

Integrated testing with the ABL Unit framework

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Acknowledgement: TVH Parts Holdings NV



Introduction

Simon Prinsloo (Masters of IT, University of Pretoria) of Vidisolve in South Africa (www.vidisolve.com)

- Working with Progress since v.7 in 1996
- Worked on various commercial systems
- Initially a lot of focus on Computer Aided Systems Engineering tools and implementing modern developments in legacy projects
- Recently a lot of back-end development and upgrades of older systems

TVH®

KEEPS YOU GOING.

A GLOBAL FORCE WITH LOCAL REACH.

>1M
SKUS
- STOCK KEEPING UNITS

EUR > 1.7B
TURNOVER IN '25

>5,000
EMPLOYEES

>55M
KNOWN REFERENCES

>92,000
ACTIVE CUSTOMERS

55
LANGUAGES

90
BRANCHES

>170
COUNTRIES

75
NATIONALITIES

KEEPING INDUSTRIES GOING.

FOR OVER 50 YEARS, TVH HAS KEPT INDUSTRIES GOING.

Serving 5 key markets with **parts** for forklifts, telehandlers, small earth-moving equipment, tractors, and more...

- MATERIAL HANDLING
- CONSTRUCTION EQUIPMENT
- INDUSTRIAL EQUIPMENT
- AGRICULTURAL EQUIPMENT
- WORKSHOP & WAREHOUSE SUPPLIES

GLOBAL PRESENCE. LOCAL SUPPORT.

90 BRANCHES WORLDWIDE.



WHEREVER YOU ARE...

WE'RE CLOSE TO YOU.

Agenda

- Background
- Test / Mock data
- JMS Layer
- AppServer Layer
- REST Layer

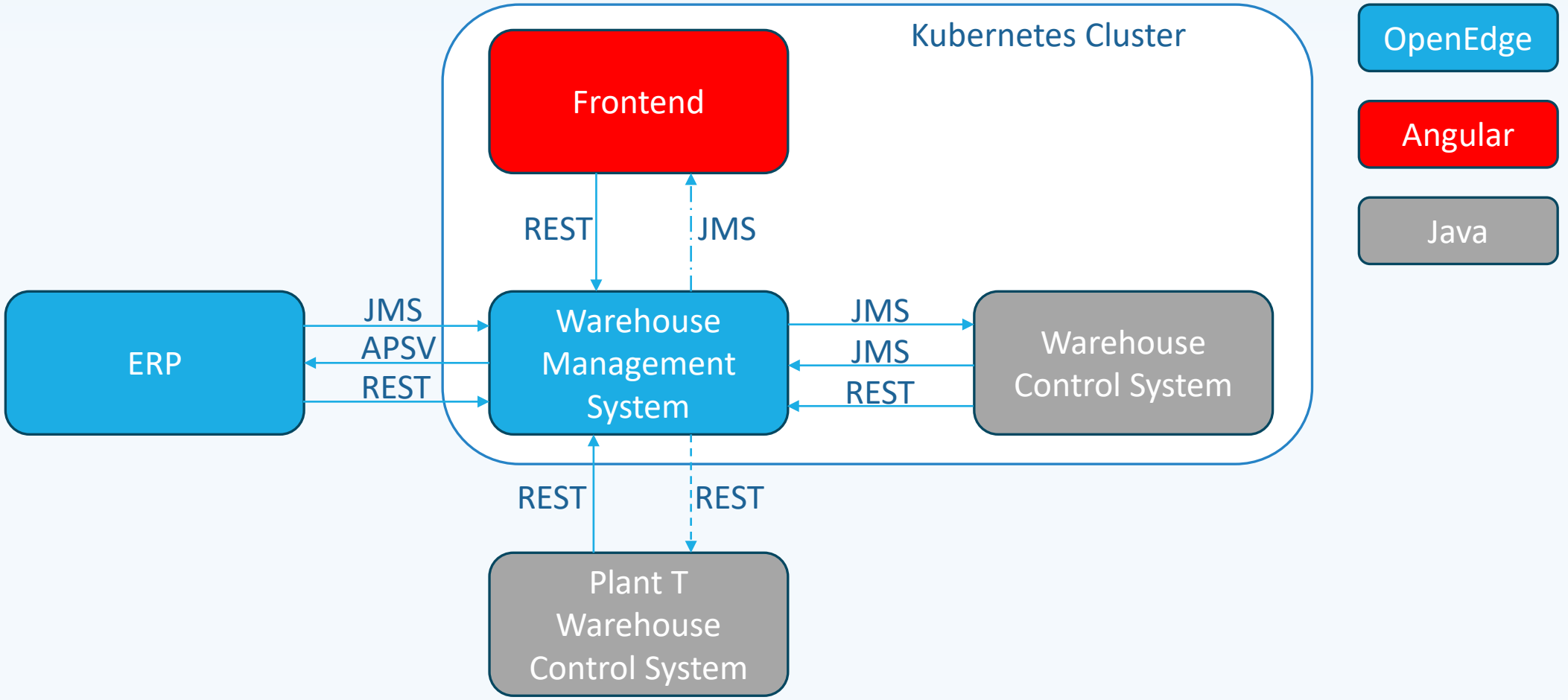
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The WB3 WMS System

- The WB3 WMS is a warehouse management system for a fully automated warehouse at TVH Parts Holdings NV.
- Unit tests were part of each development task since day one.
- Over time, we migrated towards integrated tests instead.
- Unit tests still play an important role in many cases.

