



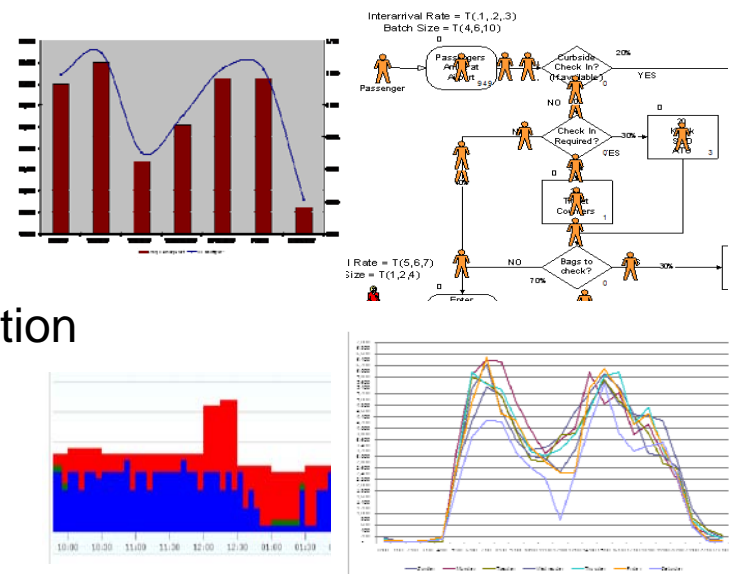
SIMULATION-BASED MANPOWER PLANNING WITH OPTIMIZED SCHEDULING IN A DISTRIBUTED MULTI-USER ENVIRONMENT

David Kalasky - IBM Corporation

Michael Coffman - Transportation Security Administration

Melanie De Grano - IBM Corporation

Kevin Field - ProModel Corporation



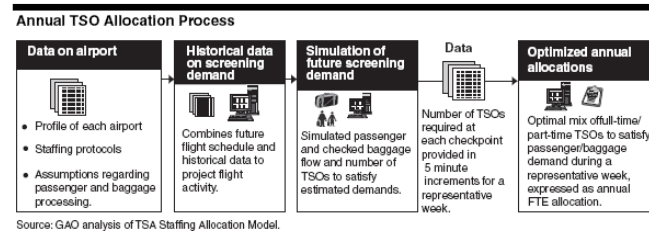
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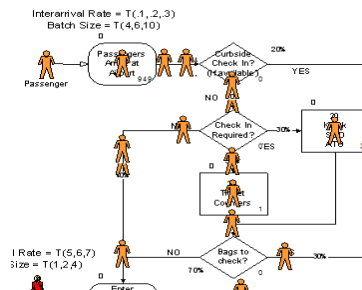
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AGENDA

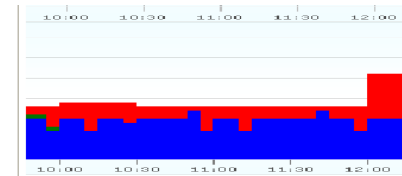
Overview of ESM process



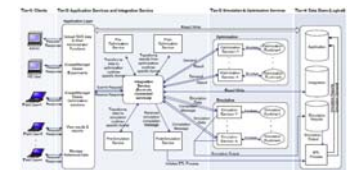
Use of simulation engine to determine requirements



Overview of scheduling optimizer



Benefits of ESM simulation-based scheduling system



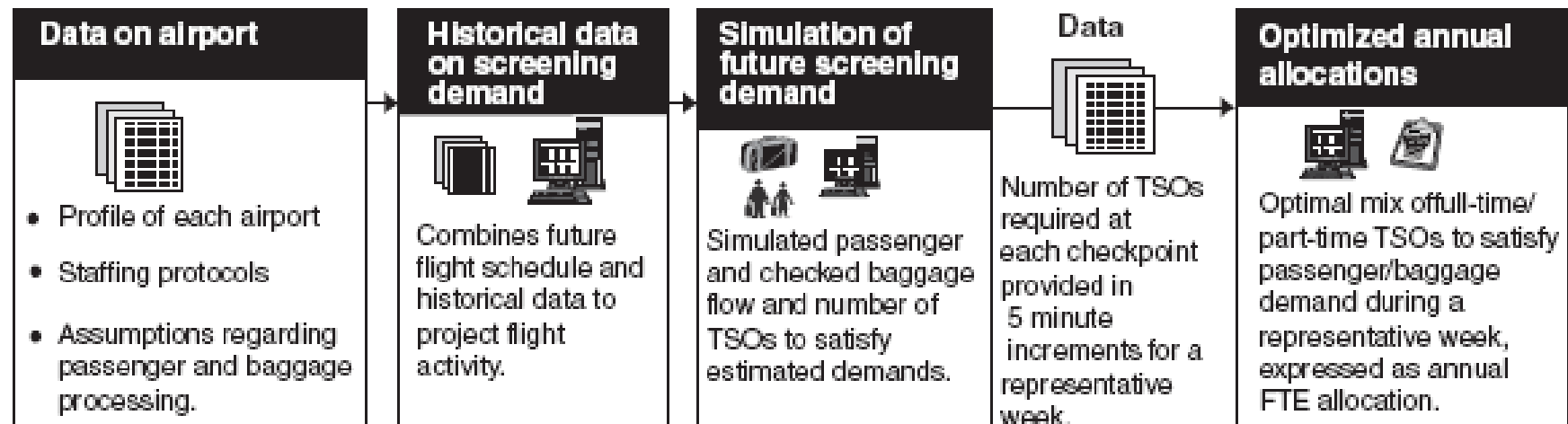
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Enhance Staffing Model (ESM) allocates airport staff based on unique airport screening, equipment, facility layout, and scheduling requirements

Annual TSO Allocation Process



Source: GAO analysis of TSA Staffing Allocation Model.

