Open and Global ICT Innovation Platform for Future Smarter Communication World
IoT Challenges @NICT: National Institutes of Information and Communications Technology
October, 2016
Fumihiko “Tom” Tomita, Dr. Sci.
Chief Research & Strategy Officer,
Vice President, NICT, Japan
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National Institute of Information and Communications Technology

The sole national research institute in the field of ICT in Japan

- Promoting its own research and development
- Cooperating with and supporting industry and academia

**Public Services**
- Japan Standard Time
- Space Weather Forecast...

**Budget:**
~ 27 Billion Yen + α / yr
(~$260 Million + α / yr)

**Personnel:** ~1000
(Researchers: ~550, PhDs: ~460) as of Apr. 2016

1. Strategic Research and Development
2. Open Innovation
3. Global deployment
History and 3rd Paradigm of ICT

- **Phase 1**: Creation of Computer and Network Systems
- **Phase 2**: Creation of Cyber-world
- **Phase 3**: Value Creation on the Fusion of Real-world and Cyber-world

Timeline:
- ~1990: Connectivity
- 2010: High Power ICT
- 2015~: New Value Creation from ICT
Social systems has been decently established, but more healthy and sophisticated style must be renovated by charming ICT.
Data Driven Innovation for Quality of Social Life

Continuous Innovation Cycle (Spiral)

- Sensing & Network
- Actuation Value Creation
- Cyberspace

Real World

Unprecedented Security

Compatibility with Privacy

Data Driven Innovation for Quality of Social Life
Next-Generation Phased Array Weather Radar

- 3D heavy rainfall and tornadoes at a spatial resolution of 100m within 30 secs.
- Prediction of sudden and localized meteorological phenomena.
Unexpectedly Localized Heavy Rain: 2014 Aug.16,21:00 - 17,05:00 (300x speed)
Wireless Smart Utility Network (Wi-SUN)

World's First Small-Sized and Low-Power "Radio Device" Compliant with Smart-Meter Standards of "ECHONET Lite" and "Wi-SUN"

Wi-SUN will Expand to the Sensor Network World

Social Cloud

Wireless Module (2cmX4cm)

More than 10-year operation driven by an AA battery

Communication range is automatically expanded by multi-hop transmission

More than 50B Sensors

Communication range is automatically expanded by multi-hop transmission

More than 50B Sensors

Charming ICT for Future World Human Happiness

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Wi-SUN will expand to Sensor Network World

Wi-SUN has been accepted by all (10) major electric companies and gas companies in Japan (over 80M houses). Now expanding to the Home Area Network and will expand to the other SENSOR NETWORK world.

Interoperability among multi vendors (Wi-SUN Alliance)
Hybrid (Laser and Radiowave) Space Communication System is an Inevitable Future!
All Photonic Network: Power-saving and Low-latency Node

- Electric node
- Optical node
- All Optical Signal

World Record! High-speed optical node
- Large capacity: 12.8 Tbit/1 terminal
- Power consumption: 1.4 kW

10X energy efficiency
Darknet-based real-time alert system
Detecting internal malware infections by darknet
Sending alert to infected organizations
Cyber-security Collaborations in NICT

● Domestic Collaborations
  ✓ Global darknet monitoring environment (240,000 addresses) with Japanese universities and enterprises
  ✓ Over 600 Japanese local governments (total;1700) joined DAEDALUS
  ✓ Information sharing with security related organizations (e.g., NISC, JPCERT/CC, IPA, etc.)

● International Collaborations
  ✓ In JASPER (Japan ASEAN Security PartnERship) project, DAEDALUS sends alerts to ASEAN countries
  ✓ Overseas deployment of darknet sensor for Asia, Oceania and European countries with mutual data exchange
  ✓ R&D collaborations and researcher exchange
AI based Disaster Information Distribution Platform

- Basically, a real-time QA system
- Provide big pictures of damages and rescue activities to rescue workers and victims, and also provides the list of answers to a question, mainly based on SNS and WEB
- 2014.4 twitter data award winner (6/1300)
- Available to the general public in 2014 > “DISAANA” based on “WISDOMX” (~Japanese Watson ! @ IBM)

automatically lists the problems and requests in an area; makes rescue activity more efficient

answers on a map, on smartphones
Universal Speech Translation Advanced Res. Consortium (U-STAR)

AI and Network-based speech-to-speech translation with the aim of breaking language barriers around the world. Over 30 research Institutes in 23 countries.
Innovation Platform: Overcome the Boundaries of Language Speech-to-Speech Translation for 2020 Tokyo Olympic Paralympic

Sightseeing

Medical Treatment

Shopping

Multi Language Translation Business based on JUST Engine

Sightseeing Service

Medical Service

Shopping Service

Japan Universal Speech and Translation (JUST) Engine

JUST Corpus

Business Corpus

ASTREC

Panasonic
FUJITSU
NEC
NICT
NTT
KDDI
AR TRAK
TOPPAN
SONY
TOSHIBA
FEAT
NHK

VoiceTra Engine

Scale-Up

“GC Plan”

2015

2018

2020

2020 ~
Enhancing collaborations with NICT’s AI Project cluster

• Newly-established Data-driven Intelligent System Research Center
• Multilingual Translation Engine (Voice recognition, machine translation)
• Research in Neural information processing

Strengthening AI research collaboration with 3 government offices

• Institute of Physical and Chemical Research: Advanced Integrated Intelligence Platform Project (RIKEN AIP)
• National Institute of Advanced Industrial Science and Technology (AIST); New Energy and Industrial Technology Development Organization (NEDO): Artificial Intelligence Research Center
Human Visual Experiences and Brain Activity
(Nishimoto et al., 2011 Current Biology)

Presented clip

Brain activity
Decoding Human Visual Experiences from Brain Activity

(Nishimoto et al., 2011 Current Biology)

- Decode natural perception in brain (with certain accuracy).
- Future: Decoding imagination in brain to help communication. One of the solutions for aging society problems.

Presented clip

Clip reconstructed from brain activity
Let’s Start
Friendly Communication for
Cooperative Innovation

Thank you very much
For your kind attention

ご静聴感謝いたします

http://www.nict.go.jp/en/