SIP in the Real World

- Some Regulatory Issues
- Interworking & Service Creation ✓
- NATs / Firewalls ✓
- Devices & Configuration
- Interoperability
- Deployments

Regulatory Issues

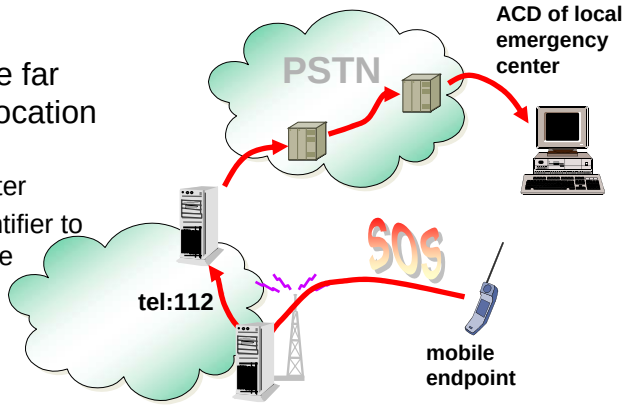
- Public telephony networks must fulfill certain functions
  - Legal interception
  - Prohibit abuse or malicious use
  - Availability for disaster recovery
  - → Need feature transparency in hybrid networks

e.g.: E.106, GETS, GTPS

- Multilevel Priorization (MLP)
  - Increase probability for call-setup on overloaded networks
    ISUP IAM precedence parameters and calling party category
    → Resource-Priority: header in SIP
  - Avoid abuse
    → authentication and authorization
- Preemption
  - Make resources available for high-priority traffic
    (release existing resource reservations if necessary)
  - Legal issues in many countries

Emergency Calls on one Slide

- Emergency calls for individuals
  - No calling party categorization
  - Geographic location of caller
  - Prohibit abuse: authentication, no CLIR possible
  - Need to respect privacy
- Access network may be far away from endpoint's location
  - Find geographically nearest emergency center
  - Map symbolic SOS-identifier to suitable emergency code
  - Add geographic info



SIP Devices

Sample SIP Phone Functionality

- Somewhat resemble a phone
  - More or less futuristic design
  - Two-line to color graphics display
  - Sometimes line power
- Basic SIP functionality
  - Registrations, voice calls (G.711, G.729, G.723, …)
- Expected “supplementary services”
  - Address book, short dials
  - Several “lines”, speaker
  - Call hold, call transfer, conferencing, …
  - N-way conferencing for a few participants (local mixing)
- Some kind of CTI support
  - APIs, 3rd party call control, …
- HTTP server for manual user configuration
- Sometimes web browsers
- Autoconfiguration: DHCP, (t)ftp, …

Autoconfiguration / Administration

- Key to large scale SIP deployments in enterprises
- Key to real plug & play products & broad deployment
- Aspects include
  - IP layer management
  - User and Device Profile Management
  - Software updates
- SIP Device Config Framework
  - Locate profile provisioning server
  - Register (authenticate) and retrieve user / device profiles
  - Receive notification of updates to profiles
- SIP Device Requirements
  - Collects expected functionality and behavior
  - Users, service providers, network admins, manufacturers, integrators
  - Representation of configuration data

Device Configuration Framework (1)

- Five functional steps
  - Discovery of a profile delivery server
  - Enrollment with the profile delivery server
    - Providing identity (+ credentials)
  - Profile retrieval
  - Profile change notification
    - Due to admin activity or after user-initiated changes to the profile
  - Upload of updated profile (from the device to the server)
- Data model: clear separation of several profiles
  - Device
  - Local Network
  - User
  - Application

Device Configuration Framework (2)

- Sample operation: provisioning a home device
- User plugs in the device (or installs the software)
  - Device performs DHCP autoconfiguration
  - Tries to obtain local network configuration parameters (unsuccessful)
- Device prompts the user for device profile delivery “server”
  - Sets up TLS connection, validates server certificate
  - SUBSCRIBEs to profile
  - Retrieves pointer to profile based upon device id (HTTPS URI)
    - Uses e.g., MAC address, UUID, … for identification
- Prompts the user for “username” and password”
  - Open TLS connection to delivery and performs HTTP GET
    - Using the credentials supplied before for digest authentication
  - Profile may contain information about user and application profiles

