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Augmenting JD Edwards EnterpriseOne with Oracle Cloud Infrastructure Services

A technical briefing document about using JD Edwards EnterpriseOne Orchestrator to authenticate to and call Oracle Cloud Infrastructure (OCI) services and integrate them with JD Edwards EnterpriseOne applications

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Purpose statement

This document provides an overview of features and enhancements included in JD Edwards EnterpriseOne Release 24 and Oracle Cloud Infrastructure (OCI) services available at the time of publishing. It is intended solely to help you assess the business benefits of using OCI services with JD Edwards EnterpriseOne and planning for the implementation and upgrade of the product features described.

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Executive Overview

JD Edwards EnterpriseOne is your ERP system, and as such it plays a major role in the success of your enterprise. More than an assembly of applications that simply collect and report data, your EnterpriseOne system is a digital representation—a “digital twin”—of how your enterprise functions.

The JD Edwards EnterpriseOne digital platform is a key enabler in your journey to digital transformation. Comprised of built-in features such as the extensibility framework, workflow, notifications, and orchestrations—each one underpinned by a “no-code/low-code” philosophy—the digital platform provides tools to help you refine your digital ore into digital gold. Perhaps the most significant and impactful component of the digital platform is the JD Edwards EnterpriseOne Orchestrator, which integrates your EnterpriseOne system bidirectionally to the digital economy.

Oracle Cloud Infrastructure (OCI) offers an array of over 150 cloud services ranging from infrastructure to artificial intelligence (AI). Used in conjunction with EnterpriseOne Orchestrator, the chemistry is quite powerful, and the matrix of possibilities is nearly endless.

An enhancement available in JD Edwards EnterpriseOne Release 24 enables you to configure an Orchestrator connection to pass credentials to OCI services. Because Orchestrator connections adhere to EnterpriseOne role-based security, you can control secure access to the connections to OCI services by role or individual user.

This document describes three use cases:

- Using an orchestration to call the OCI Object Storage service to upload files to OCI Object Storage
- Using an orchestration to call the OCI Document Understanding service to read scanned images (in this case, receipts) and extract data from them
- Combining these two use cases together for higher value, using a single orchestration to upload scanned receipts to OCI Object Storage, extract data from the receipts, and add the data and the receipt images to an EnterpriseOne expense report

Oracle has published step-by-step learning paths to guide you through these use cases.

Using the power and flexibility of Orchestrator combined with the breadth of infrastructure, utility, and AI services offered by OCI, one might imagine many new usage patterns and solutions to augment your EnterpriseOne system with intelligence, automation, and higher business value.

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The value of the JD Edwards EnterpriseOne digital platform on the path to digital transformation

JD Edwards EnterpriseOne is your ERP system, and as such it plays a major role in the success of your enterprise. More than an assembly of applications that simply collect and report data, your EnterpriseOne system is a digital representation—a "digital twin"—of how your enterprise functions. Whether you manufacture, distribute, build, grow, or service products, your EnterpriseOne system captures and records critical data about your operations. One common analogy compares business data to "digital gold." However, in practice, the raw data is more akin to " digital ore"—ore that needs to be aggregated, sifted, filtered, refined, organized, and cast into some useful, high-value form. That higher value might come from exchanging data with your customers or trading partners in an optimized digital supply chain. It might come from refined analytics that reveal deep insights into opportunities for improvement or new business models. Or you might realize higher value by integrating your EnterpriseOne system with any number of external systems or cloud services throughout the digital economy.

The JD Edwards EnterpriseOne digital platform is a key enabler in your journey to digital transformation. Beyond the intrinsic, core value of the EnterpriseOne application modules themselves, the JD Edwards EnterpriseOne digital platform provides an underlying set of capabilities that enable you to automate, optimize, and transform your use of your EnterpriseOne system. Comprised of built-in features such as the extensibility framework, workflow, notifications, and orchestrations—each one underpinned by a "no-code/low-code" philosophy—the digital platform provides tools to help you refine your digital ore into digital gold.

