

Geneva Motor Show

Maps and Location Referencing - Status and Outlook

Future Networked Car event (ITU)
Geneva Motor Show, 05.03.2015

Ogi Redzic, SVP Connected Driving

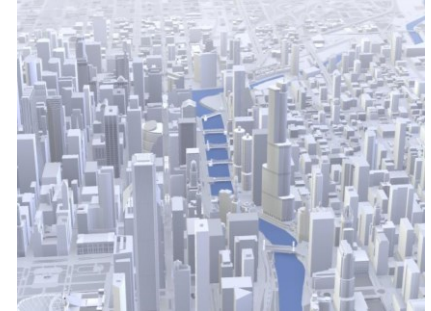
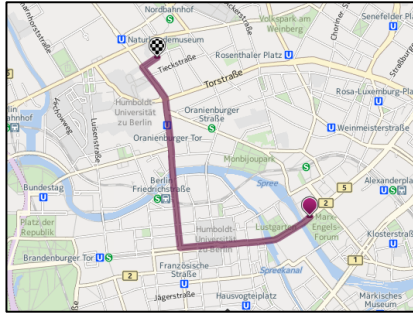
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Agenda

- Trends in maps and location referencing
- Challenges
- Examples of solutions in Traffic and HAD

We've Always Had a Bold Vision for Our Maps...

...to produce state of the art computable index of the world around us



Static flat maps

25 years ago map creation started out by digitizing physical map sources

Computable Roads

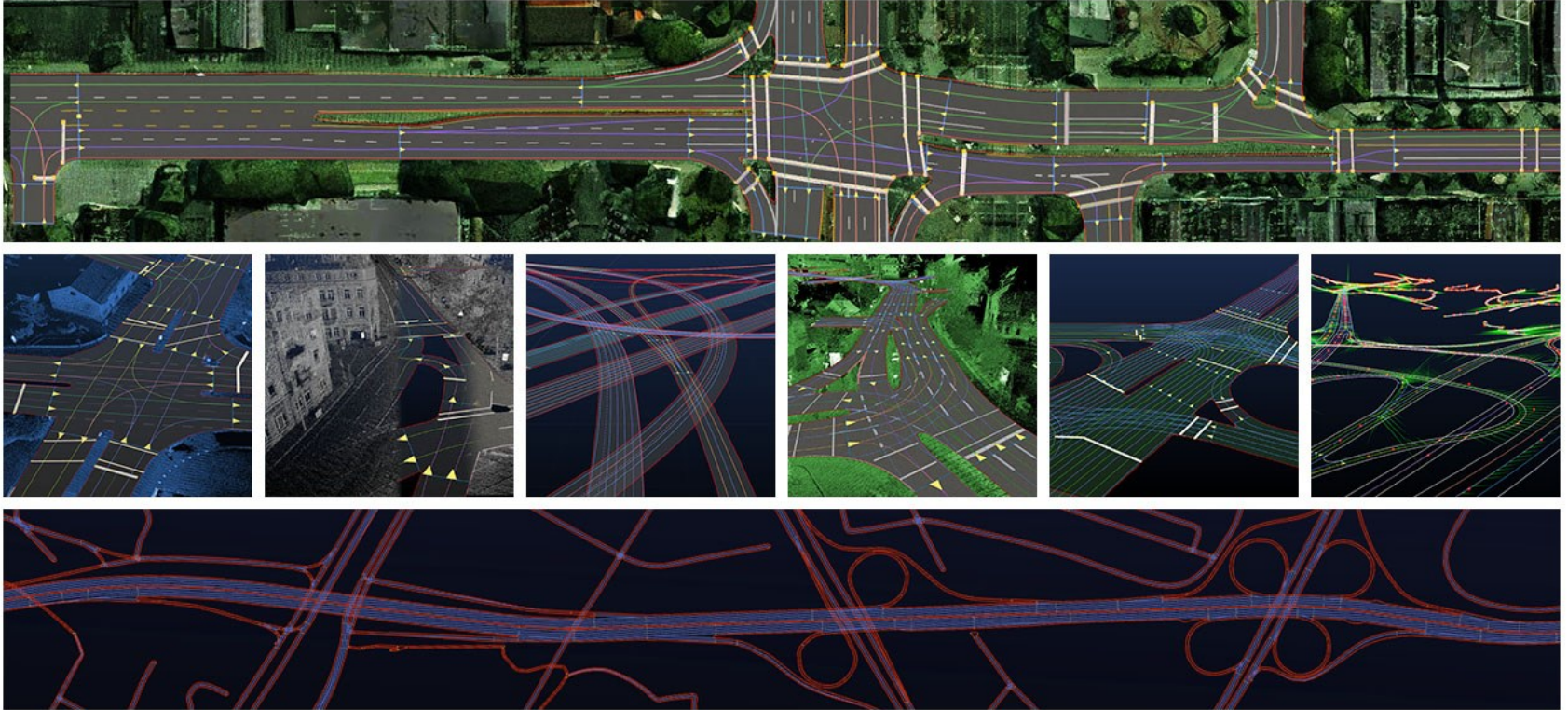
NAVTEQ started to collect precise road geometries with rich sets of attributes to make them computable

