

Imagining the future of RTGS systems

Over the past few decades, RTGS systems have played an important role in financial sector development and have been an essential tool in managing the stability of the financial system. However, since these systems were first implemented, the underlying payments ecosystems that they were initially designed to support have undergone a dramatic transformation.

The number of digital payment options has exploded with the implementation of real-time payments systems and the adoption of mobile money apps. Fintechs and third-parties now play an important role as payment and value-added service providers and often compete directly with banks to offer superior, customer-centric services. Novel fraud and security threats have become increasingly difficult to manage, with greater demand for adequate safeguards than ever before. Moreover, new payment instruments such as Central Bank Digital Currency (CBDC) and stablecoin are being increasingly explored and implemented within the industry.¹

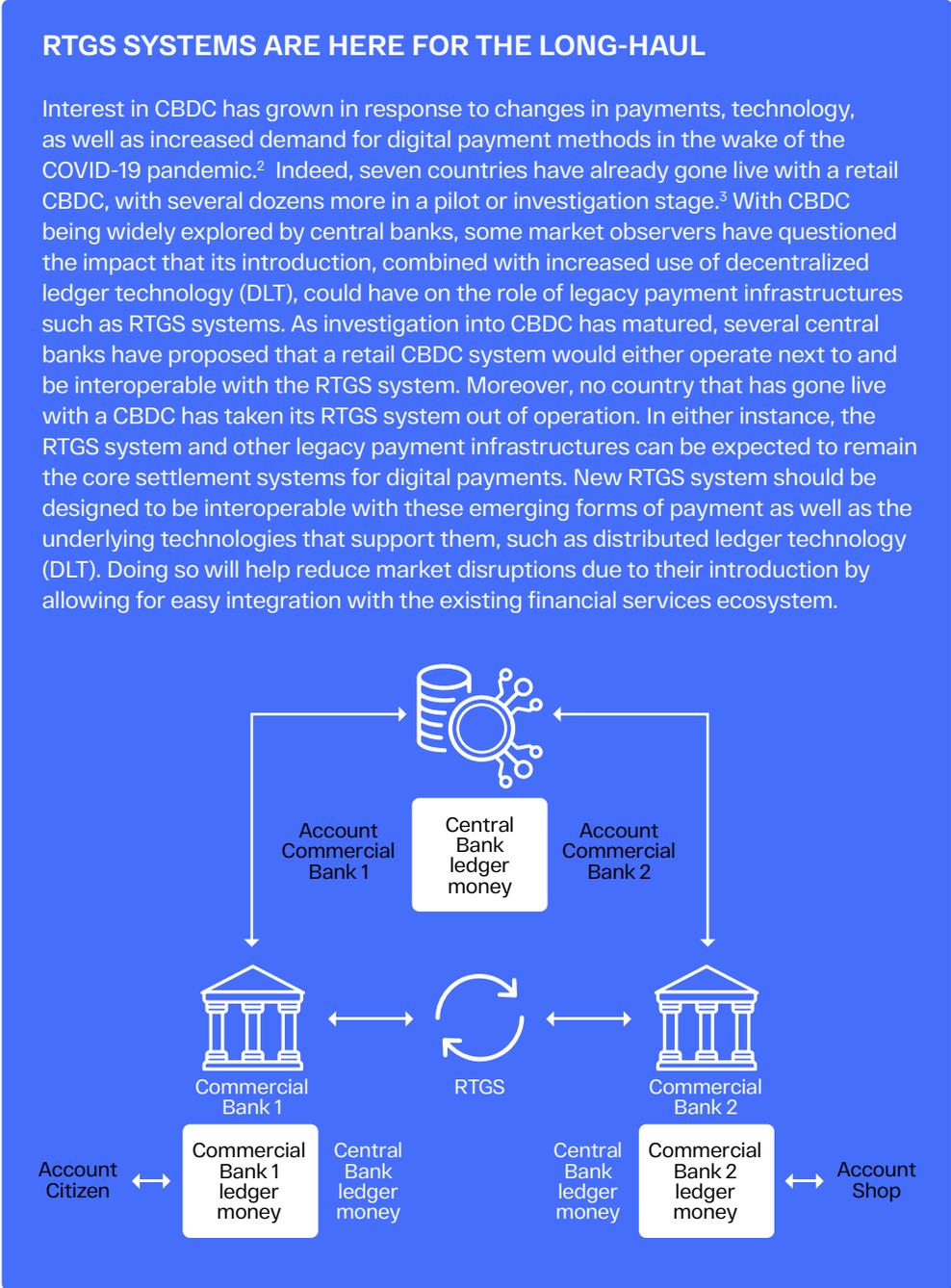
Despite all the changes happening in global payments, the fundamental and unique role of RTGS systems as a bedrock for interbank settlement has not. However, to continue successfully serving their client base and the broader payments ecosystems that they support, central banks must adapt their systems to the new normal in payments. This means more than just updating messaging standards or improving processing speed. It is about fundamentally reassessing the role of an RTGS system within a transformed and still-evolving payments ecosystem. It is about widening access and offering 24/7/365 service availability. It is about achieving a new level of global interoperability and greater protection against cyber security threats. It is about adopting a more robust contingency strategy and more proactively managing cybersecurity threats. Given the long timeline required for RTGS modernization, it is imperative that central banks begin thinking about their modernization plans now, whether that be through developing a review cycle framework for assessing RTGS functionality or undergoing an initial round of industry consultation.

