

New Organizations for IT-related R&D at Osaka University



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Forming New Organizations

- ❏ Activities on IT (Information Technology)-related research and development are widely spread in various faculties at Osaka University
 - Graduate school of Engineering
 - Graduate school of Engineering Science
 - Graduate School of Science
 - Graduate School of Language & Culture
- ❏ We need a support by a responsible organization for IT-related
 - education
 - research & development
 - ➡ *Cybermedia Center*, established in April 2000
- ❏ Also need a responsible organization to develop an interdisciplinary area in IT that integrates art and science areas
 - ➡ *Graduate School of Information Science and Technology*, planned to be started in April 2002



Information-related Institutes at Osaka University



Computation Center

- Started on April 1962 to provide the batch service, Supercomputer SC-1 introduced in June 1986
- "Computation service" by a main-frame computer and supercomputer for the University and mainly the Kansai Area
- Now supporting the campus area network called "ODINS"
- Supporting to provide various multimedia contents is requested



Education Center for Information Processing

- Established in April 1981.
- Facility was upgraded from a main-frame computer to a distributed system based on NeXT workstations in March 1992
- Supports education of information processing for faculties
- Support is requested for
 - education on computer & Internet literacy
 - education for skill on information explorer on the Internet
 - development of education methodology and computer-based contents for classes



Library

- Established in May 1931, OPAC service started on September 1988
- Historically provided reading and lending services
- Support is requested for
 - building a digital library
 - digitalization of historically valuable contents



Our Facing Problems

- ❏ No organization to take an overall leadership for all of Osaka University's education and research requirements in the information-related field
- ❏ No organization to take an initiative to plan a vision of the University's future deployment in the advanced information society
- ❏ Information infrastructure has been devoted to the hardware facilities due to the budget structure of the government
- ❏ We need a research organization to make near-, middle- and long-term plans for IT-related infrastructures in the University





Our Solution: Cybermedia Center



- ❏ Established in April 2000
 - ❏ The center for education, research, and technology transfer for advanced information-related technologies
 - ❏ Merged existing
 - Supercomputer Center
 - Education Center for Information Processing, and
 - A part of the Library
- in cooperation with
- Graduate School of Engineering
 - Graduate School of Engineering Science
 - Graduate School of Science, and
 - Graduate School of Language and Culture

Planned new building,
will be available in Oct. 2002





Missions of The Cybermedia Center

- ❏ Cooperate with other research groups at Osaka University to plan and carry out research and development for the next-generation IT
- ❏ Pursue cutting-edge researches and serve as a key vehicle for education and promotion of advanced information processing technologies
- ❏ Strengthen IT infrastructure and resources of the University and promote their effective usage
- ❏ Foster the creation of a cyber space and cyber society that facilitates new forms of human intellectual activities, and promote new ideas, discoveries and creative products to enlarge and globalize an intellectual culture
- ❏ Outside the University, the center plays a leading role of promoting the technology and making available computing and network resources in the Kansai region, and to all academic institutes in Japan

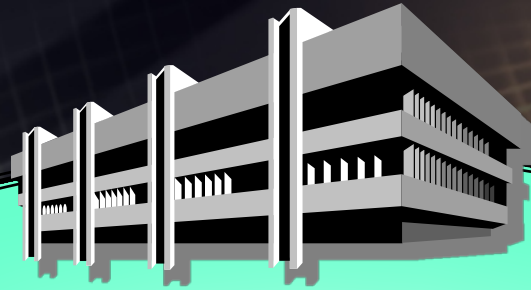


Approaches of the Cybermedia Center

- ❏ Offers a wide range of means, including digital content, information media, hardware, software, and communication media
- ❏ Contributes to the creation of a community consisting of all the teaching staff and students of Osaka University
- ❏ Provides the university's multimedia contents to the civil society

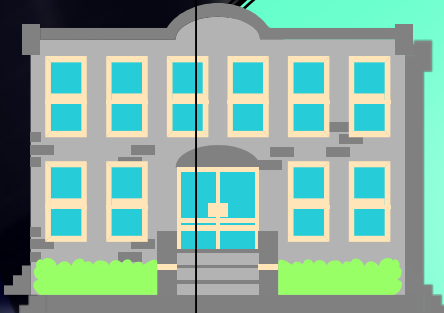


Research Divisions at Cybermedia Center



Seven Research Divisions

- Information Media Education
- Multimedia Language Education
- Supercomputing
- Computer-based Experiments
- Cyber Community
- Advanced Network Environment
- Applied Information Systems



