ProModel Extended Features Webinar

Using Extended Features in ProModel

Instructor Info:
Rebecca Santos
Technical Support Engineer
Office: 801.223.4671
rdossantos@promodel.com

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ProModel Extended Features Webinar
For Software Version: 10.0.0.3218

556 E Technology Way
Orem, UT 84097
801-223-4600

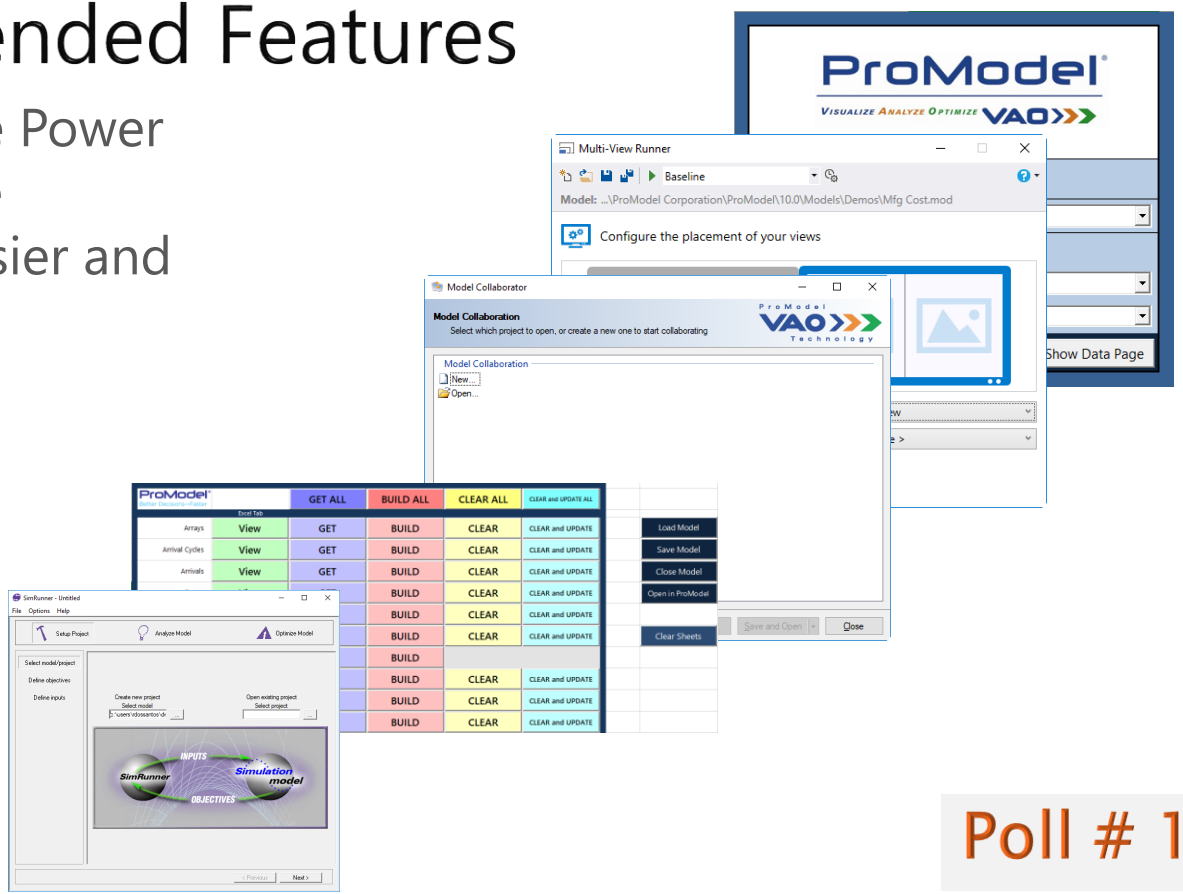
Course Objectives

During this Webinar on ProModel Extended Features you will learn how to:

- Create models in collaboration with coworkers
- Watch more than one view during the simulation
- Analyze and Manipulate RDB files in Excel
- Use Excel to create and edit models
- Optimize simulation models

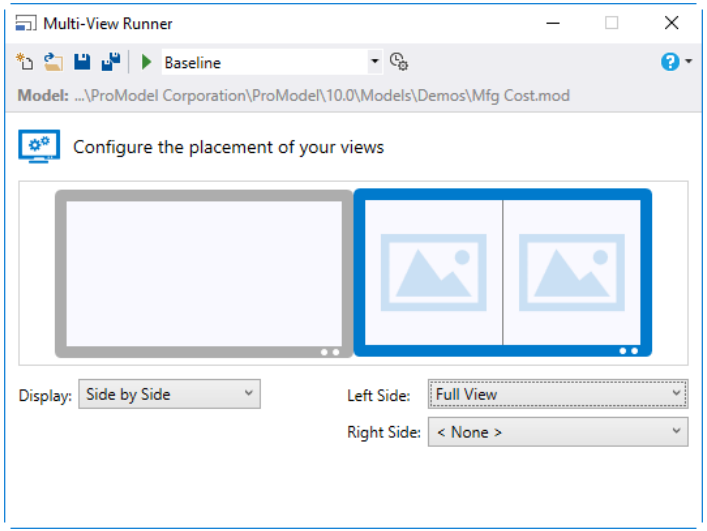
ProModel Extended Features

- ProModel has some Power Tools that can make building models easier and faster.
  - Multi-View Runner
  - ProRDB
  - Model Collaborator
  - ProActiveX
  - SimRunner



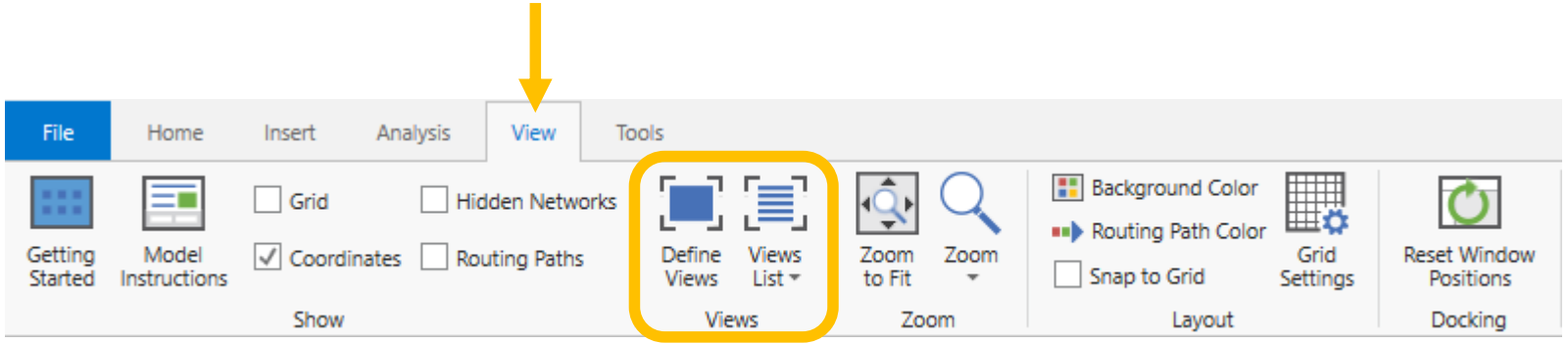
Poll # 1

1) Multi-View Runner

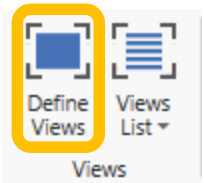


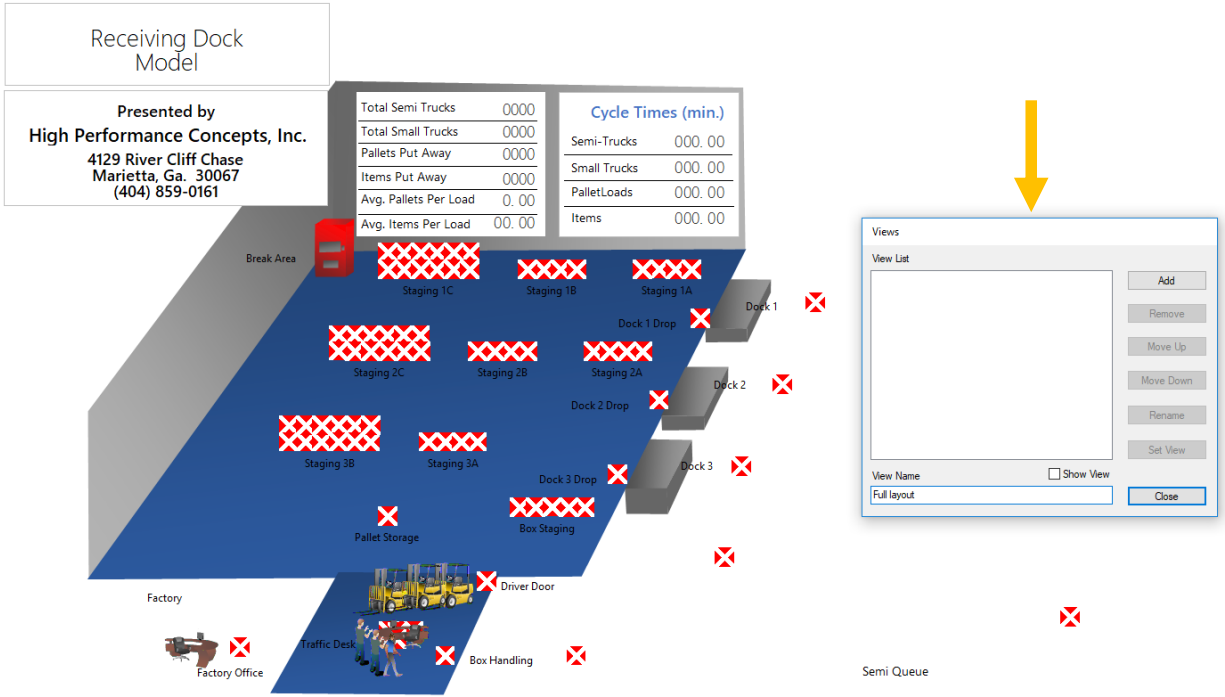
Views in ProModel

- It is possible to define views in ProModel



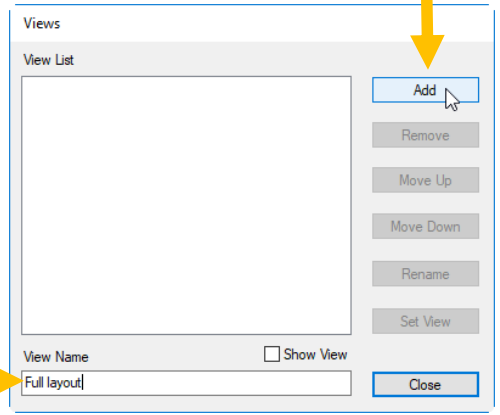
Views in ProModel



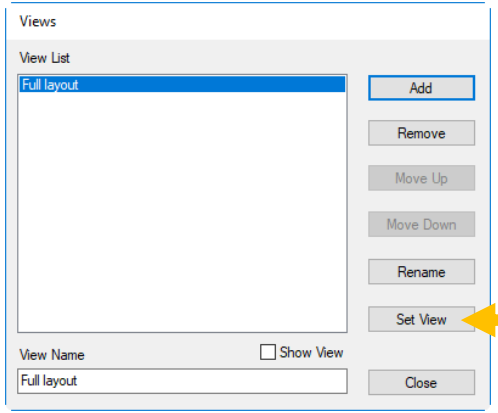


Views in ProModel

Click Add

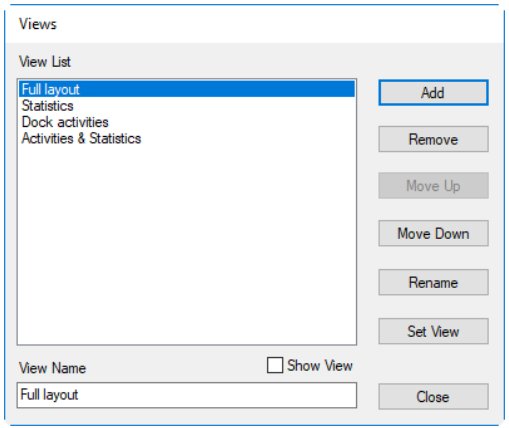


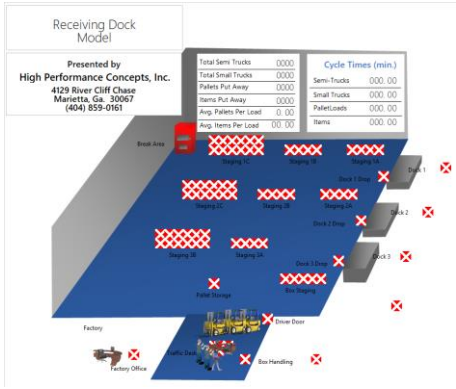
Enter Name

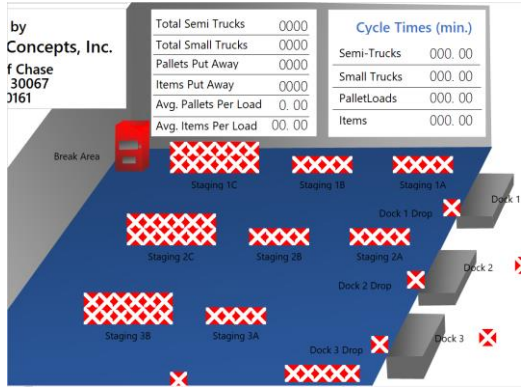


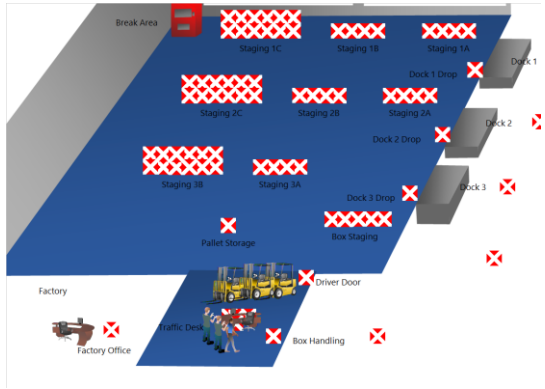
Change Zoom Options to Update Selected View

