

Compilations reproductibles

Permettre le lien entre un binaire et sa source

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Compilation reproductible?

Le principe de
« compilation reproductible »
permet à quiconque de reproduire,
des binaires identiques
à partir de la même source

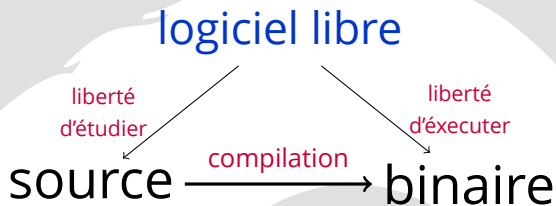


Avoir confiance dans la compilation?

source $\xrightarrow{\text{compilation}}$ binaire



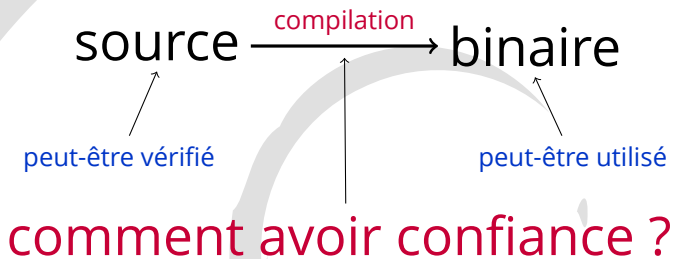
Avoir confiance dans la compilation?



Avoir confiance dans la compilation?



Avoir confiance dans la compilation?



Point de vue du dév.

« Je suis au courant de ce qu'il y a dans le binaire, c'est moi qui l'ai compilé ! »

« Je prends toute les précautions possibles ! La machine de compilation est ultra-sécurisée ! »

« Pourquoi est-ce que je devrais m'embêter avec des risques hypothétiques ? »



Sans blague

Pendant une conférence de la CIA en 2012 :

[[edit](#)] (S//NF) Strawhorse: Attacking the MacOS and iOS Software Development Kit

(S) Presenter: [REDACTED], Sandia National Laboratories

(S//NF) Ken Thompson's gcc attack (described in his 1984 Turing award acceptance speech) motivates the StrawMan work: **what can be done** of benefit to the US Intelligence Community (IC) **if one can make an arbitrary modification to a system compiler** or Software Development Kit (SDK)? A (whacked) SDK can provide a subtle injection vector onto standalone developer networks, or it can modify any binary compiled by that SDK. **In the past, we have watermarked binaries for attribution, used binaries as an exfiltration mechanism, and inserted Trojans into compiled binaries.**

(S//NF) In this talk, we discuss our explorations of the Xcode (4.1) SDK. Xcode is used to compile MacOS X applications and kernel extensions as well as iOS applications. We describe how we use (our whacked) Xcode to do the following things: -Entice all MacOS applications to create a remote backdoor on execution -Modify a dynamic dependency of securityd to load our own library - which rewrites securityd so that no prompt appears when exporting a developer's private key -Embed the developer's private key in all iOS applications -Force all iOS applications to send embedded data to a listening post -Convince all (new) kernel extensions to disable ASLR

(S//NF) We also describe how we modified both the MacOS X updater to install an extra kernel extension (a keylogger) and the Xcode installer to include our SDK whacks.

Source : The Intercept, 2015-03-10

Une backdoor, c'est petit comment?

OpenSSH 3.0.2 (CVE-2002-0083) – trou de sécurité (avec élévation de privilèges : accès *root* à distance)

```
{  
  Channel *c;  
-  if (id < 0 || id > channels_alloc) {  
+  if (id < 0 || id >= channels_alloc) {  
    log("channel_lookup: %d: bad id", id);  
    return;  
  }  
}
```



Correction du bug (en assembleur)

```
cmpl $0x0,0x8(%ebp)
js 16
mov 0x4,%eax
cmp %eax,0x8(%ebp)
jle 30
mov 0x8(%ebp),%eax
mov %eax,0x4(%esp)
movl $0x4c,(%esp)
call 25
```

```
cmpl $0x0,0x8(%ebp)
js 16
mov 0x4,%eax
cmp %eax,0x8(%ebp)
jl 30
mov 0x8(%ebp),%eax
mov %eax,0x4(%esp)
movl $0x4c,(%esp)
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mov %eax,0x4(%esp)
movl $0x4c,(%esp)
call 25
```

```
cmpl $0x0,0x8(%ebp)
js 16
mov 0x4,%eax
cmp %eax,0x8(%ebp)
jl 30
mov 0x8(%ebp),%eax
mov %eax,0x4(%esp)
movl $0x4c,(%esp)
call 25
```

Différence au niveau du binaire

Quelle est la différence entre `if (a > b)`
et `if (a >= b)` en assembleur x86?

assembleur :	JLE	JL
<i>opcode</i> :	0x7E	0x7C
binaire :	01111110	01111100

Un seul bit !

C'est aussi le cas pour d'autres *opcodes*.



Correction du bug (en hexadécimal)

Vulnérable

```
55 89 e5 83 ec
28 83 7d 08 00
78 0a a1 04 00
00 00 39 45 08
7e 1a 8b 45 08
89 44 24 04 c7
04 24 4c 00 00
00 e8 fc ff ff
ff b8 00 00 00
00 eb 35
```

Corrigé

```
55 89 e5 83 ec
28 83 7d 08 00
78 0a a1 04 00
00 00 39 45 08
7c 1a 8b 45 08
89 44 24 04 c7
04 24 4c 00 00
00 e8 fc ff ff
ff b8 00 00 00
00 eb 35
```

Correction du bug (en h xad cimal)

Vuln rable

```
55 89 e5 83 ec
28 83 7d 08 00
78 0a a1 04 00
00 00 39 45 08
7e 1a 8b 45 08
89 44 24 04 c7
04 24 4c 00 00
00 e8 fc ff ff
ff b8 00 00 00
00 eb 35
```

Corrig 

```
55 89 e5 83 ec
28 83 7d 08 00
78 0a a1 04 00
00 00 39 45 08
7c 1a 8b 45 08
89 44 24 04 c7
04 24 4c 00 00
00 e8 fc ff ff
ff b8 00 00 00
00 eb 35
```

Vérification indépendante

environnement de compilation
+
code source
=
binaire

Si tout le monde obtient le même résultat, il n'y a pas eu de malversations.



Comment je m'y suis mis?

https://blog.torproject.org/blog/deterministic-builds-part-one-cyberwar-and-global-compromise Startpage



HOME ARCHIVES ABOUT TOR

Deterministic Builds Part One: Cyberwar and Global Compromise

View Edit

Posted August 20th, 2013 by mikeperry in [cyberpeace](#), [dangerous toys](#), [decentralization](#), [deterministic builds](#), [glibian](#), [lack of foresight](#), [National Insecurity Agency](#), [security](#)

I've spent the past few months developing a new build system for the [3.0 series](#) of the Tor Browser Bundle that produces what are called "deterministic builds" -- packages which are byte-for-byte identical no matter who actually builds them, or what hardware they use. This effort was extraordinarily involved, consuming all of my development time for over two months (including several nights and weekends), babysitting builds and fixing differences and issues that arose.

When describing my recent efforts to others, by far the two most common questions I've heard are "Why did you do that?" and "How did you do that?". I've decided to answer each question at length in a separate blog post. This blog post attempts to answer the first question: "Why would anyone want a deterministic build process?"

The short answer is: to protect against targeted attacks. Current popular software development practices simply cannot survive targeted attacks of the scale and scope that we are seeing today. In fact, I believe we're just about to witness the first examples of large scale "watering hole" attacks. This would be malware that attacks the software development and build processes themselves to distribute copies of itself to tens or even hundreds of millions of machines in a single, officially signed, instantaneous update. Deterministic, distributed builds are perhaps the only way we can reliably prevent these types of targeted attacks in the face of the endless stockpiling of weaponized exploits and other "cyberweapons".

- Add a New Blog Post
- Manage Blog
- Admin Comments
- Manage Users
- Add an Event
- Manage Events
- Manage Forums

Search

La motivation pour Bitcoin

- Des modifications malveillantes des binaires pourraient permettre des transferts non-désirés et irrévocables de bitcoins.
- Des dév. pourraient être tenu·e·s pour responsables.
- Comment croire que c'est leur machine qui a été piratée?

La compilation reproductible permet de protéger les devs!



Rien de neuf

From: Martin Uecker <muecker@gmx.de>

Cc: debian-devel@lists.debian.org

Date: Sun, 23 Sep 2007 23:32:59 +0200

I think it would be really cool if the Debian policy required that packages could be rebuild bit-identical from source. At the moment, it is impossible to independly verify the integricity of binary packages.

<https://lists.debian.org/debian-devel/2007/09/msg00746.html>



Pourquoi Debian ?

- Debian est la plus grande collection de logiciels libres
- Plus de 22 000 paquets sources
- « Nos priorités sont nos **utilisateur·ice·s** et les **logiciels libres** »



Comment on fait?

- Enregistrer l'environnement de compilation
- Reproduire l'environnement de compilation
- Éliminer les variations inutiles



Approches possibles pour l'environnement

- Recompiler l'environnement
 - ▶ Coreboot, OpenWrt, Bazel
- Image système et script de configuration
 - ▶ Gitian (Bitcoin, Tor Browser), Docker (Mozilla), Vagrant
- Enregistrement des paquets et réinstallation ultérieure
 - ▶ Debian
 - ▶ (OpenSuse Build Service)



Recompiler l'environnement

- Une recette permet de reproduire l'environnement à partir des sources
- Un fichier (ex. `Makefile`) décrit la version à récupérer
- Dans le cas de Bazel, mettre l'intégralité des sources dans un système de gestion de versions.

Bonus : les changements dans les outils de compilation ont le même processus que des changements sur le code.



Image système et paquets

- Conteneur ou machine virtuelle
- Installation d'une distribution de base (e.g. Ubuntu)
- Script d'installation de l'environnement

Ça fonctionne avec des distributions stables ou alors des recompilations depuis des sources.



