Big Data and Geospatial Analysis

AMFM GIS annual conference
Napoli, 27 giugno 2018

HERE in numbers

200
countries
mapped

400+
HERE cars collecting
data for maps

700,000
3D data points per
second per car

4 of 5
in-car navigation systems
in Europe
and North America
use HERE maps

30+
years of experience
transforming location
technology

HD Live Map covering
600,000+
kilometers for
autonomous driving

9,000+
employees in 56
countries

15,000
venues mapped globally

1,600
cities with transit routing
in over 50 countries

A history of transforming maps into location technology

1985

Navigation
Technologies
founded

NAVTEQ

1994

1st map for in-car nav
1st map for web

2004

1st map for ADAS
1st map for phone
1st map for Adaptive
Cruise Control

2007

Community
mapping

Offline maps for
mobile

2009

1st map for Predictive Cruise Control

High-precision data collection and
map building technology

Use of sensor data for map building

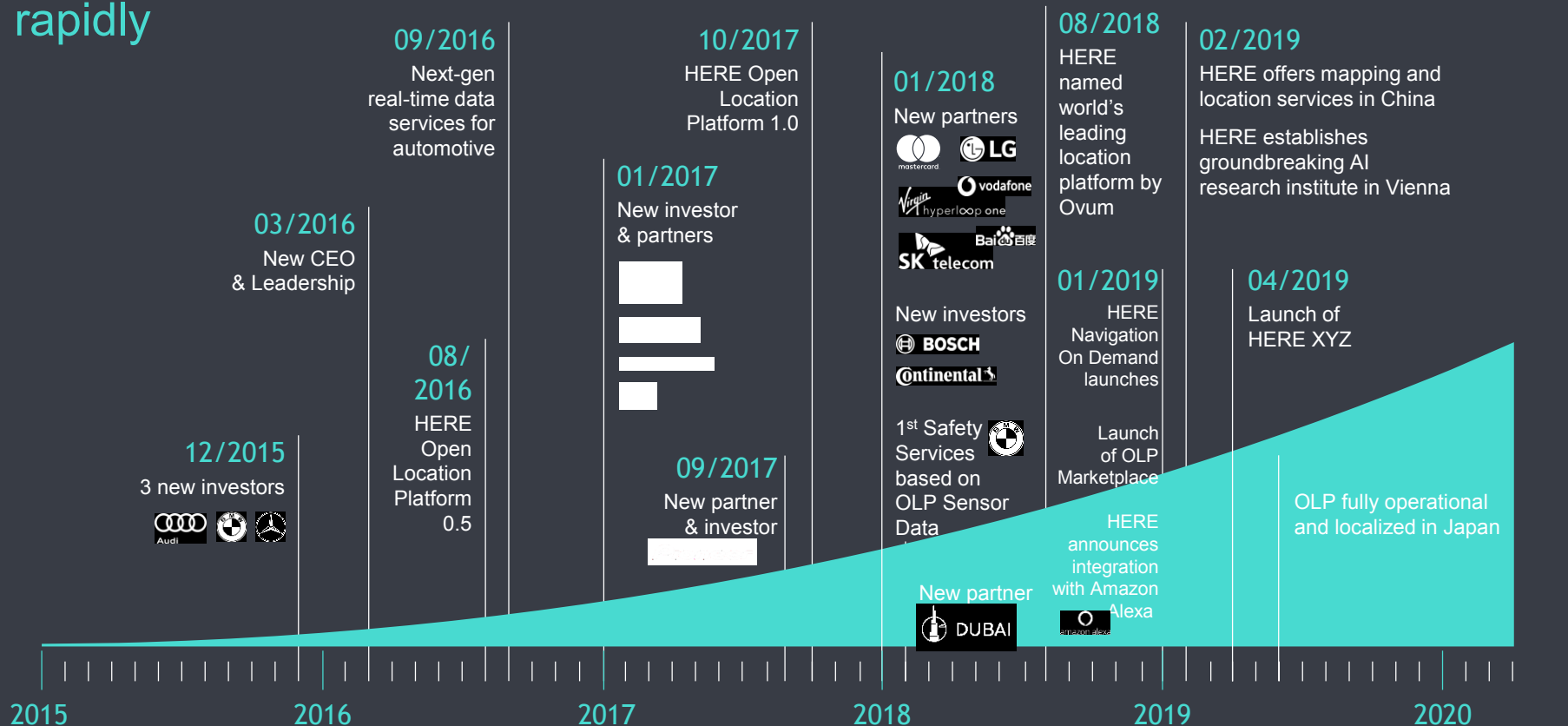**2011**

1st pure
location cloud

2015

3 new investors

Audi · BMW · Mercedes-Benz

2017

2 new investors

intel · Pioneer

2018

