



SESSION ID: AM1540B

Connected Vehicle Identity Management Using Blockchain

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JIM MASON

◇ Background

- ◇ Enterprise Architect, Project Management, Data Services
- ◇ Sky Web Team – consultant
- ◇ Citizens Bank
- ◇ Fidelity
- ◇ IBM
- ◇ OTI
- ◇ Licensed Financial Advisor, Health insurance agent

◇ Blockchain

- ◇ Hyperledger Fabric since 2017
- ◇ Work with Fabric Doc team
- ◇ DMX blockchain architect
- ◇ DMX VINblock prototype
- ◇ Data compliance on blockchain
- ◇ Hyperledger working groups
- ◇ MOBI Vehicle Identity Std team
- ◇ MOBI Connected Data Std team

AGENDA

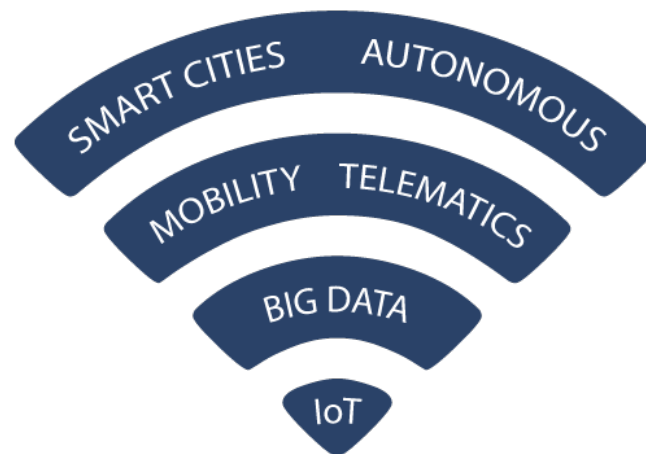
- ◇ **Mobility Marketplace Overview**
- ◇ Blockchain Basics Concepts
- ◇ Hyperledger Enterprise Blockchain Concepts
- ◇ VINBlock vehicle identity chain
- ◇ MOBI vehicle identity project
- ◇ Summary

AUTO INDUSTRY SNAPSHOT

- ◇ Auto Industry Snapshot
- ◇ 14 car company conglomerates control 64 brands worldwide

- ◇ United States
- ◇ Largest volume auto industry

- 16 OEMs Operating
- 39 Badges
- 50,000+ Dealers
- \$875+ Billion Sales
- 250+ Million Vehicles
- 225+ Million Drivers



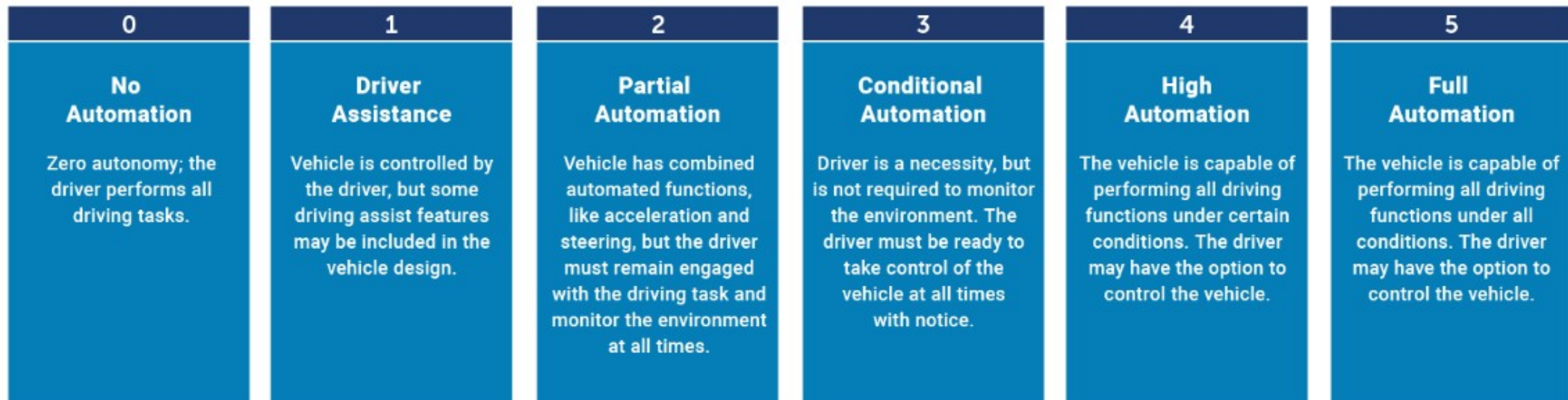
KEY CONCERNS IN MOBILITY

- ◇ Lower new car sales trends
- ◇ Rental car firms reducing fleets
- ◇ Shifting demands for vehicle types and fuel types
- ◇ Changes in ownership models, usage with ride sharing and subscriptions
- ◇ Increased regulations on privacy, vehicle usage
- ◇ Coordination of supply and demand across all forms of transportation
- ◇ Changes in supply chains and trade



MOBILITY TECHNOLOGY CHANGES

- ◇ Lower new car sales trends
- ◇ Software Defined Vehicles: the digital twin
- ◇ Decentralized, smart vehicle subsystems
- ◇ OTA vehicle software updates
- ◇ 5G vehicle to X connectivity
- ◇ AI, Blockchain, IoT, Analytics, Cloud, Automation
- ◇ Autonomous Driving levels

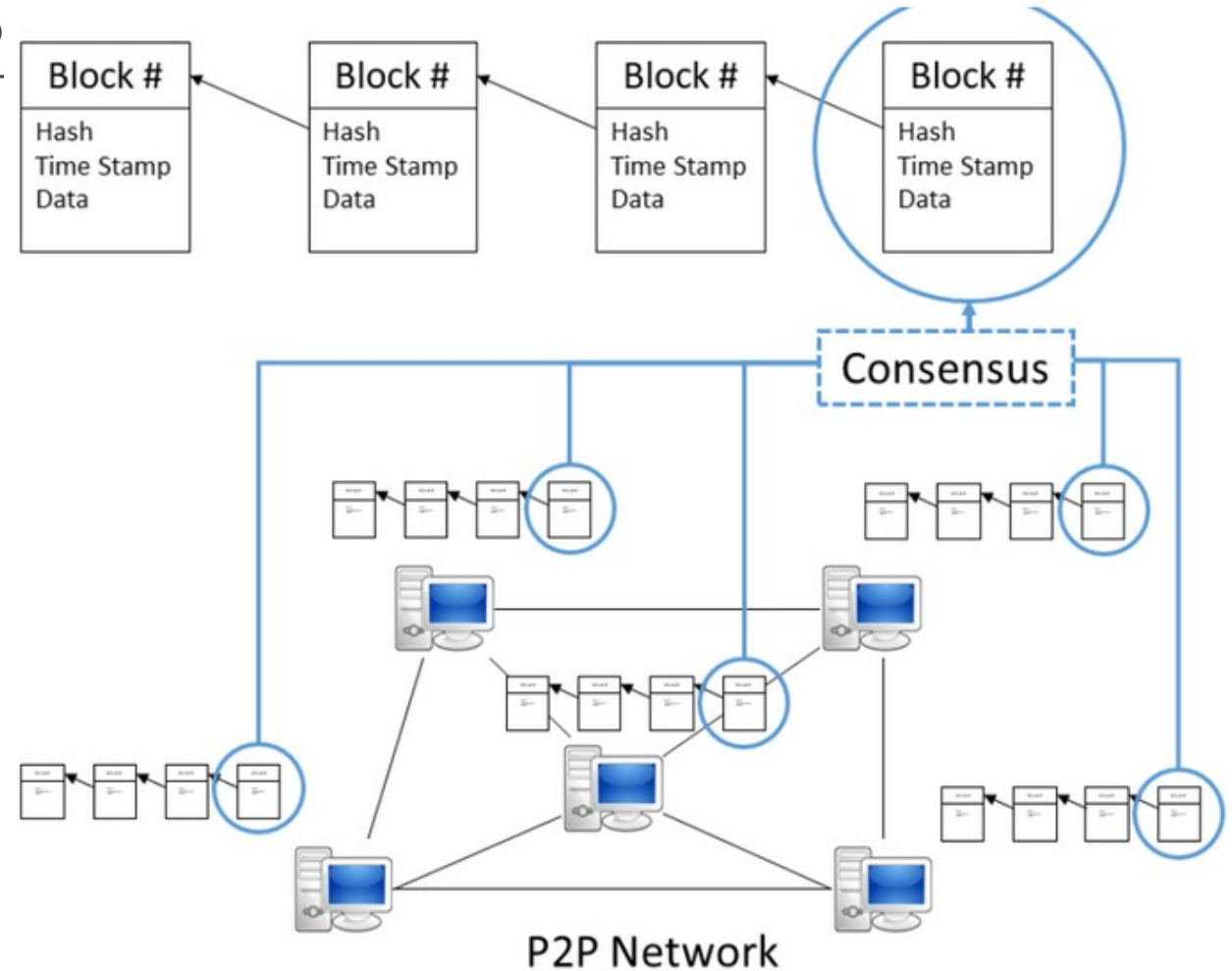


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BLOCKCHAIN FEATURES (DLT)

