THE POSSIBILITIES ARE INFINITE FUJITSU

Fujitsu Laboratories' Research Activities

November, 2006

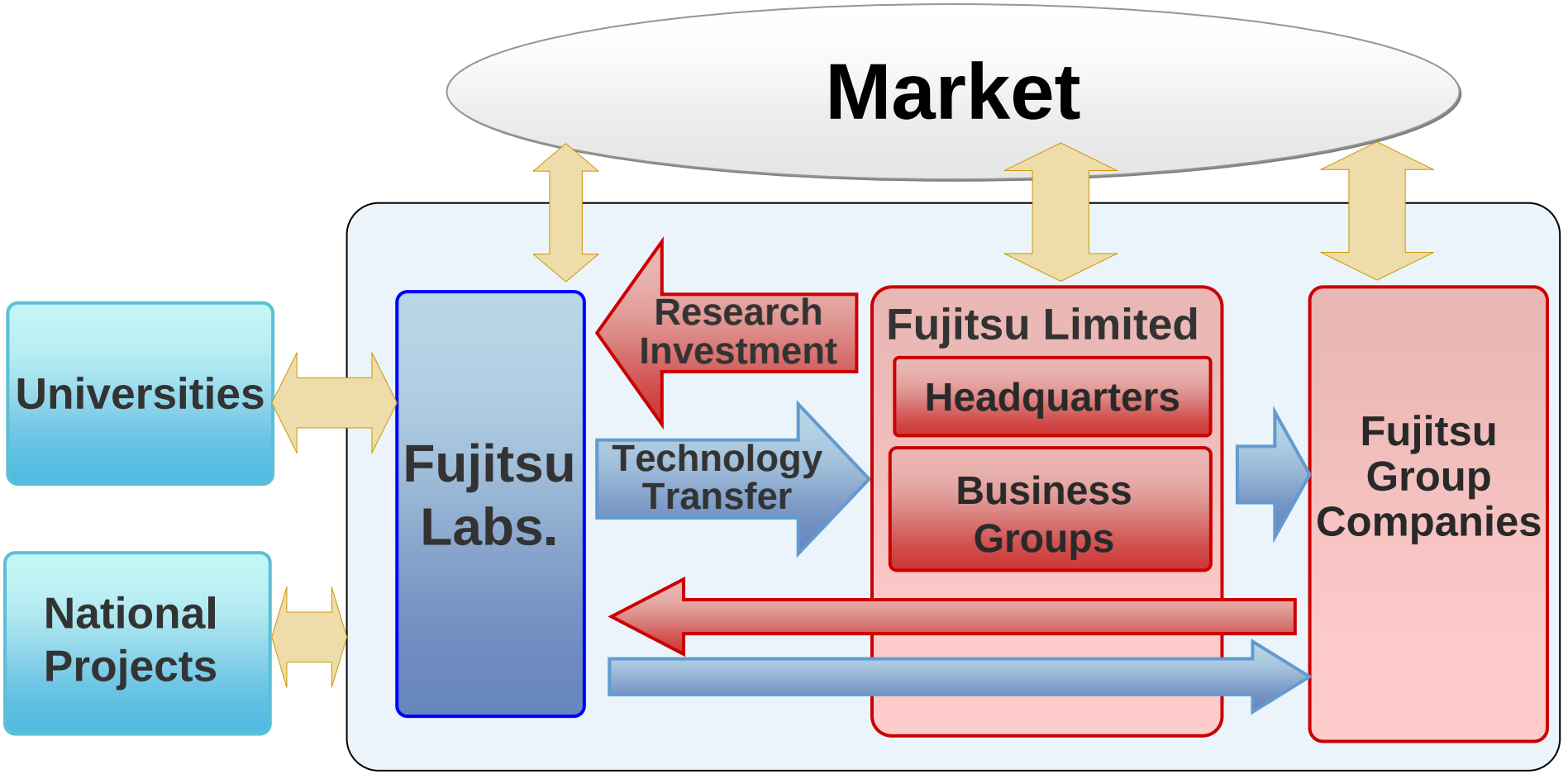
Kazuo Murano
President
Fujitsu Laboratories Ltd.

What mankind can dream, technology can achieve

Our Forward-Looking Technologies are Creating Tomorrow's Ubiquitous Networking World.

Communicate Anytime, Anywhere, and with Anyone

R&D Framework



Overview of Fujitsu Laboratories

FUJITSU

- Capital: 5 Billion Yen (US$50M: 100Yen/$)
- Budget: 40 Billion Yen (US$400M: 100Yen/$)

  Fujitsu's FY 2006 Consolidated R&D Expenditure:
  255 Billion Yen (US$2.55B: 100Yen/$)

- Employees: 1500 in Japan,
  150 at Overseas Labs
  (US, Europe, China)

- Organization (Japan):
  7 Research Labs
  7 Centers
  1 Project

R&D Management

1. Portfolio Balanced R&D
2. Roadmapping
3. Speed to Business – Customer Focus
4. Value Chain Integration
5. Global Networking
6. Partnering
7. 21 Century model
8. Intellectual Rights

