Filtering and scaling of Eiffel

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Eiffel

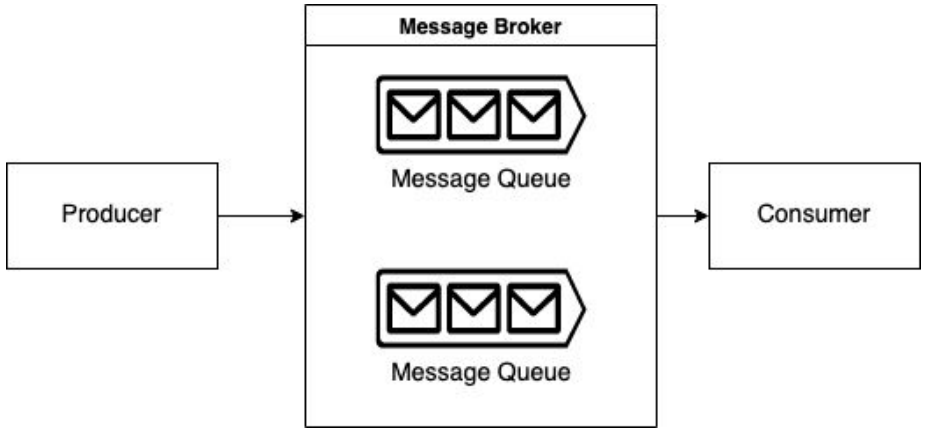
Agenda

- Message brokers
- RabbitMQ routing keys
- Scaling
- Reflections on Ericsson setup
- Reflections on Axis’s setup
- Useful patterns when processing events

Message brokers

Choice of Message Broker

- Transports the message from the publisher to the consumer
- Different brokers different setups
- Traditionally RabbitMQ
  - Was widely available when we started



RabbitMQ – lock-in?

No

- Eiffel protocol as such does not stipulate transport
- PR to show how to use Eiffel on CloudEvents

Yes

- Eiffel Sepia talks about RabbitMQ
- Some tools in the Eiffel community does use RabbitMQ

RabbitMQ – how much do you need?

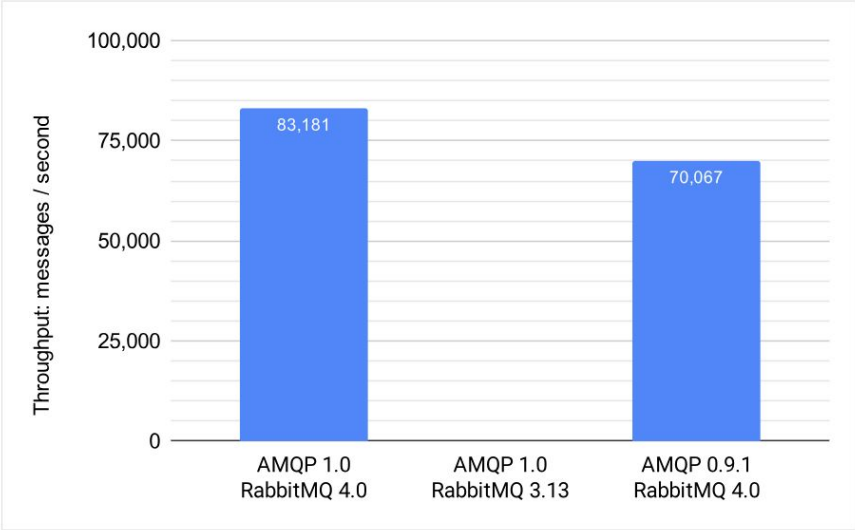


Figure 2: Quorum queue end-to-end message rate

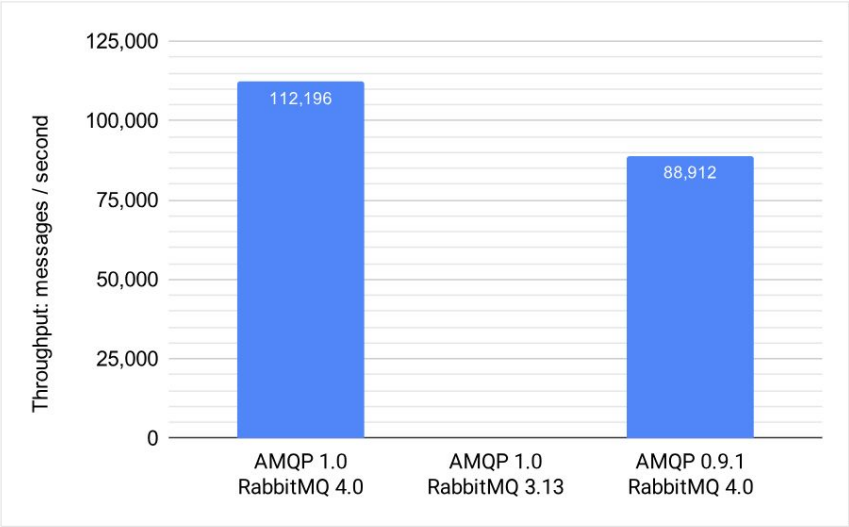


Figure 3: Stream end-to-end message rate

Modern RabbitMQ handles 70k - 110k messages/second
(on a single node 8 cores, 32GB RAM)

Eiffel

https://www.rabbitmq.com/blog/2024/08/21/amqp-benchmarks

Alternatives – RabbitMQ vs Kafka

- RabbitMQ and Kafka offer high-performance message transmission
  - Kafka outperforms RabbitMQ in message transmission capacity.
- Kafka can send millions of messages per second via sequential disk I/O
- RabbitMQ need multiple brokers to reach millions of messages per second
  - Might slow down if RabbitMQ's queues are congested.

https://aws.amazon.com/compare/the-difference-between-rabbitmq-and-kafka/

RabbitMQ – pros

- Complex routing architecture
  - RabbitMQ provides flexibility for clients with vague requirements or complex routing scenarios.
- Language and protocol support
  - RabbitMQ supports legacy protocols such as MQTT and STOMP
  - RabbitMQ supports a broader range of programming languages compared to Kafka.

https://aws.amazon.com/compare/the-difference-between-rabbitmq-and-kafka/

RabbitMQ – recommendations

- RabbitMQ blog: “*A happy Rabbit is an empty Rabbit.*“
  - RabbitMQ provides the best throughput and lowest latency when queues are empty.
- Gotchas
  - Don’t open and close connections or channels repeatedly.
  - Don't have queues that are too large or too long.
  - Don't use old RabbitMQ/Erlang versions or RabbitMQ clients/libraries.
- RabbitMQ happier with 10 queue à 1000 messages than 1000 queue à 10 messages

