

The Media Gateway Control Protocol

N. C. State University

CSC557 ♦ Multimedia Computing and Networking

Fall 2001

Lecture # 26

“Roadmap” for Multimedia Networking

1. Introduction
 - why QoS?
 - what are the problems?
2. Basic operations
 - jitter buffers (at hosts)
 - task scheduling (at hosts)
 - packet shaping (at hosts)
 - packet dropping (at routers)
 - packet scheduling (at routers)
3. Types of service
 - Integrated Services (IntServ) and Resource Reservation Protocol (RSVP)
 - Differentiated Services (DiffServ)
4. Application-level feedback and control
 - Real-time Protocol (RTP), Real-time Control Protocol (RTCP)
5. Application signaling and device control
 - Session Description Protocol (SDP)
 - Real-time Streaming Protocol (RTSP)
 - Session Initiation Protocol (SIP)
 - **Media Gateway Control Protocol (MGCP)**
6. Routing
 - multicasting
 - Multi-protocol Label Switching (MPLS)

Today's
Lecture



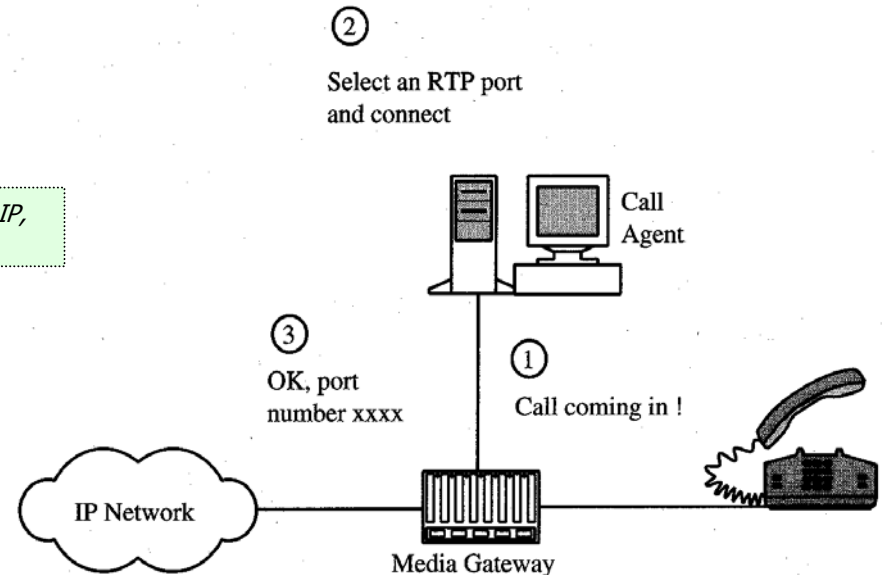
MGCP (Media Gateway Control Protocol)

- Master-slave protocol between Media Gateway Controllers (MGC) and Media Gateways (MG)
 - maintains close control over devices such as telephones
 - supports users and their subscribed features
- Main function: create, modify, and delete media streams across a gateway



Figure 6-4
Basic approach to
MGCP connection
establishment

*Source: Carrier Grade Voice Over IP,
D. Collins, McGraw-Hill, 2001*



MGCP (cont'd)

1. Media transformations

- negotiate media stream formats
- specify transformations to be applied at gateway

2. Events / actions

- notify the MGC of events in the media stream (on-hook, etc.)
- specify action MG should take in response to events

3. QoS

- configure MG to provide QoS
- report QoS from MG to MGC

4. Subscriber management

- report billing / accounting information

5. Fault tolerance

- provide recovery in event of MGC failure

Properties of MGCP

- Text-based protocol, for simplicity
- “Stateless” protocol
 - the MGC tracks the call state, but there is no transaction state

Megaco

- Megaco/H.248: a single, unified protocol developed by IETF and ITU for call control and signaling
- Alternate protocol to do same thing as MGCP
 - coexist at present; Megaco will take over?