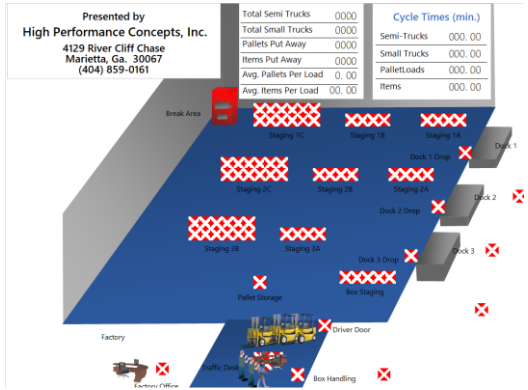
Views in ProModel





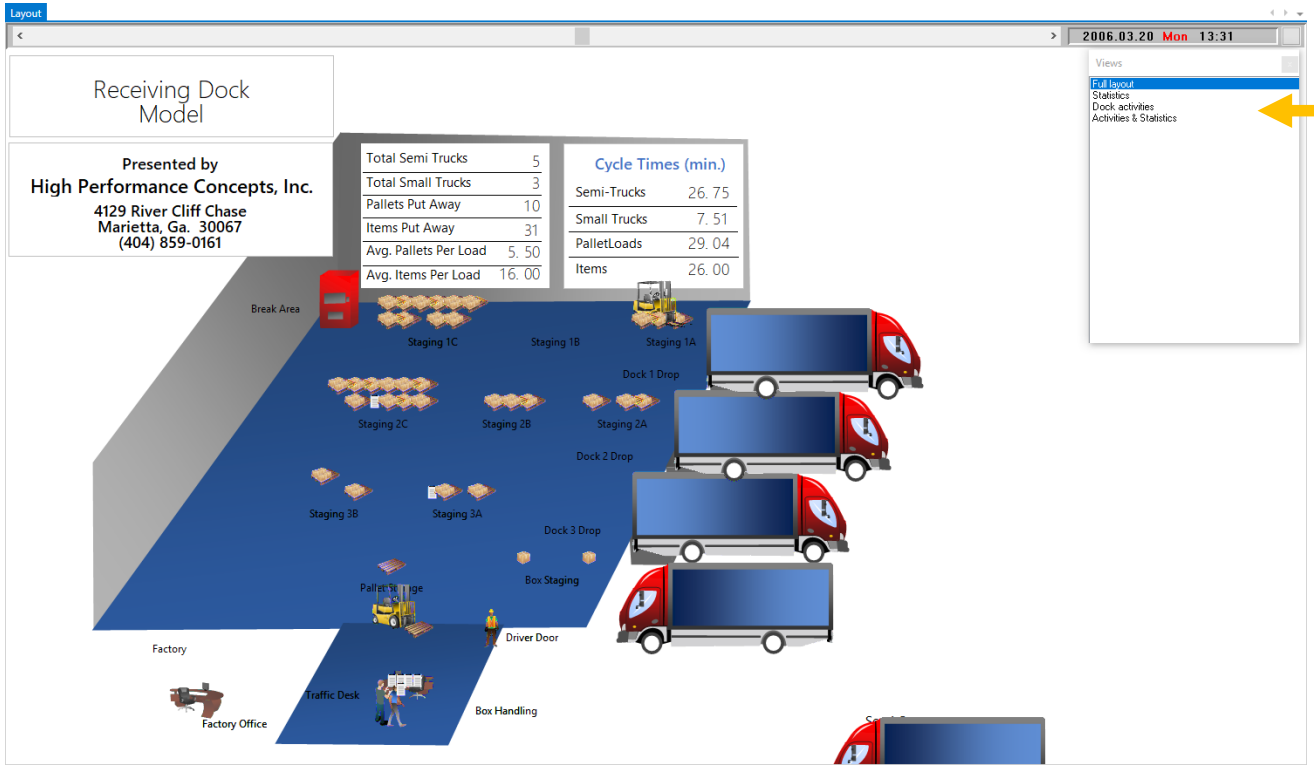






ProModel®
Better Decisions—Faster

Views in ProModel

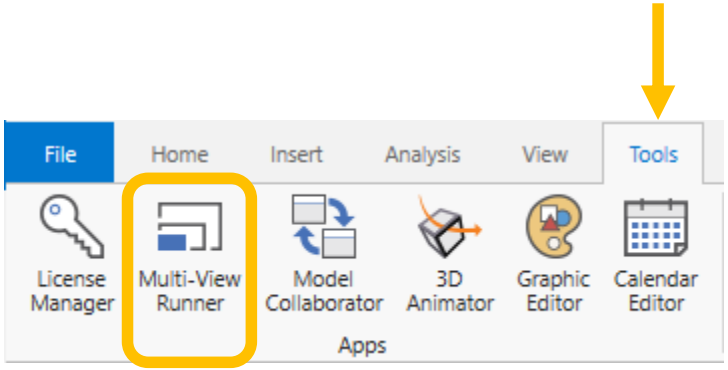


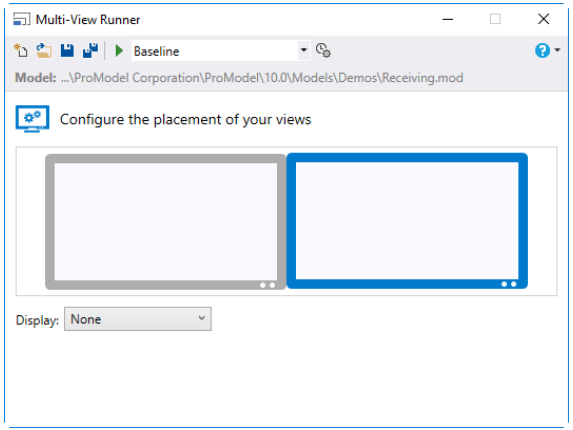
The Views window shows up during the simulation letting the user select which view he/she chooses to watch.

However, it's only possible to watch one view at a time.

Multi-View Runner

- Multi-View Runner allows you to watch more than one view at a time

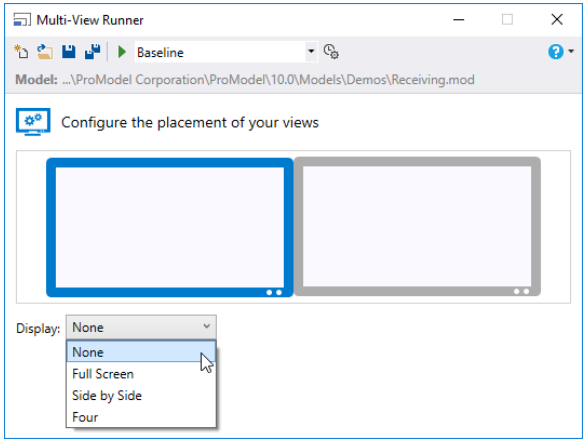




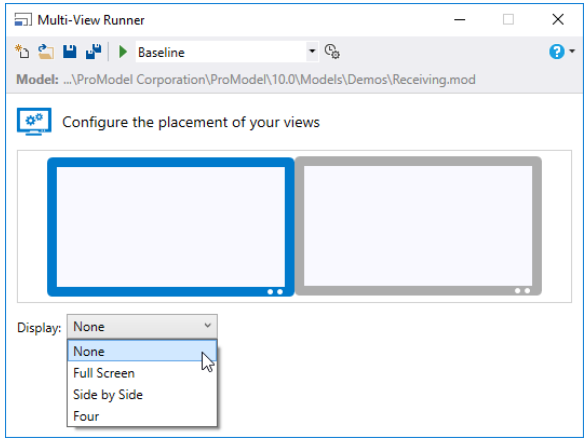
- Creates a .pmvr file

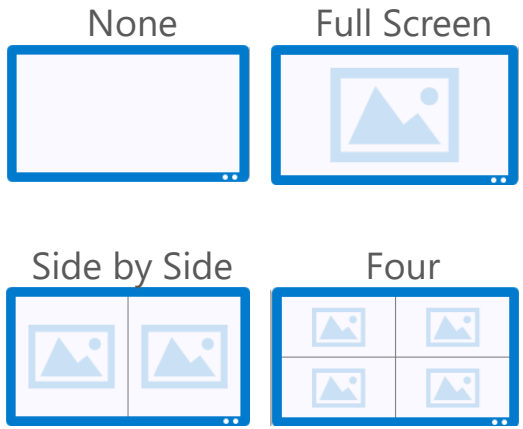
Multi-View Runner

- A monitor selection portion of the Multi-View Runner dialog box allows you to select what views you want to be displayed on the monitor.

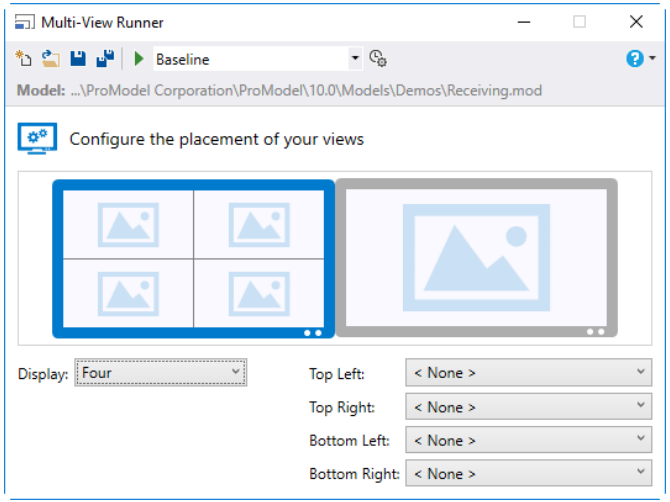


Multi-View Runner

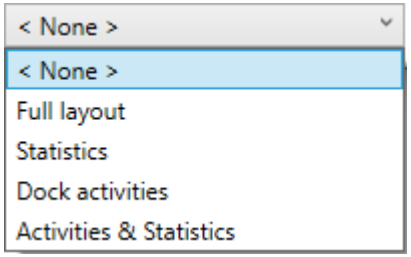




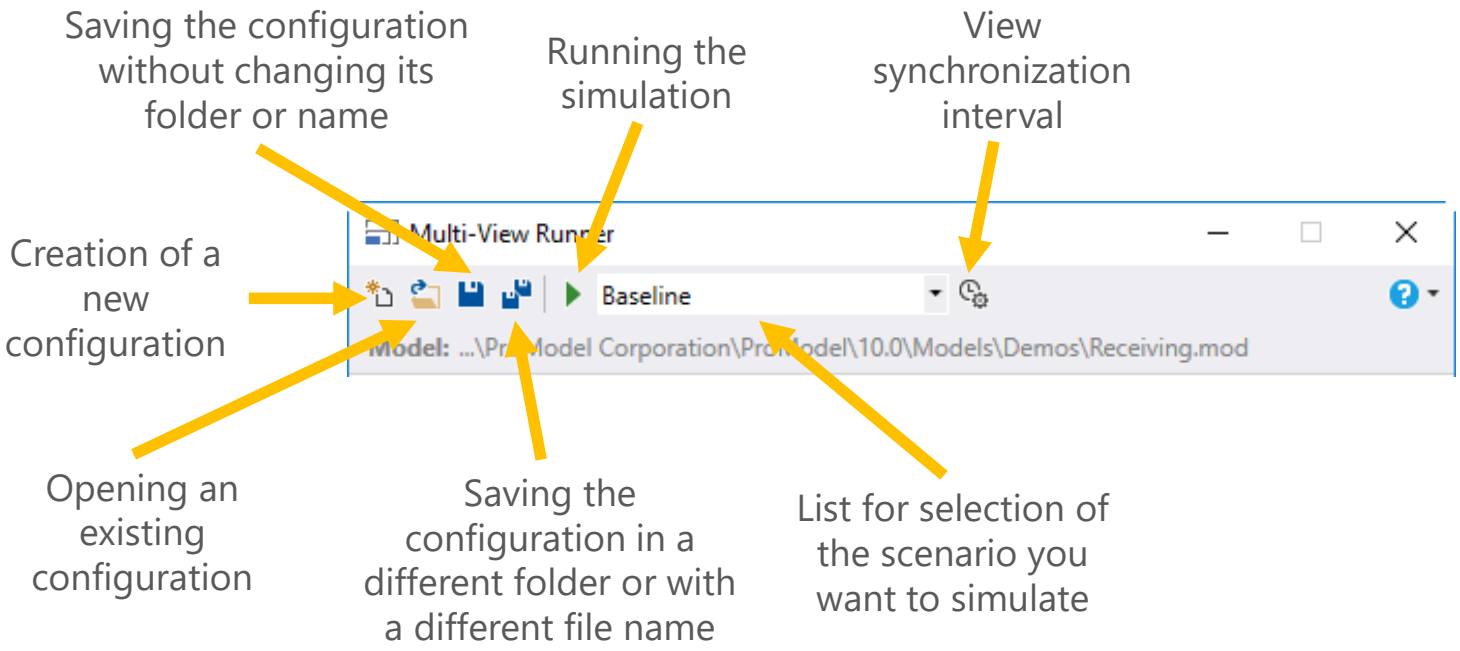
Multi-View Runner



The drop-down list allows the user to select the views they want to display on each screen

