Micron Advanced Scheduler Web Analytics Portal

IE3100M System Design Project (Group 9) | Department of Industrial Systems Engineering and Management

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Problem Overview

Problem Description

Engineers in Micron face several issues with current analytics process due to the complexity of running simulations. The extended and problematic analytics process leads to delayed decision making and longer process times for scheduling in the manufacturing facility

Issues Faced

Hardware Limitations

Users' computers need to have high storage capacities as well as 16GB of RAM to run simulations. Running simulations also requires a lot of processing power to run

Software Limitations

Running simulations depends on software such as MOST, APS Studio and the SQL server. This creates several points of failure which could affect the analytics process.

Organizational Limitations

MOST has limited visualization outputs, leading to limited analysis capabilities. Any additional outputs required approval from the MCT OI team which could take months.

Proposal Development

Objective

Develop a new web application to consolidate and streamline the analytics process with 4 features:

- **Downloading models**
- **Running simulations**
- **Management of model parameters**
- **Visualization of simulation results**

Stakeholders

1. **SDP Team:** Developing the web application
2. **SIC Analytics Team:** Providing guidance to SDP Team on app development
3. **Planning department:** Users of the web application

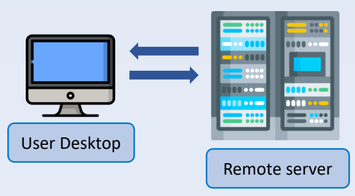
Timeline

- Discussed issues faced by planning team — Aug 2020
- Proposed approach of web application — Sep 2020
- Development of web application — Oct 2020 – Feb 2021
- Implementation and user testing — Feb 2021 – Apr 2021

Web Application Overview

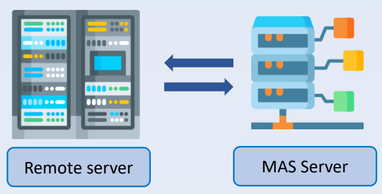
1. Connecting to The Web Application

Users connect to the web application via the Micron Intranet. The web application is hosted on a remote server which runs the backend scripts for the simulation.



2. Downloading Models

The web application allows users to download the latest simulation model, containing information about the manufacturing facility, to the remote server. Users just have to click a button.

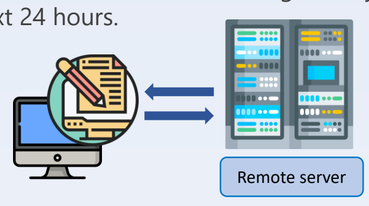


3. Model Parameter Changes

Forms were added to the web application to allow users to change certain parameters in the downloaded model. 3 different sections of input changes were added to the web application to meet users' needs.

4. Running Simulations

The model with the input changes made by the users is sent to the remote server to run a simulation. The simulation will create a new test scenario with a new prediction on the manufacturing facility output for the next 24 hours.



5. Cleaning Simulation Results

Once the simulation is run, the remote server will process the simulation results. The base scenario, containing the original simulation results will be compared against the new test scenario.

6. Output Visualizations

With the processed data, graphs and charts are created to allow users to easily discern the differences between the base and test scenario. Each visualization provides a summary of the results as well as more detailed tables for further analysis.

Coded with Python
(+) Common, universal coding language
(+) Easy handover to SIC Analytics Team
(+) Allow for easy modification

Remote hosting
(+) Removes needs to high hardware requirements
(+) Faster simulation process
(+) Accessible within Micron's Intranet

New analysis methods
(+) Addition of useful analyses previously unavailable
(+) Ending WIP, Queue Time Breach, TG Achievement Analysis

Inputs and Outputs

Input Changes

- PDM Simulation

Ignore Demand Simulation:
- Blanket Ignore Demand, by Lot Priority
- Targeted Ignore Demand, by Workstation & Lot Priority
- Targeted Ignore Demand, by Workstation & DID

Preset Configuration Changes:
- Preset Weight Change
- Preset Criteria Change
- Preset Cloning

Combined Changes
- Select Multiple Under Construction

Users have the option to make 3 different types of input changes:

1. **Step PDM Change** - Adjusts the priority of DIDs in specific steps or loops (groups of steps) by changing the associated PDM value.
2. **Ignore Demand** - This input can be used to remove the demand quantity for lots of a certain priority. The 3 subsections allow the ignore demand to target specific DIDs and workstations.
3. **Preset Changes** - This category of change involves changing the factors and weight in the preset profiles for both DIDs and workstation. The subsections allow for targeted or broad changes based on user needs.

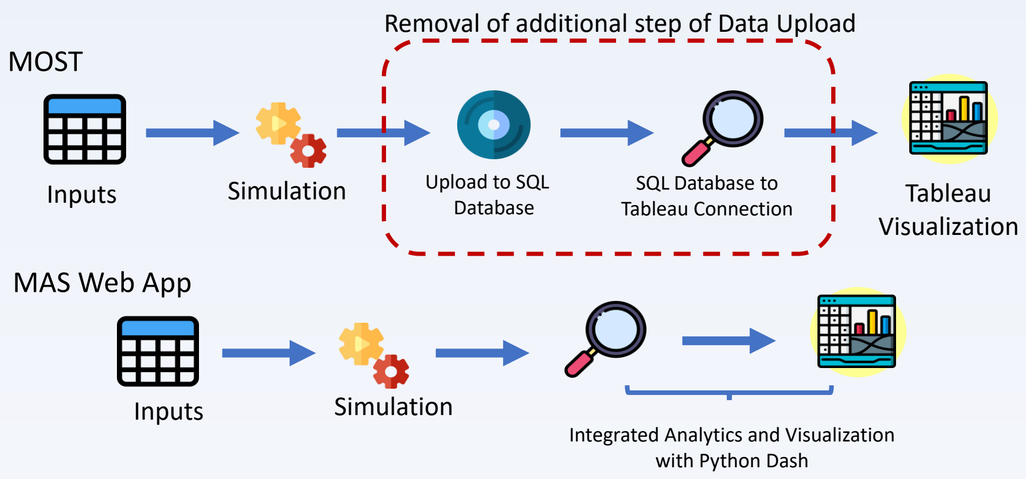
Output visualizations

Users can view 4 different visualizations:

1. **Cycle Time** - Documents the simulated cycle time for each WIP in each step.
2. **Target (TG) Achievement** - Documents whether the WIPs are meeting the scheduled targets
3. **Queue Time Breach** - Documents the total number of simulated breaches that would occurs.
4. **Ending WIP** – Gives the total number of WIP for each step

Outcomes

Shortened analytics process



Time Savings

Up to 30 minutes saved per simulation run and 7 man hours saved per week

Further development

Integration of 3 new input changes in the future: Downtime Scenario, TG Value and WS Params

Expanded rollout

Planned potential rollout to Micron manufacturing facilities globally