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Meter and AMI Options

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Agenda:

- Water Meter Types
  - Mechanical vs. Solid State
- Variables to compare
- AMI Options:
  - Licensed
  - Unlicensed
  - LoRaWAN
  - Cellular
- Water Distribution Management Systems:
  - Additional Options to Add to AMI

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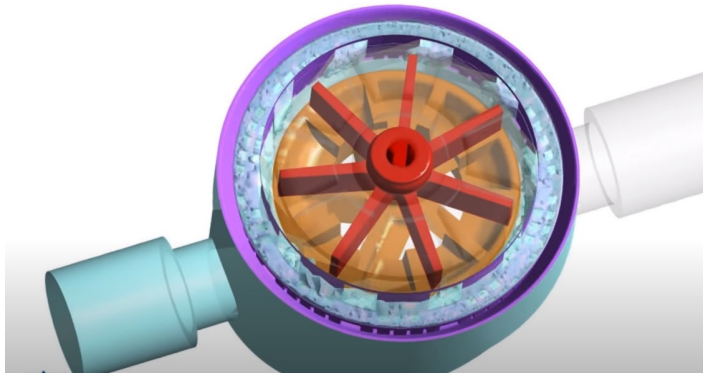
Water Meter Types

Mechanical Meter Technologies



- Nutating Disc
- Oscillating Piston
- Single/Multi Jet

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Mechanical Meter Types

- Nutating Disc

- Oscillating Piston

- Single/Multi Jet

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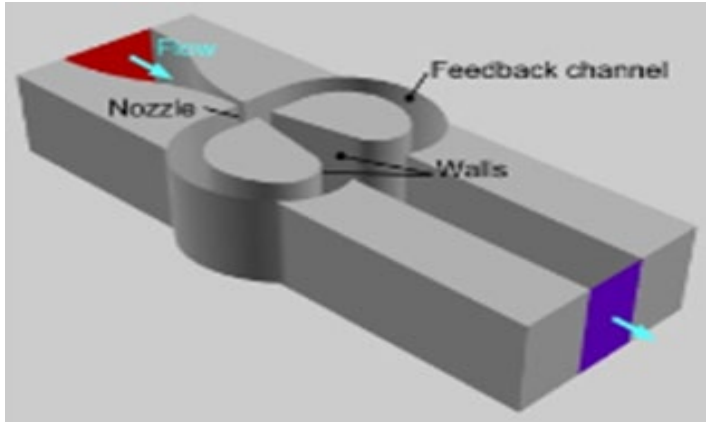
Meters: Positive Displacement vs Solid State

- Ultrasonic Time Transfer

- Electromagnetic

- Fluidic Oscillator



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Meters: Positive Displacement vs Solid State

- Ultrasonic Time Transfer

- Electromagnetic

- Fluidic Oscillator

Which Meter is right for you?

Meters

- Q: Do you have mostly meter setters or straight pipe?

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Meters

- Q: Do your meter pits fill with water?

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Meters

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Meters

- Q: What meter box lids do you have?

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Meters: Mechanical or Solid State?

Q: Do you have a lot of sediment or hard water?

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Q: Is the Low Normal Operating Flow range important to your utility?

Nutating Disc:	.5 GPM	Single Jet:	.125 GPM
Oscillating Piston:	1 GPM	Multi Jet:	1 GPM
Ultrasonic:	.1 GPM	Fluidic Oscillator:	1 GPM
Electromagnetic:	.18 GPM		

Q: Is the High Normal Operating Flow range important to your utility?

Meters: Mechanical or Solid State?

Q: Do you have a plan for meter end of life?

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Meters: Mechanical or Solid State?

Q: How do you plan to read your meters?

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Meters: Mechanical or Solid State?

Q: What type of technology are your utility workers and Customer Service personnel comfortable with?

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Why did you choose your water meter type?

Meter Wrap Up

You have options

There is no one right meter technology that is right for all utilities.

Determine what technology is right for your utility. Control your Spec!

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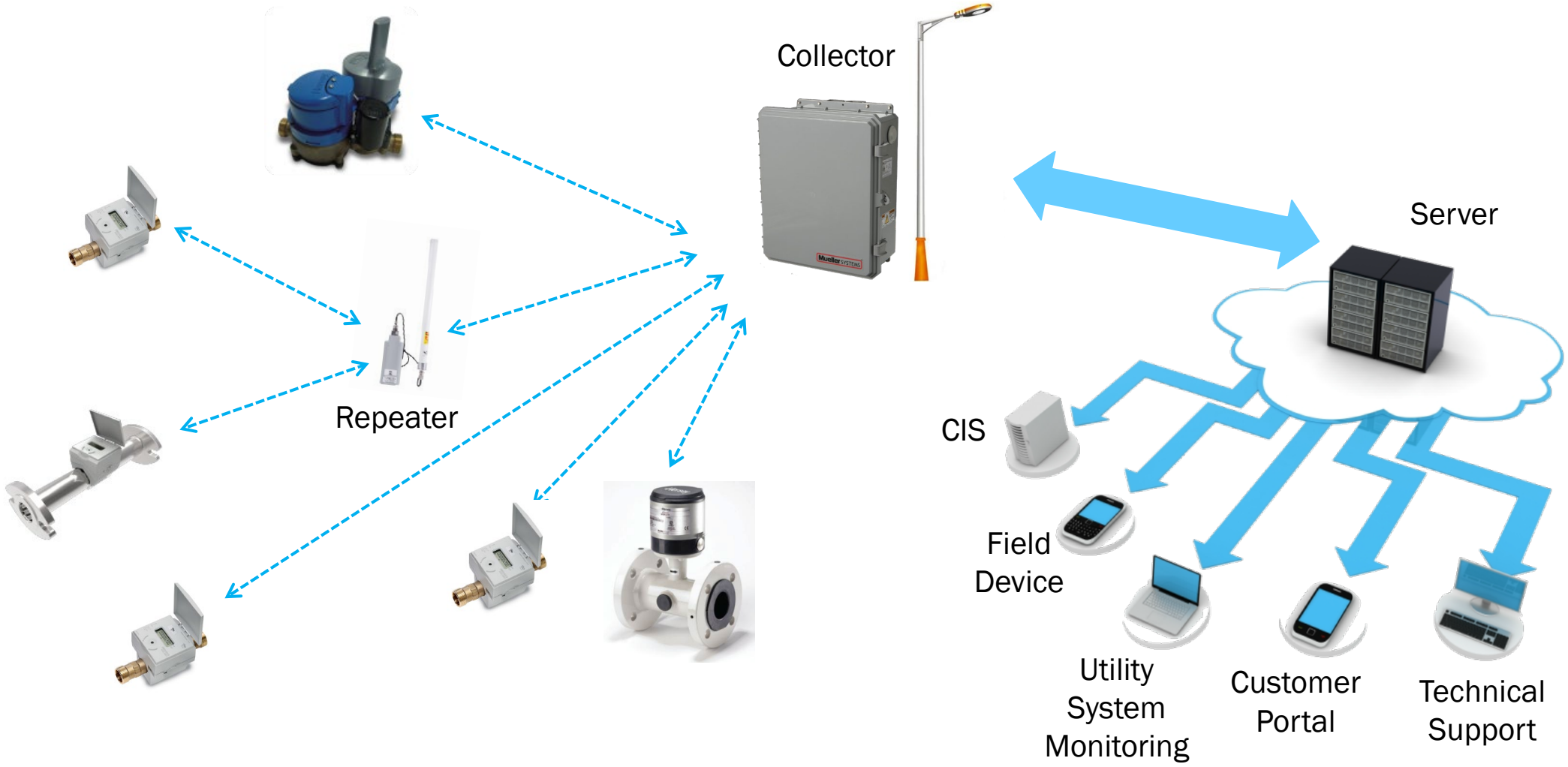
AMI

Advanced Metering Infrastructure

AMI


Collector
Server
Repeater
CIS
Field Device
Utility System Monitoring
Customer Portal
Technical Support

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Variables to Compare

- Network Design
- Saas: Software as a Service
  - Utility owns the Hardware
  - Software is hosted, utility pays a subscription fee
- NaaS: Network as a Service
  - Third Party owns the Hardware/Network
  - Utility pays a subscription fee for Hardware/Network
  - Software is hosted, utility pays a subscription fee
- Proprietary Network
  - Communication Protocol is proprietary to one manufacturer
- Open Network
  - Communication Protocol is open to any manufacturers
- Market Maturity

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Variables to Compare (continued)

- Percent Coverage with AMI
- How do you reach 100% Reads?
- Coverage Mitigation
  - What can the manufacturer/utility do to increase poor coverage
- Installation
  - In regard to meter box lids
- Latency
  - The speed to communicate with the meter/register and perform and on demand read
  - The speed to perform a remote disconnect/reconnect
- Published Expected Battery Life
- Upfront Costs
- Relative MIU cost
  - Meter Interface Unit
  - Radio/Node/MXU/etc

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Why implement an AMI System?

Why implement an AMI System?

