VoIP API 기술

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Contents

- VoIP API Overview
- SIP API drafts
- Survey of Telephony API

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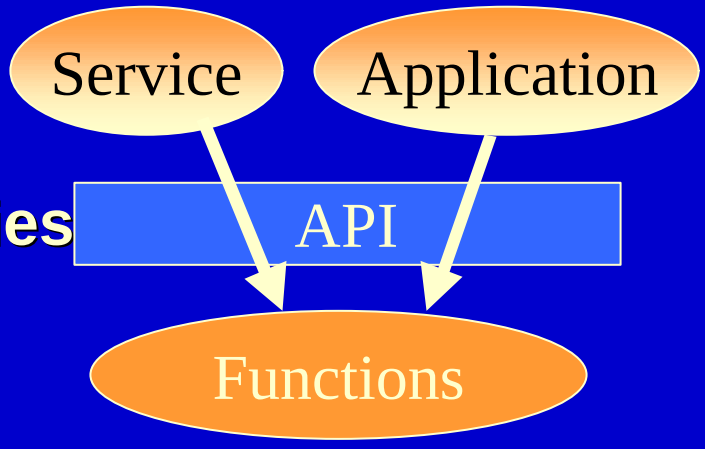
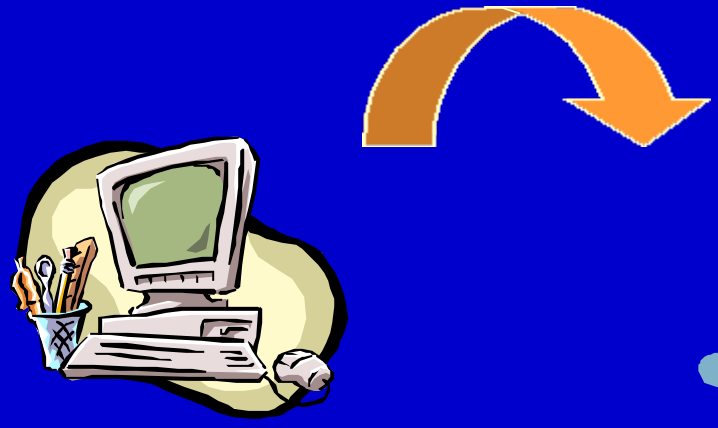
What is API?

- Application Programming Interface
- Library Functions
- API facilitates the development of robust software
- APIs are developed for
  - Programming Language
  - Commercial Software Libraries
  - Operating Systems
  - Device Manufactures



Why use standard APIs?

- Enhance programmer productivity
  - Standard API reduces learning time
- Portability



Design Requirements for API

- General API Requirements
  - Usability
  - Compatibility
  - Extensibility (Type-less Parameters, Common Signatures, Parameter Lists)
  - Flexibility
  - Reliability
  - Scalability
  - Language Interoperability
  - OS Support (Backdoor, Reentrancy, Thread safety)

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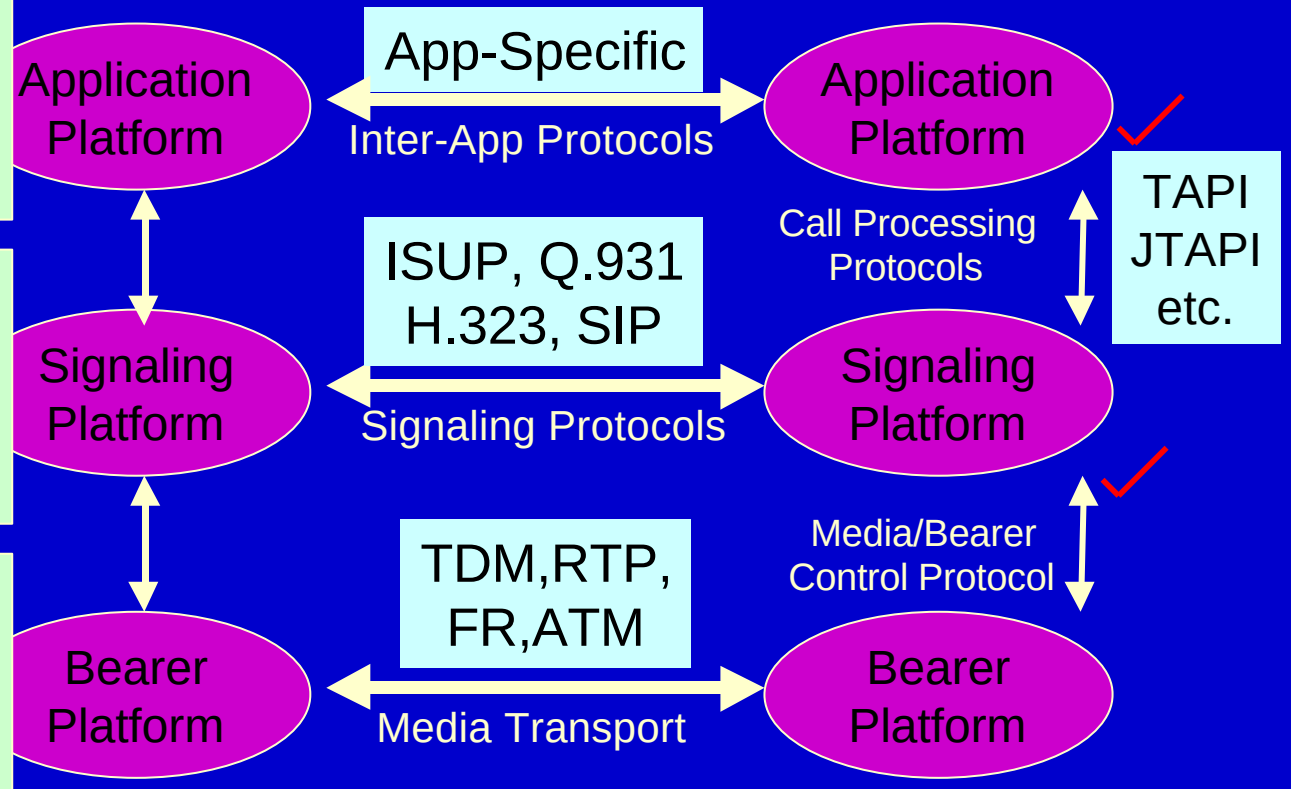
VoIP System

