FUJITSU THE POSSIBILITIES ARE INFINITE

Fujitsu's Challenges in Grid Computing

July 2003

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Fujitsu Laboratories Ltd.

Outline

- Fujitsu's Experience in Grid
- Fujitsu's Grid Strategy
- Fujitsu's Activity
  - Computational Grid
  - Data Grid
  - Access Grid
  - Utility Computing
- Conclusion

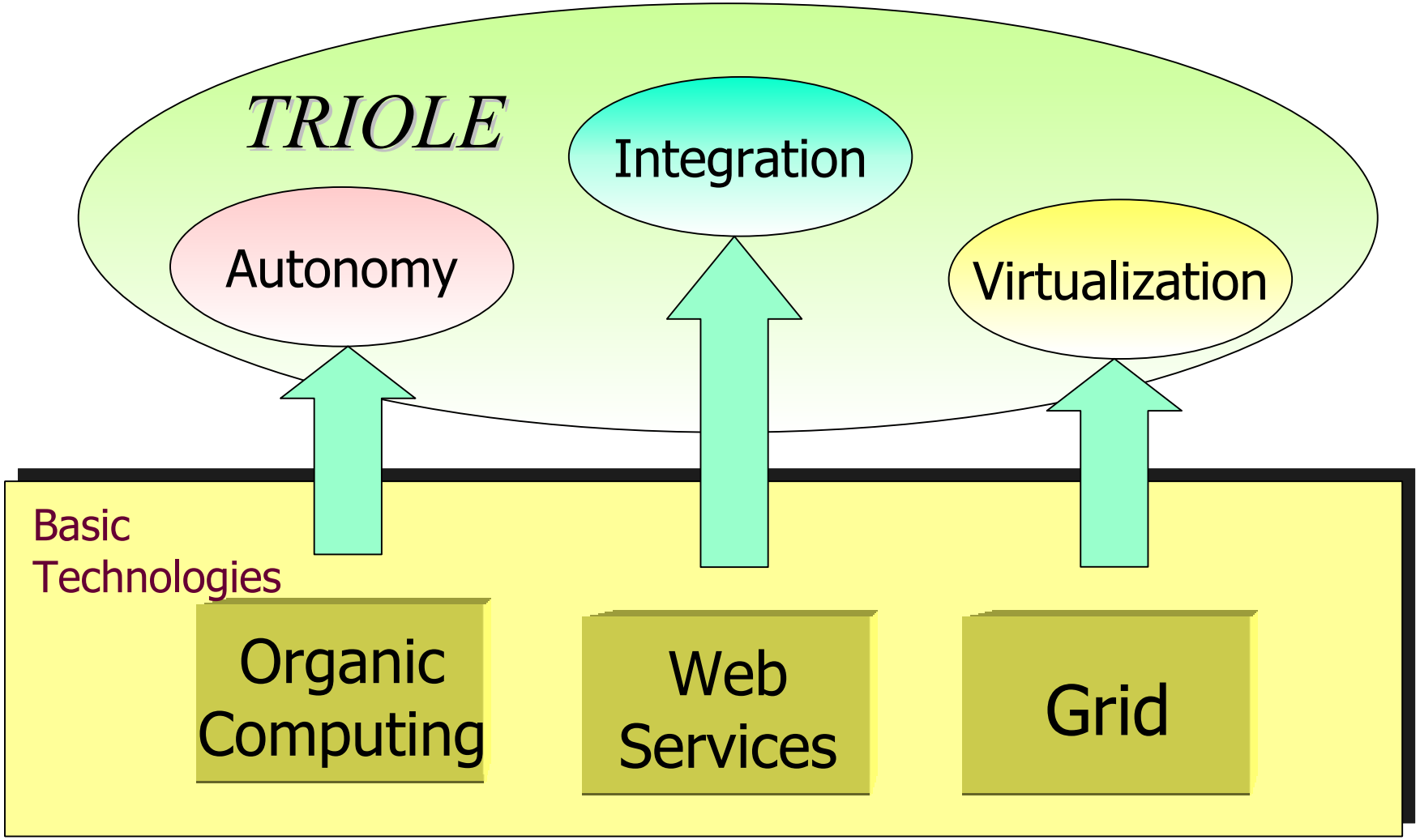
Fujitsu's Experience in Grid

- ITBL Project
  - *Basic software Development for Collaborative Research Environment*
- Super-SINET Project
  - *Construction of Grid Environments by Globus Toolkit on Super Computer VPP*
- VizGrid Project
  - *System Development for Virtual Reality Collaborative Research Environment*
- UNICORE Project
  - *Research and Development of Server side Software for Grid*
- NAREGI Project
  - *Started from April 2003, Contribution as key members*

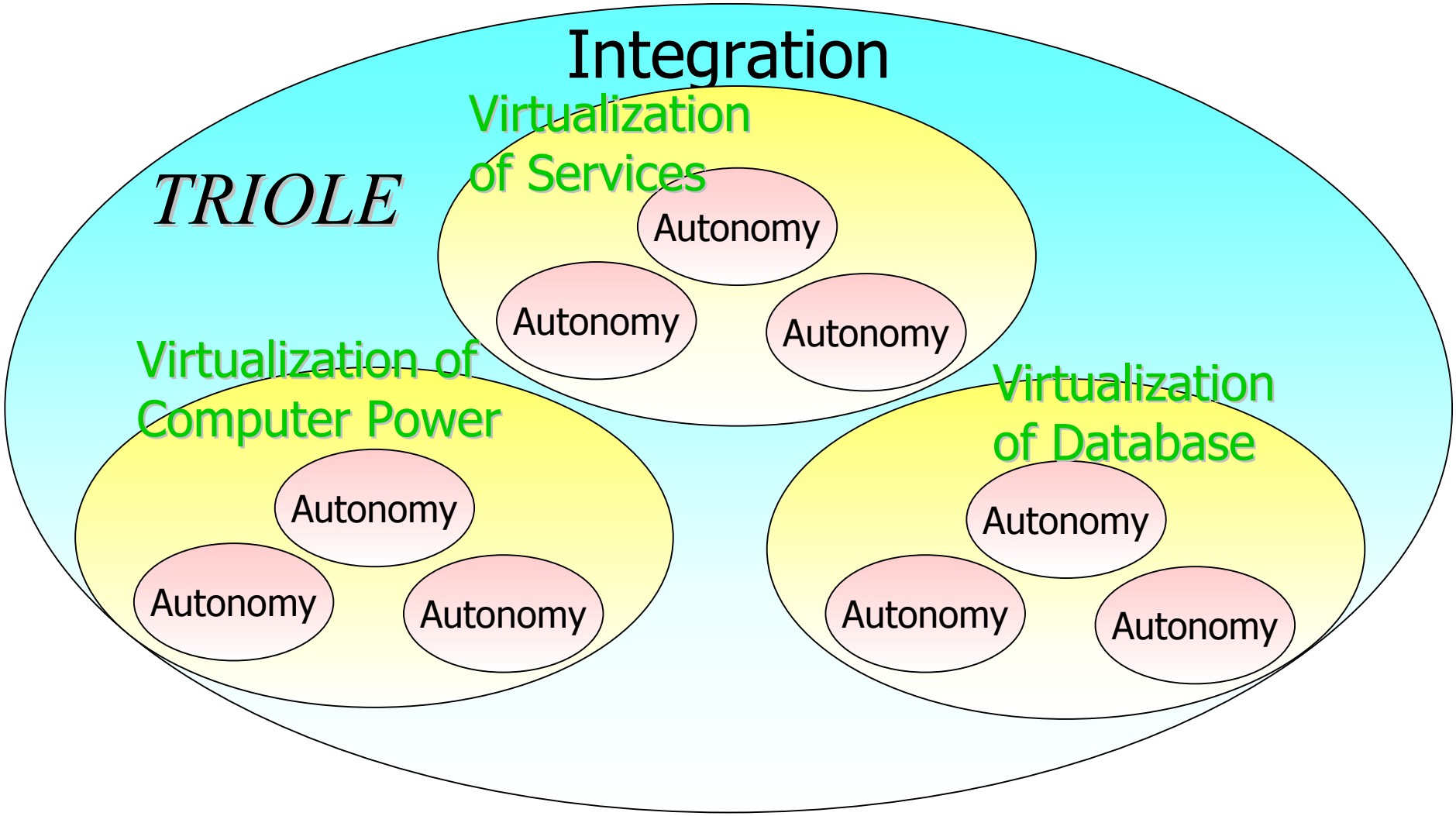
Issues for Grid Business

- How to create New Paradigm by integrating “Grid”, “Web Services” and “Organic Computing”
- How to establish Success Story by Grid not only in Scientific domain, but in Real Business

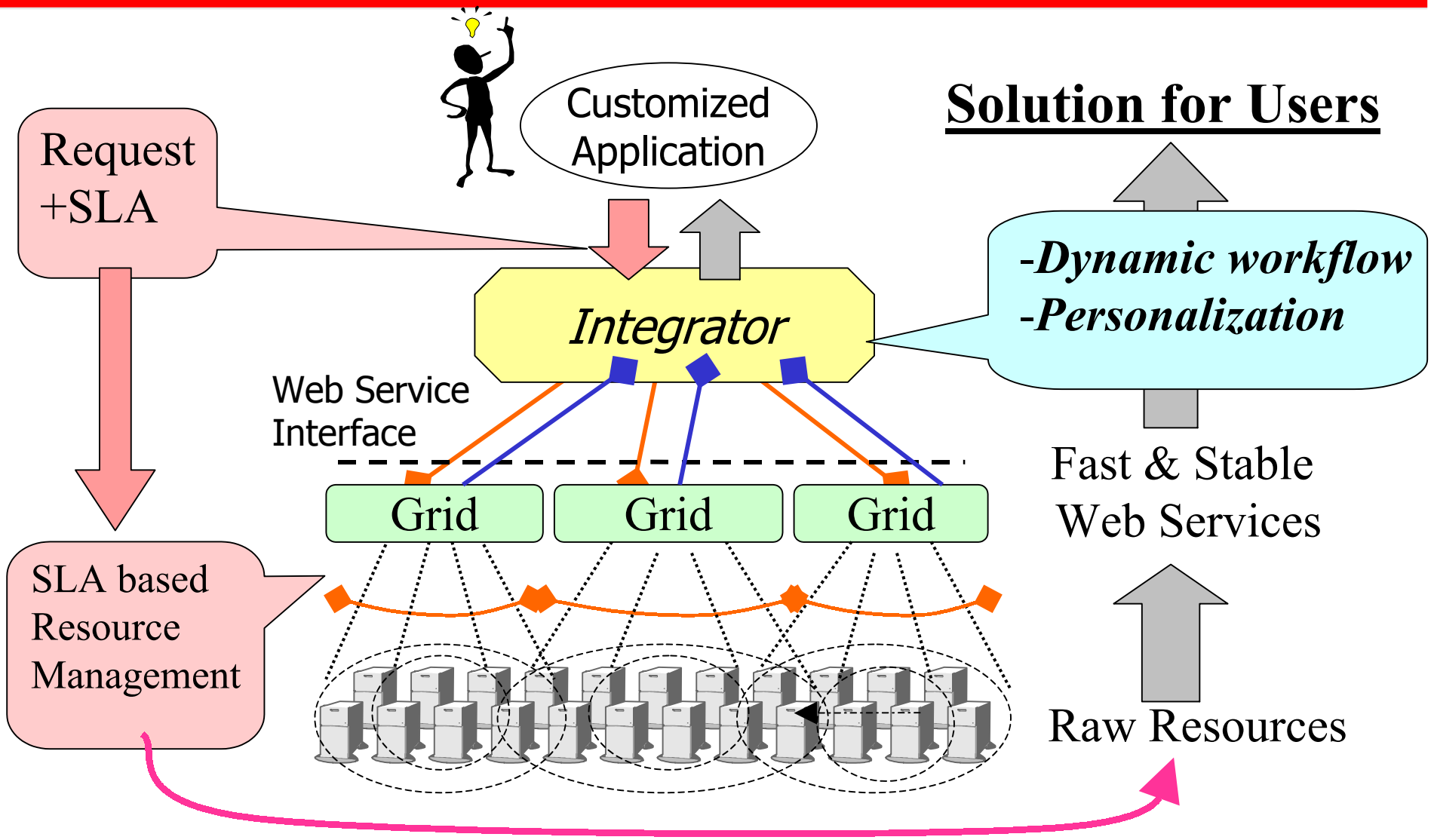
Fujitsu's Strategy to realize New Paradigm



