LocalSolver

www.localsolver.com

LocalSolver

Business Analytics & Optimization subsidiary of the Bouygues Group

- Supply chain optimization
- Vehicle routing
- Job scheduling
- Workforce planning
- Network optimization
- Revenue management
- etc.

SOFTWARE EDITOR

SERVICE PROVIDER

15 experts in mathematics, computer science, information technology

Strong grow: revenues multiplied by 5 since incorporation in 2012

Passionate people

Frédéric Gardi

Co-Founder & Managing Partner, in charge of LocalSolver

- PhD and Habilitation in Computer Science (UPMC, Paris 6)
- 20 years of experience in Operations Research
- Sole author of a software used by 10,000 users in the retail banking industry (Société Générale)
- 1st Prize Junior & Senior Challenge ROADEF 2005, 2nd Prix Senior Challenge ROADEF 2007
- 1st Prize Industrial Applications ROADEF (2011), 1st Prize Robert Faure ROADEF (2012)
- President of ROADEF, the French Operations Research Society (2014-2015)

Thierry Benoist

Co-Founder & Managing Partner, in charge of Services

- Ecole Polytechnique (X95), PhD and Habilitation in Computer Science
- 20 years of experience in Operations Research
- Sole author of a software optimizing an investment of €1 billion (Bouygues Telecom)
- Prize ASTI of the best applied PhD thesis (2005), 3rd Prize Robert Faure ROADEF (2006)
- Finalist of the EURO Excellence in Practice Award (2012)

They trust us

50 clients in France

25 clients with revenues > €1bn

30 clients worldwide

Germany, UK, Belgium, Italy,
Denmark, Sweden, Norway
USA, Canada, Japan, China

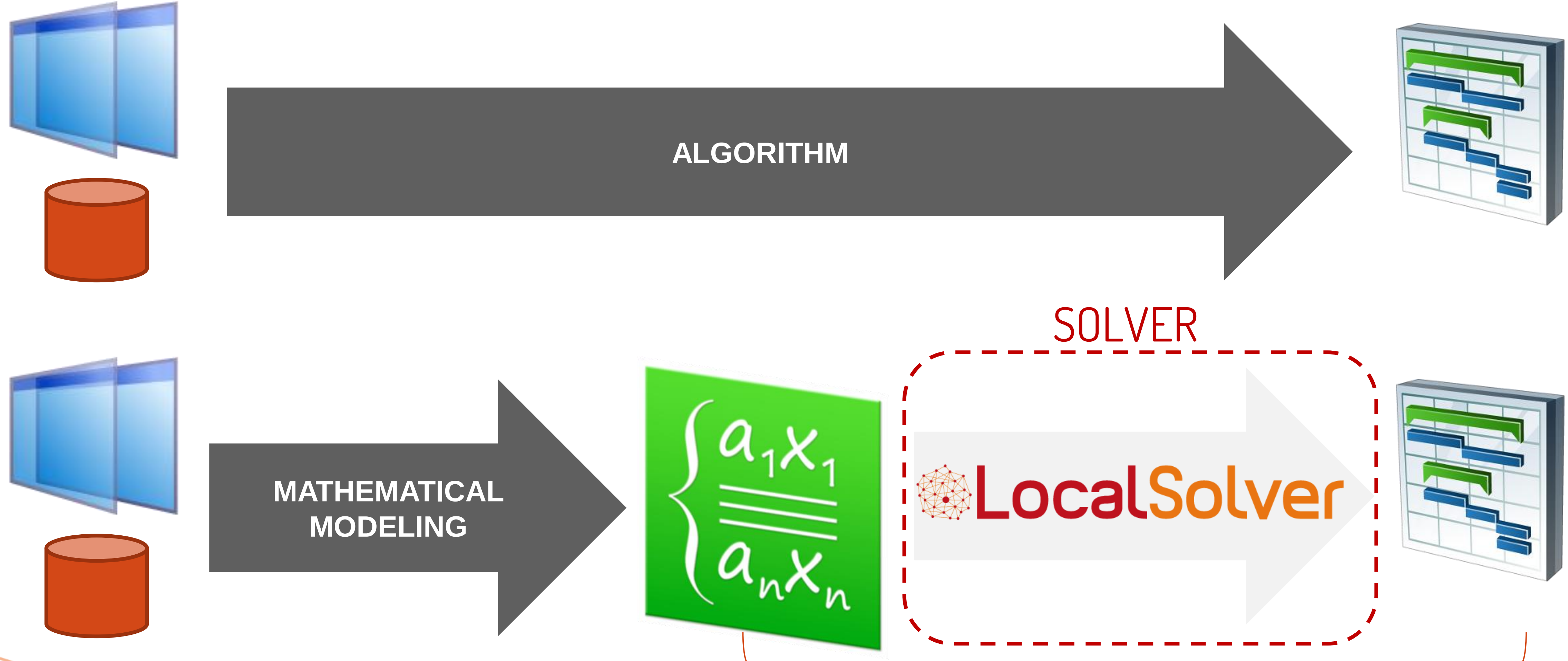
30 universities & schools

France, Germany, Belgium,
Italy, Portugal, USA, Canada,
Japan, Chine, Brazil, ...

AIRBUS
bouygues TELECOM
HYDRO
JCDecaux
BPCE
VEOLIA
TOYOTA
COLAS
DGA
FM LOGISTIC
eDF
TF1
amadeus
engie
RENAULT
SITA
FUJITSU
UNIVERSAL STUDIOS JAPAN
BOSCH
STELLAR
SIEMENS
PUBLICIS GROUPE
SNCF
Beiersdorf
HITACHI Inspire the Next
BOUYGUES CONSTRUCTION
MBDA MISSILE SYSTEMS
Pasco
SONY

LocalSolver

LocalSolver: mathematical optimization solver


Business problem
Business solution
ALGORITHM
SOLVER
MATHEMATICAL
MODELING
a_1x_1
a_nx_n
LocalSolver

Reduction by 50% of
development & maintenance costs

Why choosing LocalSolver?

Allows to separate the model from the algorithm

Model: mathematical representation of the business specifications

➔ LocalSolver offers a high-level, natural modeling formalism to model problems (especially routing problems)

➔ This formalism makes easier maintenance and evolutions of the model

Algorithm: delegated to LocalSolver which incorporates powerful (especially heuristic) optimization techniques, developed since 10 years in partnership with the French National Center for Scientific Research

➔ high-quality solutions in short running times (minutes or even seconds)

➔ scalability: able to tackle millions of decision variables

Pascoの冷凍生地
サポートします。ベーカリービジネス
業務用冷凍生地ネット通販 送料全国無料

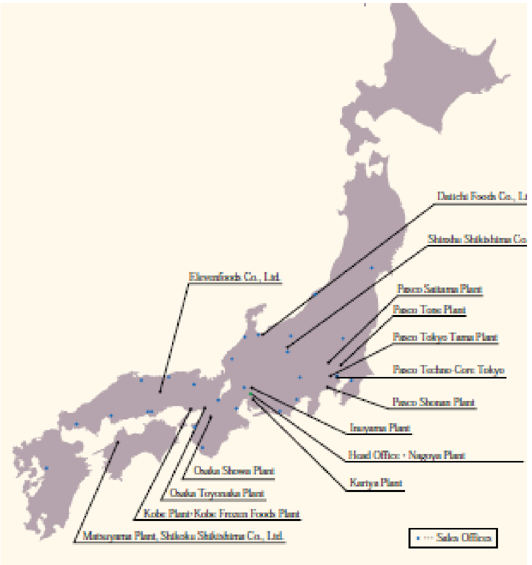
Pasco

FUTURE Architect

MSI
Management Solutions Integration

Pasco global supply chain optimization (production + distribution) for whole Japan

Daily used since 2013


Daiichi Foods Co., Lt
Shinshu Shikishima Co
Elevenfoods Co., Ltd.
Pasco Saitama Plant
Pasco Tone Plant
Pasco Tokyo Tama Plant
Pasco Techno-Core Tokyo
Pasco Shonan Plant
Inuyama Plant
Head Office · Nagoya Plant
Kariya Plant
Osaka Showa Plant
Osaka Toyonaka Plant
Kobe Plant·Kobe Frozen Foods Plant
Matsuyama Plant, Shikoku Shikishima Co., Ltd.
• ··· Sales Offices

Pasco
超熟
山型
5
国産小麦

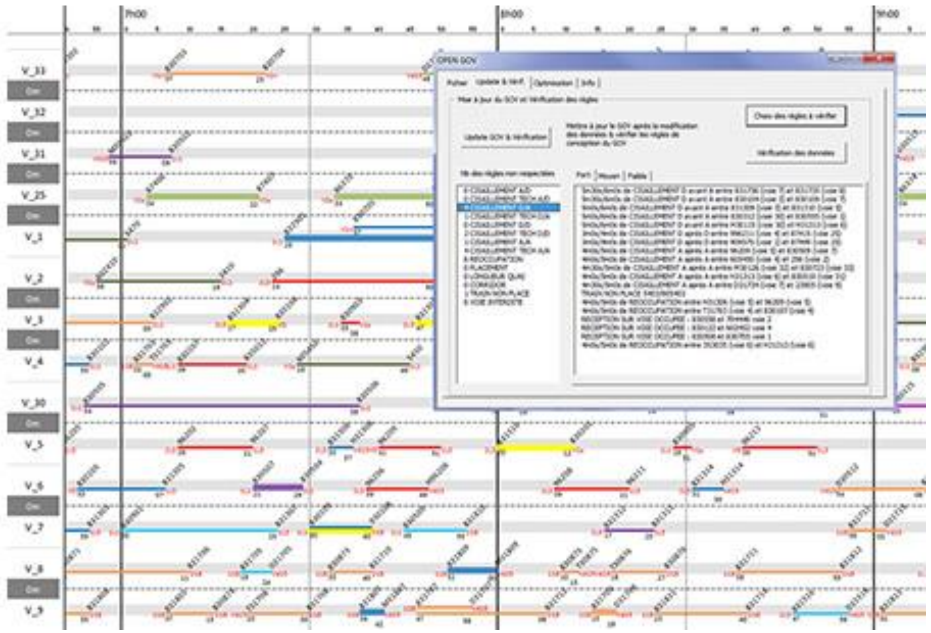
Pascoの
バラエティブレッド
ライ麦
全粒粉
くるみ
レーズン

SNCF LOGISTICS

FRET

Optimizing rotations of locomotives & drivers for the freight division of SNCF Logistics (French Railways)