Core Architecture



Unit testing vs Integrated testing

UNIT TESTING

- Single (Public) Method
- Lots of Mocking
- Many small tests
- Easily test many scenarios

INTEGRATED TESTING

- End-to-end Process
- Limited Mocking
- Fewer but larger tests
- Harder to test all code paths are tested

Agenda

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Mocking Data

MockDataAccessFactory - Configuration

```
[
  {
    "DataAccess": "com.tvh.parts.warehouse.wb3.loadcarriermanagement.domain.aisle.AisleDataAccess",
          "Data": "com/tvh/parts/warehouse/wb3/loadcarriermanagement/domain/aisle/dsAisle.xml",
          "Mock": "com.tvh.parts.warehouse.wb3.loadcarriermanagement.aisle.MockAisleDataAccess"
  },
  {
    "DataAccess": "com.tvh.parts.warehouse.wb3.loadcarriermanagement.domain.aisle.LevelDataAccess",
          "Data": "com/tvh/parts/warehouse/wb3/loadcarriermanagement/domain/aisle/dsLevel.xml"
  }
]
```

Mock is optional – Defaults to GenericMockDataAccess

Mocking Data

MockDataAccessFactory (Typical)

- Lookup original DataAccess
- Instantiate related Mock (or GenericMockDataAccess)
- Inject Dataset
- Actual implementation of the DataAccess is not tested
  - It requires the database

Mocking Data

Unit test database and Buffer classes

- Eliminated data access mock
- XML files became optional
- Data can “evolve” the same way as in the system
- Data representation more consistent with real world
- Easy and reliable reproduction of complex data scenarios
- Test suite took significantly longer
- For PDSOE we customized ABLUnitCore.p

Unit test database and Buffer classes

Eclipse customization to ABLUnitCore.p

```
// If we are in Eclipse, check if there is a custom db configuration to use.
if os-getenv("ABL_RUNTIME_DIR") ne ? and
   os-getenv("ECLIPSE_WORK") ne ? then
    ABLUnitCustomizer:switchToWorkspaceUnitTestDatabases().
```

VS Code - ablunit-test-profile.json

```
{
    "configurations": [
        {
            "initializationProcedure": "connect-unittestdb.p"
        }
    ]
}
```

Mocking Data

MockDataAccessFactory

- Kept the configuration
  - Dropped the Mock field
  - Made Data field optional
- In LoadConfiguration()
  - Use the Buffer classes to wipe database tables
  - Load data file if present

Mocking Data

MockDataAccessFactory

- Static constructor
- Check ABLUnitCustomizer:isInitialized
  - Ensure PDSOE is running against the custom ABLUnitCore.p
- Check that a Unit Test Database is connected

Buffer Class

- Wraps a database buffer
- Most methods provide for fluent syntax
- Two parts
- *Buffer_Generated.cls
  - Generated Base class
  - Property for each db field
  - Core functionality
  - Can be Regenerated
- *Buffer.cls
  - Inherits Generated
  - Only generated if missing
  - Customizable
  - Return type of most methods

Buffer Classes – The generated base class

```
class com.tvh.parts…….generated.AisleBuffer_Generated:

    define protected buffer Aisle for Aisle.
    define query qQuery for Aisle.

    define public property available as logical no-undo
    get():
        return available Aisle.
    end get.

    define public property state as character no-undo
    get():
        ensureAvailable("state").
        return Aisle.State.
    end get.
```

Buffer and Query

Buffer State

Database field name

Database data type

Buffer Fields

Buffer Classes – The generated base class

```
class com.tvh.parts…….generated.AisleBuffer_Generated:

    method public AisleBuffer clearAll():
        for each Aisle exclusive-lock:
            delete Aisle.
        end.
        return cast(this-object, AisleBuffer).
    end method.

    method public AisleBuffer create():
        create Aisle.
        return cast(this-object, AisleBuffer).
    end method.
```

Table and Buffer Manipulation

Return derived type for Fluent Syntax

Buffer Classes – The generated base class

```
…
method public AisleBuffer setState(input ixValue as character):
    ensureAvailable("setState()").
    assign Aisle.State = ixValue.
    return cast(this-object, AisleBuffer).
end method.

…
method protected void ensureAvailable(input ipReference as character):
    if not available Aisle then
        undo, throw new TVHApperror(substitute(
            "Invalid reference to AisleBuffer:&1 with no record available.",
            ipReference)).
end method.
```

Field Manipulation

Return derived type for Fluent Syntax

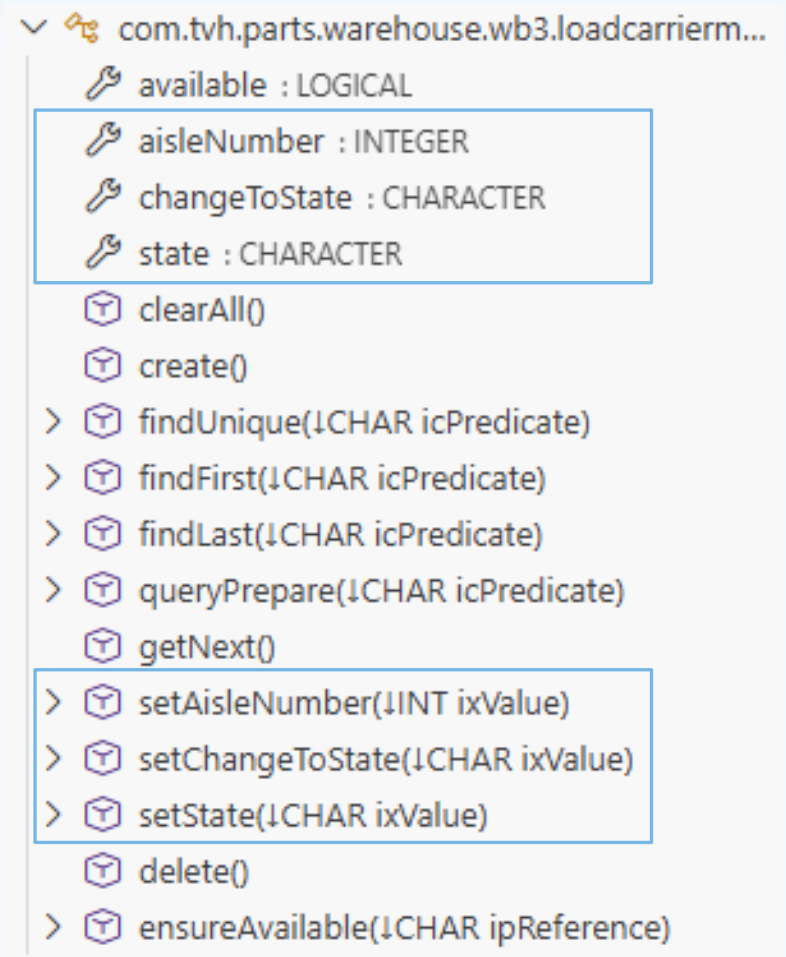
Buffer Classes – The generated base class

```
method public logical findUnique(input icPredicate as character):
    buffer Aisle:find-unique(icPredicate) no-error.
    return available Aisle.
end method.

method public logical queryPrepare(input icPredicate as character):
    query qQuery:query-prepare("for each Aisle " + icPredicate).
    return query qQuery:query-open().
end method.

method public logical getNext():
    return query qQuery:get-next().
end method.
```

