



MONETIZING VEHICLE DATA

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TOOLTECH 2018

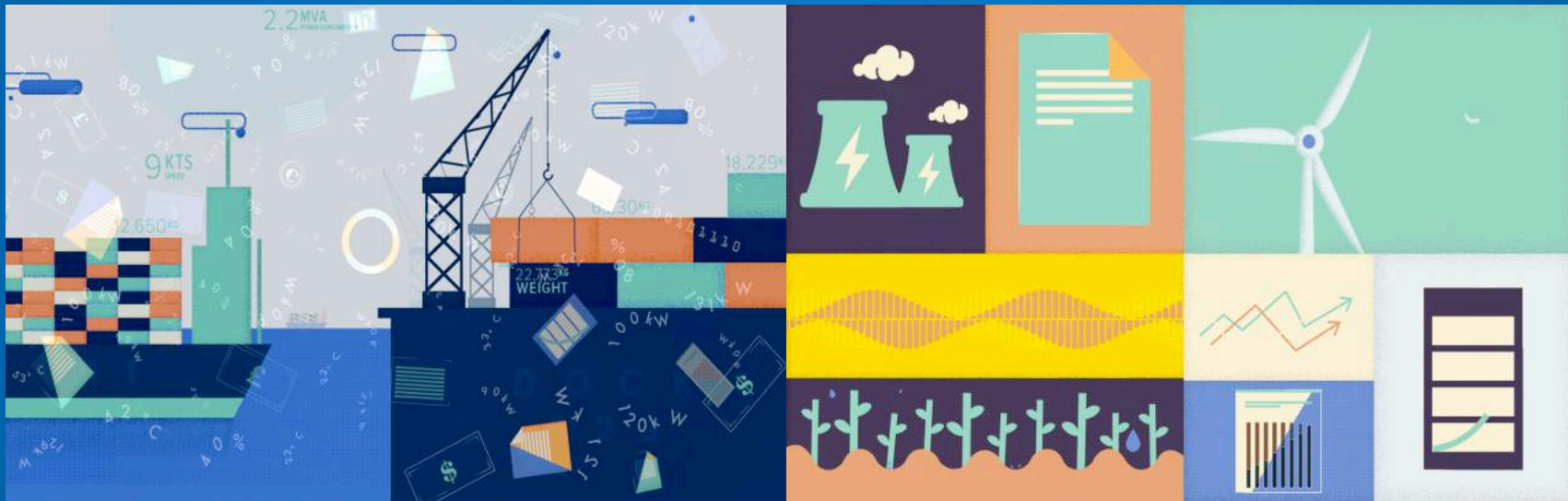
WHAT TERBINE IS ABOUT

OUR VISION

To enable the frictionless use and monetization of IoT data around the world, within and between industries