- Water Distribution Management System
  - Ability to overlap technologies to better manage your water distribution network
  - 1+1 = 3.
- ~0 hours spent to read all water meters
- Labor Savings
  - Re-reads
  - Billing Disputes and gathering customer hourly consumption data
  - Move In, Move Out
  - Final Reads
  - Disconnect/Reconnect
- Daily Alerts
- Customer Portal
  - Ability to empower the customer with their own usage Data
  - Reduces burden on Utility Billing Customer Service

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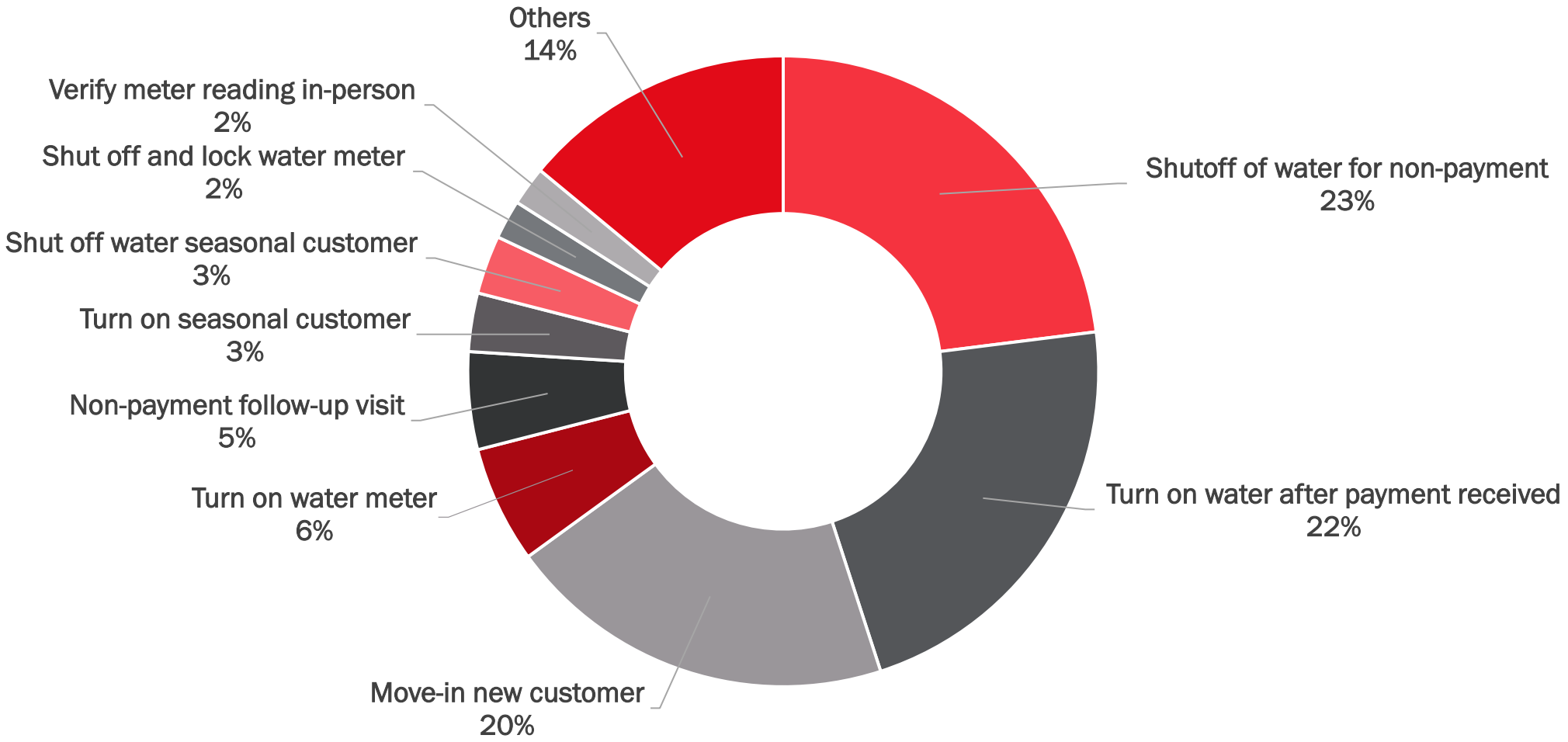
Example of Utility Work Orders



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AMI: Opportunity to complete Other Tasks

WHAT OTHER TASKS COULD YOU BE DOING?

- Hydrant Repairs/Replace
- Main Line Leak Detection
- Valve Exercising
- Water Quality Testing / Dead End flushing
- Water Plant Maintenance
- Training
- Joint Utilities
  - Sewer Flushing
  - Lawn Mowing
  - Park Maintenance
  - Holiday Decorations
  - Street Sweeping
  - Leaf Pickup

WHAT IS THE POTENTIAL OPPORTUNITY?

- Increase System reliability
- Decrease water loss percentage
- Decrease customer complaints
- Safer, Smarter, staff
- There is always more to do!
  - Reduced sewer backup payouts
  - Cleaner, safer, happier community

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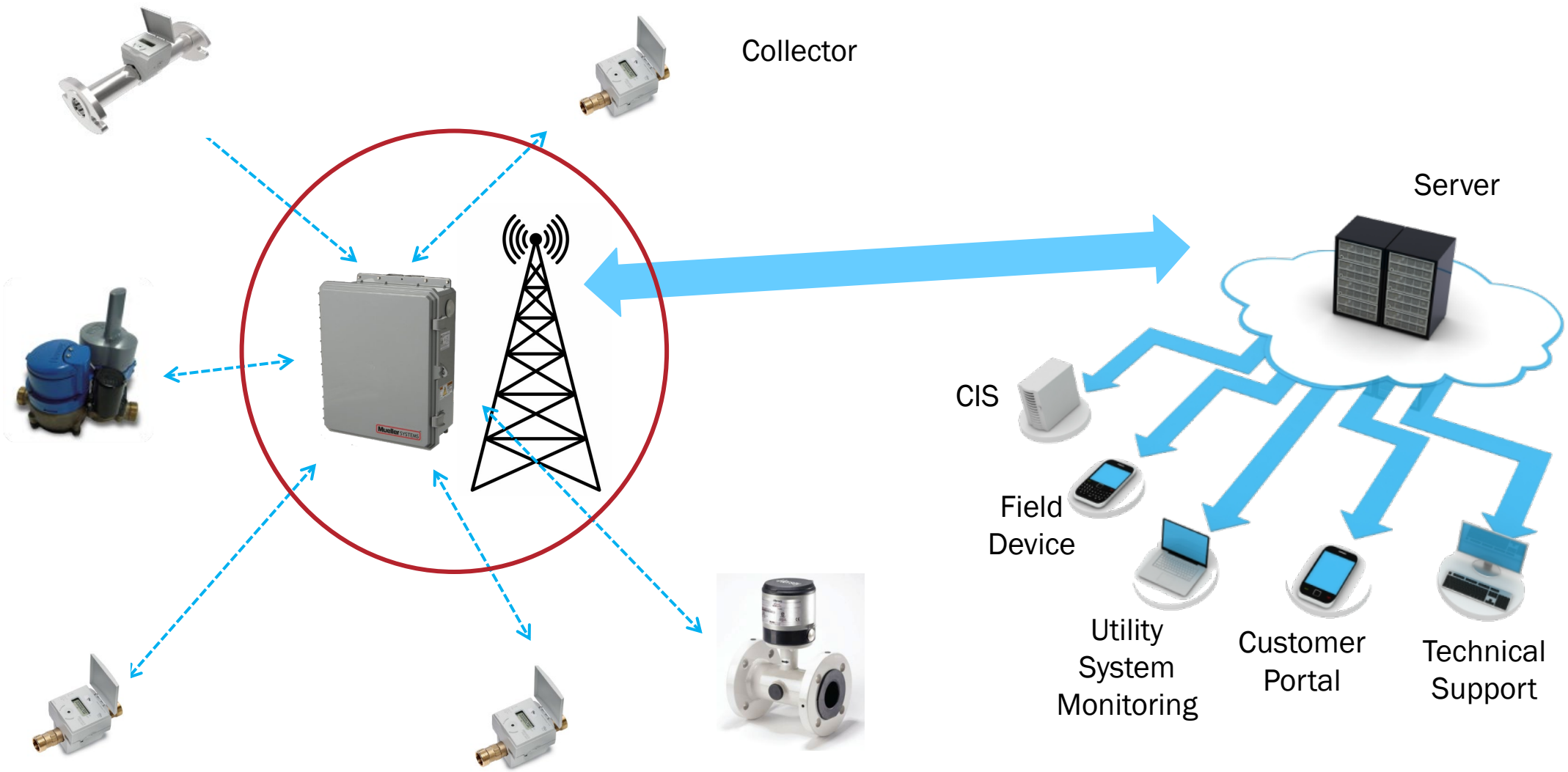
Licensed AMI

Network Design: Star



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Licensed AMI

- Network: Proprietary
- SaaS or NaaS
- Market Maturity: Very mature
- Percent Coverage:
  - Manufacture A:95%+
  - Manufacture B: 100%
- 100% Reads Through:
  - Manufacturer A: AMI+ AMR
  - Manufacturer B: DC Repeaters
- Coverage Mitigation: Additional Towers/Gateways/Repeaters
- Installation: Through the Lid (Any material), or Integral to the Meter

- Latency: Seconds/Minutes
- Expected Battery Life: 20 Years
- Relative Upfront Costs: High - Average
- Relative MIU Costs: Average

