

Digital traceability system			3KEYS	Argos Inspection and Technologies
System types & operational models	Category	Defines the initiative's structural role within the traceability ecosystem (see Section 3.1).	Commercial solution	Commercial solution
	Description	Concise summary of the system's core function, sector focus, and role in supply-chain traceability.	Consulting and implementation provider for serialisation and track-and-trace projects supporting regulatory compliance and brand protection.	Real-time digital monitoring for stock data and audit trails of bulk commodities using IoT sensors, drones, and spatial scanning.
	Operating entity type	Type of organisation that operates the system	Private technology company	Private technology company
	Governance lead(s)	Named organisation(s) responsible for governance, strategic oversight, and institutional accountability.	3KEYS GmbH	Argositech
Scope	Primary sector(s)	Main industry domain(s) for which the system is designed or primarily applied.	Cross-sector	Cross-sector
	Minerals	Mineral or material groups actively targeted in documented deployments (not theoretical capability).	Material-agnostic	Base metals
	ASM inclusion (explicit design focus)	Indicates whether the system explicitly incorporates or targets artisanal and small-scale mining (ASM) actors.	No	No
Technical architecture	Deployment model (system structure & operation)	Core technical architecture and operational configuration.	Centralised database — Commercial SaaS platform	Centralised database — Commercial SaaS platform
	Control mechanism (data integrity & claim validation)	Primary technical and/or governance mechanism used to secure data integrity and substantiate provenance or ESG claims.	Serialisation & event tracking (non-DLT)	Serialisation & event tracking (non-DLT)
	Identifier support	Indicates whether and how physical materials or products are linked to digital records through dedicated identifiers.	Serialised digital IDs	IoT-enabled IDs
	Interoperability model	Describes how the system enables data exchange with external systems and ecosystem partners.	Enterprise API interoperability	Enterprise API interoperability
Reference information	Official website	Primary publicly available source used for system documentation and verification.	https://www.3keys.com/	https://argositech.com

Digital traceability system		BATRACE	Catena-X	Circularise	Circular
System types & operational models	Category	R&D initiative	Support infrastructure	Commercial solution	Commercial solution
	Description	Research project on sustainable processing and traceability of battery metals and materials, exploring analytical methods for origin tracking and production optimisation.	Industrial data space facilitating interoperable traceability and DPP frameworks for the automotive industry.	Blockchain-based DPP platform providing mass balance traceability and tokenized sustainability certificates.	CRM and battery traceability system supporting due diligence and ESG risk management.
	Operating entity type	Public-funded consortium	Non-profit industry association	Private technology company	Private technology company
	Governance lead(s)	VTT Technical Research Centre of Finland (coordinator); Geological Survey of Finland (GTK)	Catena-X Automotive Network	Circularise	Circular
Scope	Primary sector(s)	Battery value chains	Automotive industry (multi-material)	Cross-sector	Battery value chains
	Minerals	Battery minerals	Material-agnostic	3T; battery minerals; REE	Battery minerals
	ASM inclusion (explicit design focus)	No	Not applicable	No	No
Technical architecture	Deployment model (system structure & operation)	Research prototype (non-DLT)	Federated data-space	Permissioned blockchain — Commercial SaaS platform	Permissioned blockchain — Commercial SaaS platform
	Control mechanism (data integrity & claim validation)	Experimental traceability logic	Interoperability logic (connectors & shared data models)	Mass-balance accounting (DLT-enabled)	Blockchain-based event tracking
	Identifier support	Digital product passport–style identifiers	Serialised digital IDs	Digital token identifiers	Serialised digital IDs
	Interoperability model	Controlled / permissioned interoperability	Multi-system interoperability infrastructure	Enterprise API interoperability	Enterprise API interoperability
Reference information	Official website	https://www.vttresearch.com/en/news-and-ideas/sustainable-production-methods-and-traceability-materials-battery-manufacturing	https://catena-x.net	https://www.circularise.com	https://www.circular.com