Cybermedia Center






Missions of Research Divisions

- Information Media Education Research Division
 - build an environment for advanced information processing education
 - carry out education on information processing and information ethics
 - research education including faculty development for instructors in charge of information processing education
- Multimedia Language Education Research Division
 - construct a multimedia language-education environment
 - support developments of multimedia-based teaching contents for language education
 - pursue internationalized education using networks
 - carry out education and research on foreign language education
- Supercomputing Research Division
 - support operation of the supercomputing system
 - promote technologies for visualization of computing results
 - provide education on advanced utilization technology for supercomputing systems
 - design studies on computing science and related subjects
- Computer-based Experimental Science Research Division
 - support operation of general-purpose computer systems
 - perform faculty development on computer applications for modeling and solving scientific problems
 - pursue education and research relating to learning processes of modeling and solving scientific problems



Missions of Research Divisions

-  **Cyber Community Research Division**
 - support planning and operation of SCS (Space Collaboration System)-based distance learning
 - work together with societies to plan and operate distance training in the field of advanced technology
 - undertake studies on the planning, operation and promotion of cyber community plans
-  **Advanced Network Environment Research Division**
 - support operation of the campus network called ODINS (Osaka Daigaku Information Network System)
 - introduce new network technologies including high-speed networks and mobile computing environments
 - provide education on network technology and large-scaled communication networks
 - carry out studies on network-related education
-  **Applied Information Systems Research Division**
 - develop and provide education on how to use large-scaled information systems
 - develop digital libraries
 - support the management of various databases
 - design and implement education on information systems and multimedia systems
 - undertake studies on information searching education



Services offered by Cybermedia Center

Multimedia-based Science Education

- from computer literacy to advanced computer use and faculty development
- close linking between computer-related science and natural science methodology

Management of Information Networks

- support operation of ODINS, the campus-wide network
- introduce new network technologies

Distance Learning in Multimedia Classrooms

- support planning and operation of SCS distance learning
- promote distance learning on networks
- multimedia-based distance learning system

Cybermedia Center



IT Center for Osaka University

Internationalization and language education

- foreign language education based on multimedia technologies
- developments of multimedia-based teaching materials

Electronic library

- digitalization of precious contents
- management of various databases
- sophisticated processing of multimedia contents

Information Media Education Support

- computer literacy
- computer-based information explorer
- creating multimedia contents for classes

Supercomputing

- computing services for supercomputer
- a new computing paradigm using computers
- science simulation using supercomputers



Osaka University

Multimedia-based
from computer
use and faculty
close linking
science and



Lecture at SCS (Space Collaboration System)/VSAT (Very Small Aperture Terminal) Osaka Station

Computer



Education Lab using Computer System

Information Networks
of ODINS, the campus-wide
network tech



Briefing of the Supercomputing System

on



Lecture with CALL (Computer Assisted Language Learning)

Internal
educational
foreign
based
development

Electronic library

Information Me
computer lite
computer-bas
creating multi



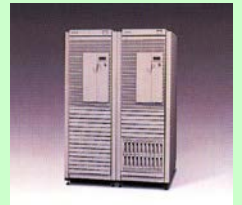
Supercomputer NEC SX-5



Computatuin Server
HP Exempler V2200/N
Multinode System (3
Node) CPU:
PA8200x68
Main Memory: 36GB



File Server
Auspex NS7000/725
Disk: 806GB
DLT Exuippment for
Backup: 2400GB



DB/Web Server
NEC NX7000/260
CPU PA8000
Main Memory: 256MB
Disk: 88GB

Existing Systems

Computer system for information processing education

Supercomputer system

ODINS

Mainframe computer

SCS

Multimedia classroom system

Library support system

CALL computer system

Visualized contents preparation system

digital library support system

New systems

Services offered by CMC

Existing Services

Support of information processing education

Supercomputing

Support of maintaining information network

International language education based on multimedia technology

Science education based on multimedia technology

Distance learning based on multimedia classroom

digital library

New services

Research Divisions

Information Media Education

Multimedia Language Education

Supercomputing

Computer-based Experiments

Cyber Community

Advanced Network Environment

Applied Information System



Hot Topics in CMC

Education

- CALL (Computer Aided Language Laboratory)
- Fundamentals of Informatics (Classes for new comers)
 - Introduction to Information Retrieval
 - E-experimental Science

New Services

- Digital Library Service
- Migration from General-Purpose Computing Service to One-stop Service by
 - Computer Center
 - Computer Education Center
 - University Library
- The Osaka University TV

New Projects

- Biogrid Project
- Wireless LAN Project
- Human Resource Development of Secure Network
- "Kaitoku-do", the Digital Contents
- Deployment of Digital Library System in 2001
 - Internet broadcasting System, Information Wall Socket, Online Databases

