Deploying Social Internet of Things and cognitive digital twins for optimized and ad-hoc logistics collaborations

Kostas Kalaboukas, SingularLogic SA

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Trends

COGLO

- eCommerce growth
- Same day delivery
- Universal Postal Sector Transformation
- Globalization
- ...

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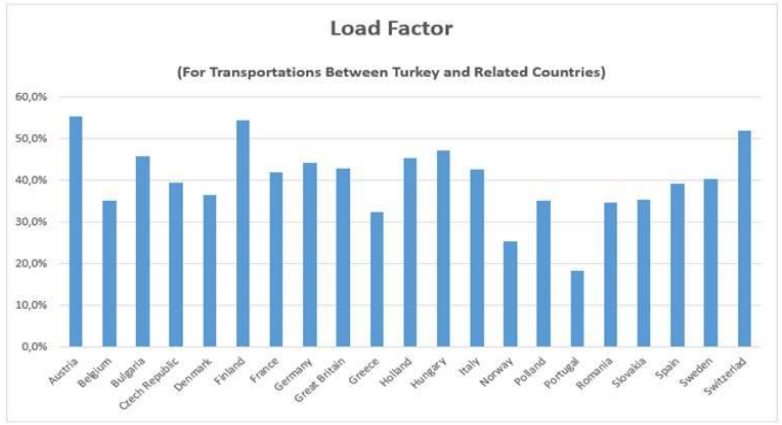
Main Challenges

COG-LO

Load factor optimization

Today



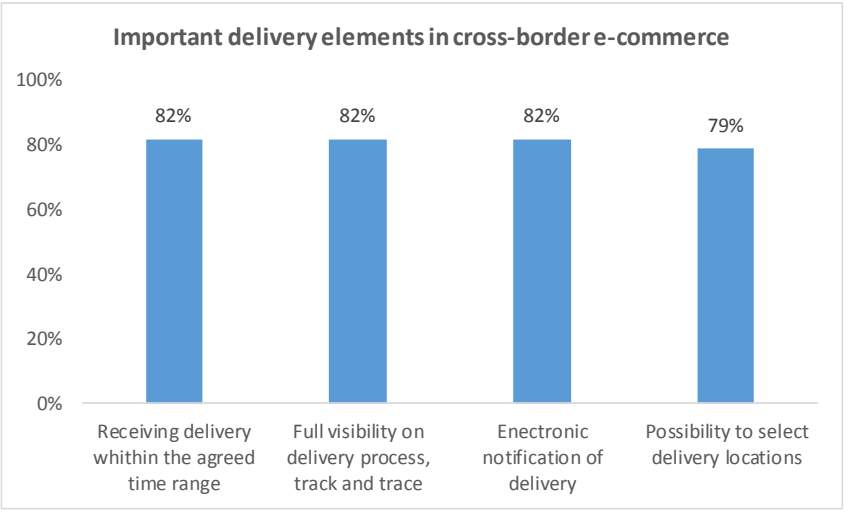
EKOL figures

Dynamic response to events and ad-hoc orders

- Ad-hoc deliveries/ returns
- Missed deliveries

~25% of the total delivery requests for EKOL Logistics is on the fly.

The growth of ecommerce and Cross-country deliveries



Ecommerce Europe's Cross-Border E-commerce Barometer 2016

The need

- Merge/consolidate deliveries
- Identify "nearby" opportunities
- Create ad-hoc collaborations

- Flexibility
- (re)schedule deliveries
- Knowledge generation from big data (events, missed deliveries, traffic, etc.)

- Common information models
- Alignment of tools and delivery processes

COG-LO

"Tweeting CLOs" Tool

- IoT and Analytics technology
- Tools to identify possible collaborations in real-time and along the route

"Cognitive Logistics Advisor" tool

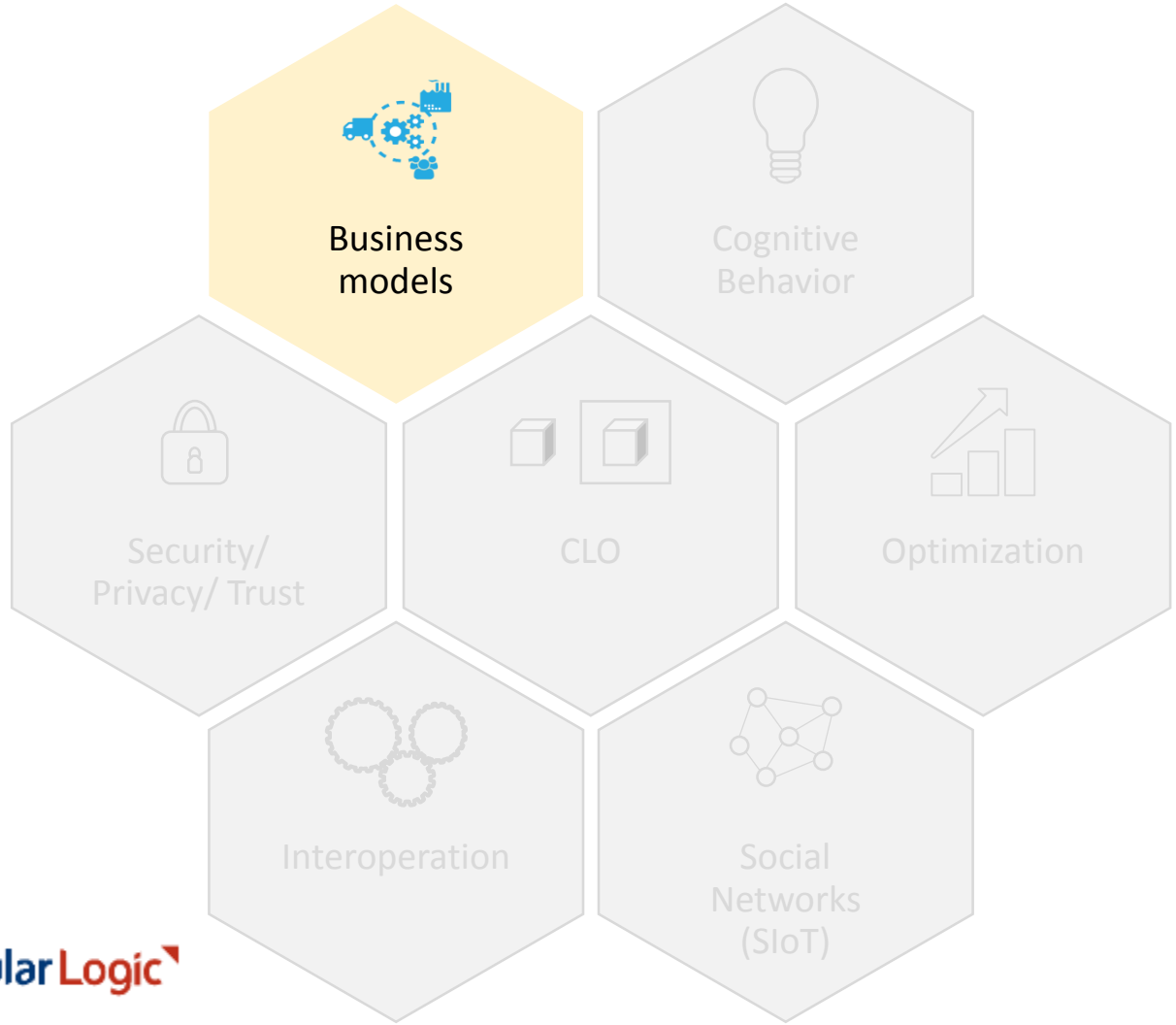
- AI/ Predictive analytics
- Cognitive Logistics Object (CLO)