- ◆ **Peer Network -**
host organizations: each maintain a copy o shared ledger in synch using smart contract
- ◆ **Immutable, shared ledger -**
Hash chain of write-only transaction blocks ordered by date replicated on host organizations
- ◆ **Smart contract -**
secured program implements a contract between parties to validate, write transactions on the ledger with event support
- ◆ **Consensus method-**
policies define how transactions are approved, posted to the ledger
- ◆ **Governance services**
to manage the network



SMART CONTRACTS & TRANSACTION CONSENSUS

Smart Contracts

- All host orgs have contracts and ledgers
- Contracts define business rules
- Client app invokes contract method (buyItem..)
- Contract execution creates transaction on hosts
- **Transactions processed on consensus flow >>>**
- Apps can receive commit event for automation
- Contracts automatically governed in Fabric v2x

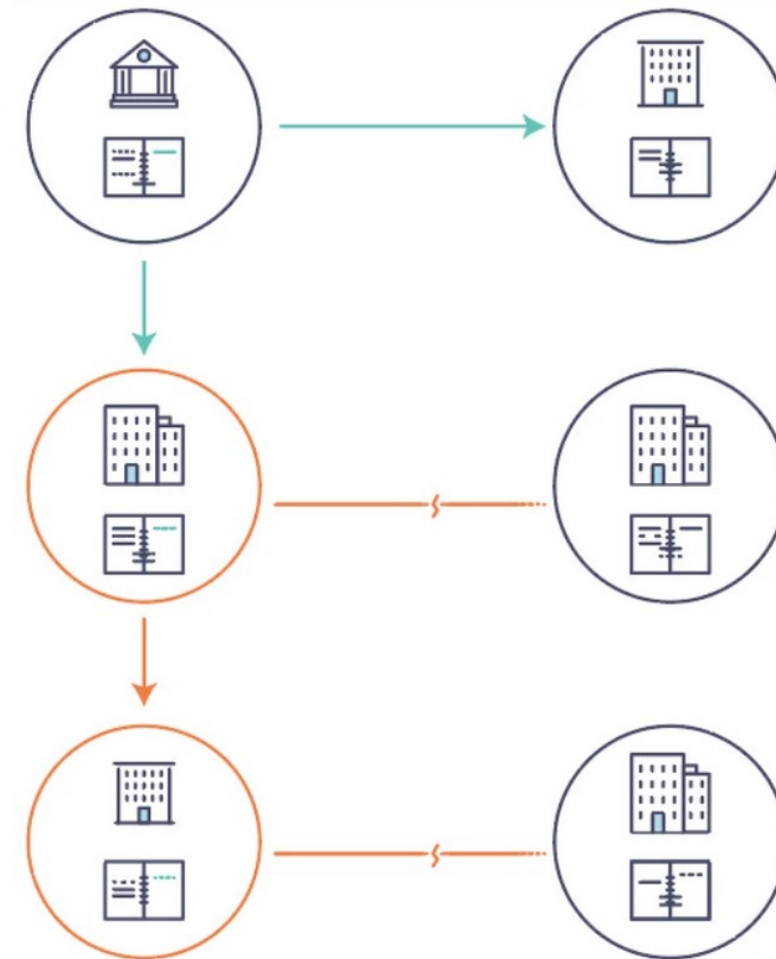
Transaction Consensus Flow

- Flexible consensus methods & policies
- Contract execution creates transaction results
- Hosts must agree transaction as valid
- Agreement based on consensus policy
- If agreed, transactions ordered in blocks
- Ordered transactions committed to ledgers
- transactions stored on ledgers



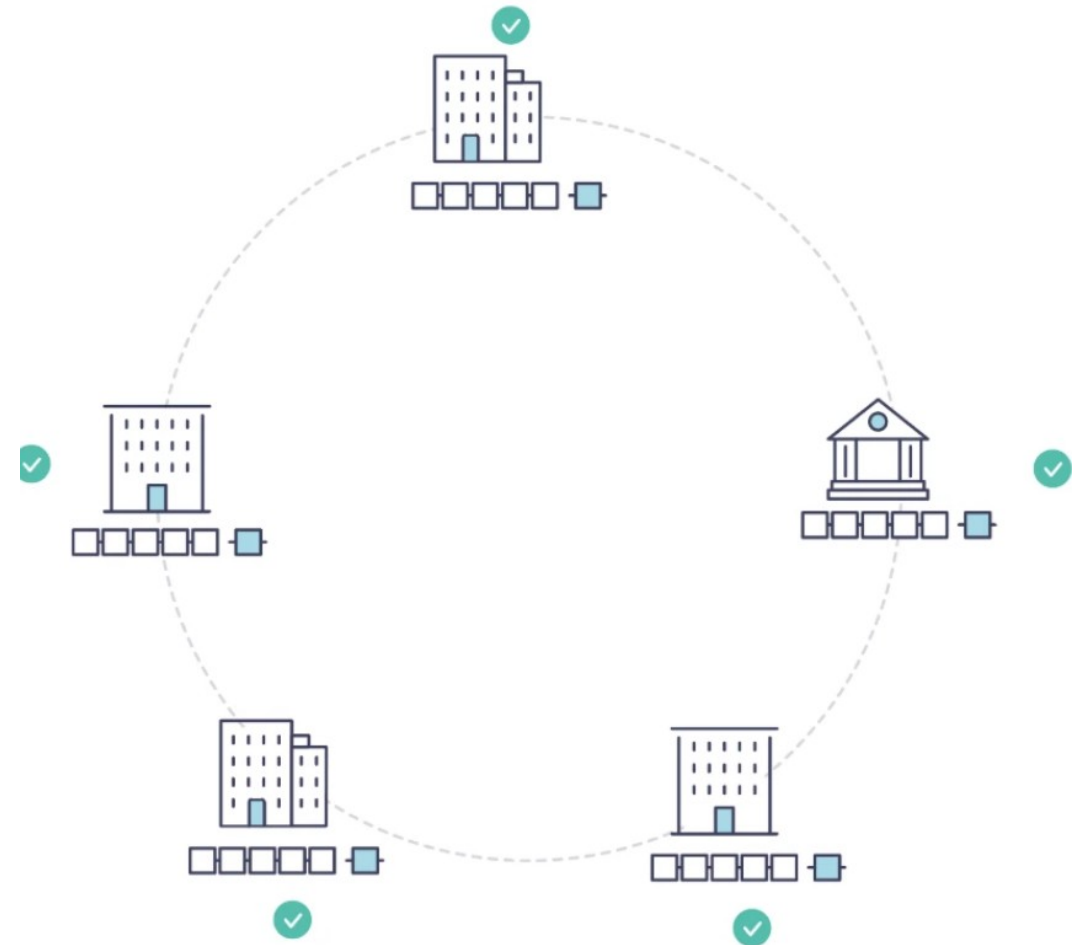
BUSINESS NETWORKS – INTEGRATION CHALLENGES

- ◇ Sample scenario looks at commercial paper life cycle
- ◇ Each organization has separate database with security, maintenance issues
- ◇ Intermediaries needed for validations to reduce counter party risks
- ◇ Transactions often move using point to point services
- ◇ Often signed documents required as well
- ◇ Added delays, errors, rework, audits, costs, risks, inefficiencies, trust & security issues, compliance issues



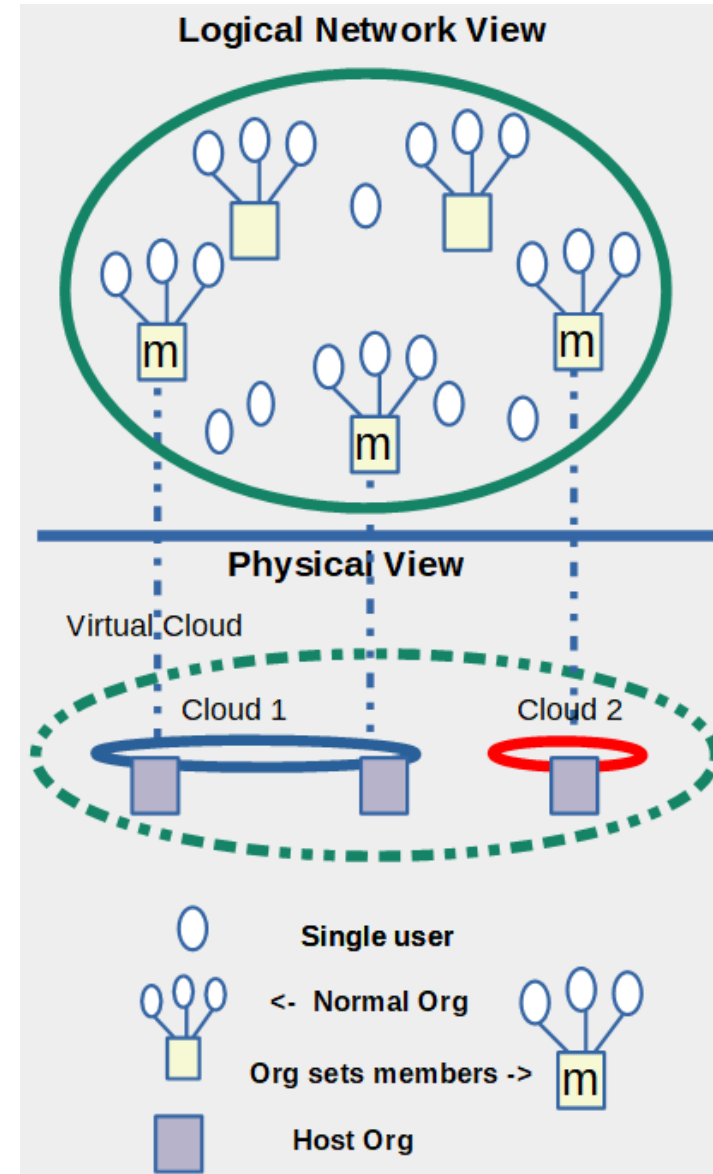
BLOCKCHAIN VALUE NETWORKS – COORDINATION BENEFITS

