iPaaS Platform Overview

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1 PLATFORM

iPaaS platform is a suit of modules for connecting systems and data across different environments, including cloud (hybrid and multi-cloud integrations).

The platform is fully-managed specifically designed for communications and media service providers as they navigate the ever-growing integration requirements of their digital journeys.

Amdocs iPaaS is a modular on-premise, cloud and on-prem hybrid integration service, leveraging an agnostic, flexible and adaptable integration platform, enabling you to connect and integrate any endpoint seamlessly and efficiently, while reducing the burden of integration-related costs.

With its telco-specific technology foundation, tools and full integration lifecycle services, the service supports any integration environment and endpoint, accelerating time to market for new services and innovation, while reducing operational risk and saving significant IT integration costs.

The Amdocs iPaaS innovation manifests in the following unique manner:

- **Technology (IP platform)** – developed by amdocs based on existing technology and new developments. The platform features unique capabilities to dramatically reduce integration time and costs.
- **Enterprise grade data processing module** – Using a real-time data processing engine to apply codeless logic and classification to massive amounts of data and transforming that data into a unique persistent model that supports operational and analytics tasks.

1.1 Platform Highlights

Amdocs iPaaS's key value, on top of being a fully featured integration platform, is that it holds telecommunication and media-specific assets – accelerating onboarding time and reducing OPEX & CAPEX expenditures by providing the full depth and breadth of both from a technical and value perspective

1.1.1 Common Functional Features

- **Integration - supporting TM-Forum Open APIs standard,** including pre-integrated, pre-enabled Open APIs with future commitment for enhancements in alignment with TMF releases. In addition, we support additional TMF telco data models (SID).
  Supporting predefined connectors to Amdocs BSS/OSS systems as well as to third-party applications.

- **Built in Industry-related modules** – including product-catalog mapping (crucial for a multi-catalog industry), customer-entity links, order fallout and order-handling components.
- **BPM \ BPS (Business Process Service)** – including industry-specific predefined business processes and integration flows (order, care, billing, etc.) from any internal or external channel. Amdocs iPaaS's BPM engine also enables the efficient creation of automated integration flows, monitoring & visibility, and issue remediation in case of 'rainy day' scenarios.
- **Workflow measurements** – Business Workflows measured during all work processes, providing analysis and visualization in a high-level and drilled-down view. Amdocs iPaaS uses analytics to analyze back-office order-to-activation processes and identify bottlenecks and inefficiencies in real time. This mechanism is used sophisticatedly to optimize the processes by automatic decision-making based on the business KPIs and contracted SLAs.
- **Business rule engine** – Out-of-the-box integration with open source BRE is used for data mapping, serviceability validations, data transformation etc. This module, with its smart dynamic rules integrated with the workflow engine, optimizes the order decomposition and routing, harnesses automation, semi-automation, and smart manual handling to timely complete the order-to-activation process within SLA.
- **Analytics, reports, E2E process monitoring** – Amdocs iPaaS uses analytics to evaluate back-office platform processes (identifying bottlenecks, inefficiencies, and other events) in real time, providing analysis and visualization at both a high-level and a granular view to quantify operating expenses, savings and revenue leakage. These measurements are then used to optimize and automate transaction remediation.
- **Having "Low-code" visual designer integration UI,** enabling the creation of new integration and translation rules between interfaces, without the need of code.
- **"As a Service" models** – being positioned on the cloud, the platform and service is supporting 'as a service' business and commercial models (for example, subscription fee per transaction/order/activation) as well as 'pay per subscription' models.

1.1.2 Non-Functional Features

- **Utilizing Open Source** – Amdocs iPaaS utilizes open source products for main processes (i.e. Business Rule Engine), allowing virtualization, scalability, access to resources, and so on.
- **Security** – Security capabilities, ensuring end-to-end privacy and network access control, covering network firewalls, web application firewall and API gateway; security layered-defense architecture combines multiple mitigating security controls to protect resources, data and the execution processes.

- **Common Data Repository** – All processed transactions are first extracted and transformed into a common data model in the Amdocs iPaaS common data repository, providing the ability to access all tools and update the central data repository directly without having to work specifically on the production environments.
  RDBMS and NoSQL compliant – Amdocs iPaaS supports both NoSQL and RDBMS databases for operational, analytics and data lake
- **Container based architecture** –Amdocs iPaaS fully supports deployment as a Docker.

