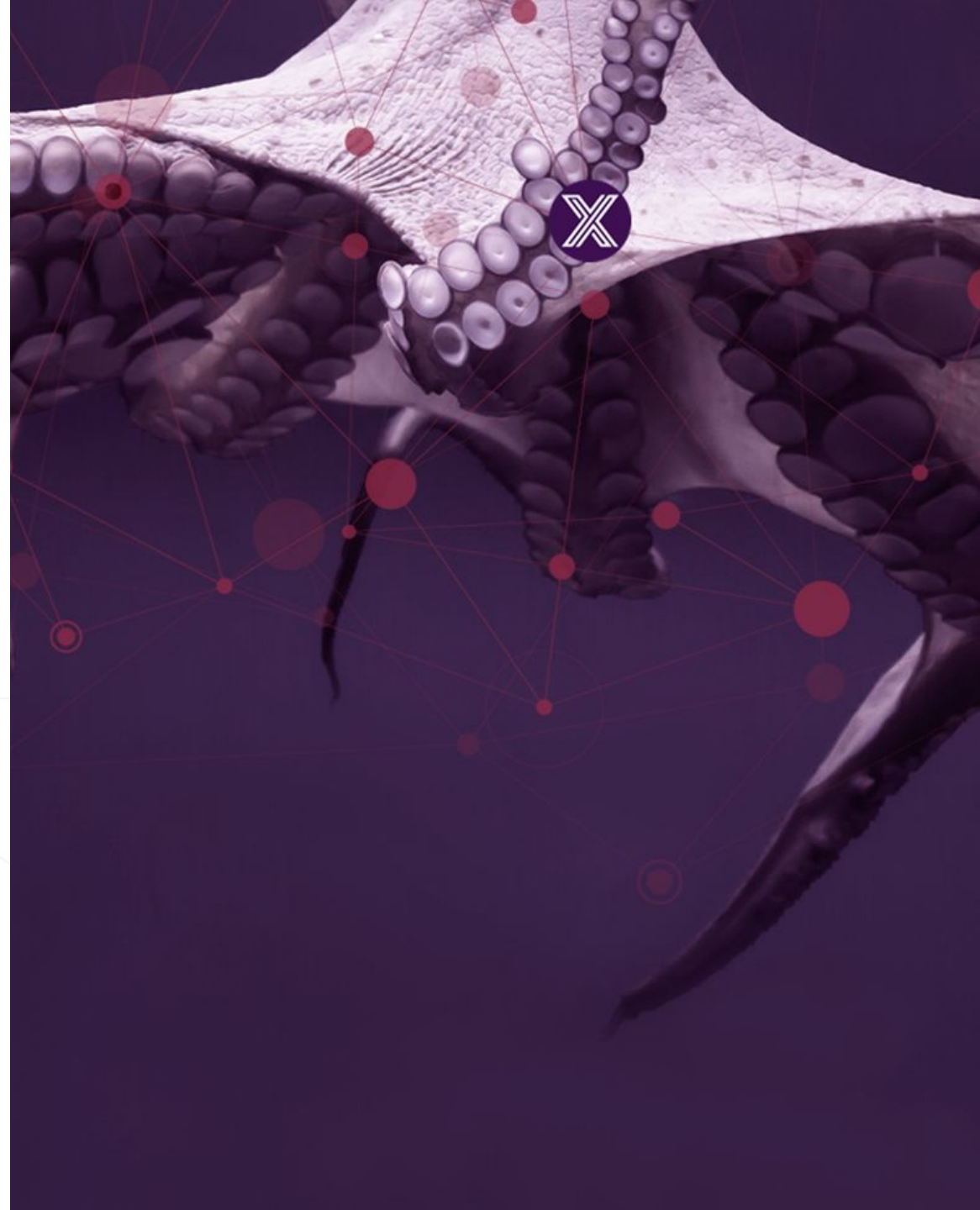




Application Services Design

Application Working Group
2018-11-13



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Meeting Logistics

- Time: November 13, 2018 11am PDT – 12am PDT

Join from PC, Mac, Linux, iOS or Android: <https://zoom.us/j/611544838>

Or iPhone one-tap :

US: +16465588656,,611544838#

or +16699006833,,611544838#

Or Telephone:

Dial(for higher quality, dial a number based on your current location):

US: +1 646 558 8656 or +1 669 900 6833

or +1 855 880 1246 (Toll Free)

or +1 877 369 0926 (Toll Free)

