More frequent measurement data delivery

Workshop 13.08.2024

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Datahub

Welcome

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Agenda

DAY 1

Time	Topic	Duration	Presenter
10:00	**Welcome**	**10:05**	**Marko**
10:05	Workshop Introduction	10:15	Marko/Remco
10:15	Introductions	10:45	All
10:45	Background and targets	11:15	Marko
11:15	Datahub and performance characteristics	11:45	Remco
11:45	**Break**	**12:45**	***All***
12:45	Workshop Business Requirements	15:00	Marko
15:00	**Break**	**15:15**	
15:15	Conclusions & Wrap up Day 1	15:55	Marko/Remco
15:55	**Meeting end**	**16:00**	**Marko/Remco**

Workshop Introduction

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Continuous metering data delivery, introduction

- 2021 Finnish coverment set the degree 767/2021 “Valtioneuvoston asetus sähköntoimitusten selvityksestä ja mittauksesta”, luku 6 § 5 (electricity delivery reporting and metering):
  - *Metering grid area company’s IT systems shall be able to handle the measurement data collection of the registered measurement data from new remote metering device to the measurement reading system at least every six hours.*
- In the end of 2023, Fingrid Datahub, together with CGI, has started the investigation of ways to resolve the continuous metering data delivery and technologies to support it and also utilizing the current datahub system and its technologies as far as possible.
- Fingrid Datahub **has made survey** to the market about possibilities to go to more frequent/continuous measurement data delivery in the end of 2023.
- Fingrid datahub established this market working group to give market parties and stakeholders to **bring up the more detailed business needs** for more frequent metering data delivery and based on those to **line the working model in Finnish market** and define the interface specification. Member companies of this working group are wished to be able to **trial run their systems against the existing solution** implemented by CGI as far as it is possible at this stage.

Introduction

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Continuous metering data delivery - workgroup members

- Market members: https://palvelut.datahub.fi/fi/kehitys-ja-yhteistyo/kehitystyoryhma#mittaustiedon-tiheampi-toimitus
- Datahub team:
  - Marko Juslin – product manager, chairman, DH dev team
  - Laura Markkanen – specialist, business architect, DH dev team
  - Otto Kuuranne – specialist, interfaces, Fingrid ICT
  - Tuomas Aunola – specialist, DH dev team
  - Remco Nederpel – integration technologies, CGI NL
  - Gerold Slagter - solution architect, CMS MDM solution, CGI NL
  - Jan Loman - specialist, CMS solution, CGI FIN

Members of the working group for more frequent delivery of metering data:

- Vesa Hulttinen, Hansen Technologies Finland Oy
- Antti Kirjola, Caruna Oy
- Anssi Knuuttila, Rejlers Finland Oy
- Elina Kontro, Landis+Gyr Oy
- Jami Kosunen, TietoEvry Oy
- Ville Kuusela, Solteq Oyj
- Jari Rusanen, Loiste Oy
- Lari Saarinen, Aidon Oy
- Pyry Suomala, Helen Oy
- Anssi Vanhatalo, Elenia Oyj
- Mikko Vähäsaari, Savon Voima Verkko Oy

Background and targets

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Continuous metering data delivery – background and targets

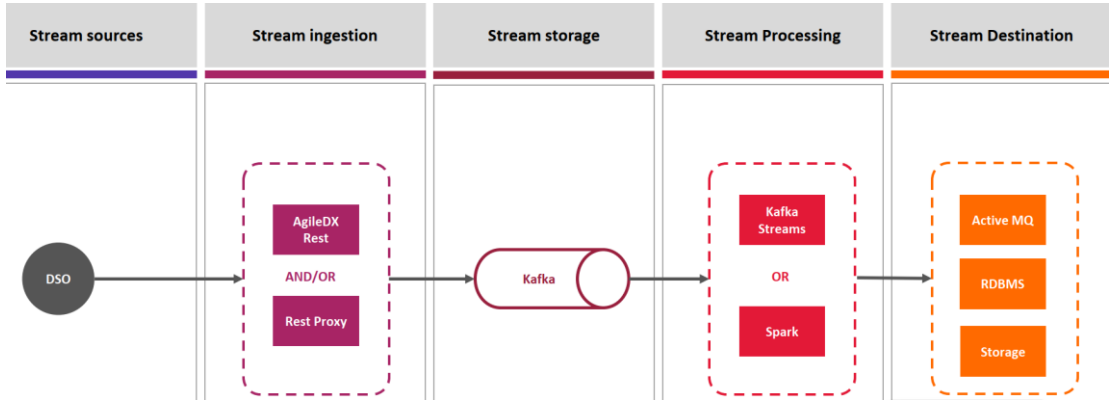
The degree 767/2021 chapter 6 § 5 (electricity delivery reporting and metering): Metering grid area company's IT systems shall be able to handle the measurement data collection of the registered measurement data from new remote metering device to the measurement reading system at least every six hours.

- Note: Law does not require continuous delivery of metering data
- From survey the feedback was to get continuous delivery of metering data parallel with current batch type of delivery
- This shall be supported in datahub and market (DSOs) systems by 1.1.2026

- Main driver from business point of view is to remove constraints (bundling size etc.) from current batch interface with new interface and enabling the Finnish market for continuous metering data delivery.

Continuous metering data delivery – background and targets

- The first phase of the proof of concept was completed by 04/2024 including
  - indications in datahub system change needs and initial proposal of solution architecture and technologies to support those changes and more frequent/continuous metering data delivery.
  - Also the performance characteristics of the platform and more specifically the timeseries processing were estimated.



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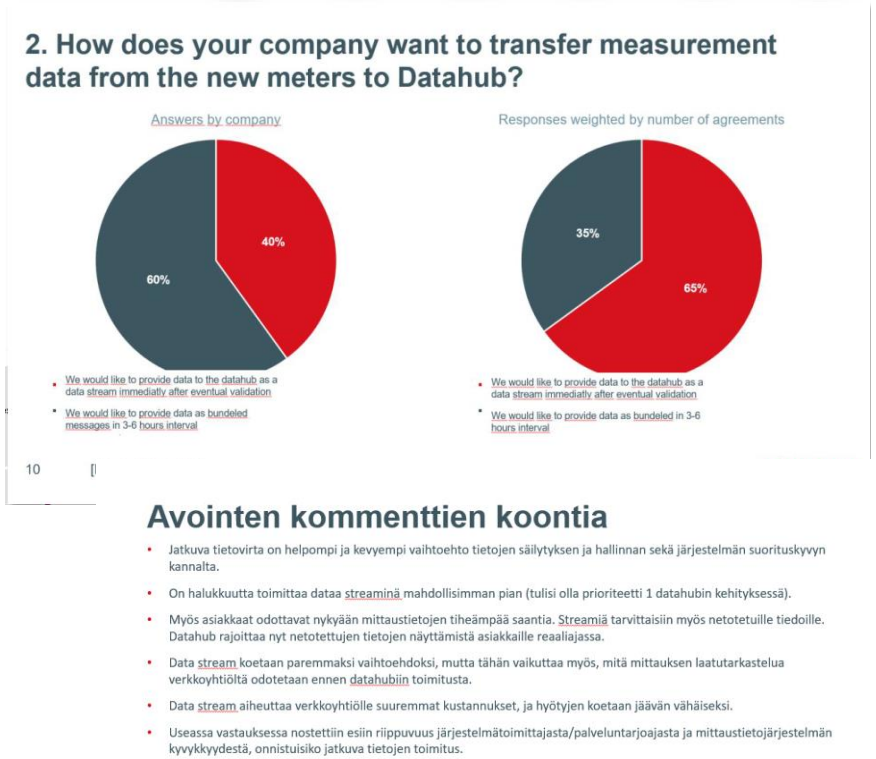
Continuous metering data delivery – background and targets

- Now the second phase of the proof of concept is ongoing and CGI has started the verification of initial selected technologies to be able to support the trial run in this phase of PoC.
- Since the survey was conducted at a high level and only provided a commitment to DH towards continuous integration without thoroughly examining the detailed business requirements, we believe it is crucial to have this discussion at the start of the workshops. The aim is to fully understand the specific business needs driving this initiative. Given that this project involves investment and ongoing operational costs, it's important to ensure there is a genuine need for its implementation. The solution should also be designed with a long-term vision in mind.
- That discussion hopefully brings inputs for the working model discussion and also possible future enhancement needs (**not mandatory in go-live by 1.1.2026**).



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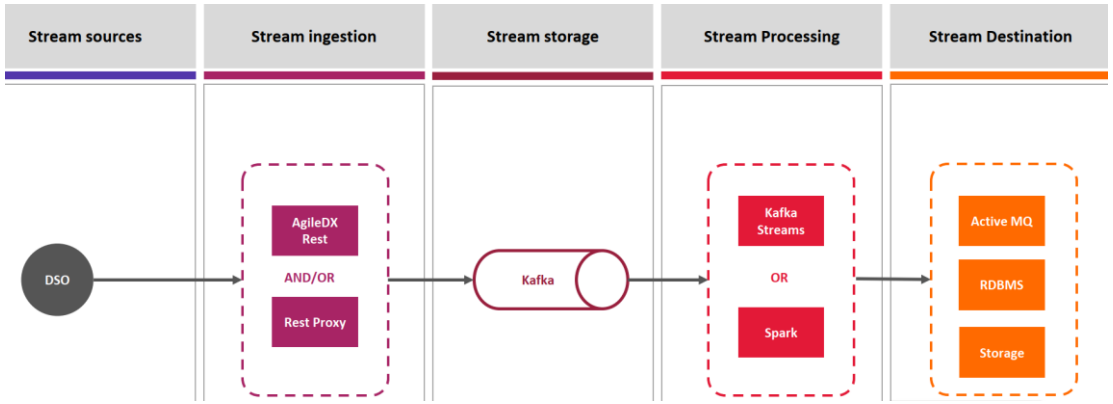
Continuous metering data delivery – background and targets

- The initially selected solution proposal and techology stack shall be adjusted based on the comments and feedback in this workshop if necessary. Adjustments are studied during or after the first workshop days.
- As end result of this PoC phase 2 (this workshop members) is that the solution and technology stack is input for final solution.
- Target is to get the working model defined, interface specification drawn-up and those are ready for commenting of whole market and also initial trial runs done by 10/2024.



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Continuous metering data delivery – background and targets

- The next phases after the PoC phase 2:
  - Working model and interface specification finalized based on the comments from the whole market by 11/2024. This give market the possibility to start the implementation into their systems to support new interface.
  - Datahub system changes design and implementation/testing planned 09/2024-05/2025.
  - Market testing planned to start 06/2025: System vendors and market parties
  - Certification of market systems starts 10/2025: System vendors and market parties

Datahub and performance characteristics

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Why the world is changing in the energy industry?

Europe wants to prevent and slow down climate change

Inflexible, weather dependent production increases and the traditional production methods will wither away

The market model have to support the electrical system, because power balance needs to be maintained at real time

The power grid have to enable well-functioning electricity market

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Market model up-date (to ver 2.0) supports the transformation of the energy system

- The market model have to update to compatible together with energy system because:
  - ✓ Energy **production** and **consumption** balancing works reliably by market prices
  - ✓ The energy and climate targets would be achieved **cost-effectively**
  - ✓ The supply of **electricity** would be affordable price.
  - → For these reasons we need to move towards real time markets

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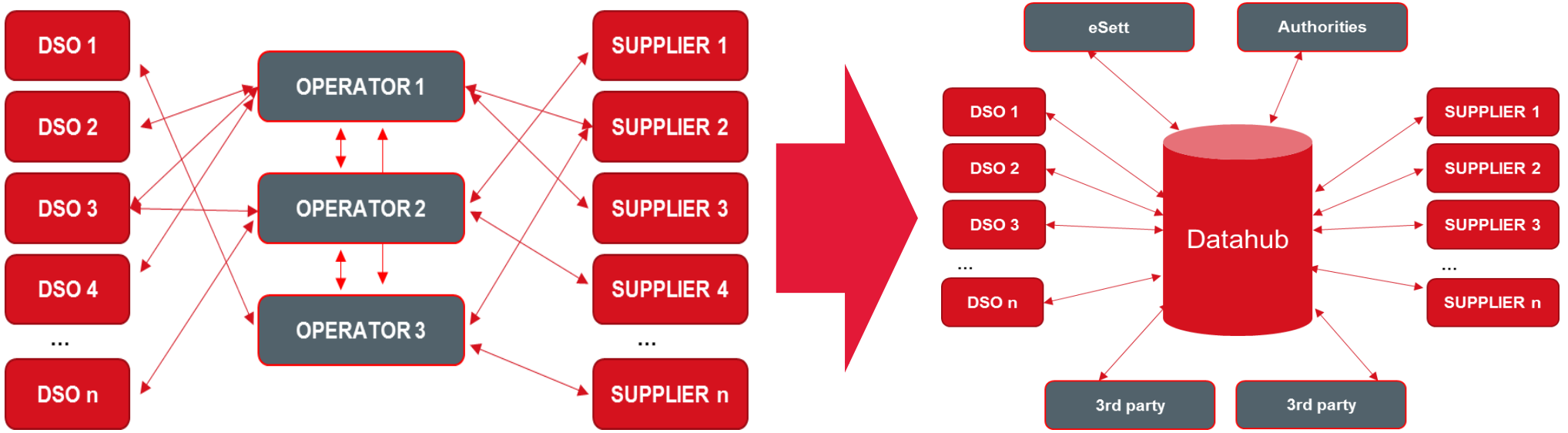
Finnish market and the drive for a Datahub

- Datahub is the logical next step for the Finnish market to:
  - Improve customer satisfaction through choice of service and quality of service
  - Supports further competition and equal access to the market
  - Efficient, secure and privacy compliant data processing



