What and How software test will be impacted by IoT?

March 22th 2017
Kenji（建児） Onishi（大西）
Today’s Agenda

- Introduction of myself
- Introduce software quality and testing major activity in Japan
- Main Topic
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, 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
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
### A Hybrid Integration of the SQuBOK

<table>
<thead>
<tr>
<th>Software quality intellectual assets in Japan</th>
<th>International software quality intellectual assets (International standards and de facto standards)</th>
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<tbody>
<tr>
<td>(Regional assets)</td>
<td>(International assets)</td>
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Information framework and templates of the SQuBOK
The Structure of SQuBOK®

BOK Structure with 5 Layers

- Fundamental Concepts of Software Quality
- Software Quality Management
- Software Quality Methods

Category

Sub-category

- Organizational-Level Software Quality Management
- Project-Level (Common) Software Quality Management
- Project-Level (Specific) Software Quality Management

Knowledge area

Topic

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The Structure of SQuBOK®

BOK Structure with 5 Layers

**Category**

- Fundamental Concepts of Software Quality
- Software Quality Management
- Software Quality Methods

**Knowledge area**

- Organizational-Level Software Quality Management
- Project-Level (Common) Software Quality Management
- Project-Level (Specific) Software Quality Management
- Process-common Techniques
- Process-specific Techniques
- Techniques for Specialized Quality Characteristics

**Sub-category**

- Concept of Quality
- Management of Quality
- Characteristics of Software Quality Management
- Quality Management System Establishment / Maintenance
- Life Cycle Management
- SPA/SPI Management
- Japanese style V&V Mgmt.
- Audit Management
- Education / Training Mgmt.
- Legal Responsibility Mgmt.
- Decision Management
- Acquisition Management
- Configuration Management
- Risk Mgmt.
- Project Management
- Quality Plan Management
- Req. Analysis Management
- Design Management
- Implementation Mgmt.
- Review Management
- Testing Management
- Quality Analysis and Evaluation Management
- Release Management
- Operations Management
- Maintenance Management
- Metrics
- Modeling Techniques
- Formal Methods
- Quality Plan Techniques
- Req. Analysis Tech.
- Design Techniques
- Implementation Tech.
- Review Techniques
- Testing Techniques
- Quality Analysis and Evaluation Techniques
- Operations Techniques
- Maintenance Tech.
- Usability
- Safety
- Security

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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
Organization structure of NPO ASTER

- Symposium
  - Japan Symposium on Software Testing
  - Software Test Design Contest

- JSTQB
  - JSTQB Logo

- R&D
  - Zengo Award
  - Study Groups

- International Activities
  - ICST 2017
  - InSTA 2017

- Education
  - ASTA
  - ISO/IEC/JTC1/SC7/WG26
World-Wide: **Steady Growth**

- Over **110** countries
- Over **650,000** exams
- Issued more than **470,000** certifications

*As of February 2017*
In Japan: **Nicely Situation**

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

*As of February 2017*
WHAT AND HOW SOFTWARE TEST WILL BE IMPACTED BY IOT?
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.
Main Characteristics of IoT

1. Communicate between two or more connected things according to a certain protocol.
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.
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**.
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.
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.
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.
Let’s think about near future
Let’s think about near future

- The world after singularity is waiting at the point of autonomous system.
Near future ~Beyond Singularity

■当日slideのみ
Near future ~Beyond Singularity

- How robot will be changed by Singularity?

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

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

спасибо GRACIAS 谢谢 THANK YOU ありがとうとうございました MERCI DANKE धन्यवाद

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