CCSDS Mission Planning & Scheduling WG
Fall Meeting 2023

Attendants:

Peter van der Plas (ESA), chair
Christoph Lenzen (DLR)
Cesar Coelho (ESA, SM&C WG)
Clement Hubin-Andrieu (CNES)
Daniel Fischer (ESA, MOIMS-AD)
David Frew (ESA)
Dominik Marszk (ESA, SM&C WG)
Geoffrey Lochmaier (NASA)
Guillermo Buenadicha (ESA, by WebEx)
Maria Wörle (DLR, by WebEx)
Marvin Wittschen (DLR, by WebEx)
Olly Page (UKSA)
Quinten Van Woerkom (ESA)

Agenda

Date	**Time**	**WG**	**Topics**
Mon 6 November	08:45 – 09:45 CET	CCSDS	CCSDS Opening Plenary
Mon 6 November	09:45 – 10:45 CET	MOIMS	MOIMS Area Opening Plenary
Mon 6 November	10:45 – 12:30 CET	SM&C	Joint session with SM&C WG - Common topics: MAL prototyping status, HTTP/XML Blue Book, MO roadmap
Mon 6 November	13:30 – 17:30 CET	SM&C	Joint session with SM&C WG - Common topics (continued)
Tue 7 November	09:00 – 12:30 CET	MP&S	WG day #1 morning session - Welcome and agenda - Blue Book: status and feedback - Yellow Book: status and feedback - Yellow Book: general sections
Tue 7 November	13:30 – 17:30 CET	MP&S	WG day #1 afternoon session - Prototyping: Services: status, progress, open issues, next steps - Yellow Book: Services: test cases, test data and test reporting (format)
Wed 8 November	09:00 – 12:30 CET	MP&S	WG day #2 morning session - Yellow Book: test approach for data types and file formats - Yellow Book: test cases and test data for data types and file formats

Wed 8 November	13:30 – 17:30 CET	MP&S	WG day #2 afternoon session - Prototyping: Data Types: hands-on session, explore potential test cases - Prototyping: File Formats: hands-on session, review current test cases
Thu 9 November	09:00 – 12:30 CET	MP&S	WG day #3 morning session - Yellow Book: hands-on (continued)
Thu 9 November	13:30 – 17:00 CET	MP&S	WG day #3 afternoon session - Additional missions for evaluation (TBD) - Adoption of the MP&S standard, plans for implementation - Next steps and planning - Reporting to MOIMS
Fri 10 November	16:00 – 17:30 CET	MOIMS	MOIMS Area Closing Plenary

MoM

Day #1: Tuesday 7th November 2023, 09:00 to 17:30

Agenda: Welcome and agenda
Blue Book: status and feedback
Yellow Book: status and feedback
Yellow Book: general sections
Prototyping: Services: status, progress, open issues, next steps
Yellow Book: Services: test cases, test data and test reporting (format)

Minutes

Main work this week yellow book and prototyping. Top up effort for prototyping - a person identified contractor at ESTEC.

Next there could be a green book update to synchronize with the Blue Book. This should be a new project to follow on after blue book closed out.

Blue Book Status

Waiting for final review by CESG, CMC poll, then agencies review. There is a version edited by Tom Gannett. Tables have been changed (no borders) and potentially compatibility with the macros may be gone. Other minor format changes. This is just a PDF, though, so perhaps this is not intended. We will pass this to Roger, maybe he could check with Tom why the formatting has been modified.

Once CESG and CMC approve, it becomes a Red Book and goes out for agencies review. There is a possibility to adopt the practice of using the XML Service Specification as the master for the tables (as for other MO books, abandoning the word Macros).

The Yellow Book should be complete for the final Blue Book to be published.

Deputy Chair Position for MOIMS area and MPS working group vacated by Marc Duhaze, unclear who will take these positions. Looking for volunteers for MPS working group.

Prototyping/Yellow Book

Group review of Yellow Book in session. The yellow book should cover the contents of the PICS table, and there should be a tracing table. This is likely to be scrutinized by CESG. Previously (spring) a subset of data structures was identified as not covered in service-based testing: these were the constraints, but in fact more data structures are not covered.

Prototyping Philosophy

Discussion points – it is not very clear what we are "prototyping" with respect to the data structures. The design of these structures is rich, but static. There is no planning process to prototype, we are not testing that. We are verifying the suitability of the interface. Between the intention of the blue book and how the interface is expressed in XML (as defined by Schema) actually looks we may discover the interface is not as clear as we intended:

- The Blue Book is implementable as intended;
- Correct translation from Blue Book tables to XML expression;
- Concrete structure composition vs intention of inheritance design;
- Ambiguity of fields;
- Is it possible to say silly things;
- Are all cases really covered?

