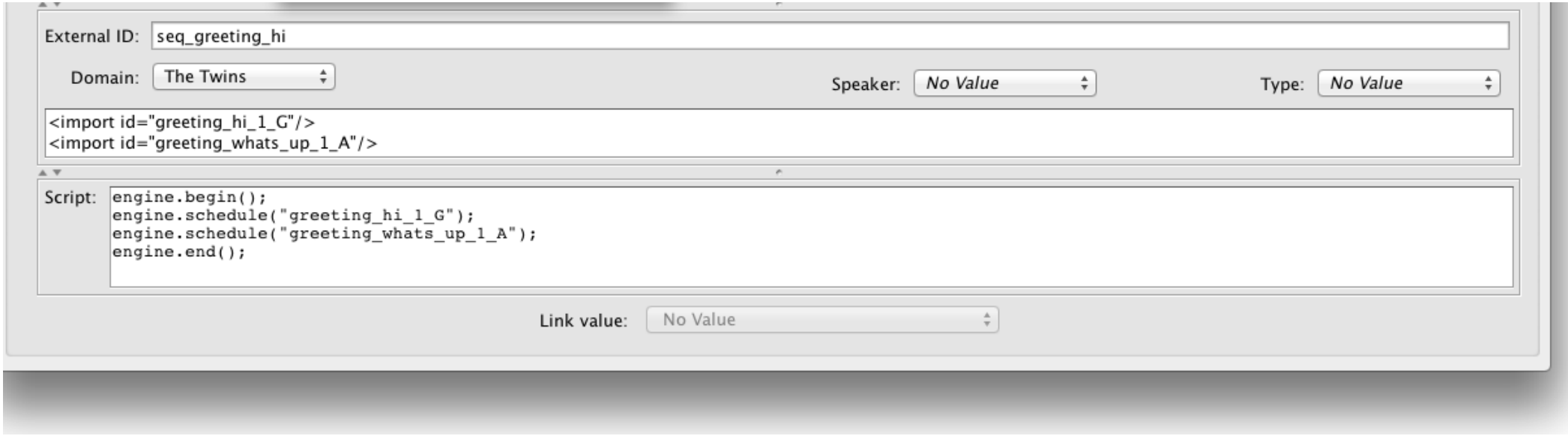
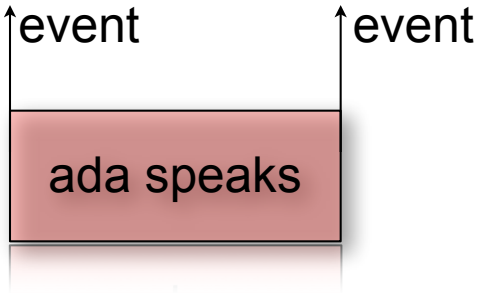
Answer Scripts



- **Scripts attached to answers**
- **Scripts can**
  - schedule a sequence of utterances
  - ... or VHMSG commands
  - update variables
  - modify utterances

Scheduling

- **State Machine**
  - Behavior
    - a thing that does things
    - send event, wait for some time, a collection of behaviors, etc.
    - fires events when starts and ends
  - Trigger
    - responds to events, starts behaviors
  - Event
    - external and internal
    - a structured object
  - Context
    - stores triggers



- **Machine listens and processes events**
- **The current execution state: triggers + scheduled and executing behaviors**
- **A state can be paused, saved, or restored**

Utterance Script Example

```
engine.context.presentCharacters.add("rio");
behavior1 = engine.schedule("rio-whats_goin_on");
engine.schedule("utah-psst_ranger");
engine.schedule("utah-yer_smart_now_try_and_stay_alive");
engine.schedule("utah-no_way_rio_kin_miss");
engine.schedule("harmony-them_sweat_rings_and_dust", behavior1.done);
engine.schedule("rio-get_packed_harmony");
engine.schedule("harmony-i_dont_want_to_go_to_wichita");
engine.schedule("rio-i_like_shootin_things");
engine.schedule("rio-why_dressed_so_nice");
engine.rest(1.5);
engine.schedule("rio-wait_hold_still");
engine.rest(1.5);
engine.schedule("rio-talking_about_right_there");
behavior2 = engine.schedule("rio-collect_tin_badges");
engine.schedule("utah-hes_lying_to_you");
engine.schedule("harmony-kill_you_anyways", behavior2.done, 0);
engine.schedule("rio-theres_the_truth");
engine.rest(60);
engine.schedule("sequence-rio-rio_calls_utah");
```

Scriptable Dialogue Manager

- **Three main components**
  - State machine
  - Utterance scripts
  - Dialogue manager script
- **Model**
  - Utterances
    - you can modify them!
  - Categories, tokens, domains
  - Other variables
    - who is present
    - is the gun out?
    - where the gun is pointing at?
  - Classifiers

Main DM Script

- **Configures the State Machine**
  - sets event handlers, timers, model, etc...