OUR MISSION

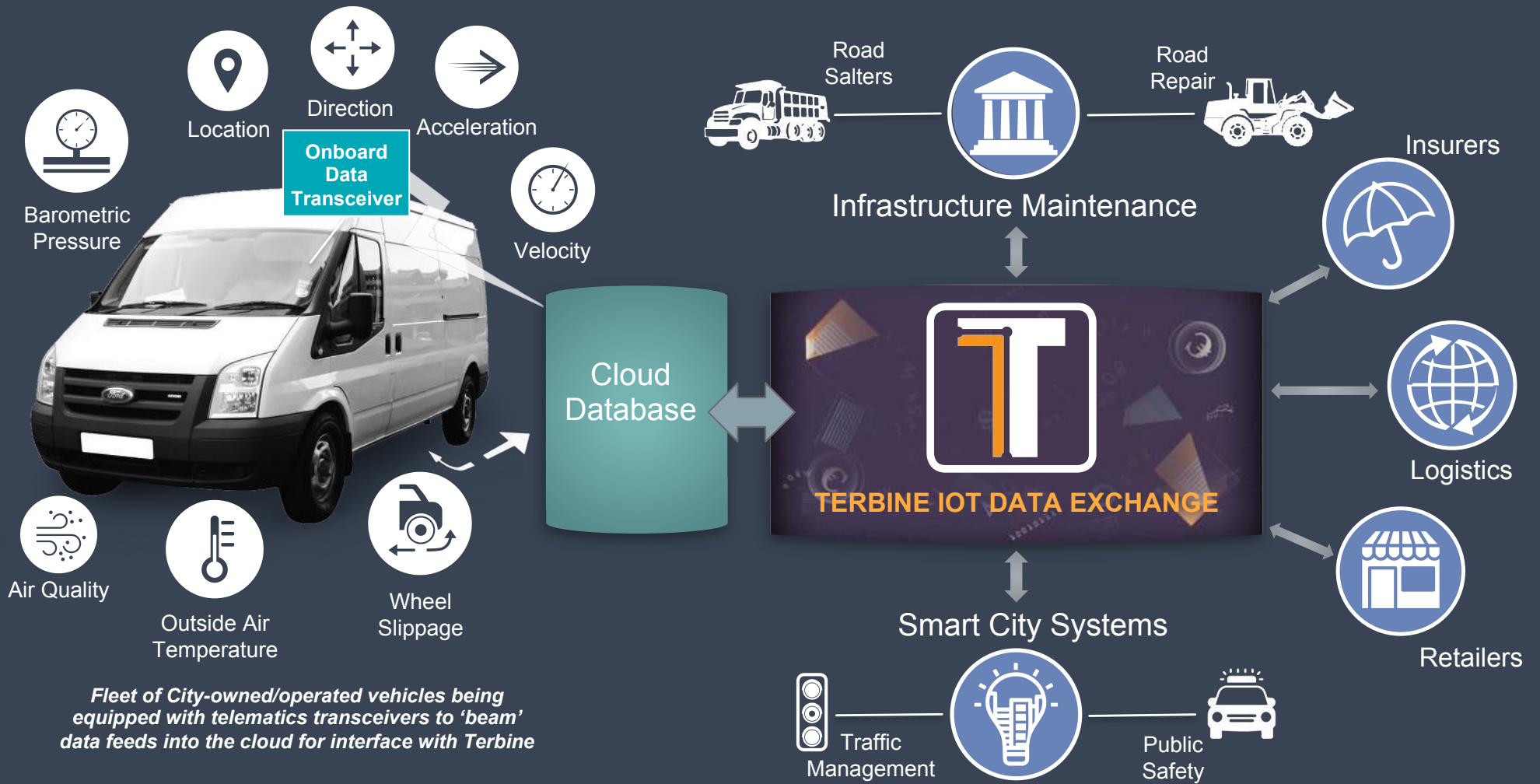
Be the leading exchange for both public and corporate IoT data, making it actionable and financially valuable



