



# Azure Data & AI

*Revolutionize your business*

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# Convergence of AI and Blockchain

"...a sweeping vista of opportunity to reimagine how the financial system can and should work in the Internet era, and a catalyst to reshape that system in ways that are more powerful for individuals and businesses alike"

- Marc Andreessen, A16z

CIO JOURNAL.

**Why Blockchains Could Transform How the Economy Works**

 Bloomberg Businessweek

**The Technology would turn a company into a seamless network of coordinated freelancers**

**Forbes**

**Blockchain For Supply Chain: Enormous Potential Down The Road**

**Is Blockchain the Most Important IT Innovation of Our Age?**

By The Guardian



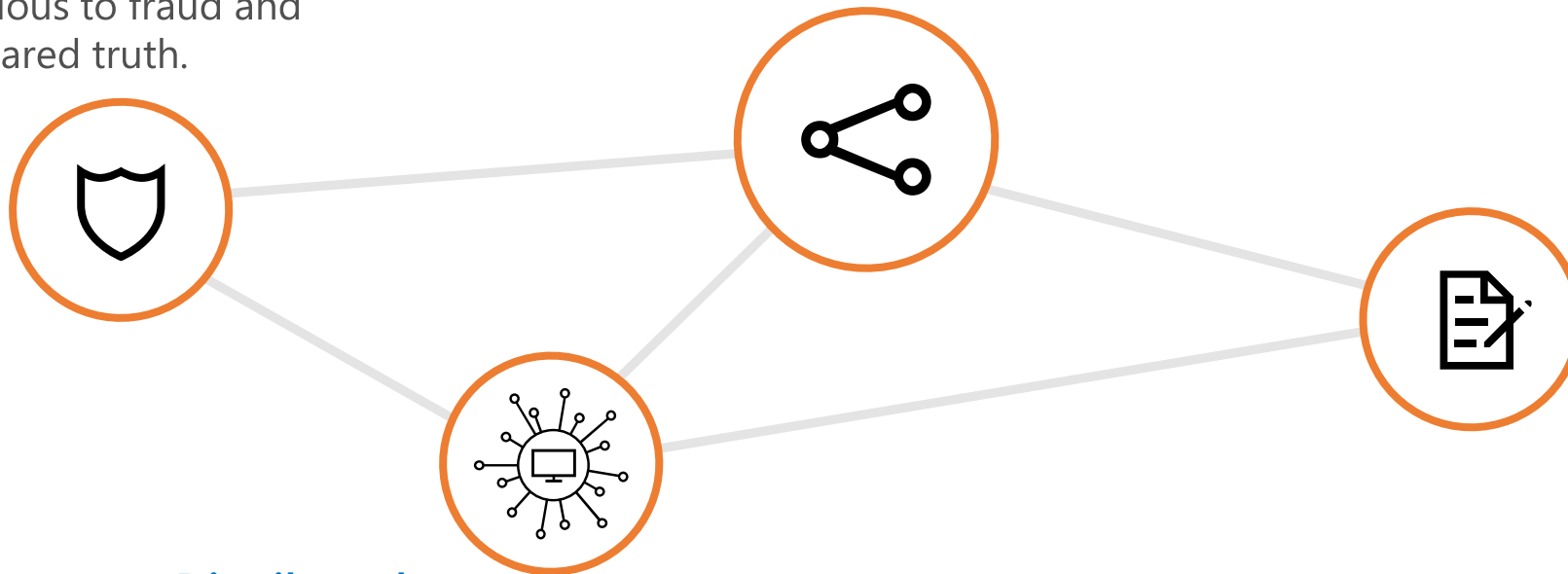
# Blockchain is a secure, shared, distributed ledger

## Secure

Uses cryptography to create transactions that are impervious to fraud and establishes a shared truth.

## Shared

Blockchain value is directly linked to the number of organizations or companies that participate in them. There is huge value to even the fiercest of competitors to participate with each other in these shared database implementations.



