Technology Commercialization: A Strategic Analysis

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Keck School of Medicine
University of Southern California

Technology Commercialization

- Background
- Organization Models
- Interface with Government
- Interface with Industry
- Interface with Venture Capital
- USC Experiences

Technology Commercialization

- Background

- Process has grown competitive
- Need to integrate Internally & Externally
- Need to be comprehensive
- Need to reach National & International partnerships - Collaboration

Technology Commercialization

- Background
  Collaboration

- Teams are stronger
- Mapping of Opportunities
- Analysis of Regional Development
- Funding Opportunities

Technology Commercialization

- Background Collaboration
- Multidisciplinary Model
- Institutional Support

Technology Commercialization

- Background Collaboration

- Alliances take time and effort to materialize
- Functional Projects must emerge

Technology Commercialization

- Background Collaboration

- Participation of Legal and Research leaders is a requirement

Technology Commercialization

- Organization Models

- Centralized Traditional Model
  - Based mostly in Patents and Licenses
- Distributed Model
  - Focused on Departments Innovation

Technology Commercialization

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Technology Commercialization

- Organization Models

- Centralized Traditional Model
  - Easier to manage
  - Unable to focus in large institutions
  - Unable to provide close support
  - Lacks comprehensive approach

Technology Commercialization

- Organization Models

- Distributed Model (Singapore)
  - More complex to manage
  - Able to focus in large institutions
  - Able to provide close support
  - Comprehensive approach

Technology Commercialization

- Interface with Government
- Federal Government
- State Government
- City Government

Technology Commercialization

- Interface with Industry
- Education Joint Programs
- Research Joint Programs
- Business Joint Ventures

Technology Commercialization

- Interface with Venture Capital
- Definition of Research and Development Areas
- Review of Immediate Opportunities
- Regional Development
- Alliances

Technology Commercialization

- USC Experiences
- Keck School of Medicine (KSOM)
- Integrated Media Center
- Pixar-Disney Venture

Technology Commercialization

- USC Experiences
  Keck School of Medicine (KSOM)
- Technology Transfer Sequence
- Biotech Park
- Hospital of the Future

TECHNOLOGY TRANSFER PROCESS

PILOT OUTLINE

- Initial evaluation
    - scientific value
    - commercial value
    - intellectual property

- Protection of IP
    - Publications
    - Preliminary filing

- Preparation of Pre project
    - Search of Prior Art
    - Identification of Potential Industrial Partners

- Second evaluation
    - Feasibility of patent
    - Interest of Industry
        - Meet requirements
        - Develop interest and requirements

- Critical Decision
    - File patent
    - Develop business plan
    - Start Joint Venture Development

- Business Development
    - Corporate Negotiations
        - Structure
        - Equity
    - Financial Negotiations
    - IP Negotiations

- Business Startup
    - Management
    - Marketing
    - Alliances
    - Production

- Business Consolidation
    - IPO
    - Long term revenue

Panoramic view of Biomedical Research Park site from USC-UH parking structure
LA Co. owned
USC owned
LA Co. owned
LA Co. Central Juvenile Hall
LA Co. owned available after LAC+USC replacement
LAC+USC Medical Center Replacement Project
New Tower
PROPERTY AND OWNERSHIP HEALTH SCIENCES CAMPUS
UNIVERSITY OWNED AND USED
GROUND LEASED
COUNTY
DOHENY
PRIVATE
PARKS
L.A. DWP
L.A. UNIFIED
N

integrated avionics systems enabled the development of "automatic pilots" and "pilot's associates" systems, integrated OEF component systems will enable the development of advanced clinical associate systems.

