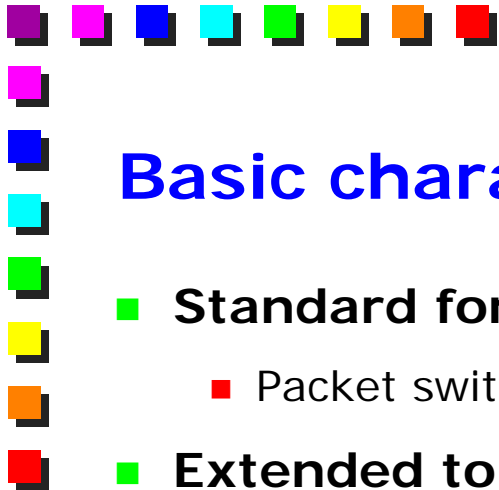




The H.323 protocol suite

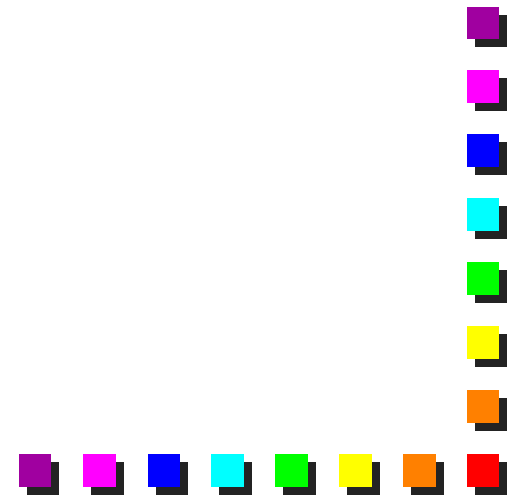
How works one of the protocol architectures for
VoIP



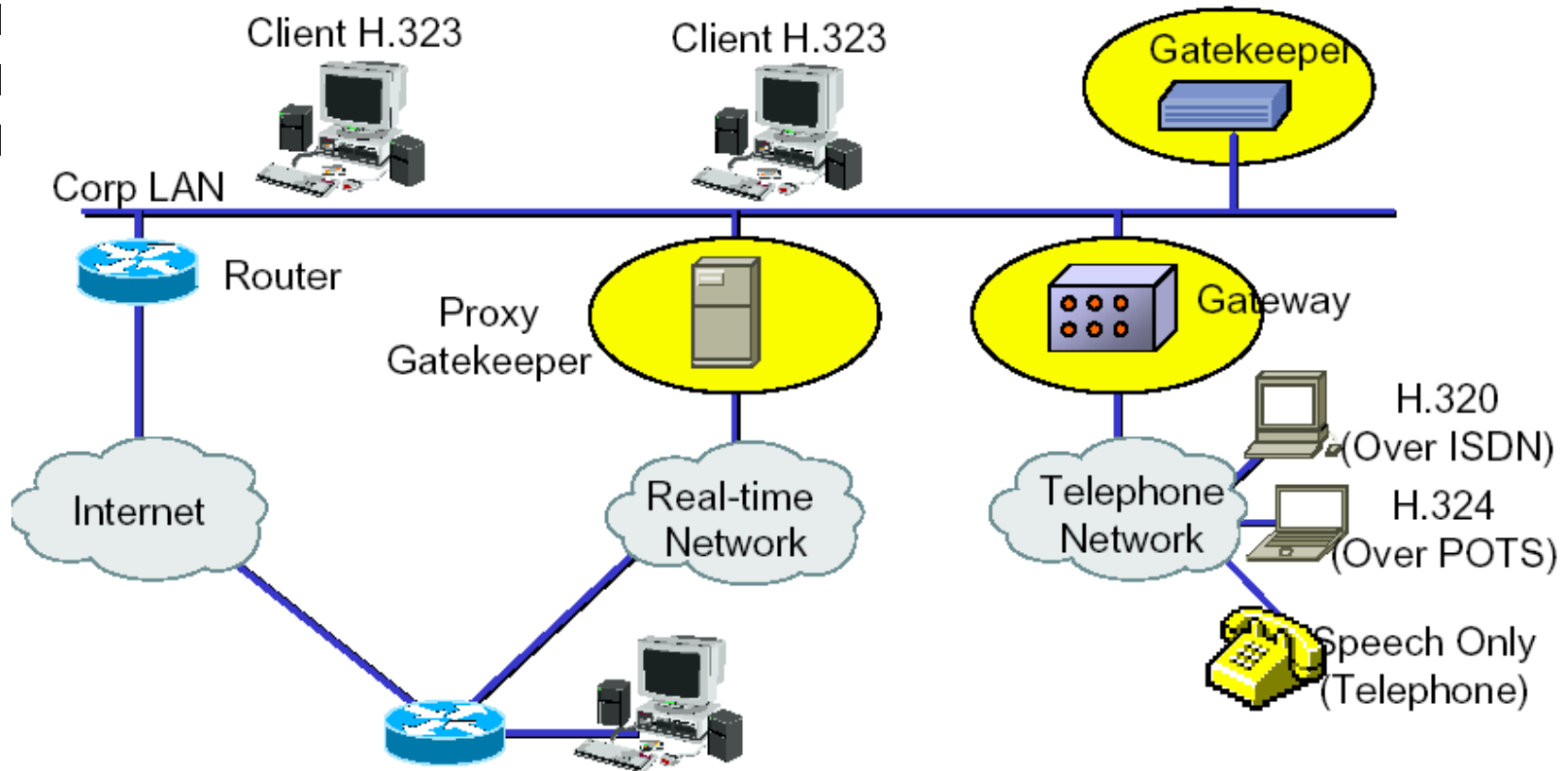


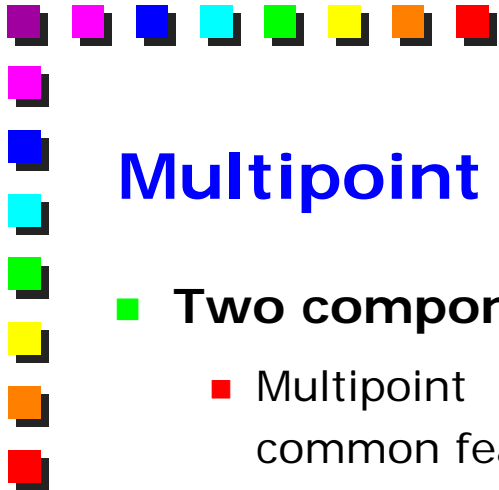
Basic characteristics

- **Standard for LAN communication**
 - Packet switched networks without guaranteed quality
- **Extended to operate over a WAN**
- **Support for**
 - Audio (mandatory)
 - Video
 - Data (shared backboard, etc)



Components of H.323 specification



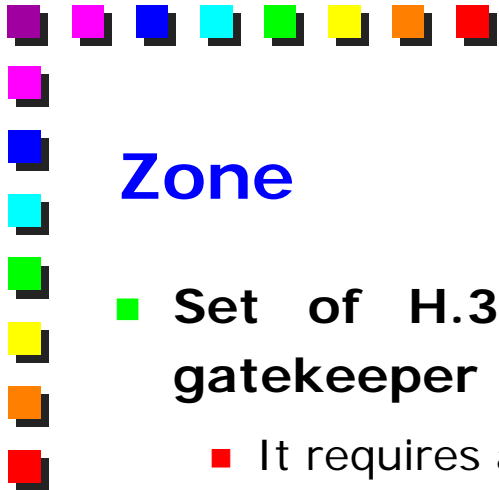


Multipoint Control Unit (MCU)

- **Two components:**
 - Multipoint Controller (mandatory): it is used to negotiate common features
 - Multipoint Processor (optional): stream mixing/switching, bandwidth adaptation, ...

