The potential of SEPA Credit Transfer implementation in Croatia

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Abstract - After joining the European Union, the Republic of Croatia became obliged to consolidate its laws and regulations with the EU's. European Commission's Regulation No 260/2012, obligatory for Croatia too, has set the 31st of October 2016 as the deadline for replacement of national euro credit transfer and direct debit schemes by SEPA Credit Transfer (SCT) and SEPA Direct Debit for the EU member countries that do not use euro as their currency. From that date, use of SCT will be obligatory for the credit transfers in euro, but it has been decided that it will be obligatory for national currency kuna, too. Since SEPA is based on ISO 20022 norm, which is built upon XML language, it is not realistic to expect from business subjects, i.e. future SEPA users, the understanding of XML technologies and ISO 20022 norm necessary for creating SCT electronic payment order. For that reason, we have built a web application, which provides for users a simple web interface with forms to fill and facilitate their transit towards SCT. This paper explains SEPA and describes its implementation in Croatia, structure of SCT electronic payment initiation order format and the web application we designed for its creation.

I. INTRODUCTION

Single Euro Payments Area (SEPA) is a project initiated by European Union and its main goal is creating an area in EU where the consumers, business subjects and government bodies can conduct their payments in euro currency under equal terms, regardless of their location. In the past few years SEPA payment tools have been slowly becoming mandatory for the EU member countries. Since it has joined the EU, Croatia is also obliged to implement SEPA until the deadline defined by the European Commission, which means that Croatian national euro credit transfer and direct debit system will have to migrate to SEPA until no later than November of 2016. This paper will describe the general purposes of SEPA, its brief history and standards it uses in the background, and SEPA activity called the SEPA Credit Transfer (SCT) along with its *pain* message format. This paper will represent a brief history of implementation of SEPA in Croatia and the main functionalities of an application developed in cooperation of Croatian Financial Agency (FINA) and Faculty of Electrical Engineering and Computing (FER) from the University of Zagreb, in order to facilitate a part of SEPA implementation in Croatia related to SEPA Credit Transfer.

Second chapter describes SEPA project into more details and the third chapter describes the norms on which SEPA is based. The fourth chapter explains SEPA Credit Transfer activity and the main document (payment order) by which a payment can be initiated. The fifth chapter brings the brief history of SEPA implementation project in Croatia and describes the application related to SCT made in cooperation of FINA and FER. Sixth chapter brings the conclusion of this paper.

II. ABOUT SEPA

Project SEPA is a part of a bigger project initiated by European Commission, which aims to unite national markets of the EU member countries into a singular European market. Creation of the united market was proposed in 1990 in the report *Making payments in the Internal Market*. The united market would have euro as a common currency, same payment operation costs regardless of the location within the area, same legal rules for national and cross-border payments, etc. The key prerequisite for such united market were cheap, fast and reliable money transfers across the area [1] and SEPA was meant to meet those requirements; SEPA payment tools would enable the users to conduct cashless payments to anyone within the SEPA area by using only their bank account and SEPA payment tools.

At the end of 2000 EU has defined SEPA as one of the main political goals and in the following years many legal acts have been brought in order to increase the integration of European market. One of the most important directives was *Payment Services Directive*, which has set the legal foundations for SEPA [2]. European Payments Council (EPC), which is consisted of European banks, created the necessary trading and technical schemes and frameworks. EPC's duty was also the creation of SEPA payment tools (schemes): SEPA Credit Transfer (SCT), SEPA Direct Debit (SDD) and SEPA Cards Framework, along with the belonging rulebooks and implementation guidelines. SEPA payment instruments became available for the first time in January 2008.

In 2010 SEPA payments became the most dominant payment type in EU and in 2011 it replaced national payment schemes of the Eurozone countries. SEPA includes 34 countries - 28 EU member countries, 4 EFTA members, Monaco and (as of February 2014) San Marino. On February 1, 2014, national payment schemes have been cancelled in all SEPA countries that have euro as the

main currency. On that date, all of the credit transfer and direct debit procedures have expired and afterwards all of the transactions can be conducted exclusively through SEPA instruments and using the IBAN bank account numbering system. For the rest of SEPA countries, which do not have euro as their main currency, the deadline for that same scenario is October 31, 2016.

