Design of Push to Talk Client for Performance Measurements

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3.2.2005

Basic Information

- *Thesis written at Celtius Oy*
  - *Celtius is a privately owned company*
  - *Specialized in communication software*
  - *Customers all over Europe and North America*
- *Supervisor: Professor (Pro tem) Jouni Karvo*
- *Instructor: M.Sc. Juhani Malka*

Contents

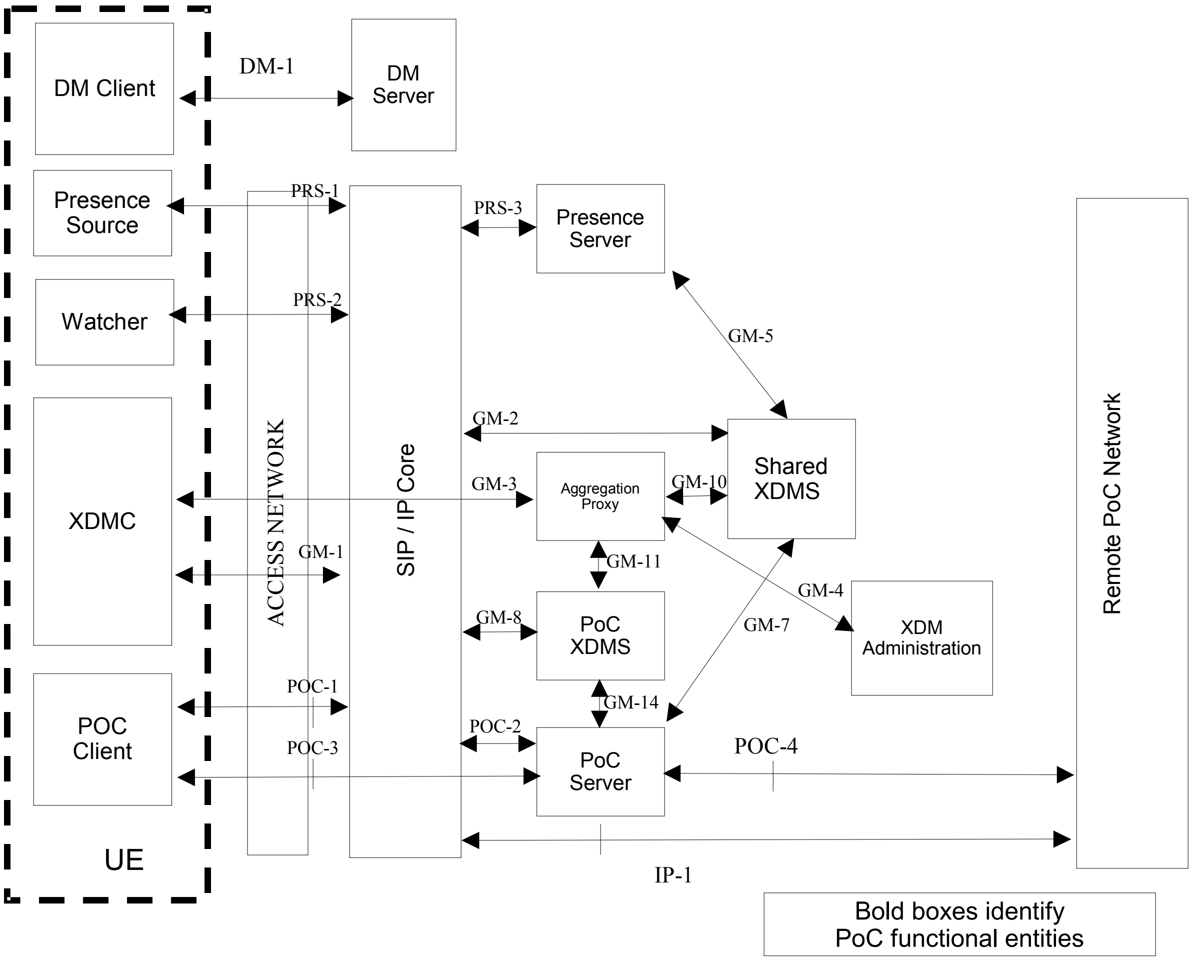
Push to Talk (PTT)

