Integration API Guide

PUBLIC

SAP Business ByDesign, SAP Cloud for Customer, and SAP Cloud for Travel and Expense

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Integration Guide for Custom Data

For SAP Business ByDesign, SAP Cloud for Customer, and SAP Cloud for Travel and Expense

Typographic Conventions

Type Style	Description
Example	Words or characters quoted from the screen. These include field names, screen titles, pushbuttons labels, menu names, menu paths, and menu options. Textual cross-references to other documents.
Example	Emphasized words or expressions.
EXAMPLE	Technical names of system objects. These include report names, program names, transaction codes, table names, and key concepts of a programming language when they are surrounded by body text, for example, SELECT and INCLUDE.
`Example`	Output on the screen. This includes file and directory names and their paths, messages, names of variables and parameters, source text, and names of installation, upgrade and database tools.
`Example`	Exact user entry. These are words or characters that you enter in the system exactly as they appear in the documentation.
`<Example>`	Variable user entry. Angle brackets indicate that you replace these words and characters with appropriate entries to make entries in the system.
EXAMPLE	Keys on the keyboard, for example, F2 or ENTER.

Document History

Version	Date	Change
1.0	2013-10-20	• Created for SAP cloud solutions version November 2013
1.0	2013-12-10	• Title changed to Integration Guide for Custom Data
1.1	2014-09-17	• Added SOAP endpoint details; Updated Technical Connectivity Guide References

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1 Introduction

SAP's cloud solutions provide lots of functions covering a wide range of business processes. Real world business processes of companies today typically require integration between various business systems both inside and outside an enterprise. Based on SAP's long standing expertise in business processes, our cloud solutions are designed as open solutions offering various integration points. For standard processes, SAP delivers ready-to-run integration between various SAP cloud and on-premise offerings, open connectors for third-party integration, and business partner collaboration.

This document gives you an overview of various architecture options for getting data from your existing solutions into and out of SAP Business ByDesign and SAP Line of Business Solutions, such as SAP Cloud for Customer or SAP Cloud for Travel and Expense. You will learn about the main characteristics of the different approaches and where and how to explore available content and find links to additional information.

This document does not cover lightweight user interface driven mashup capabilities to integrate with third-party content or applications. For more information on this kind of integration, go to the SAP Help Portal under *Cloud → Software Development Kits (SDKs)*. Select the latest version of the SAP Cloud Applications Studio.

1.1 Target Group

This guide is intended for SAP customers, partners, consultants, and IT experts. It provides information and guidance for the following roles in an integration project:

- Integration project managers and team members
- Professional services consultants

1.2 Prepackaged Integration Scenarios versus Custom Integration

SAP cloud solutions offers a set of business scenarios that cover some of the most common business processes as well as the work centers and user roles involved. Some of these scenarios also provide the capabilities for remote communication to business partners (business-to-business (B2B) communication) or other applications running on different systems (system-to-system or application-to-application (A2A) communication).

Communication configuration, which used to be a major hurdle in implementation projects, is simplified and mostly automated. By creating a communication arrangement in the *Application and User Management* work center, key users without developer skills can easily enable the system for remote communication.

For SAP to SAP solution application integration, SAP predelivers integration content which you can use as is without development effort. Partners may offer prepackaged integration content to non-SAP solutions, you may find these in the SAP Store.

Integration Scenarios

There is pre-delivered content for some partner solutions too. Find the list of cross system integration scenarios on the SAP Help Portal under *Cloud*. Select the latest version under:

- SAP Business ByDesign
- SAP Cloud for Travel and Expense

The list of integration scenarios also include integration enablers and open APIs that you can use to integrate your legacy system or other solutions.

When you use such prepackaged integration, you don't need any custom development. Instead, you may directly refer to the implementation guides, integration guides, or configuration guides. For more on this, see Further Information section.

If you look for more detailed information about the business scenarios supported by SAP Business ByDesign, see the SAP Help Portal > Cloud > SAP Business ByDesign > Select a Language > Select a Release > Additional Information > Comprehensive Visualization and Exploration of All Business Scenarios .

Web Service APIs

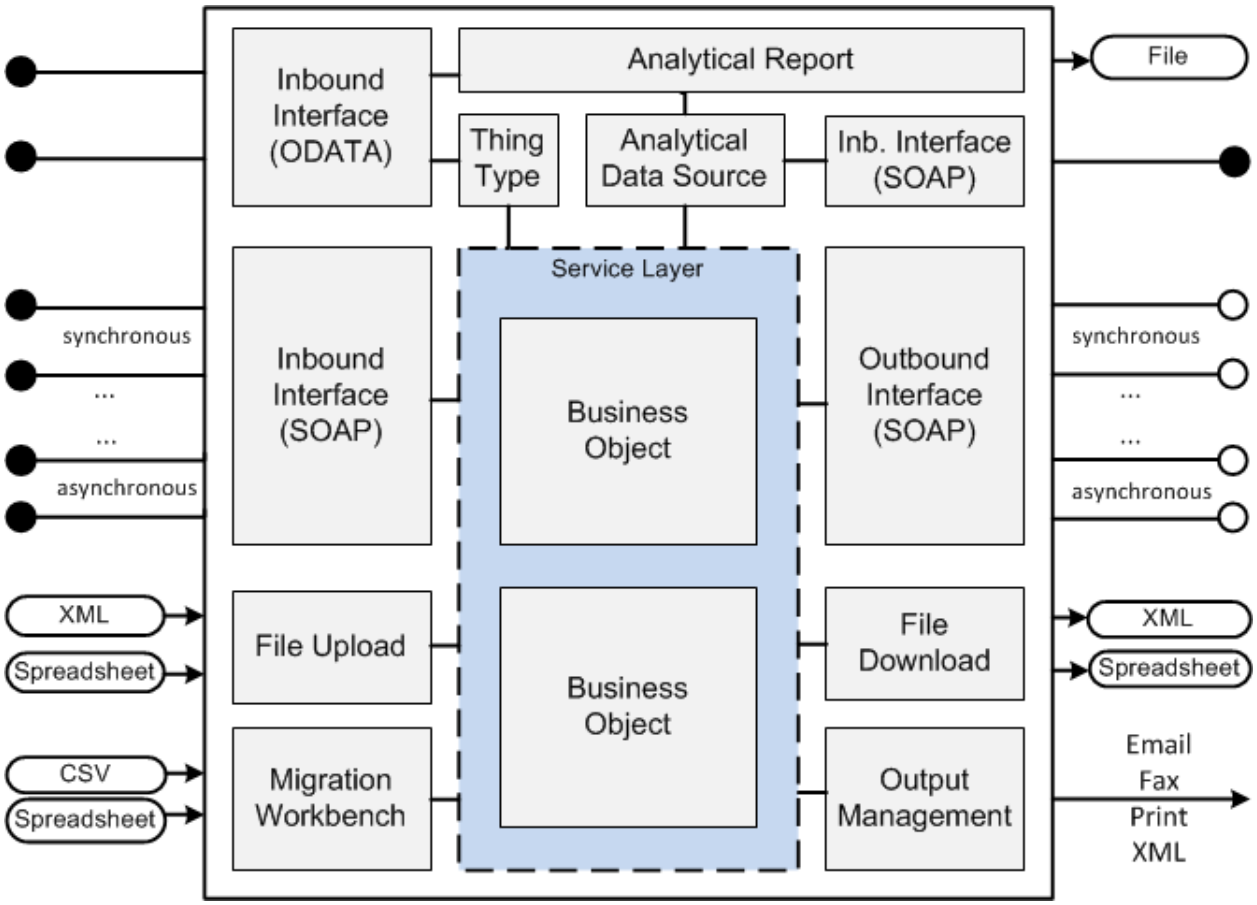
If you need an integration scenario that is not available in the standard delivery, you can build your own scenario using the existing SAP Web services. Find the list of publicly released Web Service APIs on the SAP Help Portal under *Cloud*. Select the latest version under the solution, e.g. SAP Business ByDesign. Many more Web services exist but are only available as part of prepackaged integrations or integration enablers.

