EY Blockchain overview

Capabilities and credentials

EY
Building a better
working world

What is blockchain?

Blockchain is software: it is both a database and a network

Blockchain is a **distributed infrastructure technology.** It is a decentralized ledger that keeps a record of each transaction that occurs across a **network,** which enables a **decentralized** exchange of trusted data — a "**shared record book.**"
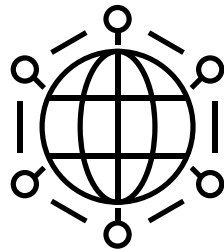

Distributed ledger

▸ Every participant in the network keeps a copy of all the transactions.

▸ Transactions are secured by encryption to prevent tampering.

Consensus algorithm

▸ No one node or server is responsible for approving transactions, leading to genuinely distributed transaction processing.

▸ Each entry is validated and recorded on all ledgers across the network.
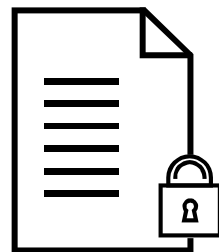
Smart contracts/programmable ledger

▸ Transactions can be sent with rules attached — small programs that govern when and how transactions are processed.

EY Blockchain overview

EY

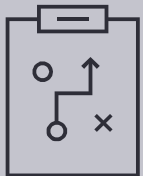# The EY blockchain story

Business overview

Product portfolio

Client use cases

Road map
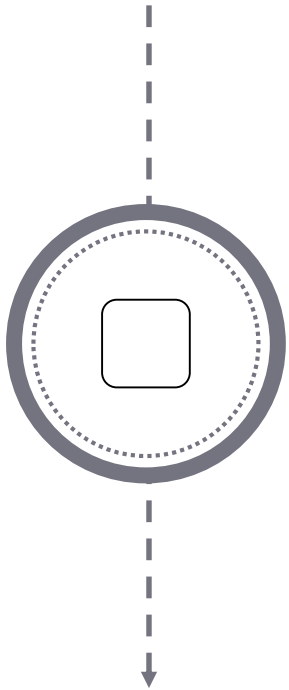
EY Blockchain overview

EY

Our strategic vision for blockchain

Blockchains will do for networks of enterprises and business ecosystems what enterprise resource planning (ERP) did for the single company.

EY

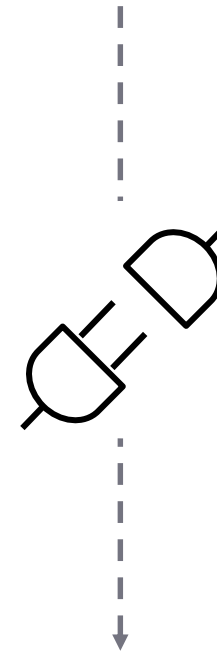# The four transitions it will take to get there

Notarization

Crypto

Separated
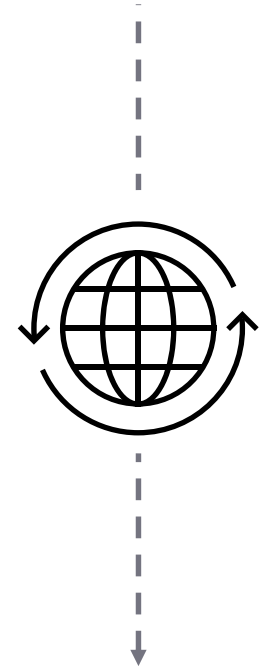
Private

Tokenization

Fiat

Integrated

Public

EY Blockchain overview
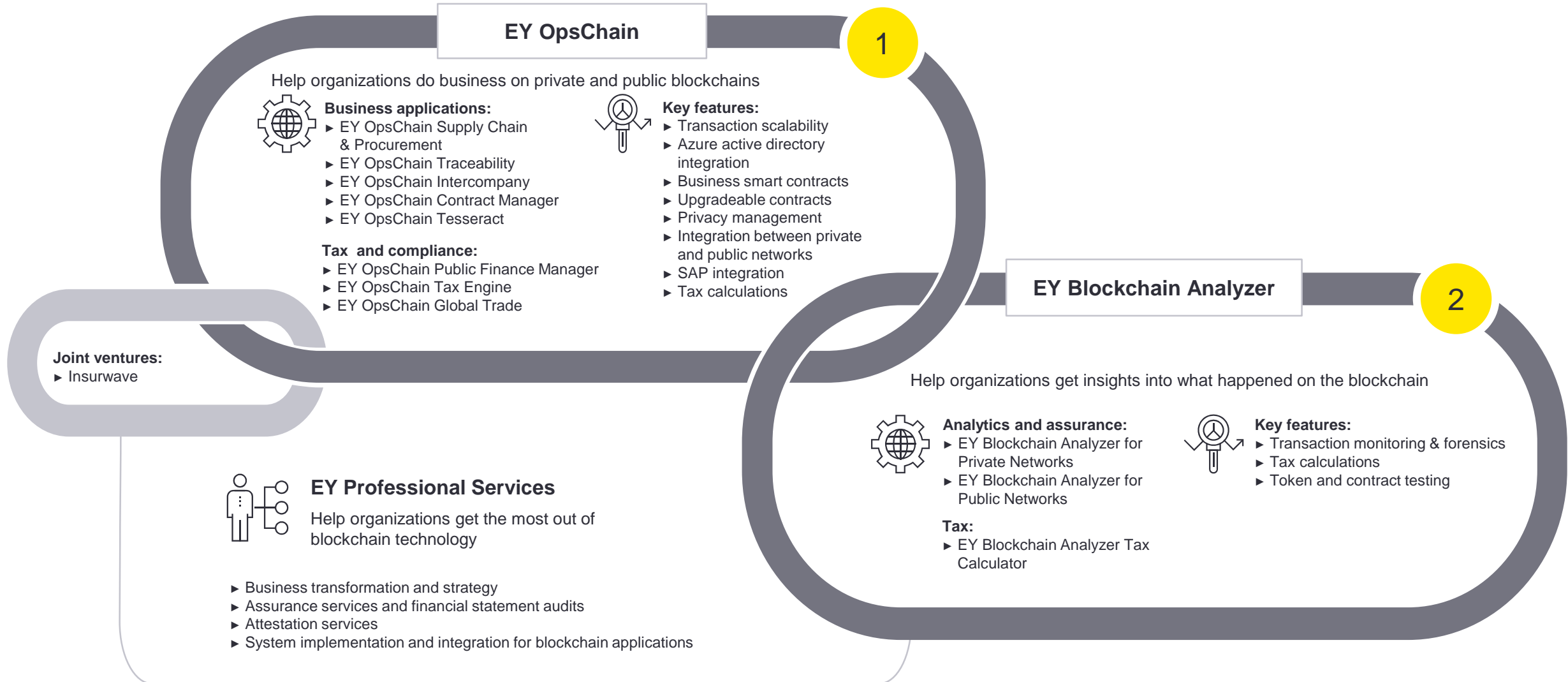
EY

EY blockchain portfolio: transforming the full business cycle
Two EY platforms: EY OpsChain and EY Blockchain Analyzer

EY OpsChain ①

Help organizations do business on private and public blockchains

Business applications:
► EY OpsChain Supply Chain & Procurement
► EY OpsChain Traceability
► EY OpsChain Intercompany
► EY OpsChain Contract Manager
► EY OpsChain Tesseract

Tax and compliance:
► EY OpsChain Public Finance Manager
► EY OpsChain Tax Engine
► EY OpsChain Global Trade

Key features:
► Transaction scalability
► Azure active directory integration
► Business smart contracts
► Upgradeable contracts
► Privacy management
► Integration between private and public networks
► SAP integration
► Tax calculations

EY Blockchain Analyzer ②

Help organizations get insights into what happened on the blockchain

Analytics and assurance:
► EY Blockchain Analyzer for Private Networks
► EY Blockchain Analyzer for Public Networks

Tax:
► EY Blockchain Analyzer Tax Calculator

Key features:
► Transaction monitoring & forensics
► Tax calculations
► Token and contract testing

Joint ventures:
► Insurwave

EY Professional Services

Help organizations get the most out of blockchain technology

► Business transformation and strategy
► Assurance services and financial statement audits
► Attestation services
► System implementation and integration for blockchain applications

EY Blockchain overview

EY

We run a truly global blockchain organization that stretches across consulting, development and delivery

By year-end 2018, the EY organization had true global delivery capability for blockchain solutions, all working as one team.

Development:

▸ Trivandrum, India
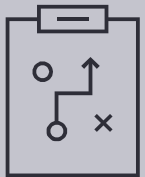▸ San Jose, Costa Rica
▸ Madrid, Spain
▸ Cambridge, US

Research sites:
▸ London
▸ Paris
▸ Tel Aviv

Client-facing locations:

▸ London
▸ Paris
▸ Munich
▸ Rome
▸ Manila

▸ Tel Aviv
▸ Singapore
▸ Tokyo
▸ Shanghai
▸ Seoul

▸ Seattle
▸ San Francisco
▸ New York
▸ Toronto

▸ On track to triple our FY18 projects to clients

▸ Globally recognized as a technology leader in blockchain

▸ Filed 17 patents in encryption and blockchain solution design

▸ Building out delivery and support infrastructure in software-as-a-service (SaaS)

▸ Delivering at scale with our Microsoft and SAP partnerships

EY

The EY blockchain story

Business overview

Product portfolio

Client use cases
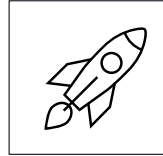
Road map

EY Blockchain overview

EY

Our product portfolio

Enterprise adoption will be driven by reusable assets, modeling business activities with tokens and smart contracts.

EY Blockchain overview

EY

The EY OpsChain platform is designed to make building repeatable, scalable platforms a reality
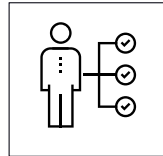
Public domain image from Philipp Silbernagl

Transaction scalability
▸ Up to 20 million transactions a day on private Quorum networks
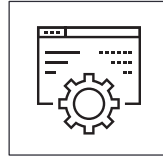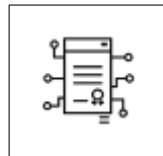
Blockchain launcher
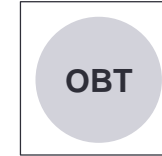▸ Automated tools to deploy and manage a permissioned network

Active directory
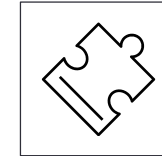▸ Easily control access to permissioned blockchains

Upgradable contracts
▸ Automatically deploy and upgrade smart contracts

OBT

EY OpsChain business token
▸ Extension of Ethereum Request for Comments 721 (ERC-721) standard
▸ Business token structure
▸ Hierarchical tokens

Business smart contracts
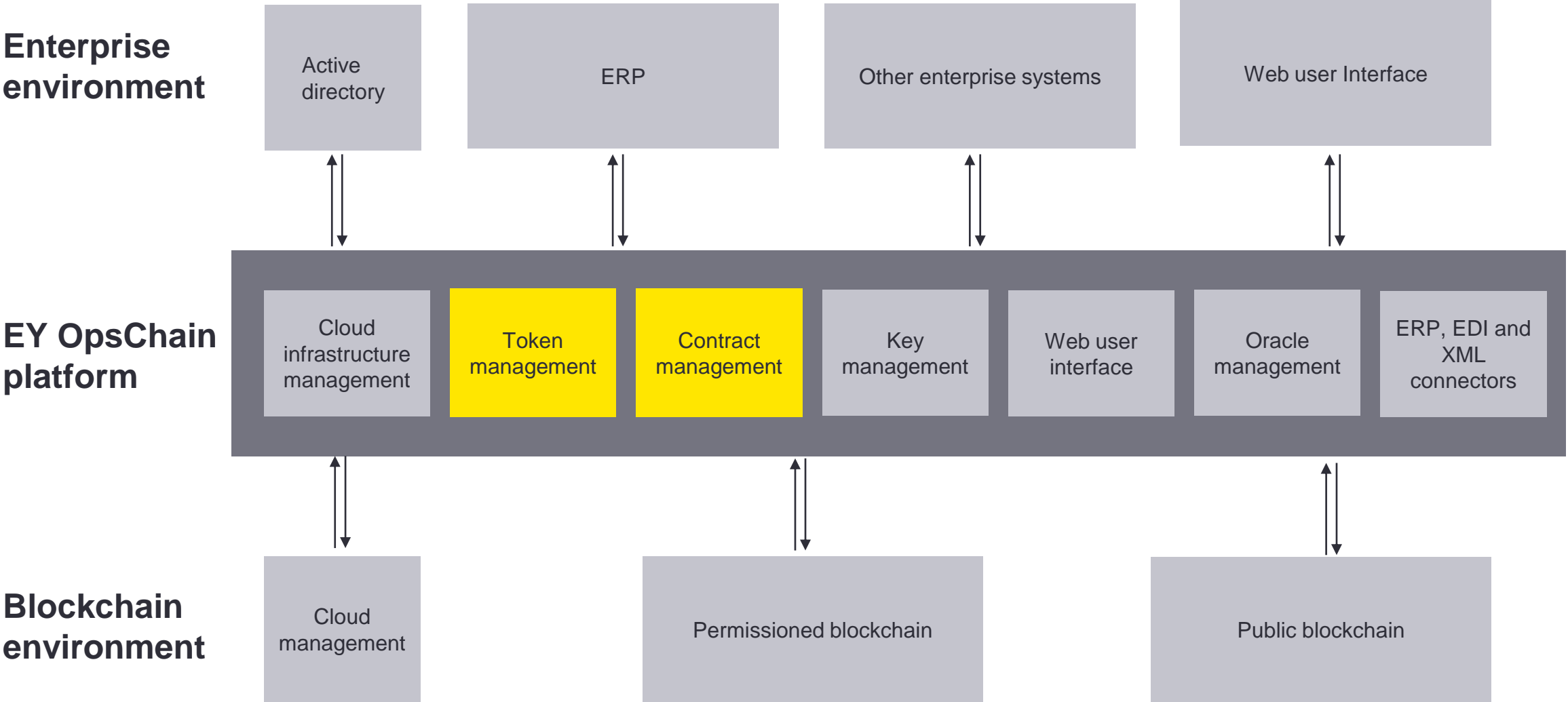▸ Standardized smart contracts for common business rules

