

STATE KEY LABORATORY OF SWITCHING TECHNOLOGY AND TELECOMMUNICATION NETWORK

北京邮电大学  
BEIJING UNIVERSITY OF POSTS AND TELECOMMUNICATIONS



## MGCP协议分析

- MGCP协议基本分析

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## 媒体网关控制协议的需求

RFC2805 - Media Gateway Control Protocol Architecture and Requirements

- Per-Call Requirements
  - Resource Reservation
  - Connection Requirements
  - Media Transformations
  - Signal/Event Processing and Scripting
  - QoS/CoS
  - Test Support
  - Accounting
  - Signalling Control
- Resource Control
  - Resource Status Management
  - Resource Assignment
- Operational/Management Requirements
  - Assurance of Control/Connectivity
  - Error Control
  - MIB Requirements
- General Protocol Requirements
  - MG-MGC Association Requirements
  - Performance Requirements
- Transport
  - Assumptions made for underlying network
  - Transport Requirements
- Security Requirements
  - Requirements specific to particular bearer types
    - Media-specific Bearer Types
    - Application-Specific Requirements

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## MGCP协议基本操作 - MGCP协议请求

- MG注册命令
  - RSIP RestartInProgress MG接入服务/退出服务
- 端点管理与查询
  - EPCF EndpointConfiguratin 对端点进行配置
  - AUEP AueditEndpoint 检测MG中特定端点的状态
  - AUCX AueditConnection 检测MG中特定连接的状态
- 事件监测设置与通知
  - RQNT NotificationRequest 请求MG处理信号,监测事件
  - NTFY Notify MG检测到了特定事件,并上报给MGC
- 连接管理
  - CRCX CreateConnection 在MG中创建特定的连接
  - MDCX ModifyConnection 修改MG中连接的属性
  - DLCX DeleteConnection 删除MG中建立的连接

MGCP所有的请求都针对“端点”

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## MGCP协议基本操作 - MGCP协议响应

- 1xx 临时的响应
  - 100 事务正在被执行
- 2xx 命令成功完成
  - 200 请求的事务成功完成
  - 250 连接成功删除
- 4xx 暂时性错误
  - 400 事务由于暂时性错误不能被执行
  - 403 端点当前没有足够的资源
  - 404 目前带宽不足
- 5xx 永久性错误
  - 500 事务由于端点未知而不能执行
  - 501 事务由于端点未准备好而不能执行
  - .....

MGCP是基于“请求-响应”的协议

MGCP是基于“Transaction”的协议

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## MGCP的消息结构

generic-message = Command Line \*Parameter Line [Session Description]

Command Line = RequestMethod TransactionID EndpointName ProtocolVersion

Parameter Line = ParameterName : [WS]ParameterValue

<b>NotificationRequest (RQNT)</b>	<b>Notify (NTFY)</b>	<b>ModifyConnection (MDCX)</b>
[RequestedEvents] R	NotifyIdentifier X	CallID C
[RequestIdentifier] X	ObservedEvents O	ConnectionID I
[DigitMap] D	[NotifiedEntity] N	[NotifiedEntity] N
[SignalRequests] S		[LocalConnectionOptions] L
[DetectEvents] T		[ConnectionMode] M
[NotifiedEntity] N		[RemoteConnectionDiscriminator] RC
<b>RestartInProgress (RSIP)</b>	<b>CreateConnection (CRCX)</b>	<b>DeleteConnection (DLCX)</b>
RestartMethod RM	CallID C	CallID C
[RestartDelay] RD	[NotifiedEntity] N	ConnectionID I
[ReasonCode] E	[LocalConnectionOptions] L	
	ConnectionMode M	
	[[RemoteConnectionDiscriminator] RC	
	SecondEndpointId] Z2	

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## MGCP协议扩展包

Generic Media Package				
Package Name: G				
Symbol	Definition	R	S	
rt	Ringback Tone		TO	

Line Package				
Package Name: L				
Symbol	Definition	R	S	
bz	Busy Tone		TO	
dl	Dial Tone		TO	
rg	Ringing		TO	
hd	On-hook Transition	S		
hu	Off-hook Transition	S		