Perhaps the most significant and impactful component of the digital platform is the JD Edwards EnterpriseOne Orchestrator. Orchestrator provides open, yet secure, access to EnterpriseOne business data and business logic through standard REST protocol. Functioning as REST APIs, orchestrations can automate and integrate business processes. For example, you might create an orchestration to return a list of all open requisitions in the EnterpriseOne system and send that list to a third-party procurement system. Or, conversely, a third-party procurement system might send a list of requisitions, and an orchestration could iterate over that list and create corresponding purchase orders in the EnterpriseOne system. By exposing EnterpriseOne data and application logic in this way, Orchestrator opens the door to many modern capabilities, such as automated data collection through Internet-of-Things devices, simplified development of mobile and web applications, REST-based integrations to third-party systems, and easy integration with cloud services. This last pattern—integration with cloud services, and particularly Oracle Cloud Infrastructure (OCI) services—is the focus of this document.

Oracle Cloud Infrastructure services

Oracle Cloud Infrastructure (OCI) offers an array of over 150 cloud services ranging from infrastructure to artificial intelligence (AI). Most of these OCI services provide REST API interfaces, making them invokable by other systems, such as JD Edwards EnterpriseOne Orchestrator.

For the purposes of this document, it is useful to categorize the available OCI services (APIs) into three general segments:

- APIs that enable system administration capabilities, such as automated provisioning of OCI services, infrastructure management, health status, and usage monitoring.
- APIs that expose general-purpose capabilities that are useful in multiple application scenarios, for example, uploading files to OCI Object Storage.
- APIs that expose artificial intelligence capabilities such as Document Understanding, Generative AI, and Language services.

The OCI cloud services in each of these categories are poised to become part of your evolving portfolio of business solutions and augment the value of your JD Edwards EnterpriseOne system.

For a comprehensive list and descriptions of available OCI services, refer to the link provided in "For More Information" at the end of this document. The portfolio of cloud services and their availability throughout global regions expands continually, so be sure to keep abreast of the latest OCI cloud service offerings.

The cumulative value of OCI services with JD Edwards EnterpriseOne and Orchestrator

As discussed earlier in this document, your JD Edwards EnterpriseOne system is a digital reflection of how your enterprise is operating, and the digital platform enables all EnterpriseOne applications and business data to participate in the digital economy. As technology advances rapidly throughout the digital economy—for example, consider advancements such as mobile applications, chatbots, cloud services, and of course artificial intelligence—you expect your EnterpriseOne system to keep pace with these advancements. It is the digital platform layer that keeps your EnterpriseOne system evolving forward and benefitting from technological advancements.

Amid the adoption of technology advancements, we must also keep our eye on the cost, complexity, and skill set necessary to implement new solutions. The technological complexity can sometimes be staggering, even prohibitive. Therefore, whenever possible we must look for no code/low code approaches to implementing new solutions. What's better than developing a solution quickly? Reusing a preexisting solution or service. In other words, whenever we can leverage a preexisting solution, especially if we can call it as a standards-based service, we can accelerate our time-to-value and reduce the cost, complexity, and skill set necessary to deploy the solution.

And that is where we begin to realize the cumulative value of using OCI Services with JD Edwards EnterpriseOne, enabled by Orchestrator.

- If you are designing a business solution that requires capture and storage of files that are ubiquitously, globally available, don't build an infrastructure, build an orchestration that calls the OCI Object Storage service.
- If your business processes would benefit from the ability to ingest scanned images or electronic documents and extract data from them, don't develop new software; build an orchestration that calls the OCI Document Understanding service.
- If your business processes would benefit from the ability to ingest image files and detect objects or attributes within them, you do not need to develop new software; build an orchestration that calls the OCI Vision service.

