

Knowledge Graph for consistent Smart Meter Operations

ZAZUKO KNOWLEDGE GRAPH FORUM, 29.9.2022



BKW – 11k Employees, 3.5 Mrd Revenue

Energy



Energy supply and procurement for private, SME and large customers

Energy generation

Buildings



Local energy production

Building technology and automation

Electro-mobility

Infrastructure



Construction and Operations

Engineering services

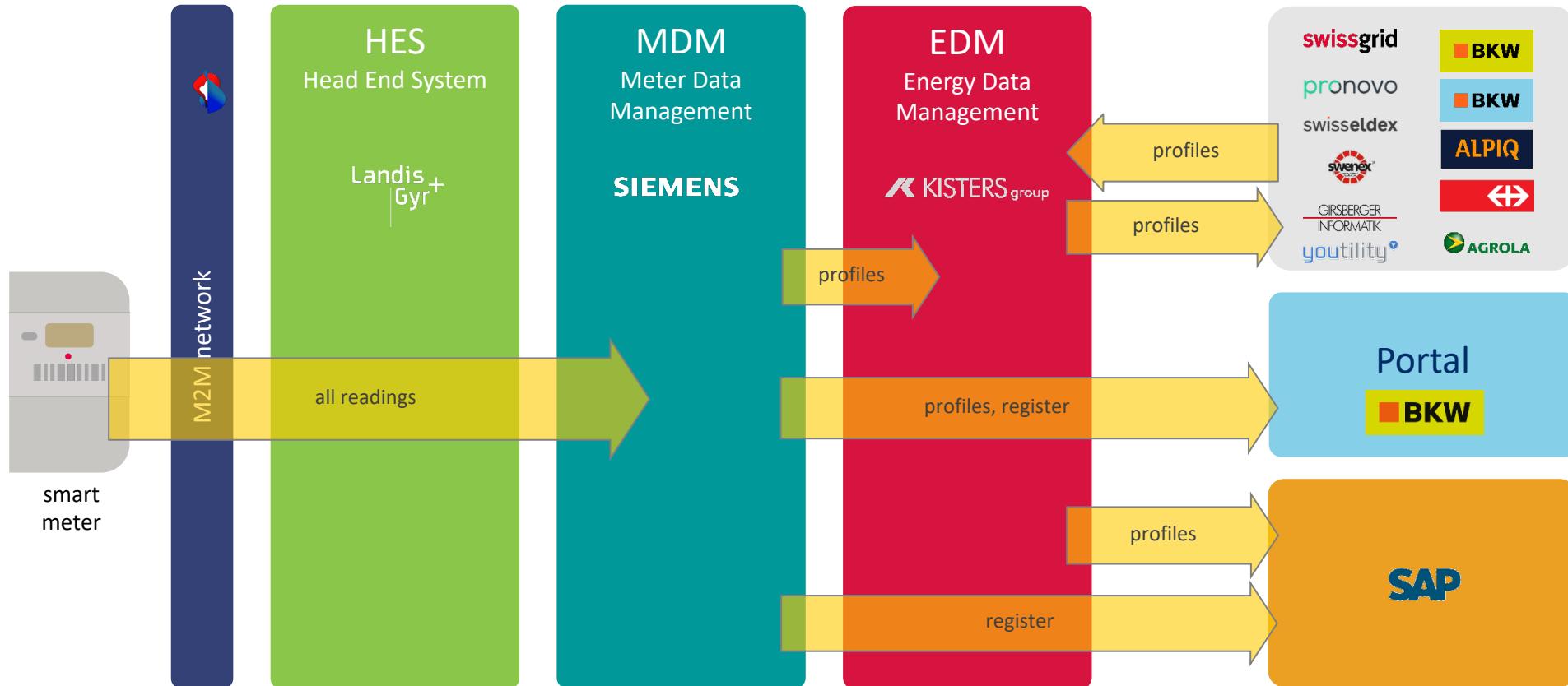
IT solutions

SMART DEVICES

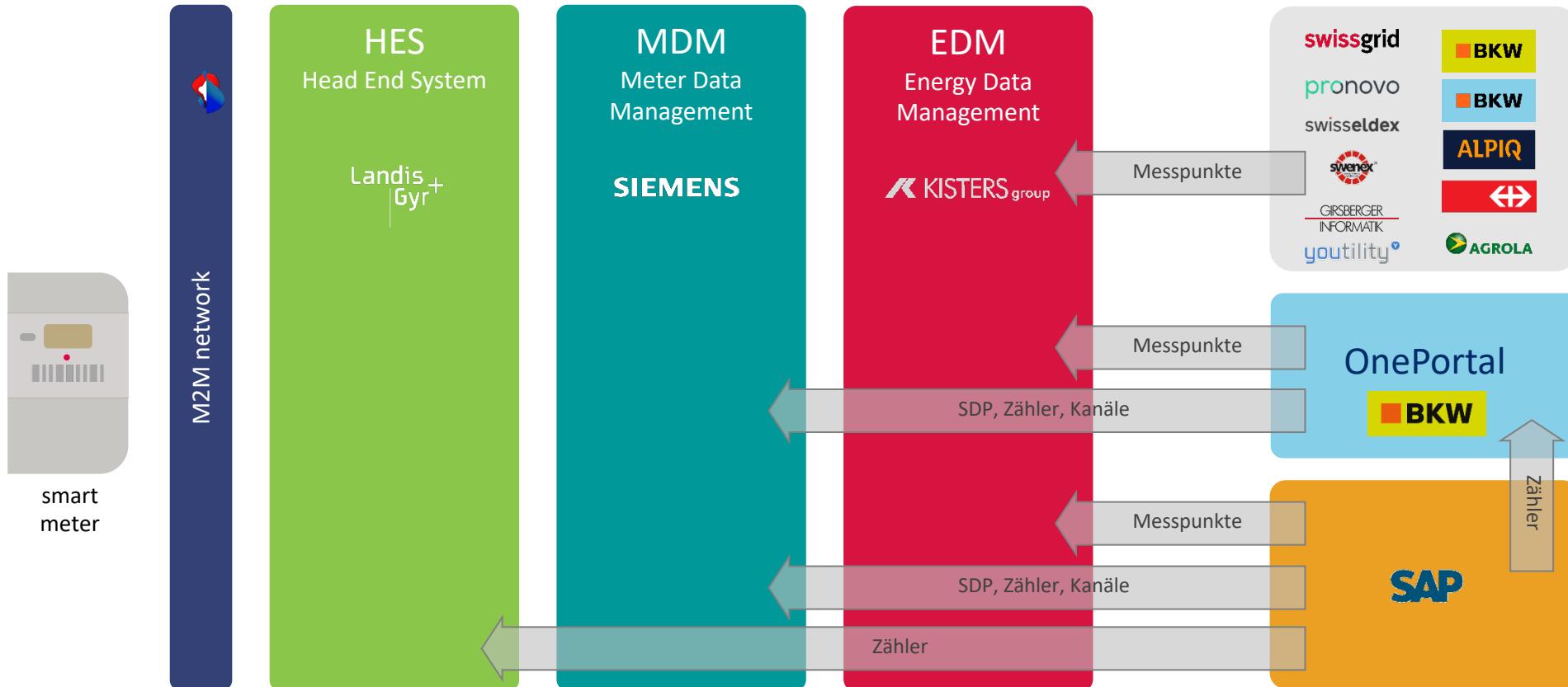


Smart Meter Roll-out mandated
currently 80K smart meters, final target 400K

Readings Flow

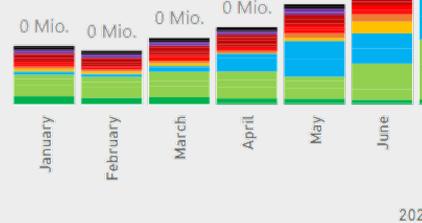
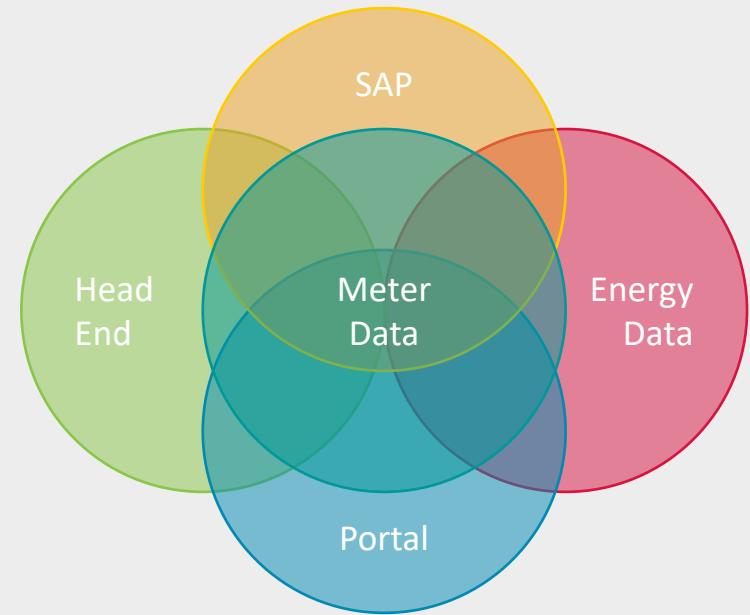


