Automated Testing

Eric Anderson / Tridium

Outline

- Why write tests?
- Testing Niagara classes
- Testing in a station
- Test helpers

Why write tests?

hello

TRIDIUM

Don't break anything!!!

Bear Trap
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Why write tests?

Have confidence that code is...
- Doing what it should
- Hasn't broken anything
- Won't be broken by anything in the future

How tests should be treated

"Test code is just as important as production code.

It is not a second-class citizen.

It requires thought, design, and care.

It must be kept as clean as production code.

...

If you don't keep your tests clean, you will lose them.
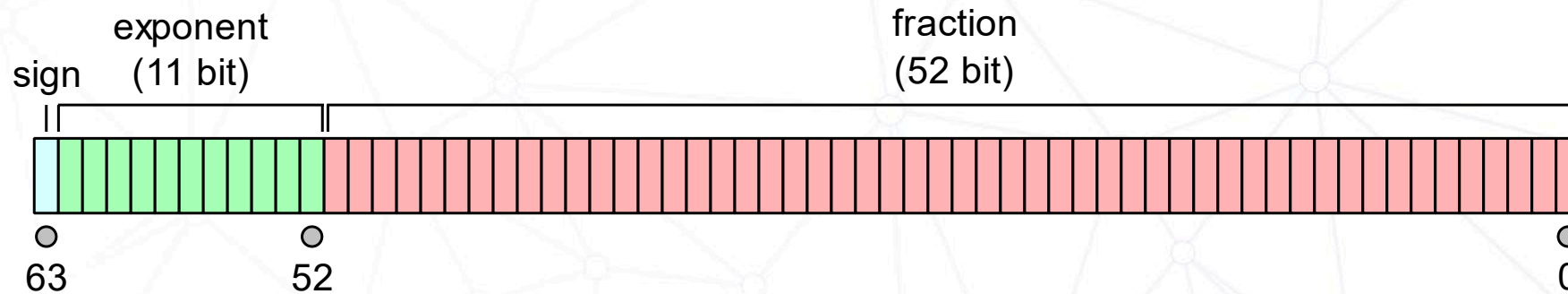Without tests every change is a possible bug."

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Testing non-Niagara classes

hello

TRIDIUM

Java Floating-Point Demux

- Sign bit
- Exponent
- Fraction

Double Floating-Point Format
Codekaizen,
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via Wikimedia Commons

```java
public class DoubleDemux
{
    private static final Pattern TRAILING_ZEROS = Pattern.compile("0{1,12}$");

    // Based on values from sun.misc.DoubleConsts
    private static final long SIGN_BIT_MASK     = 0x8000_0000_0000_0000L;
    private static final long EXP_BIT_MASK      = 0x7FF0_0000_0000_0000L;
    private static final long FRAC_BIT_MASK     = 0x000F_FFFF_FFFF_FFFFL;
    private static final long IMPLICIT_INT_BIT  = 0x0010_0000_0000_0000L;

    private double value;

    private long bits;

    private boolean isNegative;
    private int biasedExponent;
    private long fraction;

    private boolean isZero;
    private boolean isSubnormal;
    private boolean isInfinity;
    private boolean isNaN;

    public double getValue() { return value; }

    public void setValue(double value)
    {
        this.value = value;

        bits = Double.doubleToRawLongBits(value);

        isNegative = (bits & SIGN_BIT_MASK) != 0;
        biasedExponent = (int) ((bits & EXP_BIT_MASK) >> 52);
        fraction = bits & FRAC_BIT_MASK;

        isZero      = biasedExponent == 0     && fraction == 0;
        isSubnormal = biasedExponent == 0     && fraction != 0;
        isInfinity  = biasedExponent == 0x7FF && fraction == 0;
        isNaN       = biasedExponent == 0x7FF && fraction != 0;
    }
```

```java
*/
@Test
public class DoubleDemuxTest
{
    @DataProvider
    private static Object[] doubleDemuxTestCases() { return DoubleDemuxTestCase.testCases; }

    @Test(dataProvider = "doubleDemuxTestCases")
    public void setValue_updatesBits(DoubleDemuxTestCase testCase)
    {
        // Given
        DoubleDemux demux = new DoubleDemux();

        // When
        demux.setValue(testCase.value);

        // Then
        assertEquals(demux.getBits(), testCase.bits, "value: " + testCase.value);
    }
}
```

