

Our Journey for Requirements Quality and Traceability

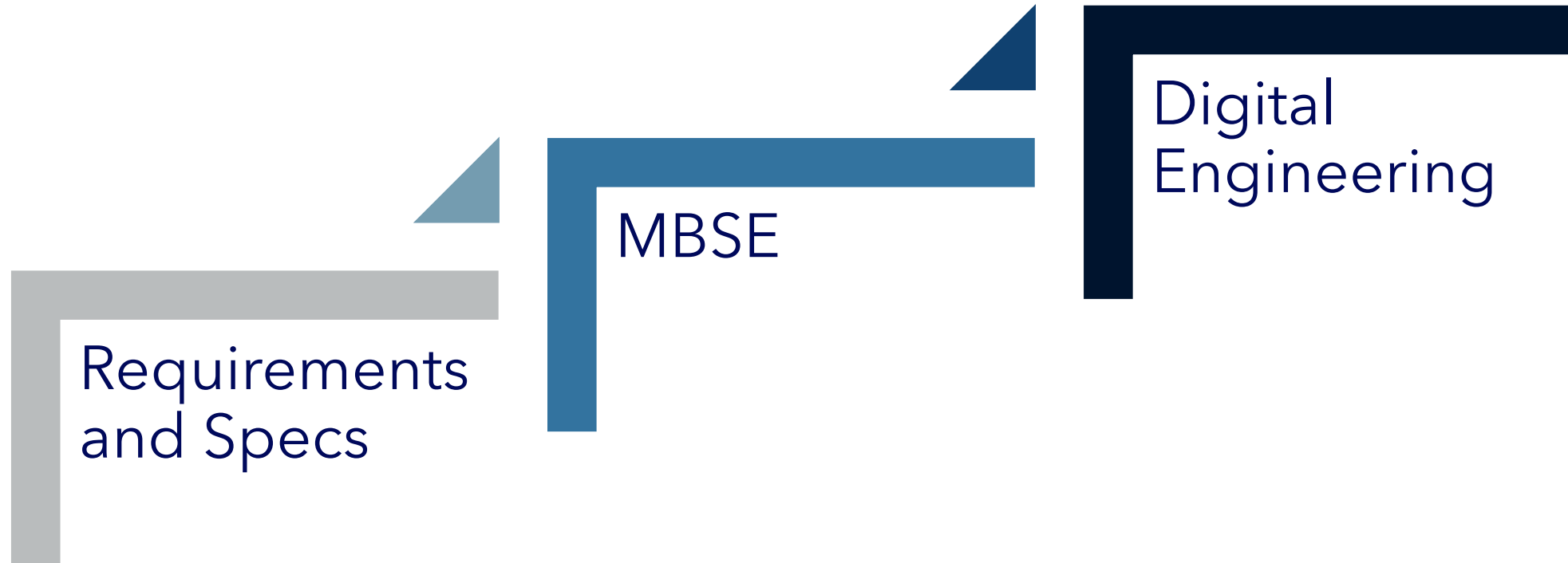
Dan Yeaw

Sr. Technical Manager Functional Safety

The Ford logo, featuring the word "Ford" in a dark blue, stylized script font.

Typical Academic Progression of Systems Engineering

Although typically systems engineering is shown to move towards digitization in a nice progression, our experience has been a bit different.

