MoSSEC and the importance of metadata interoperability in a future sustainable and connected world

Kyle Hall AIRBUS

The puzzle only makes sense when all of the pieces fit together

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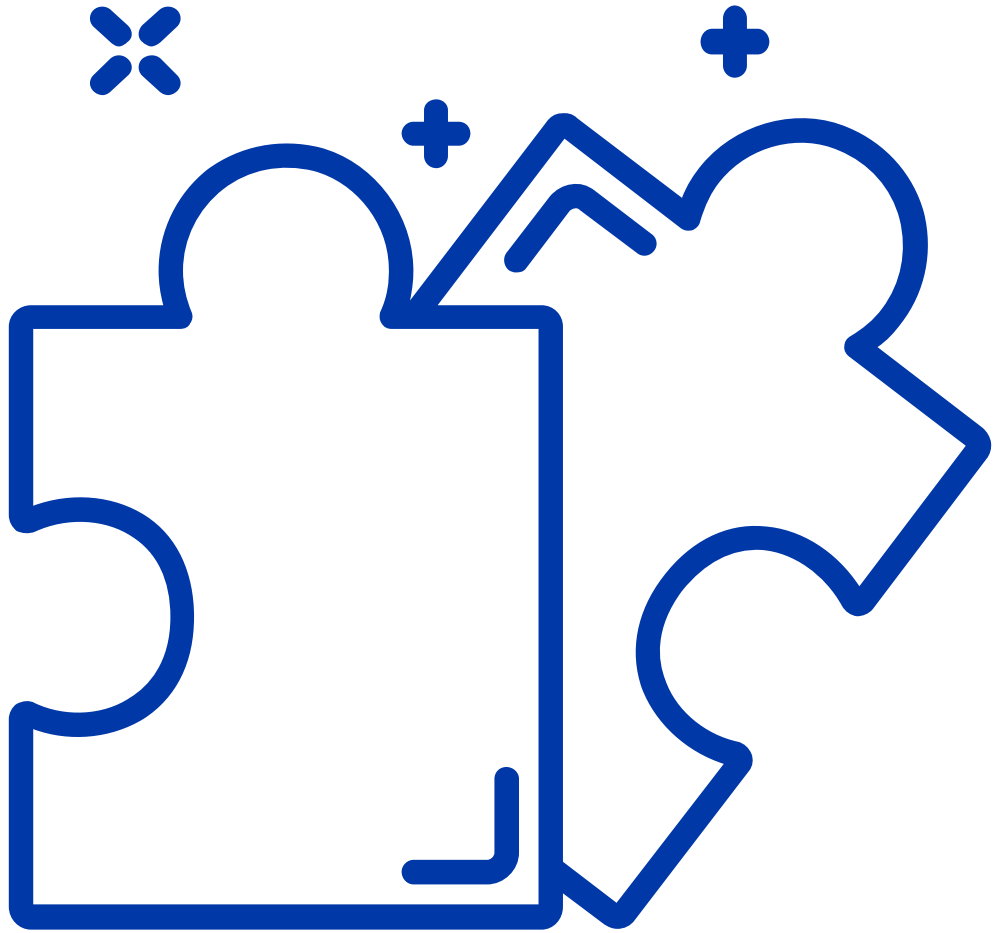

Kyle Hall

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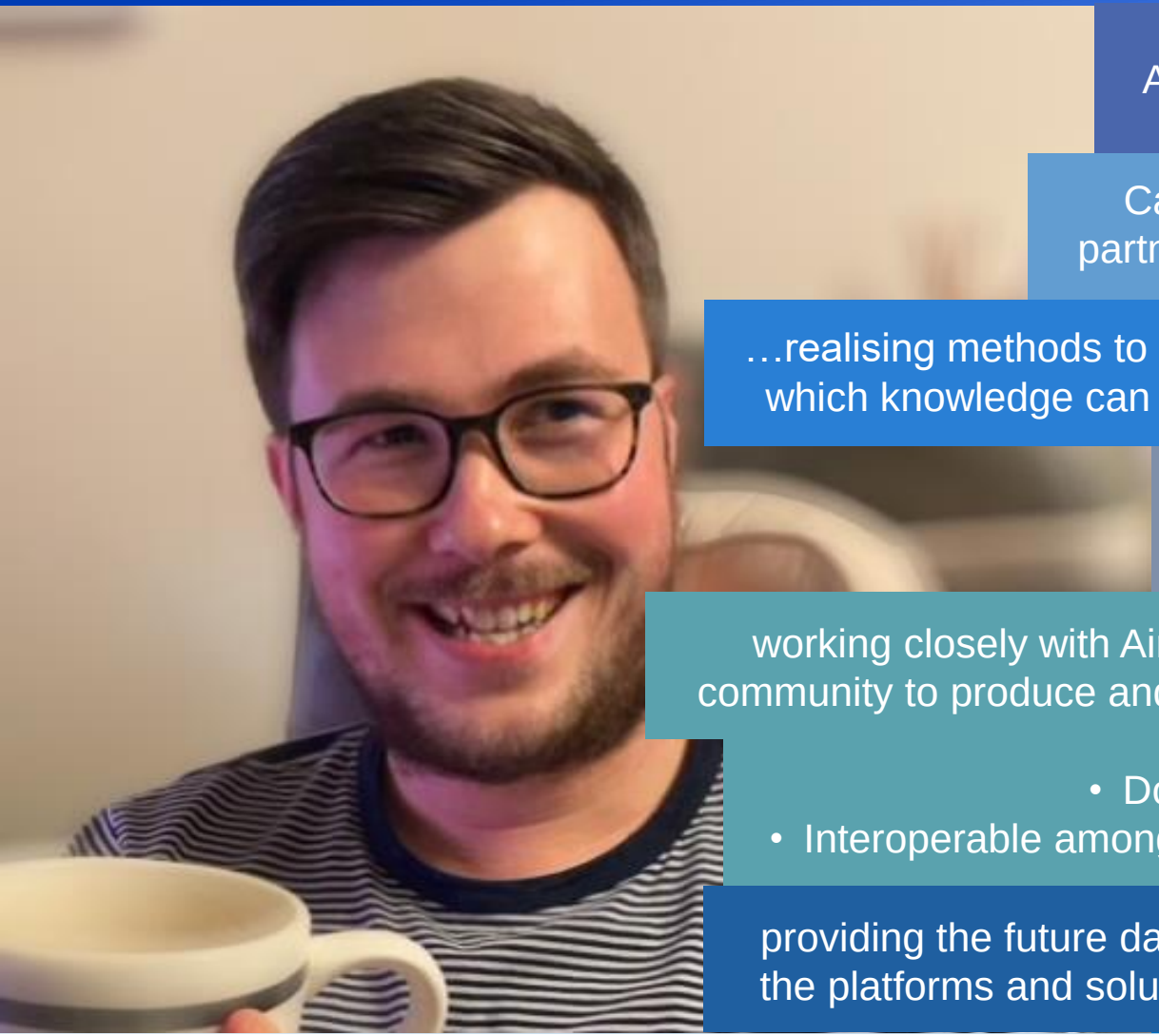

Airbus lead for ISO 10303-243 (MoSSEC)

Career working closely with international partners across industries and academia…

…realising methods to digitise and transform the ways in which knowledge can be made accessible to machines.

Current role as an Airbus Data Driven System Engineer…

working closely with Airbus' digitalisation transformation community to produce and procure solutions that are both:

- Domain specific to Airbus domains
- Interoperable amongst teams, systems and partners

providing the future data framework capability to develop the platforms and solutions that are yet to be envisioned.

The DIKW pyramid

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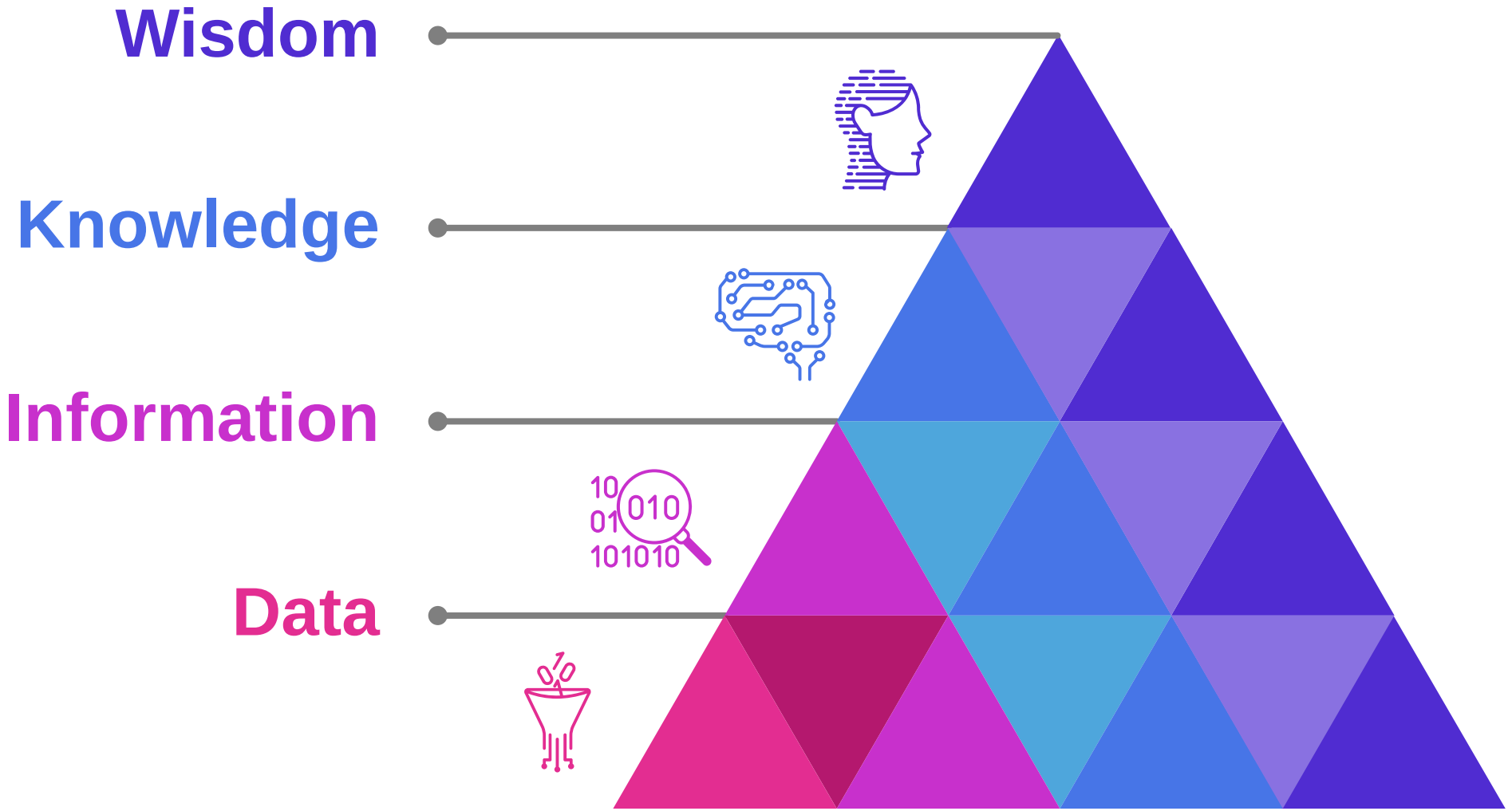

The DIKW pyramid

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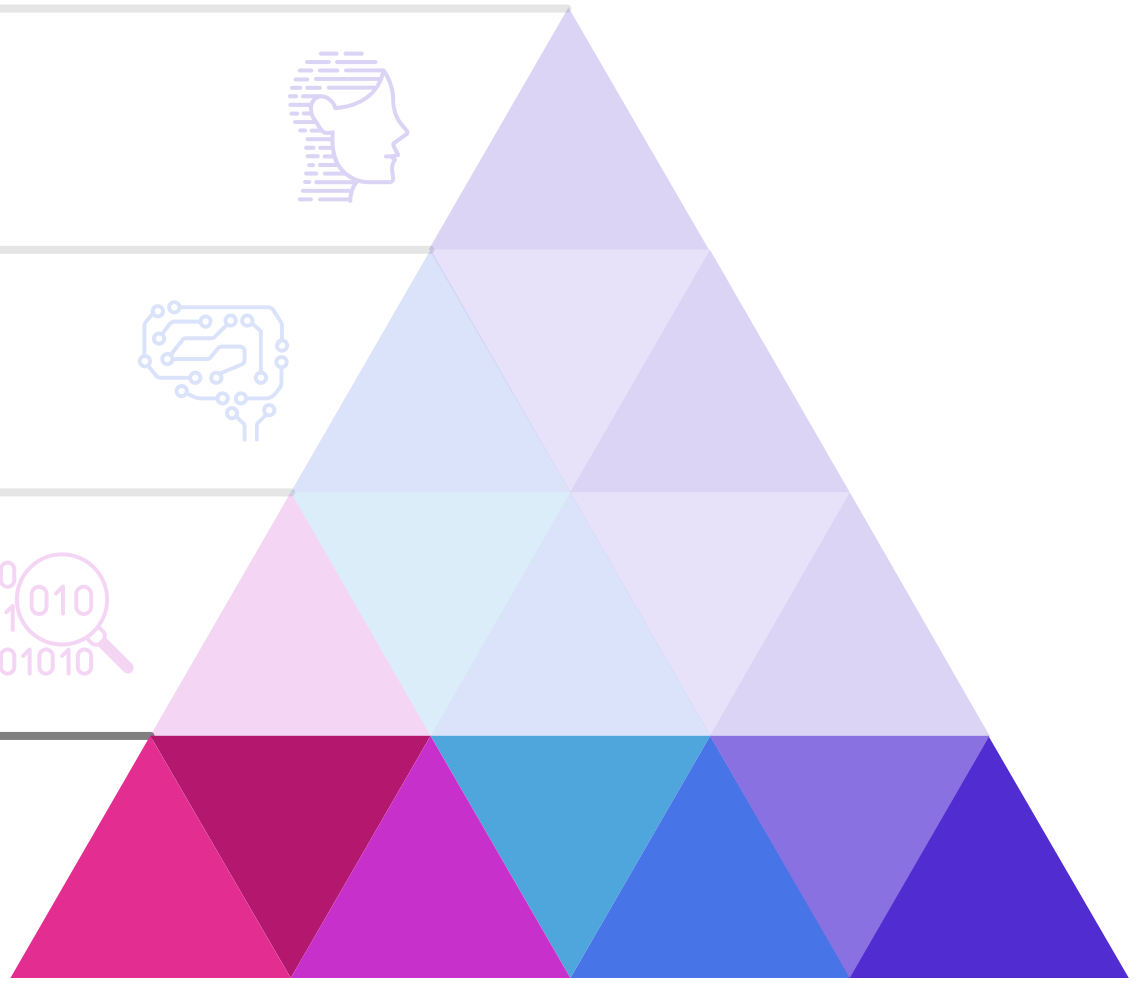
Wisdom