100%
successful

Packages   **Classes**

Package	Tests	Failures	Ignored	Duration	Success rate
us.esanderson	220	0	0	0.021s	100%

NF
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Testing in Niagara

hello

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```java
.*/
@NiagaraType
public class BDoubleDemux1
  extends BComponent
{
//region /*+ ------------- BEGIN BAJA AUTO GENERATED CODE ------------- +*/
//@formatter:off
/*@ $com.esanderson.kitFloatingPoint.BDoubleDemux1(2979906276)1.0$ @*/
/* Generated Thu May 04 15:41:26 CDT 2023 by Slot-o-Matic (c) Tridium, Inc. 2012-2023 */

  //region Type

  @Override
  public Type getType() { return TYPE; }
  public static final Type TYPE = Sys.loadType(BDoubleDemux1.class);

  //endregion Type

//@formatter:on
//endregion /*+ ------------- END BAJA AUTO GENERATED CODE -------------- +*/
}
```

```
^/
@Test
public class DoubleDemuxTest1a
{
  public void setValue_updatesBitsProperty()
  {
    // Given
    BDoubleDemux1 demux = new BDoubleDemux1();
    assertEquals(demux.getValue(), 0.0, "value property at start");
    assertEquals(demux.getBits(), 0L, "bits property at start");

    // When
    demux.setValue(1.0);

    // Then
    assertEquals(demux.getBits(), 0x3FF0_0000_0000_0000L, "bits property after updating value property");
  }
}
```

```java
@NiagaraType
@NiagaraProperty(
  name = "value",
  type = "double",
  defaultValue = "0.0",
  flags = Flags.TRANSIENT | Flags.SUMMARY | Flags.OPERATOR
)
@NiagaraProperty(
  name = "bits",
  type = "long",
  defaultValue = "0L",
  flags = Flags.READONLY | Flags.TRANSIENT | Flags.SUMMARY | Flags.OPERATOR
)
public class BDoubleDemux1
  extends BComponent
{
//region /*+ ------------ BEGIN BAJA AUTO GENERATED CODE ------------ +*/
//@formatter:off
/*@ $com.esanderson.kitFloatingPoint.BDoubleDemux1(954813887)1.0$ @*/
/* Generated Wed May 31 15:17:18 CDT 2023 by Slot-o-Matic (c) Tridium, Inc. 2012-2023 */

  //region Property "value"

  /**
   * Slot for the {@code value} property.
   * @see #getValue
   * @see #setValue
   */
  public static final Property value = newProperty(Flags.TRANSIENT | Flags.SUMMARY | Flags.OPERATOR, 0.0, null);

  /**
   * Get the {@code value} property.
   * @see #value
   */
  public double getValue() { return getDouble(value); }

  /**
   * Set the {@code value} property.
   * @see #value
   */
  public void setValue(double v) { setDouble(value, v, null); }