Buffer Classes – The generated base class



Buffer Classes – The derived class

```
class com.tvh.parts.warehouse…….generated.AisleBuffer
    inherits AisleBuffer_Generated:

    method public AisleBuffer create(input iiAisleNumber as integer):
        return this-object:create()
                          :setAisleNumber(iiAisleNumber)
                          :setState(AisleStateEnum:NORMAL).
    end method.

    method public AisleBuffer setState(input state as AisleStateEnum):
        return this-object:setState(state:ToString()).
    end method.

end class.
```

Quick create methods

Overload setter to use Enumerator as input

Buffer Classes – Data Evolution

```
define private property CARTON_TYPE as character no-undo initial "61" get.


method public TaskOrderBuffer createPickTask():

    return this-object:createTaskOrder()
                      :setOrderType(TaskOrderType:PICKING)
                      :setTaskSubType(PickTaskSubType:PICKING)
                      :setTypePriority(integer(TaskOrderTypePriority:PICKING))
                      :setLoadCarrierType(CARTON_TYPE)
                      :setIsDeliveryNoteNeeded(true).

end method.
```

Buffer Classes – Data Evolution

```
method public TaskOrderBuffer createPickTaskSentToWorkStation():

    return this-object:createPickTask()
                      :assignToWorkStation().

end method.

method public TaskOrderBuffer assignToWorkStation():

    return this-object:setWorkStationName(WORK_STATION)
                      :setStatus(TaskStatus:SENT_TO_WORKSTATION)
                      :setRunNumber(RUN_NUMBER)
                      :setAssignedToWorkStation(ASSIGNED_TO_WORK_STATION)
                      :setFirstLoadCarrierAssigned(dtNow).

end method.
```

Buffer Classes – Data Evolution

```
method public TaskOrderBuffer createPickTaskReadyToComplete():

    return this-object:createPickTaskSentToWorkStation()
                      :linkCarton().

end method.

method public TaskOrderBuffer linkCarton():

    return this-object:setLoadCarrierNumber(string(random(05000000, 09000000)))
                      :setStatus(TaskStatus:READY_TO_COMPLETE).

 end method.
```

Buffer Classes – Data Evolution

```
method public TaskOrderBuffer createPickTaskReadyForCheckStation():
    return this-object:createPickTaskReadyToComplete()
                      :setStatus(TaskStatus:COMPLETED)
                      :setProcessedBy(PROCESSED_BY).
end method.

method public TaskOrderBuffer createPickTaskCheckStationDone():
    return this-object:createPickTaskReadyForCheckStation()
                      :setStatus(TaskStatus:CHECK_STATION_PROCESSED).

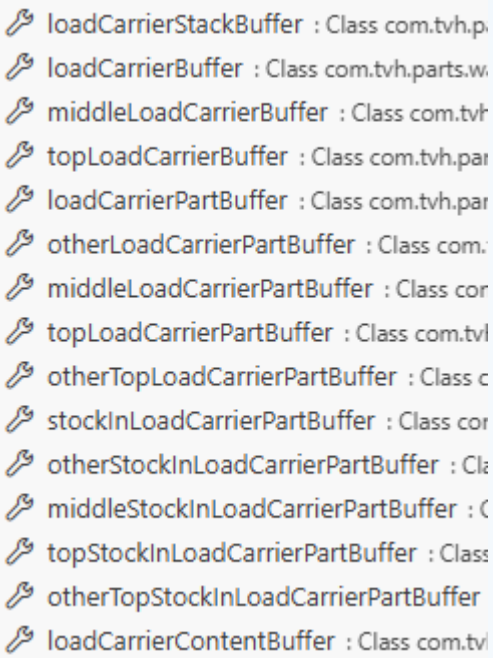
end method.
```

Data Builders

- Build complex data structures
- One or more properties for each Buffer
- Methods to build various scenarios

LoadCarrierStackDataBuilder

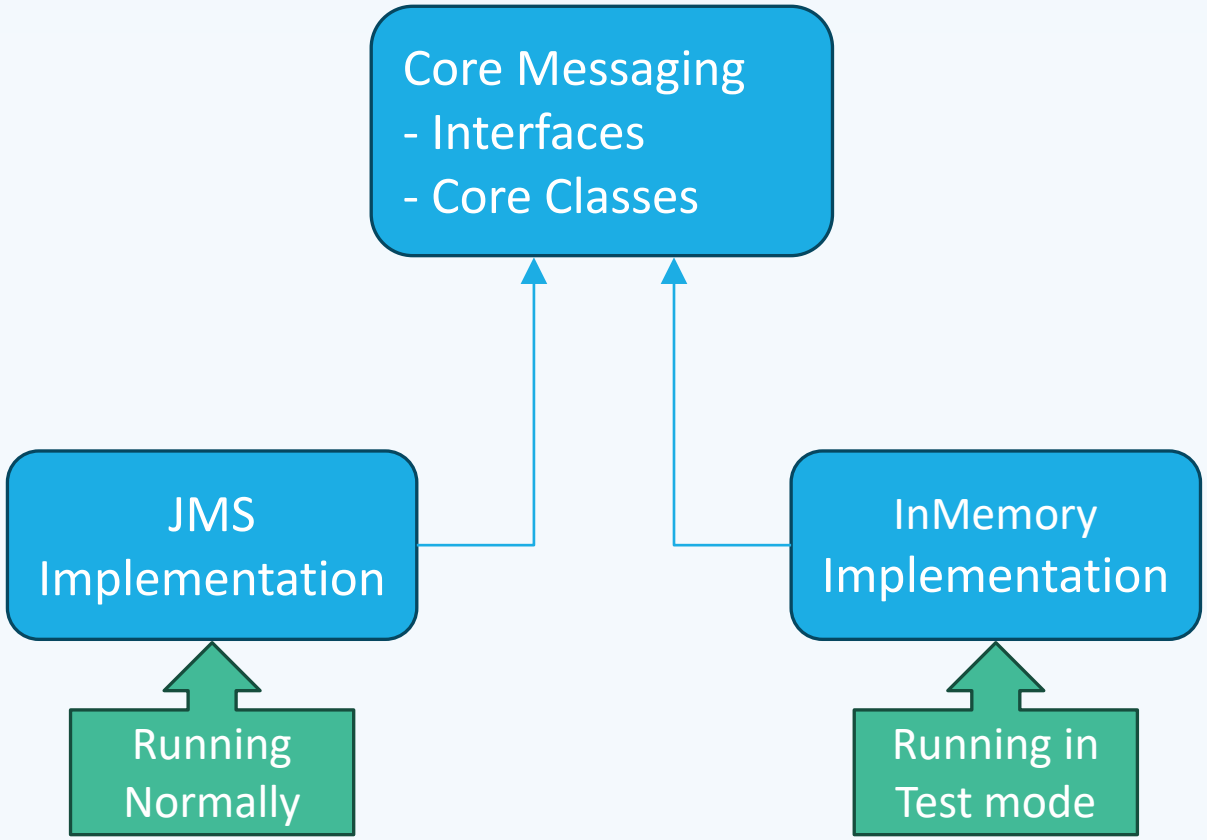
- Example Properties exposing Buffer classes for
  - LoadCarrierStack
  - Bottom, middle and top LoadCarrier
  - LoadCarrierPart buffers
  - StockInLoadCarrierPart buffers
  - LoadCarrierContent buffer
- Example Methods
  - createWithThreeSmallLoadCarriersWithStock()
  - createWithOneSmallLoadCarrierForGoods()