Enregistrement des paquets utilisés

Les fichiers *.buildinfo sont en passe d'être ajoutés dans Debian afin d'enregistrer :

- La version des dépendances de compilations
 - ▶ ... et celles de *toutes* leurs dépendances
- Une somme de contrôle pour le paquet source
- Une somme de contrôle pour les paquets binaires



Un exemple de *.buildinfo

```
Format: 1.9
Build-Architecture: amd64
Source: txdorcon
Binary: python-tdorcon
Architecture: all
Version: 0.11.0-1
Build-Path: /usr/src/debian/tdorcon-0.11.0-1
Checksums-Sha256:
 a26549d9...7b 125910 python-tdorcon_0.11.0-1_all.deb
 28f6bcbe...69 2039 tdxorcon_0.11.0-1.dsc
Build-Environment:
 base-files (= 8),
 base-passwd (= 3.5.37),
 bash (= 4.3-11+b1),
 ...
```



Réinstaller les paquets originaux

- `snapshot.debian.org` archive tous les états de l'archive Debian
- 29 Tio de données sur 17 million de fichiers (2015-05-25)



srebuild

- Script qui permet de reproduire une compilation à partir d'un *buildinfo*
- Trouve la sauvegarde de l'archive qui correspond
- Installe les paquets listés dans le fichier `.buildinfo`
- Lance la compilation

Prototype : #774415



Éliminer les variations

Il faut rendre le processus de compilation déterministe :

Même entrée
=
Même sortie



Approche générale

- Gitian (Bitcoin, Tor Browser) :
 - ▶ Utiliser une machine virtuelle (même noyau, même utilisateur, même chemin, ...)
 - ▶ `libfaketime`
- Debian :
 - ▶ Corriger les outils
 - ▶ Corriger les systèmes de compilations
 - ▶ Bidouiller en dernier recours



Comprendre les différences

- diff
- OpenSUSE build-compare
- debbindiff



debbindiff

- Examine deux fichiers
- Sort les différences au format HTML ou texte
- Décompresse les archives de façon récursive
- Cherche la lisibilité :
 - ▶ décompresse les PDF
 - ▶ désassemble les binaires
 - ▶ réassemble les fichiers Gettext
 - ▶ ... *facile à étendre pour de nouveaux formats de fichiers*
- Reviens à la comparaison binaire pour tout le reste



Comment trouver les différences?

- Compiler la source
- *Recompiler* la source dans un environnement différent
- Comparer les résultats



- Système de tests en continu piloté par Jenkins
- Grosse machine sponsorisée par ProfitBricks
- Vérifie en moyenne autour de 1300 paquets Debian par jour
- Résultats accessibles via la web
- Ajoutés récemment : Coreboot et OpenWrt



Variations testées pour les paquets Debian

La deuxième compilation est différente sur :

- l'heure
- le fuseau horaire
- l'ordre des fichiers
- l'ordre des processus
- le nombre de cœurs alloués



Variations testées pour les paquets Debian

- le nom de la machine et son nom de domaine
- le nom du compte, ainsi que *uid* et *gid*
- le *umask*
- la locale (LC_ALL) et la langue (LANG)
- la version du noyau
- le PATH



Variations en projet

- la date (*mais on triche avec les fuseaux horaires*)
- /proc/cpuinfo
- le système de fichiers

Peut-être qu'il manque encore d'autres variations à ajouter...



Problèmes identifiés

- L'horodatage (*timestamp*)
- L'ordre des fichiers
- Du (pseudo-)aléatoire :
 - ▶ Les chemins de fichiers temporaires
 - ▶ UUID
 - ▶ Les protections contre les attaques de complexité



Problèmes identifiés (suite)

- Lié au processeur ou à la mémoire :
 - ▶ Des optimisations de code liées au type de processeur
 - ▶ L'écriture d'adresses mémoires
- Le chemin du dossier de compilation
- Et bien d'autres... (par exemple les options de localisation)



Exemples

Horodatage par le système de compilation



Horodatage dans les en-têtes gzip

./usr/share/doc/dnsmasq-base/FAQ.gz

metadata

Offset 1, 1 lines modified

Offset 1, 1 lines modified

```
1 gzip-compressed data, was  
"FAQ", last modified: Mon May  
11 03:03:10 2015, max  
compression, from Unix
```

```
1 gzip-compressed data, was  
"FAQ", last modified: Mon May  
11 03:04:26 2015, max  
compression, from Unix
```



Horodatage par Maven

data.tar.xz

data.tar

annotation-indexer.jar

META-INF/maven/org.jenkins-ci/annotation-indexer/pom.properties

```
1 #Generated by Maven
2 #Tue Dec 16 21:03:56 UTC 2014
3 version=1.9
4 groupId=org.jenkins-ci
5 artifactId=annotation-indexer
```

```
1 #Generated by Maven
2 #Tue Dec 16 21:06:28 UTC 2014
3 version=1.9
4 groupId=org.jenkins-ci
5 artifactId=annotation-indexer
```

Horodatage dans des Makefile générés

./usr/share/doc/libqtengine-dev/examples/example/Makefile.gz

Makefile

Offset 1, 10 lines modified	Offset 1, 10 lines modified
1 #####	1 #####
2 #####	2 #####
2 # Makefile for building: example	2 # Makefile for building: example
3 # Generated by qmake (2.01a) (Qt 4.8.7) on: Wed May 20 11:58:29 2015	3 # Generated by qmake (2.01a) (Qt 4.8.7) on: Thu May 21 14:00:38 2015
4 # Project: example.pro	4 # Project: example.pro
5 # Template: app	5 # Template: app
6 # Command: /usr/lib/x86_64-linux-gnu/qt4/ bin/qmake -nocache QMAKE_STRIP= PREFIX= usr -o Makefile example.pro	6 # Command: /usr/lib/x86_64-linux-gnu/qt4/ bin/qmake -nocache QMAKE_STRIP= PREFIX= usr -o Makefile example.pro
7 #####	7 #####
8 #####	8 #####
9 ##### Compiler, tools and options	9 ##### Compiler, tools and options
10	10

Horodatage dans des en-têtes C

./usr/include/nepomuk2/queryinterface.h

Offset 4, 16 lines modified

```
4  .*
5  /* qdbusxml2cpp is Copyright (C) 2015 The Qt
   Company Ltd.
6  .*
7  /* This is an auto-generated file.
8  /* Do not edit! All changes made to it will
   be lost.
9  */
10
11 #ifndef QUERYINTERFACE_H_1431526756
12 #define QUERYINTERFACE_H_1431526756
13
14 #include <QtCore/QObject>
15 #include <QtCore/QByteArray>
16 #include <QtCore/QList>
17 #include <QtCore/QMap>
18 #include <QtCore/QString>
19 #include <QtCore/QStringList>
```

Offset 4, 16 lines modified

```
4  .*
5  /* qdbusxml2cpp is Copyright (C) 2015 The Qt
   Company Ltd.
6  .*
7  /* This is an auto-generated file.
8  /* Do not edit! All changes made to it will
   be lost.
9  */
10
11 #ifndef QUERYINTERFACE_H_1431526995
12 #define QUERYINTERFACE_H_1431526995
13
14 #include <QtCore/QObject>
15 #include <QtCore/QByteArray>
16 #include <QtCore/QList>
17 #include <QtCore/QMap>
18 #include <QtCore/QString>
19 #include <QtCore/QStringList>
```

Horodatage par PyQt4

data.tar.xz

data.tar

./usr/lib/armory/qrc_img_resources.py

```
# -*- coding: utf-8 -*-
```

```
# Resource object code
```

```
#
```

```
# Created: Thu Jan 1 01:13:33 2015
```

```
# by: The Resource Compiler for PyQt4
```

```
#
```

```
# WARNING! All changes made in this file
```

```
from PyQt4 import QtCore
```

```
+-87477 lines: qt_resource_data = "\----
```

```
# -*- coding: utf-8 -*-
```

```
# Resource object code
```

```
#
```

```
# Created: Thu Jan 1 01:17:12 2015
```

```
# by: The Resource Compiler for PyQt4
```

```
#
```

```
# WARNING! All changes made in this file
```

```
from PyQt4 import QtCore
```

```
+-87477 lines: qt_resource_data = "\----
```

Horodatage par le compilateur Erlang

data.tar.xz

data.tar

./usr/lib/x86_64-linux-gnu/ejabberd/ebin/mod_admin_extra.beam

4f 5231 0000 733c 4245 414d 4174 6f6d FO	64f 5231 0000 733c 4245 414d 4174 6f6d Ff
68 0264 0006 6f75 7464 summaryh.d..outd	968 0264 0006 6f75 7464 summaryh.d..outd
69 6e68 0264 0001 696b irk..ebin.h.d..ik	269 6e68 0264 0001 696b irk..ebin.h.d..ik
61 6262 6572 642d 6465 .../ejabberd-de	a61 6262 6572 642d 6465 .../ejabberd-de
64 656a 6802 6400 0776 v/includejh.d..v	564 656a 6802 6400 0776 v/includejh.d..v
00 0535 2e30 2e32 6802 ersionk..5.0.2h.	b00 0535 2e30 2e32 6802 ersionk..5.0.2h.
68 0662 0000 07de 610c d..timeh.b....a.	568 0662 0000 07de 610c d..timeh.b....a.
26 6802 6400 0673 6f75 a.a.a.a&h.d..sou	120 6802 6400 0673 6f75 a.a.a.a h.d..sou
74 6d70 2f62 7569 6c64 rcek.Q/tmp/build	f74 6d70 2f62 7569 6c64 rcek.Q/tmp/build
65 7264 2d63 6f6e 7472 d/ejabberd-contr	265 7264 2d63 6f6e 7472 d/ejabberd-contr
31 342e 3039 2e32 322f ib-0.2014.09.22/	031 342e 3039 2e32 322f ib-0.2014.09.22/
69 6e5f 6578 7472 612f mod_admin_extra/	d69 6e5f 6578 7472 612f mod_admin_extra/
5f 6164 6d69 6e5f 6578 src/mod_admin_ex	45f 6164 6d69 6e5f 6578 src/mod_admin_ex
6a 4162 7374 0000 0000 tra.erljAbst....	c6a 4162 7374 0000 0000 tra.erljAbst....
9 6e65 0000 037c 0000 0000 0000 0000 Lin	69 6e65 0000 037c 0000 0000 0000 0000 Lin

Horodatage dans les binaires au format PE

Windows, UEFI, Mono...

data.tar.xz

data.tar

./usr/lib/mono-cecil/Mono.Cecil.Mdb.dll

9000 0300 0000 0400 0000 ffff 0000 MZ...	9000 0300 0000 0400 0000 ffff 0000 MZ...
) 0000 0000 0000 0000 .....	) 0000 0000 0000 0000
) 0000 0000 8000 0000 .....	) 0000 0000 8000 0000
d 21b8 014c cd21 5468 .....!..L.!Th	d 21b8 014c cd21 5468 .....!..L.!Th
2 616d 2063 616e 6e6f is program cannot	2 616d 2063 616e 6e6f is program cannot
e 2069 6e20 444f 5320 t be run in DOS	e 2069 6e20 444f 5320 t be run in DOS
a 2400 0000 0000 0000 mode....\$......	a 2400 0000 0000 0000 mode....\$......
) 5df1 9154 0000 0000 PE..L...].T....	) 9ef1 9154 0000 0000 PE..L...].T....
l 0b01 0800 00a2 0000!......	l 0b01 0800 00a2 0000!......
) 6ec1 0000 0020 0000 .....n.....	) 6ec1 0000 0020 0000 .....n.....
) 0020 0000 0002 0000 .....@.....	) 0020 0000 0002 0000@.....
) 0400 0000 0000 0000 .....	) 0400 0000 0000 0000
) 30fb 0000 0300 4085 0 e .	) 3552 0100 0300 4085 5R e .
) 0000 1000 0010 0000 .....	) 0000 1000 0010 0000
) 0000 0000 0000 0000 .....	) 0000 0000 0000 0000
) 00e0 0000 6003 0000 ...K.....	) 00e0 0000 6003 0000 ...K.....
) 0000 0000 0000 0000 .....	) 0000 0000 0000 0000
) 0000 0000 0000 0000 .....	) 0000 0000 0000 0000