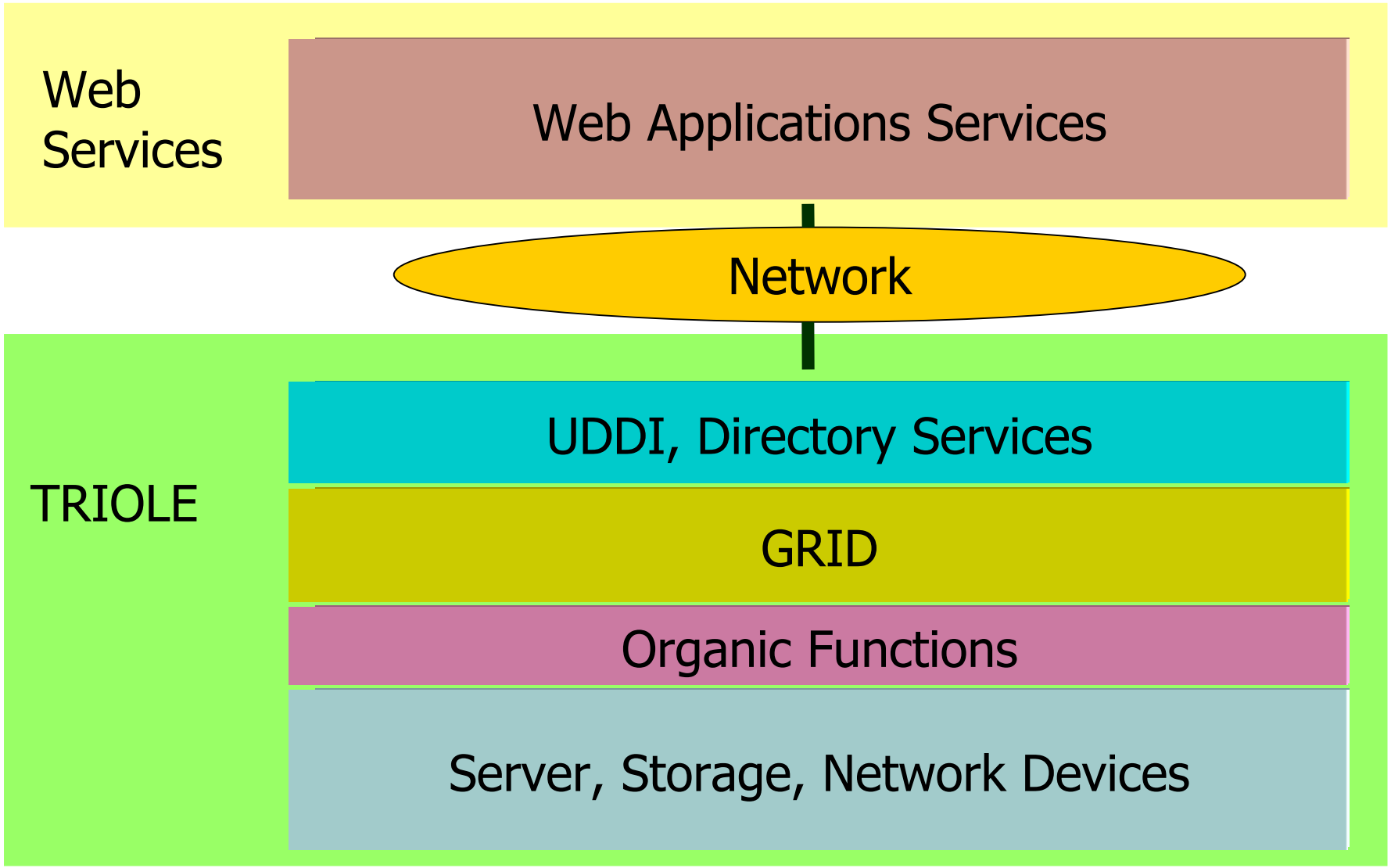
Relationship with “Autonomy”, “Virtualization” and “Integration”



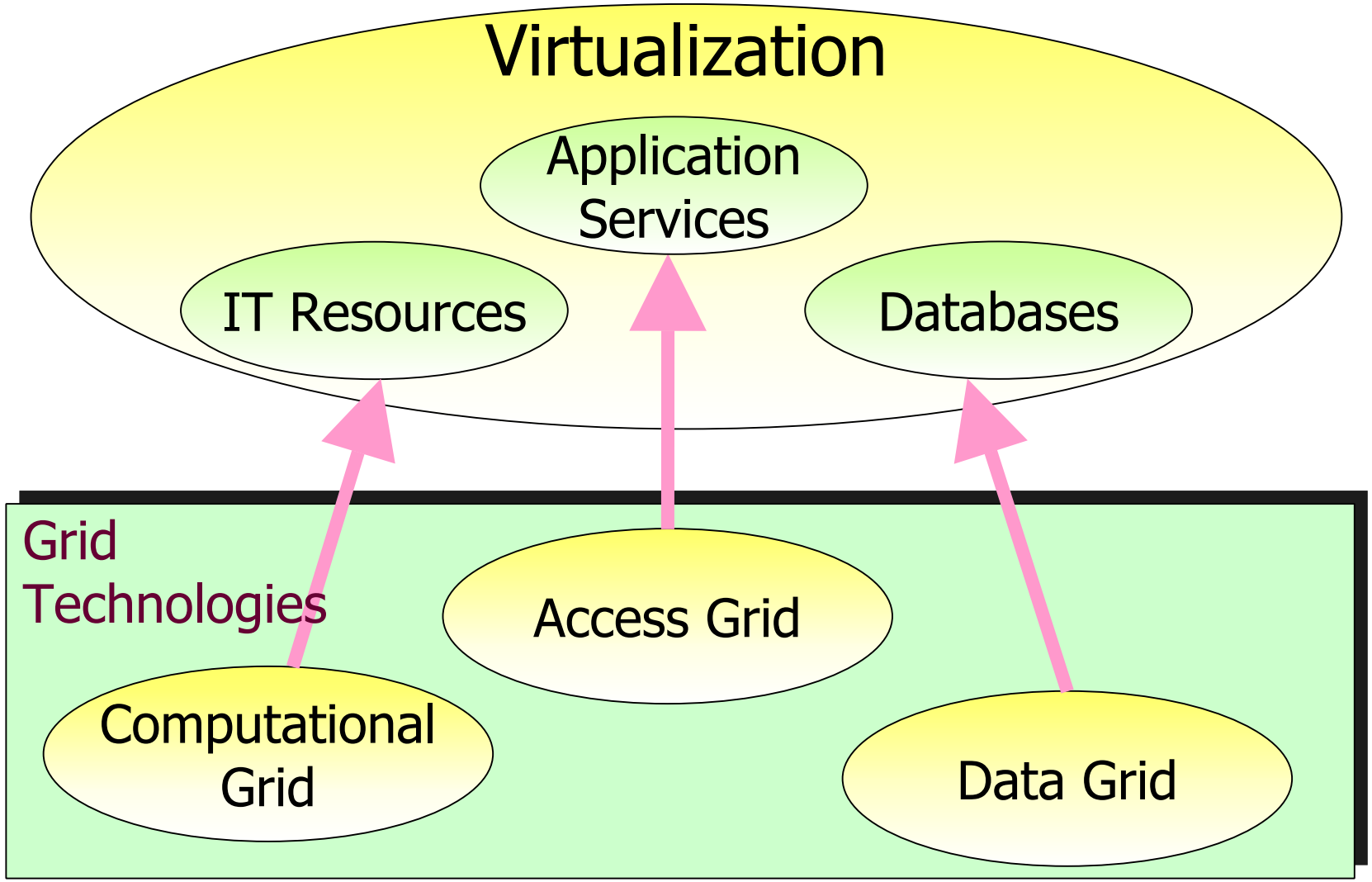
Web Services powered by Grid



Integrated Layer Structure



Strategy focusing on Grid



How to establish Success Story in Grid

Computational Grid

Focusing on Massive Computing

- Manufacturing industry
  - Many high quantity simulations to reduce TAT and to improve the quality of products
    - e.g.) LSI development, Crash Analysis, Electromagnetic Field Analysis
  - Aerospace, Auto industry, Electrical equipment manufacturer
- Financial business
  - A large quantity simulations
    - e.g.) Derivative, Risk management and etc..
  - Data processing under time restrictions
    - e.g.) Shortening a settlement-of-accounts period, Current price evaluation, Global risk management and etc..
- Distribution industry
  - Marketing strategy planning using data mining

Are Users Satisfied?