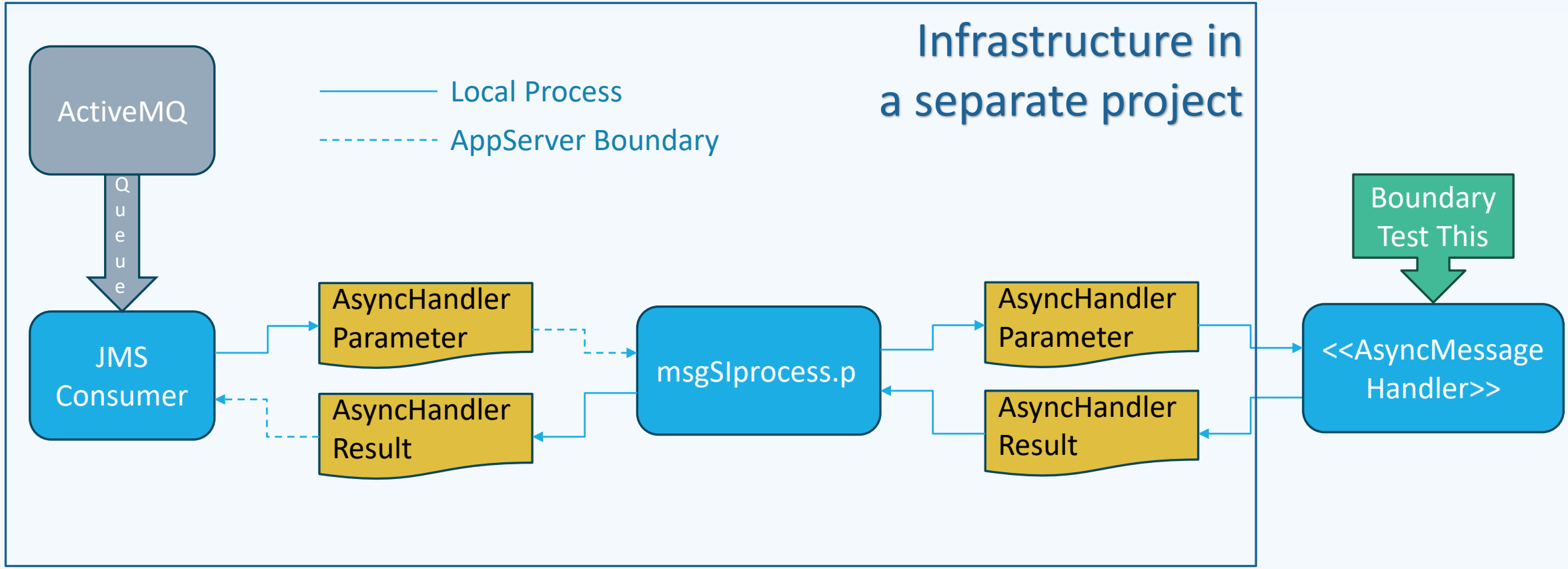
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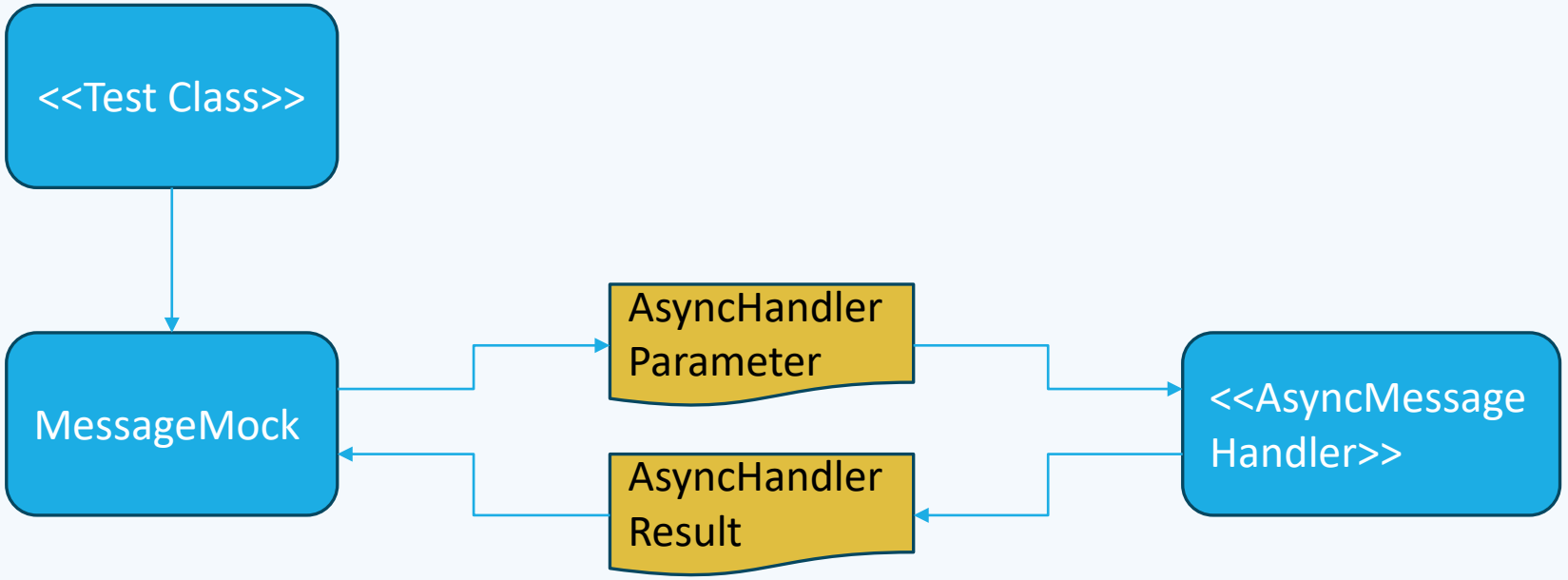
JMS Infrastructure – Messaging Module



