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International Telecommunication Union
International Multimedia Telecommunications Consortium

H.325 – Third Generation Multimedia System

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Third Generation?

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- First Generation (→ 1992)
  - H.320 (ISDN)
  - H.321 (H.320 adapted for B-ISDN)
  - H.322 (LAN w/ Guaranteed QOS)
- Second Generation (1992 to 2005)
  - H.323 (IP-based multimedia system)
  - H.324 (Narrowband / Wireless multimedia)
  - H.310 (Native B-ISDN system)
  - SIP (Session Initiation Protocol)
- Third Generation (2006 →)
  - H.325

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Why H.325?

- It has been more than 10 years since SIP and H.323 standards activities started
- It will take time to develop a new protocol
- Current systems have known limitations
- Current systems essentially reproduce the PSTN on IP networks
  - SIP is largely equated to “voice”
  - H.323 is richer, but …
- We are looking for something that is truly innovative

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Who, What, When, Where?

- H.325 is an initiative lead by ITU-T SG16, which is the lead Study Group on multimedia systems and audio/video coding
- H.325 work was launched in an effort to meet the requirements for the forthcoming NGN and overcome limitations of “legacy” systems
- H.325 may fill a void in enterprise networks
- 2005 – 2007 → Requirements
- 2007 - 2008 → Protocol definition

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Limitations of Second Generation Systems

- Poor or complex capability exchange
- Poor error handling and fault management
- Poor separation between service logic and call processing
- No clear separation of UNI and NNI
- Interoperability issues abound
- SIP and H.323 are problematic for mobile systems; operators have adopted H.324M

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Limitations of Second Generation Systems (cont)

- Little consideration given to NAT/FW and other IP network issues
- Important aspects, such as QoS, security, lawful interception, emergency services, provisioning, and management were considered later, resulting in less-than-ideal solutions
- Do not take full advantage of IP networks (e.g., downloadable codecs that plug-in on demand)

Limitations of Second Generation Systems (cont)

- Operator and enterprise IT requirements neglected
  - Designers wanted intelligence in the endpoints
  - Operators and enterprise IT want to manage and control services

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Consequence of Limitations

- Complex endpoints, higher cost
- Interoperability problems
- Multiple variants of the same protocol to meet different market requirements
- Complex product architectures required to implement the simplest of features
- Complex solution architectures

Consequence of Limitations (cont)

- Higher cost of upgrading and maintaining equipment
- Difficult to troubleshoot
- Enterprise IT staff lose granular feature control
- Service providers have less control over revenue-driving services and features
- NAT/FW devices are a huge obstacle

Consequence of Limitations (cont)

- New Feature = “upgrade the endpoint”
  - How many years will an endpoint be supported?
  - What portion of engineering resources will be allocated to sustaining older phone products that need new capabilities?
  - What are the operational costs of such upgrades?

Complexity? I thought SIP was Simple!

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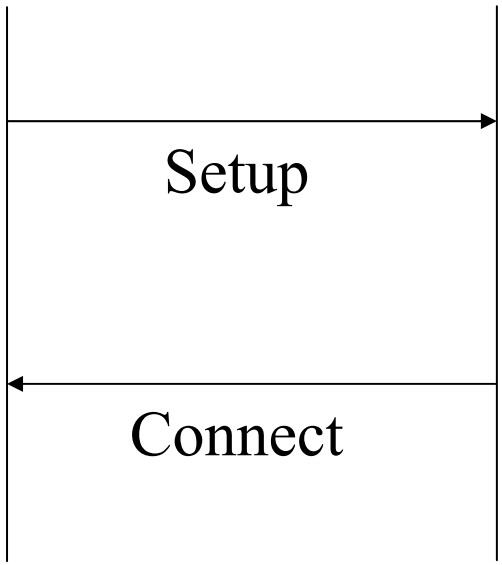
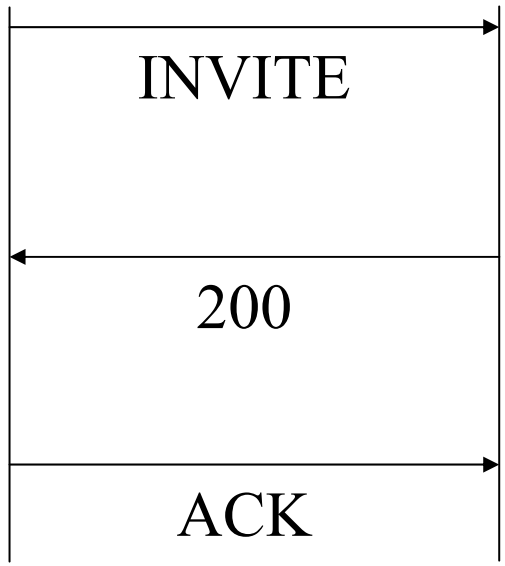
- Beauty is in the eye of the beholder
- On the highest level, both H.323 and SIP look simple. Consider:

