What and How software test will be impacted by IoT?

March 22th 2017

Kenji（建児） Onishi（大西）

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Today's Agenda

- Introduction of myself
- Introduce software quality and testing major activity in Japan
- Main Topic

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Introduction of myself

Kenji Onishi : Gaio Technology Testing Evangelist / Senior Consultant

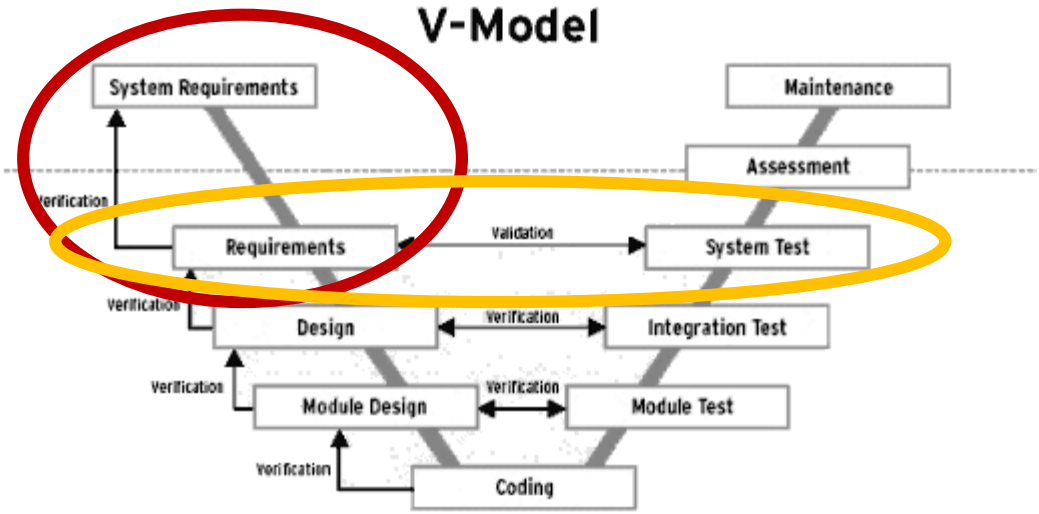
Main Activities

Activities in connection with software quality and testing as an evangelist for Gaio's testing tools and customer's quality or process improvement (from V&V up to SQA).

External Activities

- NPO ASTER Vice President aster.or.jp
- JSTQB Technical committee Vice-chair jstqb.jp
- ISTQB Advanced Level & Process Working Group Member
- Software testing symposium (JaSST) Tokyo Executive committee
- JUSE SQiP (software quality) steering committee Member
- "Software testing practice guide for step-up" Author (Japanese)
- "Lessons Learned in software testing" translators representation
- "Beautiful testing" supervision of translation
- "JSTQB textbook JSTQB Foundation Level test" (Co-Authoring)
- ISTQB Advanced Level Syllabus Test Manager Co-authoring Etc.
- Information Processing Society of Japan, the Japanese Society for Quality Control, Society of Project Management ,IEEE Computer society, ACM(Association for Computing Machinery) each professional membership

Introduction : myself



TWO MAJOR ORGANIZATION SOFTWARE QUALITY & TESTING IN JAPAN

JUSE Union of Japanese Scientists and Engineers

ASTER

SQiP Software Quality Profession

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JUSE

JUSE Union of Japanese Scientists and Engineers

- JUSE: Union of Japanese Scientists and Engineers, established in 1946.
- To promote systematic studies necessary for the advancement of science and technology
  - Education and Training
  - Awarding (The “Deming Prize”, established by JUSE)
  - Certification (JCSQE: Software Quality Engineers)
  - Convention, Symposium, Forum
  - Publicity, Publishing (periodicals, Textbooks)
  - URL: http://www.juse.or.jp/e/
- SQiP is community for software domain
  - Software Quality Profession

SQiP Software Quality Profession

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SQuBOK Guide Book

- "SQuBOK Guide – Guide to the Software Quality Body of Knowledge"
  - 1st concise version in English

  http://juse.or.jp/sqip/squbok/file/squbok_eng_ver1.pdf

- SQuBOK Guide was developed and released in November 2007 in Japan
  - To help train individuals involved with quality assurance
  - To formalize Japan's implicit knowledge concerning software quality
  - To organize and systematize new themes concerning software quality
  - To improve awareness of software quality technologies
  - To assist organizations seeking to establish software quality assurance processes

