LLamasoft®

Supply Chain By Design

Enabling Success Through Better Supply Chain Design

About LLamasoft

We are:

LLamasoft
Supply Chain By Design

The global leader in supply chain design technology, services and solutions

Unparalleled expertise and experience, with a culture of service and integrity

200+
employees

Headquartered in Ann Arbor, Michigan with support centers around the world

© 2014 LLamasoft, Inc. All Rights Reserved

Why Is Supply Chain Design Important?

LLamasoft
Supply Chain By Design

Volatility and change is the new normal

External Factors

Internal Factors

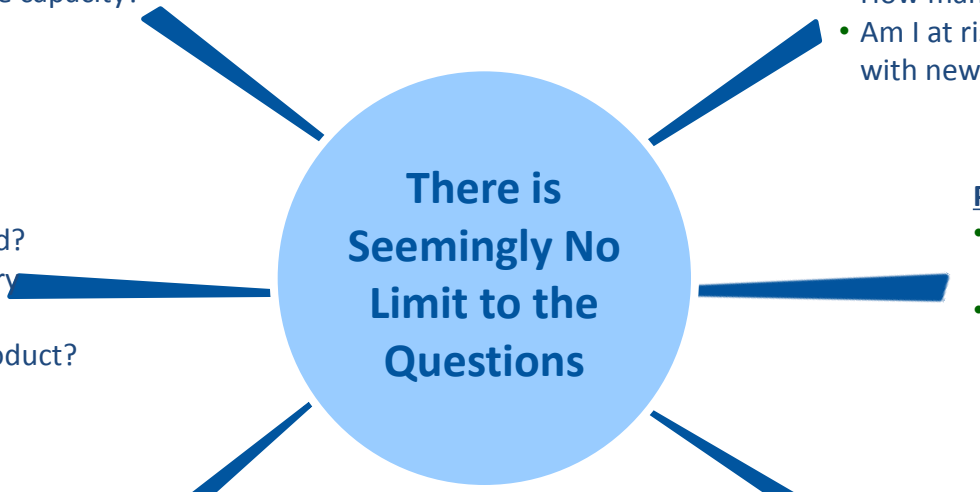
© 2014 LLamasoft, Inc. All Rights Reserved

With Volatility and Change. . .
Come More Questions to Answer

LLamasoft
Supply Chain By Design

Network Structure
- Where should I add new sites?
- Which hub should supply each SDP?
- When do I need more capacity?

Service & Performance Metrics
- How does a change in inventory policy effect my service rates?
- How many products expire?
- Am I at risk of hitting capacity constraints with new product introductions?



Inventory
- How much inventory do I need?
- How much additional inventory to increase availability?
- Where should I stock each product?

Product Flow
- How much does it cost to serve each customer?
- Should I bypass a layer in the network?

Transportation
- How many routes & assets do I need?
- What if I change delivery frequency?
- How can I reduce my empty miles?
- Can I combine inbound/outbound shipments?

Product Demand
- How are SDPs consuming our products?
- What is the variability in demand?

© 2014 LLamasoft, Inc. All Rights Reserved

An Integrated Supply Chain Design Platform Enables Businesses To:

LLamasoft
Supply Chain By Design

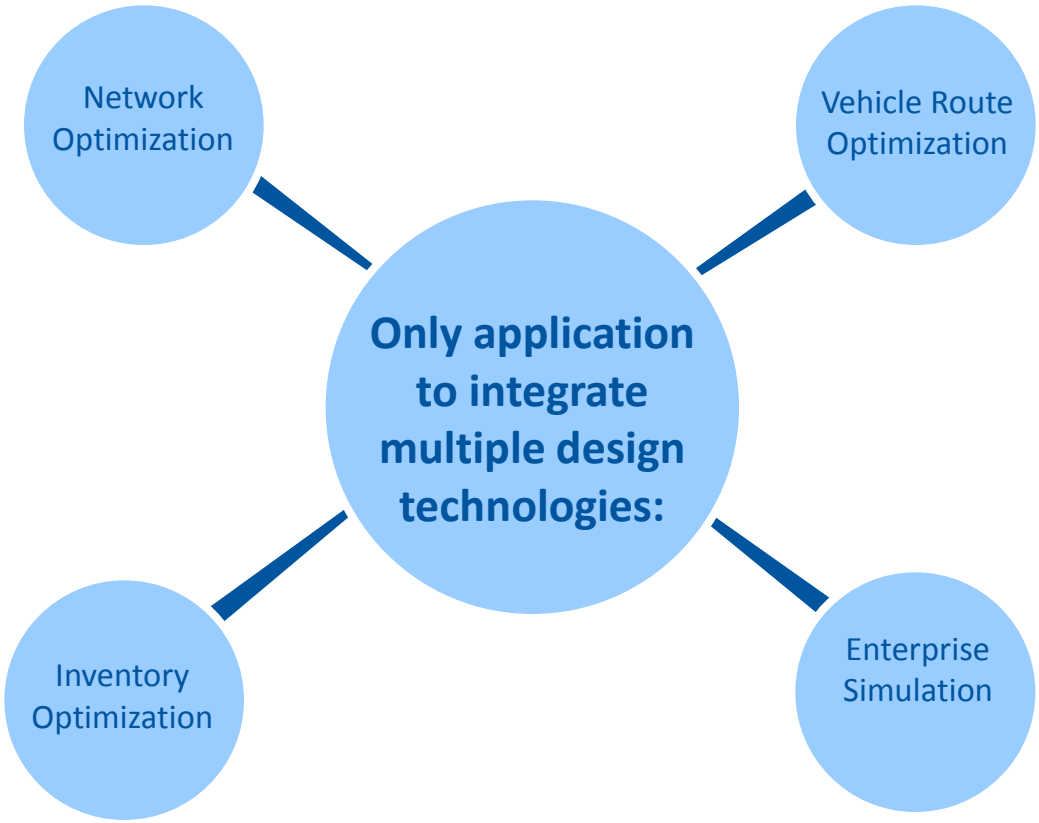
- Quickly generate models to help **visualize and analyze the current supply chain** operations
- Validate potential supply chain changes and continuously **test new what-if scenarios**
- **Optimize the supply chain for the right balance between cost, availability & risk**
- React rapidly to unplanned disruptions, market fluctuations, or new business strategies

LLamasoft
Supply Chain By Design

© 2014 LLamasoft, Inc. All Rights Reserved

Technology
Integrated Analytical Solvers

LLamasoft
Supply Chain By Design



© 2014 LLamasoft, Inc. All Rights Reserved

Commercial Customers Worldwide

LLamasoft
Supply Chain By Design

© 2014 LLamasoft, Inc. All Rights Reserved

Global Health Engagements

LLamasoft
Supply Chain By Design

© 2014 LLamasoft, Inc. All Rights Reserved

SC Design Cases we've seen today

LLamasoft
Supply Chain By Design

- Mozambique
- Benin
- Ethiopia

© 2014 LLamasoft, Inc. All Rights Reserved

SC Design Cases we've seen today

LLamasoft
Supply Chain By Design

- Mozambique
  - Skip District Level (go direct from province)
  - Reduce frequency for remote facilities
- Benin
  - Change from facility pickup to delivery
- Ethiopia
  - Skip Zonal Level (go to Woreda)
  - Frequency: Monthly delivery

What effect on cost and availability?

How best to do?

© 2014 LLamasoft, Inc. All Rights Reserved

An integrative case: Tanzania

LLamasoft
Supply Chain By Design

- Direct Delivery: 5000+ facilities
- Skipping a layer (DMO) and stopping pickup
- Essential Medicines

USAID | DELIVER PROJECT
FROM THE AMERICAN PEOPLE

JSI
John Snow, Inc.

msd
medical stores department

© 2014 LLamasoft, Inc. All Rights Reserved

An integrative case: Tanzania

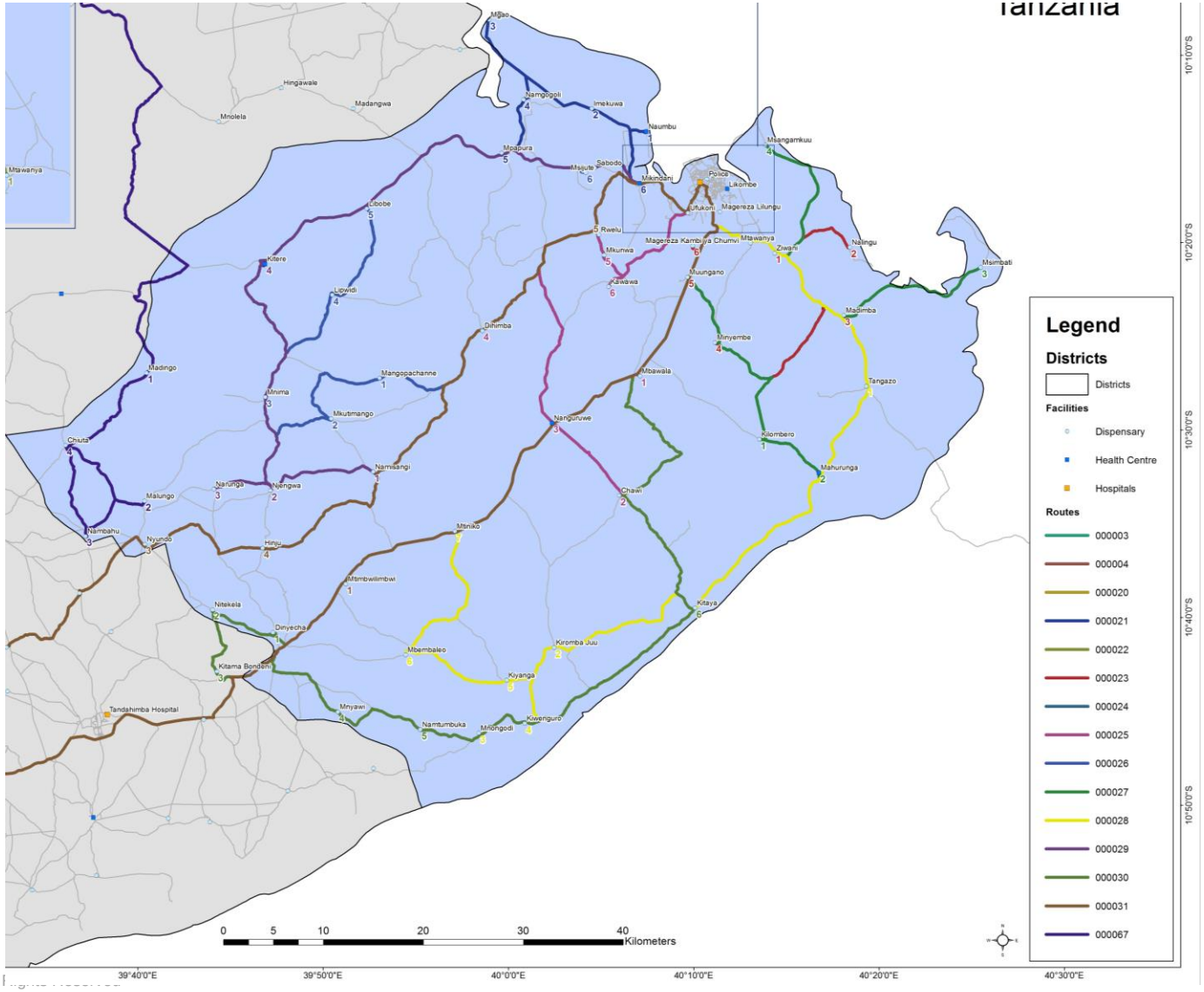
LLamasoft
Supply Chain By Design

- Which Hubs to which SDPs?
- What routes, how many vehicles?

© 2014 LLamasoft, Inc. All Rights Reserved

An integrative case: Tanzania

LLamasoft
Supply Chain By Design



© 2014 LLamasoft, Inc. All Rights Reserved

An integrative case: Tanzania

LLamasoft
Supply Chain By Design

- Data Collection and Feedback
- Continuous Process: Owning the tool
- Private Sector (Outsourcing/3PL bid assessment)
- Integration across programs

© 2014 LLamasoft, Inc. All Rights Reserved

LLamasoft®

Supply Chain By Design

Thank You!

LLamasoft®

Supply Chain By Design

BACKUP:
Supply Chain Design Client Use Cases

What Does My Supply Chain Look Like?