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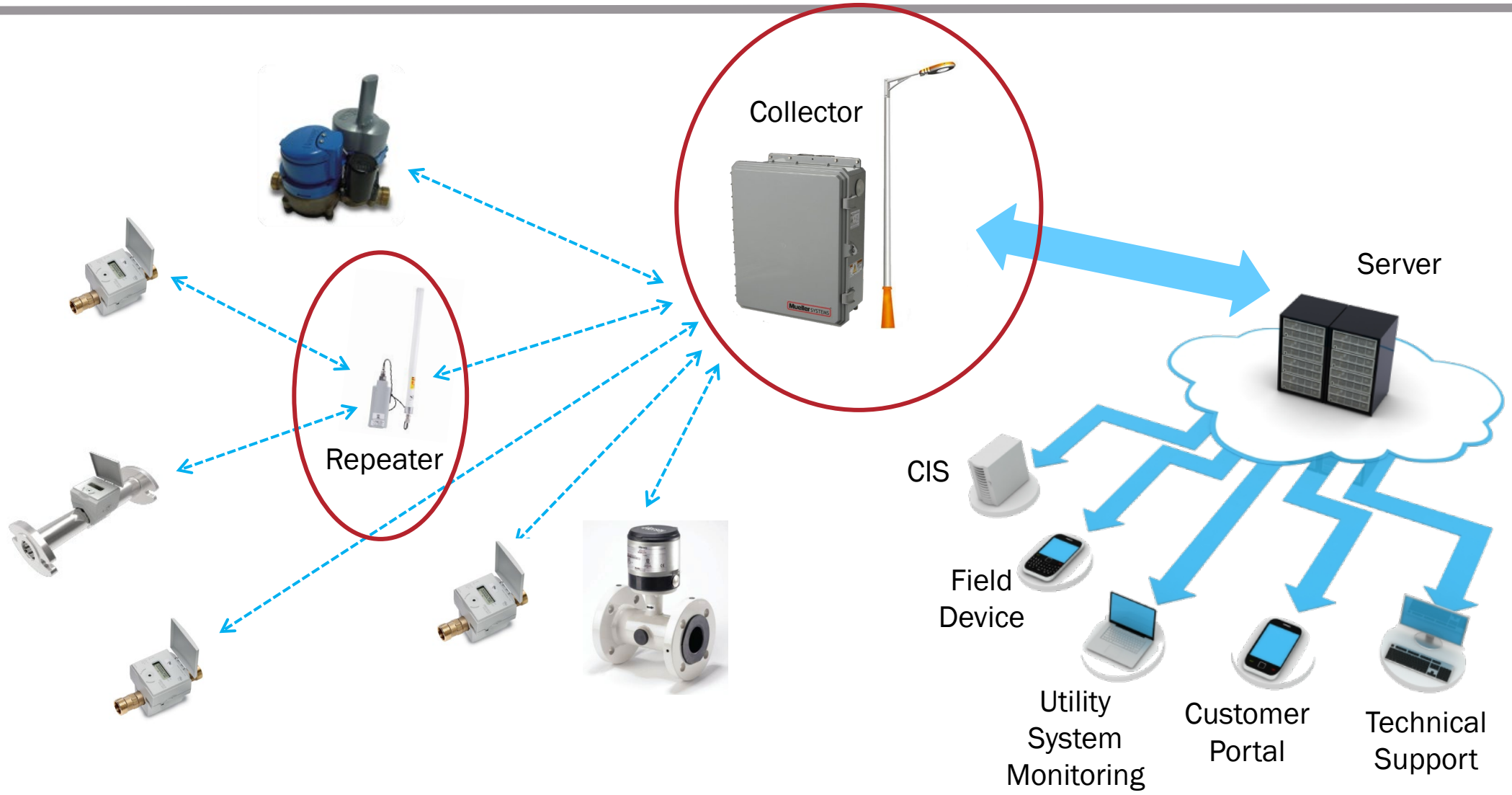
Un-Licensed LoRa AMI

Network Design: Modified Star



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Un-Licensed AMI

- Network: Proprietary
- SaaS
- Market Maturity: Mature
- Percent Coverage:
  - Manufacturer A: 100%
  - Manufacturer B: 95%+
- 100% Reads Through:
  - Manufacturer A: Repeaters
  - Manufacturer B: AMI+AMR
- Coverage Mitigation:
  - Manufacturer A: Additional Repeaters
  - Manufacturer B: AMR
- Installation: Through the Lid (Any material)

- Latency: as low as 18 Seconds
- Expected Battery Life: 20 Years
- Relative Upfront Costs: Average
- Relative MIU Costs: Average

LoRaWAN

LoRaWAN™

LoRaWAN is an Third Party Network for wirelessly connected, battery operated, LoRa, IoT devices with bi-directional communications.

Like Direct TV coverage, but designed for long term, battery powered devices.

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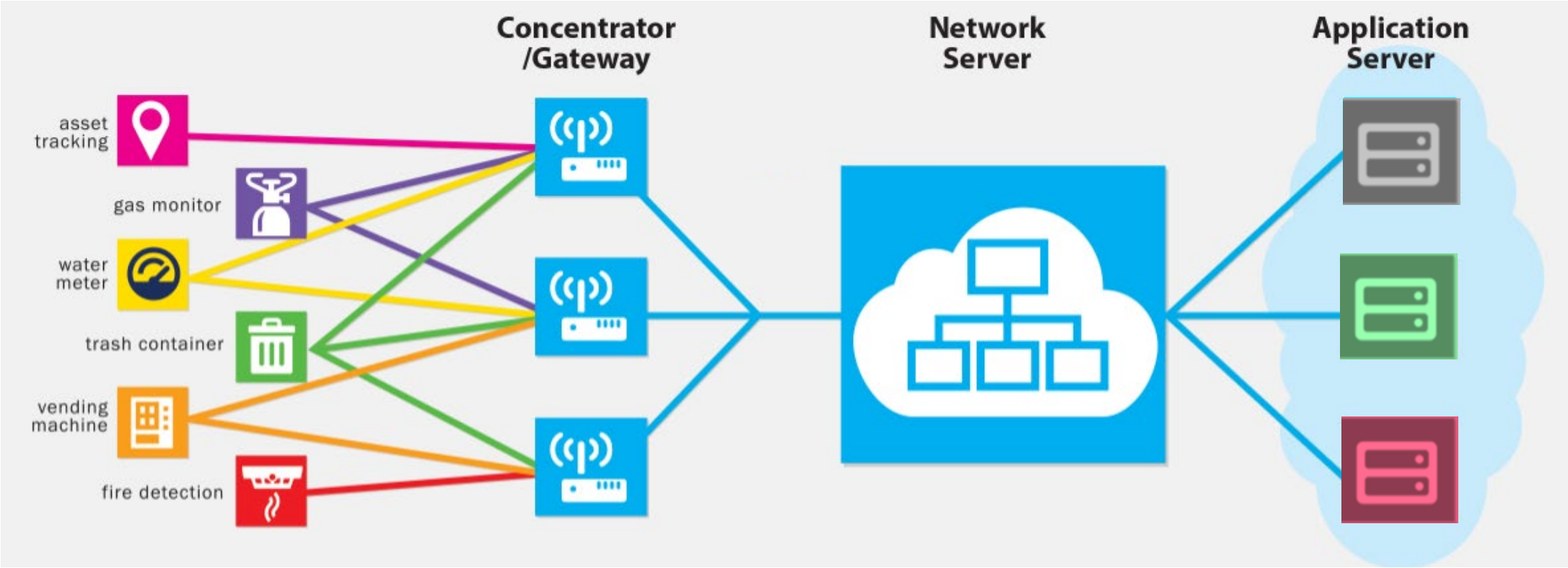
Network as a Service (NaaS)



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Smarty City: The LoRa Alliance Ecosystem

Street Lights, Traffic Lights, Electric, Gas, Parking Meters, Tank levels, pressure monitoring, etc… over 500 companies.

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LoRAWAN – What it means to you?

Cities/ Municipalities

- Infrastructure
  - Parking meters
  - Park Stadium lights
  - Streetlights
  - Traffic Signals
  - Manhole Covers
  - Gate locks

Water Utilities

- Infrastructure
  - Tank levels
  - Pressure devices
  - Scada Data
  - Valve Covers
  - Gate Locks
  - Facility Management
  - Customer Meter Management

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LoRaWAN AMI

- Network: Open
- NaaS
- Market Maturity: Radios are Mature, Network Coverage is new
- Percent Coverage: 95%+
- 100% Reads Through: AMI + Cellular AMI or AMI+AMR
- Coverage Mitigation: Cellular or AMR
- Installation: Through the Lid (Any Material)
- Latency:
  - Class A: Scheduled every 4 hours
  - Class B: Under 120 Seconds
- Expected Battery Life: 20 Years
- Relative Upfront Costs: **Minimal**
- Relative MIU Costs: Average

LoRaWAN™

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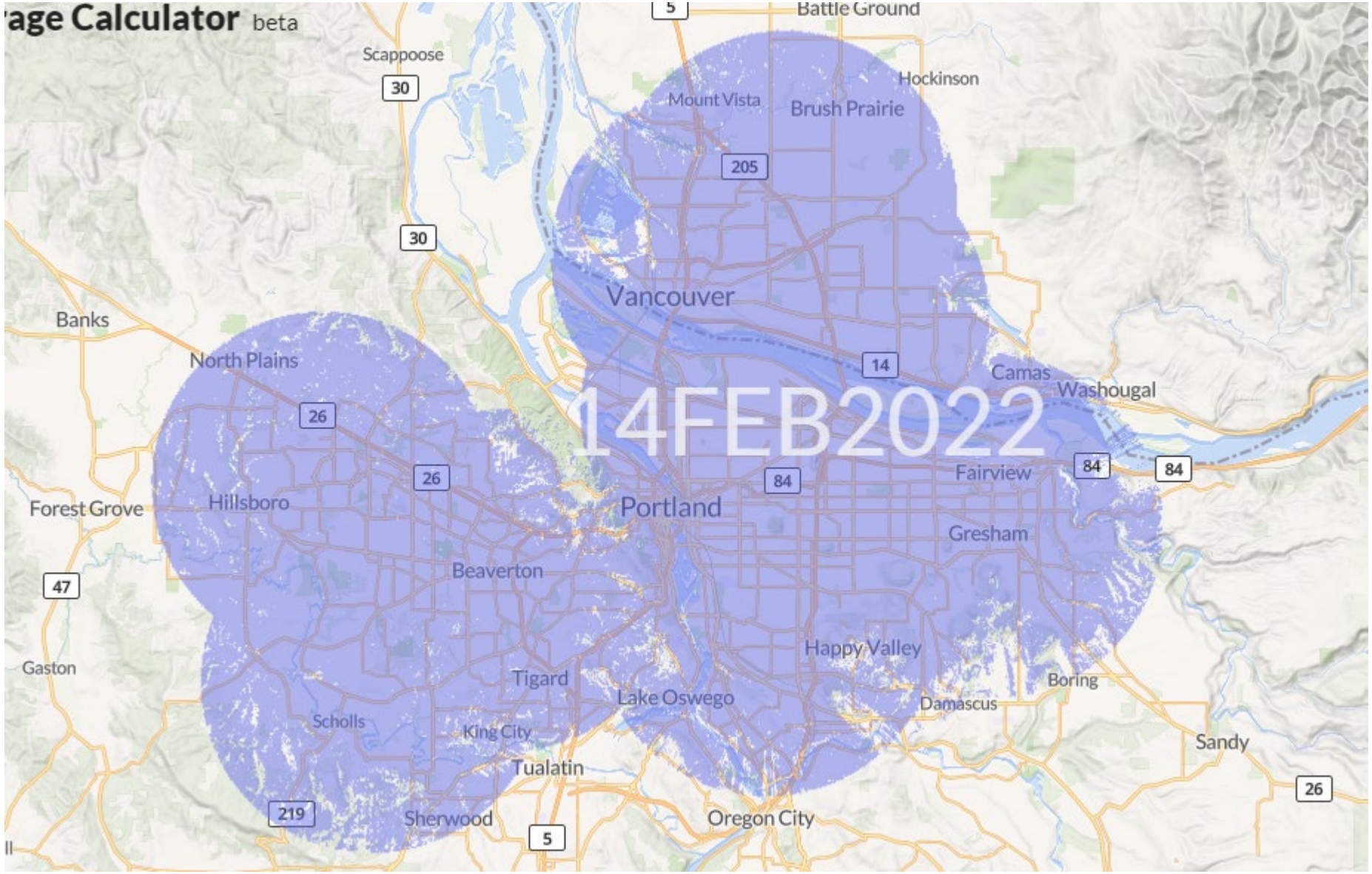
Current Coverage



