# LESSON TITLE

| Country | Cambodia |
|---|---|
| Language | ■ English ■ Local Language |
| Course Title | Software Engineering |
| Lesson Title | 03. Activity Diagram |
| SME | Mr. TAL Tongsreng |
| Submission Date | October 04th, 2015 |
| Version | 1.0 |

**Please provide  the outline of course which will**

☐ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

| Activity Diagram | |
| --- | --- |
| | 1. Activity Diagram Essentials<br>2. Activities and Actions<br>3. Decisions and Merges<br>4. Doing Multiple Tasks at the Same Time<br>5. Time Event |
| | |

**Please provide the introduction / overview on this lesson**

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| Overview |
| --- |
| In this chapter, you are going to learn about<br>• Definition of Activity and Action<br>• Know different Activity and Action<br>• Know how to use Decisions and Merges<br>• Know how to show multi-tasking in Activity diagram<br>• Know how to use Time Event in Activity diagram |

**Please make sure the hierarch of the content is well formed.
Please organize the lesson in 3-5 main topics and use 3-level headings.**

| Level 1 | Level 2 | Level 3 |
|---|---|---|
| 1. Activity Diagram Essentials | 1.1 Nodes and Actions | |
| | 1.2. Edge or Path | |
| | 1.3. Simple Example | |
| 2. Activities and Actions | 2.1. Activities | |
| | 2.2. Action | |
| | 2.3. Example | |
| 3. Decisions and Merges | 3.1. Decisions | |
| | 3.2. Merges | |
| | 3.3. Example | |

**Please make sure the hierarch of the content is well formed.**
**Please organize the lesson in 3-5 main topics and use 3-level headings.**

| Level 1 | Level 2 | Level 3 |
|---|---|---|
| 4. 4.         Doing Multiple Tasks at the Same Time | 4.1. Forks | |
| | 4.2. Joins | |
| | 4.3. Computer assembly workflow | |
| 5. Time Event | 5.1. Time wait | |
| | 5.2. Recurring Time Event | |
| | 5.3. Example | |

**Please provide objective of the lesson by high light keyword and follow (Audience, Behavior, Condition, Degree) to write the objective**

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☐ C : Only Video

| Objective |
| --- |
| Upon completion of this chapter, you will be able to<br>• Define elements in Activity Diagram<br>• Identify different between Activity and Action<br>• Use conditions in diagram and merge 2 control flows into one<br>• Use Multi-tasking in Activity Diagram<br>• Use Time delay and wait in Activity Diagram |

**Please provide keywords of the lesson with explanation**

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| Keywords | Description |
|---|---|
| **Workflow** | the sequence of industrial, administrative, or other processes through which a piece of work passes from initiation to completion. |
| Node | a point in a diagram at which lines or pathways intersect. |
| **Decision** | the action or process of deciding something or of resolving a question. |
| **Fork** | the point where something divides into two parts. |
| **Merge** | Opposite of fork. Merge combines to form a single entity. |

☐ A : Fill in the blank
☐ B : Short answer question
☐ C : Multiple Choice

Feedback type
☐ A : Text-based short answer
☐ B : Text-based short answer and more information
☐ C : Video based feedback

**Pre-Test**

| Question | Possible answers | Correct Answer | Feedback of the question |
|---|---|---|---|
| Which sentence express an action? | 1. This student is very clever.<br>2. My lovely mother is preparing meal to pagoda.<br>3. Books are in library right now. | 2. My lovely mother is preparing meal to pagoda. | "Very clever" is an adjective represents characteristic of a person, so it is not an action. |

☐ A : Fill in the blank
☐ B : Short answer question
☐ C : Multiple Choice

Feedback type

☐ A : Text-based short answer
☐ B : Text-based short answer and more information
☐ C : Video based feedback

**Pre-Test**

| Question | Possible answers | Correct Answer | Feedback of the question |
|---|---|---|---|
| Choose the correct order of Activity of making frying egg? | 1. Warm the pan with frying oil<br>2. Take off the shell and put the egg into the pan<br>3. Buy the eggs from the market | 3, 1, 2 | |

☐ A : Fill in the blank
☐ B : Short answer question
☐ C : Multiple Choice

Feedback type
☐ A : Text-based short answer
☐ B : Text-based short answer and more information
☐ C : Video based feedback

**Pre-Test**

| Question | Possible answers | Correct Answer | Feedback of the question |
|---|---|---|---|
| A Requirement said "System should be able to make a cup of hot coffee 3 in 1.", Which order of actions is correct? | 1. Boil water in a kettle, take a cup, pour water, put coffee 3 in 1, mix it well.<br>2. Take a cup, put coffee 3 in 1, pour water, mix it well, boil water in a kettle.<br>3. Boil water in a kettle, put coffee 3 in 1, mix it well, pour water, take a cup. | 1 | 2, is not correct because the coffee is mixed well in the cup with cold water<br>3, is not correct because the coffee is mixed well in the kettle, then pour it out without the cup. |

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| **(1)<br>Learning<br>Contents** | ▪ Use cases show what your system should do. Activity diagrams allow you to specify how your system will accomplish its goals<br>▪ Activity diagrams are particularly good at modeling business processes<br>▪ Activity diagrams are the only UML diagram in the process view |

Logical View

Process View

Use Case

Physical View

Development View
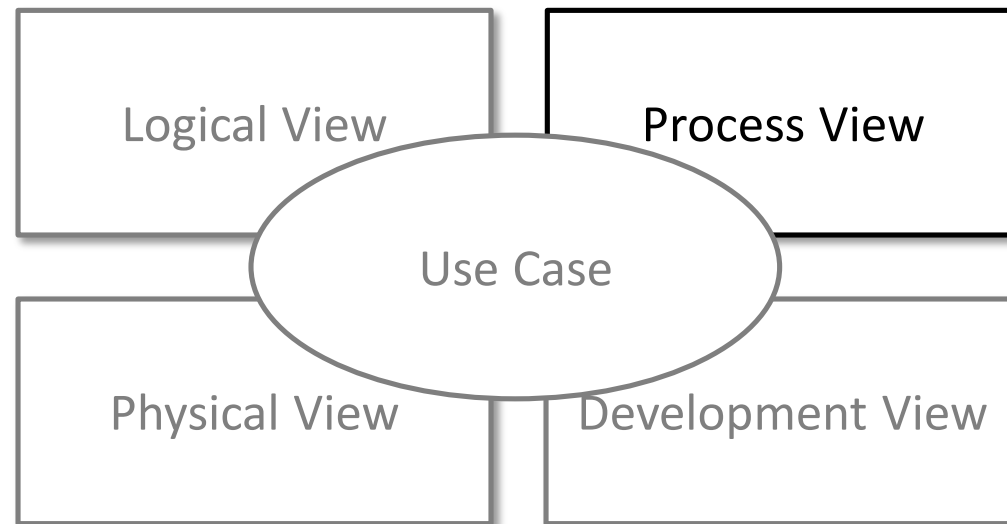
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☐ C : Only Video

