Stream: Independent Submission
RFC: 8905
Category: Informational
Published: October 2020
ISSN: 2070-1721
Authors: F. Dold, *Taler Systems SA*
C. Grothoff, *Bern University of Applied Sciences*

RFC 8905
The 'payto' URI Scheme for Payments

Abstract

This document defines the 'payto' Uniform Resource Identifier (URI) scheme for designating targets for payments.

A unified URI scheme for all payment target types allows applications to offer user interactions with URIs that represent payment targets, simplifying the introduction of new payment systems and applications.

Status of This Memo

This document is not an Internet Standards Track specification; it is published for informational purposes.

This is a contribution to the RFC Series, independently of any other RFC stream. The RFC Editor has chosen to publish this document at its discretion and makes no statement about its value for implementation or deployment. Documents approved for publication by the RFC Editor are not candidates for any level of Internet Standard; see Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at https://www.rfc-editor.org/info/rfc8905.

Table of Contents

1. Introduction

This document defines the 'payto' Uniform Resource Identifier (URI) [RFC3986] scheme for designating transfer form data for payments.

1.1. Objective

A 'payto' URI always identifies the target of a payment. A 'payto' URI consists of a payment target type, a target identifier, and optional parameters such as an amount or a payment reference.

The interpretation of the target identifier is defined by the payment target type and typically represents either a bank account or an (unsettled) transaction.

A unified URI scheme for all payment target types allows applications to offer user interactions with URIs that represent payment targets, simplifying the introduction of new payment systems and applications.

1.2. Requirements Language

The key words "**MUST**", "**MUST NOT**", "**REQUIRED**", "**SHALL**", "**SHALL NOT**", "**SHOULD**", "**SHOULD NOT**", "**RECOMMENDED**", "**NOT RECOMMENDED**", "**MAY**", and "**OPTIONAL**" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. Syntax of a 'payto' URI

This document uses the Augmented Backus-Naur Form (ABNF) of [RFC5234].

```
payto-URI = "payto://" authority path-abempty [ "?" opts ]
opts = opt *( "&" opt )
opt-name = generic-opt / authority-specific-opt
opt-value = *pchar
opt = opt-name "=" opt-value
generic-opt = "amount" / "receiver-name" / "sender-name" /
              "message" / "instruction"
authority-specific-opt = ALPHA *( ALPHA / DIGIT / "-" / "." )
authority = ALPHA *( ALPHA / DIGIT / "-" / "." )
```

'path-abempty' is defined in Section 3.3 of [RFC3986]. 'pchar' is defined in Appendix A of [RFC3986].

3. Semantics

The authority component of a payment URI identifies the payment target type. The payment target types are defined in the "Payto Payment Target Types" registry (see Section 10). The path component of the URI identifies the target for a payment as interpreted by the respective payment target type. The query component of the URI can provide additional parameters for a payment. Every payment target type **SHOULD** accept the options defined in generic-opt. The default operation of applications that invoke a URI with the 'payto' scheme **MUST** be to launch an application (if available) associated with the payment target type that can initiate a payment. If multiple handlers are registered for the same payment target type, the user **SHOULD** be able to

choose which application to launch. This allows users with multiple bank accounts (each accessed via the respective bank's banking application) to choose which account to pay with. An application **SHOULD** allow dereferencing a 'payto' URI even if the payment target type of that URI is not registered in the "Payto Payment Target Types" registry. Details of the payment **MUST** be taken from the path and options given in the URI. The user **SHOULD** be allowed to modify these details before confirming a payment.