Meeting ID: 611 544 838

International numbers available: <https://zoom.us/u/aoLL4E9yo>

Today's Agenda

-



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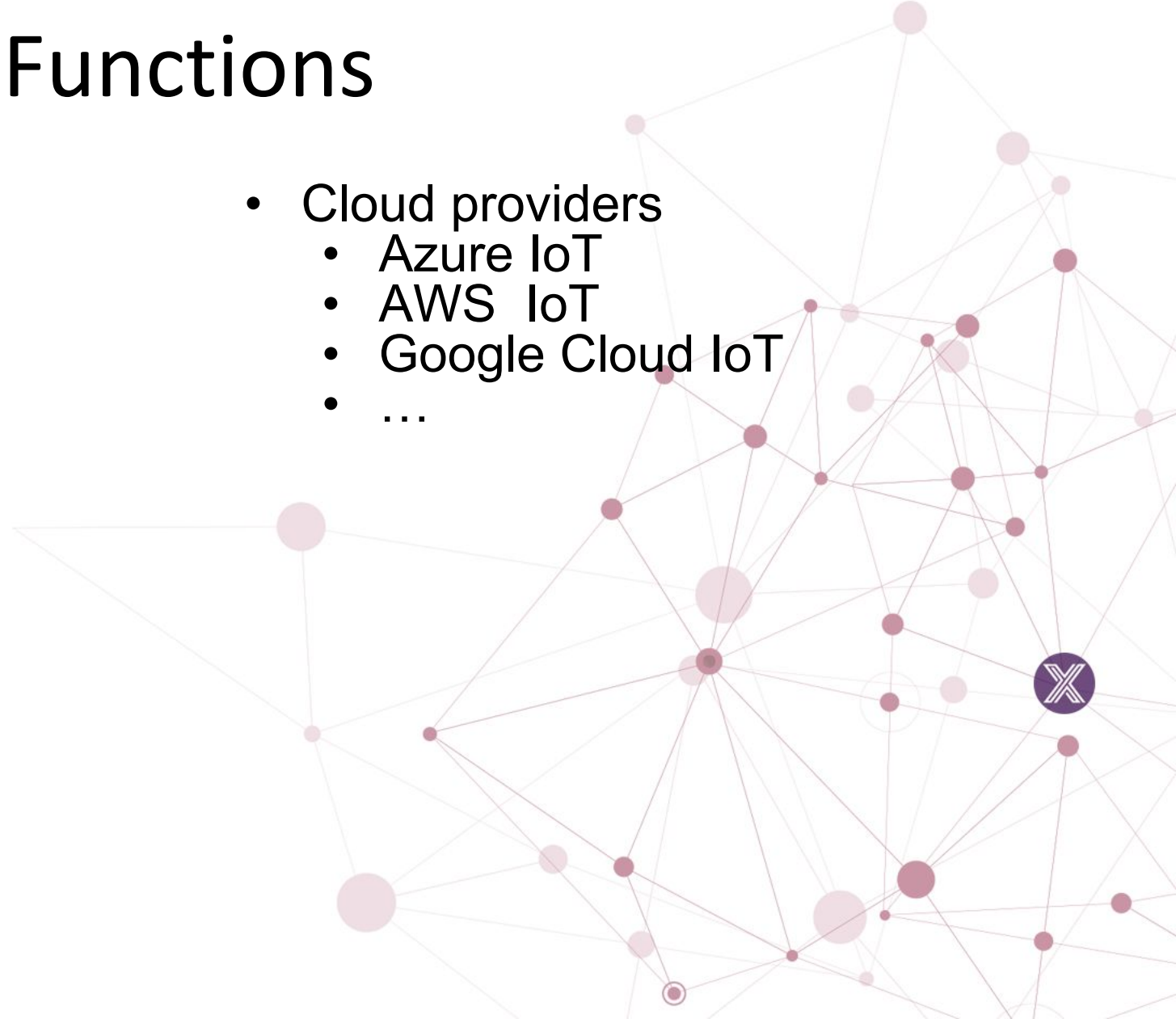
Application Service Functions

Application Services Functions

- Essentially an EAI engine
- Operations
 - Filter (only give me readings from device A; only give me readings regarding temperature, ...)
 - Validator (device ID, reading against value descriptor, ...)
 - Transformation (convert C to F values, convert CBOR to Protobuf, ...)
 - Enrich (add device metadata to reading, ...)
 - Format (JSON, XML, CSV, ...)
 - Encrypt (really different kind of transformation)
 - Compress (really different kind of transformation)
 - Custom (black box that you define what you want to happen inside)

Application Services Functions

- Endpoints
 - HTTP(s)
 - MQTT(s)
 - AMQP
 - XMPP
 - WebSockets
 - CoAP
- Cloud providers
 - Azure IoT
 - AWS IoT
 - Google Cloud IoT
 - ...



Discussion on Message Bus

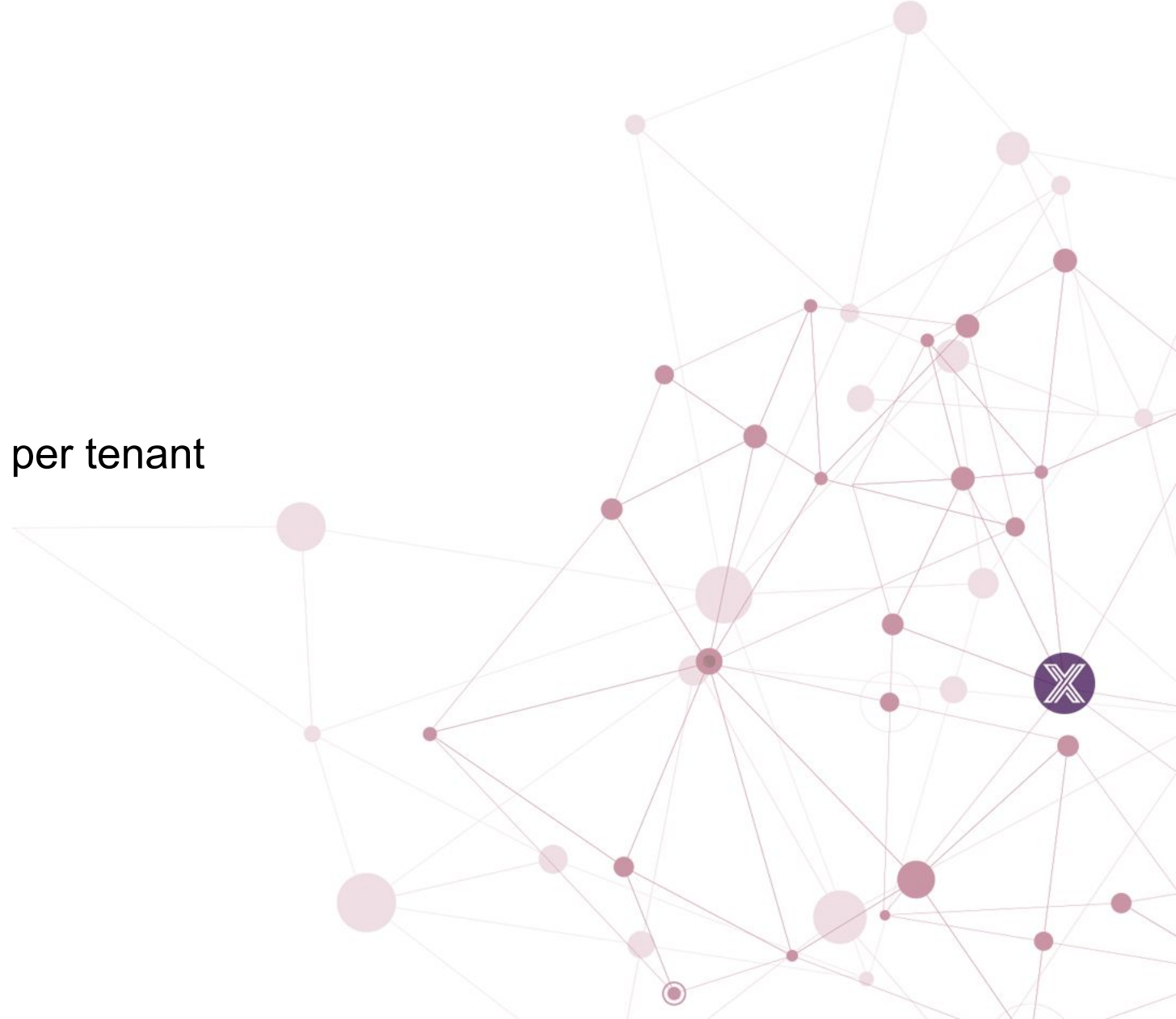
- How to discover the topics/channels on the Message bus
 - Register to Metadata?
- ZeroMQ - Issue reported running it on Windows (40% developers target windows - developer survey).
 - ZeroMQ can run in container in Windows
 - Docker has performance issues on Windows (order of magnitude slower - last year data)
 - There is ZeroMQ installer for Windows - Need to test and talk to Jim on the issue he reported.
- Plugable Implementation
-