Horodatage dans les bibliothèques ADA

./usr/lib/ada/adalib/adacgi/cgi.ali

Offset 67, 15 lines modified

67	D a-strmap.ads»	»	20090409150019	9cb836fb
68	D a-stmaco.ads»	»	20090409150019	cef4434b
69	D a-strunb.ads»	»	20120426100351	3f91d4c5
70	D a-tags.ads»	»	20111212115430	6c0509d0
71	D a-textio.ads»	»	20140129155348	386df5d4
72	D a-uncon.ads»	»	20070406091342	f9eb8f06
73	D cgi.ads»	»	20020903204119	644e0805
74	D cgi.adb»	»	20150531150616	7715e350
75	D interfac.ads»	»	20140225151838	69adb1b9
76	D i-c.ads»	»	20110801143639	5421119b
77	D i-cstrin.ads»	»	20130104124955	341d0ddf
78	D i-cstrea.ads»	»	20130412125801	8128536b
79	D system.ads»	»	20150503190927	90249111
80	D s-atocou.ads»	»	20131010110730	cd7c94ca
81	D s-atocou.adb»	»	20131010121735	62bad392

Offset 67, 15 lines modified

67	D a-strmap.ads»	»	20090409150019	9cb836fb
68	D a-stmaco.ads»	»	20090409150019	cef4434b
69	D a-strunb.ads»	»	20120426100351	3f91d4c5
70	D a-tags.ads»	»	20111212115430	6c0509d0
71	D a-textio.ads»	»	20140129155348	386df5d4
72	D a-uncon.ads»	»	20070406091342	f9eb8f06
73	D cgi.ads»	»	20020903204119	644e0805
74	D cgi.adb»	»	20150531150648	7715e350
75	D interfac.ads»	»	20140225151838	69adb1b9
76	D i-c.ads»	»	20110801143639	5421119b
77	D i-cstrin.ads»	»	20130104124955	341d0ddf
78	D i-cstrea.ads»	»	20130412125801	8128536b
79	D system.ads»	»	20150503190927	90249111
80	D s-atocou.ads»	»	20131010110730	cd7c94ca
81	D s-atocou.adb»	»	20131010121735	62bad392

Horodatage dans les gemspec Ruby

./usr/share/rubygems-integration/all/specifications/ruby-hmac-0.4.0.gemspec

Offset 4, 15 lines modified

```
4 Gem::Specification.new do |s|
5   s.name = "ruby-hmac"
6   s.version = "0.4.0"
7
8   s.required_rubygems_version = Gem::
  Requirement.new(">= 0") if s.
  respond_to?(:required_rubygems_version=)
9   s.require_paths = ["lib"]
10  s.authors = ["Daiki Ueno", "Geoffrey
  Grosenbach"]
11  s.date = "2010-01-19"
   s.description = "This module provides
  common interface to HMAC functionality.
  HMAC is a kind of \"Message
  Authentication Code\" (MAC) algorithm
  whose standard is documented in RFC2104.
```

Offset 4, 15 lines modified

```
4 Gem::Specification.new do |s|
5   s.name = "ruby-hmac"
6   s.version = "0.4.0"
7
8   s.required_rubygems_version = Gem::
  Requirement.new(">= 0") if s.
  respond_to?(:required_rubygems_version=)
9   s.require_paths = ["lib"]
10  s.authors = ["Daiki Ueno", "Geoffrey
  Grosenbach"]
11  s.date = "2010-01-20"
   s.description = "This module provides
  common interface to HMAC functionality.
  HMAC is a kind of \"Message
  Authentication Code\" (MAC) algorithm
  whose standard is documented in RFC2104.
```


Horodatage dans le registre PHP

data.tar.xz

data.tar

./usr/share/php/.registry/.channel.pecl.php.net/oauth.reg

```
"2.0";s:13:"_lastmodified";i:1419537766;} "2.0";s:13:"_lastmodified";i:1419537812;}
```



Horodatage par Cheetah

```
./usr/lib/python2.7/dist-packages/spectacle/dsc/_init_.py
```

```
Offset 28, 18 lines modified
```

```
28 ## MODULE CONSTANTS
29 VFFSL=valueFromFrameOrSearchList
30 VFSL=valueFromSearchList
31 VFN=valueForName
32 currentTime=time.time
33 __CHEETAH_version__ = '2.4.4'
34 __CHEETAH_versionTuple__ = (2, 4, 4, 'development',
35                             0)
35 __CHEETAH_genTime__ = 1433127784.620258
36 __CHEETAH_genTimestamp__ = 'Sun May 31 15:03:04
37 2015'
37 __CHEETAH_src__ = 'dsc.tpl'
38 __CHEETAH_srcLastModified__ = 'Thu Feb 24 18:40:15
39 2011'
39 __CHEETAH_docstring__ = 'Autogenerated by Cheetah:
40 The Python-Powered Template Engine'
40
41 if __CHEETAH_versionTuple__ < RequiredCheetahVersio
42 nTuple:
42     raise AssertionError(
43         'This template was compiled with Cheetah
44         version'
44         '%s. Templates compiled before version %s
45         must be recompiled.'%(
45         __CHEETAH_version__, RequiredCheetahVersio
46         n))
```

```
Offset 28, 18 lines modified
```

```
28 ## MODULE CONSTANTS
29 VFFSL=valueFromFrameOrSearchList
30 VFSL=valueFromSearchList
31 VFN=valueForName
32 currentTime=time.time
33 __CHEETAH_version__ = '2.4.4'
34 __CHEETAH_versionTuple__ = (2, 4, 4, 'development',
35                             0)
35 __CHEETAH_genTime__ = 1433127814.134734
36 __CHEETAH_genTimestamp__ = 'Mon Jun 1 17:03:34
37 2015'
37 __CHEETAH_src__ = 'dsc.tpl'
38 __CHEETAH_srcLastModified__ = 'Fri Feb 25 20:40:15
39 2011'
39 __CHEETAH_docstring__ = 'Autogenerated by Cheetah:
40 The Python-Powered Template Engine'
40
41 if __CHEETAH_versionTuple__ < RequiredCheetahVersio
42 nTuple:
42     raise AssertionError(
43         'This template was compiled with Cheetah
44         version'
44         '%s. Templates compiled before version %s
45         must be recompiled.'%(
45         __CHEETAH_version__, RequiredCheetahVersio
46         n))
```

Horodatage dans la version d'un module

```
5 -rwxr-xr-x root/root .....0 2014-06-13 23:39: 5 -rwxr-xr-x root/root .....0 2014-06-13 23:39:
04 ./usr/lib/python2.7/dist-packages/ 04 ./usr/lib/python2.7/dist-packages/
6 -rwxr-xr-x root/root .....0 2014-06-13 23:39: 6 -rwxr-xr-x root/root .....0 2014-06-13 23:39:
04 ./usr/lib/python2.7/dist-packages/Logbook-0.7. 04 ./usr/lib/python2.7/dist-packages/Logbook-0.7.
0_20150507.egg-info/ 0_20150508.egg-info/
7 -rw-r--r-- root/root .....2107 2014-06-13 23:39: 7 -rw-r--r-- root/root .....2107 2014-06-13 23:39:
04 ./usr/lib/python2.7/dist-packages/Logbook-0.7. 04 ./usr/lib/python2.7/dist-packages/Logbook-0.7.
0_20150507.egg-info/PKG-INFO 0_20150508.egg-info/PKG-INFO
8 -rw-r--r-- root/root .....1 2014-06-13 23:39: 8 -rw-r--r-- root/root .....1 2014-06-13 23:39:
04 ./usr/lib/python2.7/dist-packages/Logbook-0.7. 04 ./usr/lib/python2.7/dist-packages/Logbook-0.7.
0_20150507.egg-info/dependency_links.txt 0_20150508.egg-info/dependency_links.txt
9 -rw-r--r-- root/root .....1 2014-06-13 23:39: 9 -rw-r--r-- root/root .....1 2014-06-13 23:39:
04 ./usr/lib/python2.7/dist-packages/Logbook-0.7. 04 ./usr/lib/python2.7/dist-packages/Logbook-0.7.
0_20150507.egg-info/not-zip-safe 0_20150508.egg-info/not-zip-safe
10 -rw-r--r-- root/root .....8 2014-06-13 23:39: 10 -rw-r--r-- root/root .....8 2014-06-13 23:39:
04 ./usr/lib/python2.7/dist-packages/Logbook-0.7. 04 ./usr/lib/python2.7/dist-packages/Logbook-0.7.
0_20150507.egg-info/top_level.txt 0_20150508.egg-info/top_level.txt
11 -rwxr-xr-x root/root .....0 2014-06-13 23:39: 11 -rwxr-xr-x root/root .....0 2014-06-13 23:39:
04 ./usr/lib/python2.7/dist-packages/logbook/ 04 ./usr/lib/python2.7/dist-packages/logbook/
-rw-r--r-- root/root .....1701 2014-05-12 19:53: -rw-r--r-- root/root .....1701 2014-05-12 19:53:
```

Exemples

Les archives



Horodatage dans le bibliothèques statiques

data.tar

./usr/lib/libform_g.a

metadata

234	14112	Jan	2	06:04	2015	f_trace.o	234	14112	Jan	2	06:22	2015	f_trace.o
234	14336	Jan	2	06:04	2015	fld_arg.o	234	14336	Jan	2	06:22	2015	fld_arg.o
234	16112	Jan	2	06:04	2015	fld_attr.o	234	16112	Jan	2	06:22	2015	fld_attr.o
234	16368	Jan	2	06:04	2015	fld_current.	234	16368	Jan	2	06:22	2015	fld_current.
234	23592	Jan	2	06:04	2015	fld_def.o	234	23592	Jan	2	06:22	2015	fld_def.o
234	14920	Jan	2	06:04	2015	fld_dup.o	234	14920	Jan	2	06:22	2015	fld_dup.o
234	13064	Jan	2	06:04	2015	fld_ftchoice	234	13064	Jan	2	06:22	2015	fld_ftchoice
234	13992	Jan	2	06:04	2015	fld_ftlink.c	234	13992	Jan	2	06:22	2015	fld_ftlink.c
234	13992	Jan	2	06:04	2015	fld_info.o	234	13992	Jan	2	06:22	2015	fld_info.o
234	13616	Jan	2	06:04	2015	fld_just.o	234	13616	Jan	2	06:22	2015	fld_just.o
234	14688	Jan	2	06:04	2015	fld_link.o	234	14688	Jan	2	06:22	2015	fld_link.o
234	13472	Jan	2	06:04	2015	fld_max.o	234	13472	Jan	2	06:22	2015	fld_max.o
234	13208	Jan	2	06:04	2015	fld_move.o	234	13208	Jan	2	06:22	2015	fld_move.o
234	16296	Jan	2	06:04	2015	fld_newftyp.	234	16296	Jan	2	06:22	2015	fld_newftyp.
234	16232	Jan	2	06:04	2015	fld_opts.o	234	16232	Jan	2	06:22	2015	fld_opts.o
234	14312	Jan	2	06:04	2015	fld_pad.o	234	14312	Jan	2	06:22	2015	fld_pad.o
234	13616	Jan	2	06:04	2015	fld_page.o	234	13616	Jan	2	06:22	2015	fld_page.o
234	13504	Jan	2	06:04	2015	fld_stat.o	234	13504	Jan	2	06:22	2015	fld_stat.o
234	14912	Jan	2	06:04	2015	fld_type.o	234	14912	Jan	2	06:22	2015	fld_type.o
234	13488	Jan	2	06:04	2015	fld_user.o	234	13488	Jan	2	06:22	2015	fld_user.o

