iGrid 2000, the International Grid, demonstrates how the power of today’s research networks enables access to remote computing resources, distribution of digital media, and collaboration with distant colleagues. The concept of connecting geographically distant computing resources and people seamlessly, efficiently and routinely over high-performance networks is itself a major research topic, as computer scientists and application scientists worldwide prototype the 21st-century advanced computational infrastructure, or “grid.” iGrid highlights both the achievements in grid architecture development, and the advancements it enables in science, engineering, cultural heritage, art and architecture, media communications and distance education.

iGrid features 24 applications from 14 regions – Canada, CERN, Germany, Greece, Japan, Korea, Mexico, The Netherlands, Singapore, Spain, Sweden, Taiwan, United Kingdom and the United States – with emphasis on tele-immersion, large datasets, distributed computing, remote instrumentation, collaboration, human/computer interfaces, streaming media, digital video and high-definition television.

Applications are presented on impressive display technologies: the CAVE® virtual-reality theater developed by the University of Illinois at Chicago, the Super-High Definition digital cinema system from NTT Network Innovation Laboratory, and the Access Grid presentation environment developed by Argonne National Laboratory. Two ImmersaDesks® as well as plasma displays also showcase applications in virtual-reality (stereoscopic) or large-screen (monoscopic) mode.

iGrid is connected to the JGN, the WIDE Project Network (in cooperation with NTT, TTNet and PNJC), APAN and the APAN/TransPAC (100 Mbps) link to STAR TAPSM, the international interconnection point in Chicago, Illinois.
iGrid 2000 Networking

www.startap.net

STAR TAP is the premier global exchange point for advanced international networking, in support of applications, performance measuring and technology evaluations. National Research Network partners are: CA*net3 (Canada), CERN, IUC (Israel), MIRe (Russia), NORDUnet (Nordic countries), SURFnet (The Netherlands), RENATER (France), SingAREN (Singapore), APAN (Asia-Pacific), and TANet2 (Taiwan). In the USA, UCAID/ Internet2_Abile is connected, as well as USA NGI networks: vBNS (NSF), ESnet (Dept. of Energy), DREN (Dept. of Defense), and NREN/NISN (NASA).

STAR TAP gets major funding from the National Science Foundation (NSF), awards ANI-9712283 and ANI-9808480, to Univ. of Illinois at Chicago. STAR TAP is operated by Ameritech Advanced Data Services (AADS), Chicago, IL, USA.

www.apan.net

www.transpac.org

The Asia-Pacific Advanced Network (APAN) is a non-profit international consortium that provides an advanced networking environment for the Asian-Pacific research community and promotes international collaboration. TransPAC, under the leadership of Indiana University and APAN, provides high performance international Internet service connecting APAN to other global networks via STAR TAP in the USA in support of international collaborations in research and education.

TransPAC receives major funding from the NSF, award ANI-9730021, to Indiana University, and from the Japan Science and Technology Agency.

iGrid 2000 Networking: Establishing a High-Performance Connection to the Pacifico Yokohama Conference Center

iGrid 2000 Booth

Yokohama Pacifico Convention Center

APAN/TransPAC

(100 Mbps ATM)

WIDE Link

Star TAP

vBNS

Internet2/Abilene

MREN

DREN

SDSC

MKOCN

Tokyo-XP

JGN Network

TTNET/PNIC Network

APAN Link

NORDUnet

Osaka

Univ

SDSC

Singapore

Subaru Telescope

CDRH/NSF Link

UH-HF

APAN/TransPAC

iGrid 2000 Networking

www.tao.go.jp

The Japanese Gigabit Network (JGN) is a high-speed optical data network founded by TAO (Telecommunications Advancement Organization of Japan). The JGN research and education network supports research activities in any organization, whether a university or private company. JGN will be operated until March 2004, to explore the next-generation information infrastructure with high-speed optical technologies. JGN has 10 ATM switching systems and 39 access points. The backbone link of JGN is 2.4 Gbps.