The Finnish Datahub, its users, interfaces and processes

Integration

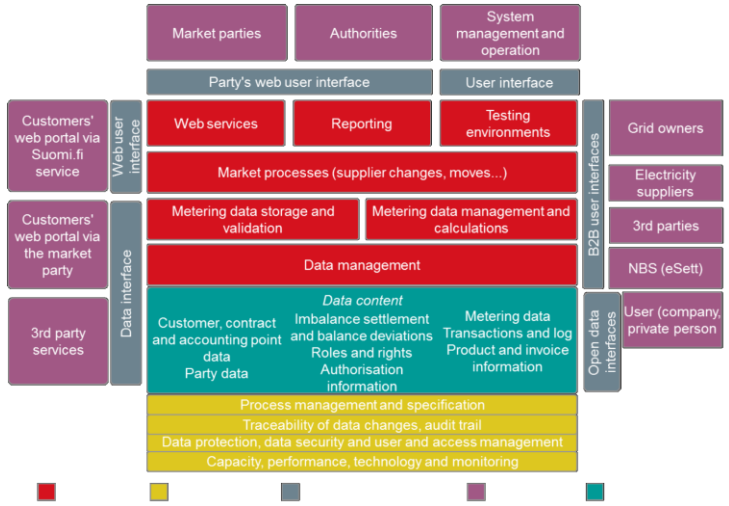
Datahub needs to support a wide user group:

- Market participants, including 3rd parties
- Customer
- Authorities
- Operations

Provide a range of interfaces, a.o.:

- User interfaces for Market Participants, Operations, Authorities
- Web Portal for Customers
- B2B interfaces for Market Participants and Data interfaces (for Customer Portals)
- Reporting
- Nord Pool
- eSett

Solution



Processes & Functions

Implement the main market process areas of:

- Retail processes
- Metering
- Settlement
- Grid fee management

And provide key functions:

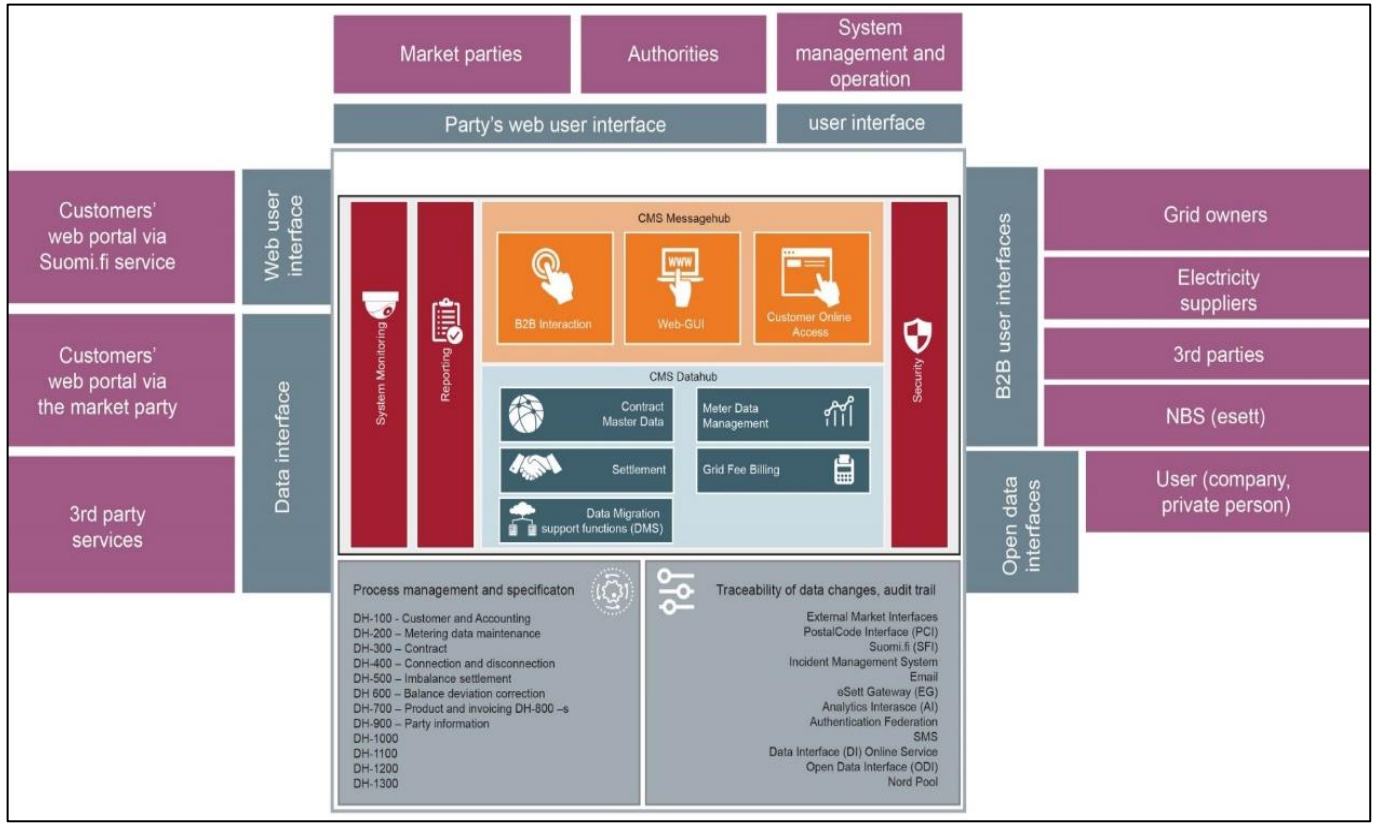
- Traceability
- Data management
- Data protections and privacy compliance
- Operational support functions for both business operations as well as technical operations

The Fingrid Datahub and CGI CMS

Fingrid has selected CGI and the CGI CMS product to implement the Fingrid Datahub.

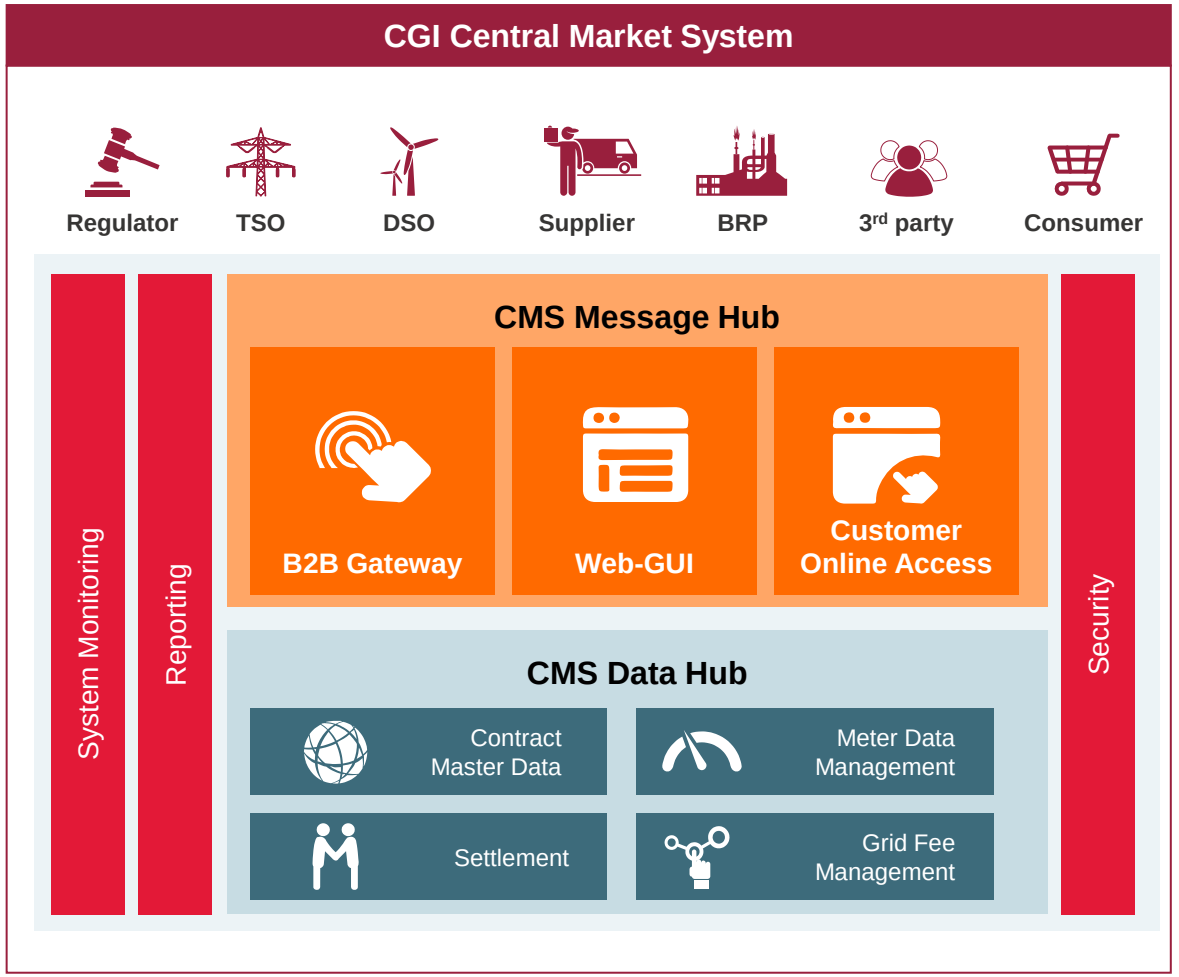
Key characteristics include:

- High level of configurability
  - Data model
  - Processes
  - Rules
  - Messages
- Designed specifically for Central market Datahubs
- Supports both Cloud deployments and On Premise installations in a best of breed model



CMS: Integrated solution for messaging, master data, metering data and settlement

Message Hub	• Central point of access to the CMS • Provides multiple communication channels, access control, system security, single sign on, audit logging • Prerequisite to handle alarms
Contract Master Data	• Central register for master data (grid areas, metering points, meters, contracts) • Real-time handling of market processes such as customer switching and moving • Highly flexible data model
Meter Data Management	• Focused on performance, with an underlying engine capable of handling millions of time series events per second • Configurability focuses on validation rules and implementation of a Meter Code as part of the VEE (Validation, Estimation and Editing)
Settlement	• Real-time insight in to metering data quality • Additional component to extend the MDM component • Allows for the configuration of so-called calculation processes
Grid Fee Management	• Calculate and prepare grid related invoice data • Combines charges/prices as master/reference data with calculations from the Settlement module to prepare data for invoicing



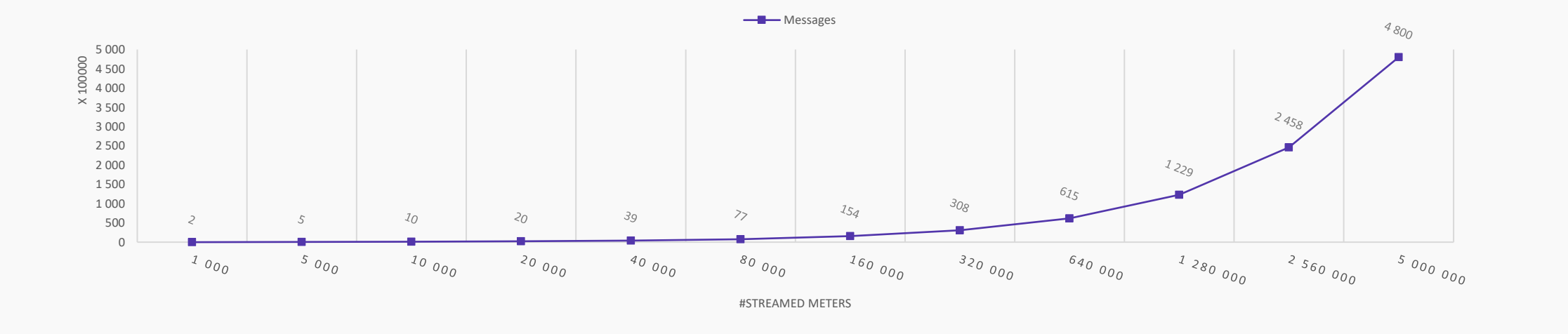
Meter to Message Ratio

Performance characteristics Datahub

Meter to message ratio

- Approximately 75.000 E66 messages a day
- Containing 6-7 million “channels”.
- Average batch size over the day is 80-100 “channels” per message.

- Assuming the introduction of timeseries being send to the datahub individually the amount of timeseries messages a day will increase rapidly up to a theoretical maximum of **~480 mio a day** when all meters will stream their individual values.

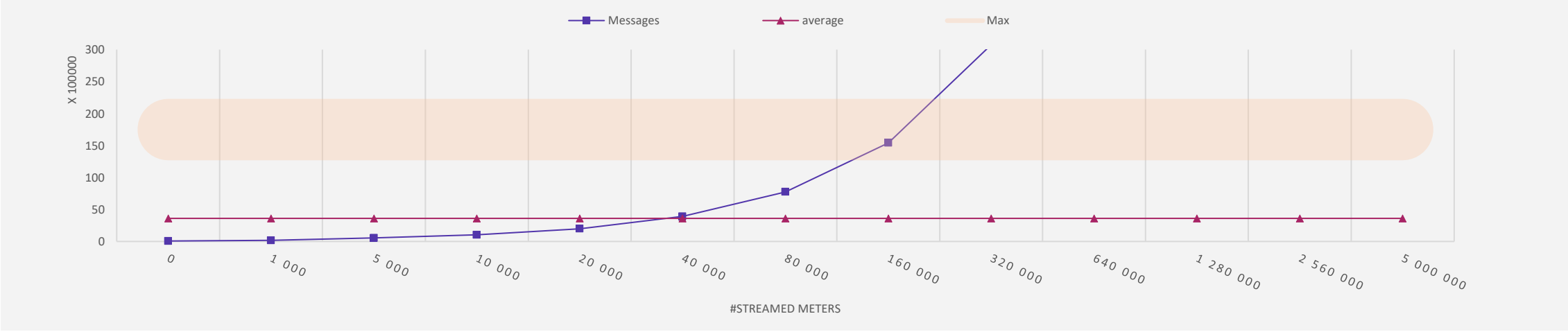


Messagehub characteristics

Performance characteristics Datahub

Message hub

- Currently on overage the Messagehub processes ~3.6 mio messages a day.
- On peak days around ~5 mio messages per day are being processed
- Minimal impact on responsetimes is seen and limited internal buffering is done which indicates current allocated resources is sufficient for handling the current load
- With current resources and platform configuration the Message hub is expected to process up to ~**10 mio messages a day** before processing is impacted
- Roughly around **25 mio messages a day** it is expected the message hub might not be able to keep up and incidents/timeouts could become more frequent.