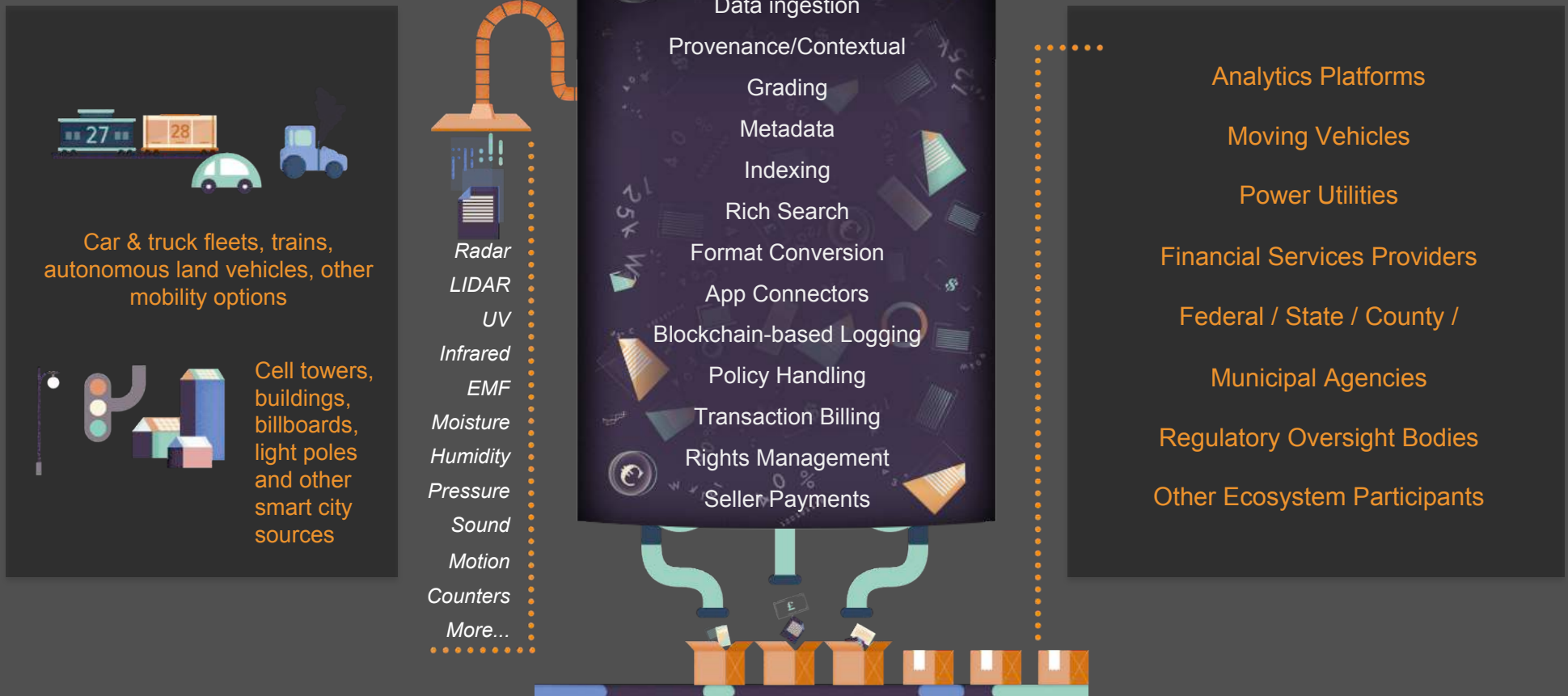
TERBINE IS THE MASTER EXCHANGE FOR PUBLIC & COMMERCIAL IOT DATA



LAS VEGAS HAS BEGUN A DATA-SHARING PILOT WITH TERBINE



A SUPPLY CHAIN FOR DATA



IOT METADATA SCHEMA (HIGH LEVEL)

Monetization is based upon rich metadata that deeply describes data sources

PROVENANCE

ORIGINATOR(S)

OWNER(S)

SOURCE NAME

SOURCE TYPE

SENSOR SPECIFICS



LOCATION

CONTAINER

ENVIRONMENT

INTERACTOR(S)

CONTEXT

DATA GRADING

IOT METADATA SCHEMA (DETAIL/FIELDS)

By applying a coordinated combination of physical science and data science techniques, data sources are characterized via searchable metadata instances. Fields include

- Global Industry Classification (GIC) codes
- Sensing category
- Sensor type
- Dataset or stream type
- Dataset schema
- Delivery method
- Owner type
- Geolocation type
- Environment (*where sensors are situated*)
- Regulatory regime (*if applicable*)
- Relation (*to other data sources*)
- Data grade
- Originator name(s)
- Owner name(s)
- Container (*if sensors are within subsystems*)
- Verbose descriptions (*to support searches*)

Plus additional fields for reading by AI/ML-based programs or systems, plus extensible fields to specific use by OEMs, Tier 1 suppliers and/or their downstream partners

METADATA SCHEMA (DATA RELATIONSHIP)

The screenshot displays the Terbine web application interface. At the top, the navigation bar includes the Terbine logo with a 'BETA' tag, a search bar, and links for FAQs, Developers, and 'What is this?'. The user is logged in as 'Welcome, Las Vegas' with a notification badge showing '0'.