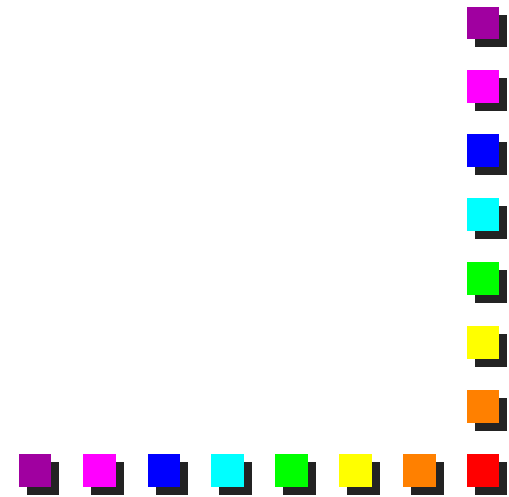
- **It is used only in case of:**
 - Conference between 3 or more parties, with unicast transmission
 - Conference between 3 or more parties in mixed mode, unicast and multicast

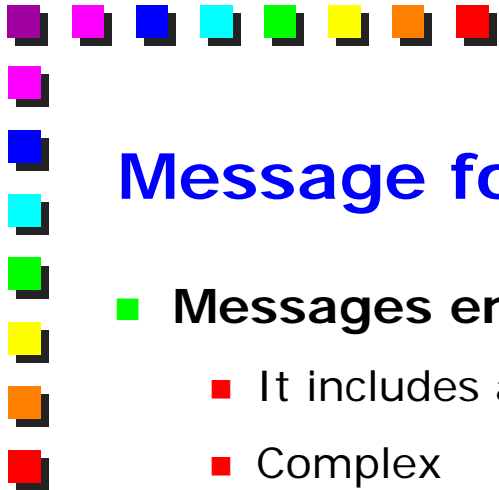




Zone

- Set of H.323 components managed by the same gatekeeper
 - It requires at least one terminal
 - It should not include more than 1 gatekeeper
 - No fault-tolerance mechanisms allowed
 - No assumption on the topology of the underlying network

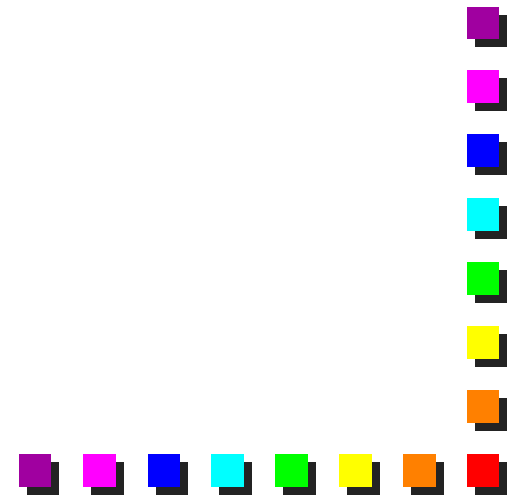




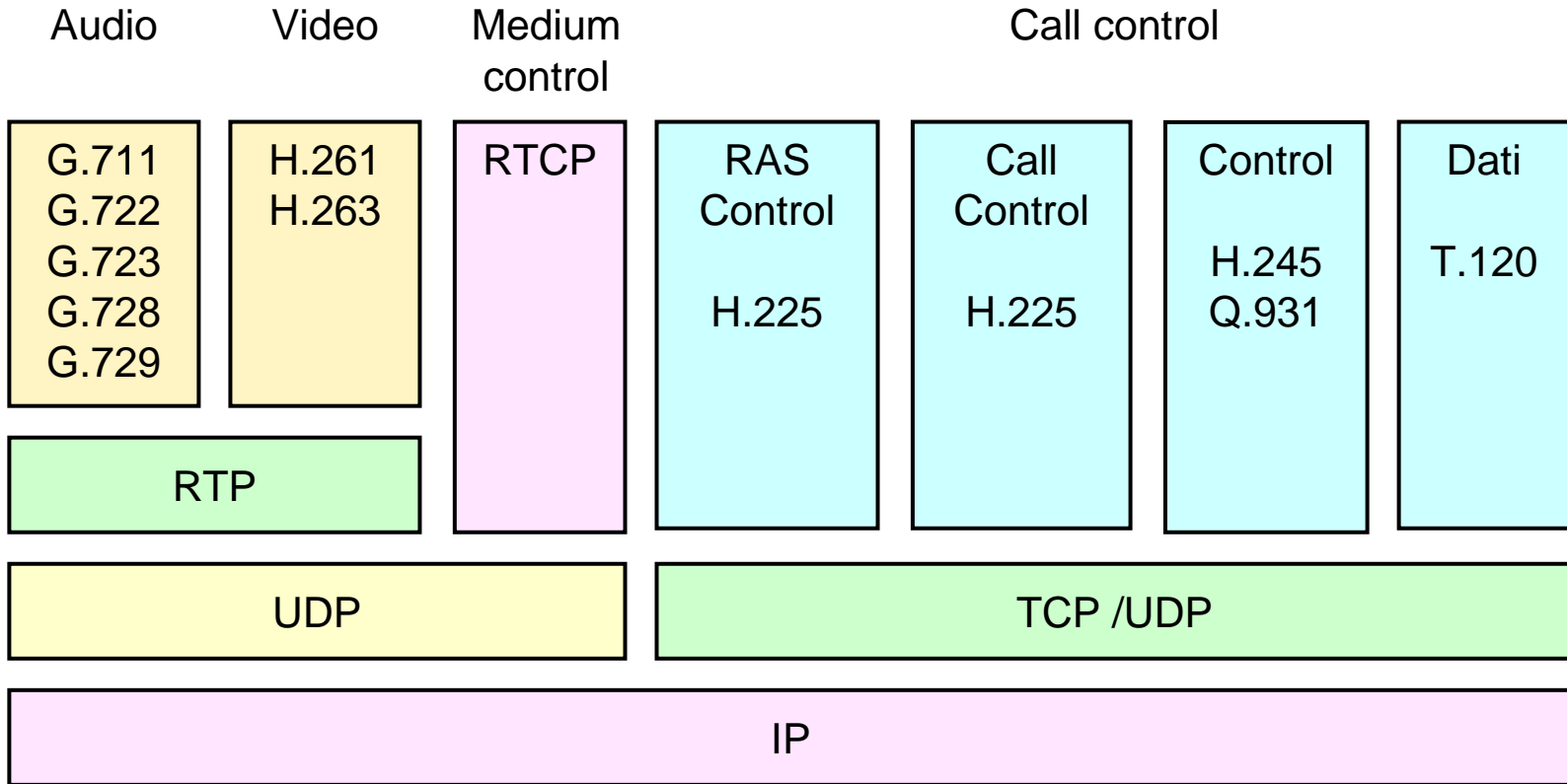
Message format

■ Messages encoded using ASN.1

- It includes advanced features (byte ordering, ...)
- Complex
- Difficult to encode/decode and to debug
- One of the major criticisms to H.323