This note will provide high-level insights into new functionalities and features that central banks should consider as part of their RTGS modernization plans. It will then examine examples of RTGS modernization projects in several markets, namely Oman, the Philippines, the UK, and Buna.

¹ In simple terms, a central bank digital currency (CBDC) would be a digital banknote and therefore a direct liability of the central bank. Stablecoin is generally understood as privately-issued digital currency that is pegged to a reference asset.

RTGS SYSTEMS ARE HERE FOR THE LONG-HAUL

Interest in CBDC has grown in response to changes in payments, technology, as well as increased demand for digital payment methods in the wake of the COVID-19 pandemic.² Indeed, seven countries have already gone live with a retail CBDC, with several dozens more in a pilot or investigation stage.³ With CBDC being widely explored by central banks, some market observers have questioned the impact that its introduction, combined with increased use of decentralized ledger technology (DLT), could have on the role of legacy payment infrastructures such as RTGS systems. As investigation into CBDC has matured, several central banks have proposed that a retail CBDC system would either operate next to and be interoperable with the RTGS system. Moreover, no country that has gone live with a CBDC has taken its RTGS system out of operation. In either instance, the RTGS system and other legacy payment infrastructures can be expected to remain the core settlement systems for digital payments. New RTGS system should be designed to be interoperable with these emerging forms of payment as well as the underlying technologies that support them, such as distributed ledger technology (DLT). Doing so will help reduce market disruptions due to their introduction by allowing for easy integration with the existing financial services ecosystem.



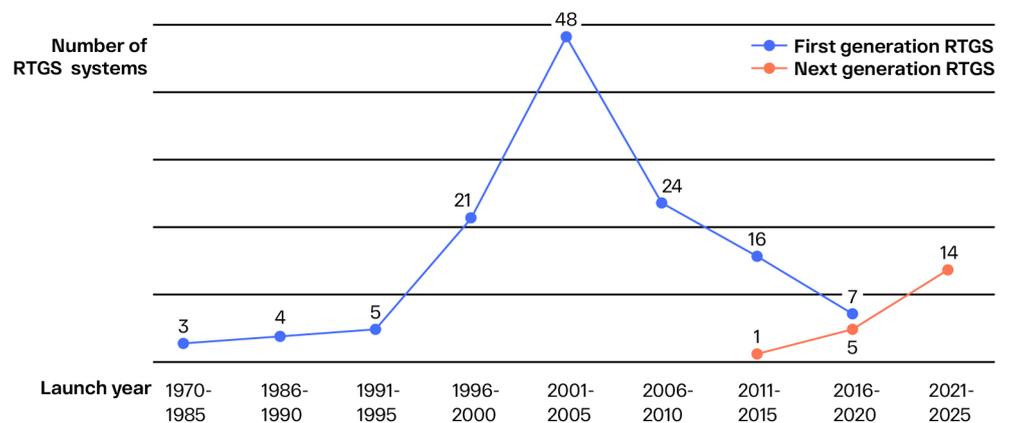
Envisioning the next generation of RTGS systems

Historically, RTGS systems have been stable and resilient tools for central banks in managing financial system stability by effectively eliminating systemic settlement risk between banks. They have also served as important infrastructure for central banks to settle payments related to their injection and withdrawal of liquidity into the system. But against the backdrop of today's rapidly digitalizing payments ecosystems, the role of RTGS systems needs to evolve. For one, the rise of P2P apps and digital wallets, technologies to ease payment initiation at point-of-sale (e.g. QR codes), and the growth in popularity of subscription-based services have shown banks and payment service providers how quickly transaction volumes can scale up. With no signs of slowing, legacy RTGS systems need to be able to accommodate the accelerated pace of activity, and quickly. With older RTGS systems, introducing new features or even making small changes can be a complex, costly, and risky process.

