



White paper

Application Programming Interfaces

Delivering a global platform
for the financial services
API economy

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Application Programming Interfaces are transforming the way business is done. Take Uber. Uber integrates a combination of services from third party providers – map and location services from Google, payment services from PayPal and the credit card companies – to create an entirely new way to connect cars and drivers with passengers and to collect payments.

The underlying technologies, “Web APIs,” are a simple way for one business to access the business value of another to create new value. There are plenty of other examples: Trivago and Expedia in the travel industry, Airbnb in hospitality, and so on.

The financial services industry has been late to adopt APIs but is catching up fast, encouraged by regulation such as PSD2 and UK Open Banking, and by pressure from customers to provide more convenient ways to access banking services.

If Web APIs are new to the financial services industry, automation is not. Electronic messaging has been used since the 1970s to enable multi-party business processes with extremely high levels of straight-through-processing (STP), security, and safety. Finance is a network business, with many institutions cooperating to complete a transaction. End-to-end processing of an international payment, for example, requires interactions between at least two, but often three or more banks and a clearing system. It works because the interactions between these players are standardised at an industry level. Banks don't need to negotiate how to interact with every other bank they do business with: they just apply the global business standards and connect to each other through a globally standardised platform.

SWIFT has been at the centre of this effort since the beginning, working with the industry to create, maintain and implement the business and platform standards needed to efficiently process financial transactions. As the industry shifts towards API technologies, we believe that ongoing effort is required to avoid fragmentation and isolation; needless complexities that will frustrate attempts to build the value-added services customers want.

At the same time, SWIFT recognises that APIs and messaging are very different. The platform provided by APIs is more exciting and transformative than the technical communications “plumbing” provided by current financial messaging networks. API solutions are rolled out (and torn down) quickly, updated regularly, and often provide access to proprietary, value-added services rather than globally standardised business processes.

In this paper we explore some of the challenges that the industry faces if it is to unlock the potential of API technology. We also propose several ways to address these challenges through targeted use of existing and improved business standards and identity frameworks.

This paper is a call to action. The transition to a financial services API economy requires sustained engagement from the industry: banks, market infrastructures, technology providers, and standards bodies.

We urge institutions that are embarking on the API journey to look beyond the immediate need to comply with regulation or to implement a tactical solution. Take this opportunity to engage with SWIFT and the broader standards community to benefit from, and help evolve, a global platform for the financial services API economy.

Addressing today's challenges

Financial industry incumbents must respond to 21st century consumer demands for more open and transparent, always-on, real-time, global access to financial services – at a time of increasing challenges from geopolitics, cyber-criminality, regulation, and more agile, technology-driven competition.

In the **banking market**, customer expectations are evolving rapidly and companies with a range of profiles continue to position themselves along the value chain with disruptive consequences. E-commerce giants such as Amazon and Alibaba continue to drive towards frictionless purchasing, while API-native FinTech players are investing to take advantage of “open banking” access to previously closed interbank systems. Additionally, card companies aim to expand into the traditional banking space in response to regulation in their core markets and competition from instant payments and e-commerce platforms.