Others

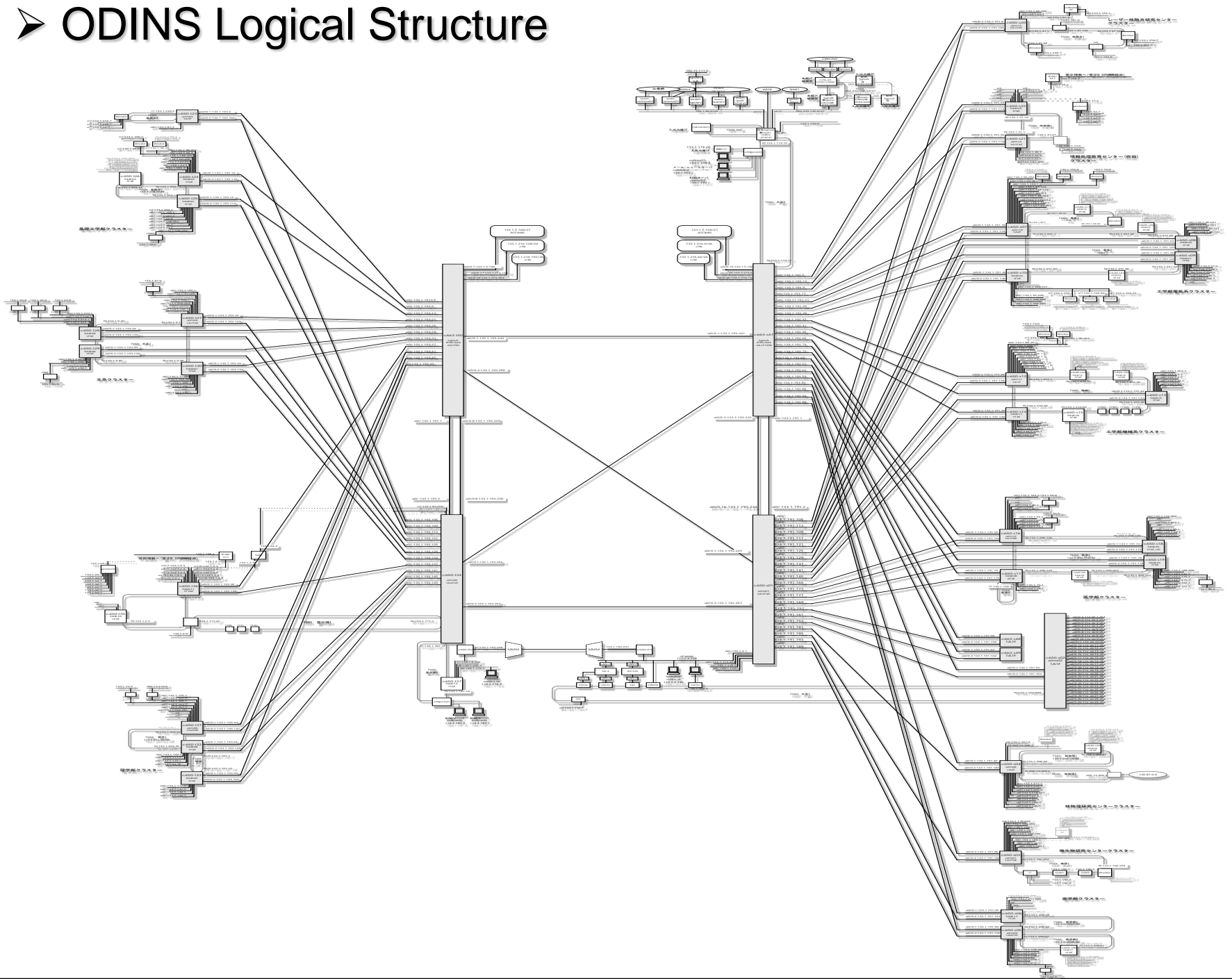
- New Building, available in October 2002



Networking Services: ODINS

- ❏ Osaka University's Campus Network called *ODINS* (Osaka Daigaku Information Network System)
 - ATM-based Ultra Fast Connection
 - High Reliability
 - ATM, 100Base-T, and 10Base-T ports are available to end users
- ❏ Funded by Ministry of Education
- ❏ 1993 – 1st generation
 - ATM + FDDI backbones
- ❏ 1996 – 2nd generation
 - ATM backbone (approx. US\$15M)
- ❏ 1999 – 3rd generation
 - Multimedia Education System (approx. US\$4M)
- ❏ 2001 – 4th generation (approx. US\$14M)
 - Highly secured (hardware-based layer 4 switching for firewall)
 - Gigabit Ethernet

