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Model Driven Software Development course

Yakindu

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Chapter 1

Yakindu

From Wikipedia (http://en.wikipedia.org/wiki/YAKINDU_Statechart_Tools): Yakindu (<http://statecharts.org/>) Statechart Tools (SCT) is an open source tool for the specification and development of reactive, event-driven systems with the help of state machines. It consists of an easy-to-use tool for graphical editing and provides validation, simulation and code generators for different target platforms. The users come from both the industrial and academic sectors.”



Figure 1.1: The logo of Yakindu

Yakindu is developed by itemis, the same company that created Xtext.



Figure 1.2: The logo of itemis

1.1 Prerequisites

From the Yakindu update site, install the following plug-ins for Eclipse:

- Yakindu SCT 2
- Copy Paste Patch
- YAKINDU SCT Generator C
- YAKINDU SCT Generator Java
- Yakindu Statechart Tools (SCT) 2
- Yakindu Statechart Tools (SCT) 2 SDK

1.2 Modeling

1. Create a new **YAKINDU Xpand Generator Project**.
2. Add a new **YAKINDU Statechart Model**.
3. Add the following code to the editor:

```
interface Service:
in event request
in event read
var success : boolean

internal:
event complete
```

4. Create the statechart #1 as shown on the figure.

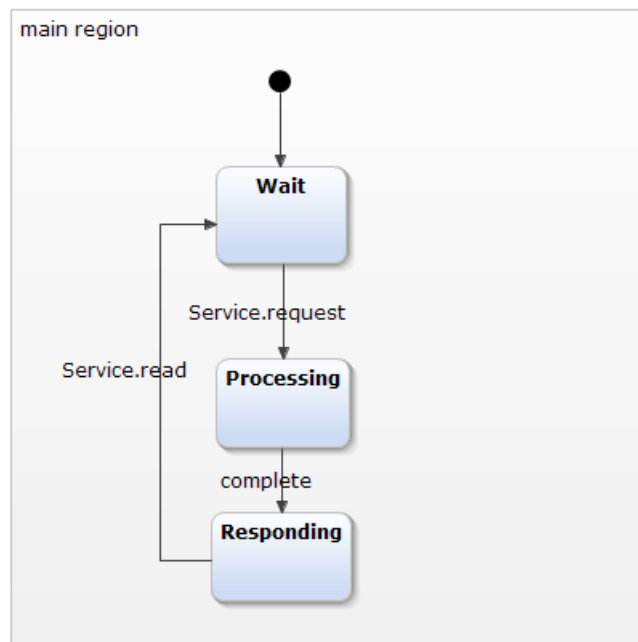


Figure 1.3: Statechart #1

5. Run the statechart (**Run As | YAKINDU Statechart**) and experiment with the **Simulation View**.
6. Extend your statechart to #2 by adding a new **State** and a **Choice**. Keep in mind that the transitions have priorities, which may cause them to behave differently than expected.
You can edit the **Transition Priority** in the **Choice's Properties** view (Right click the **Choice** on the canvas and pick **Show Properties View**).
7. Extend your statechart to #3 by adding a new **Composite State** called Frontend.
8. Modify the statechart definition block to the following:

```
interface Service:
in event request
```