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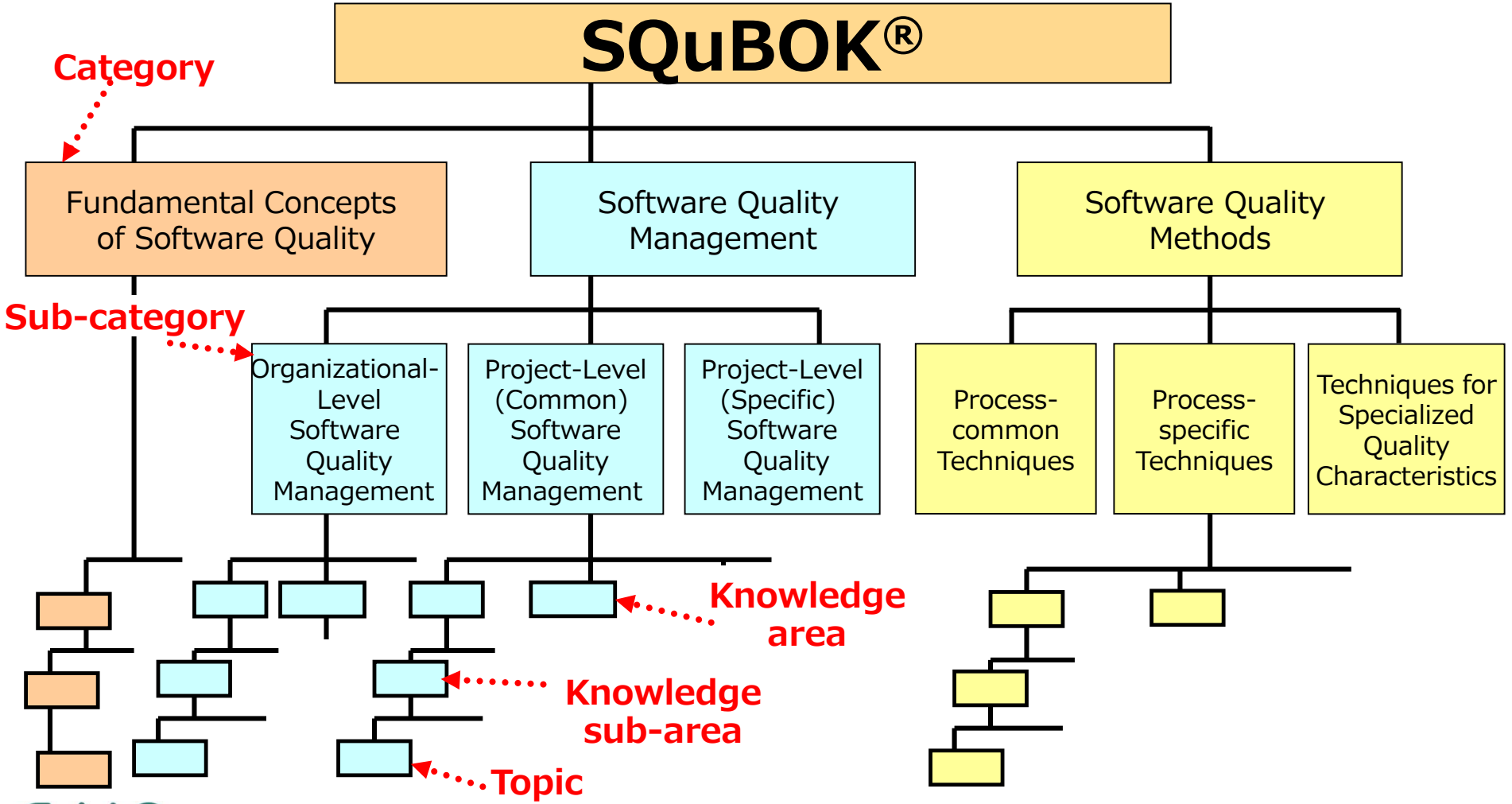
A Hybrid Integration of the SQuBOK

Software quality intellectual assets in Japan (Regional assets)	International software quality intellectual assets (International standards and de facto standards) (International assets)
Information framework and templates of the SQuBOK	

The Structure of SQuBOK®

BOK Structure with 5 Layers



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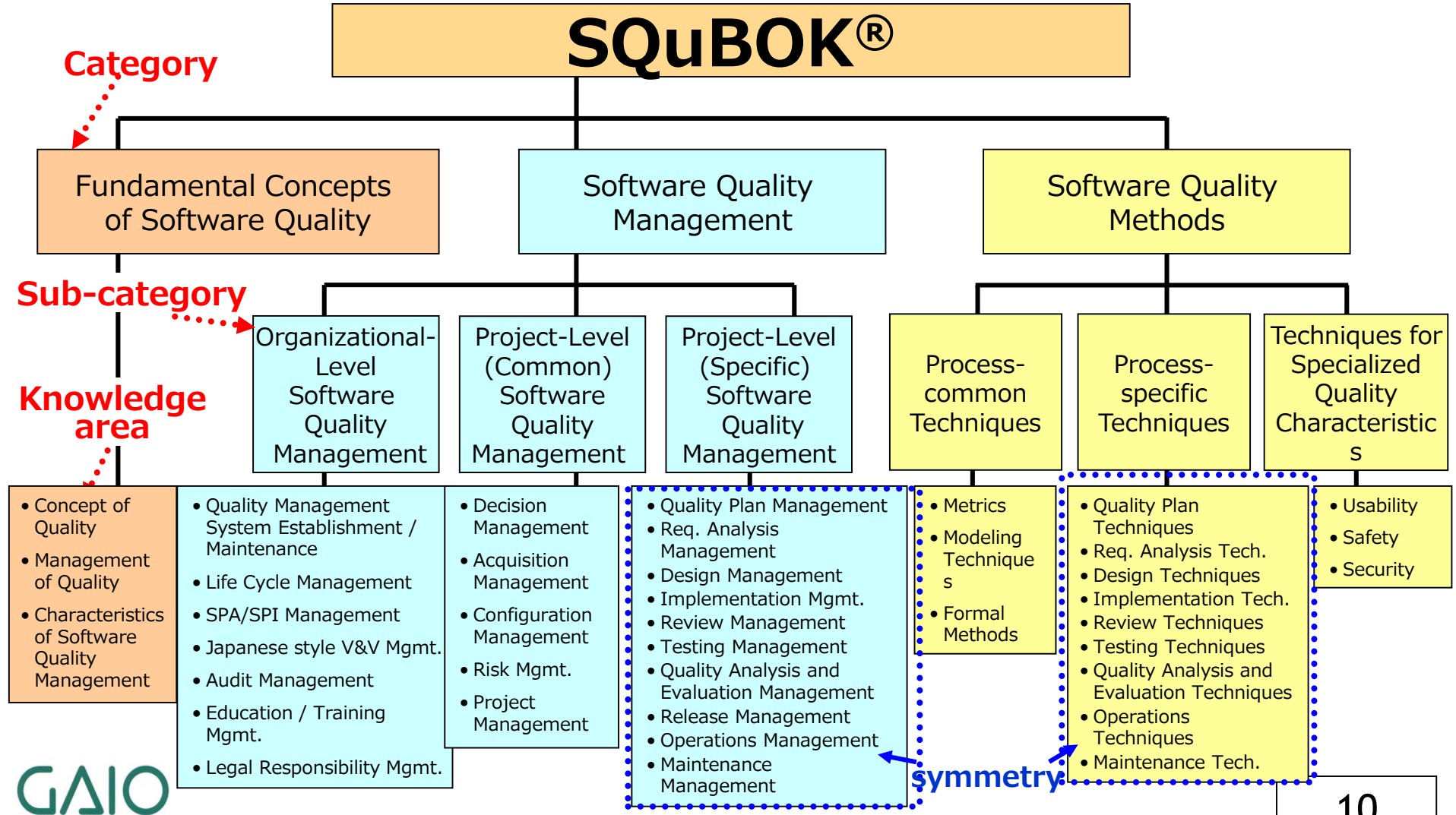
The Structure of SQuBOK®