Privacy management
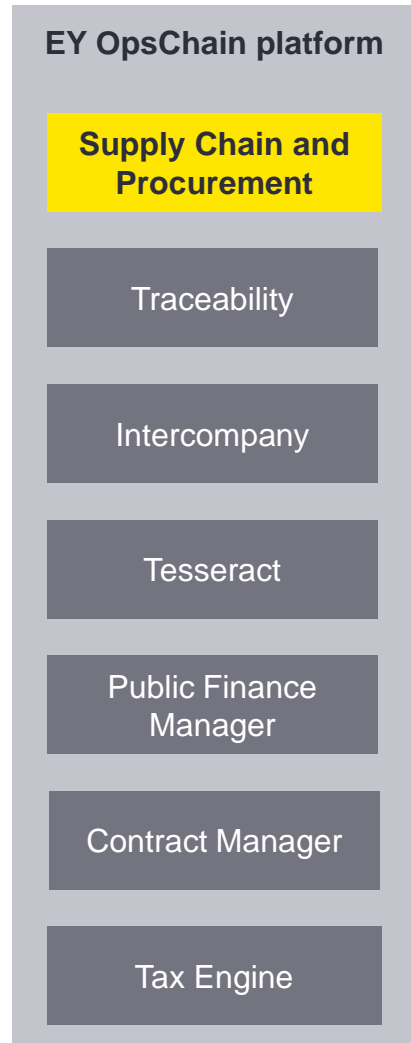▸ Keep your sensitive data private via Quorum private channels, Zero Knowledge Proof (ZKP) and Proxy-re-encryption

Public and private networks
▸ Seamlessly interact with public and private networks

EY

The EY OpsChain platform sits between a blockchain and enterprise users

Enterprise environment

Active directory	ERP	Other enterprise systems	Web user Interface

EY OpsChain platform

Cloud infrastructure management	Token management	Contract management	Key management	Web user interface	Oracle management	ERP, EDI and XML connectors

Blockchain environment

Cloud management	Permissioned blockchain	Public blockchain

EY Blockchain overview

EY

EY OpsChain Supply Chain and Procurement enhances end-to-end tracking and automatic execution of multiparty agreements

EY OpsChain platform

Supply Chain and Procurement

Traceability

Intercompany

Tesseract

Public Finance Manager

Contract Manager

Tax Engine

EY teams are working with a major automaker to help manage its Kanban replenishment process on a blockchain:

Logistics partner

Carmaker

Supplier
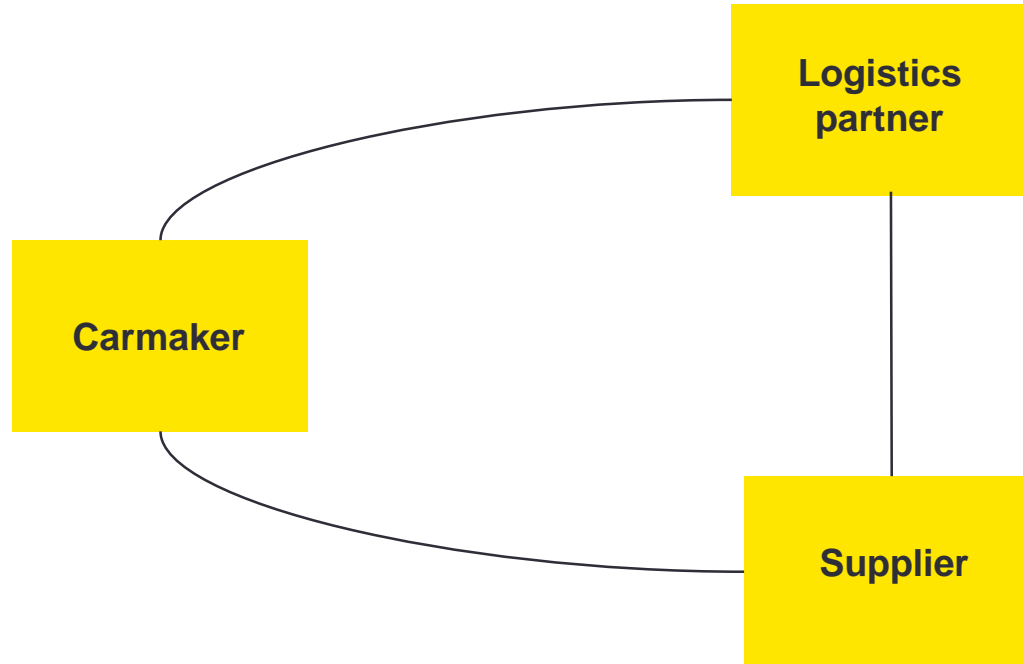
Also, **Schneider Logistics** uses EY OpsChain for end-to-end package visibility across its logistics partner network.

EY Blockchain overview

EY

EY OpsChain Traceability allows companies to build solutions that go beyond just visibility

EY OpsChain platform

- Supply Chain and Procurement
- **Traceability**
- Intercompany
- Tesseract
- Public Finance Manager
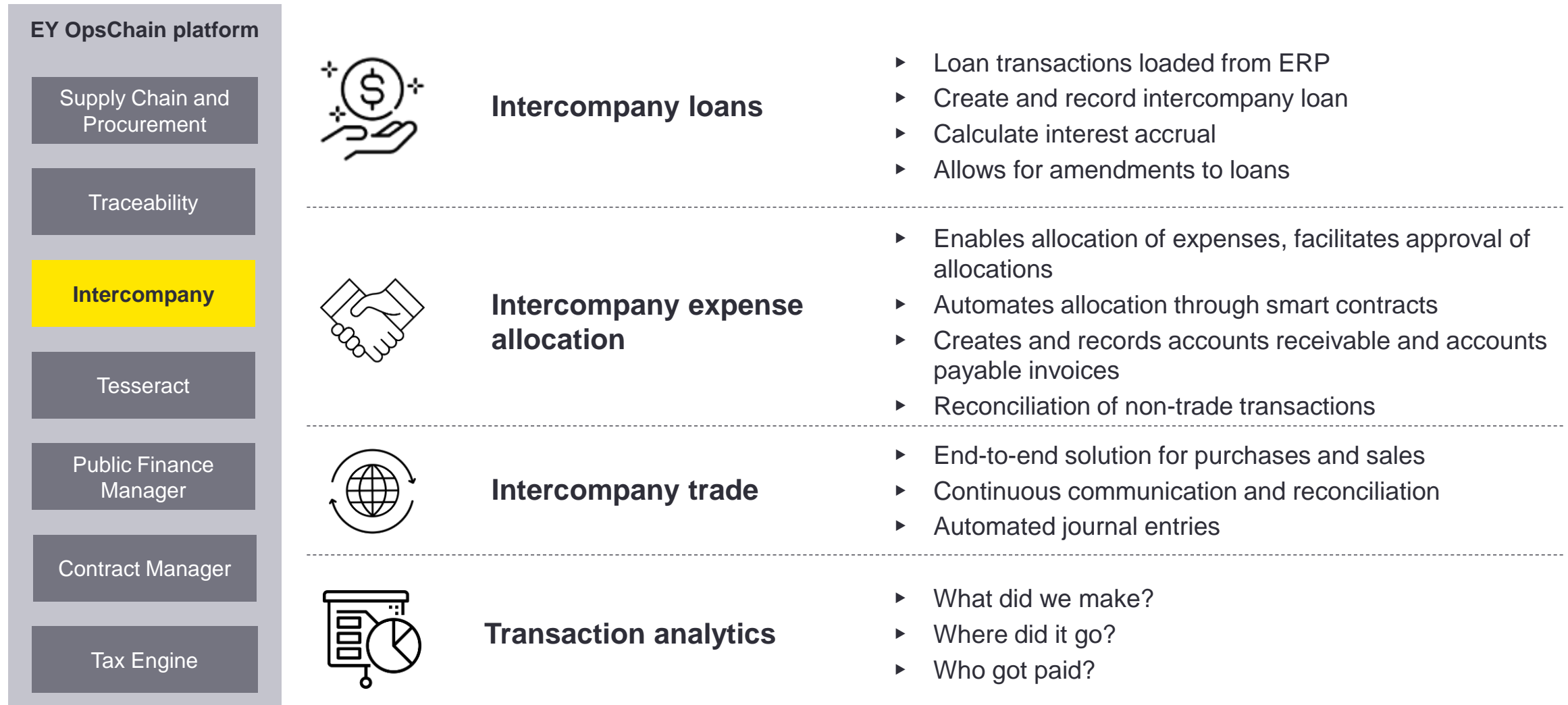- Contract Manager
- Tax Engine

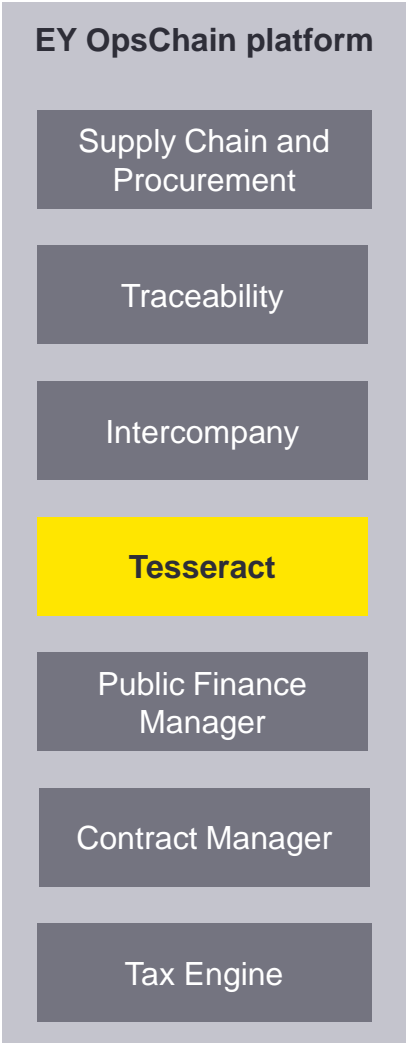Food and wine

Pharmaceuticals

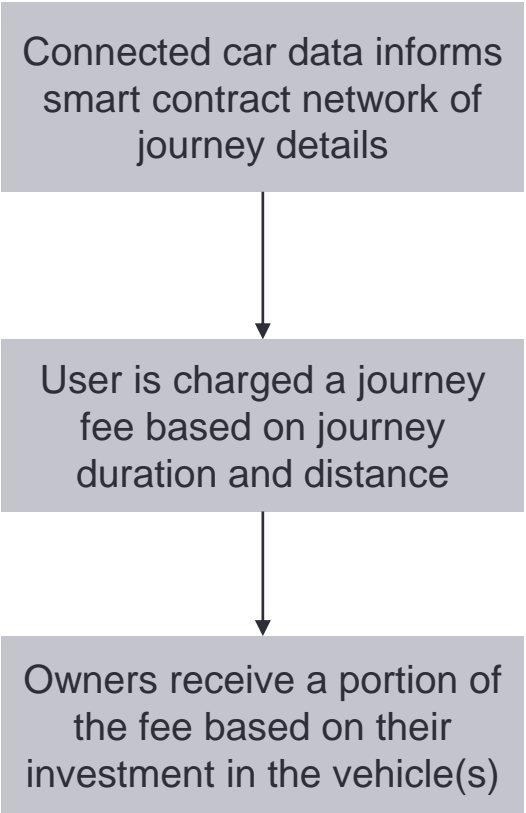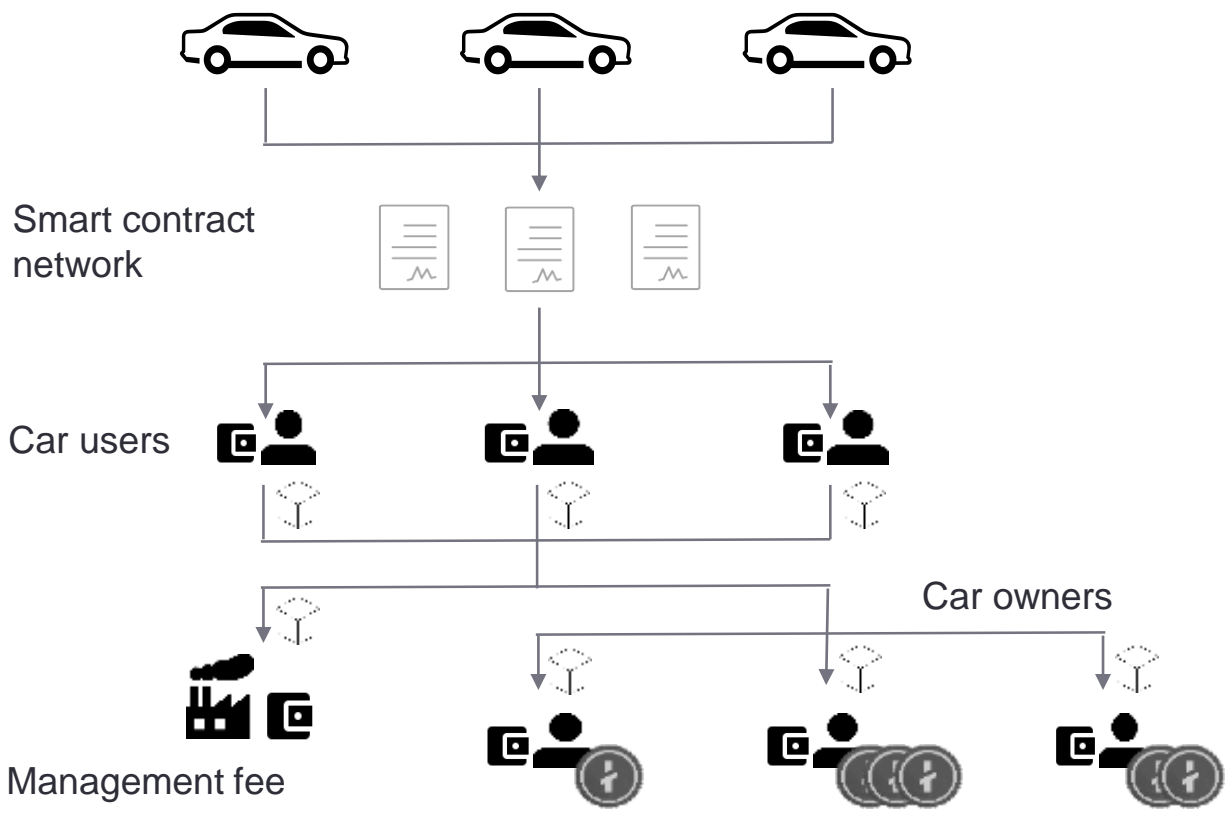|	
Asset tokenization	Asset tokenization enhances authenticity and can unlock insights into product location and storage conditions
Transparency	End consumers can access all information through a smart label linked to a landing page with storytelling and interactive solutions
Prevent fraud	Certification is created through the notarization of immutable data in the blockchain

