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Chikatamalla et al.

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(54) SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR DYNAMIC PASSCODE COMMUNICATION

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G06Q 20/02	(2012.01)

(Continued)

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(Continued)

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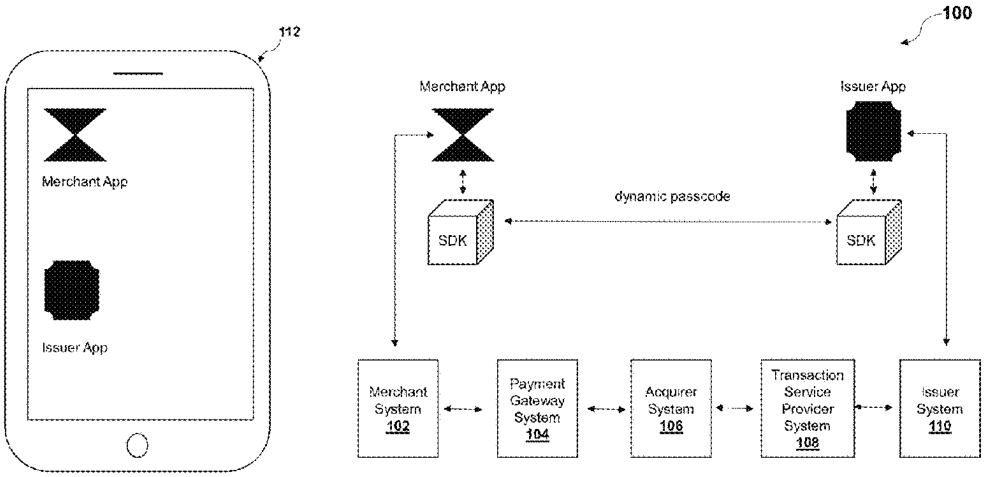
(74) *Attorney, Agent, or Firm* — The Webb Law Firm

(57) **ABSTRACT**

Systems, methods, and computer program products for dynamic passcode communication use a merchant application installed on a user device that receives transaction data associated with a transaction at a merchant system. The transaction data may include an account identifier associated with an account at an issuer system. The merchant application determines, based on the account identifier, whether an issuer application associated with the issuer system is installed on the user device. In response to determining that the issuer application is installed on the user device, the merchant application transmits, to the issuer application, a request for a dynamic passcode. The merchant application receives, from the issuer application, the dynamic passcode and transmits, to the issuer system, an authorization request including the account identifier and the dynamic passcode. The merchant application receives, from the issuer system, an authorization response authorizing or denying the transaction.

9 Claims, 6 Drawing Sheets



(51) **Int. Cl.**

G06Q 20/40	(2012.01)
G06Q 20/42	(2012.01)

(58) **Field of Classification Search**
USPC 705/44
See application file for complete search history.

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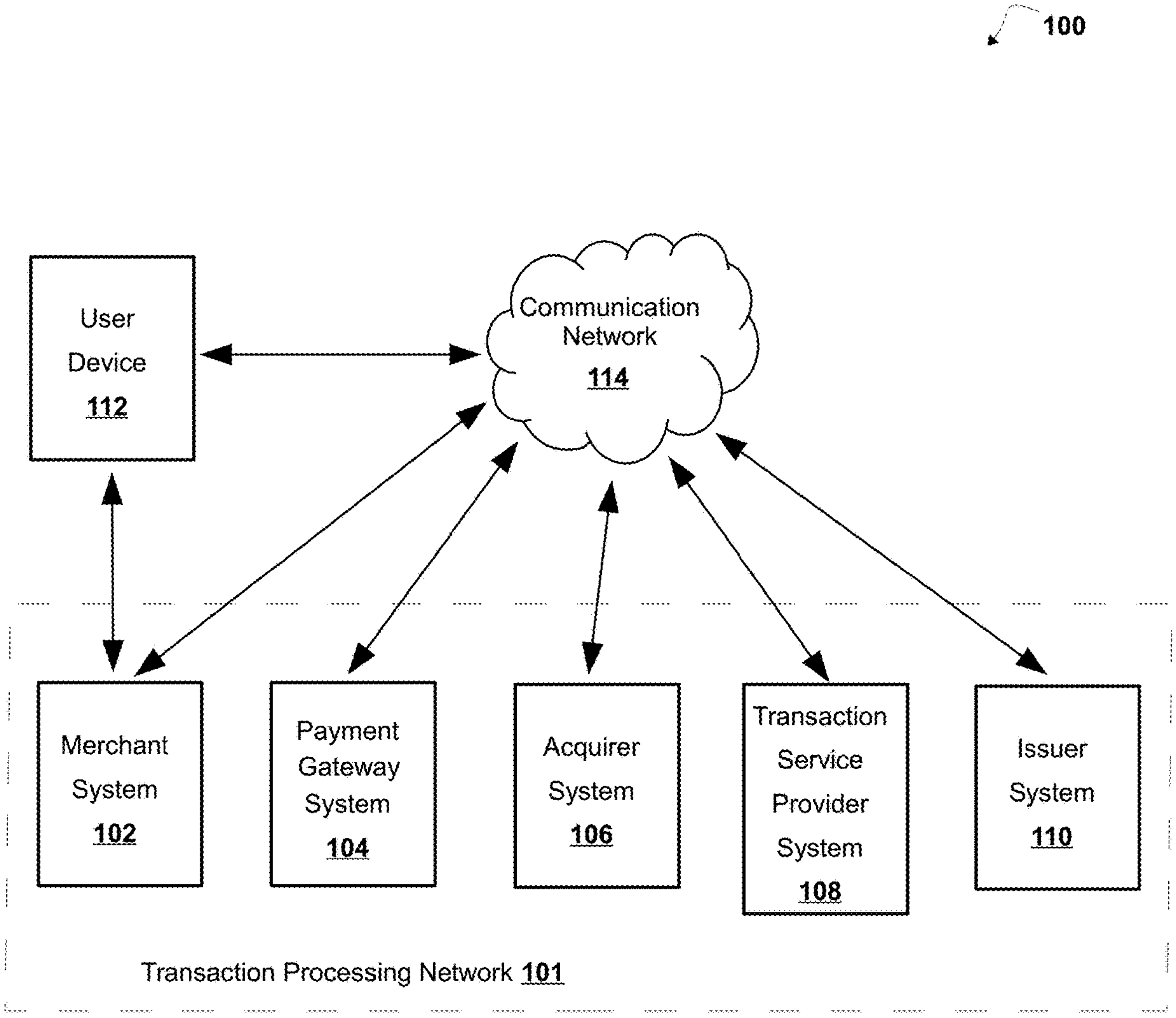
100
User Device 112
Communication Network 114
Merchant System 102
Payment Gateway System 104
Acquirer System 106
Transaction Service Provider System 108
Issuer System 110
Transaction Processing Network 101

FIG. 1A

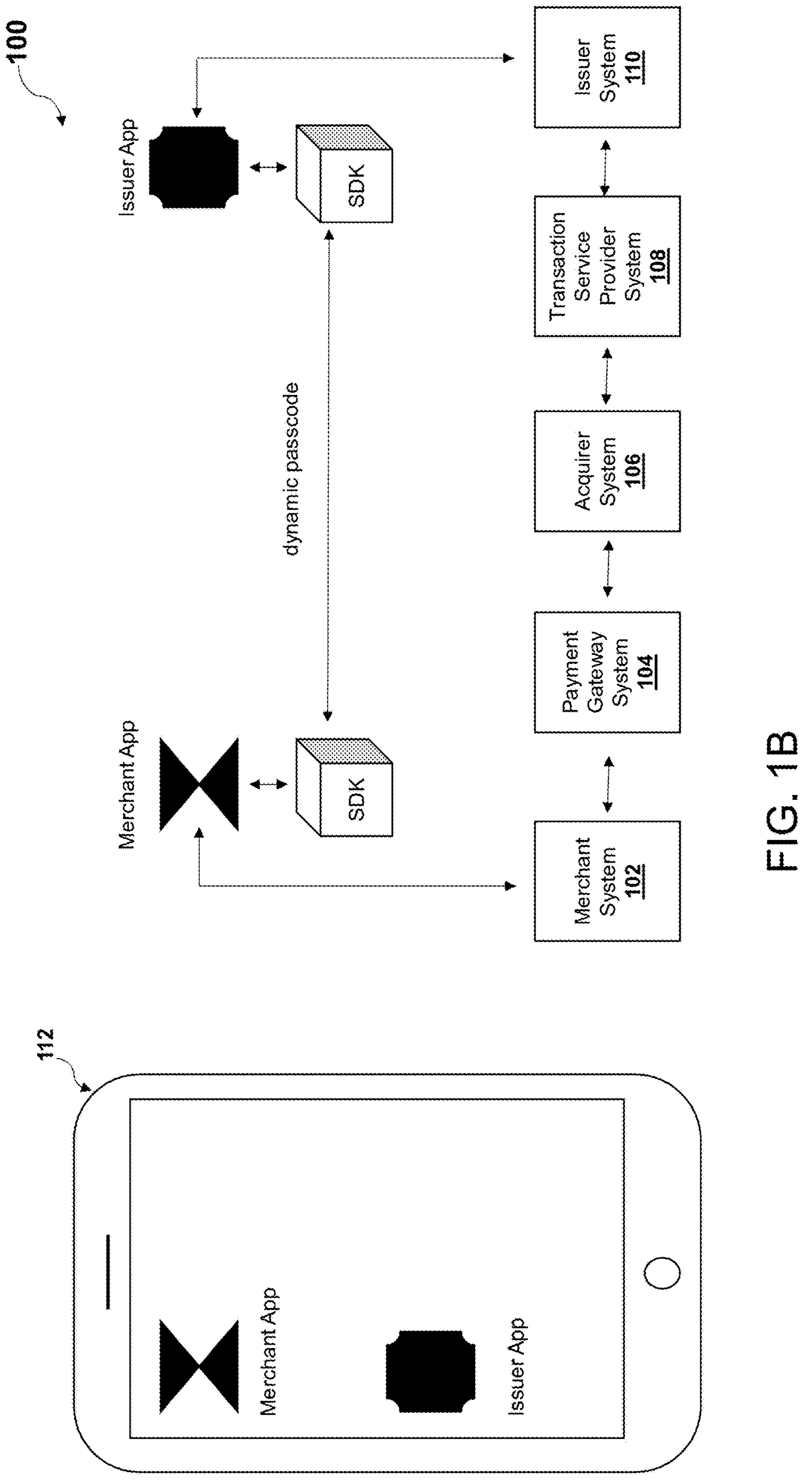
100
Merchant App
SDK
dynamic passcode
SDK
Issuer App
Merchant System 102
Payment Gateway System 104
Acquirer System 106
Transaction Service Provider System 108
Issuer System 110
112
Merchant App
Issuer App