Application Layer
- Call Intelligence
- Service Creation/Execution
- Mgmt of Provisioning

Signaling Layer
- Signaling Processing
- Signaling Conversion
- Resource Mgmt.
- Bearer Control

Media Layer
- Media Processing
- Media Transport
- QoS
- Tones and Announcement



Telephony-specific API Requirements

- Asynchronous Notification
- Interruption and Graceful Termination
- Thread Support
- Integration with other API sets
- Distributed Programming
- Portability of Telephony APIs

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SIP Drafts: API and Programming Environment

- Common Gateway Interface for SIP ✓
- SIP Servlet API Extensions
- Root SIP Servlet
- SIP Servlet Delivery
- SIP and SOAP ✓
- Java enhanced SIP (JES)
- SIP Servlet API ✓
- Java SIP Servlet API Specification
- CPL: A Language for User Control of Internet Telephony Services ✓
- Transporting User Control Information in SIP REGISTER Payloads
- Call Processing Language Framework and Requirements

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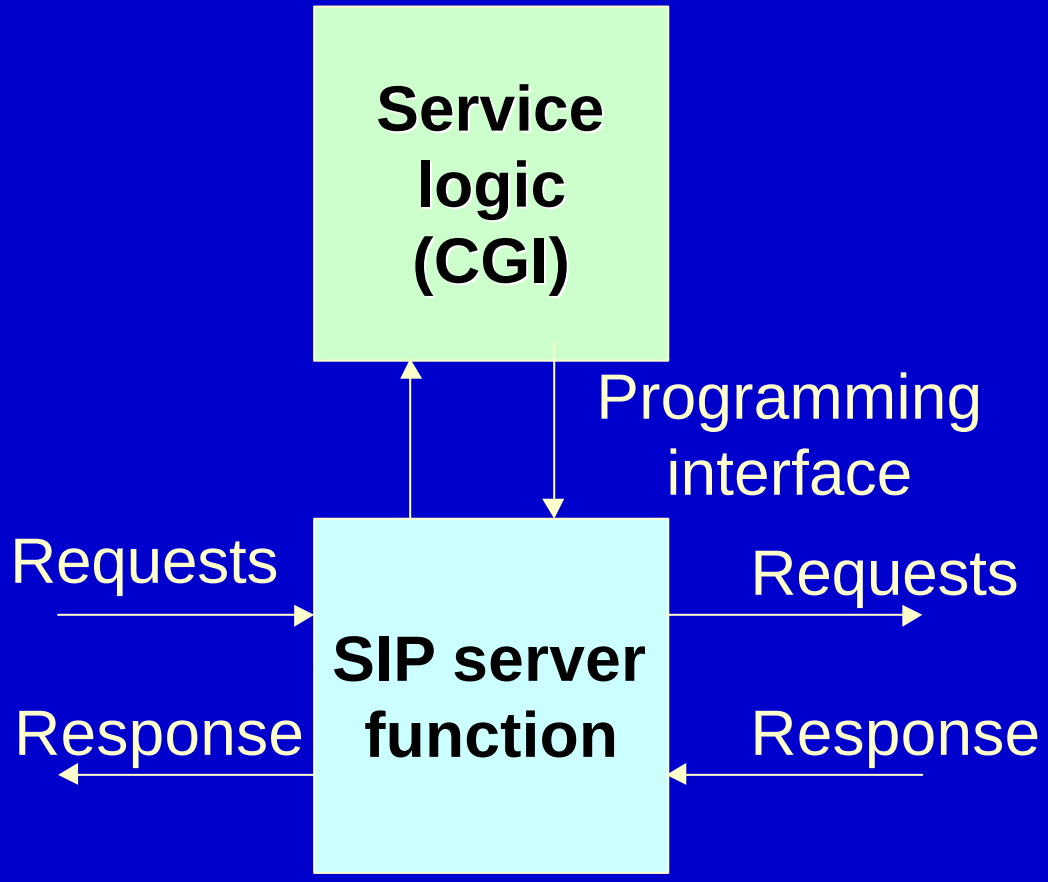
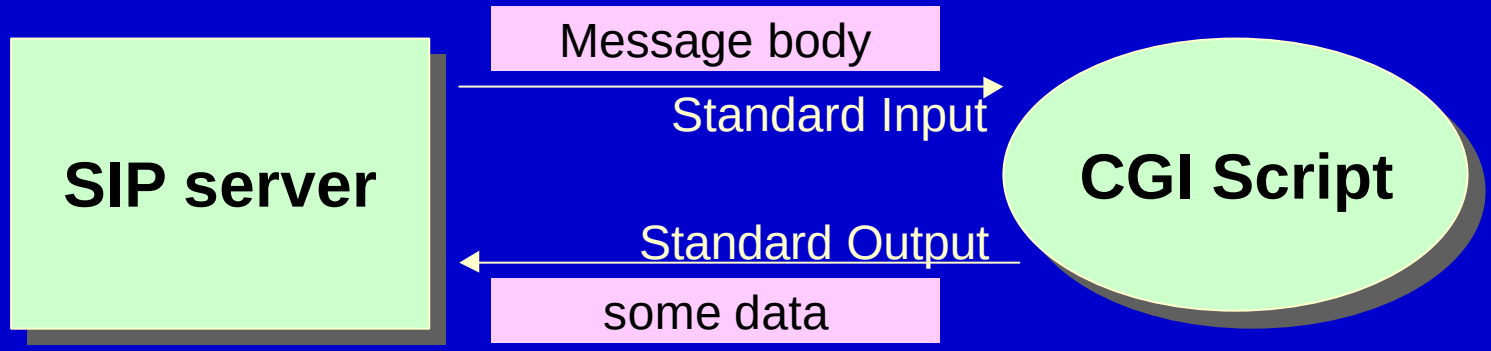
CGI for SIP(1/3)



