# ShopFloorConnect

*Job Queue Management Integration Summary*

### Executive Summary

This specification summarizes the web service based interface for connecting and communicating job queue management data between any 3rd party manufacturing execution system (MES) and the ShopFloorConnect Asset Utilization Software (SFC).

The plan is to install the ShopFloorConnect Application Programming Interface (SFC-API) web service within the same Windows Domain Intranet network hosting both MES and SFC applications. The installation strategy will provide for a well-known and robust security model using Windows Authentication between the client MES and the SFC-API web service as well as the SFC software and the Event Notification web service.

The MES user can monitor and control the manufacturing job schedules within SFC without the burden and risk when entering the same job data content in both systems.

The SFC-API will expose secure web methods to perform the following SFC Job Queue Management transactions: Add Job; Update Job; Reassign Machine Job; and Cancel Job. The SFC-API will also retrieve job data from SFC such as Get Machine Job Status and Get Machine Job Queue from exposed web methods. Additionally the SFC-API will forward all Job Completion Status events via the Event Notification web service.

### General Assumptions

All communications (i.e., command requests, data and events) between any 3rd Party Manufacturing Execution System (MES) and ShopFloorConnect (SFC) software will be implemented via web service (SFC-API) interfaces. The high level view of the communications between MES and SFC will follow a traditional request-response model, coupled with asynchronous event notification.
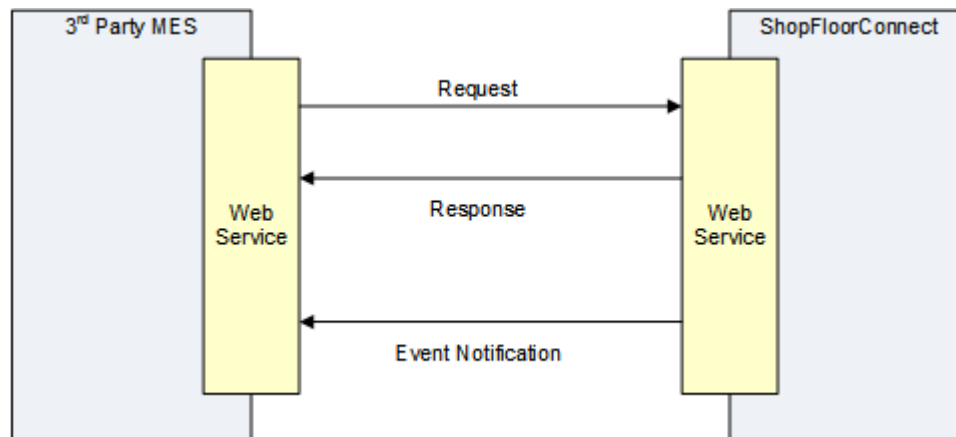
All information exchanged between a 3rd party MES and SFC will be formatted in XML. The necessary web service interface description (WSDL) and XML schema definitions will be detailed in a subsequent document.

