DevTest Best Practices
SAP Service Virtualization

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DevTest Components

Component	Purpose
Enterprise Dashboard	DevTest License and Usage Monitoring
Registry	DevTest Component Registration, DB management
Portal	**DevTest Web UI Server**
Workstation	**Rich DevTest Client UI**
Broker	DevTest Java Agent Coordinator
Coordinator	Coordinator for Tests run on Simulators
Simulator	Runs Tests
Virtual Service Environment (VSE)	**Hosts Virtual Services**

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Agenda

1. ARCHITECTURE

2. COMMUNICATION

3. CONFIGURATION

4. DEMO

5. USEFUL SAP TRANSACTION CODES, TROUBLESHOOTING & BEST PRACTICES

6. Q&A

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SAP Architecture

Presentation Layer
- Provides Graphical Screem to Users
- Users enter data on screen
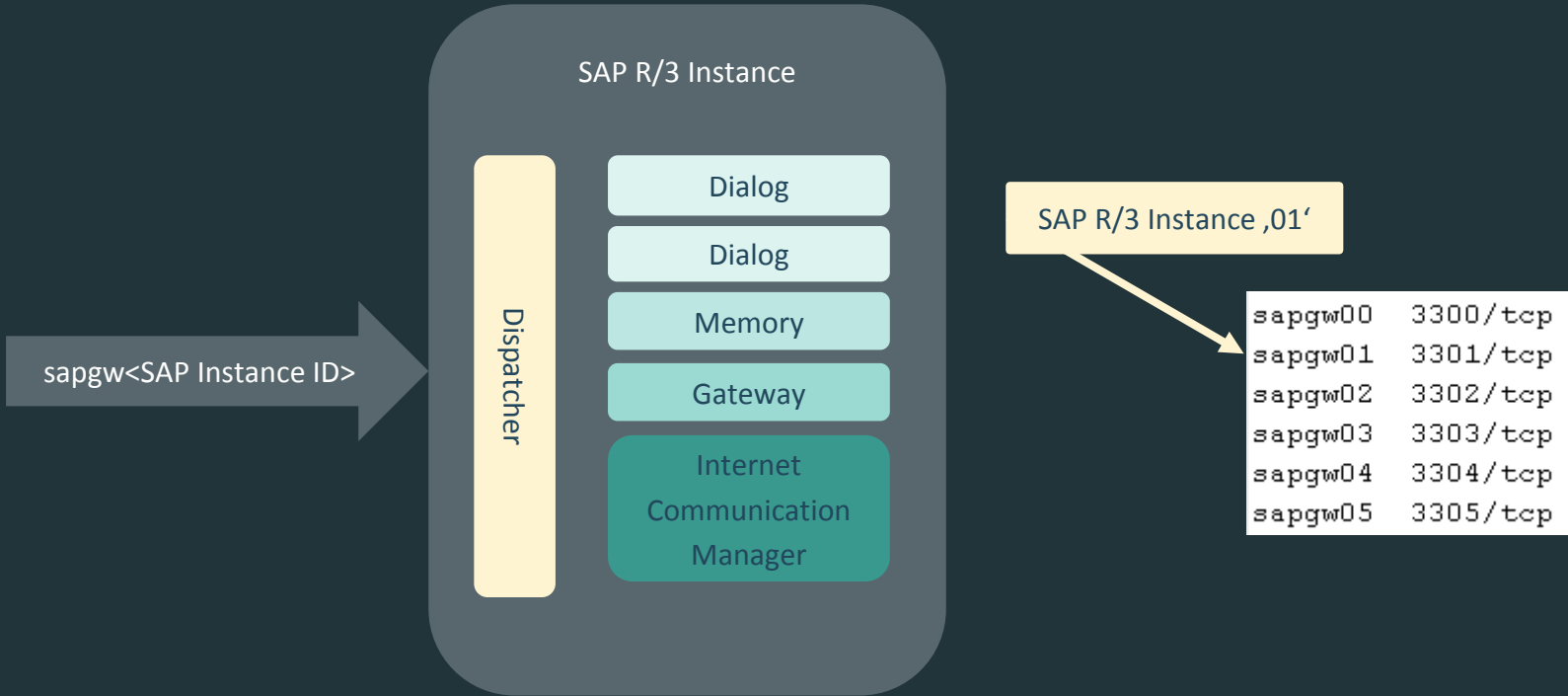- Shows processed data to user

