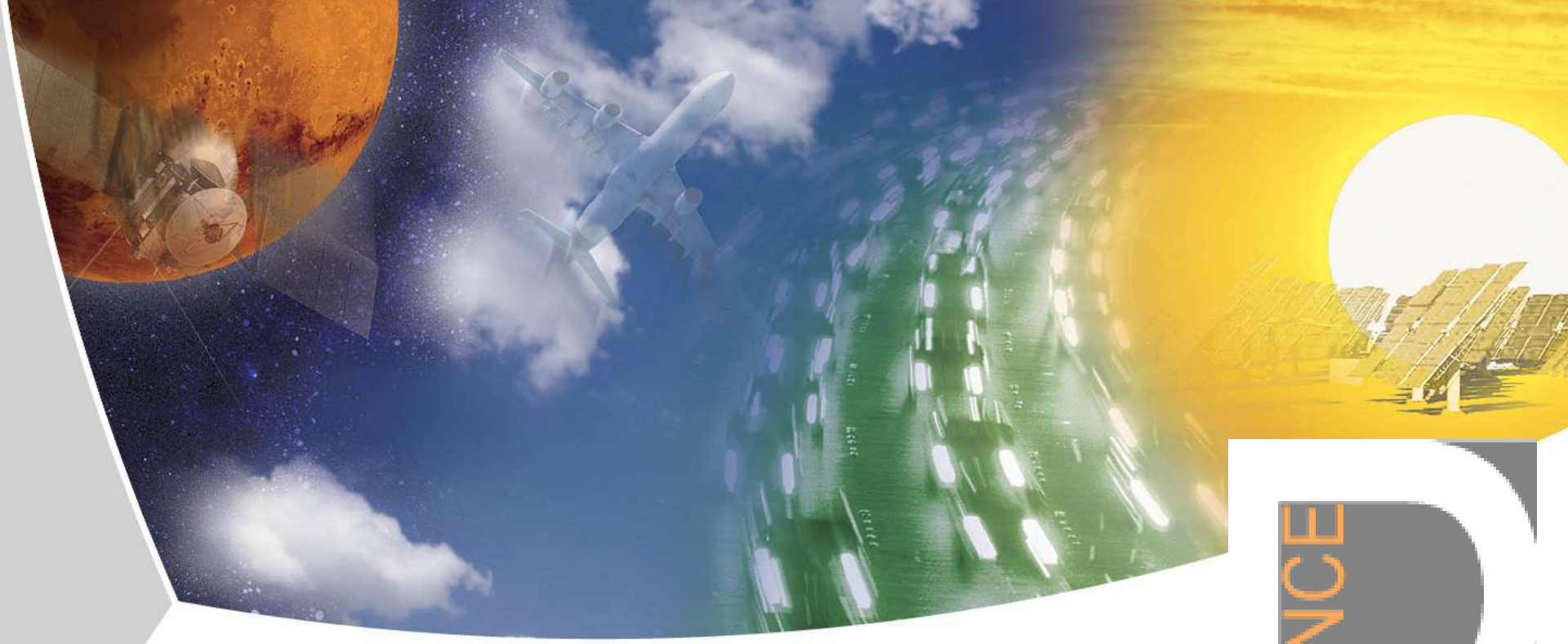

Provenance Implementation in a Scientific Simulation Environment

IPAW 2006, Chicago, May 3, 2006

Guy K. Kloss
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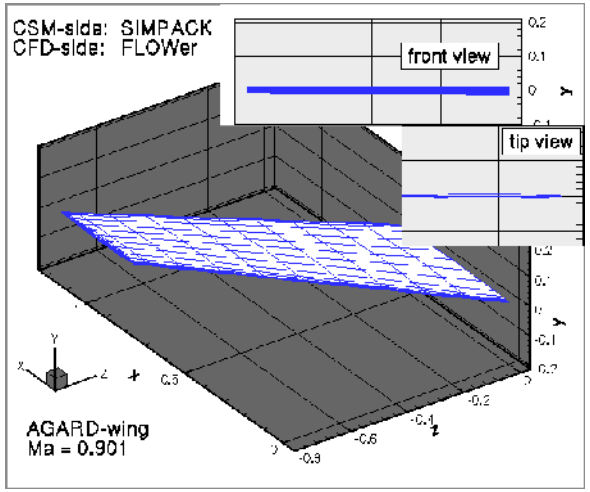
German Aerospace Center (DLR)
Simulation and Software Technology

