Blockchain Labs
by HCL Technologies

HCL Blockchain Capability Overview

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AGENDA

- What's happening in Blockchain World
- Practice capability Overview
- IP & Solutions
- Frameworks
- Key Case Studies

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Blockchain is a Distributed Cryptographic Ledger Technology

that maintains a continuously-growing list of ordered records (assets & transactions) called blocks, each linked to the previous

Distributed

Transactions are ‘shared’ between participants, computations are distributed across participating nodes on the network

Decentralized

No central ‘point of control’. Decision making (ex. acceptance of ‘valid’ transactions) is through a ‘Consensus’ mechanism between participating nodes. Each node has their own copy of records through replication

Secure

Transaction records are cryptographically secured

Forward Looking and Immutable

Blocks of transactions added to Blockchain in a chronological (timestamped) sequence. Retrospective editing to ‘accepted’ transactions practically impossible

Permissioned v/s Public

Different implementations with varying degree of access control – Public (everybody sees everything) to Permissioned (offer access control mechanisms)

Smart Contracts

Different Blockchain implementations enable ‘definition’ and ‘programmatic execution’ of Smart Contracts between Parties on the Blockchain Network

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WHAT'S HAPPENING IN BLOCKCHAIN WORLD

BAAS/ Cloud Offerings

Blockchain as a Service allows consumers to use the cloud-based services to develop, use and host their blockchain apps, functions and smart contracts.

Containerization

Containerization is making it easier for IT organizations to consume a blockchain service being hosted on any cloud platform

Smart Contract Adoption

Organizations are adopting pragmatic smart contracts to simplify the way conclude agreements, execute transactions and grant authorizations.

Unconventional Use cases

Apart from the usual use cases, many unorthodox undertakings are gaining popularity on the blockchain.
Ex- MDM on blockchain

Interoperable platforms

Blockchain interoperability aims to improve information sharing across blockchain systems making it more practical for real world usage.

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- **Practice capability Overview**
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- Key Case Studies

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HCL BLOCKCHAIN PRACTICE OVERVIEW

BLOCKCHAIN TEAM COMPENTENCY

80+ Practitioners **5+** years of incubation **10+** customers and growing **35+** Blockchain Certified Professionals

BLOCKCHAIN & CLOUD PLATFORM COVERAGE

HYPERLEDGER, ethereum, corda, MultiChain, amazon web services, Microsoft Azure, IBM Cloud

BLOCKCHAIN CONSORTIUM & ALLIANCES

BiTA BLOCKCHAIN IN TRANSPORT ALLIANCE, ENTERPRISE ETHEREUM ALLIANCE, r3, SAP, IBM, Microsoft

RECOGNITIONS

Everest Group® Leader - 2020

ISG Leader - 2019

AVASANT Leading "innovators" - 2018

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HCL BLOCKCHAIN PRACTICE OVERVIEW – IPS AND FRAMEWORKS

SERVICES

CONSULTING • ON BOARDING & OPERATIONS • IMPLEMENTATION • INTEGRATION WITH ECOSYSTEM | ECOSYSTEM MANAGEMENT SERVICES

IPs & SOLUTIONS

COTRUST BLOCKCHAIN PLATFORM • OPS MANAGER • SMART CODE • COTRUST CLOUD NATIVE

FRAMEWORKS

SecurBlock • RACE • Design Thinking • Platform Evaluation • Business case

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BLOCKCHAIN JOURNEY & ASSOCIATED SERVICE OFFERINGS

USE CASE ASSESSMENT

- Assessing and defining the use case
- Brainstorming on Blockchain applicability
- Assessing business impact

RACE - Use Case Evaluation Framework

STRATEGY AND ROADMAP ASSESSMENT

- Deployment strategy assessment
- Blockchain Platform Evaluation
- User Stories Formulation, Design Customer Journey & Process Flow
- Blockchain Workshops & Boot camps
- Blockchain Roadmap definition

Business Case Framework

Platform Evaluation Framework

SOLUTION DESIGN AND IMPLEMENTATION

- Technical design & Architecture
- Blockchain Network setup & operations
- Participant on-boarding
- Implementation of Foundational Services like Authorizations, Authentication etc.
- Workflow Management
- Developing Blockchain APIs
- Smart Contracts Implementations

CoTrust Platform

CoTrust Smart Code

SecurBlock

CoTrust Ops Manager

ECOSYSTEM MANAGEMENT

- Network management & Operations
- Defining Blockchain Governance Model
- Communicate with existing enterprise application
- Data Strategy & Assessment

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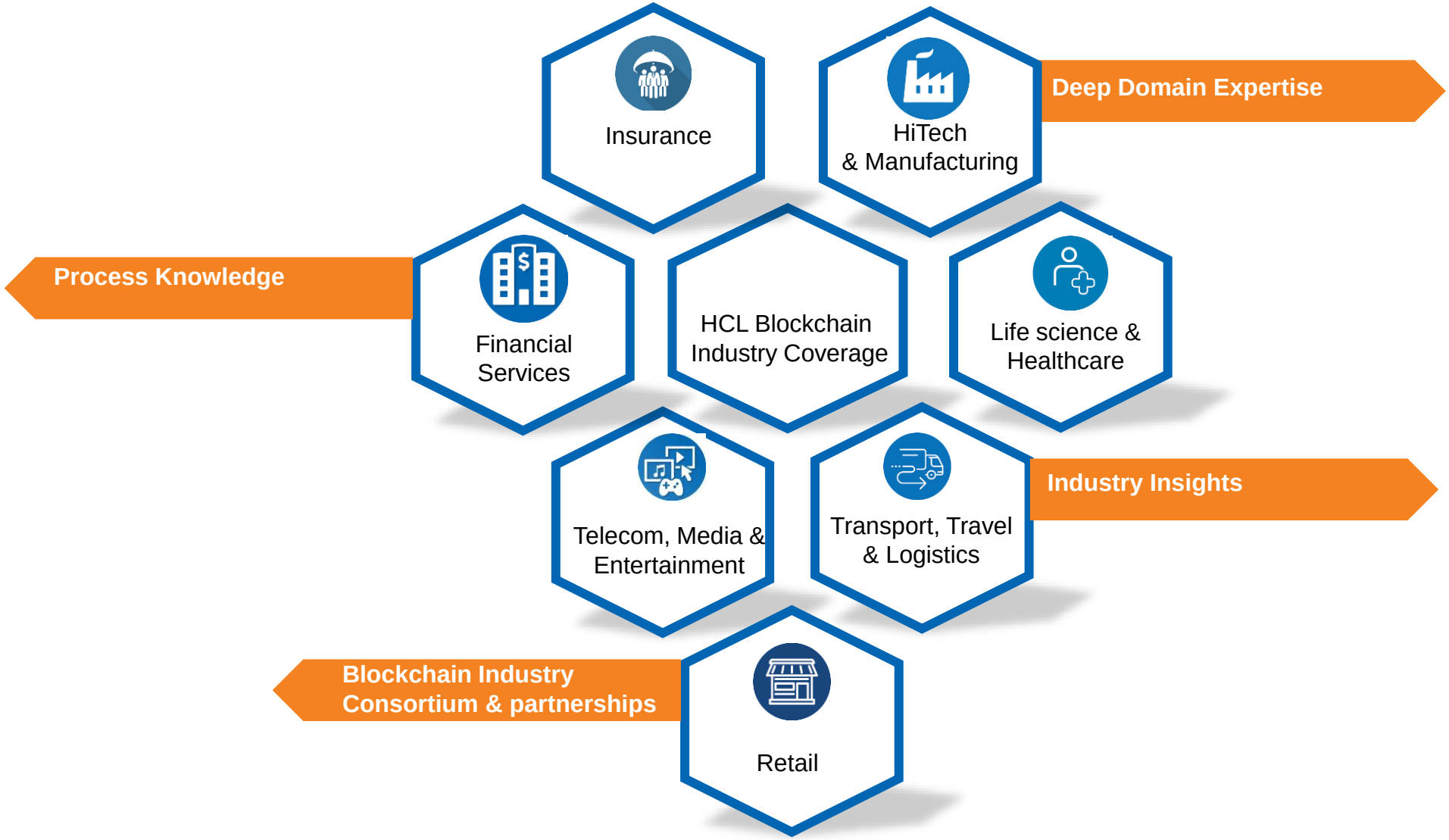
BLOCKCHAIN INDUSTRY EXPERTISE AND ENABLEMENT