² <https://www.bis.org/about/bisih/topics/cbdc.htm>
³ <https://www.atlanticcouncil.org/cbdctracker/>

A more modern system with more flexible, modular architecture has the advantage of allowing new features and functions to be designed, tested, and added without impacting live operations. Additionally, modern RTGS systems have a new role to play in fostering competition and innovation by widening access to a more diverse group of actors and by increasing interoperability with new payment instruments and technologies. However, the majority of RTGS systems in place today are based on older technologies and processes that constrain their ability to promote innovation and inclusivity in today's payment landscape. While some central banks have made piecemeal updates to their systems over the years, such as migrating to the ISO 20022 messaging standard, the majority have not implemented any significant upgrades. Even many of the newer systems implemented in the mid-to-late 2000s were designed with operational requirements and functionalities that were established years before.

Fig 1. Most RTGS Systems launched in early 2000s



Source: Lipis Advisors, CMA

Since RTGS systems will remain at the core of payments activity for years to come, central banks should seriously consider introducing new functionalities and features that are better adapted to the current and evolving needs of the market. This would greatly improve central banks' ability to support the financial system and meet other policy goals. The following section highlights several such functionalities that central banks should consider: 24/7/365 operating capability, wider and easier participant access, interoperability with existing and future payment systems, enhanced resiliency against new and emerging threats, and more flexible deployment models.

Fig 2. RTGS systems of the future will have....



24/7/365 OPERATING CAPABILITY



As more and more financial services and institutions move toward an “on-demand” model for financial services, the need for RTGS systems to extend their operating hours and at least acquire the technical capability of 24/7/365 has become increasingly clear. For example, India moved to 24/7/365 operation of its RTGS in 2020 following the explosive growth of its United Payment Interface (UPI) system. The Bank of England (BoE) has also stated that its new RTGS system will have the technical capability to support 22 operating hours per day, 5 days a week plus short windows of operation available at the weekend for the net settlement of the retail systems, although it has no plans to change its actual operating hours.⁴ The upgraded version of the RTGS system in Oman, will also operate 24/7/365.

In addition to increased demand for extended hours from local markets, there has been wide recognition from global policy bodies of the benefits of expanded RTGS operating hours, particularly for improving the speed of cross-border settlement. The BIS' Committee on Payments and Market Infrastructures recently issued a consultative report on how extending RTGS operating hours could help remove frictions related to cross-border payment processing. In its report, it introduced the concept of a 'global settlement window' as a key consideration for central banks. The possibility of 24/7/365 operations was also highlighted by the BIS as a potential model for the central bank community to move toward with the goal of completely reducing cross-border frictions due to gaps in RTGS settlement windows. It was also included as a building block of the G20's Roadmap for Enhancing Cross-Border Payments in October 2021. Such sweeping change would certainly need to be implemented in consultation with industry stakeholders, for whom there would also be major technical and operational changes required.

EASIER AND EXPANDED ACCESS



Access to national payment systems infrastructure is critical for ensuring optimal reach of digital financial services to all segments of the population. Indeed, the role of fintechs and other non-banks within the payments value-chain has become crucially important in driving efficiency, competition, and innovation. As the role of these parties has evolved, there has existed an increased demand for them to connect directly to payment systems. A few central banks, such as the RBI and BoE, have already expanded RTGS system access to non-banks. Doing so not only means that the underlying system must not only be able to support a greater number of direct technical connections but will also require more robust performance standards and risk management frameworks. Moreover, it will be necessary to simplify how the system is accessed by removing operational barriers, and using more accessible, open-source technology to lower usage costs.

But expanding access to non-banks is not just about accessing the underlying infrastructure. It is also about fostering a broader environment where third-parties can develop and deliver value-added services. Non-banks and third-parties have played an integral role in the growth of value-added services in low-value real-time systems (e.g. proxy databases, request-to-pay etc.). This has been largely in part due to the design of these systems, which are highly interoperable with other systems and applications, and easily accessible via API gateways. It is also possible due to the rich transactional data available due to implementation of ISO 20022.