2 new investors

BOSCH · Continental

here

Accelerating rapidly

09/2016
Next-gen real-time data services for automotive

10/2017
HERE Open Location Platform 1.0

08/2018
HERE named world's leading location platform by Ovum

02/2019
HERE offers mapping and location services in China

HERE establishes groundbreaking AI research institute in Vienna

01/2018
New partners

mastercard   LG

Virgin hyperloop one   vodafone

SK telecom   Baidu 百度

New investors

BOSCH

Continental

1st Safety Services based on OLP Sensor Data

03/2016
New CEO & Leadership

01/2017
New investor & partners

01/2019
HERE Navigation On Demand launches

Launch of OLP Marketplace

HERE announces integration with Amazon Alexa

04/2019
Launch of HERE XYZ

08/2016
HERE Open Location Platform 0.5

09/2017
New partner & investor

12/2015
3 new investors

Audi

New partner

DUBAI   amazon alexa

OLP fully operational and localized in Japan

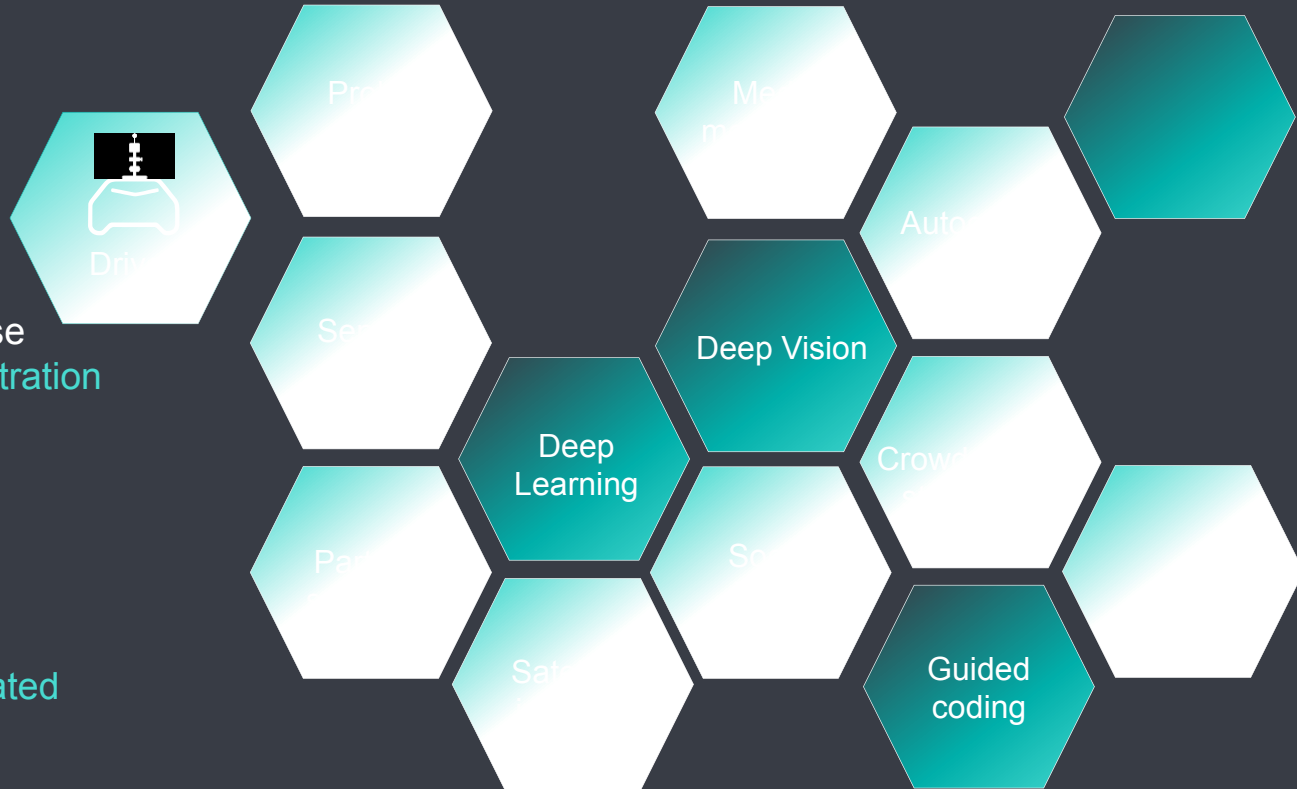2015   2016   2017   2018   2019   2020

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We envision a fully <u>automated</u> location content system