➤ ODINS Logical Structure





Supercomputer SX-4/64M2

- ❏ 2-node system
- ❏ 64 CPUs
- ❏ 128 GFLOPS of computation power
- ❏ 16GB MMU
- ❏ 32GB Extended MU
- ❏ 35,000 hours of computation each month





Osaka University

The Osaka University TV <http://origin01.odins.osaka-u.ac.jp/HandaiTV/>

Windows of Digital Contents at Osaka University

- Memorial Lectures, Open Seminar
- Classes, Distance Education





Current Status on Security in Campus Network



Attackers' Target:
Low Security & High
Performance Network

Campus Network has no standard guidelines for security because

- Requested issues differ among departments
- A subcontract of checking for security is also difficult because of the insufficient number of technicians having skill on security

- Increasing Number of Attacks
 - Thousands of attacks every 10 seconds
 - We are facing the danger of huge reparations



Why Do We Need Independent Graduate School of Information-related Technologies?

- ❏ Four Prioritized Areas in the “The Second Science and Technology Basic Plan” announced by the Council for Science and Technology Policy, Cabinet Office, in March 2001
 - Life Science, Information Technology, Environmental Science, Nanotechnology
 - Building high speed and highly reliable communication systems for supporting the information society and creating new markets, especially emphasized on
 - Mobile and Ubiquitous Computing Environment
 - Contents in addition to Hardware, Software towards C&C&C (Computer, Communication, and Content)
 - Basic research harmonized with other three prioritized fields
 - Build a infrastructure for research and development (Grid Computing)
- ❏ e-Japan 2002 Program (by IT Strategic Office)
 - promote education in the IT-related fields