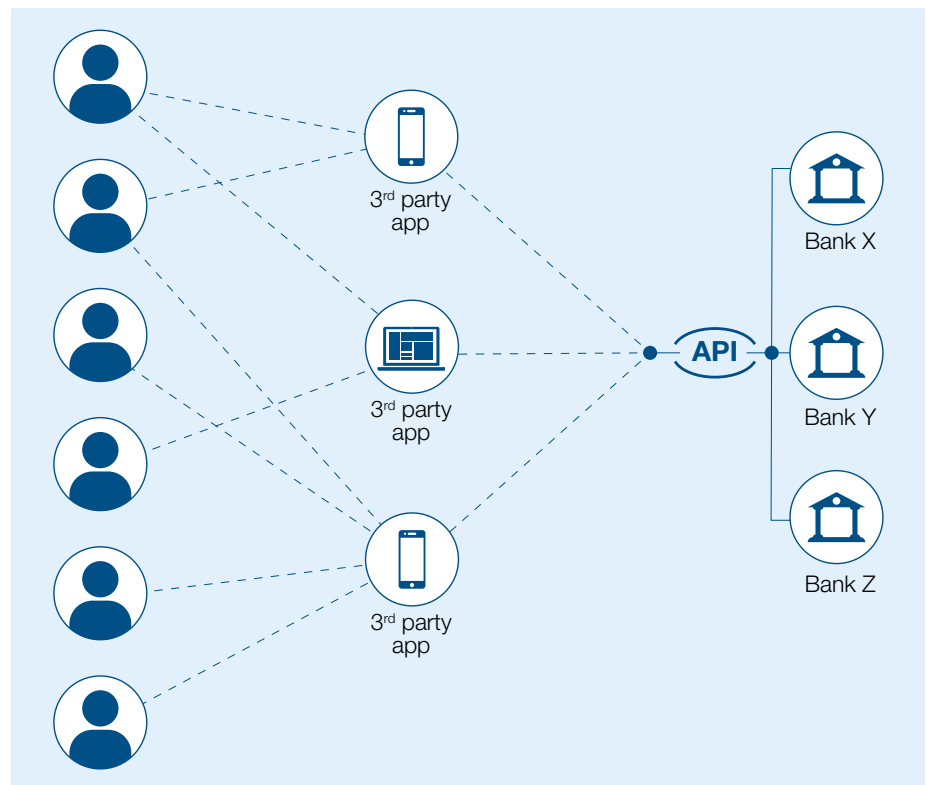
In the **securities market**, pressure from regulators and entrants using new technology is driving a search for cost savings and new ways to deliver customer value. New ecosystems are emerging and firms must decide where they fit – where to specialise and where to partner.

The current crop of Web API technologies are proving sufficiently robust for increasing numbers of financial services applications. Promising to be cheaper, faster, more flexible and less proprietary than current data access and integration technologies, they form the foundation of a new platform on which the industry can respond to these challenges.

Together with related developments in cloud computing, API-based software systems also create significant opportunities to mutualise operations and IT systems, and to outsource non-core or non-differentiating services to trusted partners.

A rapid take-up of API technology raises concerns around fragmented deployment and lack of consistency in end-to-end processes however. APIs also expose new attack vectors for cyber criminals. In many cases, these concerns are echoes of problems that the industry has tackled in earlier waves of automation, while others are unique to the new platform. This paper sets out these challenges and makes several proposals to address them.

Open APIs, open opportunities



Today, most banks expose closed, proprietary APIs for many services that are expensive to maintain and secure, yet don't necessarily add value or competitive advantage. An “open API” that is designed and secured in a standardised way allows commodity services to be opened to third-party providers who can focus on delivering the value and user experience that customers demand.

APIs can improve the agility and reduce the cost of internal IT, provide new opportunities to monetise existing business capabilities, and enable transformative new ecosystems and business models. But as the financial system reconfigures itself around these new models and invites new participants, end-to-end transactions become increasingly complex.

This presents challenges that must be met if the technology is to fulfil its potential for the financial services industry. This section introduces some key challenges.

Fragmentation

The agility and simplicity afforded by APIs and the tooling around them mean that anyone can develop and publish their own API specifications and update them whenever they wish. Under such a model, however, fragmentation is inevitable. Inconsistencies in business specifications and in identity and security frameworks negate the potential for universal reach and undermine two of the key promises of API technology: the ability to quickly and easily switch between service providers, and the ability to aggregate data and services from multiple sources to create new business value. This fragmentation occurs at multiple levels:

Business specification

Initial industry efforts to expose APIs have been driven by local “open banking” regulations, and for many banks the principal focus has been to comply with new regulations in time. Typically, each bank is left to implement its own interpretation of the local regulation, leading to a large number of APIs covering similar business functions. Globally, differences between regulatory specifications in different markets threaten to exacerbate the problem.

Identity management

Many different identity solutions are applied inconsistently across different APIs, and often focus on domestic or regional solutions. This limits opportunities for common API frameworks across regions and requires international users to maintain addressing and identity solutions for each market.

Security and data protection

As with identity, many different security and data protection frameworks may be applied to APIs, and these may also be influenced by domestic or regional regulations. This increases the costs and risks to participants wishing to operate in multiple markets.

