CONNECT LIVE 26

FLEXIBILITY MEETS EFFICIENCY: POWERING THE ENERGY TRANSITION

METER DATA MANAGEMENT

AGENDA

Hansen MDM Roadmap	Riikka Kumlin, Product Director, Hansen Sakari Seppälä, Senior Product Manager, Hansen
Hansen Data Approach	Petteri Virtanen, Solution Architect, Hansen
New features of MDM-G	Teemu Kemppainen, Product Owner, Hansen Tiina Myllymäki, Senior Product Owner, Hansen
New Utilities with MDM-ME	Vesa Hulttinen, Product Manager, Hansen
New in the Finnish Market Communication, Streaming Interface	Vesa Hulttinen, Product Manager, Hansen
Wrap Up & Closing	Esko Routama, Hansen

HANSEN MDM ROADMAP

Riikka Kumlin, Product Director, Hansen
Sakari Seppälä, Senior Product Manager, Hansen

NEW MARKET AREAS

Project on-going

- Latvia and Lithuania
  - EDM BRP
- Norway
  - EDM BRP
  - MDM DSO Localization
- Germany
  - B2B EDM calculations and billing
- Netherlands
  - EDM BPR
- USA – regulated state
  - MDM for Electricity and Water

In production

- United Kingdom
  - B2B EDM calculations and billing
- Netherlands
  - B2B EDM calculations and billing

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PRODUCT FEATURE RELEASES

Shared

- FI datahub 2.5

MDM-ME

- District heating and cooling
- Water
- Amount of real-time measurements increasing in production

MDM-G

- Correction billing including incremental corrections
- Hansen documentation in WebUI
- WebUI customisations
- Audit trail for objects and object hierarchies

AI IN ACTION AT HANSEN

- Product management
  - Code analysis for verification
  - Specification standardization and quality
  - Creating JIRA user stories from documentation
- Testing
  - Test-case and test data generation
  - Code review for automated tests
  - Assisted analysis on test failures
  - Adjustment of existing test cases after a market change
- Development
  - Dependency analysis
  - Code review
  - Agent assisted development
  - Unit test creation and analysis
  - Internal documentation of existing code
- Project management
  - Reporting from JIRA
  - Schedule follow-up
- SaaS operations and Support
  - AI bots in Hansen use

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ROADMAPS

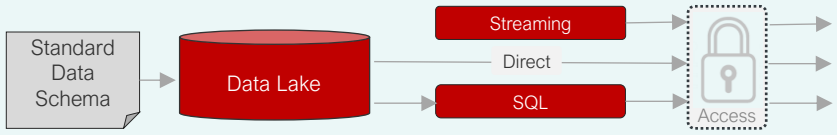
HANSEN R&D DIRECTIONS

HANSEN DIGITAL ENERGY SUITE

GUIDED SOLUTION SELLING

DIGITAL CUSTOMER ENGAGEMENT

DATA MANAGEMENT



ANALYTICS AND MACHINE LEARNING

- Consumption analysis
- Demand forecasting
- Anomaly Detection
- Multimarket Trading
- Storage Optimisation
- Customer segmentation
- Churn Analysis
- Next-Best-Offer
- Backoffice automation
- Etc

HANSEN R&D DIRECTIONS

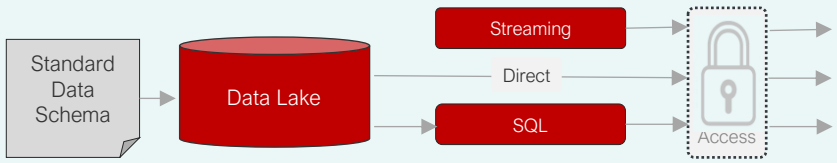
HANSEN DIGITAL ENERGY SUITE

GUIDED SOLUTION SELLING

VIRTUAL AGENT

DIGITAL CUSTOMER ENGAGEMENT

DATA MANAGEMENT



ANALYTICS AND MACHINE LEARNING

- Consumption analysis
- Demand forecasting
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- Customer segmentation
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- Next-Best-Offer
- Backoffice automation
- Etc

LONG TERM ROADMAP FOR HANSEN MDM

MDM-ME MDM-G

2026

- Data Lake Extracts & Real-time stream
- EDM UI
- DH Consumption and production optimization

2027

- Real-time settlement
- Shared Datalake
- AI / Machine learning based features

2028

- Data discovery
- Extend Data
- IoT measurements

2029

- Decision Acceleration
- 3-5min measurements to consumers

Subject to change without notice.

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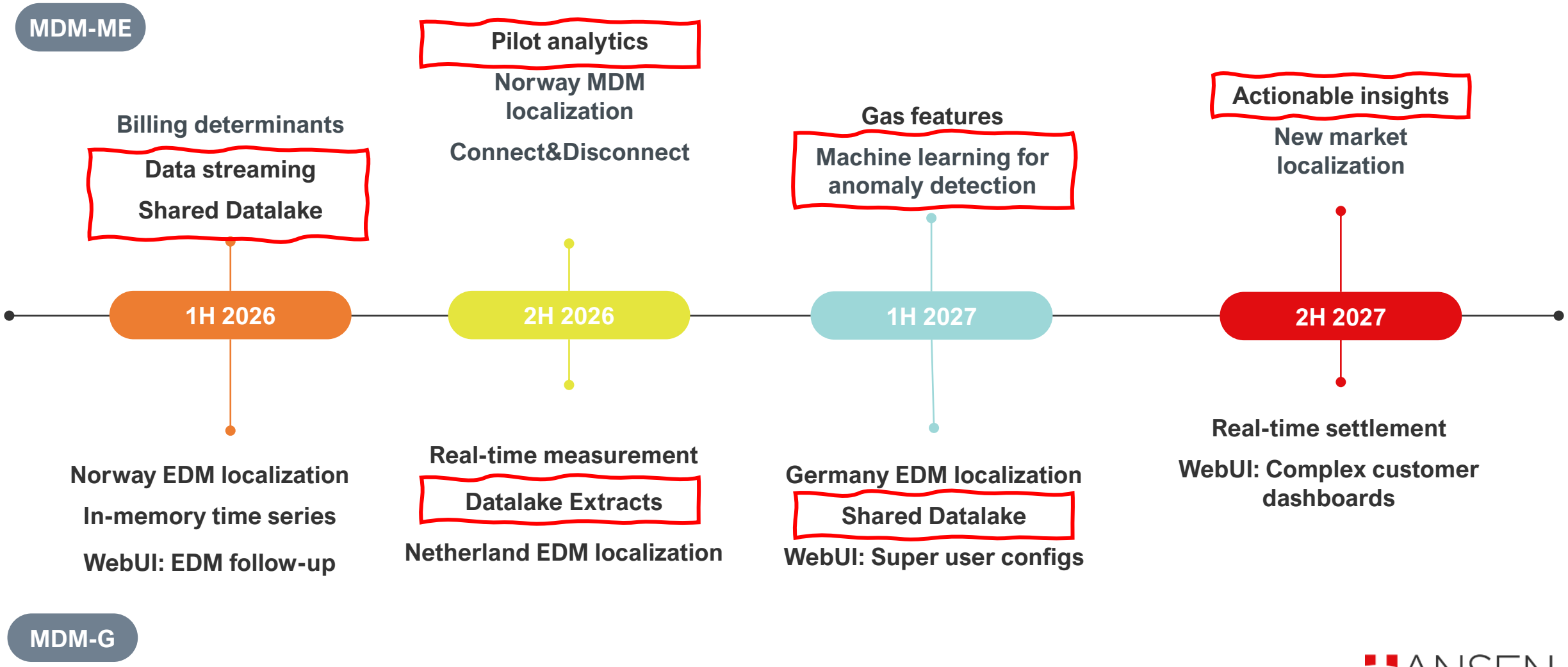
FEATURE ROADMAP FOR HANSEN MDM



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ROAD AHEAD

- Continue with two products
  - Lead by one product management team
  - Leverage common development through
    - established practices (FI Datahub)
    - new ways (e.g. data lake)
- Focus from compliance to value add

Active markets

- A lot of activity in BRP around Europe
  - Time series engine and integration extensions
- Swedish DSO's show signs of activity
- North America

Market compliance package

- Selected customer groups
  - Like Finnish DSO&RE
- Multi-year agreement
- Includes
  - Mandatory market changes for MDM
  - 3rd party version changes
  - Security updates
  - Version upgrade project
- Benefits
  - Predictable costs for customer
  - Easier vendor management
  - Focus to value adding co-operation

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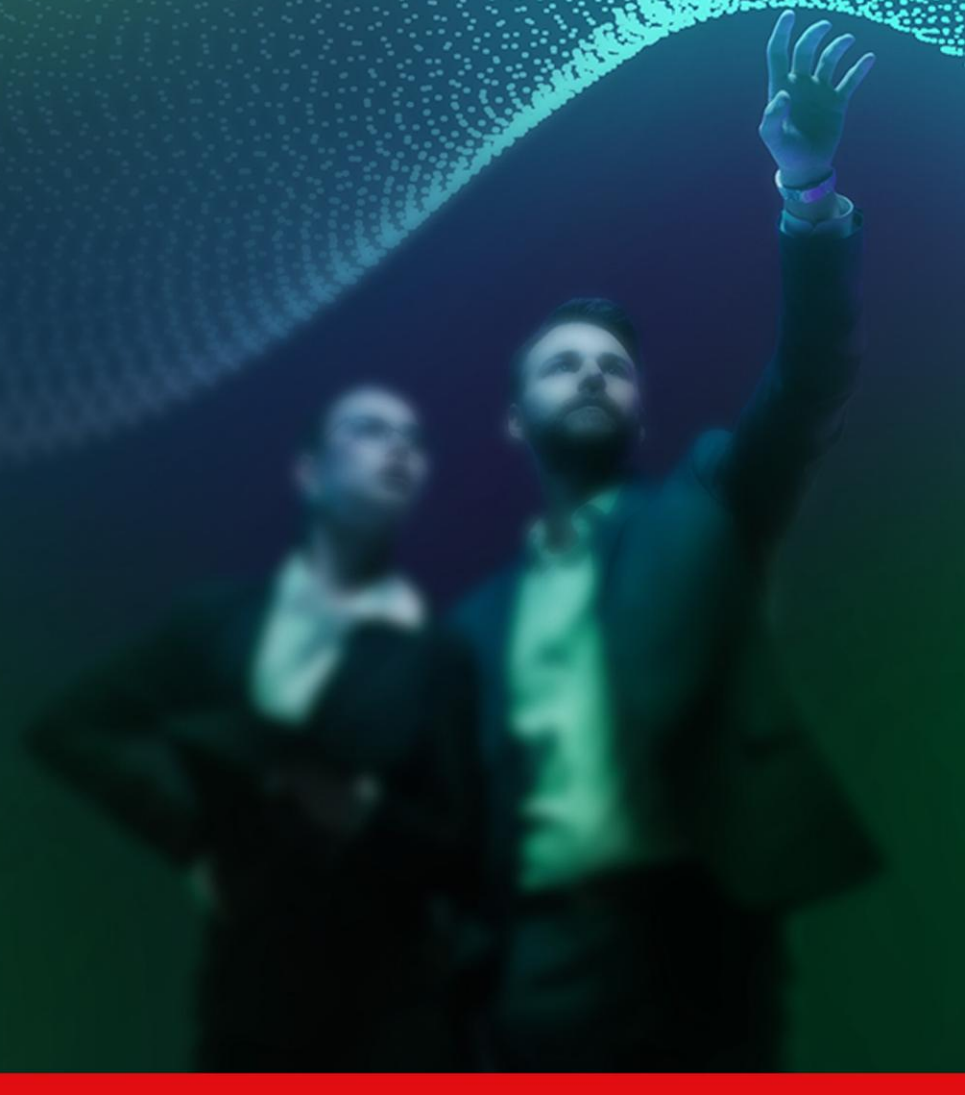
THANK YOU!



HANSEN DATA APPROACH

Petteri Virtanen, Solution Architect, Hansen

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FLEXIBILITY MEETS EFFICIENCY: POWERING THE ENERGY TRANSITION

DATA ROADMAP

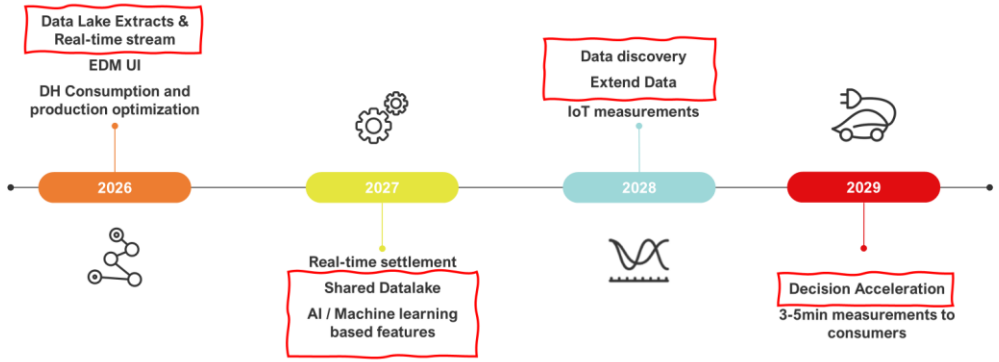
Quick recap from today and 2025

THE ROADMAP

- streaming
- shared datalake
- analytics

LONG TERM ROADMAP FOR HANSEN MDM

MDM-ME MDM-G



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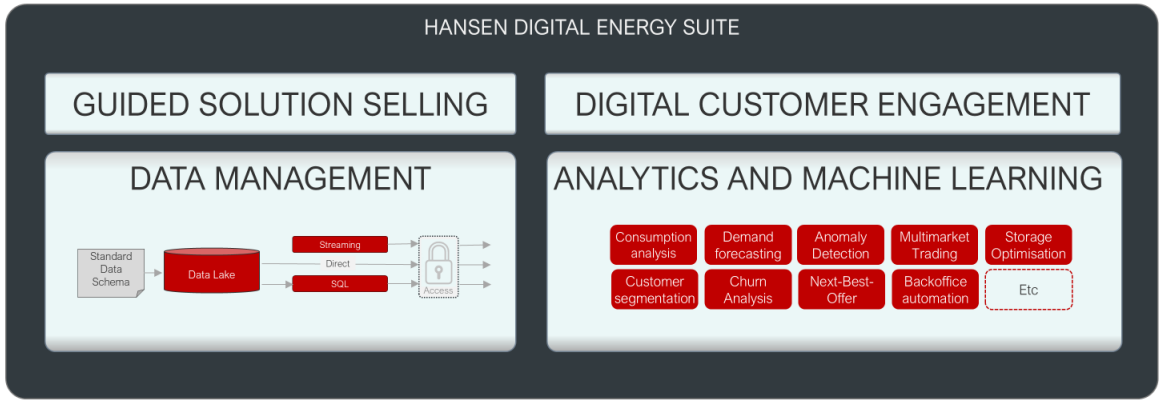
2025 HANSEN ENERGY R&D DIRECTIONS