- **Service logic**
  - **program responsible for creating services**
- **Interface**
  - **between Service logic and SIP server function**

CGI for SIP(2/3)



- **SIP CGI : persistence model**
  - **script can cause request to be proxied**
  - **state token (script cookie)**
- **proxying request, creating new request, generating response**

CGI for SIP(3/3)

```
INVITE sip:astronomer@lab2.university.edu SIP/2.0
Via: SIP/2.0/UDP ganymede.university.edu
Subject: Io's orbit
From: sip:physicist@university.edu
To: sip:astronomer@university.edu
Call-ID: 089y30n0983h2f0@112.34.55.2
CSeq: 1 INVITE
Contact: sip:j.smith@ganymede.university.edu
```

SIP request message

Proxy request to b.jacobs

```
CGI-PROXY-REQUEST sip:b.jacobs@physics.university.edu  SIP/2.0
Contact:
Subject: Earth's rotation
SIP/2.0 180 Ringing
CGI-SCRIPT-COOKIE asd-9unas SIP/2.0
```

Remove 'Contact'

Replace Subject

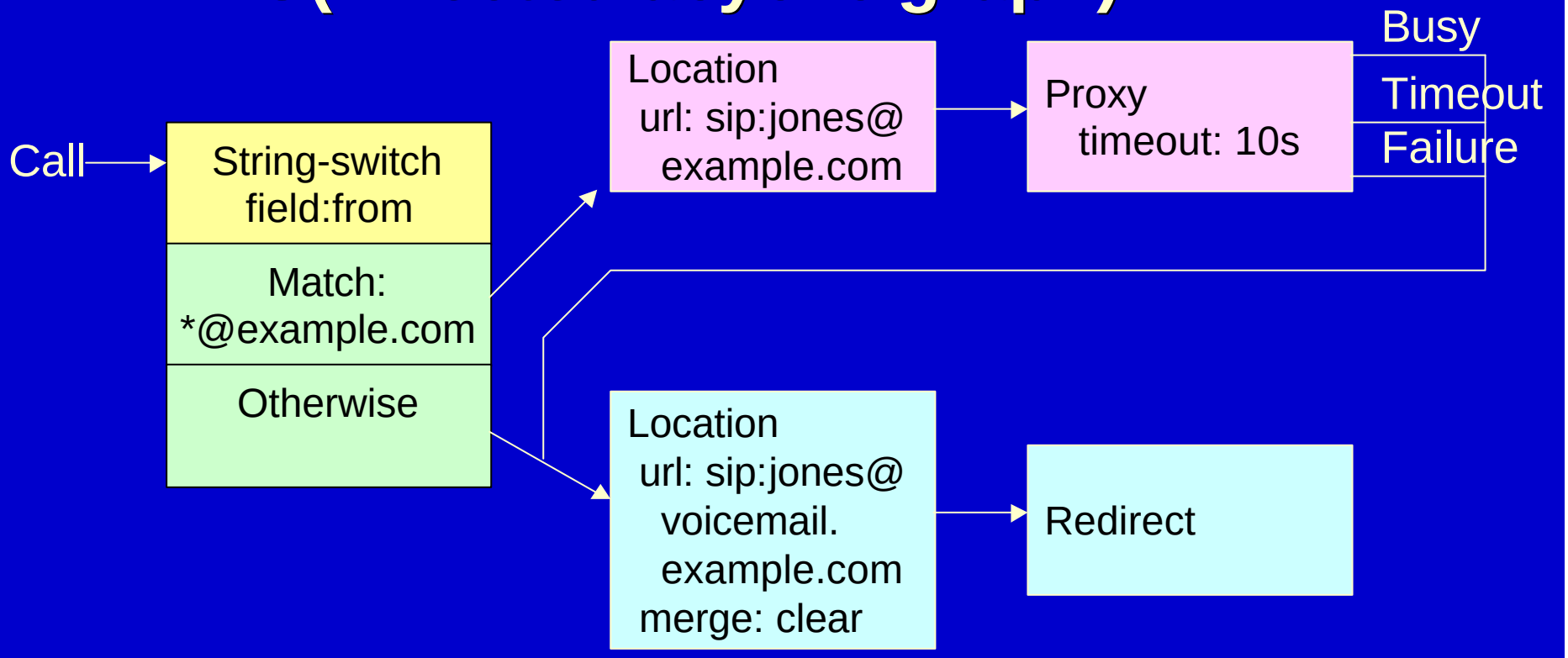
generate ringing response

save Cookie

Script outputs

CPL:DAG

- **DAG(Directed acyclic graph)**



