



# Workshop at NGN LABORATORY

ITU-D

DD/MM/AAAA



# Day One



- Workshop at NGN Lab Instrumentation; Protocols: SIP
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- Workshop at NGN Lab Protocols: H.248
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- Workshop at NGN Lab interoperability aspects. SIP-ISUP  
SIP –I (ITU-T Rec. Q.1912.5 Profile C)
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- Workshop at NGN Lab Voice Quality (PESQ ITU-T Rec. P.862)
-

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Workshop at NGN Lab  
Instrumentation; Protocols: SIP  
NGN network tests.

# SIP protocol test scenario



Tests will be run in two groups

- NGN network tests
- Tests with test equipment

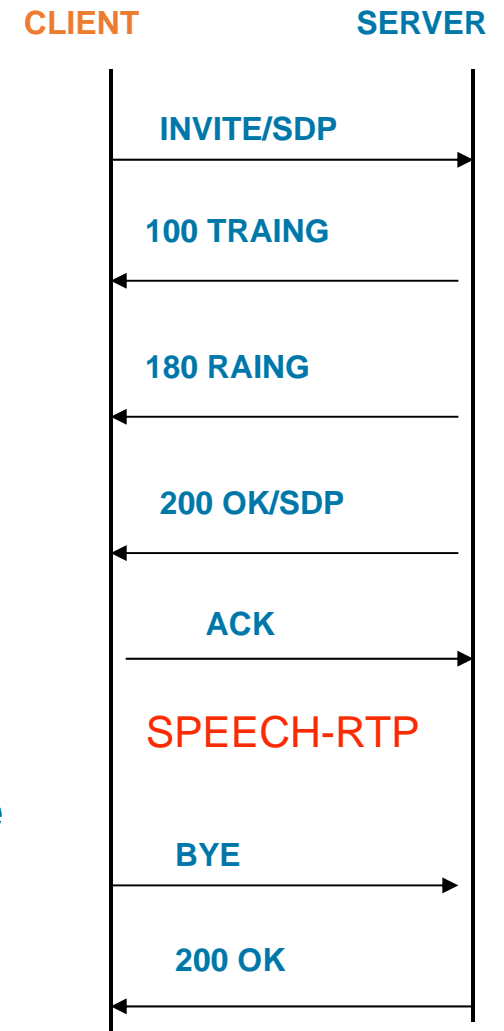
## NGN network tests

### ❑ NGN network call SIP protocol – Success Case

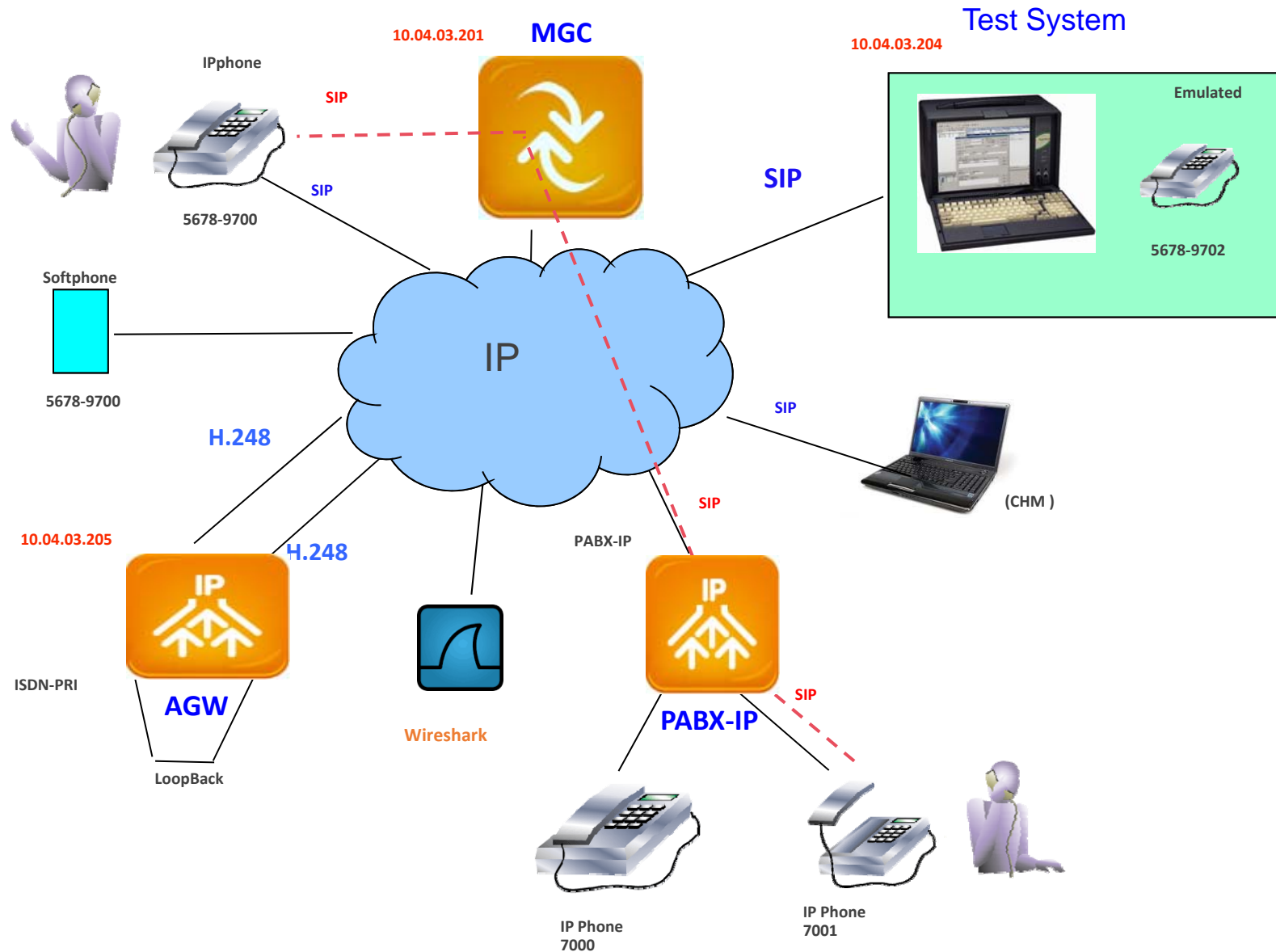
- Subscriber A originates call
- Subscriber B originates call

### ❑ NGN network call SIP protocol – Failure Case

- Release: busy
- Release: congested



# Topology SIP Protocol

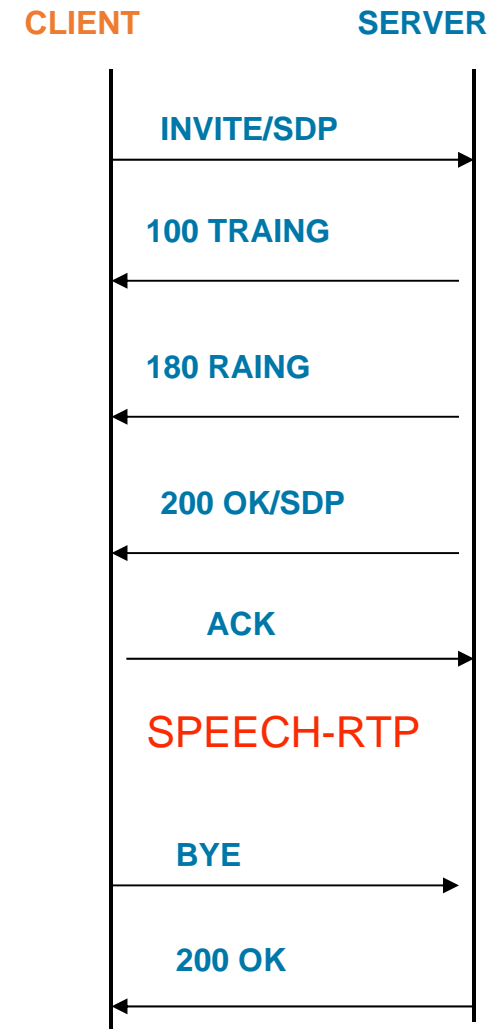


# SIP protocol call using the network

## Success Case – A originates



TEST-1	SUCCESS CASE Subscriber A originates
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>Subscriber A originates call (soft phone)</li><li>SIP Protocol, using CODEC G.711</li><li>From soft phone to IP phone</li><li>Monitored via wireshark</li></ul>
<b>Objective</b> <ul style="list-style-type: none"><li>Verify how system behaves when interfunkioning</li><li>Verify success of call completion, communication, and termination, involving NGN elements and correct codec negotiation</li></ul>	
<b>Expected results:</b> <ul style="list-style-type: none"><li>Success completing call, talking and hanging up when subscriber A originates the call</li></ul>	