Master Data flows

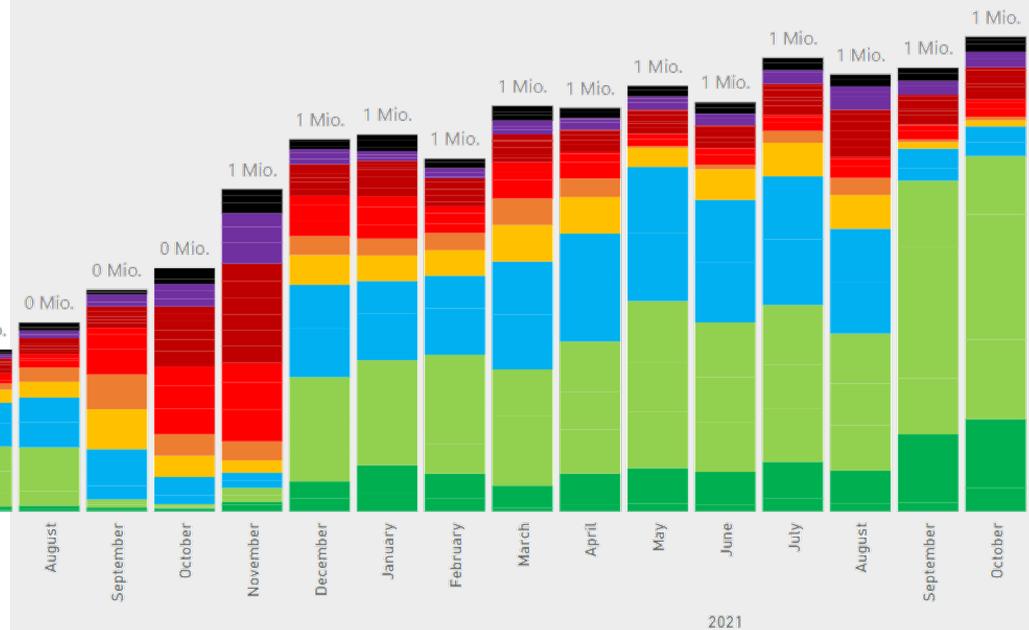


Challenges

Master data: **Consistency**



Readings: **Capacity and Performance**



Most master data was consistent,
but when errors were made nobody knew how to correct them,
because the data was buried in the systems
and not accessible to the operations teams

Consistent Master Data
is a precondition for further Smart Meter roll-out

Data models

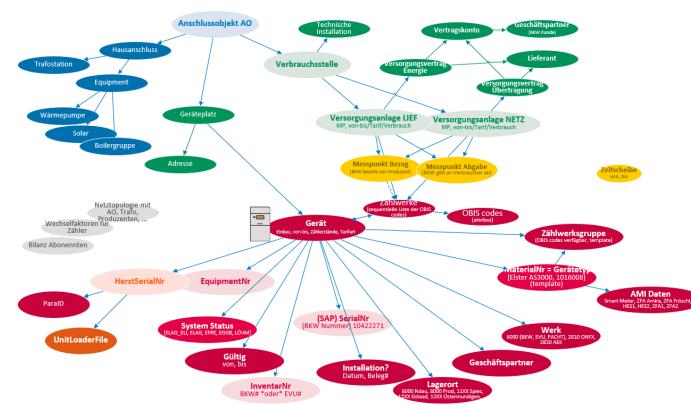
each application had it's own data model

	SUON	SUON serial grouping	BKW	Pacht	EVU BKW Zähler
SAP IS-U	EquipmentNr API_DeviceID	isu:equipmentNr	m2c:erpSerial	EquipmentNr 301423832	EquipmentNr 301424377
	HerstSerialNr	isu:herstSerialNr	m2c:mfgSerial	Herst Serial 55578568	Herst Serial 55579613
	SerialNr	isu:serialNr	no grouping	BKW# 10483434	BKW# 10483979
	InventarNr	isu:inventarNr	m2c:utilitySerial	BKW# 10483434	EVU# 1955
	Geschäftspartner	isu:geschäftspartner	no grouping	leer!	Twann 80011133
	Werk (finanzielle Abgrenzung)	isu:werk	no grouping	6000	6000
	Lagerort (nach Um lagierung)	isu:lagerort	no grouping	11XX-2XX RL 1170 Netzgitar Spiez	XX4X 1547