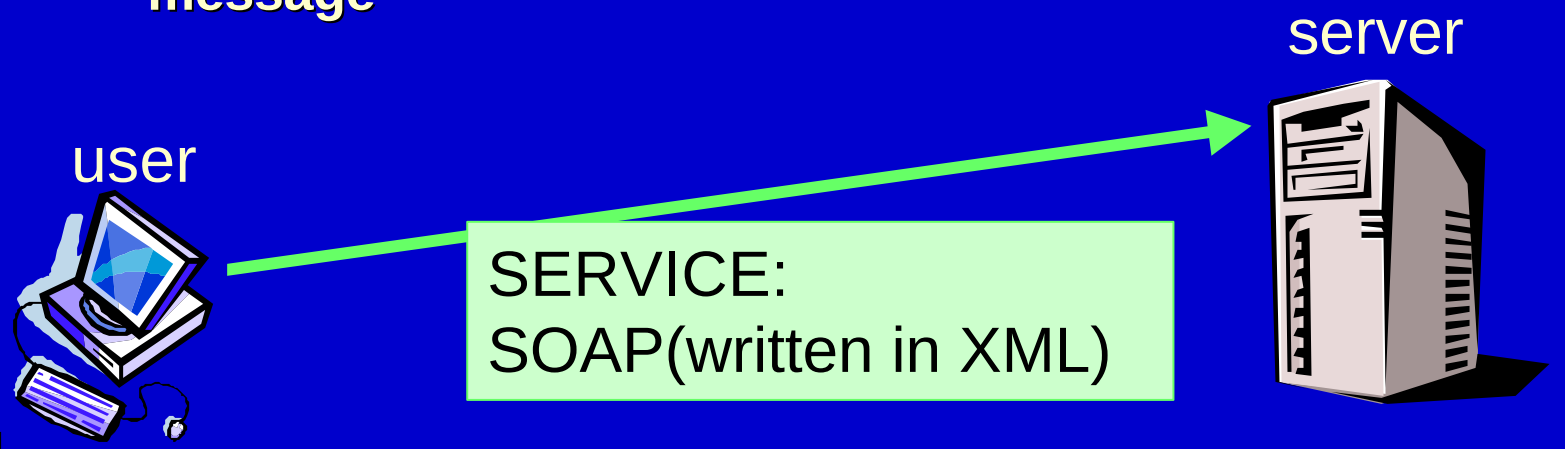
CPL: Language Primitive

- Switch nodes
  - to make decisions future action
- Location nodes
  - indicate where users can be found,
  - either directly or by reference
- Signaling nodes
  - core of the language
  - control behavior of underlying signaling protocol
- Non-Signaling Actions
  - record events or notify user

Using XML

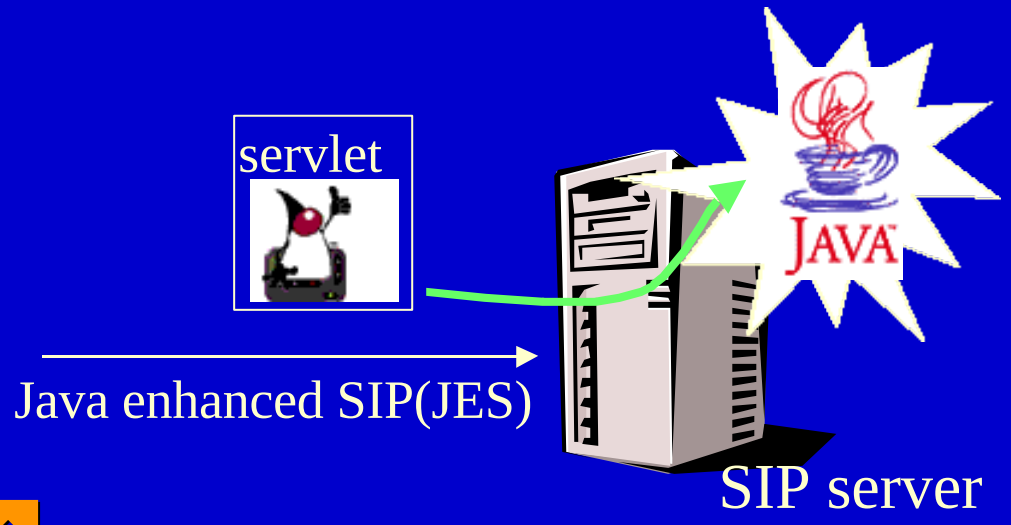
SIP and SOAP

- **“SIP and SOAP draft” provides generic extendable framework: SIP node can request additional service from remote nodes**
- **new Method, “SERVICE”**
  - **can carry SOAP(Simple Object Access Protocol) message**



SIP and Java

- **Java extension API for SIP servers**
- **SIP server can be extended with SIP servlets**
  - **Java program controls the processing of SIP messages**
- **Similar to Web server API servlet**



- SIP Servlet API Extensions
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- SIP and SOAP
- Java enhanced SIP (JES)
- SIP Servlet API
- Java SIP Servlet API Specification