Inconsistent data representation

In a complex IT organisation, many teams operating with the same data will build internal APIs independently. Similarly, in any given marketplace or ecosystem, multiple organisations will expose external APIs that work with the same kinds of data, even though they offer different functionalities. If every API publisher invents their own conventions for representing common business data (e.g. beneficiaries, accounts, transaction details, etc.), then users of multiple APIs must somehow determine the relationship between these representations then map, transform and adapt data received from one API before it can be used with the next. Without a consistent end-to-end data model, the business value of data may be diminished through misinterpretation or truncation. This need for end-to-end consistency in API semantic data models is driving a collaboration between SWIFT Standards and BIAN.

Banking Industry Architecture Network

The Banking Industry Architecture Network (BIAN) was established in 2008 to solve the internal architectural and technical challenges faced by financial institutions and the software and services vendors who serve them. BIAN's core strength lies in modelling business processes and information flows between business functions that are internal to a bank, but these models must also consider the business processes and information flows that are exchanged between financial institutions and between financial institutions and their customers. For this reason, BIAN was conceived as an extension to ISO 20022 (see ISO 20022 callout).

SWIFT and BIAN are working together towards a common ISO 20022 conceptual model that will underlie the BIAN microservices architecture. This collaboration will result in an industry standard microservices API to support internal integration of financial systems. It will also deliver significant enrichments to the ISO 20022 financial industry conceptual model to allow the industry to better model internal (A2A) and external (B2C and B2B) business processes. The first results of this collaboration can be found at BIAN's Open API Exchange.

More info at: portal.bian.org

Inconsistent API service composition

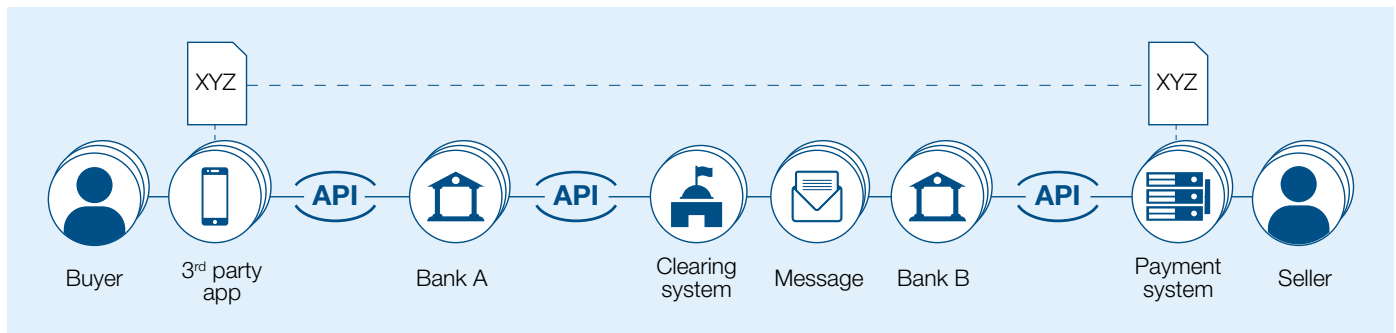
Industry value chains are growing more complex with the addition of third-party service providers. Previously well-automated business processes, for example processing a payment from initiation to settlement, now require orchestration across multiple services from different providers. Many business processes will also combine messaging with APIs for the foreseeable future. Without end-to-end consistency, the operational risk to the transaction increases. Unless an API is designed to be consistent with existing processes, it is difficult for API consumers to know how to use it safely.

Lack of flexibility in existing systems and practices

The financial system is evolving at an extremely rapid pace. APIs are a catalyst for agile development practices that allow new services to pop up and, if not successful, to fail fast. Incumbents, historically more concerned with interoperability and stability, find this new way of working difficult to adapt to.

This is not just about a more “agile” way of working – the API economy is “always on,” but it is simply not possible to bolt a 24x7x365 capability onto many of today’s financial back offices – they must be re-engineered. In a financial services API economy, batch processing and predictable downtime schedules are supplanted by flexibility, agility, and customer-centricity.

End-to-end consistency is key



APIs allow new value to be realised even in today’s most simple and fully automated transactions, but the length and complexity of the value chain is increased. Without end-to-end consistency in what data means and how it should be processed, the value of the data and transaction may be compromised at any point between the buyer and seller.

Bespoke vs industry standard APIs

Many of the above challenges reveal a tension between the agility and flexibility afforded by API tooling and the financial community's need for consistency and predictability.