EY Blockchain overview

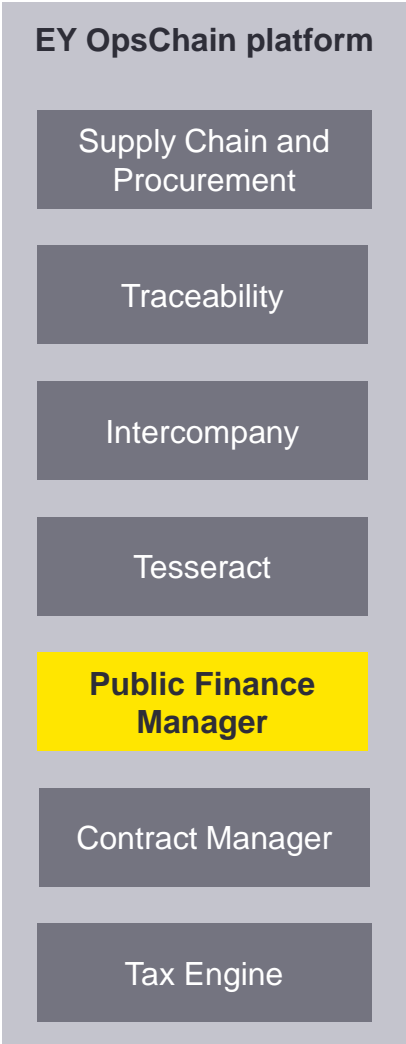# New this year: EY OpsChain Intercompany — because large enterprises do more transactions internally than externally

EY OpsChain platform

- Supply Chain and Procurement
- Traceability
- **Intercompany**
- Tesseract
- Public Finance Manager
- Contract Manager
- Tax Engine

Intercompany loans
- ▸ Loan transactions loaded from ERP
- ▸ Create and record intercompany loan
- ▸ Calculate interest accrual
- ▸ Allows for amendments to loans

Intercompany expense allocation
- ▸ Enables allocation of expenses, facilitates approval of allocations
- ▸ Automates allocation through smart contracts
- ▸ Creates and records accounts receivable and accounts payable invoices
- ▸ Reconciliation of non-trade transactions

Intercompany trade
- ▸ End-to-end solution for purchases and sales
- ▸ Continuous communication and reconciliation
- ▸ Automated journal entries

Transaction analytics
- ▸ What did we make?
- ▸ Where did it go?
- ▸ Who got paid?

EY Blockchain overview

EY

EY OpsChain Tesseract is an integrated mobility platform enabling disruptive new business models

EY OpsChain platform

- Supply Chain and Procurement
- Traceability
- Intercompany
- **Tesseract**
- Public Finance Manager
- Contract Manager
- Tax Engine

Fractionally owned community cars

Smart contract network

Car users

Car owners

Management fee

Connected car data informs smart contract network of journey details

User is charged a journey fee based on journey duration and distance

Owners receive a portion of the fee based on their investment in the vehicle(s)

EY Blockchain overview

EY

EY OpsChain Public Finance Manager (PFM) helps governments to allocate taxpayer resources more effectively

EY OpsChain platform

- Supply Chain and Procurement
- Traceability
- Intercompany
- Tesseract
- **Public Finance Manager**
- Contract Manager
- Tax Engine

Drive transparency, eliminate reconciliation and enhance the decision-making ability of governments for the financial management of public funds:

Permissioned blockchain

Govern access rights to the network and the delegation of permissions for each user

Near real-time exchange of information

Reduce direct administrative costs and reallocation costs

Tokenization

Tokenize the appropriations structure of budgets, transforming assets into tokens on the blockchain

EY Blockchain overview

EY

EY OpsChain Contract Manager will disrupt the way contracts are defined and executed between parties

EY OpsChain platform

- Supply Chain and Procurement
- Traceability
- Intercompany
- Tesseract
- Public Finance Manager
- **Contract Manager**
- Tax Engine

Microsoft

Xbox Rights and Royalties Platform Framework

Transaction occurs and is validated based on terms

Real-time validation of transaction

	Dr	Cr
Distributor	5.00	5.00
Publisher	15.00	15.00
Developer	3.00	3.00

Blockchain data integrated into upstream and downstream systems

All participants in the network get instant access to information/dashboards

Terms and conditions are agreed upon and coded into a blockchain network

Transaction details are recorded, shared and agreed upon by network participants

Facilitate balance settlement using FIAT currency token

Pre-transaction | **Transaction** | **Post-transaction**

EY

EY OpsChain Tax Engine embeds tax calculations and payment options directly into business transaction flow

EY OpsChain platform

- Supply Chain and Procurement
- Traceability
- Intercompany
- Tesseract
- Public Finance Manager
- Contract Manager
- **Tax Engine**

Seller

Buyer

Smart contract

$

tax node

- Calculate
- Record
- Analyze
- Pay

EY
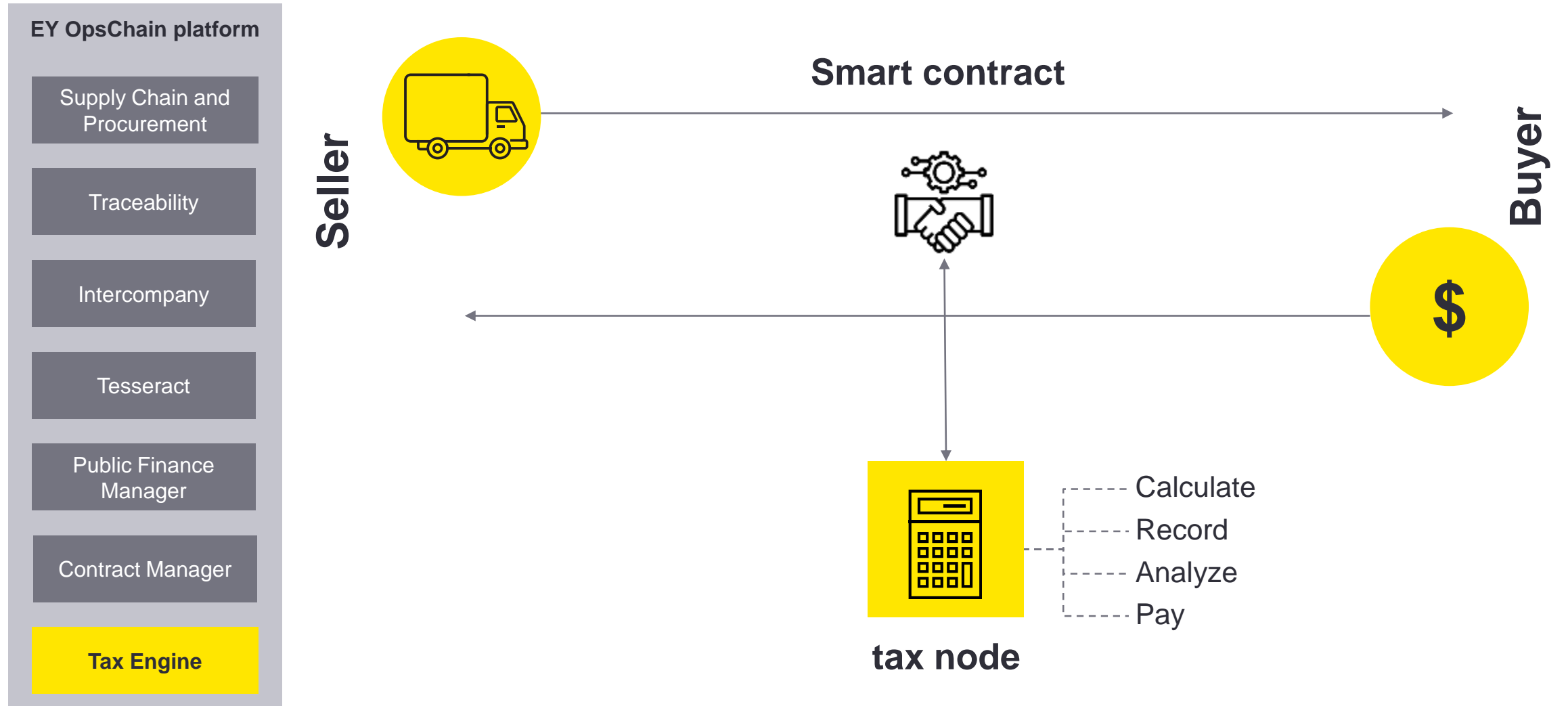
Insurwave, offered through alliances with Maersk and others in marine hull insurance, is gaining significant momentum

$30 million in insurance premiums placed and serviced so far:

Hull	Cargo (including settlement)	Corporate risks

Five founding members connected:

Maersk	XL Caitlin	MS Amlin
Willis Towers Watson	Gard	

Eight global industry awards:

1. US Insurance Award — InsurTech Initiative of the Year, 2019
2. Insurance Day Maritime Insurance awards, 2018
3. Insurtech Initiative of the Year at the Insurance Day's London Market Awards, 2018
4. Microsoft 2018 Consulting and SI Drive Award
5. Best Technology Product at the 2018 EU and UK Captive Review Awards
6. Insurance Insider InsurTech Honour Award 2018
7. Excellence in Innovation Award — CEA 2018
8. Innovation of the Year — Reactions London Market Awards, 2018

EY Blockchain overview

EY

The EY Blockchain Analyzer is all about linking the blockchain with enterprise transactions and real-world assets

Many input sources

Blockchain analytics

Blockchain Analyzer

Analytics, audit and tax

Transaction monitoring	Tax calculations	Token and contract testing
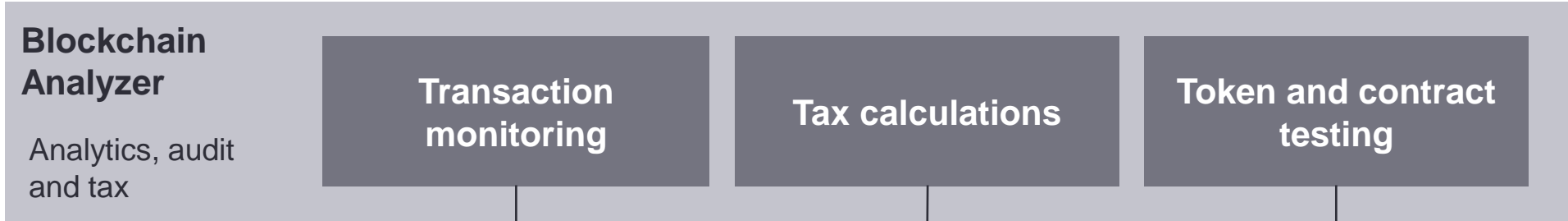
Insights and actions

- ▸ Transaction matching for audit
- ▸ Transaction histories and related accounts

- ▸ Tax liability calculation based on cryptocurrency holdings

- ▸ Contract safety and quality assurance
- ▸ Ongoing monitoring

EY Blockchain overview

The EY Blockchain Analyzer deployment progress

Phase 1 available   **Phase 2** initiated   **Phase 3**

Jan   Dec
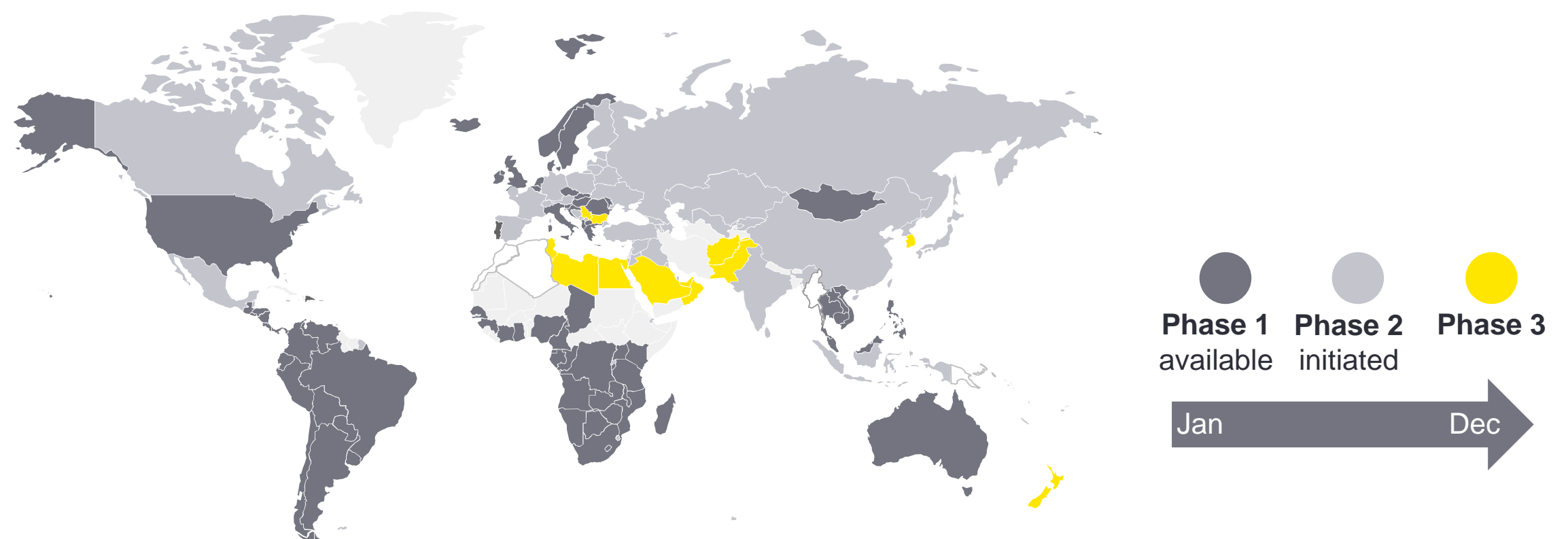
Blockchain Analyzer technical availability.
Local client usage subject to national regulatory and process reviews.