1.1.3 Services

Amdocs iPaaS offers the complete breadth and depth of business value-driven integration lifecycle services required for a successful Enterprise Integration Platform as a service (EiPaaS) environment.

- **API and business process management consulting:** building strategy, roadmaps and enterprise-grade hybrid solutions using proven best practices and technologies
- **Design and development:** ideation, architecture and development with DevOps capabilities, as well as implementation of enterprise-wide solutions
- **Testing:** full spectrum of manual and automated testing services across the entire integration lifecycle
- **IT operations:** ongoing management and governance over the iPaaS platform and related IT infrastructure (on-premise data centers, private/public cloud), including proactive issue identification and resolution
- **Business operations:** end-to-end visibility and control over integration flows, ensuring all SLAs and business KPIs are met

Amdocs iPaaS's value proposition stems from the unique fusion of its technological IP platform and end-to-end professional services, as well as its unmatched industry expertise and knowledge.

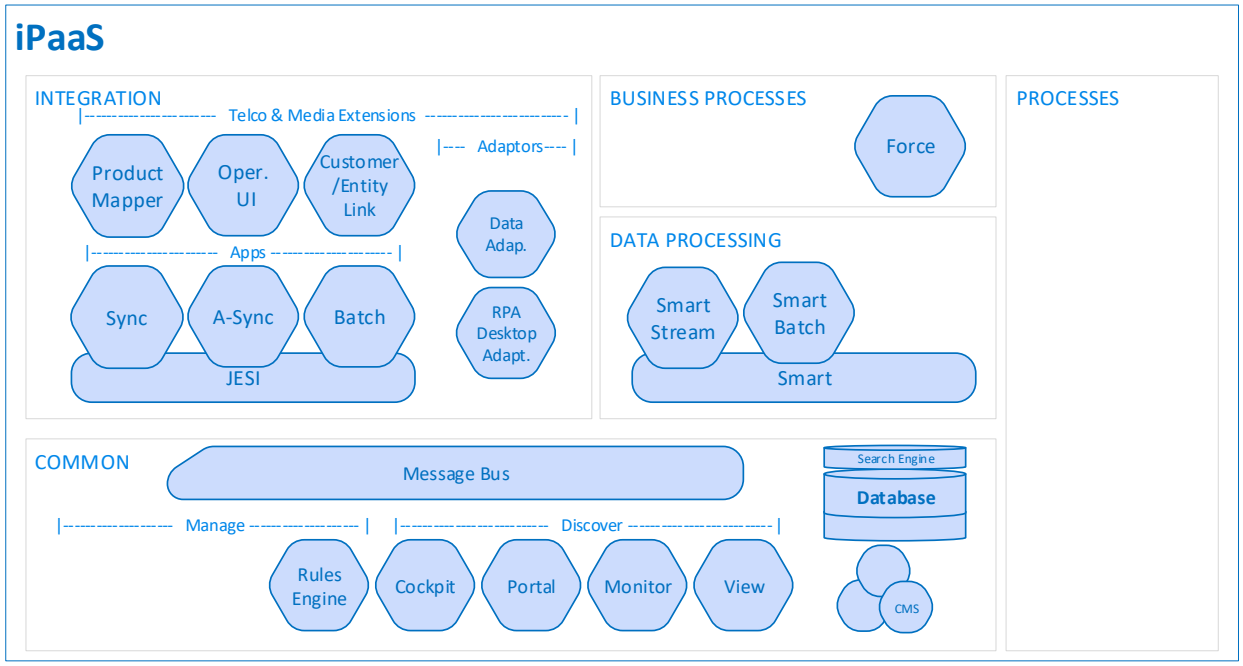
1.1.4 Deployment patterns

Enterprise-grade iPaaS is focused on supporting the onboarding and handling of multiple **complicated** integration scenarios, environments and external partners, including the principal ones outlined below:

- **Hybrid IT environments** involving integration from on-premise applications to cloud-based applications. For example, Amdocs DigitalONE connecting new self-service, microservices based portals to backend legacy.