DTMF Package				
Package Name: D				
Symbol	Definition	R	S	
1	DTMF 1	✓	BR	
#	DTMF #	✓	BR	
*	DTMF *	✓	BR	
T	Interdigit Timer	✓	TO	

Trunk Package				
Package Name: T				
Symbol	Definition	R	S	
bl	Blocking		BR	
lb	Loopback		OO	

R	Events	OO	On/Off signal	BF	Brief signal
S	Signals	TO	Time-Out signal	✓	can be requested

### MGCP消息举例

**RQNT 2050 aaln/1@rgw.com.cn mgcp 1.0**  
**R:** L/hu(n), D/[0-9#\*T](D)  
**S:** L/dl  
**X:** 2222  
**D:** (0T)00T#xxxxxxx|\*xx|91x|9011x.T)

200 2050 ok

**NTFY 25 aaln/1@rgw.com.cn mgcp 1.0**  
**O:** D/9, D/1, D/1  
**X:** 2222

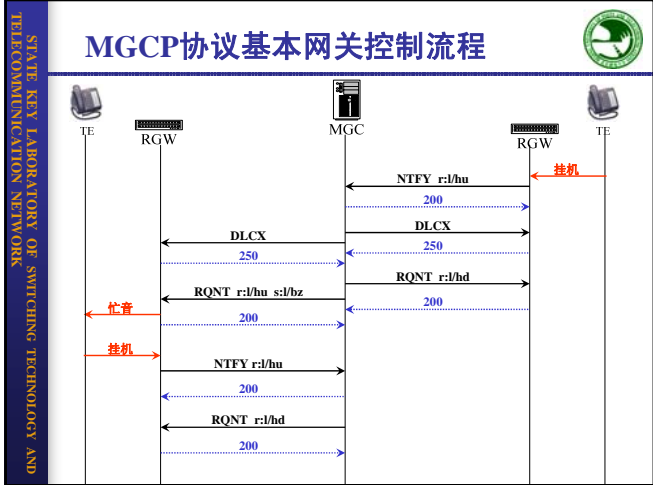
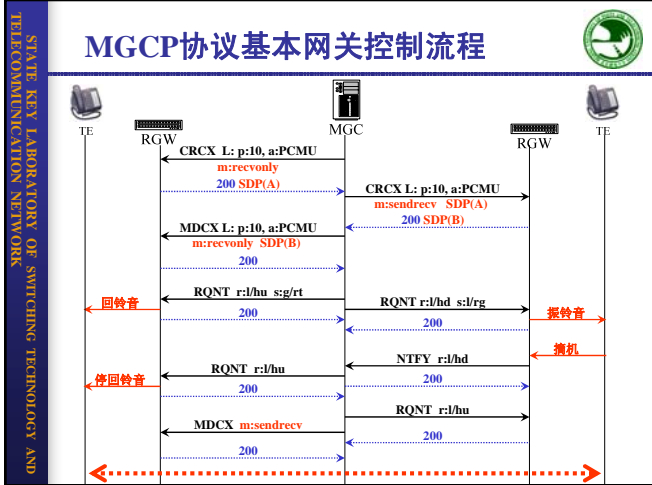
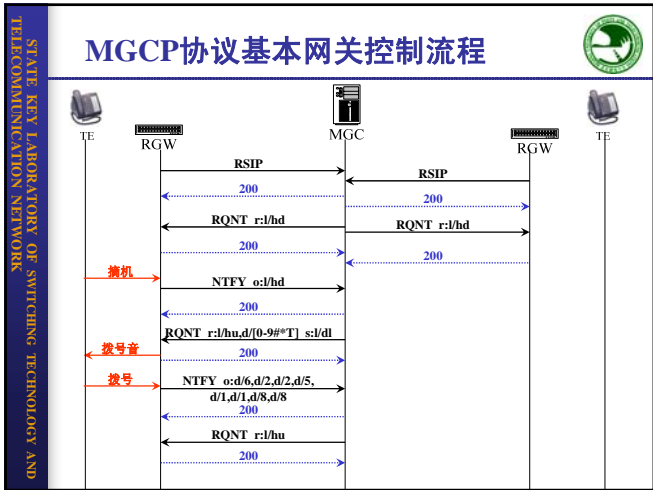
200 25 ok

