NIL

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IoT in practice

Digitization of utility services

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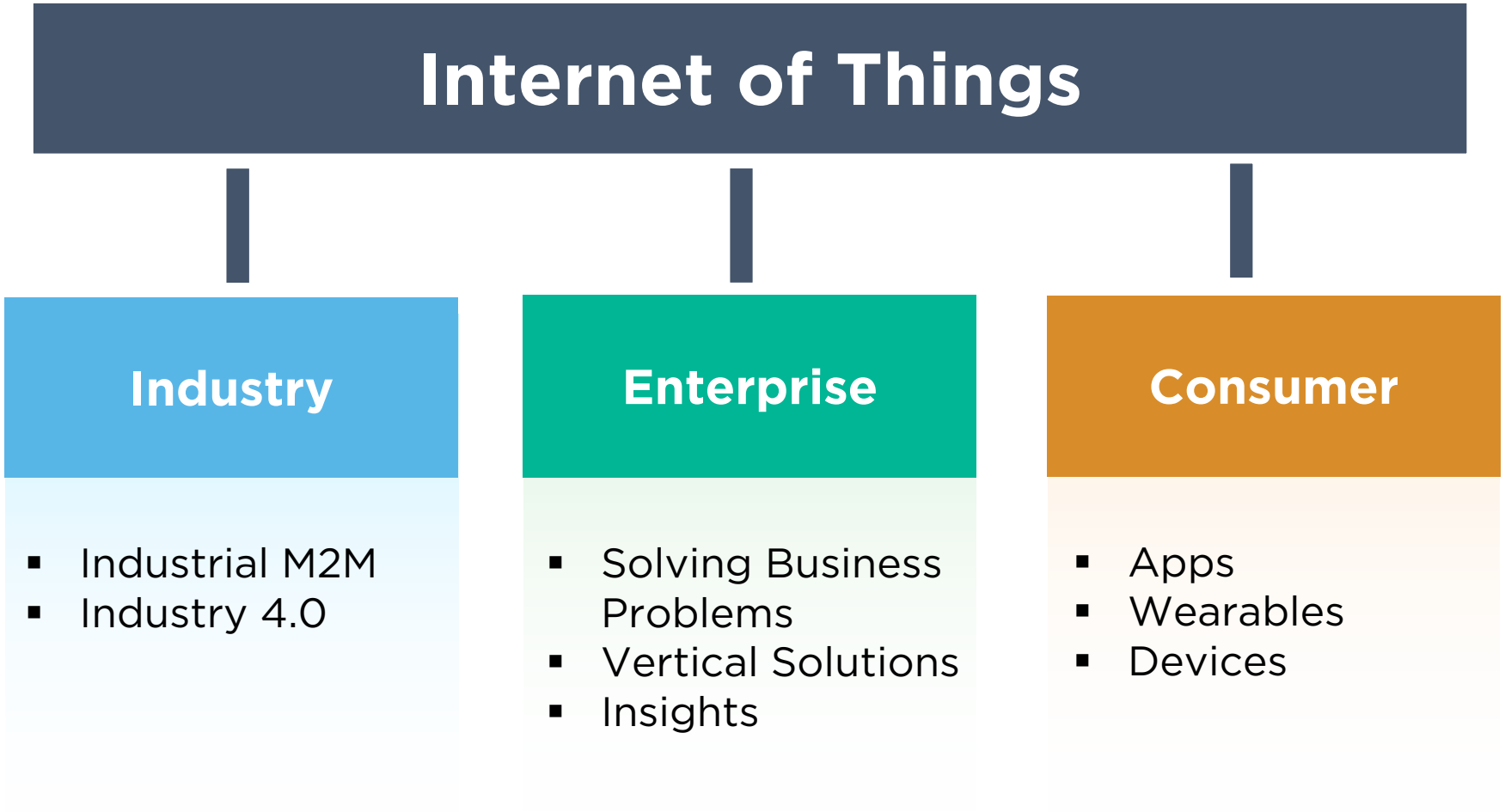
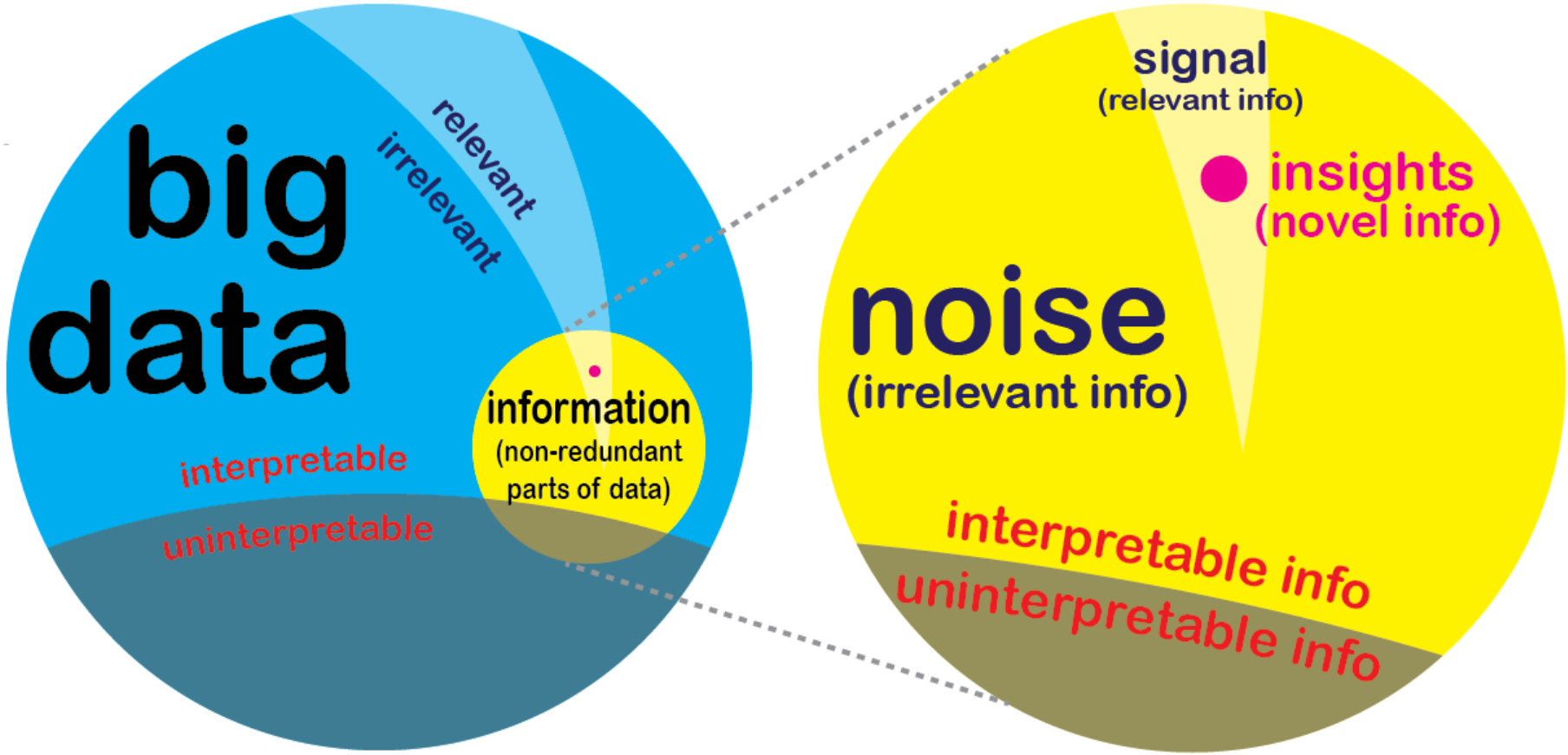
- SP team tech lead
- Consultant
- Instructor

