

NIL



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IoT in practice

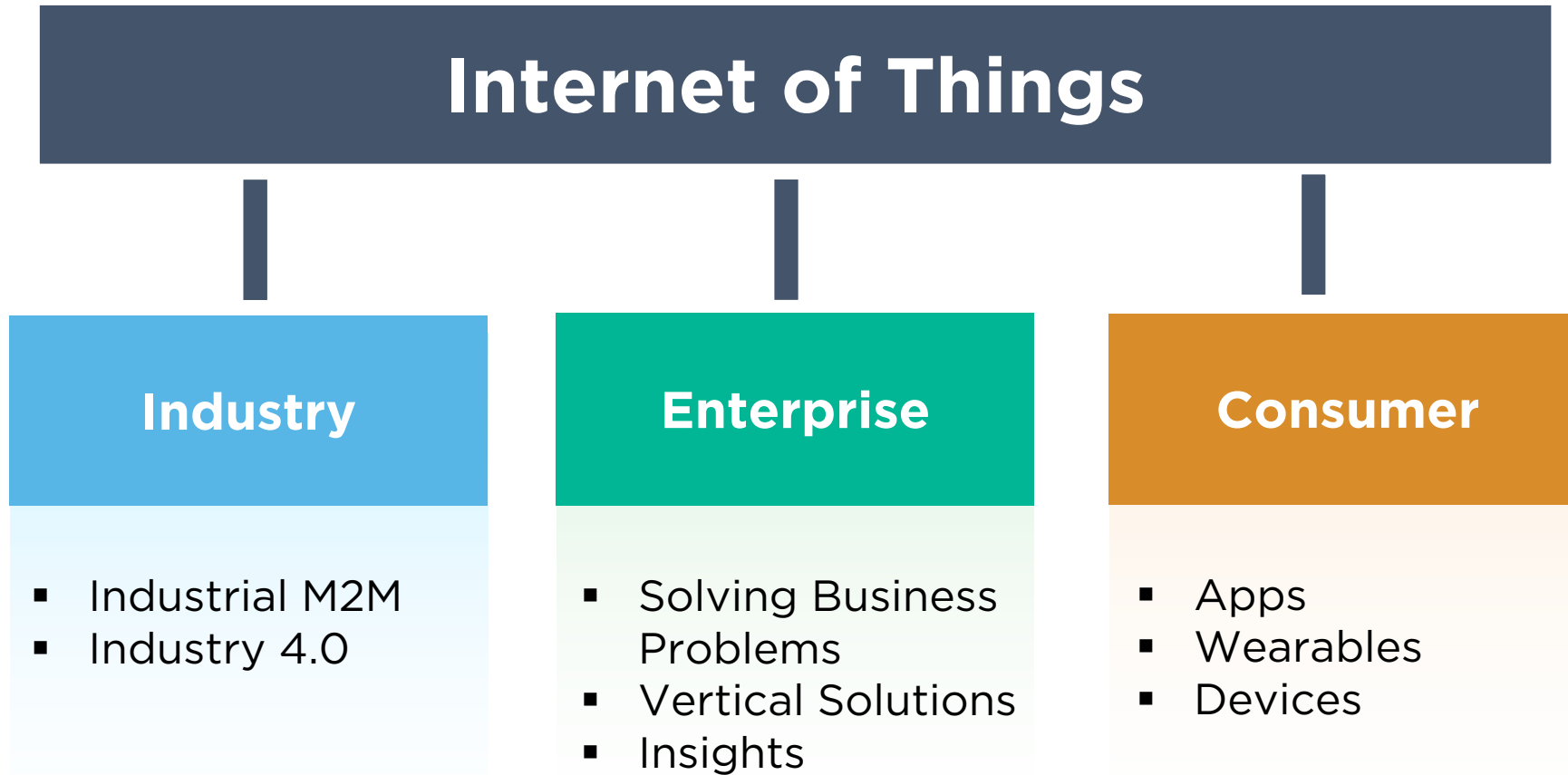