**CRCX 2052 aaln/1@rgw.com.cn mgcp 1.0**  
**C:** 9876543210  
**L:** p:20,a:PCMU  
**M:** sendrecv

v=0  
o=1234 4321 IN IP4 100.101.102.103  
s=-  
t=0 0  
c=IN IP4 100.101.102.103  
m=audio 49170 RTP/AVP 0  
a=rtptime:0 PCMU/8000

200 2052 ok  
**I:** 0123456789

v=0  
o=5678 8765 IN IP4 100.101.102.104  
s=-  
t=0 0  
c=IN IP4 100.101.102.104  
m=audio 49170 RTP/AVP 0  
a=rtptime:0 PCMU/8000



- ### MGCP协议操作总结
- 以“Endpoint”为核心的网关管理
  - 以“Connection”为核心的Endpoint管理
    - 以Connection Identifier对应一组“CRCX-MDCX-DLCX”
    - 以Call Identifier维护一组Connection
  - 以“Transaction”为基本消息处理单位
  - 以Signal和Event为基本控制元素
    - 以Request Identifier对应 RQNT-NTFY
  - 以Package完成功能组织

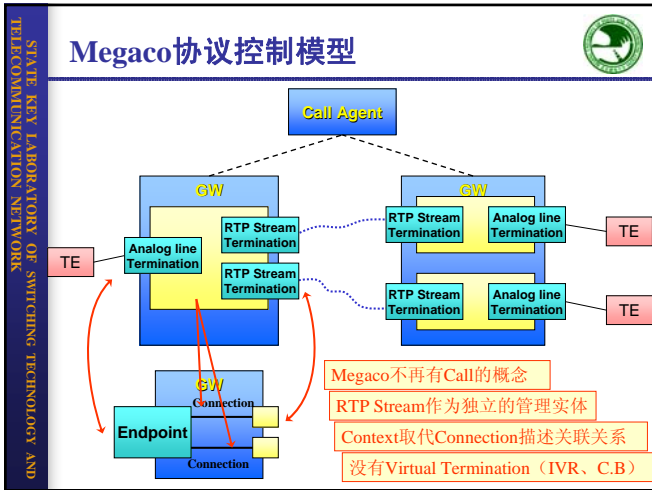
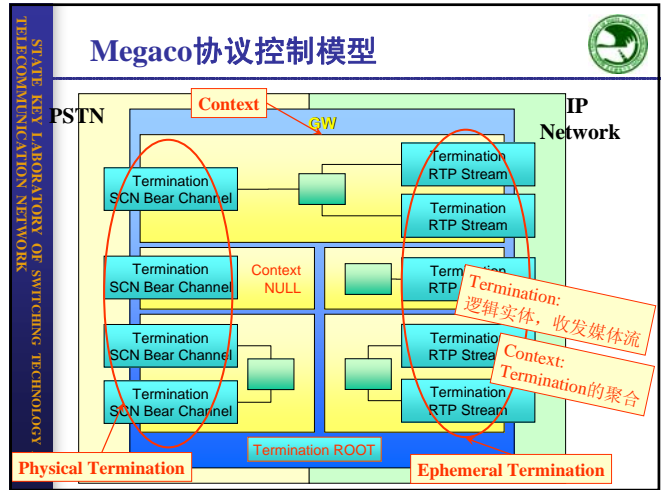
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## Megaco协议分析

-Megaco协议控制模型  
与基本协议分析

## Megaco协议控制模型基本定义

- Connection Model**
  - The connection model for the protocol describes the **logical entities**, or **objects**, within the Media Gateway that can be controlled by the Media Gateway Controller.
  - The main abstractions used in the connection model are **Terminations** and **Contexts**.
- Termination**
  - A Termination is a **logical entity** on a MG that sources and/or sinks media and/or control streams.
  - In a multimedia conference, a Termination can be multimedia and sources or sinks **multiple media streams**.
  - The media stream parameters, as well as modem, and bearer parameters are **encapsulated within the Termination**.
- Context**
  - A Context is an **association between a collection of Terminations**.
  - The Context describes the **topology** (who hears/sees whom) and the media mixing and/or switching parameters if more than two Terminations are involved in the association.
  - There is a special type of Context, the **null Context**, which contains all Terminations that are not associated to any other Termination.
  - For instance, in a decomposed access gateway, **all idle lines are represented by Terminations in the null Context**.



