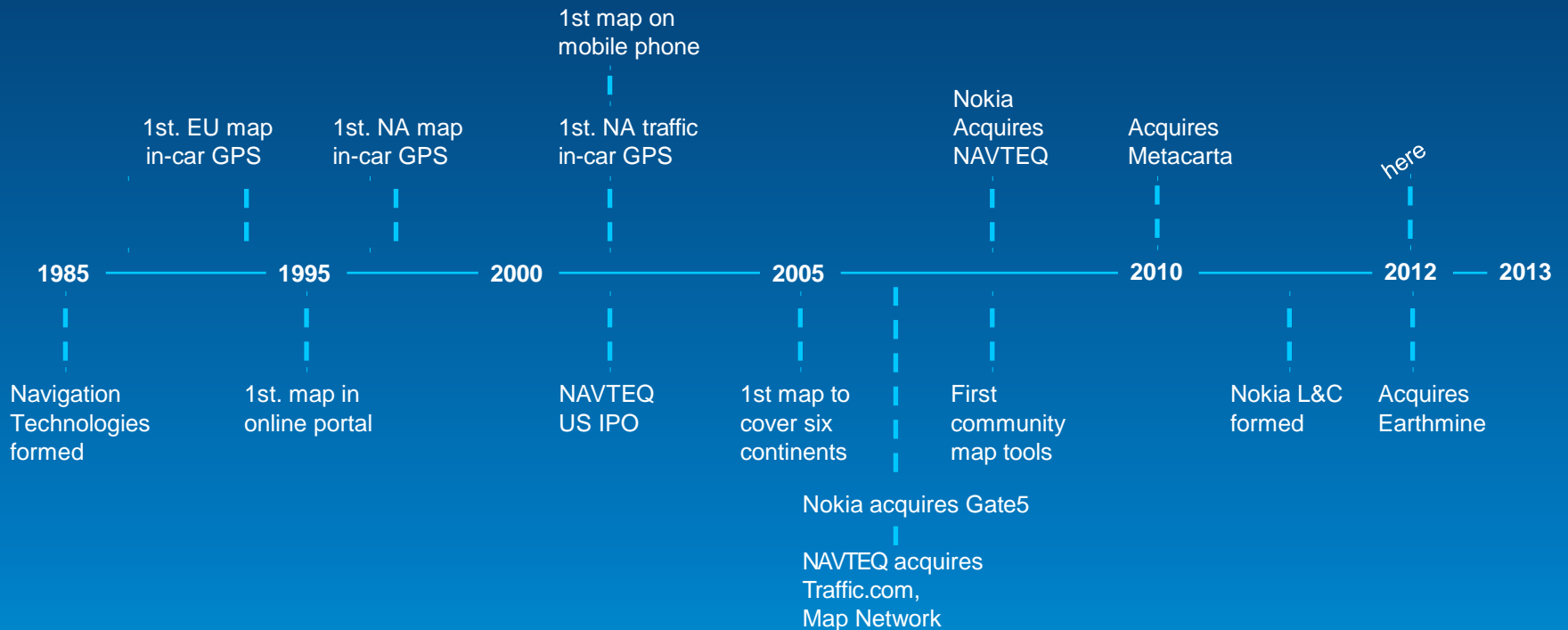


Determining Routing Improvements Resulting from HERE Map Updates AEC1413

Mike Milici



HERE has a map heritage that spans three decades



Content: capturing and indexing real life



214

Countries mapped



27M

Changes per day



75,600

Buildings with indoor maps



96

Countries with
voice-guidance



34

Countries with live
traffic services



80,000

External sources help to
create our maps



805

Cities with public transit



52

Languages



25+

Year map heritage

HERE & Esri Relationship

- HERE is an Esri Platinum Partner and works closely with Esri product development teams, as well as sales and marketing organizations to produce end-to-end solutions with the customer in mind
- HERE and Esri have been collaborating for over ten years, delivering some of the best-in-class geospatial and navigation solutions across a variety of applications
- HERE Map Content helps strengthen Esri for winning key agreements
- HERE is also an enterprise (ELA) user of Esri products – HERE uses Esri tools throughout its organization to help build precise and accurate databases worldwide
- Learn more at esri.com/here

Routing to validate fresh maps

Mike Milici

Impact of map freshness on the user routing experience

- **Improved dynamic routing using traffic and weather**
 - Additional traffic codes can help avoid traffic
 - Additional traffic areas can also refine weather warnings
- **Improved static routing using updated road and POIs**
 - New roads and updated roads
 - In 2013 Thailand had many miles of new roads added
 - In 2013 Africa had extensive corrections to the road hierarchy
 - In 2013 Indonesia had over 60 boat ferries added to the map
 - POI (Points of Interest) openings, closings, changes

Examples of common road network improvements

Australia

Q3 2012 (79 Meters difference)

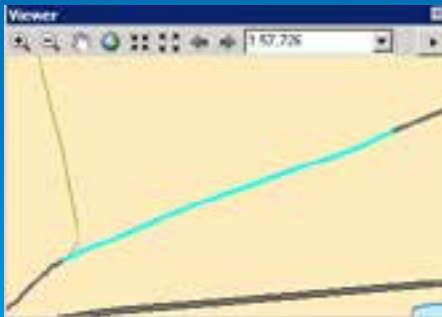


Q4 2012 route



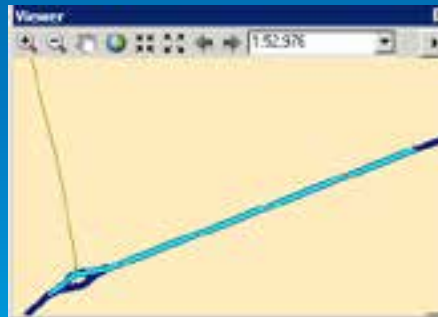
A route segment decreased in length by 79 meters as a result of the road improvements made in Australia