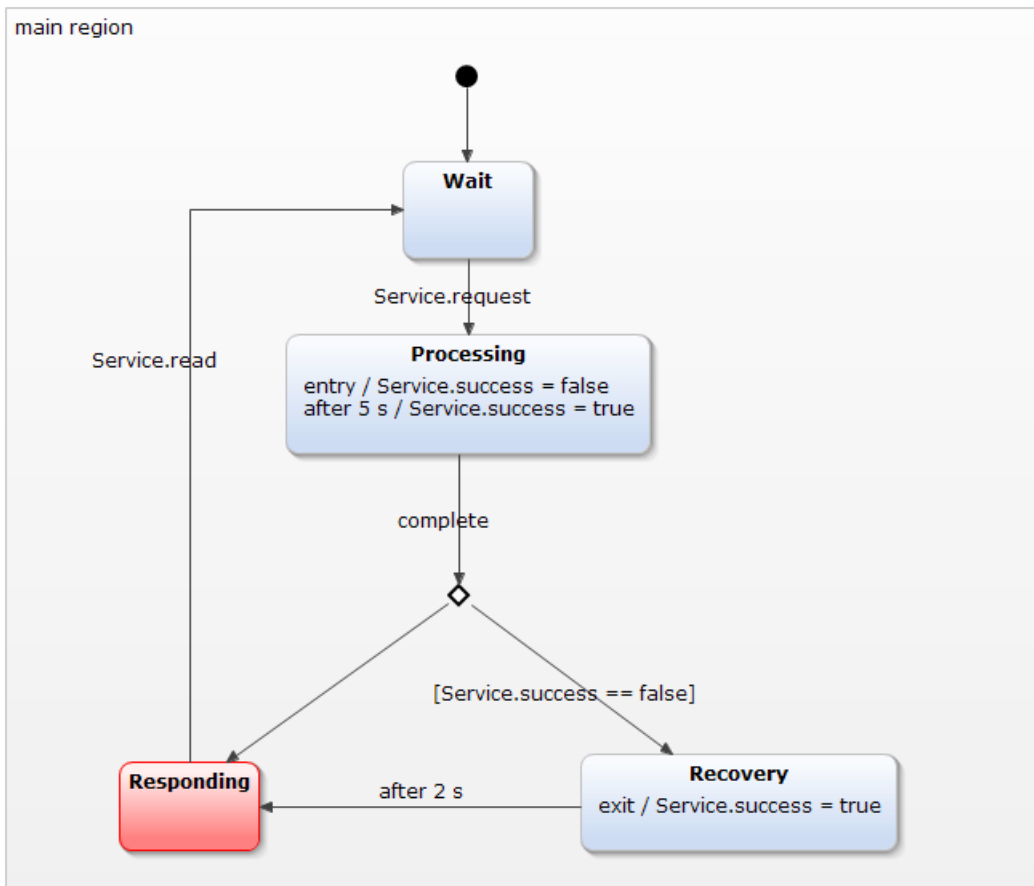


Figure 1.4: Statechart #2

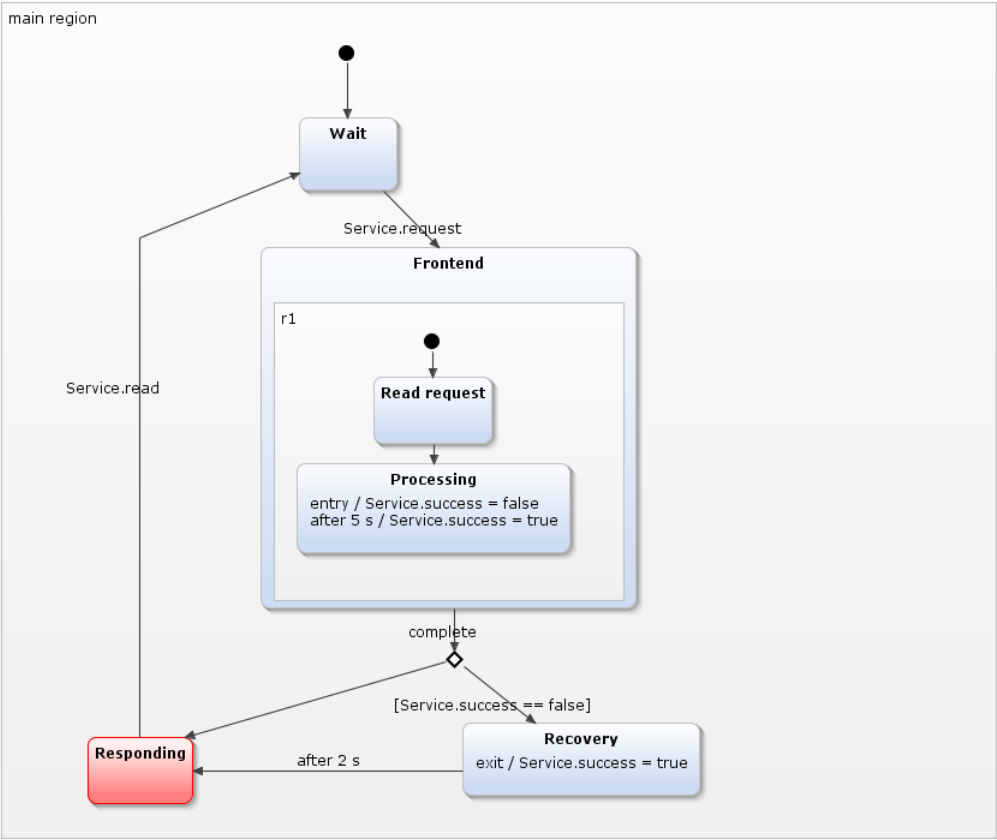


Figure 1.5: Statechart #3

```

in event read
var success : boolean

internal:
event complete
event execute
event finish

interface DB:
in event access
in event response
var data: integer

