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Bell Labs Innovations

Internet Multimedia Conferencing: What now?

Jonathan Rosenberg
Bell Laboratories

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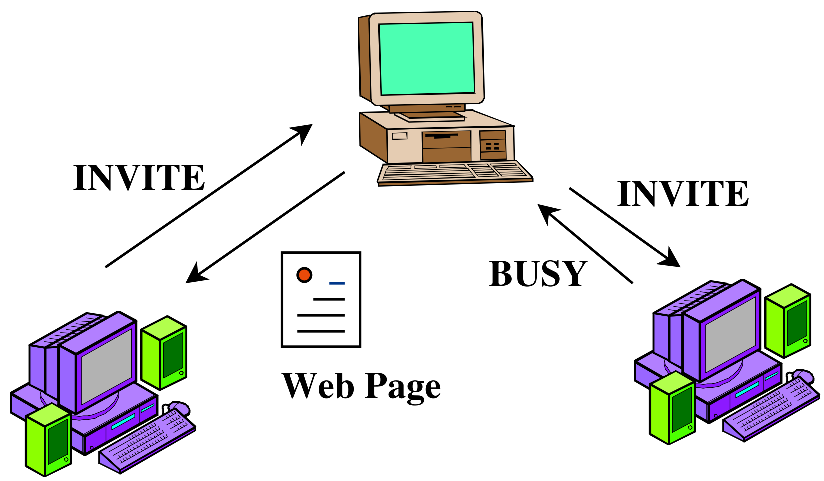
Whats next?

- Service Creation
  - SIP CGI
  - Call Processing Language
- Features
  - Caller handling directives
  - Call control

Service Creation

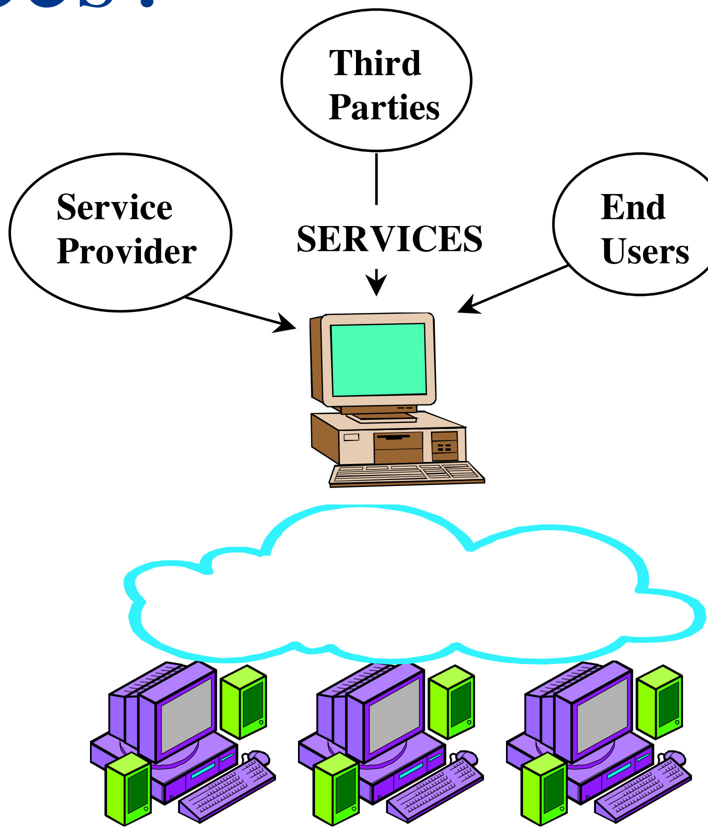
- SIP can do lots of neat services
  - call redirect web
  - web IVR
  - email call logs
  - follow-me
  - distributed home line emulation
- How to program these services?



Call Redirect to Web Service

Who Creates Services?

- Lots of people
  - service providers
  - third parties
  - end users
- Security Requirements
  - End users shouldn't access resources, crash servers
  - CGI model dangerous!

