
Technical Feasibility Study on pan-European Mobile P2P Interoperability



Version 1.0

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Executive Summary

The topic of 'instant payments' is regarded as a significant market trend with an impact on retail payments as well. The general understanding is that it brings a lot of benefits. Possible disadvantages (costs for setting up the infrastructure, higher operational risks, higher transaction costs, a.o.) can to a large extent be offset by “near” realtime solutions, providing immediate notification to sender and recipient with posting and funds availability to the recipient, but with actual settlement following afterwards. Immediate posting and funds availability as visible transaction results are probably most interesting to the end-user, who might be less interested in the (invisible) settlement part afterwards.

In modern society, the mobile phone has become an important multi-purpose initiation device for financial services transactions, changing consumer behaviour across multiple channels and with the potential to displace many different existing products and services. In different payment contexts, Mobile P2P emerges as an attractive realtime funds transfer mechanism, where innovations in customer authentication and realtime payments come together and are offering compelling instant payment functionality (i.e. immediate confirmation and availability of funds) and visibility to end-users. The arrival of multiple Mobile P2P services generally contributes to strong market competition with associated increased service levels and attractive pricing but different approaches, positioning, standards and attribute values might prevent universal and large-scale adoption. Closed-loop, non-interoperable solutions could limit the future interlinking of networks and applications across Europe and result in new European fragmentation, not taking advantage of the harmonisation and integration already achieved within the SEPA area.

In a joint initiative of principle Mobile P2P scheme services in Europe, the Berlin Group (an open, European standardisation initiative) and Mobile P2P infrastructure providers, this Feasibility Study shows a technical and functional architecture that enables interlinking of regional Mobile P2P scheme services based on existing bank (IBAN) and card (PAN) account references, initially for the P2P payment context, later to be explored for the C2B payment context as well. The architecture offers a layered approach with efficient reachability and routing flexibility in a repository layer (confirming the mapping of a registered alias to a bank or card account) and with three supported models in the clearing and settlement layer, of which one solution is already anticipating the future ‘instant SCT’. There is no immediate evidence of sufficient demand for cross-border mobile payments (a dedicated Working Group of the Euro Retail Payments Board expected only a positive business case when including a C2B payment context). In designing the architecture, this business uncertainty prompted the need to avoid costly centralised solutions, expensive dedicated collaterals/prefunding arrangements and high operational costs.

As a next step, the architecture will be further detailed in harmonised standards of open interfaces, data formats and message protocols.

Preliminary Considerations and Background

- a) The 'Berlin Group' is an open interoperability standards and harmonisation body with a focus on scheme-independent technical harmonisation and interlinking of otherwise non-interoperable systems and infrastructures in the payments industry. The Berlin Group currently has participation of 28 major players in the card industry from 24 different countries (for more information, ref. <http://www.berlin-group.org>), together representing more than 18 billion card transactions annually within the Single Euro Payments Area (SEPA). Originating from the card industry, the principle goal of the Berlin Group has always been to meet the aims of the European Central Bank (ECB), the European Commission (EC) and the European Payments Council with regard to SEPA. Throughout their work, the Berlin Group acknowledges the broad diversity of already existing and competing payment schemes and infrastructures, grown from different historical backgrounds, with different business models and stakeholders, and often diverging governance arrangements and functionality for payments throughout Europe already in place.
- b) Already in the summer of 2014, a dedicated taskforce of the Berlin Group identified the topic of realtime payment networks (instant payments) as a significant market trend that, although not fully defined yet in SEPA terms, may have an impact on different payment contexts in retail payments, not only in P2P but also in C2B, both in proximity and in remote situations, which may thus affect cardbased transactions as well. Above this, non-interoperability risks arising out of different approaches, positioning, standards and attribute values (e.g. speed, customer experience, certainty, reliability, reachability, fees, acceptance environments) in current instant payment implementations worldwide were identified, a concern that was confirmed from e.g. the December 2014 meeting of the Euro Retail Payments Board (ERPB; chaired by the ECB)¹. Closed-loop, non-interoperable instant payment solutions could limit the future interlinking of networks and applications across Europe and result in new European fragmentation, not taking advantage of the harmonisation and integration already achieved within the SEPA area. Fragmentation might also create obstacles in achieving network effects (and higher efficiency gains) at a European level.
- c) On the topic of instant payments, the ERPB distinguishes different layers and within their so-called 'scheme layer' they put a special focus on Mobile P2P payment initiation. The mobile phone is considered as a dominant initiation device for instant payments that appears to be attractive as a value-added realtime funds transfer platform with rather high acceptance levels among consumers. A focus on Mobile P2P as a payment initiation or overlay service in the scheme layer that is able to offer compelling instant payment functionality (i.e. immediate confirmation and availability of funds) and visibility to end-users, seems to be sensible as this can function without the need for immediate settlement. Settlement can follow later (the ERPB also leaves the option for deferred net

¹ https://www.ecb.europa.eu/paym/retpaym/shared/pdf/2nd_eprb_meeting_item6.pdf?b70bbb40c47214b15692369b71765d2b

settlement), not affecting the visible instant payment functionality, although it is recognised that liability risks related to deferred settlement will then have to be properly managed at a scheme layer, much in the same way as today in card payments. Mobile P2P is developing fast across Europe (a survey² of a temporary *ERPB Working Group on Mobile P2P Payments* listed already approx. 50 solutions, many of them operating at local or even intra-bank level) and, within special interest of the card payments industry, is moving from the P2P payment context to the C2B context in several Mobile P2P scheme services. Many Mobile P2P initiatives seem to offer functional and infrastructural similarities, possibly creating an opportunity for interoperability. At several occasions, the ERPB stressed the need for pan-European Mobile P2P interoperability (e.g. at the ERPB meeting of June 2015: “The ERPB expects the existing and future local mobile P2P solutions to cooperate to ensure pan-European interoperability”).

- d) With the aim to contribute to the ERPB focus on development of pan-European Mobile P2P payment initiation in the instant payments scheme layer, the Berlin Group created the idea to discuss and explore between principle Mobile P2P scheme services in Europe the background and possibilities of establishing a technical and functional architecture that enables interlinking of regional Mobile P2P scheme services in a multi-vendor, multi-network, multi-service environment, by leveraging existing interoperability standards and achieved SEPA account reference standards (IBAN, PAN) and harmonisation to the topic of instant payments as well. Interlinking existing Mobile P2P scheme services preserves, leverages and capitalises on existing investments, efficiencies, infrastructures, brand awareness, security and convenience. Open, common standards for processes, data and infrastructures are the necessary building blocks of an open, interoperable market and the current document, formatted as a Feasibility Study, reflects the discussions to investigate such interoperability.
- e) This Feasibility Study has been carried out on the basis of voluntary contributions in common meetings between participants of the Berlin Group, infrastructure providers and participants from principle Mobile P2P scheme services in Europe. The requirements for pan-European Mobile P2P services have been jointly discussed between the participating organisations via a demand-driven approach. This has led to the identification and prioritisation of services to be provided at pan-European level. At a later stage, the results of the Feasibility Study will be used as a basis for the definition of harmonised standards of open interfaces, data formats and protocols that enable such interoperability between Mobile P2P scheme services in Europe. In case further formalisation of this co-operation is needed, then this will be agreed on at a later stage. Any possible intellectual property rights associated with the results of this interoperability work (e.g. the Feasibility Study, technical specifications etc.) are intended to be put into the public domain so that they can be used freely.