Knowledge

Information

Data

Raw facts and figures



The DIKW pyramid

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Wisdom

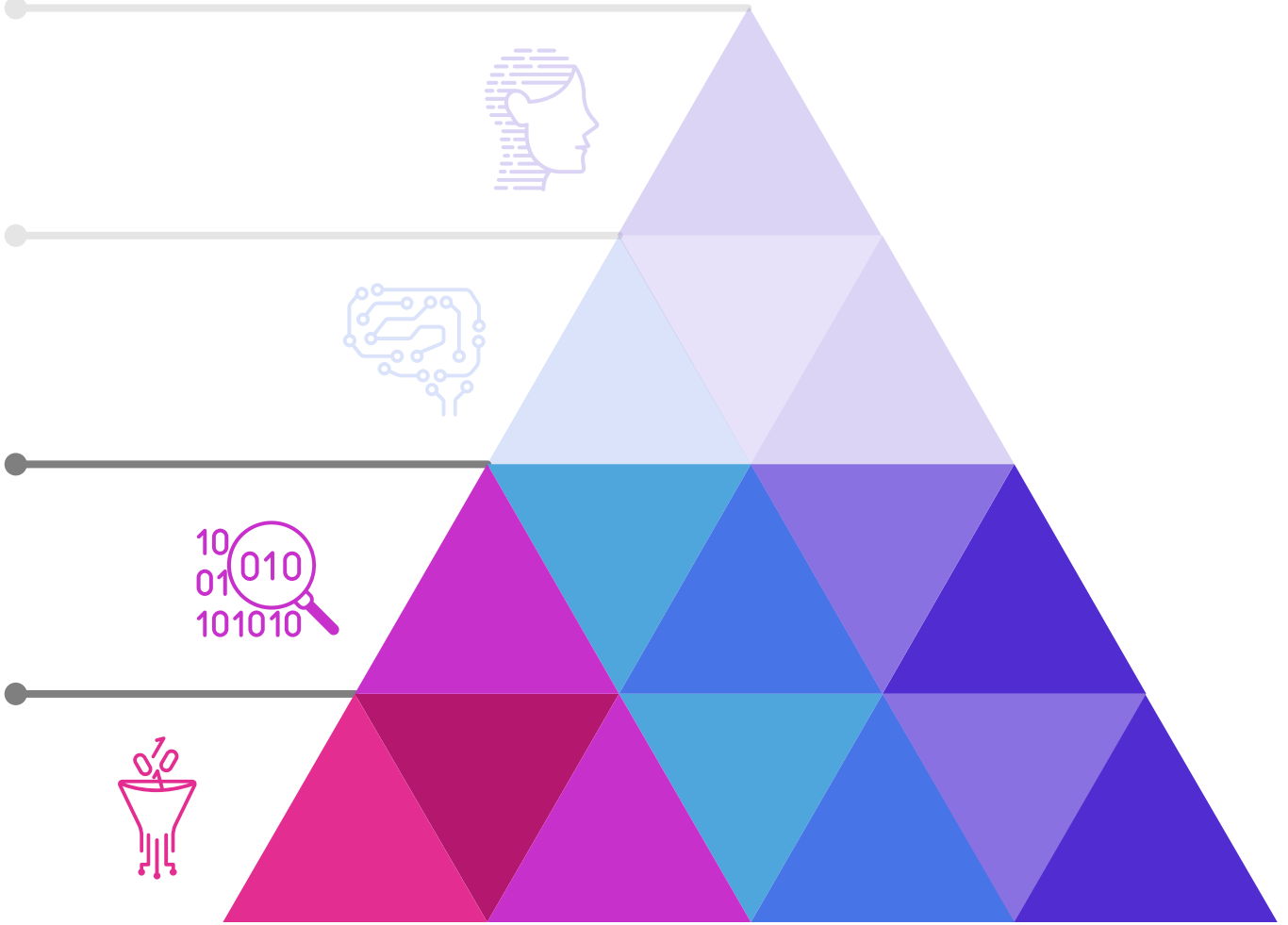
Knowledge

Information

Contextualization of Data

Data

Raw facts and figures



The DIKW pyramid

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Wisdom

Knowledge

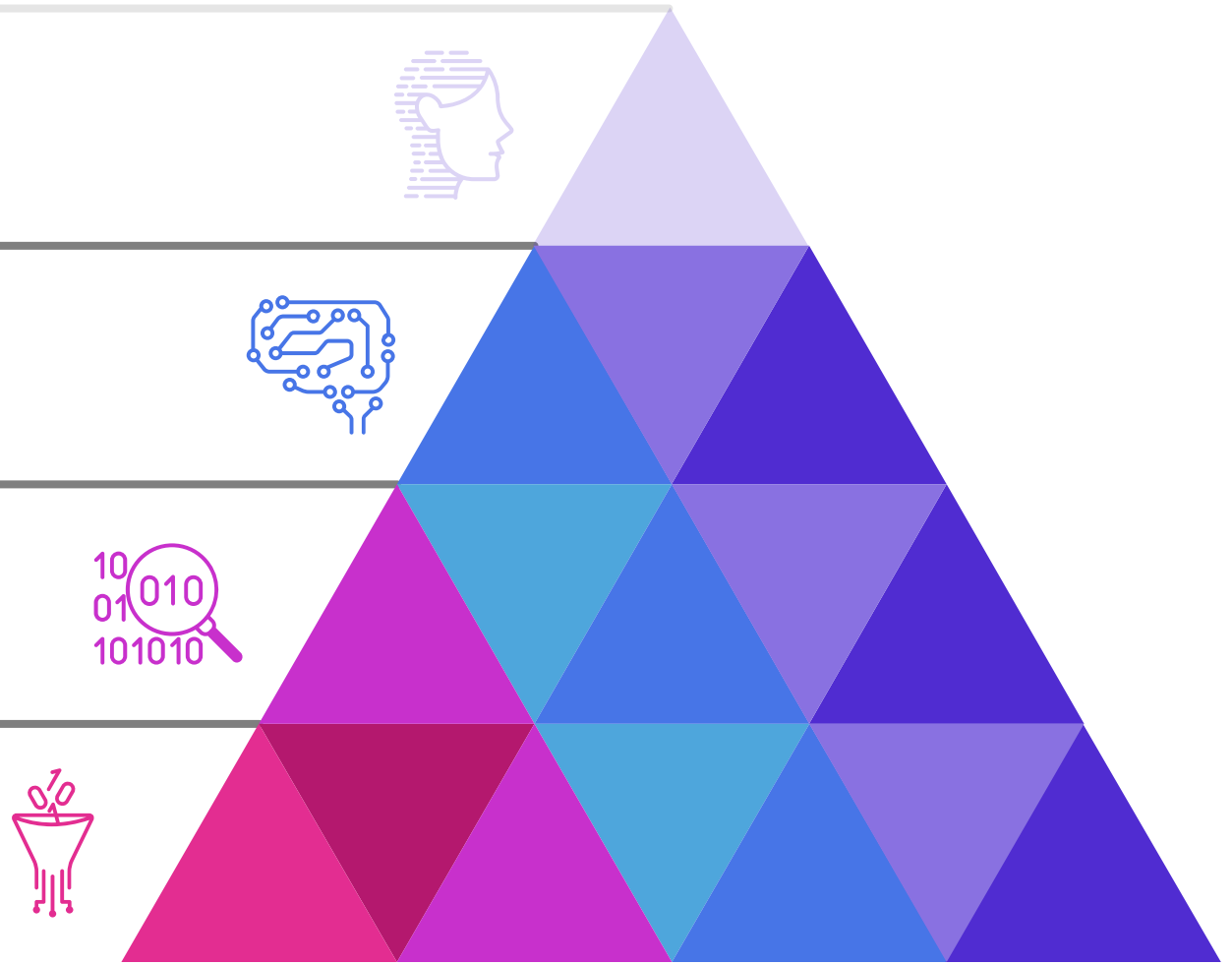
Understanding of Information

Information

Contextualization of Data

Data

Raw facts and figures



The DIKW pyramid

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Wisdom

Application of Knowledge

Knowledge

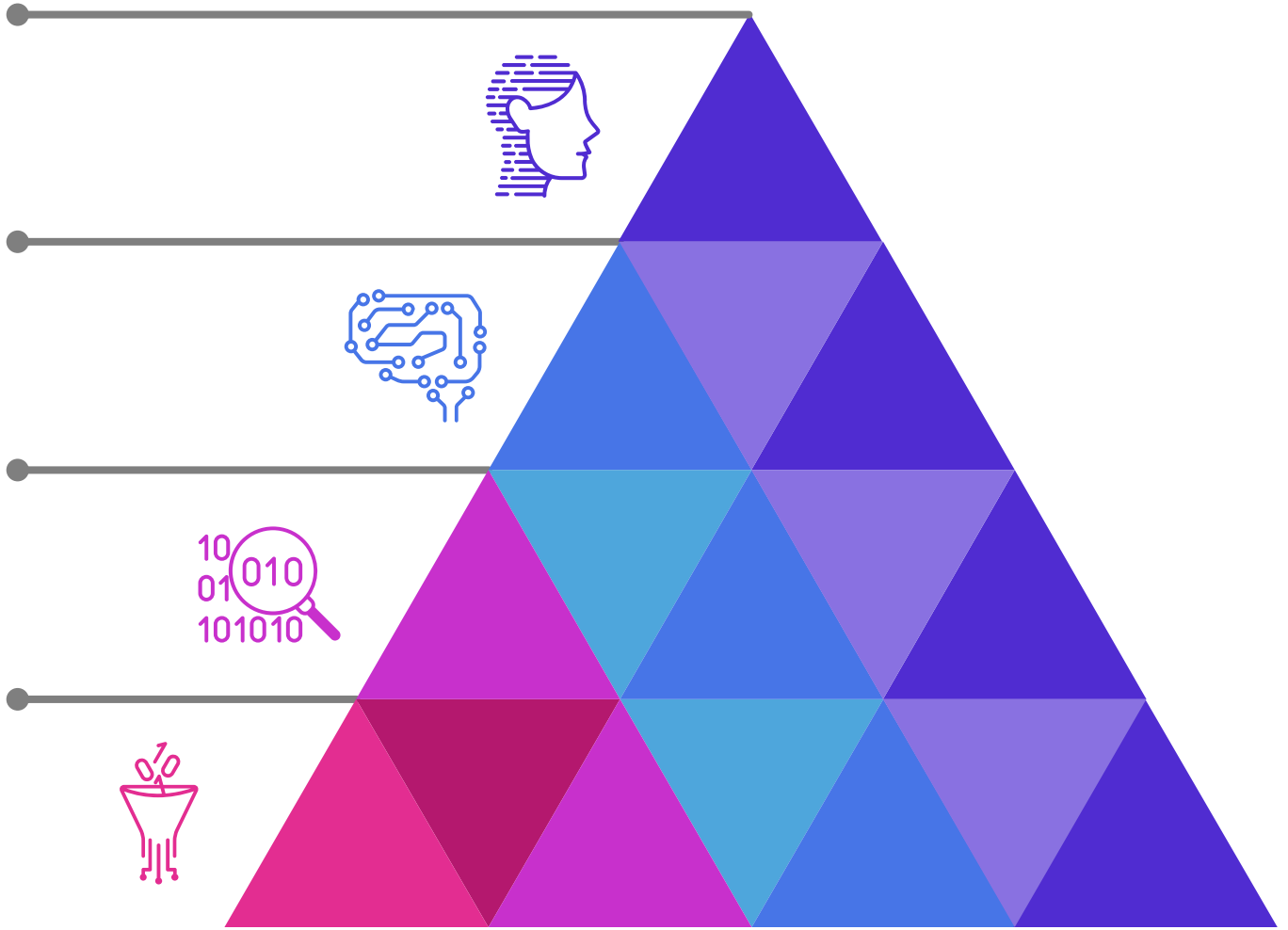
Understanding of Information

Information

Contextualization of Data

Data

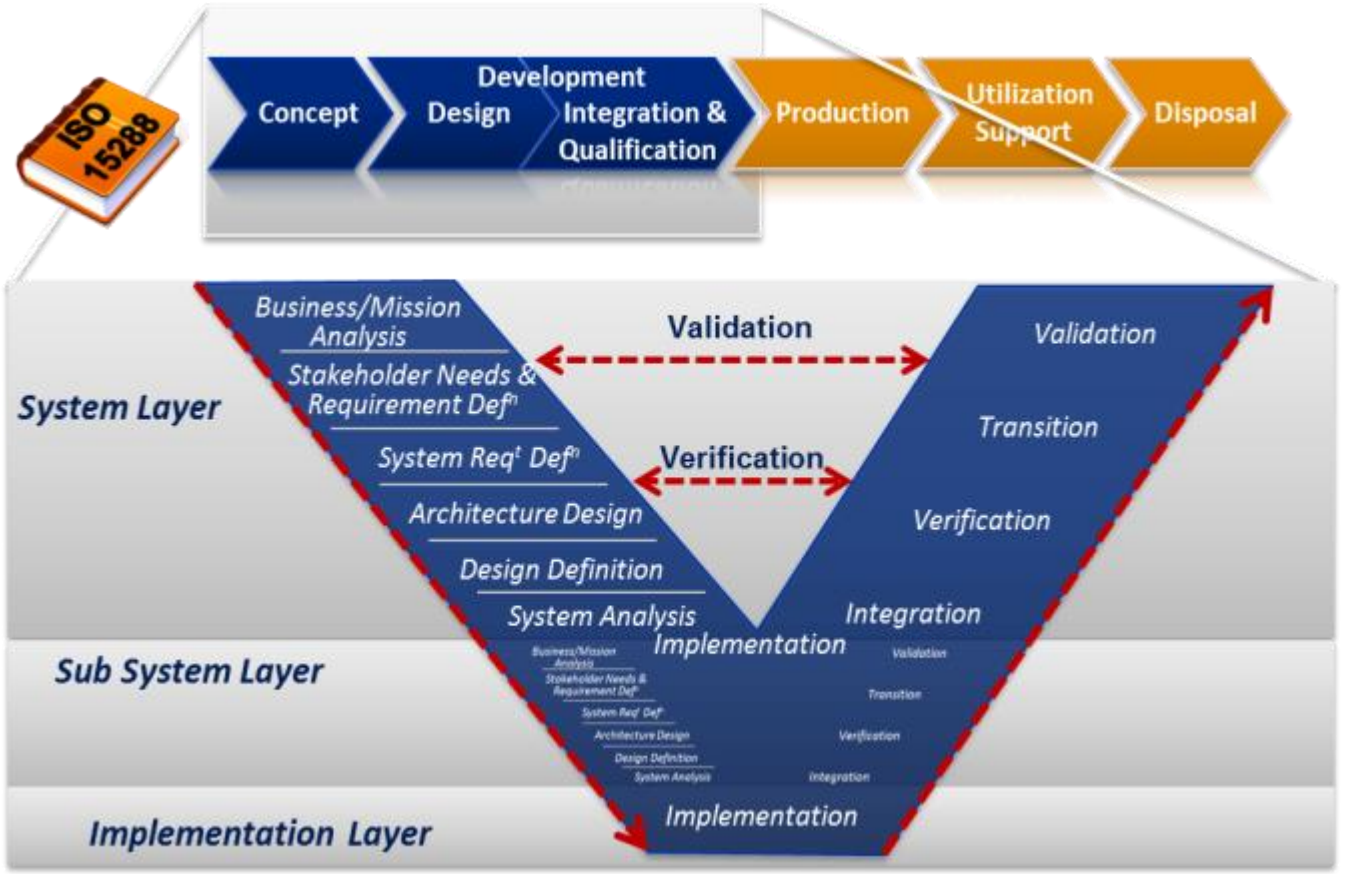
Raw facts and figures



Gaining an understanding

In a well established System Life cycle process, at each stage, a business typically requires that:

- Experts understand their roles
- Experts have access to the tools and knowledge to fulfill their roles
- Experts provide sufficient knowledge for their leaders to make decisions

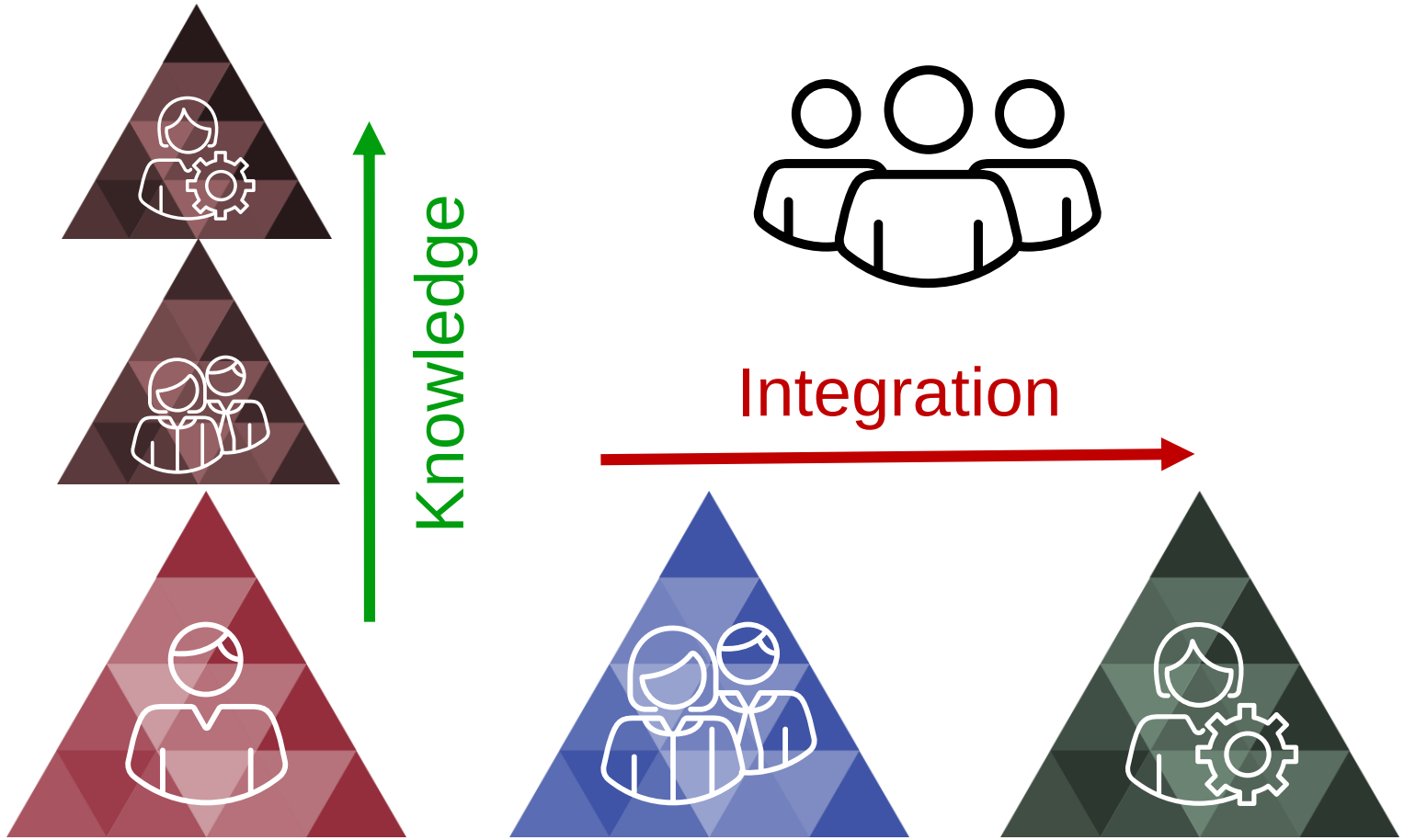


Gaining an understanding – Decision makers

Experts typically understand their role specific to their domain

These experts have their own tailored set of processes, and generate clusters of domain-specific knowledge

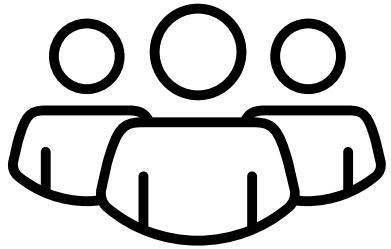
The knowledge flow is vertical, limiting horizontal integration

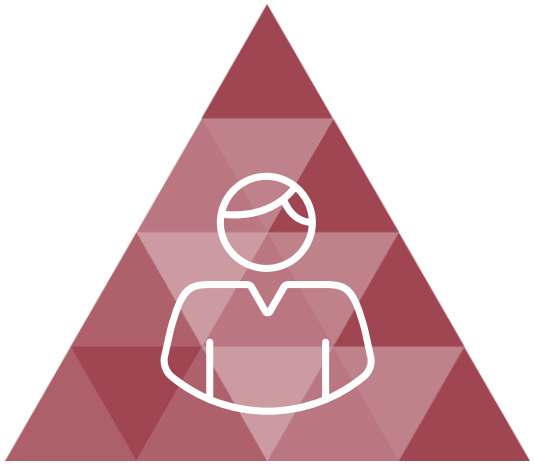


Gaining an understanding – Decision makers

Because of this isolation, data processes are:

- constrained to the domain's methodology
- knowledge sharing is impeded
- processes across the system ***can*** be unnecessarily duplicated
- ultimately results ***can*** be sub-optimal and inefficient