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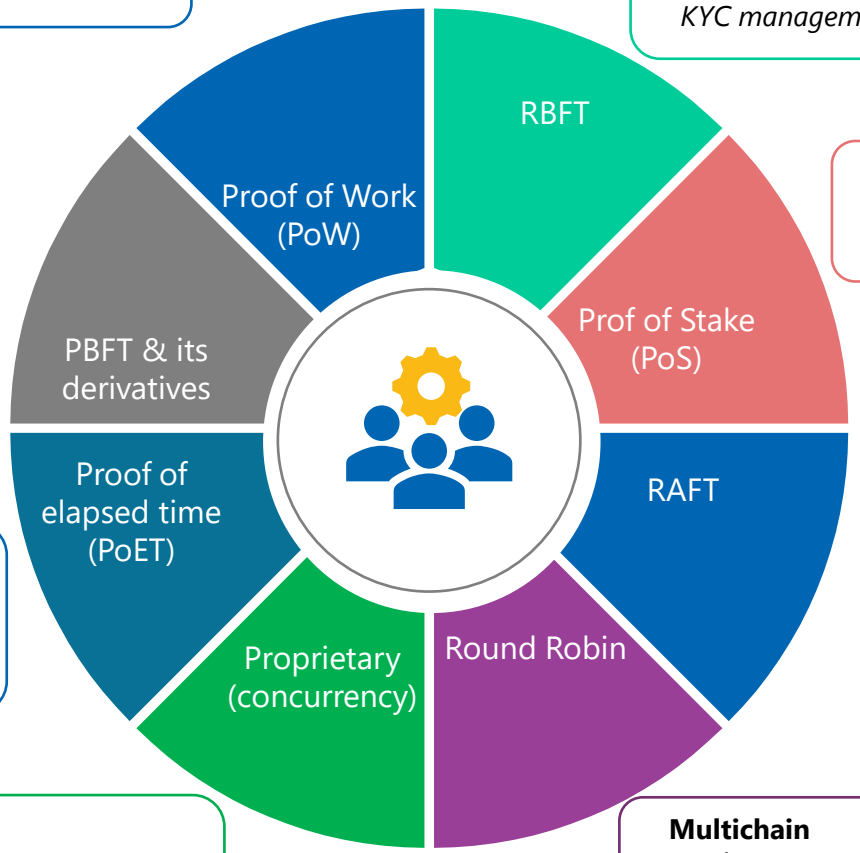
OUR EXPERIENCE ON VARIOUS CONSENSUS MECHANISMS

Bitcoin
Proprietary cryptocurrencies
Involvement- Explored

Hyperledger Indy
Key Involvement
Developed 'BlocKYC'- ZKP compliant KYC management Platform

Ethereum
Key Involvements-
- *Developed identity management system for Europe based financial institution*

Hyperledger Fabric
Key involvement
- *Supply chain management solution for Global Hi-tech company*
- *Account Settlement system for world's largest money remittance service provider*



Casper (Ethereum)
Involvement- Explored

Hyperledger Sawtooth
Key Involvement
- *Reference data management for leading bank in South Africa*

Hyperledger Fabric
(Fabric has pluggable consensus)
Key Involvement
- *Art Tracker for leading fine arts tracking company*
- *Evidence Management system for global information mgmt. company*

R3 Corda
Key Involvement
- *Developed 'BuildingBlock'- MNC insurance policy solution*

Multichain
Involvement- Explored

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INDUSTRY WORK- HACKATHONS & WORKGROUPS

HYPERLEDGER MEETUP

- Active in Hyperledger India Chapter
- Co-organiser of Hyperledger Meetup Group

HYPERHACK 2020

- 2nd Runners Up in Hyperhack 2020 (Organised by Hyperledger)

Recent Hackathons

MIT SOLVE

*MIT SOLVE Challenge-2020

Microsoft

*Covid-19 Global Hackathon

CALL FOR CODE

*IBM Call For Code-2020

* - Results awaited

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HCL BLOCKCHAIN PRACTICE SERVICE OFFERINGS – POWERING THE FUTURE

CONSULTING

- *Use Case assessment (RACE) and definition*
- *Blockchain applicability, Deployment strategy Blockchain Platform Evaluation*
- *User Stories Formulation*

ON BOARDING & OPERATIONS

- *Blockchain Participants On Boarding*
- *Blockchain Installation*
- *Network & Operations management*
- *Defining Blockchain Governance Model*

IMPLEMENTATION

- *Technical design & Architecture*
- *Blockchain Network setup & operations*
- *Developing Blockchain APIs*
- *Smart Contracts Implementations*

INTEGRATION WITH ECOSYSTEM

- *Blockchain Integration & Smart Contracts*
- *Communicate with existing enterprise application*
- *Data Strategy & Assessment*

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HCL BLOCKCHAIN ECOSYSTEM MANAGEMENT SERVICES

ECOSYSTEM MANAGEMENT SERVICES

OPS MANAGER

HCL Blockchain Ops Manager is a Blockchain framework for managing end to end operations of blockchain business network by providing insights on the blocks, transactions, channels, chaincode, API etc.

ONBOARDING FRAMEWORK

To effectively manage the on-boarding process, the onboarding framework provides step by step guidance to process, store and share the KYC data and manage certificates on blockchain

NETWORK GOVERNANCE

For both on-chain and off-chain process, we have guidelines to coordinate around decisions and decision-making processes in order to achieve the standardized and clear consensus approach

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SOLUTION PORTFOLIO

HCL's CoTrust Blockchain Studio is suit of blockchain solutions which enables enterprises to implement blockchain in easy and efficient manner.

COTRUST BLOCKCHAIN PLATFORM	COTRUST OPS MANAGER	COTRUST SMART CODE	COTRUST CLOUD NATIVE
Managed blockchain platform for accelerated enterprise blockchain adoption	Operations manager for managing and operating the blockchain network	Smart code tool for quicker and easier development, auditing and deployment of smart contracts	Cloud version of CoTrust Platform available on AWS and Azure

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HCL'S BLOCKCHAIN APPLICATION PLATFORM – COTRUST

HCL's CoTrust Blockchain application platform enables accelerated enterprise adoption of blockchain technologies. It reduces time, cost and risk by providing foundational capabilities & scaffolding required for Blockchain implementations. It also brings in reusable business capabilities & domain specific use-cases. Some of its key features include:

MANAGED PLATFORM

FRICTIONLESS ON BOARDING

END TO END SECURITY

STRUCTURED API'S

RICH INSIGHTS

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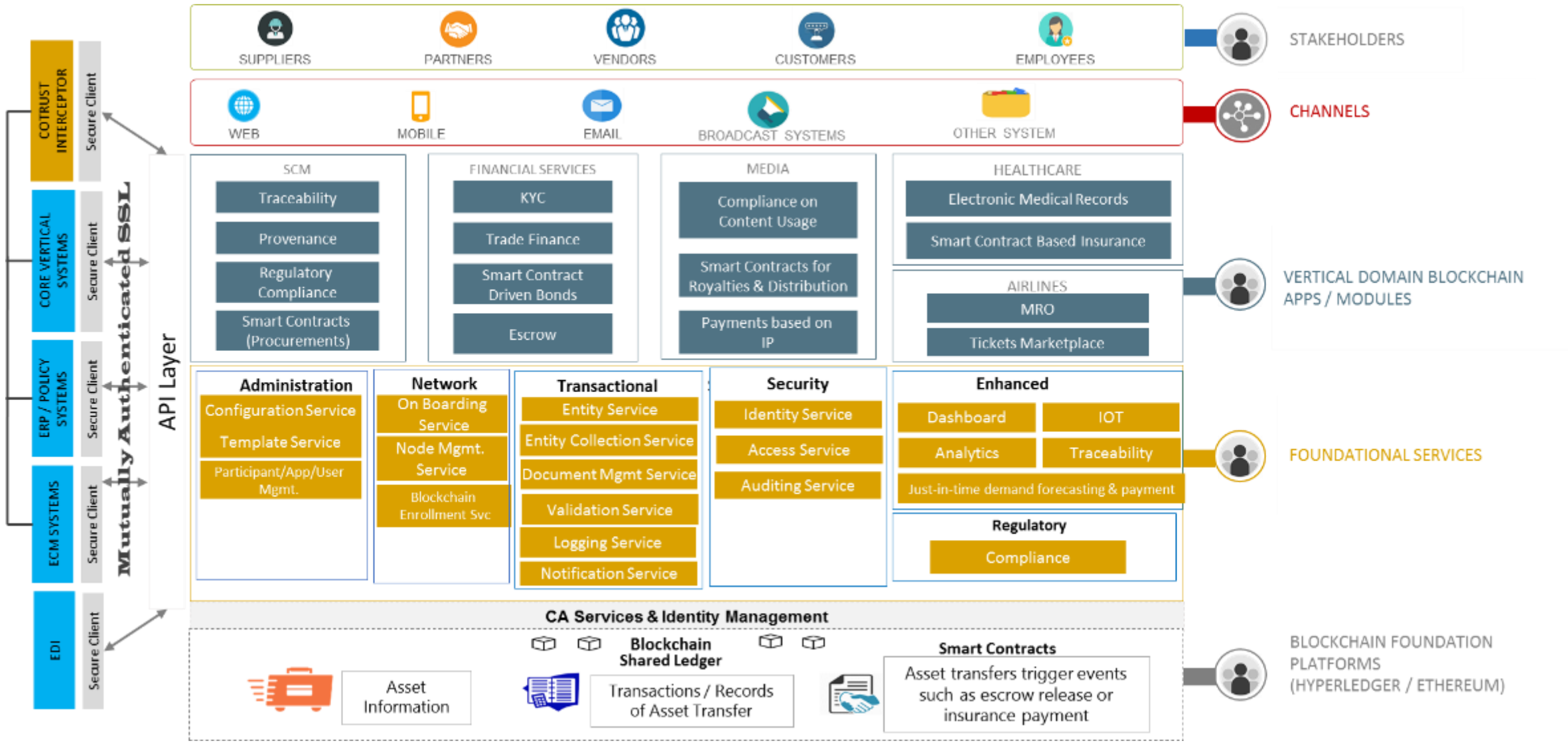
HCL BLOCKCHAIN APPLICATION PLATFORM – COTRUST