To understand this tension, one must appreciate that different types of APIs are developed by different communities of users working towards different objectives. For the purposes of this paper, we will focus on one of the broadest distinctions – between **Bespoke APIs** and **Industry standard APIs**.

SWIFT global payments innovation (gpi)

SWIFT gpi is the new standard in cross-border payments. SWIFT gpi dramatically improves the speed, traceability and price-transparency of cross-border payments to all users of the correspondent banking network, including corporates.

SWIFT gpi exposes ISO 20022-compatible APIs to the SWIFT gpi Tracker and allows interaction with transactional data in real-time.

gpi allows banks to directly query and update a transaction's status, expose its status to their customers in real time, reduce investigation costs, and even stop an in-flight payment.

The SWIFT gpi Tracker will continue to add additional APIs to support richer transaction functionality, for example, case management services, orchestration services, and pre-validation of payment information – for example, to validate a beneficiary account before the payment has even been initiated, to improve STP by avoiding issues at the receiver.

APIs are also a platform for innovation, and SWIFT is working with gpi customers to use APIs in novel ways demonstrating the great potential for API technologies to enrich and redefine how the industry constructs digital transaction services.

More info at: www.swift.com/gpi

Bespoke APIs are used to expose a dedicated service. This service may be entirely internal to the bank, but may just as easily be exposed to external users. Examples include a bank's proprietary payments overlay services, or APIs published by a central provider like a Bloomberg price feed or the SWIFT gpi payments Tracker.

Bespoke APIs may be one-of-a-kind but they must still be easy and safe to combine (or in API developers' parlance, to "mash up") with other services that are not necessarily under the control of the API developer. When designing a bespoke API, therefore, the business value that it exposes must be clear and obvious. Equally important is that the data exposed is consistent with that used by other systems with which the API is likely to be "mashed-up."

Even in bespoke APIs therefore, consistency is important. The design goal of consistent bespoke APIs is not to impose a one-size-fits-all API, but rather to engineer a proprietary API that represents data and breaks down financial transactions in a way that is easily compatible with other related APIs (and non-API-based systems), regardless of where they are developed.

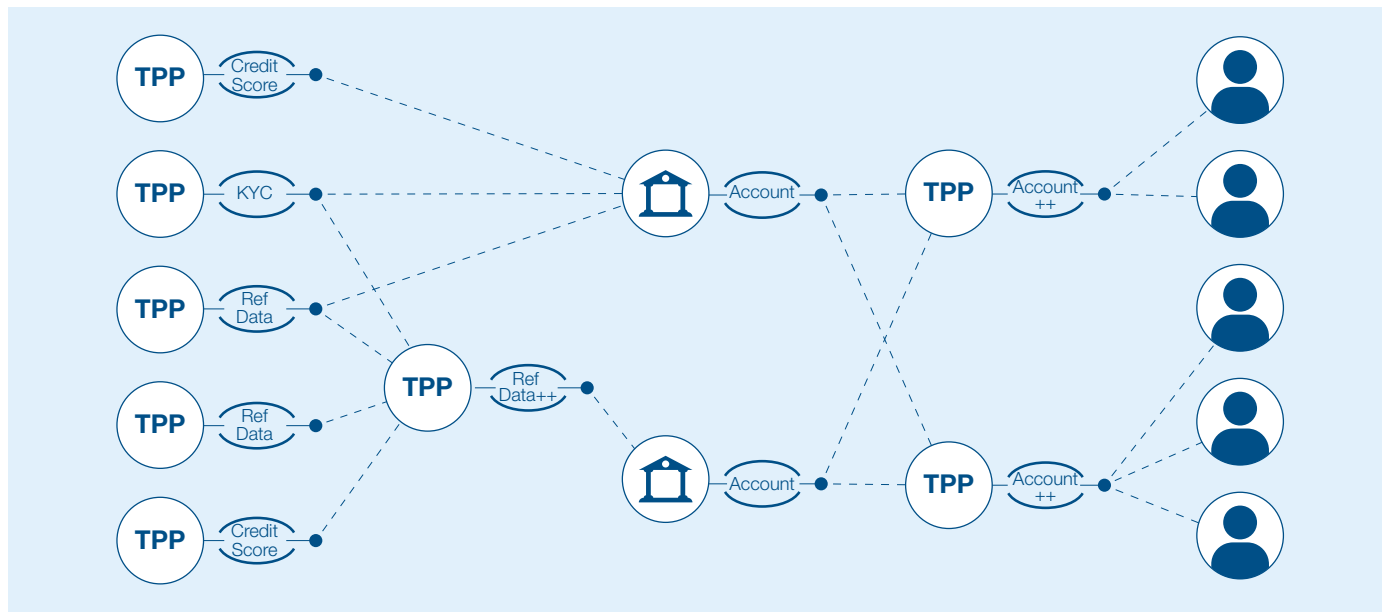
To support this, financial services API tools and development practices must evolve to support easy reuse of relevant components from existing financial business standards, while still working in a way that is familiar to API designers.