*Based on EY Data Privacy/Regulatory Restrictions map @ https://sites.ey.com/sites/countryprofiles/SitePages/maps.aspx

EY Blockchain overview

EY

The EY Blockchain Analyzer deployment progress

Live currencies and blockchains:

In development:
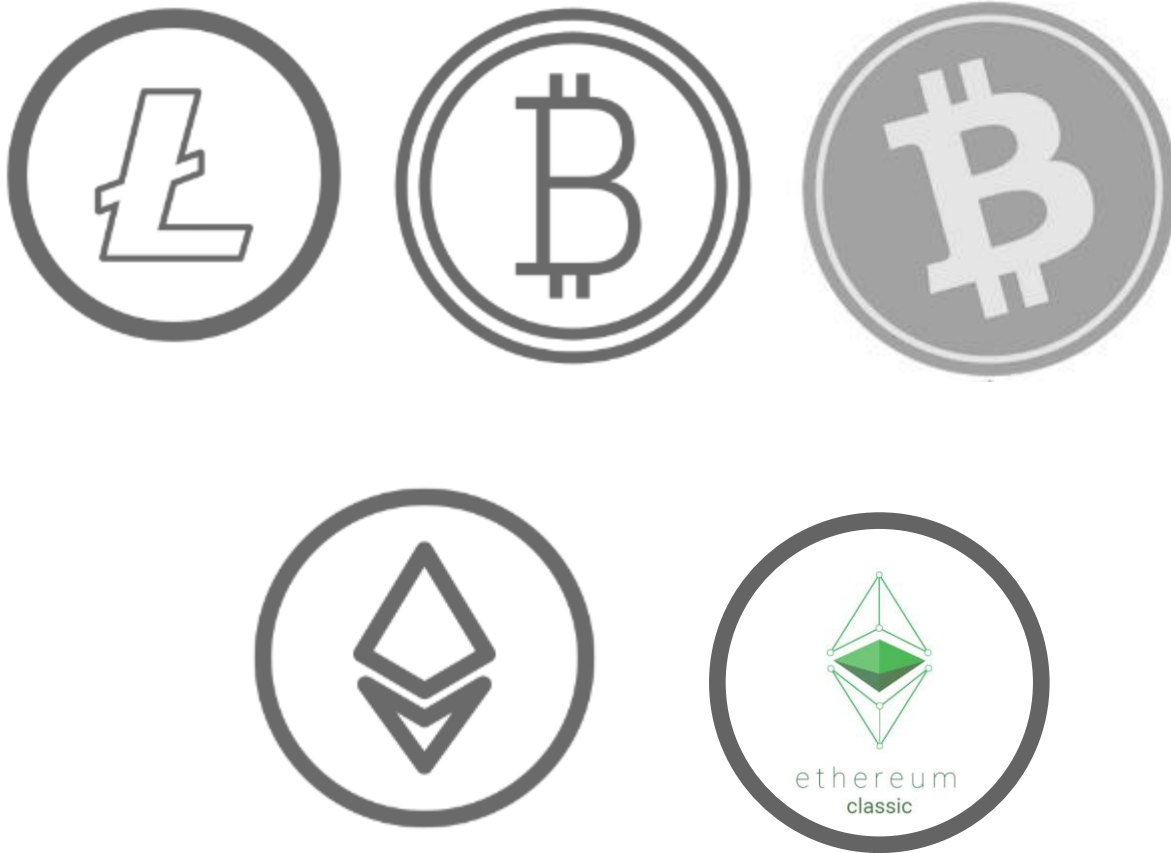
EY Blockchain overview
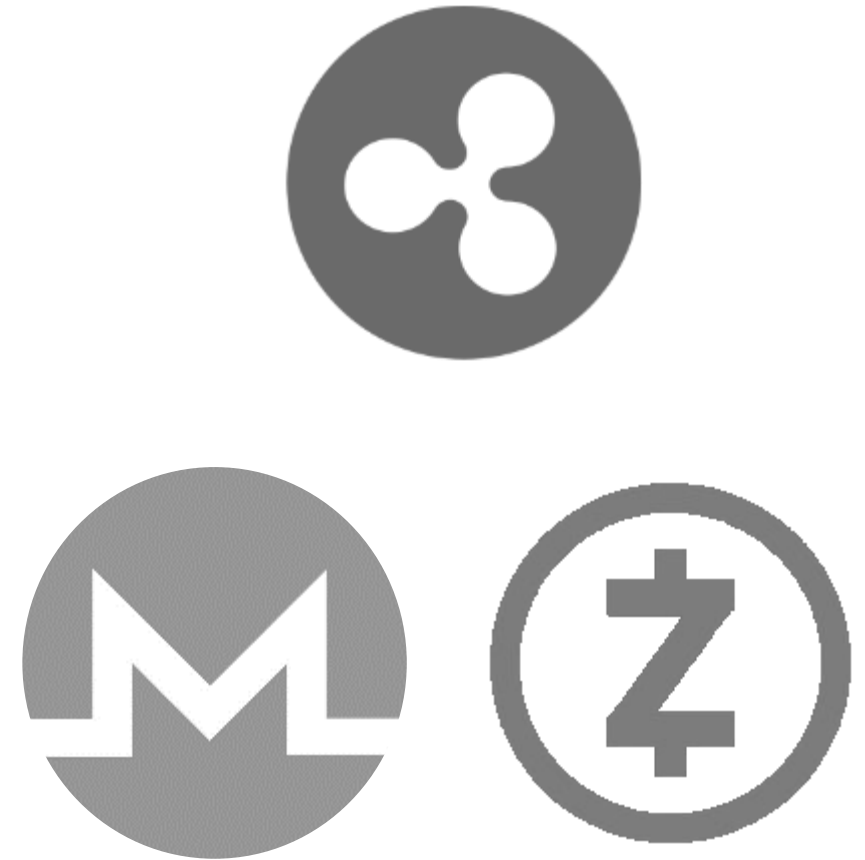
EY Crypto-Asset Accounting and Tax (CAAT), which served over 100 clients for the 2018 tax year, is being integrated into the EY Blockchain Analyzer
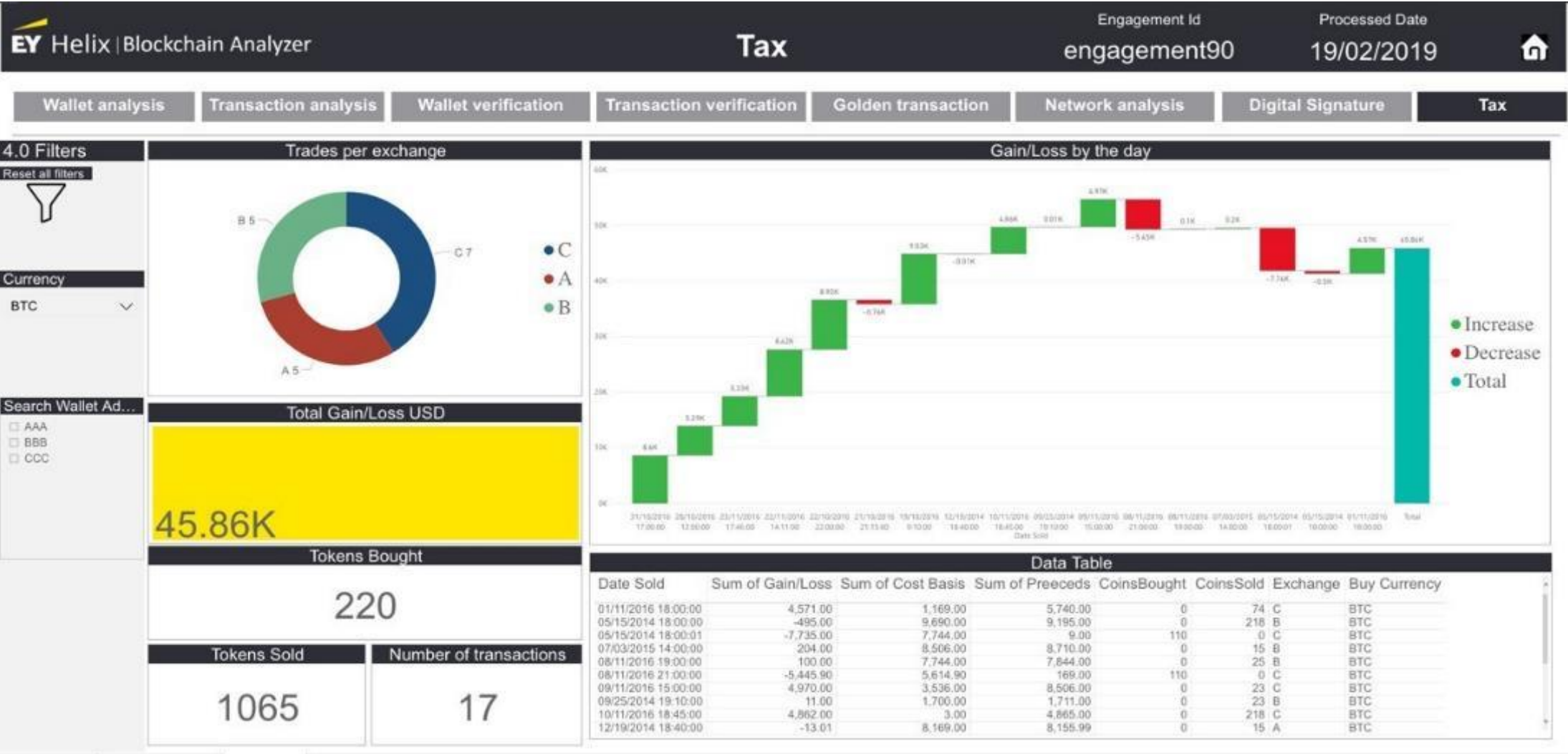
EY Blockchain overview

The EY blockchain story

Business overview

Product portfolio

Client use cases

Road map

EY Blockchain overview

EY

Our client use cases
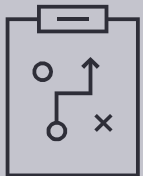
The sweet spots in the enterprise are transactions with multiple parties and shared business logic.

EY Blockchain overview

EY

While there is a decade or more of work to be done, we are off to a very good start

Project volume worldwide has grown enormously:
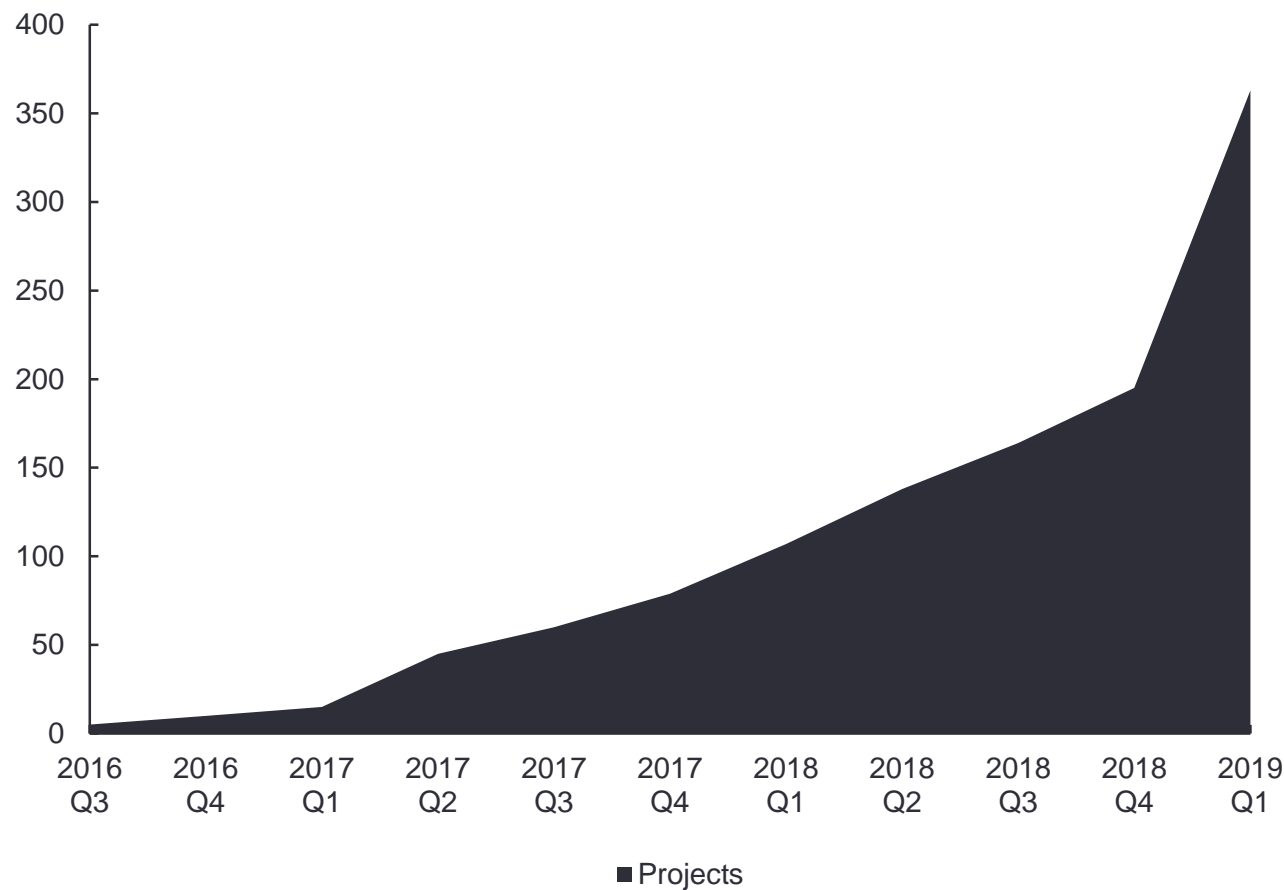
Live clients on EY-developed blockchains and using EY blockchain analytics:

EY Blockchain overview

EY
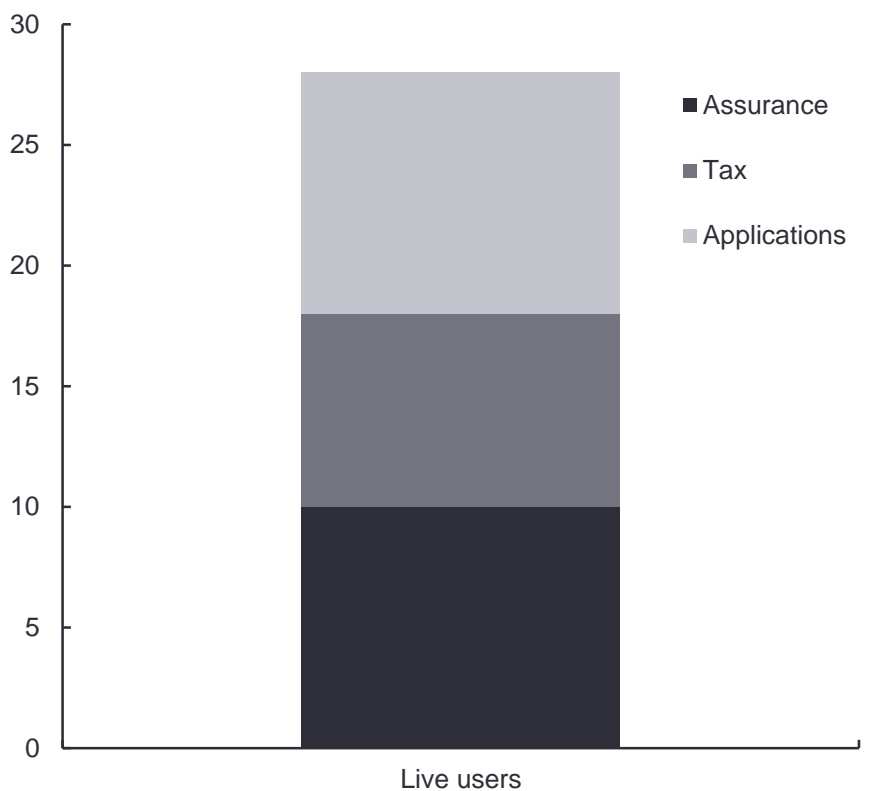
We have established two strategic alliances that are at the heart of our growth and service to enterprises