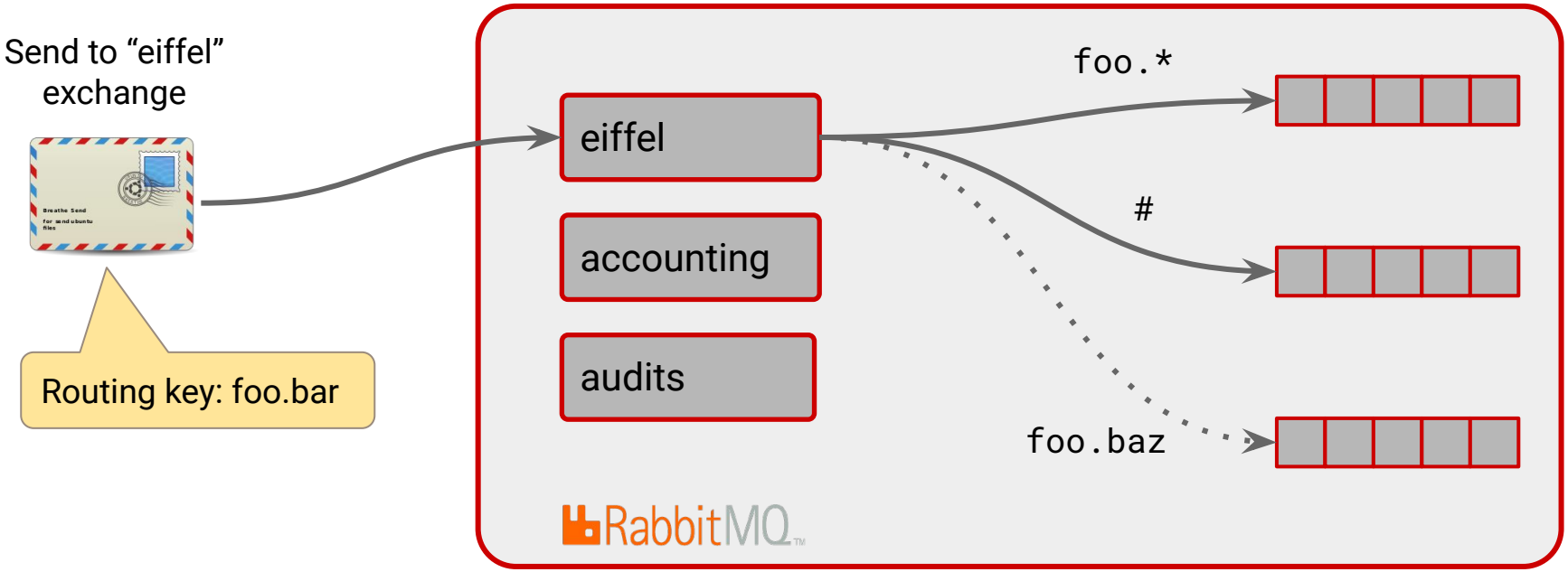
https://www.rabbitmq.com/blog/2020/06/18/cluster-sizing-and-other-considerations

https://www.cloudamqp.com/blog/part4-rabbitmq-13-common-errors.html

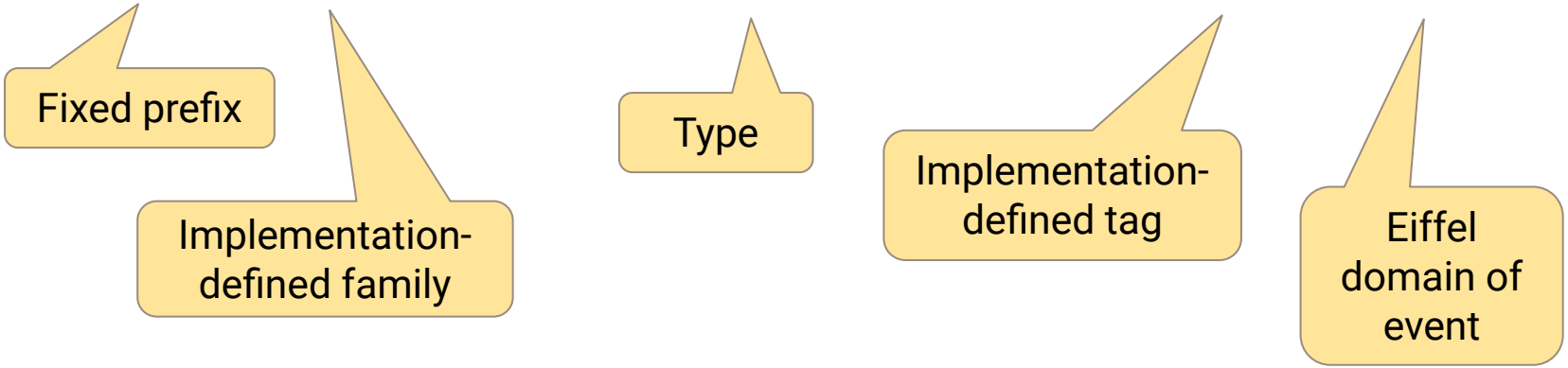
Questions?

RabbitMQ routing keys

What's a routing key?



Standard routing key schema for Eiffel events



(Full definition)