BOK Structure with 5 Layers



NPO ASTER

Association of Software Test Engineering

- ASTER is a non-profit organization which undertakes research, promotion, education and international collaboration for software testing and software quality.
- ASTER was established at Tokyo in 2006. Our Directors and members are working as volunteers. This NPO is constituted by industry-university experts.
  - URL: http://aster.or.jp/en/index.html

ASTER

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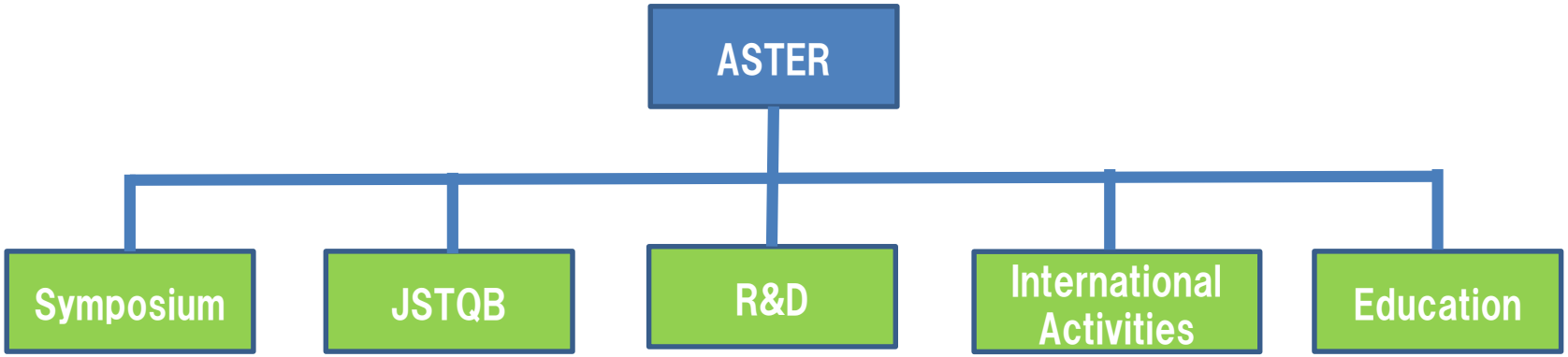
Organization structure of NPO ASTER