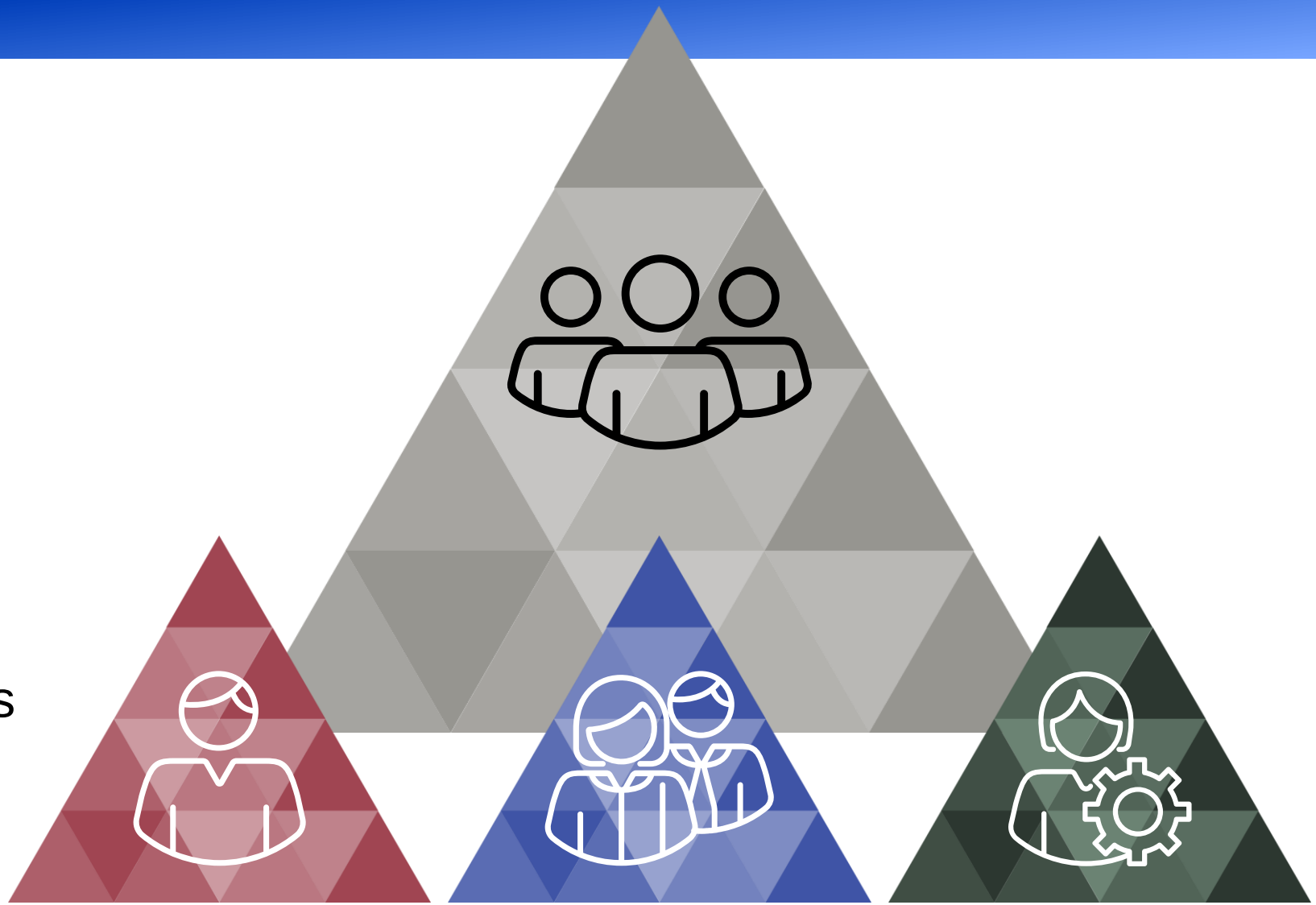




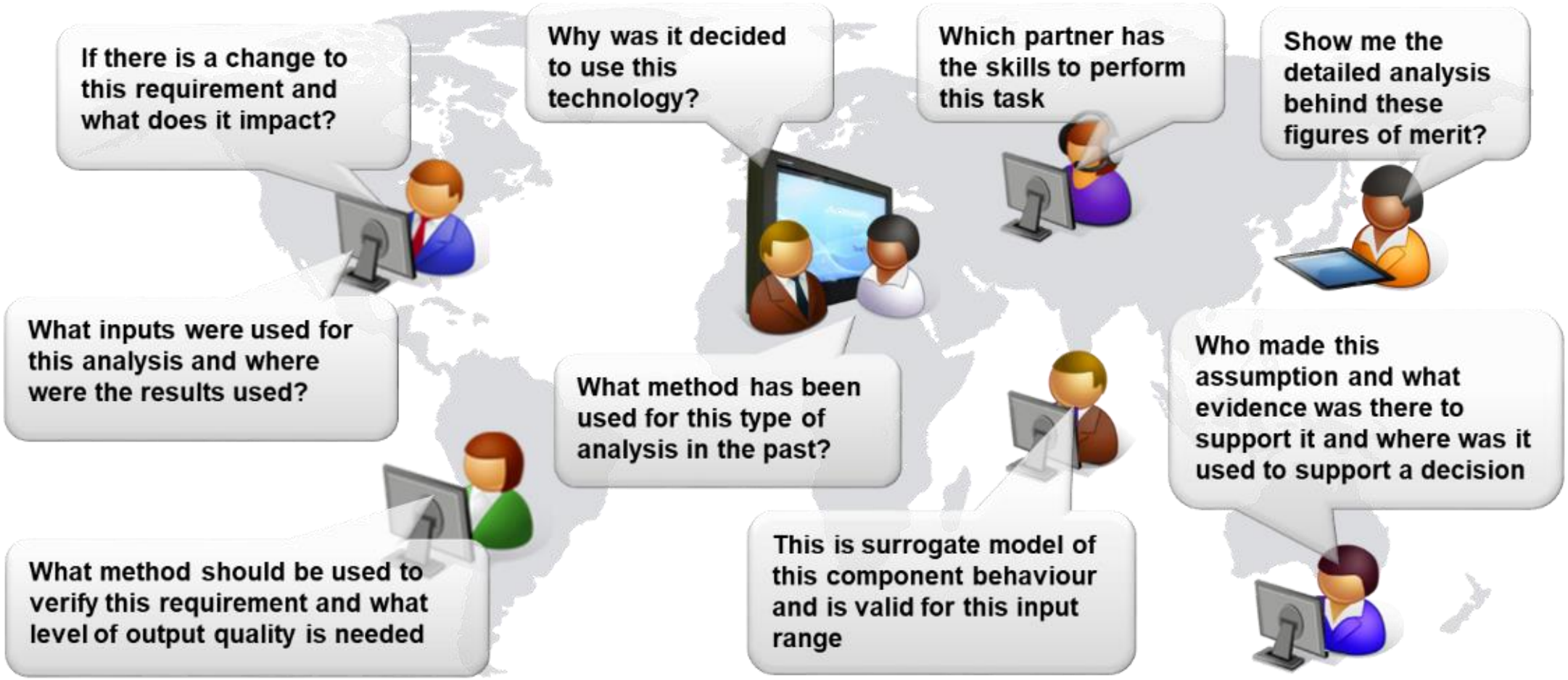
Gaining an understanding – Decision makers

The result of this disconnect culminates in often severe pain points in:

- understanding the knowledge available within the global system
- a limited understanding of previous studies, thus leading to repeated analysis
- challenges when migrating from legacy systems



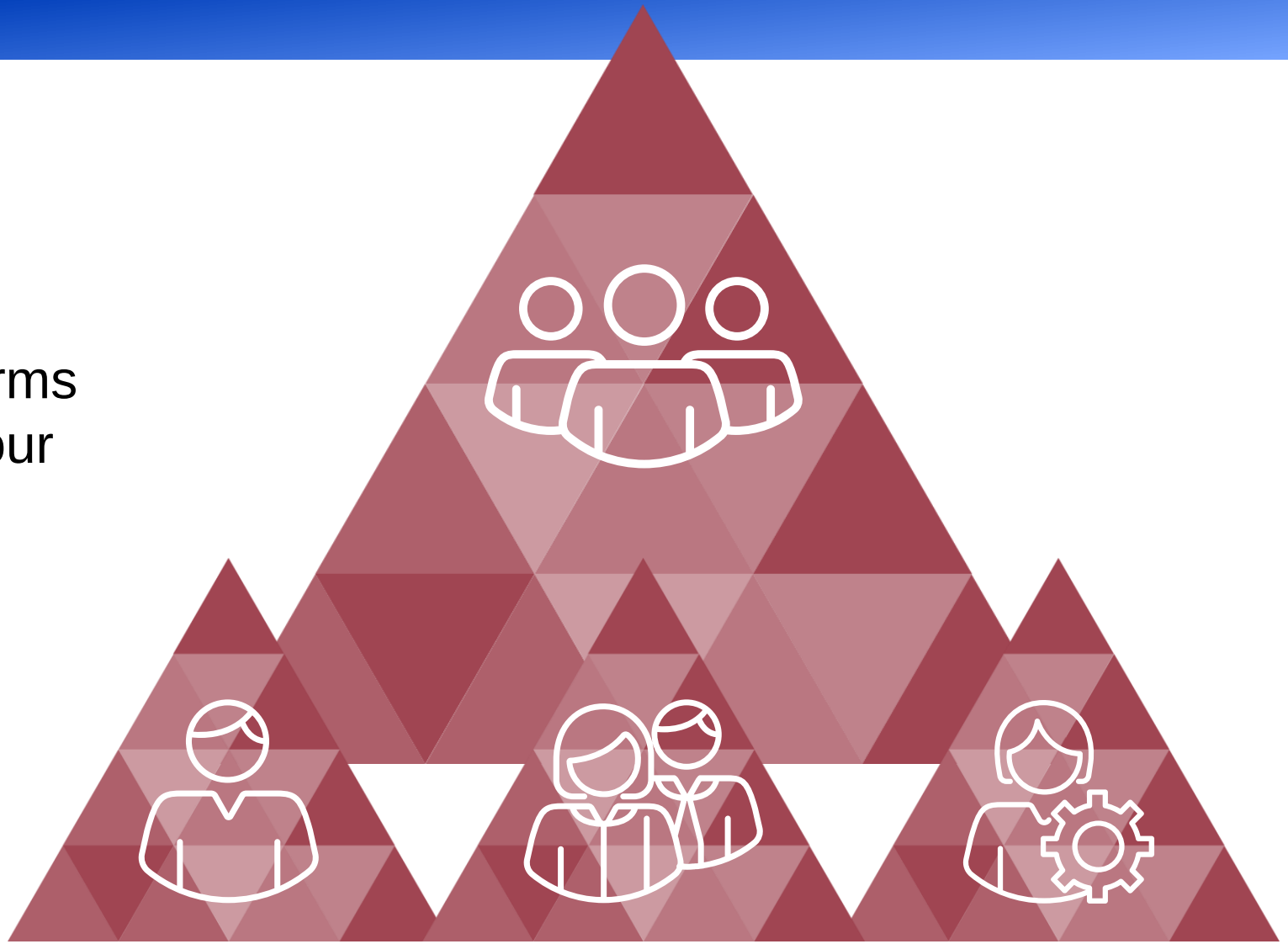
The typical questions that decision makers ask, where the information needed to answer the questions comes from multiple platforms, domains and organizations.



Gaining an understanding – Decision makers

So we enforce the same platforms for managing our data across our business?

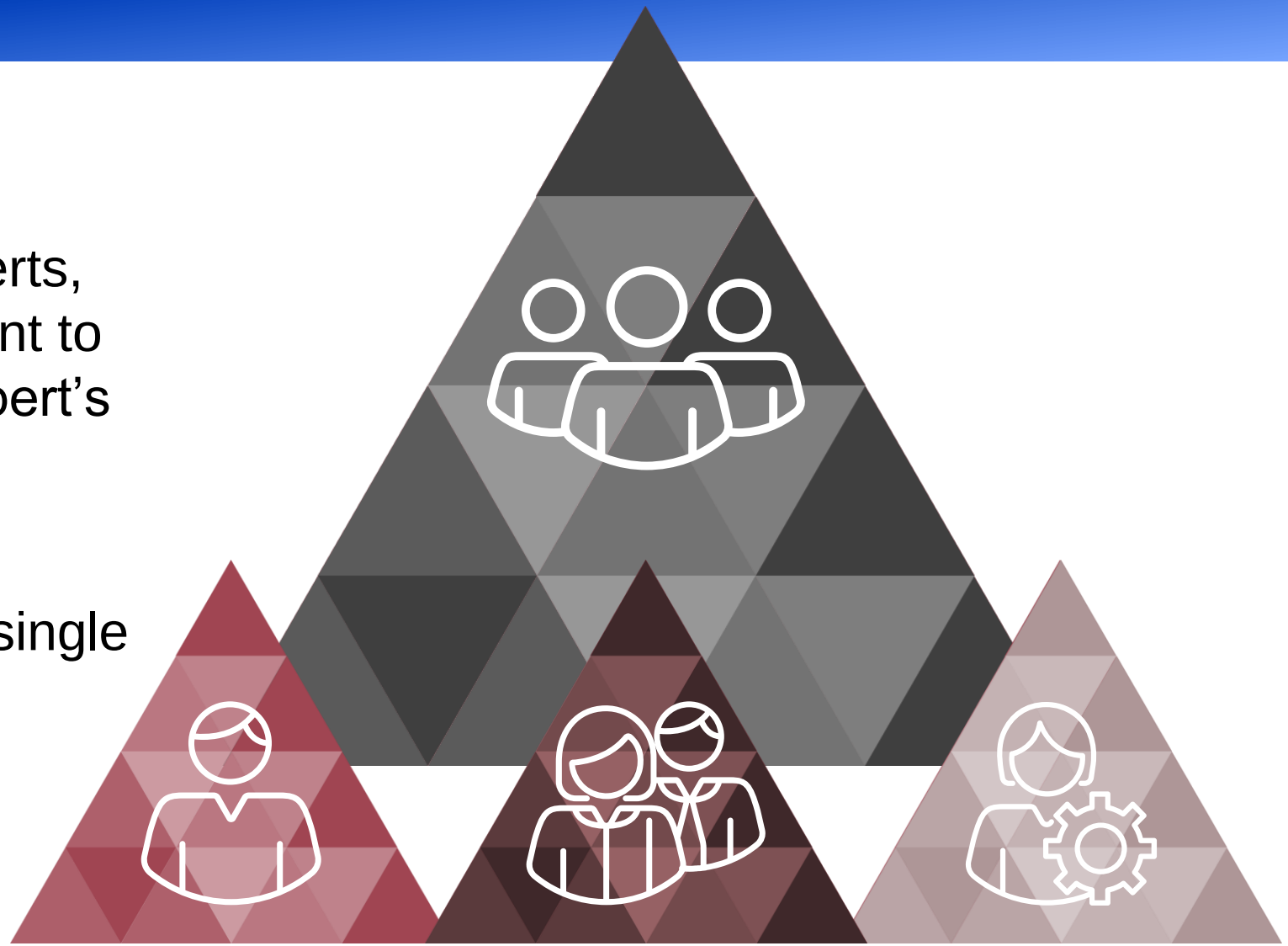
No.



Gaining an understanding – Decision makers

A single tool/ platform means:

- A sub-optimal environment attempting to cater to all experts, requiring significant investment to configure according to an expert's requirements
- Restricting opportunities for innovation – constricted to a single tool and provider
- **No** extended enterprise collaboration without the tool / platform



Gaining an understanding – Decision makers

The solution is to define a common framework for recording and sharing the context of data, to:

- understand the information throughout the **full** system life cycle
- promote knowledge sharing between domains, irrespective of the platform
- enable experts to collaboratively deliver optimal solutions

Gaining an understanding – The connected expert

Knowledge accessible as a global resource

Systems have a global understanding of the knowledge available to them.

Unobtrusive

No extra responsibilities on the experts.
Legacy tool support available.

Time Saving

The system should facilitate real, quantifiable savings in time and cost for the expert to ensure their support.

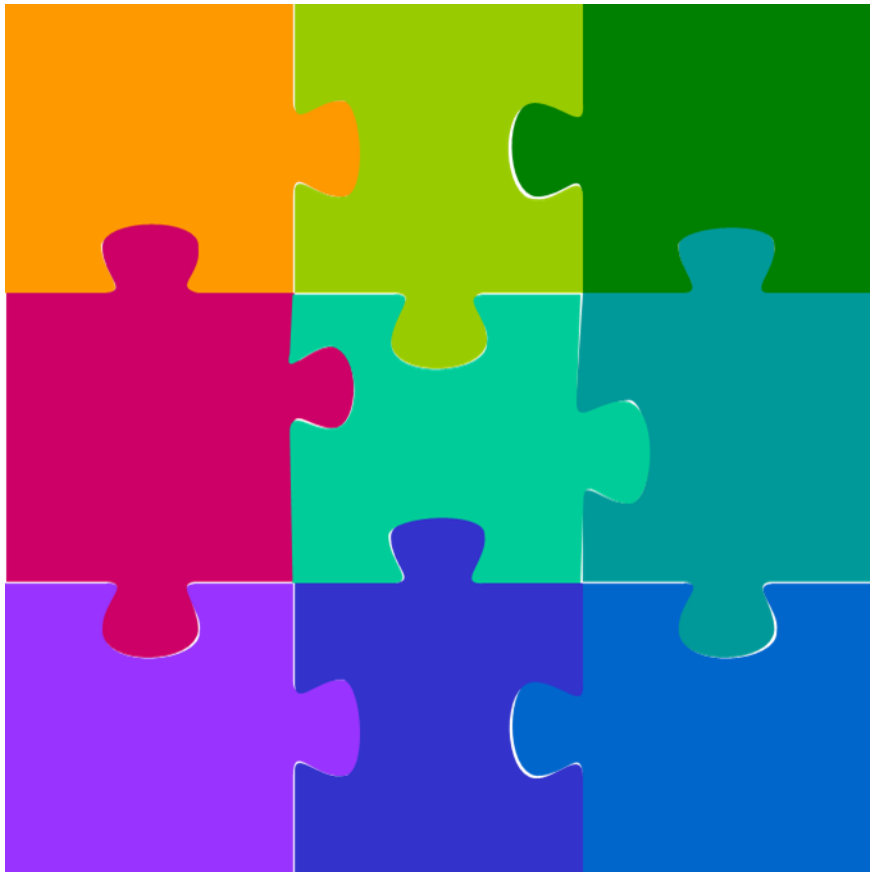
Simplicity

Connections between teams should “just work” – Setup once and forget.