Device Configuration Protocols

- Initial auto-configuration: finding the “local network” profile server
  - DHCP may provide SIP server options
  - DHCP provides DNS information (server, domain)
  - Use SIP server (DNS SRV) lookup for local domain
  - Use DNS A record lookup for “sipuaconfig.domain”
  - Fallback: manual user entry
- SIP SUBSCRIBE / NOTIFY
  - To retrieve (pointers to) profiles and obtain change notifications
  - Event package “ua-profile”
  - Event parameters: profile-type, (vendor, model, version), effective-by, document (for use with XCAP) network-user, auid
  - Use of content indirection (with FTP, HTTP(S), LDAP, XCAP, …)
  - Configuration body / content not specified by framework
- XCAP for manipulating profiles
  - User or admin

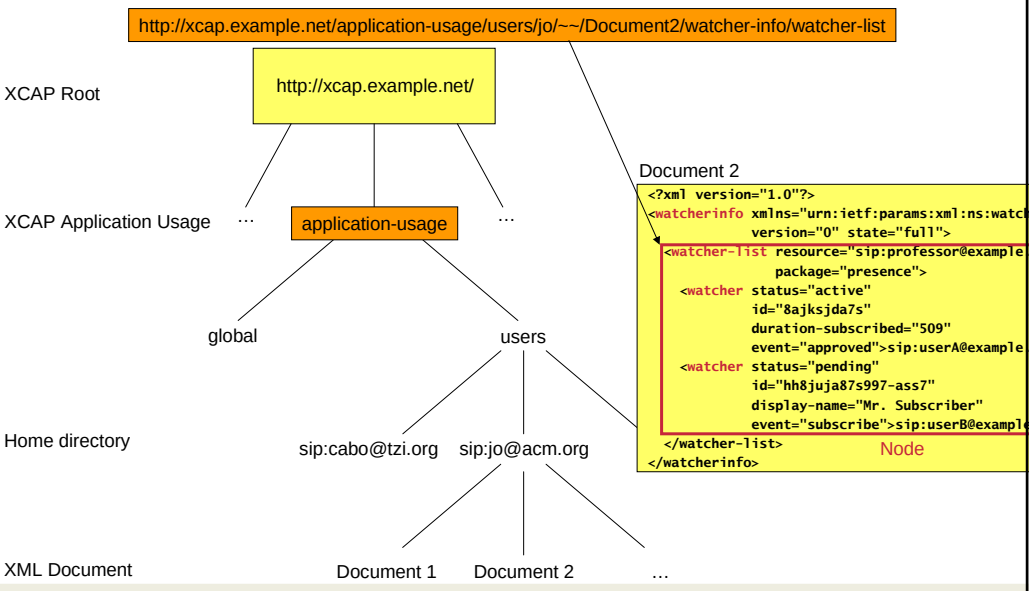
XML Configuration Access Protocol (XCAP)

- Manipulate resources represented as XML documents

```
<?xml version="1.0"?>
<watcherinfo xmlns="urn:ietf:params:xml:ns:watcherinfo"
             version="0" state="full">
  <watcher-list resource="sip:professor@example.net"
                package="presence">
    <watcher status="active"
             id="8ajksjda7s"
             duration-subscribed="509"
             event="approved">sip:userA@example.net</watcher>
    <watcher status="pending"
             id="hh8juja87s997-ass7"
             display-name="Mr. Subscriber"
             event="subscribe">sip:userB@example.org</watcher>
  </watcher-list>
</watcherinfo>
```

- Variety of application areas
  - Configuration of devices, presence and other policies, …
- Definition in a generic fashion

XCAP Document View



XCAP Operations

- HTTP as underlying transport protocol
  - PUT, GET, DELETE + message bodies
  - Selectors in URI to choose resources to operate on
    - Select a node by a URI (XPath): watcher-info/watcher-list
    - Select a node out of several ones in a list by index: watcher-info/watcher-list/watcher[1]
    - Select a (set of) nodes(s) by attribute matching: watcher-info/watcher-list/watcher[@id=…]
- Some XCAP Operations
  - Defined on a complete document, element, or attribute
  - Create/replace: PUT
  - Retrieve: GET
  - Delete: DELETE
- Support diff representation
- Application usages for: resource lists, policies, PIDF, config, …

