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BEIJING UNIVERSITY OF
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STATE KEY LABORATORY OF SWITCHING TECHNOLOGY AND
TELECOMMUNICATION NETWORK

网络协议分析与实现
第三章典型通信协议分析
MGCP/Megaco协议

李静林

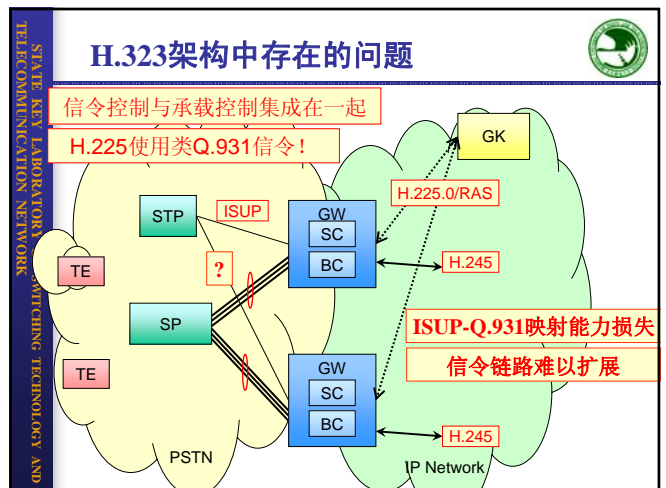
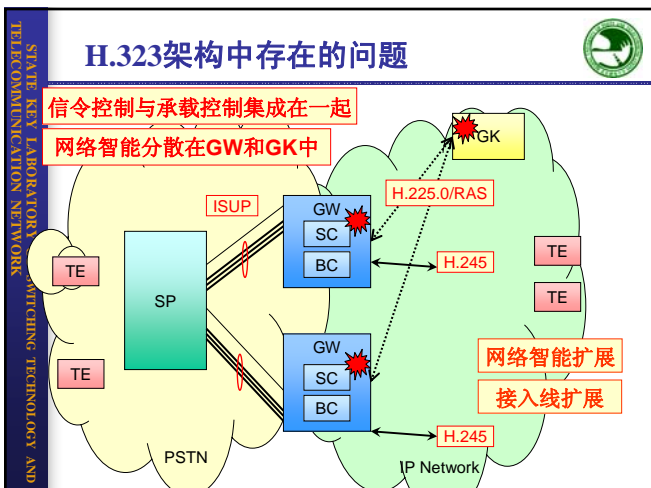
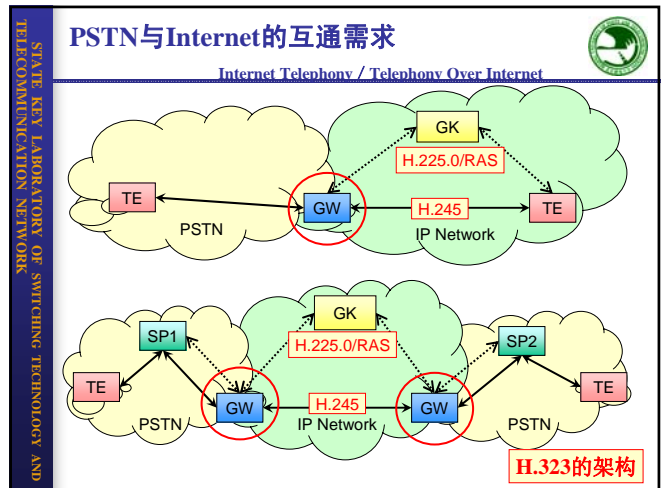
媒体网关控制协议

- MGCP/Megaco协议的产生与发展
 - 明确MGCP/Megaco协议是什么
 - 明确MGCP/Megaco协议为什么
- MGCP协议控制模型
 - 明确MGCP协议做什么
- MGCP协议基本分析
 - 明确MGCP协议怎么做
- Megaco协议控制模型
 - 明确Megaco协议做什么
- Megaco协议基本分析
 - 明确Megaco协议怎么做
- MGCP/Megaco协议扩展分析
 - 对媒体服务器的控制