Overview

- **Scenario**
- Achieving Provenance Awareness
- Provenance Queries
- Conclusion

Aerospace Engineering Application

- Aero Elastic Simulations
  - Coupled Simulation
    - Aero Dynamics
    - Structure Mechanics
  - Wing Deformation



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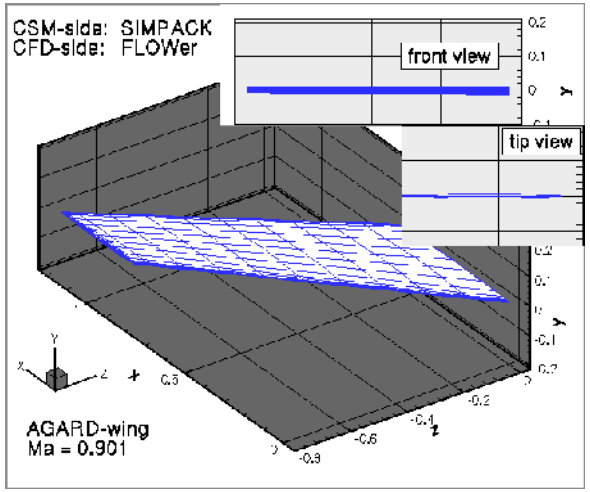
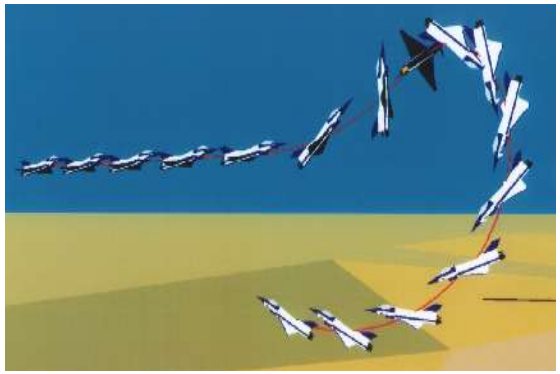
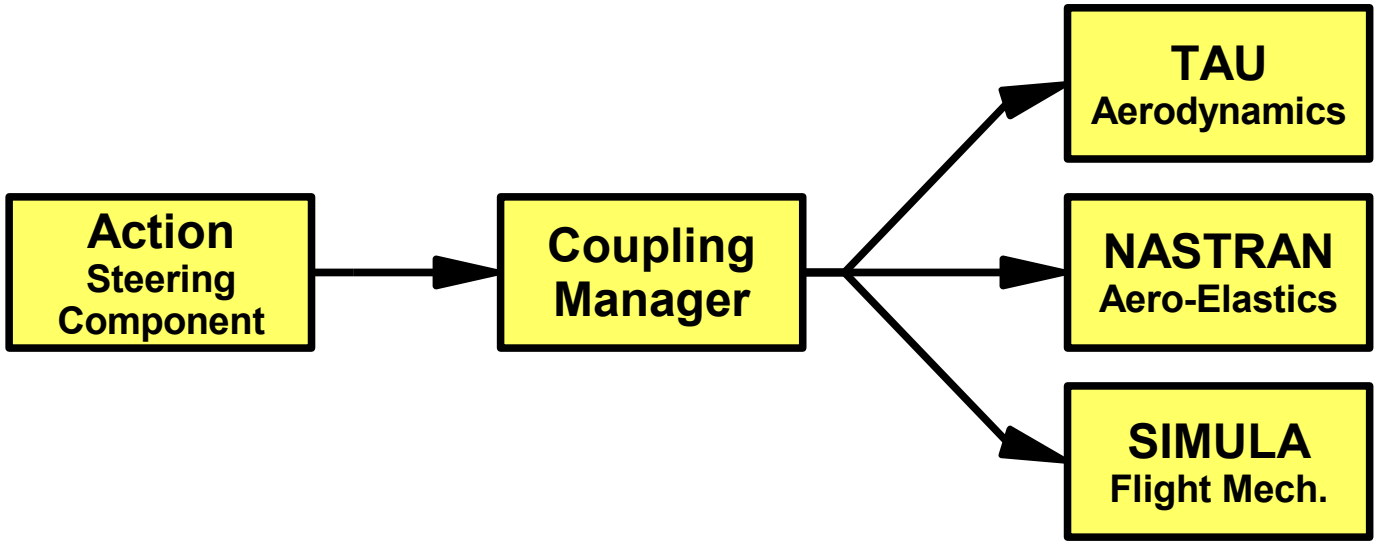