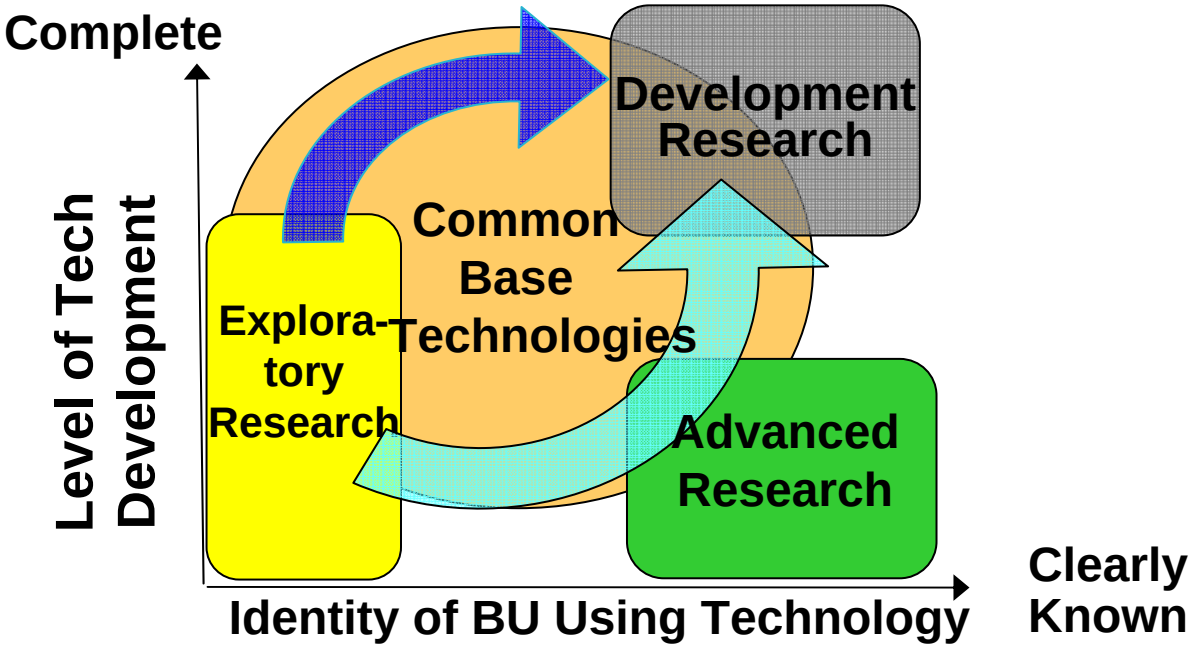
R&D Management

1. **Portfolio Balanced R&D**
2. **Roadmapping**
3. **Speed to Business – Customer Focus**
4. **Value Chain Integration**
5. **Global Networking**
6. **Partnering**
7. **21 Century model**
8. **Intellectual Rights**

1. R&D Portfolio

- Business Unit Commissioned Projects: 55%
  HQ-Commissioned Projects: 45%

- Development Research: 15%;
  Advanced Research: 35%;
  Common Base Technologies: 30%,
  Exploratory Research: 20%



High-End Servers

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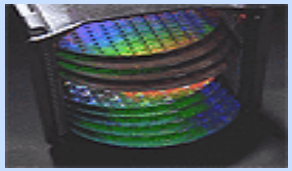
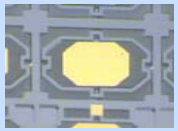
Advanced 90nm Semiconductor Technology



Advanced Network Technology



Optical Interconnect*

World-Leading Performance

PRIMEPOWER

World's Best Performance High-Reliability UNIX Server

1,157,619 Bops with 128CPU (2006.2.2)

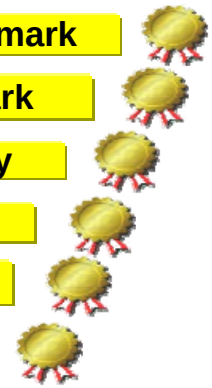
PRIMEQUEST

Pioneering Linux/Windows Server

322,719 Bops with 32CPU (2006.1.5)

Bops: Business Operations per Second

2006	PRIMEPOWER Achieves World-Record Performance in Java Application Benchmark
2006	PRIMEQUEST Achieves World-Record Performance in Java Application Benchmark
2004	PRIMEPOWER - First Unix Server to Use 90nm Process Semiconductor Technology
1995	GS8000 Global Server Series Uses World's Fastest Mainframe CMOS Processor
1992	VPP500 Series - World's Fastest Vector Parallel Supercomputer
1974	M-190 Mainframe Features World's Largest and Fastest LSI
1954	FACOM100 - Japan's First Relay-type Computer



* In Collaboration with Fujitsu Limited. Part of Fujitsu Limited's Research was Consigned by the National Institute of Information and Communication Technology of Japan.

Network Systems

Products Supported by World-Class R&D

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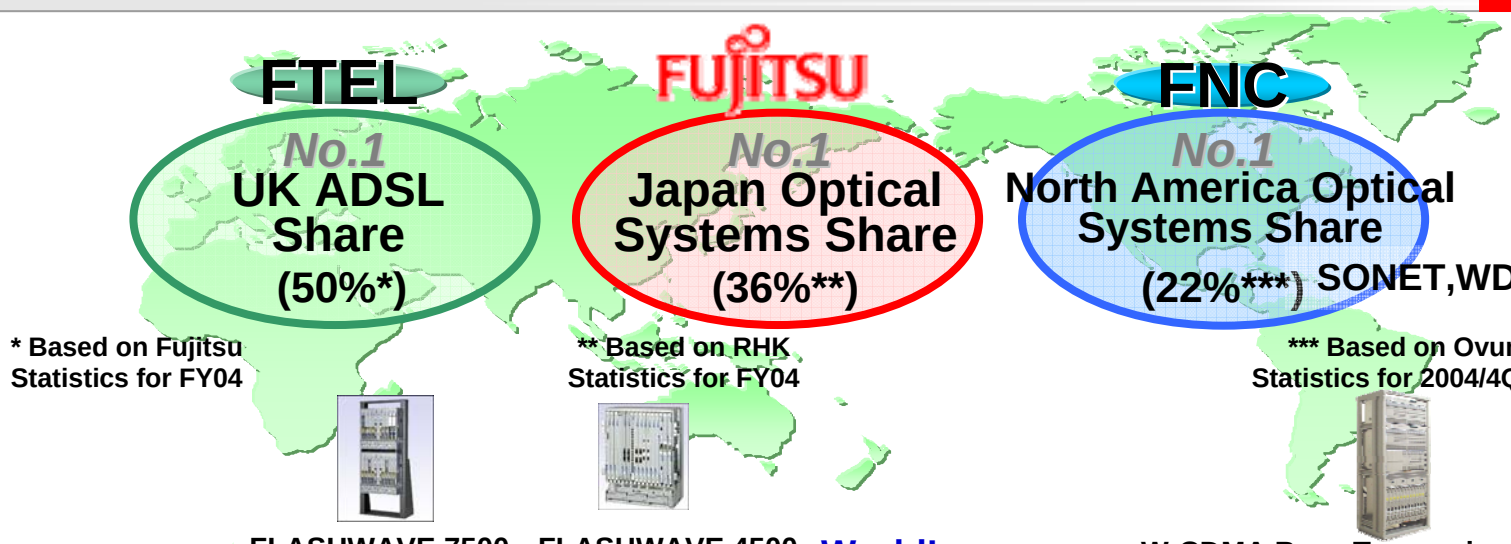

* Based on Fujitsu Statistics for FY04

** Based on RHK Statistics for FY04

*** Based on Ovum-RHK Statistics for 2004/4Q-2005/3Q

FLASHWAVE 7500 (WDM)

FLASHWAVE 4500 (SONET)

W-CDMA Base Transceiver Station

World's First

2005	640Gbps Optical Switching Device
2002	Compact Tunable Dispersion Compensator
2000	1.7Tbps WDM System
1997	WDM Optical Submarine System
1992	2.5Gbps LiNbO3 External Modulator
1988	Commercialization of SONET
1986	1.55μm Optical Transmission
1983	Long-Haul Single Mode Fiber System
1980	1.3μm Band Semiconductor Laser