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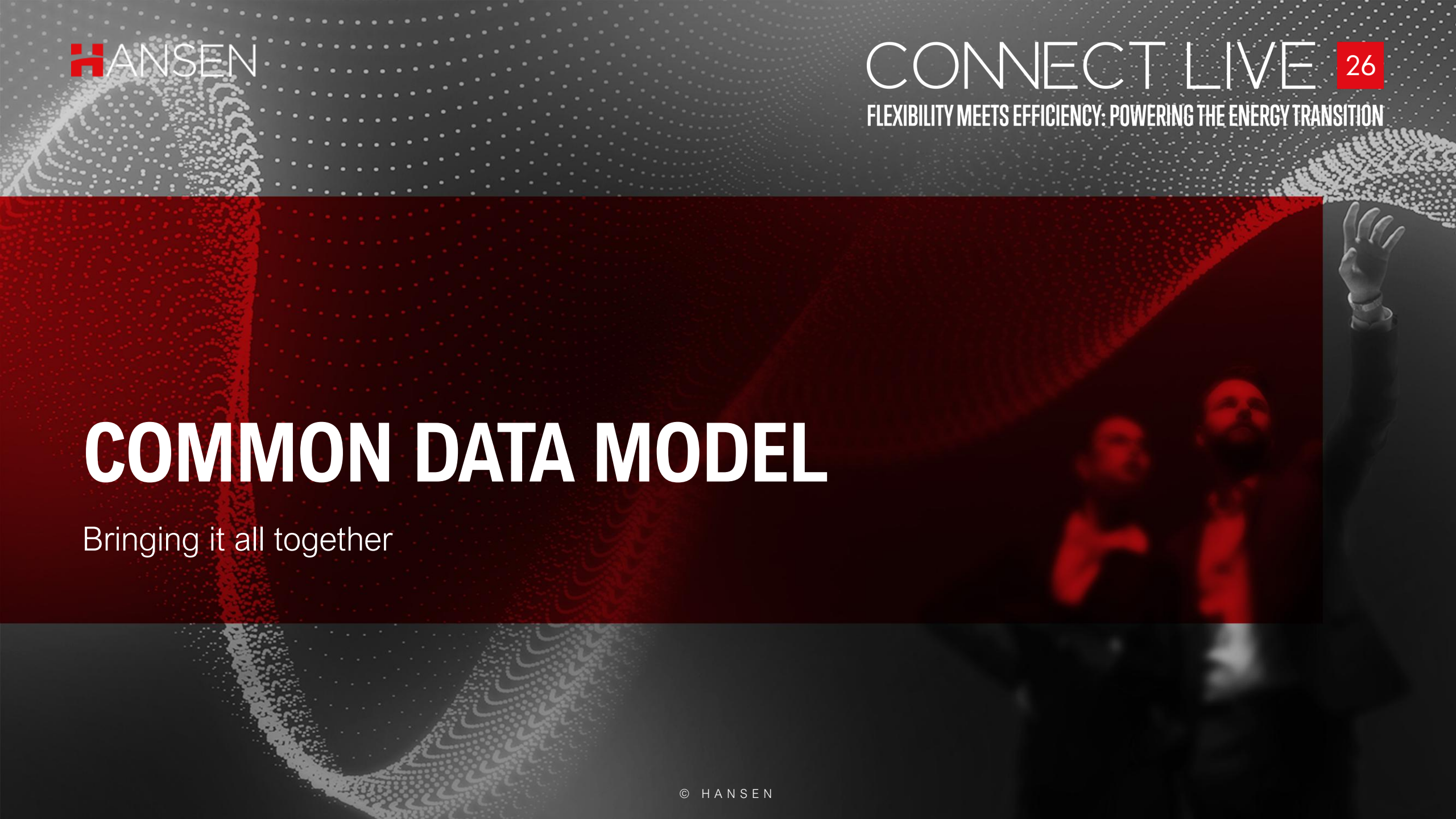
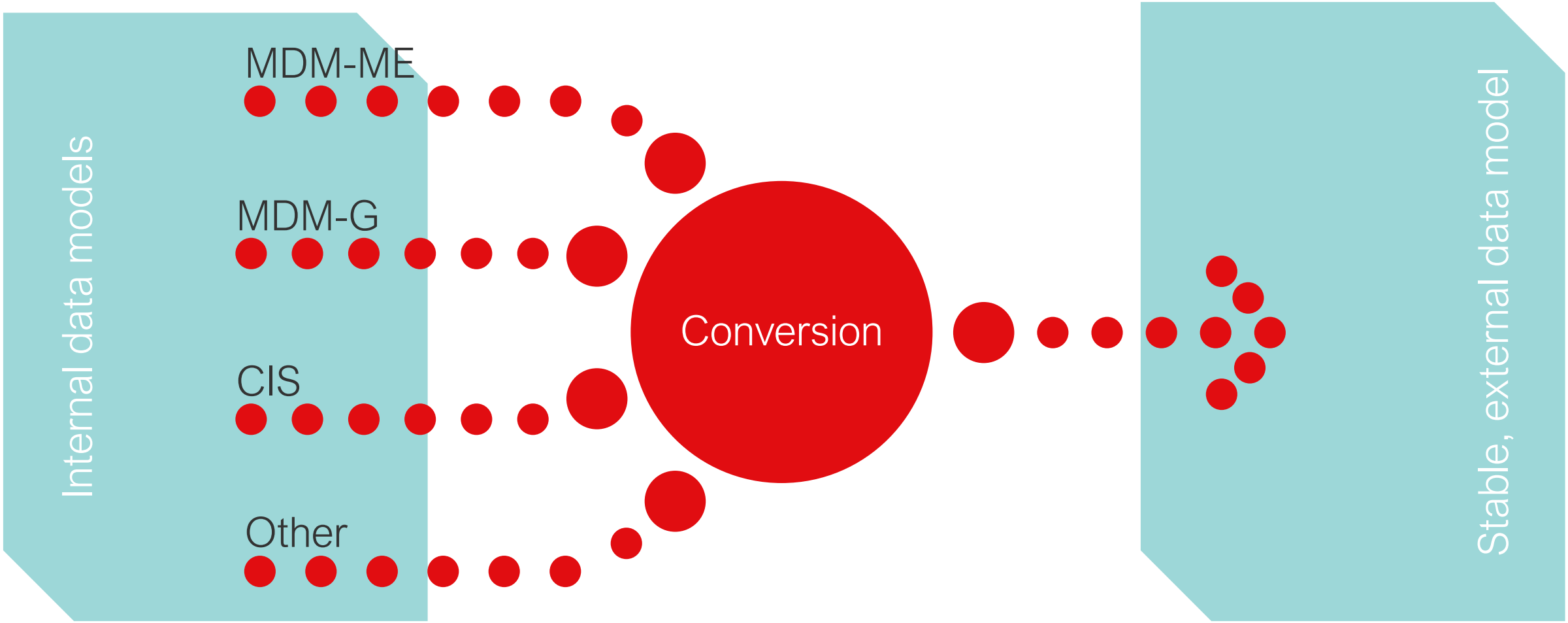
COMMON DATA MODEL

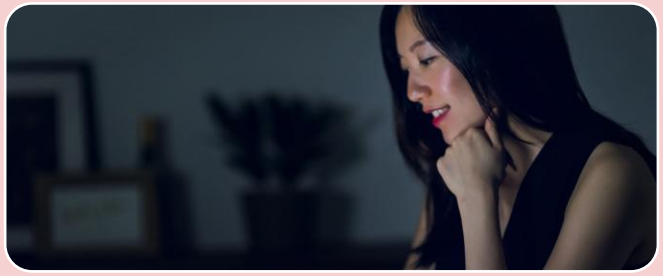
Bringing it all together



COMMON DATA MODEL



COMMON DATA MODEL OBJECTS



Customer

- customerNo
- customerType
- firstName
- lastName
- dateOfBirth

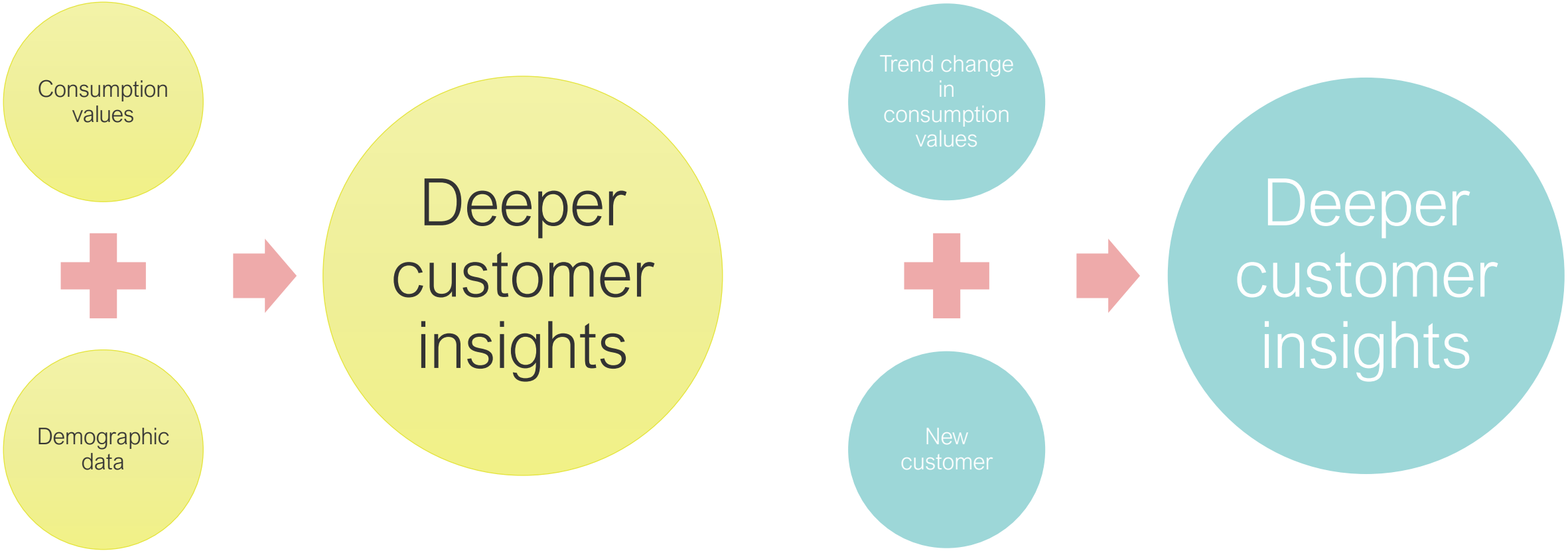
MeteringPoint

- resourceId
- meteringPointName
- eanCode
- gridOwnerId
- status

MeterDataValue

- meteringPointResourceId
- channelName
- readingTime
- readingQuantity
- readingQuality

COMMON DATA MODEL



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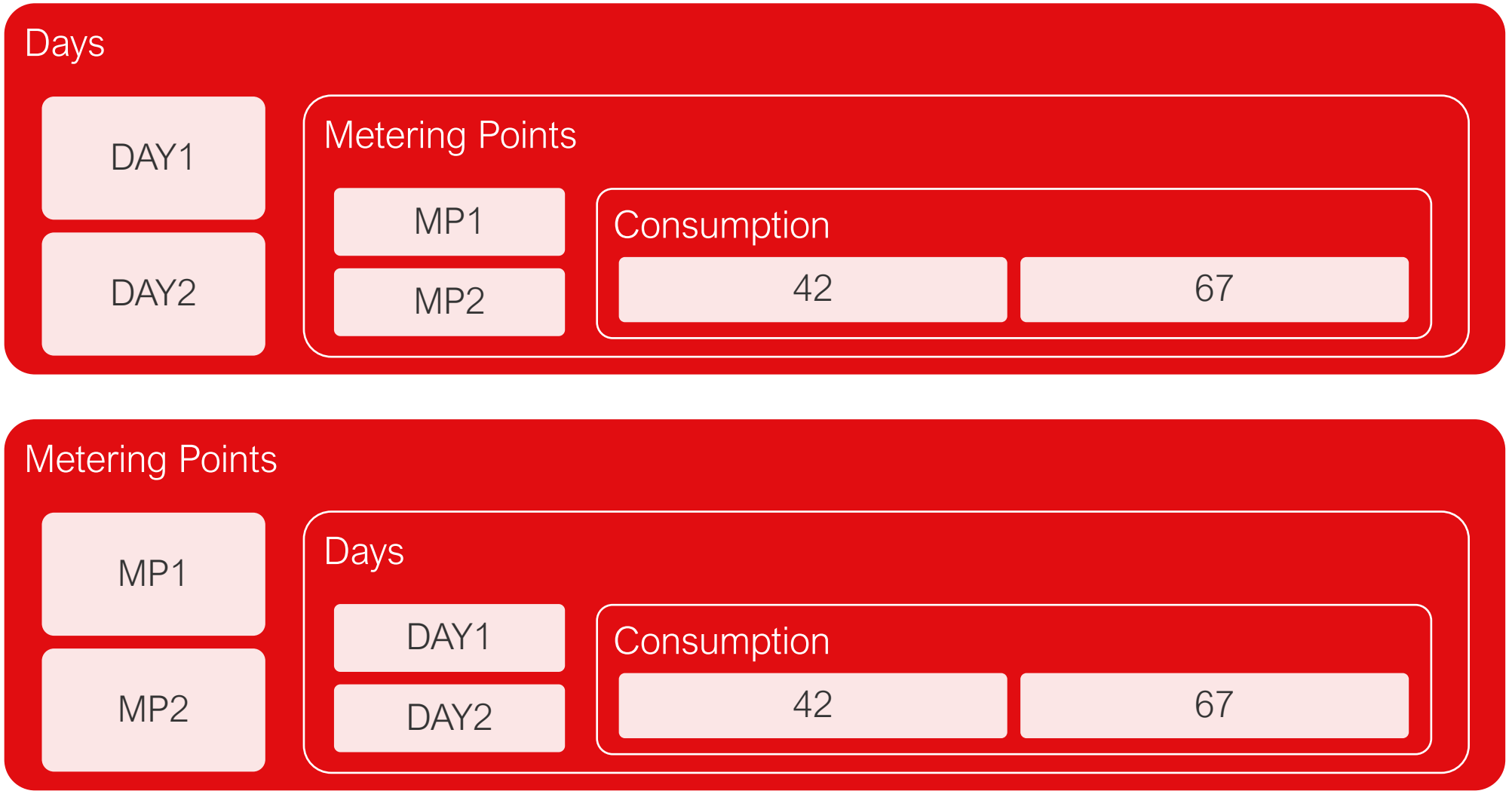
ORGANIZING THE DATA LAKE



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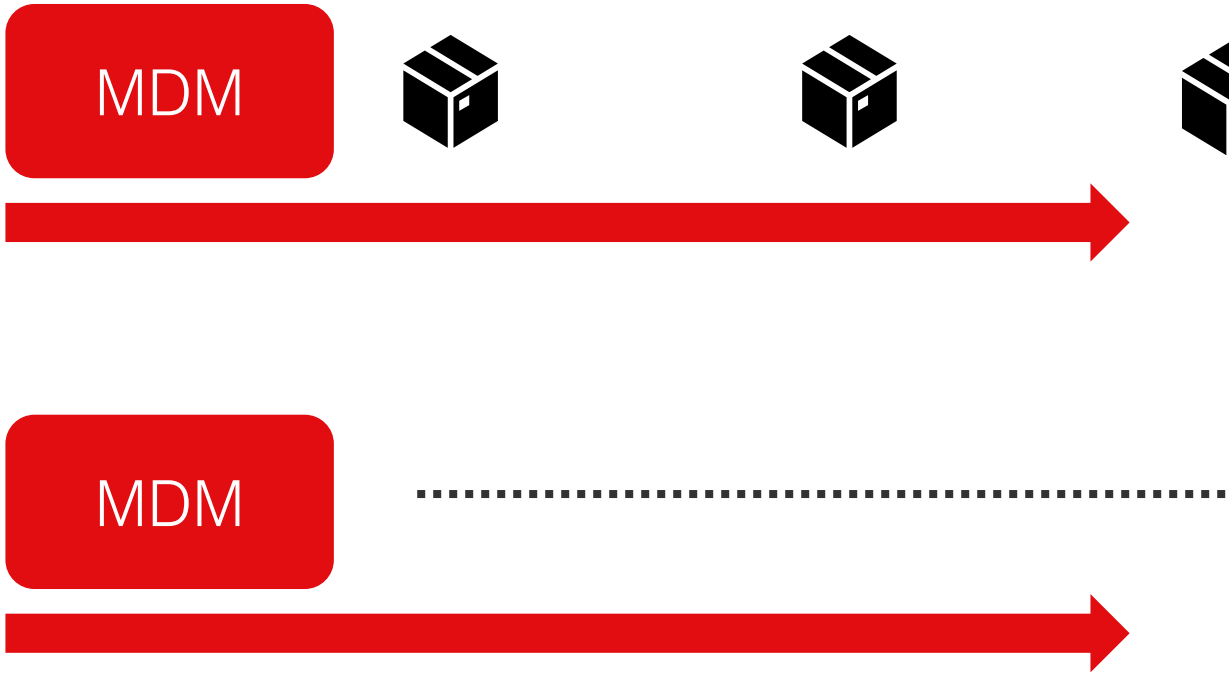
FLEXIBILITY MEETS EFFICIENCY: POWERING THE ENERGY TRANSITION