Information-related Technologies

Social Informatics

- E-commerce
- Finance Engineering
- Internet Ethics

Approaches to Human Life

- Human-media Engineering
- Bioinformatics

Information Systems Architecture

- Information Systems Engineering
- Computer Network Engineering

Basic Information Technologies

- Software Engineering
- Hardware Design Engineering

Education

- Cybermedia Center

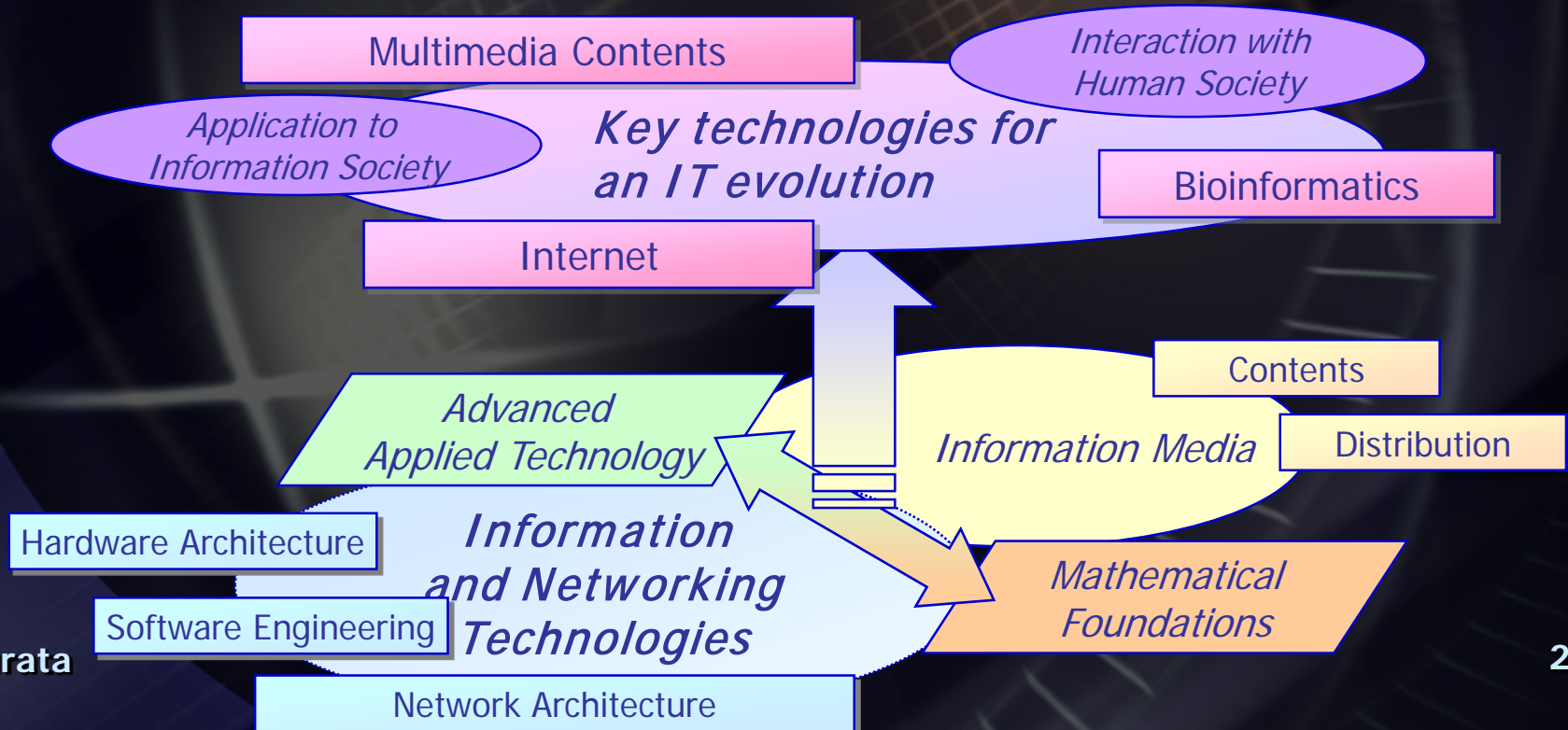
Modeling and Algorithms

- Information Mathematics
- Computation Design Science



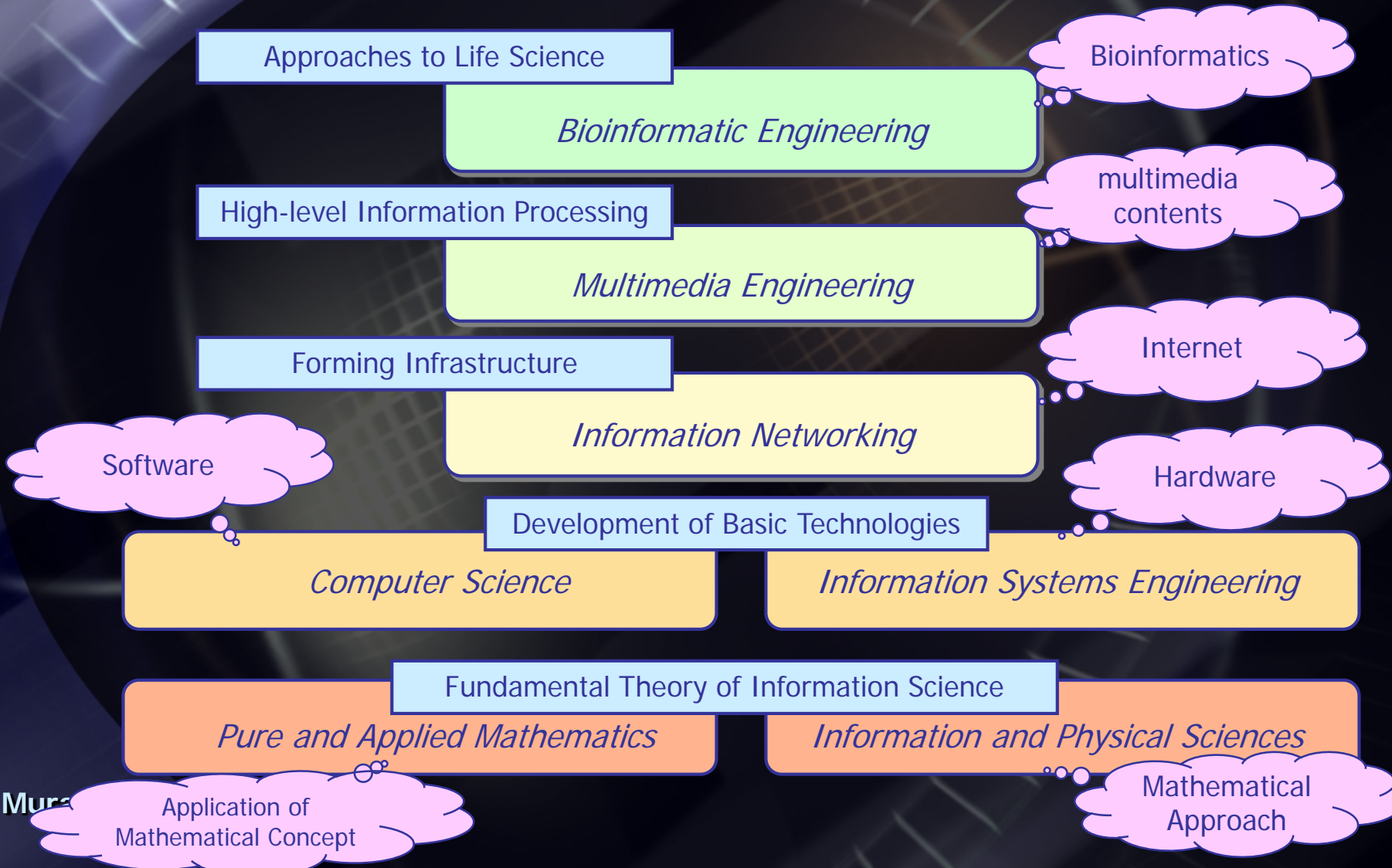
Goals of IT-related R&D at Osaka University