SAP Cloud Applications Studio

If the available Web services are not sufficient, you can use the SAP Cloud Applications Studio to create a new Web service. With this new Web service you can then develop the required integration scenario. For more information on the SAP Cloud Applications Studio, go to the SAP Help Portal under *Cloud* → Software Development Kits (SDKs). Select the latest version of the SAP Cloud Applications Studio.

1.3 Architecture Overview

There is a variety of different options for getting data into and out of the cloud system, all with different characteristics. To help you understand which option is the most useful for you, here's a short architecture overview to set the context.



1.3.1 Business Objects

SAP cloud solutions are structured along process components such as sales order processing or product maintenance, which in turn contain a variety of business objects. These business objects encapsulate semantically related data of real world entities used in business transactions. To ensure that your data is consistent, you can use business rules to manipulate it. Examples are business documents, such as sales orders or master data, such as accounts, employees, or products. A business application for a particular business scenario may require several business objects. A business object is not a flat structure but comprises several nodes, such as header and items.

Business objects offer services for access and are consumed, for example by user interfaces.

From externally, you cannot access the data directly through the database but only using validated and well-defined interfaces for file-based or Web service based integration. To ease consumption, each of these interfaces usually joins data from several nodes of one or more semantically related business objects. The Web service APIs are structured along process components.

1.3.2 Global Data Types

Each element of a business object node is defined by a data type. To ensure that data types are always used in the same way, SAP defined consolidated global data types (GDTs) that represent business-related content and conform to widely used Web and business standards. All business objects and service interfaces share the same pool of GDTs. This ensures that if the same attribute occurs in several business object nodes or service interfaces, it is always described by the same GDT and semantic description.

Data types are described in the international standards ISO/TS 15000-5 and UN/CEFACT Core Components Technical Specification (CCTS). The Extensible Markup Language (XML) schema is used for GDT definitions.

Typical data types are identifiers or codes. Each business object has one or more unique identifiers. Code lists may either be static, extensible, or customer specific. You can find further details and examples in the GDT catalog.

Find the SAP Global Data Type catalog on the SAP Developer Network (SDN).

> **Note**
>
> Codes are often used as reference data in business object nodes. In the UI, you always find a context sensitive value help showing the possible values and their description. In other consumption scenarios, like Web service consumption, you need to be aware of the code values. Often, you find the possible values in the corresponding Web service documentation. You may also use the Web service API Query Code Lists to read the values of a Code list with a given Global Data Type, or look into the SAP Global Data Type catalog.

1.3.3 Analytical Data Sources and Reports

SAP cloud solutions offer embedded analytics based on the powerful in-memory engine SAP HANA. Subsets of business object attributes are defined in data sources optimized for reporting, comprising characteristics, and key figures. Data sources can be layered. Based on data sources, analytical reports are defined for a specific reporting purpose, adding display settings. For access control, reports are assigned to work center views, making them available to business users in the *Reports* view of the corresponding work center.

Custom fields are automatically propagated into data sources and reports. As a partner or customer, you can define your own reports. These reports can be based on predelivered or custom defined data sources.

Find the list of available data sources and additional information at the following locations:

- In your SAP cloud solution: In the *Design Data Sources* view of the *Business Analytics* work center,

  Here, you can find the technical documentation for each data source, including an overview of fields.
- In the Business Center for Cloud Solutions from SAP (log in required): Data Sources Documentation

  Here, you can find the list of data sources available for reporting in SAP Business ByDesign and the documentation in PDF format.
- In the Business Center for Cloud Solutions from SAP (log in required): Characteristic Index

  Here, you can find out in which data sources a characteristic can be found.
- In your SAP cloud solution: In the Design and Assign Reports view of the *Business Analytics* work center,

  Here, you can find the documentation for a selected report by opening the context sensitive Help Center

1.3.4 UI Data Models and Thing Types

As a customer, you might want to consume business data in UI-driven scenarios, like mashup UIs or UI on mobile devices. These UIs are highly customer and use case specific and require flexible data structures.

As a customer or partner, you may model the required data structures to be returned by the API with the UI designer as so-called *Thing Type* model on top of either SAP BOs, including your custom fields or custom BOs. These *Thing Types* can then be consumed using a generic OData API, making them available also to clients with limited capabilities.

1.3.5 Spreadsheet and CSV Templates for Data Migration and Mass Changes using Import Manager

If you implement a cloud solution, you need to upload legacy data into the cloud solution as part of the legacy data migration. This often is a one-time effort for which you do not intend to implement a fully automated integration. To enable a fast start, SAP provides spreadsheet templates for the most common migration object, including your custom fields.

1.3.6 Web Service Provider Interfaces

For external Web service consumption, the solution provides various Web service provider interfaces that are based on one or more business objects.

The standard format for system to system communication is SOAP. Multiple service operations are offered, allowing for query, read, or write access.

Technically, an inbound service operation can be one of the following:

- Synchronous, that is, waiting for a response, which the consumer reacts on (including error handling)
- Asynchronous, that is, either expecting no response at all or receiving a later confirmation/notification

Web services use Extensible Markup Language (XML), Simple Object Access Protocol (SOAP), and Web Services Description Language (WSDL) to integrate software applications on the internet. XML is used to tag the data, SOAP is used to transfer the data, and WSDL is used to describe the Web service.

Our solutions provide many dedicated Web Service APIs structured along business objects rather than a single generic Web service. The endpoints are application-specific and tenant specific. The function in the Web service is defined in service operations. These operations read from the selected business object or write to it.

In addition to the SOAP APIs, two OData services are offered, one based on reports and the other based on thing types. These are optimized for user-to-system communication, for example, they are accessible only by an authenticated business user and not by a remote system.

As a customer or partner, you may also model and provide your own Web services via the SAP Cloud Applications Studio.

1.3.7 Web Service Consumption Interfaces

Some solutions consume Web services provided by partners, other cloud solutions or on-premise solutions. The solutions support both synchronous and asynchronous service consumption depending on the use case. Business objects do not directly consume Web services, but mediated via outbound agents which are triggered automatically when a business object is changed.