LLamasoft
Supply Chain By Design

Four Regional Distribution Centers

LLamasoft
Supply Chain By Design

Customers Throughout the Country

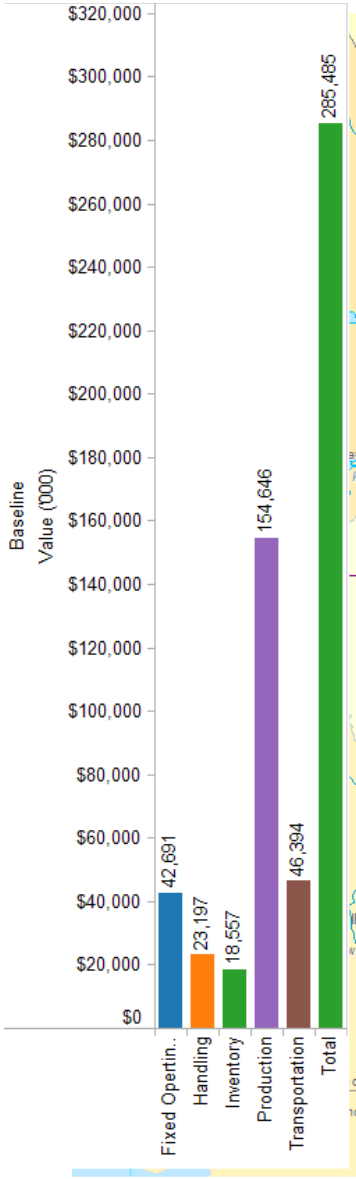
LLamasoft
Supply Chain By Design

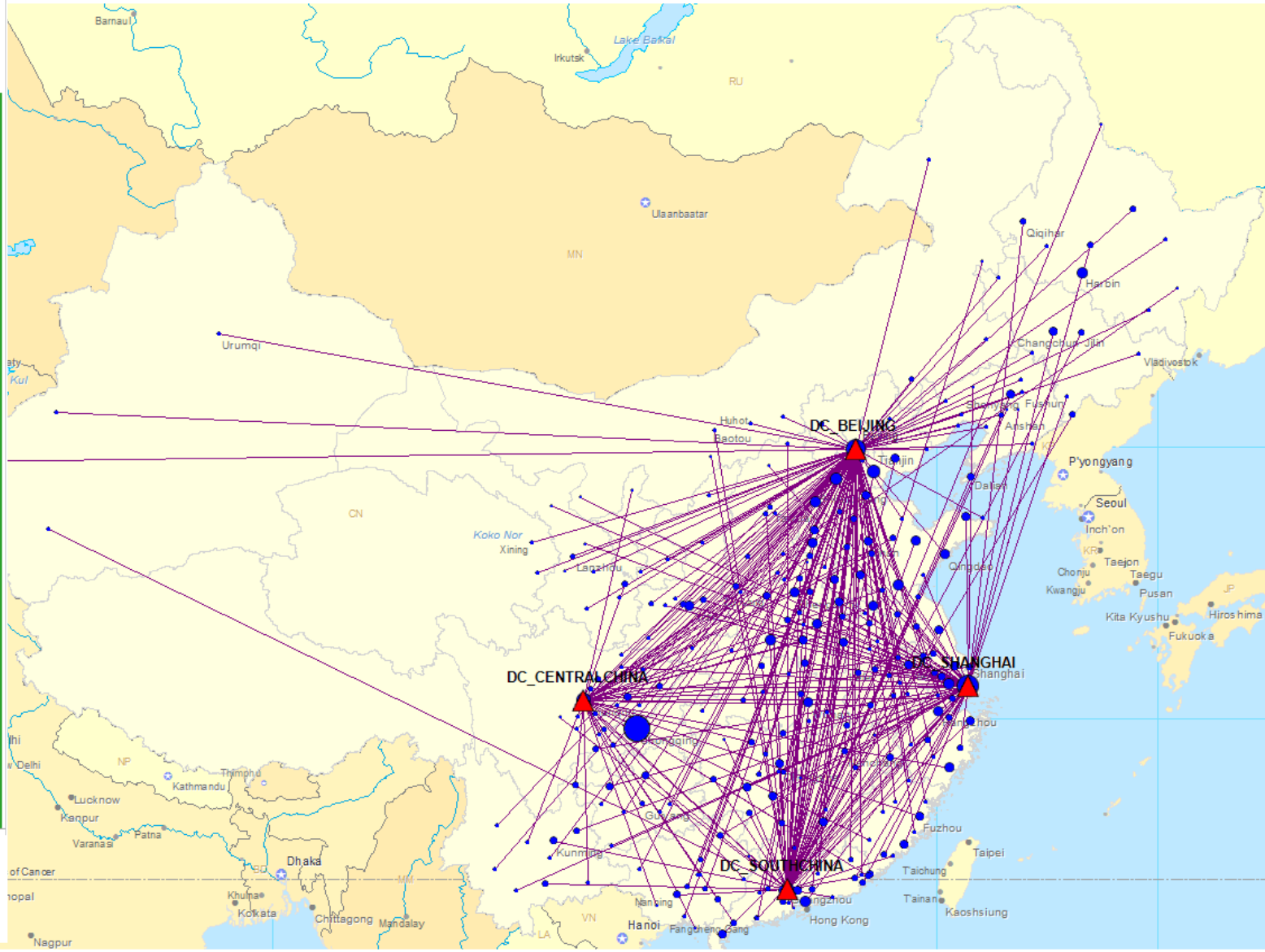
Widely Varying Demand by Customer

LLamasoft
Supply Chain By Design

As-Is Costs and Operations

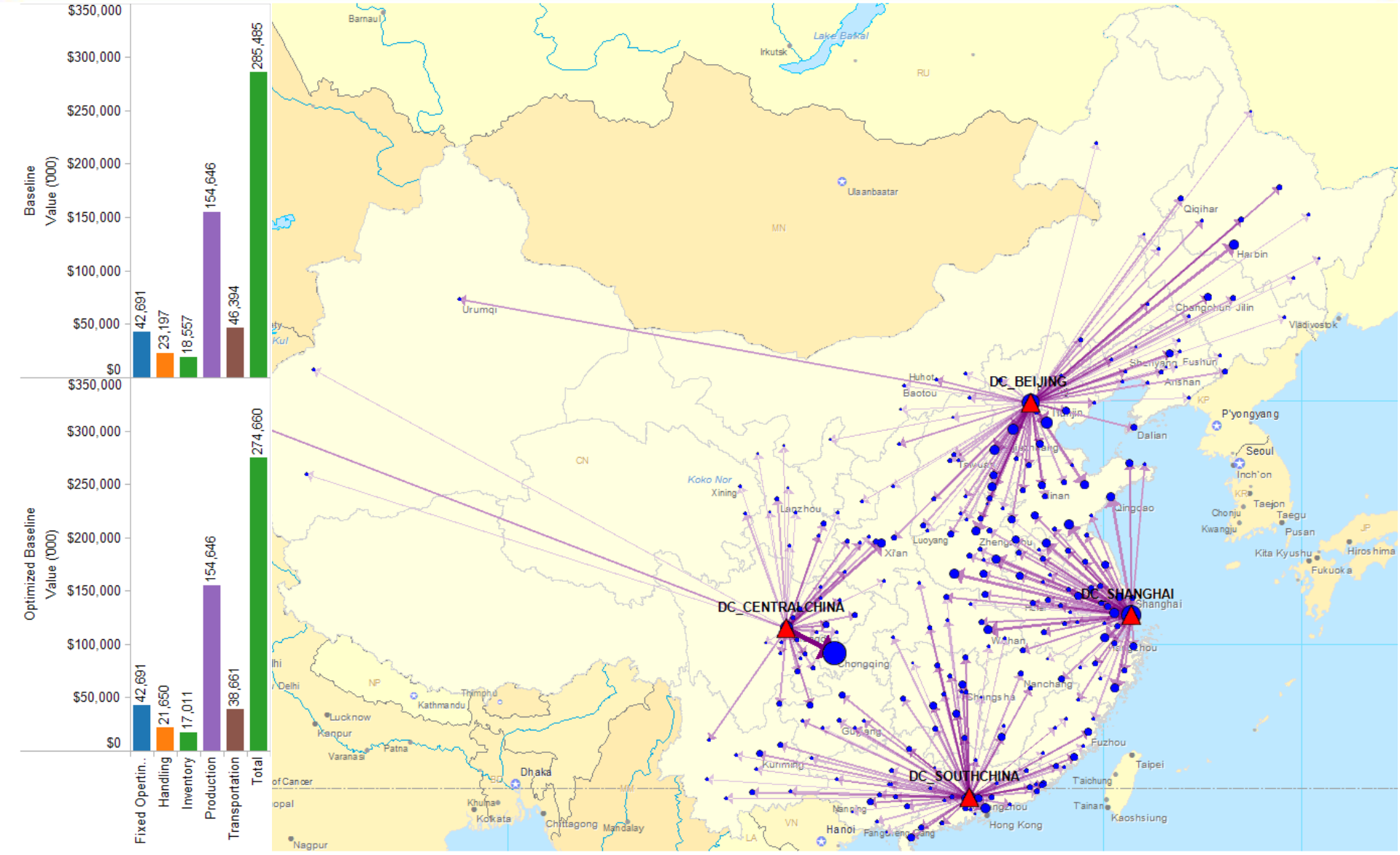
LLamasoft
Supply Chain By Design





Product Flowpath Analysis

LLamasoft
Supply Chain By Design

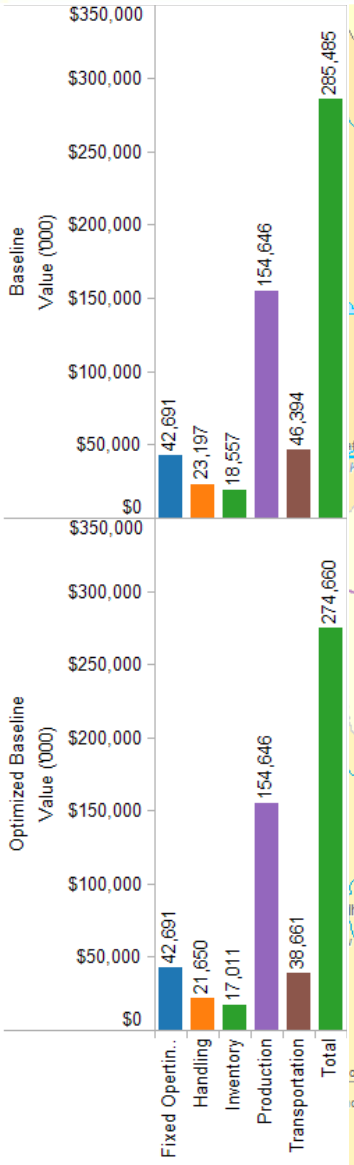


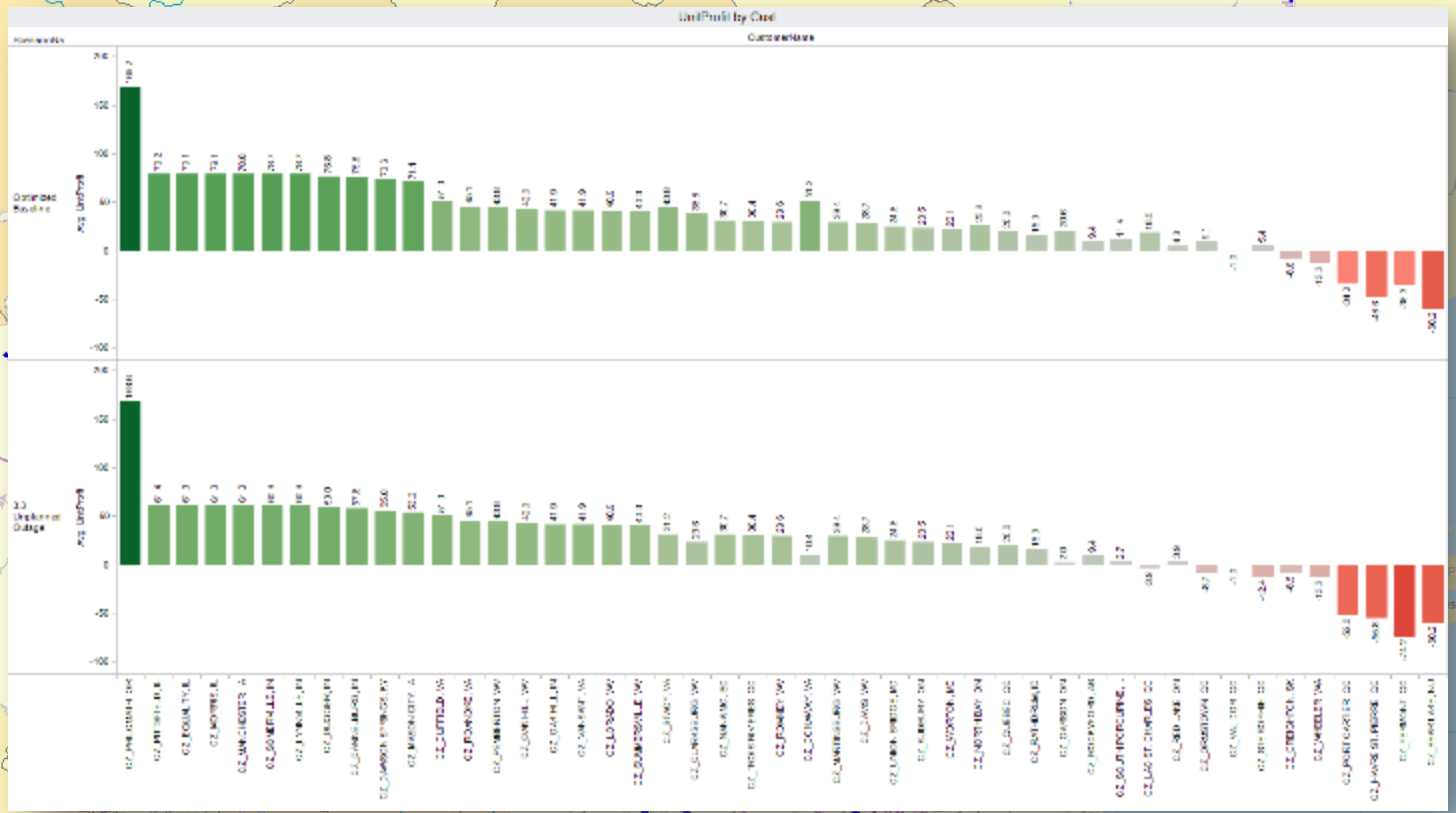
Port Flow Balancing

LLamasoft
Supply Chain By Design

Cost-to-Serve Optimization

