



Production Scheduling Tool for Metal Meshes Factory

OUTLINE

Eurystic Introduction

Project Introduction

Solution

Results

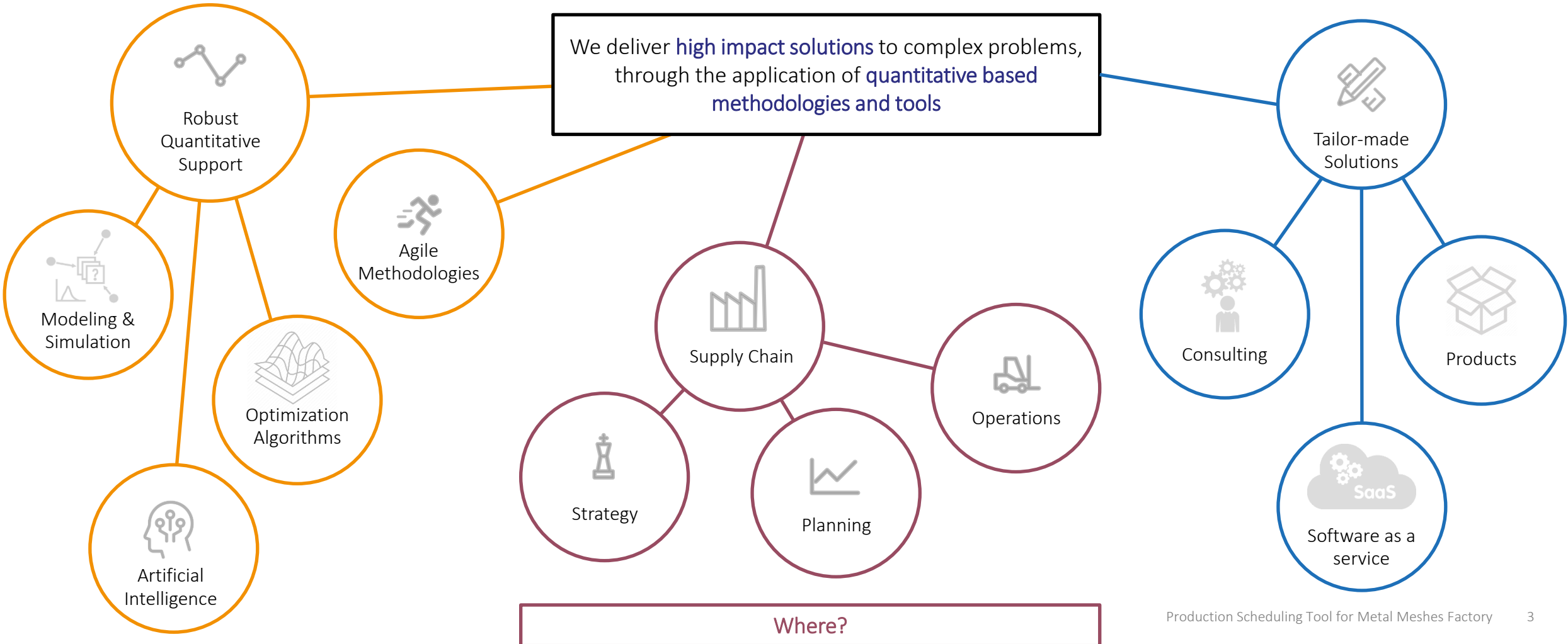
Q & A

EURYSTIC

How?

What?

We deliver **high impact solutions** to complex problems, through the application of **quantitative based methodologies and tools**