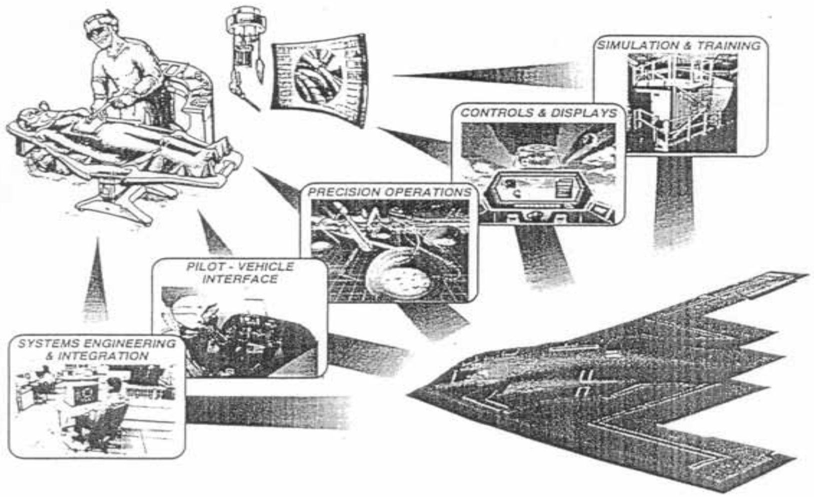

Figure 1-1. Technical Synergy — Pilot to Surgeon

- Teleoperation with programmable surgical robots
- Real-time operator-driven surgical manipulators for telepresence and medical training.

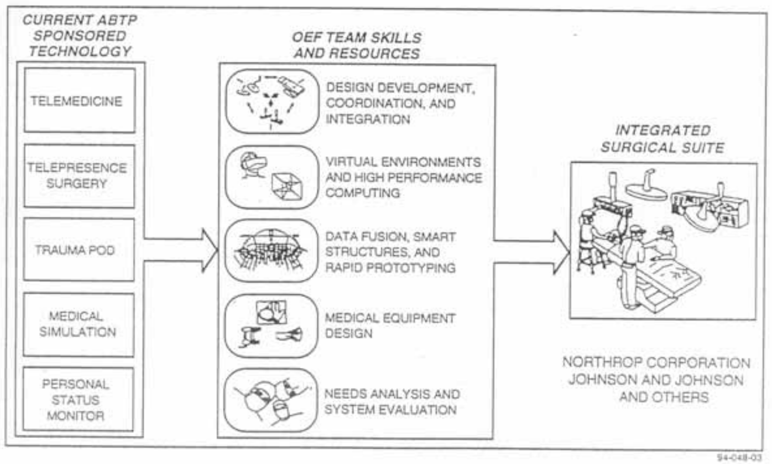

Figure 2-1. A Systems Integrated Vision of the Advanced Biomedical Technology Program

A primary focus of this program is on simulation of the entire operating environment, including embedded intelligent tutoring. Recent examples of medical simulators include an anesthesia simulator, an endosurgery simulator, and a physical rehabilitation simulator. Simulators have used virtual, computer and mechanical approaches with varying degrees of realism, including real time 3-D visual and tactile feedback. Simulators can be used for surgeon training and certification, procedure rehearsal, and rapid prototyping to speed the development cycle of new products.

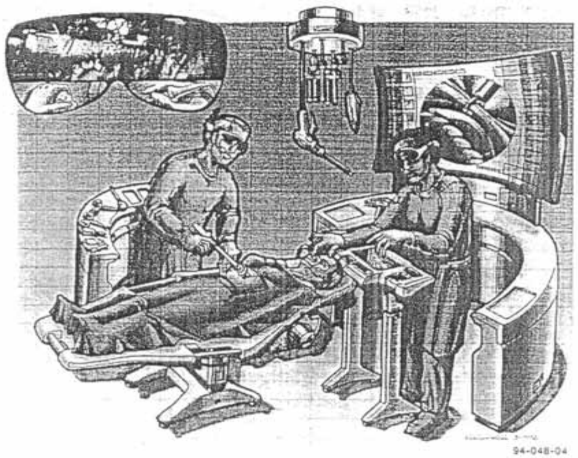

Figure 3-1. Operating Environment of the Future

- Wireless adaptors to retrofit existing medical equipment
- An intuitive display system
- A central data fusion computer with intercom for voice command
- Surgical simulator to optimize system specifications and to provide training for users
- A virtual environment simulation to optimize component integration.

