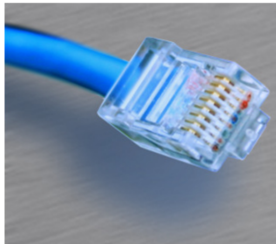


VoIP signalling standards

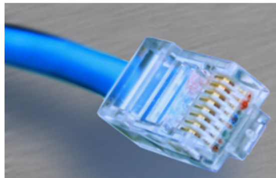
VoIP – Voice over IP

VoIP signalling standards

- A variety of IP based signalling standards to VoIP defined – and used
  - SIP
  - H.323
  - MGCP
  - ....
- SIP and H.323 included in this course
- The purpose of VoIP signalling
  - Establish, maintain and close voice calls
  - Eventually collect information for taxation

signalling standards

- Two kinds of information necessary to phone
  - Call control (signalling phone to/from exchange)
  - Voice transfer (Between participating phones)
- In traditional telephony
  - Call Control (For example POTS or ISDN)
  - Voice transfer (Circuit switched channel)
- In VoIP – Voice over IP
  - Call control (For example SIP or H.323)
  - Voice transfer (Packet switched)



SIP and H.323

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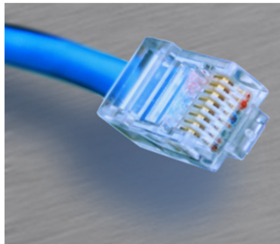
- H.323
  - Defined by ITU in 1996
    - International Telecommunication Union
  - Uses many technologies from PSTN
  - A suite of different protocols incl. voice/video
- SIP – Session Initiation Protocol
  - Defined by IETF in 1996
    - Internet Engineering Task Force
  - Uses many technologies from the Internet
  - Is a signalling protocol for voice/video



