QUASAR – bringing economy into the Internet of Things

TECHNICAL WHITEPAPER

Table of contents

1. Introduction

QUASAR is a blockchain technology-based software solution that enables instant compliant transactions and settlement between devices, corporates and people. QUASAR connects the 'Internet of Things' economy with traditional financial systems and hence enables devices to become profit centers. By providing digital wallets to IoT devices, QUASAR enables these devices to monetize their services. Consequently, corporates can create completely new business models and shift from single revenue sales to long-term revenues through services.

QUASAR is developed by QUANTOZ, a Dutch innovative startup, founded in 2015 and located in Utrecht. The QUASAR ledger won multiple awards and is designed and built especially for corporate use. QUANTOZ works, among others, with industry leaders like Porsche, BASF and UniCredit. KPMG identified QUANTOZ as one of the 50 Rising FinTech Stars in 2016.

2. The QUASAR blockchain

Blockchain can resolve some of the most complicated industry issues, especially issues based on a lack of trust and resilience. QUASAR is a permissioned consortium blockchain based on the STELLAR protocol.

QUASAR is designed as a network of nodes (servers) that power a distributed ledger and is operated by a consortium of corporates. The consortium, consisting of a corporate gateway and multiple service providers, decides which parties can join the consortium and run a node. There is no single point of failure because a complete copy of the ledger is stored on each QUASAR node. The network becomes more robust with more nodes; a minimum of seven is recommended.

The QUASAR nodes communicate and sync with each other to ensure that the transactions are valid and successfully added to the ledger. For example, if machine A wants to pay 0,2874 Euro to machine B, the majority of the nodes need to agree that machine A possesses at least 0,2874 Euro. The consensus protocol used by QUASAR is called the 'federated byzantine agreement'. This process creates a shared truth and therefore a shared trust. In addition to the immutability of the transactions, this enables corporates to work together even when they don't trust each other for 100%.

3. Core QUASAR features

Compliance layer

An important core attribute of QUASAR lies in the compliance of the system. In addition to the STELLAR core, QUASAR has an account role model called QBIC. This role model enforces compliant transactions. It does so by assigning roles to each account and enforcing the direction of payments between these accounts. For example, a car can pay a parking and a charging point, but the parking and the charging point cannot pay each other.

Integration in existing financial accounting

QUASAR enforces a periodical (for example a daily or monthly) settlement of the transactions between the IoT devices. All transactions are aggregated into one SEPA transaction and can than be further processed within the traditional financial system. QUASAR's API's and SDK's enable fast and easy integration in existing systems.

No cryptocurrencies – No liquidity locked

QUASAR does not use cryptocurrencies. Instead, digital fiat currencies like Euros or Dollars are used. This avoids volatility risks for the users and ensures seamless adaption and integration in corporate environments.

QUASAR can be used in many setups; the most common type is the 'You-Owe-Me' model. In this model, the debtor does not send the digital money to the creditor, but instead the creditor sends a debt statement to the debtor. (See 4. "How You-Owe-Me works")

High volume micro payments and low energy use

QUASAR processes, depending on hardware and network configuration, app one thousand Transactions per second with a confirmation time of less than 5 seconds. The 'federated byzantine agreement' consensus model results in low energy use.

4. How "You-Owe-Me" works

A QUASAR network is composed of a Gateway and at least one service provider. This Gateway has a billing relation with its customers. If the gateway "trusts" its customers, the gateway will create a digital wallet and may give a credit to individual customers. The gateway wants to offer additional or
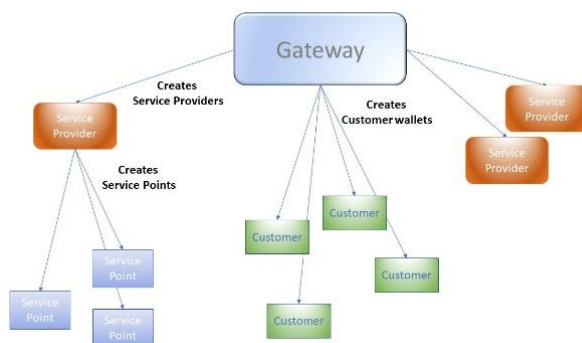
third-party services to its customers. To enable this, the gateway may appoint so called "service providers". Service providers offer their services through one or more service points. Service providers can create digital wallets for these service points.