Eiffel

Examples

Producer

```
eiffel._.EiffelArtifactPublishedEvent._._
```

Consumer

```
eiffel.*.EiffelArtifactPublishedEvent.#
```

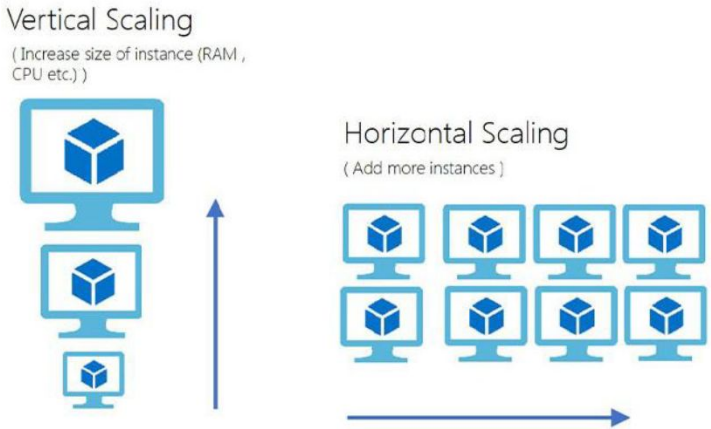
Compatibility

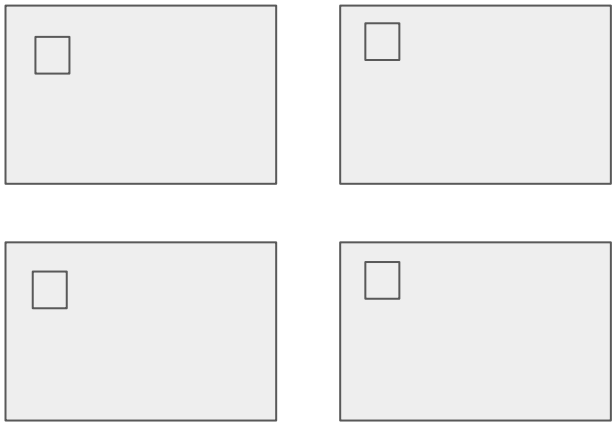
- Go SDK
- .NET SDK
- eiffel-pythonlib
- Eiffel REMReM Publish
- eiffel-broadcaster
- events-gerrit

Scaling

Scaling

- Infrastructure scaling
- Scaling through partitioning





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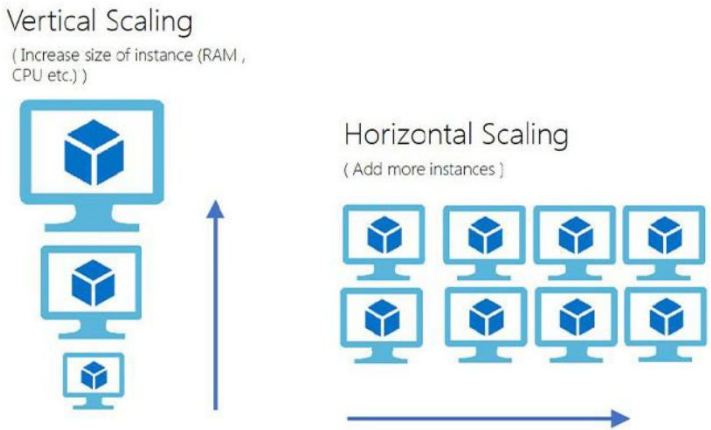

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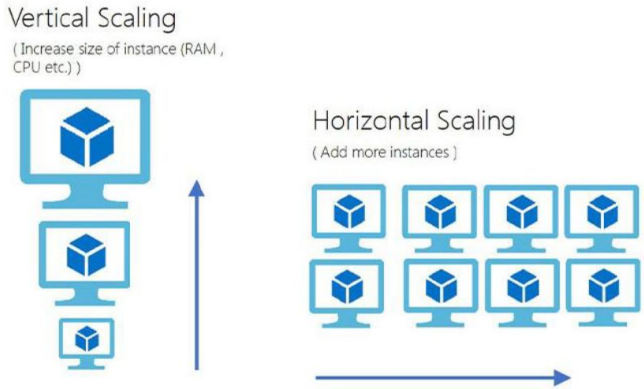
RabbitMQ – scaling

- RabbitMQ can expand its message-handling capacity
  - Vertically - allocate more compute resources to RabbitMQ's server
  - Horizontally



- Technique called RabbitMQ consistent hash exchange

https://aws.amazon.com/compare/the-difference-between-rabbitmq-and-kafka/

https://www.alibabacloud.com/tech-news/a/rabbitmq/gu0eyrdxg4-scaling-rabbitmq-with-consistent-hashing

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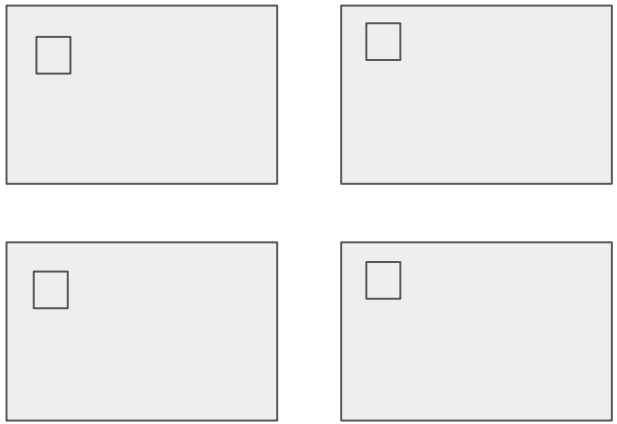
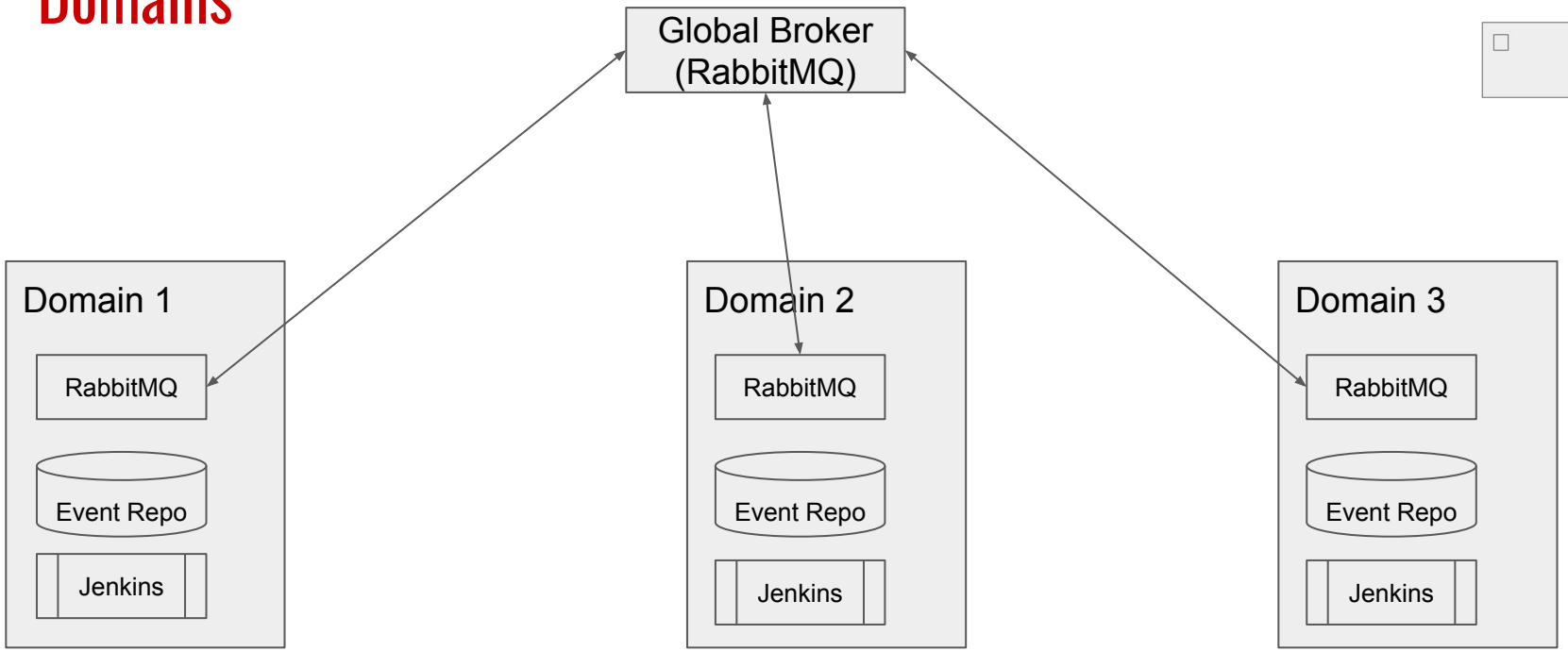