STREAMING

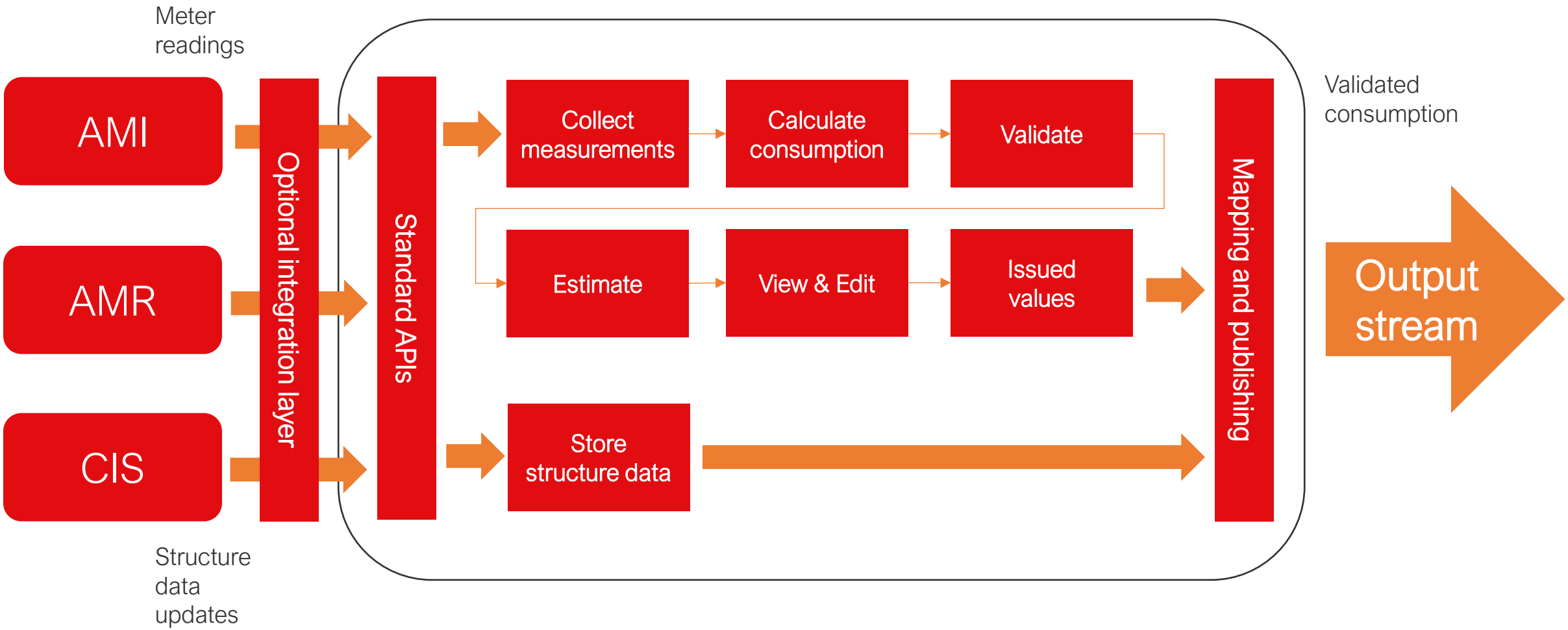
Real time change event delivery

BATCH TRANSFER VS STREAMING

- Batch delivery: file transfer
  - Example: export SAF file every six hours
- Stream delivery
  - Publish new/updated values one by one
  - As soon as they are available
  - Receiving system(s) can consume the stream at their own pace



FROM INGESTION TO STREAMING OUT



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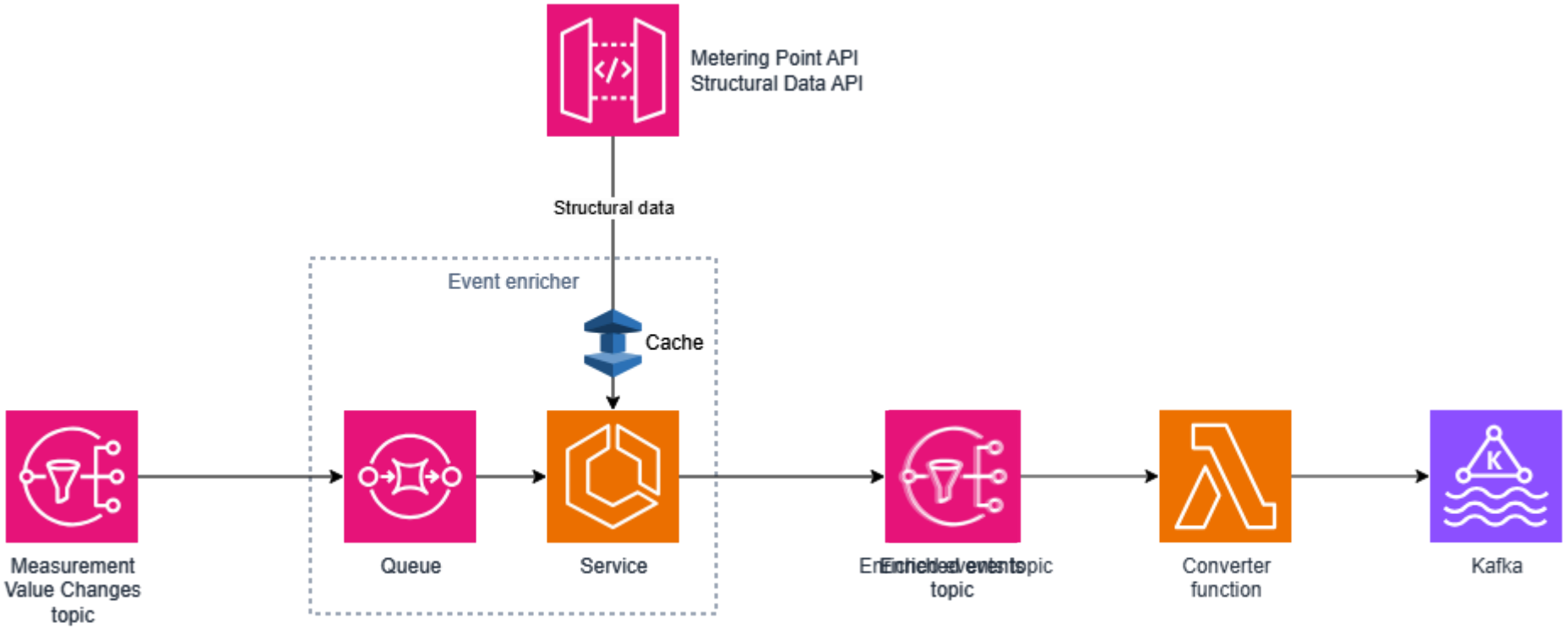
FLEXIBILITY MEETS EFFICIENCY: POWERING THE ENERGY TRANSITION

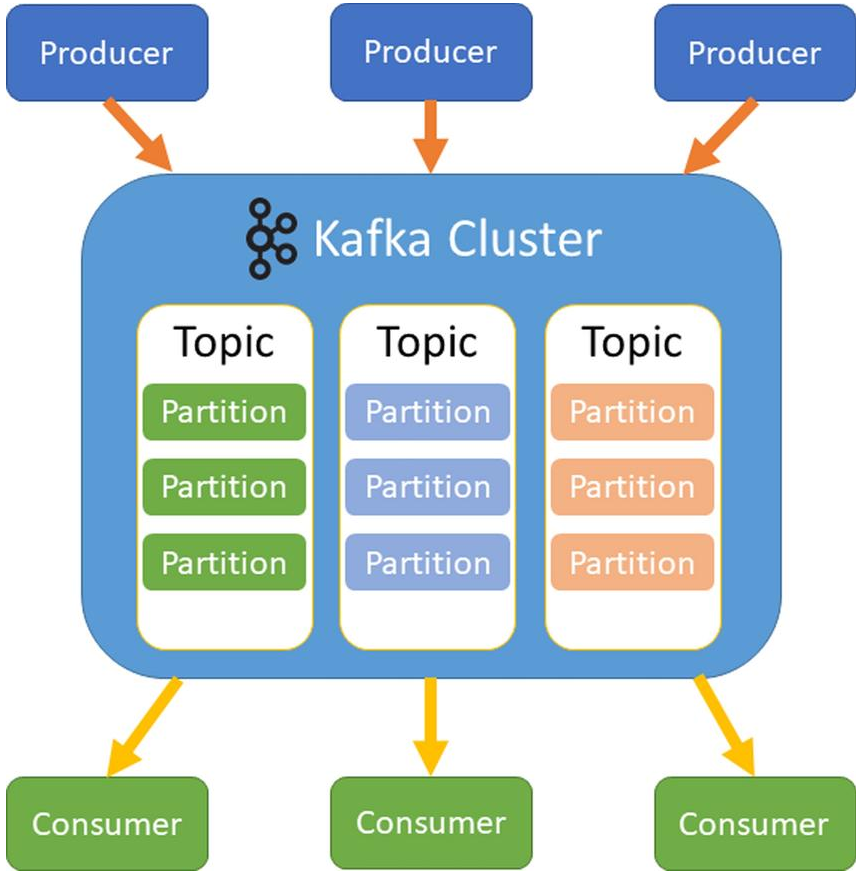
IMPLEMENTATION

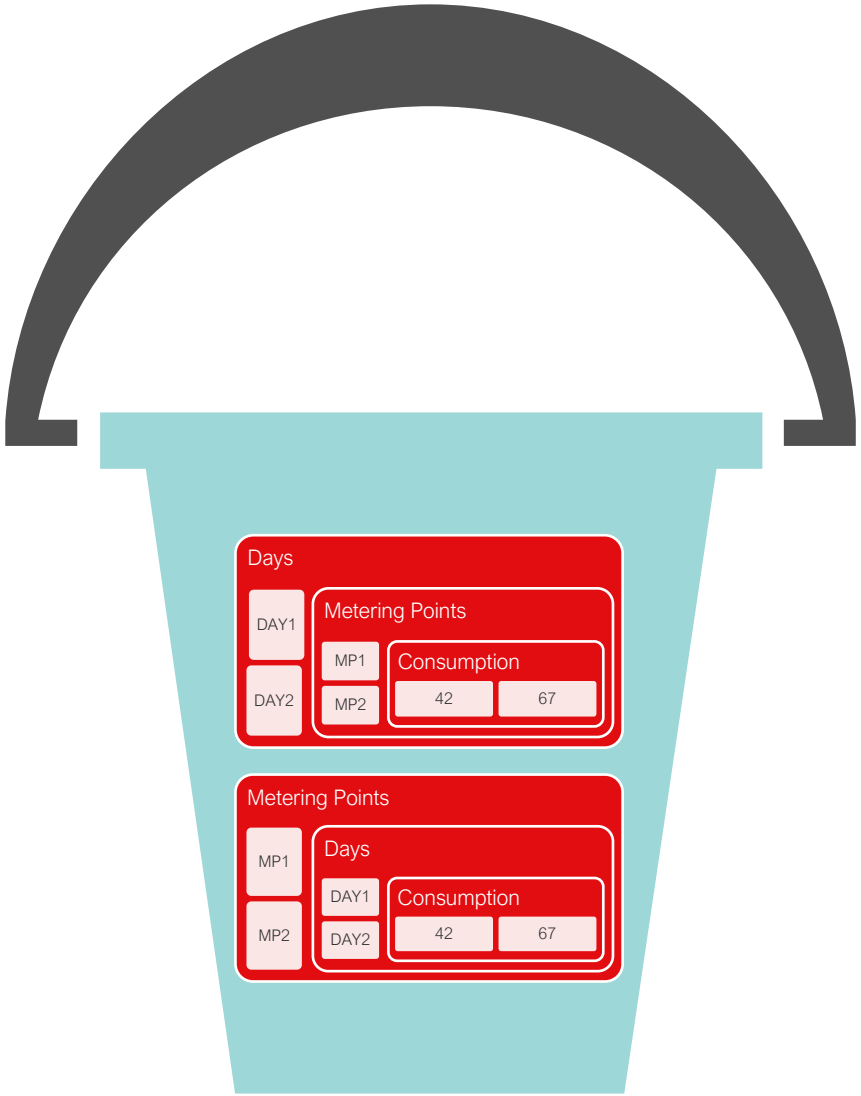
How do we do it – going technical

CONVERSION TO THE PUBLISHED MODEL



KAFKA AND AMAZON S3





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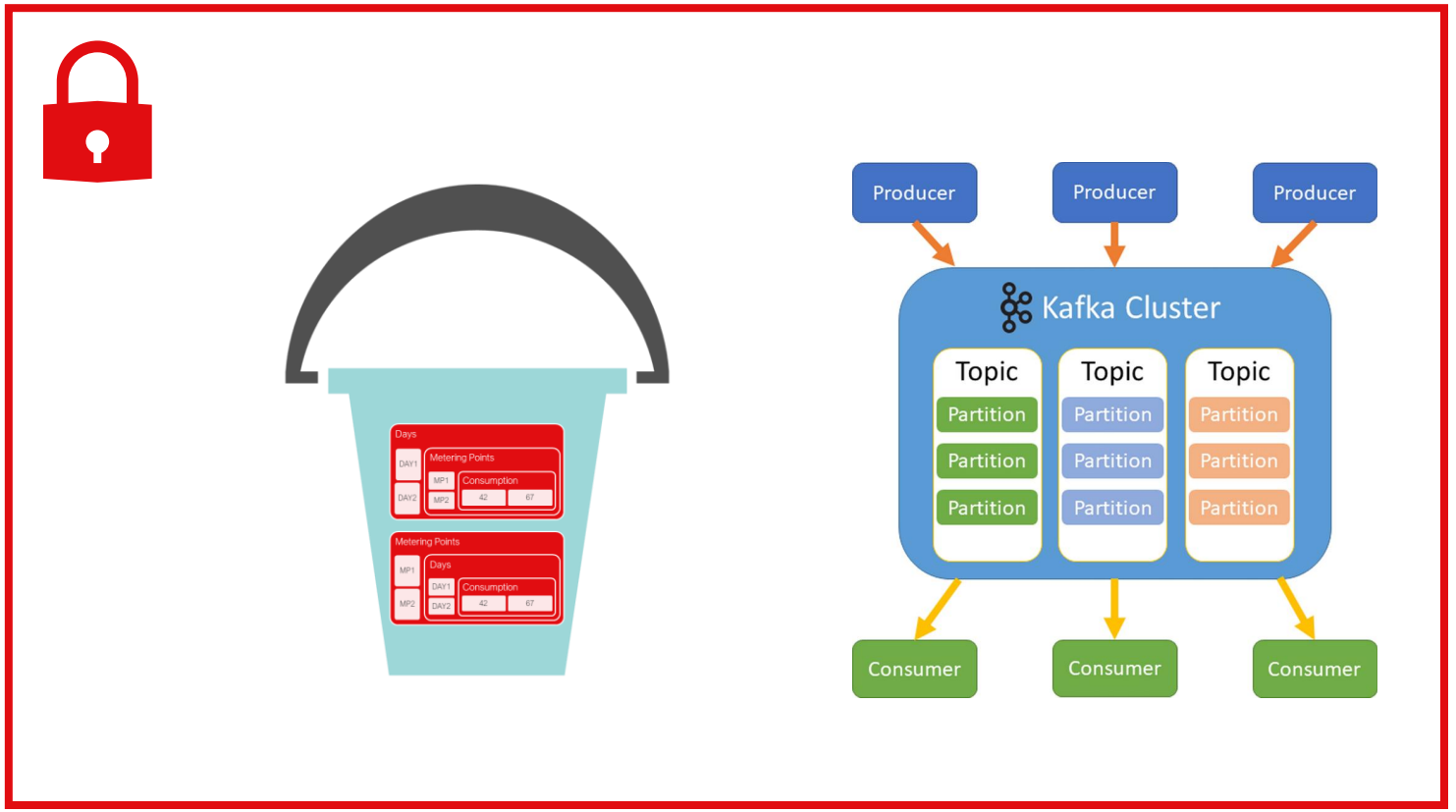
SECURITY: AUTHENTICATION AND AUTHORIZATION