MoSSEC (ISO 10303-243)

Modelling and
Simulation information in a collaborative
Systems
Engineering
Context

An ISO STEP standard to improve decision making for complex products.



Enter MoSSEC (ISO 10303-243)

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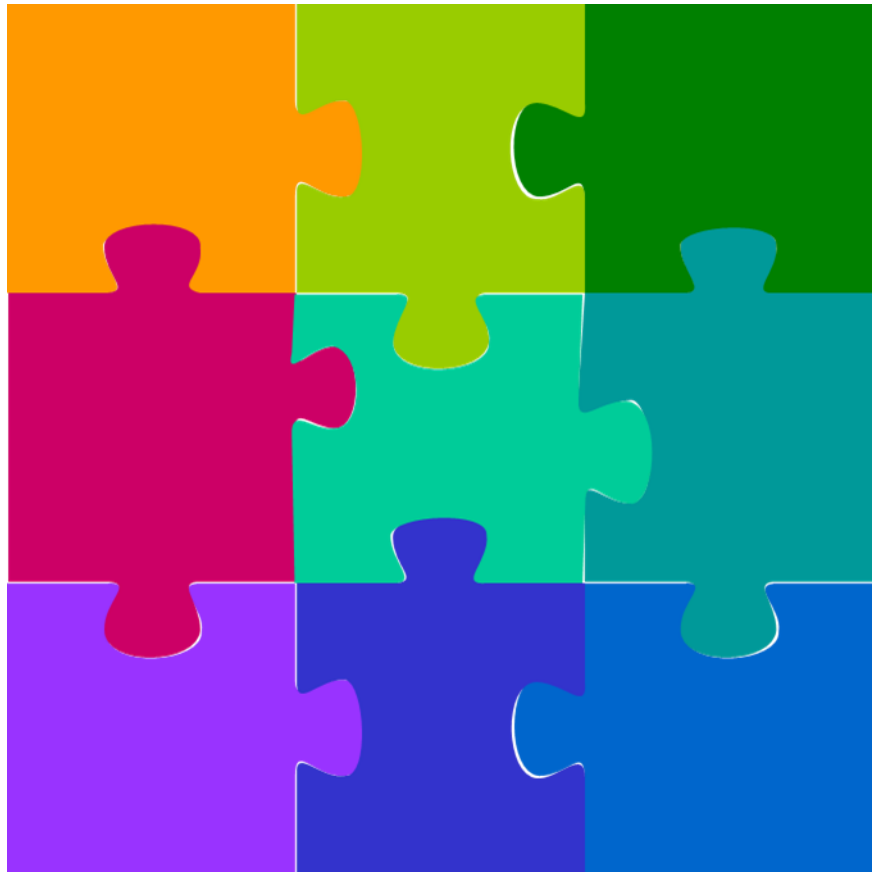
Defining the data structure for recording contextual ‘metadata’

Enabling knowledge to be recorded from subject experts into a machine interpretable metadata framework,

Thus facilitating the optimisation of decision making processes within a collaborative multi-company, discipline, platform, etc. system.



Enter MoSSEC (ISO 10303-243)

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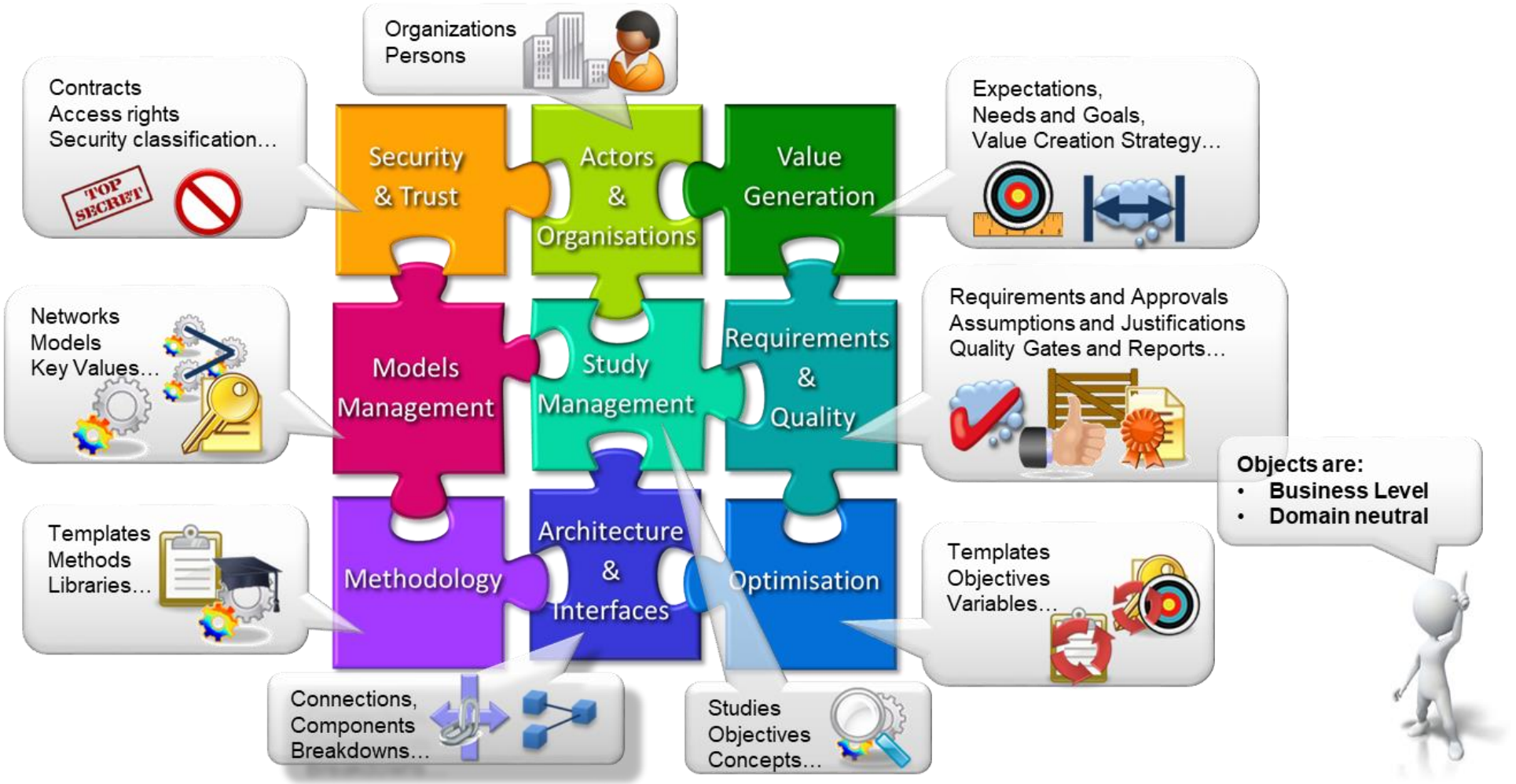

Enter MoSSEC (ISO 10303-243) – “Model Instance” context illustration

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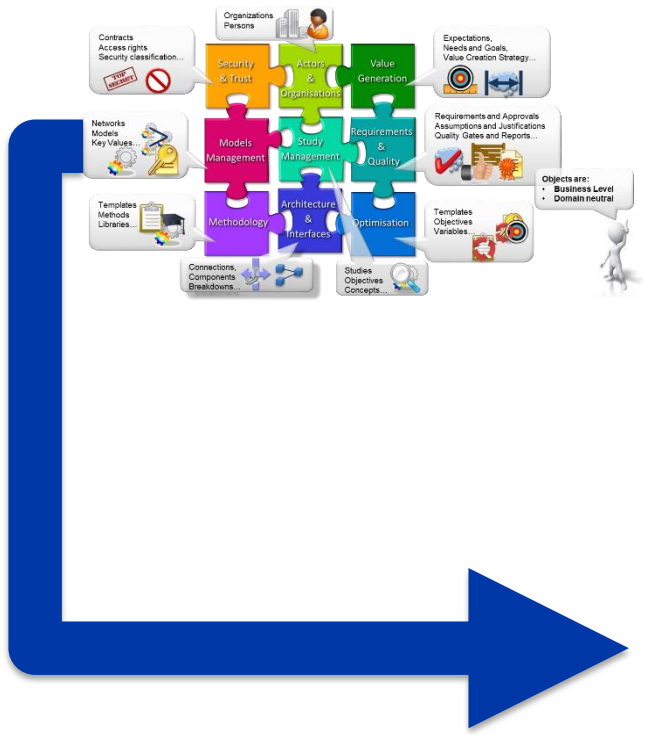
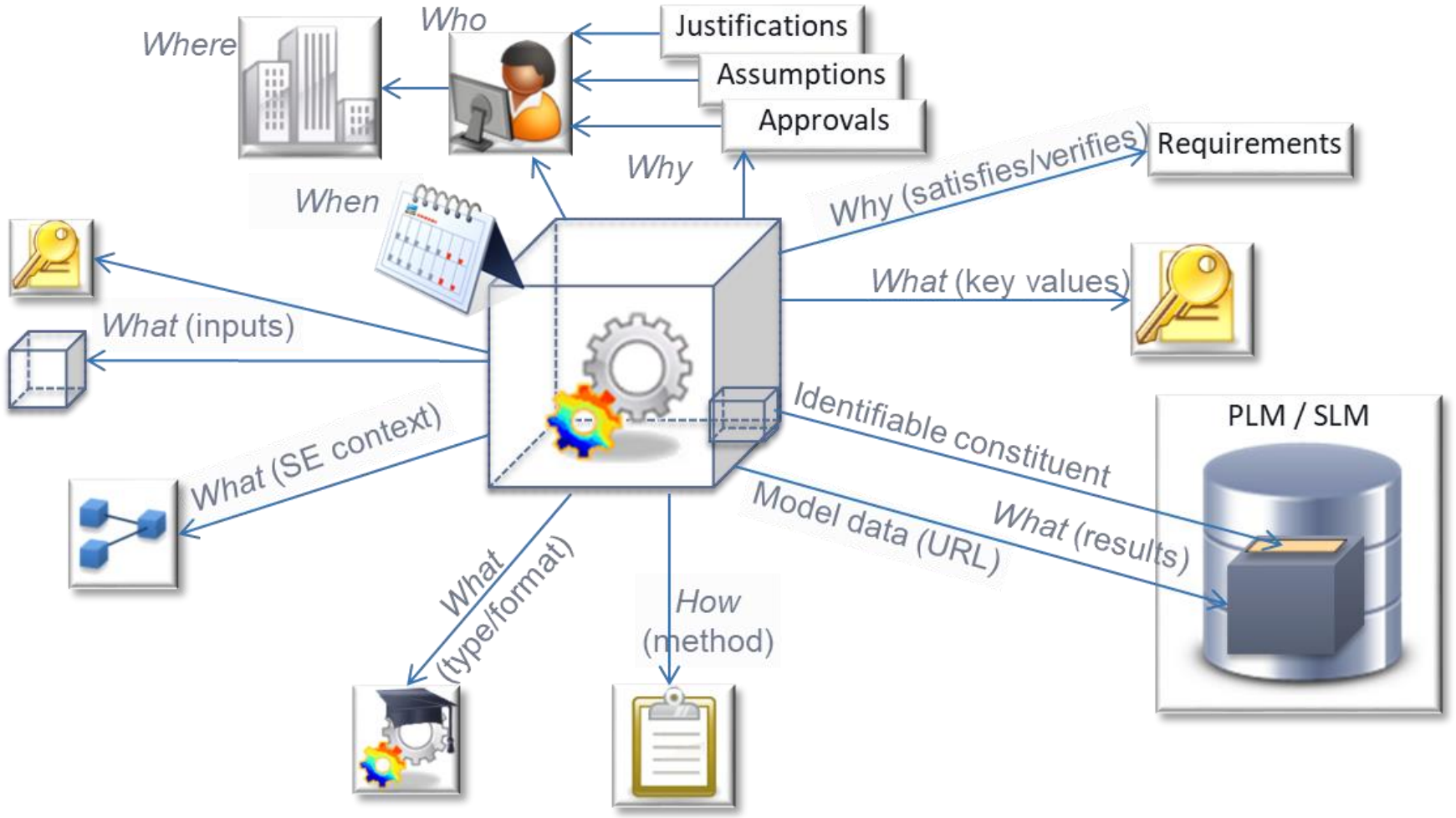
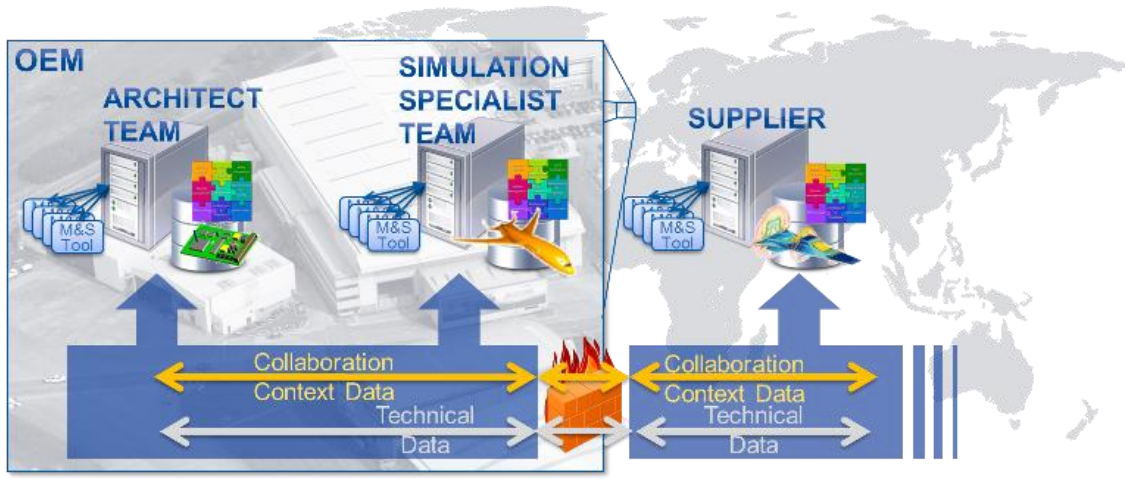




