GOVERNMENT OF DUBAI

هيئة الطرق والمواصلات
ROADS & TRANSPORT AUTHORITY

RTA

# Transport Activities Rental System (TARS)

Case study

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## 1.1    Dubai

Dubai is located on the eastern coast of the Arabian Peninsula, in the southwest corner of the Arabian Gulf. It is renowned for its warm hospitality and rich cultural heritage, and the Emirati people are welcoming and generous to visitors. With year-round sunshine, captivating deserts, luxurious hotels and shopping malls, beautiful beaches, and fascinating heritage attractions as well as a thriving business community, Dubai receives millions of leisure and business visitors from around the world each year.

The emirate is both a dynamic international business centre and a laid-back tourist escape, a city where the sophistication of the 21st century walks hand in hand with the simplicity of a bygone era. These contrasts give Dubai its unique flavour and personality, featuring a cosmopolitan society with an international lifestyle.

# 1.2  RTA

Since providing an advanced transport network for the people of Dubai has been high on the government's agenda, which is evident from its initiatives to enhance the public transport facilities and improve roads across the emirate to make travel safer and smoother, the Roads and Transport Authority (RTA) was formed by the decree number 17 in 2005.

RTA is responsible for planning and providing the requirements of transport, roads and traffic within Dubai, as well as between Dubai and other emirates of the UAE and its neighbouring countries to provide an effective and integrated transport system capable of achieving Dubai's vision and serving its vital interests.

## RTA Vision

The world leader in seamless and sustainable mobility

## RTA Mission

Develop and manage integrated and sustainable roads and transportation systems at a world-class level; provide pioneered services to all stakeholders for their happiness; and support Dubai's vision through shaping the future, developing policies and legislations, adopting technologies, innovations and world-class practices and standards.

RTA is contributing to Smart Urban Mobility through intelligent projects such as Smart Street Lights, Intelligent Pedestrian Crossing, Parking Guidance System, Smart Parking App, Smart nol (the automated and integrated fare collection system), Enterprise Command and Control Centre, S'hail App, Regulatory and Monitoring System (both part of Dubai Integrated Mobility Platform), Smart Bus Shelters, Bus On-Demand, Real-Time Passenger Information System, and field trials on Self-Driving Vehicle and Autonomous Aerial Vehicles.

RTA aims to provide highly integrated, efficient, seamless and connected mobility to citizens and visitors across different modes of transport such as metro, tram, bus, water taxi, taxi, cycling and walking. RTA is working closely with Dubai Future Accelerators to bring innovative technologies and disruptive mobility solutions such as Hyperloop, Self-Driving Vehicles and Autonomous Aerial Vehicles to add to existing Dubai modes of mobility.

# 1.3 Licensing Agency

The RTA's Licensing Agency was established by decree in 2008 in response to the increasing demand for licensing services, including the management and provision of driver and vehicle licensing services within the emirate of Dubai. Its services are delivered through a combination of agency-operated customer service centres, approved agent operators and e-service channels.

Its Drivers Licensing Department aims to train, test, and license skilled and safe new drivers and thus contributes to the RTA's strategic goal of enhancing safety and environmental sustainability and its related objective of enhancing transport and traffic safety to reduce road crashes as well as road-related deaths and injuries across the emirate.

# 1.4 Background

The Licensing Activities Monitoring (LAM) Department is one of the five departments in the Licensing Agency. The Monitoring and Enforcement Department has the following responsibilities and activities:

- Monitor and enforce commitments of service providers.
- Educate partners and drivers about systems, rules and regulations of the Licensing Agency.
- Oversee heavy duty vehicles and their movements as well as the responsibilities of drivers for vehicle safety.
- Execute accidental and corrective maintenance strategy and asset lifecycle management.

The Licensing Activities Monitoring, Commercial Transport Activities (CTA) Department and other governmental agencies are responsible for the governance vehicle rental industry.

The car rental industry is a regulated industry, and a system 'Electronic Car Rental System (ECRS)' that was mandated by the Dubai Police to be used by all rental agencies with the main purpose of managing and sharing information.