III. NORMS USED IN SEPA

Any process that aims to integrate heterogeneous systems and processes has standardization as its key method for achieving that goal. SEPA was meant to be the standard that would unite heterogeneous national payment schemes of EU member countries. However, a new standard was not created, but a decision has been brought to build SEPA upon existing standards - ISO 20022, IBAN and BIC, which are described in the following subchapters.

A. ISO 20022

ISO 20022 is an industrial ISO standard for Financial Services Messaging that was decided to be the most suitable for SEPA [3][4]. This standard ensures consistency in the exchange of messages concerning the financial business. The messages of this standard suit the needs of the entire supply chain; from the clients to the banks, between banks, price and transaction reporting, money transfers, etc. Conceptually, this standard is organized in three layers. The upper layer provides key business processes and concepts, the middle layer provides logical models of the messages and the lower layer deals with the syntax and the actual implementation. The methodology of ISO 20022 is special because it differs business information and the way it is interpreted in the message [5].

The first step of the message modeling begins with modeling of the business process, activities and actors it includes. The business data are then organized into components, which contain the business elements. For instance, in the processes of credit transfer, the key terms are debtor, creditor, debtor agent, creditor agent and payment. For each of these terms, a data type is defined. However, these data types are not necessarily simple, but can be composed of more details (e.g. creditor data type contains name, address, identifier, etc.).

In the second step of message modeling, the defined types (components) model the message logically, while the third step is related to the lowest conceptual layer and includes physical implementation of the message model. For the purpose of the implementation, ISO 20022 is built upon XML language (Extensible Markup Language), even though using other language is also possible within special business domains and with mutual agreement. Consequentially, ISO 20022 business messages are XML documents and the term of message exchange means the exchange of actual XML files, whose structure complies the standardized format. In ISO 20022, the actual standardization mediators are XSD (XML Schema Definition) schemes that define the structure of the XML files and thus standardize their format. XSD files can be found in the ISO 20022 catalogue of messages, which is available online.

B. IBAN

IBAN stands for International Bank Account Number. It is an internationally agreed standard system for numeration and identification of bank accounts. It was developed by European Committee for Banking Standards and later as a part of ISO 13616:1997 standard. The current standard is ISO 13616:2007. IBAN was initially created to facilitate money transfers within the European Union and automate processing of payment orders, but due to its flexibility it has been globally applied. As of September 2014, 66 counties are using the IBAN system.

IBAN consists of 34 alphanumeric characters at most. First two characters have to be letters that denote the country code according to ISO 3166-1, a standard for representation of countries, dependent territories and special areas of geographical interest. The following two characters have to be digits, which have the role of control digits; they ensure the overall accuracy of the IBAN and thus minimize the possibility of error during transcriptions. Use of IBANs has reduced trans-national money transfer errors to under 0.1% of total payments. After these four characters come 30 alphanumeric characters at most and they are called Basic Bank Account Number (BBAN). BBANs are country-specific; each country can decide on its own how many characters will construct the BBAN and the only limitation is that all IBANs across a country must have the same length. For instance, Croatian IBANs must be 21 characters long. First two characters are letters "HR", denoting Croatia, and the following two characters are control digits. Of the rest 17 alphanumerical characters, the following 7 characters denote the leading bank number, and 10 remaining characters denote the account number.

Use of IBAN is mandatory within the European Economic Area and its usage is one of prerequisites for implementation of SEPA payment tools. Since February 2014 usage of IBAN is mandatory for all national systems for credit transfer and direct debit.

C. BIC

BIC is an ISO 9362 standard and stands for Business Identifier Code. BICs were originally introduced by the SWIFT Standard and they are still called SWIFT addresses of codes. It is a standard format for internationally unique business identifier applicable for both financial and non-financial institutions and is approved by the ISO organization. When it identifies a non-financial institution, it is also known as Business Entity Identifier (BEI), and when it identifies banks as financial institution, BIC can be interpreted as Bank Identifier Code.

BIC information is used for routing of the money transfers and exchange of messages between banks. The latest BIC version is ISO 9326:2009. It is made of 8 or 11 characters. In case of identification of primary bank office, BIC is an 8-character code; otherwise it is 11 characters long. The first four characters have the role of Institution Code (e.g. bank code). The next two characters are letters

denoting the country code according to ISO 3166-1, just like first two characters of IBAN. The following two characters can be either letters or digits and they denote the location code, and the last three characters are alphanumerical optional characters denoting the branch code.