- **Multi-cloud integration** - integrating between multiple applications all residing on different clouds (Azure, AWS) with different technologies.
- **A combination of Hybrid IT and Multi-Cloud** – integration between cloud native apps (for example, Salesforce, Service Now) and on-premise on the one hand, but also integrating capabilities from various cloud vendors (Google/AWS – NLP, Image recognition, etc.).
- **On-premise to on-premise integration** - now commonplace M&As (Mergers & Acquisitions) resulting in dozens of different IT stacks (billing, CRM, product catalogs, etc.) which must be integrated together.

1.2 iPaaS platform modules



DOMAIN	MODULE	DESCRIPTION
INTEGRATION	iPaaS Sync	Synchronous integration services
	iPaaS A-Sync	A-Synchronous processes and persisted orchestration
	iPaaS Batch	Timer and event trigger processes
	iPaaS Operational UI	Manage, view and update transitions
	iPaaS Product Mapping	Mapping between source and target catalogs
	iPaaS Data Adapters	ETL and data quality
	iPaaS RPA	Robotics Process Automation where no API is available for system
	iPaaS Customer Link	Link customers and entities into hierarchies
BPS (Business processes)	iPaaS Force	Business process management with workflows tasks
DATA PROCESSING	iPaaS Smart - Stream	Mass data processing – live streaming
	iPaaS Smart - Batch	Mass data processing – DB batch
	iPaaS Smart – ML	Data analytics using ML
COMMON MODULES	iPaaS View	BI & Analytics
	iPaaS Portal	Reporting & form platform
	iPaaS Monitoring	Integration monitoring
	iPaaS Cockpit	Systems tracking and alerts
	iPaaS Rules Engine	Rule Engine over workbench UI and offline files
	iPaaS Databases	RDBMS and NoSQL DBs for operational, monitoring and data lake

2 MODULES

2.1 INTEGRATION

2.1.1 Platform Engine common to iPaaS Sync, A-Sync and Batch

2.1.1.1 Connectors library

- JDBC data source
    - Oracle
    - MySQL
    - PostgreSQL
    - Microsoft SQL Server
    - DB2
    - Apache Ignite
- NOLSQL
    - Cassandra
    - Elasticsearch
    - Couchbase
    - Vertica
- Salesforce Object Query Lang
- HTTP SOAP
- Http REST Swagger
- EJB
- SSH
- FTP \ SFTP
- Message
    - Kafka
    - RabbitMQ
    - Weblogic

    - JMS
    - Apache
    - MS
    - IBMMQ
    - AWS SQS
    - Google Pub/Sub
- SMS
- Apple - APLE APNS notification connector
- Telnet
- LDAP
- Mail
    - POP3
    - IMAP
    - SMPTP
- EWS for Office 365
- Tuxedo via Jolt

2.1.1.2 Framework Extensions

- Spring framework -
  Framework for programming and configuration
- Apache Camel -
  Framework for integration

2.1.1.3 Security

- In Transport
    - SSL/TLS
- In API:
    - Basic HTTP
    - Digest access authentication
    - OAuth 2.0 Authentication
    - WS-Security
- Integration with IDM (Identity Mng)
    - ASM (OOB)

- A3S - amdocs IDM as a service
- Support Security Provider plugin functionality for
  - Event Generators – API service exposure
  - Channels – service consumption

2.1.1.4 Concepts

Contract First

- Template driven
- Automatic generation of channel artifacts based on industry standard inputs
  - Interfaces
  - Hooks
  - Execution flows
  - Channel parameters
- Supported inputs
  - Swagger
  - WSDL
  - EJB
  - Jolt
- Legacy Protection
  - Circuit Breaker – detect failures and prevent repetition of it
  - Rate limit – protects back-ends services from overloading

2.1.1.5 Target Adapter Approach

- Route & execute
- Target application logic
  - Transform from Common Data Model
  - Execute commands
  - Notify status
- Multiple target adapters for any application (e.g. submit order request can have different contracts or protocols in diff applications, data virtualization requests etc.)
- Assure delivery

- Stateful services

2.1.1.6 Main features

2.1.1.6.1 Related document

See document: **Integration - workflow user guide**

2.1.1.6.2 Workflow Manager

The Workflow Manager (WF), provides a powerful workflow engine to support automation, measuring and optimization of business processes.

There are two types of activities in the iPaaS Workflow Manager: Basic and Nested. Some of the nested activities are flow control activities (If/Else, Switch, While, ForEach).