Computable Reality

We are creating fully interconnected and attributed 3D models, combining aerial and street level technologies

Maps getting ever more detailed and precise.

Unlocking new possibilities



Location Referencing requirements increase

TMC (FM based)



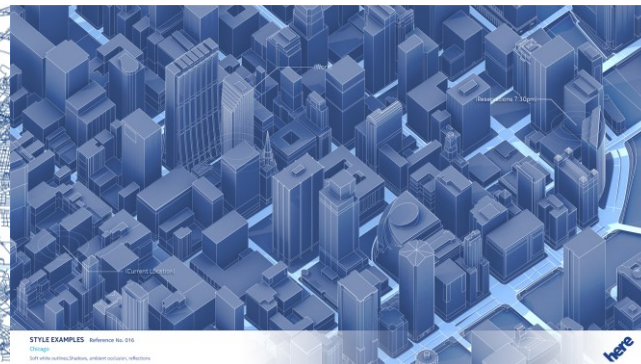
- Unique Map IDs
- Highly matured, widely adopted and cost effective
- 100% correct location reference
- Backward Map compatibility

DLR (Connected focused)



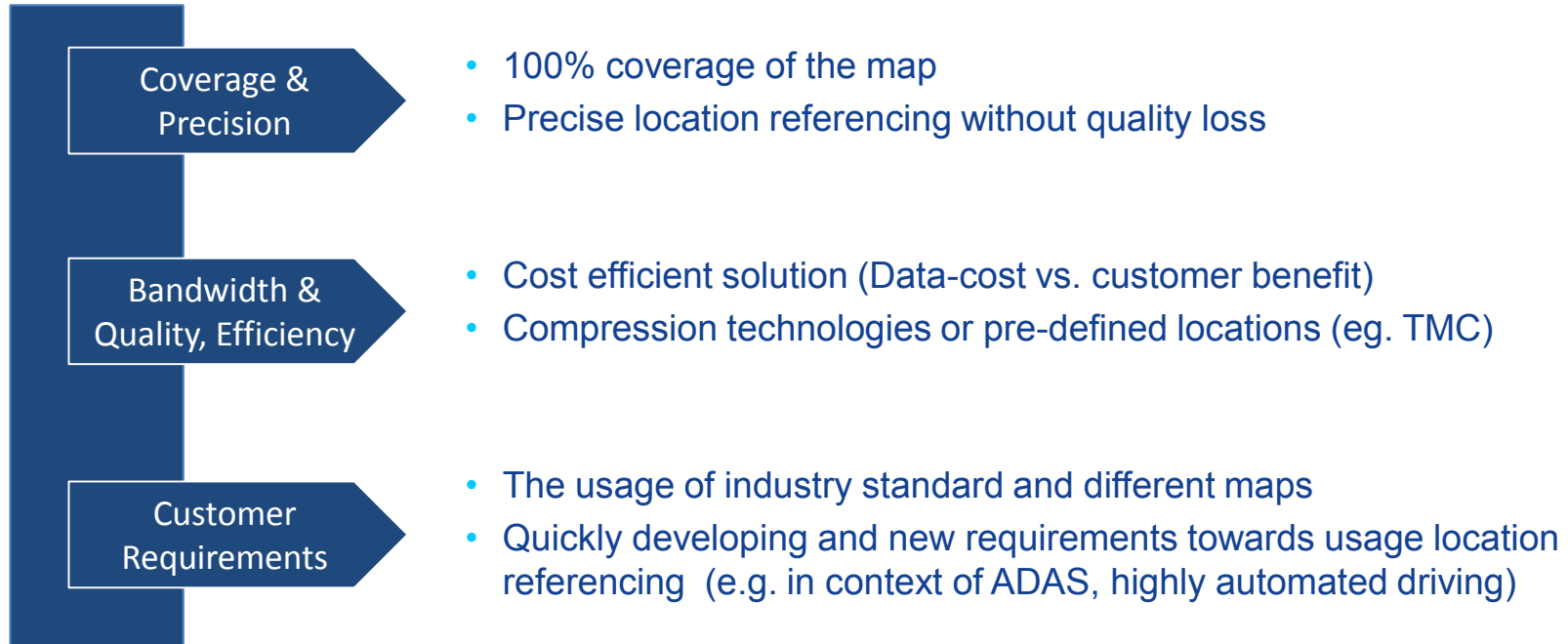
- Matching using Geo coordinates. Map version and supplier independent
- Specifications based on a series of Latitudes/Longitude (geocoded/map matched by client device)
- Various industry standard DLR methods available