- ◇ Trusted, shared, historical, single version of the truth for all
- ◇ Client apps call smart contracts to write to the ledger
- ◇ Smart contracts write approved, signed transactions to shared, immutable ledger
- ◇ Fewer delays, errors, rework, audits, costs, risks, inefficiencies, security, compliance issues
- ◇ Coordination creates a Value Chain Network (VCN)
- ◇ Add automation, smart features next



BLOCKCHAIN LOGICAL VS PHYSICAL NETWORK

- ◇ Blockchain networks with **only a few organizations** (orgs)
 - Every org may be a host on the network and the network can perform well
- ◇ Blockchain networks with **many organizations**
 - A logical network may be created where:
 - A few large host organizations run the physical blockchain network of nodes
 - Many participant (Normal) organizations, users join the network but do not host it. Gray nodes are the blockchain host nodes.
 - Host organizations here set membership for all participants in logical network view (other users, organizations)
 - Green circle ("virtual cloud") contains physical clouds (1, 2)
 - An example would be OEM auto manufacturers and car dealers. A few OEMs host thousands of car dealers.

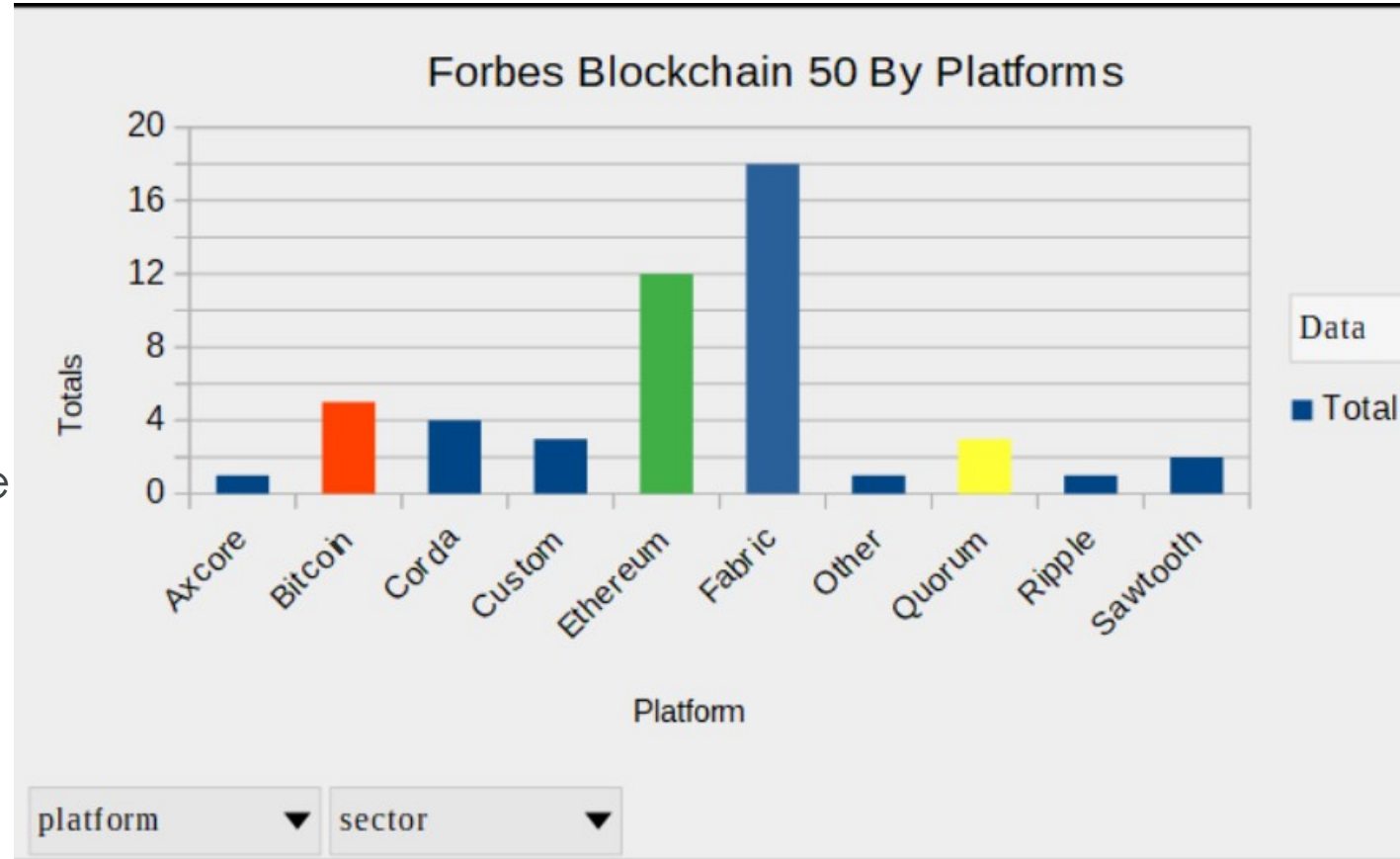


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ENTERPRISE BLOCKCHAIN PLATFORM CHOICES

- ◇ **Forbes Blockchain 50 article**
- ◇ Edited by Michael del Castillo and Matt Schifrin
- ◇ [Forbes Blockchain 50 article link](#)
- ◇ Highlights large companies using blockchain solutions
- ◇ Key impacts: speed business processes, increase transparency, lower costs, improve compliance on value chain networks
- ◇ Great place to understand blockchain value delivered
- ◇ I made assumptions on which blockchain platforms companies focused on
- ◇ Hyperledger Fabric, Ethereum, Corda biggest



HYPERLEDGER FABRIC BLOCKCHAIN: A LOT TO UNPACK

◆ Features

- ◆ A different type of distributed ledger
- ◆ Users have digital identities to access
- ◆ Transactions are signed by users
- ◆ Endorsed transactions hashed are “write-only”
- ◆ Smart contracts create transactions
- ◆ Can integrate with payments, tokens
- ◆ Public or private access, Permissioned or permissionless
- ◆ Options for private data
- ◆ Event support
- ◆ Identity and security options
- ◆ Java, Javascript, GO languages, tools
- ◆ Interoperability with other blockchains

◆ Impacts

- ◆ Shared real-time data across organizations
- ◆ Trusted, secured identity for users
- ◆ Proof who created a transaction
- ◆ Proof transactions approved, are not changed
- ◆ Authorized access only, no direct data access
- ◆ Enables payments, incentives for users
- ◆ Who can read and write to a blockchain
- ◆ Who can read shared, private transactions
- ◆ Automated workflows with transaction finality
- ◆ Easy support for compliance, regs (GDPR)
- ◆ Shorter learning curve for developers
- ◆ Hyperledger Cactus with Besu, Corda and more

