Don’t Predict Applications When You Should Model the Business

CMG98 Session 6201

Dr. Tim R. Norton
Colorado Technical University
Colorado Springs, CO
http://www.simalytic.com

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Agenda

◆ What is Enterprise Modeling?
  ◦ Levels: Device to Business
  ◦ Objectives
◆ Simalytic Modeling Review
◆ Business Modeling
  ◦ Simalytic Implementation
◆ Business Model Example
  ◦ Advantages of a Simalytic approach
◆ Conclusion
Enterprise Modeling?

◆ System View
  - Is the system big and fast enough?
  - Where are the bottlenecks?

◆ Application View
  - Which computer systems does it use?
  - Does the response time meet the objective?

◆ Business View
  - Business impact of application performance?
  - What is the Return on Investment for changes?

Overall Objectives

◆ Understand Application Performance
  - Across all aspects of the Enterprise
  - Interrelationships between components

◆ Define Levels of Detail
  - Device ➔ System ➔ Environment ➔ Business

◆ Connect the Levels
  - Use lower level results in general model
  - Use general model to find critical areas
  - Use highest level to analyze business impact
Disk Subsystem Model

- **Device Performance Analysis**
  - Focus on configuration details
  - Large amounts of trace data
  - Straight-forward verification
  - Good understanding of data paths
  - Relationship to application???
  - Relationship to business?????

Single System Model

- **Capacity/Performance Analysis**
  - Focus closer to acquisition level
  - Still large amounts of trace data
  - Verification ease is OS dependent
  - General understanding of data paths
  - Relationship to application?
  - Relationship to business???
### Application Model

**Transaction Flow**
- Focus closer to user’s expectations
- Little overall trace data
- Verification is hard to impossible
- Poor understanding of data paths
- Good relationship to application
- Relationship to business?

### Business Model

**Process Flow**
- Focus on ROI (Return On Investment)
- Little use of overall trace data
- Verification is complex
- Understanding of data paths poor to good
- Good relationship to business
- Poor relationship to application computer systems
Combined Model

- **Transaction and Process Flow**
  - Focus on supporting the business
  - Better use of trace data
  - Verification no more complex
  - Variable understanding of data paths
  - Good relationship to business
  - Good relationship to application computer systems

Simalytic Modeling Review

- **“Simalytic” (Simulation/Analytic)**
  - Hybrid - Combination of Techniques
    - Simulation model as framework
    - Analytic queuing theory node models
    - Simalytic Function bridges techniques
  - Existing tools
  - Predict capacity requirements
  - Heterogeneous computer systems
  - Enterprise level application model
Modeling Tools

◆ Platform-Centric Tools
  ● Narrow focus - Tend to be Analytic based
    ▪ Detailed information about single platform
    ▪ Easier to build but limited environments

◆ General Purpose Tools
  ● Broad focus - Tend to be Simulation based
    ▪ Features to model anything
    ▪ Level of granularity = Level of effort

◆ Business Process Tools
  ● Simulation of Business over Time
    ▪ Flows and levels

◆ All Available as Commercial Tools

Applicable Tools

◆ Most Applicable Modeling Tool
  ● Can be different for each node or part of a model
  ● Improves construction speed and accuracy

◆ Application Components
  ● Initially assumed constant
  ● Modeled for greater detail
  ● Specialized modeling tool for critical sections
Business Modeling

◆ What is it?
  ○ “System Dynamics” - Began in the 1950’s
  ○ Tool for managers to analyze complex issues

◆ How is it done?
  ○ Study:
    ▪ the parts of a system
    ▪ the interactions between the parts

◆ Why do it?
  ○ Maintain focus on business strategic objectives

What’s the Difference?

◆ Planning Capacity
  ○ System view - Internal task measurement
  ○ Resource utilization

◆ Predicting Applications
  ○ Enterprise view - User task measurement
  ○ Application responsiveness

◆ Modeling the Business
  ○ Business view - Return on Investment
  ○ Process flow understanding
Simalytic Modeling

- **Simalytic Modeling Phases**
  - Workload Analysis
  - Node Models
  - Simulation Model
  - Simalytic Model
  - Model Analysis

- **Simalytic Business Modeling Phases**
  - Business Process Analysis
  - Business Model Construction
  - Simalytic Function Integration
  - Business Model Analysis

**Example Application**

- **Order Entry Call Center**
  - Operators service customers
  - Two servers support Operators
    - Order Entry server - workload of interest
    - Shipping server - also used by OE transactions

- **Objective of the Business Model**
  - Understand the impact of transaction responsiveness on the business
  - Determine the minimal number of operators required for each hour
Example
Transaction Analysis

◆ Simple Two Server Model
  ○ Some OE transactions routed to both the Order Entry and the Shipping servers
  ○ Transaction response time goals:
    ■ OE = 1.7 seconds
    ■ S = 10 seconds
  ○ Same example presented in CMG97 paper