² http://www.ecb.europa.eu/paym/retpaym/shared/pdf/3rd_erp_b_meeting_item5_report_recommendations_P2P_mobile_payments.pdf

1 Approach and Scope

“

Interoperability is the ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems

”

European Commission
European Interoperability Framework, version 1.0, 2004

In designing an interoperability framework, (at least) five areas of interoperability need to be considered³:

1. **Technical Interoperability**: usually associated with hardware/software components, systems, platforms and services that enable machine-to-machine communication to take place. This kind of interoperability is often centred on (communication) protocols for transporting and presenting information and the infrastructure needed for those protocols to operate.
2. **Syntactic Interoperability**: usually associated with data modelling and formats, i.e. syntax and encoding of messages that are transferred by communication protocols.
3. **Semantic Interoperability**: usually associated with the meaning of content and concerns a common understanding on the meaning of the content (information) being exchanged. Semantic Interoperability enables systems to combine received information with other information resources and to process this in a meaningful way. It entails agreement on, for example, ways to discover, represent and give a context to information. This will allow automated tools to share and process information, even when they have been designed independently. The objective is not only to allow information resources to be connected but also to allow information to be automatically parsed and understood, and, consequently, be reused by computer applications that were not involved in its creation. Semantic Interoperability is therefore a prerequisite for the front-end delivery of services to a user.
4. **Operational Interoperability** is the ability of organizations to effectively communicate and transfer (meaningful) data (information) by modelling their business processes and defining service level objectives (including specifying the minimum standards to which participants should comply), even though they may be using a variety of different information systems over widely different infrastructures, possibly across

³ Derived from ETSI-methodologies

different geographic regions and cultures. Operational Interoperability depends on successful Technical-, Syntactic- and Semantic Interoperability.

5. **Business Interoperability** is concerned with defining business goals and conditions, setting up legal arrangements describing the roles, duties and liabilities of participants in e.g. commercial agreements and rules and regulations regarding payment guarantees, presentment periods, settlement dates, settlement risks, membership eligibility criteria, governance models, arbitration and compliance, liability and indemnification, market communication, etc., to support Operational Interoperability and ensure the start of full interoperability in real life.

In some respects, the ERPB vision on instant payments was not fully clear at the start of this Feasibility Study. At that time, definitions were sometimes still ambiguous and functional requirements were provided at rather high-level, e.g. on accessibility (24/7/365), on notification and funds availability (immediate), on reach (Europe-wide), on the need for interoperability and on routing (based on IBAN). Therefore, implementation of the vision was expected to be subject to an evolutionary process which is why this Feasibility Study focuses on Technical-, Syntactic- and Semantic Interoperability, enabling interlinking of regional Mobile P2P scheme services (based on existing IBAN and PAN account references) in a multi-vendor, multi-network and multi-service environment, recognising those ERPB requirements on instant payments in the Mobile P2P interoperability domain that offered already sufficient clarity:

“

...electronic retail payment solutions available 24/7/365 and resulting in the immediate or close-to-immediate interbank clearing of the transaction and crediting of the payee's account with confirmation to the payer (within seconds of payment initiation), irrespective of the underlying payment instrument used (credit transfer, direct debit or payment card) and of the underlying arrangements for clearing (whether bilateral interbank clearing or clearing via infrastructures) and settlement (e.g. with guarantees or in real time)...

”

Euro Retail Payments Board
1 December 2014

Although the participants recognised that Mobile P2P moves into a C2B payment context, it was agreed to start working first on the P2P payment context as the infrastructure connectivity had to be the first and major priority. Nevertheless, although the C2B payment context has its own complexities (for an overview of issues and barriers, ref. e.g. to chapter 5

of a recent ERPB Working Group report⁴) and not all existing MP2P schemes are already supporting C2B acceptance, this payment context will be addressed later.

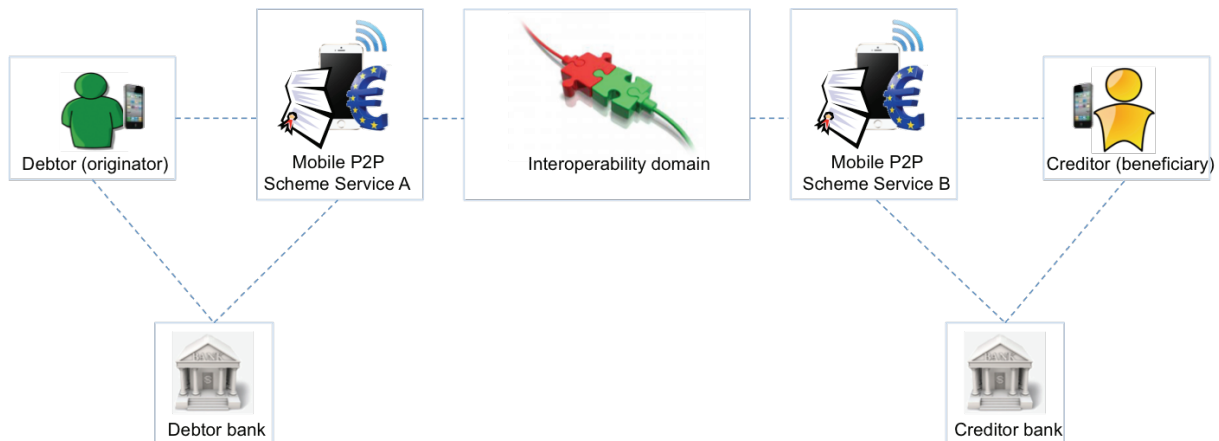
Operational- and Business Interoperability were not intended to be discussed in scope of the standardisation and harmonisation aims of this joint initiative. It was decided to leave it to market participants to bring the Operational- and Business Interoperability forward into e.g. bilateral-, multilateral- or overarching scheme agreements on the basis of the technical standardisation creating Technical-, Syntactic- and Semantic Interoperability.