SWT TWO CONTENT

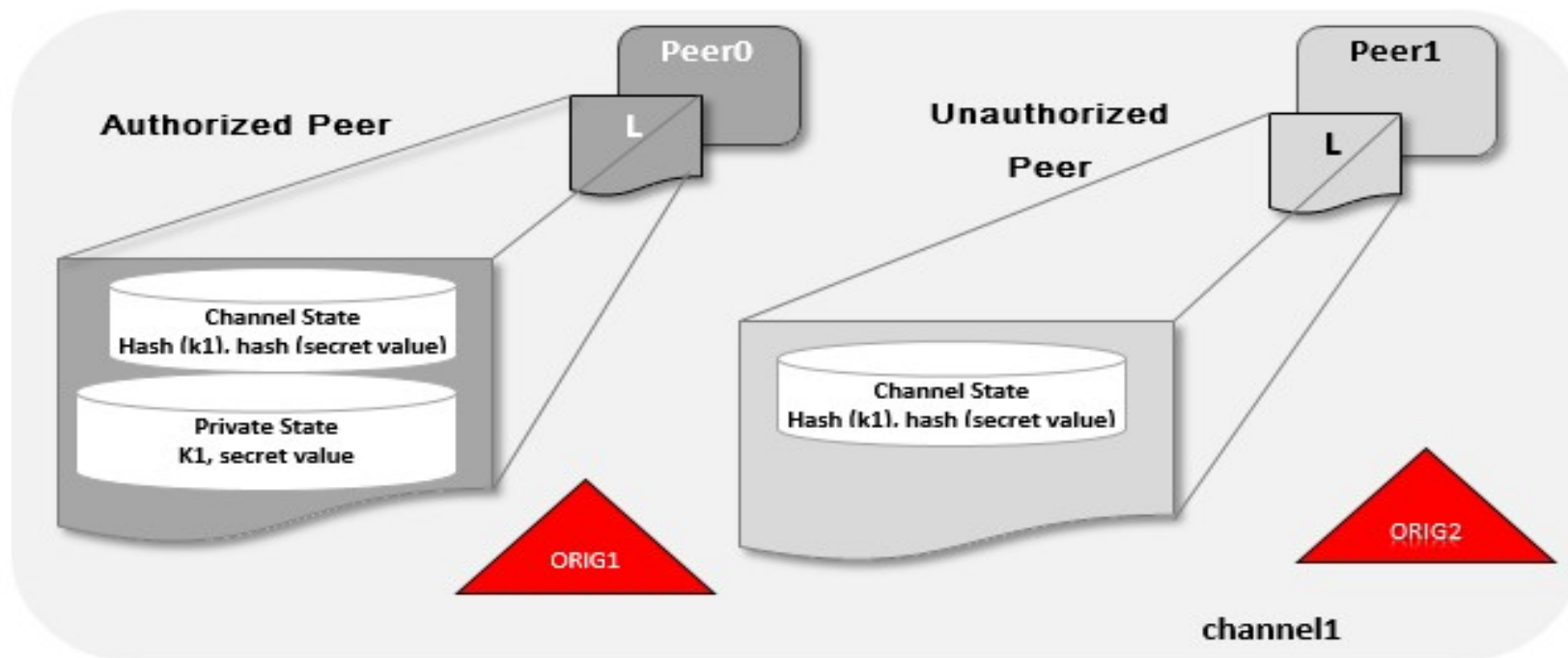
◇ Use Case:

◇ Org 1 buys an item from Org 3 at a contract price

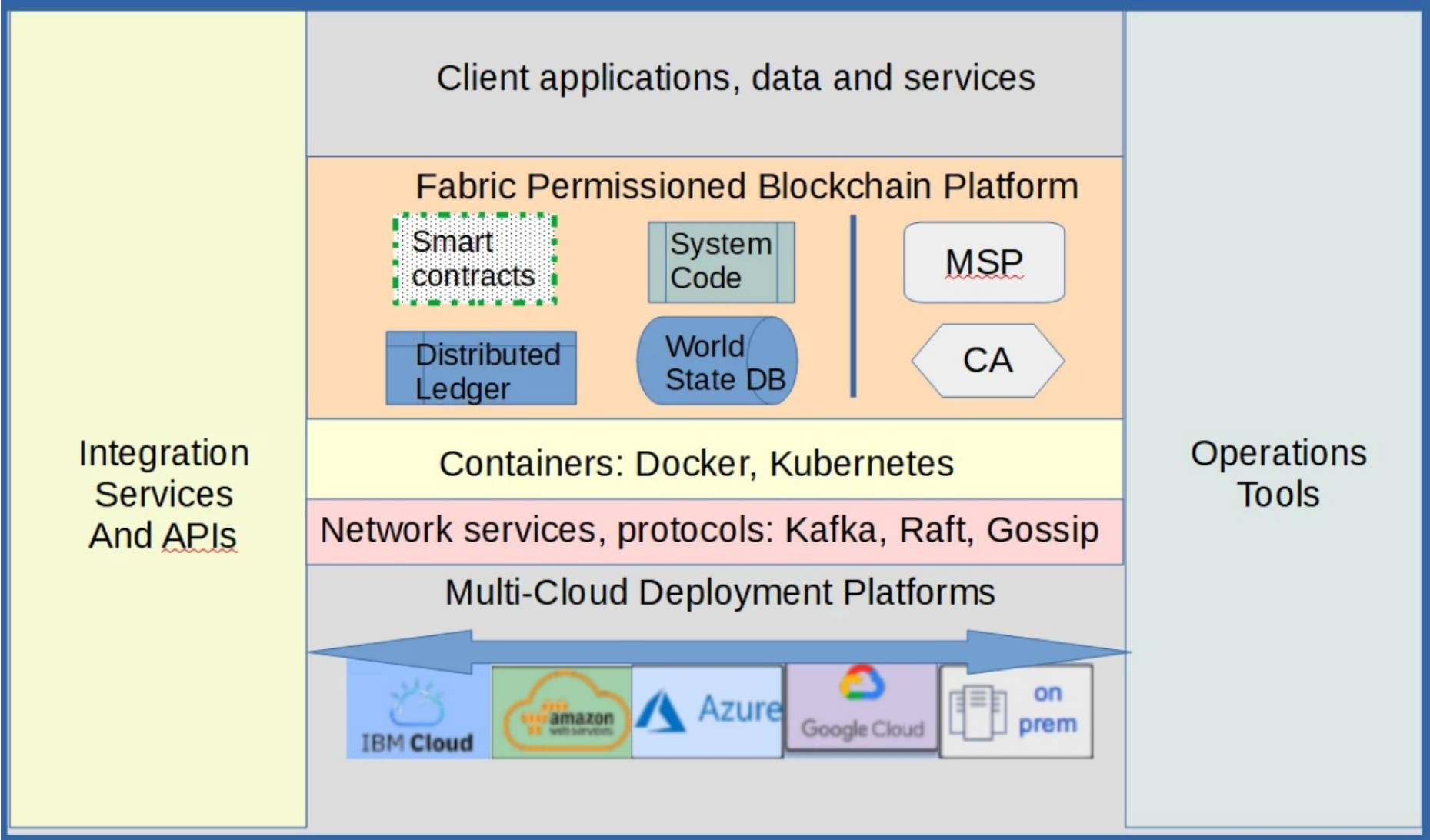
◇ Org 1 and Org 3 should have access to the transaction detail

◇ Other Orgs (Org 2) should know that the transaction exists without any detail (just a hash on the blockchain)

◇ The private data for Org 1 and Org 3 is sent signed and encrypted and stored in an off-chain data store



CONCEPTUAL FABRIC SOFTWARE STACK



IDENTITY & SECURITY

◇ Identity Management

- ◇ Fabric provides multiple options for identity management as a permissioned, enterprise blockchain
- ◇ Strategy 1 > Built in MSP (Membership Services Provider) and CA (Certificate Authority) support
- ◇ Strategy 2 > Integrate existing Security Services through standard LDAP interfaces
- ◇ Strategy 3 > Integrate another blockchain identity management system (Sovrin, Indy, etc)

◇ Security

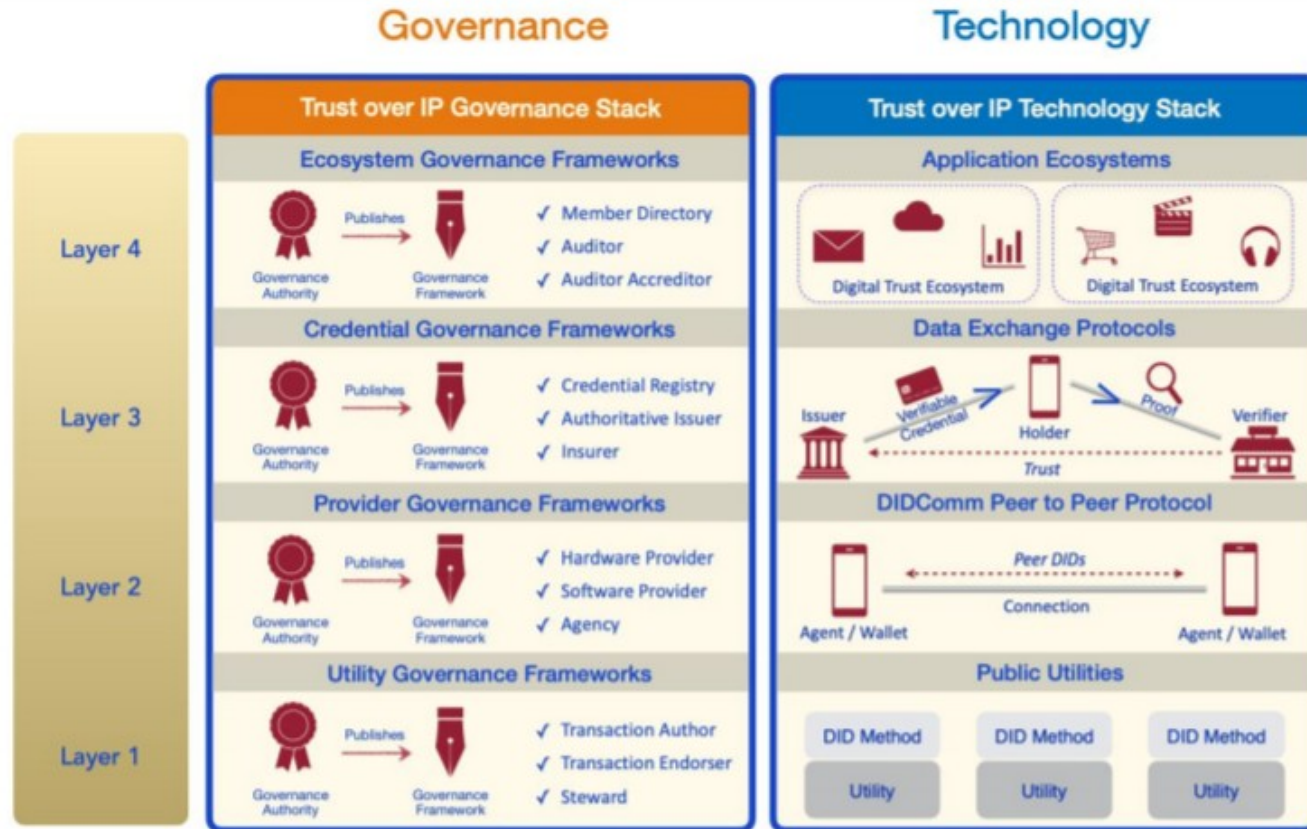
- ◇ Organizations configure security policies in Fabric allowing it to fit many usage scenarios
- ◇ All users and organizations have certificates, keys for digital signatures
- ◇ All transactions and smart contracts are signed digitally providing an audit trail
- ◇ A Fabric network uses TLS encrypted connections ensuring all data in-flight is secure
- ◇ The blockchain ledger can be encrypted ensuring data at-rest is secure
- ◇ New options are in progress for TEE - Trusted Execution Environments - that can ensure data-in-memory is secure

