Sistema de VoIP para la RAAP

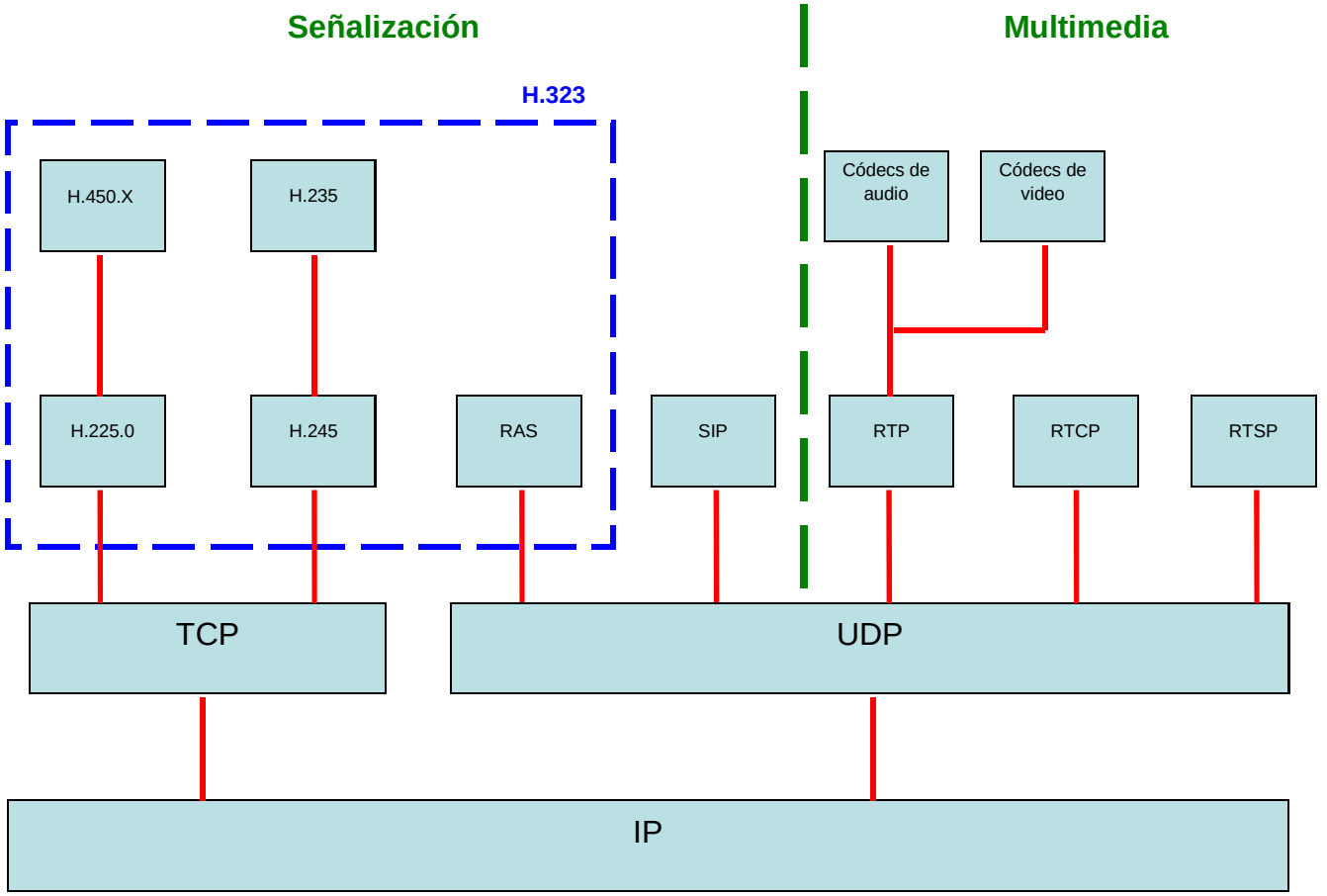
Diego Quintana Cruz

Objetivos

- Comparar los diversos protocolos de señalización y hardware necesarios para la implementación de una red con telefonía IP.
- Implementar una red piloto de telefonía IP usando Software Libre en la RAAP.