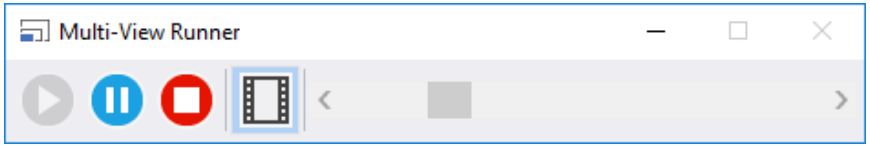


Multi-View Runner

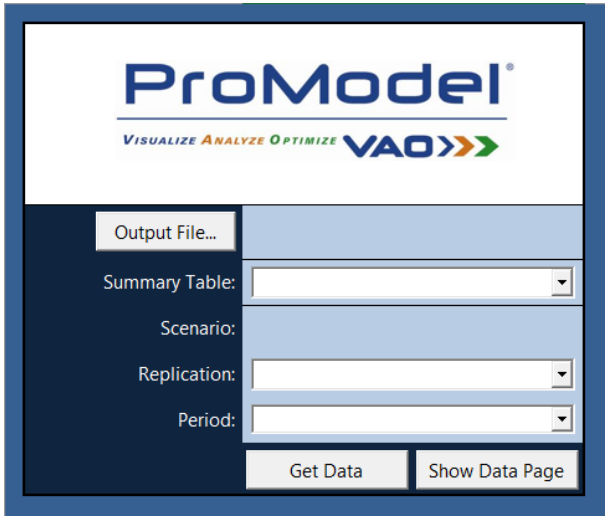


Multi-View Runner

While the simulation is running the Views window and a pop-up simulation control bar box is displayed.



2) ProRDB

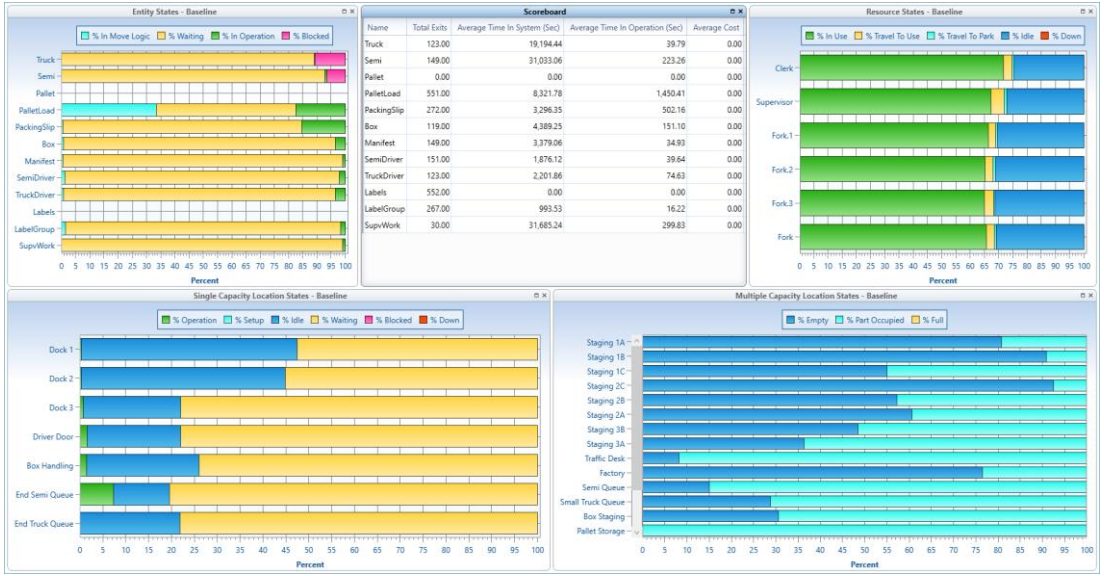

ProModel
VISUALIZE ANALYZE OPTIMIZE VAO
Output File...
Summary Table:
Scenario:
Replication:
Period:
Get Data
Show Data Page

RDB Files

- When a simulation is run RDB files are created
- These files contain the basic statistics created during the simulation
- Each scenario will have its own RDB file

RDB Files

- The information stored in the RDB files is the data displayed on Output Viewer.

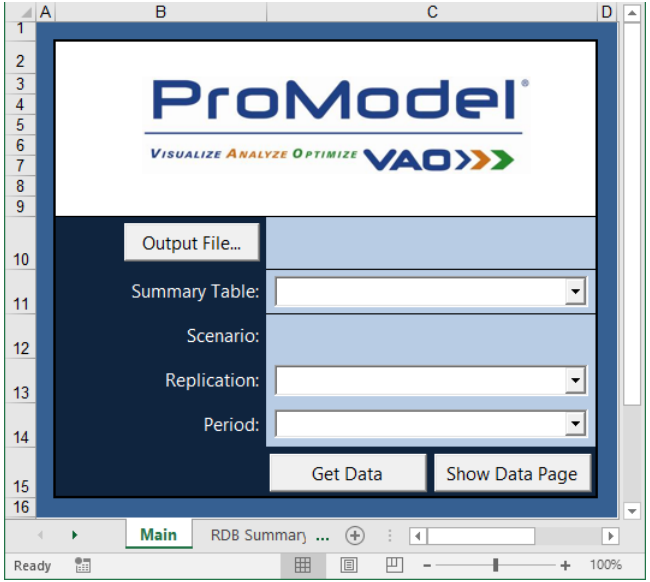


- They are located under:

C:\Users\<username>\Documents\ProModel\Output

ProRDB

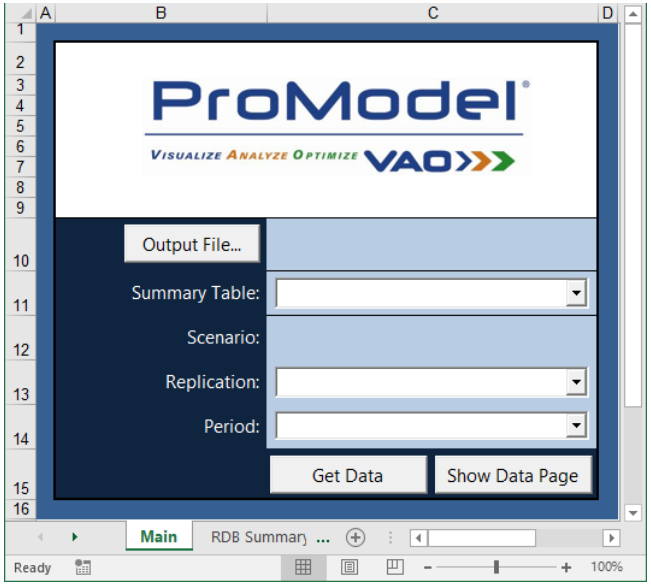
- Extract all or part of the standard ProModel output statistics



C:\Program Files (x86)\ProModel Corporation\ProModel\10.0\Power Tools

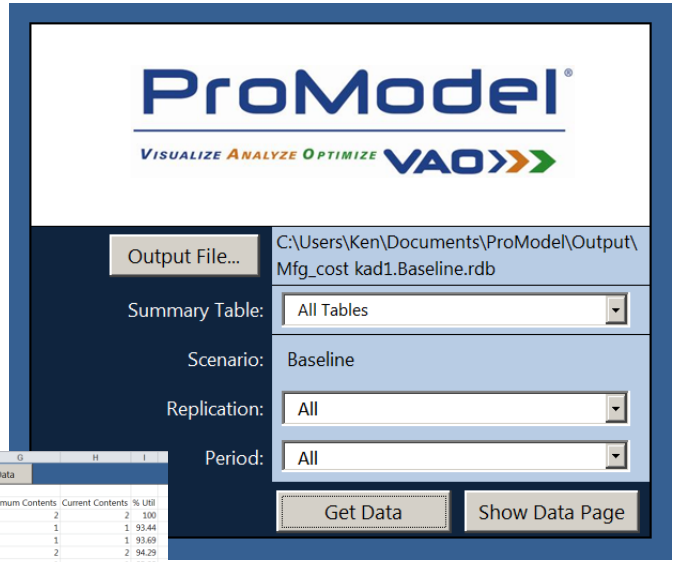
ProRDB

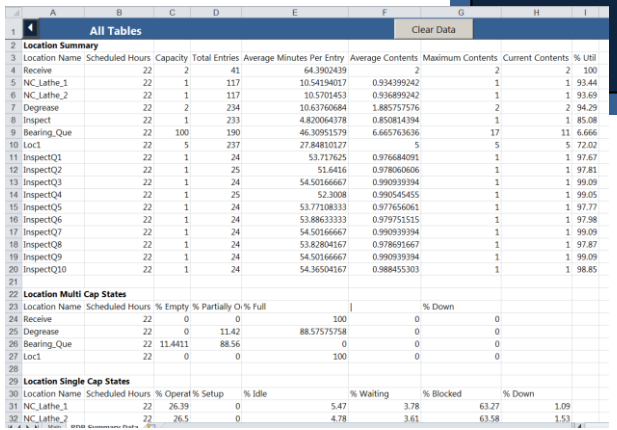
- Allows using Excel to retrieve model output data
- Granted, of minimal benefit, given the power of the standard ProModel output viewer
- Nevertheless, allows non-ProModel users to extract key metrics from output data



ProRDB

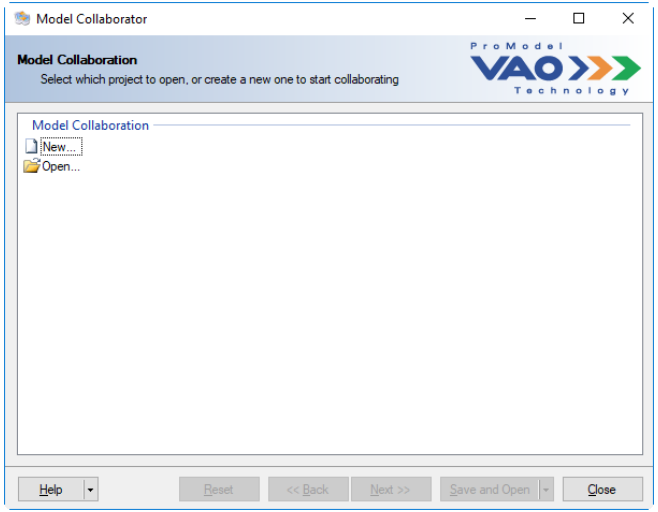
- Open ProRDB
- Specify the RDB file
- Specify the Replication and Period of interest
- Get Data