- *A half duplex speech service*
- *Many existing solutions*
  - *Conventional Land Mobile Radios (e.g. PMR, VHF)*
  - *Trunked Radio Systems (e.g. TETRA)*
- *Push to Talk over Cellular (PoC)*
  - *Let's do it over a public cellular network*
  - *Open Mobile Alliance (OMA) is working for an open standard*
    - *Started in August 2003 from specifications made by an industry consortium formed by Nokia, Siemens, Ericsson and Motorola*
    - *Candidate Enabler release was supposed to be ready in end of 2004, but it's likely to be released only in February 2005.*
  - *Some pre-standard / proprietary solutions already available (e.g. Nokia 5140)*

OMA PoC

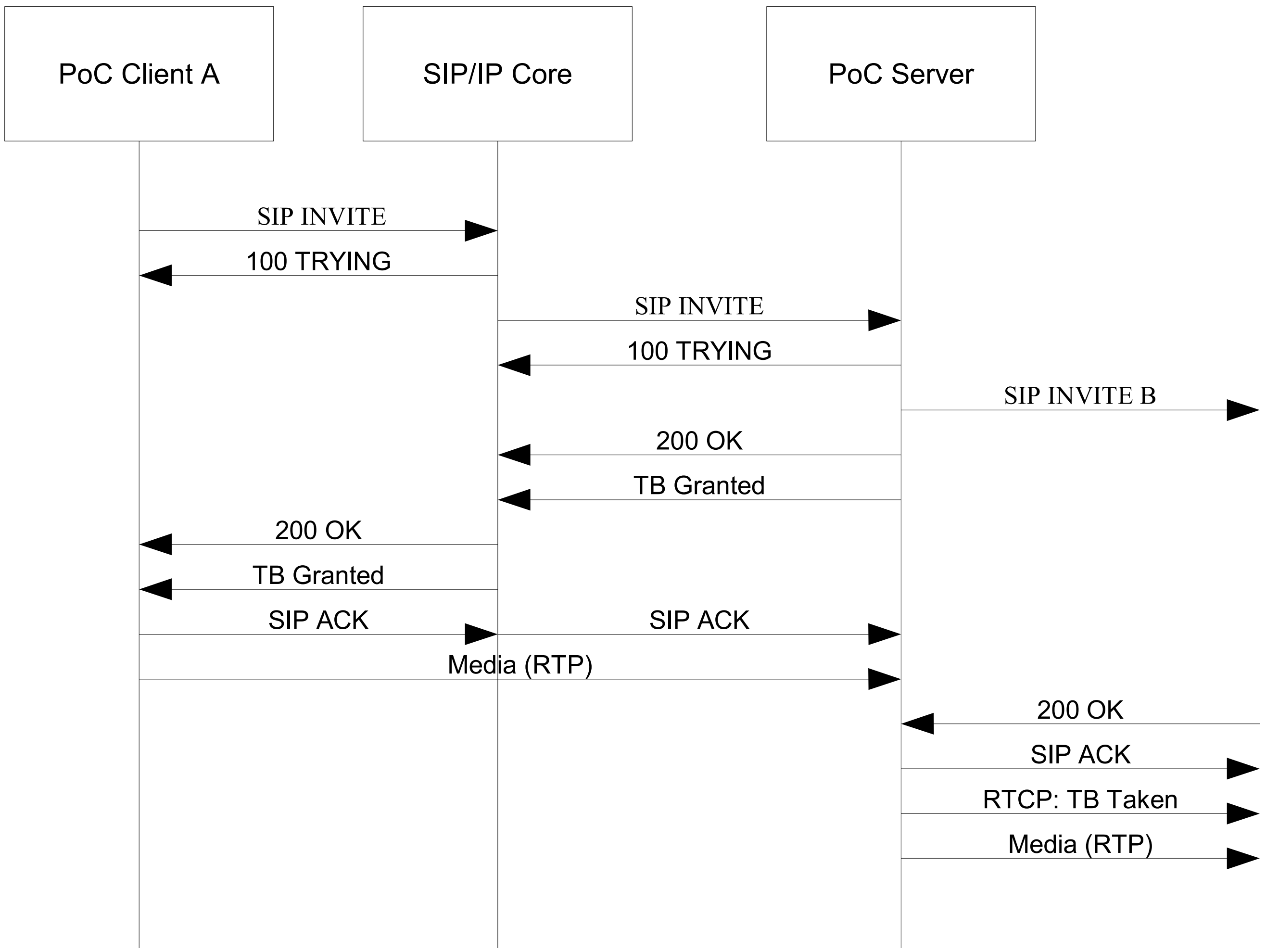
OMA PoC uses

- *SIP and SDP for signalling (e.g. session setup)*
- *RTP/RTCP for media transfer and talk burst arbitration*
- *XML Configuration Access Protocol (XCAP) for group management*



Source: OMA PoC architecure document draft version 18.1.2005

PoC session setup



OMA PoC performance requirements

- *Right-to-speak < 2,0 seconds*
  - *The duration between the times a user initiates a PoC session and when he receives a "right-to-speak" indication*
- *Start-to-speak < 1,6 seconds*
  - *The time it takes a user to receive "Start-to-speak" indication after a floor request in established PoC session.*
- *End-to-end channel delay ≤ 1,6 seconds*
- *Voice quality MOS ≥ 3 at BER ≤ 2 %*
- *Turnaround-time ≤ 4 seconds*
  - *The duration between the times a user quits talking and when he hears a response from another user*

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Packet-switched cellular networks

- *GPRS networks were originally not designed for real-time traffic such as speech*
- *Low throughput and long delays. No guarantees for the performance*
- *Cell re-selection may cause outage of 4,5-7,0 seconds*
- *Improvements coming up with EGPRS and UMTS*

Examples of network performance

Network	**Throughput**	**RTT**
GPRS	40 kbps	700 ms
EGPRS	150 kbps	400 ms
UMTS	240 kbps	200 ms

Objectives of the thesis

- *The objectives of the master thesis were:*
  - *Design a PoC client that can be used in automated performance measurements*
  - *The client should be able to measure the performance parameters stated in the OMA PoC requirement document*
  - *Test PoC performance with the client*