Northrop and Johnson and Johnson will develop the intelligent tutoring system, which, when connected to Johnson and Johnson's surgical simulator, will create the intelligent virtual reality patient. These components will be capable of interfacing to remote surgical manipulators, personnel status monitors and other advanced technology medical devices to perform real or simulated surgical tasks, surgeon training, and surgical procedure development. In addition, the

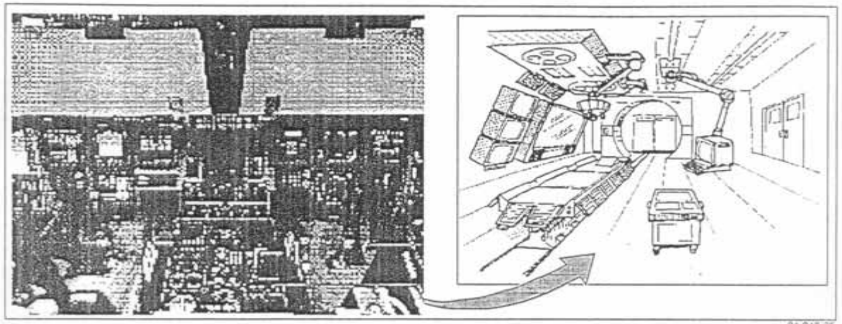

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Figure 4-1. The Modern Aircraft Cockpit as a Model for the Operating Environment of the Future

However, Northrop experience has shown that this is not a task that can be delayed under future development stages. In fact, the systems engineering/systems integration function is an integral part of this initial OEF phase. The ability to define and manage the requirements, perform the technology investigations and evaluations and select the optimal mix of new and current technologies is an up-front task. Northrop performs the requirements management task by defining the requirements as determined by the customer, decomposing them to the required product development team so that they are evaluated in an efficient manner. Once the requirements are translated into functional (and systems) requirements, they are translated back to the customer requirements level to determine if they meet the customer needs. The technologies to meet those needs are assessed against cost, performance and risk factors to ensure that all aspects and unknowns are identified early in the development. Johnson and Johnson's advisory board of surgeons and representatives from the 15 university medical schools will determine and evaluate the performance level and customer satisfaction with all aspects of the OEF system. This approach translates a program which may contain many (and sometimes unidentified) risks into a program in which risks are managed as an integral part of the product development. It also

■ Technical Volume

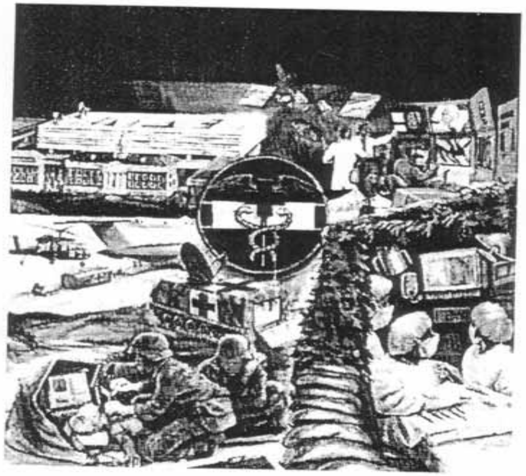
LAC + USC

Proposal for

Medical Federated Laboratory

Technical Element:

Telecommunications and Information Distribution for Telemedicine



17 August 1995

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MCMR-95 Medical Federated
Laboratory BAA

MedC3 Consortium

Los Angeles County/University of Southern California Medical Center
University of Southern California
TRW
Charles R. Drew University of Medicine and Science
The George Washington University Medical Center
Washington Hospital Center
Naval Medical Center, San Diego
Northrop Grumman Corporation
Jet Propulsion Laboratory

