

The “AluTrace” Use Case

Harnessing Lightweight Design Potentials
in LPBF-based additive manufacturing
by integration of distributed materials and process data
via the Materials Data Space®

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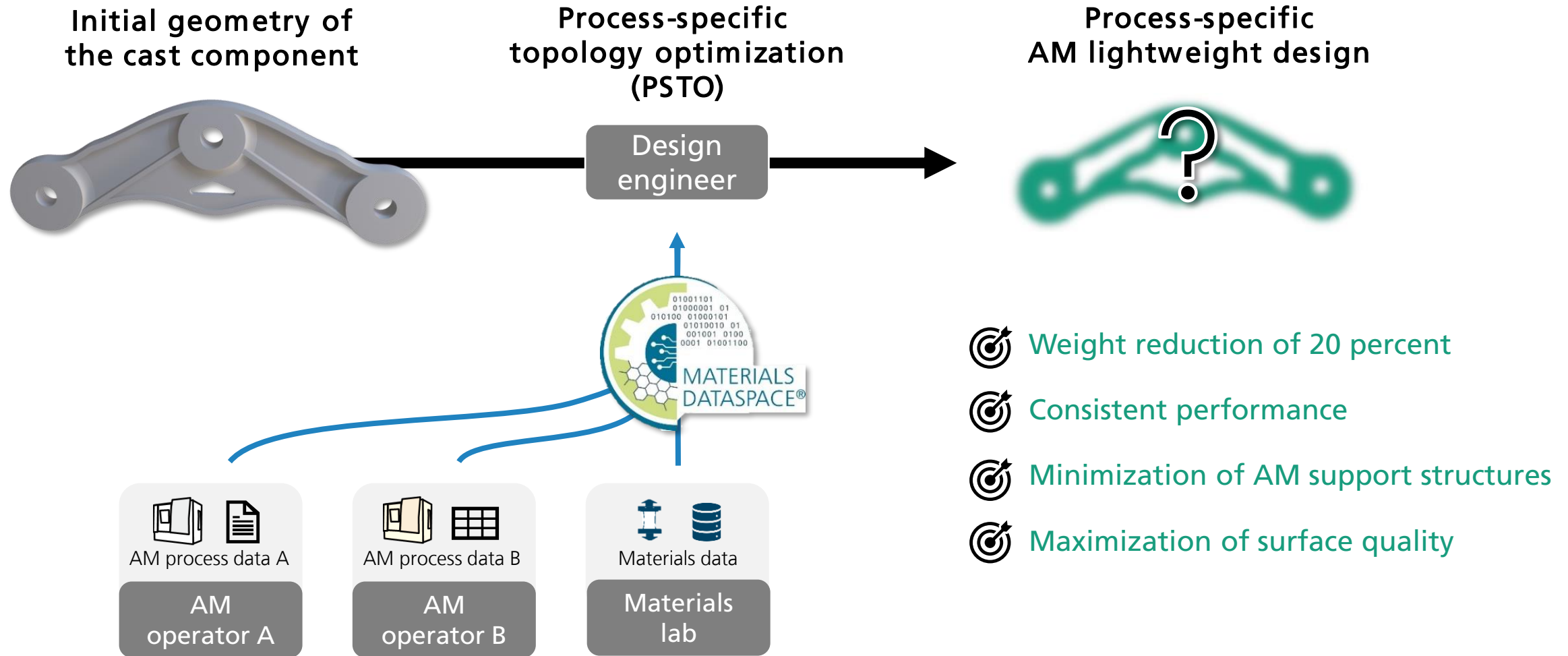
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The „AluTrace“ Use Case

aims to optimize a cast component for lightweight design using additive manufacturing (AM)

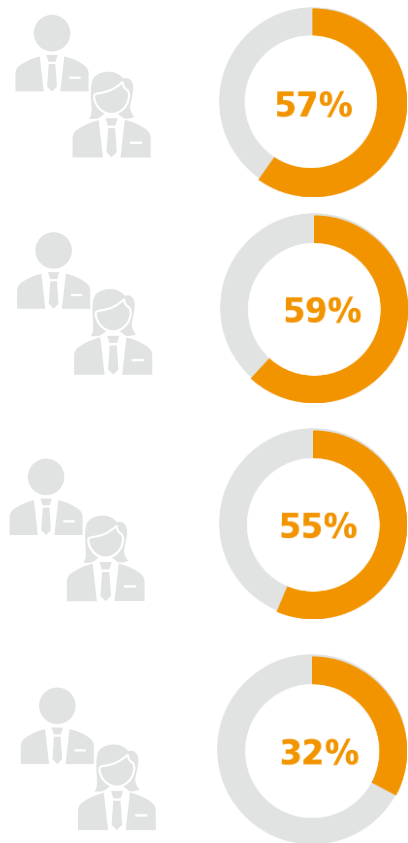


A decentralized digital ecosystem:

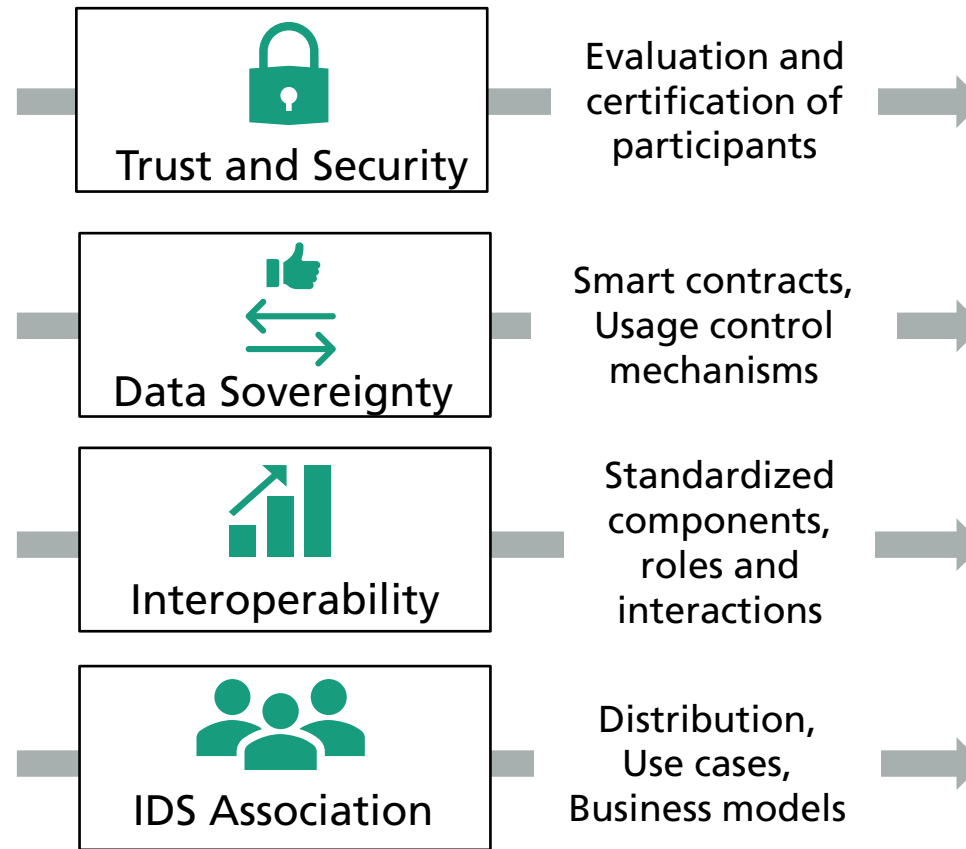
Fears of industrial executives are resolved by the IDS

Industrial executives

Percentages of respondents



International Data Spaces (IDS)