Endpoints

- Types
 - single digital channel (DS0) or multiplexed digital channel (DS1)
 - analog phone circuit
 - announcement server
 - interactive voice response server
 - conference bridge access point
 - wiretap access point
 - packet relay (firewall or security gateway)
 - etc.

Endpoints (cont'd)

- Each endpoint associated with endpoint identifier
 - ex.: DS0 #7 within DW1 #12 within DS3 #4 =
trunk_4/12/7@gateway.somenetwork.net
 - endpoint identifier can include * (wildcard) to control group of endpoints, or get response from a group of endpoints

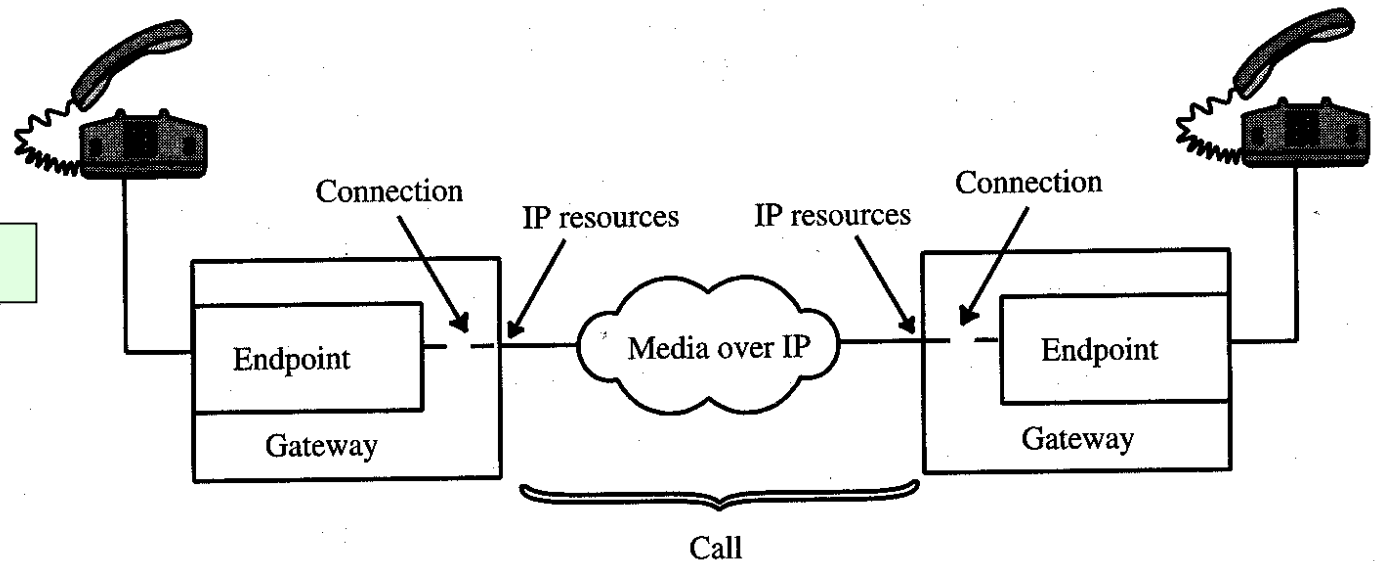
Terminology

- *Connection* = relationship between an endpoint and an RTP/IP session
- *Call* = group of connections between endpoints

Figure 6-6

Relationship between calls and connections

Source: *Carrier Grade Voice Over IP*,
D. Collins, McGraw-Hill, 2001



Commands

- 9 commands between MGC and MG
- Command headers
 - action
 - transaction Identifier
 - also put in the response header to correlate with command
 - name of target endpoint
 - protocol version
- Can encapsulate one command inside another
 - encapsulated command only executed in conjunction with outer command