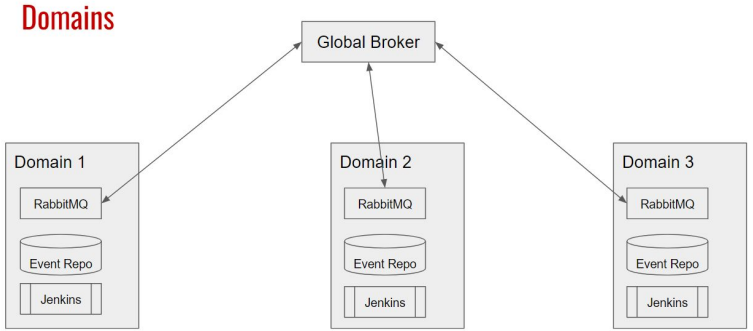
Domains



ArtC, ArtP, CLM federated by default

Domains – partitioning

- Group components
  - Upgrade components independently
- Can span several sites
- Maps to common sense
  - Like a group of people working with a product
  - All the events connected to a “product”
- A domain decides
  - whom to share events with
    - Can restrict what events will be federated
  - Who will access broker and database



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RabbitMQ – federation

- Federation plugin - transmit messages between brokers without requiring clustering
  - they may be hosted in different data centers, potentially on different continents
  - they may have different users, virtual hosts, permissions and purpose
  - they may run on different versions of RabbitMQ and Erlang
  - they may be of different sizes

- Types of federations
  - Exchange federation: for replicating a flow of messages through an exchange to a remote cluster
  - Queue federation: to create a "logical queue" across N clusters that will move messages where consumers are (if there are no local consumers)

https://www.rabbitmq.com/docs/federation

Questions?

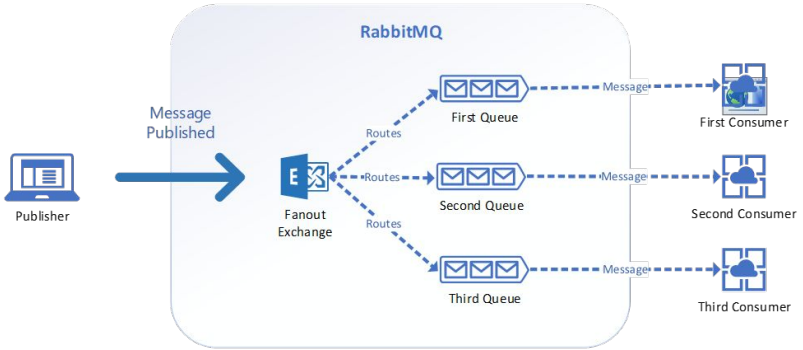
Reflections on Ericsson's setup

Domains – Where are we today in Ericsson?

- Designed years ago
  - Works well with about 4 million events/day
  - Probably not the setup if we done it today
- Original 3 domains
- Today 100+ domains (i.e. 100+ brokers)
- Need of governance
  - If you don't give a direction the engineers will create one
- Issues with syncing upgrades - then did not have 0 downtime/seamless upgrades
  - Therefore each user had their own domain

Domains – Where are we today

- A lot of users on old RabbitMQ with some not consuming lead to problems
  - Connection with Fanout using old fashion queues