Secure, private and trusted networks

- Security and Privacy aware policies
- Blockchain ensuring trust

A holistic framework…

Business Models



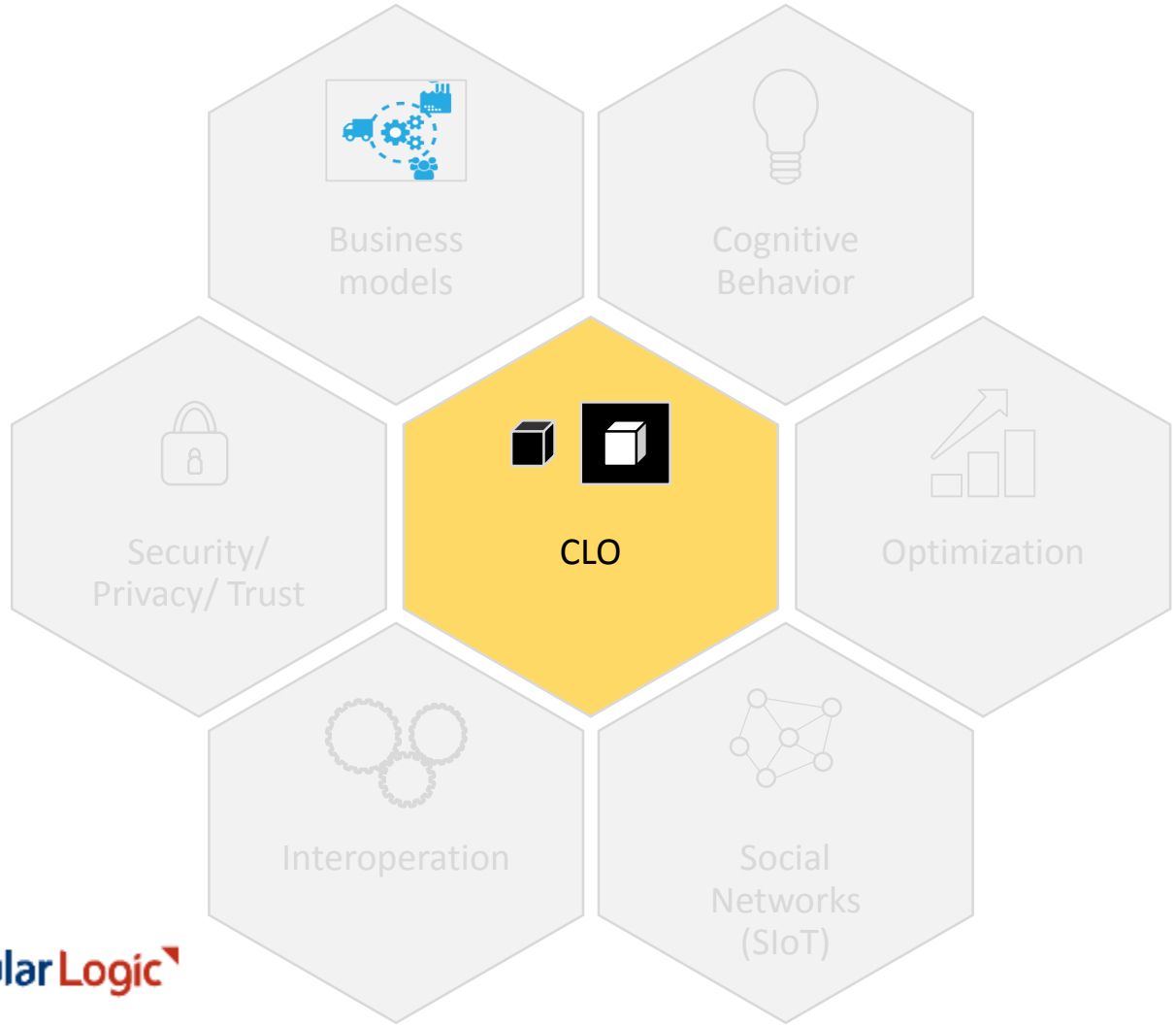
Drives the behavior of the whole system

- Same day delivery
- Faster delivery
- Last mile logistics
- Crowd logistics
- Postal operations
- Other

Business models define the strategic priorities and criterial for decision making (SLAs, priorities, etc.)

Applicable regulation and legislation

Cognitive Logistics Object



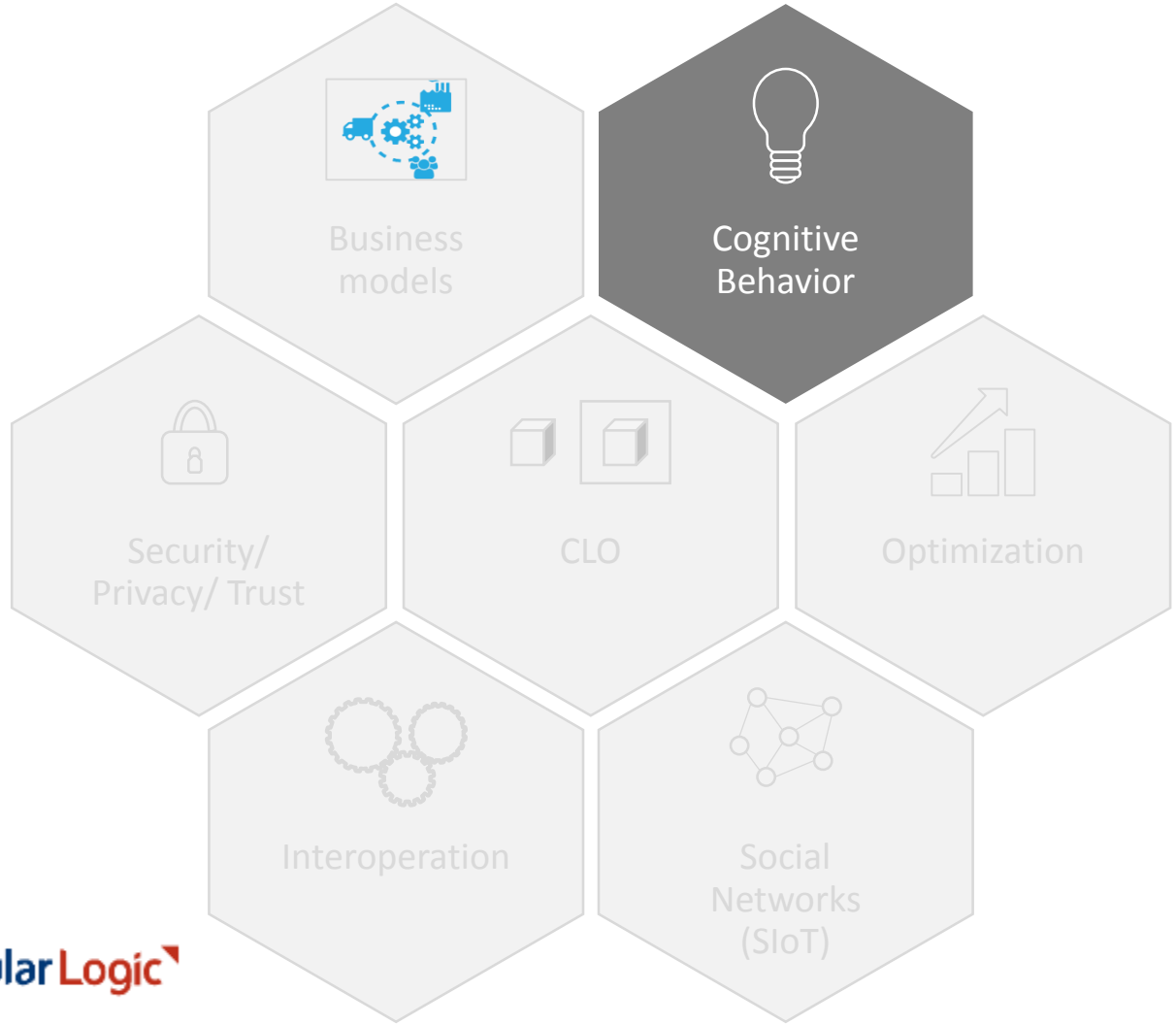
CLO is a **virtualized entity (digital twin)** that participates in the logistics process,