SIP SIGNALLING

Session initiation protocol

SIP

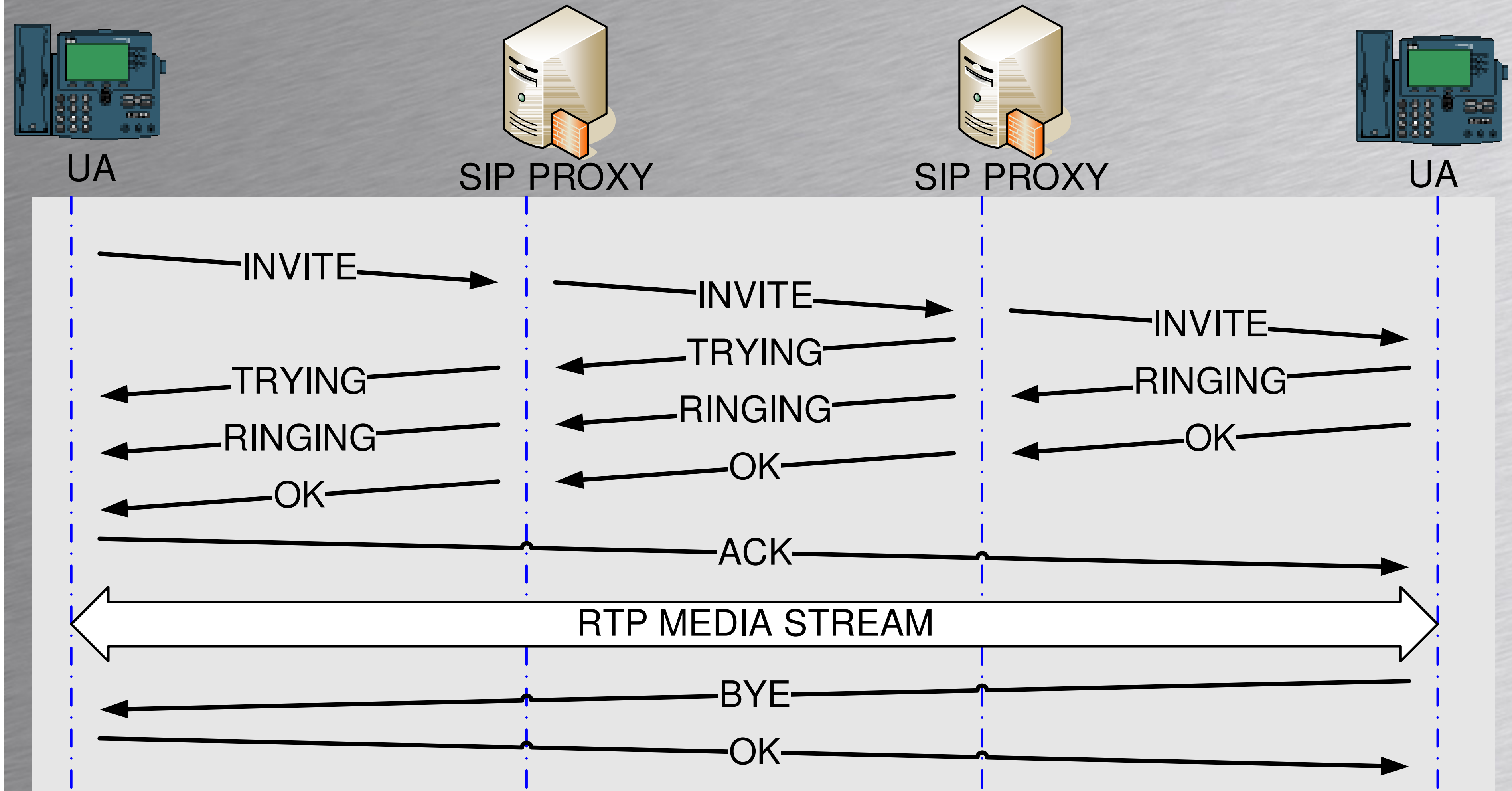
Session Initiation Protocol

- Defined by IETF in 1996
  - Internet Engineering Task Force
- Uses many technologies from the Internet
- Is a signalling protocol for voice/video
- SIP are widely used as VoIP signalling

SIP Design

- Expandable
  - Easy integration of new facilities
- (Not) a substitute for PSTN
  - SIP are used by many service providers
- Diversity of end-devices
  - Intelligent end-devices
- Multimedia
  - Voice, video….

SIP call flow example



UA = User Agent (SIP Phone)

SIP

- Is a application layer protocol
- Is a text based signalling protocol
  - Reminding of the HTTP and SMTP protocols
- Are used to establish, maintain and terminate multimedia sessions
- Support unicast and multicast sessions
- Location independent
  - Suitable for mobile users

SIP components

- There are two SIP components
- User Agents (UA) – SIP End-points (IP Phones) consisting of
  - User Agent Client (UAC): Initiates sessions
  - User Agent Server (UAS): Respond sessions
- SIP servers
  - Proxy server – Like a SIP IP-PBX
  - Registrar server – User Agent register
  - Redirect server – Redirect sessions

SIP addressing

- SIP addresses are identified by SIP URI's
  - Uniform Resource Identifier
- Example

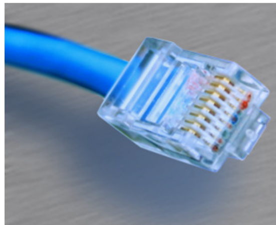
  sip:4103@mercantec.dk;transport=UDP
  - sip – The URI service
  - 4103 – The URI user part (extension/phone)
  - Mercantec.dk – The URI host part
  - ;transport=UDP – A URI parameter

SIP addressing

- Different formats of URI's
  - FQDN's: sip:heth@mercantec.dk
  - E.164: sip:30539361@mercantec.dk
  - E.164: tel:30539361
  - Mixed: sip:heth@194.123.12.23
- E.164 numbers in DNS

SIP messaging

- Messages contain header describing the communication in details
- Uses a text based syntax and header like HTTP
- Transport protocols TCP, UDP or SCTP
  - SCTP: Stream Control Transport Protocol
- Basically there are two kinds of messages
  - Requests: Sent by Clients
  - Response: Sent by servers



SIP messaging

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- Request message header

Method	Request URI	SIP version

  - – Method: INVITE, ACK, BYE ….
  - – Request URI: The receiver of the request
  - – SIP version: Used SIP version (2.0 in use)

- Response message header

SIP version	Status code	Reason phrase

  - – SIP version: Used SIP version (2.0 in use)
  - – Status code: An integer describing the answer
  - – Reason Phrase: A text description of status code

SIP requests methods

Command	Function
INVITE	Used to establish a media session between user agents. Starting a call
ACK	Confirms reliable message exchanges
BYE	Terminates a established session between agents
CANCEL	Terminates a pending request
OPTIONS	Requests information about the capabilities of a caller, without setting up a call
REGISTER	Used by a user agent to register to registrar. The user agent informs the registrar of its IP address and URI.

