NASA CICT Program

The Computing, Information and Communications Technology Program

May 10, 2002

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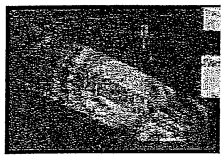


Welcome to CICT

The Computing, Information and Communications Technology Program (CICT) was established in 2001 to ensure NASA's continuing leadership in emerging technologies. It is a coordinated, Agency-wide effort to develop and deploy key enabling technologies for a broad range of mission-critical tasks.

The NASA CICT program is designed to address Agency-specific computing, information, and communications technology requirements beyond the projected capabilities of commercially available solutions. The areas of technical focus have been chosen for their impact on NASA's missions, their national importance, and the technical challenge they provide to the Program.

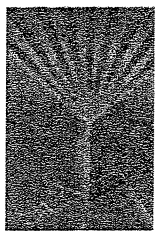
In order to meet its objectives, the CICT Program is organized into the following four technology-focused projects:

Computing, Networking and Information Systems (CNIS)

Intelligent Systems (IS)

Space Communications (SC)

Information Technology Strategic Research (ITSR)



CICT External Website Content Outline

1. **Introduction/Welcome**
   Welcomes visitor, tells them who we are, where they are, and guides them to other material on the site.

2. **CICT Goal**
   a. Goal
   b. Technical objectives:

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   b. Management Bios (NASA-only Access)
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   Archive of articles about CICT accomplishments

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    a. Plans
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CICT Goal

Enable NASA's Scientific Research, Space Exploration, and Aerospace Technology Missions with greater mission assurance, for less cost, with increased science return through the development and use of advanced computing, information and communications technologies.

Technical Objectives

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Technical Objectives

In order to achieve it's goal, the CICT Program is organized around four technical objectives, which when taken together, form a solid foundation for NASA missions well into the new century.

Goal-directed Systems

CICT will enable smarter, more adaptive systems and tools that work collaboratively with humans in a goal-directed manner to achieve NASA's twenty first century mission/science goals, including:

- Robotic exploration of deep space;
- Combined human-robotic exploration of Mars;
- Safe and cost effective operation of the Space Shuttle and follow-on launch vehicles;
- Use of Earth-orbiting satellites to establish cause and effect relationships associated with such important phenomena as global warming; and
- Development of methodologies to enhance the capacity, safety, and security of the U.S. air transportation system.

Seamless Access to NASA Information Technology Resources

CICT will enable seamless access to ground-, air-, and space-based distributed hardware, software, and information resources to enable NASA missions in aerospace, Earth science, and space science. Through this seamless access to NASA assets, scientists and engineers will be able to focus on making new discoveries in science, designing the next generation space vehicle, controlling a mission or developing new concepts for the National Airspace system rather than on the details of using specific hardware, software and information resources.

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Program Offices

MS 258-2
NASA Ames Research Center
Moffett Field, CA 94035-1000

650-604-4000 Voice
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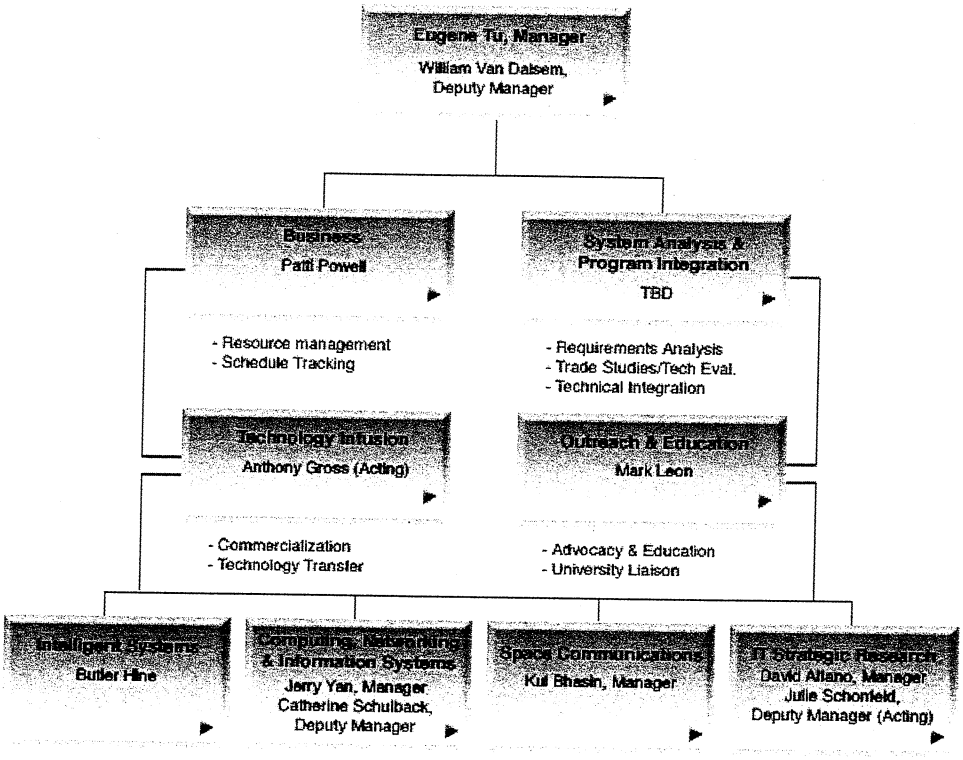
Organization Chart