End result is the airport's FTE allocation used to guide hiring and as a measure of each airport's performance




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Screening requirements are generated in the application as flight instances based on a combination of data provided by OAG (Official Airline Guide) and BTS (Bureau of Transportation Statistics)

TSA Enhanced Staffing Model (ESM) 1.0  Transportation Security Administration
Build 8.5

Dashboard **References** **Administration**

[Dashboard](#) > [Experiment Summary](#) > [Execution Settings](#) > [Scenario List](#)

→ **Staff Model: Configure Flights**

Airport: LAS **Experiment Name:** Bug Tests **Terminal:** 1 **Flight Week:** 10/31/2010 **Created By:** Atkins, Todd [Edit Experiment Properties](#)

Flight Count: 2684 **Total Est. Bags:** 153739 **Pax:** 236118

Multi-Edit

View: **General**

Filter on column: **Show All**

+ Add New Flight

	Airline	Flight#	Dest.	Day	Intl	Length	Source	Concourse	ETD	Aircraft	Capacity
	AIRTRAN AIRWAYS	773	ATL	Wednesday	N	LONG	MFS	D	7:10 AM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	774	ATL	Friday	N	LONG	MFS	D	11:10 AM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	774	ATL	Monday	N	LONG	MFS	D	11:10 AM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	774	ATL	Saturday	N	LONG	MFS	D	11:10 AM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	774	ATL	Sunday	N	LONG	MFS	D	11:10 AM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	774	ATL	Thursday	N	LONG	MFS	D	11:10 AM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	774	ATL	Tuesday	N	LONG	MFS	D	11:10 AM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	774	ATL	Wednesday	N	LONG	MFS	D	11:10 AM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	776	MKE	Friday	N	LONG	MFS	D	11:40 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	776	MKE	Monday	N	LONG	MFS	D	11:40 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	776	MKE	Saturday	N	LONG	MFS	D	11:40 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	776	MKE	Sunday	N	LONG	MFS	D	11:40 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	776	MKE	Thursday	N	LONG	MFS	D	11:40 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	776	MKE	Tuesday	N	LONG	MFS	D	11:40 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	776	MKE	Wednesday	N	LONG	MFS	D	11:40 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	778	ATL	Friday	N	LONG	MFS	D	1:30 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	778	ATL	Monday	N	LONG	MFS	D	1:30 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	778	ATL	Saturday	N	LONG	MFS	D	1:30 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	778	ATL	Sunday	N	LONG	MFS	D	1:30 PM	BOEING 737-700 [137]	137
	AIRTRAN AIRWAYS	778	ATL	Thursday	N	LONG	MFS	D	1:30 PM	BOEING 737-700 [137]	137

Page: 2 of 135 Page size: 20 Item 21 to 40 of 2684

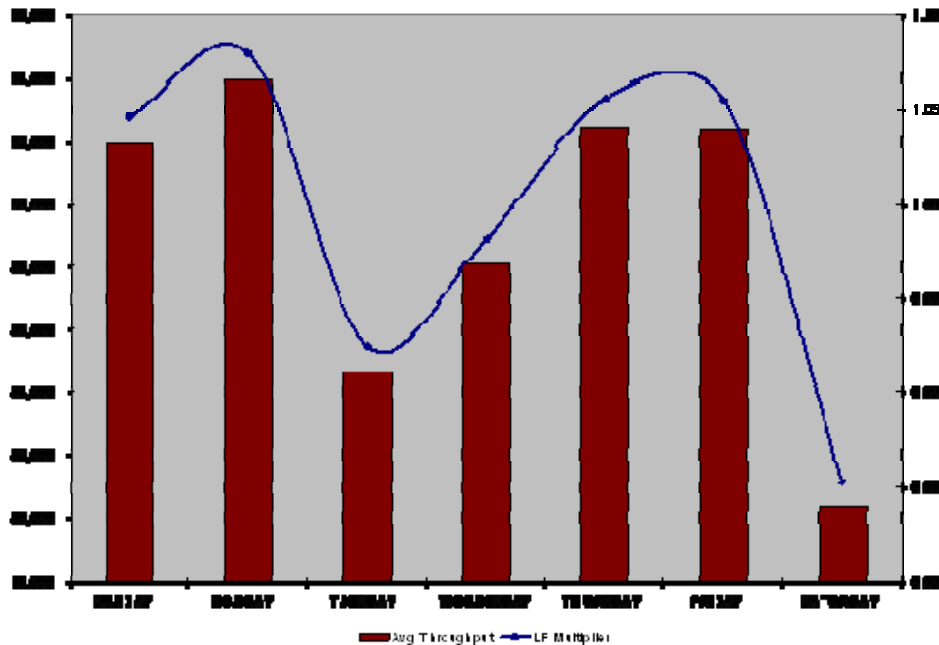


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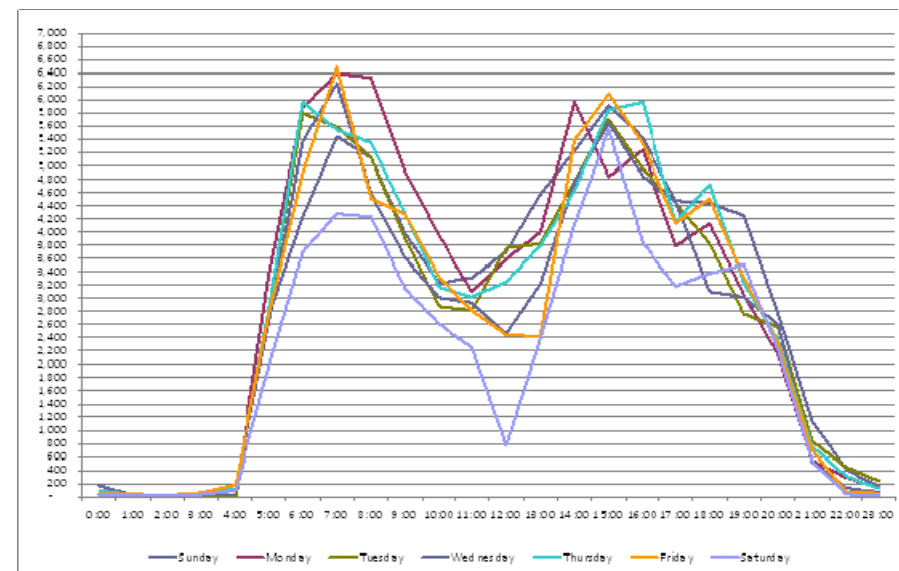