```

9. Using the new events, extend your statechart to #4 by adding a new **Composite State** called Database.

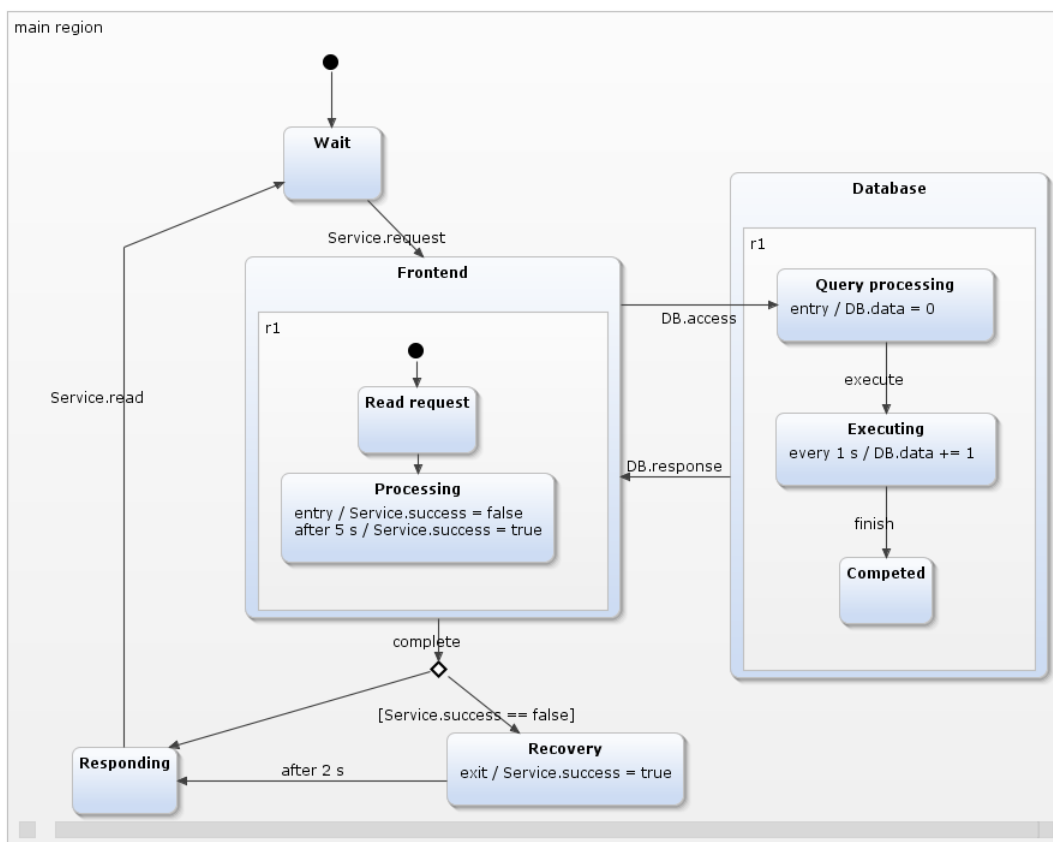


Figure 1.6: Statechart #4

10. Modify your statechart to get #5 by adding a new **Shallow History** to the Frontend state.

1.3 Code generation

1. Add a generator by clicking **File | New | Other...** and picking **Yakindu Statechart Generator Model**. Name it `service.sgen`, choose **YAKINDU SCT Java Code Generator** and tick the `service.sct` statechart.
2. Modify the `service.sgen` file to the following:

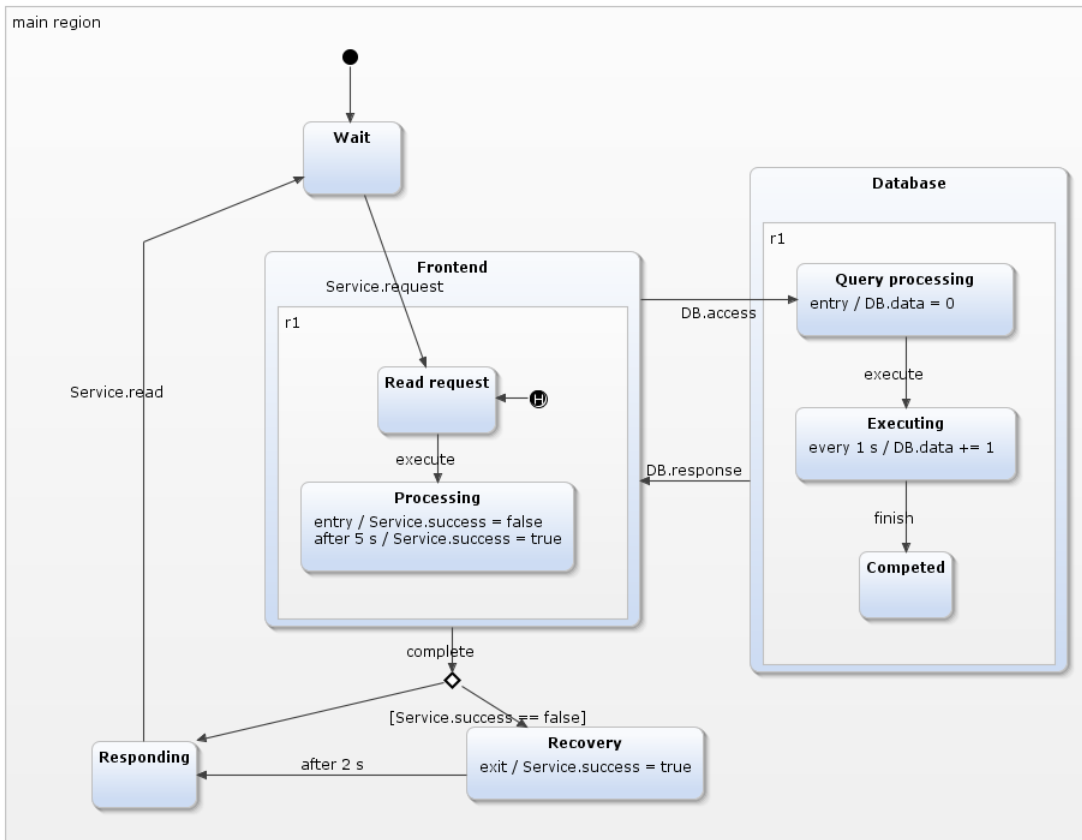


Figure 1.7: Statechart #5


```

GeneratorModel for yakindu::java {

    statechart service {
        feature Outlet {
            targetProject = "yakindu.labor"
            targetFolder = "src-gen"
        }

        feature GeneralFeatures {
            TimerService = true
        }
    }
}

```

3. Add the src-gen folder to the **Build Path**.

4. Create a class named ServiceClient in the src folder in a package named service:

```

package service;

import org.yakindu.scr.TimerService;
import org.yakindu.scr.service.ServiceStatemachine;
import org.yakindu.scr.service.ServiceStatemachine.State;

public class ServiceClient {

    public static void main(String[] args) throws InterruptedException {
        ServiceStatemachine sm = new ServiceStatemachine();
        sm.setTimerService(new TimerService());

        sm.enter();

        sm.getSCIService().raiseRequest();
        sm.runCycle();

        if (sm.isStateActive(State.main_region_Frontend_r1_Read_request)) {
            System.out.println("Reading request.");
        }
    }
}

```

5. Run the program. It will produce the following output:

```
Reading request.
```

6. Create a method that runs a number of cycles, each of which sleeps for 0.2 seconds and then notifies the statechart.

```

private static void sleep(ServiceStatemachine sm, int limit)
    throws InterruptedException {
    for (int i = 0; i < limit; i++) {
        Thread.sleep(200);
        sm.runCycle();
    }
}

```

```

}
}

```

7. Add the following call to the main method:

```
sm.getSCICCommon().raiseExecute();
```

8. This will cause a compile-time error. The problem is that the `execute` event is internal, therefore the `raiseExecute()` method is private and cannot be accessed from the main method. To address this, create a new interface called `Common` for the the internal events.

```

interface Common:
in event complete
in event execute
in event finish