Basic

Username and password

AWS access keys

Proper

AWS X-account access

Machine Identity

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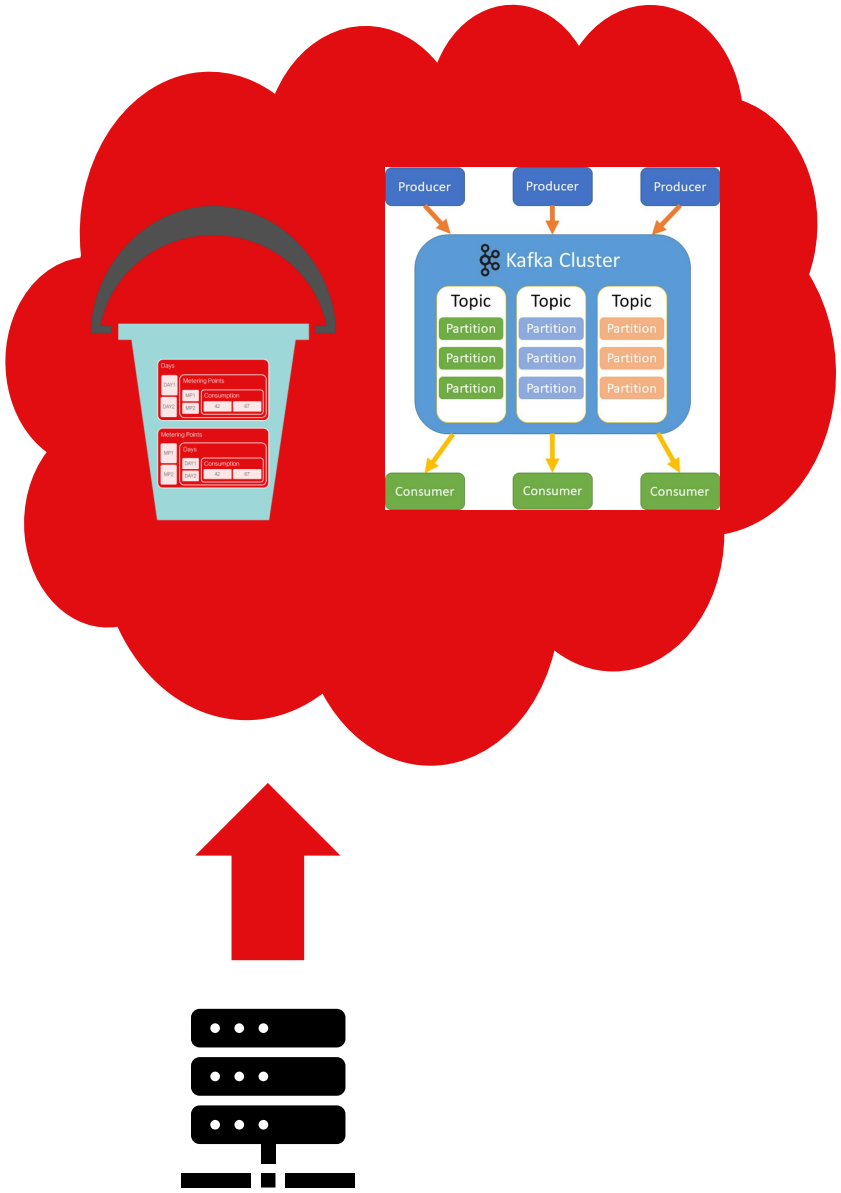
SECURITY: COMMUNICATIONS

Over the public internet, encrypted

Using AWS internal networking

Using private networking or VPN solutions



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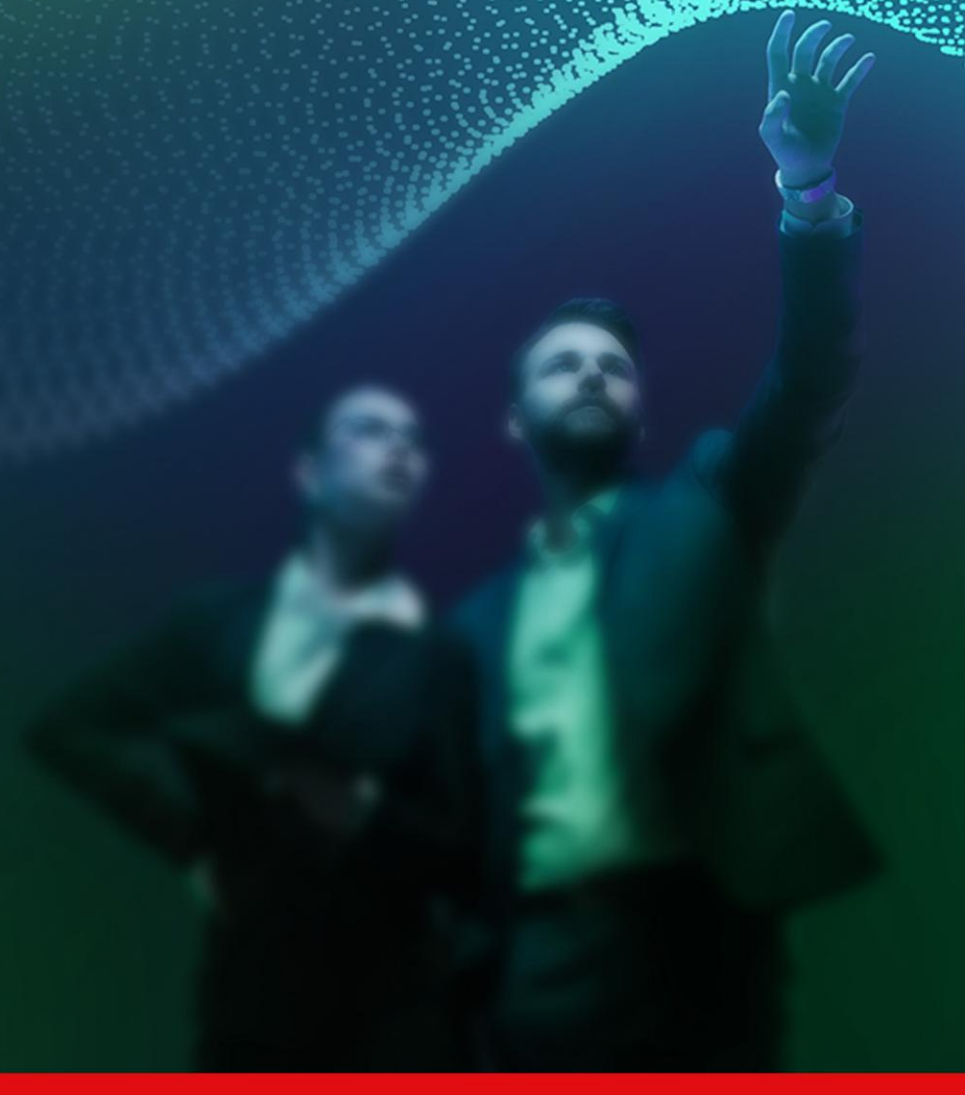
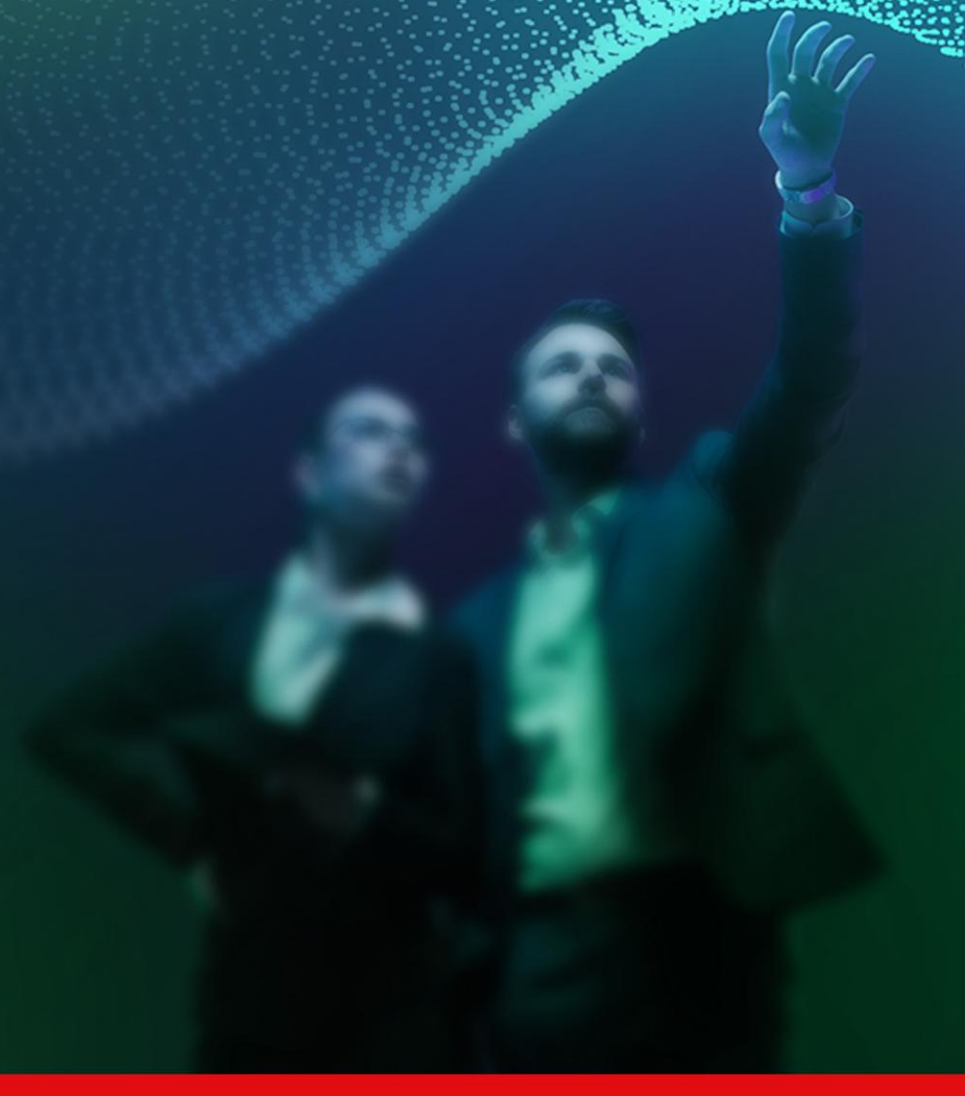
THANK YOU!



NEW FEATURES OF MDM-G

Tiina Myllymäki, Senior Product Owner, Hansen
Teemu Kemppainen, Product Owner, Hansen



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FLEXIBILITY MEETS EFFICIENCY: POWERING THE ENERGY TRANSITION

TRACEABILITY

AUDIT TRAIL FOR OBJECTS AND OBJECT HIERARCHIES

Tiina Myllymäki

AGENDA

- Purpose and scope overview
- Object traceability and auditability requirements
- Audit trail objects
- Demo and visualization in MDM-G WebUI
- Conclusion

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PURPOSE AND SCOPE OVERVIEW

The primary requirement is to audit manual and automated changes to maintain a full history of an object.

Traceability features enable an audit trail for selected MDM-G objects, such as metering points, metering configurations and time series models.

Ensuring the auditability and transparency of data and calculations within the system.

Structure data is essential for EDM processes, such as calculations, data exchange and billing.

Any changes made to structure data, including modifications and deletions, can be traced back to their source for accountability purposes.

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REQUIREMENTS AND THEIR IMPLEMENTATION

Audit Trail Key Fields	The audit trail records include the time of the change, who made the change, and the situation before the change was made.
Sources of Structure Data Mutations	Structure data mutations usually come from the CIS system, structure data imports, manual adjustments and market messages.
Structure Data Relevance	Identify the structure data that is relevant for billing, market messaging, validation and audits within grid management.
Database Triggers for Audit	The audit trail uses database triggers on the data tables to automatically and efficiently capture changes.
Audit Configuration Management	The relevant structure data and audit fields are defined in a configuration table that is managed and updated by Hansen delivery.
Data Interpretation and Retrieval	API interprets audit data, converting object IDs and enumerations into user-friendly formats for display in the UI.

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OBJECT TYPES FOR AUDIT TRAIL

Key Metering Point Fields	Critical metering point static fields like ID, code, address, and coordinates.
Linked Network and Parties	Network link and balance responsible parties with IDs and validity.
Measurement and Details Fields	Measurement data, including type, code, and linked time series, along with metering point detail attributes.
Time Series Model Fields	Time series model calculation objects and links to input and output time series and calculation logic and algorithms.
Metering Configuration Details	Metering configuration tracks object IDs, codes, types, and modification history.
Party and Network Objects	Party and network objects include roles, codes, communication details, and validity.

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DEMO

Showing object history and deleted objects in MDM-G WebUI dashboard

→ To see demo, please contact your Hansen Account Manager.

CONCLUSION

Traceability provides a comprehensive and reliable record of all changes to structure data across MDM-G.

Audit trail capabilities promote transparency, accountability and compliance, helping users to understand the reasons behind changes to structure data.

Centralised visualisation in the WebUI makes it easy to track modifications, understand dependencies and review deleted objects.

This feature improves confidence in data quality and support more efficient decision-making in daily work.

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LATEST WEBUI DEVELOPMENT

- Expanded functionality, usability and UX improvements
- Finnish G8
- Hansen documentation in WebUI

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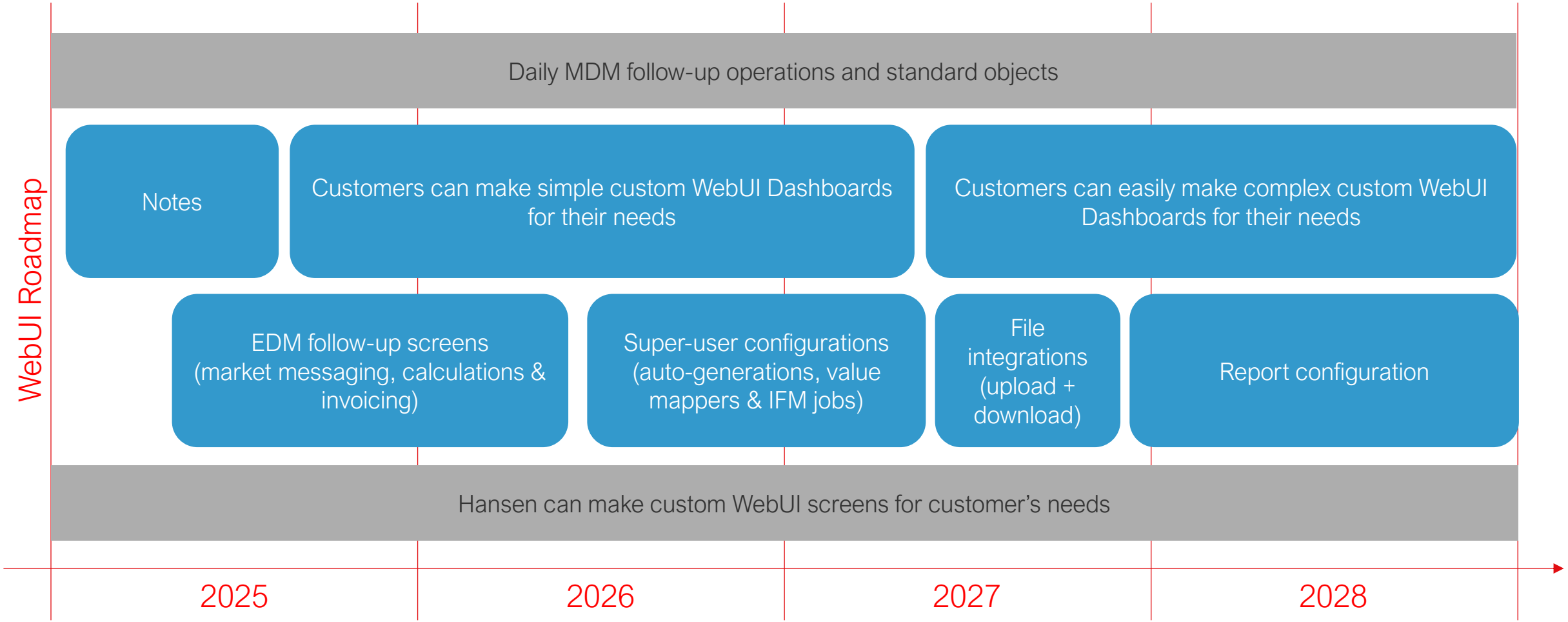
WEBUI: ROADMAP