Customers or partners may also call Web services from custom code provided via the SAP Cloud Applications Studio.

1.3.8 Form Templates for Output Management

The solution provides form templates for output management, allowing applications to automatically push/send business document data to the collaboration (business) partners via different output channels (print, e-mail, fax or XML). Output management comprises of all activities related to the output of business documents via output channels.

Form templates are used to define the content and layout of documents that can be output from the system. Form templates for different countries and languages are predelivered. New form template variants for business documents can also be created for different languages and countries in addition to the predelivered templates. Administrators can create rules that are used to determine which form template is used for the output of a business document under a defined set of conditions.

1.4 Business Configuration and Scoping Dependency

Which of the business objects, interfaces, reports etc. are visible in the solution is controlled via business configuration and scoping, which is accessible via the Business Configuration Work center. Therefore this guide can only describe the basic principles and standard artifacts provided by SAP. You have to check in each customer tenant which entities are available there.

In the following sections we will give you more details on the main channels for data integration.

1.5 Extensibility as Key Concept for Customization

SAP cloud solutions are highly extensible and configurable. SAP offers standard application content like business objects including nodes and elements, UIs, forms, reports, and so on. Partners and customers can extend the solution easily by enhancing existing content or creating new content.

The key user tools enable end users to do a code-free adaptation of the system by allowing them to easily customize fields, change the look and feel, and configure new work centers. In the SAP Cloud Applications Studio you can add extensions, such as new forms, reports, business object types, user interfaces, and services. Extensions to the system do not affect the standard integration scenarios, for example after a system upgrade.

For example, a key user can add custom elements to SAP business objects right from the UI in the adaptation mode, or a development user can implement business logic in the SAP Cloud Applications Studio, for example to

add validations. The extensibility approach ensures that custom fields are automatically accessible from standard UI, as well as APIs, forms, reports etc., while the standard SAP consistency logic is saved. The advantage for you is that if SAP adds localization logic or fixes bugs your extended business objects will automatically benefit from that while your extensions are retained.

Content Type	Extensible by Key User	Extensible via SAP Cloud Application Studio	Can be created via SAP Cloud Application Studio
Business Object	Yes	Yes (Business Object Extension)	Yes (Business Object)
Web Service Provider	Yes	Yes (Process Extension Scenario)	Yes (Web Service)
Web Service Consumer	Yes	Yes (Process Extension Scenario)	Yes (External Web Service Integration)
Data Source	Yes	Yes (Enhance Data Source)	Yes (Data Source)
Report	Yes	Yes (Enhance Report)	Yes (Analytical Report)
Thing Type	n/a	n/a	Yes (Thing Type Floorplan)
Form template	Yes	Yes (Enhance Forms)	Yes (Form) – for custom BOs only
Upload from file share	No	No	Yes (XML File Input)
Download into file share	No	No	No
Migration template	Yes	Yes (Process Extension Scenario)	No

Note

Only those entities - or parts of them -are extensible which have explicitly been released for a solution within the Public Solution Model (PSM) and marked as extensible.

2 Web Services Using SOAP Protocol

The standard way to expose business data of a cloud solution is via stateless Web services based on standards, such as HTTP/HTTPS and XML/SOAP and exposed via tenant separated endpoints. Secure communication is ensured, client authentication performed via X.509 client certificate or via user ID and password. For outbound processing, specific logical ports are used to push data out of the system.

WSDL

The WSDL files for Web services are available for download via

- The Web Services Inspection Language (WSIL) service https://<host>/sap/ap/srt/wsil?saml2=disabled (successor of former WSIL service https://<host>/sap/bc/srt/wsil?saml2=disabled)
- The *Service Explorer* work center view of your solution

  This work center view is not in the SAP Cloud for Travel and Expense system.
- The *Communication Arrangements* work center view of your solution

All access paths require a login by a business user. We recommend downloading the WSDL from the UIs within the solution you intend to integrate with. This ensures that you only see services that are in scope. In addition, the WSDL is in a more convenient format.

Over various releases, the interface will be kept stable for use, that is, SAP, customers, and partners may add additional optional elements. Elements or attributes will only be removed if these are outdated and not used at all, so that there is no impact for consumers. XML element and attribute names are always stable. Technical definitions of data types can be enhanced in a compatible way. This may result in changed data type names. External applications can rely on XML element names and attribute names, but should not rely on data type names.

Endpoints

Rather than having just one generic endpoint with a service for all business data, the solution offers specific APIs organized along process components, with separate service interfaces for *Query/Read and Write Access*. They are *Compound Services* in the sense that they do not support low-level CRUD (Create, Read, Update, and Delete) operations on individual business object nodes. Instead, they cover several nodes of one or more business objects. The advantage is that the consumer doesn't need to handle the choreography of multiple calls to ensure transactional integrity in case of dependencies. This significantly reduces the error handling effort.

Process components are the basis for structuring both business objects and service interfaces. They are also the basis for activating or deactivating the endpoints for service interfaces based on the scoping of the solution in the business configuration.

SOAP services are accessible via endpoints of the form “.../sap/bc/srt/scs/<namespace>/name>”.

> **Note**
>
> For clients that consider different paths as different endpoints, the same services are accessible via single constant path and query parameters of the form ".../sap/ap/srt/scs?namespace=<namespace>&name=<name>". That path is stateful with respect to authentication, i.e. a security session is created. This security session exists until a timeout or a logoff takes place. Therefore the security session should be removed by sending an HTTP request to the path “/sap/byd/runtime?logoff=1”.

Web Service APIs

SAP has published a catalog with all available Web service APIs that you can use in each SAP cloud solution. It contains detailed information for each Web service, such as documentation and examples.

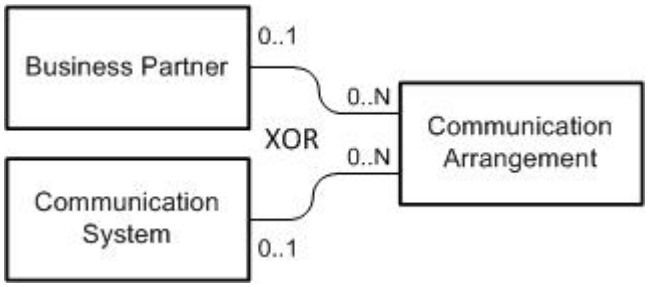
Find the most current list of Web Service APIs at the following locations:

- On the *SAP Help Portal*, under *Cloud.* Select the latest version, e.g. under *SAP Business ByDesign*.
- In your solution, go to *Application and User Management* →*Input and Output Management* → *Service Explorer*. This work center view is not available in the SAP Cloud for Travel and Expense system.

> **Note**
>
> For more information about the concepts, such as authorizations, endpoints, change state identifiers, and error handling, see Web Services.
>
> For information related to security, see Security Guide.

