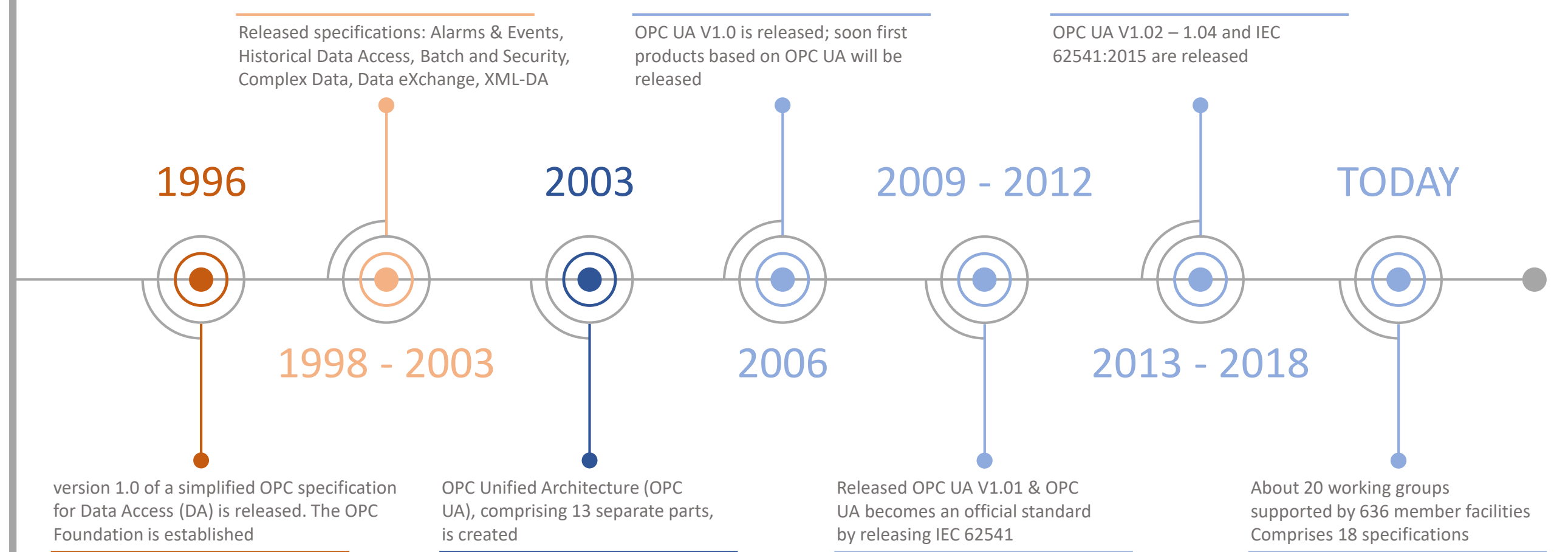


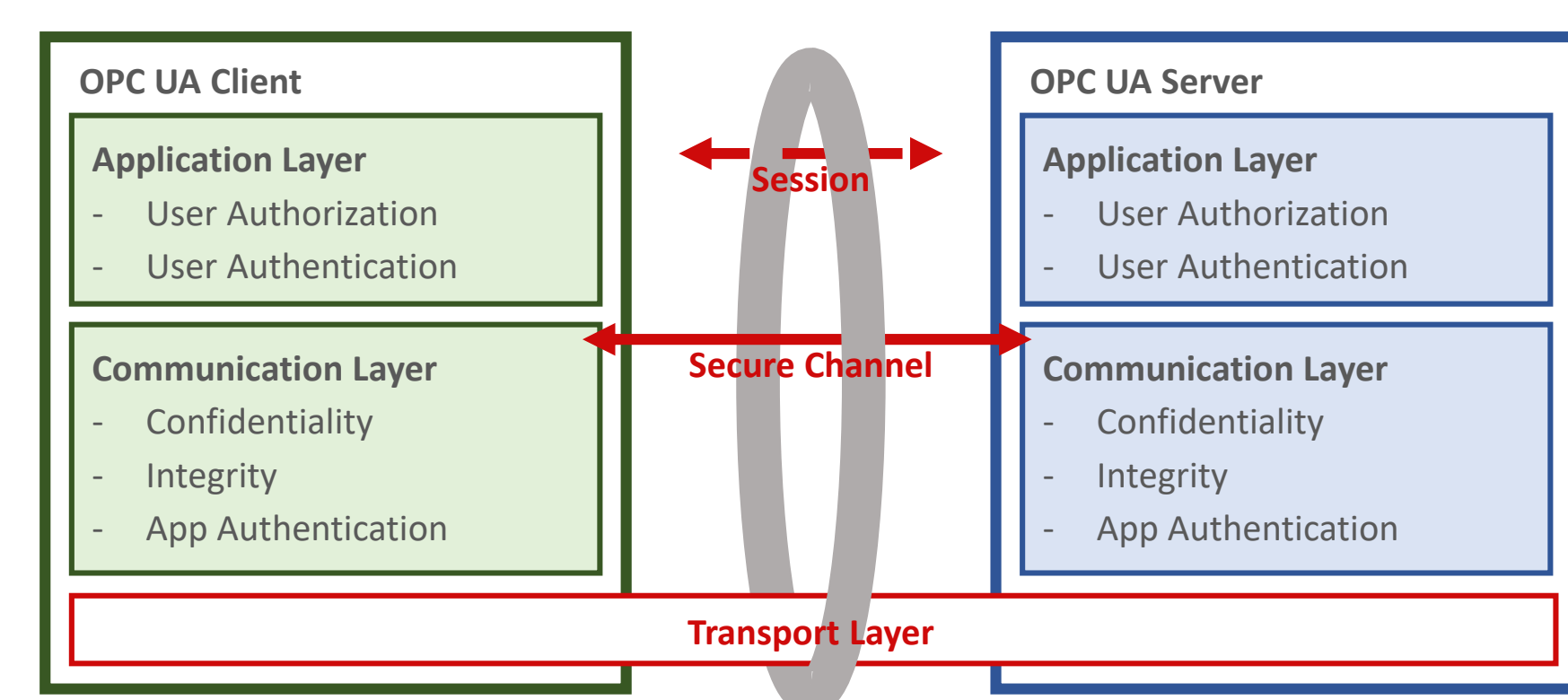
Introduction & History

- **Functional equivalence:** all COM OPC Classic specifications are mapped to UA
- **Platform independence:** from an embedded micro-controller to cloud-based infrastructure
- **Secure:** encryption, authentication, and auditing
- **Extensible:** ability to add new features without affecting existing applications
- **Comprehensive information modeling:** for defining complex information



Security Model

- **Session Encryption:** messages are transmitted securely at various encryption levels
- **Message Signing:** the recipient can verify the origin and integrity of received messages
- **Sequenced Packets:** exposure to message replay attacks is eliminated with sequencing
- **Authentication:** each UA client and server is identified through X509 certificates
- **User Control:** applications can require users to authenticate and restrict or enhance their capabilities with access rights and address-space "views"
- **Auditing:** activities by user and/or system are logged providing an access audit trail