Japan’s WIDE Internet was founded to support Internet-related technology research and development and to enable email communication among project members. As it evolved, it played a key role in the growth of the Internet, well before commercial ISPs became popular. WIDE now operates several test projects, such as “WIDE 6bone” to deploy IPv6 technology, “WISH A11” through satellite, and “RT-bone” for QoS. WIDE envisions the future of the “Mobile Computing Environment” and next-generation “native Internet generation” by constructing a “Multi-Gigabit Backbone” using DWDM.

Japanese Gigabit Network (JGN) is TAO (Telecommunications Advancement Organization of Japan)によって創設されたハイスピードの光アダプトネットワークです。JGNのリサーチおよび教育ネットワークは、大学や民間企業や関関係で、いわゆる研究研究者もサポー

日本のWIDE Internetはインターネット関連技術の研究開発をサポートし、プロジェクトメンバー間の電子メールによるコミュニケーションを可能にするために創設されました。それは発展に伴い、商用ISPが普及するまでもっと以前からインターネットの成長にとって重要な役割を果たしました。WIDEは現在IPv6テクノロジーを展開するための“WIDE 6bone”や、衛星を通しての“WISH A11”、およびCisco用の“RT-bone”などのテストプロジェクトをいくつか推進しています。WIDEは現在DWDMを用いたマルチギガビットバックボーンを構築することにより、モバイルコンピューティング環境および次世代“ネイティブインターネット世代”的未来を護ります。
Distributed Particle Physics Research
URL
http://pcbunn.cacr.caltech.edu
http://cmsdoc.cern.ch/orca
http://iguana.web.cern.ch/iguana/
http://vrvs.cern.ch
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Philippe Galvez, Gregory Denis,
California Institute of Technology, USA
DESCRIPTION ◆
This application demonstrates remote
viewing and analysis of particle physics
events. The application is the front end to
an engineered object-oriented global
system that incorporates grid middleware
for authentication and resource discovery, a
distributed object database containing
several terabytes of simulated events, and a
component that enables queries issued by
the front-end application to be matched to
available computing resources in the
system (the matchmaking service).

MediaZine: A Combination of Television,
WWW, Telecommunications and 3D
Computer Graphics
URL
www.igd.fhg.de/igd-a9/research/cve
CONTACT
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Wolfgang Felger, Tony Chan, Law Yee
Wei, Swee Eng Yeong, Centre for
Advanced Media Technology (CAMTech),
Singapore
DESCRIPTION
This interactive multimedia magazine
includes text, images, live audio, live video,
animations, 3D computer graphics and
embedded electronic commerce and
communication functions.
Supported by the Nanyang Technological University
(NTU), Singapore, and the Singapore Advanced
Research and Education Network (SingAREN),
Singapore.

Online Monitoring and Steering of
Remote Black Hole Simulations
URL
www.zib.de/visual/igrid/
www.cactuscode.org
http://amira.zib.de
CONTACT
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Andre Merzky, Hans-Christian Hege,
Werner Bengler, Ralf Kaehler,
Konrad-Zuse-Zentrum für Informationstechnik,
Berlin, Germany
DESCRIPTION ◆
This project demonstrates several remote
monitoring, steering, and visualization tools
for Remote Black Hole Simulations and
Remote Visualization of Large-Scale
Datasets.
Thanks to Argonne National Laboratory, Lawrence
Berkeley National Laboratory and the National Center
for Supercomputing Applications at the University of
Illinois, USA, for providing additional supercomputing
resources.