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Building the ESM simulation model first required a thorough understanding of passenger and bag generation as well as variability



Day of Week Variability

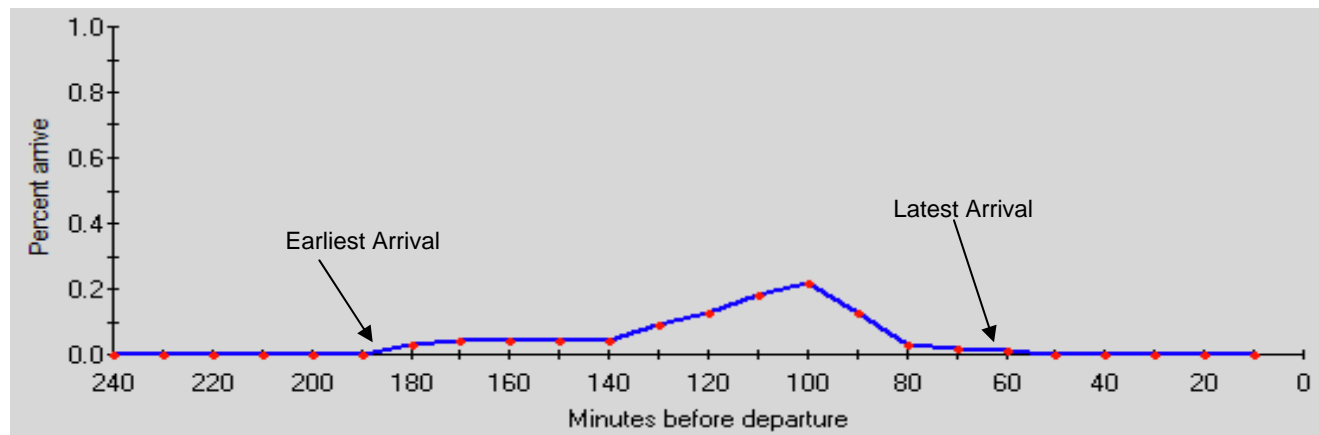


Origination Factors by Time of Day

Building the ESM simulation model first required a thorough understanding of passenger and bag generation as well as variability

*Expected # of passengers = aircraft capacity * origination factor * load factor*

Passengers are distributed using empirical distributions based on time of day, flight duration, and individual airport characteristics



Example arrival distribution for peak domestic flight

The number of checked bags is modeled as a discrete distribution ranging from zero to six bags and is a function of the flight type (Intl, Domestic, Low Cost, Legacy).

Passenger and bag screening equipment data, hours of operation, and facility layout configurations are edited by the user for each airport

Bag Zones (1) Security Checkpoints (1) Concourses (1) Airlines (4) Additional Staff (Term.)

Create New Done

1

Checkpoint Name: 1

FIS: ☐ FIS Checkpoint ☒ Process Passengers

Checkpoint Setup

Show Staff Calculations

+ Add New Refresh

	Priority	Name	Process Selectees	Lanes	PAX/HR	C1	C2	C3	XRAY/Mag	FC Unconstrained
	1	1	<input checked="" type="checkbox"/>	1	36	1.1	0	0	1	<input checked="" type="checkbox"/>
	2	2	<input type="checkbox"/>	4	36	0.9	0	0	1	<input type="checkbox"/>
Total Lane: 5										

Operating Hours

☒ In Use

Start Time: 5:30 AM Close Time: 9:30 PM Open Hours: 16.00

Concourses

Concourses Available

Concourses Served

1

Bag Zones (1) Security Checkpoints (1) Concourses (1) Airlines (4) Additional Staff (Term.)

Create New Done

1

Bag Zone Name: 1

Bag Zone Type: ☐ Standard ☐ Oversize ☒ Both

Operating Hours

☒ In Use

Start Time: 05:30 AM Close Time: 9:30 PM Open Hours: 16.00

Bag Screening Data

Location: Lobby

Protocol: Post-ticketing

Bag turn-around goal: 10 minutes

Equipment

Methodology: 100% ETD Drop & Wait

ETD

+ Add New Refresh

	Type	No. Pos.	Standard External	Standard Limited Open	Standard Full Open	Oversize External	Oversize Limited Open	Oversize Full Open
	Barringer/Ion Track	2	43	121	292	63	178	429



The logic for determining checkpoint and bag zone equipment requirements is based on the number in queue, equipment processing rate and MOE

Model first observes # in queue and determines the time needed to process the queue:

$$\text{Time to Clear Queue} = \# \text{ in Queue} / \text{Processing Rate}$$

Model determines the number of servers needed to meet the user-defined measure of effectiveness (MOE):

$$\text{Number of servers} = \text{Time to Clear Queue} / \text{MOE}$$



This provides an estimate of checkpoint lanes and bag screening equipment needed to support the MOE



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Airports of different sizes and configurations were tested against TSA-approved statistics