  //endregion Property "value"
```

Cannot use IntelliJ

java.lang.ExceptionInInitializerError

 ...

Caused by: java.lang.NullPointerException

  at javax.baja.sys.Sys.loadType(Sys.java:445)

  at javax.baja.sys.BObject.<clinit>(BObject.java:34)

  ...

Use test.exe on Niagara types

- Extend BTestNg
- test {type spec}
- Other patterns available
- Results: workbench_user_home/reports/testng

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```java
*/
@NiagaraType
@Test
public class BDoubleDemuxTest1b
  extends BTestNg
{
//region /*+ ------------- BEGIN BAJA AUTO GENERATED CODE ------------- +*/
//@formatter:off
/*@ $test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b(2979906276)1.0$ @*/
/* Generated Thu May 04 16:42:09 CDT 2023 by Slot-o-Matic (c) Tridium, Inc. 2012-2023 */

  //region Type

  @Override
  public Type getType() { return TYPE; }
  public static final Type TYPE = Sys.loadType(BDoubleDemuxTest1b.class);

  //endregion Type

//@formatter:on
//endregion /*+ ------------- END BAJA AUTO GENERATED CODE ------------- +*/

  public void setValue_updatesBitsProperty()
  {
    // Given
    BDoubleDemux1 demux = new BDoubleDemux1();
    assertEquals(demux.getValue(), 0.0, "value property at start");
    assertEquals(demux.getBits(), 0L, "bits property at start");

    // When
    demux.setValue(1.0);

    // Then
    assertEquals(demux.getBits(), 0x3FF0_0000_0000_0000L, "bits property after updating value property");
  }
}
```

```
c:\niagara\niagara-4.14.0.21.849>test


=================================================================================
 usage:
   test <nativeTarget> -native [options]
   test <target> [target ... target] [options]
=================================================================================
 global options:
   -ng                Run java tests with TestNg (default)
   -watch             Run java tests with TestNg in watch mode
   -native            Run native tests with cppunit
   -v:<n>             Set output verbosity level (1 - 10)
   -output:<path>     Set the location for test reports output
=================================================================================
 testng targets:
   all
   <module>
   <module-runtimeProfile>
   <module>:<type>
   <module>:<type>.<method>
   <com.package>.<BTestClass>
   <com.package>.<BTestClass>.<method>
   /<regex to match against the com.package.BTestClass#method format>/
=================================================================================
 testng options:
   -groups:<a,b,c>         Comma-separated list of TestNG group names to test
   -excludegroups:<a,b,c>  Comma-separated list of TestNG group names to skip
   -skipHtmlReport         Flag to disable HTML report generation
   -generateJunitReport    Flag to enable JUnit XML report generation
   -benchmark              Print the 50 highest duration tests and test suites on exit
   -loopCount:<n>          Run target(s) in a loop n times (1 - 1000000)
=================================================================================
 native targets:
   all
   <module>
=================================================================================
```

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Name	Date modified	Type	Size
target.0	4/1/2023 11:23 PM	File folder	
bullet_point.png	5/31/2023 3:24 PM	PNG File	1 KB
collapseall.gif	5/31/2023 3:24 PM	GIF File	1 KB
emailable-report.html	5/31/2023 3:24 PM	Microsoft Edge H...	4 KB
failed.png	5/31/2023 3:24 PM	PNG File	1 KB
index.html	5/31/2023 3:24 PM	Microsoft Edge H...	
jquery-1.7.1.min.js	5/31/2023 3:24 PM	JavaScript File	
navigator-bullet.png	5/31/2023 3:24 PM	PNG File	
passed.png	5/31/2023 3:24 PM	PNG File	
skipped.png	5/31/2023 3:24 PM	PNG File	
testng-reports.css	5/31/2023 3:24 PM	Cascading Style S...	
testng-reports.js	5/31/2023 3:24 PM	JavaScript File	
testng-results.xml	5/31/2023 3:24 PM	XML File	

Test	Methods Passed	Scenarios Passed	# skipped	# failed	Total Time	Included Groups	Excluded Groups
Command line test	0	0	0	1	0.0 seconds		

Class	Method	# of Scenarios	Start	Time (ms)
Command line test — failed				
test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b	setValue_updatesBitsProperty	1	1685564677280	9

Command line test

test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b:setValue_updatesBitsProperty

```
java.lang.AssertionError: bits property after updating value property expected [4607182418800017408] but found [0]
        at test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b.setValue_updatesBitsProperty(BDoubleDemuxTest1b.java:58)
        at com.tridium.testng.TestRunnerNg.loop(TestRunnerNg.java:231)
        at com.tridium.testng.TestRunnerNg.run(TestRunnerNg.java:101)
        at com.tridium.testng.TestRunnerNg.run(TestRunnerNg.java:77)
        at javax.baja.test.TestRunner.run(TestRunner.java:210)
        at javax.baja.test.TestRunner.run(TestRunner.java:110)
        at javax.baja.test.TestRunner.run(TestRunner.java:238)
        at javax.baja.test.TestRunner.runTests(TestRunner.java:350)
        at javax.baja.test.TestRunner.runTests(TestRunner.java:340)
        at javax.baja.test.TestRunner.main(TestRunner.java:335)
        at com.tridium.sys.Nre.runClass(Nre.java:560)
        at com.tridium.sys.Nre.main(Nre.java:353)
        at com.tridium.sys.Nre.bootstrap(Nre.java:174)
        at com.tridium.nre.bootstrap.Bootstrap.Main(Bootstrap.java:135)
... Removed 35 stack frames
```

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```java
@Override
public void changed(Property property, Context context)
{
    super.changed(property, context);

    setBits(Double.doubleToRawLongBits(getValue()));
}
```

Remote programming requirement

... proxy components receive all the standard change callbacks like changed() or added().

Typically developers should short circuit these callbacks if the component is not running since executing callback code within a proxy can produce unintended side effects.