- Areas of interest
  - Orchestration
  - SP SDN
  - IoT

IoT – Before we start



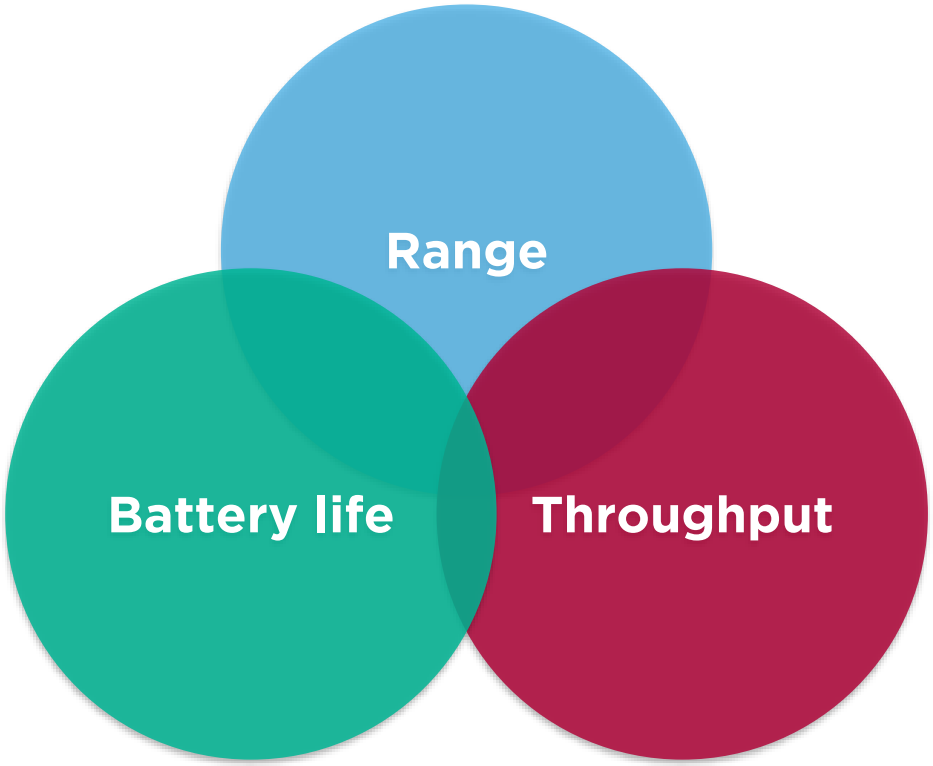
What are insights?