EY Blockchain overview

The most famous EY solution is the rights and royalties build for the Microsoft Xbox platform

- ▸ Digital contracting infrastructure running in Quorum on the Microsoft Azure

- ▸ Manage business contracts with varying terms and conditions at scale

- ▸ Easy onboarding for any client, including both blockchain and web access options

- ▸ **Now running over 25,000 transactions daily**

- ▸ **New use cases, including oil and gas, and other industries being deployed**

EY OpsChain Contract Manager

EY Blockchain overview

EY
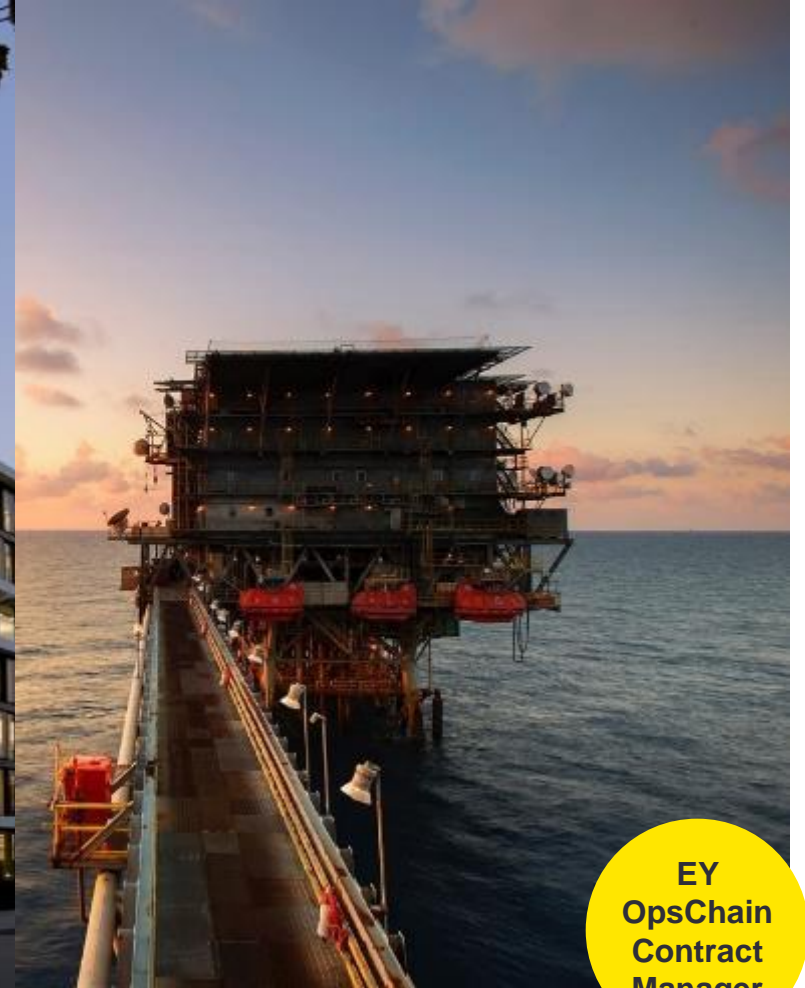
Microsoft's expected benefits from implementing a blockchain for digital rights and royalties

Less time needed to calculate rights and royalties owed

-99%

▸ From 45 days to <4 minutes to complete statements of account

Less cost to administer the entire system

-40%

▸ Reduction in the cost to administer the system

Full transparency for all leading to less litigation

▸ Increased trust from all parties being allowed to examine the transaction logs and business logic in detail

EY

EY teams are working with a major blood service organization to modernize its blood supply chain (Blood-on-a-Blockchain)

EY OpsChain Supply Chain and Procurement

EY OpsChain Traceability

Challenge

▸ Augment its national donor client base

▸ Optimize the management of its blood product supply and inventory (reduce the discards of blood and platelets and their associated costs)

▸ Shape a better partnership in nationally between donors, hospitals, patients, ministries and its employees

Strategy

▸ Create an end-to-end experience for donors

▸ Develop a solution allowing visibility and traceability

▸ Build an ecosystem that facilitates collaboration between stakeholders in the value chain to manage and optimize blood supply

Expected results

▸ Significant cost savings from improved management of discarded or expired blood

▸ End-to-end management and transparency along the key process steps from collection, transport, production/testing, storage, hospital transport/storage and patient

EY Blockchain overview

EY

EY teams helped a major oil and gas company to build a blockchain solution for contractor management

EY OpsChain Contract Manager

Challenge

▸ Client's complex network of companies provides specialized contracting services

▸ Services managed inefficiently and via siloed processes, including timesheet reporting, onboarding and contract management

▸ Significant time spent reconciling payments, contract terms and dealing with other administrative considerations, as there is no single source of truth

Strategy

▸ Designed and developed blockchain architecture and network to evaluate, standardize and automate contractor billing

▸ Led requirement gathering workshops with partners and conducted regular partner touchpoints

▸ Provided functional support and onboarding guidance throughout development phases.

Results

▸ Developed modular micro-service architecture tailored to easily configure, scale and deploy blockchain applications across client's business functions.

▸ Initial use case focused on automating processes related to contractor billing

▸ Built road map and five-year plan based on our vision, learnings and benchmarking information

EY Blockchain overview

EY

EY teams were engaged by a leading global automotive company to create a blockchain solution for bio-packet data management

EY OpsChain Supply Chain and Procurement

Challenge

▸ Client wants increased participation in Traveler Bio-packet program. Program is now paper-based with low participation due to lack of trust in process and data management

▸ Streamline collection, access and management of bio-packets (essential employee or contractor emergency contact and medical information) such that data can be readily accessed and shared securely with complete audit log of activities

Strategy

▸ Developed and executed proof of concept for using blockchain in bio-packet data management

▸ Goal to raise awareness in client's product development organization of possibilities associated with blockchain technology and possible need for a more strategic view on blockchain adoption

Results

▸ Increased protection of employee and contractor data privacy

▸ Increased ability to securely share sensitive information surrounding travelers

▸ Ability to more easily manage multiple traveller bio-packets globally

▸ Full auditability of activities on sensitives information with real-time chain of custody auditing

▸ Decreased liability supported by data purging capabilities

EY Blockchain overview

EY

EY teams worked with a leading US power and utility company to build a blockchain solution for environmental energy certificate

EY OpsChain Traceability

Challenge

- ▸ Client has proprietary environmental energy certificate program
- ▸ Certificates are issued by independent system operator (ISO) based on the generation of select types of power
- ▸ Certificates assigned to customers based on types of energy supply agreements and retired on behalf of customers annually to offset their energy consumption
- ▸ Managing program requires significant manual coordination and processing of certificates with parties internal and external to client

Strategy

- ▸ Designed and developed functional prototype to demonstrate how blockchain technology could be used to issue, assign and retire certificates

Results

- ▸ Enhanced tracking of certificates
- ▸ Reduced amount of manual coordination and processing of certificates
- ▸ Provided greater reporting capabilities on certificates to customers

EY Blockchain overview

EY

EY teams worked with an Italian food and wine producer to build a blockchain solution for product provenance (proof of origin)

EY OpsChain Traceability

Challenge

▸ Market research and analysis highlight the food sector, especially Italian wine sector, strongly needs innovative and technological solutions to improve transparency

▸ About 74% of consumer's buying behaviors affected by products' transparency and traceability

▸ 71% of consumers willing to pay premium price up to 40% for products that have certified origins and authenticity

▸ Goals to increase brand awareness, digitalization and effectiveness of communication

Strategy

▸ Data along entire supply chain is collected, including self-certify cultivation and wine-making information, to ensure origin, quality and authenticity

▸ Certification created through notarization of immutable data in the blockchain

▸ Make everything visible to the consumer through landing page accessible via smart labels

Results

▸ Blockchain-based solution delivers transparency of production information and cultivation processes to consumer, counteracting counterfeiting and increasing brand value

▸ Solution also provides producers with analytics tools to profile customers

▸ Internet of Things (IoT) solutions trace distribution and make counterfeiting impossible

EY Blockchain overview

EY

EY teams built a blockchain solution to facilitate biogas certificates for a European gas infrastructure company

EY OpsChain Traceability

Challenge

▸ Track biogas that is produced with certainty on blockchain

▸ Ensure produced biogas is only consumed once, no accounting errors possible

▸ Ease of handling of blockchain biogas certificates

▸ Ease of international transfer of blockchain biogas certificates

Strategy

▸ Create certificates for biogas on blockchain

▸ Track certificates during biogas transmission/distribution in gas network

▸ Simplicity of tracking on public blockchain

▸ Visibility of biogas certificates

▸ Certainty that certificates cannot be altered or faked on blockchain

Results

▸ Blockchain pilot project successfully delivered to show tracking of biogas certificates on the blockchain

▸ Certificates created on the blockchain during the production of biogas

▸ Blockchain biogas certificates can be transmitted, traded and transferred easily

▸ End-consumer can claim biogas certificates

EY

The EY blockchain story

Business overview

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EY Blockchain overview

Executing on our vision
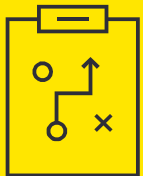
If blockchains are ever to deliver upon their full promise, public blockchains must triumph.

EY Blockchain overview

EY

The network effects of private blockchains are limited

Current model of siloed and parallel private networks is unsustainable:

Logistics provider A

Insurance provider B

Warehouse company C

Retailer A

Retailer B

Retailer C
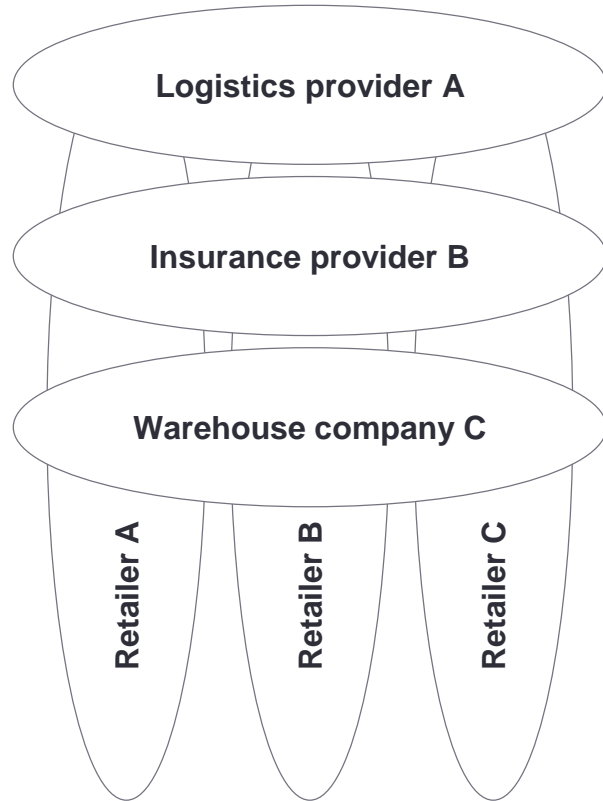
Working on a shared public infrastructure is much simpler and more scalable:

Shared public blockchain

EY Blockchain overview
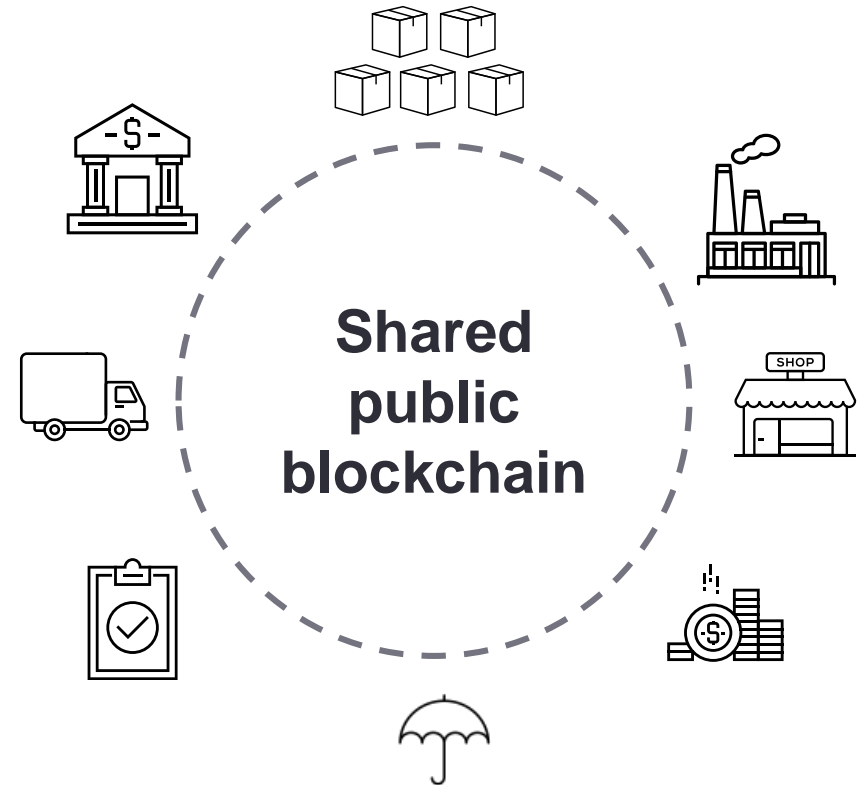
We think that any shift to public blockchains for business transactions will require five key capabilities

Private transactions

Private contracts

Token theft protection

Contract and token testing

Transaction monitoring

EY Blockchain overview

EY

In 2018, EY became the first organization to execute a private transaction on the Ethereum public main net

A simple payments blockchain using ZKPs was created in 2016:

Core verifications functions were added to Ethereum in 2017:

EY was the first to implement ZKPs on the public Ethereum main net:

ETH Zero-Proof Prototype Models: Has Ernst & Young Done What Ethereum Could Not?

cointelegraph.com

The initial deployment was in 2016 and supports only payment tokens in Z-coins — fungible tokens equivalent to cash