## Megaco协议基本操作

### Termination管理

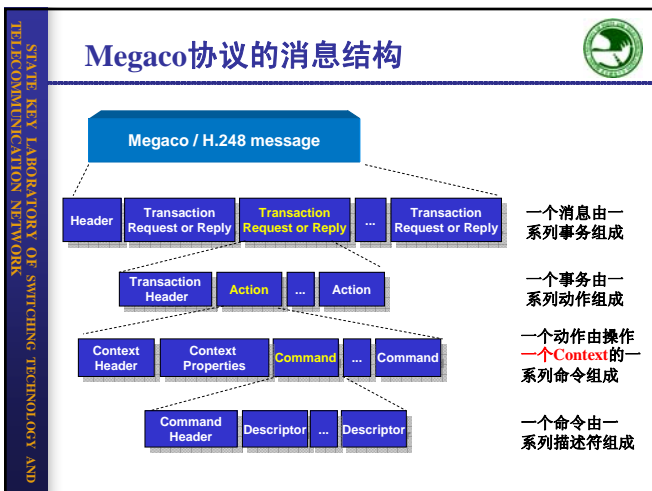
- ServiceChange** 一个 / 一组Termination 加入 / 退出服务
- AuditValue** 获取Termination当前设置的特性、事件、信号、统计信息
- AuditCapabilities** 获取Termination可能的特性、事件、信号、统计信息

### Termination/Context操作

- Add** 向一个Context添加一个Termination
- Modify** 修改一个Termination的特性、事件和信号
- Subtract** 解除一个Termination与Context之间的联系
- Move** Termination在Context之间的移动

### 事件通知

- Notify** 上报MG中发生的事件



## Megaco的消息处理

```

MEGACO/1 [216.33.33.61]: 27000
Transaction = 1236 {
  Context = {
    Add = TermA {
    }
  }
  Add = $ {
    Media {
      LocalControl {
        Mode = Receiveonly,
      },
      Local {
        v=0
        c=IN IP4 $
        m=audio $ RTP/AVP 4
      }
    }
  }
}

MEGACO/1 [209.110.59.34]: 25000
Reply = 1236 {
  Context = {
    Add = TermA,
    Add=EphA {
      Media {
        Local {
          v=0
          o= 2890844526 2890842807 IN IP4 209.110.59.34
          s=
          t= 00
          c=IN IP4 209.110.59.33
          m=audio 30000 RTP/AVP 4
          a=recvonly
        }
      }
    }
  }
}
  
```

### Megaco的消息处理

```

MEGACO/1 [216.33.33.61]: 27000
Transaction = 1248 {
  Context = 1
  Topology TermA, EphA,bothway, TermA, EphD, bothway, EphA,EphD, bothway{
  Modify = EphA {
    Media {
      {
        LocalControl {
          Mode = sendrecv,
        },
        Remote {
          v=0
          c=IN IP4 192.168.0.110
          m=audio 45000 RTP/AVP 4
        }
      }
    }
  }
}
MEGACO/1 [209.110.59.34]: 25000
Reply = 1248 {
  Context = 1 {
    Modify=EphA
  }
}

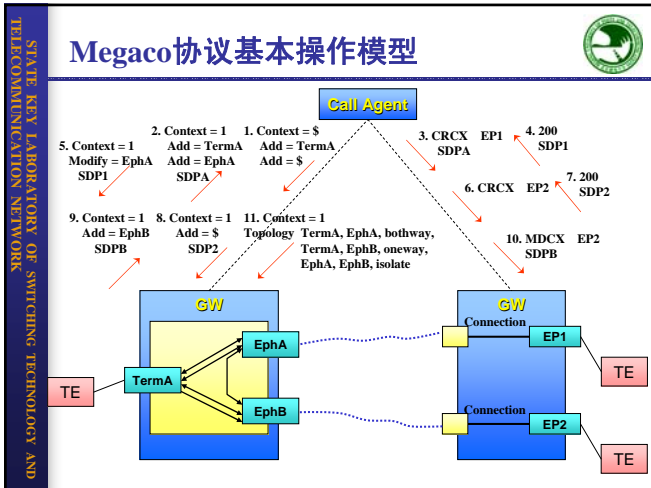
```