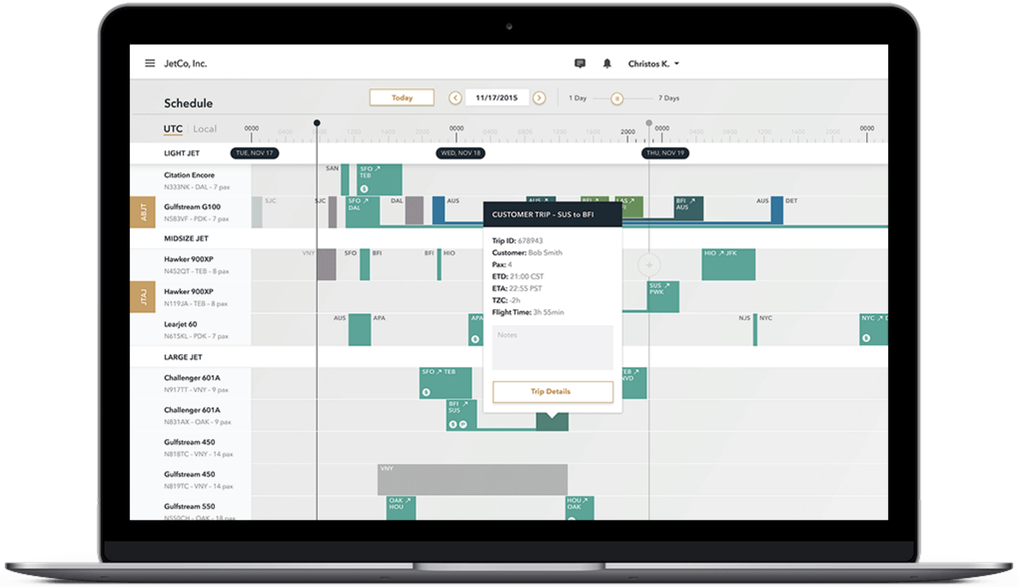
475030
FRET
SNCF



STELLAR

www.stellar.aero

Automated pricing engine
Dynamic aircraft scheduling


JetCo, Inc.
Christos K.
Schedule
Today
11/17/2015
1 Day
7 Days
UTC | Local
LIGHT JET
TUE, NOV 17
WED, NOV 18
THU, NOV 19
MIDSIZE JET
LARGE JET
Trip Details

Citation Encore
N333NK - DAL - 7 pax

Gulfstream G100
N583VF - PDK - 7 pax

Hawker 900XP
N452QT - TEB - 8 pax

Hawker 900XP
N119JA - TEB - 8 pax

Learjet 60
N615KL - PDK - 7 pax

Challenger 601A
N917TT - VNY - 9 pax

Challenger 601A
N831AX - OAK - 9 pax

Gulfstream 450
N818TC - VNY - 14 pax

Gulfstream 450
N819TC - VNY - 14 pax

Gulfstream 550

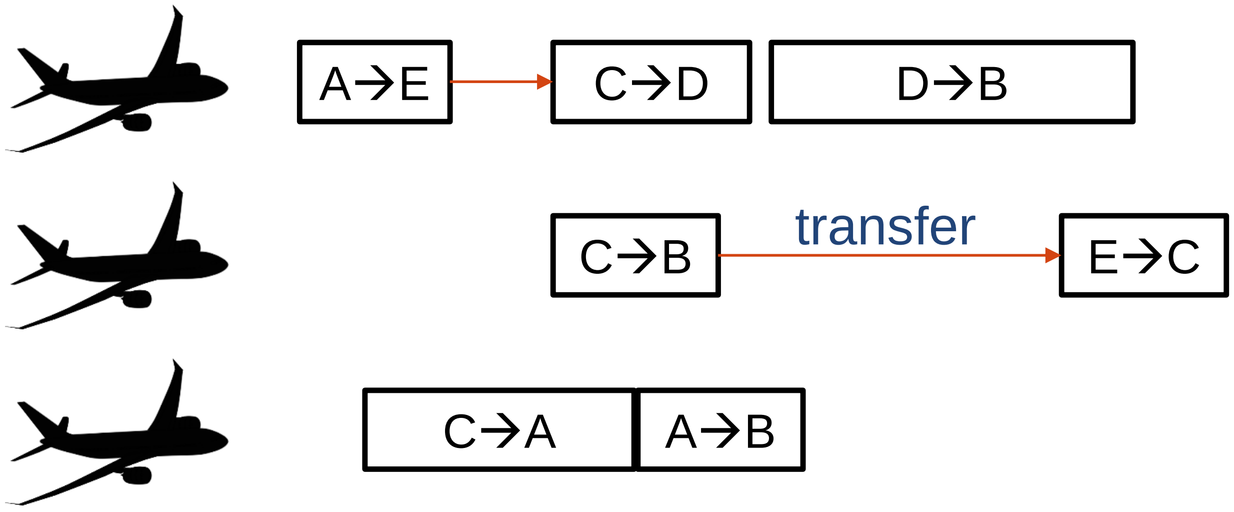
CUSTOMER TRIP - SUS to BFI

Trip ID: 678943
Customer: Bob Smith
Pax: 4
ETD: 21:00 CST
ETA: 22:55 PST
TZC: -2h
Flight Time: 3h 55min

Notes

Rocket Science for Jets

Stellar Labs is creating the most advanced commercial operations system ever made for Part 135 operators.

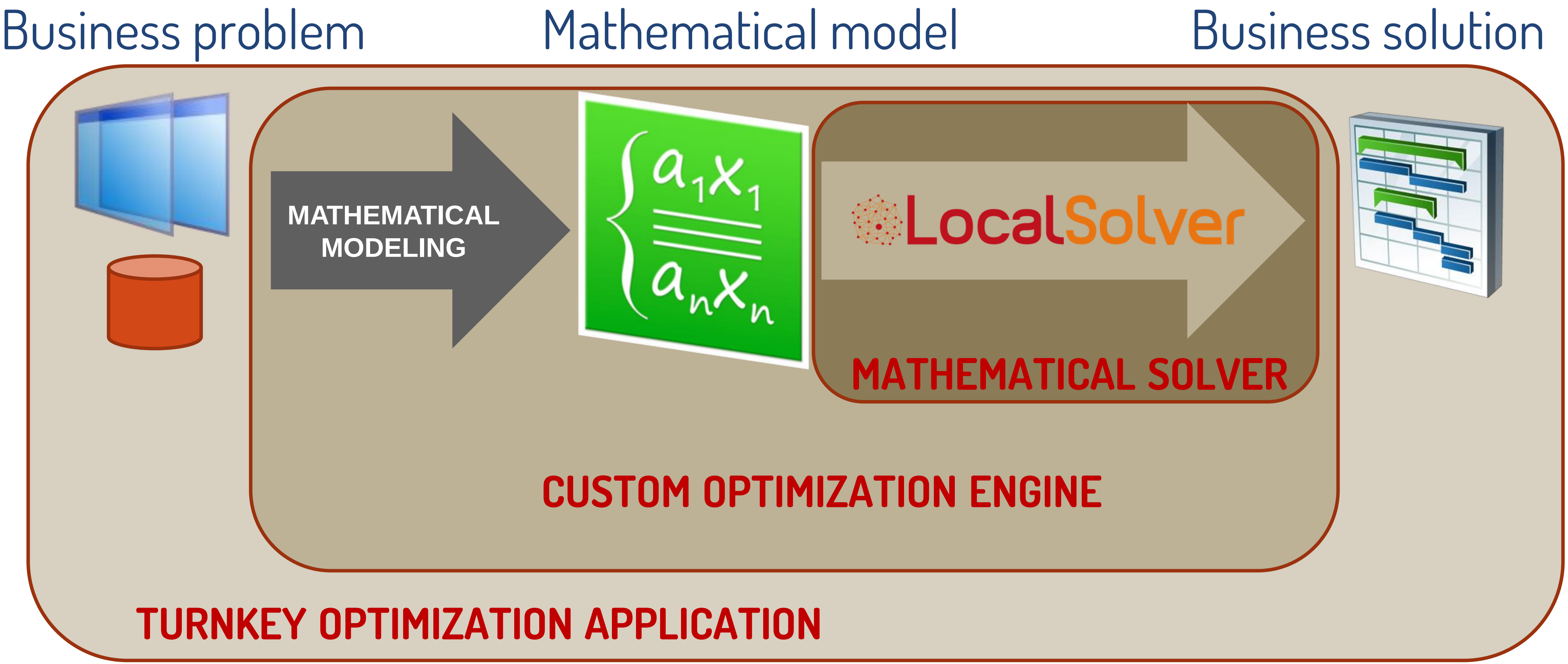


A→E
C→D
D→B

C→B
transfer
E→C

C→A
A→B

Services



Business problem

Mathematical model

Business solution

MATHEMATICAL MODELING

a_1x_1
a_nx_n
LocalSolver

MATHEMATICAL SOLVER

CUSTOM OPTIMIZATION ENGINE

TURNKEY OPTIMIZATION APPLICATION

Why choosing us?