First in North America

World's Fastest

2005	GaN HEMT for Mobile Base Stations
2003	Ultra-Efficient Base Station Amp
2002	High-Capacity 3G Base Stations
1980	Ultra-Fast Semicon. Element HEMT

World's First

W-CDMA	Wideband Code Division Multiple Access
WDM	Wavelength Division Multiplexing
SONET	Synchronous Optical Network

GaN HEMT: Gallium Nitride High Electron Mobility Transistor

Grid Computing

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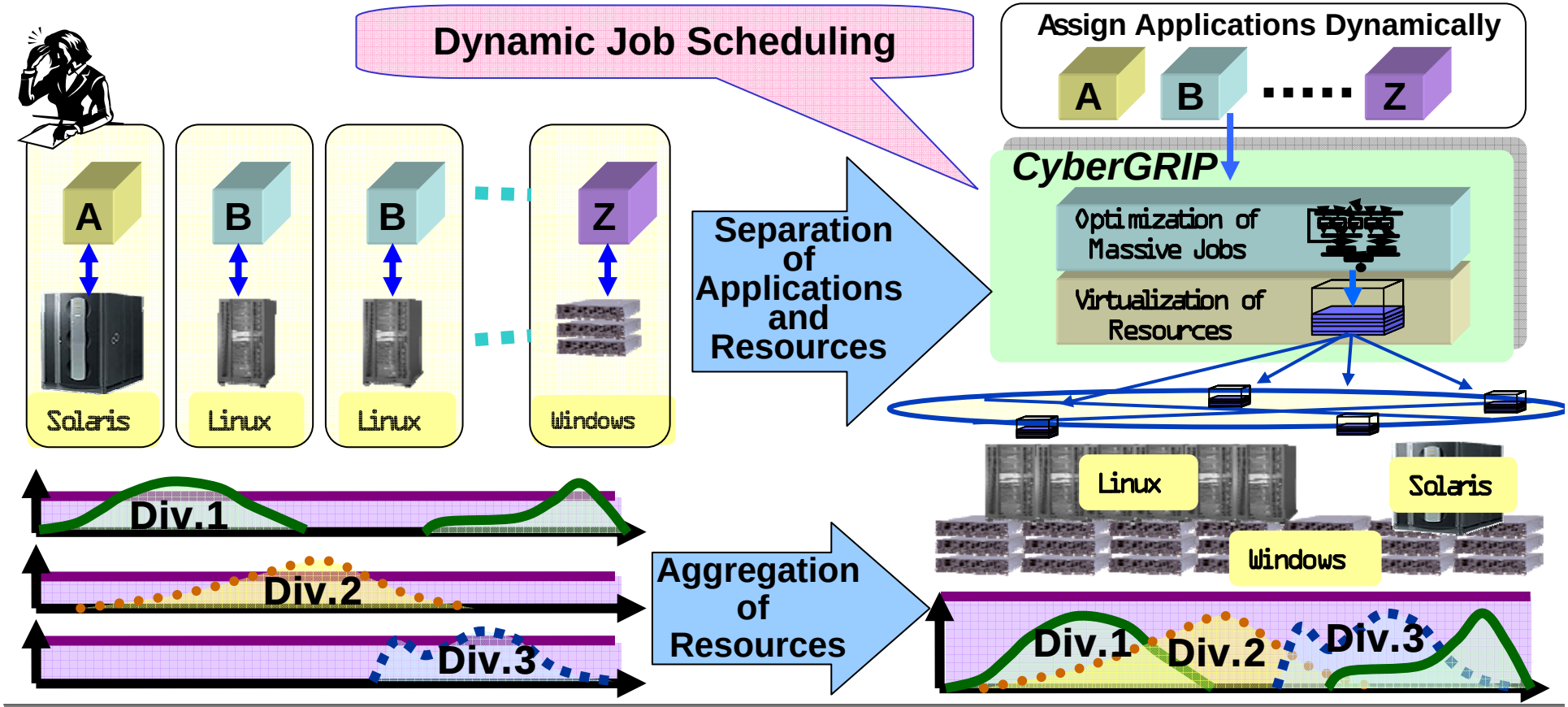
- Many Practical Grid applications: Massive Simulations and Interactive Services
  - IT Resource Utilization for Telecom Carriers (2006)
  - Hiroshima University Campus Grid (2005)
  - The Bank of Tokyo-Mitsubishi UFJ, Ltd. Financial Grid (2005)
- Results from LSI-CAD; Simulation Time: 1/3, Operational Man-hours: 1/4



Advanced

Peta-Scale Computing

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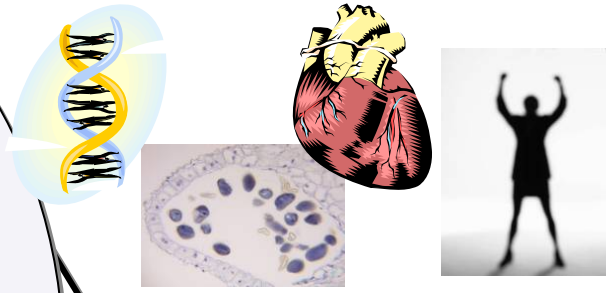
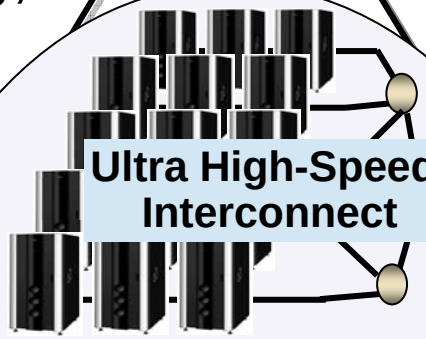
Weather Forecasting

Higher Granularity of Analytical Mesh
→Increased Forecasting Accuracy, Localized Forecasting