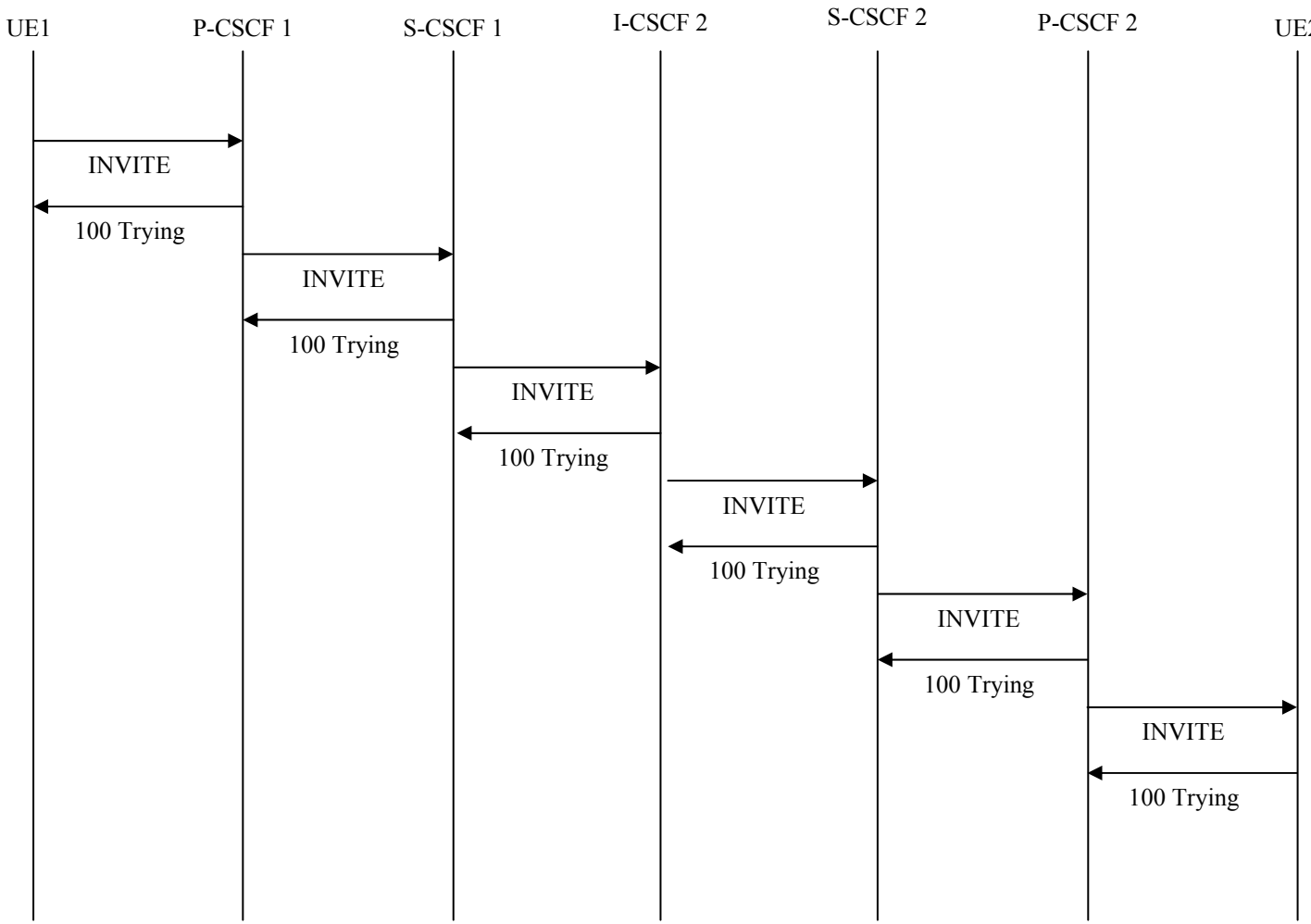


H.323

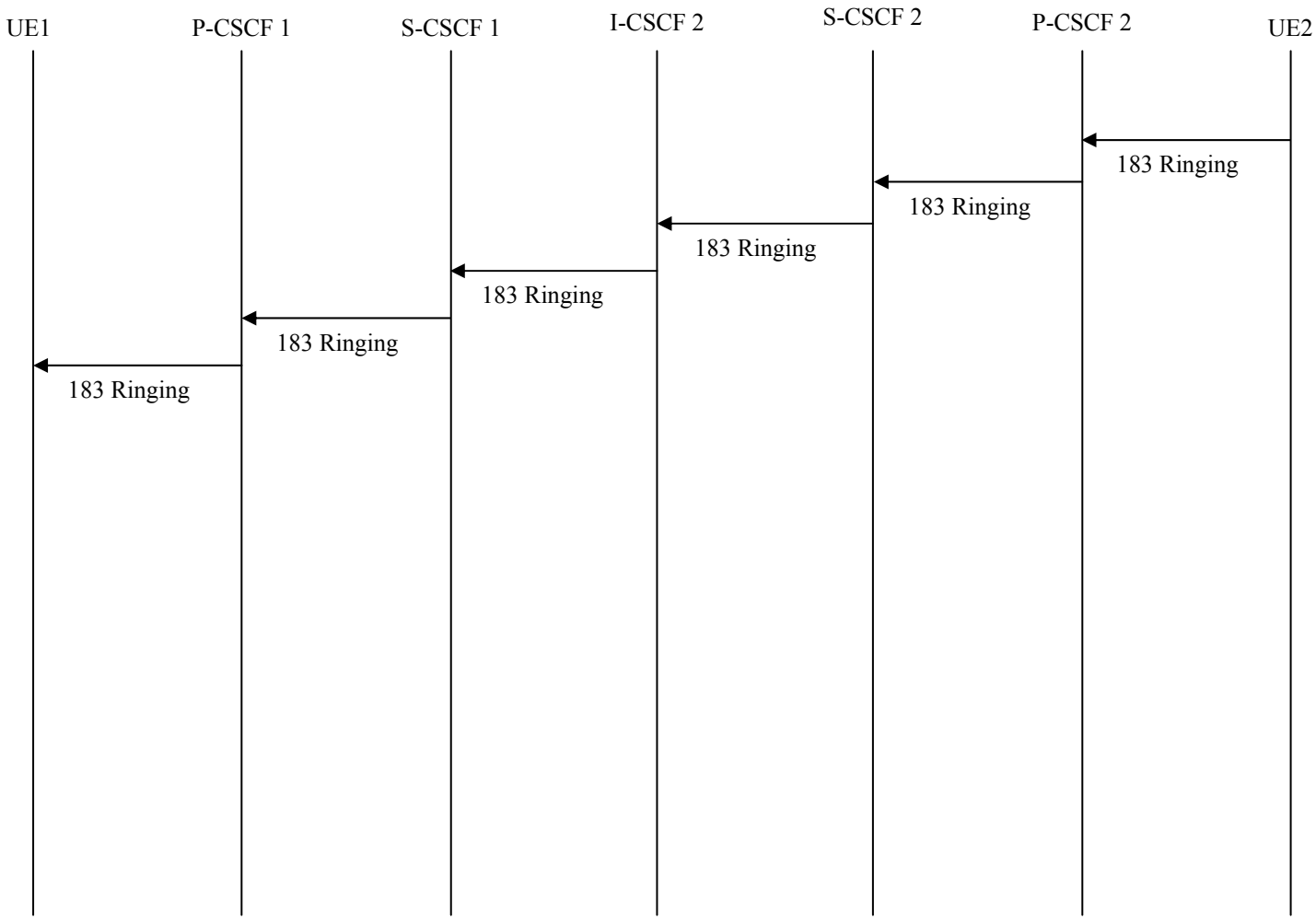


SIP