GST

Arquitectura de Protocolos de VoIP

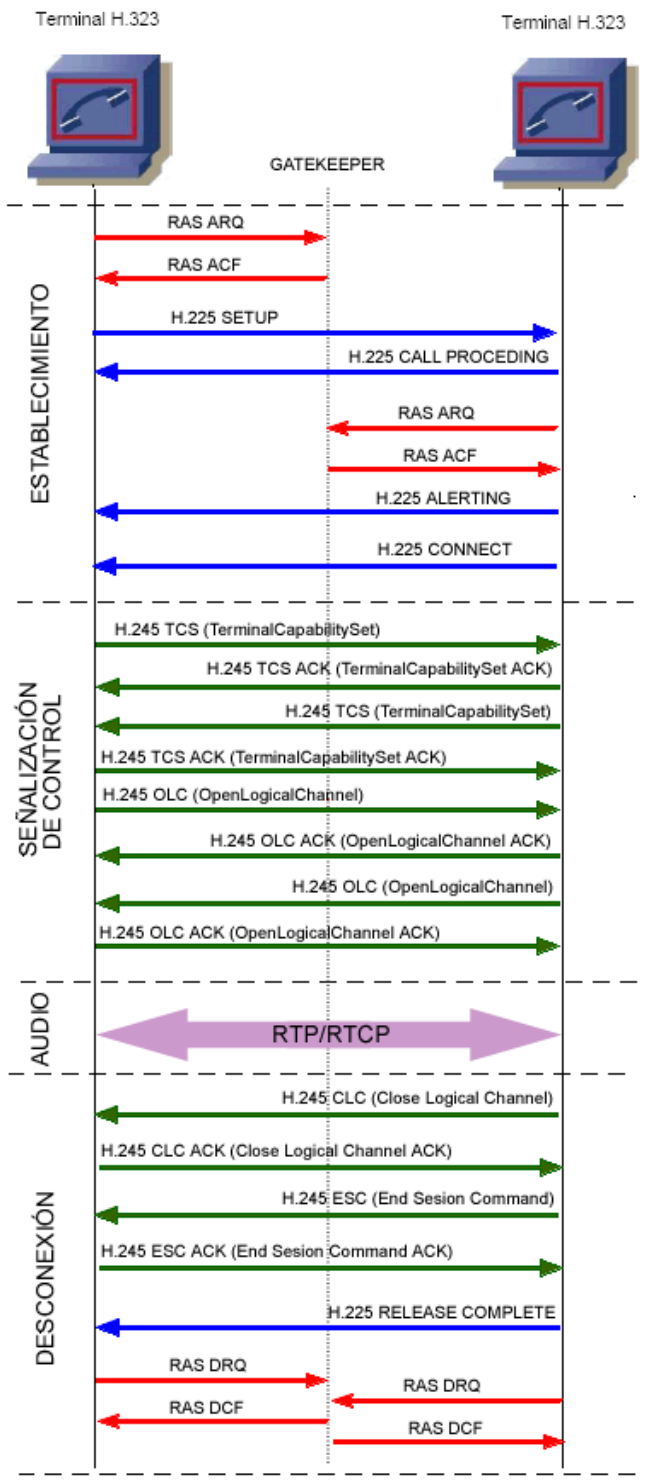


RAS: Registration, Admission and Status
RTP: Real-time Transport Protocol
RTSP: Real Time Streaming Protocol
UDP: User Datagram Protocol

SIP: Session Initiation Protocol
RTCP: RTP Control Protocol
TCP: Transmission Control Protocol
IP: Internet Protocol

H.323

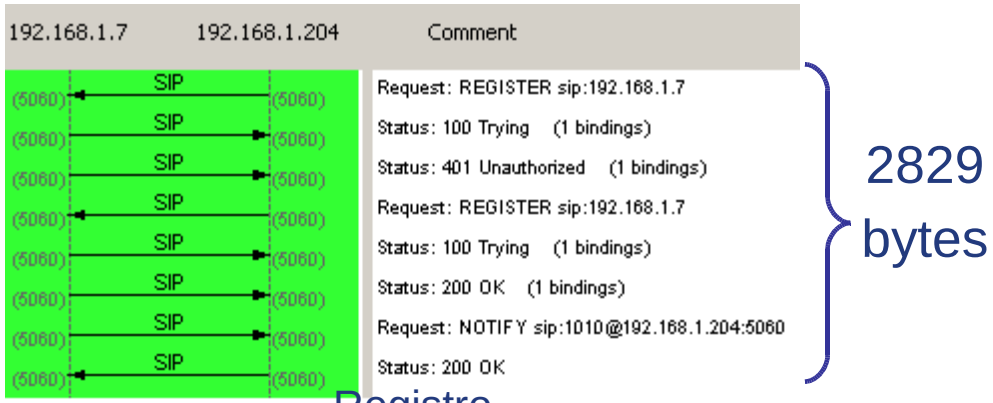
- ITU
- Control Llamada (H.225)
- Control Canal (H.245)



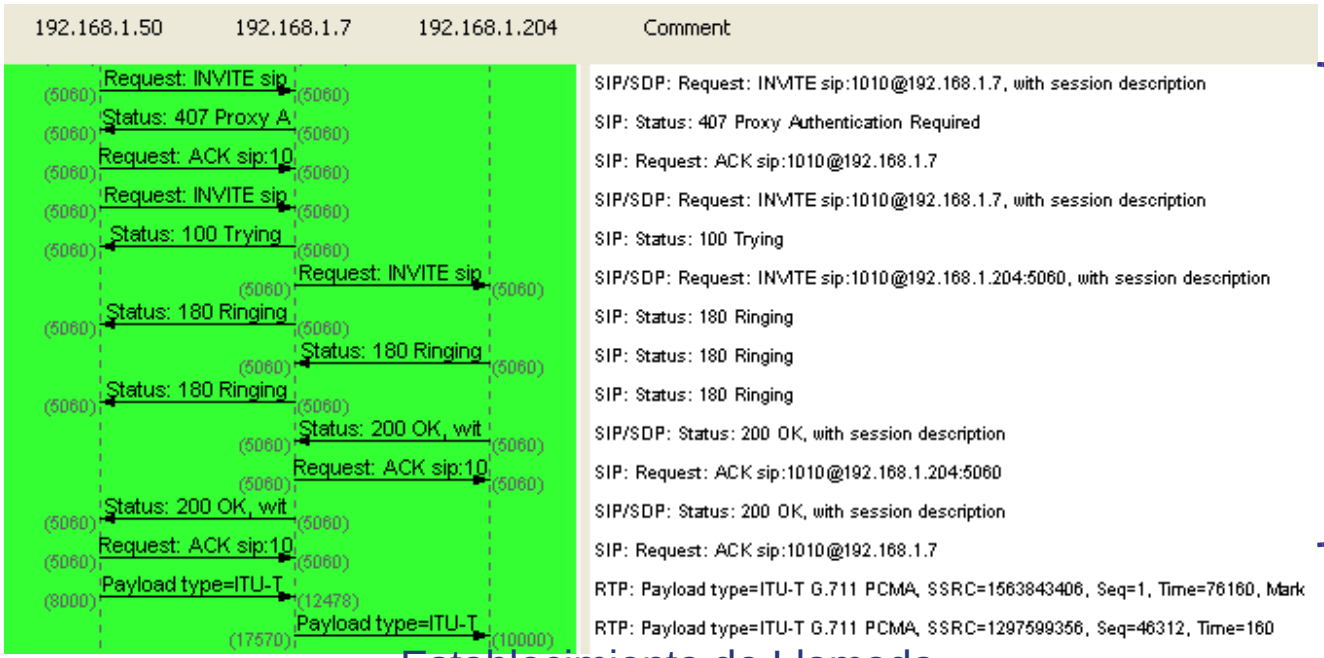
Fuente: [MAR2006]