Survey of Telephony API

- ECTF: Enterprise Computing Telephony Forum's
- TAPI: Microsoft's Telephony Application Programming Interface
- TSAPI: Novell and AT&T's Telephony Services Application Programming Interface
- JTAPI: Sun's Java Telephony Application Programming Interface
- JAIN API: Java based
- Parlay API: open, technology independent API

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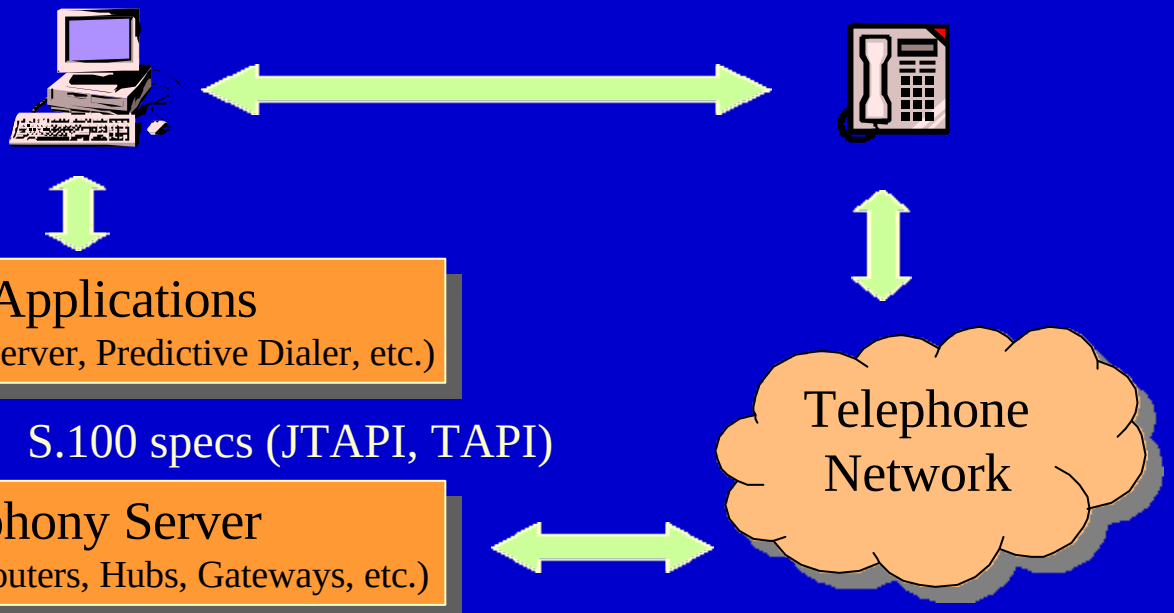
ECTF API(1/2)

- They seek new CTI application
  - Interactive Voice Response
  - Voice Mail
  - Automatic Call Distributors
  - Predictive Dialers
  - Fax-on-Demand
  - Departmental PBX
  - Enterprise PBX
  - Intelligent Conference Bridges
  - Video Dialing
- Requirements: platform independence, software architecture, resource sharing, media extensibility, customization, scalability, modularity(Application independence), fault tolerance, security, performance, configuration

ECTF API(2/2)

- **ECTF Architectural Components**
  - **ECTF Telephony Server – hardware platform providing telephony support for all CTI applications**
  - **CTI application – software applications controls telephony server**



- http://www.ectf.org

Novell and AT&T's TSAPI

- TSAPI only runs Novell networks
- Based on Computer Supported Telephony Applications(CSTA) spec. (European)
- TSAPI Functionality
  - Control Services
  - Switching Functions
  - Status Reporting
  - Snapshot Services
  - CSTA Computing Functions
  - Escape and Maintenance
  - Network Loadable Module(NLM) Interface

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Microsoft's TAPI(1/4)

- for Windows applications and platforms
- support speech and data transmission
- allow functions
  - Connect directly to telephone network from within C/C++ Windows application
  - Dial phone numbers automatically
  - Transmit documents as files, faxes, or email
  - Access data from news and other information services
  - Set up and manage conference calls
  - Receive, store, and sort voice mail
  - Use caller-ID to automate the handling of incoming calls
  - Control operations of a remote computer
  - Compute collaboratively over telephone lines