FIG. 1B

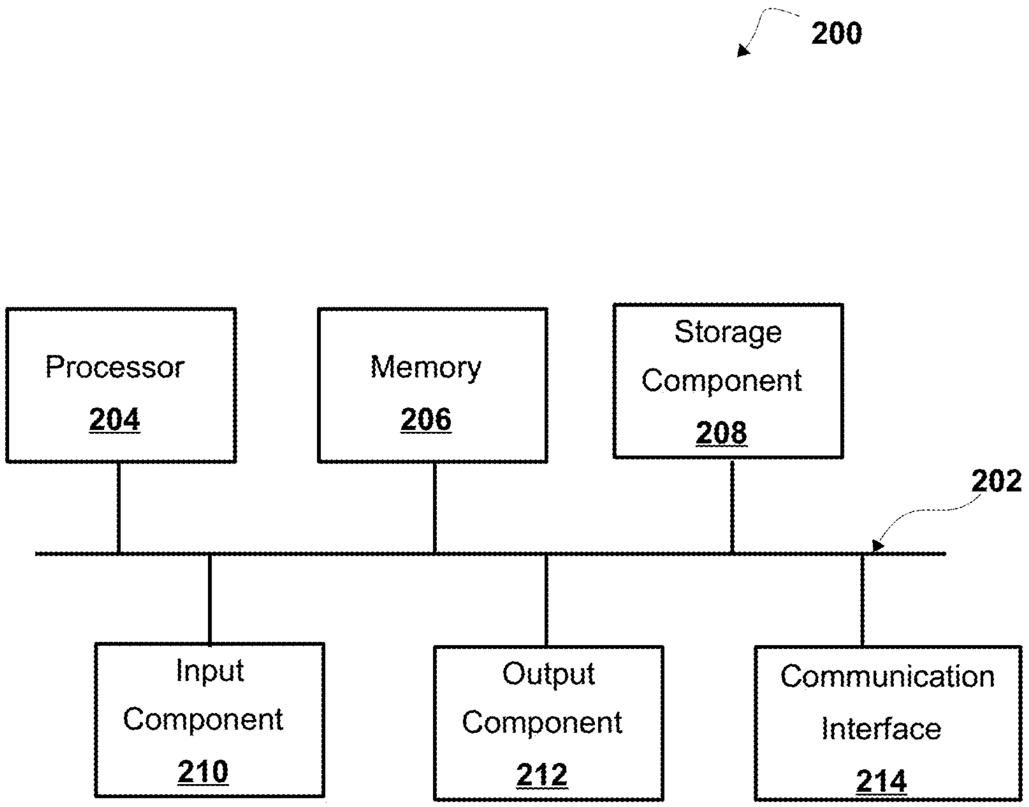
200
Processor
204
Memory
206
Storage
Component
208
202
Input
Component
210
Output
Component
212
Communication
Interface
214

FIG. 2

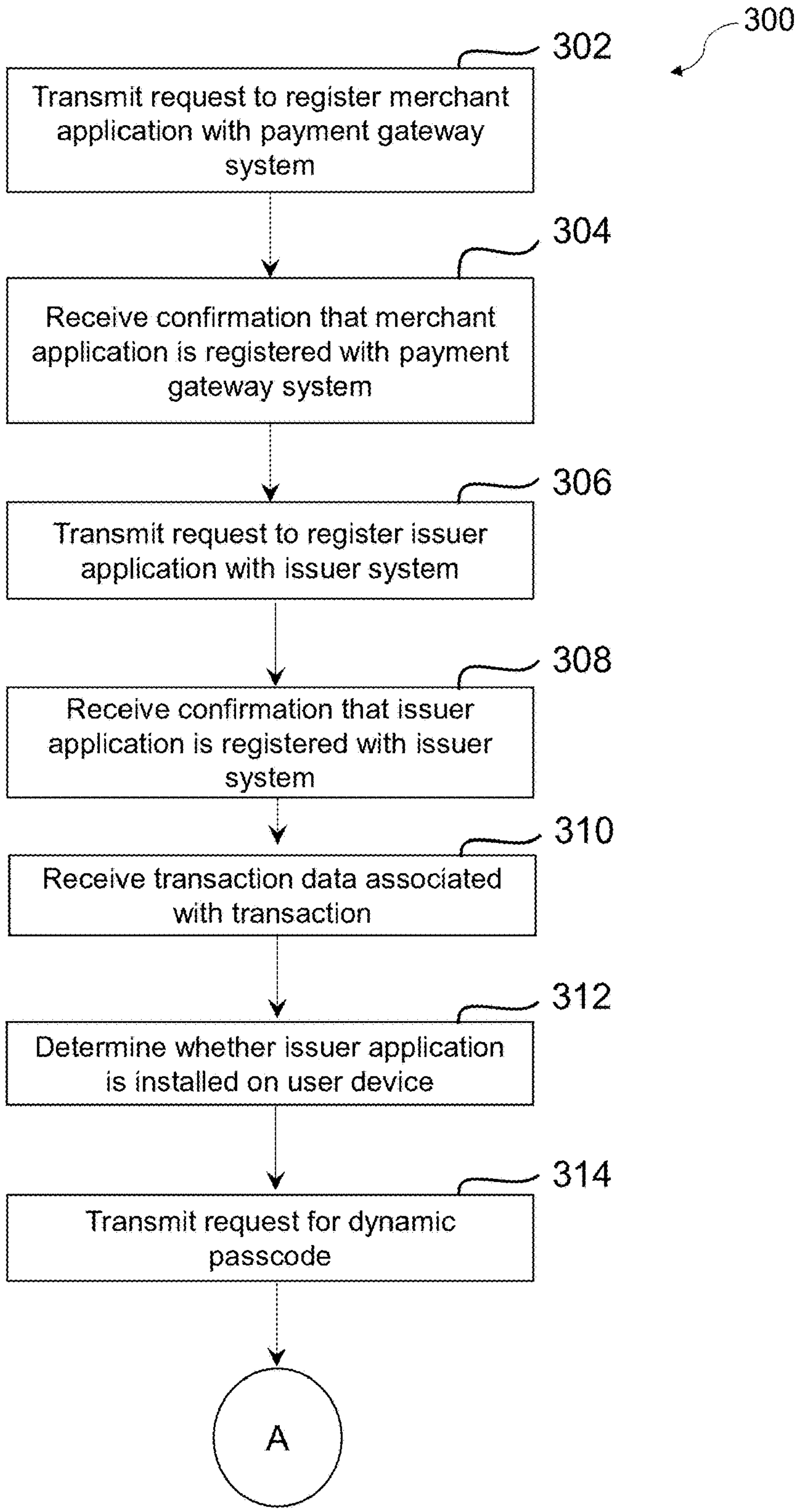
300
302
Transmit request to register merchant application with payment gateway system
304
Receive confirmation that merchant application is registered with payment gateway system
306
Transmit request to register issuer application with issuer system
308
Receive confirmation that issuer application is registered with issuer system
310
Receive transaction data associated with transaction
312
Determine whether issuer application is installed on user device
314
Transmit request for dynamic passcode
A

FIG. 3A

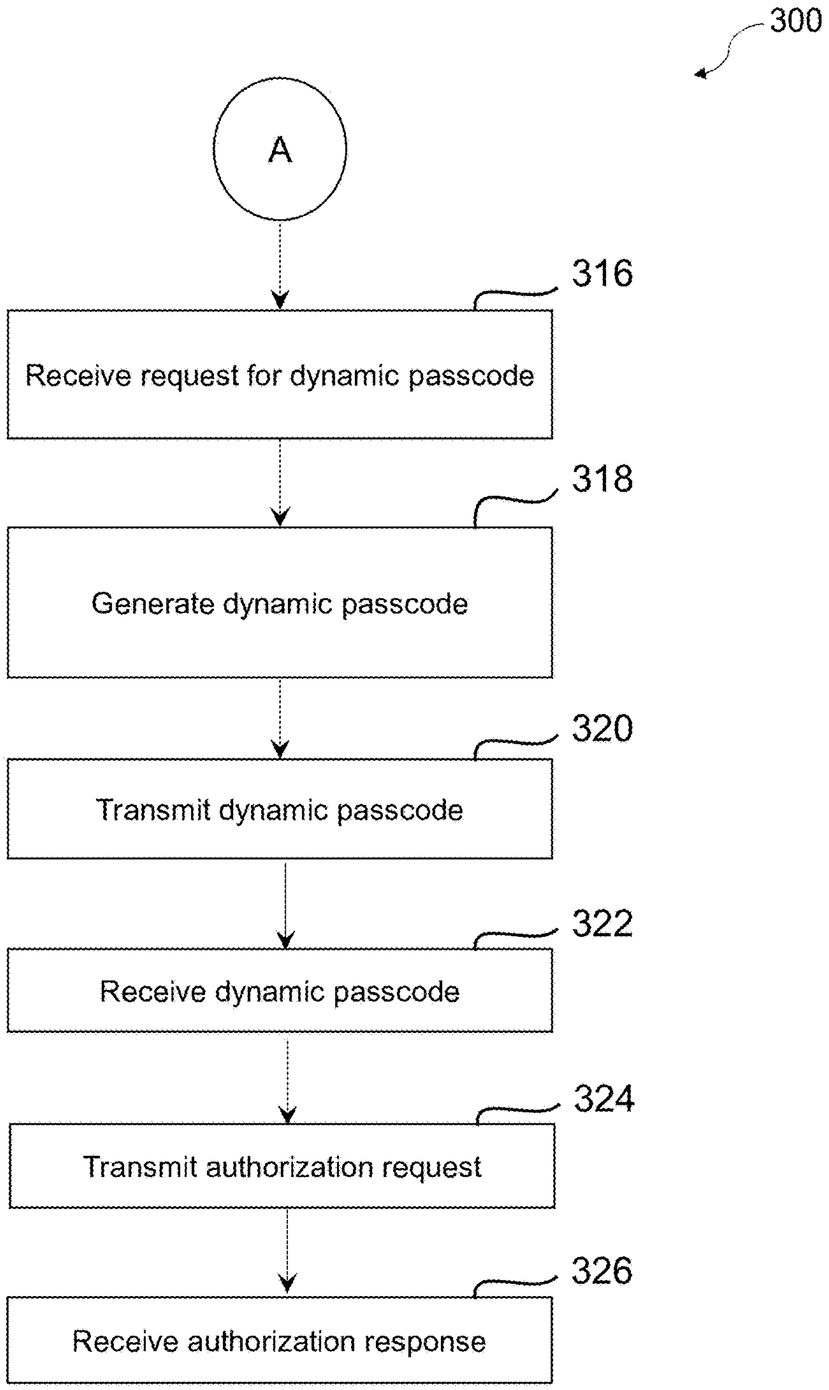
300
A
316
Receive request for dynamic passcode
318
Generate dynamic passcode
320
Transmit dynamic passcode
322
Receive dynamic passcode
324
Transmit authorization request
326
Receive authorization response

