

Secure Integration

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Learning Objectives

How can we securely integrate services?

Terminology

How to register a URI scheme?

Example: RFC 8905

Example: LSD 0006

Integration: Problem Statement

Isolation is a key paradigm in security:

- ▶ processes (address spaces!)
- ▶ users (quotas, access rights)
- ▶ departments (accounting, controlling, revision)
- ▶ organizations (auditors)

Integration: Problem Statement

Isolation is a key paradigm in security:

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How to ensure good user experience across application boundaries?

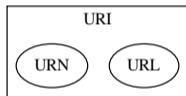
Solution domains

▶ Fax

Solution domains

- ▶ Fax
- ▶ Inter-process communication (UNIX Domain Sockets, Shared Memory, Networking)
- ▶ Intents (Android-only!)
- ▶ **Deep links**

Addressing



URI Uniform Resource Identifier

URL Uniform Resource Locator — object identification tied to location

URN Uniform Resource Name — namespace independent of location

Structure of a URI

URI = scheme “:” hierarchical-part [“?” query] [“#” fragment]

scheme Defines the method of identification

hierarchical part Hierarchical access path of the URI

query Search function

fragment access to a part of the document

URI/URN examples

foo://example.com:8042/over/there?name=ferret#nose

scheme authority path query fragment

urn:example:animal:ferret:nose

The Internet Assigned Numbers Authority (IANA)

- ▶ Responsible for unique assignment of parameters and numbers in Internet protocols
- ▶ Operates the DNS root zone
- ▶ Performs the administrative work *on behalf of* ICANN and IETF
- ▶ Web site: <https://iana.org/>
- ▶ Used to be just Jon Postel



Common URI scheme

- `ftp` File Transfer Protocol [1]
- `http` Hyper Text Transfer Protocol [2]
- `https` HTTP Secure [7]
- `mailto` Electronic mail address [4]
- `file` Host-specific file names [1]
- `imap` Internet Message Access Protocol [5]
- `pop` Post Office Protocol v3 [3]
- `ldap` Lightweight Directory Access Protocol [8]
- `urn` Uniform Resource Names¹ [6]

Except from <http://www.iana.org/assignments/uri-schemes>.

¹<http://www.iana.org/assignments/urn-namespaces>

URI examples

`http://prof.hti.bfh.ch/index.php?id=1403&L=2#howto`

`http://[2001:620:500:ff80::80]/owncloud`

`ftp://ftp.rfc-editor.org/in-notes/rfc3986.txt`

`ftp://user:geheim@ftp.bfh.ch/`

`file:///C:/WINDOWS/system32/drivers/etc/services`

`mailto:firstname.lastname@bfh.ch`

`urn:ietf:rfc:3986`

`urn:ISBN:1-56592-862-8`

Security Considerations

- ▶ Link hijacking: malicious or competing apps can register for your scheme
- ▶ Data interception: links with sensitive data may be transmitted by users over insecure channels
- ▶ Access control bypass: ensure checking access when handling links
- ▶ Insecure parameter handling: strings are the source of all eval

How to register a URI scheme? [9]

There are *permanent* and *provisional* registrations. Always start with *provisional*, but largely follow *permanent* guidelines:

1. Write and publish citable specification (ideally, RFC-style) explaining the use-case, syntax, semantics and security considerations
2. Follow syntactic requirements and ensure name is not taken
3. Send a registration request to uri-review@ietf.org and possibly other relevant lists for discussion.
4. Respond to comments, address in specification where reasonable (wait a few weeks for discussion to conclude).
5. Submit updated registration request to iana@iana.org with pointer to the discussion.

You can always “upgrade” to *permanent* status later!

RFC 8905: payto: Uniform Identifiers for Payments and Accounts

Like mailto:, but for bank accounts instead of email accounts!

```
payto://<PAYMENT-METHOD>/<ACCOUNT-NR>  
?subject=InvoiceNr42  
&amount=EUR:12.50
```

Default action: Open app to review and confirm payment.

Bankausweis (Kontokorrentausweis) für die Bank Saldovia Bank AG, Zürich. Es zeigt die Kontodaten für den Kontoinhaber K. Meister AG, Zürich. Die Kontonummer ist 21 5720 80075 20333 45590 00126. Die Bankverbindung ist Saldovia Bank AG, Saldoviastrasse 20, 8000 Zürich. Die Kontoführung ist als 'Kontokorrent' angegeben. Die Kontoführung ist als 'Kontokorrent' angegeben. Die Kontoführung ist als 'Kontokorrent' angegeben.

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Benefits of payto://

- ▶ Standardized way to represent financial resources (bank account, bitcoin wallet) and payments to them
- ▶ Useful on the client-side on the Web and for FinTech backend applications
- ▶ Payment methods (such as IBAN, ACH, Bitcoin) are registered with GANA²

²<https://gana.gnunet.org/>

Security Considerations for `payto://`

- ▶ Interactive applications handling the 'payto' URI scheme **MUST NOT** initiate any financial transactions without confirmation from the user and **MUST** take measures to prevent clickjacking.
- ▶ Unless a 'payto' URI is received over a trusted, authenticated channel, a user might not be able to identify the target of a payment. A payment target type **SHOULD NOT** use human-readable names in combination with unicode in the target account specification.
- ▶ The authentication/authorization mechanisms used to process a payment encoded in a 'payto' URI are handled by the application and are not in scope of this document.
- ▶ Payment target types **SHOULD NOT** include personally identifying information about the sender of a payment that is not essential to conduct a payment.


LSD 0006: taler: wallet triggers

<https://lsd.gnunet.org/lsd0006/>

Syntax:

```
taler-URI = ("taler://" / "TALER://" / "taler+http://"
            / "TALER+HTTP://" )
           action path-abempty [ "?" opts ]
action = ALPHA *( ALPHA / DIGIT / "-" / "." )
opts = opt *( "&" opt )
opt = opt-name "=" opt-value
opt-name = ALPHA *( ALPHA / DIGIT / "-" / "." / ":" )
opt-value = *pchar
```

Example:

 `taler://pay-push/exchange.taler.grothoff.org/D83MG3W7WKVH3C9...`

taler:// actions

withdraw bank-initiated withdrawal

pay merchant-initiated payment

refund merchant-initiated refund

pay-push P2P payment


pay-pull P2P invoice

pay-template merchant offline payment



restore restore from backup

withdraw-exchange wallet-initiated withdrawal

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