Fears

Disclosure of valuable data and business secrets

Loss of control over data

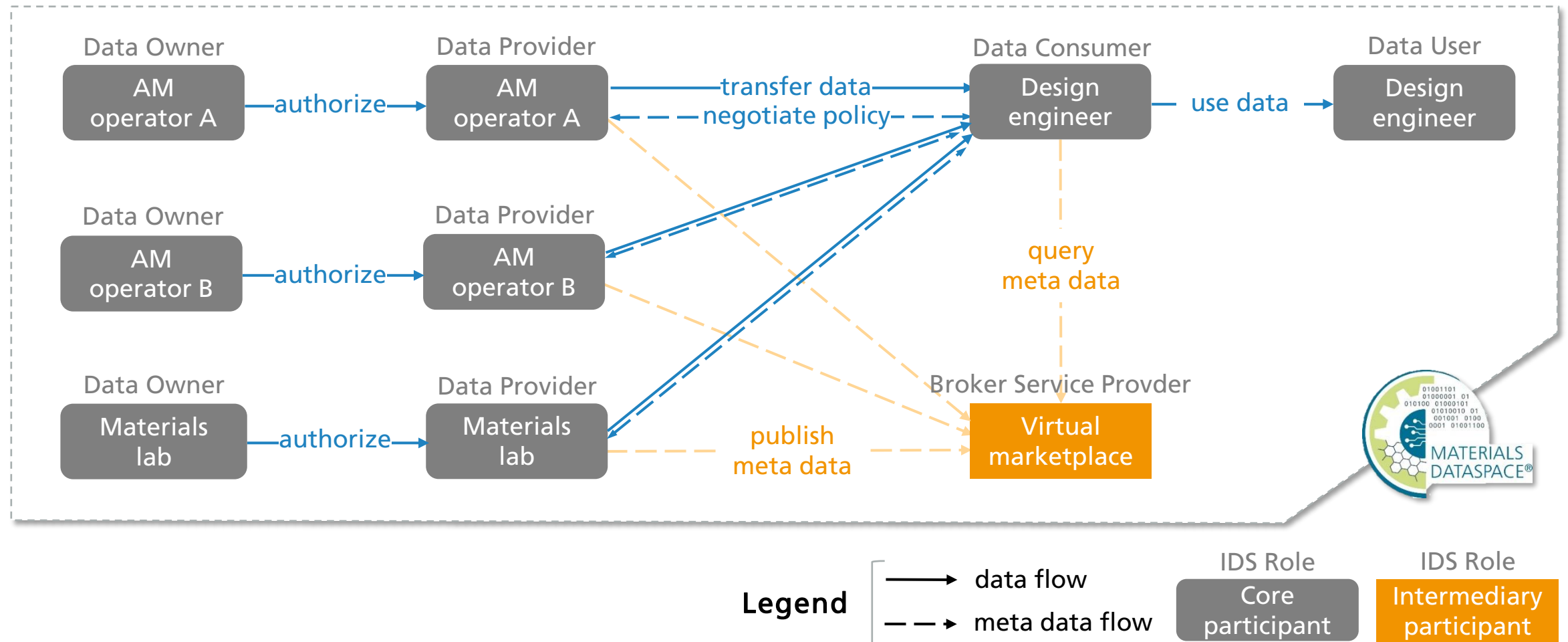
Inconsistent processes and systems

Neither applications nor network effect

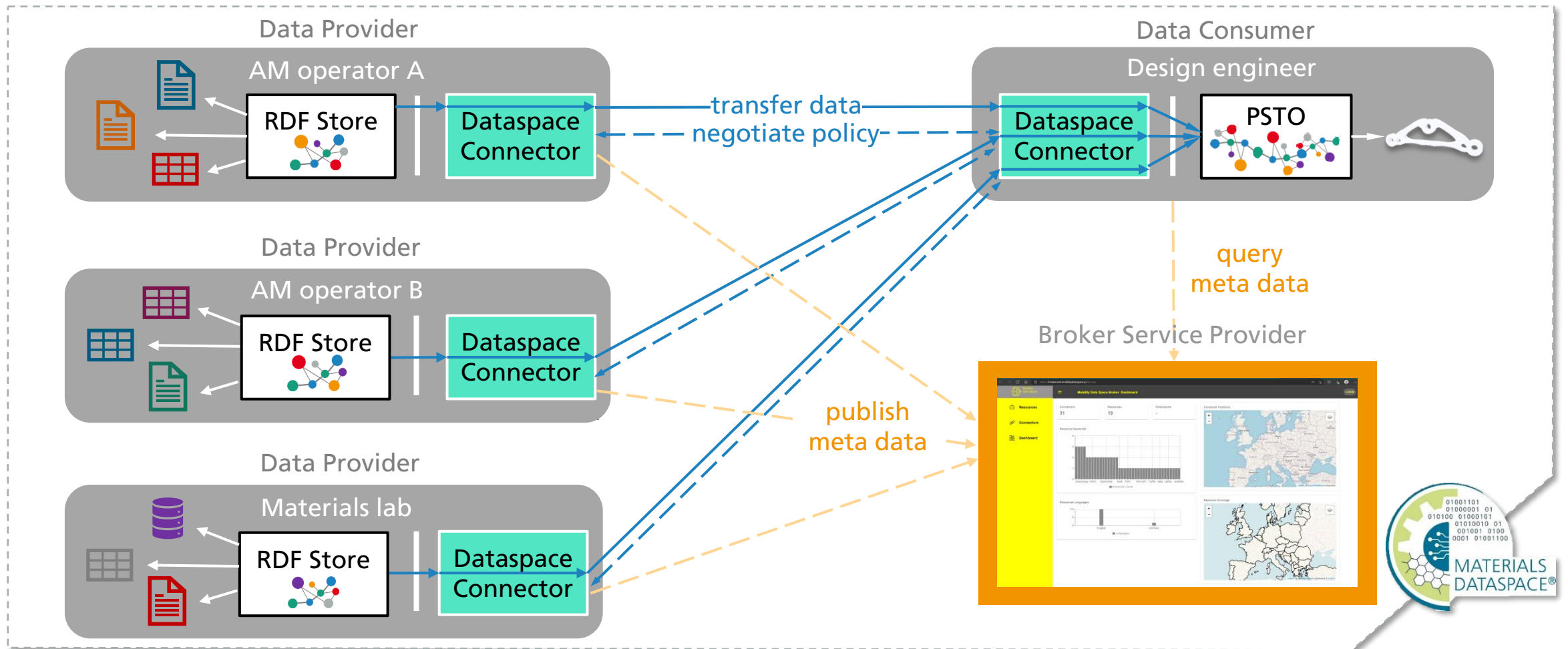
[1]

