Drools Tutorial Practice

Caroline Rizzi Raymundo
carol.rizziray@gmail.com

Orientadora: Patrícia Dockhorn Costa

Elements of

RULE FILE

Rule File Elements

Package

Imports

Globals

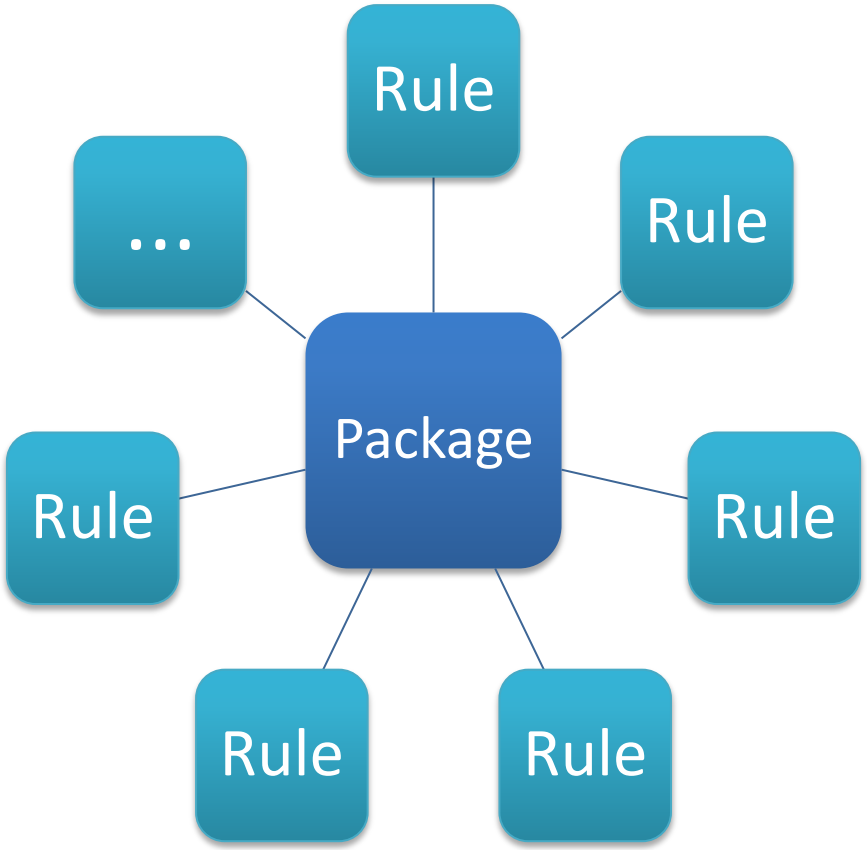
Functions

Queries

Rules

Package

- Unique
- Not related to files or folders



Import

- Like import statements in Java

TVSettings.drl

```
1  package ha.rules
2
3  import ha.objects.*;
4  import ha.objects.home.TV;
5  import ha.inferences.*;
6  import ha.inferences.home.UserHasTV;
7  import java.util.Date;
8
```

Global

- Variables available to all of the rules
- Not inserted in the Working Memory
- The engine can’t notify or track global changes
- Packages with the same global identifier
  - Must be of the same type
  - All the packages will reference the same value

Functions

- To put semantic code in the rule file
- Java code

```
function String Hello (User user) {
    return "Hello " + user.getName() + "!";
}
```

Query

Just RHS

```
query "Users which has more than 18 years"
    $user : User(age >= 18)
end
```

Result captured by a java loop

```
QueryResults qr = ksession.getQueryResults("Users which has more than 18 years");
System.out.println("Users which has more than 18 years:");
for (QueryResultsRow row : qr){
    User user = (User) row.get("$user");
    System.out.println("* " + user.getName());
}
```

Type Declaration

```
declare User
    cpf : String
    name : String
    age : int
end
```

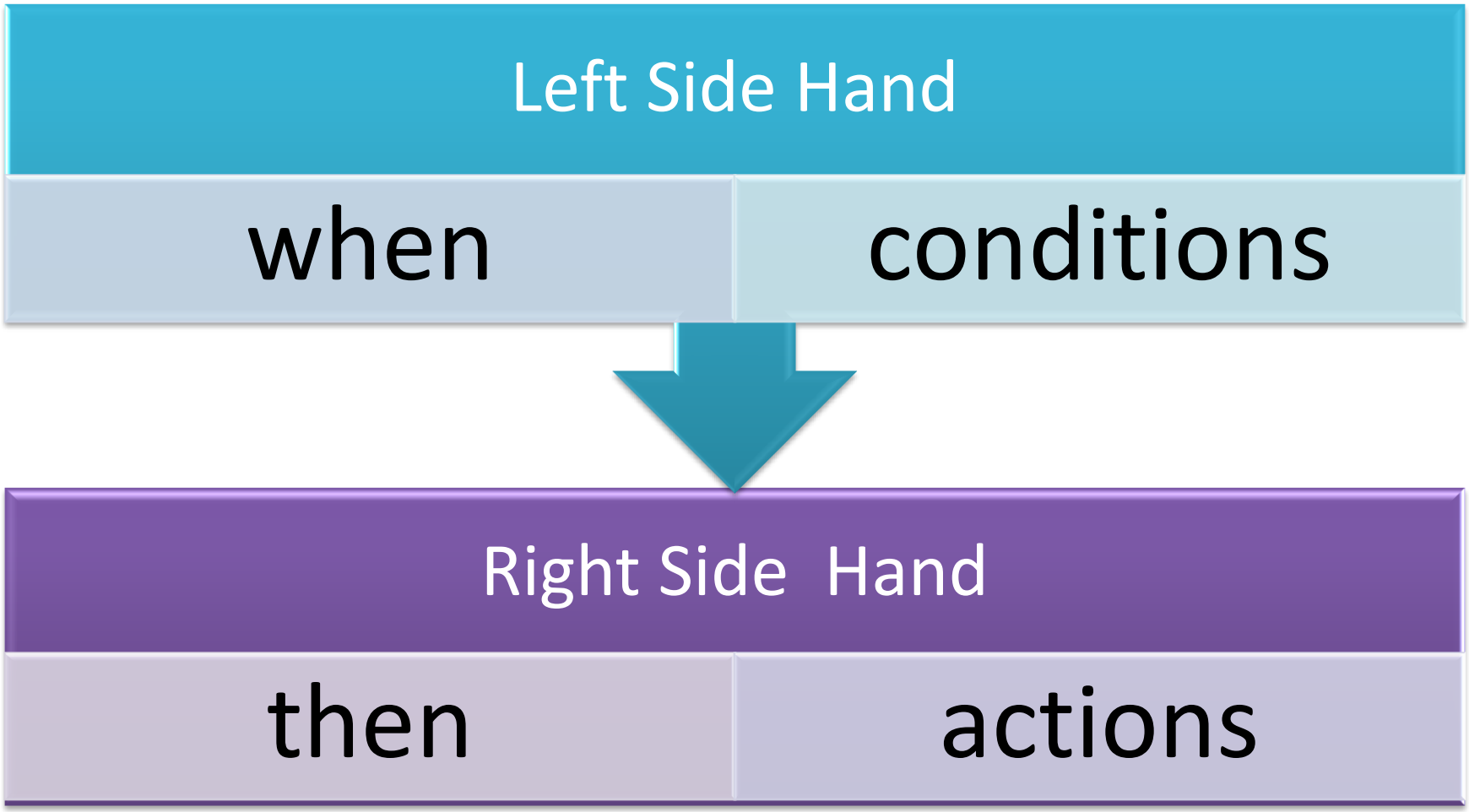
```
declare User
    @author(Carol)

    cpf : String @key @maxLength(11)
    name : String
    age : int
end
```

Fact Type Metadata

Attribute Metadata

THE RULE

Main Elements



Structure

```
5
6  rule "Rule Name"
7      <attributes>
8      when
9          LHS
10     then
11         RHS
12 end
```

```
21
22 rule "Indentifying Users"
23     salience 100
24     when
25         $user : User()
26     then
27         System.out.println ("User " + $user.getName() + " indentified.");
28 end
29
```