Discussion on Message Bus

- Message Bus - Single vs Multiple
- Pluggable Implementation
 - Need an SDK, share library, shared objects
 - Abstraction interface and APIs
- Properties that Implementation Offers:
 - Architecture Support (x86/ARM, 64/32bit)
 - Footprint
 - Scalability
 - Guaranteed Delivery
 - OS Support (Linux/Win)
 - Ordering
 - Language Support (Go, C)
 - Footprint
 - QoS
 - Performance
- Filtering
 - Tenancy,
 - Security,
 - Connection
- First implementation: split everything in export-distro except MQTT into independent services that use the MQTT exporter for the message bus
-

Multi Tenancy

- What are the requirements
- How to do it?
 - Message bus:
 - one topic/channel per tenant
 - public topic/channel and filter per tenant
 - No message bus:
 - how to do it?



Message Bus List

Name	Licence	Size	Prd. Ready	Lang.	Client	OS Support
OMQ						
NATS						
MQTT						

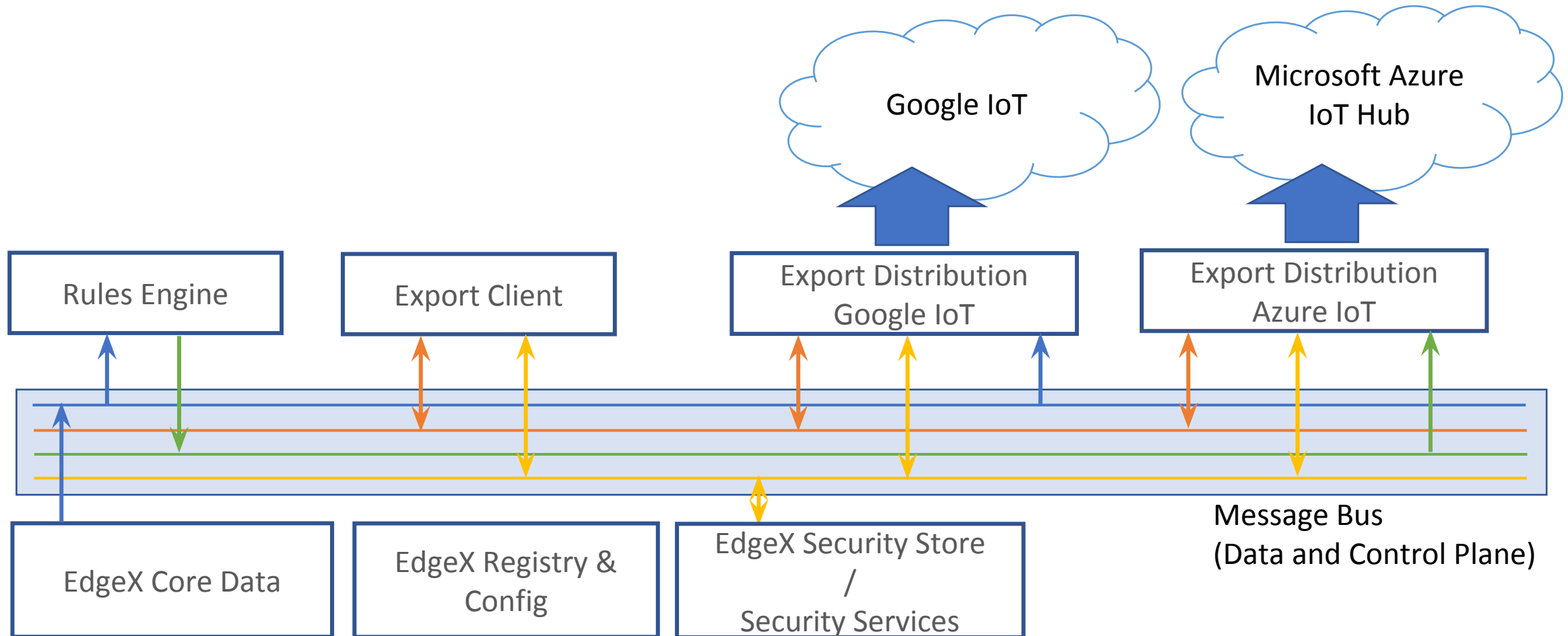
Message Bus Options - Message Brokers

Name	Licence	Size	Prd. Ready	Lang.	Client	OS Support
Mosquitto	EPL/EDL	very lightweight	Yes	C		Linux, Win, Mac
Paho	EPL-1.0	lightweight	Yes	C	C, Go, Java, ...	Linux, Win, Mac (client)
Apache ActiveMQ	Apache License 2.0		Yes	Java	Java, C, C++, C#, ...	Linux, Win, Mac
Apache Apollo						
RabbitMQ	MPL 1.1.	lightweight	Yes	Erlang	Erlang, Java, .NET, PHP, Python, JavaScript, Ruby, Go	Linux, Win, Mac
Qpid	Apache License 2.0			J, C++		Linux, Win, Mac
NATS	Apache License 2.0	lightweight	Yes	Go		Linux, Win, Mac