Application Layer
- Processes Data using Application Logic
- Communicates with both layers
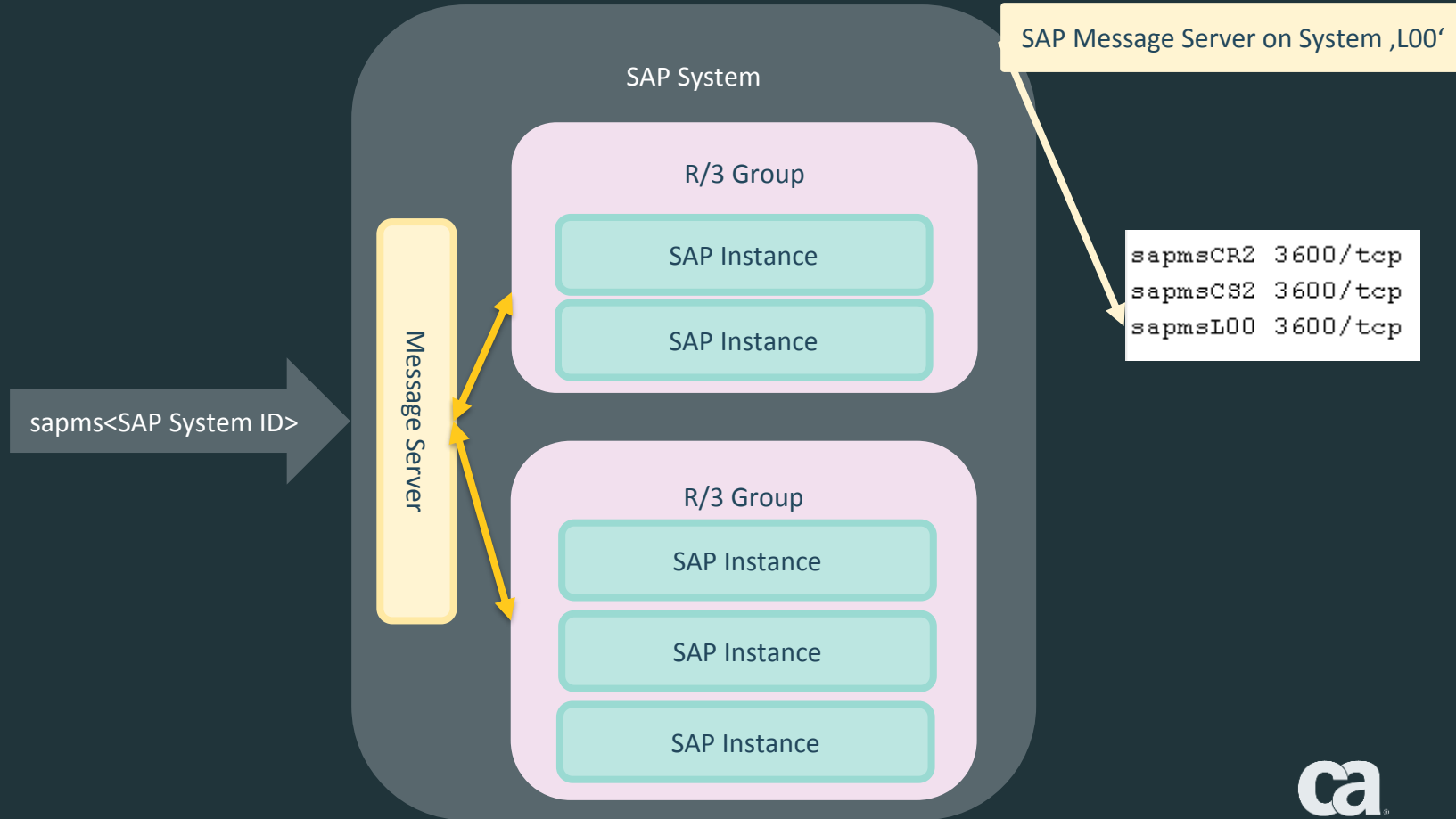- Read/Write from database
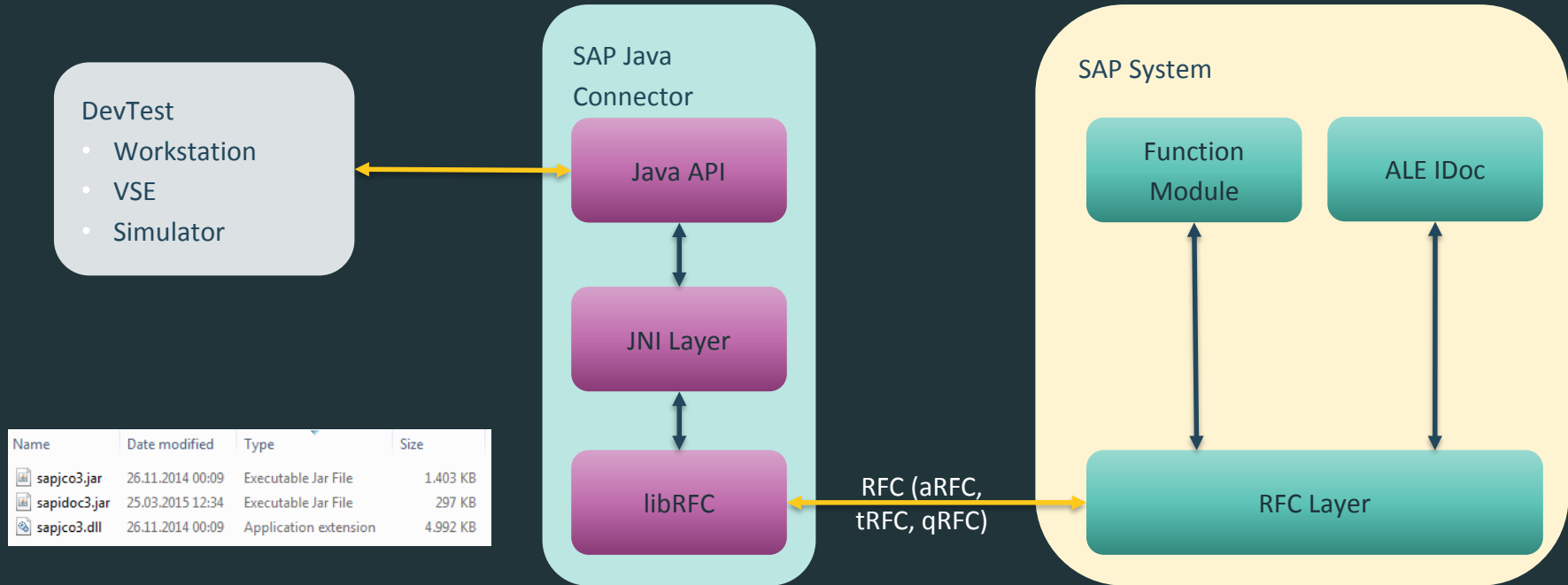
Database Layer
- Stores Data

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SAP Architecture – SAP Instance

SAP R/3 Instance

Dispatcher

Dialog

Dialog

Memory

Gateway

Internet Communication Manager

sapgw<SAP Instance ID>

SAP R/3 Instance ‚01'

```
sapgw00    3300/tcp
sapgw01    3301/tcp
sapgw02    3302/tcp
sapgw03    3303/tcp
sapgw04    3304/tcp
sapgw05    3305/tcp
```

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SAP Architecture – SAP System

SAP Message Server on System ‚L00'

```
sapmsCR2 3600/tcp
sapmsCS2 3600/tcp
sapmsL00 3600/tcp
```

SAP System

R/3 Group

SAP Instance

SAP Instance

R/3 Group

SAP Instance

SAP Instance

SAP Instance

Message Server

sapms<SAP System ID>

SAP Java Connector (JCo) Architecture

DevTest
- Workstation
- VSE
- Simulator

SAP Java Connector

Java API

JNI Layer

libRFC

Name	Date modified	Type	Size
sapjco3.jar	26.11.2014 00:09	Executable Jar File	1.403 KB
sapidoc3.jar	25.03.2015 12:34	Executable Jar File	297 KB
sapjco3.dll	26.11.2014 00:09	Application extension	4.992 KB

RFC (aRFC, tRFC, qRFC)

SAP System

Function Module

ALE IDoc

RFC Layer

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SAP IDoc Structure

- **Control Section**
  - Single segment, header information, IDoc ID, sender, receiver

- **Data Section**
  - Multiple Segments, payload, hierarchical (parent/child)

- **Status Section**
  - Multiple Segments, local to system, last status segment is significant

