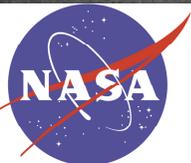




XML In MER

Ground Systems

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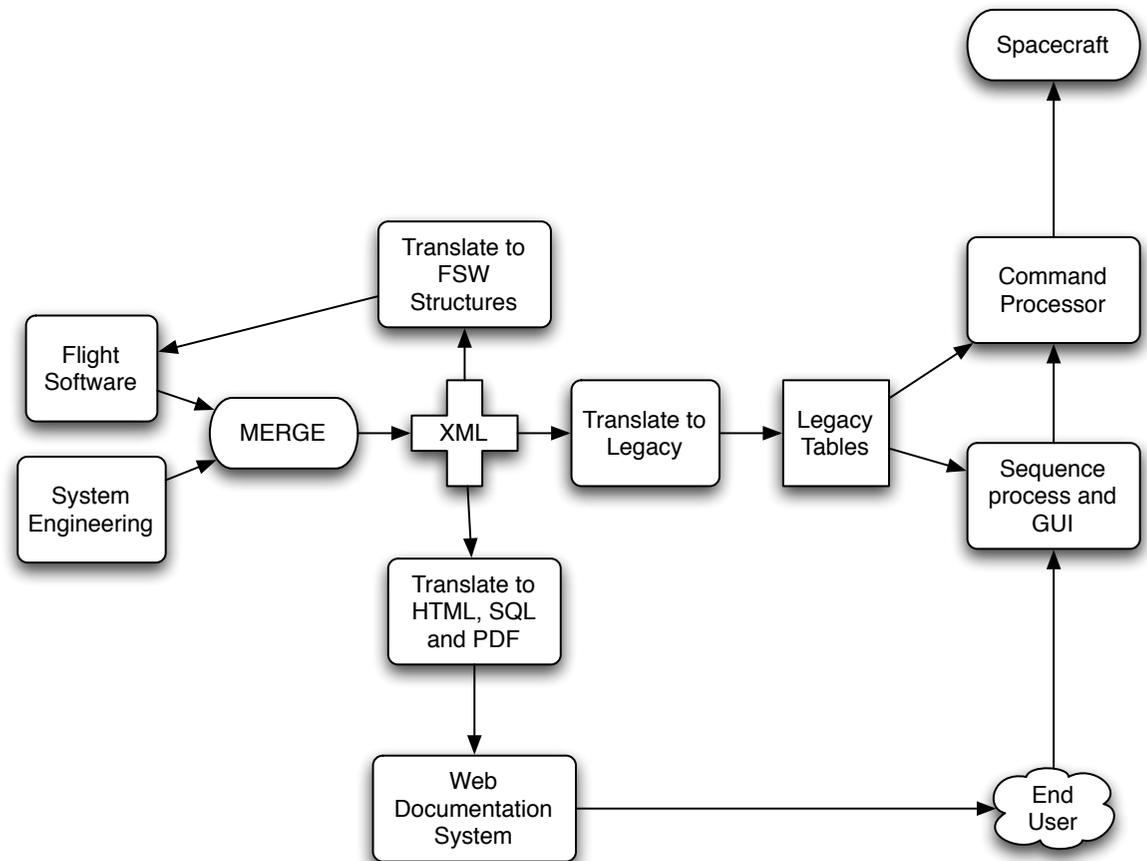
MER: The Problem

- Fast evolution of FSW commands and telemetry requires quick turnaround and automation to limit staffing requirements.
- Remove requirement of delivering GDS when FSW changed.
- New Telemetry Formats: events and products
- Documentation needs to be up to date and available across mission users (local and remote).
- Solution: XML to define formats