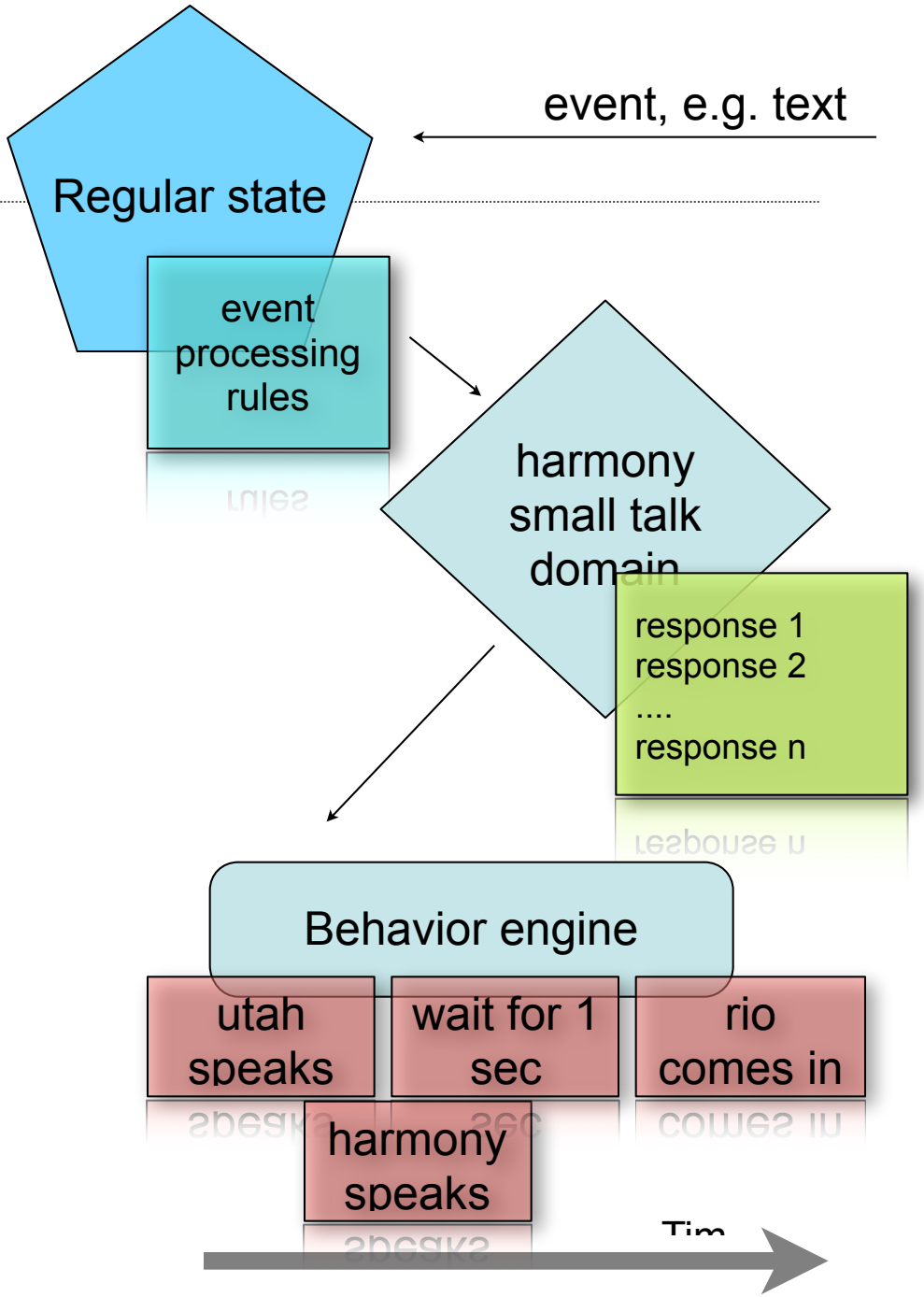
```
public boolean npcBehavior_done(Event event) {
        global.lastCharacterStoppedSpeaking    = System.currentTimeMillis();
        if (event?.utterance?.toss)
                return handleToss(event);
        return false;
}

public boolean npcBehavior_begin(Event event) {
        global.lastCharacterStartedSpeaking    = System.currentTimeMillis();
        return false;
}

public boolean vrSpeech_start(Event event) {
        global.lastUserStartedSpeaking         = System.currentTimeMillis();
        return false;
}

public boolean handleEvent(Event event) {
        global.lastUserStoppedSpeaking         = System.currentTimeMillis();
        return false;
}
```