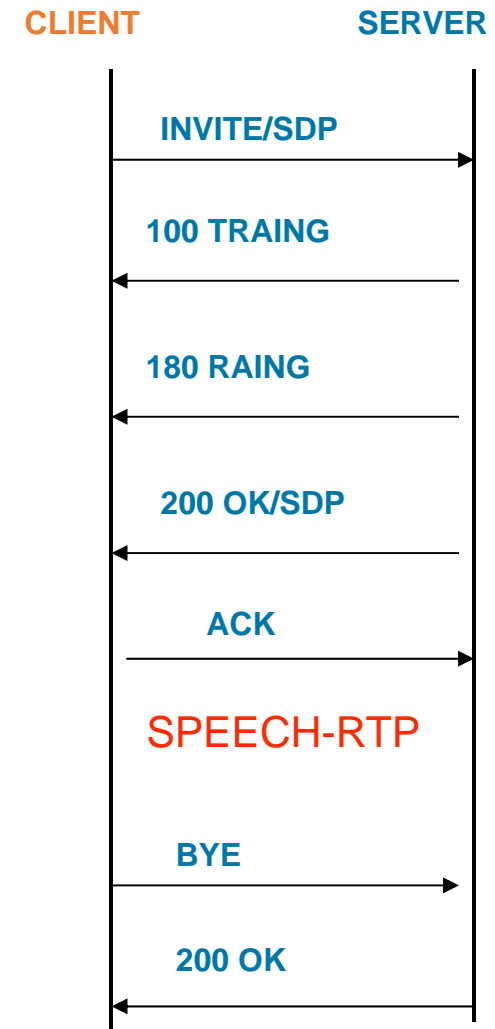


# SIP protocol call using the network

## Success Case – B originates



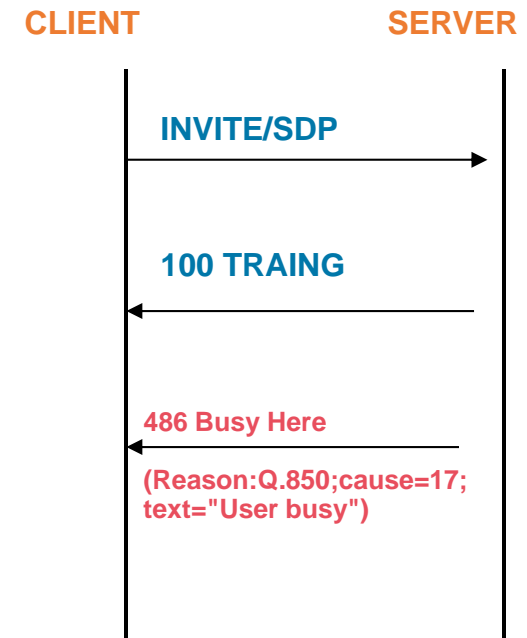
TEST-2	SUCCESS CASE Subscriber B originates
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>• Subscriber B originates call</li><li>• SIP Protocol, using CODEC G.711</li><li>• From soft phone to IP phone</li><li>• Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>• Verify how system behaves when interfunkioning</li><li>• Verify success of call completion, communication, and termination, involving NGN elements and correct codec negotiation</li></ul>	
Expected results:	
<ul style="list-style-type: none"><li>• Success completing call, talking and hanging up when subscriber B originates the call</li></ul>	



# SIP protocol call using the network with Failure Case – B busy



TEST-3	FAILURE CASE B busy
Scope	Verify how system behaves when subscriber number changed
Procedure	<ul style="list-style-type: none"><li>• Originate Call to subscriber B, whose number must be busy</li><li>• SIP protocol, using CODEC G.711</li><li>• From test equipment to IP phone</li><li>• Monitored via wireshark</li></ul>
<b>Objective</b> <ul style="list-style-type: none"><li>• Verify how system behaves when interfunktioning</li><li>• Verify if caller receives a busy tone and message 486 Busy Here</li><li>• Verify correct mapping of referred causes (ITU reference – Q.850) in the respective SIP messages</li></ul> <p>(Reason:Q.850;cause=17;text="user busy")</p>	
<b>Expected results on the caller's end:</b> <ul style="list-style-type: none"><li>• Busy tone</li><li>• Message 486 Busy Here</li></ul>	

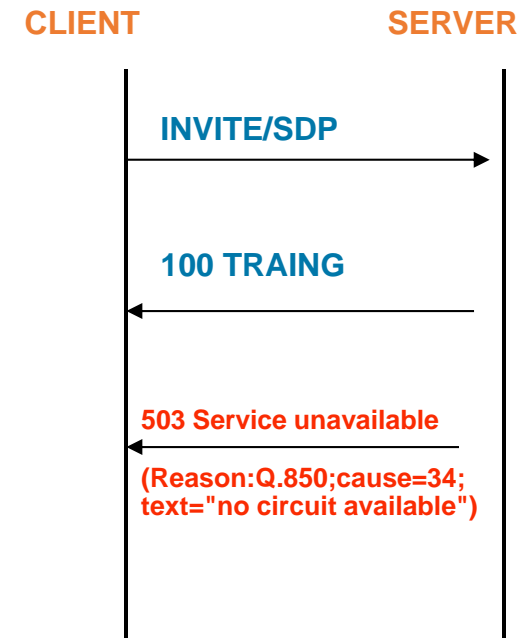




# SIP protocol call using the network with Failure Case – B congested



TEST-4	FAILURE CASE B congested
Scope	Verify how system behaves when receiving subscriber number is non-existent
Procedure	<ul style="list-style-type: none"><li>• Originate Call to subscriber B, whose number must be congested</li><li>• SIP protocol, using CODEC G.711</li><li>• From test equipment to IP phone</li><li>• Monitored via wireshark</li></ul>
Scope	
<ul style="list-style-type: none"><li>• Verify how system behaves when interfunkioning</li><li>• Verify if caller receives an empty number tone and message 503 Service Unavailable</li><li>• Verify correct mapping of referred causes (ITU reference - Q.850) in the respective SIP messages</li></ul> <p>(Reason:Q.850;cause=34;text="no circuit available")</p>	
Expected results on the caller's end:	
<ul style="list-style-type: none"><li>• Empty number tone</li></ul> <p>(Reason:Q.850;cause=34;text="no circuit available")</p>	



Workshop at NGN Lab  
Instrumentation; Protocols: SIP;  
Tests with test equipment.

