WEBINAR

Best Practices for Data Migration Towards MBSE

jama software

Our Speaker

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VP, PRACTICE DIRECTOR

Jama Software

Agenda

- What is MBSE? Isn’t it just SysML?
- Benefits of Building a Common Data Model across Tools and Disciplines
- How to Approach Data Migration to wards MBSE?
- Best Practices for Data Migration when Moving Away from Legacy Solutions

What is MBSE?

MODEL BASED SYSTEMS ENGINEERING

OMG (MBSE WiKi):

“The formalized application of modeling to support system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases.”

Reading between the lines:

MBSE is the elimination of documents to then combine requirements, architecture, behavior and V&V into a single data-driven “model” tied together with relationships.

MBSE cannot be effectively practiced when viewed from just one perspective (requirements, models, patterns, standards, industry specific application, etc.). To successfully practice MBSE, wise systems engineers recognize and use each perspective as appropriate to their specific needs. Based on these needs, they choose the appropriate capabilities, tools, and visualizations that will meet their needs.

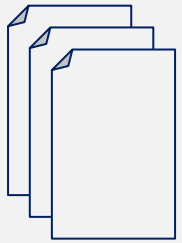
One size doesn't fit all."

Lou Wheatcraft

Co-Chair INCOSE Requirements Working Group & Wheatland Consulting LLC

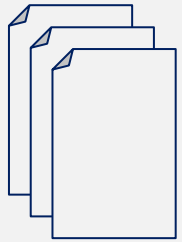
What is MBSE? It is not just SysML

ARCHITECTURE



Part Types

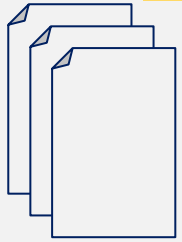
REQUIREMENTS



Requirement Types

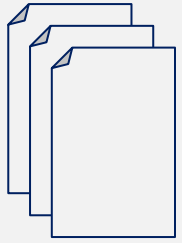
BEHAVIOR

Behavior Types

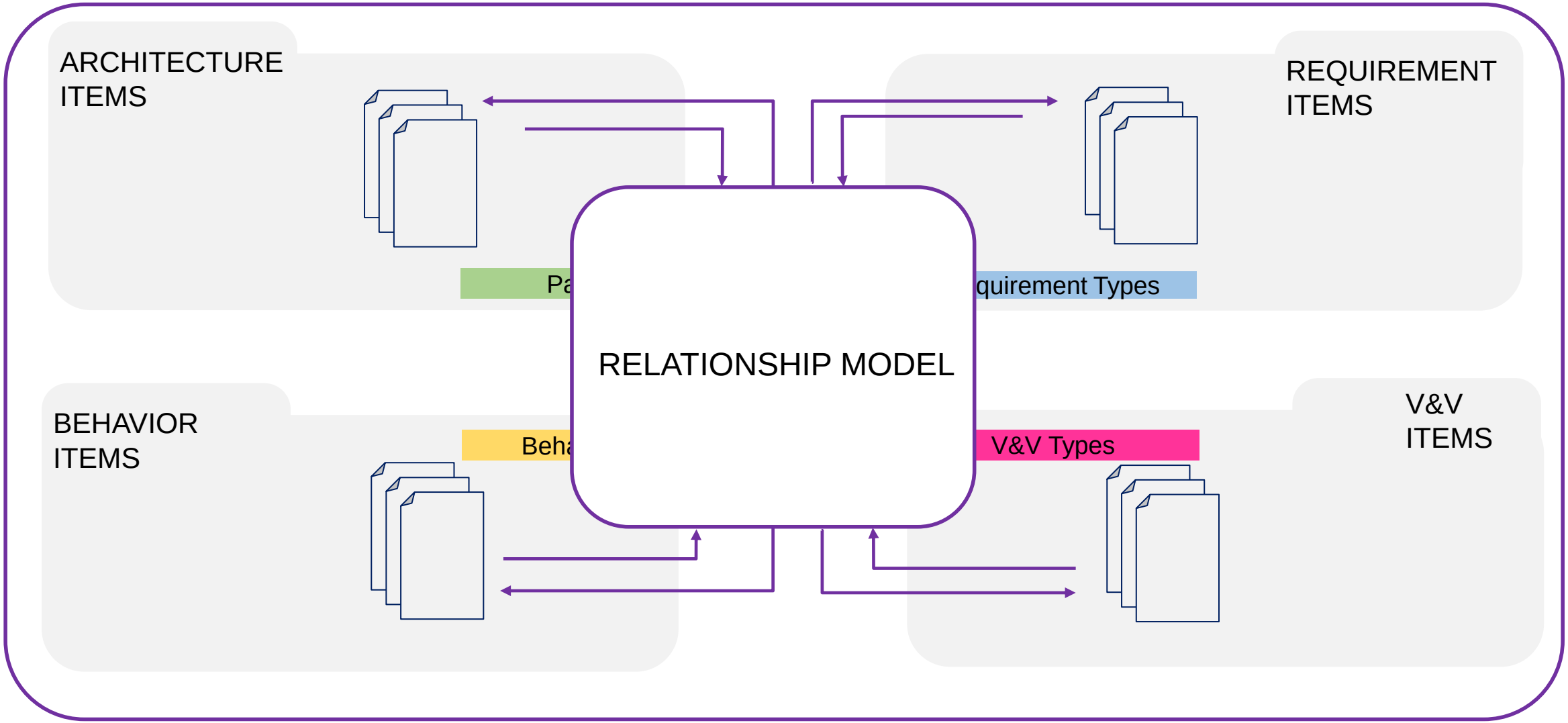


V&V

V&V Types



What is MBSE? It is not just SysML



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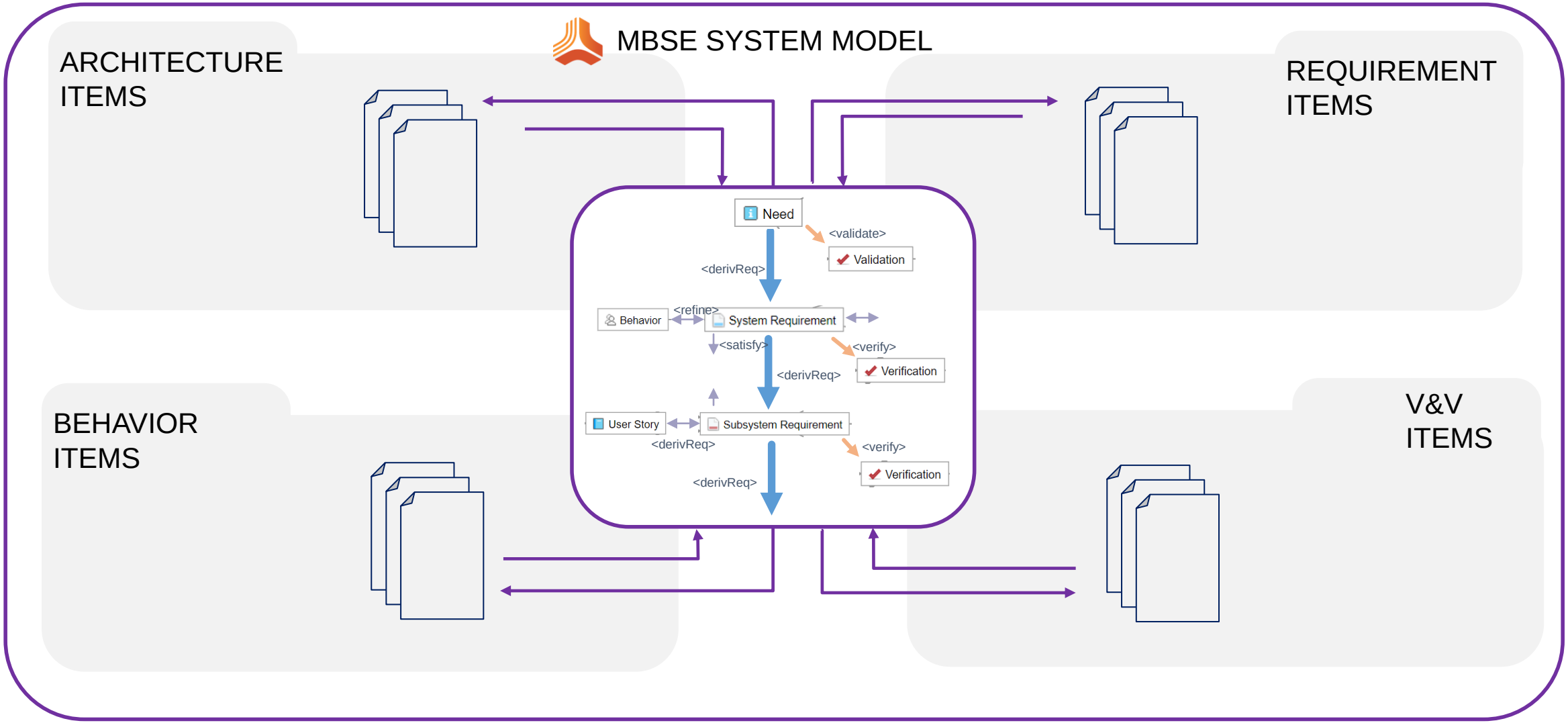
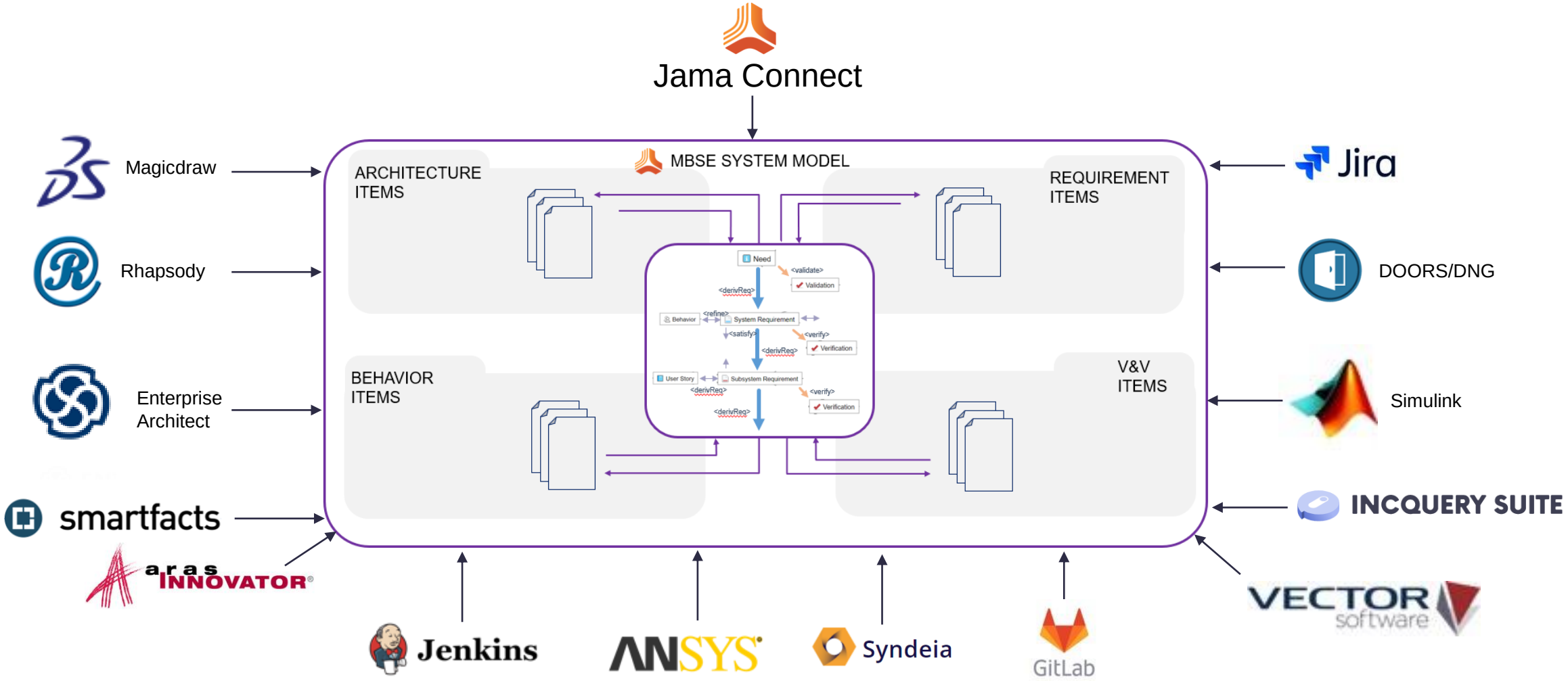
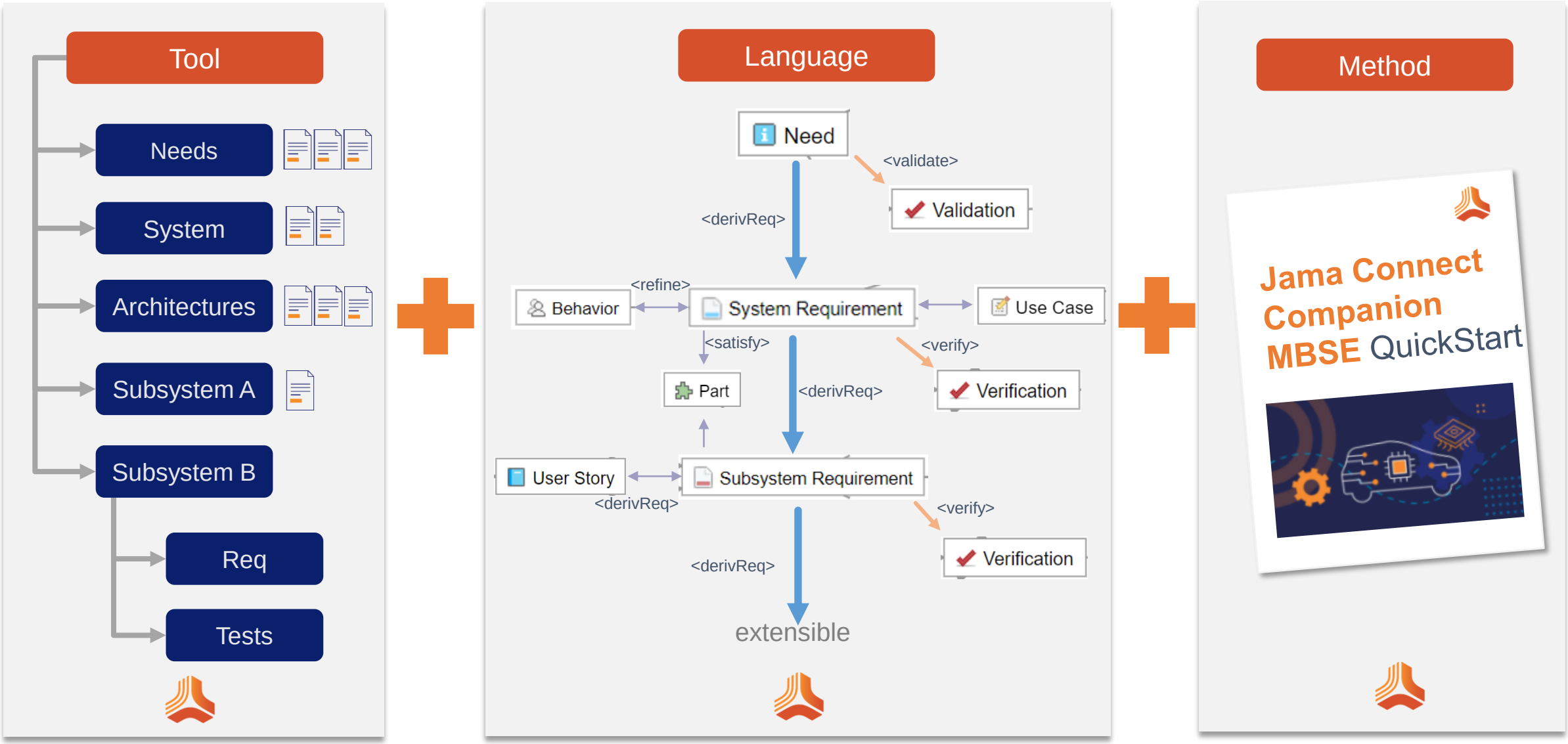