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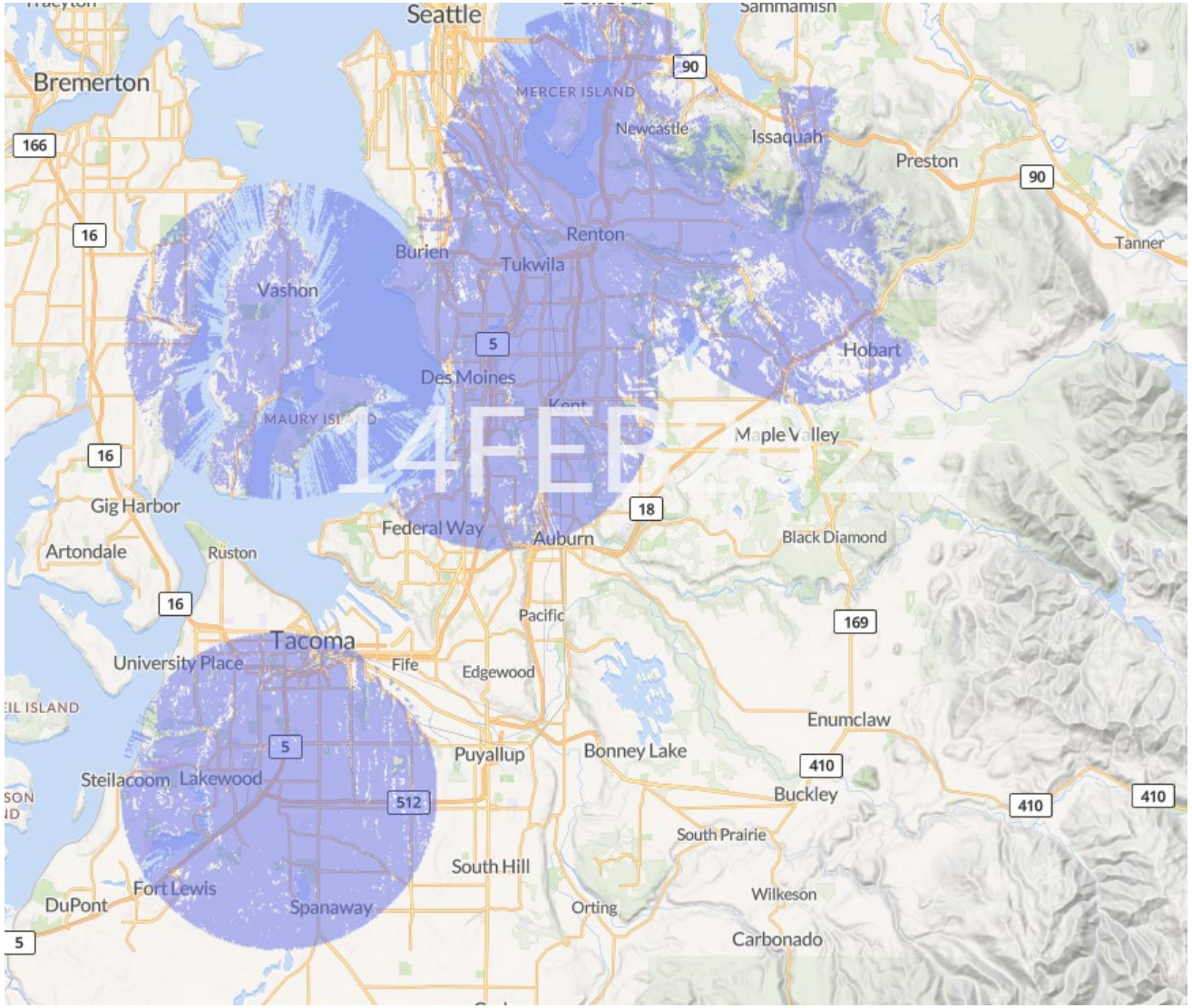
Current Coverage



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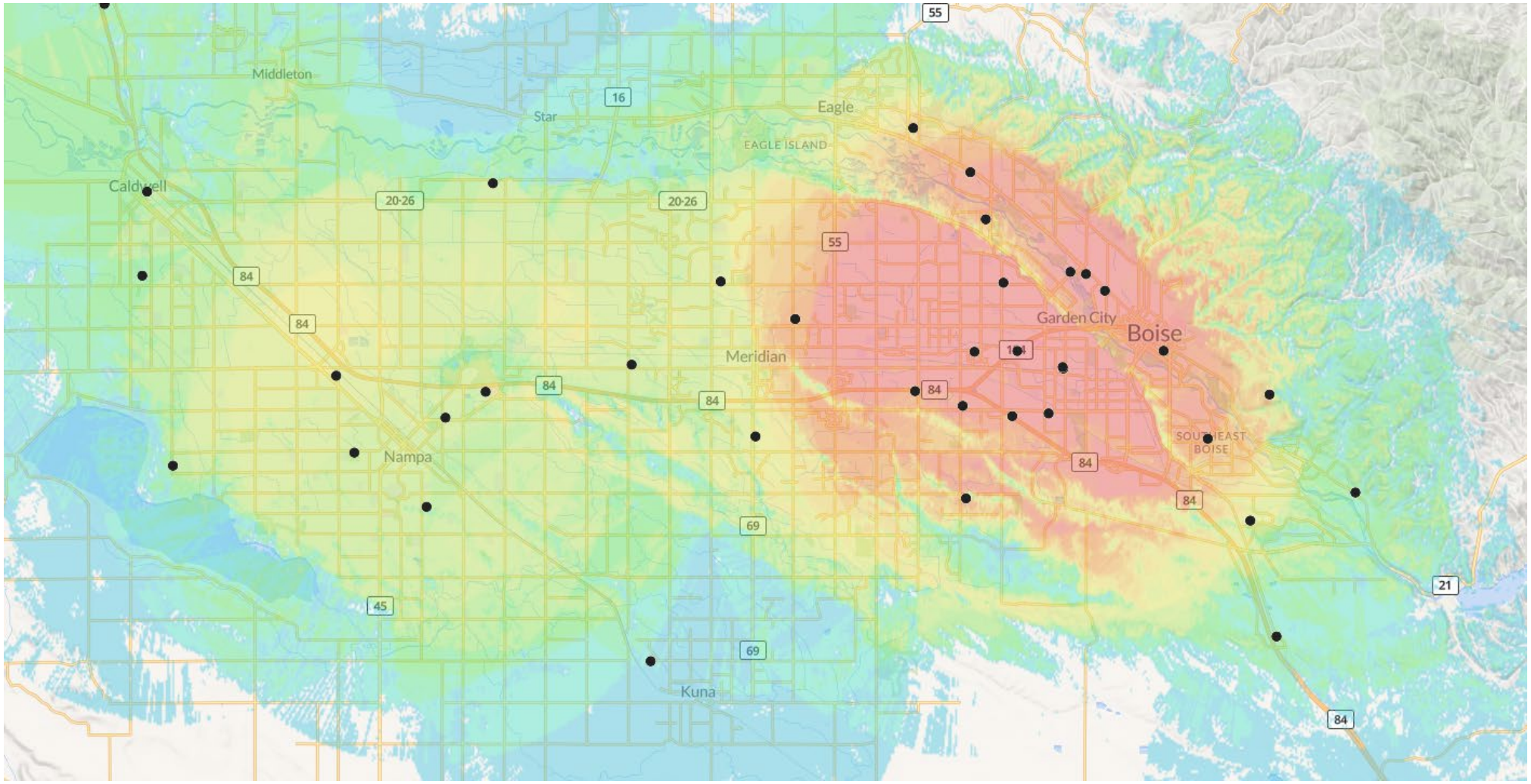
Available Towers