As already noted by the temporary *ERPB Working Group on Mobile P2P Payments*, there is no immediate evidence of sufficient demand for cross-border mobile payments (this Working Group expected only a positive business case when including a C2B payment context). This business uncertainty has imposed some design and architecture constraints into the Feasibility Study efforts, leading to a further increased focus on interconnecting Mobile P2P scheme services vs. development of costly centralised solutions (e.g. a central repository for routing and lookup services). This observation also required to avoid expensive dedicated collaterals/prefunding arrangements and high operational costs. Further design and architecture constraints derive a.o. from the future arrival of SCT_{inst}, the legal restrictions in some markets on exchange or storage of IBAN data in the interoperability domain and from the drive to avoid exchange of PAN data as this could imply being subject to PCI compliance. Therefore, the joint initiative participants have very much focused on the *Must Have* and *Should Have* business and functional requirements and less so on the *Could Have* and *Would Have* requirements.

⁴http://www.ecb.europa.eu/paym/retpaym/shared/pdf/4th-ERPB-meeting/2015-11-26_4th-ERPB_item_6_ERPB_CTLP_working_group_final_report.pdf?726f67769d37722de341702fe5f2387a

2 Interoperability Environment

The following picture gives an overview of the entities involved in a Mobile P2P Interoperability Framework, relevant to the flow and characteristics of a singular scheme Mobile P2P payment:



From the perspective of end-users, the typical characteristics of a Mobile P2P payment are:

- Availability 24/7/365.
- Payment requires access to a smartphone for e.g. authentication of the originator, input of the transaction amount, selection of beneficiary, (optional) verification of beneficiary name, entry of remittance data, etc. For some Mobile P2P scheme services, a smartphone is not necessarily required to receive money (any type of mobile phone can be used to receive confirmation of a money transfer, via e.g. SMS-messages).
- Payment relies on the registration of a mobile phone number as an alias to a bank account (with a 1:n relationship of bank account to mobile phone number(s)).
- The originator selects the (beneficiary) mobile phone number to which he wants to send the payment amount and sends this information, together with his mobile phone number which identifies his account to the scheme operator, to his Mobile P2P scheme service.
- During payment
 - it is assured that the mobile phone number aliases of both originator and beneficiary participate to a Mobile P2P scheme, and that (for both originator and beneficiary) the correct alias relation between mobile phone number and bank or card account exists.
 - the Mobile P2P scheme operator initiates authorisation of the payment.
 - after positive authorisation of the transaction, the scheme operator makes sure that the originator's (debtor) and beneficiary's (creditor) bank receive instant notification of the payment. The creditor's bank processes the credit

amount and allows the customer to dispose of the amount immediately. The debtor's bank marks the appropriate amount to the account balance.

- at its discretion, the scheme operator sends an instant notification information about the successful transaction to the phone numbers of debtor and creditor.
- the scheme operator collects the transaction information and performs settlement between the involved institutions on a regular basis (not necessarily in realtime), either through e.g. central settlement accounts or by informing the participating institutions on the incurred positions within a specific settlement period so that they can themselves perform balancing by means of SCT or use any other type of crediting mechanism.

Several processes have been identified (a.o. registration/de-registration, provisioning, initiation/maintenance of white-/black-lists, customer authentication, transaction authorisation, customer notification) that remain outside the interoperability domain and for which only input data and output results exchange may be required. Also items that are regulated within the scheme-to-customer space (e.g. user interface handling, fee charging, determination of amount limits) are considered to remain outside the interoperability domain. Exception handling or other processes for arbitration and compliance will have to be investigated during the detailed message definition phase.

2.1 Risk considerations

Every payment system has certain risks of a legal, operational and financial nature. While the materialisation of financial risks in retail payment systems will hardly ever lead to systemic financial disruption, their impact could still lead to significant losses and should therefore be contained and avoided to the maximum extent in order to preserve public confidence, avoid reputational damages and, in general, to meet oversight standards. Financial risk covers a range of risks incurred in financial transactions, including both liquidity and credit risk. Each step in the transaction phase may bear its own specific risks related to the default or the insolvency of participants. Therefore each payment system should ensure that comprehensive information, including appropriate information on financial risks, is available to all participants, and should manage and contain financial risks related to the different steps in a transaction.

From the perspective of a payment system, the risk profiling in the ECB oversight framework for card schemes, which differentiates between legal risks, financial risks, overall management risks, operational risks and reputational risks, could be used as a reference for the identification of the most important risks. Operational- and Business Interoperability should especially take care of the different types of risk categories.

From an end-user perspective, each payment transaction starts with a payment order, which in the case of Mobile P2P is initiated by the payer (originator). Part of the payment order process is to check the authenticity of the originator and check on available funds. These checks can be delegated to the originator's bank. Only after these checks and checks on the

authenticity of the beneficiary the P2P scheme service will accept the order and provide certain guarantees for the execution. From this time onwards usually a payment order cannot be revoked anymore by the originator.

The primary attributes relevant to originator (payer) and beneficiary (payee) during the P2P transaction phase are:

- Certainty - assurance to the originator and beneficiary that funds are transferred as ordered (implying that an authorised payment should be guaranteed to the beneficiary);
- Speed - timeliness of funds transfer from originator to beneficiary (authorisation should be in realtime with immediate availability of the funds and notification to the beneficiary; settlement can be in realtime but can also take place at to be defined intervals, as long as no cost-effective pan-European instant settlement facilities for low-value retail payments are available);

Relevant to these attributes is the support of 'finality of payment', i.e. the payment is unconditional, irrevocable and legally enforceable. Finality is important because when it occurs, which depends on the applicable rules and legislation, the obligations generated in the interbank payment, clearing and settlement process are discharged. Thus, the credit, liquidity and other risks generated as part of this process cease to exist at this point in time.

Based on a positive authorisation of the Mobile P2P transaction by the originator and beneficiary bank, the beneficiary bank processes the credit amount and allows his beneficiary customer to dispose of the amount immediately. Therefore, from a creditor perspective, an authorised Mobile P2P payment is guaranteed to the beneficiary and the transaction is considered 'final' when receiving a positive advice (called "Customer Finality")⁵. However, as long as no cost-effective pan-European instant settlement facilities for low-value retail payments are available, the actual movement of funds happens at a later stage during settlement (called "Bank Finality"). Between the time that instructions for the transfer of funds ("transfer order") are accepted for settlement and the time the order is actually settled, participants are subject to credit and liquidity risks, as the transfer order could be revoked or a system participant could become insolvent. Therefore, and in general to mitigate financial risks involved in the clearing and settlement process, the associated financial risks inbetween have to be managed at scheme level and/or in bilateral/multilateral arrangements between scheme participants (relayed to Operational/Business Interoperability).

In general, secure messaging and dataprivacy protection in the interoperability domain are considered as essential preconditions. Where applicable and on the basis of appropriate risk assessment, a common security and dataprivacy policy, common certification policy and common minimum security requirements for message exchanges between the scheme services should be built on industry-standard security strenghts in e.g. network-, application

⁵ The Customer Finality is based on business agreements between banks and their customers. There is no connotation with the Settlement Finality Directive.

layers and key management procedures. Switches needed for message exchange should preferably restrict to pure routing services, not linking any dataprivacy sensitive information.