SIP

- IETF
- Velocidad
- No define canales



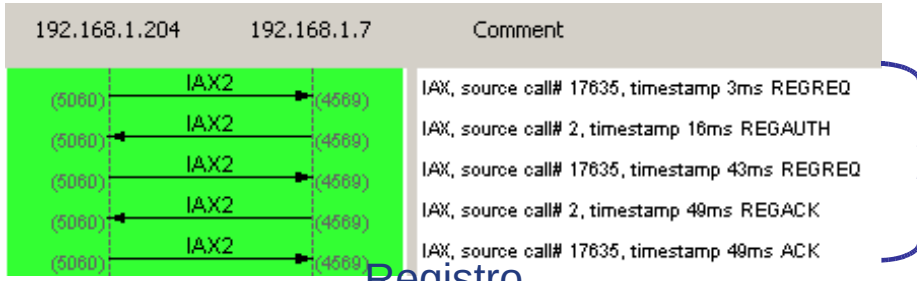
Registro



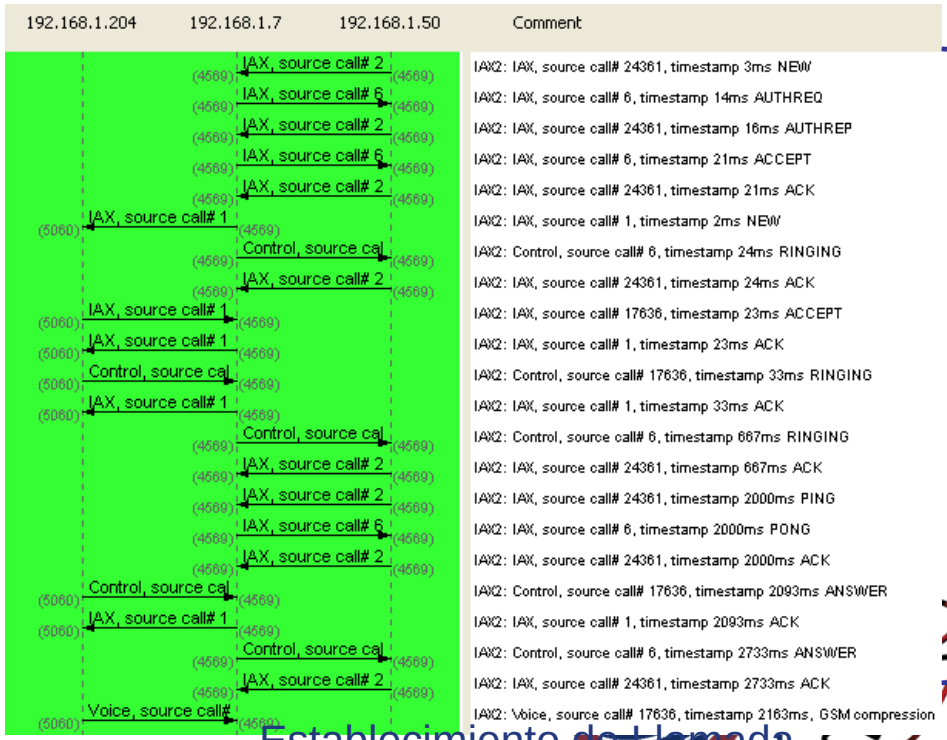
Establecimiento de Llamada

IAX2

- Asterisk
- NAT
- Puerto 4569



Registro



Establecimiento de Llamada

Códecs

- G.711: 64 kbps
- G.729: 8 kbps
- GSM: 13 kbps
- iLBC: 13.2 kbps

GST

Códecs: Tabla Resumen

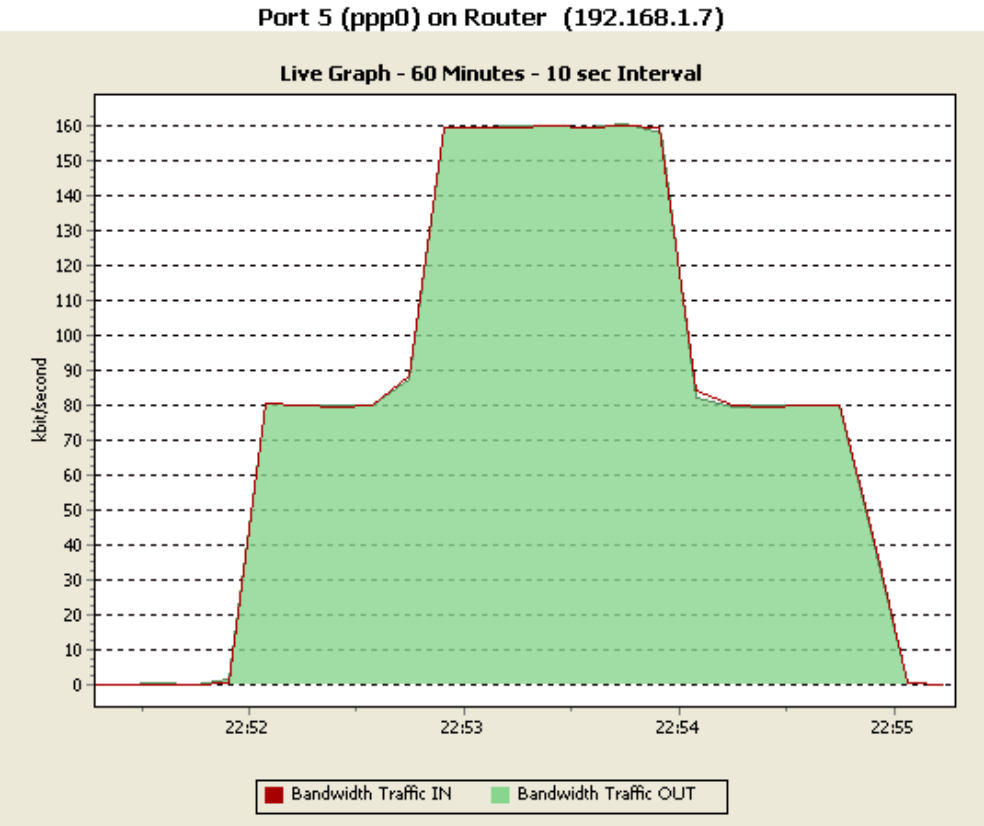
TABLA 2.1. COMPARACIÓN CODECS