Basic functionality enabled for developers but not industrialized for scalable and low-cost usage
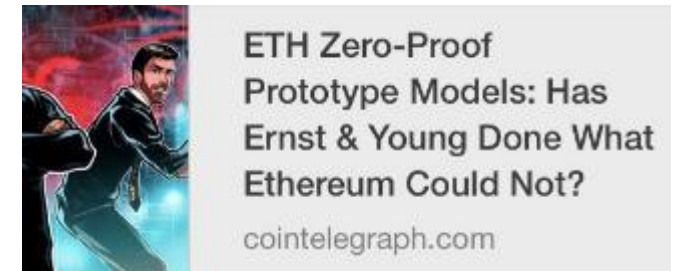
▶ Enabled the minting of private, fungible payment and asset tokens similar to ERC-20

▶ Enabled the minting of private non-fungible tokens similar to ERC-721

EY Blockchain overview

EY

In 2019, we are going much further with the introduction of EY OpsChain PE (public edition) production beta

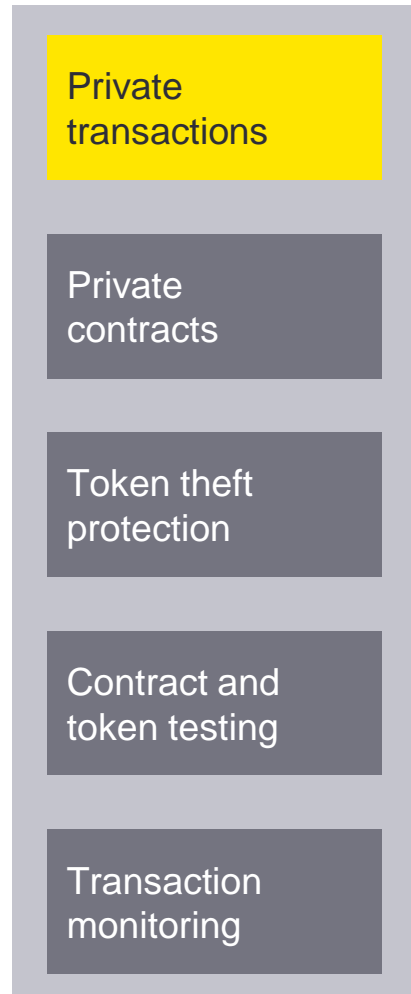**Private transactions**

Private contracts

Token theft protection

Contract and token testing

Transaction monitoring

"Nightfall," based on ZKP technology, was released by EY to the public domain* to help accelerate the adoption of secure, private transactions over public blockchains

▸ A protocol that shields transfers and payments
▸ No ability to identify the origin or destination
▸ No ability to identify the amount
▸ Works for fungible (ERC-20) and non-fungible (ERC-721) transactions

Seller
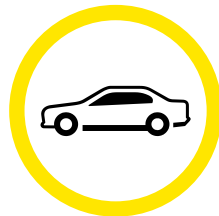
Buyer

$

*May 31, 2019 https://github.com/EYBlockchain/nightfall

EY

In 2019, we are going much further with the introduction of EY OpsChain PE (public edition) production beta

Private transactions

Private contracts

Token theft protection
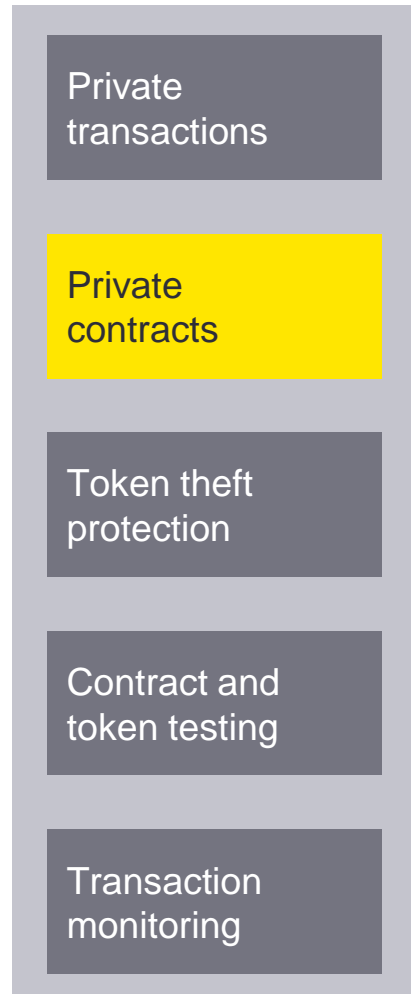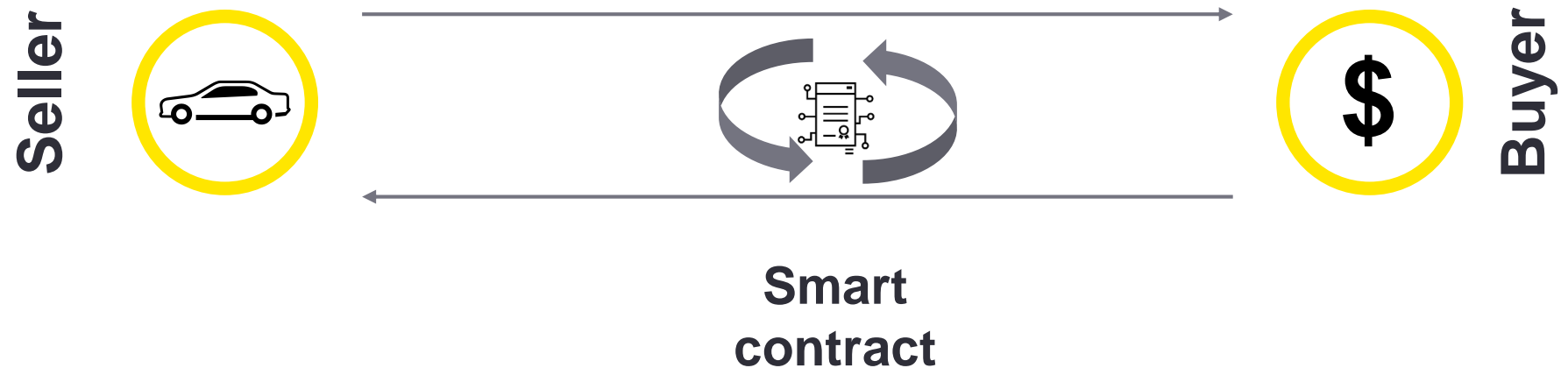
Contract and token testing

Transaction monitoring

-91%

Less gas than EY OpsChain PE prototype in 2018

EY

In 2019, we are going much further with the introduction of EY OpsChain PE (public edition) production beta

Private transactions
Private contracts
Token theft protection
Contract and token testing
Transaction monitoring

▶ EY teams use zero knowledge proofs (ZKPs) to execute contracts in a manner that are invisible to all users except authorized parties

▶ Execution proof includes conforming to agreed-upon contract terms

▶ Enables complete contracting privacy on public blockchains

Seller **Buyer**

Smart contract

EY

We are enhancing EY Blockchain Analyzer: introducing EY Dye Pack for token theft protection on public blockchains

Private transactions

Private contracts

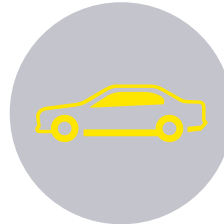**Token theft protection**

Contract and token testing

Transaction monitoring

▶ Stolen tokens can be reported to the issuing authority

▶ EY Dye Pack system marks tokens as stolen

▶ Issuing entity can issue replacements and block retrieval

▶ Works for fungible and non-fungible tokens
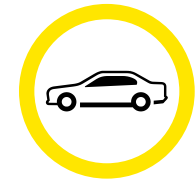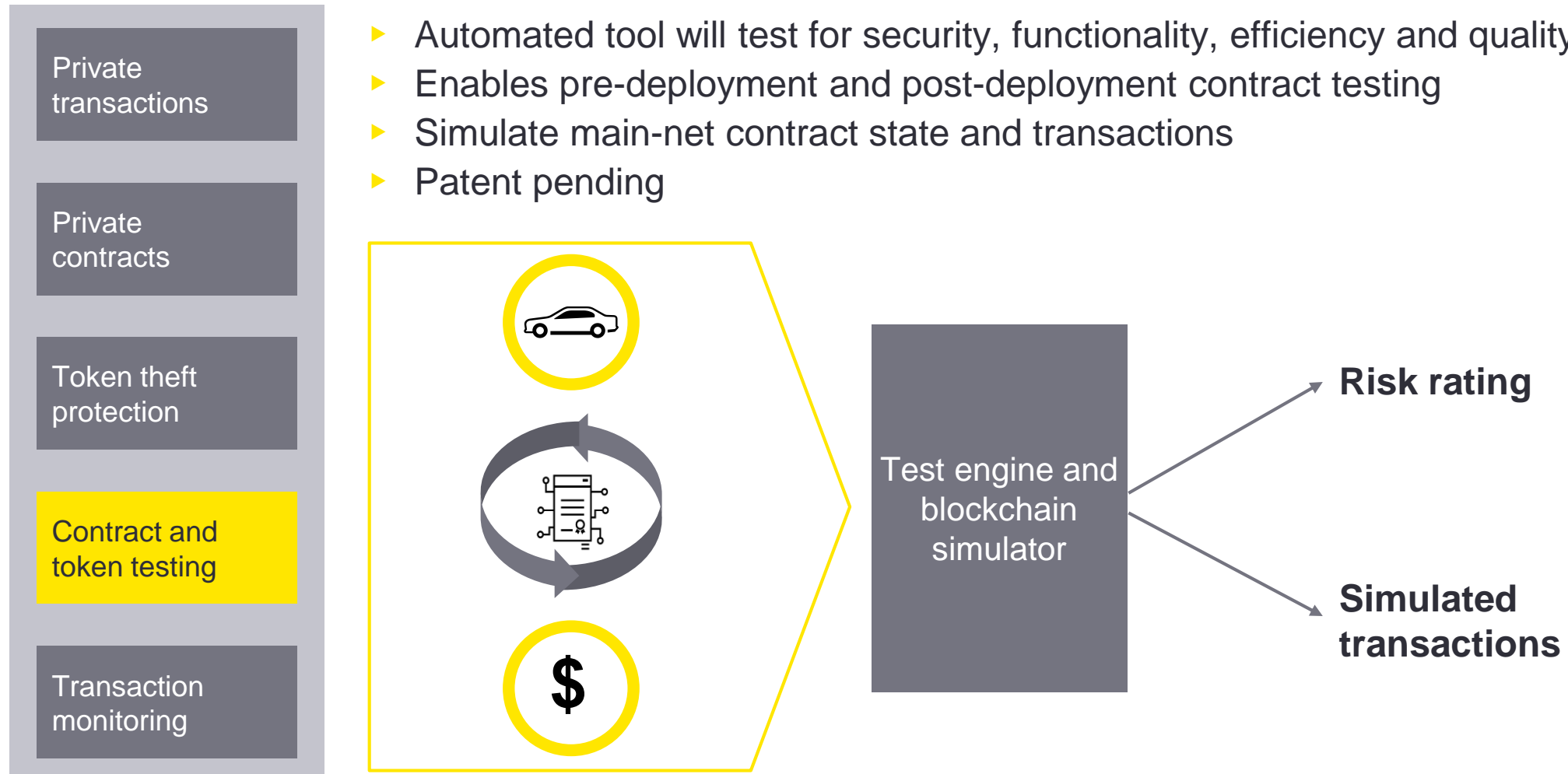
▶ Patent pending

In your wallet

When stolen

New tokens issued

EY Dye Pack marks stolen tokens as unusable for any "retrieval" against an asset in the real world.

EY Blockchain overview

EY

We are enhancing EY Blockchain Analyzer: introducing smart contract testing

Private transactions
Private contracts
Token theft protection
Contract and token testing
Transaction monitoring

▸ Automated tool will test for security, functionality, efficiency and quality issues

▸ Enables pre-deployment and post-deployment contract testing

▸ Simulate main-net contract state and transactions

▸ Patent pending

Test engine and blockchain simulator

Risk rating

Simulated transactions

EY Blockchain overview

EY

We are enhancing EY Blockchain Analyzer with functionality for full transaction history and traceability

Private transactions

Private contracts

Token theft protection

Contract and token testing

Transaction monitoring

EY Blockchain overview
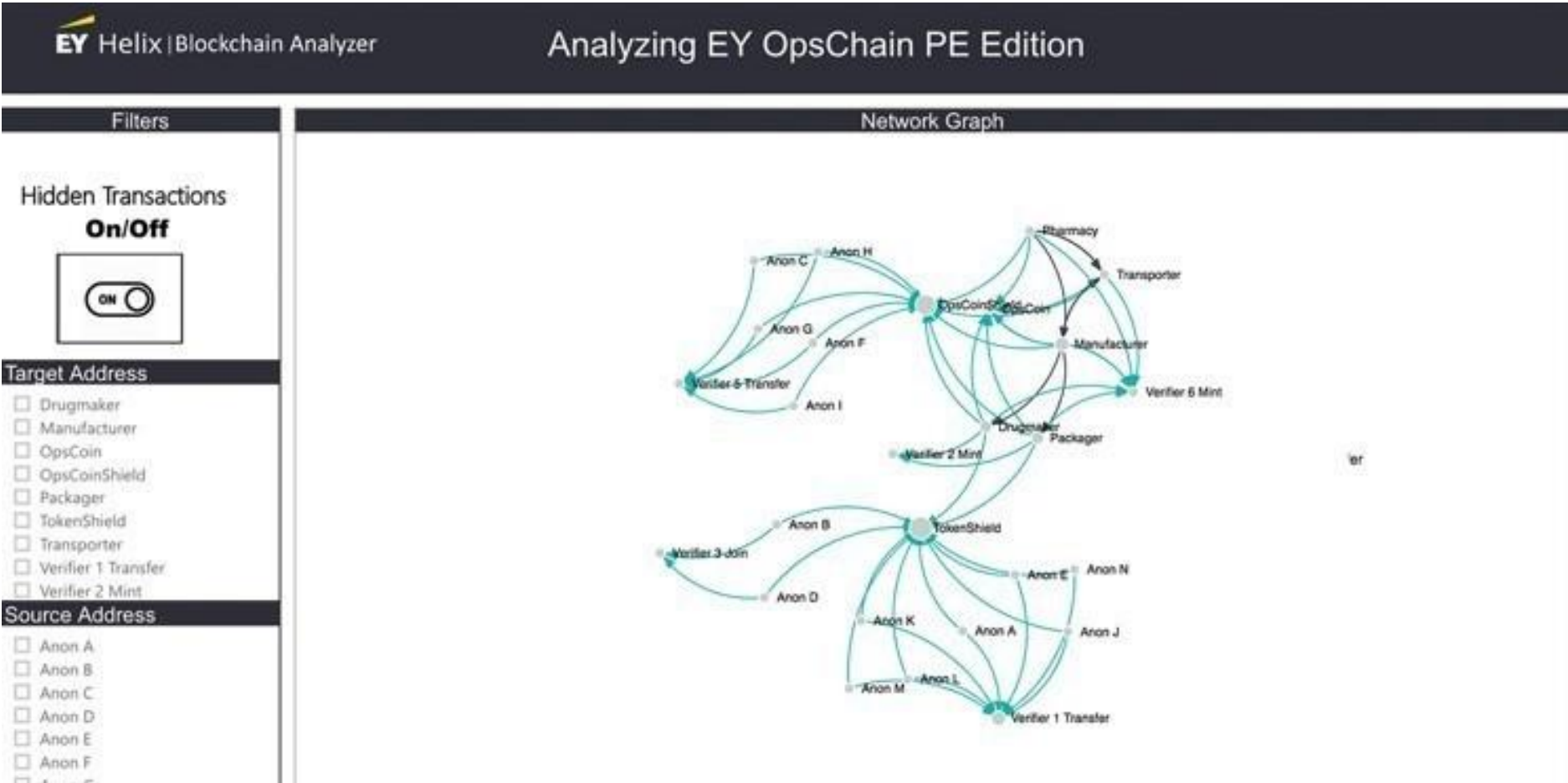
Full coverage to drive adoption of public blockchains