2.2 Interoperability Layers in the Technical Environment

The ERPB has introduced the distinction of different layers when modelling Mobile P2P systems. The modelling of the ERPB – a scheme layer, a clearing layer and a settlement layer – has been identified as not being sufficiently detailed for a Mobile P2P Interoperability environment.

Specific to a Mobile P2P context, interoperability needs to take care of processes and services within the following multiple functional layers:

- **Repository Layer**

This layer supports a reachability and routing directory look-up service (referred to by the ERPB as the 'Standardised Proxy Lookup service') for the confirmation of a registered alias for a Mobile P2P payment and a mapping to an IBAN or PAN. For the purposes of this Feasibility Study only mobile phone numbers as aliases to a bank or card account have been considered. Other types of legitimate aliases (e.g. email addresses, Facebook accounts) might be considered at a later stage. Special attention has to be paid to the directory service requirements because they determine the routing capabilities. Sending IBAN/PAN data of the beneficiary in the repository layer lookup service could be avoided, as several scheme services do not need this and are only using e.g. mobile phone numbers as proxy to the bank or card account. Such an approach could be used where data privacy issues and PCI requirements are of concern. Nevertheless, at least a central IBAN is still needed as a reference account in the clearing layer.

- **Clearing Layer (Customer Finality)**

Within this layer realtime services manage the risks of a transaction, like checking authenticity of the originator and availability of funds, the existence of the beneficiary account, operational risks like anti money laundering or others via limit checks, and transmission of the transaction data needed to validate the transaction (clearing) between debtor and creditor and their respective institutions within the Mobile P2P scheme services. This layer also supports the realtime notification service of the originator and beneficiary about the transmitted amount.

Payment guarantees and contracts are defined between the Mobile P2P scheme services. The relation between debtor and debtor bank and between creditor and creditor bank are defined within their own spheres, and not relevant for the clearing of Mobile P2P transactions on an inter-bank-level.

- **C2B Layer (optional, to be addressed later)**

When used in a C2B (proximity/remote) context, further optimisations to recognise the beneficiary account might be needed. These optimisations are relevant in a POS

Terminal to Mobile App interface, for transmitting the beneficiary account by e.g. using standardised QR codes. Other complexities related to POS C2B may arise in the scheme agreements or clearing & settlement layers, to be investigated and flagged for later discussion. This layer is initially not in scope of this Feasibility Study but is not a priori excluded and will be addressed later.

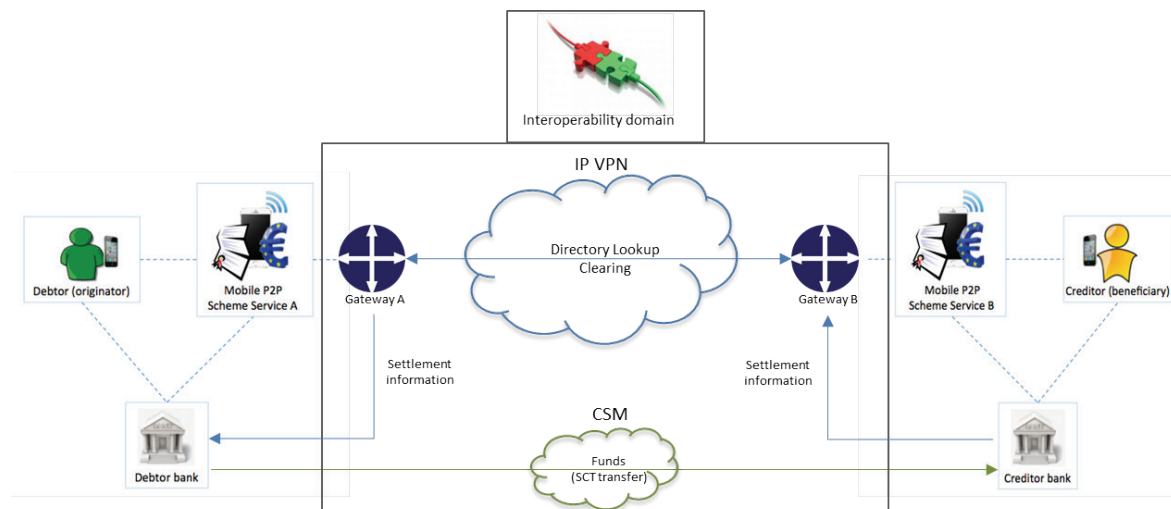
- **Settlement Layer (Bank Finality)**

This layer describes the final settlement of the Mobile P2P volumes in the interbank sphere. The valuation from the debtor to the debtor bank and from the creditor bank to the creditor normally is not part of this Feasibility Study.

Remark: The known Mobile P2P systems use push services to move the transaction amount from the originator to the beneficiary account. In a C2B environment, also pull services (as currently common for cards) could be required.

Conceptually, Sending and Recipient Mobile P2P Schemes are connecting and communicating the Layer information via processing entities called “Gateways”.

As an example, Gateways could connect with each other through an IP VPN, where the IP VPN has to comply with IP VPN Requirements (yet to be defined in a later specification phase). The following picture shows such Gateway connections through an IP VPN, as a further detailing of the interoperability domain, extended with the directory lookup, clearing and settlement flows (with SCT transfer as example settlement type).



Further technical and operational requirements to the Gateways are to be described at a later stage (as part of Operational and Business Interoperability).

2.2.1 Interoperable Processes in the Repository Layer

The Sending Scheme as well as the Recipient Scheme are using own central Directory Services with databases that hold a mapping of mobile phone numbers to bank or card account connections. In principle (ref. blue box below for the different routing mechanisms) it is possible to keep these databases decentralised, and perform the necessary matching on the basis of message exchanges between the respective databases. For the interoperability of two schemes, these Services must be connected, i.e. the central Directory Service of the Sending Scheme needs to address the Directory Service of the Recipient Scheme while delivering the alias of the beneficiary provided by the originator in his Mobile P2P app.

Response data in a positive case is an IBAN (which might be a central IBAN of the Recipient Scheme or the IBAN of the beneficiary account), PAN or general reference ID (refID) that is used as a track & trace code in subsequent phases. Optional further response data elements are the name of the beneficiary or other types of remittance data.

In case a recipient cannot be identified by a timely gateway response, the Sending Scheme has the option to try and invite the recipient within his own scheme on the basis of a commercial proposal.