**(1) Learning Contents**

- Initial node
    - Notation: filled circle
    - It marks the start of the activity

- Activity final node
    - Notation: two concentric circles with a filled inner circle
    - It marks the end of the activity

<table>
<tr>
<td rowspan="2">(1)<br>Learning<br>Contents</td>
<td>

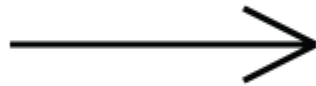☒ A : Text-based + Audio
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- Action
    - Notation: rounded rectangle
    - Actions are the important steps that take place in the overall activity
    - An action could be:
        - a behavior performed,
        - a computation,
        - or any key step in the process

</td>
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Action

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**(1) Learning Contents**

- Notation: arrowed line
- It shows the direction of flow from one action to the next
- Incoming edge: a line going into a node
- Outgoing edge: a line exiting a node

| | | |
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| | ⊠ A : Text-based + Audio<br>□ B : Text-based + Video<br>□ C : Only Video | |
| **(1)**<br>**Learning**<br>**Contents** | ▪ Create new Blog Account example |  |
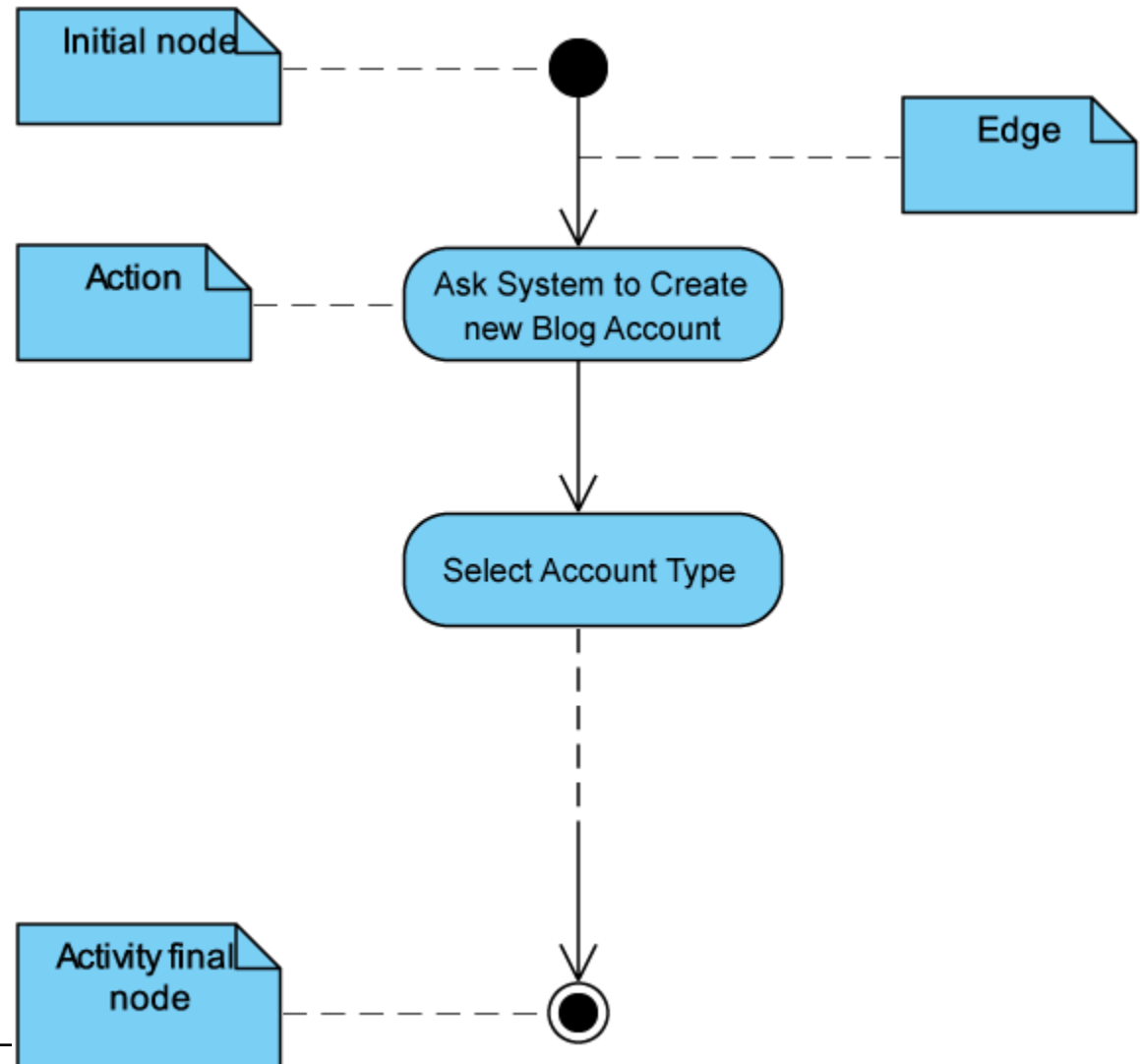
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**(1) Learning Contents**

- The word "activity" is often mistakenly used instead of "action" to describe a step in an activity diagram, but they are not the same
    - An activity is the process being modeled, such as
        - washing a car
        - booking a guesthouse
        - making coffee
    - An action is a step in the overall activity, such as
        1. Lather,
        2. Rinse, and then
        3. Dry