SAP IDoc Exchange – Live Mode
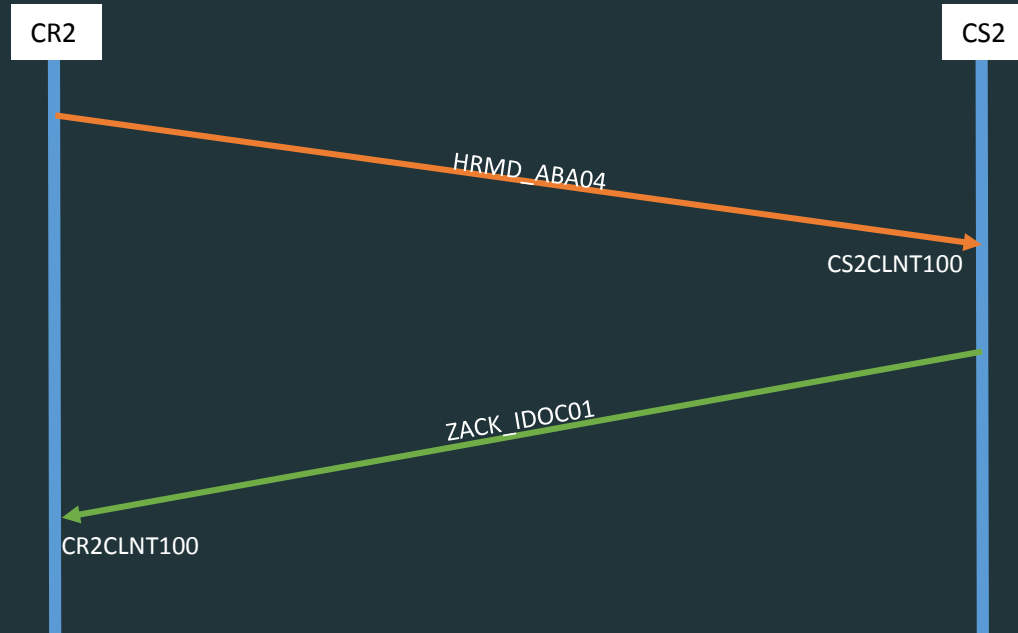
SAP IDoc Exchange – Recording Mode
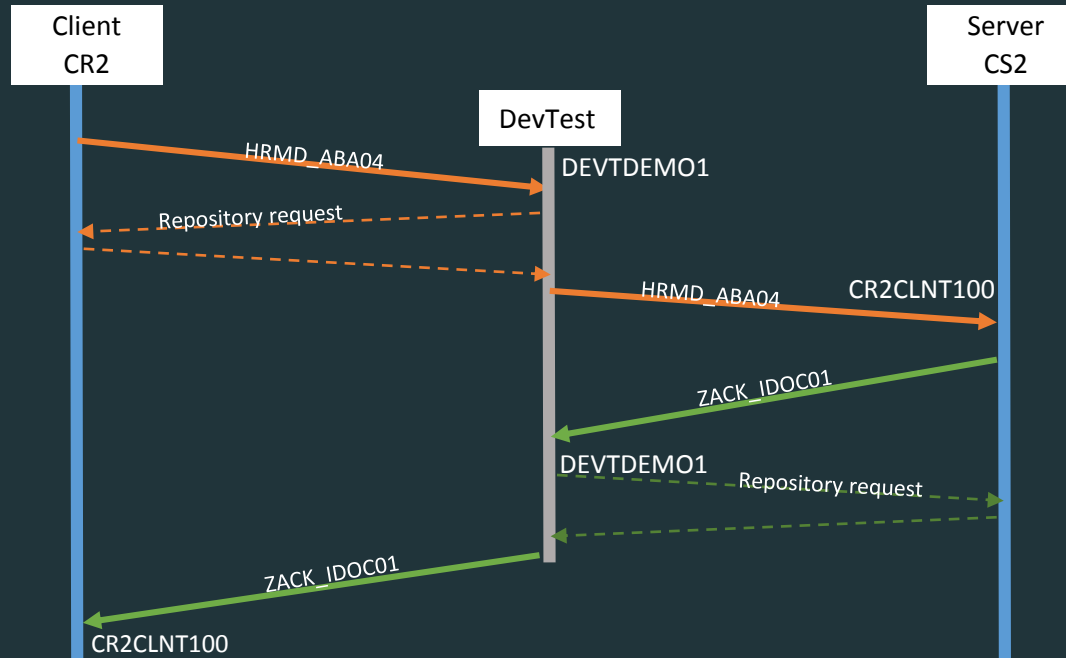
SAP IDoc Exchange – Replay Mode
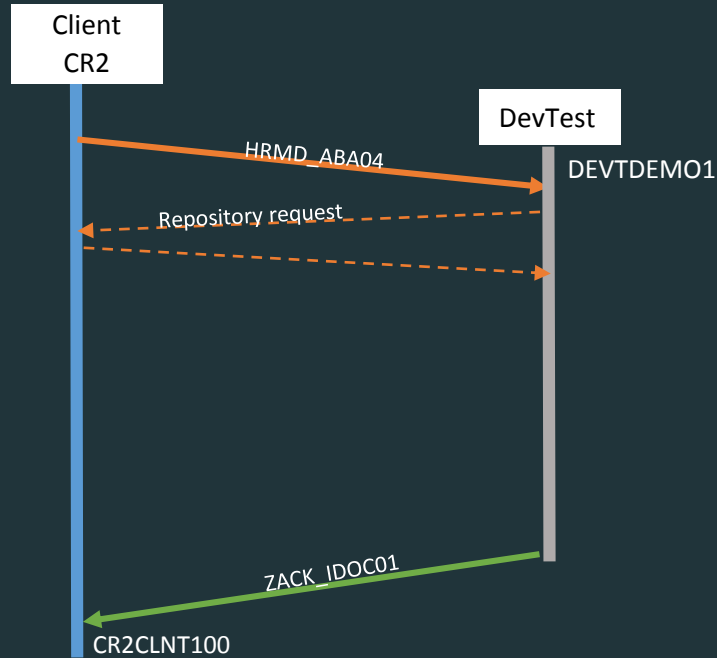
SAP RFC Destination

- **SAP Logical System**
- **SAP Partner Profile**
  - Service Registration
  - Supported Outbound and Inbound IDocs
  - RFC Destination
- **SAP User privileges**
  - Access to IDoc Meta Data Repository
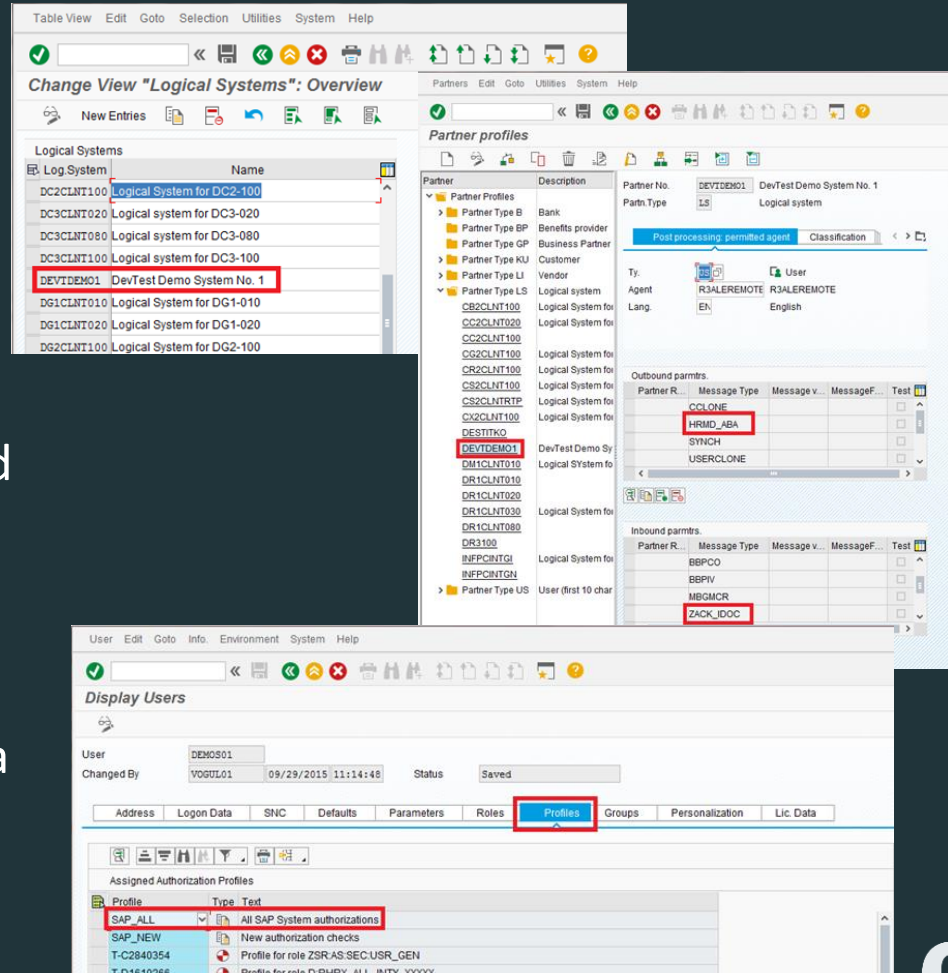
SAP Application Server