Main DM Script

- **Can have multiple configurations**
- **The State Machine can paused, reconfigured, and resumed**
- **In Groovy, the configurations defined as classes, so we can take advantage of inheritance**
  - a set of handlers can shared by using a common base class
- **Example. In Gunslinger**
  - there are 3 configurations
    - normal conversation
    - gun out
    - shoot out
  - the last two do not handle user speech input

States, States, States...

- **Three notions of state**
  - dialogue state (state)
    - a set of rules
    - how the answers are selected
    - regular conversation vs. gun out vs. gunfight
  - classifier state (domain)
    - what answers are selected
    - how to map user's text onto character text
  - output state (behavior)
    - how answers are outputed



API (Engine.java)

- List<Map<String,Object>> search(String inVHName, Map<String,Object> inQuery);
- List<Map<String,Object>> filter(List<Map<String,Object>> inList, Condition<Map<String, Object>> inFilter);
- void postEvent(Event inEvent);

- Behavior rest(double inDelayInSeconds);
- Behavior rest(double inDelayInSeconds, Event inEvent);

- Behavior schedule(String inUtteranceID);
- Behavior schedule(String inUtteranceID, Event inEvent);
- Behavior schedule(Map<String, Object> inUtterance);
- Behavior schedule(Map<String, Object> inUtterance, Event inEvent);
- Behavior schedule(Runnable inBehavior);
- Behavior schedule(Runnable inBehavior, Event inEvent);
- Behavior scheduleInResponse(Map<String, Object> inUtterance, Event inSourceEvent);

- Behavior send(String inCommand);
- Behavior send(String inCommand, Event inEvent);

- Executor getExecutor();

- Trigger addTrigger(Trigger inTrigger);
- Trigger addTrigger(Event inEvent, Runnable inRunnable);
- boolean removeTrigger(Trigger inTrigger);
- void reset();

- Collection<Map<String, Object>> answers();
- Collection<Map<String, Object>> answersForCharacter(String inName);
- int seenRecently(Map<String, Object> inUtterance, int inHistoryLength);

- boolean message(String inCommand);

- void begin();
- void end();

```
public boolean vrSpeech_asr_complete(Event event) {

    if (!event.text || ((String)event.text).trim().length() == 0) return false;

    if (global.domainName == null)
        global.domainName     = (String)event.speaker;

    try {
        List<Map<String,Object>> answers                    = engine.search(global.domainName, event);

        if (answers.isEmpty()) {
            sendOfftopic();
        } else {
            Map<String,Object>              selectedUtterance = (Map)answers[0];

            if (selectedUtterance.type == Global.kAlternative) {
                if (!global.lastSpeechEvent) {
                    sendOfftopic();
                } else {
                    offTopicCount   = 0;
                    return vrSpeech_asr_complete(global.lastSpeechEvent);
                }
                return false;
            }

            if (selectedUtterance.type == Global.kRepeat) {
                if (!global.lastUtterance) {
                    sendOfftopic();
                } else {
                    sendRegular(global.lastUtterance);
                }
                return false;
            }

            global.lastSpeechEvent     = event;
            sendRegular(leastRecent(answers,Global.kHistoryWindow));
        }

    } catch (Throwable t) {
        t.printStackTrace();
    }

    return false;
}
```

Mobile Version

- **Multiple state machines:**
  - main
  - one for each utterance sequence
- **Events go to all machines in parallel**
- **SCXML**
  - and JavaScript
- **The result: states and executable code are separate**