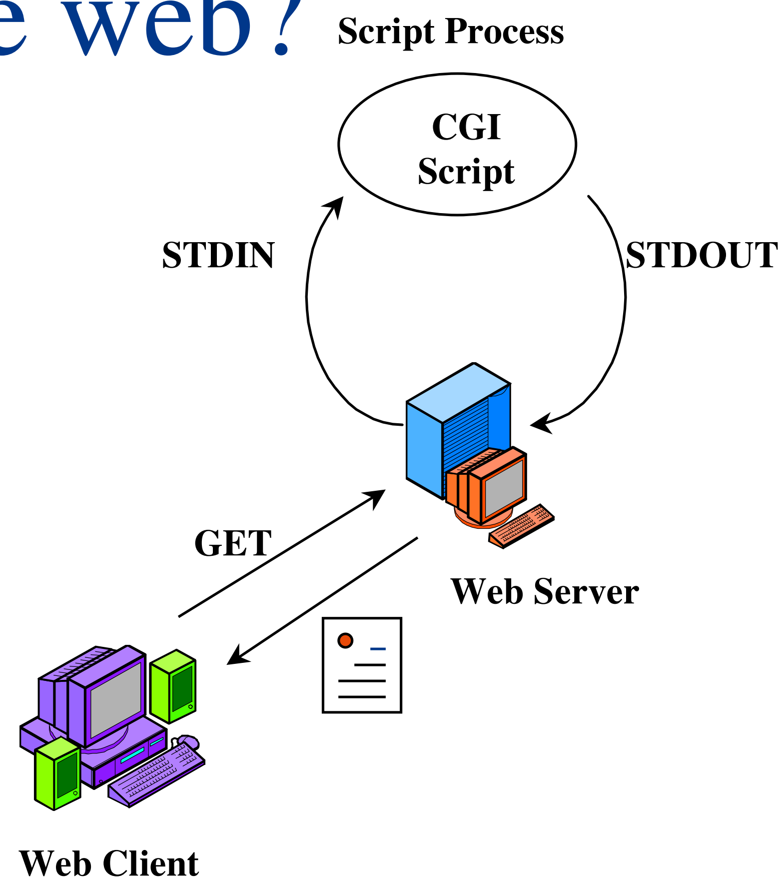


Some Requirements

- Rapid Development
  - easy services = easy program
- Rapid Deployment
  - Servers stay up
  - No code rebuilds
- Cross Platform
  - Vendor, possibly protocol
- Easy Learning
  - Little protocol expertise
  - Basic programming expertise

How's it done on the web?

- CGI = Common Gateway Interface
  - Popular web dynamic content tool
  - Request arrives at server
  - server spawns process
  - request info sent to process
  - process returns web page



SIP CGI

- SIP and HTTP are close cousins
- SIP CGI nearly same
  - Allow for "persistent" scripts
  - Allow script to proxy and return responses
- Benefits
  - ANY programming language
  - Loose coupling with server
    - separate process
    - IPC by file descriptors
    - no rebuilds or out of service
  - Little SIP understanding needed

Example perl Script

- Provides "call forward unconditional service"
- Uses database to store forwarding lists
- Returns error if user not in database
- only 19 lines of perl!!

```
#!/usr/bin/perl -w

use DB_File;

sub fail {
   my($status, $reason) = @_;
   print "SIP/2.0 $status $reason\n\n";
   exit 0;
}

tie %addresses, 'DB_File', 'addresses.db'  or fail("500", "Address database failure");

$to = $ENV{'HTTP_TO'};

if (! defined( $to )) {
   fail("400", "Missing Recipient");
}

$destination = $addresses{$to};
if (! defined( $destination )) {
   fail("404", "No such user");
}

print "CGI-PROXY-REQUEST-TO $destination SIP/2.0\n";
print "CGI-Reexecute-On: never\n\n";
untie %addresses; # Close db file
```

