Separation of responsibilities between Application Servers and Media Servers in NGNs: the “mediactrl” approach
Media Server Control WG

Charter
• http://www.ietf.org/html.charters/mediactrl-charter.html

Features
• Advanced services
  • Interactive Voice Response (IVR)
  • Conferencing
• Several topologies: 1:1 → m:n
• Modular approach
  • Opaque payloads
  • Control Packages

MEDIACTRL Framework
- Control Package 1
- Control Package 2
- Control Package 3

Protocol Messages
AS uses SIP to establish TCP/TLS connection to MS

- SIP dialog called **Control Dialog**
- TCP/TLS connection called **Control Channel**
  - Channel setup: SIP with COMEDIA negotiation
  - Authentication: SYNCH message

**Application Server**

- Frontend for UA signalling
- 3rd Party Call Control
Control Channel set up

UAC  >  AS  >  MS

SIP Control Dialog

INVITE (COMEDIA)

100 (Trying)

200 OK (COMEDIA)

ACK

TCP Connect (CTRL Channel)

SYNC (Dialog ID, etc.)

200 OK

Check SYNCH
3rd Party Call Control

UAC

INVITE (x)

180 (Ringing)

AS

Handle app(x)

INVITE (x) as 3PCC

100 (Trying)

200 OK

MS

200 OK

Negotiate media with UAC and map tags and labels

ACK

RTP Media Stream(s) flowing

ACK
A Practical Approach

**IETF Motto**
- “Rough consensus, running code”

**Only existing implementation to date: COMICS Research Group@UniNa**
- Used as a basis for an IETF call flows document
  - Implementation-oriented considerations
- State Diagrams of the framework protocol
  - both AS and MS perspectives

**Allows to reproduce many real-life scenarios**
Implementation details

Application Server
- Java code
- SIP Servlet implementing the application logic
- WeSip and OpenSer

Media Server
- Low level media processing
  - C/C++ code
- Use of existing open source components to deal with well-known protocols and languages
  - reSIProcate (SIP)
  - oRTP (RTP/RTCP)
  - Expat (XML)
  - libCURL (HTTP/FTP)
Use Case Scenarios

Real world scenarios
  • Echo test
  • Conference
  • Voice mail application
  • ...

Echo test
  • Simple but useful
  • Different approaches to realize it
    • Direct echo test
    • Record and play based echo test

Preliminary steps required
  • Control channel setup
  • 3rd Party Call Control
Direct Echo Test

Conference Control Package
- `<join>` method

1. CONTROL (Join)

SCFW 74b0dc511949 CONTROL
Control-Package: msc-conf-audio/1.0
Content-Type: text/xml
Content-Length: 87

```xml
<?xml version="1.0"?>
<join
id1="1536067209~913cd14c" id2="1536067209~913cd14c">
</join>
```

2. 200 OK

SCFW 74b0dc511949 200
Content-Type: text/xml
Content-Length: 70

```xml
<?xml version="1.0"?>
<response status="200" reason="Join successful"/>
```

Now UAC is echoed back everything

Self join UAC
Record and Play Echo Test (1/8)

Basic IVR Control Package
- Two steps are needed
  - Record
  - Play
- Asynchronous notification

UAC

AS

MS

A1 CONTROL (Record)
A2 202
A3 REPORT (Pending)
A4 200 OK
A5 REPORT (Terminate)
A6 200 OK

B1 CONTROL (recordinfo)
B2 200 OK
C1 CONTROL (Prompt)
C2 202
C3 REPORT (Pending)
C4 200 OK
C5 REPORT (Terminate)
C6 200 OK

D1 CONTROL (recordinfo)
D2 200 OK

← “This is an echo test: tell something”
“10 s of audio from UAC” →

← “Playout of the 10 s recorded voice”

Prepare & start the dialog
Save in a file
Prepare & start the dialog
Use recorded file to play announcement
Record and Play Echo Test (2/8)

A1 CONTROL (Record)

UAC

AS

MS

A2 202
A3 REPORT (Pending)
A4 200 OK
A5 REPORT (Terminate)
A6 200 OK

Prepare start the dialog

B1 CONTROL (recordinfo)
B2 200 OK
C1 CONTROL (Prompt)
C2 202
C3 REPORT (Pending)
C4 200 OK
C5 REPORT (Terminate)
C6 200 OK