Nombre	*Org.*	*Descripción*	*Bit Rate (kbps)*	*Frecuencia Muestreo (kHz)*	*Tamaño cuadro (ms)*	*Obs.*	*MOS (ideal)*
G.711	UIT	Pulse Code Modulation (PCM)	64	8	Muestreada	Ley-A Ley-μ	4.1
G.729	UIT	Conjugate-structure algebraic-code-excited linear-prediction (CS-ACELP)	8	8	10	Bajo retardo (15 ms)	3.8
GSM	ETSI	Regular Pulse Excitation – Long Term Prediction (RPE-LTP)	13	8	20	Usado por GSM	3.5-3.7
iLBC		Linear Predictive Coding (LPC)	15.2 13.33	8	20 30		4.1

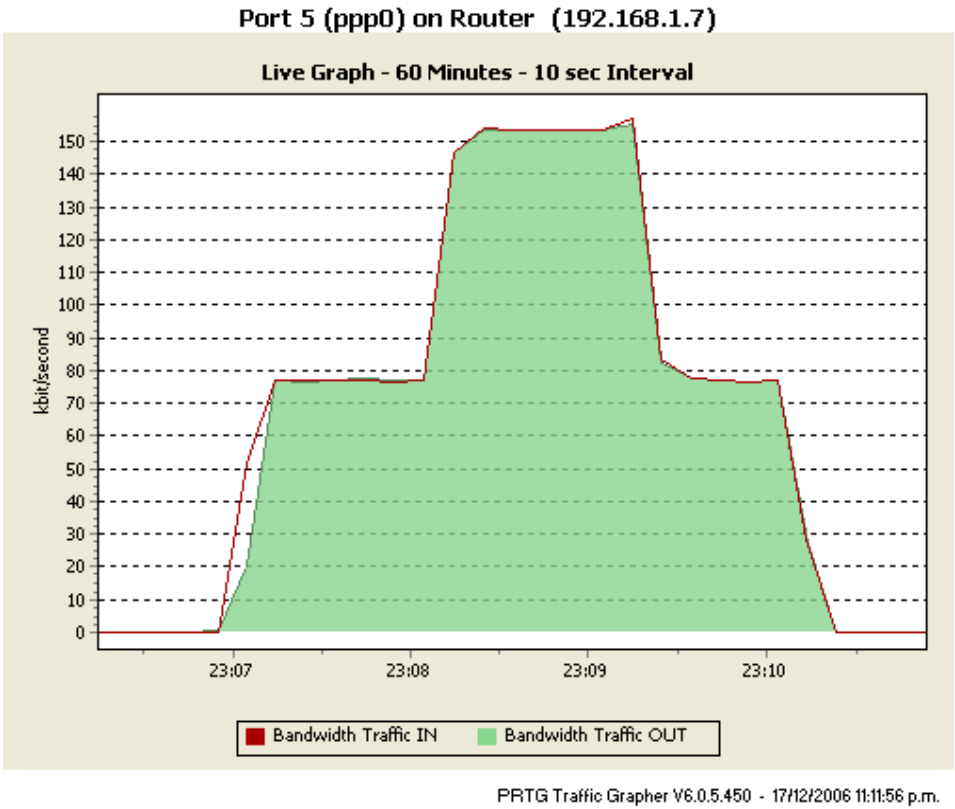
Tasa de Bits:

Protocolos Señalización

SIP

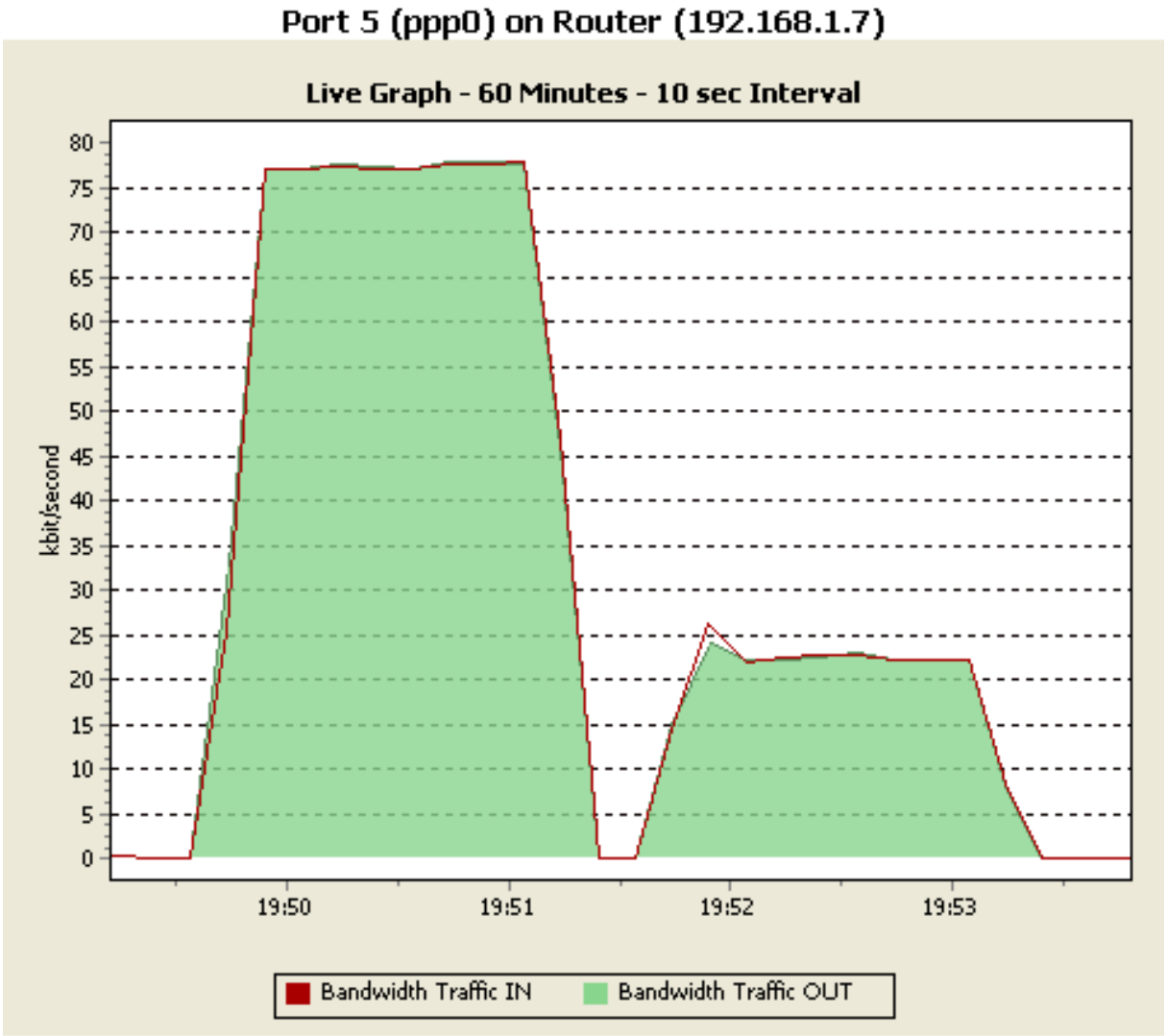


IAX2

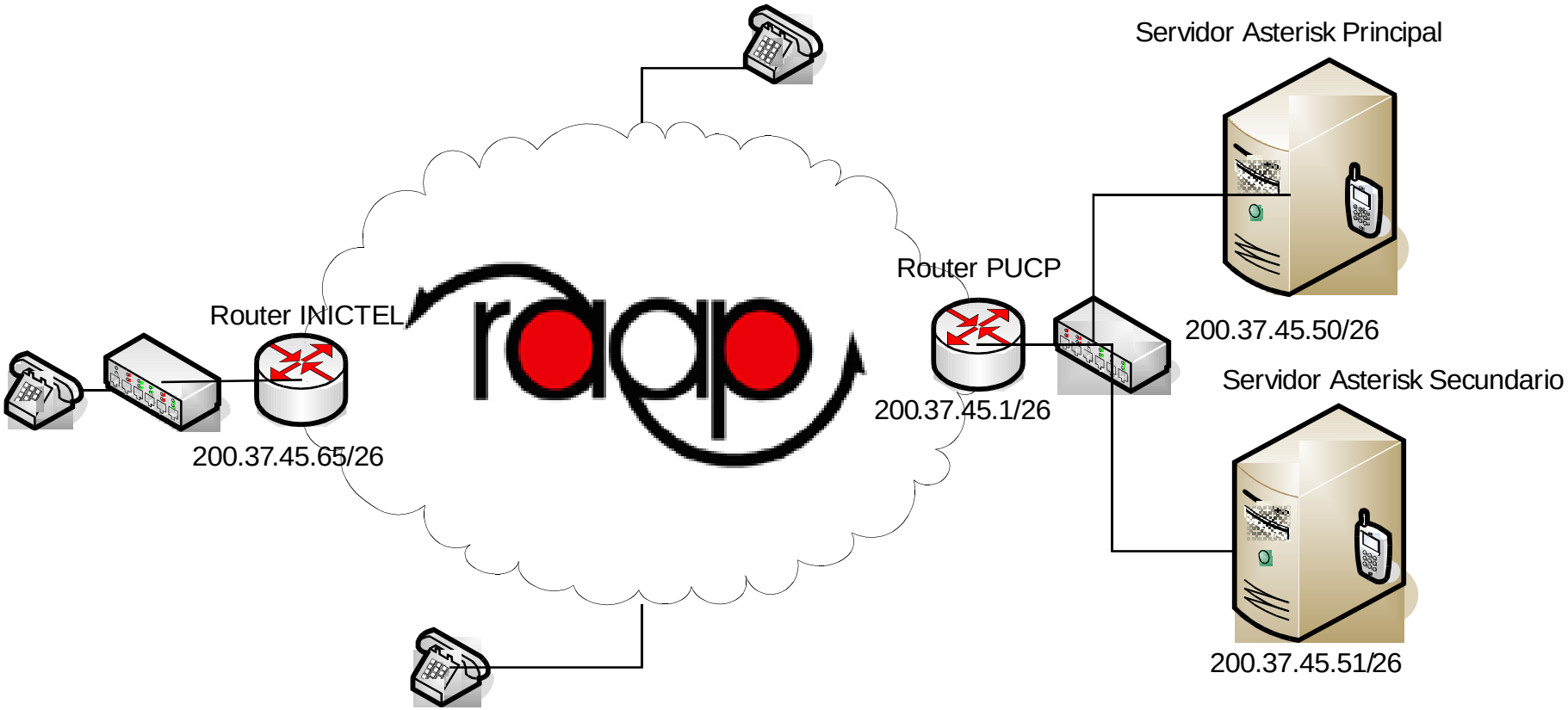


Tasa de bits: Códecs

G.711 vs iLBC



Arquitectura de Red



Implementación: HW y SW

- Servidores IBM

- Sistema Operativo Ubuntu Server

- Software:
  - Asterisk
  - AMPortal
  - HeartBeat
  - MySQL

Asterisk

AMP Asterisk Management Portal

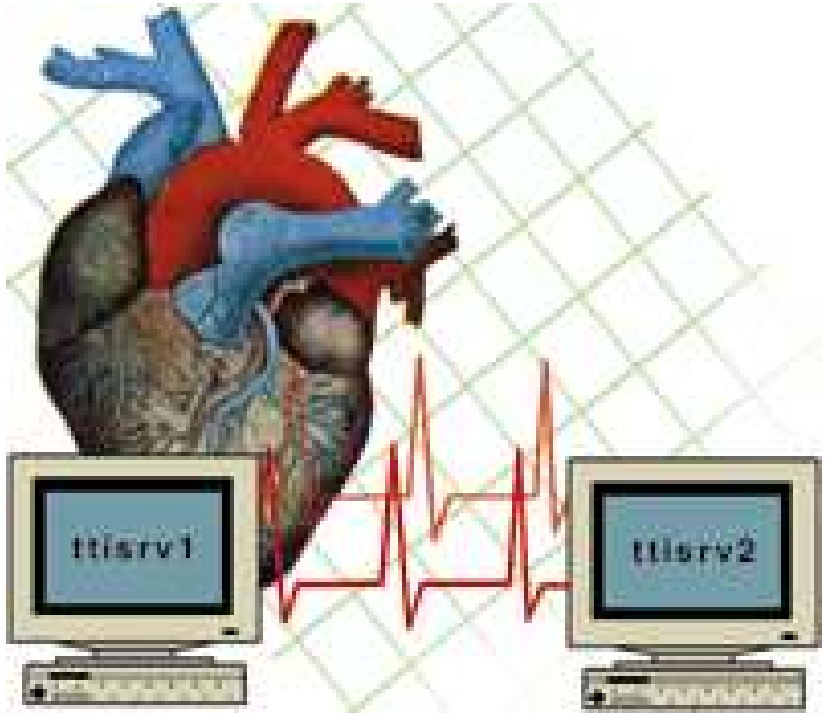
HighAvailability

MySQL

GST

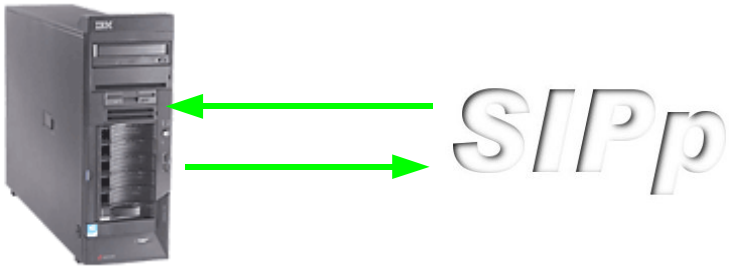
Alta Disponibilidad

- HeartBeat
  - IP virtual
  - Peticiones ARP
    - Principal o Secundario
- MySQL
  - Réplica BD



Prueba de Desempeño (1/3)

- Generación de llamadas con cada códec