Biotechnology

DNA, Protein Analysis
→Personalized Medicine / Drug Development





Ultra High-Speed Interconnect

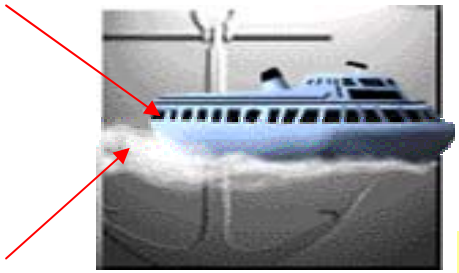
10^5 Order Processors

High-Precision Mounting Tech, Low Power Consumption Tech

Peta-Scale Computing System

CAE

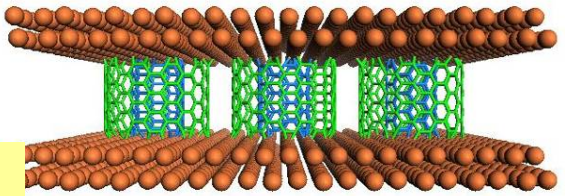
Structural Analysis



Hydrodynamic Analysis

Nanotechnology

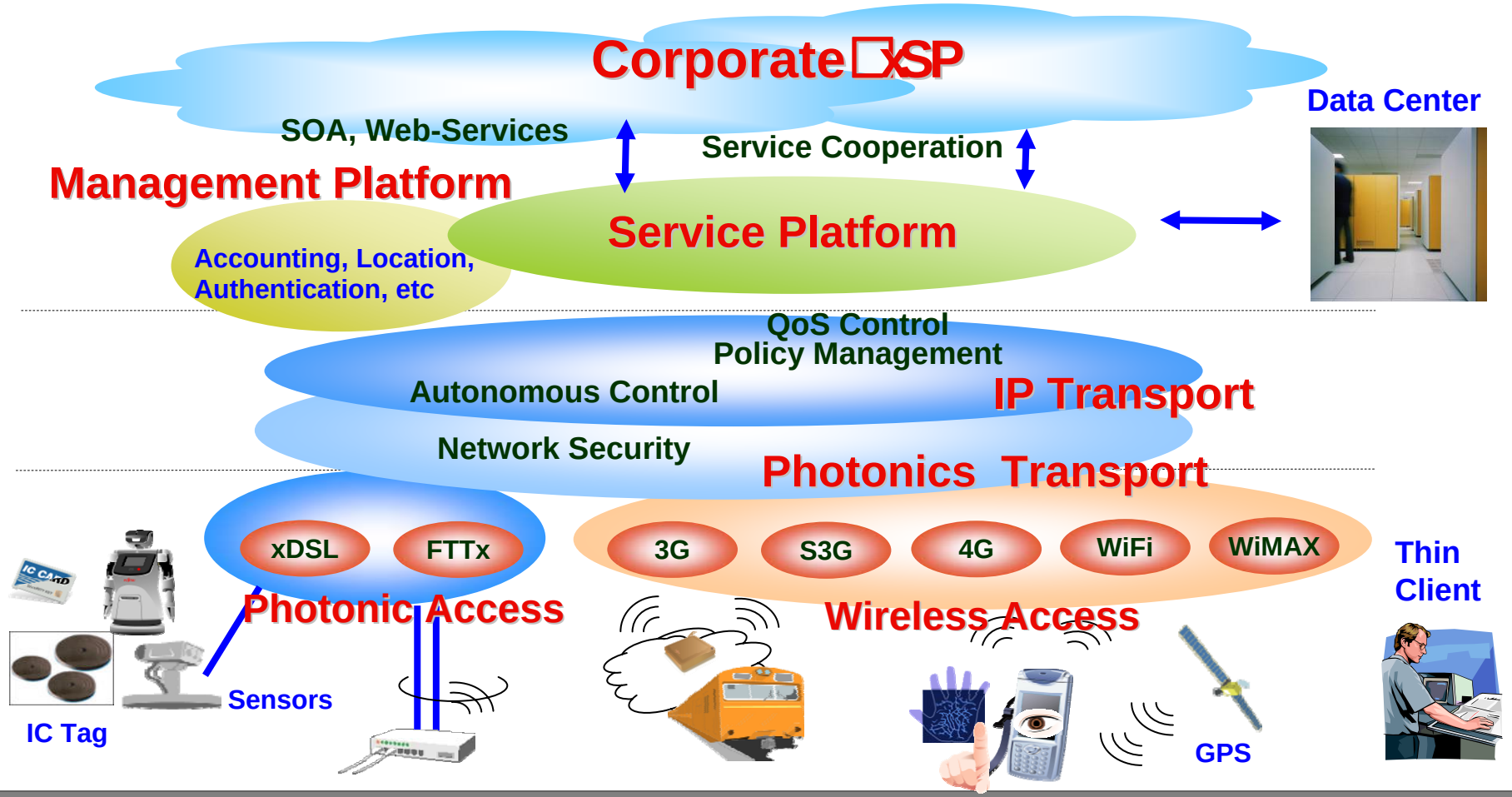
Atomic Level Simulation
→Ultra-Fine Devices



2010 Targets
Peak Performance: 10 Petaflops
Effective Performance: 1 Petaflops

Realizing Next-Generation Network

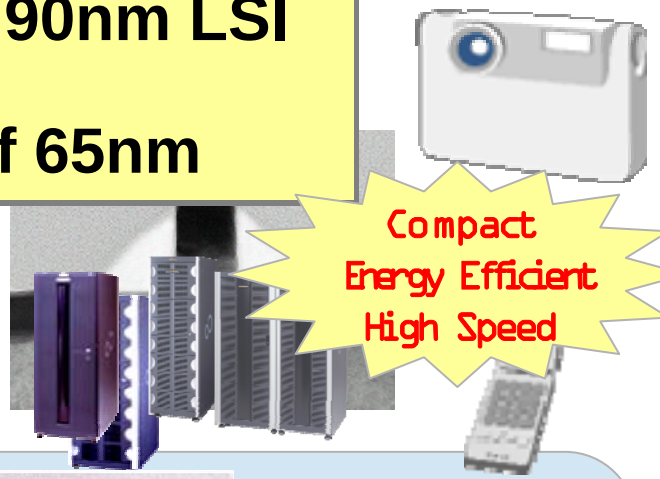
- Diverge from Today' Best Effort Network Services to IP Based and Resilient ICT Infrastructure
- Provide Information Service Environment where Service Component (i.e. Server, Application etc.) are Fully Virtualized and Integrated Autonomously



