

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

System Security

Part I: System Security

Hardware

General notions:

- ▶ Hardware is the foundation for secure architecture: memory management, isolation, etc.
- ▶ Platforms with disabled Intel ME & disabled remote administration are safer.
- ▶ Platforms using uncommon CPU architectures (Power7, Sparc) are safer.
- ▶ VMs are not a security mechanism. Side-channel attacks abound. Avoid running any software in a virtual machine “for security”.

Operating system

General notions:

- ▶ It should be safe to run different reasonably secure components (such as Nginx and Postgres) on the same physical hardware (under different UIDs/GIDs). You may want to separate them onto different physical machines during scale-out, but not necessarily for “basic” security.
- ▶ Limiting and auditing system administrator access will be crucial.
- ▶ Recommend to **not** use any anti-virus: more of a liability than an asset.
- ▶ Recommend using a well-supported GNU/Linux operating system (such as Debian or Ubuntu or Nix).

Secure Integration

Part II: Secure Integration

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:

- ▶ processes (address spaces!)
- ▶ users (quotas, access rights)
- ▶ departments (accounting, controlling, revision)
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How to ensure good user experience across application boundaries?

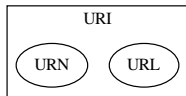
Solution domains

► 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.

The image shows a Swiss payment form (SEPA) with the following details:

- Bank:** Saldyria Bank, 8001 Zürich
- Account:** R. Muster AG, Vorstands-Konto, Industriestrasse 88, 8008 Zürich
- IBAN:** CH 15 7030 00075 20333 45590 00126
- QR Code:** A QR code is visible on the right side of the form.
- Amount:** 2830.50
- Reference:** 01 - 145-6

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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 GANA ²

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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