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CNIS Project

Computing, Networking, and Information Systems

The goal of the CNIS Project is to:

Enable seamless access to ground-, air-, and space-based distributed information technology resources (both hardware and software) to enable NASA missions in aerospace, Earth science, and space science.

The CNIS Project is creating a NASA Grid to harness the power of the agency's computers, networks, scientific instruments, and information. This grid system will give NASA scientists and engineers around the country easy access to NASA resources, and to collaborate on solutions to complex problems critical to NASA missions. These experts will now be able to focus their talents on making new discoveries in science, designing new space vehicles, and creating tomorrow's information systems technologies. CNIS will extend the basic capabilities of NASA's existing Information Power Grid architecture beyond ground-based high-performance computing grids into air and space.

Key Project Areas:

• Grand Challenge Applications - Problems in Earth and space science, computational modeling, and data analysis and sharing, important to NASA Enterprises.

• Information Environments - Tools for building applications-specific problem-solving environments and information management systems related to grand challenge applications.

• Grid Common Services - A set of services and software

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IS Project

Intelligent Systems (IS) Project

The goal of the IS Project is to:

Develop smarter, adaptive systems and tools that work together with humans to achieve NASA's Space Science, Earth Science, Exploration, and Aerospace missions of the future.

The Intelligent Systems Project will focus on the development of fundamental component technologies and the application of these technologies as isolated components. If sufficient progress in made in the development of the component technologies under the Intelligent Systems Project, the Systems Autonomy Project will begin in FY05 and focus on system level synthesis of multiple technologies and the fundamental advances that are required as the component technologies are brought together. During both the Intelligent Systems and the Systems Autonomy Projects, mission technology insertion activities will be pursued to help focus and guide the technology development process.

Key Project Areas:

- Automated Reasoning - Design systems that reliably make decisions with limited intervention in order to overcome delays related to continuous communication of commands, time delays due to distance in deep space probes, or humans with higher mission priorities.

- Human-Centered Systems - Radically enhance both individual and team productivity on NASA missions by designing "computer based agents" that can exercise more autonomy and work effectively with humans.

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SC Project

Space Communications

The goal of the SC Project is to:

Enable broad, continuous presence and coverage for high rate data delivery from ground-, air-, and space-based assets directly to the users.

The SC Project is focused on creating breakthrough products in communications, networks, and information technologies for future NASA missions. These aeronautics, near-Earth, and deep-space missions will require innovative solutions to meet NASA's unique challenges. Factors such as human safety, massive data flow, high-speed maneuvering vehicles, extreme environments, and interplanetary distances must all be considered. For example, communications links to scientific instruments such as planetary rovers and microprobes must be able to withstand temperature extremes ranging from very hot to very cold in a short timeframe. The implementation of such architectures will require revolutionary communications and networking technologies.

