AXEDRAS CASE STUDY

Connecting and Digitalizing the Precious Metals Industry

Powered by Corda Enterprise, the aXedras™ Bullion Integrity Ledger™ digitalizes the precious metal value chain all the way from miner to investor—boosting provenance tracking, regulatory compliance and product integrity while reducing transaction times, manual processes and reconciliation.

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Urs Röösli
CEO, aXedras

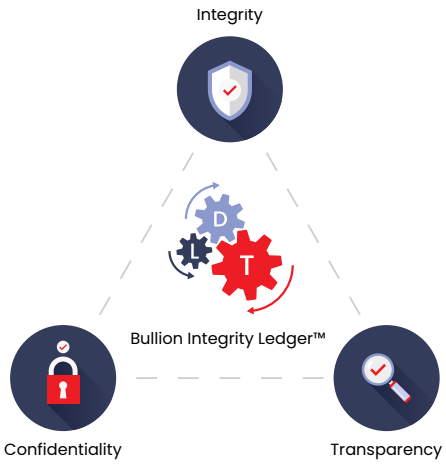
aXedras™ Bullion Integrity Ledger™—at a glance

Platform: R3's Corda Enterprise

Application: Bullion Integrity Ledger™

Application builder: aXedras

Accelerated by: R3, Microsoft, ScaleFocus



About aXedras

Founded in Switzerland in 2018 and headquartered in Zug, aXedras is an independent software developer focused on applying blockchain to benefit the precious metals markets, starting with gold and then extending to include silver, palladium and platinum. aXedras' initial proof of concept for its Bullion Integrity Ledger™ based on R3's Corda Enterprise was developed into a first prototype in October 2019, and—following very positive feedback from industry participants—the live version was launched in October 2020. The company has more than 15 FTEs employed in Switzerland, UK and Bulgaria.

The industry problem

In the gold market and industry value chain, trust between participants and confidence in the integrity of the product have traditionally been based on personal relationships. But this is no longer enough, with the rising importance of sustainability and human rights issues meaning industry players are often required to demonstrate the integrity and provenance of the physical product. However the paper-based and largely manual nature of the industry's documentation and processes means proving provenance is difficult, slow and expensive. So there's a pressing need to digitalize processes and proof of origin along the value chain, while enabling all participants to share a single version of the truth in a seamless and confidential way.

The solution

aXedras knew that any solution to gold's pain points around integrity, provenance and reputation would need to involve all industry participants, both upstream and downstream—including suppliers, refiners, logistics companies, traders and banks. So the company worked with all these players in developing the Bullion Integrity Ledger™—a blockchain-based application that digitalizes precious metals and the entire end-to-end process and value chain around it, boosting integrity and efficiency while maintaining confidentiality for all participants. aXedras chose R3's Corda Enterprise to underpin its solution, primarily because of Corda's strong privacy capabilities and peer-to-peer communications.

The outcome

Today, the Bullion Integrity Ledger™ ecosystem is up and running in its starting phase with a select grouping of the gold industry's leading refiners, logistics companies, banks and traders. Participants are experiencing the benefits from the platform at first hand, including better visibility of provenance throughout the value chain and substantial time and cost savings. Looking forward beyond the starting phase, aXedras' goals for 2021 include doubling the number

of participants in the ecosystem, onboarding additional stakeholders such as mines and recycling companies, and rolling out new modules to meet users' requests.

The pain point

A high value market beset by reputational challenges, and supply chain inefficiencies

According to the Metals Focus Gold Focus 2020, the world's total gold supply in 2020 was 4762 tones, of which around 70% was mined and 30% recycled from other sources. The total value of this gold was US$289 billion, reflecting a massive increase since the 1990s—an upward trend that's been accelerated by the investor demand from the global economic uncertainty of COVID-19.

But gold's importance to the financial markets is only part of the story. It's also at the heart of a complex global industry and physical supply chain made up of many different participants, all interacting and sharing information. On the upstream side there are the mining and recycling companies that supply the physical gold to the refiners to be refined into gold bars. Then there are the logistics companies that transport and vault the bars to the downstream customers and consumers, which include bullion banks and traders, and industries that use gold in products such as jewelry, watches and high-end electronic equipment.