- ❑ Pursues three main goals for supporting IT evolution
- ❑ Basic R&D activities become more important





Structure of Graduate School of Information Science and Technology (IST)





Forming IST

- ❏ Graduate School of Engineering
 - Department of Information Systems Engineering
 - Department of Applied Physics
 - Department of Biotechnology
 - Department of Electronic, Information and Energy Engineering
 - Department of Computer-Controlled Mechanical Systems
- ❏ Graduate School of Engineering Science
 - Department of Software Science
 - Department of Computer Science
- ❏ Graduate School of Science
 - Department of Mathematics
- ❏ The Institute of Scientific and Industrial Research
 - Division of Intelligent Systems Science
- ❏ Cybermedia Center
- ❏ Industries for operating labs jointly



Roles of IST

With companies in the Kansai Area

- Promote co-researches
- Labs operated jointly with industries

Promote Interdisciplinary Researches in cooperation with Graduate School of Life Science

Graduate School of Information Science and Technology:
Research Center of Information Technology

At Osaka University we take a leadership for IT-related education

We aim at being a hub in Asian Regional Universities

Distinguished points from other information-related graduate schools

Advanced researches in

- High-level content processing
- Internet-related technologies
- Bioinformatics engineering

Dept. of Information Networking

Everything over Next and Succeeding Generation Information Networks

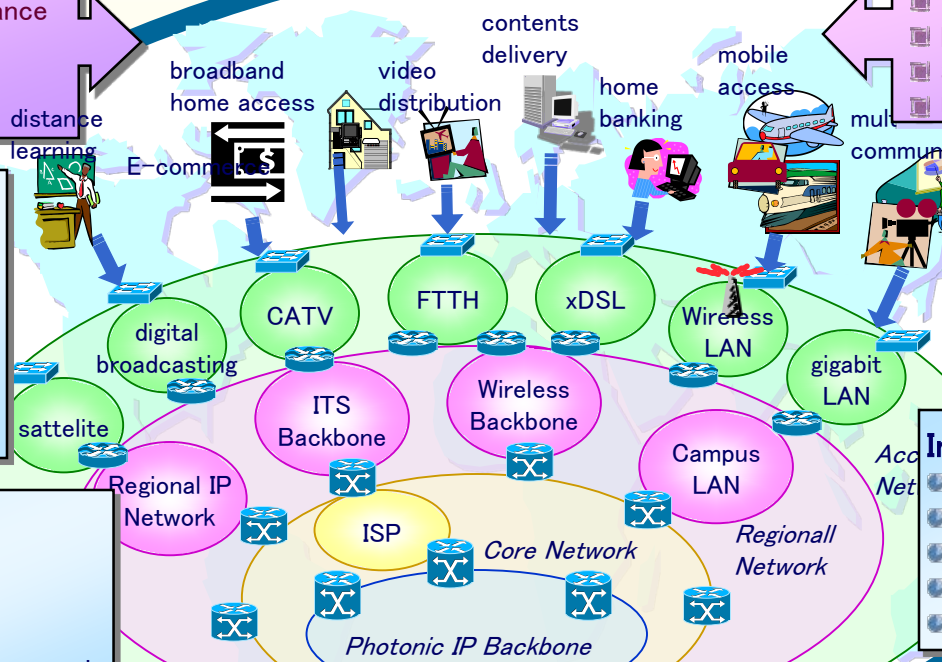
- Forms rich, highly Reliable and secure information society in the new century
- Builds intelligent information network for flexible and dynamic multimedia information distribution
- Systematic harmonization between computer and communication, wired and wireless/mobile networks, hardware and software, communication and broadcasting
- Creates useful new system and service based on system-oriented approach
- Promotes education and research covering base technologies to service technologies for the network

Qualified Network Functionalities

- High-speed and High performance
- High-level functionalities
- High Quality
- Various access methods

Qualified Network Services

- Value-added service
- Evolution of the user-friendly network
- Safe network
- Ubiquitous access methods



Multimedia Network Lab

- Media Processing Technology
- Multimedia QoS Technology
- Multimedia Communication Protocol
- Network middleware

Intelligent Networking Lab

- Intelligent Photonic Networking Technology
- Broadband home network
- Agent communication architecture

Mobile Computing Lab

- Mobile computing and ad hoc network
- Network protocol
- Information processing in the network

