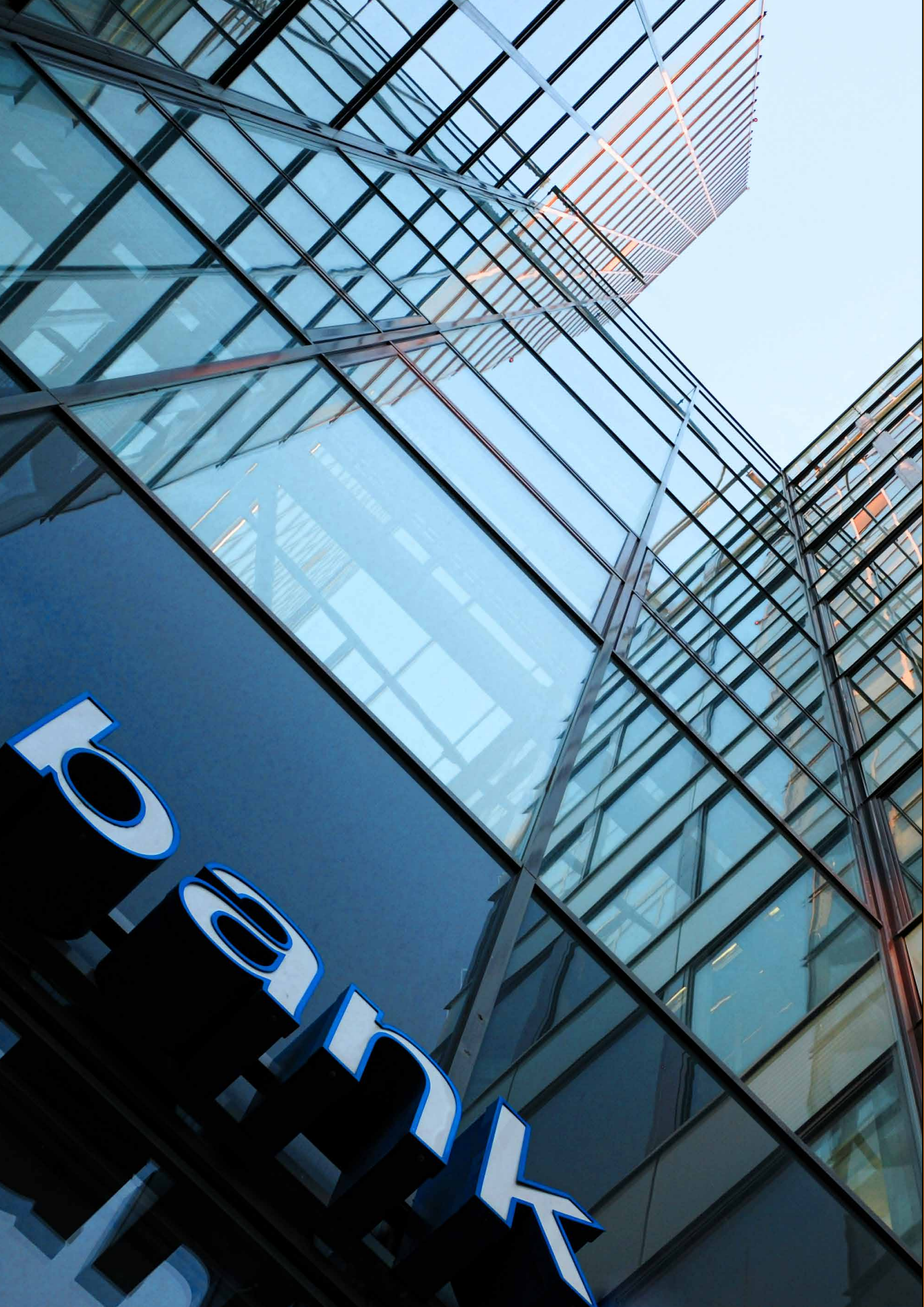


Next-generation and real-time central market infrastructure

CGI CENTRALSETTLEMENT360





INTRODUCTION

The first generation of central market infrastructures, similar to many of the banking payment systems that send them traffic, is reaching end-of-life due to technology obsolescence and major changes in the markets that use them. Further, the acceptance of ISO 20022 as the future of payment messaging is speeding up the transition to newer platforms.