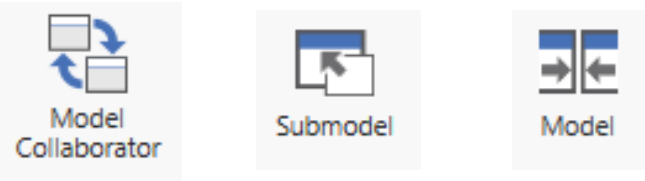
	A	B	C	D	E	F	G	H	I
1	All Tables						Clear Data		
2	**Location Summary**								
3	Location Name	Scheduled Hours	Capacity	Total Entries	Average Minutes Per Entry	Average Contents	Maximum Contents	Current Contents	% Util
4	Receive	22	2	41	64.3902439	2	2	2	100
5	NC_Lathe_1	22	1	117	10.54194017	0.934399242	1	1	93.44
6	NC_Lathe_2	22	1	117	10.5701453	0.936899242	1	1	93.69
7	Degrease	22	2	234	10.63760684	1.885757576	2	2	94.29
8	Inspect	22	1	233	4.820064378	0.850814394	1	1	85.08
9	Bearing_Que	22	100	190	46.30951579	6.665763636	17	11	6.666
10	Loc1	22	5	237	27.84810127	5	5	5	72.02
11	InspectQ1	22	1	24	53.717625	0.976684091	1	1	97.67
12	InspectQ2	22	1	25	51.6416	0.978060606	1	1	97.81
13	InspectQ3	22	1	24	54.50166667	0.990939394	1	1	99.09
14	InspectQ4	22	1	25	52.3008	0.990545455	1	1	99.05
15	InspectQ5	22	1	24	53.77108333	0.977656061	1	1	97.77
16	InspectQ6	22	1	24	53.88633333	0.979751515	1	1	97.98
17	InspectQ7	22	1	24	54.50166667	0.990939394	1	1	99.09
18	InspectQ8	22	1	24	53.82804167	0.978691667	1	1	97.87
19	InspectQ9	22	1	24	54.50166667	0.990939394	1	1	99.09
20	InspectQ10	22	1	24	54.36504167	0.988455303	1	1	98.85
21									
22	**Location Multi Cap States**								
23	Location Name	Scheduled Hours	% Empty	% Partially Or	% Full		% Down		
24	Receive	22	0	0	100	0	0		
25	Degrease	22	0	11.42	88.57575758	0	0		
26	Bearing_Que	22	11.4411	88.56	0	0	0		
27	Loc1	22	0	0	100	0	0		
28									
29	**Location Single Cap States**								
30	Location Name	Scheduled Hours	% Operat	% Setup	% Idle	% Waiting	% Blocked	% Down	
31	NC_Lathe_1	22	26.39	0	5.47	3.78	63.27	1.09	
32	NC_Lathe_2	22	26.5	0	4.78	3.61	63.58	1.53	

3) Model Collaborator



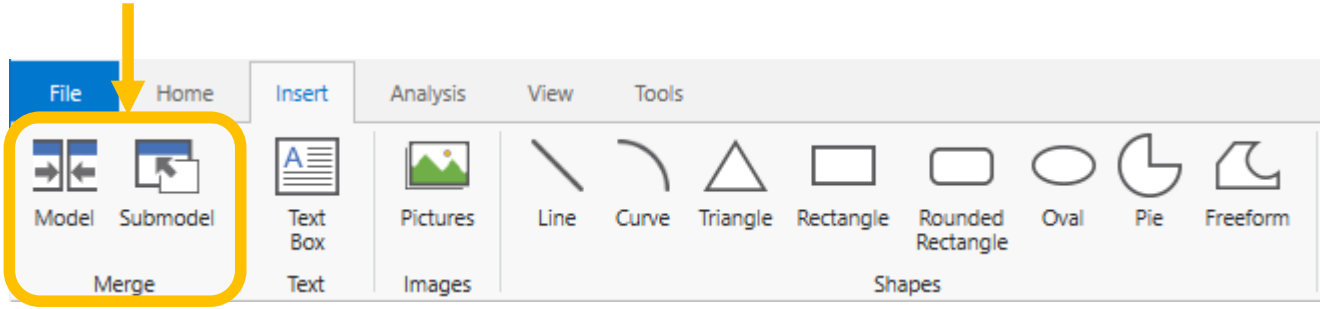
Collaborating on Model Creation

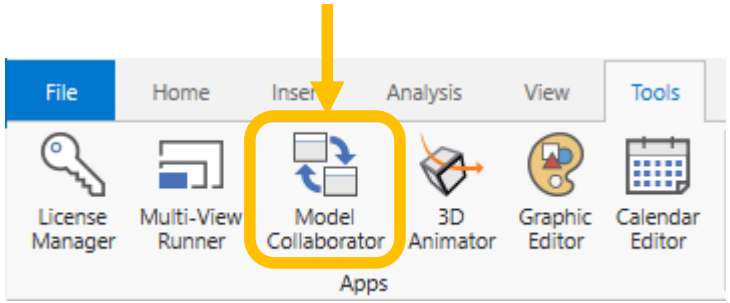
- Collaboration on model creation can speed up the process
- ProModel offers 3 tools that can help in this process:
  - Model Collaborator
  - Merge
    - Submodel
    - Model



Poll # 2

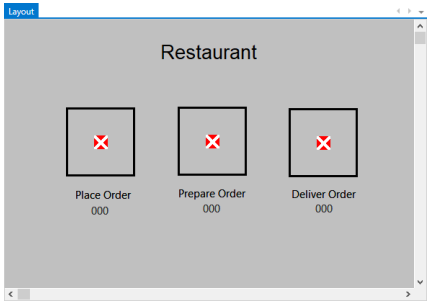
Collaborating on Model Creation





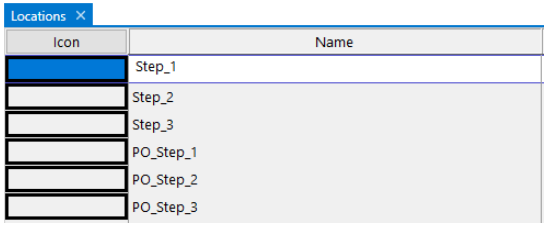
Model Merge

- Allows merging two different models



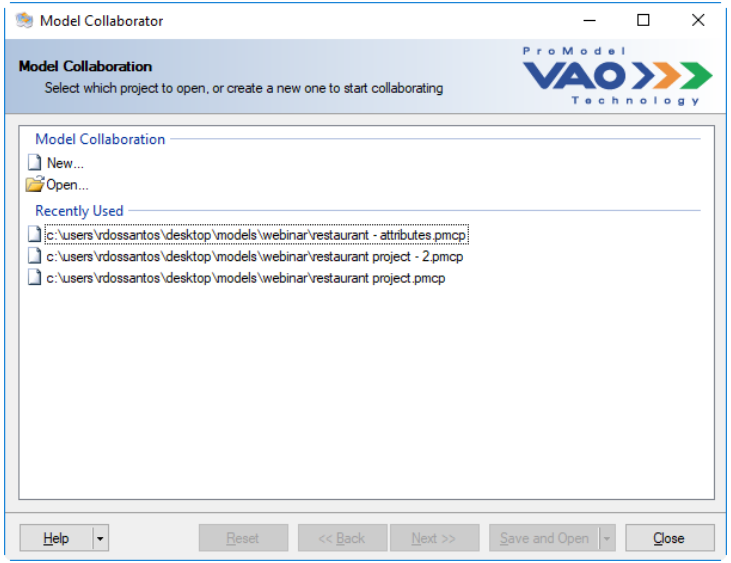
SubModel Merge

- Allows you to merge two different models even if they have duplicated locations, entities, attributes or variables.
  - If there are locations, entities, attributes or variables with the same name it will add a suffix or a prefix to the duplicate locations, entities, attributes or variables of the model that is being merged to the main model.

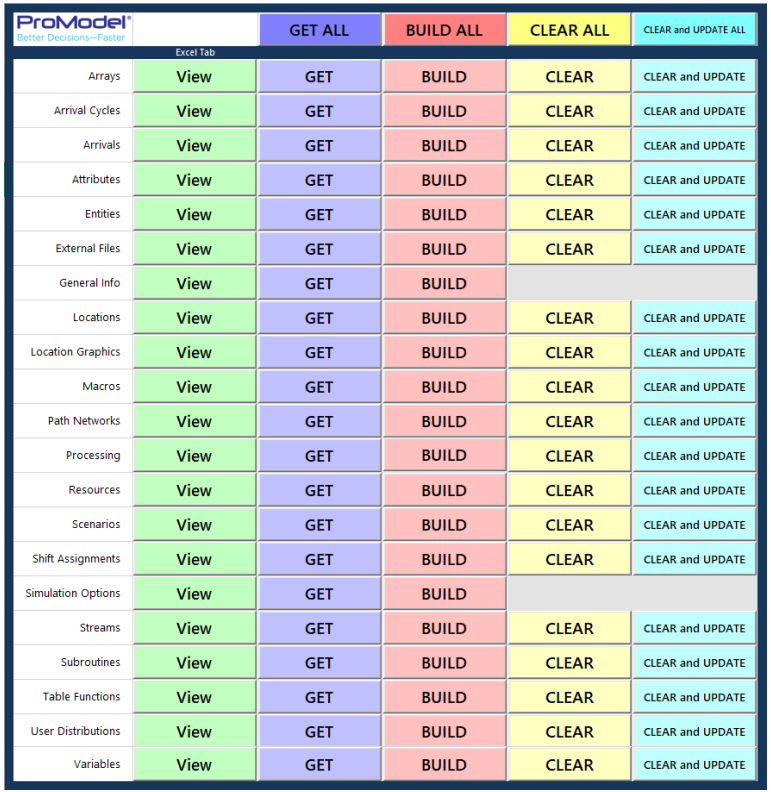


Model Collaborator

- Guides you through the merging Process in w wizard-like interface



4) ProActiveX

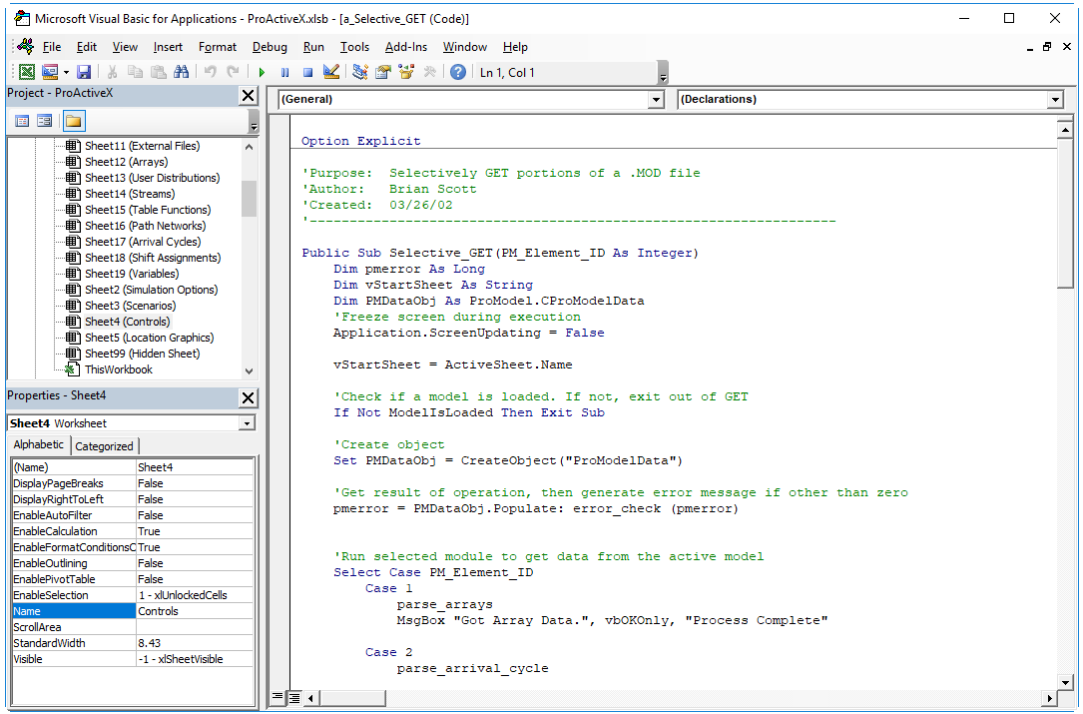


ProActiveX

- Extract & Build text and graphics items in a model
- Use Excel techniques to construct items
  - COPY / PASTE sections of items
  - FILL DOWN (iterating numbers & names)
  - CONCATENATE items to build other items
- Automate model Open & Save & Run

ProActiveX

- Written in VBA
- Allows you to edit the code.



ProActiveX

- Can be found at "C:\Program Files (x86)\ProModel Corporation\ProModel\10.0\Power Tools\ProActiveX.xlsb“

- The released version ProModel 2018 has a ProActiveX file that brings up the old User Interface. This was fixed and the new version of ProActiveX can be found in the Solutions Café (https://www.promodel.com/solutionscafe/).

ProActiveX

- Load the model so you can start working on it.