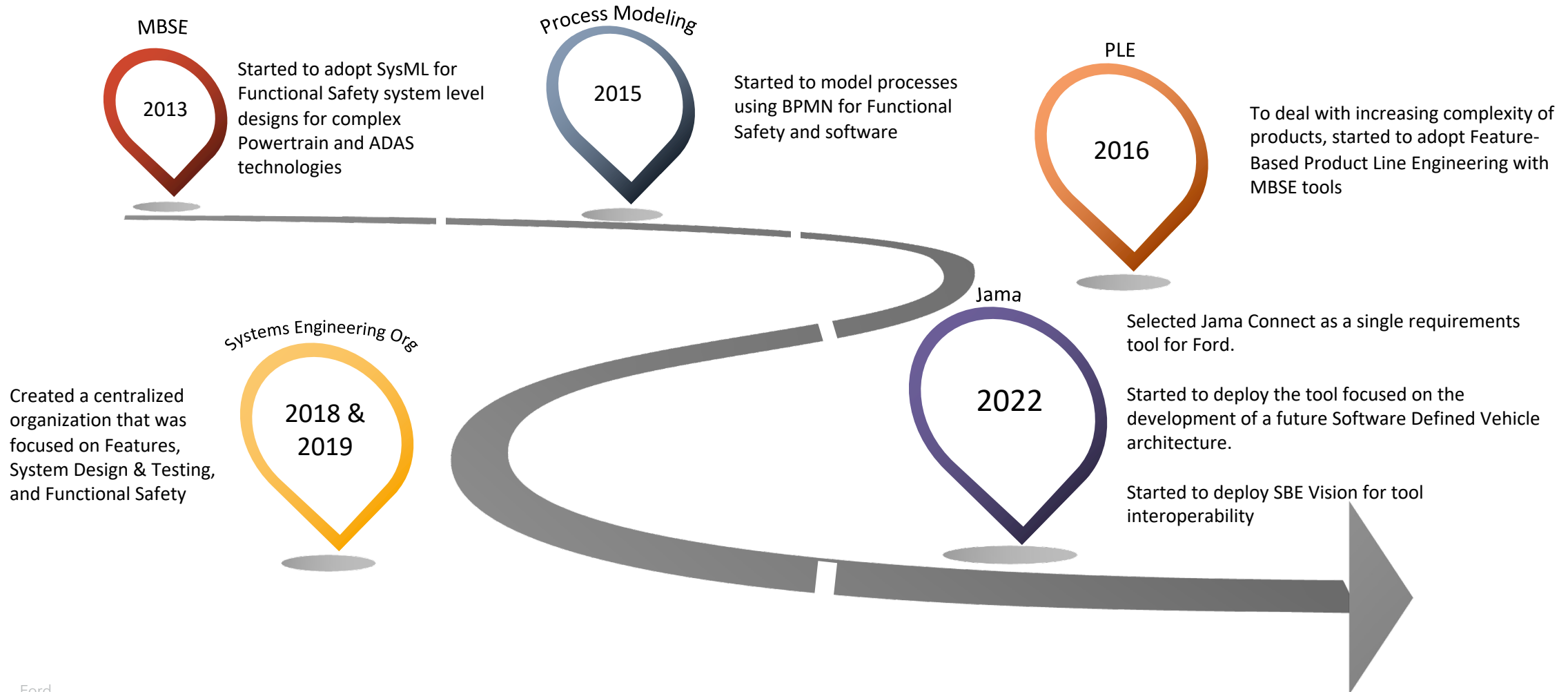


Ford Was Mechanical Design Dominated

Engineering tools were dominated by mechanical design including 3D CAD and PLM



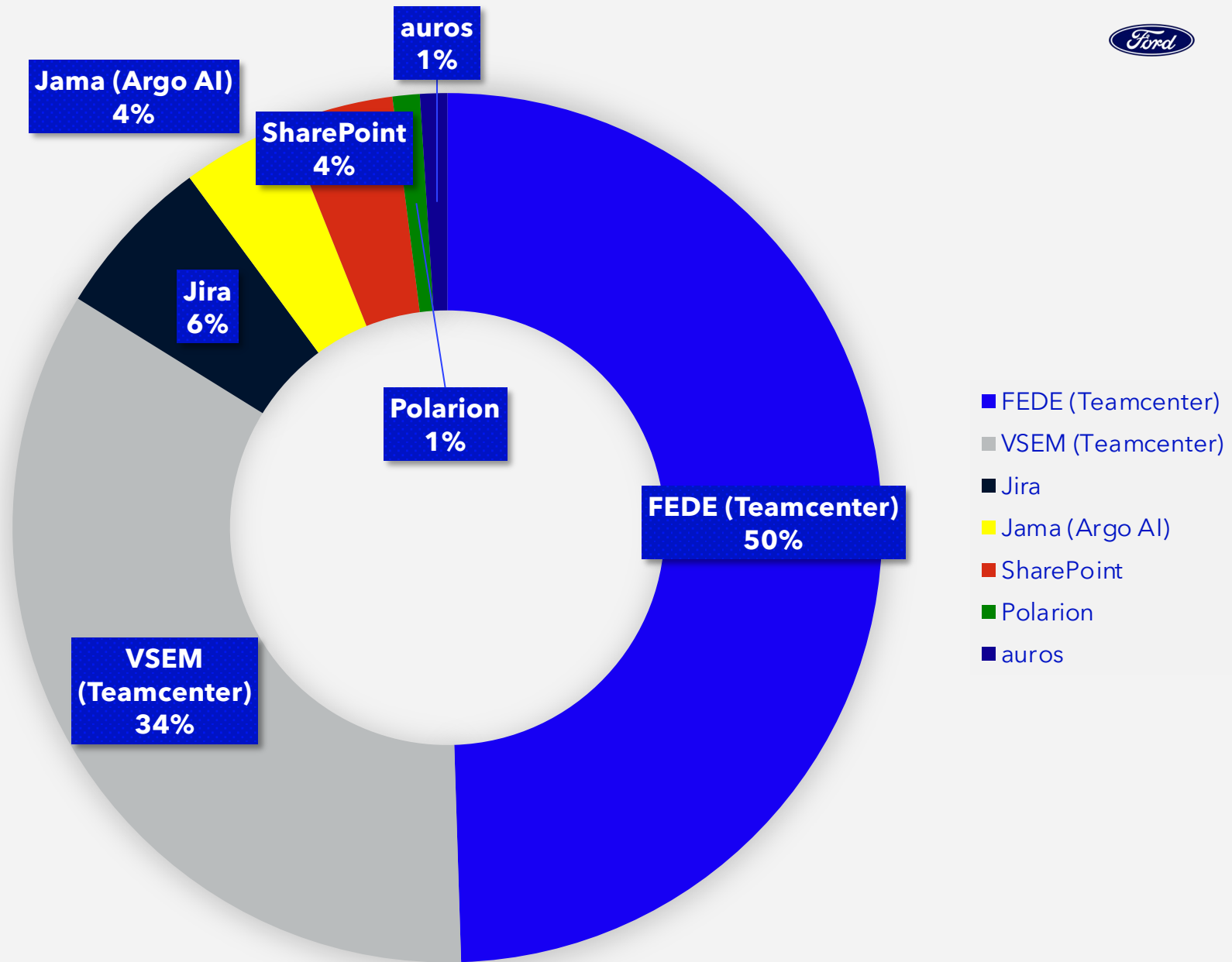
A Timeline of Systems Engineering Progress



Requirements Tool Status in 2021

Requirements were in many systems, hurting collaboration and quality.

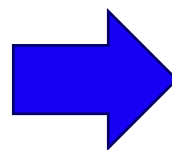
- Needed to move from 7+ tools to a single common and modern tool for the company



Requirements Quality and Traceability

Move from difficult to understand, ambiguous, vague, and subjective to clear atomic statements with relationships to other requirements and test cases.

- Engineers often lack formal training on writing requirements
- Unconstrained natural language, often is large specifications (non-atomic)
- Poor requirements are the standard and engineers have no automatic ways to receive feedback
- Suppliers receive thousands of requirement specifications in PDF, some don't apply
- Sign-off of products is a manual process, with engineers often having to chase down test results



- Requirements Engineering is a discipline with training easily available and just-in-time
- INCOSE Guide to Writing Requirements and Easy Approach to Requirements Syntax (EARS)
- Engineers receive immediate and automatic feedback on requirements quality
- Product Line Engineering defines what is applicable to a variant of a product automatically
- Dashboards show real-time and transparent progression of product sign-off



```
While <optional pre-condition>, when <optional trigger>, the <system name> shall <system response>
```

Why Jama Connect?