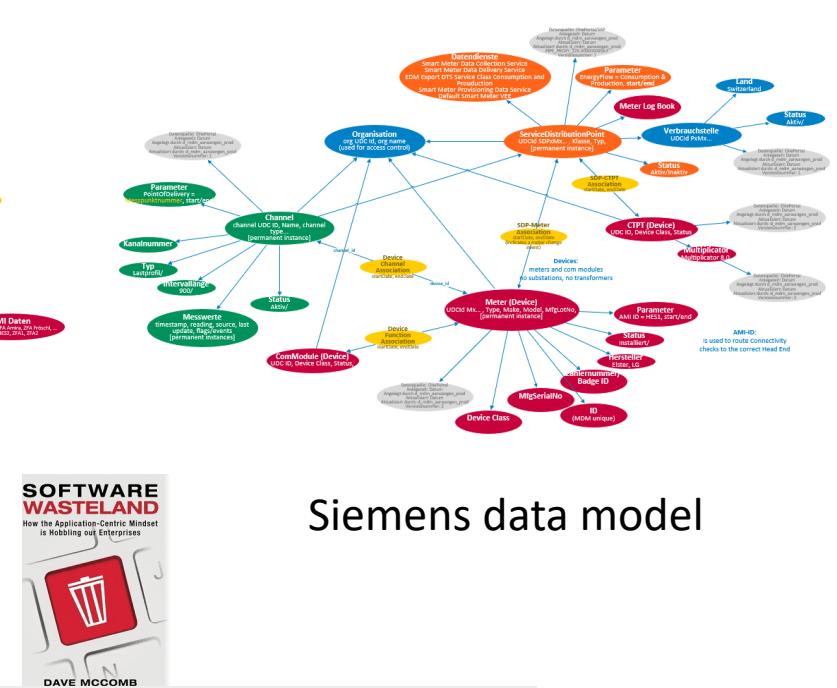
Shadow DB	Id	onep:objectID	m2c:utilitySerialMx	Mx BKW# Mx18483434	Mx EVU# 1955	Mx EVU#
	mRID (Master Record ID)	onep:mRID	m2c:utilitySerialMx	Mx BKW# Mx18483434	Mx EVU# 1955	Mx EVU#
	badgeID	onep:badgeID	m2c:utilitySerial	BKW# 16481434	BKW#	EVU#
	factoryNumber (used for user interaction)	onep:factoryNumber	m2c:utilitySerial	BKW# 10483434	EVU#	EVU#
	mfgSerialNumber	onep:mfgSerialNumb	m2c:mfgSerial	Herst Serial 55525656	Herst Serial	Herst Serial

MDM	Meter UDC ID NEM X_UTILITY_ID (Utility Registration Company ID)	mdm:u dcID	mdm:dcID_SAP mdm:dcID_Owner	m2c:erpSerial	EquipmentNr 301423832	EquipmentNr 301424377	Mx EVU# Mx11118
	Zählernummer Meter Badge ID METER_X_UNIVERSAL_ID	mdm:badgeID		m2c:utilitySerial	BKW# 1048434	BKW# 10483979	EVU# 11118
Hersteller Serien Nr. Meter MFG Num METER_X_SERIAL_ID	mdm:mfgSerial			m2c:mfgSerial	Herst Serial 55578568	Herst Serial 55579613	Herst Serial 32881309

HES	Unit no. Einheiten Nr.	hes:unitSerial	m2c:mfgSerial	Herst Serial 55578568	Herst Serial	Herst Serial
	Seriennummer Serial number (MSN)	hes:meterSerial	m2c:mfgSerial	Herst Serial 55578568	Herst Serial	Herst Serial
	Versorgerseriennr. Utility SN (USN)	hes:meterUniversalSe- rial	m2c:utilitySerial	BKW# 10483434	BKW#	EVU#
	Typenschild Kennung NameplateID	hes:metreNameplateID	m2c:utilitySerial	BKW# 10483434	BKW#	EVU#