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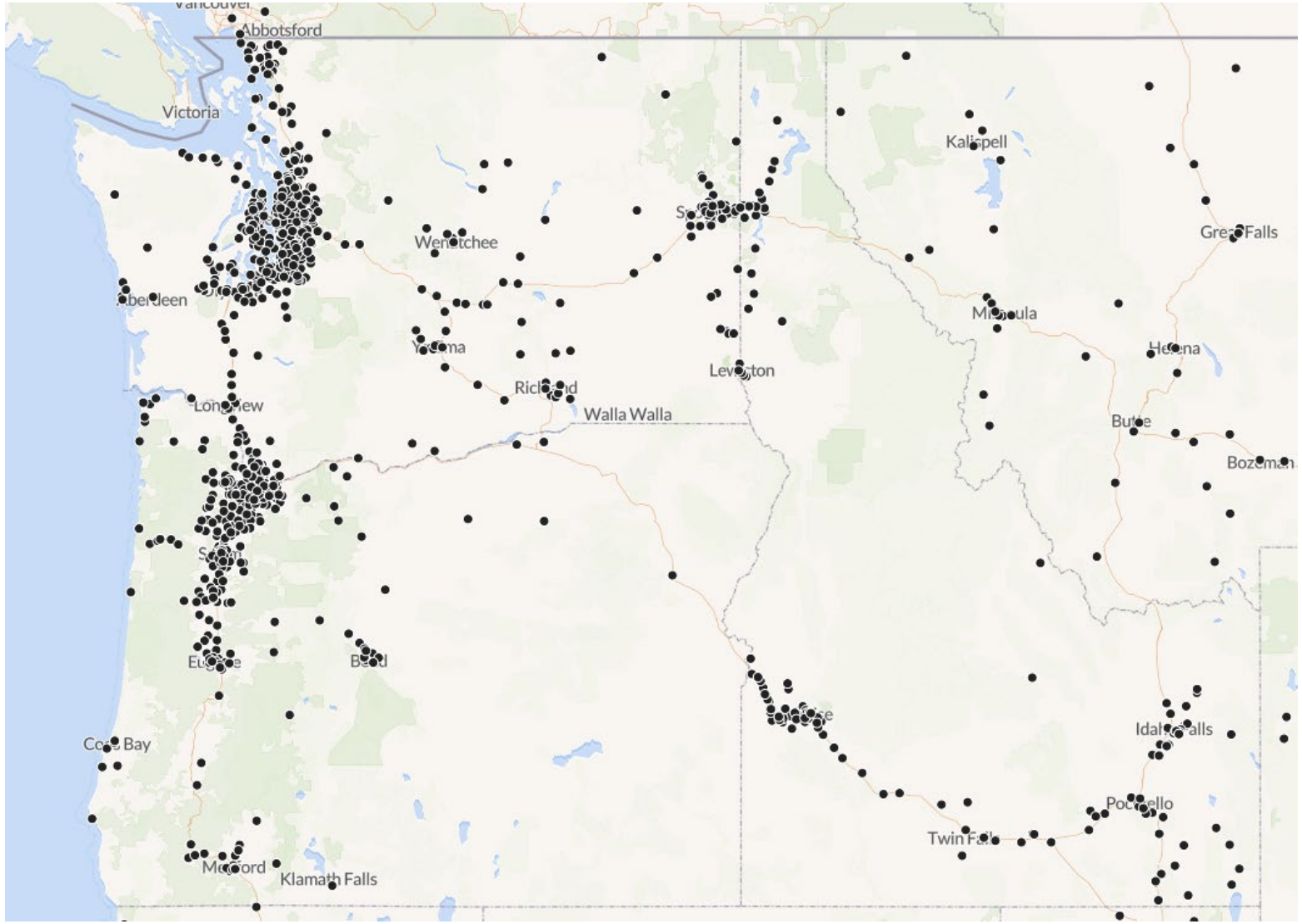
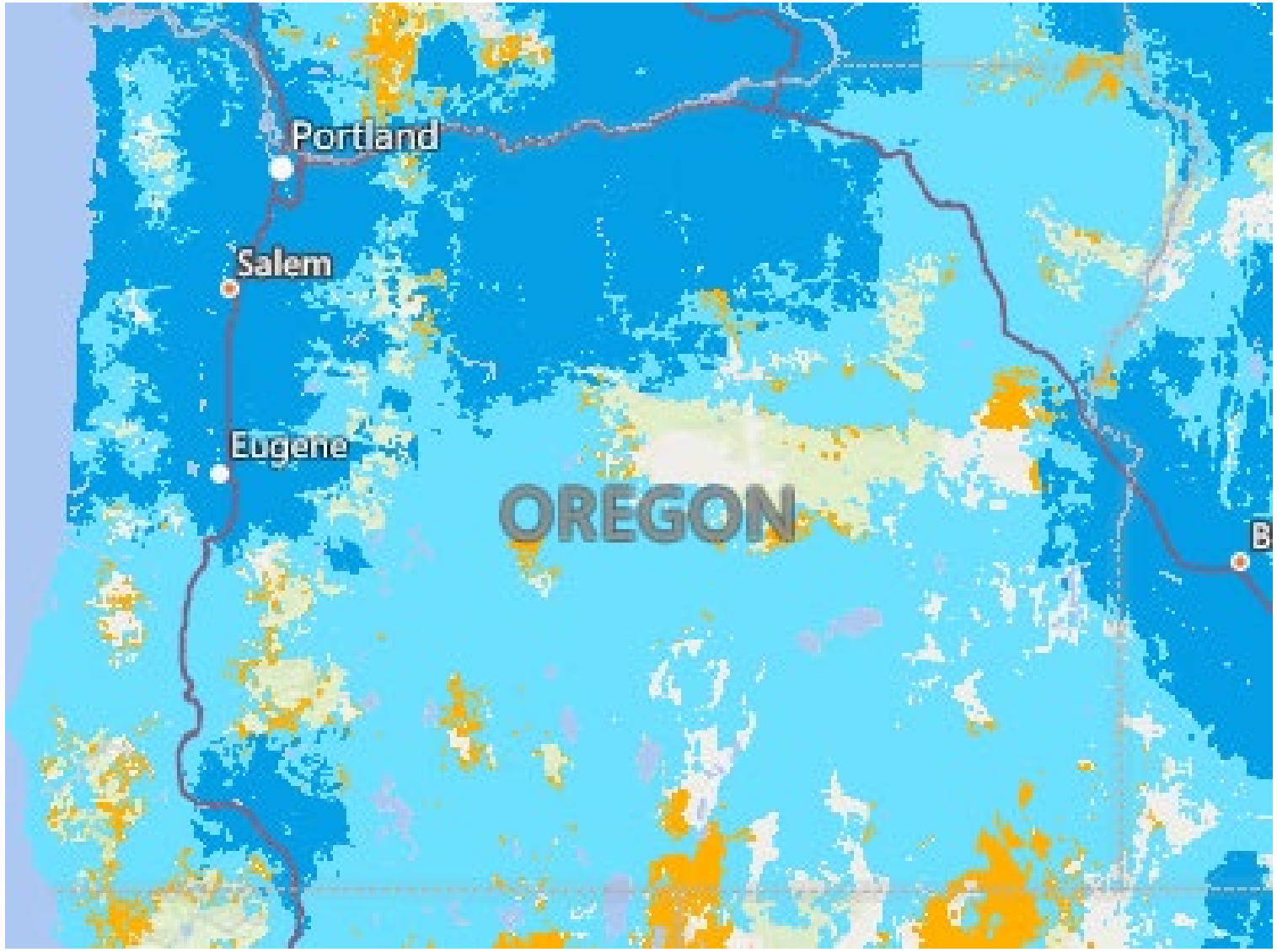
Available Towers

LoraWAN providers WILL install Collectors on City Owned Infrastructure if needed/allowed



Cellular AMI

Network Design: 3rd party



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Cellular AMI

- Network: Open
- NaaS
- Market Maturity: Radios Relatively New, Network Coverage is mature
- Percent Coverage: 95%+
- 100% Reads Through: Radio w/AMR Back Up
- Coverage Mitigation: Difficult to Mitigate, Reliant on Cell Carriers
- Installation: Through the Lid, Must replace metal lids
- Latency: Pre-scheduled Communication Intervals
- Expected Battery Life: ?
- Relative Upfront Costs: **Minimal**
- Relative MXU Costs: High

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AMI Options

- You have lots of Options!
- SaaS or NaaS
- Different ways to get to 100%
- Differences in Latency and Expected Battery Life
- Newer Technologies have brought minimal upfront costs to the market

- Determine what technology is right for your utility. Control your Spec!

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Water Distribution Management System

Water Distribution Management System

Baseline

- The utility has spent significant money on new Meter and AMI Network.
- You receive consumption data on all customer meters in your utility

Future State

- Your non-revenue water is under 5%
- Labor hours are available for other value added tasks
- You can fix leaks before they become catastrophic
  - Spend less labor hours fixing leaks
- You can proactively manage your pressure / control valves
  - Extend asset life
- Reduce or eliminate water quality issues/complaints

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How do we manage distribution networks?