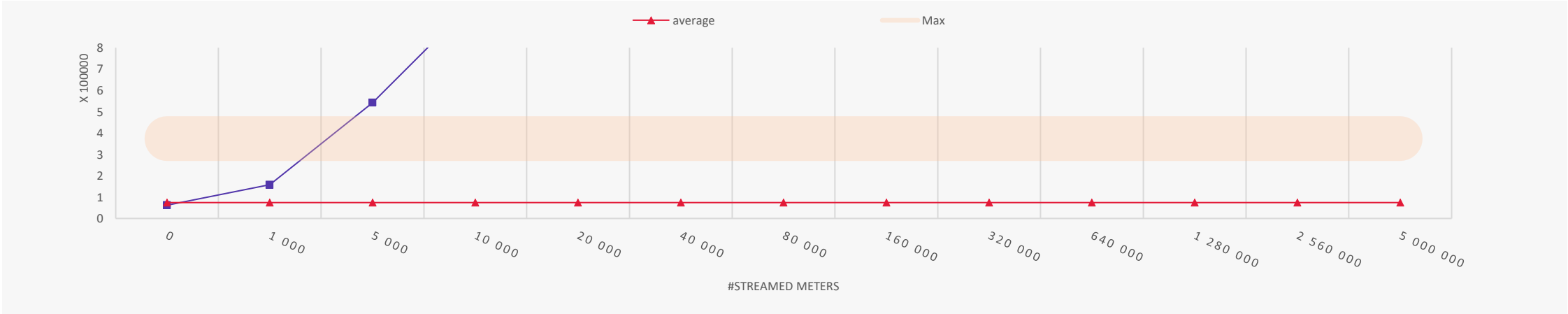


Meter Data Management characteristics

Performance characteristics Datahub

MDM

- Currently on average MDM processes **~75k messages a day**
- MDM is not very efficient in handling large numbers of messages.
- MDM includes end-of-day processing which requires all data for the day to be received and processed. Depending on when the timeseries are received this process might be delayed.
- MDM is expected to handle up to ~**250k** messages a day until processing is impacted
- Roughly above **500k** it is expected MDM won't be able to keep up and component failures or manual intervention become frequent
- Distribution log is expected to be impacted first with an additional complexity that currently the amount of messages coming in is the same amount being send to suppliers

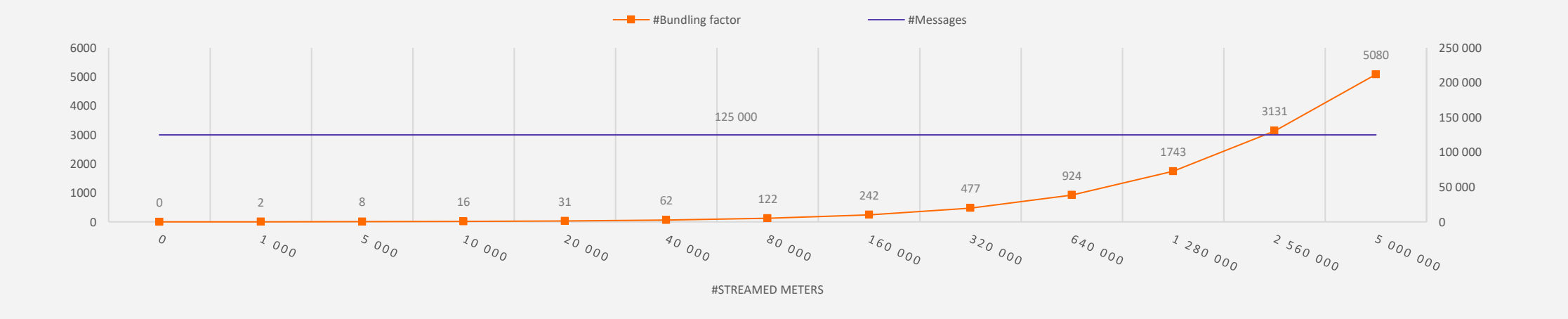


Bundling factor to prevent impact

Performance characteristics Datahub

Bundling

- Bundling the information into batch messages will prevent limits being reached in both Messagehub but more importantly in MDM
- Assuming the limit for MDM is around 250k messages a day and assuming values for an individual 15 min interval are communicated then **bundling of up to ~5.000** accounting points in a single message is required to stay well below the limit (**~125k messages per day**).



Workshop Business Requirements

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Valmistelutehtäviä työryhmälle

Johdantoa: Työpajassa on tarkoitus käydä keskustelua laajemmin liiketoiminnan tarpeista hyödyntää mittaustiedon tiheämpää saatavuutta ja ymmärtää yksityiskohtaiset liiketoimintavaatimukset taustalla.

Mitä hyötyjä näet jatkuvan toimituksen ratkaisusta eri toimijoiden näkökulmasta?

- Mitkä ovat lyhyen aikataulun tarpeet?
- Mitä pidemmän aikataulun tavoitteita/visioita voisi olla näköpiirissä?
- Mitä rajoituksia on mahdollisesti näköpiirissä?

Preparation tasks for work group members

Introduction: The purpose for the workshop is have a conversation of wider scope business needs where can be utilized the more frequent measurement data availability and understand the detailed business requirements.

What kind of benefits do you see becoming with the continious metering data delivery from different actor roles point of view?

- What are the short term needs?
- What kind of longer term goal/visions could be in the horizon?
- What kind of constraints do you see?

Collecting business requirements

- Everybody records the input from the pre-tasks (detailed business requirements) on post-it papers (about 15-20 min) in Finnish/(English)
- We will have three groups to have further discussion on the those and add some more based on discussion in the group (15-20 min)
- We will save all records, no need to make summaries of those
- Each group will present their records in English, and we will have open discussion on those.
- DH will re-group the records by themes or matter

Groups

- Groups:

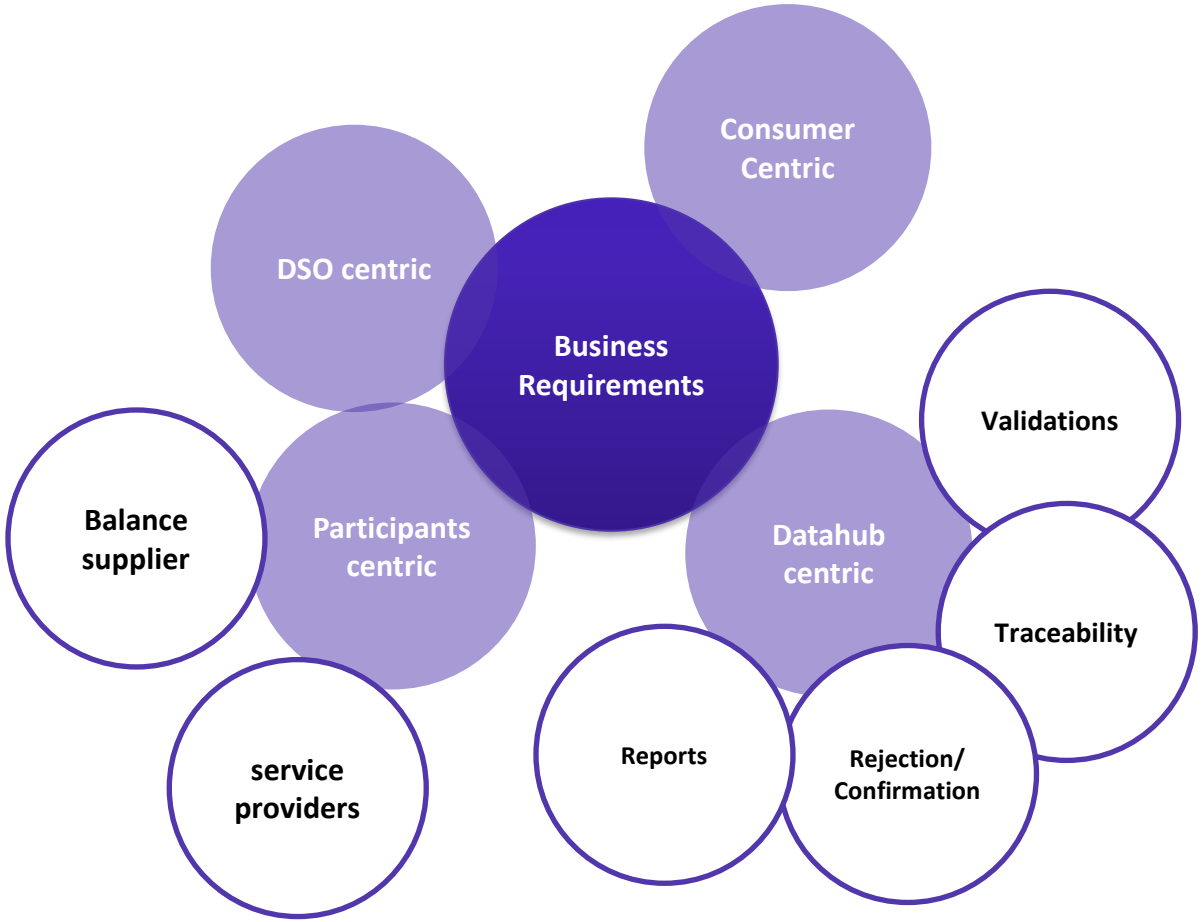
Group 1:
- Antti K, Caruna (DSO)
- Anssi K, Rejlers (MDM vendor)
- Elina K, Landis&Gyris (collection system vendor)
- (Jari R, Kajave (DSO))
- Gerold
- Marko

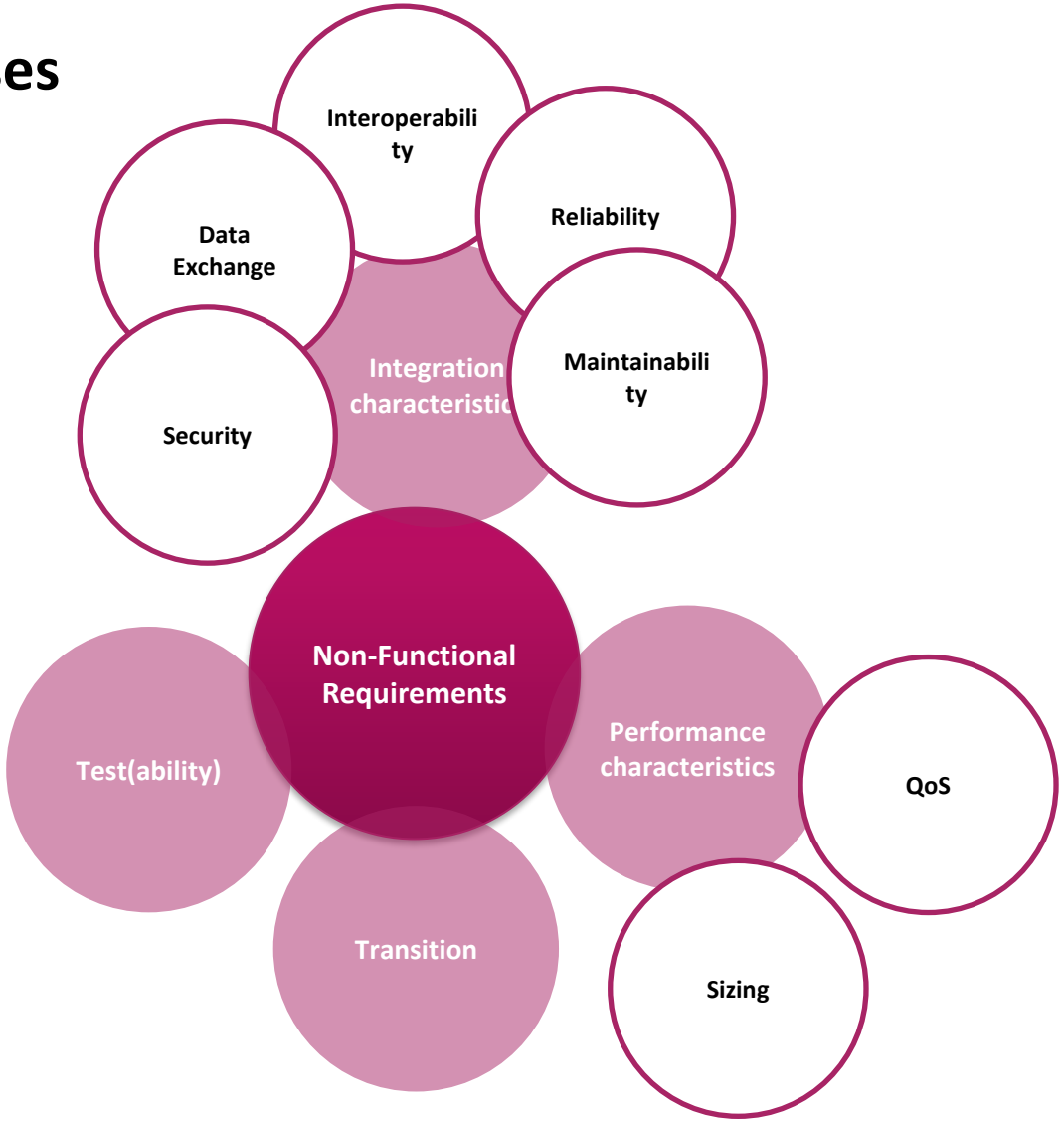
Group 2:
- Anssi V, Elenia (DSO)
- Vesa H, Hansen (MDM vendor)
- Jami K, TietoEvry (vendor)
- Pyry S, Helen (supplier/DSO?)
- Remco
- Laura

Group 3:
- Mikko V, Savon Voima (DSO)
- Ville K, Solteq (MDM vendor)
- Lari S, Aidon (collection system vendor)
- Jan
- Tuomas A

Themes and categories for inspiration purposes

Workshop Business Requirements





Wrap up

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Thanks!

