

## SIP

(Transparencias de  
H. Schulzrinne y  
W. Stallings)

Jorge García Vidal PIAM 2004-05



## Bibliografía:

- “The Session Initiation Protocol”, W. Stallings, The Internet Protocol Journal, March 2003.
- (más detalles en Transparencias H. Schulzrinne):

[http://www.cs.columbia.edu/~hgs/teaching/ais/slides/sip\\_long.pdf](http://www.cs.columbia.edu/~hgs/teaching/ais/slides/sip_long.pdf)

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## Session Initiation Protocol (SIP)

- Is an application level signaling protocol for:
  - Setting-up
  - Modifying
  - Terminatingreal time sessions between participants over an IP data network.

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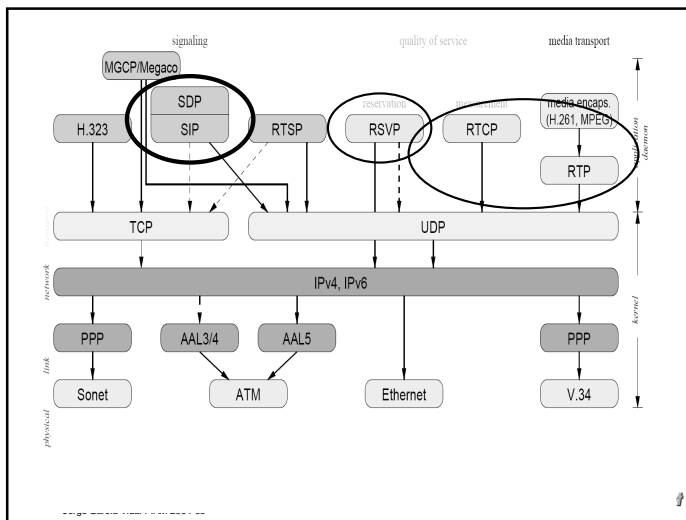


## Session Initiation Protocol (SIP)

- SIP can support any type of single-media or multi-media session, including teleconferencing
- Session Description Protocol (SDP): defines session content using a set of type similar to MIME
- The actual multimedia content is exchanged using appropriate transport protocols (eg: RTP)
- Key driving force: Internet telephony (Voice over IP, VoIP)

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## SIP functions

- **User location:**
  - Users can move to other locations and access their telephony or other applications features from remote locations
- **User availability:**
  - Determine willingness of the called party to engage in communications
- **User capabilities**
  - Media and media parameters to be used are determined

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## SIP functions

- **Session setup**
  - Point-to-point and multiparty calls are setup, with agreed session parameters
- **Session management:**
  - transfer, termination, modifying session parameters, etc

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### SIP building blocks

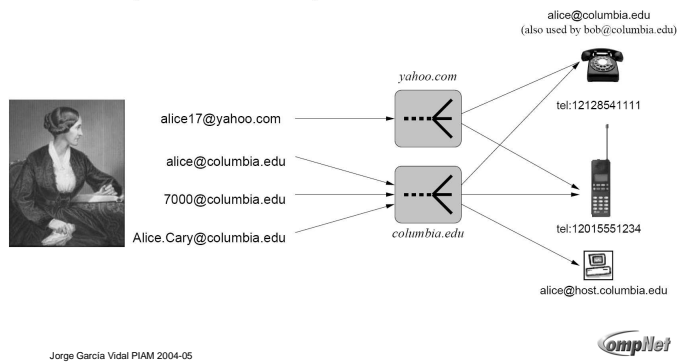
Can be client (issues SIP requests) or server (receives SIP requests and generates responses that accepts, Rejects or redirects the request)

|  |                     |  |
|--|---------------------|--|
|  | SIP user agent      | IP phone, PC, conference bridge  |
|  | SIP redirect server | returns new location for requests  |
|  | SIP stateless proxy | Use a Location Service that maintains (SIP@<->IP@) table<br>routes call requests   |
|  | SIP (forking) proxy | routes call requests   |
|  | SIP registrar       | maintains mappings from names to addresses<br>Accepts REGISTER request and places the info it receives (SIP@ <-> IP@) in those requests into the Locations Service for the domain it handles |