Normal handling of JMS Events



Mocking JMS Events



Example – Services used in Test

```
@Before. (Deprecated, should now use @BeforeAll.)

method public void initializeTest():

    ServiceLoader:LoadFromFile("config/mock-messaging-services.xml").
    ServiceLoader:LoadFromFile("config/ms-wb3-wms-services.xml").

end method.
```

Mock Messaging Services

Standard System Services

Example – Setup of the test

```
@Setup. (Deprecated, should now use @BeforeEach.)
method public void setupTest():

    MockDataAccessFactory:InitializeFromFile(
        "com/tvh/parts/warehouse/wb3/DataAccess.mock").

end method.
```

Example – The Test

```
@Test.
method public void noLoadCarrierDetectedAtPutPoint():

    new NoLoadCarrierDetectedScenario()




 end method.
```



Example – The Test

```
@Test.

method public void noLoadCarrierDetectedAtPutPoint():


    new NoLoadCarrierDetectedScenario():givenLoadCarrierAtPutPoint()


end method.
```

Given prepares data



givenLoadCarrierAtPutPoint()

```
define private property workStationName as character no-undo initial "PS301" get.
define private property loadCarrierNumber as character no-undo initial "12587790" get.

.........

method public NoLoadCarrierDetectedScenario givenLoadCarrierAtPutPoint():

    workStationBuffer:find(workStationName)
                     :setLoadCarrierAtPutPoint(loadCarrierNumber).

    return this-object.

end method.
```

Enables Fluent Syntax

Example – The Test

```
@Test.
method public void noLoadCarrierDetectedAtPutPoint():

    new NoLoadCarrierDetectedScenario():givenLoadCarrierAtPutPoint()
                                       :whenNoLoadCarrierIsDetectedAtPutPoint()

end method.
```

When triggers the entry point

whenNoLoadCarrierIsDetectedAtPutPoint()

```
method public NoLoadCarrierDetectedScenario whenNoLoadCarrierIsDetectedAtPutPoint():

    messageMock:sendMessage(new WorkStationErrorHandler(),
                            "noLoadCarrierDetected",
                            substitute(
                           '~{"workStation":"&1","waypointType":"WORKSTATION_PUT"}',
                                       workStationName)).

    return this-object.

end method.
```

Example – The Test

```
@Test.
method public void noLoadCarrierDetectedAtPutPoint():

    new NoLoadCarrierDetectedScenario():givenLoadCarrierAtPutPoint()
                                       :whenNoLoadCarrierIsDetectedAtPutPoint()
                                       :putPointHasStatusNoLoadCarrier()
                                        Validate the outcome


 end method.
```



putPointHasStatusNoLoadCarrier()

```
method public NoLoadCarrierDetectedScenario putPointHasStatusNoLoadCarrier():

    WorkStationAssert:assertThat(workStation)
                     :hasPutPointStatus(HorseShoeStatus:NO_LOADCARRIER).

     return this-object.

end method.
```

Static method returning a new WorkStationAssert

WorkStationAssert member validating state on the work station that was passed in.

Example – The Test

```
@Test.
method public void noLoadCarrierDetectedAtPutPoint():

    new NoLoadCarrierDetectedScenario():givenLoadCarrierAtPutPoint()
                                       :whenNoLoadCarrierIsDetectedAtPutPoint()
                                       :putPointHasStatusNoLoadCarrier()
                                       :loadCarrierRemovedFromPutPointMessageIsSent().
 end method.
```

Validate the outcome

loadCarrierRemovedFromPutPointMessageIsSent()

```
method public NoLoadCarrierDetectedScenario loadCarrierRemovedFromPutPointMessageIsSent():

    messageAsserts:verifySent("VirtualTopic.ServerSentEvents", "",
                              substitute(
'~{"type":"LOAD_CARRIER_REMOVED_FROM_PUT_POINT","loadCarrierId":"&1","isLoadCarrierPresent":
 false,"taskOrderId":null}',
                                         loadCarrierNumber)).

    return this-object.

end method.
```

Desired Topic

Event (JMS Header)

Payload

MessageAsserts:verifySent()

```
assign messages = inMemoryMessagingService:getReceivedMessages():ToArray().


do iCount = 1 to extent(messages) while not lFound:
  assign inMemoryMessage = cast(messages[iCount], InMemoryMessage).
  if icMessageContent eq inMemoryMessage:messageBody then do:
    if inMemoryMessage:endPoint ne icTopicName then
      undo, throw new AssertException(substitute("Expected topic &1 but got &2.", …)).
    if icEvent gt "" then
      if inMemoryMessage:messageHeaders:get("event") ne icEvent then
        undo, throw new AssertException(substitute("Expected event &1 but got &2.", …)).
    assign lFound = true.
  end.
end.
if not lFound then
  undo, throw new AssertException(substitute("Message not found: &1", …)).
```

Example – Teardown of the test

```
@TearDown. (Deprecated, should now use @AfterEach.)

method public void tearDownTest():


    MockDataAccessFactory:Shutdown().


end method.
```



