

Intermodal Terminals and their Networks How To Make It Happen

Simulation

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Why Simulation ?

- Developing and operating terminals is a multimillion dollar business.
- Planning and modelling a particular design using a computer simulation enables managers to test the operating capacity of a terminal.
- It enables more detailed risk analysis and will enhance project management and implementation.



Key Questions

- Given a particular terminal layout:
 - What are the queues and delay times that can be expected under different demand scenarios?
 - What is the maximum capacity of the terminal in terms of throughput?
 - What happens if a crane or other piece of materials handling equipment is unavailable?
 - What happens if actual demand is exceeded by say 20%?



Why simulation?

- Simulation is a cost effective way for planners and managers to test out various terminal layouts under a variety of conditions.
- It enables decision makers to test out various strategies.
- Simulation enables time compression so that a year's operations can be modelled in a few minutes.



Simulation Packages

- There are many different simulation packages.
- Note that there are two main streams – digital or discrete simulation approaches using a monte carlo approach (like Arena or Planimate).
- There are also approaches that use systems dynamics – the basis of which are systems of differential equations – an example being “Ithink”.



Simulation on spreadsheets

- Monte Carlo simulation is at the heart of most simulation systems and it is relatively easy to create a simulation using a spreadsheet and `@rand()` with a cumulative probability distribution.
- In this example we are using *Planimate* – which is a general purpose simulation tool developed in Australia with the added advantage of animation.



InterDynamics – and Planimate

- Planimate is a general purpose simulation tool that has been used in many different applications – ranging from distribution planning for the Sydney Olympics to scheduling the movement of trucks for the reconstruction of the World Trade Centre in New York. It is used by Queensland Rail to optimise its coal transport network. There are many other logistic applications.
- It is not hard to download Planimate from the InterDynamics website for educational purposes or for a trial.

<http://www.interdynamics.com/>



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Welcome to InterDynamics

InterDynamics Pty. Ltd. is an Australian company which provides business frameworks for managing **fatigue related risk, software products** and **modelling services**.

Whether you are an organisation with operational and strategic challenges, or a business which needs to manage staff fatigue, our innovative and whole-of-system approach will help you understand your operations, manage risks and improve your bottom-line.

Since 1992 InterDynamics has been supporting companies to achieve effective solutions to their operational and strategic challenges with our innovative, whole-of-system approach.

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Planimate®

Planimate® is a mature application development platform for highly interactive and animated, decision support tools for business. Its precise handling of time and animation, can enable you to plan and schedule your operations. Its highly graphical and interactive capabilities promotes common understandings across all parts of your operation.

Successfully used by many large logistics, transportation, manufacturing, and mining organisations since 1989, Planimate® is used for teaching simulation at universities because it is easy to learn and promotes a systems understanding of business.

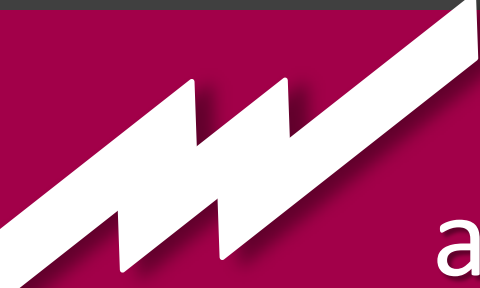
The Planimate® platform incorporates important modelling capabilities including:

- Concurrent spatial animation of resources and processes
- Multiple dynamic views over maps as well as schematics
- Visually described workflows and decision logic
- Dynamic time-based modelling (simulations) with variability
- Feature-rich tools to create interactive end-user applications
- Interfacing to databases and real time data systems