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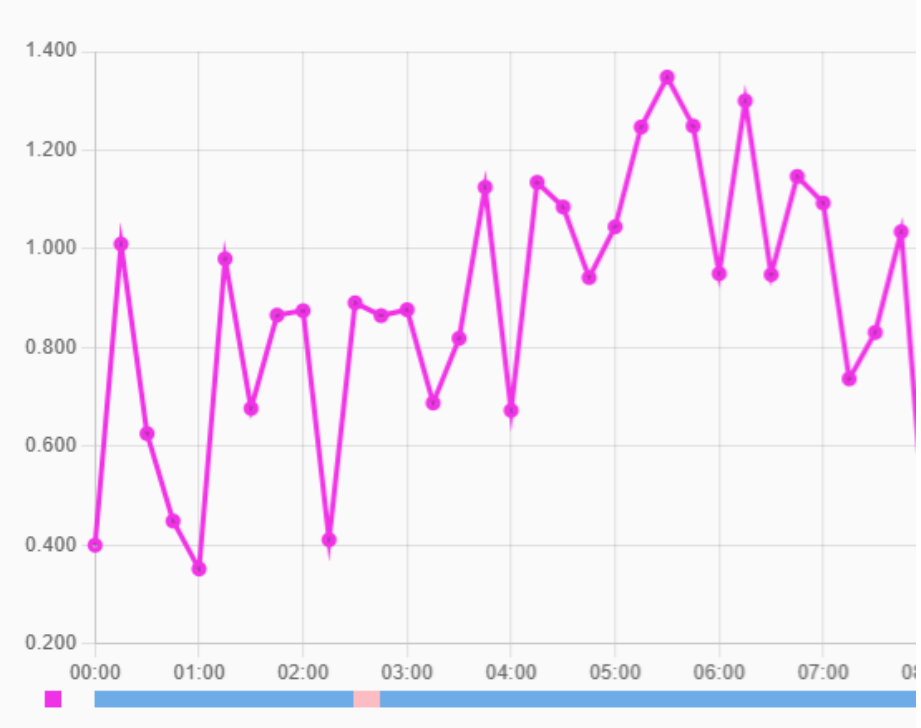
DASHBOARD EDITOR

- Easily create simple Dashboards to monitor daily processes
  - Build in WebUI, in your browser
  - Define and visualize the data according to your needs
  - You stay in control – adjust as you go



DASHBOARD EDITOR

Panel types

- Time series data view
- Search result list
- Calculation tree
- Difference time series view
- .. and more

Interacting with the data

- Configure inputs and filters
- Link outputs to inputs
- Call functions
- Start IFM-jobs

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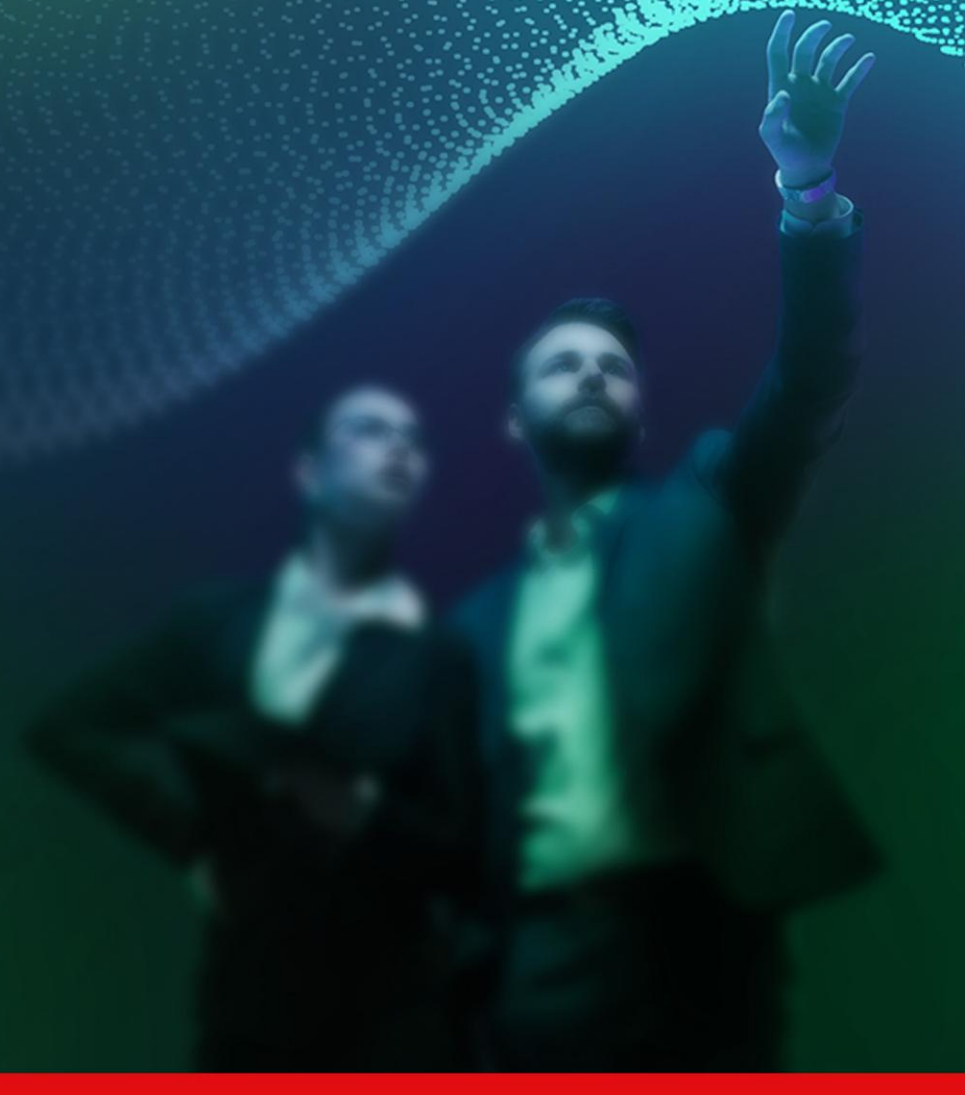
WEBUI DEMO

Hansen documentation

Dashboard editor

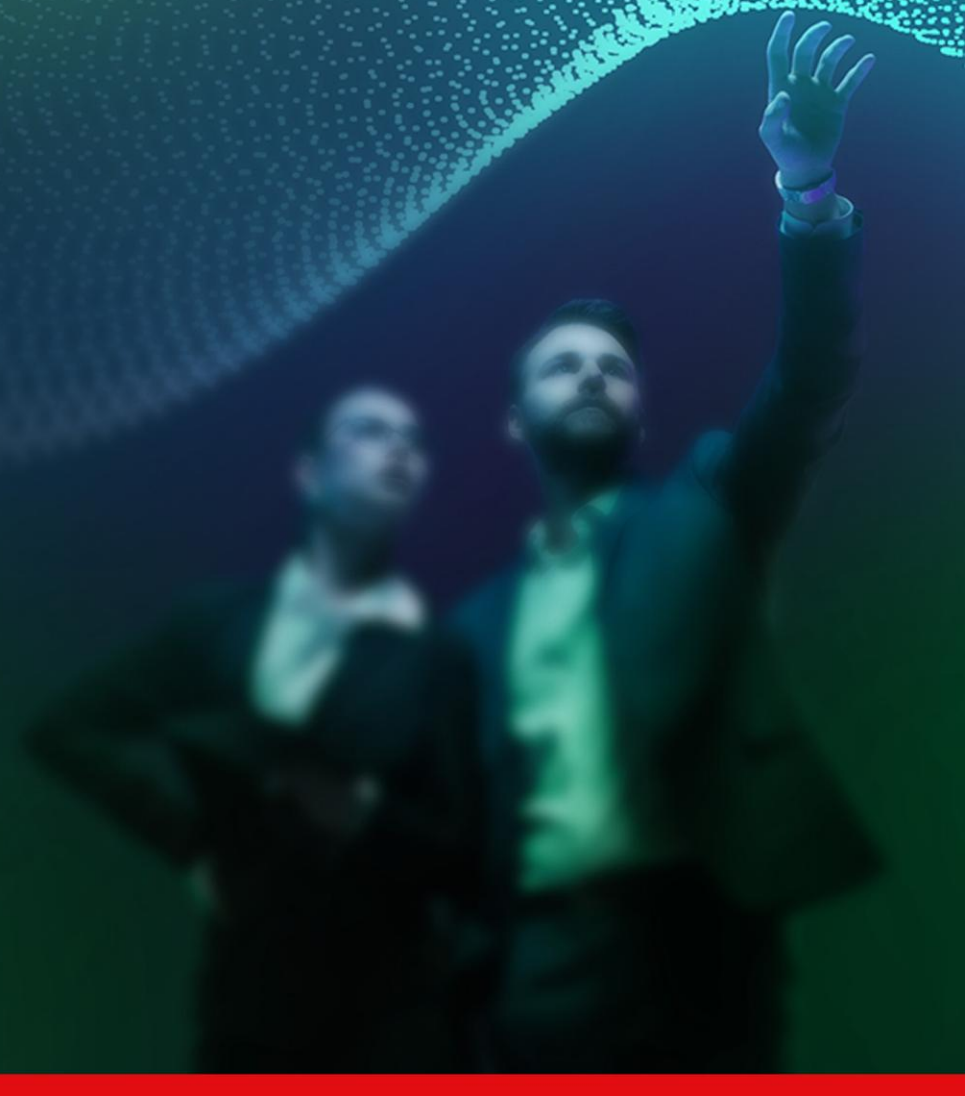
→ To see demo, please contact your Hansen Account Manager

THANK YOU!



NEW UTILITIES WITH MDM-ME

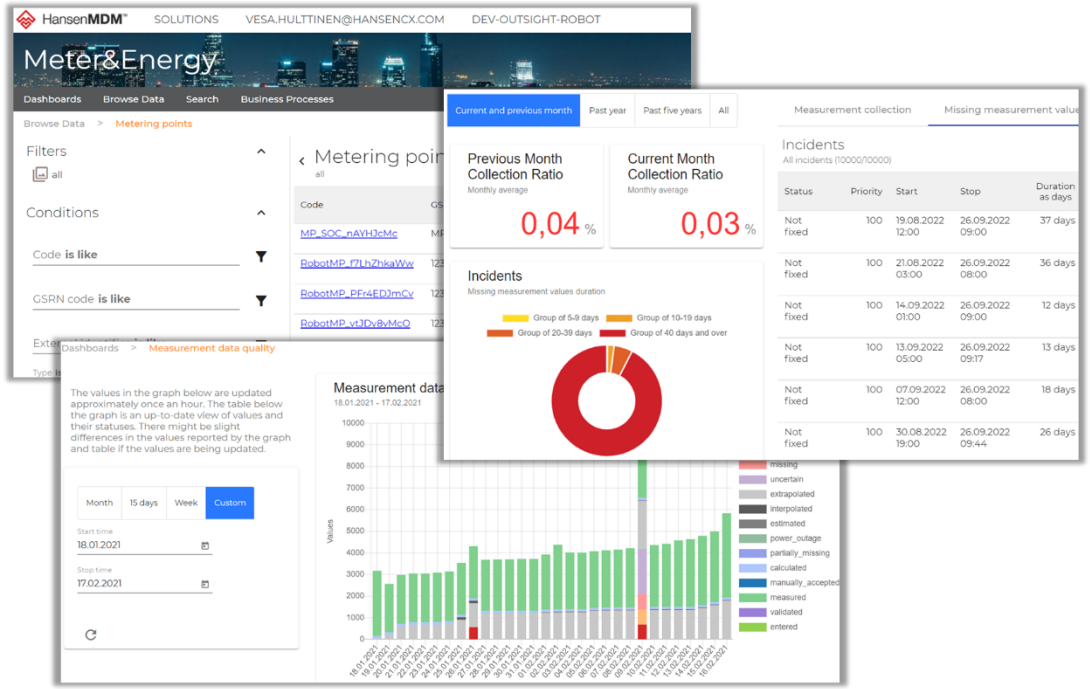
Vesa Hulttinen, Product Manager, Hansen



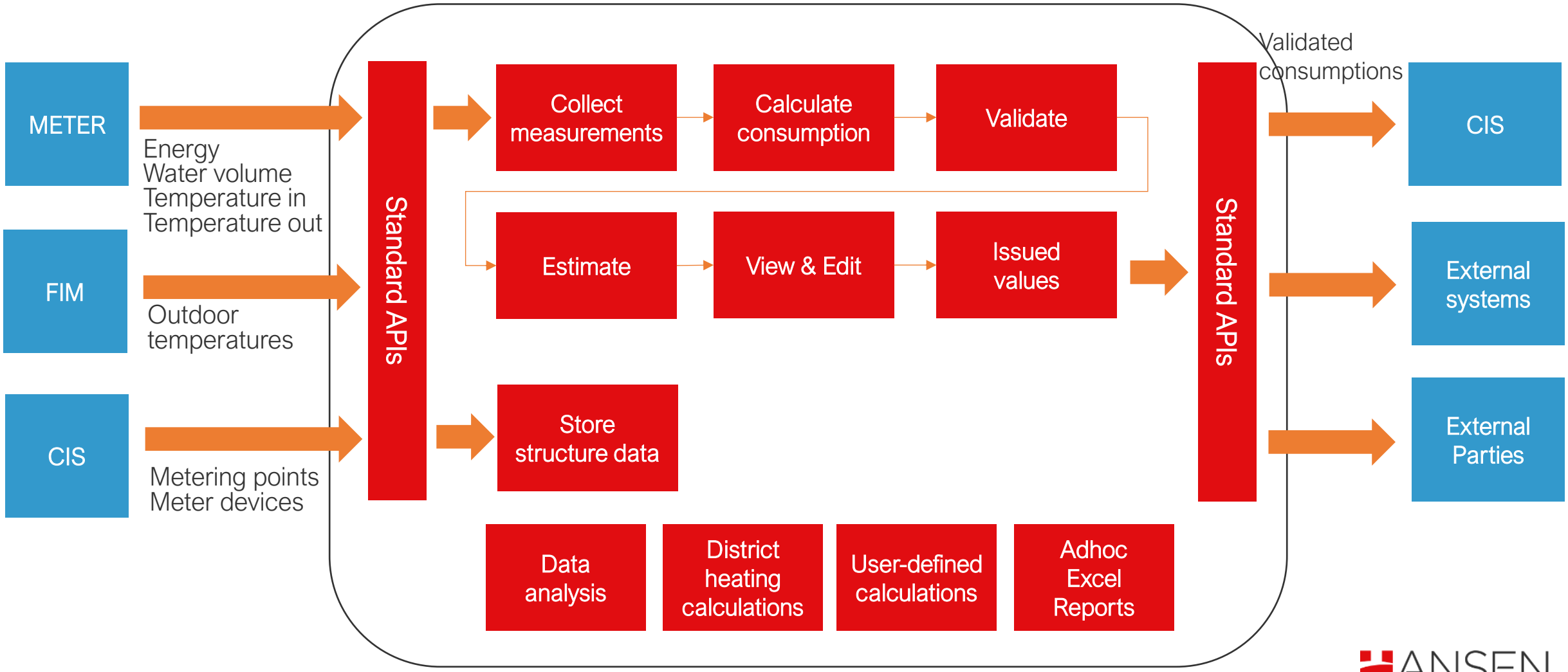
MDM-ME FOR DISTRICT HEATING AND WATER

Features of MDM-ME for district heating and water include the following:

- Standard MDM features (VEE)
- Standard APIs for integration
- Data model for district heating and water
  - Structure data and measurements
- Calculations for district heating
- Support for district cooling
- Water temperature dashboard
- Reference consumption analysis
- User-defined calculations and reports



MDM-ME – DATA FLOW AND PROCESS



DISTRICT HEATING (WATER) MEASUREMENTS

District heating metering point has the following set of measurements:

- Energy
- Water volume
- Water temperature in/out
- Degree day corrected energy (calculated)
- Degree day corrected specific energy (calculated)

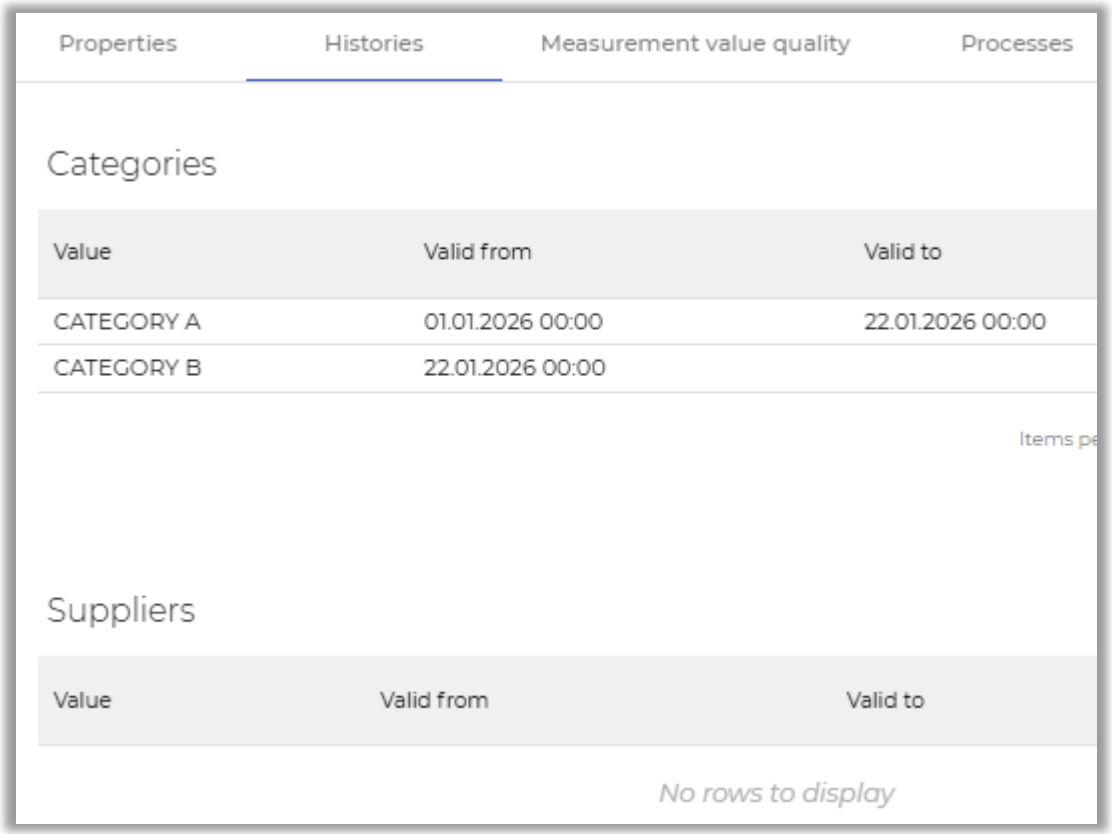
Site object measurements

Code	Valid from	Valid to	Unit	Resolution	Type	Data type	Reading type
VHU_DH_DEMO_MEAS_kWh	01.01.2026 00:00		kWh	Hourly	Energy	Measurement	Cumulative
VHU_DH_DEMO_MEAS_m3	01.01.2026 00:00		m3	Hourly	Water volume	Measurement	Cumulative
VHU_DH_DEMO_MEAS_C_in	01.01.2026 00:00		°C	Hourly	Water temperature in	Measurement	Interval
VHU_DH_DEMO_MEAS_C_out	01.01.2026 00:00		°C	Hourly	Water temperature out	Measurement	Interval
VHU_DH_DEMO_MEAS_kWh_dcc	01.01.2026 00:00		kWh	Hourly	Degree corrected energy	Calculated	Interval
VHU_DH_DEMO_MEAS_kWh_m3_dcsc	01.01.2026 00:00		kWh/m3	Hourly	Degree corrected specific energy	Calculated	Interval

DISTRICT HEATING MP HISTORIES

Metering point has the following properties with validities:

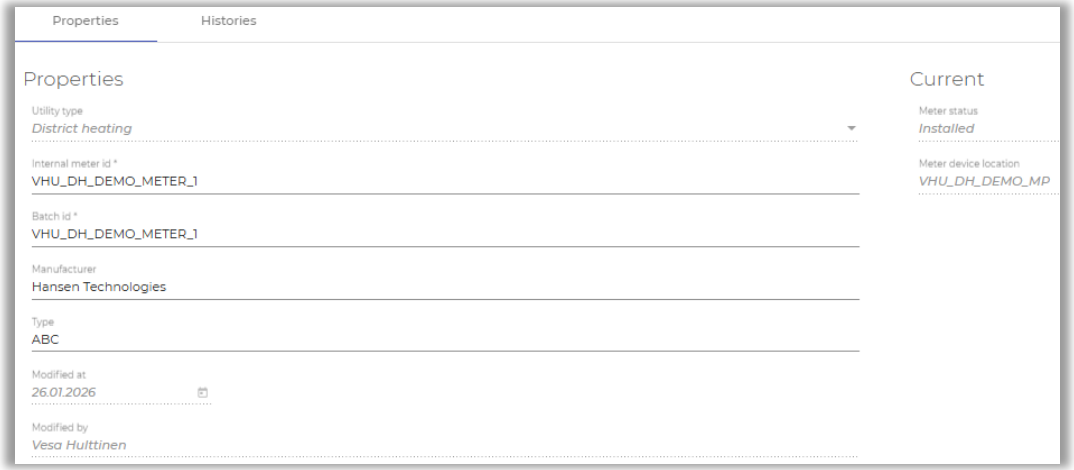
- Network
- Connection status
- Yearly energy consumption estimate
- Contracted water flow / power
- Heating volume / area
- Consumption function
- Categories
- Supplier

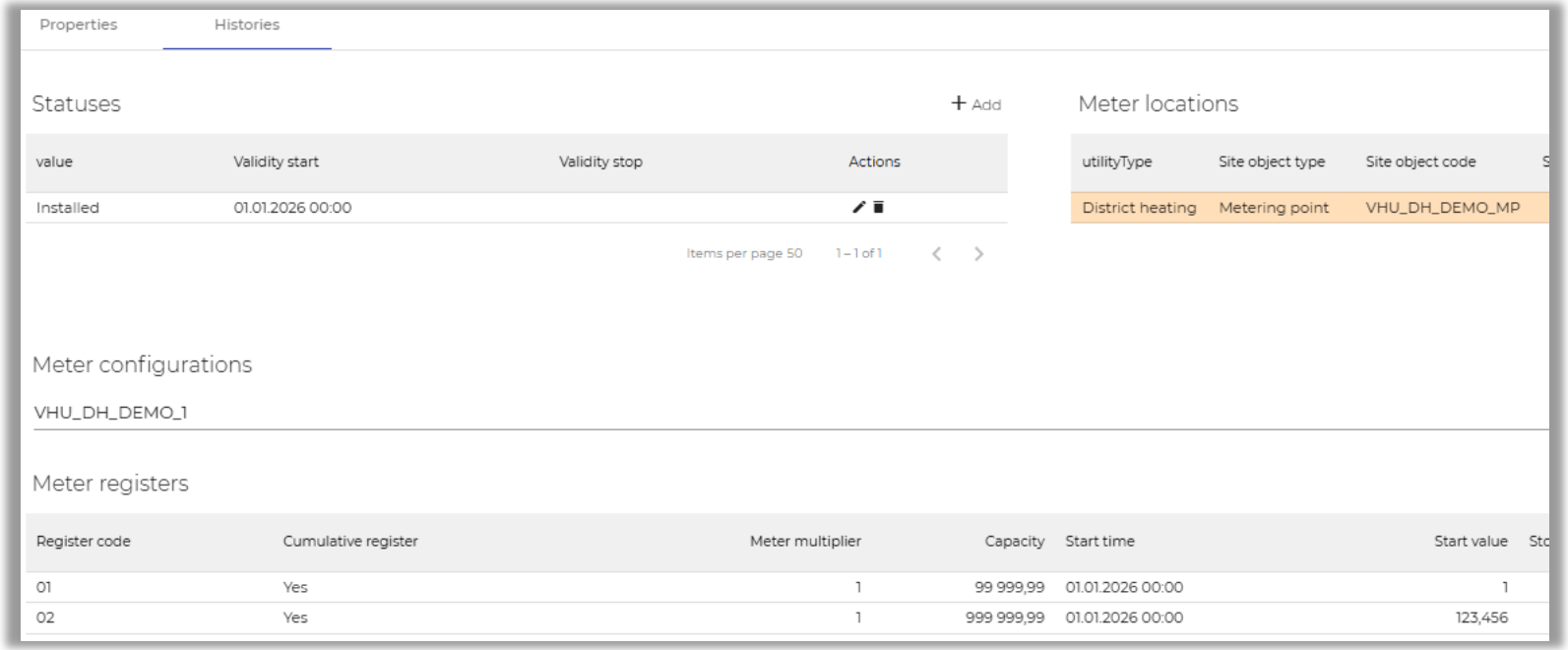


METER DEVICES

- Metering devices can be imported through standard interfaces and linked to metering points.

- Start and stop values are used for estimation when meters are changed.





CALCULATIONS FOR DISTRICT HEATING

MDM-ME executes the following calculations for each metering point:

- Consumption Function (slope, turning point temperature, constant energy)
- Degree day corrected consumption (kWh)
- Degree day corrected specific consumption (kWh/m3)
- Yearly energy consumption estimate (kWh)

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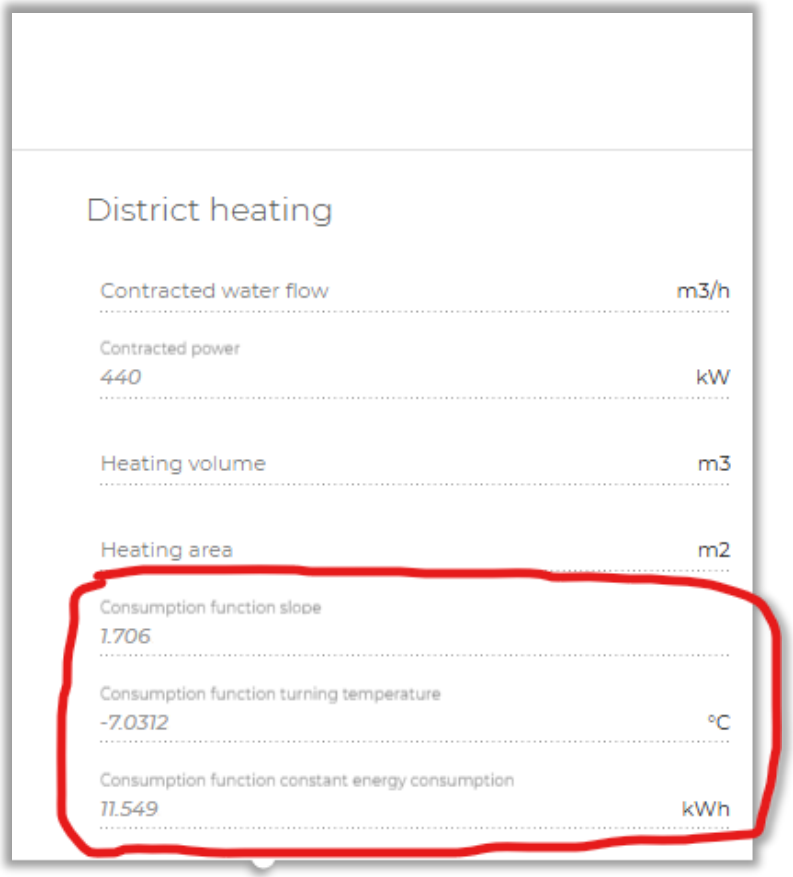
CONSUMPTION FUNCTION CALCULATION

- The following consumption characteristics are automatically calculated for each metering point:
  - ✓ Slope
  - ✓ Turning temperature
  - ✓ Energy consumption

- MDM-ME uses consumption function as input for calculating degree day corrected consumptions and yearly consumption estimates.

- Consumption functions can be exported to external systems, e.g. to CIS system.



DEGREE DAY CALCULATIONS

- MDM-ME calculates degree day corrected consumptions for each metering point:
  - ✓ Degree day corrected consumption (kWh)
  - ✓ Degree day corrected specific consumption (kWh/m3)

- Degree day corrected consumptions are saved as measurements to each metering point.

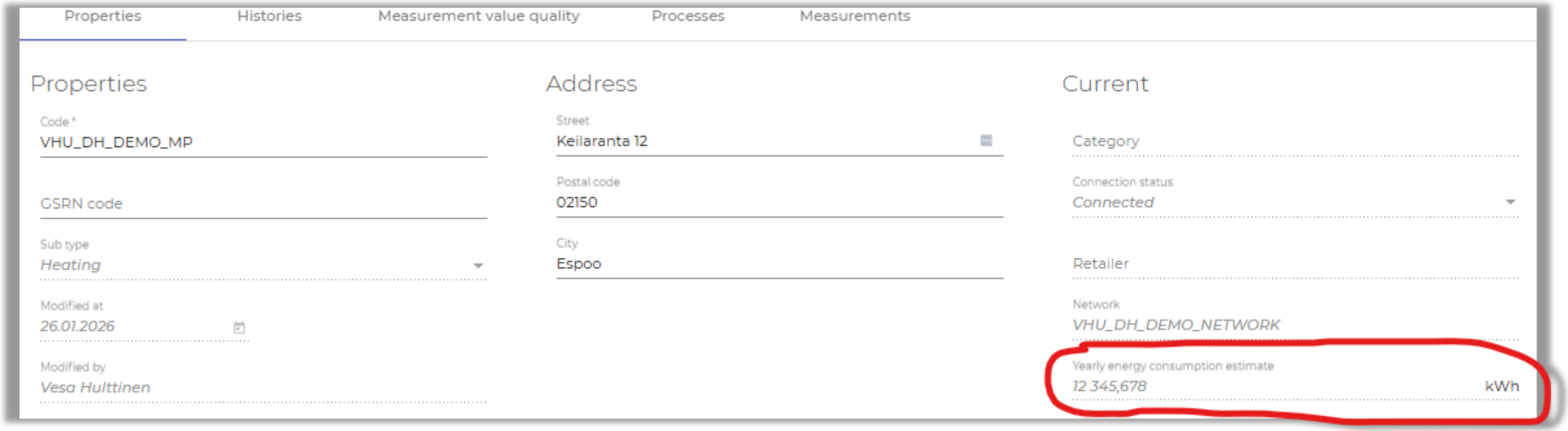
- They are used as input for yearly energy consumption calculation and for removing the effect of outdoor temperature when comparing consumption in different time periods.