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COTRUST- KEY COMPONENTS

API INTERGRATION LAYER

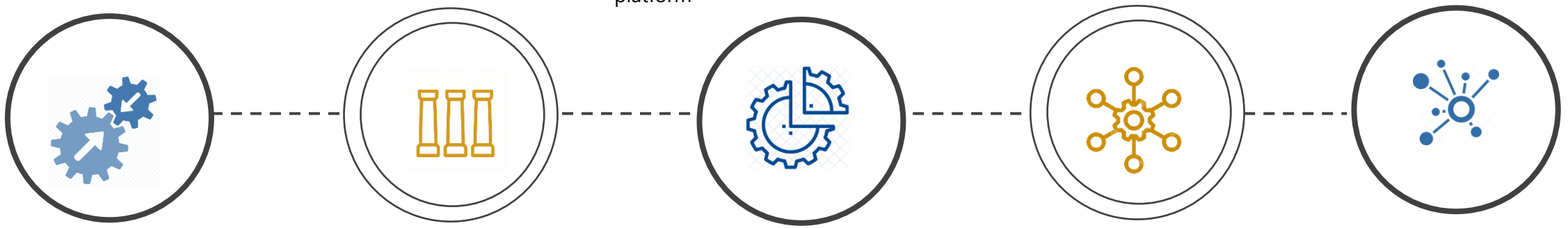
CoTrust APIs are based on Templatization which enables CoTrust API to integrate with multiple Domain / Industries with no change / minimal change.

DOMAIN SPECIFIC APPLICATIONS

The Business Service layer is a set of services that encapsulates encapsulate Enhanced and Foundation Service to handle Domain specific business requirement, by consuming only specific set of API instead of whole CoTrust platform

INTERCEPTOR

The interceptor module helps CoTrust in establishing communication between different ledgers in easy and efficient manner



FOUNDATIONAL SERVICES

Foundation Services are basic services which enables Domain to handle their basic business requirements. Foundation services are based Micro services architecture which divide the business requirement into smaller services to increase reusability and improve performance.

CHANNELS

CoTrust platform supports multiple channels to expose the services to end users, following set of Channels are supported

- Web Application
- Mobile Application

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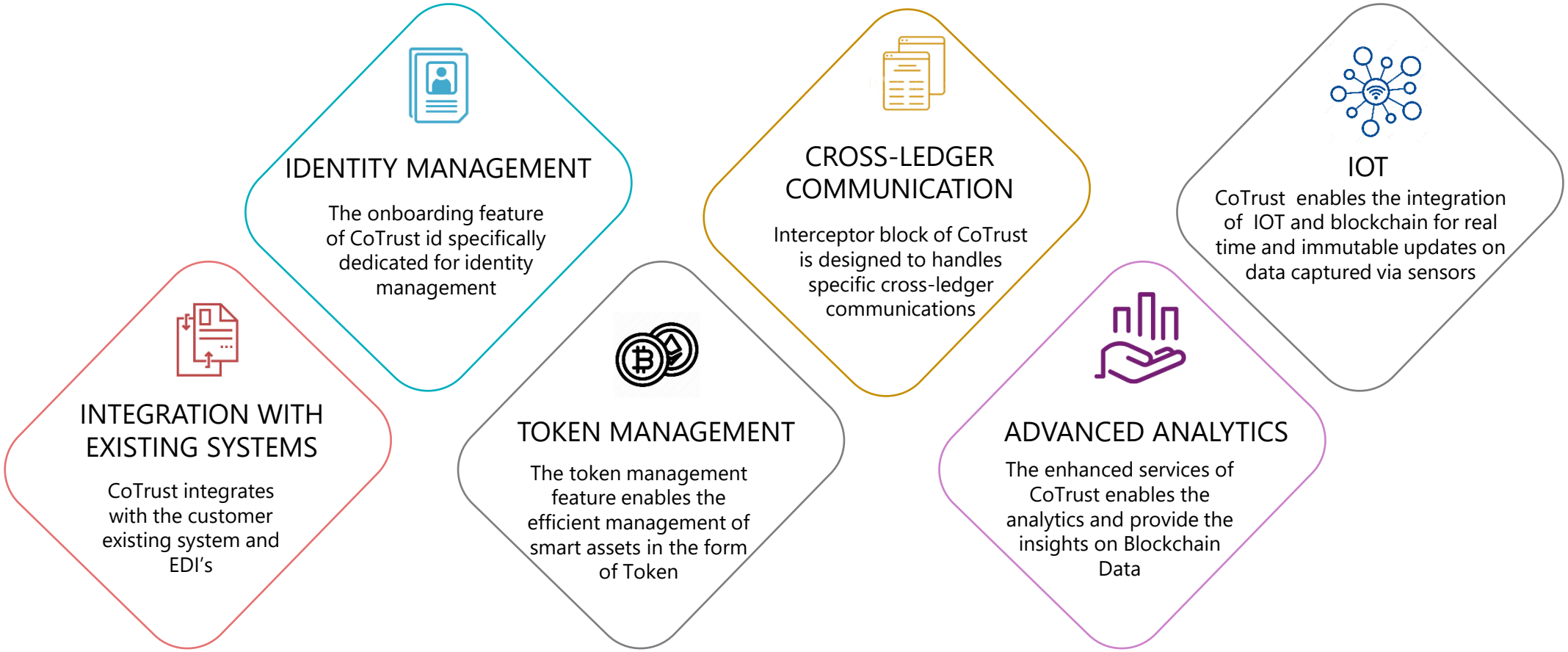
COTRUST- KEY FUNCTIONALITIES



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COTRUST- OPS MANAGER

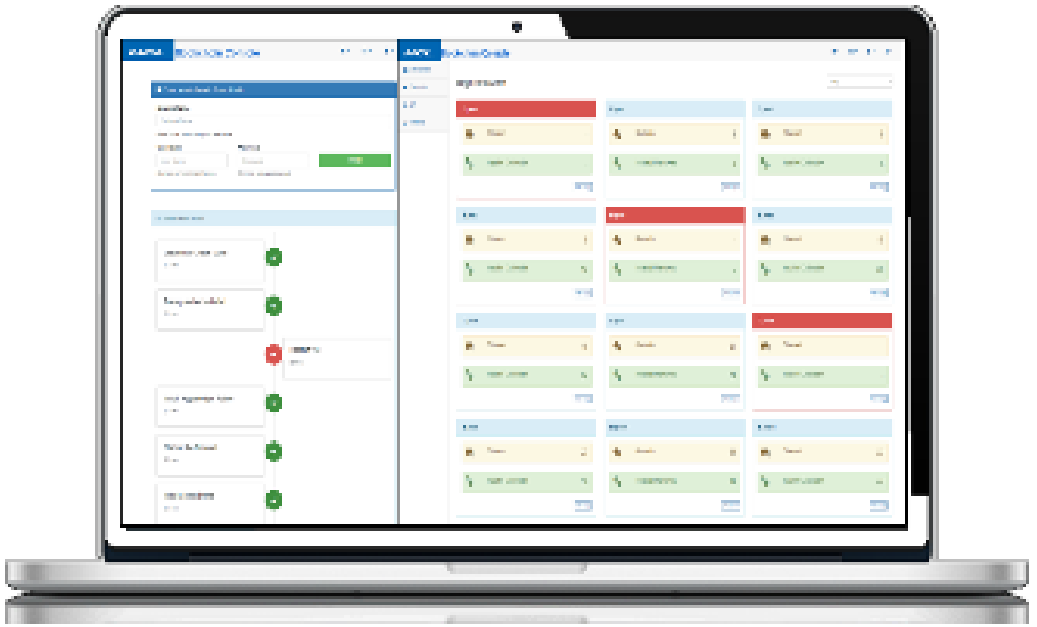
HCL CoTrust Ops Manager based on Hyperledger fabric, is a Blockchain framework for managing end to end operations of blockchain business network by providing insights on the blocks, transactions, channels, chaincode, API etc.

