Apache Kafka

Modern alternative for arranging the architecture of larger information systems and the integration of several systems in very flexible and scalable way

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Apache Kafka

- “Apache Kafka is an open-source **distributed event streaming platform** used by thousands of companies for high-performance data pipelines, streaming analytics, data integration, and mission-critical applications.” (http://kafka.apache.org)
- ” More than **80% of all Fortune 100 companies** trust, and use Kafka” (http://kafka.apache.org)
- Usually you should not use the creators/owners of technology as source, especially when very positive claims are used. Here the two statements above have been proven by practice though.
- Kafka is also developed by the community together and it’s not proprietary project.
- And as we are not doing thesis or other academic research those quotes are maybe ok

Publish-subscribe pattern

- An example of the messaging patterns.
- (Only extra reading: https://en.wikipedia.org/wiki/Publish%E2%80%93subscribe_pattern)
- **Publisher** publishes **messages/events** to **stream/queue/broker**. Publisher does not know the subscribers
- **Subscriber subscribes to receive** messages/events from the stream/queue/broker. Subscriber does not need to know the publishers
- These systems often provide these characteristics or benefits:
  - Distributed system with minimal dependencies
  - Sub-systems written even with other programming languages as long as the message is of a common format
  - Asychronous operation, Possibly/probably buffering and message retention for long time / ’forever’ if we so like
  - First come first served principle if we so wish. Or some priorities used.

Loosely related terms for discussing this topic

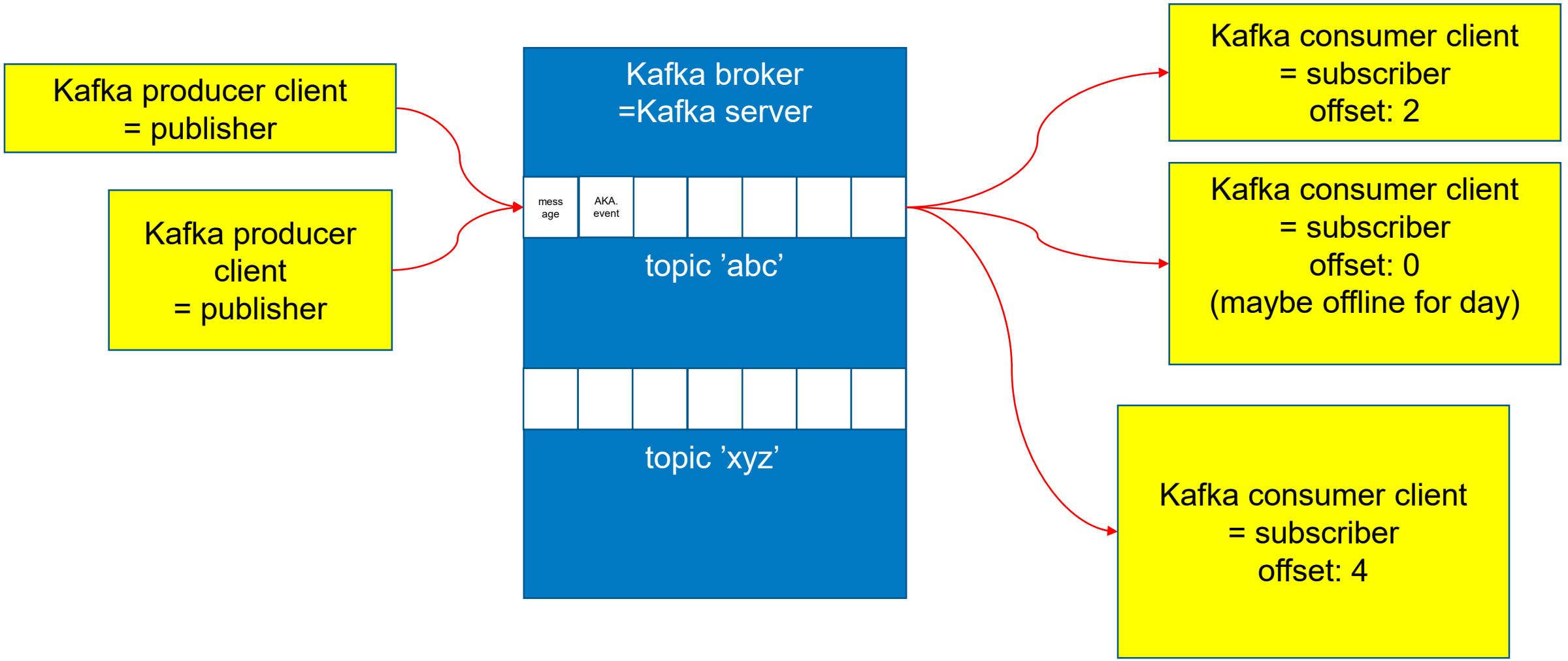
- **Event / Message** - Message or signal or other data from system or subsystem to another
- **Broker / Stream / Bus** / (*Queue) / (Buffer) - ”Server” needed for relaying messages
- **Publisher / Producer** – Application or process that creates messages to the server
- **Subscriber / Consumer** - Application or process that will receive messages from the server
- **Topic / Category / Channel / Feed / Tag** – Way to have multiple streams in same broker process, thus also connect the ends more than one way (A might produce message to topic X, but consume a message from topic Y. B might do vice versa)