3D (Broadband required)



- 3D will require a yet to be completed referencing system and development of standard

Key challenges in maps / location referencing



Offering a complete portfolio is key for success

	Reliable Map Matching	Full Map Coverage	Version/Provider Independent	Industry Standard	Lean Cost Effective
TMC	Yes	No	Yes	Yes	Yes A single 2 byte ID
OpenLR	Yes	Yes	Yes	Yes	No 40-60 bytes ~10X cellular network cost compared to other options
HERE LinkID	Yes	Yes	No Main limitation: HERE map and version specific.	No	Yes A single 4 byte ID
HERE SHP	Yes	Yes	Yes	No	No 40-60 bytes ~10X cellular network cost compared to other options
ULR	Yes	Yes	Yes	Yes	No 40-60 bytes ~10X cellular network cost compared to other options

LR application example in Traffic: Combining LR standards to achieve 100% road coverage



100% coverage
on controlled access
roads, 24x7 (FC1-FC2
roads/major highways)

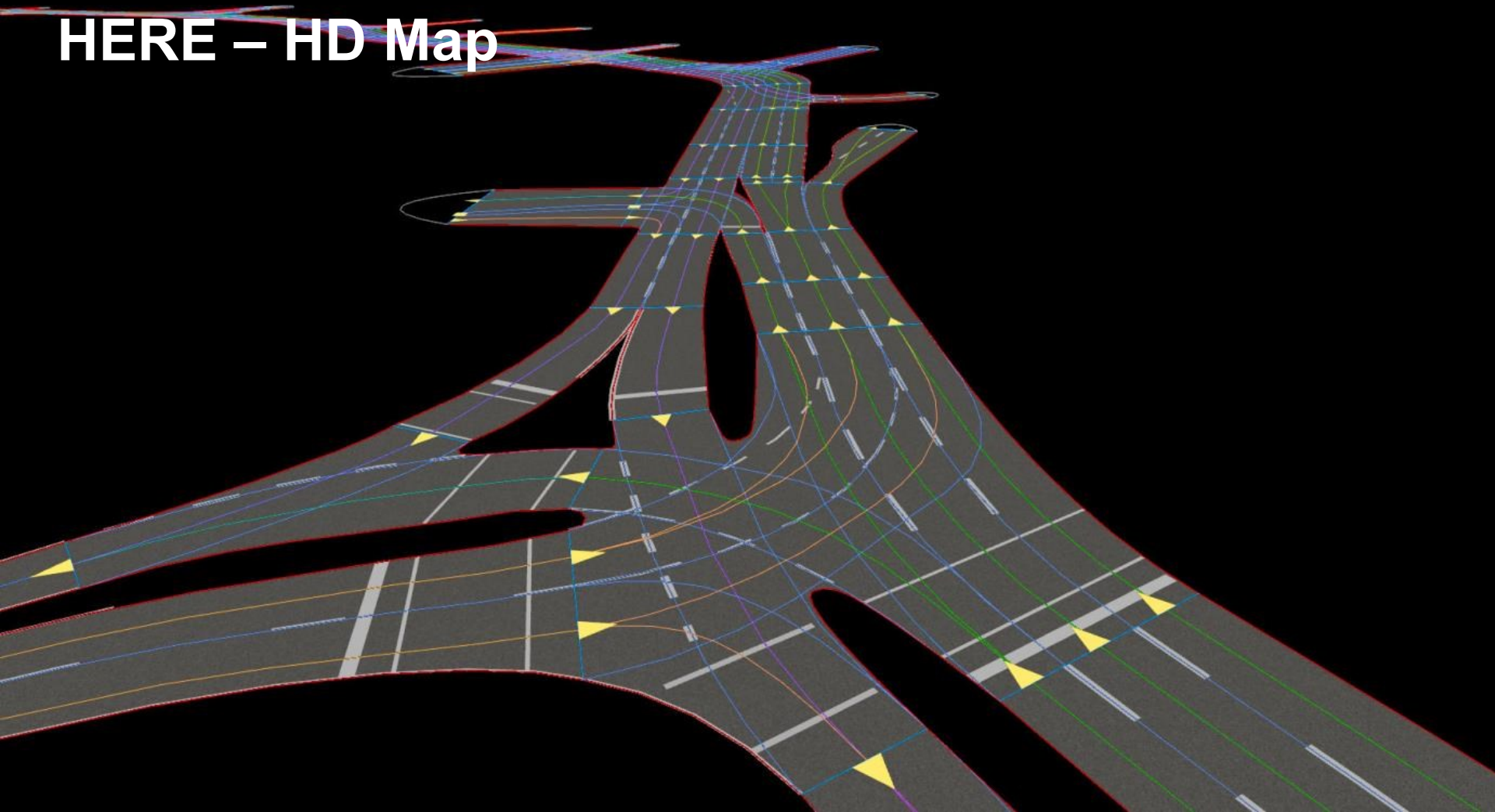


Full TMC table
coverage globally



In markets where TMC
coded roads are not
sufficient, DLR helps fill
the gaps

HERE - HD Map



HD Maps - location reference precision evolving and getting more accurate

- HD Map will provide **sub lane level accuracy** – from meters to centimeters in terms traditional mapping – but also provide fresh tile updates only for the relevant driving corridor.