Oracle Cloud Infrastructure offers over 150 cloud services enabled as REST APIs. Used in conjunction with EnterpriseOne orchestrations, the chemistry is quite powerful, and the matrix of possibilities is nearly endless. Using OCI services in conjunction with EnterpriseOne orchestrations has two distinct advantages:

- Orchestrator natively integrates with JD Edwards EnterpriseOne data and application logic, inheriting all data and application security. Further, this works bidirectionally: orchestrations can call OCI services and provide EnterpriseOne data as input, and orchestrations can receive responses from OCI services as input to subsequent orchestration steps.
- Also, as its name implies, Orchestrator can string together discrete services to "orchestrate" (accomplish) a higher-level process. The scenario highlighted later in this document is one such example. Orchestrator is used to weave together three discrete services: storing a file on OCI Object Storage, invoking OCI Document Understanding to parse data from the file, and using that data to complete an EnterpriseOne business transaction (to add an item to an expense report).

When considering a solution in which an orchestration calls OCI services, the general flow is as follows:

1. Discover and procure the appropriate OCI resources, including an OCI account, tenancy, and access to the relevant services.

2. Use the OCI web user interface to become familiar with how the service functions, including required inputs (requests) and outputs (responses) from the service.
3. Configure one or more Orchestrator connections to authenticate to the OCI services. (See “Authenticating EnterpriseOne Orchestrations to OCI Services” later in this document.)
4. Build an orchestration, including Orchestrator REST connections to the OCI services, to perform a series of steps to accomplish a business process. The orchestration might include any number of EnterpriseOne data requests, form requests, connections to OCI services, or other orchestration step types.
5. When necessary, use custom script steps or logic extensions to manipulate the data that is sent to or received from OCI services. (See “Other Considerations” later in this document.)
6. When the orchestration is complete, build an appropriate client to launch the orchestration, such as a web application, a mobile application, a scheduler, or launch the orchestration from an EnterpriseOne page or form extension.

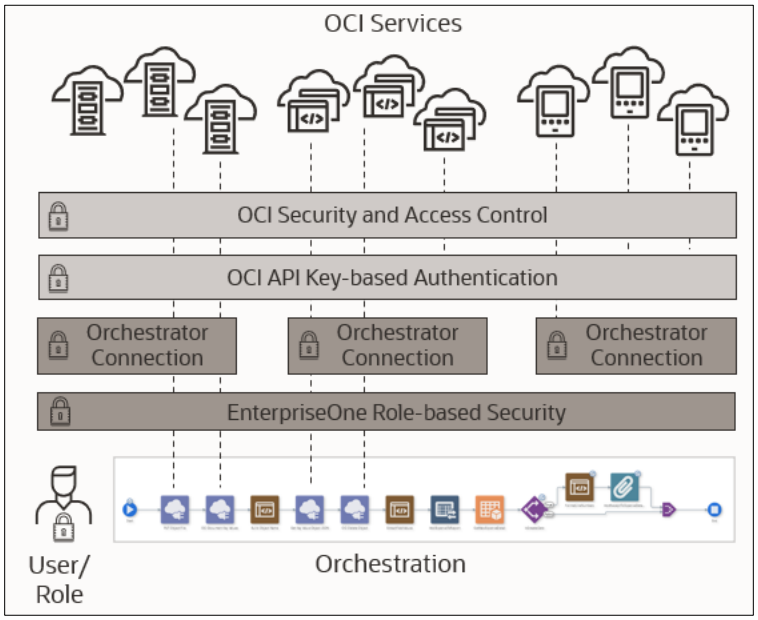
This approach of integrating OCI services with EnterpriseOne using Orchestrator requires an in-depth understanding of the business problem, a clear understanding of the OCI services, and above-average acumen in building orchestrations. Although claiming that this approach is a “no-code” solution might be somewhat overzealous, it certainly falls within the realm of “low-code” and promises a rapid, low-cost path to business value, especially compared to the alternative of custom-developed software solutions.

