

Automated Service Builder

Framework for globally distributable processing



Overview

ASB is a platform and application agnostic solution for implementing complex processing chains over globally distributed processing and data resources. ASB provides a "low coding" solution to develop a data processing facility based on orchestrated workflows. ASB makes it possible for users to define, configure and run algorithms embedded in workflows with an Automated Generation of Workflows. ASB provides functions to register new processes, graphically edit workflow definitions, executing processors with user-defined parameters, and access the results either through a product catalogue or an FTP server. ASB has implemented a customizable ontology-based mechanism that verifies the consistency of the dataflow between processes. Only compatible process parameters may be connected to pass data within workflows. Unconnected input parameters are treated as user defined inputs for which a Web-based interactive interface is automatically generated.

Generic Flexible Orchestration means that processor tasks are orchestrated by the workflow engine independent of the location of the actual executable files and independent of the underlying programming languages and related technologies. User algorithms are packaged, deployed and executed on user-selected platforms which can be where the data is located.

Algorithm developers and software specialists benefit from ASB support to Algorithm development that allows user's own algorithms and libraries to be included in the ASB knowledge base as well as providing a platform to co-develop algorithms for faster development cycles, easy substitution of modules in processing chains for comparative studies and scalability at processing platform and algorithm levels.

ASB is offered as a service, implemented by Space Applications Services or as a product to develop a processing facility supported by Space Applications Services

Applications

Defining, managing and executing complex heterogeneous processing chains (workflows) using globally distributed data and processing resources.

Services Available

Service to scientists and data analysts to perform data processing.
Product for use in developing processing facilities requiring highly scalable solutions. Implementation and customization.
Implementation and customization

Become a User

For more information on becoming a user of ASB, please visit this website:
<https://asb.spaceapplications.com/demo>

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Using ASB

Users provide algorithms and libraries to be ingested into ASB to create custom processors for use in workflows. All the processes to be executed by the processor are deployed and registered in the platform with the process metadata being registered in the Knowledge Base.

A graphical workflow editor (Figure 1) is used for identifying the processes and specifying the flow of the data between these processes (output to inputs connections).

Data flows that are undefined in a workflow are treated as user provided inputs. A form is dynamically generated and includes all the process inputs present in the workflow not connected to a process output (Figure 2).

Systematic (event driven or scheduled) and on-demand processing using the generated parameterisation form are supported.

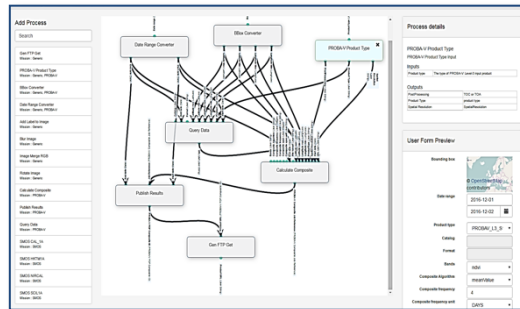


Figure 1 Graphical Workflow Editor

Progress monitoring showing the status of the processes in a workflow and percentage completion of executed processes is presented.

When the execution is complete, a report is generated which contains information about the execution as well as links to the generated data products.

Figure 2 Parameterisation Form

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Installation modes

ASB can be installed in **Stand-alone** mode where all the components as well as the processing chains are deployed and run on a single host. This setup is in particular convenient for developing and testing algorithms on small amounts of data and is particularly attractive to algorithm developers.

In **Cloud** mode, the process execution environment is a Private or Public Cloud, where resources are scalable. The available processing resources, in the form of VMs, are automatically detected and used to deploy processes. In this mode, intermediate and final products remain in the cloud, close to where they have been generated.

The **Cluster** mode is a restricted Cloud-mode in which the available processing resources are static.

Operation Environments

There are two distinct environments: the Controller Node, and a Cloud-based Environment, in which Worker Nodes are deployed as illustrated in Figure 3.