Common Data Model

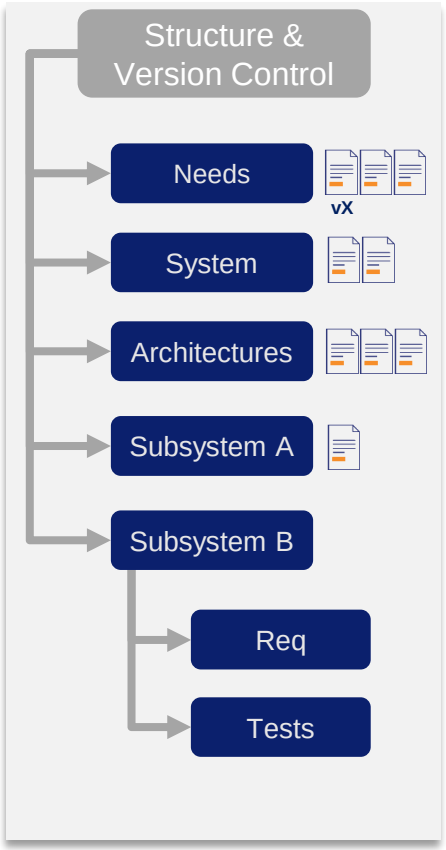
ALLOWS FOR DIFFERENT TOOLS AND DISCIPLINES TO ACCESS AND MANIPULATE DATA

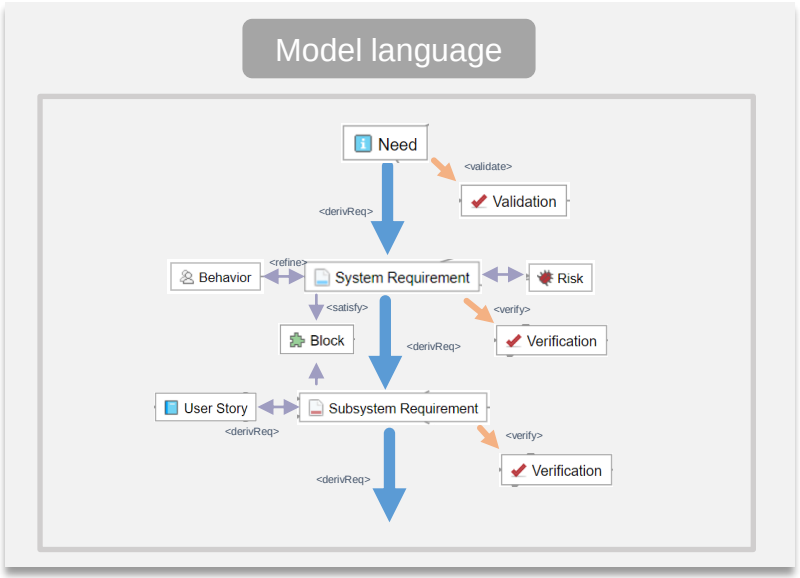


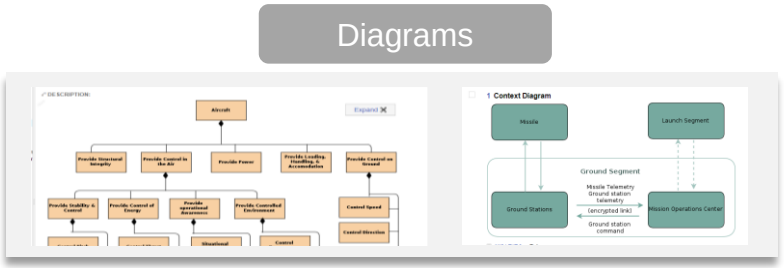
Jama Companion MBSE Framework Overview

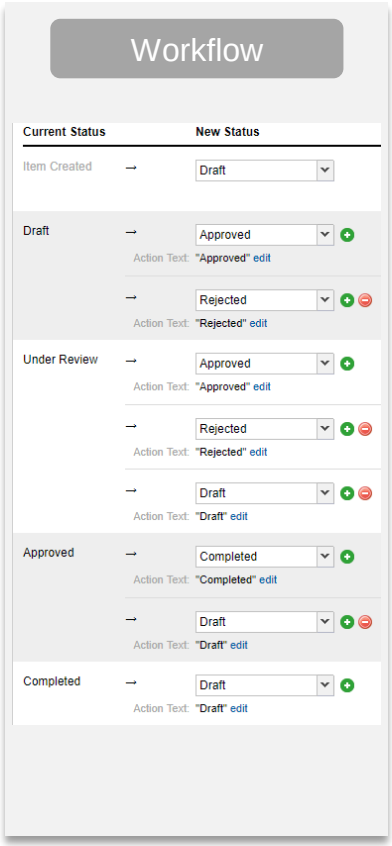


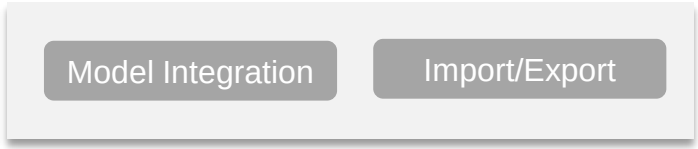
Jama Companion MBSE Value











- ✓ Reduce time and effort to accelerate development.
- ✓ Design a system using models to enable early visualization and simulation, improving stakeholder buy-in and customer satisfaction.
- ✓ Enable collaborative, innovative design and maintenance of complex systems.
- ✓ Build MBSE organizational maturity with a ready-to-use framework and the option to connect to additional model tools.
- ✓ Create a textual and relational model across your requirements, architecture, and V&V data, creating structure and relationship diagrams, to support more effective model-based systems engineering.
- ✓ Make requirements, of all the data, and relationships of the data accessible across the organization.
- ✓ Integrate software, hardware, and systems engineering.

Making the Switch

BACKGROUND

Why is Migration Expensive and Most often Fails to Leave Users Satisfied?

- Organizations have approached migration with a “give it a go” attitude
  - Migrate until something goes wrong, then fix it
  - In this situation, how can you predict how long migration will take?
- Even with a perfect migration, unless you can demonstrate to users that their data has been protected there will always be distrust
  - How can you reassure users that their data is protected, and migration worked?

The problem is not about a single vendor

- The process for migration from any legacy system is largely generic
  - The migration tools will be specific
- Jama Software provide migration tools towards an MBSE framework

Making the Switch - Migration Approach

MIGRATING TO MBSE

Steps:

1. Pre-assess
2. Plan
3. Discover
4. Export
5. Import
6. Clean
7. Verify

{repeat}

Making the Switch - Migration Approach

MIGRATING TO MBSE

1. Pre-assess

- Gauge the overall complexity of the migration

2. Plan

- Identify key stakeholders
- Assessment of data conditioning
- Documented plan

3. Discover

- Define Information Architecture, data shape and engineering process – your MBSE model
- Legacy data analysis
- Data mapping from legacy to MBSE model
- Test Migration

4. Export

- Baseline and backup legacy
- Data conditioning to help migration process
- Data export(s)
- Legacy data now READ-ONLY
- Record export validation metrics

5. Import

- Transition data into MBSE model

6. Clean

- Record import validation metrics

7. Verify

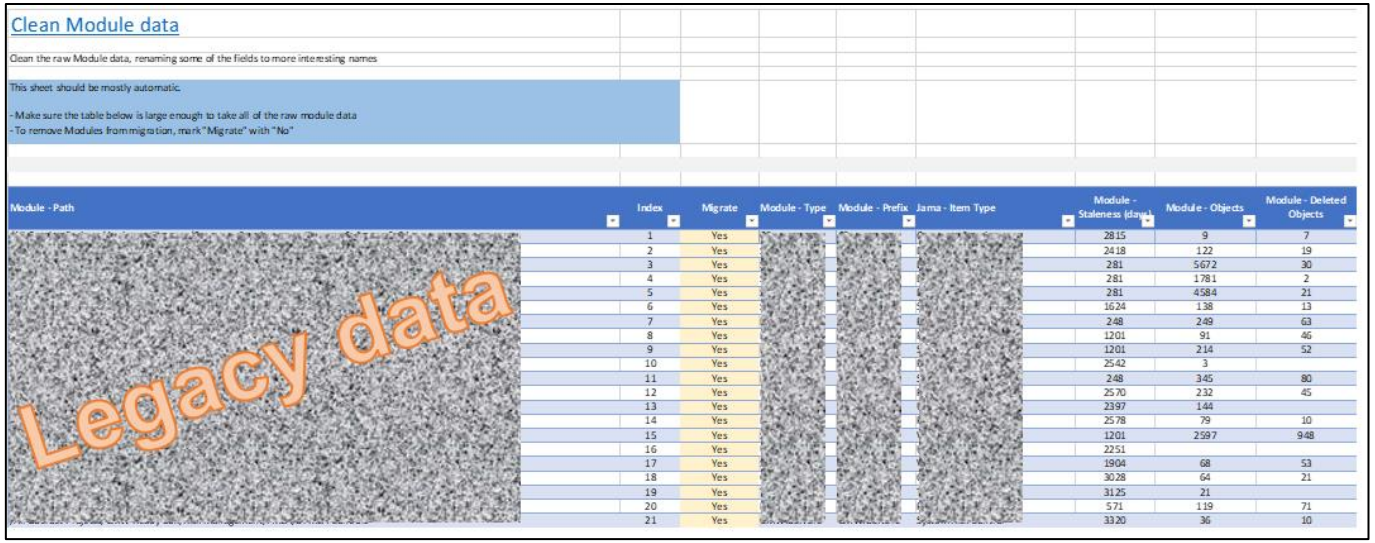
- Verification process to demonstrate a complete migration process