- ### Host name (FQDN) of SAP Application Server

- ### SAP System Number
  - SAP Instance ID
  - Two Digits – `00´ is common

- ### SAP Authentication
  - User ID
  - Password
  - SAP Client Number

SAP Message Server

- **Host name (FQDN) of SAP Message Server**

- **SAP R/3 Name**
  - Aka SAP System ID
  - Three chars - `L00´ is common

- **SAP R/3 Group Name**

- **SAP Authentication**
  - User ID
  - Password
  - SAP Client Number

SAP IDoc Exchange – Recording Mode
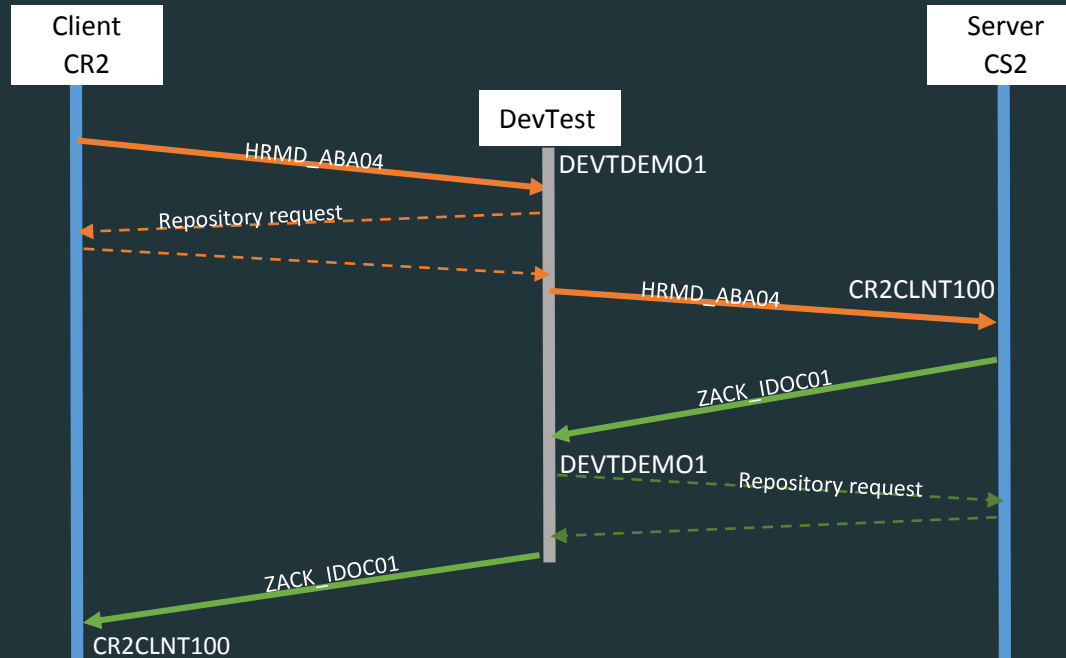
SAP Virtual Service Recorder Configuration

Where to listen for requests?

Locally Unique Connection Name

Where to send the responses?

Where to find IDoc Meta Info for request?

Where to listen for responses?

Locally Unique Connection Name

Where to send the requests?

Where to find IDoc Meta Info for response?

XPath Queries to match Request and Response

Virtual Service Image Recorder

Please provide us with the client and server connection information

Client RFC Connection Properties:	Data/CR2_RFC_Destination.properties
Client RFC Destination Name:	IDOC_CR2
Client System Connection Properties:	Data/CR2_System.properties
Client System Name:	CR2
Request Identifier XPath Expressions:	/HRMD_ABA04/IDOC/E1PLOGI/E1PITYP[7]/E1P0105/USRID/text()
Server RFC Connection Properties:	Data/CS2_RFC_Destination.properties
Server RFC Destination Name:	IDOC_CS2
Server System Connection Properties:	Data/CS2_System.properties
Server System Name:	CS2
Response Identifier XPath Expressions:	/ZACK_IDOC01/IDOC/ZACK_IDOC_SEG/USRID/text()

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SAP Virtual Service Configuration
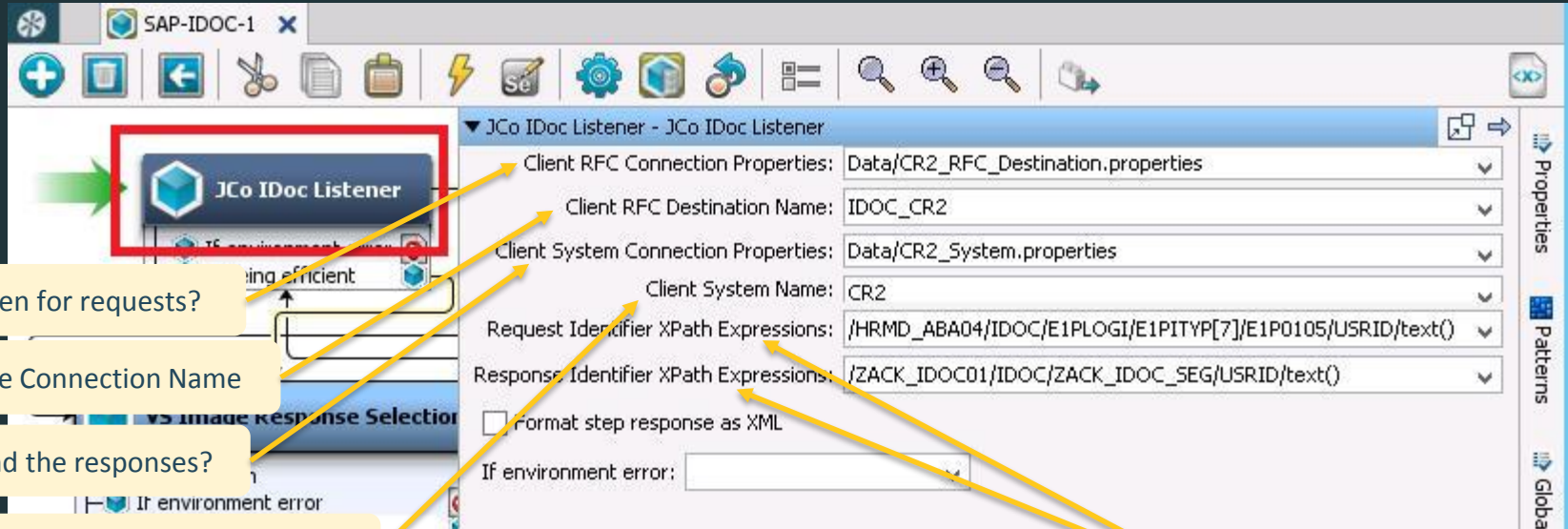
Where to listen for requests?

Locally Unique Connection Name

Where to send the responses?