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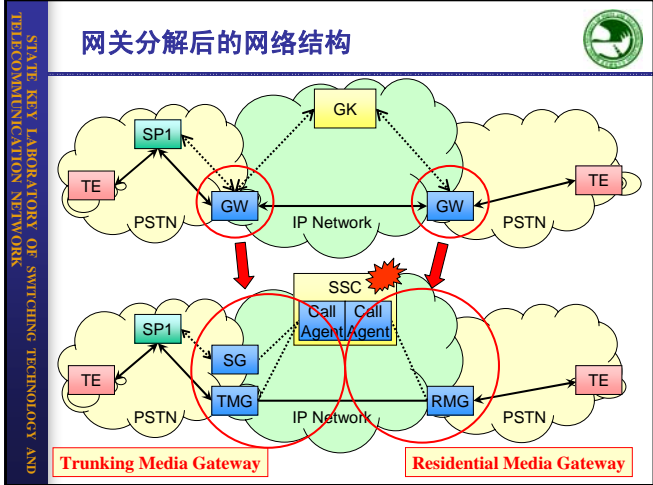
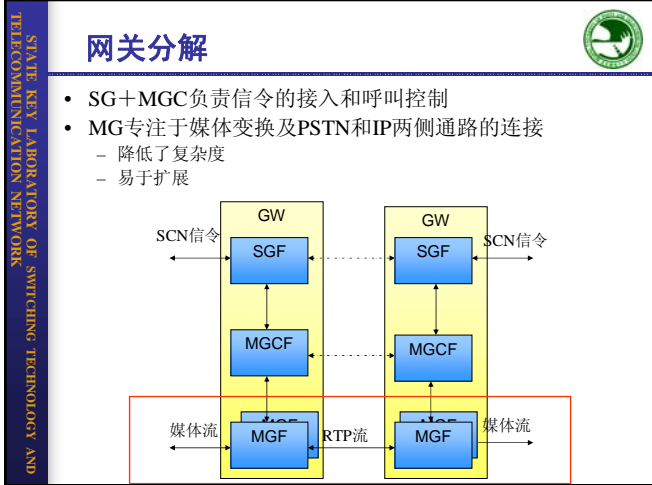
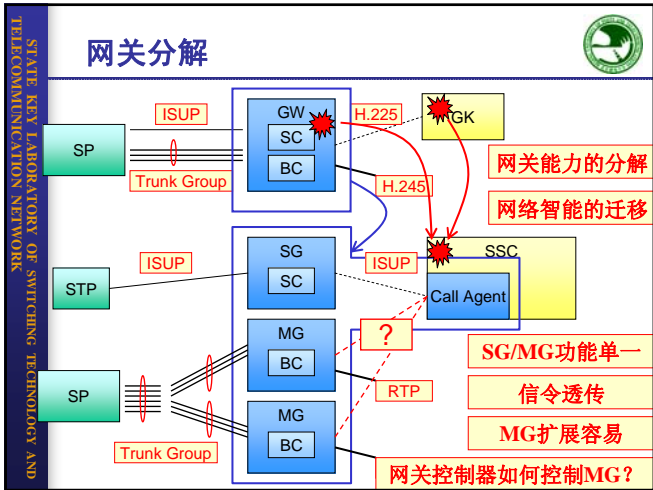
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MGCP/Megaco协议的
产生与发展



媒体网关控制协议的产生背景

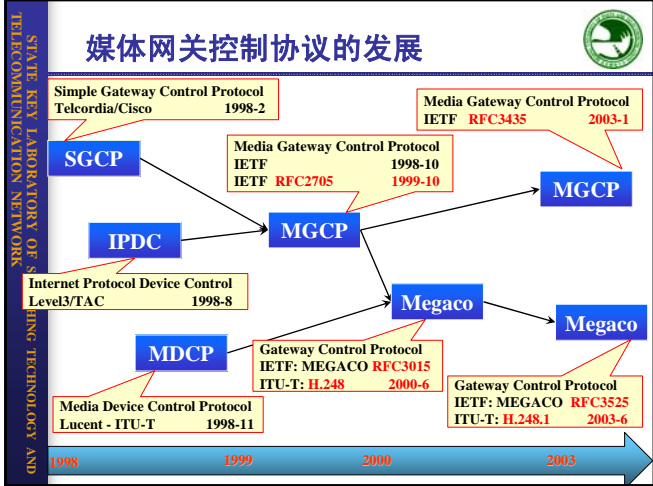
- 网络智能的分散
 - 提供业务困难
- 信令控制与承载控制形式上的分离，事实上的集成
 - 信令控制与承载控制分离受影响
 - 网关容量扩展成瓶颈
- ISUP必须映射为Q.931
 - 映射的能力损失导致不能支持ISUP的完整能力
- 怎么办?
 - 扭转信令控制和承载控制事实上的不分离
 - 网络智能的集中