Reported Statistic	
Checkpoint	Sum of passengers processed
	Sum of non-passengers processed
	Max processing time for all Checkpoints (minutes)
	Max passengers in queue for all Checkpoints
	Average processing time (Average Queue Time) in Minutes
	Total Checkpoint Utilization
	% of passengers waiting over 10 minutes
	Total # of lanes open for all priority groups
Bag Zone	Count of bag entered across all Bag Zones
	Count of bags processed across all Bag Zones
	Count of alarmed bags across all Bag Zones
	Count of alarms resolved across all Bag Zones
	Max processing time for all Bag Zones in Minutes
	Max bags in queue for all Bag Zones
	Average bag TAT (average delay) in minutes
	% of bags with TAT greater than 10 minutes
	Utilization of EDS primary systems
	Utilization of ETD alarm resolvers

Prototype logic was tested for robustness using results from the original model statistics

After results were verified, the prototype was made “generic” so that it could solve *any* airport model



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ESM results provide staffing requirements for checkpoints and bag zones, as well as any additional staff required

Airport Abbreviation:

ORD

Terminal Name:

1

Experiment Name:

ORD_RAJA

Start Date:

Comments:

This is a test comment entered for ORD_RAJA!

SUNDAY

Checkpoint3 - CheckPointStaff - Either

Time	Either	Male	Female	Staff Multiplier	Total Staff
2:00 PM	9	4	4	1	17
3:00 PM	7	3	3	1	13
4:00 PM	7	3	3	1	13
5:00 PM	7	3	3	1	13
6:00 PM	7	3	3	1	13
7:00 PM	3	1	1	1	5
8:00 PM	0	0	0	1	0
9:00 PM	0	0	0	1	0
10:00 PM	0	0	0	1	0
11:00 PM	0	0	0	1	0
Maximum by Day	9	4	4	1	17

CheckpointFIS 1 - CheckPointStaff - Either

Time	Either	Male	Female	Staff Multiplier	Total Staff
12:00 AM	0	0	0	1	0
1:00 AM	0	0	0	1	0
2:00 AM	0	0	0	1	0
3:00 AM	3	1	1	1	5
4:00 AM	3	1	1	1	5
5:00 AM	3	1	1	1	5
6:00 AM	3	1	1	1	5

TSA Enhanced Staffing Model

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Printed 9/27/2010 4:42:18 PM

Schedules are created from these staffing requirements



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The optimization engine exports the staffing requirements from ESM into a CPLEX-based scheduling optimizer

Base Shifts | Rosters | Restricted Periods | **Run-time Settings**

→ Shift Settings

Check-In/check-Out Times
☐ Use Check-In Times
 FT Check-In Time (mins)
 PT Check-In Time (mins)
☐ Use Check-Out Times
 FT Check-Out Time (mins)
 PT Check-Out Time (mins)

Breaks
Primary Break
 Interval around shift midpoint (mins)
Secondary Break
 Secondary break length (mins)
 Minimum work to qualify (mins)
 Interval around shift 1/4 point (mins)
*The 2nd secondary break will be scheduled over an interval of the same length around the 3/4 point. If the minimum hours of work requirement is met.

The user can edit shift intervals, breaks, rosters, and run-time settings before optimization

Base Shifts | Rosters | Restricted Periods | **Run-time Settings**

→ Run-time Settings

General
 Target Optimality Percentage
 Shift Interval
 FTE Roster (hrs/week)
 FTE Shift Length (hrs)

Rosters
☒ Eliminate rosters with 0% efficiency
☐ User only base shifts Reduce by base shifts first ☒ Neither
 Use Roster Type

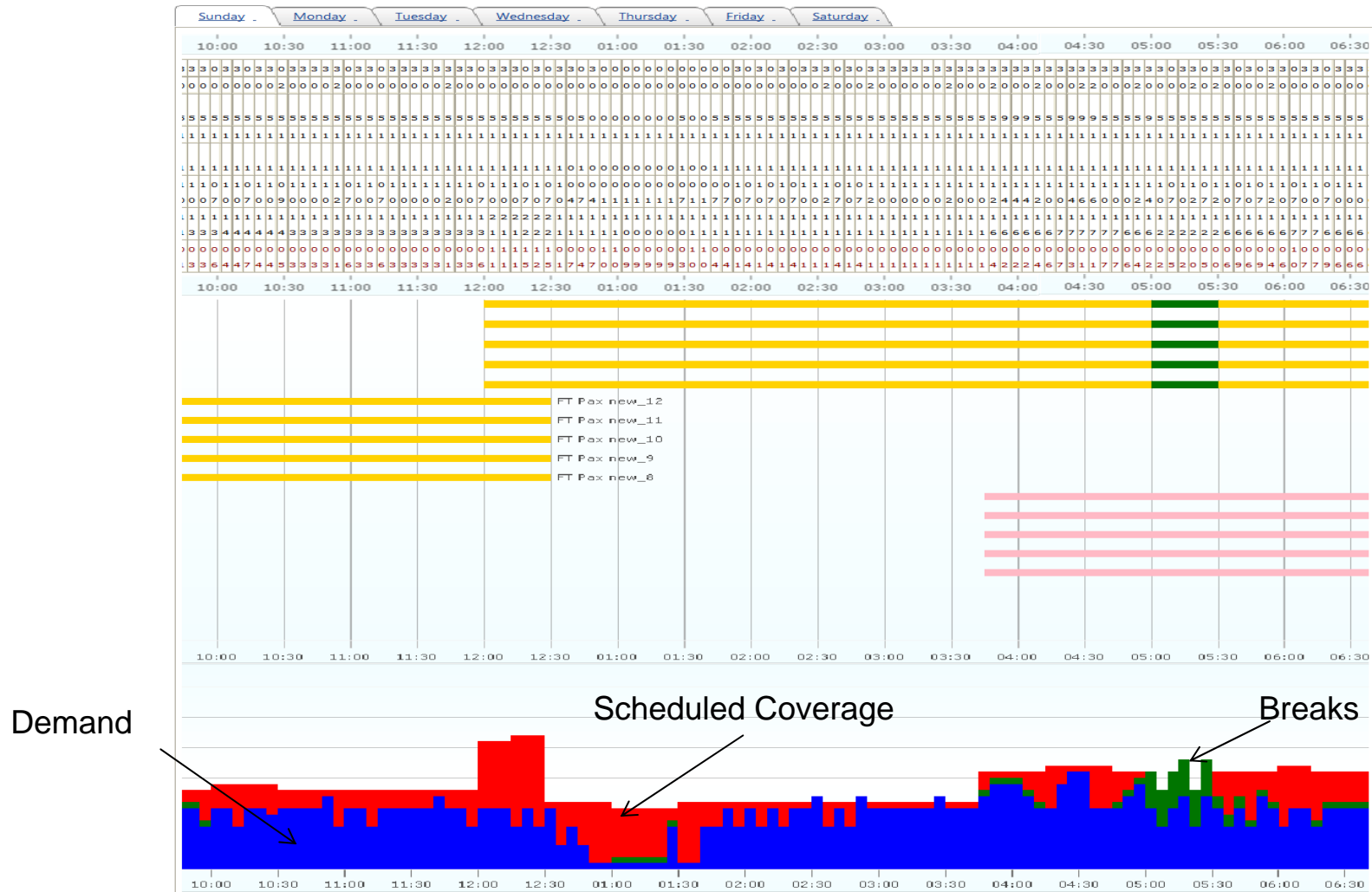
	Min #	Max #	Constant
<input checked="" type="checkbox"/> FT Rosters	<input type="text" value="0"/>	<input type="text" value="9,999"/>	
<input checked="" type="checkbox"/> PT Rosters	<input type="text" value="0"/>	<input type="text" value="9,999"/>	



