CPSC 462
Software Design
Homework (1 & 2) Outline
Fall 2017
[Version: Aug.20, 2017]

HW1 Outline
(Tentative – this outline can be changed later. Please check updates.)

- HW is to practice what you learn in this class (OOAD, UP, Design Patterns).
- You are expected to practice all professionally as you build a real system.

Problem to Solve
Using the Object-Oriented Analysis/Design (OOAD) and Unified Process (UP) (in the way that you learn in this class), build software for the target system (given below)

Target System
Your company, Fullerton SW Company, initiates a project that builds a mobile application, titled *Fullerton_Wear (FW)*, running on the mobile environment. Such wearable devices can be wrist-bands, clothes, hats, eye-glasses, or anything you can imagine wearable on human body.

Your team will choose one item of potentially wearable devices collaboratively with a hardware company, and your team will build its software part.
Your team must analyze, design and code the target system using UP and OOAD.
The VP requests that your team must consider the following requirements at least.

Functional Requirements (FRs):
- Text to 911 and favorites (whom you prefer)
- Location finding via GPS (your favorites can trace where you are now)
- Detect a heart attack
- Count a pulse
- Check a glucose (blood sugar) level
- (assume that we have such techniques for health test via skin)
- (You may have more …, but not too many)

Non-Functional Requirements (NFRs):
- The system must run on the mobile environment (like network for cell phones).
- Availability (the system must available 99%)
- Modifiability (the system must be extendable to other services in the future)
- (You may have more ..., but not too many.)

You may have more requirements if proper, however, you must keep those requirements initially given, and you must not disregard/override them when you choose other requirements.

What/How To Do
- Read all in this **HW Outline** precisely and thoroughly, follow activities as specified here (and as shown in the textbook), produce the corresponding work-products (and as shown in the textbook (at least shown in Ch.1 – Ch.20)), and document all (as specified in the **HW Report Format**).

- You are not expected to build a commercial-level complete system. However, your work must be able to well demonstrate your understanding of OOAD and UP. Decide a reasonable size of the problem set (e.g., identify at least 10 FRs first, however, choose the most important 5-6 FRs only, but complete all activities and work-products for them at least).
- Use the <u>Unified Process (UP) and OOAD as you learn in this class</u>. You have to analyze and design the target system completely (as you learn in this class) in both Inception and Elaboration phases. It also includes 'mapping design codes' (not complete coding, but at least 30-40% that shows 'proper mapping from design models to code' (as shown in Ch.20).

- **The coverage of this project/HW** (Relation between HW1 and HW2):
  This project consists of two parts: HW1 and HW2. HW2 is a continuing work on HW1.
- **HW1**: must include artifacts for Inception (1 iteration) and Elaboration (1st iteration) (at least perform activities and construct artifacts that are shown in Ch.1 – Ch.11).
- **HW2**: must include artifacts for Elaboration (2nd iteration and later) (at least perform activities and construct artifacts that are shown in both Ch.1 – Ch.11 and Ch.12 – Ch.20).
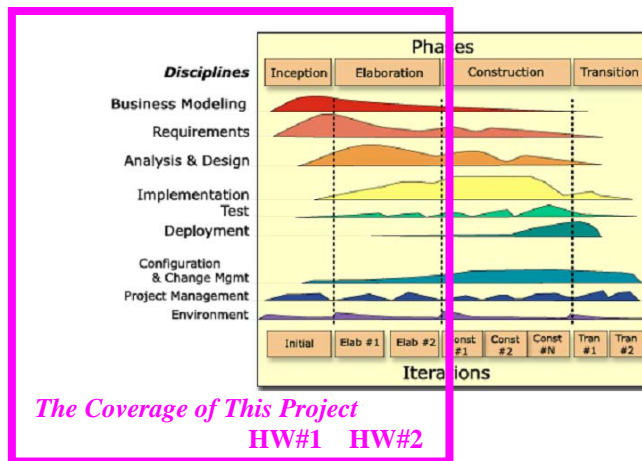
<u>Picking Groups and Planning</u> (Email your team list ASAP)
HW is a group project. Find/build your team. Each group should have 2-6 members. Regular team meetings are strongly recommended. There will be some oral presentations (volunteered or randomly selected) on each report due date.

<u>Team Charter</u>
Construct and submit your 'Team Charter' using the given template. Attach it to each HW report.
Be careful to construct your 'Team Evaluation Criteria' (in the last section of 'Team Charter') that must be used in 'objective' self-team-evaluation (when you evaluate members, do not use anything else other than team evaluation criteria that you build now).
Keep (and work as you promised in) the Team Charter throughout the project. Submit the Team Charter with your HW1/HW2 reports.

<u>Team Evaluation</u>
Find the 'Team Evaluation' form/template that you must use to evaluate each other among team members. See how you will evaluate other members, and see how you will be evaluated. Evaluation must be done objectively (with evidence) based on the 'Team Evaluation Criteria' that you built in your 'Team Charter'. Team Evaluation must be constructed and submitted with your HW1/HW2 reports (twice).
Be a good citizen in your team. Behave professionally in any case.