From "only"
Geographic Expertise
...to Big data orchestration

From batch
...to streaming
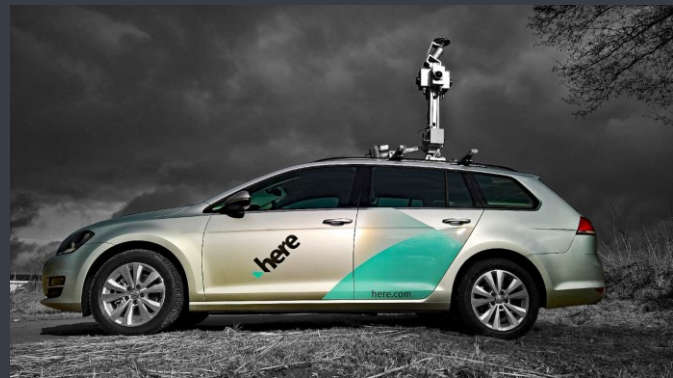
From manual
...to human-in-loop
minimized or eliminated

Deep Vision

Deep Learning

Guided coding
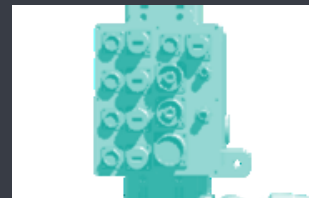
TRUE drives
Components

Velodyne

capturing 700,000
points per second
< 2cm accuracy

MARS Camera

capturing image
data 4 x 16.2MP
JPEG images

D-GPS and IMU

Positioning Data:
100Hz GPS/IMU
binary logs

* Lidar is a surveying method that measures distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor.

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Crowdsourced street-level imagery (SLI) through Mapillary

Deep Vision technology

INPUT

Street level imagery from consumer video / Mapillary

TECHNOLOGY

Deep learning
Pixel level segmentation

Understanding Road Scene

OUTPUT

High quality extractions for discovery and change detections:
- Traffic sign
- Places / POI name
- Building
- Building height
- Street name

Sign extraction

Building extraction

Probe - Automated detection

Using machine learning, deep learning & spatial algorithm to detect and validate map changes

8 features supported by probes: Turn Restriction, Direction of Travel (DOT), Lane Count, New Geometry, Missing Roundabout, Speed Limit/Category change, Traffic Signal/Stop Sign, Access Characteristics

Stunning high resolution Satellite Imagery

Valuable data source for the detection of local changes

- Significant investment in fresh global satellite imagery

- 14.8M km2 satellite imagery

- 92% global coverage with high res imagery

- 401 urban areas updated

- **Fully automated** detection, extraction, shaping & enhancement of buildings

- **85%** of precision through machine learning

- 40X savings over sourcing

Automated extraction of building footprints from Satellite Imagery

Example – Building feature detection

Input: Satellite imagery
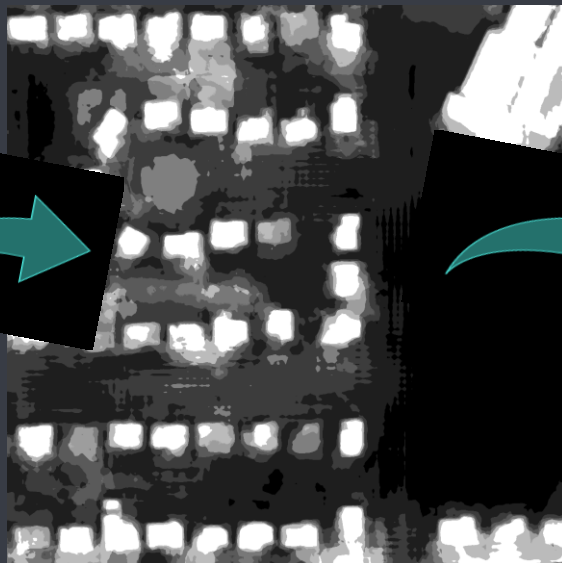
Detect
Output: raw segmented image, bounding box coordinates, image crops