- HD Map allows for **sub lane level positioning** due to lateral and longitudinal positioning components (i.e. Guard rails, walls, bridges, tunnels etc.)
- **Reduced data bandwidth** through incremental map updates
- **Important for V2X** as positioning accuracy of both sender and receiver of messages are relevant for the quality of the data fusion.

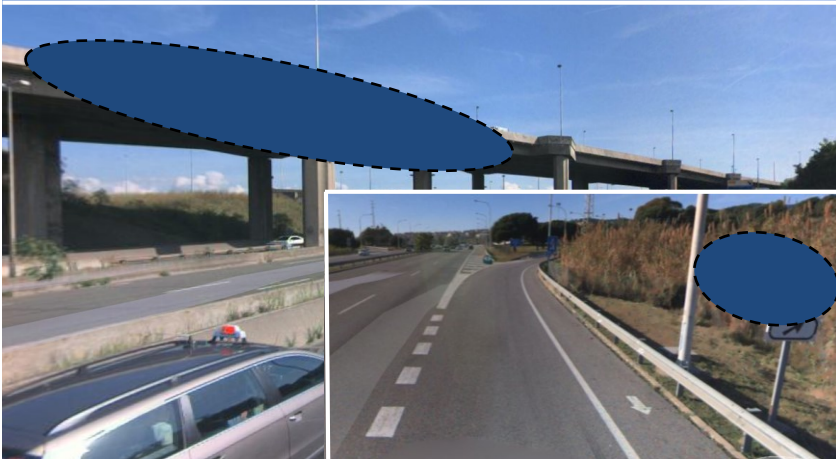
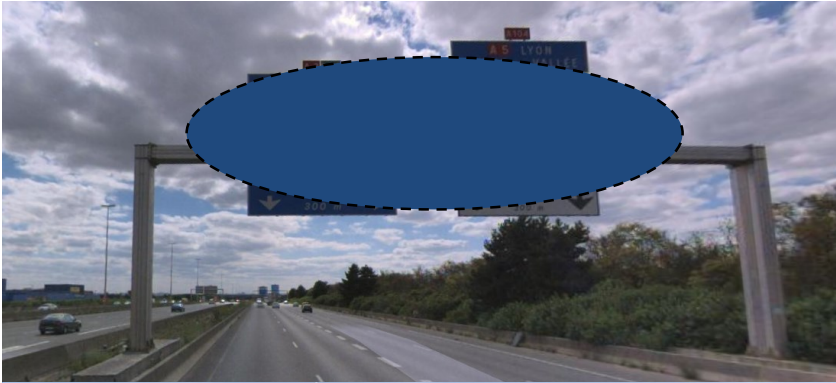
Example: Lateral Highway Positioning



Lateral Highway positioning

- HD Map Lane Model
- Physical linear structures along the road
 - Road Surface boundary (end of asphalt/concrete)
 - Guardrails
 - Walls

Example: Longitudinal Highway positioning



Longitudinal highway positioning

- HD Map Lane Model
(lane start/end/merge locations)
- Physical overhead structures
 - Gantries
 - Bridges
 - Tunnel ceiling
- Sign locations where needed

Summary

- Maps become a computable, dynamic digital representation of the world
- Current requirements in LR such as efficiency, precision, coverage best met by a combining methods to best customer value
- New requirements like 3D mapping and highly automated driving will require LR to evolve

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Thank you for your attention

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