Key Project Areas:

- Intelligent Communication Architectures - Develop intelligent, autonomous communication technologies that allow "anytime/anywhere" operations and deliver information from space directly to users.
- High Rate Backbone Network - Develop advanced communication technologies that

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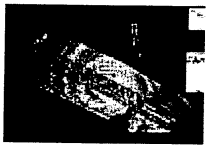

ITSR Project

Information Technology Strategic Research

The goal of the ITSR Project is to:

Research, develop, and evaluate a broad portfolio of fundamental information and bio/nano technologies for infusion into NASA missions.

The IT Strategic Research Project provides a technology incubator where high-risk, high-payoff, and long-range technologies are identified, explored, developed, verified, and transferred to other parts of the CICT Program as well as other NASA programs. This is a project where a number of related and unrelated technologies can be explored simultaneously, and evaluated for suitability for further development either as spinoff projects or as technologies that may be transferred to other research groups. The ITSR deevelopment strategy is based on accomplishing the following objectives:

- Prototype breakthrough technologies on a continuing basis and evaluate them for suitability for application to NASA missions
- Demonstrate new technologies suitable for transfer or spinoff
- Transfer technologies to other portions of the CICT Program or other NASA programs.

Key Project Areas:

- Intelligent Controls and Diagnostics - Improve component and subsystem safety and integrated system performance for aircraft applications, launch vehicles, and robotics systems, reducing development time and operational costs.

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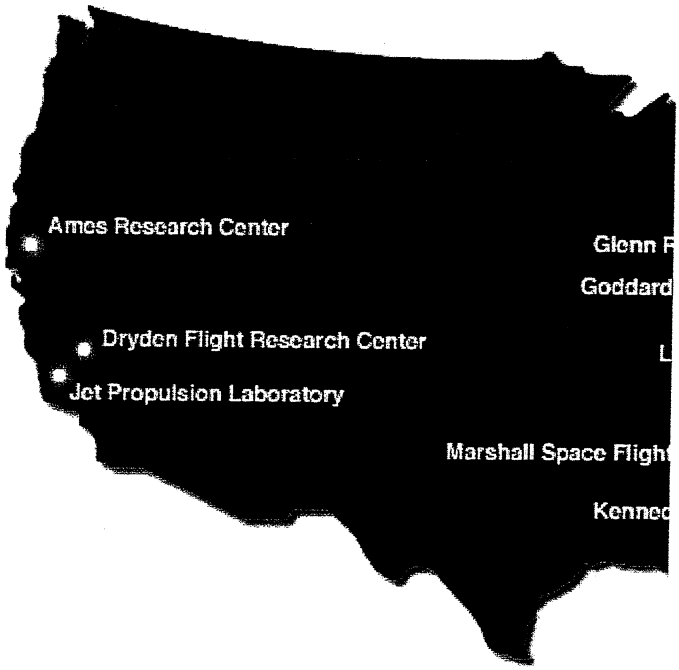
Participating NASA Centers



CICT is a coordinated, Agency-wide effort. Here are the participating field centers:

- Ames Research Center
- Dryden Flight Research Center
- Glenn Research Center
- Goddard Space Flight Center
- Jet Propulsion Laboratory
- Johnson Space Center

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Technology Infusion Philosophy

Technology Infusion is a key component of the CICT strategy. Commercialization opportunities will be exploited through Space Act Agreements, Cooperative Research Agreements and Memoranda of Understanding with industry. Joint projects in high-risk areas will be pursued on a cost-sharing basis with industry and in close collaboration with government laboratories and academia. NASA will foster horizontal partnerships between NASA and multiple companies within the aerospace sector. The NASA CICT Program Office will also foster the vertical integration of collaborative teams between hardware suppliers, third-party software vendors, and members of the U.S. aerospace community. Lastly, the NASA CICT Program sponsors and conducts technical meetings and workshops and promotes the publication of scientific and technical papers to maintain the flow of technology from NASA to industry and academia.

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NASA News
National Aeronautics & Space Administration
Ames Research Center
Moffett Field, California 94035-1000

April 2, 2002

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RELEASE: 02-36AR

NASA COMPUTER SCIENCE HELPS HEART PUMP TEAM WIN INVENTION OF YEAR

NASA computer scientists were significant contributors to the original NASA/DeBakey miniature heart assist pump, an updated version of which was just named winner of NASA's Commercial Invention of the Year Award.