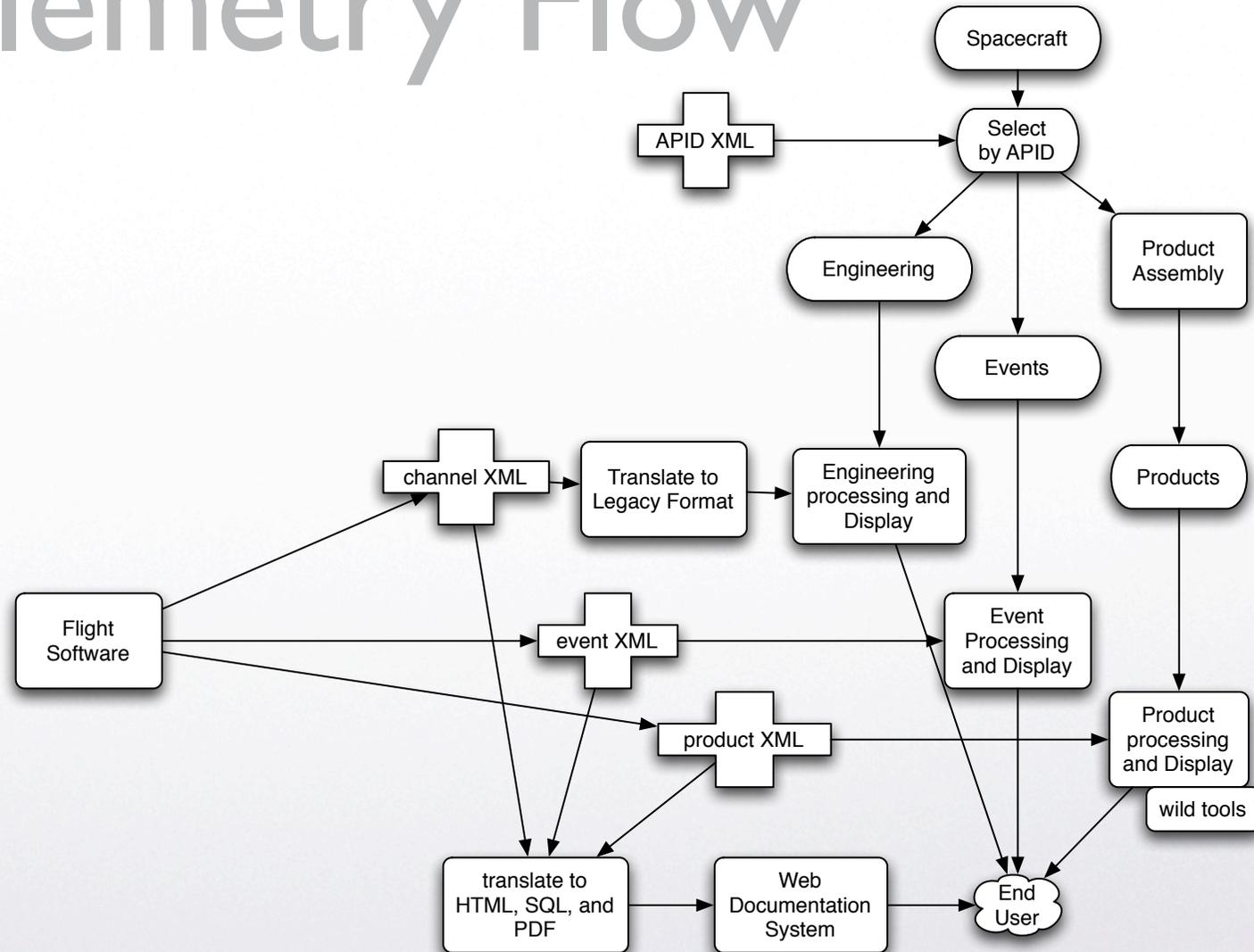


Command Flow





Telemetry Flow





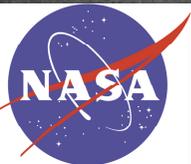
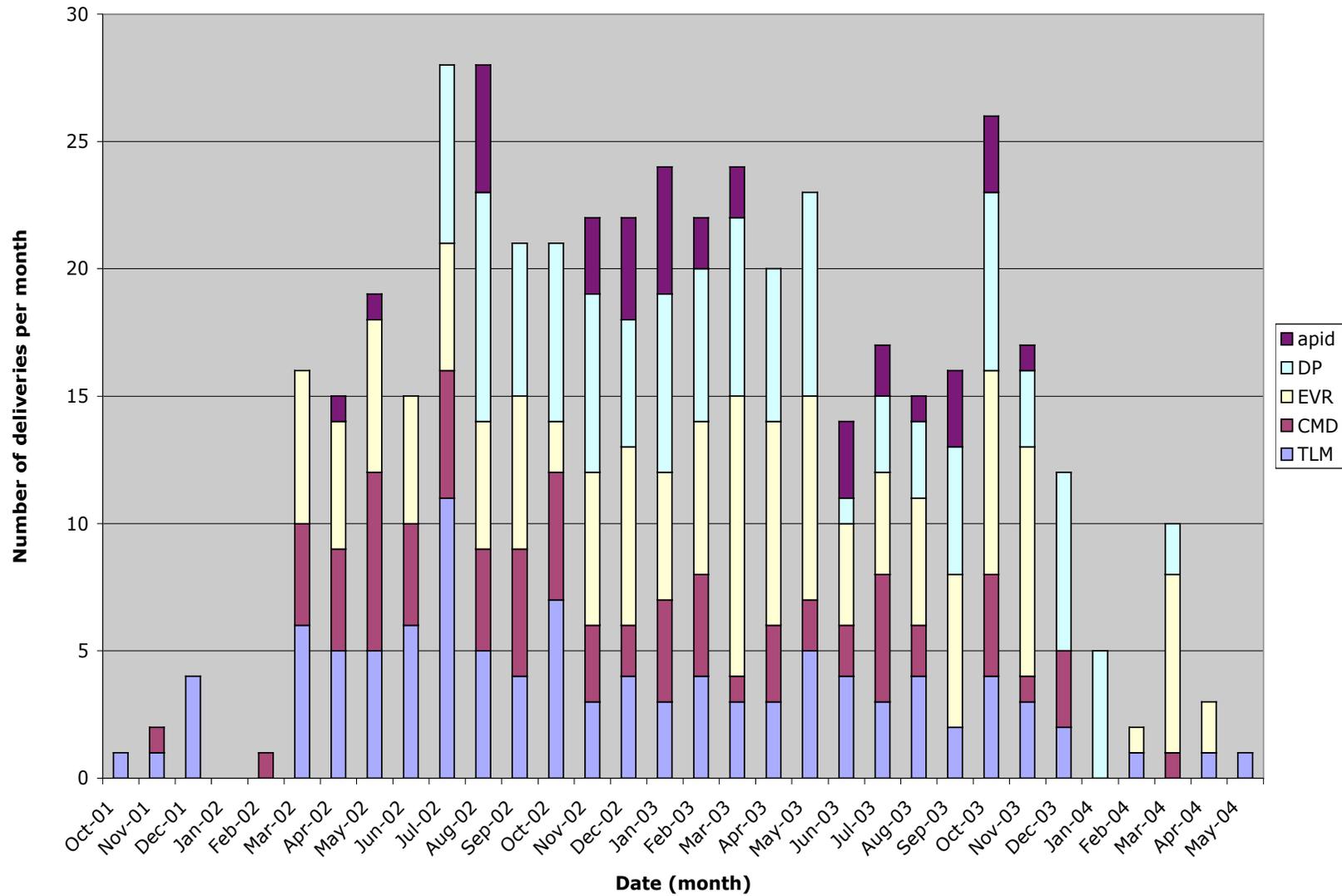
Size of XML Files

- MER
 - 9,800 Channels,
 - 800 Commands,
 - 7800 Event Messages, and
 - 460 Packet Definitions.
 - 5,500 lines of Perl, Python and Java Code, 5,800 lines of XSLT translations





MER GDS dictionary builds & installs





Our experience

- No problems with misunderstandings between documentation and system. No problems between flight and ground implementations of commands and telemetry.
- Used master web site to record information about versions and deployments allowed everyone to understand current configuration. Web logs shows the activities on each testbed, ATLO, and MSA configuration.
- On-line documentation was better than printed documentation. Easier and faster to find information of interest.