(digitally) represents **different actors** such as cargo, truck, traffic light, supporting system, etc. (depending on the case)

and has a **different capabilities** (from basic functionalities up to autonomous decision making and actuation),

which are **configured** per case.

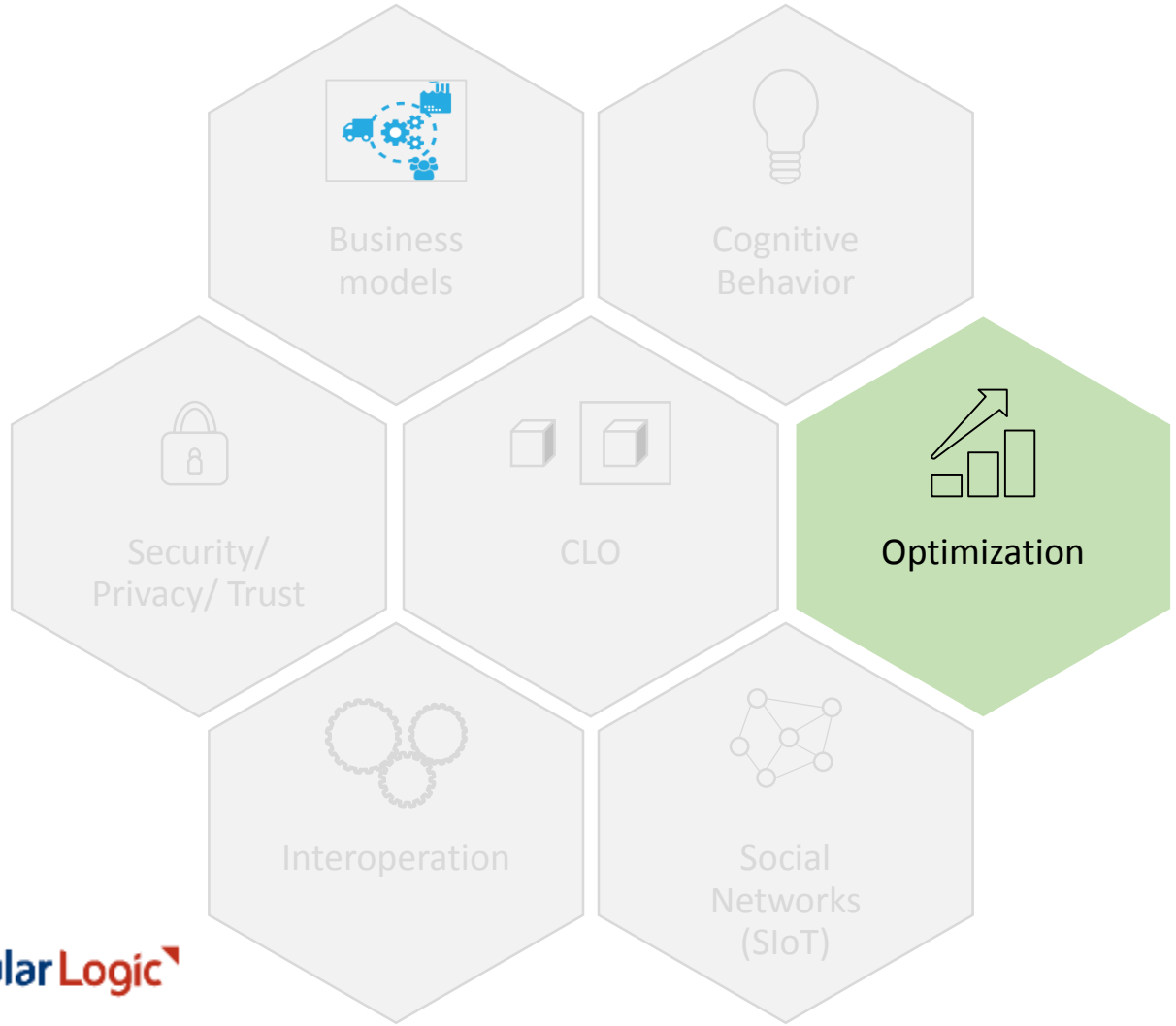
Cognitive Behaviour



Continuous and dynamic process for:

- **Modelling**: Modelling the CLOs, their interrelationships among different CLOs and the whole network
- **Monitor**: data streams and analytics
- **Understand**: based on a knowledge base, detect anomalies
- **Reason**: Creates new knowledge with learning capabilities; updating existing knowledge base

