BSc (Hons) in Information Technology

IT2020 – Software Engineering

Semester 2, 2022

Year 2

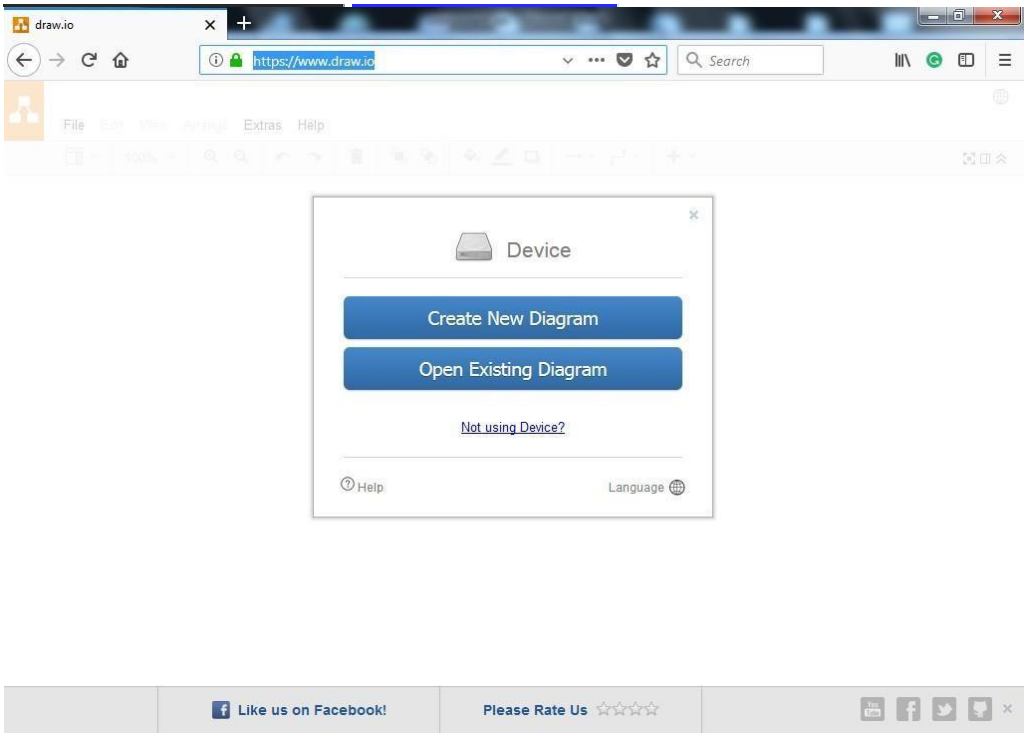
Lab 3

This Lab sheet is designed to revise your knowledge on state diagrams. We use draw.io to draw the state diagrams.

draw.io is free online diagram software for making flowcharts, process diagrams, org charts, UML, ER and network diagrams.

Instructions to start draw.io

Type following URL in the browser and open https://www.draw.io/



Click on “Create New Diagram”