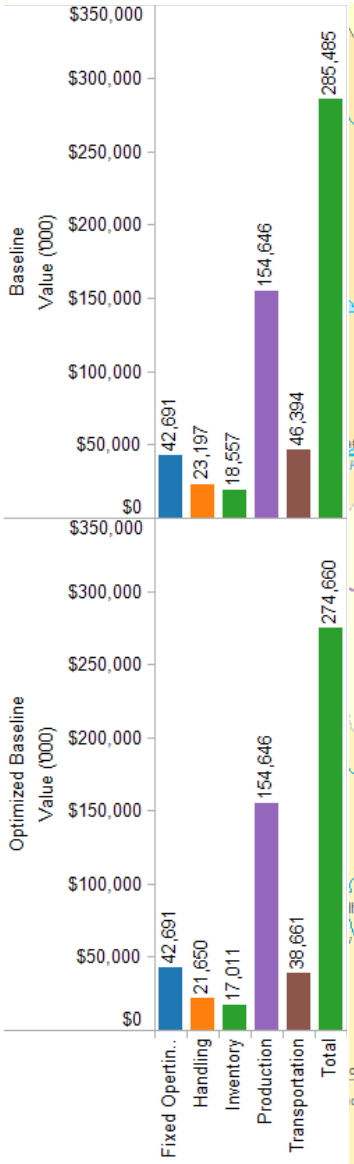
LLamasoft
Supply Chain By Design

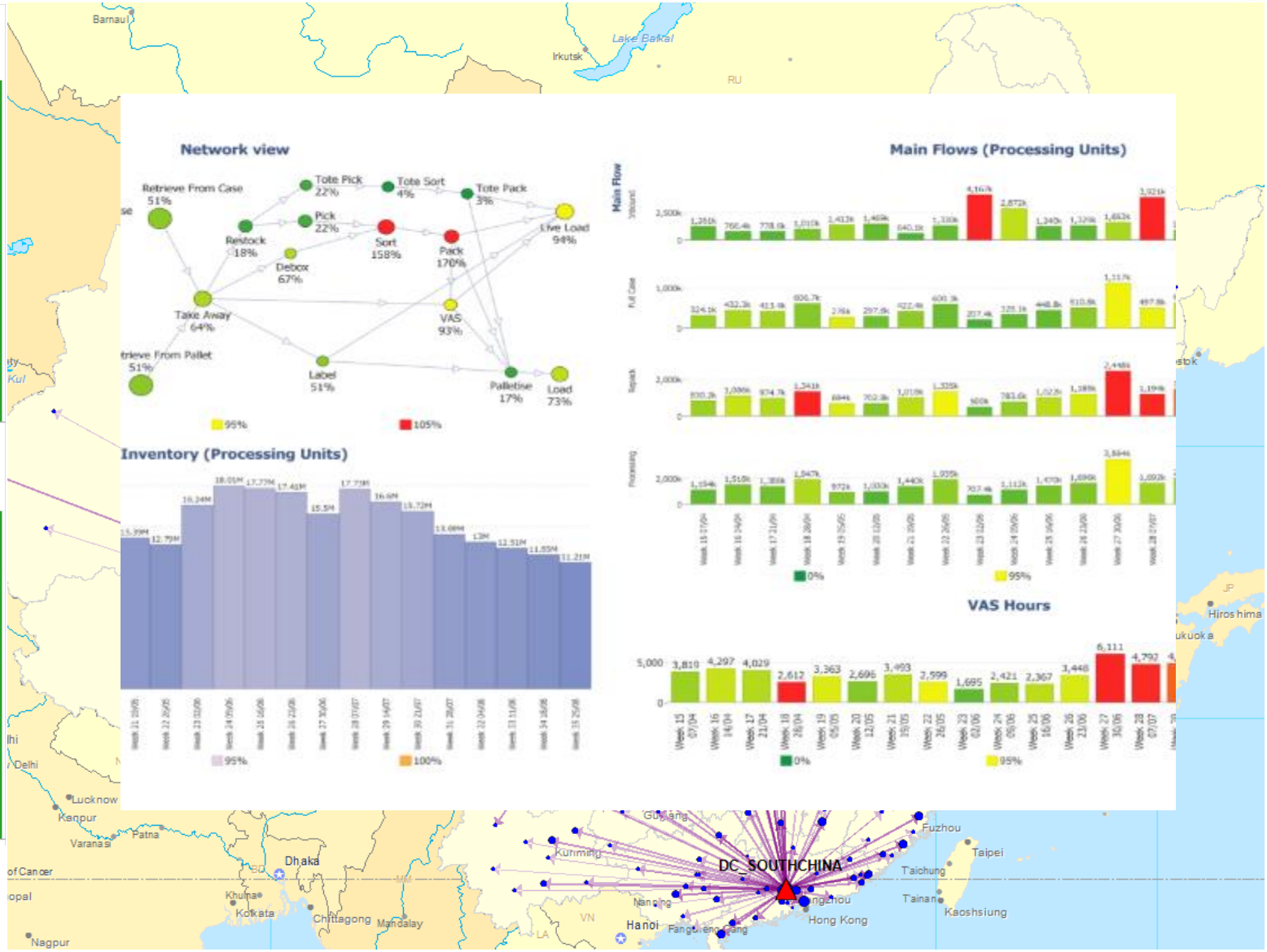




Capacity Modeling & Optimization

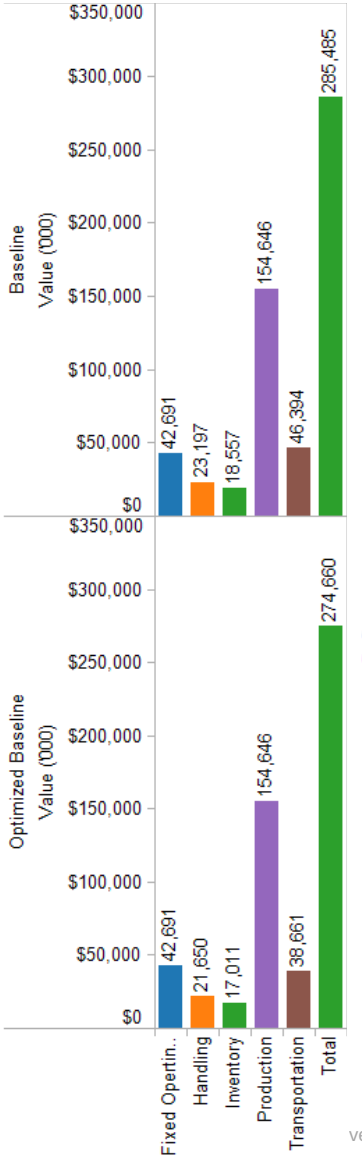
LLamasoft
Supply Chain By Design

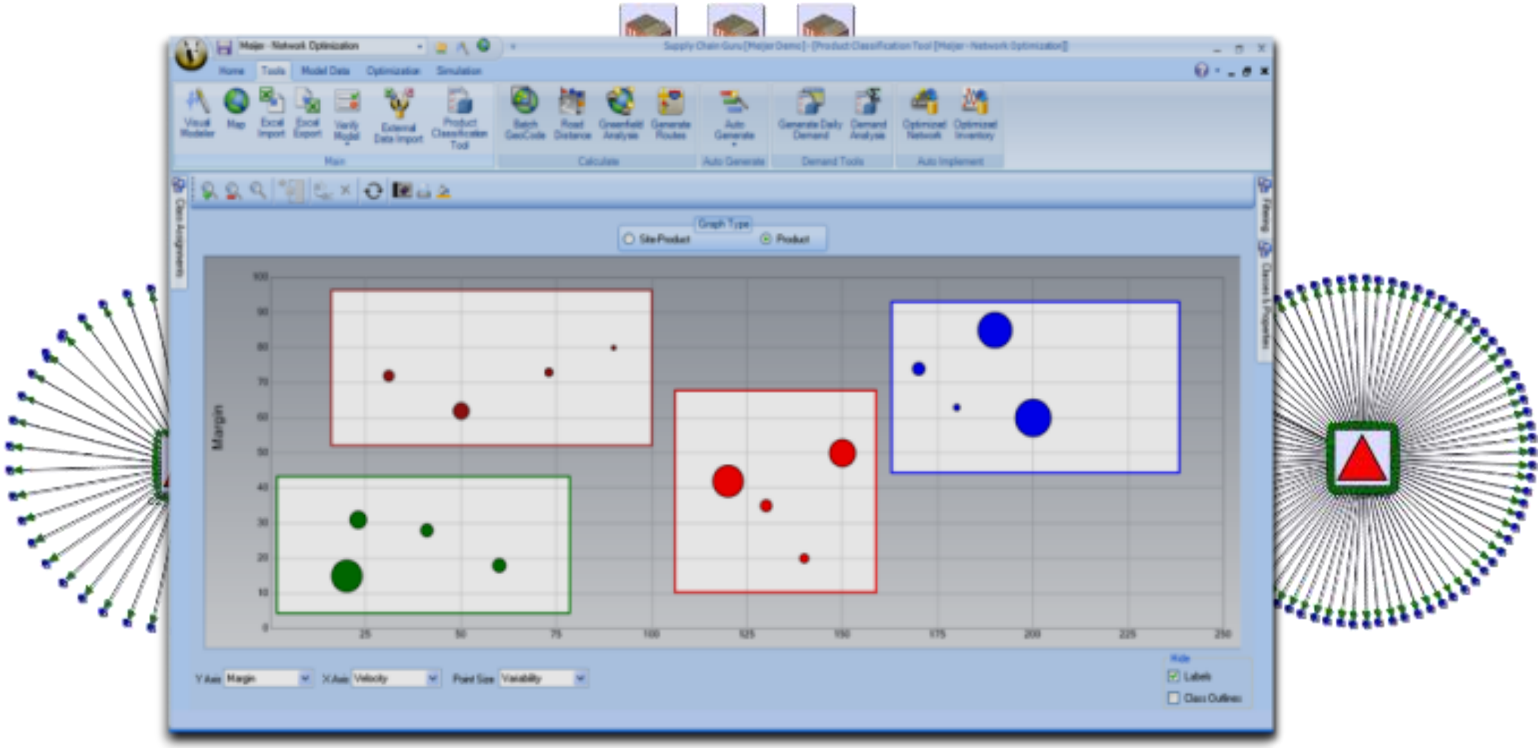




Supply Chain Segmentation

LLamasoft
Supply Chain By Design



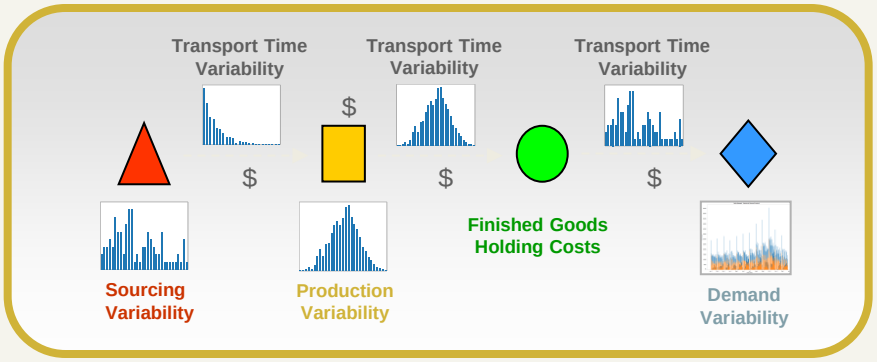


ved

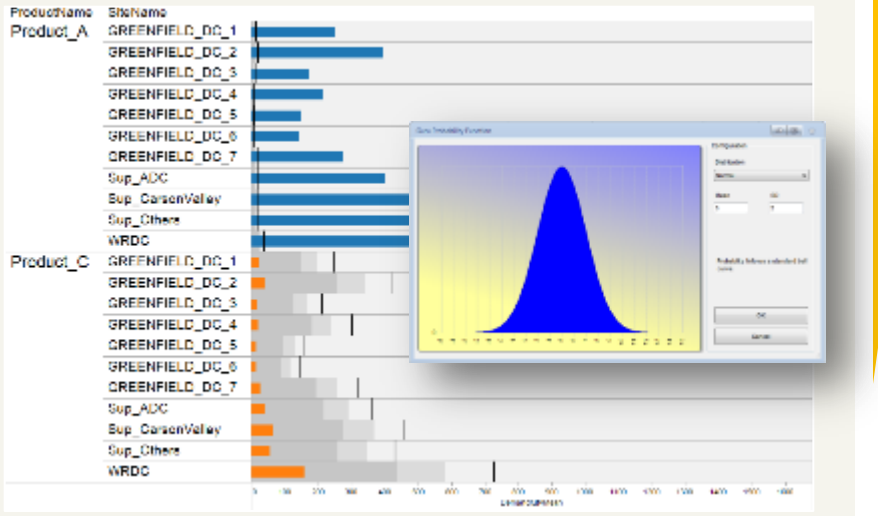
Safety Stock Optimization

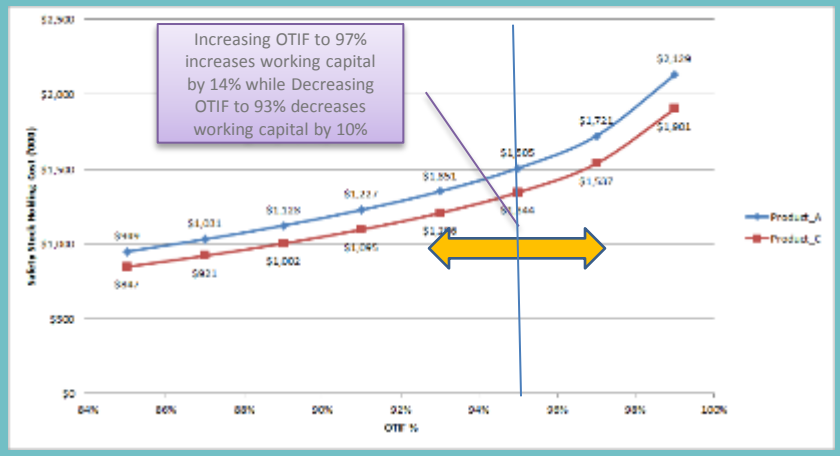
LLamasoft
Supply Chain By Design

Multi-Echelon Safety Stock Optimization



Demand & Lead Time Profiling



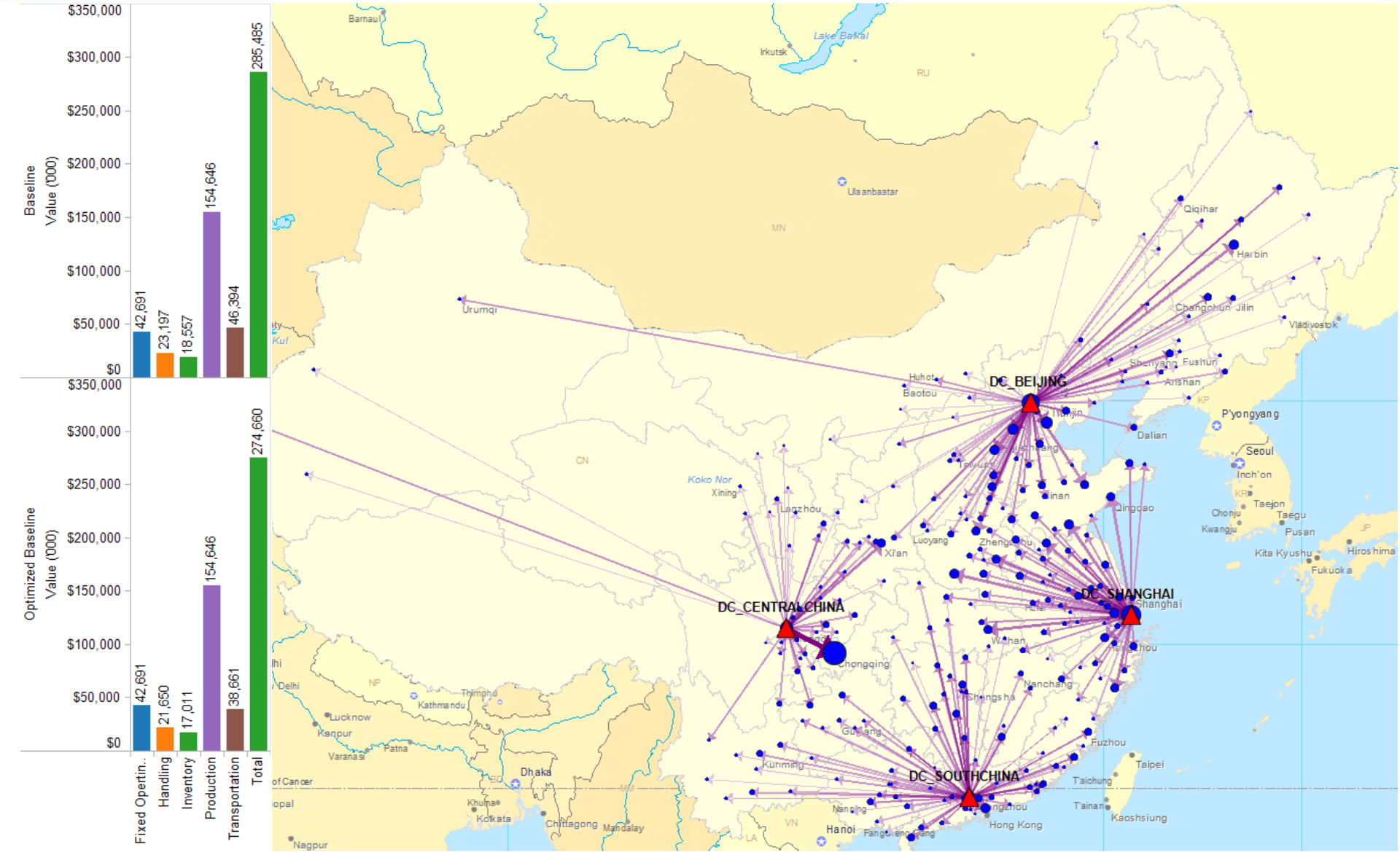


Key Benefits and Usage

- Multi-Echelon Safety Stock optimization allows the model to achieve savings in working capital while simultaneously maintaining or increasing service level to stores
- Scientifically quantify cost or benefits of service level, sourcing, and contractual lead time agreement changes.
- Combine with network optimization to set optimal inventory planning policies. ie Reorder point, order quantities by site by product
- Model can automatically profile historical sales data or use forecast and forecast error as inputs
- IO Select functionality allows automated filtering of products with non-normally distribution demand