分散粒子物理学研究
このアプリケーションは粒子物理学
イベントの遠隔からの観測と分析を
実現します。このアプリケーション
は、認証とルール発見のための
Gridミドルウェア、数テラバイトも
ある擬似イベントデータを含む分散
オブジェクトデータベースおよび、
フロントエンドアプリケーションか
ら発行される照会に対してシステム
内で利用可能な計算リソースをマッ
チングするコンポーネント（マッチ
メイキングサービス）を取り入れた
オブジェクト指向グローバルシステム
へのフロントエンドです。

MediaZine: テレビ、WWW、テレコミ
ニュケーションおよび3D コンピュータ・
グラフィックの組み合わせ
テキスト、画像、ライブラリーディオ、
ライブビデオ、アニメーション、3D
コンピュータ・グラフィック、埋め
込み型 e commerce 機能およびコミュニ
ケーション機能を含むインタラク
ティブなマルチメディア誌。

遠隔ブラックホール・シミュレ
ーションのオンライン監視およびス
テアリング（リアルタイム操作）
このプロジェクトは大規模なデー
タセットの遠隔ブラックホール・
シミュレーションおよび遠隔視覚
化のための遠隔監視やステアリン
グ、および視覚化ツールをいく
つか示します。
Distributed Simulation Analysis between Scientists Located in Germany and the USA

URL
www.cs.sandia.gov/ilab
SuperComp98/iGrid/index.htm
www.hlrs.de
www.hlrs.de/news/events/2000/iGrid/

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COLLABORATORS
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Ulrich Lang, Uwe Woessner, Matthias Mueller, High Performance Computing Center Stuttgart (HLRS), Germany

DESCRIPTION
This application emphasizes distributed parallel supercomputing and a collaborative virtual-reality computation steering environment applied to Grand Challenge problems.

Thanks to the Computer Services for Academic Research Centre (Manchester, UK), the Centre of Virtual Environments at University of Salford (UK), Tsukuba Advanced Computing Center (Japan) and Pittsburgh Supercomputing Center (USA) for additional supercomputing resources.

Shared Miletus

URL
www.evl.uic.edu/pape/projects/
iGrid-Miletus/
www.fhw.gr
http://fhw.aec.at

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Maria Roussou, Athanasios Gaitatzes, Foundation of the Hellenic World (FHW), Greece

DESCRIPTION
This Cultural Heritage demonstration takes visitors on a shared virtual voyage through the ancient Greek city of Miletus as it existed 2000 years ago.

Thanks to UIC for providing computing and networking resources.

FHW is a privately funded, non-profit cultural institution in Athens, Greece, whose mission is to preserve and disseminate historical memory and traditions, as well as the realization of the universal extent of Hellenism and the projection of its contribution in the development of civilization. We gratefully acknowledge FHW’s historical research efforts that have enabled this recreation of the city of Miletus in virtual reality.

Digital Cinema 2000: Super High Definition Digital Movie Communication System

URL
www.onlab.ntt.co.jp/en/mn/shd

CONTACT
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Junji Suzuki, Makuhari Gigabit Research Center (JGN), Japan

DESCRIPTION
NTT’s digital movie system using SHD images transmits extra-high-quality, digital, full-color movies of 2048x2048 pixel resolution at 24 or 60 Hz using 155/622 Mbps ATM transmission systems.

デジタルシネマ 2000: 超高画質デジタルムービーのコミュニケーションシステム

NTT の SHD 画像使用のデジタルムービー・システムは、155/622Mbps ATM 伝送方式を用いて 24 または 60 Hz、2048x2048 ピクセル解像度のハイクオリティなフルカラー・デジタル映像を送信します。

Miletus 共有空間

この “Cultural Heritage (文化遺産)” のデモンストレーションでは、お客様が 2000 年前に実在した遠くの古代ギリシャの都市 Miletus を巡る仮想現実の旅へとお連れします。
Haptic Collaboration in Networked Immersive Environments

URL
www.cyber.rcast.u-tokyo.ac.jp/ml2/

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Tetsuro Ogi, Toshio Yamada, Yoshiyuki Tateyama, Yuji Kurita, Takeshi Mizumori, Gifu MVL Research Center, Telecommunications Advancement Organization of Japan

DESCRIPTION
This is a demonstration of wearable haptic gear (touch and force) communication, as well as visual communication, between the CAVE® at Grid 2000 and CABIN at The University of Tokyo.

Plate Window Manager (PWM): 2D Window Manipulation System in a Virtual 3D World

URL
www.gifumvl.tao.go.jp/pwm/

CONTACT
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Koichi Hirota, Research Center for Advanced Science and Technology, The University of Tokyo, Japan

DESCRIPTION
PWM enables users in a 3D virtual world to access applications based on traditional 2D window systems, such as Web browsers.