At the moment, SEPA is based on IBAN account numbering system and SWIFT-BIC bank identification. However, an overlapping issue between ISO 9362 (BIC) and ISO 13616 (IBAN) has been noticed and discussed recently. Within the Eurozone, SWIFT network is not required for payment transmission because BIC information can be derived from IBANs. Consequentially, usage of BIC information will gradually become optional within the Eurozone (and thus the SEPA area). From the February 2014 BIC usage information became optional for the national transactions, and from February 2016 it will become optional for the cross border transactions, too.

IV. SEPA CREDIT TRANSFER

SCT is SEPA payment tool for non-urgent payment in euro currency within the SEPA area. SCT are used for Payment Initiation activities. They can only be sent in euro currency and its user, i.e. payment initiator, has to know the recipient's IBAN.

In order to achieve "straight-through processing" of the data, EPC has developed a subset of ISO 20022 XML standard messages that were suitable because they defined the structure of the messages exchanged in payment services. Consequentially, all SCT-related messages are exchanged as XML documents whose structure corresponds with the XSD schemas defined by ISO 20022 standard.

ISO 20022 provides packages of standardized messages for various bank communications performed during the conduction of SCT activities. For instance, in the processes of Clearing and Settlement, usage of message package *pacs* is mandatory. Package *camt*, designed for Reporting, is not mandatory, but the banks have to be able to offer it on demand. Package *pain*, used for Payment Initialization, is also not mandatory, but its use is recommended. Even though the mentioned packages define the structure of the messages, this structure is not ultimate. The basic message structure can be further restricted according to the specific needs. For instance, it is expected that several *pain* specifications will be developed among the SEPA members.

A. SCT PAIN

SCT Payment Initiation payments are national or cross-border euro payments from the clients' transactional accounts they have in their national banks toward transactional accounts of the recipient, which can be either national or within Europe Economic Area or EU. The client initiates the payment by giving the payment order to his bank.

SCT payment order is an XML document, whose structure is defined by a XSD schema found in the *pain* package of the ISO 20022 standard. The *pain* schemas can be found in various versions in the ISO 20022 archive, but they do not differ drastically. For the purposes of SEPA, commonly used version of the *pain* XSD schema is *pain.001*, i.e. *pain.001.001.03*, which is recommended by the European Payment Council and was also selected to be the basis of Croatian national *pain* schema. After creating the XML document, a good practice is to validate the created document against that schema definition.

SCT payment order (XML document) has two main parts - a group header and one or multiple payment instruction information elements [6].

Group header refers to all of these payment instruction information elements. It contains the general information about the payments, such as message identifier, number of transactions, control sum and information about the payment initiator. Payment initiator can either be a person or a business entity (organization), so it contains initiator's name and identification element, which is optional. For instance, organizations can be identified by BIC/BEI and a person can be identified by date, city and country of birth.

Payment instruction information is the key element for conduction of the transactions. It also contains some general information such as control sum, number of the transactions, identifier, required execution date and various codes which determine the way the payment will be conducted, e.g. urgency of the transaction, which SEPA instrument will be used, payment purpose, etc. Payment instruction information also contains information about the debtor, but it differs the debtor from the ultimate debtor. This comes practically in use in scenario when a parent is making a payment for the child's school trip, i.e. in its child's name. In that case, the parent is the debtor, but the ultimate debtor is the child. Debtor's and ultimate debtor's information set is very similar to the one previously described for the payment initiator in the group header. Since the debtor is the side that will ultimately transfer money, payment instruction information set contains information about debtor's account and debtor's agent (usually a bank). The account is identified by IBAN and the agent can be identified by BIC code.

It is important to emphasize that payment instruction information can refer to one or more actual transactions. Information for a transaction contains similar data set as the general payment information, e.g. codes which determine the way the payment will be conducted and an identifier. The actual transaction amount is also defined within this data set, as well as the currency and optional remittance information. In the transaction information part, creditor (recipient), creditor's account and agent, and ultimate creditor are defined, while ultimate debtor can be redefined in case that ultimate debtor in the payment instruction information data set is not defined. When all of the transactions have the same ultimate debtor, it is enough to define it in the payment instruction information and leave it empty in the transaction information. Creditor, ultimate creditor and ultimate debtor in this part are defined as either a person or a business entity, similarly to initiator in group header, or debtor and ultimate debtor in the payment instruction information part. Creditor's account and agent are defined similarly to debtor's account and agent in the payment instruction information part.