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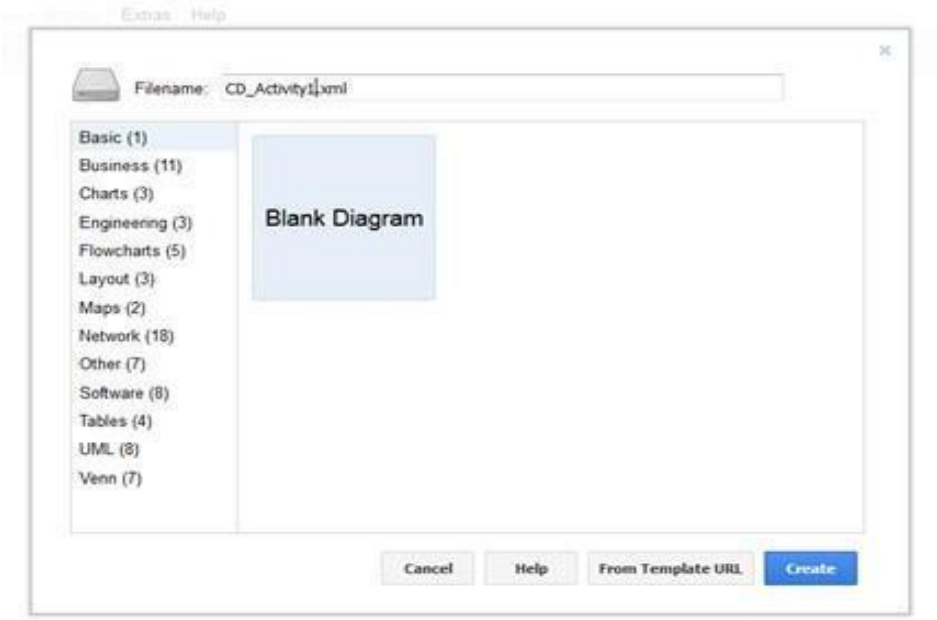
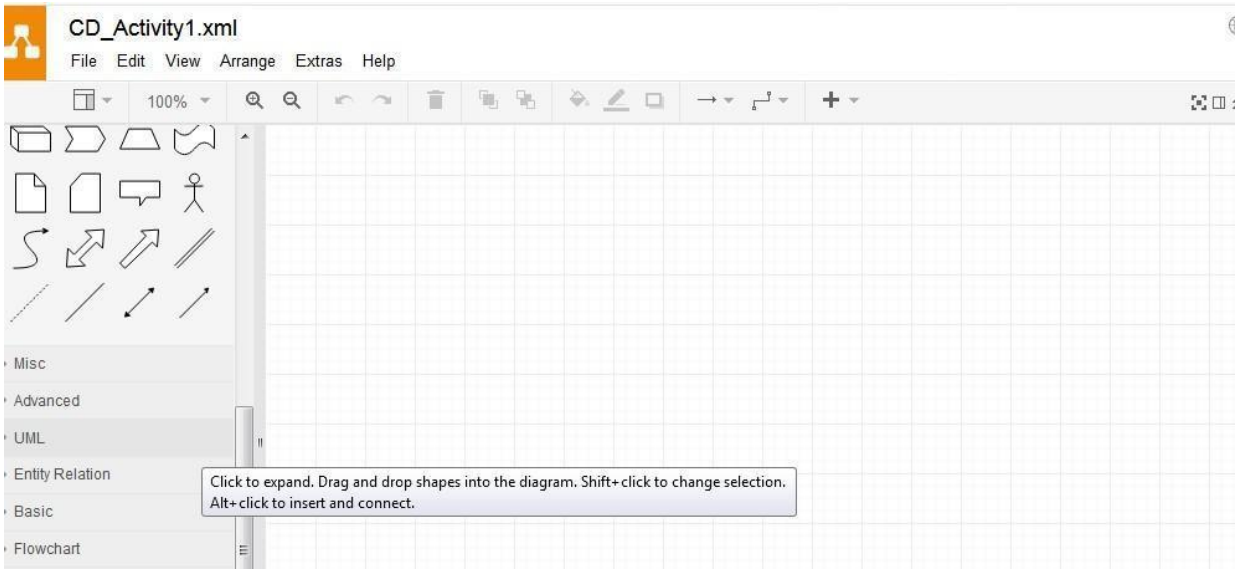


Give a file name and select “Blank Diagram” and then click “Create”.



Select “UML” from left hand side list.

Click on suitable notations to draw the diagram.

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1. Draw a state machine diagram for the following scenario, which describes the operation of a Sandwich Toaster.

Initially, the toaster is in the Power off state. It will move to Power on state once switched on. At the entry of the Power on State, the toaster is turn on its heater and turn on its green light. While in the Power on state, the toaster increases the temperature to 275 degrees. When temperature reaches to 275 degrees, the toaster moves to Operating state. While in the Operating state the toaster maintains its temperature in 275 degrees. After 5 minutes in the Operation state, the toaster automatically goes to ToastReady State. When enter to the ToastReady state, the toaster turn on its red light. This is the sign to take the toast out. ToastReady state has a exit action of Turn off Red light. While in ToasterReady state, when someone switchoff the toaster, it moves to Power off state again. Also, switchoff the toaster is possible from Operating state as well as from Power on state, which moves back to Power off state.