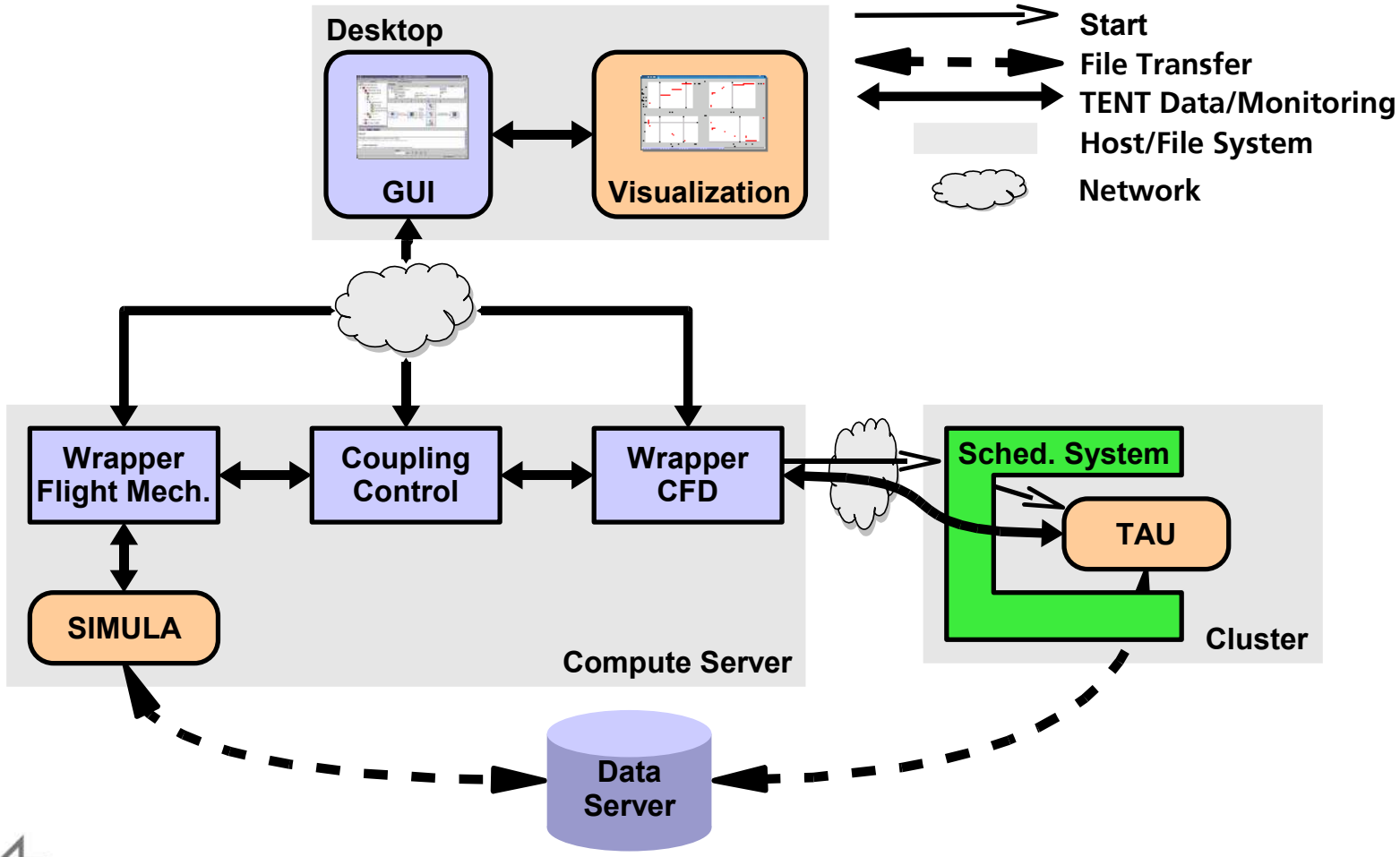
- Flight Maneuvers
  - Coupled Simulation
    - Aero Dynamics
    - Aero Elasticity
    - Flight Mechanics
  - Test Case
    - Military airplane X-31