Japan Symposium on Software Testing

ソフトウェアテストシンポジウム JaSST ージャスト Japan Symposium on Software Testing

Software Test Design Contest

JSTQB Japan Software Testing Qualifications Board

ISTQB International Software Testing Qualifications Board

Zengo Award

Study Groups

ICST 2017

InSTA 2017

ASTA

ISO/IEC/JTC1/ SC7/WG26

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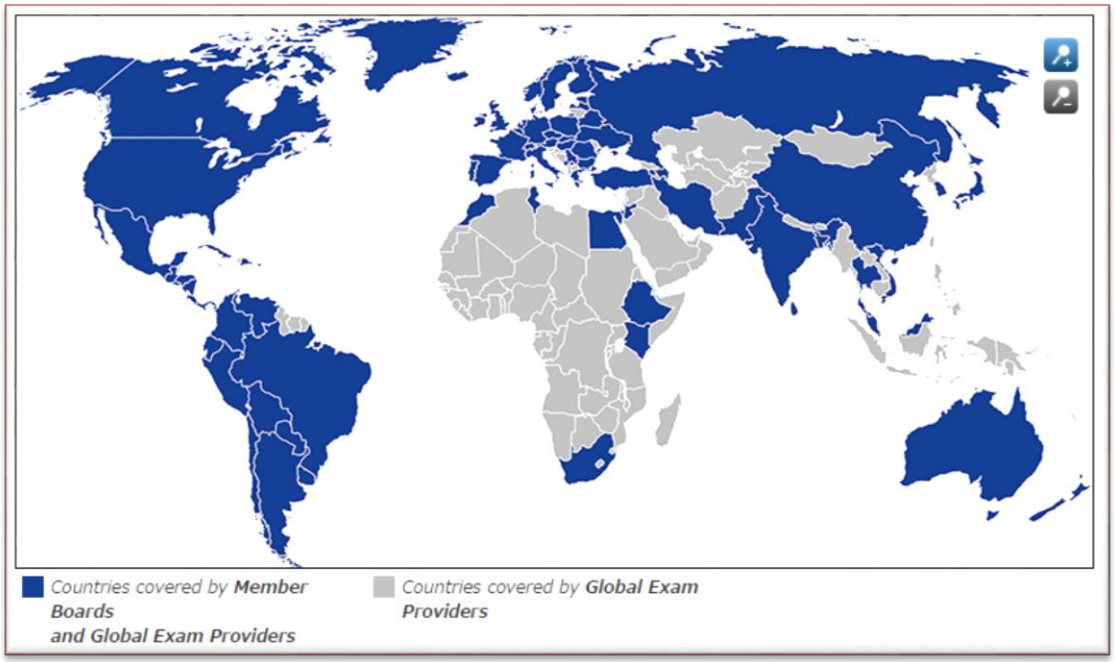
ISTQB/JSTQB Certified tester

- World-Wide: **Steady Growth**
  - Over **110** countries
  - Over **650,000** exams
  - Issued more than **470,000** certifications



*As of February 2017

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ISTQB/JSTQB Certified tester

In Japan : **Nicely Situation**

- Issued more than **13,000** certifications

The largest issued certifications for software tester in Japan

*As of February 2017

WHAT AND HOW SOFTWARE TEST WILL BE IMPACTED BY IOT?

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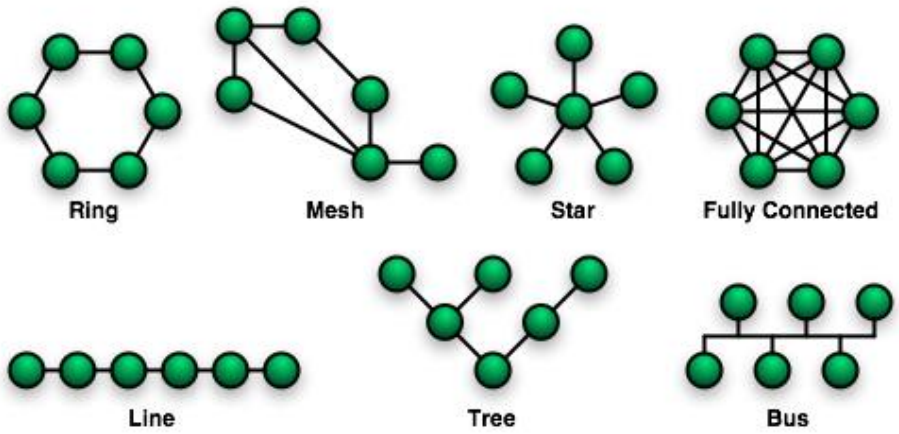
Main Characteristics of IoT

- 1. Communicate between two or more connected things according to a certain protocol.

- 2. Various things, such as business, services, and machine, should be connected on network.



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Main Characteristics of IoT

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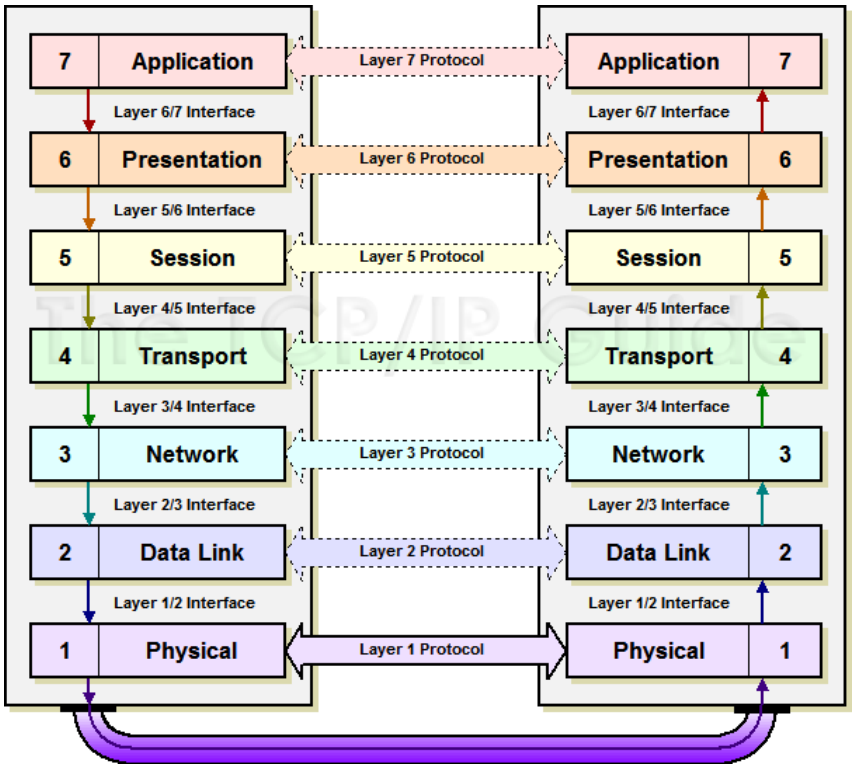