Many legacy systems were not designed to operate in the modern world and are becoming more difficult to support and more expensive to maintain. Central banks around the world are reviewing their next steps and evaluating what an ideal next-generation platform looks like. What functional areas should be included? How can transactions be processed from several different schemes through a single architecture? How can you ensure participant risk is minimized while liquidity is efficiently managed? The answer to these questions is a powerful, highly secure, and flexible modern platform.

With this in mind, CGI banking and payments experts developed CGI CentralSettlement360. This next-generation, real-time solution provides central banks with a single platform for real-time gross settlement (RTGS), instant payment, batch automated clearing house (ACH), and a host of other central market functions.

CGI CentralSettlement360 is the culmination of **more than 30 years of experience** in delivering highly resilient and efficient solutions to central markets globally. CGI has played a highly influential role in the development of core financial infrastructures, including delivering some of the world's first automated RTGS solutions, helping to design the core infrastructure for SWIFT, and designing core components for the launch of the Continuous Linked Settlement (CLS) institution, which clears and settles 90% of the world's foreign exchange transactions.

CGI CentralSettlement360 fulfills the highly demanding clearing and settlement requirements of any major central bank in a real-time, ISO 20022-enabled world and beyond. The solution fundamentally changes the way that central clearing and settlement is delivered and secured.

DESIGN - CONFIGURATION OVER CUSTOMIZATION

CGI CentralSettlement360 favors configuration over customization, which means it can be deployed for a variety of payment schemes through the same platform. To achieve this, it delivers mini- and micro-services that support flexible deployment of any central market infrastructure (CMI).

The core CGI CentralSettlement360 platform includes all components necessary to support a CMI, including the following:

- Security
- Data stores
- Core processing engines capable of clearing more than 14,000 transactions per second (TPS)
- Core ledger
- Generic services that can be leveraged to build detailed workflows
- Key components to ease integration with existing market infrastructures

The platform’s architecture ensures the integrity of data and transactions processed by the core ledger. Transactions and data can reach the ledger only through published mini-services. Each mini-service validates the data and filters out invalid traffic.

The CGI CentralSettlement360 platform also includes business elements. These unique building blocks enable settlement under a specific scheme such as prefunded direct settlement (PDS), deferred net settlement (DNS), RTGS, rule-based DNS (rDNS) or periodic DNS (pDNS). Business elements can be configured into simple or complex workflows that leverage generic mini-services to create a unique processing environment capable of meeting the needs of any market.

Through business elements, CGI CentralSettlement360 can be deployed concurrently with different settlement schemes or with multiple versions of a real-time settlement workflow, depending on whether it will be leveraged as an end-to-end CMI or as settlement on behalf of a third-party exchange. This enables CGI CentralSettlement360 to fit practically any CMI configuration and solve issues by replacing services and then expanding across multiple services when additional benefits can be realized.



BUILDING FLEXIBILITY INTO THE PLATFORM

To ensure complete flexibility and enable easier deployment, CGI CentralSettlement360 has three types of core components with configurations stored in its core XML data store. This approach allows each implementation to be highly configured to the individual and custom requirements of each central bank.

Workflows

Workflows are the operational instruction set for CGI CentralSettlement360. Each payment type has a flow that identifies the related area of business logic and is implemented by a set of Kubernetes mini-services, where each service realizes specific behavior defined as part of the flow and uses and manages the data related to that payment type.

Generic services

Generic services are mini- or micro-services that can be leveraged by multiple workflows to build out greater components. The ability to configure behaviors at all levels of the system enables the introduction of generic processing to ease the expansion of the core solution.