Industry standard APIs are exposed by multiple service providers as part of an overall community or industry initiative. Many examples already exist or are under development, such as a Payment Services Directive 2 (PSD2) Payment Initiation API, and the "Pay Later" Loan Initiation APIs.

Fragmentation, as described above, is a particular impediment to adoption of industry standard APIs. In such cases it is worth additional industry investment to elevate the specification itself to the status of a standard. An industry standard API must describe not only the technical signature of the API, but also its behaviour and the role that it plays in wider business processes.

Industry standard API specifications must be maintained and governed and there is much to be learned from existing standards governance best practices.

An API marketplace needs a consistent platform



Services that are designed and exposed in a way that is consistent across the industry allow banks to outsource non-critical and non-differentiating services to best-of-breed third-party providers (TPPs), and to easily switch providers whenever there is a business need to do so. They also allow banks and third parties to safely “mash-up” services to deliver novel value.

Industry Standard API Case Study: The Pay Later Initiative

The Pay Later API allows an e-commerce customer to request instant approval for a loan from their own bank for an online purchase. The customer may go to a website to buy, for example, a washing machine. Having selected the model and delivery plan, the customer is directed to the site’s payment page. In addition to the usual payment options there is a *Pay Later* button. Clicking on it, the customer is interfaced to their bank, where, if the bank approves, various loan types and schedules are displayed. If the customer accepts the offer then the loan is initiated, funds are credited to the merchant, and the washing machine is dispatched.

All players in this scenario stand to benefit: the merchant makes a sale, the bank gets a loan on its books from a customer it knows, and the customer gets funding from a regulated bank that knows their creditworthiness so can offer the best rate, rather than being forced to setup a new bank relationship with the merchant’s bank. To really take off though, such an initiative requires many players to get involved. Customers buy goods from different merchants and use different banks. Merchants will only want to invest in implementation if they can

reach the banks used by a decent proportion of their customers, and banks will only implement if a good number of merchants sign up to bring them business.

This is why Pay Later APIs and scheme rules are being standardised at the industry level. If each bank offered an entirely different API and conditions, the implementation effort for the merchant would increase dramatically as each new bank system comes on stream. With the API and scheme rules standardised, however, the incremental cost for a merchant to work with a new bank (or a bank to work with a new merchant) is greatly reduced. In addition, technology vendors on both sides see a growing market for common solutions, and critical mass is much easier to achieve.

The Pay Later initiative is building the standards required. Participants in the group include banks, merchants and technology providers, working together to codify and publish standard API specifications and a rulebook to be implemented consistently by all parties. The aim is to create the

conditions for a broad ecosystem of merchants, banks and customers to grow and flourish.

SWIFT is at the centre of this effort, fulfilling its established role as a trusted standards setter. SWIFT provides a neutral venue for collaboration, standards and payments business expertise, a platform for capturing, publishing and testing specifications and a fair IP policy that ensures all participants can contribute with confidence.

Moreover, by re-using business definitions from the established ISO 20022 standard, SWIFT ensures that data specified in APIs is compatible with the messages used to clear and settle payments, simplifying data integration for both banks and merchants.

For more information, and to apply to join the group, please contact API@swift.com

Reducing the impediments through standardisation

API technologies support more agile architectures for the systems that execute the business of finance and make it easier for new entrants to join, but they do not fundamentally change the business of finance itself. For this reason, SWIFT believes that much can be learned from existing industry best practices in **business standardisation** and **platform standardisation**.