<u>Minimum Requirements</u>
- Use (conform to) the given **HW Report Format** (see below). Have separate sections that describe each phase: Inception, Elaboration, Construction and Transition.
- Read mainly Ch.1 – Ch.11 first. Understand UP, OOAD, Inception, and Elaboration. While you do HW1, read them iteratively until you fully understand all clearly. Also briefly review the rest of the textbook (Ch.12 - Ch.20 to learn other required activities briefly that will be used in HW2).
- Throughout the HWs, study/perform/understand everything individually first, and then have team meetings to collaborate and complete the work. Individual preparation for team meeting is very important to do work effectively and to understand all parts completely. If you do/understand a partial work, you will have a trouble in the exams that will ask about various parts of HWs.
- Read this HW Outline thoroughly and iteratively (if you read it again, you may find something new that you did not recognize before). With your members, discuss what are required to do in both HW1 and HW2. Iteratively discuss to confirm all members understand what to solve. Ask the instructor if you cannot understand the HW. <u>When you email to the instructor 'regarding team and HWs'</u>, "**CC to all members**", so that all members can share the same information (so that the instructor can also easily "Reply to all members").

- The followings show more specifically <u>what you must use/perform/produce</u>:
- Start with the UP disciplines for your project. (Figure 2.7 UP disciplines and Figure 2.8 Disciplines and phases)
- Build the Development Case for your project. (Table 2.1 Sample Development Case of UP artifacts)
- Build all artifacts you defined in your Development Case for Inception and Elaboration (1st iteration) in HW1 (and continue building other artifacts in HW2). (Ch.4 – Ch.11)
- Define the architectural layers. (Figure 3.1 Sample layers and objects)
- Refine artifacts you developed in Inception. (Table 4.1 Sample inception artifacts)
- Understand and analyze requirements. (Ch.5 & Ch.6)
- Define use cases for your problem to solve. Find actors, goals, and use cases. Draw use case diagrams. (Ch.6)
- Draw an UP artifact influence. (Figure 6.1 Sample UP artifact influence, Figure 6.7 Process and setting context)
- Write a supplementary specification (Ch.7 and P.58), glossary (Ch.7), and vision (Ch.7).
- Compare and contrast system features with use cases. (Ch.7)
- Relate the vision to other artifacts, and to iterative development. (Ch.7)
- Define quality attributes. (Ch.7)
- Other activities and artifacts in Inception include (<u>optional extras</u> in this project): risk list (high/medium, low risk), user interface-oriented prototype to clarify the vision of functional requirements, recommendations on what components to buy/build/reuse, plan for the iteration, candidate tools list, define user interface and test a prototype, and so on.
- Construct the (required) artifacts for Elaboration (Table 8.1). Include domain models (Ch.9), associations (Ch.9), attributes (Ch.9), system sequence diagrams (Ch.10), operation contracts (Ch.11).

- All artifacts must be <u>*traceable* backward and forward</u>.
    - o (Traceable: requirements analysis model ⇔ design model ⇔ code)
    - o Traceability will be checked in grading.

[The **HW Report Format** (Required Work Products)]
- Using this format, document all above activities and the corresponding work-products.
- The contents/format of the HW report must be (at minimum) like the following:
    - A Cover Page
        - HW Title, team title, names of all (only participating) members (and email addresses, signatures), submission date, course title, instructor name, …
    - Revision History
        - Who did what, and when (dates).
    - Table of Contents (chapter titles, page numbers)
    - Project Plan (1-2 page)
        - What, why, who, when, scope, estimation, resources, logistics, …
    - Inception (1 iteration only)
        - Document activities. Document the corresponding work products.
    - Elaboration (at least 2 iterations)
        - Document activities. Document the corresponding work products.
        - Iteration 1
            - Document activities. Document the corresponding work products.
        - Iteration 2
            - Document activities. Document the corresponding work products.
        - …
            - …
    - Construction (have this chapter/phase title at least)
        - Say "Not included in this HW."
    - Transition (have this chapter/phase title at least)
        - Say "Not included in this HW."
    - References (list references here, and cite them in appropriate places in the report)

    - Lessons Learned (each member individually must write a short essay in 200-500 words to talk about own LL first, and talk the group experience/LL by group at the end)

    - Team Charter (in the given format)
    - Team Evaluation (in the given format)

[The End of the **HW Report Format**]

Submission
- By the due date, submit/upload a soft-copy of your HW report (in a PDF/DOC file that includes all work-products you produced). Do not forget to attach both 'Team Charter' and 'Team Evaluation'.

No Plagiarism (very important)
- HWs require creative thinking and creative writing (100%).
- No copy or cut&paste from other sources is allowed for this HW report. Do not use other resources as the basis for your HW. Your HW report must be 100% unique (no copy of even a sentence or a diagram from other sources is allowed). All members will be responsible with plagiarism (even though only one member violates plagiarism). The worst score (F, or 0 depending on seriousness) will be given to the cases of cheating (or plagiarism).
- Start HW early and do it creatively. Prepare and ask questions in the LAB discussion sessions (or Q&A, office hours) for HWs.