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Domains – good and tricky

- Logical grouping valuable for understanding, reasoning, and filtering
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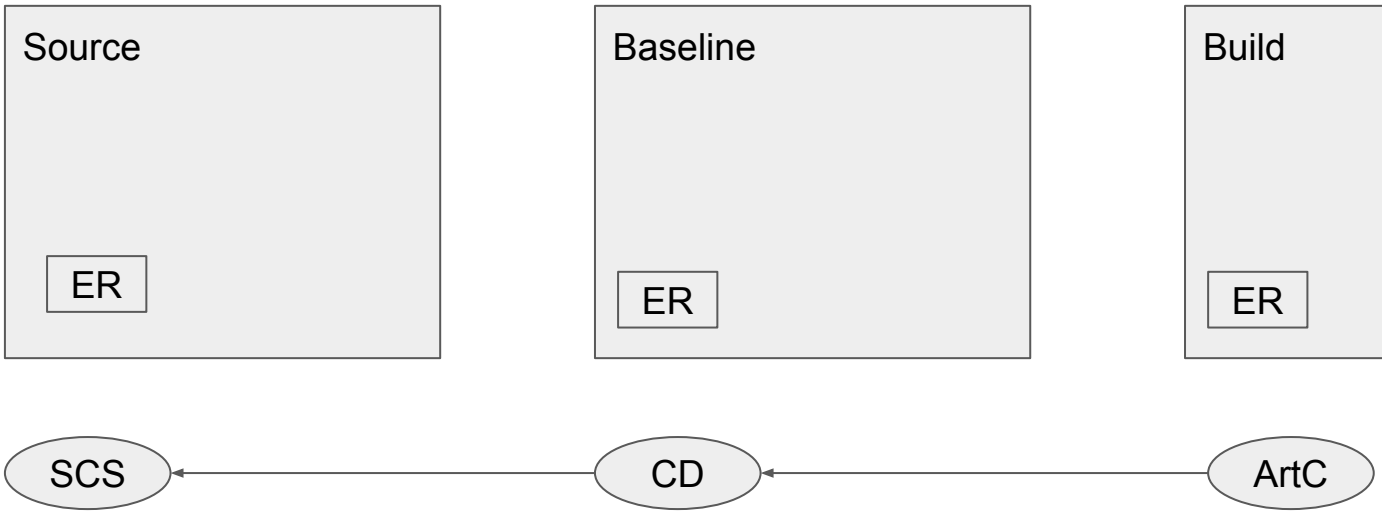
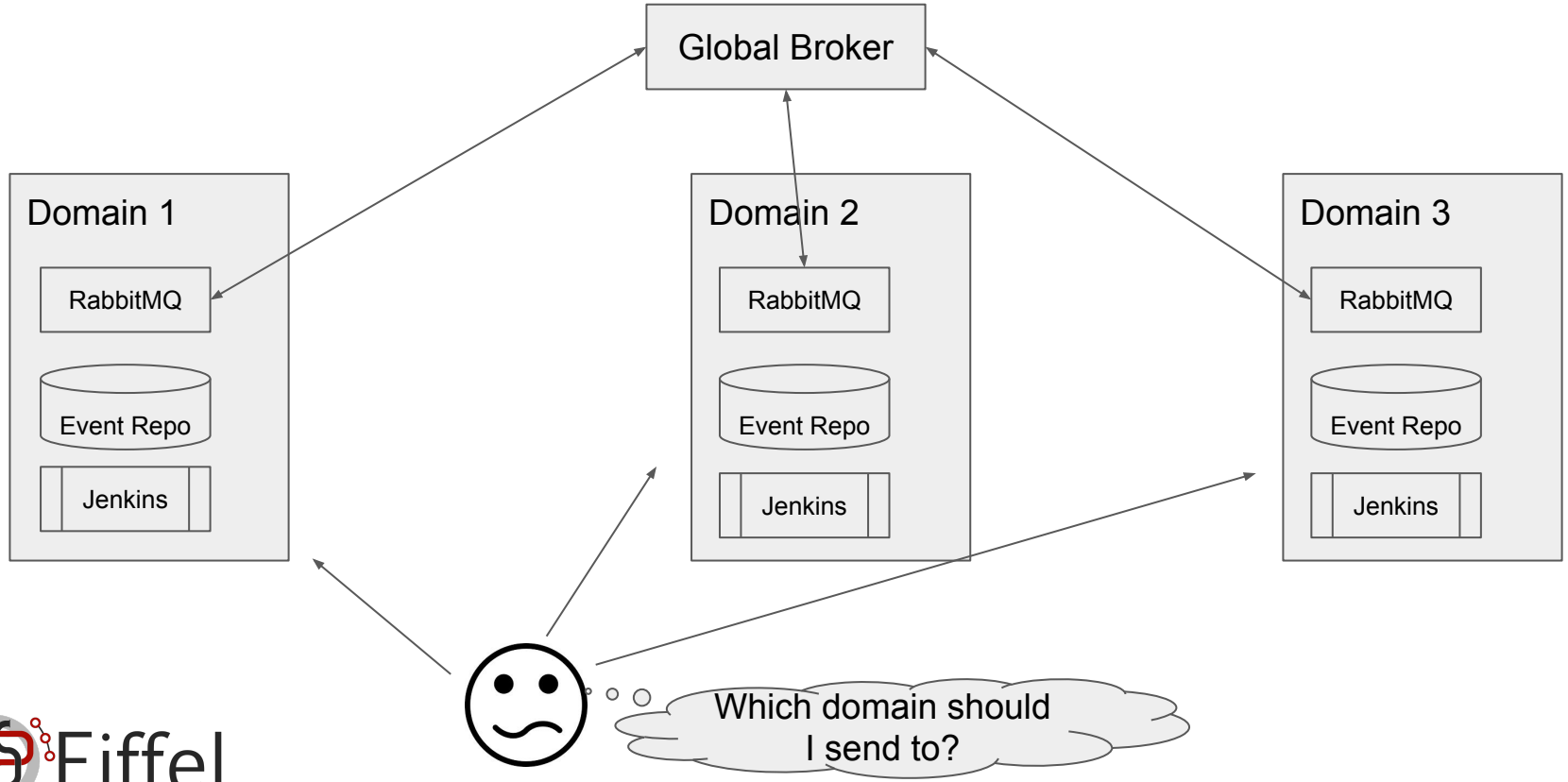
- Physical grouping
  - Tricky

Traverse several databases



Where to send



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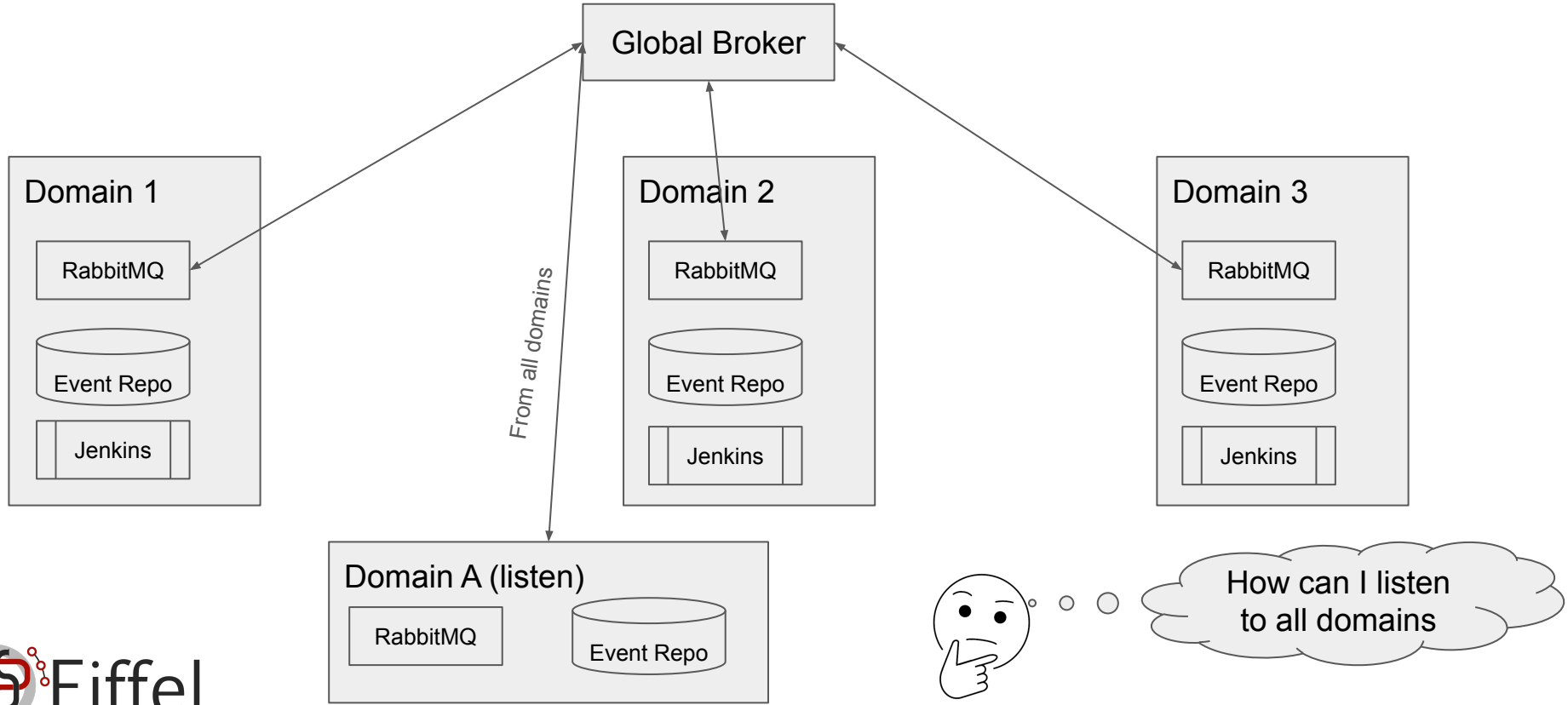
Listening domain