Main Characteristics of IoT

- 2. Various things, such as business, services, and machine, should be connected on network.
  - System of enterprise which deals with information, and embedded system which deals with the physical world are connected.
  - Even if location where physical controlled system exists, and location where entity who controls exists are not same places, each entity can be connected.
  - Several S/W which properties, such as open source, commercial, and military, different entities are connected.

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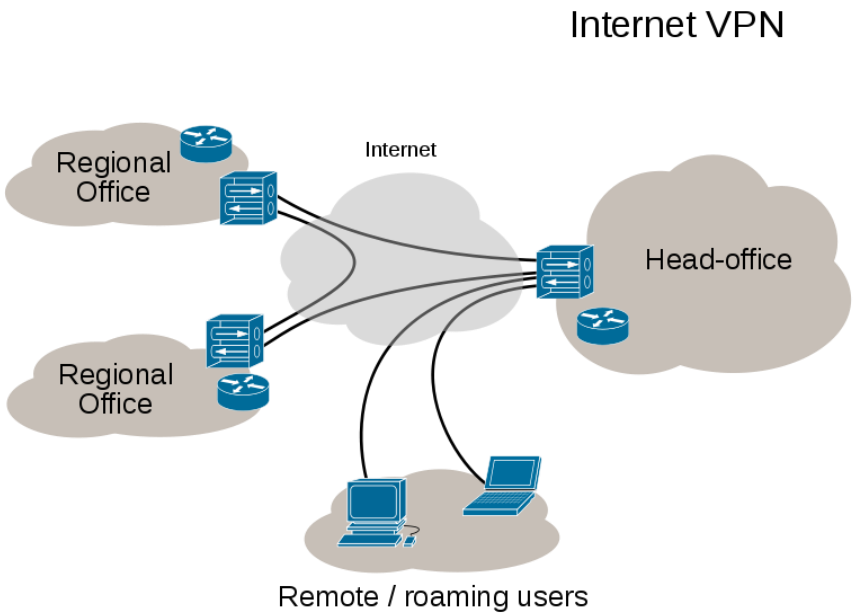
Pre-Condition for Classic Test Object

- In almost cases, boundary exists in system and S/W which Test Objects.
  - Even if, some system shall connect with another system, it shall be connected within limited area.
  - Range which can be connected, is defined as well.

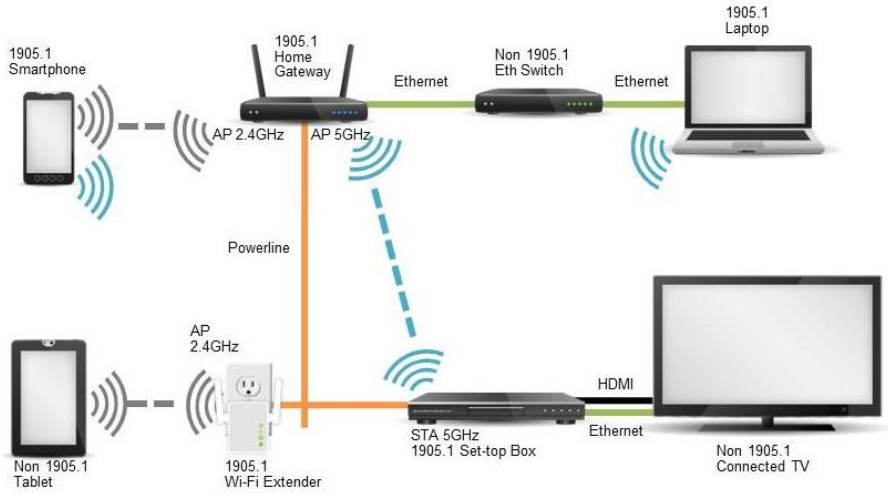


Pre-Condition for Current Testing

- Test object and test items are known.
- Test basis for clarifying quality characteristics exists for test object, and test items.
- In test basis, information for conducting equivalent partitioning and boundary-value analysis for test design are described.
- For test design, essence for examining combination of test cases are written in specifications.