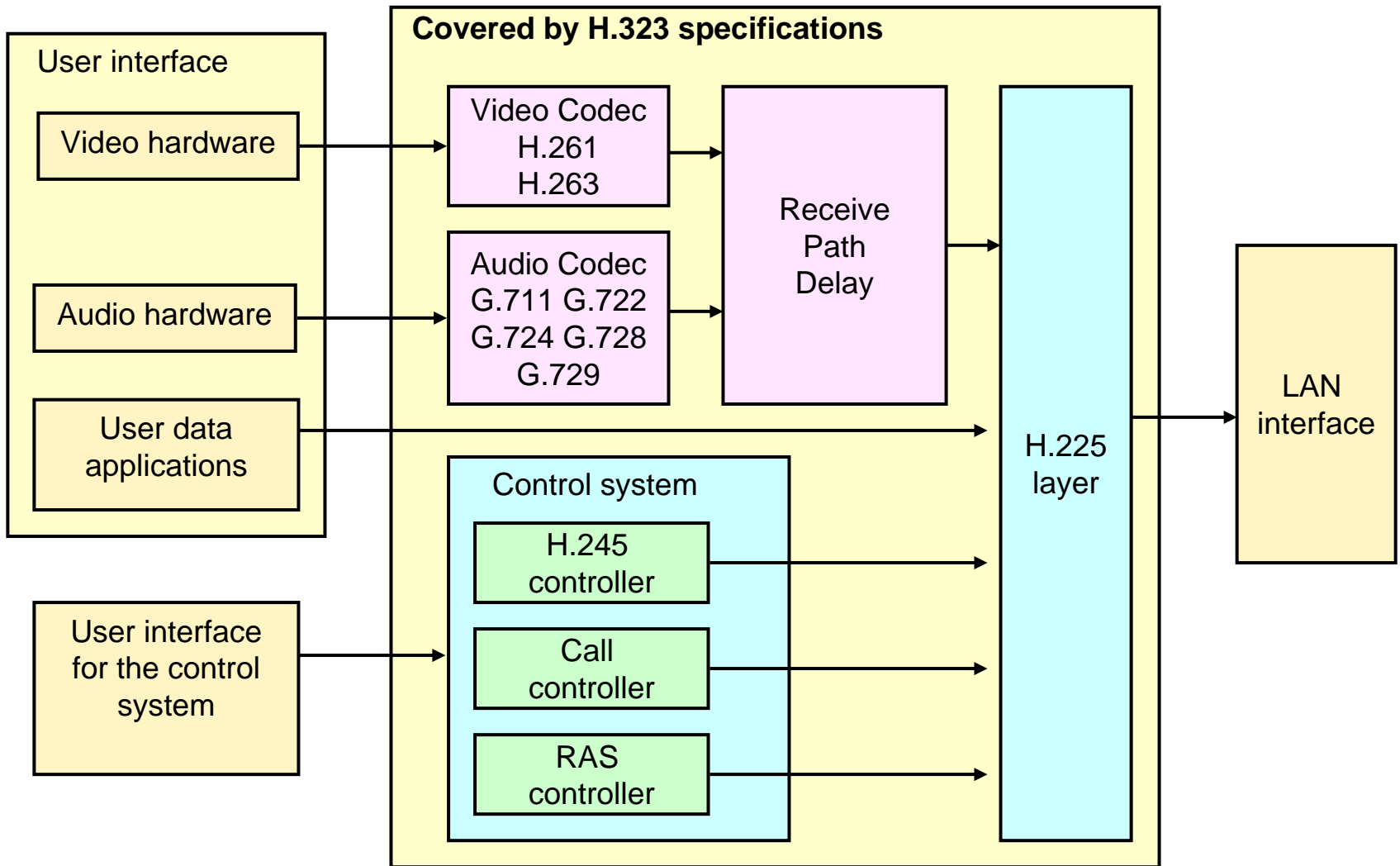


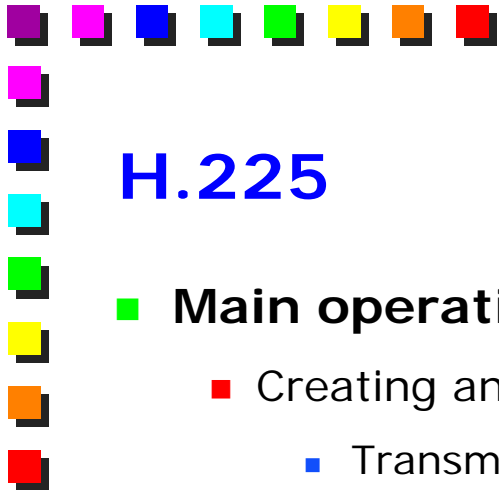
Protocol architecture



RAS: Registration, Admission and Status

Block diagram of an H.323 terminal

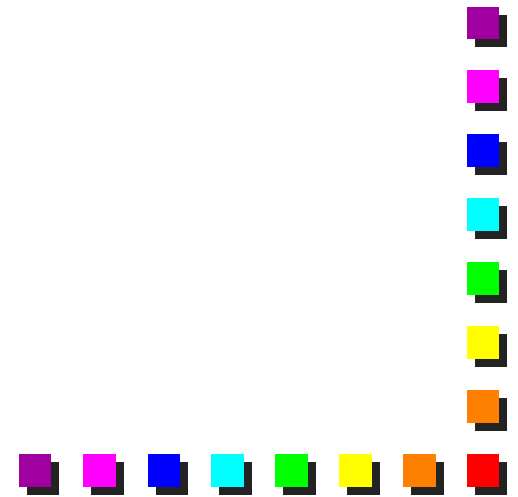




H.225


■ Main operations

- Creating and formatting logical channels
 - Transmission and reception of control packets
- Sequence numbering
- Assigning a logical channel ID (0-65525)
 - 0 reserved to H.245
- Error detection and/or correction





RAS controller

- It is active only if a gatekeeper is present
 - It uses H.225 messages
 - Terminal registration
 - Terminal admission
 - Changes in the bandwidth (even when a call is in progress)
 - Status control
 - Closing procedure between terminal and gatekeeper
 - **RAS channel**
 - Open within H.225
 - Independent from H.245 signaling and control messages
 - Open before any other channel
 - Communication channel between user-agent and gatekeeper
- 




Call controller

- It uses H.225 signaling
- It establishes a connection between 2 endpoints
- Activated after a RAS channel is open






H.245 controller

- **End-to-end logical channel control**
 - **Aims**
 - Terminal capacity
 - Requesting operating modes
 - General commands and information
 - **It is normally established between endpoint and gatekeeper (this acts like a “proxy”)**
 - It may exist also directed to the endpoint
 - **One channel for each call**
 - Gatekeeper may have several open channels
 - **Physical implementation**
 - Separate channel
 - Channel 0 within H.225
- 