Utility Value	AMI Metering w/DMA	Acoustic Monitoring	Pressure Monitoring	Pressure Control	Water Quality & Smart Flushing	Condition Assessment
Increase customer Service	✓	✓	✓	✓	✓	✓
Decrease costs	✓	✓	✓	✓	✓	✓
Improve speed / quality of repair	✓	✓	✓	✗	✓	✗
Decrease real losses	✗	✓	✓	✓	✗	✗
Extend asset life	✗	✗	✗	✓	✗	✓
Decrease unavoidable losses	✗	✗	✗	✓	✗	✗
Decrease break rate	✗	✗	✗	✓	✗	✓
Find bursts	✗	✗	✓	✗	✗	✗
Find slow growing leaks	✗	✓	✗	✗	✗	✗
Increase revenue	✓	✗	✗	✗	✗	✗
Improve capital plans	✓	✗	✗	✗	✗	✓
Find household leaks	✓	✗	✗	✗	✗	✗
Decrease aparrent losses	✓	✗	✗	✗	✗	✗

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District Metering Areas (DMAs)

- Utilize the existing AMI Meters inside of a pressure zone
- Install a District Meter on all inlet/Outlets of that pressure zone
- AMI software will automatically determine Water Loss % in the DMA
  - Every hour of every day
- Leverage a district meters and AMI data to determine where $$ need to be spent to reduce water loss

Utility Value	AMI Metering w/DMA
Decrease aparrent losses	✓
Find household leaks	✓
Improve capital plans	✓
Increase revenue	✓
Decrease costs	✓
Improve speed / quality of repair	✓
Increase customer Service	✓
Find bursts	✗
Decrease break rate	✗
Decrease unavoidable losses	✗
Extend asset life	✗
Decrease real losses	✗
Find slow growing leaks	✗

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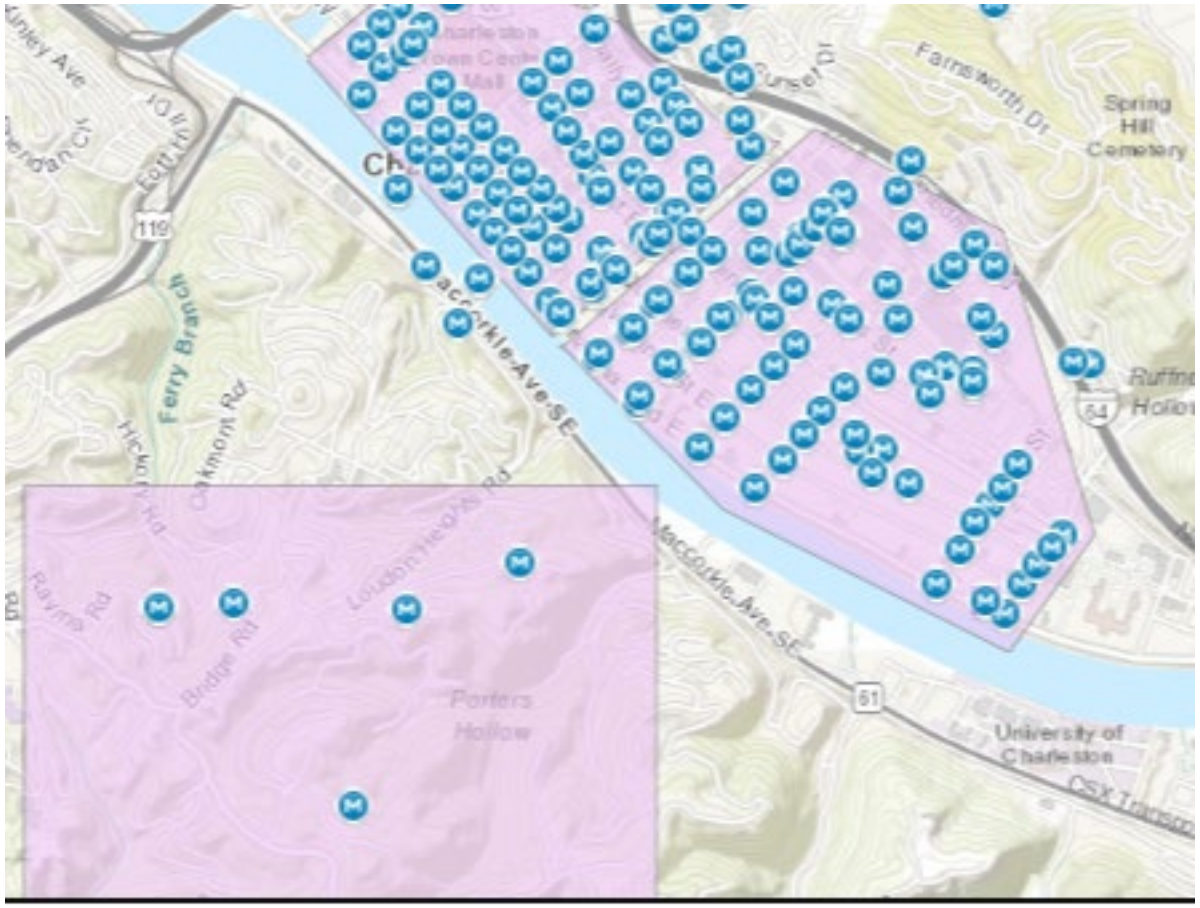
District Metering Areas (DMAs)



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Leak Detection

- Now, find the leaks and fix them.
- Continually monitor for when new leaks start
- Proactively fix leaks before they become large.
- Cast/Ductile/AC/Steel

Utility Value	Acoustic Monitoring
Increase customer Service	✓
Improve speed / quality of repair	✓
Find slow growing leaks	✓
Decrease real losses	✓
Decrease costs	✓
Increase revenue	✗
Improve capital plans	✗
Find household leaks	✗
Find bursts	✗
Extend asset life	✗
Decrease unavoidable losses	✗
Decrease break rate	✗
Decrease aparrent losses	✗

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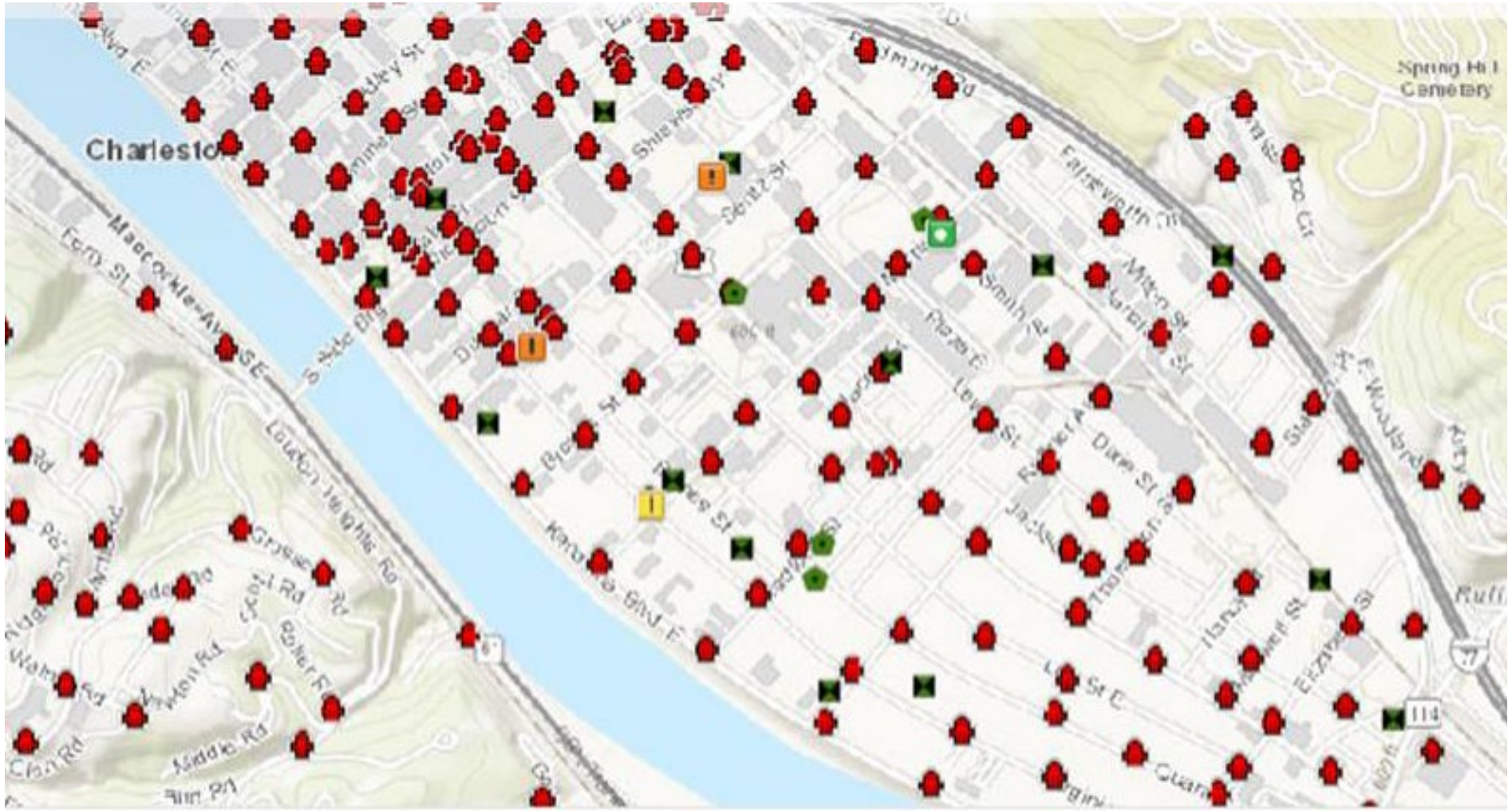
Leak Detection