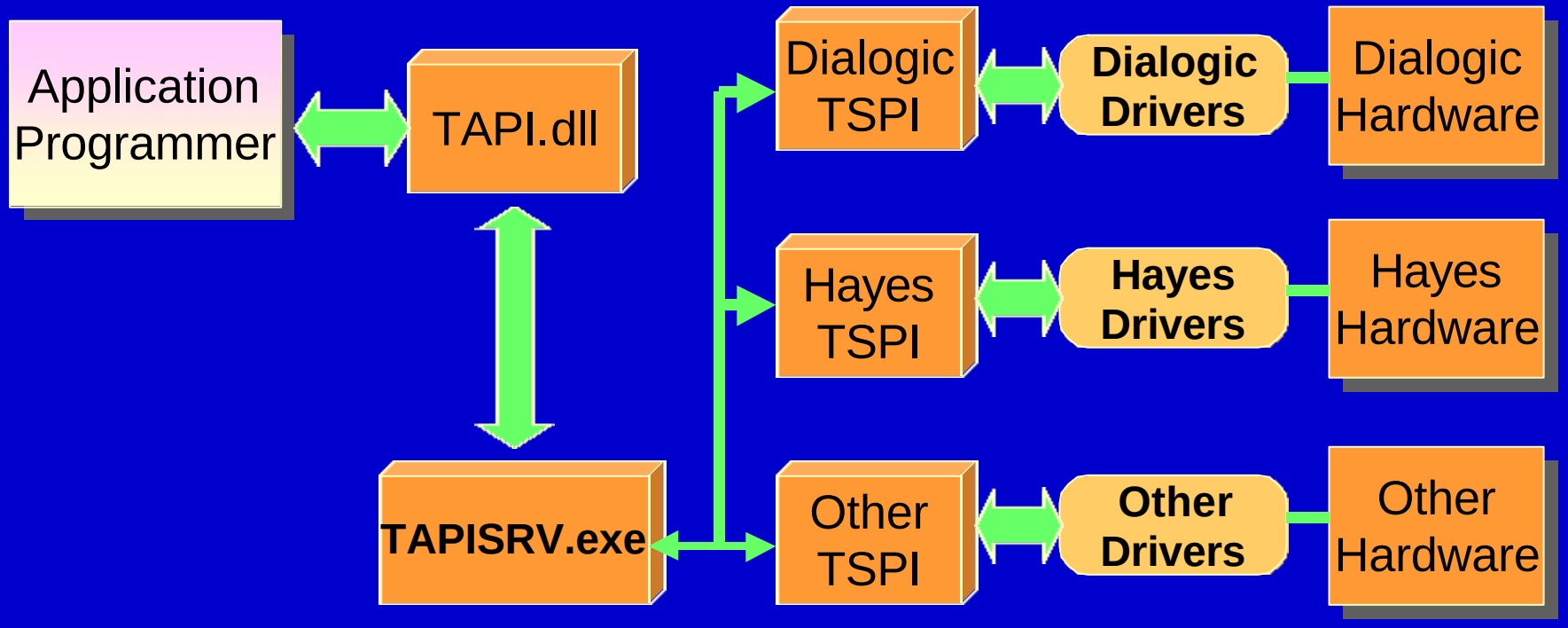
Microsoft's TAPI(2/4)

- **TAPI Components**

Software Component	Function
TAPI32.dll	Application programmer's telephony service interface
TAPISRV.exe	Telephony Server. Translate TAPI calls to vendor TSPI implementations
Vendor-specific drivers	Implement TAPI calls , TSPI interface

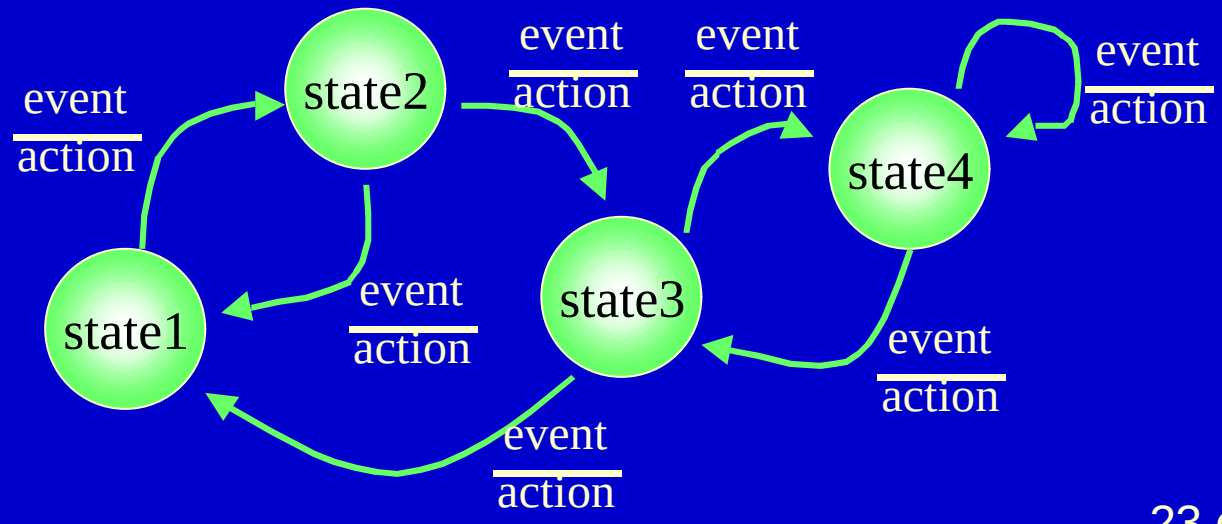
Microsoft's TAPI(3/4)

- **TAPI Component Interaction**



Microsoft's TAPI(4/4)

- TAPI Programming Concepts
  - Call Ownership
    - application own a call, affect state of call
  - Event and Call state Transitions
    - event-driven APIs : best model for telephony programming
    - use finite stat machine : FSM