Some Response Parameters

- CallID (C): generated by MGC, identifies call (involving one or more connections)
- ConnectionMode (M): sent by MGC to endpoint to establish connection state (normal, send only, receive only, loopback, etc.)
- ConnectionID (I): generated by endpoint in response to CRCX command
- RequestIdentifier (X): generated by MGC as part of notification request
- DigitMap (D): reules about combinations of digits that can be dialed and how to interpret them

Parameters (cont'd)

- RequestedEvents (R) : list of events for which endpoint must watch
- ObservedEvents (O): events detected by endpoint for which notification has been requested
- LocalConnectionOptions (L): encoding method, packetization interval, bandwidth, type of service, echo cancellation indicator
- ConnectionParameters (P): statistics sent by endpoint to MGC when connection deleted
 - packets sent and received, bytes sent and received, packets lost, average jitter, average latency
- RequestedInfo (F): return a local connection descriptor

Commands

- Endpoint Configuration (EPCF)
 - sent from MGC to MG; inform of "line-side" characteristics
 - parameters: BearerInformation
- Create Connection (CRCX)
 - create a connection to an endpoint
 - mandatory parameters: CallID ConnectionMode
 - SDP description may be part of the message body
- Modify Connection (MDCX)
 - change characteristics of an existing connection
 - mandatory parameters: CallID ConnectionID
 - SDP description may be part of the message body

Commands (cont'd)

- Delete Connection (DLCX)
 - terminate the connection
 - mandatory parameters: CallID ConnectionID
- Request Notification (RQNT)
 - issued by MGC to MG; alert MGC when event has been detected in media stream
 - mandatory parameters: RequestIdentifier
- Notify (NTFY)
 - notification from MG to MGC that an event has occurred
 - mandatory parameters: RequestIdentifier ObservedEvents

Commands (cont'd)

- Audit Endpoint (AU EP)
 - request the capabilities and state of an endpoint
 - mandatory parameters: (none)
- Audit Connections (AUCX)
 - request the capabilities and state of a connection
 - mandatory parameters: ConnectionID RequestedInfo

“Digit Maps”

- A pattern specifying particular sequences of keypresses and what they mean
- The MG collects and analyzes digits to see if a complete number has been dialed
 - saves communication (keypress by keypress) with the MGC
- Examples:
 - [2-9]xxxxxx = normal 7 digit number for local call
 - *xx = request for a feature
 - etc.

Return Codes

- 100-199 Provisional response, final response follows later
- 200-299 Success
- 400-499 Failure due to temporary error
 - ex.: phone already off hook, insufficient bandwidth available
- 500-599 Failure due to permanent error
 - Ex.: endpoint unknown, protocol error, gateway does not support request, unknown call-ID, hardware failure, ...