Horodatage dans le bibliothèques statiques

data.tar

./usr/lib/libuninum.a

No differences found inside, yet data differs

a 2f20 2020 2020 2020 !<arch>./	a 2f20 2020 2020 2020 !<arch>./
0 3134 3231 3837 3334 14218734	0 3134 3231 3837 3334 14218734
0 2020 3020 2020 2020 06 0 0	0 2020 3020 2020 2020 51 0 0
0 3239 3634 2020 2020 0 2964	0 3239 3634 2020 2020 0 2964
a 0000 0bd8 0000 0bd8	a 0000 0bd8 0000 0bd8
3 0000 0bd8 0000 0bd8	3 0000 0bd8 0000 0bd8
3 0000 0bd8 0000 0bd8	3 0000 0bd8 0000 0bd8
3 0000 0bd8 0000 0bd8	3 0000 0bd8 0000 0bd8
3 0000 0bd8 0000 0bd8	3 0000 0bd8 0000 0bd8
0bd8 0000 0bd8 0000 0bd8 0000 0bd8	0bd8 0000 0bd8 0000 0bd8 0000 0bd8
5 6e67 6433 0074 656e engd2.tengd3.ten	5 6e67 6433 0074 656e engd2.tengd3.ten
7 6435 0074 656e 6764 gd4.tengd5.tengd	7 6435 0074 656e 6764 gd4.tengd5.tengd
7 0074 656e 6764 3800 6.tengd7.tengd8.	7 0074 656e 6764 3800 6.tengd7.tengd8.
4 656e 6764 3130 0074 tengd9.tengd10.t	4 656e 6764 3130 0074 tengd9.tengd10.t
0 756e 696e 756d 2e6f engd11..uninum.o	0 756e 696e 756d 2e6f engd11..uninum.o
0 3134 3231 3837 3334 / 14218734	0 3134 3231 3837 3334 / 14218734
0 2020 3132 3334 2020 05 1234 1234	0 2020 3132 3334 2020 50 1234 1234
0 3336 3636 3038 2020 100644 366608	0 3336 3636 3038 2020 100644 366608

Horodatage dans les archives ZIP

data.tar.xz

data.tar

./usr/share/boa-constructor/Docs/boa.apphelp.htb

metadata

```
+--249 lines: Archive:  boa.apphelp.htb-----
minimum file system compatibility required:  MS-DOS, OS/2 or NT FAT
minimum software version required to extract:  2.0
compression method:                          deflated
compression sub-type (deflation):             normal
file security status:                         not encrypted
extended local header:                        no
file last modified on (DOS date/time):        2015 Jan 16 09:55:52
file last modified on (UT extra field modtime): 2015 Jan 16 09:55:52 local
file last modified on (UT extra field modtime): 2015 Jan 16 09:55:52 UTC
32-bit CRC value (hex):                       5bb8662c
compressed size:                              1660 bytes
uncompressed size:                           5682 bytes
length of filename:                          19 characters
length of extra field:                       24 bytes
length of file comment:                      0 characters
```



Horodatage dans les .jar Java

data.tar

./usr/share/java/flute-1.1-SNAPSHOT.jar

metadata

```
l.1-SNAPSHOT.jar                                l.1-SNAPSHOT.jar
1568 bytes, number of entries: 45              1568 bytes, number of entries: 45
inx      0 bx stor 15-Jan-07 20:23 META inx      0 bx stor 15-Jan-07 20:25 META
inx      259 b- defN 15-Jan-07 20:23 META inx      259 b- defN 15-Jan-07 20:25 META
inx      0 b- stor 15-Jan-07 20:23 org/ inx      0 b- stor 15-Jan-07 20:25 org/
inx      0 b- stor 15-Jan-07 20:23 org/ inx      0 b- stor 15-Jan-07 20:25 org/
inx      0 b- stor 15-Jan-07 20:23 org/ inx      0 b- stor 15-Jan-07 20:25 org/
inx      0 b- stor 15-Jan-07 20:23 org/ inx      0 b- stor 15-Jan-07 20:25 org/
inx      0 b- stor 15-Jan-07 20:23 org/ inx      0 b- stor 15-Jan-07 20:25 org/
inx      0 b- stor 15-Jan-07 20:23 org/ inx      0 b- stor 15-Jan-07 20:25 org/
inx      585 b- defN 15-Jan-07 20:23 org/ inx      585 b- defN 15-Jan-07 20:25 org/
inx      5744 b- defN 15-Jan-07 20:23 org/ inx      5744 b- defN 15-Jan-07 20:25 org/
inx      320 b- defN 15-Jan-07 20:23 org/ inx      320 b- defN 15-Jan-07 20:25 org/
```

En fait, ce sont des archives ZIP.

Horodatage dans les archives Tar

data.tar.xz

data.tar

./usr/share/doc/allegro4-doc/examples/source.tar.gz

source.tar

metadata

54	2015-01-09	22:29:44	CMakeLists.txt	54	2015-01-09	22:32:29	CMakeLists.txt
08	2015-01-09	22:29:44	afinfo.c	08	2015-01-09	22:32:29	afinfo.c
19	2015-01-09	22:29:44	akaitest.c	19	2015-01-09	22:32:29	akaitest.c
32	2015-01-09	22:29:44	allegro.pcx	32	2015-01-09	22:32:29	allegro.pcx
70	2015-01-09	22:29:44	digitest.c	70	2015-01-09	22:32:29	digitest.c
10	2015-01-09	22:29:44	ex12bit.c	10	2015-01-09	22:32:29	ex12bit.c
46	2015-01-09	22:29:44	ex3buf.c	46	2015-01-09	22:32:29	ex3buf.c
57	2015-01-09	22:29:44	ex3d.c	57	2015-01-09	22:32:29	ex3d.c
34	2015-01-09	22:29:44	exaccel.c	34	2015-01-09	22:32:29	exaccel.c
06	2015-01-09	22:29:44	exalpha.c	06	2015-01-09	22:32:29	exalpha.c
32	2015-01-09	22:29:44	example.dat	32	2015-01-09	22:32:29	example.dat
55	2015-01-09	22:29:44	example.h	55	2015-01-09	22:32:29	example.h
30	2015-01-09	22:29:44	examples.txt	30	2015-01-09	22:32:29	examples.txt

Login and groupe dans les archives Tar

data.tar.xz

data.tar

./usr/share/doc/raster3d/diffs.tar.gz

diffs.tar

metadata

1	-rw-r--r--	pbuilder1/pbuilder1	1	-rw-r--r--	pbuilder2/pbuilder2
2	-rw-r--r--	pbuilder1/pbuilder1	2	-rw-r--r--	pbuilder2/pbuilder2
3	-rw-r--r--	pbuilder1/pbuilder1	3	-rw-r--r--	pbuilder2/pbuilder2
4	-rw-r--r--	pbuilder1/pbuilder1	4	-rw-r--r--	pbuilder2/pbuilder2
5	-rw-r--r--	pbuilder1/pbuilder1	5	-rw-r--r--	pbuilder2/pbuilder2
6	-rw-r--r--	pbuilder1/pbuilder1	6	-rw-r--r--	pbuilder2/pbuilder2
7	-rw-r--r--	pbuilder1/pbuilder1	7	-rw-r--r--	pbuilder2/pbuilder2
8	-rw-r--r--	pbuilder1/pbuilder1	8	-rw-r--r--	pbuilder2/pbuilder2
9	-rw-r--r--	pbuilder1/pbuilder1	9	-rw-r--r--	pbuilder2/pbuilder2
10	-rw-r--r--	pbuilder1/pbuilder1	10	-rw-r--r--	pbuilder2/pbuilder2
11	-rw-r--r--	pbuilder1/pbuilder1	11	-rw-r--r--	pbuilder2/pbuilder2
12	-rw-r--r--	pbuilder1/pbuilder1	12	-rw-r--r--	pbuilder2/pbuilder2

Ordre aléatoire dans les archives Tar

./usr/src/kfreebsd-source-10.1.tar.xz

kfreebsd-source-10.1.tar

metadata

Offset 1, 13642 lines modified	Offset 1, 13642 lines modified
1 -rwxr-xr-x root/src.....0·2014-12-28·01:39:03·kfreebsd-source-10.1/	1 -rwxrwxr-x root/src.....0·2014-12-28·01:39:03·kfreebsd-source-10.1/
-rwxr-xr-x root/src.....0·2014-12-28·01:39:03·kfreebsd-source-10.1/ sys/	-rwxrwxr-x root/src.....0·2014-12-28·01:39:03·kfreebsd-source-10.1/ sys/
-rwxr-xr-x root/src.....0·2015-05-18·10:57:01·kfreebsd-source-10.1/ sys/conf/	-rwxrwxr-x root/src.....0·2014-12-28·01:37:48·kfreebsd-source-10.1/ sys/geom/
-rw-r--r-- root/src.....106378·2014-09-30·16:55:19·kfreebsd-source-10.1/ sys/conf/NOTES	-rw-rw-r-- root/src.....19301·2012-01-28·14:00:21·kfreebsd-source-10.1/ sys/geom/geom_bsd.c
-rw-r--r-- root/src.....1041·2013-05-21·03:05:49·kfreebsd-source-10.1/ sys/conf/Makefile.i386	-rw-rw-r-- root/src.....20553·2014-10-28·14:01:58·kfreebsd-source-10.1/ sys/geom/geom_disk.c
-rw-r--r-- root/src.....10198·2014-09-23·07:50:04·kfreebsd-source-10.1/ sys/conf/files.pc98	-rw-rw-r-- root/src.....16426·2014-01-07·01:32:23·kfreebsd-source-10.1/ sys/geom/geom_dev.c
-rw-r--r-- root/src.....511·2013-09-17·17:37:04·kfreebsd-source-10.1/ sys/conf/options.powerpc	-rw-rw-r-- root/src.....9446·2010-02-03·01:12:19·kfreebsd-source-10.1/ sys/geom/geom_redboot.c
-rw-r--r-- root/src.....6849·2011-02-18·20:54:12·kfreebsd-source-10.1/ sys/conf/ldscript.sparc64	-rwxrwxr-x root/src.....0·2014-12-28·01:37:47·kfreebsd-source-10.1/ sys/geom/journal/

Exemples

Horodatage dans la doc



Horodatage par Doxygen

data.tar.xz

data.tar

**./usr/share/doc/libnfo-doc/html
/dir_68267d1309a1af8e8297ef4c3efbcdba.html**

```
: <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd"><html><head><meta charset="utf-8" /><title>libnfo ->
emitem:nfo_8h"><td class="memItemLeft" align="right" rowspan="2"><td class="memItemLeft" align="right" rowspan="2">
eparator:"><td class="memSeparator" colspan="2"><td class="memSeparator" colspan="2">
ontents -->
outer part -->
outer"/><address class="footer"><small>
Mon Dec 15 2014 04:03:26 for libnfo by &#1
footer" src="doxygen.png" alt="doxygen" />
ress>
```