Digital traceability system		CIRPASS-2	Ethereum / IPFS	Everledger	iPoint
System types & operational models	Category	R&D initiative	Support infrastructure	Commercial solution	Commercial solution
	Description	EU-funded multi-stakeholder Innovation Action building on CIRPASS pilot to scale real-world deployment and interoperability testing of DPPs aligned with ESPR.	Public decentralised blockchain (Ethereum) combined with distributed file storage (IPFS), forming general-purpose Web3 infrastructure used by some traceability applications	Blockchain platform providing traceability for high-value assets and a range of industries.	Enterprise software platform for supply-chain transparency, material compliance, and product sustainability, supporting traceability, due diligence, and ESG/regulatory reporting.
	Operating entity type	Public-funded consortium	Decentralised protocol	Private technology company	Private technology company
	Governance lead(s)	CEA (coordinator); and consortium partners	Ethereum Foundation / Protocol Labs	Everledger	iPoint
Scope	Primary sector(s)	Cross-sector	Cross-sector	Cross-sector	Cross-sector
	Minerals	Material-agnostic	Material-agnostic	Diamonds & gemstones; battery minerals	3T; battery minerals
	ASM inclusion (explicit design focus)	Not applicable	Not applicable	Yes	No
Technical architecture	Deployment model (system structure & operation)	Research prototype (non-DLT)	Public distributed blockchain infrastructure	Permissioned blockchain — Commercial SaaS platform	Centralised database — Commercial SaaS platform
	Control mechanism (data integrity & claim validation)	Interoperability logic (semantic models, interoperability standards, and DPP data specifications)	Blockchain anchoring	Blockchain-based event tracking	Serialisation & supplier documentation (non-DLT)
	Identifier support	No dedicated identifier layer	Identifier application-defined (infrastructure-level)	No dedicated identifier layer	Documentation-based identifiers (supplier/product references)
	Interoperability model	Standards-based ecosystem integration	Open infrastructure layer	Enterprise API interoperability	Enterprise API interoperability
Reference information	Official website	https://cirpass2.eu/	https://ethereum.org/ https://ipfs.tech	https://www.everledger.io	https://www.ipoint-systems.com

Digital traceability system		iTraceIT	iTSCi	MaDiTraCe	MineHub
System types & operational models	Category	Commercial solution	Multi-stakeholder programme	R&D initiative	Commercial solution
	Description	Blockchain traceability platform capturing product origin, ownership, compliance documents, and transformation history across complex supply chains.	Traceability for tin, tantalum, and tungsten (3T) minerals due diligence in the African Great Lakes region.	EU-supported project developing digital and material traceability methods for CRMs, integrating them into a prototype certification scheme.	Digital platform for mining commodity transactions and supply chain collaboration, with integrated shipment tracking and provenance capabilities.
	Operating entity type	Private technology company	Industry association	Public-funded consortium	Private technology company
	Governance lead(s)	iTraceIT	International Tin Association	BRGM (coordinator); and consortium partners	MineHub Technologies
Scope	Primary sector(s)	Cross-sector	Minerals & metals	Minerals & metals	Minerals & metals
	Minerals	Diamonds & gemstones; precious metals	3T	Battery minerals; REE	Base metals
	ASM inclusion (explicit design focus)	Yes	Yes	No	No
Technical architecture	Deployment model (system structure & operation)	Permissioned blockchain — Commercial SaaS platform	Centralised database (non-DLT, programme-based)	Research prototype (non-DLT)	Permissioned blockchain — Commercial SaaS platform
	Control mechanism (data integrity & claim validation)	Blockchain-based event tracking	Procedural validation (bag-and-tag, audits, incident follow-up)	Analytical proof-of-origin + digital certification layer	Blockchain-based event tracking
	Identifier support	Serialised digital IDs	Bag-and-tag physical IDs	Analytical fingerprinting	Serialised digital IDs
	Interoperability model	Enterprise API interoperability	Controlled / permissioned interoperability	Standards-based ecosystem integration (prototype)	Enterprise API interoperability
Reference information	Official website	https://cirpass2.eu/	https://www.itsci.org/	https://www.maditrace.eu	https://www.minehub.com