Box – Reachability & Routing

Routing is the act of moving information across an internetwork from a source to a destination. In an interoperable Mobile P2P environment, a smooth transmission of messages from one Mobile P2P network to another requires a commonly agreed addressing and routing mechanism on the basis of unique identifiers for payer and payee that is usable within all connected networks in order to transfer payment information from the payer network to the payee network. Bank or card account numbers are such unique identifiers but often considered to be part of one's "transactional identity," which is sensitive information that should be protected. Because of this concern, payees may be reluctant to give their account number to a payer for a P2P payment and might instead prefer to use a less sensitive but still unique alias, such as a mobile phone number, an email address, Facebook account, etc., which is registered to their bank or card account (with a 1:n relationship of account to aliases). Such an alias will then be used as a proxy in the addressing systems that identify both the institutions and the accounts of payer and payee. The addressing system is the technical basis for reachability, routing payments and for participation and recognition in interbank services where a directory look-up service is needed to find confirmation of a registered alias for a Mobile P2P payment and a mapping to an IBAN or a PAN.

For the time being and for the purposes of this Feasibility Study only mobile phone numbers as aliases to a bank or card account have been considered as proxies for addressing destinations. The following table outlines several possible routing mechanisms, with a (preliminary; based on current discussions) preference ranking (in descending order) from high to low:

Routing option	Comment	Ranking	Decision
Autonomous	On the basis of existing agreement(s) with other gateways, it is up to the sending gateway to decide which route to follow and in which order to contact the other gateways within the IP VPN network. This procedure could be enhanced by	High	Feasible

	storing relations of mobile numbers and connections which have been successfully processed once. This information could be re-used then later on.		
Multicast/ broadcast	The entire group of gateways is contacted all at once. A decision algorithm by the sending scheme then selects the appropriate scheme to be contacted.	High	Feasible
Based on scheme identifier	An additional scheme identifier relates to the appropriate gateway. Creates decentralised complexities and has an impact on Apps, since this scheme identifier then needs to be presented and explained to the customer.	Medium	Disregarded
Token proxy	Routing tables at gateway level with universal tokens (belonging to scheme gateways) that link an alias to IBAN or PAN. Creates decentralised complexities (impact on Apps) and requires organised token provisioning and management. The latter item seems by far too complex with its impact on Mobile P2P architectures.	Medium	Disregarded
Self-Organising	Decentralised databases at gateway level link aliases to IBANs or PANs. Disregarded as too complex in technical and governance setup and maintenance.	Low	Disregarded
Central repository	A central European database links aliases to IBANs or PANs. Disregarded as too complex, too costly and too vulnerable in technical and governance setup and maintenance. A central repository solution was also not favoured by the former ERPB WG on P2P Mobile Payments.	Low	Disregarded
Mobile phone country code	Not feasible: several Mobile P2P scheme services have no restriction on the use of country codes. Anyhow, the mobile phone country code could be a good criterium to optimize the autonomous routing mechanism mentioned in the first line.	Low	Disregarded

Remark: Because of the limited business opportunity (ref. page 10), decentralised components like smartphone apps should not be affected. Also, the impact on the customer should be as low as possible. Therefore, it has been agreed that the first two options seem to be the only manageable and efficient solutions. It is then up to the sending scheme which mechanism to choose and how to optimise it regarding flexibility and efficiency.

2.2.2 Interoperable Processes in the Online Clearing Layer

Clearing and settlement processes are strictly bound together. Nevertheless, these two layers can be separated from an abstract or functional point of view. Conventional payment (SCT/SDD based) and cardbased clearing/reconciliation methods have been considered. The detailed process description in Section 3 then will differentiate different settlement variants with their impact on clearing.

The Sending Scheme Gateway sends a clearing message to the Recipient Scheme Gateway after having checked the authentication and funds availability of the Sender internally. The format of the clearing message will depend on the chosen settlement variant. Three feasible methods have been identified:

1. Online clearing message with transactions then settled via SCT
2. Online clearing message e.g. ISO8583 based, where settlement is performed on a daily cut sum
3. Usage of SCT_{INST} as clearing & settlement solution (not available yet)

The required information for AML and similar types of screenings must be available in the clearing message.

The Recipient Scheme Gateway will check limits, black lists and other risk parameters, e.g. for anti money laundering and responds to the Sending Scheme Gateway with a positive/negative acknowledgement, including an appropriate reason code.

With a successful clearing message, the financial guarantee between the Sender bank and the Beneficiary bank is provided according to interoperable scheme rules and debtor and creditor should be notified of the result. According to the rules, the transaction is final, i.e. the creditor has irrevocable and unconditional access to the transferred funds.

A thorough exception handling is needed in case the Server of the Sending Scheme is not receiving an acknowledgement of the Recipient Scheme within defined timeframes.

Remark: The current EPC proposals for the introduction of an SCT_{INST} scheme would fully match the requirements for the clearing layer of an interoperable mobile P2P solution, in case the routing is based on IBANs. Nevertheless, the service is planned to be optional for banks to support.

Remark: By definition, transactions will be cleared in EURO in variant 1 and 3. This implies that schemes operating in other currencies than EURO will have to send and receive in EURO, make the currency conversions and notify their customers.

2.2.3 Interoperable Processes in the Settlement Layer

The settlement of the transaction can be performed in two variants, in an aggregated settlement variant or in a single transaction settlement variant. Two connected Mobile P2P schemes need to agree within business agreements to use one of these variants when connecting the schemes through gateways.

Aggregated Settlement Variant

In this variant, all transaction information needed for settlement is already transported within the clearing layer. In this case, settlement is performed once a day in a net settlement position between the connected banks or between the connected schemes. In case of settling between mobile P2P schemes, settlement banks need to be agreed on. To reconcile these settlement positions a cut must be performed between the gateways or reports exchanged between gateways about the performed messages between two cuts. Details of the processes to be installed need to be defined.

Remark: Using the SCT_{INST} clearing messages within the clearing layer would lead automatically to an aggregated settlement variant.

Single Transaction Settlement Variant

In this variant, the sending scheme is settling all transactions by the use of the SCT scheme. Then, the transaction information is sent within the settlement process.