Figure 1, Example of a QUASAR Payment Network

Customers can pair "things" (this can be any device like a car or a refrigerator) with their wallets. After pairing, the device can autonomously pay for consumed services. The payments for these services are collected on the QUASAR blockchain: immutable and transparent.
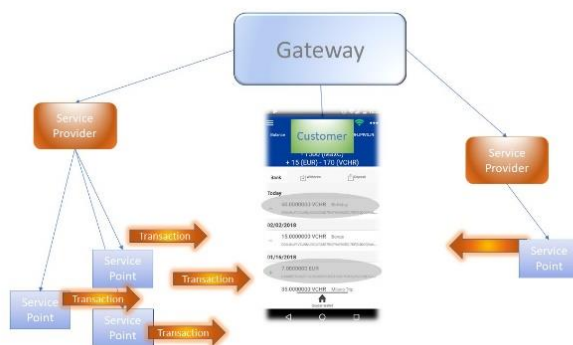

Figure 2, IoT Devices sending Debt Statements to the customers wallet

At the end of a period (week, month) the gateway adds up all the (micro) transactions and creates a SEPA transaction (figure 3.).
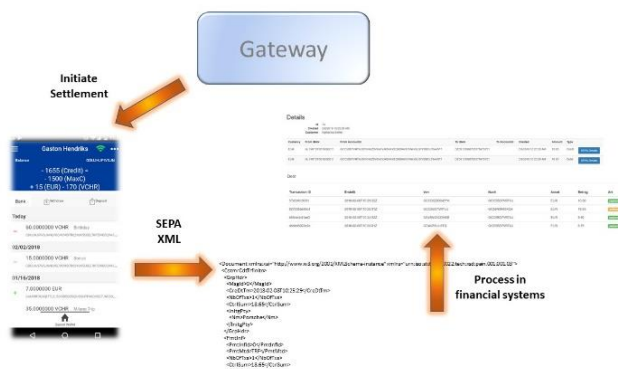

Figure 3, Transfer debt statement to financial system

The gateway then collects the money from the customers bank account. After collecting the money, the gateway will distribute the money among the service providers (figure 4.).
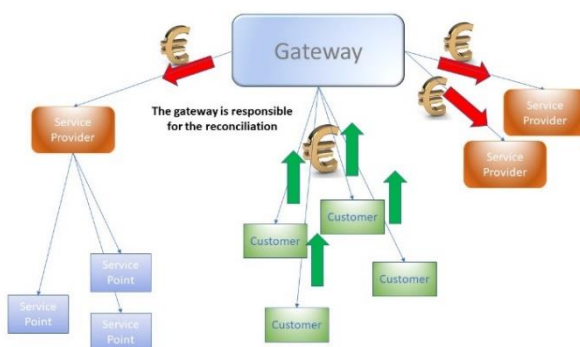

Figure 4, the Gateway collects and distributes the money

The You-Owe-Me model has several advantages: there is no need for cash deposit and withdrawal processes between digital wallet and bank account. Offering a credit to customers and devices reduces also the need for liquidity.

Vouchers

QUASAR You-Owe-Me supports different types of vouchers:

- **Event Vouchers (Tickets).** These are sent to the customers wallet and can for example be spend at events. Currently, event vouchers can only be issued by the Gateway.
- **Credit Vouchers.** Service Providers and the Gateway can issue credit vouchers. These vouchers will be settled with the customer's credit.

5. Use Case Connected Car: "QUASAR Drive for the Automotive Industry"

QUASAR Drive is a (micro)-payment platform for tomorrow's automotive industry. Using QUASAR Drive, the car driver doesn't need to leave his car, use some manual payment method to pay fees using car-related infrastructure.

No matter if parking, charging electronic cars, passing the toll station or using "virtual services" like entertainment or navigation. There is no need for the car driver to manually initiate any payment - the car can pay for itself.

