Fujitsu North America Technology Forum 2016

February 16, 2016

"Enabling Digital: Business Transformation through Human-Centric Innovation"
Digital Business Transformation for Human-Centric Innovation: Hyperconnected Cloud

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CEO and Representative Director
Fujitsu Laboratories Ltd.
Fujitsu Laboratories Group: Introduction
Fujitsu Laboratories Group: Mission

- Technologies to drive growth of the Fujitsu Group

- Growth Markets
- New Domains
- New Technologies
Fujitsu Laboratories Group: Overview

- **CEO and Representative Director:** Dr. Hideyuki Saso
- **Capital:** 5 billion JPY
- **R&D Budget:** Approx. 30 billion JPY
- **Total Employees:** Approx. 1,500 worldwide

*"$=\120: the approximate closing rate on March 31, 2015. FY 2014 is fiscal year ended March 31, 2015."*
Fujitsu Laboratories: R&D Strategy Structure

Fujitsu Technology and Service Vision

R&D Vision and Strategy

Applied Innovation Research

Commercialization R&D

Advanced Research

Leading-Edge Basic Research

ICT Megatrends

- Computer Architecture
- Network Architecture
- Cognitive Computing
- Social Science
- Physical and Chemical

Natural Disaster Mitigation
Environment
Social Infrastructure
Energy
Transportation/Logistics
Healthcare
Agriculture
Education
Fujitsu Laboratories Group: Global Collaboration

- 11 Countries, 51 Projects

- Off-shore research leveraging exceptional researchers
- Discovering regional technology trends
- Technology dissemination to raise global presence
- “Act local” activities targeting discovery of new businesses
Evolution of ICT
Digital Business Platforms: Stage of the Next Growth

Drivers
Innovators
Applied Domains
Technologies


ICT Vendors

Enterprise Users

ICT Users

ISD

CIO

CEO

Individuals

New Value Creation

Management /
Growth Strategy

Digital
Business
Platforms

MIS

DSS

BPR

Open Architecture

Internet Services

EDS

Innovators

Applied
Domains

Technologies

Drivers

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ICT Vendors

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Innovators

Applied
Domains

Technologies

Drivers

Innovators

Applied Domains

Technologies

A multitude of “things” are connected with the Internet

- 3.5 billion sets of smart devices [IPv6 : $10^{36}$] (-2018)
- Over 2 billion M2M connections (-2018)
- 1 trillion sensors (-2023)
From server consolidation-based usage, to amoeba-like cloud connections.
Full advent of Artificial Intelligence (AI)

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>AI term coined (Dartmouth conference) ['56]</td>
</tr>
<tr>
<td>1960</td>
<td>ELIZA language processing program developed</td>
</tr>
<tr>
<td>1970</td>
<td>Expert System Expert Incompetence Agent System Turing Machine</td>
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<tr>
<td>1980</td>
<td>AI’s failures (Lighthill report) ['73]</td>
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<tr>
<td>1990</td>
<td>Massive AI Project established (Japan ICOT ['82], U.S. MCC ['83], U.K. Alvey ['84])</td>
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<tr>
<td>2000</td>
<td>DEC R1 ['82]</td>
</tr>
<tr>
<td>2010</td>
<td>Deep Blue victory ['97]</td>
</tr>
<tr>
<td>2020</td>
<td>Watson Victory ['11]</td>
</tr>
</tbody>
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**AI: 1st major wave**
- Era: Search and Deductive Inference

**AI: 2nd major wave**
- Era: Knowledge Acquisition

**AI: 3rd major wave**
- Era: Machine learning

**Computing Power**
- Cray-1 160 MFlops
- VP-400 1 GFlops
- CM-5/1024 60 GFlops
- ASCI Red 2.4 TFlops
- K computer 1 PFlop
- Exascale ~1 EFlop

**Data**
- Integrated Data Base (GE) ['64]
- Relational Database (Acceleration)
- Column-Oriented DB
- Multimedia DB (IoT, Imagery, Video)
- Graph Database (Full-scale Utilization)
- Structured (SQL) Unstructured (NoSQL) Big Data (40 ZB)
SoE Data Base

Explosive expansion of Unstructured Data

SoE
Value Creation
Unstructured Data
IoT, M2M, SNS
Sensor Networks,
Web Applications

SoR
Acceleration
Structured Data
Business Data,
Enterprise Databases

Data Volume

1990  2000  2010  2020

RDB
(Unstructured)

Column Databases
(Transaction Records, DWH)

In-Memory Databases
(Acceleration)

Graph Database
(Full-scale Utilization)

Multimedia Databases
(IoT, Imagery, Video)

RDB: Relational Data Base
DWH: Data Ware House

40 ZB
(Z: 10^{21})

Source: Ministry of Internal Affairs and Communications (Japan) + content added by Fujitsu Laboratories Ltd.
People will be encapsulated by ICT spaces

- Front-End Networks
- Core Networks
- Mobile Devices
- Vehicles
- IoT
- Public Clouds
- Private Clouds
- 5G
- PAN, BAN
- LAN
- WAN
- NFV/SDN
- BLE
- Sensors
- People

PAN: Personal Area Network
BAN: Body Area Network
WAN: Wide Area Network
NFV: Network Functions Virtualization
SDN: Software Defined Network
BLE: Bluetooth Low Energy
Fujitsu Laboratories: R&D Vision and Strategy for Digital Transformation
Digital Business Transformation

New Businesses  
New Ecosystems

Co-creation  
Cross-sectoral Cooperation

Applications

Data
A Company

Data
Applications
B Company

Open Data
Applications
- Public Sectors
- Different Business Domains

 Technologies
ICT Vendors

Know-how
Usage Scenario: Food Industry

Hyperconnected Cloud

Digital Business

- Farmers
  - Co-Creation
  - New Products
    - Organic Vegetables
    - Functional Food

- Logistics
  - Co-Creation
  - New Payment System

- Sales
  - Co-Creation
  - New Digital Marketing

- Individual Innovator
  - Co-Creation
  - New Idea

- New Payment System
- New Digital Marketing
- New Idea
NATF 2016
“Enabling Digital: Business Transformation through Human-Centric Innovation”

People

Infrastructure

Information
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- Macro-economic environments and market trends in the principle geographic markets for Fujitsu’s services and products, which are Japan, EMEIA, Americas, Asia, Oceania and elsewhere, particularly such conditions that may effect customers’ IT spending;
- Rapid technological change, fluctuations in customer demand and intensifying price competition in IT, telecommunications, and electronic device markets in which Fujitsu competes;
- Fujitsu’s ability to dispose of non-core businesses and related assets through strategic alliances and sales on commercially reasonable terms, and the impact of losses which may result from such transactions;
- Uncertainties as to Fujitsu’s access to, or protection for, certain intellectual property rights;
- Uncertainty as to the performance of Fujitsu’s strategic business partners;
- Declines in the market prices of Japanese and foreign equity securities held by Fujitsu which could cause Fujitsu to recognize significant losses in the value of its holdings and require Fujitsu to make significant additional contributions to its pension funds in order to make up shortfalls in minimum reserve requirements resulting from such declines;
- Poor operating results, inability to obtain financing on commercially reasonable terms, insolvency or bankruptcy of Fujitsu’s customers, or any such factor that could adversely impact or preclude these customers’ ability to timely pay accounts receivables owed to Fujitsu; and
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