Workflow
Flight Maneuver Simulation



Distribution of Application



Overview

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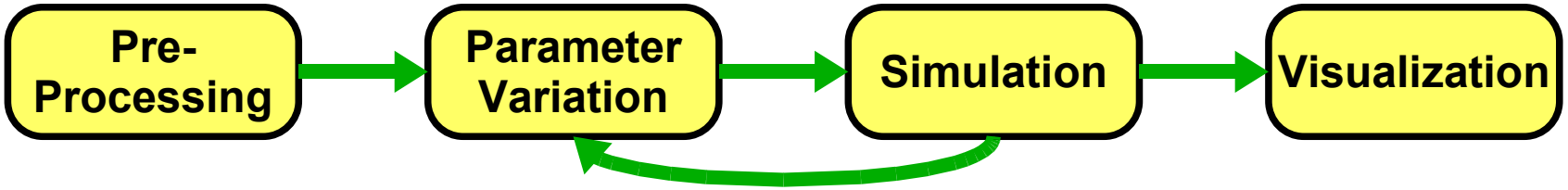
Implementing Provenance Awarenes



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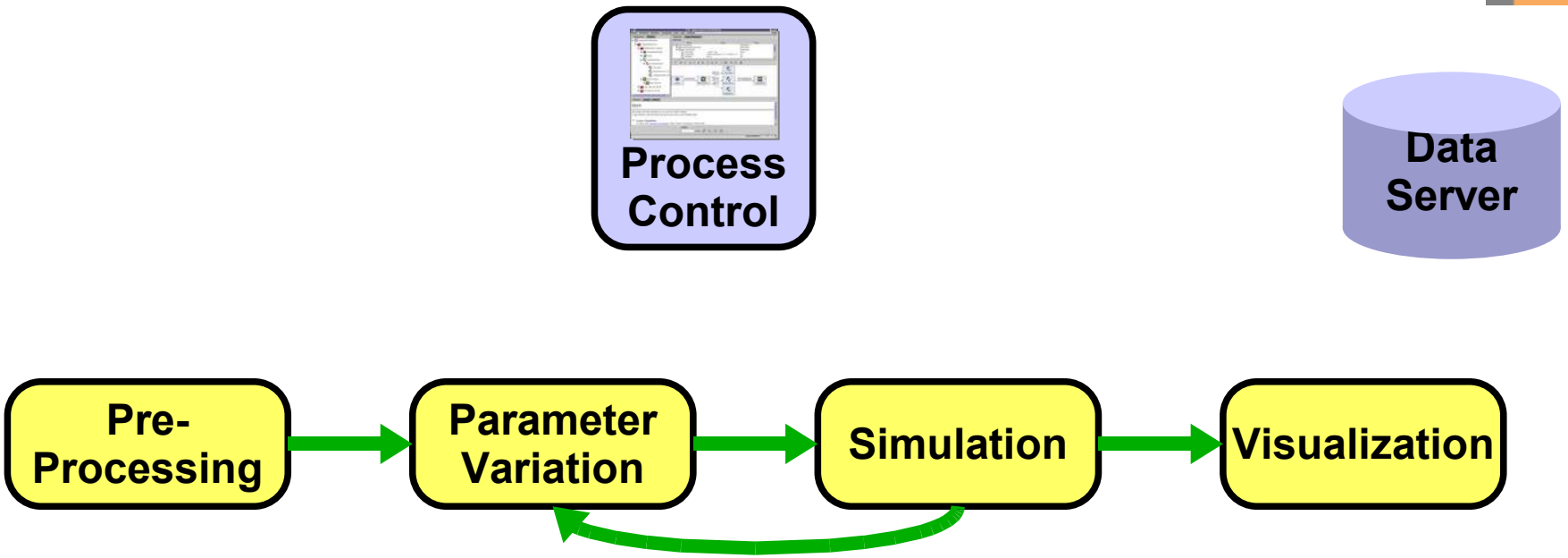