It is user-friendly web application that helps view & deploy various components of the blockchain Network

Simple installation on Hyperledger in On-premises or Cloud environment

Manage multiple networks using this console

Rich UI and usability



View the peer logs though the console

Service API's

Quick Blockchain Implementation

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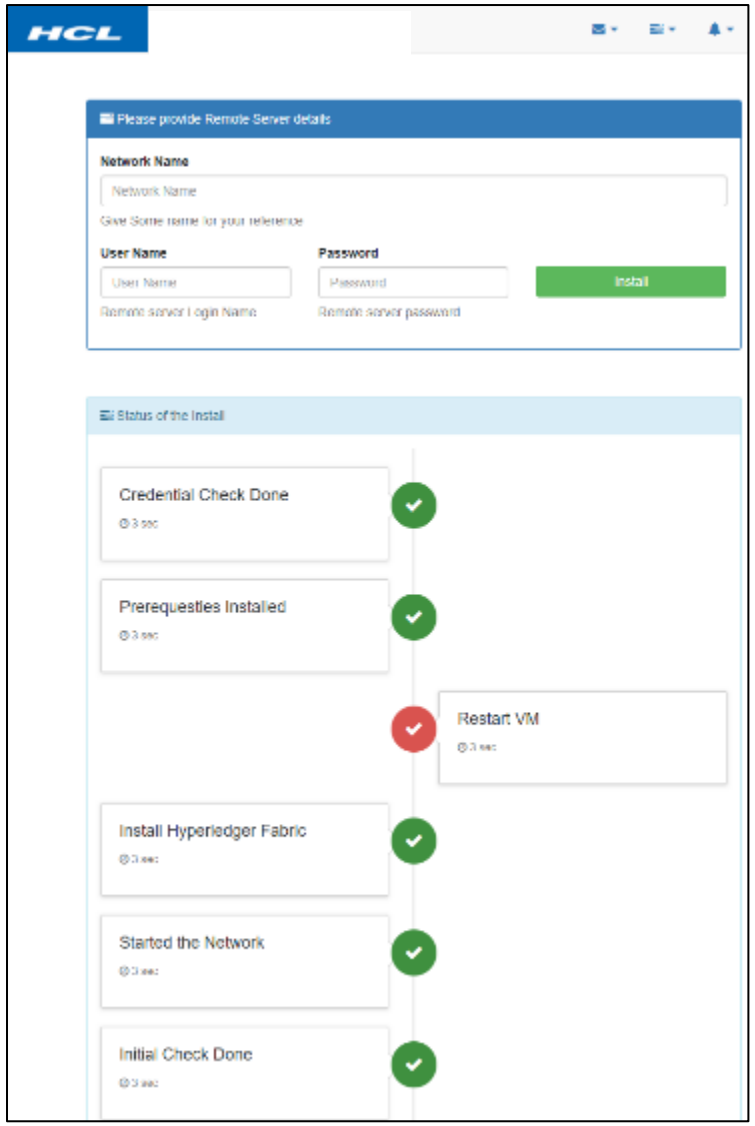
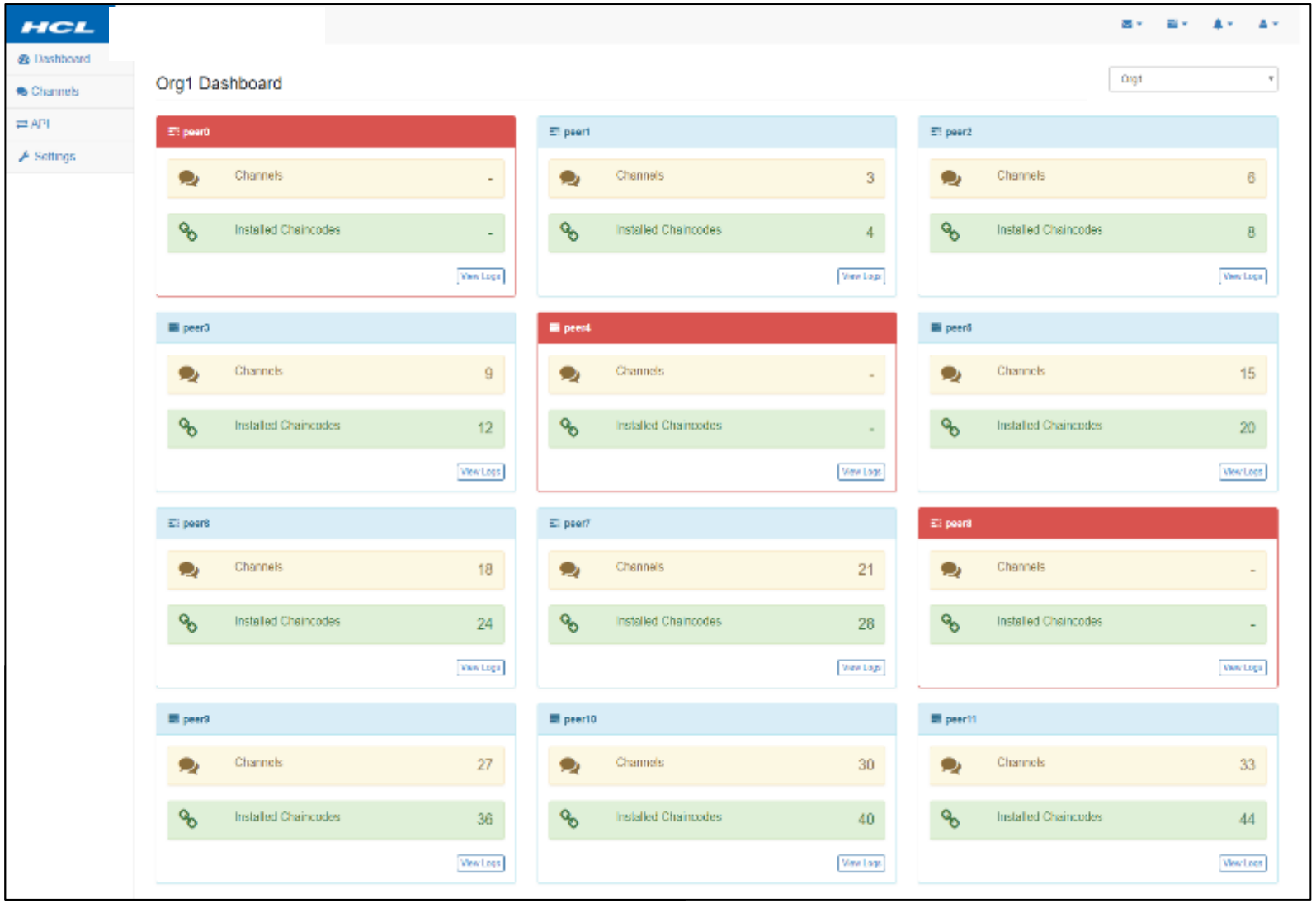
COTRUST- OPS MANAGER SNAPSHOTS





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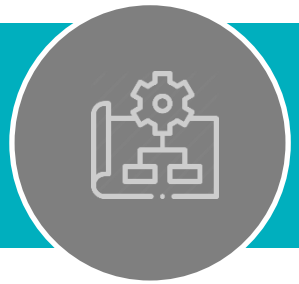
COTRUST SMART CODE

DESIGN

Create the flow of the smart contract

Design using drag and drop feature



CREATION AND IMPLEMENTATION

Signoff from the relevant network participants on the draft version of the developed smart contract

Compile the code and generate the executable files

AUDIT

Unit testing and integration testing of the developed smart contract

Automated and Manual Analysis

Audit report generation

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COTRUST™ PLATFORM ON AWS MARKETPLACE

CoTrust

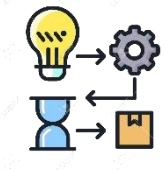
CoTrust on AWS

Mercury release involved CoTrust which is HCL's blockchain application platform, which enables an accelerated adoption of blockchain. This was followed by Mars release (v2.0) which added UI based setup and ability to manage the network.

awsmarketplace

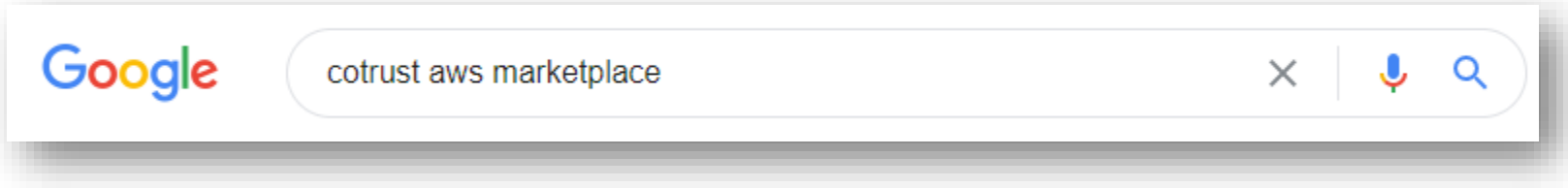
CLICK THE LOGO to view the offering On AWS Marketplace

Set up the Hyperledger Fabric environment with a single command.