Example
Responsiveness

◆ Transaction RT
  ○ Table of RT results profiles application at each server
  ○ Created using OpenQN analytic modeling tool
  ○ Not every arrival rate required

<table>
<thead>
<tr>
<th>Arrival Rates</th>
<th>Response Times</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Order Entry</td>
</tr>
<tr>
<td>0.01</td>
<td>0.10</td>
</tr>
<tr>
<td>0.50</td>
<td>2.70</td>
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<tr>
<td>1.00</td>
<td>4.54</td>
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<tr>
<td>1.10</td>
<td>5.43</td>
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<tr>
<td>1.20</td>
<td>6.98</td>
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<td>8.33</td>
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<tr>
<td>16.50</td>
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</tbody>
</table>

OpenQN Example Results
Example

Simlytic Model

◆ Application Model
  ○ Framework simulation model in Simul8
  ○ Replace static service times with Simlytic Function using OpenQN model results
  ○ Simlytic Model run for expected transaction arrival rates

Example

Transaction Results


Example

Business Analysis

◆ Business Elements
  ○ Call Flow
  ○ Call Completion Time
    ▪ Computer time (includes transaction response time)
    ▪ Other time (simplified process for this example)
  ○ Call Backlog
  ○ Operator Productivity

◆ Relationship Between Elements
  ○ Degree (i.e. small change causes large change)
  ○ Direction (direct, inverse, not consistent, etc.)

◆ Other Aspects: (Not Addressed in Example)
  ○ Calls: Types, length, complexity
  ○ Operators: Training, experience, seniority
  ○ Orders: Number per call, size, special kinds
  ○ Inventory: Age, promotions, turn-over
Example
Business Model

Diagram:

- **New Calls** → **Call Backlog**
- **Call Backlog** → **Number of Operators**
- **Number of Operators** → **Calls Completed**
- **Calls Completed** → **Transaction Response Time**
- **Transaction Response Time** → **Transactions per Call**
- **Transactions per Call** → **Transaction Setup Time**
- **Transaction Setup Time** → **Calls per Operator**
- **Calls per Operator** → **Computer Time**
- **Computer Time** → **Calls Completed**
- **Calls Completed** → **Other Time**
- **Other Time** → **Number of Operators**


Example
Business Model Results

**Number of Required Operators Comparison**

<table>
<thead>
<tr>
<th>Hour of the Day</th>
<th>Min Number of Operators</th>
<th>Max Number of Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>250</td>
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<tr>
<td>4</td>
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<td>24</td>
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<td>250</td>
</tr>
</tbody>
</table>

Best Case / Worst Case Analysis

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Example
Simalytic Business Analysis

- **Same Business Model**
- **Vary Transaction Response Time**
  - Business load adjusts transaction load
  - Transaction load determines response time
  - Response time impacts backlog
  - Backlog determines number of operators

- **Key:** Transaction response time is based on a realistic application profile created by a valid application model.

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Example
Simalytic Business Model

![Diagram of Simalytic Business Model]
Example Business Model Results

Number of Required Operators Comparison

![Graph showing the comparison of required operators with different models.](image)

- Staff reduction greater than 25 operators for 8 hours of the day over worst case analysis.
- More than 50 additional staff required for peak hours over best case analysis.

Example Business Model Analysis

- **Number of Operators Required**
  - Best case model shows non-stress number
  - Worst case model shows peak number
  - Simalytic model shows which applies to each hour

- **Best / Worst case scenarios identify the extremes but not the transition between them.**

- **Simalytic approach directly correlates upgrade cost to expense reduction.**
Conclusion

◆ Capacity Planning is Evolving
  ○ From system to applications focus
  ○ Greater need to predict application performance
  ○ Increased desire to relate application performance to business requirements
  ○ Evolution increases complexity
    ■ Client/Server increasing application complexity
    ■ Requires increasing modeling complexity
    ■ Adding complexity adds time, effort and cost
    ■ Business impact is the ultimate measure

◆ Most Modeling Tools
  ○ Good for specific problems
    ■ But generally only for a subset of whole problem
  ○ Fail when extended beyond design scope
    ■ Cannot be everything for everyone

◆ Needed Approach
  ○ Connect the “islands”
  ○ Examine the whole problem
  ○ Focus on details when needed
Conclusion

◆ Modeling Applications across Enterprise
  ○ Focus on evolution of capacity planning
  ○ Predicts application performance
  ○ Answer the business questions
◆ Simalytic Business Modeling
  ○ Technique for modeling applications
    ■ Across the enterprise with a business perspective
    ■ Defined implementation steps
    ■ Addresses the increased complexity

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Conclusion

◆ Don’t Plan Capacity
  ○ Of complex multi-server applications
  ○ Or multi-tier Client/Server systems
◆ Don’t Predict Applications
  ○ Without overall objectives
  ○ Or understanding the business process impact
◆ Model the Business
  ○ To answer the Business questions
  ○ And insure the Business succeeds
Questions