- SIPp
- Escenario:
  Archivo XML



Prueba de Desempeño (2/3)

- Archivo XML (1/2)

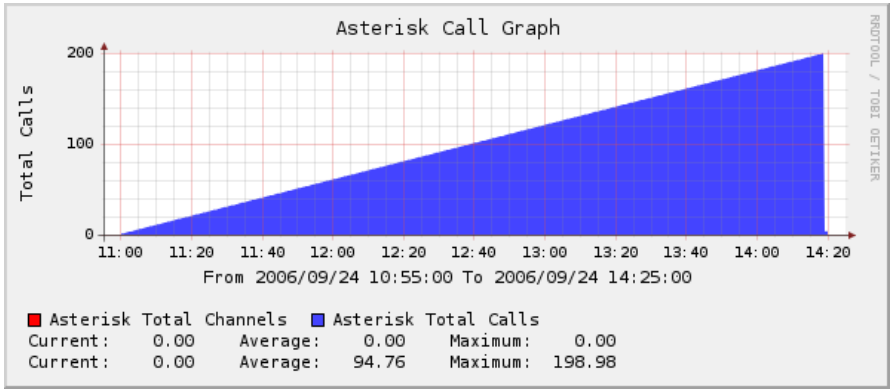
```
…
INVITE sip:[service]@[remote_ip]:[remote_port] SIP/2.0
      Via: SIP/2.0/[transport] [local_ip]:[local_port];branch=[branch]
      From: sipp <sip:sipp@[local_ip]:[local_port]>;tag=[call_number]
      To: sut <sip:[service]@[remote_ip]:[remote_port]>
      Call-ID: [call_id]
      CSeq: 1 INVITE
      Contact: sip:sipp@[local_ip]:[local_port]
      Max-Forwards: 70
      Subject: Performance Test
      Content-Type: application/sdp
      Content-Length: [len]
…
```

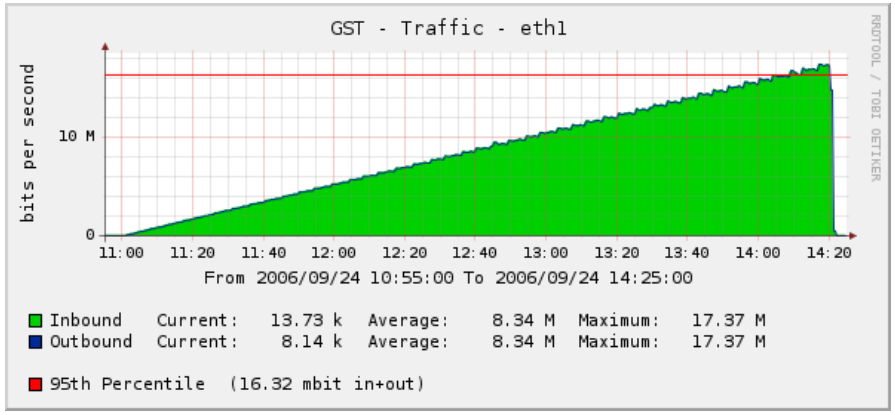
Prueba de Desempeño (3/3)