4. Examples

Valid Example:

```
payto://iban/DE75512108001245126199?amount=EUR:200.0&message=hello
```

Invalid Example (authority missing):

```
payto:iban/12345
```

5. Generic Options

Applications **MUST** accept URIs with options in any order. The "amount" option **MUST NOT** occur more than once. Other options **MAY** be allowed multiple times, with further restrictions depending on the payment target type. The following options **SHOULD** be understood by every payment target type.

amount: The amount to transfer. The format **MUST** be:

```
amount = currency ":" unit [ "." fraction ]
currency = 1*ALPHA
unit = 1*(DIGIT / ",")
fraction = 1*(DIGIT / ",")
```

If a 3-letter 'currency' is used, it **MUST** be an [ISO4217] alphabetic code. A payment target type **MAY** define semantics beyond ISO 4217 for currency codes that are not 3 characters. The 'unit' value **MUST** be smaller than 2^53. If present, the 'fraction' **MUST** consist of no more than 8 decimal digits. The use of commas is optional for readability, and they **MUST** be ignored.

receiver-name: Name of the entity that receives the payment (creditor). The value of this option **MAY** be subject to lossy conversion, modification, and truncation (for example, due to line wrapping or character set conversion).

sender-name: Name of the entity that makes the payment (debtor). The value of this option **MAY** be subject to lossy conversion, modification, and truncation (for example, due to line wrapping or character set conversion).

message: A short message to identify the purpose of the payment. The value of this option **MAY** be subject to lossy conversion, modification, and truncation (for example, due to line wrapping or character set conversion).

instruction: A short message giving payment reconciliation instructions to the recipient. An instruction that follows the character set and length limitation defined by the respective payment target type **SHOULD NOT** be subject to lossy conversion.

6. Internationalization and Character Encoding

Various payment systems use restricted character sets. An application that processes 'payto' URIs **MUST** convert characters that are not allowed by the respective payment systems into allowable characters using either an encoding or a replacement table. This conversion process **MAY** be lossy, except for the instruction field. If the value of the instruction field would be subject to lossy conversion, modification, or truncation, the application **SHOULD** refuse further processing of the payment until a different value for the instruction is provided.

To avoid special encoding rules for the payment target identifier, the userinfo component [RFC3986] is disallowed in 'payto' URIs. Instead, the payment target identifier is given as an option, where encoding rules are uniform for all options.

Defining a generic way of tagging the language of option fields containing natural language text (such as "receiver-name", "sender-name", and "message) is out of the scope of this document, as internationalization must accommodate the restrictions and requirements of the underlying banking system of the payment target type. The internationalization concerns **SHOULD** be individually defined by each payment target type.

7. Tracking Payment Target Types

A registry of "Payto Payment Target Types" is described in Section 10. The registration policy for this registry is "First Come First Served", as described in [RFC8126]. When requesting new entries, careful consideration of the following criteria is strongly advised:

1. The description clearly defines the syntax and semantics of the payment target and optional parameters if applicable.
2. Relevant references are provided if they are available.
3. The chosen name is appropriate for the payment target type, does not conflict with well-known payment systems, and avoids potential to confuse users.
4. The payment system underlying the payment target type is not fundamentally incompatible with the general options (such as positive decimal amounts) in this specification.
5. The payment target type is not a vendor-specific version of a payment target type that could be described more generally by a vendor-neutral payment target type.
6. The specification of the new payment target type remains within the scope of payment transfer form data. In particular, specifying complete invoices is not in scope. Neither are processing instructions to the payment processor or bank beyond a simple payment.

7. The payment target and the options do not contain the payment sender's account details.

Documents that support requests for new registry entries should provide the following information for each entry:

Name: The name of the payment target type (case-insensitive ASCII string, restricted to alphanumeric characters, dots, and dashes).

Description: A description of the payment target type, including the semantics of the path in the URI if applicable.

Example: At least one example URI to illustrate the payment target type.

Contact: The contact information of a person to contact for further information.

References: Optionally, references describing the payment target type (such as an RFC) and target-specific options or references describing the payment system underlying the payment target type.

This document populates the registry with seven entries as follows (see also Section 10).

7.1. ACH Bank Account

Name: ach

Description: Automated Clearing House (ACH). The path consists of two components: the routing number and the account number. Limitations on the length and character set of option values are defined by the implementation of the handler. Language tagging and internationalization of options are not supported.