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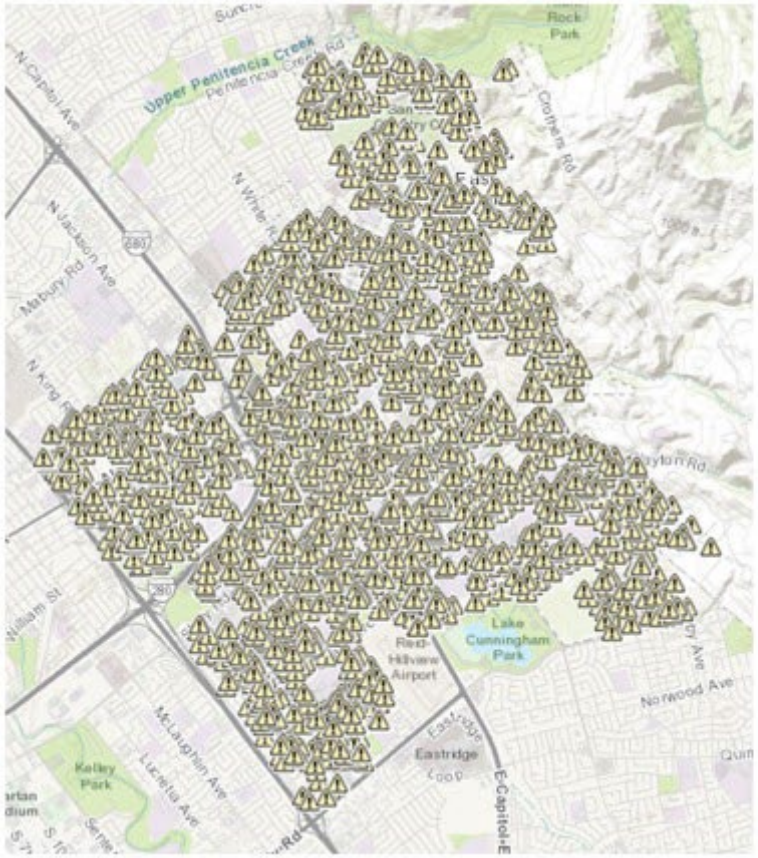
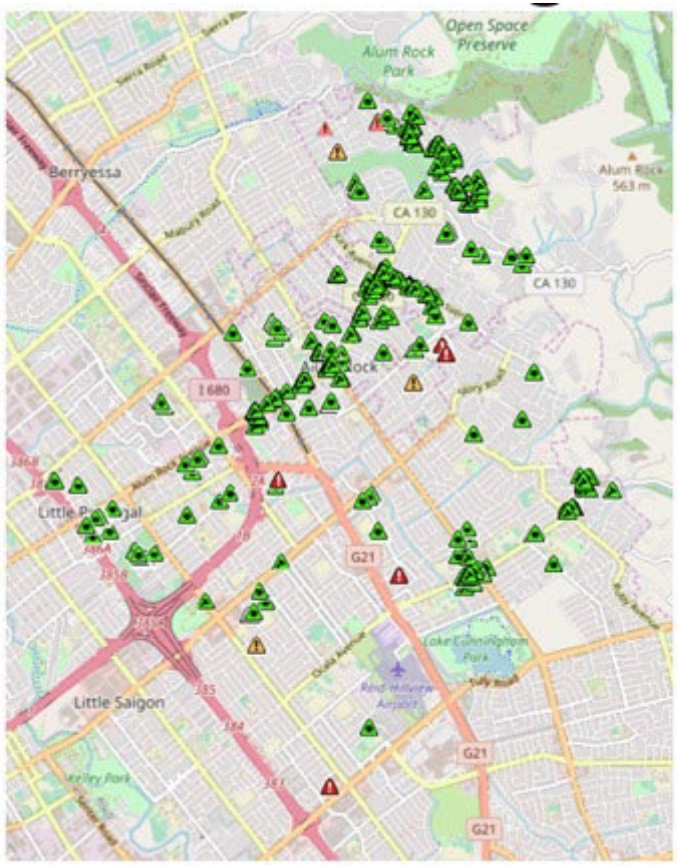
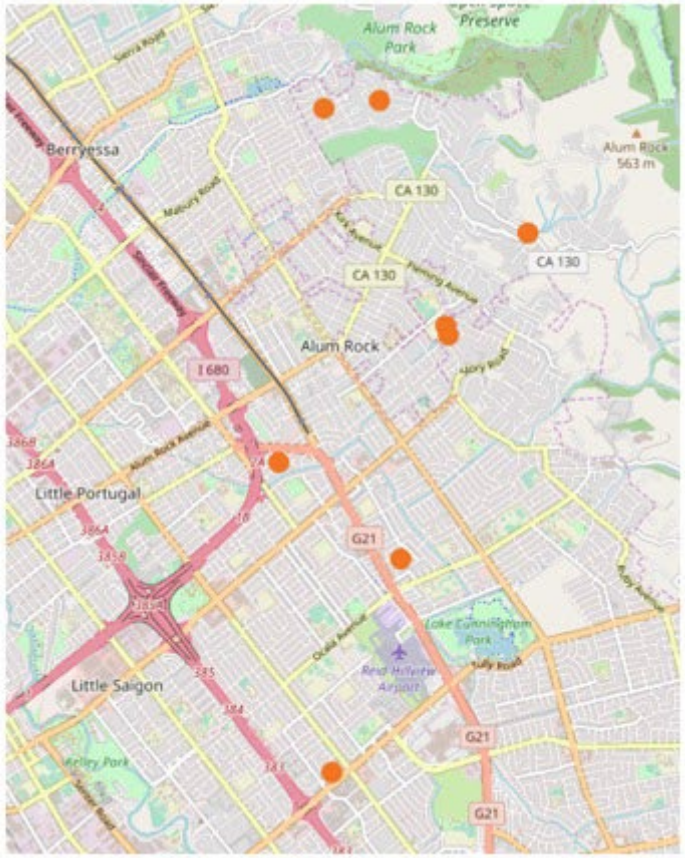
Leak Detection







Data
29, 297 Network Noises

Information
555 Persistent Noises

Insight
8 Investigations Recommended

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Leak Detection

Year	Value	Units
2015	135.25	Gal/Connection
2016	115.32	Gal/Connection
2017	89.36	Gal/Connection
2018	93.34	Gal/Connection
2019	74.63	Gal/Connection

Value	Units
$4.11	$/Connection/Month
$3.51	$/Connection/Month
$2.72	$/Connection/Month
$2.84	$/Connection/Month
$2.27	$/Connection/Month

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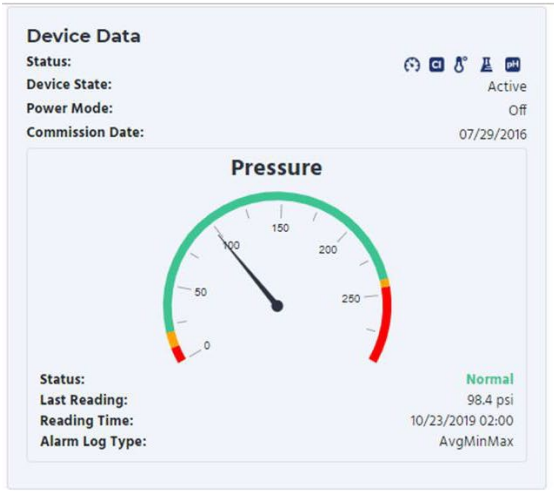
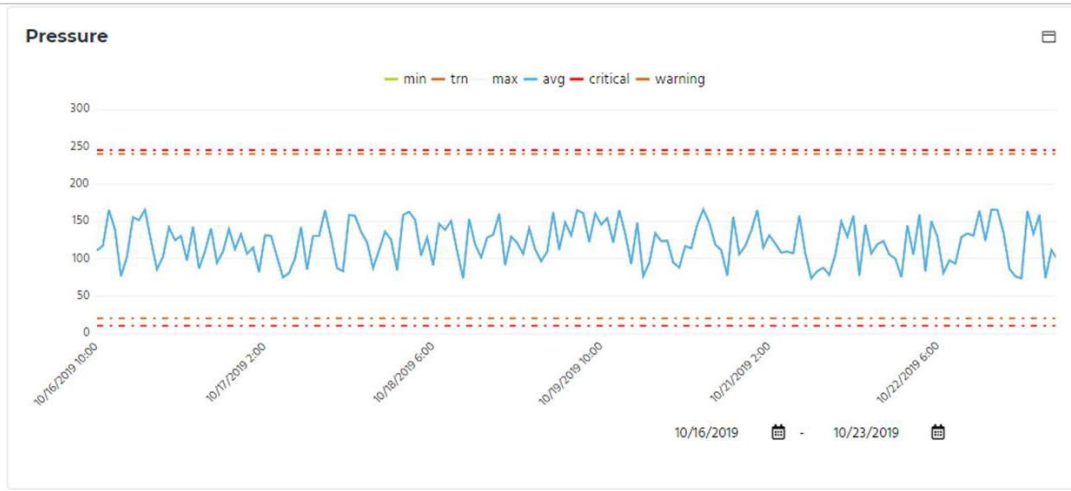
Pressure Monitoring

- Control Valves
- Small, inexpensive devices
- Water Meters
- Hydrants





Utility Value	Pressure Monitoring
Increase customer Service	✓
Improve speed / quality of repair	✓
Decrease real losses	✓
Decrease costs	✓
Find bursts	✓
Find slow growing leaks	✗
Increase revenue	✗
Improve capital plans	✗
Find household leaks	✗
Extend asset life	✗
Decrease unavoidable losses	✗
Decrease break rate	✗
Decrease aparrent losses	✗

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Pressure Monitoring and Control

- Adjust the outlet pressure
- Remotely
- Lower the pressures every night/Season
  - Less GPM leaks
  - Less Water loss
  - Reduce Costs

Utility Value	Pressure Control
Increase customer Service	✓
Decrease real losses	✓
Decrease costs	✓
Extend asset life	✓
Decrease unavoidable losses	✓
Decrease break rate	✓
Improve speed / quality of repair	✗
Find bursts	✗
Find slow growing leaks	✗
Increase revenue	✗
Improve capital plans	✗
Find household leaks	✗
Decrease aparrent losses	✗