Configuration for Consumption of Web Service APIs

To be able to consume a Web service API, you need to make some technical settings to ensure that the end point is active. Credentials need to be maintained, and authorizations need to be granted. The basis for the



communication configuration is a configuration scenario, in which services are grouped that belong, from a business perspective, to such a scenario. The communication arrangement can be created either automatically during business configuration for certain predefined scenarios or manually at a later point in time. Predefined scenarios can be utilized from legal perspective for exactly one remote communication partner since only one technical user is available and credentials can be assigned only once. In contrast to this, manually-created communication arrangements are always based on business partners for B2B collaboration or based on communication systems for cross-system A2A integration. Therefore multiple technical users can be created to which separate credentials can be assigned.

In addition to the existing communication scenarios that are predefined by SAP, customers may define their own specific communication scenarios based on our open synchronous APIs.

In our cloud solution, all technical complexity is hidden and a simple UI for key users is provided. In *the Application and User Management* work center, you may define communication systems, explore existing communication scenarios based on Web Service APIs or create new ones. For more information, see Communication Scenarios Quick Guide.

Finally, you can create one or more sender-specific and receiver specific communication arrangements for existing communication scenarios. For more information, see Communication Arrangements Quick Guide.

Before 1311, bundling of Web services to create communication arrangements was only available in the SAP Cloud Applications Studio. For more information on how to bundle the available Web services and to create your own communication scenarios in the SAP Cloud Applications Studio, see Web Services Quick Guide.

Monitoring and Error Handling

For remote message communication, local monitoring and error handling is available in the *Application and User Management* work center. Forward error handling is supported by the business task management. In the *Business Communication Monitoring* view, you see the status of external inbound and outbound communication, aggregated and enriched with business context. Here you can also find a view for rejected Web service calls, which also covers synchronous inbound interfaces, and is especially useful for trouble shooting technical connectivity issues, authorization errors, and communication configuration mismatches.

When entering the Business Communication in the Monitoring Application and User Management work center all asynchronous messages with errors are displayed by default. Other monitoring capabilities are supported like:

- View other messages belonging to a certain communication partner
- Provisioning of detail information for specific message. For some integration scenarios, forward navigation from a specific message to the corresponding business object instance is possible
- Display the root cause of errors during synchronous message exchange.
- Error resolution mechanisms for certain error situations for the key user to solve errors.

For more information, see:

- Business Communication Monitoring Quick Guide
- Quick Guide for Process Communication Errors

With SAP cloud solution version November 2013 (1311), SAP offers the additional *Web Service Message Monitoring* view, which is optimized for monitoring high volume asynchronous cross system communication.

For more information, see Web Service Message Monitoring Quick Guide.

Caution

Local IDs (keys) of business entities and code values - especially when they are extensible -can differ between systems and system types, for example between SAP ERP and SAP Business ByDesign. For Business Partners, standard IDs like Dun & Bradstreet (DUNS) or Global Location Number (GLN) can be maintained and used for the identification of both communication partners in B2B collaboration. For cross-system A2A integration or SAP On-Demand / On-Premise integration, standard IDs are not required. Therefore, SAP cloud solutions include capabilities to transform IDs or code values in inbound (and outbound) messages. Key mapping for master data is stored in the business object Object Identifier Mapping and can be accessed in the *ID Mapping for Integration* view of the *Application and User Management* work center. For more information, see On-Demand System: Create ID Mapping.

Value mapping for code lists can be maintained in the *Business Configuration* work center, as part of the Go-Live Activity phase *Integrate and Extend*. For more information, see Configuration: Code List Mapping

Technical Connectivity Setup

To access the SAP Cloud solution, a unique, customer-specific URL must be used. This URL can be found in the communication arrangement UI in the Application and User Management Workcenter. Here also security settings like credentials maintenance or downloading client certificates and mapping to the communication user can be made.

During communication, all incoming messages pass through the SAP Web Dispatcher component in the SAP data center. The SAP Web Dispatcher performs an URL filter, terminates SSL, and redirects the message to the corresponding SAP Cloud solution tenant. Communication between SAP Web Dispatcher and SAP Cloud solution tenant is again encrypted using SSL.

Outgoing messages pass through a transparent HTTPS proxy, which translates the host name to the external host name and forwards communication from SAP Cloud solution to external locations or to the customer landscape.

Communication partners often protect their landscapes using IP filtering mechanisms. For outgoing communication from the SAP Cloud solution, it might be necessary to enable your network to receive XML messages, which means the IP ranges for the SAP Cloud solution data centers must not be filtered out. If IP source filtering is enabled, the firewalls need to be opened from SAP Business ByDesign data center IP ranges.

More details can be found in the Security Guide on the SAP Help Portal under *Cloud*, and in the Technical Connectivity Guide for OnDemand - OnPremise Hybrid Applications.

Authentication

We offer the following authentication mechanisms for accessing the SAP cloud solution via one of the mentioned protocols:

- X.509 client certificate
- User ID and password

For information on technical connectivity settings including firewalls, certificates, and proxies, see Technical Connectivity Guide for OnDemand - OnPremise Hybrid Applications, the latest version of which is available for SAP customers in the Service Marketplace, e.g. https://service.sap.com/ondemand -> Release and Upgrade Info -> Cloud Solutions from SAP -> SAP Cloud for Customer (latest Release) -> Technical Connectivity Guide.

2.1 Synchronous Web Service SOAP APIs for Query/Read and Write

Synchronous services support the following:

- System-to-system communication, for example application integration (AI)
- User-to-system communication, for example Excel Write-back

The following Interface Patterns are supported:

Access	Interface Name	Operation Name	Description
Read	Query<BO>In	Find<Node>[Simple|<View>]By<Selection>	Find business objects and their elements for various selection criteria
Write	Manage<BO>In	MaintainBundle CheckMaintainBundle	Create, update, delete business object (nodes)
Write	<BO>ActionIn	<Action>, Check<Action>	Execute Actions in business objects

Every *Check<Operation>* operation executes the same data manipulations and validations as the real operation with the only difference that no data are stored in database. As a result no numbers will be drawn from the number ranges.

There is no specific *Delete* operation, only logical deletion is supported via status change on BO level.

The *Maintain* operation supports both *Create* and *Change/Update.* As a consumer, you don't need to know whether the object already exists*.* Usually it is offered as mass-instance operation with all-or-nothing behavior. Erroneous instances will be part of the log element in the response.

In responses and confirmations, the common data type *http://sap.com/xi/AP/Common/GDT/Log* is used to represent the result of a service interface operation.

Result Control in Queries

Query parameters are usually exposed as select options, that is, as *SelectionBy<Element>* elements. The maximum number of rows returned by a query is determined by the elements *QueryHitsUnlimitedIndicator* and *QueryHitsMaximumNumberValue* of the element *ProcessingConditions*.

The element *LastReturnedObjectID* in the response of query operations can be used for paging.

> **Caution**
>
> The responsibility for ensuring reasonable transaction sizes for mass-operations lies with the consumer. It is in the consumer's interest to avoid transactions that are too large. Transferring huge amounts of data across the network may easily cause communication timeouts.