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PROJECT INTRODUCTION

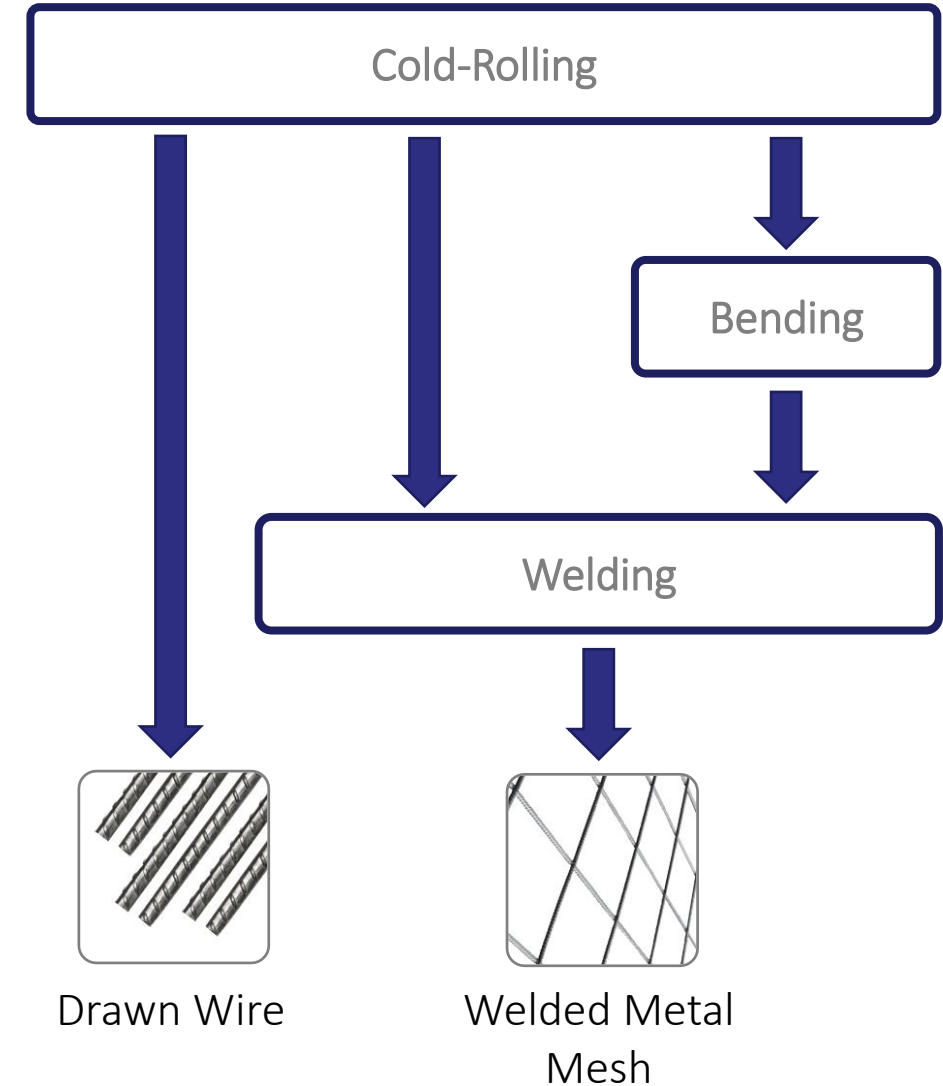
The client has a metal meshes factory composed of many machines spanning different processes:

- Cold-rolling
- Bending
- Welding

Materials flow between these machines using limited transportation means and buffers.

Two end-products: Drawn Wire and Welded Metal Mesh.

Mostly make-to-stock policy.



BUSINESS CHALLENGE

The factory faced several problems



Manual scheduling did not consider relevant factors such as resource availability and workload.



Low productivity levels were registered.



Difficulty to predict stock levels and events such as warehouse saturation.



Lack of coordination between supply and demand.

BUSINESS CHALLENGE

The customer sought to develop a tool that could generate an optimized production schedule for each of the machines in the factory and forecast the systems behavior.

The customer requires a production schedule and forecast with a horizon of at least one month.



Objective

Maximize service level and fulfillment of the delivery schedule (which requires a balanced product mix), while considering resource efficiency (reduce unproductive setups, buffer saturation, etc.).



Subject to

- Buffer capacities
- Transportation means availability
- Machine calendar
- Machine productivity and efficiency
- Raw material availability

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WHY SIMULATION & ANYLOGIC

A simulation model of the system was required due to its complexity and temporal dynamism.

- Simultaneous interactions between several system's components
- Dynamic use of shared limited resources.
- Many exceptions and particular logics.

