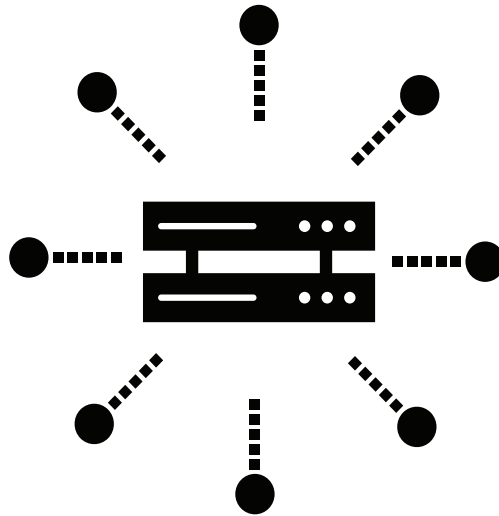# Sample Real-Time Scheduling Integration Overview

Systems Integration

Introduction

This Requirements Specification is an example of how the Real-Time Modeling System will function when implementation is complete at a potential customer site.

This document, in conjunction with a User Requirements and Functional Design document(s) will provide Business Users and Technical Teams with a complete understanding of what the Real-Time Modeling System does, how it works, and how it is designed.

System Overview

The Real-Time Modeling System (RTMS) is the software platform used to develop model flow diagram templates for planning and scheduling activity and dependencies in manufacturing operations.

The Integration Framework is a set of modules which update the RTMS models with real time data from the customers data sources (see External Integration Requirements in section listed below).

The RTMS Web Application provides a light-weight web view of the production schedules.

The RTMS application consists of four components: the RTMS Client Application, installed on each user's machine who use the software, a database server which hosts data associated with the finite scheduler, the integration server which performs periodic updates to the RTMS database, and the web application server hosting the RTMS Web App. The application utilizes the Microsoft .Net platform and will be hosted on a customer's Business Network. See Figure 1 for infrastructure requirements.

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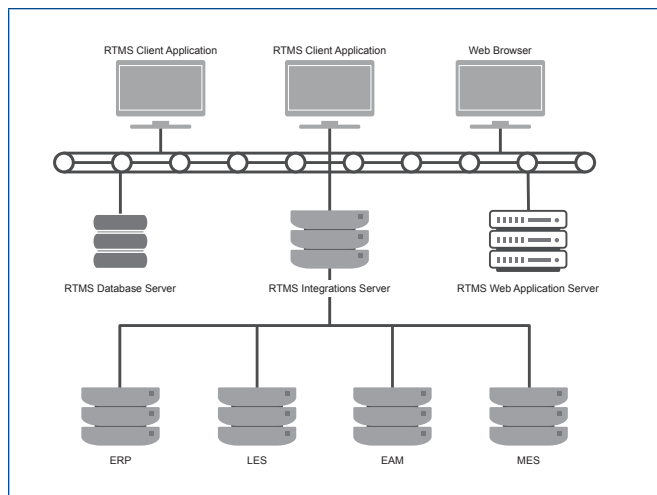
Client Minimum Specifications and Requirements

These minimum specifications relate both to the RTMS Client Application.

1. Windows 7 running .Net Framework 4.5.

2. 2Ghz processor, 8GB RAM, 500MB free hard drive space.

3. Network connection to SQL Server Database.

Server Minimum Specifications and Requirements

These minimum specifications relate both to the Web Application and the Integration Framework server.

1. Server 2012 R2 running .Net Framework 4.5.

2. Dual 2Ghz processor, 32GB RAM, 10GB free hard drive space.

3. Network connection to SQL Server Database.

Security Requirements

- Single sign on will be based on Active Directory Authentication

External Systems Integration

The Real-Time Modeling System is configured to allow read-only integration with any number of external systems hosted by a customer. Most MES/DCS systems can be accessed via the Integration Framework's SQL Connector. This connector can be configured to read data from any SQL based database. Queries are fully customizable and allow for clients to access any custom views/data they have in addition to the base system tables. Several specialized systems are supported via pre-built

connectors: Sample Manager LIMS, SAP, MAXIMO, and OSI/PI Batch. Information relating to either planned start times, or current process status (started, or completed) will be sourced from these external systems.

