Hot topic study - Task 2

The integration of Service Orientation and Internet of Things (IoT) offers an array of benefits to various industries. While there are several general benefits of Service Orientation, such as modularity, flexibility, interoperability, and scalability. This report discusses the exclusive benefits of Service Orientation in the IoT industry, i.e., reduced complexity, improved security, and better analytics.

Overview

Table of Benefits:

Benefits	Short description of the benefits	Link
Reduced complexity	Using service orientation can make it easier to manage IoT systems by breaking them down into smaller, more manageable parts.	Ref1
Improved security	Service-oriented architecture can help protect IoT systems from attacks by embedding security measures within individual services.	Ref2
Better analytics	Service orientation standardizes data produced by IoT systems, which can be analyzed using tools for valuable business insights.	Ref3

Benefits of Service Orientation in IoT

Reduced complexity

Service Orientation in IoT is a logical approach to break down system functionality into smaller, more manageable components. In IoT systems, as the number of devices, protocols, and data sources increases, the complexity of the system grows exponentially, making it challenging to work with it. By integrating Service Orientation, system functionality can be divided into smaller, reusable parts or microservices. By separating IoT functionality into distinct components, Service Orientation can simplify the design, implementation, and maintenance of applications. Combining Service Orientation with Edge Computing, the latency and bandwidth issues can be resolved with smart, distributed computing, routing tasks, data storage, analytics, and standardization, saving resources and enhancing privacy.

For instance, in the Industrial Internet of Things (IIoT) research field, connecting different industrial equipment with data acquisition, exchange, and analysis systems are essential to optimize processes and efficiency, minimizing costs. Incorporating Edge Computing into IIoT can significantly reduce decision-making latency, save on bandwidth resources, and protecting privacy. This report highlights the Edge Computing research progress in IIoT, including its concepts, future architecture, technical progress in routing, task scheduling, data storage, analytics, and standardization. It also discusses the potential challenges and opportunities of Edge Computing in IIoT, introduces application scenarios such as PHM, smart grids, manufacturing coordination, ICV, and smart logistics.

- Edge computing in industrial internet of things: Architecture, advances and challenges

Improved security

Incorporating Service Orientation in IoT systems enhances the security of the network. IoT devices are vulnerable to cyber-attacks because of their constant connectivity and communication of a vast amount of data. However, Service-Oriented Architecture enables the embedding of security measures such as encryption, authorization, and data integrity checks into individual services, providing an extra layer of protection against intrusion of the system. It is thus essential to integrate security measures into individual services within the IoT system, enhancing the overall security parameters of the system. Improved security measures are vital in ensuring information confidentiality, privacy, and maintaining system integrity.

A use case of Service Orientation enhancing security in IoT systems is in healthcare. In the healthcare sector, IoT systems monitor patients through connected devices. The system can be designed to have security measures embedded in individual services such as encryption to ensure patient privacy, customer authentication to prevent unauthorized access, and data integrity checks to prevent undue tampering of health data. Thus, by incorporating security measures into IoT system services, the solution's security profile is greatly enhanced, ensuring confidential and secure management of patient information.

- Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications
- The rise of "big data" on cloud computing: Review and open research issues

Better analytics

The Service Orientation approach in IoT systems ensures that consistent data production is obtained, facilitating more effective analysis using analytical tools to derive actionable insights. With IoT systems producing large data sets, analyzing data and extracting valuable business insights is crucial. Utilizing Service Orientation, developers can create services that produce data in a standardized format that makes analyzing data efficient. By analyzing sensor measurements, traffic flows, user behavior, and critical data points, Service Orientation in IoT can lead to better algorithms, new insights, and innovative services.

Service Orientation in IoT systems enables Better Analytics. By breaking down IoT system functionalities into more manageable components, analyzing IoT applications becomes more feasible. This effective integration of system components allows for efficient data processing, acquisition, storage, and presentation, leading to better analysis of the system.

- Big data processing architecture for smart farming

Additionally, let us take an example of a smart city that seeks to optimize transportation services through a data-driven approach. Without using service orientation, the complexity of this system could be overwhelming, making it difficult to manage effectively. However, by breaking down the system's functionality into smaller, more manageable components using a service-oriented architecture, the task becomes more feasible. For instance, each transportation service could be reduced to a single service, allowing the system to be designed, implemented, and maintained in a more practical manner.

- Service-oriented architecture for big data analytics in smart cities