ProModel Better Decisions—Faster	Excel Tab	GET ALL	BUILD ALL	CLEAR ALL	CLEAR and UPDATE ALL
Arrays	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Arrival Cycles	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Arrivals	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Attributes	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Entities	View	GET	BUILD	CLEAR	CLEAR and UPDATE
External Files	View	GET	BUILD	CLEAR	CLEAR and UPDATE
General Info	View	GET	BUILD		
Locations	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Location Graphics	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Macros	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Path Networks	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Processing	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Resources	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Scenarios	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Shift Assignments	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Simulation Options	View	GET	BUILD		
Streams	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Subroutines	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Table Functions	View	GET	BUILD	CLEAR	CLEAR and UPDATE
User Distributions	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Variables	View	GET	BUILD	CLEAR	CLEAR and UPDATE

1

Load Model

Save Model

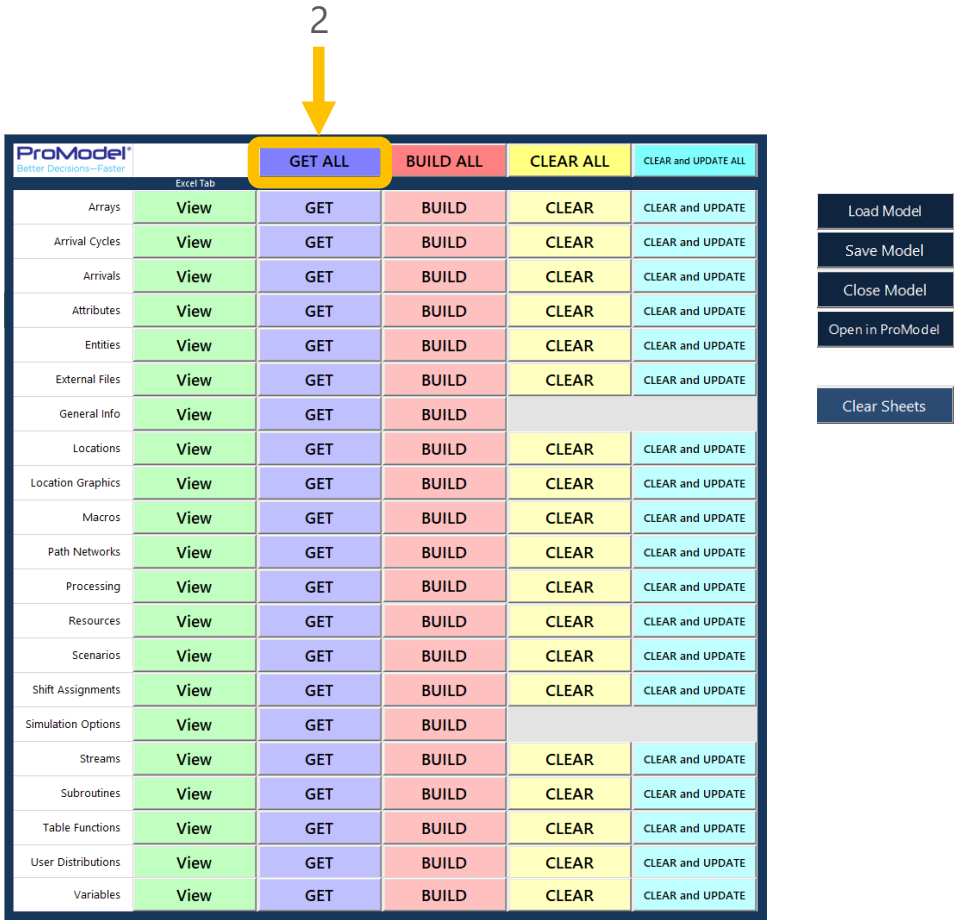
Close Model

Open in ProModel

Clear Sheets

ProActiveX

- Click on GET ALL to import the model information to ProActiveX



ProActiveX

- Click on View start editing

3

ProModel Better Decisions—Faster		GET ALL	BUILD ALL	CLEAR ALL	CLEAR and UPDATE ALL
Arrays	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Arrival Cycles	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Arrivals	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Attributes	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Entities	View	GET	BUILD	CLEAR	CLEAR and UPDATE
External Files	View	GET	BUILD	CLEAR	CLEAR and UPDATE
General Info	View	GET	BUILD		
Locations	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Location Graphics	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Macros	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Path Networks	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Processing	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Resources	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Scenarios	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Shift Assignments	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Simulation Options	View	GET	BUILD		
Streams	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Subroutines	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Table Functions	View	GET	BUILD	CLEAR	CLEAR and UPDATE
User Distributions	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Variables	View	GET	BUILD	CLEAR	CLEAR and UPDATE

Load Model

Save Model

Close Model

Open in ProModel

Clear Sheets

ProActiveX

- Click on Build ALL when you finish editing

4

ProModel Better Decisions—Faster		GET ALL	BUILD ALL	CLEAR ALL	CLEAR and UPDATE ALL
Excel Tab					
Arrays	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Arrival Cycles	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Arrivals	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Attributes	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Entities	View	GET	BUILD	CLEAR	CLEAR and UPDATE
External Files	View	GET	BUILD	CLEAR	CLEAR and UPDATE
General Info	View	GET	BUILD		
Locations	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Location Graphics	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Macros	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Path Networks	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Processing	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Resources	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Scenarios	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Shift Assignments	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Simulation Options	View	GET	BUILD		
Streams	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Subroutines	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Table Functions	View	GET	BUILD	CLEAR	CLEAR and UPDATE
User Distributions	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Variables	View	GET	BUILD	CLEAR	CLEAR and UPDATE

Load Model

Save Model

Close Model

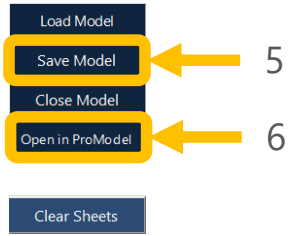
Open in ProModel

Clear Sheets

ProActiveX

- Save your model and click Open in ProModel

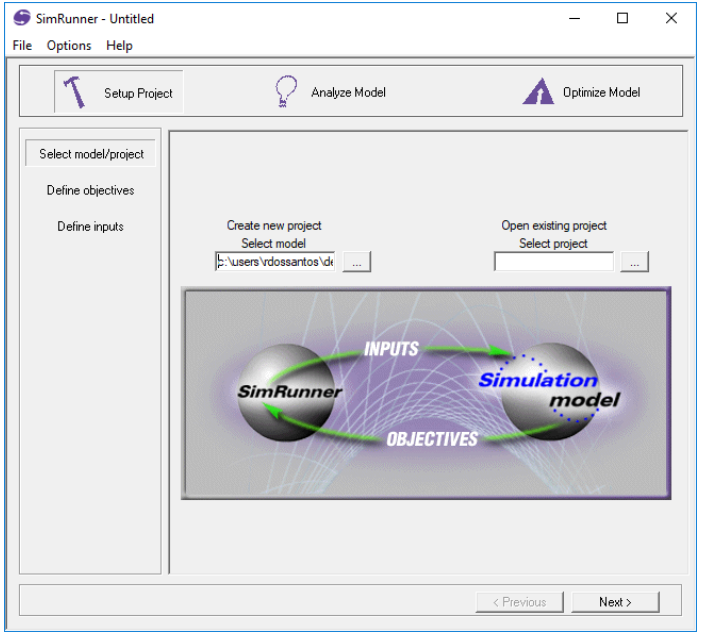
ProModel Better Decisions—Faster		GET ALL	BUILD ALL	CLEAR ALL	CLEAR and UPDATE ALL
Excel Tab					
Arrays	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Arrival Cycles	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Arrivals	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Attributes	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Entities	View	GET	BUILD	CLEAR	CLEAR and UPDATE
External Files	View	GET	BUILD	CLEAR	CLEAR and UPDATE
General Info	View	GET	BUILD		
Locations	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Location Graphics	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Macros	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Path Networks	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Processing	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Resources	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Scenarios	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Shift Assignments	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Simulation Options	View	GET	BUILD		
Streams	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Subroutines	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Table Functions	View	GET	BUILD	CLEAR	CLEAR and UPDATE
User Distributions	View	GET	BUILD	CLEAR	CLEAR and UPDATE
Variables	View	GET	BUILD	CLEAR	CLEAR and UPDATE



ProActiveX

- Special notes
  - Always Save a backup copy of your model before making any changes
  - Always carefully check to see if ProActiveX did what you expected

5) SimRunner


SimRunner - Untitled
File
Options
Help
Setup Project
Analyze Model
Optimize Model
Select model/project
Define objectives
Define inputs
Create new project
Select model
Open existing project
Select project
INPUTS
SimRunner
Simulation model
OBJECTIVES
< Previous
Next >

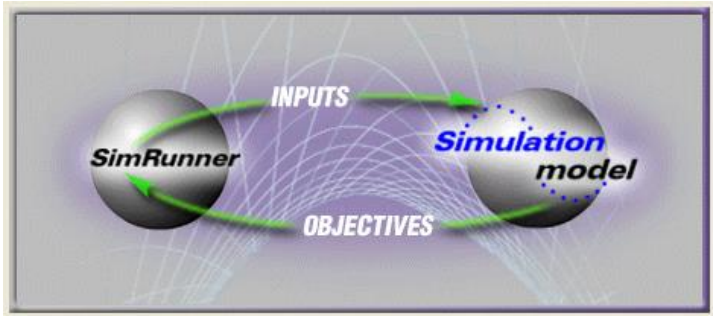
SimRunner

- Optimization tool

Finding the best solution
for a System (model)
given some constraints (inputs)
driving toward a Goal (objective function)

Poll # 3

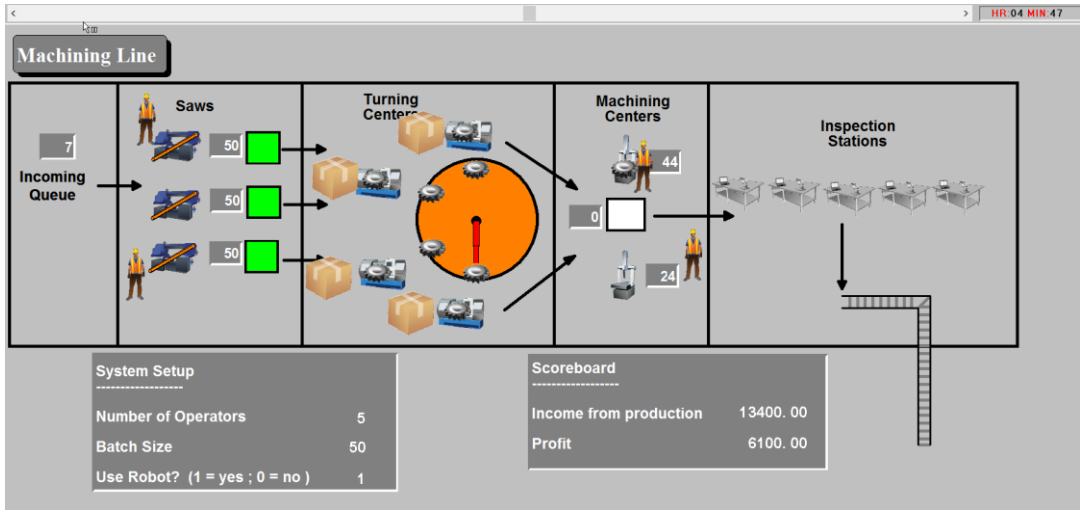
SimRunner



- When to use it
  - Want to play with certain key system controls to:
    - **Maximize** throughput; **Minimize** WIP; **Maximize** utilization of key bottleneck machine; **Minimize** delays; **Min/Max** whatever

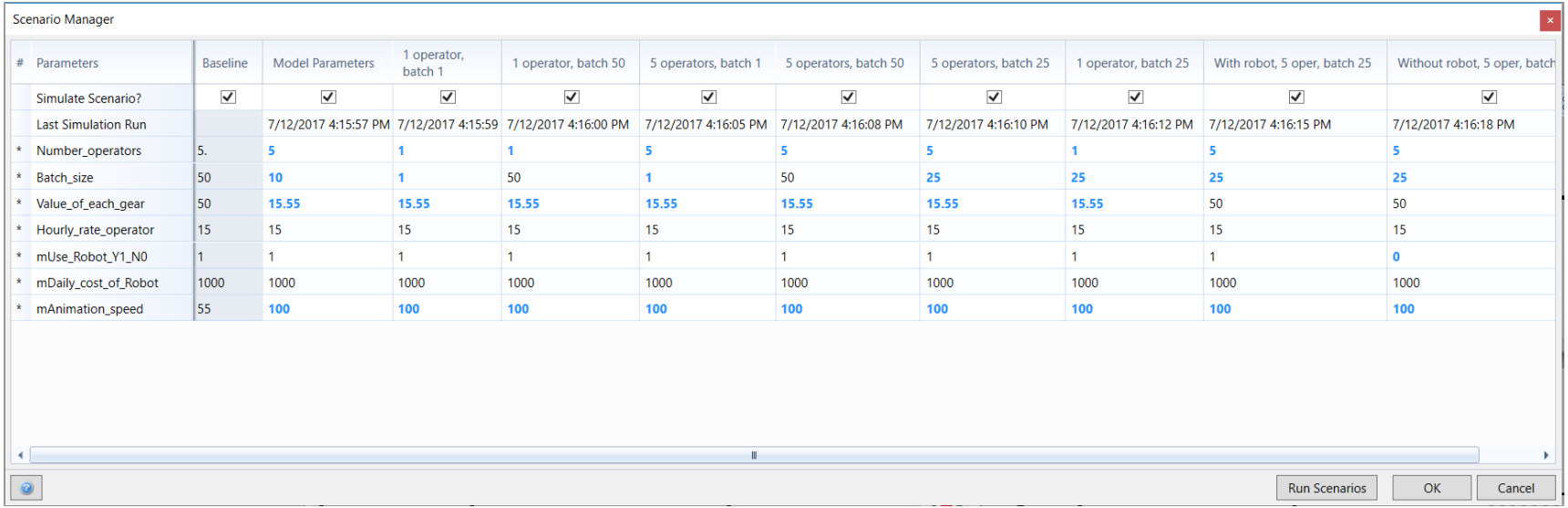
Scenarios to Find “Best” Solution

- Goal: Maximize profit
- Can change:
  - Quantity of Operators
  - Batch Size
  - Use Robot or Not