Digitization of utility services



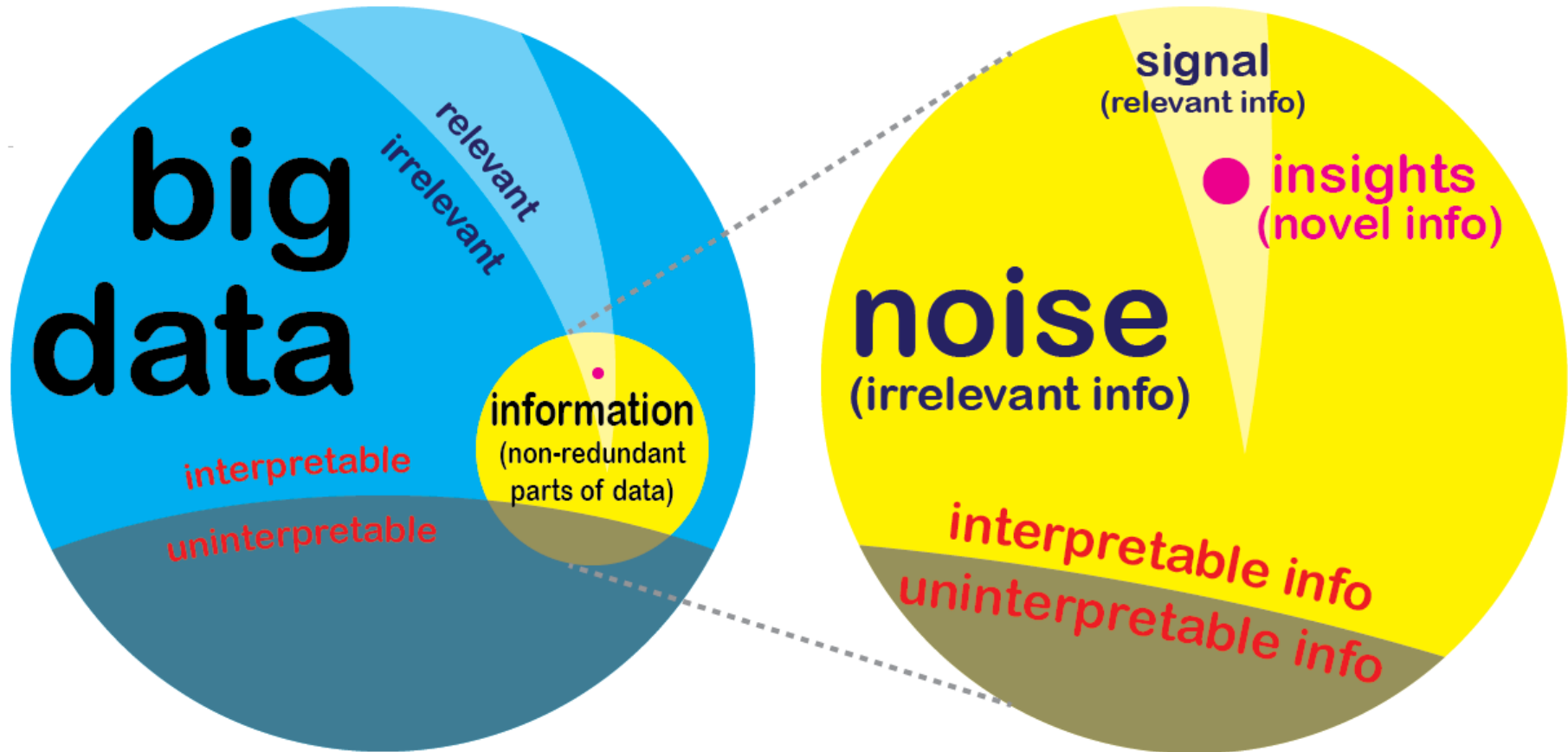
- SP team tech lead
- Consultant
- Instructor

