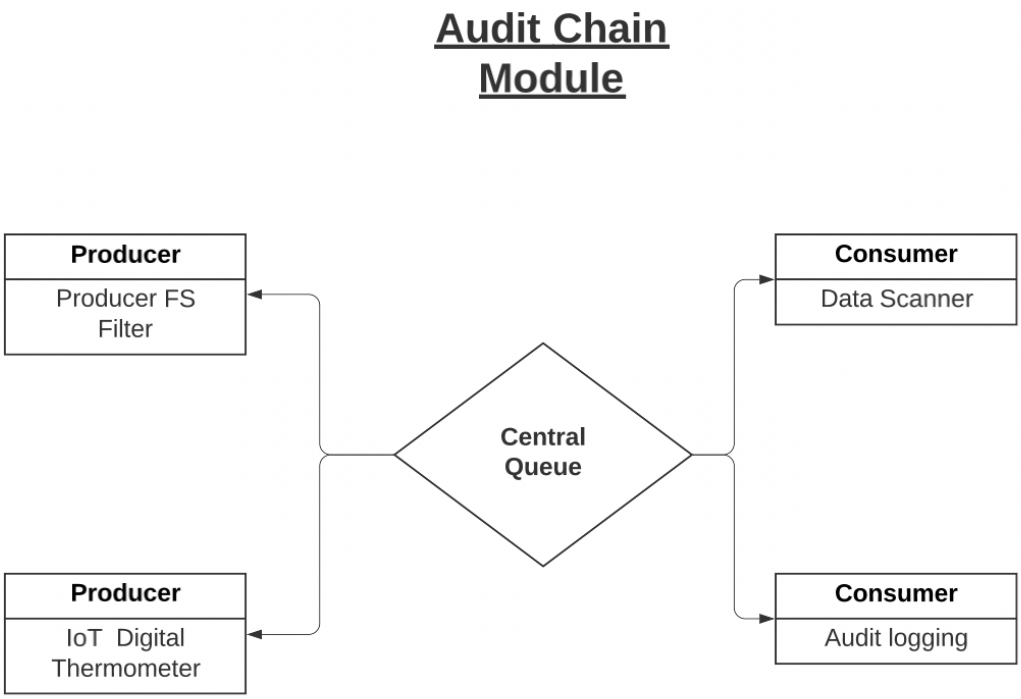
SOFTWARE ARCHITECTURE DESCRIPTION

AMOS SS2022

Project 2 – Audit Chain

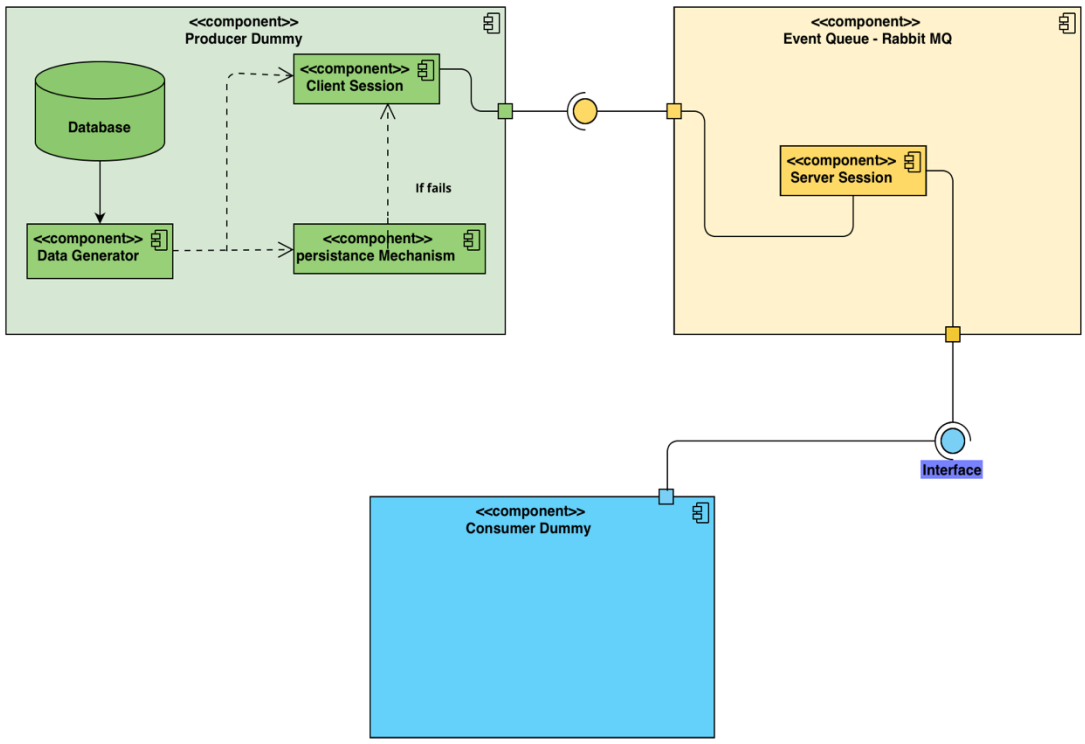
Runtime Components



The main idea of our project is that events of any kind like IoT, file systems, and measurement loggers should be transmitted securely via the network. So, there is also a central event queue, which records these events and for further steps provides. Furthermore, services can then register at the event queue to pick up the events and to be able to process, also via a network. All changes to files (timestamp, size, permissions) in a defined.
File structures are recorded as an event. These are securely transmitted to the central queue on another node, and they are taken from the central queue by a process (from a third Node off), stored audit-proof (e.g., in a blockchain technology secured Storage), and then deleted from the queue.
The producer is the creator and the sender of events. Also, the events are recorded serially, and the central event queue is transmitted via the network queue. Moreover, as it concerns the queue, in this case, events are accepted over the network and securely cached and offer the possibility for producers and consumers to register.
Finally, we have the consumer who uses the events from the queue to trigger further actions based on them. These actions can be, for example, in the

simplest case, the secure permanent storage of events, but also further processing steps such as process control.

Code Components



We have used the component diagram to show different components of our code solution. Our code is basically comprised of 3 major components, producer dummy (client), rabbitMQ (Event Queue), and consumer dummy. The producer dummy operates through the dependencies among its 3 sub-components database, data generator, and persistence mechanism (storage buffer). When the producer dummy is triggered, the data generator catches data events (message) from the database and then forwards it to the client session and persistence mechanism. The persistence mechanism is a contingent component that stores the last data event and gets triggered in case of any failure.
After the producer dummy successfully generates an event, it goes to rabbitMQ (event queue). RabbitMQ is a 3rd party program that we are using as a

component for queuing events. Furthermore, we checked for data replication in RabbitMQ. Lastly, after rabbitMQ queues events successfully, the data event moves to the consumer dummy.
So, first step was to build the consumer dummy by developing firstly the prototype and giving the acknowledgment that message is received. Consumer receives messages from RabbitMQ, and those messages are submitted in sequenced number. Also, we followed a specific strategy to save messaged in correct order. And then we integrate blockchain data structure in consumer data, where we save the received messages in data structure and ensure the right sequence of incoming messages. Finally, we ensure the flow of the consistent message.

