

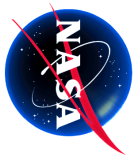
Computational Technologies Workshop Charter

ESTO

Earth Science Technology Office

- Identify the Earth Science Enterprise computing capabilities required to achieve the Earth System Prediction Goals and applications strategy for 2010 and beyond.
- Evaluate current ESE computing capabilities against these requirements.
- Determine and quantify what gaps in capabilities exist.
- Determine which gaps can be addressed by advances in computational technologies
- Identify and quantify the advancements in computational technology capabilities that require NASA investment in order to bridge these gaps.
- Prioritize these capability advancements in terms of their likelihood to enable the Earth System Prediction Goals for 2010.
- Create a roadmap for each unique capability advancement.
- Create a final report.





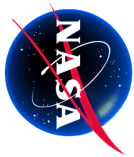
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- Identify the Earth Science Enterprise computing capabilities required to achieve the Earth System Prediction Goals and applications strategy for 2010 and beyond.
 - What will achievement of the prediction goals require? I.e., imagine what the community infrastructure would look like to enable these goals ...
 - Rate of observational data ingestion?
 - Real-time, simultaneous, multi-satellite data availability?
 - Model resolution?
 - Number of model runs? (I.e., computing infrastructure throughput?)
 - Data volume being stored, processed, and transfer rate?
 - Show stoppers? I.e., is development of new modeling and/or analysis techniques the pacing item here? Do we even know how to achieve these prediction goals?
 - Software Development/Programming Environment - does this need to change from how you work today?





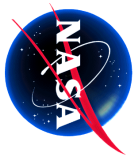
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- Evaluate current ESE computing capabilities against these requirements.
 - How do you do business today?
 - Rate of observational data ingestion?
 - Model resolution?
 - Number of model runs? (I.e., current throughput?)
 - Data volume being stored, processed, and transfer rate?
 - Model complexity?
 - Software Development process?
 - Software portability?
 - Adequate platforms?
- What needs to change in this decade and beyond?





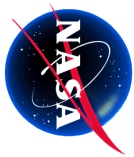
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- Determine and quantify what gaps in capabilities exist.
 - **Model Complexity** - Limited by science understanding or ability to engineer and implement software? Both?
 - **Model validation process?**
 - **Data management?**
 - **Data movement?**
 - **Computing throughput?**
 - **Human interface to the analysis?**
 - **Visualization?**
 - **Other gaps?**
- **Make a list of the capability gaps and describe each in sufficient detail, e.g.**
 - Random access to petabytes of sensor data products**
 - Automatic generation and execution of ensembles of models**
 - Plug and play modeling infrastructure**
- **Try to stay away from implementation solutions at this point**





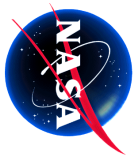
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- Determine which gaps can be addressed by advances in computational technologies
 - **Are any of the gaps identified not dependent on advances in computational technology? I.e., those that are fundamental physics modeling issues should be separated from implementation advancements required**





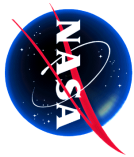
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- Identify and quantify the advancements in computational technology capabilities that require NASA investment in order to bridge these gaps.
- We are looking for a break down into more specific technology areas. Some possible examples:
 - **Algorithms - faster, more scalable, etc.**
 - **Applications software engineering - Code development and testing tools, programming models, ...**
 - **System software - ...**
 - **Computing Platforms & networks - ...**
- Identify any items where advancements are required - but NASA investment would not be productive or it is not unique to NASA- I.e.:
 - **Industry will do it**
 - **Another agency is already the leader in this area**
 - **Other reasons?**





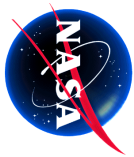
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- Prioritize these capability advancements in terms of their likelihood to enable the Earth System Prediction Goals for 2010.
 - Given the list of capabilities needed, assign a priority (high, medium, low) that indicates how important a capability will be in enabling a prediction. This could also be interpreted as
 - **Must Have - Can't do prediction without it**
 - **Important - work will be harder without it**
 - **Nice to have - goals are achievable without it**





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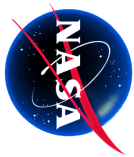
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First type of Roadmap

- Create a roadmap for each prediction/science capability goal.
Start with each prediction/application scientific knowledge base against enabling computational technology needed, as a function of time:
 - **Current state of knowledge base**
 - **Current computing technology base**
 - **Science-based milestones for achieving each prediction goal.**
 - **Milestone for a technology development activity to enable prediction goal (with success criteria and date required)**
 - **Major development milestones and test cases along the way with desired completion dates**
 - **Think of what other science capabilities might be dependent on these intermediate technology milestones?**





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Second type of Roadmap

- Create a roadmap for each unique computing capability advancement.
 - **Current state**
 - **Current development activities (who, what)**
 - **End goal milestone for a technology development activity to address this capability (with success criteria and date required)**
 - **Major development milestones and test cases along the way with desired completion dates**
 - **Indicate science capabilities that might be dependent on these intermediate milestones?**
 - **Are there any external dependencies with other technology developments?**

