Estimating Freight Activity on Major Highways with the Freight Analysis Framework (FAF)

Geospatial Interest Group of the Federal Committee on Statistical Methodology
October 16th, 2015
Michael Sprung

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Domestic</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>20,063</td>
<td>17,950</td>
<td>914</td>
<td>1,199</td>
</tr>
<tr>
<td><strong>Truck</strong></td>
<td>13,955</td>
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<td><strong>Air, air &amp; truck</strong></td>
<td>15</td>
<td>3</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td><strong>Multiple modes &amp; mail</strong></td>
<td>1,554</td>
<td>459</td>
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<tr>
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<td>1,539</td>
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<td>137</td>
</tr>
<tr>
<td><strong>Other &amp; unknown</strong></td>
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Understanding Freight Transportation

• **How much & what** freight moves from place to place?
  – Weight
  – Value
  – Type of commodity

• **Where & how** is freight moving?
  – Origin & destination
  – Route used
  – Mode of transport

• **When** is freight being carried?
  – Season
  – Time of day
What FAF Does

• Estimate current and future volumes of freight moving within and between regions by mode and commodity

• Assigns truck flows on highway corridors

• Identify baseline conditions for a better understanding where there are freight-related challenges

• Forecast the pressure future freight flows would place on the existing highway network
What FAF Does Not Do

• Estimate flows precisely within local regions and on individual routes

• Estimate temporal variations in freight flows

• Include effects of capacity limitations on forecasts of future demand

• Forecast future capacity expansion

• Adjust for changes in costs of transportation
**FAF Data Products**

- A tabular database of regional O-D freight flows by tons and value for all modes, including annual provisional updates, and long-range forecasts.

- An assignment of the average number of freight-hauling trucks to individual highway segments on the national network.

### Table: 2013 Domestic Exports and Imports

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*Note: Some values may not add up due to rounding.*
# FAF Data Product Details

## Regional O-D Database
- Tons & value
- Origin/destination
- All modes
- Commodity detail
- Base year, most recent year, & forecast years
- Accessed with tabular data software or create subsets using the online data tabulation tool

## Network Database
- Avg. Daily traffic counts on highway segments
- Highway only
- No origin/destination
- No commodity detail
- Base year and 30 year forecast
- Accessed with GIS software
Origin-Destination Database Details

• Value & weight for all domestic, export, & import shipments

• 8 Domestic modes (truck, rail, water, air, multiple modes & mail, pipeline, other & unknown, and no domestic mode)

• 7 Foreign modes

• 131 Domestic regions

• 8 International regions (Canada, Mexico, & 6 groupings of all other countries)

• 43 Commodity classes (2-digit SCTG codes)
Network Database Details

- Approximately 450,000 miles of the nation’s highways where trucks are permitted to operate
- Route type
- FAF trucks (freight hauling trucks)
- All trucks
- All highway vehicles
- Capacity measures
- Volume to capacity ratios
- Base and forecast year
FAF Network Coverage

- All interstate highways
- Non-interstate NHS routes
- NN routes not part of NHS
- Other rural and urban principal arterials
- Intermodal connectors
- Rural minor arterials for those counties that are not served by either NN or NHS routes
- Urban bypass and streets as needed for network connectivity
Network Assignment Components

- O-D matrix
- Routable highway network
- Truck payload factors (VIUS & VTRIS)
- Empty trucks estimate (VIUS)
- Calibrated O-D disaggregation
- Assignment model
- Traffic counts (HPMS)
- Network capacity/restrictions
- Impedance factors
**O-D Disaggregation**

- More than 4600 O-D centroids created based on several factors:
  - County Business Patterns
  - Truck based distribution centers
  - Warehouse clusters
  - Rail/Truck intermodal facilities

- Secondary disaggregation at international freight gateways:
  - Land border crossings
  - Water ports

- Calibrated trip distribution model applied to account for the spatial interaction of freight movements
Trucks on the Network