Profit = Value of product * Quantity Produced - Cost of raw material - Cost of Labor - Cost of Robot

Scenarios


Scenario Manager

#	Parameters	Baseline	Model Parameters	1 operator, batch 1	1 operator, batch 50	5 operators, batch 1	5 operators, batch 50	5 operators, batch 25	1 operator, batch 25	With robot, 5 oper, batch 25	Without robot, 5 oper, batch
	Simulate Scenario?	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
	Last Simulation Run		7/12/2017 4:15:57 PM	7/12/2017 4:15:59	7/12/2017 4:16:00 PM	7/12/2017 4:16:05 PM	7/12/2017 4:16:08 PM	7/12/2017 4:16:10 PM	7/12/2017 4:16:12 PM	7/12/2017 4:16:15 PM	7/12/2017 4:16:18 PM
*	Number_operators	5.	5	1	1	5	5	5	1	5	5
*	Batch_size	50	10	1	50	1	50	25	25	25	25
*	Value_of_each_gear	50	15.55	15.55	15.55	15.55	15.55	15.55	15.55	50	50
*	Hourly_rate_operator	15	15	15	15	15	15	15	15	15	15
*	mUse_Robot_Y1_N0	1	1	1	1	1	1	1	1	1	0
*	mDaily_cost_of_Robot	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
*	mAnimation_speed	55	100	100	100	100	100	100	100	100	100

Run Scenarios | OK | Cancel

Scenarios

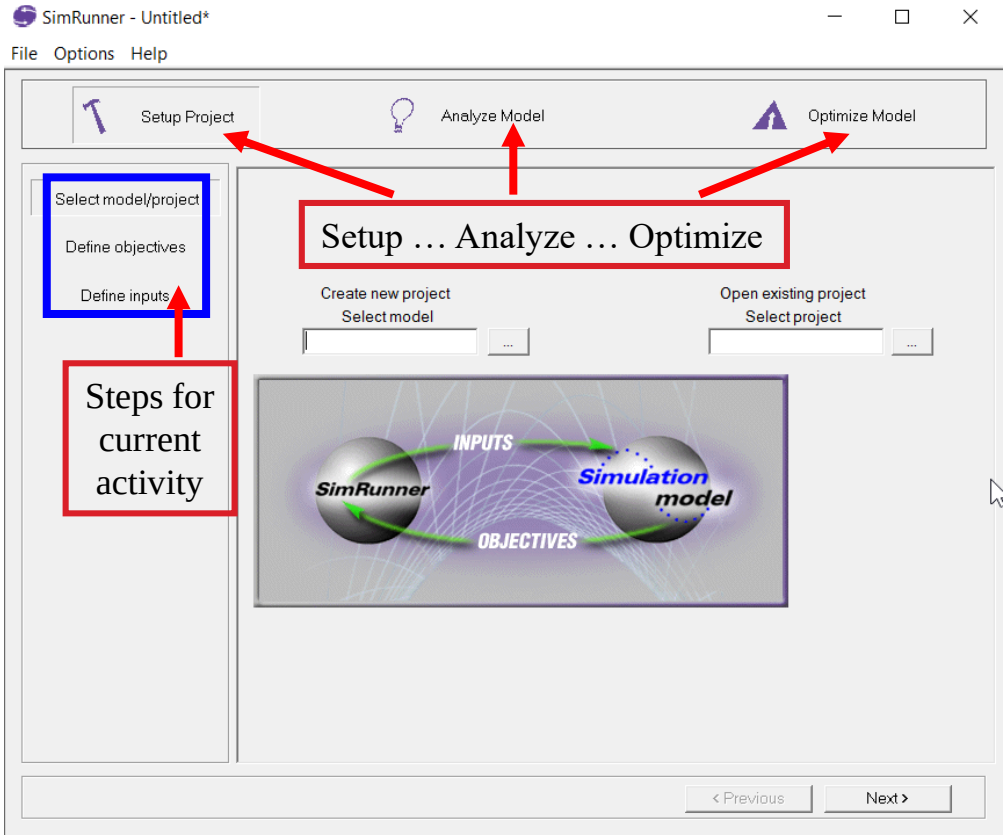
- How many Scenarios are possible?
  - Parameters choices * Parameters choices = BIG!!!

- For example:
  - Between 1 & 5 operators
  - Batch size between 1 & 50
  - Use a robot or not (2 choices)
  - Therefore: (5) * (50) * (2) = 500 Scenarios!!!
    Do you want to create 500 scenarios to find the right solution?

Steps for Using SimRunner

- Create simulation model
  - Scenario Parameter macros
  - Output metrics
- Open SimRunner
- Define Objective Function
- Define Input Factors
- Define Optimization control parameters
- Run Optimization
- Examine results … We have a winner!!!

SimRunner Three Main Parts



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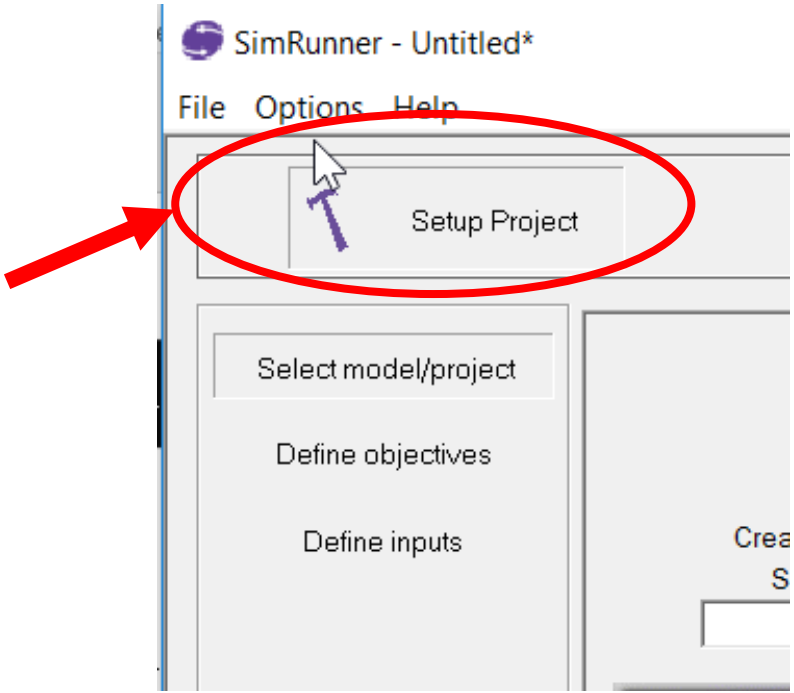
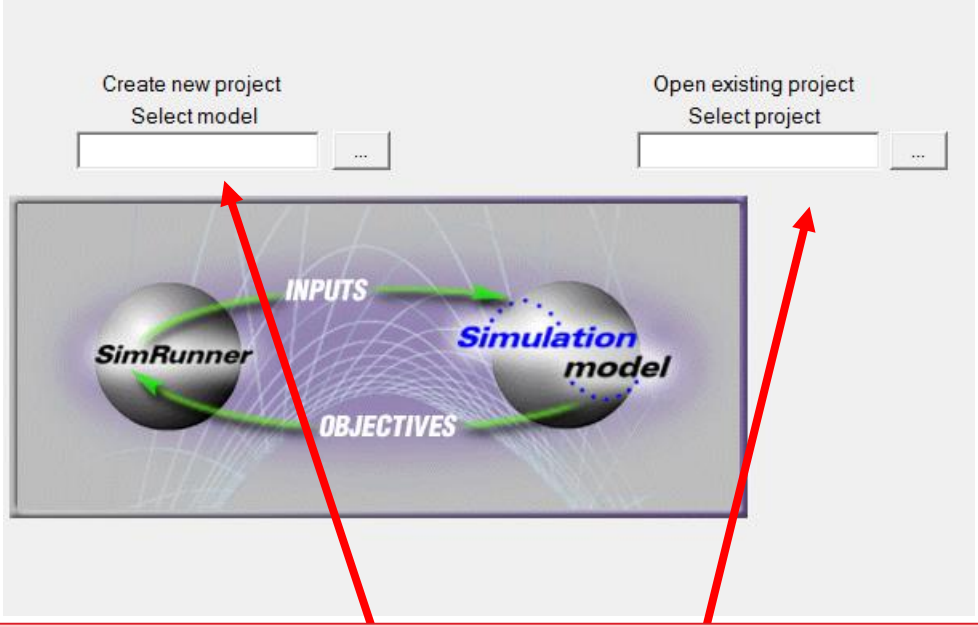
Set Up Project



Select Model/Project

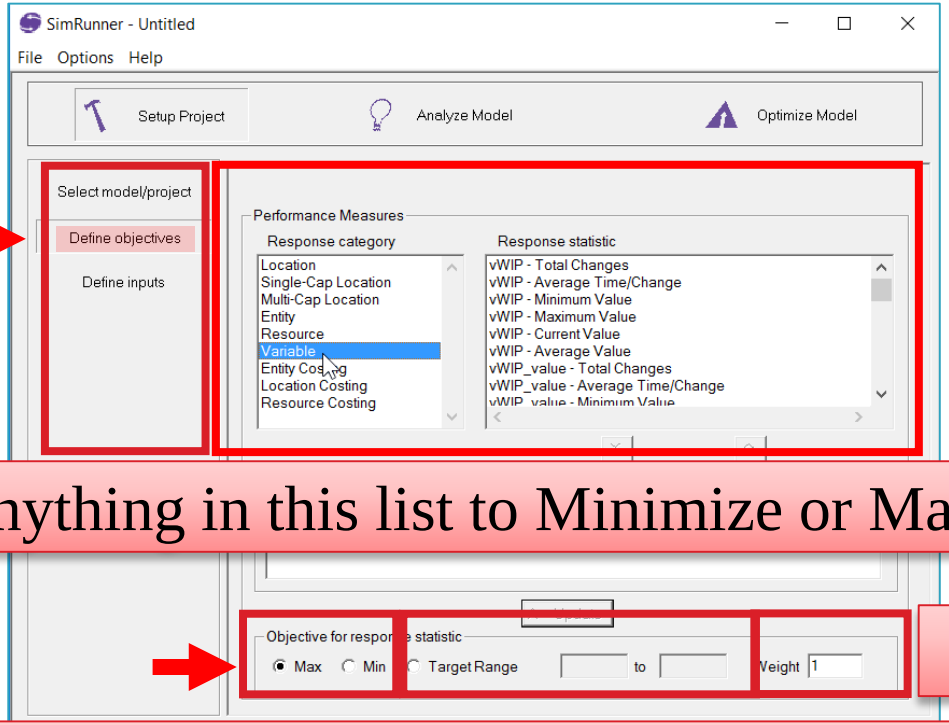


Select Model Name (if starting new Project) or Project Name (if previously created)

What is an Objective Function?

