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 archtectures (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)

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How to ensure good user experience across application boundaries?

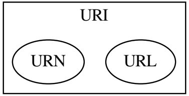
Solution domains

- 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]

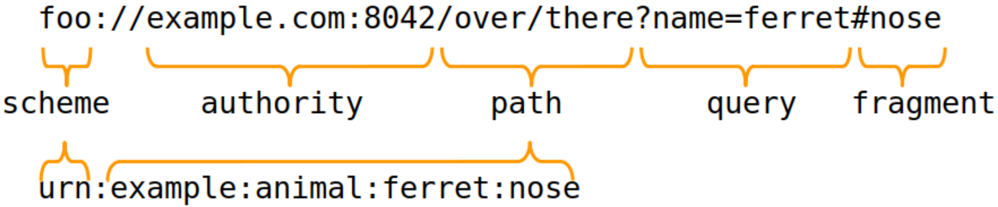
scheme Defines the method of identification

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 Names[1] [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.

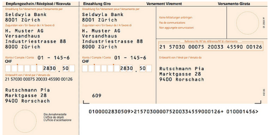
You can always “upgrade” to *permanent* status later!

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.



Empfangsschein / Récépissé / Ricevuta

Einzahlung für / Versement pour / Versamento per

Seldwyla Bank
8001 Zürich

Zugunsten von / En faveur de / A favore di

H. Muster AG
Versandhaus
Industriestrasse 88
8000 Zürich

Konto / Compte / Conto 01 - 145-6

CHF 2830 . 50

Einbezahlt von / Versé par / Versato da

21 57030 00075 20033 45590 00126

Rutschmann Pia
Marktgasse 28
9400 Rorschach

Die Annahmestelle
L'office de dépôt
L'ufficio d'accettazione

Einzahlung Giro **Versement Virement** **Versamento Girata**

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8000 Zürich

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CHF 2830 . 50

609

Keine Mitteilungen anbringen
Pas de communications
Non aggiungete comunicazioni

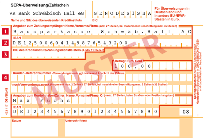
Referenz-Nr. / N° de référence / N° di riferimento

21 57030 00075 20033 45590 00126

Einbezahlt von / Versé par / Versato da

Rutschmann Pia
Marktgasse 28
9400 Rorschach

0100002830509>215703000075200334559000126+ 010001456>



SEPA-Überweisung/Zahlschein

VR Bank Schwäbisch Hall eG

Name und Sitz des überweisenden Kreditinstituts

BIC: GENODES1SHA

Für Überweisungen in Deutschland und in andere EU-/EWR-Staaten in Euro.

1 Angaben zum Zahlungsempfänger: Name, Vorname/Firma (max. 27 Stellen, bei maschineller Beschriftung max. 35 Stellen)

Bausparkasse Schwäb.Hall AG

2 IBAN

DE12500604149876543200

3 BIC des Kreditinstituts/Zahlungsdienstleisters (8 oder 11 Stellen)

Betrag: Euro, Cent

100,00

4 Kunden-Referenznummer - Verwendungszweck, ggf. Name und Anschrift des Zahlers

noch Verwendungszweck (insgesamt max. 2 Zeilen à 27 Stellen, bei maschineller Beschriftung max. 2 Zeilen à 35 Stellen)

Angaben zum Kontoinhaber/Zahler: Name, Vorname/Firma, Ort (max. 27 Stellen, keine Straßen- oder Postfachangaben)

Max Fuchs

IBAN

DE12345678901234567890

08

Datum

Unterschrift(en)

Schreibmaschine: normale Schreibweise!
Handschrift: Blockschrift in GROSSBUCHSTABEN und dabei Kästchen beachten!

423 417 DG VERLAG

MUSTER

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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