## Distributed

There are many replicas of the blockchain database. In fact, the more replicas there are the more authentic it becomes.

## Ledger

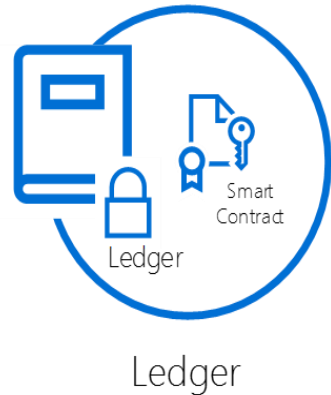
The database is "write once" so it is an immutable record of every transaction that occurs.

# Reference Architecture for Blockchain Solutions

## Pre-Ledger Workflow and Activities

- Source Systems & Data Ingestion
- Pre-Processing Compute and Storage
- Reference Data Retrieval

## Ledger Focused Development



## Post-Ledger Workflow and Activities

- Post-Processing Compute
- Post-Processing Storage and Analytics
- Integration Services
- Consuming Apps, Services, Systems

## Foundational Services

- Identity and Access Management
- Key Management
- Networking
- DevOps

Reference data for the solution can be pulled from any source, processed by smart contracts and results recorded in the ledger

Raw data held off chain will be hashed and then stored with that hash.

Data would be sent to an Event Hub which will have event consumers that can process and deliver data to the ledger

Streaming data can also be analyzed and provide data, such as business KPIs, to dashboard(s) targeted to one or more of the personas for the solution.

## Pre-ledger activities

Receives transactions via a client API and interacts with other consortium members to derive consensus via voting. Once consensus is achieved, bundled transactions in a block are added to the chain.

Smart contracts deployed to the ledger provide the logic and state representing business processes.

These transactions either update the smart contract state or are used to provide detail related to the smart contracts in the solution.

Review with PG

# Ledger and Smart Contracts

Retrieve and update smart contracts with the current state of important reference data and direct it to appropriate downstream consumers.

Store data in a data lake and/or a data warehouse. Can be leveraged for machine learning or big data analytics .

Expose this data as an API and deliver specific data to consortium member subscribers, and ultimately deliver this data to mobile clients or third party systems.

Interactive querying of the chain using an API or with a chat bot that enables organizations to query the state of current transactions in the system.

Notification services such as contacting a consortium member by mobile phone, email, or voice message about a change in state in the solution.

# Post-Ledger Analytics

# Blockchain scenarios – Impact across all Industries



## Financial

Redesign costly legacy workflows, improve liquidity and free up capital. Help reduce infrastructure costs, increase transparency, reduce fraud and improve execution and settlement times.



## Healthcare

Removes third-party verifiers such as health information exchanges by directly linking patient records to clinical and financial stakeholders. Provides fast, secure, authenticated access to personal medical records across healthcare organizations and geographies.



## Government

Increase transparency and traceability of how money is spent. Track asset registration, such as vehicles. Reduce fraud and operational costs.



## Retail & Manufacturing

Better supply chain management, smart contract platforms, digital currencies, and tighter cybersecurity.