These read-only integration tasks will be performed by the Integrations Framework, a windows service application running on the Integration Server which is located on a customer's network on the RTMS application servers (both Production environment and Test environment).

Data from these integrations will be stored on the RTMS Database Server, which is located on the Customers corporate network (both Production and Test). This integration will be performed by the Real-Time Modeling System (RTMS) on an as-needed basis by users.

MES/DCS via SQL Connector

The Real-Time Modeling System will be configured to retrieve start and end times for activities via ADO.NET SQL queries. The information obtained will relate to the status (started, completed) of manufacturing operations on the molecule that the customer manufactures.

The interface used will be through Microsoft's ADO.NET provider interface. This information will be used to update the 'started' and 'completed' status fields in the system showing a visual indication in real-time whether the manufacturing operation has started processing or has completed. This interface can automatically update the times on the schedule and/or provide an indication of what has started or completed for activities completed early. Activities completed late will automatically have completed times updated in schedule. This functionality requires access to SQL database containing a read-only copy of the MES/DCS data.

Sample Manager LIMS

The Real-Time Modeling System is configured to retrieve LIMS data on a timed interval. The information obtained will relate to the status (started, completed) of QC tests for all molecules a customer manufactures.

The interface used will be through Microsoft or Oracle SQL queries to a specific View on that system. This information will be used to update the 'started' and 'completed' status fields in the system showing a visual indication in real-time whether the test has started processing or has completed. This interface will not automatically update the times on the schedule, just provide an indication of what has started or completed for activities completed early. Activities completed late will automatically have completed times updated in schedule.

SAP

The Real-Time Modeling System will be configured to retrieve SAP data on a timed interval. The information obtained will relate to planned and process orders for material numbers related to all molecules manufactured at the customers site, this will include buffer and media prep order information.

The interface used will be through remote function call BAPIs using SAP's .Net Connector "NCO" as part of the Integration Framework. This information will be used to update the earliest start date field in the schedule, which will adjust the start date of activities related to that field. This should be limited to the first operation of each batch and RTMS should schedule the rest. Finite scheduling horizon should be limited to a set duration.

OSI/PI

The Real-Time Modeling System will be configured to retrieve batch data from OSISoft PI on a timed interval. The information obtained will relate to the status (started, completed) of manufacturing operations on the molecule that the customer manufactures.

The interface used will be through PI's OLEDB provider interface. This information will be used to update the 'started' and 'completed' status fields in the system showing a visual indication in real-time whether the manufacturing operation has started processing or has completed. This interface can automatically update the times on the schedule and/or provide an indication of what has started or completed for activities completed early. Activities completed late will automatically have completed times updated in schedule. This functionality requires the successful implementation of OSISoft PI Batch.

Data Updates to Validated Systems

Most integrations involve read-only access to data sources and therefore can avoid system validation. Occasionally, a bi-directional connection is required. In this case, our best-practice approach is to use a synchronization table.

A synchronization table is a well-defined SQL table (or set of tables) agreed to by both sides of the connection (ex: ERP <-> RTMS). The Integrations Framework inserts/ updates well-formed records in the table. Periodically (or on a SQL trigger), an update script runs from the validated system side to validate the records, ingest them and update the validated system date. This is essentially an API based on a SQL table.

This approach provides several benefits:

- The synchronization table provides a well-documented, testable interface that is accessible by both systems independent of the other.

- Validation extends to the update script and the synchronization table definition; but not to RTMS/Integration Framework.

- Software update/change management for each system is scoped to it's side of the synchronization table.

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