Authenticating EnterpriseOne orchestrations to OCI services

Before considering how to call various OCI services from orchestrations, we must first consider how to securely authenticate to those OCI services. As of the publication of this document, OCI uses an authentication scheme known as “OCI API Key-based Authentication Version 1.”An enhancement available in JD Edwards EnterpriseOne Release 24 (specifically, Tools Release 9.2.8.2) enables you to configure an Orchestrator connection to pass credentials to OCI services.

Additionally, because Orchestrator connections adhere to EnterpriseOne role-based security, you can control secure access to the connections by role or individual user. Once you have configured one or more connections to OCI services, you can create connector steps in the orchestration to perform specific functions. For example, you might design a solution in which an orchestration calls the OCI Document Understanding service to extract data from incoming invoice documents. Because this solution is intended to be used only by your Accounts Payable team, you can configure a connection to the OCI Document Understanding service and delegate access to that service only to your “APTEAM” role. Similarly, you can configure other connections to enable access to other OCI services to other EnterpriseOne roles or users. Figure 1 shows how the EnterpriseOne role-based security layer passes the authenticated orchestration user to Orchestrator connections, which in turn delegate authorization to use OCI services.

Figure 1. Authenticating to OCI services using an Orchestrator connection



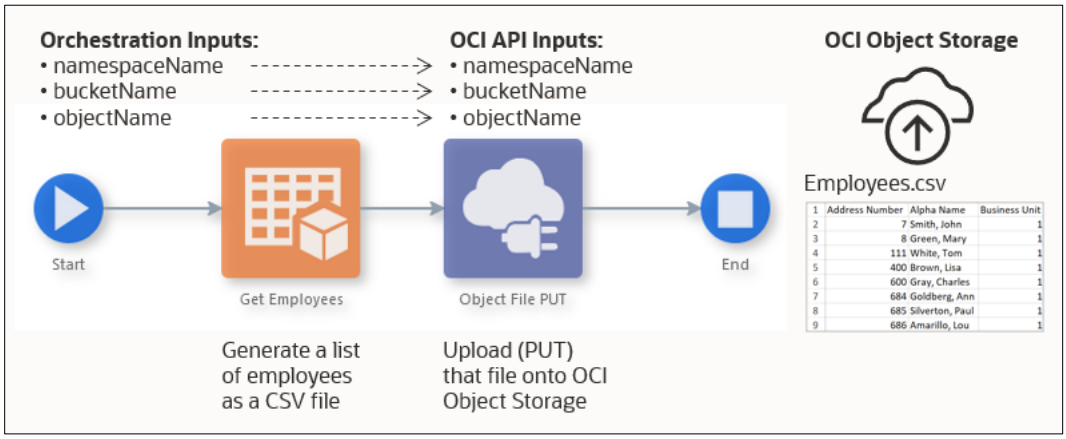
See “For More Information” at the end of this document for a link to learning paths that describe how to configure an Orchestrator connection to OCI services.

General-purpose services: Using Orchestrator to store files on OCI Object Storage

Some OCI services provide capabilities that are generally useful in many applications. For example, the ability to automate the interaction with the OCI Object Storage service by creating and deleting buckets (logical containers), uploading, downloading, and deleting objects (files), and managing object metadata. Several other OCI services that act on data expect the data to be stored in an OCI Object Storage bucket. Or perhaps you simply need a cloud repository in which to store files temporarily or permanently, for example, for archiving or auditing purposes.

Because Orchestrator can accept files as input and can also call external REST APIs, creating an orchestration to automatically upload or download files on the OCI Object Storage service is relatively straightforward. Figure 2 shows an example of an orchestration that generates a list of employees as a CSV file and then uploads that file to OCI Object Storage.