Access technology choice

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

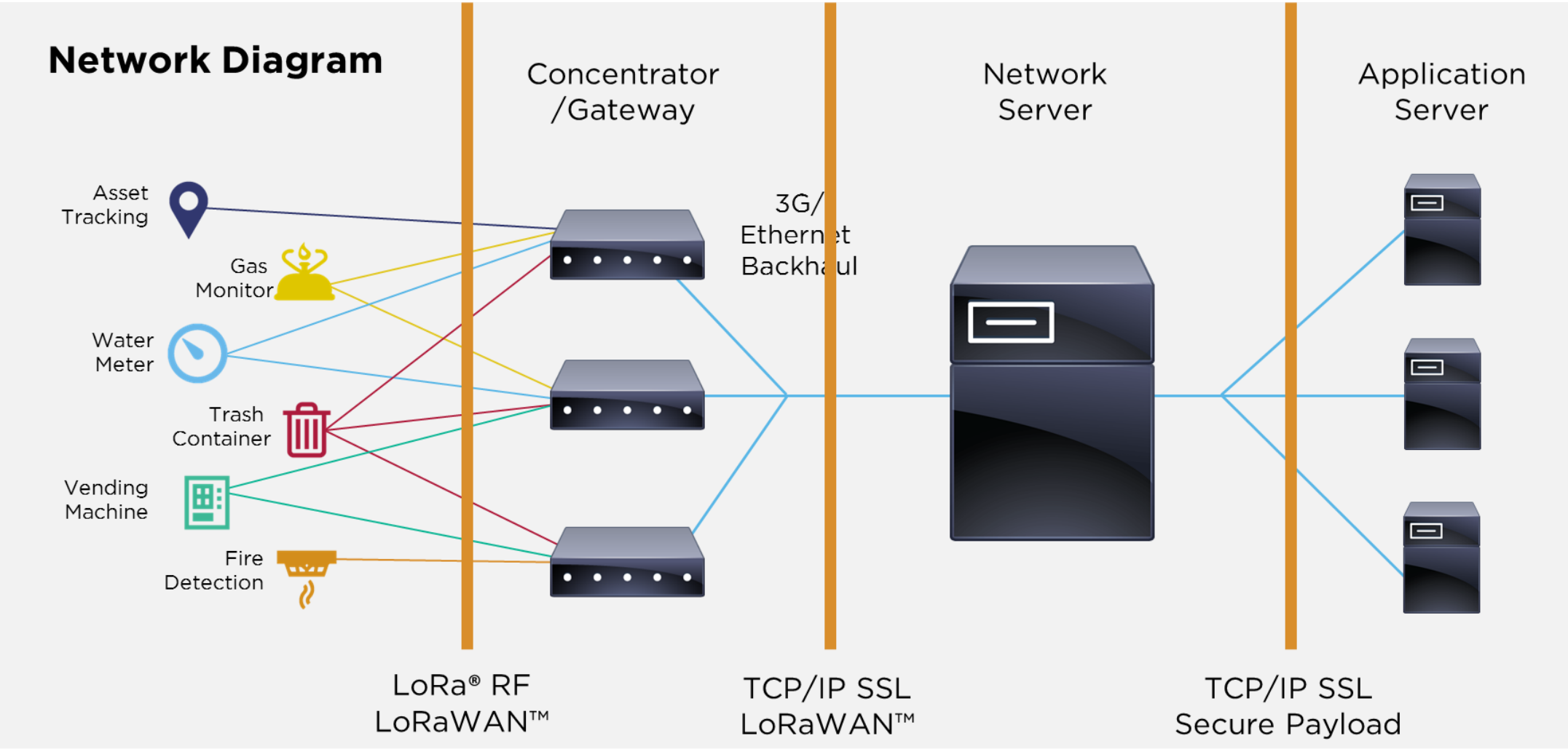
- Range
- Throughput
- Battery life
- Standard/License



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.

