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Mobile Data Models: Using Data Orchestration Engine

Sybase Unwired Platform 2.2

DOCUMENT ID: DC01732-01-0220-01
LAST REVISED: April 2012

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Getting Started with DOE-Based Application Development

This developer guide provides information about using Sybase® Unwired Platform features to create DOE-based applications.

SAP Data Orchestration Engine (DOE)

DOE is the short name for the SAP® Data Orchestration Engine, which is a component of NetWeaver Mobile. DOE consolidates data from SAP back-end sources and distributes the data to mobile applications.

DOE is event-driven middleware that receives data from the SAP back end, follows rules to calculate all the affected receivers, and prepares the data to be sent to the devices without waiting for the devices to connect. DOE uses messaging to transmit data to and from the devices.

DOE includes:

- An administration and monitoring component for managing and troubleshooting the data flow.
- A design-time component, the DOE Workbench, for defining data objects and data distribution.
- A runtime component that replicates, synchronizes, and distributes data between the system components.

DOE-based applications, working with Sybase Unwired Platform, allow system designers to model and consolidate SAP mobile content in the middle tier, while separately layering distribution rules over this content. This approach is especially useful when back ends cannot provide a mobile interface that serves up mobile data, or if additional flexibility is required. Distribution rules can evolve separately from the content model, and different distribution rule sets can be used with the same content model.

When building a DOE-based application, the developer starts by using the DOE Workbench to describe back-end interaction and the application content model. After the content model is described and the distribution rules are configured, the developer can create a package to be deployed to Unwired Server to allow devices to communicate with DOE.

Once the mobile package is deployed, the developer can generate device-side artifacts that form the basis of mobile application interactions with Unwired Platform services and data. One or more packages can be used within a single application. Package version information is embedded in the device-side artifacts and is used to match the device application with the correct runtime package.

DOE-Based Application Scenarios

The Sybase Unwired Platform DOE option consolidates all mobile data from back-end SAP systems, then uses rules to determine mobile distribution. This approach allows distribution rules to evolve separately from the content model and for different distribution rule sets to be used with the same content model.

The Sybase Unwired Platform DOE deployment option allows the system designer to model and consolidate SAP mobile content in the middle tier and separately layer distribution rules over this content. This approach allows distribution rules to evolve separately from the content model and for different distribution rule sets to be used with the same content model. Even customers can change the rules without rewriting client or back-end code, after actively deploying applications.

The technology to enable this behavior is built directly into the NetWeaver stack and is therefore best suited to SAP-only implementations or where third-party back-end integration is already provided through NetWeaver. This method specifies BAPI CRUD interfaces to adapt back-end suite datasources to the middleware data consolidation area.

The Sybase Unwired Platform DOE option consolidates all mobile data from the back-end SAP system, then uses rules to determine mobile distribution. The rules are fired on these events:

- New device is registered – initial receiver determination
- Back-end data or client data changes because of user updates or batch updates – staging are update
- Business change resulting in change of user subscriptions, for example, moving from region A to region B – device realignment

DOE-based applications are well suited to these situations:

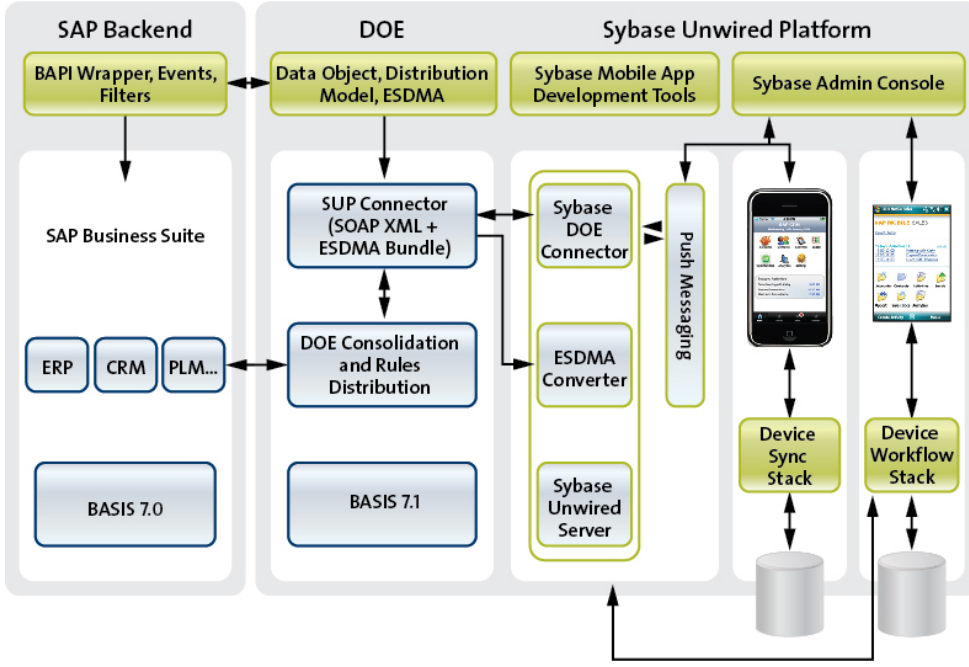
- The SAP back end cannot directly support mobile queries, or mobile queries place an unacceptable load on the back end.
- The design dictates that the data distribution take place in the middleware.
- A scenario requires flexibility in adapting to different back-end interfaces or versions without changing the mobile model.
- A scenario requires flexibility in changing the distribution rules without changing the mobile model and mobile application.
- A scenario requires a centralized in-box for error resolution by an administrator.
- Multiple customized SAP back ends must work with the same mobile application, for example, if the same mobile application is resold to multiple customers who use different distribution rules.
- A mobile solution is working primarily against the SAP back end.

- Customized conflict resolution is required within the mobile middleware, rather than in the back end.

Application Architecture

All application data resides on the SAP back end. The Data Orchestration Engine (DOE) consolidates the data and communicates with Sybase Unwired Platform, which communicates with the application on user devices. Sybase Control Center manages the user devices.

Figure 1: System Architecture of a DOE-based Application



The SAP back end is where the enterprise data resides, in the SAP Business Suite, running on top of the SAP Basis infrastructure.

BAPI wrappers, events, and filters that you create in the DOE Workbench make the data available for distribution and consolidation by the DOE, through data objects and a distribution model that you also create in the DOE Workbench, and output to Unwired Platform as an entity set definition for mobile applications (ESDMA) bundle.

On Sybase Unwired Platform, the ESDMA converter utility converts the ESDMA bundle into an Unwired Platform package that you deploy to Unwired Servers. You use the Sybase Mobile SDK and native integrated development environments to create the screens and business logic

that ties the application together with a user interface, which you deploy to devices through the Sybase administration console, Sybase Control Center.

On user devices, the application communicates through push messaging with the Sybase DOE Connector (DOE-C), which relays data back and forth with the DOE. The DOE consolidation and distribution rules ensure that only the absolute minimum of data necessary to keep the device data and the SAP back end data in sync is transmitted.

Monitoring of Unwired Platform messages in the store and forward infrastructure takes place in Sybase Control Center.

Developer Roles

There are three stages of DOE-based application development, each involving distinct types of tasks and skill sets. These correspond to three different developer roles.

In your organization, the same person may perform multiple roles.

SAP Expertise

Someone with an advanced knowledge of SAP systems must perform a considerable amount of work on the SAP back end to make the SAP data accessible to your mobile application.

The SAP back-end tasks are summarized in this document, and include links to more detailed instructions in the SAP documentation. See *Creating a Software Component Version* on page 8.

Administrative Expertise

The final task on the SAP back end is to generate an ESDMA bundle. Before you can begin device platform-specific development, this ESDMA bundle must be converted to a Sybase Unwired Platform package, which is then deployed to one or more Unwired Servers. See *Modeling Distribution Logic* on page 9.

Device Platform-Specific Expertise

The remaining tasks for creating a DOE-based application include generating native code that is specific for the target device platform, then bundling that code with supporting compile-time and runtime components, to build a functioning application. See *Developing Platform-Specific Device Code* on page 12.

SAP Data Structure Customization

You can perform varying degrees of customization on the data that comes from the SAP back end.

There are several levels of customization of the original SAP data structure.