Video Avatar Communication in Networked Virtual Environments

URL
http://green.iml.u-tokyo.ac.jp/ml2/avatar/

CONTACT
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Michitaka Hirose, Koichi Hirota, Makoto Kano, The University of Tokyo, Japan

DESCRIPTION
Video avatars communicate among the CAVE® at Grid 2000, CABIN at The University of Tokyo and COSMOS at the Gifu Technoplace.

ネットワーク上のビデオアバターコミュニケーション

プレイアウトのウインドウ・マネージャー(PWM)：バーチャル3Dワールドにおける2Dウィンドウ操作システム

PWMは3Dバーチャルワールドにおいてユーザがウェブブラウザのような従来の2Dウィンドウシステムを基盤としたアプリケーションアクセスできるようにします。
Cultural Heritage in Virtual Reality
URL
www.evl.uic.edu/cavern/lara
CONTACT
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Tomoko Imai, Susumu Tachi, Tomonori Aoyama, Michitaka Hirose, Kiyohara Aizawa, Hiroyuki Morikawa, Takeshi Naeura, The University of Tokyo, Japan
Tetsuro Ogi, TAO, Japan
Nobuo Fujii, Kouichi Sano, Kazuhiro Hayashi, Ken Toyoshima, Akihiro Tsutsui, Ryutaro Kamamura, Hiroyuki Tanaka, NTT, Japan
Noboru Isshiki, NHK, Japan
DESCRIPTION
Using Cultural Heritage as an application driver, the goal of the Networked Virtual Environments Collaborative Trans-Oceanic Research (N*VECTOR) project is to link EVL’s CAVE® and Tokyo’s CABIN, to better understand the requirements of multiple media flows among sophisticated virtual-reality displays over great distances.

Data and Information Access Link (DIAL)
URL
http://dial.gsfc.nasa.gov
http://dial.eoc.nasa.go.jp
CONTACT
Ramachandran Suresh, NASA ESDIS /RITSS, NASA Goddard Space Flight Center (GSFC), USA
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Kenneth McDonald, NASA GSFC, USA
Kaori Kuroiwa, National Space Dev. Agency (NASA)/RESTEC, Japan
Shin-ichi Sobue, Osamu Ochiai, NASDA, Japan
Jeff Smith, NASA EOS, USA
DESCRIPTION
DIAL is a web-based distributed system to search, access and visualize satellite remote sensing data for Global Change research. In collaboration with NASA and other institutions, NASA has DIAL servers set up to distribute satellite remote sensing data. NASA and NASDA also collaborate on the Tropical Rainfall Measurement Mission (TRMM); 3D data is transferred from NASA to NASDA using TransPAC/APAN, processed and visualized for the web.

High Speed Networking with Subaru Telescope in Hawaii
URL
www.naoj.org
CONTACT
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hiroshi@wide.ad.jp
COLLABORATORS
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Ryuusuke Ogasawara, National Astronomical Observatory, Japan
David Lassner, University of Hawaii, USA
Kazunori Konishi, KDD Laboratories, Japan
Tommy Matsumoto, AT&T, Japan
DESCRIPTION
The Subaru Telescope in Hawaii is connected via a high-speed link to the INET2000/Grid2000 conference site in Yokohama, and high-definition astronomical images are quickly retrieved and downloaded. Real-time interactive classes and discussions with researchers also take place between Hawaii and Yokohama using high-quality multimedia communication tools.