V. SEPA PROJECT IN CROATIA

After joining the European Union in July 2013, Croatian national payment system was incorporated into SEPA area. From that moment, the option to join SEPA Credit Transfer Scheme became administratively available to Croatian banks. Even though SEPA became available after Croatia joined the EU, it has still remained optional for the upcoming period which will last until October 31, 2016. This date is the deadline because Croatian main currency is not euro and for that reason the later deadline - defined by the European Commission - is applied to Croatia. Until that date, the national euro credit transfer and direct debit schemes will have to be replaced with SEPA Credit Transfer and SEPA Direct Debit. However, a decision has been brought that SEPA will be implemented not only for national euro transactions, but also for the national currency kuna and thus will be one of the first EU countries to implement ISO 20022 payments in non-euro currency [7]. Regarding the deadlines, Croatian banking community has decided that an earlier deadline will be applied for SCT, April 1, 2016.

In order to fulfill the obligation of implementation of SEPA in Croatia, Croatian National Payment System Committee initiated the SEPA project in Croatia [8] in 2012 and still governs it as the supervisor. In May, 2013 they formed the project's working bodies - Croatian SEPA Coordination Committee and Croatian SEPA Forum [9], whose main mission in the implementation of SEPA project in Croatia0. Both the Committee and the Forum are consisted of the representatives of Croatian Banking Association, Croatian National Bank, Croatian Chamber of Economy, Ministry of Finance and Fina. Croatian SEPA Coordination Committee deals with the migration of the national payment system to SEPA, including the credit transfers and direct debits, creates and conducts the solutions necessary for credit transfers and direct debits consolidation with the Regulation No 260/2012, etc. Croatian Banking Association leads the Committee, whose members are elected as its chairmen. Croatian SEPA Forum is oriented towards informing and educating the payment services users about SEPA and general promotion of SEPA payment services, and is presided by the Croatian Chamber of Economy. The Committee and the Forum can also found special workgroups (task forces) for the purpose of fulfillment of their objectives, whose goal will be proposing and finding the practical solutions for the set objectives and tasks. Figure 1. displays the general organization of the working bodies.

In the countries that have adopted SEPA, creating another national body called National Adherence Support Organization has been common practice. Its main purpose was giving support to the payment services providers during the process of transition to SEPA payment schemes. This body establishes contact between the providers and the European Payments Council and facilitates their procedures of collecting the documentation necessary for accessing SEPA schemes. On May 15, 2014 National Payment System Committee has brought the decision that Croatian Financial Agency (FINA) will perform the role of Croatian National Adherence Support Organization (NASO), as mediating body between EPC and payment service providers. As a part of the Croatian SEPA project, FINA will support the implementation of SEPA in Croatia, i.e. migration of the Croatian national payment system to SEPA payment tools, schemes and formats.

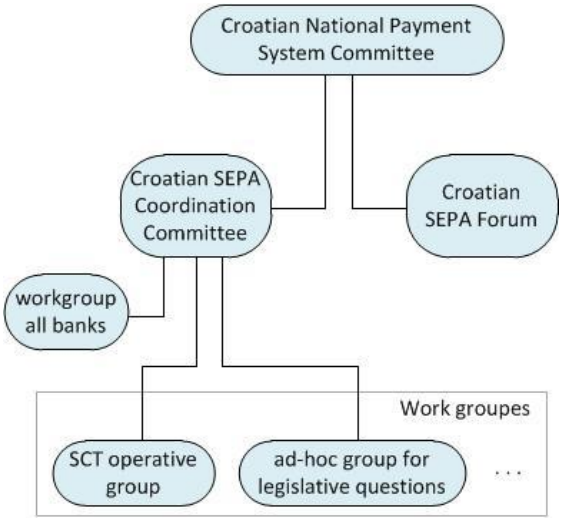

Figure 1. Organization of the SEPA working bodies [7][9]

In order to be able to participate in SEPA area, Croatian monetary institutions had to transit to IBAN account numbering system. Banks had to enable its usage until June 1, 2012. From that date started a two-year transitional period toward exclusive use of IBAN, during which the usage of IBAN was optional for either creditor's or recipient's account number field of the payment orders, and its purpose was to introduce the users to using IBAN. One year later, on June 1, 2013, IBANs became mandatory for the creditor's account number field. One year after that, on June 1, 2014, IBANs became mandatory for the recipient creditor's account number field too and that was the end of transition to IBAN account numbering system in Croatia. Since June 1, 2014 all of the transactions in Croatia can be conducted exclusively by using IBAN account numbers of the creditor and recipient.