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More frequent measurement data delivery

Workshop 14.08.2024

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Welcome

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Agenda

DAY 2

Time	Topic	Duration	Presenter
09:00	**Welcome**	**09:05**	**Remco**
09:05	Datahub - Event Channel introduction	09:30	Remco
09:30	Tell & Share	10:00	Remco
10:00	**Break**	**10:15**	
10:15	Recap Day 1/ Focus Day 2	10:30	Remco/Laura
10:30	Workshop Business Requirements	12:00	All
12:00	**Break**	**13:00**	
13:00	Workshop Business Requirements	14:30	All
14:30	Conclusions & Wrap up Day 2	14:55	**Marko/Remco**
14:55	**Meeting end**	**15:00**	**Marko/Remco**

Datahub
Event Channel Introduction

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Timeseries Event Channel

Get insight into your energy usage within hours via AgileDX

2024

CGI

Summary

Datahub

- Business Context
- System Context

Background

- Timeline
- Legislation change
- NextGen meter
- Datahub characteristics
- Stakeholder survey
- Focus Area Technology Study

Technology Study

- Approach
- Patterns
- Requirements
- Technology Analysis
- Design

Proof of Concept

Advise on proof of concepts to be done in phase 2 to determine the feasibility of the chosen architecture and its components.

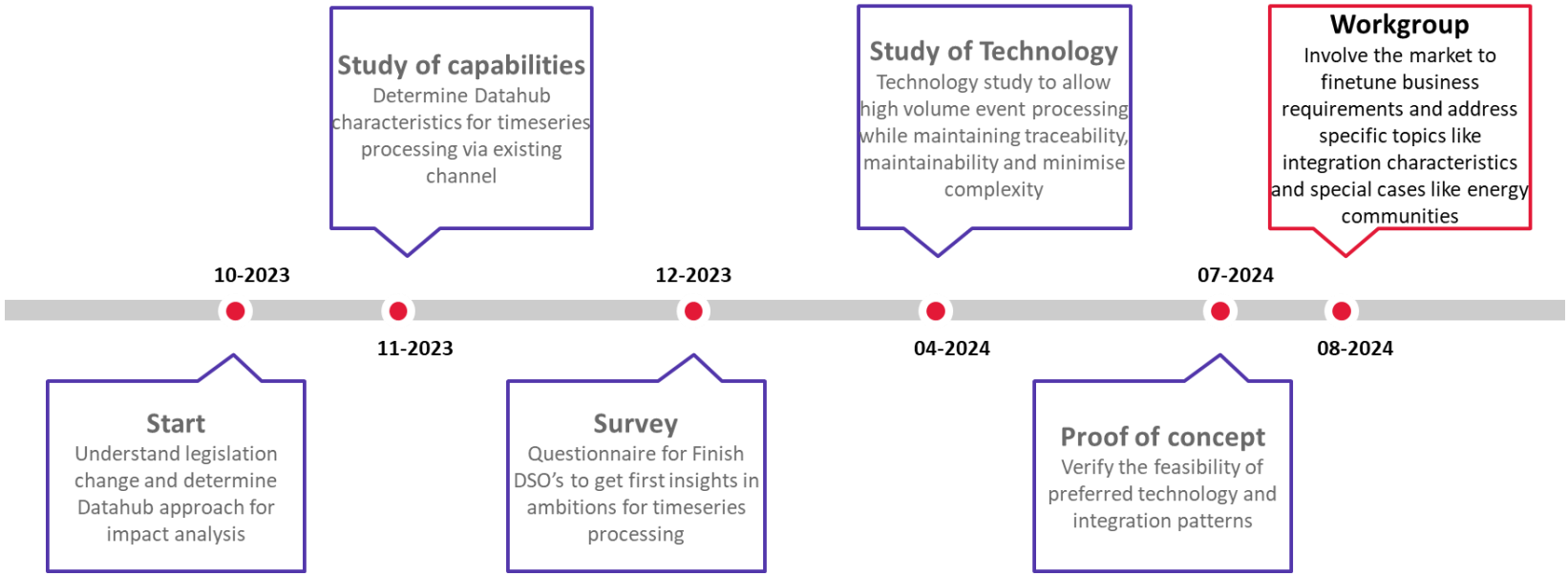
Summary

Summary

The decree 767/2021 “Valtioneuvoston asetus sähköntoimitusten selvityksestä ja mittauksesta” (Government Decree on the Settlement and Measurement of Electricity Supplies) introduces a directive to make measurement data available within 6 hours per 1/1/2026.

A preliminary analysis of what this could mean for involved parties and the Datahub has been performed and the verification on the feasibility of a high performant event channel has started.

Next step is to closely involve the market to identify the business needs, align on interpretation, align on technicalities including specifications and working models and produce acceptable solutions for affected functionalities.



Background

Legislation

Background

The decree 767/2021 “Valtioneuvoston asetus sähköntoimitusten selvityksestä ja mittauksesta” (Government Decree on the Settlement and Measurement of Electricity Supplies) chapter 6, § 5 states

“network operator's information system processing metering data shall collect the registered measurement data from the new remote metering equipment into the metering data reading system at least every six hours”.

According to the Finnish regulator the purpose of the requirement is **to provide measurement data to the end consumer at least within six hours**. As **datahub** can be appointed as point of delivery for measurement data the decree requirement also applies to the datahub system.

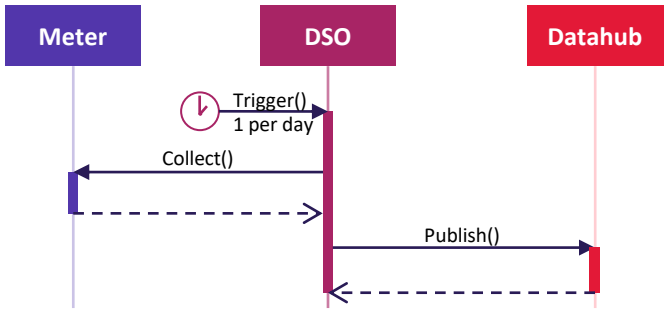
The requirement is limited to the **next generation** of smart meters and comes into force **1.1.2026**.

NextGen Meters

Background

GEN I

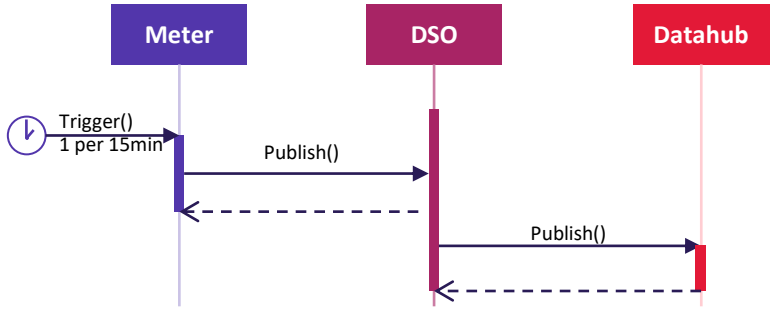
First Generation meters only provide APIs to request for measurement data and do not have the capability to push measurement data.



A batch driven approach is more suitable by collecting measurement for a period, validate and then publish for other consumers

GEN II

Second Generation meters have the capability to push the available measurement data as it becomes available.



This allows for a more event driven approach to the collection, validation a publication of the available measurement data

Datahub characteristics – Study of Capabilities

Background

The existing channel for receiving timeseries data can be categorized as a batch interface. Designed for current Fingrid situation with additional validations optimized for current integration characteristics.

As a result the current interface is expected to be able to process up to ~250k – 500k messages per day.

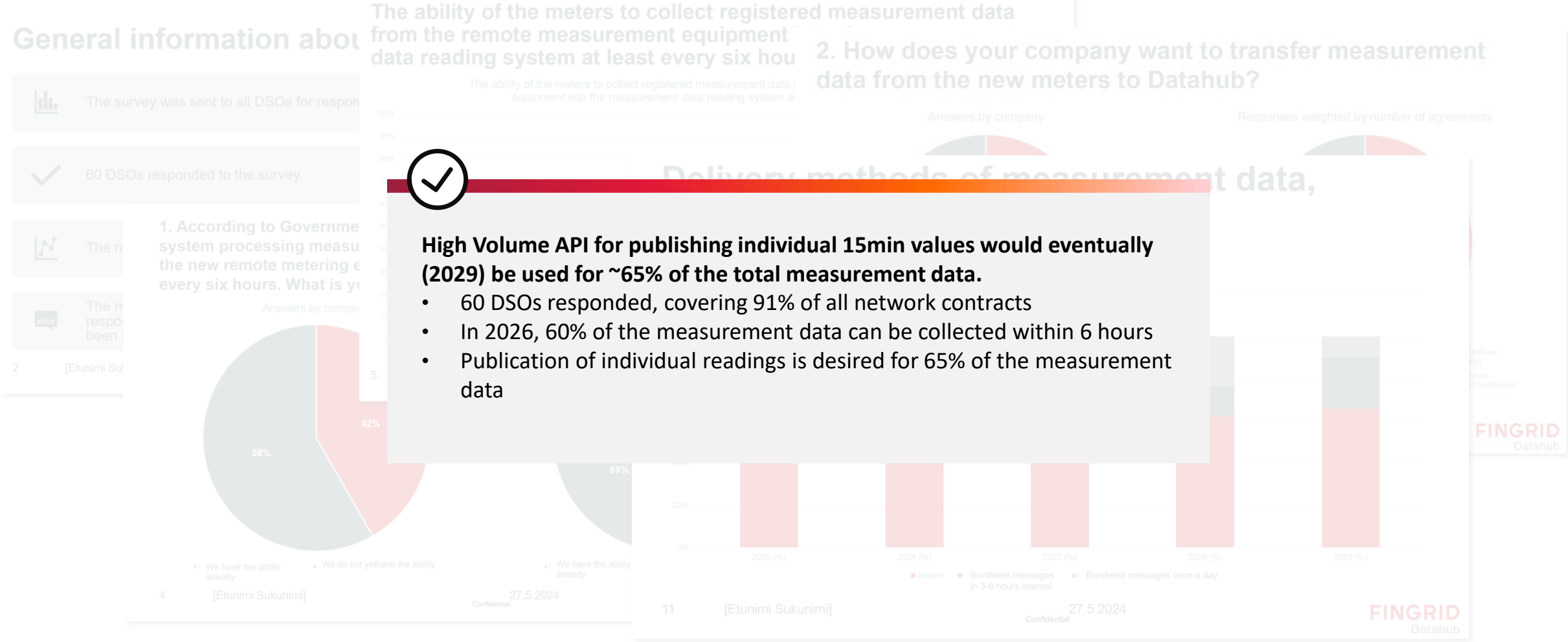
Currently Datahub processes around 75k messages a day which in total contains around 500 mio timeseries

Fingrid Survey

Background

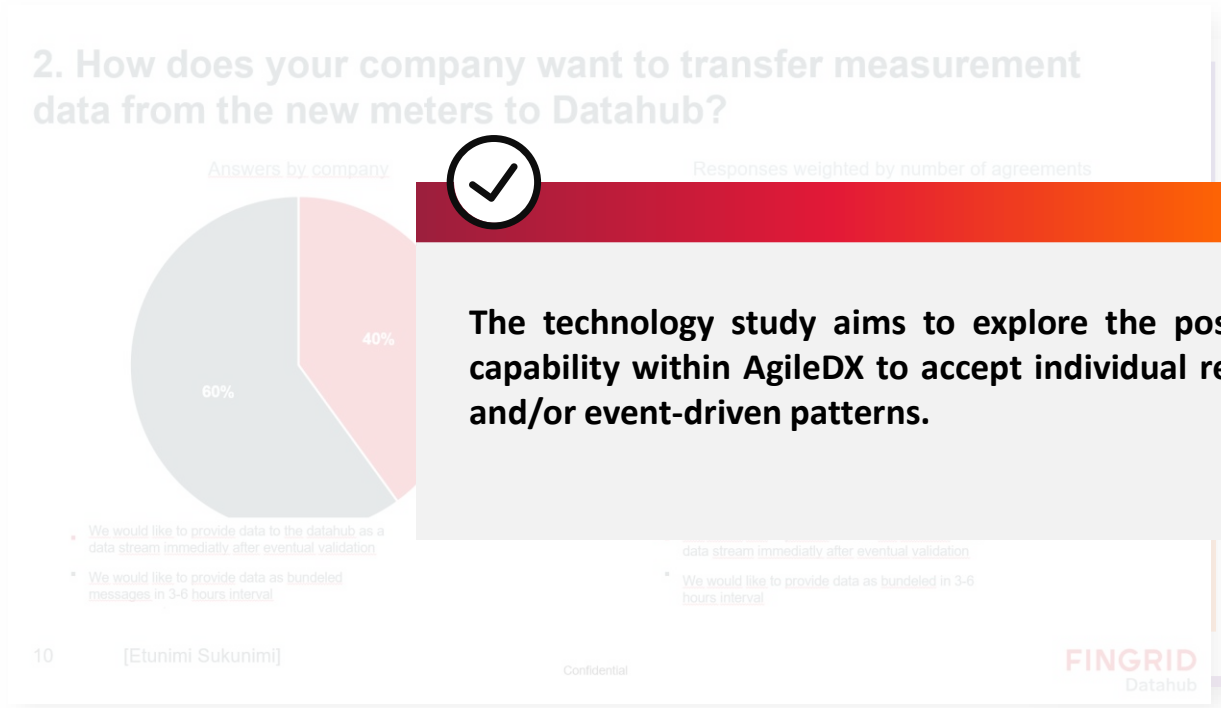
High Volume API for publishing individual 15min values would eventually (2029) be used for ~65% of the total measurement data.