Customization	Tasks to Implement	Tasks to Upgrade
None.	Download the ESDMA bundle and deploy it on Unwired Server.	Subscribe a new device and start using the application.
Change the distribution pattern.	Change the distribution pattern,before or after downloading ESDMA bundle.	Unsubscribe and resubscribe old devices.
Add code-free extensions.	Add custom fields to dummy nodes on the SAP back end. Include code in the application to manage the dummy fields.	None; users continue using the application without interruption.
Change the data model.	Release the SWCV for shipment, then change the data object, enhance and regenerate the back-end adapter, and generate and download the ESDMA.	Generate a new application with a new ESDMA and deploy to Unwired Server in a new domain. Continue running both old and new applications in different domains and let users decide when to move to the new application in the new domain.

Development Task Flow

Define the back-end interface in the SAP Business Suite, define data models and distribution logic in the DOE, develop mobile components in Unwired Platform and in a platform-specific IDE, and deploy the application on Unwired Platform.

	Defining Back-End Interface	Defining Data Model and Data Distribution Logic	Developing Mobile Components	Deploying the Application
SAP Business Suite	1. Identify or create BAPIs and encapsulate them			
DOE		2. Create software component versions 3. Model data objects 4. Model distribution logic	5. Create, generate, and download ESDMA	
Sybase Unwired Platform			6. Convert ESDMA bundle to Unwired Platform package 7. Deploy package to Unwired Server	11. Deploy finished application
Platform-specific IDE			8. Generate initial code 9. Add code for screens and business logic 10. Test and debug	

1. *Creating and Encapsulating BAPIs*

   Use the BAPI Wrapper wizard to identify or write BAPI wrappers that make SAP data available to your application.

2. *Creating a Software Component Version*

   The Software Component Version (SWCV) is a shipment unit for design-time objects in the Data Orchestration Engine (DOE) repository. You must create SWCVs before you can create data objects.

3. *Modeling Data Objects*

   You must model data objects to make the required application data available to DOE for consolidation and distribution.

4. *Modeling Distribution Logic*

   Perform distribution logic modeling tasks, which require system administrator expertise, in the back-end SAP system.

5. *Creating, Generating, and Downloading the ESDMA Bundle*

   The ESDMA bundle contains SAP metadata in a form you can import into the Sybase Unwired Platform environment on your developer workstation.

6. *Converting the ESDMA Bundle into an Unwired Platform Package*

   Use the ESDMA Converter utility to convert an ESDMA bundle into an Unwired Platform package you can deploy to Unwired Server.

7. *Deploying the Unwired Platform Package*

   Deploy the Unwired Platform package to Unwired Server before you begin coding your application. You will then be ready to test your code.

8. *Developing Platform-Specific Device Code*

   To complete a DOE-based application, you must generate initial code, manually add code, test and debug the code, and deploy the finished application. These tasks are covered in platform-specific developer guides.

Creating and Encapsulating BAPIs

Use the BAPI Wrapper wizard to identify or write BAPI wrappers that make SAP data available to your application.

For detailed instructions, see the SAP documentation, *Creating BAPI Wrappers Using the Wizard*, at *http://help.sap.com/saphelp_nwmobile71/helpdata/en/3e/1e6323e59a4dc1b236f4905960ccdd/content.htm*

1. Identify the business scenario that you want to mobilize.
2. Define the flow of your application.
3. Use the BAPI Wrapper Wizard to identify or write BAPI wrappers.

Creating a Software Component Version

The Software Component Version (SWCV) is a shipment unit for design-time objects in the Data Orchestration Engine (DOE) repository. You must create SWCVs before you can create data objects.

For detailed instructions, see the SAP documentation:

- *Transport Organizer (BC-CTS-ORG)*, at *http://help.sap.com/saphelp_nwmobile71/helpdata/en/57/38dd4e4eb711d182bf0000e829fbfe/frameset.htm*
- *Creating a Software Component Version*, at *http://help.sap.com/saphelp_nwmobile71/helpdata/en/e2/cba40f77a144658f8bb5181371a5d8/content.htm*

1. Create a transport organizer.

2. Log in to the SAP NetWeaver Application Server and open the Data Orchestration Engine Workbench.
3. Choose **Create SWCV**.
4. Fill in the information required to create the SWCV.