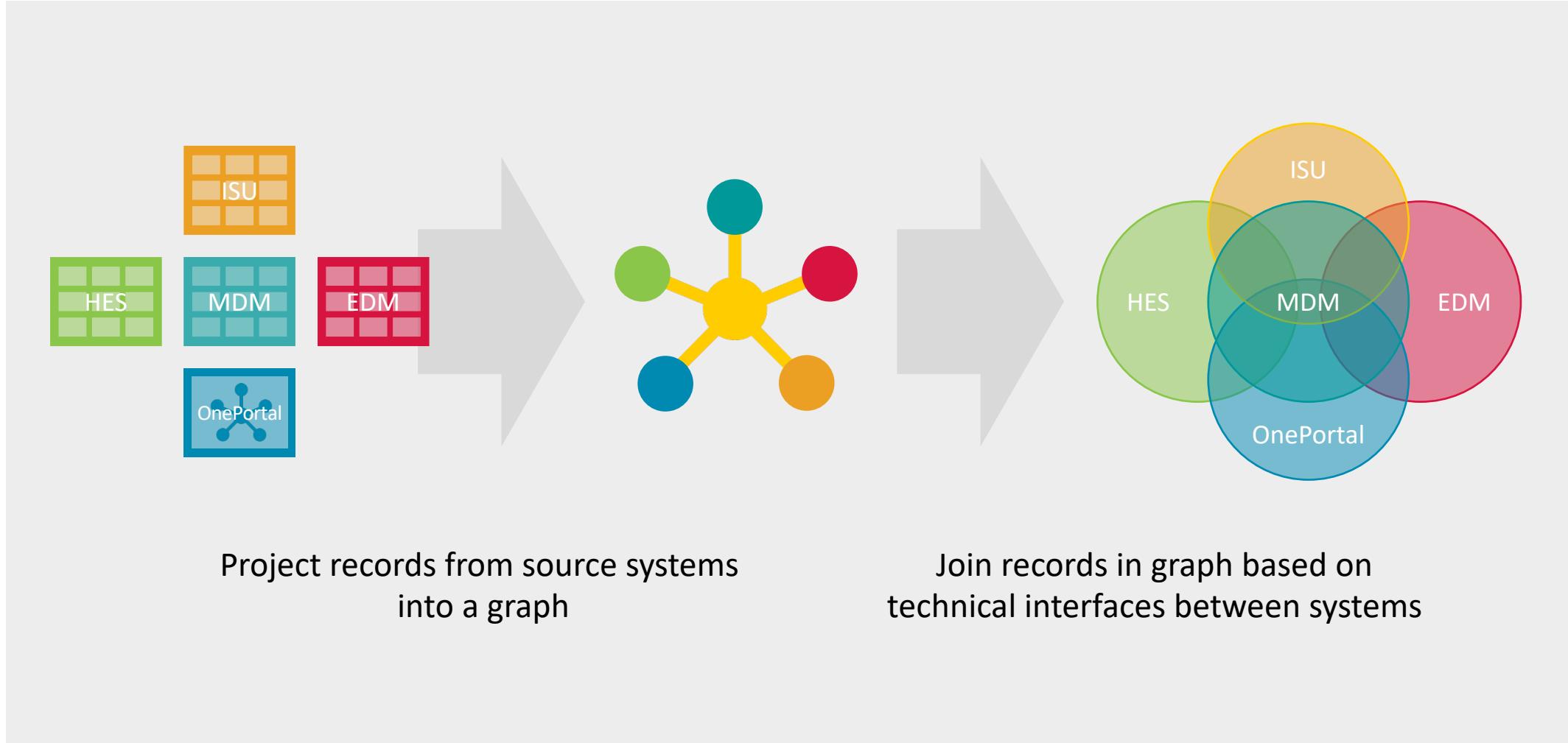
SAP data model



Siemens data model

identifiers in whole system chain

Approach: use RDF data integration

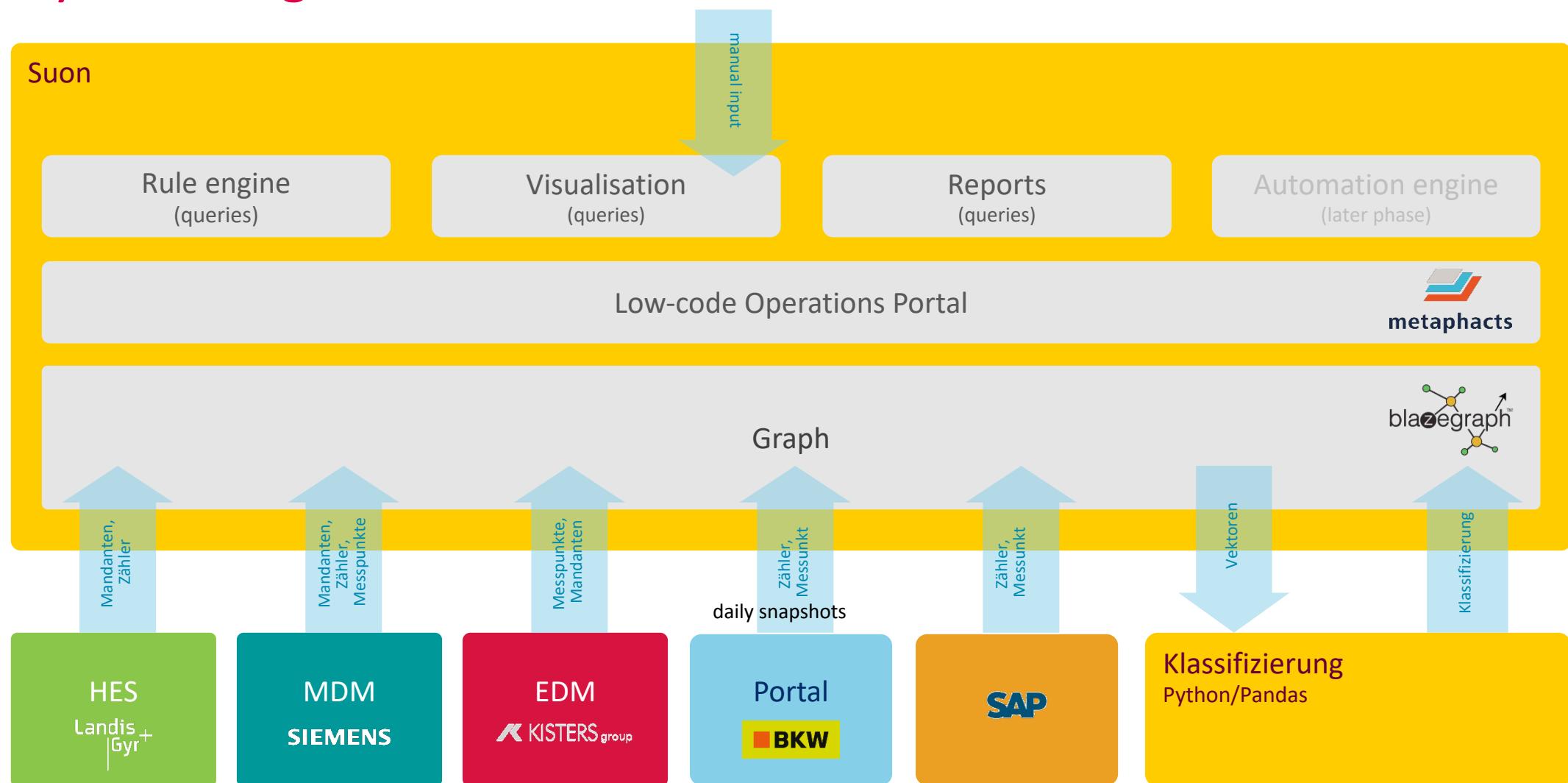


Business Case and Qualitative Benefits