Planimate®
Build Dynamic Models and Applications

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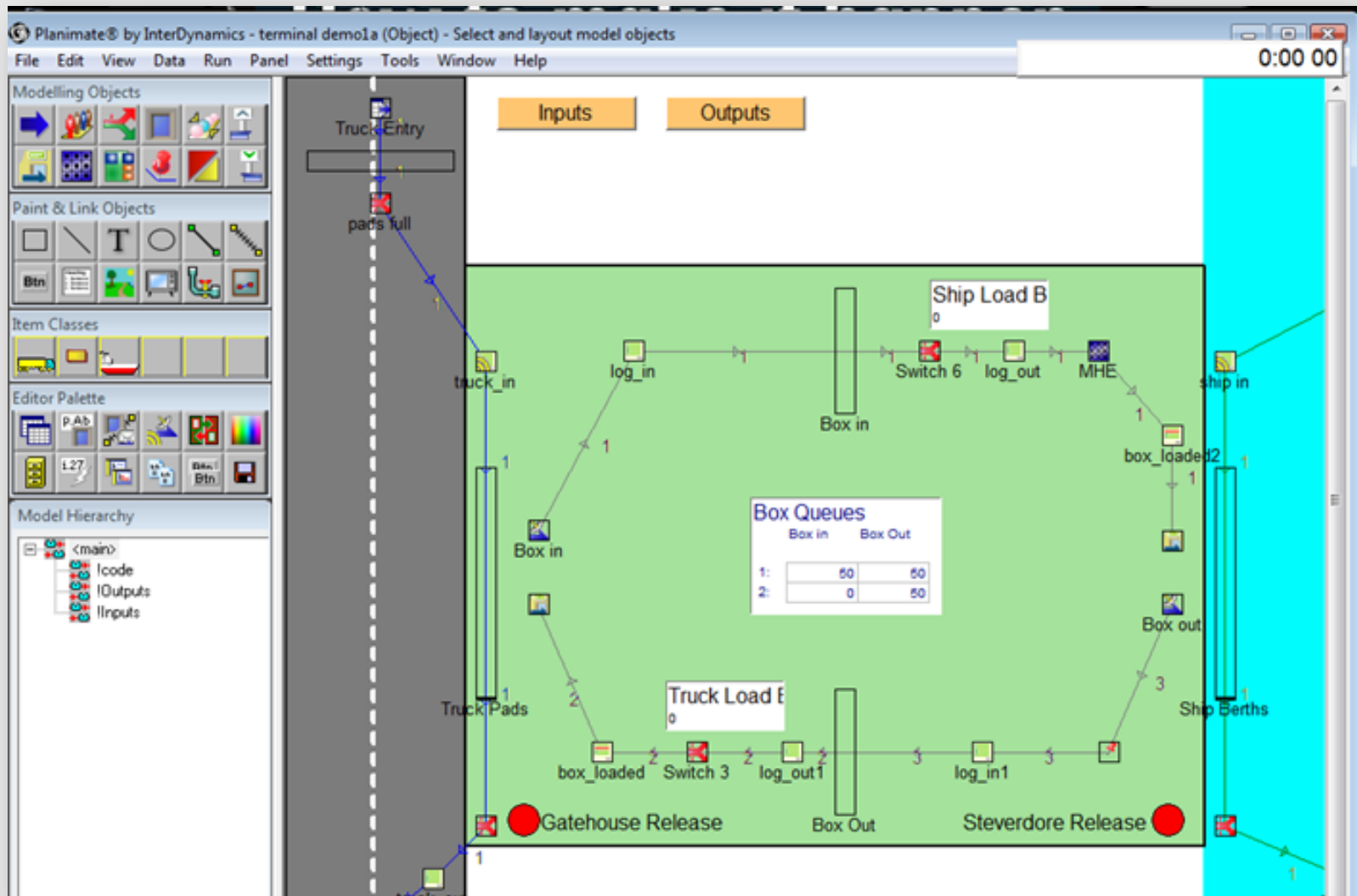


Simulating an intermodal terminal

- The following are screen shots from a very basic simulation to test the capacity of an intermodal terminal.
- The model is of a marine terminal – with trucks dropping off containers and picking up containers and ships on the water side delivering and picking up containers.
- See the tables for the input structure which defines the operating capabilities of the terminal.