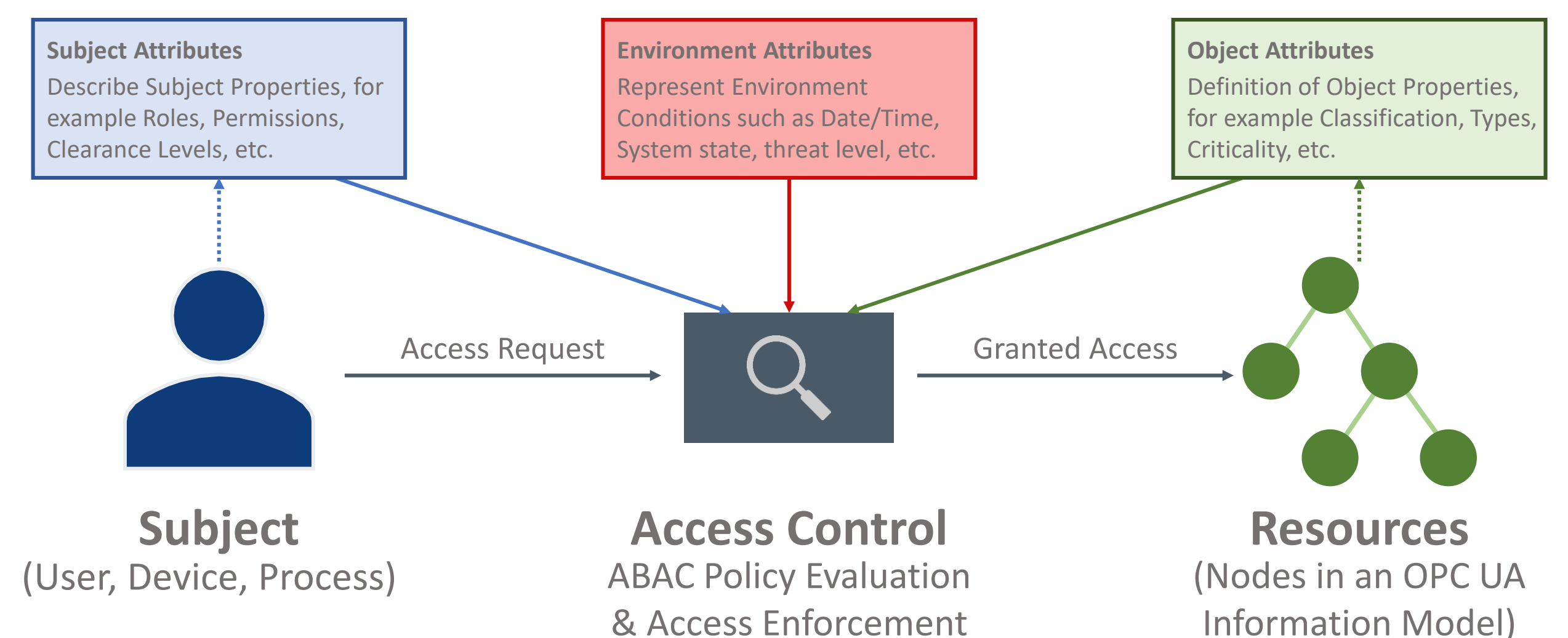
Interoperability

- **Platform independence:** OPC UA can be used on traditional PC hardware, cloud-based servers, PLCs, micro-controllers
- **Operating System independence:** OPC UA can be used on Microsoft Windows, Apple OSX, Android, or any distribution of Linux
- **Language independence:** Several open-source implementations are developed in different programming languages. The most popular ones are:

Github trends	Implementation	Language	Link
1k	open62541	C	
774	node-opcua	JavaScript	
730	UA-.NETStandard	C#	
606	python-opcua	Python	