- Areas of interest
 - Orchestration
 - SP SDN
 - IoT



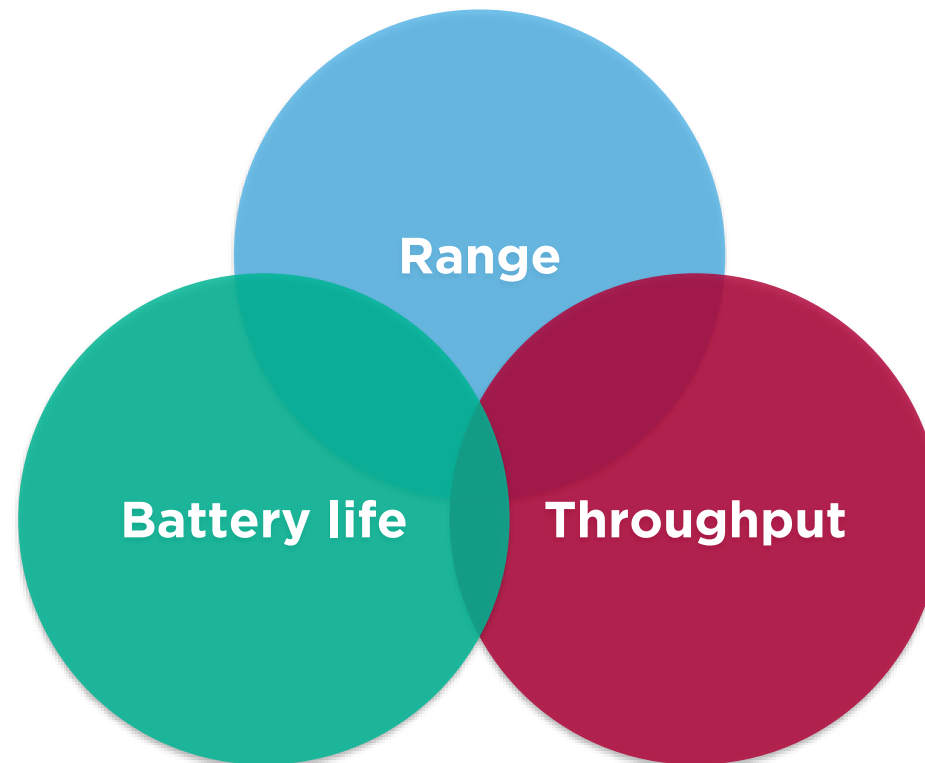


What are insights?



Depending on the use case requirements we will have address the following requirements:

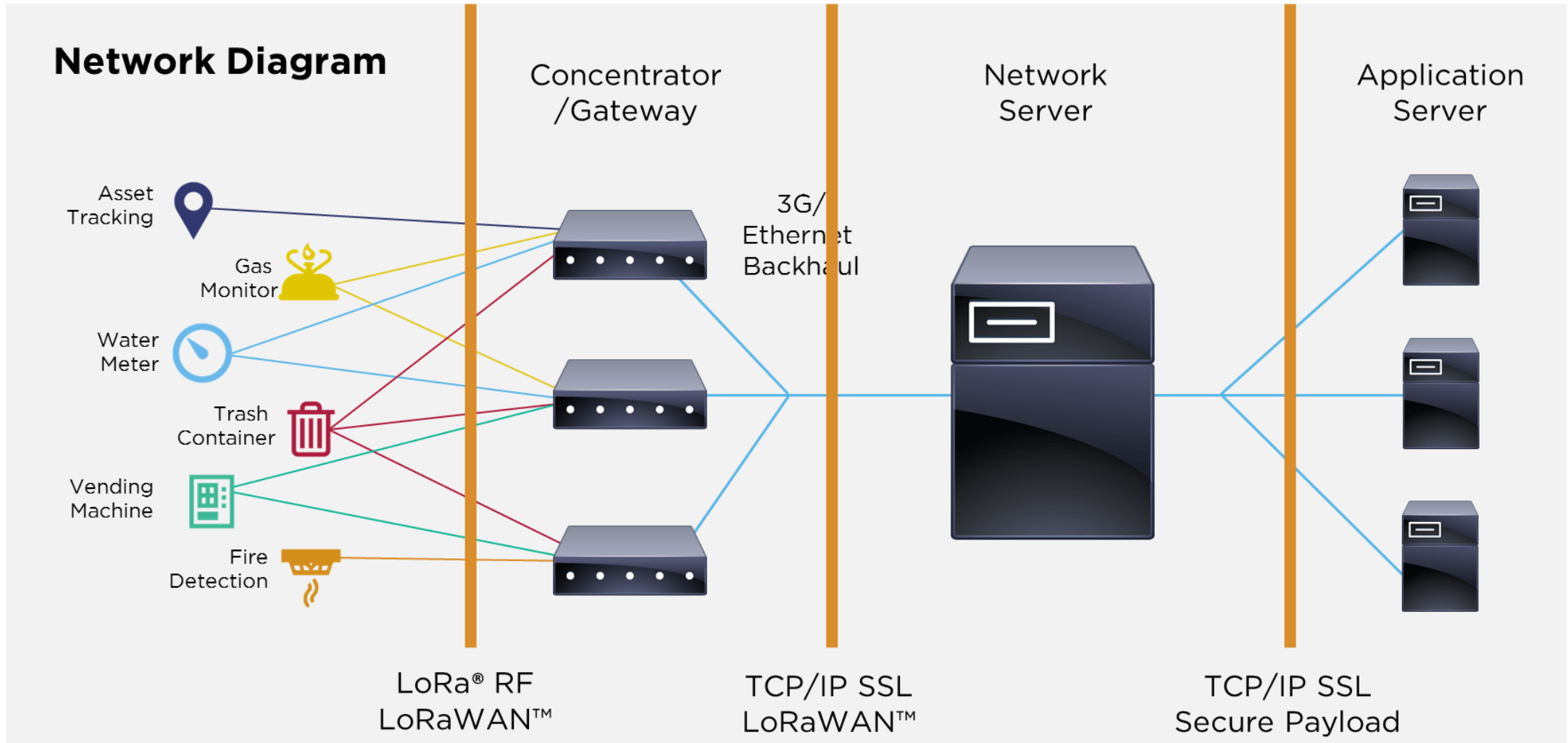
- Range
- Throughput
- Battery life
- Standard/License