FIG. 3B

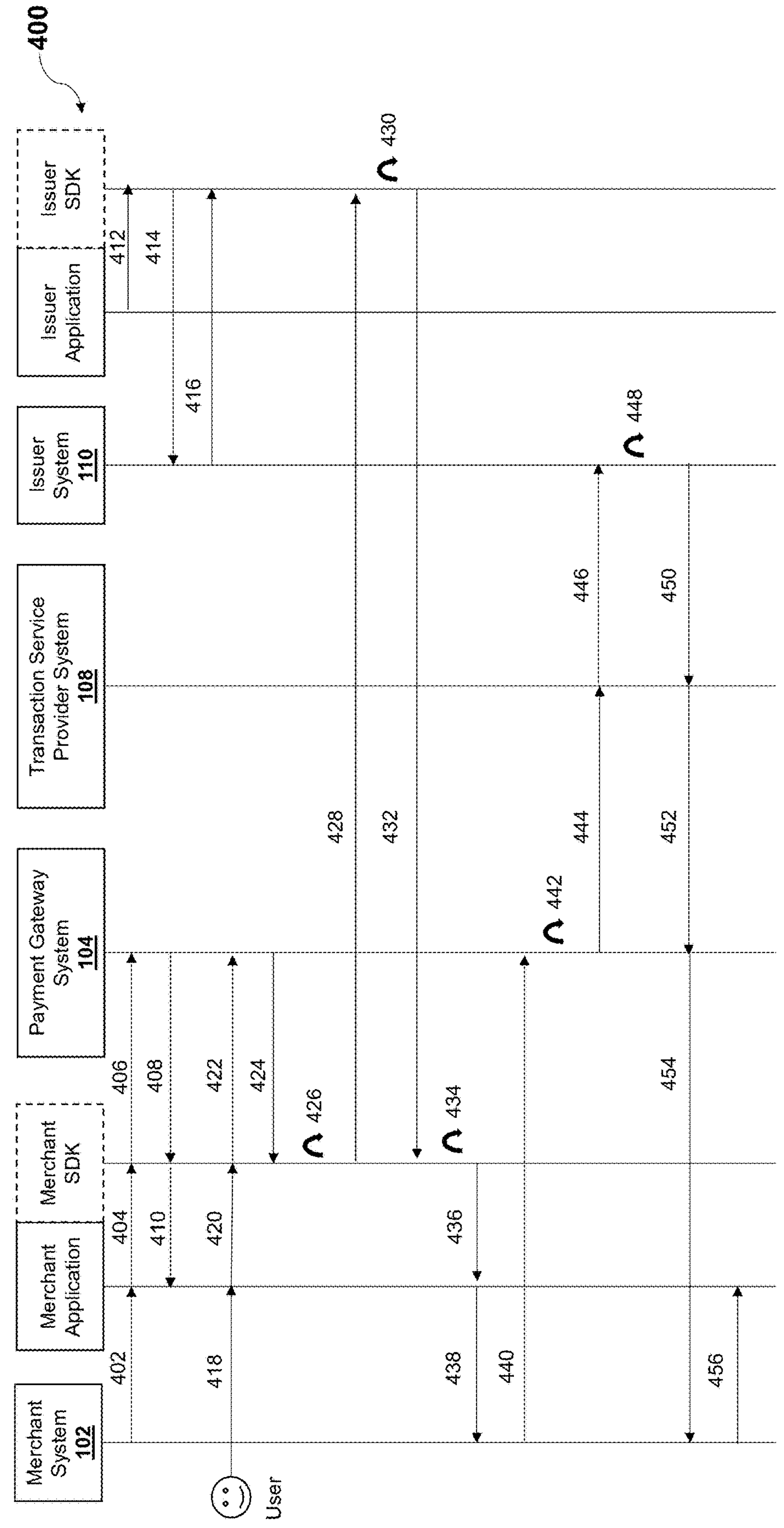
400
Merchant System 102
Merchant Application
Merchant SDK
Payment Gateway System 104
Transaction Service Provider System 108
Issuer System 110
Issuer Application
Issuer SDK
User
402
404
406
408
410
412
414
416
418
420
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FIG. 4

SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR DYNAMIC PASSCODE COMMUNICATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 17/632,556, filed Sep. 1, 2021, which is the United States national phase of International Application No. PCT/US2021/048642 filed Sep. 1, 2021, the entire disclosures of which are hereby incorporated by reference in their entirety.

BACKGROUND

1. Field

This disclosure relates to electronic payment networks and, in some non-limiting embodiments or aspects, to dynamic passcode communication for frictionless multi-factor authentication (MFA) for electronic payments.

2. Technical Considerations

Multi-factor authentication (MFA) (or two-factor authentication) is an electronic authentication method in which a user is authorized only after successfully presenting two or more pieces of evidence (or factors) to an authentication mechanism (e.g., a user-controlled password with a dynamic passcode or one-time password (OTP), etc.). MFA protects the user from an unknown person trying to access and/or use their data such as personal ID details or financial assets. For example, payment service requirements, such as strong customer authentication (SCA), and/or the like, may require that electronic payments be performed with MFA, to increase the security of the electronic payments. However, the additional factors required by MFA may increase a number of steps that a customer performs to successfully complete a transaction, increase a number of application calls after a transaction is initiated, and/or increase a number of communications between transaction processing systems.

SUMMARY

Accordingly, provided are improved systems, devices, products, apparatus, and/or methods for dynamic passcode communication.

According to some non-limiting embodiments or aspects, provided is a computer-implemented method including: receiving, with at least one processor, with a merchant application installed on a user device, transaction data associated with a transaction at a merchant system, wherein the merchant application is associated with the merchant system, wherein the transaction data includes an account identifier associated with an account at an issuer system; determining, with the at least one processor, with the merchant application, based on the account identifier, whether an issuer application associated with the issuer system is installed on the user device; in response to determining that the issuer application associated with the issuer system is installed on the user device, transmitting, with the at least one processor, from the merchant application, to the issuer application, a request for a dynamic passcode; receiving, with the at least one processor, with the merchant application, from the issuer application, the dynamic passcode; transmitting, with the at least one processor, from the merchant application, to the issuer system, an authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier and the dynamic passcode; and receiving, with the at least one processor, with the merchant application, from the issuer system, an authorization response authorizing or denying the transaction.

In some non-limiting embodiments or aspects, the method further includes: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmitting, with the at least one processor, from the merchant application, to a payment gateway system, a request to register the merchant application installed on the user device with the payment gateway system; and in response to transmitting the request to register the merchant application installed on the user device, receiving, with the at least one processor, with the merchant application, from the payment gateway system, a confirmation that the merchant application is registered with the payment gateway system.

In some non-limiting embodiments or aspects, determining whether the issuer application associated with the issuer system is installed on the user device includes: transmitting, from the merchant application, to the payment gateway system, at least a portion of the account identifier; receiving, with the merchant application, from the payment gateway system, an identification of the issuer application associated with the issuer system associated with the account identifier; and determining, based on the identification, with the merchant application, whether the issuer application associated with the issuer system associated with the account identifier is installed on the user device.

In some non-limiting embodiments or aspects, the at least one processor transmits the authorization request from the merchant application to the issuer system via the merchant system and the payment gateway system.

In some non-limiting embodiments or aspects, the at least one processor receives the authorization response with the merchant application from the issuer system via the merchant system and the payment gateway system.

In some non-limiting embodiments or aspects, the method further includes: receiving, with the at least one processor, with the issuer application, from the merchant application, the request for the dynamic passcode; in response to receiving the request for the dynamic passcode, generating, with the at least one processor, with the issuer application, the dynamic passcode; and transmitting, with the at least one processor, from the issuer application, to the merchant application, the dynamic passcode.

In some non-limiting embodiments or aspects, the method further includes: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmitting, with the at least one processor, from the issuer application, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes a token associated with each of the account identifier and a device identifier associated with the user device, and wherein the token is configured to validate the dynamic passcode; and in response to transmitting the request to register the issuer application installed on the user device with the issuer system, receiving, with the at least one processor, with the issuer application, from the issuer system, a confirmation that the issuer application is registered with the issuer system.

According to some non-limiting embodiments or aspects, provided is a system including: at least one processor programmed and/or configured to: receive, with a merchant application installed on a user device, transaction data associated with a transaction at a merchant system, wherein the merchant application is associated with the merchant system, wherein the transaction data includes an account identifier associated with an account at an issuer system; determine, with the merchant application, based on the account identifier, whether an issuer application associated with the issuer system is installed on the user device; in response to determining that the issuer application associated with the issuer system is installed on the user device, transmit, from the merchant application, to the issuer application, a request for a dynamic passcode; receive, with the merchant application, from the issuer application, the dynamic passcode; transmit, from the merchant application, to the issuer system, an authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier and the dynamic passcode; and receive, with the merchant application, from the issuer system, an authorization response authorizing or denying the transaction.

In some non-limiting embodiments or aspects, the at least one processor is further programmed and/or configured to: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmit, from the merchant application, to a payment gateway system, a request to register the merchant application installed on the user device with the payment gateway system; and in response to transmitting the request to register the merchant application installed on the user device, receive, with the merchant application, from the payment gateway system, a confirmation that the merchant application is registered with the payment gateway system.

In some non-limiting embodiments or aspects, the at least one processor is programmed and/or configured to determine whether the issuer application associated with the issuer system is installed on the user device by: transmitting, from the merchant application, to the payment gateway system, at least a portion of the account identifier; receiving, with the merchant application, from the payment gateway system, an identification of the issuer application associated with the issuer system associated with the account identifier; and determining, based on the identification, with the merchant application, whether the issuer application associated with the issuer system associated with the account identifier is installed on the user device.

In some non-limiting embodiments or aspects, the at least one processor is further programmed and/or configured to transmit the authorization request from the merchant application to the issuer system via the merchant system and the payment gateway system.

In some non-limiting embodiments or aspects, the at least one processor is further programmed and/or configured to receive the authorization response with the merchant application from the issuer system via the merchant system and the payment gateway system.

In some non-limiting embodiments or aspects, the at least one processor is further programmed and/or configured to: receive, with the issuer application, from the merchant application, the request for the dynamic passcode; in response to receiving the request for the dynamic passcode, generate, with the issuer application, the dynamic passcode; and transmit, from the issuer application, to the merchant application, the dynamic passcode.

In some non-limiting embodiments or aspects, the at least one processor is further programmed and/or configured to: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmit, from the issuer application, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes a token associated with each of the account identifier and a device identifier associated with the user device, and wherein the token is configured to validate the dynamic passcode; and in response to transmitting the request to register the issuer application installed on the user device with the issuer system, receive, with the issuer application, from the issuer system, a confirmation that the issuer application is registered with the issuer system.