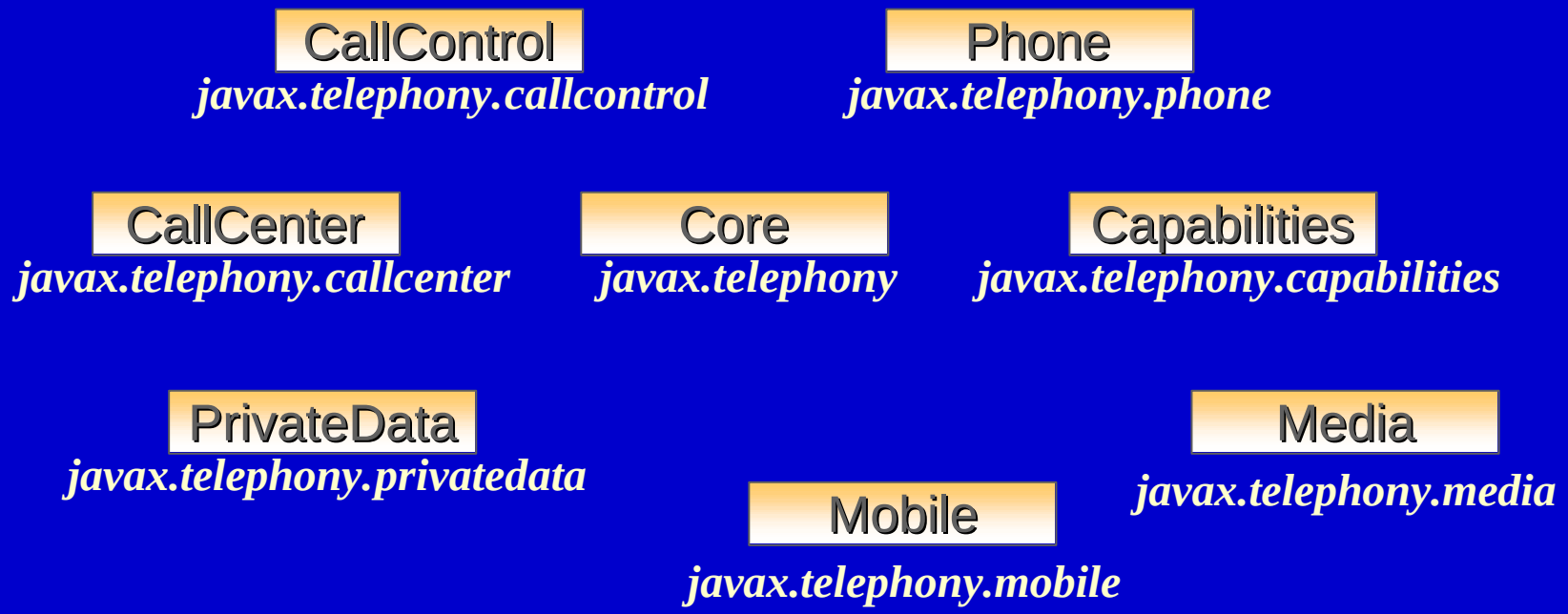


JTAPI (1/4)

- JTAPI supporting
  - call control
  - Telephone Physical Device Control
  - Media Services for Telephony
  - Administrative Services for Telephony
- Tao of JTAPI
  - portability
  - scaleable
  - simple
  - compatible with the C.001 Call Model
  - extensible
  - implementable on existing telephony APIs

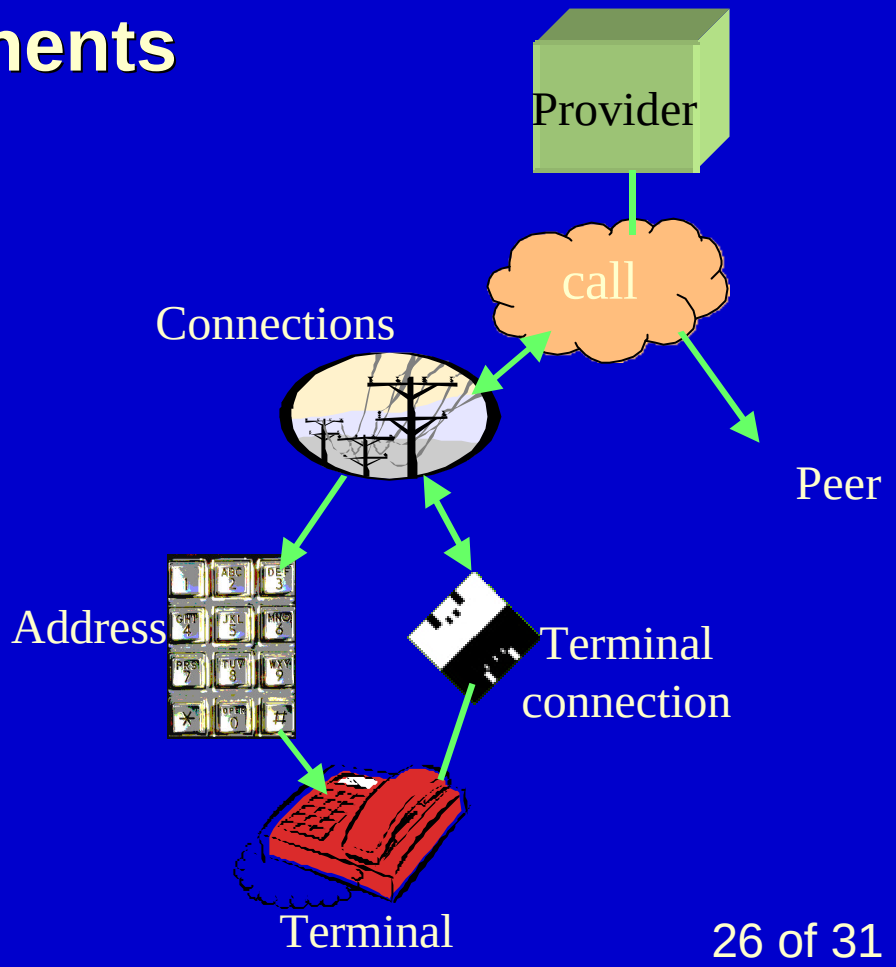
JTAPI (2/4)

- **Java Telephony Package Architecture**



JTAPI (3/4)

