The Session Initiation Protocol (SIP) – A Non-Technical Introduction

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Overview

- What is SIP (and not)?

- What is it good for?

- Internet telephony architectures

- SIP products

- Defining SIP

- SIP for VoIP services

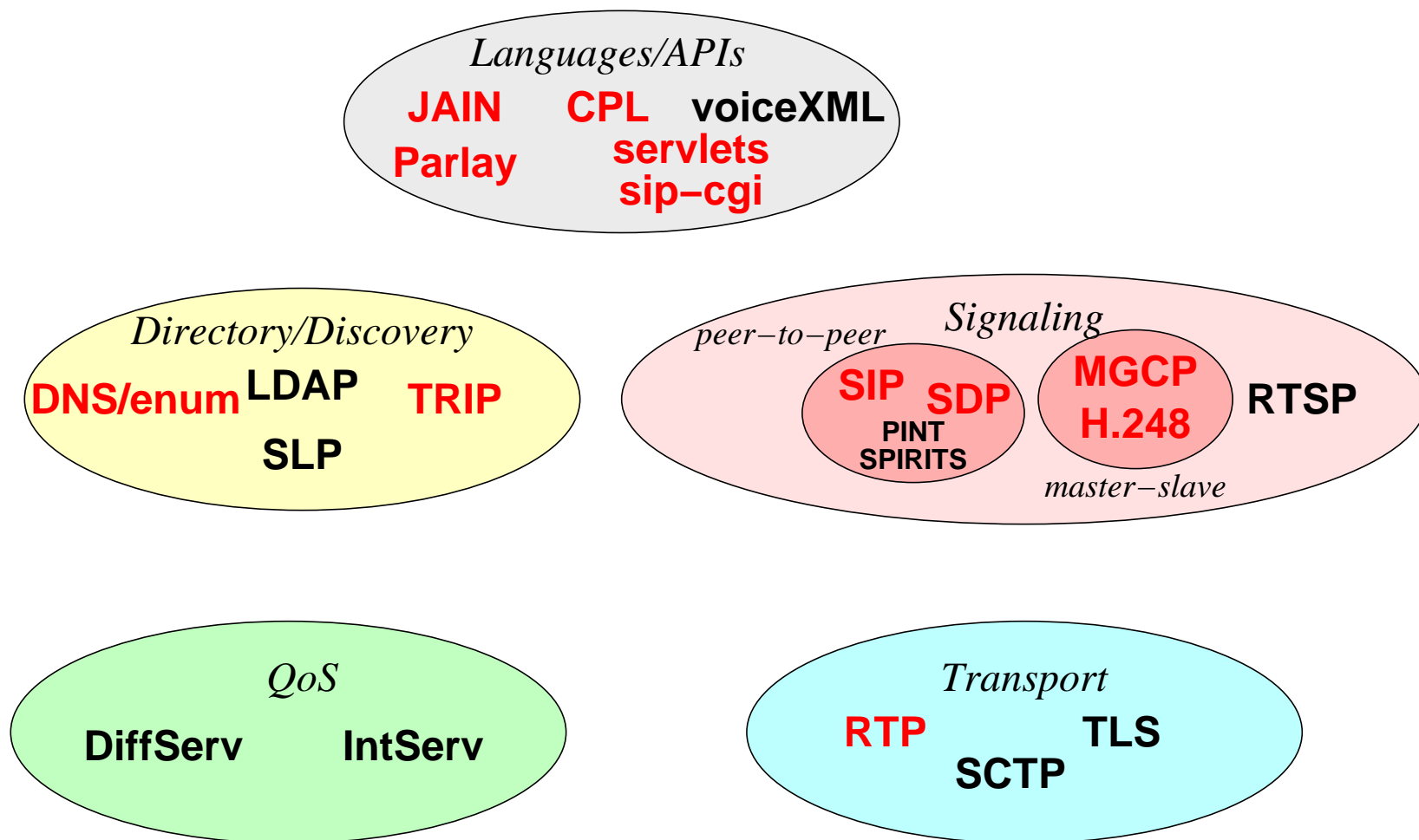- SIP for instant messaging and presence

What is SIP?

- sets up and tears down *sessions*
    - content-neutral: audio, video, shared applications, ...
    - network-neutral: ATM, FR or IP, but mostly IP
- notifies users of *events*: "I'm online", "person entered room", "dishes are done", ...
- sends messages – instant (text) messages ("SMS", "IM"),

How does SIP work?

