



Project Panda - 11939

Software Requirements Specification

1 Abstract

Project *Panda* delivers two components. The first is a state model enhancement to the Ciera Java model compiler. The second is an external entity that facilitates manipulation of time and date within xtUML models. This note explains the project from a high-level requirements and project management point of view.

2 Introduction and Background

BridgePoint Verifier and MC-3020 support a modeling feature which allows actions to be defined on the transitions of state machines supporting Mealy style as well mixed Mealy/Moore state machines. This feature is not present in Ciera (Java model compiler). This work adds it.

BridgePoint Verifier and model compilers by default manipulate time, date, durations and delayed events through an external entity named Time with key letters 'TIM'. The TIM EE has existed and been stable for many years. However, it is limited. The work done in the project addresses the ability to manipulate and compare date, time and duration values.

3 Requirements

All work shall be done within the open source 'xtuml' configuration management system (currently hosted on github.com) and licensed under the current licensing of the greater body of BridgePoint and xtUML artifacts (currently Apache 2.0 and Creative Commons CC0). No source, models or documentation shall be proprietary.

3.1 Actions on Transitions

Table 1. Actions on Transitions Requirements

| ID | Description |
|------|--|
| AoT1 | Actions on transitions will be translated in Java source code using the Ciera model compiler. |
| AoT2 | The semantics of actions on transitions will conform to those implemented in BridgePoint Verifier as the defacto standard. |
| AoT3 | The Ciera user guide shall be updated to reflect this work. |
| AoT4 | A test model shall be created and published that tests the capability and serves for future regression testing. |

3.2 Time Arithmetic

In the following requirements a semantic distinction is made between *time* (date/time) and *duration*. A *time* is an instant within an *epoch* (a point on a timeline) relative to the start of the epoch. A *duration* is a quantity of time independent of a starting point. It is noted that in this design there will be no syntactic distinction; both *time* and *duration* will be core numeric types (integers).

Restated, this work does not introduce a new type. The type of epoch time and duration values returned from these bridges will be `integer` with a tacit unit of seconds.

Table 2. Date, Time and Duration Arithmetic Requirements

| ID | Description |
|------|--|
| TA1 | A new external entity shall be supplied which manipulates time relative to an epoch. |
| TA2 | A bridge operation shall be supplied through which the start of an epoch can be initialized (e.g. <code>EPOCH::initialize(...)</code>). |
| TA3 | A bridge operation shall be supplied which returns the current time as a numeric type expressed as a quantity of seconds since the beginning of the epoch (e.g. <code>EPOCH::current_time() : integer</code>). |
| TA4 | A bridge operation shall be supplied which converts numeric time values into strings formatted per an input format string containing some or all of year, month, day-of-month, hour, minute, second (e.g. <code>EPOCH::format(mytime, "yyyy/MM/dd hh:mm:ss") : string</code>). |
| TA5 | Comparing two numeric time or duration values shall be provided. All operations corresponding to the following operators shall be supported: <code><</code> , <code>></code> , <code>=</code> , <code>>=</code> , <code>!=</code> , <code>==</code> . This will be supported directly in OAL. |
| TA6 | A subtraction operation shall be supported using the native OAL operator <code>-</code> with no type checking or error reporting (in the case of a negative result). |
| TA7 | A means to add a duration to a time value shall be supplied directly in OAL using the <code>+</code> operator. No detection (error or warning) is supplied to detect addition of multiple time values. |
| TA8 | A means to subtract a duration from a time value shall be supplied directly in OAL using the <code>-</code> operator. No detection (error or warning) is supplied to detect subtraction of a time value from a duration. |
| TA9 | A time-of-day operation shall be provided which returns a duration since the start of the day given a time value (e.g. <code>EPOCH::time_of_day(timeval) : integer</code>). |
| TA10 | A test model shall be created and published that tests the capability and serves for future regression testing. |

4 Document References

1. 11939 - Project Panda
2. 11936 - actions on transitions for Ciera
3. 11937 - time and date arithmetic

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