

e=MSC^x

ENGINEERING. EDUCATION. ENTERPRISE.
2009 VPD
VIRTUAL
PRODUCT
DEVELOPMENT
CONFERENCE

Enterprise Deployment of Simulation Data Management

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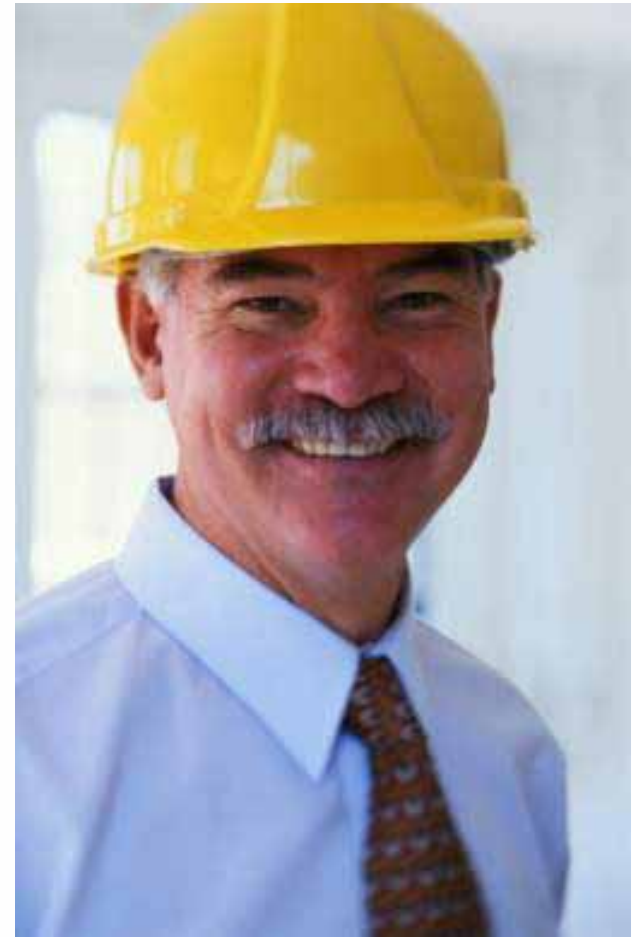
Engineering Tools Center of Excellence



Product Definition
Technology



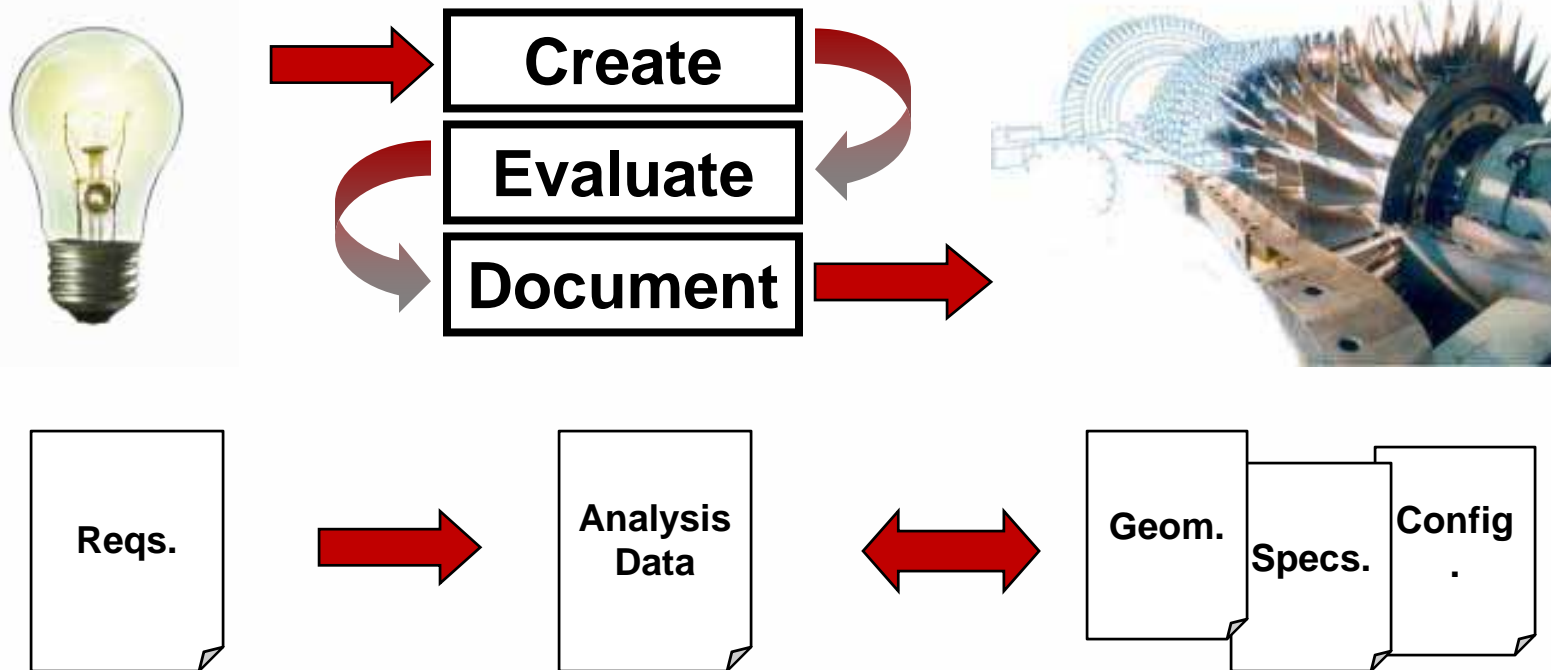
Enabling higher quality designs and improved engineering productivity