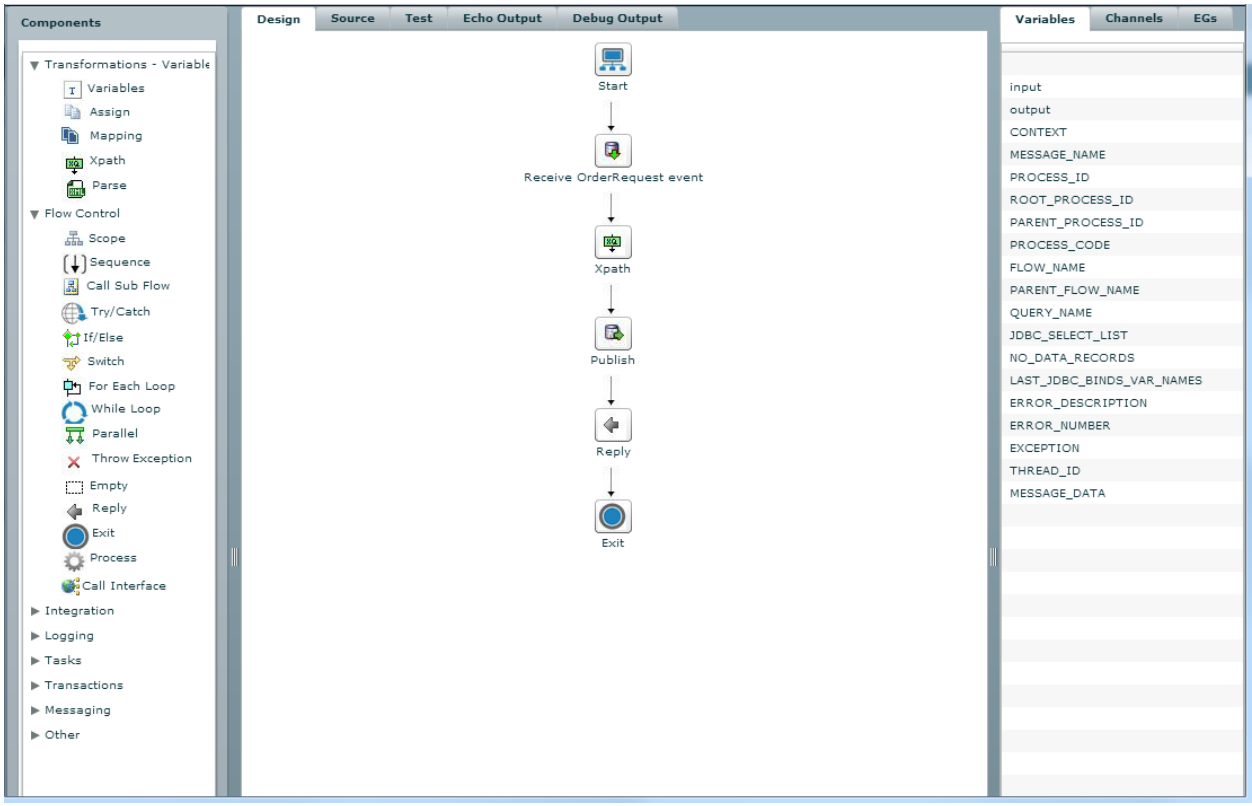
Following are some of the Workflow Manager functionalities:

- Supports the creation and update of workflows
- Supports Task activities (A Task is a special activity that defines the workflow as a human workflow).
  - Provides a Web Services API for task activities
  - Supports authorization management for users and groups. Only authorized users and groups can act on a task.
- Supports process versions, to allow updating processes that have running instances
- Persistence flow recovery
- Workflow can publish events and subscribe to events
- Supports various types of alarms that are related to various activities. The alarms are activated by due dates and publishing events.
- Supports a built-in calendar
- Supports transaction fragment definition, meaning one or more activities that are performed sequentially

2.1.1.6.3 Process Flow Designer

iPaaS provides a visual web tool with which to design workflow processes.