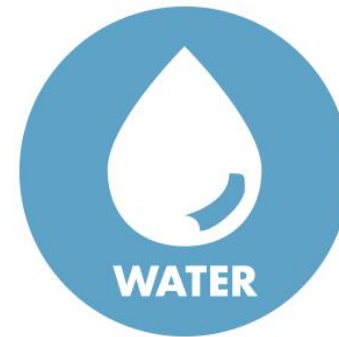
LPWAN - opening new use cases

Technology	2G	3G	LTE	WiFi	Zigbee	Wireless Hart	802.15.4g	LPWA (LoRa, Ingenu, SigFox, etc.)	NB-IOT EC-GSM
Range	Long	Long	Long	Limited (<200m)	Short	Limited (<250m)	Limited (<1 km)	Long >10 km (rural) >1 km (urban)	Long
Topology	P2P	P2P	P2P	P2P/Mesh	Mesh	Mesh	Mesh	P2P	P2P
Tx Current Consumption (3V)	30mA to 400mA	500 to 1000mA	600 to 1100 mA	19 to 400 mA	34mA	28mA	~ 35mA	<20 mA	<20 mA
Standby Current Consumption (3V)	0.35 mA	1.2 to 3.5mA	1.5 to 5.5mA	1.1 mA	0.003mA	0.008mA	~.005mA	<0.005mA	<0.005mA
Energy Harvesting	No	No	No	No	Possible	Possible	Possible	Possible	Possible
Operating Life on battery (2000mAh) h=hours; d=days A=active; I=Idle	4-8 h (A) 36 d (I)	2-4 h (A) 20 d (I)	2-3 h (A) 12 d (I)	4-8 h (A) 50 h (I)	60 h (A)	8-10 years	Variable	Up to 10 years	Up to 10 years
Module Cost (est.)	\$8-10	\$35-\$50	\$40-\$80	\$5-\$8	\$6-\$12	NC	\$3	<\$5	TBC
Spectrum	Lic.	Lic.	Lic.	Unlic.	Unlic.	Unlic.	Unlic.	Unlic.	Lic.





- A traditional utility company is responsible for several different areas:
 - Water management
 - Drinking water
 - Waste water
 - Waste management
 - Energy management
 - Funeral services
 - Real-estate management
 - Geodetic services
 - ...



- **Water management**

- Remote management of water meters
- Approximately 1000 water meters (domestic)
- Offering web based monitoring services to customers

- **Waste management**

- Remote management of central waste locations
- Future extension to a per-household monitored system
- Route planning