- (* with settings it’s possible to make it reversed as Stack too, Last in-First out that is)

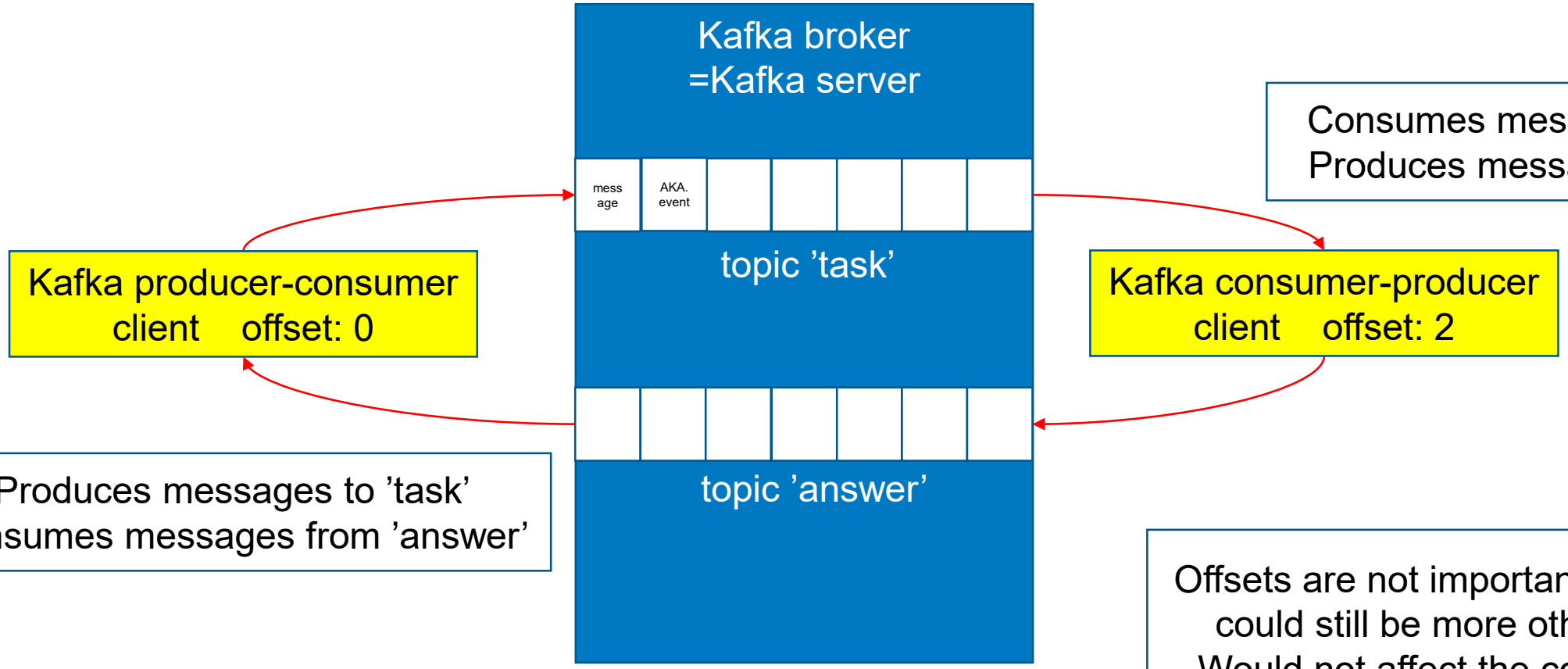
Kafka uses some of those common terms

- **Event** - Message or signal or other data from system or subsystem to another
- **Broker** - ”Server” needed for relaying messages
- **Producer** – Application or process that creates messages to the server
- **Consumer, subscribe** - Application or process that will receive messages from the server
- **Topic** – Way to have multiple streams in same broker process, thus also connect the ends more than one way (A might produce message to topic X, but consume a message from topic Y. B might do vice versa)
- Offset – Basically an index on how much a certain Consumer has already handled of the arrived messages
- https://data-flair.training/blogs/kafka-terminologies/
- Not so important Kafka terms now (related to performance, reliability, modularity, etc. not the first simple operation you need):
  - Cluster, Node, Partition, Log, Replica, Leader, Follower, Consumer group