Code	Valid from	Valid to	Unit	Resolution	Type	Data type	Reading type
VHU_DH_DEMO_MEAS_kWh	01.01.2026 00:00		kWh	Hourly	Energy	Measurement	Cumulative
VHU_DH_DEMO_MEAS_m3	01.01.2026 00:00		m3	Hourly	Water volume	Measurement	Cumulative
VHU_DH_DEMO_MEAS_C_in	01.01.2026 00:00		°C	Hourly	Water temperature in	Measurement	Interval
VHU_DH_DEMO_MEAS_C_out	01.01.2026 00:00		°C	Hourly	Water temperature out	Measurement	Interval
VHU_DH_DEMO_MEAS_kWh_dcc	01.01.2026 00:00		kWh	Hourly	Degree corrected energy	Calculated	Interval
VHU_DH_DEMO_MEAS_kWh_m3_dcsc	01.01.2026 00:00		kWh/m3	Hourly	Degree corrected specific energy	Calculated	Interval

YEARLY CONSUMPTION ESTIMATE CALCULATION

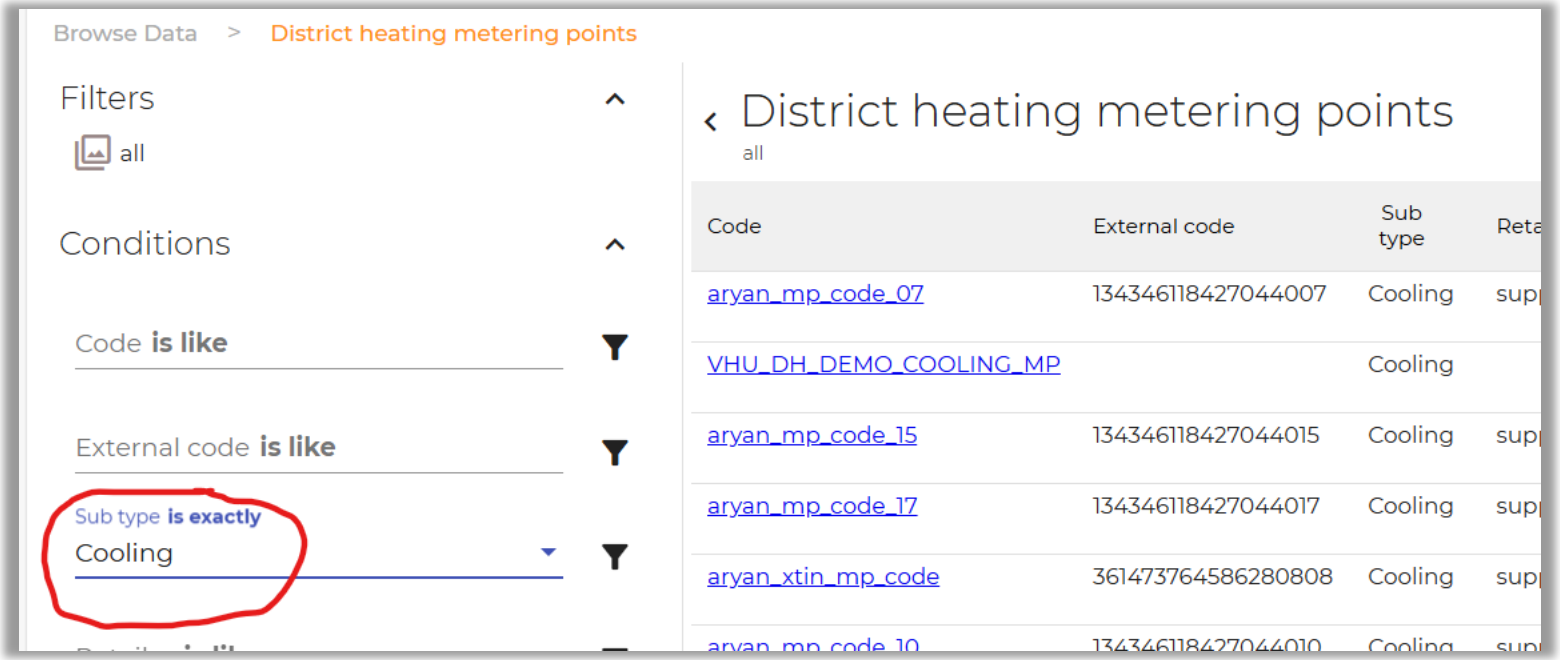
- MDM-ME calculates yearly energy consumption for each metering point.

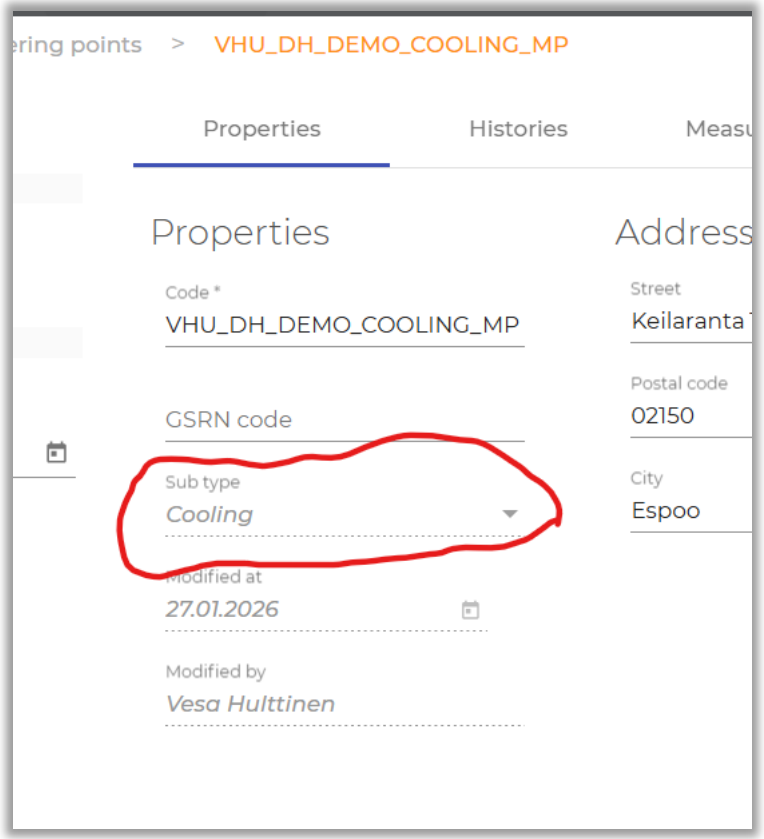
- Calculation is based on the degree corrected consumption of previous 12 months.



SUPPORT FOR DISTRICT COOLING

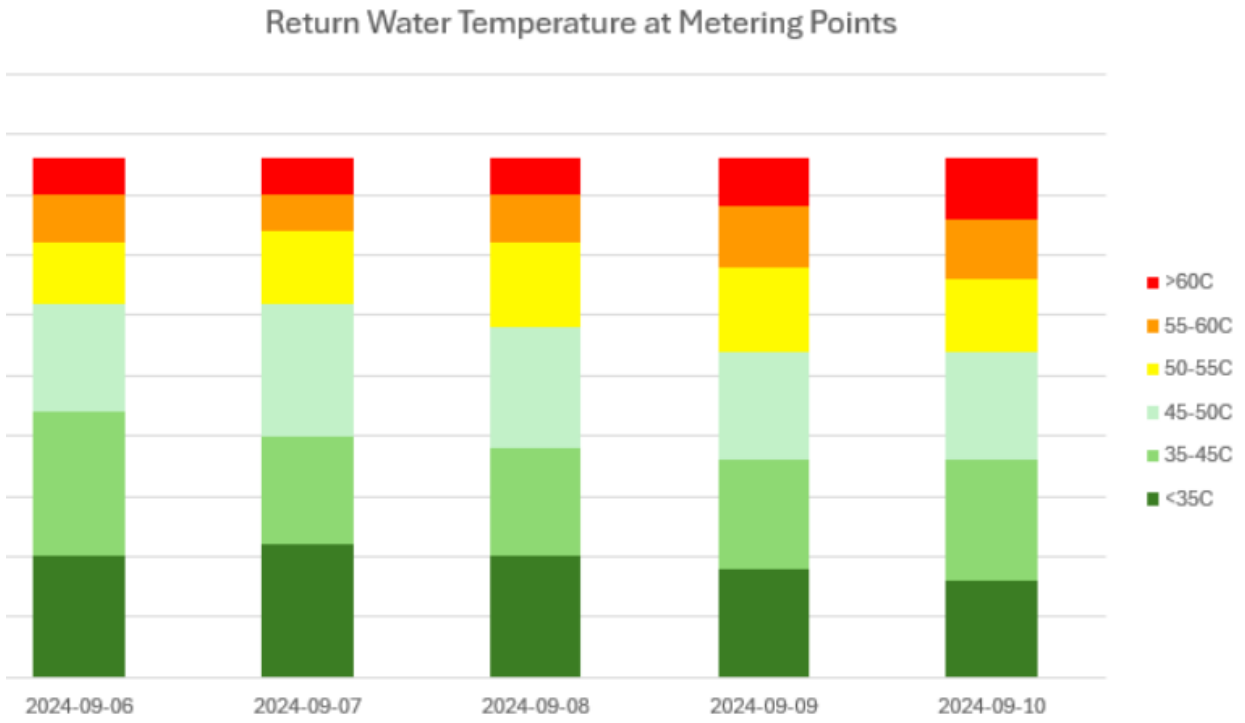
- A metering point can have sub type “Cooling”
- Sub type can be used a filter in list views
- Cooling metering points are handled differently in e.g. calculations





WATER TEMPERATURE DASHBOARD

- Tool for identifying metering points that have issues with heat exchange equipment.
- Divides metering points into categories based on return water temperature.
- Temperature intervals are color coded from green to red depending on whether the return water flow temperatures are low (good/green) or high (bad/red).



REFERENCE CONSUMPTION ANALYSIS

- Compares the consumption of an inspection period to the consumption of a historical reference period.
- Tool for identifying metering points where consumption has either decreased or increased by significant amounts.
- The reference period comparison is based on degree-day corrected energy consumption data.

MP Code	GSRN	Address	MeasCode	Inspection period daily avg	Tarkasteluja	Comparison period daily avg	Vertailujakson kok.kul. (norm	Relative change (+/- %)	Absolute change
10001		Testikatu 1	10001_PC	10		15		-33.3	-5
10002		Testikatu 2	10002_PC	10		14		-28.6	-4
10003		Testikatu 3	10003_PC	10		13		-23.1	-3
10004		Testikatu 4	10004_PC	10		12		-16.7	-2
10005		Testikatu 5	10005_PC	10		11		-9.1	-1
10006		Testikatu 6	10006_PC	10		10		0.0	0
10007		Testikatu 7	10007_PC	10		10		0.0	0
10008		Testikatu 8	10008_PC	10		10		0.0	0
10009		Testikatu 9	10009_PC	10		10		0.0	0
10010		Testikatu 10	10010_PC	10		10		0.0	0
10011		Testikatu 11	10011_PC	10		10		0.0	0
10016		Demokatu 1	10016_PC	10		10		0.0	0

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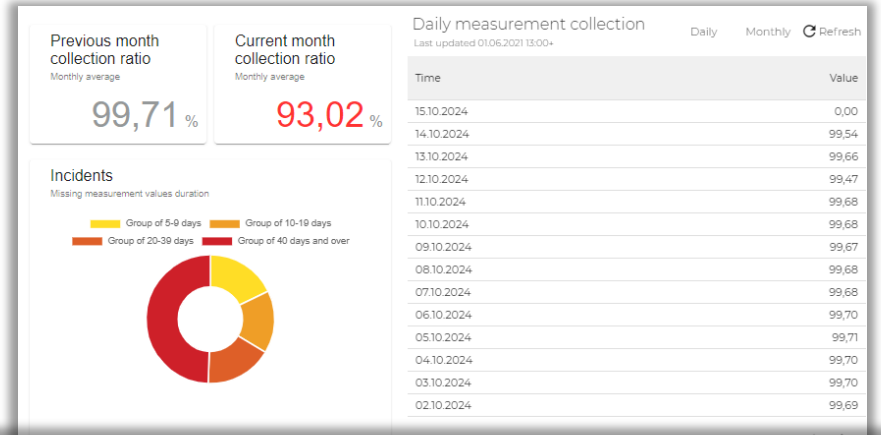
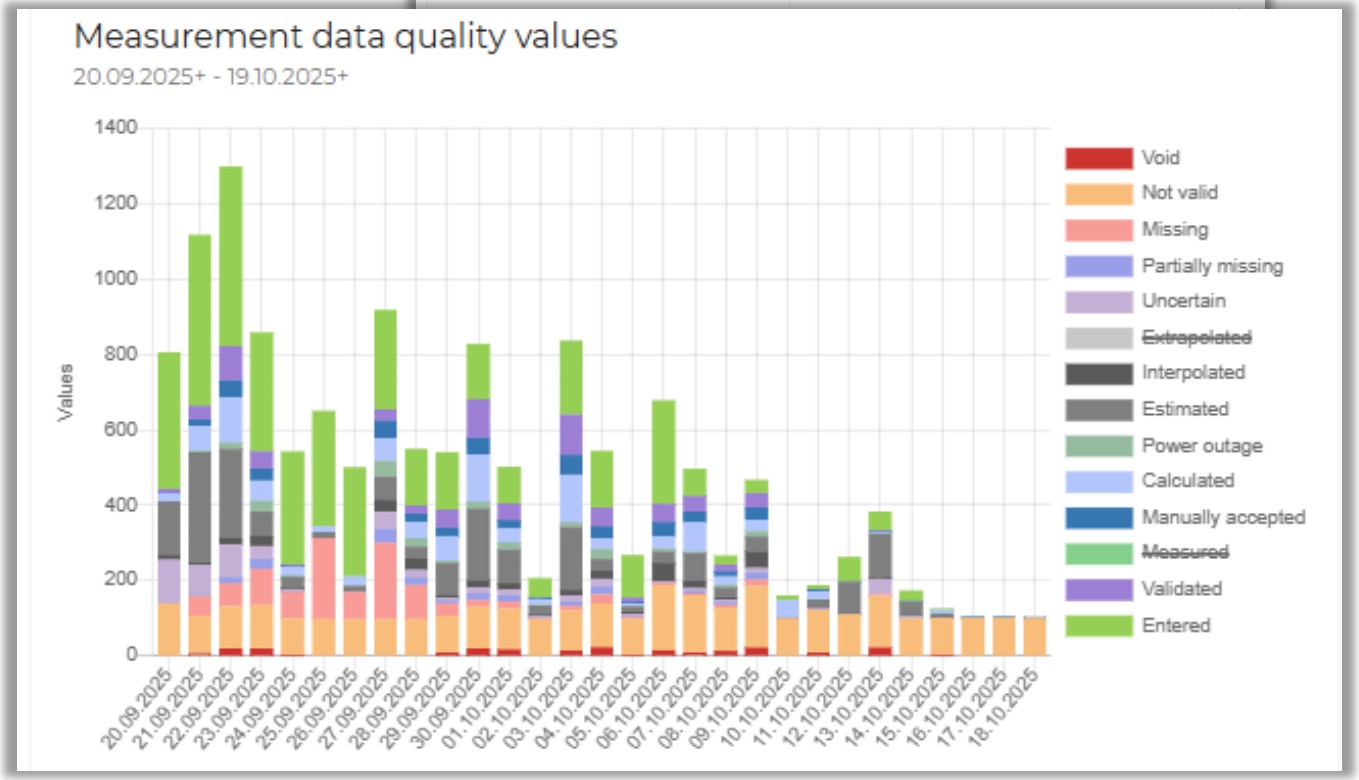
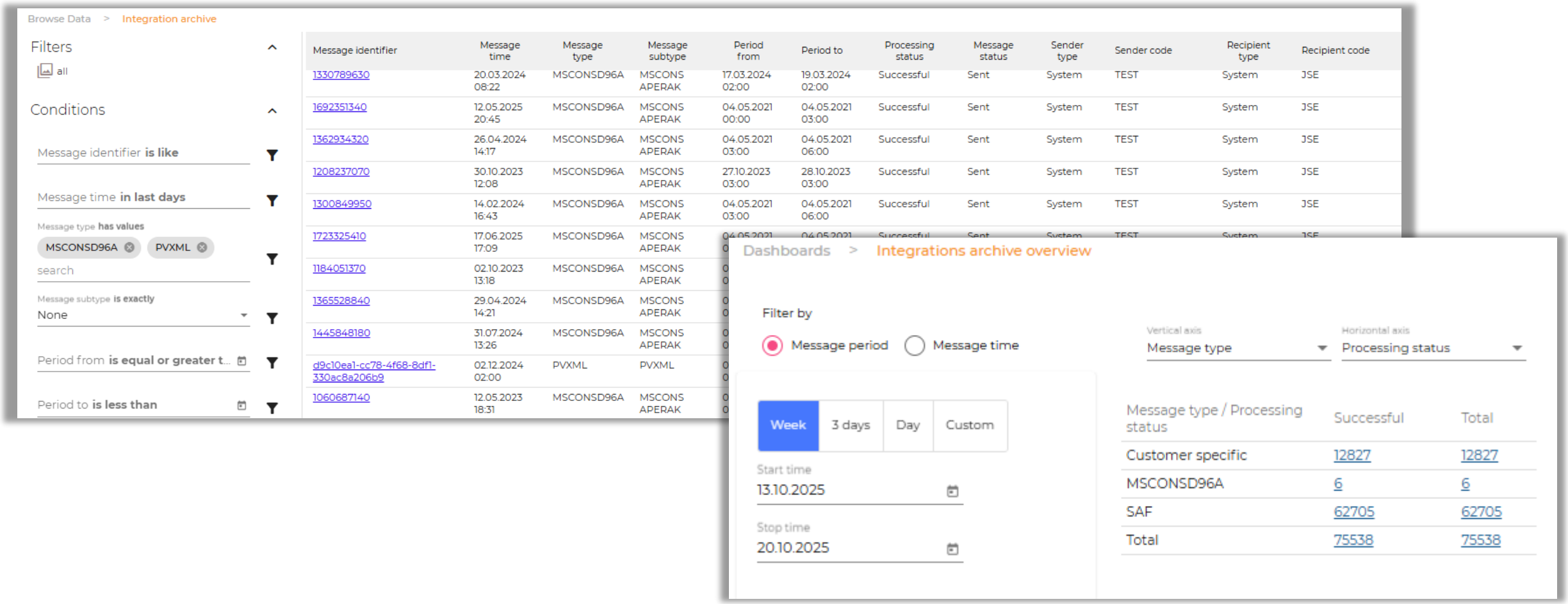
MONITORING OF DATA QUALITY