Existing **business standards** describe financial data and how to interact with it to execute the business of finance. Specifically:

- Reference Data standards define identifiers for common data items like currencies, countries, assets, and market participants.¹
- Semantic standards define common business concepts and the relationships between them, providing a common vocabulary and data model for business information.
- Transactional standards define the steps required to complete a transaction – who is responsible at each step, what data is exchanged, etc.

Existing **platform standards** provide consistent, robust, secure, and private access to other participants in the financial system, allowing the transactions described in the business standards to be executed with confidence.

Not every API in the future financial services API economy requires the same level of security, privacy, and availability. However, a vital sub-set of financial processes will benefit from a standardised, secure entry point to trusted services from unimpeachably qualified providers.

About ISO 20022

There are many financial business standards but the most modern in terms of architecture, and broadest in terms of business coverage and adoption is ISO 20022.

ISO 20022 was conceived to harmonise the fragmented financial messaging standards landscape, but inherent to its design is an architecture that also makes it a future-proofed, full-stack standardisation methodology for APIs.

An ISO 20022 Payment Initiation API looks significantly different to an ISO 20022 Payment Initiation message. Although it is flatter and smaller, an ISO 20022 API nonetheless shares the same business semantics and data dictionary as a related ISO 20022 message. This greatly simplifies the task of integrating the API into existing financial systems and processes.

There are two key aspects to ISO 20022. It is a methodology: a "recipe" to be followed to standardise financial transactions. And it is a machine-processible repository of content: the definitions of messages, business concepts, processes and everything else required to describe those transactions.

ISO 20022 is an open, global standard. It is not controlled by a single interest and is open to anyone in the industry who wants to participate. It is platform and technology agnostic, and free for anyone to implement in any business or software environment, or on any network.

More info at: www.iso20022.org

¹ Literally dozens of existing reference data standards are used to ensure the smooth running of finance today, and must be made natively available on any future financial services API platform. For example: Currencies (ISO 4217), Countries (ISO 3166), Legal Entity Identifiers (LEI - ISO 17442), International Securities Identification Number (ISIN - ISO 6166), International Bank Account Number (IBAN - ISO 13616), and Business Identifier Code (BIC - ISO 9362).

Towards financial services API business standards

There are established best practices for designing and implementing APIs. These are well-supported by existing tools and widely used by developers. Until now, however, there has been no real concerted attempt to apply existing **financial business standards** to these toolsets and practices.

Much of the content required to do so already exists, so there is no need to reinvent the wheel. There are plentiful reference data standards for common identifiers, and ISO 20022 already includes semantic and transactional definitions covering business processes as diverse as retail and wholesale payments, foreign exchange, securities lending, repo transactions, collateral management, securities settlement, asset reconciliation, trade finance, cards transactions, regulatory reporting, and more.

Although API transactions are different from messaging transactions in significant ways, the work needed to enrich ISO 20022 into a common model for both messaging and API specifications is well understood and already underway.

API standards governance

The industry knows from experience that global business standardisation must happen according to an open, transparent, participative process. To ensure that this works in an API context though, existing standards governance must go even further to:

- be more agile and allow for frequent iterations. APIs cannot be bound to a yearly release cycle, but by the same token, surprises must be avoided, so schedules and pending changes must be transparent and well managed;
- support backward compatibility between iterations, allowing minor and major revisions; and
- be governed by a neutral but empowered industry-specific standards body (see callout on the importance of global standards governance).

Even when a globally-agreed specification exists, it may still be necessary to adapt it to local market practices, or to enhance it to support value-added innovation. Such flexibility requires support from tools that standardise the differences; to contextualise a global specification in a given market or use case, or to support comparison between variants. The industry, through SWIFT, has invested in the MyStandards platform to solve this problem for financial messaging. Investment continues to bring MyStandards to the financial services API economy².

The importance of global business standards governance

Consider that in today's messaging-based financial system, a typical securities transaction may be advertised with a FIX IOI (type 6) message, ordered with a FIX New Order – Single (type D) message, finalised with an ISO 15022 Deliver Against Payment (MT 543) message, funded with a SWIFT General Financial Institution Transfer (MT 202) message and reported to two different authorities in reports that are compliant to the XBRL US GAAP and ESMA ESEF taxonomies. This means that a large financial player must have competence in SWIFT MT for their Payments business, FIX for their front-office securities and HFT, ISO 15022 in securities back-office and settlement, and various flavours of XBRL for regulatory reporting.