Example – End of Test class

```
@After. (Deprecated, should now use @AfterAll.)

method public void destroyTest():


    ServiceLoader:UnloadFromFile("config/mock-messaging-services.xml", true).
    ServiceLoader:UnloadFromFile("config/ms-wb3-wms-services.xml", true).


end method.
```

Mock Messaging Services

Standard System Services

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GenericParameter class

- Serializable class that carries data in a JsonObject
- Methods to add and read
  - Scalars, JSON, Datasets and Temp-tables
  - Returns ? if the key does not exist
- serialize() to longchar for the wire – v11.7 vs v12.x
- toLongchar() for logs
  - Masks sensitive content
  - Replace “data” fields (File content) with placeholders

GenericParameter advantages

- One parameter shape for all AppServer calls
- wms-service-interface.p – AppServer entry point
  - Input name of procedure to run
  - Input longchar serialized GenericParameter
  - Output longchar serialized GenericParameter
- Remote procedures
  - Input GenericParameter
  - Output GenericParameter

AppServerHelper class

- Handles all calls to the ERP AppServer
- Connect to the remote AppServer
- Serializes GenericParameter input to longchar
- Makes remote call
- Deserializes output longchar to GenericParameter
- Logs details and errors
- Records performance metrics

AppServerHelperMock class

- Records every ERP call in order
- Optionally runs a stub procedure to obtain output
- Allows inspection of input, output and errors

Example – Services used in Test

```
@Before.
method public void initializeTest():

    ServiceLoader:LoadFromFile("config/mock-scl-tvh-services.xml").
    ServiceLoader:LoadFromFile("config/ms-wb3-wms-services.xml").


end method.
```

Mock Framework Services

Example – The test

```
@Test.
method public void printDeliveryNote():


    new PrintDeliveryNoteScenario()




end method.
```



Example – The scenario

```
define private property appServerHelper as AppServerHelperMock no-undo
get():
  if not valid-object(appServerHelper) then
    assign appServerHelper =
         cast({Consultingwerk/get-mandatory-service.i AppServerHelper},
              AppServerHelperMock).
  return appServerHelper.
end get.
set.
```

Example – The test

```
@Test.
method public void printDeliveryNote():

    new PrintDeliveryNoteScenario():givenPickTaskCheckStationDone()
                                    :whenPrintDeliveryNoteIsRequested()
                                    :deliveryNoteIsCreatedAndPrinted().

end method.
```

deliveryNoteIsCreatedAndPrinted()

```
define variable parameters as GenericParameter no-undo.

assign parameters =
                appServerHelper:getInput(ErpTaskPrintMap:createAndPrintDeliveryNote).
```

- Each call to the ERP produces a GenericParameter as input.
- AppServerHelperMock has many ways to find the parameters that were used.
- Erp…Map classes define constants naming remote procedures.

```
define public static property createAndPrintDeliveryNote as character no-undo
      initial "wb3/api/print/create-and-print-delivery-note.p" get.
```

deliveryNoteIsCreatedAndPrinted()

```
define variable parameters as GenericParameter no-undo.

assign parameters =
                appServerHelper:getInput(ErpTaskPrintMap:createAndPrintDeliveryNote).

Assert:EqualsTrue(valid-object(parameters)).
Assert:Equals(taskOrderBuffer:orderNumber, parameters:getInt64("orderNumber")).
Assert:Equals(taskOrderBuffer:orderSequence, parameters:getInteger("orderSequence")).
Assert:Equals(taskOrderBuffer:loadCarrierNumber,
                                        parameters:getCharacter("cartonNumber")).
Assert:Equals(4154, parameters:getInteger("printerNumber")).
Assert:Equals("A4", parameters:getCharacter("deliveryNoteFormat")).
```

Example – Mocking the ERP

```
@Test.
method public void cartonLeftPutPointScheduleCheckStationFails():

    new LoadCarrierLeftWorkStationScenario():givenPickTaskReadyForCheckStation()
                                            :withOrderNumber()

end method.
```

Prepares data to trigger failure by setting order number to 423498773

Example – Mocking the ERP

```
@Test.
method public void cartonLeftPutPointScheduleCheckStationFails():

    new LoadCarrierLeftWorkStationScenario():givenPickTaskReadyForCheckStation()
                                            :withOrderNumber()
                                            :whenCartonLeftPutPoint()

end method.
```

Triggers code.

ERP Stub injects failure.

process-order-at-check-station.p

```
define input parameter inputParameters as GenericParameter no-undo.
define output parameter outputParameters as GenericParameter no-undo.

define variable appError as AppError no-undo.
define variable requestError as RequestToErpError no-undo.

if inputParameters:getInt64("orderNumber") eq 423498773 then do:
    assign appError =  new AppError("Ask for dummy", -1).
    appError:AddMessage("Error returned from LINK.", 0).
    assign requestError = new RequestToErpError(appError,
                                "Checkstation processing in ERP went wrong.").
    requestError:AddMessage("for ~n OrderNumber: 423498773 ~n OrderSequence: 0 ~n
 CheckingGroup: 1001", 0).
    undo, throw requestError.
end.
```

Inject failure

Example – Mocking the ERP

```
@Test.
method public void cartonLeftPutPointScheduleCheckStationFails():

    new LoadCarrierLeftWorkStationScenario():givenPickTaskReadyForCheckStation()
                                            :withOrderNumber()
                                            :whenCartonLeftPutPoint()
                                            :checkStationProcessingFailed().


end method.
```



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REST Layer


Progress.Web.IWebHandler(built-in interface)
OpenEdge.Logging.ISupportLogging
OpenEdge.Web.WebHandler (abstract)
Builds WebRequest – Wrapping web-context
Consultingwerk...WebHandler.SmartWebHandler (abstract)
Writes WebResponse
Consultingwerk.OERA.RestResource.RestEntitiesWebHandler
Looks up the handling class/method and invokes
com.tvh.parts.scl.TVHRestEntitiesWebHandler

REST Layer

OpenEdge.Web.WebHandler (abstract)

| Builds WebRequest – Wrapping web-context

Consultingwerk...WebHandler.SmartWebHandler (abstract)

| Writes WebResponse

Consultingwerk.OERA.RestResource.RestEntitiesWebHandler

| Looks up the handling class.method and invokes

com.tvh.parts.scl.TVHRestEntitiesWebHandler

|

com.tvh.parts.rest.RestEntitiesWebHandlerMock (test)

