**General**

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| ID[[1]](#endnote-1) |  | | | |
| Use case name | Value-based Service | | | |
| Application domain | Manufacturing | | | |
| Deployment  model | Hybrid deployment: Cloud and on-premise deployment in the production field | | | |
| Status | PoC | | | |
| Scope[[2]](#endnote-2) | Process and status data from production and product use sources are the raw materials for future business models and services. | | | |
| Objective(s) | The objective of this use case is the provision of remote services for product and production based on (generic) service platforms. This use case can be seen as a fundament for the deployment of arbitrary AI remote services. | | | |
| Narrative | Short description (not more than 150 words) | Service platforms collects data from product use – for example machines or plants – and analyses and processes this data to provide tailor-made individualized services, e.g. optimized maintenance at the proper time, or the timely provision of the correct process parameters for a production task currently being requested. Companies offering these services (service providers) occupy the interface between the product provider and the user. | | |
| Complete description | Use Case description taken from [1,2,3]. In the consumer area, the increased interconnectivity of users which has made it possible to collect user data has made a whole new range of services possible. For example, navigation systems in our cars not only determine the shortest route, but also the quickest, as the traffic situation is assessed in real time based on movement data from other users. Entertainment media is no longer purchased rather made available as needed using streaming services. The services offered extend beyond simply making the products available. The individual customer receives optimized offers, based on user data: the quickest route during rush hour, or music tailored to that customer’s taste.  Similar developments are occurring in an increasingly interconnected industrial environment. Services that go significantly beyond simply providing a production unit – a contemporary example is leasing – are gaining in importance and are changing the classic value-added processes and business models.  **Key aspects**  At the heart of this application scenario are IT platforms that collect data from product use – for example machines or plants for production purposes – and analyze and process this data to provide tailor-made individualized services. This could include for example optimized maintenance at the proper time, or the timely provision of the correct process parameters for a production task currently being requested. The collected data could be product parameters, for example the machines and plants required for manufacture, the product status information, or data from the production process or the upstream supply process. Even the characteristics of the processed raw materials or the parts of the product could be included. The goal is to use this data as a raw material for optimizing products and production processes and for new services. This can help to not only improve existing value chains but also perhaps create new value-added elements.  **Effect on value chains**  The industrial environment today is influenced in principle by two actors – the product provider (i.e. manufacturers of production facilities and service providers) and the customer (product users, i.e. production facility operators), who work together with varying degrees of intensity.  With the introduction of Value-Based Services an additional actor enters the scene, operating IT platforms that it uses to provide new services to both classic partners. This platform operator could be a new element of the value chain, that is, an autonomous company. However, this role could be taken on by product providers by increasing their value added compared with the current situation.  Product providers make their product data and parameters available. On the basis of all of this user data, new services can now be developed, such as individual optimized maintenance or specific operating and process parameters that optimize or even expand production capabilities of the existing infrastructure. The companies offering these services (service providers) occupy the interface between the product provider and the user. The result is that the share in the value chain spanning from the product provider to the user can be shifted significantly, compared with the situation today. The user can then distinguish between the products by considering the accompanying services or the possibility of expanding those services even after purchasing the product, and no longer primarily by the (physical) specifications mandated by the product provider. This makes it very attractive for the product provider to use such platforms and to offer new services on them.  **Value added for participants**  In this application scenario the value added for the product provider stems from the availability of a multitude of process data from various application scenarios, which the user can apply to further development of its product port-folio. As an operator of related IT platforms, the product provider can offer new services. In this way, it strengthens customer loyalty and increases its portion of value added.  Value added for the user, on the other hand, can come from better utilization of the product, enhanced product availability from improved maintenance, for example, or optimized product use as a result of optimally adapted product parameters. | | |
| Stakeholders[[3]](#endnote-3) | Customer (product user), platform provider, service provider, product provider | | | |
| Stakeholders’  assets, values[[4]](#endnote-4) |  | | | |
| System’s threats and vulnerabilities[[5]](#endnote-5) |  | | | |
| Key performance indicators (KPIs) | ID | Name | Description | Reference to mentioned use case objectives |
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| AI features | Task(s) | Reasoning and autonomous problem solving in the platform, services based on the platform use AI features, e.g. for predictive maintenance, data semantics (cf. [5,6] for an overview) | | |
| Method(s)[[6]](#endnote-6) |  | | |
| Hardware[[7]](#endnote-7) |  | | |
| Topology[[8]](#endnote-8) |  | | |
| Terms and concepts used[[9]](#endnote-9) |  | | |
| Standardization  opportunities/ requirements | Standardization needs for setting up this use case is currently under further investigation. Some initial intentions on standardization needs are the following: For this use case, standardization can be seen as enabler because an agreement on a (small set of) communication protocols would facilitate to connect to the platform and use this protocol also for device2device communication. Since services running on a platform are not aware of an implicit sematic of data sources (machines, sensors, actuators, …), an explicit semantic or a common vocabulary is need describing data and enable reasoning about machine states on premise (on the machine/edge) as well as on the cloud. For cloud2cloud communication and cloud federation, further interoperability standards are required on communication level as well as on data semantics level. | | | |
| Challenges and issues |  | | | |
| Societal  concerns | Description | Increasing complexity of modern cyber-physical production systems cannot be managed by humans. AI technologies provide one solution in this context for more reliable, fault-tolerant, safe and secure production systems. | | |
| SDGs[[10]](#endnote-10) | Industry, Innovation, and Infrastructure | | |