PROPOSAL FOR THE DEVELOPMENT OF THE

NATIONAL CENTER FOR NEUROLOGICAL DISEASES IN CHINA

January 12, 2004

EURORIENT FINANCIAL GROUP | CHINA PARTNERS LTD.
UNIVERSITY OF SOUTHERN CALIFORNIA KECK SCHOOL OF MEDICINE
FIELDS DEVEREAUX HARLEY ELLIS | CESAR PELLI & ASSOCIATES | ELLERBE BECKET
TURNER CONSTRUCTION - INTERNATIONAL LLC CONSTRUCTION CONSULTANTS

Integrated Media Systems Center
Viterbi School of Engineering
University of Southern California

USC | IMSC

MANAGEMENT IN THE UNIVERSITY ENVIRONMENT: THE IMSC EXPERIENCE

Isaac Maya, Ph.D., P.E
Director, Industry and Technology Transfer Programs
213-740-2592, imaya@imsc.usc.edu

Integrated Media Systems Center

NSF Engineering Research Center:
a partnership in pursuit of *research and innovation* in multimedia and immersive technologies and their applications

28 Investigators and 260 students in partnership with:

- *National Science Foundation*
- *University of Southern California*
  - Viterbi School of Engineering
    - Ranked 8th in US, $115M/yr in grant funding
  - Annenberg Center for Communication
- *Commercial Partners*
  - Computer Hardware and Software
  - Aircraft, Aerospace, Defense
  - Petroleum, Oil, Gas
  - Telecommunications
  - Entertainment
- *Other Government Agencies*
  - DARPA, NASA, JPL, NIMA, ONR, U.S. Army