- GOAL!!
- Desired Minimize or Maximize of item(s)
- Equation that calculates desired metric
  - Example: v_Profit = v_Revenue – v_Cost
  - Example: v_WIP = (CONTENTS(x)+CONTENTS(y)+…)
  - …

Define Objectives



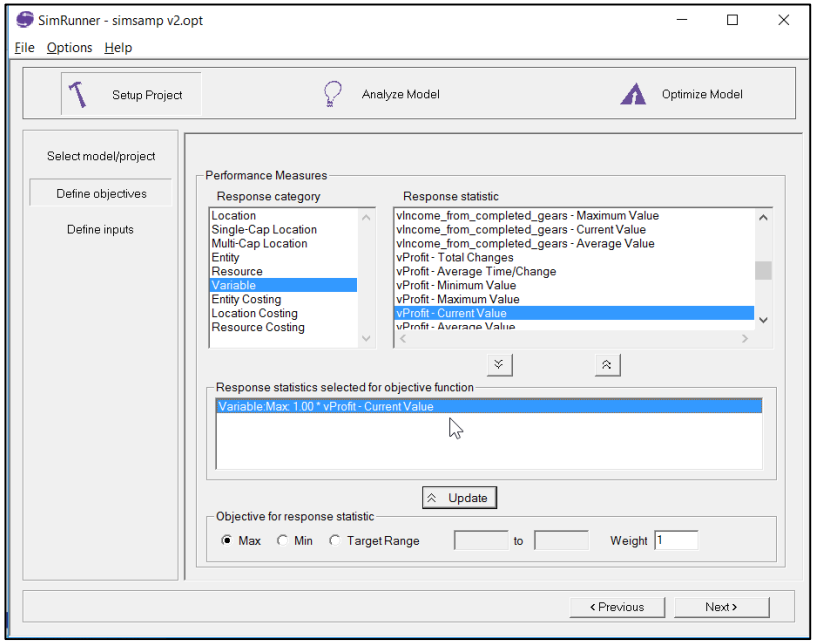
Pick anything in this list to Minimize or Maximize

Weight Factor

Target Range … For identifying Infeasible Solutions

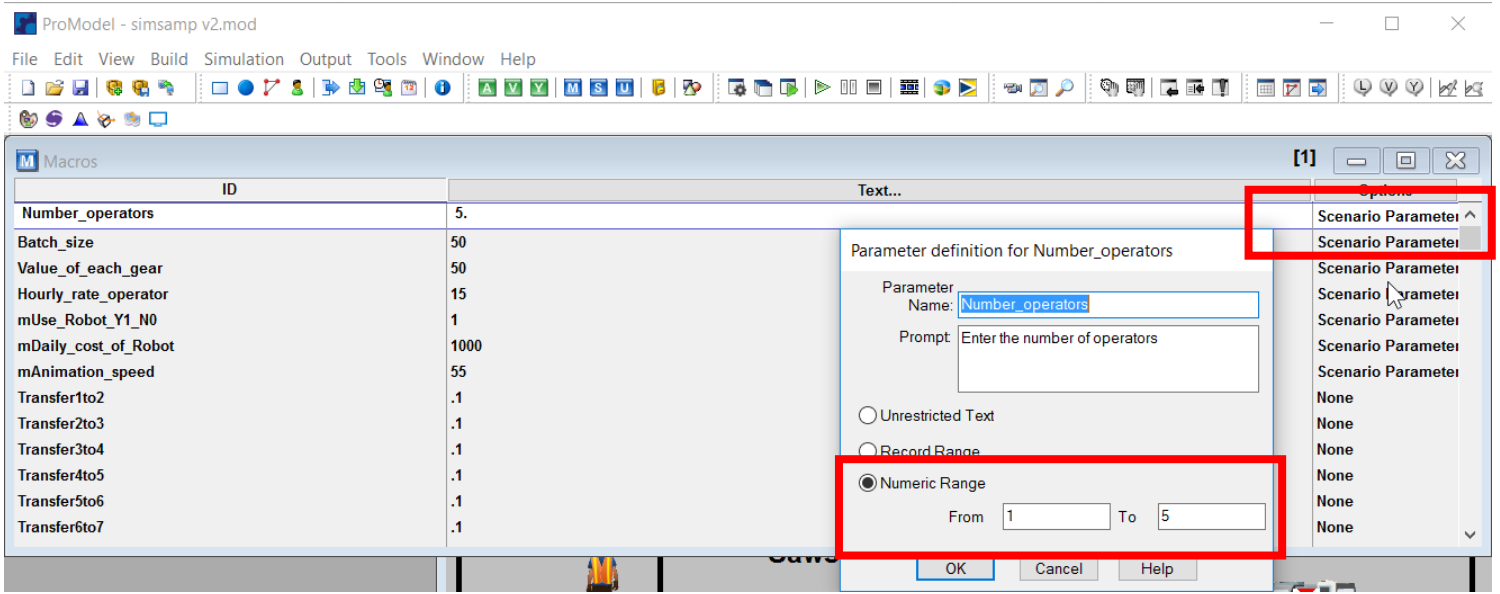
Define Objective Function

- Choose Item
  - For this model: v_Profit – Current Value (current value = At the End of the Run)
- Choose:
  - Maximize or Minimize
  - Target Range, if any
  - Weight
- If you change something, don't forget to press the Update button

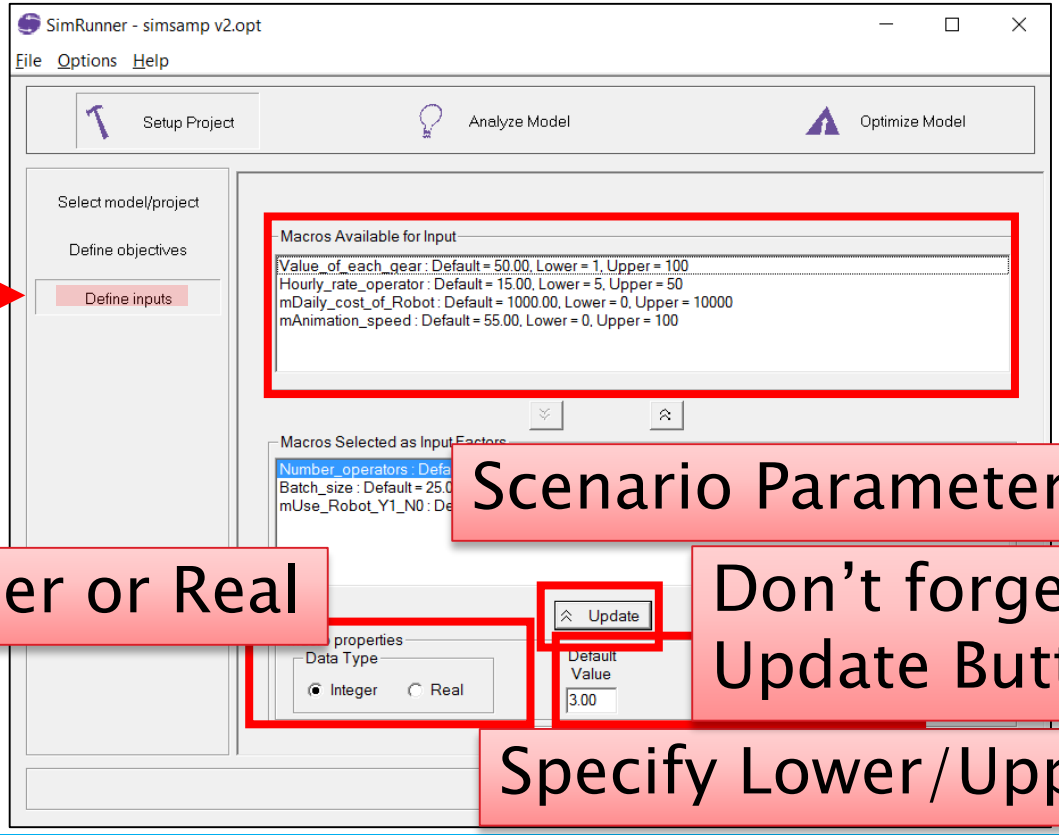


Define Inputs

- The Changeable Parameter to use for creating Scenarios must be numeric Scenario Macros



Define Inputs



Scenario Parameter Macros

Choose Integer or Real

Don't forget the Update Button

Specify Lower/Upper Limits

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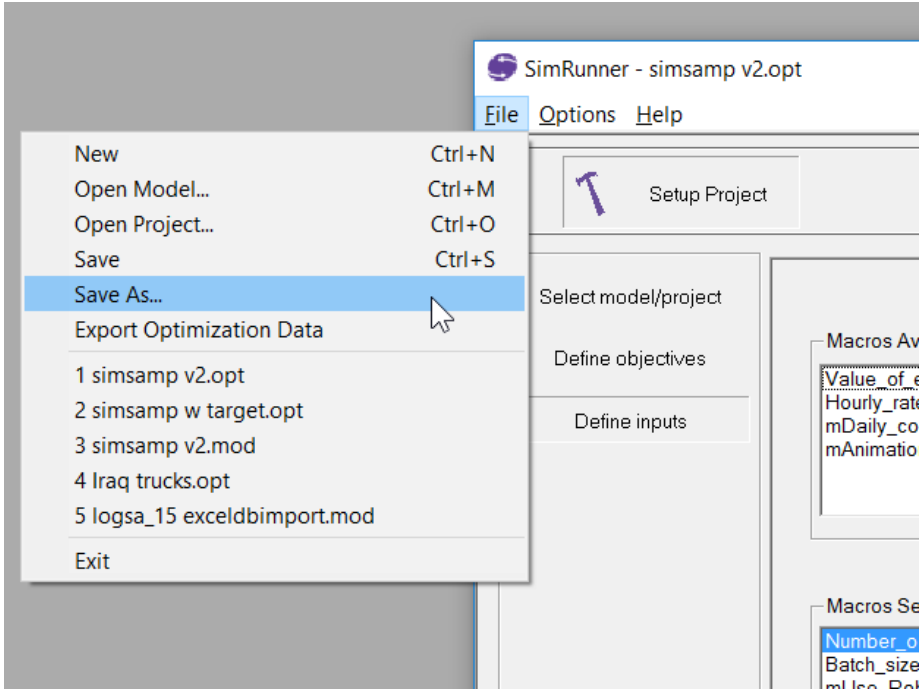
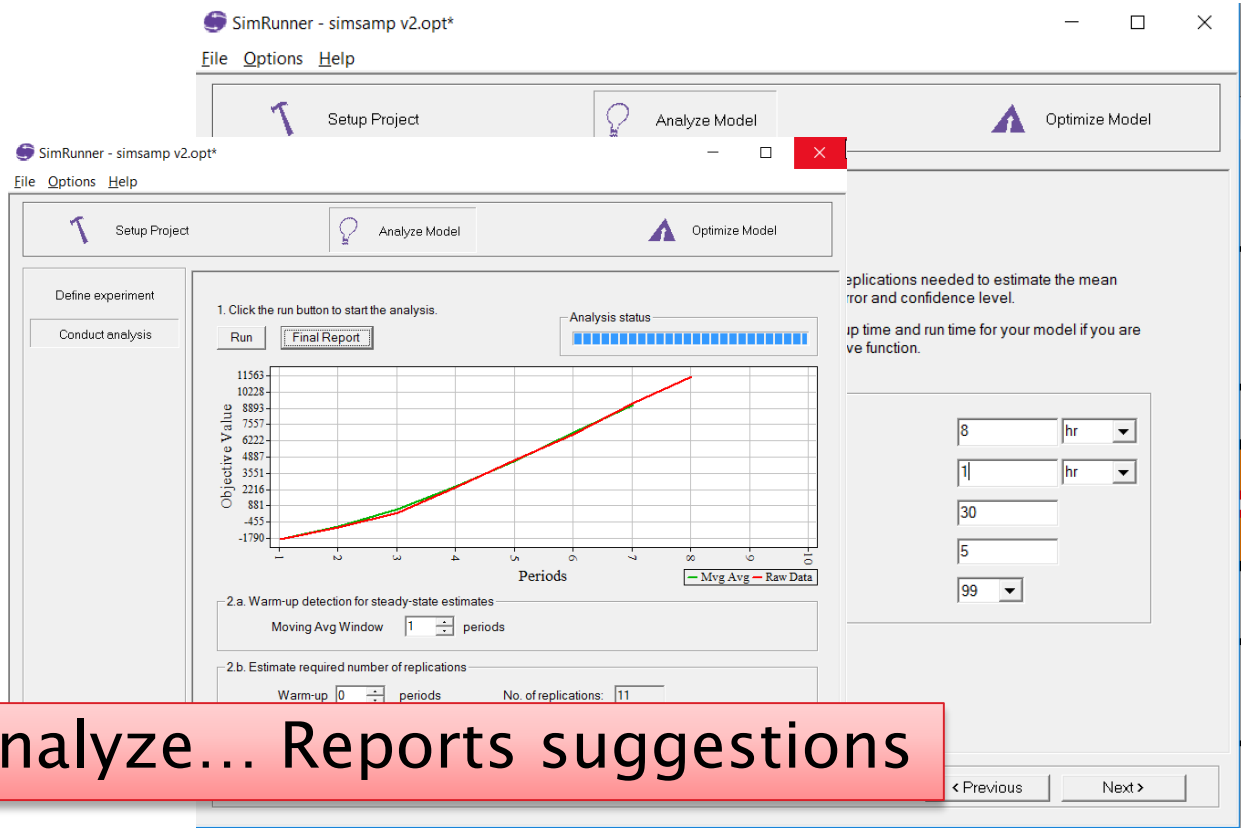
SimRunner Project