Modeling Data Objects

You must model data objects to make the required application data available to DOE for consolidation and distribution.

For detailed instructions, see the SAP documentation:

- *Data Object Concepts*, at *http://help.sap.com/saphelp_nwmobile711/helpdata/en/47/a991ef7dbd3376e10000000a421937/frameset.htm*
- *Creating a Back-End Adapter*, at *http://help.sap.com/saphelp_nwmobile71/helpdata/en/88/9e21142beb442b9eae5085e34e813c/frameset.htm*
- Customizing a Receiver Meta Model, at *http://help.sap.com/saphelp_nwmobile711/helpdata/de/48/74befbd1431b5ae10000000a42189c/frameset.htm*

1. Create the data objects.
2. Create the back-end adapters.
3. Create the distribution patterns.
4. (Optional) Customize the receiver meta model.

Modeling Distribution Logic

Perform distribution logic modeling tasks, which require system administrator expertise, in the back-end SAP system.

For detailed instructions, see the SAP documentation:

- *Concepts of Distribution*, at *http://help.sap.com/saphelp_nwmobile71/helpdata/en/6b/b2edf8d0b9463fabbea2e50d088182/frameset.htm*
- *Creating Distribution Models*, at *http://help.sap.com/saphelp_nwmobile71/helpdata/en/6b/b2edf8d0b9463fabbea2e50d088182/frameset.htm*

1. Create a distribution model.
2. Create a distribution dependency.
3. (Optional) Add distribution rules to the distribution model.

Creating, Generating, and Downloading the ESDMA Bundle

The ESDMA bundle contains SAP metadata in a form you can import into the Sybase Unwired Platform environment on your developer workstation.

For detailed instructions, see the SAP documentation, *Configuration Guide Gateway to SAP NetWeaver Mobile* , available from *https://websmp202.sap-ag.de/~form/sapnet?_SHORTKEY=01100035870000729606&_SCENARIO=01100035870000000202&*.

1. Create an ESDMA.
2. Assign data objects.
3. Assign a distribution model software component version (SWCV).
4. Define a design-time projection.
5. (Optional) Define runtime projections.
6. (Optional) Define a runtime header.
7. (Optional) Configure a client-specific distribution model SWCV (DMSWCV).
8. (Optional) Add custom services.

   For example, specify the back-end search BAPI for an ESDMA object.
9. Generate the ESDMA bundle.
10. Download the `.zip` file for the ESDMA bundle to a temporary location on your developer workstation.
11. Extract the contents of the ESDMA bundle `.zip` file to an *<ESDMA_dir>* directory on your developer workstation.

Note: The *<ESDMA_dir>* directory name cannot contain any spaces.

Converting the ESDMA Bundle into an Unwired Platform Package

Use the ESDMA Converter utility to convert an ESDMA bundle into an Unwired Platform package you can deploy to Unwired Server.

1. Create a `META-INF` directory under the *<ESDMA_dir>* where you downloaded and extracted the ESDMA bundle for your application.
2. In the `META-INF` directory, create a file named `sup-db.xml`.
3. Use a text editor to open `sup-db.xml`, and copy these lines into it:

```
<package name="EXAMPLE" short-name="EXAMPLE" sup-name="EXAMPLE"
version="1.0"
    java-package="com.sybase.example.db" /* For Android
```

```
Application */
    cs-namespace="Sybase.Example.db" /* For Windows Mobile
Application */
    oc-namespace="example_db_"> /* For iOS Application */
  <!-- Update with new host and port, listener.url must end with /
doe/publish. -->
  <property name="listener.url" value="http://
<Unwired_Server_host>:<listener_port>/doe/publish" />
  <database name="example-database" />
  <database-class name="ExampleDatabase" />
  <personalization-parameter name="language" type="string"
owner="client" />

  <include file="afx-esdma.xml" />

</package>
```

4. Replace the bolded values above as follows:
   - **EXAMPLE –** your Sybase Unwired Platform package name. This value appears three times.
   - **com.sybase.example.db –** the required Java namespace for BlackBerry application development.
   - **Sybase.Example.db –** the required C# namespace for Windows and Windows Mobile application development.
   - **example_db_ –** the required Objective C namespace for iOS application development.
   - **http://<*Unwired_Server_host*>:<*listener_port*>/doe/publish –** the Unwired Server host name and listener port.