NOTE: There are defined more SIP request methods than indicated in the above table. The shown methods are from RFC 3261

SIP response codes

With examples

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Respons class	Status code	Reason phrase
Info	**1xx**	**Provisional responses**
	100	Trying
	180	Ringning
Succes	**2xx**	**Succesful responses**
	200	OK
Redirect	**3xx**	**Redirection responses**
	302	Moved temporarily
Client error	**4xx**	**Client failure responses**
	401	Unauthorized
Server error	**5xx**	**Server failure responses**
	503	Service unavailable
Global failure	**6xx**	**Global failure responses**
	603	Decline

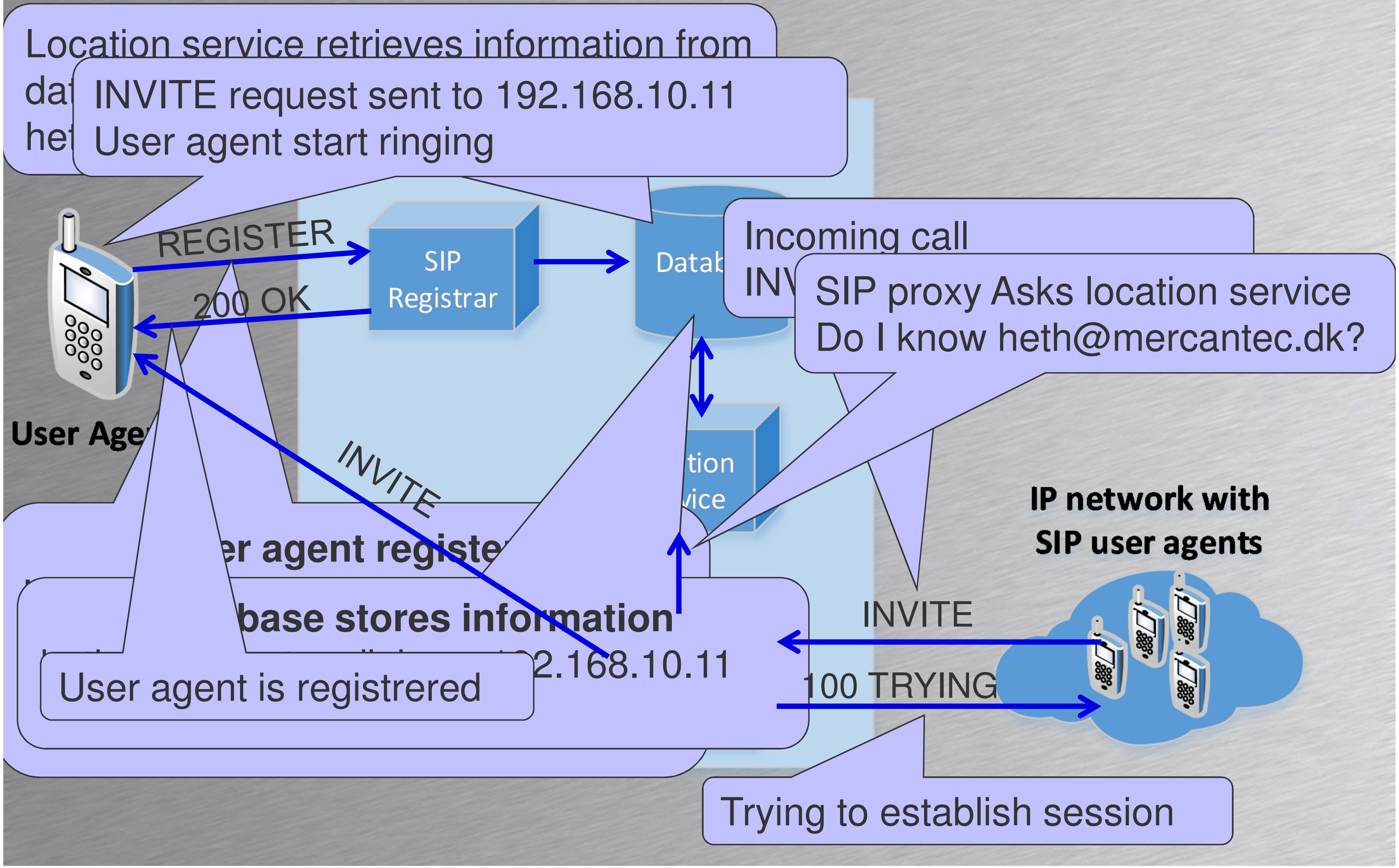
SIP User Agent – UA

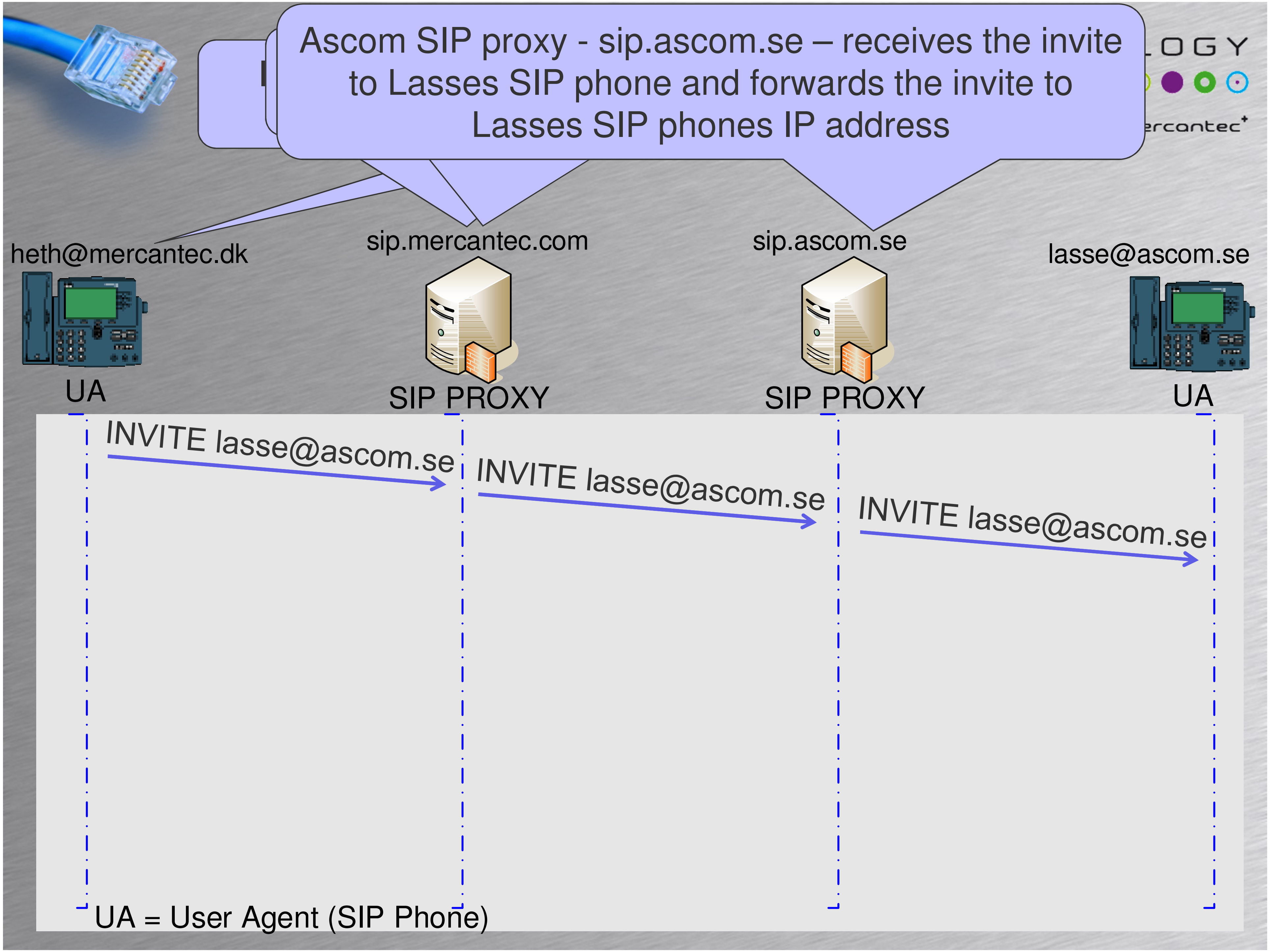
- A User Agent is a software component acting on behalf of a user
- The SIP phone soft or hard is a SIP UA
- User Agent Client – UAC
  - Initiates SIP sessions when calling
  - Send SIP requests
- User Agent Server – UAS
  - Accepts or rejects SIP session requests
  - Receives SIP requests and return SIP response