Business elements

Business elements are specific services covering a single portion of payment business logic that can then be leveraged by workflows. They typically offer access to a settlement scheme such as RTGS, DNS, or PDS. For example, a SEPA Instant Credit Transfer (SCT Inst) clearing and settlement mechanism (CSM) could take the PDS business element and configure it to meet the needs of that scheme. Incorporating this into a SCT Inst workflow, alongside a check for sufficient funds, funds reservation, payment message and a few other services, would facilitate rapid deployment of a new payment scheme.

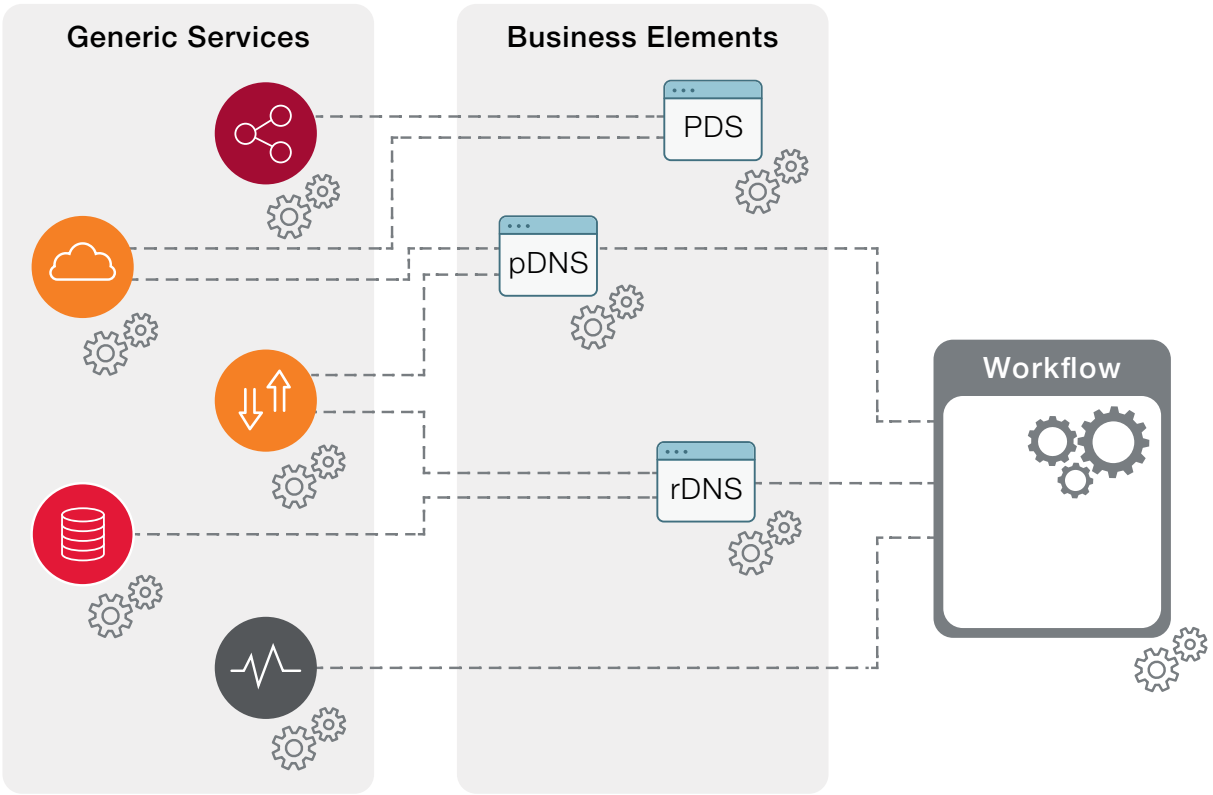


Figure: The three core components create a hierarchical system capable of great flexibility