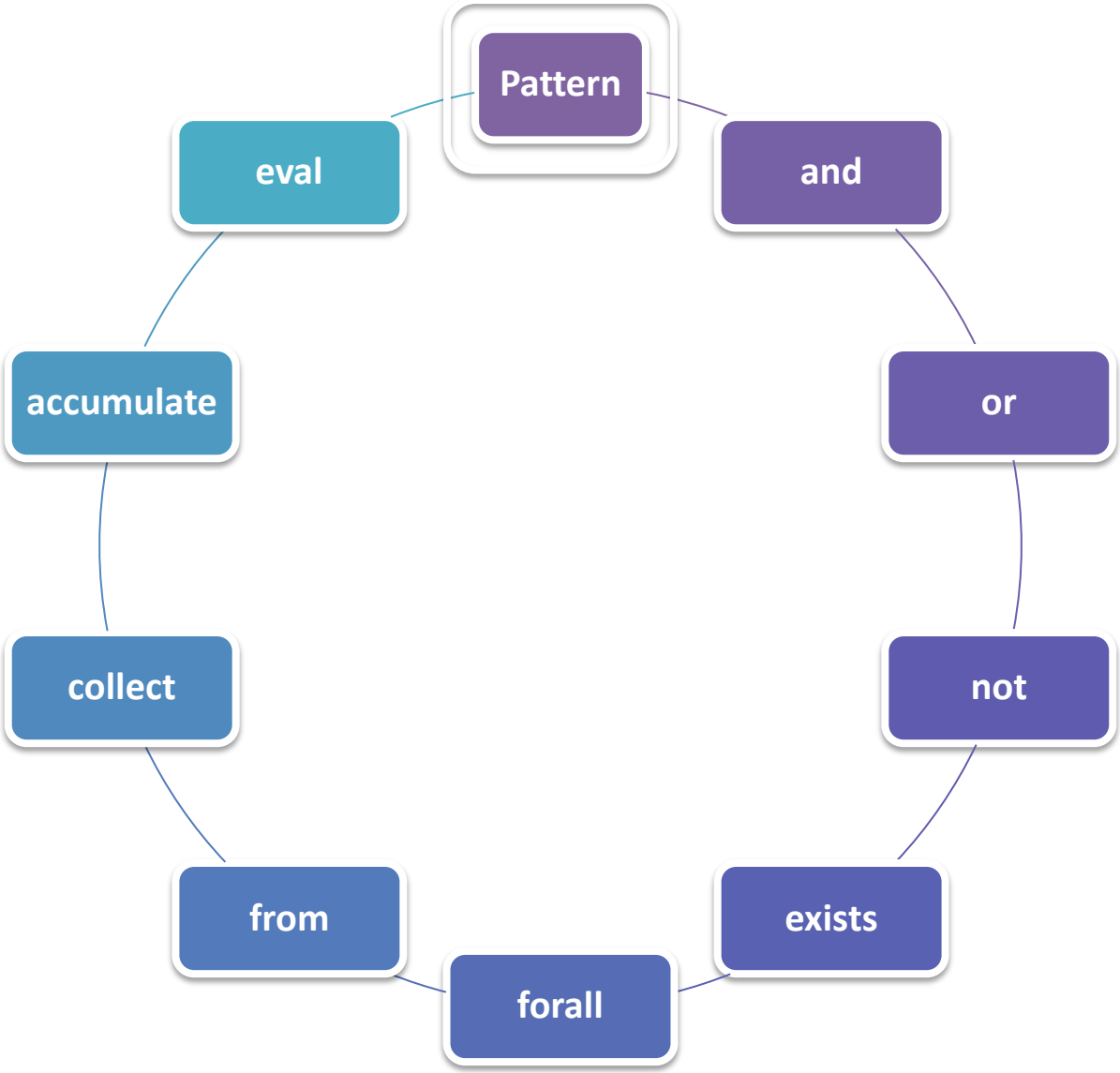
Attributes

no-loop
salience
lock-on-active
enabled
ruleflow-group
date-effective
agenda-group
duration
date-expires
activation-group
dialect
auto-focus

