



BLOCKCHAIN  
LABORATORY



# Blockchain Technologies

***At the heart  
of technology***



## About Us

TÜBİTAK BİLGEM Blockchain Laboratory was established in 2017 as Türkiye's first blockchain research and development center funded by public resources.

With an interdisciplinary team of cryptographers, computer engineers, and information security researchers, the laboratory conducts both fundamental R&D and applied projects that make strategic contributions to Türkiye's digital security infrastructure.

TÜBİTAK BİLGEM approaches blockchain not merely as a ledger technology, but as a foundational element of **critical infrastructure security** and a transformative tool for **generating economic and social value**.

Guided by this vision, the laboratory develops **secure, sustainable, and nationally sovereign solutions** by integrating blockchain technologies into Türkiye's digital infrastructure.

Serving as a bridge between public institutions, the private sector, and academia, Blockchain Laboratory advances Türkiye's blockchain landscape through technology development, capacity building, and ecosystem growth.

In the age of digital transformation, **ensuring trust, identity, and data integrity** is the foundation of technological sovereignty. As TÜBİTAK BİLGEM, we are rebuilding Türkiye's digital security on the principle of **decentralized trust**.



### Our Mission

To specialize in blockchain technologies and conduct R&D,

To serve as a technical partner to public institutions on blockchain projects, particularly on matters of security and privacy,

To develop skilled professionals and contribute to the formation of national infrastructures and ecosystems,

To support the drafting and implementation of regulations in the areas of technology and its applications.



### Our Vision

To be a pioneering research center that develops, directs, and sets the standards for blockchain technologies in the public interest, with the goal of building trustworthy, transparent, and inclusive digital infrastructures.

## Our Research Areas

The TÜBİTAK BİLGEM Blockchain Laboratory is structured around five areas of expertise, encompassing research, development, and implementation activities across all layers of blockchain technology.

This structure represents a holistic R&D approach, from infrastructure design and security through to application development and ecosystem formation. Each domain contributes to projects that strengthen Türkiye's digital security, thereby establishing the technical foundation for the national blockchain vision.

### Blockchain Architecture



Designs the underlying infrastructure of blockchain systems. Works on consensus algorithms, network topology, cross-chain communication, and performance optimization to develop secure and scalable blockchain solutions.

### Blockchain Security



Ensures the resilience of blockchain infrastructures against cyber threats. Works on attack analysis, threat intelligence, AML (anti-money laundering), and secure software development to contribute to the protection of the blockchain ecosystem.

### Decentralized Applications



Develops smart contracts and blockchain-based digital applications. Designs decentralized, transparent, and auditable systems across domains such as finance, identity, energy, and supply chain.

### Application Areas and Ecosystems



Conducts pilot deployments and industry-university collaborations in the public, finance, energy, and industrial verticals. Works toward the scaling and wider adoption of technologies developed in the laboratory, and develops skilled professionals in critical fields to support the growth of Türkiye's blockchain ecosystem.

### Blockchain Cryptography



Forms the mathematical foundation of blockchain security. Conducts R&D on zero-knowledge proofs (ZKP), multi-party computation (MPC), homomorphic encryption, and digital signature technologies to ensure data confidentiality and integrity.

## Our Solutions



### Digital Türkiye

An infrastructure operated in accordance with the next-generation digital identity management model and governed by its own community.



### Digital Asset Custody System

A multi-party computation (MPC) and hardware security module (HSM) based solution for the secure storage, management, and transfer of institutional digital assets.



### Digital Wallet

A user-friendly digital wallet solution for the secure transfer of identities, documents, and digital assets.

## Our Focus Areas



### Research & Development

TÜBİTAK BİLGEM develops original infrastructures and innovative solutions that address Türkiye's strategic needs through pioneering blockchain projects.

**Digital Assets:** Through Central Bank Digital Currency (CBDC) and gold-backed digital currency projects, we are building the infrastructure to digitize national currencies.

**Digital Identity:** We are building a Self-Sovereign Identity (SSI) infrastructure that puts data control in the hands of users, aligned with international standards such as DID and Verifiable Credentials.

**Custody Systems:** We are developing digital asset custody systems backed by Multi-Party Computation (MPC) and Hardware Security Module (HSM) technologies.