Product Lifecycle Management platforms and MoSSEC

There are mature PLM platforms in the marketplace that manage traceability, however the distinguishing feature of the traceability targeted by MoSSEC is the need for **interoperable** traceability between:

- **domain teams**
- **platforms**
- **organizations**

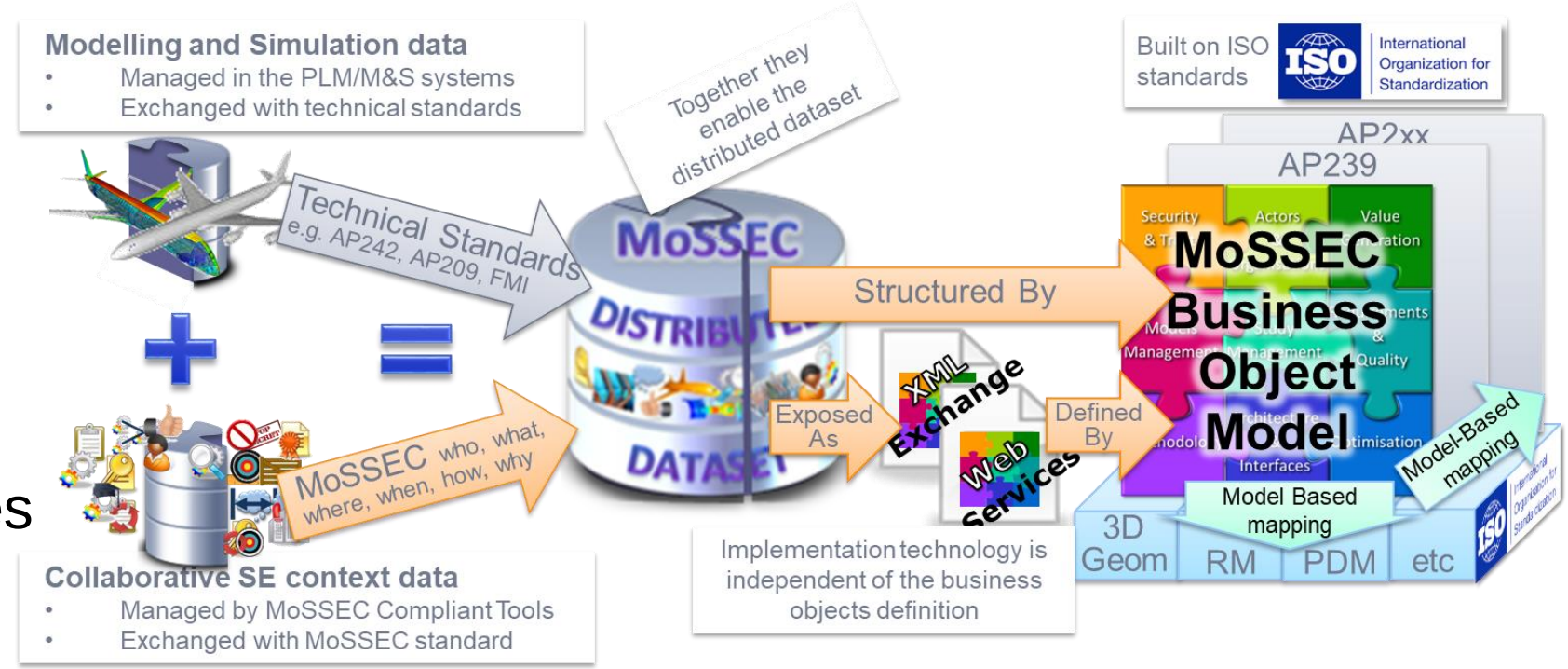


… ***permitting knowledge exchange irrespective of the platform***

Product Lifecycle Management solutions and MoSSEC

MoSSEC is the complementary standard to existing technical M&S standards capturing collaborative SE context data.

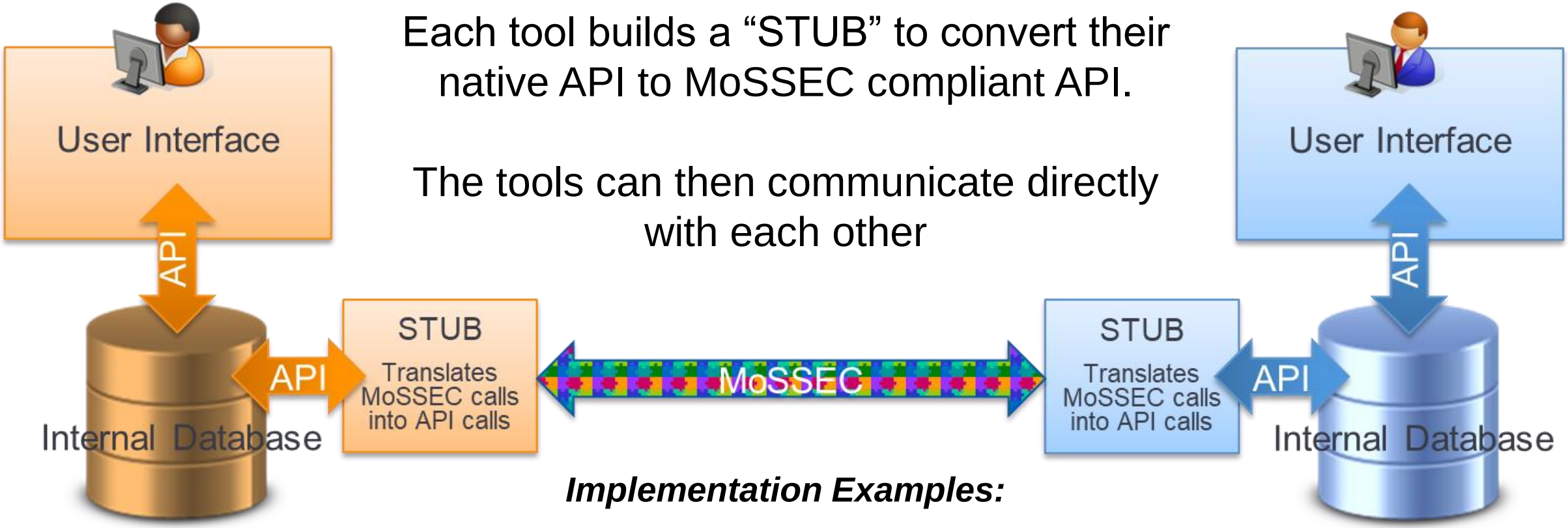
Combining the technical data with its context provides the MoSSEC Distributed Dataset or a *“150% model”*, to which queries can then be made.



The MoSSEC Web Service Direct Communication method

Each tool builds a “STUB” to convert their native API to MoSSEC compliant API.

The tools can then communicate directly with each other



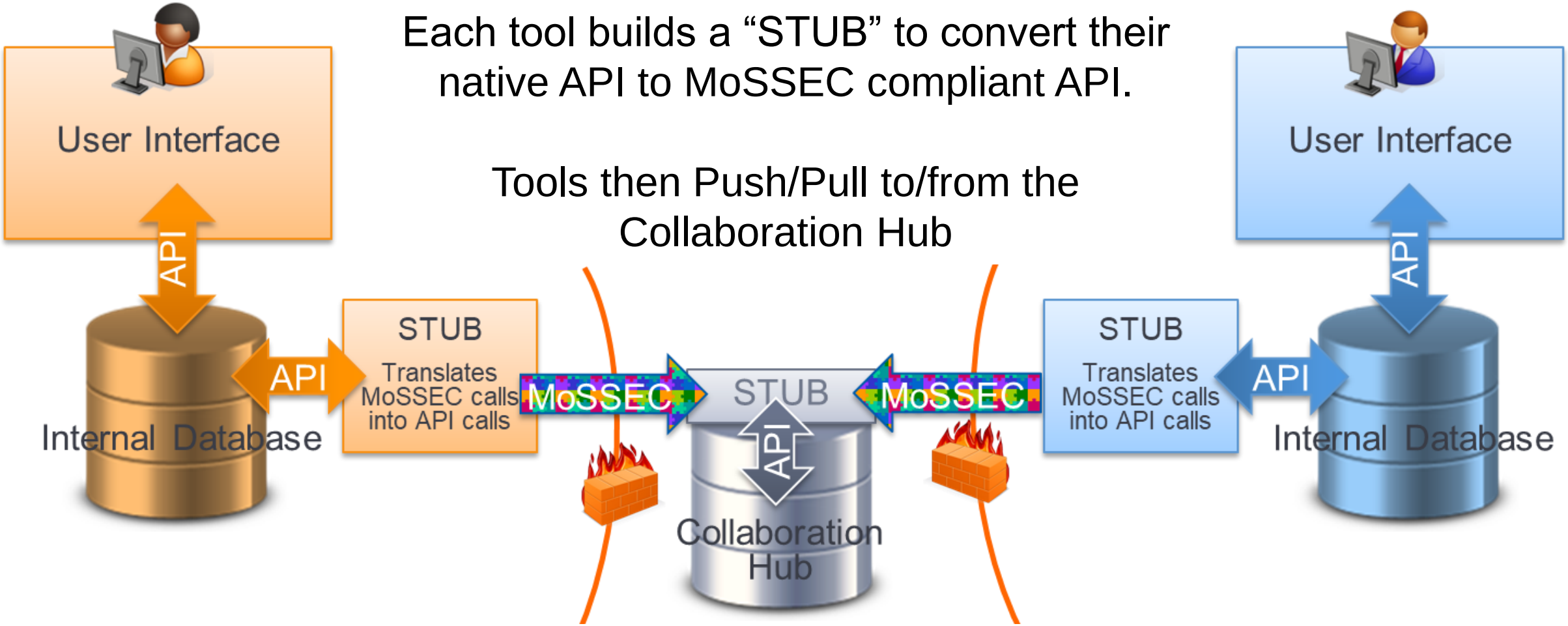
Implementation Examples:

3DX (Dassault Systèmes)	⟷	TeamCenter (Siemens)
3DX	⟷	SimManager (MSC)
Non COTS (various)	⟷	SimManager

The MoSSEC Web Service Intermediate Collaboration Hub method

Each tool builds a “STUB” to convert their native API to MoSSEC compliant API.

Tools then Push/Pull to/from the Collaboration Hub



E.g. ShareAspace (EuroSTEP)

Conceptual Airframe & Engine Collaboration example

Research project jointly funded by industry and the UK government between 2016 and 2019.

Target of process standardisation and full data traceability between Airbus and Rolls-Royce.

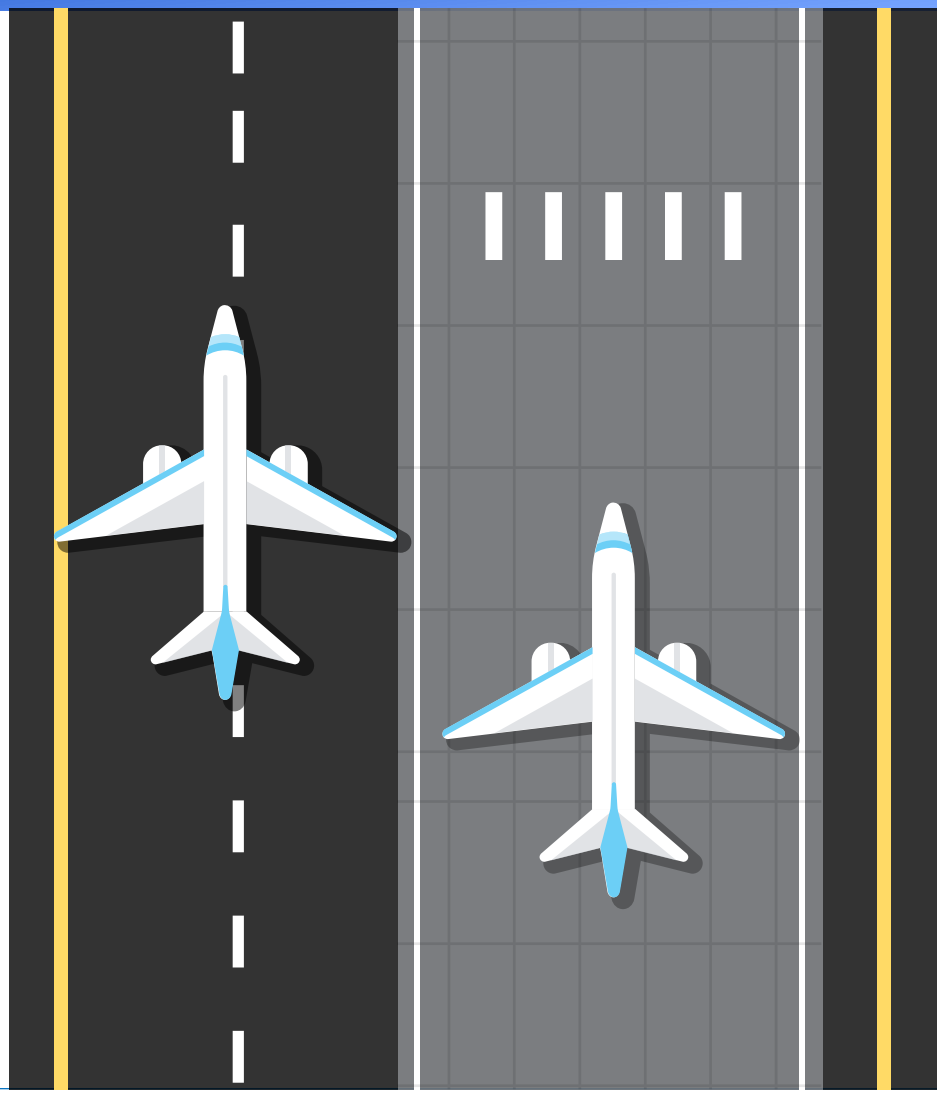
Conventional v. APROCONE concept assessment Realistic but NOT Real aircraft with:

Lighter engines

Lower Max Take Off Weight

Less fuel burn

Significant reduction in development time



AIRBUS · UNIVERSITY OF CAMBRIDGE Engineering Design Centre · cfms · Cranfield Aerospace · GKN AEROSPACE · MSC Software Simulating Reality, Delivering Certainty · Rolls-Royce

But why MoSSEC in a future sustainable and connected world?