Another solution

- CGI is unlimited in flexibility
  - ideal for service providers, third parties
  - not ideal for end users
- Want restrictions for end users
  - limited access to resources
  - limited services
  - guarantees on correctness
  - bounds on execution time
  - automated verification

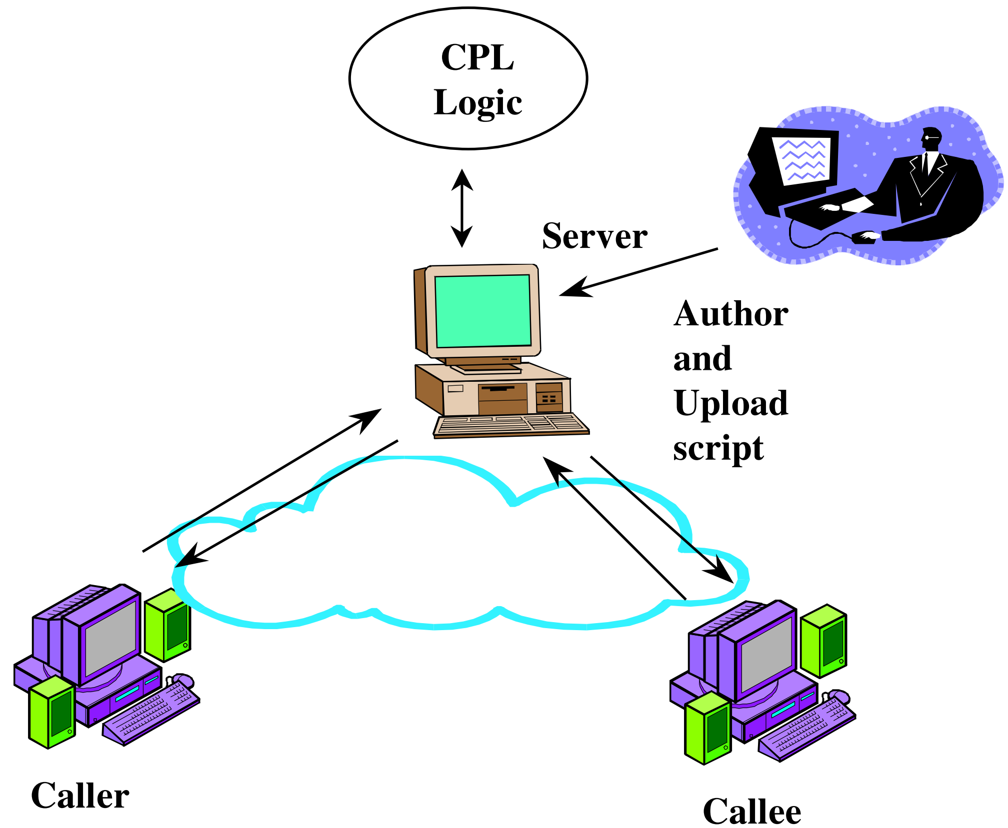
Call Processing Language

- A scripting language to describe call services
- Language properties guarantee safefy
- Based on XML
- Hand or tool authoring
- Example: “call forward on busy/no-answer”
- Under development in IETF

```
<call>
 <location url="sip:jones@pc.ex.com">
  <proxy timeout="8s">
   <busy>
    <location url="sip:jones@vmail.ex.com”
     merge="clear” id="voicemail" >
     <proxy />
    </location>
   </busy>
   <noanswer>
    <link ref="voicemail" />
   </noanswer>
  </proxy>
 </location>
</call>
```