```java
  public void setValue_updatesBitsPropertyWhenRunning()
  {
    // Given
    BDoubleDemux1 demux = new BDoubleDemux1();
    assertTrue(demux.isRunning(), "demux isRunning at start");
    assertEquals(demux.getValue(), 0.0, "value property at start");
    assertEquals(demux.getBits(), 0L, "bits property at start");

    // When
    demux.setValue(1.0);

    // Then
    assertEquals(demux.getBits(), 0x3FF0_0000_0000_0000L, "bits property after updating value property");
  }

  public void setValue_doesNotUpdateBitsPropertyWhenNotRunning()
  {
    // Given
    BDoubleDemux1 demux = new BDoubleDemux1();
    assertFalse(demux.isRunning());

    // When
    demux.setValue(1.0);

    // Then
    assertEquals(demux.getBits(), 0L, "value: 1.0");
  }
}
```

Testing in a station

hello

BTestNgStation

- Basic services
  - Role, User, Category, Authentication
  - Alarm, History, Job
  - Box, Fox
  - (opt-in) Search, Web
- Roles/Users
  - Super
  - Admin (rwiRWI)
  - Operator (rwi)

BTestNgStation

- Drivers folder
  - Niagara Network

configureTestStation

- Add anything to the station before it starts
- Convenience methods for adding roles and users

setupStation

- Actions for after station start but before any test methods
- Must call super.setupStation
- Station has started once super.setupStation finishes
- Keeping alwaysRun is optional

teardownStation

- Actions for before or after station stop after test methods
- Must call super. teardownStation
- Station has stopped once super. teardownStation finishes
- Keep alwaysRun so station clean-up happens
- Do not allow exceptions before super.teardownStation

```java
`*/
@NiagaraType
@Test
public class BDoubleDemuxTest1b
  extends BTestNgStation
{
```

```java
  @Override
  protected void configureTestStation(BStation station, String stationName, int webPort, int foxPort)
    throws Exception
  {
    super.configureTestStation(station, stationName, webPort, foxPort);

    station.add(null, folder);
  }

  @AfterMethod
  public void afterMethod()
  {
    folder.removeAll();
  }

  public void setValue_updatesBitsPropertyWhenRunning()
  {
    // Given
    BDoubleDemux1 demux = new BDoubleDemux1();
    folder.add(null, demux);
    assertTrue(demux.isRunning(), "demux isRunning at start");
    assertEquals(demux.getValue(), 0.0, "value property at start");
    assertEquals(demux.getBits(), 0L, "bits property at start");

    // When
    demux.setValue(1.0);

    // Then
    assertEquals(demux.getBits(), 0x3FF0_0000_0000_0000L, "bits property after updating value property");
  }

  public void setValue_doesNotUpdateBitsPropertyWhenNotRunning()
  {
    // Given
    BDoubleDemux1 demux = new BDoubleDemux1();
    assertFalse(demux.isRunning());

    // When
    demux.setValue(1.0);

    // Then
    assertEquals(demux.getBits(), 0L, "value: 1.0");
  }

  private final BFolder folder = new BFolder();
}
```

Test	Methods Passed	Scenarios Passed	# skipped	# failed	Total Time	Included Groups	Excluded Groups
Command line test	1	1	0	1	4.1 seconds		

Class	Method	# of Scenarios	Start	Time (ms)
Command line test — failed				
test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b	setValue_doesNotUpdateBitsPropertyWhenNotRunning	1	1685574915221	5
Command line test — passed				
test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b	setValue_updatesBitsPropertyWhenRunning	1	1685574915231	0

Command line test

test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b:setValue_doesNotUpdateBitsPropertyWhenNotRunning