Renowned experts in optimization

- 20 years of experience in optimization and decision support
- Our culture: expertise, listening, agility → client-centric team & project methodology
- Strong industrial and academic recognition (a dozen awards)

A perfect match to your needs

- Development of a tailor-made solution, with a proven methodology
- Using a powerful solver: LocalSolver
- IT expertise that allows us to adapt to any information system & technology

A reliable, long-term partner

- Fixed-price & fixed-deadline commitment
- Accompaniment to the total satisfaction of our clients
- Backed by the Bouygues Group (€33 billion in revenue, 115,000 employees)

LNG supply chain optimization

Long-term planning of delivery routes and storages

Stakes in €bn

L N G
GDF SUEZ

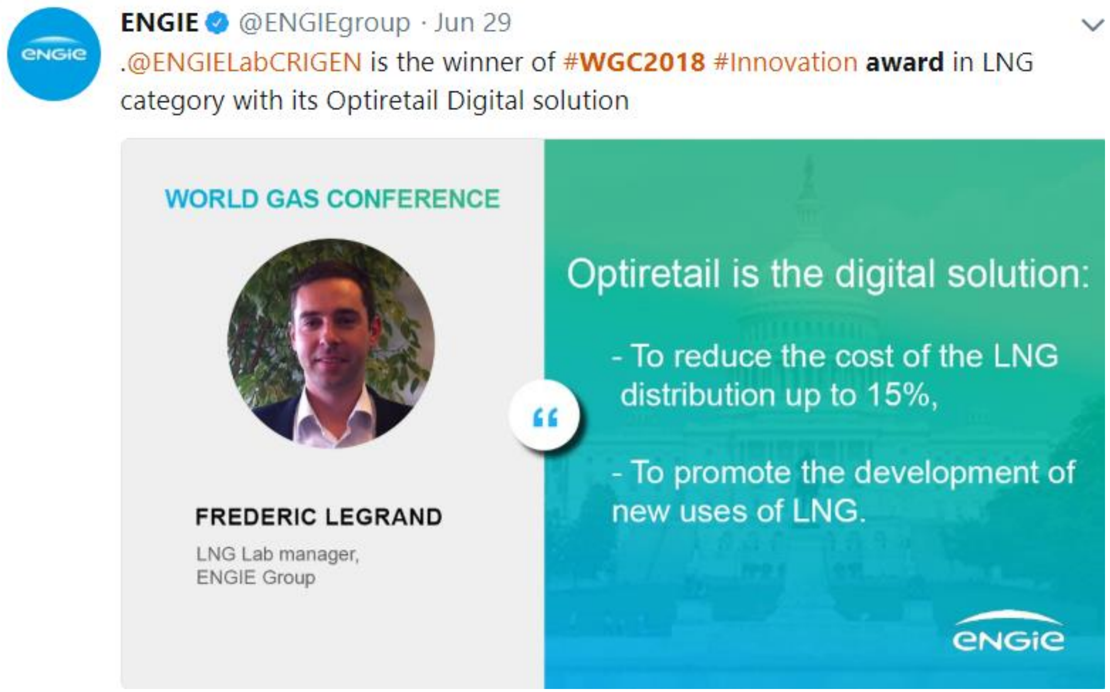
Liquefied Natural Gas (LNG)

27th WORLD GAS CONFERENCE
WASHINGTON DC
JUNE 25-29 2018
IGU

Category Winner: Optiretail by ENGIE Lab CRIGEN

Inspired by the most recent logistics and operational research publications, and based on its LNG expertise, ENGIE Lab CRIGEN has designed an innovative decision making software for small scale LNG projects: Optiretail. Optiretail designs the optimal LNG supply chain from sourcing to delivery by minimizing the total cost of the project (CAPEX and OPEX). It enables to quickly test new configurations and can be used for project dimensioning and real-time optimization for all small scale LNG market opportunities: LNG-to-Power, LNG-as-fuel for road and marine transportation as well as LNG-for-industrials. The software was tested on the supply of 70 fueling stations in Europe and 19 LNG-to-power plants in Indonesia. Ongoing developments aim at adapting Optiretail to Liquid Hydrogen (LH2).

Frederic Legrand**, LNG Research Program Manager, **ENGIE Lab CRIGEN


ENGIE @ENGIEgroup · Jun 29
.@ENGIELabCRIGEN is the winner of #WGC2018 #Innovation **award** in LNG category with its Optiretail Digital solution

WORLD GAS CONFERENCE

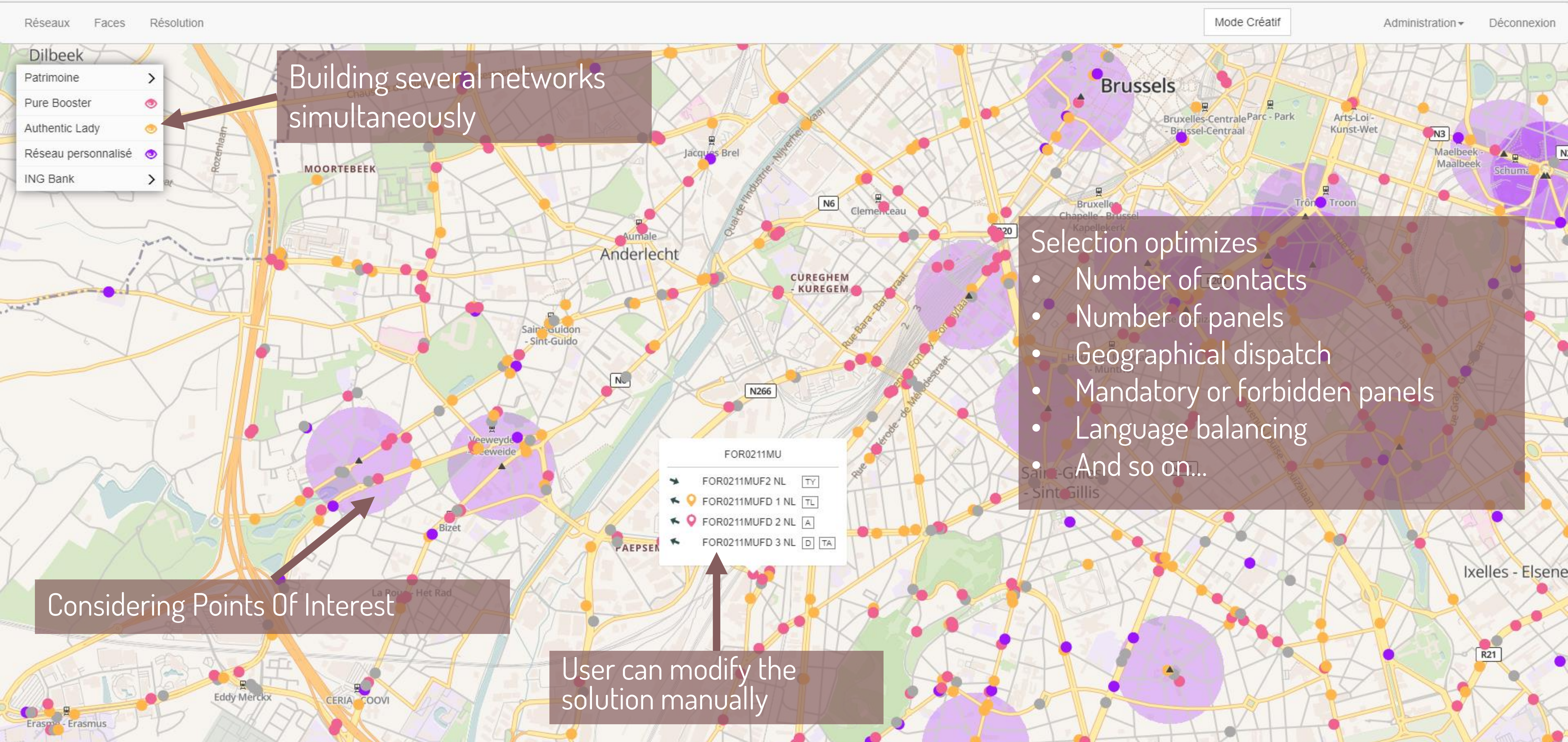
FREDERIC LEGRAND
LNG Lab manager,
ENGIE Group

Optiretail is the digital solution:

- To reduce the cost of the LNG distribution up to 15%,
- To promote the development of new uses of LNG.

engie

Programmatic advertising for out-of-home (OOH) media campaigns at JCDecaux Belgium


Réseaux
Faces
Résolution
Mode Créatif
Administration
Déconnexion
Patrimoine
Pure Booster
Authentic Lady
Réseau personnalisé
ING Bank
Dilbeek
MOORTEBEEK
Anderlecht
Aumale
Jacques Brel
Clemenceau
CUREGHEM - KUREGEM
Saint-Guidon - Sint-Guido
Veeweyde - Veeweide
Bizet
La Roue - Het Rad
Eddy Merckx
CERIA - COOVI
Erasme - Erasmus
Brussels
Bruxelles-Centrale - Brussel-Centraal
Parc - Park
Arts-Loi - Kunst-Wet
Maelbeek - Maalbeek
Schuman
Trône - Troon
Bruxelles-Chapelle - Brussel-Kapellekerk
Saint-Gilles - Sint-Gillis
Ixelles - Elsene
N6
N266
N3
R20
R21

FOR0211MU

- FOR0211MUF2 NL TY
- FOR0211MUFD 1 NL TL
- FOR0211MUFD 2 NL A
- FOR0211MUFD 3 NL D TA

Building several networks simultaneously

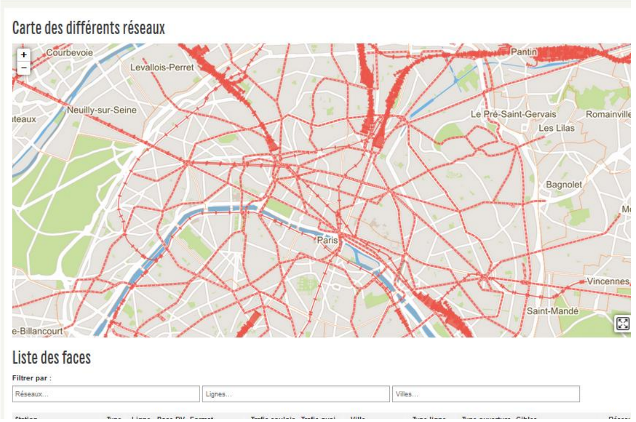
Selection optimizes
- Number of contacts
- Number of panels
- Geographical dispatch
- Mandatory or forbidden panels
- Language balancing
- And so on…

Considering Points Of Interest

User can modify the solution manually

JCDecaux

Optimization of the routing & scheduling of field service technicians at JCDecaux France

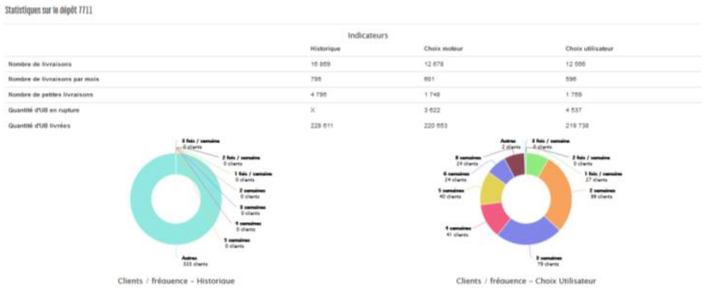

Carte des différents réseaux

Courbevoie
Levallois-Perret
Pantin
Neuilly-sur-Seine
Le Pré-Saint-Gervais
Romainville
Les Lilas
Bagnolet
Paris
Vincennes
Saint-Mandé
e-Billancourt

Liste des faces

Filtrer par :

Réseaux...
Lignes...
Villes...