Create channels, install chain code, and invoke and query chain code using CoTrust Ops Manager

In-built Hyperledger Explorer helps to monitor the blockchain environment.



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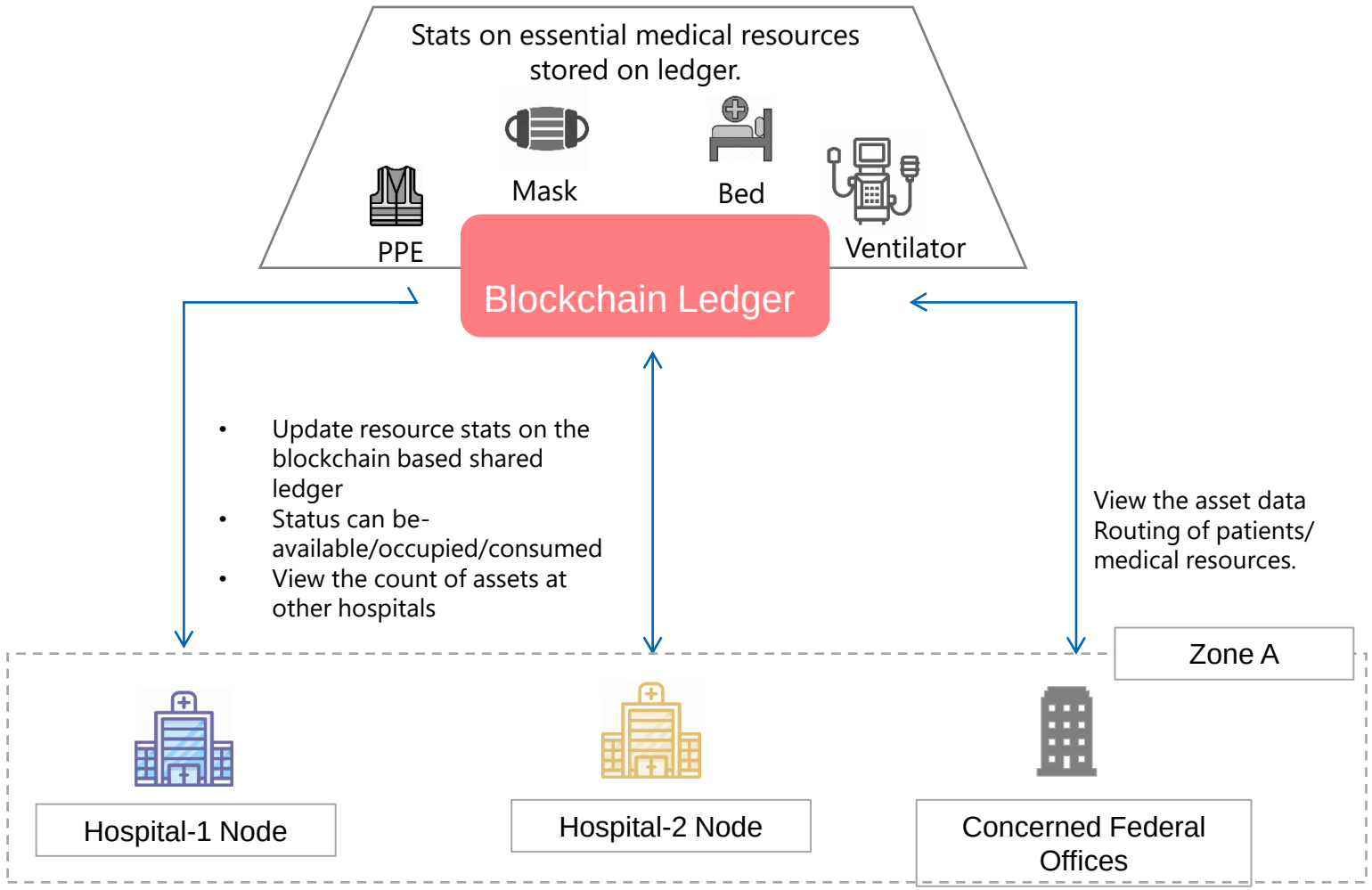
COTRUST VITALWATCH – CAPACITY PLANNING OF CRITICAL MEDICAL RESOURCES

Blockchain based platform to track essential medical resources like PPE. Hospital bed, ventilator etc, at multiple hospitals in various zones. This will help authorities in efficient patient handling and better handling of critical medical resources in pandemic scenarios like COVID.



Key Highlights

- Creating a permissioned network for hospitals
- All marked hospitals providing care during the pandemic to access the ledger to write their resource details i.e. (available/occupied/consumed)
- Smart contract-based notifications on critical asset threshold breach
- Network would have multiple nodes managed by public & private players for improved and regional access
- Multiple zones will be created to ensure regional focus. The solution will ensure separation of zonal data from each other. Via channels.
- Federal government organizations can be part of multiple zones based on their jurisdiction.

Key benefits :

- Effective critical equipment capacity planning by federal agencies using real time data
- Better patient channelization based on resource availability in the hospitals.
- Immutable transaction records will ensure accountability and thus strengthen the trust in the system

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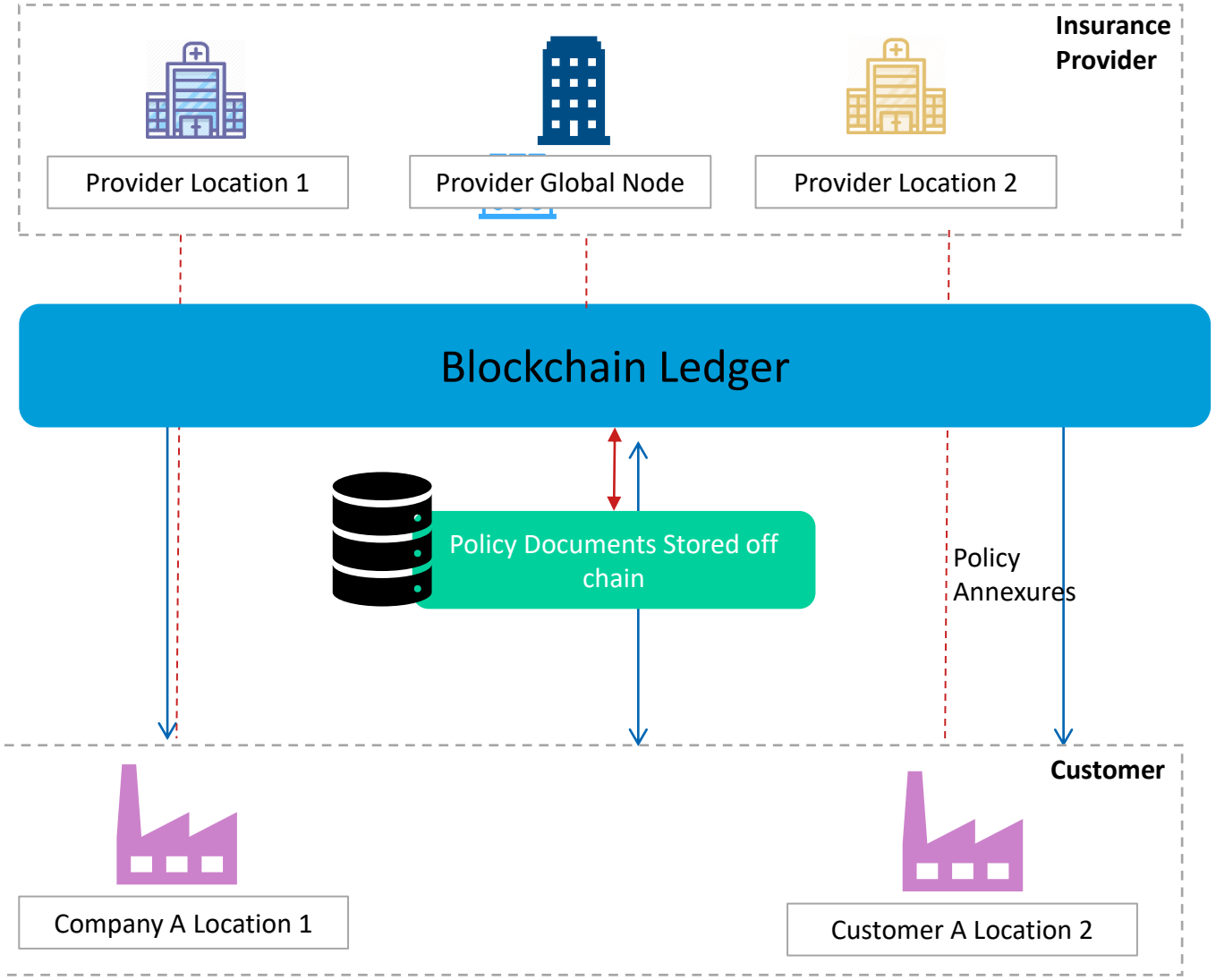
COTRUST BuildingBLOCK – BLOCKCHAIN BASED MNC INSURANCE POLICY MANAGEMENT