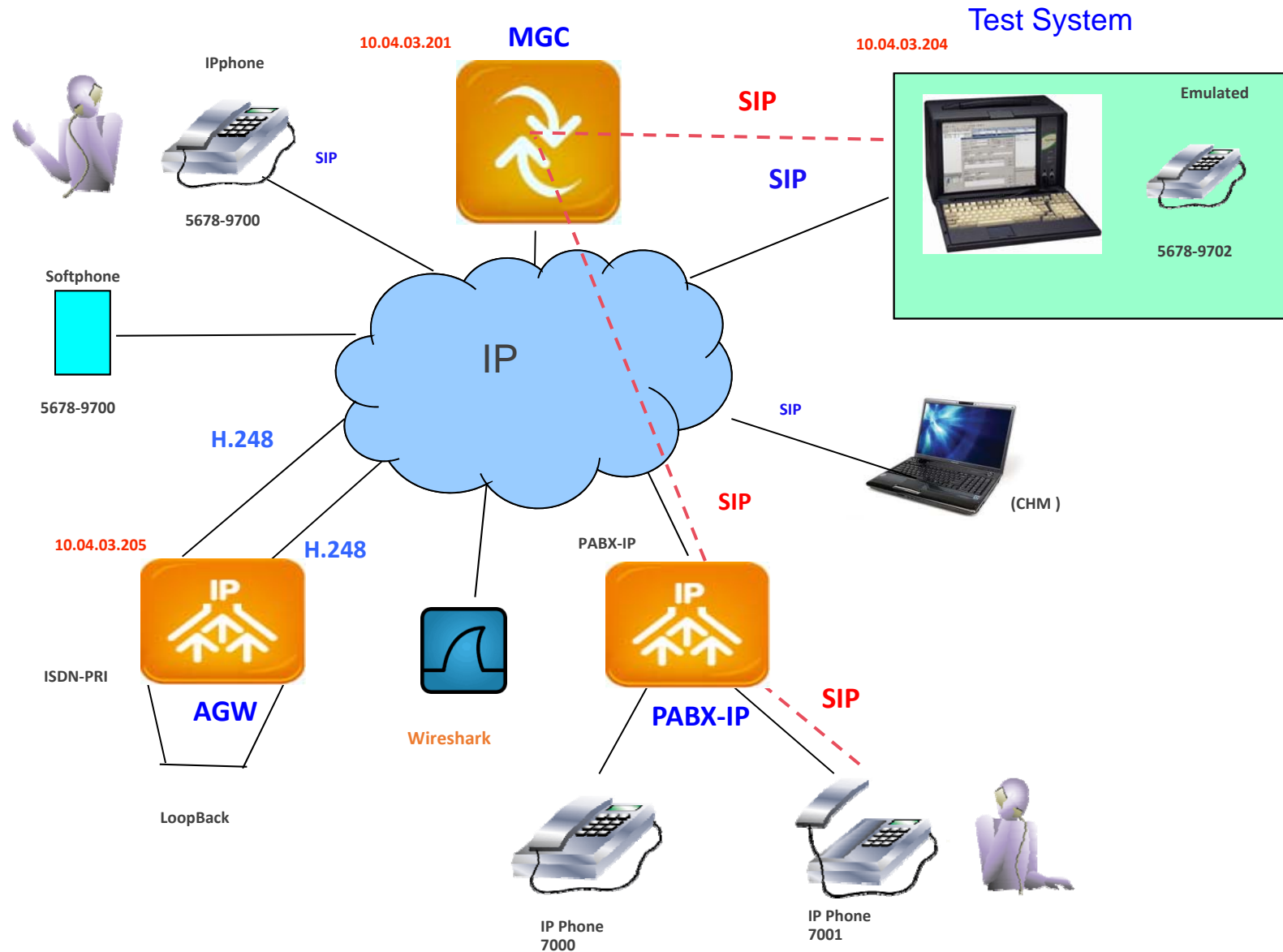
# SIP protocol test scenario



## Tests with test equipment

- ❑ **NGN network call SIP protocol – Success Case**
  - Subscriber A originates call
  - Subscriber B originates call
  
- ❑ **NGN network call SIP protocol – Failure Case**
  - Release: number changed
  
- ❑ **Conformance Test ETSI TS 102 027-2 V4.1.1 (2006-07) – Methods for Testing and Specification (MTS); Conformance Test Specification for SIP (IETF RFC 3261);**
  - SIP\_CC\_OE\_CE\_V\_032
  - SIP\_CC\_OE\_CR\_V\_010
  - SIP\_CC\_OE\_CE\_TI\_003
  - SIP\_MG\_TE\_V\_013

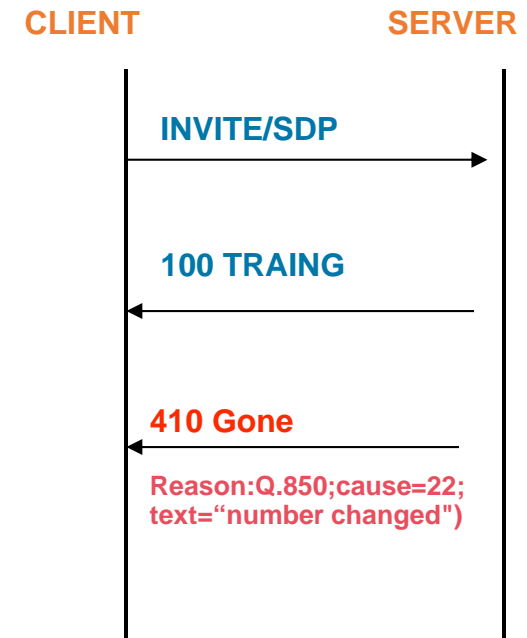
# Topology SIP Protocol



# SIP protocol call, Failure Case – B number changed



TEST-1	FAILURE CASE B number changed
Scope	Verify how system behaves when subscriber fails – 22 number changed
Procedure	Originate Call to subscriber B (number changed) SIP protocol, using CODEC G.711 From test equipment to IP phone Monitored via wireshark
<b>Objective</b> <ul style="list-style-type: none"><li>• Verify how system behaves when interfunctioning</li><li>• Verify if caller receives a busy tone and message 410 Gone</li><li>• Verify correct mapping of referred causes (ITU reference – Q.850) in the respective SIP messages</li></ul> <b>(Reason:Q.850;cause=22;text="number changed")</b>	
<b>Expected results on the caller's end:</b> <ul style="list-style-type: none"><li>• Busy tone</li><li>• Message <b>410 Gone</b></li></ul>	



# Conformance Test: SIP\_CC\_OE\_CR\_V\_010 – CANCEL



## ❑ Conformance Test:

- TPId: SIP\_CC\_OE\_CR\_V\_010

**Status:** Mandatory

**Ref:** RFC 3261

**Purpose:** Ensure that the IUT having received a Trying (100 Trying) response to its INVITE request, to give up the call, sends a CANCEL request.

# Conformance Test: SIP\_CC\_OE\_CE\_V\_032 (NotFound (404 Not Found))



## ❑ Conformance Test:

### ■ TPIId: SIP\_CC\_OE\_CE\_V\_032

**Status:** Mandatory

**Ref:** RFC 3261

**Purpose:** Ensure that the IUT when an INVITE client transaction is in the Calling state, on receipt of a Not Found (404 Not Found) response sends an ACK request with the same Call-ID, From headers and Request-URI as in the original INVITE request and the same Tag in the To header as in this response.

# Conformance Test: SIP\_CC\_OE\_CE\_TI\_003 – Timer



## ❑ Conformance Test:

- TPIId: SIP\_CC\_OE\_CE\_TI\_003

**Status:** Mandatory

**Ref:** RFC 3261

**Purpose:** If an unreliable transport (UDP) is used, ensure that the IUT, when an INVITE client transaction is in the Calling state having already repeated its INVITE wait for a timer A set with a value of  $2 \cdot T1$  before sending it again.



# Conformance Test: SIP\_MG\_TE\_V\_013 – short names



## ❑ Conformance Test:

- TPIId: SIP\_MG\_TE\_V\_013

**Status:** Mandatory

**Ref:** RFC 3261

**Purpose:** Ensure that the IUT on receipt of an INVITE request including headers set with short names, sends a Success (200 OK) response preceded optionally by informational (1XX) response.