バーチャル・リアリティにおける文化遺産
Networked Virtual Environment Collaborative Trans-Oceanic Research (N*Vector)プロジェクトは、アプリケーションドライバとしてCultural Heritageを利用し、EVLのCAVE®と東京大学のCABINを結び、遠距離における高度バーチャル・リアリティ表示環境開発への要求条件の理解を深めることを目指しています。

データおよび情報アクセスリンク (DIAL)
DIAL は Global Change のための衛星リモート・センシング・データを検索、アクセス、および視覚化するウェブベースの分散システムです。NASA およびその他の組織の協力のもとで、NASA は衛星リモートセンシングデータを配信するための DIAL サーバーを設定しています。

ハワイのサブール天文台（すばる望遠鏡）とのハイビジョン・ネットワークリング
ハワイのすばる望遠鏡は、ハイビジョン・リンクを通じて横浜 INET2000/Grid2000 コンファレンスのウェブサイトに接続されており、高品位の天文画像を素早く検索し、ダウンロードすることができます。また、ハイビジョンネットワーク中で高品質のマルチメディア・コミュニケーションツールを用いて研究者とのリアルタイムでの対話型講義および討議も実施されます。
**Advanced Networking for Telemicroscopy**

URL

www.npaci.edu/online/v3.10/telemicroscopy.html
www-ncmir.ucsd.edu
www.uhvem.osaka-u.ac.jp

CONTACT

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Hans-Werner Braun, National Laboratory for Advanced Network Research, USA
Bob Fink, Lawrence Berkeley National Laboratory, USA
Tom Hutton, Anke Kamrath, SDSC, National Partnership for Advanced Computational Infrastructure, USA
Hirotaro Mori, Research Center for Ultra-High Voltage Electron Microscopy, Osaka University, Japan

DESCRIPTION

Two online telemicroscopy systems, one at NCMIR and one at Osaka, use international research networks to provide interactive, remote control of high-power microscopes.

**ALIVE: Architectural Linked Immersive Environment**

URL

www.sara.nl
www.archfonds.nl
www.iit.edu/departments/pr/masterplan/mccortribcamcen.html

CONTACT

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COLLABORATORS

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Frans Blok, Office of Metropolitan Architecture, Rotterdam, Netherlands
Jason Leigh, Electronic Visualization Laboratory (EVL), University of Illinois at Chicago, USA

DESCRIPTION

ALIVE is used to evaluate the usability of collaborative virtual reality for architectural design. The ALIVE project started February 1999 at SARA in cooperation with EVL and the Office for Metropolitan Architecture. In February 1998, architect Rem Koolhaas won the Richard H. Driehaus Foundation International Design Competition for the new Campus Center at Illinois Institute of Technology’s historic Mies van der Rohe campus.

**Human Anatomy Lecture-on-Demand at the National University of Singapore**

URL

www.cit.nus.edu.sg/proj.htm
http://ivle.nus.edu.sg

CONTACT

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COLLABORATORS

J.A. Gilles Doiron, NUS, Singapore
P. Gopalakrishnakone, Department of Anatomy, NUS, Singapore
Eugene Heiw, Centre for Instructional Technology, NUS, Singapore

DESCRIPTION

The NUS Integrated Virtual Learning Environment enables staff and students to communicate, exchange information, discuss and access custom learning materials and course-related web sites. “Lecture-on-Demand” (LoD) delivery makes students assume more responsibility, and provides greater flexibility, in learning. A prototype anatomy LoD, “The Abdominal Wall and Inguinal Canal,” is demonstrated.
CyberCAD: Internet Distributed Interactive Collaborative Design

URL
http://eicu.tp.edu.sg/APAN-GDM/
http://ils.tp.edu.sg/apan/

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Francis Eng-Hock Tay, Qun Liu, National University of Singapore, Singapore

Donald F. McMullen, Indiana Univ., USA

DESCRIPTION
CyberCAD software has a controller-observer architecture to support reliable point-to-point synchronous portable Collaborative Computer Aided Design (COCAD). It allows geographically dispersed designers to work and communicate together synchronously on 3D design models, regardless of platform.

Steering and Visualization of a Finite-Difference Code on a Computational Grid

URL
www.pdc.kth.se/projects/GEMSviz

CONTACT
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COLLABORATORS
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Lennart Johnsson, University of Houston, USA

DESCRIPTION
This application enables computational steering of electromagnetic simulations across distributed resources using interactive visualization in a virtual-reality environment.