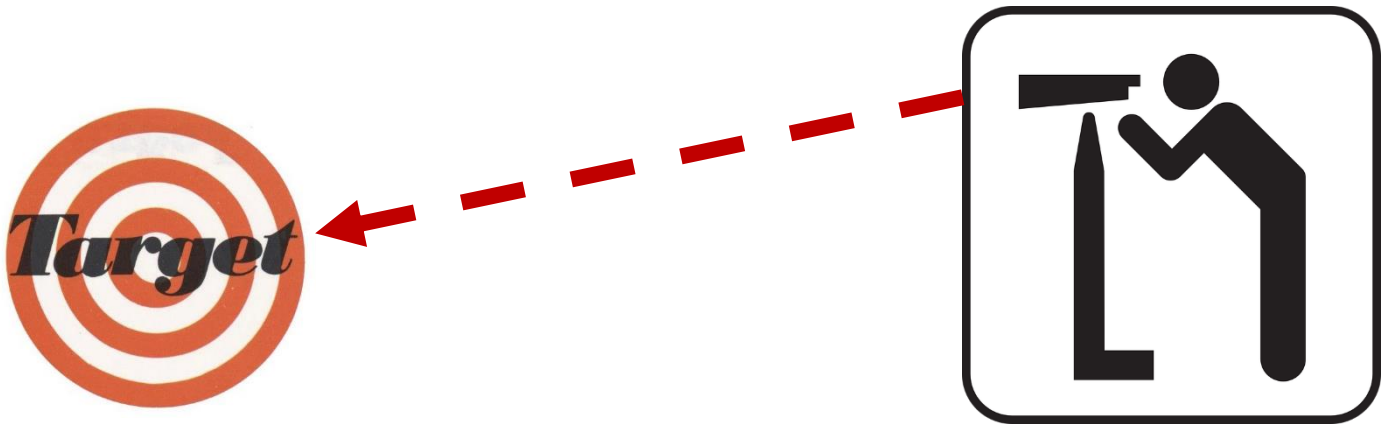
How test design will be impacted?

- Let's consider scenes which carries out boundary-value analysis.
  - Private dedicated protocol may be used.
  - Boundary is exist between protocols class rather than numerical value.
    - —Boundary protocol analysis will be conducted during test design for verifying whether it can/shall be connected or not.



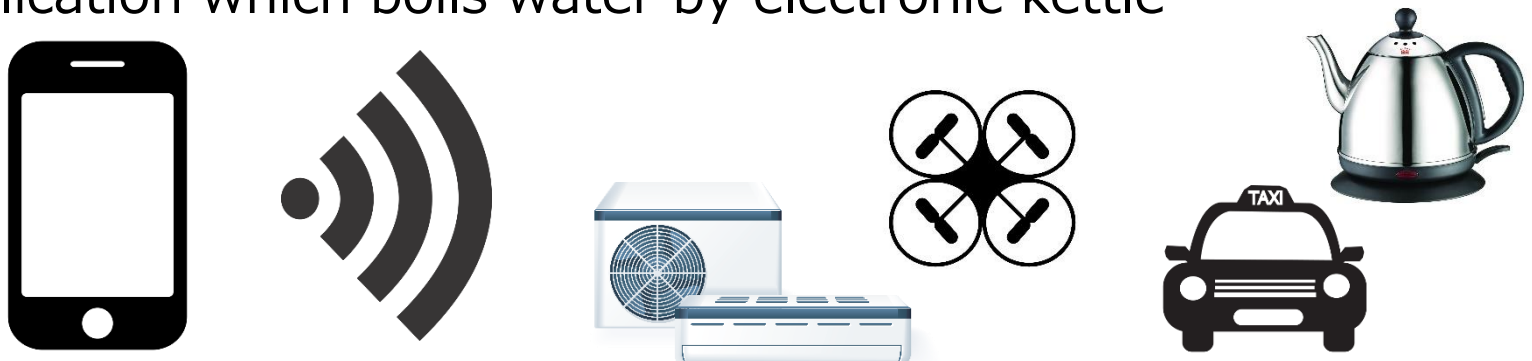
How test design will be impacted?

- What kind of target to communicate?
  - Analysis of valid equivalent class and invalid equivalent class will be conducted to know whether it is able to communicate or not.
  - Node or Device used as the target end of communication cannot be specified.



How test design will be impacted?

- Products shall be connected to different type of targets.
  - Application which controls illumination and air-conditioner at house
  - Application for connecting with shopping site, ordering shopping and delivering purchased thing by drone at appointed time-of-day and location
  - Application which arranges taxi to operate automatically at appointed time-of-day and location
  - Application which boils water by electronic kettle



Nature of Testing ~Current and Beyond

- Nature for testing can divide into two cases.
  - Current: Quality can be guaranteed in approach of testing held up to now.
  - Beyond: Quality assurance is **Depend on nature of each application**.

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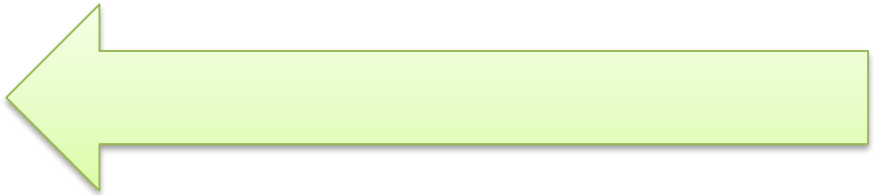
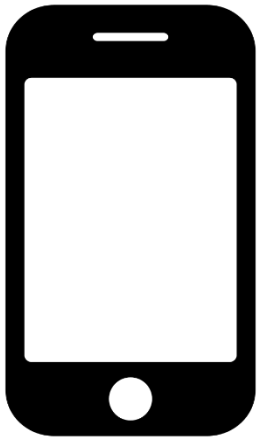
How classical testing change?

Think by Example : Electronic Kettle





- Sometime controlled application never know about target's condition or situation.
- Target devices what received instructions from some applications, should be having counteraction for invalid instructions which must be specified by devices side.

How classical testing change?