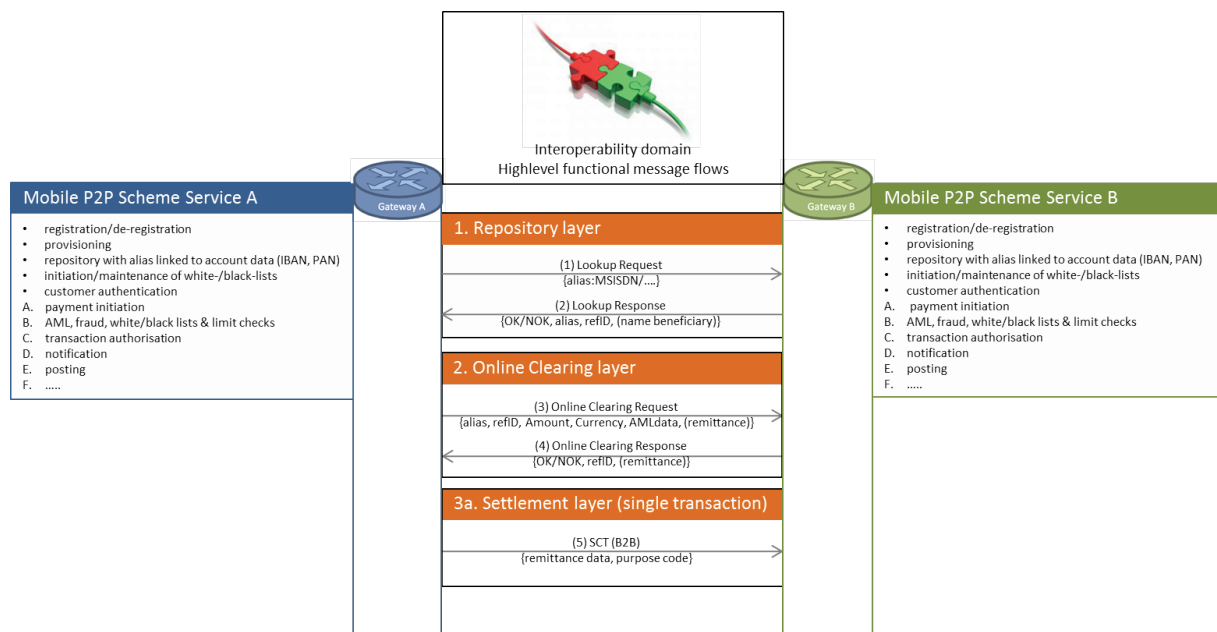
3 Process Overview

In the following, a more detailed description for the overall processes is given. The different flavours resulting from different clearing/settlement solutions yield three different process variants.

The process steps for a bilateral Mobile P2P transaction are divided into steps referring to existing central services of the related Mobile P2P services and specific gateway services only needed for the bilateral processes.

3.1 Process using SCT (Single Transaction Variant)

The following picture gives an overview on the whole process, when using one SCT transaction to settle each individual bilateral Mobile P2P transaction:



Even though every single transaction will be settled via SCT in this solution, the online clearing layer will already anticipate and use the upcoming SCT_{INST} formats. The approach is to implement an easy entry solution for the technical clearing part of SCT_{INST}, before a full fledged SCT_{INST} solution integrating rules, risk management and settlement will be available in the market.

Central Services Sending Scheme	Gateway Services Sending Scheme	Gateway Services Receiving Scheme	Central Services Receiving Scheme
Step 1 Repository Layer			
Selection of Mobile Number Receiver			
	Send Repository Request		

Central Services Sending Scheme	Gateway Services Sending Scheme	Gateway Services Receiving Scheme	Central Services Receiving Scheme
	following routing algorithm		
		Respond Repository Request (optional: beneficiary name, other remittance data)	
	Receive Response and turn it into internal format		
Step 2 Clearing Layer			
Authenticate Sender; check limits and balance of the sender			
	Send clearing message, based on SCT _{INST} formats		
		Translate clearing message into internal format for clearing	
			AML checks, limit checks, acceptance decision; notify beneficiary bank and beneficiary, dispose amount on the account
		Respond via SCT _{INST} confirmation	
	Receive response and translate into internal format		
Notify customer about successful process			
Step 3 Settlement Layer			
Determine successful bilateral transactions after cut			
	Create SCT per transaction with specific purpose code and remittance information		
		If clearing via central account: reconcile settlement amount with clearing amount; start corrections	
			If clearing directly on

Central Services Sending Scheme	Gateway Services Sending Scheme	Gateway Services Receiving Scheme	Central Services Receiving Scheme
			beneficiary account: Turn disposition on the beneficiary account into booking

The single SCT transaction for Settlement

- will transport a dedicated Remittance Information for reconciliation purposes containing
 - the Authorisation ID
 - the alias of the Receiver,
 - the ID of the Recipient Scheme
- shall use a dedicated Purpose Code.

Remark: In a specification phase it is to be clarified whether some of this information is put into Ultimate Creditor fields.

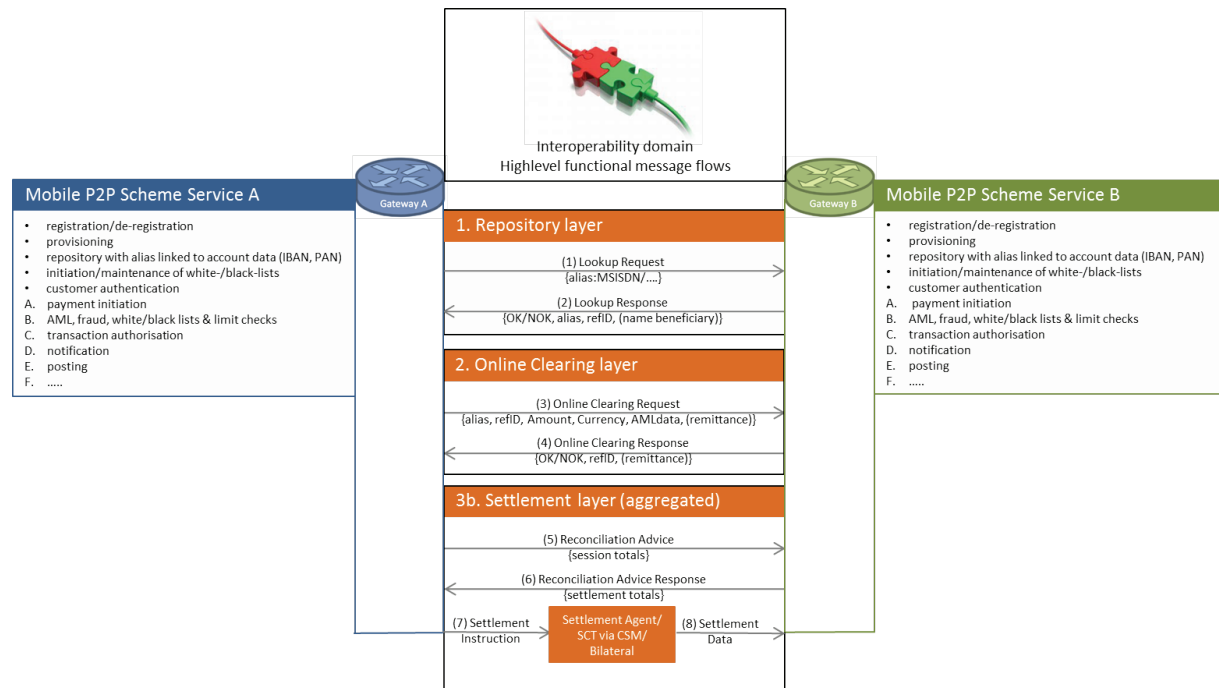
Arguments

For this solution, the following Pros&Cons have been identified:

		Pros	Cons
		Low setup costs for settlement	Specific online clearing messages have to be implemented and operated
		Direct settlement between originator and beneficiary bank possible	Disposition matching on bank level needed (synergy to cards processing)
		Online messages could be based already on SCT _{INST} , as an “easy entry” solution, if available soon	Settlement risk not covered, specific risk management needed on P2P scheme level
		All prerequisites defined for the solution	
		If receiving scheme is IBAN based, more cost efficient for banks	

3.2 Process using dedicated Reconciliation Mechanisms (Aggregated Variant)

This process is based on processes typical for card payments, re-using formats and best practices for clearing and settlement:



This solution would typically fit into an infrastructure, where card processing is performed by directly booking online clearing messages.