As a part of their commitment, LAM regularly communicates with and educates the rental agencies, requests data, gathers information, generates reports, and ensures regulatory compliance by the rental agencies.

The current ECRS core activities are:
- Record car and renter details.
- Record vehicle lease between agencies.
- Tool to exchange messages.
- Other activities that are mainly relevant to compliance requirements.

# 1.5 ECRS Management Transfer and the Challenges

In 2017, the Executive Council of Dubai issued a ruling that mandates RTA and other relevant government bodies (e.g. Dubai Police) to effectively monitor and regulate the transport rental industry, which are classified into 17 different types of rental activities. The system in use at that time was ECRS and was meant only for data sharing by car rental agencies. With the law delegating the transfer of existing system, enhancing or building a new solution to support the monitoring and governance tasks, and post assessment of the existing systems helped identify some challenges.

## Business Issues

**Isolated** Computer System: the only channel for accessing ECRS is through a browser on a PC that is connected to Dubai Police's intranet. Dubai Police distributes a 3G USB with a SIM card when the company registers as a car rental company. The computers used to access ECRS are completely isolated from the internet and are considered a black box.

**ECRS** was not aligned with RTA's digital strategy and relevant government strategies.

**ECRS** services were inefficient, with errors and glitches being the main source of issue. Moreover, services being provided to rental companies were found to be in need of updates and additional services were proposed to increase rental companies' use of the system.

**Rental** agencies were not incentivised to use the current system.

**Data** entry and information entering was entirely manual, which leads to discomfort and lost time for both rental companies and RTA staff.

**ECRS** did not have the capabilities for it to be extended to include other types of rental vehicles.

## Technical Issues

**ECRS** is a monolithic application with rigid business logic.

**ECRS** is based on outdated technology.

**No** automation of data entry and information provision services with most services being a purely manual process regarding data entry.

**Lack** of integration with other governmental entities' systems.

**Weak** reporting capabilities with inflexible reports.

**Complex** and weak user authorisation model.

# Transport Activities Rental System (TARS)

Based on findings, it was decided that a new solution has to be comprehensively designed – a future-proof application that is scalable to meet current and future demands. Hence, the newly designed system, TARS, was proposed to support RTA's digital strategy including:

## Innovation

Adoption of innovative services and technologies (such as Blockchain, Telematics, Artificial Intelligence, Machine Learning, etc.) and fostering an innovation culture in LAM and RTA.

## Agile Delivery

Quick delivery of services, features, integration and business insights.

## Integrated Dubai

Integration of the system with other governmental entities' systems to enable easy and effective flow of data and information.

## People Happiness

Engaging user experience for customers and staff including RTA's employees, vehicle rental agencies and customers.

## Sustainability

Driving business continuity and financial sustainability by optimising total cost of ownership, enabling new business opportunities, minimising downtime, ensuring scalability, and implementing robust cybersecurity and user access controls.

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## Agile Engineering

In line with RTA's vision to be the ultimate agile organisation, the delivery team was molded and mentally prepared to focus on four key actions. It was an opportunity to exercise the principles of agility and deliver TARS in an iterative product development approach.

### Working Software
Meetings, demonstrations and works–in–progress. Working software helps in making progress visible and products acceptable.

### Individuals and Interactions
Communicate openly and actively on common Slack channels, Jira, Confluence and GitHub. Communication is visible across vendors and team members.

### Customer Collaboration
Engage with customers and team members actively watches the progress of the delivery through stand-up meetings and steering committee meetings.

### Responding to Change
Continuously iterate on a feedback to adapted with the changes in both business and technology (e.g. progressive elaboration of requirements, newer versions of components).