媒体网关控制协议的产生

- 1998-2 Telcordia
- SGCP — Simple Gateway Control Protocol
 - an application programming interface (SGCI) and a corresponding protocol (SGCP) for **controlling Telephony Gateways** from **external call control elements**
- 协议的设计原则
 - keeping the gateways simple, by concentrating programming difficulties in the call agent
 - keeping the protocol simple, by limiting its role to the specific case of gateway control
 - keeping the implementation simple, by choosing text encodings

媒体网关是非智能的
媒体网关功能是非常简单的 (不是功能有限)



媒体网关控制协议的标准化进展

- 基本需求
 - RFC2805 - Media Gateway Control Protocol Architecture and Requirements
- MGCP
 - 基本协议
 - RFC2705/RFC3435-Media Gateway Control Protocol
 - RFC3661 - MGCP Return Code Usage (Update RFC3435)
 - 扩展包
 - RFC2897 - Proposal for an MGCP Advanced Audio Package
 - RFC3064 - MGCP CAS Packages
 - RFC3149 - MGCP Business Phone Packages
 - RFC3441 - ATM Package for the MGCP
 - RFC3624 - The MGCP Bulk Audit Package
 - RFC3660 - Basic MGCP Packages (Update RFC2705)
 - RFC3991 - MGCP Redirect and Reset Package
- Megaco
 - 基本协议
 - RFC3015/RFC3525 - Megaco Protocol
 - H.248.1 - Gateway control protocol: Version 2
 - 扩展包
 - RFC3054 - Megaco IP Phone Media Gateway Application Profile

媒体网关控制协议的标准化进展

- H.248.2 - Facsimile, text conversation and call discrimination packages
- H.248.3 - User interface elements and actions packages
- H.248.4 - Transport over Stream Control Transmission Protocol (SCTP)
- H.248.5 - Transport over ATM
- H.248.6 - Dynamic Tone Definition package
- H.248.7 - Generic announcement package
- H.248.8 - Error code and service change reason description
- H.248.9 - Advanced media server packages
- H.248.11 - Media gateway overload control package
- H.248.13 - Quality Alert Ceasing package
- H.248.14 - Inactivity timer package
- H.248.15 - SDP H.248 package attribute
- H.248.16 - Enhanced digit collection packages and procedures
- H.248.17 - Line test package
- H.248.18 - Package for support of multiple profiles
- H.248.22 - Shared Risk Group package
- H.248.23 - Enhanced Alerting packages
- H.248.24 - Multi-frequency tone generation and detection packages
- H.248.25 - Basic CAS packages
- H.248.26 - Enhanced analog line packages
- H.248.27 - Supplemental tones packages

媒体网关控制协议的设计目的

- MGCP — Media Gateway Control Protocol
 - an application programming interface and a corresponding protocol for controlling **VoIP Gateways** from external call control elements.
 - MGCP assumes a call control architecture where the **call control "intelligence"** is outside the gateways and handled by **external call control elements**.
 - **RFC2705**
 - an application programming **interface** and a corresponding **protocol** which is used between elements of a **decomposed multimedia gateway**.
 - The decomposed multimedia gateway consists of a **Call Agent**, which contains the **call control "intelligence"**, and a **media gateway** which contains the media functions, e.g., conversion from TDM voice to VoIP.
 - **RFC3435**

体现网关分解
规范网关分解后的接口和协议

媒体网关控制协议的设计目的

- Megaco — MEdia Gateway COntrol Protocol
 - the protocol used between elements of a **physically decomposed multimedia gateway**.
 - There are no functional differences from a **system view** between a decomposed gateway, with distributed sub-components potentially on more than one physical device, and a monolithic gateway such as described in H.246.
 - Megaco does not define how gateways, multipoint control units or interactive voice response units (IVRs) work. Instead it **creates a general framework** that is suitable for these applications
 - **RFC3015**
 - the protocol used between elements of a physically decomposed multimedia gateway, i.e. a **Media Gateway** and a **Media Gateway Controller**.
 - **RFC3525**