CMOS Scaling

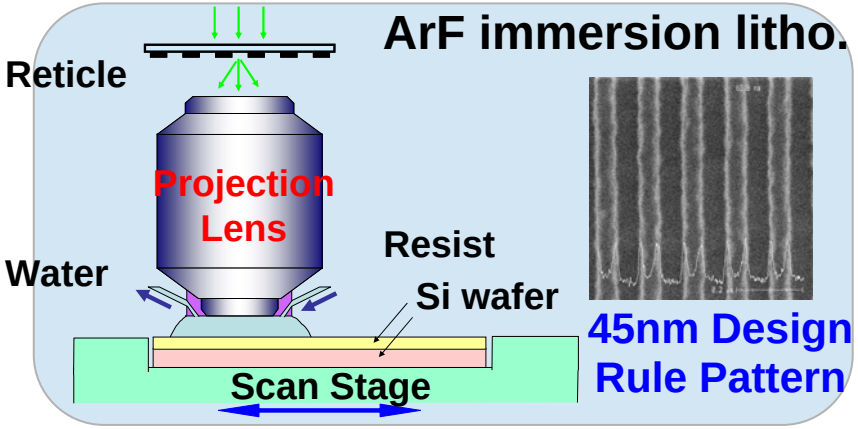
FUJITSU

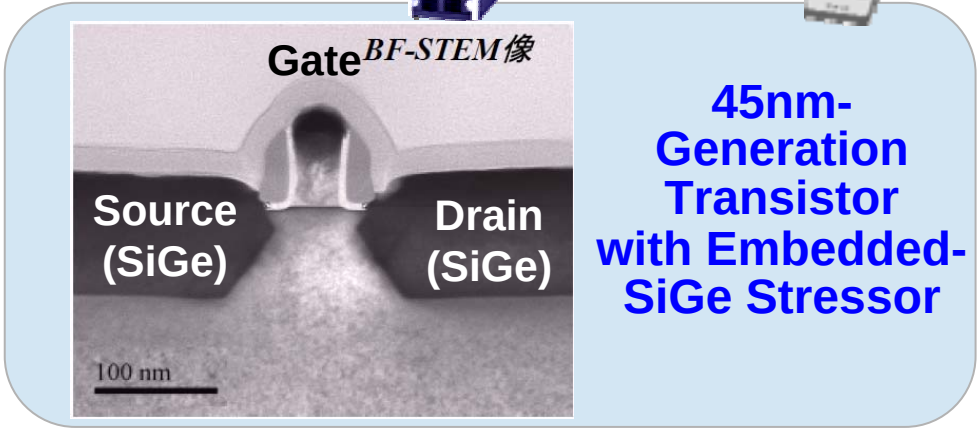
- Shipping World-Top Rated HP and LP 90nm LSI since July, 2006
- Started Accepting Customer Design of 65nm



Technology for Realizing 45nm

- ArF Immersion Lithography
- Embedded-SiGe Stressor





Challenges at 32nm & Beyond

- New Materials/Processes
- Achieving Low Power Consumption

Extensive Application of Nanotechnology

Exploratory

"enon" Service Robot

(an exciting nova on network)

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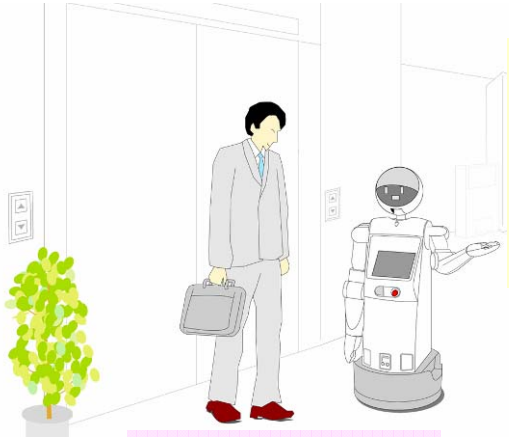