A. FINA's Cooperation with University of Zagreb

As a part of SEPA project in Croatia, FINA and Faculty of Electrical Engineering (FER) from University of Zagreb have developed an application, whose purpose is creating one or more SEPA electronic payment orders (XML documents). Its goal is preparing business subjects for SEPA payments and using SCT formats and thus facilitate this transition which will become mandatory in 2016 for both currency of euro and kuna. FER helped FINA in specifying the user requests and modeling the application. The main functionalities of this application will be described in the following subchapter. In the nearer future, it is possible to expect that FINA will develop this web application further.

B. Web Application for Creation of SEPA Electronic Payment Order

The web application created by FINA and FER helps users to create a SEPA electronic payment order (XML

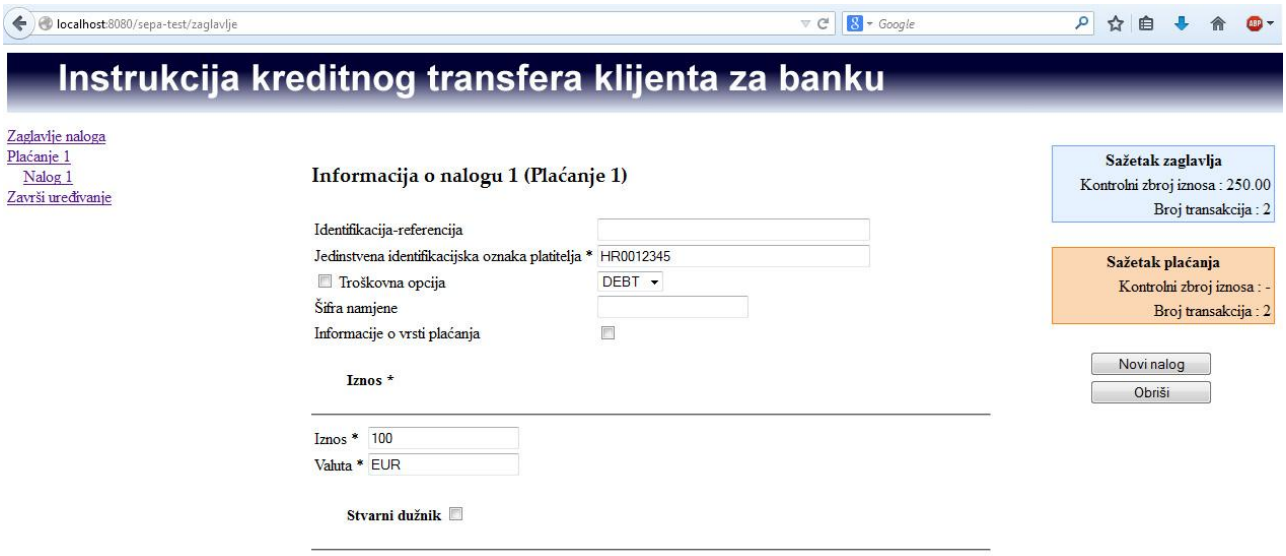

Figure 2. Screenshot of the web application for creation for SEPA electronic payment order

file) through filling and editing of simple web forms. Along with this main functionality, application enables user registration and authentication with basic built-in security mechanisms, validates user's inputs and generated XML file, and offers the generation and download of payment report in a PDF file.

The application has been developed in Java programming language using JavaServer Pages (JSP) and Java servlet web technologies. The servlets process HTTP requests and render the HTML code, acting as intermediary between the client and the actual JSP documents on the web server. This way, clients do not access the JSP documents directly and do not have to worry about the documents' actual location - which is hidden from them - but they access just the URL address, which is mapped to the corresponding servlet. The application provides bilingual interface - the users can choose whether they want the interface in Croatian or English language. The user's choice of language is stored in HTTP session attribute, and based on it the labels (displayed text) in the JSP page are built during the page rendering. The labels are dynamically fetched from a corresponding *property* file; for each of the offered languages one *property* file has been created. This way the application remains easily extensible with more interface languages by adding more *property* files and making few minor changes in the application code.