MOVE TO DECENTRALIZED DIGITAL TRUST SYSTEMS

- ◇ New Digital Trust frameworks
- ◇ Efficient, peer to peer model
 - Reduces need for central systems
- ◇ SSI – Self Sovereign Identity
 - Issuer issues Decentralized ID Doc (DID)
 - You decide what data to share when
- ◇ Digital Wallets
 - Store your IDs, credentials, payment types
- ◇ Trust Over IP framework
 - Automates trust between systems
 - 4 layers for trust with matching governance

Human Trust

Technical Trust



VERIFIABLE ORGANIZATIONS NETWORK (VON)

- ◇ Government issues credentials to orgs
- ◇ Orgs share credentials to other orgs

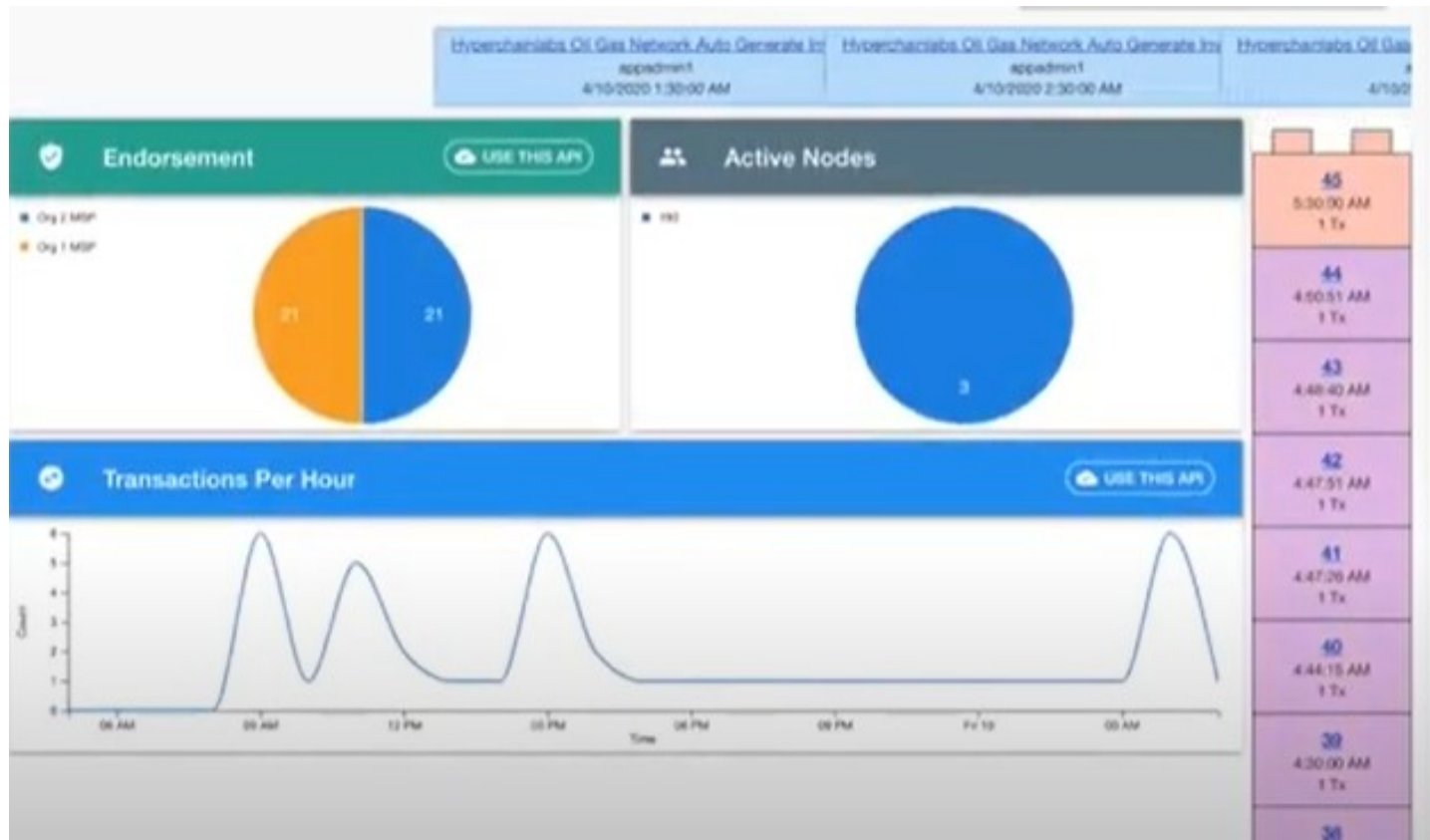
What if ... businesses could provide verifiable proofs about qualifications when transacting online?



15:02 / 55:43

Mary *owns* this proof-of status for her business

- ◇ Automates oil field trucking end to end
- ◇ Cut total overhead costs > 50%
- ◇ All parties have blockchain identity
- ◇ Tanks have smart IoT sensors
- ◇ Sensors call for service when tank full using smart contract
- ◇ Truckers accept disposal requests
- ◇ Mobile app lets trucker accept order using smart contract
- ◇ Tank sensors notify tank emptied
- ◇ automated payment via smart contract
- ◇ Uses AI, blockchain, IoT, cloud, automation