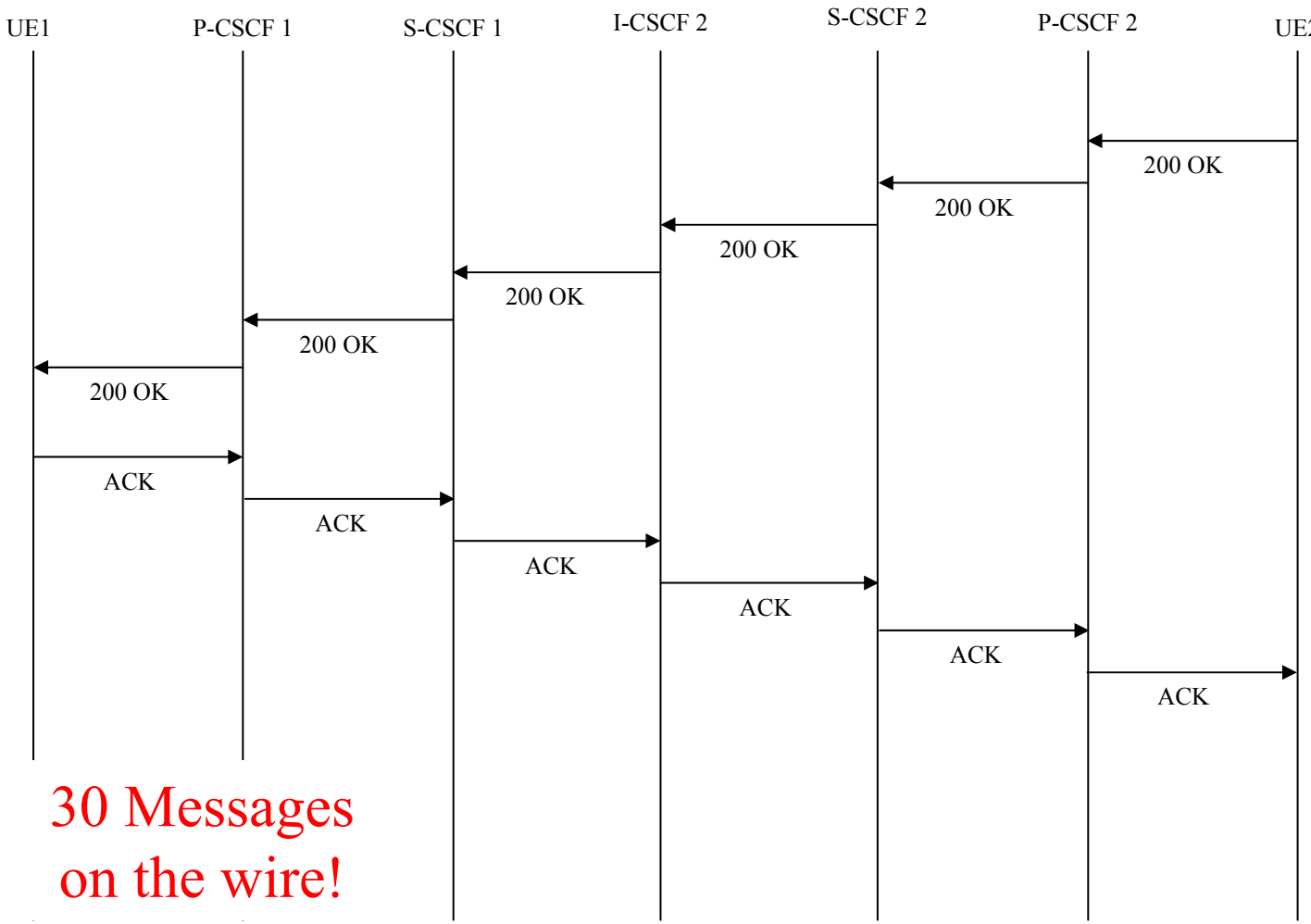
The IMS Factor



Almost there…



Now We're Talking…



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Poor Capability Negotiation Lends to Complexity