Q4 2012 route



Argentina

Q1 2013 route



A route segment increased in length by 113 meters as a result of the road improvements made in Argentina

Map Routing Analysis to analyze map updates

- **Countries that are undergoing map updates to the road network are flagged as candidates for routing analyses**
 - **Up to 10,000 routes are run on both the reference map and also on the new map per country**
 - **Routes are paired and examined for:**
 - **Which routes stay the same**
 - **Which routes improve by shorter distance or time**
 - **Which routes deteriorate by getting longer or unsolvable**

Map Routing Analysis ArcGIS Configuration

- **Install ArcGIS 10.1 or later (in 10.1 routes can be extracted)**
- **Obtain Advanced License Level**
- **Enable the network analyst extension**
- **Enable 64 bit GP (needed for thousands of routes at a time)**

France Example

Q4 2013 to Q1 2014 – no change in routes



25 most populous cities appear as tiny blue dot, each city is labeled with the city and county level administrative area

Base Routes

Thick line

Test routes

Thin line

Cities



Germany Example

Q4 2013 to Q1 2014 – no change in routes



25 most populous cities appear as tiny blue dot, each city is labeled with the city and county level administrative area

Base Routes

Thick line

Test routes

Thin line

Cities



USA Example

Q4 2013 to Q1 2014 – no change in routes



31 most populous cities appear as tiny blue dot, each city is labeled with the city and county level administrative area

Base Routes

Thick line

Test routes

Thin line

Cities



Indonesia and Thailand had significant map updates in 2013 (good changes)

- **Indonesia had over 70 boat ferries added in 2013**
- **Thailand had new highways added to the map decreasing the length of routes between major cities**
- **Brazil map updates resulted in an error in routing during early publishing trials**

Indonesia Q4 2012 to Q1 2013

Q4 2012 to Q1 2013 boat ferries added utility



Thin Blue lines show the additional roads that became used and the new routes that became solvable

194 out of 600 2012Q4 routes were solvable

400 out of 600 2013Q1 routes were solvable

Base Routes

Thick line

Test routes

Thin line

Indonesia Q1 2013 Q1 2014 (600 routes, 25 cities)

Q4 2012 to Q1 2014 more boat ferries continue to improve utility



Pink lines over land show roads that are no longer used in inter city travel

Blue lines over water are ferry routes

Pink lines over water are ferry routes added in the Q1 2013 map

Base Routes

Thick line

Test routes

Thin line

Indonesia

Q1 2013 Q1 2014 600 routes and also unused boat ferries in blue



Green Lines show latest routes

Blue lines over water are ferry routes that were not used in our test

Thailand– Q4 2012 to Q1 2013 (good change)



Pink lines show roads used in older product

Blue lines show roads used in newer product

Pink lines without blue are old roads that now are not being used due to better alternatives

Blue lines without pink are new roads that shorten the distance between cities

Base Routes

Thick line

Test routes

Thin line

Thailand– Q4 2012 to Q1 2013 (zoomed)



Pink lines without blue are old roads that now are not being used due to better alternatives

Blue lines without pink are new roads that shorten the distance between cities

The newer map is better, trips between cities were shortened by as much as 300 KM

Base Routes

Thick line

Test routes

Thin line

Trouble in Brazil – wrong way link on HWY

Q1 2013



Light blue line shows the point where the route diverges due to the link reversal

The route used for testing increased in length by 185 KM

Light blue polygon shows

Location of single link (stretch of road) that was reversed

Q2 2013 – error in map



Wrap-up

Still Mike Milici

MRA and Transport



- **Automotive networks are mature in most countries**
- **Transport restrictions come in over 100 varieties that differ from country to country**
- **Transport attributes were added to the core map in 2007 and 2008**
- **Transport networks still have large portions of the road attribution unverified resulting in:**
 - **The inability to route trucks between two points (when there should be a result)**
 - **The failure to return an optimal route for transport customers**

Conclusions

- Millions of updates are improving the utility of digital maps with each release (quarterly, monthly, instantly)
- New highways and ferries are excellent reasons to update your map, corrected geometry is also reason to update
- Large scale route testing (as shown here) of products can be used to improve map quality and reduce your carbon footprint as shorter routes are found
- The Esri arcpy library and network analyzer were reliable, flexible and powerful

Thank You!

Be sure to visit [HERE](#) during Esri UC!

SDCC Exhibit Area – HERE Booth #817

Demos

- StreetMap Premium
- ArcGIS Online:
 - Routing
 - Geocoding
 - Traffic
 - Pedestrian
- HERE Map Content for Geocoding

HERE Summits

- National Security Summit
- Federal Showcase Reception
- Federal Showcase Demo - Presenter
- 3D Mapping Forum – Presenter
- Business Summit – Presenter
- AEC Summit – Presenter
- Transportation Exchange
- Transportation SIG – Presenter
- TelUG
- LATAM RUG – Presenter
- Europe RUG – Presenter