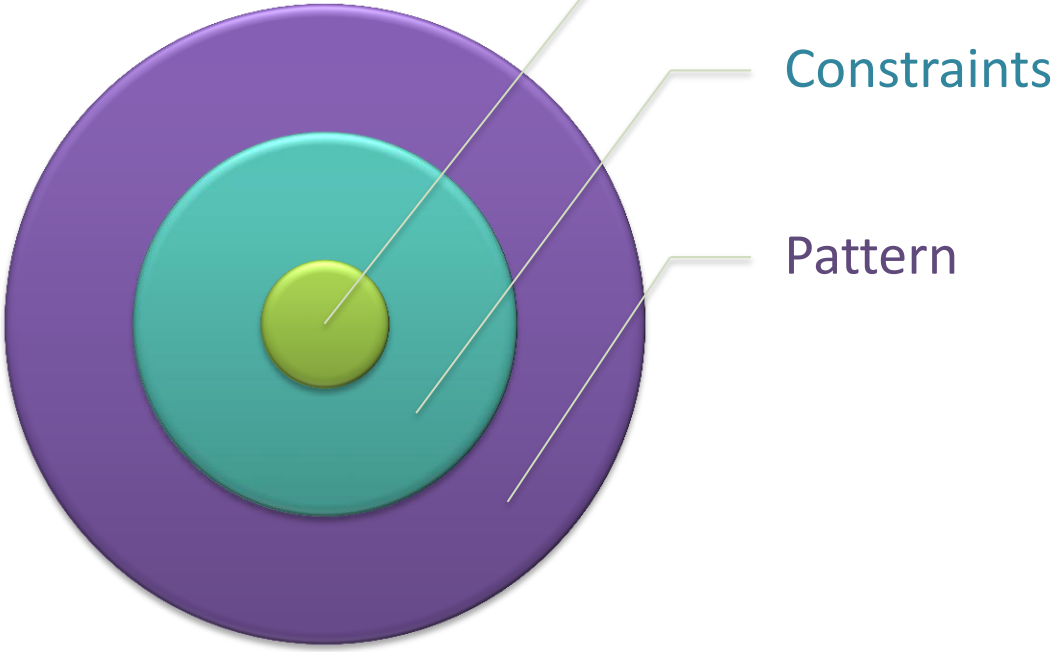
The LHS

LEFT HAND SIDE

Conditional Elements

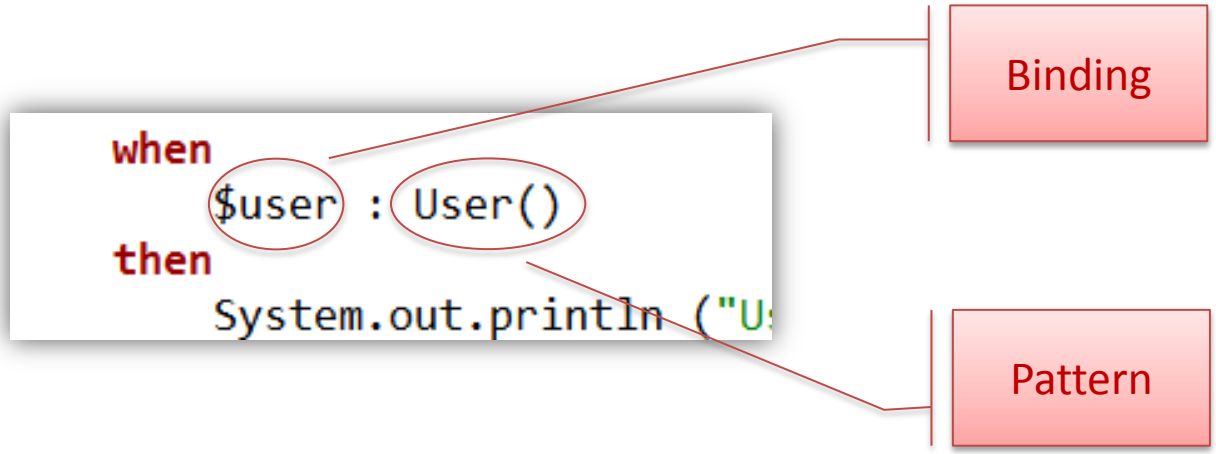


Pattern Structure

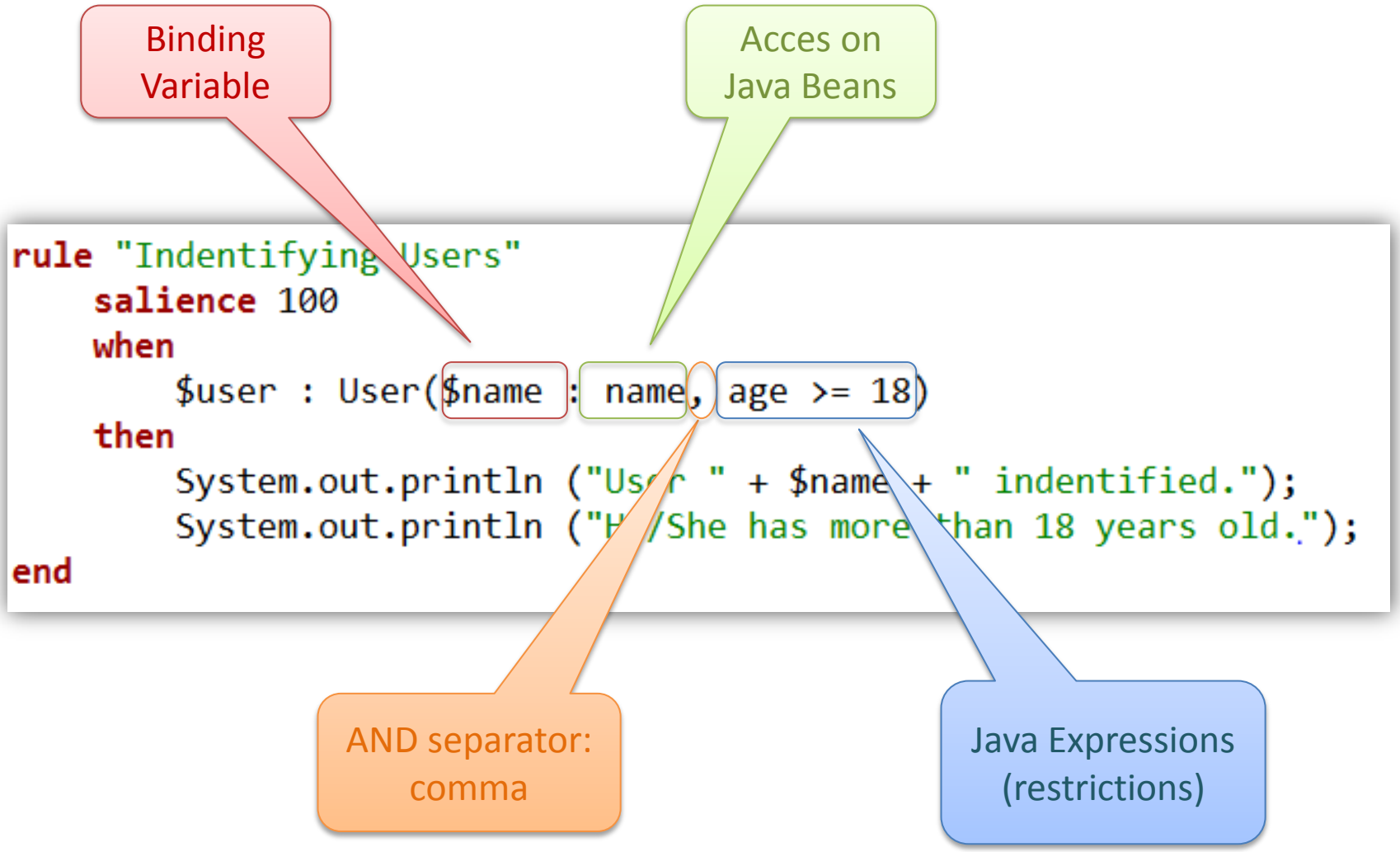


Pattern

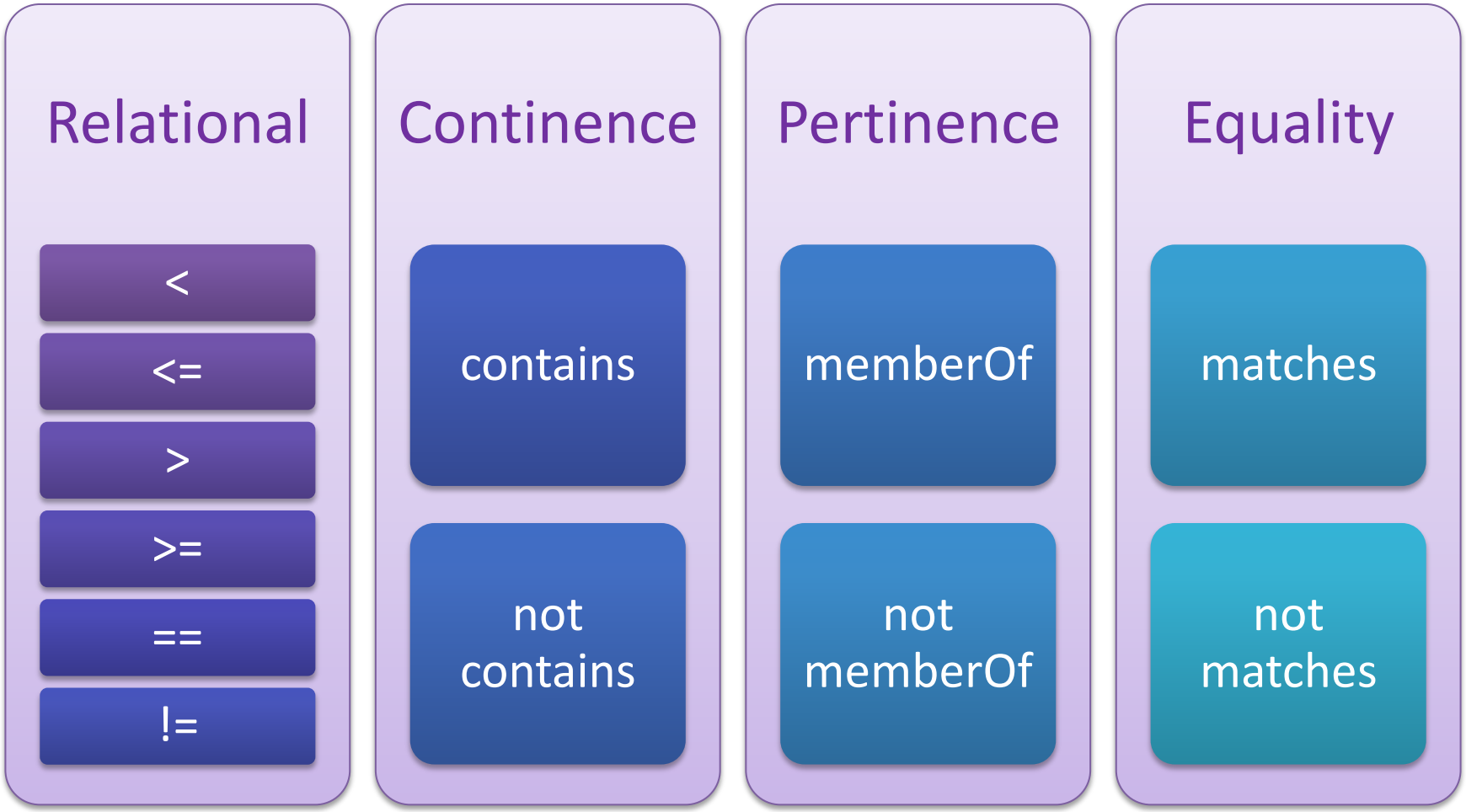
- Most important conditional element
- Contains zero or more constraints
- Has a optional pattern binding



Constraint


Binding Variable
Acces on Java Beans
rule "Indentifying Users"
salience 100
when
$user : User($name : name, age >= 18)
then
System.out.println ("User " + $name + " indentified.");
System.out.println ("He/She has more than 18 years old.");
end
AND separator: comma
Java Expressions (restrictions)