Agenda

- Simulation Data Management, GE Version
- Enterprise vs. Department Deployment
 - Benefits
 - Challenges

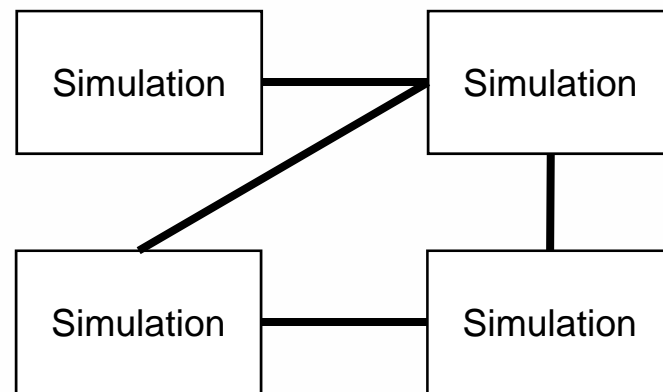
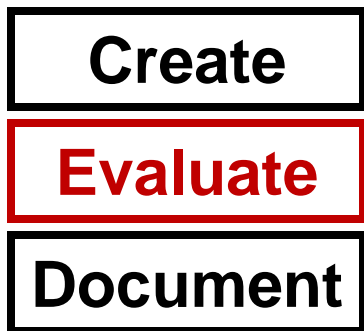
Data Management



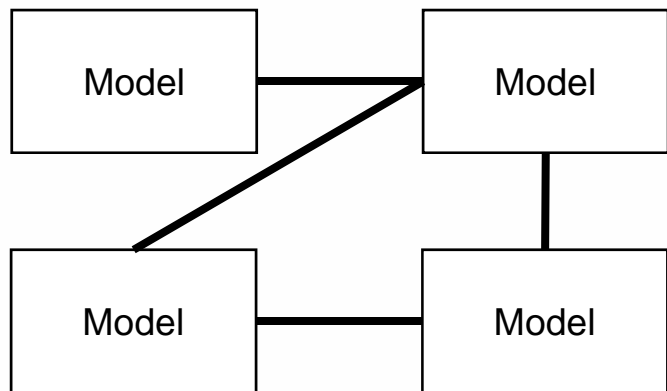
Documents to be Managed

- ✓ Requirements
- ✓ Specifications
- Analysis Data
- ✓ Configuration
- ✓ Geometry
- ✓ Change