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## Personal mobility

SIP uses email-style addresses to identify users



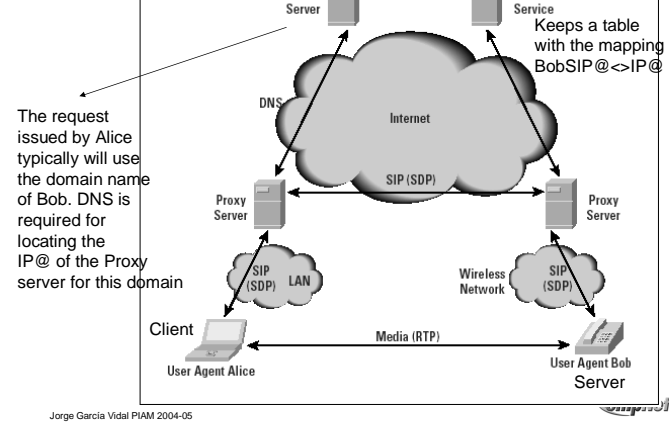
## SIP addressing

- typically, same as user's email address:  
alice@example.com  
12125551212@gateways-r-us.com
- written as URL, e.g., sip:alice@example.com
- can add parameters, such as type (user="phone") or transport protocol

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Figure 1: SIP Components and Protocols



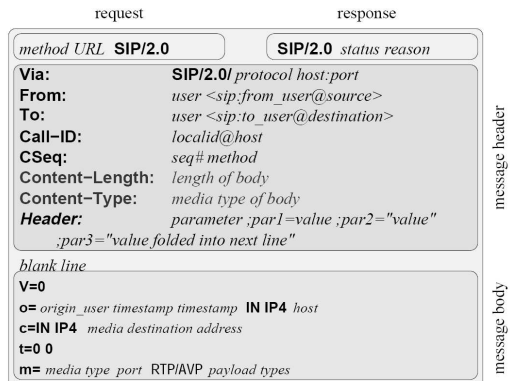
## SIP requests and responses

- text, not binary, format
- look very similar to HTTP/1.1
- requests and responses are similar except for first line
- requests and responses can contain *message bodies*: typically session descriptions, but also ASCII or HTML

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## SIP syntax



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message

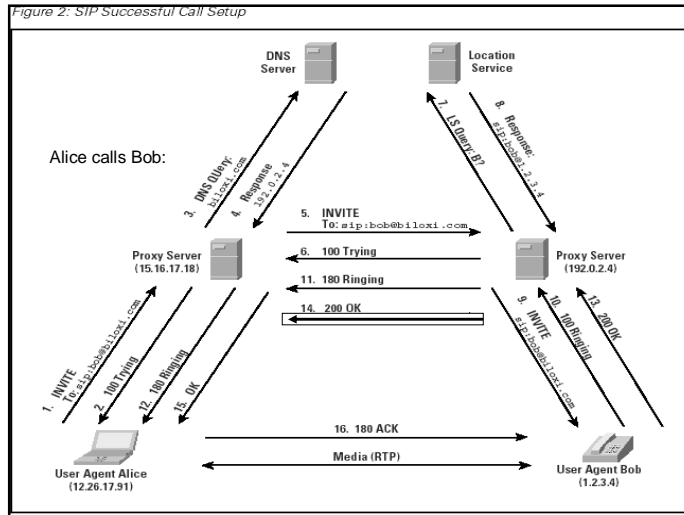
## SIP methods

|           |  |
|-----------|--|
| INVITE    | initiate call                                      |
| ACK       | confirm final response                             |
| BYE       | terminate (and transfer) call                      |
| CANCEL    | cancel searches and "ringing"                      |
| OPTIONS   | features support by other side                     |
| REGISTER  | register with location service                     |
| INFO      | mid-call information (ISUP)                        |
| COMET     | precondition met                                   |
| PRACK     | provisional acknowledgement                        |
| SUBSCRIBE | subscribe to event                                 |
| NOTIFY    | notify subscribers                                 |
| REFER     | ask recipient to issue SIP request (call transfer) |

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Figure 2: SIP Successful Call Setup