- Suppose you just bought the latest SIP video terminal with a very cool display and sporting the H.264 codec (and also supporting H.261 and H.263)
- You take the terminal out of the box, plug it in, and configure it to use H.264 for video and G.711 for audio
- Through magic not yet universally followed, you place a call to a friend with a modern, but less hip, terminal that only supports H.263
- The end result?

Unsupported Capabilities “Disappear”

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IMTC

Offer

```
m=audio 5000 RTP/AVP 0
m=video 5002 RTP/AVP 98
a=rtpmap:98 H264/90000
a=fmtp:98 profile-level-id=42A01E;
    sprop-parameter-sets=Z0IACpZTBYmI,aMljiA==
```

Answer

```
m=audio 6400 RTP/AVP 0
m=video 0 RTP/AVP 98
```

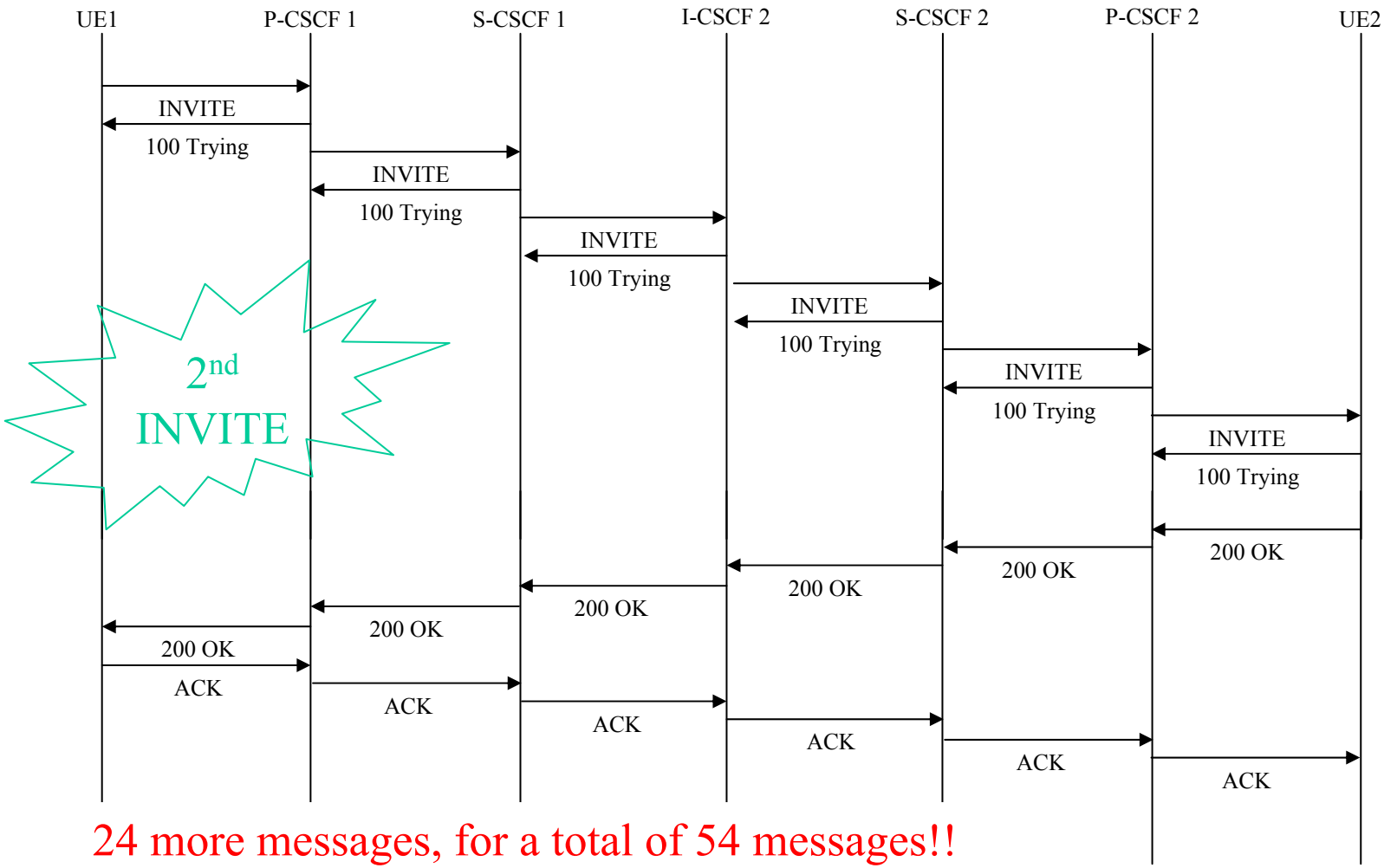
➔ No video!!