▪ Challenges

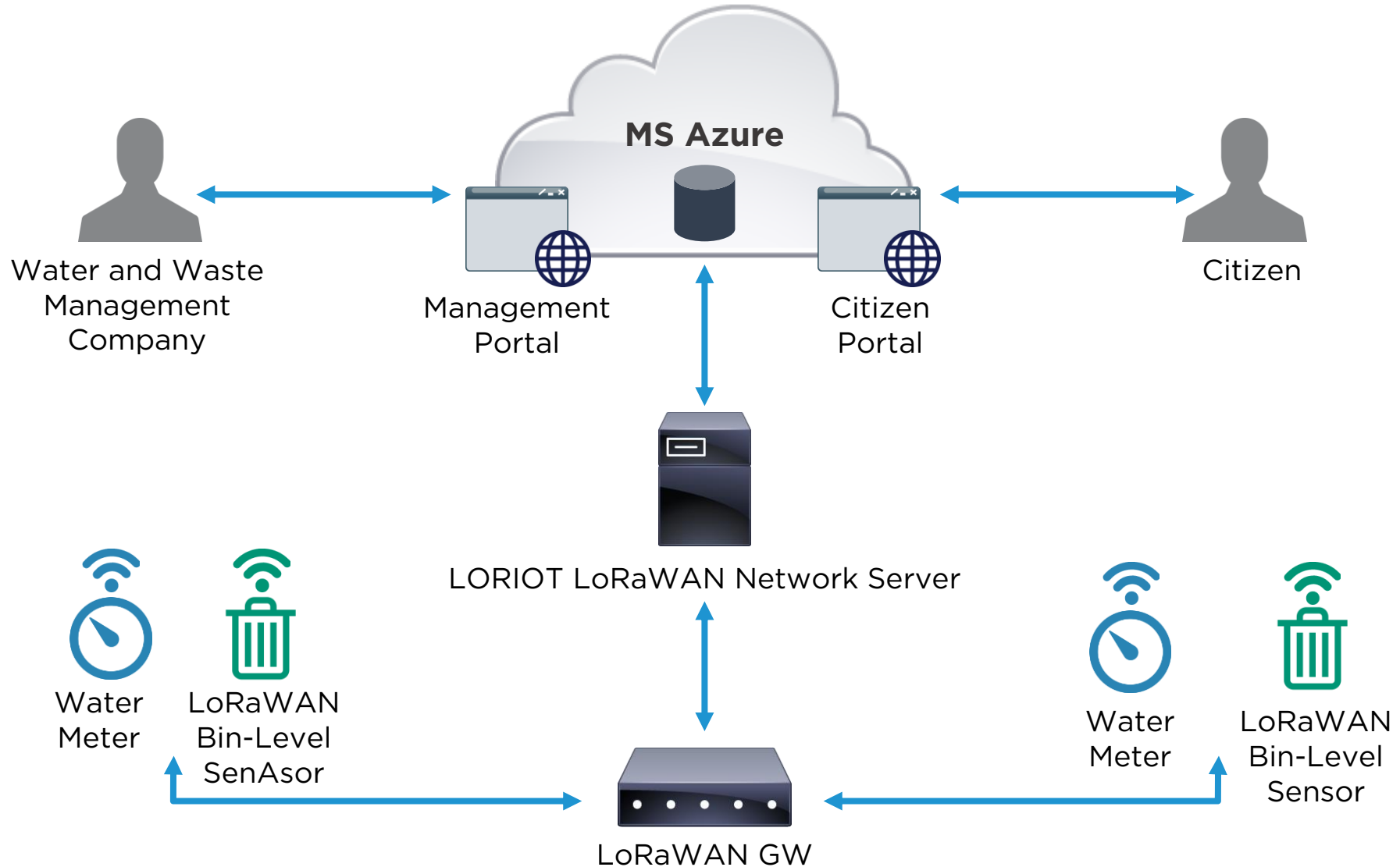
- Loss of water during distribution (up to 40%)
 - Location of water loss is often difficult to pinpoint
- Remote reporting of water consumption
 - Water meters are located in remote locations
- Consumer monitoring and management
 - End consumer visibility and reporting through portal
 - Notifications