The *Controller Node* comprises a number of core components, exposing their functions through remotely callable (SOAP or REST) APIs making it possible to distribute the components on several (physical or virtual) hosts, should it be necessary. Its physical location is of little importance. It can be deployed locally or remotely, in a dedicated server, or in a Cloud.

Worker Nodes are Virtual Machines (VMs) running in Cloud Environments. By default, these VMs run an Agent and have no pre-installed processes. Workflow processes are dynamically deployed and executed.

ASB Components

Product Catalogue

The Product Catalogue stores the metadata of all the products available in the system.

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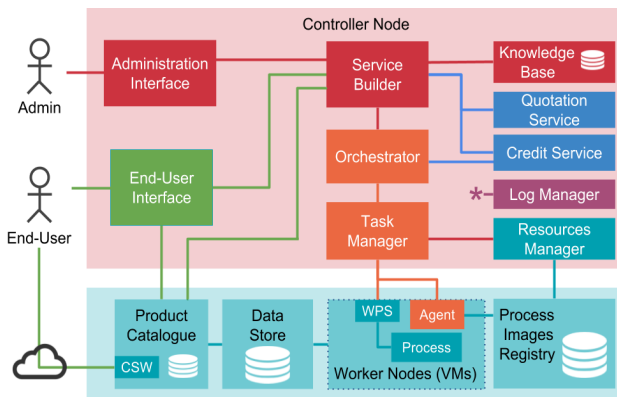


Figure 3 ASB Core components

Knowledge Base, injecting user-provided inputs if any, resolving the dependencies between processes and selecting the appropriate input data products. The Orders are transmitted to the Orchestrator for

execution.

Orchestrator

The Orchestrator is in charge of executing processor workflows. Individual process execution requests are sent to the Task Manager.

Task Manager

The Task Manager's role is to abstract the execution of each task launched by the Orchestrator, by hiding the Cloud Environment where the task will be executed. The Task Manager balances the load of the tasks stemming from the Orchestrator according to the resources deployed in the Cloud Environment.

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The actual products are persisted in the Cloud. These products are accessible for download to the registered and authenticated end-users. The Product Catalogue gives also the possibility to search for specific products according to criteria.

Knowledge Base

The Knowledge Base contains the information necessary to generate the products. In particular, it stores the definition of knowledge elements such as data types, input and output parameters, processes and processors.

Service Builder.

The Service Builder transforms product requests into Workflow Execution Orders by fetching the necessary definitions from the

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Resource Manager

The component maintains a registry of all the processes that can be deployed.

Process Images Registry

The Process Images Registry stores the image of the containers in which the processing services are deployed. Images are available for download, instantiation and execution. Each of these images may be instantiated and started multiple times within the same VM or within several VMs.

Quotation Service

The Quotation Service computes the estimation of IT resource required to run a given process with specific inputs.

Credit Service

The Credit Service holds the credit values for each end-user of the system. These are used by the Service Builder in order to control access to the product generation. The Credit Service converts IT resource values or estimations into credits.

Log Manager

The Log Manager collects and stores the log traces issued by the other ASB components. It also gives the administrator the possibility to browse and query these data in a highly configurable Web-based interface.

End-user Interface

The End-user interface is the web-based graphical front-end that allows an End-user to access the Product Catalogue and generate new Products. This interface also allows following the progress of the products being built and to access information about the products that have been generated in the past.

Administration Interface

The Administration interface gives access to the various administration interfaces implemented in the ASB Core Components.

Processing Service

A Processing Service is the execution unit of the atomic tasks of a Workflow Execution Order.

It wraps a pre-existing processor behind an OGC WPS interface, so

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that it will process given inputs into outputs in a standardized way.

A Processing Service can also be used to get a resources consumption estimation of a specific process from the Quotation Service.

Roadmap

ASB will be extended and improved in already on-going activities.

This will include additional functionality for editing and knowledge base definition functionality.

Also, the introduction of an installation mode to include the use of HPC is planned.

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