According to some non-limiting embodiments or aspects, provided is a computer program product comprising at least one non-transitory computer-readable medium including program instructions that, when executed by at least one processor, cause the at least one processor to: receive, with a merchant application installed on a user device, transaction data associated with a transaction at a merchant system, wherein the merchant application is associated with the merchant system, wherein the transaction data includes an account identifier associated with an account at an issuer system; determine, with the merchant application, based on the account identifier, whether an issuer application associated with the issuer system is installed on the user device; in response to determining that the issuer application associated with the issuer system is installed on the user device, transmit, from the merchant application, to the issuer application, a request for a dynamic passcode; receive, with the merchant application, from the issuer application, the dynamic passcode; transmit, from the merchant application, to the issuer system, an authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier and the dynamic passcode; and receive, with the merchant application, from the issuer system, an authorization response authorizing or denying the transaction.

In some non-limiting embodiments or aspects, the program instructions, when executed by the at least one processor, further cause the at least one processor to: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmit, from the merchant application, to a payment gateway system, a request to register the merchant application installed on the user device with the payment gateway system; and in response to transmitting the request to register the merchant application installed on the user device, receive, with the merchant application, from the payment gateway system, a confirmation that the merchant application is registered with the payment gateway system.

In some non-limiting embodiments or aspects, the program instructions, when executed by the at least one processor, cause the at least one processor to determine whether the issuer application associated with the issuer system is installed on the user device by: transmitting, from the merchant application, to the payment gateway system, at least a portion of the account identifier; receiving, with the merchant application, from the payment gateway system, an identification of the issuer application associated with the issuer system associated with the account identifier; and determining, based on the identification, with the merchant application, whether the issuer application associated with the issuer system associated with the account identifier is installed on the user device.

In some non-limiting embodiments or aspects, the program instructions, when executed by the at least one processor, further cause the at least one processor to: transmit the authorization request from the merchant application to the issuer system via the merchant system and the payment gateway system; and receive the authorization response with the merchant application from the issuer system via the merchant system and the payment gateway system.

In some non-limiting embodiments or aspects, the program instructions, when executed by the at least one processor, further cause the at least one processor to: receive, with the issuer application, from the merchant application, the request for the dynamic passcode; in response to receiving the request for the dynamic passcode, generate, with the issuer application, the dynamic passcode; and transmit, from the issuer application, to the merchant application, the dynamic passcode.

In some non-limiting embodiments or aspects, the program instructions, when executed by the at least one processor, further cause the at least one processor to: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmit, from the issuer application, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes a token associated with each of the account identifier and a device identifier associated with the user device, and wherein the token is configured to validate the dynamic passcode; and in response to transmitting the request to register the issuer application installed on the user device with the issuer system, receive, with the issuer application, from the issuer system, a confirmation that the issuer application is registered with the issuer system.

Further non-limiting embodiments or aspects are set forth in the following numbered clauses:

Clause 1. A computer-implemented method comprising: receiving, with at least one processor, with a merchant application installed on a user device, transaction data associated with a transaction at a merchant system, wherein the merchant application is associated with the merchant system, wherein the transaction data includes an account identifier associated with an account at an issuer system; determining, with the at least one processor, with the merchant application, based on the account identifier, whether an issuer application associated with the issuer system is installed on the user device; in response to determining that the issuer application associated with the issuer system is installed on the user device, transmitting, with the at least one processor, from the merchant application, to the issuer application, a request for a dynamic passcode; receiving, with the at least one processor, with the merchant application, from the issuer application, the dynamic passcode; transmitting, with the at least one processor, from the merchant application, to the issuer system, an authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier and the dynamic passcode; and receiving, with the at least one processor, with the merchant application, from the issuer system, an authorization response authorizing or denying the transaction.

Clause 2. The computer-implemented method of clause 1, further comprising: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmitting, with the at least one processor, from the merchant application, to a payment gateway system, a request to register the merchant application installed on the user device with the payment gateway system; and in response to transmitting the request to register the merchant application installed on the user device, receiving, with the at least one processor, with the merchant application, from the payment gateway system, a confirmation that the merchant application is registered with the payment gateway system.

Clause 3. The computer-implemented method of clauses 1 or 2, wherein determining whether the issuer application associated with the issuer system is installed on the user device includes: transmitting, from the merchant application, to the payment gateway system, at least a portion of the account identifier; receiving, with the merchant application, from the payment gateway system, an identification of the issuer application associated with the issuer system associated with the account identifier; and determining, based on the identification, with the merchant application, whether the issuer application associated with the issuer system associated with the account identifier is installed on the user device.

Clause 4. The computer-implemented method of any of clauses 1-3, wherein the at least one processor transmits the authorization request from the merchant application to the issuer system via the merchant system and the payment gateway system.

Clause 5. The computer-implemented method of any of clauses 1-4, wherein the at least one processor receives the authorization response with the merchant application from the issuer system via the merchant system and the payment gateway system.

Clause 6. The computer-implemented method of any of clauses 1-5, further comprising: receiving, with the at least one processor, with the issuer application, from the merchant application, the request for the dynamic passcode; in response to receiving the request for the dynamic passcode, generating, with the at least one processor, with the issuer application, the dynamic passcode; and transmitting, with the at least one processor, from the issuer application, to the merchant application, the dynamic passcode.

Clause 7. The computer-implemented method of any of clauses 1-6, further comprising: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmitting, with the at least one processor, from the issuer application, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes a token associated with each of the account identifier and a device identifier associated with the user device, and wherein the token is configured to validate the dynamic passcode; and in response to transmitting the request to register the issuer application installed on the user device with the issuer system, receiving, with the at least one processor, with the issuer application, from the issuer system, a confirmation that the issuer application is registered with the issuer system.

Clause 8. A system comprising: at least one processor programmed and/or configured to: receive, with a merchant application installed on a user device, transaction data associated with a transaction at a merchant system, wherein the merchant application is associated with the merchant system, wherein the transaction data includes an account identifier associated with an account at an issuer system; determine, with the merchant application, based on the account identifier, whether an issuer application associated with the issuer system is installed on the user device; in response to determining that the issuer application associated with the issuer system is installed on the user device, transmit, from the merchant application, to the issuer application, a request for a dynamic passcode; receive, with the merchant application, from the issuer application, the dynamic passcode; transmit, from the merchant application, to the issuer system, an authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier and the dynamic passcode; and receive, with the merchant application, from the issuer system, an authorization response authorizing or denying the transaction.

Clause 9. The system of clause 8, wherein the at least one processor is further programmed and/or configured to: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmit, from the merchant application, to a payment gateway system, a request to register the merchant application installed on the user device with the payment gateway system; and in response to transmitting the request to register the merchant application installed on the user device, receive, with the merchant application, from the payment gateway system, a confirmation that the merchant application is registered with the payment gateway system.

Clause 10. The system of clauses 8 or 9, wherein the at least one processor is programmed and/or configured to determine whether the issuer application associated with the issuer system is installed on the user device by: transmitting, from the merchant application, to the payment gateway system, at least a portion of the account identifier; receiving, with the merchant application, from the payment gateway system, an identification of the issuer application associated with the issuer system associated with the account identifier; and determining, based on the identification, with the merchant application, whether the issuer application associated with the issuer system associated with the account identifier is installed on the user device.

Clause 11. The system of any of clauses 8-10, wherein the at least one processor is further programmed and/or configured to transmit the authorization request from the merchant application to the issuer system via the merchant system and the payment gateway system.

Clause 12. The system of any of clauses 8-11, wherein the at least one processor is further programmed and/or configured to receive the authorization response with the merchant application from the issuer system via the merchant system and the payment gateway system.

Clause 13. The system of any of clauses 8-12, wherein the at least one processor is further programmed and/or configured to: receive, with the issuer application, from the merchant application, the request for the dynamic passcode; in response to receiving the request for the dynamic passcode, generate, with the issuer application, the dynamic passcode; and transmit, from the issuer application, to the merchant application, the dynamic passcode.

Clause 14. The system of any of clauses 8-13, wherein the at least one processor is further programmed and/or configured to: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmit, from the issuer application, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes a token associated with each of the account identifier and a device identifier associated with the user device, and wherein the token is configured to validate the dynamic passcode; and in response to transmitting the request to register the issuer application installed on the user device with the issuer system, receive, with the issuer application, from the issuer system, a confirmation that the issuer application is registered with the issuer system.

Clause 15. A computer program product comprising at least one non-transitory computer-readable medium including program instructions that, when executed by at least one processor, cause the at least one processor to: receive, with a merchant application installed on a user device, transaction data associated with a transaction at a merchant system, wherein the merchant application is associated with the merchant system, wherein the transaction data includes an account identifier associated with an account at an issuer system; determine, with the merchant application, based on the account identifier, whether an issuer application associated with the issuer system is installed on the user device; in response to determining that the issuer application associated with the issuer system is installed on the user device, transmit, from the merchant application, to the issuer application, a request for a dynamic passcode; receive, with the merchant application, from the issuer application, the dynamic passcode; transmit, from the merchant application, to the issuer system, an authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier and the dynamic passcode; and receive, with the merchant application, from the issuer system, an authorization response authorizing or denying the transaction.

Clause 16. The computer program product of clause 15, wherein the program instructions, when executed by the at least one processor, further cause the at least one processor to: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmit, from the merchant application, to a payment gateway system, a request to register the merchant application installed on the user device with the payment gateway system; and in response to transmitting the request to register the merchant application installed on the user device, receive, with the merchant application, from the payment gateway system, a confirmation that the merchant application is registered with the payment gateway system.

Clause 17. The computer program product of clauses 15 or 16, wherein the program instructions, when executed by the at least one processor, cause the at least one processor to determine whether the issuer application associated with the issuer system is installed on the user device by: transmitting, from the merchant application, to the payment gateway system, at least a portion of the account identifier; receiving, with the merchant application, from the payment gateway system, an identification of the issuer application associated with the issuer system associated with the account identifier; and determining, based on the identification, with the merchant application, whether the issuer application associated with the issuer system associated with the account identifier is installed on the user device.

Clause 18. The computer program product of any of clauses 15-17, wherein the program instructions, when executed by the at least one processor, further cause the at least one processor to: transmit the authorization request from the merchant application to the issuer system via the merchant system and the payment gateway system; and receive the authorization response with the merchant application from the issuer system via the merchant system and the payment gateway system.

Clause 19. The computer program product of any of clauses 15-18, wherein the program instructions, when executed by the at least one processor, further cause the at least one processor to: receive, with the issuer application, from the merchant application, the request for the dynamic passcode; in response to receiving the request for the dynamic passcode, generate, with the issuer application, the dynamic passcode; and transmit, from the issuer application, to the merchant application, the dynamic passcode.

Clause 20. The computer program product of any of clauses 15-19, wherein the program instructions, when executed by the at least one processor, further cause the at least one processor to: before receiving, with the merchant application installed on the user device, the transaction data associated with the transaction at the merchant system, transmit, from the issuer application, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes a token associated with each of the account identifier and a device identifier associated with the user device, and wherein the token is configured to validate the dynamic passcode; and in response to transmitting the request to register the issuer application installed on the user device with the issuer system, receive, with the issuer application, from the issuer system, a confirmation that the issuer application is registered with the issuer system.