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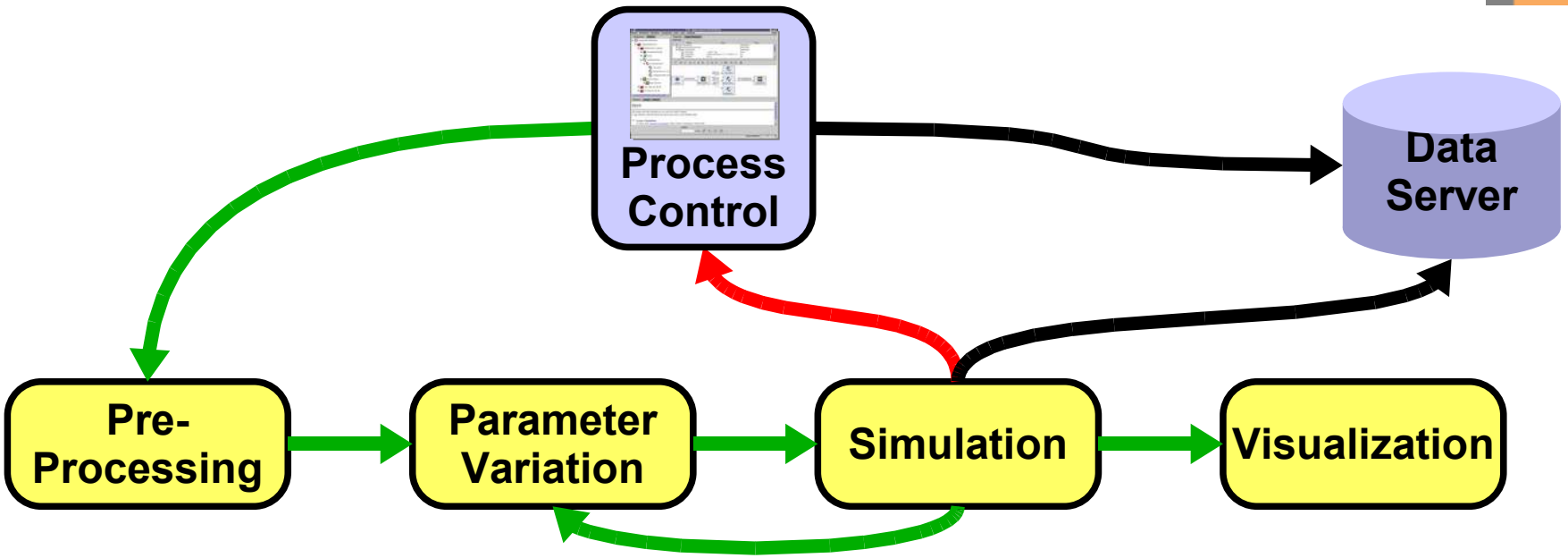