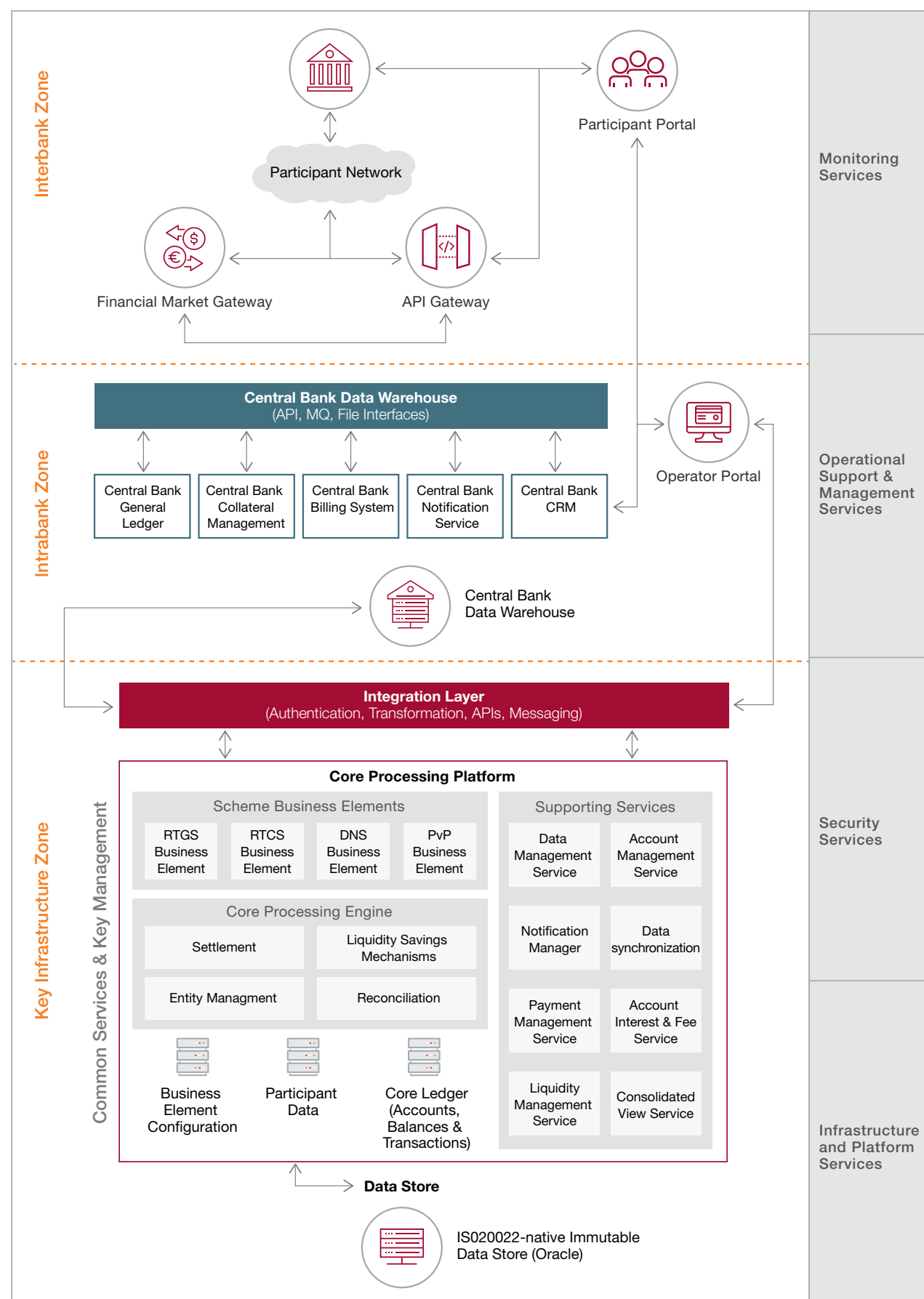


Figure: Deployed in multiple security zones, the platform creates a complete next-generation central market infrastructure

ENABLING FUTURE REQUIREMENTS

CGI CentralSettlement360 ensures that any CMI can support new industry technological advancements and changing market situations. For example, leveraging distributed ledger

technology such as Ripple or Ethereum would simply require a new business element to be built and deployed alongside, or instead of, the existing business element providing traditional RTGS.

