How many EDS formats do you need to plan a spacecraft? Possible ways towards standardization

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Jena - DLR Institute Of Data Science

- Datamanagement and Analytics
  - Datamanagement Technologies
  - Climate Informatics
  - Visual Analytics
- Software Systems for Digitalization
  - **Digital Production Platforms**
- IT Security
  - Secure Software Engineering
- Citizen Science
  - Citizen Science

Platform To Build Spacecraft

Planning (CEF)

CEF
1. Design of spaceship
2. Need reactionwheel according to spec
3. Send requirement to platfrom
4. Launch in 8 months?

Supplier 1
- We can deliver, but only in 6 months

Supplier 2
- We can deliver within 2 months

Supplier 3
- Can deliver immediately but with minor deviations to spec

Launch

Test (Components + System)

Operation (Mission Data)

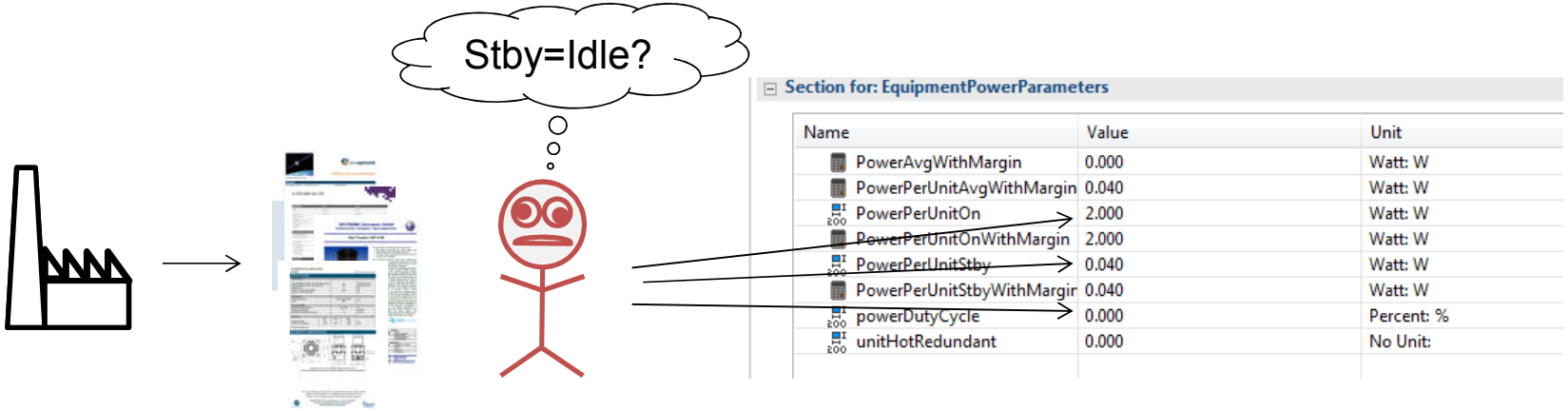
Operation (Health of Components)