**Blockchain Security:** We are developing Anti-Money Laundering (AML) and anomaly detection solutions by analyzing on-chain transactions using artificial intelligence.

**Tokenization:** We are enabling secure asset transfer by creating blockchain-based representations of digital and physical assets.

**Blockchain-Based Public Administration Projects:** We are developing pilot deployments that bring transparency, speed, and accountability to public services such as land registry, energy management, and social assistance.



### Regulation & Standards

Working with national and international bodies, we build the regulatory and standards frameworks that enable blockchain technology to be adopted safely, compliantly, and with full auditability.

**Technical Criteria and Legislative Support:** We define the technical criteria required for crypto asset regulations under the Capital Markets Law and provide expert input throughout the legislative process.

**Technical Reporting and Auditing:** We prepare technical reports on crypto asset service providers at the request of the Capital Markets Board of Türkiye (CMB) and take an active role in audit processes.

**International Standards Engagement:** We contribute to ISO technical committees working on global blockchain standards.

**National Standardization:** In coordination with Turkish Standards Institution (TSE), we lead the integration of international standards into the local ecosystem and develop national technical guidelines.



## Ecosystem & Infrastructure

Through our national blockchain initiatives, we aim to build a culture of knowledge sharing and collaborative development that strengthens Türkiye's capabilities and expands its partnerships in this field.

**Digital Türkiye:** We are building a sustainable digital trust infrastructure governed by its own community and aligned with next-generation digital identity standards.

**Education and Awareness:** We strengthen blockchain awareness and expertise across the ecosystem by organizing scientific events, training programs, and contributing to university curricula.

**National Blockchain Framework:** We develop the standards and strategic frameworks crucial to improving interoperability across public and private sector systems in Türkiye.

**NGO Partnerships:** We collaborate with relevant associations, chambers, and foundations to broaden blockchain awareness and support ecosystem development.



## Education & Consulting

We work with public and private sector stakeholders to build the technical capacity needed for the secure and efficient use of blockchain technologies, and to develop a stronger ecosystem in this field.

**Blockchain Technologies:** Training programs covering everything from foundational concepts to architectural design.

**Digital Identity:** Technical knowledge sharing on digital identity ecosystems aligned with DID, VC, and eIDAS 2.0 standards.

**Digital Asset Custody:** Specialized training on institutional custody models, secure key management, and regulatory compliance.

**Blockchain-Based Transformation:** Strategic consulting services that help organizations redesign their business processes using blockchain technology.

**Blockchain Security:** Hands-on training covering cyber threat analysis, network security, and cryptographic security testing.

## Our Projects



### **BiGA – Bir Gram Altın**

Developed in collaboration with Takasbank, the BiGA system (translates to: One Gram Gold) is a digital gold solution operating on a blockchain network that preserves transaction privacy and data integrity by utilizing advanced cryptographic techniques such as zero-knowledge proofs (ZKP) and homomorphic encryption.



### **Crypto Radar**

An AI and big data-powered platform that delivers 24/7 analysis and surveillance of crypto asset markets. It combines anomaly detection, risk scoring, and social media monitoring to provide comprehensive, real-time visibility into market activity, helping regulators and market participants respond to emerging risks faster.



### **Digital Identity**

Designed to enable the secure verification of identities across individuals, institutions, and connected objects, this infrastructure standardizes digital identity verification, authorization, and data sharing through solutions built on decentralized identifiers (DID) and verifiable credentials (VC).



### **BLUEDU**

BLUEDU is designed to strengthen the blockchain knowledge and digital skills of vocational educators in information and communication technologies, with the broader goal of supporting student career development. To this end, the project has carried out activities including the definition of learning objectives, the development and validation of teaching materials, and the creation of an interactive e-book.



### **Digital Asset Custody**

A solution that provides secure storage, key management, and access control for digital assets at the institutional level.



### **Digital Currency Infrastructure**

The Digital Currency Infrastructure Project encompasses the development of a blockchain-based digital currency architecture, advanced cryptographic protocols that secure user privacy and data integrity, digital identity integration, and a multi-layered cybersecurity infrastructure.

***At the heart  
of technology***



Building Türkiye's digital sovereignty,  
**block by block.**



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