- protocol similar to HTTP

- uses either UDP or TCP

- uses URLs that identify *logical* destination, not IP address of end system

SIP in the VoIP protocol ecosystem

Languages/APIs
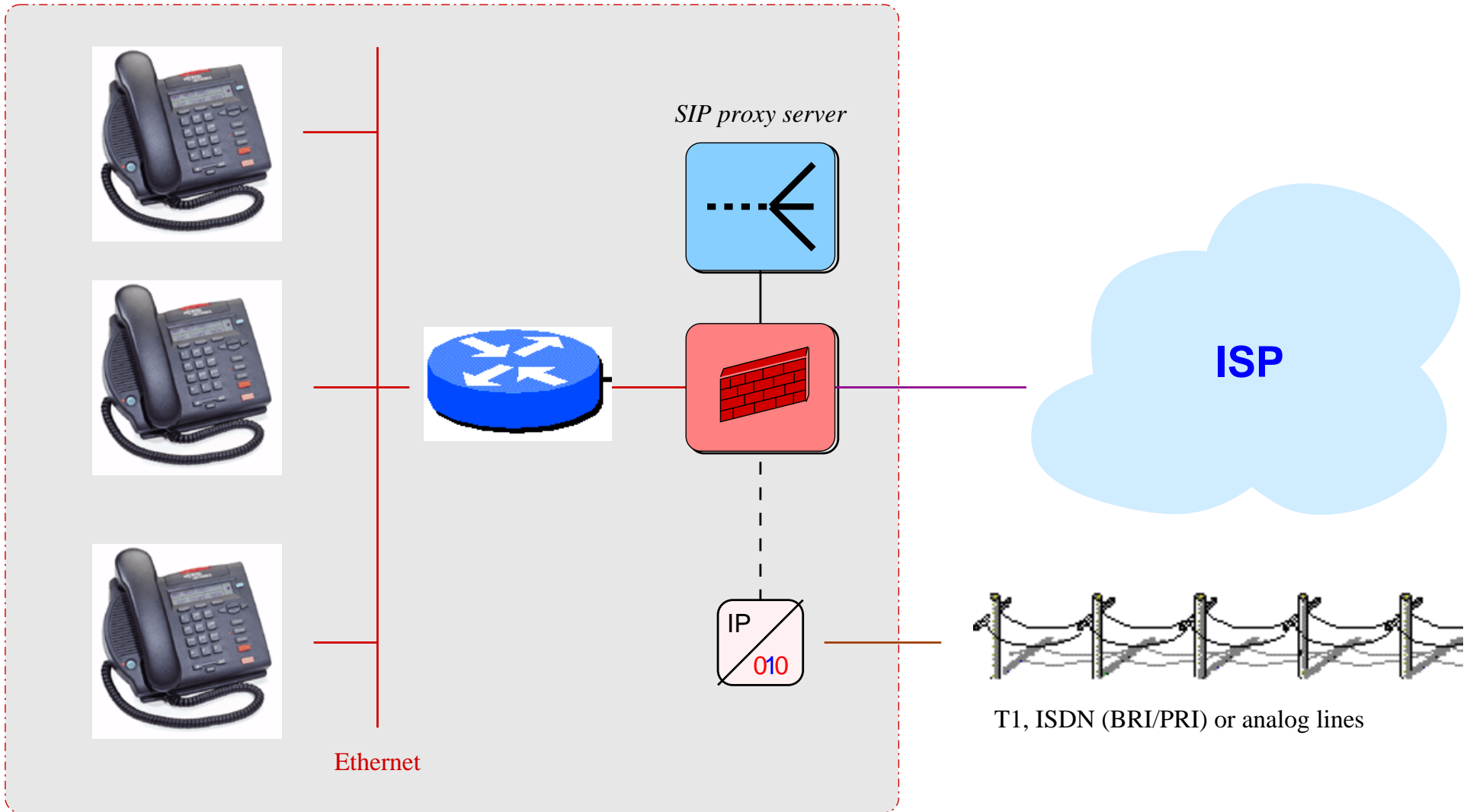
JAIN   **CPL**   **voiceXML**
Parlay   **servlets**
sip−cgi

Directory/Discovery

DNS/enum **LDAP**   **TRIP**
SLP

Signaling

peer−to−peer

SIP **SDP**   **MGCP**
H.248   **RTSP**
PINT
SPIRITS

master−slave

QoS

DiffServ   **IntServ**

Transport

RTP   **TLS**
SCTP

What is it not?

- replacement for the web (HTTP) or email

- media or data transport protocol ⇒ RTP

- conference control protocol ⇒ ?