Information Platform Lab

- Highly Reliable Platform
- B-to-B networking
- E-commerce architecture
- Contents distribution architecture
- Information service description

Cyber Communication Lab

- Create Cyber Community
- Cyber Communication Infrastructure
- Multimedia Contents Delivery

Advanced Network Architecture Lab

- High Speed Protocol Processing
- Photonic Internet
- High Speed Switching
- High Performance End System

Dept. of Multimedia Engineering

- Obtain/edit/structurize multimedia contents and establish the methodology to build the large-scaled multimedia system
- multimedia information processing technology and multimedia database system design/management method to process/edit/store the multimedia contents efficiently
- contents access architecture by considering a security aspect of management systems of access rights, copyrights, and distribution services
- development of business information systems such as E-commerce system and supply chain system based on the multimedia technology
- High-level human interface technology including virtual and extended real environments

High-Level Information Processing

- Rapid progress of digital technology
- High-speed information network
- Various access methods to the Internet
- Digitalization of various contents

Requirements from Societies

- deployment of E-commerce
- digitalization of companies/governments
- merge of communication/broadcasting

"Multimedia Society"

Multimedia Data Engineering

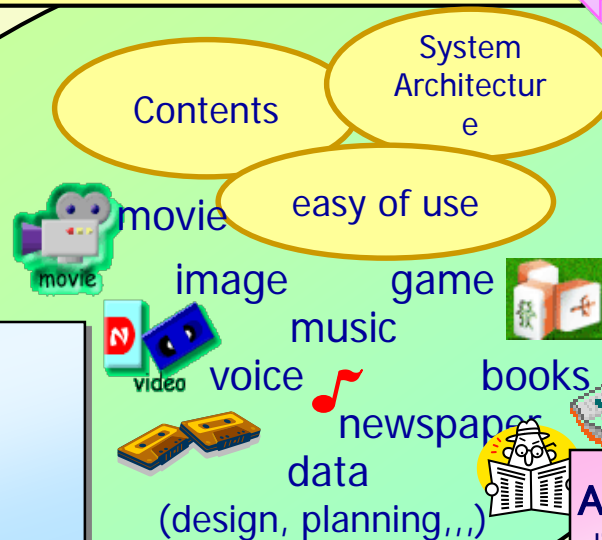
- data modeling
- database management system
- content access architecture

Business Information System

- Planning and evaluation of E-commerce
- Supply chain management system
- Knowledge management system

Human Interface Engineering

- Virtual reality
- Cooperative environment by merging real/virtual environments
- real time interaction with multimedia contents
- precognitive engineering of human interface



Security Engineering

- code/cryptography theory
- security authentication
- secure content protection/distribution
- media processing
- information ethics