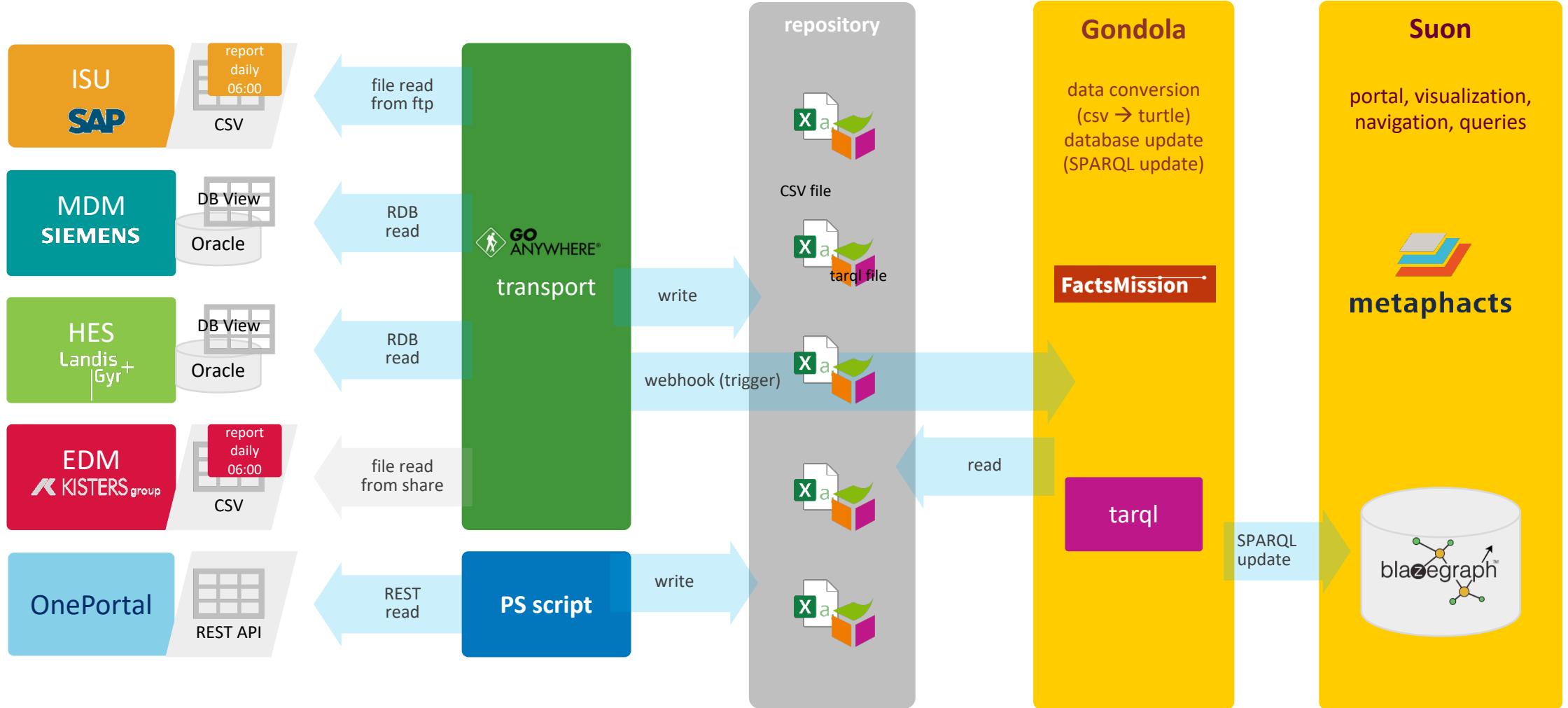
- Break even after 2 years
 - Savings: 130K per year operational effort
 - Cost: 71K per year
SW licencing, Hosting, (YRC)
external & internal resources (OTC)
 - Project costs: 157 K
internal and external expenses
 - NPR = 105,000