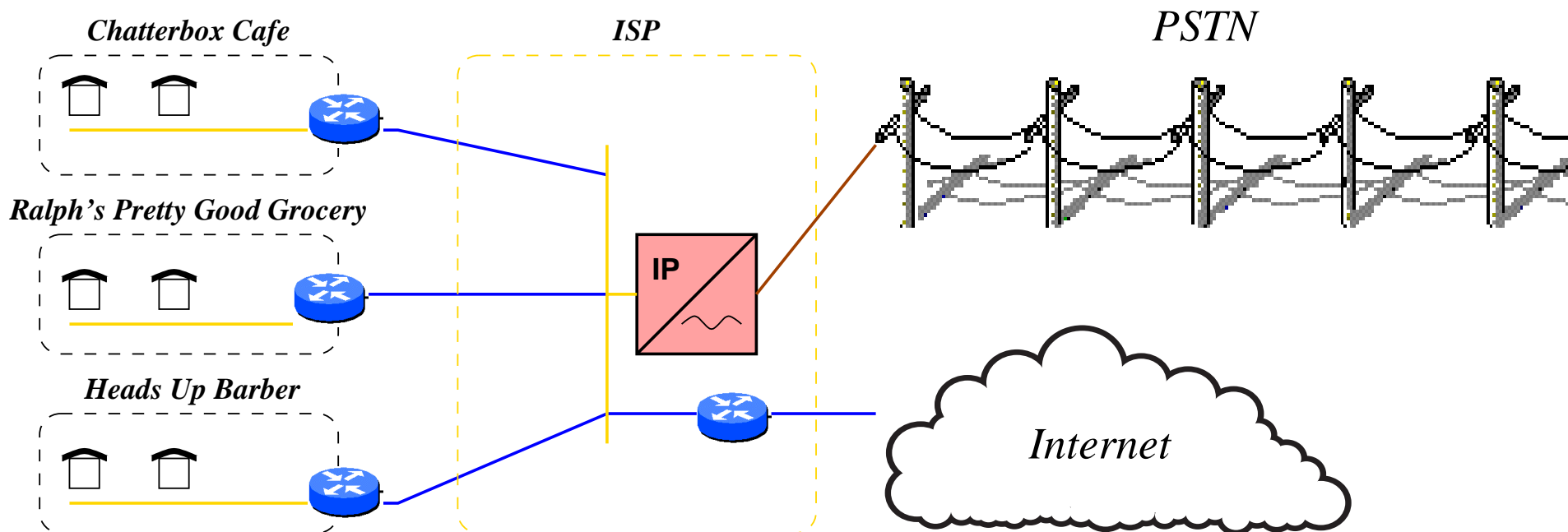- database access protocol ⇒ LDAP, DNS

Internet telephony service models

- Internet "PBX"

