

Navigating the Future of Road Data Production

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Context

Purpose:

Introduce and alternative governance framework

Spark thought and meaningful conversations

These are ideas, not USDOT policy



Content

Examine the future of Road Data Production
Influenced by Changing Data Markets
Advent of Autonomous Vehicles (AV)

Consider HD maps and AV charts

Apply of chart production paradigm to HD map production

Questions and opportunities



Multiple Sources, Multiple Datasets, 1 Network

Providing reliable access to accurate road data is difficult

Road Data Layers available from

- All scales of government

- Multiple private data providers (PDP)

- Multiple open data projects (ODP)

All work independently to describe the same network



Multiple Sources, Multiple Datasets, 1 Network

Ideal: A coordinated efforts to produce a basic standardized road dataset which is updated in near-real-time

The complexities of the geospatial ecosystem makes reaching the ideal a wicked problem

Acknowledging the complexity shapes our approach

- Magic solution does not exist

- Focus efforts improving the system and subsystems



Complexity Fuels Inefficiency - Public

Public Stakeholders

- 19,500 incorporated places
- 3,143 counties
- 574 tribal nations
- 50 states + Territories
- Federal government
- > 23,268 Jurisdictions

Public Challenges

- Mutually reinforcing processes inhibit innovation and collaboration
- Stovepipes fueled by
 - competing missions
 - minimum funding
 - interagency rivalries
 - individual prestige guarding
- A neutral examination of the problem could produce innovative alternatives



Complexity Fuels Inefficiency - Private

Dynamic Network

Must deal with a dynamic network

Millions of daily updates reflect changes

Public and Private Actors don't share update frequencies or all the same technologies

They do share the network they're trying to describe

Change Detection

Government collaborations

Survey vehicles

Volunteered geographic information (VGI)

Remote sensing

Artificial intelligence



Network Update Burdens

Public providers, PDPs, & ODPs share relationships with creators

Data creators endure the burden of

Keeping everyone aware of network changes

Ensuring network changes are captured by providers

These efforts drain resources



Market Trends

Most data providers agree they describe the same basic network

Distinguish themselves by

- Describing the network better

- Offering better services

- Providing better decision support services



Market Trends

Some PDPs have considered releasing a basic road network (minimum content) in the public domain

Extraordinary Implications

Creates a Public Good

Nonrivalrous – Consumption does not diminish supply

Nonexcludable – Everyone has access



Public Goods

Governments often intervene when public goods are created

Intervention improves market efficiency

Interventions have included governments assuming

- Burden of production

- Liability associated with production



HD Maps are Charts

Characteristic	Maps	Charts	HD Map / AV Chart
Authoritative		✓	✓
Cartographic Liability (Negligence)		✓	✓
Product Liability (Defective Chart)		✓	✓
Large Scale		✓	✓
Working Document (Must be Maintained)		✓	✓
Inform Navigation (Hazard Avoidance)		✓	✓
Inform Routing (Efficient Network Traversal)	✓	✓	✓



Why Distinguish Between Maps & Charts

I don't distinguish the difference, the law does

Helps chart producers to consider and understand their legal responsibilities

Helps identify the requirements and legal expectations of AV Charts

It's a useful framework for considering the future of road data governance

It makes my brain itch when some calls a chart a map

I'm offended if someone calls my chart a map

(I'm a former NOAA nautical chart cartographer)



216 Years of Chart Making Experience

Office of Coast Survey established in 1807 by Thomas Jefferson

OCS – Domestic Nautical Charts

FAA – Domestic Aeronautical Charts

USACE – Domestic Inland Charts

NGA – International Nautical and Aeronautical Charts

Let's rely on this vast wealth of institutional knowledge as we consider the future of road data production.



Risk of Liability

The case has been instanced ... and referred to by my brother Denning of a marine hydrographer who carelessly omits to indicate on his map the existence of a reef. The Captain of the 'Queen Mary', in reliance on the map and having no opportunity of checking it by reference to any other map, steers her on the unsuspected rocks, and she becomes a total loss. Is the unfortunate cartographer to be liable to her owners in negligence for some millions of pounds of damages? If so, people will, in the future, think twice before making maps. Cartography would become an ultra-hazardous occupation.

L.J. Asquith - 1951



Policy Window

The creation of a Public Good Network coupled with the advent of Avs may open a policy window

Is this an opportunity to completely reconsider how we govern road information?

Is this an opportunity to investigate the spectrum of collaborative governance alternatives?



Collaborative Governance Spectrum

Status Quo

Do Nothing

Let the market figure it out.

Public-Private Partnerships

Collaboration among Public Agencies, PDPs, and ODPs

Produce a basic standardized road layer for the nation

Enable value adding for Government, PDPs and ODPs

Government Intervention

Coordinate data collection from all stakeholders

Perform data registration and tracking

Produce basic charts

Enable value adding for Government, PDPs and ODPs

Establish reliable feedback loops

Retire data when its no longer valid

Assume Liability



Opportunities / Questions

Could PDPs, government agencies, and ODPs cooperate to create and maintain a basic standardized road layer for the nation?

If sustainable, how could the federal government save money and resources by using a common road network?

Could the government use a common road network to meet multiple missions & reduce or eliminate duplicative efforts?

Would a common road network reduce burdens on subnational governments?

Could PDPs to gain efficiencies and avoid opportunity costs through collaboration?

- No need to survey same road segments multiple times

- Redirect resources to improving services resulting in safer travel

Is liability risk too great for PDPs? If so, what happens to AV chart production?

Would an independent evaluation produce innovative alternatives?



Conclusion

Questions?



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