BuildingBLOCK Solution

- Provider has a Global Node which initiates a master policy formation
- Provider's local nodes are updated on the new policy formation and requested to form their annexure based on local laws and compliance
- Every location from a customer Geo perspective is mapped to a local node from Providers end.
- Policy documents are stored off chain

CLICK THE LOGO to view the offering On R3 Marketplace

Business Benefits

- Directly impacts turnaround time and shortens the policy creation lifecycle
- Intra company use case

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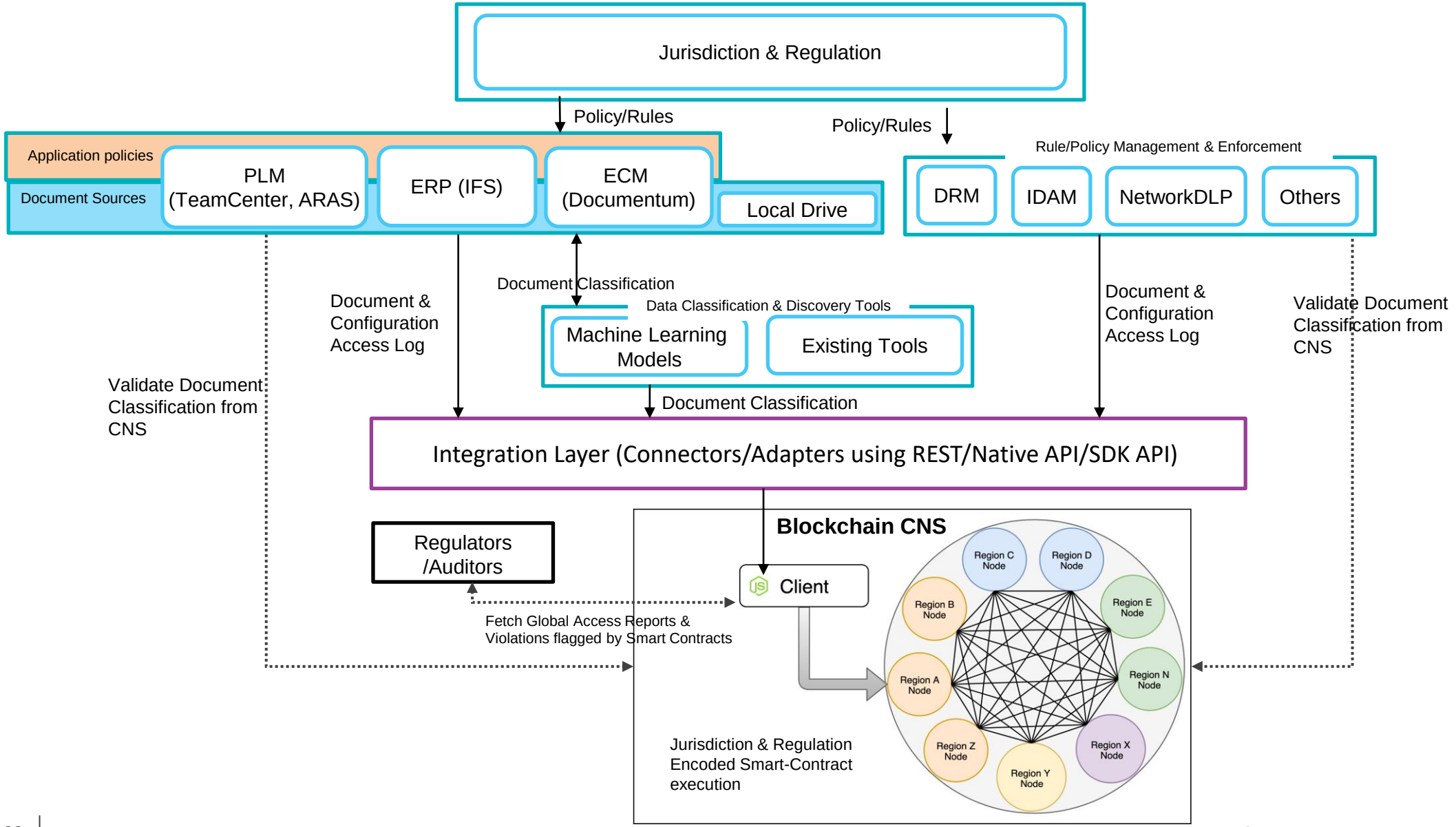
COTRUST BLOCKCHAIN CENTRAL NERVOUS SYSTEM (CNS) – DOCUMENT

WORLD STATE FOR EXPORT COMPLIANCE



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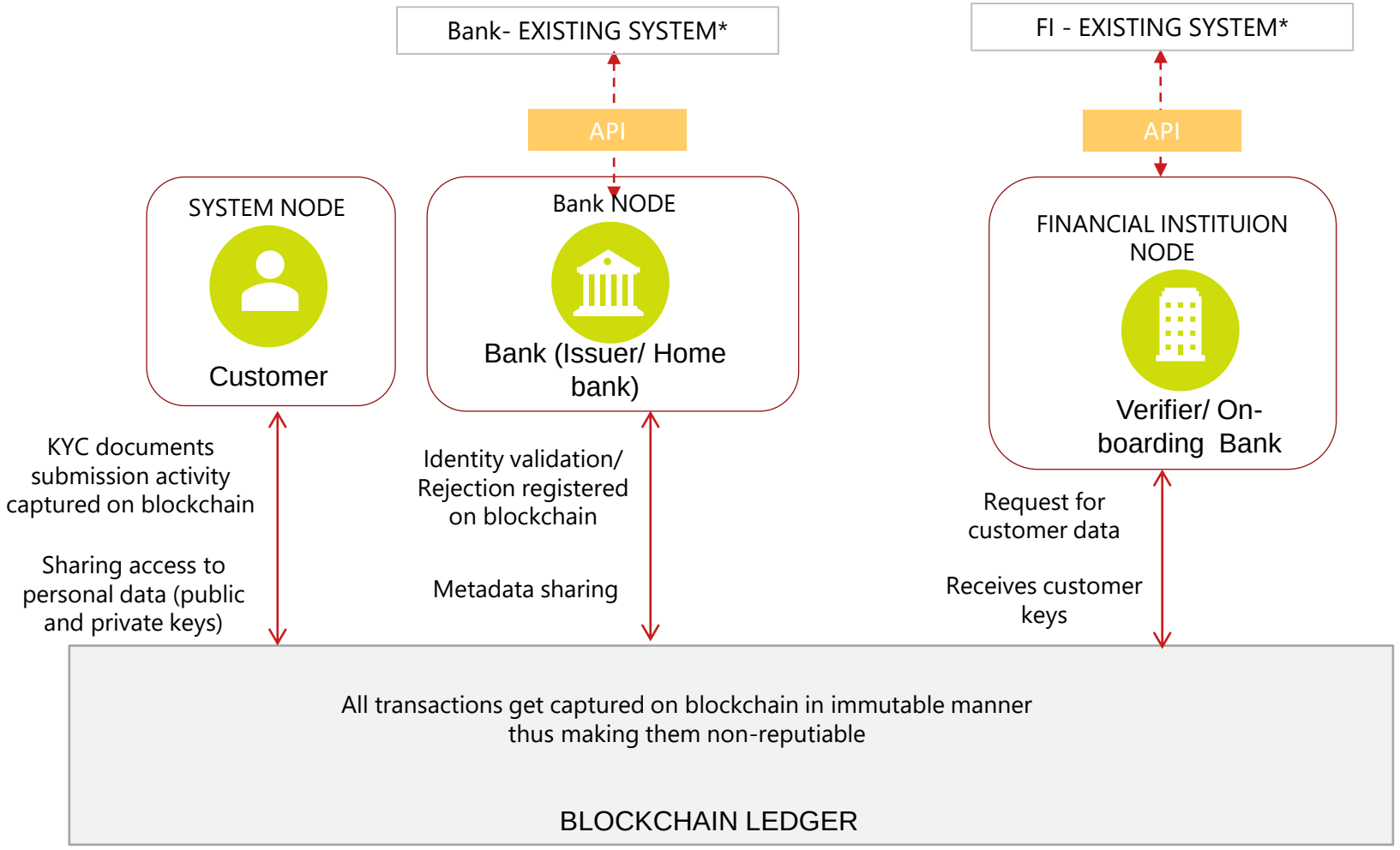
COTRUST BlocKYC – KYC MANAGEMENT SOLUTION ON BLOCKCHAIN

Blockchain based network in which Bank, another financial institution and the customer will be participants. Immutable ledger which holds the validated customer KYC data which can be utilized as a single source of truth for any customer data requirements internal or by any other financial institution externally. The PoC will also give control of the data to the customer using custom privacy solution.