Figure 2. Using an orchestration to upload files to OCI Object Storage



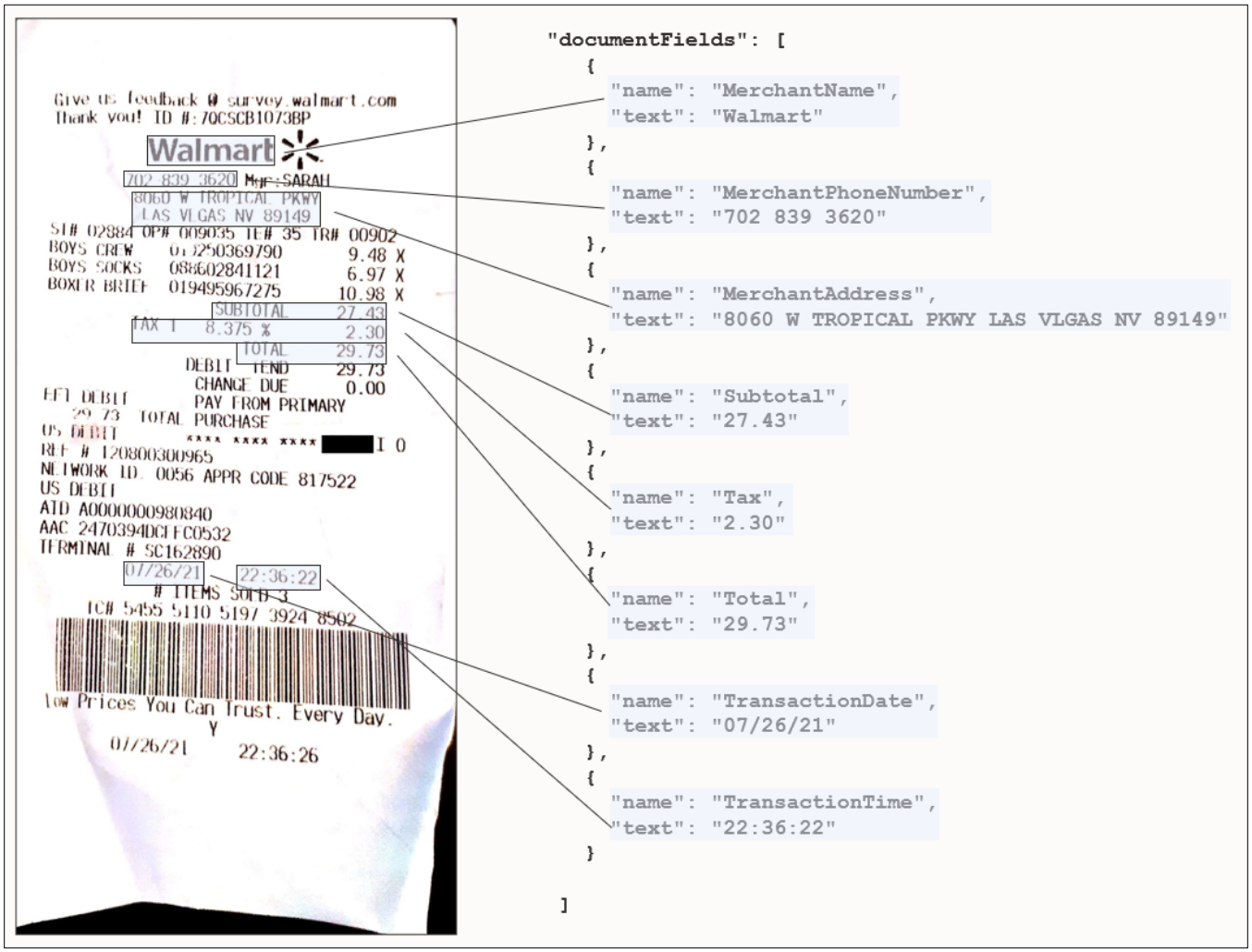
Artificial intelligence services: Using Orchestrator and OCI Document Understanding to extract data from a scanned receipt