Horodatage par docbook-to-man

data.tar.xz

data.tar

ace_netsvcs.1.gz

ace_netsvcs.1

ETSVCS" "1" -----	ETSVCS" "1" -----
vc.conf, /usr/share/doc/ace-netsvcs/ACE-r	vc.conf, /usr/share/doc/ace-netsvcs/ACE-r
dt@cs.wustl.edu>	dt@cs.wustl.edu>
docbook-to-man, Thu 25 Dec 2014, 01:10	docbook-to-man, Thu 25 Dec 2014, 01:23

Horodatage par Groovydoc

./usr/share/doc/libcodenarc-groovy-java/api/groovy/org/codenarc
/AnalysisContext.html

Offset 2, 17 lines modified

```
1 <!-- *****  
2 *****  
3 <!--* PLEASE KEEP COMPLICATED  
EXPRESSIONS OUT OF THESE TEMPLATES, *--  
4 <!--* i.e. only iterate & print data  
where possible. Thanks, Jez.*-->  
5 <!-- *****  
6 *****  
7 <html>  
8 <head>  
9 <!-- Generated by groovydoc (1.8.6) on  
Fri May 08 23:22:43 GMT-12:00 2015 -->  
10 <title>AnalysisContext (Groovy  
Documentation)</title>  
11 <meta name="date" content="2015-05-08">  
12 <link href="../../groovy.ico"  
type="image/x-icon" rel="shortcut icon">
```

Offset 2, 17 lines modified

```
1 <!-- *****  
2 *****  
3 <!--* PLEASE KEEP COMPLICATED  
EXPRESSIONS OUT OF THESE TEMPLATES, *--  
4 <!--* i.e. only iterate & print data  
where possible. Thanks, Jez.*-->  
5 <!-- *****  
6 *****  
7 <html>  
8 <head>  
9 <!-- Generated by groovydoc (1.8.6) on  
Sun May 10 01:25:26 GMT+14:00 2015 -->  
10 <title>AnalysisContext (Groovy  
Documentation)</title>  
11 <meta name="date" content="2015-05-10">  
12 <link href="../../groovy.ico"  
type="image/x-icon" rel="shortcut icon">
```

Horodatage par Epydoc

./usr/share/doc/python-configshell/doc/html/class-tree.html

Offset 126, 15 lines modified

```
126 .....</tr></table></th>
127 ..</tr>
128 </table>
129 <table border="0" cellpadding="0"
130 cellspacing="0" width="100%">
131 ...<tr>
132 ...<td align="left" class="footer">
133 ...Generated by Epydoc 3.0.1
134 ...on Mon Jun 1 04:01:24 2015
135 ...</td>
136 ...<td align="right" class="footer">
137 ...<a target="mainFrame" href="http://
138 /epydoc.sourceforge.net"
139 .....>http://epydoc.sourceforge.net</
140 a>
141 ...</td>
142 ...</tr>
143 ..</tr>
144 </table>
```

Offset 126, 15 lines modified

```
126 .....</tr></table></th>
127 ..</tr>
128 </table>
129 <table border="0" cellpadding="0"
130 cellspacing="0" width="100%">
131 ...<tr>
132 ...<td align="left" class="footer">
133 ...Generated by Epydoc 3.0.1
134 ...on Tue Jun 2 06:03:49 2015
135 ...</td>
136 ...<td align="right" class="footer">
137 ...<a target="mainFrame" href="http://
138 /epydoc.sourceforge.net"
139 .....>http://epydoc.sourceforge.net</
140 a>
141 ...</td>
142 ...</tr>
143 ..</tr>
144 </table>
```


Horodatage par Sphinx

./usr/share/man/man1/bottle.1.gz

bottle.1

Offset 1, 10 lines modified

```
1  .\" Man page generated from  
   reStructuredText.  
2  .  
3  .TH "BOTTLE" "1" "May 12, 2015" "0.12"  
   "Bottle"  
4  .SH NAME  
5  bottle - command line interface  
6  .  
7  .nr rst2man-indent-level 0  
8  .  
9  .del rstReportMargin  
10 \\$1\\n[an-margin]
```

Offset 1, 10 lines modified

```
1  .\" Man page generated from  
   reStructuredText.  
2  .  
3  .TH "BOTTLE" "1" "May 14, 2015" "0.12"  
   "Bottle"  
4  .SH NAME  
5  bottle - command line interface  
6  .  
7  .nr rst2man-indent-level 0  
8  .  
9  .del rstReportMargin  
10 \\$1\\n[an-margin]
```

Horodatage par Ghostscript

data.tar.xz

data.tar

./usr/share/doc/c++-annotations/cplusplus.pdf

pdftk cplusplus.pdf output - uncompress

```
-----  
d='W5M0MpCehiHzreSzNTczkc9d'?>  
a/' x:xmptk='XMP toolkit 2.9.1-13, fram  
3.org/1999/02/22-rdf-syntax-ns#' xmlns:  
er>dvips + GPL Ghostscript 9.06</pdf:Pr :2b7e66bf-d448-11ef-0000-a06d27758a43 '  
Date>2015-01-14T20:23:14Z</xmp:ModifyDa :2b7e66bf-d448-11ef-0000-a06d27758a43 '  
:29Z</xmp:CreateDate>  
rref package</xmp:CreatorTool></rdf:Des  
DocumentID='uuid:b743c33d-d447-11ef-000 :2b7e66bf-d448-11ef-0000-a06d27758a43 '  
t='application/pdf'><dc:title><rdf:Alt> :2b7e66bf-d448-11ef-0000-a06d27758a43 '
```



Horodatage par LaTeX

16999endobj	16999endobj
170001404 0 obj	170001404 0 obj
17001<<	17001<<
17002/ModDate (D:20150603063443-12'00')	17002/ModDate (D:20150604084024+14'00')
17003/Subject ()	17003/Subject ()
/PTEX.Fullbanner: (This is pdfTeX, Version 3.17000414159265-2.6-1.40.15 \(\TeX Live 2015/dev/Debian\) \kpathsea version 6.2.1dev)	/PTEX.Fullbanner: (This is pdfTeX, Version 3.17000414159265-2.6-1.40.15 \(\TeX Live 2015/dev/Debian\) \kpathsea version 6.2.1dev)
17005/CreationDate (D:20150603063443-12'00')	17005/CreationDate (D:20150604084024+14'00')
17006/Author ()	17006/Author ()
17007/Title ()	17007/Title ()
17008/Keywords ()	17008/Keywords ()
17009/Creator (LaTeX with hyperref package)	17009/Creator (LaTeX with hyperref package)
17010/Trapped /False	17010/Trapped /False
17011/Producer (pdfTeX-1.40.15)	17011/Producer (pdfTeX-1.40.15)
17012>>	17012>>
Offset 18417, 14 lines modified	Offset 18417, 14 lines modified
184170000814153 00000 n	184170000814153 00000 n
184180000814195 00000 n	184180000814195 00000 n
184190000814399 00000 n	184190000814399 00000 n
18420trailer	18420trailer
18421	18421
18422<<	18422<<
18423/Info 1404 0 R	18423/Info 1404 0 R
18424/ID: [<0cbe44d40f979041b25e07fe3e515b0f> <0cbe44d40f979041b25e07fe3e515b0f>]	18424/ID: [<fd91169f124fbfe85092d8da582c471a> <fd91169f124fbfe85092d8da582c471a>]
18425/Root 1403 0 R	18425/Root 1403 0 R
18426/Size 1405	18426/Size 1405
18427>>	18427>>

Horodatage par texi2html

./usr/share/doc/ilisp-doc/ilisp.html

Offset 1, 10 lines modified

```
1 <!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html401/loose.dtd">
2 <html>
3 <!-- Created on May 21, 2015 by texi2html 1.82
4 texi2html was written by:
5 .....Lionel Cons <Lionel.Cons@cern.ch> (original author)
6 .....Karl Berry
7 <karl@freefriends.org>
8 .....Olaf Bachmann
9 <obachman@mathematik.uni-kl.de>
10 .....and many others.
11 Maintained by: Many creative people.
12 Send bugs and suggestions to <texi2html-bug@nongnu.org>
```

Offset 1, 10 lines modified

```
1 <!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html401/loose.dtd">
2 <html>
3 <!-- Created on May 22, 2015 by texi2html 1.82
4 texi2html was written by:
5 .....Lionel Cons <Lionel.Cons@cern.ch> (original author)
6 .....Karl Berry
7 <karl@freefriends.org>
8 .....Olaf Bachmann
9 <obachman@mathematik.uni-kl.de>
10 .....and many others.
11 Maintained by: Many creative people.
12 Send bugs and suggestions to <texi2html-bug@nongnu.org>
```

Horodatage par texi2html (suite)

3141	<pre><tr><td></td><td valign="top">Common·Lisp·HyperSpec</td><td valign="top">5.2·Documentation·functions</td></tr></pre>	3141	<pre><tr><td></td><td valign="top">Common·Lisp·HyperSpec</td><td valign="top">5.2·Documentation·functions</td></tr></pre>
3142	<pre><tr><td></td><td valign="top">Common·Lisp·Manual</td><td valign="top">1.1·Configuration·and·compilation</td></tr></pre>		
3143	<pre><tr><td></td><td valign="top">Common·Lisp·manual</td><td valign="top">5.2·Documentation·functions</td></tr></pre>	3142	<pre><tr><td></td><td valign="top">Common·Lisp·manual</td><td valign="top">5.2·Documentation·functions</td></tr></pre>
		3143	<pre><tr><td></td><td valign="top">Common·Lisp·Manual</td><td valign="top">1.1·Configuration·and·compilation</td></tr></pre>
3144	<pre><tr><td></td><td valign="top">Common·Lisp·Manual</td><td valign="top">1.1·Configuration·and·compilation</td></tr></pre>	3144	<pre><tr><td></td><td valign="top">Common·Lisp·Manual</td><td valign="top">1.1·Configuration·and·compilation</td></tr></pre>

Horodatage par help2man

`./usr/share/man/man1/codespell.1.gz`

codespell.1

Offset 1, 9 lines modified	Offset 1, 9 lines modified
1 .\" DO NOT MODIFY THIS FILE! It was generated by help2man 1.46.6.	1 .\" DO NOT MODIFY THIS FILE! It was generated by help2man 1.46.6.
2 .TH CODESPELL "1" "May 2015" "codespell 1.7" "User Commands"	2 .TH CODESPELL "1" "June 2015" "codespell 1.7" "User Commands"
3 .SH NAME	3 .SH NAME
4 codespell - detect spelling mistakes in source code	4 codespell - detect spelling mistakes in source code
5 .SH SYNOPSIS	5 .SH SYNOPSIS
6 \fBcodespell\fR [OPTIONS] [file1 file2 ... fileN]	6 \fBcodespell\fR [OPTIONS] [file1 file2 ... fileN]
7 .SH DESCRIPTION	7 .SH DESCRIPTION
8 .PP	8 .PP
9 codespell is designed to find and fix common misspellings in text files.	9 codespell is designed to find and fix common misspellings in text files.