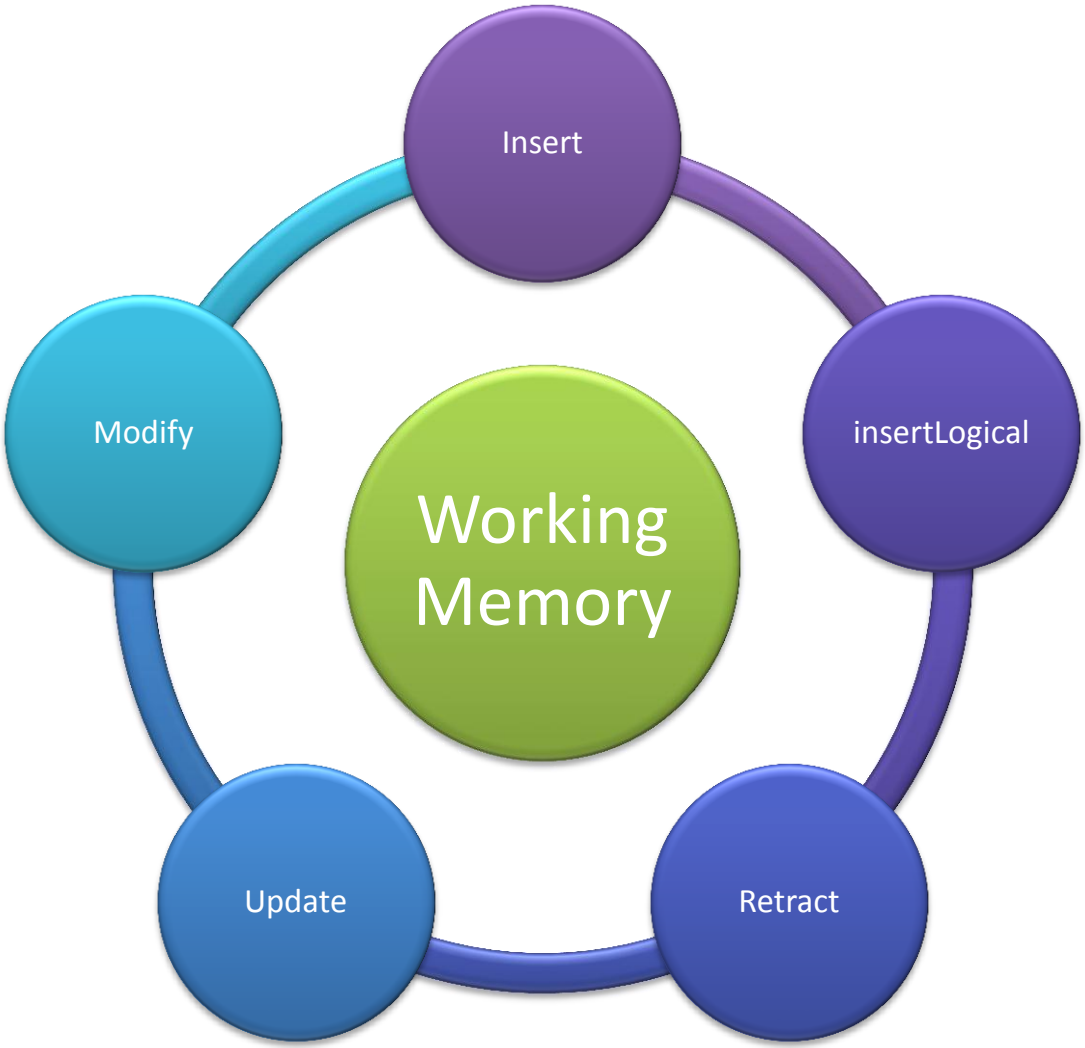
Restriction Operators



The RHS

RIGHT HAND SIDE

Modifying the WM



Starting the Practice

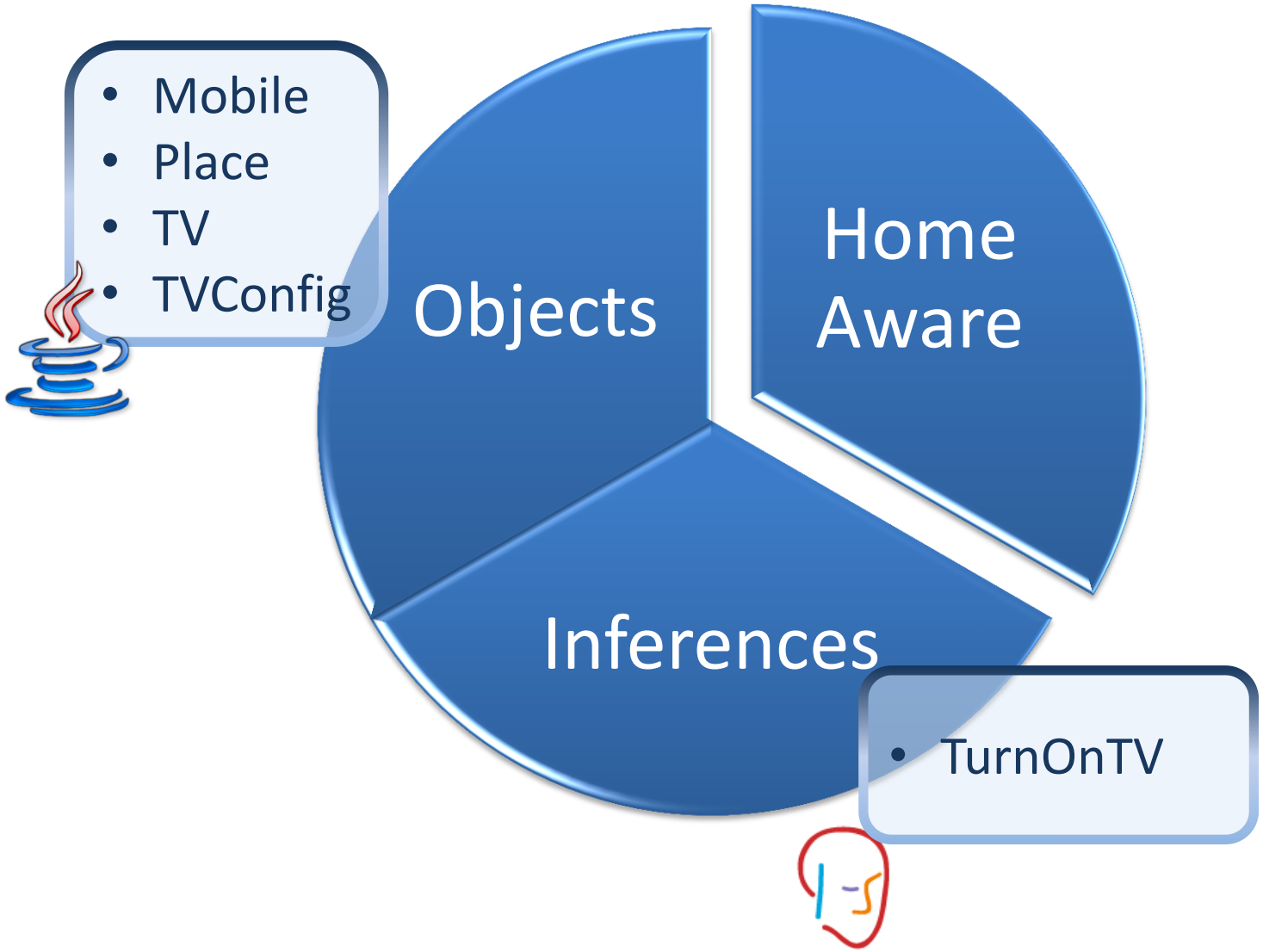
HANDS-ON

Sample: Home Aware

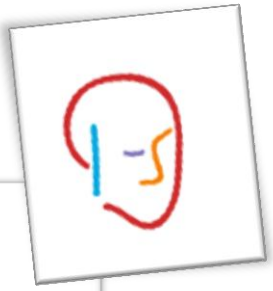
- Devices and Sensors of the House
  - TV
  - Stereo
  - Lamps
  - Air Conditioner
- GPS
  - Android Mobile

Context Aware System

Components


Mobile
Place
TV
TVConfig
Objects
Home Aware
Inferences
TurnOnTV

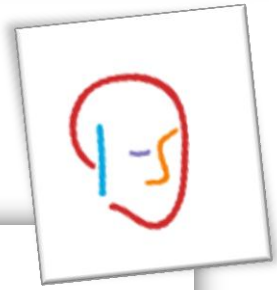
Package and Imports



```
package my.pack

import com.sample.Place;
import com.sample.Mobile;
import com.sample.TV;
import com.sample.TVConfig;
import java.lang.Math;
```

