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Towards Reference Architectures: A Cloud-agnostic Data Analytics Platform Empowering Autonomous Systems

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In this demo we would like to present a scalable, cloud-agnostic and fault-tolerant data analytics platform for state-of-the-art autonomous systems that is built from open-source, reusable building blocks. As a baseline for further new reference architectures [2,3] it represents an architecture blueprint for processing, enriching and analyzing various feeds and streams of structured and unstructured data from advanced Internet-of-Things (IoT) -based use cases.

Reference architectures have the potential to increase the efficiency and reliability of the development process in many application domains. In our demo, we would like to present how Reference Architectures can be applied to develop cloud-based applications. High abstraction-level reference architectures typically incorporate state-of-the-art approaches and system design principles but lack references to particular implementations. Contrary, low-level architectures focus on the implementation details. An example of a high-level reference architecture is the Lambda Architecture [4] and the Kappa Architecture [5], whereas [6] is an example for a low-level architecture offered by a public cloud provider promoting its services. Our approach [10] was developed within the DIGITbrain [1] European project.

Our platform builds on industry best practices, leverages on solid open-source components in a reusable fashion and is based on our experience gathered from numerous IoT and Big Data research projects [7,8,9]. Our platform is container-based, built using orchestration tools and utilizes reusable building blocks. The platform consists of two main parts. The first part contains the custom components of the different use cases, whereas the second part hosts the core components shared between all use cases.

The platform is currently used in the framework of the National Laboratory for Autonomous Systems in Hungary (abbreviated as ARNL). We would like to demonstrate the platform through a selected use case from ARNL involving data collection from autonomous vehicles.

Any relevant links

[1] Digitbrain H2020 project (2020). https://digitbrain.eu/.
[2] What is a reference architecture? –https://www.hpe.com/us/en/what-is/reference-architecture.html.
[3] Pekka Pääkkönen and Daniel Pakkala. Reference architecture and classification of technologies, products and services for big data systems. Big Data Res., 2(4):166–186, dec 2015.
[4] Nathan Marz. How to beat the cap theorem. http://nathanmarz.com/blog/ how-to-beat-the-cap-theorem.html, 2011.
[5] Jay Kreps. Questioning the lambda architecture. https://www.oreilly.com/ radar/questioning-the-lambda-architecture/, 2014.
[6] Azure iot reference architecture. https://docs.microsoft.com/en-us/azure/ architecture/reference-architectures/iot.
[7] Attila Csaba Marosi, Róbert Lovas, Ádám Kisari, and Ernö Simonyi. A novel iot platform for the era of connected cars. In 2018 IEEE International Conference on Future IoT Technologies (Future IoT), pages 1–11, 2018.
[8] Attila Csaba Marosi, Attila Farkas, and Robert Lovas. An adaptive cloud-based iot back-end architecture

and its applications. In 2018 26th Euromicro International Conference on Parallel, Distributed and Network-based Processing (PDP), pages 513–520, 2018.
[9] Róbert Lovas, Attila Csaba Marosi, Márk Emödi, Ádám Kisari, Ernö Simonyi, and Péter Gáspár. Paas-oriented iot platform with connected cars use cases. In 2018 International Conference on Sensor Networks and Signal Processing (SNSP), pages 409–420, 2018.
[10] Marosi, Attila Csaba, et al. "Interoperable Data Analytics Reference Architectures Empowering Digital-Twin-Aided Manufacturing." Future Internet 14.4 (2022): 114.

Topic

Data Spaces

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