QUASAR Drive can be managed by the car manufacturer that acts as a "Gateway"
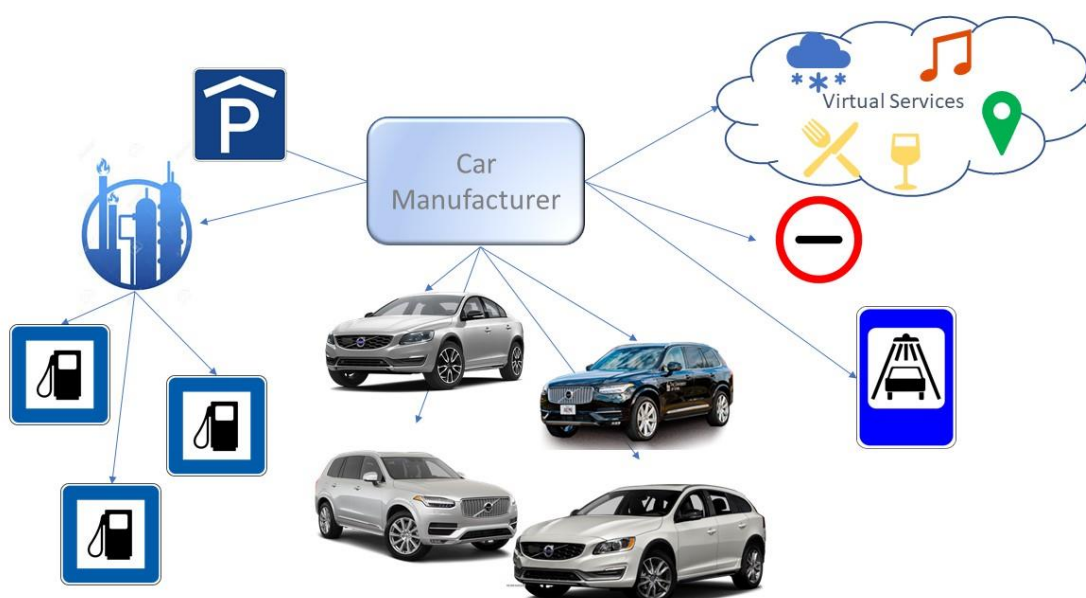
QUASAR Drive helps car manufacturers shifting from one-time sales of commodities to becoming a platform provider with a pay-per-use services model.

Vouchers are available in QUASAR Drive. They support Service Providers in customer retention programs, even without knowing the customer. If for example, a car visited five times (different) parking garages from a Service Provider, this Service Provider can send a five-euro voucher to the car's wallet.

QUANTOZ was selected out of more than 450 applications as one of the winners of the Mondial Tech Award during the Paris Autosalon October 2018. In a recently published article, Porsche describes how they implemented the You-Owe-Me model.