Improves process speed, efficiency and effectiveness

Shifts operating model from transactional to relationship driven

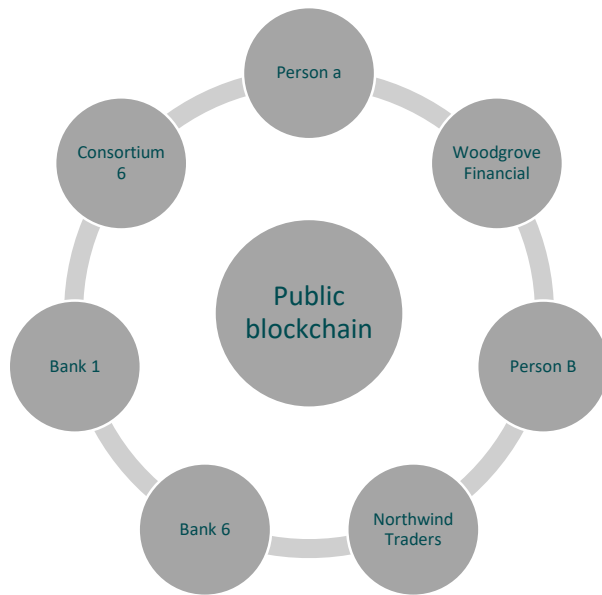
Enhances multi-party transparency

Lowers adoption barriers

## Blockchain-enabled Digital Transformation - Benefits

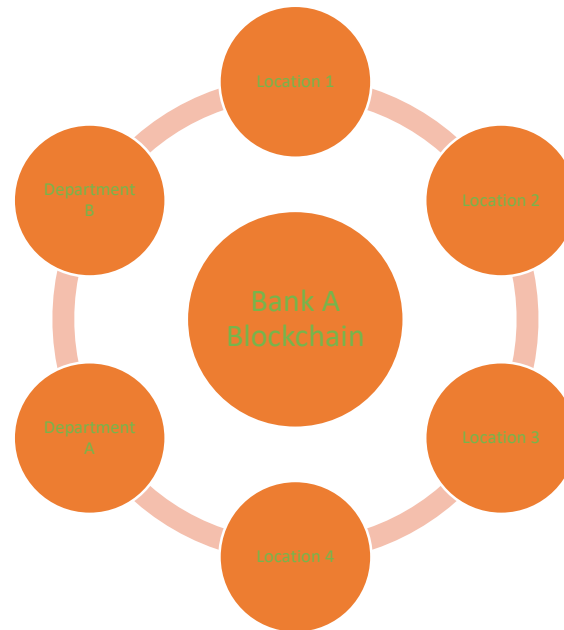
# Types of blockchain networks

## Public



- Many, unknown participants
- Writes by all participants
- Reads by all participants
- Consensus by Proof of Work