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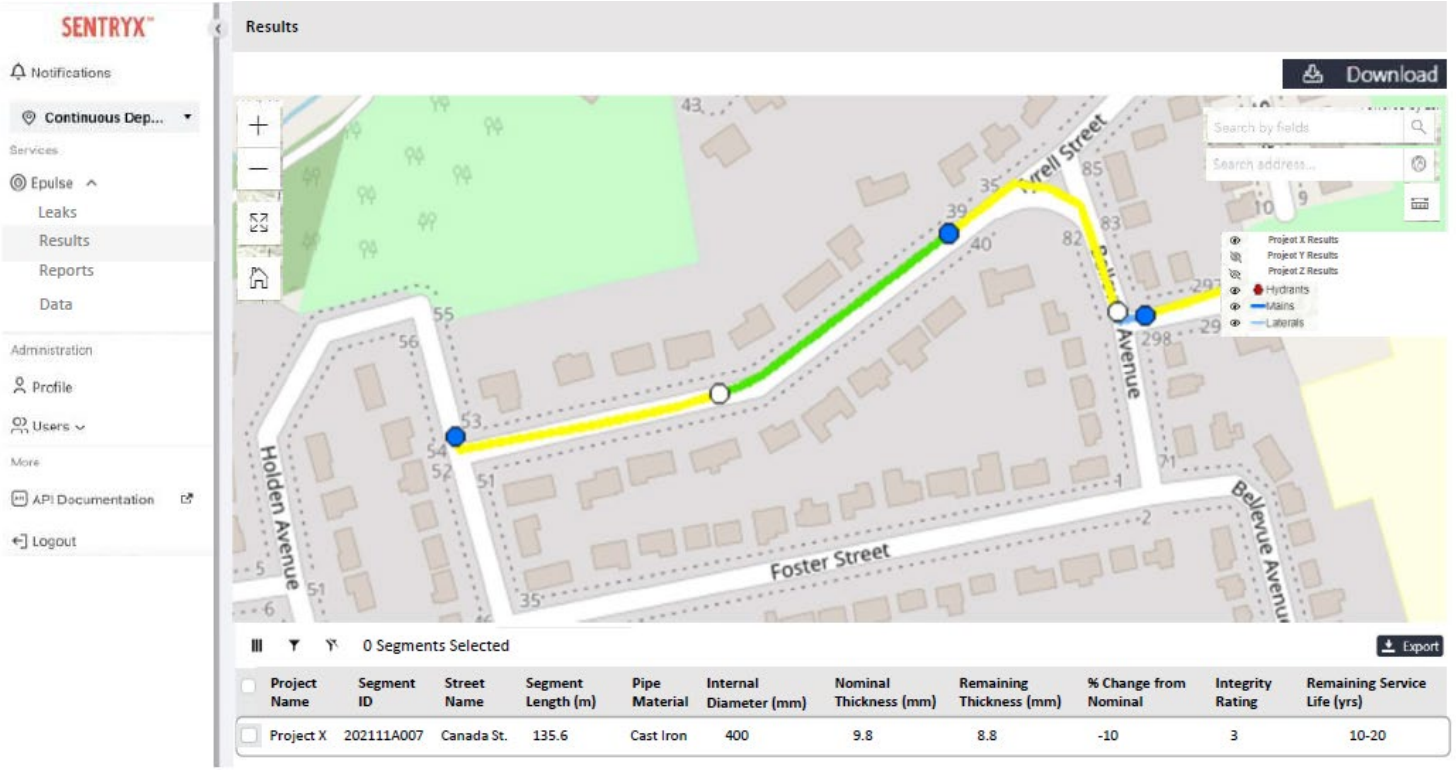
Condition Assessment

- Determine quality of pipe before doing repairs
- Improve Capital Plans



Utility Value	Condition Assessment
Increase customer Service	✓
Decrease costs	✓
Extend asset life	✓
Decrease break rate	✓
Improve capital plans	✓
Improve speed / quality of repair	✗
Decrease real losses	✗
Decrease unavoidable losses	✗
Find bursts	✗
Find slow growing leaks	✗
Increase revenue	✗
Find household leaks	✗
Decrease aparrent losses	✗

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Condition Assessment

Pipeline 1	Pipeline 2
Installed 1860	Installed 1860
Brown sandy soil	Brown sandy soil
Moderate soil corrosivity	Moderate soil corrosivity
6” Cast Iron Pipe	6” Cast Iron Pipe

31% Thickness Loss

1% Thickness Loss

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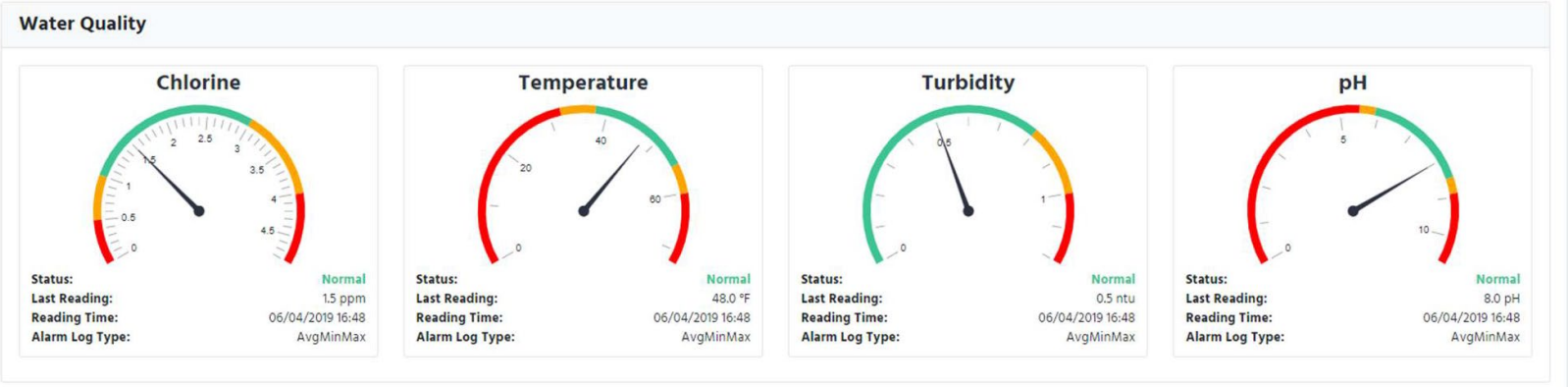
Water Quality and Smart Flushing

- In the distribution system
- All day, every day
- Alerts
- Auto Flush if out of range



Utility Value	Water Quality & Smart Flushing
Increase customer Service	✓
Decrease costs	✓
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Decrease break rate	✗
Find bursts	✗
Find slow growing leaks	✗
Increase revenue	✗
Improve capital plans	✗
Find household leaks	✗
Decrease aparrent losses	✗

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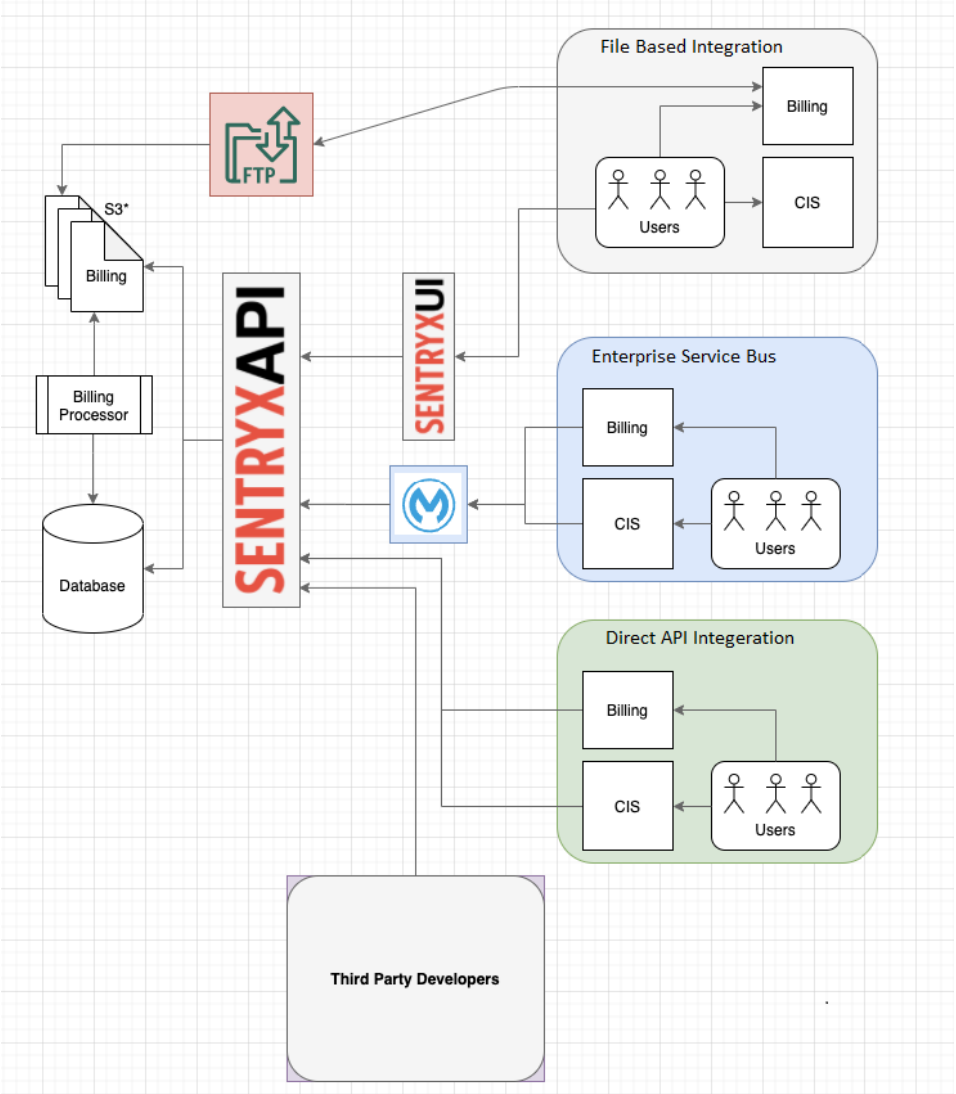
Application Program Interface (API)

- IoT platform
- Simple and Secure Integration with minimal coding
- Enables 3rd Party App Development & SCADA Integration
- Example API Endpoints
  - Billing, consumption, device control, water pressure, installation, networking, groups & DMAs



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Water Distribution Management Systems

- Turn data into insights
- Reduce cost, labor, and non-revenue water
- Increase Customer Service
- Relative to the cost of AMI, inexpensive additions
- APIs to send Data to other programs!

- No longer just AMI, Water Distribution Management System

- Determine what technology is right for your utility. Control your Spec!

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Questions?

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Thank You!

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