Example:

```
payto://ach/122000661/1234
```

Contact: N/A

References: [NACHA], RFC 8905

7.2. Business Identifier Code

Name: bic

Description: Business Identifier Code (BIC). The path consists of just a BIC. This is used for wire transfers between banks. The registry for BICs is provided by the Society for Worldwide Interbank Financial Telecommunication (SWIFT). The path does not allow specifying a bank account number. Limitations on the length and character set of option values are defined by the implementation of the handler. Language tagging and internationalization of options are not supported.

Example:

```
payto://bic/SOGEDEFFXXX
```

Contact: N/A

References: [BIC], RFC 8905

7.3. International Bank Account Number

Name: iban

Description: International Bank Account Number (IBAN). Generally, the IBAN allows to unambiguously derive the associated Business Identifier Code (BIC) using a lookup in the respective proprietary translation table. However, some legacy applications process payments to the same IBAN differently based on the specified BIC. Thus, the path can consist of either a single component (the IBAN) or two components (BIC followed by IBAN). The "message" option of the 'payto' URI corresponds to the "unstructured remittance information" of Single Euro Payments Area (SEPA) credit transfers and is thus limited to 140 characters with character set limitations that differ according to the countries of the banks and payment processors involved in the payment. The "instruction" option of the 'payto' URI corresponds to the "end-to-end identifier" of SEPA credit transfers and is thus limited to, at most, 35 characters, which can be alphanumeric or from the allowed set of special characters, i.e., "+?/-:().,'". Language tagging and internationalization of options are not supported.

Examples:

```
payto://iban/DE75512108001245126199
payto://iban/SOGEDEFFXXX/DE75512108001245126199
```

Contact: N/A

References: [ISO20022], RFC 8905

7.4. Unified Payments Interface

Name: upi

Description: Unified Payment Interface (UPI). The path is an account alias. The amount and receiver-name options are mandatory for this payment target. Limitations on the length and character set of option values are defined by the implementation of the handler. Language tags and internationalization of options are not supported.

Example:

```
payto://upi/alice@example.com?receiver-name=Alice&amount=INR:200
```

Contact: N/A

References: [UPILinking], RFC 8905

7.5. Bitcoin Address

Name: bitcoin

Description: Bitcoin protocol. The path is a "bitcoinaddress", as per [BIP0021]. Limitations on the length and character set of option values are defined by the implementation of the handler. Language tags and internationalization of options are not supported.

Example:

```
payto://bitcoin/12A1MyfXbW6RhdRAZEqofac5jCQQjwEPBu
```

Contact: N/A

References: [BIP0021], RFC 8905

7.6. Interledger Protocol Address

Name: ilp

Description: Interledger protocol (ILP). The path is an ILP address, as per [ILP-ADDR]. Limitations on the length and character set of option values are defined by the implementation of the handler. Language tagging and internationalization of options are not supported.

Example: payto://ilp/g.acme.bob

Contact: N/A

References: [ILP-ADDR], RFC 8905

7.7. Void Payment Target

Name: void

Description: The "void" payment target type allows specifying the parameters of an out-of-band payment (such as cash or other types of in-person transactions). The path is optional and interpreted as a comment. Limitations on the length and character set of option values are defined by the implementation of the handler. Language tags and internationalization of options are not supported.

Example:

```
payto://void/?amount=EUR:10.5
```

Contact: N/A

References: RFC 8905

8. Security Considerations

Interactive applications handling the 'payto' URI scheme **MUST NOT** initiate any financial transactions without prior review and confirmation from the user and **MUST** take measures to prevent clickjacking [HMW12].

Unless a 'payto' URI is received over a trusted, authenticated channel, a user might not be able to identify the target of a payment. In particular, due to homographs [unicode-tr36], a payment target type **SHOULD NOT** use human-readable names in combination with unicode in the target account specification, as it could give the user the illusion of being able to identify the target account from the URI.

The authentication/authorization mechanisms and transport security services used to process a payment encoded in a 'payto' URI are handled by the application and are not in scope of this document.

To avoid unnecessary data collection, payment target types **SHOULD NOT** include personally identifying information about the sender of a payment that is not essential for an application to conduct a payment.