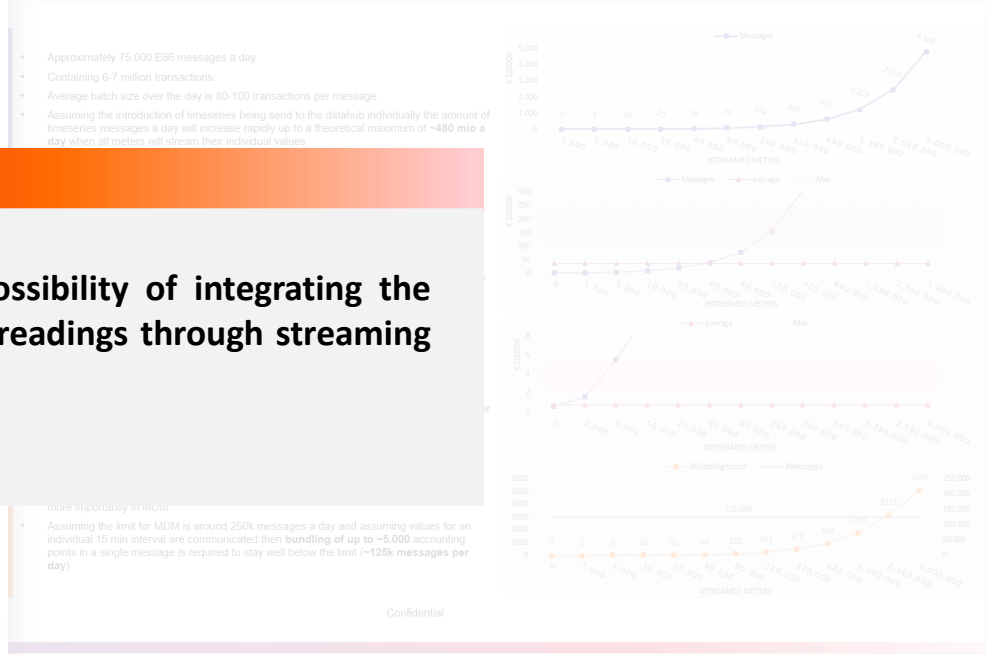
- 60 DSOs responded, covering 91% of all network contracts
- In 2026, 60% of the measurement data can be collected within 6 hours
- Publication of individual readings is desired for 65% of the measurement data



Focus Area Technology Study

Background



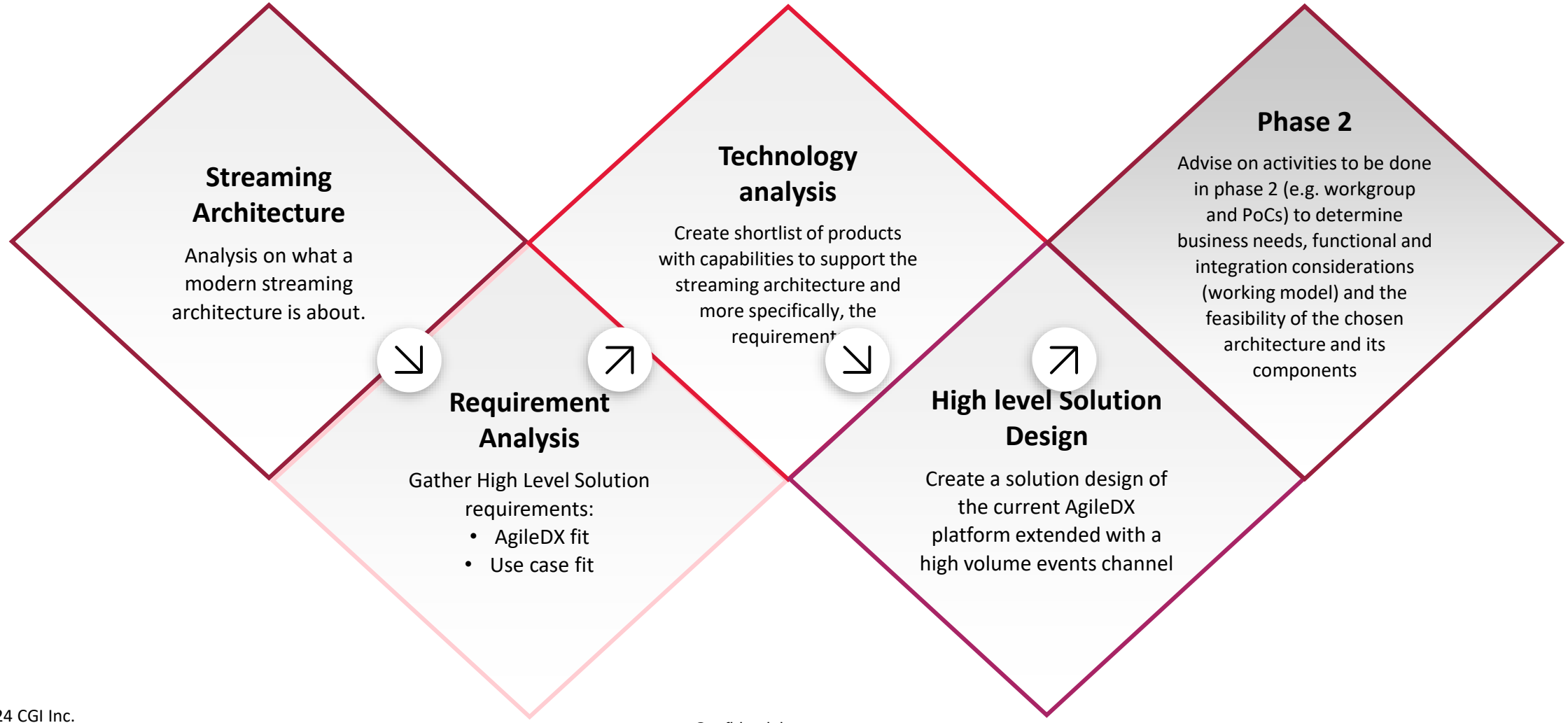


The technology study aims to explore the possibility of integrating the capability within AgileDX to accept individual readings through streaming and/or event-driven patterns.

Technology Study

Approach

Technology Study



What is streaming data

Technology Study

Streaming data is data that is emitted at high volume in a continuous, incremental manner with the goal of low-latency processing.

Characteristics

Chronologically significant
Individual elements in a data stream contain time stamps

Continuously flowing
A data stream has no beginning or end

Unique
Repeat transmission of a data stream is challenging because of time sensitivity

Nonhomogeneous
Some sources may stream data in multiple formats that are in structured formats

Imperfect
Temporary errors at the source may result in damaged or missing elements in the streamed data

Source: *©Amazon - https://aws.amazon.com/what-is/streaming-data/*

Modern Data Streaming Architecture

Technology Study

Stream Sources	Stream Ingestion	Stream Storage	Stream Processing	Stream Destination
Your source of streaming data includes data sources like sensors, social media, IoT devices, log files generated by using your web and mobile applications, mobile devices that generates semi-structured and unstructured data as continuous streams at high velocity.	The stream ingestion layer is responsible for **ingesting data into the stream storage layer**. It provides the ability to collect data from tens of thousands of data sources and ingest in **near real-time**.	The stream storage layer is responsible for providing **scalable** and **cost-effective** components to store streaming data. The streaming data can be **stored in the order it was received** for a **set duration of time** and can be **replayed indefinitely during that time**.	The stream processing layer is responsible for **transforming data into a consumable state** through data validation, cleanup, normalization, transformation, and enrichment. The streaming records are read in the order they are produced, allowing for real-time analytics, building event driven applications, or streaming ETL.	The destination layer is like a purpose-built destination depending upon your use case. Your destination can be an event driven application, data lake, data warehouse, database, or an OpenSearch.
• Smart meters • Database Change • Sensor networks • Social Media feeds	• HTTP/2 • WebSocket • MQTT (Message Queuing Telemetry Transport) • AMQP (Advanced Message Queuing Protocol)	• Kafka • RabbitMQ	• Kafka Streams • Spark • Flink • Storm	• Database (e.g MongoDB) • Storage (e.g E3) • Etc.

Source: *©Amazon - https://docs.aws.amazon.com/whitepapers/latest/build-modern-data-streaming-analytics-architectures/what-is-a-modern-streaming-data-architecture.html*

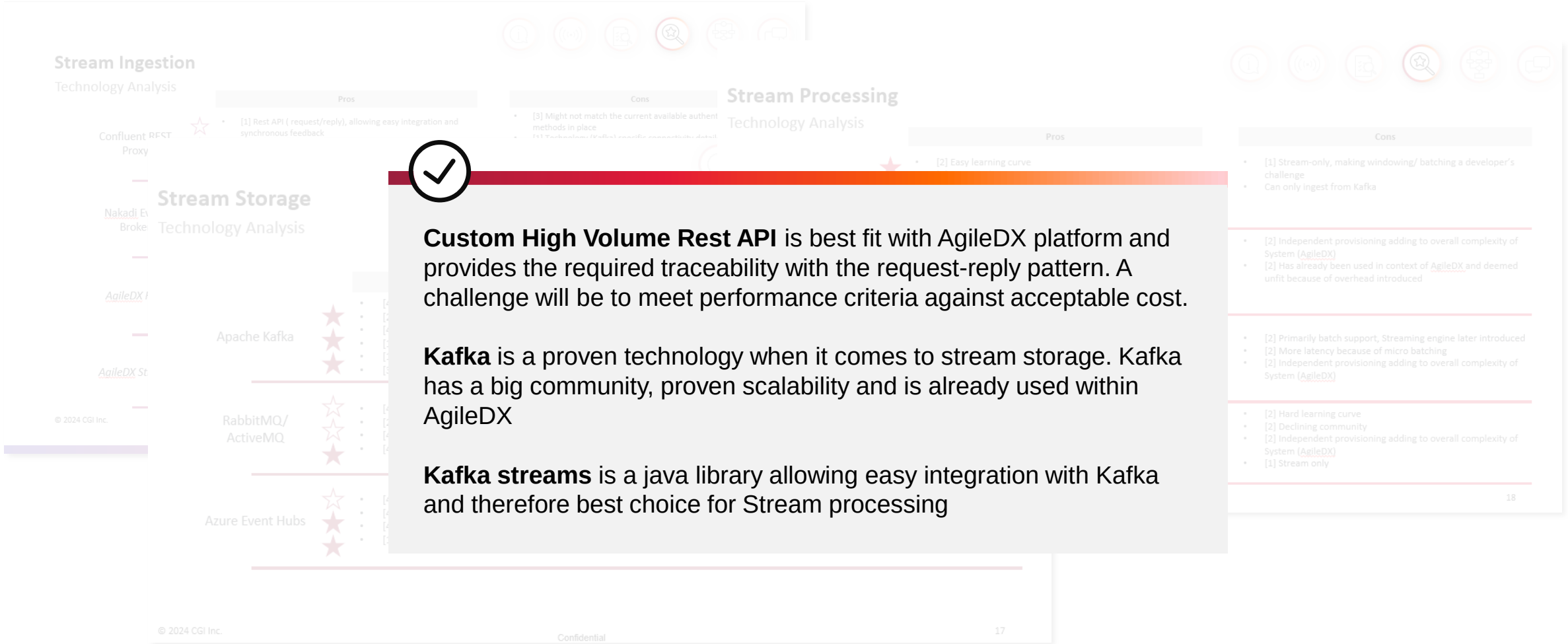
Main Requirements per Solution area

Technology Study

Stream Sources	Stream Ingestion	Stream Storage	Stream Processing	Stream Destination
	1. **Minimize complexity** for event producers to send their events by utilizing open standards and common interaction patterns; 2. Primarily support for up to **40.000.000 events per 15min**; 3. Authentication and authorization relying on **existing IAM implementation** (AD, certificates, partners); 4. **Minimize impact on existing platform** (from maintenance, development and deployment perspective), reuse existing components where possible.	1. Primarily support for up to **1.000.000.000 events per day** and technically scalable up to 5.000.000.000 events per day 2. **Open Source where possible** (no additional licenses); Third party (contracting)dependencies kept to the minimum to allow for flexible scaling, deployment and predictable costing. 3. **Stream to (micro) Batch capability** to integrate with MDM module; 4. **Minimize impact on existing platform** (from maintenance, development and deployment perspective), reuse existing components where possible.	1. **Stream to (micro) Batch capability** to integrate with MDM module; 2. **Minimize impact on existing platform** (from maintenance, development and deployment perspective), reuse existing components where possible. 3. **Open Source where possible** (no additional licenses); Third party (contracting)dependencies kept to the minimum to allow for flexible scaling, deployment and predictable costing.	

Technology Analysis

Technology Study



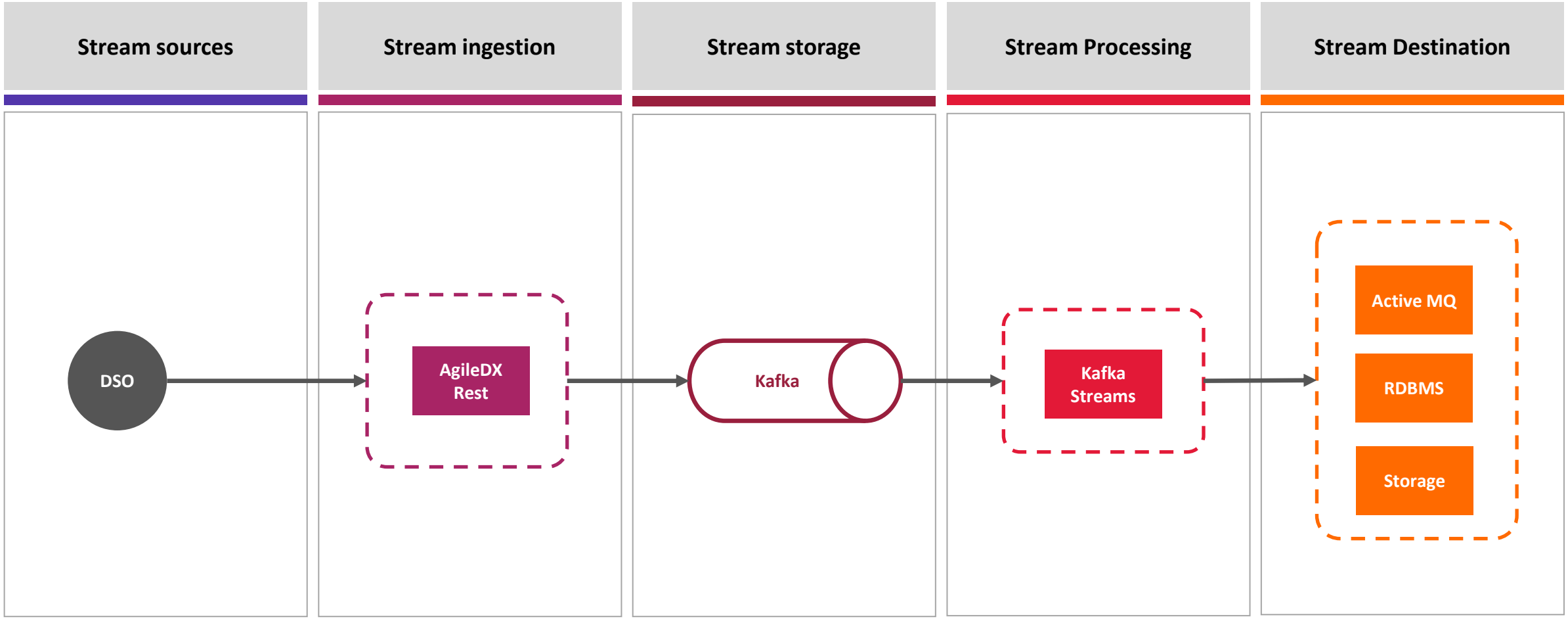
Custom High Volume Rest API is best fit with AgileDX platform and provides the required traceability with the request-reply pattern. A challenge will be to meet performance criteria against acceptable cost.