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Domains – good and tricky

- Logical grouping valuable for understanding, reasoning, and filtering
  - E.g. separate staging and production environments
- Physical grouping
  - Tricky
    - causes problems when traversing over several databases
    - Where should I send my event - may need access to send in many domains
      - Eg. when using a test framework used by many products need to send in their own domain
    - Sometime we need to create domains to listen in many domains
    - Many separate brokers
      - Ericsson: Upgrades responsible on many,
      - Infrastructure cost - many domains many brokers

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      - Can from RabbitMQ 3.9 restrict on topic

Eiffel

https://www.rabbitmq.com/docs/access-control#topic-authorisation

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Don’t introduce domain just because of organization, but when you really need it e.g. because of security

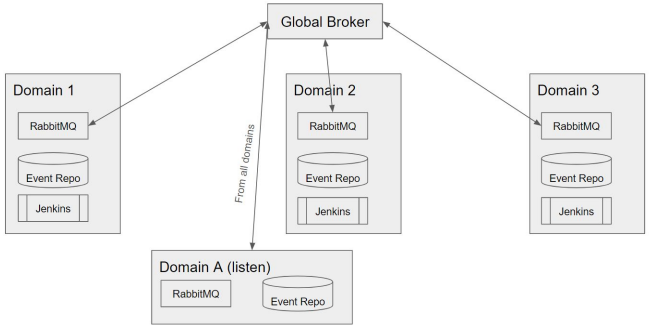
https://www.rabbitmq.com/docs/access-control#topic-authorisation

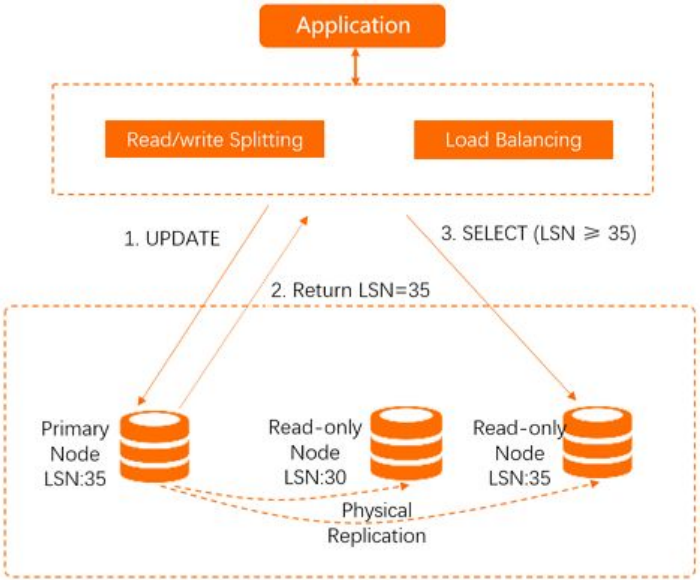
Security to motivate separation

- Event Content Tampering
  - Think zero trust
  - Sign event to guard against tampering instead of relying on broker authentication
- Sensitive information in events
  - Don’t put sensitive information in the events link to it instead
- Read access
  - Hidden? -> Domain for it

Separate databases (re-hash)

- Security applications could motivate it
  - Read access
- Hard to find chains over several databases
  - Need aggregating event from many domains
- Cost?
- Performance reading?