Shape refinement
Output: final polygon with good shape

Vehicle sensor data

Delivering a full stack of services- from static content to most dynamic & rich layers
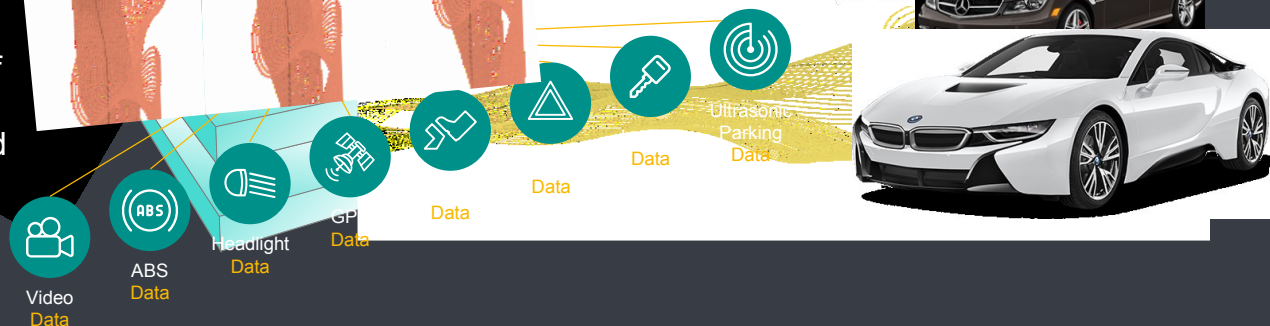
HDLM