These and other features and characteristics of the present disclosure, as well as the methods of operation and functions of the related elements of structures and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of limits. As used in the specification and the claims, the singular form of "a," "an," and "the" include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

Additional advantages and details are explained in greater detail below with reference to the exemplary embodiments that are illustrated in the accompanying schematic figures, in which:

FIGS. **1**A and **1**B are diagrams of non-limiting embodiments or aspects of an environment in which systems, devices, products, apparatus, and/or methods, described herein, may be implemented;

FIG. **2** is a diagram of non-limiting embodiments or aspects of components of one or more devices and/or one or more systems of FIGS. **1**A and **1**B;

FIGS. **3**A and **3**B are a flowchart of non-limiting embodiments or aspects of a process for dynamic passcode communication; and

FIG. **4** is a signal flow diagram of an implementation of non-limiting embodiments or aspects of a process for dynamic passcode communication.

DESCRIPTION

It is to be understood that the present disclosure may assume various alternative variations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification, are simply exemplary and non-limiting embodiments or aspects. Hence, specific dimensions and other physical characteristics related to the embodiments or aspects disclosed herein are not to be considered as limiting.

No aspect, component, element, structure, act, step, function, instruction, and/or the like used herein should be construed as critical or essential unless explicitly described as such. Also, as used herein, the articles "a" and "an" are intended to include one or more items, and may be used interchangeably with "one or more" and "at least one." Furthermore, as used herein, the term "set" is intended to include one or more items (e.g., related items, unrelated items, a combination of related and unrelated items, etc.) and may be used interchangeably with "one or more" or "at least one." Where only one item is intended, the term "one" or similar language is used. Also, as used herein, the terms "has," "have," "having," or the like are intended to be open-ended terms. Further, the phrase "based on" is intended to mean "based at least partially on" unless explicitly stated otherwise.

As used herein, the term "communication" may refer to the reception, receipt, transmission, transfer, provision, and/or the like, of data (e.g., information, signals, messages, instructions, commands, and/or the like). For one unit (e.g., a device, a system, a component of a device or system, combinations thereof, and/or the like) to be in communication with another unit means that the one unit is able to directly or indirectly receive information from and/or transmit information to the other unit. This may refer to a direct or indirect connection (e.g., a direct communication connection, an indirect communication connection, and/or the like) that is wired and/or wireless in nature. Additionally, two units may be in communication with each other even though the information transmitted may be modified, processed, relayed, and/or routed between the first and second unit. For example, a first unit may be in communication with a second unit even though the first unit passively receives information and does not actively transmit information to the second unit. As another example, a first unit may be in communication with a second unit if at least one intermediary unit processes information received from the first unit and communicates the processed information to the second unit.

It will be apparent that systems and/or methods, described herein, can be implemented in different forms of hardware, software, or a combination of hardware and software. The actual specialized control hardware or software code used to implement these systems and/or methods is not limiting of the implementations. Thus, the operation and behavior of the systems and/or methods are described herein without reference to specific software code, it being understood that software and hardware can be designed to implement the systems and/or methods based on the description herein.

As used herein, the term "transaction service provider" may refer to an entity that receives transaction authorization requests from merchants or other entities and provides guarantees of payment, in some cases through an agreement between the transaction service provider and an issuer institution. For example, a transaction service provider may include a payment network such as Visa® or any other entity that processes transactions. The term "transaction processing system" may refer to one or more computing devices operated by or on behalf of a transaction service provider, such as a transaction processing server executing one or more software applications. A transaction processing system may include one or more processors and, in some non-limiting embodiments, may be operated by or on behalf of a transaction service provider.

As used herein, the term "account identifier" may include one or more primary account numbers (PANs), tokens, or other identifiers associated with a customer account. The term "token" may refer to an identifier that is used as a substitute or replacement identifier for an original account identifier, such as a PAN. Account identifiers may be alphanumeric or any combination of characters and/or symbols. Tokens may be associated with a PAN or other original account identifier in one or more data structures (e.g., one or more databases and/or the like) such that they may be used to conduct a transaction without directly using the original account identifier. In some examples, an original account identifier, such as a PAN, may be associated with a plurality of tokens for different individuals or purposes.

As used herein, the terms "issuer institution," "portable financial device issuer," "issuer," or "issuer bank" may refer to one or more entities that provide one or more accounts to a user (e.g., a customer, a consumer, an entity, an organization, and/or the like) for conducting transactions (e.g., payment transactions), such as initiating credit card payment transactions and/or debit card payment transactions. For example, an issuer institution may provide an account identifier, such as a PAN, to a user that uniquely identifies one or more accounts associated with that user. The account identifier may be embodied on a portable financial device, such as a physical financial instrument (e.g., a payment card), and/or may be electronic and used for electronic payments. In some non-limiting embodiments or aspects, an issuer institution may be associated with a bank identification number (BIN) that uniquely identifies the issuer institution. As used herein "issuer institution system" may refer to one or more computer systems operated by or on behalf of an issuer institution, such as a server computer executing one or more software applications. For example, an issuer institution system may include one or more authorization servers for authorizing a payment transaction.

As used herein, the term "merchant" may refer to an individual or entity that provides goods and/or services, or access to goods and/or services, to users (e.g. customers) based on a transaction (e.g. a payment transaction). As used herein, the terms "merchant" or "merchant system" may also refer to one or more computer systems, computing devices, and/or software application operated by or on behalf of a merchant, such as a server computer executing one or more software applications. A "point-of-sale (POS) system," as used herein, may refer to one or more computers and/or peripheral devices used by a merchant to engage in payment transactions with users, including one or more card readers, near-field communication (NFC) receivers, radio frequency identification (RFID) receivers, and/or other contactless transceivers or receivers, contact-based receivers, payment terminals, computers, servers, input devices, and/or other like devices that can be used to initiate a payment transaction. A POS system may be part of a merchant system. A merchant system may also include a merchant plug-in for facilitating online, Internet-based transactions through a merchant webpage or software application. A merchant plug-in may include software that runs on a merchant server or is hosted by a third-party for facilitating such online transactions.

As used herein, the term "mobile device" may refer to one or more portable electronic devices configured to communicate with one or more networks. As an example, a mobile device may include a cellular phone (e.g., a smartphone or standard cellular phone), a portable computer (e.g., a tablet computer, a laptop computer, etc.), a wearable device (e.g., a watch, pair of glasses, lens, clothing, and/or the like), a personal digital assistant (PDA), and/or other like devices. The terms "client device" and "user device," as used herein, refer to any electronic device that is configured to communicate with one or more servers or remote devices and/or systems. A client device or user device may include a mobile device, a network-enabled appliance (e.g., a network-enabled television, refrigerator, thermostat, and/or the like), a computer, a POS system, and/or any other device or system capable of communicating with a network.

As used herein, the term "computing device" may refer to one or more electronic devices configured to process data. A computing device may, in some examples, include the necessary components to receive, process, and output data, such as a processor, a display, a memory, an input device, a network interface, and/or the like. A computing device may be a mobile device. As an example, a mobile device may include a cellular phone (e.g., a smartphone or standard cellular phone), a portable computer, a wearable device (e.g., watches, glasses, lenses, clothing, and/or the like), a PDA, and/or other like devices. A computing device may also be a desktop computer or other form of non-mobile computer.

As used herein, the terms "electronic wallet" and "electronic wallet application" refer to one or more electronic devices and/or software applications configured to initiate and/or conduct payment transactions. For example, an electronic wallet may include a mobile device executing an electronic wallet application, and may further include server-side software and/or databases for maintaining and providing transaction data to the mobile device. An "electronic wallet provider" may include an entity that provides and/or maintains an electronic wallet for a customer, such as Google Pay®, Android Pay®, Apple Pay®, Samsung Pay®, and/or other like electronic payment systems. In some non-limiting examples, an issuer bank may be an electronic wallet provider.

As used herein, the term "payment device" may refer to a portable financial device, an electronic payment device, a payment card (e.g., a credit or debit card), a gift card, a smartcard, smart media, a payroll card, a healthcare card, a wrist band, a machine-readable medium containing account information, a keychain device or fob, an RFID transponder, a retailer discount or loyalty card, a cellular phone, an electronic wallet mobile application, a PDA, a pager, a security card, a computer, an access card, a wireless terminal, a transponder, and/or the like. In some non-limiting embodiments or aspects, the payment device may include volatile or nonvolatile memory to store information (e.g., an account identifier, a name of the account holder, and/or the like).

As used herein, the term "server" and/or "processor" may refer to or include one or more computing devices that are operated by or facilitate communication and processing for multiple parties in a network environment, such as the Internet, although it will be appreciated that communication may be facilitated over one or more public or private network environments and that various other arrangements are possible. Further, multiple computing devices (e.g., servers, POS devices, mobile devices, etc.) directly or indirectly communicating in the network environment may constitute a "system." Reference to "a server" or "a processor," as used herein, may refer to a previously-recited server and/or processor that is recited as performing a previous step or function, a different server and/or processor, and/or a combination of servers and/or processors. For example, as used in the specification and the claims, a first server and/or a first processor that is recited as performing a first step or function may refer to the same or different server and/or a processor recited as performing a second step or function.

As used herein, the term "acquirer" may refer to an entity licensed by the transaction service provider and/or approved by the transaction service provider to originate transactions using a portable financial device of the transaction service provider. Acquirer may also refer to one or more computer systems operated by or on behalf of an acquirer, such as a server computer executing one or more software applications (e.g., "acquirer server"). An "acquirer" may be a merchant bank, or in some cases, the merchant system may be the acquirer. The transactions may include original credit transactions (OCTs) and account funding transactions (AFTs). The acquirer may be authorized by the transaction service provider to sign merchants of service providers to originate transactions using a portable financial device of the transaction service provider. The acquirer may contract with payment facilitators to enable the facilitators to sponsor merchants. The acquirer may monitor compliance of the payment facilitators in accordance with regulations of the transaction service provider. The acquirer may conduct due diligence of payment facilitators and ensure that proper due diligence occurs before signing a sponsored merchant. Acquirers may be liable for all transaction service provider programs that they operate or sponsor. Acquirers may be responsible for the acts of its payment facilitators and the merchants it or its payment facilitators sponsor.

As used herein, the term "payment gateway" may refer to an entity and/or a payment processing system operated by or on behalf of such an entity (e.g., a merchant service provider, a payment service provider, a payment facilitator, a payment facilitator that contracts with an acquirer, a payment aggregator, and/or the like), which provides payment services (e.g., transaction service provider payment services, payment processing services, and/or the like) to one or more merchants. The payment services may be associated with the use of portable financial devices managed by a transaction service provider. As used herein, the term "payment gateway system" may refer to one or more computer systems, computer devices, servers, groups of servers, and/or the like operated by or on behalf of a payment gateway.

As used herein, the term "application programming interface" (API) may refer to computer code that allows communication between different systems or (hardware and/or software) components of systems. For example, an API may

include function calls, functions, subroutines, communication protocols, fields, and/or the like usable and/or accessible by other systems or other (hardware and/or software) components of systems.