**Data (optional**

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| --- | --- |
| Data characteristics | |
| Description |  |
| Source[[11]](#endnote-11) |  |
| Type[[12]](#endnote-12) |  |
| Volume (size) |  |
| Velocity (e.g. real time)[[13]](#endnote-13) |  |
| Variety (multiple datasets)[[14]](#endnote-14) |  |
| Variability  (rate of change)[[15]](#endnote-15) |  |
| Quality[[16]](#endnote-16) |  |

**Process scenario (optional)**

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| Scenario conditions | | | | | |
| No. | Scenario name | Scenario description | Triggering event | Pre-condition[[17]](#endnote-17) | Post-condition[[18]](#endnote-18) |
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**Training (optional)**

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| Scenario name | Training | | | | |
| Step No. | Event[[19]](#endnote-19) | Name of process/Activity[[20]](#endnote-20) | Primary actor | Description of process/activity | Requirement |
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| Specification of training data[[21]](#endnote-21) | |  | | | |

**Evaluation (optional)**

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| Scenario name | Evaluation | | | | |
| Step No. | Event[[22]](#endnote-22) | Name of process/Activity[[23]](#endnote-23) | Primary actor | Description of process/activity | Requirement |
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| Input of evaluation[[24]](#endnote-24) | |  | | | |
| Output of evaluation[[25]](#endnote-25) | |  | | | |

**Execution (optional)**

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| Scenario name | Execution | | | | |
| Step No. | Event[[26]](#endnote-26) | Name of process/Activity[[27]](#endnote-27) | Primary actor | Description of process/activity | Requirement |
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| Input of Execution[[28]](#endnote-28) | |  | | | |
| Output of Execution[[29]](#endnote-29) | |  | | | |

**Retraining (optional)**

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| Scenario name | Retraining | | | | |
| Step No. | Event[[30]](#endnote-30) | Name of process/Activity[[31]](#endnote-31) | Primary actor | Description of process/activity | Requirement |
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| Specification of retraining data[[32]](#endnote-32) | |  | | | |

**References**

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| References | | | | | | |
| No. | Type | Reference | Status | Impact on use case | Originator/organization | Link |
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[1] Working Group on Research and Innovation of the Plattform Industrie 4.0. Aspects of the Research Roadmap in Application Scenarios, Working Paper, German Federal Ministry for Economic Affairs and Energy, url: <https://www.plattform-i40.de/I40/Redaktion/EN/Downloads/Publikation/aspects-of-the-research-roadmap.html> , 2016.