AnyLogic

- Provides a great development experience.
- Reduces the time and effort required to develop a simulation model.
- Team's experience with AnyLogic & Java



INPUTS & PARAMETERS



Machines

Working & Maintenance Calendar
Setup times
Required workforce



Products

Bill of materials
Production route and productivities



Storage

Storage areas w/ capacities



Transportation
Resources

Transportation resources by
product type



Demand

Confirmed Sales
Forecasted Demand



Raw Material
Availability

Available quantity
by date



Initial
Situation

Initial stock
Initial configuration of each machine
Predefined schedule

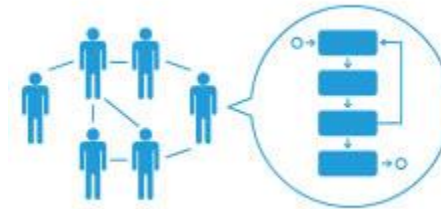


Other
Parameters

Time horizon
Optimization parameters

MODEL – Simulation Model

Simulation Model



Pure Agent
Based Model



Machines with complex statecharts that monitors and controls their behavior.



Inner heuristics govern and optimize certain aspects of the process.



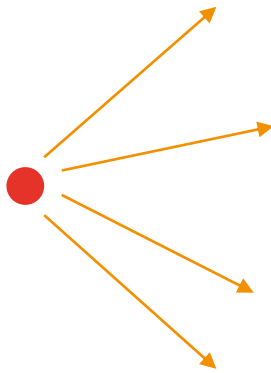
Buffers with detailed storage constraints and logics to accurately reproduce the system.

MODEL – Optimization Engine – Construction Phase

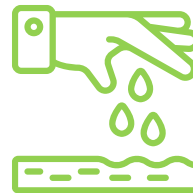
A custom optimization engine was developed to run multiple simulations and find the best schedule, applying local search strategies and metaheuristics such as Tabu Search.

Construction Phase

Search Phase



First, several simulation runs are triggered using a construction heuristic with different production strategies.

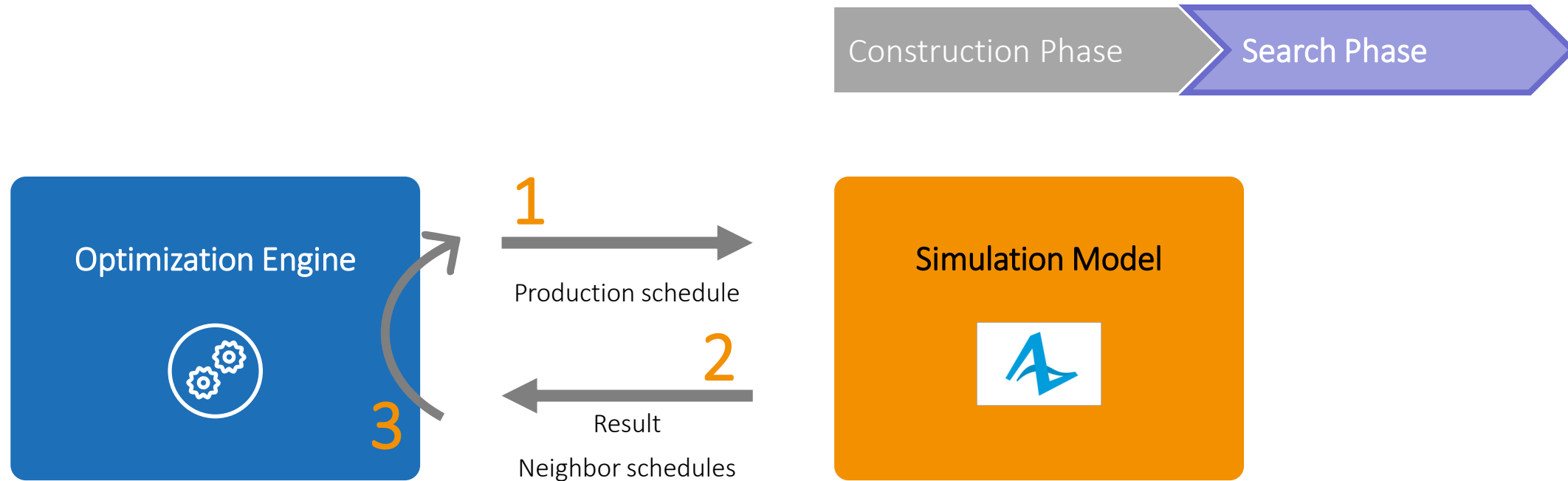


These runs make up the seeds of the optimization engine.



The best of these seeds is selected by a local search algorithm and starts exploring the neighborhood.

MODEL – Optimization Engine – Search Phase



1 The optimization engine starts a simulation with the instruction to follow certain schedule.

2 The simulation is run and computes the result. Additionally, it discovers alternatives schedules (best neighbors).

3 The optimization engine determines if the result is superior to the current winner and continues with step 1 using another schedule.