Central Services Sending Scheme	Gateway Services Sending Scheme	Gateway Services Receiving Scheme	Central Services Receiving Scheme
Step 1 Repository Layer			
Selection of Mobile Number Receiver			
	Send Repository Request following routing algorithm		
		Respond Repository Request (optional: beneficiary name, other remittance data)	
	Receive Response and turn it into internal format		
Step 2 Clearing Layer			
Authenticate Sender; check limits and balance of the sender			
	Send clearing message,		

Central Services Sending Scheme	Gateway Services Sending Scheme	Gateway Services Receiving Scheme	Central Services Receiving Scheme
	based on e.g. ISO8583		
		Translate clearing message into internal format for clearing	
			AML checks, limit checks, acceptance decision; notify beneficiary bank and beneficiary, dispose amount on the account
		Response message, based on e.g. ISO8583	
	Receive response and translate into internal format		
Notify customer about successful process			
Step 3 Settlement Layer			
Determine successful bilateral transactions after cut			
	Create a reconciliation message. This can be integrated into reconciliation of other directly booking business processes of the partners		
		Import reconciliation format into internal processes	
			Reconcile transactions with beneficiary
		Send Reconciliation Acknowledgment	
	Receive Acknowledgement, settle sum of all transactions		
		Control booking on settlement account	

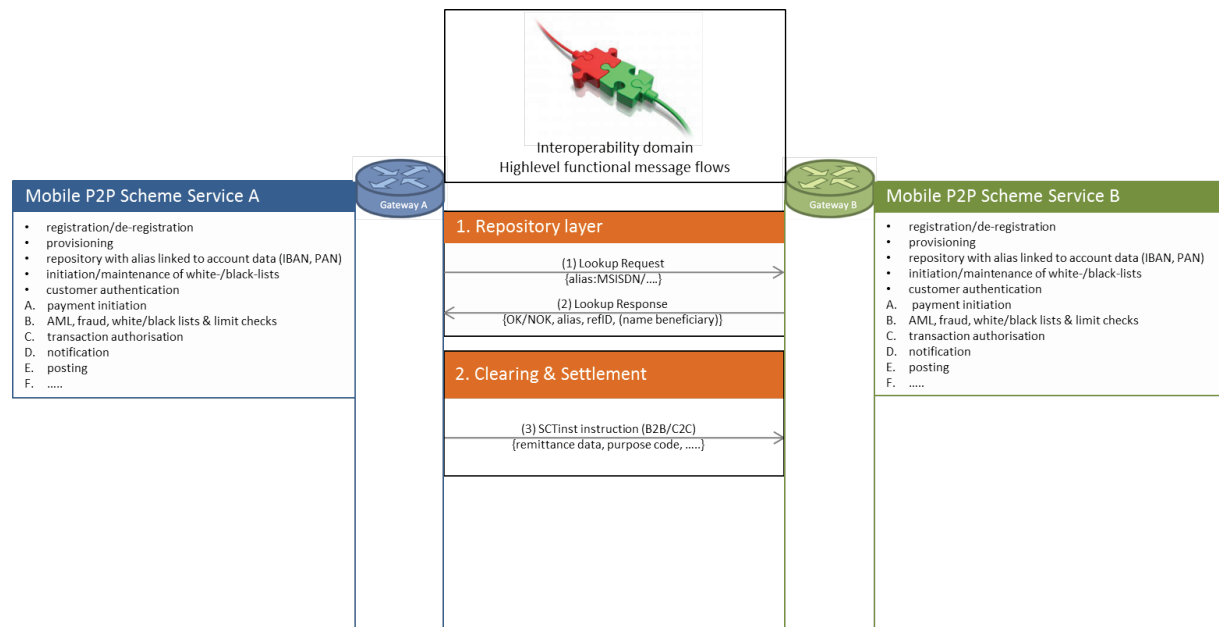
Arguments

For this solution, the following Pros&Cons have been identified:

Assumptions	Pros	Cons
Clearing messages with MSISDN or token provided by Receiving Scheme in lookup service and Amount/Currency	No extra single clearing/settlement message needed	Specific reconciliation mechanisms needed, which is costly, if not available as generic mechanism
Reconciliation/ Settlement is asynchronous, to be defined between P2P Schemes		Specific clearing message with AML checks needed
		More complex to migrate to SCT _{INST} later

3.3 Process using SCT_{INST} in Clearing/Settlement

The following picture defines the process flow, in the situation that SCT_{INST} would become available in the European market:



The Process in this solution is a simplification of the processes described in the solution in Section 3.1. The clearing and settlement then is taken out of the box by using the SCT_{INST} infrastructure (which is yet to be built).

Arguments

For this solution, the following Pros&Cons have been identified:

Assumptions	Pros	Cons
Specific Purpose Code for Mobile P2P, Specific Remittance Information	If available and implemented as a general mechanism, then for Mobile P2P: <ul style="list-style-type: none">• very low additional setup costs• no specific additional authorisation/clearing message implementation needed• short time to market	Not available yet
Receiving P2P Scheme can define scheme/gateway account or customer account as beneficiary account	Fits into SEPA infrastructure/ ISO 20022 implementations of banks	Optional support for banks, but only one bank per P2P community needed for support
	Settlement risk is covered by the settlement solution	Processing prices for SCT _{INST} not known yet, but expected to be similar to current card online processing.
	AML issues are covered by the transaction solution	

4 Conclusions

Principle Mobile P2P scheme services in Europe, the Berlin Group (an open, European standardisation initiative) and Mobile P2P infrastructure providers, have conducted this Feasibility Study with the aim to analyse the possibilities of establishing a technical and functional architecture that enables interlinking of regional Mobile P2P scheme services based on existing bank (IBAN) and card (PAN) account references. The analysis has initially focused on the P2P payment context as a first and major priority basis for infrastructure connectivity. Although the C2B payment context has its own complexities and not all existing MP2P schemes are already supporting C2B acceptance (in proximity or remote contexts), C2B payments will be addressed later as well.

