Supply Chain + Blockchain
Trusted Data Capture for the Transportation Industry
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1 | Who We Are

Trakopolis helps enterprises harness the power of the Internet of Things. Trakopolis connects assets, manages the vast amounts of data they transmit and visualizes the output as usable business intelligence. For example:

- A fleet manager can look at a single dashboard to assess the maintenance schedule of rental machinery spread across an entire continent.
- An operations manager can re-calculate cycle times based on accurate analysis of logging trucks in remote forests.
- A finance department can comply with U.S. and Canadian mandates on everything from fuel taxes to driver hours without having to wade through sheaves of paperwork.

The Trakopolis platform connects everyone and everything while visualizing the location and performance of vehicles, equipment and people in real time, increasing safety, reducing overheads and enhancing operational excellence.
Two rapidly emerging technologies are on a path to converge, expanding our understanding and capabilities for remote data capture. At the intersection of Blockchain and IoT we see increasing potential for the business value of software solutions that can navigate the rapidly evolving market.

As summarized by many others we believe and agree with Goldman Sachs that Blockchain promises “The New Technology of Trust”. At the core, this model for a digitally distributed ledger offers a method of securing transactions by forcing immutability through cryptography, and replicating the records across many network participants to provide a collaborative maintenance system.

Trakopolis is leveraging blockchain software with our existing enterprise IoT platform to the benefit of our partners and customers. The business solutions we are building today will be enhanced by the increased transactional security, flexibility and resilience of emerging cryptocurrency and digital ledger platforms.

Many examples can be found through large and small companies: IBM partnered with Samsung to demonstrate the latter’s proof-of-concept system: ADEPT (Autonomous Decentralized Peer-to-Peer Telemetry). This system uses blockchain in anticipation of future IoT ecosystems that will handle hundreds of billions of transactions per day.
Microsoft is working on an open-source framework named “Coco” to enable blockchain networks. Mark Russinovich, CTO for Microsoft Azure explains,

“this offers a trusted foundation with which existing blockchain protocols can be integrated to deliver complete, enterprise-ready ledger solutions, opening up broad, high scale scenarios across industries and furthering blockchain’s ability to digitally transform business.”

As Trakopolis is an established and successful Azure IoT platform solution provider, we are keenly interested in methods to improve our ongoing research and development into various blockchain software platforms such as Ethereum, Interbit.io and Hyperledger Fabric.
3 | Blockchain Use Cases – A Cold Chain Solution

Every day around the world countless shipments of food, critical vaccines and other pharmaceuticals rely on a temperature-controlled supply chain. Regulation of their production, handling and shipment ensures a healthy ecosystem for preserving these goods. Mobile refrigeration demands accurate temperature verification and safe delivery.

**Problem:** Resolving cold chain supply problems requires fast exception management to protect consumers from problems such as bacterial outbreaks and spoiled vaccines. Maintaining cold chain safety requires constant regulatory compliance, verification and enforcement. All of these safety and remediation activities add costs to the supply chain including insurance.

**Cold Chain Solution:** By assembling telemetry, time, temperature and other data onto a decentralized ledger via a smart contract, cold chain provides an immutable, indisputable record of the status of perishable goods throughout the supply chain, captured dispassionately via mechanical and electronic sensors. The “true” status of the goods upon delivery removes the need for exception management, compliance checking and human audits thus reducing the costs associated with managing compliance of the cold chain, while improving productivity.

Trakopolis is developing a specific commercial solution by expanding one of our existing software features with cold chain management. We foresee a valuable model for blockchain technology where requirements for regulatory verification and improved logistical efficiency exist within a “smart contract”. This term refers to a digital transaction ledger that ensures the secure storage, replication and verification of an exchange using cryptography software.
Blockchain is ideal as a basis for trusted transactions. The “smart contract” model in development by Trakopolis must include specific records and conditions such as the location, date and time for delivery of goods and specific temperatures recorded throughout the shipment journey. Using this digital ledger transaction, blockchain technology can improve regulatory compliance, cost-efficiency and provide better assurance of the quality of the product upon reaching its destination, all while reducing manual administration and automating audit procedures. To reach their optimal potential, many companies are exploring the use of this decentralized economic structure and trust model as are the expanding cryptocurrency players.