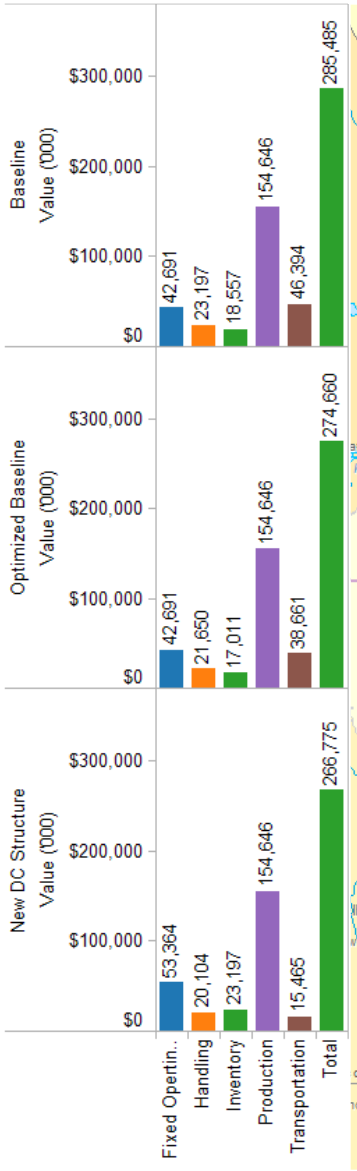
As-Is Supply Chain

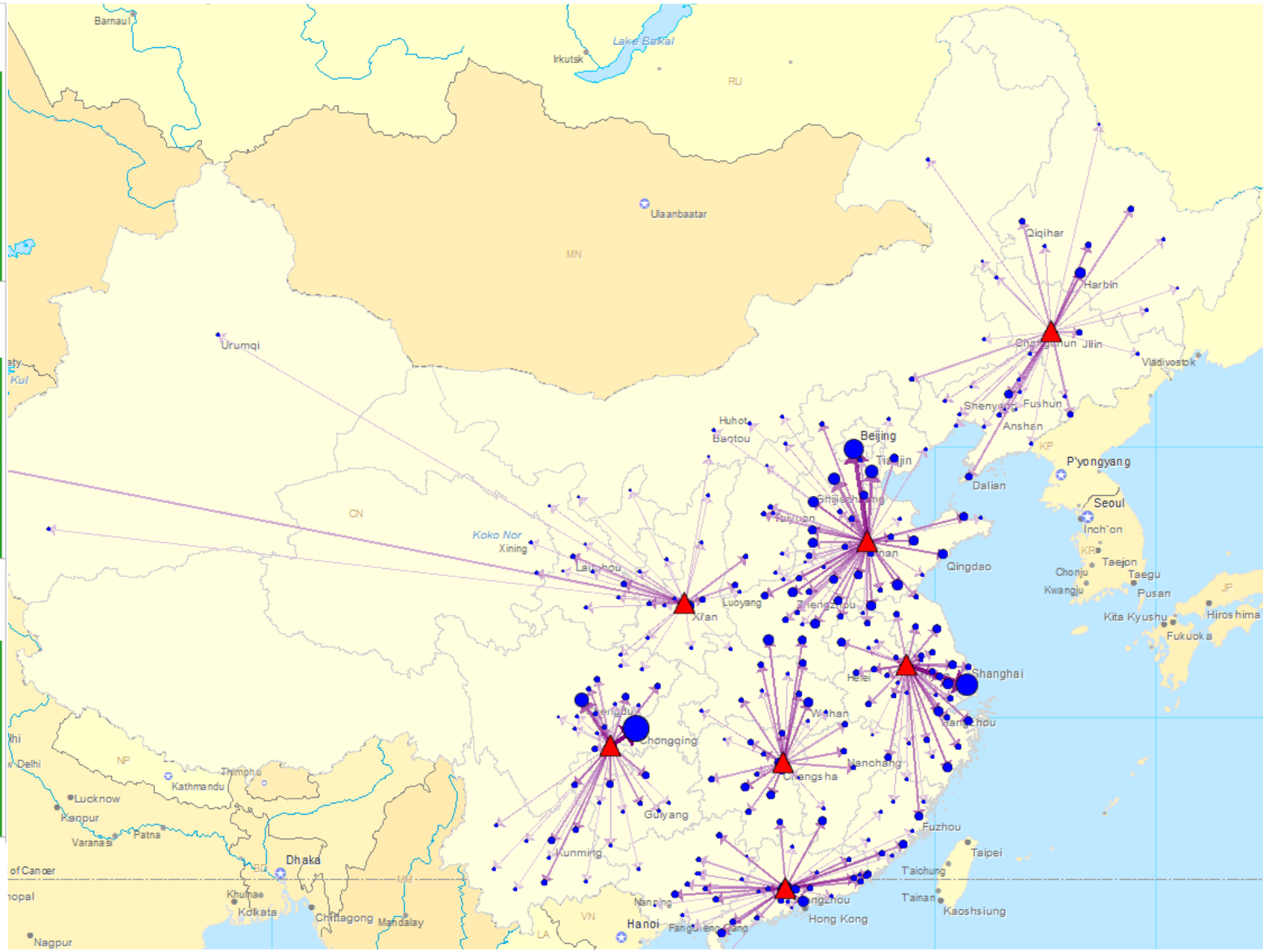
LLamasoft
Supply Chain By Design



New Optimal Structure

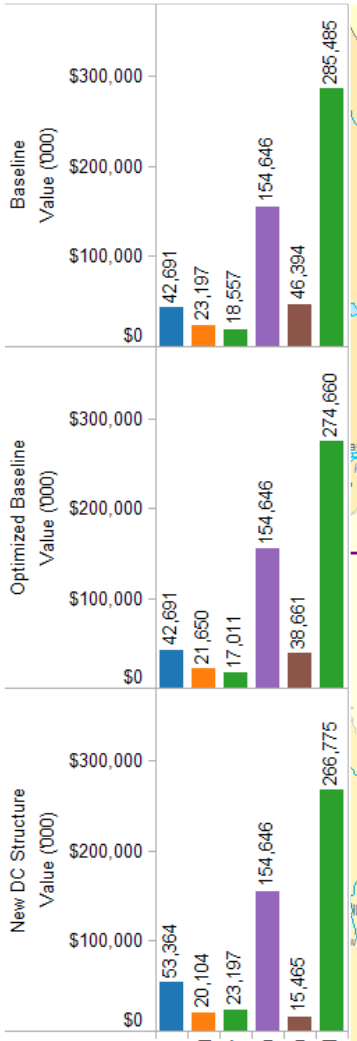
LLamasoft
Supply Chain By Design

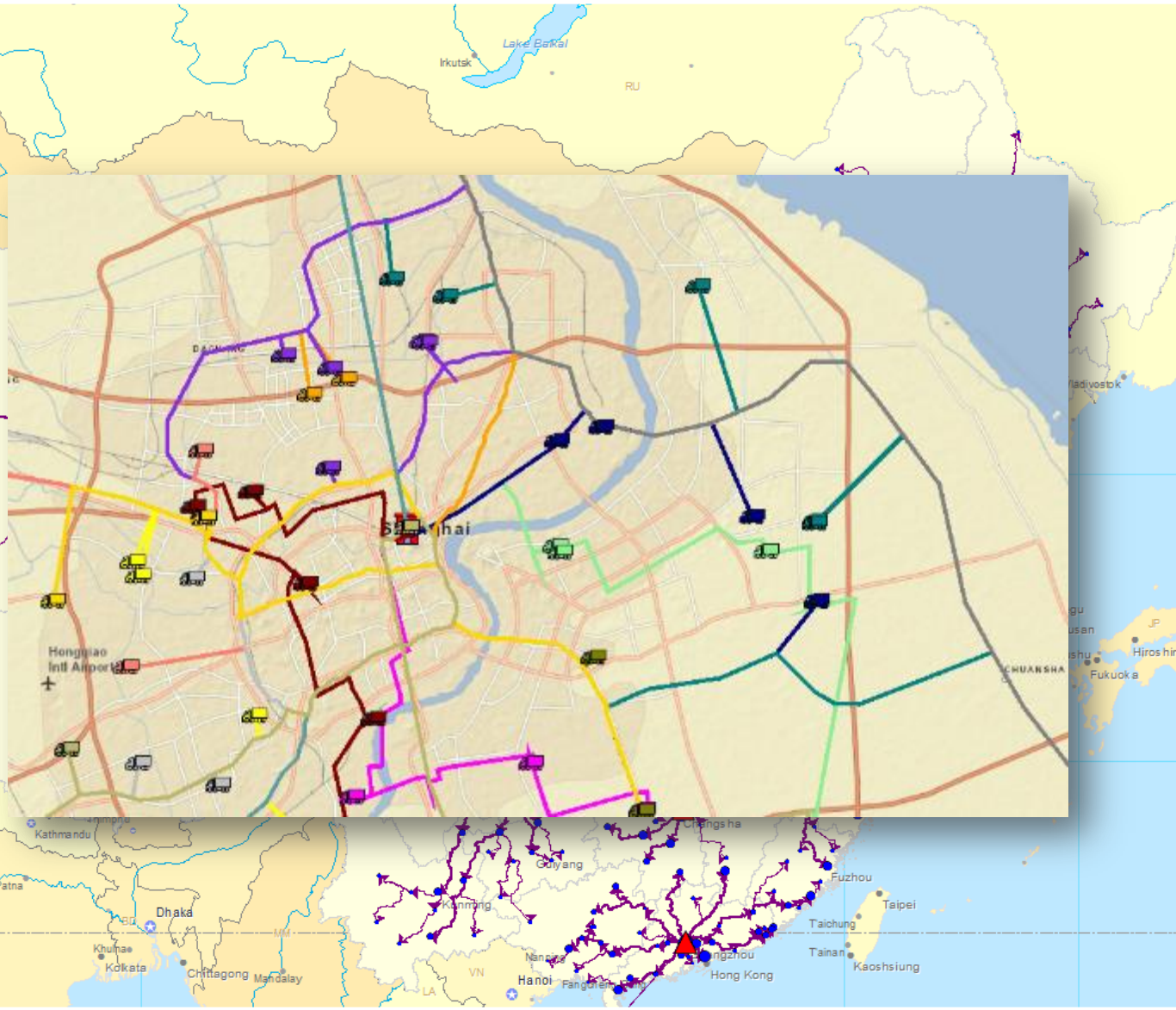




New Transportation Routes

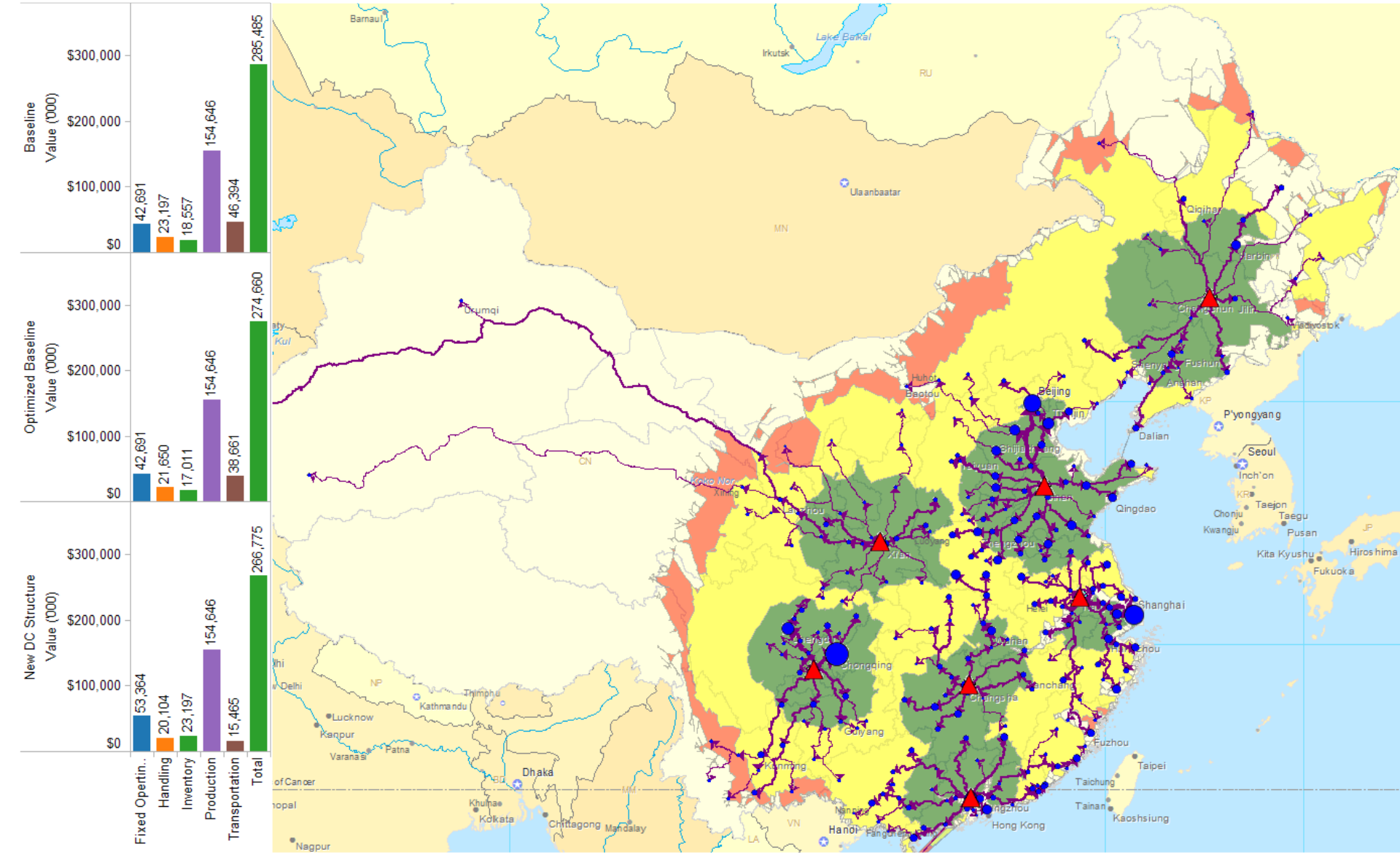
LLamasoft
Supply Chain By Design





Service Coverage

LLamasoft
Supply Chain By Design

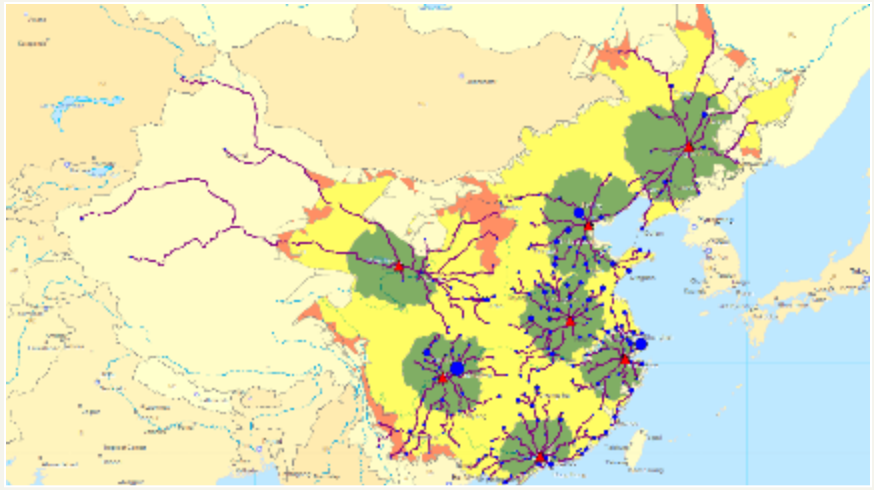


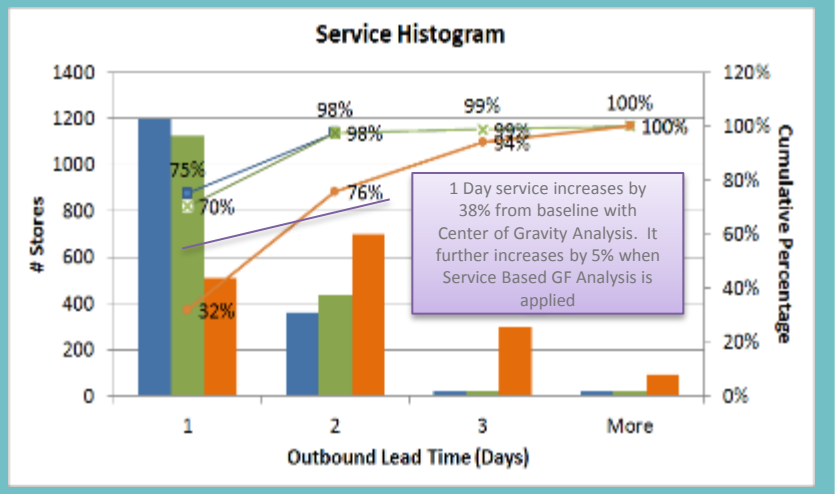
Service Based Optimization

LLamasoft
Supply Chain By Design

Service Based Greenfield Formulation

Center of Gravity Greenfield Formulation



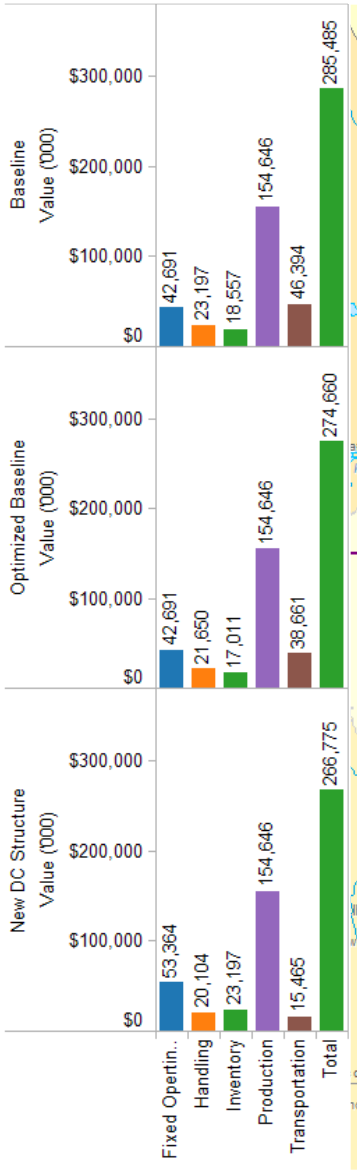


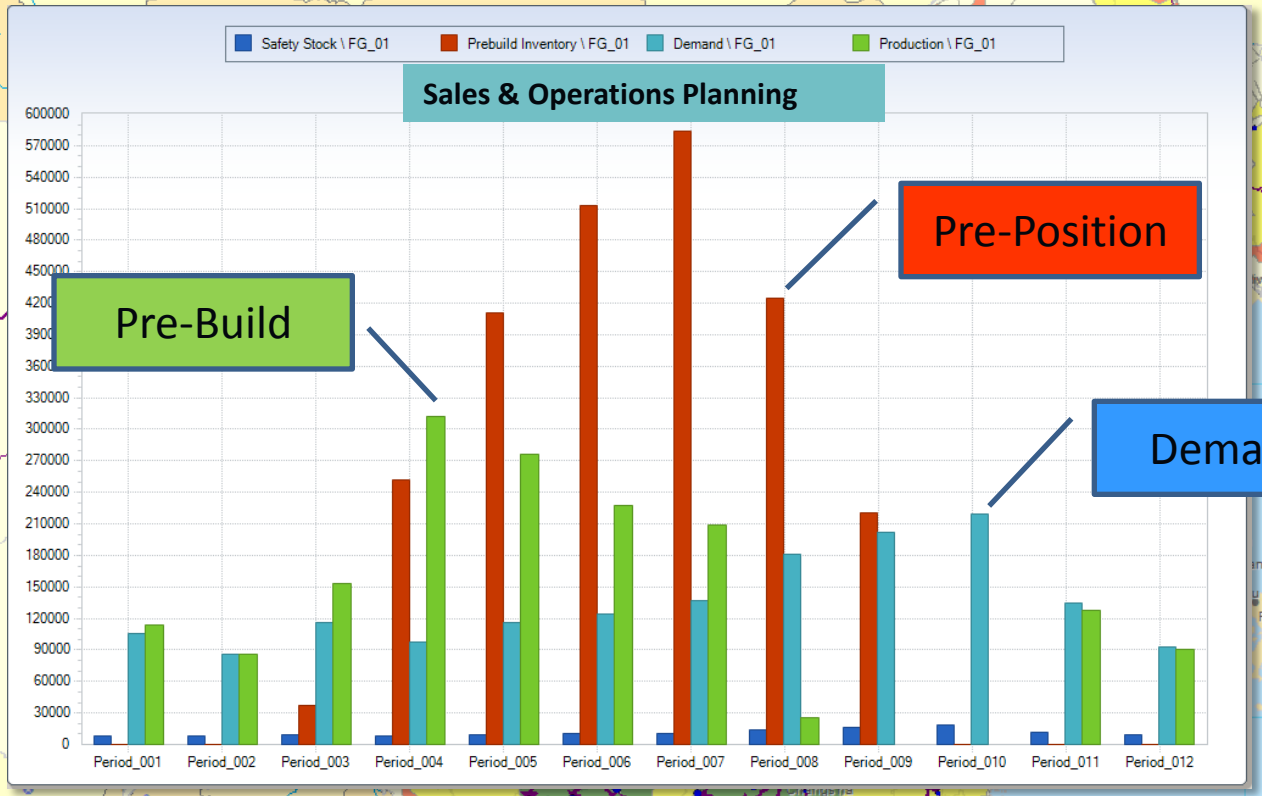
Key Benefits and Usage

- Depending on the objective, Greenfield analysis can either be performed using **Center of Gravity** or **Service Based** methods
- Service Based Optimization allows the model to decide "**How Many?"** And **"Where?"** given customer locations and service requirements.