Platform Services

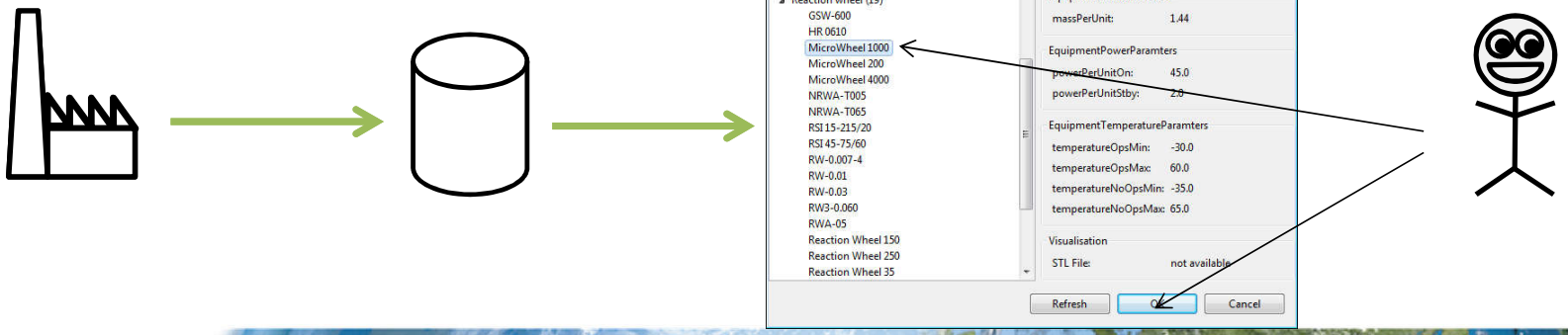
Industry 4.0 Platform

Supplier Data In MBSE For Concurrent Engineering

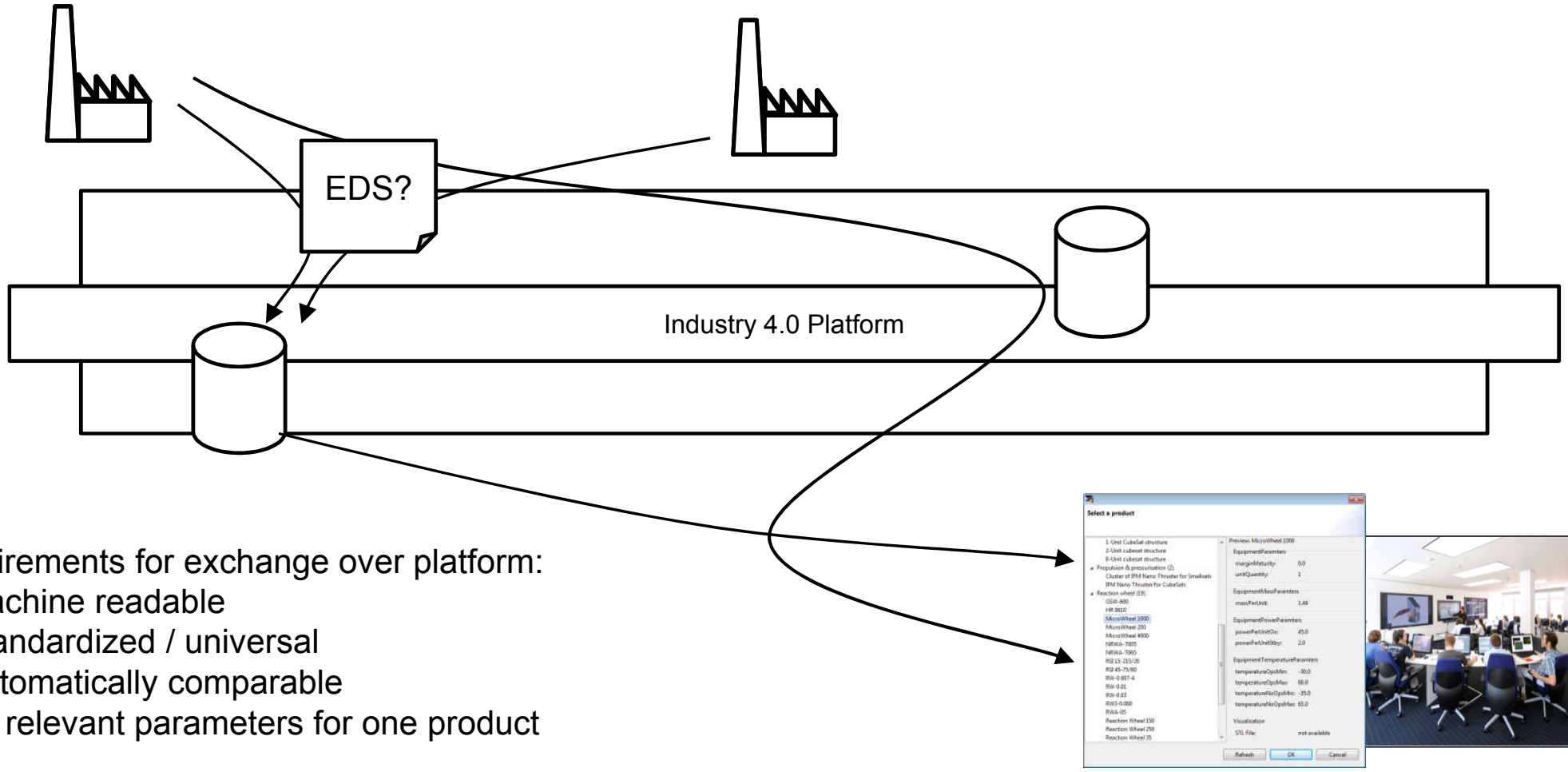
By today supplier information is often transferred manually by a user.