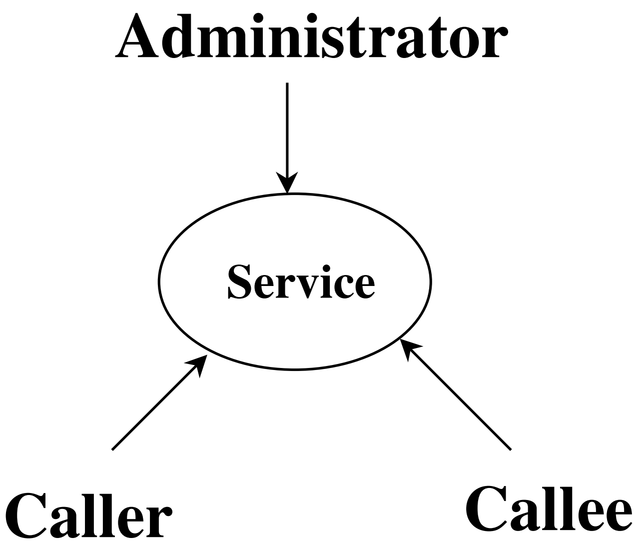
How is it used?

- User authors script
  - tools or by hand
- User uploads script to server
  - SIP, HTTP, FTP, email
- Someone calls user
- Server executes script
- Script rings phone at work
- Call accepted



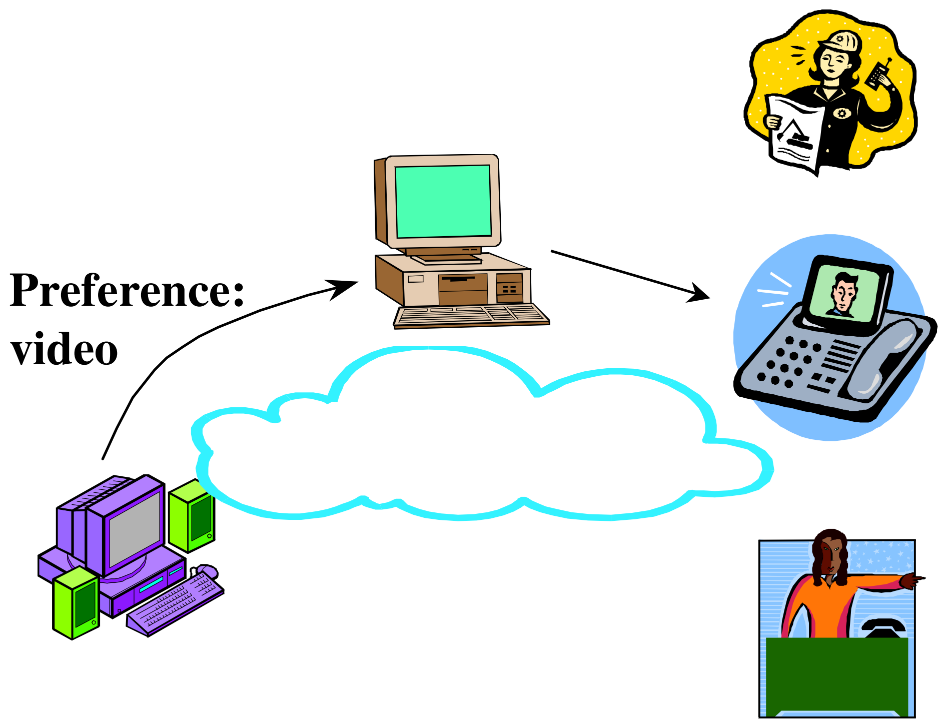
Who controls the service?

- Three parties interested in a call
  - caller
  - callee
  - administrators
- CPL and CGI used for callee/administrator logic
- How about caller logic?