## Private

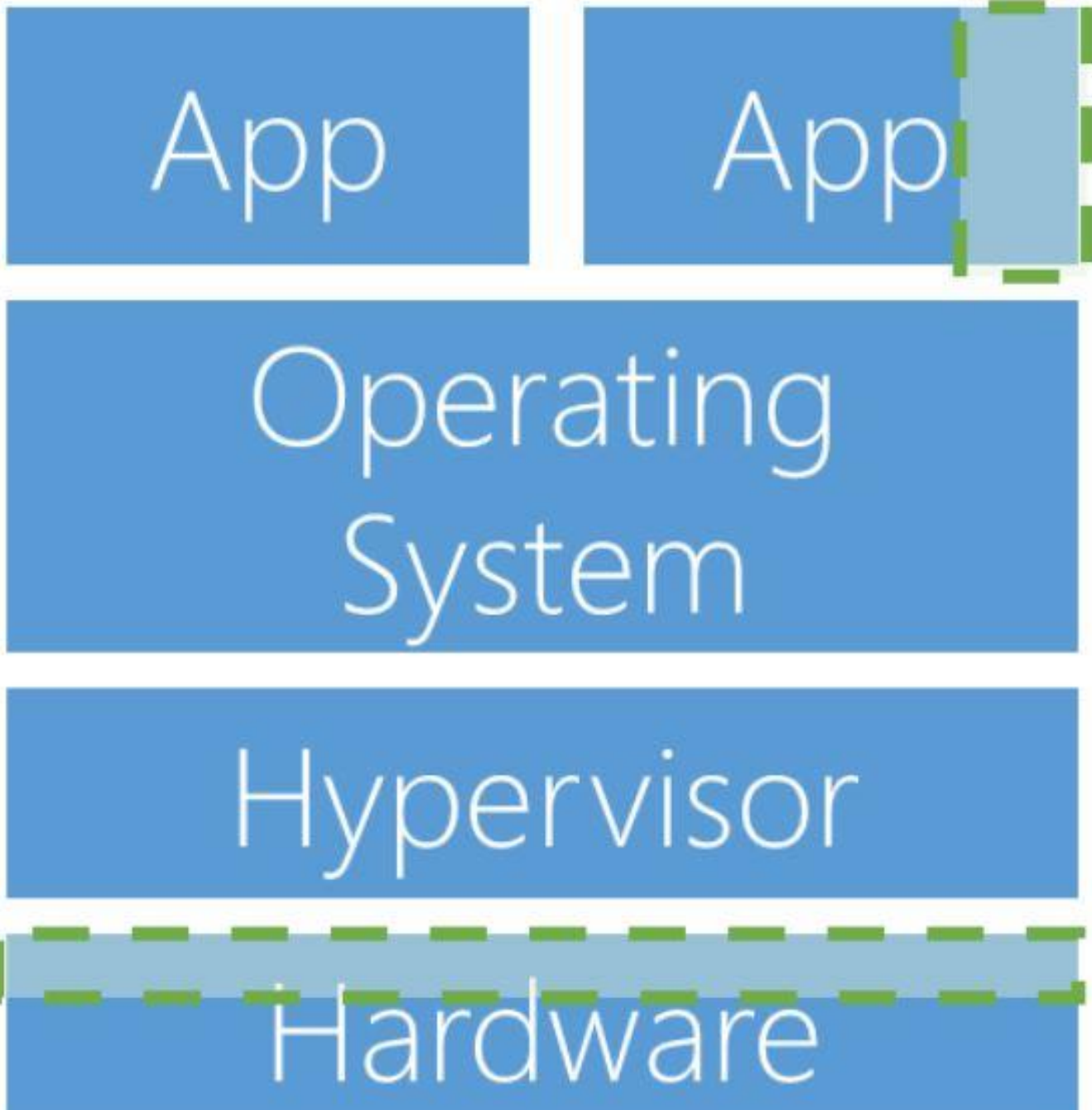


- Known participants from one org
- Write permissions centralized
- Reads may be public or restricted
- Multiple algorithms for consensus

## Consortium



- Known participants from multiple orgs
- Writes require consensus of n participants
- Reads may be public or restricted
- Multiple algorithms for consensus



## Azure Trusted Execution Environment

- Virtual Secure Mode
- Intel Software Guard Extensions (SGX) servers

Confidential computing blockchain efforts;  
Efficient Processing (*TEEs/Enclave*)

Richer, more flexible confidentiality models  
(RBAC, distributed governance)

Can be integrated to deliver complete, enterprise-  
ready ledger solutions.