Tomorrow the data transfer process happens automatically – the user only selects a product.



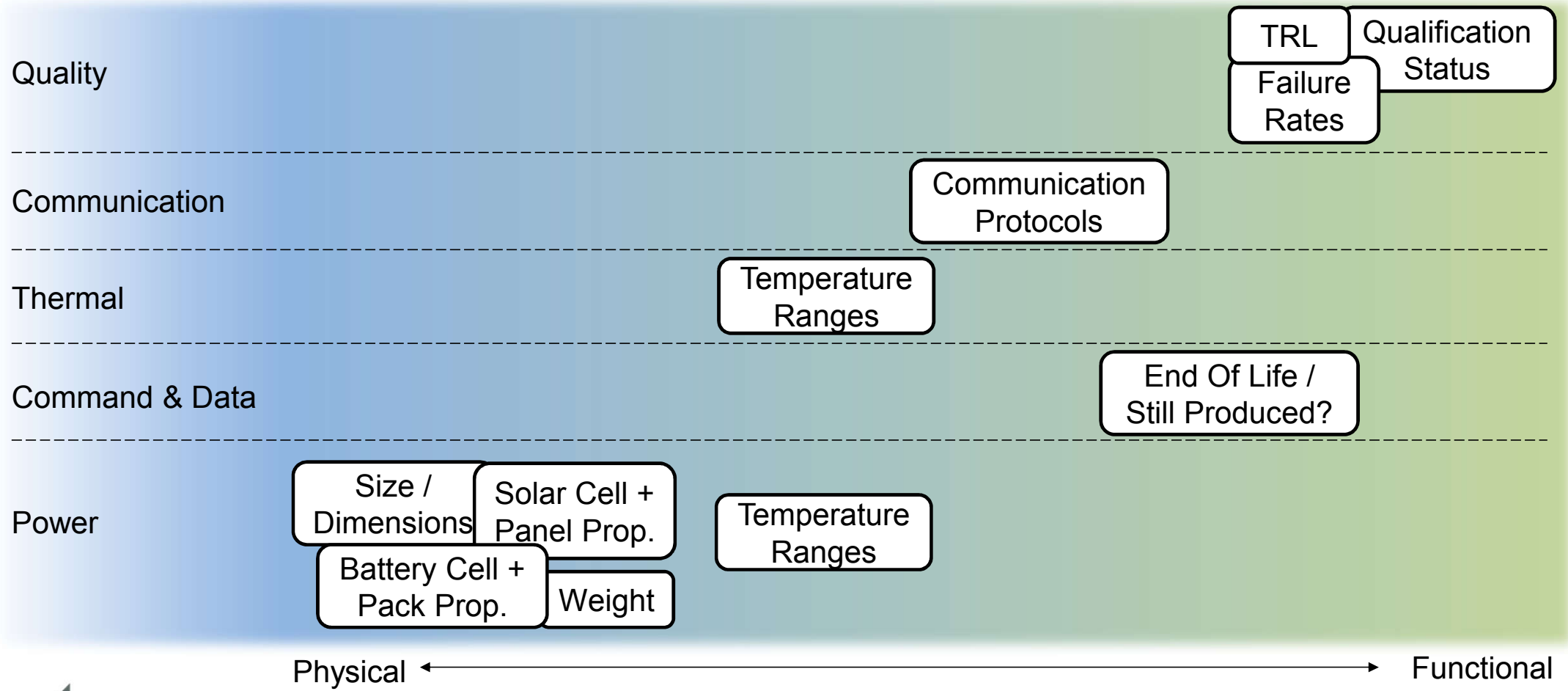
We Need: Replacement For PDF & Others



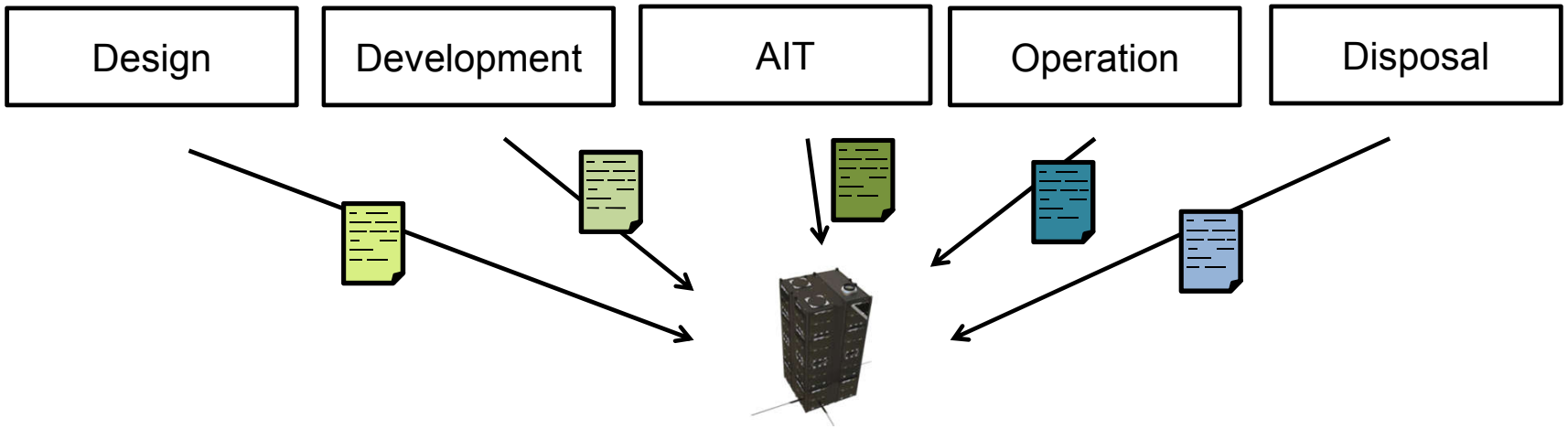
Requirements for exchange over platform:

- Machine readable
- Standardized / universal
- Automatically comparable
- All relevant parameters for one product