This situation has arisen because these standards grew over many decades to solve point problems in specific business domains. The industry is investing in ISO 20022 as a means to harmonise this fragmented messaging standards landscape, but doing so retrospectively is proving expensive, risky, and slow due to the impact on legacy systems and processes. While it is possible to explain the current situation, experience teaches us that piecemeal standardisation is a particularly expensive form of technical debt. A new API platform presents an ideal opportunity to apply the ISO 20022 standard from the outset.

² For more information, please see www.swift.com/mystandards

Towards financial services API platform standards

Generic API platform services that are perfectly suited to many financial services use cases are widely available from open source tools and proprietary cloud providers. To support a marketplace for API services that interact with critical financial data however, a **standard platform** is needed to provide a consistent, robust, and secure global platform for designing, testing, and accessing high-value services.

To scale, the platform must not only be able to reach every key player in the financial ecosystem, it must also guarantee the identity of these players with absolute certainty.

Almost as important as identity is the assurance of absolute privacy, neutrality, and non-commercial use of the data and transactional metadata that passes through the platform.

SWIFT anticipates that many financial services APIs, such as non-critical or public reference data will continue to be offered either on the Internet or via proprietary cloud solutions with security and availability measures in line with those “open,” or commercial platforms. This could even extend to low-value retail banking systems.

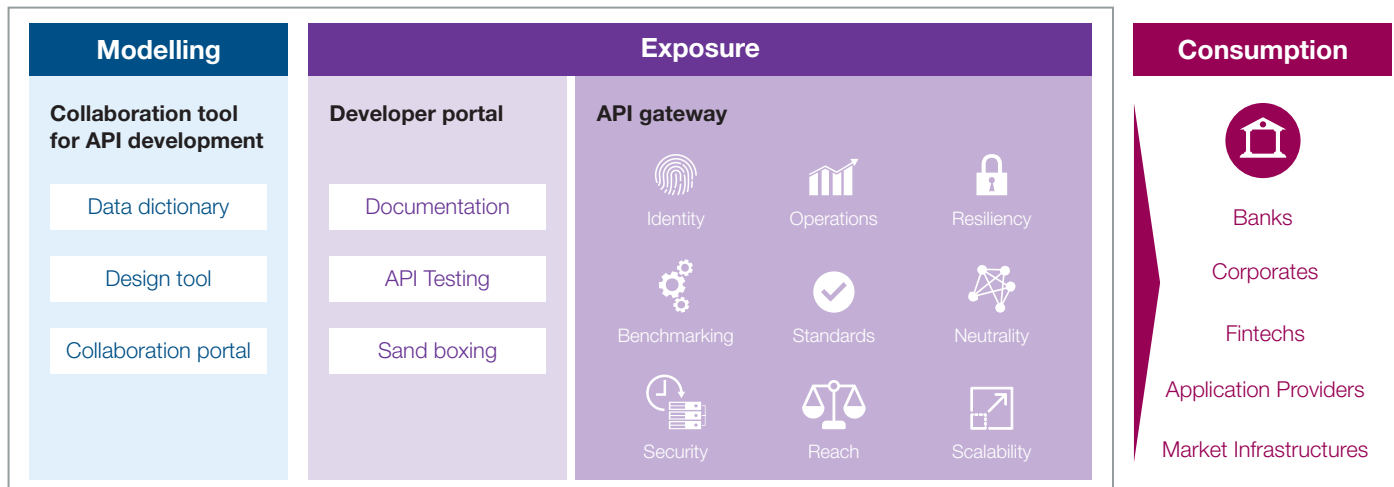
To support high-value transactions and flows for which absolute trust and privacy is required, SWIFT is preparing a governed platform with advanced security, identity management, resilience, and solutions to combat fraud. This platform will be flexible and “open” to services from any appropriately qualified provider. Bespoke, standards-compatible APIs and even APIs that are entirely proprietary to a service provider can benefit from these features of the SWIFT platform. Where required, the platform can also enforce compliance with industry standard APIs, which is especially important for APIs that are interlinked with legacy business processes.

The SWIFT platform will deliver the following business features:

1. A “Modelling” toolset that natively supports existing financial business standards, so API developers can develop and govern APIs that are easy to integrate into existing financial systems and processes.
2. An “Exposure” platform built around a developer portal and a robust API gateway that provides a single trusted entry point to all financial institutions and global corporates.
3. A range of “Consumption” gateways and Software Development Kits (SDK) that provide simple but secure access to the Exposure platform.