While it's a well-established part of both the global financial and industrial systems, gold suffers from some significant challenges. aXedras CEO Urs Röösli takes up the story. "It is often alleged that gold is used for illegal drugs and money laundering, that some of the gold held in vaults is fake, and that it's mined using child labor. All of this creates huge reputational risks for gold as an investment product. So the gold market has to find a way to accurately document provenance and provide a clear chain of custody to demonstrate high integrity and protect against counterfeit. All of this can be done by digitalizing the whole process along the value chain—meaning the entire industry has an opportunity to change and improve before it is forced to. That's where we can provide the support the industry needs."

The pressure for change has been increasing in recent years. Over the past decade or so, the rise of corporate social responsibility (CSR) and environmental, social and governance (ESG) issues up the agenda for society, investors and governments has intensified the focus on gold's provenance. Scrutiny has been further intensified by rising awareness of inequality, human rights and climate change as global problems where gold mining can give rise to issues, especially relating to emerging markets in regions such as Latin America and Africa where gold mining activities are often locally organized.

The net effect? Today, it's become imperative for all players in the value chain to be able to prove beyond doubt where gold was produced and that it was sourced ethically and sustainably. While this can be done with existing paper-based systems, it's slow and costly: if an NGO or another interested party asks a refinery for evidence that the gold it's processing is from ethical sources, the refinery will need to trawl through its archives and produce the requested documentation. This takes time and money—and auditing and regulatory compliance processes are similarly expensive and time-consuming. With paper documents remaining the industry's principal way of sharing and storing information, similar inefficiencies exist all the way along the gold value chain.

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> **CEO, aXedras**

Delivering the solution

Connecting and digitalizing the global gold supply chain with a platform for trust, integrity and efficiency

When Swiss-based aXedras set out to develop a solution to gold's pain points around integrity, provenance, reputation and process efficiency, it could see that only a holistic approach would work. "From day one, we knew that building a solution that just met the needs of refineries or traders would not be enough," says aXedras CEO Urs Röösli. "It had to be for the whole market and all participants, both upstream and downstream. And to achieve our goal of digitalizing the gold bar and the entire end-to-end process around it, we had to be a neutral player who would be acceptable to everyone and able to speak to all of them."

Established in 2018, aXedras set about developing the solution—a process that involved close consultation with many potential users, some of them in direct competition with each other. "We brought together the biggest players in the market, and sat down with them to really get to know them and understand what they need," Urs Röösli explains. "This created a feedback loop that was vital to our product development." The engagement with different groups of users showed that each of them has specific pain points to address: for example, refineries need to prove responsible sourcing and transferences to help address ethical and counterfeiting risks, while traders need to optimize their back office to the same degree as the front office. But they all share a need to achieve greater efficiency and visibility along the value chain while maintaining complete confidentiality. The only question is how.

A close analysis of these needs confirmed that distributed ledger technology (DLT) was the right technology to underpin such a solution. But this would be a blockchain platform different from any the industry had seen before. "Over the past five years, participants in the gold value chain have been bombarded with blockchain initiatives," says Urs Röösli. "But none of these really solved their problems in terms of providing transparency on the product and keeping confidentiality on their activities. So we set out to maintain the confidentiality of all parties involved, while still creating the transparency needed at the product level."

This objective created a number of baseline requirements that the blockchain solution selected by aXedras would have to meet. As aXedras CPO Iwan Lottenbach explains, one of the most important was the need for complete privacy. "The requirement for confidentiality in the gold market is absolute," he explains. "It simply isn't acceptable to have a platform provider that centralizes all the information and knows everything that's going on. So having private peer-to-peer connectivity was imperative—supported by robust network rules on how data would be exchanged."

Iwan Lottenbach adds that several other requirements were also key. These included:

- Digital reconciliation capabilities, enabling participants to minimize cost and effort by receiving data digitally based on mutual data standards.
- Enterprise-grade software stack and security, both for the network operating components and the customer installation.
- Easy and simple integration with legacy systems, with one API connecting each participant to the platform and in turn to the other members of the ecosystem.
- Digital transformation of business processes, streamlining the B2B processes while steering and controlling the underlying data updates in a process-driven, efficient and tamper-proof manner.
- Enterprise-grade software support with an ongoing development trajectory and roadmap.