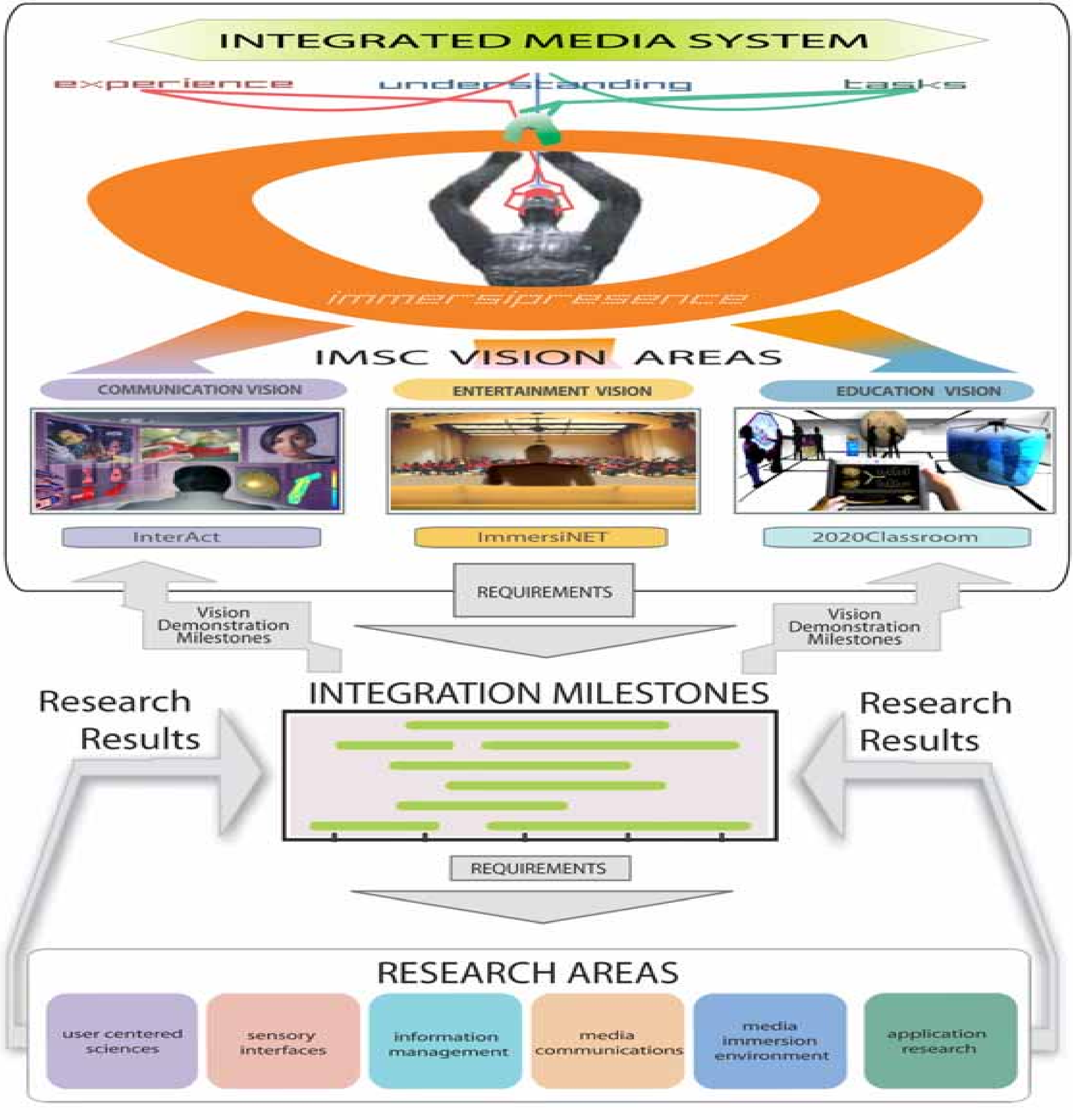
IMSC Headquarters

Education

- 209 students graduated with IMSC providing funding, classes, and research aspects of their education experience
  - 112 with PhD, 82 with MS, and 15 with BS
- IMSC created six academic programs
  - 3 MS programs with 454 students enrolled (152 graduates)
  - 2 UG minor programs with 76 students enrolled (121 graduates)
  - BSEE (IMS) enrollment starts F03
- IMSC gave UG research fellowships to 44 students
- Created 23 new courses for IMSC and SoE programs
  - Human Factors in Integrated Media Systems
  - Integrated Media Systems - SAI project course
  - Engineering Approaches to Music Perception and Cognition
  - Intro to Art and Technology - SoE/FA course

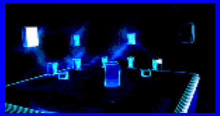
Strategic Plan

- Driving Application Research Projects
- Engineering and Integration
- Basic Research



Research Highlights

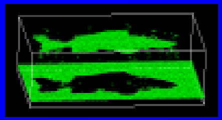
IMSC has produced ground breaking results and fundamental research in:



– **immersive audio**
  - multichannel and HRTF approaches - holistic DSP approach

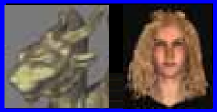
– **streaming servers and multimedia databases**
  - distributed and scalable streaming architecture, immersidata analysis and query

– **computer vision**



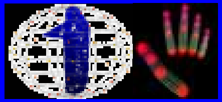
  - computational framework for grouping based on tensor voting, tracking for augmented realities and SFX

– **graphics & animation**



  - 3D DSP mesh processing, compression, mesh operations, hair modeling and animation

– **multimodal emotive, 3D interfaces**



  - Speech and dialog, vision sensing of body and hands, facial expressions analysis and expressive avatars

– **virtual reality and simulations**
  - applications to psychology (ADD diagnosis), and user studies

IMSC Research Program

ucs — user-centered sciences

- Theory of Perceptual and Cognitive Pleasure
- Emotional Expressions
- User State Sensing and Perceptual User Interfaces
- Virtual Environments for Performance Testing and Training

si — sensory interfaces

- Immersive audio
- Speech Recognition and Synthesis
- Facial Gesture Analysis and Animation
- Robust Vision Analysis
- Digital Geometry Processing

im — information management

- Information Integration
- Immersi-data Content Extraction & Analysis
- Customized Querying & Rendering
- Immersive Media Real-Time Storage & Retrieval

mc — media communications

- Multimedia Networks, Transmission, and Comm-unication
- Ultra Wideband Wireless
- Compression

mie — media immersion environment (systems architecture)