# Day One



- Workshop at NGN Lab Instrumentation; Protocols: SIP.
- 



- Workshop at NGN Lab Protocols: H.248
- 



- Workshop at NGN Lab interoperability aspects. SIP-ISUP  
SIP –I (ITU-T Rec. Q.1912.5 Profile C)
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- Workshop at NGN Lab Voice Quality (PESQ ITU-T Rec. P.862)
-

# Workshop at NGN LabProtocols: H.248.

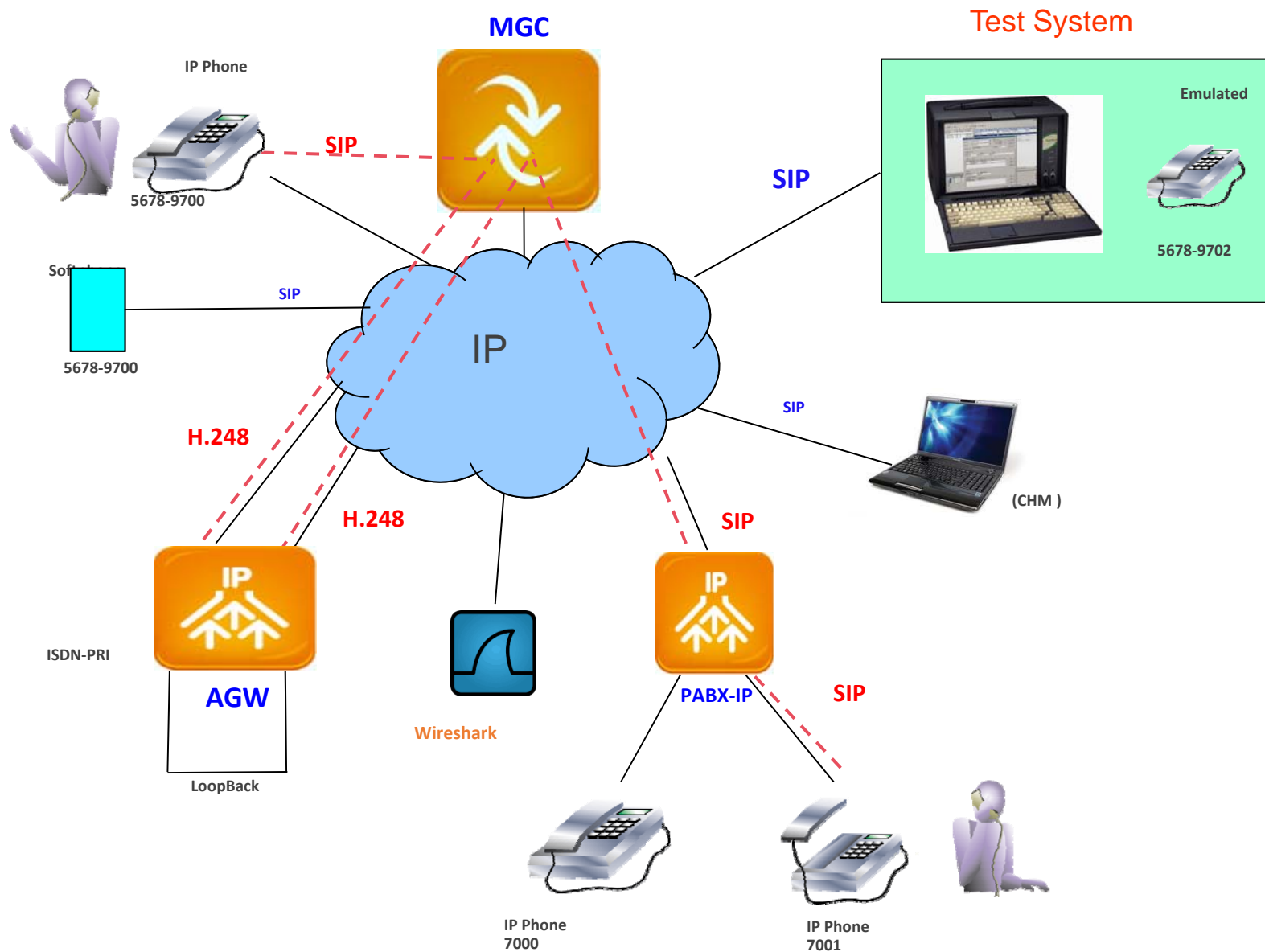
# Signaling protocol H.248 scenario



**Four kinds of tests will be run:**

- ☐ **MGW alignment**
  - **Service Change**
  
- ☐ **NGN network call H.248 protocol – Success Case**
  - **Subscriber A originates call**
  - **Subscriber B originates call**
  
- ☐ **H.248 tests with RTP EVENTE**
  
- ☐ **NGN network call H.248 protocol – Failure Case**
  - **Release: busy**
  - **Release: non-existent**

# Topology H.248 NGN network, VOICE call



# H.248 protocol signaling call Alignment



TEST-1	ALIGNMENT
Scope	Verify system behavior when starting up
Procedure	<ul style="list-style-type: none"><li>• Remove board and insert it again to verify how system behaves when starting up</li><li>• Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>• Verify start up behavior of a new alignment between MGW and MGC, using the Service Change command</li></ul>	
Expected results:	
<ul style="list-style-type: none"><li>• Alignment successful</li></ul>	

# H.248 protocol signaling call Success Case – A originates



TEST-2	SUCCESS CASE Subscriber A originates
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>• Originate Call from IP phone subscriber</li><li>• H.248 protocol, using CODEC G.711</li><li>• From IP phone to soft phone</li><li>• Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>• Verify how system behaves when interfunctioning</li><li>• Verify success of call completion, communication, and termination, involving NGN elements and correct codec negotiation.</li></ul>	
Expected results:	
<ul style="list-style-type: none"><li>• Success completing call, talking and hanging up when subscriber A originates the call</li></ul>	

# H.248 protocol signaling call Success Case – B originates



TEST-3	SUCCESS CASE Subscriber B originates
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>• Originate Call from IP phone subscriber</li><li>• H.248 protocol, using CODEC G.711</li><li>• From IP phone to soft phone</li><li>• Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>• Verify how system behaves when interfunctioning</li><li>• Verify success of call completion, communication, and termination, involving NGN elements and correct codec negotiation.</li></ul>	
Expected results:	
<ul style="list-style-type: none"><li>• Success completing call, talking and hanging up when subscriber B originates the call</li></ul>	



# H.248 protocol signaling call Success Case – DTMF Digits



TEST-4	SUCCESS CASE DTMF Digits
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>• Originate Call from IP phone subscriber</li><li>• H.248 protocol, using CODEC G.711</li><li>• From IP phone to IP phone</li><li>• Digits from 0 to 9 shall be input</li><li>• Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>• Verify how system behaves when interfunctioning</li><li>• Verify success of call completion, communication, and termination, involving NGN elements and correct codec negotiation</li><li>• Verify digits in RTP events</li></ul>	
Expected results:	
<ul style="list-style-type: none"><li>• Success completing call, talking and hanging up when subscriber A originates the call</li></ul> Verify digits in RTP events	

# H.248 protocol call

## Failure Case – Subscriber B busy



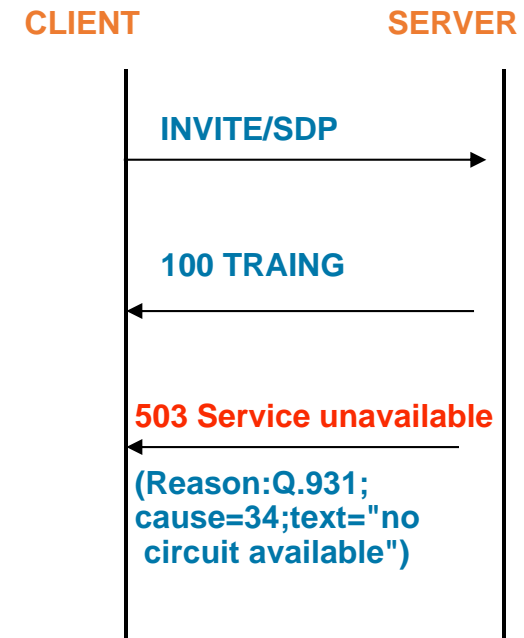
TEST-5	FAILURE CASE Receiver must be busy
Scope	Verify how system behaves when receiving subscriber number is busy.
Procedure	<ul style="list-style-type: none"><li>• Originate Call to subscriber B, whose number must be busy</li><li>• H.248 protocol, using CODEC G.711</li><li>• From test equipment to IP phone</li><li>• Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>• Verify how system behaves when interfunctioning</li><li>• Verify if caller receives a busy tone and the message Subtract ,</li><li>• Verify correct mapping of referred causes (ITU reference - Q.931) in the respective ISDN messages, cause 17.</li></ul> <p>(Reason:Q.931;cause=17;text="user busy").</p>	
Expected results on the caller's end:	
<ul style="list-style-type: none"><li>• Busy tone</li><li>• Message CAUSE# 17 User busy</li></ul>	