SOLUTION OUTCOMES

- Validated KYC data available on shared blockchain ledger in Hashed form, masking it from misuse.
- Self sovereign identity for customer where they will be controlling their data. Solution design mitigates unwanted correlations.
- Data recorded on blockchain uses encryption and hashing to ensure data integrity and privacy

*Any integration with existing system is out of scope

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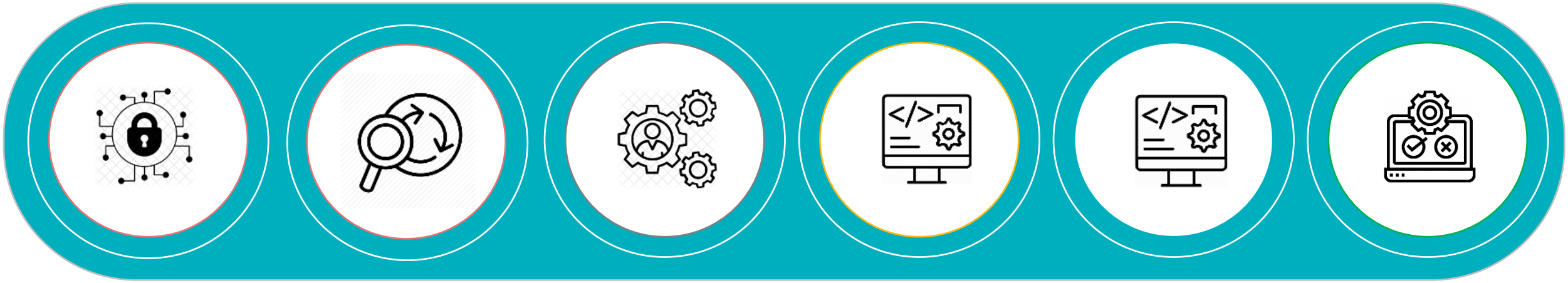
FRAMEWORKS



Secure Block	RACE	Design Thinking	Platform Evaluation	Business Case	Testing
HCL Blockchain Security Framework	HCL Blockchain Use Case Evaluation Framework	Design thinking framework for a blockchain MVP	Framework for evaluating the blockchain platform	Framework for deriving the blockchain business case	Framework for blockchain application testing

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COTRUST BLOCKCHAIN TESTING FRAMEWORK

Test product for Security issues and Vulnerabilities including vulnerabilities of libraries used that can be exploited by malicious users.

Security Testing

Test Smart Contracts before and after deploying them in the network.

Including checking them for behavior and validations.

Smart Contract Testing

Fault testing focuses on fault and crash scenarios for the nodes and network delays

Key highlights-

- Using Fault Loads to mock malicious node behavior.
- Using Traffic Control to mock n/w delays.

Fault Testing

Performance Testing

Key testing parameters :

- Latency and throughput, commit and finality
- Cryptography and block cutting time
- Success rate at varied workload and fault load

Network Testing

Network testing focuses on testing your network & Nodes. It includes testing for network Setup, health, Node backup , Node Sync & discovery.

API Testing

This testing is done to test the clients and sdk's supplied with the product that enable the communication and interaction with the blockchain layer and other components.

Integration Testing

This testing is performed on the connectors that are supplied with the product to enable easier integration with other products.

TES

Loadrunner HYPERLEDGER CALIPER acunetix OWASP ZAP TRUFFLE chai GO node

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SECURBLOCK - HCL BLOCKCHAIN SECURITY FRAMEWORK

HCL Security framework is a guide to adopt and implement blockchain security regulations and best practices. Some of the high-level principles that HCL Security Framework for Blockchain are

GOVERNANCE

- Manage identities of stakeholders and business
- Security Governance
- Security dashboards
- Strong Security Assessments and review of platforms, smart contracts and consensus mechanism.
- Identify Security loopholes on interfaces and blockchain environment overall

SMART CONTRACTS

- Smart contracts integrity

IDENTITY AND ACCESS

- Certificates issuance, management, setup of CA
- Private key management – hardware, shared

DATA

- Cryptography at data storage level
- Securing off chain data storage

NETWORKS AND INFRA

- Secure business application's integration and API's with various merchants and aggregators.
- Container/VM/Cloud level security
- Use of data privacy features like channels in Hyperledger fabric.
- Different models bring in different risks

CONSENSUS

- Using the right consensus mechanism for the requirement
- Behavior of network when nodes are connected/disconnected.

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RACE - HCL BLOCKCHAIN USE CASE EVALUATION FRAMEWORK

HCL Blockchain Evaluation framework **assist in evaluating and identify the right use case for blockchain**. It enables **in quick inceptive analysis of whether blockchain is an appropriate solution for a defined problem**.

R — RESPOND

Respond to the key blockchain use case evaluation questions listed under each parameter

A — ANALYSE

Analyse the response to each question mapped to a particular parameter

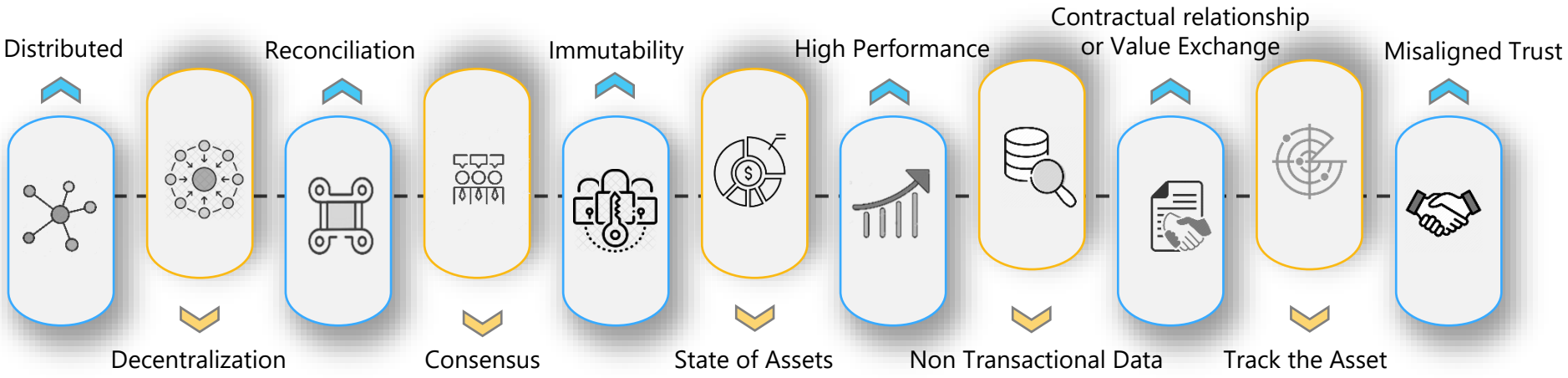
C — CALIBRATE

Calibrate your overall response for each parameter based on the majority response for each parameter

E — EVALUATE

Evaluate your overall result against mentioned guidelines for decision criteria and decide blockchain applicability of the use case

Key Evaluation Parameters



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HCL'S DESIGN THINKING BLOCKCHAIN PILOT PROGRAM

- **The Design thinking approach is an empathy based creative framework and mindset.**
- **Design thinking focuses on defining the right problem to solve and generating a use case that solves it.**

Process

Discover + Define

Week 1

- Idea prioritisation and assessment
- Use Case assessment and definition
- Formulate User Stories, Persona Maps, Empathy Maps
- Design Customer Journey & Process Flow

Design

Week 2

- Technical Design & Feasibility Assessment
- Use Case Functionality to CoTrust Services
- Identification & Selection of Blockchain Engine
- Identify Custom Vs Reusable Components
- Evaluating Cloud Platform Options – HyperLedger on Bluemix, Ethereum on Azure, …

Deliver

Week 3 to 6

- Prototype Development
- Rapid Iteration with business users to refine prototypes
- Deployment
- Demo Prototype

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HCL BLOCKCHAIN KEY USE CASES IMPLEMENTED

1. Supply Chain Track & Trace
2. KYC
3. Invoice Discounting
4. Art Tracking
5. Evidence Management
6. Digital Loan Processing
7. Patient Healthcare Management
8. Reference Data Management
9. Consent Management

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BLOCKCHAIN KEY CUSTOMER CASE STUDIES: FINANCIAL

ACCOUNT SETTLEMENT SYSTEM FOR WORLD'S LARGEST MONEY REMITTANCE SERVICE PROVIDER

Implemented faster and Transparent Account Settlement and Reconciliation using Blockchain by showcasing money transfer from Digital (US Credit Card) to Digital (US Bank Account) using Digital platform. It enabled external Partners with real time visibility into their respective Account balances, thus eliminating error-prone Settlement and Reconciliations

DECENTRALIZED IDENTITY FOR EUROPE BASED INSURANCE PROVIDER

Built a decentralized digital identity platform for bringing individuals, organizations, ID providers, credit bureaus, notaries etc. on the same platform. Identity Verification and KYC (Know Your Customer) documents related information is stored on Blockchain. This allows Individuals remain in full control of their information.