- Remote Media Immersion
- Software Architecture for Immersi-presence

arp — application research projects

- ImmersiNET - fusion of internet and cinema
- 2020Classroom – immersion, authoring, and assessment
- InterAct – aware computing and multimodal interaction

Enabling the Vision: Application Research Projects

ImmersiNet – *Entertainment*

Prof. Alexander Sawchuk (EE)

Prof. Roger Zimmermann (CS)

InterAct – *Communication*

Prof. Shri Narayanan (EE)

Prof. Isaac Cohen (CS)

2020Classroom – *Education*

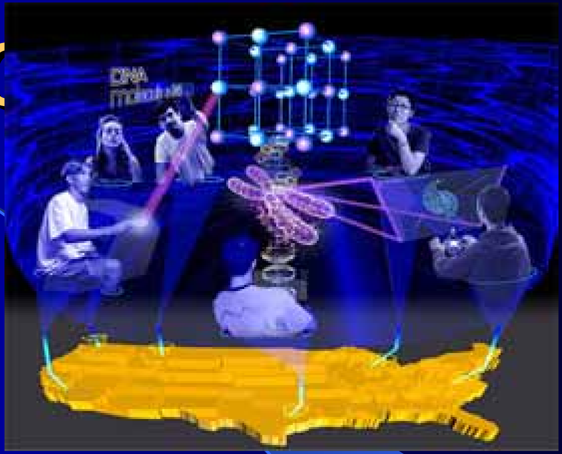
Prof. Cyrus Shahabi (CS)

Prof. Chris Kyriakakis (EE)

2020Classr

- The future of immersive technologies as applied to learning, encompassing:
  - Software and hardware architecture for distributed learning
  - Investigate innovative methods for student/teacher interaction with the curriculum
  - Dynamic curriculum content, specifically designed for this unique immersive platform
  - Development and assessment of high fidelity presence in learning

  - Our two testbed sites are used to study the requirements for interface design, computational complexity, visual and aural fidelity, network performance, and data acquisition of presence for learning applications



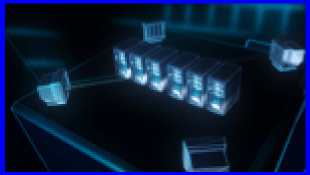
InterAct: Communications and Collaboration

- Media-rich integration of sensory modes to support human tasks and communication
  - *Multimodal interfaces* – speech synthesis and recognition, vision tracking and interpretation of human behavior, facial gesture analysis and avatar rendering, haptics, ...
  - *Tele-immersion* – Hi-fidelity low-latency robust communication over IP networks, graceful incorporation of PDA or low-BW
  - 3D/4D visualization and modeling of time-varying surfaces, volumes, and imagery
  - Data fusion – 3D models and video streams and sensor data
  - Data streaming, synchronization, analysis, and query

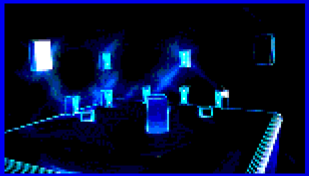
ImmersiNet: P2P Streaming Media over IP Networks

- A fusion of internet browsing with a theater-like immersive experience
  - HD Video at up to 45 Mbits/sec
  - 10.2 channel Immersive audio (12 Mbits/sec)
- Steaming on-demand over the Internet

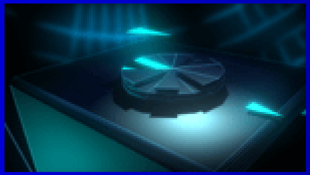
Streaming media servers and recorders



Immersive audio capture and rendering



Protocols for error management



Synchronization

- Recent accomplishments:

Bing Theater I2 Conf

Live Duet

HD video NWS

Applications

Immersed in a college football game

Doctors assisting in a remote procedure

Business people negotiating like they are in the same room

Students visiting an aquarium a thousand miles away

IMSC Industrial Members and Collaborators

KDDI
Olympus
Japan

EverFocus
III
ITRI
Taiwan

Microsoft
WA

Intel
OR

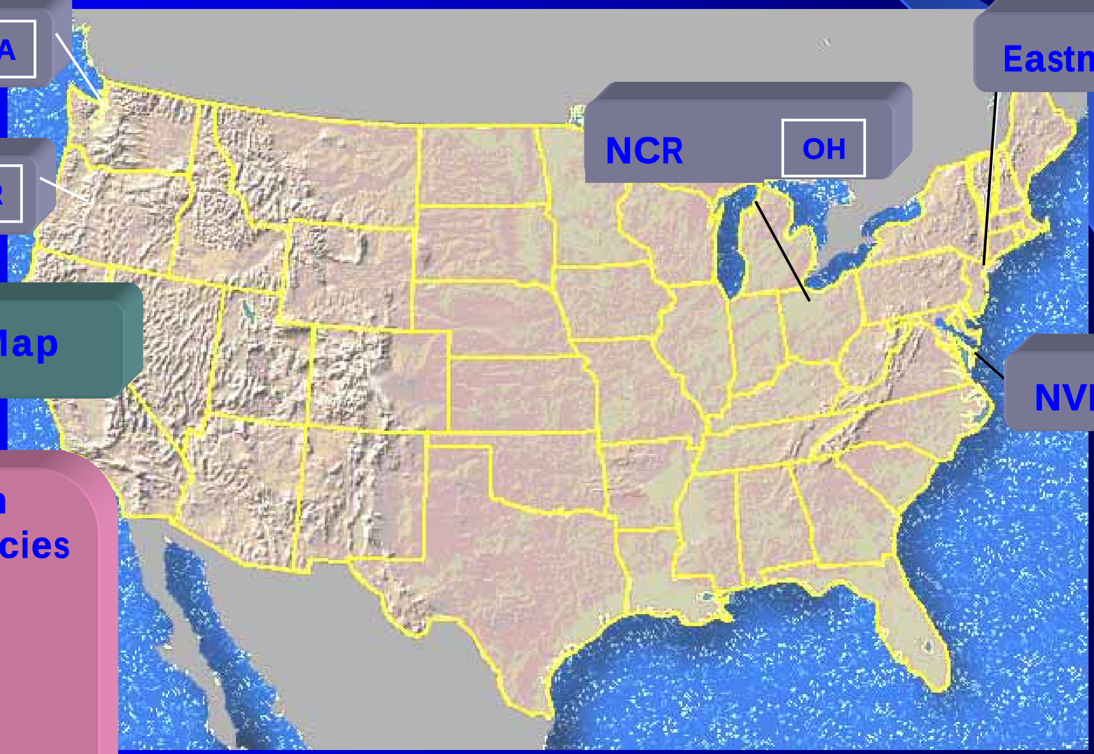
See California Map

BTG
UK

Eastman Kodak
NY

NCR
OH

NVIS
VA



Collaborations with Government Agencies and Foundations:

US Army
DARPA, ONR
NASA, NIMA
Toyota Foundation

IMSC Industrial Members and Collaborators

Silicon Valley

- ConceptLabs
- F-X Palo Alto Laboratory
- Hewlett-Packard
- IBM
- Lockheed Martin
- ChevronTexaco

Los Angeles/San Diego

- JPL
- Lord Foundation
- Los Angeles Times
- Northrop Grumman
- TMH Corporation

Technology Commercialization

- Pixar- Disney Example

- Artistic Content – Technology Collaboration
- Concept Correct
- Business Approach Correct
- Product Successful
- Alliance Failed

Technology Commercialization

- CONCLUSIONS
- Focused Support - Distributed Organization
  IP
  Start Ups
- Government Support
- Industry Support
- Venture Capital Support