# 3.1 Product Approach vs. Project Approach

It was important for all stakeholders especially the vendor to agree that a product implementation approach will be the only approach to achieve the objectives and scope of TARS. The guidelines were clearly highlighted as:

| Project Approach | Product Approach |
|---|---|
| ✕ Pre-defined scope, start, and end date | ✓ Backlogs, feedbacks, and value delivered in short cycles |
| ✕ Changes = Variations | ✓ Changes = Evolution |
| ✕ Delivery time is the success factor | ✓ Value to customers is the success factor |
| ✕ Design is final | ✓ Design is evolutionary |
| ✕ Software Refactoring = Variation | ✓ Software Refactoring = Product Enhancement |
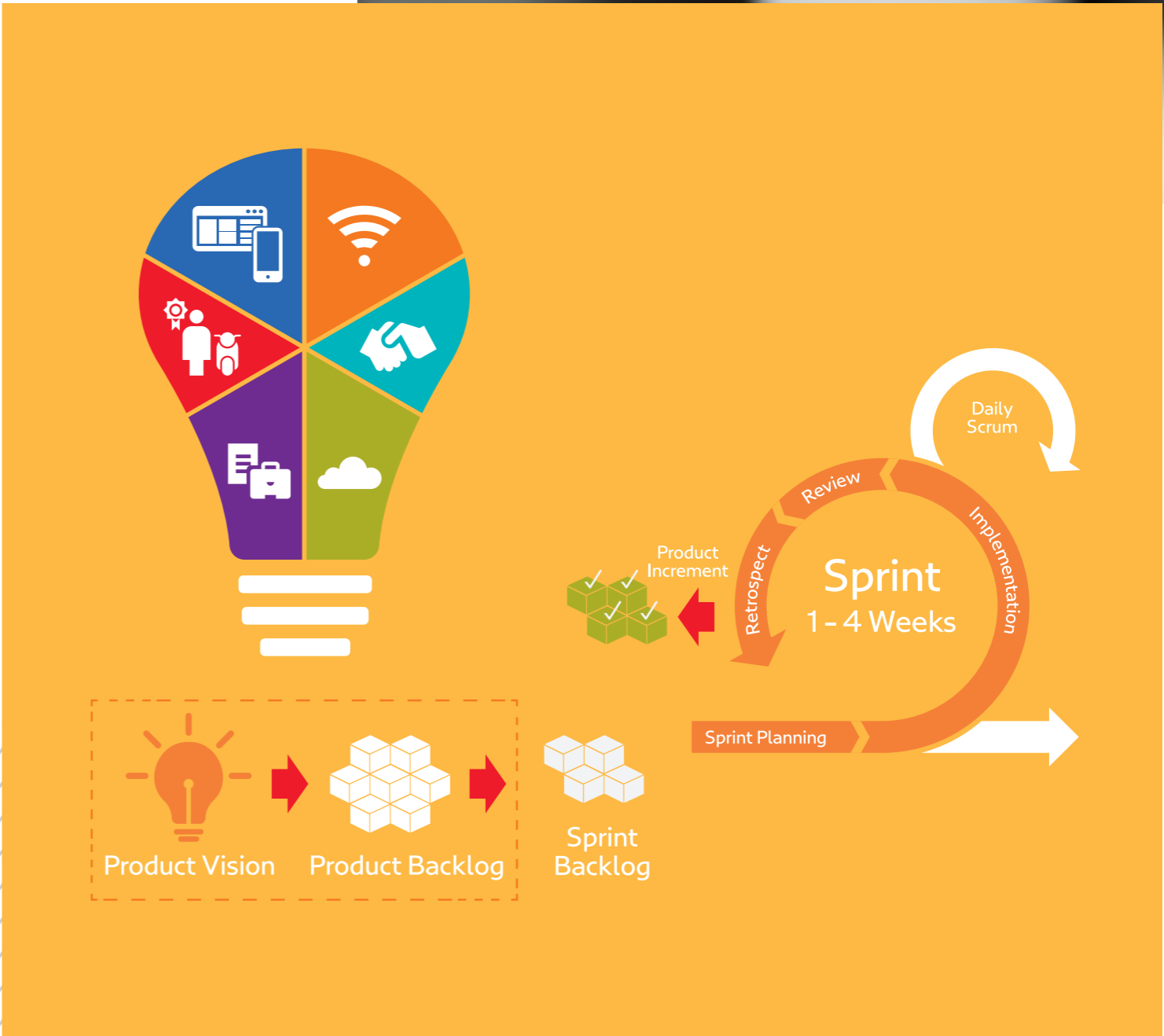
# 3.2 Digital Platform for Continuous Delivery