Verified identity can be shared with organizations, removing the need to go through the whole process again. This can be integrated with any existing on-boarding process/system across domains

ILLIQUID ASSET TRADING PLATFORM FOR BIG FINANCIAL SERVICE PROVIDER

Trading Illiquid Assets Using Blockchain- Market offering liquidity for such instrument that efficiently connects market participants with marketplace assets and enables the direct transactional exchange of ownership, of the asset itself.

The blockchain based solution offers greater connectivity /accessibility through the transactional efficiencies offered by decentralized infrastructures

DIGITAL LOAN PROCESSING SYSTEM FOR GLOBAL ENTERPRISE INFORMATION MANAGEMENT FIRM

Blockchain based Digital Loan Processing platform to bring end to end transparency and easier data dissemination between various stakeholders involved in the resale

The main objective is to allow key participants to oversee, track, verify, and provide real time update on the Loan Certification Process with the use of Blockchain

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BLOCKCHAIN KEY CUSTOMER CASE STUDIES: FINANCIAL

IP NOTICES HANDLING SYSTEM FOR CANADIAN INSURANCE COMPANY

Handling Interested Party Notices between Insurers and Banks on Blockchain to effectively track IP notices and provide immutable and valuable data around them

The system brings key stakeholders on common platform where they can view important stats around unmatched policies, policy renewals & cancellations and track the IPs in effective manner

NETTING & SETTLEMENT FOR EUROPE BASED AUTOMOTIVE ORGANIZATION

Reconciliations and Netting Settlements using blockchain. Customer is facing challenges around Reconciliation and Netting Process between its two regional units.

Scope involves blockchain implementation to transform the currently established process. Blockchain would help towards transparency, Immutability and the need for real time reconciliations and Netting Settlements

INVOICE DISCOUNTING PLATFORM FOR EUROPE BASED FINANCIAL INSTITUTION

HCL created a Blockchain based invoice discounting platform, Invochain. Invochain is an online blockchain Platform for invoice/bill discounting with features built in to reduce the risk and inefficiencies of the current process. Both banks and customers to have access to larger market.

The whole lifecycle of Bill of exchange is managed digitally on platform, right from creation of bill of exchange to getting it approved and settlement.

REFERENCE DATA MANAGEMENT FOR LEADING BANK IN SOUTH AFRICA

Reference data management using Blockchain technology. Standardization of the reference data management across bank was done to reduce errors. Solution handles the Incorrect / Inconsistent reference data due to lack of ownership leading to manual interventions, fraudulent activities and inconsistent reporting.

Integration with other critical systems like Finance, HR, Real Estate Services to ensure the process for creating, maintaining reference data carried out automatically across to prevent any manual interventions

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BLOCKCHAIN KEY CUSTOMER CASE STUDIES: NON-FINANCIAL

EVIDENCE MANAGEMENT SYSTEM FOR GLOBAL ENTERPRISE INFORMATION MANAGEMENT FIRM

Blockchain based evidence tracking system which brings end to end traceability of every evidence through out it's lifecycle. It stores and disseminates the data on chain of custody right from the evidence collection, to storage, to lab, to court till the evidence destruction/sale etc.
This leads to greater transparency into the system and reduces discrepancies.

DIGITAL TOKEN REWARD MANAGEMENT FOR US BASED GLOBAL AIRLINE

Created a digital token / currency for use within the organization. Token will be used for HR incentives such as work anniversaries, project performances etc.

Tokens are stored in the digital wallets/mobile applications of the organization and managed on blockchain, thus infusing trust into the system

ART TRACKER FOR LEADING FINE ARTS HANDLING COMPANY

Blockchain based Artwork tracking system to bring end to end traceability and condition reporting of artwork through its lifecycle.

This system stores and disseminates the data on chain of custody and condition reporting during creation of artwork on the portal, transportation to collectors/museums, receipt by the collector/museum.

ART CONDITION REPORT FOR FINE ARTS HANDLING COMPANY

Handling the condition report associated with an artwork on blockchain. The solution integrates with existing application from where the condition report is uploaded on the blockchain platform.

The platform provides key functionalities on blockchain like access control based viewing and downloading the art image, condition report pdf & JSON of an artwork.

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BLOCKCHAIN KEY CUSTOMER CASE STUDIES: NON-FINANCIAL

SUPPLY CHAIN MANAGEMENT FOR LEADING HITECH CUSTOMER

Supply Chain Management on CoTrust for Manufacturing & Logistics Industry. Supply chain ecosystem suffer from larger challenges due to lack of transparency, traceability & time delays in movement of goods. Blockchain can ensures both transparency & security.

The key use cases that were built to address the major areas of problem in supply chain ecosystem are Track N Trace & Provenance of Goods, enabling product recalls in case of any defects & trade compliance management.

PATIENT DATA MANAGEMENT FOR LEADING EUROPE HEALTHCARE PROVIDER

Patient Data Management for enabling timely care on Blockchain including all the key stakeholders starting from Doctor, Hospital ,Diagnostic center, Care takers, Pharmacist.

This also provides the right over information to the patient so that he/she has full control on his information and documents. The medical history of the patient could be further used in new research.

ART INSURANCE VALUATION FOR FINE ARTS STORAGE COMPANY

Bringing Insurance Valuation an Art Collection on blockchain.
The platform bring all the key stakeholders like art collectors, underwriters, art handlers etc. on blockchain platform to efficiently manage the insurance valuation process on blockchain.

The platform provides key functionalities on blockchain like access control based viewing and downloading the associated art information and providing insurance valuation based on them.

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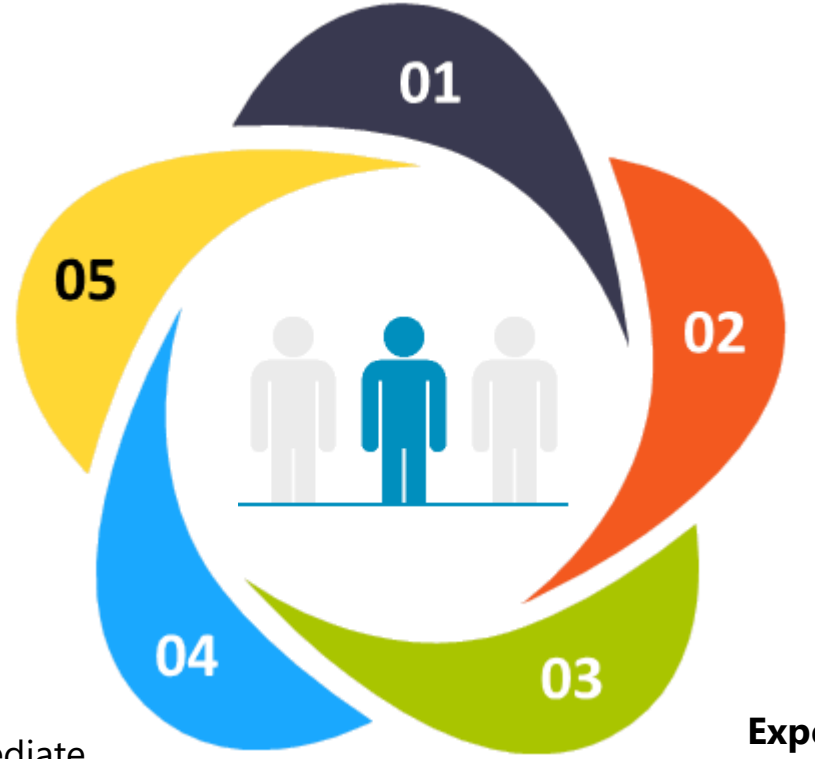
WHY HCL

Engineering based approach towards Blockchain technology and expertise across multiple Blockchain platforms.

Holistic view by collaborating with a spectrum of players like academicians, legal experts and start-ups 3



HCL's CoTrust as an **enabler for accelerated adoption of Blockchain** in Enterprise implementations

Framework based approach to remediate the challenges associated with blockchain implementations

Experience of working in multiple Blockchain implementations across vertical domains and levels (Early stage adoption, PoC, Pilot, use case identification etc.

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THANK YOU!

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