While general-purpose OCI services provide general utility across a wide range of usage patterns, there are some OCI services that offer more specific, targeted functionality. Among these are the OCI services directed toward artificial intelligence (AI) capabilities. AI, in all its various interpretations and manifestations, has become a fulcrum at the intersection of business and technology. Of all the recent technological innovations, perhaps AI seems to be the most elusive to comprehend, to align with business objectives, and to implement for rapid return on investment. But it doesn't have to be. OCI offers AI services that are available and accessible as REST APIs, and as previously discussed, those APIs can be called by orchestrations for rapid and straightforward integration with EnterpriseOne applications and data.

For example, consider the OCI Document Understanding AI service. This service is directed at ingesting scanned image or electronic documents, applying algorithms and machine learning to "understand" the classification and content of those documents, and to extract structured data from these unstructured sources. Is this AI capability relevant to JD Edwards EnterpriseOne business processes? Are there patterns in which we would like to receive documents that represent receipts, sales orders, purchase orders, quality certifications, and so on, extract data from those documents, and use that data to create transactions in EnterpriseOne? Certainly. In fact, document handling has been the primary focus of many process automation initiatives for customers of all sizes, in all industries, and in all geographies.

Because Orchestrator can accept files as input to orchestrations, you can create orchestrations that pass files to OCI Document Understanding and benefit from its services. Perhaps you simply want to classify a file by type: Is this document most likely a purchase order, a resume, or a contract? Document Understanding can employ its AI algorithms and provide a classification with a stated degree of accuracy. Or perhaps your objective is to extract data from the unstructured document and transform it into structured data. Figure 3 shows how OCI Document Understanding can employ its AI algorithms and machine learning to identify key data in the document and return the data in a format that is usable to subsequent steps in an orchestration.

Figure 3. OCI Document Understanding can extract data from a document image



Document Undertanding is not the sole AI service provided by OCI. Similar AI services such as Vision (image processing), Language services, and Generative AI services provide similar opportunities for augmenting EnterpriseOne processes with modern AI services without an insurmountable investment in technology or skillset.