Kafka is a proven technology when it comes to stream storage. Kafka has a big community, proven scalability and is already used within AgileDX

Kafka streams is a java library allowing easy integration with Kafka and therefore best choice for Stream processing

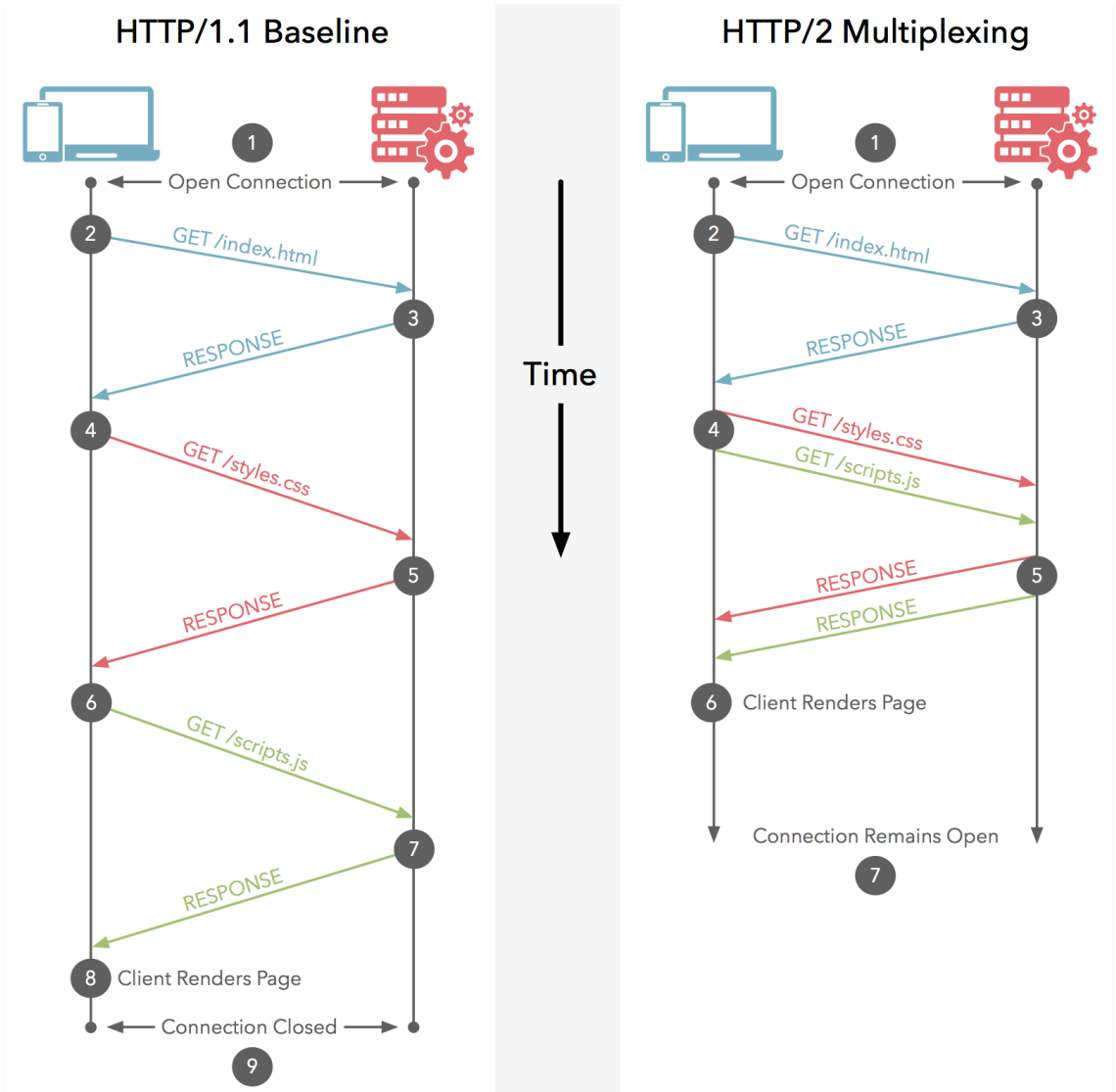
High Level Solution Design

Technology Study



HTTP/2

Technology Study



Proof of Concept

Phase 2

Proof of Concept

Stream ingestion

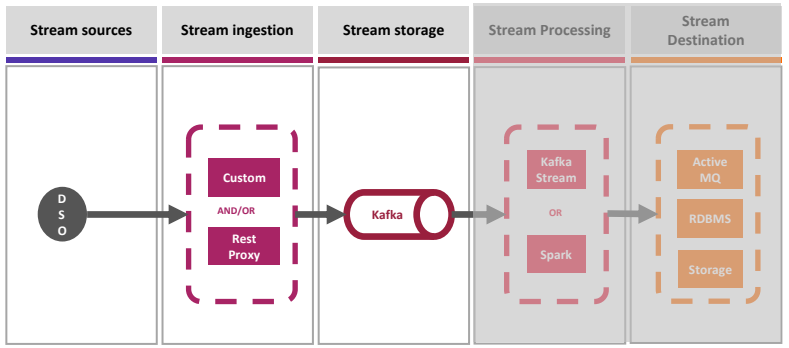
Proof of Concept

High performant ingestion channel integrated with available AgileDX logging and authentication modules. Verify pattern to be used in actual implementation

- [preferred] **REST API based on HTTP/2** preferred because of reduced complexity for participants and synchronous reply if a message has successfully been received.
- [Fallback] Stream API based on protocols like websocket, MQTT

Goal of the proof of concept is to confirm solution direction for receiving events with special attention to:

- Scalability (> 40 mio events per 15 minutes)
- Security integration
- Kafka architecture



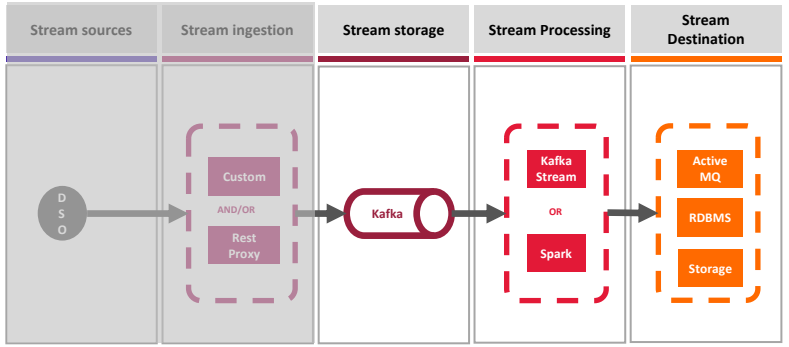
Stream Processing

Proof of Concept

Verify if **Kafka Streams** suffice as stream processor or additional technologies are required. If so, extend proof of concept with Apache Spark.

Goal of the proof of concept is to verify if Kafka Streams is able to process events and combine them to batch messages for MDM to process. Special attention goes to:

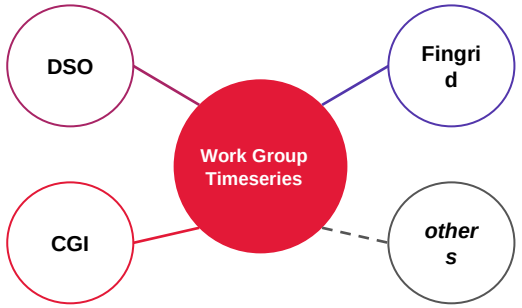
- Scalability (> 40 mio events per 15 minutes)
- Windowing capabilities
- Metadata requirements/constraints to allow for efficient Stream to Batch
- Baseline Kafka cluster configuration to allow Stream to Batch



Work group

Introduction of a high volume event handling channel will introduce technical and possibly functional deviations from the current way of working. To allow optimal fit for the Finnish market it is advised to have a work group organized with experts from Fingrid, DSO's, Software vendors and CGI to agree on aspects like:

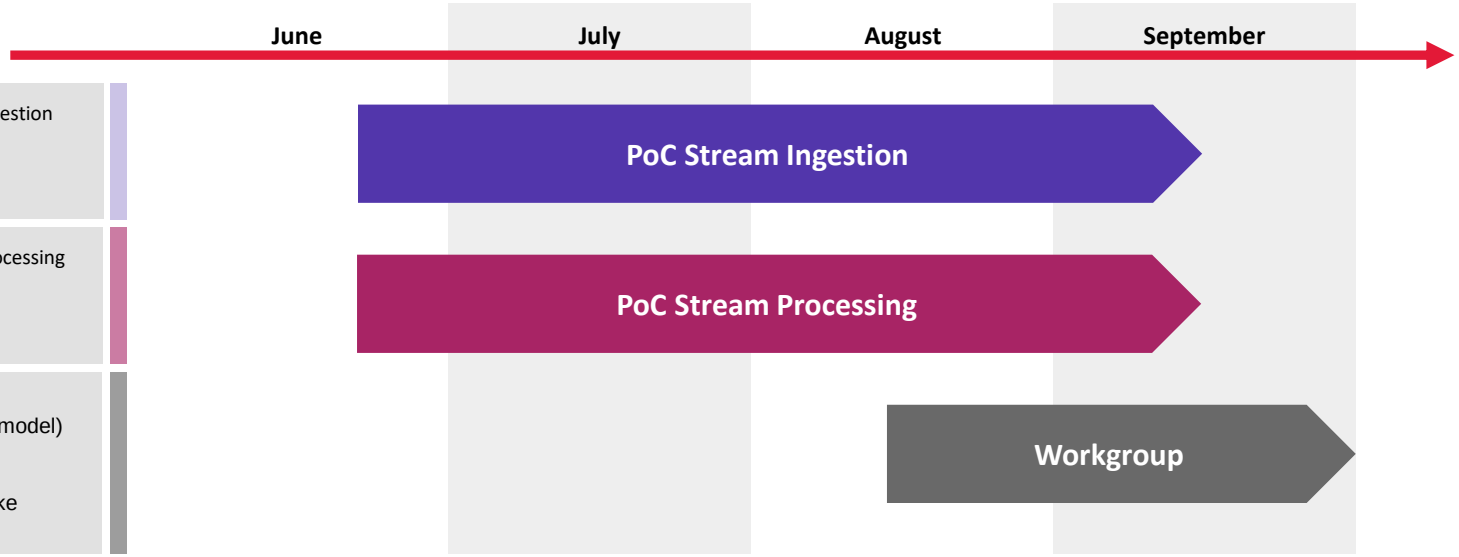
- Event format (attributes, identifiers)
- Patterns (Request/ Reply; Put and Update)
- Rejections and/or confirmations
- Distribution to other market parties.
- How to support specific scenarios like "energy communities"



Planning

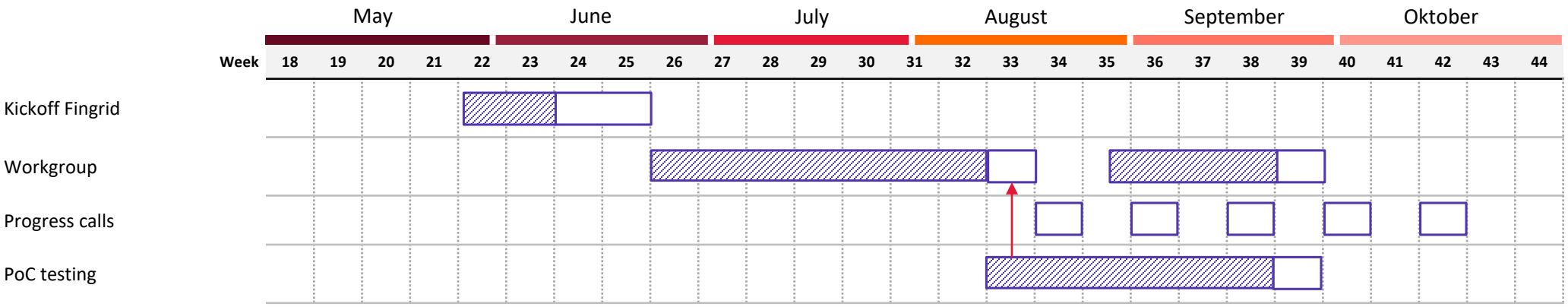
Proof of Concept

PoC Stream Ingestion	• Design/build/test/provision Stream ingestion • Loadtest Stream Ingestion • Optimize • Report
PoC Stream Processing	• Design/build/test/provision Stream processing • Loadtest Stream Processing • Optimize • Report
Workgroup	• Event format (attributes, identifiers) • Patterns (Request/ Reply; working model) • Rejections and/or confirmations • Distribution to other market parties. • How to support specific scenarios like “energy communities”



Workgroup Planning

Proof of Concept



- Kick-off fingrid to align on previous steps (phase 1 – report), future steps (phase 2), Preparation for workshop
- Workshop with sector.
  - 1st (13-14 August): Kickoff, Event format, Pattern, Rejection/Confirmation, status PoC
  - 2nd (25th September): Lookback, Distribution to other market parties, Special cases, Testing days
- Progress calls: Biweekly digital call to address progress on actions from workshop (only when needed)
- PoC Testing: 2 days (23-24 September) onsite for connecting selected parties to sandbox. During 1st workshop the Test tooling as used by CGI will be made available to stakeholders.

Week meeting will be held

Lead/preparation time for participants. Supported with ad-hoc meetings if needed

Phase 2

Proof of Concept

PoC
CGI is responsible for the deliverable
Fingrid is informed

- **Report - Event Channel Timeseries** describing the results of the proof of concepts including the feasibility of the technology and a continuation plan in case technology is deemed unfeasible
- **High Level Design - Event Channel Timeseries** including design considerations, decisions and dependencies and expected on premise resource requirements, to be used as input for System Design/Architecture
- **Test Tool** (driver written in NodeJS) shared with workgroup, prior to testing days, as reference.