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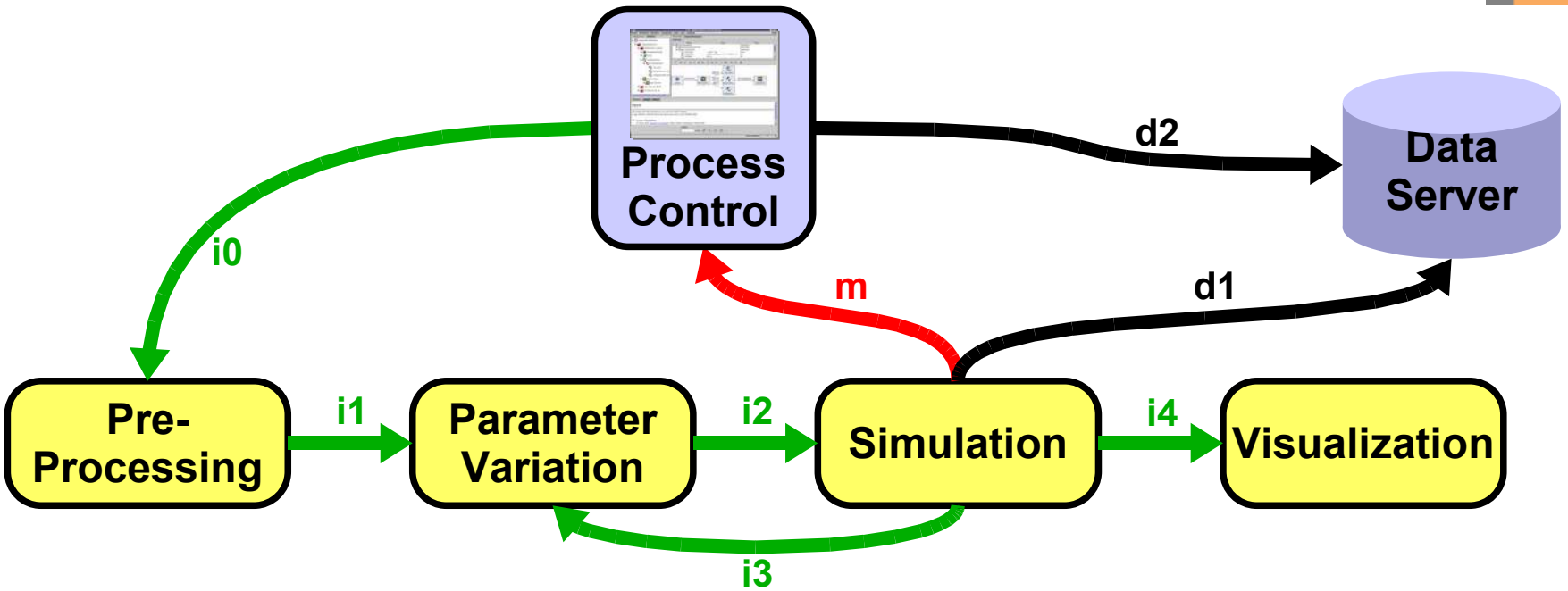
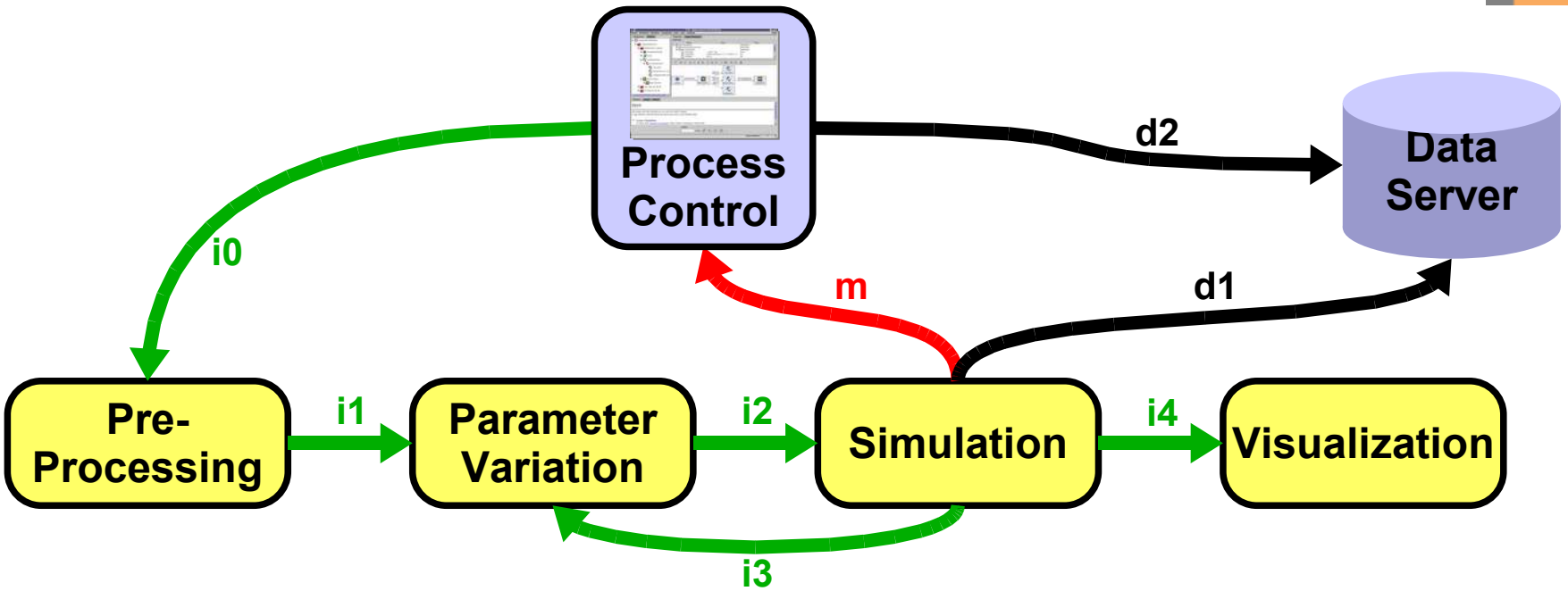


Interactions:

- Process Flow
- Monitoring
- Data Management

Implementing Provenance Awarenes



Interactions:

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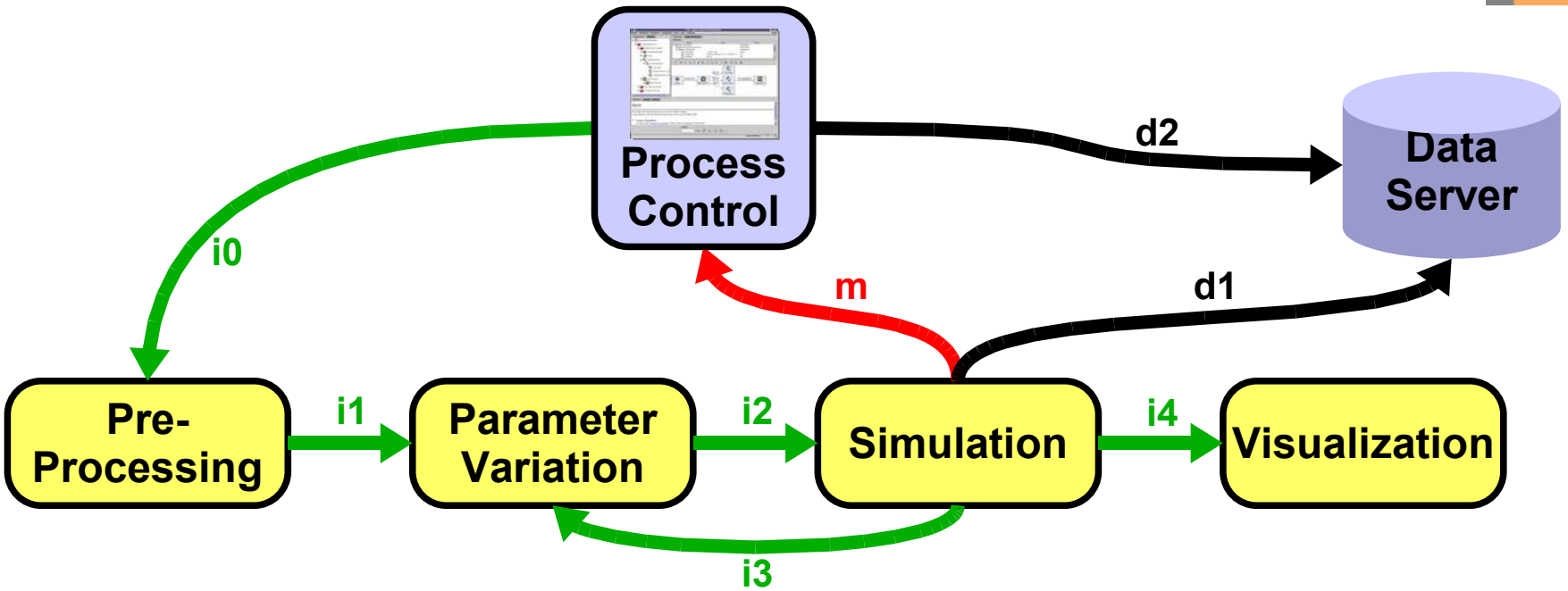
State:

of the **Actors**

Implementing Provenance Awarenes



Interactions:

- Process Flow
- Monitoring
- Data Management

State:

of the **Actors**

Relationships:

- r0: i0 causes i1
- r1: i1 causes i2
- r2: i2 causes i3
- r3: i2 causes i4
- r4: i3 causes i2
- r5: i2 causes m
- r6: i2 causes d1
- r7: i0 causes d2

Overview

- Scenario
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Queries

- Given some data item,
  what was the simulation case?
- Given some parameter,
  in what simulation(s) has it been used?
- What data has been recorded
  in a simulation with a specific parameter?
- What simulations have been run
  using a given model (aircraft design)?
- Given two/more simulations with the same setup,
  what is the result and the difference in provenance?

Overview

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Conclusion

- Provenance Recording: “It's gotta be done!”
  - Compliance to Regulations
  - Liability
  - Proof and Reproducibility of Results

- Burden of Recording

Conclusion

- Provenance Recording: “It's gotta be done!”
  - Compliance to Regulations
  - Liability
  - Proof and Reproducibility of Results
- Burden of Recording
- Further Benefits
  - Better Insight into Problems
  - New Means for Data Analysis
  - Easier Access to Data

Thank you for your attention!

Further Information:

http://www.GridProvenance.org

or

http://www.dlr.de/sc/projekte/PROVENANCE

Any Questions?