Horodatage par GNU groff

./usr/share/doc/corosync/html/confdb_context_get.3.html

Offset 1, 9 lines modified

```
1 <!-- Creator.....: groff version 1.22.3 -->
2 <!-- CreationDate: wed May 27 04:13:02 2015 -->
3 <!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
4 "http://www.w3.org/TR/html4/loose.dtd">
5 <html>
6 <head>
7 <meta name="generator" content="groff -Thtml, see www.gnu.org">
8 <meta http-equiv="Content-Type" content="text/html; charset=US-ASCII">
9 <meta name="Content-Style" content="text/css">
```

Offset 1, 9 lines modified

```
1 <!-- Creator.....: groff version 1.22.3 -->
2 <!-- CreationDate: Thu May 28 06:15:35 2015 -->
3 <!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
4 "http://www.w3.org/TR/html4/loose.dtd">
5 <html>
6 <head>
7 <meta name="generator" content="groff -Thtml, see www.gnu.org">
8 <meta http-equiv="Content-Type" content="text/html; charset=US-ASCII">
9 <meta name="Content-Style" content="text/css">
```

Horodatage par Javadoc

./usr/share/doc/libbytecode-java-doc/api/allclasses-frame.html

Offset 1, 14 lines modified

```
1 <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML
  4.01 Transitional//EN" "http://www.w3.
  org/TR/html4/loose.dtd">
2 <!-- NewPage -->
3 <html lang="en">
4 <head>
5 <!-- Generated by javadoc (version 1.7.
  0_79) on Sat May 23 22:30:08 GMT-12:00
  2015 -->
6 <title>All Classes (bytecode API)</
  title>
7 <meta name="date" content="2015-05-23">
8 <link rel="stylesheet" type="text/css"
  href="stylesheet.css" title="Style">
9 </head>
10 <body>
11 <h1 class="bar">All Classes</h1>
12 <div class="indexContainer">
13 <ul>
14 <li><a href="org/biojava/utils/bytecode/
  ByteCode.html" title="class in org.
  biojava.utils.bytecode"
  target="classFrame">ByteCode</a></li>
```

Offset 1, 14 lines modified

```
1 <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML
  4.01 Transitional//EN" "http://www.w3.
  org/TR/html4/loose.dtd">
2 <!-- NewPage -->
3 <html lang="en">
4 <head>
5 <!-- Generated by javadoc (version 1.7.
  0_79) on Mon May 25 00:31:17 GMT+14:00
  2015 -->
6 <title>All Classes (bytecode API)</
  title>
7 <meta name="date" content="2015-05-25">
8 <link rel="stylesheet" type="text/css"
  href="stylesheet.css" title="Style">
9 </head>
10 <body>
11 <h1 class="bar">All Classes</h1>
12 <div class="indexContainer">
13 <ul>
14 <li><a href="org/biojava/utils/bytecode/
  ByteCode.html" title="class in org.
  biojava.utils.bytecode"
  target="classFrame">ByteCode</a></li>
```


Horodatage par man2html

Offset 301, 10 lines modified	Offset 301, 10 lines modified
301 <DT>LICENSE<DD>	301 <DT>LICENSE<DD>
302 </DL>	302 </DL>
303 </DL>	303 </DL>
304 <HR>	304 <HR>
305 This document was created by	305 This document was created by
306 man2html,	306 man2html,
307 using the manual pages. 	307 using the manual pages.
308 Time: 01:02:07 GMT, June 02, 2015	308 Time: 01:03:16 GMT, June 02, 2015
309 </BODY>	309 </BODY>
310 </HTML>	310 </HTML>

Horodatage par LaTeX (.dvi)

data.tar.xz

data.tar

manual.dvi.gz

manual.dvi

b 0000 0000 04b0 1b20	b 0000 0000 04b0 1b20
0 7574 2032 3031 342e TeX output 2014.	0 7574 2032 3031 342e TeX output 2014.
6 3430 8b00 0000 0100 12.11:0640.....	6 3431 8b00 0000 0100 12.11:0641.....
0 0000 0000 0000 0000	0 0000 0000 0000 0000
0 0000 0000 0000 0000	0 0000 0000 0000 0000
d 9ff2 0000 8ea0 0218	d 9ff2 0000 8ea0 0218
b 8d91 63ba d4f3 327c .s.....{.c...2|	b 8d91 63ba d4f3 327c .s.....{.c...2|
0 0800 0000 0463 6d72 {Y.....cmr	0 0800 0000 0463 6d72 {Y.....cmr
0 7490 871c 7970 9078 8.Go....t...yp.x	0 7490 871c 7970 9078 8.Go....t...yp.x
5 7365 7474 696e 6793 7573 696e 6793 .es	5 7365 7474 696e 6793 7573 696e 6793 .es

Exemples

« Compilé le/sur/par »



Horodatage par macros du préprocesseur C

```
80     {"to",1,NULL,'t'},
81     {0,0,0,0}
82 };
83
84 #define MSGSIZE 512
85 #define INPUT_TEXT_SIZE_INIT 32
86
87 char *pgrname ="numconv";
88 char compdate[]="Compiled " __DATE__ " " __TIME__ ;
89
90 void ShowNumberSystems(int which) {
```

package info (click to toggle)

libuninum 2.7-1.1

- links: [PTS](#)
- area: main
- in suites: jessie, sid, wheezy
- size: 1,972 kB
- SLOC: ansic: 9,968; sh:
8,715; tcl: 553; makefile: 78

Horodatage par macros du préprocesseur C

```
190 z_version(void)
191 {
192     printf("Zorp %s (%s)\n"
193           "Revision: %s\n"
194           "Compile-Date: %s %s\n"
195           "Config-Date: %s\n"
196           "Trace: %s\n"
197           "Debug: %s\n"
198           "IPOptions: %s\n"
199           "%s\n"
200           ,
201           BROCHURE_VERSION, VERSION,
202           ZORP_SOURCE_REVISION,
203           __DATE__, __TIME__,
204           ZORP_CONFIG_DATE,
205           ON_OFF_STR(ENABLE_TRACE) ,
206           ON_OFF_STR(ENABLE_DEBUG) ,
207           ON_OFF_STR(ENABLE_IPOPTIONS) ,
```

package info (click to toggle)

zorp 3.9.5-4

- links: [PTS](#)
- area: main
- in suites: jessie, sid, wheezy
- size: 5,412 kB
- ctags: 5,387

Horodatage via Makefile

```
149 genversion.$(OBJEXT): $(genversion_SOURCES) genversion.h
150
151 genversion.h: $(top_builddir)/config.status
152     -rm -f $@ $@.new
153     echo '#define CC "$(CC)'" > $@.new
154     echo '#define BUILT_DATE "'`date`'" >> $@.new
155     echo '#define BUILT_MACH "$(target)'" >> $@.new
156     mv $@.new $@
157
158 version.c: genversion$(EXEEXT)
159     -rm -f version.c
160     ./genversion$(EXEEXT) > version.c
161
162 BUILT_SOURCES += genversion.h version.c
```

package info (click to toggle)

amanda 1:3.3.6-4

- links: [PTS](#), [VCS](#)
- area: main
- in suites: jessie, sid
- size: 25,248 kB
- ctags: 28,823
- SLOC: ansic: 225,464; perl:

Nom de machine enregistré via ./configure

```
364     VERSION="$VERSION (svn$SVN_REV)"
365     fi
366     fi
367     HOSTNAME=`hostname`
368     DATE=`date +"%d.%m.%Y %H:%M:%S %Z"`
369
370     cat > version.h <<EOF
371     /*
372     * anytun version info
373     *
374     * this file was created automatically
375     * do not edit this file directly
376     * use ./configure instead
377     */
378
379     #ifndef ANYTUN_version_h_INCLUDED
380     #define ANYTUN_version_h_INCLUDED
381
382     #define VERSION_STRING_0 " version $VERSION"
383     #define VERSION_STRING_1 "built on $HOSTNAME, $DATE"
```

package info (click to toggle)

anytun 0.3.5-1

- links: [PTS](#), [VCS](#)
- area: main
- in suites: jessie, sid
- size: 1,424 kB
- ctags: 1,339
- SLOC: cpp: 9,126; sh: 618;
makefile: 367

Horodotage via ./configure

```
364     VERSION="$VERSION (svn$SVN_REV)"
365     fi
366     fi
367     HOSTNAME=`hostname`
368     DATE=`date +"%d.%m.%Y %H:%M:%S %Z"`
369
370     cat > version.h <<EOF
371     /*
372     * anytun version info
373     *
374     * this file was created automatically
375     * do not edit this file directly
376     * use ./configure instead
377     */
378
379     #ifndef ANYTUN_version_h_INCLUDED
380     #define ANYTUN_version_h_INCLUDED
381
382     #define VERSION_STRING_0 " version $VERSION"
383     #define VERSION_STRING_1 "built on $HOSTNAME, $DATE"
```

package info (click to toggle)

anytun 0.3.5-1

- links: [PTS](#), [VCS](#)
- area: main
- in suites: jessie, sid
- size: 1,424 kB
- ctags: 1,339
- SLOC: cpp: 9,126; sh: 618;
makefile: 367

Macros m4 pour autoconf (horodatage)

```
75 AC_FLDIGI_SH_DQ([echo $ac_configure_args])
76 AC_DEFINE_UNQUOTED([BUILD_CONFIGURE_ARGS], [$ac_sh_dq], [Configure arguments])
77
78 AC_FLDIGI_SH_DQ([date])
79 AC_DEFINE_UNQUOTED([BUILD_DATE], [$ac_sh_dq], [Build date])
80
81 AC_FLDIGI_SH_DQ([whoami])
82 AC_DEFINE_UNQUOTED([BUILD_USER], [$ac_sh_dq], [Build user])
83
84 AC_FLDIGI_SH_DQ([hostname])
85 AC_DEFINE_UNQUOTED([BUILD_HOST], [$ac_sh_dq], [Build host])
86
87 AC_FLDIGI_SH_DQ([$CXX -v 2>&1 | tail -1])
88 AC_DEFINE_UNQUOTED([BUILD_COMPILER], [$ac_sh_dq], [Compiler])
```

Macros m4 pour autoconf (login)

```
75 AC_FLDIGI_SH_DQ([echo $ac_configure_args])
76 AC_DEFINE_UNQUOTED([BUILD_CONFIGURE_ARGS], [$ac_sh_dq], [Configure arguments])
77
78 AC_FLDIGI_SH_DQ([date])
79 AC_DEFINE_UNQUOTED([BUILD_DATE], [$ac_sh_dq], [Build date])
80
81 AC_FLDIGI_SH_DQ([whoami])
82 AC_DEFINE_UNQUOTED([BUILD_USER], [$ac_sh_dq], [Build user])
83
84 AC_FLDIGI_SH_DQ([hostname])
85 AC_DEFINE_UNQUOTED([BUILD_HOST], [$ac_sh_dq], [Build host])
86
87 AC_FLDIGI_SH_DQ([$CXX -v 2>&1 | tail -1])
88 AC_DEFINE_UNQUOTED([BUILD_COMPILER], [$ac_sh_dq], [Compiler])
```