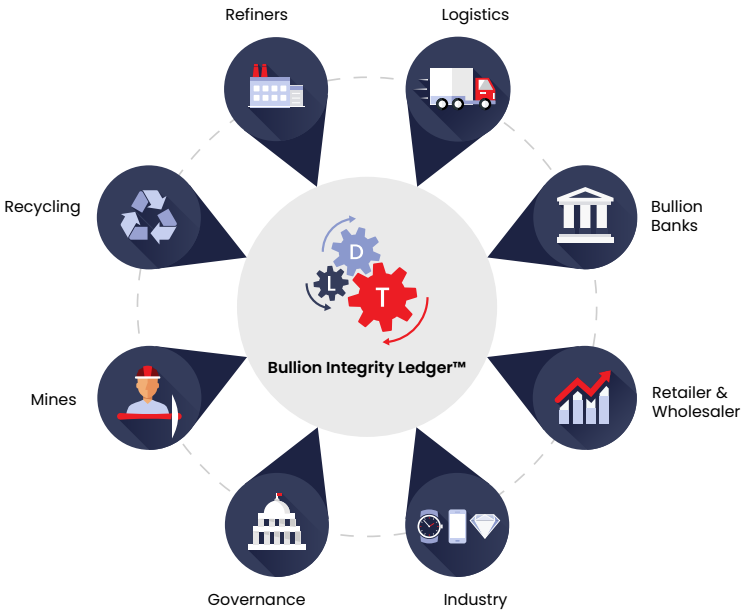
When aXedras benchmarked a range of blockchain platforms against these requirements, Corda Enterprise emerged as the winner. "One key factor was that our platform had to be a permissioned, enterprise-grade DLT network," says aXedras CPO Iwan Lottenbach.

"Equally as important, we needed secure, private peer-to-peer transactions, and that concept is at the heart of Corda—which uses separate distribution of information to maintain security rather than the encryption used by some other blockchain platforms. Corda is also very scalable. And we wanted a technology stack that most users would be familiar with. With Corda we could build the stack on the common Java Virtual Machine industry standard."

aXedras has also used some specific technical elements of Corda—such as transaction attachments and non-validating notary capabilities—to underpin aspects of its Bullion Integrity Ledger™. To maintain confidentiality, data on the decentralized platform is modelled in different states that are shared only with the parties involved. And integrity is achieved by using the format requirements of Corda data fields to define which participant has the right to update which data. For example, only the storage provider can update a product's visual status field. Also, updates of specific states may only be allowed depending on other states: the relocation state can only be updated to "outbounded" if the vault status on the product state has been updated to "in transit". Meanwhile, the aXedras™ governance node has a descriptive view on all products without seeing transaction details, meaning it can alert the parties involved if duplicate products are registered.

aXedras has brought all this together to build the Bullion Integrity Ledger™ with Corda Enterprise at its core (see Figure 1). CEO Urs Rööslı sums up: "Corda Enterprise was the clear choice because it has a very high confidentiality compared to other blockchain platforms. But what's also important to us is having an enterprise-grade solution, because that creates trust. And it's good to be partnering with a global provider that is well-established in the financial markets and whose confidentiality is strong enough for banks rely on. Because, at the end of the day, gold is an important financial product."

Figure 1: The aXedras™ Bullion Integrity Ledger™: connecting and digitalizing the precious metal industry



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The results achieved

Boosting provenance, compliance and product integrity while reducing transaction times, manual processes and reconciliation—and maintaining strict confidentiality

The way the aXedras™ platform operates and delivers benefits for all players along the gold value chain is illustrated in Figure 2. While the solution is starting with gold, it is also designed to cover other precious metals—silver, palladium and platinum. In each case, the Bullion Integrity Ledger™ supports the value chain with digital traceability from the very beginning, with the source of the raw metal itself—be it from a mine or recycled from existing products. Then it continues through the transportation to the refiner, a stage where traceability and integrity are paramount because of the need to trust the product's provenance. From the refiner, the solution accompanies the product downstream into the circulation stage—where integrity remains vital for maintaining trust, the confidentiality of all parties must be safeguarded, and the platform's digitalization enables efficient processes.

In terms of the physical product itself, every gold bar created by a refiner participating in the Bullion Integrity Ledger™ has an accompanying "digital twin" attached to it. This takes the form of a digital Bullion Integrity Certificate™ that describes the exact features of the product—weight, quality, provenance and so on (see Figure 3)—along with unique digital identifiers including an aXedras™ Code. This digital certificate replaces the multiple paper documents that have traditionally been passed between different parties, and provides a single digital identity throughout the product's life-cycle.