PLAN BLOCKCHAIN: WEF BLOCKCHAIN TOOLKIT

World Economic Forum Blockchain Toolkit

Enterprise Blockchain Requirements



Figure 1.1 – All 14 modules available in this toolkit

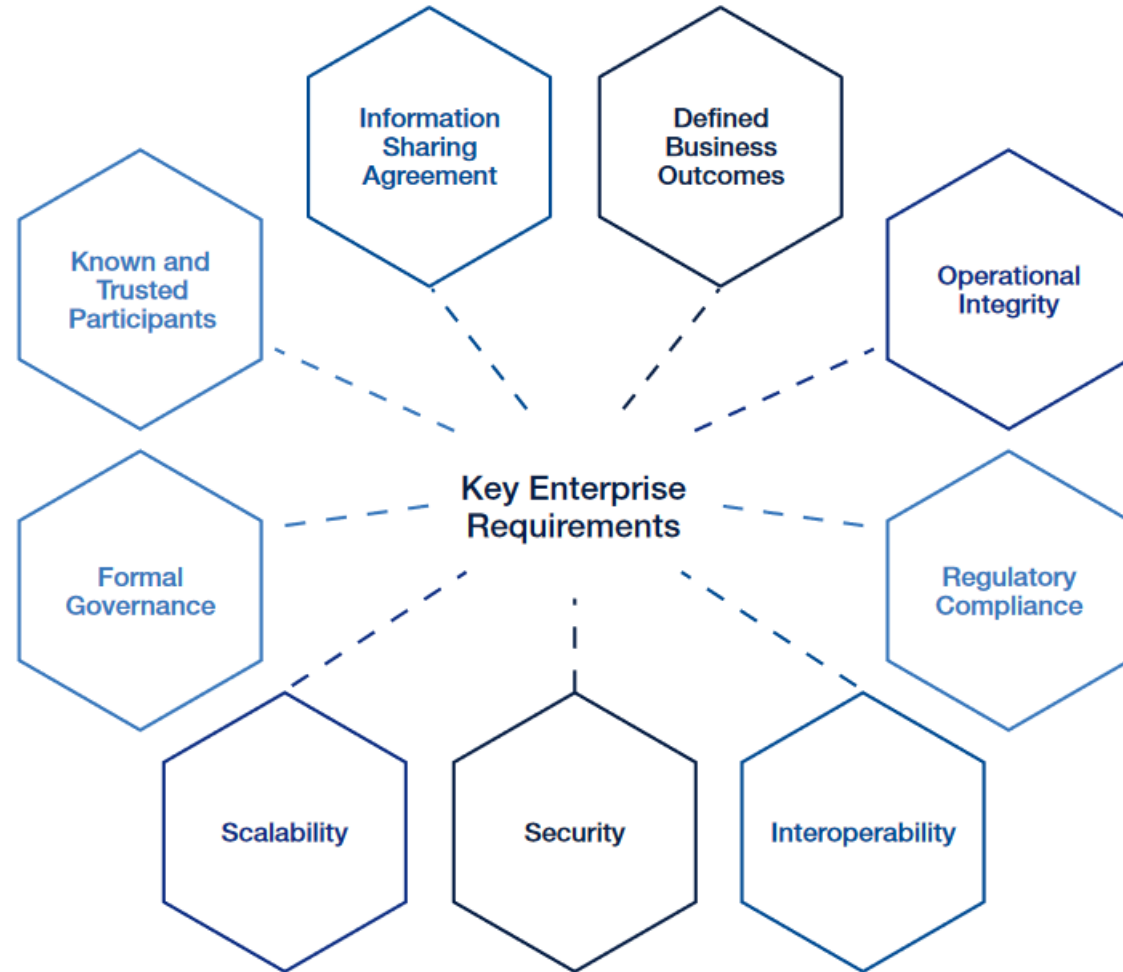


Figure 1.2 – Essential considerations typical for enterprise technology solutions

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DMX VINBLOCK CONCEPTS

- ◇ Automotive Ecosystem:
 - OEMs, Dealers, Parts, Finance services, Regulators, Infrastructure, Carriers, Consumers
- ◇ An Enterprise Blockchain Ecosystem for automotive supply chain will improve:
 - Trust
 - Privacy
 - Security
 - Mobility
 - Transparency

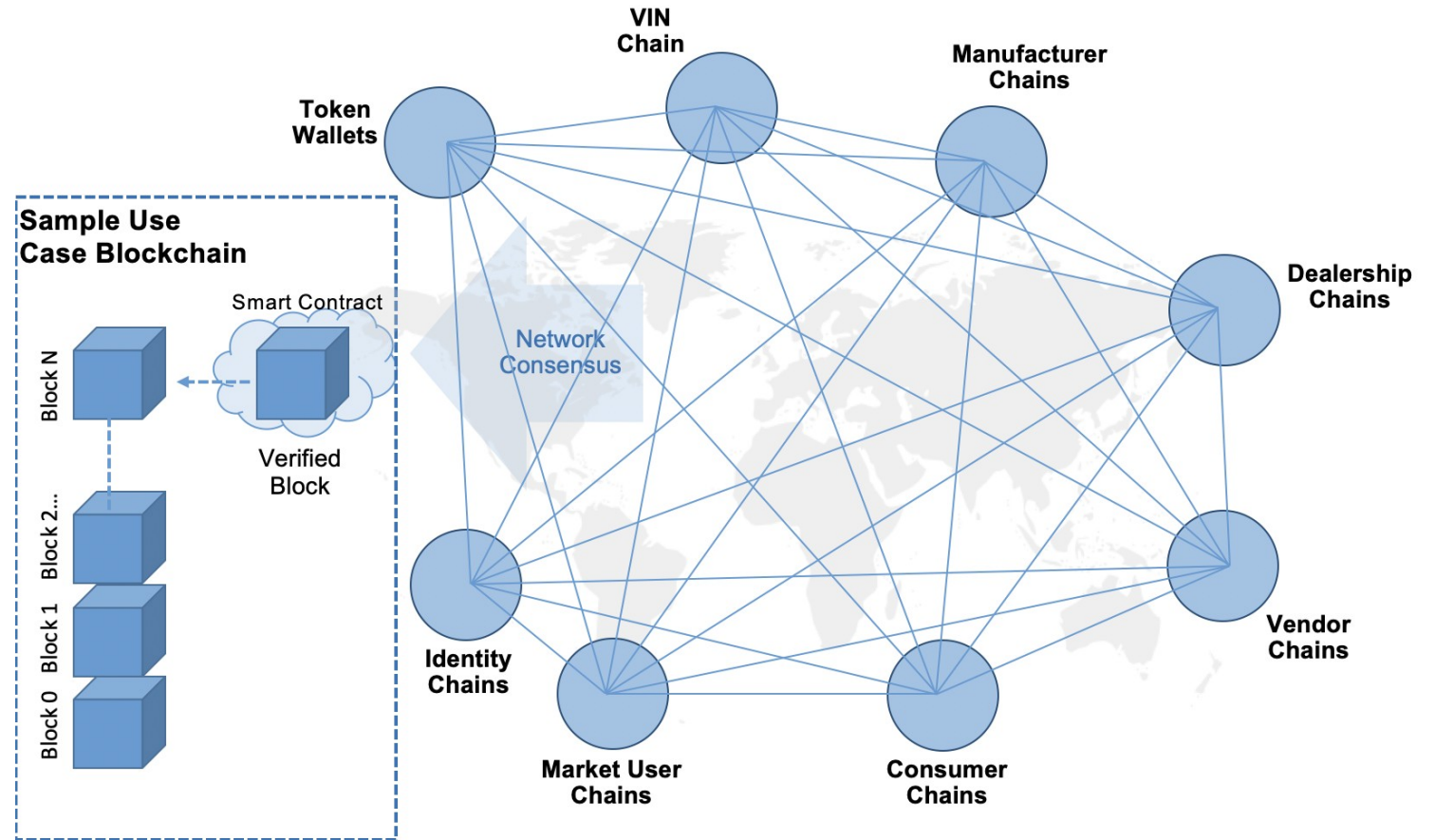


VINBLOCK SOLUTION

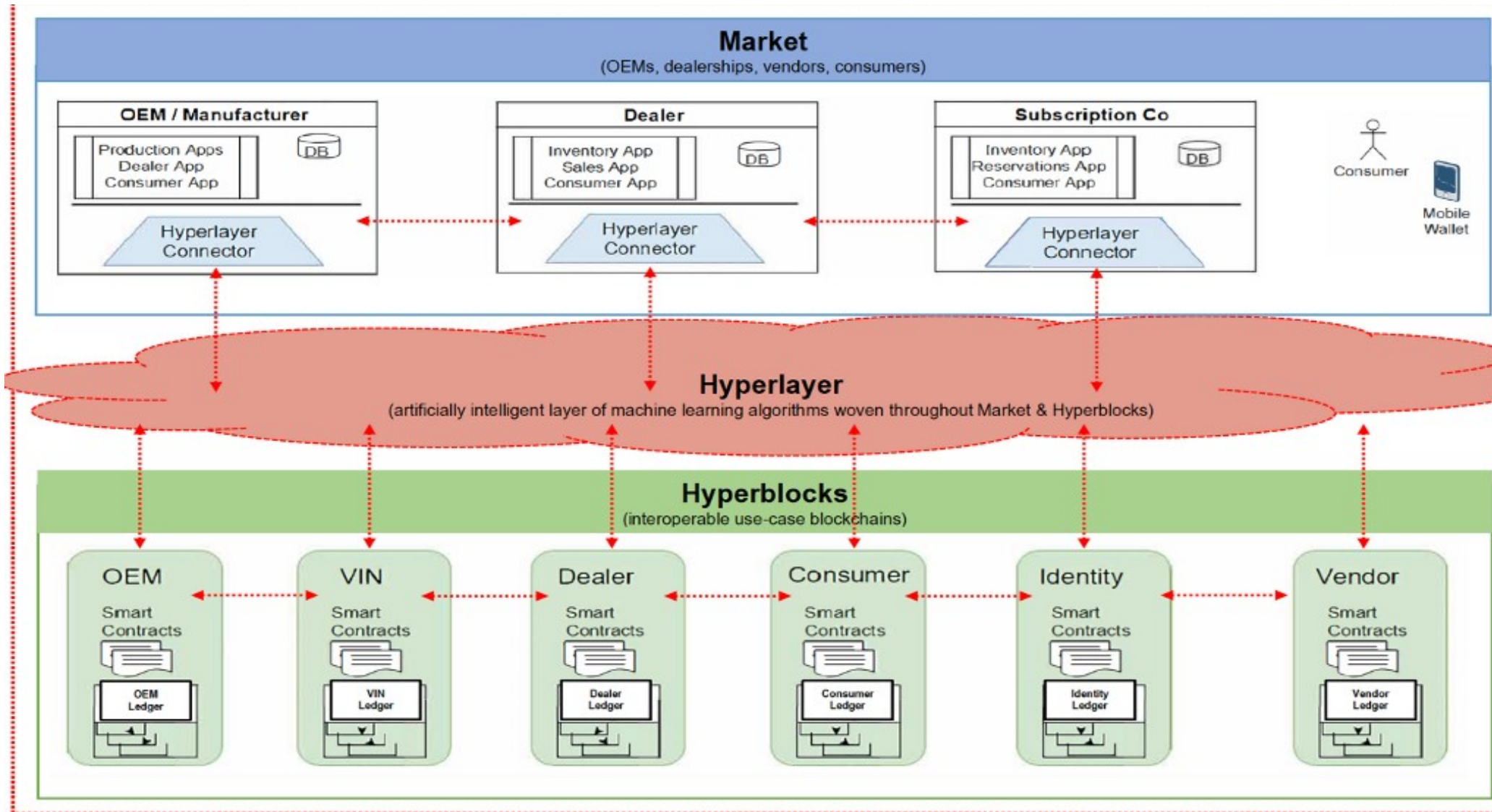
- ◇ Vehicle Identity lifecycle: birth to scrap
- ◇ Transparent, secure blockchain ecosystem of life time data across all parties



Automotive Industry Blockchain



DMX HYPERLAYER BLOCKCHAIN ARCHITECTURE



Vehicle Identity: the First Use Case

- ◇ VINblock POC: VirtualBox, Ubuntu, Fabric
- ◇ List of VIN operations
- ◇ Create a VIN
- ◇ Change a VIN owner
- ◇ Query a VIN
- ◇ Remote access VIN in blockchain CouchDb

VINblock applications

An OEM–dealer–vendor–consumer VIN blockchain providing secure, immutable, transparent and relevant vehicle data to industry users. First in series of interoperable use case blockchains to form industry ecosystem.