```

9. Modify your statechart's transitions accordingly to get statechart #6.

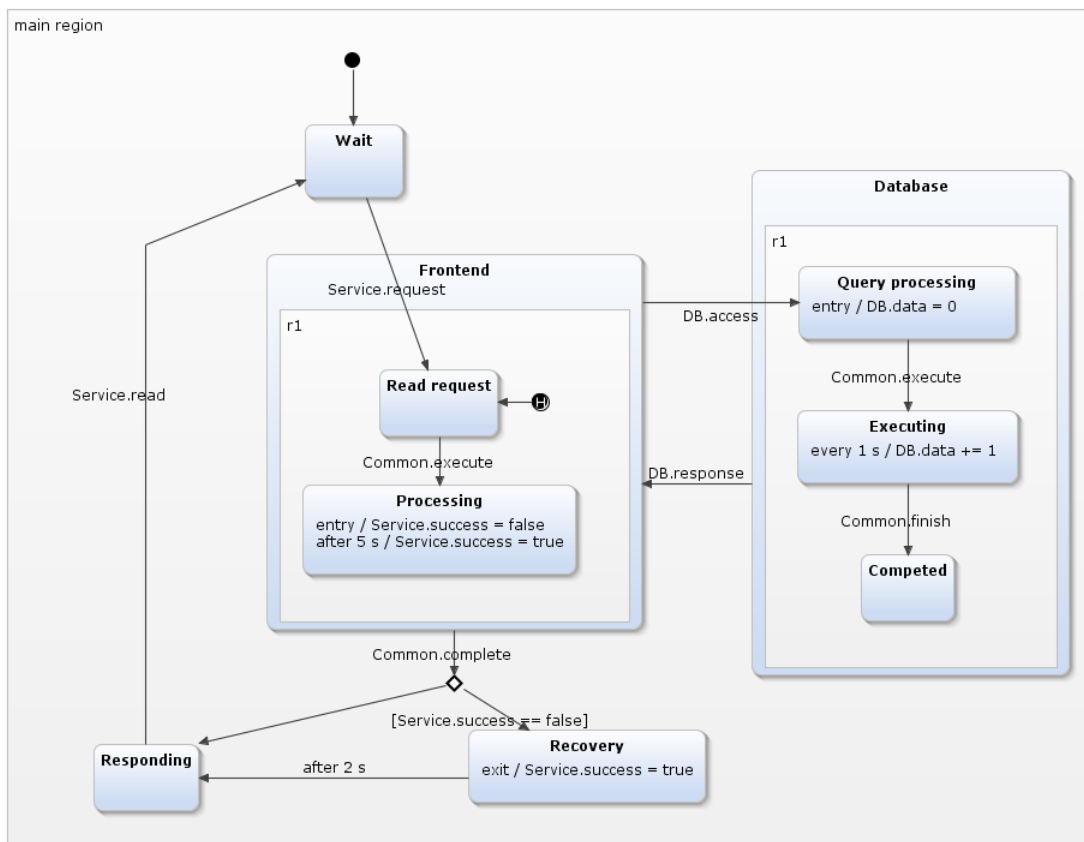


Figure 1.8: Statechart #6

10. After this, the `raiseExecute()` will be visible. Continue expanding the main method with the following:

```

sm.getSCICCommon().raiseExecute(); // we added this previously

sm.getSCIDB().raiseAccess();
sm.runCycle();

```

```

sm.getSCICommon().raiseExecute();
sm.runCycle();

sleep(sm, 30);

sm.getSCIDB().raiseResponse();
sm.runCycle();

System.out.println("Data = " + sm.getSCIDB().getData());

sleep(sm, 10);
sm.getSCICommon().raiseComplete();
sm.runCycle();

if (!sm.getSCIService().getSuccess()) {
    System.out.println("Unsuccessful call.");
    System.out.println("Recovery state active: " +
        sm.isStateActive(State.main_region_Recovery) + ".");
    sleep(sm, 11); // more than 2 seconds
}

if (sm.isStateActive(State.main_region_Responding)) {
    System.out.println("Responding.");
}

sm.exit();

```

11. Run the application. The output is the following:

```

Reading request.
Data = 6
Unsuccessful call.
Recovery state active: true.
Responding.

```

If you run the program multiple times, you can observe that the Data value is sometimes 5 instead of 6. Think about reason behind this.

1.4 Tips

- If the Java code is not generated automatically, right click the `service.sgen` file and click **Generate State-chart Artifacts**.
- If you cannot find the **Simulation View**, right click the **SC Simulation** perspective's name and choose **Reset**.