[Map of the United States showing highways and trucks on the network]
Diversion Analysis Example

- May 2011 - a section of I-40 in Arkansas was closed due to flooding from the White River

- Major non-interstate routes in the surrounding area were also flooded or closed because of the possibility for flooding

- Of the ~31,000 vehicles that cross the I-40 White River Bridge on an average day, an estimated 60% are large commercial vehicles
Post-Scenario FAF Truck Flow (Regional)
Change in FAF Truck Flow (Regional)

18% Increase

28% Increase
Freight Flows by Highway, Railroad and Waterway
Accessing FAF Data

- U.S. DOT Freight Page:

- FHWA Website:

- BTS Website
  - [www.bts.gov](http://www.bts.gov) – Fall 2015
Freight Analysis Framework

The Freight Analysis Framework (FAF) integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. With data from the 2007 Commodity Flow Survey and additional sources, FAF version 3 (FAF³) provides estimates for tonnage, value, and domestic ton-miles by region of origin and destination, commodity type, and mode for 2007, the most recent year, and forecasts through 2040. Also included are state-to-state flows for these years plus 1997 and 2002, summary statistics, and flows by truck assigned to the highway network for 2007 and 2040.

FAF³ Origin-Destination Data

- **FAF Data Tabulation Tool** - Create and download customized FAF³ summary tables.
- Regional Database of tonnage, value, and domestic ton-miles by FAF region of origin and destination, commodity type, and mode for 2007 through 2040
  - FAF³ Regional Database for 2007 with forecasts through 2040, and 2012 and Provisional Data in zipped Microsoft Access format [FAF3.5_access03.zip 227MB]
  - FAF³ Regional Database for 2007 with forecasts through 2040 in zipped CSV format [FAF3.5.zip 141MB]
  - FAF³ Provisional Annual Data for 2012 in zipped CSV format [FAF3.5_provisional_2012.zip 23MB]
- State Database of tonnage, value, and domestic ton-miles by state of origin and destination, commodity type, and mode for 1997 through 2040. Note: 1997 and 2002 have been reprocessed using FAF³ methodology with original source data.
  - FAF³ State Database for 2007 with forecasts through 2040, 2012 Provisional Data, and Reprocessed State Annual Data for 1997 and 2002 in zipped Microsoft Access format [FAF3.5_access03_State.zip 116MB]
  - FAF³ State Database for 2007 with forecasts through 2040 in zipped CSV format [FAF3.5_State.zip 51MB]
  - FAF³ State Provisional Annual Data for 2012 in zipped CSV format [FAF3.5_provisional_2012_State.zip 9MB]
  - FAF³ Reprocessed State Annual Data for 1997 in zipped CSV format [FAF3.3_1997_State.zip 10MB]
  - FAF³ Reprocessed State Annual Data for 2002 in zipped CSV format [FAF3.3_2002_State.zip 7MB]

FAF³ Summary Statistics and Products

- **State Summary Tables by Mode and Commodity**
- **FAF and Related Freight Maps**

FAF³ Network Data

- **FAF³ Network Database and Flow Assignment for 2007 and 2040**

FAF³ Documentation

- **FAF³ Users Guide**
- **FAF³ Documentation**
- **Version Descriptions**
Moving Forward

• BTS
  – 2012 benchmark O-D data by commodity and mode
  – Provisional annual updates

• FHWA
  – Long range forecasts of O-D
  – Network assignment of truck flows
Upcoming Releases

• FAF4 O-D data benchmarked to 2012 CFS – October 2015
• Long-range forecasts through 2045 – January 2016
• Network assignment, and highway flow maps – March 2016
• Domestic ton-miles and distance bands – Summer 2016
Thank You

For additional information on BTS programs and products visit: www.bts.gov

For additional information on USDOT freight data programs and products visit: www.freight.dot.gov

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Without Data
It’s Just An Opinion.