Custom Web Services

If you cannot find APIs that suits your needs in the *Service Explorer* view of the *Application and User Management* work center, you can use the SAP Cloud Applications Studio to create your own custom Web services for reading (query, retrieve) or writing (create, update, delete, action).

For more information on the SAP Cloud Applications Studio, go to the *SAP Help Portal* under *Cloud → Software Development Kits (SDKs)*. Select the latest version of the SAP Cloud Applications Studio. From there, go to *English Complete Help: Online Version→ Developer Desktop → Web Services → Business and Technical Background*.

2.2 Asynchronous Web Service Consumers and Providers for Business Collaboration

SAP Business ByDesign enables its customers and their communication partners to facilitate application-to-application (A2A) and business-to-business (B2B) process integration, usually by asynchronous messaging. The solution provides a communication infrastructure that enables secure, standards-based, reliable, and scalable communication between provider and consumer applications.

2.2.1 Supported Application Protocols

Message-based integration relies on transport protocol HTTPS connectivity between the remote system and the SAP cloud network. Secure communication between consumer and provider is guaranteed using the Secure Socket Layer (SSL) protocol for protection at the transport level (TLS, transport level security).

Depending on the supported protocols on service interface level, standards-based XML communication can be conducted using the four standard application protocols:

- SAP XI 3.0 protocol,
- SAP IDOC over SOAP protocol,
- WSRM 1.1, or
- SOAP 1.1.

The application protocol can be chosen by selecting the corresponding 'Application Protocol' drop-down list in the Communication Arrangement view, depending on the supported protocols on service interface level. Here all supported application protocols for each interface are selectable.

The asynchronous services are designed for 'asynchronous reliable' message exchange, which means the default quality of service (QoS) is 'Exactly Once', where the solution guarantees the delivery of the XML messages. In inbound processing, forward conflict and error resolution is supported which helps to solve errors where they occur.

SAP XI 3.0

SAP XI 3.0 is the preferred protocol for B2B collaboration and some cross-system A2A integration. Since the XI 3.0 protocol is SAP proprietary, it can be used only if the remote system is another SAP system, for example, an SAP PI or another SAP Cloud Solution tenant. Sender and receiver information (consisting of standard IDs and the process components of the sender and receiver) as well as interface information are expected in the XI message header. The SAP Cloud Solution has ByDesign has one generic endpoint for the XI 3.0 protocol, which can be addressed using the path: /sap/xi/engine?type=entry.

SAP IDOC over SOAP

To support out-of-the-box integration with SAP ERP 6.0 without enhancement packages, SAP enabled the IDoc format for communication with SAP Cloud Solutions for specific interfaces and added the SOAP channel for IDocs, offering specific endpoints for services supporting the SAP IDOC over SOAP protocol. With IDocs, several existing integration interfaces of the on-premise SAP ERP can be leveraged for subsidiary end-to-end processes without any code changes. Missing integration capabilities can be added per solution with integration components. The Integration guides of the various solutions describe how the Suite systems are enabled for the communication, for example, which SAP notes have to be applied.

WSRM (Reliable Messaging) 1.1 Protocol

The WSRM 1.1 protocol is supported for B2B collaboration and cross-system A2A communication for selected interfaces.

- For B2B collaboration in SAP Business ByDesign, the WSRM 1.1 protocol can be configured if either the partner Alligacom or a middleware in the partner's network is in scope.
- For cross-system A2A communication, WSRM 1.1 interoperability is guaranteed for remote systems that are based on
  - Windows Communication Foundation

    For more information about the interoperability between SAP NetWeaver and WCF, see the SAP Community Network.
  - Java Metro based systems

    Metro based systems need to support Metro Version 2.0.1 and NetBeans 6.9.1 (Java package incl. GlassFish 3.0.1)

    If the remote system is a SAP system and defined as 'SAP-based' communication system in SAP Cloud Solution, WSRM 1.1 also can be utilized.

Plain SOAP / SAP RM Protocol

SAP Cloud Solutions enables plain SOAP-based communication as an alternative to WSRM1.1-based reliable messaging if the service supports ‘Plain SOAP’ and is defined as ‘asynchronous non reliable’. The quality of service (QoS) “Best Effort” is guaranteed, enabling interoperability with non-SAP applications since they frequently do not support the WS RM protocol.

Many of the asynchronous SAP Business ByDesign services are defined as ‘asynchronous reliable’. If such a service is SOAP-enabled, the SAP RM protocol gets applied. SAP RM protocol is a proprietary extension of the ‘Plain SOAP’ protocol, which guarantees QoS “ExactlyOnce” (EO) and can also be extended for “ExactlyOnceInOrder” (EOIO).

To fulfill the SAP RM requirements, the SAP Cloud Solution expects to receive the message ID for such services. The message ID must be in either the SOAP header (using WS addressing or using a SAP-specific namespace) and/or as part of the URL. If QoS EOIO is required, a sequence ID needs to be sent as well, either in the SOAP header and/or as part of the URL. If no message ID is provided, the communication is terminated by an HTTP 500 error and a SOAP fault message.

The SAP Cloud Solution tenant transfers a message ID in the SOAP header and in the URL. For QoS EOIO, a sequence ID is transferred as additional information in the SOAP header and/or in the URL. Synchronous communication is always treated as ‘Plain SOAP’ communication without a duplicate check.

For more information about the support of Plain SOAP / SAP RM, see the SAP Community Network.

2.2.2 Outbound Messaging

The cloud solutions provide domain specific outbound interfaces for asynchronous (and in some special cases, synchronous) communication. The supported interfaces are bundled in scenarios and can be explored, depending on your scoping, in the *Communication Scenarios* view of the *Application and User Management* work center.

In business configuration you can define the scope your solution is actually using. Only the relevant entities for the chosen scope will be offered for activation. Connectivity settings, such as endpoints and authentication can be maintained in the *Communication Arrangements* work center view.

Receiver determination is also defined in this UI. For business to business communication, the target is a business partner, for application to application integration, you assign a business system.

In most cases, asynchronous messaging is triggered automatically based on business object change notifications after save. Some applications offer dedicated work center views that can either start outbound processing immediately or schedule batch messaging.

2.3 SOAP API for Analytical Data Access

SAP cloud solution support rich analytics within the solution. Many customers, especially large customers, have a separate on-premise data ware house in place for central reporting.

You can replicate analytical data from the cloud solution to an existing SAP Business Warehouse (BW) system of release 7.30 SP8 or higher using operational data provisioning (ODP). SAP ByDesign offers the Web service interface *OperationalDataProvisioningIn* by which mass data from exposed data sources can be extracted by scheduled batch jobs automatically from the SAP cloud solution via SOAP protocol.

SAP NetWeaver BW pulls and schedules this extraction – both for direct access and replication scenarios. The data extraction process is logged for tracking and diagnostics purposes.

With ODP it is possible to include your extension fields in standard data sources as well as your customer specific data sources or into the replication process.