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**(1) Learning Contents**

▪ Activity presents a process or workflow being modeled

Example: Making Coffee activity:
1. First, boil water in a kettle,
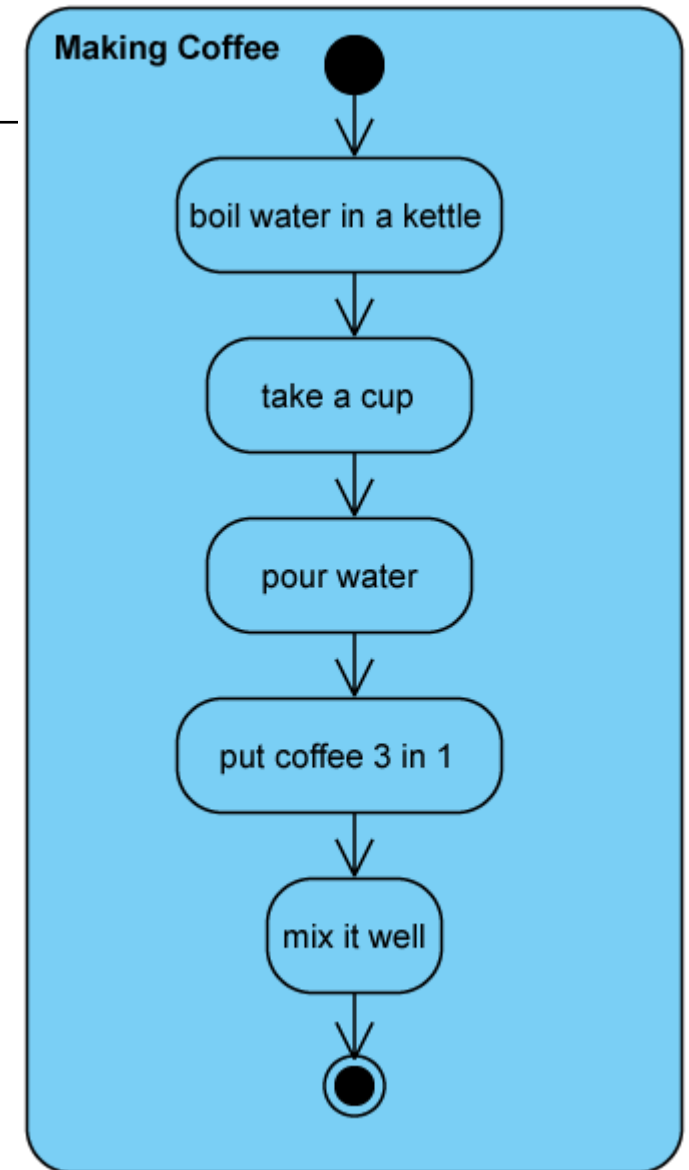2. take a cup,
3. pour water,
4. put coffee 3 in 1,
5. mix it well
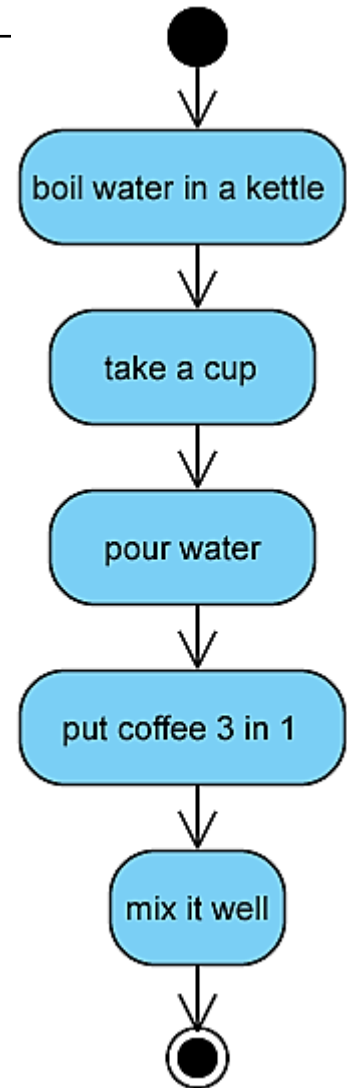
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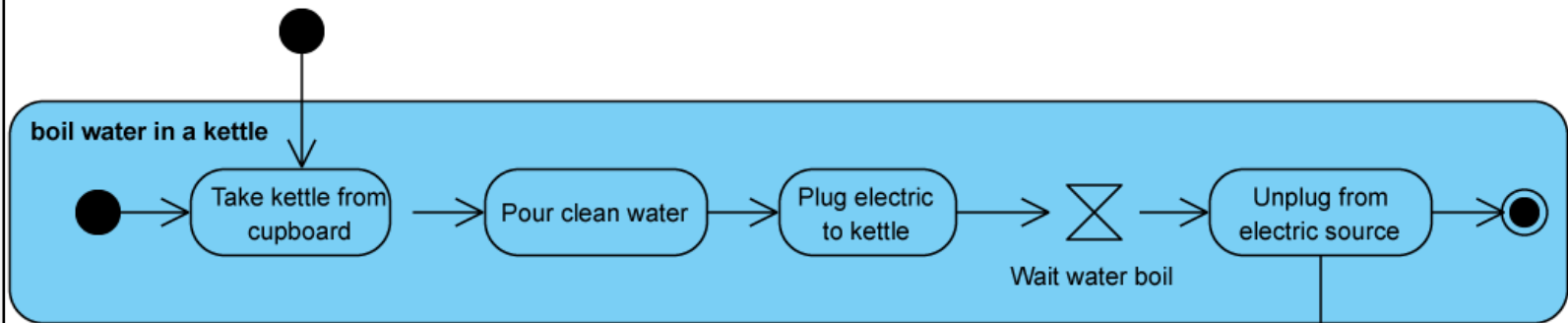☐ B : Text-based + Video
☐ C : Only Video

**(1) Learning Contents**

- Activity Frame
    - Notation: rounded rectangle
    - It encloses the entire activity
    - The name of the activity is put in the upper left corner
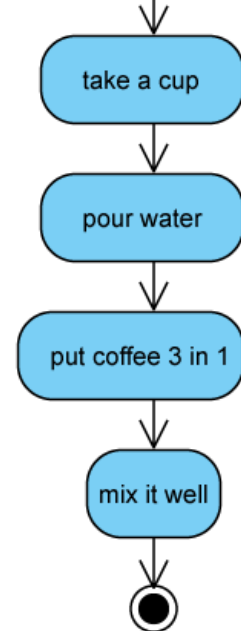
**Making Coffee**

boil water in a kettle

take a cup

pour water

put coffee 3 in 1

mix it well

☒ A : Text-based + Audio
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☐ C : Only Video

**(1) Learning Contents**



boil water in a kettle

Take kettle from cupboard → Pour clean water → Plug electric to kettle → Wait water boil → Unplug from electric source

take a cup → pour water → put coffee 3 in 1 → mix it well

- Action is a step in overall Activity
  Each step of making coffee Activity is an action.
  An action can become activity when that action
  contains more actions to do (it becomes Activity Frame).
  Example: Boil water in a kettle:
  1. Take the kettle from the cupboard
  2. Pour clean water from a tab into the kettle
  3. Plug the electric to kettle and heat the kettle
     (Suppose that the kettle is electric kettle)
  4. Wait until the water boil
  5. Unplug the kettle from electric source

