HUBBLE

PERCIVAL

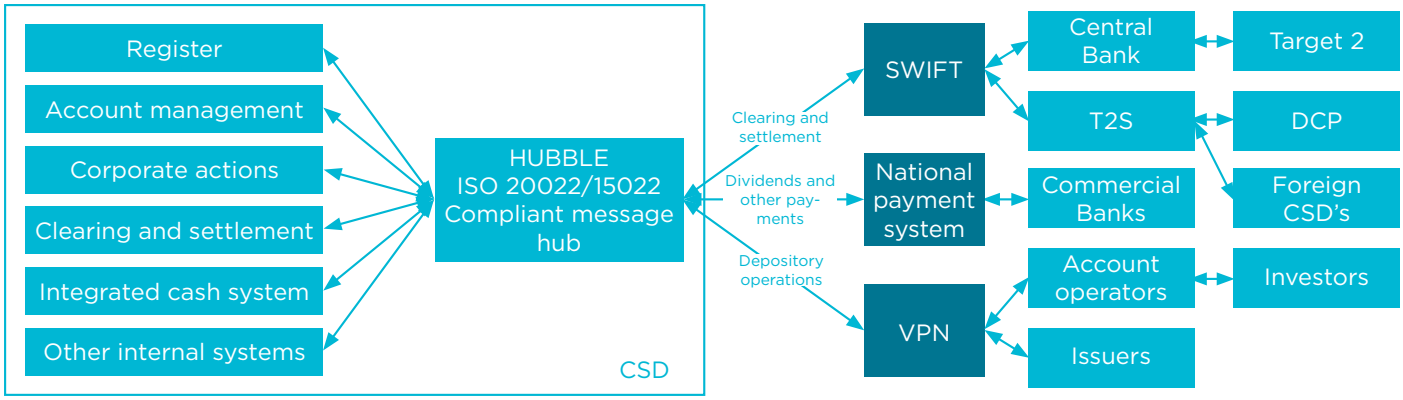
HUBBLE - Enterprise Service Bus

HUBBLE is Percival's integration tool that connects business solutions using a range of connectivity options. Connections can be chosen from a wide range of standard methods including message exchange, direct API connections, web services, SQL and more. Message protocols can be international standards like FIX or ISO, and it is also possible to configure proprietary messaging and connections to handle integration with legacy systems.

HUBBLE is Percival's preferred integration tool as there are ready-made configuration packages for our own products (DEPEND, REGARD, CAPSULE).

HUBBLE is based on an ESB (Enterprise Service Bus) solution for routing and transforming messages between different information systems. HUBBLE is specifically designed to handle financial market messages defined by ISO standards 20022 and 15022.

Sample Hubble based integration for T2S enabled markets



Our current configuration packages are based on RabbitMQ and Java Spring Integration components using SQL database for configuration. Support for WSMQ, MSMQ and REST web-services as communication channels is on roadmap.

HUBBLE is highly configurable for business needs inside and outside depository business area. Configurations are made via browser based GUI. Main concepts and components are:

Queue – start and endpoint for messages exchanged between systems.

Channel – internal logical application communication link. There are several sub-applications inside HUBBLE that all have their own incoming channel to get tasks (business flow steps). Between each task there is an application called Message Flow Controller which decides, to whom pass on the results from previous step inside flow.

Currently there are channels for message routing, message transformation, message header enrichment, message validation and queue delivery.

Flow Step – defines a channel (e.g. Message Transformer) where the current form of message should be sent.

Message Router – there are several Routing Scenarios (gathered into **Scenario Groups**) what to do (which Flow Step to apply) with an incoming message. Correct scenario is picked out by Routing Criteria which base on content of the message (Root element, namespace, value on specific X-path).

Message Transformer – most commonly used sub-application inside HUBBLE. It can:

- Convert one XML message type into another using X-path
- Convert data format inside elements (date, integer, decimal)
- Convert data dynamically into another value, using values in other elements inside message
- Pick elements to put into XML according to values in message
- Create complex nested XML-files that contain several message types, like file header, business application header and business messages, according to defined templates
- Create more than one outgoing message from single incoming message (copies for several counterparties or for the same counterparty with different content)
- Use XSD to apply correct sequence for elements inside outgoing message

Incoming Message Validator – uses definition per each message queue, which incoming messages (by namespace, by document root element) are accepted by HUBBLE.