```
java.lang.AssertionError: value: 1.0 expected [0] but found [4607182418800017408]
        at test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b.setValue_doesNotUpdateBitsPropertyWhenNotRunning(BDoubleDemuxTest1b.java:88)
        at com.tridium.testng.TestRunnerNg.loop(TestRunnerNg.java:231)
        at com.tridium.testng.TestRunnerNg.run(TestRunnerNg.java:101)
        at com.tridium.testng.TestRunnerNg.run(TestRunnerNg.java:77)
        at javax.baja.test.TestRunner.run(TestRunner.java:210)
        at javax.baja.test.TestRunner.run(TestRunner.java:110)
        at javax.baja.test.TestRunner.run(TestRunner.java:238)
        at javax.baja.test.TestRunner.runTests(TestRunner.java:350)
        at javax.baja.test.TestRunner.runTests(TestRunner.java:340)
        at javax.baja.test.TestRunner.main(TestRunner.java:335)
        at com.tridium.sys.Nre.runClass(Nre.java:560)
        at com.tridium.sys.Nre.main(Nre.java:353)
        at com.tridium.sys.Nre.bootstrap(Nre.java:174)
        at com.tridium.nre.bootstrap.Bootstrap.Main(Bootstrap.java:135)
... Removed 35 stack frames
```

back to summary

test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b:setValue_updatesBitsPropertyWhenRunning

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TRIDIUM

```java
  @Override
  public void changed(Property property, Context context)
  {
    super.changed(property, context);

    if (!isRunning())
    {
      return;
    }

    setBits(Double.doubleToRawLongBits(getValue()));
  }
```

Test	Methods Passed	Scenarios Passed	# skipped	# failed	Total Time	Included Groups	Excluded Groups
Command line test	2	2	0	0	4.1 seconds		

Class	Method	# of Scenarios	Start	Time (ms)
Command line test — passed				
test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b	setValue_doesNotUpdateBitsPropertyWhenNotRunning	1	1685575161580	3
	setValue_updatesBitsPropertyWhenRunning	1	1685575161587	0

Command line test

test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b:setValue_doesNotUpdateBitsPropertyWhenNotRunning

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test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b:setValue_updatesBitsPropertyWhenRunning

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Test	Methods Passed	Scenarios Passed	# skipped	# failed	Total Time	Included Groups	Excluded Groups
kitFloatingPointTest_DoubleAlarmAlgorithmTest2							
Command line test	1	1	0	0	0.0 seconds		
kitFloatingPointTest_DoubleDemuxTest1b							
Command line test	2	2	0	0	2.9 seconds		
kitFloatingPointTest_DoubleDemuxTest2							
Command line test	2	2	0	0	1.0 seconds		
kitFloatingPointTest_DoubleAlarmAlgorithmTest1							
Command line test	1	1	0	0	4.1 seconds		
Total	**6**	**6**	**0**	**0**	**8.1 seconds**		

Class	Method	# of Scenarios	Start	Time (ms)
kitFloatingPointTest_DoubleAlarmAlgorithmTest2				
Command line test — passed				
test.com.esanderson.kitFloatingPoint.BDoubleAlarmAlgorithmTest2	isNormal_returnFalseWhenOutIsNaN	1	1685576670256	4
kitFloatingPointTest_DoubleDemuxTest1b				
Command line test — passed				
test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest1b	setValue_doesNotUpdateBitsPropertyWhenNotRunning	1	1685576671161	1
	setValue_updatesBitsPropertyWhenRunning	1	1685576671163	0
kitFloatingPointTest_DoubleDemuxTest2				
Command line test — passed				
test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest2	setValue_doesNotUpdateBitsPropertyWhenNotRunning	1	1685576673197	0
	setValue_updatesBitsPropertyWhenRunning	1	1685576673199	981
kitFloatingPointTest_DoubleAlarmAlgorithmTest1				
Command line test — passed				
test.com.esanderson.kitFloatingPoint.BDoubleAlarmAlgorithmTest1	raisesOffnormalWhenOutIsNaN	1	1685576668164	53

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BTestNgStation overhead

- Subclasses have a fixed station start-up time
- May want to limit usage to when necessary

Test helpers

hello