Supports People in an Office Environment by Performing a Variety of Services

Guiding

Can Guide Visitors and Move Autonomously using Visual Function

Communicating

Speech Recognition/Synthesis, and LCD Monitor

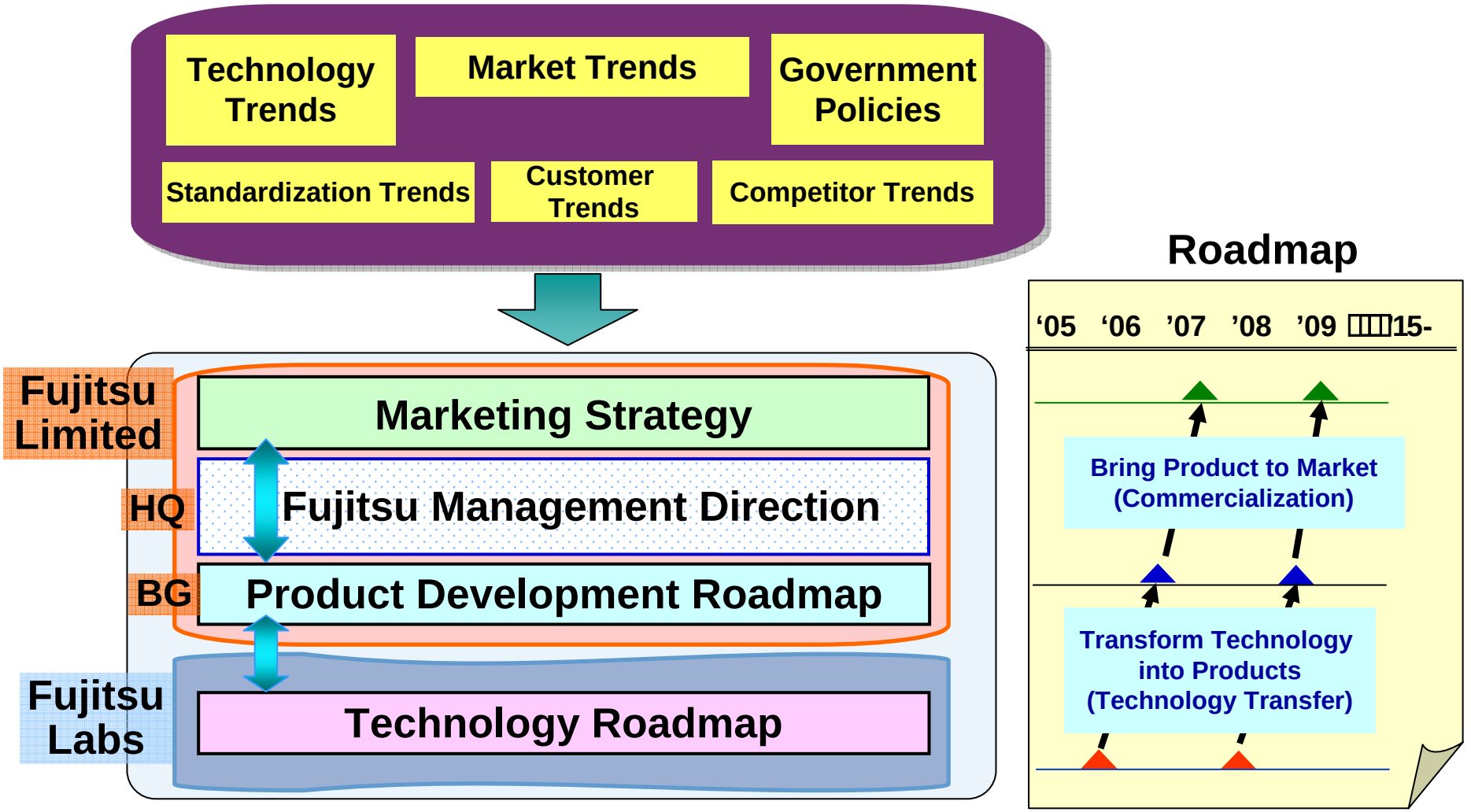
Guarding

Remote Monitoring using the Network

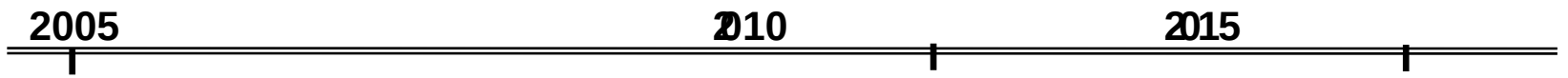
Carrying

Lifting and Stowing of Packages

2. Roadmap as Cornerstone of R&D Strategy



Main Research Areas & Roadmap of Achievements



IT Systems / Services

Business System Optimization
Business Process Innovation
B2B&C System Optimization
Systems that Support Efficient Management
Service Platforms
SOA
Web2.0
User-Centric Computing
IT Platforms
Organic Computing
Autonomous Systems for Non-stop IT Service
Autonomous Computing
Grid Computing
Peta-Scale Computing

Networks

Photonic
10Tbps-class Core Networks
Networks that Connect Everyone and Everything
Wireless
3.5G (HSDPA / HSUPA)
WiMAX
Ultra High Speed (100Mbps – 1 Gbps)

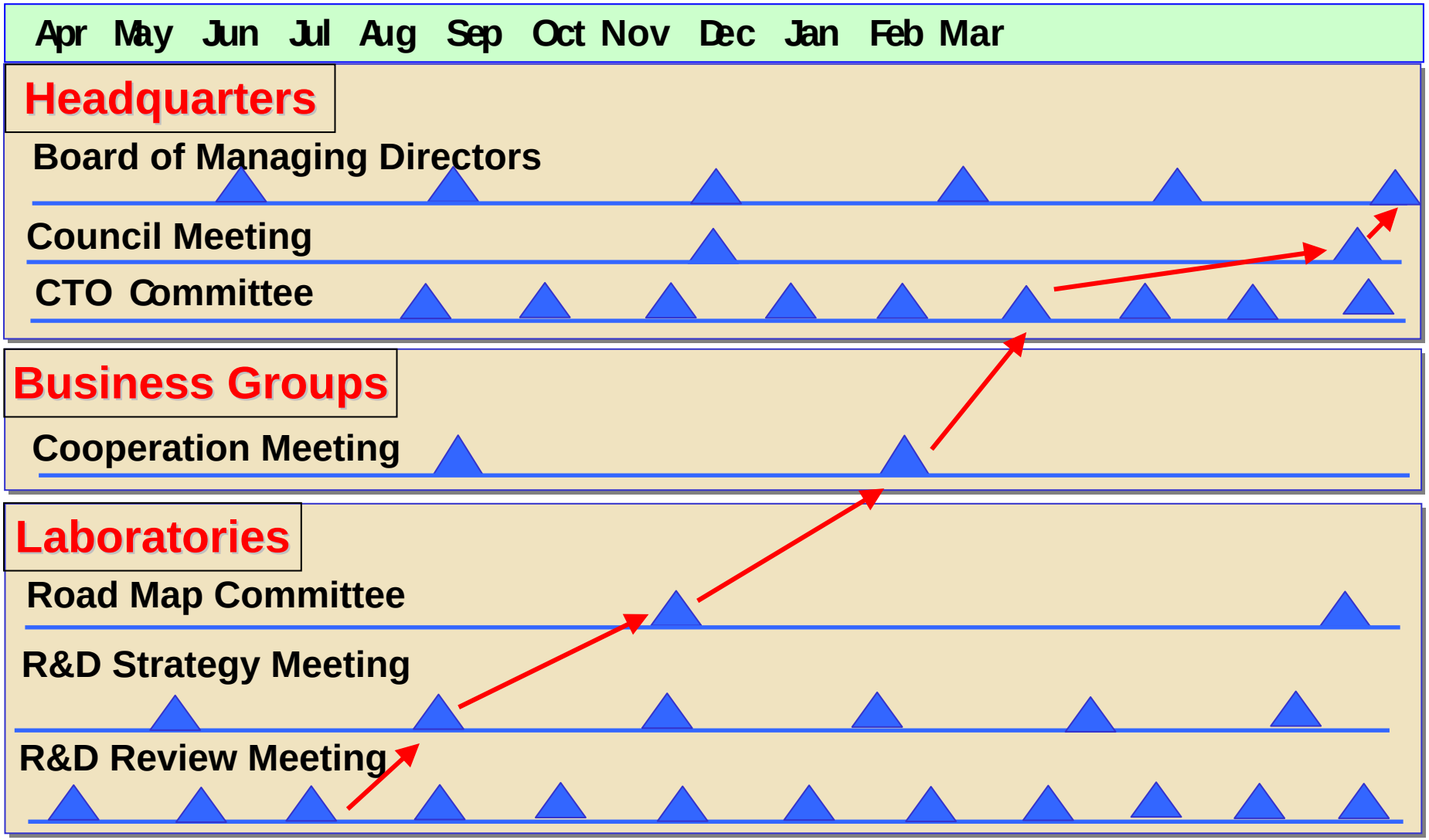
Ubiquitous

RFID
Electronic Paper
Intelligent Robots
Natural Human-Machine Interfaces
Security
Palm Vein Authentication
Robust Security Based on Biometrics

Base Technologies

HDD
Optical / Magnetic Fusion 1Tb/in^2
System LSI
Digital AV (H.264 etc.)
Robust Infrastructure to Support Next-Generation IT Systems
Silicon Semiconductors
CMOS Scaling
65nm
45nm
Carbon Nanotube Applications
Compound Semiconductors
GaN Amplifiers
Quantum-Encrypted Communication
Environment
Life Cycle Assessment