- Service Based Optimization can provide a strategic advantage from a service lead time perspective. The objective is to cover the most number of customers using the fewest number of distribution points within a defined set of service goals.
- Center of Gravity Formulation solves the "Where?" question given customer locations, demand volumes and number of DCs as inputs.
- The Center of Gravity method can often yield the lowest cost solutions from a freight perspective. It is often utilized for completely realigning the current footprint or identifying the next best location to setup a facility.

Sales & Operations Planning

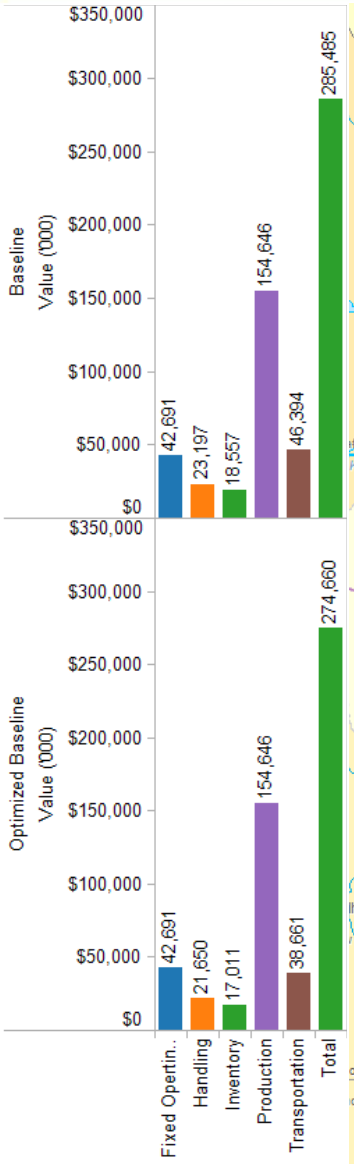
LLamasoft
Supply Chain By Design

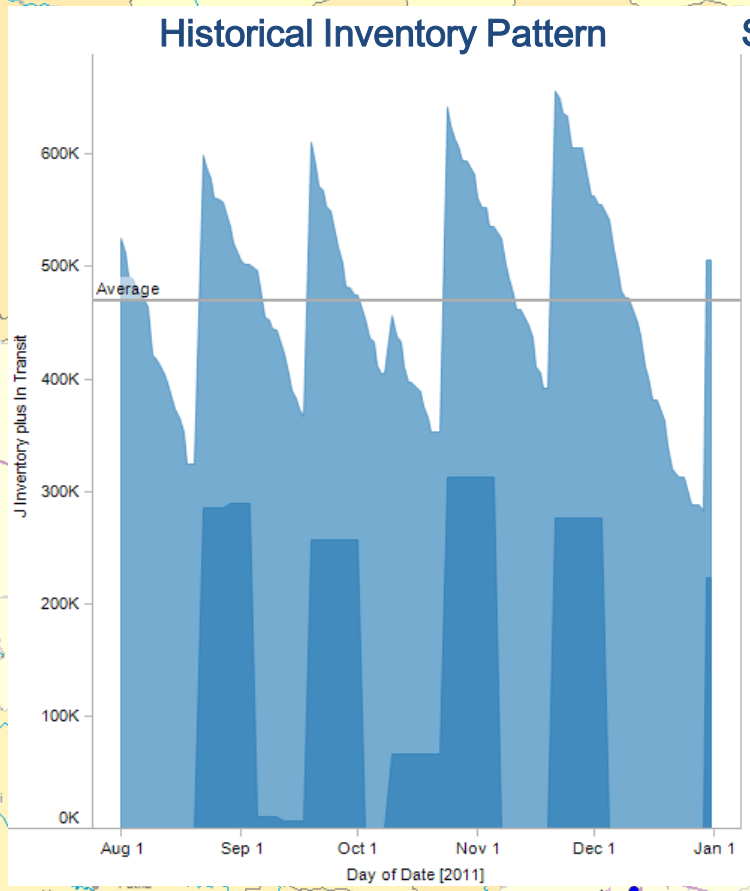


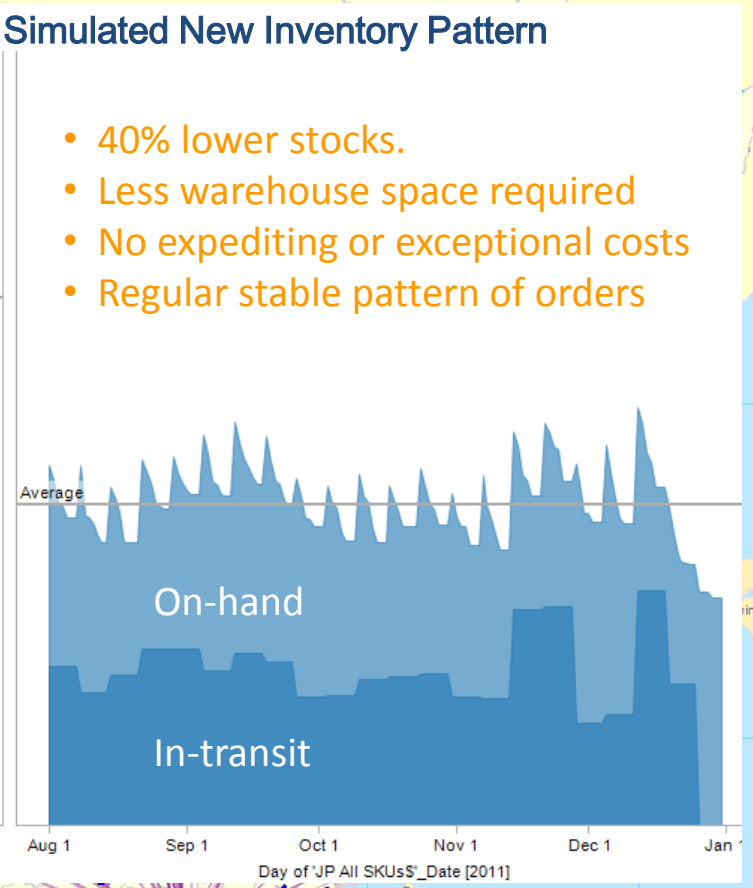


Production Modeling & Simulation

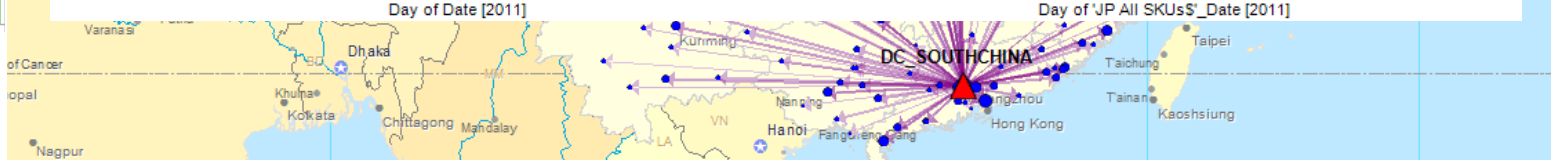
LLamasoft
Supply Chain By Design







- 40% lower stocks.
- Less warehouse space required
- No expediting or exceptional costs
- Regular stable pattern of orders