An IDS data space architecture was developed

based on the International Data Spaces (IDS) Reference Architecture Model [2]

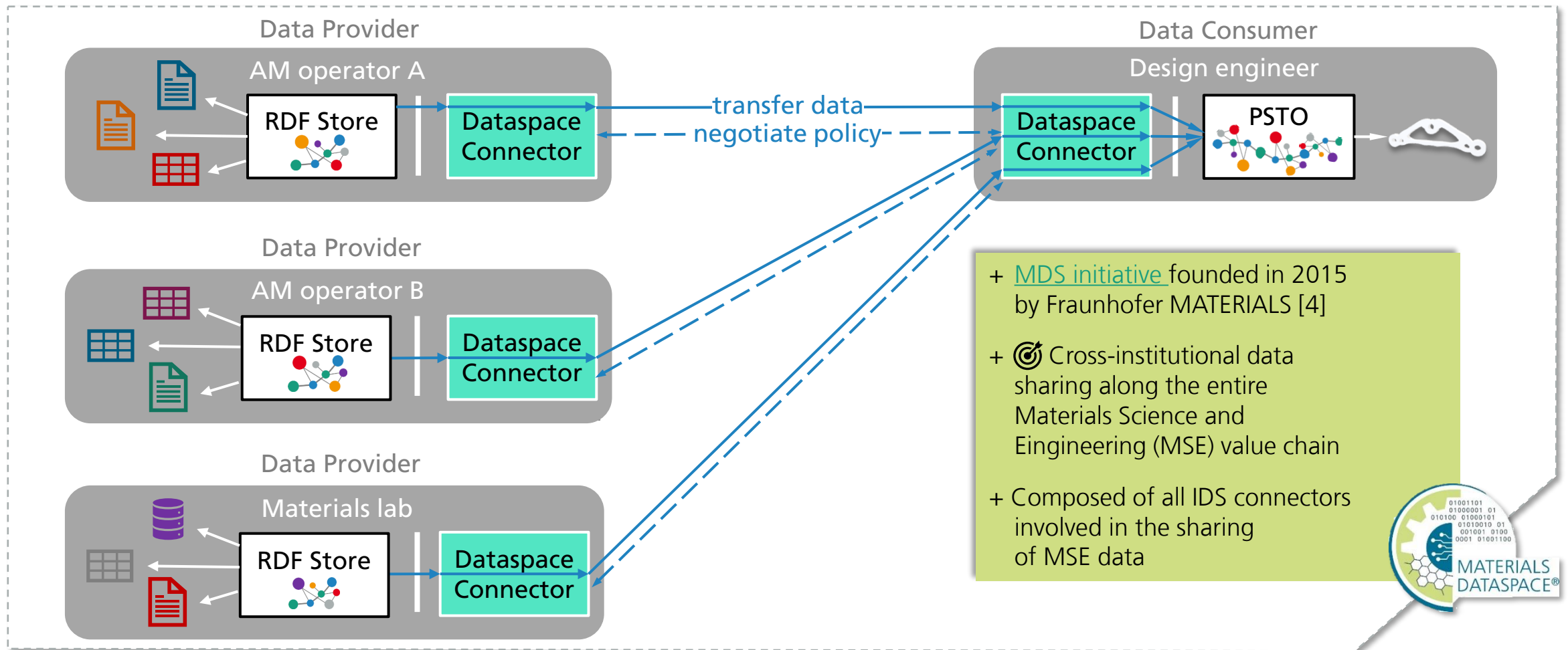


The Materials Data Space® was implemented