Distributed Event Stream architecture – e.g. Kafka



How two systems can ’discus’ in Kafka



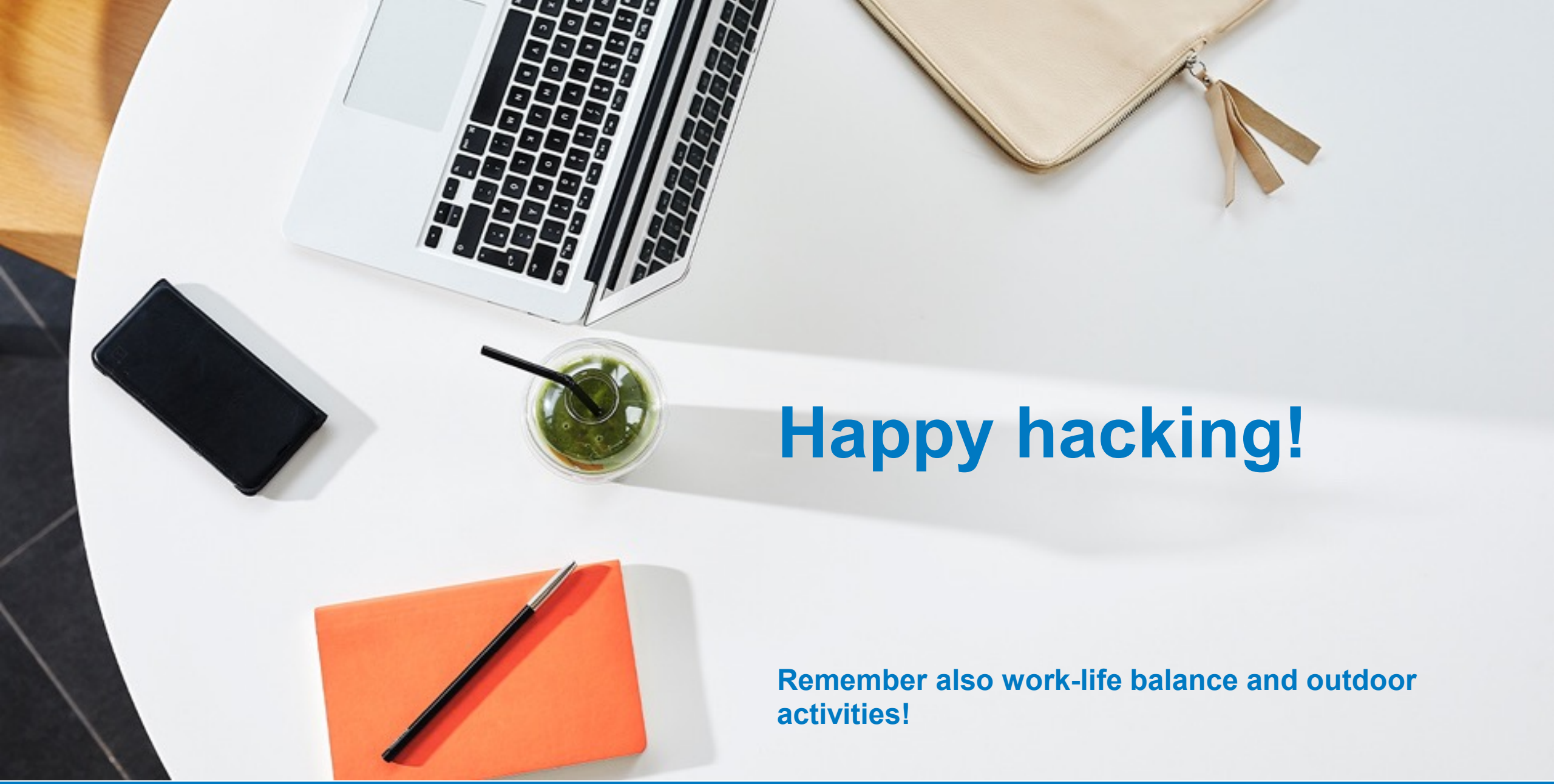
Offsets are not important here. Also there could still be more other consumers. Would not affect the communication of these two if they are the only producers to these two channels / topics

Create your own Kafka test?

- You can write Kafka clients (publishers and/or subscribers) with at least these languages:
  - https://cwiki.apache.org/confluence/display/KAFKA/Clients
  - E.g. Node.js, C/C++, .NET, Java, Python, Rust, Ruby, Swift… Basically any language that has any relevance nowadays
- Advance step by step, testing each step to reduce error possibilities.
- There is an Assignment available that first is just writing based on model and making it to run

Steps of Kafka demo/tryout system development

- Download Kafka runnables (Kafka server and Zookeeper) (Or use them from Docker image repository)
- Configure Kafka server and Zookeeper process (Or the docker container for them)
- **Start** the Kafka server
- Setup a Topic (A name for the Topic, kind of a Channel)
- Code your Kafka producer client with your preferred programming language and runtime so that it puts some message to server's Topic
  - Start the producer
- Code your Kafka consumer client with your preferred programming language and runtime so that it subscribes to receive those messages.
  - Language does not have to be same as the producer. But possibly you want to use the same for simplicity
  - Start the consumer



Happy hacking!

Remember also work-life balance and outdoor activities!