- The Designer provides the following:
  - Out of the box activities that can be used by the workflow
  - Drag-Drop activities
  - List of all the variables defined in the flow, including reserved variables
  - The variables can be reused within the workflow
  - List of all the server source adapters and target adapters that can be used within the workflow



Following are some of the basic activities that are supported out of the box:

Variable:	Creates new variables in the flow. All variables in the flow are maintained in the flow context and can be used in other activities.
Validation:	Allows execution of validation that is defined internally in IPaaS
Assign:	Can be used to copy data from one variable to another, as well as to construct and insert new data, using functional expressions

Mapping:	Provides IPaaS to transform one variable to another by using a predefined mapping
Xpath:	Invokes the Xpath engine Using the Xpath engine, it is possible to access values inside a variable even when the variable type is indeterminate.
Dictionary:	Provides easy access from the process flow to predefined dictionaries. Dictionaries can be file based or database Query based.
Parse:	Invokes the XMLParser, which parses a string to the xml object.
Code:	Runs a java code within the process flow.
Java:	Invokes a java method on a java class or object.
Throw:	Throws an exception of any requested type.
Channel:	Enables the process flow to integrate with external systems; for example, web services, db, files, and JMS.
Flow:	Calls a sub flow in a synchronic or a-synchronic manner.
Echo:	Prints a text to the log file/console.
Logging:	Enables logging at any stage in the flow This can be used for the flow monitoring and reporting (please refer to the dashboard reports section). IPaaS provides also the ability to print to a log file using the log4j abilities.
Wait:	Changes the process status to standby and postpones it until the duration time passes, or the deadline has arrived.
Calendar:	Invokes the business calendar to assist in calculating dates using a predefined calendar.
Human Task:	Invokes a task that requires a human activity and waiting for user input before the flow can be completed.
Publish:	Invokes the Publish Event Manager to publish a dispatch event.
Receive:	Allows the flow to subscribe to events.
Sort:	Receives as input List, Vector or Array and sort it by the required field.
Merge:	Receives two input objects and merges them into one.
Replay:	Allows the business process to return a variable or a constant.
Exit:	Allows the business process to exit the flow and determine what would be the process flow status
Save point:	Allows for setting process save points.
Call Interface:	Allows for calling an existing IPaaS Interface handler

Add Note:	Enables adding new notes to a persistence type workflow
Business Rules:	allows execution of business rules in external Business Rule Engine

Following are some of the nested activities containers that are supported out of the box:

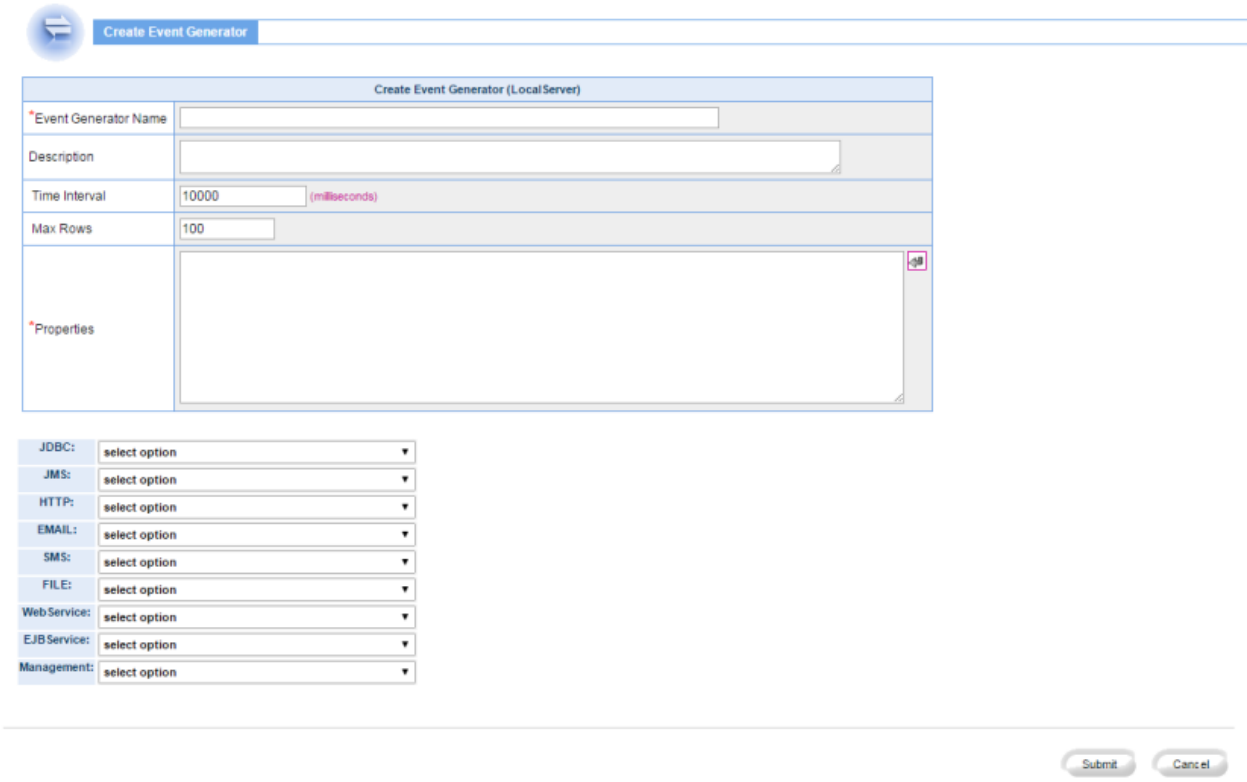
If/Else:	
For each:	
While:	
Switch:	Provides conditional behavior for list of conditions
Sequence:	Provides the ability to perform multiple activities sequentially
Parallel:	Provides the ability to define few sequential processes to run in parallel
Try/Catch:	Wraps some activities in a Try element and in case of failure, the activities in the Catch element will be executed.
Pick:	Allows the flow to subscribe to several different events simultaneously