Definition of the QUASAR Connected-Car Compliance Model in QuBic

Below a diagram of the relations between the different consortium partners in a QUASAR Connected Car network.
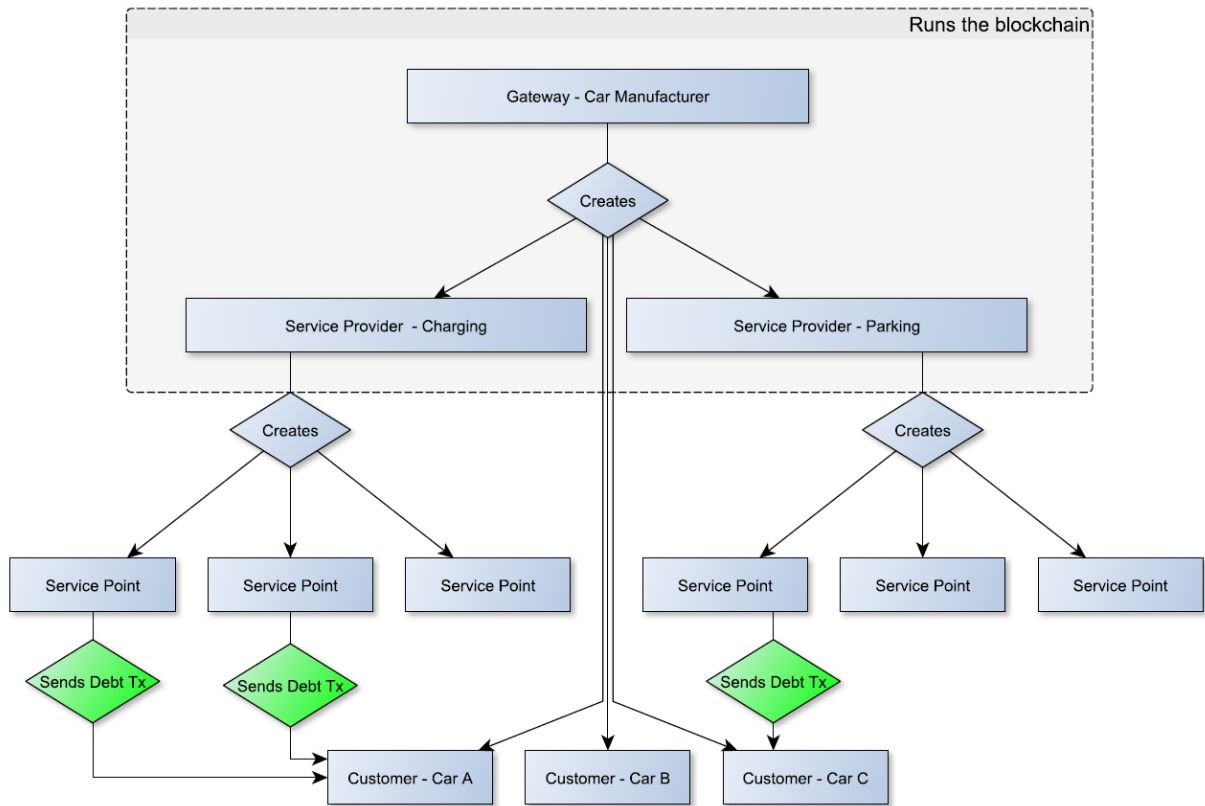

Figure 5, Relationship Connected Car

6. Use Case "Pay per Therapy" in Healthcare

The You-Owe-Me model can be applied in many different industries. Costs for Healthcare increase rapidly and pay per use (pay per therapy, per treatment, pay for disposals) is a solution to achieve better cost control.

In one of Quantoz' recent projects, the manufacturer of healthcare devices acts as the gateway, the customers are hospitals and care centers. Service Providers can be the manufacturer itself, country organization and/ or distributors. The gateway creates digital wallets for the customers and the healthcare devices.
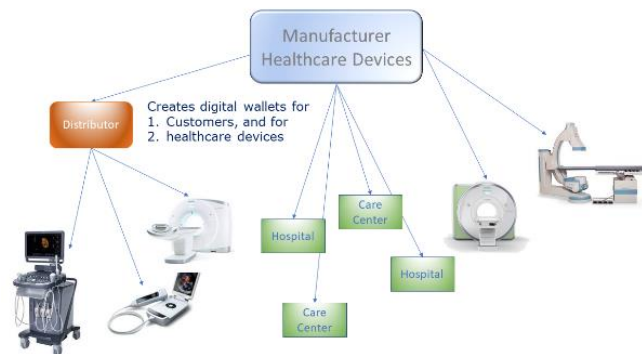

Figure 6 A Payment Network in Healthcare, compare with Figure 1.

The healthcare device sends, every time it is used, a "You-Owe-Me" transaction to the customers' wallet. At the end of the period, all transactions are priced and aggregated into one invoice. The customer (hospital) has a detailed and fully transparent overview of all transactions (every transaction can be looked up in the QUASAR blockchain).
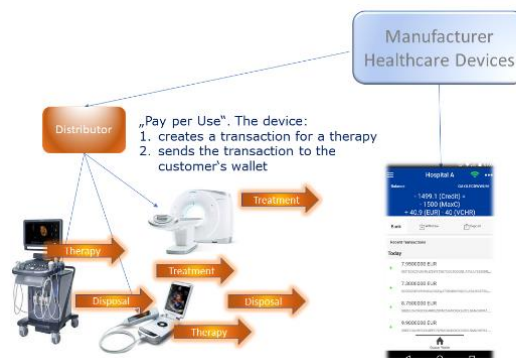

Figure 7 Pay per Therapy, Treatment etc. compare with Figure 2.

Visit the Quantoz website for more information about our project in healthcare: https://quantoz.com/2017/09/27/generic-life-cycle-of-products-on-the-QUASAR-ledger/