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Established staffing rules are validated in the optimization engine, and a deployable schedule with FTE requirements is generated



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The move from PC-based to network model provides benefits to the user while meeting the required end-user functionality

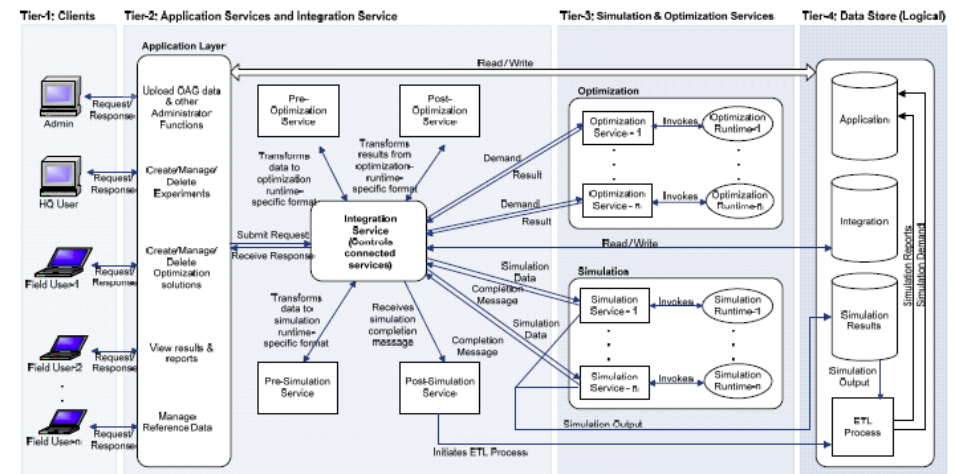
Network efficiency is improved due to single data repository, centralized end-user support, and instant access to model and data upgrades

Users are more productive due to faster simulation run time and ability to run simultaneous models

Reduced help desk support and TCO

Access to TSA SOA IT infrastructure & support

Improved security



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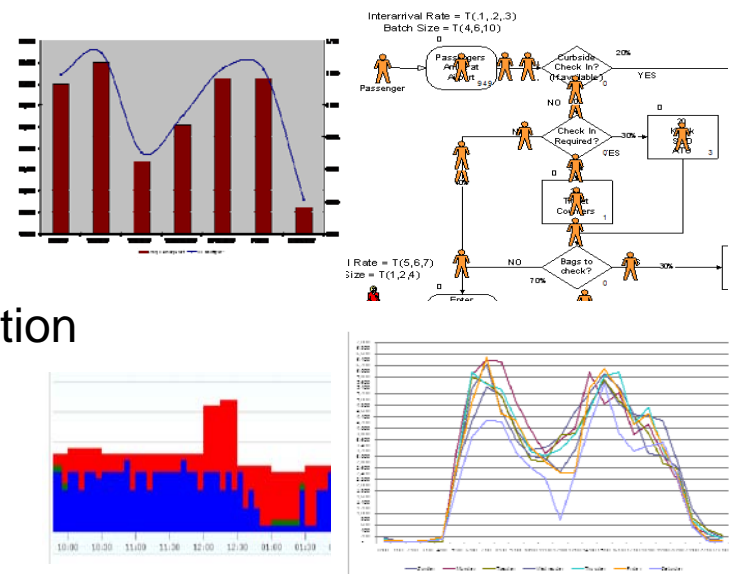
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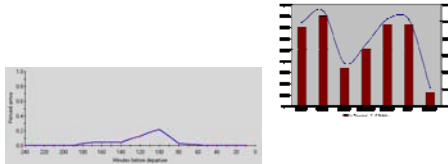