Digital traceability system		Minespider	OPTEL	PeerLedger	RCS Trace
System types & operational models	Category	Commercial solution	Commercial solution	Commercial solution	Commercial solution
	Description	Blockchain-based traceability platform for mineral supply chains, supporting multi-actor data sharing.	Traceability and carbon reporting platform used by companies across multi-sector supply chains.	Blockchain-based traceability platform using shared ledgers to support ESG data exchange in supply chains.	Traceability platform for mineral supply chains, supporting chain-of-custody tracking and due diligence reporting, including implementation through programmes such as Better Mining
	Operating entity type	Private technology company	Private technology company	Private technology company	private technology company
	Governance lead(s)	Minespider	Optel Group	PeerLedger	RCS Global
Scope	Primary sector(s)	Minerals & metals	Cross-sector	Cross-sector	Minerals & metals
	Minerals	3T; battery minerals; base metals	3T; battery minerals, base metals	3T; precious metals; battery minerals	3T; precious metals; battery minerals
	ASM inclusion (explicit design focus)	Yes	No	No	Yes
Technical architecture	Deployment model (system structure & operation)	Permissioned blockchain — Commercial SaaS platform	Centralised database — Commercial SaaS platform	Permissioned blockchain — Commercial SaaS platform	Permissioned blockchain — Consortium network
	Control mechanism (data integrity & claim validation)	Blockchain-based event tracking	Serialisation & event tracking (non-DLT)	Blockchain-based event tracking	Blockchain-based event tracking
	Identifier support	Serialised digital IDs	Serialised digital IDs	Serialised digital IDs	Serialised digital IDs
	Interoperability model	Enterprise API interoperability	Enterprise API interoperability	Enterprise API interoperability	Enterprise API interoperability
Reference information	Official website	https://www.minespider.com	https://www.optelgroup.com	https://www.peerledger.com	https://www.slrconsulting.com/

Digital traceability system		RE SOURCE	SAP GreenToken	START (Rio Tinto)	SustainBlock
System types & operational models	Category	Commercial solution	Commercial solution	Commercial solution	Multi-stakeholder programme
	Description	Supply-chain traceability and ESG compliance platform for critical minerals and battery value chains.	Solution for mass-balance traceability and sustainability attribution in complex supply chains.	Customer-facing sustainability and traceability label for Rio Tinto products, providing shipment-level ESG metrics to support due diligence and reporting.	Blockchain-enabled chain-of-custody pilot, coordinated by iPoint, to strengthen due diligence, transparency, and ASM inclusion in mineral supply chains.
	Operating entity type	Private technology company	Private technology company	Mining company	Public-funded consortium
	Governance lead(s)	Industry partnership led by Glencore, CMOC (via IXM), and Eurasian Resources Group (ERG)	SAP	Rio Tinto	iPoint (coordinator); BetterChain
Scope	Primary sector(s)	Minerals & metals	Cross-sector	Minerals & metals	Minerals & metals
	Minerals	Battery minerals	Base metals	Base metals	3T; precious metals
	ASM inclusion (explicit design focus)	No	No	No	Yes
Technical architecture	Deployment model (system structure & operation)	Permissioned blockchain — Consortium network	Permissioned blockchain — Commercial SaaS platform	Permissioned blockchain — Corporate-controlled SaaS platform	Permissioned blockchain — Programme-based implementation
	Control mechanism (data integrity & claim validation)	Blockchain-based event tracking	Mass-balance accounting (DLT-enabled)	Blockchain-based event tracking	Hybrid: blockchain + procedural validation
	Identifier support	Serialised digital IDs	Digital token identifiers	Serialised digital IDs	Bag-and-tag + digital IDs
	Interoperability model	Controlled / permissioned ecosystem platform	Enterprise API interoperability	Limited / proprietary system	Controlled / permissioned interoperability
Reference information	Official website	https://re-source.tech	https://www.sap.com	https://www.riotinto.com/en/sustainability/ethics-compliance/value-chain/start	https://www.sustainblock.org/