Real-Time Traffic

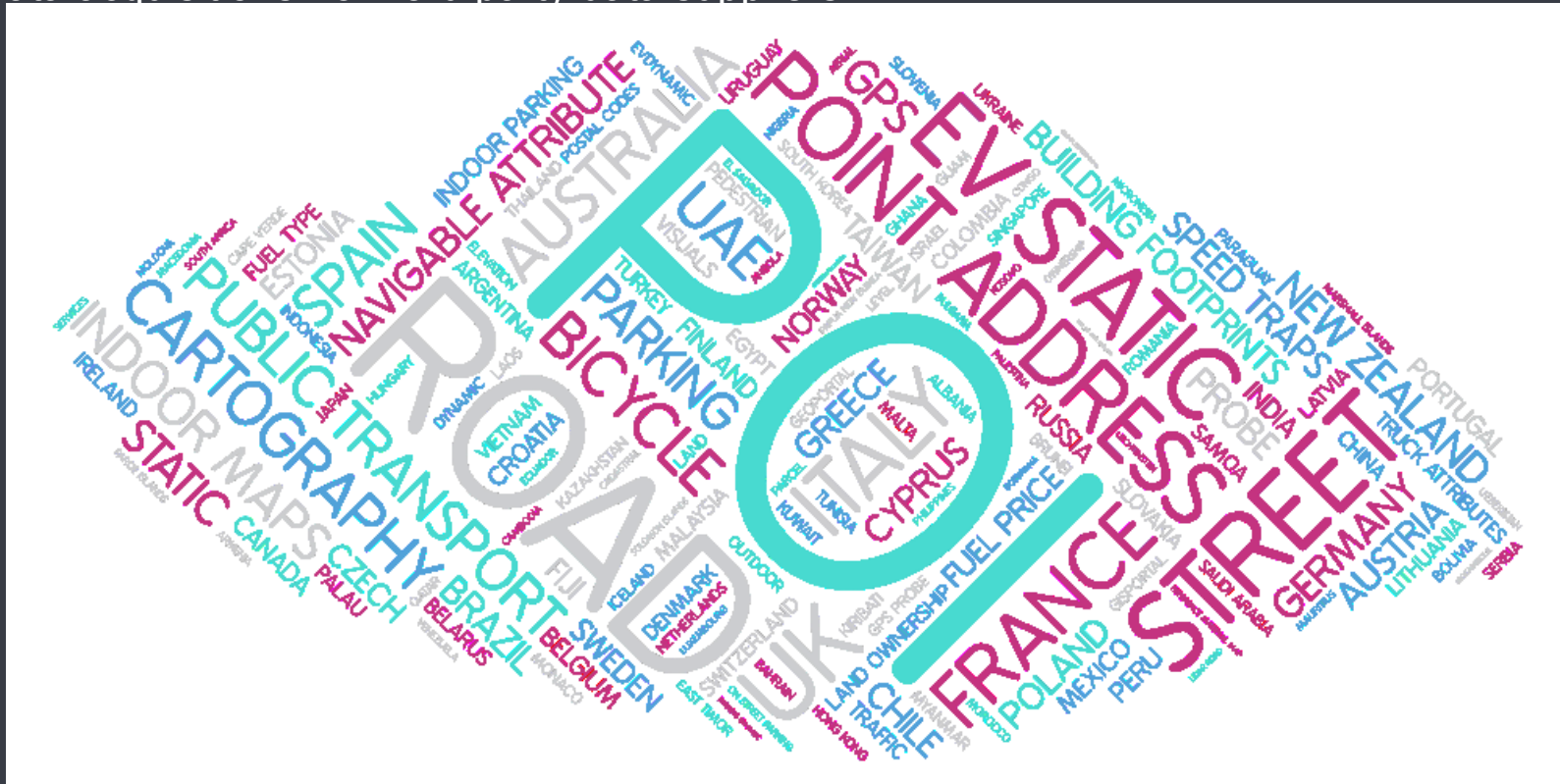Road Sign Validation

On-Street Parking

Hazard Warnings

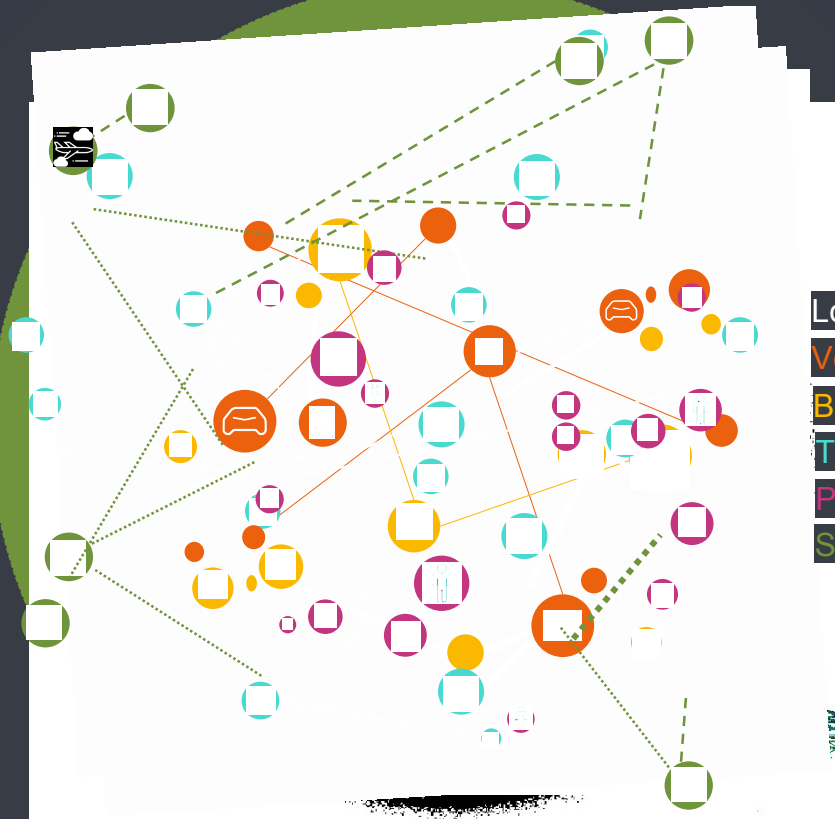HERE pioneered the development of Sensoris, the 1st open specification for vehicle sensor data gathering and analysis

Map updates near real-time

Video Data

ABS Data

Headlight Data

GP Data

Data

Data

Data

Ultrasonic Parking Data

here

Sources & suppliers

80k+ data acquisitions from 3rd party data suppliers

Location & POIs
Vehicles
Beyond Roads
Things
People
Spatial & Aerial

Why the HERE Map?