Enter LORAWAN



Slovenian utility - Responsibilities

- 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
  - …

Project goals

- **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

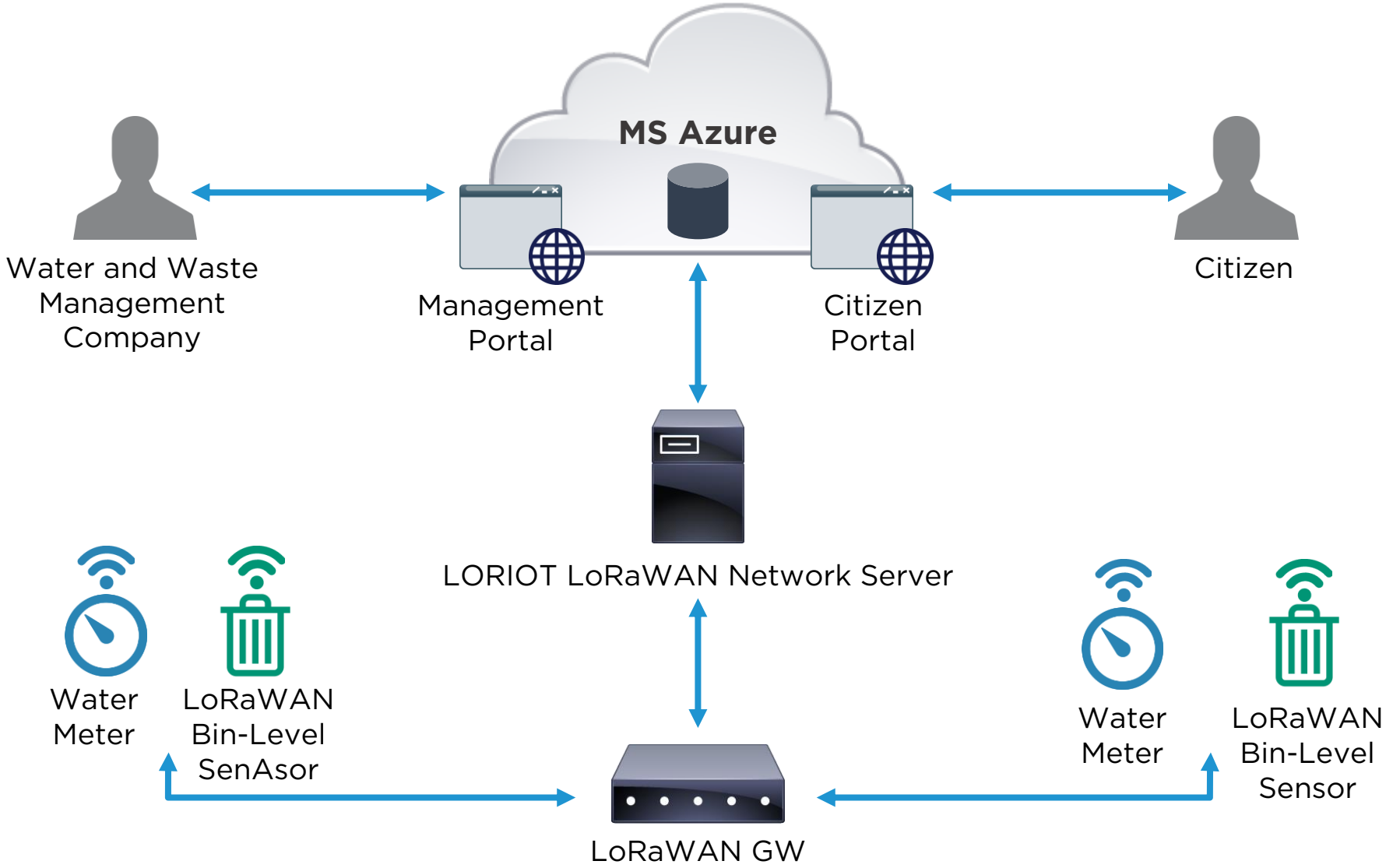
Water management

- **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 trough portal
    - Notifications