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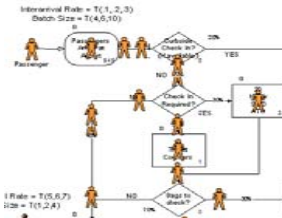


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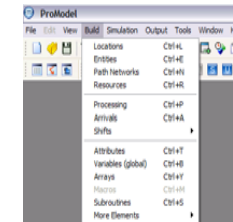
The ESM simulation engine was built in steps



Gain thorough understanding of passenger/bag generation and variability



Build a prototype with prototypical data



Decompose prototype into generic submodels

	Report/Statistic
Checkpoints	Sum of passengers processed
	Sum of off-passengers processed
	Max processing time for all CB checkpoints (minutes)
	Max passengers in queue for all Checkpoints
	Average processing time (Average Queue Time) in Minutes
Bag Zones	Total Checkpoint Utilization
	% of passengers waiting over 10 minutes
	Total of lanes open for all priority groups
	Count of bags entered across all Bag Zones
	Count of bags processed across all Bag Zones
Bag Zones	Count of items entered across all Bag Zones
	Count of items processed across all Bag Zones
	Max processing time for all Bag Zones in Minutes
	Max bags in queue for all Bag Zones
	Average bag TAT (average delay) in minutes
Bag Zones	% of bags with TAT greater than 10 minutes
	Utilization of ETS primary system
	Utilization of ETS print system

Test submodels and logic for robustness, “harden”

11:41:04 AM Instantiating application, data & ...
11:41:04 AM Instantiated application, data & ev...
11:41:04 AM Loading Zero Level Model (ZLM) from ...
11:41:04 AM Loaded Zero Level Model (ZLM) from ...
11:41:04 AM Processing master file: c:\Temp\ESM...
11:41:04 AM Processed master file: c:\Temp\ESM...
11:41:04 AM Merging concourse models: 1
11:41:04 AM Merged concourse models: 1
11:41:04 AM Merging checkpoint models: 1
11:41:04 AM Merged checkpoint models: 1
11:41:04 AM Merging bazone models: 4
11:41:04 AM Merged bazone models: 4

Coordinate design and use of external data files

Icon	Name	Cap.	Units
	concourse_CC_1	INFINITE	1
	checkpoint_q_CP_1	INFINITE	1
	checkpoint_CP_1	1	1
	bagzone_q_BZ_1	INFINITE	1
	bagzone_BZ_1	1	1
	bagzone_sq_BZ_1	INFINITE	1
	bagzone s BZ_1	1	1

Develop schema for programmatic model builds

Test, test, test!



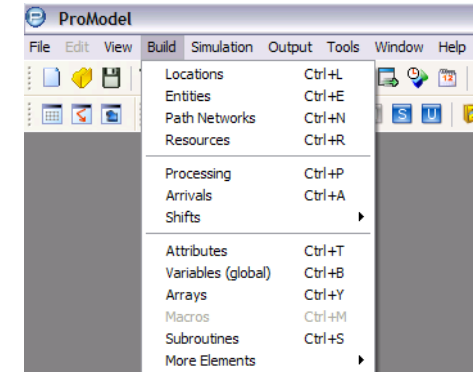
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The prototype was used to create generic concourse, checkpoint and bag zone submodels along with a base “zero-level” model

The zero-level model (ZLM) contains the attributes, global variables, data arrays, subroutines, and statistical distributions inherent in every model



The concourse submodel has processing records for passengers (arrival delay, check-in, bag divesting , routing) and for bags (generation, determine standard or oversize, routing to bag zone)

The checkpoint submodel has processing records used at the checkpoint queues for the processing of passengers and non-passengers

The bag zone submodel is similar to the checkpoint submodel but also has another queue with infinite capacity and multiple server locations for secondary processing of the bags

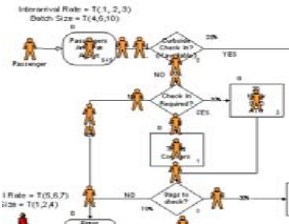
Screening requirements are based on average weekly enplanements for the peak month of travel for each airport

Month	Monthly Enplanements	Days	Avg Weekly Enplanements
Jan	254168	31.00	8199
Feb	238635	28.00	8523
Mar	302462	31.00	9757
Apr	282966	30.00	9432
May	314311	31.00	10139
Jun	315088	30.00	10503
Jul	330806	31.00	10671
Aug	308251	31.00	9944
Sep	267968	30.00	8932
Oct	310840	31.00	10027
Nov	284867	30.00	9496
Dec	269556	31.00	8695

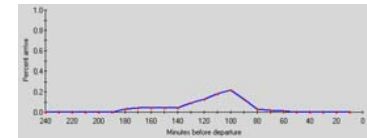


The ESM simulation engine was built in steps

Gain thorough understanding of passenger/bag generation and variability



Build a prototype with prototypical data



Decompose prototype into generic submodels and test for robustness

Reported Statistic	
Checkpoint	Sum of passengers processed
	Sum of non-passengers processed
	Max processing time for all Checkpoints (minutes)
	Max passengers in queue for all Checkpoints
	Average processing time (Average Queue Time) in Minutes
	Total Checkpoint Utilization
Bag Zone	% of passengers waiting over 10 minutes
	Total # of lanes open for all priority groups
	Count of bag entered across all Bag Zones
	Count of bags processed across all Bag Zones
	Count of alarmed bags across all Bag Zones
	Count of alarms resolved across all Bag Zones
	Max processing time for all Bag Zones in Minutes
	Max bags in queue for all Bag Zones
	Average bag TAT (average delay) in minutes
	% of bags with TAT greater than 10 minutes
Utilization of EDS primary systems	
Utilization of ETD alarm resolvers	