The DevOps implementation on TARS digital platform has enabled RTA to roll out new solutions and features in an incremental and iterative manner. The releases are planned on a bi-weekly schedule. The pipelines and Kubernetes/OpenShift features allow seamless deployments to production.
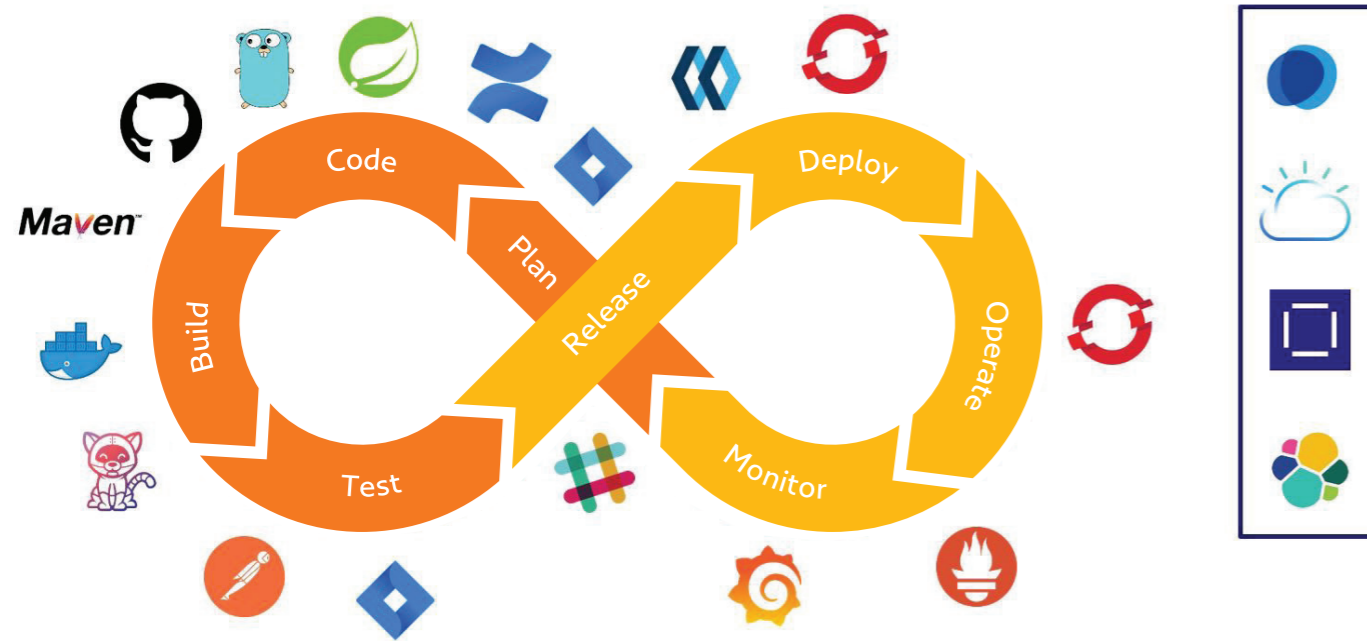


This has positively impacted the experience and productivity of end-users and stakeholders. The application was implemented through continuous feedback from industry stakeholders (rental car companies) and government stakeholders. Major players in the industry directly integrate their ERPs with RTA through APIs, which improved the productivity of the companies. This also enhanced business operations and reduced overall violations and infractions.