- Internet Centrex

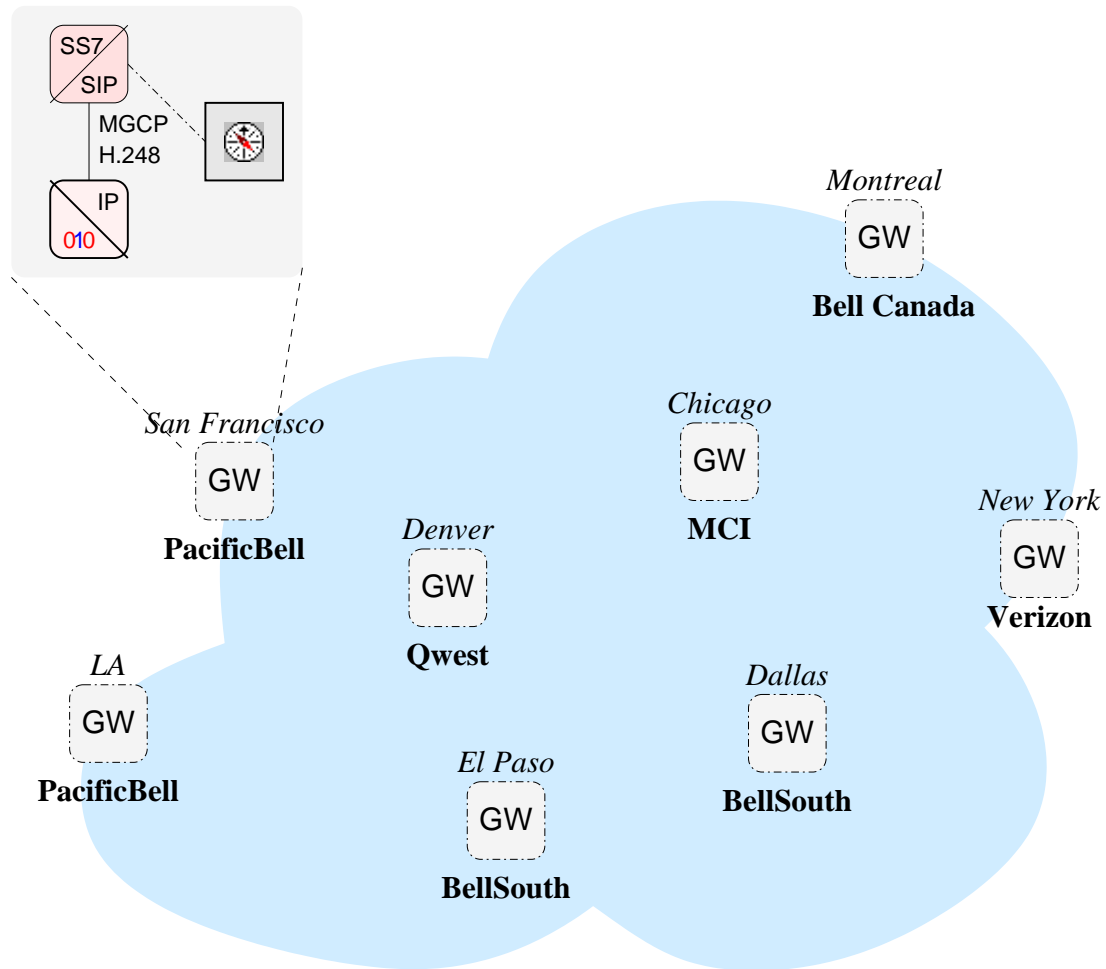- Internet Carrier

➠ same basic equipment, but size of gateway varies

Internet PBX

SIP proxy server

ISP

IP

010

T1, ISDN (BRI/PRI) or analog lines

Ethernet

IP Centrex

Chatterbox Cafe

Ralph's Pretty Good Grocery

Heads Up Barber

ISP

IP

PSTN

Internet

IP Carrier

SS7

SIP

MGCP
H.248

IP

010

Montreal

GW

Bell Canada

Chicago

GW

MCI

New York

GW

Verizon

San Francisco

GW

PacificBell

Denver

GW

Qwest

Dallas

GW

BellSouth

LA

GW

PacificBell

El Paso

GW

BellSouth

What is SIP good for?

- replicate functionality of traditional PSTN services:
  - caller id
  - call forwarding
  - call transfer
  - 800/900# services
  - find me/follow me
  - conference calls

- create new services:
  - Internet integration
  - programmable services
  - multi-destination routing
  - multimedia
  - event notification

New SIP services: Internet integration

- typically, SIP URL $\equiv$ email address, e.g., `sip:joe@net2phone.com` or `tel:+1201-555-1212`

- URLs everywhere:
  - forward calls to email
  - forward calls to web page
  - forward calls to recordings
  - pager, cell phone numbers
  - IM addresses

- SIP messages can contain HTML and other web objects:
  - menu pops up when calling restaurant
  - error messages: "not here, but please choose from . . ."
  - visual caller id – photos of callee

New SIP services: programmable services

- three sources of services:

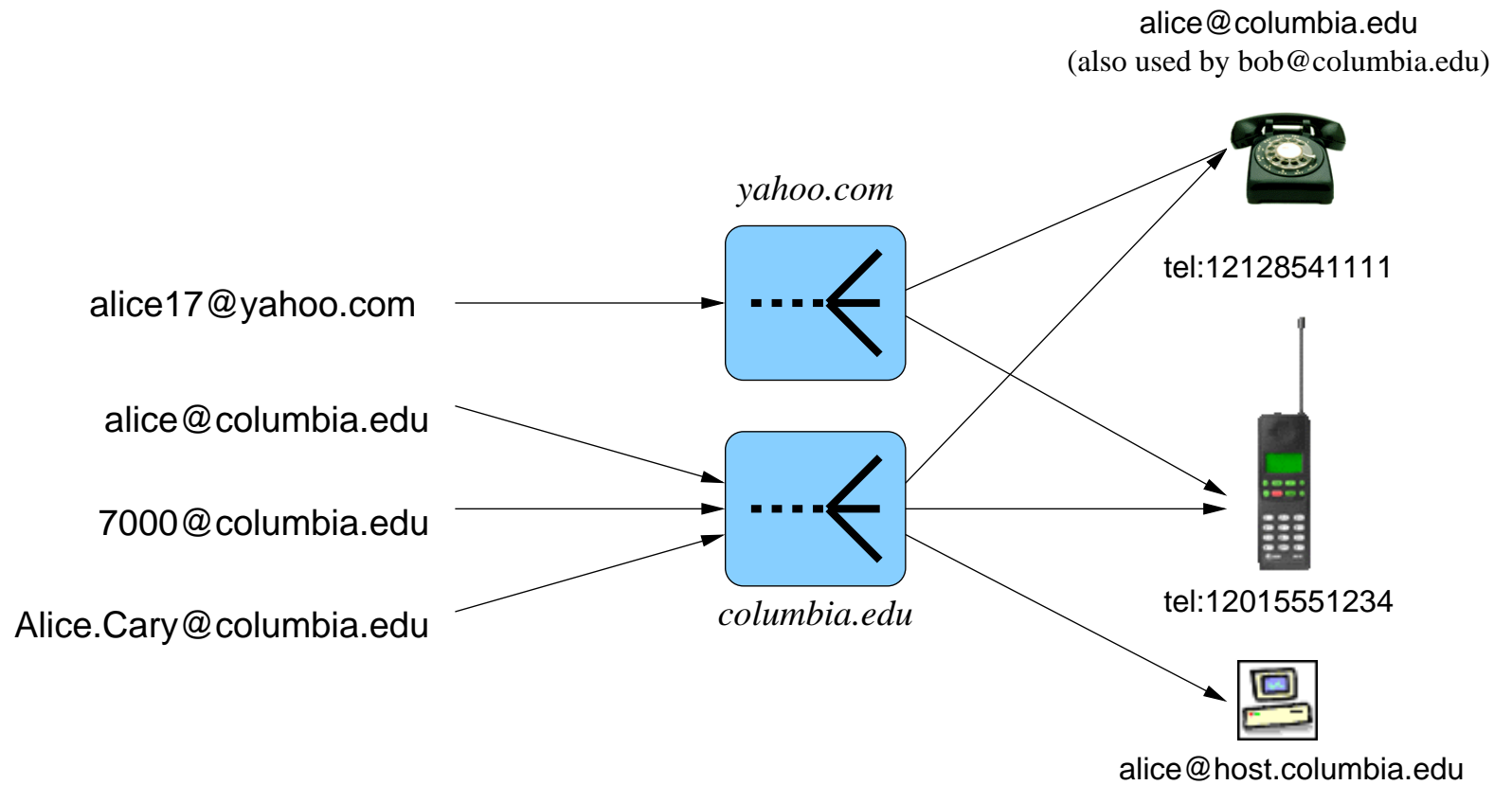   **Vendor:** program into software ⇒ efficient, robust, but long cycles, inflexible