Also known as a 'ventricular assist device' (VAD), the pump is currently undergoing human trials with patients awaiting heart transplants. It is based in part on technology used in space shuttle fuel and oxidizer pumps. NASA computer engineers suggested improvements after simulating blood flow through the pump using a NASA computer that normally models the flow of fuel through rockets.

"Johnson Space Center and DeBakey Heart Center of Baylor College of Medicine asked us to help them because of our experience with simulating fluid flow through rocket engines," said Dochan Kwak, chief of the NASA Advanced Supercomputing Applications Branch at NASA's Ames Research Center in California's Silicon Valley. He and colleague Cetin Kiris analyzed blood flow through the battery-powered heart pump, whose blade normally spins as fast as 10,000 rpm. "The speed of fluid flow through a rocket engine is faster than blood flow, but very similar in many ways," Kiris noted.

Please click here to reach publication size images related to this news release.

MicroMed Technology, Inc., Houston, manufactures the pump, now called the DeBakey VAD™;. It is intended as a long-term 'bridge' to a heart transplant, or as a long-term device to help patients move toward recovery and a more normal life. In European trials, the VAD was implanted in 115 people with no device failure. U.S. trials will involve 178 implants; 21 have been performed successfully to date.

During initial development of the one-inch by three-inch implantable axial rotary heart pump, engineers noticed two major problems. Friction led to damaged blood cells because the device created high shear flows through pump parts. Further, there were stagnant regions in the pump that caused blood clotting, a major problem with ventricular assist devices.

Following supercomputer simulations, NASA computer scientists were able to reduce red blood cell damage to an amount comfortably below acceptable limits. The improved blood flow pattern also reduced the tendency for blood clots to form.

"We worked with the team to make the blood flow more smoothly through the pump; that also removed the stagnant regions," Kiris said. NASA Ames scientists first began assisting the NASA/Baylor team in 1993, and continue to collaborate with them.

In keeping with its mission of transferring space-based technology to the private sector, in 1996 NASA granted exclusive technology rights to MicroMed Technology Inc. after a period of intense competition.

"Without the support of the NASA supercomputer design experts, the pump would not function as efficiently as it has," said Dallas Anderson, president and CEO of MicroMed.

Within two years of receiving the NASA license for the pump, MicroMed gained international quality and electronic standards certifications, got permission to begin clinical trials in Europe and implanted the first device. The first patient, a 56-year-old man, received the DeBakey VAD™; in November 1998, in Berlin. The pump functioned normally and to its design specifications, Anderson said. The device has been implanted for periods of up to one year in individual patients, thus far.

"There are three groups who made this effort successful," Kwak said. "The medical team led by Dr. Michael DeBakey and Dr. George Noon, the systems engineers at Johnson Space Center, and the Ames computational team that used NASA supercomputer know-how to help develop the VAD™."

The concept for the pump began years ago with talks between DeBakey and one of his heart transplant patients, David Saucier, a NASA Johnson engineer who passed away in 1996.

Six months after his 1984 heart transplant, Saucier was back at work. With fellow NASA employees, as well as DeBakey, Noon and other Baylor staff, Saucier worked evenings and weekends on the initial pump design.

"Since my own transplant, I have spent a lot of time visiting people who are waiting for a donor heart," Saucier said at the time. NASA began funding the project in 1992.

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http://amesnews.arc.nasa.gov/releases/2002/02images/heart/heart.html

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NASA News
National Aeronautics & Space Administration
Ames Research Center
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Dec. 26, 2001

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RELEASE: 01-108AR

NASA SUPPORTS 200 HIGH SCHOOLS IN ROBOTICS COMPETITION

NASA and its corporate partners will support robotics education for about 200 high schools next year by sponsoring teams that will participate in a national robotics competition.

The NASA-sponsored teams will join hundreds of others in constructing robots that will compete in regional contests and a final, national competition in April 2002 at Walt Disney World's EPCOT Center, Orlando, Fla. Students at the competing schools will be challenged to design a robot that will complete a specified set of tasks within rules to be outlined next week.

"Education is key to the success of our country, and this approach represents one of the most powerful ways to get students motivated," said Mark Leon, project manager of the Robotics Education Project at NASA's Ames Research Center, in California's Silicon Valley. "Some of these students may go on to help NASA engage in bold new missions of exploration of our solar system. The idea here is to involve students in hands-on activities to turn them on to science and math."