Where to find IDoc Meta Info for request?

XPath Queries to match Request and Response

JCo IDoc Listener - JCo IDoc Listener

Client RFC Connection Properties: Data/CR2_RFC_Destination.properties

Client RFC Destination Name: IDOC_CR2

Client System Connection Properties: Data/CR2_System.properties

Client System Name: CR2

Request Identifier XPath Expressions: /HRMD_ABA04/IDOC/E1PLOGI/E1PITYP[7]/E1P0105/USRID/text()

Response Identifier XPath Expressions: /ZACK_IDOC01/IDOC/ZACK_IDOC_SEG/USRID/text()

Format step response as XML

If environment error:

SAP Virtual Service Configuration – Where to Listen

'Registered Program Name' in RFC Destination Definition in SAP

SAP Host Name
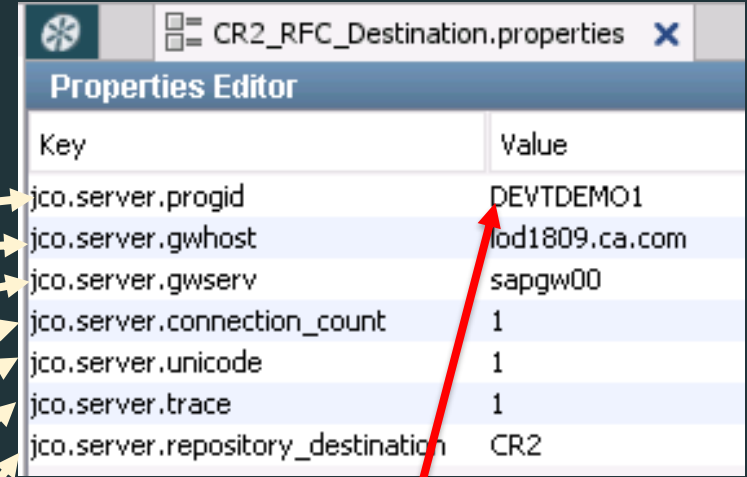
SAP service (port no. in etc/services) is in SAP Instance `00´

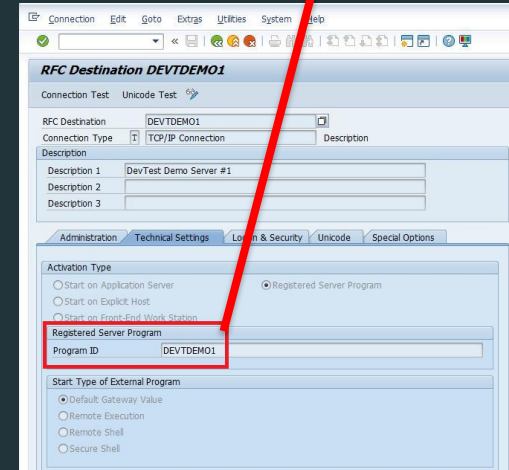Concurrent connections to SAP. **Should match** RFC Destination configuration in SAP.

Unicode support on this connection? **Must match** RFC Destination configuration in SAP

SAP JCo connection Trace level

SAP System ID to find the IDoc Meta Repository

CR2_RFC_Destination.properties

Properties Editor

Key	Value
jco.server.progid	DEVTDEMO1
jco.server.gwhost	lod1809.ca.com
jco.server.gwserv	sapgw00
jco.server.connection_count	1
jco.server.unicode	1
jco.server.trace	1
jco.server.repository_destination	CR2

RFC Destination DEVTDEMO1

Connection Test   Unicode Test

RFC Destination   DEVTDEMO1
Connection Type   T   TCP/IP Connection   Description
Description
Description 1   DevTest Demo Server #1
Description 2
Description 3

Administration | Technical Settings | Logon & Security | Unicode | Special Options

Activation Type
○ Start on Application Server   ● Registered Server Program
○ Start on Explicit Host
○ Start on Front-End Work Station