Figure 3: "Digital twin": digitalization of physical products—enabling digitalization of end-to-end processes

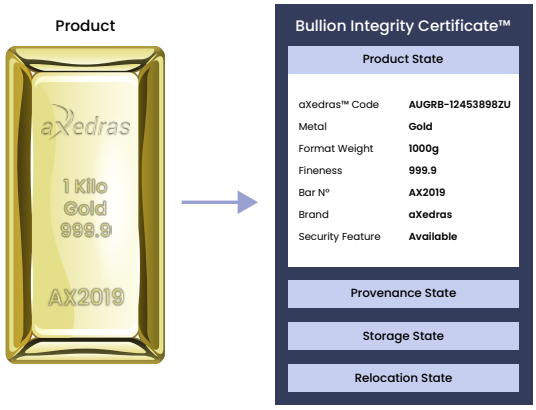
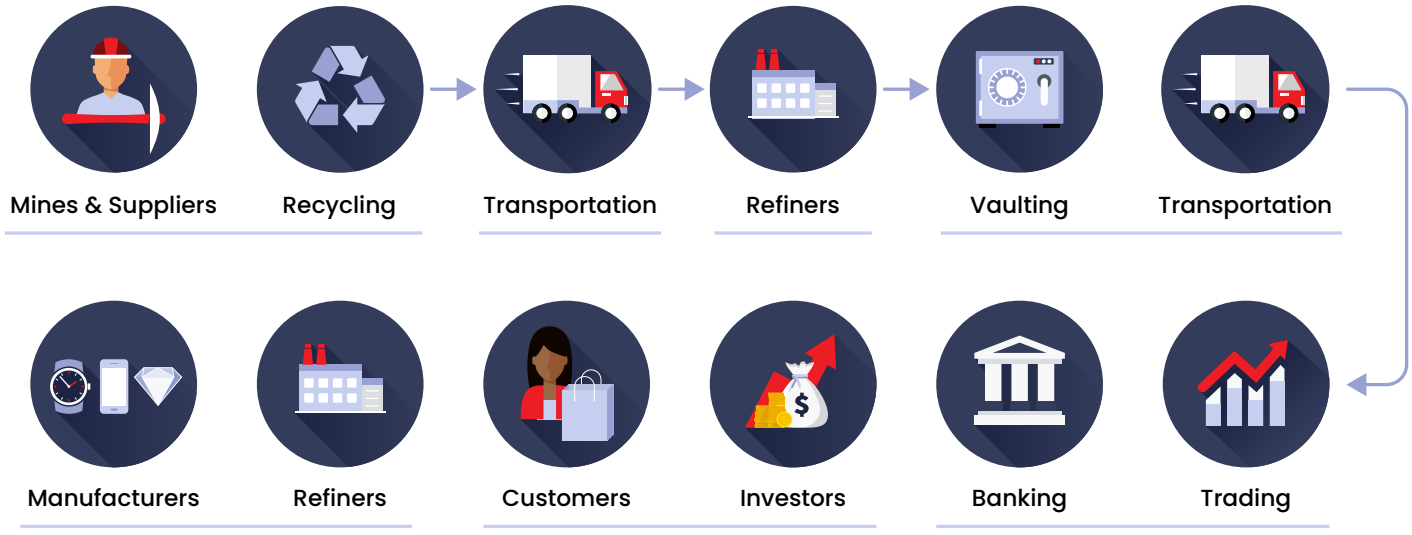


Figure 2: How the aXedras™ solution digitalizes the entire gold value chain—by connecting provenance and chain-of-custody