Relevant Parameters For Domains - Examples From Discussions



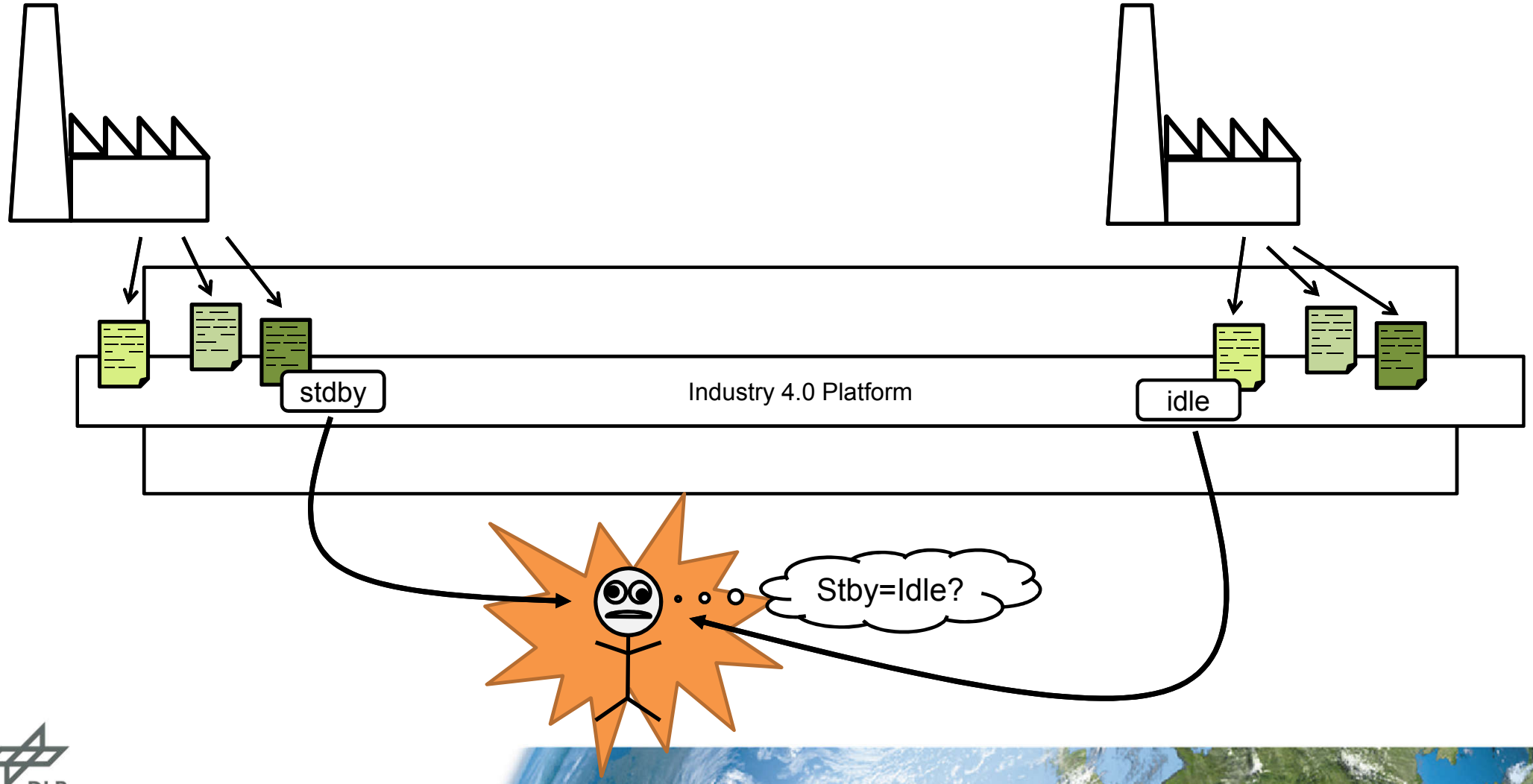
Relevant Parameters Along The Lifecycle



- Design: Mission Concept parameters for OCDT, VirSat, etc.
- Development: Preliminary PUS
- AIT and Operations with EGS-CC: TMTC, PUS, MIB, XTCE, CCSDS

EGS-CC: data from AIT should be reused for utilization
-> need to refer to the same product across different phases

One Common Semantic Understanding of Supplier Information



Potential Misinterpretation by Example: TWV640

Electrical ICD

"The TWV640 camera supports 30Hz and 60Hz frame rates. The 30Hz and 60Hz mode can be offered as a switchable operating mode […]"

Table 7-2 8-bit YCbCr signal descriptions

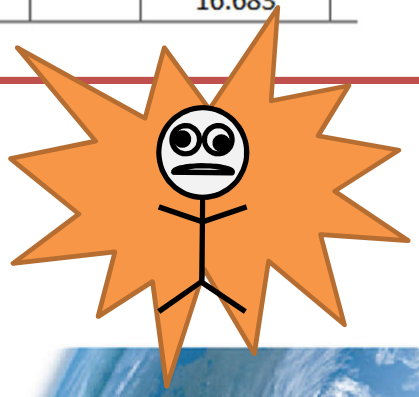
Timing Parameter	30 Hz			60 Hz		
	min	typ	max	min	typ	
T_{frame_active}		30.507			15.253	
T_{frame_blank}		2.860			1.430	
T_{frame_total}		33.367			16.683	

Software ICD

"The TWV640 supports 30 and 60 Hz frame rates […]"