Macros m4 pour autoconf (nom de machine)

```
75 AC_FLDIGI_SH_DQ([echo $ac_configure_args])
76 AC_DEFINE_UNQUOTED([BUILD_CONFIGURE_ARGS], [$ac_sh_dq], [Configure arguments])
77
78 AC_FLDIGI_SH_DQ([date])
79 AC_DEFINE_UNQUOTED([BUILD_DATE], [$ac_sh_dq], [Build date])
80
81 AC_FLDIGI_SH_DQ([whoami])
82 AC_DEFINE_UNQUOTED([BUILD_USER], [$ac_sh_dq], [Build user])
83
84 AC_FLDIGI_SH_DQ([hostname])
85 AC_DEFINE_UNQUOTED([BUILD_HOST], [$ac_sh_dq], [Build host])
86
87 AC_FLDIGI_SH_DQ([$CXX -v 2>&1 | tail -1])
88 AC_DEFINE_UNQUOTED([BUILD_COMPILER], [$ac_sh_dq], [Compiler])
```

Version du noyau

```
Offset 14520, 19 lines modified
14520 438c20 20626520 706f7369 74697665 0a007369  be positive..si
14521 438c30 6c6c7920 446f6f72 20706f73 6974696f  lly Door positio
14522 438c40 6e202225 73220a00 62616420 446f6f72  n "%s"..bad Door
14523 438c50 20646573 74696e61 74696f6e 20222573  destination "%s
14524 438c60 220a0073 696c6c79 20446f6f 72206465  ".silly Door de
14525 438c70 7374696e 6174696f 6e202225 73220a00  stination "%s"..
14526 438c80 252a7300 00000000 506c6174 666f726d  %s.....Platform
14527 438c90 3a20204c 696e7578 20332e31 362e302d  ..Linux 3.16.0-
14528 438ca0 302e6270 6f2e342d 616d6436 34000000  0.bpo.4-and64...
14529 438cb0 4275696c 643a2020 46726920 4d617920  Build: Fri May
14530 438cc0 31352031 333a3238 3a353120 474d542b  15 13:28:51 GMT+
14531 438cd0 31322032 30313500  ..12 2015.....
14532Contents of section .eh_frame_hdr:
14533 438cd8 011b033b 440b0000 67010000 48acfcf  ....;D...g...H...
14534 438ce8 900b0000 58b9fcff 402c0000 d8b9fcff  ....X...@.....
14535 438cf8 d01a0000 96d0fcff 600b0000 98d1fcff  ....X.....@.....
14536 438d08 b80b0000 58d2fcff f80b0000 78d2fcff  ....X.....x....
14537 438d18 100c0000 f8d2fcff 380c0000 a8d3fcff  ....8.....
14538 438d28 600c0000 e8d3fcff 800c0000 e8f6fcff  ....8.....

Offset 14520, 19 lines modified
14520 438c20 20626520 706f7369 74697665 0a007369  be positive..si
14521 438c30 6c6c7920 446f6f72 20706f73 6974696f  lly Door positio
14522 438c40 6e202225 73220a00 62616420 446f6f72  n "%s"..bad Door
14523 438c50 20646573 74696e61 74696f6e 20222573  destination "%s
14524 438c60 220a0073 696c6c79 20446f6f 72206465  ".silly Door de
14525 438c70 7374696e 6174696f 6e202225 73220a00  stination "%s"..
14526 438c80 252a7300 00000000 506c6174 666f726d  %s.....Platform
14527 438c90 3a20204c 696e7578 20332e36 2e35362d  ..Linux 2.6.56-
14528 438ca0 302e6270 6f2e342d 616d6436 34000000  0.bpo.4-and64...
14529 438cb0 4275696c 643a2020 53617420 4d617920  Build: Sat May
14530 438cc0 31362031 353a3239 3a323820 474d542b  16 15:29:28 GMT
14531 438cd0 31342032 30313500  ..14 2015.....
14532Contents of section .eh_frame_hdr:
14533 438cd8 011b033b 440b0000 67010000 48acfcf  ....;D...g...H...
14534 438ce8 900b0000 58b9fcff 402c0000 d8b9fcff  ....X...@.....
14535 438cf8 d01a0000 96d0fcff 600b0000 98d1fcff  ....X.....@.....
14536 438d08 b80b0000 58d2fcff f80b0000 78d2fcff  ....X.....x....
14537 438d18 100c0000 f8d2fcff 380c0000 a8d3fcff  ....8.....
14538 438d28 600c0000 e8d3fcff 800c0000 e8f6fcff  ....8.....
```

Points bonus

```
int they_used_the_source()
{
    /*
     * A little joke for the programmers. If *you* built it
     * from source less than 1 hour ago you get...
     *
     * a million bonus points.
     *
     * (Hey, the _very first_ thing the game tells you is
     * "Uuuuse the Soooooresource!!!!" It's not kidding. :-)
     */

    struct timeval now;
    int uid;

    gettimeofday(&now, NULL);
    uid = getuid();

    return (uid == builder &&
            now.tv_sec - builtat > 0 &&
            now.tv_sec - builtat < 60*60);
}
```

package info (click to toggle)

wordwarvi 1.00+dfsg1-3

- links: [PTS](#)
- area: main
- in suites: jessie, sid, stretch
- size: 5,600 kB
- SLOC: ansic: 12,754;
makefile: 105

Exemples

Aléatoire



Ordre aléatoire des hash Perl

cf. *Algorithmic complexity attacks* perlsec(1).

data.tar.xz

data.tar

./usr/share/perl5/GBrowse/ConfigData.pm

Offset 161, 22 lines modified

```
161
162 =cut
163
164
165   _DATA_
166 do{ my $x = [
167   .....{
168   ..... 'conf' => '/etc/gbrowse',
169   ..... 'databases' => '/var/lib/gbrowse/
170   ..... 'installetc' => 'y',
171   ..... 'registration_done' => '1',
172   ..... 'config_done' => 1,
173   ..... 'cgibin' => '/usr/lib/cgi-bin/gbrowse',
174   ..... 'persistent' => '/var/lib/gbrowse',
175   ..... 'OpenIDConsumerSecret' =>
176   ..... '201066527966744',
177   ..... 'tmp' => '/var/cache/gbrowse',
178   ..... 'htdocs' => '/usr/share/gbrowse/htdocs'
179   ..... },
180   ..... {},
181   ..... {}
182   ..... };
```

Offset 161, 22 lines modified

```
161
162 =cut
163
164
165   _DATA_
166 do{ my $x = [
167   .....{
168   ..... 'installetc' => 'y',
169   ..... 'config_done' => 1,
170   ..... 'conf' => '/etc/gbrowse',
171   ..... 'registration_done' => '1',
172   ..... 'OpenIDConsumerSecret' =>
173   ..... '564731985781676',
174   ..... 'htdocs' => '/usr/share/gbrowse/htdocs',
175   ..... 'tmp' => '/var/cache/gbrowse',
176   ..... 'cgibin' => '/usr/lib/cgi-bin/gbrowse',
177   ..... 'persistent' => '/var/lib/gbrowse',
178   ..... 'databases' => '/var/lib/gbrowse/
179   ..... databases'
180   ..... },
181   ..... {},
182   ..... {}
183   ..... };
```