☒ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

- Washing car workflow:
    1. Lather,
    2. Rinse, and then
    3. Dry

L
C

Lather → Rinse → Dry
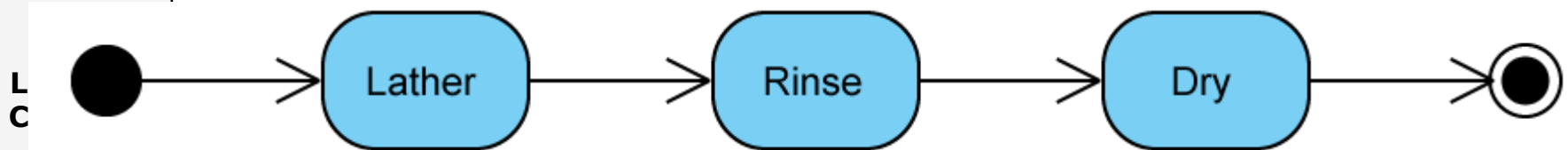
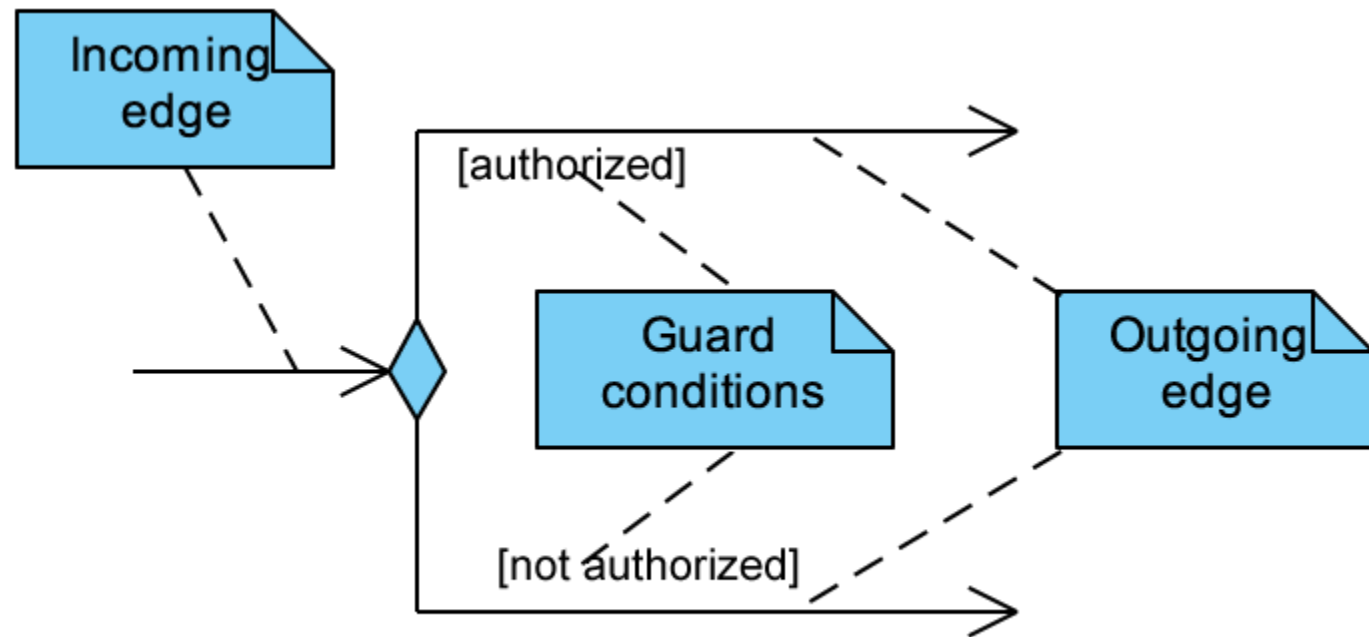| | |
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| **(1)**<br>**Learning**<br>**Contents** | ☒ A : Text-based + Audio<br>☐ B : Text-based + Video<br>☐ C : Only Video |
| | ▪ Decision<br>     Decisions are used when you want to<br>     execute a different sequence of actions depending on a condition<br><br>▪ Merge<br>     The branched flows join together at a merge node,<br>     which marks the end of the conditional behavior started<br>     at the decision node |

☒ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

**(1) Learning Contents**

- Notation: diamond-shaped node with one incoming edge and multiple outgoing edges
- Each branched edge contains a guard condition written in brackets
- Guard conditions determine which edge is taken after a decision node
- Guard conditions are statements that evaluate to true or false

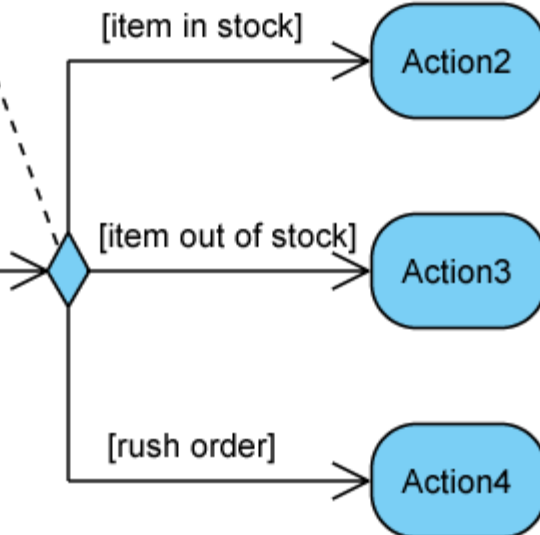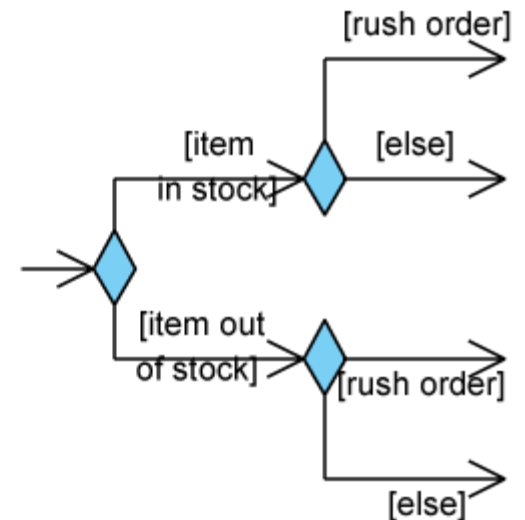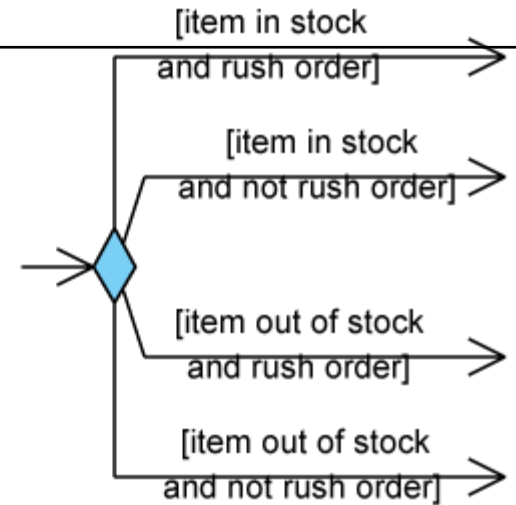☒ A : Text-based + Audio
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☐ C : Only Video