```java
*/
@NiagaraType
@Test
public class BDoubleDemuxTest2
  extends BTestNg
{
//region /*+ ------------ BEGIN BAJA AUTO GENERATED CODE ------------ +*/
//@formatter:off
/*@ $test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest2(2979906276)1.0$ @*/
/* Generated Mon May 08 15:25:01 BST 2023 by Slot-o-Matic (c) Tridium, Inc. 2012-2023 */

  //region Type

  @Override
  public Type getType() { return TYPE; }
  public static final Type TYPE = Sys.loadType(BDoubleDemuxTest2.class);

  //endregion Type

//@formatter:on
//endregion /*+ ------------ END BAJA AUTO GENERATED CODE ------------ +*/

  public void setValue_updatesBitsPropertyWhenRunning()
  {
    // Given
    BDoubleDemux1 demux = Mockito.mock(BDoubleDemux1.class);
    Mockito.when(demux.isRunning()).thenReturn(true);
    assertTrue(demux.isRunning(), "demux isRunning at start");
    assertEquals(demux.getValue(), 0.0, "value property at start");
    assertEquals(demux.getBits(), 0L, "bits property at start");

    // When
    demux.setValue(1.0);

    // Then
    assertEquals(demux.getBits(), 0x3FF0_0000_0000_0000L, "bits property after updating value property");
  }
```

```
// See documentation at module://docDeveloper/doc/build.html#dependencies for the supported
// dependency types
dependencies { this: DependencyHandlerScope
  // NRE dependencies
  nre("Tridium:nre")

  // Niagara module dependencies
  api("Tridium:baja")
  api("Tridium:alarm-rt")
  api("Tridium:control-rt")

  // Test Niagara module dependencies
  moduleTestImplementation("Tridium:test-wb")
  testUberjar("org.mockito:mockito-inline:4.11.0")
  testUberjar("com.e-movimento.tinytools:privilegedaccessor:1.2.2")
}
```

TRIDIUM

Test	Methods Passed	Scenarios Passed	# skipped	# failed	Total Time	Included Groups	Excluded Groups
Command line test	1	1	0	1	1.0 seconds		

Class	Method	# of Scenarios	Start	Time (ms)
Command line test — failed				
test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest2	setValue_updatesBitsPropertyWhenRunning	1	1685575885621	957
Command line test — passed				
test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest2	setValue_doesNotUpdateBitsPropertyWhenNotRunning	1	1685575885609	9

Command line test

test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest2:setValue_updatesBitsPropertyWhenRunning

```
java.lang.AssertionError: bits property after updating value property expected [4607182418800017408] but found [0]
        at test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest2.setValue_updatesBitsPropertyWhenRunning(BDoubleDemuxTest2.java:57)
        at com.tridium.testng.TestRunnerNg.loop(TestRunnerNg.java:231)
        at com.tridium.testng.TestRunnerNg.run(TestRunnerNg.java:101)
        at com.tridium.testng.TestRunnerNg.run(TestRunnerNg.java:77)
        at javax.baja.test.TestRunner.run(TestRunner.java:210)
        at javax.baja.test.TestRunner.run(TestRunner.java:110)
        at javax.baja.test.TestRunner.run(TestRunner.java:238)
        at javax.baja.test.TestRunner.runTests(TestRunner.java:350)
        at javax.baja.test.TestRunner.runTests(TestRunner.java:340)
        at javax.baja.test.TestRunner.main(TestRunner.java:335)
        at com.tridium.sys.Nre.runClass(Nre.java:560)
        at com.tridium.sys.Nre.main(Nre.java:353)
        at com.tridium.sys.Nre.bootstrap(Nre.java:174)
        at com.tridium.nre.bootstrap.Bootstrap.Main(Bootstrap.java:135)
... Removed 35 stack frames
```

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test.com.esanderson.kitFloatingPoint.BDoubleDemuxTest2:setValue_doesNotUpdateBitsPropertyWhenNotRunning

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TRIDIUM

```java
  public void setValue_updatesBitsPropertyWhenRunning()
  {
    // Given
    BDoubleDemux1 demux = Mockito.spy(BDoubleDemux1.class);
    Mockito.doReturn(true).when(demux).isRunning();
    assertTrue(demux.isRunning(), "demux isRunning at start");
    assertEquals(demux.getValue(), 0.0, "value property at start");
    assertEquals(demux.getBits(), 0L, "bits property at start");