Root Command: framerate

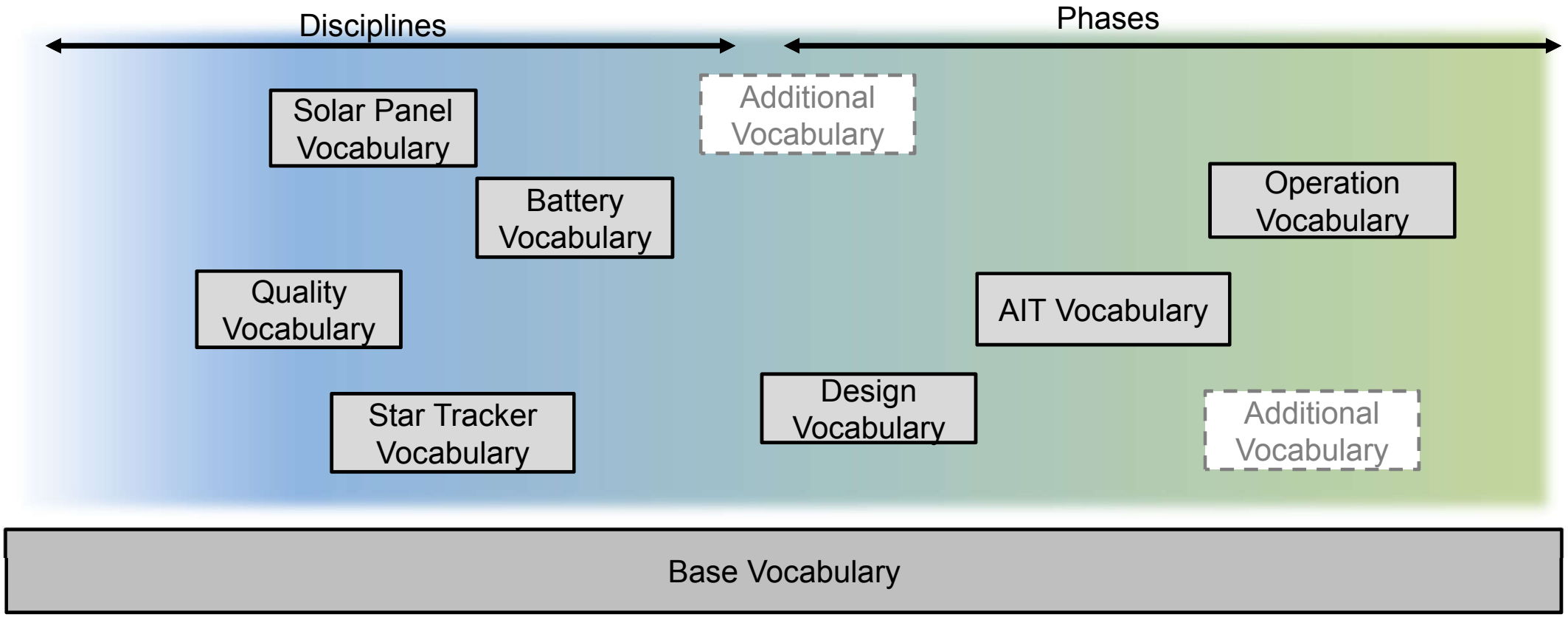
Subcommand	Argument	Description
default*	30 | 60*	Sets camera default frame rate to either 30 frames per second or 60 frames