Business Continuity Planning

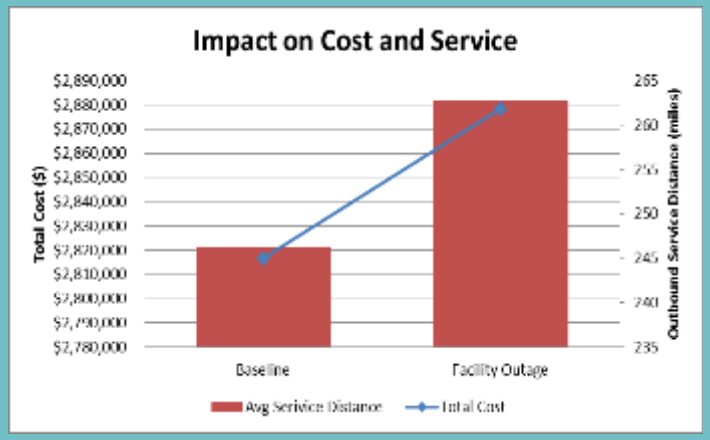
Facility Outage Simulation

LLamasoft
Supply Chain By Design

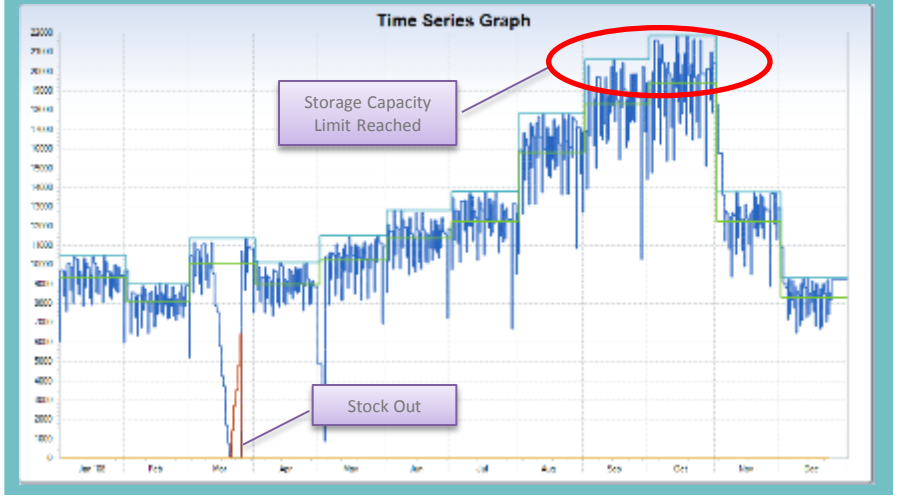
Baseline Sourcing Pattern

Business Continuity Plan

Huanghua DC shut down increases freight spend by 2% while service distance increases by 7%



Predict & Visualize Operational Impacts with Discrete Event Simulation

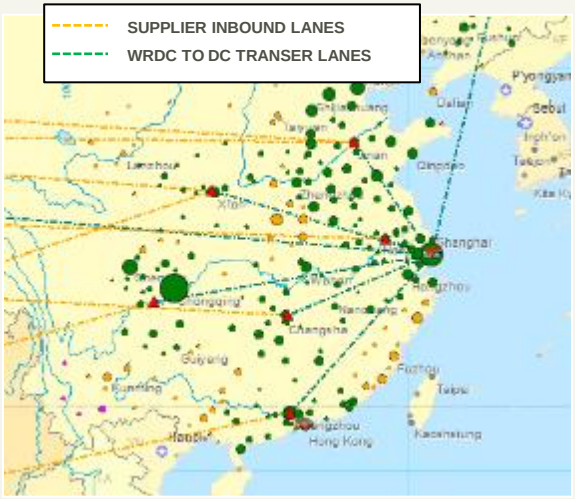


Risk Management

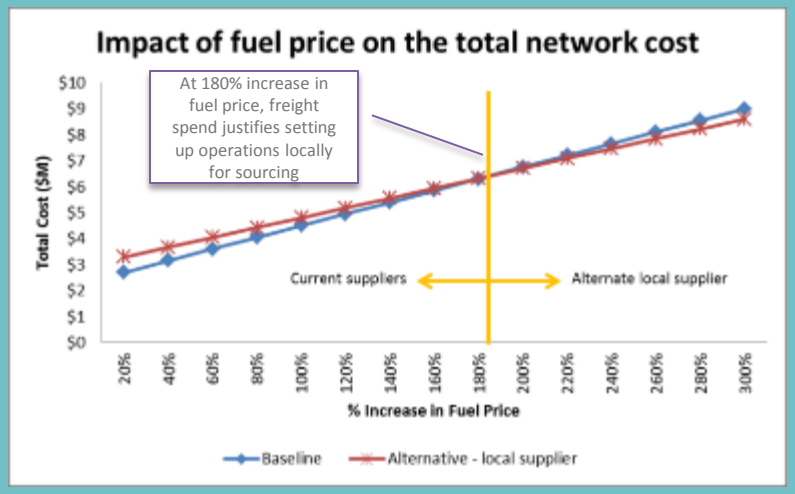
Commodity Pricing Shocks

LLamasoft
Supply Chain By Design

Baseline Sourcing Pattern



Business Continuity Plan



Key Benefits and Usage

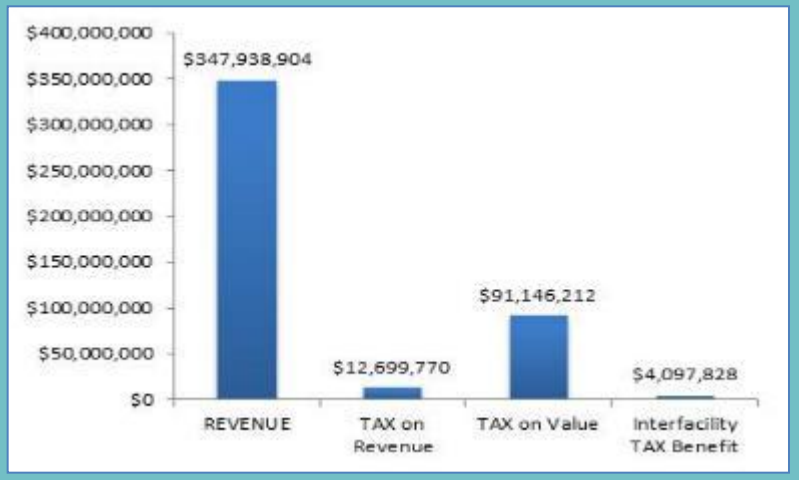
- Pre-plan supply chain responses in response to various risks in supply, demand, weather and geo-political events.
- Identify optimal alternate suppliers, carriers, production sites, distribution paths, etc. prior to supply chain risk events occurring
- Understand the impact to capital expenditures, operating expenses and service to customers
- Combine optimal designs with discrete event simulation to predict and anticipate impact to daily operations
- Model varying lengths of risks for different supply chain responses

Tax/Duties Optimization

LLamasoft
Supply Chain By Design

Optimized Network without Tax Considerations

Tax Efficient Network



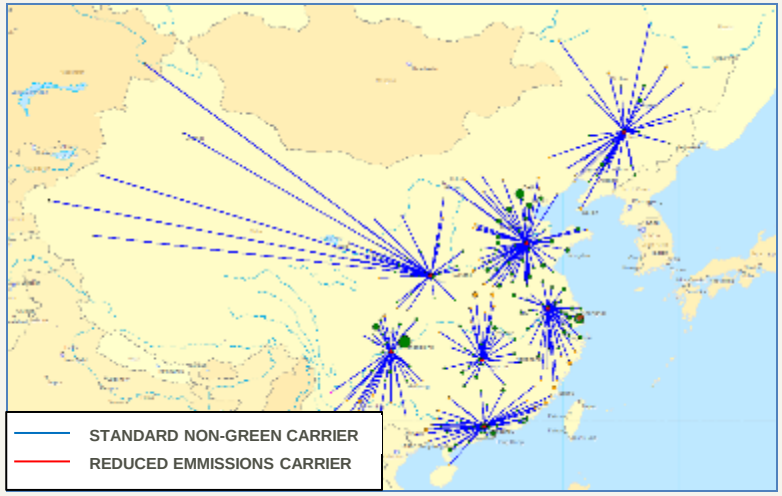
Key Benefits and Usage

- Optimize network with tax/duties considerations
- Apply tax/duties/tariffs based on transfer pricing across regions
- Calculate tax/duties/tariffs based on revenue
- Calculate tax/duties/tariffs based on import/export arrangements
- Capture region specific product standard cost based on production cost and exchange rate differences
- Determine tax/duties/tariffs based on region to region movements
- Account for tax/duties/tariffs based on invoicing locations