### Megaco的消息处理

```

MEGACO/1 [216.33.33.61]: 27000
Transaction = 1235 {
  Context = - {
    Modify = TermA {
      Signals (cg/dt),
      DigitMap= Dmap1 ((2XXX)),
      Events = 1112 {
        al/on, dd/ce (DigitMap=Dmap1)
      }
    }
  }
}
MEGACO/1 [209.110.59.34]: 25000
Reply = 1235 {
  Context = - {Modify = TermA}
}
MEGACO/1 [209.110.59.34]: 25000
Transaction = 2001 {
  Context = - {
    Notify = TermA {
      ObservedEvents =1112 {
        20010202T10010000:dd/ce (ds="2992", Meth=FM)
      }
    }
  }
}
MEGACO/1 [216.33.33.61]: 27000
Reply = 2001 {
  Context = - {Notify = TermA}
}

```



### Megaco消息处理总结

- Megaco/H.248从一个更抽象的角度对网关的控制方式进行了定义 (**Termination**、**Context**)
- 以“**Termination**”为核心的网关管理
  - 以Signal和Event为基本控制元素
- 以“**Context**”为核心的Termination管理
  - Context的Topology简化多方管理
  - Move方法简化Termination在Context间的移动
- 以“**Transaction**”为基本消息处理单位
- 以Package完成功能组织

### MGCP与Megaco的差异

- 控制模型的差异
  - Endpoint & Connection
  - Termination & Context
- 控制能力的差异
  - 针对单个端点的控制
  - 对单个端点的控制 & 对端点间拓扑结构的控制

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## MGCP / Megaco 协议 分析总结

- MS控制模型

### MGCP/Megaco对媒体服务器的支持

控制能力	MGCP	Megaco	控制能力	MGCP	Megaco
承载连接的媒体协商	MGCP控制	MGCP控制	多方服务的连接建立	MGCP针对多方服务端点的连接建立	MGCP针对Context的终结点加入
服务动作的控制	MGCP针对服务提供端点的控制	MGCP针对连接终结点的控制	多方服务拓扑结构控制	MGCP针对多方端点每一个连接属性控制	MGCP针对Context拓扑结构控制

### 使用SIP协议作为MS控制协议?

SIP UA, Call Agent, MS, SIP TE, SIP Proxy, SIP UA

SIP, MGCP/Megaco

Call Agent, SIP Proxy

SIP TE, MS

### 一种新的MS控制模型

connection, operator, conference, dialog, dialog

如何提供高级MS控制?

媒体服务器控制能力:  
1、承载连接的媒体协商  
2、服务动作的控制  
3、多方服务的连接建立  
4、多方服务拓扑结构控制

都通过扩展SIP协议来完成吗?

MSML/MOML, MSCL  
Media Objects Markup Language  
Media Sessions Markup Language  
Media Server Control Markup Language

SIP做什么?  
网络连接的建立  
控制连接的建立

### 以SIP协议为基础的MS控制过程

SIP UA, Call Agent, MS

INVITE, ACK, INFO createconference, INVITE SDP-UA, 200 SDP-MS, ACK, INFO join

Control Dialog A, Session Dialog 1, Control Dialog A

对于控制信道, SIP是什么类型的协议?  
对于会话信道, SIP是什么类型的协议?

### 如何看待一个协议?

- 从整体角度看问题
- 系统的体系结构模型?
- 协议在体系结构中所处的位置?
- 协议在体系结构中所起的作用?