Current Solution

- There are a few solutions to this problem, one of the more popular being this:
  - Send an INVITE offering all preferred audio and video modes*
  - Let called device select preferred or supported audio and video modes
  - Send a new INVITE with desired audio and video mode
- Using the IMS example we saw before, that would be…

* This solution is significantly complex in some environments where an array of fax relay, modem relay, text relay, and VBD modes are utilized, not to mention the increased probability of media clipping

Current Solution (cont)



24 more messages, for a total of 54 messages!!

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H.325 Aims To… (one view)

- Reduce complexity
- Provide a modular design
- Use basic call primitives
- Allow for service control
- Allow for rapid service creation
- Provide better management
- Provide better capabilities negotiation
- Yield in faster call establishment
- Truly take advantage of IP networks

H.325 Aims To… (another view)

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- Create a terminal with even more autonomy and even less centralization
- Focus on end-to-end security
- Be creative with NAT/FW traversal
- Remove all obstacles related to address resolution Apply new thinking to the problem
  - Less focus on a “protocol”
  - More focus on terminal behavior and response to stimuli

H.325 Architecture

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Some Design Ideas

- Intelligent endpoints
  - Excellent capabilities negotiation
  - Less reliance on core services for basic calls
- Service logic controlled by servers
- Protocol defined in terms of basic primitives
  - “Move a Call Leg”
  - “Join a Call Leg”
  - “Re-route media flows”
- Server drives user interface, allowing for consistency in terms of user expectation

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Some Design Ideas (cont)

- Security must be addressed from the outset
- Address NAT/FW issues
- System must scale
- Optimize for performance
- Take advantage of IP network
  - Downloadable codecs
  - Wideband codecs
  - Use names and numbers for addressing
  - Applications

Some Design Ideas (cont)

- Avoid media clipping
- Intelligently and consistently enable
  - Presence
  - Voice, video, and text
  - Instant messaging
  - Electronic whiteboard
  - File transfer
  - Application sharing
- Be more robust than current systems

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Some Design Ideas (cont)

- Improve on error handling and diagnostics
  - System should report media quality issues to the network
  - One should not have to guess why a fax fails
- Management and provisioning
  - Buy a phone, plug it in
  - Remotely control and manage equipment
- Support lawful interception
- QoS considerations from the first day
- Support user, terminal, & service mobility

Some Design Ideas (cont)

- Must not forget that interworking with legacy equipment is still important
- IPv6 ready
- Provide improved support for video
  - Video streaming
  - Videoconferencing
  - Video telephony
- Design for accessibility
  - Text, voice, video
  - Lip synchronization
  - Proper video quality

What's Next?

- Give thought to:
  - What market potential would such a system have?
  - What kinds of new services can be delivered through such a system?
  - How can such a system improve communication and our lives?
  - How should this project be changed?
    - Everything is fluid
- Get involved.