**(1) Learning Contents**

BAD! two guard may evaluates to true

[item in stock]  →  Action2

[item out of stock]  →  Action3

[rush order]  →  Action4

Modify so that only one outgoing guard evaluates to true, as in these diagrams

[item in stock and rush order]

[item in stock and not rush order]

[item out of stock and rush order]

[item out of stock and not rush order]

[rush order]

[item in stock]  [else]

[item out of stock]  [rush order]

[else]

  

| | |
|---|---|
| | ☒ A : Text-based + Audio<br>☐ B : Text-based + Video<br>☐ C : Only Video |
| **(1)**<br>**Learning**<br>**Contents** | ▪ Notation: diamond-shaped node with multiple incoming edges and one outgoing edge<br><br> |

| | |
|---|---|
| | ☒ A : Text-based + Audio<br>☐ B : Text-based + Video<br>☐ C : Only Video |
| **(1)**<br>**Learning**<br>**Contents** | ▪ Movie ticket buying and reservation system, user can:<br>    ▪ select a movie<br>    ▪ select available time<br>    ▪ input number of seats<br>    ▪ choose the available seat number (s)<br>    ▪ confirm order<br>    ▪ choose between book or buy the ticket directly<br>    ▪ In case booking:<br>        ▪ input detail information including name and tel<br>    ▪ In case buying:<br>        ▪ choose payment service (PayPal, Wing, Amk, TrueMoney, etc.)<br>        ▪ let payment service identify user account and payment<br>        ▪ verify payment service to make sure that user has already been paid<br>        ▪ If user cancel transaction, let user make booking<br>        ▪ otherwise, let user input detail information including name and tel<br>    ▪ submit order |
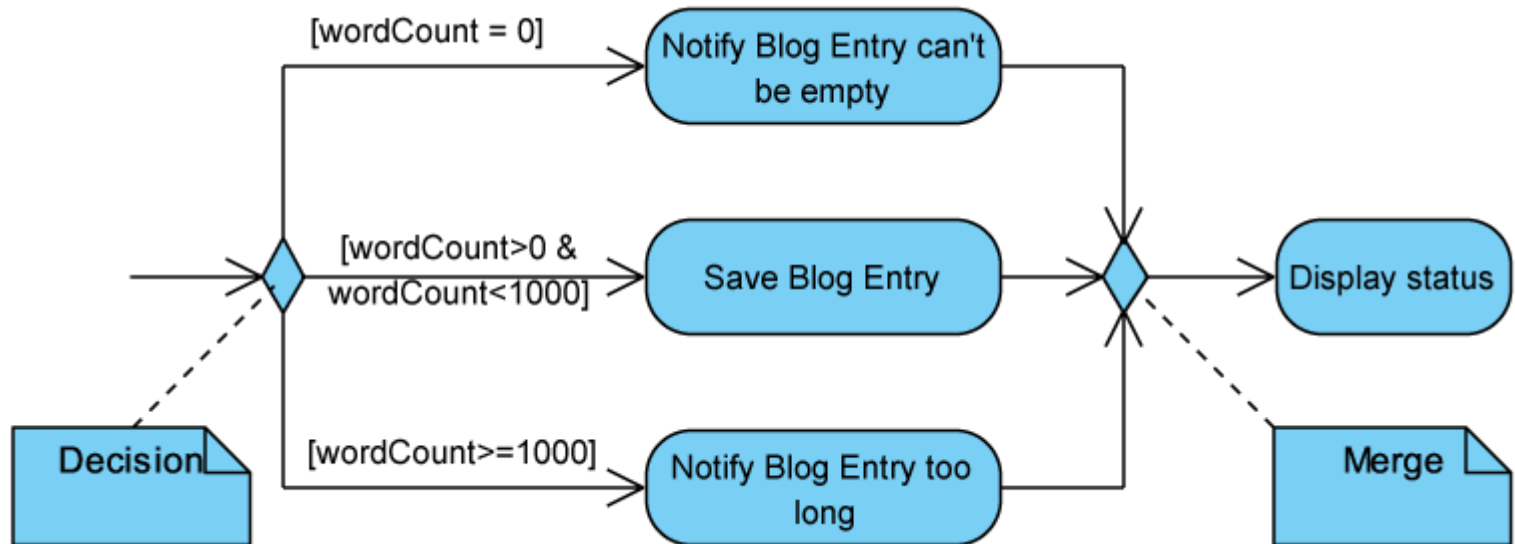
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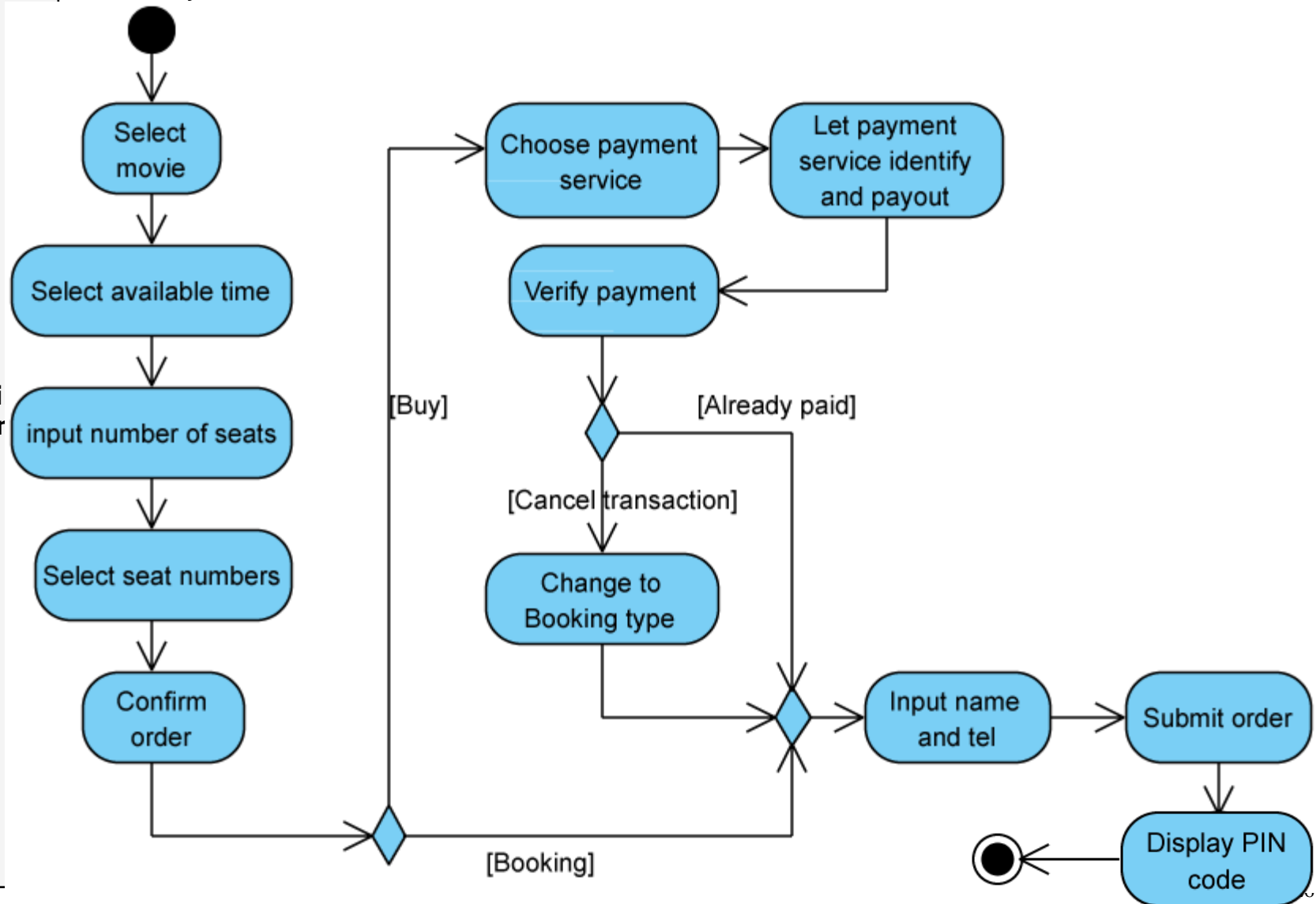
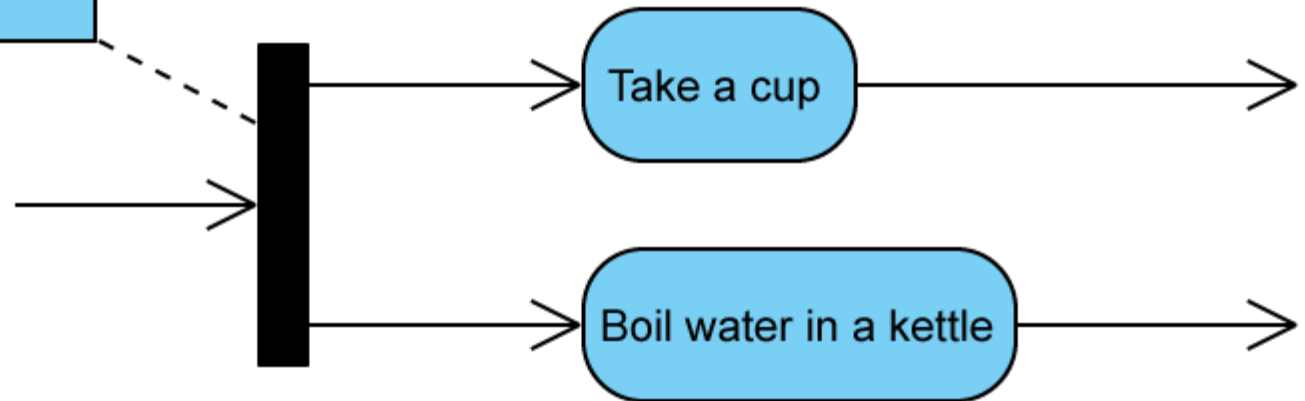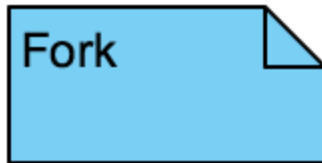| | |
|---|---|
| **(1)<br>Learning<br>Contents** | ☒ A : Text-based + Audio<br>☐ B : Text-based + Video<br>☐ C : Only Video |
| | ▪ Some tasks can be done in parallel.<br>Doing this to:<br> ▪ Shorten the time we work<br> ▪ Make an activity to be done by multiple persons (share the work)<br> ▪ Reduce time wait<br><br> |