- Define application which finally receives instructions as**" Terminal Application“.**
  - Important to conduct equivalent class analysis whether instructions of requesting source are valid or invalid, in environment of IoT.
  - Test design for invalid instructions to terminal application can be performed.
- Is it always true whether testing implementation possible for all the invalid instructions?
  - If terminal application becomes autonomous system, it becomes impossible simply to extract invalid test condition .

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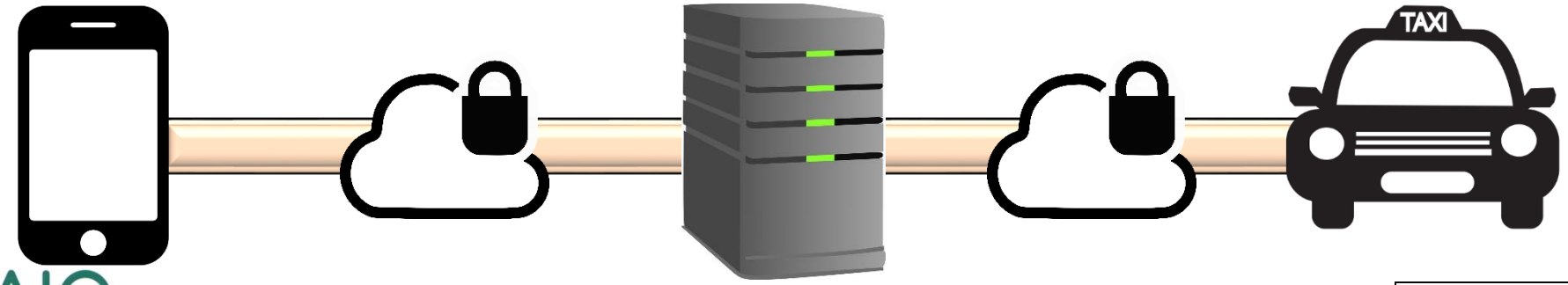
Let's think about near future

- Autonomous system : e.g. Vehicle
  - Application of smart phone which passenger has communicates to arrangements and billing of taxi among servers of taxi company.
  - At this time, server of taxi company shall instruct to pick up passenger to taxi, and where it goes.
  - After passenger takes taxi, assume that taxi itself which is autonomous terminal application has responsibility safely sent to destination.