The robotics project will kick off Jan. 5, 2002 at the Verizon Center in Manchester, N.H., with a demonstration of the task for this year's regional and national competitions. Rules, goals and other details, such as the layout of the playing field, will be revealed during NASA TV's broadcast of the ceremony. Detailed requirements of the robotic games are carefully guarded until announced at the kickoff event.

Following the ceremony, students and their advisors will have six weeks to design and construct remote-control robots, using identical kits of material.

The annual nationwide robotics competition is conducted by the non-profit FIRST (For Inspiration and Recognition of Science and Technology) organization in Manchester and sponsored by NASA and a number of corporations. Each year FIRST presents a game problem and identical parts kits to each team. The teams, composed of high school students and professional engineers and scientists, work together to construct their robots for the competition. The engineers come from NASA, private industry, other government agencies and universities.

Students also will organize marketing, public relations, fund-raising and management groups to compete for the award-winning solution. Each year's competition is different, so returning teams always have a new challenge.

NASA-sponsored teams will receive a total of about $1.5 million. Each school received a $5,000 credit toward registration fees, and about $1,000 for travel to the kickoff ceremony. The group of NASA-sponsored teams includes many from disadvantaged schools. For a complete list of the awards issued by NASA, see:

http://robots.larc.nasa.gov/

A complete list of the regional events, corporate sponsors and other details are included on the FIRST website at:

http://www.usfirst.org/

FIRST was started in 1989 by inventor Dean Kamen to persuade American youth that engineering and technology are exciting fields. The annual robotics competition is patterned after Massachusetts Institute of Technology professor Woodie Flowers' engineering design course. NASA participation in the FIRST program is provided through the NASA Office of Space Science and is directed by Dave Lavery.

More infromation on the NASA's Robotics Education Project can be found at:

http://robotics.nasa.gov

- end -

Note to editors: The NASA TV broadcast on Jan. 5 will begin at 9 a.m. and end at 1 p.m. EST. It will be available via satellite on GE-2, transponder 9C, at 85 degrees west longitude. The frequency is 3880.0 MHz. Polarization is vertical and audio is monaural at 6.8 MHz. NASA also will webcast the event on the Internet at: http://robotics.nasa.gov

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PRT Workshop

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- CICT Overview (4.2MB)
- CNIS Project (4.1MB)
- IS Project (2.2MB)
- SC Project (1.3MB)
- ITSR Project (6.3MB)

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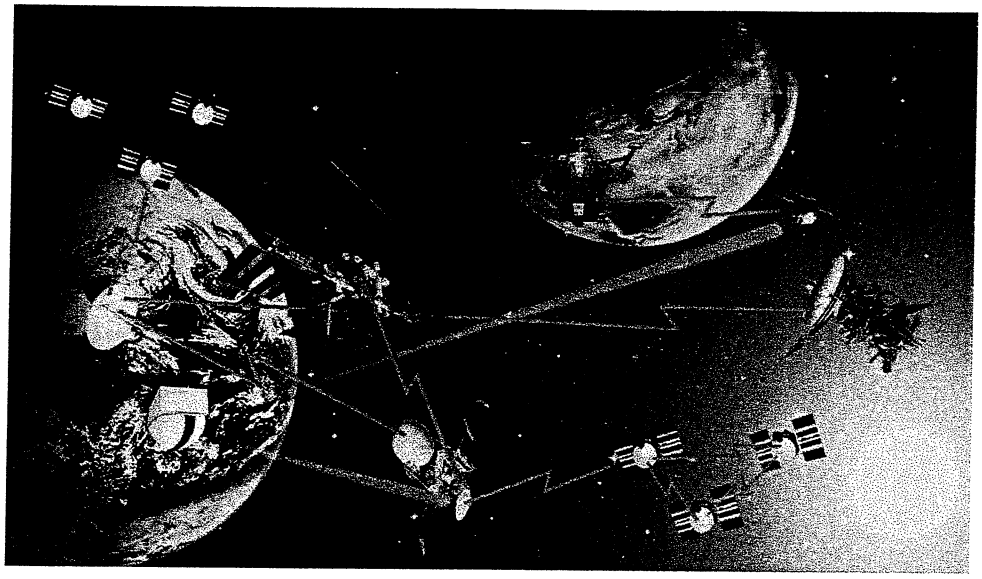