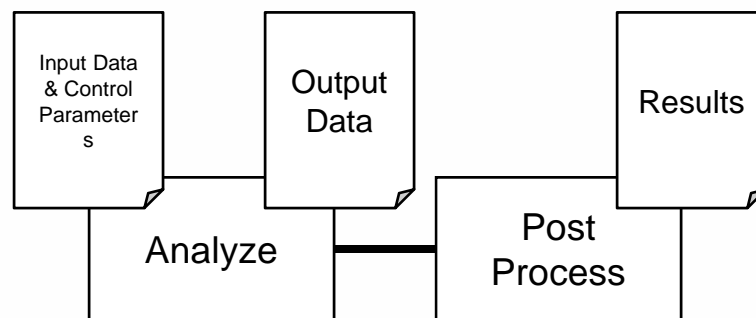
Analysis Data



Design Studies are composed of Simulations



Simulations are composed of Models

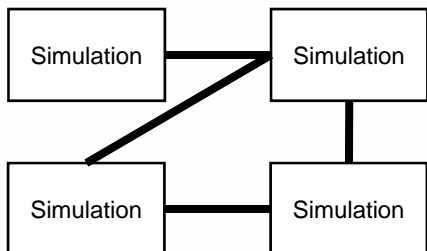


Models are sets of input data, control parameters, analysis apps & post processors

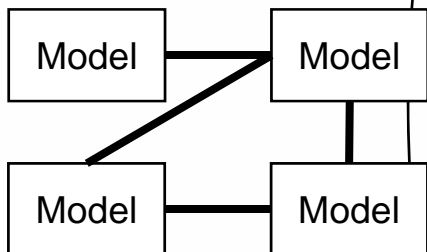


Simulation Data Management

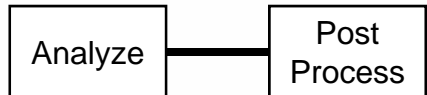
Studies



Simulations



Models



Study Management

Studies:

- Description
- Design Practice
- Simulations
- Results summary
- Conclusions
- Time, date, owner
- Security

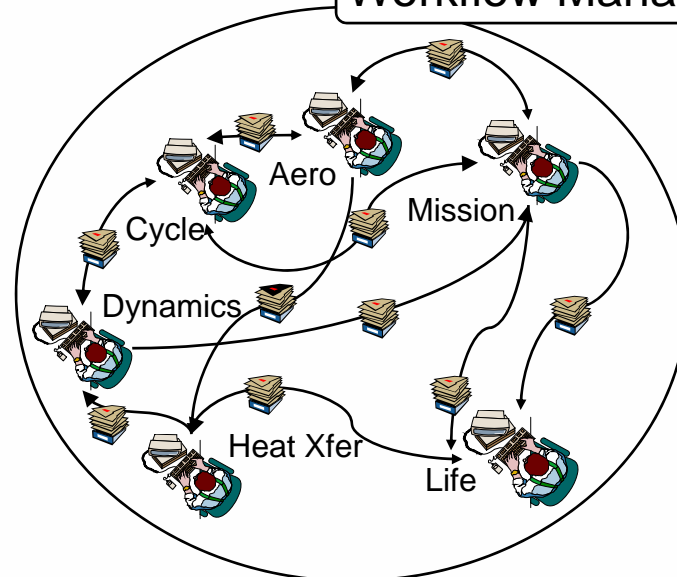
Simulations:

- Description
- Design Practice
- Models
- Model sequence
- Results
- Time, date, owner
- Security

Model:

- Description
- Results
- Time, date, owner
- Security

Workflow Management



Model Management

Tools

- Name
- Version
- Location
- License

Input & Output Files

- File name, loc, size
- Creation date & time
- Security
- Author/owner
- System of origin
- Security

SDM Benefit Opportunities



Productivity

- Data Management
- Automated Studies
- Design pedigree for DRB & certification

Quality

- First time right
- Design accuracy
- Time to market

Knowledge Management

- Process template automation
- New engineer training
- Security
 - IP protection
 - Export control