Fig 3. What benefits come from third-party developed value-added services?



⁴ <https://www.bankofengland.co.uk/payment-and-settlement/rtgs-renewal-programme/functionality-of-the-new-rtgs-service>
⁵ <https://www.bis.org/cpmi/publ/d199.htm>
⁶ <https://www.fsb.org/wp-content/uploads/P131021-1.pdf>
⁷ Ibid.

In contrast, the limited access model of RTGS systems today does not as easily allow for the development of such services for the wholesale market, such as advanced fraud prevention or transaction monitoring tools. Such services could be developed and offered to system participants by third-parties in several ways, such as via an API gateway or through a centralized overlay layer. Furthermore, new infrastructure could also be built to support an application layer in which third-parties can leverage underlying clearing and settlement infrastructure to develop new services. Another approach could be offering a sandbox environment for API providers or fintech businesses to experiment with developing new products and services in a controlled environment overseen by regulators.⁸

INTEROPERABILITY WITH EXISTING AND FUTURE PAYMENT SYSTEMS



Many RTGS systems in use today were not designed with the intention of being interoperable with RTGS systems in other countries. However, common message formats, such as a harmonised version of ISO 20022 and API protocols can play an important role in payment system interlinking and in addressing differences in data standards in cross-border payments.⁹ Many central banks have built new systems using this standard, while a few others have planned the migration to ISO 20022 in legacy systems.¹⁰ Its adoption has already been helpful in establishing bilateral cross-border linkages between domestic instant payment infrastructures, such as the linkage between PayNow in Singapore and PromptPay in Thailand, for example.¹¹

However, the concept of interoperability has broadened to include more than simply creating linkages with other payment systems. It increasingly refers to linking payment systems to other types of infrastructures, such as securities settlement infrastructures, collateral management systems, and FX settlement mechanisms. New RTGS settlement mechanisms, such as 'atomic settlement' could also help achieve a new level of interoperability in this way and is being explored by the BoE as part of its RTGS renewal program.¹² Under this model, cash movements in one system occur simultaneously with the movement of cash or assets in other systems. If applied in an RTGS context, this could allow for the settlement of payment being conditional on the simultaneous settlement of a digital asset, and would potentially allow for more seamless linkages with different types of market infrastructures. It also has the potential to remove settlement risk and substantially reduce settlement costs.

Lastly, with the growth in popularity of DLT and blockchain technologies and token-based payment systems, future interoperability with CBDC or a widely adopted stablecoin has increasingly come into focus. Interoperability with these instruments could be achieved by linking RTGS systems directly to DLT settlement systems and the existing central bank payment system where CBDC is available for settlement. In this set-up, the settlement leg of a Delivery-versus-Payment (DvP) transaction involving tokenized securities initiated on the DLT is automatically settled in existing conventional systems in CBDC.¹³ Project Jura, an initiative of the Banque de France, Swiss National Bank and BIS, recently experimented with this approach.¹⁴

GREATER RESILIENCY AND ENHANCED CONTINGENCY CAPABILITIES



Resiliency is one of the key aspects of any successful RTGS system. And while RTGS systems have been largely successful in this regard, more robust models for contingency should be considered, particularly as the payments globally are rapidly digitalizing and the costs of a systemic failure are likely to be amplified. These could include limiting dependency on a single provider, increasing support for rotating data center operations,

⁸ <https://www.pwc.in/consulting/financial-services/fintech/fintech-insights/the-sandbox-approach.html>

⁹ <https://www.fsb.org/wp-content/uploads/P131021-1.pdf>

¹⁰ Countries with RTGS systems that have already migrated to or that plan to soon migrate to ISO 20022 include the UK, Australia, Hungary, Thailand, Malaysia, Singapore and the Philippines.

¹¹ <https://www.mas.gov.sg/news/media-releases/2021/singapore-and-thailand-launch-worlds-first-linkage-of-real-time-payment-systems>

¹² <https://www.bankofengland.co.uk/-/media/boe/files/payments/rtgs-renewal-programme/rtgs-renewal-back-ground-guide-to-proposed-rtgs-functionality-synchronisation.pdf?la=en&hash=0541EC1E9F7F98DCBC4123F4B-1875C3E04997BE8>

¹³ https://www.banque-france.fr/sites/default/files/media/2021/11/09/821338_rapport_mnbc-04.pdf

¹⁴ <https://www.bis.org/publ/othp44.pdf>

or developing a third contingency site. The BoE, for example, has announced that in its renewed RTGS system, there will be an automated contingency solution for critical payment submissions in the event of an outage of the primary messaging network.¹⁵ Installing a cloud-based contingency site is becoming increasingly popular, supported by vendors like Amazon Web Services.