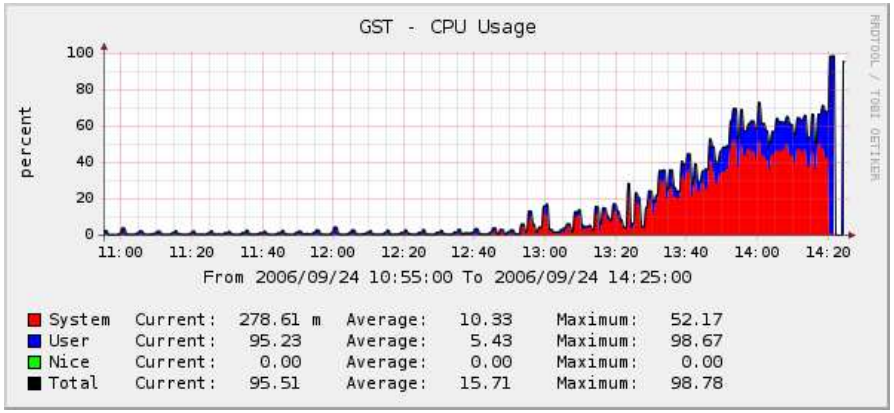
- Archivo XML (2/2)

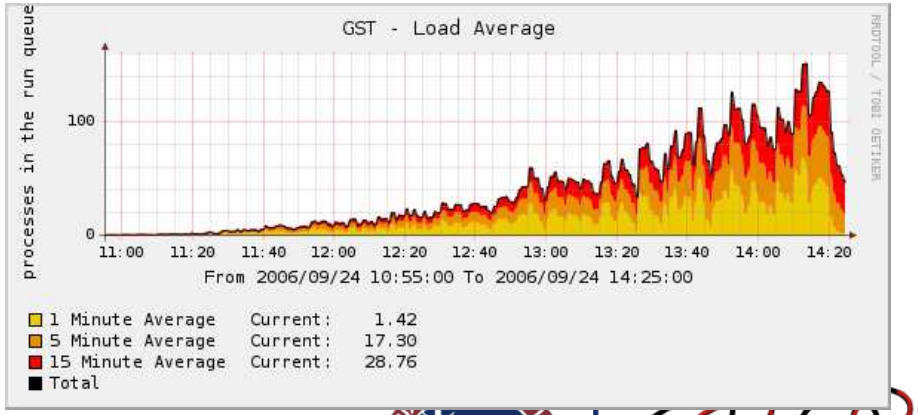
```
…
        v=0
        o=user1 53655765 2353687637 IN IP[local_ip_type] [local_ip]
        s=-
        c=IN IP[media_ip_type] [media_ip]
        t=0 0
        m=audio [media_port] RTP/AVP 0
        a=rtpmap:96 iLBC/8000
…
```