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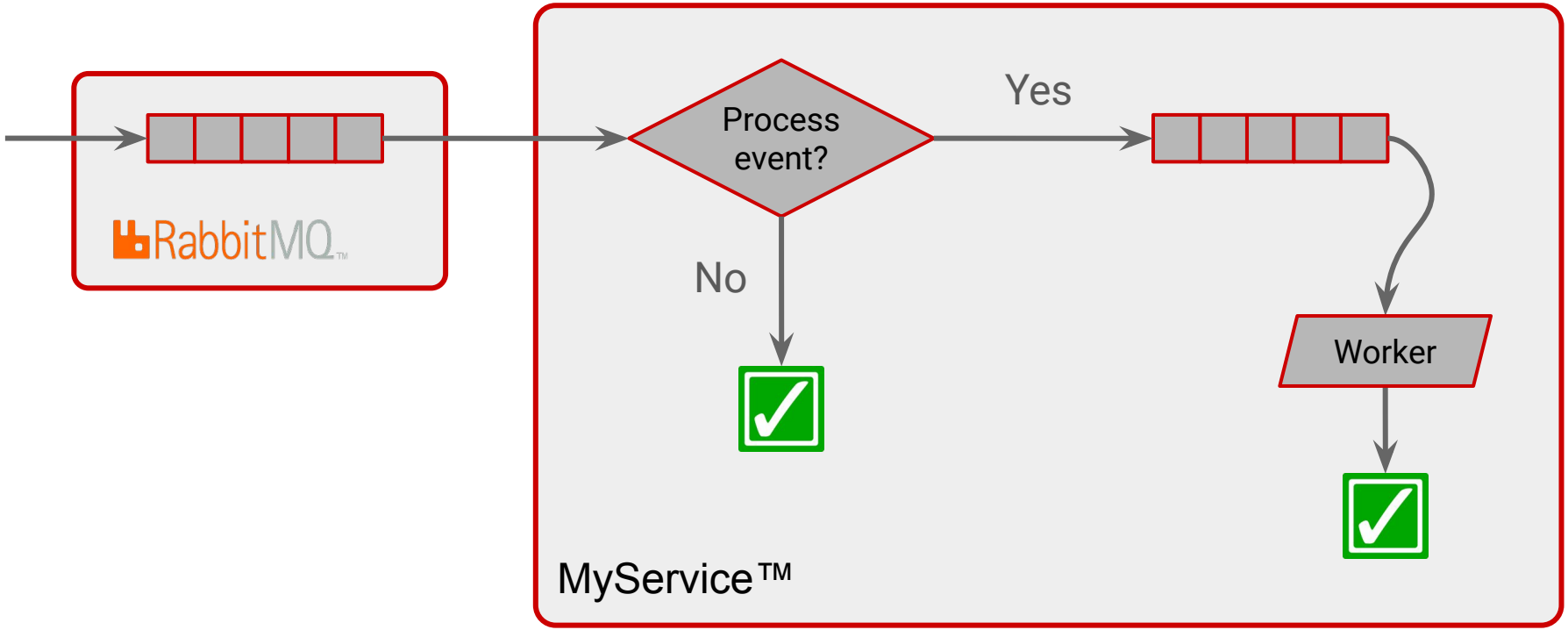
Takeaways

- Create a team to set the foundations, think platform
  - Have some central governance not to diverge too much
- Put the user first, many instances will make it harder for them
- Make sure to use the right queues
- Get the data of how much you actually need
- Enable seamless upgrades

Questions?