Presentation
- By the due date, submit/upload a soft copy of your HW report (in one file that includes all work products).
- Bring your file in a USB drive for presentation.
- No preparation for separate/extra presentation materials is needed. (Just project your file 'as is', when presenting.)

Grading of HW

Your homework will be evaluated based on the following factors: quality of report (rather than quantity), organization of report (required format), uniqueness and consistency of contents in the report, tight accordance with the subjects learned/required from this class (first you have to discuss it based on only what you learned from the class, and you may discuss more learned from outside only if you want – this is for fair grading with objective evidence), an overall team work, participation (attendance and/or discussions) and collaboration (self-evaluation), the logs and the meeting records (submitted only if requested), the group/individual presentation, and the professional attitude toward team work.

The homework will be graded as group, but self-evaluation will be used to grade collaboration individually. If your contribution to the team is less than B (80%), or if your HW scores is less than B (80%), you will not get a full credit for the collaboration score.

Many exam questions will be asked to filter out understanding of homework's contents. Exam questions related to homework will individually measure understanding of each member. Students who put more effort into homework (who understand all parts of HW thoroughly) are usually more successful in those exam questions.

Grading Examples:
10/10: almost perfect (or, with minor error) (A+ for this HW)
9/10: good but need improvement to enhance quality (A)
8/10: acceptable but need critical improvement (B)
7/10: require serious improvement (C)
1-6/10: seriously deficient; unacceptable (D or F for this HW)
0-F: academic dishonesty found (0 or F for the course + report to the university)

Self-Team-Evaluation: Be fair and objective: You must evaluate your team members fairly and objectively. Carefully build your evaluation criteria in the Team Charter in advance, and use the evaluation criteria only in your evaluation. Do not involve any personal and subjective opinions in evaluation. Behave professionally.

Perform at your best (you must show proper effort): An unsuccessful team (below B) may not get a full credit for collaboration scores. If your HW score is below B (8/10), you may not get a full credit for the collaboration score (which is factored by self-evaluation score). For example, if your HW score is 6, and your self-evaluation is 100% (10), you may not get full 10 for the collaboration score and may get 6 (= [10 * 6/10]) for the collaboration score at maximum.

You may not get 100% (A) even though you work hard (working hard does not mean quality product). However, if you give up working hard (targeting B), you may not even pass (may get C or less if your target fails). Show your best effort to successfully pass (for A or B at least).

Be a good citizen in your team: An ill-collaborated member may not get a full credit for the HW score. For example, if you get 10% (1/10) in your evaluation score by team members, you may get 10% of your HW score at maximum. Make and keep your commitment. Let members fully

understand your situation if anything happened / scheduled, and show your extra effort to make them up later or in advance. Put your best effort to make your stakeholders (members, customers, etc.) satisfy. You must accept the Evaluation Criteria, once it is defined in your Team Charter.

[The End of HW1 Outline]

[The HW2 Outline: see the next page]

HW2 Outline

(Tentative – this outline can be changed later. Please check any updates.)

- In addition to the artifacts you produced (and submitted) in HW1, build following work products:
- Use the same **HW Report Format**. Keep the HW1 contents. HW2 is a continuing work on HW1.

What/How to Do
- In this phase you build the core architecture, resolve the high-risk elements, define most requirements, estimate the overall schedule and resources, construct design artifacts, and finally map design artifacts to codes.

- Study Ch.12 – Ch.20 to prepare for HW2.
- Update artifacts constructed in HW1, only if necessary/proper.
- Construct logical architecture and package diagrams (Ch. 13 and Ch.33), interaction diagrams (Ch.15) and design class diagram (Ch.16).
- Use GRASP patterns (Ch.17 and Ch.18) to realize use cases.
- Consider visibility (Ch.19).
- Map design artifacts to code in the Java (or C++) language (as shown in Ch.20). You are not expected to code 100% completely to run the target system. The more important thing is to show enough that your code is accurately traceable to the design models.
- Perform all above through at least 2 iterations in Elaboration. Understand how iterative work is different from the work you do using the sequential process.

- Your project may stop at this point. You may not need to perform Construction and Transitions phases. Remember coding can be started in Elaboration or even in Inception, even though you do not reach at Construction. Why? Think how UP is different from the sequential process model (e.g., 1-pass Waterfall Model without feedback or iteration). Really knowing (and practicing/experiencing) this difference is one of the most important things in this class. In grading, how much you understand/perform iterative work well/properly will be considered seriously.

- All artifacts must be *traceable* backward and forward.
  - (Traceable: requirements analysis model ⇔ design model ⇔ code)
  - Traceability will be checked in grading.

- Check and refine your HW report to meet the HW requirements and **HW Report Format**.
- Revise the Reference List if needed.
- Rewrite Lessons Learned. See how your LL has been changed since HW1. See what other members have learned differently, while they do the same project with you.
- Attach your Team Charter.
- Attach your Self-Team-Evaluation.

[The End of HW2 Outline]