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Design and Implementation

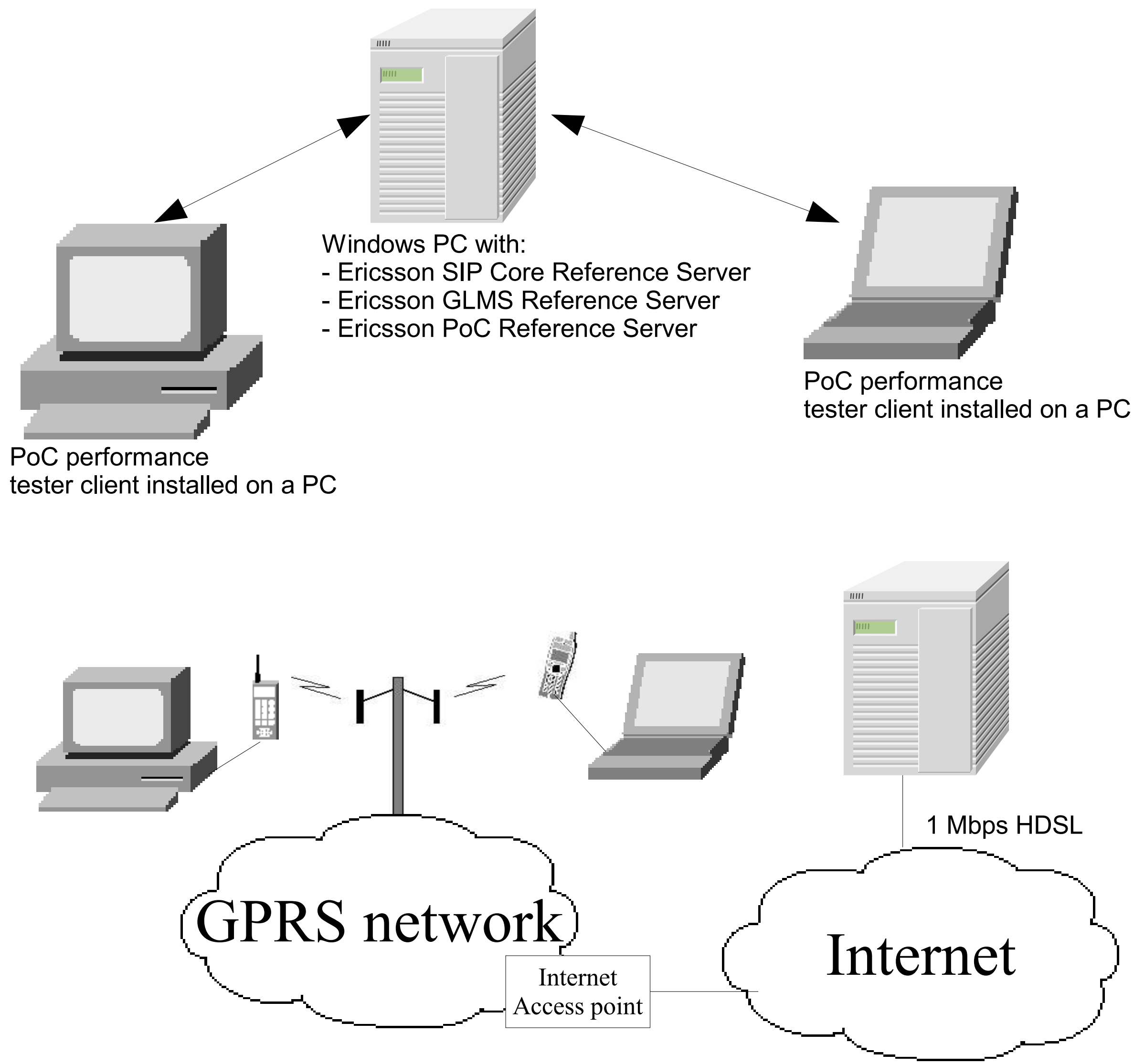
- *Separate Push to Talk API was designed and the client was implemented on top of it*
- *Implementation done in C++ according to the industry consortium PoC specifications*
- *In future the PoC API may be also implemented according to OMA specifications*

Tester client		
PoC API		
RTP and media API	SIP API	XCAP API
JRTPLIB	Resiprocate	HTTP API

- *Resiprocate SIP and JRTPLIB open-source libraries were used*
- *SIP signalling compression (SigComp) and group management not implemented*

Test setup

- *Ericsson PoC reference test suite servers were used*
- *The tests were performed over a public GPRS network*
- *The server was connected to Internet*
- *The clients were stationary*



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Test results

- *Outages of several seconds occurred even though the clients were stationary*
- *Results are just indicative:*
  - *Use of SigComp would lower Right-to-Speak*
  - *Real servers would be in operator's network*
  - *Many variables that can be optimized*

		Measured values	
Parameter	**Requirement**	**Average**	**Worst case**
Right-to-speak	2,0 s	2,09 s	2,49 s
Start-to-speak	1,6 s	0,63 s	1,45 s
End-to-end delay	1,6 s	1,30 s	4,44 s
Turnaround time	4,0 s	4,10 s	6,47 s
Voice quiality	MOS 3	MOS 3,1	MOS 2,02

(PESQ-MOS)

Conclusions

- *The client that was designed and implemented can be used for PoC performance measurements*
- *PoC can work in GPRS network*
- *The performance of PoC cannot be guaranteed in current cellular networks*
  - *Long cell-reselection times*
  - *Network congestion lowers throughput*
- *Future cellular networks will improve the usability of PoC*

Questions or comments?

Thank you!