Workgroup
CGI (and Fingrid) responsible for the deliverable
Workgroup is consulted

- **Technical Interface Specification** where Fingrid and CGI are responsible for creating the draft and workgroup is consulted
- Memo per main topic addressed by workgroup
  - **Integration pattern** (Request/Response/ working model)
  - **Traceability** (confirmation/ rejection)
  - **Special cases** (e.g. Energy Communities)
  - **Distribution of Timeseries** to DSO and Suppliers
  - Concept **Test Planning** and environment dependencies phase 3

  These memos are to be used as input for System Design/Architecture

Tell & Share

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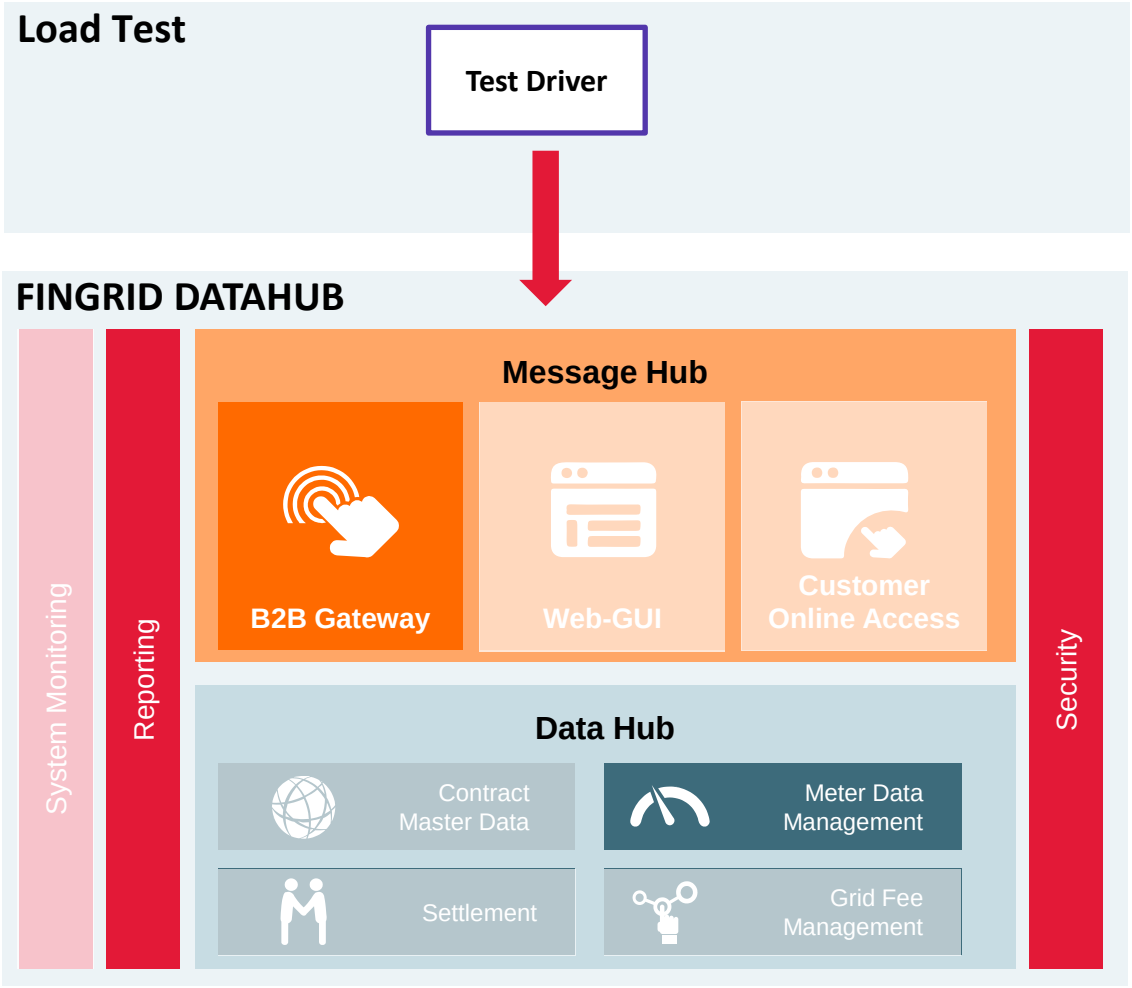
Concept solution PoC

- NodeJS script.
- Utilizing multiplex feature of HTTP/2
- Static timeseries event in JSON (unique identifier per event)
- Scaling via:
  - #workers (related to #CPUs)
  - #Client connections (related to receiver maximum)
  - #Multiplex (related to HTTP/2 limitations)

- Authorization service (not in scope POC)
- High performant, light weight REST Service (request/reply)
- JSON schema validation
- Authorization token validation
- Scaling via:
  - B2B Gateway - 4 instances (autoscaling is possible)
  - Kafka – 3 node cluster
- Transformation to internal MDM batch format



Status

Individual components

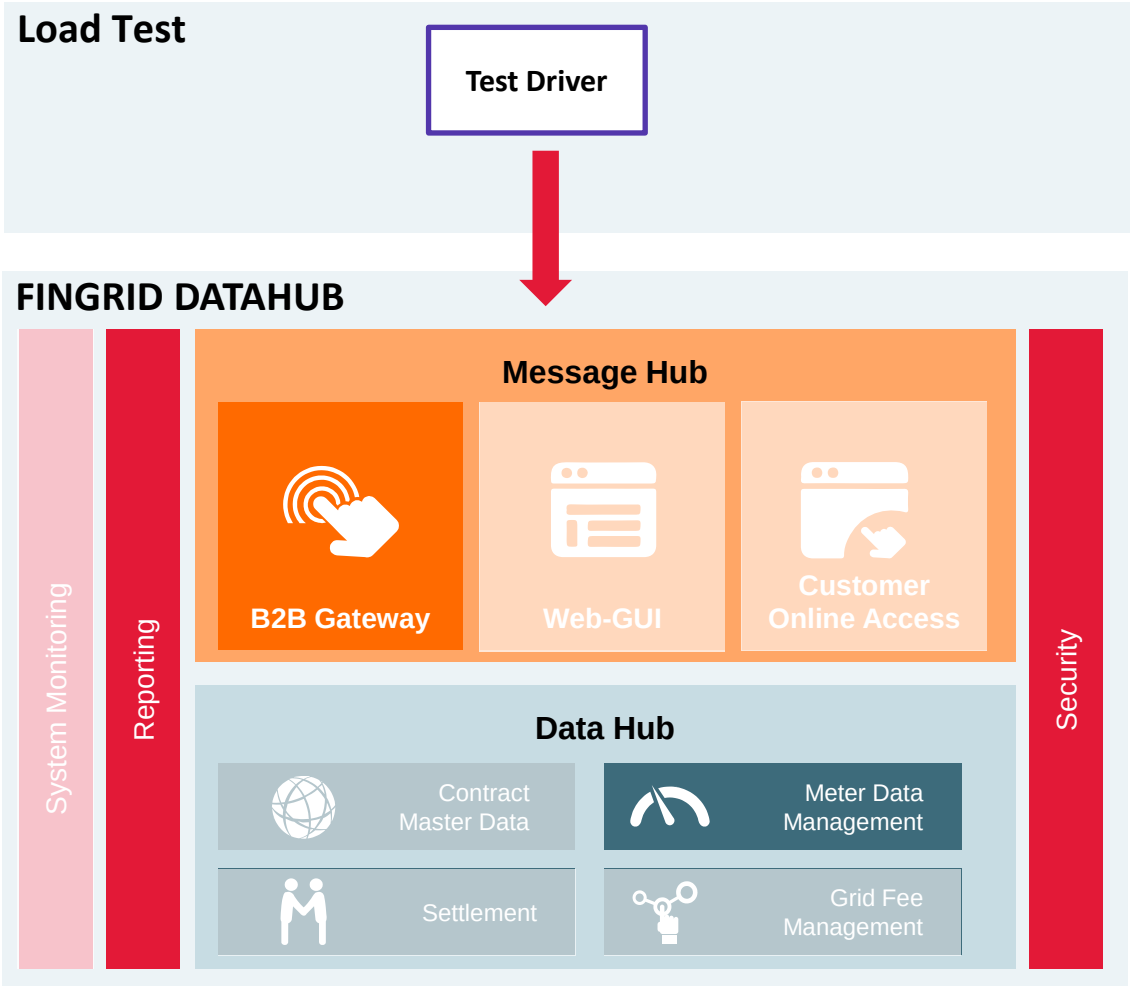
- Test driver is sized and unit tested to deliver up to **100k events per second** at 20ms responsetimes
- Kafka cluster is loadtested to handle to handle **~390 k records per second**
- Rest API has an execution time **<1 ms** for processing the event and routing it internally to Kafka

Complete flow

- Rest API is measured to handle up to **100k messages per second** with 8 instances and on average 2ms processing time per event
  - This included json schema validation
  - This excludes token verification
  - Driver measured on average 20ms responsetime per event. Responsetimes are expected to increase cause of traffic over internet in real life scenarios

Preliminary conclusion

- Performance criteria for PoC was set at **50k events per seconds** and it seems realistic this performance criteria can be met from Datahub perspective.
- Multiplexing (HTTP/2) has less of a positive impact then expected. Still 3k open client connections was required to reach the 100k events per second
- Impact on Datahub regarding the sizing of B2B Gateway seems reasonable and linear scalable up to at least 100k events per second



Event Format

PoC Screenshot

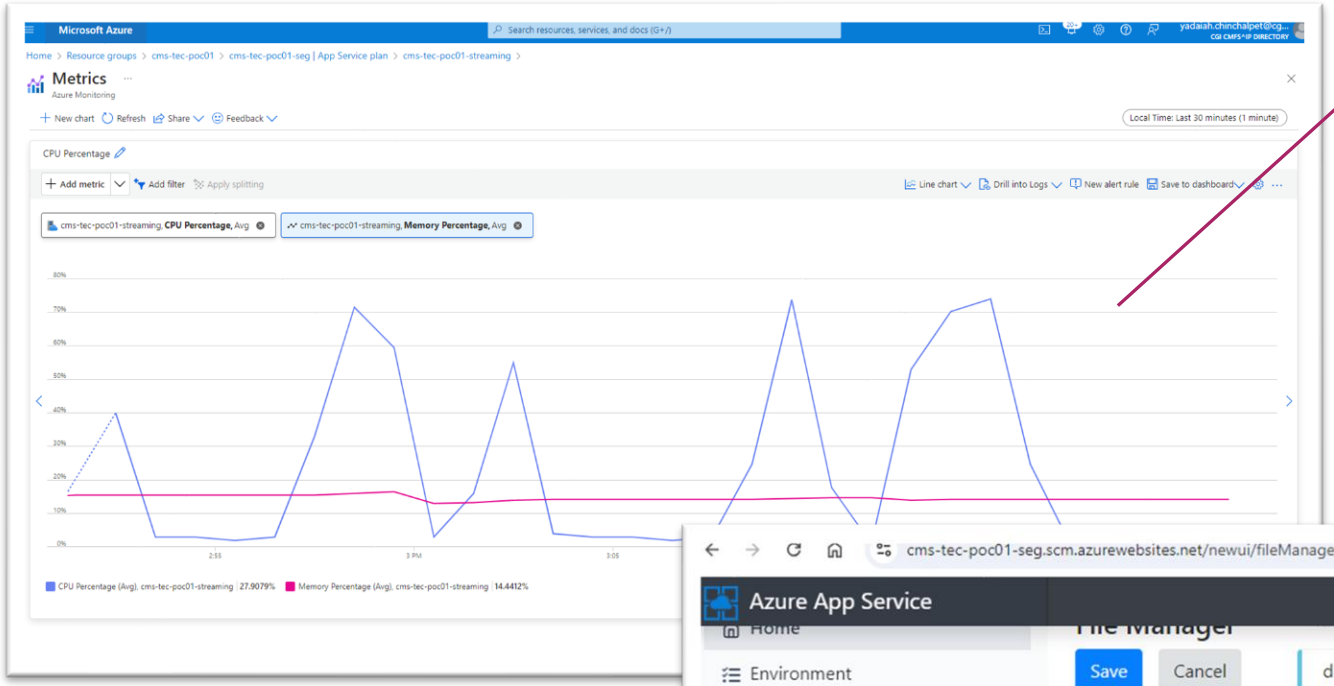

```
{
  "mrid": "8803565d-5242-4016-96eb-900f4080e856",
  "cdt": "2024-04-03T08:21:56Z",
  "mp": "640502010245201095",
  "mptype": "F01",
  "sep": "6430076050014",
  "jep": "6430076050014",
  "mga": "0000562140649364",
  "mgai": "0000562140649364",
  "mgao": "0000562140649364",
  "ind": "23",
  "ch": [
    {
      "res": "PT15M",
      "product": {
        "id": "8716867000030",
        "unit": "KWH"
      },
      "dir": "E17",
      "vol": {
        "dt": "2024-04-03T08:21:56Z",
        "qty": 0,
        "qq": "string"
      }
    }
  ]
}
```


- Unique event identifier
- Create date time of event
- Meteringpoint/ allocation point identifier
- Meteringpoint type
- Sending market party identifier
- [conditional] Juridical market party identifier
- [conditional] Gridarea
- [conditional] Grid area infeed
- [conditional] Grid area outfeed
- Industry (energy type)

- Resolution
- Product + unit
- Direction (production | consumption)
- Timestamp of volume
- Volume quantity
- Volume quality