DAWN used because I no longer have access to MER

Testbed/ATLO Configuration and Status Information

ATLO & TESTBED	GDS version	SFOC version	CMD Dictionary version	Tel Dictionary version
FSW Test Sets	R8.00.137+	V27.1	c8_1e	s8_1d4
FSW Test Bed	R10.00.43	V27.1	c8_1e	s8_1d4
CEDL Test Bed	R10.00.43	V27.1	c8_1e	s8_1d4
Surface System 1 Test Bed	R10.00.43	V27.1	c8_1e	s8_1d4
MER1 ATLO (historical only)	R8.00.57	V27.1	c7_2d2	t7_2g2_mer1_1
MER2 ATLO (historical only)	R8.00.57	V27.1	c7_2d2	t7_2g2_mer2_1
GDS TESTBED	R10.00.64	V27.1	c8_1e	s8_1d4
SSTB field test trailer	R10.00.43	V27.1	c8_1e	s8_1d4
CMSA (historical only)	R8.00.137+	V27.1	c8_1d	s8_1d1
SMSA	R10.00.66	V27.1	c8_1e	s8_1d2

Dawn Command Dictionary

NOTE: Access is restricted under ITAR

F5_0_3DDAWN_5_0_2005May05_1318_124 Version

Start	<input type="text"/>								
Search in Description	<input type="text"/>								
Command Types	<input type="text" value="ANY"/>								
ITAR Restricted	<input type="text" value="ANY"/>								
Command Id	<input type="text"/>								
Op Code	<input type="text"/>								
Safety Level	<input type="text" value="ANY"/>								
Flags	<table border="0"> <tr> <td>Immediate <input type="text" value="ANY"/></td> <td>Non-Interactive <input type="text" value="ANY"/></td> </tr> <tr> <td>VML Sequence <input type="text" value="ANY"/></td> <td>Telemetry Verify <input type="text" value="ANY"/></td> </tr> <tr> <td>VML Dynamic <input type="text" value="ANY"/></td> <td></td> </tr> <tr> <td>IPC <input type="text" value="ANY"/></td> <td>HELP <input type="text" value="ANY"/></td> </tr> </table>	Immediate <input type="text" value="ANY"/>	Non-Interactive <input type="text" value="ANY"/>	VML Sequence <input type="text" value="ANY"/>	Telemetry Verify <input type="text" value="ANY"/>	VML Dynamic <input type="text" value="ANY"/>		IPC <input type="text" value="ANY"/>	HELP <input type="text" value="ANY"/>
	Immediate <input type="text" value="ANY"/>	Non-Interactive <input type="text" value="ANY"/>							
	VML Sequence <input type="text" value="ANY"/>	Telemetry Verify <input type="text" value="ANY"/>							
	VML Dynamic <input type="text" value="ANY"/>								
IPC <input type="text" value="ANY"/>	HELP <input type="text" value="ANY"/>								

External files

- [View Steam Reference](#)
- [View Command Errors](#)
- [Printable command dictionary](#)
- [Command Dictionary Report Builder NEW](#)
- [Command Dictionary DIFFERENCE reportNEW](#)





