



BANCA D'ITALIA
EUROSISTEMA

The role of TIPS for the future payments landscape

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I wish to thank President Weidmann and Mr Balz for their kind invitation to this conference on "The Future of Payments in Europe". Payments play a crucial role in the functioning of the economy and in our daily lives. They allow every citizen, every day, to participate in civil life and are essential to the well-functioning of domestic and international trade.

Today, technological innovation and the development of digital technologies are radically reshaping the demand and supply of new forms of payment. This change cannot be left unguided, as it must be ensured that payments are efficient, inclusive and safe. Central banks are at the forefront of this innovation process.

The Eurosystem's retail payments strategy aims to foster innovative and cost efficient payments. Providing the possibility to make easy, instant, efficient and safe payments to any counterparty, anywhere in Europe, is the cornerstone of this strategy.

Within this framework, the Eurosystem has launched a powerful platform for the continuous settlement of instant payments: TARGET Instant Payment Settlement (TIPS).¹ In what follows, I will talk about the characteristics of this platform and its possible role in the future European payments landscape.

¹ Several documents regarding TIPS are available from the Bank of Italy's website, at the [Vision 2020](#) page. For a general overview see M. Renzetti (coordinator), "TIPS TARGET Instant Payment Settlement – The Pan-European Instant Payment Settlement Service", Bank of Italy, forthcoming. See also European Central Bank, *TARGET Instant Payment Settlement – User Handbook*, version 3.0, November 2020; European Central Bank, *Common Reference Data Management – User Detailed Functional Specifications*, version 2.1.1, November 2020; European Central Bank, *TARGET Instant Payment Settlement – User Detailed Functional Specifications*, version 3.0, November 2020; European Central Bank, *Mobile Proxy Lookup – User Detailed Functional Specifications*, version 0.9.1, November 2020.

TIPS: principles, characteristics and architecture

The TIPS project started in June 2017 (slide 1). In launching TIPS, the Eurosystem aimed to provide a pan-European framework for the settlement of instant payments in central bank money, with the objective of allowing citizens and firms to make payments via their banks or other payment service providers anywhere in the euro area within a matter of seconds. At the same time, the Eurosystem had the ambitious goal of positioning itself at the frontier of the digital revolution, by developing innovative, customer-friendly, instant retail payment solutions.

The Bank of Italy is one of the four national central banks – known as “the 4CB” – that have been implementing market and payment infrastructures in the euro area since the introduction of the euro. Among the many projects we have dealt with, we have recently been entrusted with the development and operational management of TIPS. The development and testing of the new system took just over one year and, at the end of November 2018, the TIPS service started to operate. In addition to the tight schedule, the TIPS project was particularly challenging because of its interdependence with the TARGET2-T2S Consolidation project, which started in 2017 and is still going on, and because of its highly innovative profile, which relies on high-tech solutions.

In its design, a number of principles were defined (slide 2). First, TIPS had to be based on the SEPA Instant Credit Transfer (SCT Inst) Scheme – i.e. the standard for pan-European instant payments developed by the European Payments Council at the request of the Euro Retail Payments Board – and had to offer the final and irrevocable settlement of instant payments in central bank money, every day of the year. Accordingly, TIPS was developed as an extension of TARGET2: in order to join TIPS, institutions must fulfil the same eligibility criteria as they do for their participation in TARGET2.

Second, TIPS had to operate on a full cost-recovery and not-for-profit basis, with a very competitive pricing scheme and a high reachability. And, thirdly, although TIPS was primarily designed for instant payment settlements in euro, it had to be a multi-currency system. Thanks to this feature, TIPS is currently attracting considerable interest in the community of central banks.

Working on a full cost-recovery basis, the price per transaction was set at 0.20 cents (€0.002); this is the only cost for banks, as TIPS does not require any entry or account-maintenance fees (slide 3). Underlying TIPS is also the requirement that the whole sequence of individual steps needed to carry out an instant payment transaction be completed within a maximum of 10 seconds. TIPS fully satisfies this requirement: the typical execution time (the “latency”) is actually well below the 10 seconds threshold, in the order of less than 5 seconds for 99 per cent of the transactions.