Non-deterministic transactions

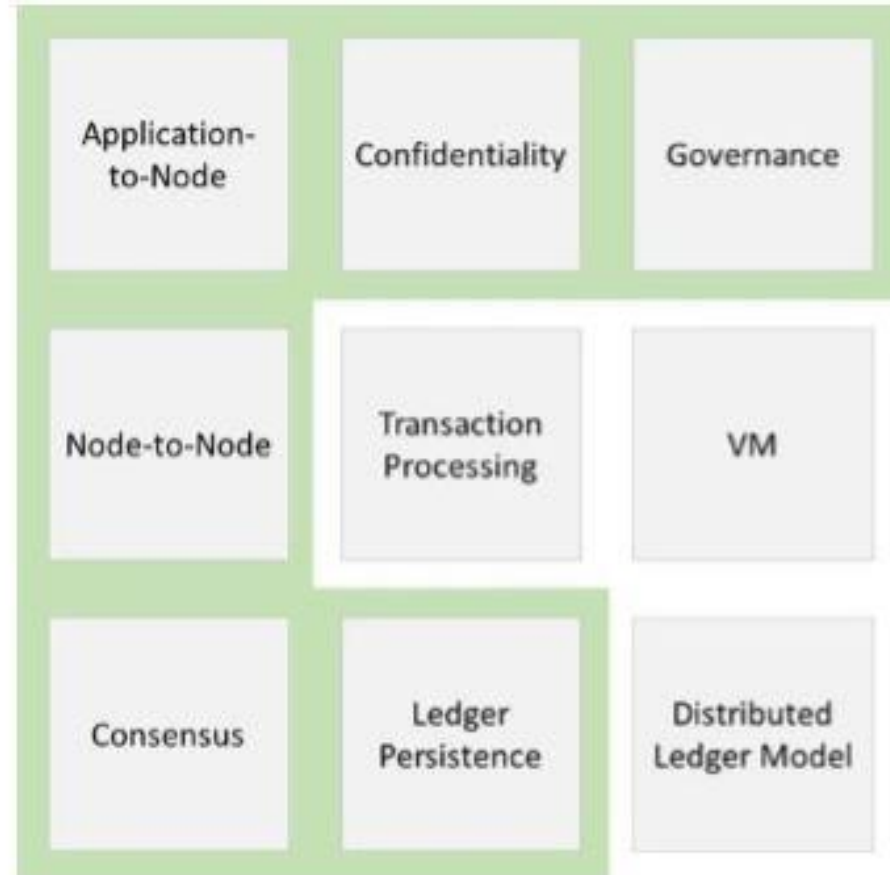
Reduced energy usage

Why Coco  
Framework for  
enterprises?