In order to effectively de-couple the MES from SFC, the execution system will not have direct access to SFC. The execution system will be responsible for providing SFC with all the required job schedule information. Consequently, the MES will also be in charge of pulling processing-related data from SFC (via a well-defined web service) and updating the MES data accordingly.
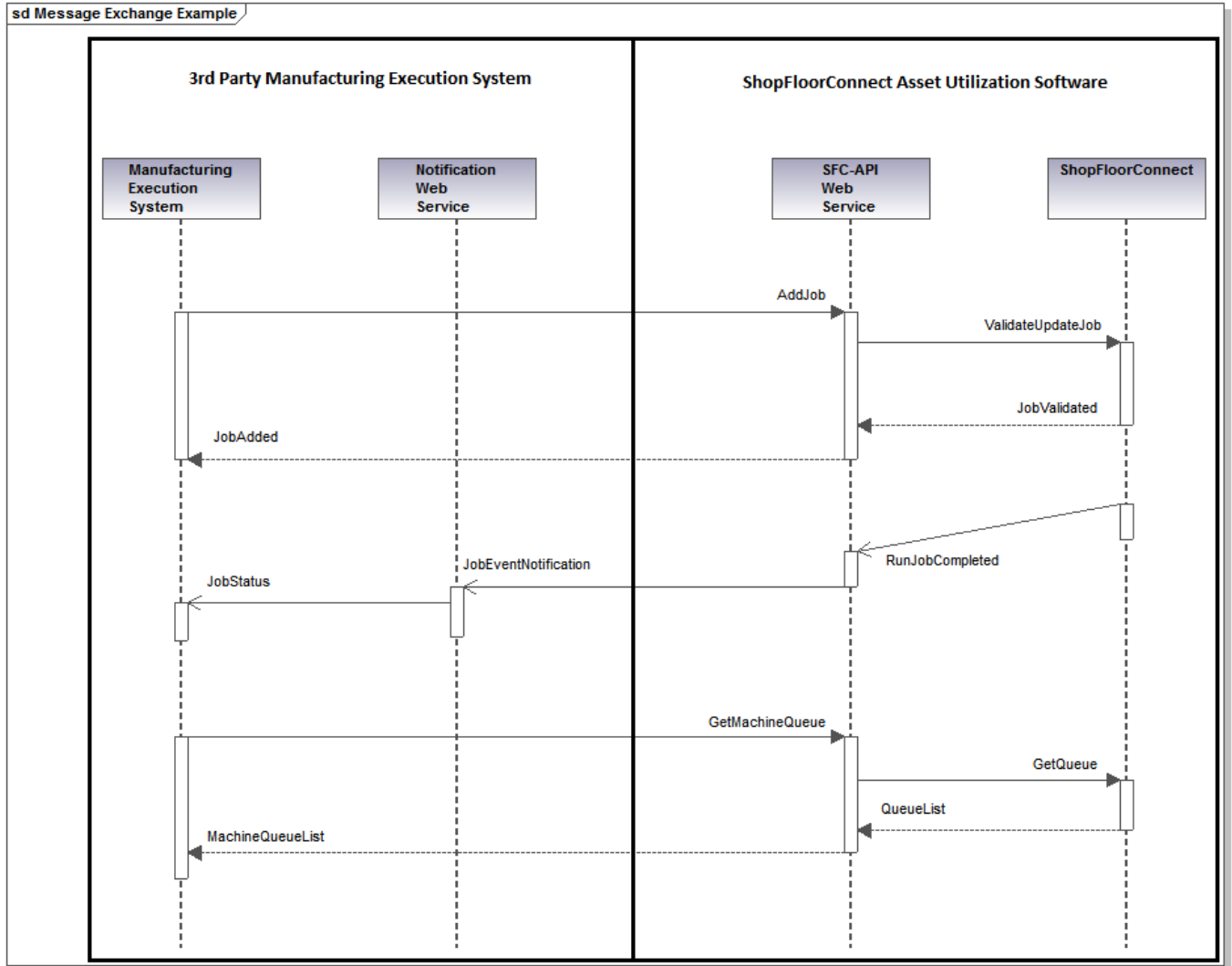
## Web Service Overview

The Web Service based interface between ShopFloorConnect and any 3rd Party Manufacturing Execution System consists of two web services. The SFC-API web service will be hosted by the ShopFloorConnect server and the MES Notification web service will be hosted by the 3rd party MES server.

The ShopFloorConnect API Web Service provides a control interface for obtaining Job Status information, Job Queuing and Cancellation operations. The Notification Web Service provides an asynchronous event communication between ShopFloorConnect and the 3rd party Manufacturing Execution System. The 3rd party is responsible for providing the Notification Web Service for ShopFloorConnect to consume.
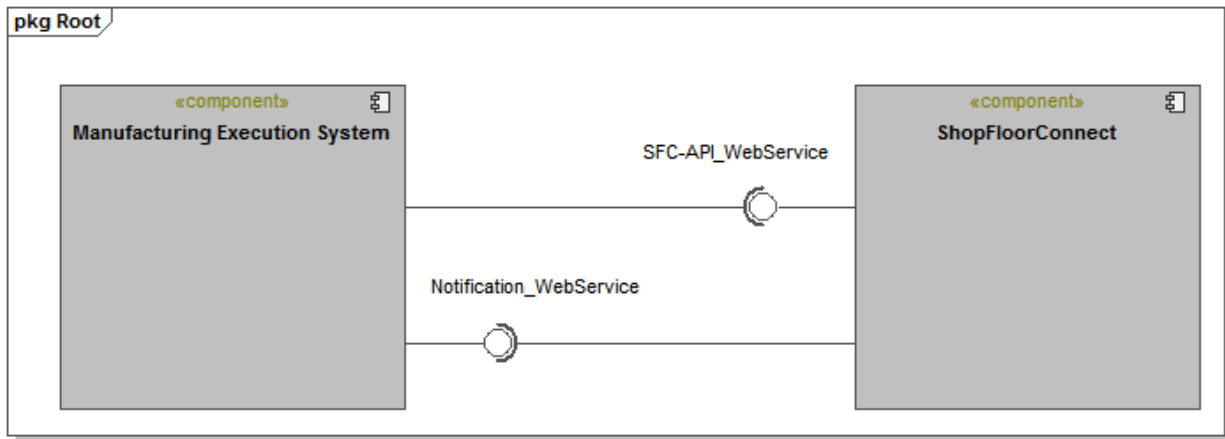
The sequence diagram below shows an example of three different use case message exchanges between any 3$^{rd}$ party Manufacturing Execution System and ShopFloorConnect via the two web services: SFC-API Web Service and 3$^{rd}$ party Notification Web Service.