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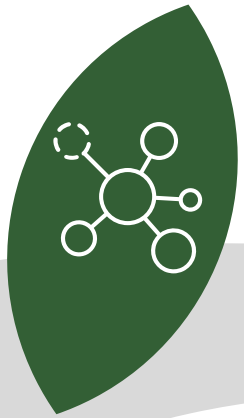
Overall product complexity

New technologies, New partners

Knowledge retention



Regulation compliance

Evolving customer expectations

The future innovation potential

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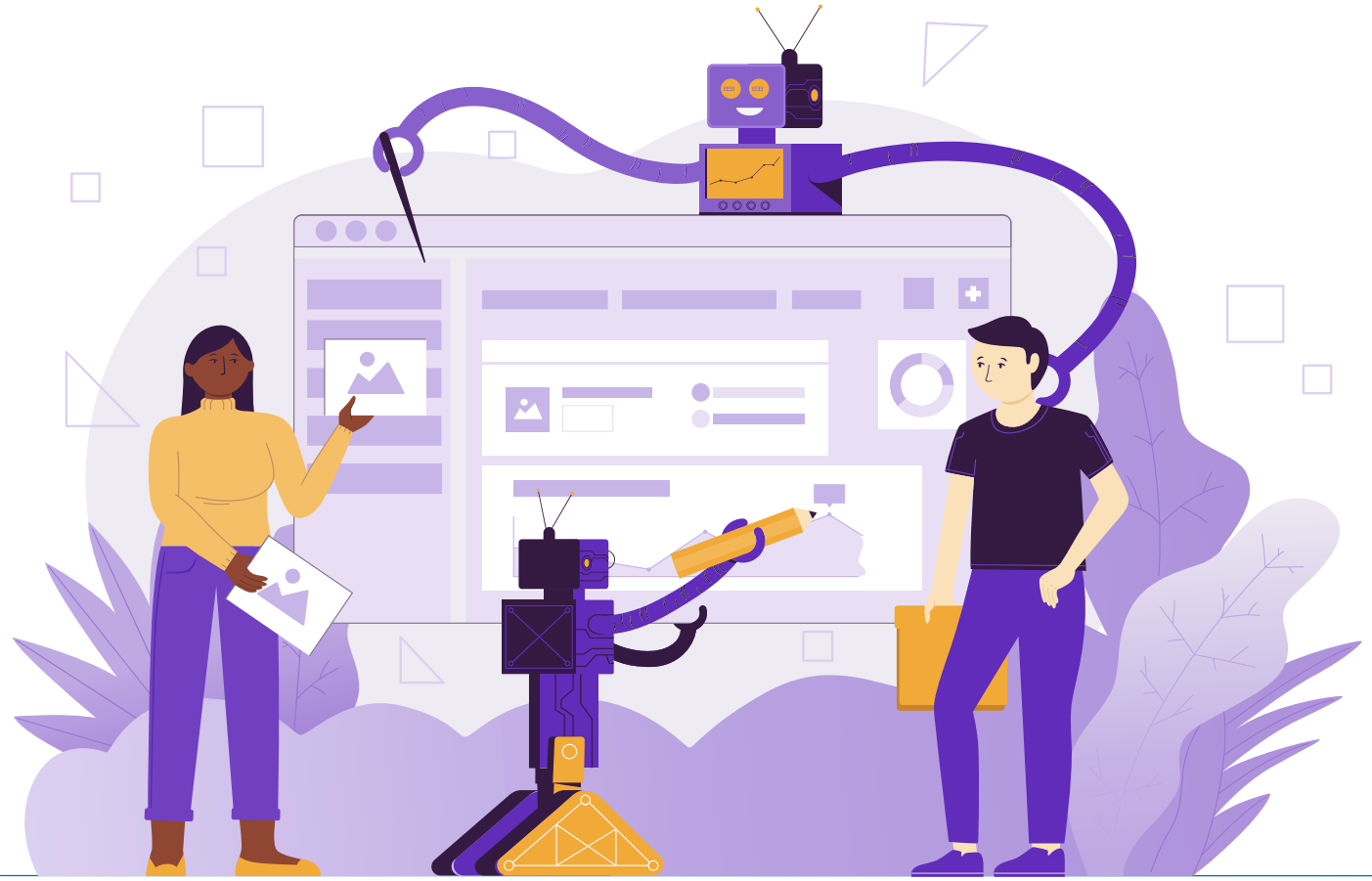

1. Knowledge behind the System's life cycle is made Machine Interpretable thanks to MoSSEC
2. AI technology interoperating between domains, platforms and organizations interprets the MoSSEC objects
3. Novel **collaborations** and solutions to problems are automated with traceable AI "thought" processes

A personal MoSSEC 2025 vision

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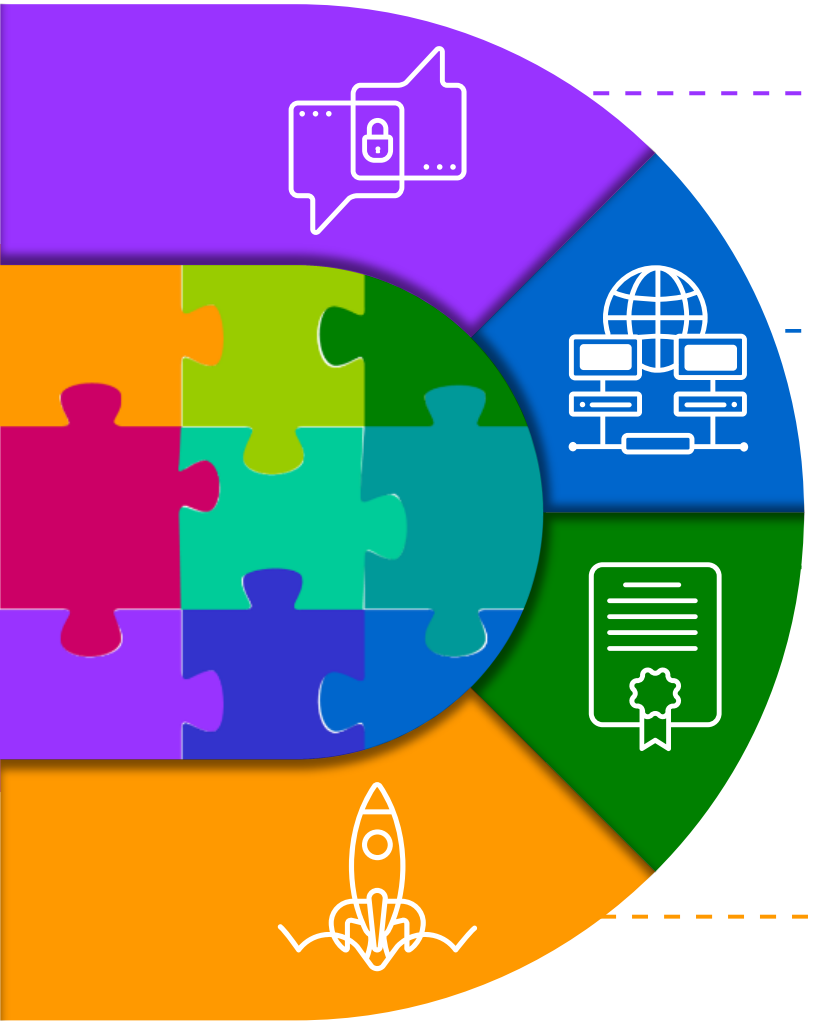

Secure — Secure communication is embedded throughout interoperability developments

Exchange — Object exchange processes are well documented and established

Certify — MoSSEC compliance can be measured and certified

Explore — A community sharing concepts, ideas and solutions using MoSSEC objects

ATLAS Project Days – Proposed MoSSEC Interoperability Forum

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ISO 10303-243 (MoSSEC) INTEROPERABILITY FORUM

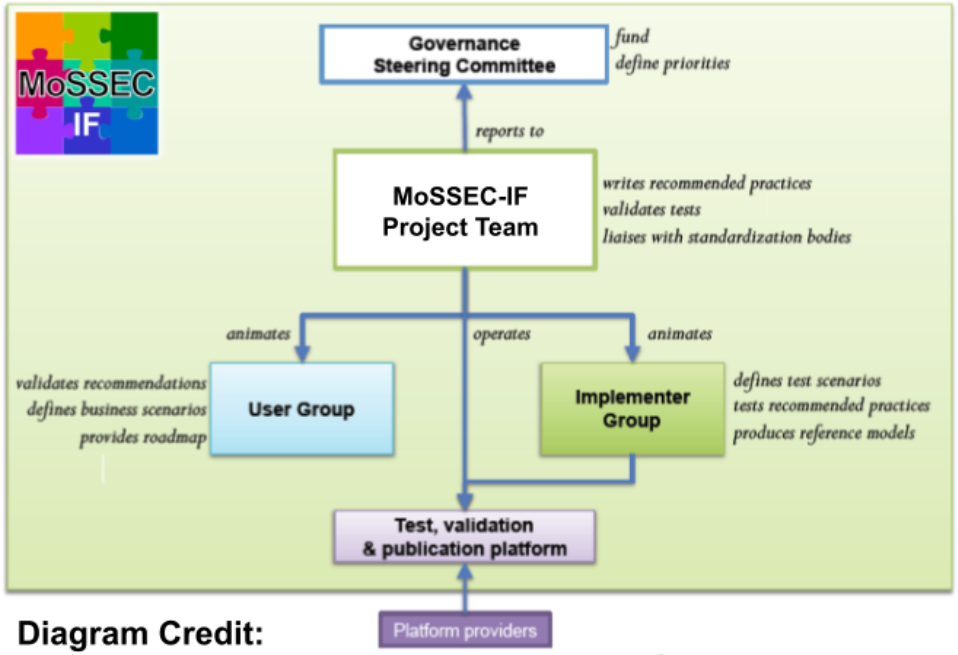

Diagram Credit: adopted from PDM-IF

ISO 10303-243 (MoSSEC) is defined.
Now it needs to be implemented.

1. AFNeT Standards Days 2022 begins the start of discussions for a MoSSEC IF - Creating the User Group.
2. MoSSEC IF should be part of the MBx IF
3. Begin the conversations between Vendors and Industry to break down blockers to implementation
4. Engage Trade / Standardisation Associations interest and foster the global partnerships for effective implementation

Contact: Kyle Hall
kyle.hall@airbus.com

Email me

ATLAS Projects Days - 11 / 12 May 2022 - https://atlas.afnet.fr/ - team-atlas@afnet.fr

The road to interoperability. How you can get involved

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Reach out to the MoSSEC community