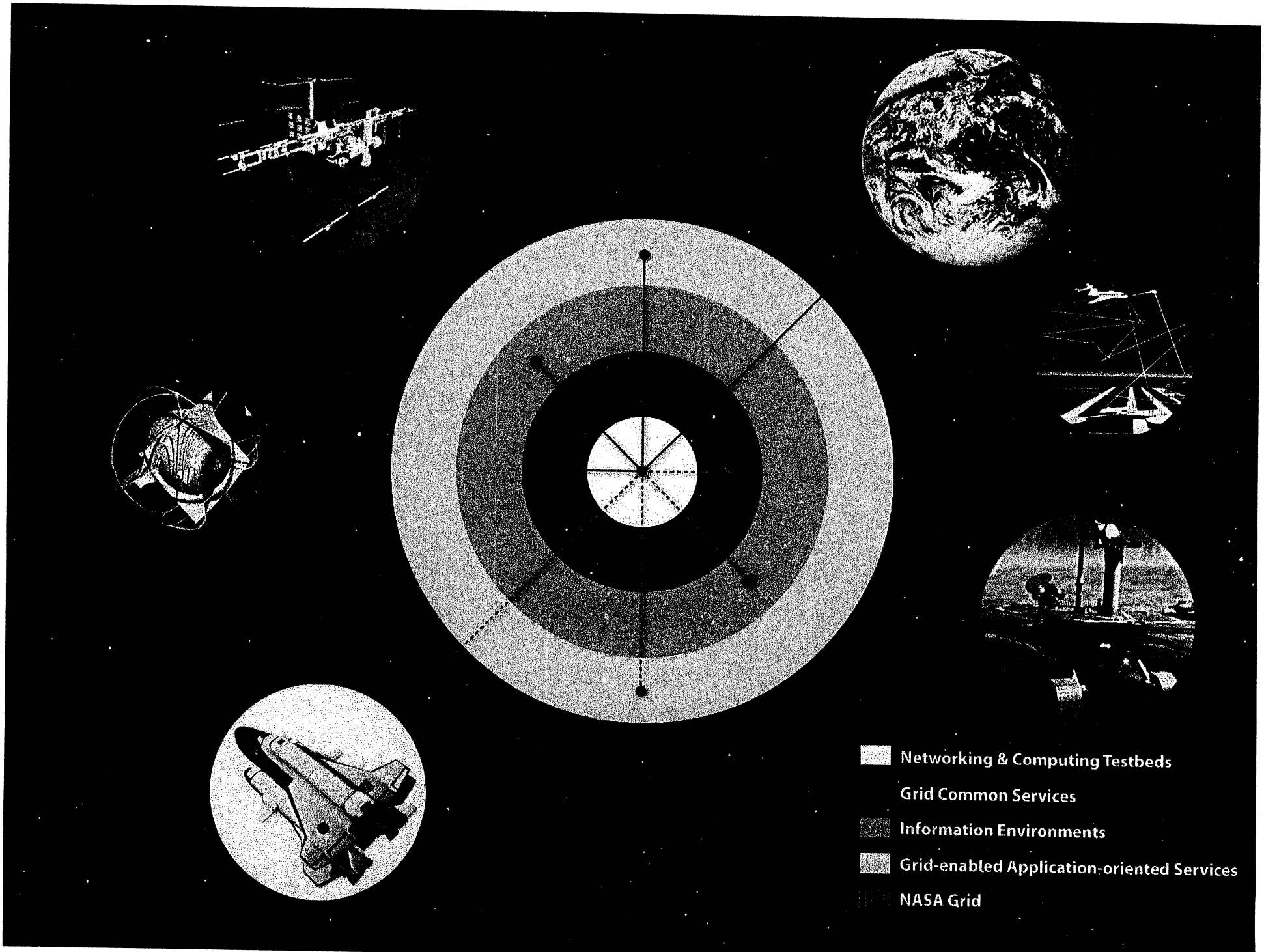
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