Global Variable

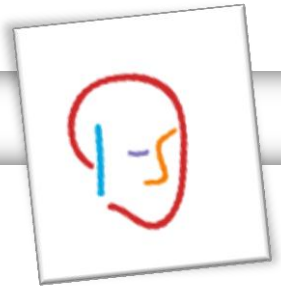
```
ksession.setGlobal("PLACE", new Place("home", 12, 15));
```



```
7
8 global com.sample.Place PLACE;
9
```

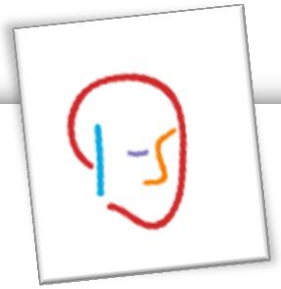
Some rules

```
27
28 #Report Rule
29 rule "There is at least one mobile"
30     salience 100
31     when
32         exists Mobile()
33     then
34         System.out.println("There is at least one mobile.");
35 end
36
```



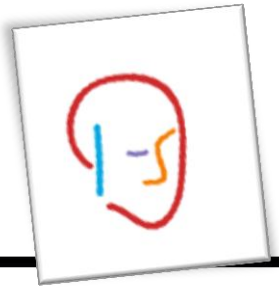
```
36
37 #Report Rule
38 rule "Detected Mobiles"
39     salience 90
40     when
41         $mobile : Mobile($name:name, $id:id)
42     then
43         System.out.print("Mobile detected.\tName: " + $name +
44         System.out.println("\t Position: " + $mobile.getLatitu
45 end
46
```

Inference Rules



```
55
56 #Inference Rule
57 rule "Request to turn on TV"
58     salience 70
59     when
60         $config : TVConfig($mobileId:mobileId)
61         Mobile(id == $mobileId, CalcDistance(PLACE, this) >= 0 && <= $config.distanceToPowerOn)
62     then
63         String tvId = $config.getTvId();
64         System.out.println("Mobile " + $mobileId + " is requesting to turn on the TV " + tvId +
65         insertLogical(new TurnOnTV(tvId, $mobileId));
66 end
67
```

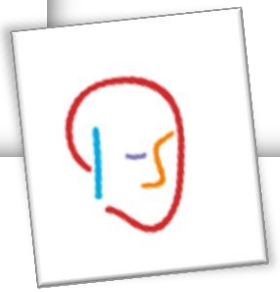
CalcDistance Function



```
function double CalcDistance(Place place, Mobile mobile){
    try{
        double longDist = place.getLongitude() - mobile.getLongitude();
        double latDist = place.getLatitude() - mobile.getLatitude();
        double dis = Math.sqrt(Math.pow(longDist, 2) + Math.pow(latDist, 2));
        return dis;
    }catch (Exception e){
        return -1;
    }
}
```

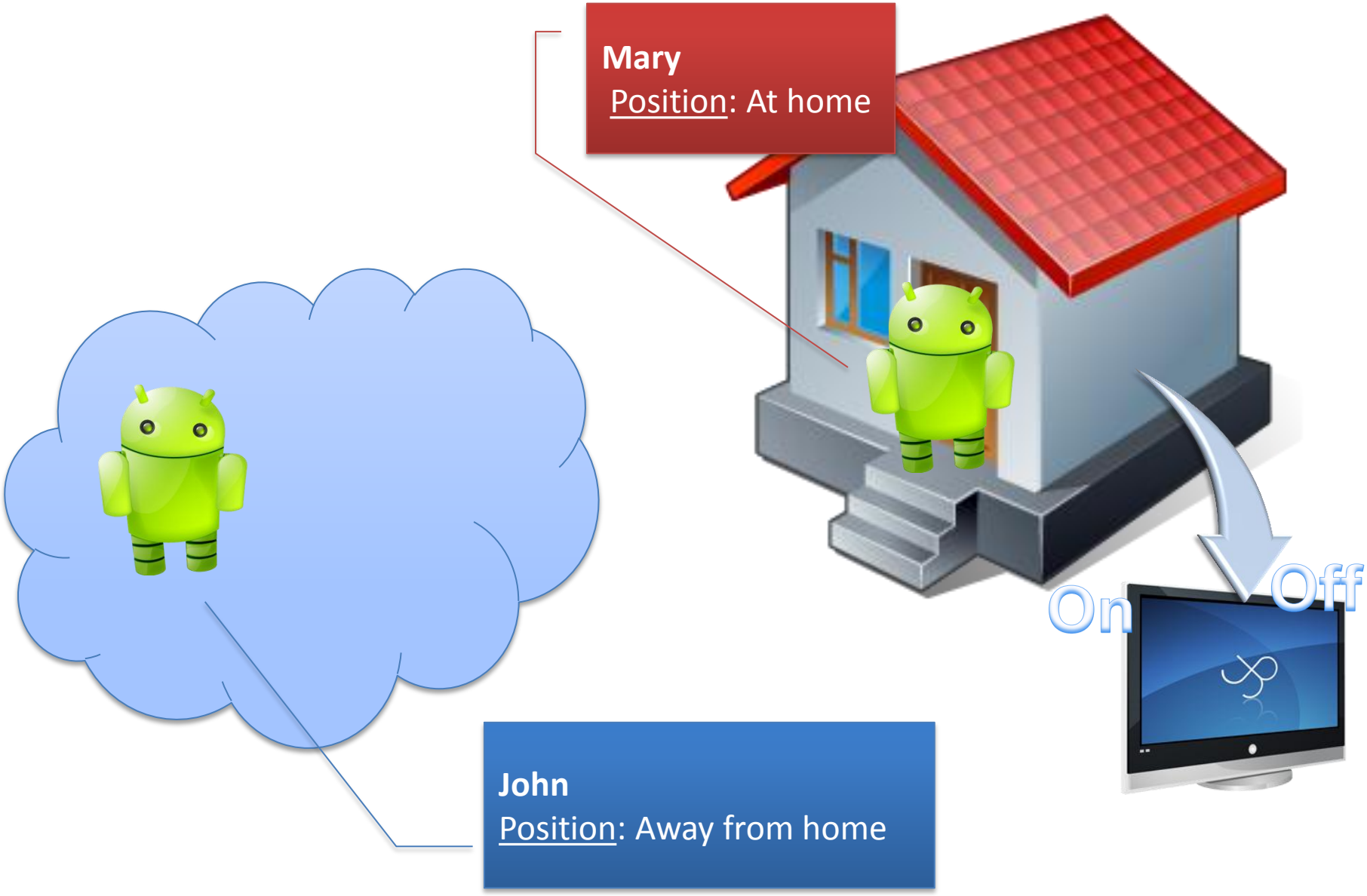
Active Rules

```
68 #Action Rule
69 rule "Turning on TV"
70     salience 60
71     when
72         $tv : TV($tvId : id, on == false)
73         exists(TurnOnTV(tvId == $tvId))
74     then
75         System.out.println("Turning on the TV " + $tvId);
76         $tv.setOn(true);
77         update($tv);
78 end
```