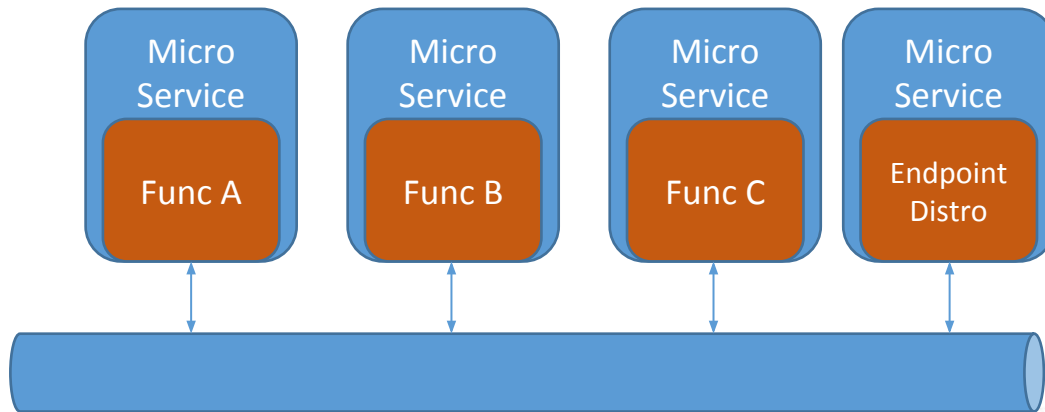
Message Bus Options - No Message Brokers

Name	Version	Size	Supported Lang
OMQ			
Nanomsg			
GRPC			
Thrift			
DPS (Intel)	https://github.com/intel/dps-for-iot		

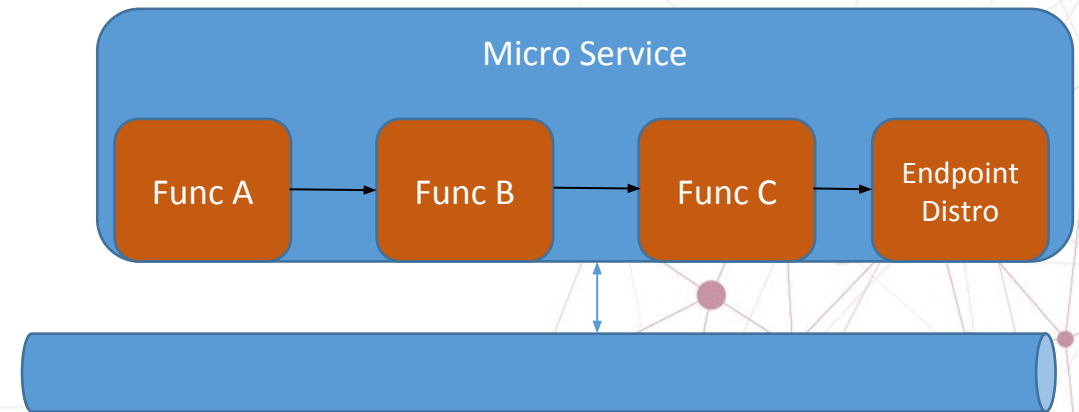
General Architecture Diagram – Multiple Export Targets



Implement by functions or by service?