- Manufacturing industry
  - People manage compute resources by hands
  - Various scale of simulation

  -> Have to interrupt simulation due to time limit

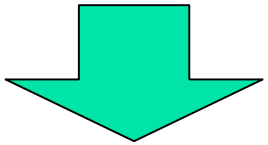
  -> Retrogression of development, Great losses caused by remake of LSI
- Financial business
  - 1 more figure of simulation accuracy

  -> Lost business chance
- Distribution industry
  - data mining

  -> Necessity of supercomputer

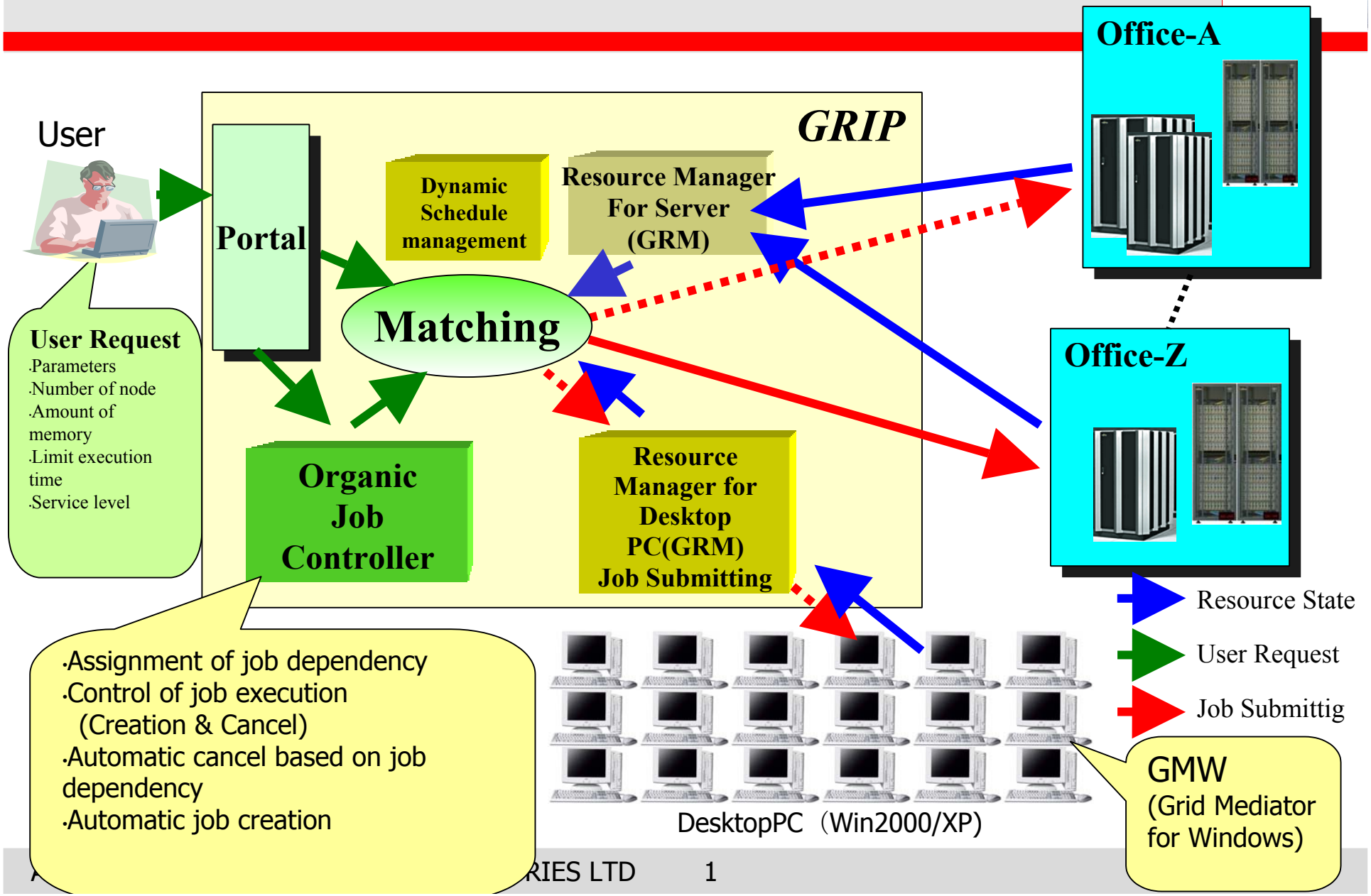
Problem Solving with Grid

- Do you use compute resource fully?
  - Usage of servers : Under 30%
  - Usage dispersion for each working group
  - Large remaining power leaves desktop PCs



How to get best efficiency of all compute resources in a enterprise!!

System Configuration of GRIP



Characteristics of GRIP

- Monitoring the state of all resources
- Matching most suitable resource for each job
- Organic Job Control
- Real time feed back of computing results

Field Trial of CAD-Grid

Phase-1 2003/2/21～
Job Admin.、Resource Management
(Prime Power,Organic Server, PC Cluster)
Phase-2 2003/5～
Join of Desktop PCs

Design Division

Web Browser
Command I/F

Corporate Product Engineering Group

CAD-Grid Portal

Program,
Data Transfer

Job
Submitt

Grid Middleware

Organic Job Controller

GRM
(Grid Resource Manager)

Management Tools

PCs in FUJITSU
(Phase-2 2003/5～)

GMW

fnet

Desktop PCs ～10k CPU
(Windows 2K,XP)

PC Cluster (Linux) 45CPU

Prime Power (Solaris) 16 CPU

IT Core LABS, IDC LAB.

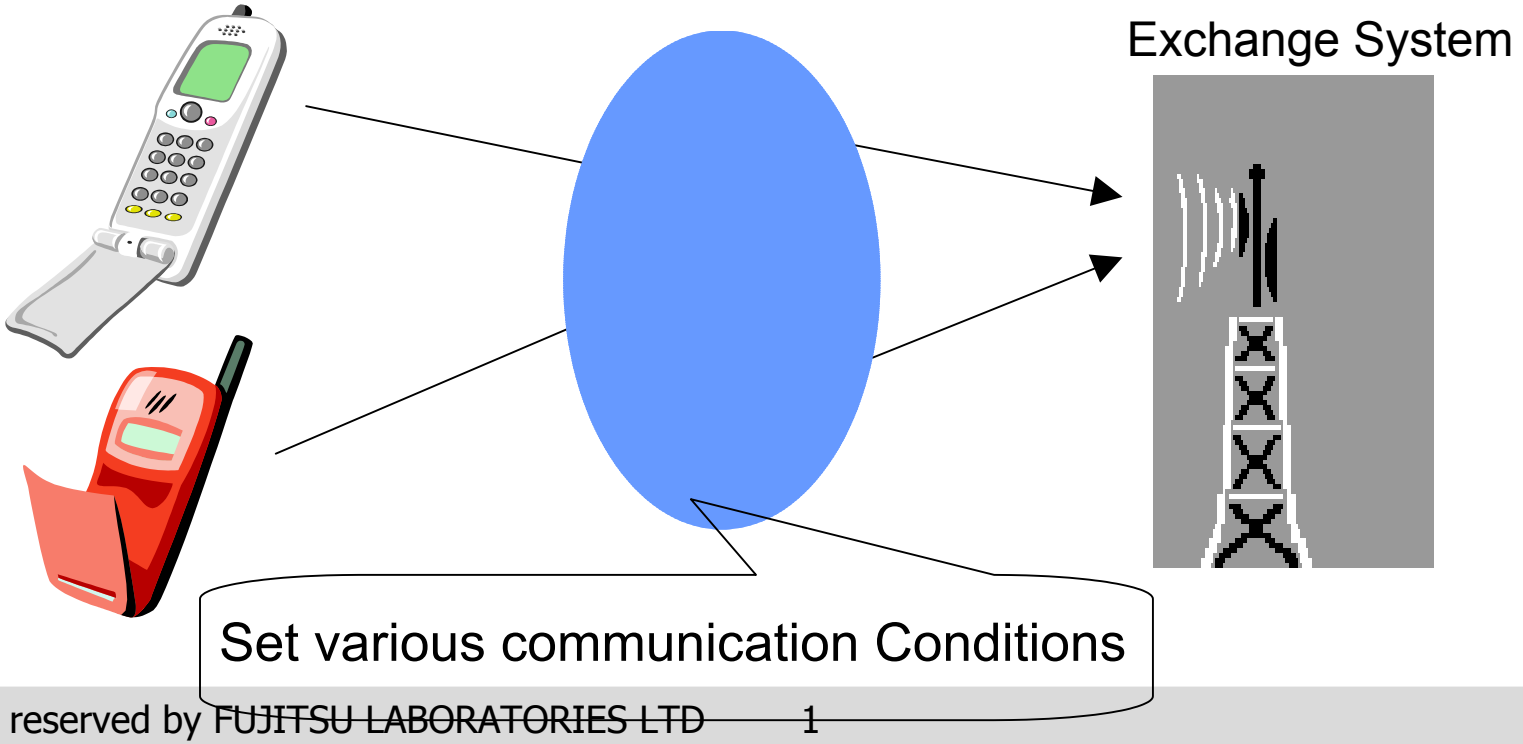
Prime Power (Solaris) 62CPU

Organic Server (Linux) 200CPU

Simulation Program for Field trial

-Target: W-CDMA Communication between Mobile Phone and Exchange System

-Purpose: To get the value of electric power (X-axis) when the error rate (Y-axis) becomes below than base value