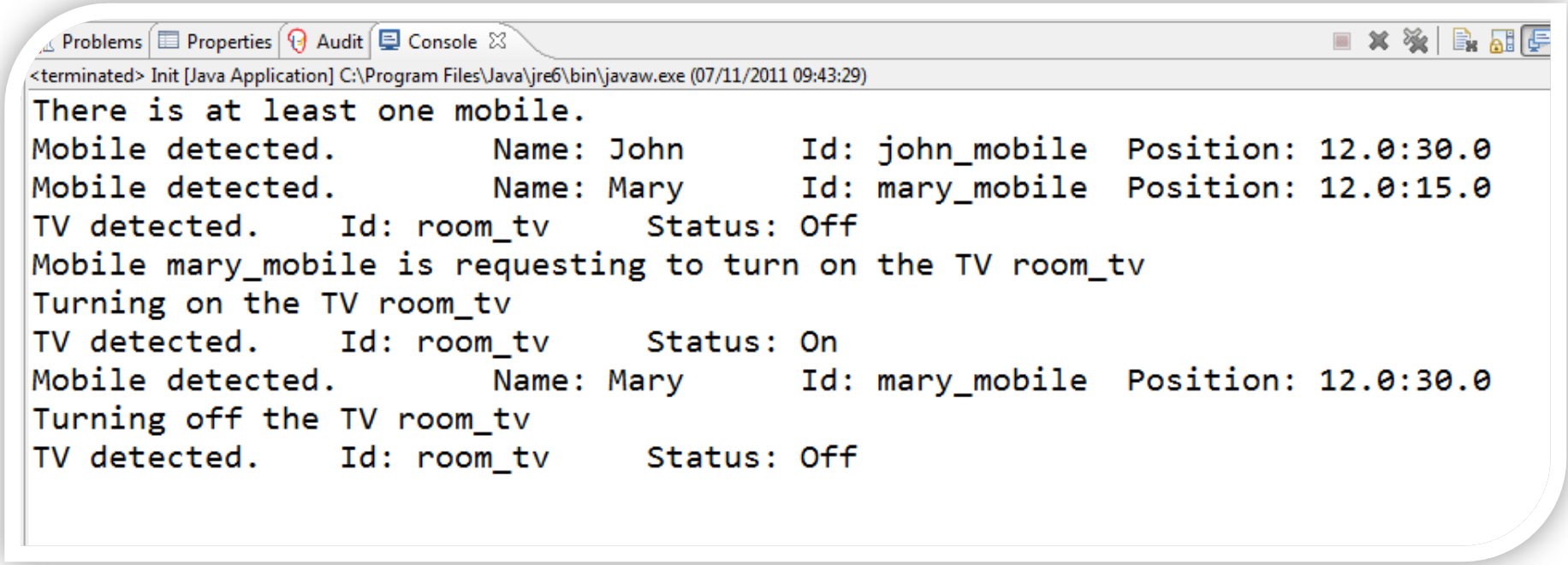


```
80 #Action Rule
81 rule "Turning off TV"
82     salience 60
83     when
84         $tv : TV($tvId : id, on == true)
85         not (exists(TurnOnTV(tvId == $tvId)))
86     then
87         System.out.println("Turning off the TV " + $tvId);
88         $tv.setOn(false);
89         update($tv);
90 end
```

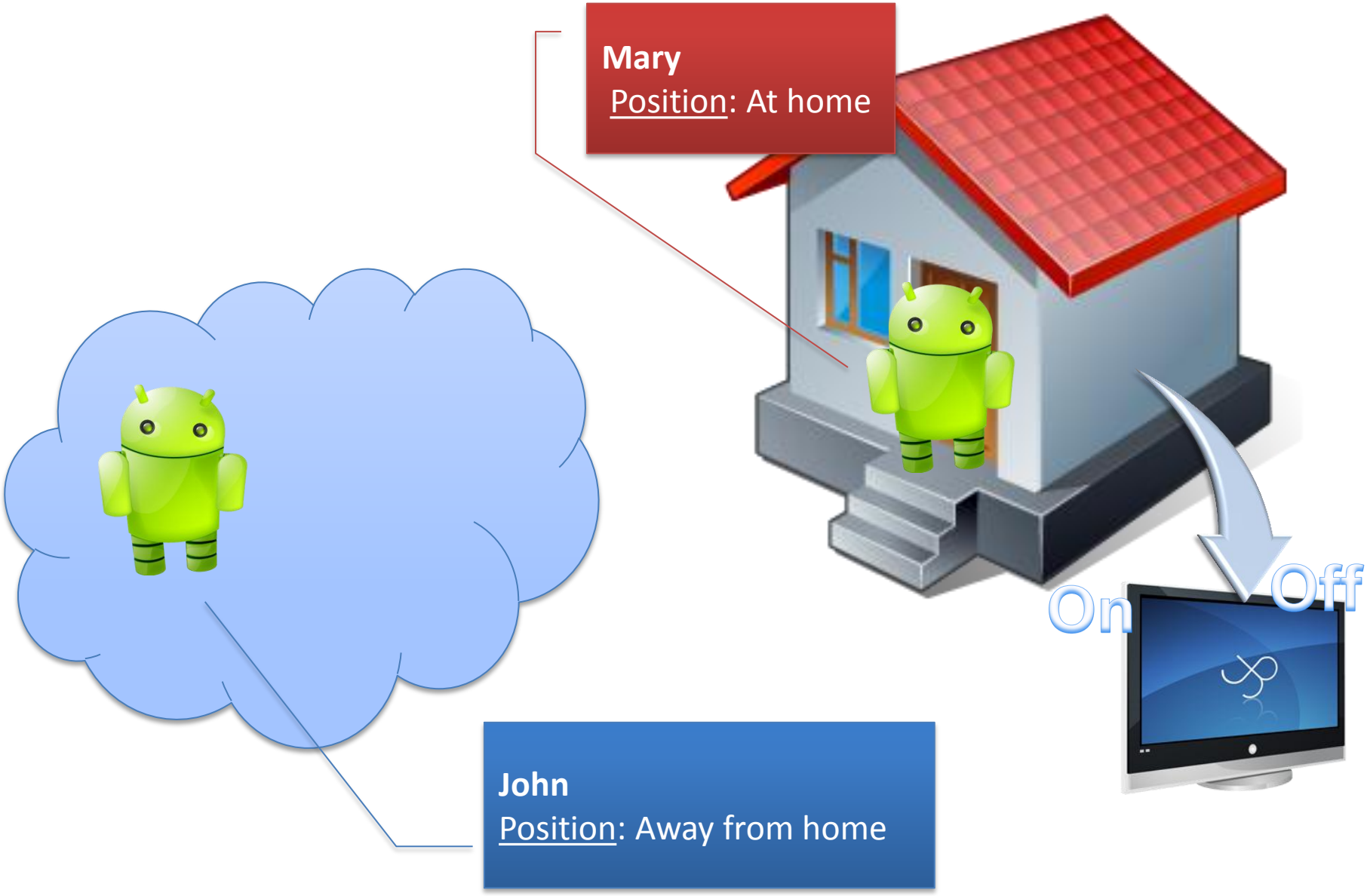
Test



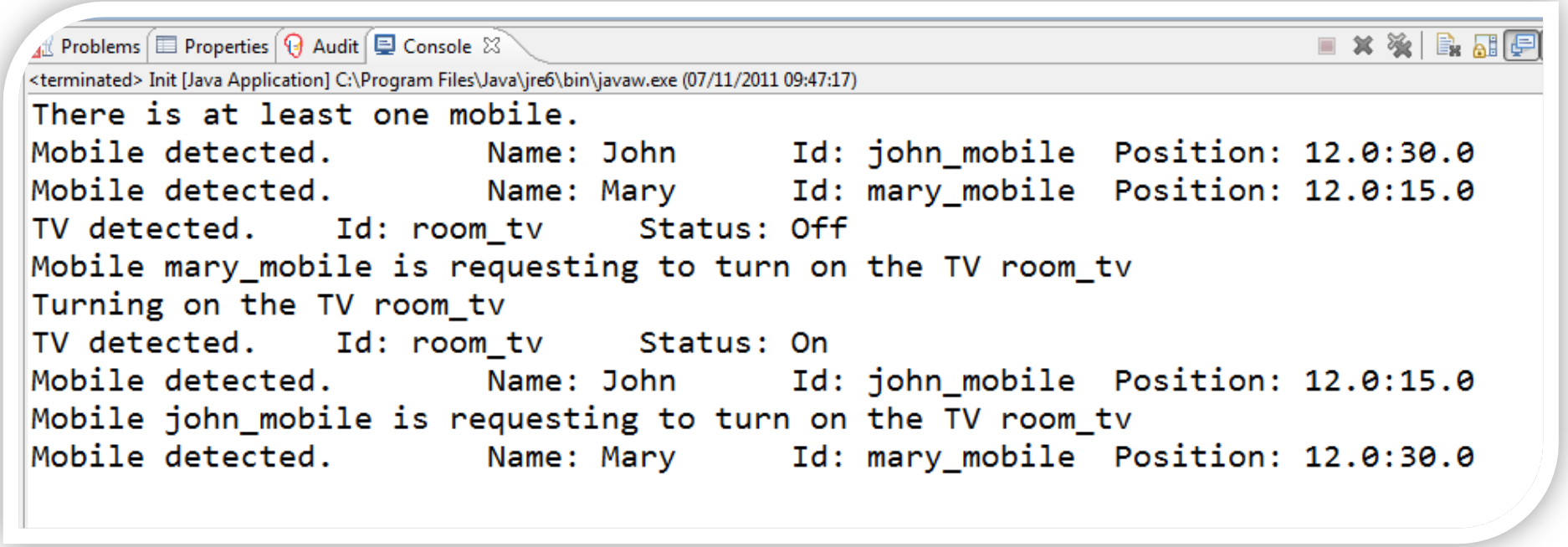
Result


Problems
Properties
Audit
Console
<terminated> Init [Java Application] C:\Program Files\Java\jre6\bin\javaw.exe (07/11/2011 09:43:29)
There is at least one mobile.
Mobile detected. Name: John Id: john_mobile Position: 12.0:30.0
Mobile detected. Name: Mary Id: mary_mobile Position: 12.0:15.0
TV detected. Id: room_tv Status: Off
Mobile mary_mobile is requesting to turn on the TV room_tv
Turning on the TV room_tv
TV detected. Id: room_tv Status: On
Mobile detected. Name: Mary Id: mary_mobile Position: 12.0:30.0
Turning off the TV room_tv
TV detected. Id: room_tv Status: Off