- Dashboards for monitoring the overall quality of measurement data collection
- Possibility to drill-down to individual measurements and metering points
- Incident view for monitoring validation errors
- Heat-map for monitoring data quality in a single metering point

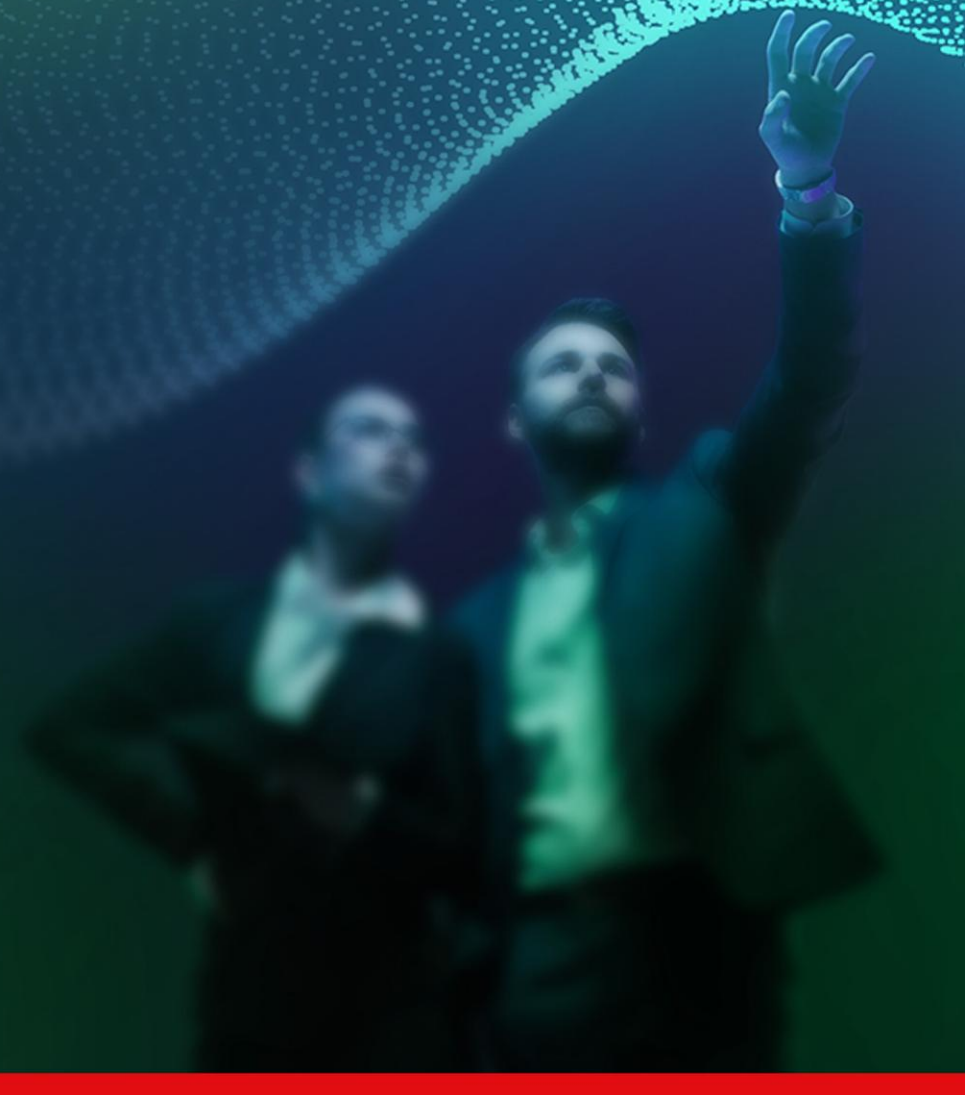




MONITORING OF MESSAGE FLOWS



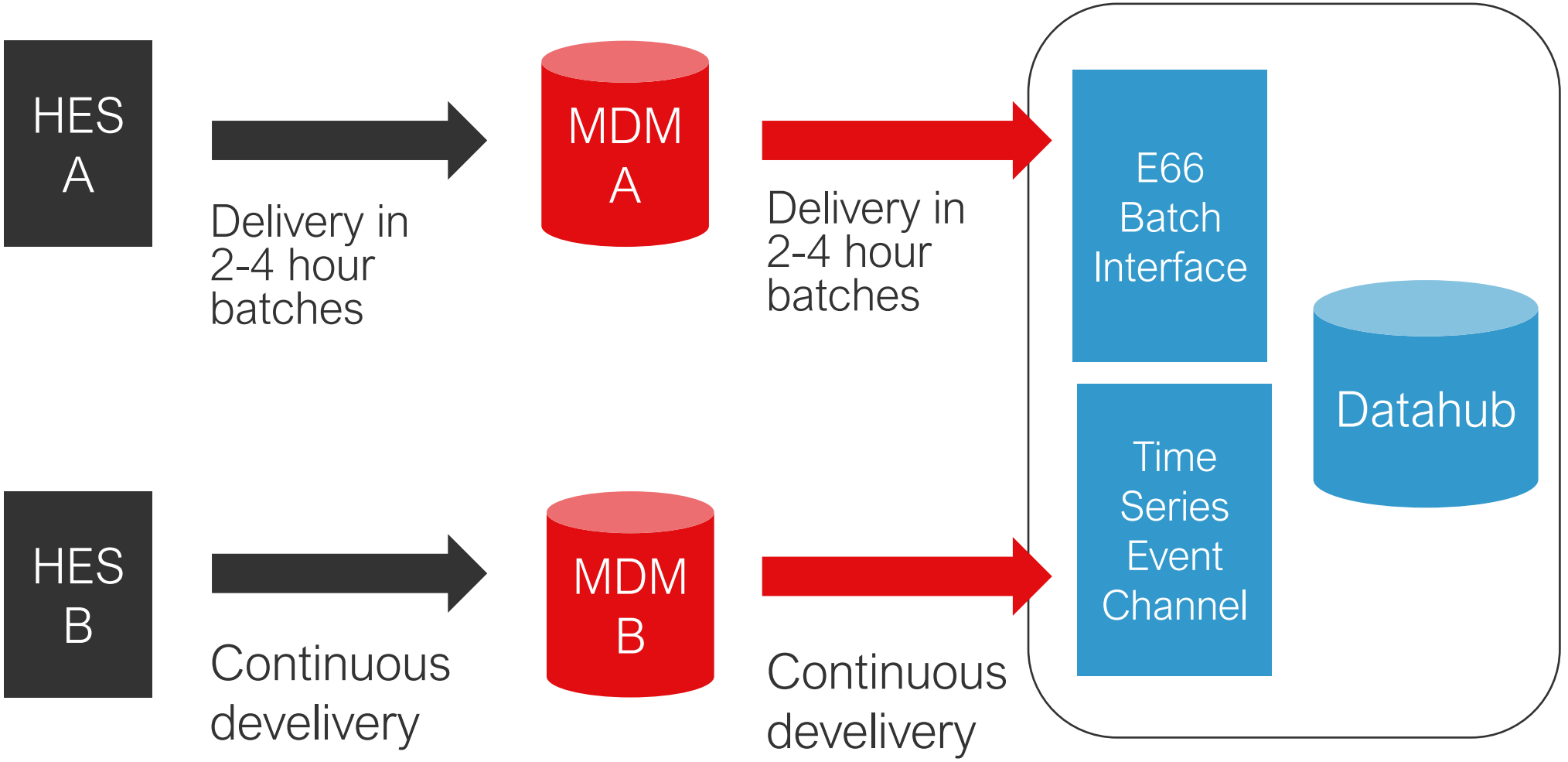
THANK YOU!



NEW IN THE FINNISH MARKET COMMUNICATION, STREAMING INTERFACE

Vesa Hulttinen, Product Manager, Hansen

TWO CHANNELS TO DELIVER MEASUREMENTS



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TIMESERIES EVENT CHANNEL

- Datahub's external interface for near real-time delivery of measurement data.
- Continuous delivery of measurement values as events – One value per one event.
- Connectivity via REST API using JSON presentation of one transactions.
- To be published in Datahub version 2.6


```
{
  "mrid": "cb31355a-982e-4e10-81d7-396bd3911068",
  "tsid": "33b59c05-2313-49c5-80de-29b029b7cc4b",
  "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"
    },
    "vol": {
      "dt": "2024-04-03T08:21:56Z",
      "qty": 1.100323,
      "qq": "56"
    }
  }
}
```

DATAHUB 2.6 TIMETABLE

- Testing and certification for market participants started on 19.1. in CERT02 test environment.
- Freezing of Datahub version 2.6 will take place on 1.5.2026.
- Go-Live of Datahub version 2.6 will take place on 19.5.2026.

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REQUIREMENTS FOR DSO MDM

- Support for continuous collection and delivery of measurement data.
- Integration to the new Timeseries Event Channel REST API.
- Support for acknowledgements from the event channel.
- Dashboards suitable for monitoring continuous sending of data.

REQUIREMENTS FOR RETAILER MDM

- Support for receiving of E66 Messages in 15-minute batches.
- The number and frequency of E66 messages received will be highly increased

NEW DATA MODEL FOR MONITORING

- New data model for monitoring more frequent data delivery will be implemented.

- The new data model will make it possible to monitor data delivery per value basis:
  - Statuses of values sent to Datahub
  - Positive and negative acknowledgements per values
  - Values not sent at all
  - Delivery times per value
  - Total amount of values sent

NEW DASHBOARDS AND LIST VIEWS

- List views and dashboards will be provided for monitoring of the following aspects:
  - Delivered statuses and acknowledgements
  - Monitoring of delivery times

- List views and dashboards will be provided for both short term and long term monitoring.

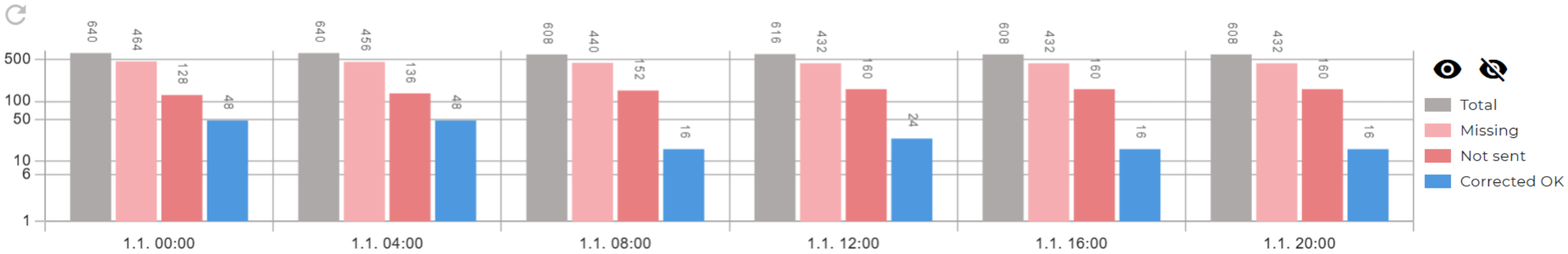
DASHBOARD EXAMPLE – DELIVERED STATUSES

Status statistics | SLA statistics | List view

Period: 01.01.2026 00:00-02.01.2026 00:00

Network*: All networks

Resolution: 4 hours



Time	Total	OK	Corrected OK	Estimated	Rejected	Not sent	Uncertain	Missing
01.01.2026 00:00	640		48			128		464
01.01.2026 04:00	640		48			136		456
01.01.2026 08:00	608		16			152		440
01.01.2026 12:00	616		24			160		432
01.01.2026 16:00	608		16			160		432
01.01.2026 20:00	608		16			160		432

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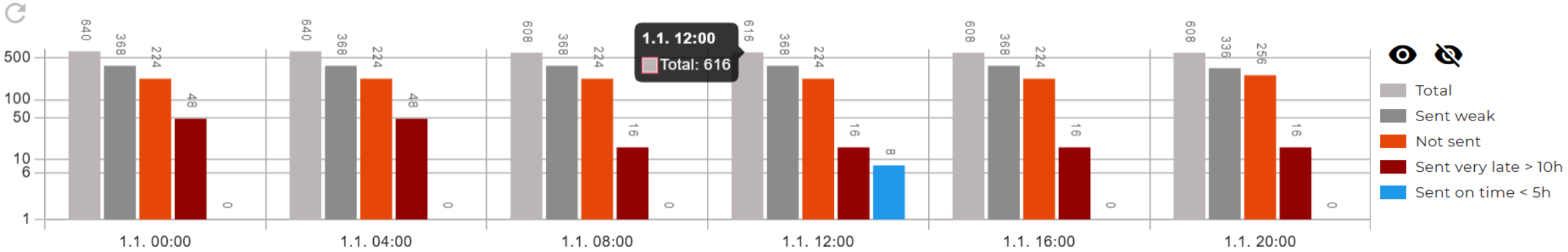
DASHBOARD EXAMPLE – DELIVERY TIMES

Status statistics | SLA statistics | List view

Period: 01.01.2026 00:00-02.01.2026 00:00 | Network*: All networks | Resolution: **4 hours**



Time	Total	Not sent	Sent weak	Rejected	Sent on time < 5h	Sent late 5h-10h	Sent very late > 10h
01.01.2026 00:00	640	224	368				48
01.01.2026 04:00	640	224	368				48
01.01.2026 08:00	608	224	368				16
01.01.2026 12:00	616	224	368		8		16
01.01.2026 16:00	608	224	368				16
01.01.2026 20:00	608	256	336				16

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DASHBOARD EXAMPLE – LIST VIEW

Status statistics | SLA statistics | List view

Period: 01.01.2026 00:00-02.01.2026 00:00 | Resolution: Default | Fetch mode*: Latest message

Metering point GSRN	Measurement	Time	Datahub status	Processing state	Created at	Modified at	Network EIC
56789	X9V48SAk_2_meas_code	01.01.2026 00:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 01:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 02:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 03:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 04:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 05:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 06:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 07:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 08:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 09:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 10:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 11:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 12:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 13:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 14:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 15:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net
56789	X9V48SAk_2_meas_code	01.01.2026 16:00	Missing	Message accepted	02.01.2026 13:22	02.01.2026 13:22	RobotTest_Net

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THANK YOU!