

## Experimentation and Model Performance Improvement

- ▶ Experimentation
- ▶ How to improve model execution speed
- ▶ User participation expected

## Experimentation Basics

- ▶ **Experiments** run multiple replications as fast as possible
- ▶ **Controls** (aka Referenced Properties) allow definition of Scenarios
  - Categories organize it better
- ▶ **Responses** support KPI analysis, custom expressions, and Response Results (aka SMORE charts).
  - Summary or details of raw SMORE data can be exported.
  - Summary or details of Pivot Grid data can be exported.
- ▶ **Add-ins** support extended analysis
  - OptQuest
  - Ranking and Selection

## Airport Example Experiment

| Scenario | Name | Status | Required | Completed | Checkin Kiosks | Scanner Stations | Checkin Clerks | ID Check | Revenue | Profit | Cost |
|----------|------|--------|----------|-----------|----------------|------------------|----------------|----------|---------|--------|------|
| 001      | Idle | 5      | 5 of 5   | 5         | 2              | 5                | 1              | 32111.2  | 27691.2 | 4400   |      |
| 002      | Idle | 5      | 5 of 5   | 1         | 2              | 1                | 1              | 11642.4  | 7532.4  | 4110   |      |
| 003      | Idle | 5      | 5 of 5   | 8         | 2              | 8                | 1              | 37312    | 32642   | 4670   |      |
| 004      | Idle | 5      | 5 of 5   | 3         | 2              | 3                | 1              | 27834.4  | 23564.4 | 4270   |      |
| 005      | Idle | 5      | 5 of 5   | 6         | 2              | 6                | 1              | 34962.4  | 30482.4 | 4510   |      |
| 006      | Idle | 5      | 5 of 5   | 7         | 2              | 1                | 1              | 34980    | 30660   | 4300   |      |
| 007      | Idle | 5      | 5 of 5   | 1         | 2              | 7                | 1              | 19632.8  | 15252.8 | 4300   |      |
| 008      | Idle | 5      | 5 of 5   | 8         | 2              | 4                | 1              | 37048    | 32528   | 4490   |      |
| 009      | Idle | 5      | 5 of 5   | 1         | 2              | 4                | 1              | 19289.6  | 15044.6 | 4245   |      |
| 010      | Idle | 5      | 5 of 5   | 3         | 2              | 6                | 1              | 29664.8  | 25259.8 | 4405   |      |
| 011      | Idle | 5      | 5 of 5   | 6         | 2              | 3                | 1              | 37444    | 33069   | 4375   |      |
| 012      | Idle | 5      | 5 of 5   | 4         | 2              | 1                | 1              | 27090    | 22845   | 4215   |      |
| 013      | Idle | 9      | 9 of 9   | 8         | 2              | 6                | 1              | 39893.3  | 35313.3 | 4580   |      |
| 014      | Idle | 5      | 5 of 5   | 3         | 2              | 8                | 1              | 28946.4  | 24351.4 | 4495   |      |
| 015      | Idle | 8      | 8 of 8   | 8         | 2              | 2                | 1              | 36690.3  | 32290.3 | 4460   |      |
| 016      | Idle | 7      | 7 of 7   | 8         | 2              | 7                | 1              | 37940.6  | 33315.6 | 4625   |      |

## Execution Options



- ▶ Multiple cores for parallel procession
- ▶ Replication Runner
  - InProcess, External32Bit, External, or None
  - Maximum 16 concurrent replications
- ▶ Distribute Runs (Team or Enterprise)
  - Run on other computers in your local network.
  - Up to 16 included free, additional available at a fee
- ▶ Distributed execution
  - Try using multiple runner processes, each one handling a small number of replications, rather than using our default Windows Service that runs all in a single process.
  - Command-line argument is `-maxreps:N`, where N is number of replications.
  - We intend to make this work automatically, so this is a temporary workaround
- ▶ Simio Portal
  - Massively parallel model execution using Azure SaaS

7/18/2017

Copyright 2016 Simio LLC

5

## Model execution speed



- ▶ Things that are fast and/or small
  - Fast hardware, more cores, more cache, SSD, lots of memory
  - Events
  - Process logic
  - Internal statistics
  - Tallies
  - States and state statistics (usually)
  - Low poly count 3D symbols
  - In-memory data access through tables
  - Exclusion expression in object steps
  - Certain specific step setups (simple Seize with no property references for example)
  - Simple flow networks that are steady state for a majority of the runtime

7/18/2017

Copyright 2016 Simio LLC

6

## Model execution speed



- ▶ Things that can be slow or big
  - 64 Bit
  - Search step
    - Don't repeatedly search for same value – cache result for reuse if possible
  - Relational table validation
  - Scan step
  - Trace
  - 3D AutoCAD files and high-poly count 3D Symbols
  - Runtime access to external databases
  - Reading large data files at model initialization
  - Complex flow networks that are steady state for a minority of the runtime
- ▶ Use Profile window to help identify problems

7/18/2017

Copyright 2016 Simio LLC

7

## Model execution speed



- ▶ Things that are now fast(er)
  - Many of the same 3d symbol on the screen at the same time (though this is dependent on certain hardware on DirectX only)
  - Automatic table import at the start on the run
  - We do have more ideas for more improvements, but allocation of development resources will follow customer pain points

7/18/2017

Copyright 2016 Simio LLC

8