The main features of TIPS are its high processing capacity (i.e. the possibility to process 500 payments per second – 2.000 at peak rate – and more than 40 million payments a day) and the scalability (i.e. the possibility to process an increasing volume of transactions without modifying the architecture of the system). The settlement engine is able to process very high transactional volumes of payments. Distributed software architecture, self-healing capabilities and the redundancy of the hardware

provide high availability and resilience: TIPS can operate on a continuous 24/7/365 basis, unmanned outside normal working hours and, in the event of a disaster, the recovery time objective is limited to a maximum of 15 minutes. The ability to function independently contributes to the very low running costs, because no staff are required out of hours.

It is worth noting that the perimeter of TIPS is limited to the interactions between the institutions participating in TIPS (banks or automated clearing houses), which settle their payments in central bank money (slide 4). The communication between the actual originator and the beneficiary of a payment (i.e. the individuals or institutions transferring funds between each other) and their banks is outside the scope of TIPS and is independently handled by each participating bank or automated clearing house, using its own interface with its customers.

TIPS is a public service that does not compete with market solutions, but rather facilitates their development by ensuring the interoperability of systems and the pan-European reachability of customers. As an interbank settlement infrastructure, it is flexible and neutral with respect to different technology standards adopted by the market, for example for initiating a mobile payment at the point of sale or executing a person-to-person money transfer. In this respect, TIPS could also support the development of both existing and new instant payment solutions such as those based on the "tokenisation" of payment cards.

But what really makes TIPS unique and different from any other settlement platform is its distributed architecture in all layers, from application to infrastructure (slide 5). This architecture is based on "industry standard" and open-source software and is designed to ensure very high levels of stability, making service interruptions and software bugs very unlikely. In order to identify, mitigate and manage cyber risks, TIPS is implemented in compliance with international cyber-resilience standards and guidance.

The high availability of the system is achieved by using an architecture based on "redundant servers": all the servers operate (currently in two different sites) by processing, at any given moment, the very same input flow of messages. One instance is "active", i.e. provides the service, while the other servers stand ready to take over the processing in the event of the failure of the active one or in case of unavailability of one of the processing sites.

The presence of redundant servers allows the settlement engine to process payments exclusively "in memory". This avoids creating bottlenecks in the processing flow and makes it possible for TIPS to be very fast and achieve system resilience. It must be emphasised that this architecture differs from distributed-ledger systems (such as those, based on a block chain) which need to generate trust and consensus among a distributed community by means of an expensive and energy-intensive global validation process. In the case of TIPS, the recognition and guarantee of the transactions comes from the trust provided by the Eurosystem (the key task of a central bank).

This also allows TIPS to be "green". As shown in a recent research, the TIPS carbon footprint per transaction for the year 2019 is a very small fraction of the amount of CO₂

emitted by other distributed-ledger-based networks during 2018.² The reason is that, absent the need to generate trust and consensus among all the network participants, there is no energy dissipation.

TIPS and the future landscape for payments

In September 2020, the European Commission adopted a Retail Payments Strategy for the European Union (EU) that sets a number of targets: removing market fragmentation, promoting market-driven innovation in finance and addressing new challenges and risks associated with digital finance, whilst ensuring technological neutrality.³

This strategy aims at making the use of digital and instant payment the “new normal” solution across the EU. At the same time, it recognises the need to foster innovative, competitive and highly secure retail payments markets which, in turn, must rely on efficient and interoperable infrastructures, open to all players. Finally, it underlines the importance of achieving faster and more affordable cross-border payments involving non-EU countries, including remittances.

To implement the European vision on retail payments, the Eurosystem must overcome the fragmentation of clearing and settlement services and enable customers to use instant payment at the point of interaction (in store, e-commerce, peer-to-peer). More specifically, the Eurosystem will have to ensure a pan-European reachability for instant payments and support innovative retail payment solutions.

With the aim of achieving pan-European reachability for instant payments, last July the Governing Council of the European Central Bank (ECB) approved a set of measures known as the “Pan-European reachability package” (slide 6).⁴ All payment service providers which have adhered to the SCT Inst scheme and are reachable in TARGET2 should also become reachable in a TIPS central bank money liquidity account, either as a participant or as a reachable party (i.e. through the account of another participant). At the same time, all automated clearing houses are required to migrate their technical accounts from TARGET2 to TIPS in order to offer instant payments. The Eurosystem will discuss with payment service providers and automated clearing houses whether a migration window is needed for this purpose.