Gateway

- It is seen as an H.323 terminal in the IP network and as a telephone terminal in the PSTN
 - It translates
 - Data channels (e.g. G.729 / RTP in telephone sampling)
 - Control channel (e.g. H.225 to H.221)
 - Signaling procedures (e.g. H.245 to H.242)
 - Usage
 - Interface between different technologies
 - Adaptation device in homogeneous networks (e.g. compression)
 - Backup of the IP network over PSTN
- 




Gatekeeper

■ It is responsible of one zone

- It translates addresses, from alias H.323 address to a transport layer address
- Admission control, by means of RAS messages
- Management of the H.323 zone

■ Optional functionalities

- Call authorization
 - Bandwidth management
 - E.g. by limiting the number of H.323 terminals connected
 - Call control
 - It keeps track of the terminal currently involved in a call
- 





Addressing

- **Need for a unique identifier**
 - Network address (IP address)
- **TSAP identifier (Transport layer Service Access Point)**
 - It corresponds to a TCP/UDP port
 - Well known: signaling channel, RAS channel
 - Decided at run-time: data channels

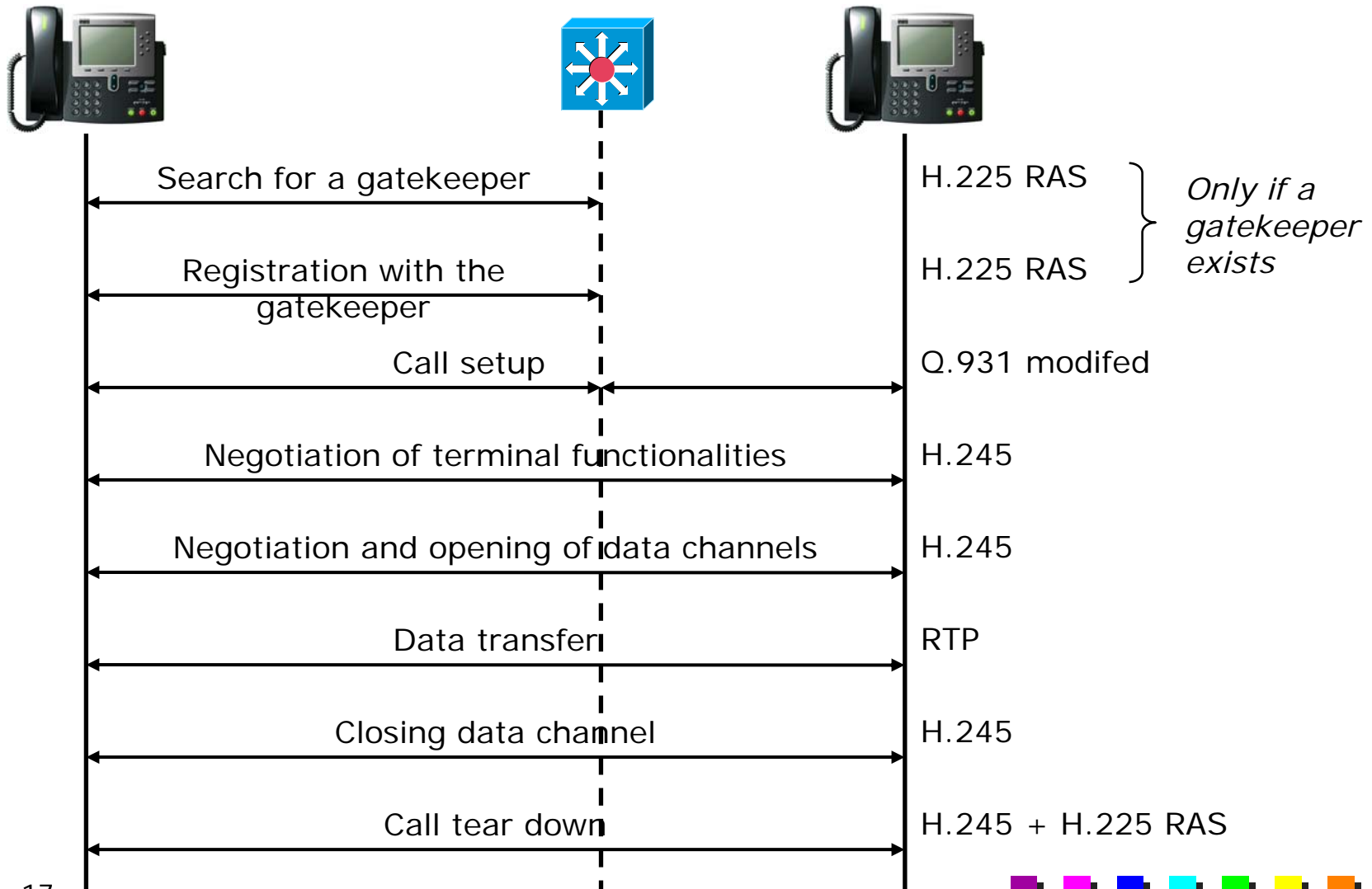


Addressing: alias

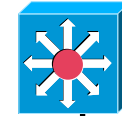
- It is possible to have different forms
 - name@domain.com
 - E-164 phone numebr
 - nickname
 - ...
- They are available only if a gatekeeper exists
- They are mapped onto an address/port pair



Main phases of an H.323 call

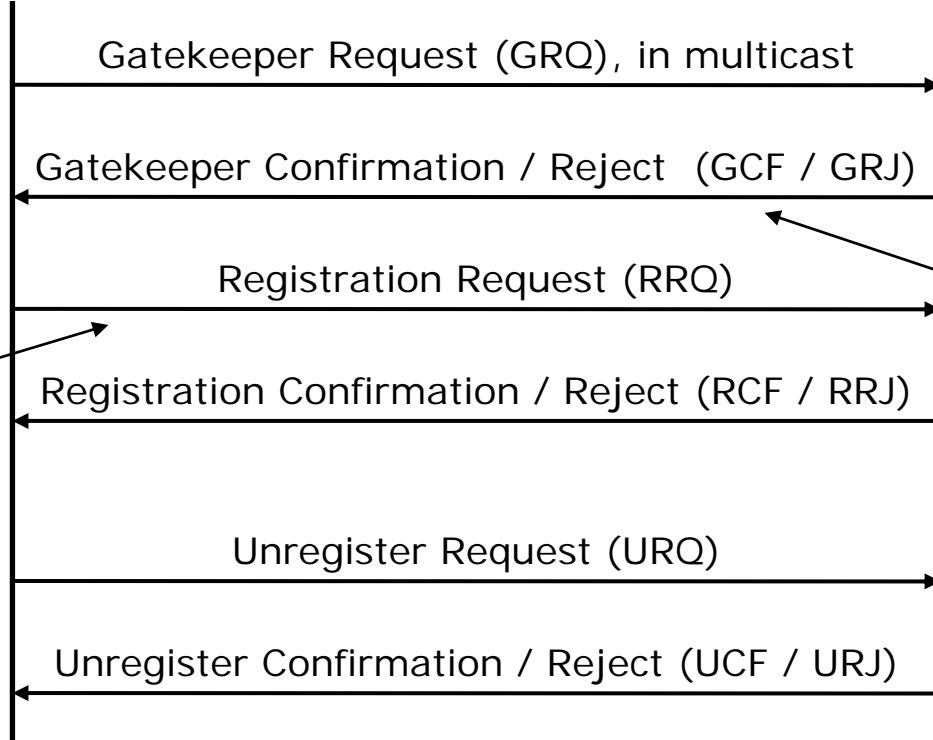


Search for and registration with a gatekeeper



The client should select only 1 Gatekeeper, in case several responses are received