Resultados G.711

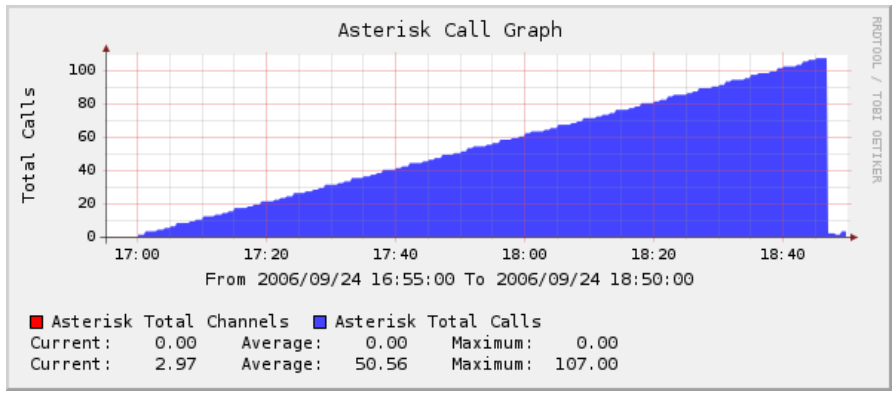


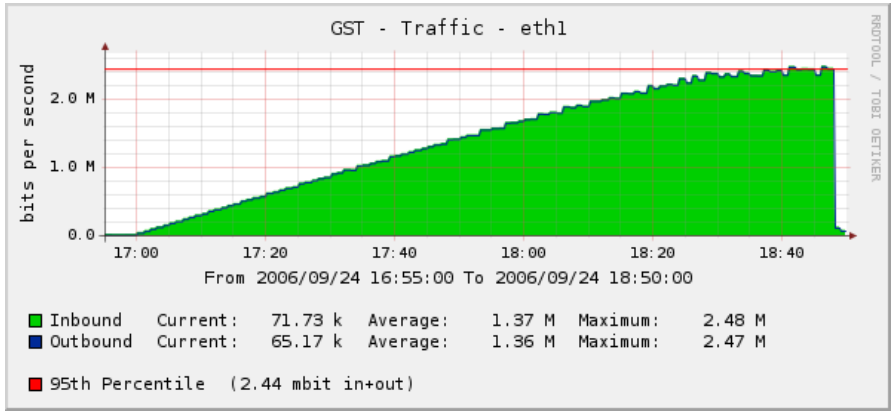


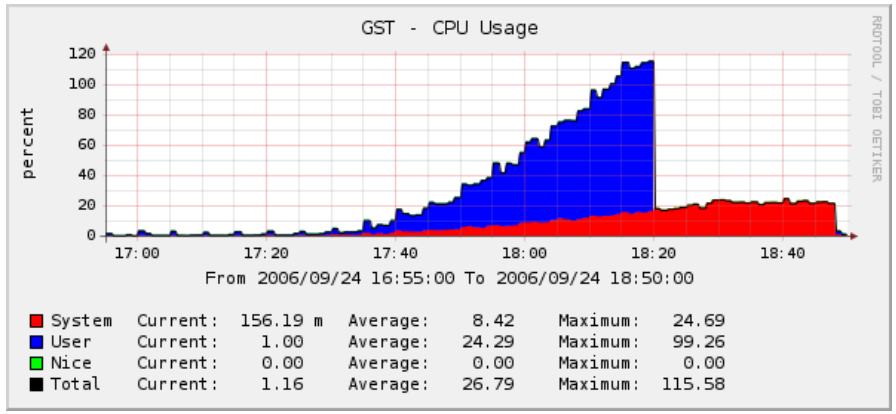


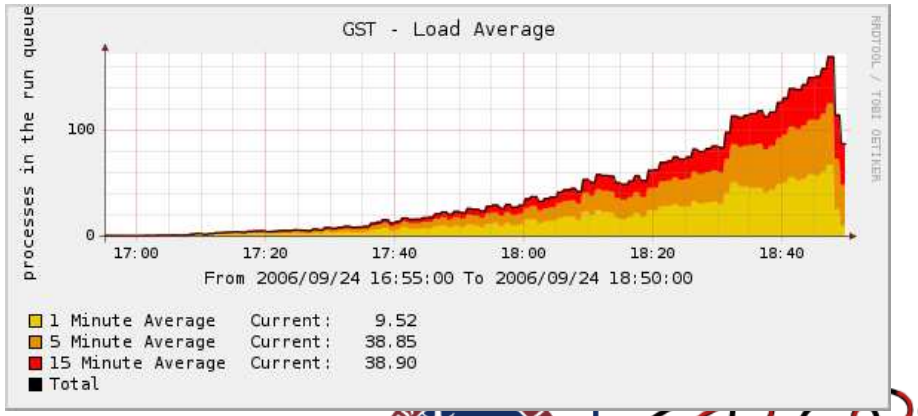


Resultados iLBC





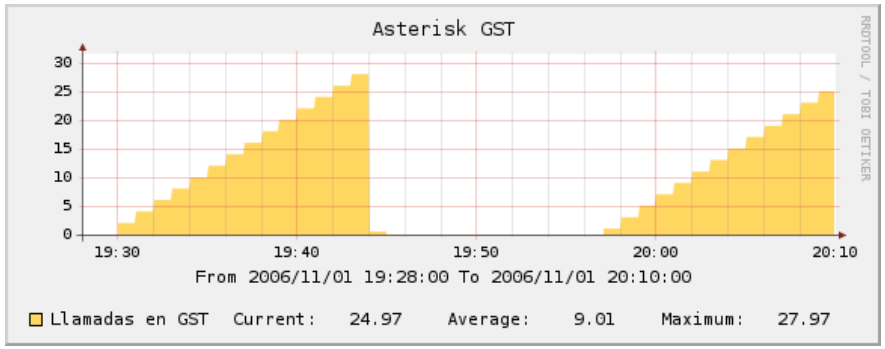




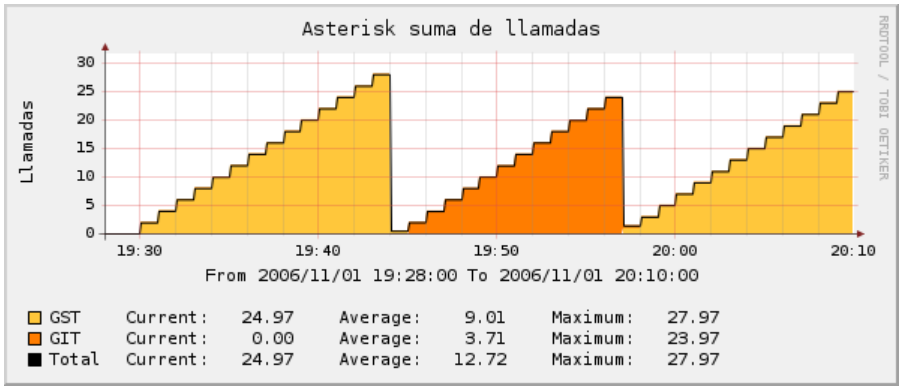
Resultados

Alta Disponibilidad

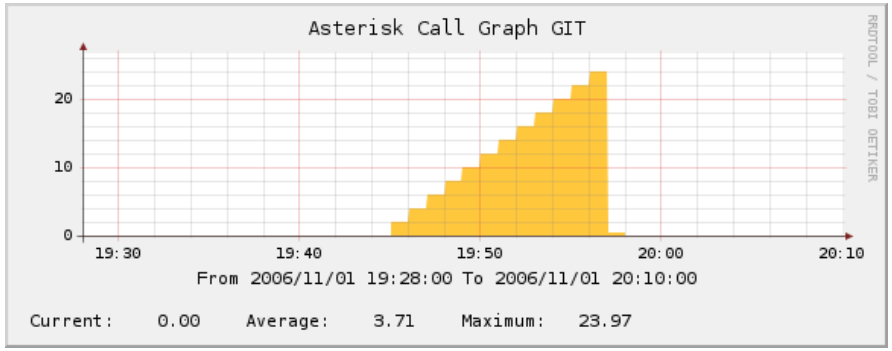
Servidor Principal



Total de Llamadas



Servidor Secundario



ET LUX IN TENEBRIS LUCET
MCMXVII

GST

Recomendaciones

- Tecnologías Recomendadas
  - Protocolos: IAX2, SIP
  - Hardware basado en IP
  - Códec: G.711

Conclusiones

- *Benchmarking* de las diversas tecnologías disponibles.
- Implementación satisfactoria de la red piloto.
- Cuantificación de la capacidad real del sistema.

Trabajos Futuros

- Implementar la no pérdida de comunicación cuando se caiga el servidor principal.
- Implementar nuevos servicios.
- Implementar el cluster de alta disponibilidad en distintos segmentos de red.

GST

¡ MUCHAS GRACIAS !

http://gst.telecom.pucp.edu.pe/~dquintana/tesis.pdf

dquintana@pucp.edu.pe
diegoquintana@gmail.com
http://routerman.blogsome.com