    Service provider: differentiation, vertical markets, but limited set
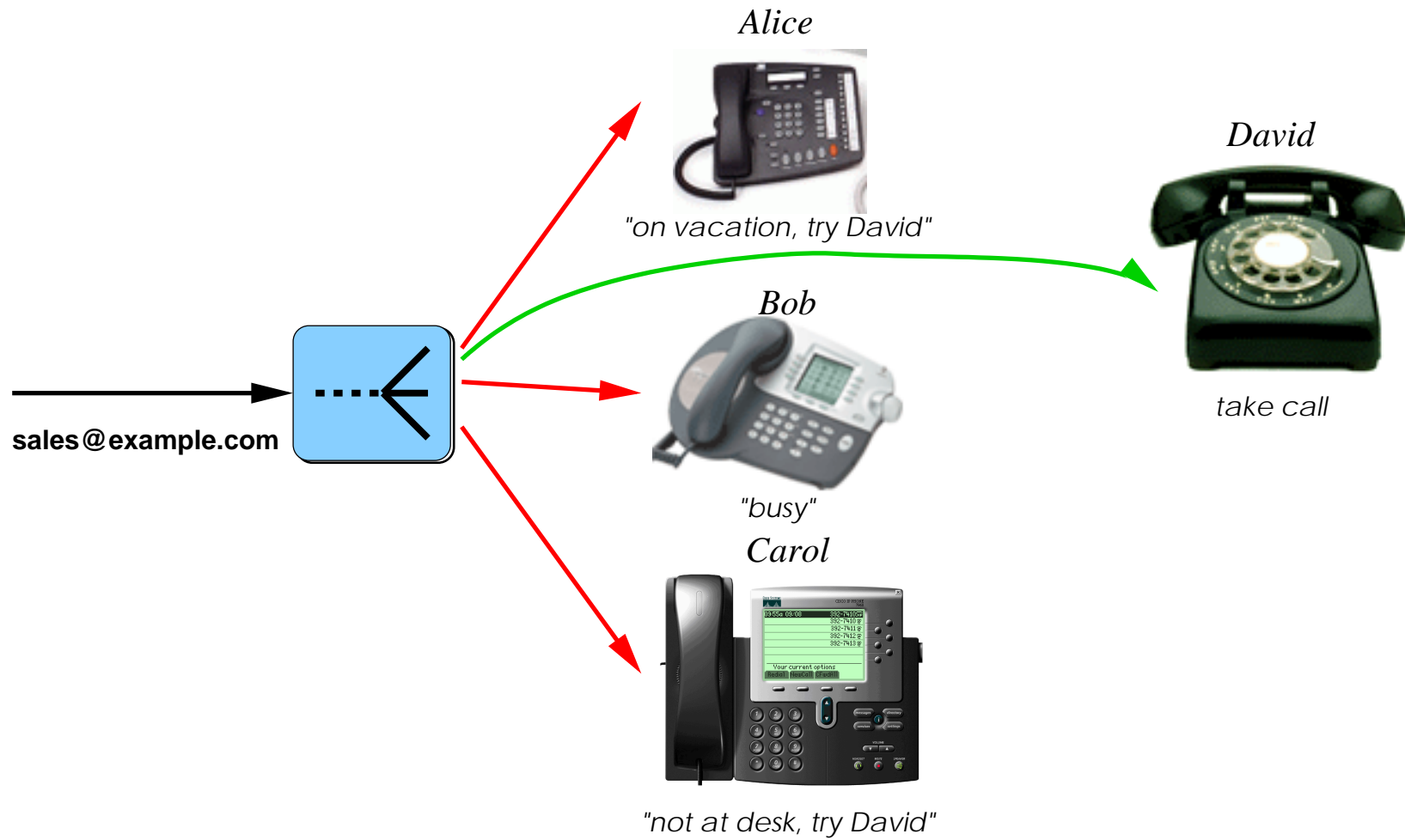
    User: customized and personalized

