

## Motivation

Ceridian's current scheduling module cannot monitor and **project key performance indicators** of a schedule.

Therefore, Ceridian tasked the team to build a proof-of-concept **simulation application** to evaluate employee shift schedules and identify areas for potential improvements.

## Requirements

**Project key performance indicators** based on user-defined schedule data.

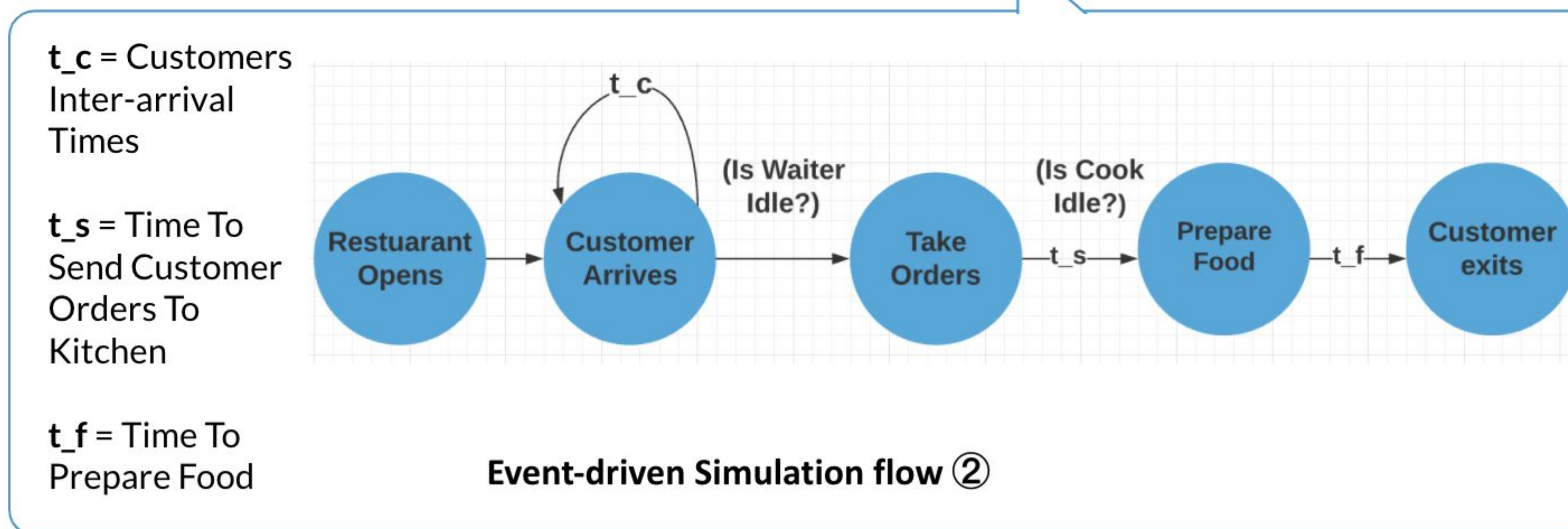
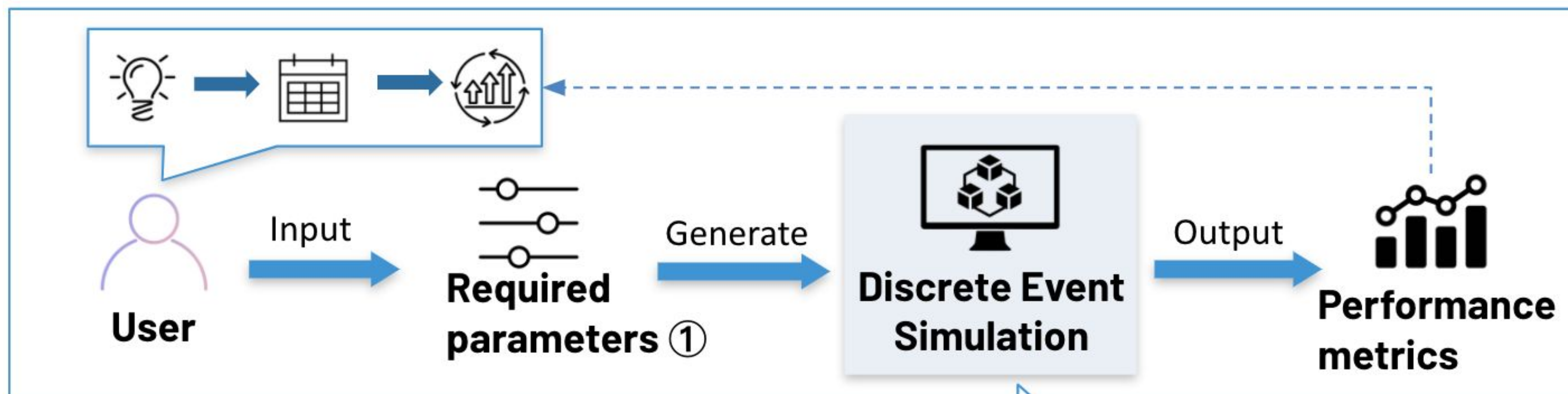
**Target user groups:** Restaurants, Pubs, Hotels, Retail Stores, etc.

**Key requirements:** Customizable, Multiple Performance Indicators

## Use Case: Restaurant

## Restaurant Scenario Simulation

The discrete event simulation application models real world scenarios as queuing systems and projects performance metrics for future schedule analysis.



### ① Input Data

The team simulated one single Monday operation of a restaurant client of Ceridian with their shift schedule and hourly customer arrivals from 9AM to 10PM. Input data is shown in Figure 1.

### ② Simulation

- The simulation time duration was 13 hours.
- Event-driven simulation defined 5 types of events: **new arrival**, **waiting**, **internal arrival from prior service activity**, **providing service**, **departure**
- The team modeled the restaurant operation as a sequence of chronological events.
- The restaurant state was updated every time an event finished.

## Simulation Results

### Projected Performance Indicators

- Avg. Time in System (min:sec): 20:40
- Avg. Time in **Taking Orders** (min:sec): 03:30
- Avg. Wait Time in **Taking Orders** (min:sec): 00:28
- Avg. Time in **Preparing Food** (min:sec): 17:39
- Avg. Wait Time in **Preparing Food** (min:sec): 01:54
- Throughput Rate(per min): 0.06
- Server Utilization Rate: 0.78

## Results Analysis

- Avg. Wait Time in **Taking Orders** → Whether scheduled waiters is reasonable
- Avg. Wait Time in **Preparing Food** → Whether scheduled cooks is reasonable
- Server Utilization Rate** → proportion of server time that is busy

## Conclusion

- The application can be widely used to project meaningful indicators, providing quantitative evidences for **comparing** different schedules.
- Each performance indicator assesses a specific aspect of the system, indicating which areas need to be **improved**.

## Acknowledgements

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	Server ID	Shift Schedule	Estimated Service Time Distribution (Minutes)
Service activity 1 <b>Take Orders</b>	Waiter 1	9:00 - 15:00	Normal(mean = 3.21, std =1.2)
	Waiter 2	12:00 - 21:00	
	Waiter 3	17:00 - 22:00	
Service activity 2 <b>Prepare Food</b>	Cook 1	6:00 - 15:00	Normal(mean = 17.5, std =2)
	Cook 2	11:00 - 22:30	
	Cook 3	17:00 - 22:30	

**Figure 1:** Restaurant information and estimated distributions