TARS also established the digital platform and design patterns which is emulated by newer projects within RTA. The significant technical improvements and implementations include:

- Blockchain Platform based on Hyperledger Fabric – IBM Blockchain Platform
- Search and Analytics powered by Elasticsearch
- Kubernetes and DevOps tooling using RedHat OpenShift
- API Gateway and Developer Portal using IBM API Connect
    - api.rta.ae
    - developer.rta.ae
- Modern authentication using OAuth2 for both users and APIs
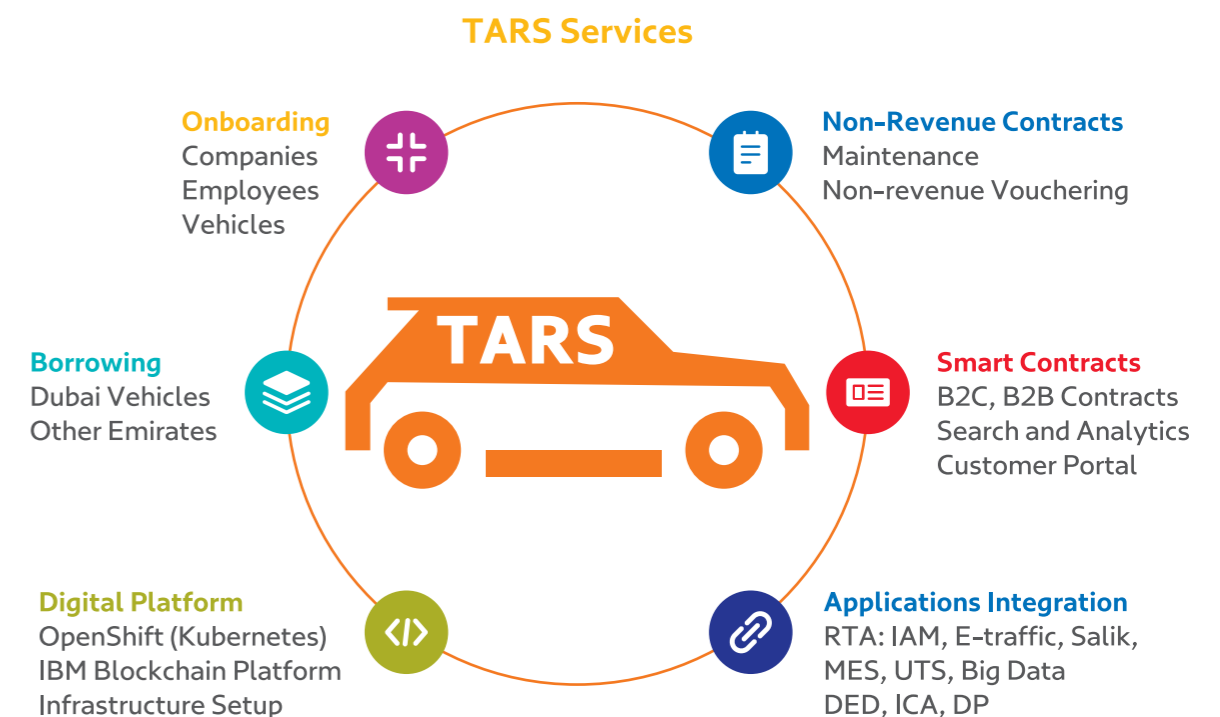- End-user portal using JAMstack – Nuxt.js, TailwindCSS, APIs

# 3.3  TARS – A Solid Use Case for Blockchain Application

TARS was envisaged to be the governance system of the Licensing Agency with seamless flow of information across various stakeholders – both government agencies and rental car companies. In line with the strategy of Dubai Government, TARS was conceived to leverage blockchain technology to transform rental contracts as smart contracts. The solution phase-wise will eventually lead to a digital and smart ecosystem for vehicle rentals across Dubai.

Blockchain is essentially a distributed ledger, and the transactional entities were conceived as ledger entities – cars as assets, companies as parties and rental contracts as documents. This in turn facilitated asset ledgers, party ledgers and document ledgers, which could then be used to create smart contracts within blockchain. The blockchain becomes the system of record and a validation and consensus mechanism.