提供网关能力的通用框架
媒体网关—媒体网关控制器

MGCP/Megaco协议

- MGCP / Megaco是应用层协议

```

graph TD
    SDP[Session Direct (SDP)] --- RTP[RTP]
    SDP --- RTCP[RTCP]
    RTP --- MGCP[MGCP/Megaco]
    RTCP --- MGCP
    MGCP --- UDP[UDP]
    MGCP --- TCP[TCP]
    UDP --- IP[IPv4 or IPv6 Unicast or Multicast]
    TCP --- IP
    IP --- ATM[ATM]
    IP --- Ethernet[Ethernet]
    IP --- SLIP[SLIP or PPP]
  
```

小结

- 网关分解
- 媒体网关控制协议的制定目的
- 媒体网关控制协议的标准化

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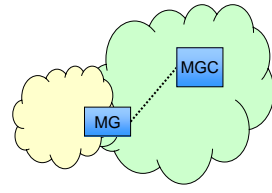
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MGCP协议分析

- MGCP协议控制模型

MGCP/Megaco协议的网络模型



- MG的类型
 - Trunking gateways
 - Voice over ATM gateways
 - Residential gateways
 - Access gateways
 - Business gateways
 - Network Access Servers
 - Circuit switches
- SGCP - keeping the gateways simple
 - MGC-MG 是 Master - Slave结构
 - MG的所有动作都由MGC决定和控制
 - 由于MG种类的不同, MGC提供的控制能力也将不同

- MGCP / Megaco协议是一种提供主从控制的协议

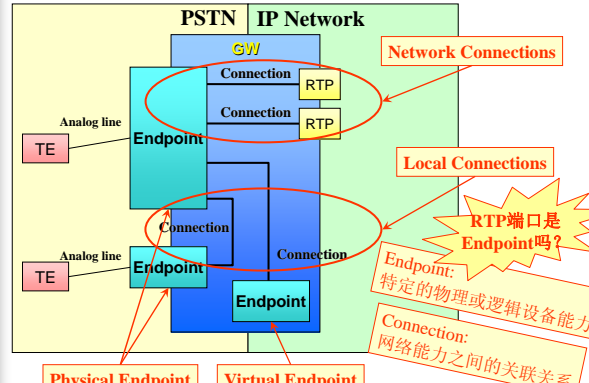
MGCP协议基本定义

- Media gateways contain **endpoints** on which the Call Agent can create, modify and delete **connections** in order to establish and control **media sessions** with other multimedia **endpoints**.
- the Call Agent can instruct the endpoints to detect certain **events** and **generate signals**.
- the endpoints automatically communicate changes in service state to the Call Agent.
- the Call Agent can **audit endpoints** as well as the connections on endpoints.
- most media gateways will need to implement one or more MGCP packages, which define extensions to the protocol suitable for use with specific types of media gateways.

几个关键字

- Endpoints
- Connections
- Call

MGCP协议控制模型



Network Connections

Local Connections

RTP端口是Endpoint吗?