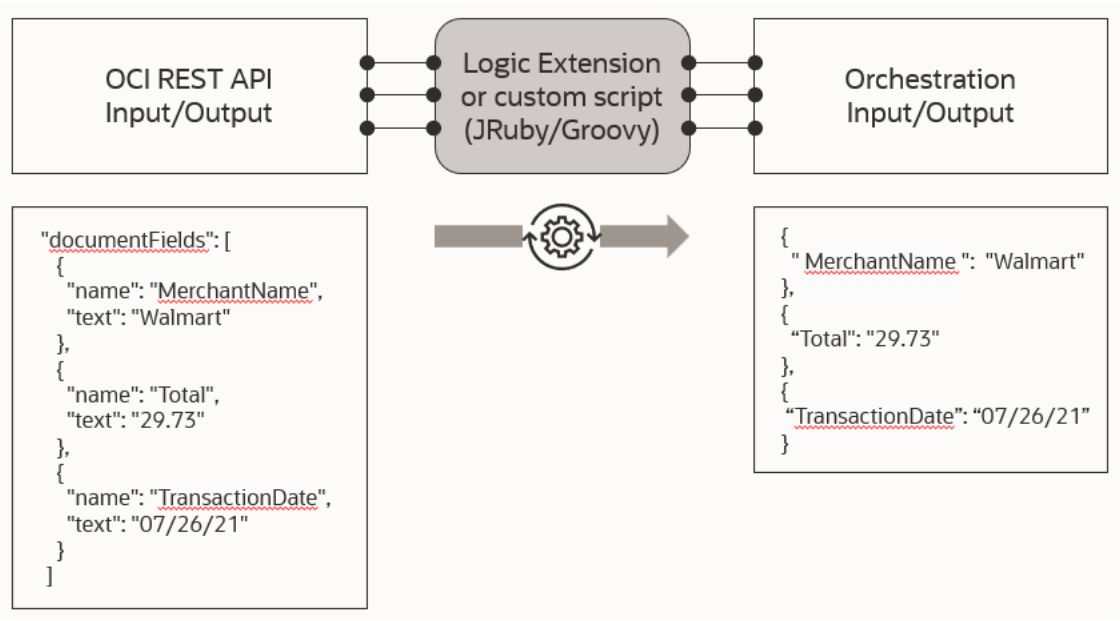
Other considerations

At a theoretical level it is convenient, and not incorrect, to think about the interoperability between orchestrations and OCI services as nothing more than the exchange of inputs and outputs as REST APIs in a well-known, structured notation such as JSON arrays and key/value pairs. However, in practice, there are situations in which, even with standard JSON notation, the implementation of inputs and outputs between orchestrations and OCI services might not be precisely aligned. Or, there might be cases in which it is beneficial to reduce a verbose output of many parameters to just a few distinct parameters. In such cases, it might be necessary to use custom logic in orchestrations, in the form of logic extensions or custom scripts (JRuby, Groovy, Jython) to manipulate the format and structure of the parameters being exchanged between orchestrations and OCI services.

For example, the illustration in Figure 4 shows how the OCI Document Understanding service returns data extracted from a document in key/value pairs. The data is returned as a JSON array with the name of the field designated in a “name” element and the value of that field designated in a “text” element. Such a JSON representation is perfectly valid. However, when passing data as parameters between orchestration steps, it is more straightforward to have a

more “flattened” representation of the key/value pairs, for example, “`MerchantName`”: “`Walmart`”. In such cases a logic extension or custom script can be used to manipulate the data from one notation to another.

Figure 4. Using a logic extension or custom script to manipulate the parameters passed between OCI services and orchestrations



Putting it all together: An orchestration to read a receipt image and create an EnterpriseOne expense report using OCI services

In the previous sections we discussed a number of discrete ways in which orchestrations can interact with OCI services:

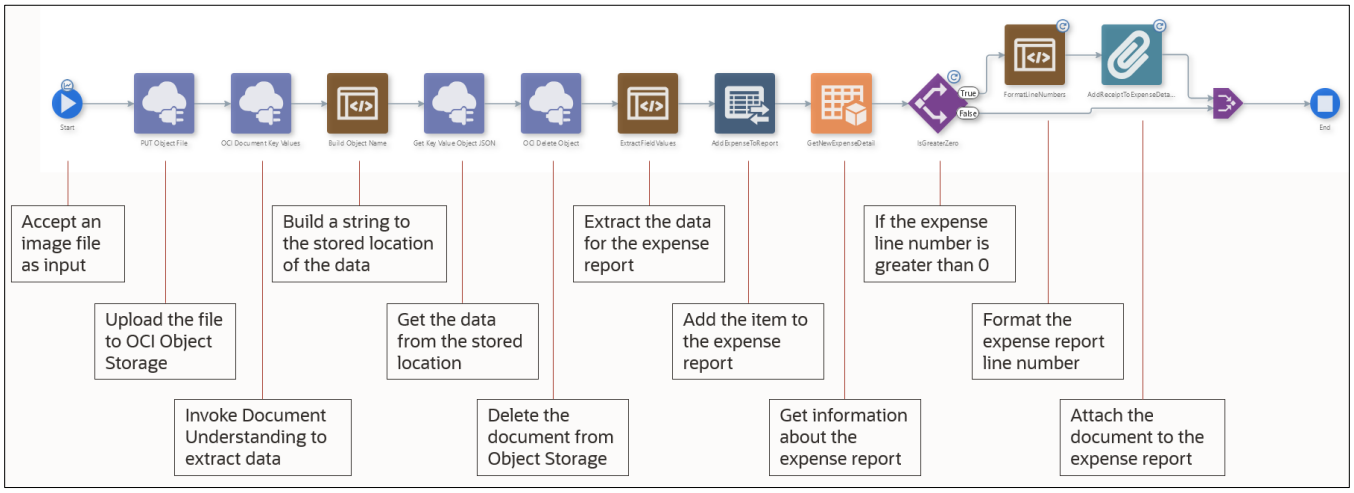
- Using an Orchestrator connection to authenticate EnterpriseOne users to OCI services
- Using the OCI Object Storage API to upload a file
- Using the OCI Document Understanding API to read a document image and extract data
- Using logic extensions or custom scripts to manipulate the format of data within an orchestration