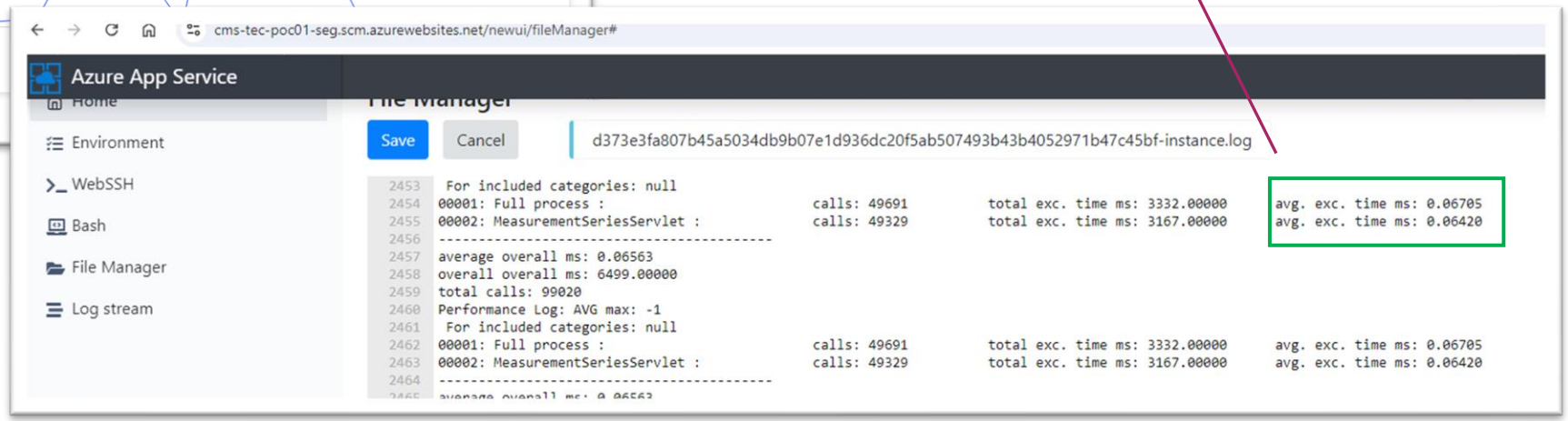
B2B Gateway – Event Channel

PoC Screenshots



Resource consumtion staying below thresholds **(~80%)** per instance

Average of **<1ms** per message processing time

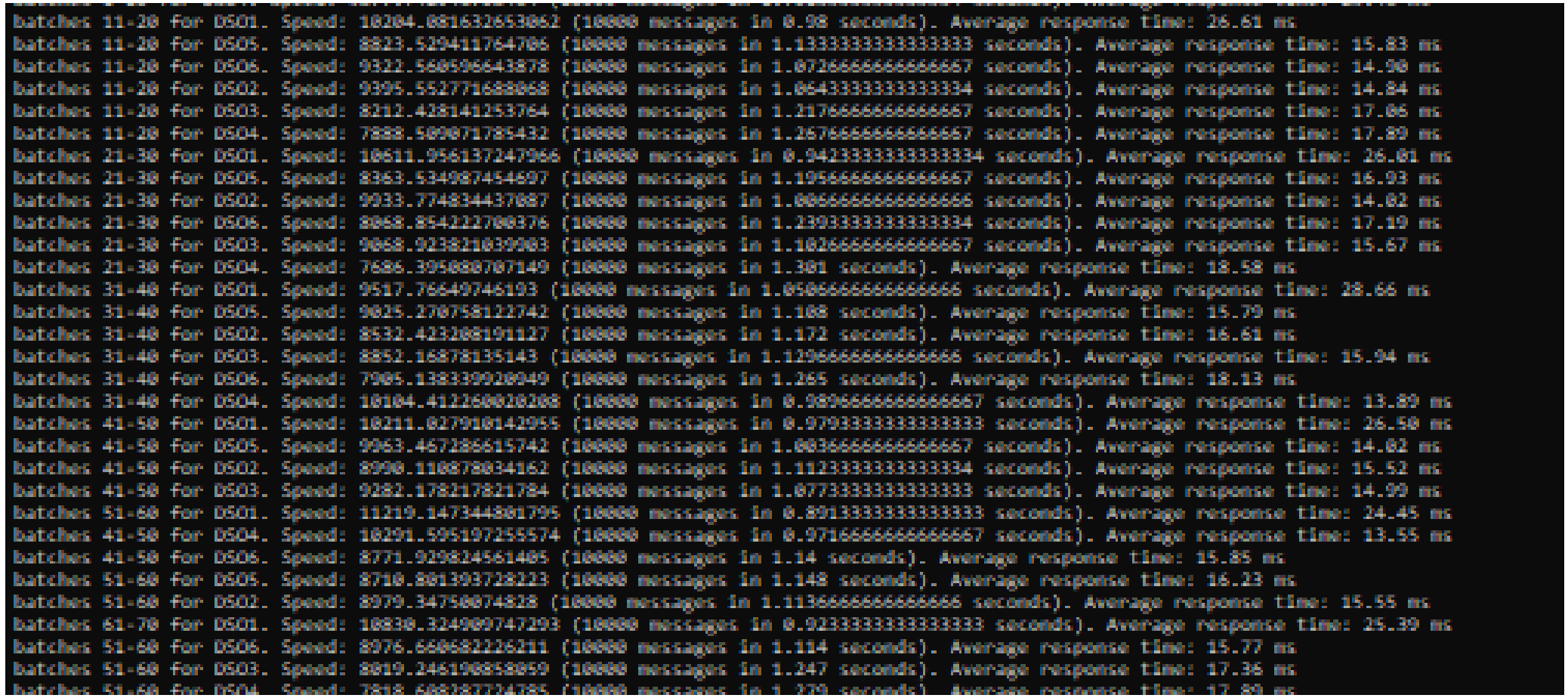


Test Driver

PoC Screenshots

- 6 workers
- 10k batchsize
- Average responsetime ~20ms
- B2B Gateway – 4 instances
- 10k messages in ~1.1 s per worker

~ 50k per second



Test Driver Package

- Driver script
- Installation instructions
- Operation instructions

Package will be uploaded to teams

Recap Day 1/ Focus Day 2

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Recap Day 1/ Focus Day 2

Conclusion Day 1

- Working assumption Timeseries Event Channel is required from datahub perspective
- Current batch channel needs to be impacted (revise requirements, optimise interface)
- Continuous delivery is currently described as. Variable frequency (1 min - 6 hours). Standardised interval. (15m | 1h)

Focus Areas

- Planning and priority
- What are the consequences to introduce an event channel
  - Viewpoints: DSO, Supplier, 3rd Party, vendors, customer and Datahub
- How to proceed

Workshop Business Requirements

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Collecting business requirements

- Everybody records the input from the pre-tasks (detailed business requirements) on post-it papers (about 15-20 min) in Finnish/(English)
- We will have three groups to have further discussion on the those and add some more based on discussion in the group (15-20 min)
- We will save all records, no need to make summaries of those
- Each group will present their records in English, and we will have open discussion on those.
- DH will re-group the records by themes or matter

Groups

- Groups:

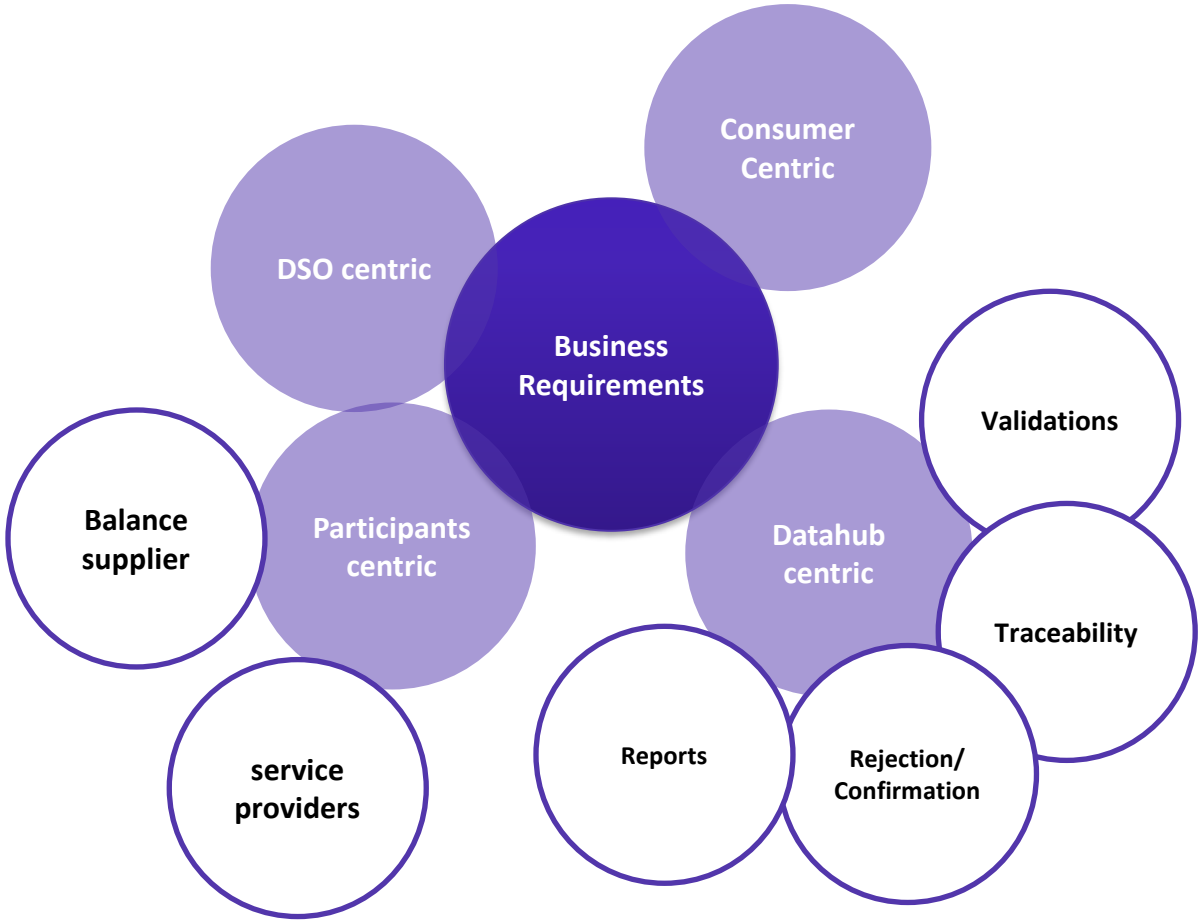
Group 1:
- Antti K, Caruna (DSO)
- Anssi K, Rejlers (MDM vendor)
- Elina K, Landis&Gyris (collection system vendor)
- (Jari R, Kajave (DSO))
- Gerold
- Marko

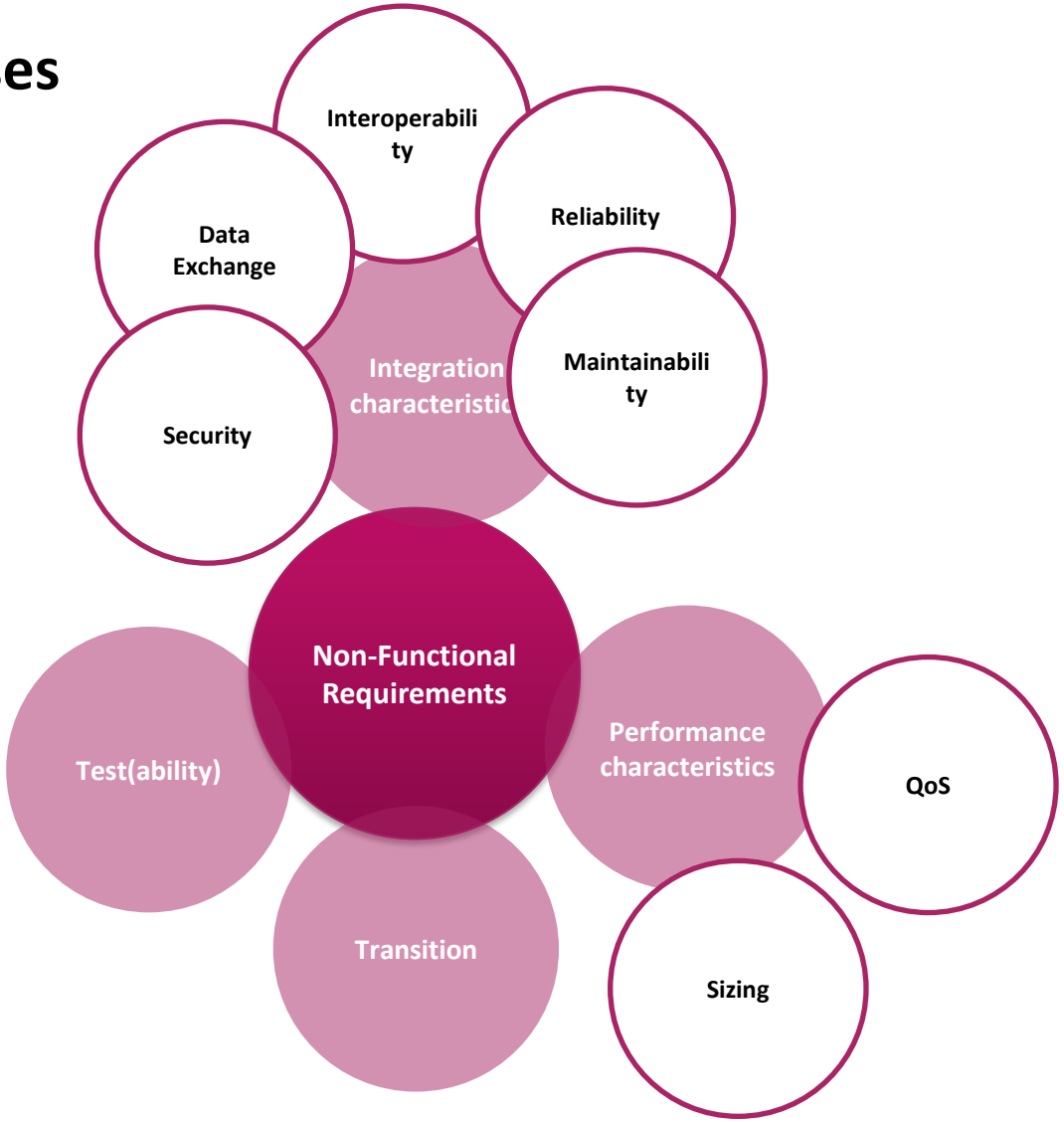
Group 2:
- Anssi V, Elenia (DSO)
- Vesa H, Hansen (MDM vendor)
- Jami K, TietoEvry (vendor)
- Pyry S, Helen (supplier/DSO?)
- Remco
- Laura

Group 3:
- Mikko V, Savon Voima (DSO)
- Ville K, Solteq (MDM vendor)
- Lari S, Aidon (collection system vendor)
- Jan
- Tuomas A

Themes and categories for inspiration purposes

Workshop Business Requirements





Thanks!

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