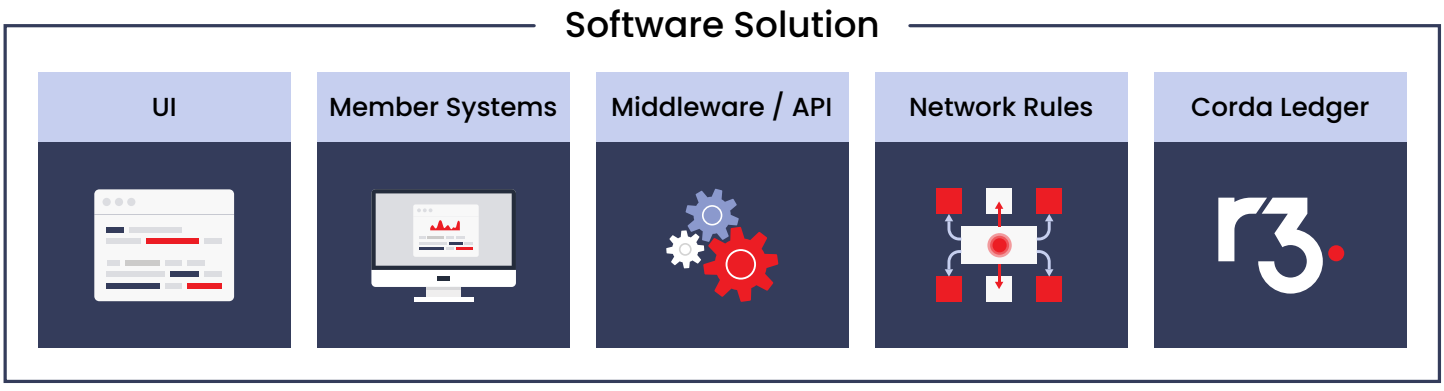


Having digitalized the product, aXedras provides network access to all the members, who connect via their aXedras™ node to gain seamless, secure and private interaction with their network partners. The decentralized architecture guarantees that members always retain full control and ownership of their data. The network governance rules for different participants provide a further layer of security and integrity: for example, refiners—and not traders—can register new products. aXedras CEO Urs Röösli comments: "Technically, we built our solution on Corda; we built the network rules to reflect market processes of the precious metals market; and we built efficient middleware, and can provide an API to each player to connect efficiently to their existing IT solution. Or they can use and apply our software on the user interface directly."

Today, the Bullion Integrity Ledger™ ecosystem is up and running in its starting phase, which includes a number of the gold industry's leading refiners, logistics companies, banks and traders. As the successful pilot continues, the focus for aXedras is on discussing the business case individually with prospects and conducting implementation and integration projects.

aXedras Business Development Engineer Philipp Stockinger says that, alongside technical and industry expertise, the stamina and resilience of the business development team has been instrumental in the company's success. "We talk to so many different players along the entire value chain, including several refineries who are competitors to each other. The same applies to the logistics companies, the banks, the retailers. We talk to all of them individually and also together in common calls to get them all on the same page. This is essential for us to be seen as a neutral and independent technology provider, and achieve our vision of connecting them all and supporting to digitalize their business models."

Figure 4: Members gain seamless, secure and private interactions while staying in control of their data



Next steps

Continuing the global roll-out while building additional modules in response to feedback on users' needs

Looking forward beyond the pilot phase, aXedras' goal for the Bullion Integrity Ledger™ is to scale up by doubling the number of participating refiners, logistic companies and traders/banks. Also planned is onboarding of new types of stakeholder such as mines and recycling companies. And with the first clients putting their registered products on the platform and moving to circulation, aXedras has gained some clear indications of what additional features the market participants would like. It's responding by developing a number of additional modules and functionalities—some upstream, some downstream and some financing oriented—which it aims to bring into production in the near future. Plans are also in hand to roll out the existing upstream and downstream products globally, going beyond the pilot's initial focus on continental Europe.

Another development in prospect is that—alongside saving participants time and money, while also providing traceability and integrity along the value chain—the aXedras™ platform will also enable companies to offer completely new services to their own customers. Philipp Stockinger explains: "In the future, the Bullion Integrity Ledger™ will open up new and innovative revenue streams that will add value to the entire industry. For example, once a participant has digitalized its information it can share the data with its customers. So, for example, an asset manager investing in gold could constantly have a real-time, end-to-end view of where its assets are currently located and the provenance of the precious metals under storage, as well as the whole chain of custody." The message is clear: the Corda-enabled digital transformation that aXedras has initiated in the global gold market is only just beginning.

Continue the conversation

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About R3

R3 is an enterprise software firm that is pioneering digital industry transformation. We deliver purpose-built blockchain technology for all types of businesses in all industries.

Developed in collaboration with our ecosystem, our enterprise blockchain platform Corda is transforming entire industries by digitalizing the processes and systems that firms rely on to connect and transact with each other. Our blockchain ecosystem is the largest in the world with more than 350 institutions deploying and building on Corda and Corda Enterprise. Our customers and partners have access to a network of leading systems integrators, cloud providers, technology firms, software vendors, corporates and banks.

To ensure our customers derive the greatest value from their investment, we provide services and support to shorten time-to-market, as well as guidance on implementation, integration and building ecosystems based on a blockchain platform. Learn more at **r3.com** and **corda.net**.

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