Save in a file

D1 CONTROL (recordinfo)
D2 200 OK

Use recorded file to play announcement

“Playout of the 10 s recorded voice”

“Playout of the 10 s recorded voice”

Prepare & start the dialog

Use recorded file to play announcement

“This is an echo test: tell something”
“10 s of audio from UAC”

SCFW 74b0dc511949 CONTROL
Control-Package: msc-ivr-basic/1.0
Content-Type: text/xml
Content-Length: 354

<?xml version="1.0"?>
<dialogstart connectionid="153607209~913cd14c">
  <basicivr>
    <prompt iterations="1">
      <media src="http://www.ms.org/prompts/connected.wav" type="audio/wav" />
    </prompt>
    <record maxtime="10s" dtmfterm="false" beep="true" />
  </basicivr>
</dialogstart>
Record and Play Echo Test (3/8)

- **UAC**
  - A1 CONTROL (Record)
  - A3 REPORT (Pending)
  - A5 REPORT (Terminate)

- **AS**
  - B1 CONTROL (recordinfo)
  - B2 200 OK
  - C1 CONTROL (Prompt)
  - C3 REPORT (Pending)
  - C5 REPORT (Terminate)

- **MS**
  - A2 202
  - A4 200 OK
  - A6 200 OK
  - D1 CONTROL (recordinfo)
  - D2 200 OK

**Messages**

- A2 (SCFW 202)
  - SCFW 74b0dc511949 202

- A3 (SCFW REPORT pending)
  - SCFW 74b0dc511949 REPORT
    - Seq: 1
    - Status: pending
    - Timeout: 10

- A4 (SCFW 200, ACK)
  - SCFW 74b0dc511949 200
    - Seq: 1

**Instructions**

- **UAC**
  - Prepare & start the dialog
    - “This is an echo test: tell something”
    - “10 s of audio from UAC”

- **AS**
  - Use recorded file to play announcement

- **MS**
  - Prepare & start the dialog
    - “Playout of the 10 s recorded voice”
Record and Play Echo Test (4/8)

UAC

A1 CONTROL (Record)
A2 202
A3 REPORT (Pending)
A4 200 OK
A5 REPORT (Terminate)
A6 200 OK

AS

B1 CONTROL (recordinfo)
B2 200 OK
C1 CONTROL (Prompt)
C2 202
C3 REPORT (Pending)
C4 200 OK
C5 REPORT (Terminate)
C6 200 OK

MS

Prepare & start the dialog

“Save in a file”

Use recorded file to play announcement

“Playout of the 10 s recorded voice”

A5 (SCFW REPORT terminate)

SCFW 74b0dc511949 REPORT
Seq: 2
Status: terminate
Timeout: 10
Content-Type: text/xml
Content-Length: 88

<?xml version="1.0"?>
<response status="200"
reason="Dialog started"
dialogid="05ded7b"/>

A6 (SCFW 200, ACK)

SCFW 74b0dc511949 200
Seq: 2
Record and Play Echo Test (5/8)

UAC

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>CONTROL (Record)</td>
</tr>
<tr>
<td>A2</td>
<td>202 Prepare &amp; start the dialog</td>
</tr>
<tr>
<td>A3</td>
<td>REPORT (Pending)</td>
</tr>
<tr>
<td>A4</td>
<td>200 OK</td>
</tr>
<tr>
<td>A5</td>
<td>REPORT (Terminate)</td>
</tr>
<tr>
<td>A6</td>
<td>200 OK</td>
</tr>
</tbody>
</table>

AS

<table>
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<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>CONTROL (RecordInfo)</td>
</tr>
<tr>
<td>B2</td>
<td>200 OK</td>
</tr>
<tr>
<td>B3</td>
<td>CONTROL (Prompt)</td>
</tr>
<tr>
<td>B4</td>
<td>202</td>
</tr>
<tr>
<td>B5</td>
<td>REPORT (Pending)</td>
</tr>
<tr>
<td>B6</td>
<td>200 OK</td>
</tr>
</tbody>
</table>