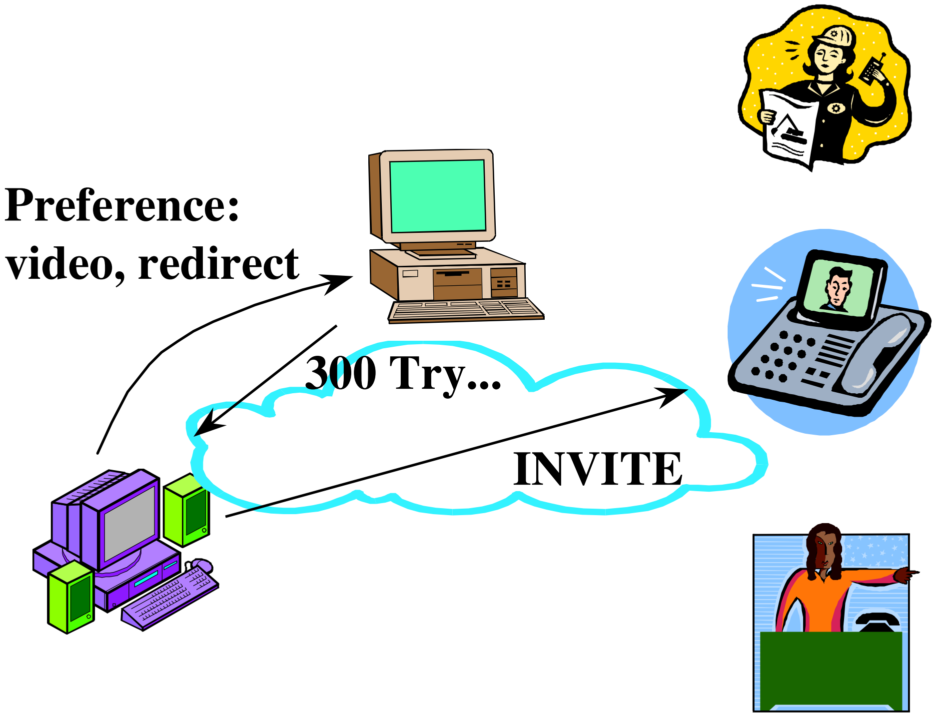
SIP Caller Preferences

- SIP Extensions for specifying caller preferences
- Preferences carried in INVITE setup message
- Preferences for
  - reaching callee at home or work
  - fax, video, audio call
  - mobile or landline
  - secretary or voicemail
  - priority locations



Additional Preferences

- Caller can also direct server features
  - proxy or redirect
  - reach all, reach first
  - call queue
- Challenge
  - Merging all these preferences
  - Feature interaction
  - Differentiator!



New SIP Features

- SIP's current features are mostly for call initiation
- Need features for post-call setup
  - Transfer
  - Multi-party
  - Dial-in bridges
- Requirements
  - Features can be implemented **anywhere**
    - end systems alone
    - central servers
  - Don't specify feature - specify primitive
  - Primitive example
    - Add call leg

Not your ordinary transfer...

- Internet is not PSTN
- End systems *can* be smart
- Give them information
  - All parties know what service is invoked
- Give them a choice
  - Any party can refuse or accept service
- Give them security
  - Parties can be sure of identity of others involved in service
- Dumb endpoints can ignore these
  - don’t tell user about service
  - accept service
  - ignore security