- Save the Project
  - Creates a .OPT file



Analyze the Model

- Helps determine:
  - Number of replications
  - Warmup period
- However…
  - ~30 Reps usually OK
  - You'll know if Warm-up is appropriate



Run Analyze… Reports suggestions

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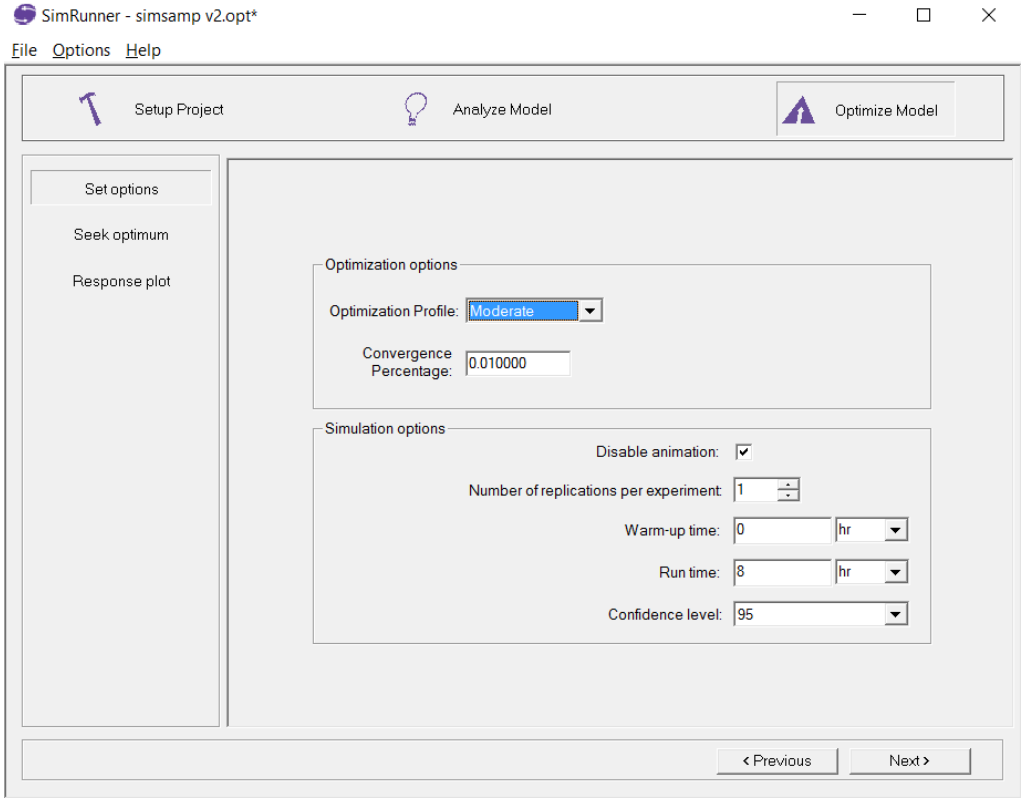
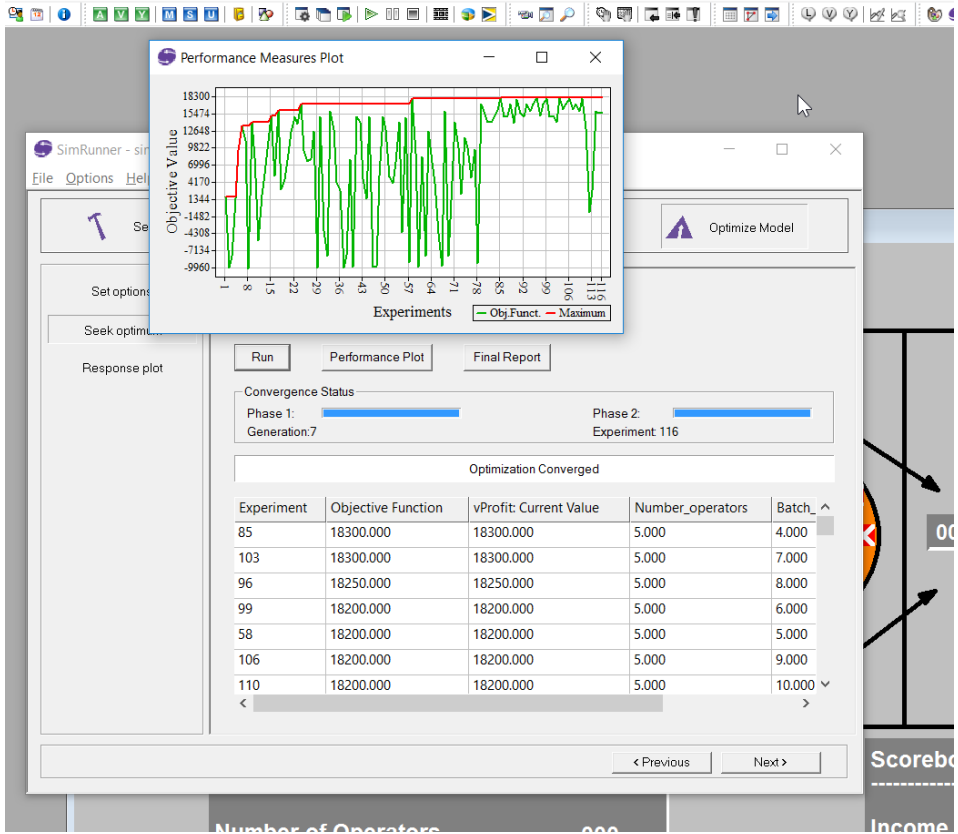
Run the Optimization - Settings

- Profile
  - Cautious, (more runs)
    Moderate,
    Aggressive (less runs)
  - Convergence %
- No Animation
- # of Replications
- Warmup/Run Time
- Confidence Level



Run the Optimization

- Run…
  - Results for each run…
    "Performance Plot"
    Green – Each run
    Red – Best so far
  - Table of Results
- When finished…
  "Optimization Converged"



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Examine the Results

- Best solution is at the top
  - For our example:
    $18,300 profit for the day
    5 Operators
    Batch size: 4 or 7
    Yes, Use the Robot

Optimization Converged

Experiment	Objective Function	vProfit: Current Value	Number_operators	Batch_size	mUse_Robot_Y1_N0
85	18300.000	18300.000	5.000	4.000	1.000
103	18300.000	18300.000	5.000	7.000	1.000
96	18250.000	18250.000	5.000	8.000	1.000
99	18200.000	18200.000	5.000	6.000	1.000
58	18200.000	18200.000	5.000	5.000	1.000
106	18200.000	18200.000	5.000	9.000	1.000
110	18200.000	18200.000	5.000	10.000	1.000
90	18050.000	18050.000	5.000	3.000	1.000

Examine the Results

- But more can be gleaned…
  - What if someone doesn't show up for work (4 Operators instead of 5): Profit of only $17,260

Optimization Converged

Experiment	Objective Function	vProfit: Current Value	Number_operators	Batch_size	mUse_Robot_Y1_N0
85	18300.000	18300.000	5.000	4.000	1.000
103	18300.000	18300.000	5.000	7.000	1.000
96	18250.000	18250.000	5.000	8.000	1.000
99	18200.000	18200.000	5.000	6.000	1.000
58	18200.000	18200.000	5.000	5.000	1.000
106	18200.000	18200.000	5.000	9.000	1.000
110	18200.000	18200.000	5.000	10.000	1.000
90	18050.000	18050.000	5.000	3.000	1.000
79	17300.000	17300.000	5.000	14.000	1.000
105	17260.000	17260.000	4.000	9.000	1.000
24	17250.000	17250.000	5.000	13.000	1.000
93	17250.000	17250.000	5.000	15.000	1.000
95	17250.000	17250.000	5.000	12.000	1.000
88	17250.000	17250.000	5.000	11.000	1.000

Examine the Results

- Regarding the Batch Size…
  - How sensitive is the Profit?
    Not very ($250/day), for sizes 3,4,5,6,7,8,9,10
  - What if there are “standard” containers?
    Then don’t fill every hole

Optimization Converged

Experiment	Objective Function	vProfit: Current Value	**Number_operators**	Batch_size	mUse_Robot_Y1_N0
85	18300.000	18300.000	5.000	4.000	1.000
103	18300.000	18300.000	5.000	7.000	1.000
96	18250.000	18250.000	5.000	8.000	1.000
99	18200.000	18200.000	5.000	6.000	1.000
58	18200.000	18200.000	5.000	5.000	1.000
106	18200.000	18200.000	5.000	9.000	1.000
110	18200.000	18200.000	5.000	10.000	1.000
90	18050.000	18050.000	5.000	3.000	1.000
79	17300.000	17300.000	5.000	14.000	1.000

Examine the Results

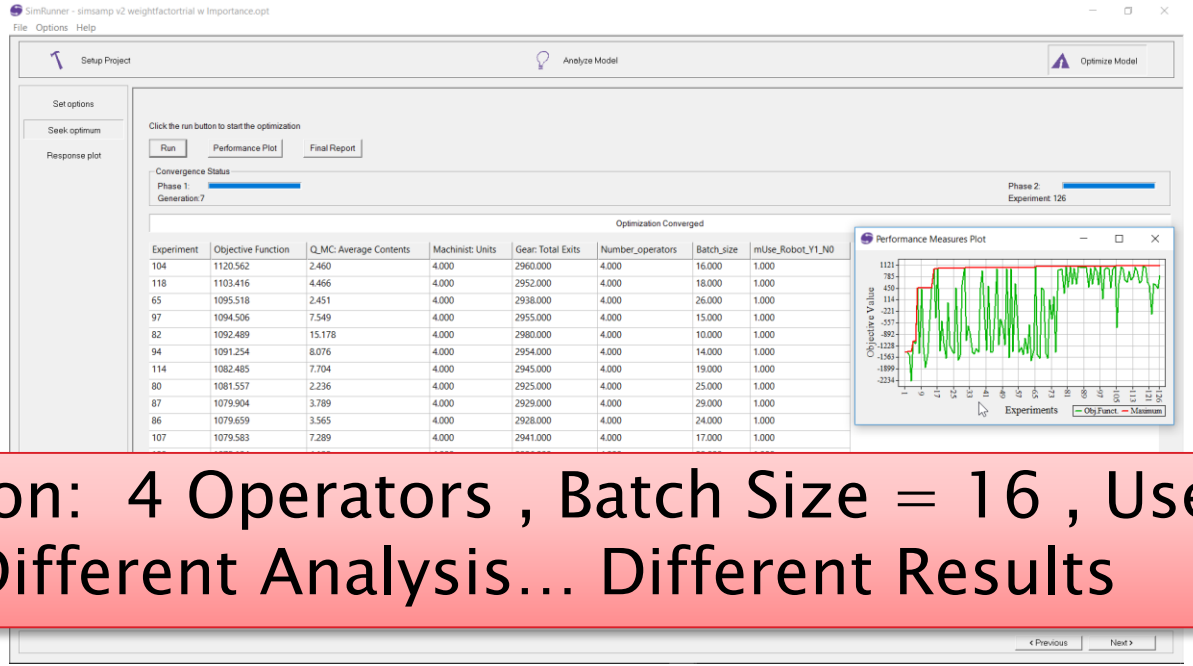
- Regarding the Robot…
  - What's it's worth?
    $13,600 - $18,300 = -$4,700 day loss without

Optimization Converged

Experiment	Objective Function	vProfit: Current Value	Number_operators	Batch_size	mUse_Robot_Y1_N0
81	14200.000	14200.000	5.000	47.000	1.000
9	14200.000	14200.000	5.000	50.000	1.000
89	14150.000	14150.000	5.000	42.000	1.000
23	13910.000	13910.000	4.000	50.000	1.000
6	13600.000	13600.000	5.000	13.000	0.000
111	13260.000	13260.000	4.000	2.000	1.000
50	13050.000	13050.000	5.000	11.000	0.000
34	13000.000	13000.000	5.000	28.000	0.000
63	12800.000	12800.000	5.000	37.000	0.000
28	12750.000	12750.000	5.000	6.000	0.000
21	12600.000	12600.000	5.000	1.000	1.000
74	11650.000	11650.000	5.000	3.000	0.000
7	11170.000	11170.000	3.000	13.000	1.000
14	11070.000	11070.000	3.000	26.000	1.000

Examine the Results

- How about if we don't use Profit?
  - Max Throughput, Min WIP, Min Labor – w/ Weights



Best Solution: 4 Operators , Batch Size = 16 , Use Robot
Different Analysis… Different Results

FINISHED

- Thanks for attending this ProModel Extended Features Webinar! We hope it was helpful.
- Remember, help is only an email or phone call away.
- Good luck and happy modeling!

Technical Support
888-776-6633
support@promodel.com
6 am - 6 pm M-F, Mountain Time