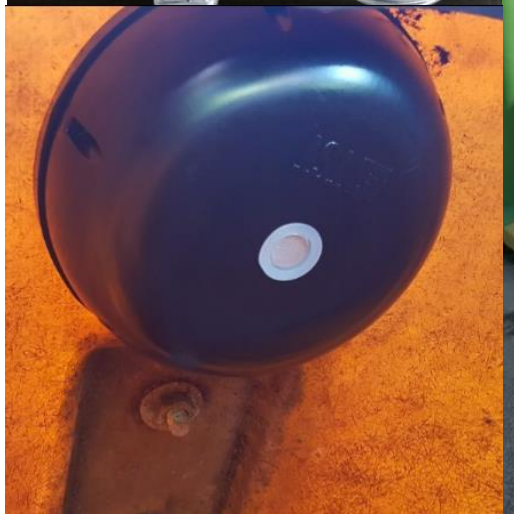
Waste management

- **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

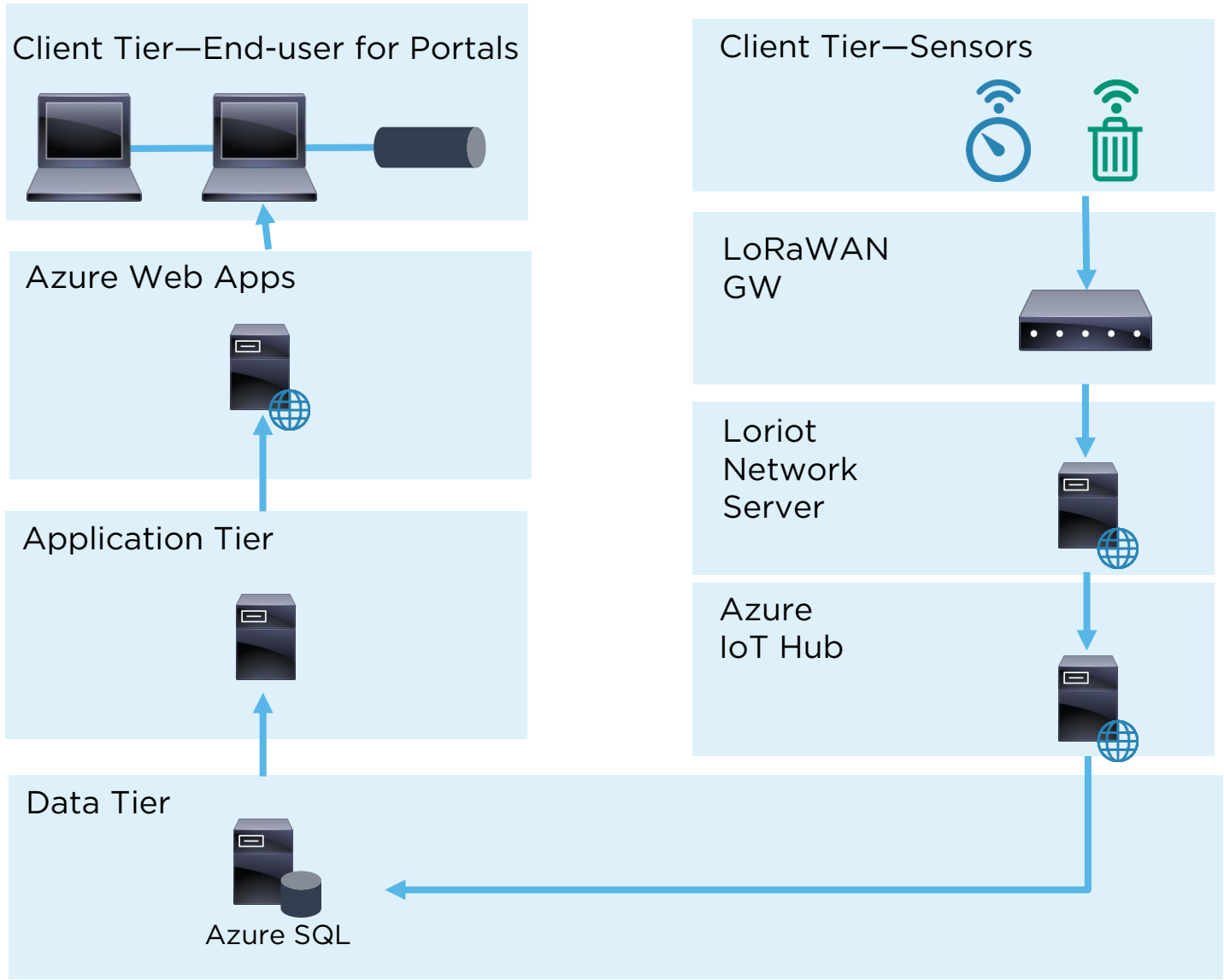
Solution



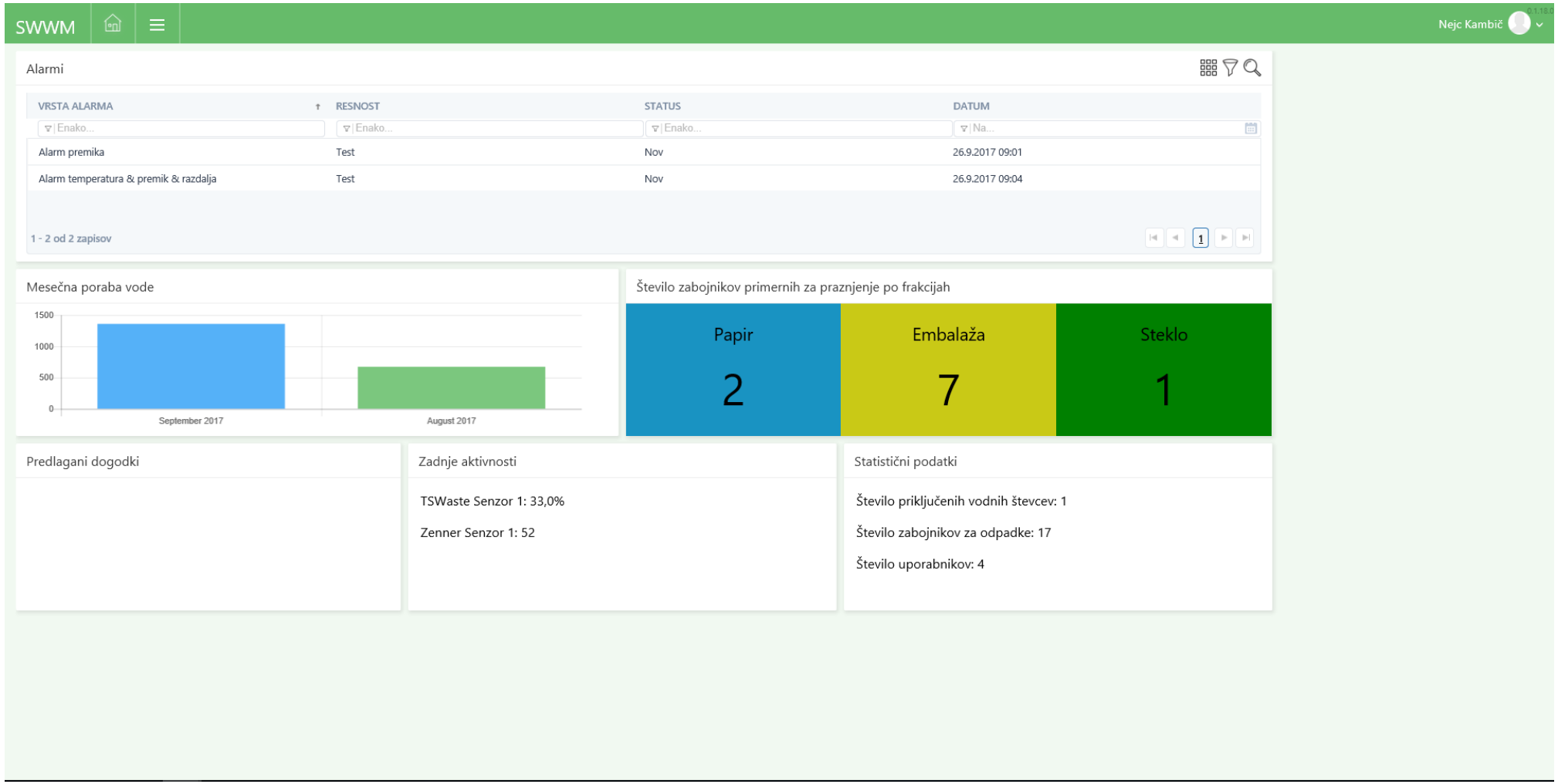
Sensors



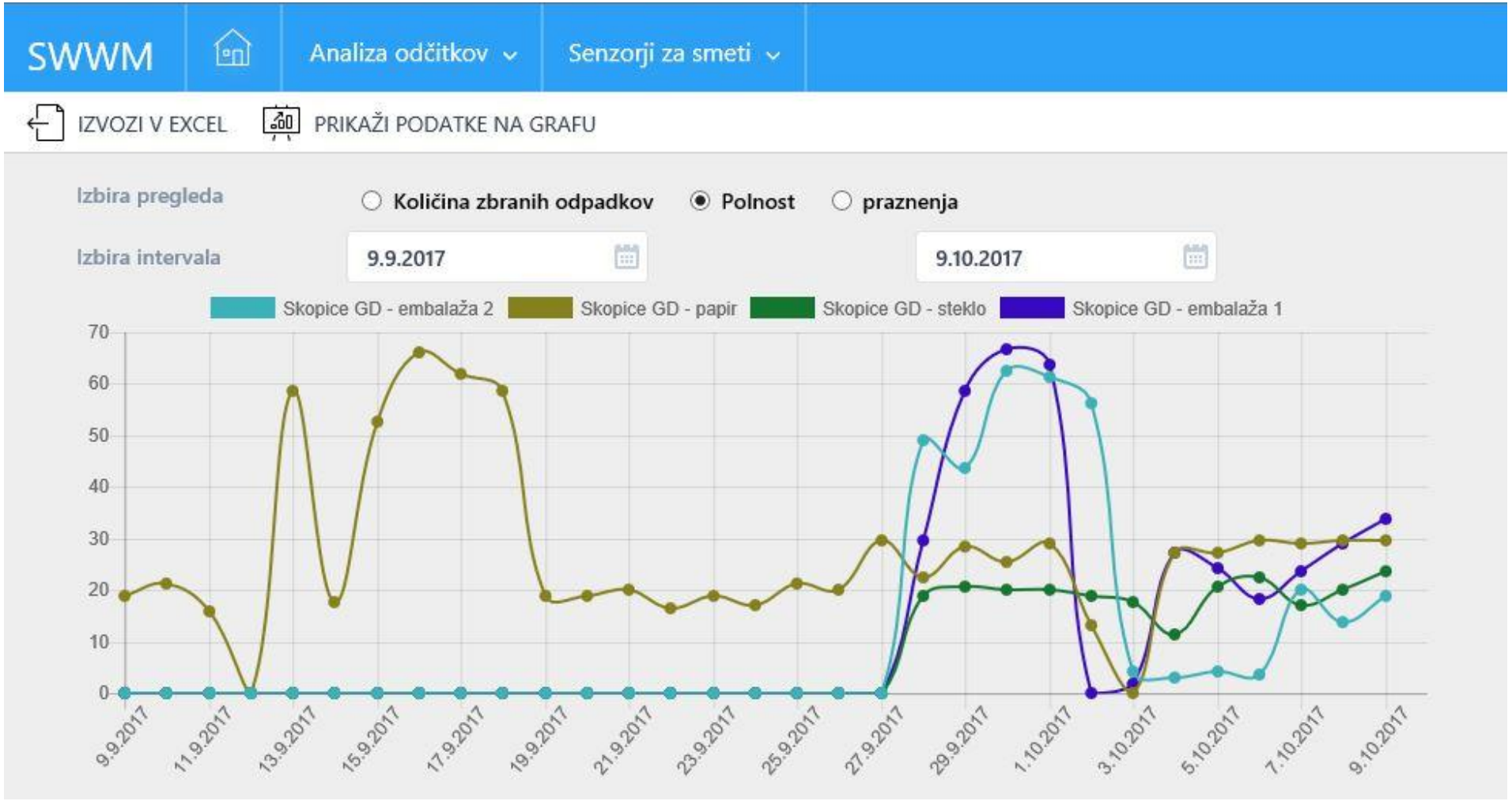
Infrastructure – Using the cloud



Application - Dashboard



Applications – Container level



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