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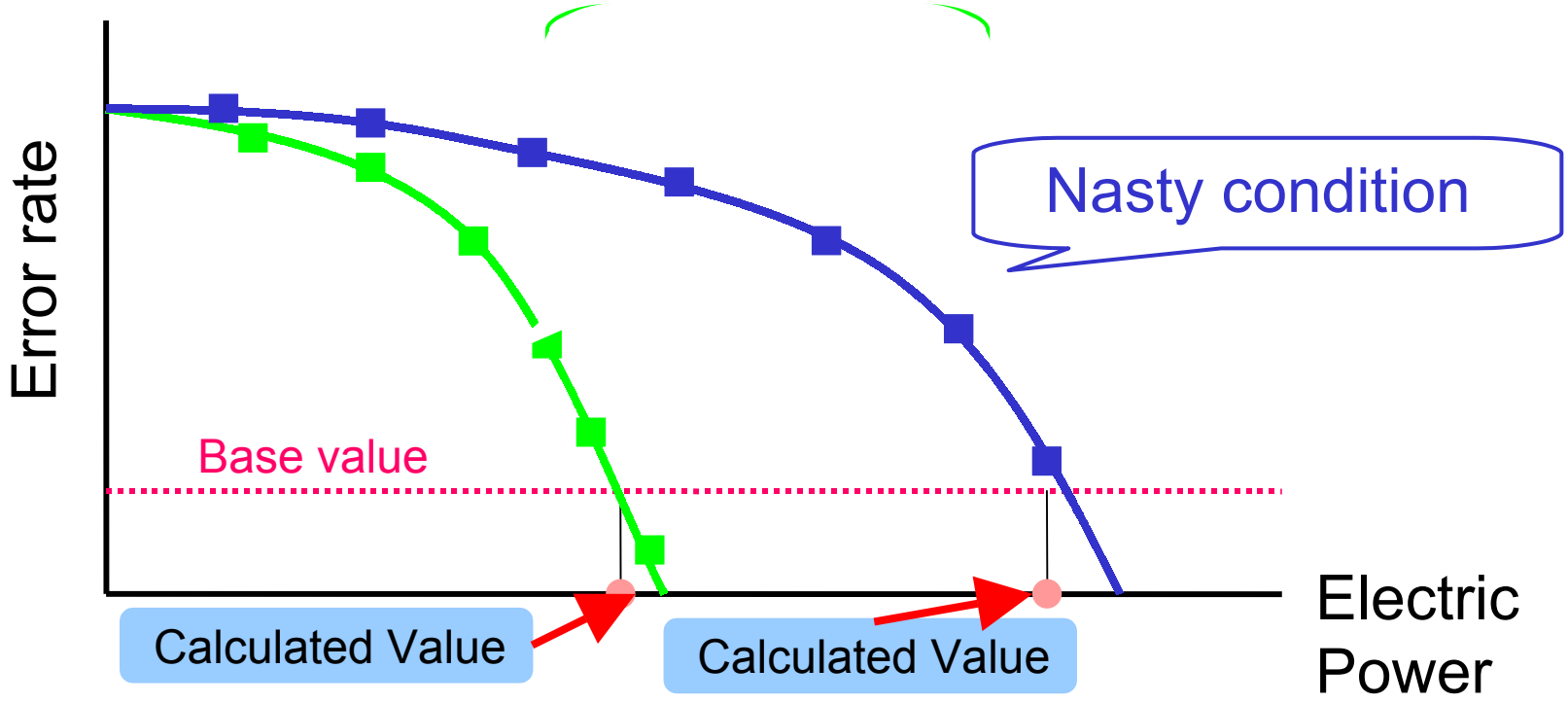
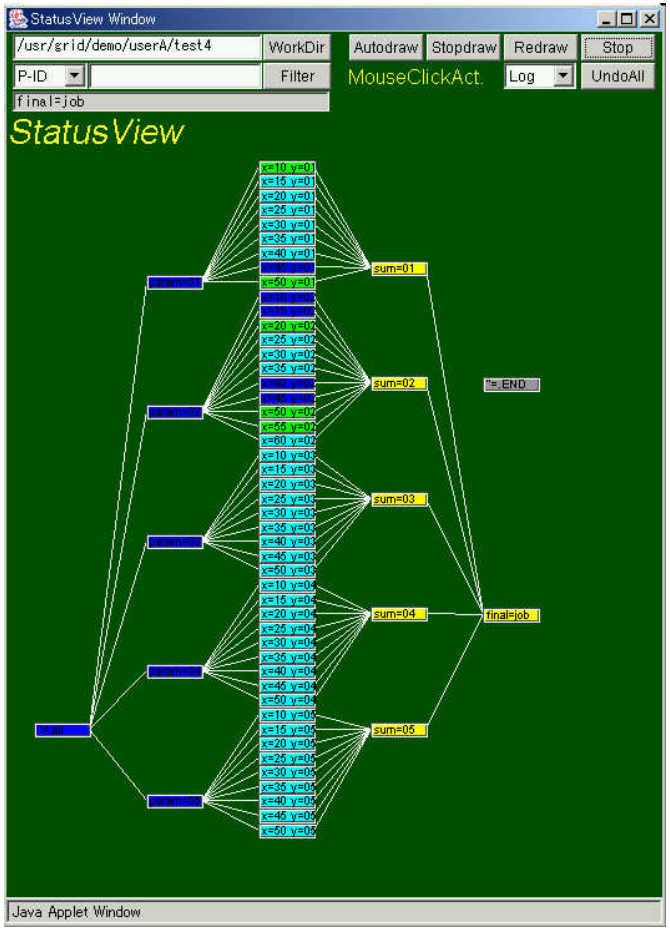
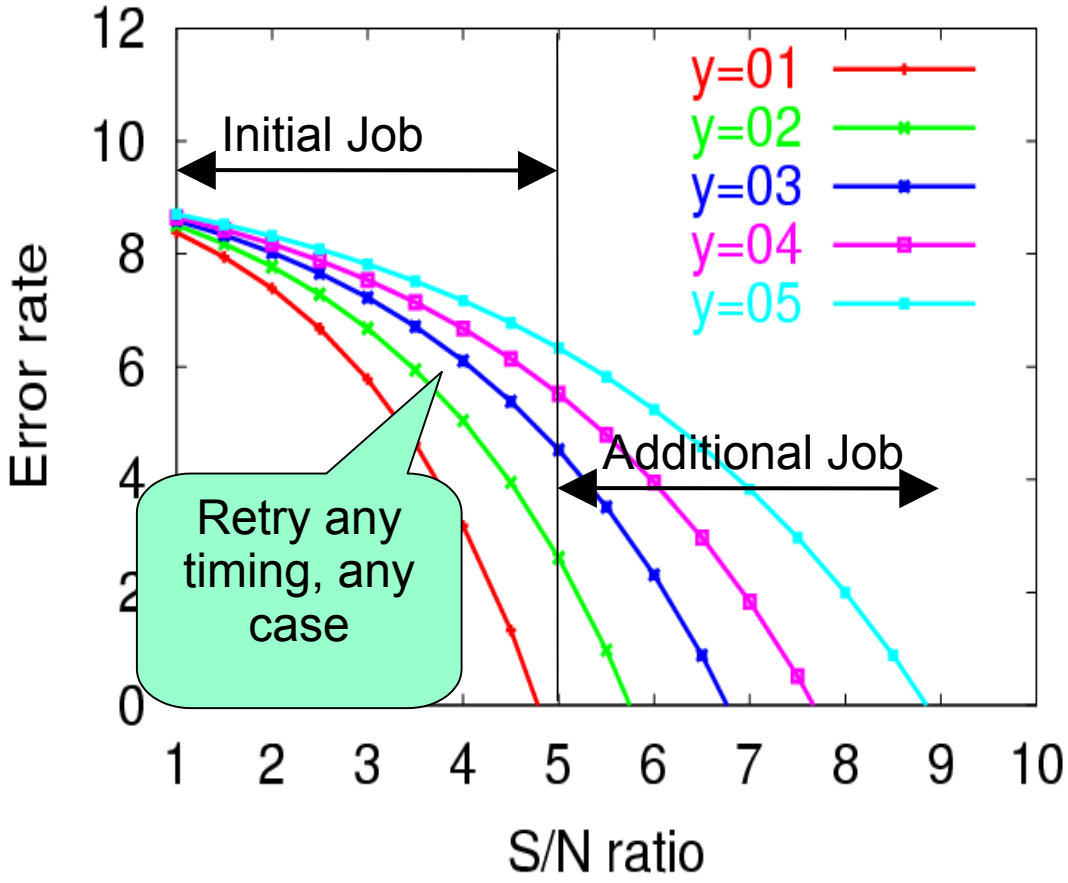


Organic Job Controller

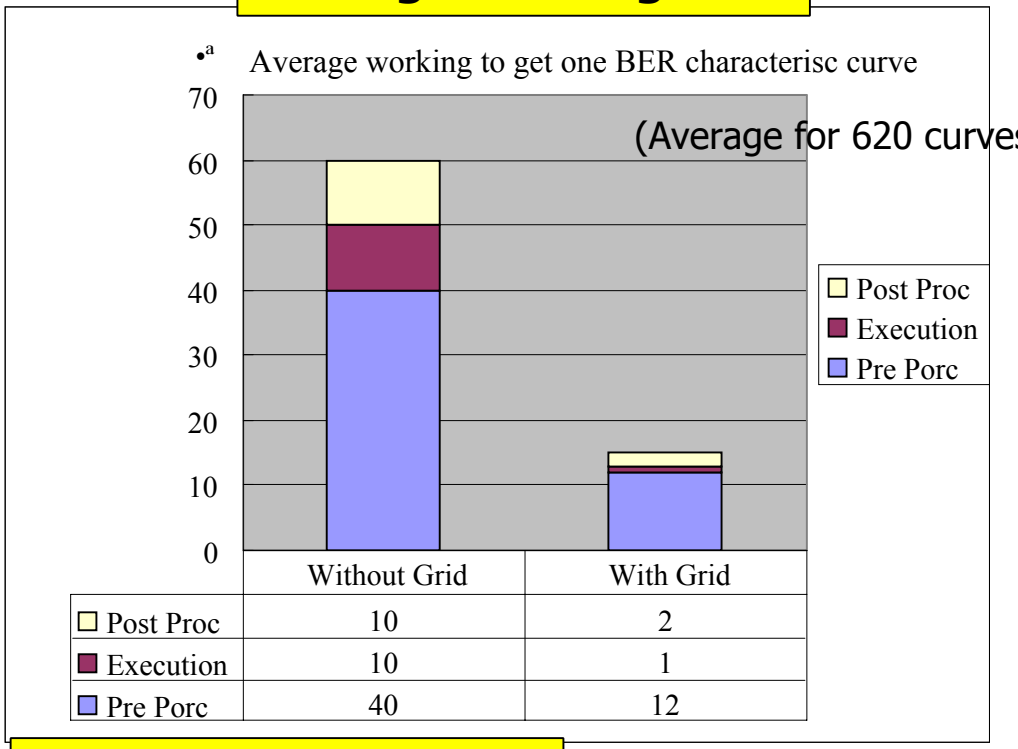
- Graph is automatically created from simulation





Results of Field Trial

Average working time



	Without Grid	With Grid
Post Proc	10	2
Execution	10	1
Pre Porc	40	12

Man-Power for Simulation

○**Former: 3.8 Man-Month**
(3 engineers x 1/2 x 2.5

○**After applying GRIP:**
0.8 Man-Months
(1 engineer x 1/3 x 2.5

Turn Around Time: 1/3
Man-Power:1/4

Number of executed job

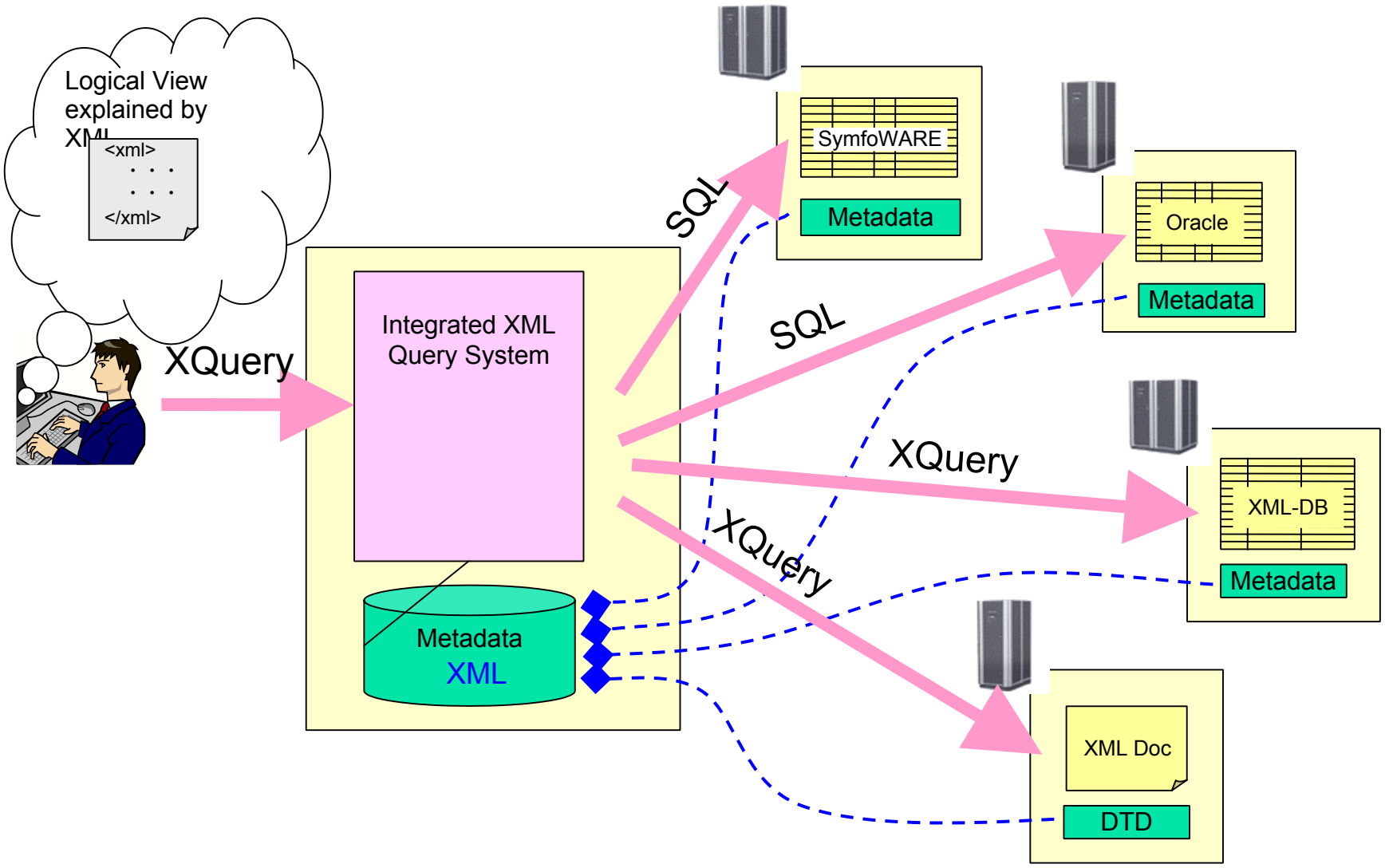
- Period: 2003/2/24 – 2003/4/30 （66Days）
- Number of job : 4,720 jobs
- Sum of Calculation Time : 31,000 Hours
(In usual environment, it takes 7 months)