Device Configuration Data Sets

- Profile data set framework
  - XML-based container for data sets, namespaces
  - Rules for merging information from different sources
- SIP Configuration
  - Transport protocols, outbound proxies
  - SIP methods and option tags
    - Enable and disable UA features
- SIP UA Identity
  - AoR, registration configuration, q value, realms & credentials
- “VoIP” Features
  - Configure message waiting indication, call waiting, call transfer
  - Provide “digit maps” for dialing (incl. emergency number identification)

Some SIP Phones

Some (S)IP WLAN phones

SIP Interoperability Tests

- 20 interop evens held so far (#21 held recently)
- "Definition" of a SiPit event:
  - Informal gathering of engineers
  - To test interoperability and robustness
  - Of products and prototypes
  - With on-site debugging
- Goals: improve implementations and specs
- Tests: Peer to peer and in groups
- Test classification
  - Basic and Intermediate SIP capabilities for UAs
  - Advanced SIP capabilities for Proxies
  - Test scenarios
- Preparation
  - Documentation: Torture tests, call flows
  - Tools: Free / cheap implementations, servers, …

SIP Deployments

- Adopted by many IP Telephony Service Providers (ITSPs)
  - Check out search at http://www.myvoipprovider.com/index.php
- Embraced by PBX manufacturers
  - Siemens, Alcatel, Ericsson, …
  - Open source: http://www.asterisk.org/

Standards bodies

- Some profiled or adapted us of SIP, typically for provider protection
  - Typically trying to prevent end-to-end services and “hold the customer hostage”
- 3GPP, 3GPP2
  - SIP-based Internet Multimedia Subsystem (IMS) for Release 5 and 6
- ETSI TISPAN
  - Trying to apply the 3GPP architecture to the fixed “next generation network”
- CableLabs
  - Similar ideas to the above

Some SIP Software

- Nice product overview at http://www.iptel.org/info/products/
  - Servers
  - Softphones and hardware SIP phones
  - Gateways
  - Stacks
  - And much more
- Some SIP pieces to play with
  - SIP Express Router (SER) at http://www.iptel.org/
  - kphone for Linux at http://www.wirlab.net/kphone/
  - Misc stuff at http://www.sipfoundry.org/
- SIP using peer-to-peer technology: http://www.p2psip.org/

Closing Thoughts

- SIP is modular, extensible, and operates end-to-end
  - Empowers end users and devices
  - Enables distributed service creation and thus promotes innovation
  - Designed in the spirit of the Internet
- Beware of dummies
  - Not every package labeled SIP truly contains SIP
    - You may even find PSTN, ISDN, or QSIG inside
  - SIP is a protocol for session setup that can be (mis)used in many ways
  - Examples for non-SIP usages of SIP
    - Closed networks based upon open standards trying to preserve yesterday's paradigms
    - Locking in users is not a viable an option (see skype and peer-to-peer in general)
- Beware of too much complexity (doing too much in SIP)
  - SIP does not have to provide all features built-in
- Innovative uses of SIP are the way to go…
  - If you don't do it with SIP, people will find another (maybe less open) way

Further Information

http://www.ietf.org/html.charters/sip-charter.html
http://www.ietf.org/html.charters/sipping-charter.html
http://www.ietf.org/html.charters/simple-charter.html
http://www.ietf.org/html.charters/xcon-charter.html

http://www.softarmor.com/sipwg/
http://www.softarmor.com/sippingwg/
http://www.softarmor.com/simple/
http://www.p2psip.org/

http://www.cs.columbia.edu/sip/
http://www.sipit.net/

http://www.sipcenter.com/
http://www.sipforum.org/

Concluding Remarks on the Course

- Focus: *standardized* multimedia protocols and services *as done in the open Internet way*
  - Get an idea of how one could/should be doing things
  - But also learn about inadequacies of standardization in some places
  - Up to you to decide what is good and what is bad
- No coverage on others
  - ITU-T, 3GPP, ETSI TISPAN, CableLabs, DVB, …
  - Proprietary protocols: Cisco's Skinny, skype, …
- Understand and judge technologies and their deployment options
- More breadth in Prof. Kantola's Signaling Course (S-38.3115)
- More depth in assignments, theses, projects

And finally…

- Please provide feedback on the course:
  - http://palaute.ee.hut.fi/lomake.php?id=857
- You can also talk to us or send email.
- Helps us with our next iteration in Fall 2008