for the first time using the Dataspace Connector (DSC) [3]



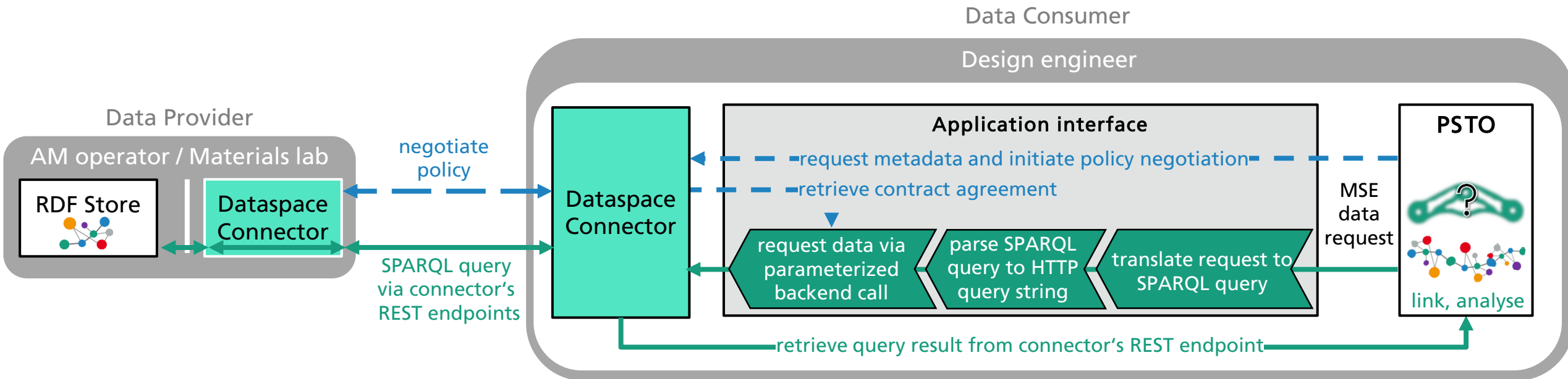
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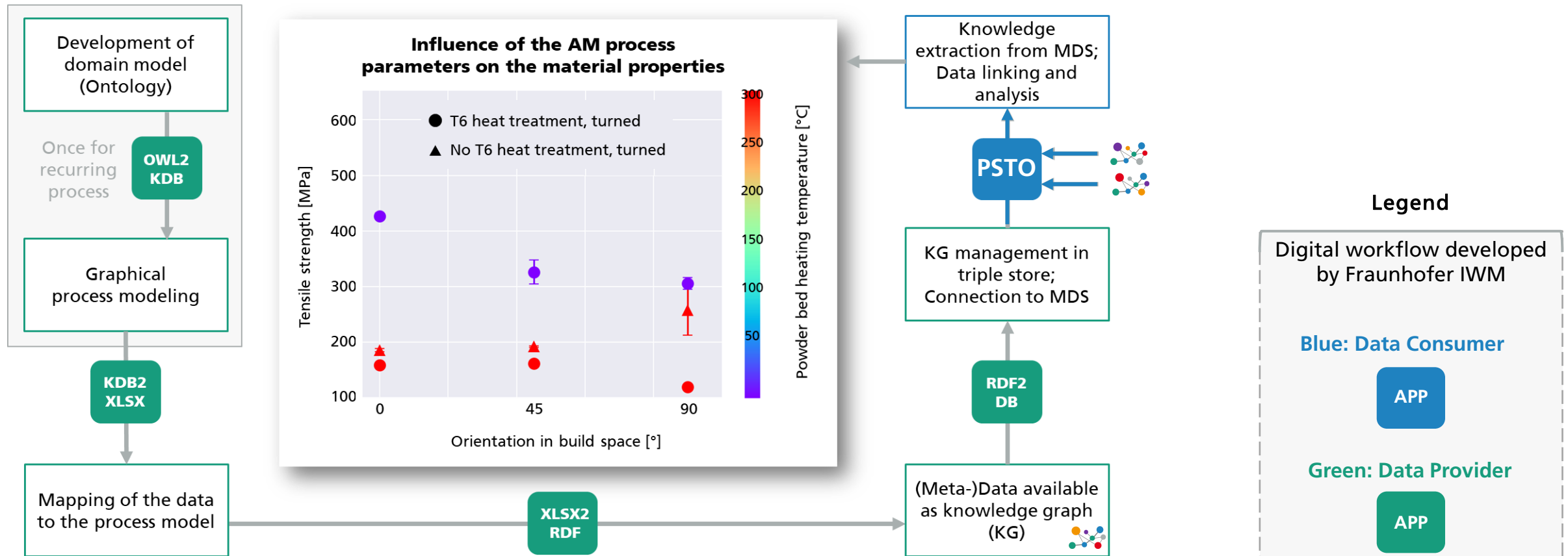