2.1.1.6.4 Source Adaptors (Event Generators)

IPaaS provides transactions screens to allow users to define source adapters.

The source adapters can be any one of the following types: JDBC, JMS, HTTP, Email, SMS, File, Web Service, EJB Service

Figure 2-1 Create Event Generator Screen

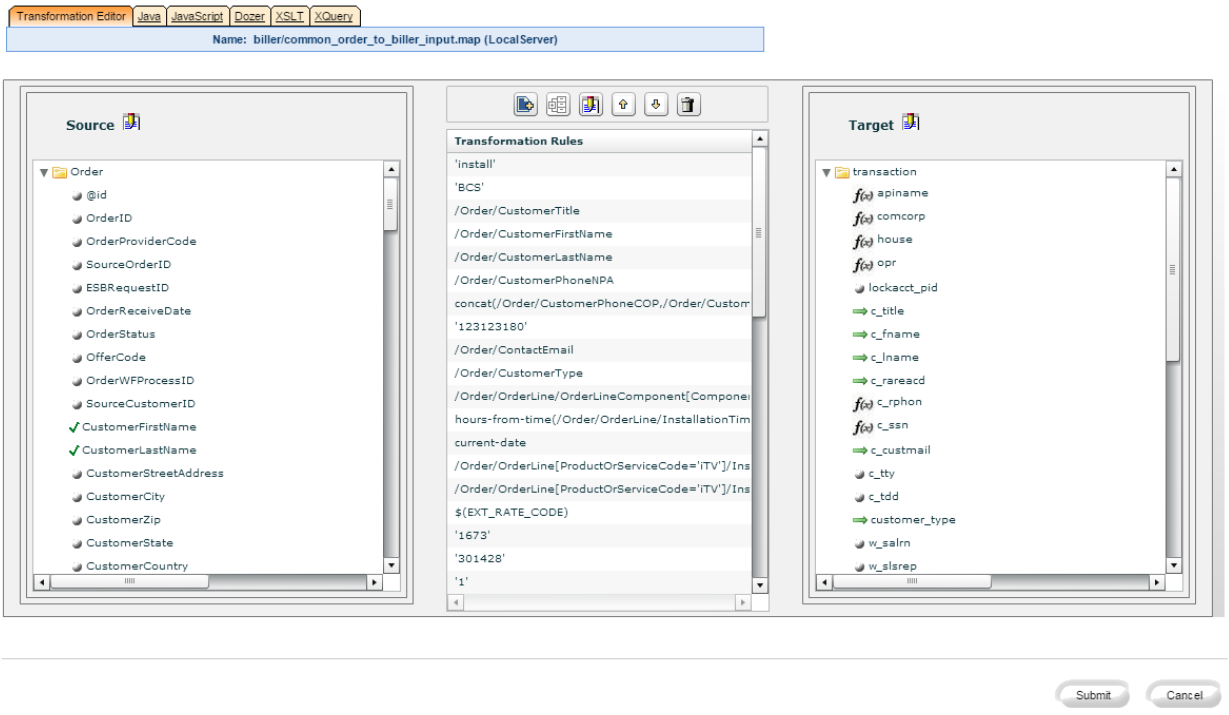


2.1.1.6.5 Transformation Designer

IPaaS provides a visual web tool with which to define transformation and mapping between different objects.