Optimization

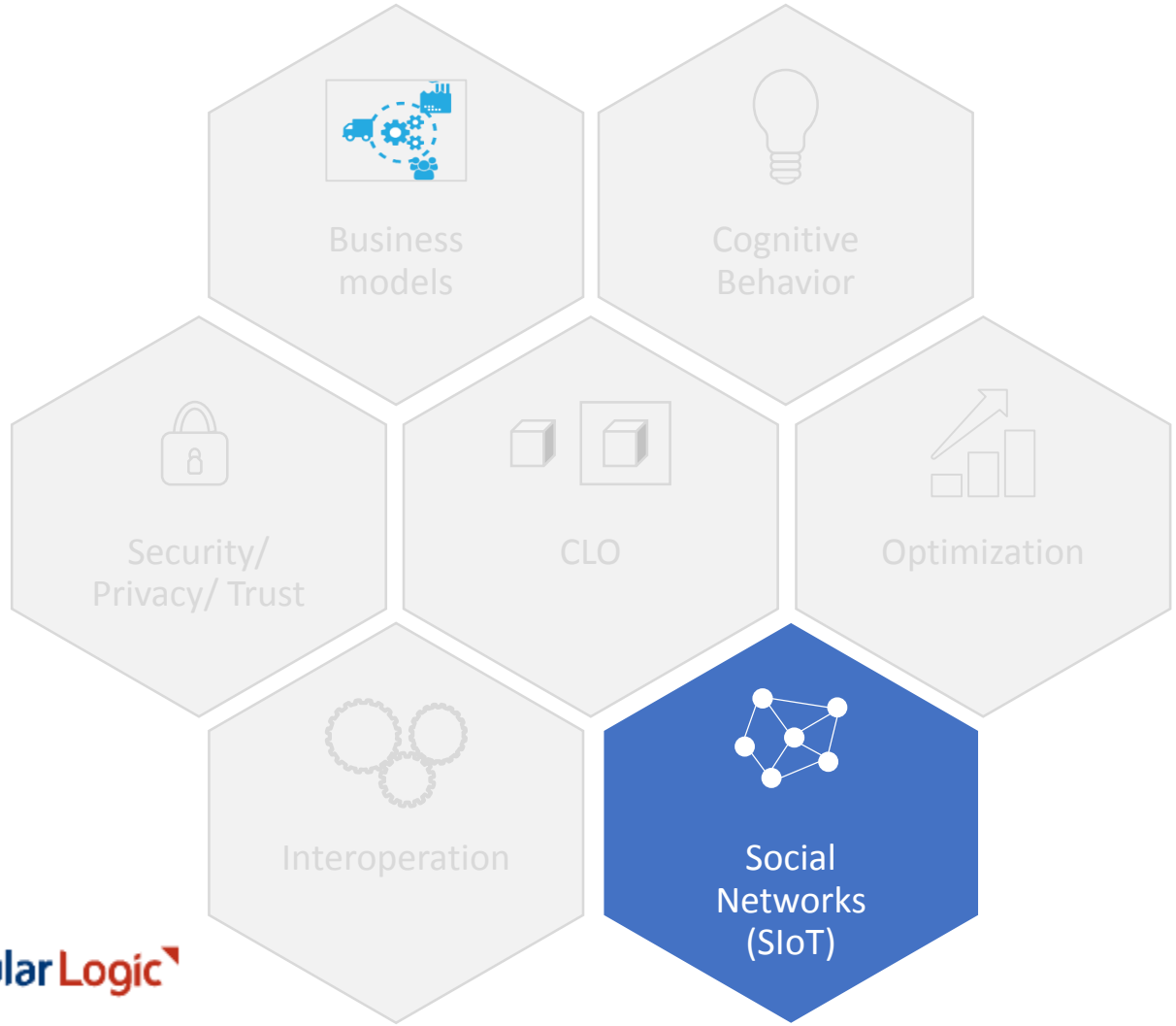


Optimization algorithms, models and services configurable to different circumstances

Based on event / anomaly detection different factors affecting optimization

- Load factor
- Time
- Cost
- SLAs
- Other…

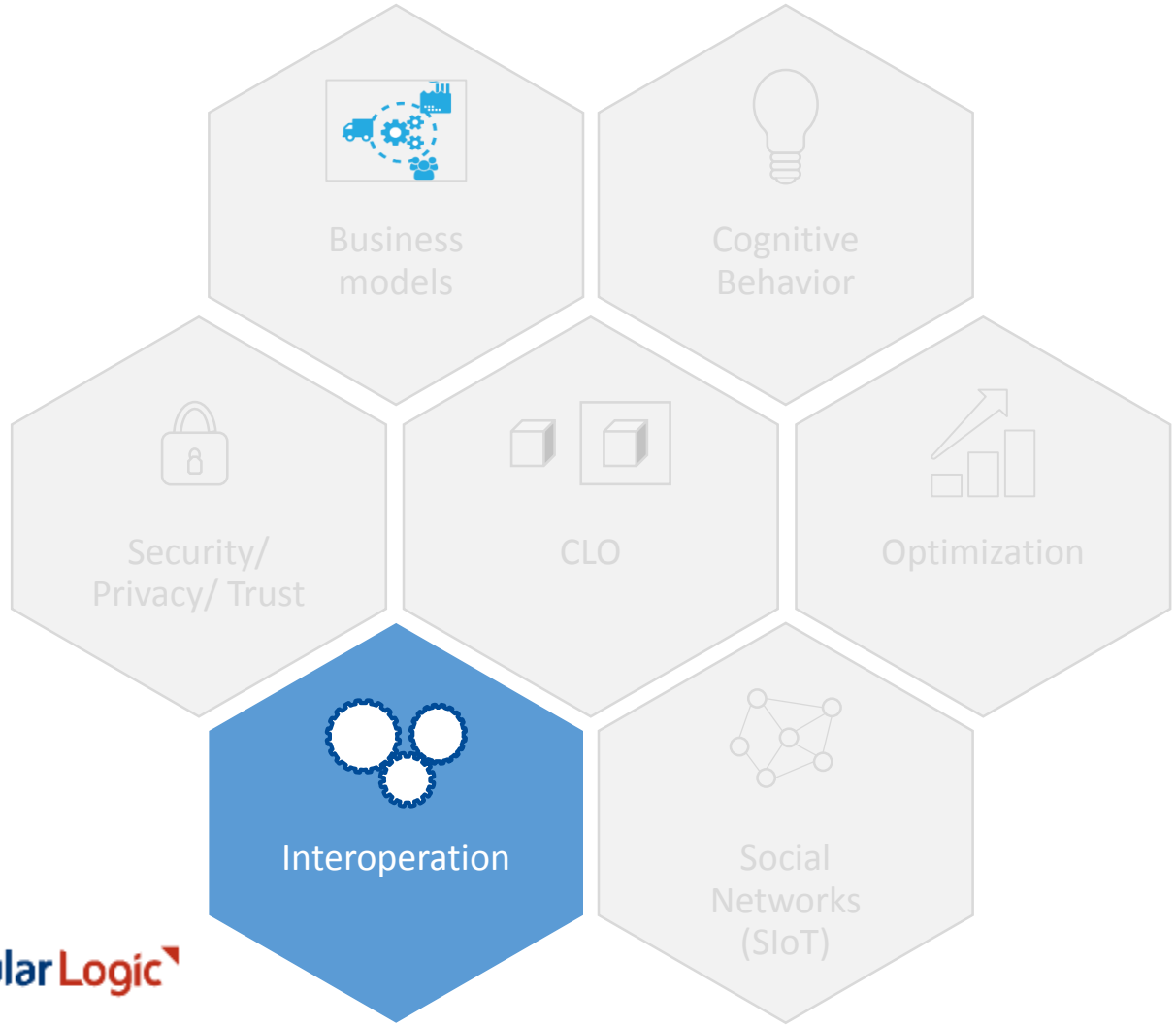
Social Internet of Things



A distributed infrastructure allowing CLOs to communicate each other and exchange information