A Virtual GIS-Based 3D Hydro-Dynamic Model of Tamshui River

URL
http://140.110.59.157/Tamshui/
www.nchc.gov.tw/RESEARCH/taiger/taiger/Welcome.html
www.bauinf.tu-cottbus.de/taiger

CONTACT
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Frank Molkenthin, Institut für Bauinformatik, Brandenburg University of Technology at Cottbus, Germany

DESCRIPTION
Due to the dense population and rapid economic development of the Tamshui River, the largest estuarine system of the island, Taiwan is studying the river’s hydrodynamic and water quality. Dirty water, air, soil and mudslides pose a threat to public health, causing deaths and property losses during seasons of typhoon and heavy rain. Tele-immersion tools enable researchers to visualize and analyze the computed results.
### Access Grid: Wide-Area Group Collaborative Visualization

**URL**
www.mcs.anl.gov/fl/accessgrid/

**CONTACT**
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**COLLABORATORS**
Lisa Childers, Terry Disz, Ivan Judson, Bob Olson, Mike Papka, Rick Stevens, Argonne National Laboratory, USA

**DESCRIPTION**
The Access Grid is the ensemble of resources used to support group-to-group human interaction across the grid. It consists of large-format multimedia projective displays, presentation and interactive software environments, interfaces to grid middleware, and interfaces to remote visualization environments. The Access Grid is designed to support large-scale distributed meetings, collaborative teamwork sessions, seminars, lectures, tutorials and training.

---

### Argus: Controlling Real-Time Imaging Sensors from a Virtual Environment

**URL**
www.phs.uiuc.edu/Projects/Argus
http://mayflower.isl.uiuc.edu/
big.projects.crumbs.html

**CONTACT**
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**COLLABORATORS**
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David Brady, ECE, UIUC, USA
Lillian Fernandez, CS, UIUC, USA

**DESCRIPTION**
This project streams 2D and 3D images from Argus, a room surrounded with cameras, into the CAVE® using Crumbs volumetric rendering software. The project explores tradeoffs between sending 3D data volumes versus low-bandwidth, low-latency stereo pairs. This demonstration showcases how parallel video acquisition lends itself to viewing 3D scenes in different time zones.

---

### Blue Window Pane II

**URL**
http://dolinsky.fa.indiana.edu/bwp/

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**DESCRIPTION**
Blue Window Pane II is a networked environment that explores communication building through whimsical characters, conceptual landscapes and sound-activated graphics. Using art as a communication tool for shared connectivity, participants collaborate in a world of dreams, dilemmas and reflections.
TIDE: Tele-Immersive Data Explorer

URL
www.evl.uic.edu/cavern
www.ncdm.uic.edu

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DESCRIPTION
TIDE is a CAVERNsoft-based collaborative, immersive environment for querying and visualizing data from massive and distributed datastores.

Tele-Immersive Image Based Rendering

URL
www.evl.uic.edu/cavern/cibr

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DESCRIPTION
The Collaborative Image Based Rendering Viewer (CIBR View) is a CAVERNsoft-based tool for viewing animated sequences of image-based renderings from volume data. CIBR View was designed to enable US Department of Energy scientists to view volume renderings composed of 2D image slices.

GiDVN: Global Internet Digital Video Network

URL
www.icair.org/inet2000

CONTACT
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DESCRIPTION
GiDVN projects are enhancing media capabilities for the next-generation Internet, enabling new applications to interoperate throughout the world.
### iGrid 2000 Enabling Technologies

#### CAVERNsoft

CAVERNsoft G2 is a C++ toolkit for building collaborative, networked virtual reality applications. Developed and deployed by the Electronic Visualization Laboratory at the University of Illinois at Chicago, CAVERNsoft G2 is designed to enable the rapid construction of tele-immersive applications, to equip previously single-user applications with tele-immersive capabilities, and to provide a testbed for research in tele-immersion.