Statistiques sur le dépôt 7711

	Indicateurs		
	Historique	Choix moteur	Choix utilisateur
Nombre de livraisons	16 869	12 678	12 666
Nombre de livraisons par mois	798	601	598
Nombre de petites livraisons	4 798	1 748	1 759
Quantité d'UB en rupture	X	3 622	4 537
Quantité d'UB livrées	228 611	220 653	219 738

Clients / fréquence - Historique

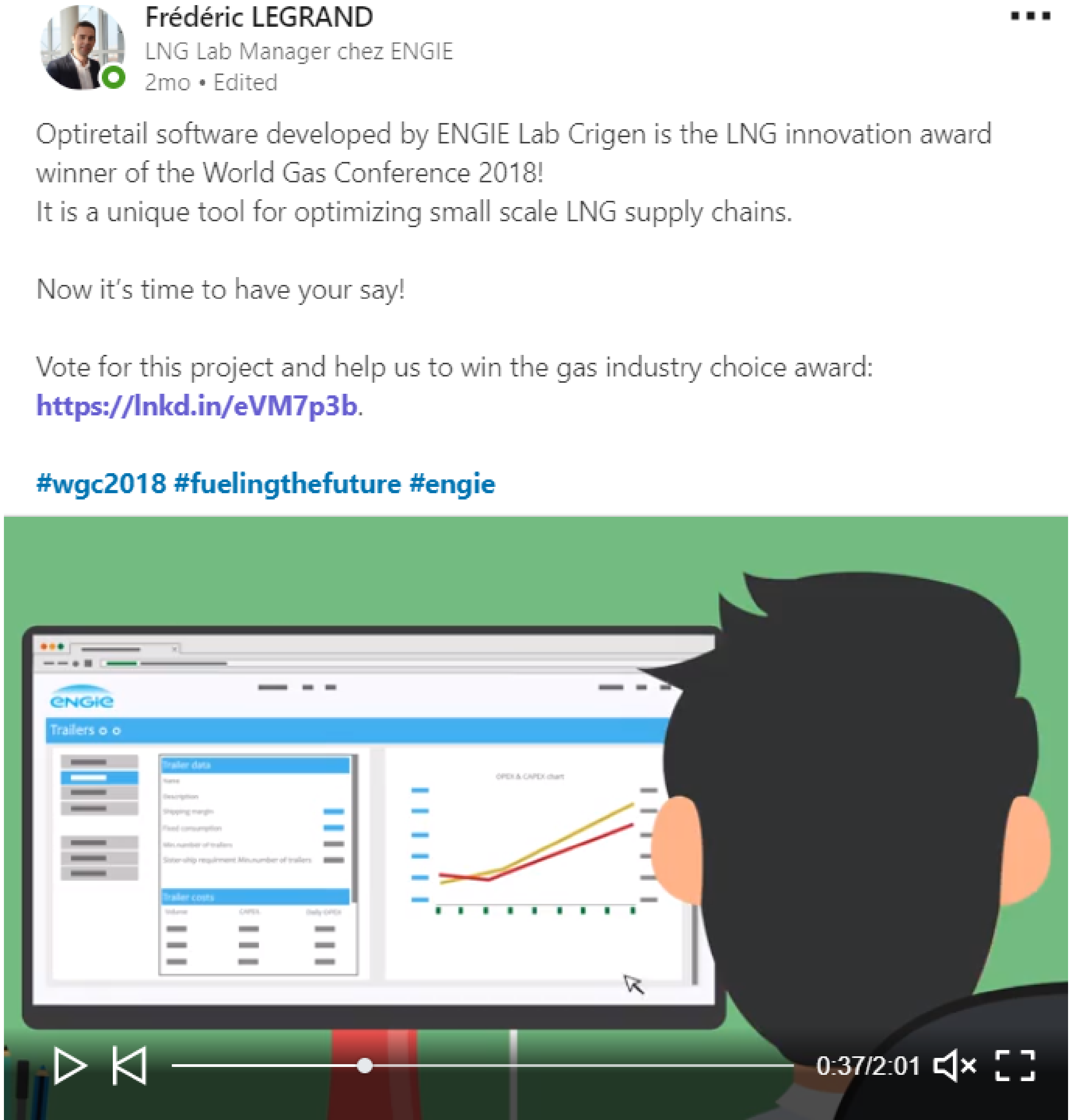
Clients / fréquence - Choix Utilisateur

ENGIE LNG

Success Story

27th WORLD GAS CONFERENCE
WASHINGTON DC
JUNE 25-29
2018
IGU

engie


...
Trailers
Trailer data
Trailer costs
OPEX & CAPEX chart
0:37/2:01

Frédéric LEGRAND
LNG Lab Manager chez ENGIE
2mo • Edited

Optiretail software developed by ENGIE Lab Crigen is the LNG innovation award winner of the World Gas Conference 2018!
It is a unique tool for optimizing small scale LNG supply chains.

Now it's time to have your say!

Vote for this project and help us to win the gas industry choice award:
https://lnkd.in/eVM7p3b.