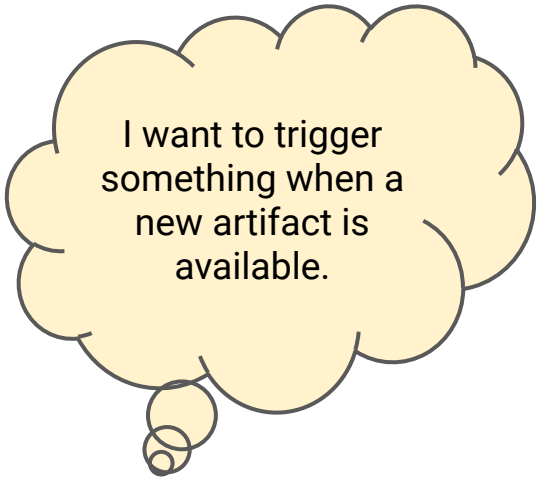
Useful patterns when processing events

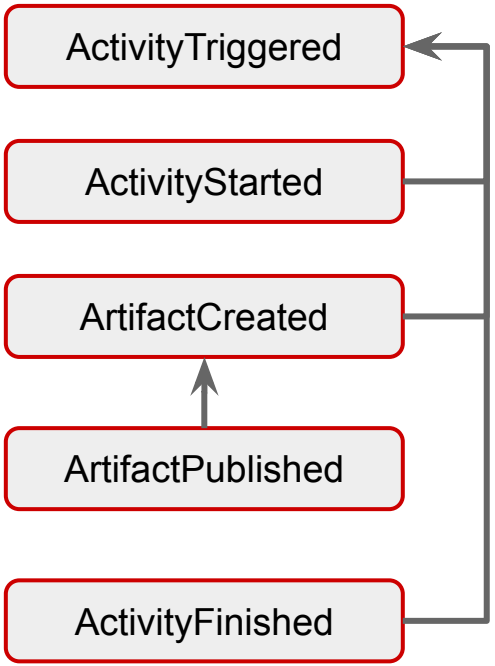
Use a queue inside your service



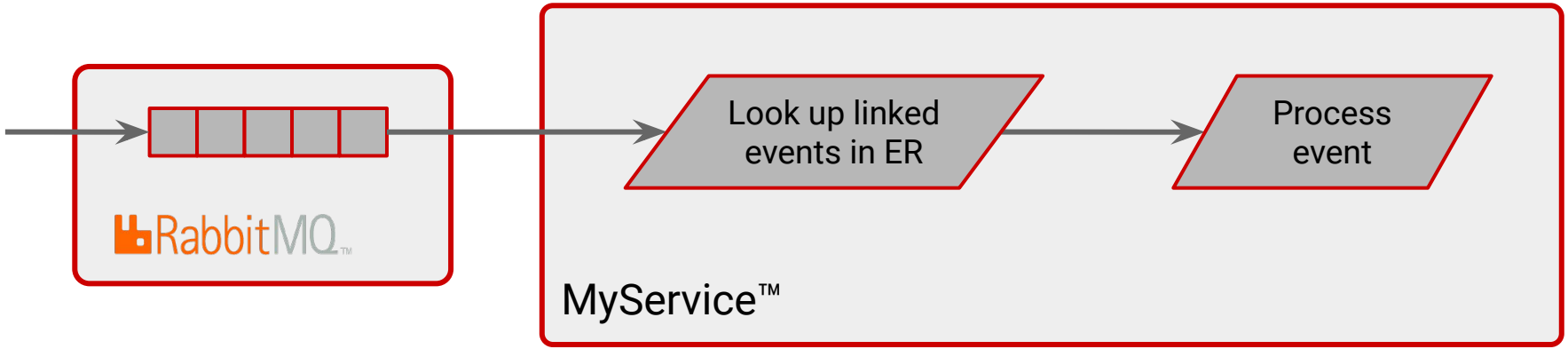
Eiffel

Avoiding event repository dependencies in consumers: Premise

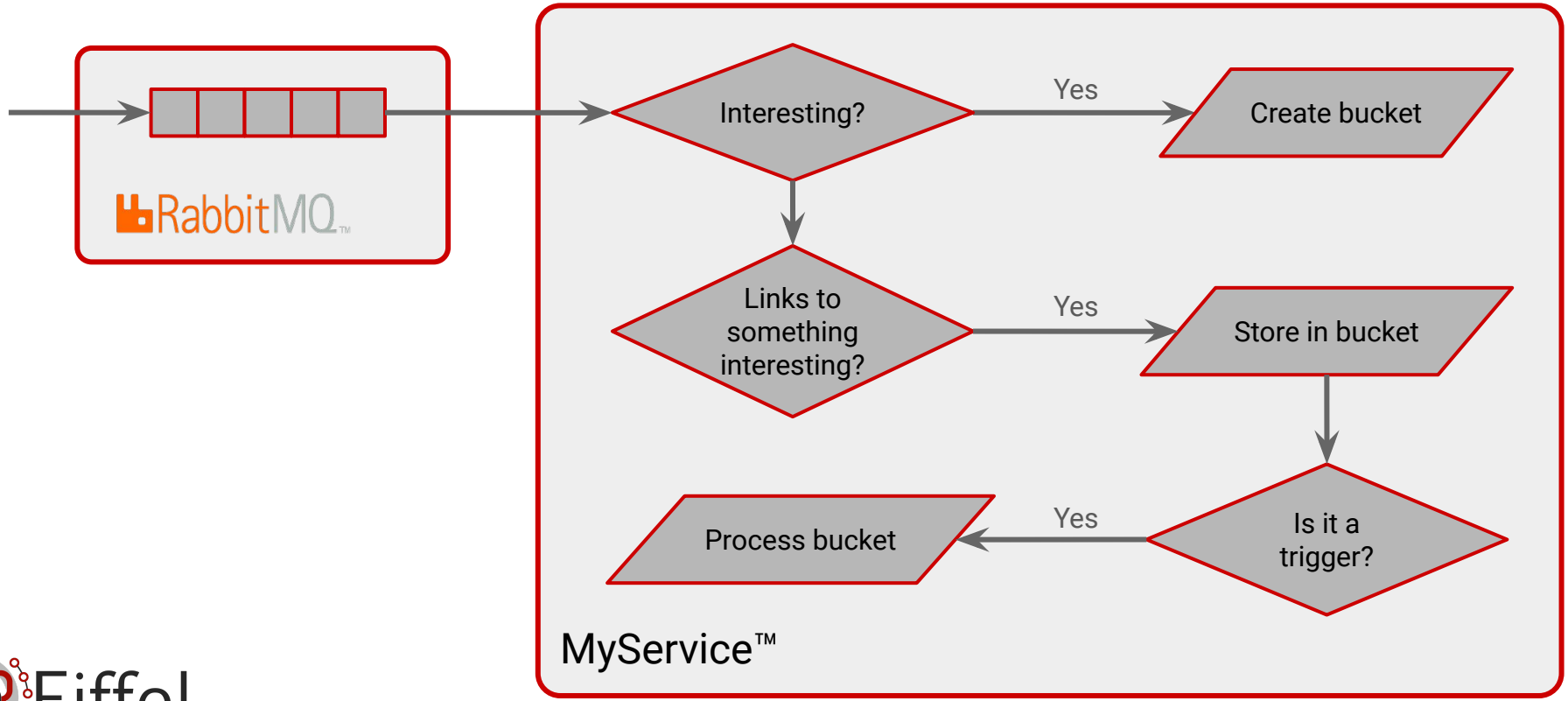




Avoiding event repository dependencies in consumers: Not great



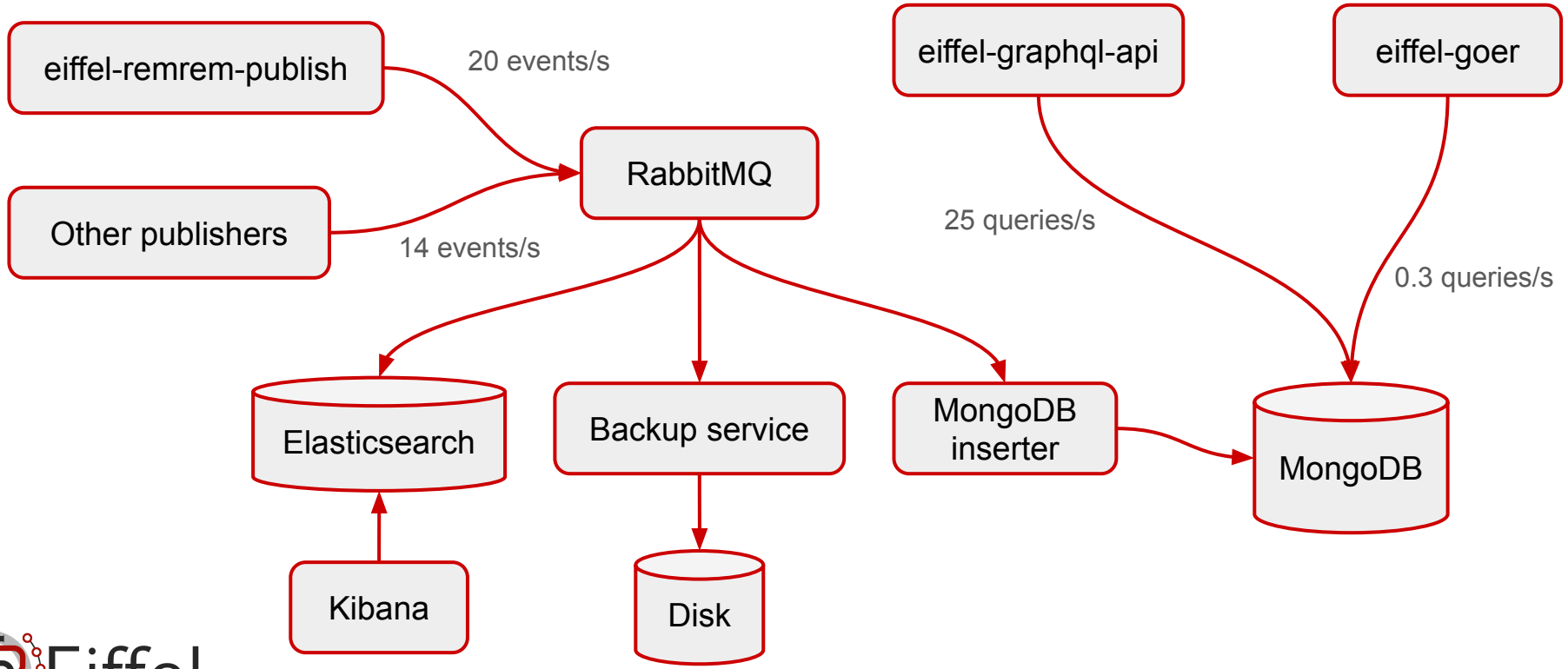
Avoiding event repository dependencies in consumers: Better



Eiffel

Reflections on Axis's setup

Axis's Eiffel infrastructure



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