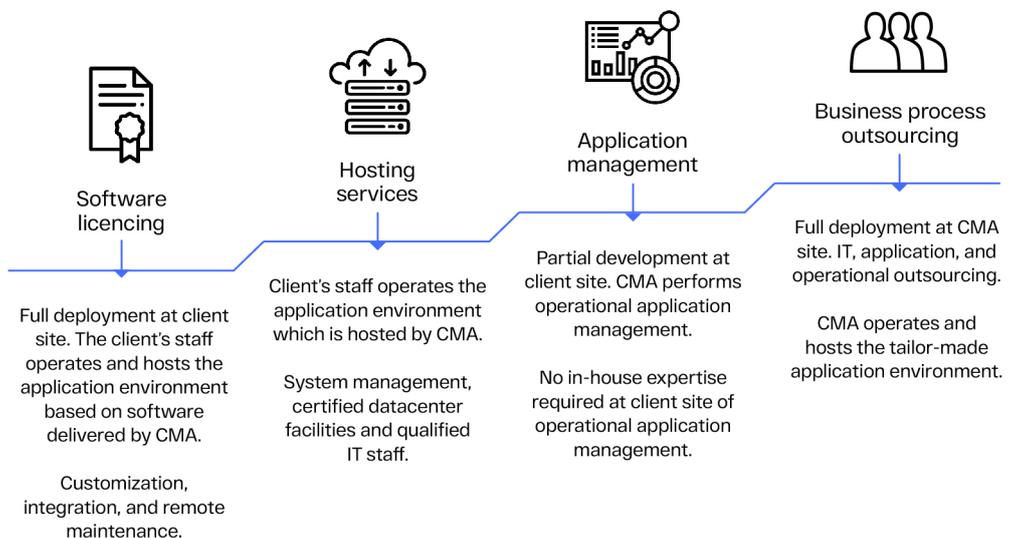
Developing a more robust contingency model should also be considered in the context of the increasingly sophisticated types of cybersecurity risks that are facing central banks today. In this environment, even one major outage due to a malicious actor has the potential to significantly undermine public confidence in both the central bank and the financial system. While large consumer data breaches have become almost commonplace, the impact from a sustained cyber attack on an RTGS system or one of its participants would likely be significant. Central banks must absolutely consider the utility of enhanced protection and controls when assessing the need to modernize RTGS systems, particularly in the context of increased access channels. The consequences stemming from a failure to do so can be grave. In 2018, five participants in the SPEI infrastructure in Mexico were the victims of several cyber attacks over the course of several months. Although the attackers did not penetrate SPEI itself, hackers were able to submit false orders to the system by accessing the third-party software used by participants to connect to the infrastructure. The false orders were received by SPEI, which processed them as usual. Even though the infrastructure itself was not breached, the incident still undermined confidence in the central bank and resulted in significant internal reforms.¹⁶

MORE FLEXIBLE DEPLOYMENT MODELS



Central banks have often outsourced the development and implementation of their RTGS systems to external vendors, which has been an extremely successful model for many developing countries that lack the resources to do so themselves. As new RTGS systems may require more operational and technical resources than legacy systems (e.g. 24/7/ operating capability), there may also exist in the possibility to outsource the operational management and maintenance of an RTGS system using a 'managed service' model. This could particularly benefit many small countries that lack access to more sophisticated IT infrastructure, or that lack the resources to absorb the operational demands of running a more complex and demanding system. Deployments could range from full deployment at the client site to colocation and application hosting services, to partial or full deployment at the vendor site.

Fig 4. New models for RTGS deployment

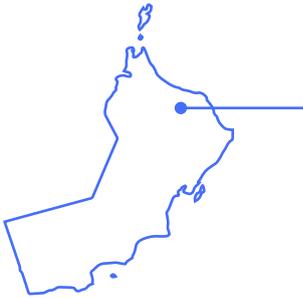


¹⁵ <https://www.bankofengland.co.uk/payment-and-settlement/rtgs-renewal-programme/functionality-of-the-new-rtgs-service>
¹⁶ <https://www.reuters.com/article/us-mexico-cyber-idUSKCN1IH38Q>

Case studies: Oman, Philippines, the UK, and Buna

With an understanding of the types of features and functionalities modern RTGS systems will need, this next section aims to briefly look at recent and ongoing RTGS modernization initiatives and examine which of these concepts are being applied in different countries.