It will also be possible for banks to expose their own APIs, facilitating greater agility while retaining the possibility of leveraging the identity verification and security SWIFT can provide.

SWIFT API platform features



Conclusion: A necessary investment in the future of our industry

The current crop of “Web API” technologies are hardly new, but after more than 20 years of development and testing in real-world applications, Web API technologies are proving sufficiently robust for increased use in financial services.

The time is right to invest in APIs to address the challenges our industry faces. Investment is needed both at the institutional and at the industry level.

Strategic investment in API technologies is also an important foundation for many of the next big technology trends.³

For example, APIs are the dominant means to access “Big Data”-driven services that will unlock the enormous potential of machine learning and artificial intelligence. These have the potential to transform practically every aspect of financial IT: from technical operations and systems management deep in the back office, to strategic business intelligence and threat mitigation, to front-office trading and customer service helpdesk.

APIs are also the primary means for accessing blockchain and other Distributed Ledger Technology (DLT) platforms and services that may offer future efficiencies in many financial services business processes.

The agility and simplicity afforded by APIs and the tooling around them mean that anyone can make their business services available to the whole world with a few clicks. Already today though, we are seeing serious challenges in the fragmentation that almost inevitably results from such flexibility.

It is vital that the industry learns from past experiences with piecemeal standardisation and avoids the temptation to reinvent the wheel. A successful transition towards an API-based financial services ecosystem is possible if financial standards efforts converge towards a single, shared business standardisation methodology and governance strategy for APIs.

To counteract the effects of fragmentation and promote interoperability, SWIFT is leveraging its standards expertise to provide a neutral collaboration platform for the development, maintenance and publication of common API specifications. We further believe that re-use of ISO 20022 business definitions and data models will ensure end-to-end consistency in business processes that encompass API and legacy technologies, and we support the significant majority of respondents to the

ISO 20022 migration consultation⁴ who feel that API standardisation should build upon the existing industry momentum behind ISO 20022.

In support of these business standardisation efforts, SWIFT is enabling users to expose their own API-based services via the SWIFT platform. We are also extending the range of SWIFT services that can be accessed via APIs, such as our financial crime compliance portfolio, reference data, gpi, and business intelligence. Customer and SWIFT APIs will benefit from SWIFT identity management, which provides a common, secure global digital identity framework for financial institutions, their market infrastructures, and global corporates.

SWIFT is working on behalf of our members to deliver an API platform for the future of finance, but the transition to an API economy requires sustained engagement from across the industry: banks, market infrastructures, technology providers and standards bodies.

We urge institutions that are embarking on the API journey to look beyond the immediate need to comply with regulation or to implement a tactical solution. Take this opportunity to engage with SWIFT and the broader standards community to benefit from, and help evolve, a shared global platform for the financial services API economy.

To get involved, please contact us at **API@swift.com**.

³ SWIFT has previously described the importance of standardisation in the scope of emerging technologies in papers available on www.swift.com, such as:

- “Business Standards and Emerging Technologies”
- “Distributed Ledgers, Smart Contracts, Business Standards, and ISO 20022”
- “SWIFT on distributed ledger technologies”

⁴ <https://www.swift.com/news-events/news/swift-community-to-embark-on-migration-to-iso-20022-for-payments-traffic>



About SWIFT

SWIFT is a global member-owned cooperative and the world's leading provider of secure financial messaging services. We provide our community with a platform for messaging and standards for communicating, and we offer products and services to facilitate access and integration, identification, analysis and financial crime compliance.

Our messaging platform, products and services connect more than 11,000 banking and securities organisations, market infrastructures and corporate customers in more than 200 countries and territories, enabling them to communicate securely and exchange standardised financial messages in a reliable way.

As their trusted provider, we facilitate global and local financial flows, support trade and commerce all around the world; we relentlessly pursue operational excellence and continually seek ways to lower costs, reduce risks and eliminate operational inefficiencies.

Headquartered in Belgium, SWIFT's international governance and oversight reinforces the neutral, global character of its cooperative structure. SWIFT's global office network ensures an active presence in all the major financial centres.

For more information,
visit www.swift.com