id	Name	Timestamp	News
3111	jlei	2005-04-28	<p>The latest SCLPDCCT files for MER-A and MER-B have been installed and set to default in the following directories /qds/mex/sci/kscct</p> <p>The SCLPDCCT files are: MER_354_SCLPDCCT.00014 MER_354_SCLPDCCT.00014 MER_353_SCLPDCCT.00013 MER_353_SCLPDCCT.00013</p>
3105	wiklow	2005-03-16	<p>The latest SCLPDCCT files for MER-A have been installed in the following directories /qds/mex/sci/kscct /qds/mex/c8_le/seq_rv/seq_input/sci/k</p> <p>The SCLPDCCT files are: MER_354_SCLPDCCT.00015 MER_353_SCLPDCCT.00015</p>
3098	jlei	2005-03-14	<p>Data product dictionary updates are now available: The new Data Product XML Structures delivered is: Sp_53_001_v10b.xml - Mobility Parameters</p>
3093	jlei	2005-02-14	<p>New Data Product XML Structures is delivered: Sp_53_001_v10a.xml - Mobility Parameters</p>
3087	rtanobody	2005-02-11	<p>The latest SCLPDCCT files for MER-B have been installed in the following directories /qds/mex/sci/kscct /qds/mex/c8_le/seq_rv/seq_input/sci/k</p> <p>The SCLPDCCT files are: MER_353_SCLPDCCT.00013 MER_353_SCLPDCCT.00013</p>
3076	jlei	2005-02-11	<p>EVX dictionary evx_53-1_18_id_08_le_30050104-1 has been installed and made the default in SCDA.</p>
3075	jlei	2005-01-27	<p>New Data Product XML Structures delivered: Sp_53_001_v7.xml - Mobility Parameters Sp_53_001_v8.xml - Mobility Parameters Sp_53_001_v9.xml - Mobility Parameters Sp_53_001_v10.xml - Mobility Parameters Sp_53_001_v8.xml - Mobility Summary Report</p>





Technology Evolution

- MER (Phase 1)
 - Perl, DOM (XML::Twig), XSLT, XMLSpy, XML Schema
 - Problems: took 8-12 hrs to process command and telemetry documentation. Producing channel tables would occasionally fail because of lack of memory. Needed differences between versions (channels/commands added and removed or changed type)
- MER (Phase 2)
 - Python, Perl, Java, SAX, XSLT, XMLSpy, XML Schema, Xinclude
 - Solution: used SAX parser to speed up system, remove problems with lack of memory. Added Java for difference finding. Split channels and commands into groups for XSLT processing and XSLT-FO. Made documentation processing parallel operation so it would not delay the production of the configured GDS. Built simple Xinclude processor in Perl to allow different products to use the same definitions. Use Python for more complex transformations. (note: bug in python and perl)
 - Problem: when xml format changed, GDS was last to know and usually found out by having processing crash. Solution: FUTURE: Validate xml formats with Schema
- Documentation
 - MySQL, Apache, PHP





Future Evolution

- Use Template System (Perl Template Toolkit) for the creation of documentation instead of XSLT.
- Automated translation, documentation creation, and deployment.
- Flight Software Developer instantiation of GDS for command and telemetry development.
- Validate Against Schemas





You can find more information at <http://www.relaxng.org>. RELAX NG is a schema language for XML. The key features of RELAX NG are that it:

- is simple
- is easy to learn
- has both an XML syntax and a compact non-XML syntax
- does not change the information set of an XML document
- supports XML namespaces
- treats attributes uniformly with elements so far as possible
- has unrestricted support for unordered content
- has unrestricted support for mixed content
- has a solid theoretical basis
- can partner with a separate data typing language (such W3C XML Schema Data types)

We use the Compact format. In the compact format `element name { text }` defines a tag `<name>text</name>`. An attribute is defined as `element name { attribute id { text }, text }` defines a tag `<name id="text">text</name>`.

Optional counting marks are allowed after the element or attribute. These are:

- `?` preceding is optional
- `+` preceding can occur one or more times
- `*` preceding can occur zero or more times

RelaxNG has the idea of ordered and unordered groups of elements (note: attributes are always unordered). The ordered group has the elements linked by a comma `,`, the unordered group has the elements linked by a ampersand `&`. Parens can be used to make the grouping clearer.

Besides the normal text and token data types, RelaxNG automatically loads the XSD data types. They can be accessed via the namespace such as `xsd:integer`. Custom data types are possible.