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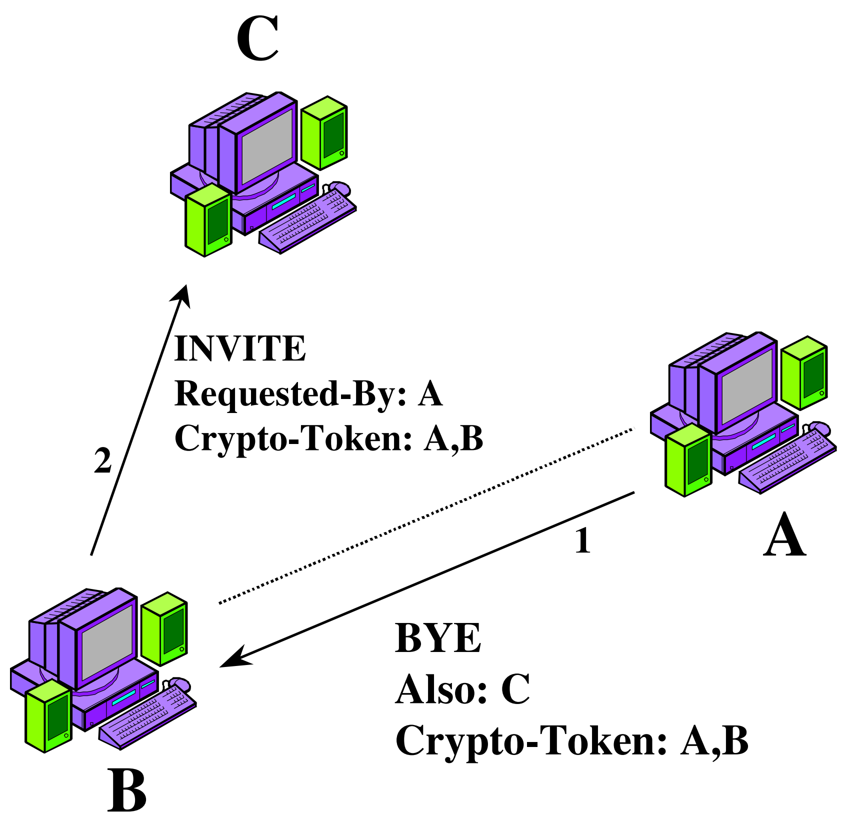
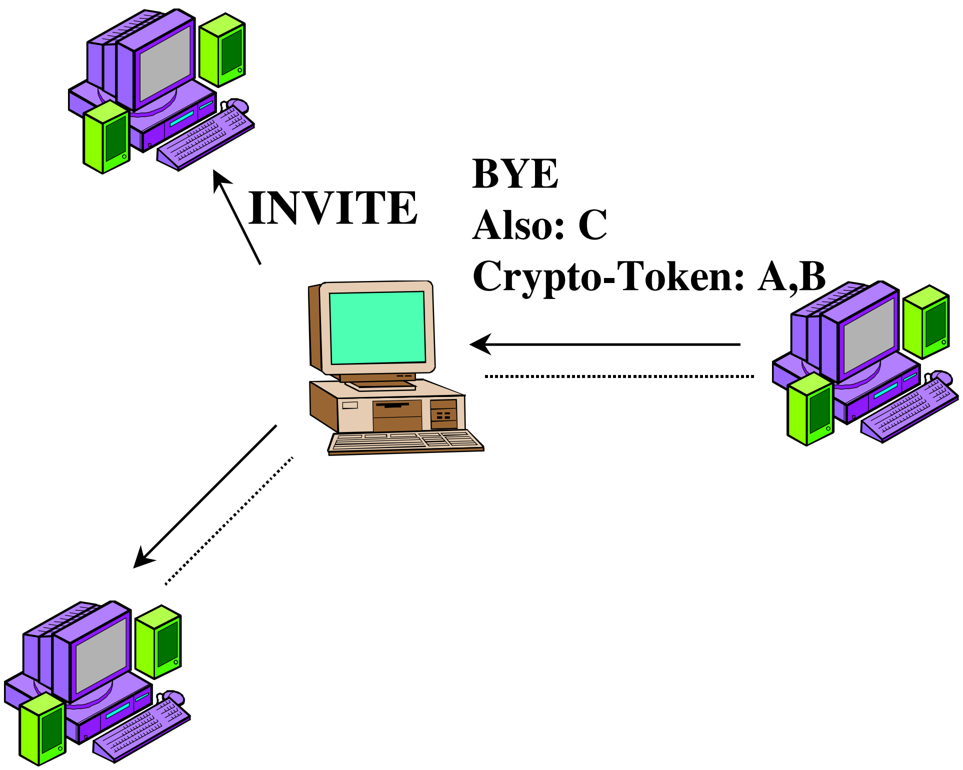
E2E Call Transfer

- A transfers B to C
- Whats new?
  - C knows A did transfer
  - C can accept/reject transfer
  - B knows its being transferred to C
  - B can accept/reject transfer



Net-Provided Transfer

- Same service - A transfers B to C
- Proxy steps in
- A does same thing
- Service looks like traditional transfer now!



Conclusion

- CGI and CPL for programming services
- Caller preferences
- Call control