Innovation

- Directed Studies
- Optimized Studies
- Probabilistic Studies

Enterprise Deployment Benefits



Cross organization knowledge sharing

Innovation

Time to market

Security enforcement

Reduced infrastructure

Efficient support organization



Enterprise Deployment Challenges

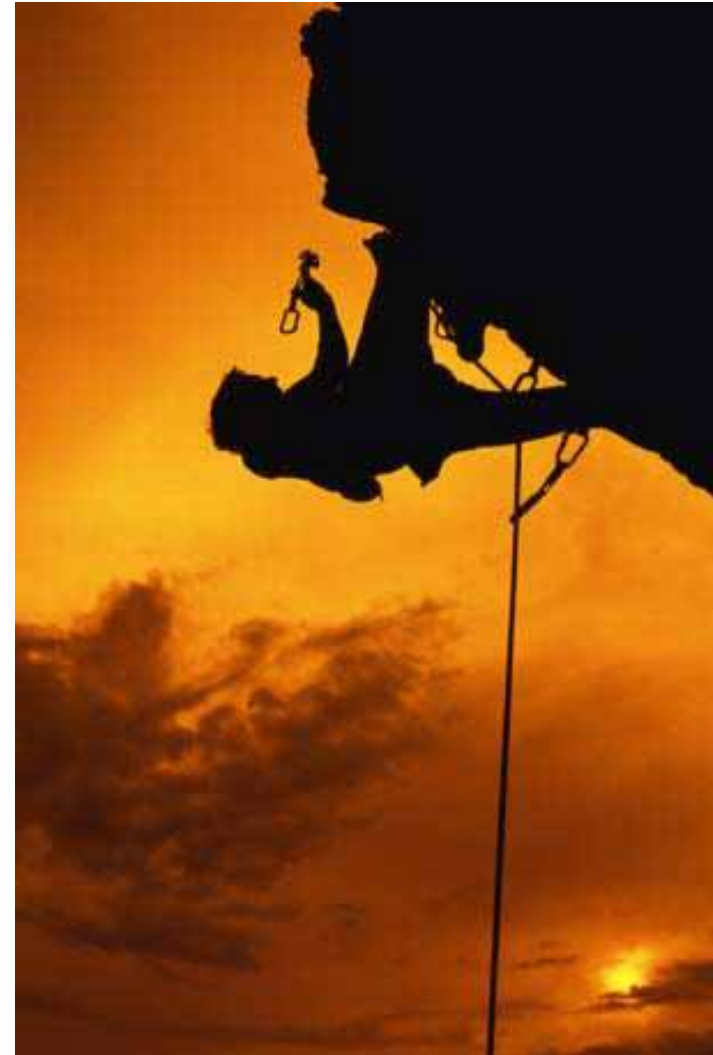


Infrastructure Capacity

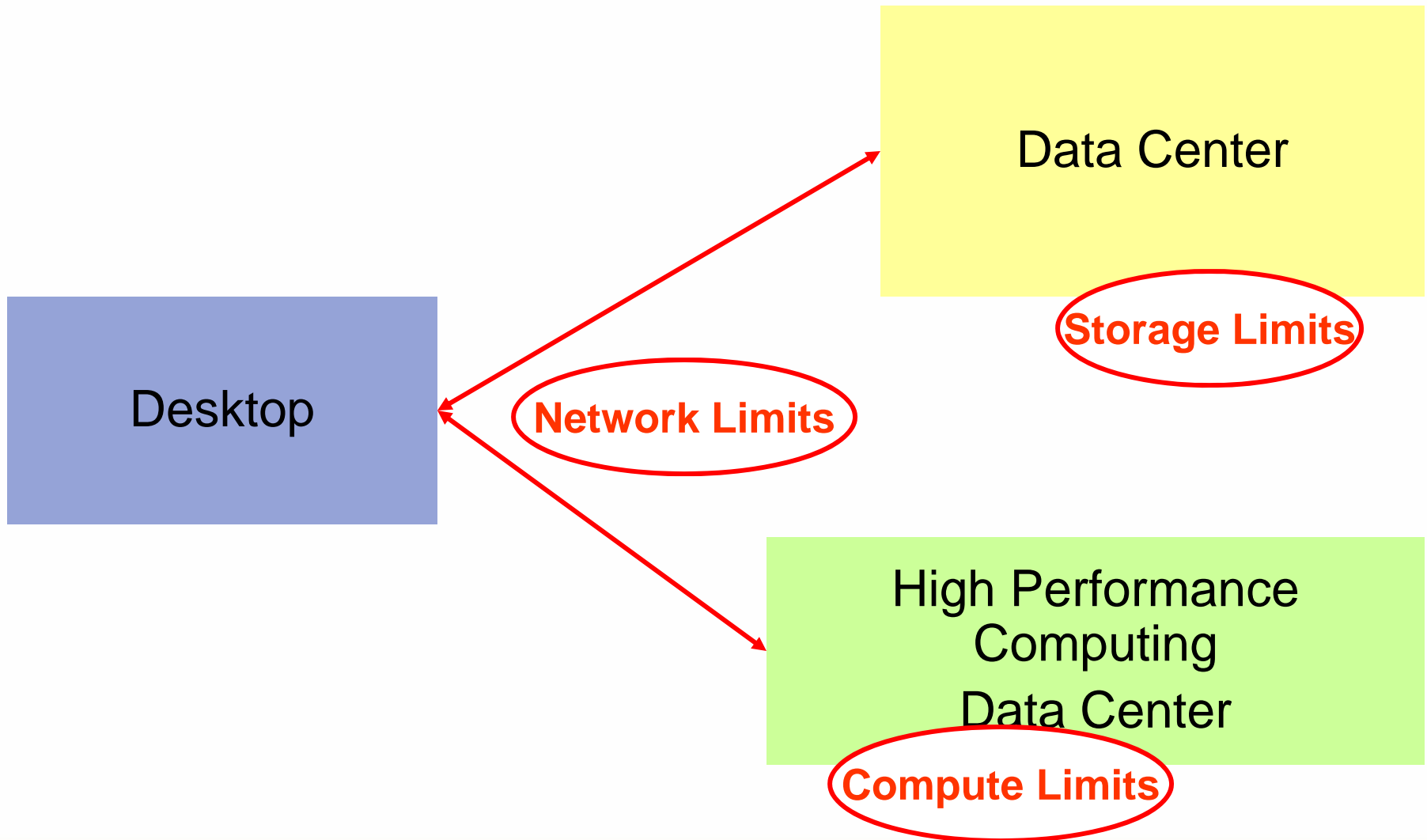
Data Structure

Legacy Data Migration

Security



Infrastructure Capacity - Challenge



Infrastructure Capacity - Plan



Model Requirements

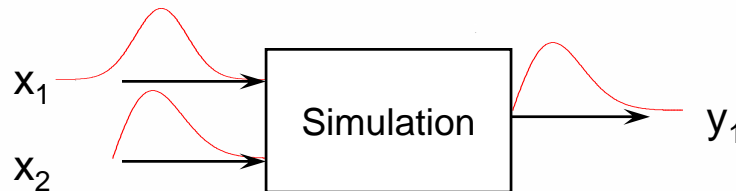
Data Volume = SUM (File Count * File Size)