MS

<table>
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<tr>
<th>Step</th>
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</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>CONTROL (Prompt)</td>
</tr>
<tr>
<td>C2</td>
<td>202</td>
</tr>
<tr>
<td>C3</td>
<td>REPORT (Pending)</td>
</tr>
<tr>
<td>C4</td>
<td>200 OK</td>
</tr>
<tr>
<td>C5</td>
<td>REPORT (Terminate)</td>
</tr>
<tr>
<td>C6</td>
<td>200 OK</td>
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</tbody>
</table>

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<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>CONTROL (PromptInfo)</td>
</tr>
<tr>
<td>D2</td>
<td>200 OK</td>
</tr>
</tbody>
</table>

B1 CONTROL (RecordInfo)

SCFW 4rgth45632d1 CONTROL
Control-Package: msc-ivr-basic/1.0
Content-Type: text/xml
Content-Length: 197

```xml
<?xml version="1.0"?>
<event
dialogid="05ded7b">
<dialogexit status="1">
<recordinfo termmode="maxtime"
duration="10000" size="161644" type="audio/wav"
recording="http://www.ms.org/recording-05ded7b.wav"/>
</dialogexit></event>
```
Record and Play Echo Test (6/8)

UAC

A1 CONTROL (Record)
A2 202
A3 REPORT (Pending)
A4 200 OK
A5 REPORT (Terminate)
A6 200 OK

Prepare & start the dialog

Use recorded file to play announcement

“Playout of the 10 s recorded voice”

B1 CONTROL (recordinfo)
B2 200 OK

C1 CONTROL (Prompt)
C2 202
C3 REPORT (Pending)
C4 200 OK
C5 REPORT (Terminate)
C6 200 OK

Save in a file

C1 CONTROL (Prompt)

D1 CONTROL (promptinfo)
D2 200 OK

SCFW 238e1f2946e8 CONTROL
Control-Package: msc-ivr-basic/1.0
Content-Type: text/xml
Content-Length: 319

<?xml version="1.0"?>
<dialogstart connectionid="1536067209~913cd14c">
  <basicivr>
    <prompt iterations="1">
      <media src="http://www.ms.org/recording-05ded7b.wav" type="audio/wav"/>
    </prompt>
  </basicivr>
</dialogstart>
Record and Play Echo Test (7/8)

UAC

AS

MS

A1 CONTROL (Record)
A2. 202
A3 REPORT (Pending)
A4 200 OK
A5 REPORT (Terminate)
A6 200 OK

Prepare & start the dialog

“This is an echo test: tell something”
“10 s of audio from UAC”

Use recorded file to play announcement

B1 CONTROL (recordinfo)
B2 200 OK
C1 CONTROL (Prompt)
C2. 202
C3 REPORT (Pending)
C4 200 OK
C5 REPORT (Terminate)
C6 200 OK

Prepare start the dialog

“Playout of the 10 s recorded voice”

D1 CONTROL (promptinfo)
D2 200 OK

Save in a file

C5 REPORT (terminate)

SCFW 238e1f2946e8 REPORT
Seq: 2
Status: terminate
Timeout: 10
Content-Type: text/xml
Content-Length: 88

<?xml version="1.0"?>
<response status="200" reason="Dialog started" dialogid="6faf4e0"/>

Record and Play Echo Test (8/8)

UAC | AS | MS
---|---|---
A1 CONTROL (Record) | A2 202 | 
A3 REPORT (Pending) | A4 200 OK | 
A5 REPORT (Terminate) | A6 200 OK | 

← “This is an echo test: tell something”
“10 s of audio from UAC” →

Prepare & start the dialog
Save in a file

Use recorded file to play announcement

B1 CONTROL (recordinfo) | B2 200 OK | 
C1 CONTROL (Prompt) | C2 202 | 
C3 REPORT (Pending) | C4 200 OK | 
C5 REPORT (Terminate) | C6 200 OK | 

← “Playout of the 10 s recorded voice”

D1 CONTROL (promptinfo) | D2 200 OK | 

D1 CONTROL event

SCFW g56dhg73g8r5 CONTROL
Control-Package: msc-ivr-basic/1.0
Content-Type: text/xml
Content-Length: 165

<?xml version="1.0"?>
<event dialogid="6faf4e0">
<dialogexit status="1">
<promptinfo termmode="completed" duration="10000" iterations="1"/>
</dialogexit>
</event>