Outgoing Message Validator – uses XSD to validate message before sending it to counterparty. Also checks if limit of message size has not been reached, if it is, then divides message into pages.

Flow Controller – uses (JMS) header elements like Correlation ID to continue business flow according to message received back from counterparty.

Error Handler – uses configuration inside database to create error e-mails and insert both business and technical errors into database with help of **Error Logger.**

Message Logger – stores full information about a message before and after each step, together with references to applied rules and transformations inside step.

Versioning – each flow, rule, transformation definition or XSD can be connected to a specific version. Versions have a start and end date.

User Interface

Business Flow Definition – this interface enables user to click through entire flow definition, seeing decision points, route according to made decision and rules applicable for each step.

Message Flow – enables user to filter out specific (incoming) message and click through entire flow that has been used for this message, seeing log stored by **Message Logger.** Interrupted Message flow can be manually restarted.

Overview of HUBBLE architecture

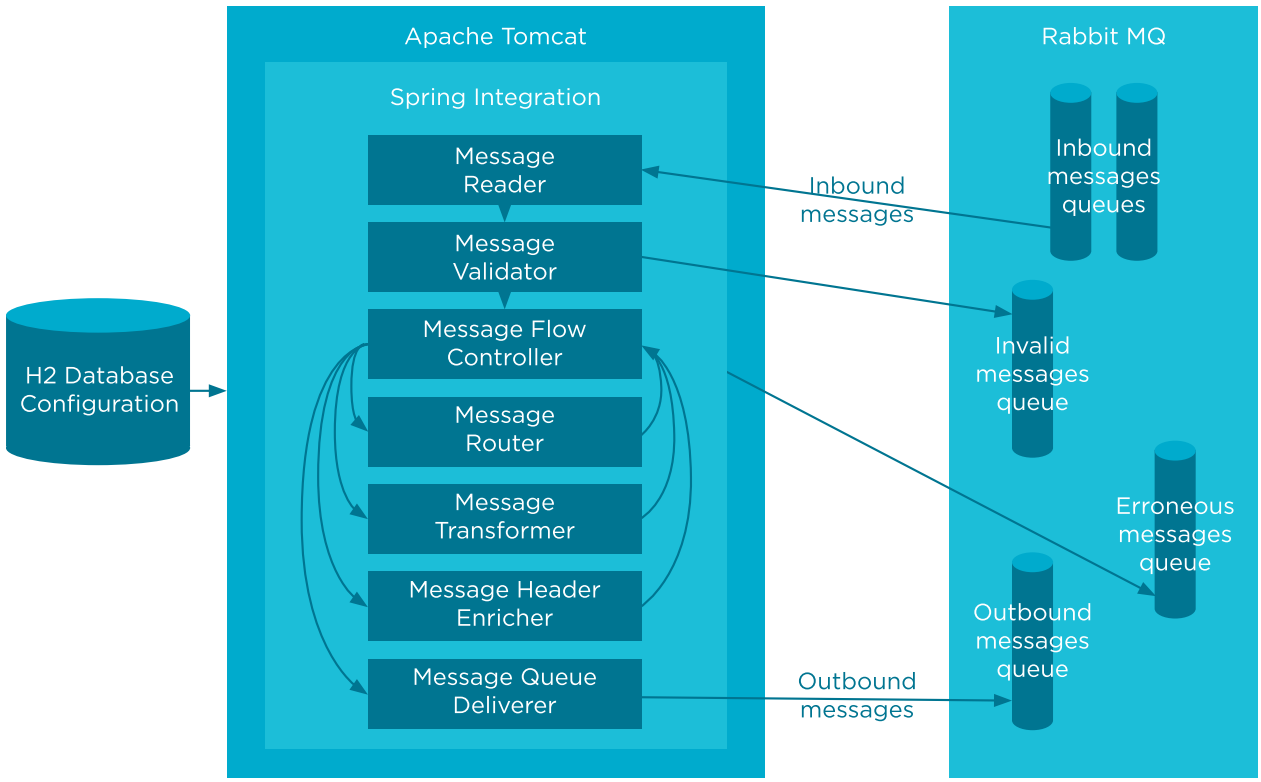


Figure 1. Architectural overview of HUBBLE

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