Coordinate design and use of external data files

<ul style="list-style-type: none"> Bagzone_Configuration.csv BZ_List Checkpoint_Configuration.csv Checkpoint_Distribution.csv Checkpoint_Routing.csv CP_List Flight_Data.csv Master.csv Non_Pax_Percent.csv Non_Pax_Qty.csv 	<ul style="list-style-type: none"> Microsoft Office SFT File Microsoft Office Microsoft Office Microsoft Office Microsoft Office Microsoft Office Microsoft Office Microsoft Office Microsoft Office Microsoft Office 	<pre> 11:41:04 AM Instantiating application, data & e 11:41:04 AM Instantiated application, data & e 11:41:04 AM Loading Zero Level Model (ZLM) from 11:41:04 AM Loaded Zero Level Model (ZLM) from 11:41:04 AM Processing master file: C:\Temp\ESM 11:41:04 AM Processed master file: C:\Temp\ESM 11:41:04 AM Merging concourse models: 1 11:41:04 AM Merged concourse models: 1 11:41:04 AM Merging checkpoint models: 1 11:41:04 AM Merged checkpoint models: 1 11:41:04 AM Merging bagzone models: 4 11:41:04 AM Merged bagzone models: 4 </pre>
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Develop schema for programmatic model builds

Locations			
Icon	Name	Cap.	Units
	concourse_CC_1	INFINITE	1
	checkpoint_q_CP_1	INFINITE	1
	checkpoint_CP_1	1	1
	bagzone_q_BZ_1	INFINITE	1

The prototype was then designed and tested as generic concourse, checkpoint and bag zone submodels along with a base “zero-level” model

After submodels were tested, external data files were incorporated

All airport data was handled within ProModel as Arrays, User Distributions, and Shift files

	Name	Type
Distributions	Airline_OS_Bagzone.csv	Microsoft Office Excel Comma Separated Values File
	Airline_Reg_Bagzone.csv	Microsoft Office Excel Comma Separated Values File
	Arrival_Distribution.csv	Microsoft Office Excel Comma Separated Values File
	Bag_Distribution.csv	Microsoft Office Excel Comma Separated Values File
	Bagzone_Configuration.csv	Microsoft Office Excel Comma Separated Values File
Data arrays	BZ_1.sft	SFT File
	Checkpoint_Configuration.csv	Microsoft Office Excel Comma Separated Values File
	Checkpoint_Distribution.csv	Microsoft Office Excel Comma Separated Values File
Shift Files	Checkpoint_Routing.csv	Microsoft Office Excel Comma Separated Values File
	CP_1.sft	SFT File
	Flight_Data.csv	Microsoft Office Excel Comma Separated Values File
	Master.csv	Microsoft Office Excel Comma Separated Values File
	Non_Pax_Percent.csv	Microsoft Office Excel Comma Separated Values File
	Non_Pax_Qty.csv	Microsoft Office Excel Comma Separated Values File

A subroutine is called at initialization of the model to read each of the files to populate the three main data arrays for Flight Data, Checkpoint, and Bag Zone Configuration



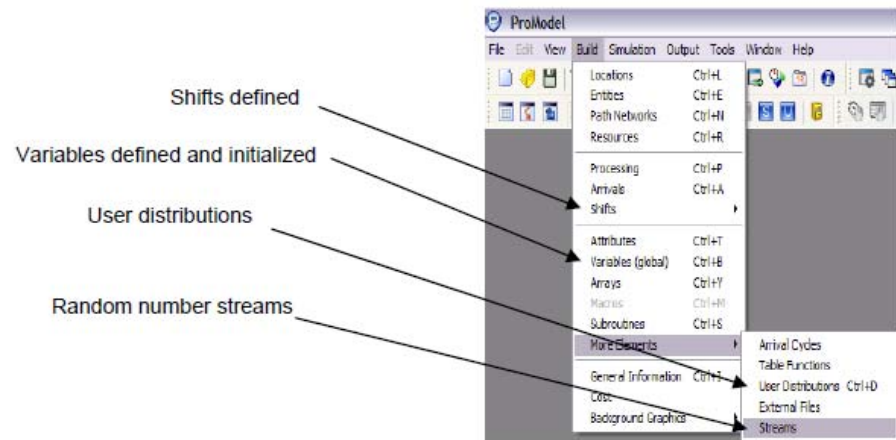
ESM programmatically builds each unique airport model from the input files

ESM begins by loading the zero-level model

Based on the unique airport configuration information, submodels are merged (concourses, checkpoints and bag zones) to model the airport

Using this schema, an airport with one concourse, one checkpoint and one bag zone would generate a Locations table as shown below

Locations			
Icon	Name	Cap.	Units
	concourse_CC_1	INFINITE	1
	checkpoint_q_CP_1	INFINITE	1
	checkpoint_CP_1	1	1
	bagzone_q_BZ_1	INFINITE	1
	bagzone_BZ_1	1	1
	bagzone_sq_BZ_1	INFINITE	1
	bagzone_s_BZ_1	1	1



Automatically-applied suffixes are used in order to differentiate among multiple submodels with the same name



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After ZLM and submodels are successfully merged, the remaining configuration data is read in

The ProModel application programming interface (API) populates the remaining configuration and operational data including secondary bag screening equipment counts and screening rates