- Logistics: **prevent issues** by doing pre-checks
 - Smart Meter Operations:
 - **proactive** verification of master data consistency
 - accelerated **troubleshooting**
 - accelerated **verification** of operational statuses (meter status, AMICAG)
 - accelerated **testing** for changes and projects

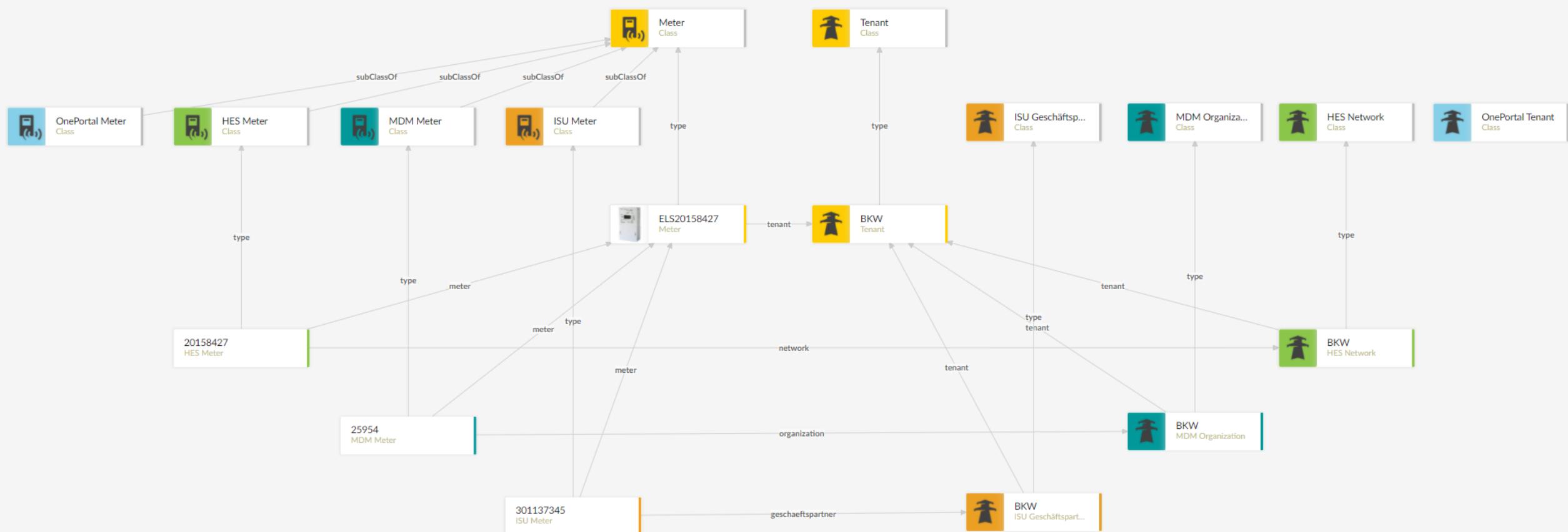
System diagram



Data pipelines



Simple Ontology



Meter Search

search all meters using facets below



Hide Filter

Quick search



Filter columns

Group columns

Device	Image	Type	Tenant	Utility Serial (EVU)	Manufacturer Serial	ERP Serial (SAP)	Meter status	Issue status	Issues	Comments
> ELS20166300 (1)		Elster AS 3000, 3x230/400V, 10(100)A	BKW	10173834	20166300	301176789				
> ELS20166301 (1)		Elster AS 3000, 3x230/400V, 10(100)A	BKW	10173835	20166301	301176790				
> ELS20166302 (1)		Elster AS 3000, 3x230/400V, 10(100)A	BKW	10173836	20166302	301176791				
> ELS20166303 (1)		Elster AS 3000, 3x230/400V, 10(100)A	BKW	10173837	20166303	301176792				
> ELS20166304 (1)		Elster AS 3000, 3x230/400V, 10(100)A	BKW	10173838	20166304	301176793				
> ELS20166305 (1)		Elster AS 3000, 3x230/400V, 10(100)A	BKW	10173839	20166305	301176794				



Meter

Shows details of a particular meter. Multiple records with the same manufacturer serial number are combined here.