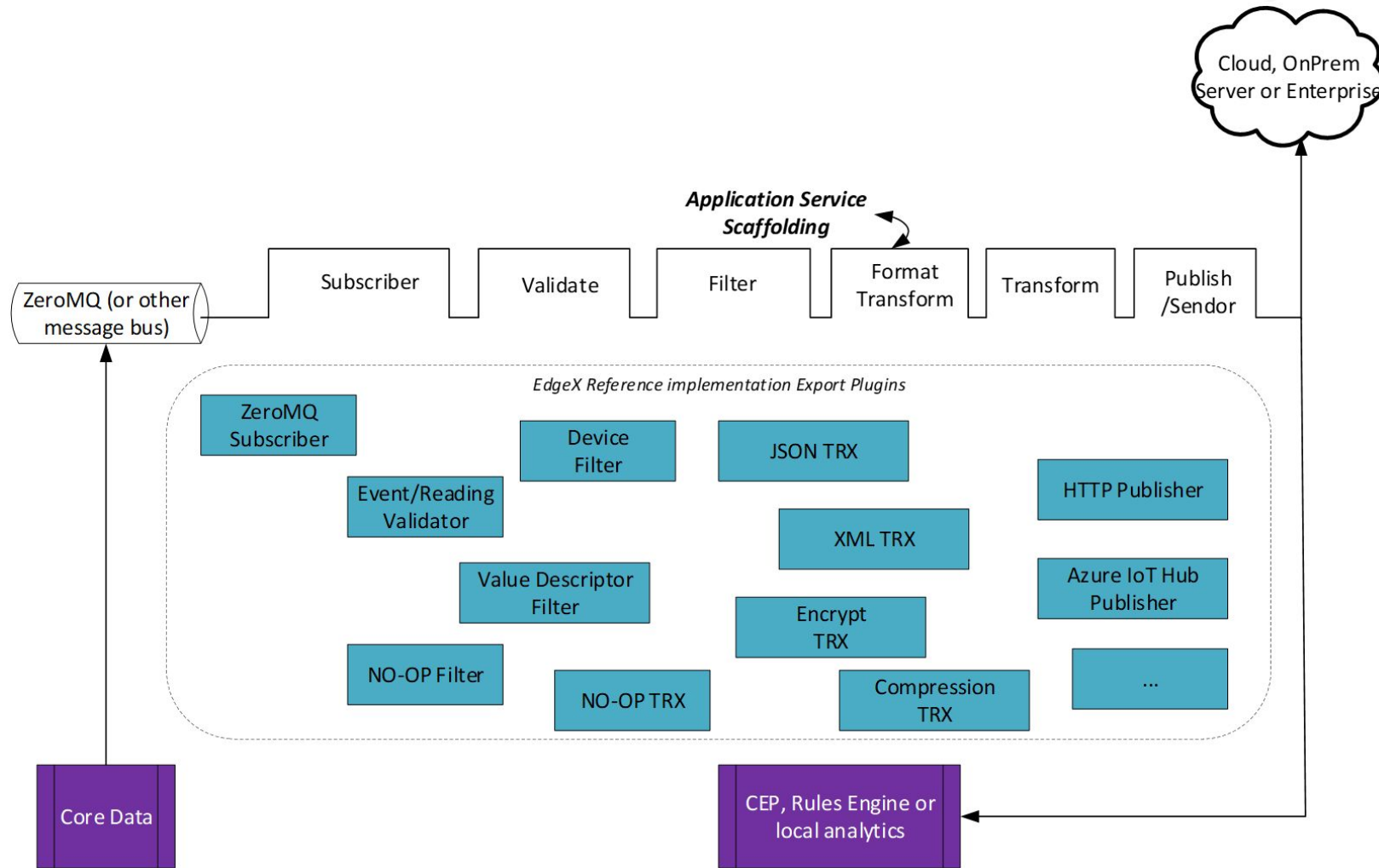
OR



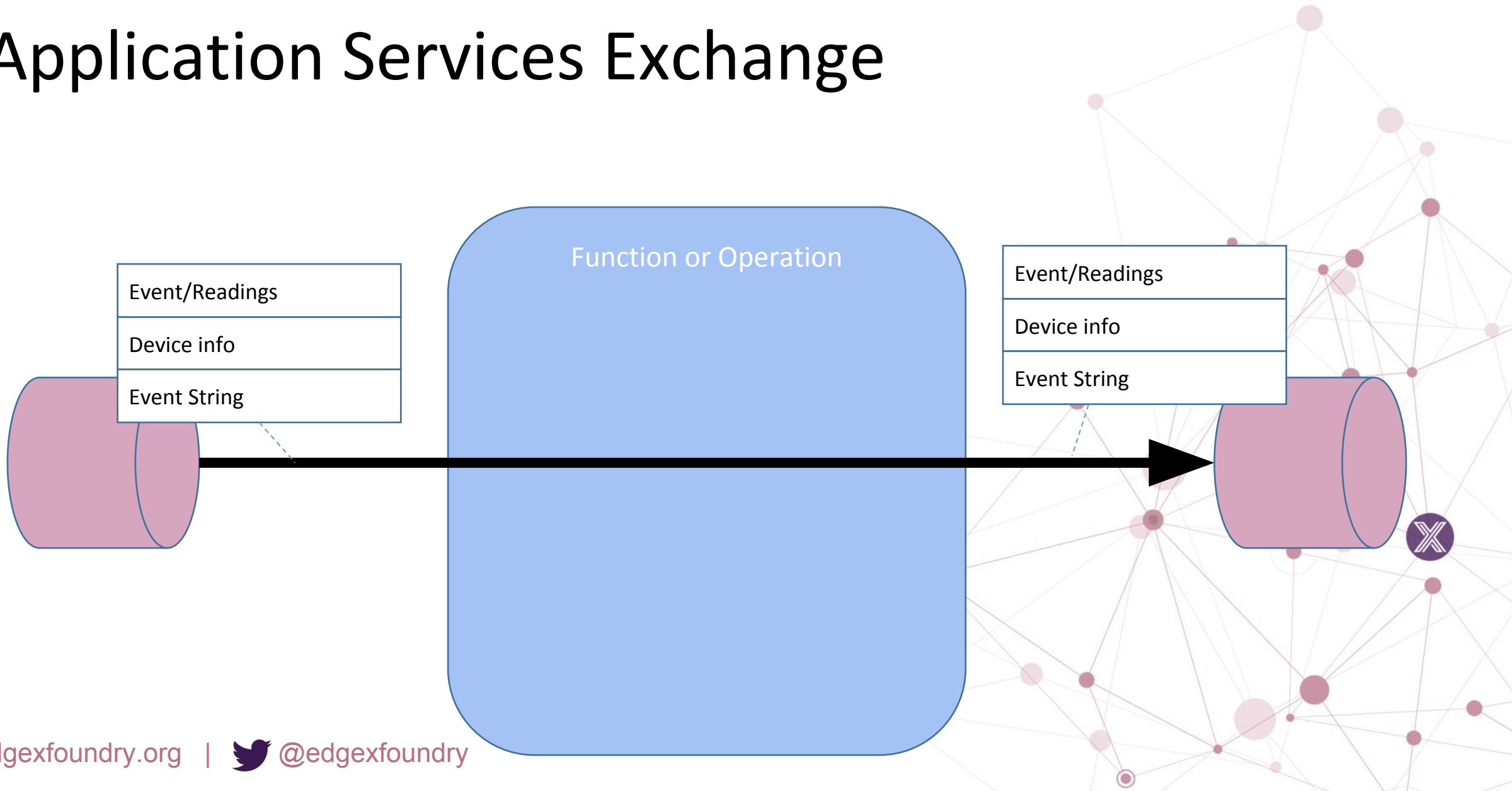
How to orchestrate per client?
How to secure?
Functions can be reused across clients

Internally secure
Internally orchestrated
Per client micro service
Duplicate code in each service

What provides the “scaffolding”?



Application Services Exchange



Internal Service Architecture

- Metrics and Tracing –
 - Do we need it?
 - Is the export of metrics and logs part of the System Management?
 - Do we need to expose endpoints for Kubernetes health-check
- Do we need to separate control plane from data plane for application services or it is (or will be) handled in System Management?
- Event Streaming / Event Sourcing:
 - Do we need to publish events on message bus?
 - Connected to export services xyz.
 - Export Service xzy1 configured...