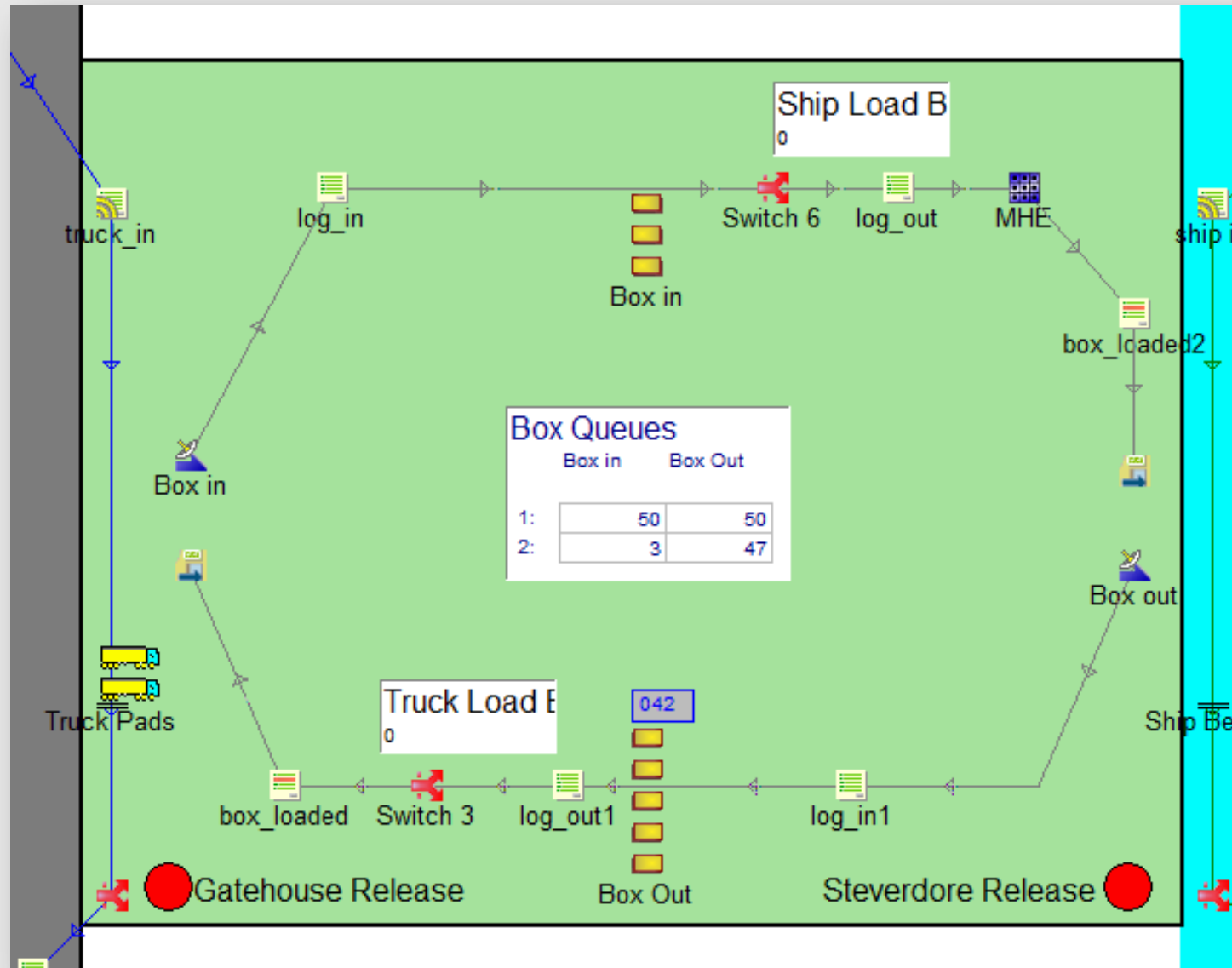
Planimate

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Inputs to the simulation model

Max. Terminal Boxes: 600

Transport Setup

Transport	Min per Day	Mode per Day	Max per Day	Capacity Boxes	% Pickup	Load Min	Load Mode	Load Max	Unload Min	Unload Mode	Unload Max
						Minutes/Box	Minutes/Box	Minutes/Box	Minutes/Box	Minutes/Box	Minutes/Box
Truck	400	600	800	1	45%	2	5	8	2	5	8
Train	0	0	0	0	100%	0	0	0	0	0	0
Ship	1	1	2	300	100%	2	3	6	2	3	6