Building a pure blockchain-based solution will exclude a lot of companies who do not have the technical prowess to access blockchain or run own nodes. This is where the additional layers are added to include all participants until the technology becomes accessible and the overall blockchain landscape evolves. This can be observed in the crypto world as the exchanges provide easy access to investors. In the same spirit, TARS added a proxy node for participants who do not access blockchain directly. This proxy node and the blockchain layer is wrapped using an API layer. The API layer in turn is exposed via a user interface layer, an API platform on RTA (api.rta.ae), with TARS as the first API provider. This enables RTA to expose business capabilities as APIs, creating a digital ecosystem for the partners to do business with RTA.

## TARS Services

**Onboarding**
Companies
Employees
Vehicles

**Non-Revenue Contracts**
Maintenance
Non-revenue Vouchering

**Borrowing**
Dubai Vehicles
Other Emirates

**TARS**

**Smart Contracts**
B2C, B2B Contracts
Search and Analytics
Customer Portal

**Digital Platform**
OpenShift (Kubernetes)
IBM Blockchain Platform
Infrastructure Setup

**Applications Integration**
RTA: IAM, E-traffic, Salik,
MES, UTS, Big Data
DED, ICA, DP

Today, major rental companies integrate with RTA through APIs, reducing the cost of operations and improving the speed and compliance.

In addition to the blockchain and API, TARS also built an integrated and comprehensive analytics platform. The platform provides insights to both rental companies and government agencies. Rental companies get an overview and trend of the transactions to reconcile their reporting as against their own systems. Government agencies get an overview of rental industry landscape, down to individual transactions. The platform also provides a comprehensive search capability to discover and locate cars, customers, companies or contracts and analyze for trends and patterns.

Internally, TARS established a blueprint for digital transformation in Licensing Agency which is considered as a beacon project for further digital initiatives.

# 3.4 New Net Value Delivered

## Innovation

**Blockchain** as a capability to manage transactions, in a system-of-record approach was new to RTA. The early implementations across the industry used blockchain as a system of reference with another system addressing the transactional aspects. In TARS, blockchain and smart contracts facilitate the starting transaction.

**Business** APIs is another new capability realised through TARS. TARS has gone through setting up the platform and creating guidelines around defining, exposing, securing and managing APIs in RTA.
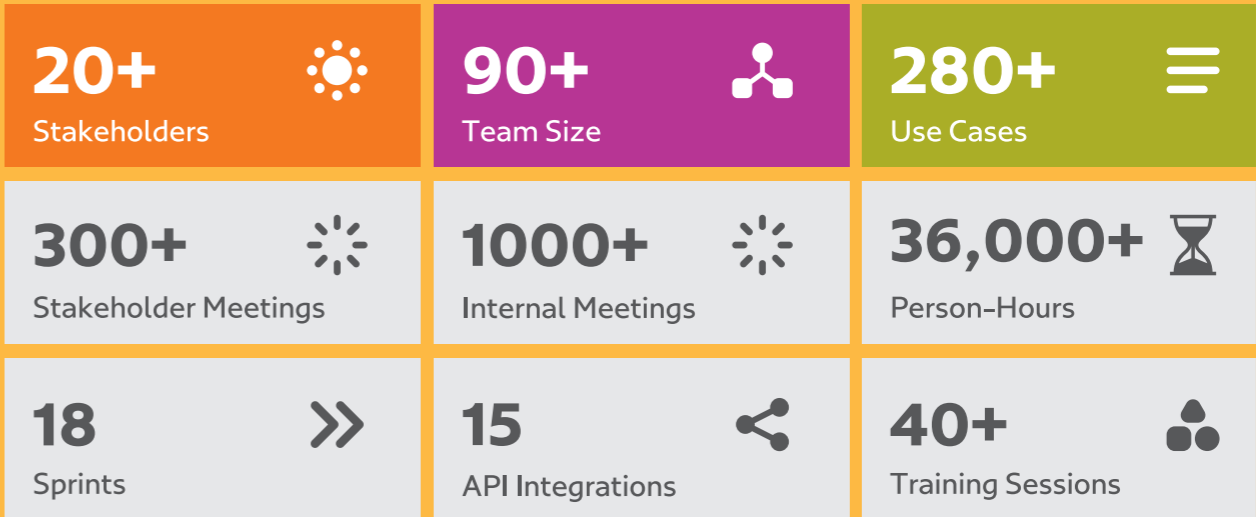
## Evolutionary Architecture