This includes IP address, list of alias for the terminal, and a "TTL" field defining the validity of the registration



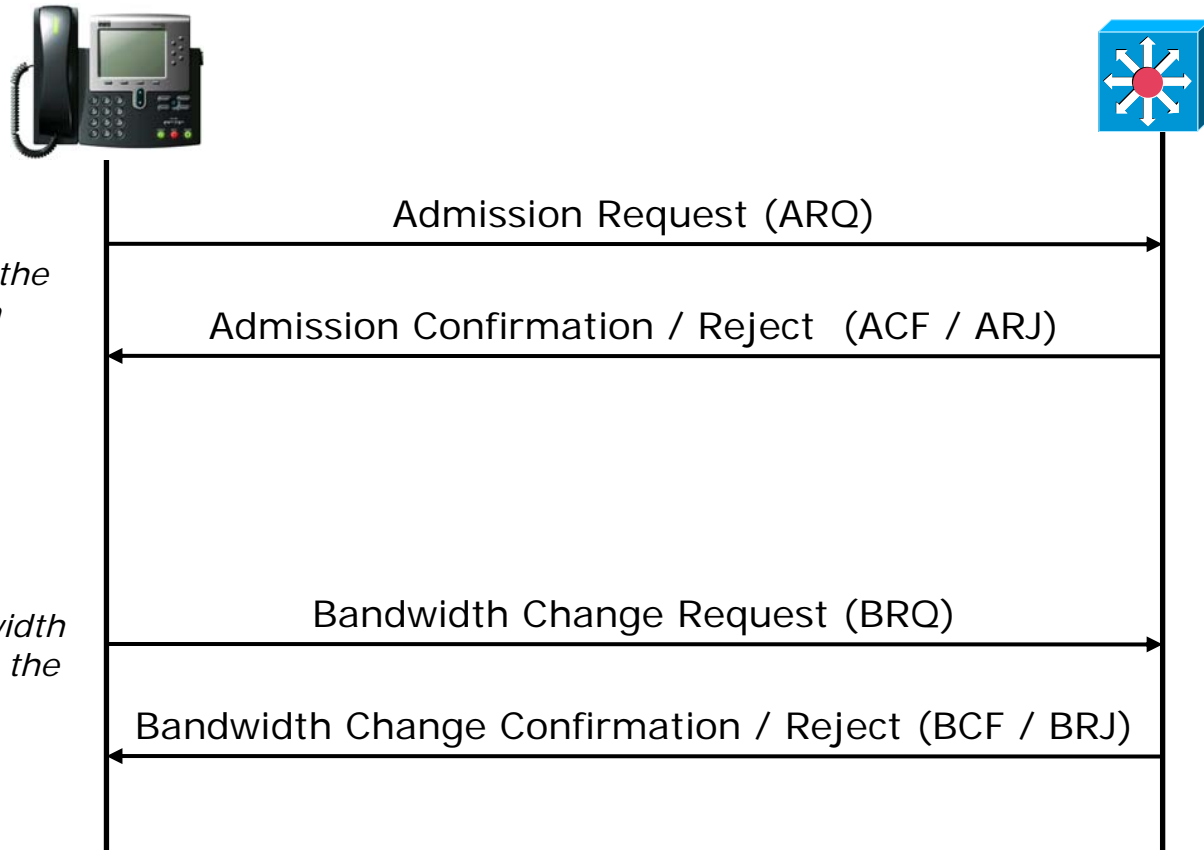
Alternatively: static configuration of the gatekeeper address

The GCF may include a list alternative gatekeepers to be used in case of failure

The gatekeeper may start the de-registration with URQ

Gatekeeper Discovery IP address / port	224.0.1.41/1718 (UDP)
Gatekeeper Registration and Status port	1719 (UDP)