The ultimate goal of the “package” is to enable European citizens to make electronic payments in euro to and from any country in real time, both in person and online. Enabling the reachability of all payment service providers in SEPA is indeed a pre-condition for the development of a pan-European instant payments system. However, their success

² See P. Tiberi, “The Carbon Footprint of the Target Instant Payment Settlement (TIPS) System: A Comparative Analysis with Bitcoin”, Bank of Italy, forthcoming.

³ See European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a Retail Payments Strategy for the EU*, COM/2020/592 final, Bruxelles, September 2020.

⁴ See European Central Bank, “ECB takes steps to ensure pan-European reach of instant payments”, *Press release (MIP news)*, Frankfurt, July 2020.

ultimately hinges on the experience of end-users. User-friendly, hassle-free end-user solutions are of the essence.

In order to support banks and other payment service providers in offering end-user solutions for instant payments, TIPS will therefore be complemented by the Mobile Proxy Look-up (MPL) service. MPL will be an optional functionality that will enable a bank that receives the request from one of its customers to execute an instant payment in favour of a beneficiary identified with a proxy (e.g. a mobile number), to retrieve from a central repository the beneficiary IBAN needed to initiate the payment in TIPS.

The high potential of TIPS can be exploited in several directions. It provides an infrastructure for instantaneous private transactions, but could also be used to increase the efficiency of public payments. Its use as a means to provide European citizens with a fast and safe digital euro is currently under consideration. And it is a solution available to help overcoming the current unsatisfactory status of cross-border payments.

Government payments represent a critical mass of financial transactions (slide 7). Governmental usage of instant payments would generate benefits in terms of reduced settlement times and cost. It could also promote a change in preferences by end-users, encouraging the adoption of real-time innovative instruments for a wide range of transactions. As Treasurer of the Italian Government, we are reviewing the IT procedures for public payments in order to make it possible in the future to use TIPS for the instant payments of the Italian public administration.

The ECB recently published a report on the issuance of a central bank digital currency (CBDC) from the perspective of the Eurosystem.⁵ The report offers a preliminary analysis of potential solutions for the technical implementation of a digital euro with regard to the back-end infrastructure and end-user access solutions. According to the report, a retail CBDC could be based on deposit accounts with the central bank (slide 8). This paves the way for exploiting the usability, speed and cost-efficiency of TIPS, also in light of the fact that its high scalability may permit the processing of one billion transactions per day and the management of hundreds of millions of accounts.

TIPS is by design a multi-currency platform (slide 9). This feature signals that the Eurosystem does not only aim to provide yet another market infrastructure, but has the ambition of supporting the market in promoting closer cooperation, even with non-euro central banks. In April 2020, the Riksbank concluded an agreement with the Eurosystem to use the TIPS technical platform for the settlement of Swedish krona and is currently working with the Bank of Italy and the ECB to implement the so-called RIX-INST instant payment service, with a plan to go live in May 2022. This development gave rise to the idea of exploiting the common instant payment infrastructure in order to provide a cross-currency solution for instant payments. This solution will initially involve only the euro and krona communities but, in the near future, it will of course be available for all other currencies joining TIPS.

⁵ See European Central Bank, *Report on a Digital Euro*, Frankfurt, October 2020.

Recently, TIPS also played a prominent role in a trial launched by SWIFT to test fast global transactions.⁶ The trial involved a group of 19 banks from 13 markets and the results were impressive, with settlement times of less than 60 seconds for payments in euro. The fastest payment settled was initiated in Singapore and reached the beneficiary in Spain, via Germany, in 41 seconds. This proved the potential of TIPS to mitigate and address the key challenges faced by cross-border payments with regard to speed and access to payment systems.

During the 2020 Saudi Arabian Presidency, the Group of Twenty (G20) has made enhancing cross-border payments a priority.⁷ The Financial Stability Board (FSB) was asked, in coordination with the relevant stakeholders, to define a three-stage process and to develop a roadmap to make these payments faster, cheaper, more transparent and inclusive. The roadmap identifies five areas as focal points for action, ranging from implementing international guidance and principles for cross-border payments, to improving access to payment systems.