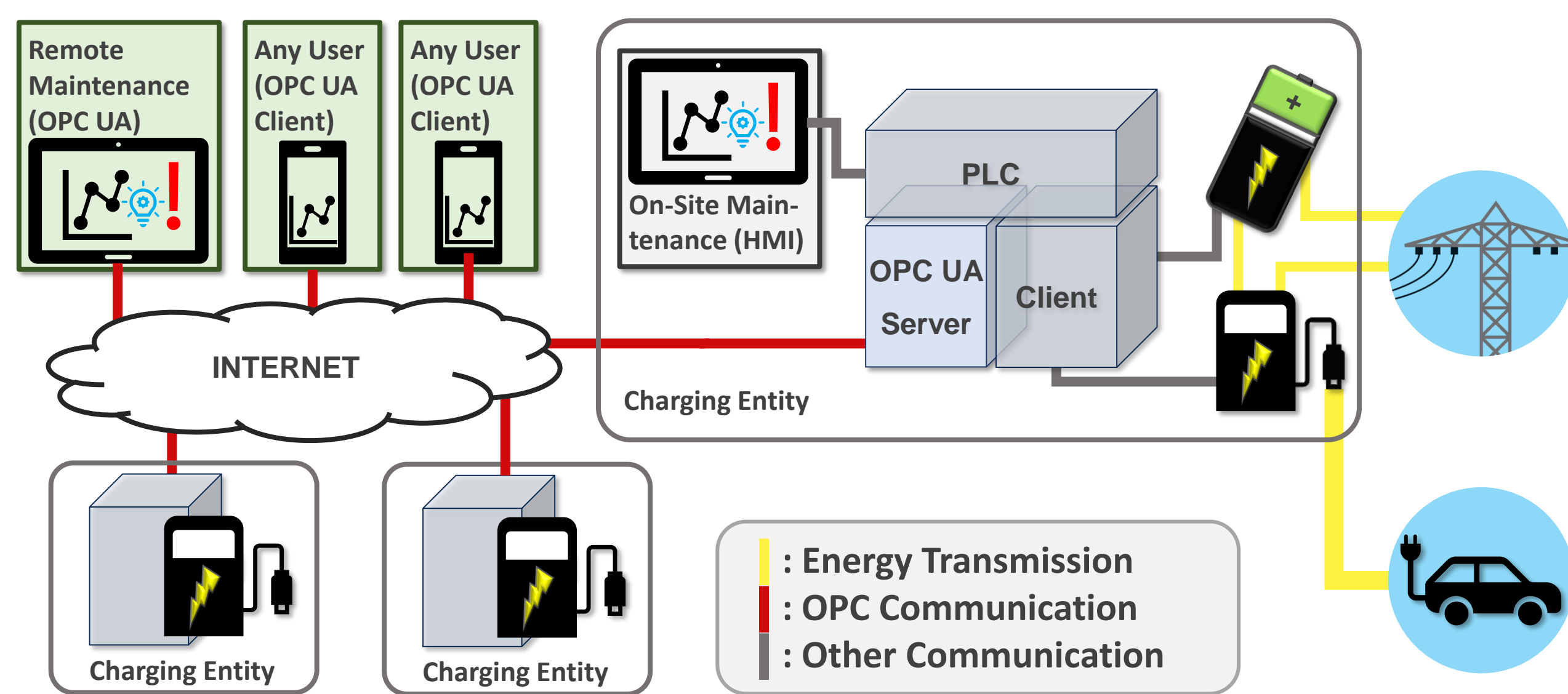
Attribute Based Access Control

- **Fine-granular Access Control:** Attribute-based Access Control (ABAC) describes resources, accessing subjects and the environment by associated attributes.
- **High Security:** ABAC allows definition of access rules that consider factors such as system state, risk, context, parameter values as well as subject- and object properties.
- **Flexibility:** Access privileges are granted by associated attributes and policies, systems such as Role-based Access Control can also be realized with ABAC