- **An iGrid CAVERNsoft application**

#### The Globus Toolkit

The Globus Toolkit is an open source, community-based suite of services and libraries for building applications and tools that require geographically distributed resources. The multi-institutional development team is led by Argonne National Laboratory and the University of Southern California’s Information Sciences Institute, but includes participants from around the world. The Globus Toolkit is at the heart of major infrastructure development projects, such as NASA’s Information Power Grid and the US NSF’s National Technology Grid.

- **An iGrid Globus application**

#### Digital Video Services at iGrid

Indiana University, in cooperation with corporate and university partners, is providing digital video services at iGrid 2000 to facilitate collaboration and globally disseminate iGrid 2000 demonstrations. Litton Network Access Systems’ CAMVision-2 MPEG2 IP-multicast codecs deliver live and taped broadcast-quality video from iGrid to US Internet2 sites. The University of Washington is bridging CAMVision-2 broadcasts to nation-wide audiences via the ResearchChannel direct broadcast satellite channel and to Washington communities via educational access channels. Wire One Technologies’ H.323 videoconferencing systems enable iGrid researchers to talk with their home institutions. High, medium and low bandwidth multicast and unicast video streaming services are utilized to provide global outreach for the iGrid 2000 event.

- **An iGrid Digital Video Services application**

#### Digital Video Transport System (DVTS)

DVTS is IP-based, high-quality, real-time audio/visual (AV) communications software that uses Digital Video (DV) camcorders and VCR consumer products with IEEE 1394 (Firewire) interfaces. DVTS works with both IPv4 and IPv6 on a FreeBSD system, and is integrated with the ALTO module to enable fine packet transmission scheduling and DiffServ.

RTP (Real-time Transport Protocol) provides interoperability among systems, and achieves dynamic flow control among hosts. For the highest quality communication, the system consumes over 35 Mbps of network bandwidth. Using RTP, DVTS achieves dynamic flow control and optimizes the DV transmission for the available bandwidth, e.g., DV transmission over 10base-T Ethernet.

- **An iGrid Digital Video Transport System application**

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### Japanese

#### iGridでのデジタル・ビデオ・サービス

インディアナ大学は企業および大学のパートナーと協同で、共同研究を容易にし、iGrid 2000のデモストレーションを世界的に広めるために、iGrid 2000でデジタル・ビデオ・サービスを提供しています。またワシントン大学はCAMVision-2放送をResearchChannel直接放送衛星チャンネルを通じて全国の視聴者に、そして教育用アクセス・チャンネルを通じてワシントンの人々へ観賞しをします。Wire One TechnologiesのH.323ビデオ会議システムにより、iGridの研究者はその所属組織と対話することができます。高、中、低帯域幅のマルチキャストおよびユニキャストのビデオ・ストリーミング・サービスが、iGrid 2000イベントを世界中に届けるために利用されます。

#### Digital Video Transport System (DVTS)

DVTSはIEEE 1394（Firewire）インターフェースを使用するDigital Video (DV) キャンプコーダおよびVCR 消費者製品を利用して、IP ベースのハイクオリティな実時間オーディオ／ビジュアル (AV) コミュニケーション・ソフトウェアです。DVTSはFreeBSDシステムにおいてIPv4およびIPv6の両方で動作し、また高品質のパケットスケジューリングおよびDiffServを可能にするためにALTQと統合しています。

RTP (Real-time Transport Protocol)は、システム間の公開通信を提供し、ホスト間で動的フロー制御を実現します。最高品質のコミュニケーションには、システムは35 Mbps以上のネットワーク帯域幅を消費します。DVTSはRTPを用いて動的フロー制御を実現し、使用可能な帯域幅（例：10base-T Ethernetを通じてのDV伝送）に対するDV伝送を最適化します。

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#### CAVERNsoft

CAVERNsoft G2は、ネットワークでつながった協同型仮想現実のアプリケーションを構築するためのC++ツールキットです。

The Globus Toolkit

The Globus Toolkitは地理的に分散する資源を必要とするアプリケーションを構築するためのオープンソースで、コミュニケーションベースのサービスセットおよびライブラリです。
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- Indiana University
- Keio University/WIDE Project
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