The API is generic and can be used to extract all data sources in the system. For security reasons, no data sources are exposed for the API by default. In the *Design Data Sources* work center view of the *Business Analytics* work center, data sources for data replication can be exposed or excluded from exposure accordingly.

For more information, see *Design Data Sources Quick Guide*.

The SOAP API offers operations for discovery, meta data retrieval and data access.

Operation	Description
GetList	Returns a list of all exposed data sources
GetDetails	Returns detail technical information about the data source, for example, the data types used in the data source
FetchDataDirect	Returns data from the data source in binary form. The content in xml tag "BinaryObject" is in Base64 encoding and has to be decoded. Different rows will be contained within <item> element

> **Note**
>
> Examples for Base64 decoding can be found on http://www.base64decode.org .

> **Caution**
>
> The responsibility for ensuring reasonable transaction sizes lies with the consumer. The service provider implementation times out after 12 minutes or 2GB data volume per request. The provider does not allow more than 3 concurrent requests. Only one session is allowed per data source, no delta load is supported.
>
> This API is officially released only for consumption by SAP Netweaver BW. For other clients please contact SAP.

> **Note**
>
> In the *Business Analytics* →*Data Sources* → *Monitoring* work center view, you can monitor the status of the data replication runs from the SAP NetWeaver BW system against data sources that are exposed in the solution.

Find the list of available data sources at the following locations:

- In your SAP cloud solution: In the *Design Data Sources* view of the *Business Analytics* work center,
- In the Business Center for Cloud Solutions from SAP (log in required): Data Sources Documentation

For more information, see also Integrating Analytics with an SAP NetWeaver Business Warehouse System.

3 OData APIs for Read-Only Access

SAP offers Web services for querying data following the Open Data Protocol (OData) for user-to-system communication (for example for native mobile devices). OData is based on HTTP and follows many of the principles of REST. An OData API is easy to consume and provides a uniform way of accessing data via resources identified by Uniform Resource Identifiers (URIs) and defined in a data model.

You address specific objects or elements by constructing URLs and interact with a service using standard HTTP methods, in the same way across any OData service, regardless of the data it exposes. For more information on the OData protocol, see http://www.odata.org.

The following OData APIs are offered for:

- Analytical reports
- Custom thing types.

3.1 OData API for Analytical Reports

The Open Data Protocol (OData) service returns analytical data available to the business user. Like in the regular UI, only reports that are available in the *Reports* work center views of the business user's assigned work centers can be retrieved. You can also retrieve the characteristics and key figures of reports, for example.

The OData API also returns additional metadata defined by SAP in the SAPData XML namespace. This additional metadata contains labels, annotations, and so on that are useful for display settings that the consumer might want to do.

Example

```
<Entity Type Name=”RPMATERIAL_Q0001QueryResult“
sap:semantics=”aggregate“sap:label=”New
Materials“xmls:sap=”http://www.sap.com/Protocols/SAPData“>
<Property Name=”CCRTA_DATE“ Type=”Edm.DataTime“ Nullable=”true“
sap:label=”Created On ID“ sap:aggregation-role=”dimension“ sap:filterable=”true“
/>
```

You control the response of the OData API simply by expanding the URI.

For a report-based REST service, the basic URL schema is as follows:

```
https://<hostname>.<domain>
/sap/byd/odata/
<technical name of the Work Center>/
<name of the analytical report>s
?<parameter list, for example filter, paging, etc.>
```

The following data may be retrieved:

- Discovery of Available OData Services

URL	Result
https://<yoursystem>.com/sap/byd/odata	Returns a list of SAP data protocol services, representing the work centers assigned to the login user. For services with the following convention, analytics data is available: `<shortened name of work center>_analytics.svc`.
https://<yoursystem>.com/sap/byd/odata/cc_home_analytics.svc	Returns all reports available to the logon user as a business user, including reports that have been personalized.
https://<yoursystem>.com/sap/byd/odata/ana_businessanalytics_analytics.svc	Returns all reports available to the logon user as an administrator, excluding reports that have been personalized.

> **Note**
>
> Note that you get one service per assigned work center.

- Meta Data Document of an Analytical Service

URL	Result
https://<yoursystem>.com/sap/byd/odata/<shortened name of work center>_analytics.svc/$metadata	Returns the reports assigned to the specified work center along with the corresponding fields in the reports, exposing the characteristics and key figures of the report.
https://<yoursystem>.com/sap/byd/odata/cc_home_analytics.svc	Returns the reports assigned to the user irrespective of Work Center assignment

- Data of a Report

URL	Result
https://<yoursystem>.com/sap/byd/odata/<shortened name of work center>_analytics.svc/RP<report ID>QueryResults	Returns the first 50 lines (default page size) of data of the specified report.

- Supported Query Options

  For the following supported query options, the example base of the URI is:

  > **Example**
  >
  > ```
  > https://<yoursystem>.com/sap/byd/odata/<shortened name of work center>_analytics.svc/RP<report ID>QueryResults?
  > ```

Parameter	Description
$select	URI parameter: $select=<one or more specified characteristics separated by commas>

Parameter	Description
$orderby (ascending)	URI parameter: $orderby=<one or more specified characteristics followed by asc, separated by commas>
$orderby (descending)	URI parameter: $orderby=<one or more specified characteristics followed by desc, separated by commas>
$totals	URI parameter: $totals=<one or more specified characteristics separated by commas>
$filter	URI parameter: $filter=<specified characteristic> eq '<filter value>'
$top	URI parameter: $top=<specified number>
$skip	URI parameter: $skip=<specified number>

Example

```
/sap/byd/odata/pmm_productdata_analytics.svc/RPSERVICE_Q0002QueryResults?$select
=CCHG_DATE,TSERV_INT_ID,CSERV_INT_ID,KCCHG_SERV,ID&$orderby=CCHG_DATE
desc&$skip=5&$top=5
```

Filtering

```
/sap/byd/odata/pmm_productdata_analytics.svc/RPSERVICE_Q0002QueryResults?$select=CCHG_
DATE,TSERV_INT_ID,CSERV_INT_ID,KCCHG_SERV,ID&$filter=CSERV_INT_ID eq '10000001'
```

ID Access

```
/sap/byd/odata/pmm_productdata_analytics.svc/RPSERVICE_Q0002QueryResults('%7CCCHG_DATE
%3D27.10.2011%7CCSERV_INT_ID%3DMCW-0003%7C')
```

Note

In some cases, data sources or reports only contain a technical ID (global unique identifier) for references to instances of other objects, such as. master data. To get the human readable identifier or description of the referenced object, you may have to access another data source or report. Another option might be usage of the Web Service API Query Object Descriptions.

Caution

Data accessed by OData is always based on the default variable values of the report. There is no way to change the variable values by OData. If current default variable values do not fit, you might consider copying a report and change the default variables.

3.2 OData API for Custom Thing Types

You may want to consume data of the SAP cloud solution in your own mobile application or custom UI built on any platform. Typical UI-initiated consumption needs are highly use case specific. Instead of predelivering fixed response structures, SAP just provides the infrastructure to build custom models easily.