Registered Server Program
Program ID   DEVTDEMO1
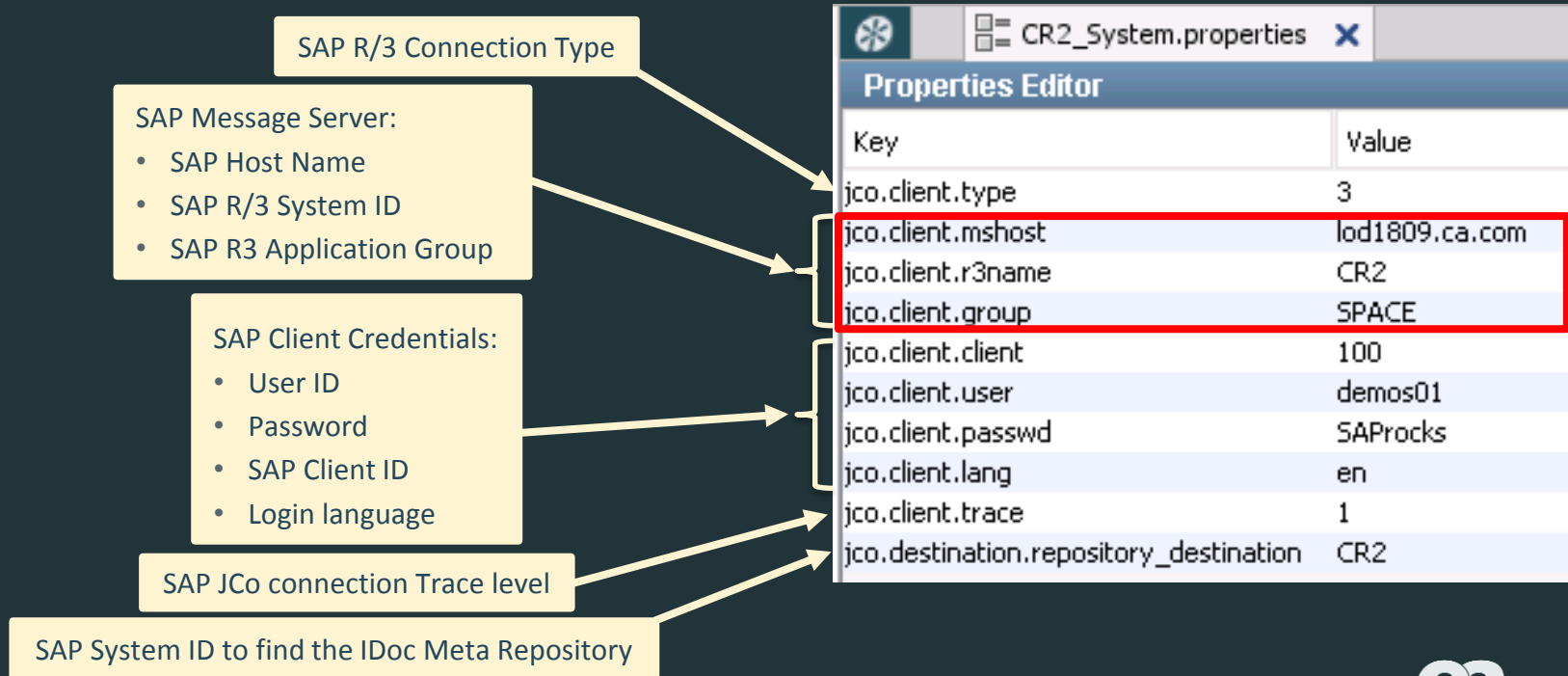
Start Type of External Program
● Default Gateway Value
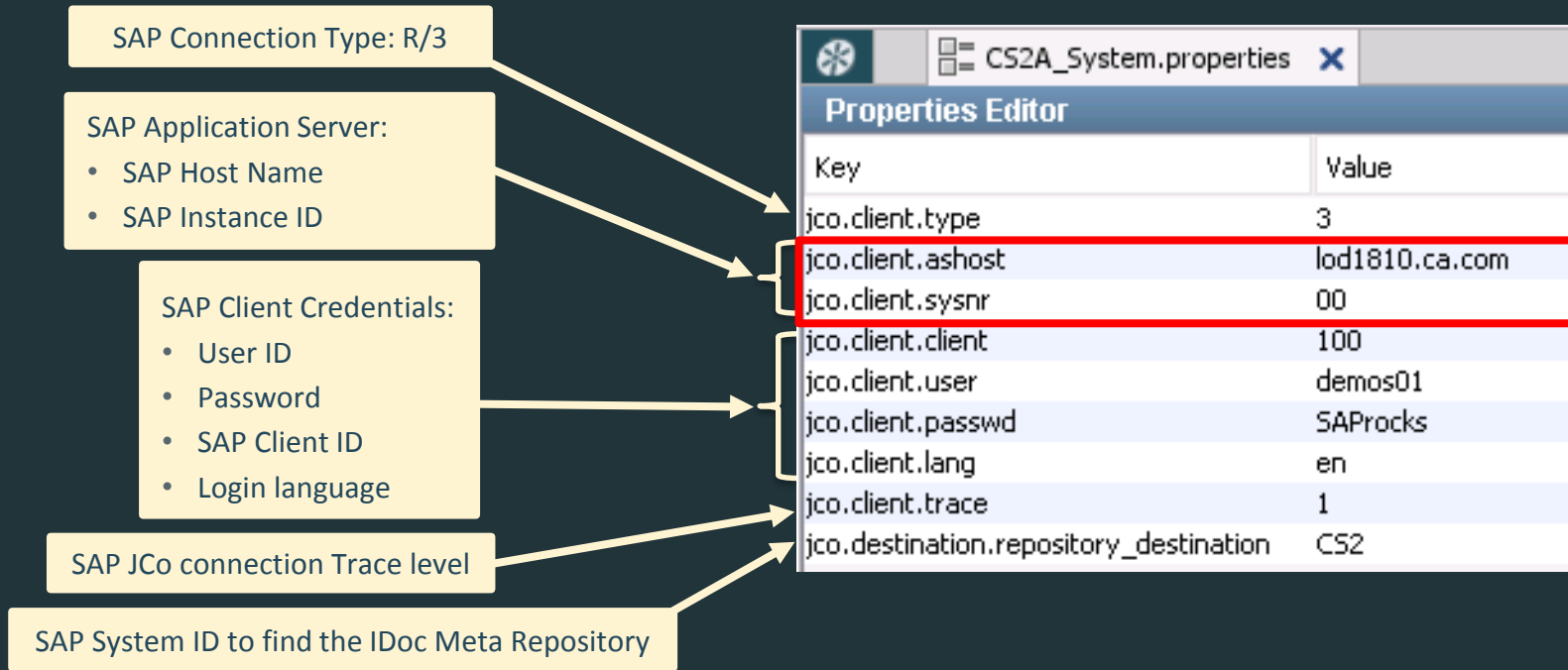○ Remote Execution
○ Remote Shell
○ Secure Shell

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SAP Virtual Service Configuration
Send to **Message** Server

SAP R/3 Connection Type

SAP Message Server:
- SAP Host Name
- SAP R/3 System ID
- SAP R3 Application Group

SAP Client Credentials:
- User ID
- Password
- SAP Client ID
- Login language

SAP JCo connection Trace level

SAP System ID to find the IDoc Meta Repository

CR2_System.properties

Properties Editor

Key	Value
jco.client.type	3
jco.client.mshost	lod1809.ca.com
jco.client.r3name	CR2
jco.client.group	SPACE
jco.client.client	100
jco.client.user	demos01
jco.client.passwd	SAProcks
jco.client.lang	en
jco.client.trace	1
jco.destination.repository_destination	CR2

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SAP Virtual Service Configuration
Send to **Application** Server

SAP Connection Type: R/3

SAP Application Server:
- SAP Host Name
- SAP Instance ID

SAP Client Credentials:
- User ID
- Password
- SAP Client ID
- Login language

SAP JCo connection Trace level

SAP System ID to find the IDoc Meta Repository

CS2A_System.properties ✕

Properties Editor

Key	Value
jco.client.type	3
jco.client.ashost	lod1810.ca.com
jco.client.sysnr	00
jco.client.client	100
jco.client.user	demos01
jco.client.passwd	SAProcks
jco.client.lang	en
jco.client.trace	1
jco.destination.repository_destination	CS2

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SAP Virtual Service Configuration
IDoc Request/Response Correlation

Request: /HRMD_ABA04/IDOC/E1PLOGI/E1PITYP[6]/E1P0105/USRID/text()

```xml
<?xml version="1.1"?>
<HRMD_ABA04>
    <IDOC BEGIN="1">
        <EDI_DC40>
        <E1PLOGI SEGMENT="1">
            <PLVAR>01</PLVAR>
            <OTYPE>P</OTYPE>
            <OBJID>00044087</OBJID>
            <OPERA>I</OPERA>
            <E1PITYP>
            <E1PITYP>
            <E1PITYP>
            <E1PITYP>
            <E1PITYP>
            <E1PITYP>
            <E1PITYP SEGMENT="1">
                <PLVAR>01</PLVAR>
                <OTYPE>P</OTYPE>
                <OBJID>00044087</OBJID>
                <INFTY>0105</INFTY>
                <SUBTY>0001</SUBTY>
                <BEGDA>18000101</BEGDA>
                <ENDDA>99991231</ENDDA>
                <E1P0105 SEGMENT="1">
                    <PERNR>00044087</PERNR>
                    <INFTY>0105</INFTY>
                    <SUBTY>0001</SUBTY>
                    <ENDDA>99991231</ENDDA>
                    <BEGDA>20110704</BEGDA>
                    <SEQNR>000</SEQNR>
                    <AEDTM>20110602</AEDTM>
                    <UNAME>DEVSU02</UNAME>
                    <USRTY>0001</USRTY>
                    <USRID>SCHCH44</USRID>
                </E1P0105>
            </E1PITYP>
            <E1PITYP>
```

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SAP Virtual Service Configuration
IDoc Request/Response Correlation

Response: /ZACK_IDOC01/IDOC/ZACK_IDOC_SEG/USRID/text()

```xml
<?xml version="1.1"?>
<ZACK_IDOC01>
    <IDOC BEGIN="1">
        <EDI_DC40>
        <ZACK_IDOC_SEG SEGMENT="1">
            <IDOC NUM>0000000001948334</IDOC NUM>
            <USRID>{{=request_IDOC_E1PLOGI_E1PITYP_E1P0105_USRID_1;/*SCHCH44*/}}</USRID>
            <STATUS>Error</STATUS>
        </ZACK_IDOC_SEG>
    </IDOC>
</ZACK_IDOC01>
```