# H.248 protocol call using the network

## Failure Case – B congested



TEST-6	Failure Case B congested
Scope	Verify how system behaves when receiving subscriber number is non-existent
Procedure	<ul style="list-style-type: none"><li>• Originate Call to subscriber B, whose number must be congested</li><li>• H.248 protocol, using CODEC G.711</li><li>• From test equipment to IP phone</li><li>• Monitored via wireshark</li></ul>
<b>Objective</b> <ul style="list-style-type: none"><li>• Verify how system behaves when interfunctioning</li><li>• Verify if caller receives an empty number tone and message 486 Busy Here ,</li><li>• Verify correct mapping of referred causes (ITU reference - Q.931) in the respective release messages (Reason:Q.931;cause=34;text="no circuit available")</li></ul>	
<b>Expected results on the caller's end:</b> <ul style="list-style-type: none"><li>• Empty number tone (Reason:Q.931;cause=34;text="no circuit available")</li></ul>	



# Day Two



- Workshop at NGN Lab Instrumentation; Protocols: SIP.
- 



- Workshop at NGN Lab Protocols: H.248
- 



- Workshop at NGN Lab interoperability aspects. SIP-ISUP  
SIP –I (ITU-T Rec. Q.1912.5 Profile C)
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- Workshop at NGN Lab Voice Quality (PESQ ITU-T Rec. P.862)
-

Workshop at NGN Lab interoperability  
aspects. SIP-ISUP, SIP-I  
(ITU-T Rec. Q.1912.5 Profile C).

# SIP-I protocol test scenario

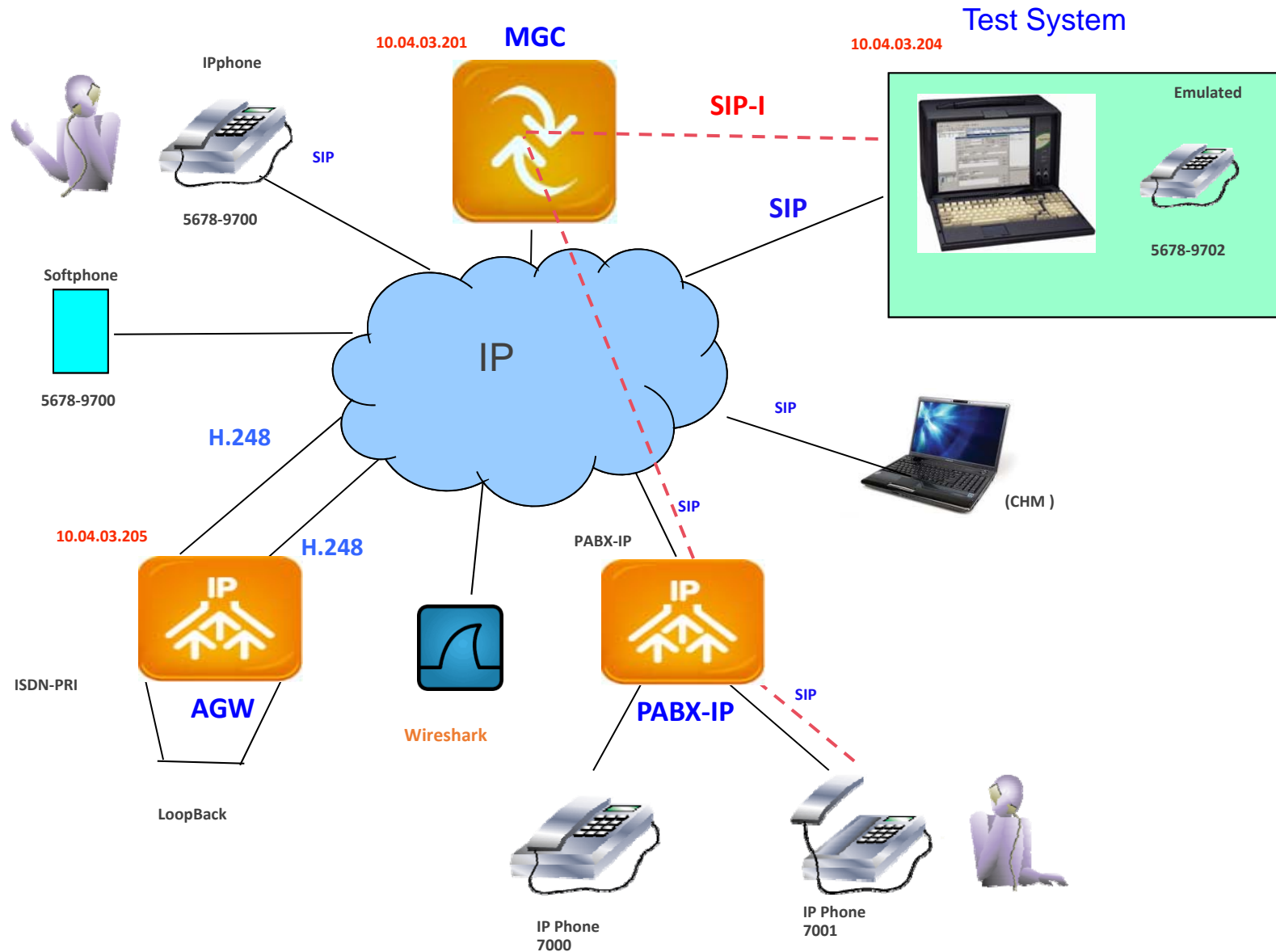


## Tests with test equipment

### NGN network call SIP-I protocol

- ❑ CODEC G.711A success case
  - Subscriber A originates call
  - Subscriber B originates call
  
- ❑ CODEC G.729A success case
  - Subscriber A originates call
  - Subscriber B originates call
  
- ❑ Failure Case
  - Release: busy
  - Release: congested

# Topology SIP-I Protocol

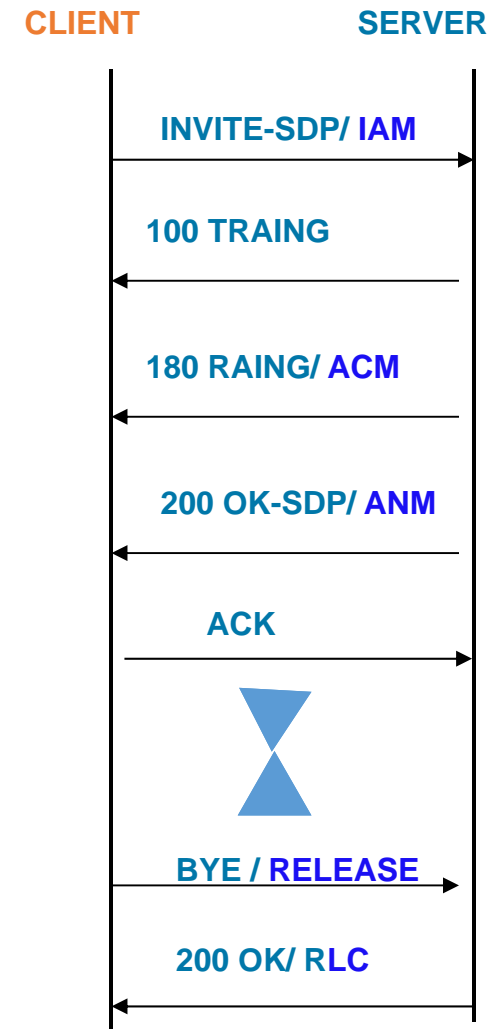


# Signaling call SIP-I protocol – Success Case

## Subscriber A originates CODEC-G.711



TEST-1	SUCCESS CASE From A, CODEC-G.711
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>Subscriber A originates a call</li><li>Protocol SIP-I, using CODEC G.711</li><li>From test equipment to IP phone</li><li>Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>Verify how system behaves when interfunctioning</li><li>Verify success of call completion and termination, involving NGN elements</li></ul>	
Expected results: <ul style="list-style-type: none"><li>Success completing call, correct codec negotiation and termination.</li></ul>	