SIP servers

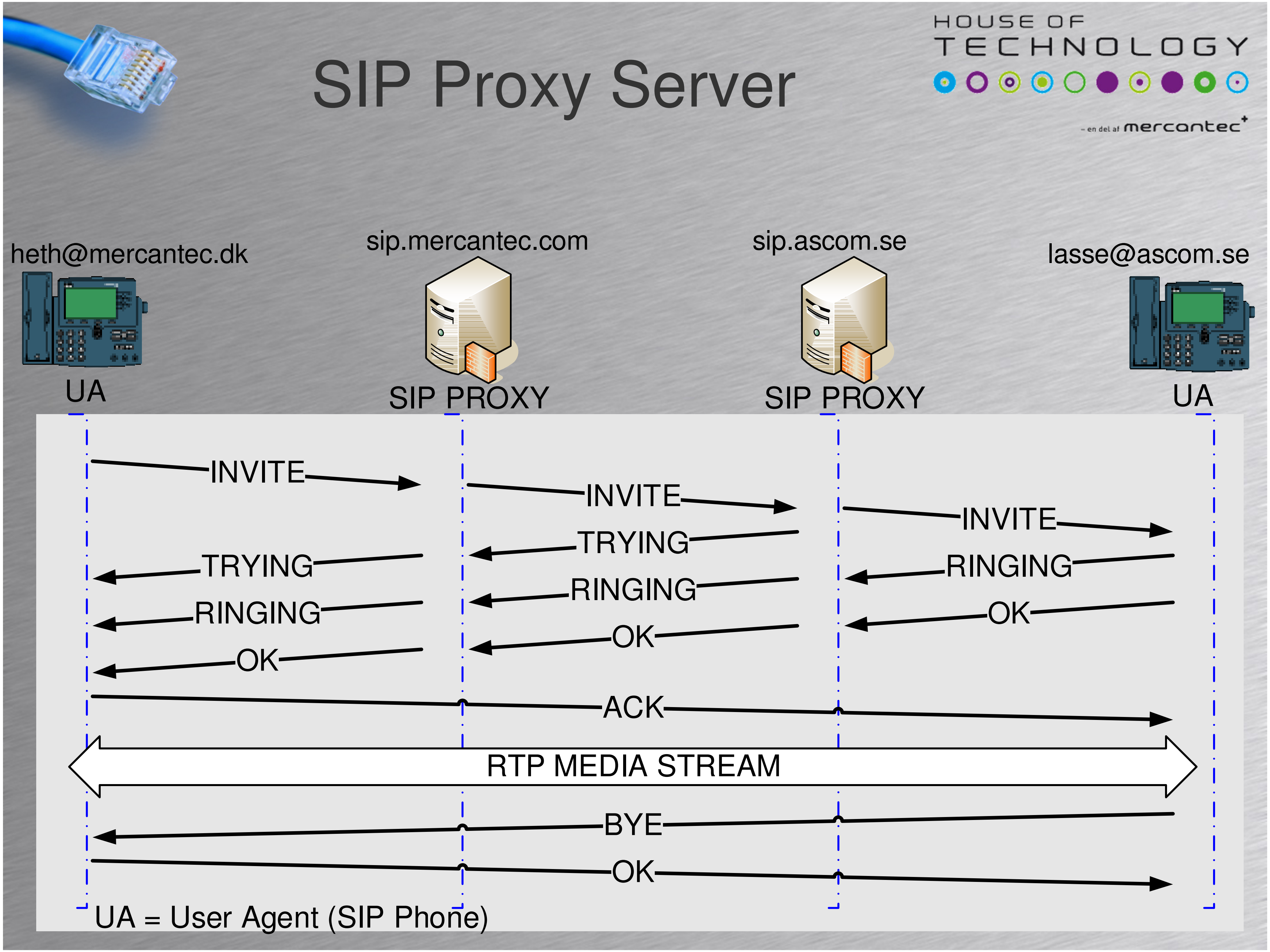
- Proxy server
  – Receive and sends SIP request and responses on behalf of the User Agents. (UA)
- Registrar server
  – User Agents register to the registrar server
  – Keeps track on User Agents URI and IP addresses and acts as a location service
- Redirection Server
  – Returns “contact this address” responces
- The servers often live on the same “box”

SIP servers


Location service retrieves information from
dat
het
INVITE request sent to 192.168.10.11
User agent start ringing
REGISTER
200 OK
SIP
Registrar
Datab
Incoming call
INV
SIP proxy Asks location service
Do I know heth@mercantec.dk?
User Age
tion
vice
INVITE
er agent registe
base stores information
2.168.10.11
User agent is registrered
IP network with
SIP user agents
INVITE
100 TRYING
Trying to establish session


Ascom SIP proxy - sip.ascom.se – receives the invite to Lasses SIP phone and forwards the invite to Lasses SIP phones IP address
heth@mercantec.dk
sip.mercantec.com
sip.ascom.se
lasse@ascom.se
UA
SIP PROXY
SIP PROXY
UA
INVITE lasse@ascom.se
INVITE lasse@ascom.se
INVITE lasse@ascom.se
UA = User Agent (SIP Phone)

SIP Proxy Server



SIP Redirect

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