Jama Connect is a modern requirements tool

- Data First Approach
- Outstanding UX
- REST API
- Collaborative Reviews
- Requirements Quality Checker



Jama
software®



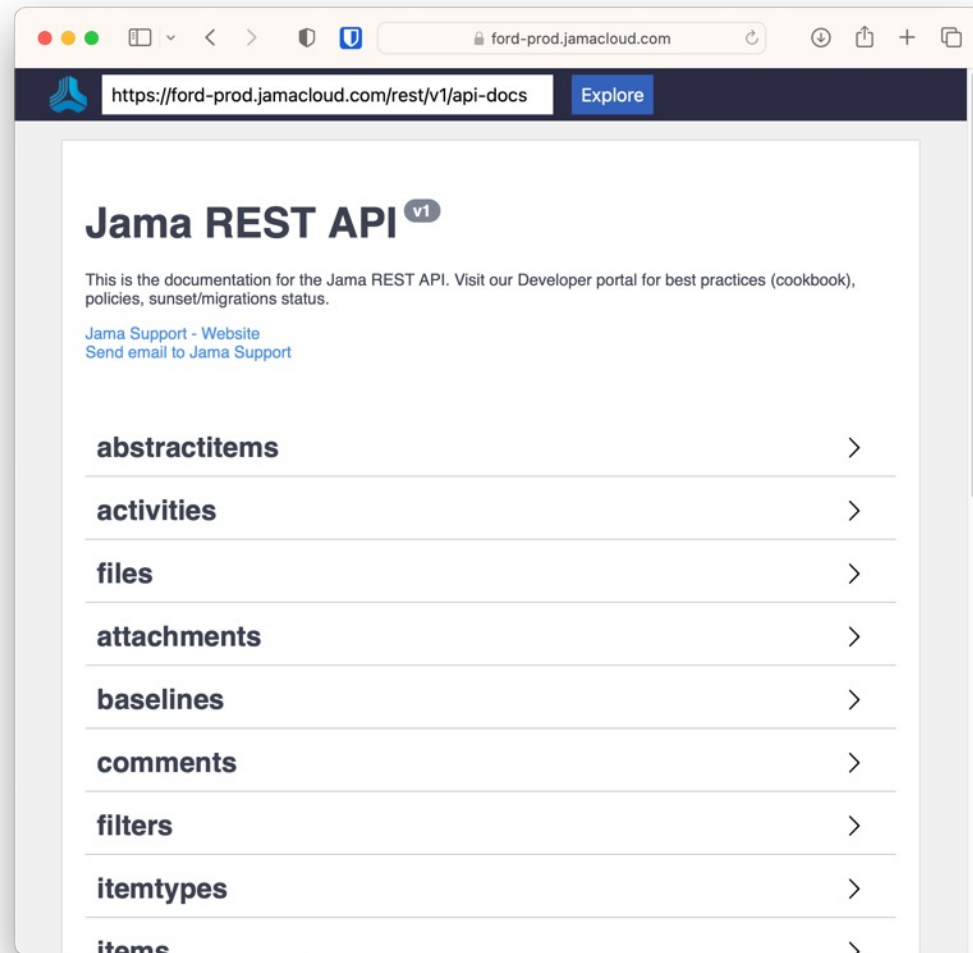
```
import requests

url = "https://ford-prod.jamacloud.com/rest/v1/projects"

payload={}
headers = {}

response = requests.request("GET", url, headers=headers, data=payload)

print(response.text)
```