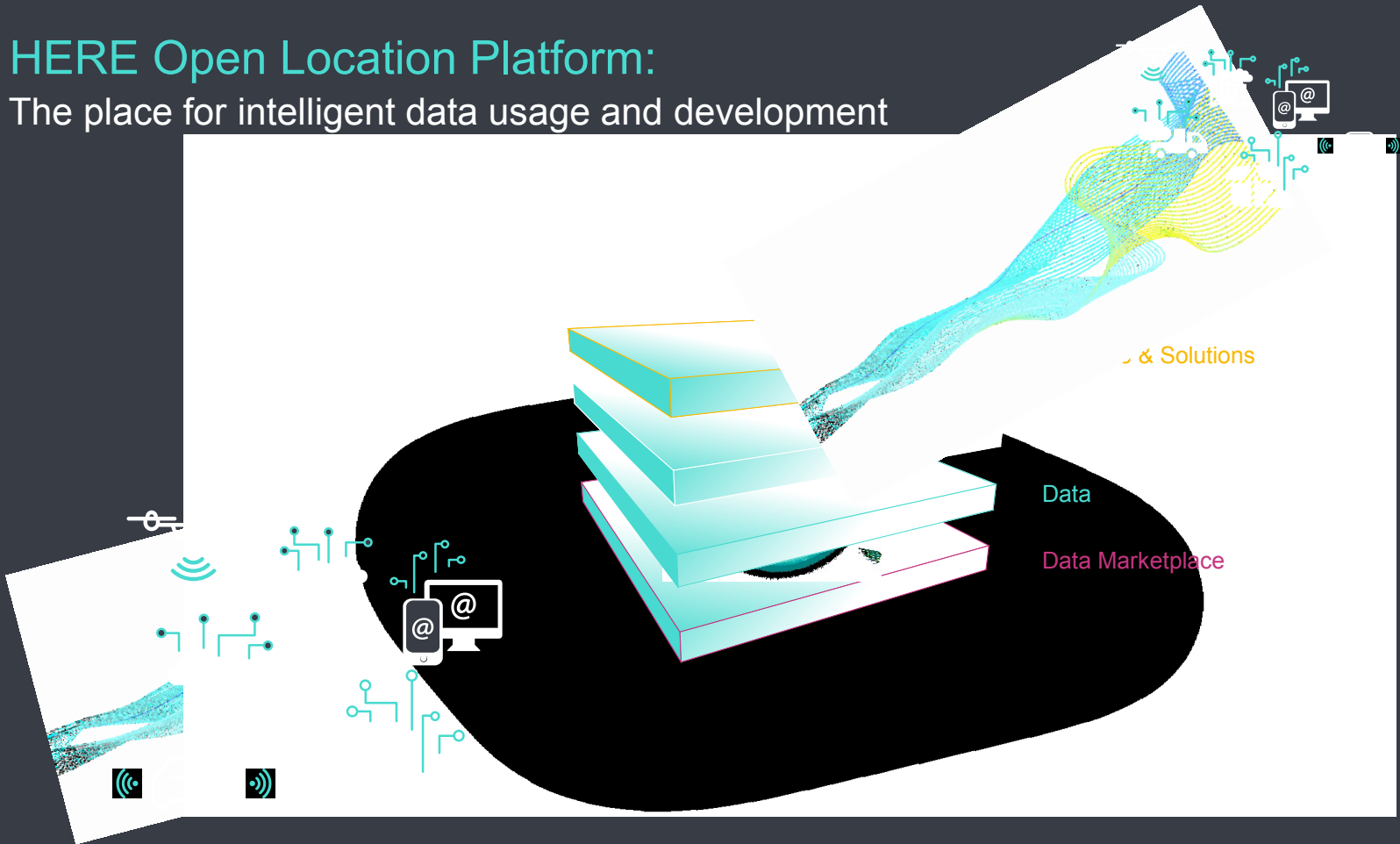The 4 Dimensions of Map differentiation

Accuracy

Richness

Freshness

Coverage

Access Restrictions

Road Geometry

Street Name

Correct!

LOCAL TRAFFIC ONLY

NO THRU TRAFFIC

CHICAGO AV 800 N

Oneways

ONE WAY

Incorrect?

Speed Limit

Turn Restrictions

20

Extra?

Missing?

House / Building Address

Dividers

HERE Open Location Platform:

The place for intelligent data usage and development

& Solutions

Data

Data Marketplace

Using the same datasets for different use-cases

Now move to a global scale. Revolutionizing every industry.

Real Estate

Telco & Utilities

Media

Public Sector Infrastructure

Transport &

Location data

Elec

Insuranc

Hea

Key takeaways

HERE is investing heavily in the creation of the Reality Index to allow Machine Learning /AI use at scale

Maintenance of HERE Reality Index requires deep relationships with partners and providers to grant data availability

Digital transformation and sharing of location data: an opportunity for PA and enterprises

Data protection and security: the challenge for the new GI

Thank you

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