Next year the Italian G20 Presidency will remain committed to enhancing the efficiency of cross-border payments. It will do so by targeting the focus areas where digitalisation is posing challenges. One of these areas concerns the technical and operational improvements to existing domestic and international payment infrastructures needed for cross-border payments. TIPS has the potential to support the business cases and the minimum requirements that shared or interoperable infrastructures will have to meet to provide the settlement of cross-border payments.

* * *

The Eurosystem has set out a comprehensive strategy to respond to the transformation of the European payments landscape. The promotion of pan-European payment solutions and the development of instant, efficient and safe payments in the entire euro area are crucial building blocks of this strategy.

The Bank of Italy's commitment to fostering the transition towards a more digital economy is unwavering. The initiatives aiming at promoting technological innovation in the financial sector and in the payments system have been, and will continue to be, ever stronger.

Important innovations are underway in TIPS to allow users to carry out transactions in real time using mobile devices and to significantly expand the number of intermediaries connected to it, in line with the indications of the European Commission and the Eurosystem. We are currently co-operating with the ECB and the euro area national central banks in assessing the potential of TIPS as a possible technical solution for a digital euro.

⁶ See I. Terol, *SWIFT GPI Instant: Making Instant Cross-Border Payments a Reality – Trial with European TIPS*, presentation at the workshop "The ECB at Sibos 2019", London, September 2019.

⁷ For the roadmap see Financial Stability Board, *Enhancing Cross-border Payments: Stage 3 Roadmap*, Basel, October 2020.

TIPS is a multi-currency platform, with the capability to process other currencies as well as the euro. The agreement concluded with Riksbank last April represents a starting point for broader initiatives, which may ultimately result in interconnecting other currencies and other currency areas. Fostering a resilient and innovative payments market, aimed at strengthening confidence and trust in the euro, is certainly key for the welfare of all European citizens. Widespread benefits for all countries can be reaped worldwide by delivering faster, cheaper, more transparent and more inclusive cross-border payment services.

To conclude, I would like once again to underline the public nature of TIPS. Not only is it an inclusive, efficient and sustainable infrastructure but it also incorporates, by design, the objective of making instantaneous payments the "new normal" in a world that is so rapidly, and in several ways so dramatically, changing.

SLIDES

TIPS: from a vision to a product

Key decision

PRESS RELEASE

ECB to develop a service for the settlement of instant payments

22 June 2017

TIPS will allow citizens and firms to make payments via their bank anywhere in the euro area within a matter of seconds

By providing TIPS, the ECB will make sure that the demand for instant payments is met at European level and further facilitate the integration of the euro area.

The service will be developed in close cooperation with the banking industry in Europe

TIPS is scheduled to start operating in November 2018.

The decision of the ECB Governing Council triggered the start of the realisation phase of the TIPS Project, whose duration was just 17 months.

TIPS Project challenges



Challenging time-to-market



Time and technical dependencies



Innovative High Tech Solution

1

TIPS Principles



24/7/365
operating hours



Supports participants in complying with the **SCT Inst scheme**



Instant payments settlement in **Central Bank Money**



Same **participation criteria** as for TARGET2



Multi-currency
technical capability



Operated on a **full cost-recovery** basis

2

TIPS Design

HIGH VOLUMES



TIPS is able to process **500 payments per second** (2,000 at peak rate), **43.2 million payments a day**.

AVAILABILITY & RESILIENCE



Operating 24/7/365. The **Recovery Time Objective** in the event of a major failure is **15 minutes**.

LOW LATENCY



Overall **response time** per transaction below **5 seconds**.