EASY MAINTENANCE AND 24/7 OPERATIONS

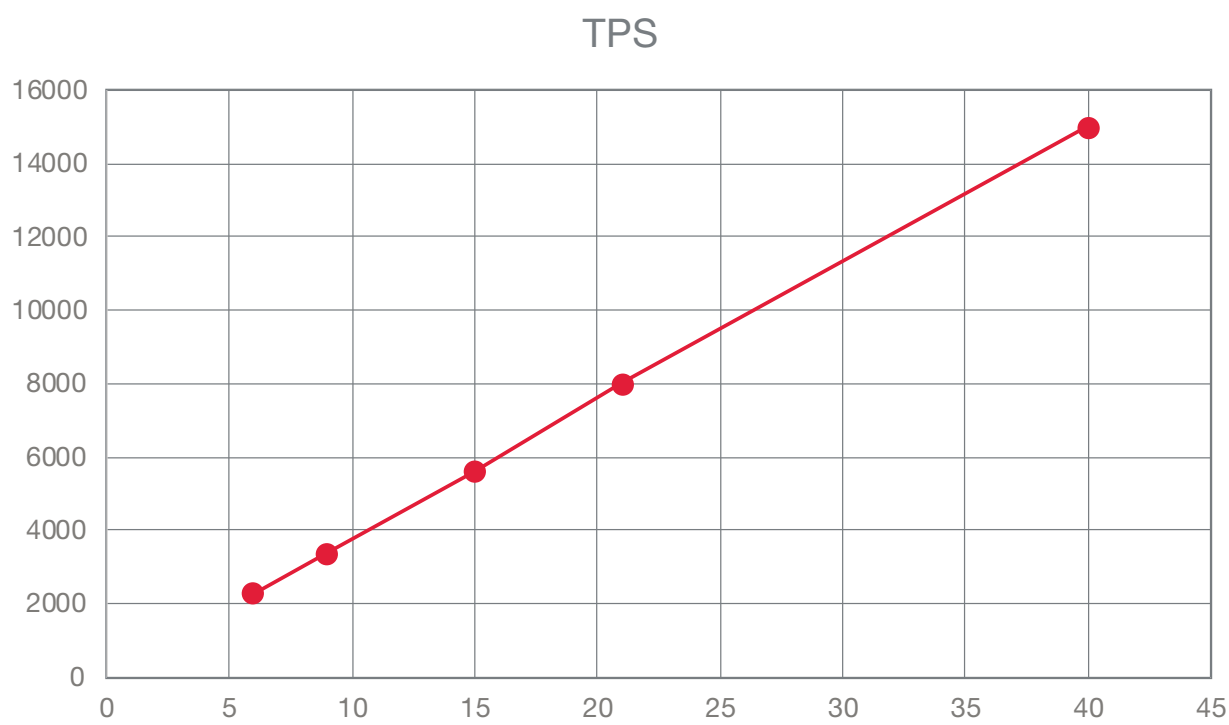
With its focus on configuration, CGI CentralSettlement360's platform is inherently easier to maintain than previous generations or other solutions on the market today. Individual mini- or micro-services can be replaced in a high-availability deployment without the need for downtime. Configuration changes can be scheduled ahead of time and integrated in real time once they have passed through the appropriate checks and balances in the release train. This time-release function for configuration changes also helps to massively ease the onboarding of new participants.

While major releases, such as platform enhancements and new features, are typically delivered through a more traditional annual release cycle, the design of CGI CentralSettlement360 enables CGI to make incremental changes throughout the year as needed. Additionally, as part of CGI's standard support process, CGI will hold a copy of each client's configuration. This allows releases and patches to be tested in advance against a client's environment and improve overall deployment quality. As part of our CI/CD approach, it also enables our support agents to quickly replicate any issues with greater ease, reducing time-to-fix for our clients.