per second, does not change the current frame rate



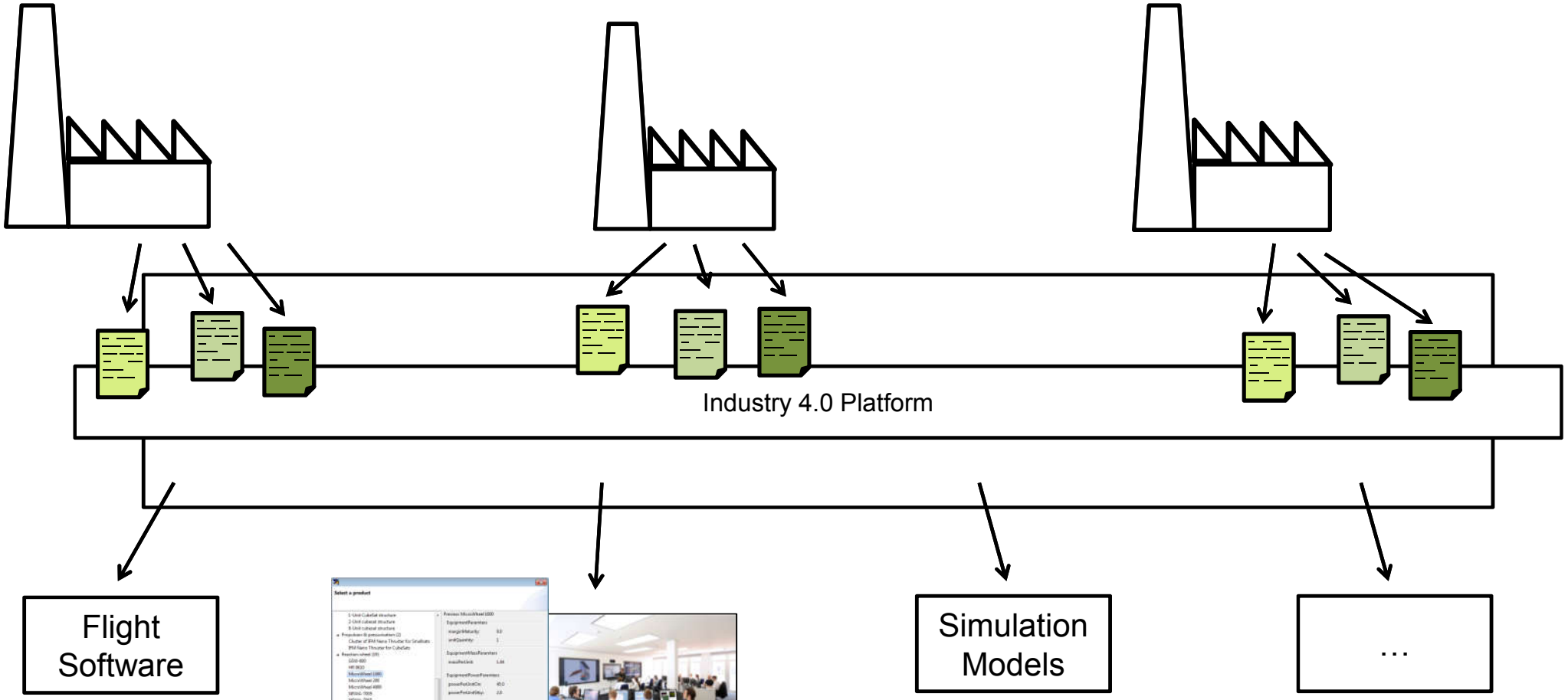
How to bring T_{frame_active} and the command *framerate* together? Is that even correct?