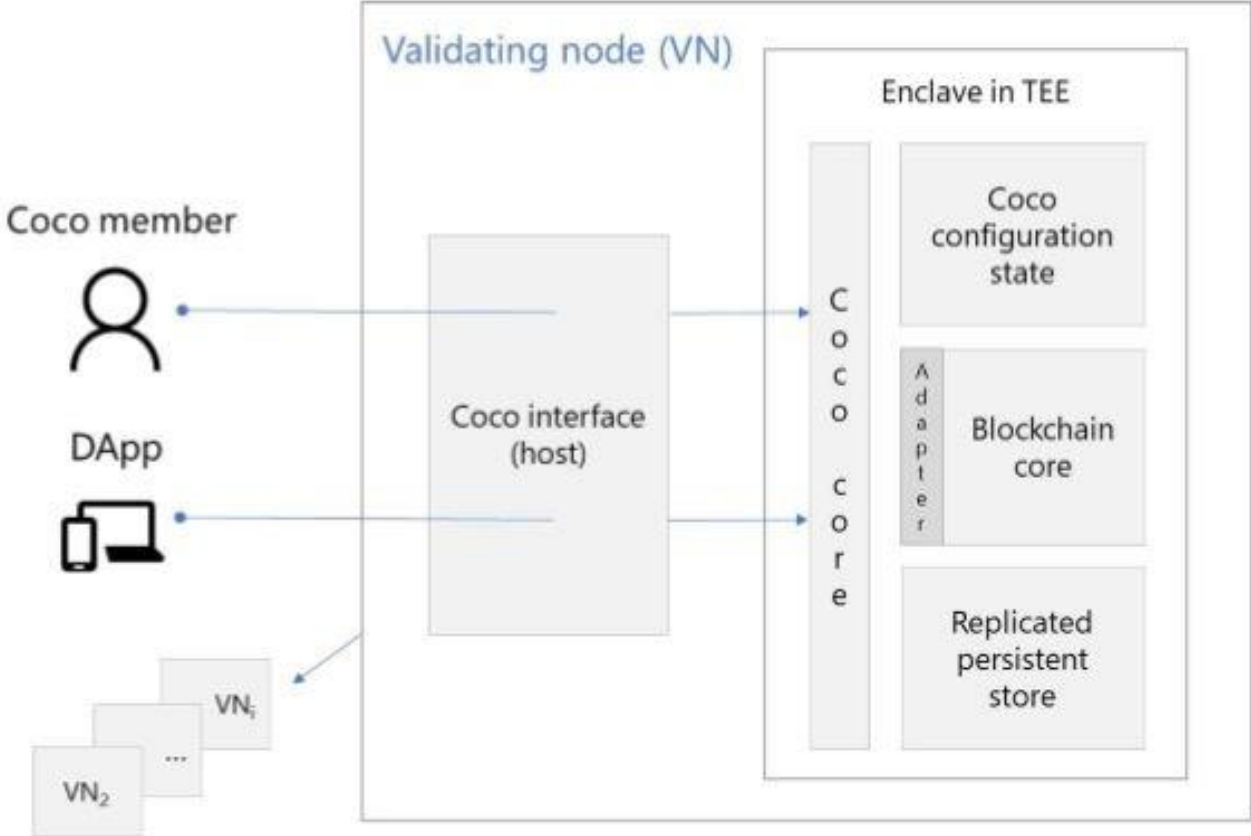
# Conceptual Overview



# Logical components of Coco blockchain protocol



# Coco Architecture



# Actors and Identity

- **Members** are the **governing bodies** of a consortium, with collective control over who can transact on the network and its governance—including network membership, the code that runs in the TEEs, and the definition of network policies.
- **Participants** unlike members, cannot vote and thus have **no operational control** over who can directly access the network or its governance. Participants are determined by the network's members and, like members, participants can transact on the network.



Coco network can accept transactions from members or participants.

Application transactions ( business transactions )

Administrative transactions (e.g.: adding a member )

Similar workflows for both types of transactions

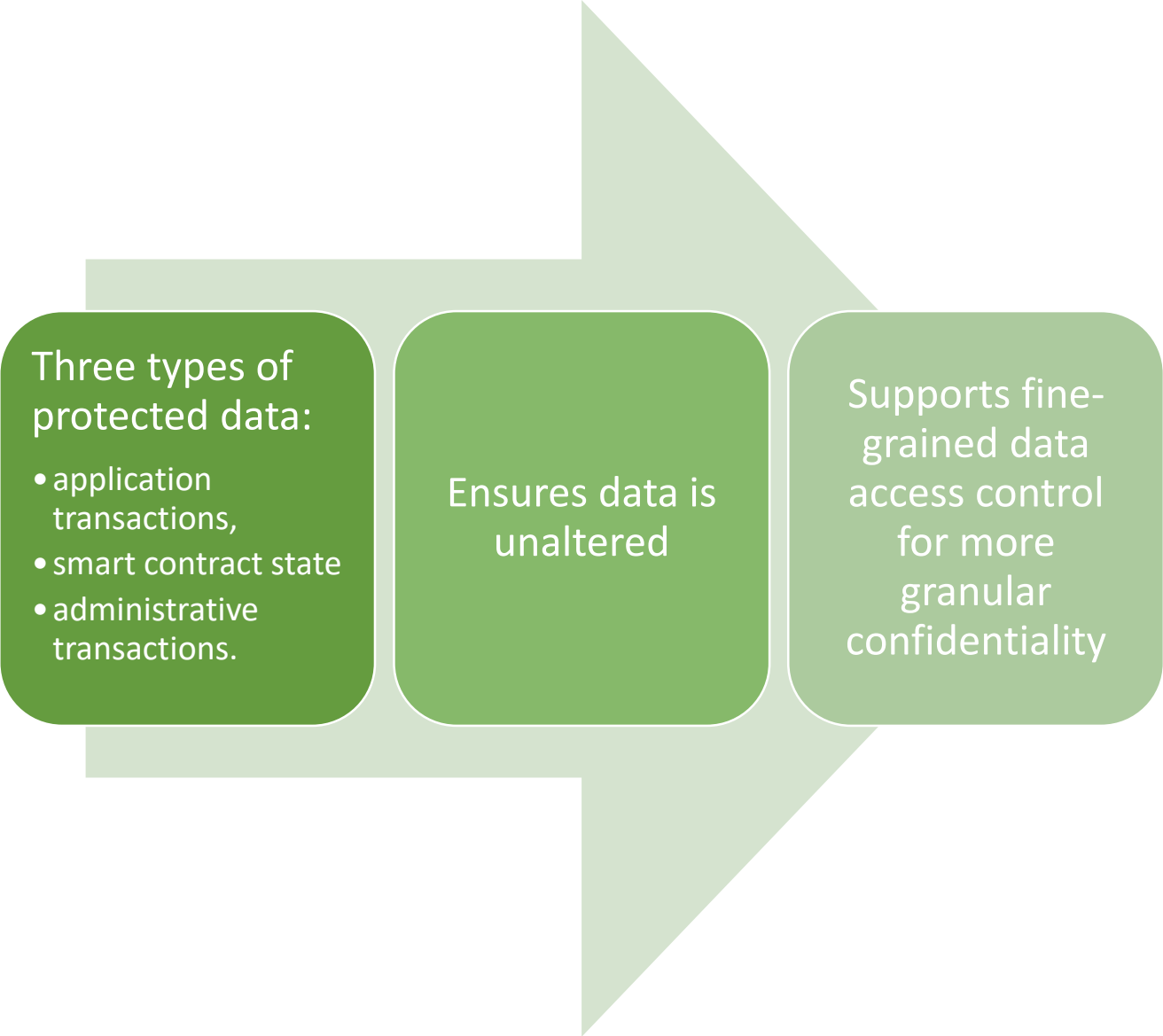
Secure communication channels to protect confidentiality