## SIP message example

Message (1) might look like this:

```
INVITE sip:bob@biloxi.com SIP/2.0
Via: SIP/2.0/UDP 12.26.17.91:5060
Max-Forwards: 70
To: Bob <sip:bob@biloxi.com>
From: Alice
<sip:alice@atlanta.com;tag=1928301774>
Call-ID: a84b4c76e66710@12.26.17.91
CSeq: 314159 INVITE
Contact: <sip:alice@atlanta.com>
Content-Type: application/sdp
Content-Length: 142
```

Alice expects answer on this IP@, transport Protocol & port

Max-Forwards: 70 ← Max # of proxies can forward the request

Random String Which Identifies The session

Global id for the call

Sequence number

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## SIP message example

Message (13) might look like this:

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP server10.biloxi.com
Via: SIP/2.0/UDP bigbox3.site3.atlanta.com
Via: SIP/2.0/UDP 12.26.17.91:5060
To: Bob <sip:bob@biloxi.com;tag=a6c85cf>
From: Alice <sip:alice@atlanta.com;tag=1928301774>
Call-ID: a84b4c76e66710@12.26.17.91
CSeq: 314159 INVITE
Contact: <sip:bob@biloxi.com>
Content-Type: application/sdp
Content-Length: 131
```

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Figure 3: SIP Presence Example

Eg: Bob was not available.  
Alice issues a SUBSCRIBE  
Message indicating that wants to be  
Informed when Bob is  
available

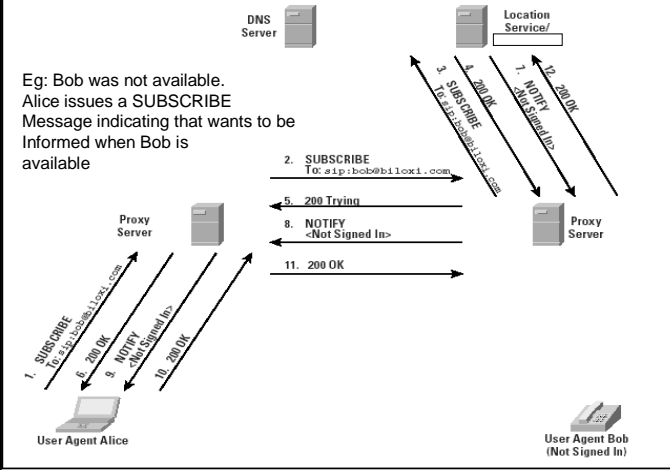
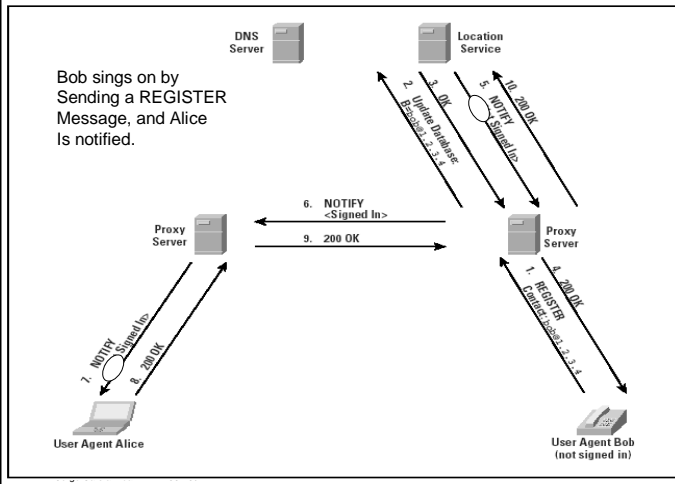
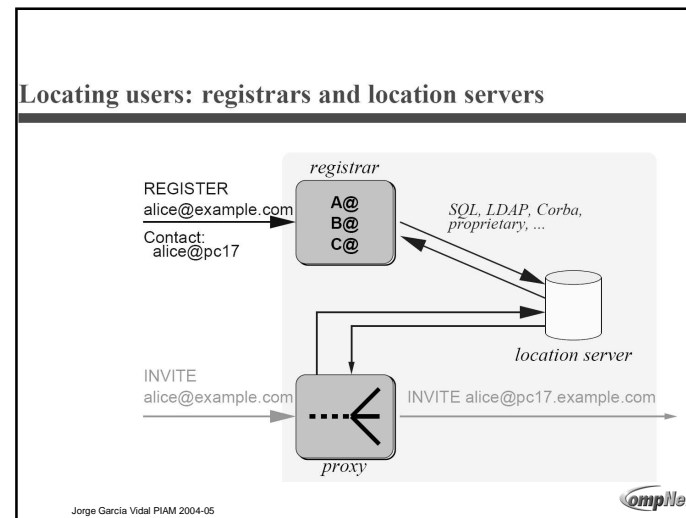


Figure 4: SIP Registration and Notification Example

Bob sings on by  
Sending a REGISTER  
Message, and Alice  
Is notified.



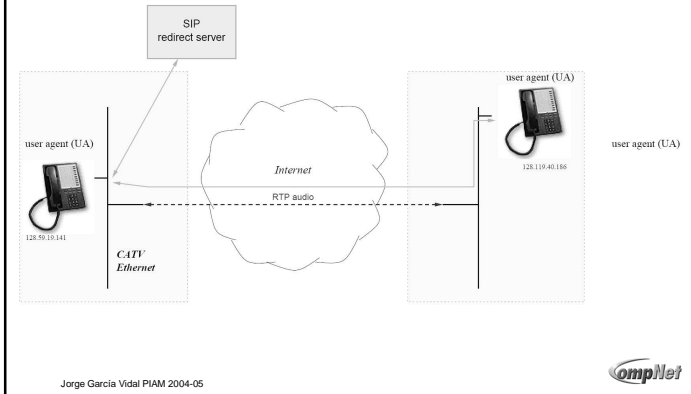
## Locating users: registrars and location servers



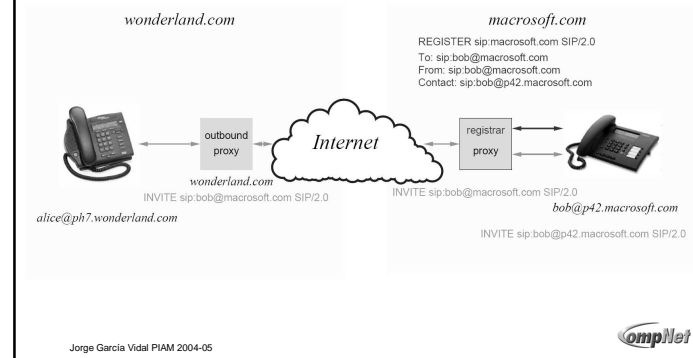
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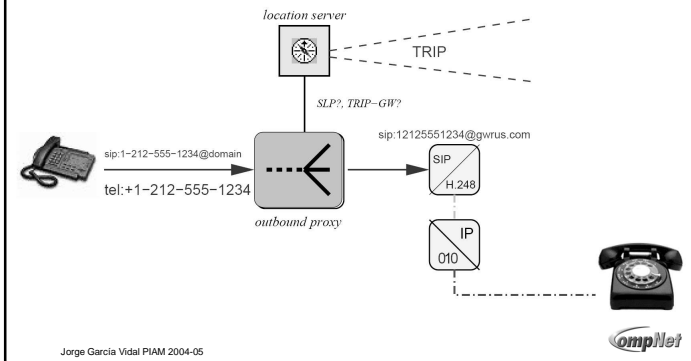
### SIP architecture: peer-to-peer



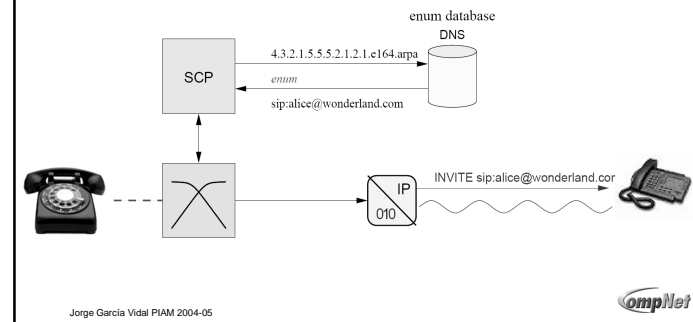
### SIP architecture: outbound proxy



### SIP architecture: VoIP to PSTN



### SIP architecture: PSTN to VoIP



## SIP operation in redirect mode