Road Map Management



3. Accelerating Commercialization of R&D Results

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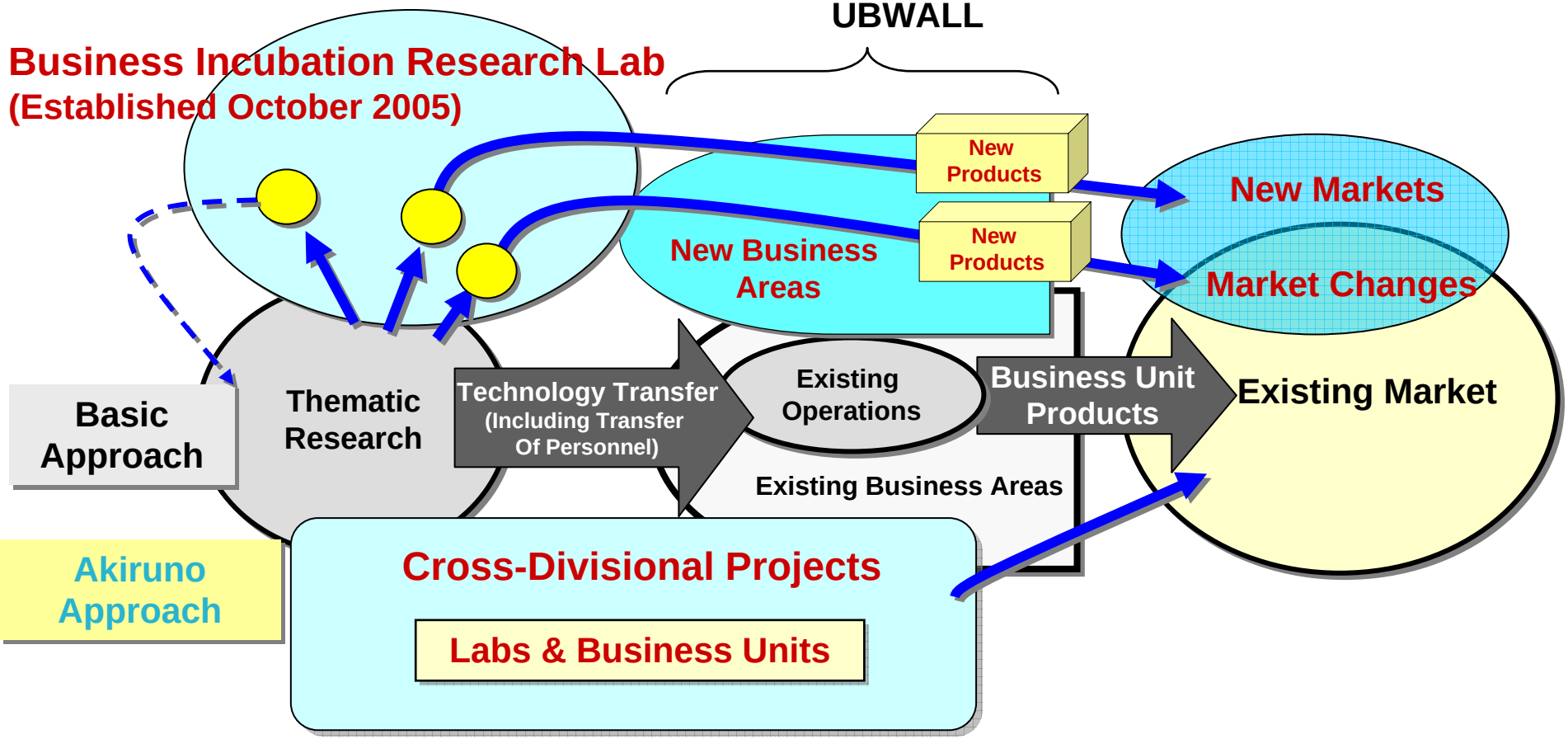
New Product Research

Collaboration among Business Units, Sales, SE, and Affiliates

Examples: Palm Vein Authentication, Grid Computing
UBWALL



Examples: 90nm LSI (Concentrated at Akiruno Technology Center)
HDD Technology, 3G/3.5G Mobile Communications Base Stations

Example of Business Incubation

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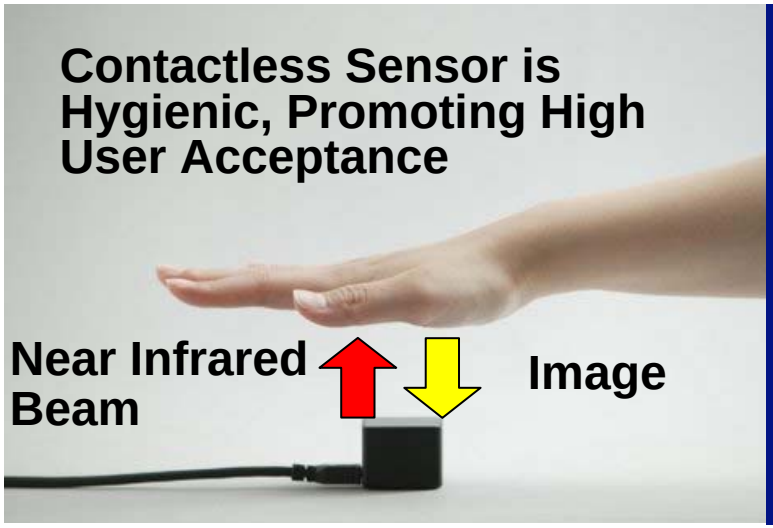
Palm Vein Authentication