Through SIoT, neighbor actors can be identify and contacted

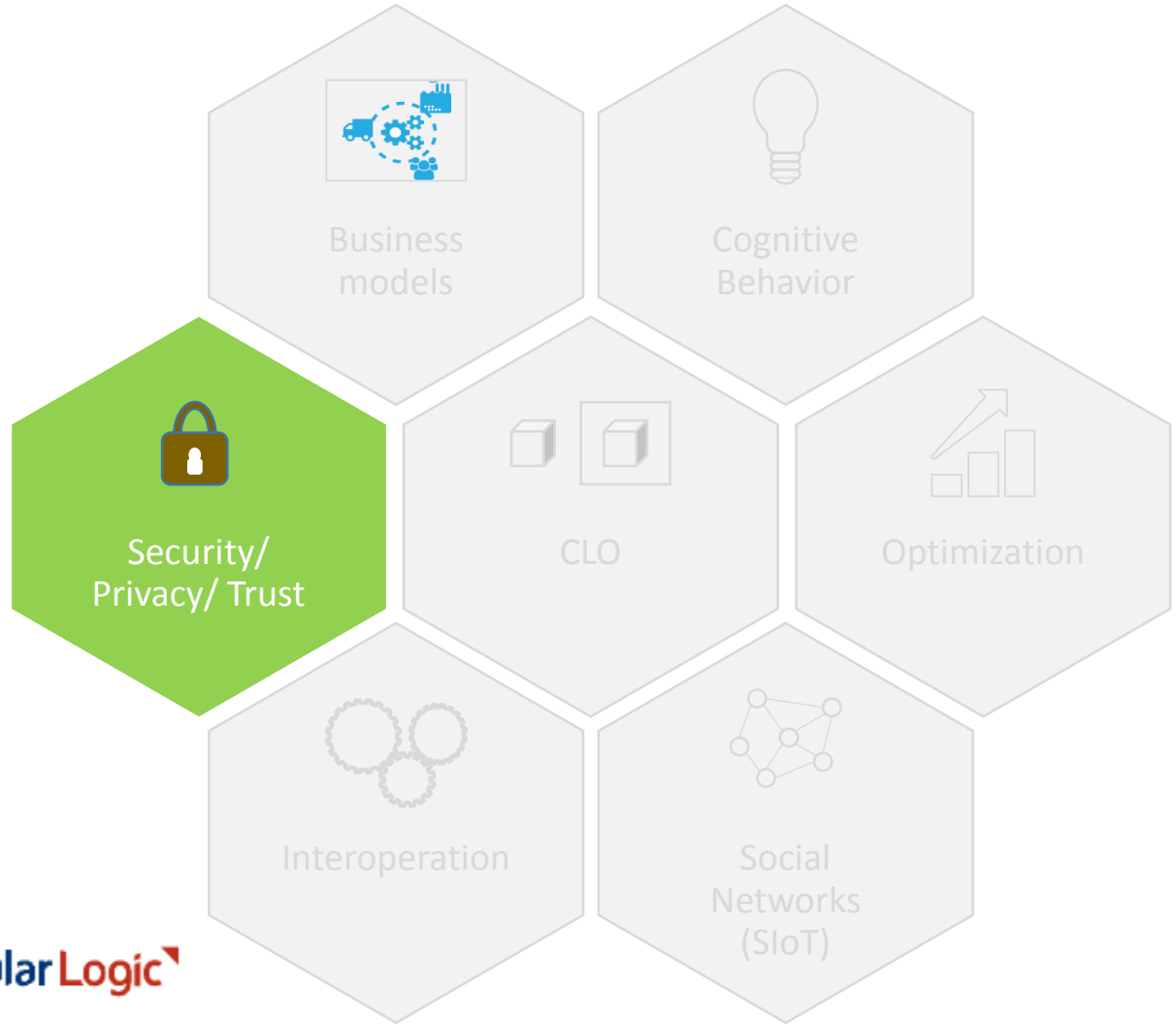
Interoperation



Common information models based on exiting standards to allow for exchange of information among different CLOs

A message bus that orchestrates different services and among different systems

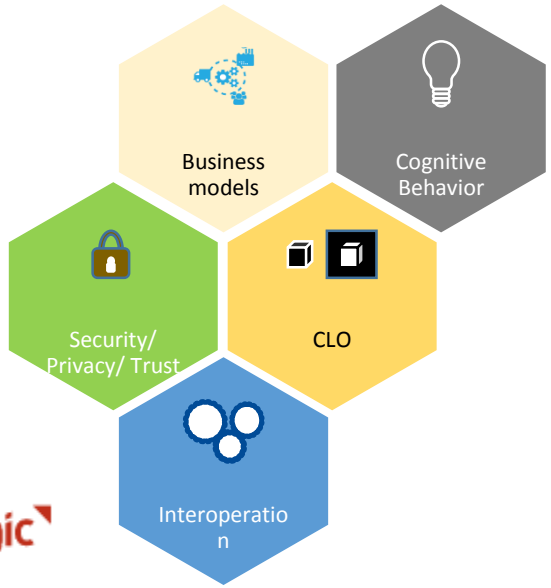
Security/ Privacy/ Trust

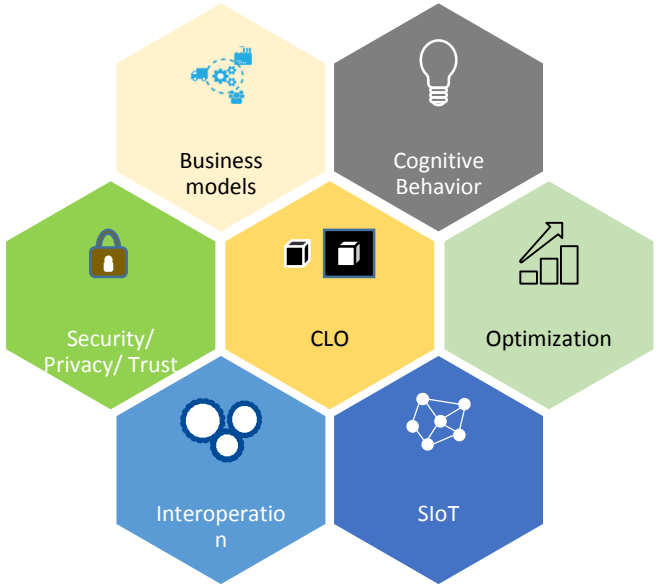


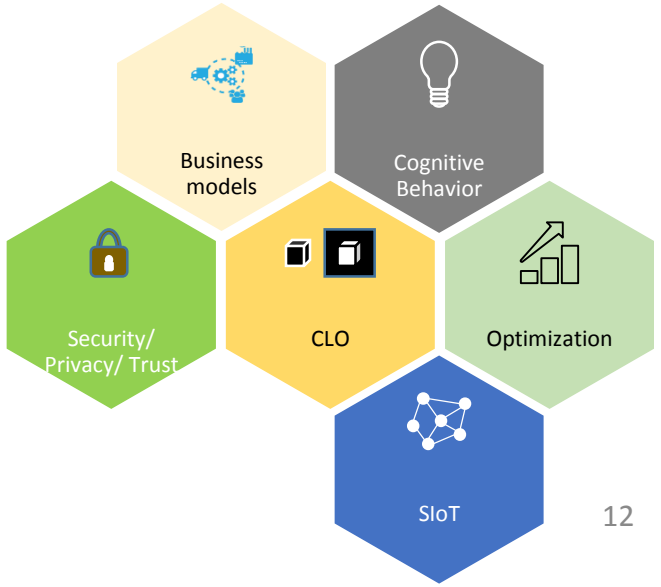
- Crypto-based mutual authentication
- Authorization policies
- Trusted authentication through distributed ledger
- Data protection mechanisms

A modular approach…

- COG-LO is not a monolithic platform.
- Consists of: a set of reference models, services and tools to allow for more collaborative and cognitive logistics
- Different implementations and configurations according to customer needs