     Note: The listener port must be followed by "/doe/publish", with no trailing "/".

     The default value for the listener port is 8000.
   - **example-database –** the name of the required database file.
   - **ExampleDatabase –** the name of the required database class.
5. (Optional) Add additional entity definitions not defined in the ESDMA.

   This is necessary to define client-side data entities that have no relationship with entities defined in the ESDMA bundle.
6. (Optional) In the `<ESDMA_dir>\Resources` directory, create a `MetaMerge.xml` file.

   This file is used by the Unwired Platform code generation and deployment tools to adapt the ESDMA bundle, if necessary to, for example:
   - Hide select data objects defined in the ESDMA.
   - Add supplementary indexes on data objects that can be used by the client.
7. Run the ESDMA converter utility to convert the ESDMA bundle resource metadata file to an Unwired Platform package.

   See *esdma-converter Command* in *System Administration*.

8. After running the ESDMA converter utility, verify that these files have been created in the `META-INF` directory:
   - `afx-esdma.xml`
   - `ds-doe.xml`

Deploying the Unwired Platform Package

Deploy the Unwired Platform package to Unwired Server before you begin coding your application. You will then be ready to test your code.

In the steps below you are prompted for each of the parameters for the deploy command. Alternatively, you may include the parameters when entering the command. See *deploy Command* in *System Administration*.

1. Start the SAP DOE Command Line Utility.

   See *Starting the Command Line Utility Console* in *System Administration*.
2. At the **doec-admin** prompt, enter `deploy`, followed by the command parameters.

```
deploy -d|--domain domainName
-a|--applicationID appID
{-u|--technicalUser SAPUserAccount
-pw|--password SAPUserPassword} |
{-ca|-certAlias certificateAlias}
[-sc|--securityConfiguration securityConfigName]
[-dir|--deployFilesDirectory deploymentDirectory]
[-h|--help] [-sl|--silent]
```

   Alternatively, enter `deploy`, then enter the parameters as prompted.

Developing Platform-Specific Device Code

To complete a DOE-based application, you must generate initial code, manually add code, test and debug the code, and deploy the finished application. These tasks are covered in platform-specific developer guides.

Continue with these tasks in the developer documentation for your specific platform:

- *Developer Guide: Android Object API Applications*
- *Developer Guide: iOS Object API Applications*
- *Developer Guide: Windows and Windows Mobile Object API Applications*

Documentation Roadmap for Unwired Platform

Sybase® Unwired Platform documents are available for administrative and mobile development user roles. Some administrative documents are also used in the development and test environment; some documents are used by all users.

See *Documentation Roadmap* in *Fundamentals* for document descriptions by user role. *Fundamentals* is available on the Sybase Product Documentation Web site.

Check the Sybase Product Documentation Web site regularly for updates: *http://sybooks.sybase.com/sybooks/sybooks.xhtml*, then navigate to the most current version.

Troubleshooting

Determine the causes of problems and apply the recommended solutions.

Problem	Resolution
SAP user sees `Password logon no longer possible – too may failed attempts` and is locked out after too many failed login attempts	**1.** Log in to SAP with a different user account. **2.** In the Transaction Code field, enter `su01`. **3.** In the User field, enter the ID of the user who is locked out. **4.** Click the **Lock** icon. **5.** If the Lock User dialog indicates that the user is `Locked due to incorrect logins`. click the **Unlock** icon. If the dialog in step 5 indicates the user is not locked, the system has automatically unlocked the user account after a set period of time has passed.
`Unable to parse` error in DOE-C logs	Possible causes: **1.** Duplicate SyncKey – verify that the failed XML uses unique SYNCKEY_MMW values across all nodes. **2.** Metadata mismatch – verify that: • The DOE configuration for ESDMA is as expected. • If the ESDMA has been regenerated, the older ESDMA is undeployed from Sybase Unwired Platform and the new one is deployed. • Ensure the code is regenerated, recompiled, and deployed to devices.