Research, Customer Acquisition, Commercialization, and Global Business

Compact Sensor: 3.5 cm X 3.5 cm

High Speed: 1 Second for Image Input; 0.5 Second for Verification



Sensor

Palm Vein Pattern Image

Wide Range of Applications: ATMs, Room Access Control, IT Security

Electronic Paper

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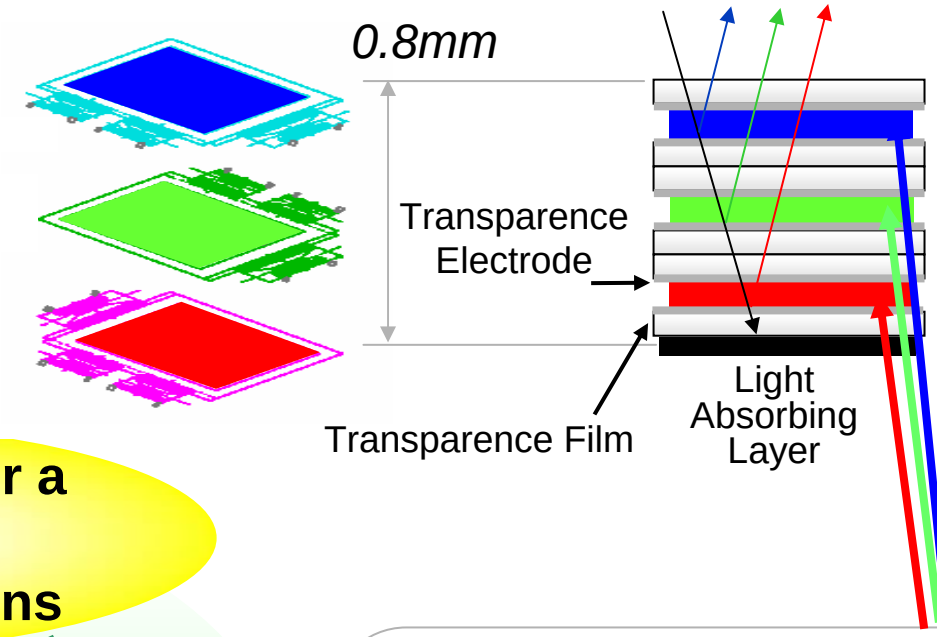
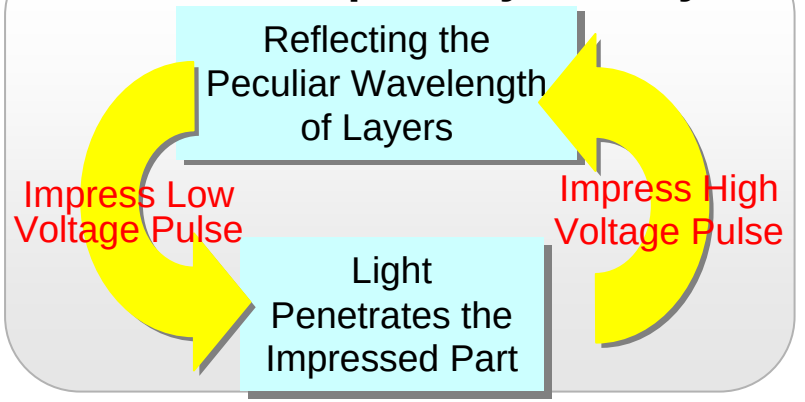
Environmentally & Human-friendly Display Takes the Place of Paper



Design Flexibility for a Wide Variety of Potential Applications

- **No Power Consumption** (Low power for Re-writing)
- **Thin**
- **Bendable**
- **Lightweight**

Cholesteric Liquid Crystal Layer

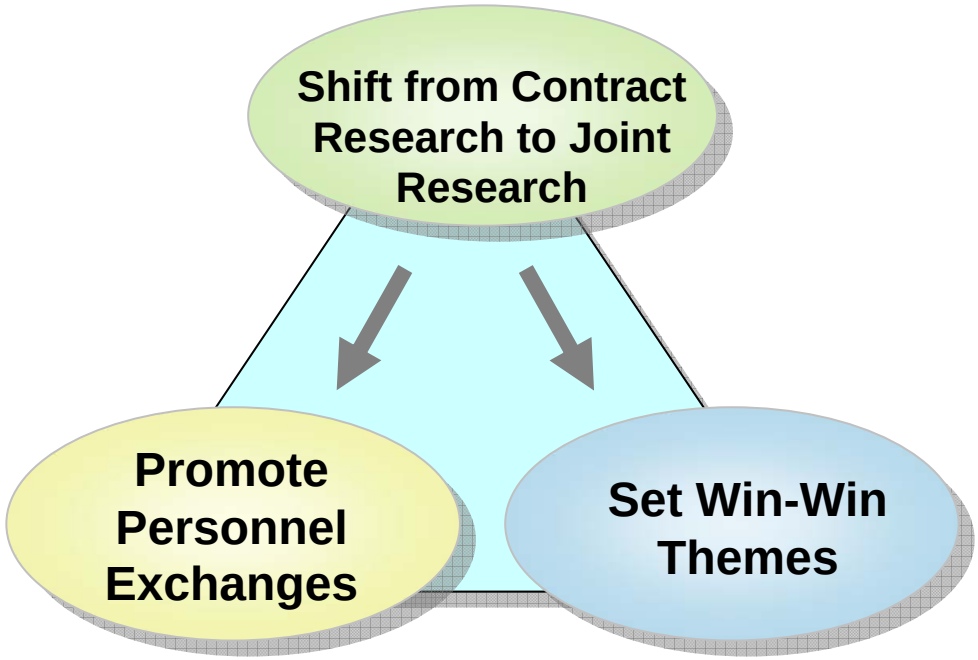


6. Collaborations with Academic Institutions

Leverage University Research - Mainly in New Research Areas

Japan Gov't Policy: Increased Budget to Promote Industry-Academic Collaboration

Strengthen Partner Relationships



Japan (Comprehensive Contracts)

- University of Tokyo
- Tokyo Institute of Technology
- Osaka University
- Kyushu University
- Waseda University, GITI/GITS

Overseas (Main Partners)

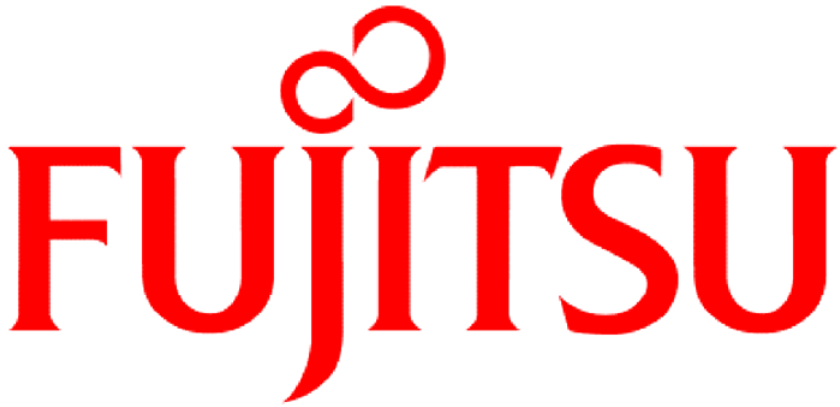
US
- Stanford University
- University of Maryland

Europe
- Heinrich Hertz Institute
- Munich University of Technology

China
- Peking University
- Shanghai Jiao Tong University

Australia
- (ANU, University of Wollongong)

- Example 1: Quantum Dot Lasers (University of Tokyo, Arakawa Lab)
- Example 2: 640Gbit/s Optical Signal Processing (Heinrich Hertz Institute)



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