SELECT SCENARIO

input anylogic conference 1

input anylogic conference 2

input anylogic conference 3

SCENARIO DESCRIPTION

Version: AnyLogic Conference
Support: contacto@eurystic.com.ar

Input template

PARAMETERS

INITIAL DATE

27/7/2020

OPTIMIZATION HORIZON

- M0 full
- M1 full
- Predefined horizon
- Until: 26/8/2020

STORAGE CRITERIA

- Without product mix
- With product mix
-Min. number of free positions: 4
-Max. number of product type per position: 2

PRODUCTION CRITERIA

- Containers always full
- Containers partially filled
-Demand limit for partial filling: 90 %
-Min. filling: 500 kg

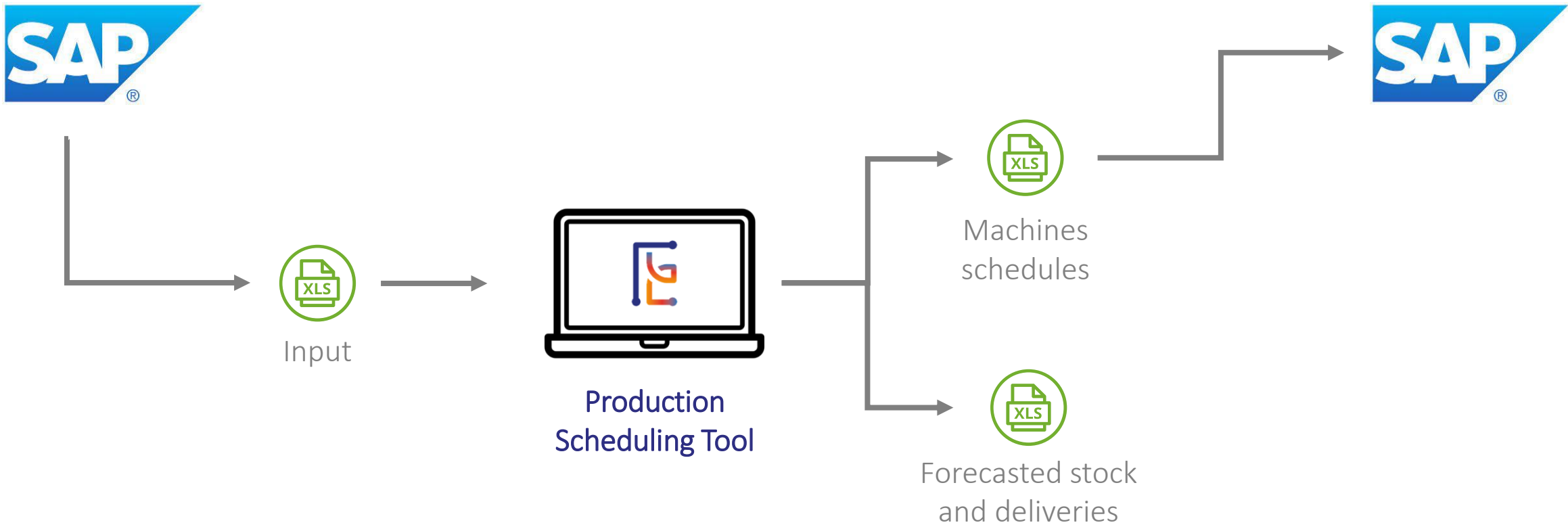
EXECUTION MODE

- Fast mode
- Global optimization
-Max. time 5 minutes

RUN OPTIMIZATION

COMPARE RUNS

MODEL - Integration



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RESULTS

A tool with automatic generation of the optimized schedule was delivered, including dashboards and KPIs showing estimated production, service level, resources usage, potential delays, buffer saturation, among others.

The production scheduling tool enabled



Increase production (until now up to +10% in metal meshes, and even more is expected) and machine efficiency.



Make important strategic decisions.



Partially automate and greatly reduce the time required for the schedule generation process.



Anticipate potential problems such as buffer saturation and take preventive actions.



Provides the possibility of running multiple scenarios, tune parameters, and adjust resource availability.



Improved communication and coordination between different sectors:

- Sales delivery predictions.
- Logistics & Transportation.
- Machine maintenance.
- Raw material requirements.

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THANK YOU

Contact us

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