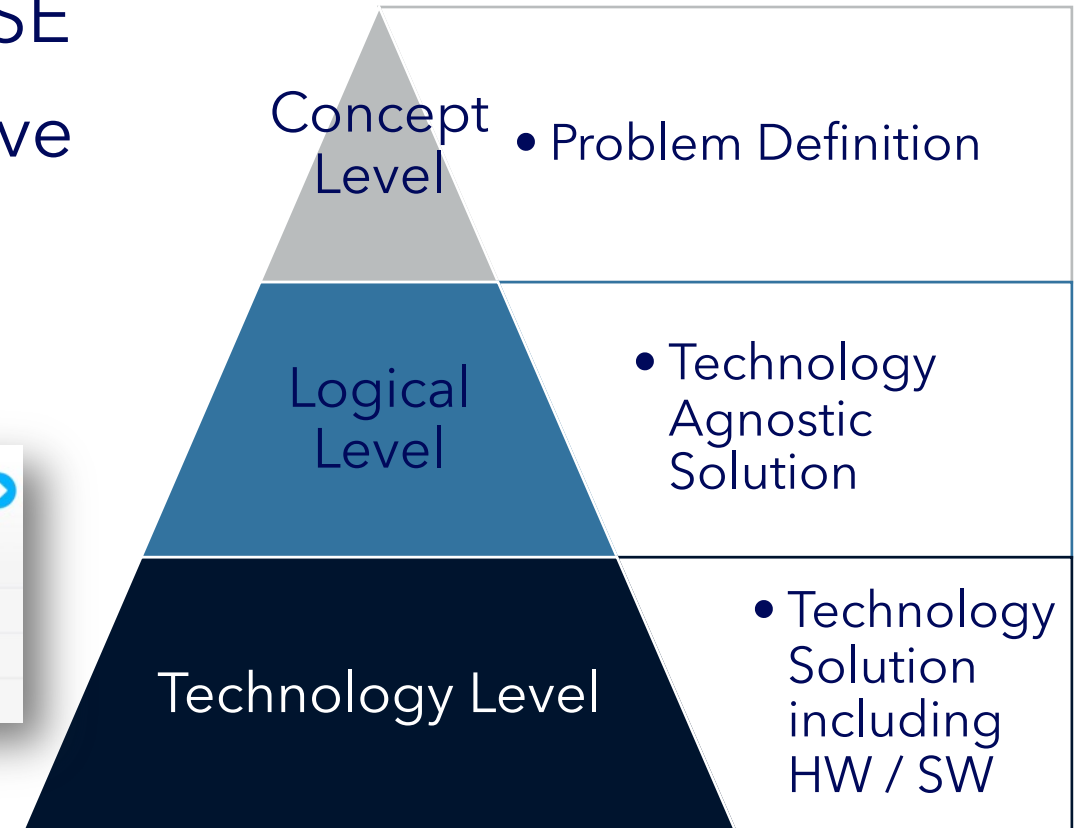
The screenshot shows a web browser window with the address bar displaying `https://ford-prod.jamacloud.com/rest/v1/api-docs`. The page title is "Jama REST API v1". Below the title, there is a brief introduction: "This is the documentation for the Jama REST API. Visit our Developer portal for best practices (cookbook), policies, sunset/migrations status." There are two links: "Jama Support - Website" and "Send email to Jama Support". A list of API endpoints is displayed, each with a right-pointing chevron:

- abstractitems
- activities
- files
- attachments
- baselines
- comments
- filters
- itemtypes
- items

Common Data Types, Relationships, and Process

Adoption of Jama has allowed us to push towards a common ontology.

