



EPA's NIT R&D Program: Future Directions

Gary J. Foley, Ph.D.

Office of Research and Development
National Exposure Research Laboratory

Research Triangle Park, NC

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Research is Key to Fulfilling EPA's Mission

“...to conduct leading-edge research and foster the sound use of science and technology to fulfill EPA's mission to protect human health and safeguard the natural environment.”

ORD Strategic Plan 2000

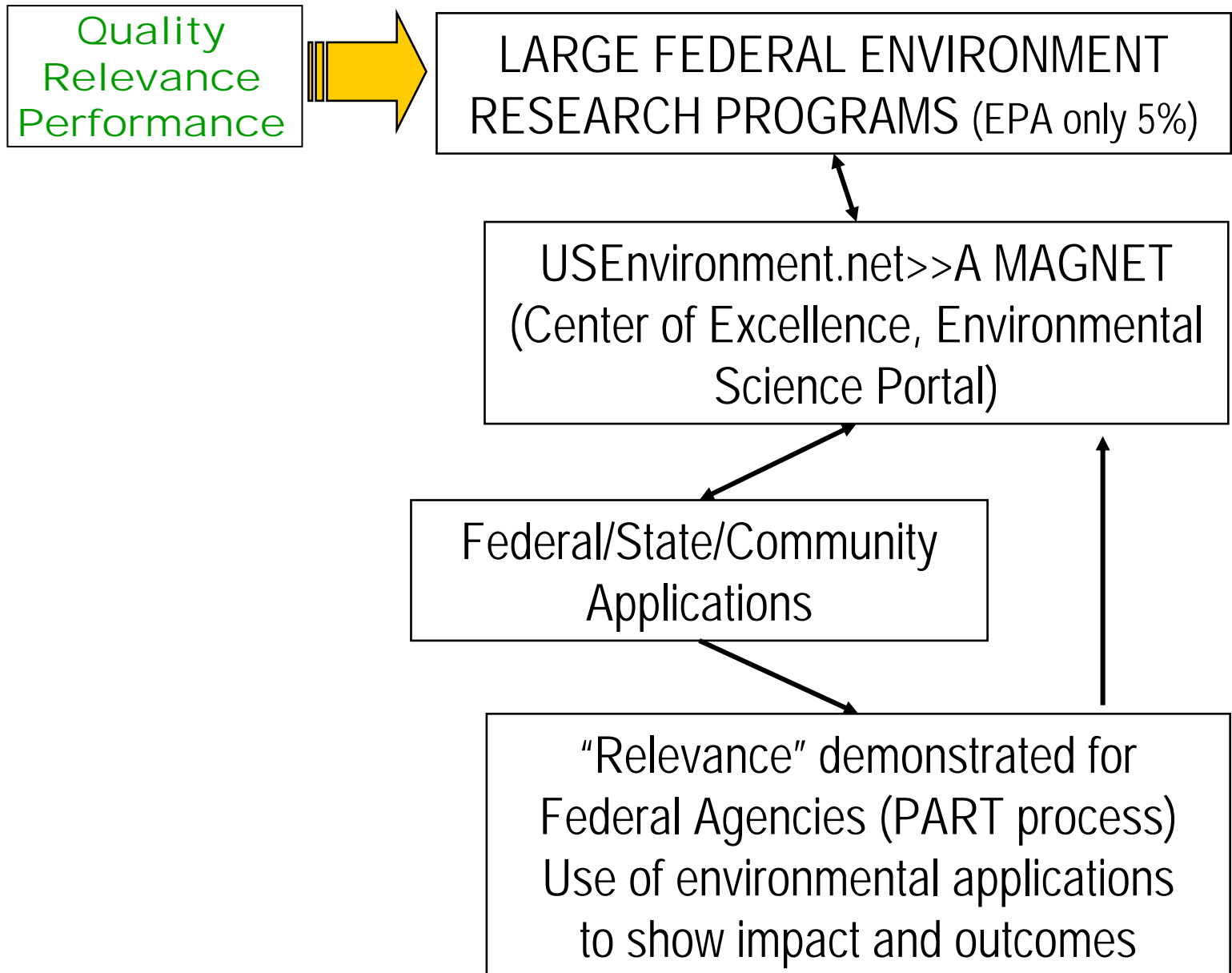
IT R&D Makes Cutting - Edge Research Possible