The main content area is divided into two tabs: 'Details' (active) and 'Technical'. The 'Details' tab shows the title 'RTC Vehicle-sampled Barometric Air Pressure' and a description: 'Timestamped & geolocated readings of barometric pressure on fleet vehicles equipped with the GeoTab On Board Diagnostics (OBD-II standard) capture / transceiver device. Fleet of Ford E450 vans operated by the Regional Transportation Commission (RTC) of Southern Nevada. Data feeds provided under pilot arrangement with Terbine'.

Below the description, a table lists metadata attributes:

No. Datasets:	23781
Last Modified:	04/16/2018
Metadata Created:	10/07/2017
GICS:	
Sensor Type(s):	Motion
Grade:	● Bronze
Owner Type:	Government
Geolocation:	
Legal:	Legal Information for COPYRIGHT
Regulatory:	Regulatory Information for SAFEHARBOR

On the left side, under 'Most Recently Added', there is a section for 'RTC Vehicle-specific Parameters' with a description: 'Timestamped & geolocated readings of vehicle-specific parameters on fleet vehicles equipped with the GeoTab On Board Diagnostics (OBD-II standard) capture / transceiver device. Data feeds provided under pilot arrangement with Terbine'. Below this, there are filters for 'Motion', 'Not specified', 'Government', and 'Bronze'. An 'Add To Workspace' button is at the bottom.

On the right side, there is a search bar and a 'Sort by: Date | Name' dropdown. Below it, there is a section for 'RTC Vehicle-sampled Barometric Air Pressure' with a description: 'Timestamped & geolocated readings of barometric pressure on fleet vehicles equipped with the GeoTab On Board Diagnostics (OBD-II standard) capture / transceiver device. Data feeds provided under pilot arrangement with Terbine'. Below this, there are filters for 'Not specified', 'Government', and 'Bronze'. An 'Add To Workspace' button is at the bottom.

A given Metadata Instance can associate to any number of datasets or streams that match/conform to the characteristics fully described by that Instance

PROJECTED REVENUES ARE BASED ON DATA TYPES AND SCALE

Geographic concentrations of vehicles are the key to generating data income

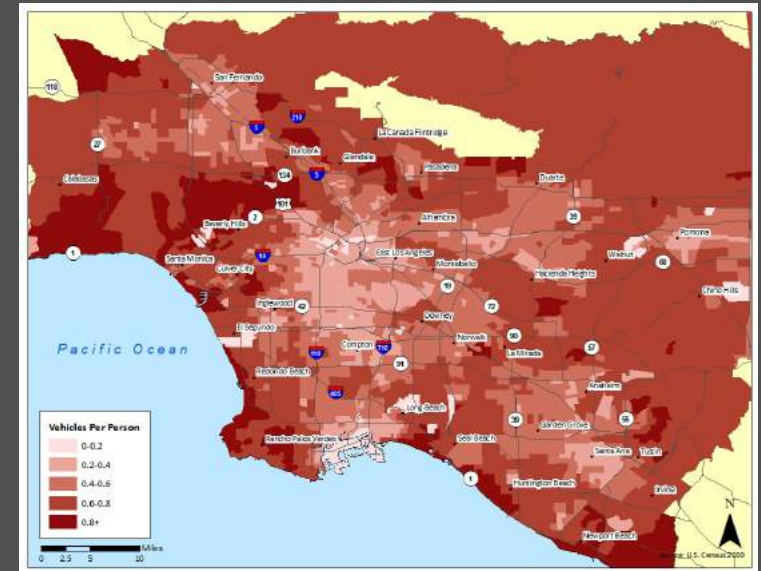
The more vehicles that are generating data within a given area, most particularly cities, the higher the number of potential use-cases and therefore aggregated revenue value

Beginning with what is available from the vehicles on the road now

Currently the feed can include a vehicle's Heading, Latitude/Longitude

Future sensor outputs will be desirable to various buyers and applications

The range of use-cases opens dramatically with new feeds such as ABS, Air Quality, Ambient Air Temperature (AAT), Barometric Pressure, States including doors front and rear, headlamps, occupation of seats front and rear, traction control activation, wipers and more



