Duncan Smith
CSS499 Summer Quarter 2004
Enhancing the UWAgent Execution Engine

Status Report 07/12/2004

Status Summary

I have modified UWAgent and UWInject to allow the user to specify the maximum number of children that a parent may spawn. This status report contains a description of the system changes, and execution output showing test results. The complete system, including these changes, is located in **/home/uwagent/MA/UWAgent.new**.

My task during the next three weeks will be to implement cascading termination and descendent termination.

Description of System Changes

UWInject now recognizes a –*m* command-line option, which allows the user to specify the **m**aximum number of children that a non-root agent may spawn. This value is passed to the new UWAgent during the injection process. Note that although the system documentation specifies an upper limit of 1000 children (999 for the root agent), this limit does not appear to be enforced by the system. During tests, many more than 1000 agents could be created; the only limiting factor appeared to be system memory. Therefore, if the user does not specify a –m argument, the system does not limit the number of children.

Note: command-line option –c was suggested in the specification. However, this character is already used for the "client name" option, so –m was chosen as the next best mnemonic.

To store the maximum value passed from UWInject, UWAgent now has a *maxChildren* member variable. Before a child is spawned from a given agent, this value is compared with the number of children that the agent has already spawned. If the limit (adjusted down by one for the root agent) has been reached, then the spawning process aborts with an error message.

Source Code

All of the source code is available in **/home/uwagent/MA/UWAgent.new**.

The following source files were modified:
UWAgent.java
UWInject.java

The following source files were created to test the changes:
        SpawnTest.java
        SpawnTest2.java
        SpawnTest3.java

Execution Output

To test the changes, test agents called SpawnTest, SpawnTest2, and SpawnTest3 were created. SpawnTest is the root agent, and it spawns a given number of SpawnTest2 agents. SpawnTest2 then spawns a given number of SpawnTest3 agents. All three agents print statistics as they run.

Here is the execution output showing the maxChildren functionality. SpawnTest is injected from mnode1 to mnode2, with maxChildren = 3, but requesting that SpawnTest spawn 6 children and each SpawnTest2 spawn 5 children. Each mnode2 output line is prefixed by its test agent number (1 for SpawnTest, 2 for SpawnTest2, 3 for SpawnTest3). The error messages (shown in bold) indicate that SpawnTest is limited to 2 children (maxChildren – 1) and SpawnTest2 is limited to 3 children (maxChildren). Note that because of multithreading the error messages do not always appear directly after the spawn attempt.

Output from mnode1:

```
[uwagent@mnode1 UWAgent.new]$ java UWInject mnode2 SpawnTest -m 3 6 5
File : /home/uwagent/MA/UWAgent.new
URL : file:/home/uwagent/MA/UWAgent.new/
ip = mnode1/10.1.0.1, time = 1089596480734, ID = 0
file = ./SpawnTest.class
byteArrayClass.length = 1651
end of UWInject (main)
```

Output from mnode2:

```
1: Hello from SpawnTest
1: My ID = 0
1: My parent's ID = null
1: My class name = SpawnTest
1: My parent's class name = null
1: SpawnTest spawning SpawnTest2

2: Hello from SpawnTest2
2: My ID = 0.0
2: My parent's ID = 0
2: My class name = SpawnTest2
2: My parent's class name = SpawnTest
2: SpawnTest2 spawning SpawnTest3
1: Number of children I have spawned so far = 1
2: Number of children I have spawned so far = 1

3: Hello from SpawnTest3
3: My ID = 0.0.0
3: My parent's ID = 0.0
3: My class name = SpawnTest3
3: My parent's class name = SpawnTest2
3: SpawnTest3 exiting

2: SpawnTest2 spawning SpawnTest3
1: SpawnTest spawning SpawnTest2
2: Number of children I have spawned so far = 2
```

```
2: SpawnTest2 spawning SpawnTest3

2: Hello from SpawnTest2
2: My ID = 0.1
2: My parent's ID = 0
2: My class name = SpawnTest2
2: My parent's class name = SpawnTest
2: SpawnTest2 spawning SpawnTest3
1: Number of children I have spawned so far = 2
1: SpawnTest spawning SpawnTest2
```
UWAgent#spawnChild: Cannot spawn more than 2 children
```
1: Number of children I have spawned so far = 2
1: SpawnTest spawning SpawnTest2
2: Number of children I have spawned so far = 3
2: SpawnTest2 spawning SpawnTest3

3: Hello from SpawnTest3
3: My ID = 0.0.2
3: My parent's ID = 0.0
3: My class name = SpawnTest3
3: My parent's class name = SpawnTest2
3: SpawnTest3 exiting
```
UWAgent#spawnChild: Cannot spawn more than 3 children
```
2: Number of children I have spawned so far = 3
2: SpawnTest2 spawning SpawnTest3

3: Hello from SpawnTest3
3: My ID = 0.0.1
3: My parent's ID = 0.0
3: My class name = SpawnTest3
3: My parent's class name = SpawnTest2
3: SpawnTest3 exiting
```
UWAgent#spawnChild: Cannot spawn more than 2 children
```
1: Number of children I have spawned so far = 2
1: SpawnTest spawning SpawnTest2
```
UWAgent#spawnChild: Cannot spawn more than 2 children
```
1: Number of children I have spawned so far = 2
1: SpawnTest spawning SpawnTest2
```
UWAgent#spawnChild: Cannot spawn more than 2 children
```
1: Number of children I have spawned so far = 2
1: SpawnTest exiting
```
UWAgent#spawnChild: Cannot spawn more than 3 children
```
2: Number of children I have spawned so far = 3
2: SpawnTest2 exiting


3: Hello from SpawnTest3
3: My ID = 0.1.0
3: My parent's ID = 0.1
3: My class name = SpawnTest3
3: My parent's class name = SpawnTest2
3: SpawnTest3 exiting

2: Number of children I have spawned so far = 1
2: SpawnTest2 spawning SpawnTest3

3: Hello from SpawnTest3
3: My ID = 0.1.1
3: My parent's ID = 0.1
3: My class name = SpawnTest3
3: My parent's class name = SpawnTest2
3: SpawnTest3 exiting

2: Number of children I have spawned so far = 2
2: SpawnTest2 spawning SpawnTest3
2: Number of children I have spawned so far = 3
2: SpawnTest2 spawning SpawnTest3
```
UWAgent#spawnChild: Cannot spawn more than 3 children

```
2: Number of children I have spawned so far = 3
2: SpawnTest2 spawning SpawnTest3
UWAgent#spawnChild: Cannot spawn more than 3 children
2: Number of children I have spawned so far = 3
2: SpawnTest2 exiting


3: Hello from SpawnTest3
3: My ID = 0.1.2
3: My parent's ID = 0.1
3: My class name = SpawnTest3
3: My parent's class name = SpawnTest2
3: SpawnTest3 exiting
```