Call Setup

Figure 6-7
MGCP call-
establishment
overview

Source: *Carrier Grade Voice Over IP*,
D. Collins, McGraw-Hill, 2001

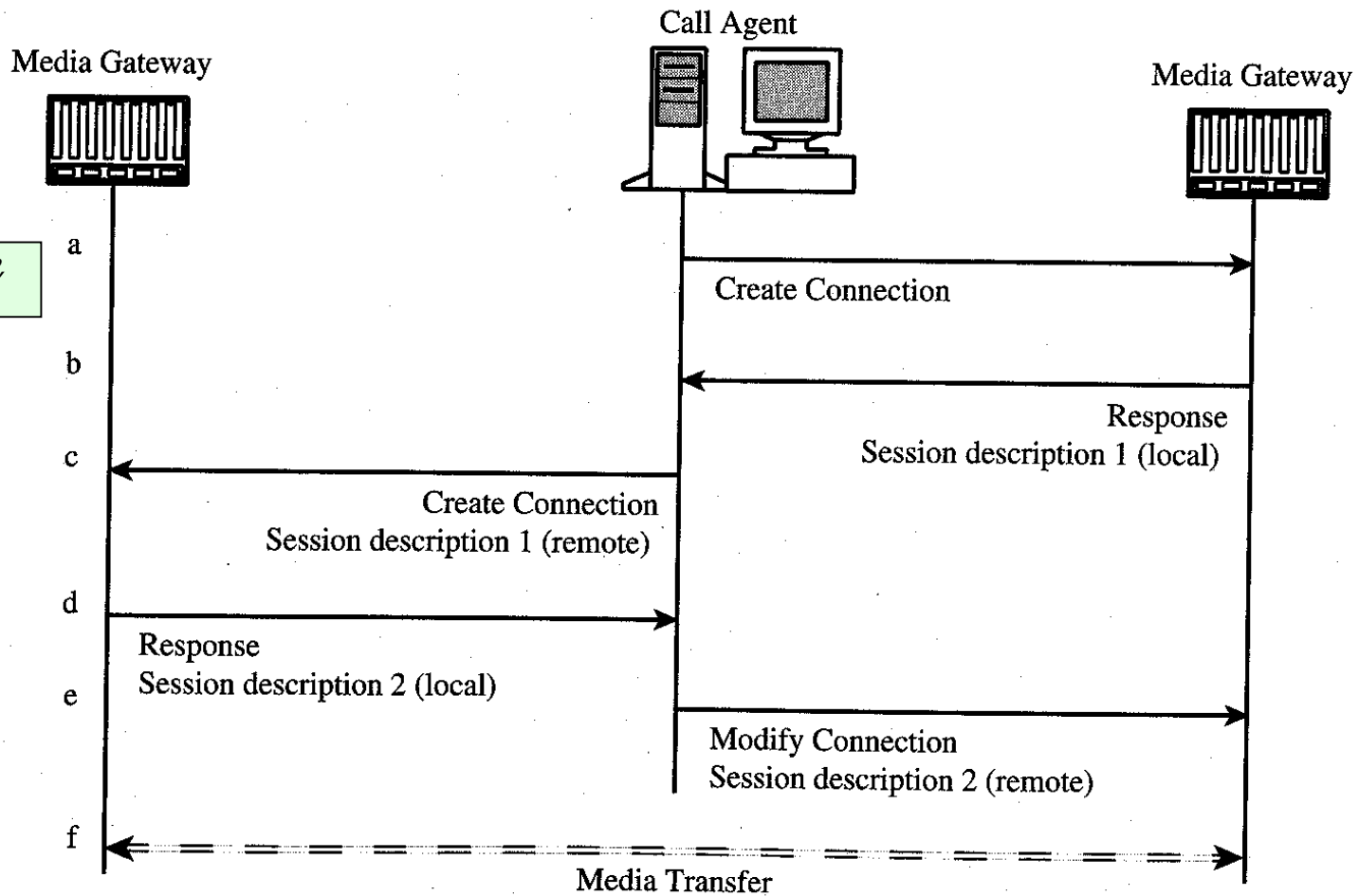