Test



Result


Problems
Properties
Audit
Console
<terminated> Init [Java Application] C:\Program Files\Java\jre6\bin\javaw.exe (07/11/2011 09:47:17)
There is at least one mobile.
Mobile detected. Name: John Id: john_mobile Position: 12.0:30.0
Mobile detected. Name: Mary Id: mary_mobile Position: 12.0:15.0
TV detected. Id: room_tv Status: Off
Mobile mary_mobile is requesting to turn on the TV room_tv
Turning on the TV room_tv
TV detected. Id: room_tv Status: On
Mobile detected. Name: John Id: john_mobile Position: 12.0:15.0
Mobile john_mobile is requesting to turn on the TV room_tv
Mobile detected. Name: Mary Id: mary_mobile Position: 12.0:30.0

Starting the Practice

DROOLS FUSION

What is Drools Fusion?

- Module of Drools responsible for enabling event processing behavior.
- Extras:
  - Session Clock
  - Streams Support
  - Temporal Reasoning
  - Sliding Window

Declaration

```
declare EventName
    @role (event)
end
```

```
declare UserInPlace
    @role (event)

    userId : String
    placeId : String
    dateTime : Date
end
```

- Metadata
  - role
  - timestamp
  - duration
  - expires

Session Clock

Real Clock

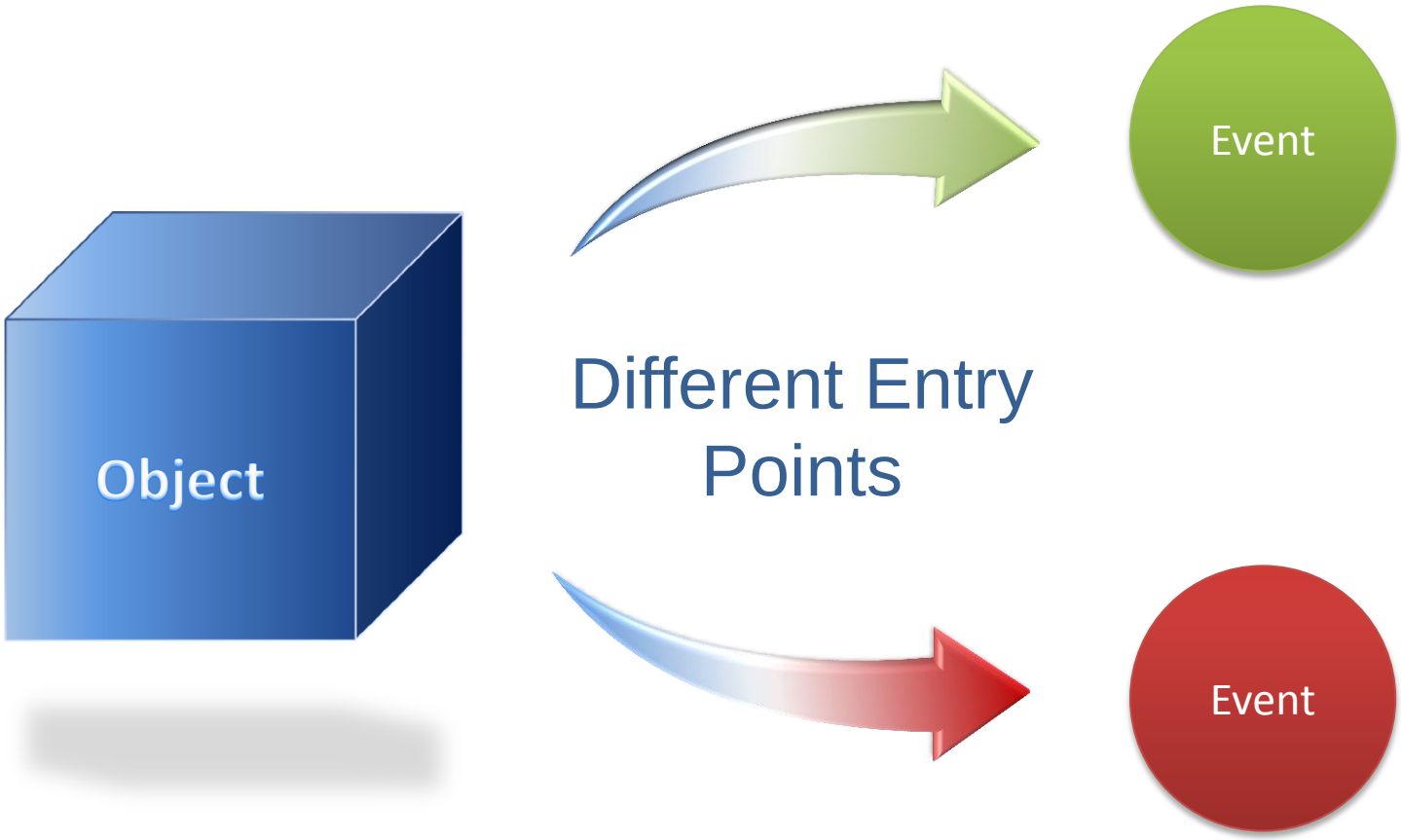
- Default
- System Clock

Pseudo Clock

- Controlled by the application

```
SessionPseudoClock clock = ksession.getSessionClock();

ksession.insert(new User("John", "male", 17));
clock.advanceTime( 10, TimeUnit.SECONDS );
ksession.insert(new User("Mary", "female", 34));
clock.advanceTime( 30, TimeUnit.SECONDS );
ksession.insert(new User("Mike", "male", 21));

ksession.fireAllRules();
```

Envent Entry Point



Envent Entry Point

```
WorkingMemoryEntryPoint admim =
        ksession.getWorkingMemoryEntryPoint("Administrator");

admim.insert(john);
ksession.insert(mike);
ksession.insert(mary);
```