Private transactions ✔

Private contracts ✔

Token theft protection ✔

Contract and token testing ✔

Transaction monitoring ✔

EY Blockchain overview

EY

The result: public blockchains are starting to look like a very good option for enterprises

Private transactions are getting cheaper faster:

EY OpsChain public edition
October 2018   **$100**

Zether protocol
February 2019   **$20**

EY OpsChain public edition
Generation 2, April 2019   **$5**

And a little benchmarking for reference:

$5 Average cost for private networks with 50,000 annual transactions

$1.5 Average fees on a credit card transaction in the US

$0.50 Average cost for private networks with 500,000 annual transactions

$0.10 Average cost for private networks with 3m annual transactions

Average costs/prices rounded to nearest whole numbers. Source: EY research and testing.

EY Blockchain overview

EY

The result: public blockchains are starting to look like a very good option for enterprises

Public blockchains are simpler to manage:

|	
Simpler blockchain management	▸ No need to stand up the blockchain network ▸ No need to manage user access to the network ▸ No managing replication and patching issues
Simpler partner onboarding	▸ Take advantage of the global ecosystem of service providers ▸ Take advantage of self-service, open source tools ▸ No new onboarding if partner already uses public blockchain
Simpler integration to new services	▸ Standard tokens and contracts mean that new services can "just work" without new integrations

EY Blockchain overview

EY

The result: public blockchains are starting to look like a very good option for enterprises

EY solutions are designed to support enterprise requirements:
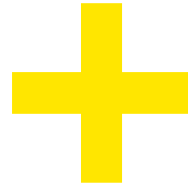
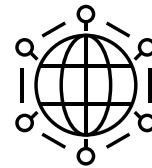Hidden tokens
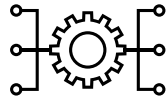
Hidden contracts

Dye packs

Contract testing

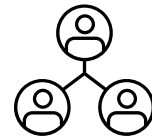Public blockchains themselves are the "platinum standard" for transaction security:

Open source and public domain

True immutability

True decentralization

Vigilant community

EY Blockchain overview

EY

If the cloud is any guide, it's a 10-year journey that is just getting started

2006

The year Amazon web services launched.

2017

The year the majority of ERP installs shifted to the cloud.

EY Blockchain overview

EY

Appendix

Marketing assets and key contacts

EY Blockchain overview

EY

Additional use cases

EY Blockchain overview

EY teams were engaged by House of Roosevelt to build a blockchain solution for the TATTOO Wine Blockchain platform

Challenge

- ▶ Current distribution model of quality wine is complex, with many steps along the supply chain
- ▶ Consumers abroad can choose only among the few labels that are made available, with prices much higher than those charged at the source
- ▶ Consumer has no guarantee of the authenticity of the wine compared to the country of origin of the production

Strategy

- ▶ Build blockchain solution leveraging OpsChain Traceability, which Blockchain Wine Pte. Ltd. will operate to help determine the quality, provenance, and authenticity of new and vintage wines
- ▶ Focus on markets in China, Japan, South Korea, Thailand, and Singapore, where the consumption of European wines is expanding

Results

Results measured on an ongoing basis:

- ▶ Digital tokens and smart contracts used to represent entire life cycle of a specific bottle of wine, increasing provenance and efficiency
- ▶ Single source of truth created to maintain records and agree upon and execute shared business logic
- ▶ More than 11 million bottles of wine tokenized for multiple clients

EY OpsChain Traceability

EY Blockchain overview

EY

EY teams worked with Merck Animal Health (MAH) to build a blockchain solution to track animal vaccines

EY OpsChain Supply Chain and Procurement

Challenge

- Current supply chain of animal vaccines is complex, with limited visibility to which batch of vaccine is delivered to which farm
- End consumer (pigs in this case) is not linked to the specific batch of vaccine they received with current technology

Strategy

- EY teams built a POC, leveraging EY OpsChain, to prove blockchain-enabled visibility for tracking animal vaccines is viable across the supply chain through the use of tokenization
- A table-top demo provided education into how the process would work and demonstrated the ability to track individual units from the time of manufacture to the time of injection

Results

- Tokenization allowed link to be created between a MAH product and actual customer (or pig) that consumes it
- Positioned MAH as blockchain pioneer
- Enabled MAH to respond to customer requests for more visibility into the supply
- Project moving into pilot phase were the blockchain solution is being integrated with production systems

EY Blockchain overview

EY

EY teams worked with Spinosa to build a blockchain solution for food traceability

EY OpsChain Traceability

Challenge

▸ Counterfeiting of Made in Italy typical products is becoming a large problem in the region

▸ "We are facing a new paradigm in the food market," says Giuseppe Perrone, EY Blockchain Hub Mediterranean Leader. "The digitalization of the supply chain is a strategic asset for agri-food companies."

▸ "For Spinosa, the blockchain will be particularly important on foreign markets, where 74% of consumers are sensitive to the concept of authenticity".

Strategy

▸ Built blockchain solution using EY OpsChain Traceability to certify entire Mozzarella di Bufala Campana PDO (Buffalo mozzarella from Campania PDO) product line

▸ Commercialized with Spinosa's own brand — every pack of cheese carries "Blockchain — Quality Certificate"

▸ QR code on label allows consumer to access all information about production chain

Results

▸ From 45 certified farms (located between the Volturno plain and the Agro Pontino area) to processing and packaging stages, the same code makes possible to verify all quality standards that the company adheres to

▸ Greater confidence from consumers

EY

EY teams were engaged by Carrefour to build a blockchain solution for food traceability

Challenge

▸ Counterfeiting of Made in Italy typical products becomes large problem in the region

▸ Supply chains are increasingly global and complex

▸ Management of supply chain quality control becomes difficult for partners, suppliers and consumers

Strategy

▸ Build a suite of highly integrated services for supply chain improvement and revenue increase for food products, via the EY OpsChain Traceability product

▸ Commodities tracked in this manner receive a QR code on the parcel that reports, via scanning, every data tracked for that individual commodity

▸ Attest the source and processing of Made in Italy commodities

Results

▸ Easier to collect and make readily available to clients on DLT the traceability information of food products

▸ Trial results in doubling of revenues on commodities traced on blockchain and a significant rise in visits to page accessed through the QR code

▸ Increased trust from manufacturers, distributors and the final client

EY OpsChain Traceability

EY Blockchain overview

EY teams worked with a large financial institution to build a blockchain solution for securitization

Challenge

▸ The securitization market suffers from inconsistent and complex processes across many participants in a value chain

▸ Investors and regulators find it difficult and expensive to unwind/trace back through the value chain when issues arise

Strategy

▸ Develop proof of concept demonstrating how blockchain record provides additional transparency into material loan details in the event of a default

▸ Tokenizing mortgages at origination introduces new level of traceability and flexibility during securitization

Results

▸ Demonstrated how blockchain supports tokenization of mortgages at origination, and subsequent manipulation of those tokens during the aggregation and securitization phases

▸ Demonstrated how distributed ledger serves as a single source of truth for details around which a mortgage was issued, sold or serviced

EY Blockchain overview

EY

EY teams worked with a large financial institution to build a blockchain solution for syndicated loans

Challenge

- Servicing syndicated loans, which can involve hundreds of individual lenders, is substantial
- Lack of data transparency across the syndicate forces our client to spend significant amounts of time communicating with lenders by email and phone to reconcile payments and loan positions

Strategy

- Develop proof of concept demonstrating how blockchain technology impacts loan servicing function
- Tokenize syndicated loans at the utilization level and enable straight-through payment processing from borrowers and lenders

Results

- Demonstrated how blockchain can create and maintain shared source of truth for event details associated with syndicated loan
- Demonstrated how blockchain technology processes and records interest payment on a loan
- Provided lens into a future where loans are tokenized and traded on secondary markets to increase liquidity across the ecosystem

EY Blockchain overview

EY

EY teams worked with a leading consumer products company to build a blockchain solution for tax reconciliation and invoice automation

Challenge

▸ Conduct proof of concept demonstrating how blockchain solution can eliminate reconciliation issues, manual intervention to generate final e-invoice and provide visibility to various tax calculations and invoice line items

Strategy

▸ Created working prototype that demonstrated key elements required to calculate country-specific import/export taxes and automated validation of mandatory invoice elements

Results

▸ Elimination of invoice tax reconciliation process and auditing millions of supplier invoices for discrepancies and mismatches

▸ Visibility of transactions across entire client and service provider network

▸ Blockchain-enabled system that automates and authenticates tax treatment and legal invoice "must-have" fields for client's ocean freight invoices

EY Blockchain overview

EY teams worked with a major e-commerce service provider to build a blockchain solution for logistics

Challenge

▸ Provide sustainable blockchain solution to improve visibility of orders across the value chain and related stakeholders for their complex e-commerce delivery business

Strategy

▸ Designed and developed working blockchain application to prove the value and meet challenges related to visibility and track and trace

▸ Developed interactive user interfaces to manage orders, simulate execution and dashboard for track and trace

Results

▸ Elimination of manual reconciliation across the network on order tracking

▸ Value chain optimization leading to significant cost reduction across value chain stakeholders

▸ Synchronized and responsive supply chain across the network

▸ Encourage transparency from manufacturer to the end consumer

EY Blockchain overview

EY

EY teams worked with the City of Vienna to build a blockchain solution for open government data

Challenge
▸ Notarization of open government data: process for uploading/maintaining open government data of the City of Vienna does not include an audit trail showing how and when data is changed

Strategy
▸ Develop pilot demonstrating how blockchain technology impacts and ensures integrity of open government data
▸ Enable independent checks to be made as to whether data records of the City of Vienna existed at a specific time

Results
▸ Demonstrated ability to keep track of document changes in open government data, allowing interested parties to verify the document existed at a certain point in time to settle legal disputes

EY Blockchain overview

EY

EY teams worked with the City of Vienna to build a payment process optimization blockchain solution

Challenge

▸ The City of Vienna employs approximately 30,000 people, all of whom receive meal vouchers

▸ Vouchers are printed, distributed and collected on paper, and payments are made to the restaurants following manual reporting of the paper vouchers

▸ Vouchers are liable to loss/tampering, and payments at the end of the month are problematic due to the manual accounting

Strategy

▸ Digitize food voucher issuance and collection process on private Ethereum blockchain to automate and optimize process

▸ Understood by all participants in a transparent manner without storing personal data of the participants

Results

▸ Enabling food vouchers to be loss/tamper-proof and restaurant owners to transfer funds directly to the city's account department at the end of the month

▸ Security and privacy for all transactional and reference data for recordkeeping and settlement

EY Blockchain overview

EY

EY teams worked with BNP Paribas to build a blockchain solution for ALM treasury operations

Challenge

- Getting complete, accurate and timely information to ensure that positions can be managed effectively
- Retrieval of ALMT data from distributed ledger, feeding back to the legacy systems
- Offering treasurers worldwide to square a position from any other entity/TFLM (intragroup)
- Two-sided transactions to execute themselves on a distributed ledger

Strategy

- Bring innovation and optimize efficiency to treasury management through blockchain technology, adopting "follow the sun" process and setup, which could ultimately replace the system currently enabling intra-treasuries two-legs transactions

Results

- Real-time economic information (including position sharing)
- Time saving through an integrated feeding solution
- Improved reporting solutions opportunity
- Secured data by the sophisticated encryption mechanisms

EY Blockchain overview

EY

EY teams worked with Allianz to build a blockchain solution for captive fronting insurance

Challenge

▸ Provide near real-time transactions and information updates on policy extensions

▸ Develop fully digital, e-2-e processing and scalable tool prototype

Strategy

▸ Optimized and digitized captive fronting contract and policy and claim handling, and premium and claim payments management system

▸ Shared, replicated data base with controlled access for all parties with transparency on claims, policy and payment data

Results

Designed fully functional pilot that included:

▸ Policy extension, review, approval and sign&pay function

▸ Claims issuance, review and update cycle and sign&pay

▸ Payment trigger to bank account

▸ Visualization of payment flow inclusion fee and tax deduction across global entities chain

▸ Front-end and UAT bank account integration

EY Blockchain overview

EY teams were engaged by a large Australian financial institution to build a blockchain solution for smart asset management

Challenge

▸ Assess evolution of Smart Assets and advent of sharing economy's impact on client's asset financing business

▸ Focus on assessment of asset classes that client currently finances, as well as those not currently financed, and identify which are most likely to be impacted

Strategy

▸ Identified new potential revenue sources through becoming an enabler of the sharing economy

▸ Developed three use cases worthy of further exploration via a proof of concept (PoC) development

▸ Assets relevant to agriculture business services identified as asset class to be targeted through development of any PoCs

Results

▸ Asset Management Platform PoC — utilizes data collected from IoT instrumented asset to drive greater insights into asset and entity behavior and associated market conditions

▸ Remote Control of Assets PoC — a working PoC that includes smart contract that enables IoT control of an asset where a borrower has failed to meet repayments

▸ Sharing of Assets PoC — utilizes blockchain technology, where smart asset is connected as part of a sharing economy

EY Blockchain overview

EY

EY teams were engaged by a leading managed health care company to build a digital health ID blockchain solution

Challenge

▸ Consumer identity is not portable, provider credentialing is repetitive and time-consuming