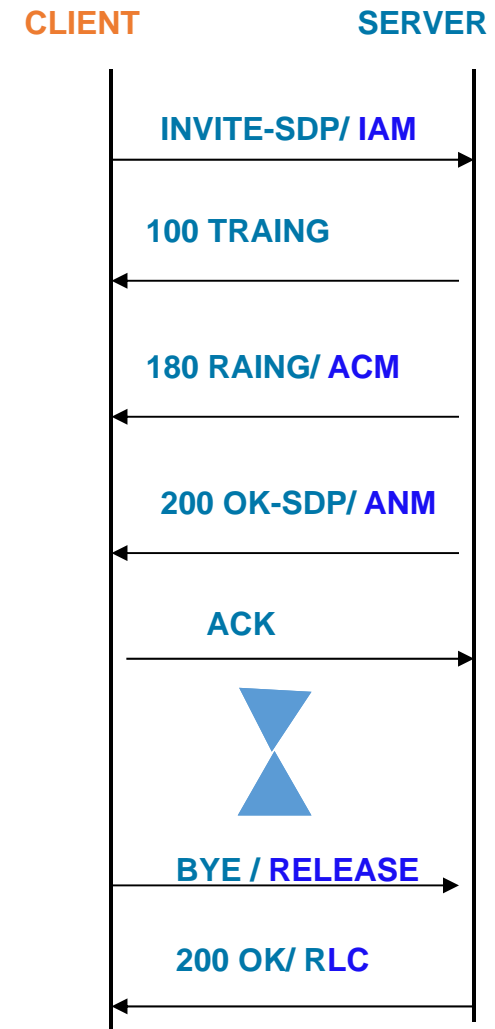


# Signaling call SIP-I protocol – Success Case

## Subscriber B originates CODEC-G.711



TEST-2	SUCCESS CASE From A, CODEC-G.711
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>Subscriber B originates a call</li><li>Protocol SIP-I, using CODEC G.711</li><li>From test equipment to IP phone</li><li>Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>Verify how system behaves when interfunctioning</li><li>Verify success of call completion and termination, involving NGN elements</li></ul>	
Expected results:	
<ul style="list-style-type: none"><li>Success completing call, correct codec negotiation and termination.</li></ul>	

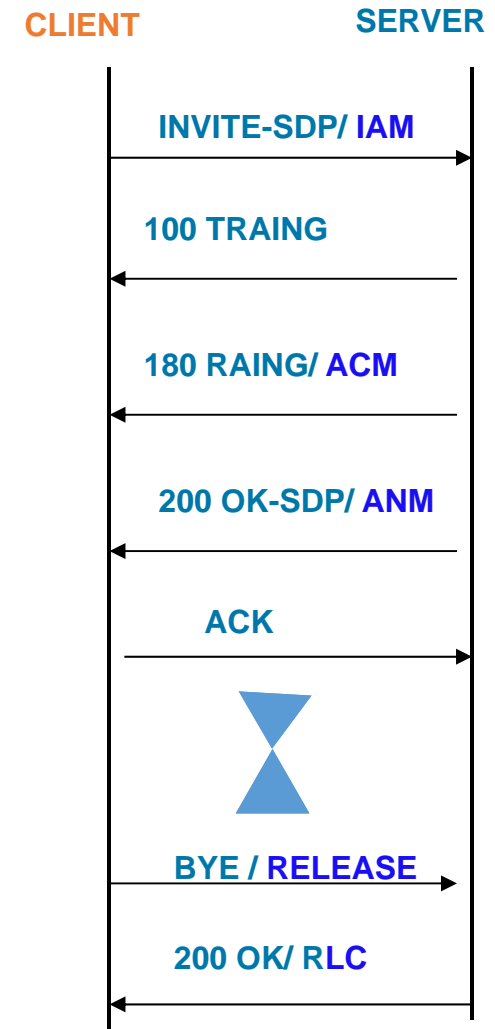


# Signaling call SIP-I protocol – Success Case

## Subscriber A originates CODEC-G.729



TEST-3	SUCCESS CASE From A, CODEC-G.729
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>Subscriber A originates a call</li><li>Protocol SIP-I, using CODEC G.729</li><li>From test equipment to IP phone</li><li>Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>Verify how system behaves when interfunctioning</li><li>Verify success of call completion and termination, involving NGN elements</li></ul>	
Expected results: <ul style="list-style-type: none"><li>Success completing call, correct codec negotiation and termination.</li></ul>	

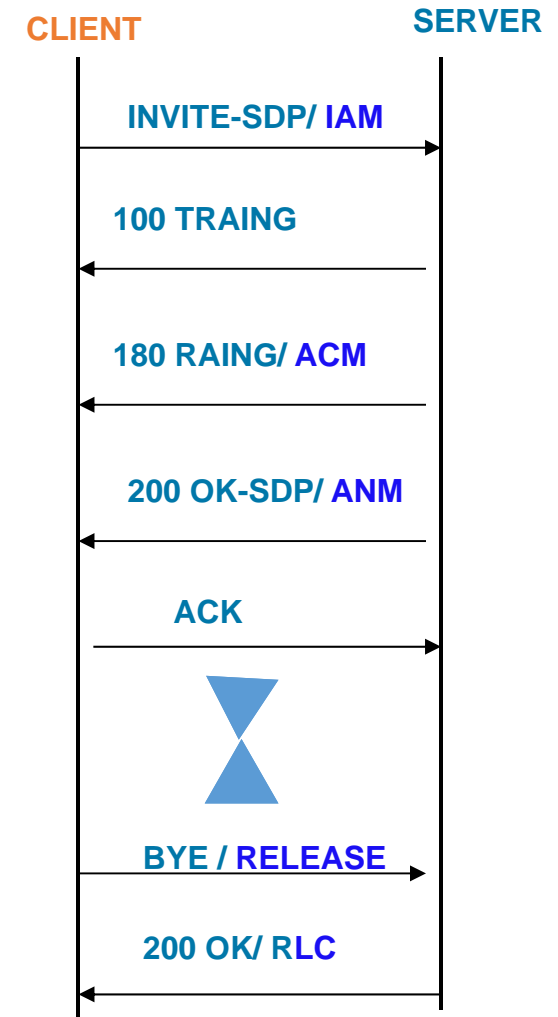


# Signaling call SIP-I protocol – Success Case

## Subscriber B originates CODEC-G.729



TEST-4	SUCCESS CASE From B, CODEC-G.729
Scope	Verify how system behaves when subscriber is free
Procedure	<ul style="list-style-type: none"><li>• Subscriber B originates a call</li><li>• Protocol SIP-I, using CODEC G.729</li><li>• From test equipment to IP phone</li><li>• Monitored via wireshark</li></ul>
Objective	
<ul style="list-style-type: none"><li>• Verify how system behaves when interfunctioning</li><li>• Verify success of call completion and termination, involving NGN elements</li></ul>	
Expected results:	
<ul style="list-style-type: none"><li>• Success completing call, correct codec negotiation and termination.</li></ul>	