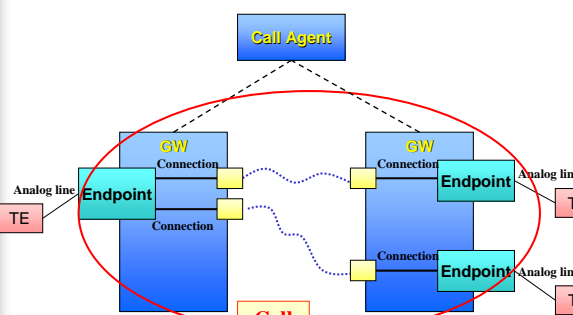
Endpoint: 特定的物理或逻辑设备能力

Connection: 网络能力之间的关联关系

Physical Endpoint

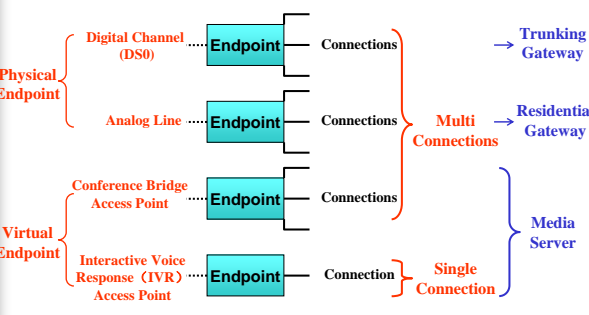
Virtual Endpoint

MGCP协议控制模型



Call: 归属于同一个呼叫关系的Endpoints和Connections

Endpoints类型



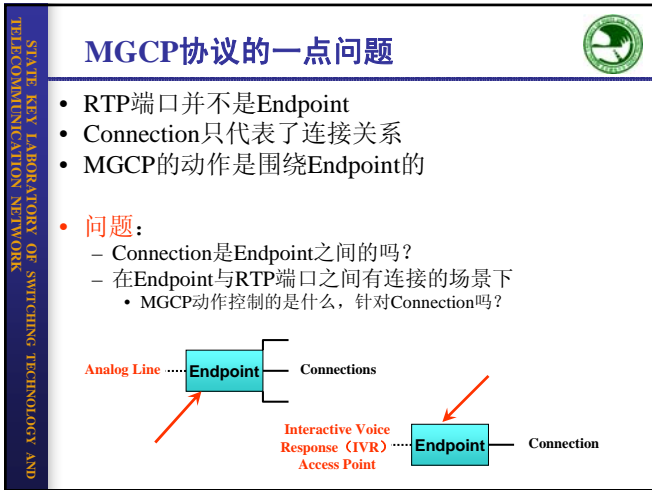
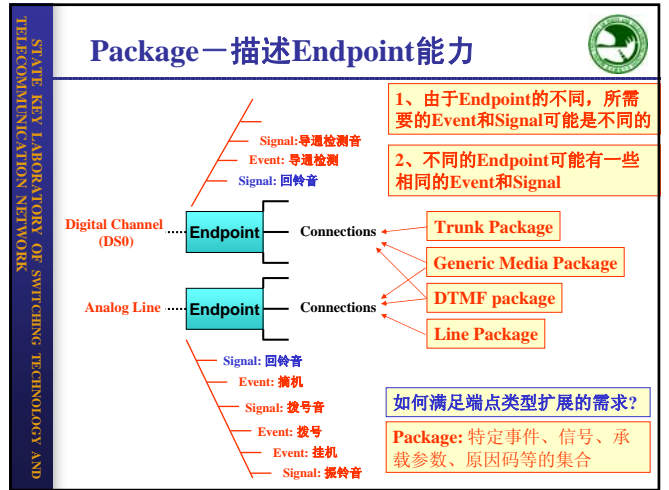
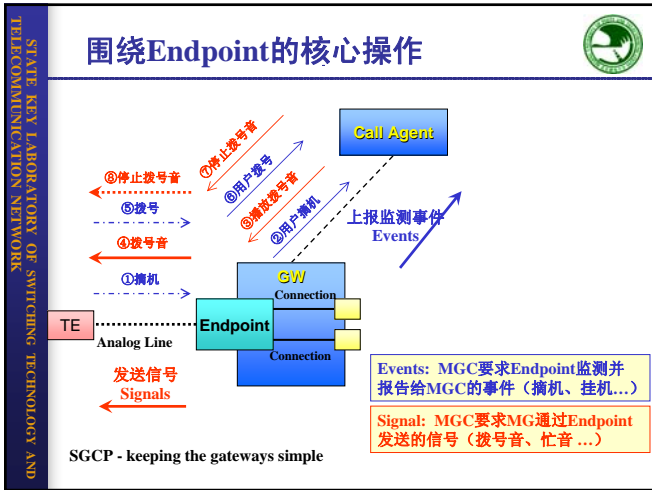
Physical Endpoint

- Digital Channel (DS0) Endpoint -> Connections -> Trunking Gateway
- Analog Line Endpoint -> Connections -> Multi -> Residential Gateway

Virtual Endpoint

- Conference Bridge Access Point Endpoint -> Connections -> Media Server
- Interactive Voice Response (IVR) Access Point Endpoint -> Connection -> Single Connection -> Media Server

物理设备的Endpoints类型决定了物理设备的类型和能够提供的能力



- ### 小结
- 媒体网关控制协议的网络结构
 - MG-MGC / Master-Slave
 - MGCP核心概念
 - Endpoint
 - Connection
 - Call
 - Endpoints的类型
 - Events & Signals
 - Package