SAP Virtual Service Configuration
SAP Service/Port Configuration

etc/service on Windows

	This PC ▸ Local Disk (C:) ▸ Windows ▸ System32 ▸ drivers ▸ etc			
Name		Date modified	Type	Size
hosts		21.11.2016 21:34	File	1 KB
lmhosts.sam		22.08.2013 17:38	SAM File	4 KB
networks		22.08.2013 15:25	File	1 KB
protocol		22.08.2013 15:25	File	2 KB
services		08.08.2016 10:38	File	21 KB
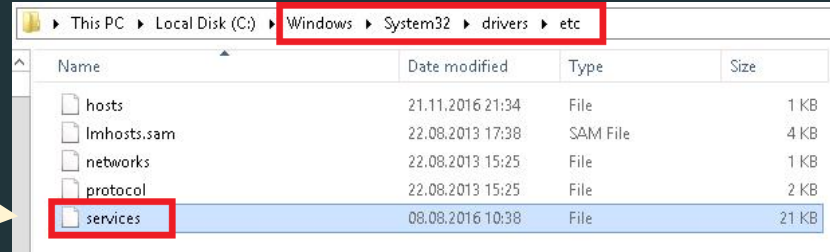
SAP Message Server Services

```
sapmsCR2  3600/tcp
sapmsCS2  3600/tcp
sapmsL00  3600/tcp
```

SAP Application Server Services

```
sapgw00    3300/tcp
sapgw01    3301/tcp
sapgw02    3302/tcp
sapgw03    3303/tcp
sapgw04    3304/tcp
sapgw05    3305/tcp
```

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SAP Configuration Checklist

- **SAP JCo Libraries**
  - DEVTEST_HOME/lib/shared
  - DEVTEST_HOME/bin

- **SAP User Credentials**
  - Privileges to Read IDoc Meta Data from IDoc Repository

- **SAP Communication Settings**
  - RFC Destination (SAP JCo Server)
  - SAP System (SAP JCo Client)

- **XPath Specification for IDoc request and response**

- **SAP Service aka Gateways in etc/services**

- **RR Pairs in XML Format**

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Demo

SAP Service Virtualization – Bill of Material

- SAP JCo Libraries (Version 30P_12 (14/11) used in demo)

- SAP Service RR Pairs in XML Format
  - XPath queries for Request/Response Correlation identified
- SAP Communication Specifications
  - SAP User ID and Credentials
  - SAP User Privileges to access/read from IDoc Repository
  - SAP RFC Destination configured
  - SAP Message Server or Application Server identified
  - SAP Services for etc/services
  - Unicode enabled/disabled

SAP Virtualization Best Practices

- Get SAP Communication Configuration settings in advance to create the SAP JCo configuration files in advance
  - Validate the settings with the SAP administrator or on the target SAP system
- Get SAP IDoc RR pairs in XML format in advance
  - Test creation of virtual SAP service with connection to inhouse SAP test system
  - Determine the Xpath expressions
- Two Appointments
  - Communication Configuration Setup and Validation
  - Use Case Execution
- SAP Administrator support/attendance required
- SAP Application SME support/attendance required

SAP Transaction Codes and Troubleshooting

SAP Transaction Codes
BD54 – List Logical Systems

- DevTest System must be listed in SAP as a logical system (LS)
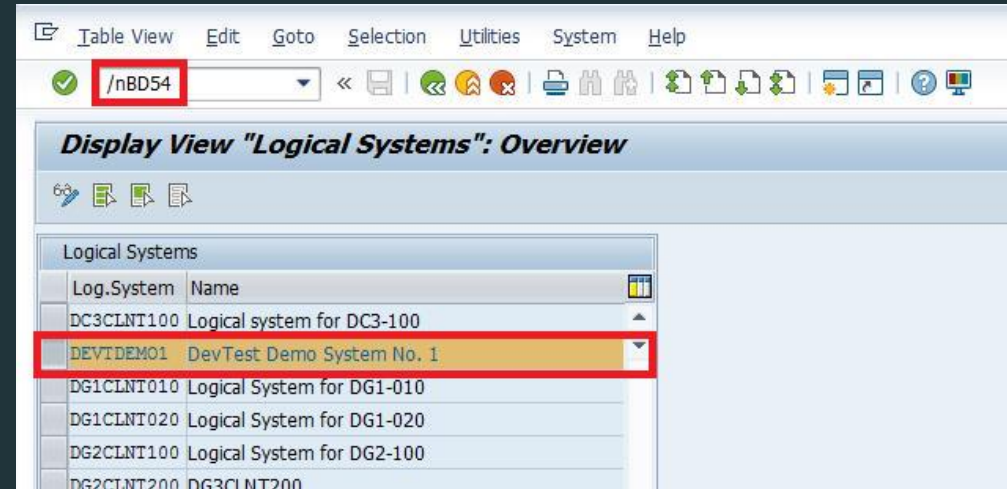
SAP Transaction Codes
WE20 – Partner Profile

- DevTest must have a partner profile in SAP for configuration of outbound IDoc requests and inbound IDoc responses

SAP Transaction Codes
WE20 – Partner Profile: Immediate Transfer

- Double click on the **Outbound** Message Type

- Verify IDocs are submitted immediately, i.e. 'Transfer IDoc immed.' is selected.

SAP Transaction Codes
SM59 – Configuration of RFC Connections

- RFC Destination for DevTest must be configured transaction code SM59
- Often the RFC Destination name is identical to the SAP Logical System (LS) name.
- The 'Registered ~~S~~ Program' na~~me~~ used in JCo ~~~~ (jco.server.p~~~~

SAP Transaction Codes SM59 – Connection Tests

- Tests require virtual SAP service or VSE recorder for SAP IDoc recording is started successfully

- If Unicode is required in 'jco.server' settings, Unicode must also be defined in RFC Destination configuration.

SAP Transaction Codes
SM59 – Connection Test Outcomes

- Successful
- Failed

SAP Transaction Codes
WE19 – Test Tool for IDoc

- Resent IDoc
  - Query for sent IDocs or
  - Enter known IDoc ID
- Submit by **Standard Outbound Processing**