Digital traceability system		Tilkal	TinLink	Trace4EU / EBSI	TraceMet
System types & operational models	Category	Commercial solution	Multi-stakeholder programme	Support infrastructure	R&D initiative
	Description	Blockchain-based multi-sector traceability platform combining supply chain data and analytics to support transparency, compliance and risk management.	Blockchain-based project for enhanced traceability and due diligence in tin supply chains, integrating data and governance to support actor collaboration and transparency.	EU-led public blockchain infrastructure (EBSI) and associated Trace4EU pilots that explore traceability use and verifiable credentials for cross-border data exchange.	Research and pilot initiative exploring technical and governance designs for metal traceability systems.
	Operating entity type	Private technology company	Public-funded consortium	Public authority (EU Commission)	Public-funded consortium
	Governance lead(s)	Tilkal	LuNa Smelter Ltd (coordinator); Siemens Energy; Responsible Trade LLC; Minespider; Woodcross Resources; Luma Congo; Luma Holding; International Women in Mining	Trace4EU Consortium; European Commissio	IVL Svenska Miljöinstitutet (coordinator); RISE; Svemin; Boliden; Elektrokoppar; LKAB; SSAB; ABB; Scania; Volvo Group
Scope	Primary sector(s)	Cross-sector	Minerals & metals	Cross-sector	Minerals & metals
	Minerals	Battery minerals	3T	Material-agnostic	Base metals
	ASM inclusion (explicit design focus)	No	Yes	Not applicable	No
Technical architecture	Deployment model (system structure & operation)	Permissioned blockchain — Commercial SaaS platform	Permissioned blockchain - Programme-based implementation	Public-permissioned blockchain infrastructure	Research prototype (DLT)
	Control mechanism (data integrity & claim validation)	Blockchain-based event tracking	Hybrid: blockchain + procedural validation	Blockchain anchoring	Experimental traceability logic
	Identifier support	Serialised digital IDs	Bag-and-tag + digital IDs	Digital credentials	Serialised digital IDs
	Interoperability model	Enterprise API interoperability	Controlled / permissioned interoperability	Open infrastructure layer	Standards-based ecosystem integration (prototype)
Reference information	Official website	https://www.tilkal.com	https://tinlink.eu	https://trace4eu.eu	https://www.swedishmininginnovation.se/project/tracemet/

Digital traceability system		Valutrax (Anglo American)
System types & operational models	Category	Commercial solution
	Description	Proprietary blockchain-based traceability platform from Anglo American that tracks metals and minerals from mine to customer, providing product provenance and key ESG indicators.
	Operating entity type	Mining company
	Governance lead(s)	Anglo American
Scope	Primary sector(s)	Minerals & metals
	Minerals	Base metals
	ASM inclusion (explicit design focus)	No
Technical architecture	Deployment model (system structure & operation)	Permissioned blockchain — Corporate-controlled SaaS platform
	Control mechanism (data integrity & claim validation)	Blockchain-based event tracking
	Identifier support	Serialised digital IDs
	Interoperability model	Limited / proprietary system
Reference information	Official website	https://www.angloamerican.com/about-us/marketing-solutions-for-our-customers/

Methodological note:

The matrix categorises digital traceability systems based on publicly available documentation, including company materials, project reports, technical descriptions, and institutional publications.

Where detailed technical specifications were not publicly disclosed, classifications reflect the system’s stated design logic and operational model as inferred from official descriptions and implementation reports. The matrix captures the dominant or intended integrity mechanism rather than all possible features or optional integrations.

Given the evolving nature of digital traceability technologies and variation in implementation across pilots and commercial deployments, classifications should be interpreted as structured analytical approximations rather than exhaustive technical audits.