An Application Interface

retrieves MSE data from the data space for the PSTO application



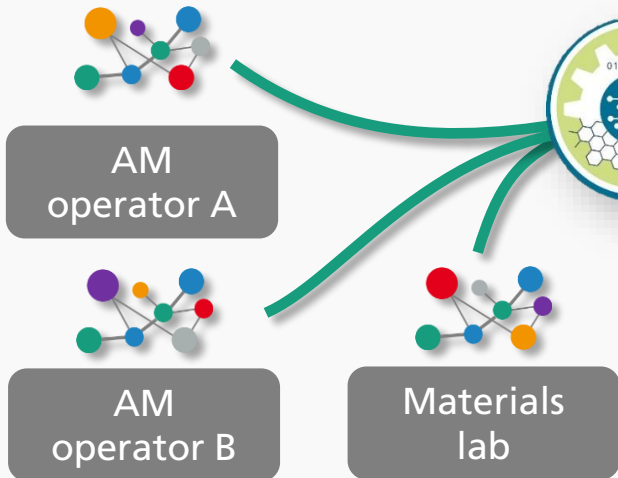
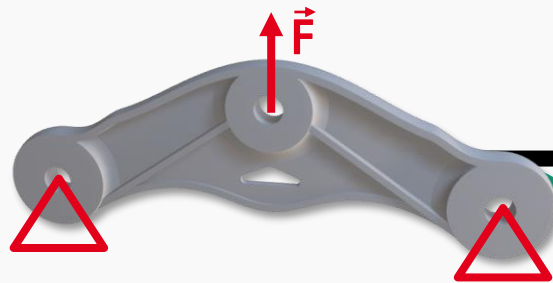
A digital workflow for semantic structuring of MSE (meta) data enables cross-institutional data linking and analysis



Added Value in the Use Case

Cross-institutional data sharing significantly improves AM lightweight design properties [6; 7]

Input



Topology optimization

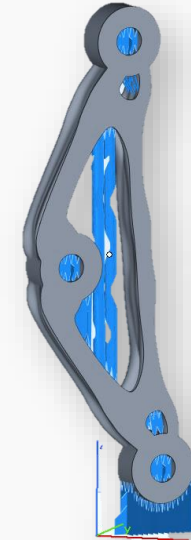
Previous state-of-the-art

Design engineer

Process-specific topology optimization (PSTO)