▪ Challenges

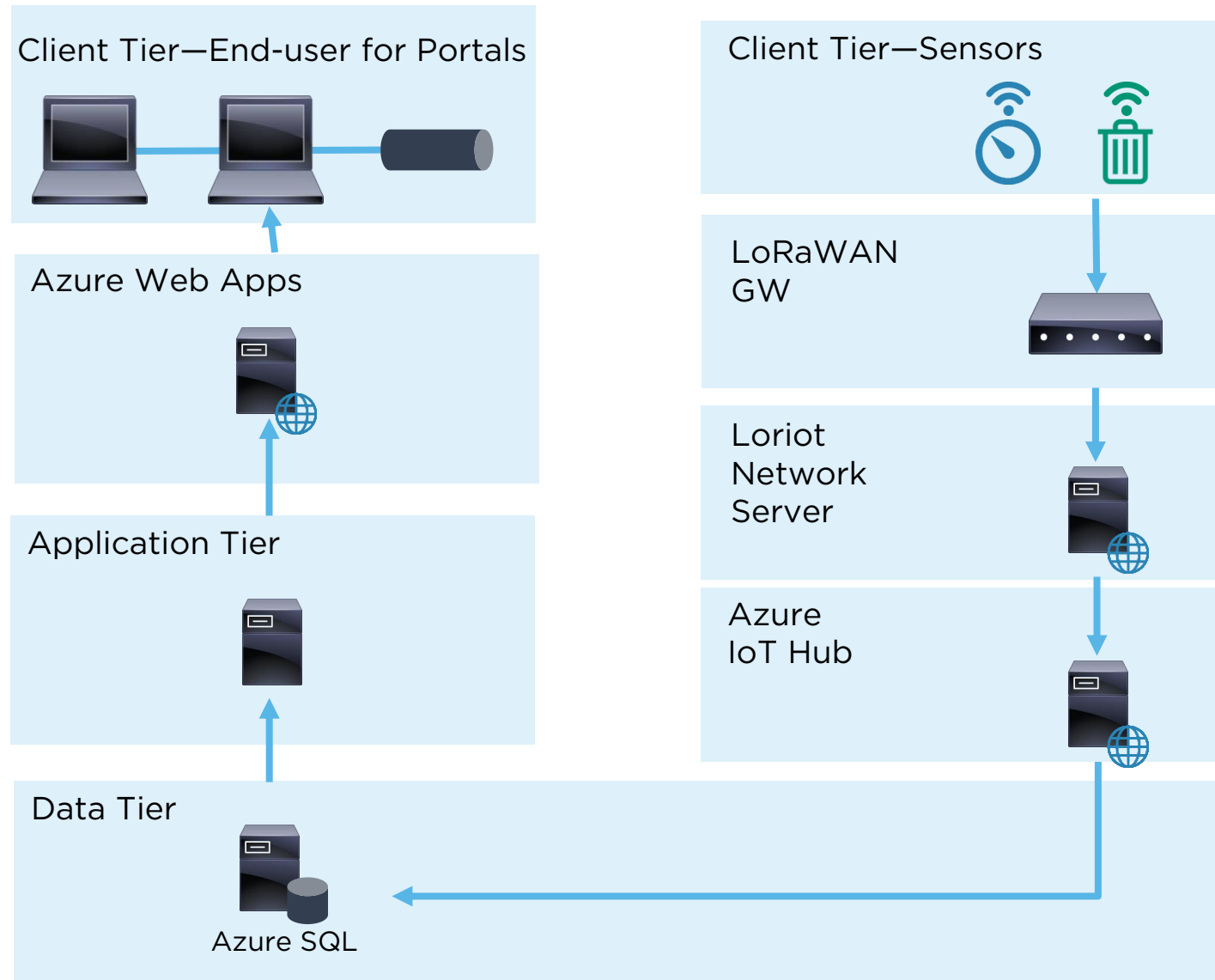
- Waste monitoring
 - Level of container content
- Waste theft
 - Valuable waste (paper, glass) that is already sorted is being stolen
- Management of waste collection
 - Planning the truck collection route







Infrastructure - Using the cloud



SWWM
Nejc Kambič 0.118

Alarmi

VRSTA ALARMA	RESNOST	STATUS	DATUM
Alarm premika	Test	Nov	26.9.2017 09:01
Alarm temperatura & premik & razdalja	Test	Nov	26.9.2017 09:04

1 - 2 od 2 zapisov

Mesečna poraba vode

Mesečna poraba vode	September 2017	August 2017
Value	~1300	~600

Število zabojnikov primernih za praznjenje po frakcijah

Papir 2	Embalaža 7	Steklo 1
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Predlagani dogodki