OMAN



The Central Bank of Oman (CBO) first went live with its RTGS system in 2005, and subsequently upgraded the infrastructure in 2012.¹⁷ In 2020, the CBO announced that it would be upgrading its RTGS system as part of ongoing efforts to enhance its payments infrastructure more broadly. The new system is expected to have 24/7/365 operating capability and is in the process of being integrated with two new cross-border payment systems in the region, the Gulf Cooperation Council's regional RTGS system (AFAQ), as well as the Arab Monetary Fund's Buna platform's Buna.¹⁸ Other functionalities will include automated credit services and other business functions such as improved liquidity management tools and real-time monitoring capabilities.¹⁹

PHILIPPINES



The BSP first went live with its RTGS system in the country in 2002.²⁰ Seventeen years later, the Philippines went live with PhilPaSS^{plus}, an upgraded version of its existing RTGS system in July 2021. The upgrade to its RTGS system is a part of the Bangko Sentral ng Pilipinas (BSP)'s Digital Transformation Roadmap 2020-2023, which aims to leverage emerging technologies to expedite and improve payment services in the country.²¹ The improved RTGS system has double the capacity of the previous system along with increased access channels. It is based on the ISO 20022 messaging standard allowing for greater interoperability with domestic and global payment infrastructures. Moreover, it leverages underlying transactional data and to support the decision-making and related functions of system participants.²²

UNITED KINGDOM



The Bank of England first published a blueprint for updating its RTGS system in 2017, with the goal of offering an RTGS product better adapted to the rapidly changing payment landscape. In 2021, it formally launched its RTGS Renewal Programme, with the new service aimed at delivering higher resilience, wider access, increased interoperability, improved resilience, stronger end-to-end risk management framework and improved user functionality.²³ Key planned functionalities of the new RTGS service include: the technical capability to support nearly 24/7 operations, the ability to accommodate a much larger number of direct participants, an automated contingency solution for critical payment submissions in the event of an outage of the primary messaging network and the ability to send and receive payment messages from multiple messaging networks. The system will be based on the ISO 20022 messaging

¹⁷ <https://www.cma.se/case/central-bank-of-oman>

¹⁸ The GCC-RTGS system, also known as AFAQ, is a regional payment system that connects the RTGS system of the Gulf countries. Buna is a multi-currency regional enabling instant cross-border payments in multiple regional currencies and is owned by the Arab Monetary Fund.

¹⁹ <https://cbo.gov.om/sites/assets/Documents/English/Publications/AnnualReports/AnnualReport2019English.pdf>

²⁰ <https://openknowledge.worldbank.org/bitstream/handle/10986/36186/Philippines-Financial-Sector-Assessment-Program-Philippine-Payment-and-Settlement-System-Technical-Note.pdf?sequence=1&isAllowed=y>

²¹ https://www.bsp.gov.ph/Media_And_Research/Primers%20Faqs/Digital%20Payments%20Transformation%20Roadmap%20Report.pdf

²² <https://www.bsp.gov.ph/SitePages/MediaAndResearch/MediaDisp.aspx?ItemId=5912>

²³ <https://www.bankofengland.co.uk/payment-and-settlement/rtgs-renewal-programme>

standard and will be designed to support more efficient and diverse settlement mechanisms (e.g. DLT systems, and potentially synchronized settlement functionality) and will offer enhanced liquidity savings mechanisms. The user functionality of the system is also expected to be greatly enhanced via real-time transaction and liquidity monitoring, reporting and analytics. To this end, the central bank plans to develop automated real-time tools for accessing RTGS transactional and liquidity data via Business Intelligence APIs.²⁴

The BoE's effort is supported by several industry committees, including an External Advisory Group first established in 2017. The RTGS renewal is happening in concert with a much larger reimagining of retail payments infrastructure in the UK, an initiative known as New Payments Architecture (NPA). Led by Pay.UK, the NPA is an effort to consolidate country's retail systems into a single core clearing and settlement platform. The NPA is based on the principles of many of the same principles as the BoE's RTGS renewal, namely widened access, greater competition and innovation, well as ongoing stability and resilience.²⁵

BUNA



The Arab Monetary Fund launched the regional payment platform, Buna, in February 2020 to enable commercial and central banks to send and receive cross-border payments across the Arab region in local currencies as well as key international currencies, in an efficient, cost-effective, risk-controlled and transparent environment.²⁶ Buna is a centralized multicurrency platform and functions as a regional RTGS system with enhanced AML/CFT controls. The system is expected to promote trade relations and develop investment activities between the Arab countries by providing an environment that facilitates the development of financial and banking services and products in the region.