9. IANA Considerations

IANA maintains the "Uniform Resource Identifier (URI) Schemes" registry, which contains an entry for the 'payto' URI scheme as follows. IANA has updated that entry to reference this document.

Scheme name: payto

Status: provisional

URI scheme syntax: See Section 2 of RFC 8905.

URI scheme semantics: See Section 3 of RFC 8905.

Applications/protocols that use this scheme name: payto URIs are mainly used by financial software.

Contact: Christian Grothoff <grothoff@gnu.org>

Change controller: Christian Grothoff <grothoff@gnu.org>

References: See Section 11 of RFC 8905.

10. Payto Payment Target Types

This document specifies a list of payment target types. It is possible that future work will need to specify additional payment target types. The GNUnet Assigned Numbers Authority (GANA) [GANA] operates the "Payto Payment Target Types" registry to track the following information for each payment target type:

Name: The name of the payment target type (case-insensitive ASCII string, restricted to alphanumeric characters, dots, and dashes)

Contact: The contact information of a person to contact for further information

References: Optionally, references describing the payment target type (such as an RFC) and target-specific options or references describing the payment system underlying the payment target type

The entries in the "Payto Payment Target Types" registry defined in this document are as follows:

Name	Contact	Reference
ach	N/A	RFC 8905
bic	N/A	RFC 8905
iban	N/A	RFC 8905
upi	N/A	RFC 8905
bitcoin	N/A	RFC 8905
ilp	N/A	RFC 8905
void	N/A	RFC 8905

Table 1

11. References

11.1. Normative References

[ISO20022] International Organization for Standardization, "Financial Services - Universal financial industry message scheme", ISO 20022, May 2013, <https://www.iso.org>.

[ISO4217] International Organization for Standardization, "Codes for the representation of currencies", ISO 4217, August 2015, <https://www.iso.org>.

[NACHA] Nacha, "2020 Nacha Operating Rules & Guidelines", 2019.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC3986] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifier (URI): Generic Syntax", STD 66, RFC 3986, DOI 10.17487/RFC3986, January 2005, <https://www.rfc-editor.org/info/rfc3986>.

[RFC5234] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, DOI 10.17487/RFC5234, January 2008, <https://www.rfc-editor.org/info/rfc5234>.

[RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June 2017, <https://www.rfc-editor.org/info/rfc8126>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

[unicode-tr36] Davis, M., Ed. and M. Suignard, Ed., "Unicode Technical Report #36: Unicode Security Considerations", September 2014.

11.2. Informative References

[BIC] International Organization for Standardization, "Banking -- Banking telecommunication messages -- Business identifier code (BIC)", ISO 9362, December 2014, <https://www.iso.org>.

[BIP0021] Schneider, N. and M. Corallo, "Bitcoin Improvement Proposal 21", September 2019, <https://en.bitcoin.it/w/index.php?title=BIP_0021&oldid=66778>.

[GANA] GNUnet e.V., "GNUnet Assigned Numbers Authority (GANA)", April 2020, <https://gana.gnunet.org/>.

[HMW12] Huang, L., Moshchuk, A., Wang, H., Schecter, S., and C. Jackson, "Clickjacking: Attacks and Defenses", 2012, <https://www.usenix.org/system/files/conference/usenixsecurity12/sec12-final39.pdf>.

[ILP-ADDR] Interledger, "ILP Addresses - v2.0.0", <https://interledger.org/rfcs/0015-ilp-addresses/>.

[UPILinking] National Payments Corporation of India, "Unified Payment Interface - Common URL Specifications For Deep Linking And Proximity Integration", November 2017, <https://www.npci.org.in/sites/default/files/UPI%20Linking%20Specs_ver%201.6.pdf>.

Authors' Addresses

Florian Dold
Taler Systems SA
7, rue de Mondorf
L-5421 Erpeldange
Luxembourg
Email: dold@taler.net

Christian Grothoff
Bern University of Applied Sciences
Quellgasse 21
CH-2501 Biel/Bienne
Switzerland
Email: christian.grothoff@bfh.ch