- Air Quality Forecasting – In partnership with NOAA, forecasting ozone and PM in urban areas
- Beach/recreational water and drinking water source water contamination forecasting
- Reducing animal testing through computational tools
- Predicting risks and effects of exposure to pollutants using computational models
- Estimating and visualizing dynamics of combustion, smoke, and pollutant transport

Strategic NIT R&D Planning: Where It Can Take Us...

- **Fully Exploiting the Possibilities of Nanoscale Technology**
 - **Microsensors and monitoring arrays**
 - **Nanoscale models for interactions of pollutants and biological systems**
- **Approaching Environmental Problems through Understanding of Biological Systems**
 - **Genomics/Proteomics/Metabonomics**
 - **Bioinformatics**
 - **Computational toxicology**
 - **Computational approach to design of enzymes to degrade pollutants and toxins**
 - **Risk prediction**
- **Linking Air Quality, Landscape, Climate and Weather Research to Environmental Applications**

PRESIDENT'S MANAGEMENT AGENDA



Advancements in High-End Computing have opened up New Dimensions in Solving Environmental Problems

“The tools for scientific discovery have changed. Previously, science had been limited to experiment and theory as the two pillars for investigation of the laws of nature...**We must think of high-end computation as the third of the three pillars that support scientific discovery.**”

-- July 2003, Testimony of Dr. Raymond L. Orbach, Director, Office of Science, U.S. Department of Energy before the U.S. House of Representatives Committee on Science

Approaches need to be integrated across scales, disciplines, and organizations

“Environmental Synthesis...New instrumentation, data-handling, and methodological capabilities have expanded the horizons of what we can study and understand about the environment. **Research must integrate spatial, temporal, and organizational scales, draw from many disciplines, and facilitate the synergy that results from partnerships among governmental, academic, and private organizations.**

--January 2003, NSF Advisory Committee for Environmental Research and Education, A 10-Year Outlook for the National Science Foundation, Complex Environmental Systems)