1) Pre-assess

ASSESS DATA COMPLEXITY

Some Legacy Systems Provide Analysis Functions Giving Metrics over Data

- If no built-in tool exists, you might have to create one
  - Don’t go into data migration blind
  - Understand the scale and complexity of the problem before you export data
- Migration needs to be predictable and repeatable
- Best practice to run in a Sandbox environment
  - Reduces the risk to ongoing project works



Migration Iterations

OVERVIEW

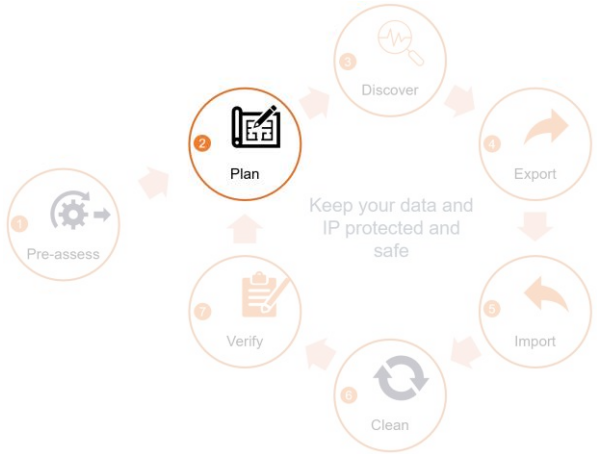
Two Reasons Migration Might Take Multiple Iterations:

- **Groups require their own extensions to a common MBSE model**
  (information architecture)
  - Planning and discovery could be needed for each group
  - Most likely for Enterprise migrations

- **Individual projects contain a lot of data**
  - We might require more iterations around Export, Import, Clean and Verify
  - Most likely for Complex migrations

2) Plan

OVERVIEW



In Order to Reduce Risk, Write a Plan and Execute it:

- Predictable outcomes
- Predictable risks
- Predictable estimates

A Plan will Consist of:

- Statement of work, defining migration tasks
- Roles and names of people involved in migration
- Assessment of data conditioning

Ask Vendors for Help

- Services are cheap in comparison to the value of your data

2) Plan

ASSESSMENT OF DATA CONDITIONING

Metric Gathering:

- Take a detailed measure of your legacy
- Assess data scale
- Assess conditioning required – cleaning your data in the migration process
- Analyse for tool specific data and form a migration plan
- Don’t migrate dead wood unless it contains knowledge
- It’s as important to know what not to migrate as to what is needed
  - Organizations can drown if they don’t have an understanding of the data they attempt to maintain
  - Partly due to a legacy “clone-and-own” process
  - Copy-paste, copy-paste , copy-paste , copy-paste , copy-paste

ASSESSMENT OF DATA SCALE

Metric	Count	Description
Modules to migrate		
Objects to migrate		
Soft deleted objects to migrate		Consider purging data or this will be undeleted and migrated
Largest module		
Relationship types		
Links		We count "out links" only as this is where DOORS stores links
Cross-project links		
Unique items types		
Unique attribute definitions allocated to Item Types		Total count of fields across all item types
Unique enumerated lists		
OLE count in Object Text		Migrated as attachments
OLE count in custom attributes		Migrated as attachments

ASSESSMENT OF DATA CONDITIONING

Metric	Count	Description
Number of stale modules, not changed in a long time		A stale module has not changed in 365 days. Review if these modules should be migrated
Conflicting module type systems		
Conflicting attribute definitions		Each conflicting Module Type system must be resolved by reducing attributes for migration or increasing attributes on the targeted item type
Conflicting enumerated lists		Conflicting fields to be migrated to the same Item Type. These conflicts must be resolved before migration
Conflicting relationship types		Conflicting pick-list sets to be migrated to the same pick-list name. These conflicts must be resolved before migration
Objects with Heading and Object Text		We must split objects with both Heading and Description into two objects for migration
Objects with Heading text >255 characters		An item type name in Jama can only contain 255 characters. This data needs to be cleaned prior to migration
Picture count		Pictures must be converted to OLE objects or they will be lost
DXL Attribute		DXL Attributes will migrate as static data. Need to verify what they were being used for.

OTHER DATA CONSIDERATIONS

Metric	Count	Description
DOORS Tables		Migration should at least be aware that DOORS Tables are in play and need to be counted differently for migration verification
Average DOORS Table celll count		An indication of typical table size
OSLC Links		If OSLC links are in play, we need to discuss if and how to migrate
External Links		External links are not migrated so we will need to discuss if and how to migrate this data
Test Tracking Toolkit modules		TTT is a built in Test Management utility provided by DOORS. This data indicates that there are test items that might need to be treated as test items and not requirements
QCI modules		QCI is the integration to Quality Center. If found, we need to decide how to migrate this data if required
RQMI modules		RQM is the old product name for IBM Engineering Test Management. If found, we need to decide how to migrate this data if required
Modules using WEXP		WEXP is an old customization provided by QSS and Telelogic to help with document generation. If found the data is likely to have a higher degree of requirements for Document Generation. Need to review for needs within Jama Connect.