**(1) Learning Contents**

- Fork is the point where workflow divides into two or more parts
- Notation: thick bar
- After a fork, the flow is broken up into two or more simultaneous flows
- the actions along all forked flows execute
- Forks have multiple outgoing flows
- For example, in making coffee workflow, we can boil the water and at the same time, we take a cup and put coffee 3-in-1.

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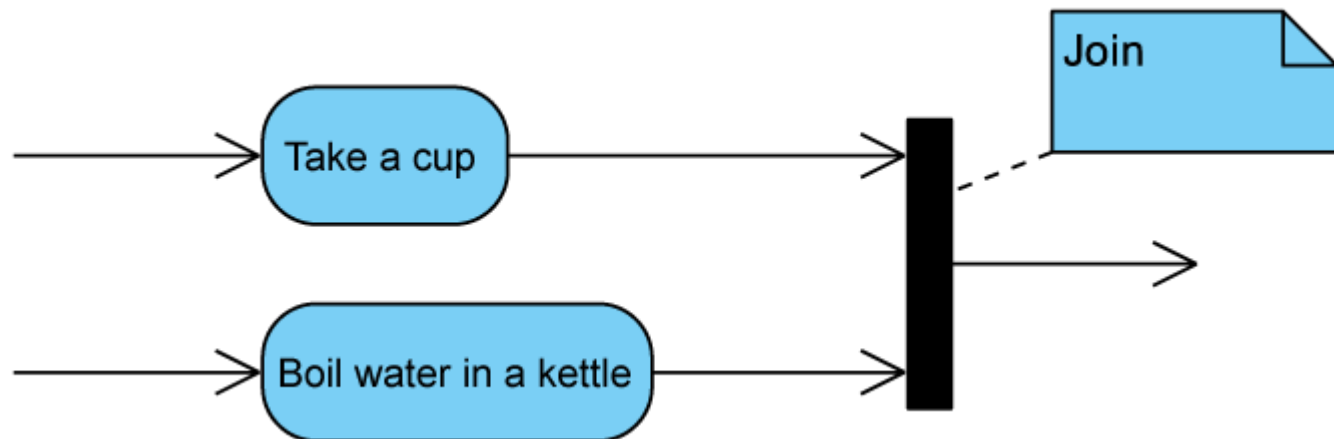☐ B : Text-based + Video
☐ C : Only Video

**(1)
Learning
Contents**

- Join is to connect many fork flows together into one flow
- Notation: thick bar
- All incoming actions must finish before the flow can proceed past the join
- Join have multiple incoming flows