Figure 6-8
MGCP call setup
between two gateways

Source: *Carrier Grade Voice Over IP*,
D. Collins, McGraw-Hill, 2001

Call Setup

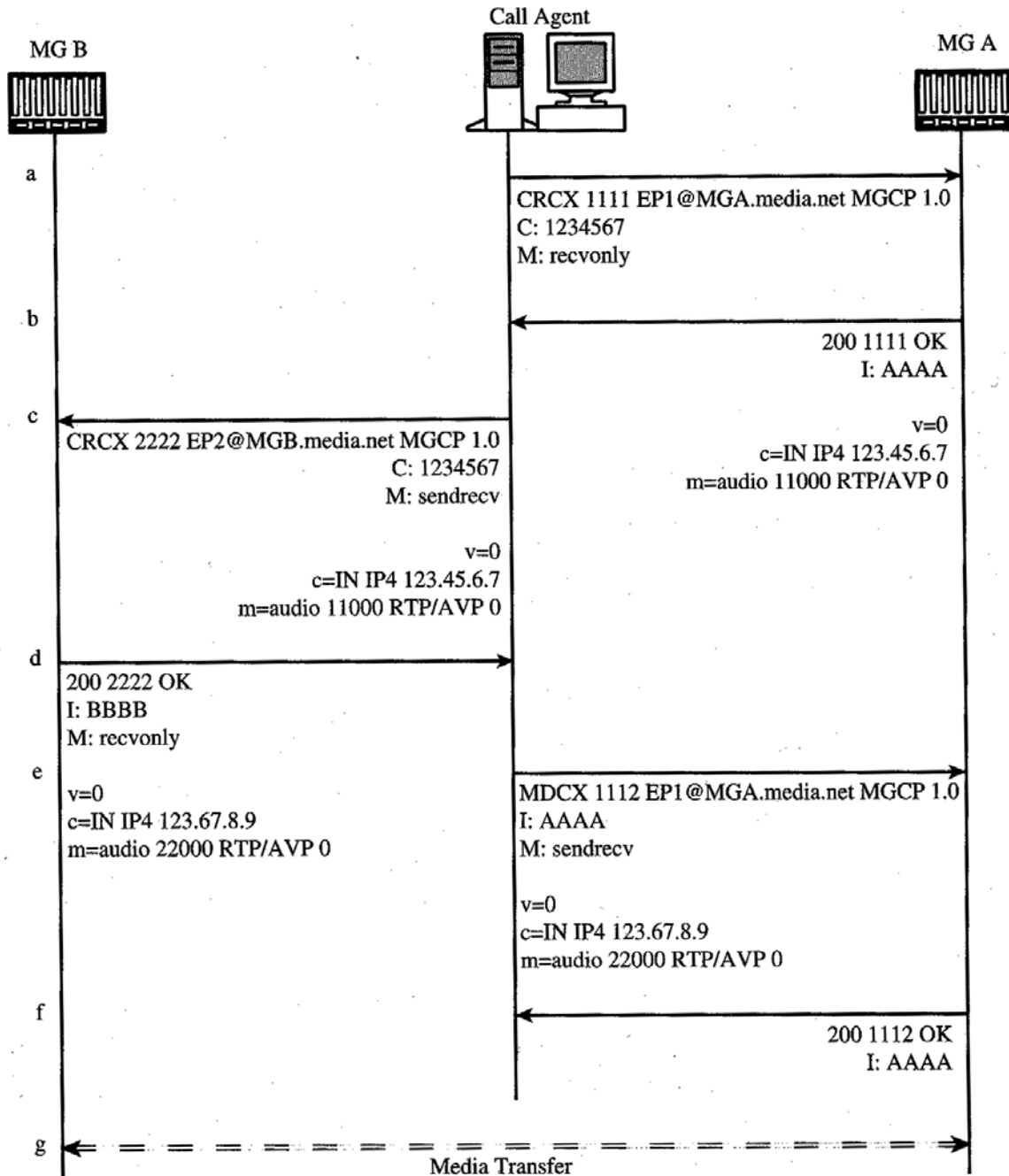


Figure 6-9
MGCP call setup
between residential
and trunking
gateways

Source: *Carrier Grade Voice Over IP*,