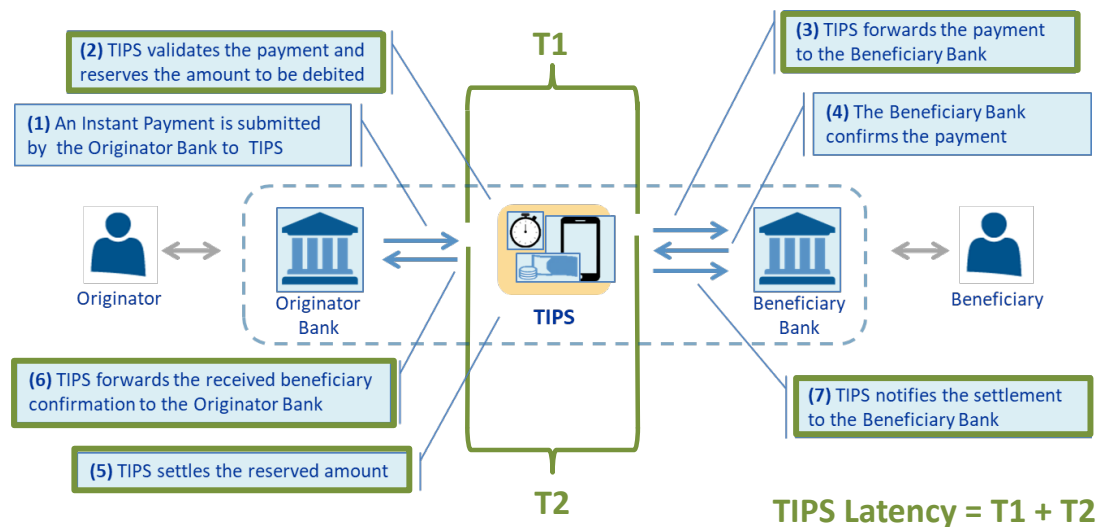
LOW COST



TIPS technical architecture is conceived to keep cost per transaction as low as possible (**0.2 euro cents**).

3

The settlement of an instant payment in TIPS



The latency of 99% of instant payments processed by TIPS is below or equal to 5 seconds

4

TIPS Architecture: key features

VERY FAST



Because of the high use of **in-memory processing** (with very limited use of persistence).

RESILIENT



Resilience is achieved by using **redundant servers** that process the very same input flow.

STRAIGHTFORWARD



Thanks to a lean and **streamlined design** and implementation.

GREEN

According to a Bank of Italy study, the environmental impact of TIPS is significantly lower than that of other systems based on distributed ledger technology (e.g. the Bitcoin network).

The results shows a CO_2e emission value per single transactions of only 0,004g CO_2e .



5

Current challenges and future-oriented solutions

Pan-European reachability package



The ECB's Governing Council approved in July this year a set of measures (known as "Pan-European reachability package").

The package will ensure that all PSPs will be reachable across the chain, irrespective of which ACH (or TIPS) they will be using for instant payments.

Mobile Proxy Look-up service



The MPL service supports PSPs in offering P2P payment solutions to initiate instant payments across SEPA using mobile devices.

The MPL service allows participants to retrieve beneficiary data required to address a payment by providing the mobile phone number of the beneficiary.

6

A business case: *speeding up* Government payments

Adopting *SCT Inst* for public payments would provide several benefits to **Government, Households and Firms**



For **Government**

- Reduction of settlement times (G2P)
- Timely management of failed payments
- Real-time collection (P2G)



For **Households and Firms**

- 24/7/365 availability
- Real-time payments (P2G)
- Potential integration with mobile services and Request-To-Pay

Government payments would provide a critical mass

- spreading the culture of innovative payments
- accelerating the return on IT investments made by mkt participants

7

€-CBDC: a digital euro based on TIPS architecture?

An **account-based digital euro** may be implemented by leveraging the very high scalability of TIPS technical architecture.

Processing one **billion** transactions per day and managing **hundreds of millions** of accounts without modifying the architecture of the system.



8

TIPS: a solution for cross-border payments beyond euro area

Multi-currency capability

TIPS is a multicurrency system. Other currencies could be supported besides the euro.

TIPS is ready to welcome Riksbank.



Go-live date:
23 May 2022

Current volume:
1.8 millions payments/day
(July 2020)

Expected volume:
2.7 millions payments/day
(November 2022)

Expected migration end date:
30 November 2022

Enhancing cross-border payments

TIPS may play a **crucial role** ensuring interoperability with other international fast payment infrastructures.

TIPS offers opportunities for **the development of payment solutions** for cross-border payments (e.g. SWIFT gpi).

A cross-currency solution in TIPS is under consideration by Riksbank, ECB and Banca d'Italia.