Encryption and authentication supported at the application layer instead of the transport layer.

# Transaction Workflow

# Consensus Algorithms supported

- Supports pluggable consensus algorithms
- Helps achieve efficient agreement and maximum throughput
- Regardless of the consensus algorithm employed, consensus can be achieved as quickly as durability and serializability requirements are met for the algorithm



Three types of protected data:

- application transactions,
- smart contract state
- administrative transactions.

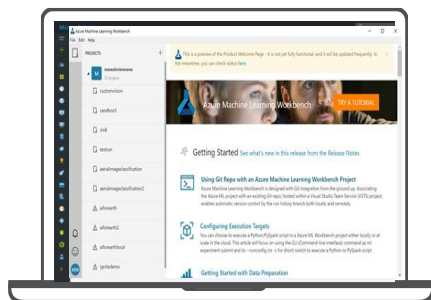
Ensures data is unaltered

Supports fine-grained data access control for more granular confidentiality

Confidentiality  
and Integrity-  
Persistent state

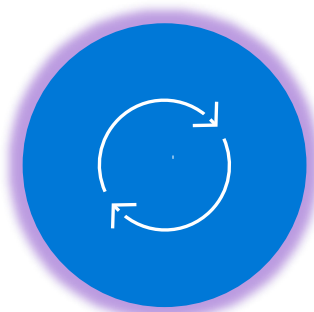
# Azure Machine Learning: New Capabilities