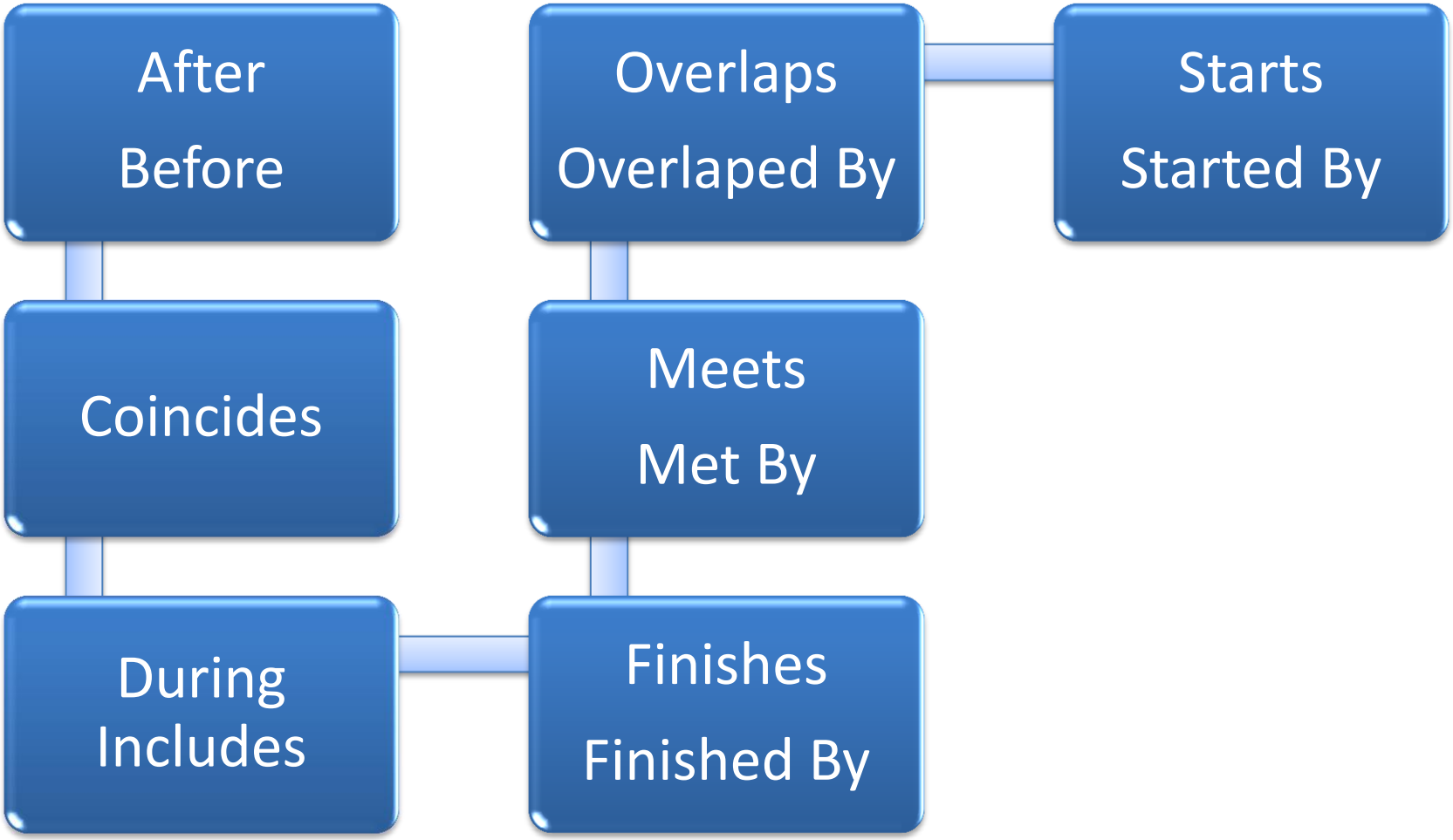
User instance

```
rule "Administrator Configurations"
    when
        $user : User () from entry-point "Administrator"
        $command : TimeToTurnOffTVCommand (user == $user, $tv : tv)
        UserHasTV(user == $user, tv == $tv)
```

Console

```
<terminated> HomeAwareFusion [Java Application] C:\Program Files\Java\jre6\bin\javaw.exe (01/10/2011 09:32:19)
User Mary has a TV in the place Home
User Mike has a TV in the place Home
User John has a TV in the place Home
Time to turn off TV changed successfully. Administrator: John
User Mary is not a administrator and cannot change the configurations
User Mike is not a administrator and cannot change the configurations
```

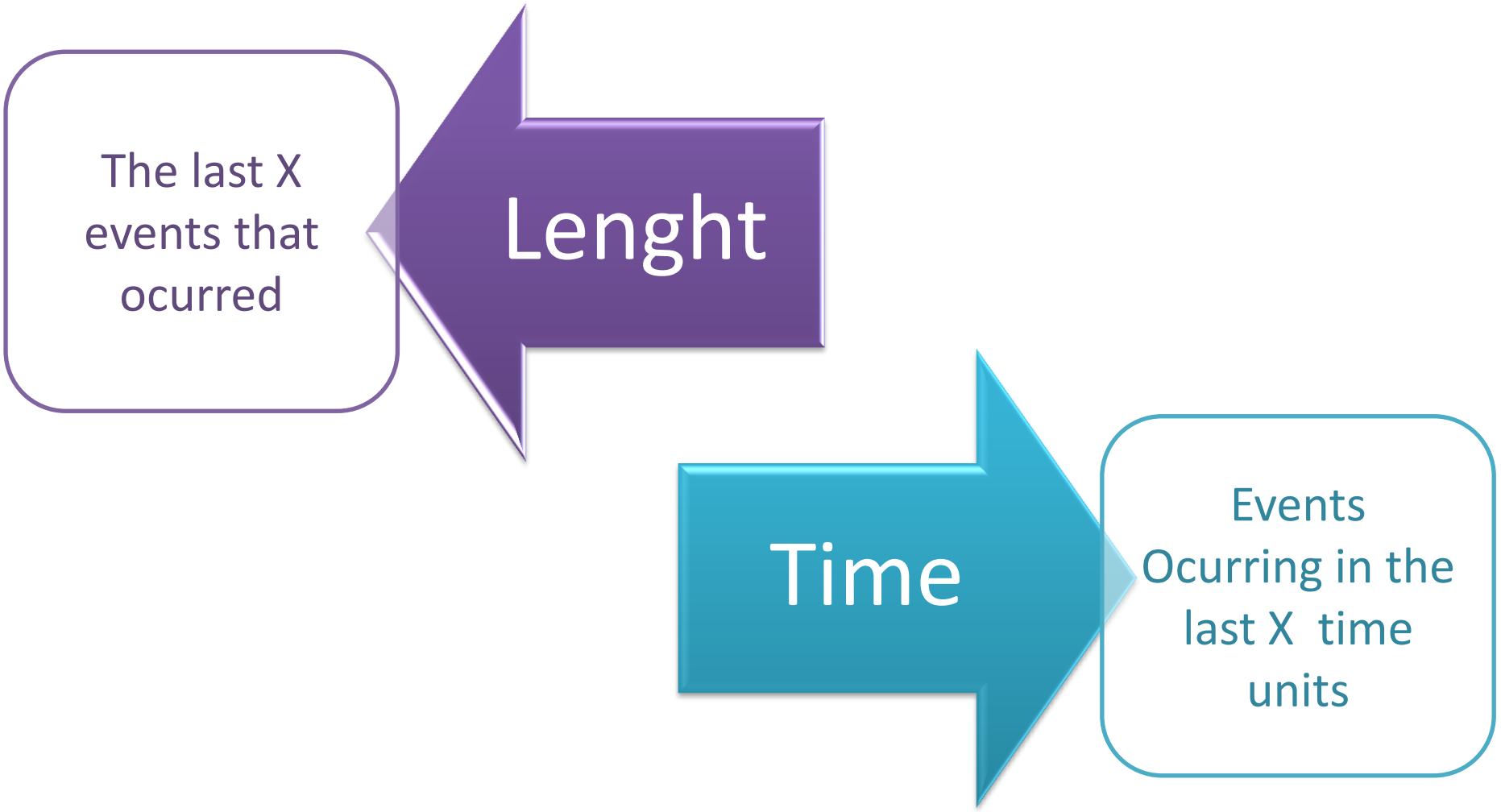
Temporal Reasoning



Temporal Reasoning

```
rule "Perimeter Adjusting"
    when
        $nearPlace : UserNearPlace($place : place)
        UserInPlace(place == $place, this after [0, 2m] $nearPlace)
    then
        System.out.pritln("Your distance radius is too small.");
        System.out.pritln("Would you like to increase it?");
end
```

Sliding Window



Sliding Window

```
61
62 rule "Turn off air conditioner (ideal temperature reached)"
63     when
64         $place : Place($idealTemp : idealTemperature, airConditioner.on == true)
65         $avg : Number (doubleValue <= $idealTemp) from accumulate
66         (
67             PlaceSensor(place == $place.id, $temp : currentTemperature) over window:time( 10m ),
68             average($temp)
69         )
70     then
71         System.out.println("Turning off the air conditioner: " + $place.getId());
72         System.out.println("Temperature Average: " + $avg);
73         $place.getAirConditioner().setOff();
74         update($place);
75 end
```

References

- Jboss, Drools Expert User Guide. http://docs.jboss.org/drools/release/5.3.0.CR1/drools-expert-docs/html_single/index.html
- Jboss, Drools Fusion User Guide. http://docs.jboss.org/drools/release/5.3.0.CR1/drools-fusion-docs/html_single/index.html
- Jboss, Overview (Drools :: API 5.1.1). http://downloads.jboss.com/drools/docs/5.1.1.34858.FINAL/apidocs/
- Grupo de Estudo: https://groups.google.com/forum/#!forum/drools-ufes