Data Grid

Research Target of Data Grid

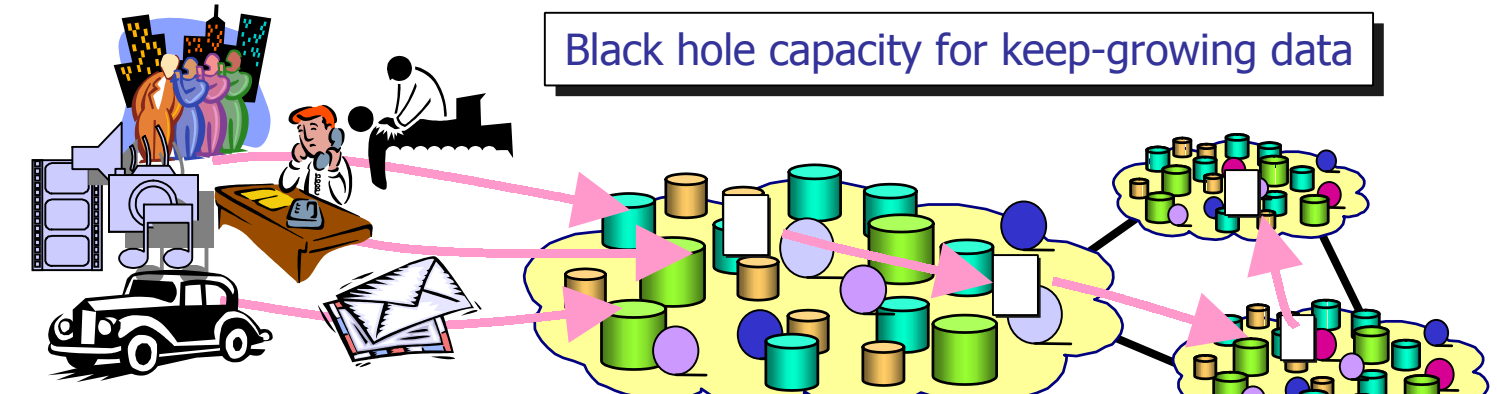
- Virtualization of Heterogeneous and Distributed Database Systems
- Realization of Data Migration

Basic Architecture of Data Grid



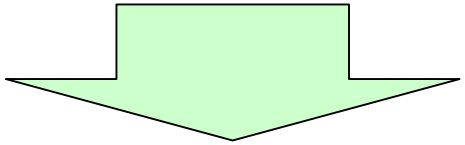
Data Migration
(Organic Storage System)

- A Storage System with Autonomy & Unlimited Scalability
  - Delivers Disk Volume Image over IP Network
  - Autonomic Module Architecture Enables Unlimited Scalability, and Parallel Data Transfer between Modules Accelerates Volume Duplication and Migration



Access Grid

- Virtualization of IT Resources for users
- Process Integration

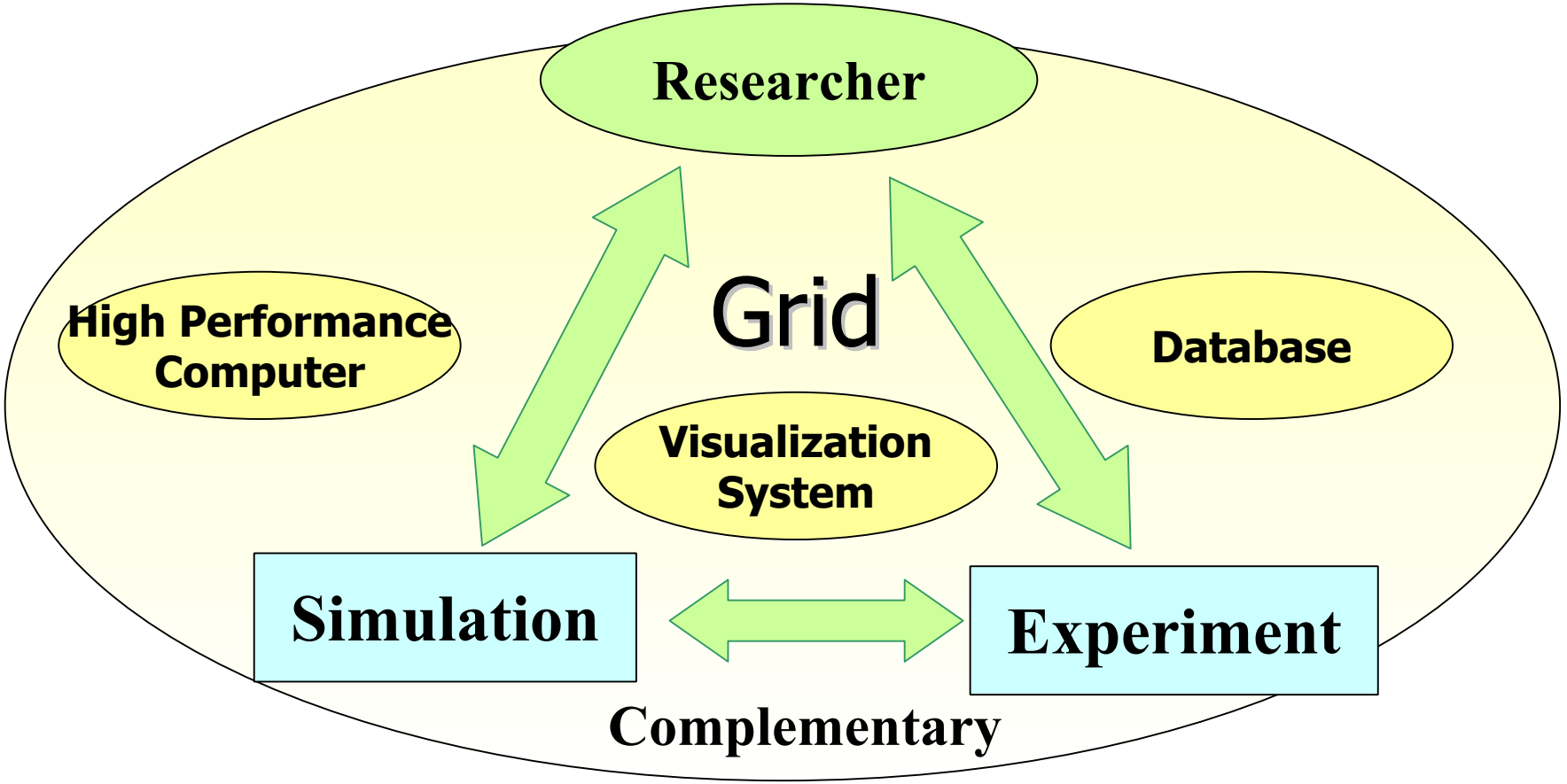


PIV Virtual Laboratory using Grid Technology

(Collaborative Research with Kanazawa University)