Correspondent banks are still needed to fund and defund accounts during the payments process, but Buna processes payments directly between originating and receiving banks without the need for chains of intermediaries between them. It currently offers payments in six currencies – Emirati dirhams, Egyptian pounds, Jordanian dinars and Saudi riyals, plus US dollars and Euros – with more planned.

²⁴ <https://www.bankofengland.co.uk/-/media/boe/files/payments/rtgs-renewal-programme/rtgs-renewal-api-up-dates-june2019.pdf?la=en&hash=6C9918476BE80C3D8EAF25B478547F1F25D3AB30>

²⁵ <https://www.wearepay.uk/programmes/new-payments-architecture-programme/>

²⁶ <https://www.amf.org.ae/en/content/arab-monetary-fund-announces-launch-buna-payment-platform-platform-serves-enhance>

Conclusion

There are numerous questions for central banks to weigh in thinking about which new functionalities and features to implement in a future RTGS system. But at their core, these systems will undoubtedly need to be more flexible and dynamic to stay relevant and meet the needs of today's evolving payments landscape. They should allow for broader access, have greater resiliency, be interoperable with existing and future payment rails, leverage a richer data set to deliver new value to users, and employ new and flexible deployment models. Central banks will need to consider a comprehensive design that is best tailored to their local market, while still applying international best practices and standards.

RTGS systems are here to stay, and a new wave of RTGS modernization is on the horizon. Before launching an RTGS modernization program, central banks must first identify the key challenges that system participants face regarding the legacy system and identify which stakeholders to engage and how to consult them. They then must select the system's new features and what technology vendors or solutions could best support them. In fostering a broader ecosystem of services, they must not only consider how design of the system itself, but how it could be leveraged to promote the development of value-added services.

Launching a new payment infrastructure takes time, as it requires not only designing and building a new or upgraded system but also engaging the industry and other stakeholders and eventually onboarding system participants. This only underscores the need to begin this process sooner rather than later, as starting today could mean that the system goes live in three years or more.

AUTHORS:

[Lipis Advisors](#)

Bonni Brodsky, Senior Consultant
Akira Sasaki, Managing Consultant

[CMA Small Systems](#)

Maxim Neshcheret, Regional Director, APAC

ABOUT CMA

CMA Small Systems is a Swedish based IT Company - independent global turnkey solutions provider to the Financial Service Industry. Through the development and implementation of business-critical applications, CMA has served the Financial Services Industry since 1990. CMA's market activities focus mainly on countries with emerging market economies in EMEA region, Asia, Middle East, Africa and Latin America.

Primary area of CMA business is design and management of the successful delivery of:

- Settlement, Clearing, Instant payment and Depository solutions for Central Financial Institutions such as Central Banks, Clearing Houses, Exchanges and Depositories.
- Infrastructure and technical analyses and design serveries for business critical 24x7x365 computing.
- Consulting and expertise in developing client's IT strategy and reengineering of business processes.

ABOUT LIPIS ADVISORS

Lipis Advisors is a leading strategy consultancy specializing in the payment sector. Lipis Advisors staff are experts on payment systems, services, and strategy, as well as the underlying technologies that support payment infrastructures. Lipis Advisors advises on all forms of payments, including ACH payments, real-time payments, card payments, cheques, mobile payments, online payments, and RTGS/wire payments.

To learn more about Lipis Advisors, please visit www.lipisadvisors.com

30+

years on the market of financial technology solutions

50+

countries; our systems work in 24 time zones

150+

business and technical experts with international experience in financial systems

55

central banks are among our clients

1500+

commercial banks use our solutions

500+

projects completed worldwide

\$100 bln+

daily transactions through our systems

Connect with CMA and see what we can do for you on cma.se

cma

info@cma.se

46 8 566 30 800

Fax 46 8 566 30 800