SIP mobility

terminal   cross-provider

personal   different terminals, same address

service   different terminals, same services

session   move sessions across terminals

SIP personal mobility

alice@columbia.edu
(also used by bob@columbia.edu)

yahoo.com

alice17@yahoo.com

alice@columbia.edu

7000@columbia.edu

Alice.Cary@columbia.edu

columbia.edu

tel:12128541111

tel:12015551234

alice@host.columbia.edu

New SIP services: multi-destination routing

Alice

"on vacation, try David"

David

Bob

take call

sales@example.com

"busy"

Carol

"not at desk, try David"

New SIP services: event notification

- many telecom services are really events:
  - voicemail notification
  - call supervision
  - automated call back
  - call waiting

- generalizes to
  - physical events: "water in basement"
  - communication events: "email has arrived"
  - network events: "print job is done"

What kind of SIP products are emerging?

SIP libraries: for building end systems

SIP "clients": also known as user agents; PC-applications

SIP proxy servers: call routing and applications

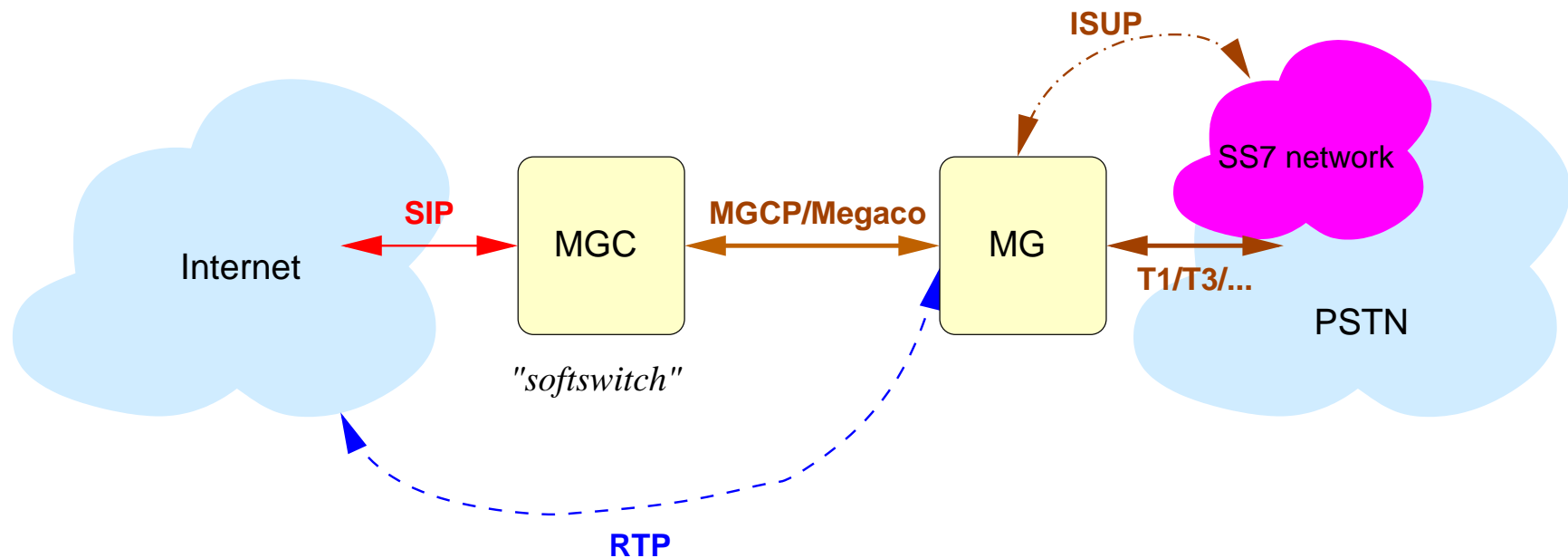**SIP unified messaging servers:** record voice calls

SIP conference servers: multipoint control units

SIP testers: debug applications, load testing

SIP-enabled firewalls: get voice through firewalls

Marketing terms: softswitches

Commonly used in marketing, but pretty vague:

- Software version of class-4/class-5 switch?