Tenant: BKW State:	Utility Serial number: 10173838	Manufacturer Serial number: 20166304	SAP Serial number: 301176793	OnePortal Identifiers: does not apply	no issues detected
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comment

Enter comment here...

Add comment

[Save](#) [Reset](#)

in SAP ISU

Quick search Group columns ▾

> equipmentNr property value

> 301176793 (21) 21 values

21 entries

in MDM

Quick search Group columns ▾

> mdmID property value

> 35373 (16) 16 values

16 entries

in HES

Quick search Group columns ▾

> unitSerial property value

> 20166304 (17) 17 values

17 entries

in OnePortal

⚠ no data found
[open OnePortal](#)

Reading flow

the diagram reconstructs the flow of readings based on the identifiers used in the APIs

20166304
HES Meter
 BKW
ERP Serial:
Utility Serial: 10173838
Manufacturer Serial: 20166304

universalSerial-badge

35373
MDM Meter
 BKW
ERP Serial: 301176793
Utility Serial: 10173838
Manufacturer Serial: 20166304

judcID-equipment

301176793
ISU Meter
 BKW
ERP Serial: 301176793
Utility Serial:
Manufacturer Serial: 20166304



Meter

Shows details of a particular meter. Multiple records with the same manufacturer serial number are combined here.

Tenant: AEK, Lüterkofen State: and	Utility Serial number: 500398, 10309660, 62000500398	Manufacturer Serial number: 14247278	SAP Serial number: 301033237, 301328789	OnePortal Identifiers: Mx500398	Issues: , 2 ERP serials, 3 Utility serials, 2 herstSerialNr duplicates in ISU2 Tenants, , , ,
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comment

Enter comment here...

[Add comment](#)[Save](#) [Reset](#)

in SAP ISU

Quick search Group columns ▾

equipmentNr	property	value
> 301328789 (21)	21 values	
> 301033237 (19)	19 values	

40 entries

in MDM

Quick search Group columns ▾

mdmID	property	value
> 15536 (16)	16 values	
> 35590 (16)	16 values	
> 104231 (16)	16 values	

48 entries

in HES

Quick search Group columns ▾

unitSerial	property	value
> 14247278 (18)	18 values	

18 entries

in OnePortal

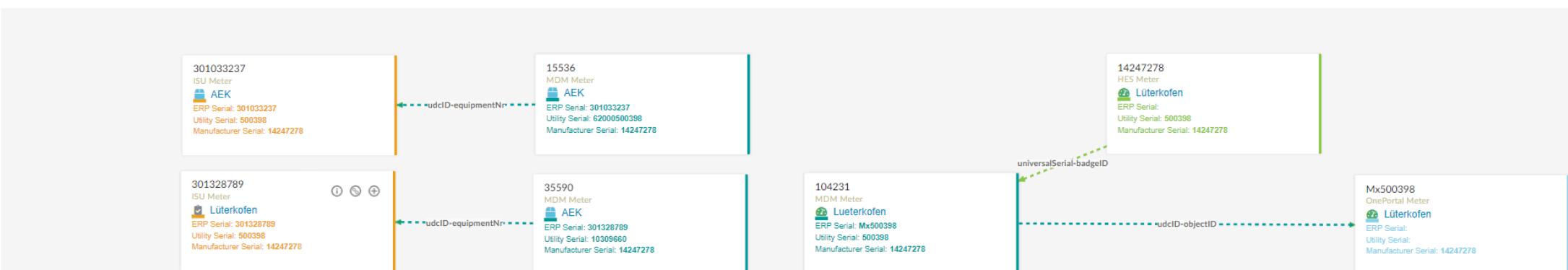
Quick search Group columns ▾

objectId	property	value
> Mx500398 (24)	24 values	

[open OnePortal](#)

Reading flow

the diagram reconstructs the flow of readings based on the identifiers used in the APIs



Expansion and Vision

Supports analysis but has further potential: foundation for automation and enabler for AI use cases

Analyze	Automate	Artificial Intelligence	Paradigm change
masterdata consistency	data flow monitoring	correct master data (node2vec)	auto-discovery of meters
operations portal	scheduling of readings at head end	predictive maintenance for meters	bounty model for field force
data flow analysis end to end	Messpunkt EDM		
	network topology for EDM		

Learnings

data integration with RDF
works really well (tarql)

graph simplifies both data
aggregation and consolidation

low-code environment
(metaphacts) speeds up
project 4x-10x

the graph is the application

business staff (non-IT) can
take over solution

overcome Excel Thinking
(columnar thinking)

added closed/open circles
and stars to my analytical
toolbox

People can not imagine
usefulness of analytical and
operational data in one graph

-
prepare them well



Knowledge Graph for consistent Smart Meter Operations

Questions? Impressions? Suggestions?

BIEL, 23.09.2022