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2. Draw a State diagram for the door object scenario given below.

All dangerous chemicals are stored in the restricted area and access to that area is prohibited for any unauthorized person. It operates under specific regulations and guild lines. There is only one security door to enter and leave the restricted area.

The security door either can be “Opened”, “closed” or “locked”, “alert”. Initially the door is in closed and it can be opened only with a correct security code. Once the code is entered, it will check for the validity of the code and provide or deny access. In the case of an unauthorized security code, it will allow another two attempts to enter the code and in the third time Door alarm would sound if the code is invalid.

Once the door is opened within 20 seconds it will close itself automatically. When a person enters he/she can close the door by pressing the close button from inside. When the door is in the closed mode, door gets automatically locked after closing it within 10seconds. Door will lock only when it’s closed. While the door is locked the alarm would ring creating an alert stage once a security breach is detected. In this stage alarm would ring continually until it is turned off. The alarm can be turned off only by a valid fingerprint, which will result the door to open.

3. Draw the state chart diagram for the Drive Control object. State any assumptions made.

The Drive Control object is used in controlling the speed and stopping the elevator. If the elevator is more than two floors away from reaching the desired floor, Drive Control object moves to FastUp state in order to move fast. If the current floor is only one floor away from the desired floor, then Drive Control moves to SlowDown state. When the elevator is at the desired floor and if it is not an emergency, the Driver Control returns to the Normal Stop. In case of emergency, Drive Control receives emergency brake signal and results in an Emergency Stop.

Self-Study Questions

Students need to try these questions by themselves.

1. Draw a State Machine diagram for the following scenario.

An Electric Oven is in Idle state at the beginning. While in the idle state the oven is displaying time. When press Full Power button, it moves from idle state to FullPower state. When enter FullPower state, power set to 800. Similarly, when press Half Power button, it moves from Idle state to HalfPower state. When enter HalfPower state, power set to 400. FullPower state can changed to HalfPower state when presses Change Power button and vice versa.

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Both FullPower and HalfPower states can move to SetTime state when Timer presses. While in the SetTime Sate, the oven is getting the time and when exit set the time. After set time, if the door is still open, the oven moves to Disabled state.

While in the disabled state the oven is displaying “Waiting”. When the door closed after setting time, oven moves to Enabled sate. While in the Enabled state the oven is displaying “Ready”. Also in the Disabled state, if door is closed the oven is moving to Enabled state. While in the Enabled state, if press start button, the oven moves from Enabled state to Operation state. During the Operation state the oven is operating. In Operation state, if press cancel, oven moves back to waiting state.

2. Given below is an application that handles seminars for enrollment. Draw a State Transition Diagram for the state changes in the Seminar class. Indicate all the conditions, entry and exit requirements for each state.

A member of the academic department first proposes a seminar. If the seminar is approved by the management it will be scheduled, otherwise the proposed seminar will be cancelled. When a seminar is scheduled, it can either be opened for enrollment or be cancelled due to logistical and other management problems. The seminar will be open for enrollment one week before the scheduled date.

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Once the seminar is open for enrollment, students are enrolled as long as the seats are available. If the seats are filled the seminar will be switched to “Full” state. Students can still enroll to the seminar, and when the students are enrolled in this state, they will be added to the waiting list. If a student is dropped from the seminar, a student from the waiting list will be added to the seminar.

If the number of students dropped from the seminar is more than the number of students in the waiting list, the seminar will be switch back to the Open for Enrollment state. On the day prior to the seminar day, seminar will be closed for enrollment and the instructors for the seminar will be notified about the participants of the seminar. Even after closing the seminar for enrollment, there is a possibility of cancelling the seminar. In this case all the enrolled students will be notified about the cancellation details.