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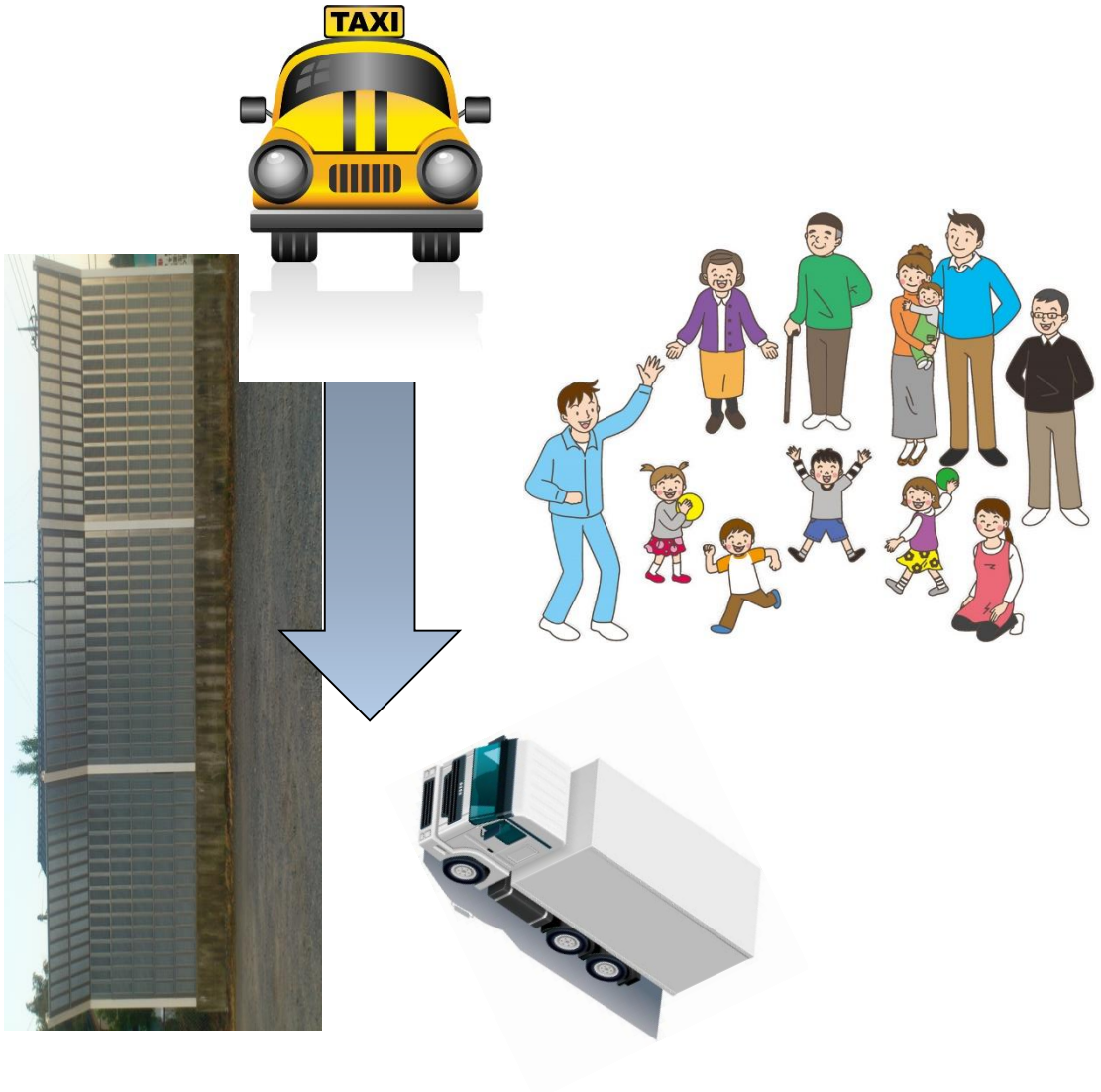
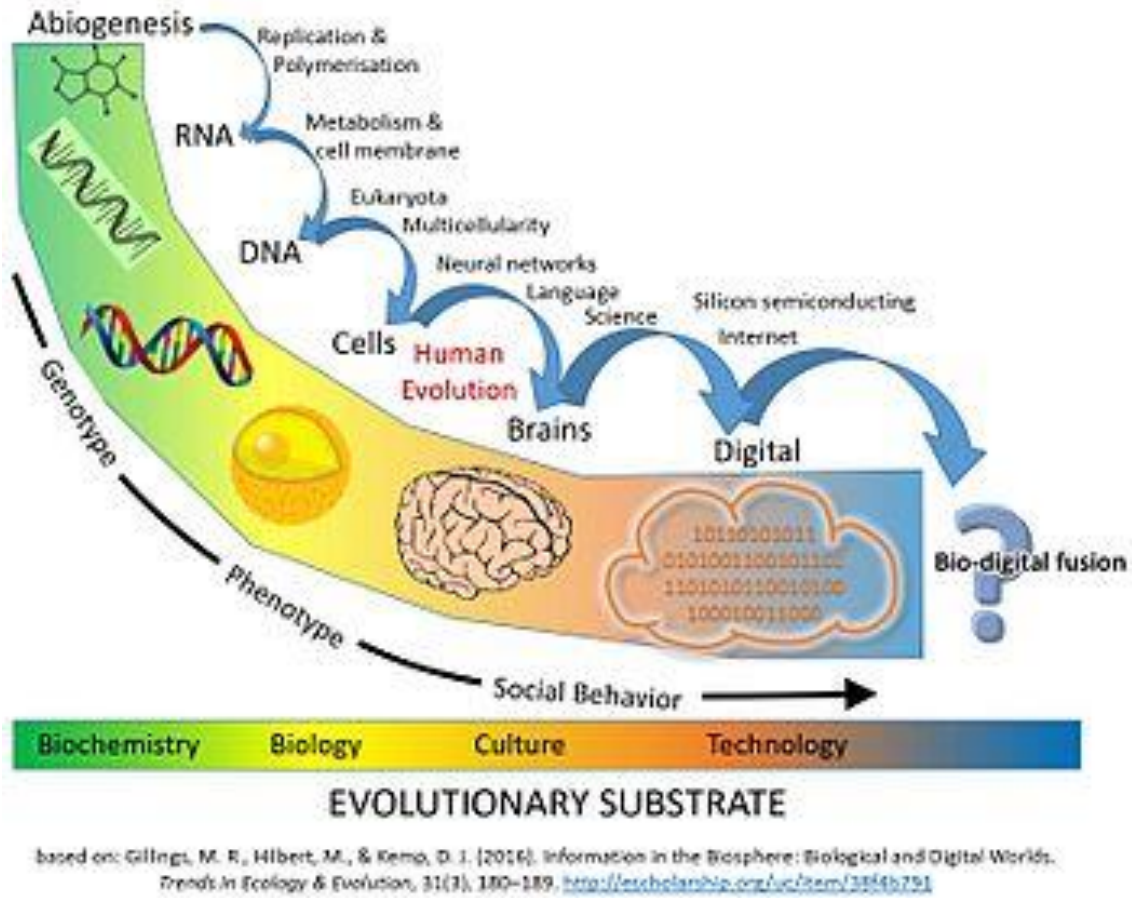
Let’s think about near future



Let's think about near future

- The world after singularity is waiting at the point of autonomous system.



based on: Gillings, M. R., Hilbert, M., & Kemp, D. J. (2016). Information in the Biosphere: Biological and Digital Worlds. *Trends in Ecology & Evolution*, 31(3), 180–189. http://escholarship.org/uc/item/3864b791

Near future ~Beyond Singularity

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Near future ~Beyond Singularity

- How robot will be changed by Singularity?

- How human being can testing for robot which act autonomously?

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Near future ~Beyond Singularity

The Three Laws or known as Asimov's Laws

- 1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- 2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
- 3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

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Near future ~Beyond Singularity

- Robot is also recognized to be “Terminal application”.

- It is terminal application autonomous to highly developed, and can also be said as “Autonomous Actuator”.

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Near future ~Beyond Singularity

- **Verification of Autonomous Actuator** to be assured that do not giving safety hazard to human being is **Top Priority** importance as a test condition.
  - How much autonomous actuator have impact about safety hazard to human being according to condition of relation with people.
  - Test engineer have to keep thinking hard to find solution for their testing.
  - **Evolution of the further test method and technology is needed!**

Thank you for your attention

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