DATA THAT IS NOT MIGRATED

Metric	Count	Description
Module Baseline count		It is difficult to migrate baselines to any tool, including IBM DOORS Next. Where found and required a bespoke solution will be needed. Baselines will not normally be migrated.
Modules with Module Discussions		Module discussions are bespoke to DOORS and will not be migrated.
Modules with Object Discussions		Object discussions are bespoke to DOORS and will not be migrated.
Public views		Views will be considered in the Discovery and Administration training
Private views		Views will be considered in the Discovery and Administration training
Custom views		Views will be considered in the Discovery and Administration training

3) Discover

OVERVIEW

MBSE Data Model

- Interview stakeholders
- Define your Information Architecture, data shape and engineering process – your MBSE meta-model
  - Make your MBSE data-model in your own language. Exploit the best out of the tools you use and don't constrain them with old data shapes

Legacy-MBSE Data Mapping

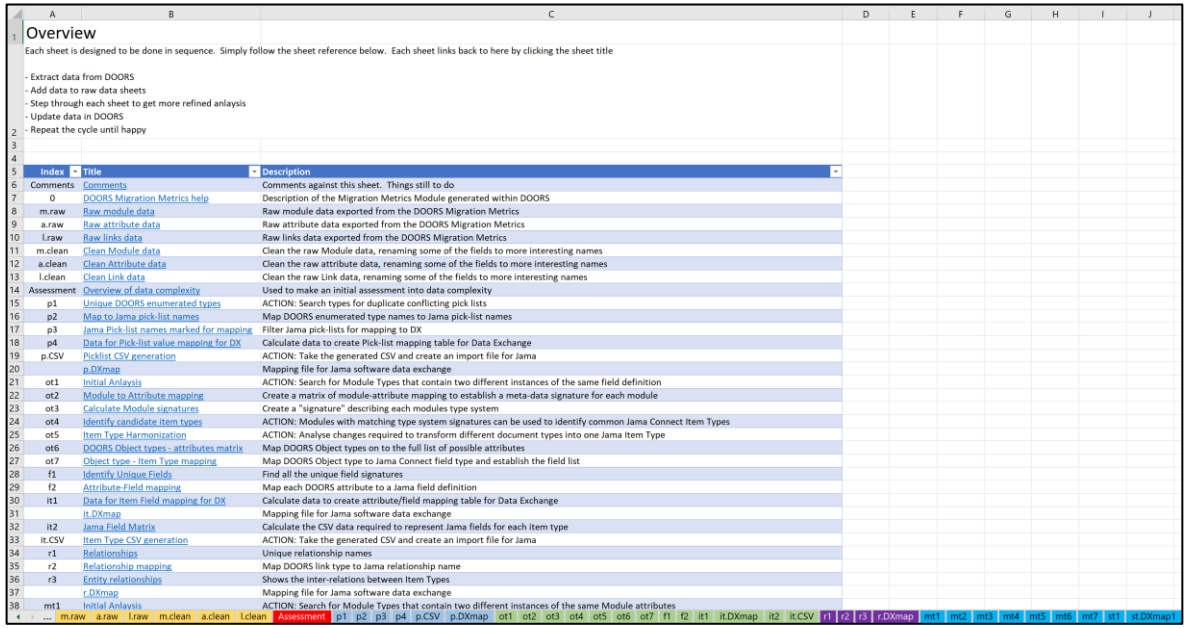
- Legacy data analysis
- Associate legacy meta-data to MBSE data model

Test Migration

- Migration tools come in different shapes, for requirements data, ReqIF might be sufficient
- User verification of a small amount of data to verify migration works as expected and your new MBSE data model is acceptable

3) Discover

DOORS DATA ANALYSIS



Overview

Each sheet is designed to be done in sequence. Simply follow the sheet reference below. Each sheet links back to here by clicking the sheet title

- Extract data from DOORS
- Add data to raw data sheets
- Step through each sheet to get more refined anlaysis
- Update data in DOORS
- Repeat the cycle until happy

Index	Title	Description
Comments	Comments	Comments against this sheet. Things still to do
0	DOORS Migration Metrics help	Description of the Migration Metrics Module generated within DOORS
m.raw	Raw module data	Raw module data exported from the DOORS Migration Metrics
a.raw	Raw attribute data	Raw attribute data exported from the DOORS Migration Metrics
l.raw	Raw links data	Raw links data exported from the DOORS Migration Metrics
m.clean	Clean Module data	Clean the raw Module data, renaming some of the fields to more interesting names
a.clean	Clean Attribute data	Clean the raw attribute data, renaming some of the fields to more interesting names
l.clean	Clean Link data	Clean the raw Link data, renaming some of the fields to more interesting names
Assessment	Overview of data complexity	Used to make an initial assessment into data complexity
p1	Unique DOORS enumerated types	ACTION: Search types for duplicate conflicting pick lists
p2	Map to Jama pick-list names	Map DOORS enumerated type names to Jama pick-list names
p3	Jama Pick-list names marked for mapping	Filter Jama pick-lists for mapping to DX
p4	Data for Pick-list value mapping for DX	Calculate data to create Pick-list mapping table for Data Exchange
p.CSV	Picklist CSV generation	ACTION: Take the generated CSV and create an import file for Jama
	p.DXmap	Mapping file for Jama software data exchange
ot1	Initial Anlaysis	ACTION: Search for Module Types that contain two different instances of the same field definition
ot2	Module to Attribute mapping	Create a matrix of module-attribute mapping to establish a meta-data signature for each module
ot3	Calculate Module signatures	Create a "signature" describing each modules type system
ot4	Identify candidate Item types	ACTION: Modules with matching type system signatures can be used to identify common Jama Connect Item Types
ot5	Item Type Harmonization	ACTION: Analyse changes required to transform different document types into one Jama Item Type
ot6	DOORS Object types - attributes matrix	Map DOORS Object types on to the full list of possible attributes
ot7	Object type - Item Type mapping	Map DOORS Object type to Jama Connect field type and establish the field list
f1	Identify Unique Fields	Find all the unique field signatures
f2	Attribute-Field mapping	Map each DOORS attribute to a Jama field definition
it1	Data for Item Field mapping for DX	Calculate data to create attribute/field mapping table for Data Exchange
	it.DXmap	Mapping file for Jama software data exchange
it2	Jama Field Matrix	Calculate the CSV data required to represent Jama fields for each item type
it.CSV	Item Type CSV generation	ACTION: Take the generated CSV and create an import file for Jama
r1	Relationships	Unique relationship names
r2	Relationship mapping	Map DOORS link type to Jama relationship name
r3	Entity relationships	Shows the inter-relations between Item Types
	r.DXmap	Mapping file for Jama software data exchange
mt1	Initial Anlaysis	ACTION: Search for Module Types that contain two different instances of the same Module attributes

... m.raw a.raw l.raw m.clean a.clean l.clean Assessment p1 p2 p3 p4 p.CSV p.DXmap ot1 ot2 ot3 ot4 ot5 ot6 ot7 f1 f2 it1 it.DXmap it2 it.CSV r1 r2 r3 r.DXmap mt1 mt2 mt3 mt4 mt5 mt6 mt7 st1 st.DXmap1

Data Analysis:

- Now we must do a more detailed data analysis
- We don't just look at meta-data but we also assess for data cleaning
- We understand and resolve migration issues prior to actual migration

Example - Pick lists:

- Many organizations use enumerated types or pick-lists, do you know they are consistently used to move into a common MBSE data model?
- Are you happy with literal names or do you want them to change in the migration process?