    // When
    demux.setValue(1.0);

    // Then
    assertEquals(demux.getBits(), 0x3FF0_0000_0000_0000L, "bits property after updating value property");
  }
```

Mockito

- testUberjar("org.mockito:mockito-inline:4.11.0")
- May have to spy on BComponents
- Mocking final class or stubbing final methods is tricky

TestHelper

- assertWillBeTrue
- waitForClockChange
- And more…

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```java
@NiagaraType
public class BDoubleAlarmAlgorithm
  extends BTwoStateAlgorithm
{
//region /*+ ------------ BEGIN BAJA AUTO GENERATED CODE ------------ +*/
//@formatter:off
/*@ $com.esanderson.kitFloatingPoint.BDoubleAlarmAlgorithm(2979906276)1.0$ @*/
/* Generated Wed May 10 21:55:50 CEST 2023 by Slot-o-Matic (c) Tridium, Inc. 2012-2023 */

  //region Type

  @Override
  public Type getType() { return TYPE; }
  public static final Type TYPE = Sys.loadType(BDoubleAlarmAlgorithm.class);

  //endregion Type

//@formatter:on
//endregion /*+ ------------ END BAJA AUTO GENERATED CODE -------------- +*/

  @Override
  public boolean isGrandparentLegal(BComponent grandparent) { return grandparent instanceof BNumericPoint; }

  @Override
  public void changed(Property p, Context cx)
  {
    super.changed(p, cx);

    if (!isRunning())
    {
      return;
    }

    executePoint();
  }

  @Override
  protected boolean isNormal(BStatusValue out)
  {
    double value = ((BStatusNumeric)out).getValue();
    return !Double.isNaN(value);
  }
}
```

```java
public void raisesOffnormalWhenOutIsNaN()
{
    // Given
    BDoubleAlarmAlgorithm algorithm = new BDoubleAlarmAlgorithm();

    BAlarmSourceExt doubleAlarmExt = new BAlarmSourceExt();
    doubleAlarmExt.setOffnormalAlgorithm(algorithm);

    BNumericWritable point = new BNumericWritable();
    point.add(null, doubleAlarmExt);
    point.set(BDouble.make(1.0));

    folder.add(null, point);

    TestHelper.assertWillBeTrue(
        () -> Double.compare(point.getNumeric(), 1.0) == 0,
        () -> "At start of test, out is " + point.getNumeric() + " instead of 1.0");
    assertEquals(doubleAlarmExt.getAlarmState(), BAlarmState.normal, "alarmState at start of test");

    // When
    point.override(new BNumericOverride(Double.NaN));
    TestHelper.assertWillBeTrue(
        () -> Double.compare(point.getNumeric(), Double.NaN) == 0,
        () -> "After override, out is " + point.getNumeric() + " instead of " + Double.NaN);

    // Then
    assertEquals(doubleAlarmExt.getAlarmState(), BAlarmState.offnormal, "alarmState at end of test");
}
```

TestHelper

- assertWillBeTrue
- waitForClockChange
- And more…

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```java
  @Override
  protected boolean isNormal(BStatusValue out)
  {
      double value = ((BStatusNumeric)out).getValue();
      return !Double.isNaN(value);
  }
```

```
  // Test Niagara module dependencies
  moduleTestImplementation("Tridium:test-wb")
  testUberjar("org.mockito:mockito-inline:4.11.0")
  testUberjar("com.e-movimento.tinytools:privilegedaccessor:1.2.2")
```

```java
  public void isNormal_returnFalseWhenOutIsNaN()
    throws Throwable
  {
    // Given
    BDoubleAlarmAlgorithm algorithm = new BDoubleAlarmAlgorithm();
    BStatusValue out = new BStatusNumeric(Double.NaN);

    // When
    boolean actual = (boolean) PA.invokeMethod(algorithm, "isNormal(javax.baja.status.BStatusValue)", out);