Network Demand = (Data Volume / Day) * Job Count * Concurrency

$$= (((Cnt_s * Size_s) + (Cnt_m * Size_m) + (Cnt_L * Size_L)) / Day) * Cnt_j *$$

Conc * Conv

Solve Using Probabilistic Analysis



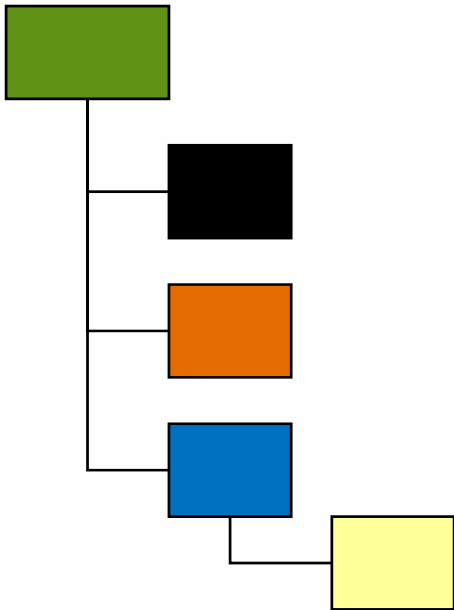
Build Out Infrastructure Appropriately

Monitor Performance

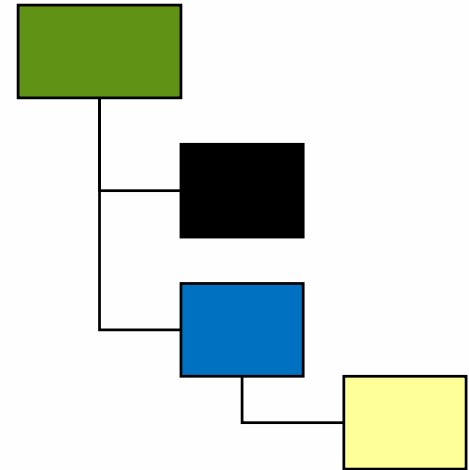
Data Structure - Challenge



Organization A



Organization B



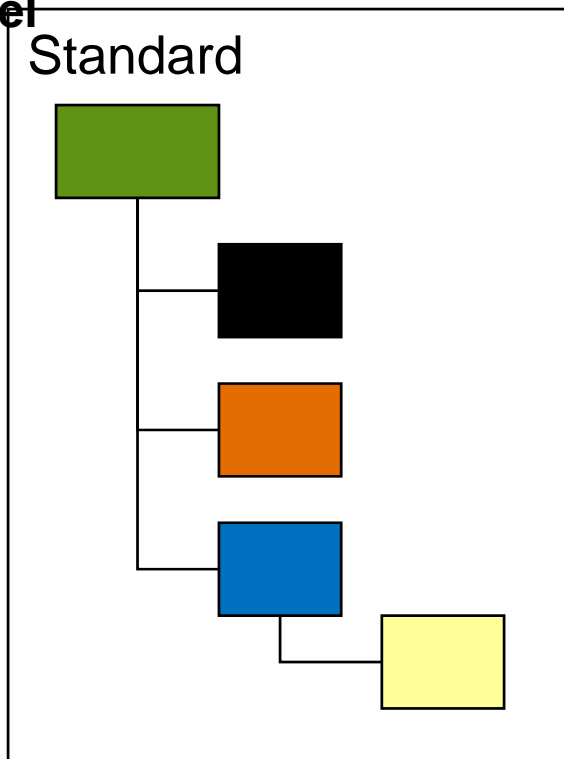
**Folders, projects,
database entities ...
same pieces, different
structure:**

- **Difficult collaboration**
- **Complex security model**
- **Data transfer issues**
- **Difficult maintenance**
- **Complex upgrades**