Terminal Capacity

Transport Pads / Sidings / Berths MHE / Berth

Truck	5	1
Train	1	0
Ship	3	3

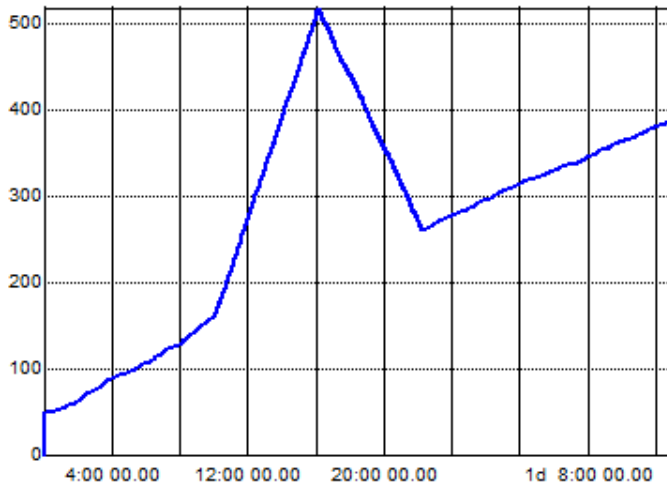
Inputs

Outputs

Outputs – maximum boxes
On ground 500

!Outputs

Total Boxes



Box Queues

	Box in	Box Out
1:	50	50
2:	301	85

Truck Pads

Truck Load E
0

080

box_loaded 2

Switch 3

log_out1

log_in1

Box Out

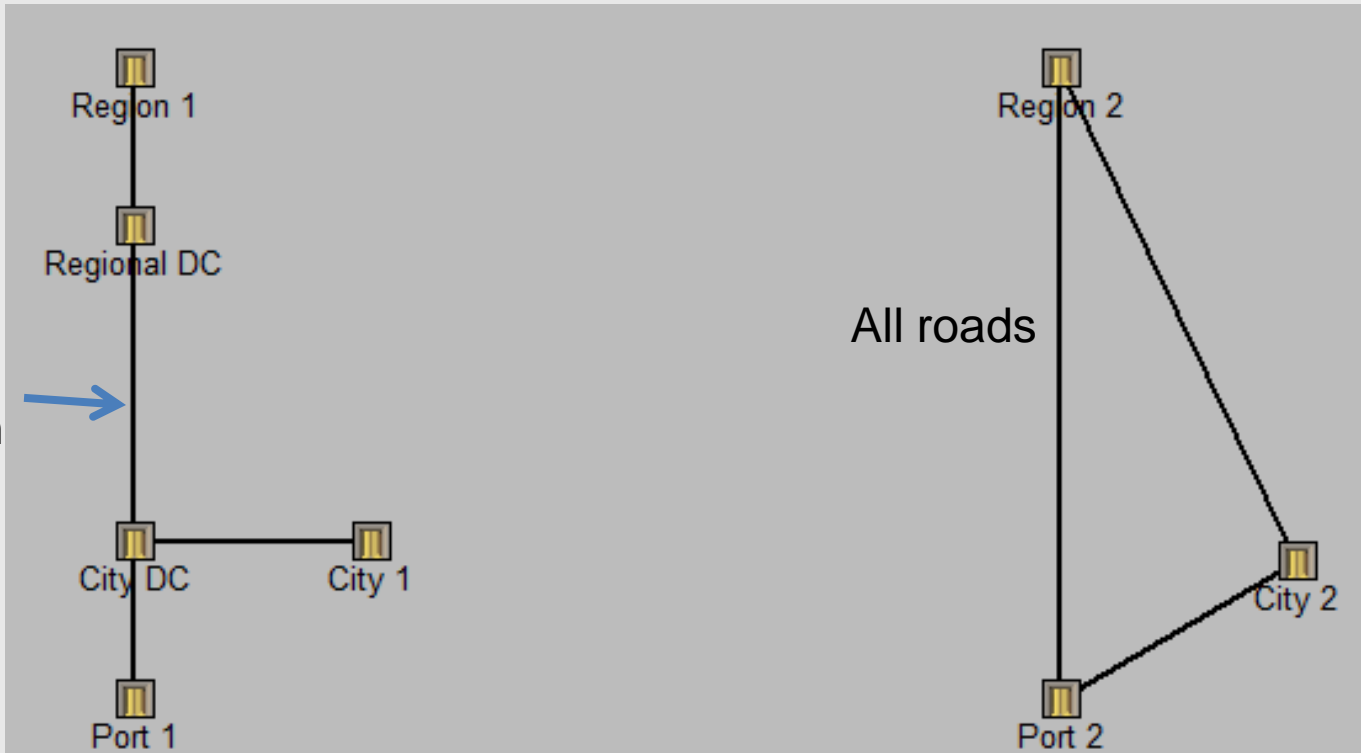
Steverdore Release

Ship Berth

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Modelling simple networks

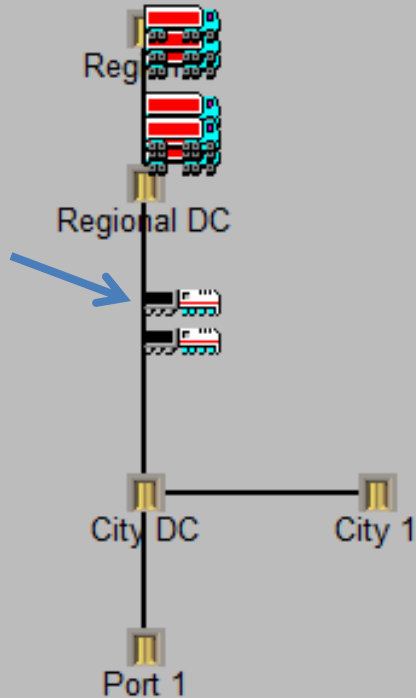
Rail
connection



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Exploring different rail road network combinations

Rail
Shuttles



Road
only