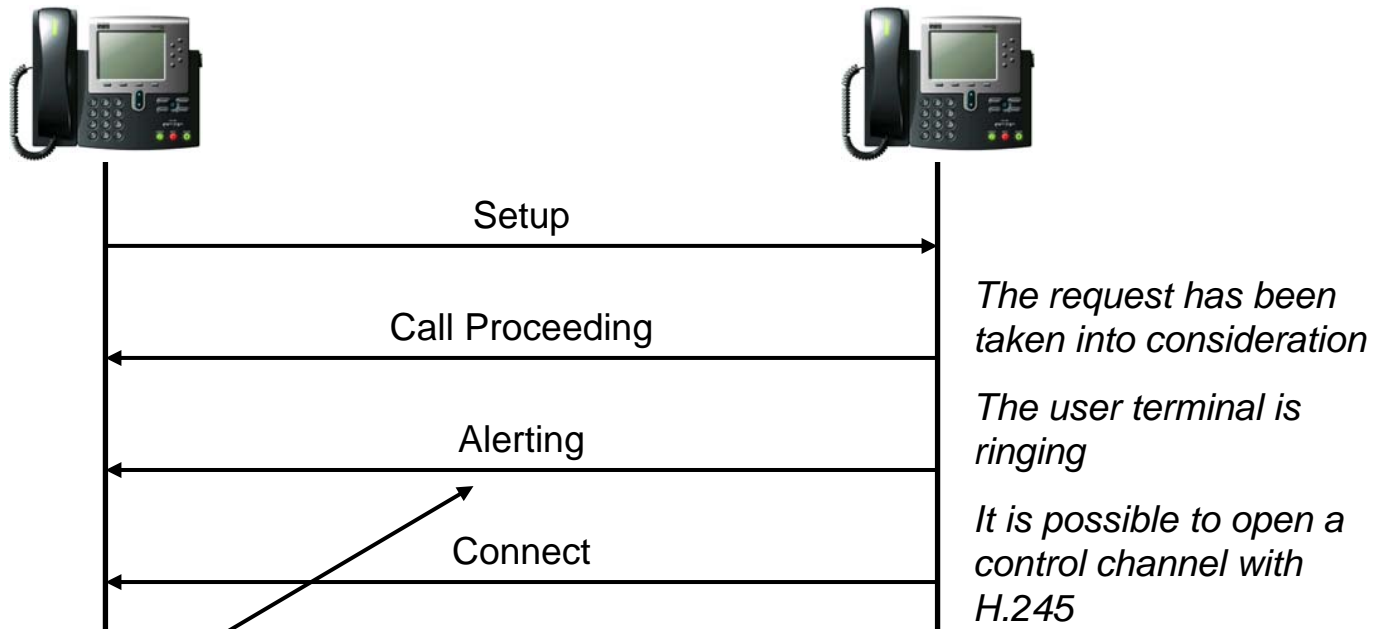
Call admission and bandwidth change



Request of authorizing the call and for a certain bandwidth

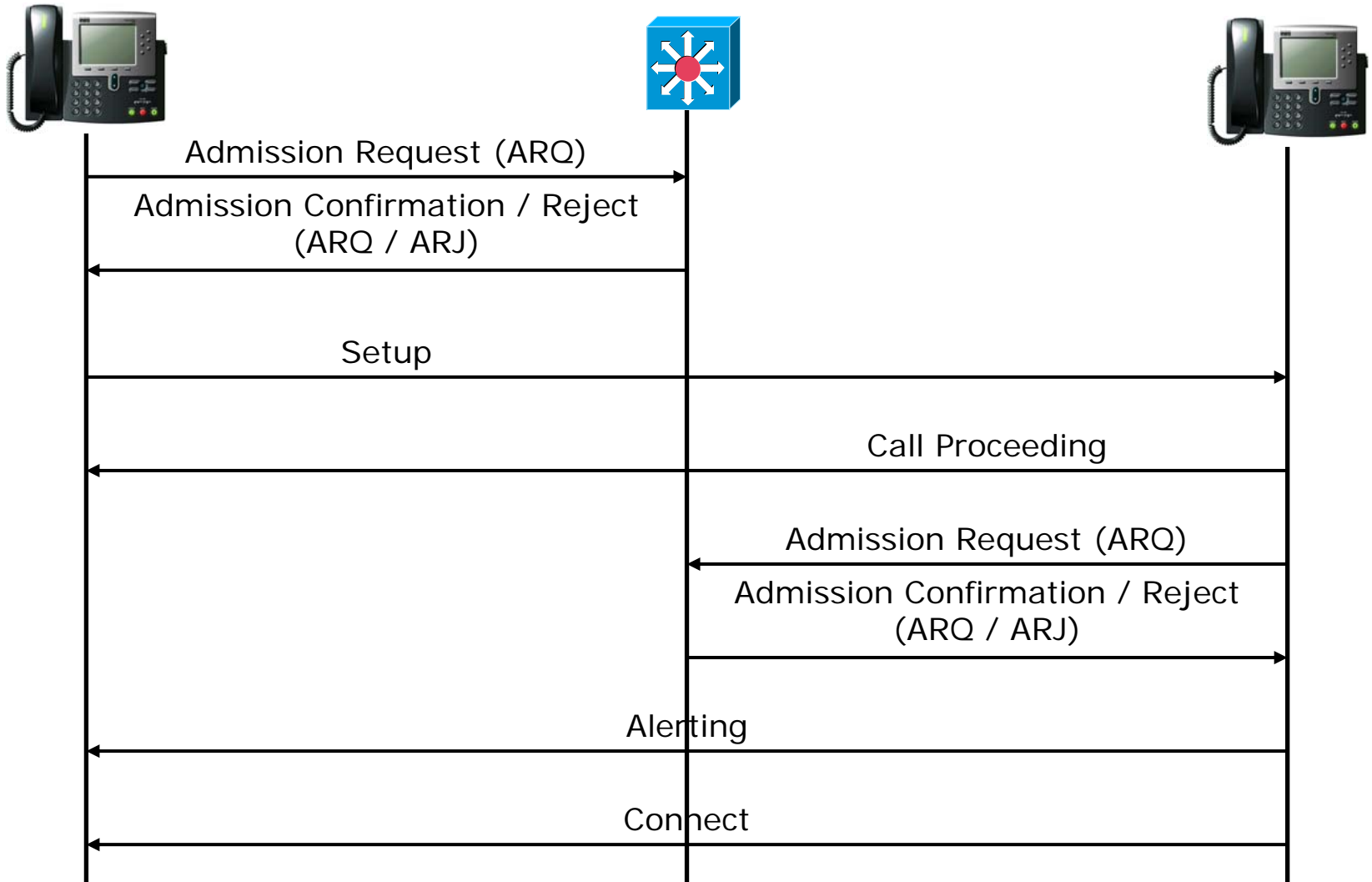
Modification of the bandwidth requested: allowed while the call is in progress

Direct call, without gatekeeper (Q.931)

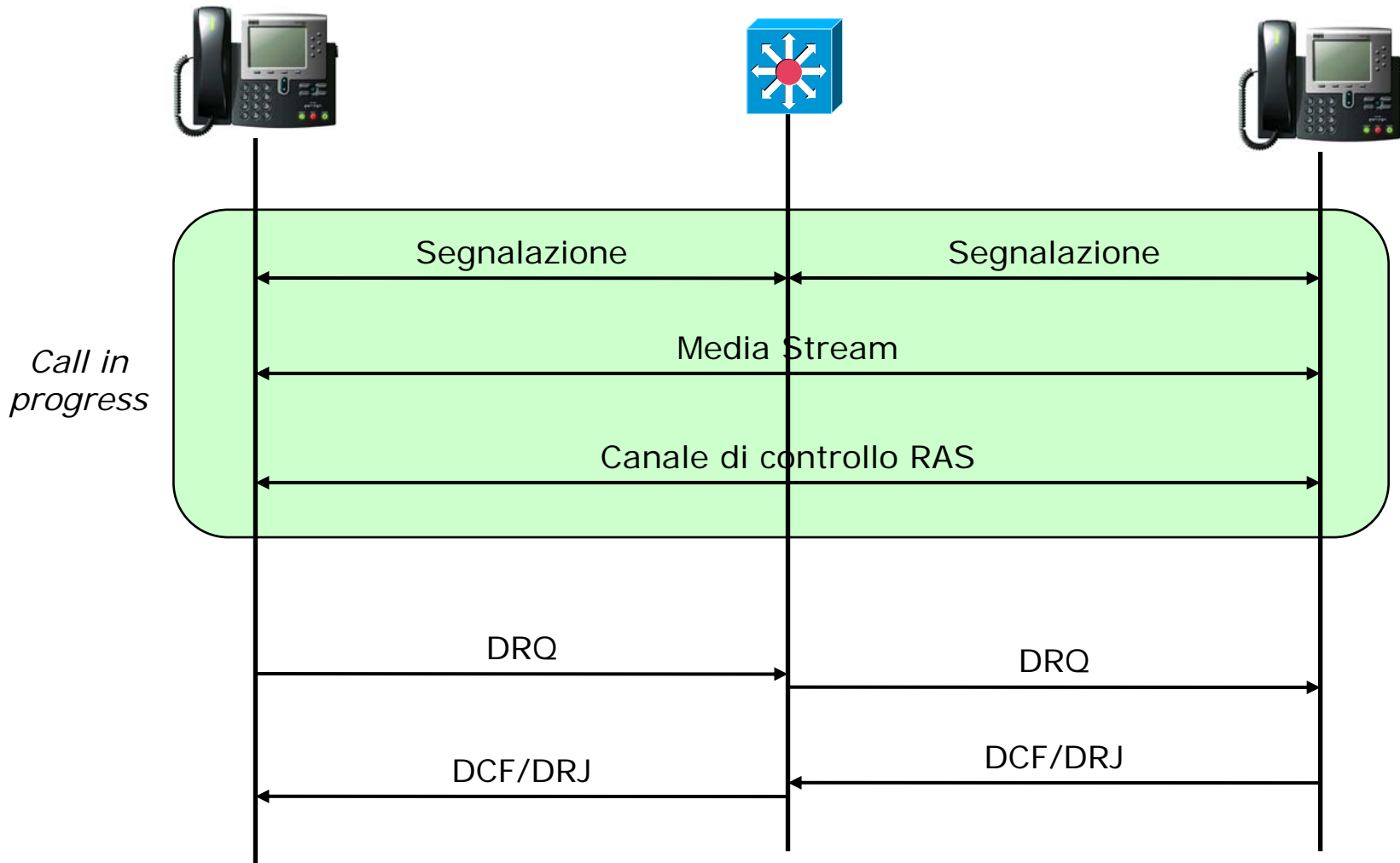


Optional, provided that Connect (oppre Release Complete) is received in 4 sec.