Zadnje aktivnosti

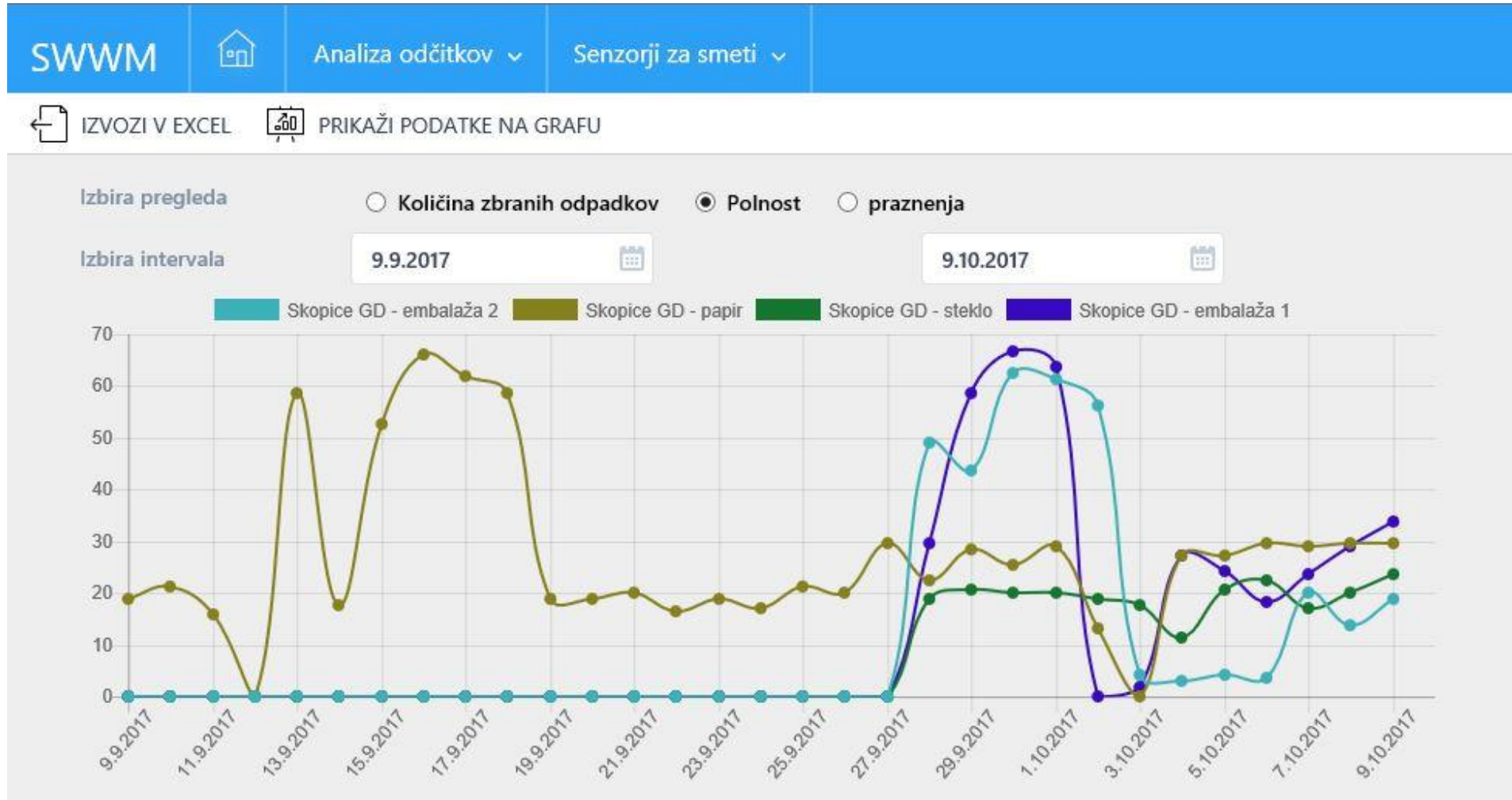
- TSWaste Senzor 1: 33,0%
- Zenner Senzor 1: 52

Statistični podatki

- Število priključenih vodnih števecov: 1
- Število zabojnikov za odpadke: 17
- Število uporabnikov: 4



Applications - Container level



An aerial night photograph of a city, likely Dubai, featuring a complex multi-level highway interchange in the foreground and several illuminated skyscrapers in the background. The scene is lit with a warm, yellowish light, possibly from streetlights or building lights. A semi-transparent white horizontal band is overlaid across the middle of the image, containing the text "ENABLING IT FOR BUSINESS".

ENABLING IT FOR BUSINESS