As used herein, the term "user interface" or "graphical user interface" refers to a generated display, such as one or more graphical user interfaces (GUIs) with which a user may interact, either directly or indirectly (e.g., through a keyboard, mouse, touchscreen, etc.).

Provided are improved systems, devices, products, apparatus, and/or methods for dynamic passcode communication that receive, with a merchant application installed on a user device, transaction data associated with a transaction at a merchant system, wherein the merchant application is associated with the merchant system, wherein the transaction data includes an account identifier associated with an account at an issuer system; determine, with the merchant application, based on the account identifier, whether an issuer application associated with the issuer system is installed on the user device; in response to determining that the issuer application associated with the issuer system is installed on the user device, transmit, from the merchant application, to the issuer application, a request for a dynamic passcode; receive, with the merchant application, from the issuer application, the dynamic passcode; transmit, from the merchant application, to the issuer system, an authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier and the dynamic passcode; and receive, with the merchant application, from the issuer system, an authorization response authorizing or denying the transaction.

In this way, an issuer SDK can be used for dynamic passcode generation, the dynamic passcode can be securely transmitted to a merchant SDK, and the dynamic passcode can be included in an authorization request to be used by an issuer system to authenticate a transaction, which enables more frictionless multi-factor authentication (MFA) for electronic payment transactions by reducing a number of steps that a customer performs to successfully complete a transaction, decreasing a number of application calls after a transaction is initiated, and decreasing a number of communications between transaction processing systems.

Referring now to FIGS. **1**A and **1**B, FIGS. **1**A and **1**B are diagrams of an example environment **100** in which devices, systems, methods, and/or products described herein, may be implemented. As shown in FIGS. **1**A and **1**B, environment **100** includes transaction processing network **101**, which may include merchant system **102**, payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, issuer system **110**, user device **112**, and/or communication network **114**. Transaction processing network **101**, merchant system **102**, payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, issuer system **110**, and/or user device **112** may interconnect (e.g., establish a connection to communicate, etc.) via wired connections, wireless connections, or a combination of wired and wireless connections.

Merchant system **102** may include one or more devices capable of receiving information and/or data from payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, issuer system **110**, and/or user device **112** via communication network **114** and/or communicating information and/or data to payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, issuer system **110**, and/or user device **112** via communication network **114**. Merchant system **102** may include a device capable of receiving information and/or data from user device **112** via a communication connection (e.g., an NFC communication connection, an RFID communication connection, a Bluetooth® communication connection, etc.) with user device **112**, and/or communicating information and/or data to user device **112** via the communication connection. For example, merchant system **102** may include a computing device, such as a server, a group of servers, a client device, a group of client devices, and/or other like devices. In some non-limiting embodiments or aspects, merchant system **102** may be associated with a merchant as described herein. In some non-limiting embodiments or aspects, merchant system **102** may include one or more devices, such as computers, computer systems, and/or peripheral devices capable of being used by a merchant to conduct a payment transaction with a user. For example, merchant system **102** may include a POS device and/or a POS system.

Payment gateway system **104** may include one or more devices capable of receiving information and/or data from merchant system **102**, acquirer system **106**, transaction service provider system **108**, issuer system **110**, and/or user device **112** via communication network **114** and/or communicating information and/or data to merchant system **102**, acquirer system **106**, transaction service provider system **108**, issuer system **110**, and/or user device **112** via communication network **114**. For example, payment gateway system **104** may include a computing device, such as a server, a group of servers, and/or other like devices. In some non-limiting embodiments or aspects, payment gateway system **104** is associated with a payment gateway as described herein.

Acquirer system **106** may include one or more devices capable of receiving information and/or data from merchant system **102**, payment gateway system **104**, transaction service provider system **108**, issuer system **110**, and/or user device **112** via communication network **114** and/or communicating information and/or data to merchant system **102**, payment gateway system **104**, transaction service provider system **108**, issuer system **110**, and/or user device **112** via communication network **114**. For example, acquirer system **106** may include a computing device, such as a server, a group of servers, and/or other like devices. In some non-limiting embodiments or aspects, acquirer system **106** may be associated with an acquirer as described herein.

Transaction service provider system **108** may include one or more devices capable of receiving information and/or data from merchant system **102**, payment gateway system **104**, acquirer system **106**, issuer system **110**, and/or user device **112** via communication network **114** and/or communicating information and/or data to merchant system **102**, payment gateway system **104**, acquirer system **106**, issuer system **110**, and/or user device **112** via communication network **114**. For example, transaction service provider system **108** may include a computing device, such as a server (e.g., a transaction processing server, etc.), a group of servers, and/or other like devices. In some non-limiting embodiments or aspects, transaction service provider system **108** may be associated with a transaction service provider as described herein. In some non-limiting embodiments or aspects, transaction service provider system **108** may include and/or access one or more one or more internal and/or external databases including transaction data.

Issuer system **110** may include one or more devices capable of receiving information and/or data from merchant system **102**, payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, and/or user device **112** via communication network **114** and/or communicating information and/or data to merchant system **102**, payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, and/or user device **112** via communication network **114**. For example, issuer system **110** may include a computing device, such as a server, a group of servers, and/or other like devices. In some non-limiting embodiments or aspects, issuer system **110** may be associated with an issuer institution as described herein. For example, issuer system **110** may be associated with an issuer institution that issued a payment account or instrument (e.g., a credit account, a debit account, a credit card, a debit card, etc.) to a user (e.g., a user associated with user device **112**, etc.).

In some non-limiting embodiments or aspects, transaction processing network **101** includes a plurality of systems in a communication path for processing a transaction. For example, transaction processing network **101** can include merchant system **102**, payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, and/or issuer system **110** in a communication path (e.g., a communication path, a communication channel, a communication network, etc.) for processing an electronic payment transaction. As an example, transaction processing network **101** can process (e.g., initiate, conduct, authorize, etc.) an electronic payment transaction via the communication path between merchant system **102**, payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, and/or issuer system **110**.

User device **112** may include one or more devices capable of receiving information and/or data from merchant system **102**, payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, and/or issuer system **110** via communication network **114** and/or communicating information and/or data to merchant system **102**, payment gateway system **104**, acquirer system **106**, transaction service provider system **108**, and/or issuer system **110** via communication network **114**. For example, user device **112** may include a client device and/or the like. In some non-limiting embodiments or aspects, user device **112** may be capable of receiving information (e.g., from merchant system **102**, etc.) via a short range wireless communication connection (e.g., an NFC communication connection, an RFID communication connection, a Bluetooth® communication connection, and/or the like), and/or communicating information (e.g., to merchant system **102**, etc.) via a short range wireless communication connection.

As shown in FIG. 1B, in some non-limiting embodiments or aspects, user device **112** may include one or more applications associated with user device **112**, such as an application stored, installed, and/or executed on user device **112** (e.g., a mobile device application, a native application for a mobile device, a mobile cloud application for a mobile device, an electronic wallet application, a peer-to-peer payment transfer application, a merchant application, an issuer application, etc.).

For example, user device **112** may include a merchant application associated with merchant system **102**. The merchant application may be capable of being used by a user to conduct an electronic payment transaction with merchant system **102**. A merchant software development kit (SDK) may be integrated into the merchant application on user device **112**. The merchant SDK may be one of Java® Development kit, .NET® framework SDK, iOS® SDK, and the like.

As an example, user device **112** may include an issuer application associated with issuer system **110**. An issuer SDK may be integrated into the issuer application on user device **112**. The issuer SDK may be one of Java® Development kit, .NET® framework SDK, iOS® SDK, and the like. The issuer SDK may be configured to generate a dynamic passcode or one-time password (OTP) that can be used by issuer system **110** to authenticate an electronic payment transaction conducted with the merchant application on user device **112** using an account associated with issuer system **110**. For example, the issuer SDK may bind or link a token to user device **112** (e.g., to a device identifier associated with user device **112**, etc.), the issuer application installed on user device **112** (e.g., to an application identifier associated with the issuer application, etc.), and/or an account identifier associated with the account and register the token at issuer system **110** for validating the dynamic passcode. As an example, the merchant SDK in the merchant application may be configured to communicate with the issuer SDK in the issuer application and, in response to receiving a request from the merchant SDK, the issuer SDK may securely communicate the dynamic passcode generated on the issuer application with the issuer SDK to the merchant SDK in the issuer application. In such an example, the merchant SDK may provide the dynamic passcode with an authorization request requesting authorization of the electronic payment transaction to issuer system **110**.

Communication network **114** may include one or more wired and/or wireless networks. For example, communication network **114** may include a cellular network (e.g., a long-term evolution (LTE) network, a third generation (3G) network, a fourth generation (4G) network, a code division multiple access (CDMA) network, etc.), a public land mobile network (PLMN), a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), a telephone network (e.g., the public switched telephone network (PSTN)), a private network, an ad hoc network, an intranet, the Internet, a fiber optic-based network, a cloud computing network, and/or the like, and/or a combination of these or other types of networks.

The number and arrangement of devices and systems shown in FIGS. **1**A and **1**B is provided as an example. There may be additional devices and/or systems, fewer devices and/or systems, different devices and/or systems, or differently arranged devices and/or systems than those shown in FIGS. **1**A and **1**B. Furthermore, two or more devices and/or systems shown in FIGS. **1**A and **1**B may be implemented within a single device and/or system, or a single device and/or system shown in FIGS. **1**A and **1**B may be implemented as multiple, distributed devices and/or systems. Additionally, or alternatively, a set of devices and/or systems (e.g., one or more devices or systems) of environment **100** may perform one or more functions described as being performed by another set of devices and/or systems of environment **100**.

Referring now to FIG. **2**, FIG. **2** is a diagram of example components of a device **200**. Device **200** may correspond to one or more devices of merchant system **102**, one or more devices of payment gateway system **104**, one or more devices of acquirer system **106**, one or more devices of transaction service provider system **108**, one or more devices of issuer system **110**, and/or user device **112** (e.g., one or more devices of a system of user device **112**, etc.). In some non-limiting embodiments or aspects, one or more devices of merchant system **102**, one or more devices of payment gateway system **104**, one or more devices of acquirer system **106**, one or more devices of transaction service provider system **108**, one or more devices of issuer system **110**, and/or user device **112** (e.g., one or more devices of a system of user device **112**, etc.) may include at least one device **200** and/or at least one component of device **200**. As shown in FIG. **2**, device **200** may include bus **202**, processor **204**, memory **206**, storage component **208**, input component **210**, output component **212**, and communication interface **214**.

Bus **202** may include a component that permits communication among the components of device **200**. In some non-limiting embodiments or aspects, processor **204** may be implemented in hardware, software, or a combination of hardware and software. For example, processor **204** may include a processor (e.g., a central processing unit (CPU), a graphics processing unit (GPU), an accelerated processing unit (APU), etc.), a microprocessor, a digital signal processor (DSP), and/or any processing component (e.g., a field-programmable gate array (FPGA), an application-specific integrated circuit (ASIC), etc.) that can be programmed to perform a function. Memory **206** may include random access memory (RAM), read-only memory (ROM), and/or another type of dynamic or static storage device (e.g., flash memory, magnetic memory, optical memory, etc.) that stores information and/or instructions for use by processor **204**.