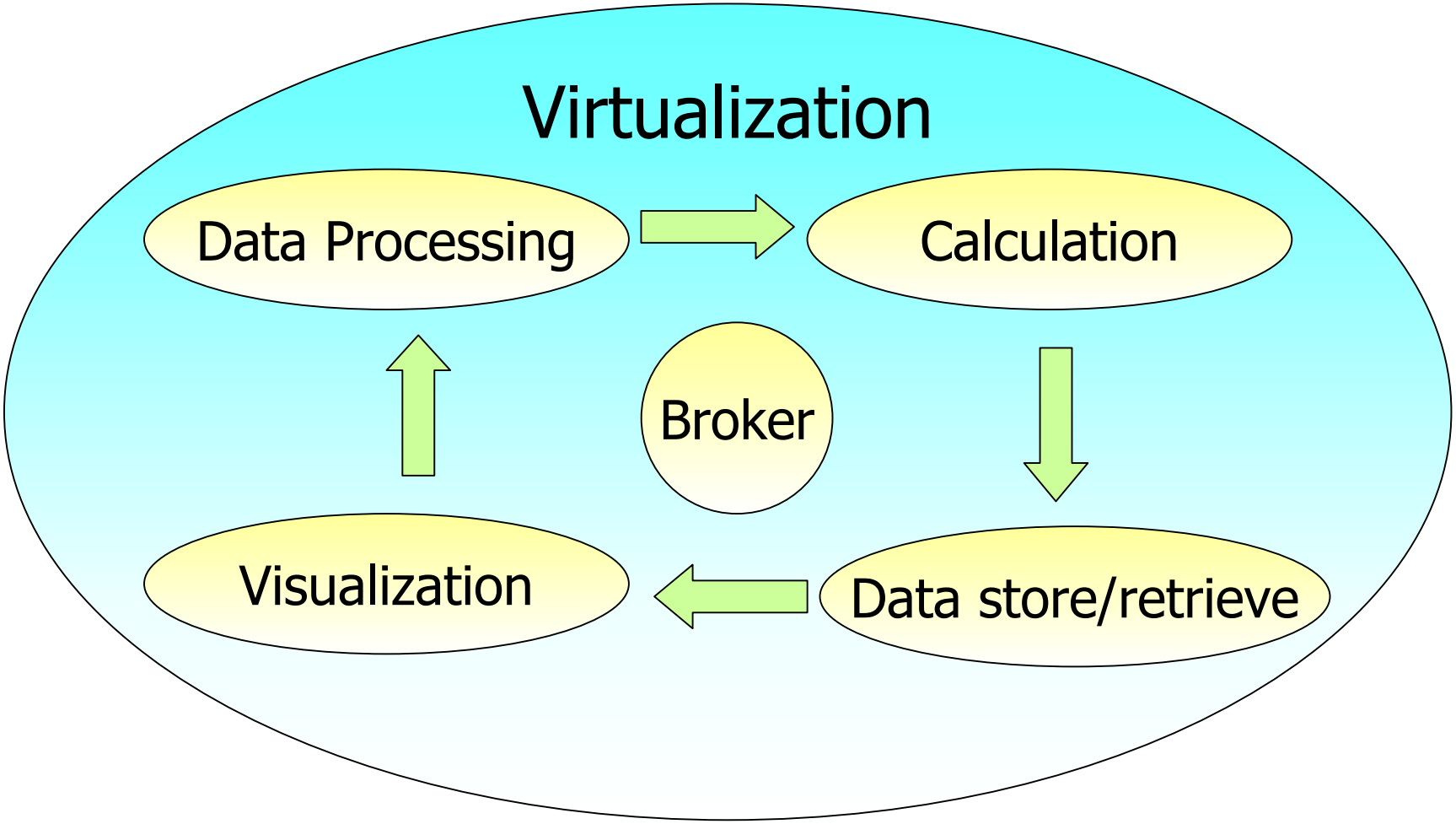
PIV: Particle Image Velocimetry

Establishment of Collaborative Research Environment



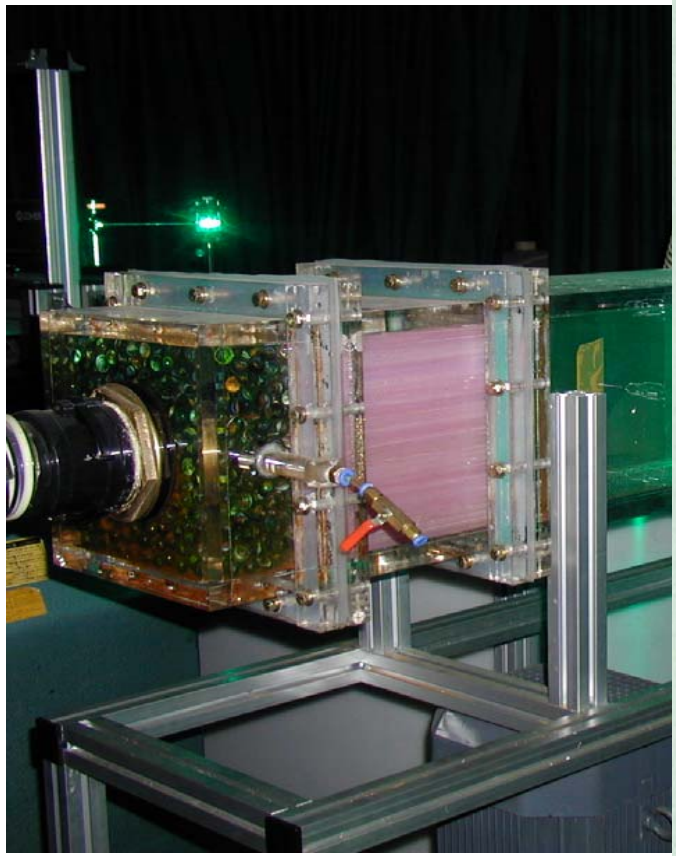
To Realize Collaborative Research Environment for Experiments and Simulations