Builds WebRequestMock

Stores WebResponse

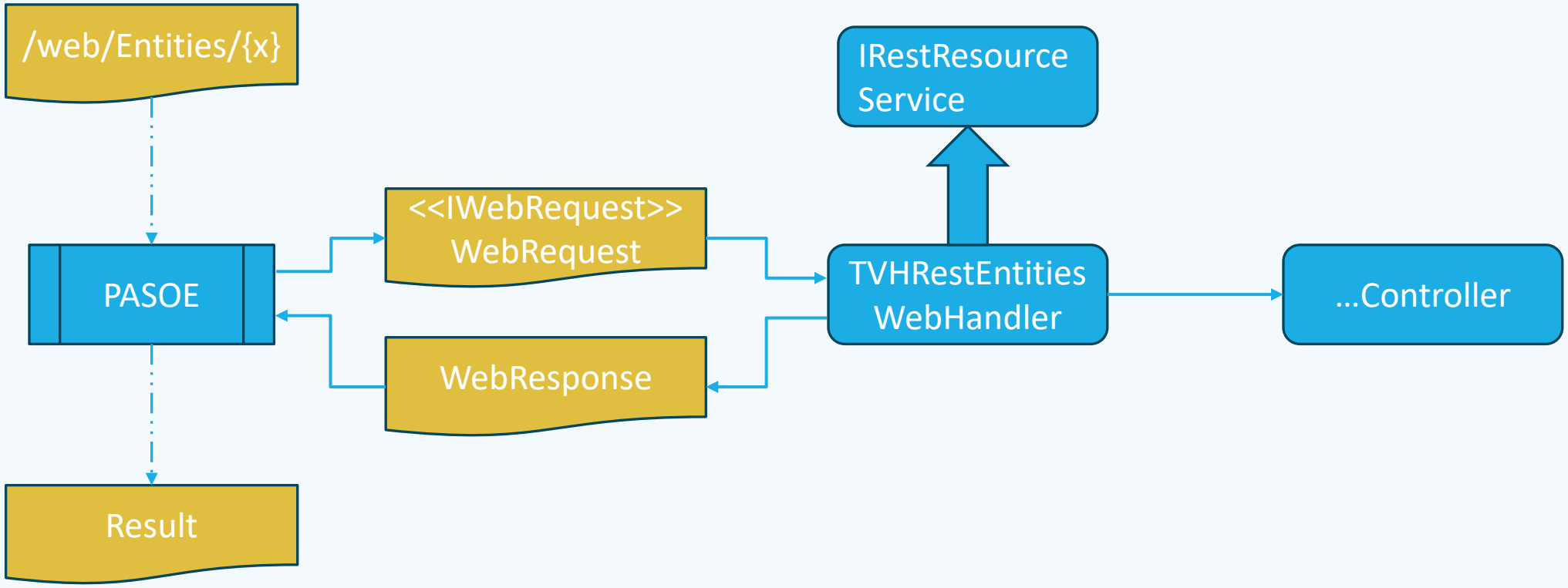
WebRequestMock

- Implements only what we need
- Members that are not needed throw errors
  - AddHeaderValues()
  - AddCookieValues()

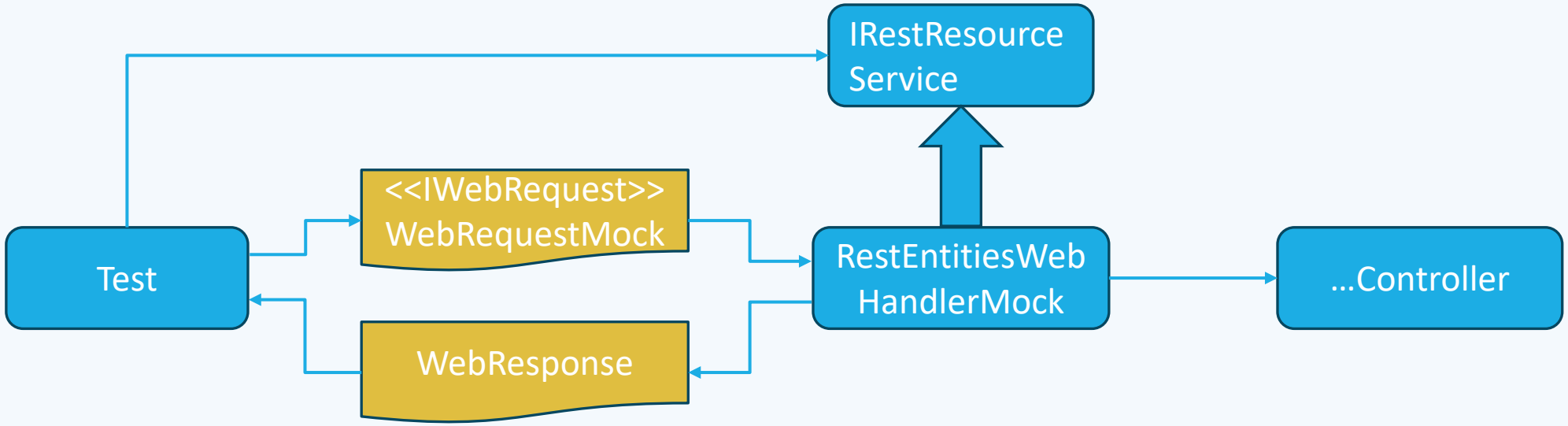
Result

- Everything from RestEntitiesWebHandler down runs unchanged.
- Only the two edges are swapped out:
  - how the request comes in (WebRequestMock)
  - how the response goes out (WriteResponse).