- **JTAPI Core Components**
  - JTAPI Core Classes
    - Observables
      - Logical Abstractions
        - Call
        - Address
        - Connection
      - Physical Abstractions
        - Terminal
        - TerminalConnection
    - Observers
      - AddressObserver
      - CallObserver
      - TerminalObserver
      - ProviderObserver
    - Peers
      - Provider
      - JTAPIPeer
      - JTAPIPeerFactory



JTAPI (4/4)

- **Construction of JTAPI Library**

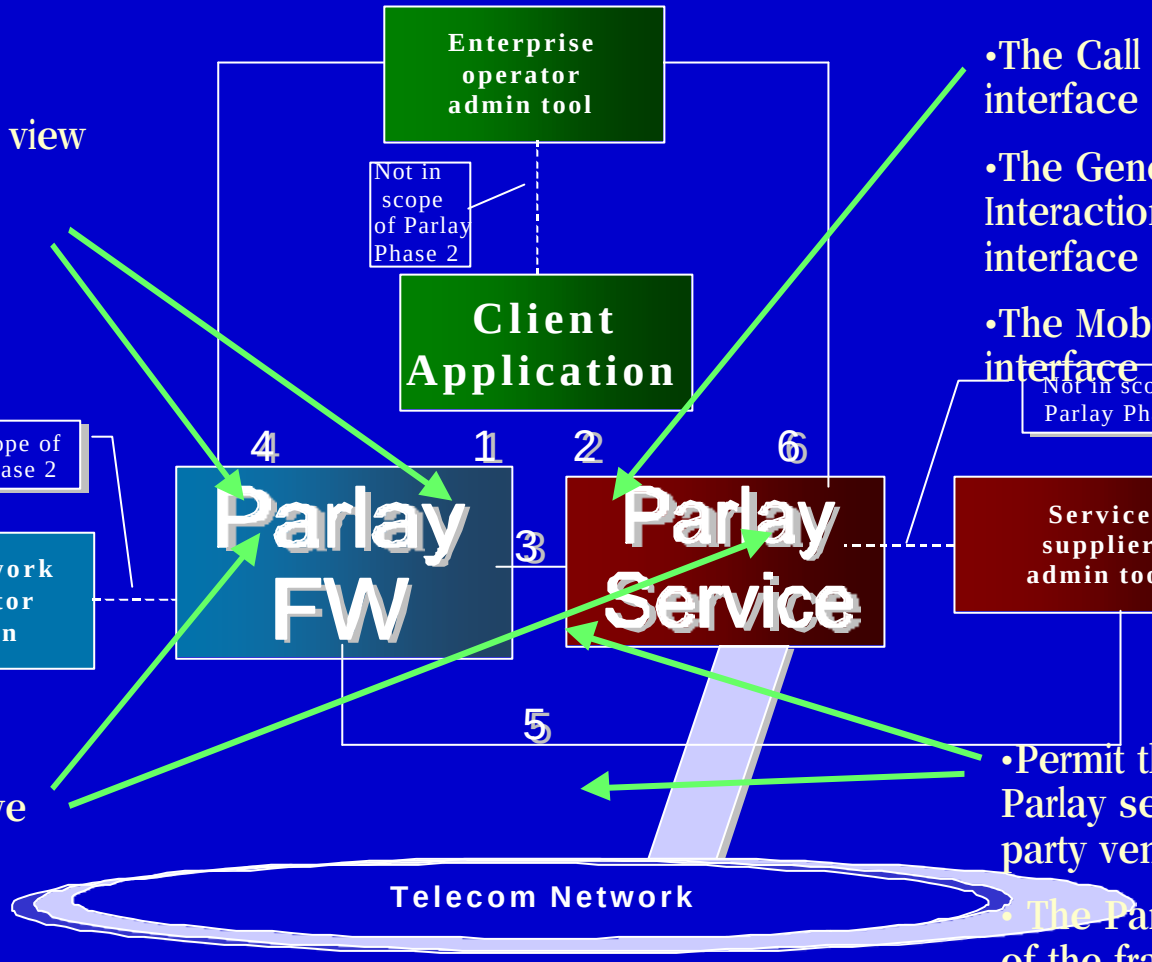
Subprogram Identification	Data Mapping	Encapsulation	Wrapping
•which JTAPI method •which library function	•which parameters, return value •which transient data	•Encapsulate all library function call into code module(C/C++) •Compile it into platform library(DLL)	•wrap code into Java native method •wrap it into application API

- This process is repeated for every method in the application API requiring a native mapping

Parlay API(1/2)

- **Intimately link IT applications with the capabilities of the communications world**
- **Open, technology independent Application Programming Interfaces (APIs)**
  - –enable IT companies, ASPs, ISVs, Internet Companies, E-Business Companies, software creators, service bureaus, and large and small enterprises as well as network providers, network equipment vendors and application suppliers to develop applications across multiple networks

Parlay API(2/2)



•The client application view of the framework

•Support administrative functions within the enterprise

•The Call Control service interface

•The Generic User Interaction service interface

•The Mobility service interface

•Permit the supply of Parlay services by third party vendors

• The Parlay service view of the framework

JAIN API

- a set of Java technology based APIs
  - enable the rapid development of Next Generation telecom products and services on the Java platform
  - bring service portability, convergence, and secure network access to telephony and data networks
  - integration of IP and IN
- a community extension to the Java Platform
- Two Area : Protocol API Spec, Application API Spec.

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