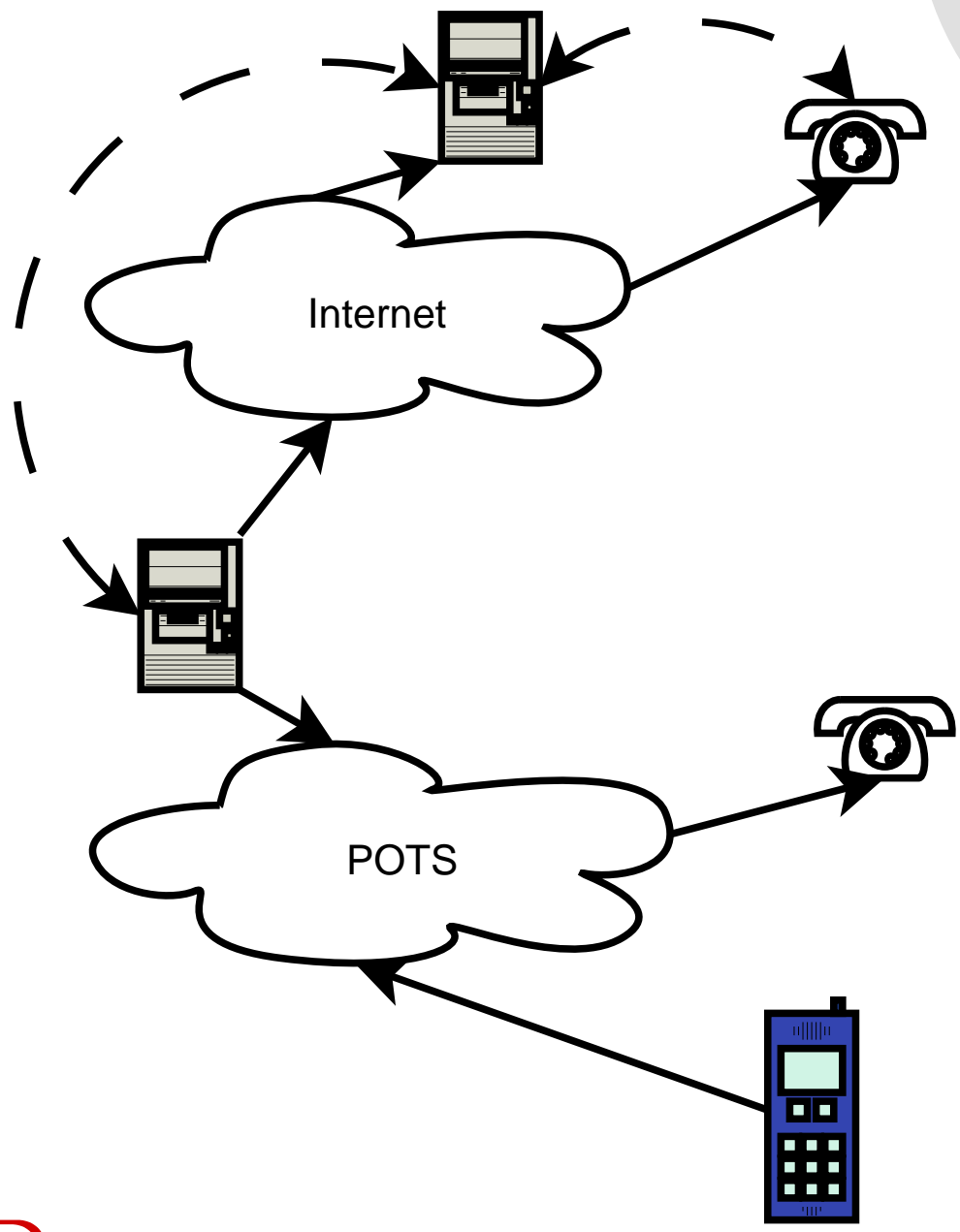
- SCTP - packet oriented transport protocol with selectable reliability
- Can use multiple network addresses and change transport to new address
- Not sure if it dynamically can find new end-point-addresses
- Does probably not support mobility - just resilience

Session Initiation Protocol - SIP

- Supports service mobility by
 - user agent registering with server
 - caller contacting via server(proxy)
 - address sip:user@domain
- nice for conferencing, IP telephony, presence, instant messaging
scales well - just initial signaling via proxy
- high activity in IETF in above areas : sip, sipping, iptel, mmusic..

IP telephony

- 73% of telephony expenses mobile related (Gigacampus)
1 MEuro/year is local - potential for WLAN IP-telephony
IP-telephony not common in R&D
Infrastructure needed is cheap
- SIP using Asterix open software on PC's - cheap
E164 ENUM prefixes points to SIP-servers
Easy to do - need infrastructure coordination from NRN's



IP telephony on campus

IP-telephony needs continuous coverage solutions :

- smart clients discover roaming and HDCP
- mobile IP can provide continuous sessions
- IP phones can have own VLAN across campus
- or accept break of call through campus ?

Campus infrastructure

Campus WLAN full coverage (1000+ base stations)

WLAN Roaming supported, but IP-subnets must change over campus

- universitites (must) have multiple IP subnets accross campus

- there are proprietatry tunneling solutions to keep address

WLAN quality varies - one client can fill capacity

Prioritization of voice traffic most probably needed

What to do

We are pushing eduroam now

We need to build IP-telephone SIP infrastructure with QoS

We will need continuous mobility support soon

Common open solutions - gives the sector power

Come on !

<http://www.ietf.org>

<http://www.nanog.org/mtg-0405/abarbanel.html> Boeing mobile nets