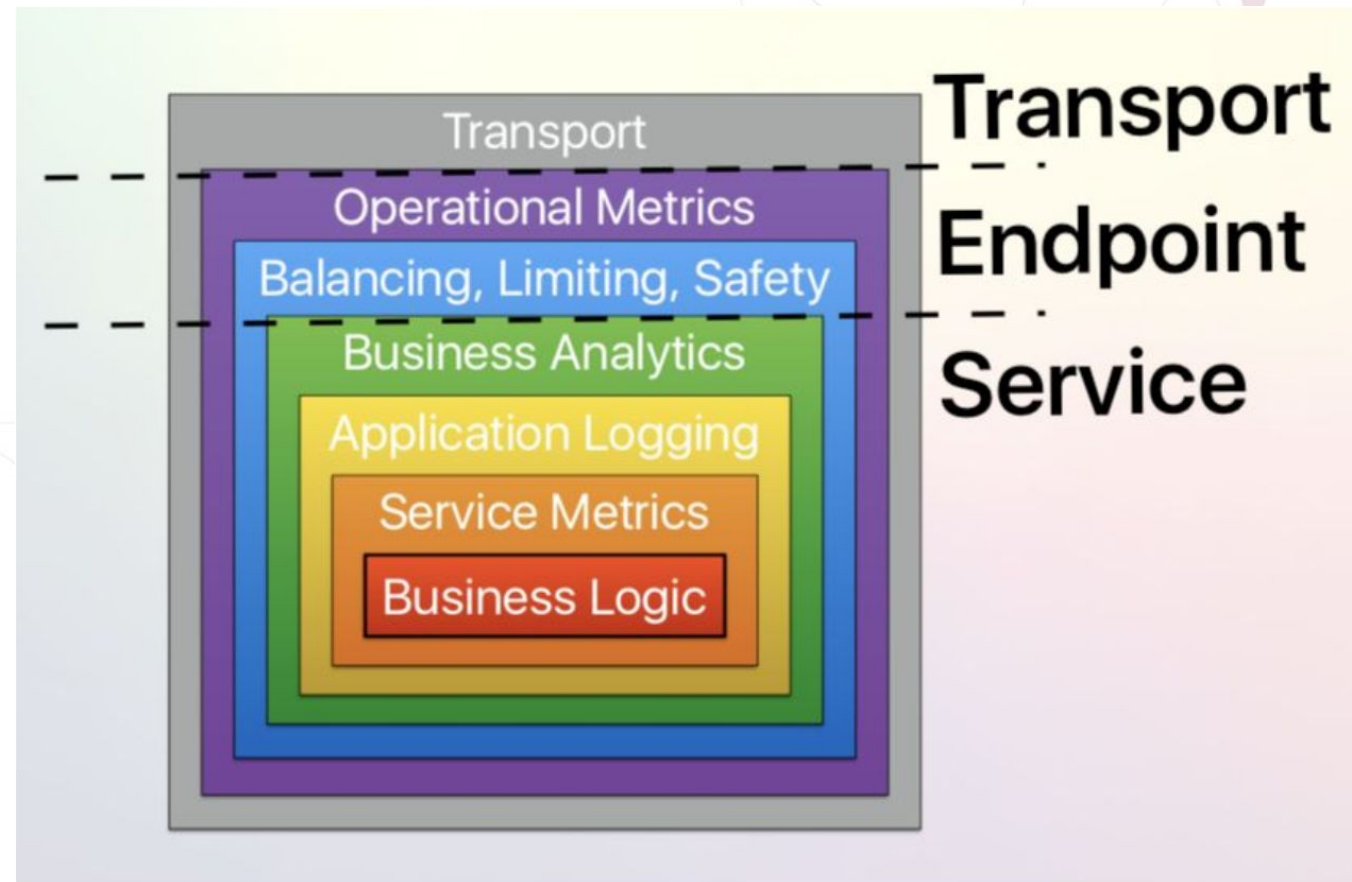
Using Go Kit - Benefits

- Go kit is a collection of Go (golang) packages (libraries) that help you build robust, reliable, maintainable microservices.
- You should use Go kit if you know you want to adopt the microservices pattern in your organization. Go kit will help you structure and build out your services, avoid common pitfalls, and write code that grows with grace.
- Go kit de-risks both Go and microservices by providing mature patterns and idioms, written and maintained by a large group of experienced contributors, and validated in production environments
- Go kit fills in the gaps left by the standard library - PC safety, system observability, infrastructure integration.

Go Kit Benefits - Onion Layers

1. Transport layer
2. Endpoint layer
3. Service layer

Requests enter the service at layer 1, flow down to layer 3, and responses take the reverse course.



Using Go Kit - Downside

- Too verbose: a. Function in the interface (make sense) b. Implementation (make sense) c. Endpoint factory function d. Transport function e. Request encoder, request decoder, response encoder and response decoder. f. Add the endpoint to the server g. Add the endpoint to the client.
- When using the go-kit, your endpoints get an `interface{}` object and return an `interface{}`, error tuple. You need to explicitly write the conversion to your implementation function. Actually, your endpoint factory will almost be a copy-paste of the following function:



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Why FaaS is the Right Move

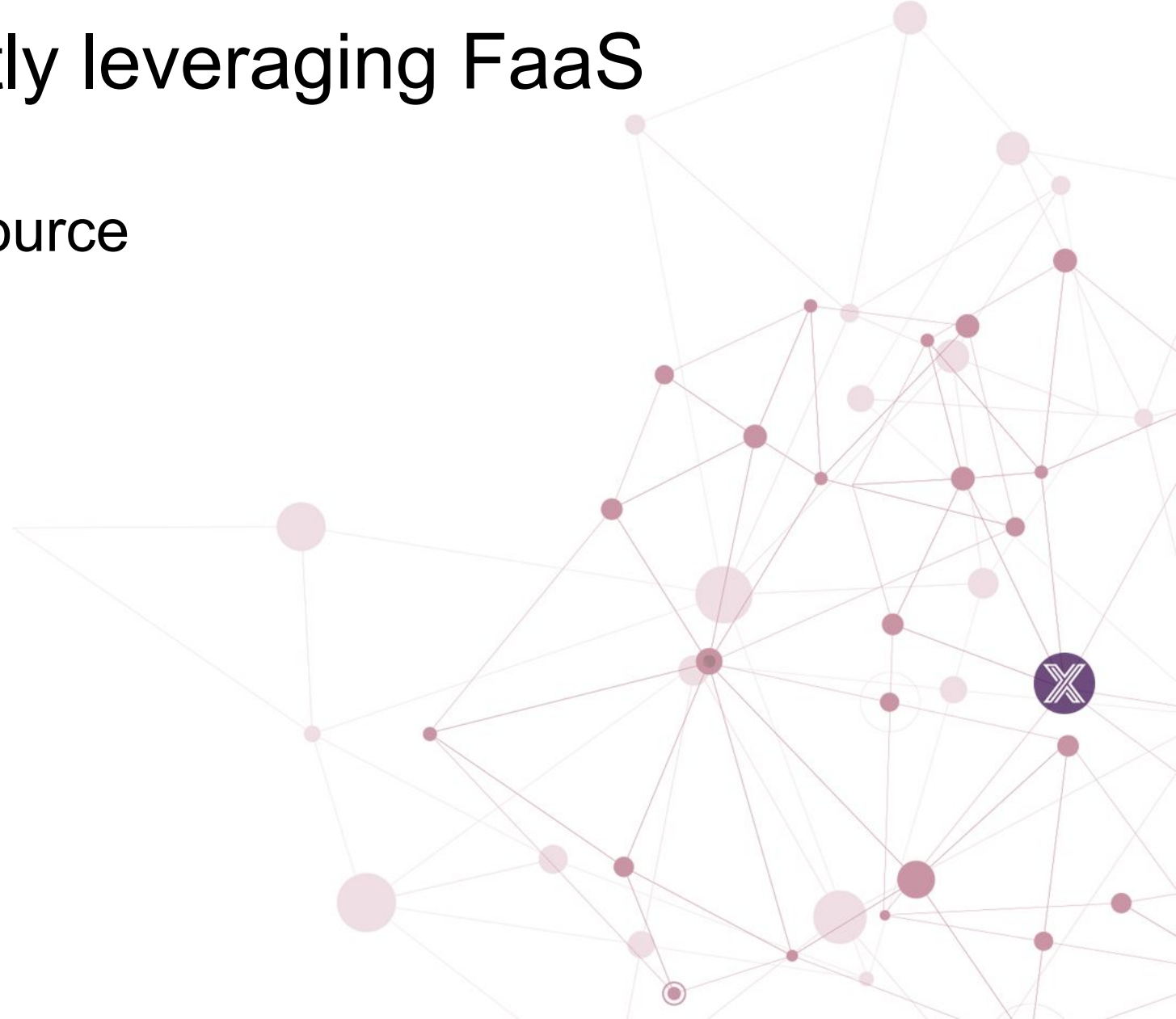
Michael Johanson (Intel), Lenny Godell (Intel)

Edge Platforms currently leveraging FaaS

- Azure IoT Edge – Open Source
- AWS Greengrass
- Target's UniMatrix

Coming Soon:

- EdgeX



Recommended order of FaaS projects

1. Nuclio – Easy to use
2. OpenFaas – Easy to use and get started
3. IronFunctions – API seemed to work, however UI wasn't so helpful.

Didn't Evaluate:

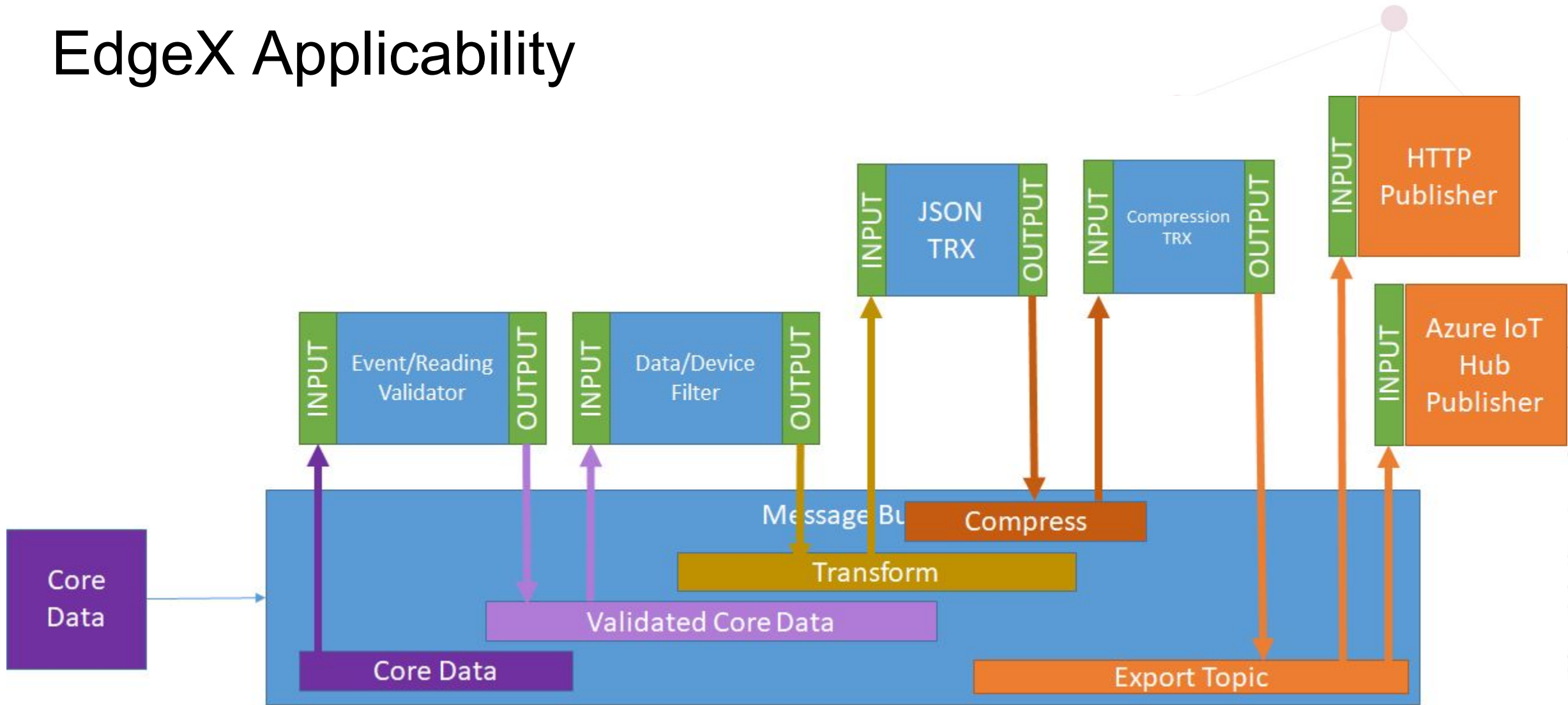
4. OpenWhisk didn't seem to have an easy way to get started
5. Kubeless – locked into Kubernetes