Regular flow



Test flow


IRestResource
Service
<<IWebRequest>>
WebRequestMock
Test
RestEntitiesWeb
HandlerMock
…Controller
WebResponse

Example – Simple Get

```
@Before.
method public void initializeTest():
    var RestResourceServiceMock restResourceService.

    ServiceLoader:LoadFromFile("config/ms-wb3-wms-services.xml").
    ServiceLoader:LoadFromFile("config/mock-scl-tvh-services.xml').
                                        Mock Framework Services
    assign restResourceService = cast({Consultingwerk/get-mandatory-service.i
                                       IRestResourceService},
                                       RestResourceServiceMock).


    restResourceService:register(get-class(AisleController)).
end method.
```

Example – Simple Get

```
@Test.
method public void getAisles():


    new GetAislesScenario()




end method.
```



Example – The scenario

```
class com.tvh.parts.warehouse.wb3…scenarios.GetAislesScenario
    inherits RestScenario:









    define variable aisleBuffer as AisleBuffer no-undo.
```

RestScenario : bodyIs(LongChar)

```
define variable cResponse as longchar no-undo.

if not valid-object(webResponse:Entity) then
  undo, throw new AssertException("Response Entity is unknown.").

if not type-of(webResponse:Entity, JsonConstruct) then
  undo, throw new AssertException(……).

cast(webResponse:Entity, JsonConstruct):Write(input-output cResponse) no-error.

if cResponse ne icBody then
  undo, throw new AssertException(substitute("Expected content &1 but found &2",
                                             icBody, cResponse)).
```

RestScenario

```
method public RestScenario contentTypeIs(input icContentType as character):

    if webResponse:ContentType ne icContentType then
        undo, throw new AssertException(…
    return this-object.
end method.

method public RestScenario statusCodeIs(input statusCode as StatusCodeEnum):

    if webResponse:StatusCode ne integer(statuscode) then
        undo, throw new AssertException(…

    return this-object.
end method.
```

RestEntitiesWebHandlerMock

```
class com.tvh.parts.rest.RestEntitiesWebHandlerMock
    inherits TVHRestEntitiesWebHandler:

    define public property response as WebResponse no-undo
    get.
    private set.
```

Example – The scenario

```
class com.tvh.parts.warehouse.wb3…scenarios.GetAislesScenario
    inherits RestScenario:

    define protected property rest as RestEntitiesWebHandlerMock no-undo
    get():
        if rest eq ? then
            assign rest = new RestEntitiesWebHandlerMock().
        return rest.
    end get.
    private set.

    define variable aisleBuffer as AisleBuffer no-undo.
```

RestEntitiesWebHandlerMock

```
method public WebResponse get(input cPath as character,
                              input cQueryParameters as character):

    HandleGet(new WebRequestMock(MethodEnum:GET, RestHandlerType:Entities,
                                 cPath, cQueryParameters)).

    return this-object:response.

end method.

.....
```

RestEntitiesWebHandlerMock

```
    ……

    method override protected void WriteResponse(input response as IHttpResponse):

        assign this-object:response = cast(response,WebResponse).

    end method.

end class.
```

Example – Simple Get

```
@Test.
method public void getAisles():


    new GetAislesScenario():givenAisles() Prepare data
                           :whenAislesAreRequested() Trigger endpoint



end method.
```

whenAislesAreRequested()

```
method public GetAislesScenario whenAislesAreRequested():

    assign webResponse = rest:get("/aisles").

    return this-object.

end method.
```

Example – Simple Get

```
@Test.
method public void getAisles():


    new GetAislesScenario():givenAisles()
                           :whenAislesAreRequested()
                           :aislesAreReturned().


end method.
```



aislesAreReturned()

```
method public GetAislesScenario aislesAreReturned():


    bodyIs('[~{"aisleNumber":1,"state":"NORMAL"},~{"aisleNumber":2,"state":"NO_OUTBOUND"},'
          + '~{"aisleNumber":3,"state":"UNIQUE_OUTBOUND"},~{"aisleNumber":4,"state":"NORMAL"}]').

    statusCodeIs(StatusCodeEnum:OK).


    return this-object.


end method.
```

Example – Post

```
@Before.
method public void initializeTest():

  ServiceLoader:LoadFromFile("config/ms-wb3-wms-services.xml").
  ServiceLoader:LoadFromFile("config/mock-scl-tvh-services.xml").

  assign
    restResourceService =
                  cast({Consultingwerk/get-mandatory-service.i
                        IRestResourceService}, RestResourceServiceMock)
    restResourceService:register(
                           get-class(ParcelSortingScheduleController)).

end method.
```

Example – Post

```
@Test.
method public void createAParcelSortingSchedule():

    new CreateParcelSortingScheduleScenario()




end method.
```

Example – Post

```
@Test.
method public void createAParcelSortingSchedule():

    new CreateParcelSortingScheduleScenario()
                :whenCreatingAParcelSortingSchedule()


end method.
```

whenCreatingAParcelSortingSchedule()

```
var JsonObject requestBody = new JsonObject(),
                scheduledTime = new JsonObject().
scheduledTime:Add("hour", 8).
scheduledTime:Add("minute", 15).
requestBody:Add("parcelSorting", "abc").
requestBody:Add("day", "MONDAY").
requestBody:Add("time", scheduledTime).

cast(sequenceService, MockSequenceService)
                :setCurrentValue(Wb3wmsSequence:NEXT-PARCELSORTINGSCHEDULE, 0).

assign webResponse = rest:post("/parcel-sorting-schedules", requestBody).
return this-object.
```

```
{
  "parcelSorting": "abc",
  "day": "MONDAY",
  "time": {
    "hour": 8,
    "minute": 15
  }
}
```

Inherited from RestScenario

Example – Post

```
@Test.
method public void createAParcelSortingSchedule():

    new CreateParcelSortingScheduleScenario()
                :whenCreatingAParcelSortingSchedule()
                :thatParcelSortingScheduleShouldBeReturned().

end method.
```

thatParcelSortingScheduleShouldBeReturned()

```
bodyIs(parser:ParseFile(
            "test/com/tvh/……/results/createparcelsortingschedule.json")).
```

Inherited from RestScenario

```
statusCodeIs(StatusCodeEnum:OK).


return this-object.
```

createparcelsortingschedule.json

```
{
    "id": 1,
    "parcelSorting": "abc",
    "day": "MONDAY",
    "time": {
      "hour": 8,
      "minute": 15
     }
}
```

Human readable format

bodyIs(JsonConstruct)

```
method public RestScenario bodyIs(input body as JsonConstruct):

    define variable lcResponse as longchar no-undo.

    body:Write(input-output lcResponse).

    return bodyIs(lcResponse).

end method.
```

Write unformatted.

Questions