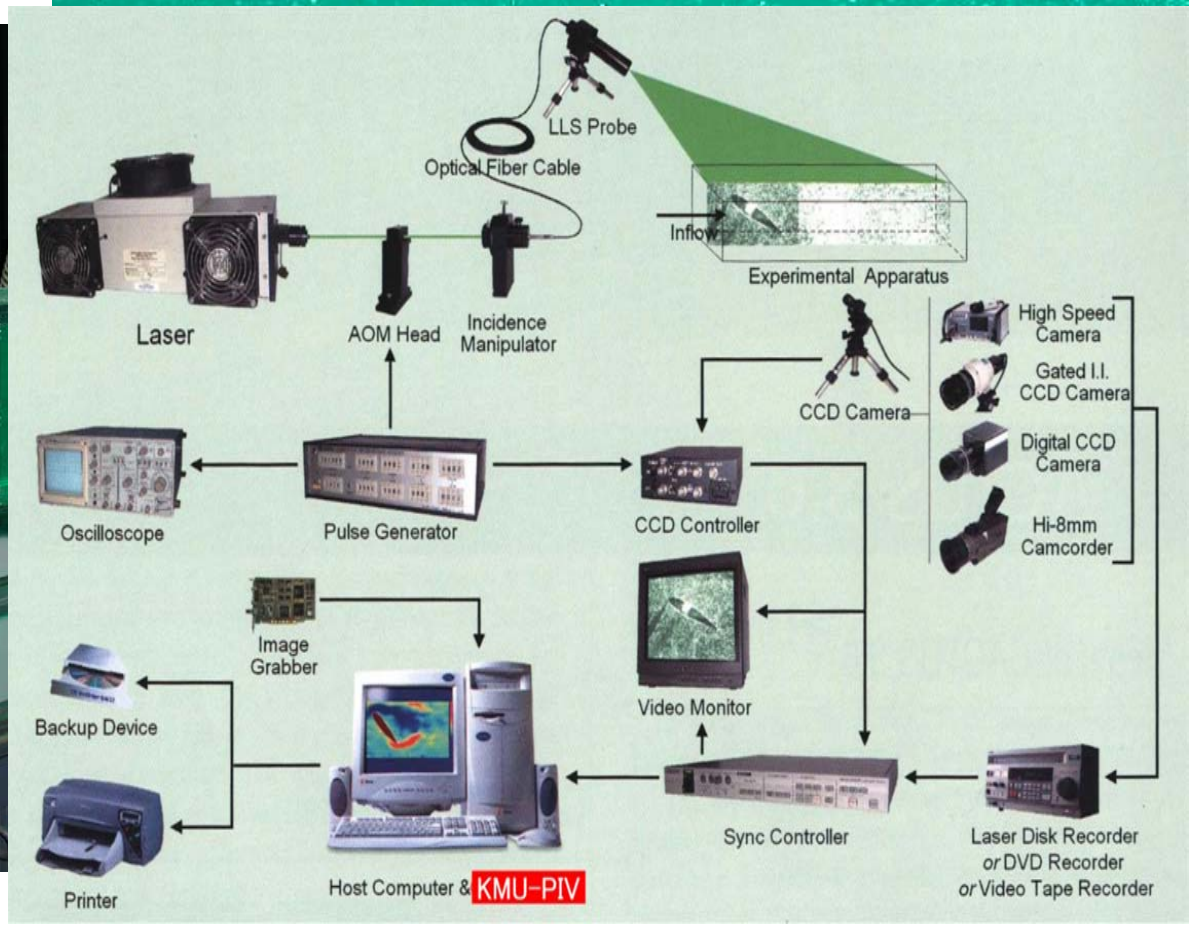
Process Integration



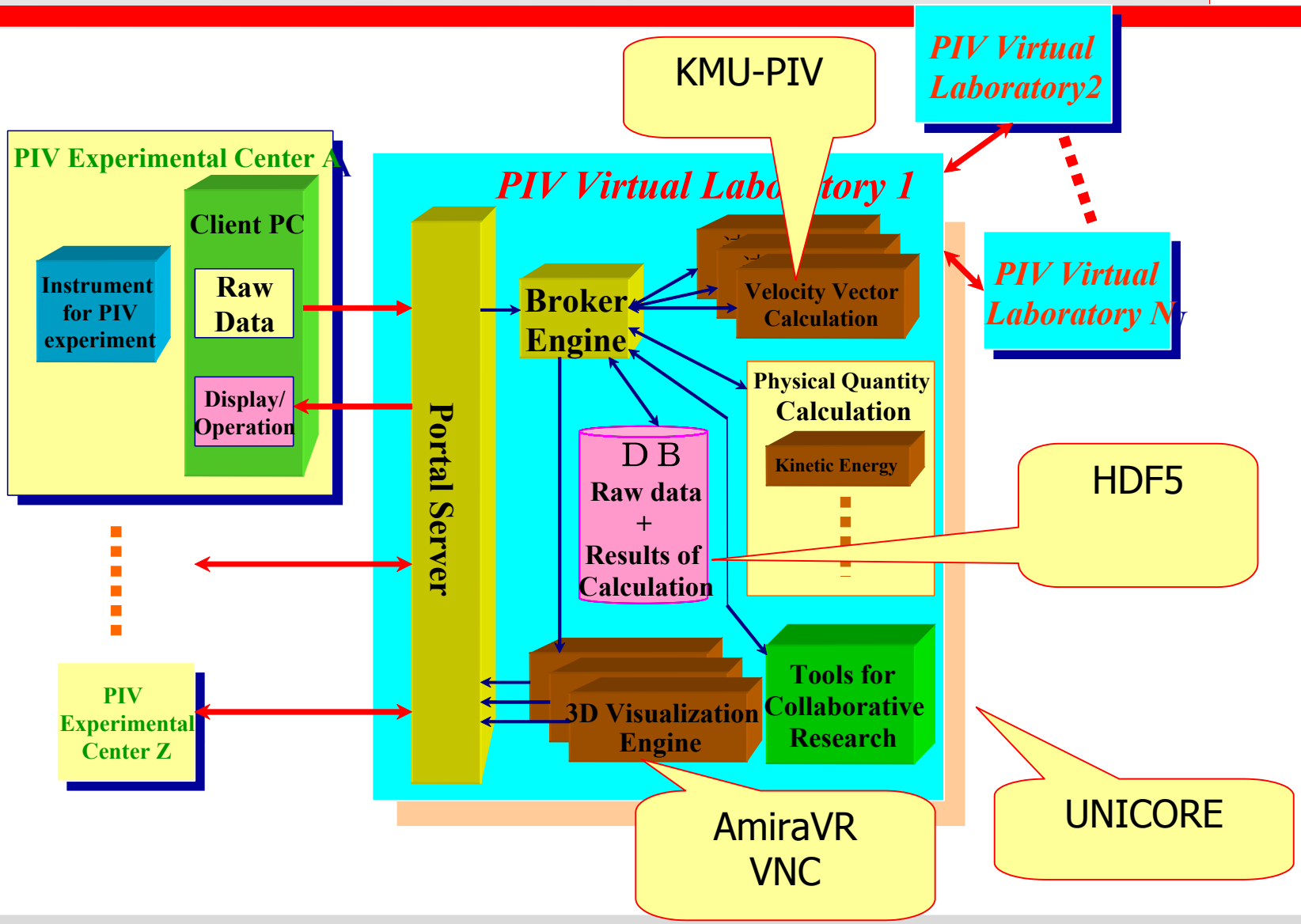
KMU-PIV System

Particle Image Velocimetry (PIV) developed by Korea Maritime Un

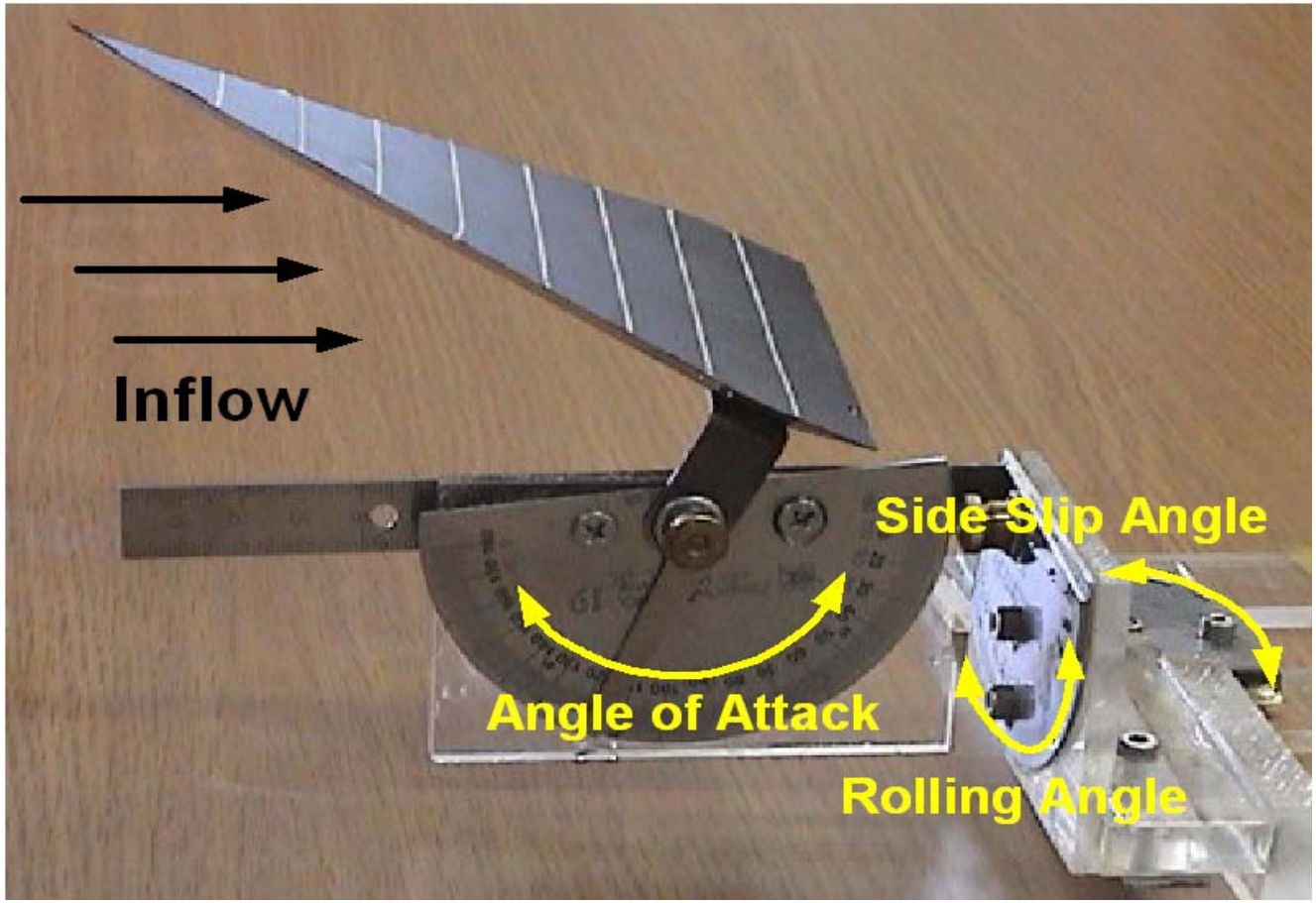




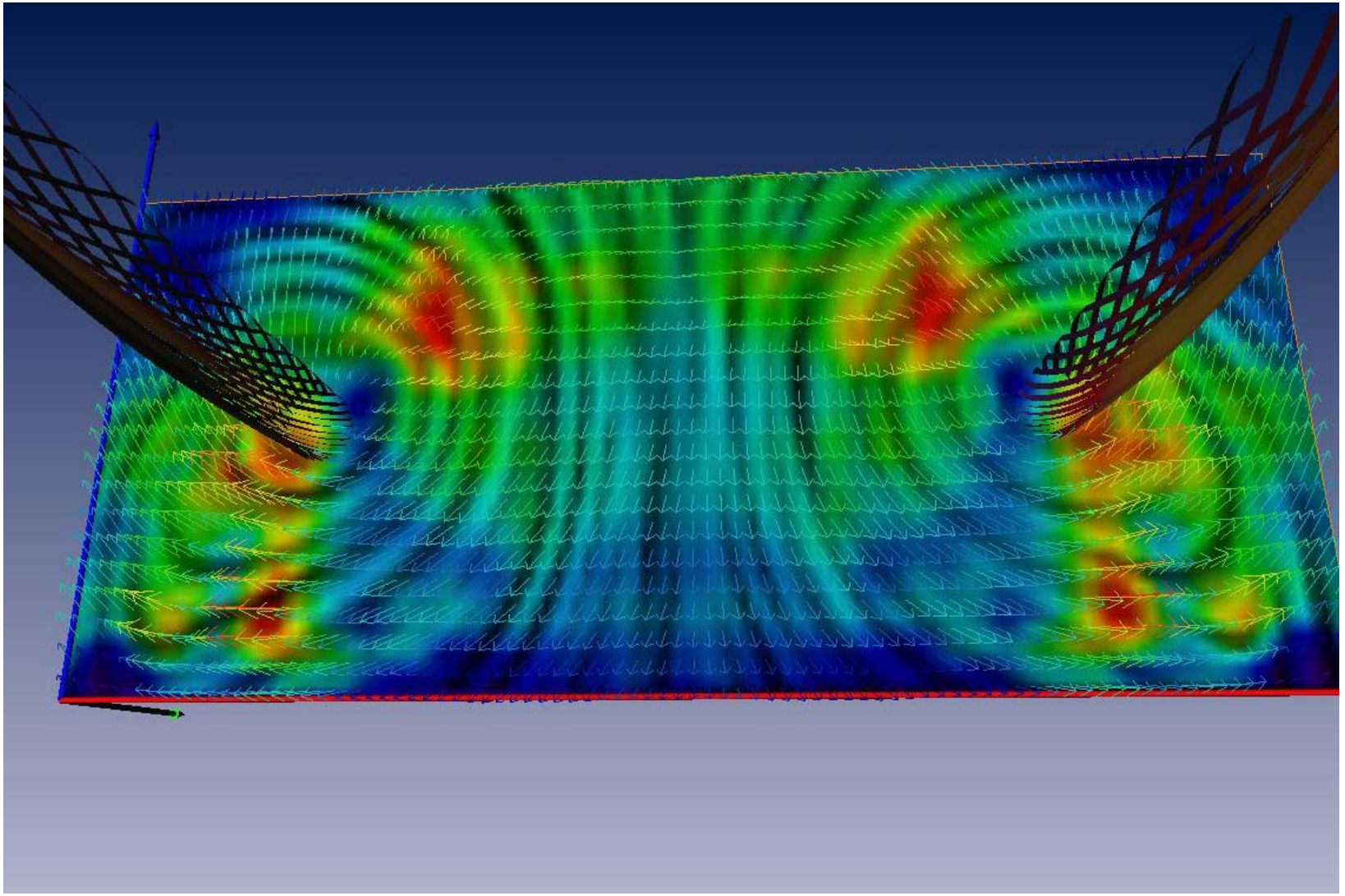
Architecture of PIV Virtual Laboratory



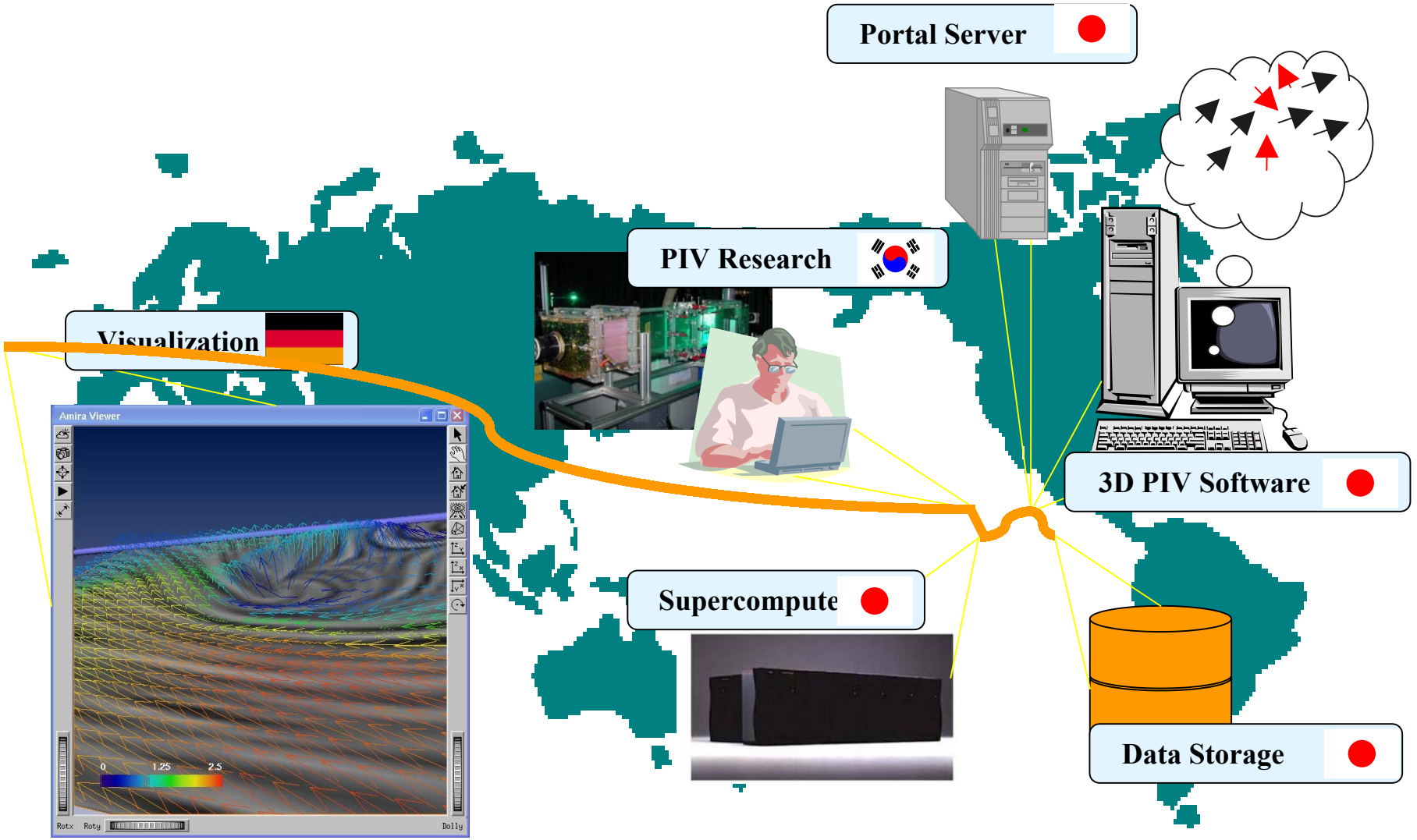
Experimental Data (Obstacle)