Design engineer

Output



Recommendation

+ AM-System A
+ 96° Orientation
+ T6-Heat Treatment
+ Polish / Turn

Properties

Lightweight design

- 23% weight reduction

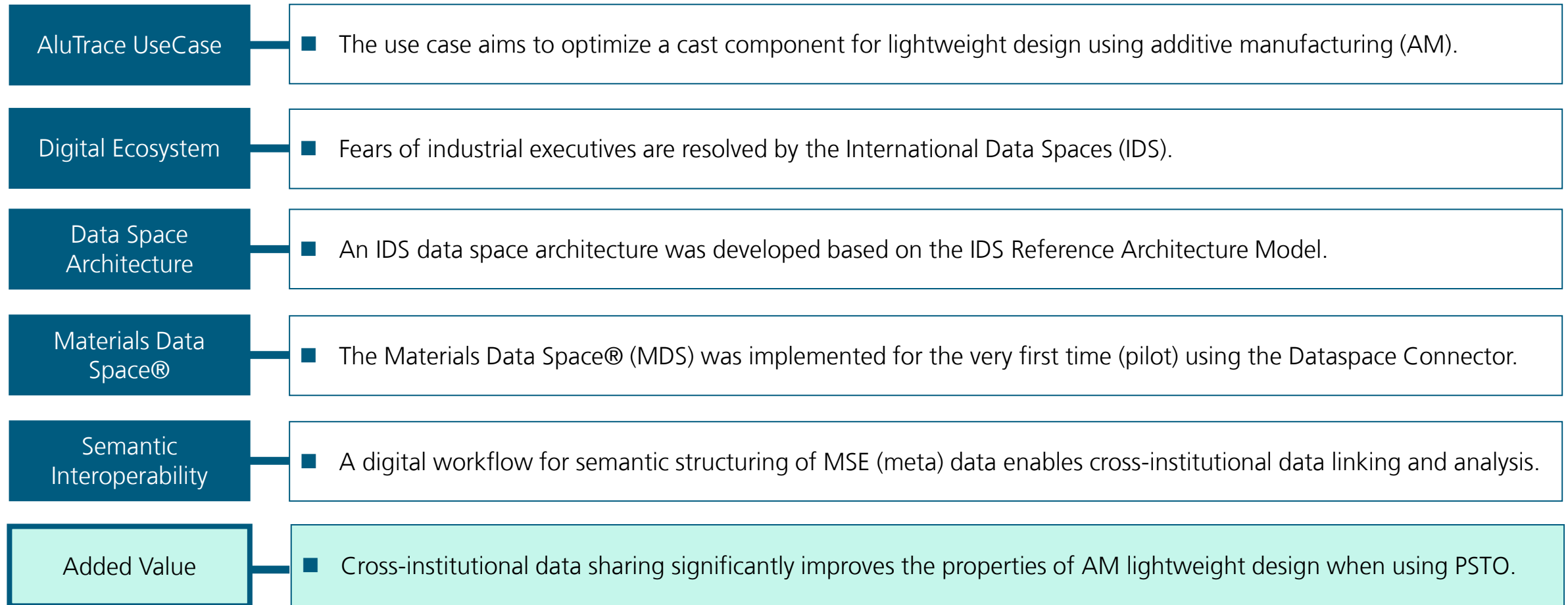
Improved

Process-specific AM lightweight design

-23% weight reduction
+15% safety under overload
-67% AM support structures
+16% surface quality

The “AluTrace” Use Case:

Harnessing Lightweight Design Potentials via the Materials Data Space®



References

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- [2] B. Otto, S. Steinbuß, A. Teuscher, and S. Lohmann, “Reference Architecture Model: Version 3.0,” International Data Spaces Association, 2019.
- [3] Dataspace Connector. [Online]. Available: <https://github.com/International-Data-Spaces-Association/DataspaceConnector> (accessed: Feb. 22 2022)
- [4] *Materials Data Space*. [Online]. Available: <https://www.materials.fraunhofer.de/de/strategische-initiativen/materials-data-space-/aktuelles-/erste-mds-implementierung-.html> (accessed: Sept. 28 2022)
- [5] Martin Huschka et al., “Leichtbau: Datenvernetzung für additive Fertigung,” wt Werkstattstechnik online 06/2022, 2022. Accessed: Sep. 26 2022. [Online]. Available: <https://www.ingenieur.de/fachmedien/wt-werkstattstechnik/fraunhofer-gesellschaft/leichtbau-datenvernetzung-fuer-additive-fertigung/>
- [6] Martin Huschka et al., „The "AluTrace" Use Case: Harnessing Lightweight Design Potentials via the Materials Data Space“, Vienna, Austria, TRUSTS - Trusted Secure Data Sharing Space, 3. Juni 2022. [Online]. Available: <https://www.trusts-data.eu/wp-content/uploads/2022/06/01-The-AluTrace-Use-Case-Harnessing-Lightweight-Design-Potentials-via-the-Materials-Data-Space.pdf>. Accessed: 28. September 2022.

Thank you for your attention!

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