*Build, Deploy, Manage and Monitor models at any scale*



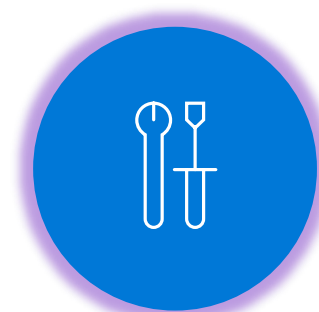
## Workbench

*Wrangle Data, Build models, Deploy & Manage*



## Experimentation

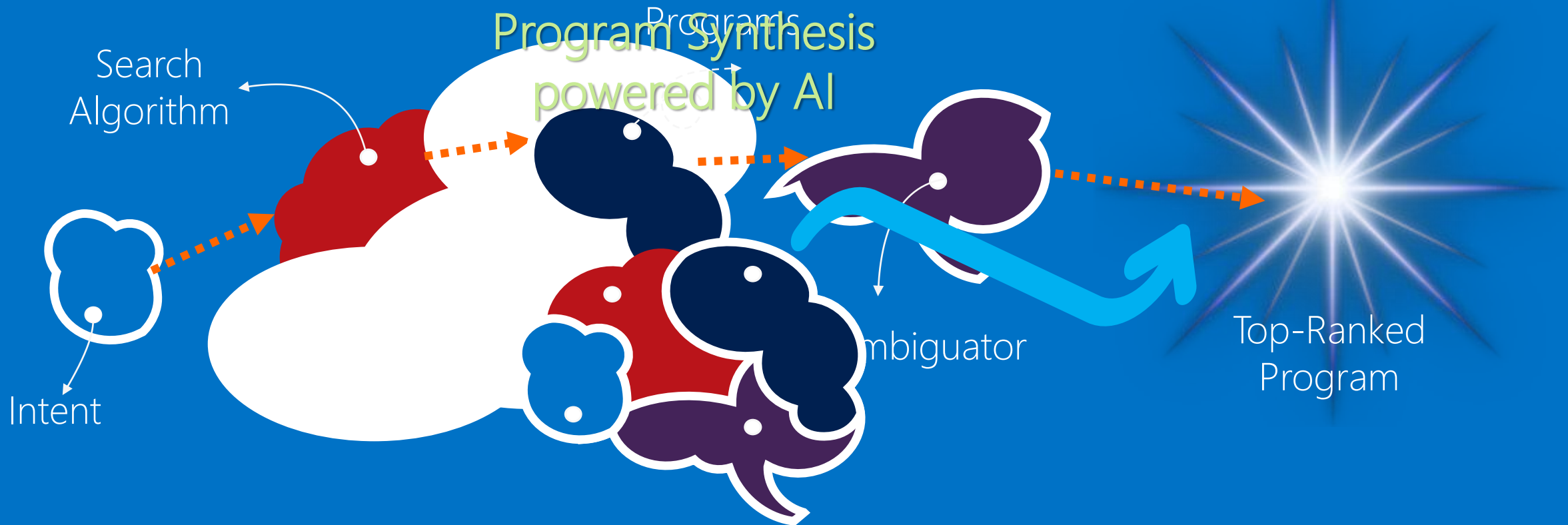
*Boost productivity with Spark, GPUs and agile development.*



## Model Management

*Deploy, Version, Manage & Monitor Models*

# Less Cleaning, More Exploring with AI based Program Synthesis



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More productive in - **getting data, shaping it, and preparing it**

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Microsoft Research on [program synthesis \(PROSE\)](#) and [data cleaning](#)

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**Inclusion of a simple set of libraries** for handling data sources

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**Scale out transparently** across our cloud compute engines

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Building your **data transformations by example**

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Easy to inject custom python code or libraries to filter or transform the data

# AML workbench

*AI powered Data wrangling*



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Complete history of **how your model evolves over time**

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Every project **backed by a Git repository**

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**Simple command line tool** for managing experimentation and training runs

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**Flexibility of tools**

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Leverage any Python tools and frameworks that you want to use

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Experiments can run locally, inside of a Docker container **locally or remotely**, or scaling out on top of Spark

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# Azure Machine Learning Experimentation

*Handles the execution of machine learning experiments*



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**Docker as the vehicle** to provide control and flexibility for model hosting

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repeatable and **consistent environment** for hosting your models

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Models are exposed via web services written in Python

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Deployed models can be **monitored through Application Insights**

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**Versions tracked** with deployed models

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**No downtime** – Support for managing upgrades, rollback to a version

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**Retraining** for continuous improvement (based on new data)

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## Model Management Capabilities

*Deployment, Hosting, Versioning, Management, and Monitoring for models*





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Governance and Lineage of deployed models

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Visibility into any decision and tracing it back if required

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Debugging and Diagnostics story across the end to end lifecycle of a model.

# Experimentation and Model Management services in conjunction

*Visibility into any decision*