The Feasibility Study has already identified a functional and technical architecture which outlines a layered approach and distinguishes five levels of interoperability with efficient reachability and routing flexibility in a repository layer (confirming the mapping of a registered mobile phone to a bank or card account) and with three supported models in the clearing and settlement layer, of which one solution is already anticipating the future 'instant SCT' (or 'SCT_{inst}'). All clearing and settlement models assume 'Customer Finality' to the beneficiary (an authorised Mobile P2P payment is guaranteed to the beneficiary) and therefore, as long as no cost-effective pan-European instant settlement facilities for low-value retail payments are available, it is assumed that interbank settlement follows later. This Feasibility Study proposes that associated financial risks inbetween have to be managed at scheme level and/or in bilateral/multilateral arrangements between scheme participants (relayed to Operational/Business Interoperability). In designing the architecture, it has been possible to avoid costly centralised solutions, expensive dedicated collaterals/prefunding arrangements and high operational costs.

The participants believe that true interoperability is the essential ingredient in creating competitive pan-European Mobile P2P services that will contribute to further completion of the European Internal Market, benefit the payments industry in general and European consumers in specific. The technical and functional interoperability architecture delivered by this initiative is fully in line with the recently stated expectations on pan-European Mobile P2P interoperability from the Euro Retail Payments Board and will allow further development into detailed harmonised standards of open interfaces, data formats and message protocols.

Appendix A: Glossary of Terms

The following terms & definitions apply:

Term	Definition
Authentication	The provision of assurance of the claimed identity of an entity or of data origin.
Authorisation	In a payment context: the process by which a transaction request is approved or declined. An authorisation process manages the risks of a transaction, like checking authenticity of the originator and availability of funds, operational risks like antimoney laundering or others via limit checks, black lists etc.
Clearing	The process of exchanging financial transaction details between Gateways, potentially including the netting of orders, facilitating reconciliation and establishment of final settlement positions.
CSM	Clearing and Settlement Mechanism, conceptually described in the former EPC document “PE-ACH/Clearing and Settlement Mechanism (CSM) Framework” (currently withdrawn).
Gateway	A processing entity whose role is to support the routing and processing of authorisation, clearing and settlement messages of interoperable MP2P transactions on behalf of MP2P participants.
Instant payment	Electronic retail payment solution available 24/7/365 and resulting in the immediate or close to immediate interbank clearing of the transaction and crediting of the payee’s account (within seconds of payment initiation), irrespective of the underlying payment instrument used (credit transfer, direct debit or payment card) and of the underlying clearing and settlement arrangements that make this possible (<i>source: ERPB</i>).
Posting	Debiting a payer’s account resp. crediting a payee’s account. In this definition, posting is sometimes called (customer) settlement, not implying ‘settlement finality’ according to the Settlement Finality Directive. Posting takes place in the ‘Bank to Customer’ domain.

Reconciliation	A service which enables two Gateways to seek an agreement on financial totals (amounts, number of transactions).
SCT	SEPA Credit Transfer as defined by the European Payments Council.
Settlement	The completion of a transaction or of processing with the aim of discharging scheme participants' obligations through the (interbank) transfer of funds. Settlement finality (as intended in the Settlement Finality Directive) usually takes place when the retail payment system settles in the central bank's RTGS system. Payments are final when the interbank balances are settled. Settlement takes place in the 'Interbank' domain.

Appendix B: Initiatives related to instant payment standardisation

(scope restriction to Europe)

Status as of September 2015 (in chronological order, as per launch date)

- November 2014
ERPB “Pan-European instant payments in euro: definition, vision and way Forward”,
http://www.ecb.europa.eu/paym/retpaym/shared/pdf/2nd_eprb_meeting_item6.pdf?b70bb40c47214b15692369b71765d2b
- January 2015
EACHA “Study on interoperability of immediate payment systems”,
http://www.eacha.org/form_download.php?doc=EACHA%20Study%20on%20Interoperability%20of%20Immediate%20Payment%20Systems
- March 2015
EBA Open Forum on pan-European Instant Payments,
<https://www.abe-eba.eu/Open-Forum-on-pan-European-Instant-Payments-N=b509549e-035b-48e2-9218-7369bb523d5d-L=EN.aspx>
- April 2015
SWIFT “The Global Adoption of Real-Time Retail Payments Systems (RT-RPS)”,
http://www.swift.com/assets/swift_com/documents/products_services/White_Paper_Real_Time_Payments.pdf
- April 2015
VocaLink “Standing on the shoulders of giants”,
<https://www.vocalink.com/downloads-and-media/whitepapers/standing-on-the-shoulders-of-giants/>
- April 2015
ECB “Instant payments: main features and recent developments”,
<https://circabc.europa.eu/sd/a/61b39079-361b-427f-af5c-b0b5fb74129f/6%20-%20ECB%20-%202015-04-28%20Instant%20payments%20main%20features%20and%20recent%20developments%20-%20Tur%20Hartmann%20-%20European%20Commission%20PSMEG.pdf>
- May 2015
EBA Open Forum on pan-European Instant Payments,
https://www.abe-eba.eu/downloads/thought-leadership/Open_Forum_20150512_Slides_FINAL_v2_0.pdf

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- June 2015
EPC Report to the ERPB on Instant Payments
http://www.ecb.europa.eu/paym/retpaym/shared/pdf/3rd_erp_b_meeting_item4a_report_instant_payments.pdf?8d07aae6da6ebc121ec5dbff0d55ae1a
 - July 2015
EBA Open Forum on pan-European Instant Payments,
https://www.abe-eba.eu/downloads/thought-leadership/Open_Forum_20150706_Slides_FINAL_for_distribution_v2_0.pdf
 - July 2015
EBA Clearing “Blueprint instant payments” (version 1.3),
<https://www.ebaclearing.eu/N=Blueprint-Instant-Payment-Solution.aspx>
 - August 2015
ISO “Harmonisation of ISO 20022 for Real-Time Payments”,
ISO20022 Newsletter – Summer Edition,
http://www.iso20022.org/documents/Newsletters/ISO20022_Newsletter_Summer2015_Edition_v1.pdf
 - October 2015
EBA Clearing “Blueprint instant payments” (version 2.0),
<https://www.ebaclearing.eu/N=Blueprint-Instant-Payment-Solution.aspx>
 - November 2015
EPC proposal for the design of an optional euro SCT Instant scheme,
http://www.ecb.europa.eu/paym/retpaym/shared/pdf/4th-ERPB-meeting/2015-11-26_4th-ERPB_item_5_EPC_proposal_for_the_design_of_an_SCT_Instant_scheme_in_euro.pdf?7c61194669073552a2e6549a62138c21
 - November 2015
EBA Open Forum on pan-European Instant Payments,
https://www.abe-eba.eu/downloads/thought-leadership/Open_Forum_20151117_Slides_for_distribution.pdf

Appendix C: Existing and planned Mobile P2P solutions

(scope restriction to Europe)

Status as of September 2015

Reference is made to “Report and Recommendations ERPB WG on P2P Mobile Payments”:
http://www.ecb.europa.eu/paym/retpaym/shared/pdf/3rd_erpb_meeting_item5_report_recommendations_P2P_mobile_payments.pdf?cc2d834a7bda7796f4cda4d06dff5cc9