▸ There are duplicative identity and access management (IAM) efforts and infrastructure costs

▸ There is dependence on for-profit entities for identity-proofing services

Strategy

▸ Created working prototype with key features required of a portable and digital health ID across the member, identity proofer and relying party

Results

▸ Improved patients and providers' digital health care experience

▸ Reduced IAM operating costs by harnessing the power of the working group to "crowdsource" identity proofing

▸ Reduced reliance on commercial identity-proofing services

EY Blockchain overview

EY

EY teams worked with a leading consumer products company to build a blockchain solution for contract manufacturing (directed buy)

Challenge

▸ Client had compliance issues in its procurement organization

▸ There are defined instances where contract manufacturer is directed to source from a specific supplier(s) for raw and packaging materials

▸ Audits reveal lack of adherence to correct raw and packaging material pricing, necessitating time-consuming and recurring reconciliation efforts on quarterly basis

Strategy

▸ Conducted proof of concept (PoC) demonstrating how blockchain solution can eliminate compliance issues and provide visibility of business transactions across client's entire network

▸ Built a high level business case for doing the blockchain implementation across all of client's contact manufacturers

▸ Built road map based on the prototype, including next steps for pilot expansion into the supply chain

Results

▸ Significant reduction of value leakage across contract manufacturing and supplier network

▸ Elimination of price verification process

▸ Visibility of transactions across entire contract manufacturing and supplier network

▸ Full cost pass through of raw and packaging pricing each time

EY Blockchain overview

EY

EY teams built a blockchain solution to support commercial valuation services for a distributed ledger firm

Challenge

▸ The client, a fast-growing, early-stage blockchain FinTech business, wanted to raise equity from a consortium consisting mainly of global banks to execute on its vision to implement distributed ledger technology across the financial services industry

Strategy

▸ Conducted proof of concept (PoC) demonstrating how blockchain solution can eliminate compliance issues and provide visibility of business transactions across their entire contract manufacturing and supplier network

Results

▸ A detailed analysis of the primary value drivers underpinning the performance and value of the company under a number of potential scenarios (base case, upside, downside, failure)

▸ Client was able to understand the impact of potential delays in key milestones in their business plan

EY Blockchain overview

EY

EY teams were engaged by an Asian governmental financial regulator to build a blockchain solution and business model

Challenge

- ▸ Client wanted to build blockchain-based testbeds in conjunction with a blockchain startup
- ▸ The startup sought our support in assessing client's fit for blockchain from a business perspective, and providing key considerations for strategic next steps

Strategy

- ▸ Determined client's business needs and processes through document analysis, interviews, workshops and workflow analysis
- ▸ Identified potential technical, functional and regulatory issues to support the build-out of a road map for future phases

Results

- ▸ Enhanced the outcomes of pilot for the client
- ▸ Provided a comprehensive assessment of the feasibility of applying blockchain to the client's current and future business

EY Blockchain overview

EY

EY teams were engaged by a global credit card company to provide blockchain strategic advice and formulate a business model

Challenge

▸ Pilot a blockchain-enabled interbank payments and settlement solution in conjunction with a blockchain startup and six European banks

▸ Along with the startup company, the client conducted six experiments across a period of six weeks

▸ The client needed support in evaluating and assessing the pilot project and providing key considerations for strategic next steps

Strategy

▸ Provided market insights drawn from experience of business transformation projects, payments technology and working with startups

▸ Shared impartial observations of areas for further exploration and improvements to be made for further phases of the pilot

▸ Highlighted key considerations for strategic next steps

▸ Created a final report for the client with our key findings

Results

▸ EY teams involvement improved outcomes of the pilot for the client by providing an impartial assessment of the effectiveness of the pilot, as well as some key considerations for strategic next steps.

▸ Final report produced by EY teams for the client was based on the outcomes of discussions with the client and the workshops held with banking participants, and was intended to support the build-out of a road map for future phases

EY Blockchain overview

EY teams were engaged by a US blockchain FinTech company to provide go-to-market strategy support

Challenge

▸ Client wanted to introduce a blockchain-enabled matching and settlement solution to the London bullion market

▸ Client sought our support with their go-to-market strategy, operating model rationalization and support in engaging bullion market participants, as well as regulatory bodies

Strategy

▸ Produced white papers highlighting key opportunities and use cases for the solution across the bullion market (including market makers, bullion clearing banks, refiners and miners)

▸ Developed and refined business processes and design principles for the target operating model from an operational, risk and regulatory perspective

▸ Created approach for conducting a successful pilot program with settlement banks, market makers and bullion clearing banks

Results

▸ Instantaneous settlement times, increased fungibility of bullion and greater transparency to an opaque marketplace

▸ Increased sales momentum and operational effectiveness by bringing clarity to the messaging and value proposition for each market participant

▸ Facilitated development of documentation for key business processes required to operationalize the solution

EY Blockchain overview

EY

EY teams were asked to perform an AML/KYC assessment for a swap exchange facility

Challenge

▸ A startup bitcoin derivatives exchange, seeking approval from a federal regulator, sought a review and recommendations of their AML policies and procedures

Strategy

▸ Applied industry knowledge of AML regulations and exchanges, as well as a deep understanding of virtual currencies and associated AML and sanctions risks, to perform an assessment and benchmarking of the current operations and AML policies of the company

Results

▸ Findings and future state recommendations were developed based on the assessment and benchmarking criteria

▸ The exchange gained the highly sought after temporary regulatory approval to operate as a swap exchange, the first in the market

EY Blockchain overview

EY

EY blockchain marketing assets

2019 EY Global Blockchain Summit:

VIDEO: 2019 EY Global Summit recap

VIDEO: Paul Brody, EY Global Blockchain Leader, delivers keynote on the current reality and strategic vision for the future of blockchain

VIDEO: EY blockchain strategy

VIDEO: Using blockchain to reimagine your industry

EY Blockchain overview

EY blockchain marketing assets
IoT | cryptocurrency

[Securing the blockchain-Cybersecurity consideration in a decentralized world](#)

[Privacy in digital age: enterprise value through personal empowerment](#)

[How Blockchain is pushing the cloud all the way to the edge](#)

[Report: Initial Coin Offerings (ICOs) The Class of 2017 — one year later](#)
- [Press Release: October 19, 2018](#)
- [Infographic](#)

[EY Research](#): Initial Coin Offerings (ICO's) — Big Risks in ICO Market (Jan 2018) – [Press Release](#)

[Valuation of crypto assets](#)
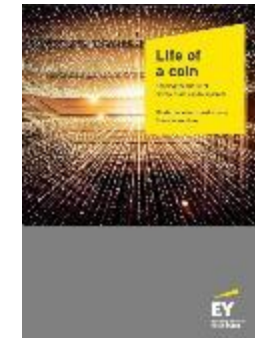
Life of a coin: [The future of crypto-assets capital markets](#)

EY blockchain marketing assets
Finance, tax, assurance

IFRS: Accounting for Crypto-assets
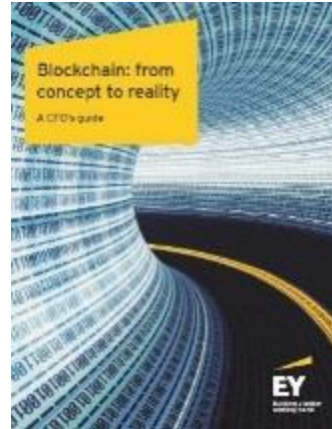
Blockchain: from concept to reality — **a CFO guide**

Blockchain: How this technology could impact the **role of the CFO**

Tax Insights: the future of tax and the impact of disruptive technologies **(blockchain, RPA, analytics)**

HCM: payroll of the future
Data ownership compliant w laws and protected against cyber attacks
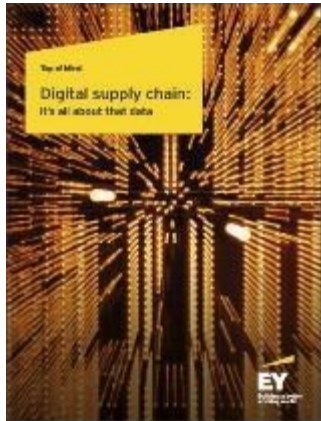- ▸ RPA
- ▸ AI Chatbots
- ▸ Blockchain

Total cost of ownership (TCO) for blockchain solutions

VIDEO: Blockchain and the future of audit — transforming the finance function

EY Blockchain overview

EY blockchain marketing assets
Supply chain | media and entertainment, energy/oil and gas, transportation

[The digital supply chain](#)

SAP Digitalist: Revolutionizing the supply chain with blockchain [(three-part series)](#)

[Is it time to industrialize the blockchain?](#)

[Industrializing blockchain in ASEAN](#)

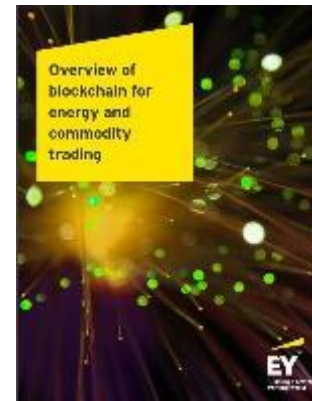[Mobility of the future: fractional ownership](#) — Autonomous transport (EY Tesseract)

[Blockchains impact to the IP life cycle](#) (rights management)

[VIDEO:](#) EY and Microsoft build blockchain network for gaming business

O&G: [blockchain for energy and commodity trading](#)

[How blockchain is transforming the distributed energy world](#)

EY Blockchain overview

EY

EY blockchain marketing assets
Health care, life sciences

Health care reimaged: building networks of the future with blockchain

Life Sciences

Product life cycle management on a blockchain

EY and Humana: crowdsourcing health care provider directory maintenance

Seven things health care professionals should know about blockchain

EY Blockchain overview

EY blockchain marketing assets
Financial services

Insurance for the marine industry: blockchain-based marine insurance from EY, Guardtime and Microsoft

Implications of blockchain technology on the insurance industry (the role of data and analytics)

Blockchain in insurance: applications and pursuing a path to adoption

Blockchain innovation in wealth and asset management

1. Welcome to the machine economy: Commonwealth Bank Australia
2. Smart assets for farming equipment

EY Blockchain overview

EY blockchain marketing assets
Analyst reports

EY Global Blockchain Summit TBR Special Report — EY lays out its digital blueprint with blockchain use cases easily fitting into the construct

Source: Special report: In its third annual blockchain summit, EY calls this 'Year 0' for blockchain. TBR, May 2019

Gartner

EY cited in Market Guide for Blockchain and Consulting and Proof of Concept Development Services as a representative vendor

Source: Market Guide for Blockchain Consulting and Proof-of-Concept Development Services. Gartner, March 2018

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The Nightfall protocol by EY:

Fungible token transfer

Non-fungible token transfer

ZKP verification

Delivered as public domain code free from any restrictions or conditions

May 31, 2019 https://github.com/EYBlockchain/nightfall

Say Hello to Nightfall — Paul Brody

Big Four Auditing Firm EY Open Sources its Ethereum Private Transaction Solution

EY Open-Sources 'Nightfall' Code for Private Transactions on Ethereum

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Recent press releases from EY global blockchain summit

EY OpsChain industrializes the blockchain at scale for enterprises	**Multimillion-dollar investment in EY Blockchain Analyzer delivers new upgrades for blockchain and cryptocurrency audit and tax services**	**EY launches smart contract testing service for blockchain clients**	**EY releases zero-knowledge proof blockchain transaction technology to the public domain to advance blockchain privacy standards**
EY today announced the launch of the second generation of EY Ops Chain, the organization's flagship solution for the industrialization of blockchain technology for enterprise users. EY Ops Chain is now one of the world's leading blockchain business applications, with seven use cases across the food and beverage, health care, financial services and asset management industries, as well as enterprise functions such as supply chain, procurement and asset management.	EY today announced the launch of the second generation of EY Blockchain Analyzer, a blockchain analytics tool, at the annual EY Global Blockchain Summit. The summit convenes more than 200 executives, analysts and EY clients to offer a first-time demo of the full EY blockchain solutions suite and provide a comprehensive view of the state of the technology's integration across industries.	EY announced today the launch of EY Smart Contract Analyzer, a smart contract testing and security service for the public Ethereum blockchain. The service, now entering a private beta test, will allow users to monitor smart contracts and tokens for known security risks.	EY today announced that it will release its zero-knowledge proof (ZKP) private transaction protocol into the public domain to help accelerate the adoption of secure, private transactions over public blockchains. For most enterprises and investors, the inability to conduct secure private transactions has been a major obstacle to fully embracing public blockchain networks.
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Ernst & Young LLP blockchain contacts

Paul Brody
EY Global Blockchain Leader
Work +1 415 894 8046
paul.brody@ey.com

Rajat Kapur
EY Blockchain Sales Leader
Work +1 312 879 2716
rajat.kapur@ey.com

Arwin Holmes
EY Blockchain Technology Operations Leader
Mobile +1 212 773 6710
arwin.holmes@ey.com

Quentin Drouot
EY OpsChain Platform Leader
Mobile +33 7 78 88 27 67
quentin.drouot@fr.ey.com

Craig Farrell
EY Blockchain Analyzer Platform Owner
Work +44 20 7197 7752
craig.farrell@uk.ey.com

Chen Zur
EY Americas Blockchain Advisory Lead
Work +1 212 773 7095
chen.zur@ey.com

Abhishek Sinha
EY Canada Blockchain Advisory Leader
Mobile +1 416 943 4537
abhishek.sinha@ca.ey.com

Xavier De Boissieu
EY EMEIA Blockchain Advisory Lead
Work +33 1 46 93 41 91
xavier.de.boissieu@fr.ey.com

Jimmy Ong
EY Asia-Pacific Blockchain Advisory Lead
Work +65 6309 8260
jimmy.ong@sg.ey.com

David Byrd
EY Blockchain Assurance Strategy Leader
Work +1 415 894 8801
david.byrd@ey.com

Jerry Gruner
EY Americas Blockchain Assurance Leader
Work +1 212 773 0076
jerry.gruner@ey.com

Amarjit Singh
EY EMEIA Blockchain Assurance Leader
Work +44 20 795 14419
asingh@uk.ey.com

Adam Gerrard
EY Asia-Pacific Blockchain Assurance Leader
Work +65 6309 6957
adam.gerrard@sg.ey.com

Dennis Post
EY Global Blockchain Tax Leader
Work +31 88 40 70997
dennis.post@nl.ey.com

For operations support, contact john.t.frechette@ey.com or mihir.s.kulkarni1@ey.com
For brand, marketing and communications support, contact marikit.kleinsmith@ey.com or lindsey.m.reichelt@ey.com

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