http://www.fairchildimaging.com/files/twv640_electrical_icd_revb_for_core_type_a_b_c_d_e.pdf
http://www.fairchildimaging.com/files/twv640_software_icd_revb_1606.pdf

One Common Understanding Based on Modular Vocabularies



This is Also Applicable for Simulation, OBSW Development and Many More



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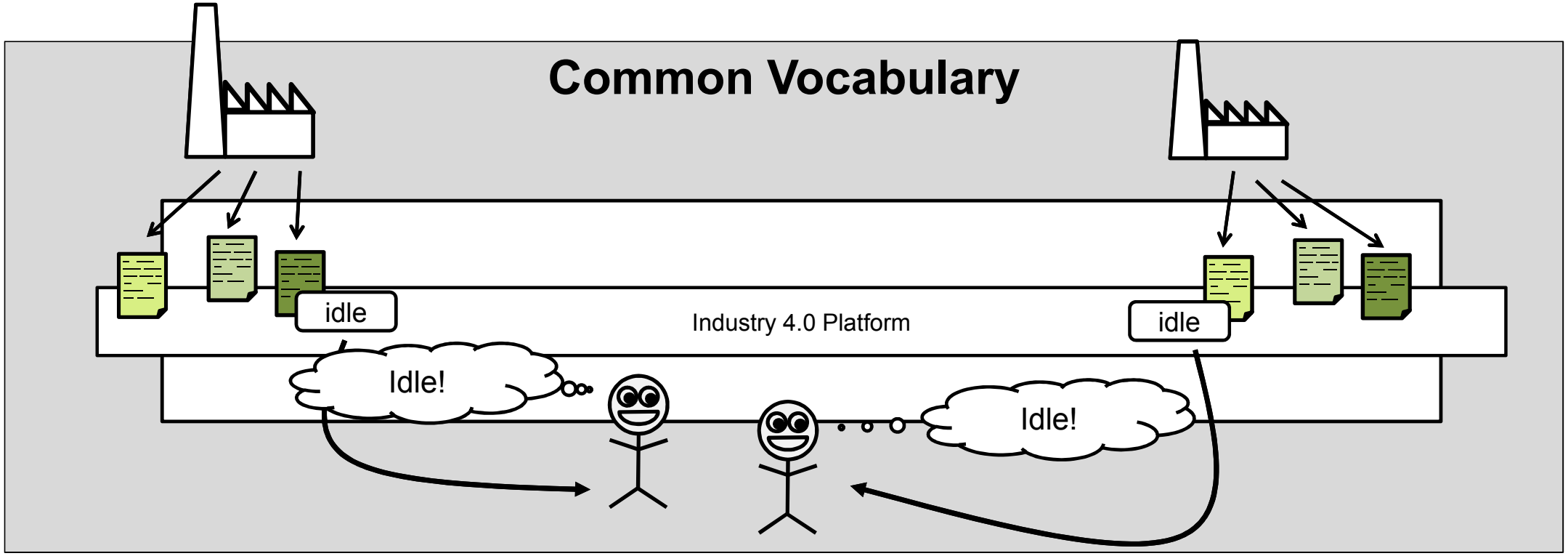

What is needed:

- Domain knowledge for capturing relevant parameters, units, …
- Technical solution requires a serious progress on ontologies in spacecraft design.
- There are probably more / **YOUR** use cases!

Thank you for your attention!
Questions?

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