VINblock applications list

- ◇ VIN creation // newly manufactured or historical imports
- ◇ VIN transactions // title ownership changes
- ◇ VIN mobility // rentals, subscriptions, loaners
- ◇ VIN shipments // intrastate, interstate, international
- ◇ VIN service / repairs // accidents, repairs, maintenance
- ◇ VIN modifications // vehicle upgrades, rebuilds, modifications
- ◇ VIN salvage // scrap, junk, salvage status

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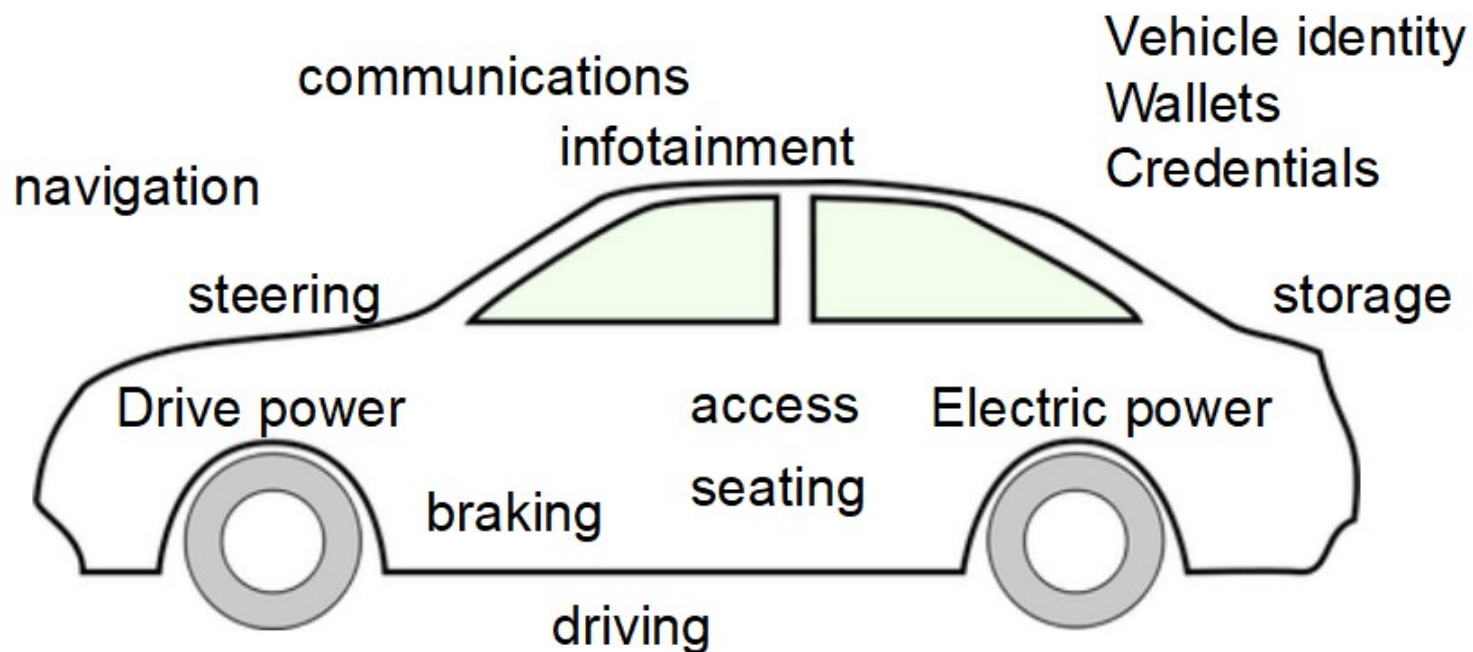
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- ◇ **MOBI is a member-led consortium**
- ◇ Working to make transportation greener, more efficient, and more affordable, using blockchain and related technologies.
- ◇ Through research, education, innovation platforms, colloquiums, and working groups, MOBI works to create and promote high industry standards for smart mobility blockchain adoption



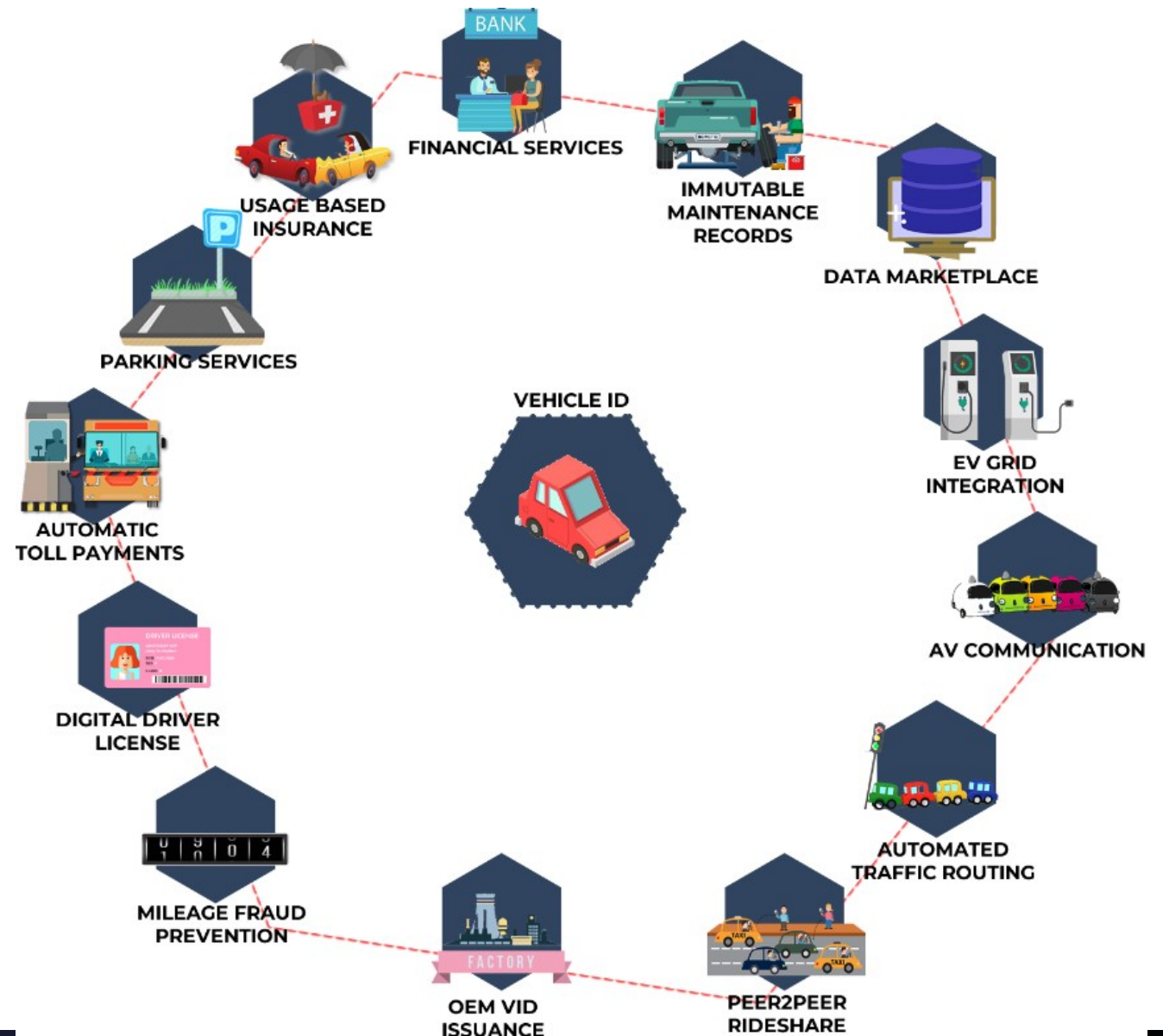
- ◇ **MOBI Updates**
- ◇ 20+ teams
- ◇ Sample projects
 - IOT parking and driving communication
 - Decentralized network formation of drones
 - Route and vehicle status data on blockchain to help with emergencies
 - Preventing odometer fraud
 - Smart intersection and negotiation of routes
 - Payments on blockchain V2V and V2X
- ◇ Geographic spread : North America, Europe, China, India
- ◇ Participants: MOBI members and outside