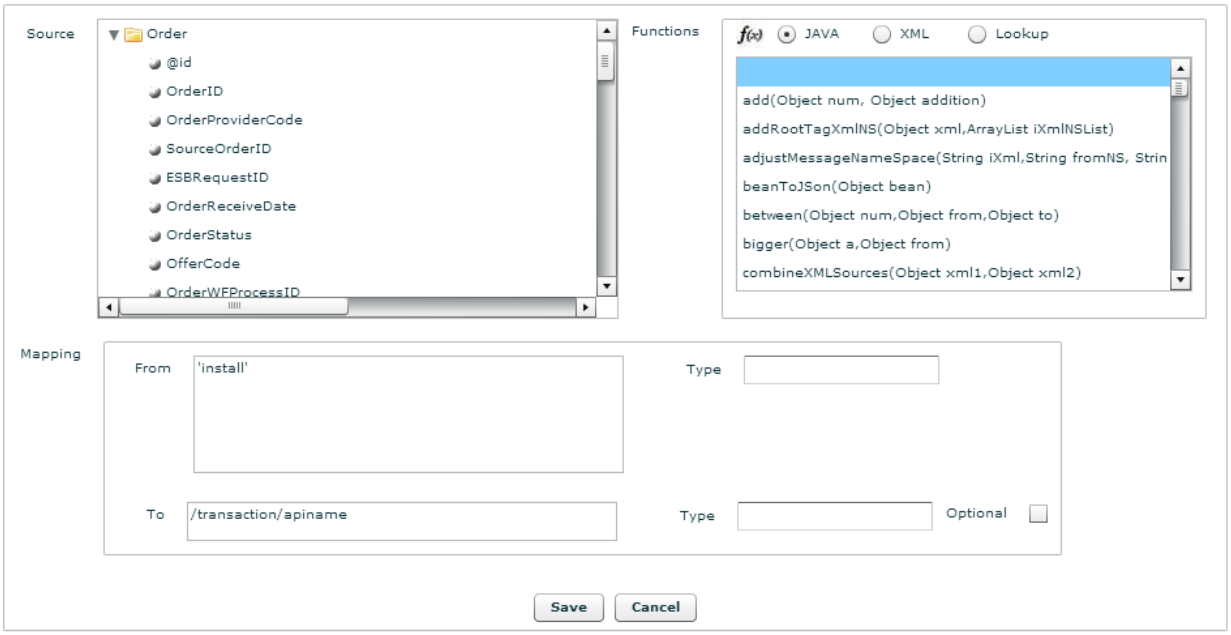
- The Designer supports:
  - Drag Drop
  - Display mapping rules and allows editing them
  - The transformation input/output can be one of the following: Java, XML, XSD, WSDL, JSON, Flat, etc.

Figure 2-2 Transformation Editor Tab



- Ability to define mapping rules using Java functions, W3C XML functions
- Ability to define mapping rules using Lookup. Lookup can be done on a database using JDBC, files or web services.