Technology Stack

TOOL	TYPE	VERSION
GitHub + Git	Version Control	
Java 16(SDK)	Software Development Kit	16 of the Java SE
RabbitMQ	An open-source message-broker software	TBD
Linux	Ubuntu	18.04

A Summary of the underlying technology stack

First, a tech stack combines technologies a company uses to build and run an application or project. It typically consists of programming languages, frameworks, databases, front-end tools, back-end tools, and applications connected via APIs. It has become essential for building easy-to-maintain, scalable web applications.
In our project, we use different technologies to fulfil our aim.
First, we use RabbitMQ, an open-source distributed message broker that facilitates efficient message delivery in complex routing scenarios. Also, it employs a push model and prevents overwhelming users via the consumer configured prefetch limit. RabbitMQ natively implements AMQP 0.9.1 and uses plug-ins to offer additional AMQP 1.0, HTTP, STOMP, and MQTT protocols, and it officially supports Java, JavaScript, PHP, Python, Spring, etc. It also supports various dev tools and clients using community plug-ins. We use RabbitMQ to process high-throughput and reliable background jobs, plus integration, intercommunication between and within applications, perform complex routing to consumers and integrate multiple applications and services with nontrivial routing logic. We prefer it instead to Kafka because with Kafka we would introduce way more complexity. It sends messages to users that these messages are removed from the queue once they are processed and acknowledged.
On the other hand, Kafka is a log that uses continuous messages, which stay in the queue until the retention time expires. Finally, RabbitMQ employs the innovative broker/dumb consumer model while Kafka uses the dumb broker/innovative consumer model. Kafka doesn't monitor the messages each user has read. Instead, it retains unread messages only, preserving all messages for a set time. Consumers must monitor their position in each log. Moreover, we use Java, a multi-platform, object-oriented, and network-centric programming language. We chose it as the first option instead of Python because Java is a statically typed and compiled language that offers limited string-related functions. Python is a dynamically typed and interpreted language that provides many string-related parts. Finally in the 4th week of the project and in consultation with our industry partner we decided not to proceed with the python programming as it would be too time consuming to implement every feature in python as well.
Furthermore, we implemented JUnit is a unit testing open-source framework for the Java programming language. We use this framework to write and execute automated tests. However, in Java, there are test cases that must be re-executed

every time a new code is added. This is done to make sure that nothing in the code is broken.