**sd Message Exchange Example**

| 3rd Party Manufacturing Execution System | ShopFloorConnect Asset Utilization Software |
|---|---|
| Manufacturing Execution System     Notification Web Service | SFC-API Web Service     ShopFloorConnect |

AddJob

ValidateUpdateJob

JobValidated

JobAdded

RunJobCompleted

JobEventNotification

JobStatus

GetMachineQueue

GetQueue

QueueList

MachineQueueList

The ShopFloorConnect Machine Queue Information request example is shown.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<MachineQueueInformation>
    <MachineJobQueues>
        <MachineJobQueue>
            <MachineName>Bihler Molder Press 23</MachineName><!-- Name of the Machine (Required) -->
            <PrimaryType>Tool Number</PrimaryType><!-- Primary Type Name (Required) -->
            <SecondaryType>Part Number</SecondaryType><!-- Secondary Type Name (Optional) -->
            <!-- Boolean delete all jobs in the machine queue then add the contents in the request-->
            <FlushAndFill>false</FlushAndFill>
            <MachineJobs>
                <Job>
                    <!-- RequestType: Add, Update, Reassign, or Cancel (Required) -->
                    <RequestType>Add</RequestType>
                    <!-- Unique Identifier: TBD SFC or 3rd party assigned (Required) -->
                    <QueueId>0</QueueId>
                    <!-- Job Number, Production Order, Batch Number (Required) -->
                    <JobNumber>11491147</JobNumber>
                    <JobSequence>1</JobSequence><!-- Job execution priority 1,2,3, ... (Required) -->
                    <PrimaryItem>Tool A1213</PrimaryItem><!-- Primary Item name or value (Required) -->
                    <!-- Secondary Item name or value (Optional) -->
                    <SecondaryItem>OA-54023-A01</SecondaryItem>
                    <Quantity>6000</Quantity><!-- Job Quantity to complete (Required) -->
                    <DueDate>2014-09-11T04:30:33</DueDate><!-- Planned Due Date for the Job (Required) -->
                    <OperatorComment></OperatorComment><!-- Comment to send to the machine operator (Optional) -->
                    <!-- Requeue Action on Incomplete Job completion (Required) -->
                    <IncompleteQueueAction>No</IncompleteQueueAction>
                    <!-- Name of the Target Machine - Required and Valid for Request Type: Reassign -->
                    <MoveToMachineName></MoveToMachineName>
                </Job>
                <Job/>
                <Job/>
            </MachineJobs>
        </MachineJobQueue>
        <MachineJobQueue>
            <MachineName>Hardening Station B14</MachineName>
            <PrimaryType>Part Number</PrimaryType>
            <SecondaryType></SecondaryType>
            <FlushAndFill>false</FlushAndFill>
            <MachineJobs>
                <Job>
                    <RequestType>Update</RequestType>
                    <QueueId>5432344</QueueId>
                    <JobNumber>11491147</JobNumber>
                    <JobSequence>4</JobSequence>
                    <PrimaryItem>OA-54023-A01</PrimaryItem>
                    <SecondaryItem></SecondaryItem>
                    <Quantity>6000</Quantity>
                    <DueDate>2014-09-11T18:45:00</DueDate>
                    <OperatorComment></OperatorComment>
                    <IncompleteQueueAction>No</IncompleteQueueAction>
                    <MoveToMachineName></MoveToMachineName>
                </Job>
            </MachineJobs>
        </MachineJobQueue>
    </MachineJobQueues>
</MachineQueueInformation>
```