Many conversations are taking place on the legal implications of smart contracts. At York University, the Osgoode Hall Law School program recently discussed “Will smart contracts require changes in contract law or are existing doctrines flexible enough to accommodate this innovation?” The use of blockchain-distributed ledgers and smart contracts should be considered as innovative business process applications that reduce the traditional efforts required on transaction verification.
According to Grand View Research, the North American market size for cold chain management in 2015 was valued at USD 62.37 billion. The expected growth includes expansion of monitoring components like those used within the Trakopolis IoT platform, such as temperature and location sensors. These sensors are required under transport regulation of certain sensitive goods — like pharmaceutical products that are controlled by the United States Federal Drug Administration.

```go
type Geolocation struct {
    Latitude  *float64  'json:"latitude,omitempty"
    Longitude  *float64  'json:"longitude,omitempty"
}

type AssetState struct {
    AssetID   *string           'json:"assetID,omitempty"    // all assets must have an ID
    Location   *Geolocation  'json:"location,omitempty"     // current asset location
    Temperature  *float64     'json:"temperature,omitempty"   // asset temp
    Carrier   *string           'json:"carrier,omitempty"     // the name of the carrier
}
```

Reference: Sample Hyperledger - Smart Contract - Data Structure
4 | Trakopolis IoT and Blockchain

Relying on our experience in IoT and logistics, Trakopolis is considering developing a platform for location-based load-matching, combined with delivery-verification contracts powered by blockchain technology. Incorporating our IoT location and sensor capabilities for large and small fleets, we can create a logistics utility platform with the ability to connect people and businesses. Our initial research is promising.

Trakopolis provides fleet management and electronic logbook applications to our growing customer base in the transportation industry. The Trakopolis platform communicates with mobile display terminals in commercial vehicles and we continue to provide customers with new enterprise functionality that can maximize business outcomes.

Allowing transport operators to easily access and post load information allows our customers to offer access to a wide audience for searching load data, based on capacity, constraints and features offered. New functionality for faster access to information on pickup and delivery within a mobile application should include methods for fast digital financial transactions. This model shares similar ease-of-use improvements seen in the acknowledged success of mobile technology such as Uber.

Financial institutions generate revenue with transaction and interchange fees. Consider the situation for Visa negotiating with the Government of Canada to provide a 5-year locked amount of 1.5% on consumer credit interchange rates. With a tokenized cryptocurrency exchange combined with settlement, it is possible to remove the existing brokers and financial institutions from the transactions. Trakopolis is well-positioned to design a platform that provides access and competitive transaction fees within a private load network. This allows the operators of the network to generate earnings where traditional fee payments for payment processing would only be available to large financial networks and banks.
Trakopolis is also researching a risk management feature where all blockchain nodes involved in a contract will be able to rank one another based upon the contract criteria. The smart contract is not only about the load capacity and delivery time, but it also incorporates our IoT capability to enhance transparency and reliability. Therefore, the user will be able to monitor the requirements throughout a delivery service such as the location of goods and ambient temperature.

Once the service or delivery contract is completed, the transaction ledger can be available to all users of the network. This can include the history of successful contracts and ranking information based on member feedback. Over time this model can establish service reliability such that users can consider this factor along with others, like service price, shipment duration and successful delivery history.
5 | Blockchain Technology

With a fast evolution cycle, we expect the blockchain platforms to progress and compete for users. Drawing on our experience with hardware telemetry and IoT devices, we must plan for a flexible business solution that can run on multiple platforms. Our development team has been evaluating software such as Hyperledger Fabric, Corda, Ethereum, Interbit.io and Microsoft Coco. These frameworks will continue to advance with new available features and usability for developers. We will focus on the blockchain platform that has a development vision that complements business solutions within the IoT industry.

Given our existing customer base and current targeted requirements, Trakopolis will continue development of a blockchain solution on the Hyperledger Fabric smart contract solution within the Microsoft Azure cloud platform. The tools and resources provided by our partner Microsoft are expected to accelerate Trakopolis’ blockchain development — while improving reliability and ease of maintenance with future software updates.

6 / Conclusion

Commercial software products that Trakopolis develops must be built on a reliable and stable platform and ready for enterprise-level customers with complex business needs. We will dedicate our research and development on the Trakopolis IoT platform so that it is ready for massive scale usage while also aligned with our target service level agreements as a cloud platform provider.

Cold chain management solutions exist today; blockchain will make them better. We have a commercially available temperature-monitoring logistics product and it can be improved with the promise of a distributed and immutable smart contract blockchain ledger.

Blockchain technology is still relatively new and provoking many conversations about its emerging potential. We eagerly monitor the growth of this industry and we will carefully evaluate all available new technologies that can provide real business value and we look forward to the challenges and opportunities ahead.