Problem	Resolution
Packet dropped state with message, `Request Entity Too Large` Three consecutive entries in the log contain the text shown below – in the first entry, *<actual_byteSize>* is larger than *<max_byteSize>*. `... Detected a packet-dropped candidate message - size <actual_byteSize>, maximum <max_byteSize>` `... DOE-C MESSAGE ID: 554 CODE: 413 MESSAGE: Request Entity Too Large` `...is now in a packet-dropped state. The DOE-C will no longer push messages to this subscription.`	Use the **setEndpointProperties** command in the Sybase SAP DOE Connector Command Line Utility (CLU) to make the `doePacketDropSize` larger than the *<actual_byteSize>* in the first of the three consecutive error log entries. `setEndpointProperties {-i|--in inputXmlFile} | {-d|--domain domainName {-a|--all | -ps|--packageNames nameAndVersionList} {-u|--technicalUser SAPUserAccount -pw|--password SAPUserPassword} | {-ca|-certAlias certificateAlias} [-ds|--doePacketDropSize byteSize] [-ew|--doeExtractWindow maxNumMsgs] [-t|--soapTimeout seconds] [-h|--help] [-sl|--silent]`  **Note:** When you increase `doePacketDropSize` you should also increase the JVM heap size. For more details on **setEndpointProperties**, see *setEndpointProperties Command* in *System Administration Guide*.
User cannot get application through the SAP portal	The SAP portal must be configured to allow users to get DOE-based applications without administrator assistance. 1. Ask your SAP basis team to apply note 1250795 to the portal server, which enables the challenge pop-up. See https://websmp230.sap-ag.de/sap/support/notes/1250795. 2. Have users enter a URL in SUP that is something like this: http://<portalUrl:port>/redirect/redirect?url=/irj/portal.

Problem	Resolution
Subscription times out	Possible causes: **1.** During import, there are exceptions in processing the message. For example, Parsing Error, ADS Exception. **2.** `importResult` is not being generated (Check `JMSBridge`). **3.** The DOE server is sending all messages with `SER_MSG_ID = 0` (visible in SOAP dumps). This causes DOE-C to drop messages as duplicates. Possible solutions: • For Parsing errors, identify the data causing the parsing failure (for example, causing a Duplicate Sync Key error) and re-subscribe.

Glossary

Terms used in DOE-based application development.

You should be familiar with these software components and concepts before beginning DOE-based application development.

- **BAPI –** business application program interface; generally referring to a BAPI "wrapper." Contains the parameters required to synchronize the device data and the SAP back-end data.
- **CDS –** the consolidated data store. The SAP DOE middleware component where data is consolidated by the DOE.
- **CUD requests –** create, update, delete requests. All transactions from the application to DOE are called CUD requests.
- **Data synchronization –** the process by which the DOE reconciles changes in data on the device and data on the SAP back end.
- **DOE –** Data Orchestration Engine. The SAP component that supports data exchange between SAP back-end systems and mobile devices.
- **DOE-C –** the Sybase SAP DOE Connector. The Sybase component that connects applications running on Sybase Unwired Platform with the DOE.
- **ESDMA –** entity set definition for mobile applications. Contains the external metadata definition of a SWCV that you can use to construct a client that can interact with the DOE.
- **ESDMA converter –** the Sybase Unwired Platform utility that converts an ESDMA bundle into an Unwired Platform package that can be deployed to Unwired Servers.
- **Gateway for Netweaver Mobile –** Add-on that is installed on top of DOE to provide integration with Sybase Unwired Platform.
- **Messaging framework –** the messaging functionality provided by the Sybase SAP DOE Connector to connect the SAP DOE with devices.
- **Mobile data model –** relates the SAP back-end data and the data that ends up on the device.
- **Persistence layer –** the collection of database files, containing tables, that is available on the device through the Sybase Client Object API.
- **Request/response requests –** search queries sent to the DOE by the client application to retrieve data that is not delivered as part of the subscription data set.
- **Subscription –** defines how data is transferred between a user's mobile device and Unwired Server. Subscriptions notify a device user of data changes, then the updates are pushed to the user's mobile device.
- **SWCV –** software component version. A shipment unit for design-time objects in the DOE repository.

- **Sybase Unwired Platform package –** converted from an ESDMA by a Sybase Unwired Platform utility for deployment to Unwired Server, which makes the data available to client devices.

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