Figure 2-3 Defining Mapping Rules Using Lookup Screen



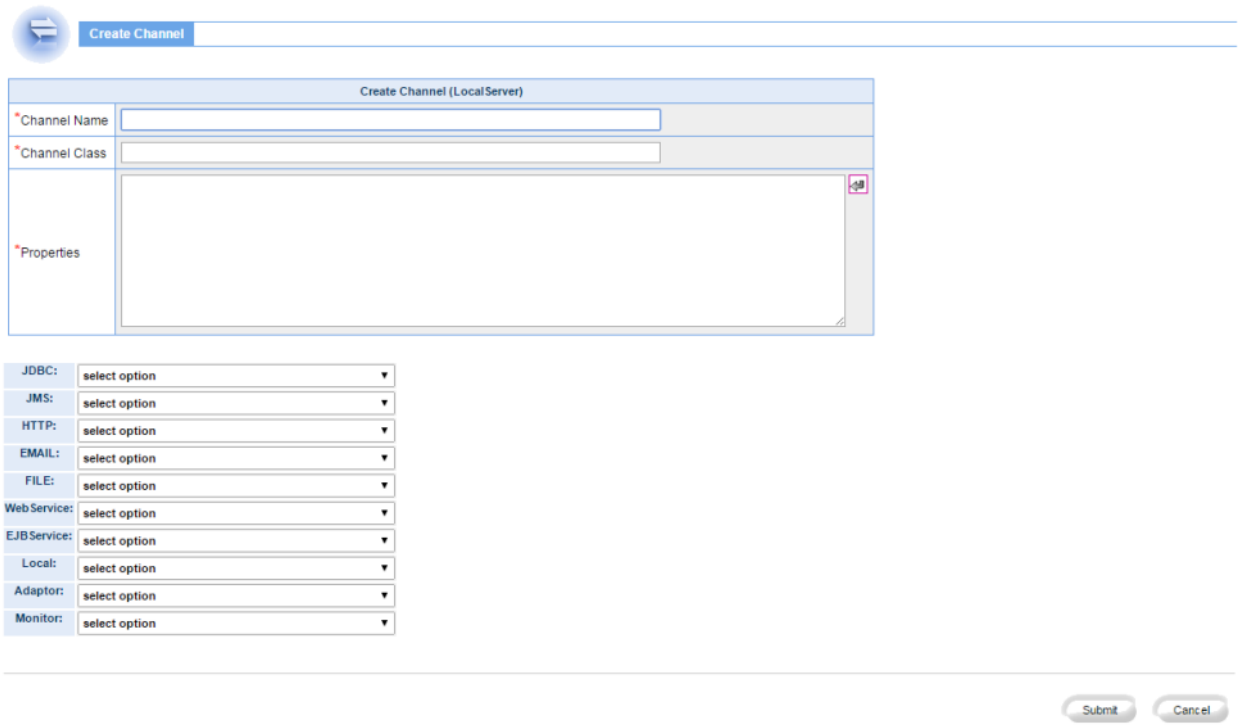
2.1.1.6.6 Target Adaptors

A target adapter is a configurable workflow process that has the logic of how to transform the required information from the Logical common data model to the target system model, as well as the procedural requirements, to perform the required activities, by calling the relevant services in the right sequence, etc.

Each target system will have dedicated target adapters for specific functions.

IPaaS provides transactions screens, in which to define target adapters.

Figure 2-4 Create Target Adapter Channel Screen



2.1.1.6.7 Event Handler

The Event Handler is responsible for invoking the relevant workflow process that is associated with the event type. It is designed to handle internal (timer triggered or in-flow events) or external events (for example. API calls) as well as being able to operate either asynchronously or synchronously, handling all incoming events received by iPaaS Integration Layer.

2.1.1.6.8 Transaction Decompression

Transaction-identified dependencies are queued according to the type of dependency. iPaaS, will apply the rules check to verify when the dependency is fulfilled and the action can be executed, or alternatively when the "previous" step has failed and as a result the dependency should be failed as well.

2.1.1.6.9 Lookup Manager

The Lookup Manager assists the data mapping mechanism and supports the mapping of data from one structure to another, by using predefined lookup tables. The lookup can access internal and/or external repositories. The Lookup Manager assists and provides the ability to retrieve decode values from reference tables, files (e.g. xml and text files) and by calling web services.

2.1.1.6.10 Validation Manager

The Validation Manager provides the ability to define execution checkpoints where validation logic and data manipulation is performed. The validations can be written in Java or JavaScript and can be turned on and off easily in any IPaaS process, via the IPaaS Admin UI.

2.1.2 iPaaS Sync

Module used for managing Synchronous integration services, utilizing capabilities listed in the platform engine chapter

Provided integration and mapping services to external systems and inner services provider for other iPaaS modules

This module can run with or without persistency

2.1.3 iPaaS A-Sync

Module used for managing A-Synchronous processes and persisted orchestration

2.1.4 iPaaS Batch

Module used for batch-oriented processes being involved by predefined events - such as timer, message or timers.