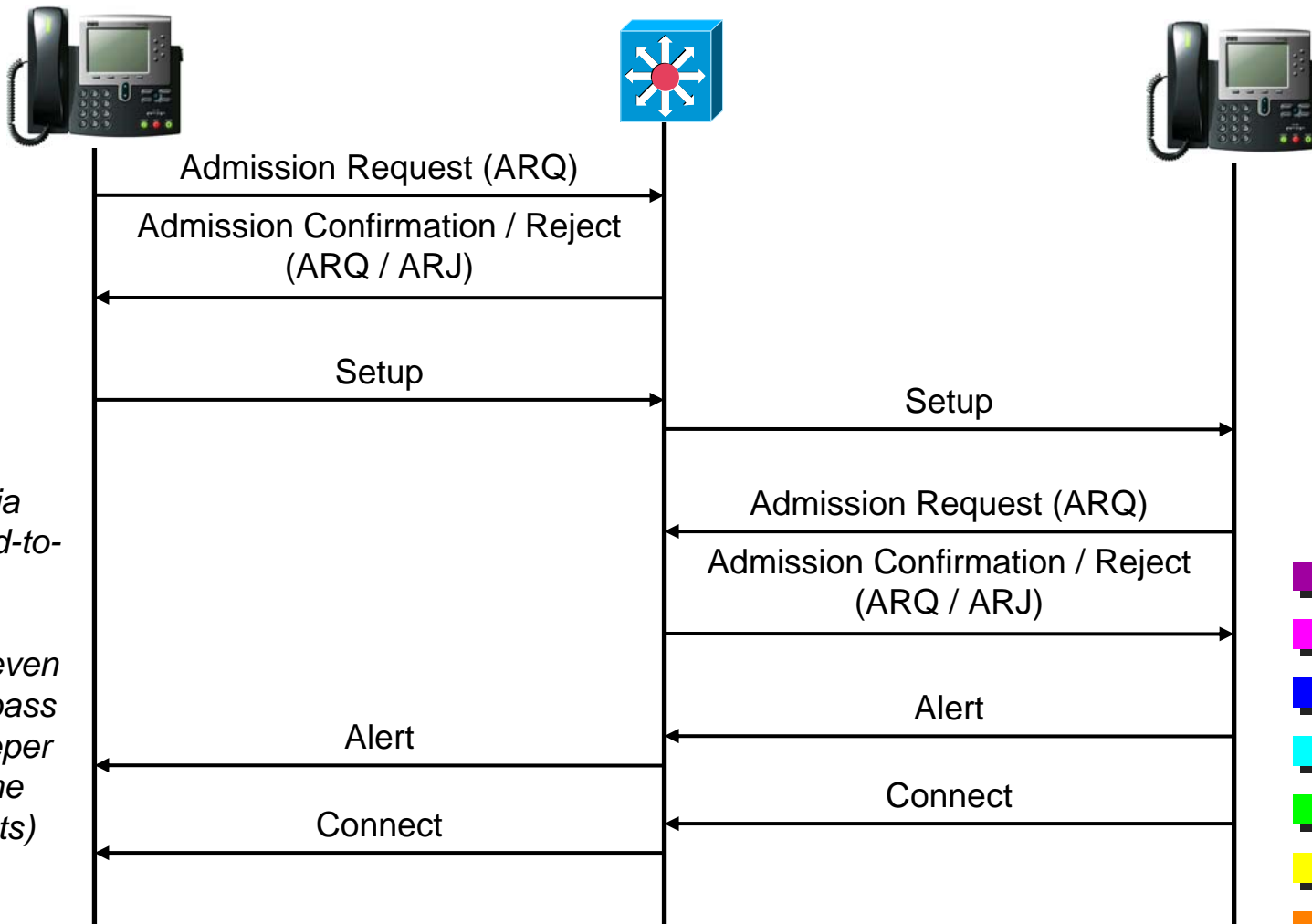
Gatekeeper Direct Endpoint (1)

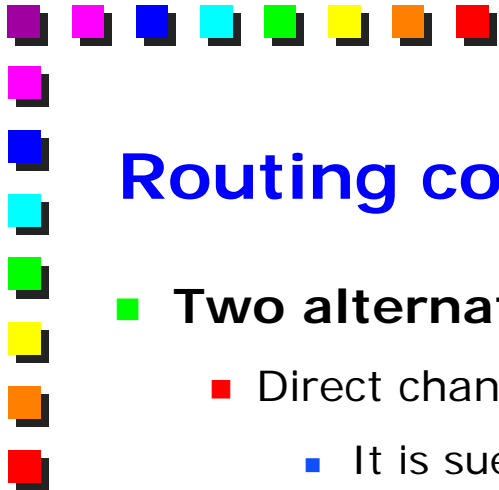


Gatekeeper Direct Endpoint (2)