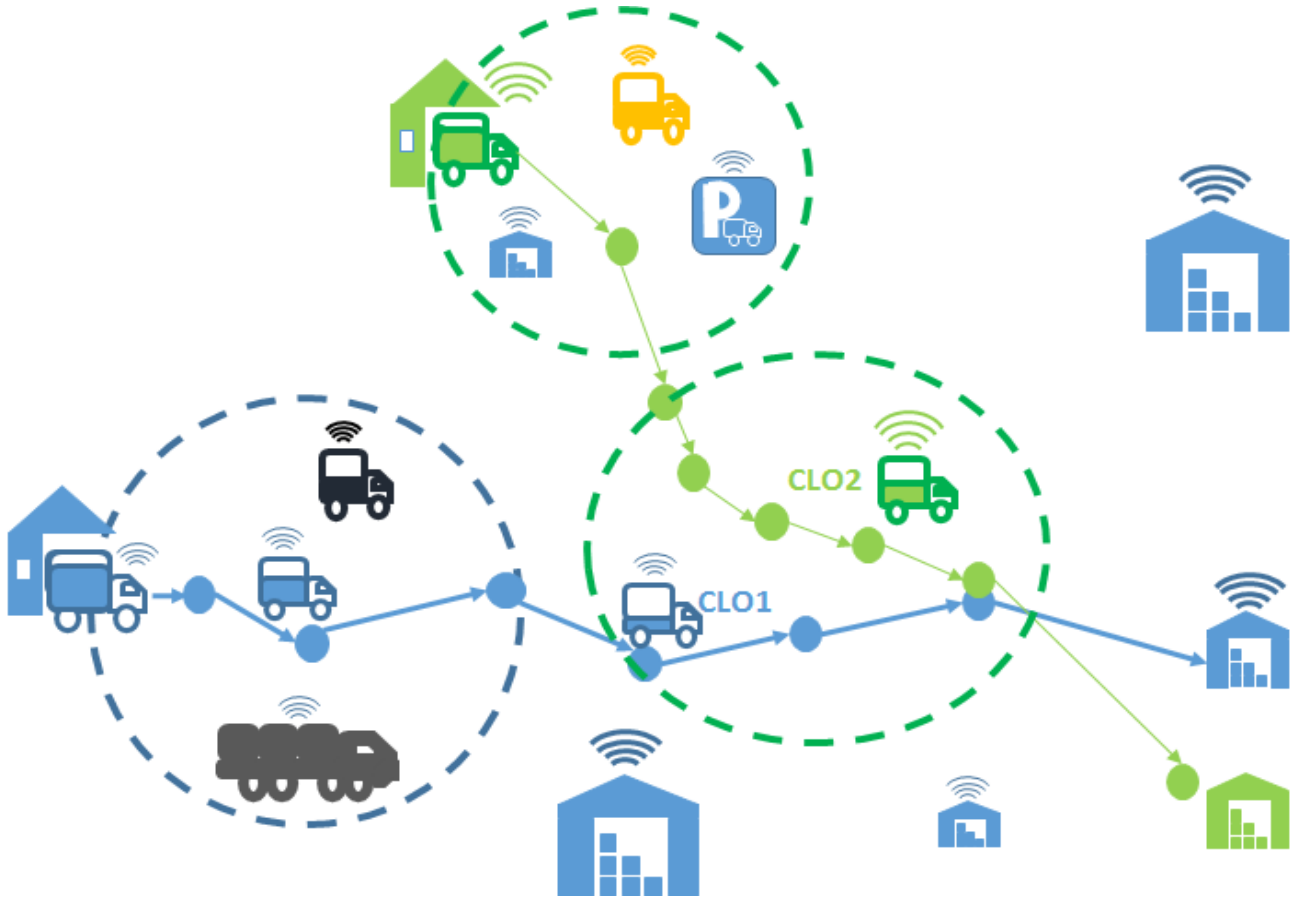






How it works

1. A **CLO** is always aware of its status
2. The **CLO** (truck, warehouse, Parking spot, etc.) joins different fixed or ad-hoc social networks
3. Through **Social Internet of Things (Tweeting CLOs)**, the CLO communicates with its fellow CLOs to negotiate about alternatives in case of an event
4. The **Cognitive Advisor** suggests optimal solutions



Project Results

Methodological approach	#1: New cognitive cargo-centric multi-modal transport models
	#2: A reference model for future Cognitive Logistics behavior
Core Services	#3: Cognitive behavior tools with APIs
	#4: Comprehensive framework/tools for security, privacy and trust
	#5: Collaboration platform powered by Social Internet of Things
Tools	#6: Cargo Hitchhiking tool
	#7: Cognitive Advisor tool

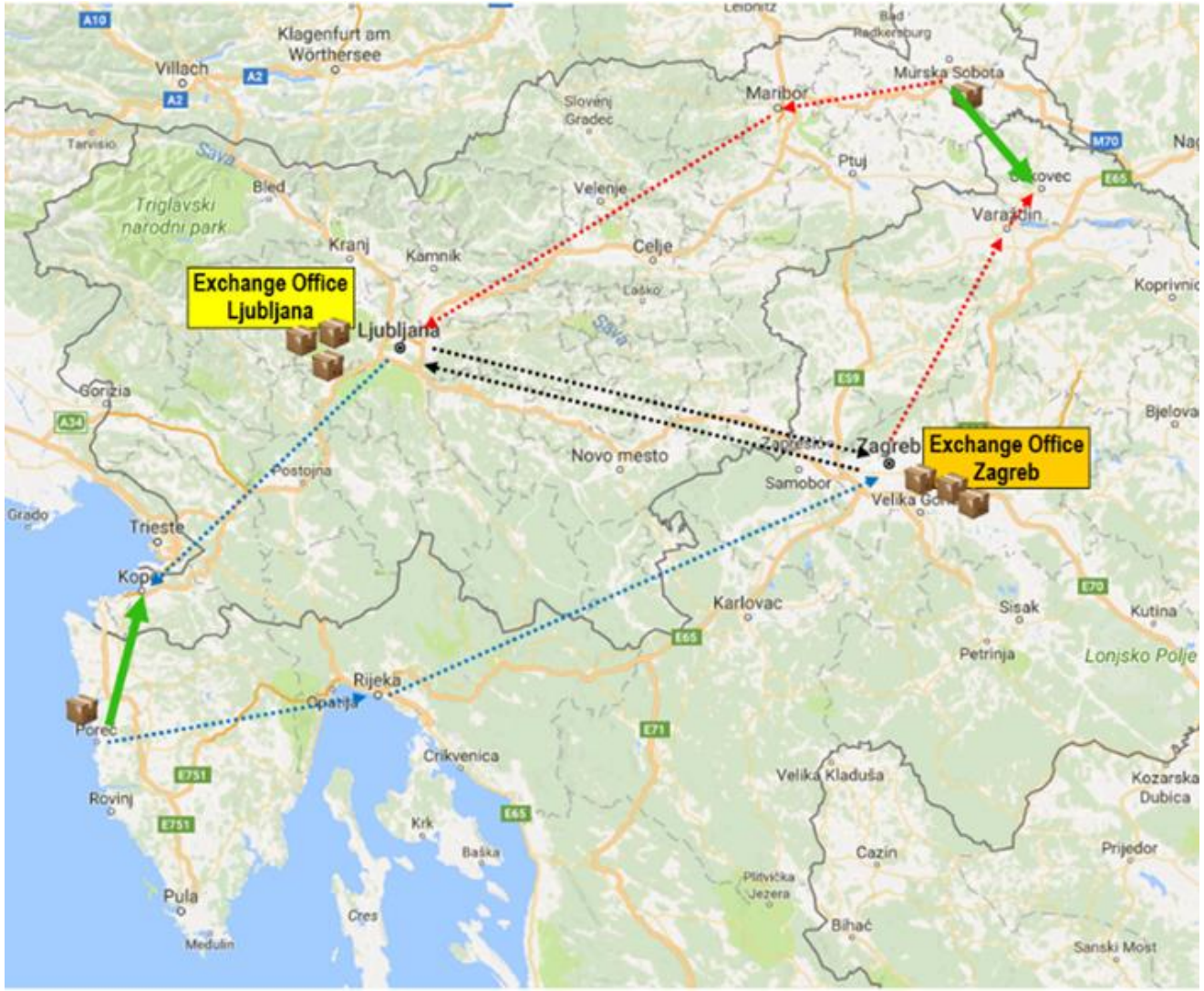
Posta Slovenia-Croatia Post: Cross-country parcel deliveries