Where we try to implement cases in XML, this is like a deeper review of what we've said in the Blue Book, where the design may be reflect what is meant. Where we find things that don't make sense- we should go back into the Blue Book. Note some structures (filters, acknowledgements) are not in file-based schema since they only apply to service interaction. We believe we can mix and match coverage across services and XML file-based testing.

Tabulation of Test Cases

We need a tabulation of every concrete data structure. There should be a prototyping exercise for each structure, with multiple test cases for use. Table should specify if the case is covered by either Service or File Based Testing. Possibly a column for any issues found.

MAL Prototyping (by SM&C)

- Yellow Book updated, Prototype updated, Testing with CNES done.

- Next release is V10 (final) and make available next week. Current date 7/11/2023.

DLR Prototyping

V10 (prelim) used. Issues sent to Roger for update. Actual testing for prototype (service based) is to be finalized. Probably testing will include some structures (filters, others) which will cause the "prototype" for MPS testing will be updated, since this includes test case data.

We have "final" (for this MPS version) XML for MPS is included in the prototype. SANA Registry has this Area 5 version 001, which corresponds to July 2023 (before freeze for CSESG/CMC reviews). THIS MAY NOT BE ACCURATE –

ACTION: Peter to check/update SANA registry version of the XML service spec. Also check everything else.

Questions on the Future Maintenance of MO MAL Based Services

Is there potentially an issue with maintenance and development for MAL and future services, i.e. that we will have trouble in the future?
It was commented that we might consider adding annotations to the XSD, which is a very good suggestion. However – it is noted that the world can also see this. However, it is not the standard, it is a reference implementation only. It is noted it is not clear in the MAL Blue Book whether the prototype implementation is "normative" or not – perhaps the section should be an annex? Practically speaking, this is semantics.

Logging for Test Runs

We should use Info level logging for Step summary and Debug for detail of step tracing. Warnings and errors should be for warnings and errors. Advice

- Log levels are not necessary, but do log at least failures
- One line summary overall test passed/failed

Yellow Book discussion

Discussion of the Yellow Book and test case specification, particularly the services-based testing. We need to add tests cases and covered service/data structures to test cases in a tracing table to PICS features. This may require a reverse tracing table from Data type/service to test case and PICS feature.
The test cases will include service based and file-based testing, which will

- Verify the file formats.
- Be used to complete coverage of data types, particularly those required. Given that we will try to test complex structures (plans, requests, constraints) the service-based testing should cover at least the testing of structures that
- Are required to test service invocation and interaction.

- Are only involved in service invocation (acknowledgments, requests including filters).
- Where service-based testing makes multiple calls using a particular structure, there should be at least one instance of each attribute that is not null. DLR/ESOC will need this to complete service-based testing.

ACTION: Guillermo to provide updated table of test cases within two weeks (from 7/11/2023).

Day #2: Wednesday 8th November 2023, 09:00 to 17:30

Agenda: Yellow Book: test approach for data types and file formats
Yellow Book: test cases and test data for data types and file formats
Prototyping: Data Types: hands-on session, explore potential test cases
Prototyping: File Formats: hands-on session, review current test cases

Minutes

Prototyping of Data Types

Today's discussions will mainly (not exclusively) be about File Based Testing to prototype the data types (aside from those that only be used for dynamic service invocation). We will try to

- Do a couple of worked examples;
- Update the yellow.

Configuration

Discussion concerning configurable objects, i.e. activities and plans. Without a "Test Configuration" how can we instantiate anything that's configurable? Nominally would expect a common configuration for both service consumer and provider for services, in order to refer to concrete definitions of activities and plans (etc.).
The same exists for File Based Testing, we need a test configuration for try to instantiate an activity, event or plan. Question is asked: what can we prototype without a test configuration?

- Is there any test configuration used for service-based testing (possibly not)?
- Service interactions with no references to configuration?
- Things which aren't configurable?
- Can we meet minimum requirements?

We conclude that any MPS data type with a "definition" part cannot be prototyped (since we have no configuration), but this doesn't prevent us prototyping service use and parts of the data types are not configurable.

Detailed Issues

As a group we looked at some detailed issues and found some fairly major problems straight away, mainly:

- Duration Constraints have mandatory Min / Max values;
- All constraints seem to have mandatory expression fields, with concrete value fields.

On the level of instantiating files (for a planning request, plan, etc.) this makes for very confusing and ambiguous formations. Since there has not been any developmental prototyping or trying out of the XML on a ground level during development of the standard, the "prototyping" of the standard will inevitably find them here.
This has so far not been an issue since the service-based prototyping has largely not exercised the data structures. The approach should be to write the yellow book anyway and perform "verification" prototyping activity while raising RIDs, expecting we will not be able to say we have passed.