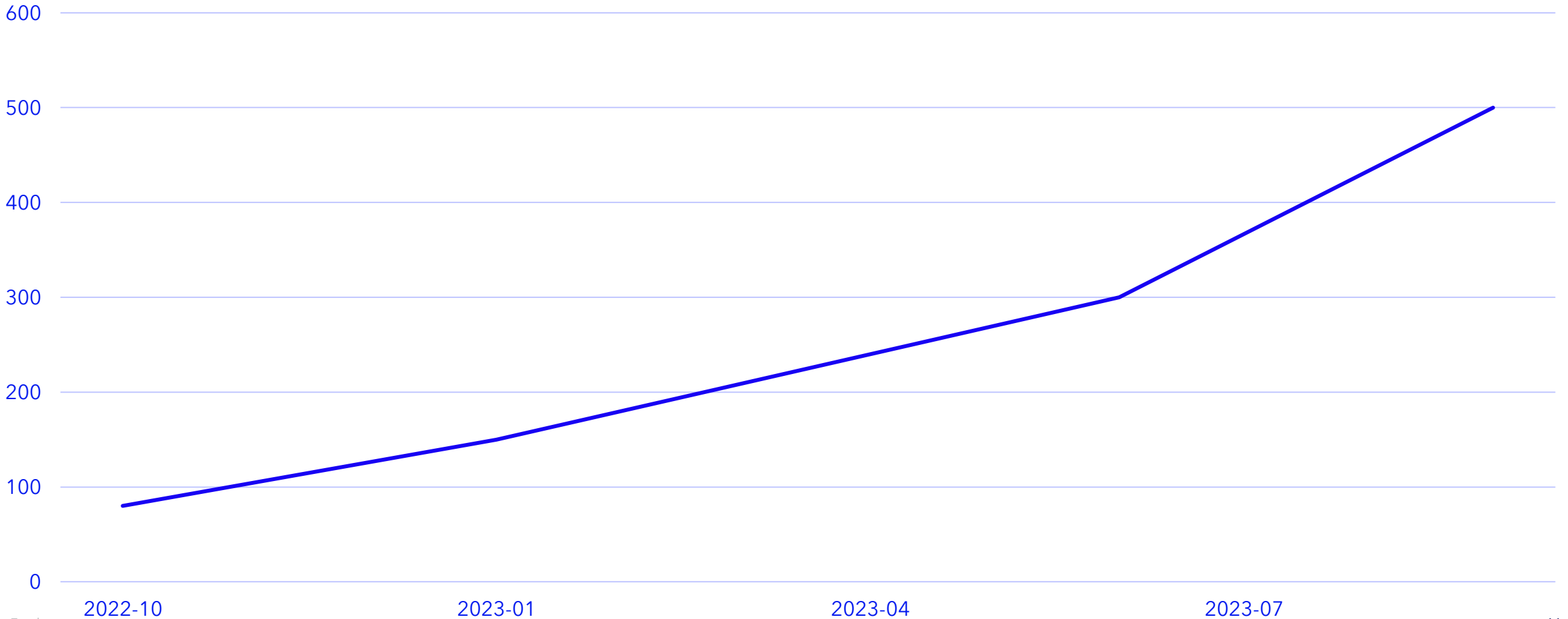
- Common data types and relationships, based on our abstraction levels used for MBSE
- Limit the number of projects to improve collaboration and reuse
- Relationships first approach



SOURCE ITEMS				1 LEVEL DOWN			
Safety Goal (1)				Functional Safety Requirement (3)			
Project ID	Name	Description		Project ID	Name	Description	
FORD-SG-1	Vehicle Body Tilt An...	The vehicle body tilt ...		FORD-FSR-1	Vehicle Speed Deter...	Vehicle speed infor...	
				FORD-FSR-2	Steering Wheel Angl...	Steering angle infor...	
				FORD-FSR-3	Correct Determinatio...	Vehicle body tilt angl...	

Jama Adoption Over Time

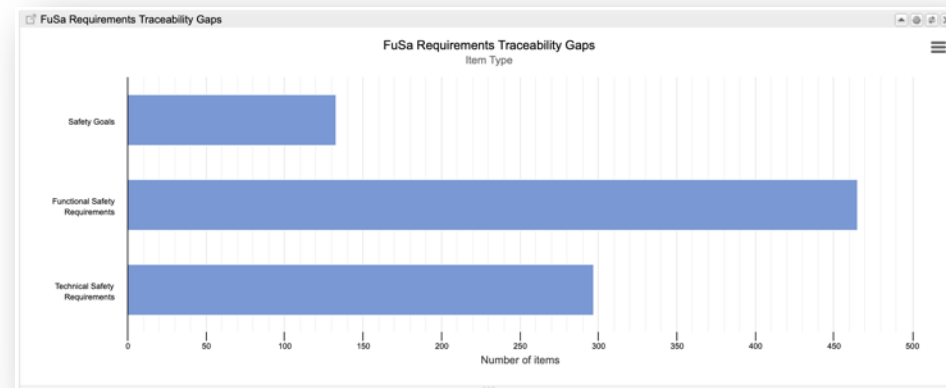
Peak Floating License Use



Challenges and Opportunities

Jama Connect has some opportunities to be even better.

1. Enhancement requests currently go to an ideation community site for voting, needs a better process for enterprise customers
2. Dashboards are limited, they are setup for the whole project instead of user customizable
3. Full Branching / Merging capabilities (in progress)



Work Still to Do

We are still on our journey towards Digital Engineering.

- Continue to spread Jama adoption and migrate requirements in other systems, especially for mechanical engineering areas
- Improve visibility of requirements quality across Jama through dashboards
- Improve Test Case development process and product sign-off
- Continue to improve tool interoperability for bi-directional traceability across tools





Ford