[2] Working Group on Research and Innovation of the Plattfom Industrie 4.0 and Alliance Industrie du Futur: Plattform Industrie 4.0 & Alliance Industrie du Futur : Common List of Scenarios. url: <https://www.plattform-i40.de/I40/Redaktion/DE/Downloads/Publikation/plattform-i40-und-industrie-du-futur-scenarios.html>, 2018

[3] Communication Promoters Group of the Industry-Science Research Alliance and German National Academy of Science and Engineering. Recommendations for implementing the strategic initiative INDUSTRIE 4.0, Final report of the Industrie 4.0 Working Group, url: <https://www.acatech.de/Publikation/recommendations-for-implementing-the-strategic-initiative-industrie-4-0-final-report-of-the-industrie-4-0-working-group>, April 2013

[4] Bo-hu LI, Bao-cun HOU, Wen-tao YU, Xiao-bing LU, Chun-wei YANG. Applications of artificial intelligence in intelligent manufacturing: a review. Frontiers of Information Technology & Electronic Engineering. 2017

[5] Lee, Jay, Hung-An Kao, and Shanhu Yang. "Service innovation and smart analytics for industry 4.0 and big data environment." Procedia Cirp 16 (2014): 3-8.

**Footnote**

1. Leave this cell blank. [↑](#endnote-ref-1)
2. The scope defines the limits of the use case. [↑](#endnote-ref-2)
3. Stakeholder involved in the scenario - examples are: type of organization; customers, 3rd parties; end users; humans; environment; negative stakeholders (attackers, criminals, etc). [↑](#endnote-ref-3)
4. Assets and values that are valuable to the stakeholders and at the risk of being compromised by the AI system deployment – examples can include competitiveness; reputation or trust; fairness; safety; privacy; stability; etc. [↑](#endnote-ref-4)
5. Threats and vulnerabilities can compromise the assets and values above. Examples are: different sources of bias; incorrect AI system use; new security threats; challenges to accountability; new privacy threats (hidden patterns). [↑](#endnote-ref-5)
6. AI method(s)/framework(s) used. [↑](#endnote-ref-6)
7. Hardware system used. [↑](#endnote-ref-7)
8. Topology is the study of geometric forms differentiated by intersection and bifurcation. The term is used for the graphic aspects network architectures. [↑](#endnote-ref-8)
9. Terms and concepts listed here can be used to extend the work of WG 1 (AWI 22989 and AWI 23053) as necessary. [↑](#endnote-ref-9)
10. The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a collection of 17 global goals set by the United Nations General Assembly. SDGs are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

    See URL for more details: <http://www.undp.org/content/undp/en/home/sustainable-development-goals.html> [↑](#endnote-ref-10)
11. Origin of data, which could be from instruments, IoT, web, surveys, commercial activity, or from simulations. [↑](#endnote-ref-11)
12. Structured/unstructured Images, voices, text, gene sequences, and numerical. Composite: time-series, graph-structured [↑](#endnote-ref-12)
13. The rate of flow at which the data is created, stored, analysed, or visualized. [↑](#endnote-ref-13)
14. Data from a number of domains and a number of data types. The wider range of data formats, logical models, timescales, and semantics complicates the integration of the variety of data. [↑](#endnote-ref-14)
15. Changes in data rate, format/structure, semantics, and/or quality. [↑](#endnote-ref-15)
16. Completeness and accuracy of the data with respect to semantic content as well as syntactical of the data (such as presence of missing fields or incorrect values) [↑](#endnote-ref-16)
17. Describe which condition(s) should have been met before this scenario happens. [↑](#endnote-ref-17)
18. Describe which condition(s) should prevail after this scenario happens. The post-condition may also define "success" or "failure" conditions. [↑](#endnote-ref-18)
19. The event that triggers the step. This might be completion of the previous event. [↑](#endnote-ref-19)
20. Action verbs should be used when naming activity. [↑](#endnote-ref-20)
21. Training data can be further specified. [↑](#endnote-ref-21)
22. The event that triggers the step. This might be completion of the previous event. [↑](#endnote-ref-22)
23. Action verbs should be used when naming activity. [↑](#endnote-ref-23)
24. Specify input of evaluation. [↑](#endnote-ref-24)
25. Specify output of evaluation. [↑](#endnote-ref-25)
26. The event that triggers the step. This might be completion of the previous event. [↑](#endnote-ref-26)
27. Action verbs should be used when naming activity. [↑](#endnote-ref-27)
28. Specify input of evaluation. [↑](#endnote-ref-28)
29. Specify output of evaluation. [↑](#endnote-ref-29)
30. The event that triggers the step. This might be completion of the previous event. [↑](#endnote-ref-30)
31. Action verbs should be used when naming activity. [↑](#endnote-ref-31)
32. Retraining data can be further specified. [↑](#endnote-ref-32)