DERIVING PER-VEHICLE DATA REVENUE ESTIMATES: *CURRENT*

Factors/assumptions used in estimating

- 6.1 million average number of vehicles / large city environment (based on NYC, SF Bay Area, LA)
- 10% typical percentage of those vehicles produced by the OEM
- 20% of current OEM vehicles having onboard cellular with user opted-in
- 5.6 average number of hours / week driven
- 21.5 average number of miles / week driven
- Currently available passenger car sensor outputs made available via onboard cellular
- 2 minute data update rate average

Leading to

- 20.5 million data readings / week from all OEM's cars in a large city thus 1.1 billion readings / city / year
- Currently available outputs are usable primarily for roadgoing use-cases e.g. certain insurances, hedge fund analytics, traffic management, city planning – the latter two not being highly funded for data procurement, whereas the first two groups have discretionary funds for such purchases
- Data purchases based on current sensor outputs can total \$20-35/annum per vehicle

DERIVING PER-VEHICLE DATA REVENUE ESTIMATES: *FORWARD*

Adding to the prior calculation

- A dramatic increase in the types of sensor outputs made available via cellular transmissions
- A steady progression in the percentage of OEM's vehicles having onboard cellular transceivers
- New incentives induce owners to opt-in
- 60% of future OEM vehicles having onboard cellular with user opted-in
- 30 second data update rate average

Leading to

- 245 million data readings / week from all OEM's cars in a large city thus 12.7 billion readings / city / year
- Assuming 4X number of sensor feeds and large increase in scope of possible use-cases and users in non-vehicular market sectors, estimated per-vehicle revenue can grow to \$95 per annum
- Expanded potential data buyer base now includes broader financial services and insurance (fleets, events, cities), providers of non-automotive transportation i.e. intermodal, logistics operators, public safety, retailing, energy suppliers both petrochemical and electrical, environmental monitoring agencies and others who increasingly require "ground truth" data to perform analysis and decision-making

POTENTIAL FOR PER-VEHICLE ANNUALIZED REVENUES

INITIALLY AVAILABLE

Heading
Latitude
Longitude
Timestamp
Vehicle ID
(obfuscated from VIN)

\$20-35

Average Annualized Gross
Revenue / Vehicle (1st World)

\$50-95

Average Annualized Gross
Revenue / Vehicle (1st World)

ABS Activation & Duration
Acceleration
Air Quality (CO/CO2/NO2)
Ambient Air Temperature
Barometric Pressure
Doors Open/Close
Headlamp State
Rapid (non-ABS) Braking
Seats Occupied State
Steering / Swerve
Traction Control
Windshield Wiper State

DESIRED TO BOOST REVENUES

WHERE VEHICLE-GENERATED DATA CAN BE EXCHANGED & SOLD

KEY INDUSTRY SECTORS WITH EARLY EVIDENCE OF DEMAND



Power



Transportation



Environmental



Smart Cities



Insurance



Financial Services



Safety



Logistics



Retail



Food Production

WHERE THIS CAN GO: LEVERAGING THE EMERGENCE OF NEXT-GEN TECHNOLOGIES

WEATHER RIGHT HERE

Winds at 3MPH NNW
Air temperature here 71°F
Rain Likelihood 39% next hour



TRAFFIC VECTORS

Right turn: avg. speed 2MPH
Left turn: 16MPH
Straight ahead: road blocked



PARKING

Available spots at your destination 72



CHARGING STATIONS

Seven within ten-block radius
Next available predicted 13 mins.
Park & 57th Tesla-compatible



ROAD HAZARDS

Construction this block: right side
Construction ahead: road blocked



As infrastructure evolves to provide 5G, edge computing and embedded AI, frictionless handling of machine-generated data will become ever-more important for feeding connected cars, autonomous air and land vehicles, as well as augmented reality applications



THANK YOU

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