Storage component **208** may store information and/or software related to the operation and use of device **200**. For example, storage component **208** may include a hard disk (e.g., a magnetic disk, an optical disk, a magneto-optic disk, a solid state disk, etc.), a compact disc (CD), a digital versatile disc (DVD), a floppy disk, a cartridge, a magnetic tape, and/or another type of computer-readable medium, along with a corresponding drive.

Input component **210** may include a component that permits device **200** to receive information, such as via user input (e.g., a touch screen display, a keyboard, a keypad, a mouse, a button, a switch, a microphone, etc.). Additionally, or alternatively, input component **210** may include a sensor for sensing information (e.g., a global positioning system (GPS) component, an accelerometer, a gyroscope, an actuator, etc.). Output component **212** may include a component that provides output information from device **200** (e.g., a display, a speaker, one or more light-emitting diodes (LEDs), etc.).

Communication interface **214** may include a transceiver-like component (e.g., a transceiver, a separate receiver and transmitter, etc.) that enables device **200** to communicate with other devices, such as via a wired connection, a wireless connection, or a combination of wired and wireless connections. Communication interface **214** may permit device **200** to receive information from another device and/or provide information to another device. For example, communication interface **214** may include an Ethernet interface, an optical interface, a coaxial interface, an infrared interface, a radio frequency (RF) interface, a universal serial bus (USB) interface, a Wi-Fi® interface, a cellular network interface, and/or the like.

Device **200** may perform one or more processes described herein. Device **200** may perform these processes based on processor **204** executing software instructions stored by a computer-readable medium, such as memory **206** and/or storage component **208**. A computer-readable medium (e.g., a non-transitory computer-readable medium) is defined herein as a non-transitory memory device. A non-transitory memory device includes memory space located inside of a single physical storage device or memory space spread across multiple physical storage devices.

Software instructions may be read into memory **206** and/or storage component **208** from another computer-readable medium or from another device via communication interface **214**. When executed, software instructions stored in memory **206** and/or storage component **208** may cause processor **204** to perform one or more processes described herein. Additionally, or alternatively, hardwired circuitry may be used in place of or in combination with software instructions to perform one or more processes described herein. Thus, embodiments or aspects described herein are not limited to any specific combination of hardware circuitry and software.

Memory **206** and/or storage component **208** may include data storage or one or more data structures (e.g., a database, etc.). Device **200** may be capable of receiving information from, storing information in, communicating information to, or searching information stored in the data storage or one or more data structures in memory **206** and/or storage component **208**.

The number and arrangement of components shown in FIG. **2** are provided as an example. In some non-limiting embodiments or aspects, device **200** may include additional components, fewer components, different components, or differently arranged components than those shown in FIG. **2**. Additionally, or alternatively, a set of components (e.g., one or more components) of device **200** may perform one or more functions described as being performed by another set of components of device **200**.

Referring now to FIGS. **3**A and **3**B, FIGS. **3**A and **3**B are a flowchart of non-limiting embodiments or aspects of a process **300** for dynamic passcode communication. In some non-limiting embodiments or aspects, one or more of the steps of process **300** may be performed (e.g., completely, partially, etc.) by user device **112** (e.g., one or more devices of a system of user device **112**). In some non-limiting embodiments or aspects, one or more of the steps of process **300** may be performed (e.g., completely, partially, etc.) by another device or a group of devices separate from or including user device **112**, such as such as merchant system **102** (e.g., one or more devices of merchant system **102**), payment gateway system **104** (e.g., one or more devices of payment gateway system **104**), acquirer system **106** (e.g., one or more devices of acquirer system **106**), transaction service provider system **108** (e.g., one or more devices of transaction service provider system **108**, etc.), and/or issuer system **110** (e.g., one or more devices of issuer system **110**).

As shown in FIG. **3**A, at step **302**, process **300** includes transmitting a request to register a merchant application with a payment gateway system. For example, user device **112** may transmit, from a merchant application installed on user device **112**, to payment gateway system **104**, a request to register the merchant application installed on user device **112** with payment gateway system **104**.

Referring also to FIG. **4**, FIG. **4** is a signal flow diagram of an implementation **400** of non-limiting embodiments or aspects of a process for dynamic passcode communication. As shown in FIG. **4**, at reference number **402**, the merchant application may request and receive a token (e.g., a JSON web token, etc.) from merchant system **102** and, at reference number **404**, provide the token associated with merchant system **102** to the merchant SDK. At reference number **406**, the merchant SDK may transmit, to payment gateway system **104**, the token with the request to register the merchant application with payment gateway system.

As shown in FIG. **3**A, at step **304**, process **300** includes receiving a confirmation that a merchant application is registered with a payment gateway system. For example, user device **112** may, in response to transmitting the request to register the merchant application installed on user device **112**, receive, with the merchant application, from payment gateway system **104**, a confirmation that the merchant application is registered with payment gateway system **104**. As an example, and as shown in FIG. **4**, at reference number **408**, the merchant SDK may receive the confirmation that the merchant application is registered with payment gateway system **104** and, at reference number **410**, provide the confirmation to the merchant application.

As shown in FIG. **3**A, at step **306**, process **300** includes transmitting a request to register an issuer application with an issuer system. For example, user device **112** may transmit, from the issuer application, to issuer system **110**, a request to register the issuer application installed on user device **112** with issuer system **110**. The request to register the issuer application may include a token associated with each of the account identifier and a device identifier associated with user device **112**. The token may be configured to validate the dynamic passcode.

As an example, and as shown in FIG. **4**, at reference number **412**, the issuer application may request (e.g., in response to a user logging into the issuer application, etc.) the issuer SDK to initialize registration with issuer system **110** and, in response thereto, at reference number **414**, the issuer SDK may transmit, to issuer system **110**, the request to register the issuer application installed on user device **112** with issuer system **110**. In such an example, the issuer SDK may bind or link a token to user device **112** (e.g., to a device identifier associated with user device **112**, etc.), the issuer application installed on user device **112** (e.g., to an application identifier associated with the issuer application, etc.), and/or an account identifier associated with an account that is associated with the installed issuer application and transmit the token with the request to register the issuer application installed on user device **112** with issuer system **110**. The token may be stored and/or registered by issuer system **110** in association with the account identifier for use in validating a dynamic passcode generated by the issuer SDK in association with an electronic payment transaction that uses the account identifier.

As shown in FIG. **3**A, at step **308**, process **300** includes receiving a confirmation that an issuer application is registered with an issuer system. For example, user device **112** may, in response to transmitting the request to register the issuer application installed on user device **112** with issuer system **110**, receive, with the issuer application, from issuer system **110**, a confirmation that the issuer application is registered with issuer system **110**. As an example, and as shown in FIG. **4**, at reference number **416**, the merchant SDK may receive, from issuer system **110**, the confirmation that the issuer application is registered with issuer system **110**.

As shown in FIG. **3**A, at step **310**, process **300** includes receiving transaction data associated with a transaction. For example, user device **112** may receive, with a merchant application installed on user device **112**, transaction data associated with a transaction at merchant system **102**. The merchant application may be associated with merchant system **102**. The transaction data may include an account identifier (e.g., a PAN, a BIN, etc.) associated with an account at issuer system **110**.

As an example, and as shown in FIG. **4**, at reference number **418**, the merchant application may receive and/or determine, based on user input from a user to the merchant application, parameters associated with the transaction and, at reference number **420**, provide one or more of the parameters (e.g., a BIN, etc.) to the merchant SDK.

In some non-limiting embodiments or aspects, transaction data may include parameters associated with a transaction, such as an account identifier (e.g., a PAN, etc.), a transaction amount, a transaction date and time, a type of products and/or services associated with the transaction, a conversion rate of currency, a type of currency, a merchant type, a merchant name, a merchant location, a merchant, a MCG, a MCC, and/or the like.

As shown in FIG. 3A, at step **312**, process **300** includes determining whether an issuer application is installed on a user device. For example, user device **112** may determine, with the merchant application, based on the account identifier, whether an issuer application associated with issuer system **110** is installed on user device **112**. As an example, user device **112** may transmit, from the merchant application, to payment gateway system **104**, at least a portion of the account identifier, receive, with the merchant application, from payment gateway system **104**, an identification of the issuer application associated with issuer system **110** associated with the account identifier, and determine, based on the identification, with the merchant application, whether the issuer application associated with issuer system **110** associated with the account identifier is installed on user device **112**.

In such an example, and as shown in FIG. **4**, at reference number **422**, the merchant SDK may transmit the BIN to payment gateway system **104** and, at reference number **424**, the merchant SDK may receive the identification of the issuer application (e.g., a name of the issuer application, a name of an issuer associated with issuer system **110**, etc.) associated with the BIN. At reference number **426**, the merchant SDK may scan user device **112** for the identified issuer application and/or verify if the issuer application includes the issuer SDK integrated within the issuer application.

As shown in FIG. 3A, at step **314**, process **300** includes transmitting a request for a dynamic passcode. For example, user device **112** may, in response to determining that the issuer application associated with issuer system **110** is installed on user device **112**, transmit, from the merchant application, to the issuer application, a request for a dynamic passcode. As an example, and as shown in FIG. **4**, at reference number **428**, the merchant SDK may transmit, in response to determining that the issuer application associated with issuer system **110** is installed on user device **112** and includes the issuer SDK, to the issuer SDK, the request for the dynamic passcode. In such an example, the merchant SDK may communicate directly with the issuer SDK.

As shown in FIG. 3B, at step **316**, process **300** includes receiving a request for a dynamic passcode. For example, user device **112** may receive, with the issuer application, from the merchant application, the request for the dynamic passcode. As an example, and as shown in FIG. **4**, again at reference number **428**, the issuer SDK may receive, from the merchant SDK, the request for the dynamic passcode. In such an example, the request for the dynamic passcode may include the account identifier and/or a device identifier associated with user device **112**.

As shown in FIG. 3B, at step **318**, process **300** includes generating a dynamic passcode. For example, user device **112** may, in response to receiving the request for the dynamic passcode, generate, with the issuer application, the dynamic passcode. As an example, and as shown in FIG. **4**, at reference number **430**, the issuer SDK may generate, based on the account identifier and/or the device identifier, the dynamic passcode. In such an example, the dynamic passcode may be configured for validation with the token registered at issuer system **110** in association with the account identifier.

As shown in FIG. 3B, at step **320**, process **300** includes transmitting a dynamic passcode. For example, user device **112** may transmit, from the issuer application, to the merchant application, the dynamic passcode. As an example, and as shown in FIG. **4**, at reference number **432**, the issuer SDK may transmit, to the merchant SDK, the dynamic passcode. In such an example, the issuer SDK may communicate directly with the merchant SDK.