Context

e-Commerce parcels from Slovenia to Croatia through Postal Operator services

Problem/ Challenge

- Collaborative parcels tracking
- Optimized Slovenia->Croatia deliveries (currently only though Ljubljana hub)
- Real-time load factor monitoring and improvement



Hellenic Posts: Backbone and urban parcels deliveries

Context

- Backbone logistics for the intra-country transportation (Athens -> Thessaloniki)
- Urban logistics - merging delivery and picking boxes process

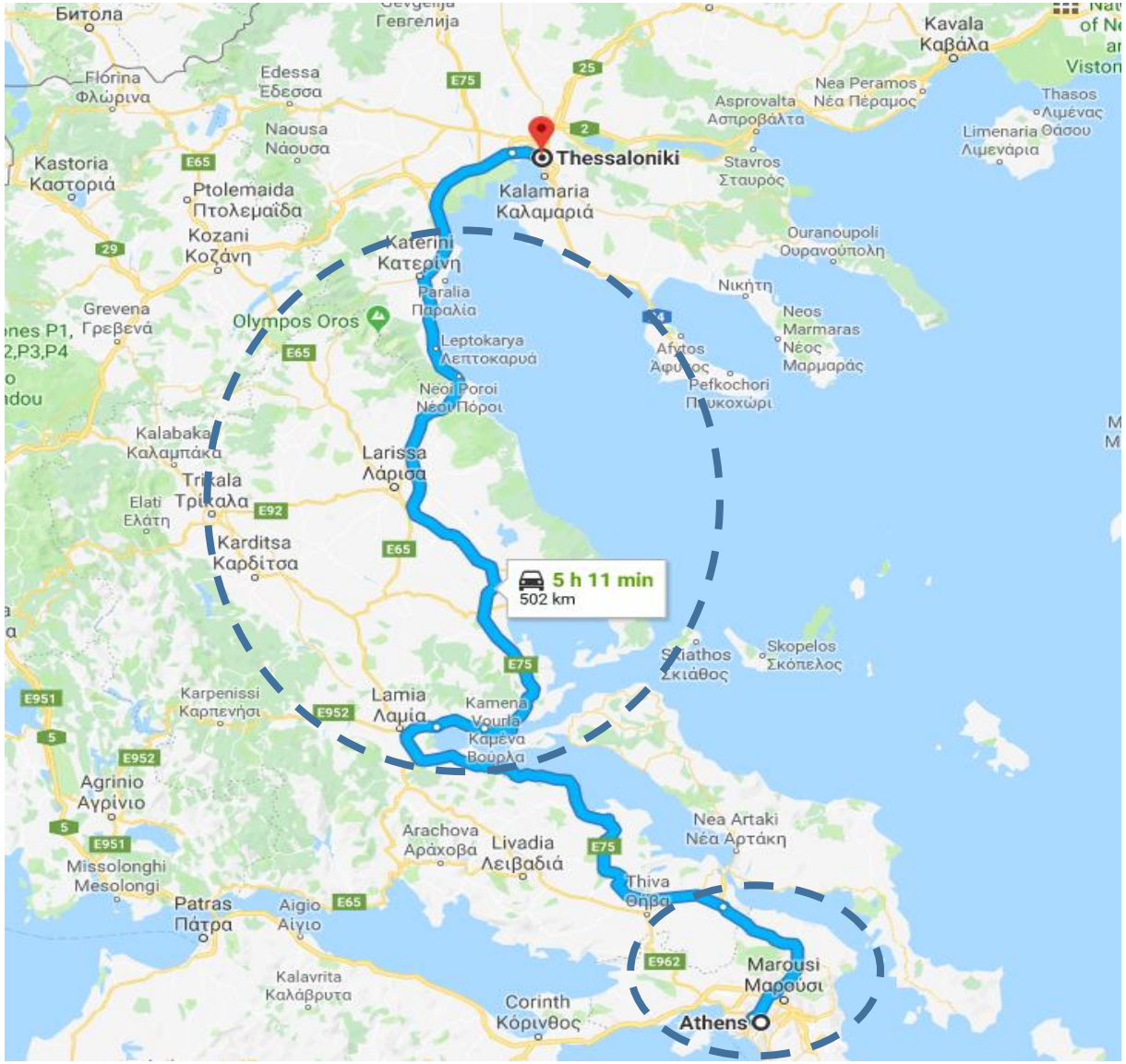
Problem/ Challenge

<u>Backbone logistics:</u>

- Improve leading position with new collaborations
- Load factor optimization

<u>Urban Logistics</u>

- Improve response to ad-hoc events
- Real-time optimization and routing
- New collaborative models (retail,…)