Example - Item Types:

- MBSE will encourage your data to be more strongly typed: User Requirements, System Design, Integration test etc
- Like minded legacy data must be consistent to move into a common notation

Example - "What if" Scenarios for Data Migration:

- The ability to remove attributes & modules from migration to see how this impacts data cleanliness

DOORS Data Analysis

JAMA SOFTWARE DOORS MIGRATION METRICS TOOLKIT

We use the Module Signatures to Collect Modules that Share the Same Type System

- Here we see a collection of 4 modules sharing 3 different type systems
- 2 Modules share the same type system (i.e. have the same Module Signature) which would imply they carry the same type of data and should probably be mapped on to the same Jama Connect Item Type
- Mapping all these modules to the same data type causes conflict and needs mapping rules

Module Type	Module	Module Path
Verification	1,1,0,1	/My Project/User Requirements
	1,0,0,1	/My Project/System Requirements
		/My Project/Test Approach
	1,1,1,1	/My Project/Meeting Minutes

DOORS Data analysis

JAMA SOFTWARE DOORS MIGRATION METRICS TOOLKIT

Resolve Differences Between Information Types

- Now we have a better understanding of module types, we need to perform some more contextual analysis
- Take a set of Module paths that you would wish to map to a Jama Connect and perform some analysis:

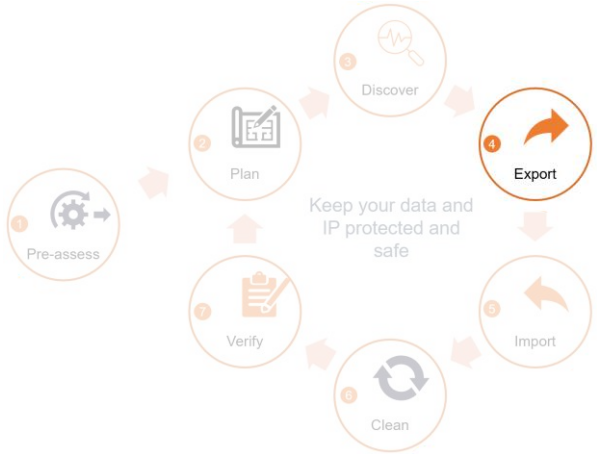
Module Type	Module	Module Path
Verification	1,1,0,1	/My Project/User Requirements
	1,0,0,1	/My Project/System Requirements
		/My Project/Test Approach
	1,1,1,1	/My Project/Meeting Minutes

Module Path	Module Type	Module Pro	Absolute N	Actual Res	Affected Iten	Back Trace	Comments,	Complexity	Cost,0, Inte	Created By,
/My Project/User Requirements	Verification		1	0	1	0	1	0	0	1
/My Project/System Requirements	Verification		1	0	1	0	1	0	0	1
/My Project/Test Approach	Verification		1	0	0	0	0	0	0	1
/My Project/Meeting Minutes	Verification		1	1	0	0	1	0	0	1
Proposed Jama item type:	Verification		Absolute N	Actual Res	Affected Iten		Comments,		Cost,0, Inte	Created By,

- If we leave the data alone we see a list of attributes that would be needed to migrate this data to the same Jama Connect Item Type
- Attributes marked in RED are included in some Modules but not others
- Attributes marked in GREEN are missing from some modules

4) Export

OVERVIEW



Preparation

- Data conditioning required to ensure data is mapped to the expected structures in Jama connect
- We use an Extended Migration Metrics Report to control the migration process

Data Conditioning

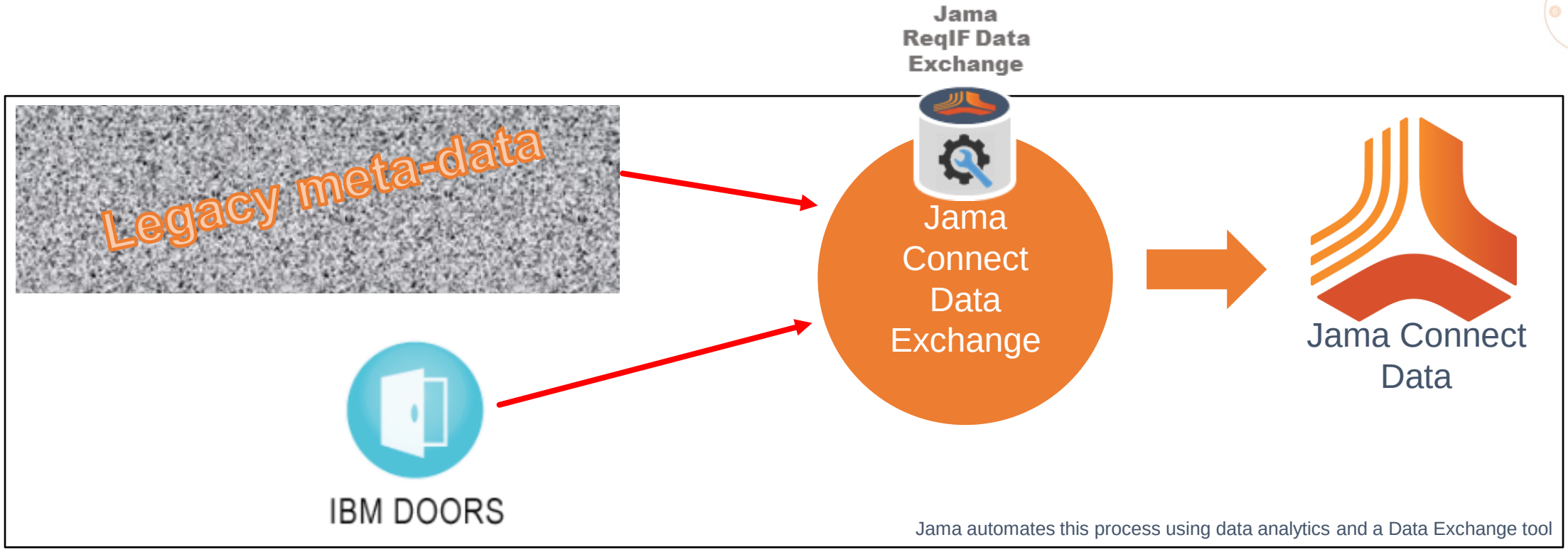
- Jama Software provided DXL scripts to
  - Report on inconsistencies
  - Fix inconsistencies