As a customer or partner, you model the response data structures with the UI designer as *Thing Type* model on top of either SAP BOs including your custom fields or custom BOs. You publish and grant access by assigning

your thing types to a work center which in turn can be assigned to users. At runtime, authentication can be performed via user ID and password or via X.509 client certificate.

For a thing type-based REST service, the basic URL schema contains the host, the work center view and an entity set name, which is the name of the thing type - as defined in the designer-, followed by the character "s". An URL schema looks as follows:

```
https://<hostname>.<domain>
/sap/byd/rest/
<name of the work center view> /
<name of the thing type>s
?<paramter list, for example filter, paging, etc.>
```

Example

```
/sap/byd/rest/zcontract_wcf.wcf.svc/zcontracts?$filter=Account eq
'MYACCOUNT'&$top=1
```

Caution

This API enables read (query, retrieve) operations on top of a SAP BO or custom BO. Limitations: write (create, update, delete, action) operations are not supported yet. Response data model is a flat structure. Custom fields cannot be added to OData Thing Type models yet. Code list filtering depending on business object instance data is not supported.

4 Uploading Files for Data Migration

Legacy data migration is a critical step for each implementation project. It is often a main cost driver because it is a complex step and requires highly skilled personnel to carry it out. SAP is well aware of these challenges and provides guidance, templates, and tool support to lower the barrier for customers to move to the cloud. Data migration is an integrated part of the *Go-Live Activity* list in the *Business Configuration* work center. While data extraction from the legacy system as well as data clean-up is always custom specific and cannot be predelivered by SAP for non-SAP source systems, SAP supports you in the subsequent data uploads.

The *Migration Workbench* is used for initial load. It can upload spreadsheets (with several sheets for hierarchical data) as well as CSV files. The *Migration Workbench* can upload files efficiently and handle cross object dependencies via sequencing,

SAP provides spreadsheet templates for the most common migration objects that are enabled for tool-supported migration. You can download them directly from the *Go-Live Activity* list. They include your custom fields. Each template contains different tabs that group the data into logical units and allow import of hierarchical data. The templates include annotations including field definitions and filling instructions to support you during population of the templates.

The migration tool supports you in various ways. It allows you to:

- Centrally track the template-based migration objects and their associated tasks (progress)
- Verify content of filled templates by simulation uploads
- Consistently map your legacy values to SAP cloud solution specific values in order to reducing mapping effort. For example, to map legacy payment term value to SAP Business ByDesign payment term value.
- Perform error handling as an integral part of the initial load. The tool separates erroneous entries into separate files for post processing.

> **Note**
>
> For SAP Business ByDesign Subsidiaries Edition, We deliver a non-invasive ERP data extractor as installable Add-On.

> **Note**
>
> Most financial data, for example, open items payables / receivable, can only be migrated via UI or migration templates,

> **Recommendation**
>
> Find the list of migration objects, corresponding templates, and documentation in the Business Center for Cloud Solutions from SAP (log in required): Data Migration Wiki

5 Uploading or Downloading Interactive Files

The SAP cloud solution offers various options for uploading or downloading files.

5.1 Simple UI-Driven File Download of Lists

There is a generic way to download data into generated spreadsheets from any UI tables. Some applications provide file download into specific templates.

> **Note**
>
> This kind of download is usually not sufficient for integration scenarios as it supports flat data only. However, it's an easy and light weight WYSIWYG approach to quickly access data.

For more information, see Export Business Data Using Microsoft Excel®.

5.2 Excel Write-Back Scenarios

In many work centers you can download data from an object work list into MS Excel® spreadsheets that contain a plugin that allows submitting data changes you made in the spreadsheet to the system via web service call.

For more information, see Upload and Download an Object.

5.3 UI-Driven Analytical Data Download

You can use the *Business Analytics* work center to download any report to Microsoft Excel® in XML or CSV format. Note that the report opens in read only mode.

In addition to reports, you can also download data sources in CSV format.

The format and the available fields of the downloaded data source differ from a downloaded report. For example, in a downloaded report, the value and unit of measure are combined in one field but these fields are separate in the downloaded data source. Another example is that there may be key figures only defined for the report, which are not available in the underlying data source.

For more information, see Upload and Download an Object.

5.4 Mass Change Work Center

In the *Mass Change* work center, you can download business data into a spreadsheet, maintain mass changes there conveniently and upload the file again to apply the data changes. This work center is available in SAP Business ByDesign and SAP Cloud for Customer.

5.5 Custom Upload from File Share

Customers and partners can use SAP Cloud Applications Studio to provide custom XML file upload scenarios for loading external data into a standard or custom business object. On activation in SAP Cloud Applications Studio, a file share (WebDAV Folder) is created which you can use to store the files to be uploaded. You can download a XML schema file describing the required format. Key users can import data in XML format from other systems into a business object. Technically, the processing is done by using a service interface and uses the standard business object *Document*. In the *Application and User Management* work center, define an upload job (on time or recurring job).

> **Note**
>
> Custom development of a download into a file share scenario is not supported yet.

For more information, go to the SAP Help Portal under *Cloud* → Software Development Kits (SDKs). Select the latest version of the SAP Cloud Applications Studio. From there, go to *English Complete Help: Online Version* → *Developer Desktop* → *Service Integration* → *Tasks* → *Create XML File Input*.

6 Other Data Input and Output Capabilities

6.1 Output Management

Output management deals with the organization, formatting, management, and distribution of business data created by the solution. In addition to printing via print manager integration it also enables the output as e-mail, as fax via e-mail, as XML message and as PDF file. Form-based documents can be output on an ad hoc basis via download to the UI client or as an integrated part of a business process in the background.

Ad hoc output is generated when a user previews a document in Adobe Reader and either prints a paper copy or saves an electronic copy of the document in portable document format (PDF). This type of output is possible at any time.

Business process integrated output means that the output of a document is triggered and performed by the system as part of a business process. For example, a purchase order is created by an employee and sent to his or her manager for approval. On approval by the manager, the document is automatically sent to the output channel defined in the output settings of the document. This output channel could be a printer, an e-mail, XML message, or a fax. Default output settings and output channel and form template rules can be created by key users to define how a particular document is output by the system.

> **Note**
>
> In addition to the SAP standard scenarios for output management, customers and partners can create custom ad hoc output scenarios.

SAP cloud solutions support interactive forms scenarios. Support for custom interactive forms scenario is not available.

For more information, see Output Management.

6.2 File Input and Output

Sometimes, file-based integration is preferable to message-based communication. There is a generic file input and output, where the file needs to be in an xml format. Some applications provide specific file input and output scenarios where the file can contain arbitrary format. In the cloud solution, files used in file input and output scenarios are stored in the Business Object *Document* or as attachments to other business objects.

Some examples:

- Application-specific file output: Outgoing payment
- Application-specific file input: Bank statement upload

  For more information, see Bank Statements Quick Guide → *Tasks* -> *Upload a Bank Statement*
- Generic file input: Customer invoice request upload

For more information on file input, see File Input Quick Guide.