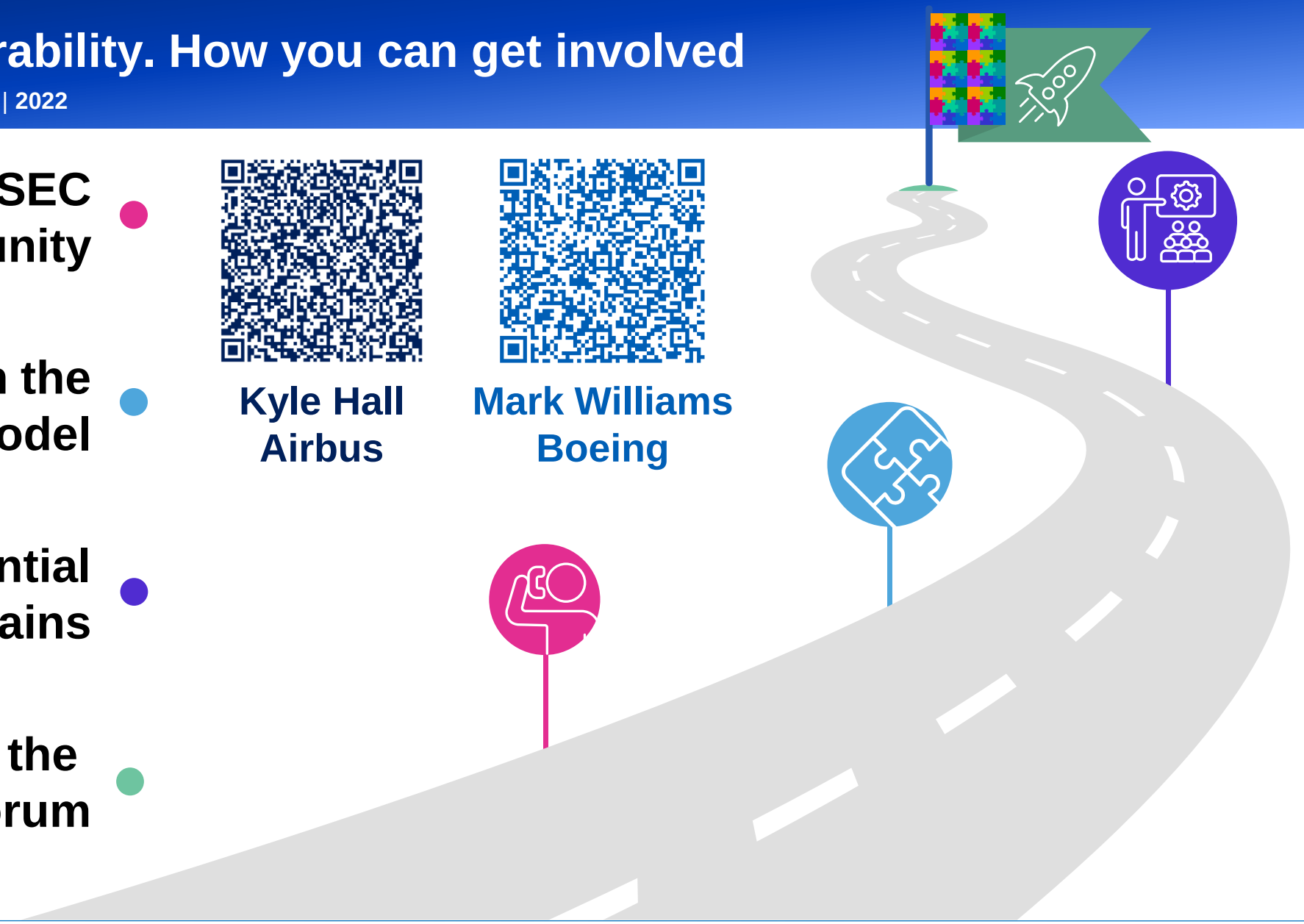
Experiment with the MoSSEC object model

Demonstrate the potential to your domains

Get involved with the Interoperability Forum

Kyle Hall
Airbus

Mark Williams
Boeing



The puzzle only makes sense when all of the pieces fit together

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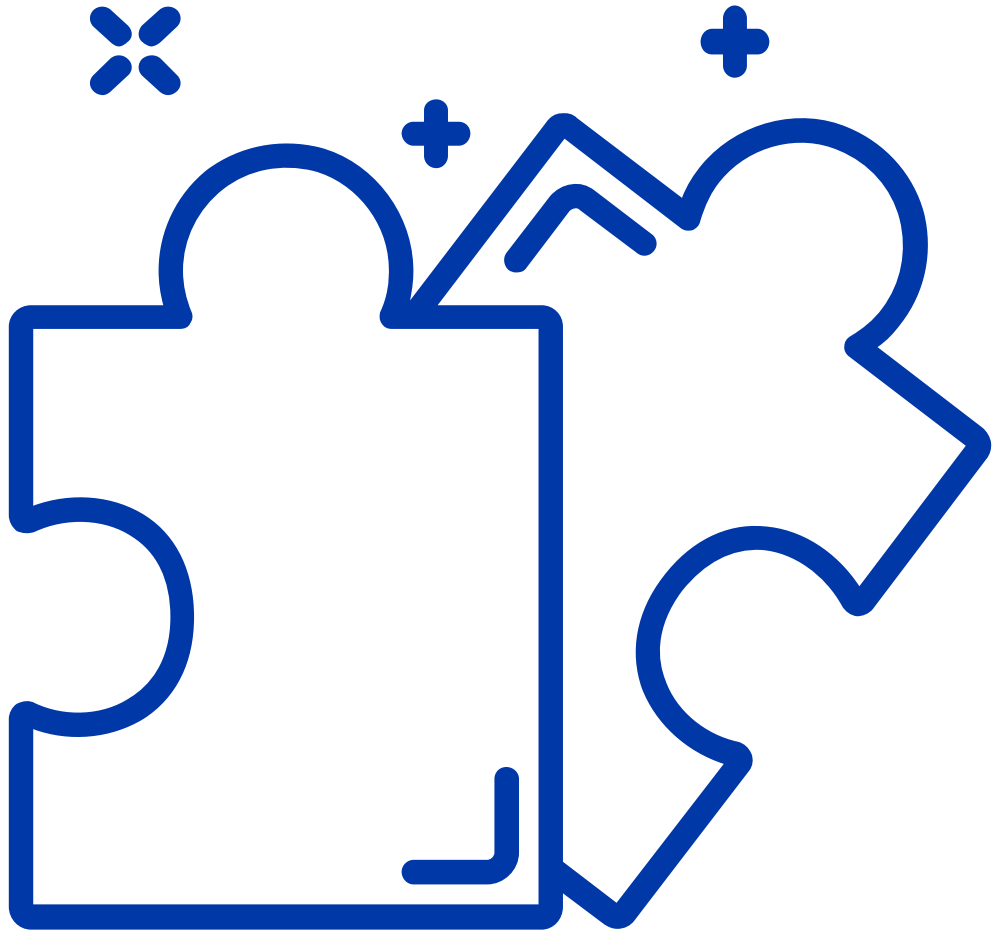

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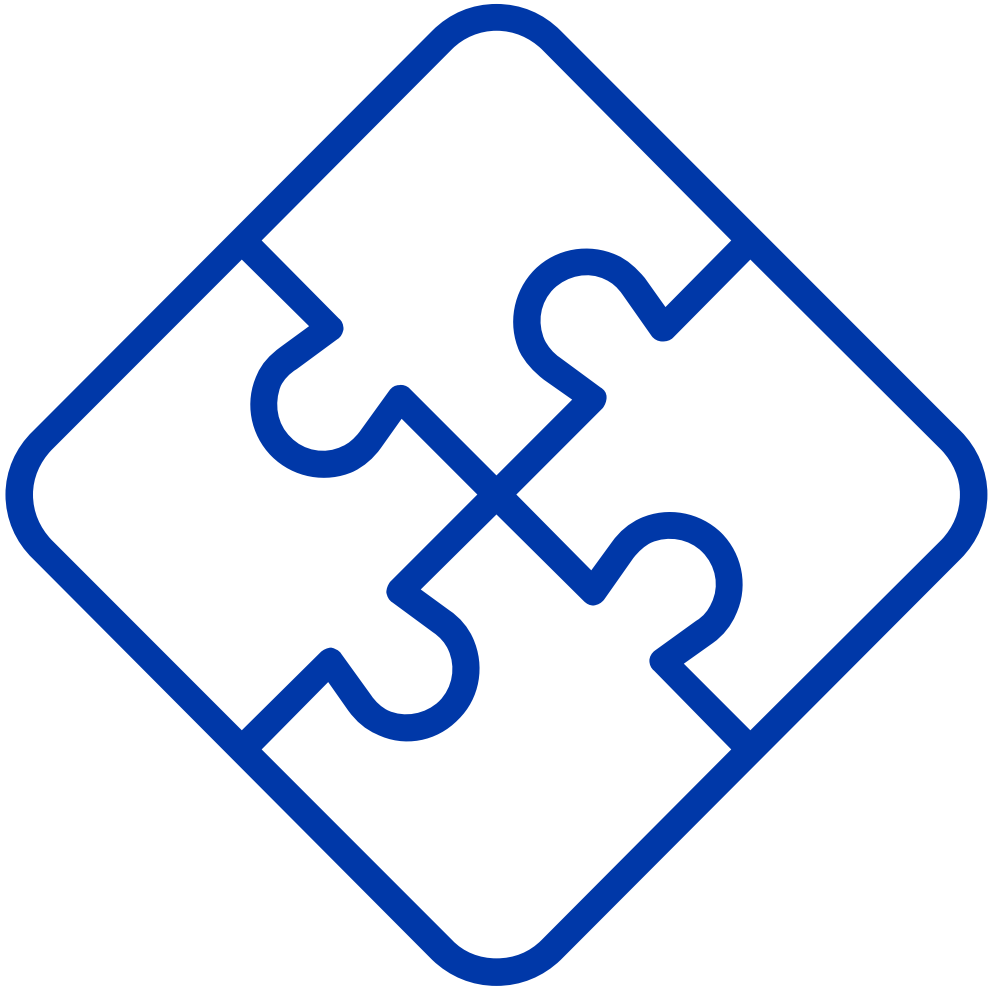

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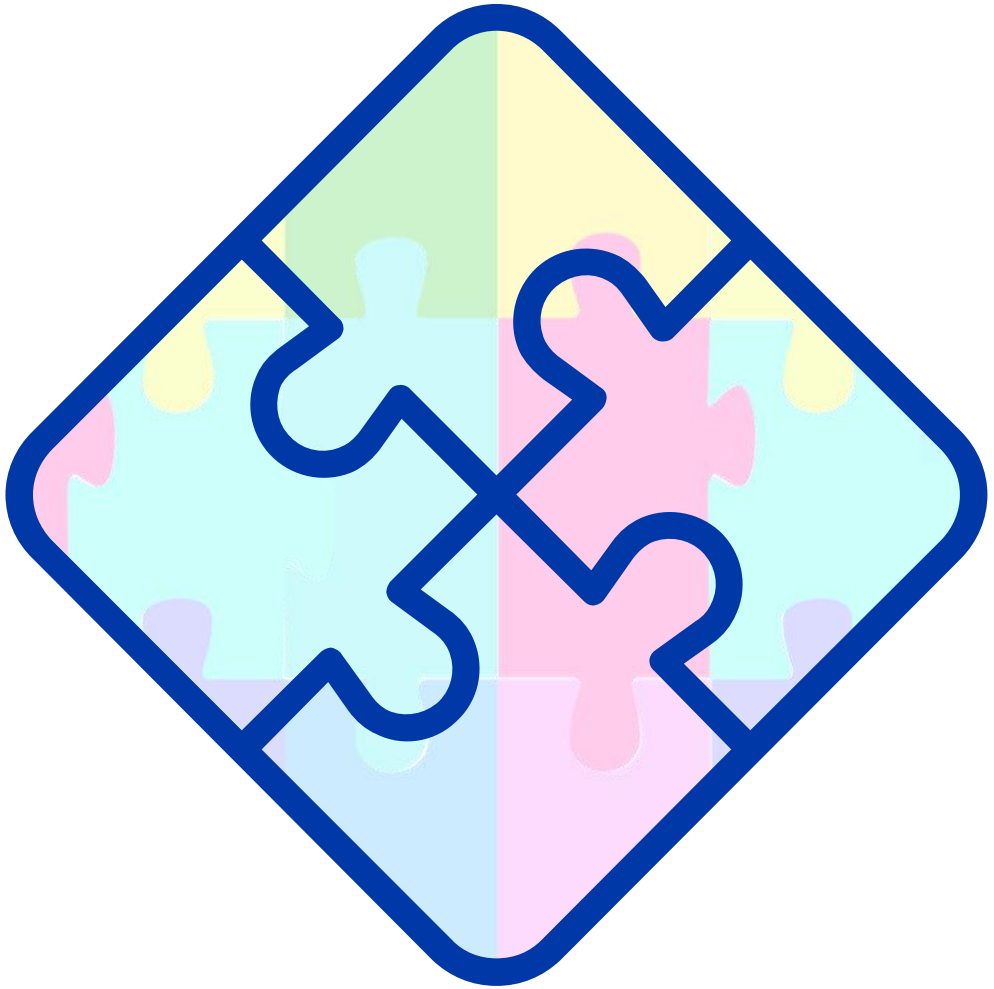

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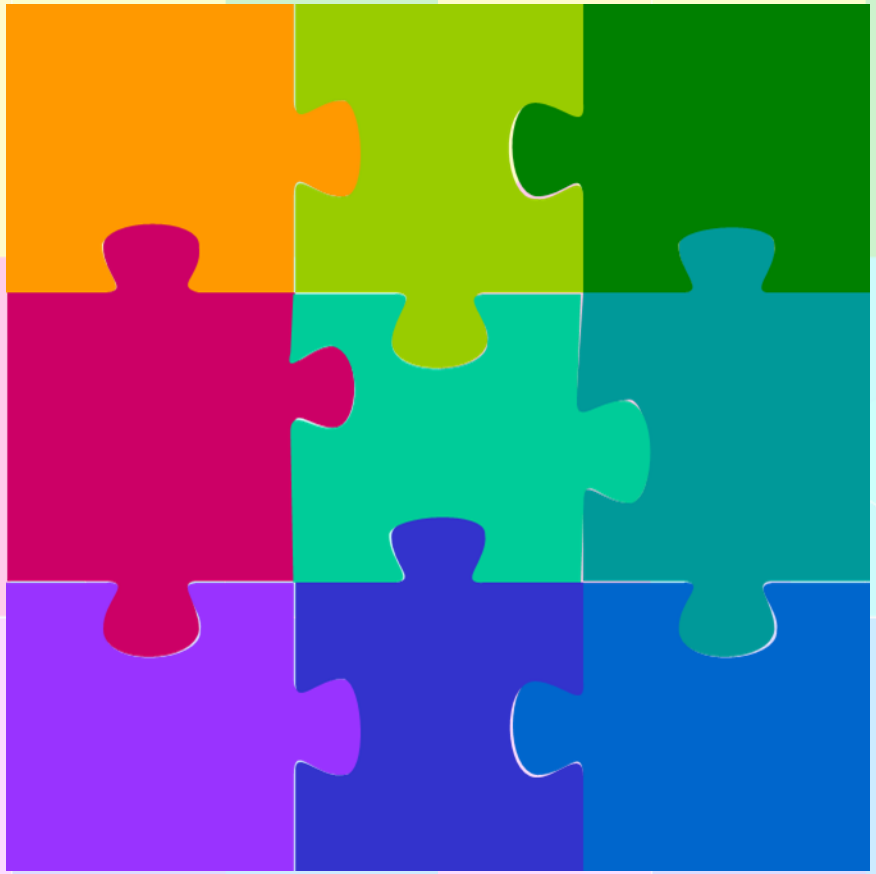

MoSSEC and the importance of metadata interoperability in a future sustainable and connected world

Kyle Hall AIRBUS