Export Automation

- Jama Provided scripts to create ReqIF definitions for data export
- A report will be run prior to each migration to detail data to be expected in this iteration
- Preserve requirement links before migration
- Perform migration tasks

5) Import

CLEAN LEGACY DATA EXPORTED FROM THE OLD SYSTEM AND IMPORT YOUR MBSE DATA-MODEL



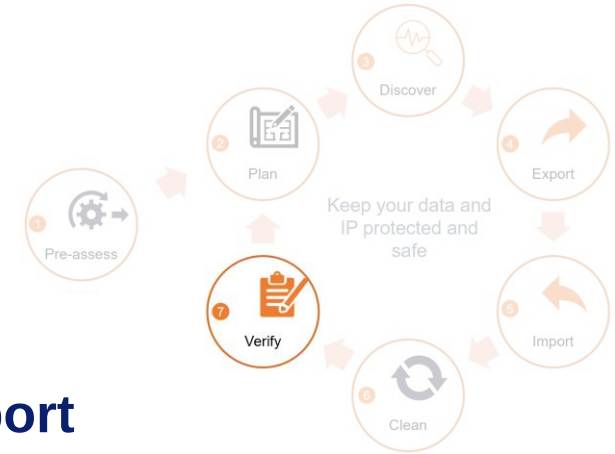
6) Clean

OVERVIEW

- **Often Data Cleaning is Required in the Target Tool**
- **Reduce the Amount of Cleaning by Reshaping Data in the Export/Import Process**

7) Verify

ESSENTIAL TO DEMONSTRATE TO USERS THEIR DATA IS PROTECTED



Compare Import Summary to the Data Measurements Taken Before Export

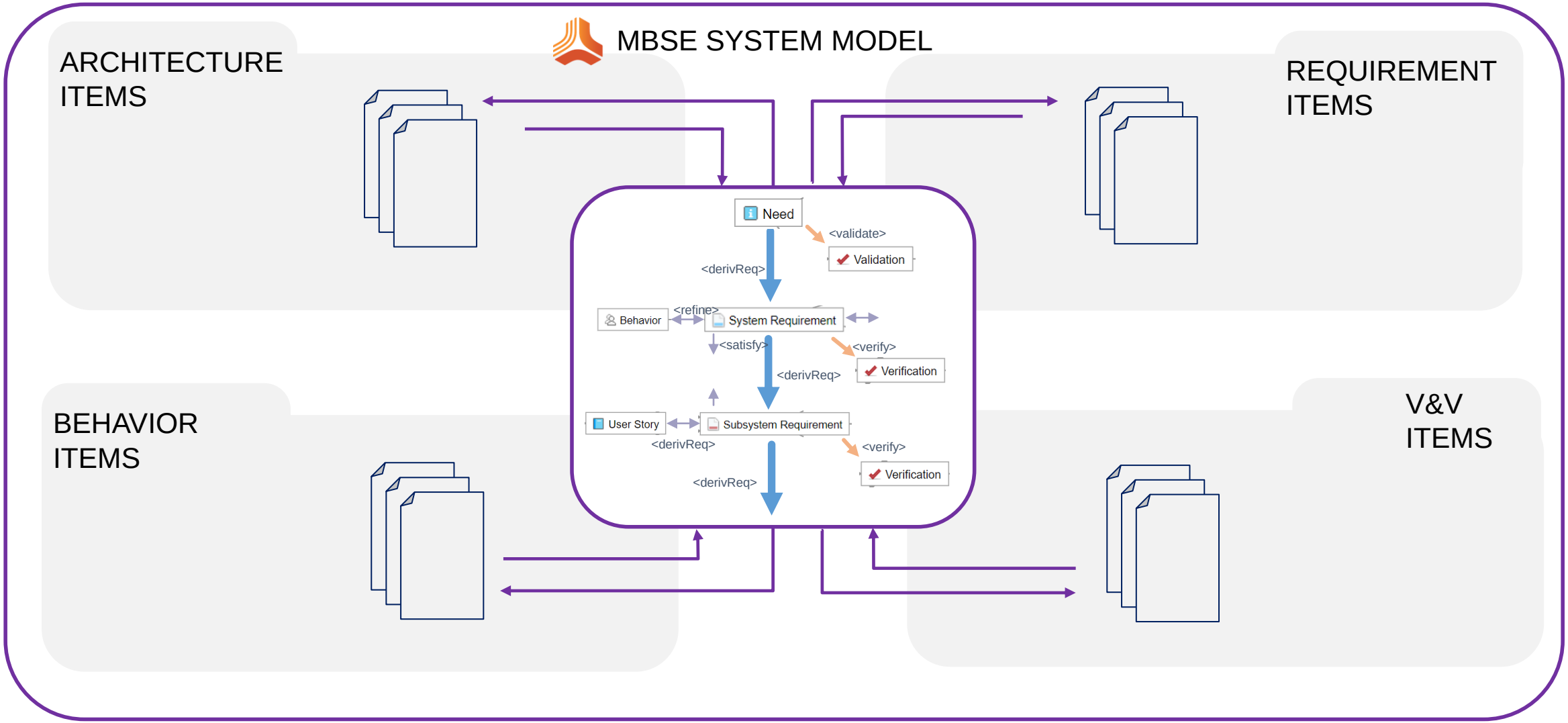
- Some “translation” will be required
- Source tool concepts might differ to target tools
- E.g. DOORS tables or DOORS embedded Pictures but be modernized into a different presentation

Three Levels of Reports

- Different layers of verification report are needed to ensure migration has been successful.
  - Executive Summary – Overall Migration report
  - Specification Summary – Executive Summary for each data set
  - Detailed item Information – used for debugging purposes to investigate any suspicious data

If tools do not exist, don’t be afraid to create them for yourself.

What is MBSE? It is not just SysML



Questions

Thank You!

For more information: visit www.jamasoftware.com/platform