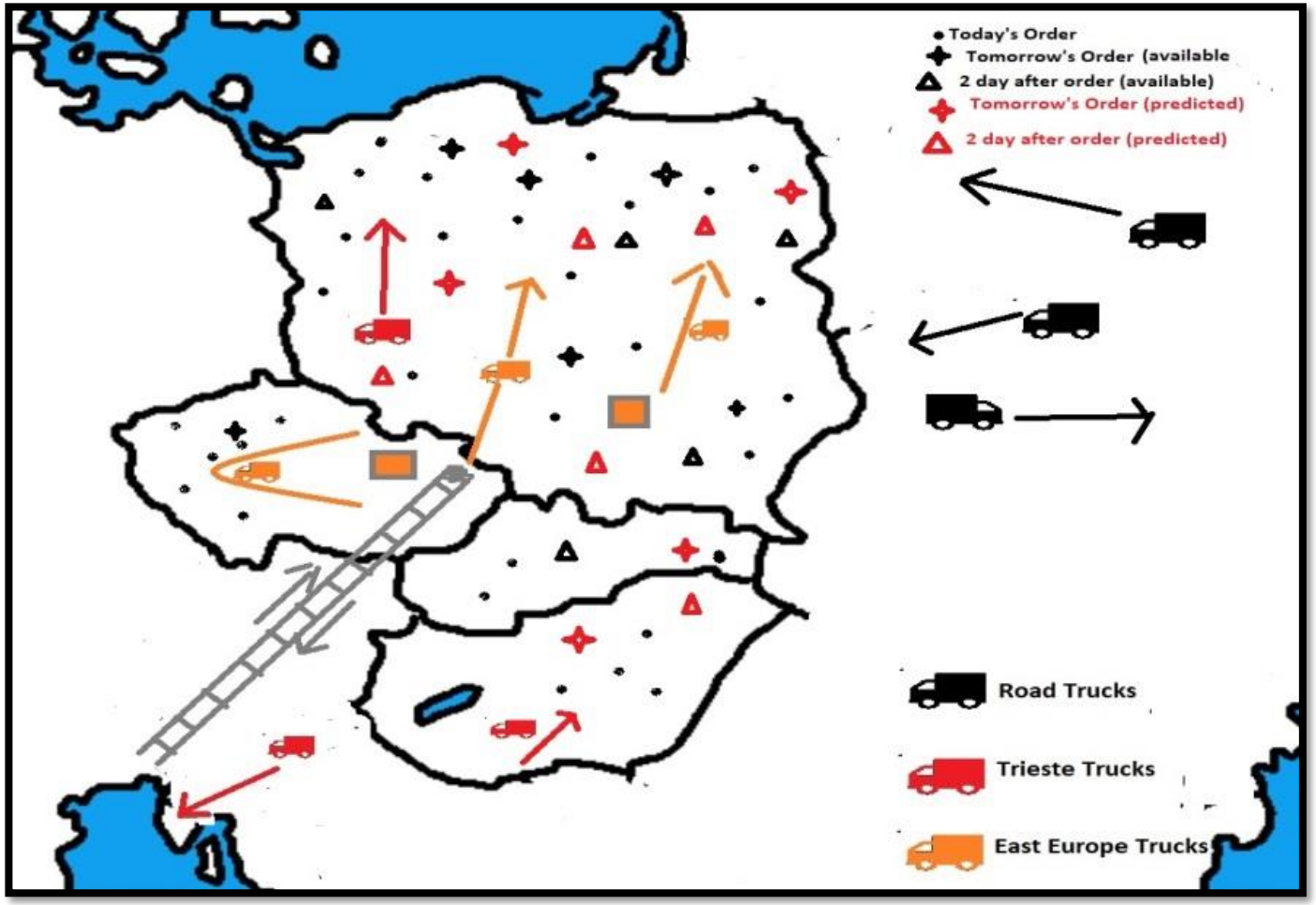
EKOL: Optimized cargo forwarding at Port of Trieste

Context

Cargo transshipment operations from Eastern Europe to Turkey – multimodal operations and forwarding (truck, train, ship) exploiting Trieste-Ostrava railway and Trieste-Lavrio-Yalova port connections

Problem/ Challenge

- Under-utilization of resources
- Legislative restrictions on different truck types
- Cancellations or delays (road or rail network)
- Ad-hoc orders in Eastern Europe
- Predict delays and events in Trieste railway operation
- Optimization of orders' and trucks'allocation



Benefits

COGLO

- Increased load factor
- Reduced costs
- Reduced deliveries - improved assets utilization
- Improve delivery times
- Improve responsiveness
- Improve customer satisfaction

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COGLO

COGnitive Logistics Operations through secure, dynamic and ad-hoc collaborative networks

Project Coordinator

cnit

Technical Coordinator

SingularLogic

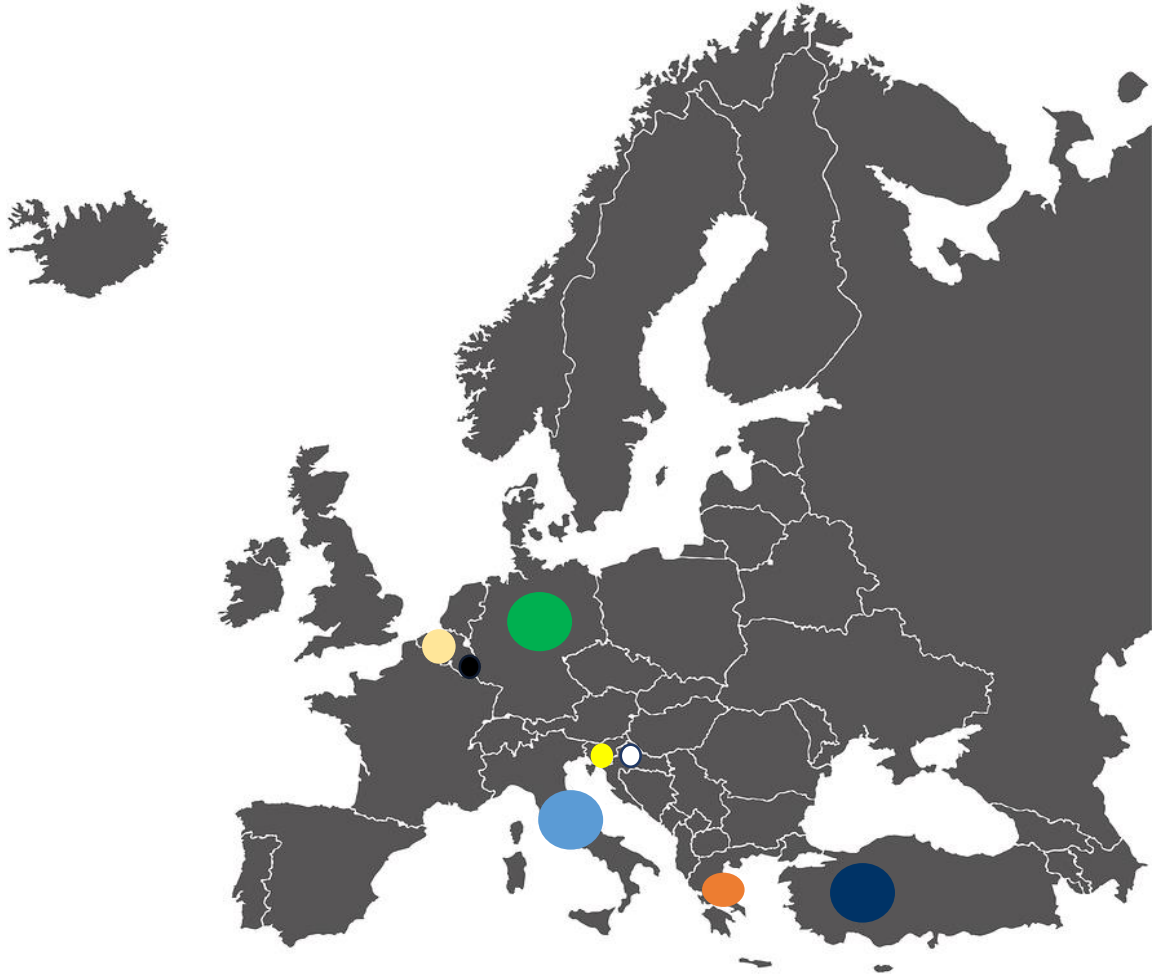
Scientific Coordinator

Jožef Stefan Institute

Project Funding ~ 5mio €

Start Month: June 2018
End Month: May 2021

Duration: 36 months



Technology Providers

- cnit
- SingularLogic
- INTRASOFT INTERNATIONAL
- swarco

Optimization, big data analytics

- NEC
- Jožef Stefan Institute
- ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

Consultancy

- TRT

Pilots

- Pošta Slovenije
- Hrvatska pošta
- ΕΛΤΑ Hellenic Post
- ekol LOGISTICS 4.0

Associations

- POST EUROP — YOUR LINK TO POSTAL EXPERTISE
- ITS HELLAS Intelligent Transport Systems

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THANK YOU

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