#wgc2018 #fuelingthefuture #engie

ENGIE

Multinational electric and gas utility company

€65 billion in revenue

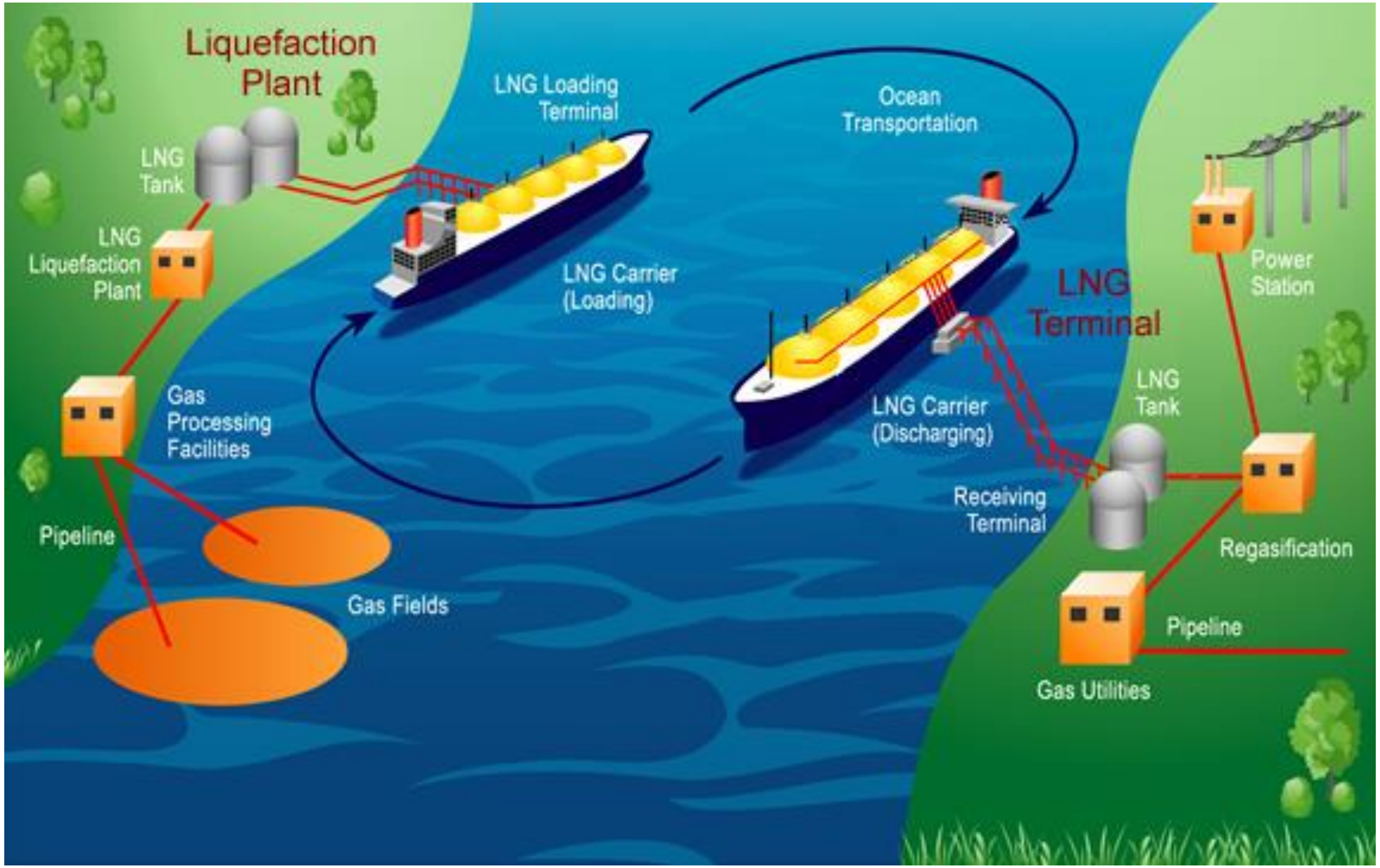
http://www.engie.com

ENGIE is a major gas agent in Europe

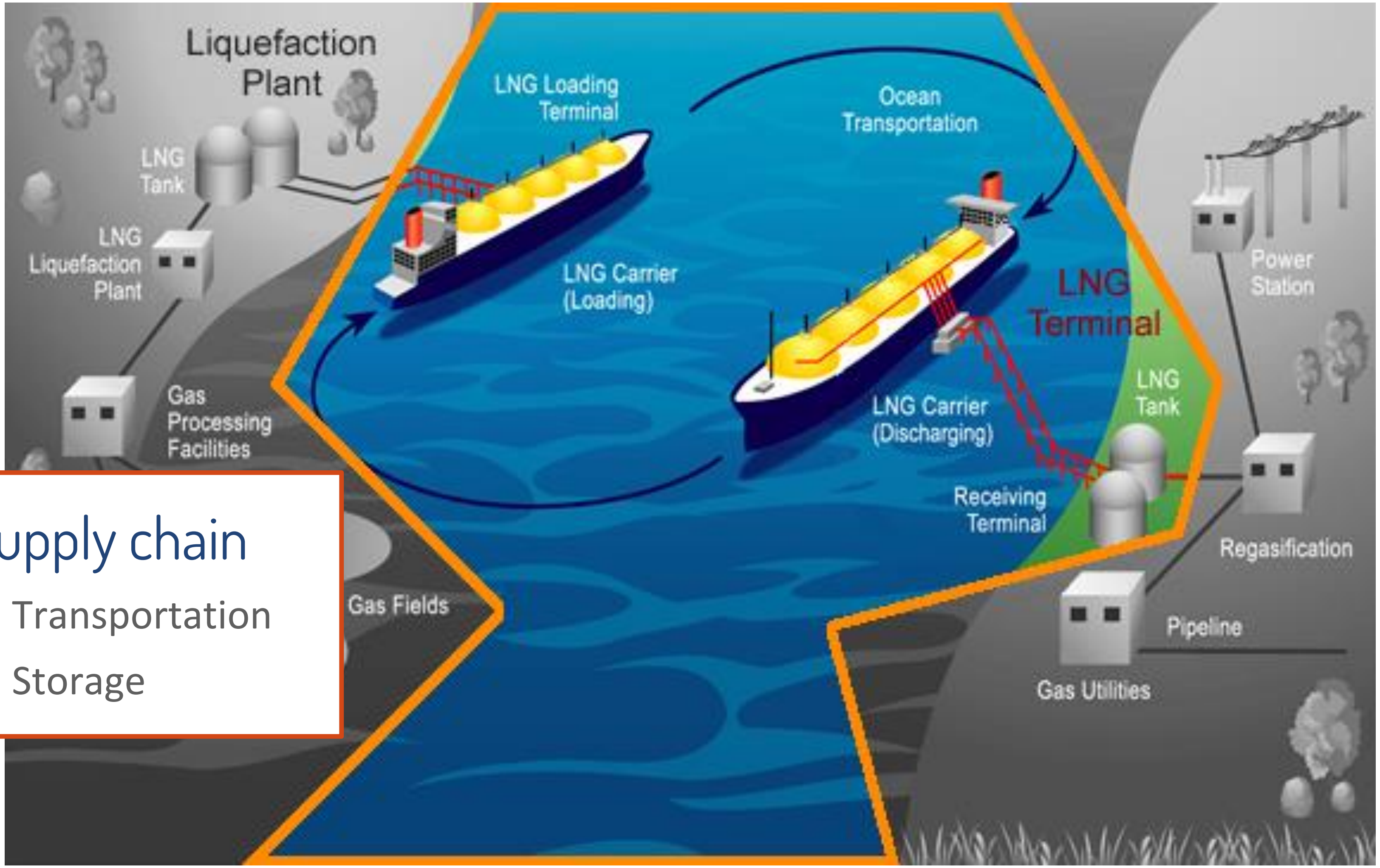
- No. 2 buyer
- No. 1 transport and distribution network manager
- No. 1 storage operator
- No. 1 in Liquefied Natural Gas (LNG)

ENGIE LNG will be part of TOTAL in July 2018

LNG supply chain


Liquefaction Plant
LNG Loading Terminal
Ocean Transportation
LNG Tank
LNG Liquefaction Plant
LNG Carrier (Loading)
Power Station
LNG Terminal
Gas Processing Facilities
LNG Tank
LNG Carrier (Discharging)
Receiving Terminal
Pipeline
Regasification
Gas Fields
Pipeline
Gas Utilities

LNG supply chain


Liquefaction Plant
LNG Tank
LNG Liquefaction Plant
Gas Processing Facilities
Gas Fields
LNG Loading Terminal
LNG Carrier (Loading)
Ocean Transportation
LNG Carrier (Discharging)
LNG Terminal
LNG Tank
Receiving Terminal
Power Station
Regasification
Pipeline
Gas Utilities

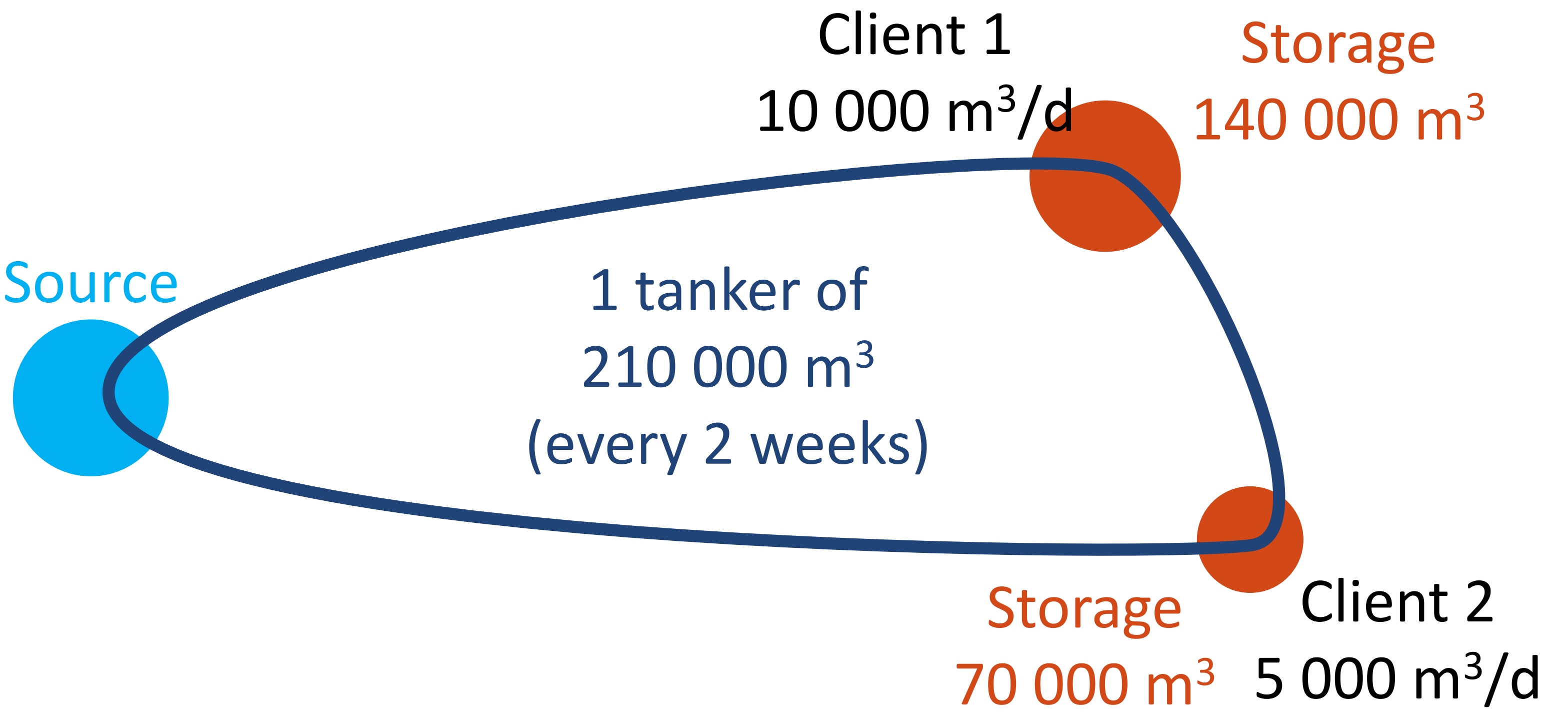
Supply chain

- Transportation
- Storage

Route planning + fleet and storage sizing

Strategic optimization of the LNG supply chain

→ Long-term planning of the LNG delivery routes and storages



Client 1
10 000 m³/d

Storage
140 000 m³

Source

1 tanker of
210 000 m³
(every 2 weeks)

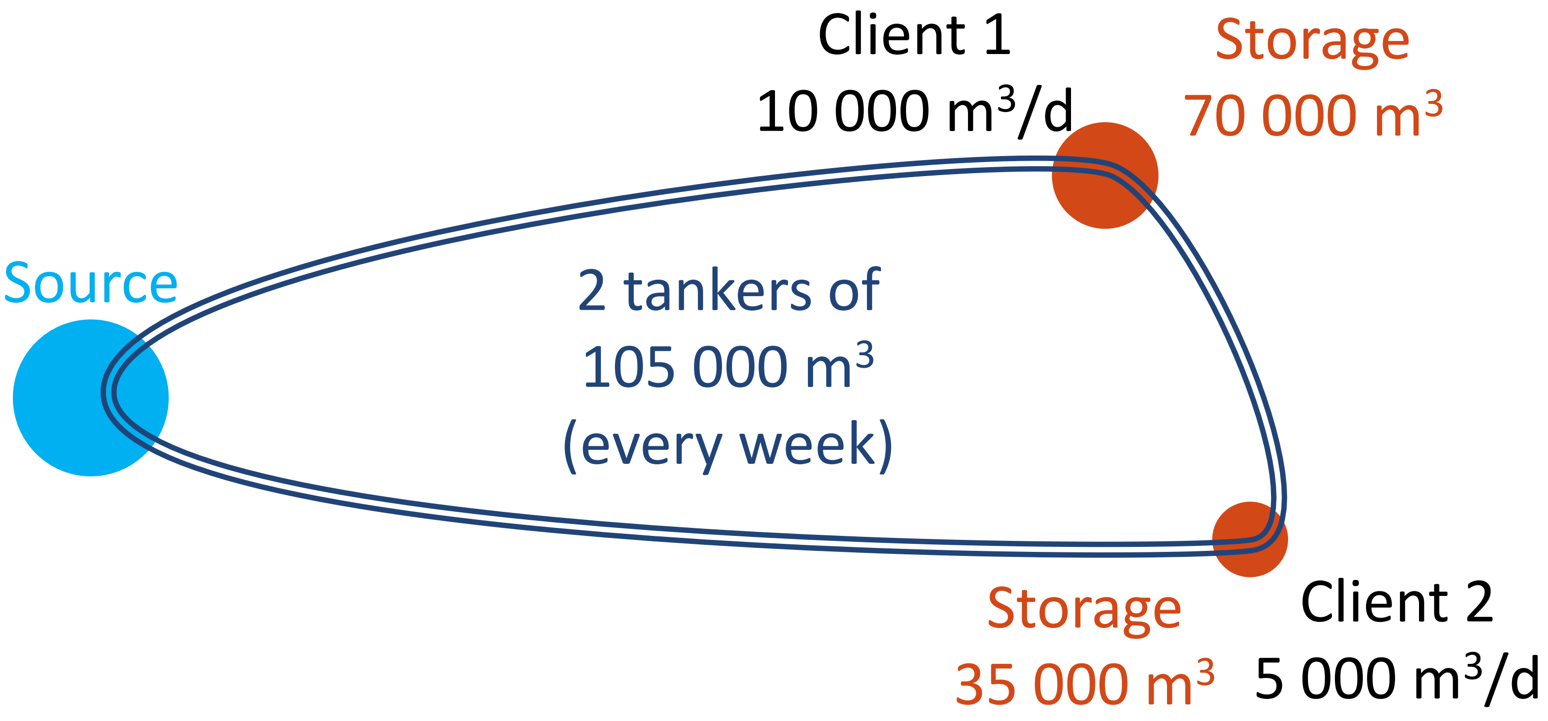
Storage
70 000 m³

Client 2
5 000 m³/d

Route planning + fleet and storage sizing

Strategic optimization of the LNG supply chain

➔Long-term planning of the LNG delivery routes and storages


Client 1
10 000 m^3/d

Storage
70 000 m^3

Source

2 tankers of
105 000 m^3
(every week)