In order to be able to work with the application's web forms, users will have to be registered and logged in. Users register by their names and e-mails and they must define their password. The application stores the data necessary for the login in the database; the passwords are stored encrypted to keep them safe in case of database breach. The application communicates with the database by *Prepared statements* in order to avoid the possibility of *SQL Injection* attack. After the registration, the users will receive an e-mail from the application with the activation link and will be able to log in after opening that link in the web browser. However, the activation has to take place within the 20 minutes from the registration; otherwise the registration will be annulled. In the moment of registration, the application stores the timestamp so it could compute the time difference in the moment of activation attempt. If the time difference is greater than 20 minutes, the database record will be deleted and user will have to register again. Application will also enable redefinition of the password in case the user has forgotten it. The process is similar to registration process, but the user needs to provide the correct name and e-mail that were used for registration. Pages for login, registration and password recovery (i.e. publicly available pages) also implement CAPTCHA security mechanism so that application could be safe from *botnet* attacks.

After they log in, users will be able to access the electronic payment order form pages and fill the web forms for payment order group header, payment instruction information and the belonging credit transaction information. They will be able to manipulate the number of total payment instructions and the number of their credit transactions, i.e. add or delete them, and navigate through the filled data in order to check or update them. Figure 2. displays a web form for data input for credit transfer information. Navigation is on the left of the screen and helpful summary data, along with the buttons for adding or deleting credit transfer information is displayed on the right. During any kind of data manipulation, application will perform validation of the entered data; e.g. if the mandatory data are filled, if the order contains at least one payment instruction information and a payment instruction information contains at least one credit transfer, if the predefined codes are entered correctly, if IBANs and BICs have the correct form, etc. A part of user's input validation is conducted client-side (i.e. in the user's web browser) and is implemented by JavaScript functions. However, a part validation of the data policies concerning the elements' cardinality, such as number of payment instruction information elements in the group header element, can not be implemented by JavaScript functions and has to be conducted server-side, after the data are submitted from web browser to the application server. The submission

occurs when the users fill the form and want to save the data. After the reception of the data, the application performs server-side data validation and tries to store the data into the data model objects in the session attributes.

The application's main data model is derived from the XML Schema (*pain* XSD schema), meaning that the relations of the data model classes correspond to the relations of elements defined by the XML Schema. The model was generated by JiBX, a framework for XML data binding. After the users have finished their work with the web forms, application will offer them the download of the XML file or the PDF payment report. In both cases, an XML file will be generated based on the data stored in data model objects in the session attributes. In order to map Java objects to XML and generate the XML file, application uses JiBX marshalling methods that generate the contents of the XML file. Internally, once the XML file has been generated, application validates it against *pain* XSD schema by using common Java libraries for XML processing. If user chooses to download the payment report in the PDF, the application will use the generated XML file as a source to create a PDF report using JasperReports, a Java reporting tool.

After generating the requested file, the application sends it and the users can save it locally on their computer. Afterwards, they can either send the XML file by e-mail to their bank or agent, or bring it on a memory stick.

VI. CONCLUSION

SEPA offers potentially ultimate payment tools that could unite all of the EU member countries one step further. Deadlines for scheme implementation favor its success, especially with the fact that it was built upon existing standards which were partially used before they became imperative. This paper has explained the use of these standards and benefits SEPA would bring for each EU member country and SEPA area in general. Croatia has entered the SEPA area only recently and has a lot to achieve in the following two years to migrate to SEPA. However, Croatia's recent entrance is not such a bad thing, because in the meantime European SEPA project has developed to a decent state of maturity. FINA and FER have developed a web application for creation of SEPA electronic payment order in successful collaboration. This application will in future be provided as a service to business subjects and facilitate their transition to using SEPA Credit Transfer for the currencies of euro and kuna. This way SEPA will become one technical standard for payments both in currency of euro and kuna. The application will facilitate a part of the implementation of SEPA Credit Transfer in Croatia, which will be implemented by the beginning of April 2016.

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