6.3 End-of-Life Service

Once the contract between SAP and the customer ends, customers may want to get their data out of the system, for example, for archiving purposes or to use as a source for a data migration.

Customers may download their transactional data via the standard reporting functionality.

For important master data, on customer request, SAP extracts and provides data in spreadsheet xml files. Supported master data include Customers, Employees, Suppliers, Materials and Material Valuation, Sales Price List.

For financials data, customers can start an *Extraction Run for Financial Data* in the General Ledger work center. For more information, see Extraction Run for Financial Data Quick Guide.

7 Further Information

7.1 Integration Hubs

The following communication flavors for remote integration are supported technically:

- Point-to-point (P2P) communication
- Mediated communication using an integration hub

Point-to-point communication requires that sender and receiver support the same message format (i.e. message structure and content semantics), if message mapping (structure and content) is required, this always has to happen locally in the remote network, otherwise you have to use a mediation approach via a middleware.

Large enterprises often operate mandatory middleware hubs, which are utilized to mediate message traffic and service invocation between different application systems.

As integration hub, you can use any middleware you like. Several middleware solutions offer special connectors for SAP cloud solutions, based on our open Web service APIs.

SAP NetWeaver Process Integration is not mandatory in the on-premise landscape but supported and may be used if a customer already operates it. As a cloud option, SAP HANA Cloud Integration can be used.

For B2B collaboration in SAP Business byDesign, where content, structural and protocol mapping is required, SAP Business ByDesign offers the capability to incorporate partner Collaboration Providers. A contract with the collaboration partner needs to be signed before the services can be used. Once a partner solution is bought and activated via SAP Store, the customer must update their scoping and activity list.

7.2 SAP HANA Cloud Integration

SAP HANA Cloud Integration (HCI) is a new holistic cloud-based integration technology from SAP with both process and data integration capabilities on a multi-tenant cloud infrastructure. This technology supports integration of SAP cloud applications to not only SAP but other third-party applications/data sources - both on-premise and cloud – as well. It is one of the capabilities in our broader SAP HANA Cloud Platform. For more information, see:

- SAP HANA Cloud Integration on www.sap.com
- SAP HANA Cloud Integration on https://help.sap.com

7.3 Useful Links

Document Type	Where to find
Web Services API Overview	Find the list of publicly released Web Service APIs on the SAP Help Portal under *Cloud*. Select the latest version under:

Document Type	Where to find
	• SAP Business ByDesign
Integration Scenarios Overview	Find the list of integration scenarios on the SAP Help Portal under *Cloud*. Select the latest version under: • SAP Business ByDesign • SAP Cloud for Travel and Expense
SAP Global Data Types (HTML) SAP Global Data Types (PDF) SAP Global Data Types (XML)	Find the SAP Global Data Type catalog on the SAP Developer Network (SDN).
SAP Cloud Applications Studio	Go to the SAP Help Portal under *Cloud* → Software Development Kits (SDKs). Select the latest version of the SAP Cloud Applications Studio.
SAP HANA Cloud Integration SAP HANA Cloud Integration	On www.sap.com On https://help.sap.com
SAP Business ByDesign Studio — Application Development.	SAP Press
Data Migration Wiki	Business Center for Cloud Solutions from SAP
Technical Connectivity Guide for OnDemand - OnPremise Hybrid Applications	Available for SAP customers in the Service Marketplace for information on technical connectivity settings including firewalls, certificates, and proxies. Check for the latest version in the Service Marketplace, e.g. https://service.sap.com/ondemand -> Release and Upgrade Info -> Cloud Solutions from SAP -> SAP Cloud for Customer (latest Release) -> Technical Connectivity Guide.
Security Guide	On the SAP Help Portal under *Cloud*. Select the latest version under: • SAP Business ByDesign
SAP Cloud for Travel and Expense: • Master Guide • Integration Guide	Go to the SAP Service Market Place. There find the latest version under *Cloud Solutions from SAP*→ *SAP Cloud forTravel and Expense.* **Note** Note that you need an authorized user ID to access the *SAP Service Market Place*. If you need to register for the SAP Service Marketplace login, you can register here.
SAP Cloud for Customer: • Integrating SAP Cloud for Customer with SAP	Go to the SAP Service Market Place. There find the latest versions under *Cloud Solutions from SAP*→ *SAP Cloud for*

Document Type	Where to find
ERP • Integrating SAP Cloud for Customer with SAP ERP using SAP HANA Cloud Integration Option • Operations Guide for SAP Cloud for Customer with SAP ERP • Integrating SAP Cloud for Customer with SAP CRM using SAP NetWeaver Process Integration, On-Premise • Operations Guide: SAP Cloud for Customer with SAP CRM, Integrated via SAP NetWeaver Process Integration, On-Premise • Integrating SAP Cloud for Customer with SAP CRM using SAP HANA Cloud Integration Option • Developing a Custom Channel • SAP Cloud for Customer CTI Guide	*Customer.*

8 Glossary

Term	Definition
A2A	application-to-application
B2B	business-to-business
Global Data Types	Formal description of the structural representation of data used by software programs. Actual data values can be seen as instances of (one or more) global data types. Data types restrict the actual data values that can be represented as instances of these types. Global data types are based on core data types that are defined by United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) in Core Components Technical Specification (CCCTS).
HTTPS	Hyper Text Transfer Protocol Secure
Mashup	A Web service or application that has been integrated into an SAP cloud solution. Mashups combine and transform internal business data with information or services provided by external online service providers.
Open Data Protocol (OData)	Web protocol for querying and updating data. It applies and builds upon Web technologies such as HTTP, Atom Publishing Protocol (AtomPub), and JSON to provide access to information from a variety of applications.
Public Solution Model	Contains all entities in SAP's cloud solutions that are released for external consumers. External consumers can be partners who develop solutions on top of SAP's cloud solutions or administrators who create new reports.
QoS	Quality of Service, describes the quality of the message exchange for example ‘best-effort’ for which no guarantee is given that data is delivered
SAP IDoc	Intermediate Document, an SAP document format for transferring the data for a business transaction
SAP RM protocol	SAP Reliable Messaging protocol, a proprietary extension of the SOAP protocol to enable QoS ‘exactly once’
SOAP	Simple Object Access Protocol, is a protocol specification for exchanging structured information
SSL	Secure Socket Layer protocol
Thing Type	Entity that defines tangible work objects. A prominent data object fulfilling additional constraints.
WSDL	WSDL is an XML format for describing network services as a set of endpoints operating on messages that contain either document-oriented or procedure-oriented information.

Term	Definition
	For more information, see Web Services Description Language (WSDL) 1.1
WSRM	Web Service Reliable Messaging, see OASIS - Web Services Reliable Messaging (WS-ReliableMessaging)
X.509	Defines a standard certificate format for public key certificates and certification validation
XML	Extensible Markup Language is a markup language that defines a set of rules for encoding documents

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Material Number