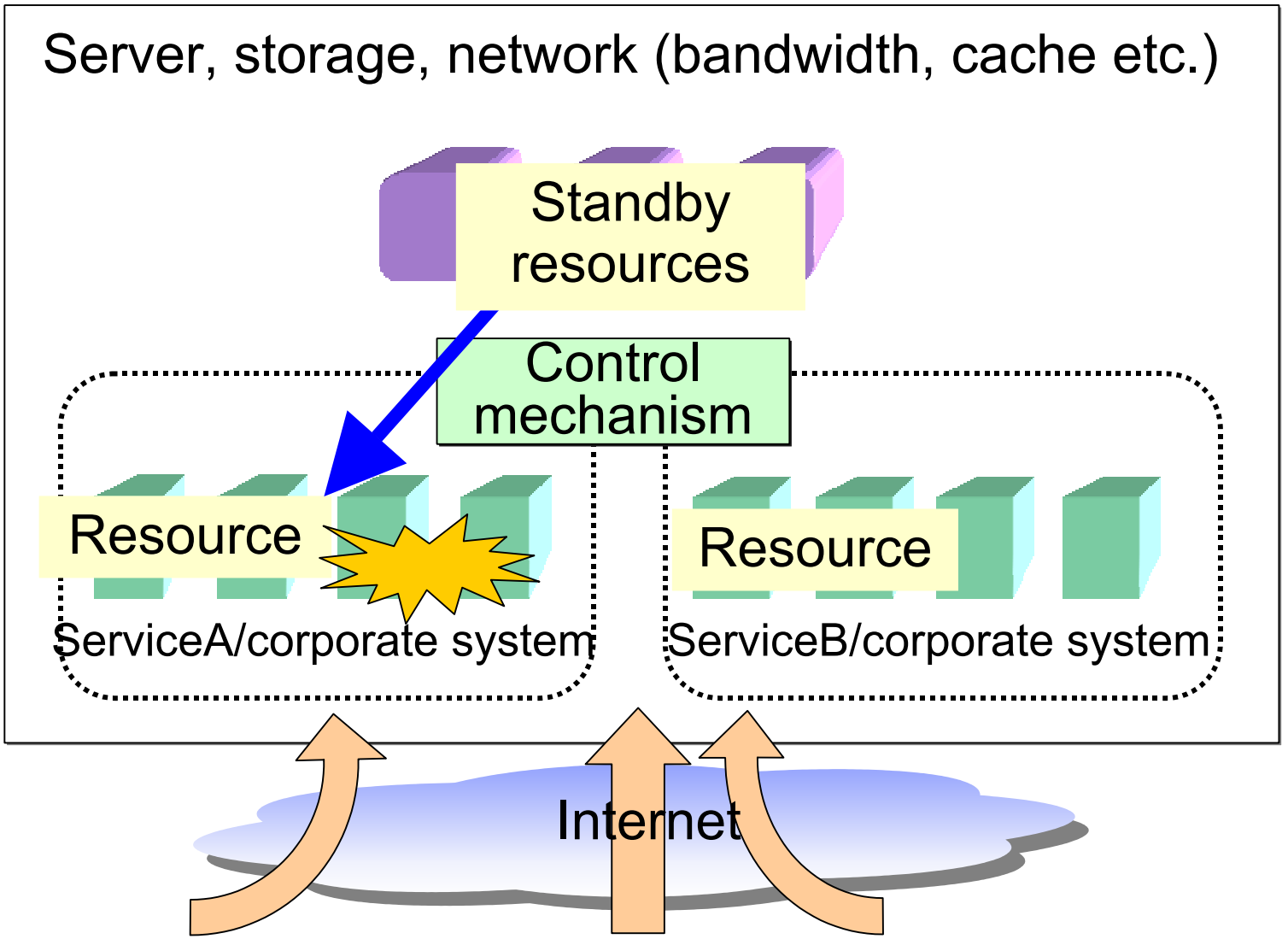
Demonstration by Amira



Collaboration Plan of PIV Research transcending National Barriers in Summer, 2003

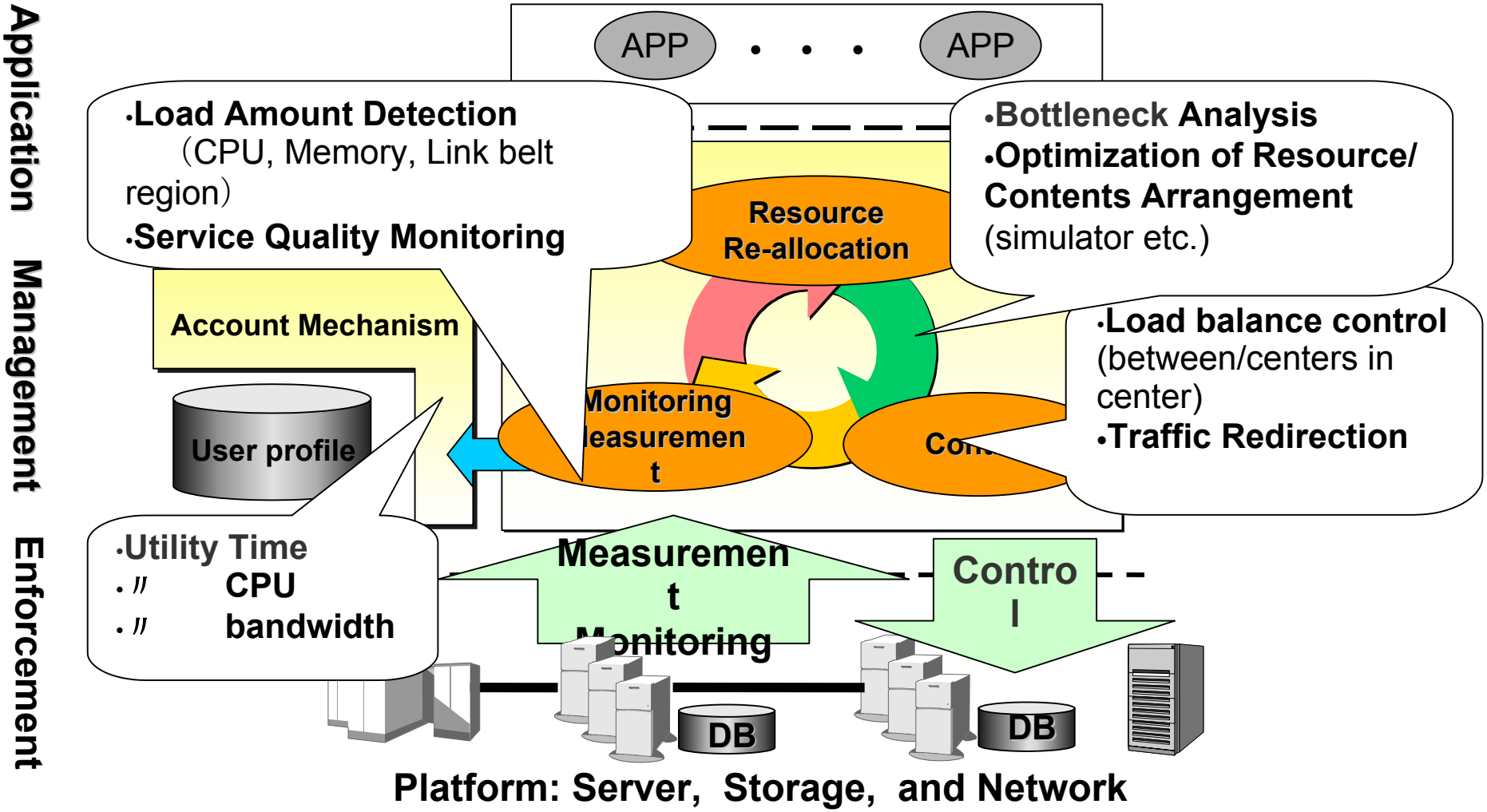


Utility Computing (Concept Idea)



Utility Computing (Accounting)

- **Dynamic resource allocation/control according to load status.**
- **Various account control according to amount of use of resource.**



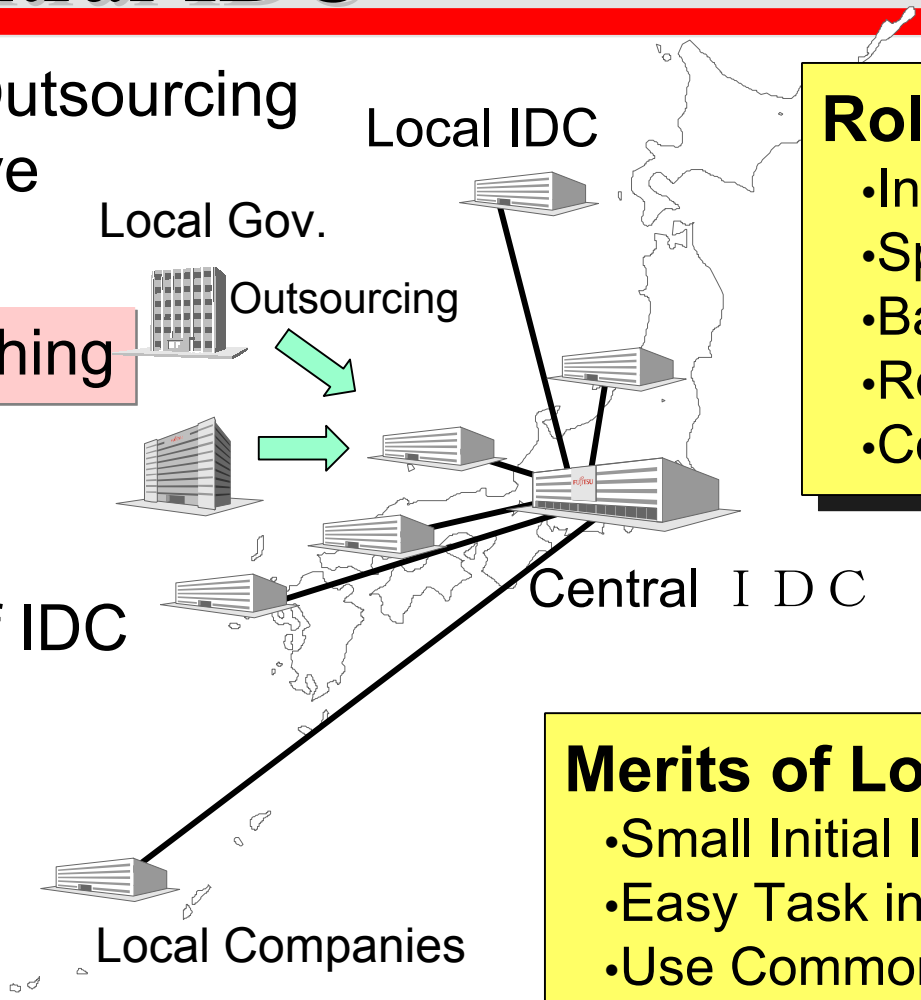
Linkage among Local IDC and Central IDC

- Deployment of Outsourcing
- e-JAPAN Initiative

Local IDC Launching

- Small Start
- Keep the level of IDC

Linkage among Local IDC and Central IDC



Role of Central
- Integrated Mgt.
- Spare Resource
- Backup (Power, Net)
- Remote Operation
- Common ASP

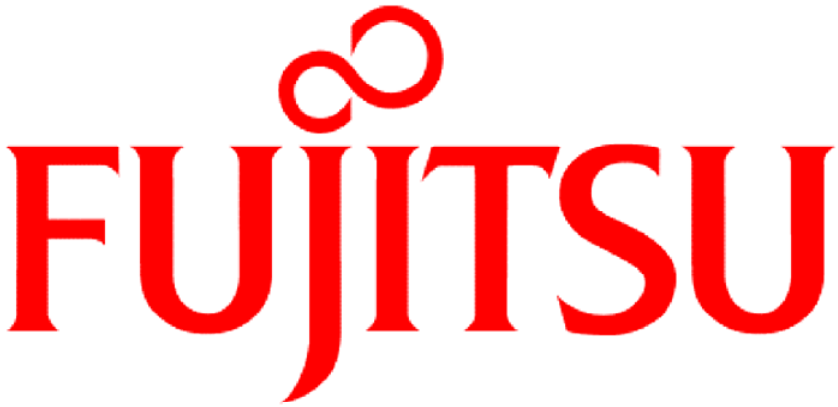
Merits of Local IDC
- Small Initial Investment
- Easy Task in emergency
- Use Common ASP
- Additional Invest. on-demand
- Cut of Running Cost

Conclusion

Web Services powered by

GRID computing + TRIOLE

(Organic Computing)



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