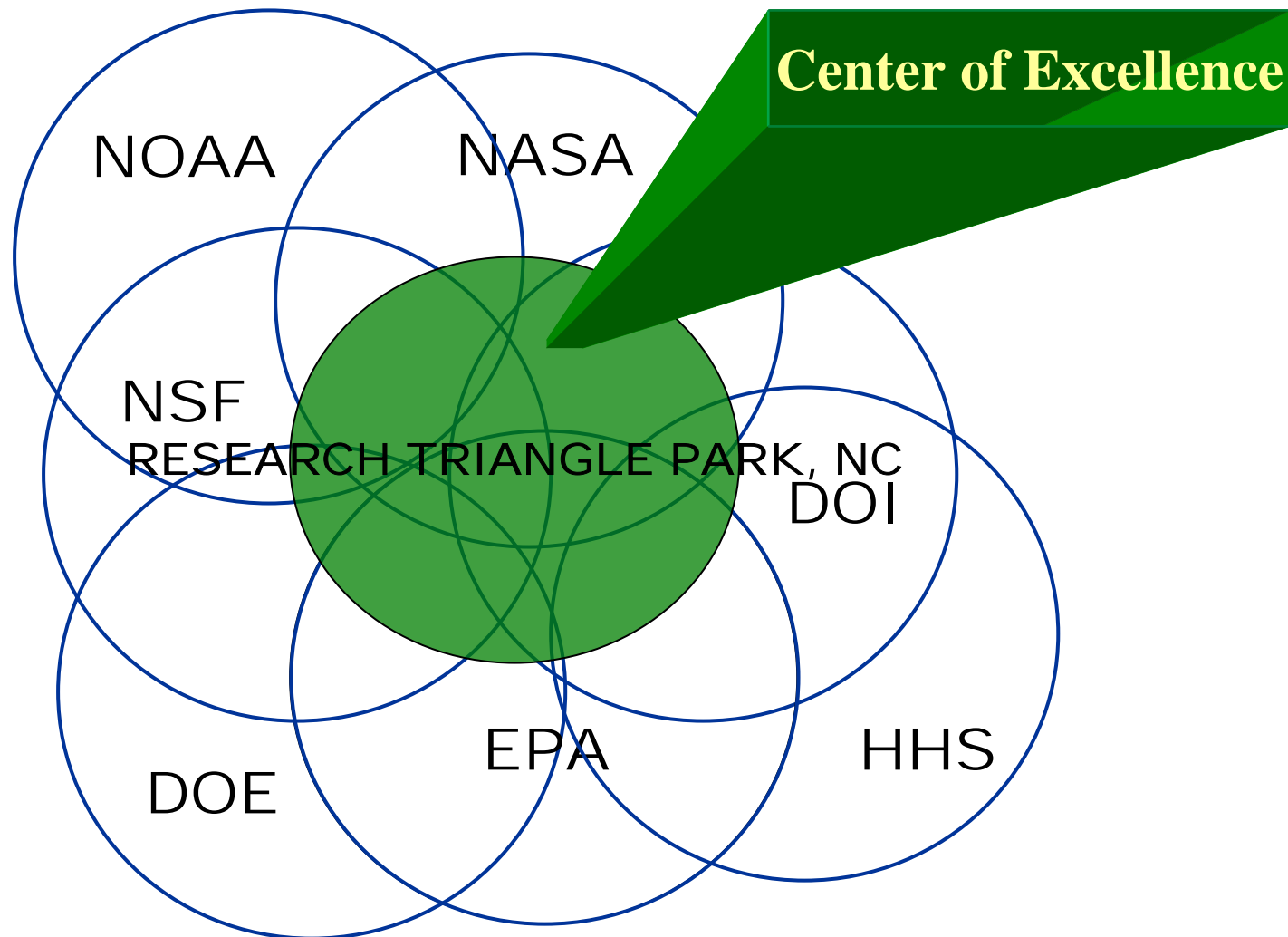
Integrate cutting edge science and emerging IT solutions to transform decision making.

- **High-end computing is at a historically unprecedented threshold**, providing the means to predict the behavior of complex systems never available before
- **Landmark scientific discoveries** in areas such as, molecular science, structural and systems biology, and chemistry and catalysis, **poise us to make monumental advances** in addressing environmental issues
- **Because of these advances, the time is now to integrate** across scales, disciplines, and organizations

EPA's Focus on High-Performance Computing

- **Partnerships** -- Identifying HPC tools and technologies to meet Agency science and environmental protection mission.
- **Partnerships** -- Working to bring cutting-edge solutions to complex environmental problems.
- **Capacity Building** -- Building computing capacity and access by States and Local Governments for more application of advanced problem solving tools.

An Integrated Enterprise for Environmental Research



An EPA Center of Excellence in Environmental Computational Science

- Through Interagency Partnerships, Create...
 - A Center to provide models and tools to address complex environmental applications,
 - A Research and Applications Network to provide computing capacity,
 - An Environmental Science Portal to integrate environmental information and deliver tools to decision makers,
 - And build on existing State/EPA network to provide computational services.

How Would This Transform Environmental Decision Making?

- **Reduces barriers and stovepipes** between EPA labs and programs, Federal agencies, academia and private industry.
- **Collects and shares scientific information in a timely and seamless manner** among entities involved in environmental research.
- **Runs benchmark data and applications on most optimized hardware platform** across partner networks.
- **Allows for spikes in HPC demand** through on-demand resources.
- **Provides capacity for States to run applications and environmental models** at Center of Excellence.
- **Provides for collaboration and corroboration of scientific results** with other Government agencies and the private sector.
- **Exploits distributed resources** to provide capacity for high-demand applications.
- **Permits sharing among EPA and other organizations (states, academia)** via a computational grid.

Partnerships are Critical to Success

- Interagency Agreements -- leverage federal resources in ongoing programs
- Cooperative Research and Development Agreements – partnering with the private sector