Storage
35 000 m^3

Client 2
5 000 m^3/d

LocalSolver resolution

Size of the instances

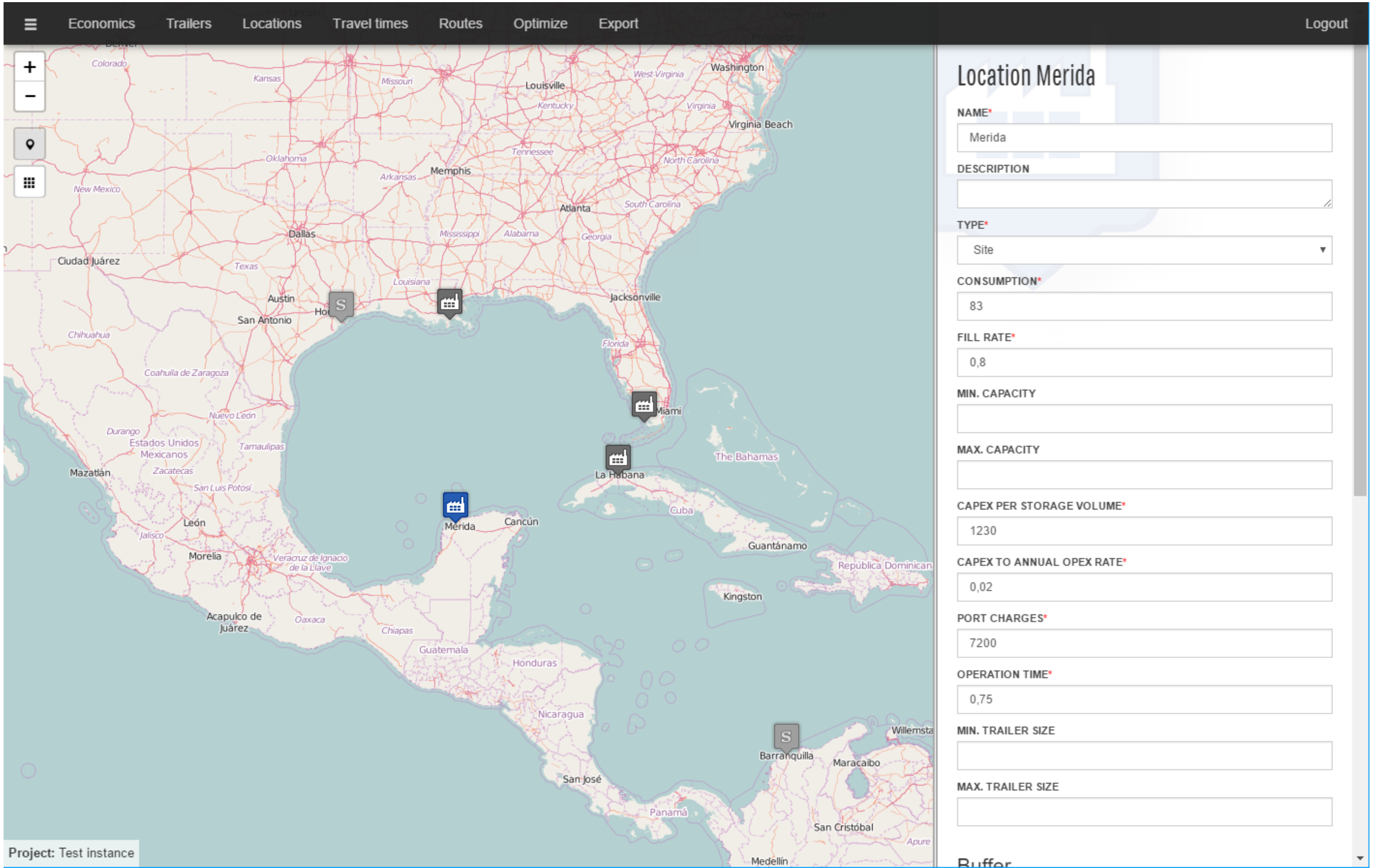
- 5 sources
- 20 hubs
- 100 clients
- 10 types of tankers

Resolution

- Short running time: 90 seconds
- Modern but standard server: 8-core Intel Xeon, 2.70 GHz, 8 GB RAM

→ Direct resolution by LocalSolver

Creating & updating locations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Economics
Trailers
Locations
Travel times
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Optimize
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Logout
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Washington
Louisville
Virginia Beach
Memphis
Atlanta
Dallas
Ciudad Juárez
Austin
San Antonio
Jacksonville
Miami
La Habana
The Bahamas
Cuba
Mérida
Cancún
Guantánamo
República Dominicana
Kingston
Mazatlán
León
Morelia
Acapulco de Juárez
Guatemala
Honduras
Nicaragua
San José
Panamá
Barranquilla
Maracaibo
San Cristóbal
Medellín
Estados Unidos Mexicanos
Texas
Louisiana
Florida
Colorado
Kansas
Missouri
Oklahoma
Arkansas
Tennessee
Kentucky
West Virginia
Virginia
North Carolina
South Carolina
Georgia
Alabama
Mississippi
New Mexico
Chihuahua
Coahuila de Zaragoza
Nuevo León
Durango
Tamaulipas
Zacatecas
San Luis Potosí
Jalisco
Veracruz de Ignacio de la Llave
Oaxaca
Chiapas
Willemsta
Apure
S

Project: Test instance

Location Merida

NAME*: Merida

DESCRIPTION:

TYPE*: Site

CONSUMPTION*: 83

FILL RATE*: 0,8

MIN. CAPACITY:

MAX. CAPACITY:

CAPEX PER STORAGE VOLUME*: 1230

CAPEX TO ANNUAL OPEX RATE*: 0,02

PORT CHARGES*: 7200

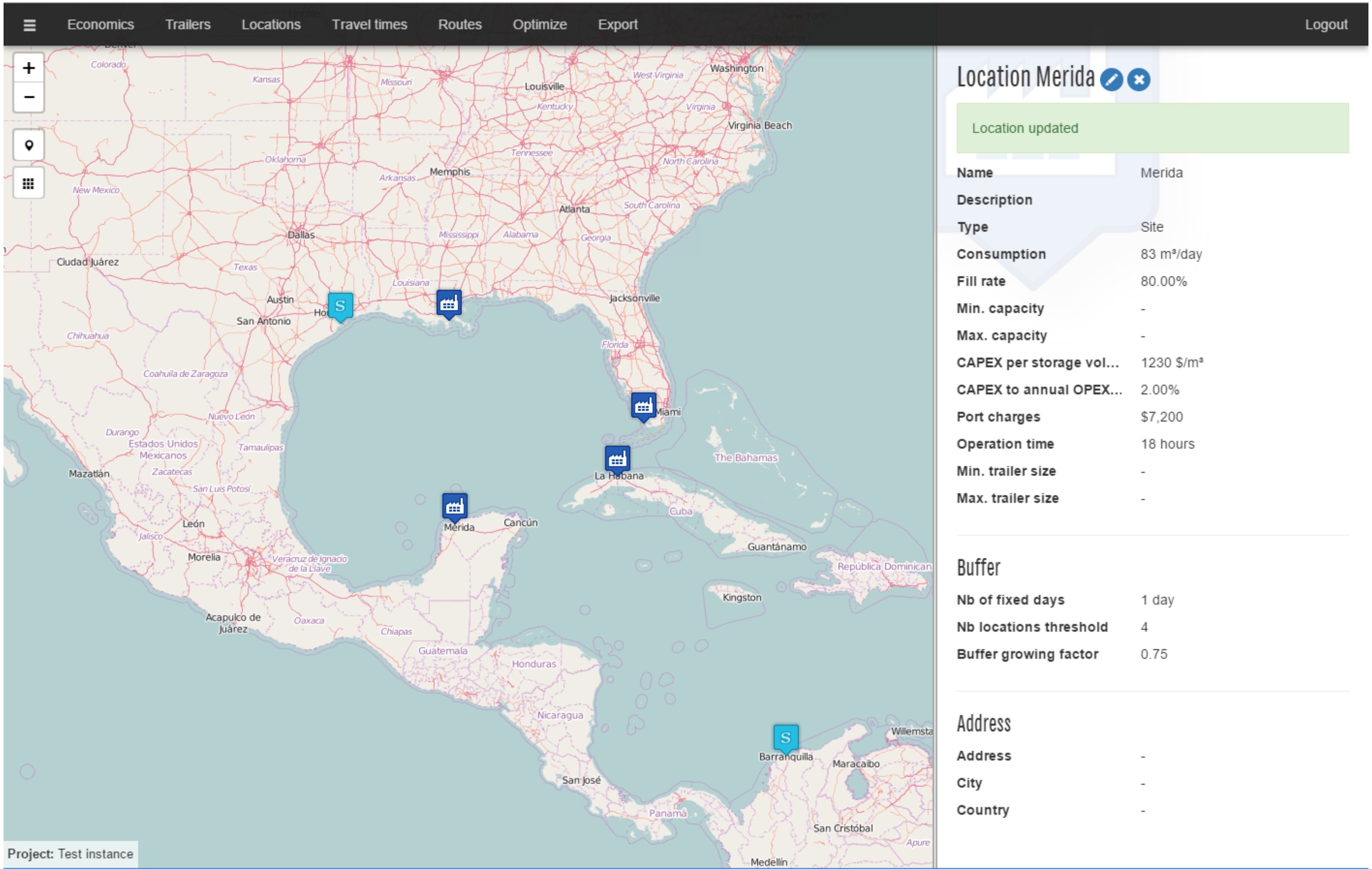
OPERATION TIME*: 0,75

MIN. TRAILER SIZE:

MAX. TRAILER SIZE:

Buffer

Creating & updating locations



≡
Economics
Trailers
Locations
Travel times
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Optimize
Export
Logout
+
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Project: Test instance

Location Merida

Location updated

Name	Merida
Description	
Type	Site
Consumption	83 m³/day
Fill rate	80.00%
Min. capacity	-
Max. capacity	-
CAPEX per storage vol...	1230 $/m³
CAPEX to annual OPEX...	2.00%
Port charges	$7,200
Operation time	18 hours
Min. trailer size	-
Max. trailer size	-

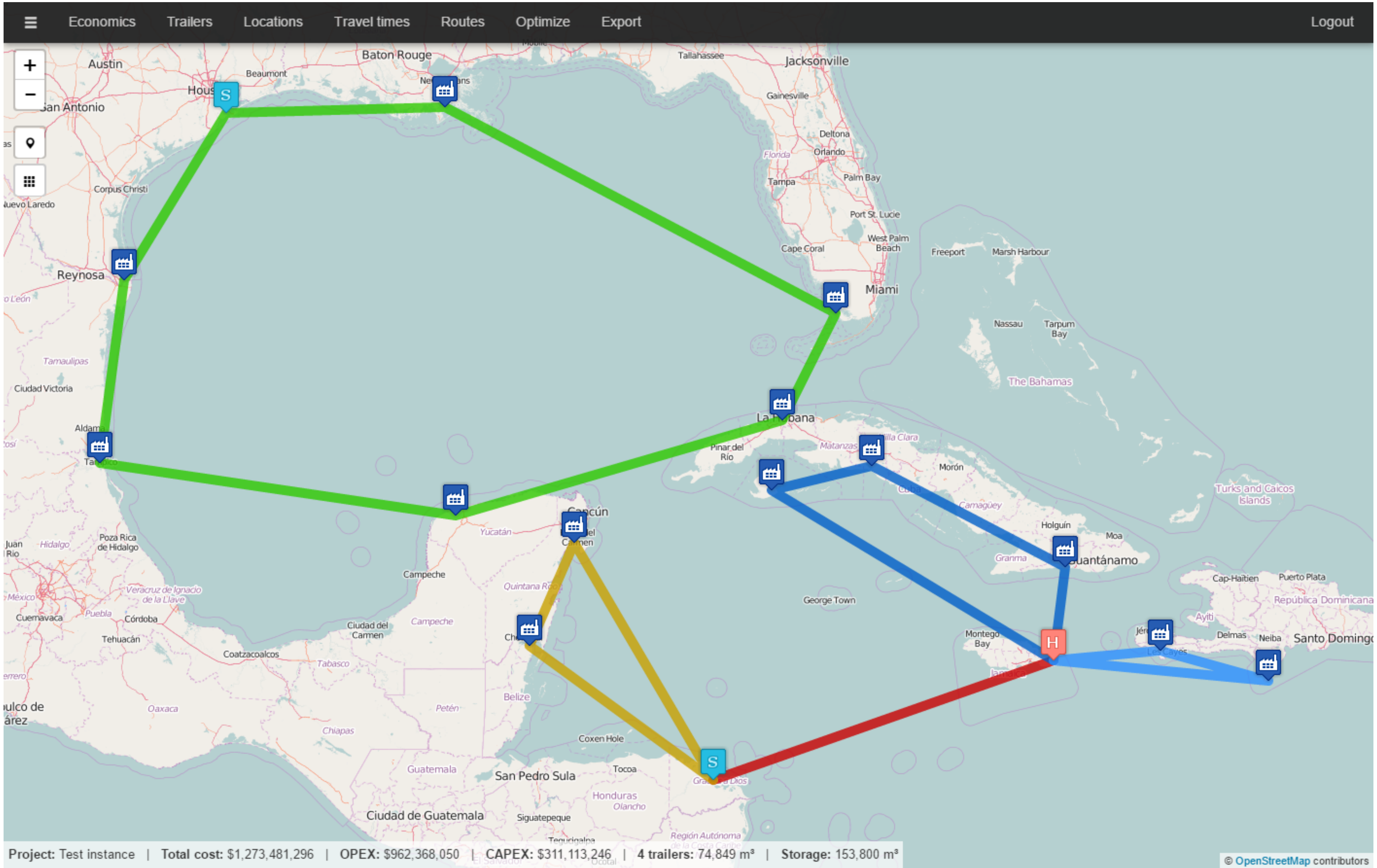
Buffer

Nb of fixed days	1 day
Nb locations threshold	4
Buffer growing factor	0.75

Address

Address	-
City	-
Country	-

Automating & optimizing solutions (by LocalSolver)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Beaumont
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San Antonio
Tallahassee
Jacksonville
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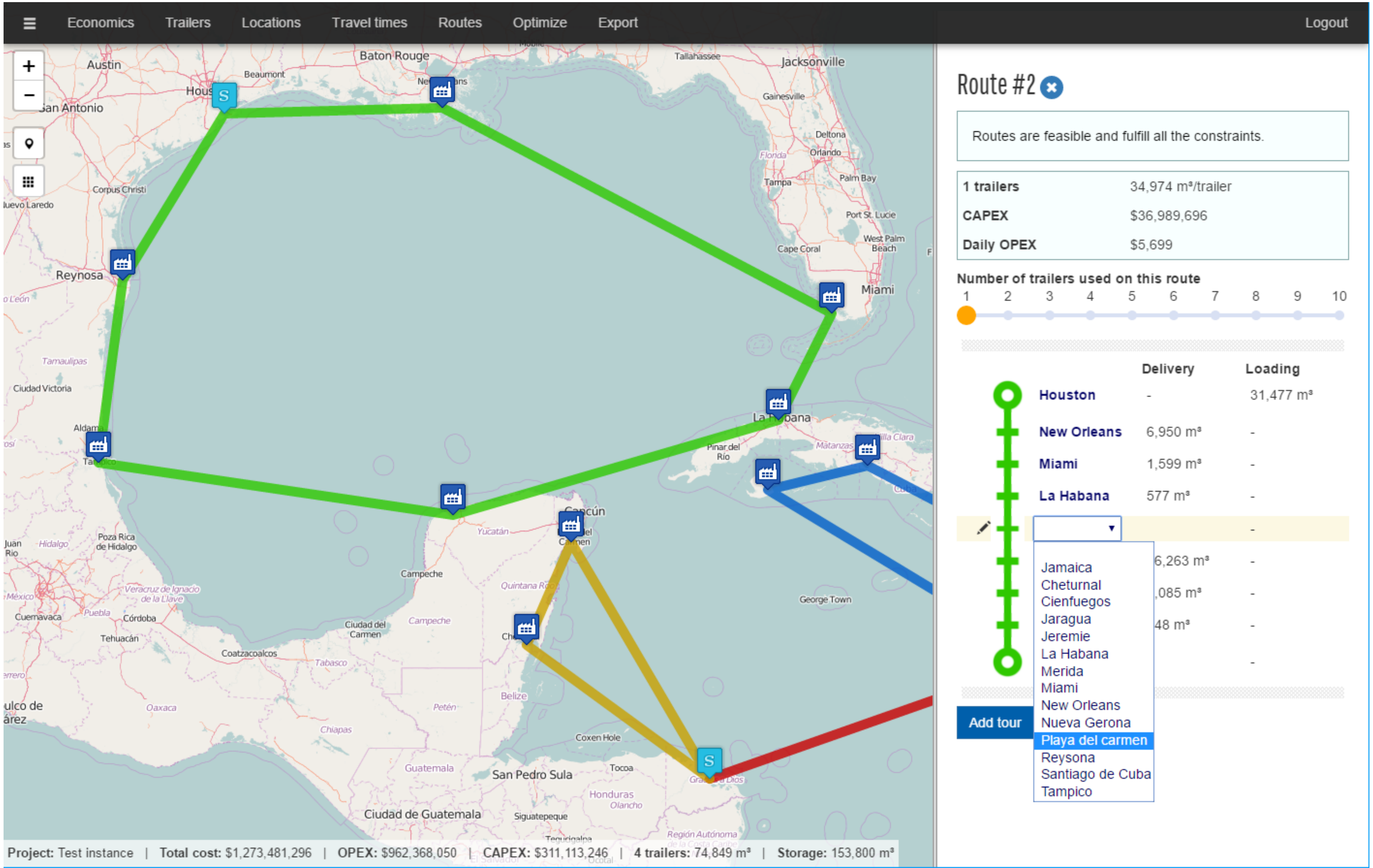
Deltona
Orlando
Florida
Tampa
Palm Bay
Port St. Lucie
West Palm Beach
Cape Coral
Freeport
Marsh Harbour
Miami
Nassau
Tarpum Bay
The Bahamas
Corpus Christi
Nuevo Laredo
Reynosa
Tamaulipas
Ciudad Victoria
Aldama
La Habana
Pinar del Río
Matanzas
Villa Clara
Morón
Camagüey
Holguín
Moa
Granma
Guantánamo
Turks and Caicos Islands
Cap-Haïtien
Puerto Plata
República Dominicana
Ayiti
Delmas
Neiba
Santo Domingo
Montego Bay
George Town
Cancún
Playa del Carmen
Yucatán
Campeche
Quintana Roo
Chetumal
Belize
Coxen Hole
Tocoa
San Pedro Sula
Honduras
Olancho
Guatemala
Ciudad de Guatemala
Siguatepeque
Petén
Chiapas
Oaxaca
Tabasco
Coatzacoalcos
Ciudad del Carmen
Tehuacán
Córdoba
Cuernavaca
Puebla
México
Veracruz de Ignacio de la Llave
Poza Rica de Hidalgo
Hidalgo
Tampico
Gracias a Dios
Región Autónoma
© OpenStreetMap contributors

Project: Test instance | **Total cost:** $1,273,481,296 | **OPEX:** $962,368,050 | **CAPEX:** $311,113,246 | **4 trailers:** 74,849 m³ | **Storage:** 153,800 m³

Manual editing of solutions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Belize
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Coxen Hole
Guatemala
San Pedro Sula
Tocoa
Honduras
Olancho
Ciudad de Guatemala
Siguatepeque
Tegucigalpa
Región Autónoma
S
Add tour

Route #2

Routes are feasible and fulfill all the constraints.