Possible Process of Testing

Options:
1. One party generates a file per case, the other checks it;
2. Both parties generate a file per case, exchange and check (preferred)

Other points;
- Number of cases per file, and what, should be mandated by the test specification;
- Each party should use different XML editing/reading tools;
- Comparison could be "diff" with normalization;
- There is a verification aspect and a pragmatic developmental aspect too…;
- The second part is more important right now;
- Discuss issues and raise useful, essential rids, in discussion.

PM Discussion

Review of the morning's discussion. Noted that we cannot really explore definitions, since we have no configuration. We also cannot instantiate anything configurable. It is tentatively assumed this is not a problem (some WG members doubt this conclusion).

Comparison of results – it has been observed that since XML elements are not necessarily ordered a physical diff could be unreliable.
Test cases should therefore mandate ordering, or sequential elements interpreted in the specification order.

Production Flow:
- The service spec XML defines data objects;
- The File Based XML spec redefines the same spec.

This is a logically not ideal, and introduces the possibility the definitions are different, and therefore they should theoretically both tested.

Possible solutions are:

1. a comparison tool to check both definitions are exactly the same.
2. rethink the production flow to allow common definition of all common objects.

Point 2 is the correct solution, but is practically difficult since this part of the production flow is under the control of the MAL production. It is noted that a more modular construction of XML definitions on the MAL side may actually be a benefit to all MO services.

Discussion of some Constraints

ComplexResourceConstraint

This type inherits from ResourceConstraint and adds sliders, with offsets, to define a window. The offsets are a Duration time (can be negative, from the MAL) which caused some confusion since this wasn't intuitive. It was concluded there were no issues with it, but it is the first time a signed Duration type and lack of dedicated Offset type are included in the MAL.

GeometricConstraint

The use of the Expression<ObjectRef> for applicability confused everyone. We need to Clarify with Roger.

PointingConstraint

We discussed the pointing constraint and concluded the following

- Boresight back into the temples because it is part of the pointing, rather than a constraint on the pointing;
- The pointing frame should also be taken out since it is either inferred by the template or explicitly specified in the target / boresight;
- It is not completely clear what the template phaseAngle, offsetAngle is supposed to mean;
- Attribute "pointingArguments" needs an improved explanation.

Day #3: Thursday 9th November 2023, 09:00 to 17:00

Agenda: Yellow Book: hands-on (continued)
Green Book update and Blue Book evolution
Adoption of the MP&S standard, plans for implementation
Next steps and planning
Reporting to MOIMS

Minutes

Some summary points from Yesterday

Testing errors when prototyping/validation of XSD schema defining File Based MPS could be:

- Ambiguity in the Blue Book Structure Design;
- Ambiguity in Yellow Book Test Cases;
- Errors in translation/generation of XSD structures from Blue Book.

Need to check information model in File Based MPS same as services expression (since these are independently generated). We have discovered already some problems, highlighting the value of prototyping and its nature as developmental and the value of really exercising the information model. Specifically examples include general constraint modelling and inheritance and also pointing constraint formulation.
MAL v10 final next week.

Nominal plan towards finalization of the Blue Book and Yellow Book after the Spring meeting next year (assuming we get through the reviews).

Future activities and issues for the MP&S WG:

- Adoption of MPS standard? Who will take it up – mission evaluation?
- Finished by Spring meeting?
- Green Book Update?

Possible problems / CESG poll:
History: originally there was a preference for two books by some agencies: services and information model. However the charter was approved with a single blue book for information model and services. We can see the value in retrospect of the splitting things, although it is not the nominal plan.

There remain other possibilities, including descoping some of the options and moving them to an extension (for example for the constraints). In any case we should start a new project for the 5-year review of the Green Book (agreed with the WG and MOIMS AD.

Any future additions to the blue book (e.g. addition of a configuration service) are an opportunity to split the blue book in other ways). Consideration of early adoption from industry and agencies is support for the concepts, could also inform on split of the books.

Possible extensions?

1. Configuration of planning;
2. If planning function as a service to get specific info to aid planning requests (flow through of flight dynamics events);
3. Ability to monitor and control of planning function? For example to aid in planning cycles, reporting of operational circumstances;
4. Condition branching in planning and plan execution;

Point 1 is of higher priority. The others we can't decide yet, but it can be observed that point 3 and point 4 might support similar possibilities and that should not be confusing.

Afternoon: continued discussing the testing approach:

- Decomposition of file-based test cases;
- Table design for PICS tracing;
- Table design for reverse tracing vs test design for file-based testing.

Summary of actions:

- Peter to check/update SANA registry version of the XML service spec. Also check everything else.
- Guillermo to provide updated table of test cases within two weeks (from 7/11/2023).

Next meeting:

Next WG meeting will be TENTIVELY on Wednesday **6 December 2023**, 16:00 – 18:00, also to be confirmed by Roger.

Next Prototyping splinter will be TBD (in advance of the WG meeting).

Attachments:

None.