D. Collins, McGraw-Hill, 2001

Call Setup When User Picks Up Phone

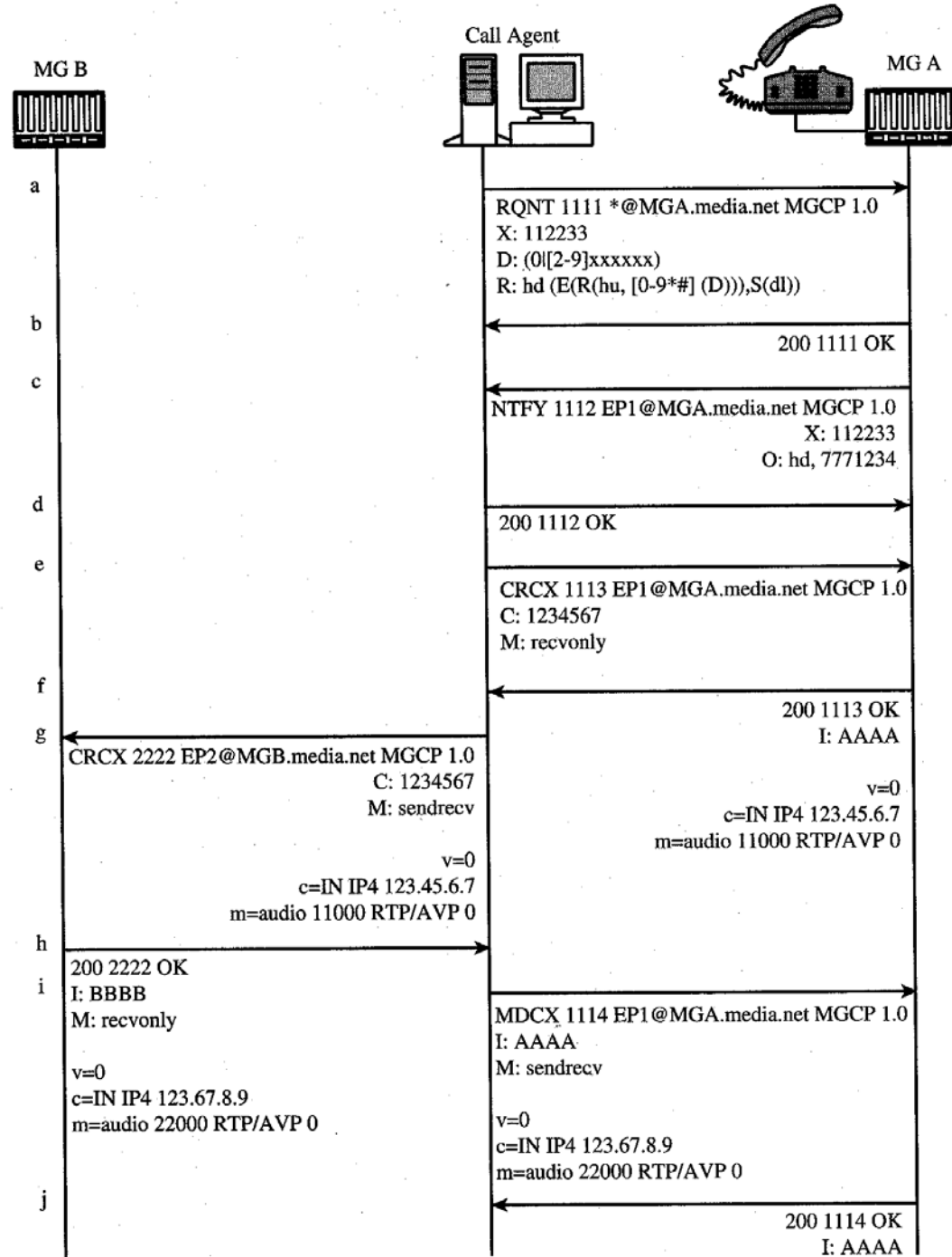
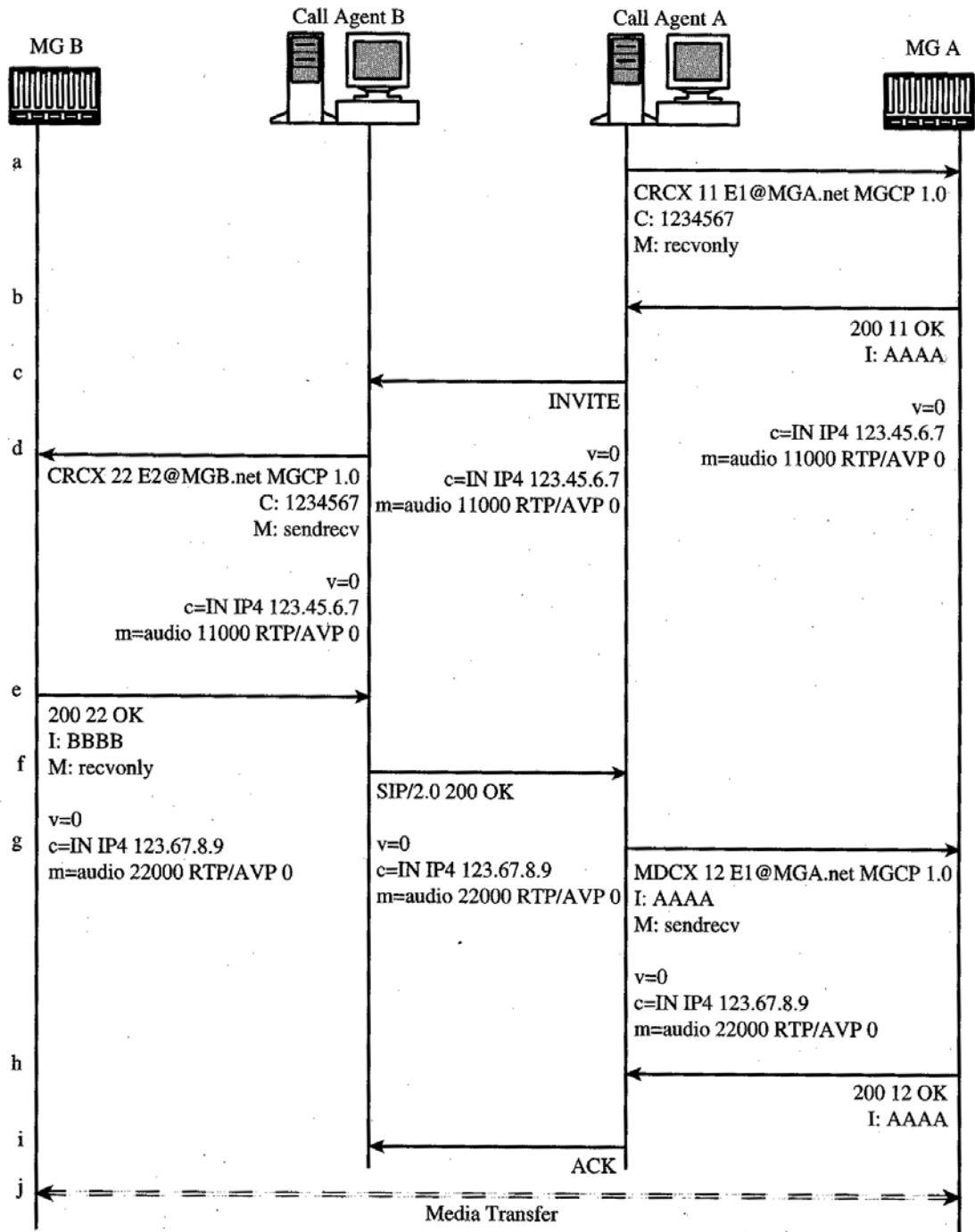


