Being the Best in the World

Modeling and Simulation

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Kammer's Four Questions

- What measurements and standards are needed by industry and the country, now and in the future?

- How well are we meeting these needs?

- How does our performance compare to the best in the world?

- What could we do to be or remain at the pinnacle of the field?

Why Do Modeling and Simulation?

The purpose of computing is insight,
not numbers.

Richard Hamming, 1962

The purpose of computing is insight,
not impressive computer graphics.

Jim Blue, 1995

Why Do Modeling and Simulation?

- To facilitate understanding and insight
- Because it's
  - Cheaper
  - Faster
  - Better

Who Does Modeling at NIST?

- Some people in the Mathematical Modeling Group

- Some people in the Mathematics and Statistics divisions in ITL

- Some people in every lab

- Everyone who takes measurements or interprets them

Customers for Modeling and Simulation

- Most Laboratories:
  - Industry
  - Own Laboratory

- Mathematics and Statistics Divisions:
  - Industry
  - ITL
  - Other NIST Labs

Aspects of Modeling and Simulation

Math models (equations)

Algorithms

Software (Computer Programs)

Computers (Do the Simulation)

Interpretation & Visualization

Validation (Experiment)

Being the Best in the World

What do we mean by

"Being the Best in the World

in Modeling and Simulation"

?

Defining "Best in the World" for Measurements is Easy

Measure Quantity Q

with accuracy of 1 Part in 10^p

•

My p is bigger than your p.

Being the Best in the World in Modeling and Simulation

- What areas?

- Compared to whom?

- Or only good enough for NIST's measurements to be best in the world?

What Does it Take?

Math models	Math, *Science*
Algorithms	Math, Computer Sci.
Software	Comp. Sci., Support
Computers	Support
Interpretation	Comp. Sci., *Science*
Validation	Statistics, *Science*

What Does it Take?

• No one person or group is expert in all the needed areas

• Interdisciplinary teams are needed

• Math and Statistics Divisions are available for short–term and long–term consulating and collaboration