☒ A : Text-based + Audio
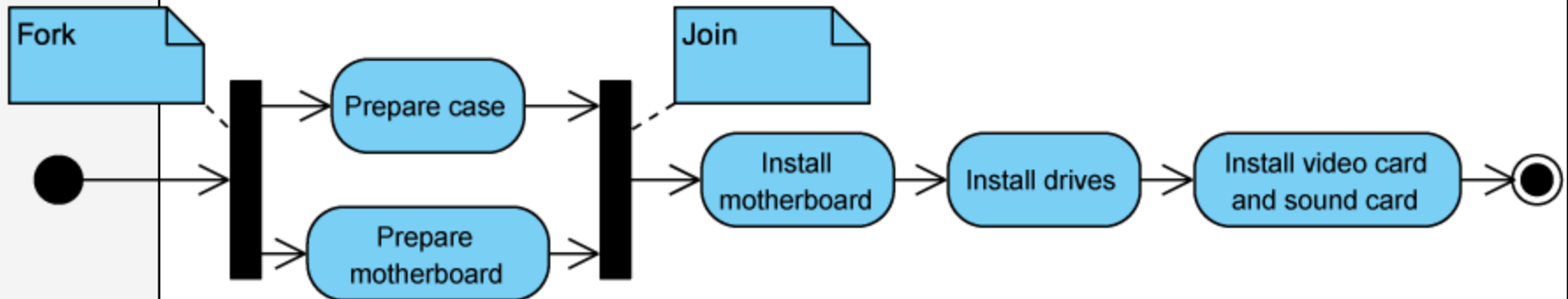☐ B : Text-based + Video
☐ C : Only Video

**(1) Learning Contents**

- Example: computer assembly workflow
    1. Prepare the case
    2. Prepare the motherboard
    3. Install the motherboard
    4. Install the drives
    5. Install the video card and sound card
- This work flow is modeled **sequentially**
- But Prepare case and prepare motherboard can done in parallel.

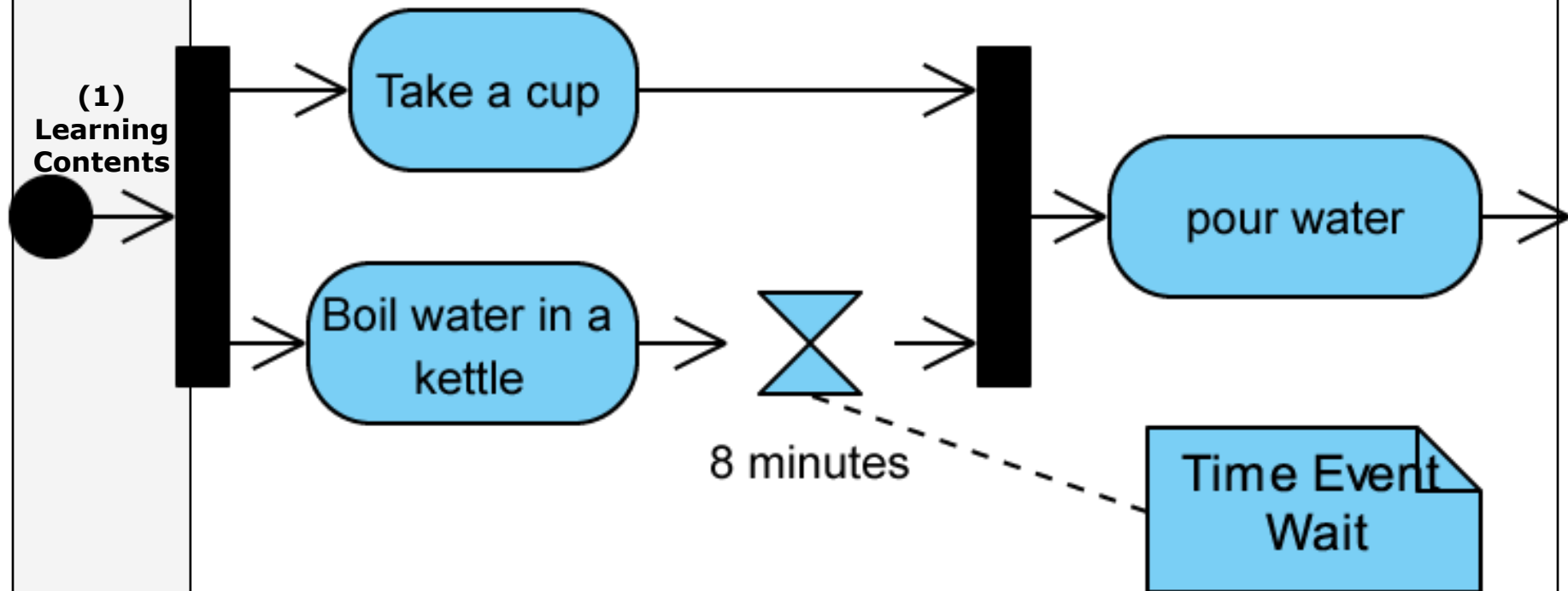| | |
|---|---|
| **(1)**<br>**Learning**<br>**Contents** | ☒ A : Text-based + Audio<br>☐ B : Text-based + Video<br>☐ C : Only Video<br><br>▪ Sometimes time is also a factor in your activity<br>    ▪ Example in Making coffee workflow,<br>    boiling water action is required to wait until water boil.<br>    ▪ Example in Online ordering products process,<br>    after buying, client needs to wait for transportation period of 3 days.<br><br> |

☒ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

- Time event is used to model a wait period
    - Notation: an hour glass symbol with the amount of time written next to it
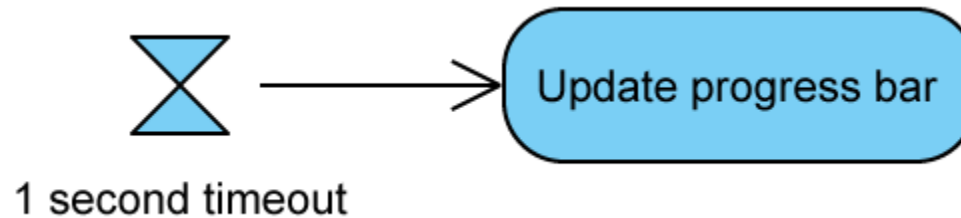    - The incoming edge to the time event indicates that the time event is activated once

**(1) Learning Contents**

☒ A : Text-based + Audio
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☐ C : Only Video

**(1)**
**Learning**
**Contents**

- A time event with no incoming flow is a recurring time event
- It can be an alternative way to start an activity (which is launched periodically)