Figure 6-10
Call setup using
MGCP and SIP

Source: *Carrier Grade Voice Over IP*,
D. Collins, McGraw-Hill, 2001

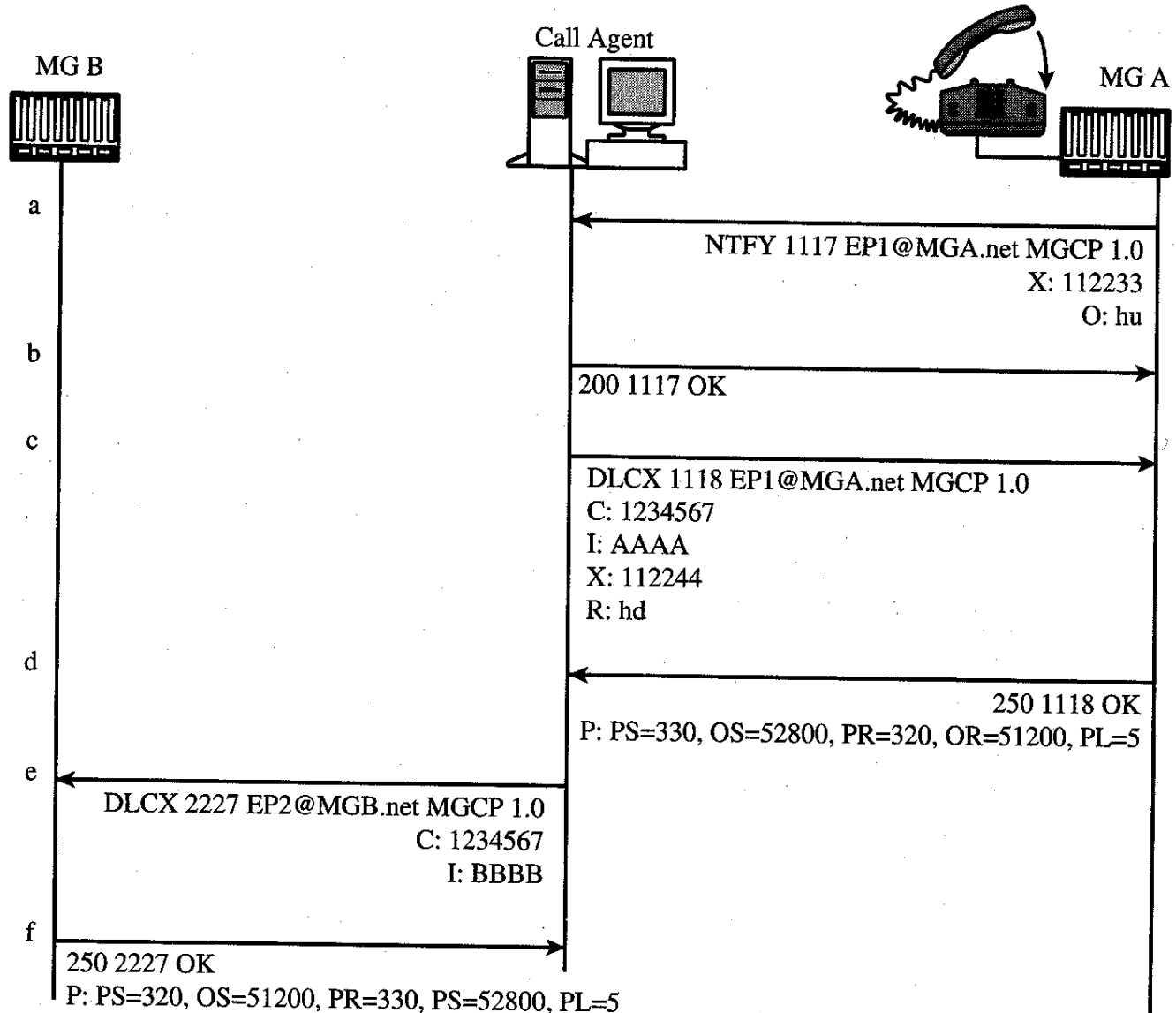
Call Setup Using MGCP and SIP



Call Release

Figure 6-11
MGCP call release

Source: *Carrier Grade Voice Over IP*,
D. Collins, McGraw-Hill, 2001



Sources of Info

- Recommended Books
 - D. Collins, *Carrier-Grade Voice over IP*, 2001
 - Chapter 6
- Other books
 - O. Hersent et al., *IP Telephony*, 2000
 - Chapter 2
 - B. Douskalis, *IP Telephony*, 2000
- RFCs
 - [Media Gateway Control Protocol Version 1.0](#)