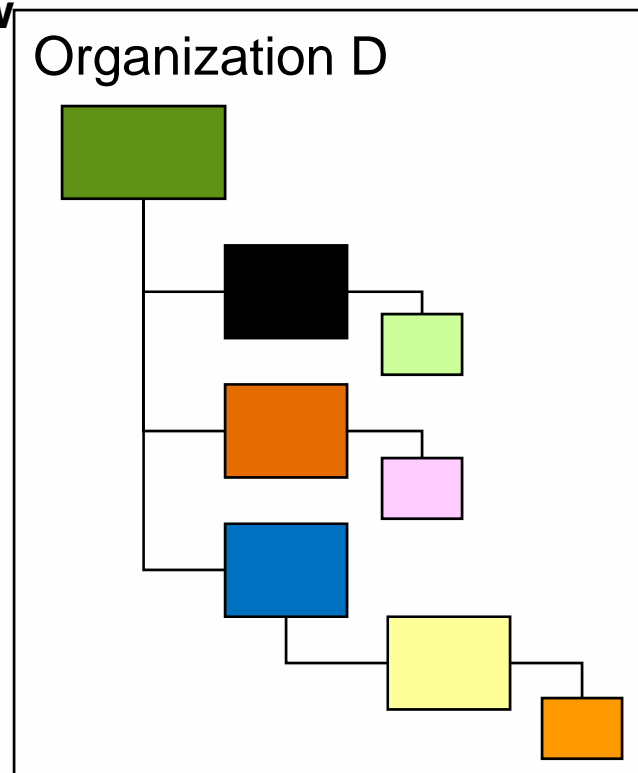
Data Structure - Plan



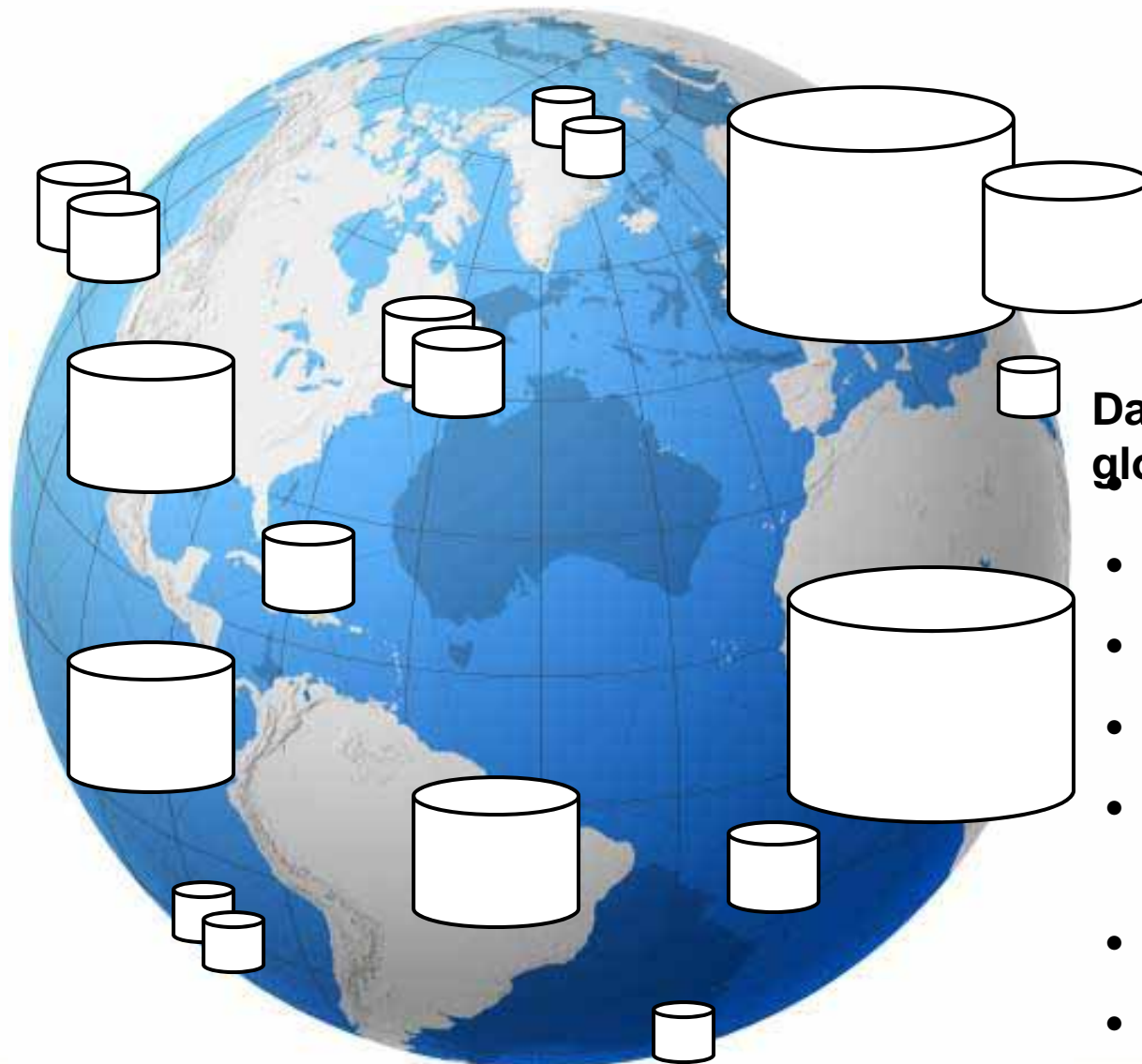
Develop Standard Abstract Model



Only Allow Customization Below



Legacy Data Migration - Challenge



Data scattered around globe:
• No backup

- Insecure
- Limited reuse
- Lost
- Under utilized infrastructure
- Random structure
- No usage information

Legacy Data Migration - Plan



Data Center

Leave data where it is

Consolidate data into data centers

Develop tools

Drive vendors to develop tools

Derive usage information from structure

Spawn separate program

Security - Challenge



Export Control

- National security
- Not just US government
- Dynamic