**TARS** was implemented in a true digital architecture, using components of the applications are individually deployable and scalable leveraging a loosely coupled architecture, and a loosely coupled team organisation. TARS have automated integration tests which serve as a regression test suite to ensure quality and improve the speed of delivery.

**TARS** adopted a modular microservices architecture with independent modules serving the different functional areas. The aim is to independently manage the different functional areas including maintenance and enhancements.

## Agile Delivery

**TARS** was delivered in an agile fashion with a minimum viable product reaching the customers in 10 months and a general available rollout in another 8 months. This has resulted in a quick validation of business scenarios and a stable rollout with minimal disruptions in the business processes and systems.

| 20+ Stakeholders | 90+ Team Size | 280+ Use Cases |
| --- | --- | --- |
| 300+ Stakeholder Meetings | 1000+ Internal Meetings | 36,000+ Person-Hours |
| 18 Sprints | 15 API Integrations | 40+ Training Sessions |

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# Project Challenges

**COVID-19**: The enormous scale of the crisis and its impact was huge. The project started on February 2020 and the team was mobilised accordingly. But the pandemic caused uncertainty at all levels and many of the team members had to return to their countries before borders are shutdown with indefinite notice. Establishing a communication channel was one of the challenges that put the project in jeopardy.

**Human Resources**: Highly skilled software engineers and special blockchain engineers are scarce and in high demand; hence, managing and maintaining a remote team had its difficulties. Resignation with short notices was a key challenge that needed an artful management.

**Integration with Legacy Systems**: TARS building block and technology stack are cutting edge. Incompatibility with legacy systems was one of the key challenges that we had to address very early at the design stage. The API-First approach was used at all levels so that the application interface is solid enough to abstract integration issues with any legacy system.

# Lessons Learned

**Time to Market**: TARS was delivered in an **agile** approach with a minimum viable product reaching the customers in 10 months and a general available rollout in another 8 months. This has resulted in a quick validation of business scenarios and a stable rollout with minimal disruptions in the business processes and systems.

**Iterate and Increment**: Deploying features in production and getting feedbacks from all stakeholders has allowed us to improve processes, workflows, and iron out performance issues prior to releasing and mandating it to all car rental companies. Feedback and interaction was key to the success of the project and eliminated any assumption based development and release a stable product.

**Working on Cutting Edge Technologies**: It is important to understand that blockchain is essentially a distributed ledger and map the real-world ledgers into distributed ledgers. TARS was quick to realise different types of ledger entities in the domain on car rentals and map it to blockchain to enable smart contracts contained within the bounded context of blockchain.

**Customer-Centric Designs**: It is also important to create an inclusive design, especially when embarking on newer technologies and platforms to be consumed by partners at different levels of technical maturity. By providing different levels of interfaces – blockchain, APIs and Portals, TARS enabled users to interact with different levels of technical maturities among the rental companies. This also encouraged the companies to investigate higher levels of maturity as more companies came forward for API integration than expected. We expect the companies to soon adopt blockchain technologies to directly participate in the smart contracts.

**Change Management**: End-user training and handholding are quite important when implementing new technologies and transitioning users from one process to another. The first companies onboarded used APIs which reduced the human intervention and provided enough scale to validate business scenarios. This also allowed the system to stabilise with minimal impact to day-to-day operations of the companies.

**Plan for Continuous Delivery and Periodic Upgrades**: New features, approaches, techniques and bug-fixes are fairly common and frequent. The TARS platform and SDKs have upgraded multiple times to keep the product sustainable and extend its lifecycle.

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