Applied Media Engineering

- digital library
- global distributed computing
- content service technology

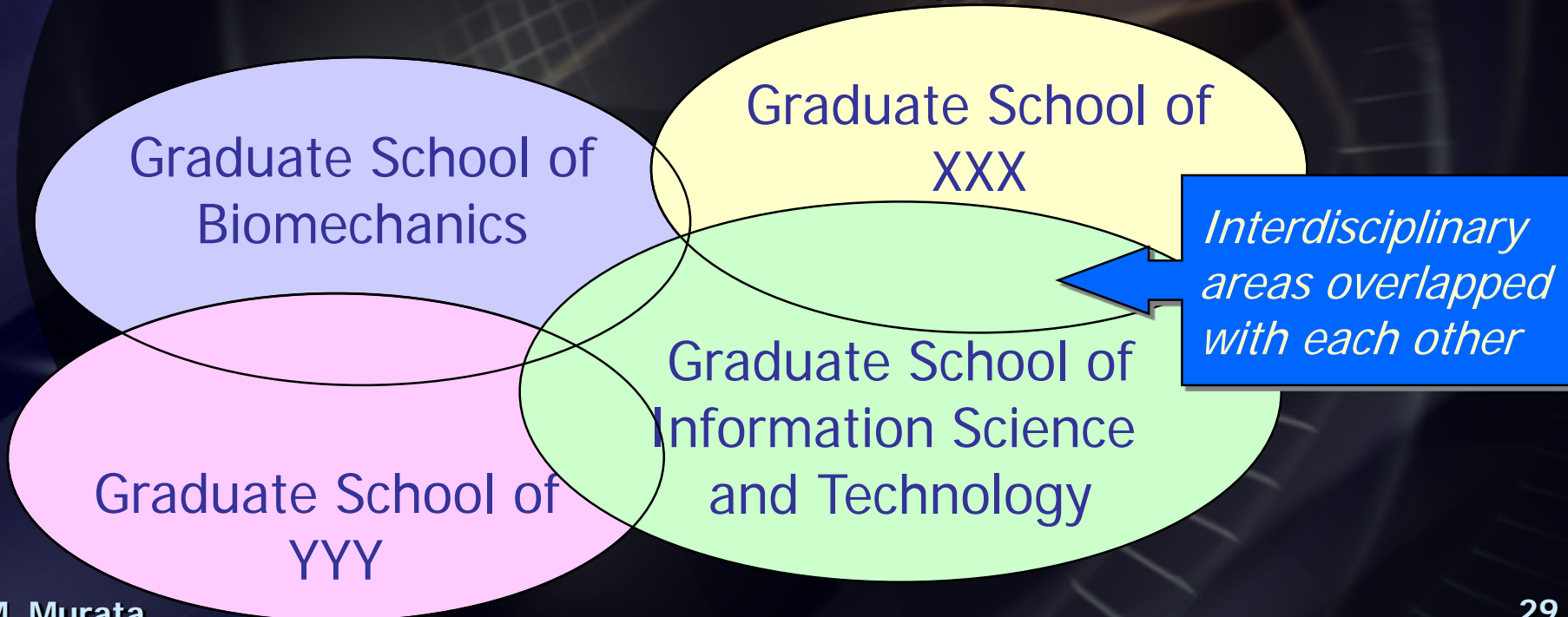
Multimedia Agent

- mobile agent
- agent programming



Ideal "University" is ...

🖥️ A spiral structure of interdisciplinary areas reveal an ideal "university"






Department of Information Networking

Consists of six laboratories

- Multimedia Network Lab.
- Intelligent Network Lab.
- Information Platform Lab.
- Mobile Networking Lab.
- Cyber Communications Lab.
- Advanced Network Architecture Lab.

 NOTE: In all departments, each lab has one professor, one associate professor, one assistant professor, a rather small unit. But,

- It can take dynamic actions
- Inheritance of R&D is easy



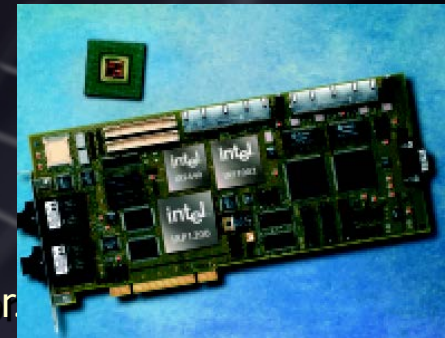
Course Design

- ❏ 22 subjects each year (two credits for each subject)
 - Required subjects; ten
 - information network design, multimedia network, information network architecture, network software, information platform design, information platform, mobile computing, mobile communication protocol, gigabit network, very high-speed network architecture
 - Optional course; several from twelve subjects in other departments
 - 30 credits in total are required
 - Two courses are given by lecturers from industries
- ❏ Two laboratories each year
 - Intended to complement the lecture courses. Students will study a set of on-line course materials and complete a set of programming assignments illustrating the concepts taught in the lecture course.
 - Laboratory 1 (1st Semester); April-September
 - Experiencing network processors to learn about network design, implementation, and evaluation in a hands-on fashion
 - Laboratory 2 (2nd Semester); October-March
 - Advanced network programming at each laboratory



Laboratory 1: Experiencing Network Processors

- ❏ Estimated quota of students: 20 students (4 students/lab. X 5 labs)
- ❏ Instructor: Masayuki Murata
- ❏ Support: 2 Research Associates, 2 Teaching Assistants
- ❏ Period: First semester from April to September (half year)
- ❏ Credit: 2
- ❏ Course Description
 - The goal of this course is to learn about network design, implementation, and evaluation in a hands-on fashion. Teams of students will design, implement, and evaluate a network protocol or a router feature. The network infrastructure consists of Intel Development platform for the IXP 1200 network processor.
 - Each team consisting of typically two to three students will develop network components. For example,
 - Data plane component that is involved in processing packets that are forwarded by the router.
 - Control plane component that manages and controls the function that is implemented on the network processor.
 - Applications that realize the new network feature.





Laboratory 2: Advanced Network Programming

- ❏ Estimated quota of students: 20 students (4 students/lab. X 5 labs)
- ❏ Instructor: Associate Professor of Each Lab
- ❏ Period: Second semester from October to March (half year)
- ❏ Credit: 2
- ❏ Course Description
 - The goal of this course is to learn about advanced network programming. Examples include implementation of a new multicast protocol, creation of new network service, etc.
 - A program of “training persons for special skills on security management” (financially supported by MEXT) is started at the Cybermedia Center, Osaka University. We plan to have a joint course (ODINS configuration and firewall setup training) as a part of the program.