- doesn't really "switch" voice

Marketing term: application server

- supports Internet telephony applications

- typically, programmable:
    - APIs, such as JAIN and Parlay
    - Java servlets
    - Call Processing Language

- may be able to initiate calls or just route calls

Partial list of vendors with SIP products

Libraries	UAs	Phones	Proxies	Gateways
3Com	Alcatel	3Com	3Com	Cisco
Columbia U.	Columbia	Cisco	Columbia	Komodo
Data Connection	SIPHON	Pingtel	dynamicsoft	Mediatrix
dynamicsoft	dynamicsoft	Siemens	HP	Nuera
HelloSoft	GMD Fokus	Snom	Hotsip	Sonus Net.
Hughes	HearMe	Way2Call	Indigo	T&S
Indigo	Hotsip		MicroAppl.	UCL
Mediatrix	Indigo		ObjectSoft.	
NIST	MicroAppl.		Sonus Net.	
oSIP	Microsoft		T&S	
RADvision	Motorola		Ubiquity	
Telogy	SIPcomm		Vovida	
Trillium	Sonus Net.			
Ubiquity	Ubiquity			
Vovida	Vovida			

Other SIP products

- network test equipment (protocol analysis, load generation)

- firewalls

- unified messaging

- announcement server

- conference server (mixer)

- instant messaging and presence

- H.323 signaling gateways

SIP-enabled networks

- Chunghwa Telecom, Taipei

- Level 3

- MCI Worldcom

- VONage

Others to follow soon.

Example: Pingtel SIP phone
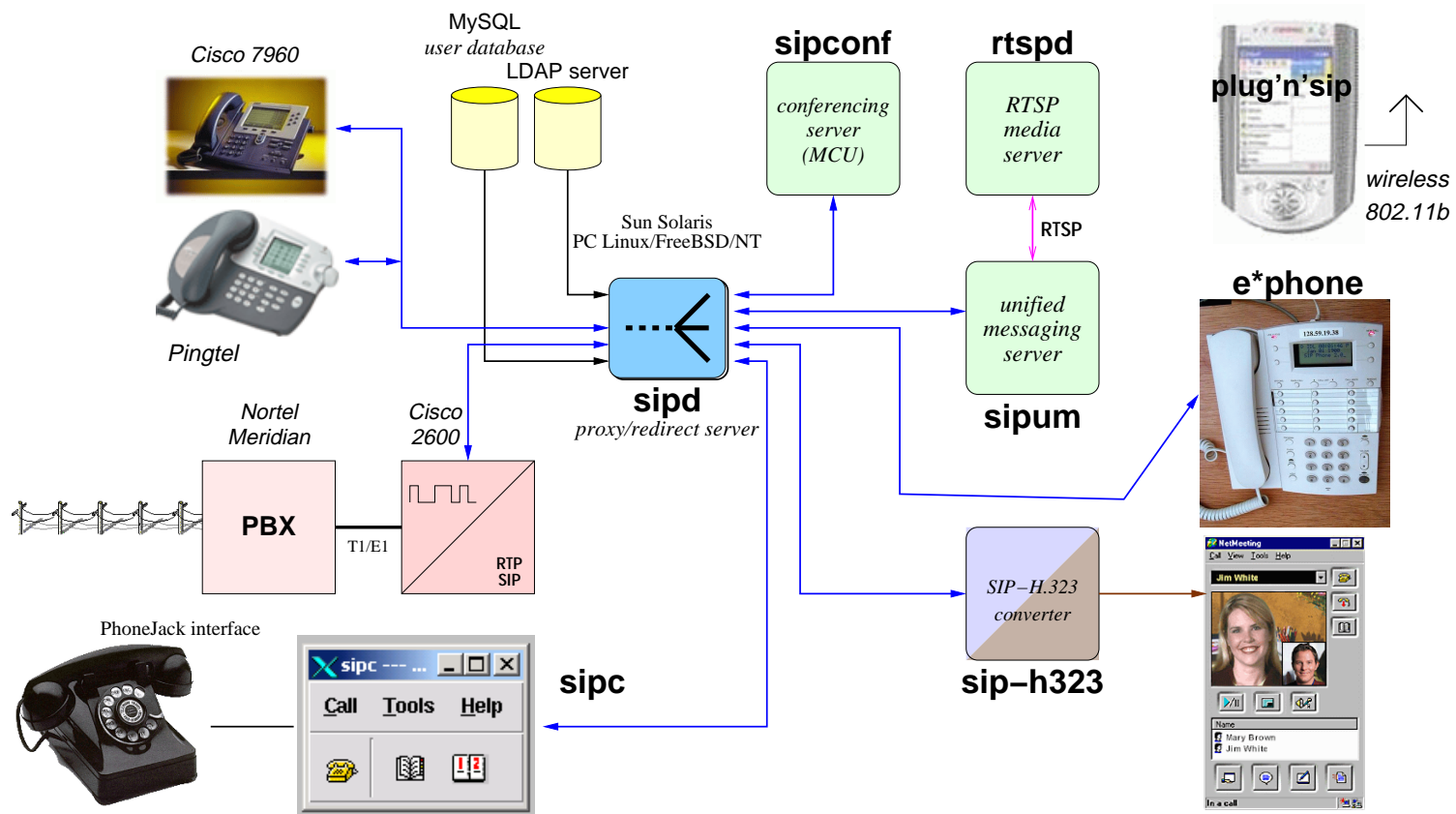
Example: Cisco and 3Com SIP phones