Intellectual Property Protection

- Substantial business losses
- Not just GE IP
- Dynamic



Security - Plan



Stay current with security policies

Standardize data structures

Enterprise deployment

Drive vendors to provide tools



Summary



Infrastructure Capacity

- Model, predict, plan, monitor

Data Structure

- Standardize, control

Legacy Data Migration

- Consolidate, standardize structure

Security

- Prepare, standardize



Questions



Contact Details :



- For further information please contact

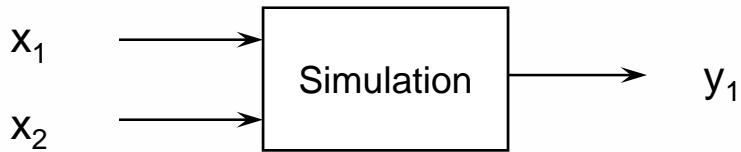
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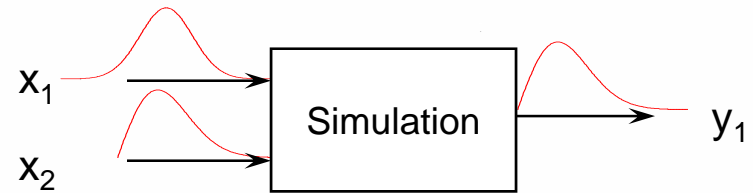
513 552 3429
mark.e.miller@ge.com