1 second timeout          Update progress bar

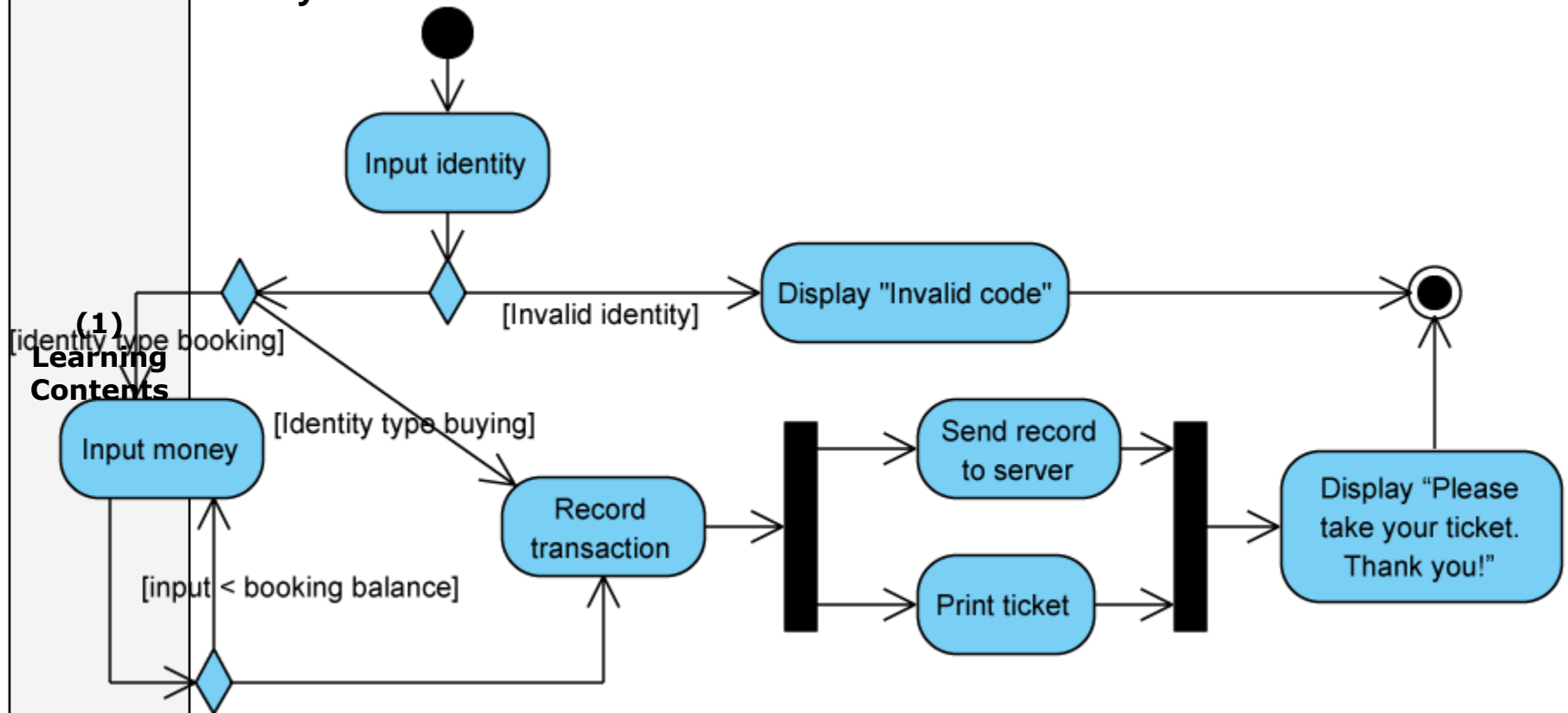| | |
|---|---|
| | ☒ A : Text-based + Audio<br>☐ B : Text-based + Video<br>☐ C : Only Video |
| **(1)**<br>**Learning**<br>**Contents** | **Lobby of the theater**<br>This example is continued from previous ticket booking system. This system is to print the ticket, buy and check booking or buying (phone number and PIN code).<br>The system:<br>▪ Let user input the identity (phone number and PIN code)<br>▪ In case invalid identity, reject it with message "invalid code"<br>▪ Otherwise,<br>    ▪ In case booking, ask user to pay in place, wait until user input enough money<br>    ▪ Send information server to store as history and accounting<br>    ▪ At the same Print ticket<br>    ▪ And also display message "Please take your ticket. Thank you!" |

☒ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

**Lobby of the theater**



**(1)**
**Learning**
**Contents**

| Question | Possible answers | Correct Answer |
|---|---|---|
| 1. Activity diagram describes: | a) Activities of development process<br>b) how your system will accomplish its goal<br>c) Process of making activity<br>d) All features in project | b) how your system will accomplish its goal |
| 2. Completing blank field: | Activity diagrams are particularly good at modeling…………………….. | business processes |
| 3. Choose a name that is not Activity Diagram Element: | a) Time Event<br>b) Action<br>c) Association<br>d) Activity<br>e) Decision | c) Association |
| 4. Activity Frame is used to: | a) Name and activity<br>b) Group actions perform a specific goal<br>c) Represent an action that has name<br>d) Sub System<br>e) Represent optional actions | b) Group actions that has the same goal |
| 5. What are different between Fork and Decision? | a) Incoming flow is only one | b) Has many Outgoing flows<br>c) Execution flow |

☐ A : Fill in the blank
☐ B : Short answer question
☐ C : Multiple Choice

Feedback type

☐ A : Text-based short answer
☐ B : Text-based short answer and more information
☐ C : Video based feedback

**Practice**

| No. | Exercise | Solution |
|-----|----------|----------|
| 1. | Draw Activity diagram of ATM system (see detail in Moodle) | |
| 2, | Draw Activity diagram of Insurance System | |
| 3, | Draw Activity diagram of Check-in-system | |

**Please give a lesson summary.**
**Each topic can be summarized into a sentence, diagram, or even a word.**

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**Summarize**

▪ Activity diagram shows the process of the system.
▪ Activity diagram components include Initial node, final node, action, activity, control flow, decision, merge, fork and join.
▪ Control IF…ELSE is represented with Decision node, then Merge node to merge back.
▪ Forks are used to enable us do multiple tasks at the same time, and Joins are used to eliminate multi-tasking.
▪ Time Event has 2 types including waiting time and event trigger time.

**Provide references if you think the students need.**

**Reference**

- Miles, R. (2006). Learning UML 2.0. O'Reilly
- Chonoles, M. & Schardt, J. (2003). UML 2 for Dummies. Wiley Publishing
- http://www.visual-paradigm.com/features/
- http://staruml.io/support
- http://staruml.sourceforge.net/v1/documentations.php
- http://www.math-cs.gordon.edu/courses/cs211/ATMExample/UseCases.html

**This is the end of the lesson.**
**Ending message and introduction to next lesson including lesson title and topics should be given.**

☒ A : Text-based + Audio
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☐ C : Only Video

| | |
|---|---|
| **Next Lesson Title** | **Class Diagram**<br>1.  What is class?<br>2.  Getting started with classes in UML<br>3.  Visibility<br>4.  Class properties<br>5.  Static parts of your classes |