However, the real business benefit is realized in the cumulative value of stringing these components together to comprise an end-to-end business solution. Let’s consider this use case:

> **Business Problem:** Your internal expense controls require employees to submit document receipts for expense report items. Expense items are often lacking the required documents, and users often make mistakes by mistyping important information such as an expense amount or date. This causes undue rework, delay in paying expenses, and sometimes bad data in the EnterpriseOne system.
>
> **Objective:** Streamline the process of attaching receipts to expense reports and eliminate human data entry.
>
> **Outcome:** 100% compliance with controls, 100% accuracy of data, faster and easier user experience.

How can we accomplish this? The illustration in Figure 5 shows an orchestration that integrates capabilities of OCI services and EnterpriseOne applications to perform all the necessary functions in a single orchestration.

Figure 5. Putting it all together: An orchestration to ingest a scanned receipt and add it to an expense report



And there we have it: an orchestration that, in a single invocation as a REST API, integrates the process to:

1. Accept a scanned image document as input.
2. Upload the file to OCI Object Storage.
3. Call the OCI Document Understanding AI service to read the document and extract data.
4. Pass the data to the EnterpriseOne Expense application to create an expense item.
5. Attach the document to the expense report.

In a complete, real-world scenario, the only remaining task would be to expose this orchestration to a user, most likely through a mobile application that could leverage the mobile devices camera to capture the image.

See “For More Information” at the end of this document for a link to a learning path that includes detailed steps on how to build this orchestration.

Summary

Over a span of years, perhaps decades, you have already realized immense value from your JD Edwards EnterpriseOne system through its ability to capture, process, store, and report your critical business transactions. As the source of truth for your business data—your digital gold—it helps to guide your operations and enables you to make informed business decisions. And as technology pushes forward, the EnterpriseOne digital platform, anchored by Orchestrator, keeps your EnterpriseOne system integrated to advancements in the digital economy. Oracle Cloud Infrastructure offers such advancements in the form of infrastructure, utility, and AI cloud services. This document invites you to explore the myriad of use cases made possible by integrating your EnterpriseOne system with OCI services using Orchestrator. Securely. Flexibly. Powerfully. Regardless of how long you have been using EnterpriseOne to amass your “digital gold,” you can leverage the latest technologies, including OCI AI services, to augment—to amplify—the value you realize from your EnterpriseOne system.

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For more information

For more information and details about implementing OCI cloud services with JD Edwards EnterpriseOne as described in this document, refer to the following resources:

- *Oracle Cloud Infrastructure Documentation*: API Reference and Endpoints
- *Oracle Business Brief:* Oracle Artificial Intelligence with Oracle JD Edwards EnterpriseOne
- Frequently Asked Questions for Oracle Cloud Infrastructure (OCI) Artificial Intelligence with Oracle JD Edwards EnterpriseOne
- *Learning Path* - Using OCI AI Document Understanding to Add Expenses to JD Edwards
- *Learning Path* - Inspecting Components in JD Edwards using OCI AI Vision
- *Learning Path* – Using OCI AI Document Understanding to Automate Invoice Processing in JD Edwards
- *Learning Path* - Creating an Orchestration to Retrieve OCI Usage Data

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