1 trailers	34,974 m³/trailer
CAPEX	$36,989,696
Daily OPEX	$5,699

Number of trailers used on this route

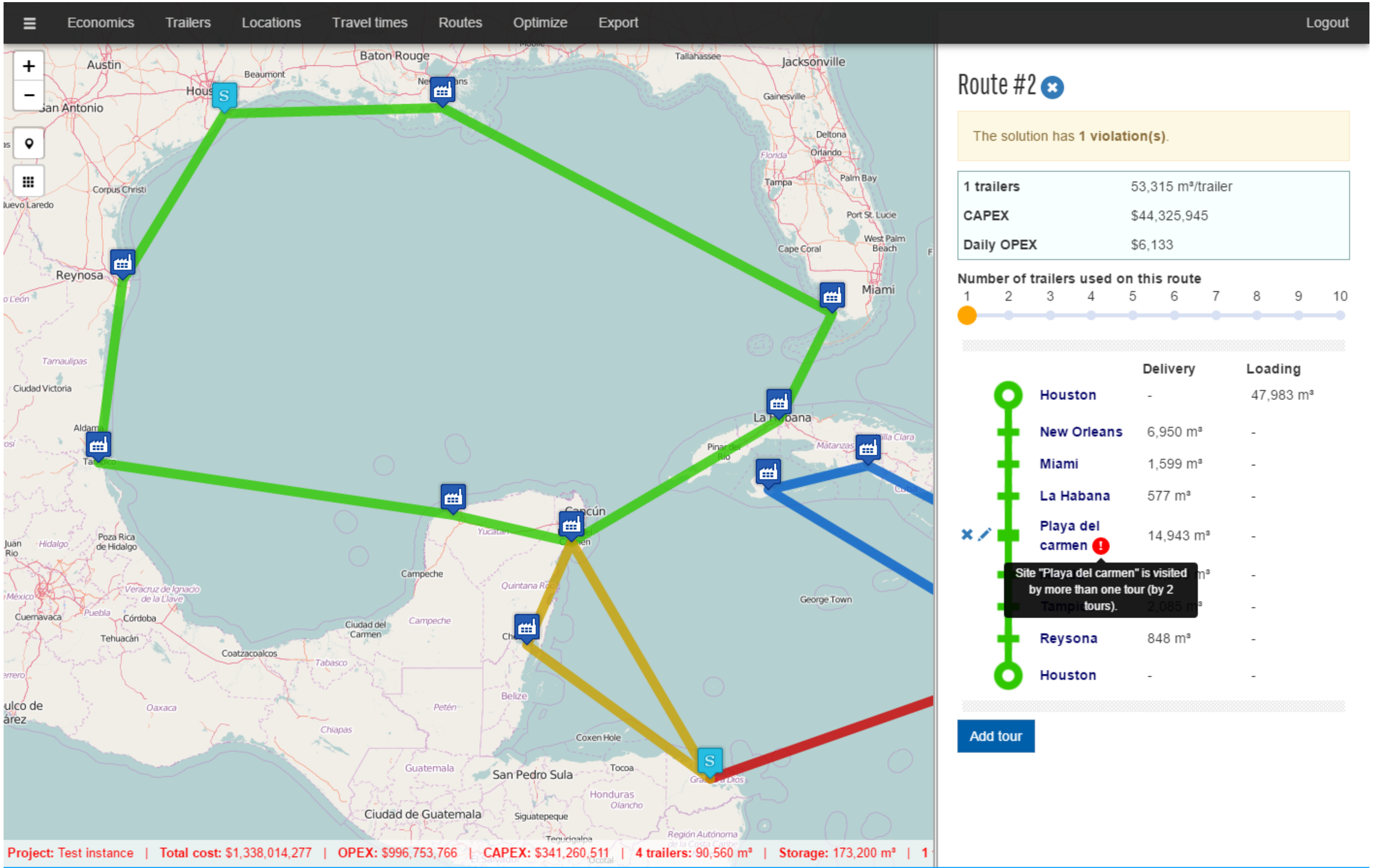
1 2 3 4 5 6 7 8 9 10

	Delivery	Loading
Houston	-	31,477 m³
New Orleans	6,950 m³	-
Miami	1,599 m³	-
La Habana	577 m³	-
▾		-
	6,263 m³	-
	,085 m³	-
	48 m³	-
		-

- Jamaica
- Cheturnal
- Cienfuegos
- Jaragua
- Jeremie
- La Habana
- Merida
- Miami
- New Orleans
- Nueva Gerona
- Playa del carmen
- Reysona
- Santiago de Cuba
- Tampico

Project: Test instance | **Total cost:** $1,273,481,296 | **OPEX:** $962,368,050 | **CAPEX:** $311,113,246 | **4 trailers:** 74,849 m³ | **Storage:** 153,800 m³

Manual editing of solutions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Tehuacán
Coatzacoalcos
Ciudad del Carmen
Campeche
Yucatán
Quintana Roo
Cancún
La Habana
Pinar del Río
Matanzas
Villa Clara
George Town
Tabasco
Oaxaca
Chiapas
Petén
Belize
Coxen Hole
Guatemala
San Pedro Sula
Tocoa
Honduras
Olancho
Ciudad de Guatemala
Siguatepeque
Tegucigalpa
Región Autónoma
S

Route #2

The solution has **1 violation(s)**.

1 trailers	53,315 m³/trailer
CAPEX	$44,325,945
Daily OPEX	$6,133

Number of trailers used on this route

1 2 3 4 5 6 7 8 9 10

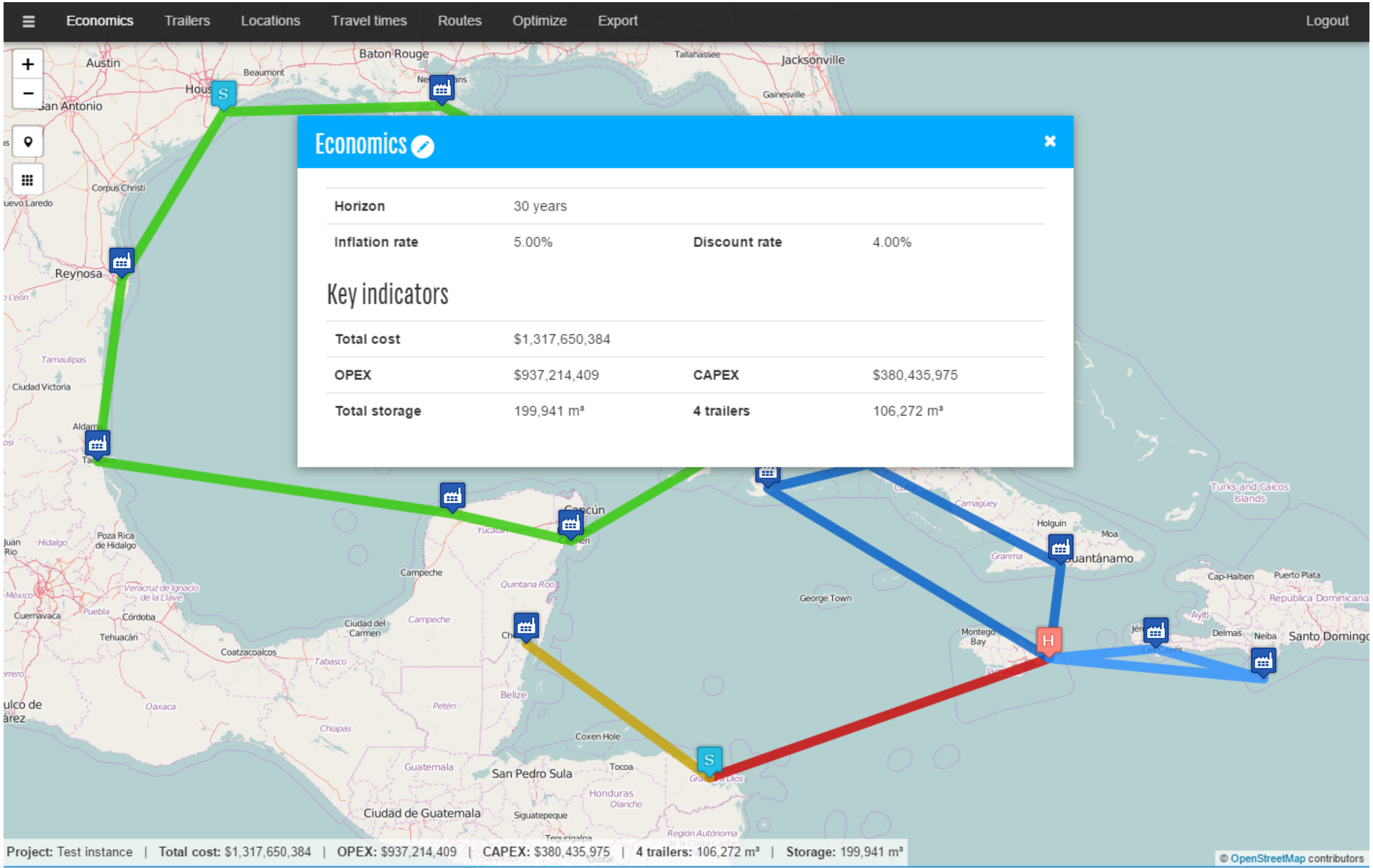
	Delivery	Loading
Houston	-	47,983 m³
New Orleans	6,950 m³	-
Miami	1,599 m³	-
La Habana	577 m³	-
Playa del carmen	14,943 m³	-
[illegible]	[illegible] m³	-
Tampico	2,085 m³	-
Reysona	848 m³	-
Houston	-	-

Site "Playa del carmen" is visited by more than one tour (by 2 tours).

Add tour

Project: Test instance | **Total cost:** $1,338,014,277 | **OPEX:** $996,753,766 | **CAPEX:** $341,260,511 | **4 trailers:** 90,560 m³ | **Storage:** 173,200 m³ | 1

Displaying KPIs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Beaumont
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Reynosa
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Ciudad Victoria
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Campeche
Quintana Roo
Cancún
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Tehuacán
Coatzacoalcos
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Delmas
Neiba
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Economics

Horizon	30 years		
Inflation rate	5.00%	**Discount rate**	4.00%

Key indicators

Total cost	$1,317,650,384		
OPEX	$937,214,409	**CAPEX**	$380,435,975
Total storage	199,941 m³	**4 trailers**	106,272 m³

Project: Test instance | **Total cost:** $1,317,650,384 | **OPEX:** $937,214,409 | **CAPEX:** $380,435,975 | **4 trailers:** 106,272 m³ | **Storage:** 199,941 m³

LocalSolver

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