DESIGN - TECHNICAL SUMMARY

- We designed CGI CentralSettlement360 using our award-winning and Open Group-certified Risk and Cost Driven Architecture (RCDA) solution architecture methodology, which is a solution architecture approach for the digital age.
- CGI CentralSettlement360 is a highly-scalable, cloud-ready, native-ISO 20022 solution that is built to evolve with the changing needs of central markets while offering best-in-class functionality. It combines benchmarked processing speeds in excess of 14,000 TPS with the always-on, multi-thread, multi-queue, multi-payment type capabilities demanded by next-generation payment solutions.
- With full application programming interface integration throughout its mini-services and micro-services architecture, CGI CentralSettlement360 offers the appropriate blend of open services and discrete processing to ensure that efficiency is never compromised.
- Complementing CGI's RCDA solution architecture methodology is a Security Architecture Risk Assessment approach that evaluates client security requirements, along with potential vulnerabilities and security threats. The approach then defines appropriate controls to mitigate identified risks.
- Every system function within CGI CentralSettlement360 can be monitored and audited through a comprehensive logging and role-based permissions system available to every service. Security is baked in and invested in upfront, including multi-factor authentication and single sign-on, configurable 4 and 6 eyes authentication, customizable dashboards, and configurable alerts.
- Flexible deployment models include onsite, private cloud, public cloud or hybrid models.
- Configurable algorithmic components ensure efficiency and optimization, including multi-lateral queue optimization and gridlock buster.



Performance Benchmark

- TPS per node is constant
- Architecture is linearly scalable
- Every extra dollar spent on hardware capacity may yield an equivalent increase in TPS, enabling business growth without technology limitations

ADVANCED SECURITY BAKED INTO THE PLATFORM

Knowing that security is paramount for a critical national infrastructure, CGI has built security into the design of CGI CentralSettlement360. We approached the design, development, and implementation of CGI CentralSettlement360 with the following in mind:

- Encryption: Everything is encrypted—at rest and in flight.
- Secure practices and processes: The solution delivers standardized security hygiene measures, vulnerability assessment and management, security operations, secrets management, an integrated development environment, software composition analysis, and dynamic and static analysis security testing.
- Security architecture and controls: Security standards, including ISO 27001 and NIST 800-53, as well as specific architectural guidance from industry security bodies, support different time zones for processing.

- Solution delivery security: CGI provides secure development and testing environments with strict sign-off controls for the promotion of code, authentication, authorization, logging, and audit across security monitoring systems.

CGI CentralSettlement360's high-level architecture features multiple security zones, as well as component layers that are encrypted to ensure that all data at rest or in transit is secure from point of origination through all interfaces, API calls, systems and databases. There is no longer room for compromise in data security, as global lessons learned show that CMLs must be treated as zero-trust environments due to the proliferation of bad actors globally that are targeting systemically important financial and economic infrastructures.



SUMMARY

CGI CentralSettlement360 is the next-generation central market infrastructure that brings:

- Improved efficient use of liquidity for all participants
- Easier onboarding and participant management
- Full ISO 20022 support, together with unique identifiers, that enable complete payments tracking, with customizable dashboards and real-time reporting to ensure all stakeholders stay informed at all times of real-time positions
- Highly secure platform with baked-in security to ensure that the platform is highly resilient to attacks from unauthorized sources and identifies/monitors new threats
- Single platform that can be implemented to support any payment scheme, both current and future, ensuring maximization of return on investment in core systems
- Flexible technical design that enables new technologies to be rapidly and simply deployed
- Efficient processing that vastly reduces end-of-day processing and enables efficient introduction and support for 24/7 operations, together with support for multiple operational plans that enable more efficient daytime management



About CGI

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world. Operating in hundreds of locations across the globe, CGI delivers an end-to-end portfolio of capabilities, from strategic IT and business consulting to systems integration, managed IT and business process services and intellectual property solutions. CGI works with clients through a local relationship model complemented by a global delivery network to help clients achieve their goals, including becoming customer-centric digital enterprises.

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