Gatekeeper Routed Call

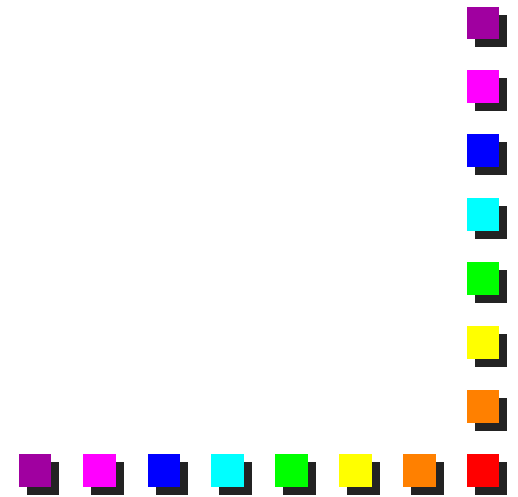




Routing control messages

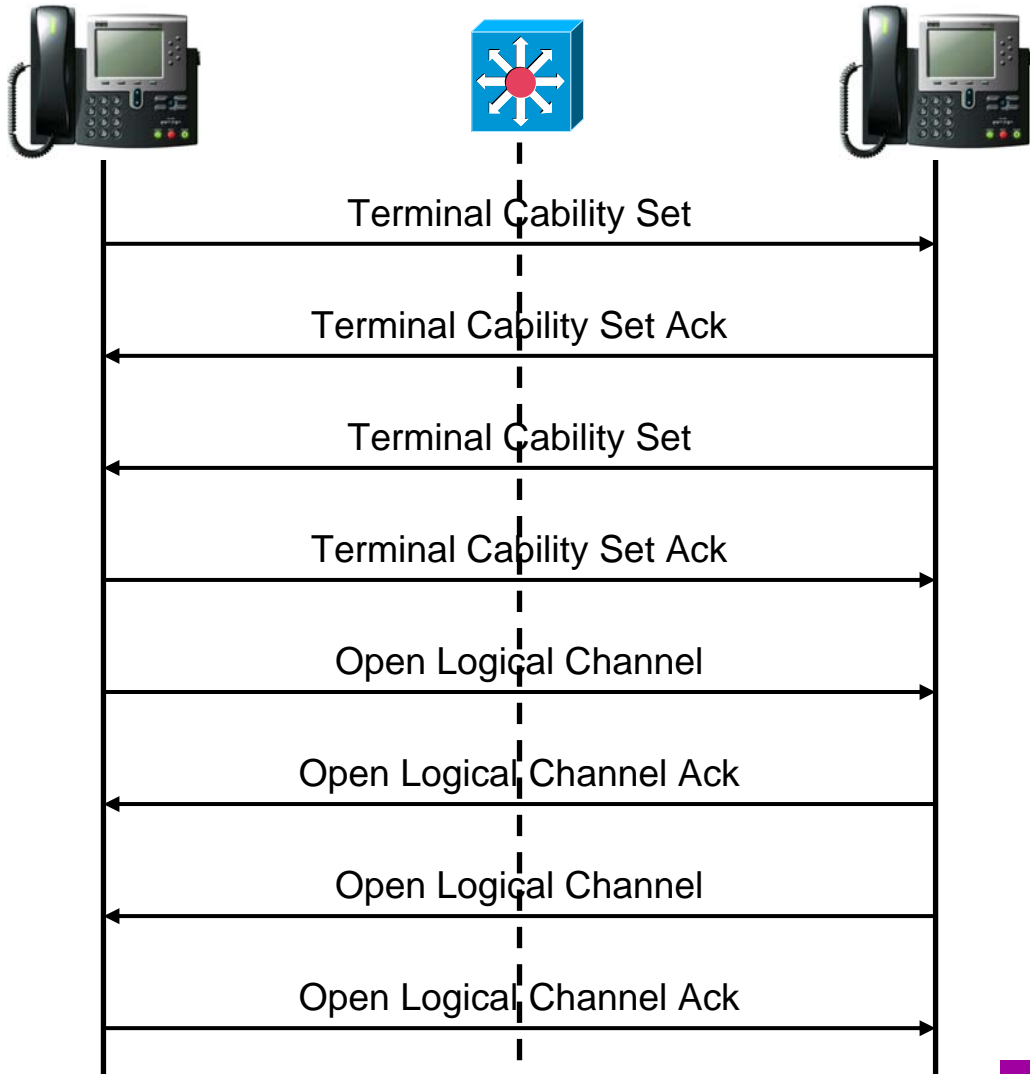
■ Two alternatives

- Direct channel between the endpoints
 - It is sued in case of direct call
 - Experimental in case of call through a Gatekeeper
- Channel directed to the Gatekeeper





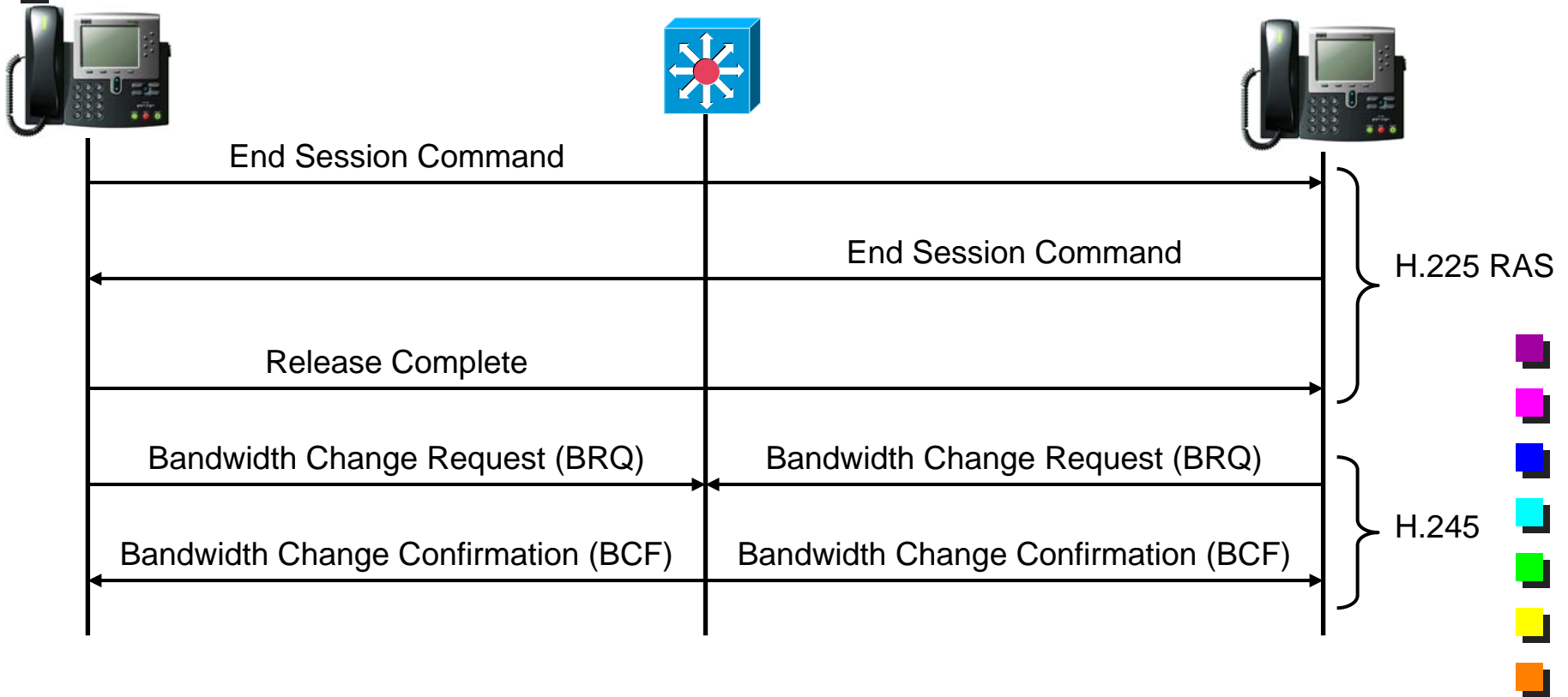
beginning of the call

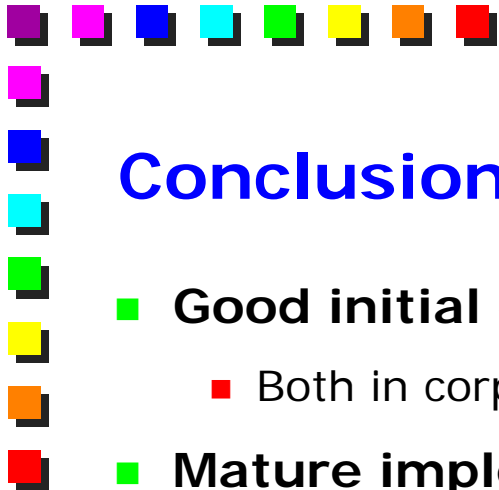


H.245 messages



Call termination





Conclusions

- **Good initial diffusion**
 - Both in corporate and in telecom provider environments
- **Mature implementations**
- **Complicated**
- **There is an ever growing interest in SIP**