Top 3 In order recommendations

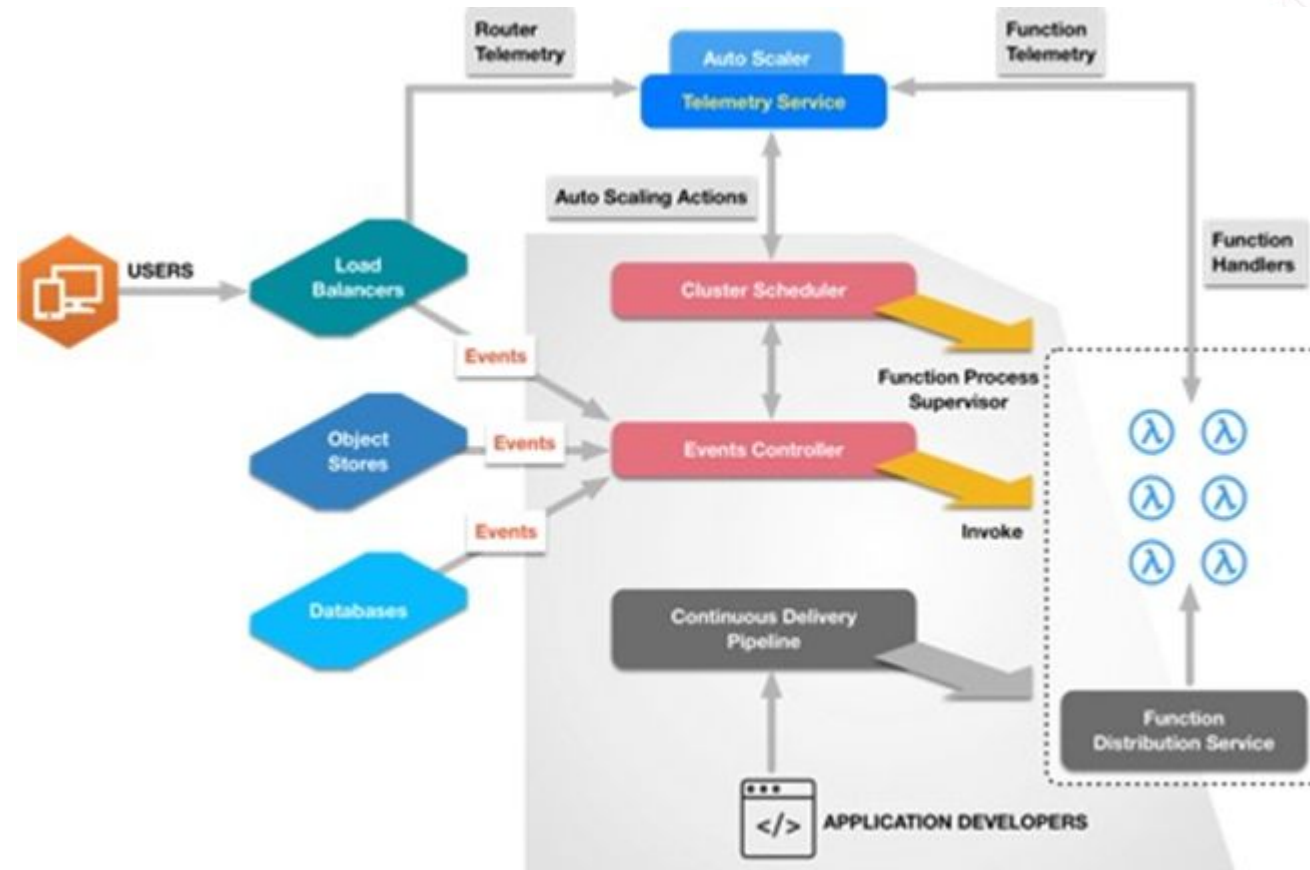
Framework/Platform	Docker Based	Language Support	Ease of use (1 Low -5 High)	Triggers	License
Nuclio	Y	Go, Python, .NET Core, Java, JS/NodeJS, Shell, Ruby *	5	Cron (Schedule based), EventHub, HTTP, Kafka, Kinesis, NATS, RabbitMQ, v3ioStream, CLI	Apache 2.0
OpenFaas	Y	*	3.5	HTTP (default) CLI	MIT
IronFunctions	Y	Go, JS, Ruby *	2	HTTP	Apache 2.0

Not Tested: Kubeless, OpenWhisk, AzureFunctions

EdgeX Applicability



Anatomy of a Serverless Architecture



“Serverless” adoption growing at rate faster than containers

- <https://stacksense.io/cloudopinion/expert-opinions/serverless-will-grow-at-a-faster-rate-than-cloud-did/>
- <https://read.acloud.guru/serverless-is-eating-the-stack-and-people-are-freaking-out-and-they-should-be-431a9e0db482>
- <https://www.infoworld.com/article/3265457/serverless-computing/why-serverless-is-the-better-option-than-containers.html>
- <https://blog.spotinst.com/2017/07/16/serverless-at-the-edge/>
- <https://thenewstack.io/week-numbers-serverless-adoption-par-containers/>
- <https://www.forbes.com/sites/forbestechcouncil/2018/05/18/why-companies-are-adopting-serverless-cloud-technology/#7c84737574d9>