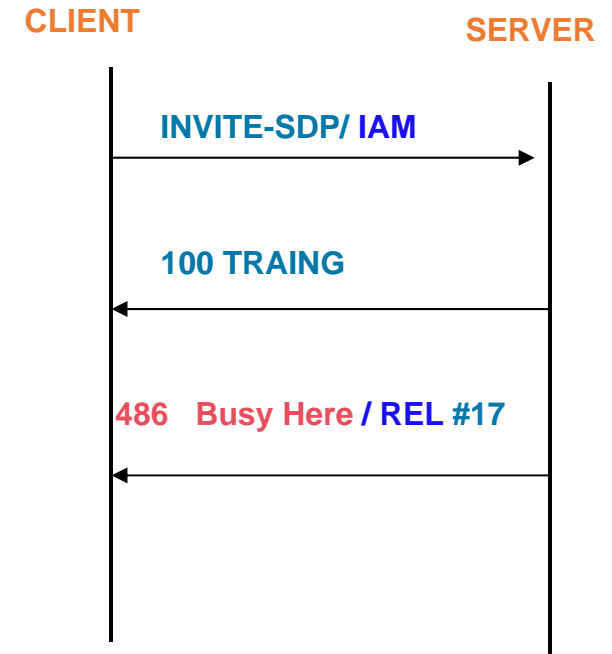


# Signaling call SIP-I protocol

## Failure Case – B Busy



TEST-5	FAILURE CASE B Busy
<b>Scope</b>	Verify how system behaves when receiving subscriber number is busy.
<b>Procedure</b>	<ul style="list-style-type: none"><li>• If making an IP phone call, test equipment must receive it</li><li>• Protocol SIP-I, using CODEC G.711</li><li>• Monitored via wireshark</li></ul>
<b>Objective</b>	
<ul style="list-style-type: none"><li>• Verify how system behaves when interfunctioning</li><li>• Verify message 486 Busy Here</li><li>• Verify correct mapping of referred causes (ITU reference – Q.850) in the respective SIP messages</li></ul> <p>(Reason: Q.850;cause=17;text="user busy").</p>	
<b>Expected results:</b>	
<ul style="list-style-type: none"><li>• Busy tone</li><li>• Message 486 Busy Here / REL #17</li></ul>	

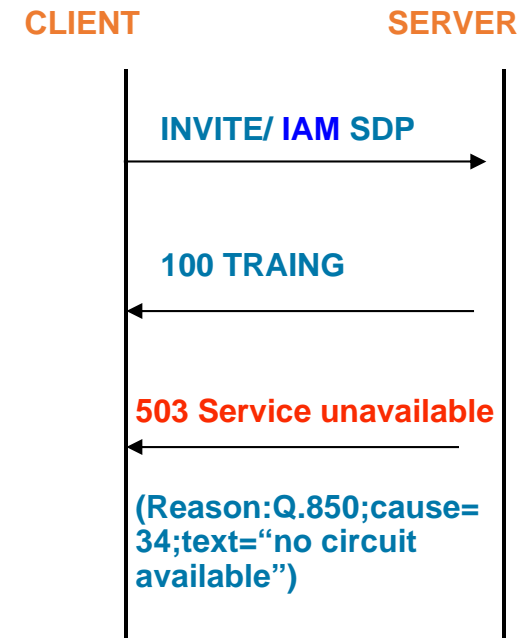


# SIP-I protocol call

## Failure Case – B congested



TEST-6	FAILURE CASE B congested
Scope	Verify how system behaves when receiving subscriber number is non-existent
Procedure:	<ul style="list-style-type: none"> <li>• Originate call to subscriber B, whose number must be congested</li> <li>• SIP protocol, using CODEC G.711</li> <li>• From test equipment to IP phone</li> <li>• Monitored via wireshark</li> </ul>
Objective	
<ul style="list-style-type: none"> <li>• Verify how system behaves when interfunctioning</li> <li>• Verify if caller receives an empty number tone and message 486 Busy Here</li> <li>• Verify correct mapping of referred causes (ITU reference – Q.850) in the respective SIP messages</li> </ul> <p>(Reason:Q.850;cause=34;text="no circuit available")</p>	
Expected results on the caller's end:	
<ul style="list-style-type: none"> <li>• Empty number tone</li> </ul> <p>(Reason:Q.850;cause=34;text="no circuit available")</p>	



# Day Two



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Workshop at NGN Lab Voice  
Quality (PESQ ITU-T Rec. P.862)

# Voice Quality Measurement Scenario – MOS



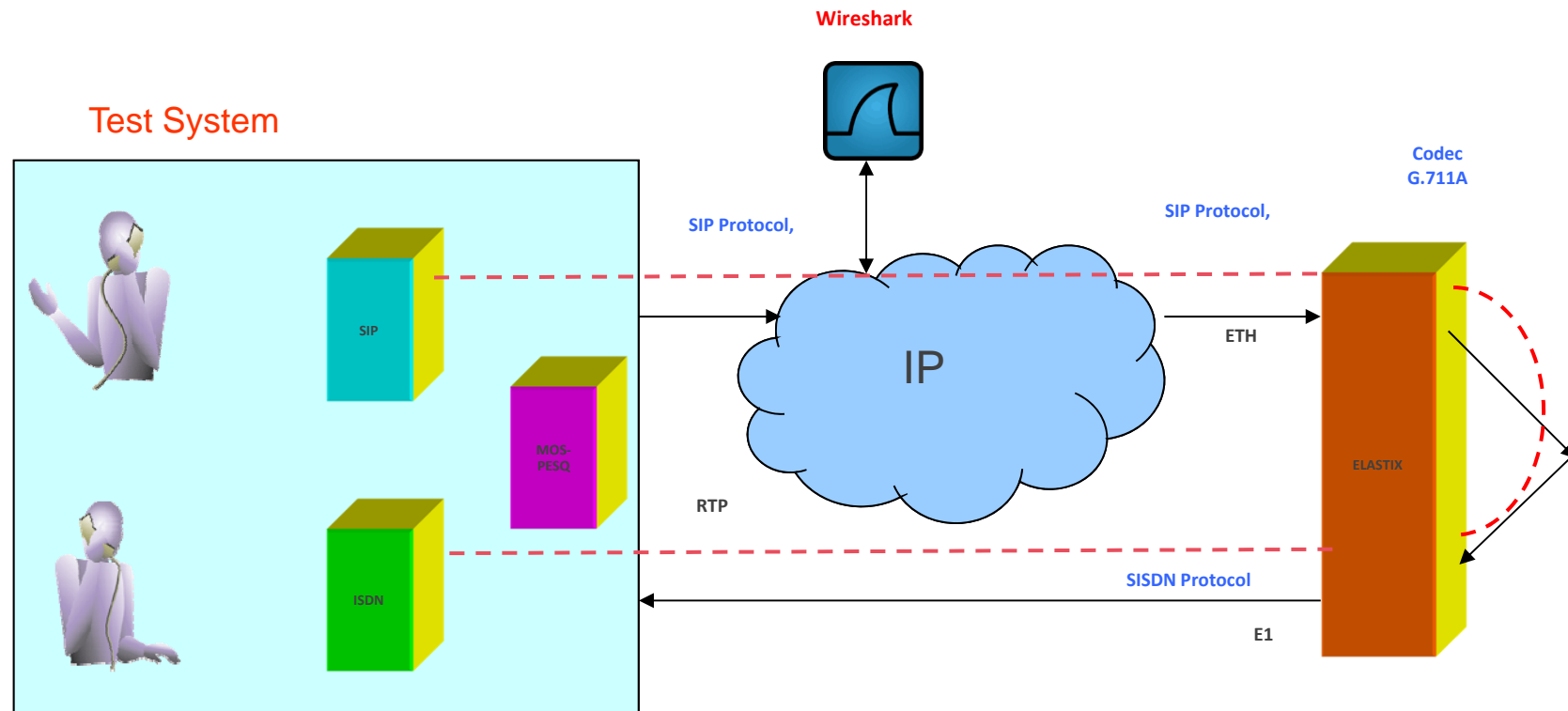
Two test cases will be run:

Case 1: VOICE calls (female and male sentences, SIP-ISDN protocol, using codec **G.711**)

Case 1: VOICE calls (female and male sentences, SIP-ISDN protocol, using codec **G.729**)