SAP Transaction Codes
SU01 – Display Users

- SAP user ID must have access to IDoc Meta data repository. In our SAP test environments the user ID has SAP privilege 'SAP_ALL'
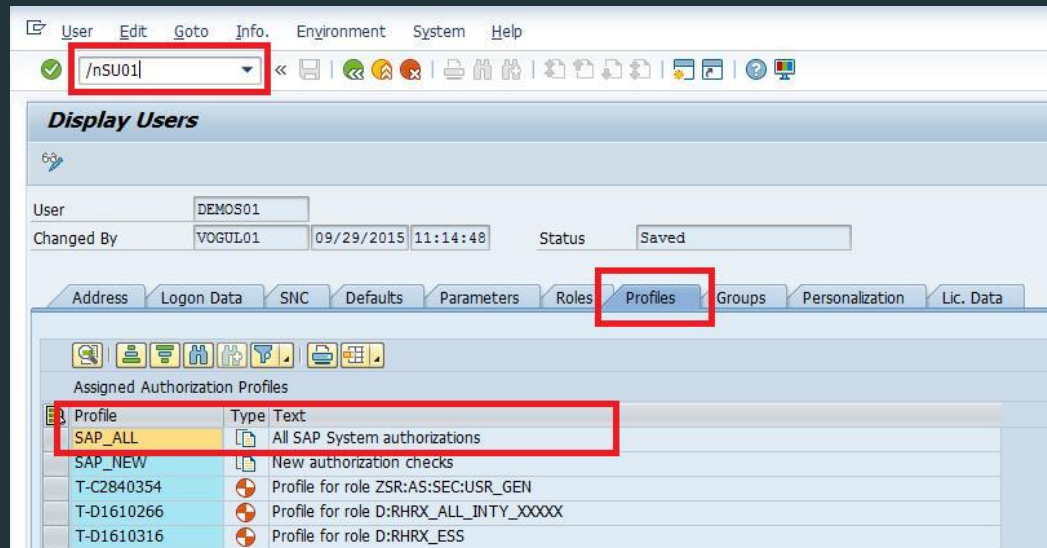
Troubleshooting DevTest/SAP Connectivity issues I

- <u>Symptom</u>: Workstation or VSE cannot connect to SAP system although connection settings are correct
- <u>Cause</u>: SAP JCo resources bound to an even failed connection to the SAP system are not released correctly and are considered still in use
- <u>Workaround</u>: Bounce Workstation or VSE that was connected or attempted to connect to SAP system, even with erroneous connection settings. Shutdown virtual SAP service first

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Troubleshooting DevTest/SAP Connectivity issues II

- <u>Symptom</u>: VSE or Workstation cannot connect to SAP system. Log file shows error
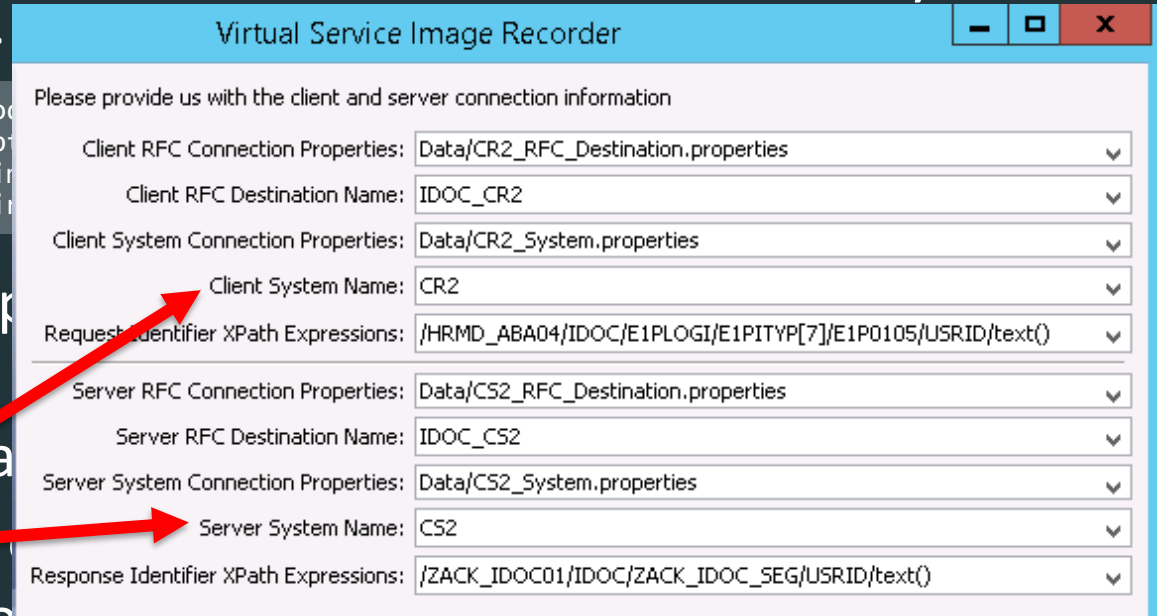
```
com.itko.lisa.test.TestNod
com.sap.conn.jco.JCoExcept
not exist java.lang.Runtim
JCO_ERROR_RESOURCE: Destin
```

- <u>Cause</u>: jco.server.rep
to an existing client
or Server System Na

- <u>Fix</u>: Rename (Client
virtual SAP service of VSE recorder settings. Bounce VSE or
Workstation.

Virtual Service Image Recorder

Please provide us with the client and server connection information

Client RFC Connection Properties: Data/CR2_RFC_Destination.properties
Client RFC Destination Name: IDOC_CR2
Client System Connection Properties: Data/CR2_System.properties
Client System Name: CR2
Request Identifier XPath Expressions: /HRMD_ABA04/IDOC/E1PLOGI/E1PITYP[7]/E1P0105/USRID/text()
Server RFC Connection Properties: Data/CS2_RFC_Destination.properties
Server RFC Destination Name: IDOC_CS2
Server System Connection Properties: Data/CS2_System.properties
Server System Name: CS2
Response Identifier XPath Expressions: /ZACK_IDOC01/IDOC/ZACK_IDOC_SEG/USRID/text()

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Troubleshooting DevTest/SAP Connectivity issues III

- **Symptom**: SAP System sends IDoc, but Workstation or VSE does not receive IDoc. Log file shows error

> 2016-11-30 08:44:34,821Z (09:44) [JCoServerThread-2] ERROR com.ca.sv.protocol.jcoidoc.connector.JcoIdocConnector - Server Error Occurred for connection 1-lod1809.ca.com|sapgw00|DEVTDEMO1
> com.sap.conn.idoc.IDocMetaDataUnavailableException: (3) IDOC_ERROR_METADATA_UNAVAILABLE: The metadata for the IDoc type "   踌刀鸇骑开衩箭衩   ††" with extension " HRMSAPCRL CR2CL   " is unavailable.

- **Cause**: SAP RFC Destination is not configured for Unicode
- **Fix**: Adjust SAP RFC Destination configuration. Restart VS

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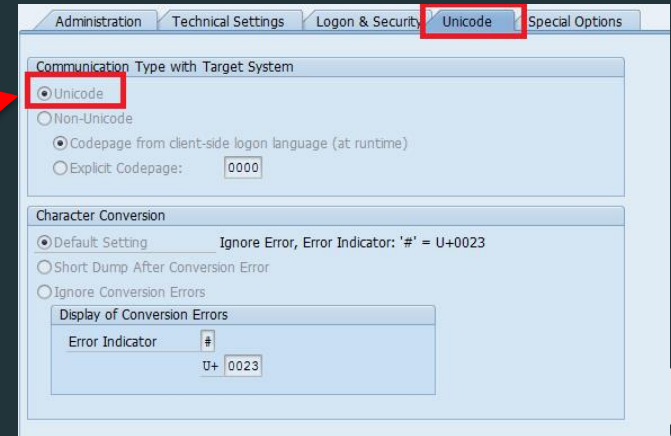
Summary

- DevTest Concept for SAP Service Virtualization
- SAP JCo Configuration for DevTest
- SAP BOM for DevTest and SAP Configuration Checklist
- Best Practices for virtualizing SAP Services
- Important SAP Transaction Codes to Validate SAP Configuration and to test IDoc transfer to DevTest
- Troubleshooting hints

Questions?

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