Cisco

3Com ($395 list)

Example: Columbia CS Phone System

Expand existing PBX via IP phones, with transparent connectivity

Cisco 7960

MySQL
user database
LDAP server

sipconf

conferencing
server
(MCU)

rtspd

RTSP
media
server

plug'n'sip

*wireless
802.11b*

Sun Solaris
PC Linux/FreeBSD/NT

RTSP

Pingtel

unified
messaging
server

e*phone

128.59.19.38

sipd
proxy/redirect server

sipum

Nortel
Meridian

Cisco
2600

PBX

T1/E1

RTP
SIP

SIP−H.323
converter

PhoneJack interface

sipc

sip−h323

Status of SIP in the market

- all major manufacturers of telephony-related equipment appear to be working on SIP

- generally, first-generation products

- not yet widely available as consumer products

- but largely interoperable

- use of SIP in Windows XP (MS Messenger) will accelerate uptake

Where is SIP being defined?

IETF (Internet Engineering Task Force)   SIP core and extensions

3GPP (3rd Generation Partnership)   mobile networks (SIP for signaling)

Softswitch Consortium   profiles for soft switches

PacketCable   profiles for cable modems

SIP Forum   evangelism, operational guidelines

IETF involvement

- two primary working groups: SIP and SIPPING

- also, IPtel for telephony routing (TRIP)

- open admission: no corporate membership, only pay for attending meetings

- most work on mailing lists

- meets three times a year (next, London)

- Internet Drafts for ideas – anybody can write one

- RFCs for specification

SIPit – SIP interoperability testing

- gathering of small engineering teams

- bringing products and prototypes

- from companies, research labs and universities

- test interoperability and robustness of SIP-related software and hardware

SIPit Events

Every four months:

#	when	where/host	location
1	April 1999	Columbia University	New York, New York
2	August 1999	Pulver	Melville, New York
3	December 1999	Ericsson	Richardson, Texas
4	April 2000	3Com	Schaumburg (Chicago), Illinois
5	August 2000	Pulver	Melville, New York
6	December 2000	Sylantro/Sun	Santa Clara, California
7	March 2001	ETSI	Cannes, France
8	August 2001	Ubiquity	Cardiff, UK
9	December 2001	Nuera	San Diego, California

SIPit 7 participants

3Com	GMD Fokus	Nokia Mobile Phones
ACACIA	HearMe	Nokia Research
AlliedTelesis K.K.	Hewlett Packard	Nortel Networks
Aspect Communications	Hotsip	Nuera
AudioCodes	Hughes Software Systems	Pingtel
BrixNetworks	Indigo Software	RADCOM
Broadcom	INOVATEL/CEGETEL	RADVision
CCL/ITRI	ipDialog	Samsung
Cisco Systems	Iwatsu America	Scott Tarnoff
CLARENT Corporation	Iwatsu Electric	SIP Communications
Columbia University	LongBoard	Snowshore Networks
CommWorks Corporation	Lucent Technologies	Startek Technologies
Compaq	MailVision	Sunrise Telecom
Comverse	Mediatrix Telecom	Telesoft Technologies
CSELT/Telecom Italia	NetCentrex	Trillium
CUseeMe Networks	Netergy Networks	Ubiquity Software
deltathree	NetNumber.com	VegaStream
dynamicsoft	NexTone Communications	Webley Systems
Ericsson	NIST	Winbond Electronics

For more information…

SIP: http://www.cs.columbia.edu/sip

SDP: http://www.cs.columbia.edu/˜hgs/internet/sdp.html

RTP: http://www.cs.columbia.edu/˜hgs/rtp

Papers: http://www.cs.columbia.edu/IRT