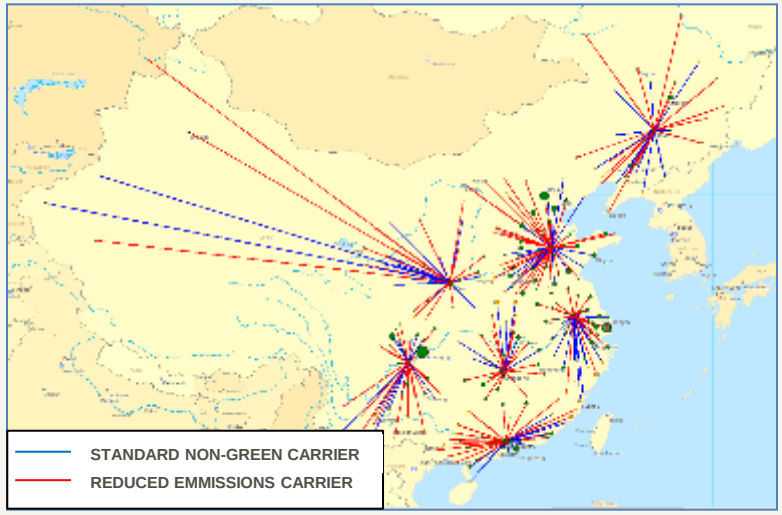
Sustainability Optimization

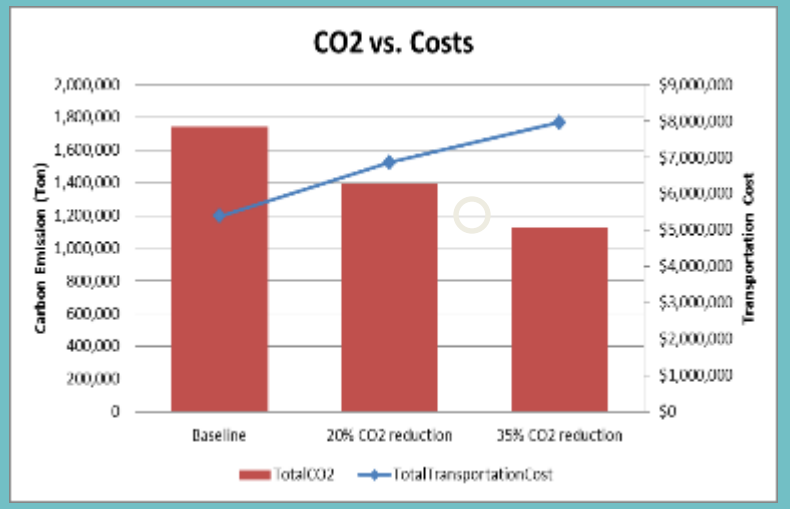
LLamasoft
Supply Chain By Design

Baseline GHG Network Profile



35% GHG Reduction Network Profile





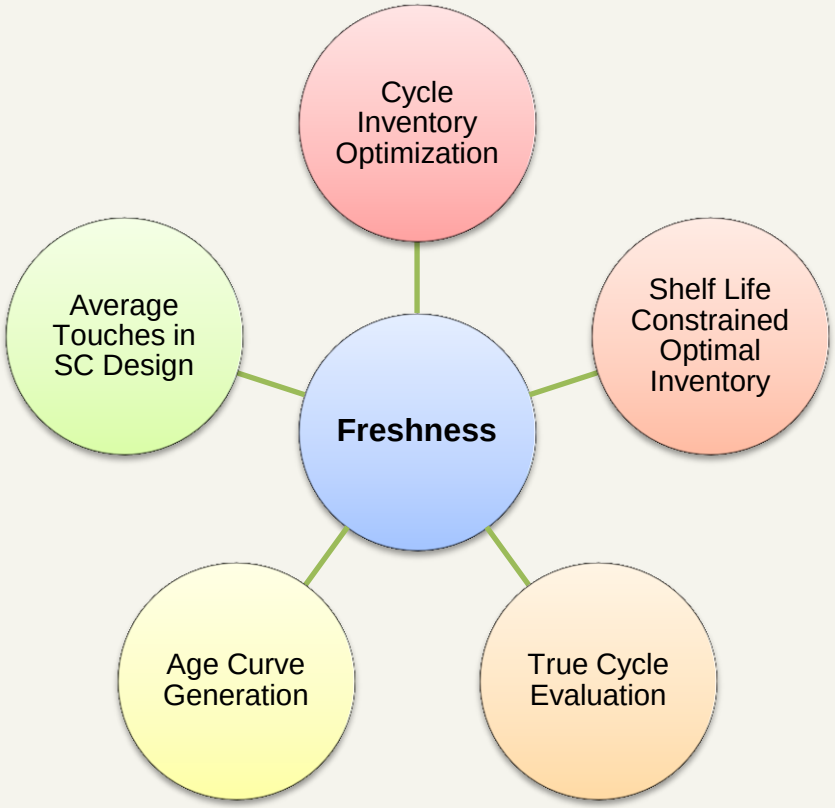
Key Benefits and Usage

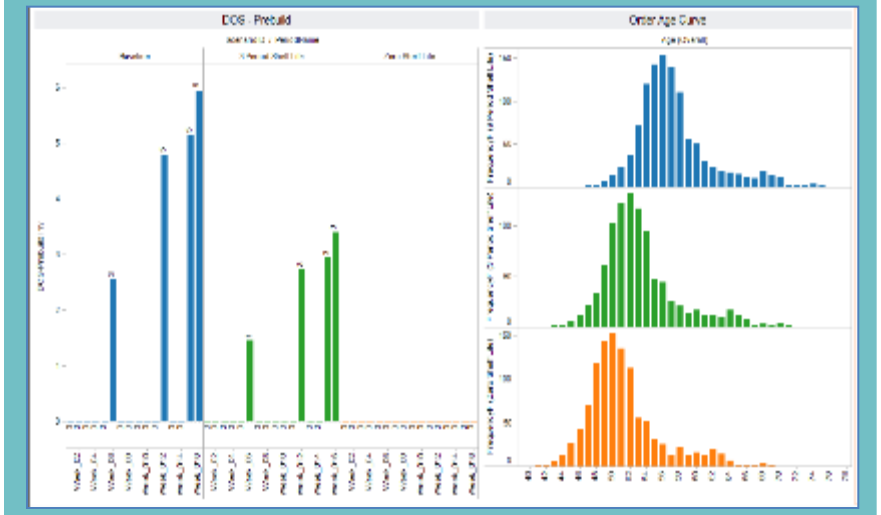
- Quantify financial benefit or costs of achieving sustainability goals
- Built in published emission factors accurately models and outputs emissions from various forms of transportation
- Optionally, carbon offsets are calculated as a part of the profit and loss calculations
- Fees and duties as a result of non-green equipment/facility usage can be incorporated into the overall profit and loss calculations
- Ramp up of sustainability efforts can be modeled as a multi-year green house gas reduction initiative

Freshness Considerations

LLamasoft
Supply Chain By Design

Baseline Sourcing Pattern

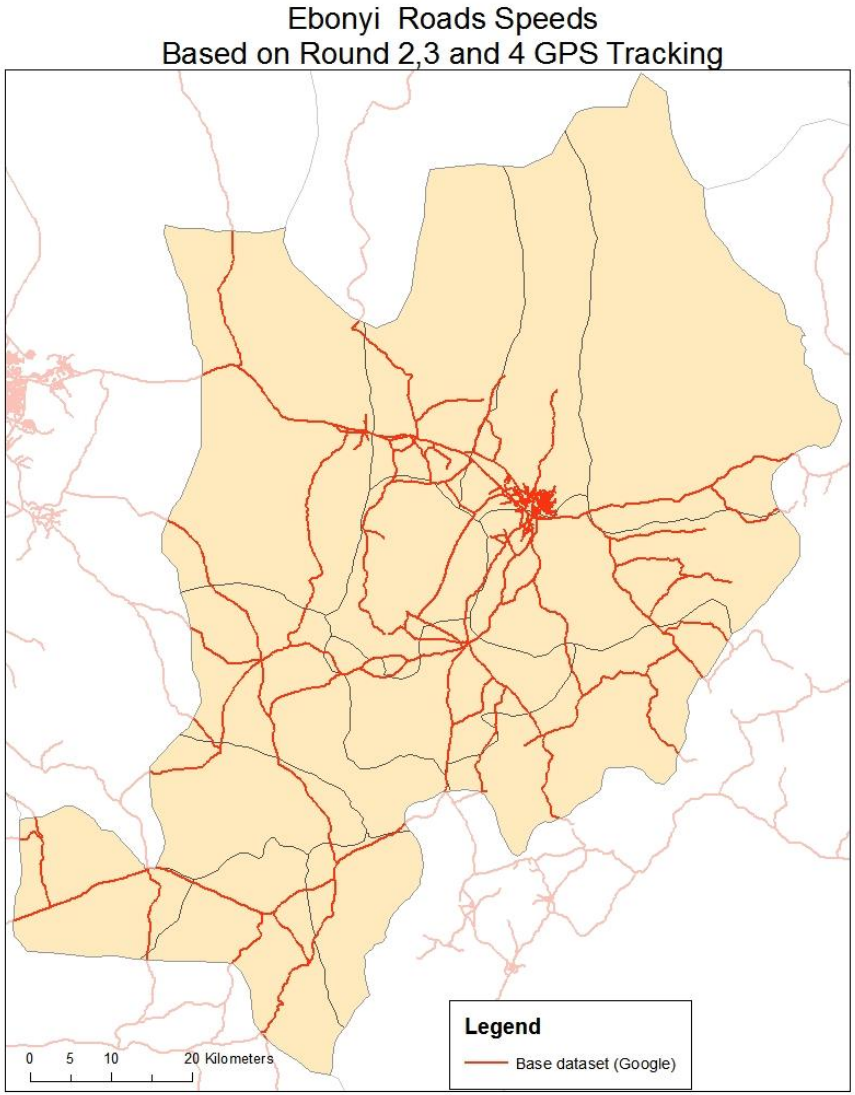




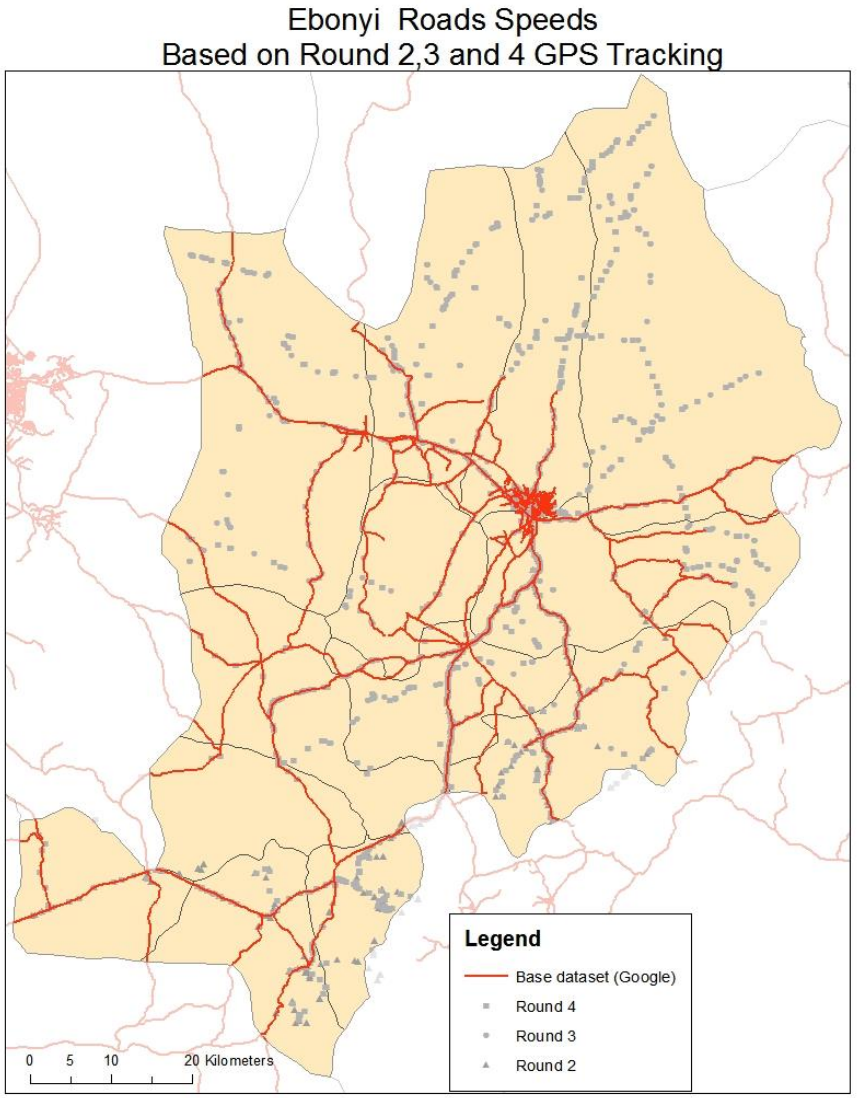
Key Benefits and Usage

- Production with freshness – what if's to optimize production lot size against probability of dumping
- Product flow contingency planning with freshness – flow paths that minimize freight, inventory and spoilage costs
- Inventory planning with freshness – minimize inventory with respect to shelf life, service level agreements and production constraints
- Ability to track to true age of productions
- Minimize obsolescence and cost write downs for high turn-over items (ie fashion, electronics)

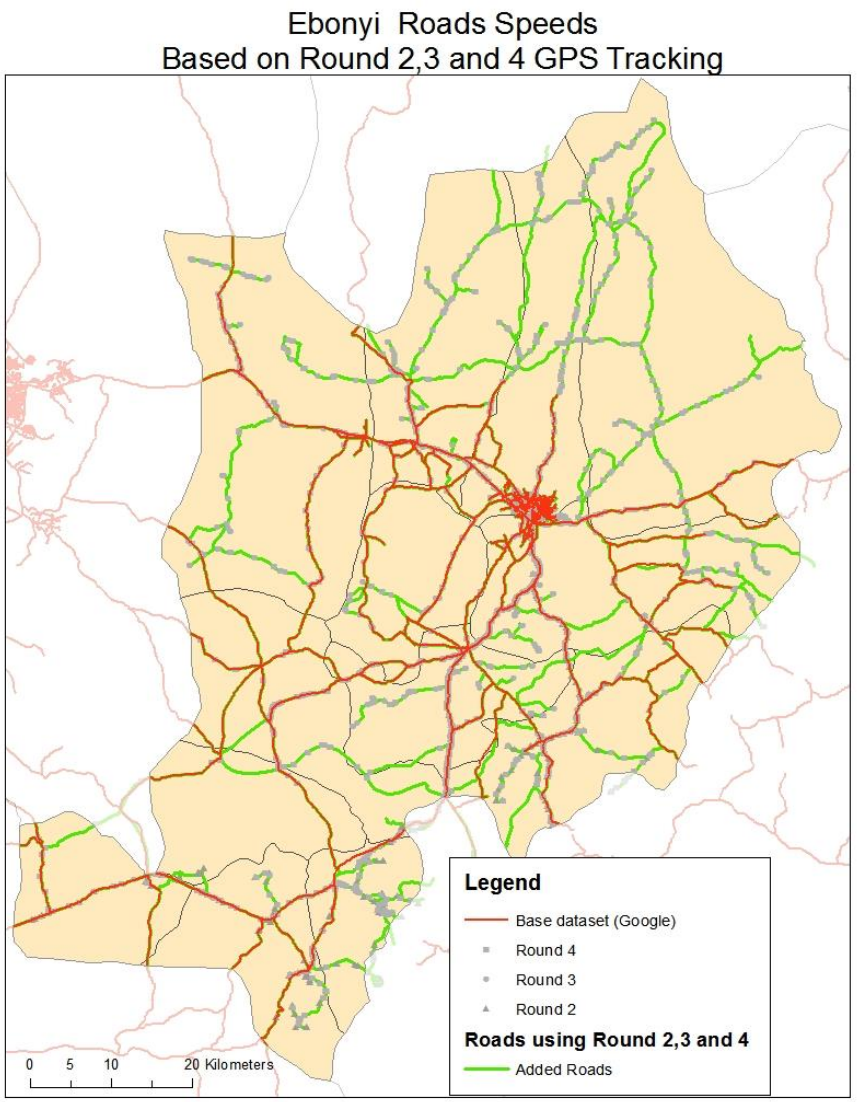
Using Car-Track to improve Digital Road Network: Nigeria Example



Using Car-Track to improve Digital Road Network: Nigeria Example



Using Car-Track to improve Digital Road Network: Nigeria Example



Using Car-Track to improve Digital Road Network: Nigeria Example