    // Then
    assertFalse(actual);
  }
```
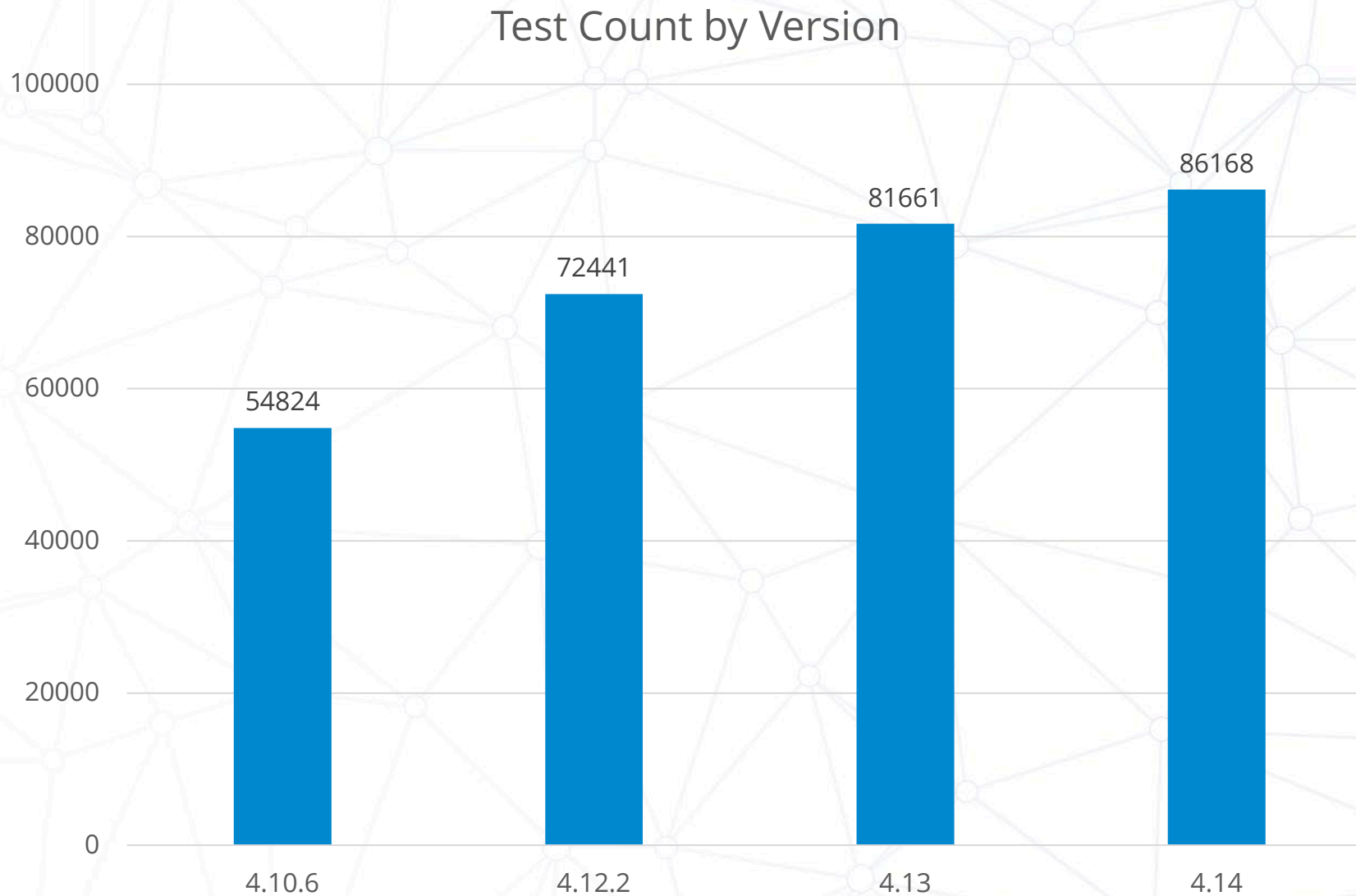
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Privileged Accessor (PA)

- "com.e-movimento.tinytools:privilegedaccessor:1.2.2"

TRIDIUM

Tridium's commitment to testing

Test Count by Version

Version	Test Count
4.10.6	54824
4.12.2	72441
4.13	81661
4.14	86168

Documentation

- module://docDeveloper/doc/test.html
- module://docDeveloper/doc/build.html
- test-wb source code available in help system

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Thanks!

hello

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