# SIP-ISDN calls test topology, with voice quality measurement – MOS

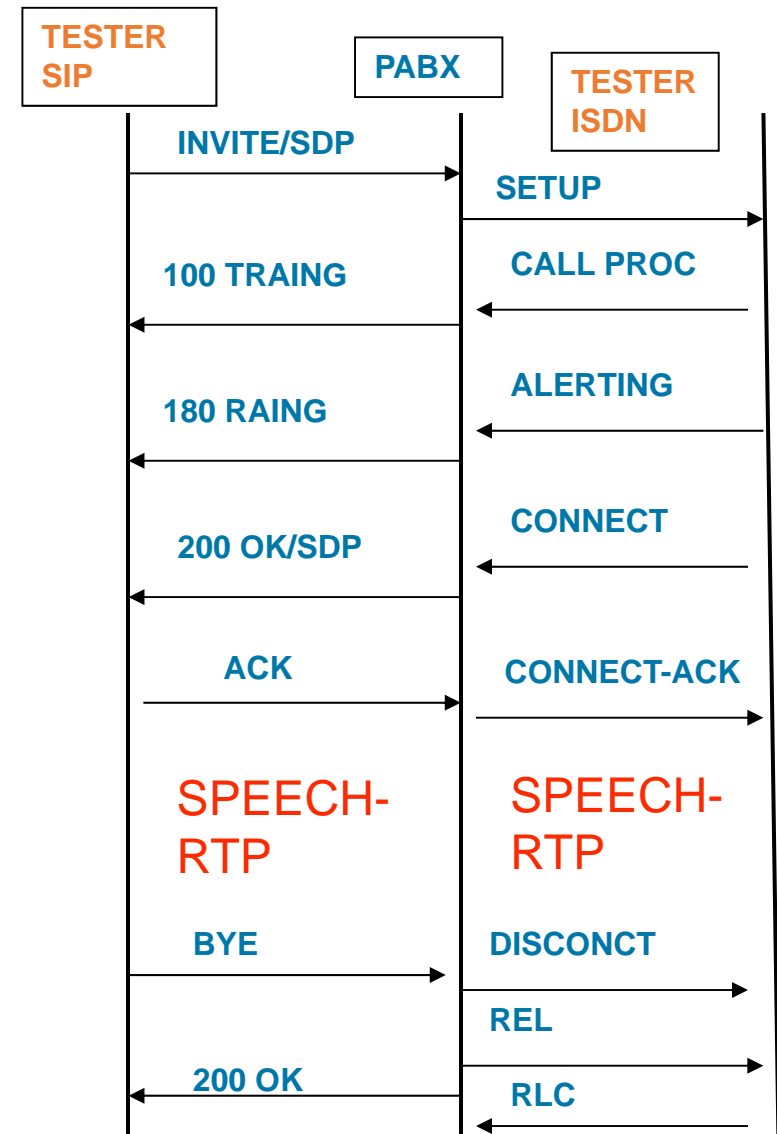


Perceptual Evaluation of SpeechQuality (PESQ) in standard P.862

# MOS Tests with CODEC G.711



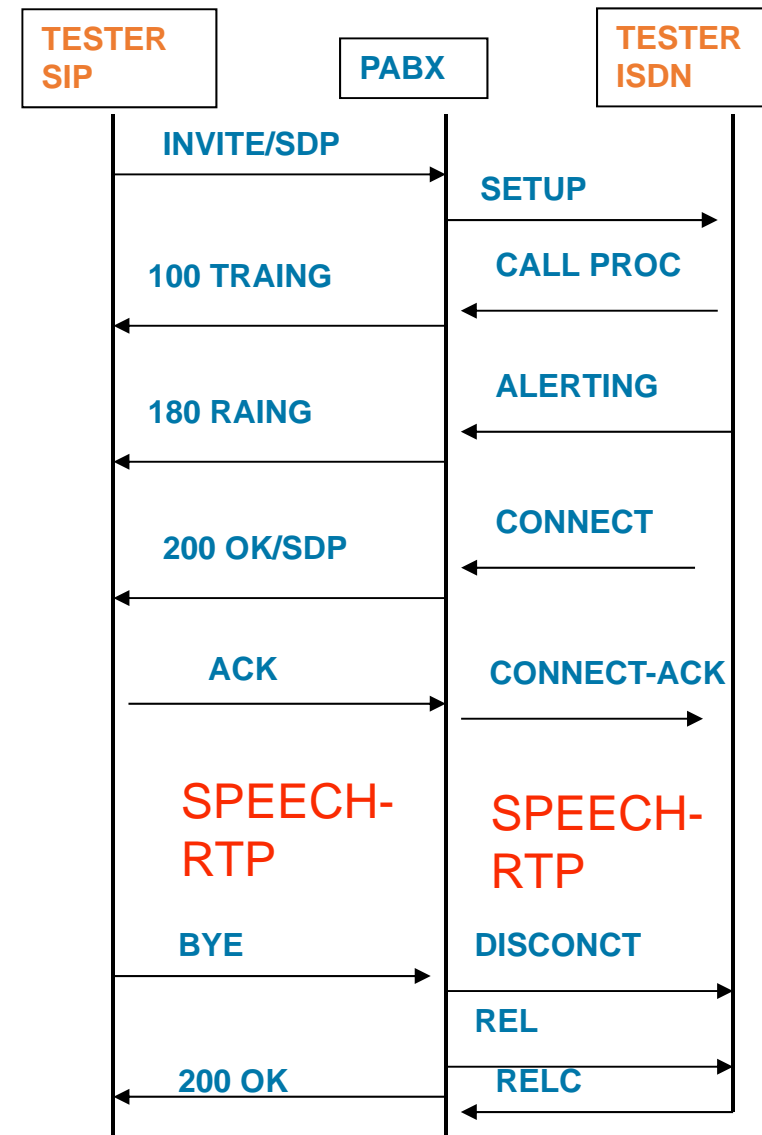
TEST-1	MOS tests with CODEC G.711
<b>Scope</b>	Verify call completion and mos Mos measurements for codec G.711
<b>Procedure</b>	<ul style="list-style-type: none"> <li>Simultaneous SIP calls shall be made, originating from test equipment, with male and female sentences, to be received by the IP-PABX</li> <li>The PABX-IP shall forward the calls to the ISDN route, to be answered by the test equipment</li> <li>CODEC G.711</li> <li>From SIP test equipment, passing through the IP-PABX, to be received by the ISDN test equipment.</li> <li>Monitored via wireshark</li> </ul>
<b>Objective</b>	
	<ul style="list-style-type: none"> <li>Verify how system behaves when interfunctioning</li> <li>Verify call completion</li> <li>Verify results of MOS FROM MOS score</li> <li>Verify packet loss jitter delay</li> </ul>
<b>Expected Results:</b>	
	<ul style="list-style-type: none"> <li>Complete calls (without loss)</li> <li>Mos SCORE within satisfactory standards</li> </ul>



# MOS Tests with CODEC G.729



TEST-2	MOS tests with CODEC G.729
<b>Scope</b>	Verify call completion and mos Mos measurements for codec G.729
<b>Procedure</b>	<ul style="list-style-type: none"> <li>Simultaneous SIP calls shall be made, originating from test equipment, with male and female sentences, to be received by the IP-PABX</li> <li>The PABX-IP shall forward the calls to the ISDN route, to be answered by the test equipment</li> <li>CODEC G.729</li> <li>From SIP test equipment, passing through the IP-PABX, to be received by the ISDN test equipment</li> <li>Monitored via wireshark</li> </ul>
<b>Objective</b>	
<ul style="list-style-type: none"> <li>Verify how system behaves when interfunctioning</li> <li>Verify call completion</li> <li>Verify results of MOS FROM MOS score</li> <li>Verify packet loss jitter delay</li> </ul>	
<b>Expected Results:</b>	
<ul style="list-style-type: none"> <li>Complete calls (without loss)</li> <li>Mos SCORE within satisfactory standards</li> </ul>	





# Thanks!

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