As shown in FIG. 3B, at step **322**, process **300** includes receiving a dynamic passcode. For example, user device **112** may receive, with the merchant application, from the issuer application, the dynamic passcode. As an example, and as shown in FIG. **4**, again at reference number **432**, the merchant SDK may receive, from the issuer SDK, the dynamic passcode.

As shown in FIG. 3B, at step **324**, process **300** includes transmitting an authorization request. For example, user device **112** may transmit, from the merchant application, to issuer system **110**, an authorization request requesting authorization of the transaction. The authorization request may include the account identifier and the dynamic passcode. In such an example, user device **112** may transmit the authorization request from the merchant application to issuer system **110** via merchant system **102**, payment gateway system **104**, acquirer system **106**, and/or transaction service provider system **108** (e.g., via transaction processing network **101**, etc.).

As an example, and as shown in FIG. **4**, at reference number **434**, the merchant SDK may bundle and encrypt the dynamic passcode with other authentication parameters and/or transaction parameters (e.g., a username, a password, a pin, a CVV, a PAN, etc.) and, at reference number **436**, provide the bundled and encrypted data to the merchant application. At reference number **438**, the merchant application may transmit the bundled and encrypted data to merchant system **102** and, at reference number **440**, merchant system **102** may transmit the bundled and encrypted data to payment gateway system **104**. At reference number **442**, payment gateway system **104** may decrypt the data to recover the dynamic passcode and, at reference number **444**, transmit the dynamic passcode as part of the authorization request to transaction service provider system **108**. At reference number **446**, transaction service provider system **108** may transmit risk data associated with a predicted risk of the transaction with the authorization request including the dynamic passcode to issuer system **110**. At reference number **448**, issuer system **110** may receive the authorization request and determine whether to authorize or deny the transaction based on the risk data and/or the dynamic passcode.

As shown in FIG. 3B, at step **326**, process **300** includes receiving an authorization response. For example, user device **112** may receive, with the merchant application, from issuer system **110**, an authorization response authorizing or denying the transaction. In such an example, user device **112** may receive the authorization response with the merchant application from issuer system **110** via merchant system **102**, payment gateway system **104**, acquirer system **106**, and/or transaction service provider system **108** (e.g., via transaction processing network **101**, etc.).

As an example, and as shown in FIG. **4**, at reference number **450**, issuer system **110** may transmit the authorization response to transaction service provider system **108** and, at reference number **452**, transaction service provider system **108** may transmit the authorization response to payment gateway system **104**. At reference number **454**, payment gateway system **104** may transmit the authorization response to merchant system **102** and, at reference number

456, merchant system **102** may transmit the authorization response to the merchant application, which may provide the authorization response including the authorization or denial of the transaction to the user via user device **112**.

Although embodiments or aspects have been described in detail for the purpose of illustration and description, it is to be understood that such detail is solely for that purpose and that embodiments or aspects are not limited to the disclosed embodiments or aspects, but, on the contrary, are intended to cover modifications and equivalent arrangements that are within the spirit and scope of the appended claims. For example, it is to be understood that the present disclosure contemplates that, to the extent possible, one or more features of any embodiment or aspect can be combined with one or more features of any other embodiment or aspect. In fact, any of these features can be combined in ways not specifically recited in the claims and/or disclosed in the specification. Although each dependent claim listed below may directly depend on only one claim, the disclosure of possible implementations includes each dependent claim in combination with every other claim in the claim set.

What is claimed is:

1. A computer-implemented method comprising:

requesting, with at least one processor, with an issuer application installed on a user device, an issuer software development kit (SDK) integrated into the issuer application on the user device, to initialize registration with an issuer system;

binding, with the at least one processor, with the issuer SDK integrated into the issuer application on the user device, a token to each of an account identifier associated with an account at the issuer system and a device identifier associated with the user device;

transmitting, with the at least one processor, with the issuer SDK integrated into the issuer application installed on the user device, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes the token bound to each of the account identifier associated with the account at the issuer system and the device identifier associated with the user device;

registering, with the at least one processor, with the issuer system, the token in association with the account identifier;

receiving, with the at least one processor, with the issuer SDK integrated into the issuer application installed on the user device, from the issuer system, a confirmation that the issuer application is registered with the issuer system;

receiving, with the at least one processor, with the issuer SDK integrated into the issuer application installed on the user device, directly from a merchant SDK integrated into a merchant application installed on the user device, a request for a one-time password associated with a transaction at a merchant system, wherein the request for the one-time password includes the account identifier and the device identifier, and wherein the merchant application is registered with a payment gateway system;

generating, with the at least one processor, with the issuer SDK integrated with the issuer application installed on the user device, based on the account identifier and the device identifier, the one-time password, wherein the one-time password is configured for validation with the token registered at the issuer system in association with the account identifier and the device identifier;

transmitting, with the at least one processor, with the issuer SDK integrated into the issuer application installed on the user device, directly to the merchant SDK integrated into the merchant application installed on the user device, the one-time password for bundling and encrypting of the one-time password with the account identifier in an authorization request requesting authorization of the transaction;

receiving, with the at least one processor, with the issuer system, from the merchant SDK integrated into the merchant application installed on the user device via the payment gateway at which the merchant application is registered, the authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier bundled with the one-time password that has been decrypted at the payment gateway at which the merchant application is registered;

determining, with the at least one processor, with the issuer system, whether to authorize or deny the transaction based on the one-time password; and

transmitting, with the at least one processor, with the issuer system, to the merchant application installed on the user device via the payment gateway at which the merchant application is registered, an authorization response authorizing or denying the transaction.

2. The computer-implemented method of claim **1**, further comprising:

receiving, with the at least one processor, with the issuer system, from a transaction service provider system, risk data associated with a predicted risk of the transaction, wherein the at least one processor determines, with the issuer system, whether to authorize or deny the transaction based on the one-time password and the risk data.

3. The computer-implemented method of claim **2**, wherein the at least one processor receives, with the issuer system, the authorization request via the payment gateway system and the transaction service provider system.

4. A system, comprising:

at least one processor programmed and/or configured to:

request, with an issuer application installed on a user device, an issuer software development kit (SDK) integrated into the issuer application on the user device, to initialize registration with an issuer system;

bind, with the issuer SDK integrated into the issuer application on the user device, a token to each of an account identifier associated with an account at the issuer system and a device identifier associated with the user device;

transmit, with the issuer SDK integrated into the issuer application installed on the user device, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes the token bound to each of the account identifier associated with the account at the issuer system and the device identifier associated with the user device;

register, with the issuer system, the token in association with the account identifier;

receive, with the issuer SDK integrated into the issuer application installed on the user device, from the issuer system, a confirmation that the issuer application is registered with the issuer system;

receive, with the issuer SDK integrated into the issuer application installed on the user device, directly from a merchant SDK integrated into a merchant application installed on the user device, a request for a one-time password associated with a transaction at a merchant system, wherein the request for the one-time password includes the account identifier and the device identifier, and wherein the merchant application is registered with a payment gateway system;

generate, with the issuer SDK integrated with the issuer application installed on the user device, based on the account identifier and the device identifier, the one-time password, wherein the one-time password is configured for validation with the token registered at the issuer system in association with the account identifier and the device identifier;

transmit, with the issuer SDK integrated into the issuer application installed on the user device, directly to the merchant SDK integrated into the merchant application installed on the user device, the one-time password for bundling and encrypting of the one-time password with the account identifier in an authorization request requesting authorization of the transaction;

receive with the issuer system, from the merchant SDK integrated into the merchant application installed on the user device via the payment gateway at which the merchant application is registered, the authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier bundled with the one-time password that has been decrypted at the payment gateway at which the merchant application is registered;

determine, with the issuer system, whether to authorize or deny the transaction based on the one-time password; and

transmit, with the issuer system, to the merchant application installed on the user device via the payment gateway at which the merchant application is registered, an authorization response authorizing or denying the transaction.

5. The system of claim **1**, wherein the at least one processor is further programmed and/or configured to:

receive, with the issuer system, from a transaction service provider system, risk data associated with a predicted risk of the transaction, wherein the at least one processor determines, with the issuer system, whether to authorize or deny the transaction based on the one-time password and the risk data.

6. The system of claim **5**, wherein the at least one processor is further programmed and/or configured to receive, with the issuer system, the authorization request via the payment gateway system and the transaction service provider system.

7. A computer program product comprising at least one non-transitory computer-readable medium including program instructions that, when executed by at least one processor, cause the at least one processor to:

request, with an issuer application installed on a user device, an issuer software development kit (SDK) integrated into the issuer application on the user device, to initialize registration with an issuer system;

bind, with the issuer SDK integrated into the issuer application on the user device, a token to each of an account identifier associated with an account at the issuer system and a device identifier associated with the user device;

transmit, with the issuer SDK integrated into the issuer application installed on the user device, to the issuer system, a request to register the issuer application installed on the user device with the issuer system, wherein the request to register the issuer application includes the token bound to each of the account identifier associated with the account at the issuer system and the device identifier associated with the user device;

register, with the issuer system, the token in association with the account identifier;

receive, with the issuer SDK integrated into the issuer application installed on the user device, from the issuer system, a confirmation that the issuer application is registered with the issuer system;

receive, with the issuer SDK integrated into the issuer application installed on the user device, directly from a merchant SDK integrated into a merchant application installed on the user device, a request for a one-time password associated with a transaction at a merchant system, wherein the request for the one-time password includes the account identifier and the device identifier, and wherein the merchant application is registered with a payment gateway system;

generate, with the issuer SDK integrated with the issuer application installed on the user device, based on the account identifier and the device identifier, the one-time password, wherein the one-time password is configured for validation with the token registered at the issuer system in association with the account identifier and the device identifier;

transmit, with the issuer SDK integrated into the issuer application installed on the user device, directly to the merchant SDK integrated into the merchant application installed on the user device, the one-time password for bundling and encrypting of the one-time password with the account identifier in an authorization request requesting authorization of the transaction;

receive with the issuer system, from the merchant SDK integrated into the merchant application installed on the user device via the payment gateway at which the merchant application is registered, the authorization request requesting authorization of the transaction, wherein the authorization request includes the account identifier bundled with the one-time password that has been decrypted at the payment gateway at which the merchant application is registered;

determine, with the issuer system, whether to authorize or deny the transaction based on the one-time password; and

transmit, with the issuer system, to the merchant application installed on the user device via the payment gateway at which the merchant application is registered, an authorization response authorizing or denying the transaction.

8. The computer program product of claim **7**, wherein the program instructions, when executed by the at least one processor, further cause the at least one processor to

receive, with the issuer system, from a transaction service provider system, risk data associated with a predicted risk of the transaction, wherein the at least one processor determines, with the issuer system, whether to authorize or deny the transaction based on the one-time password and the risk data.

9. The computer program product of claim **8**, wherein the at least one processor is further programmed and/or configured to receive, with the issuer system, the authorization request via the payment gateway system and the transaction service provider system.

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