Backup Slides

Probabilistic Design



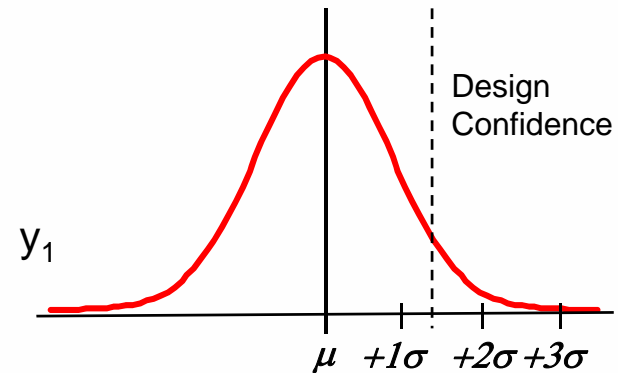
Existing simulation codes are *deterministic*



However, input & output *vary* across some distribution

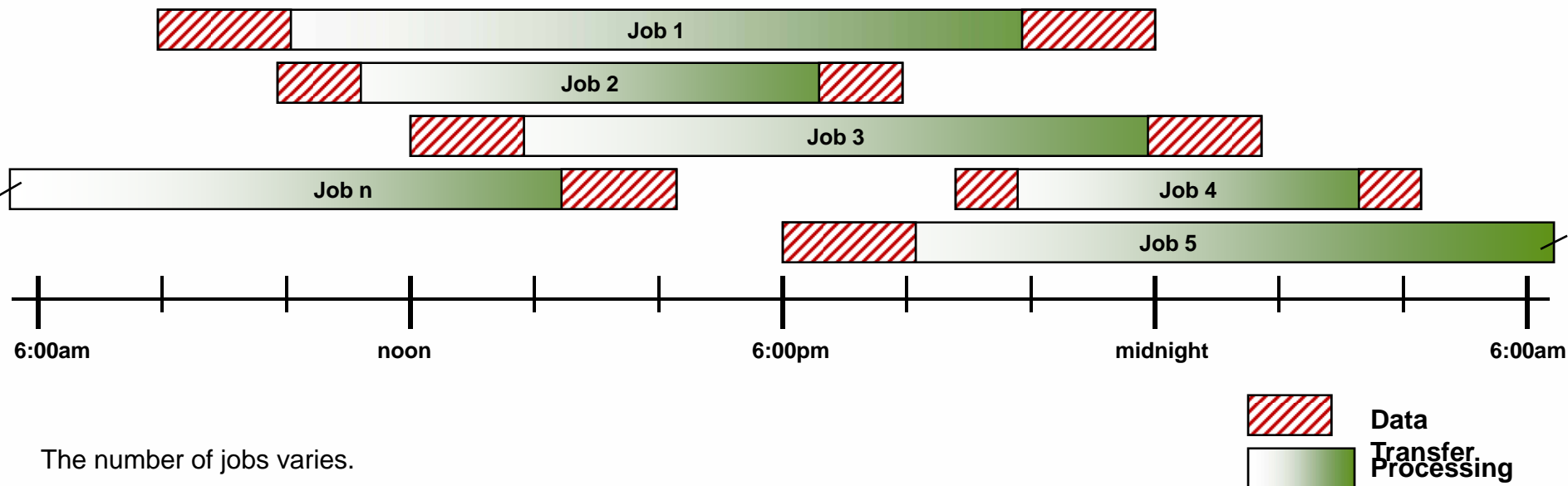
Probabilistic Design:

- Predicts Y distributions from X distributions
- Predicts which X factors are significant contributors
- Defines how to control the Y distributions through the X distributions



Probabilistic Design requires *easy linking of optimization algorithms* to probability analysis systems and the ability to *manage large data files*.

Analysis Jobs Per Day



The number of jobs varies.

The amount of data to transfer for each job varies.

Data may or may not need to be transferred.

Job start and end times vary.

The processing time varies for each job.

Jobs do not necessarily end during the time period.

No data transfer takes place during processing.

Data transfer should take place as fast as possible.

Network speed varies.