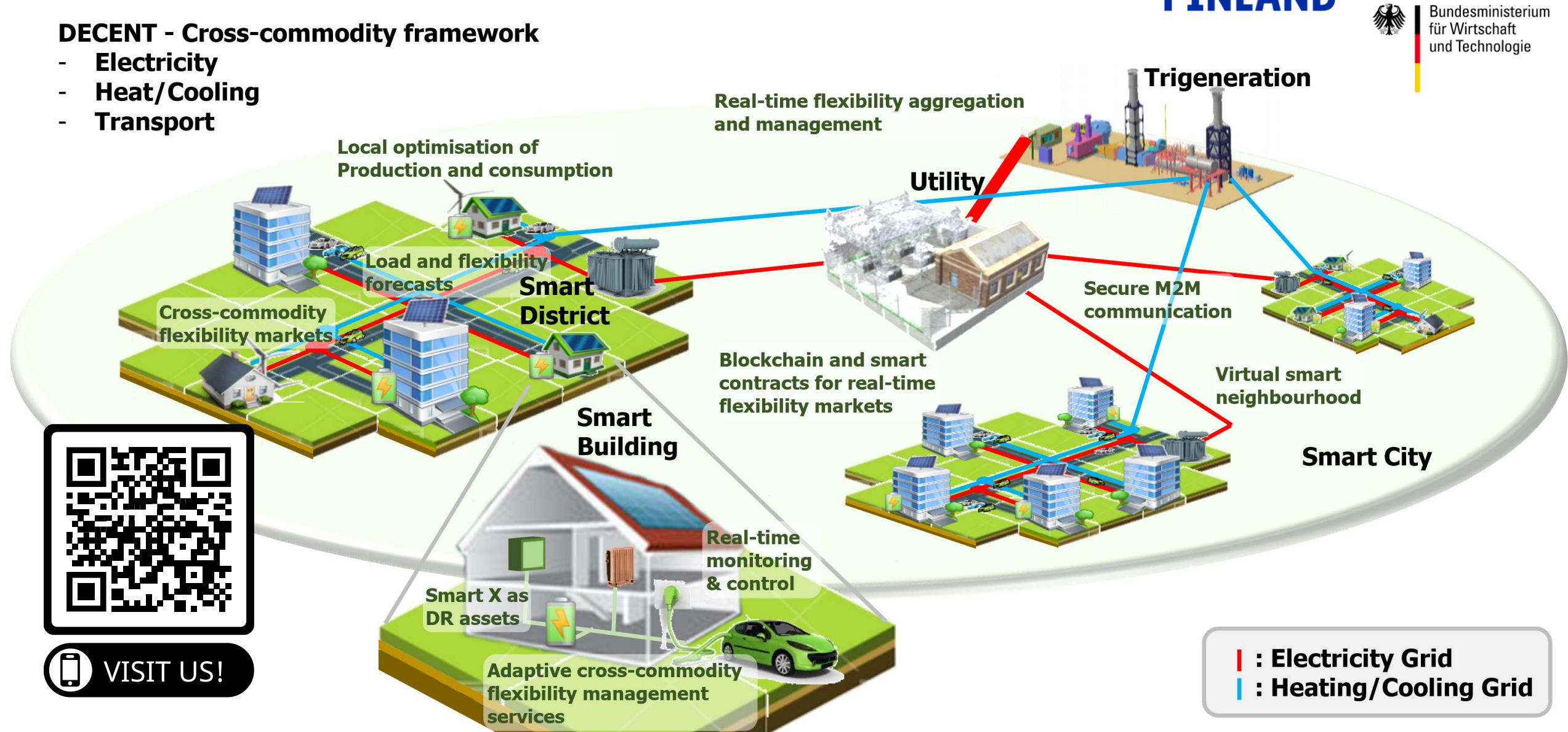
Life Demonstrator

- **Smart grids:** overcome fluctuations due to renewable energy sources
- **Crucial secure communication:** OPC UA facilitates decentralized communication – secure and completely independent on the manufacturer
- **Address space:** OPC allows different views on definition of user roles



DECENT & Battery Chargers

- **DECENT: DEcentralized Cross-commodity Energy Management:** German & Finnish collaborative research project
- **Goal:** ICT solution for cross-commodity sharing
- **OPC UA:** ensures secure end-to-end communication in DECENT



Sources

- [1] DECENT project: <https://www.decent.future-iot.org/>
- [2] OPC Foundation: <https://www.opcfoundation.org/>
- [3] V. Watson, J. Sassmannshausen and K. Waedt. Secure Granular Interoperability with OPC UA, *INFORMATIK 2019 Workshops, Lecture Notes in Informatics (LNI)*, p. 309-320, Gesellschaft für Informatik, 2019