Lastly, shifts, variables, user distributions and random number streams are added programmatically and the model is run

```

Simulation_Process - Notepad
File Edit Format View Help

9/20/2010 11:41:52 AM Saving and populating merged model: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\MMB.MOD
9/20/2010 11:41:52 AM Saved and populated merged model: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\MMB.MOD

9/20/2010 11:41:52 AM Parsing locations table to verify successful merge of all sub-models
9/20/2010 11:41:52 AM Parsed locations table to verify successful merge of all sub-models

9/20/2010 11:41:52 AM Updating array & external file table for flights from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Flight_Data.csv
9/20/2010 11:41:52 AM Updated array & external file table for flights from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Flight_Data.csv

9/20/2010 11:41:52 AM Updating array & external file table for airline master from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Airline_Master
9/20/2010 11:41:53 AM Updated array & external file table for airline master from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Airline_Master

9/20/2010 11:41:53 AM Uploading arrival distributions from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Arrival_Distribution.csv
9/20/2010 11:41:53 AM Uploaded arrival distributions from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Arrival_Distribution.csv

9/20/2010 11:41:53 AM Uploading bag distributions from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Bag_Distribution.csv
9/20/2010 11:41:53 AM Uploaded bag distributions from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Bag_Distribution.csv

9/20/2010 11:41:53 AM Uploading checkpoint distributions from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Checkpoint_Distribution.csv
9/20/2010 11:41:53 AM Uploaded checkpoint distributions from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Checkpoint_Distribution.csv

9/20/2010 11:41:53 AM Updating array & external file table for checkpoint configuration from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Checkpoint_Configuration.csv
9/20/2010 11:41:53 AM Updated array & external file table for checkpoint configuration from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Checkpoint_Configuration.csv

9/20/2010 11:41:53 AM Updating routing table for concourse-checkpoint from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Checkpoint_Routing.csv
9/20/2010 11:41:53 AM Updated routing table for concourse-checkpoint from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Checkpoint_Routing.csv

9/20/2010 11:41:53 AM Updating array & external file table for concourse-checkpoint routing from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Concourse_Checkpoint_Routing.csv
9/20/2010 11:41:53 AM Updated array & external file table for concourse-checkpoint routing from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Concourse_Checkpoint_Routing.csv

9/20/2010 11:41:53 AM Uploading shift file for checkpoint_CP_1 from file: CP_1.sft
9/20/2010 11:41:53 AM Uploaded shift file for checkpoint_CP_1 from file: CP_1.sft

9/20/2010 11:41:53 AM Updating array & external file table for non-passenger percentage from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Non_Passenger_Percentage.csv
9/20/2010 11:41:53 AM Updated array & external file table for non-passenger percentage from file: C:\Temp\ESM_SimulationFiles\Files\RequestID_575\Non_Passenger_Percentage.csv
    
```

Example Simulation Process Log

ESM overcame many unique modeling challenges

TSA Enhanced Staffing Model (ESM) 1.0 Transportation Security Administration Build 8.7

Dashboard **References** **Administration**

Welcome to the TSA Staffing Simulation and Planning Tool

Filter on column

File Management

- Import Staffing Demand (.csv)
- Manually Create Demand

Airport	Cat	Term	Experiment Name	Status	Flight Wk	Eff. End	Created By	Modified	Reports	Execu. Status
ABE	2	MAIN	20COMP ABE - V	OPEN		11/8/2009	todd.atkins	9/20/2010	Exper. Config.	Completed
<p>Scenario Optimization Setting Results Status FTE FT PT Efficiency</p> <p>ALL SAM10 (CAT X,II) Demand Chart Staffing Chart Completed 46.75 36 21 57.39</p> <p>Workgroup Results Status FTE FT PT Efficiency</p> <p>ALL Demand Chart Staffing Chart Staff Reports Completed 46.75 36 21 57.39</p>										
ABI	3	MAIN	20COMP ABI - V	OPEN		11/8/2009	todd.atkins	9/20/2010	Exper. Config.	Completed
ACY	2	MAIN	20COMP ACY - V	OPEN		11/8/2009	todd.atkins	9/20/2010	Exper. Config.	Completed
ATL	X	MAIN	20COMP ATL (2008) - V	OPEN	10/31/2010	5/31/2009	todd.atkins	9/9/2010	Exper. Config.	Completed
BNA	1	MAIN	20COMP BNA - V	OPEN		11/8/2009	todd.atkins	9/20/2010	Exper. Config.	Completed
BOI	1	MAIN	20COMP BOI - V	OPEN		9/30/2009	todd.atkins	9/20/2010	Exper. Config.	Completed
BWI	X	MAIN	20COMP BWI - V	OPEN		11/8/2009	todd.atkins	9/8/2010	Exper. Config.	Completed
DEN	X	MAIN	20COMP DEN (2008) - V	OPEN		5/31/2009	todd.atkins	9/7/2010	Exper. Config.	Completed
DIK	4	MAIN	20COMP DIK - V	OPEN		11/8/2009	todd.atkins	9/20/2010	Exper. Config.	Completed
EUG	2	MAIN	20COMP EUG - V	OPEN		11/8/2009	todd.atkins	9/20/2010	Exper. Config.	Completed
LAS	X	1	20COMP LAS - V	OPEN		11/8/2009	todd.atkins	9/7/2010	Exper. Config.	Completed
MEM	1	MAIN	20COMP MEM - V	OPEN		11/8/2009	todd.atkins	9/7/2010	Exper. Config.	Completed
MLI	2	MAIN	20COMP MLI - V	OPEN		11/8/2009	todd.atkins	9/7/2010	Exper. Config.	Completed
MYR	2	MAIN	20COMP MYR - V	OPEN		11/8/2009	todd.atkins	9/7/2010	Exper. Config.	Completed
ORD	X	1	20COMP ORD - V	OPEN		9/30/2009	todd.atkins	9/7/2010	Exper. Config.	Completed

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Create Experiment Manage Staff Scenarios Flight Comparison Report Airport Comparison Report Experiment Comparison Delete

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Data-driven model builds for 450 unique airports

Data and model integrity for 450 unique end-users (non-simulationists)

Integration with network GUI and optimizer

File interchange via .CSV files

Naming conventions and passing strings

Improved speed vs. compiled language code