- ◇ Vehicle Identity and Birth Certificate
- ◇ Vehicle Wallets
- ◇ Vehicle Credentials (registrations etc)
- ◇ Trusted vehicle history for significant events and subsystems
- ◇ Trusted OTA updates
- ◇ Autonomous driving support levels for vehicles
- ◇ Infotainment systems
- ◇ Vehicle operations systems
- ◇ Vehicle safety systems



MOBI OFF VEHICLE APPLICATIONS

- ◇ pay for road use, tolls, parking
- ◇ reduce traffic congestion
- ◇ improve safety and reduce accidents
- ◇ real-time accident reporting
- ◇ sell data to businesses and organizations
- ◇ sell open seats in vehicles for trips
- ◇ earn credits for taking preferred routes
- ◇ Alternate transportation methods
 - Bus, rail, scooters, bikes, ride shares
- ◇ real-time carbon emissions tracking
- ◇ usage-based insurance
- ◇ automated maintenance and service



- ◇ VID is the digital identity of a unique vehicle providing the necessary bridge to the physical asset that allows vehicle owners, users, and the transportation IoT ecosystem to trust and verify the vehicle's identity
- ◇ The Mobility Open Blockchain Initiative (MOBI) is working with BMW, Ford, GM, Groupe Renault, Honda, and other major automakers to develop a multi-stakeholder Proof of Concept (PoC) for a blockchain-based Vehicle Identity (VID)
- ◇ Vehicle Identity (& wallets) foundational
- ◇ First Vehicle Identity (VID) Standard out
- ◇ VID part 2 – define a valid POC model
- ◇ Review solutions for: Security, Enterprise readiness, Support for standards, Scalability, Integration of specific protocols
- ◇ Identity and access management approaches focused on SSI, TOIP
- ◇ Identity creation, revocation of Identities, Identity Proofing
- ◇ Scalability, Portability of data across data stores
- ◇ Portability of identity, keys/key pairs across devices
- ◇ Decentralization of Infrastructure
- ◇ Data management: What data is On-Chain vs. Off-Chain? Why? Finality?
- ◇ Data Sovereignty: Selective Disclosure of data to share
- ◇ Which automotive use cases are addressed?
- ◇ Integration with existing IAM: SSO and Enterprise IAM integration?
- ◇ Interoperability: Support for OIDC, SAML, FIDO for interoperability
- ◇ Control for private data, public data and asset owner changes
- ◇ Privacy: How does your solution address privacy concerns?
- ◇ Protection of data: Do you use solutions like Zero-Knowledge proof ?

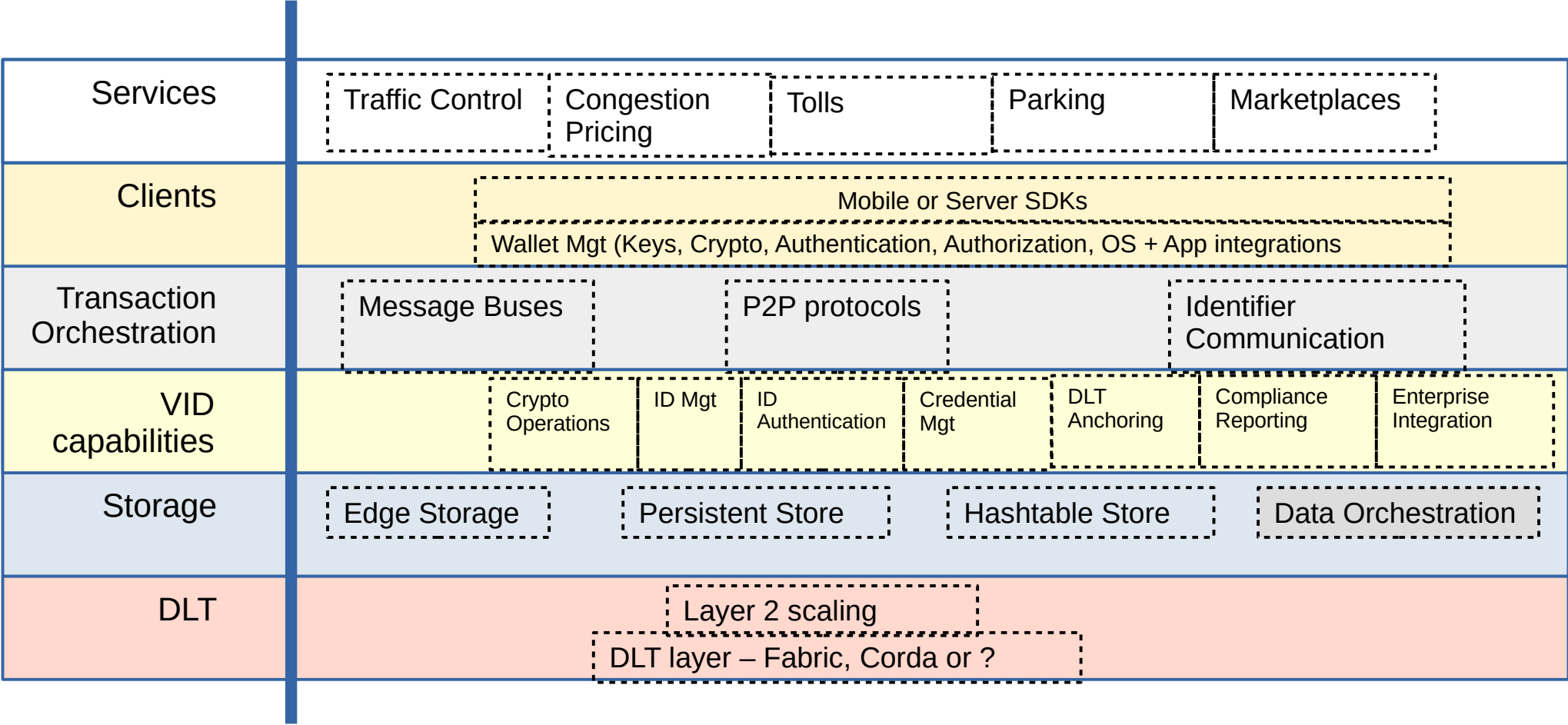
Team Focus

- ◇ The connected vehicle is trusted, intelligent, shared, automated data services to external applications and marketplaces.
- ◇ Autonomous Vehicles add services for driving, smart applications, direct payment services etc
- ◇ The team explores how blockchain adds value in connected applications and marketplaces.
- ◇ Blockchain's trust, transparency, privacy and collaboration features can add value for many connected applications.
- ◇ Define key use cases for connected data flows
- ◇ Define models for connected data
- ◇ Evaluate existing standards, technologies
- ◇ Draft connected data standards for key use cases
- ◇ Specify candidate POC recommendations

Candidate Connected Data Use Cases

- ◇ pay for road use, tolls, parking
- ◇ reduce traffic congestion
- ◇ improve safety and reduce accidents, reporting
- ◇ Autonomous vehicle driving
- ◇ sell data to businesses and organizations
- ◇ sell open seats in vehicles for trips
- ◇ earn credits for taking preferred routes
- ◇ Alternate transportation methods
 - Bus, rail, scooters, bikes, ride shares
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VEHICLE SERVICES LAYER MODEL



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BLOCKCHAIN SOLUTION DELIVERY PROCESS

Our Delivery Process

- ◇ Engage – Understand Community, Needs
- ◇ Assess – Assess Value Opportunities
- ◇ Plan – Define Solution
- ◇ Deliver – Deliver Solution
- ◇ Implement – Implement Solution Support
- ◇ Grow – Grow the Solution, Network

Keys for a Value Chain Trust Network

- ◇ Who are the parties are in the Business Network?
- ◇ What value does each role deliver?
- ◇ What challenges does each role have?
- ◇ Is there counter party risk?
- ◇ How are trust issues resolved?
- ◇ How are identity, security managed?
- ◇ Do parties cooperate now? How?
- ◇ Are the processes clear? Efficient?
- ◇ What are key decisions & events?
- ◇ How do intermediaries add value?
- ◇ What are regulations, compliance issues?
- ◇ How can the Value Chain Network grow?

SUMMARY

What We Covered:

- ◇ How the MOBI Vehicle blockchain standards support a trusted, connected vehicle ecosystem
- ◇ Key Hyperledger Fabric blockchain features that support identity, privacy, transparency, trust and scalability
- ◇ What a vehicle identity blockchain service is and the steps to build it

Final Thoughts

- ◇ Mobility methods, fuel sources and preferences are changing rapidly
- ◇ Newer technologies are providing mobility solutions that were never possible before
 - Enterprise blockchain
 - Digital Trust
 - AI and Machine Learning
 - 5G connectivity for vehicles
 - IoT integration on vehicles and infrastructure
 - Automation of many systems
 - Cloud services

QUESTIONS?

Thank you! You can find me at:



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