Numéro de série aléatoire dans les flux Ogg

```
./usr/share/games/kiki-the-nano-bot/sound/atom_digest.ogg
Offset 1, 13 lines modified                                Offset 1, 13 lines modified
1 00000000: 4f67 6753 0002 0000 0000 0000 0000 ebef OggS..... 0 1 00000000: 4f67 6753 0002 0000 0000 0000 0000 d0fb OggS.....
2 00000010: 8b2e 0000 0000 e32e 097e 011e 0176 6f72 . . . . . 6 . . . . . vor 2 00000010: 6223 0000 0000 bf07 2fe7 011e 0176 6f72 b# . . . . . + . . . . . vor
3 00000020: 6269 7300 0000 0001 112b 0000 0000 0000 bis . . . . . 3 3 00000020: 6269 7300 0000 0001 112b 0000 0000 0000 bis . . . . . + . . . . . vor
4 00000030: 4871 0000 0000 0000 9901 4f67 6753 0000 Hq . . . . . OggS . 4 00000030: 4871 0000 0000 0000 9901 4f67 6753 0000 Hq . . . . . OggS .
5 00000040: 0000 0000 0000 0000 ebef 8b2e 0100 0000 . . . . . 0 . . . . . 5 00000040: 0000 0000 0000 0000 d0fb 6223 0100 0000 . . . . . b# . . . . . 5
6 00000050: 77b2 1810 0b3f ffff ffff ffff ffff ffb5 w . . . . . ? . . . . . 6 00000050: 9878 bac1 0b3f ffff ffff ffff ffff ffb5 . x . . . . . ? . . . . . 6
7 00000060: 0376 6f72 6269 732f 0000 0058 6970 682e . vorbis/.Xiph. 7 00000060: 0376 6f72 6269 732f 0000 0058 6970 682e . vorbis/.Xiph. 7
8 00000070: 4f72 6720 6c69 6256 6f72 6269 7320 4920 Org libVorbis I 8 00000070: 4f72 6720 6c69 6256 6f72 6269 7320 4920 Org libVorbis I 8
9 00000080: 3230 3134 3031 3232 2028 5475 7270 616b 20140122 (Turpak 9 00000080: 3230 3134 3031 3232 2028 5475 7270 616b 20140122 (Turpak
10 00000090: c3a4 72c3 a46a 6969 6e29 0000 0105 . . . . . r . j i i n ) . . . . . 10 00000090: c3a4 72c3 a46a 6969 6e29 0000 0105 . . . . . r . j i i n ) . . . . .
11 000000a0: 766f 7262 6973 1242 4356 0100 0001 000c vorbis.BCV . . . . . 11 000000a0: 766f 7262 6973 1242 4356 0100 0001 000c vorbis.BCV . . . . .
12 000000b0: 5214 2125 1953 4a63 0895 5252 2905 1d63 R ! % $ j c . . R R ) . c 12 000000b0: 5214 2125 1953 4a63 0895 5252 2905 1d63 R ! % $ j c . . R R ) . c
13 000000c0: 505b 471d 63d4 3946 2164 1053 8849 19a5 P [ G . c . 9 f i d . S . I . . 13 000000c0: 505b 471d 63d4 3946 2164 1053 8849 19a5 P [ G . c . 9 f i d . S . I . .
Offset 159, 16 lines modified                             Offset 159, 16 lines modified
159 000009e0: a594 524a 0925 9452 4a29 a594 524a 2921 . . R J . % R J ) . . R J ) ! 159 000009e0: a594 524a 0925 9452 4a29 a594 524a 2921 . . R J . % R J ) . . R J ) !
160 000009f0: 9452 4a29 a594 524a 29a5 0000 8003 0700 . . R J ) . . R J ) . . . . . 160 000009f0: 9452 4a29 a594 524a 29a5 0000 8003 0700 . . R J ) . . R J ) . . . . .
161 00000a00: 8000 23e8 24a3 ca22 6c34 e1c2 0310 0000 . . # $ . " 14 . . . . . 161 00000a00: 8000 23e8 24a3 ca22 6c34 e1c2 0310 0000 . . # $ . " 14 . . . . .
162 00000a10: 0002 0002 4c00 8f01 8282 5108 0284 1108 . . . . . L . . . . . Q . . . . . 162 00000a10: 0002 0002 4c00 8f01 8282 5108 0284 1108 . . . . . L . . . . . Q . . . . .
163 00000a20: 0000 0000 0008 00f8 0000 480a 8088 8868 . . . . . H . . . . . h 163 00000a20: 0000 0000 0008 00f8 0000 480a 8088 8868 . . . . . H . . . . . h
164 00000a30: e60c 0e10 1214 1618 1a1c 1e20 2224 0000 . . . . . " $ . . . . . 164 00000a30: e60c 0e10 1214 1618 1a1c 1e20 2224 0000 . . . . . " $ . . . . .
165 00000a40: 0000 0000 0000 0000 0000 0000 044f 6767 5300 . . . . . OggS . 165 00000a40: 0000 0000 0000 0000 0000 0000 044f 6767 5300 . . . . . OggS .
166 00000a50: 04af 1200 0000 0000 000b 8fb8 2802 0000 . . . . . 0 . . . . . 166 00000a50: 04af 1200 0000 0000 000b 8fb8 2802 0000 . . . . . b# . . . . .
167 00000a60: 001c e1ae ba14 5e40 3b47 4c37 3a49 3f42 . . . . . % g : L 7 : I P B 167 00000a60: 004c b09e da14 5e40 3b47 4c37 3a49 3f42 . . . . . L . . . . . % g : L 7 : I P B
168 00000a70: 4046 3c36 4b4a 494b 5b59 a6eb c648 a583 @ F < 6 K J I K [ Y . . H . 168 00000a70: 4046 3c36 4b4a 494b 5b59 a6eb c648 a583 @ F < 6 K J I K [ Y . . H .
169 00000a80: 01c0 4064 a003 c3f1 2b47 af3d 7cfd e12b . . e d . . + G . = | . + 169 00000a80: 01c0 4064 a003 c3f1 2b47 af3d 7cfd e12b . . e d . . + G . = | . +
170 00000a90: 472f a5ed 4976 9229 e5e5 15e7 e3b5 e9df G / . I v . . . . . 170 00000a90: 472f a5ed 4976 9229 e5e5 15e7 e3b5 e9df G / . I v . . . . .
171 00000aa0: c9f2 f202 c7eb f9eb 3b2a 2a00 78f9 70db . . . . . * . x . p . 171 00000aa0: c9f2 f202 c7eb f9eb 3b2a 2a00 78f9 70db . . . . . * . x . p .
172 00000ab0: 1415 1588 bcc8 8bbc 983c 8a4f 03b5 e5aa . . . . . < . 0 . . . . . 172 00000ab0: 1415 1588 bcc8 8bbc 983c 8a4f 03b5 e5aa . . . . . < . 0 . . . . .
173 00000ac0: aaba aaaa aaaa 0913 264c 9830 4165 d51a . . . . . & L . 0 a e . . 173 00000ac0: aaba aaaa aaaa 0913 264c 9830 4165 d51a . . . . . & L . 0 a e . .
174 00000ad0: accl 1a8e e888 d600 92e2 39ee fd62 c108 . . . . . 9 . b . . 174 00000ad0: accl 1a8e e888 d600 92e2 39ee fd62 c108 . . . . . 9 . b . .
```


Ordre aléatoire des imports dans du Python

`./usr/share/eric/modules/Cooperation/Ui_ChatWidget.py`

Offset 201, 10 lines modified	Offset 201, 10 lines modified
<code>.....self.clearHostsButton.</code>	<code>.....self.clearHostsButton.</code>
<code>201 setText(_translate("ChatWidget", "</code>	<code>201 setText(_translate("ChatWidget", "</code>
<code>"Clear", None))</code>	<code>"Clear", None))</code>
<code>.....self.connectionLed.</code>	<code>.....self.connectionLed.</code>
<code>202 setToolTip(_translate("ChatWidget", "</code>	<code>202 setToolTip(_translate("ChatWidget", "</code>
<code>"Shows the connection status", None))</code>	<code>"Shows the connection status", None))</code>
<code>.....self.serverGroup.</code>	<code>.....self.serverGroup.</code>
<code>203 setTitle(_translate("ChatWidget", "</code>	<code>203 setTitle(_translate("ChatWidget", "</code>
<code>"Server", None))</code>	<code>"Server", None))</code>
<code>.....self.label_4.</code>	<code>.....self.label_4.</code>
<code>204 setText(_translate("ChatWidget", "</code>	<code>204 setText(_translate("ChatWidget", "</code>
<code>"Port:", None))</code>	<code>"Port:", None))</code>
<code>.....self.serverPortSpin.</code>	<code>.....self.serverPortSpin.</code>
<code>205 setToolTip(_translate("ChatWidget", "</code>	<code>205 setToolTip(_translate("ChatWidget", "</code>
<code>"Enter the server port", None))</code>	<code>"Enter the server port", None))</code>
<code>.....self.serverLed.</code>	<code>.....self.serverLed.</code>
<code>206 setToolTip(_translate("ChatWidget", "</code>	<code>206 setToolTip(_translate("ChatWidget", "</code>
<code>"Shows the status of the server",</code>	<code>"Shows the status of the server",</code>
<code>None))</code>	<code>None))</code>
<code>207</code>	<code>207</code>
<code>208 from ESGui.ESLed import ESLed</code>	<code>208 from ESGui.ESLed import ESLed</code>
<code>209 from ESGui.ESComboBox import</code>	<code>208 from ESGui.ESComboBox import</code>
<code>ESClearableComboBox</code>	<code>ESClearableComboBox</code>
<code>210 from ESGui.ESLineEdit import</code>	<code>209 from ESGui.ESLineEdit import</code>
<code>ESClearableLineEdit</code>	<code>ESClearableLineEdit</code>
<code>210 from ESGui.ESLed import ESLed</code>	<code>210 from ESGui.ESLed import ESLed</code>

Exemples

Toujours plus d'horodatage !



Horodatage dans les EPUB

/usr/share/doc/ubuntu-packaging-guide-epub-de/ubuntu-packaging-guide.epub

content.opf

Offset 5, 15 lines modified

```
5 <?xml:lang="http://www.w3.org/XML/1998/namespace" />
6 <dc:language>de</dc:language>
7 <dc:title>Ubuntu Packaging Guide</dc:title>
8 <dc:creator opf:role="aut">Ubuntu Developers</dc:creator>
9 <dc:publisher>Ubuntu Developers</dc:publisher>
10 <dc:rights>2010-2014 , Ubuntu Developers, Creative Commons Attribution-ShareAlike 3.0</dc:rights>
11 <dc:identifier id="unknown" opf:scheme="unknown">unknown</dc:identifier>
12 <dc:date>2015-05-24</dc:date>
13 </metadata>
14 <manifest>
15 <item id="ncx" href="toc.ncx" media-type="application/x-dtbncx+xml" />
16 <item id="epub-0"
17 href="search.html"
18 media-type="application/xhtml+xml" />
19 <item id="epub-1"
```

Offset 5, 15 lines modified

```
5 <?xml:lang="http://www.w3.org/XML/1998/namespace" />
6 <dc:language>de</dc:language>
7 <dc:title>Ubuntu Packaging Guide</dc:title>
8 <dc:creator opf:role="aut">Ubuntu Developers</dc:creator>
9 <dc:publisher>Ubuntu Developers</dc:publisher>
10 <dc:rights>2010-2014 , Ubuntu Developers, Creative Commons Attribution-ShareAlike 3.0</dc:rights>
11 <dc:identifier id="unknown" opf:scheme="unknown">unknown</dc:identifier>
12 <dc:date>2015-05-25</dc:date>
13 </metadata>
14 <manifest>
15 <item id="ncx" href="toc.ncx" media-type="application/x-dtbncx+xml" />
16 <item id="epub-0"
17 href="search.html"
18 media-type="application/xhtml+xml" />
19 <item id="epub-1"
```

Offset 61, 27 lines modified

```
61 <item id="epub-15"
62 href="static/pygments.css"
63 media-type="text/css" />
64 <item id="epub-16"
65 href="images/kde toys-udd-diff.png"
66 media-type="image/png" />
67 <item id="epub-17"
68 href="images/kde toys-udd-branch.png"
69 media-type="image/png" />
70 <item id="epub-18"
71 href="images/fixing-a-bug.png"
72 media-type="image/png" />
73 <item id="epub-19"
74 href="images/cycle-process.png"
75 media-type="image/png" />
76 <item id="epub-20"
77 href="images/cycle-items.png"
78 media-type="image/png" />
79 <item id="epub-21"
80 href="images/cycle-branching.png"
81 media-type="image/png" />
82 <item id="epub-22"
83 href="ubuntu-packaging-guide/udd-working.html"
84 media-type="application/xhtml+xml" />
85 <item id="epub-23"
86 href="ubuntu-packaging-guide/udd-uploading.html"
87 media-type="application/xhtml+xml" />
```

Offset 61, 27 lines modified

```
61 <item id="epub-15"
62 href="static/pygments.css"
63 media-type="text/css" />
64 <item id="epub-16"
65 href="images/kde toys-udd-diff.png"
66 media-type="image/png" />
67 <item id="epub-17"
68 href="images/cycle-branching.png"
69 media-type="image/png" />
70 <item id="epub-18"
71 href="images/cycle-process.png"
72 media-type="image/png" />
73 <item id="epub-19"
74 href="images/cycle-items.png"
75 media-type="image/png" />
76 <item id="epub-20"
77 href="images/fixing-a-bug.png"
78 media-type="image/png" />
79 <item id="epub-21"
80 href="images/kde toys-udd-branch.png"
81 media-type="image/png" />
82 <item id="epub-22"
83 href="ubuntu-packaging-guide/udd-working.html"
84 media-type="application/xhtml+xml" />
85 <item id="epub-23"
86 href="ubuntu-packaging-guide/udd-uploading.html"
87 media-type="application/xhtml+xml" />
```



Horodatage dans les PNG

Even images!

data.tar.xz

data.tar

./usr/share/icons/hicolor/128x128/apps/hedgewars.png

sng

```
1 +--104 lines: #SNG: from stdin-----
105 ( 64,141,230) # rgb = (0x40,
106 }
107 bKGD {index: 12}
108 tRNS {
109 0}
110 tIME {
111 # 31 Dec 2014 05:46:02 GMT
112 year: 2014
113 month: 12
114 day: 31
115 hour: 5
116 minute: 46
117 second: 2
118 }
119 tEXt {
120 keyword: "date:create";
121 text: "2014-12-31T05:46:00+00:00"
122 }
```

```
1 +--104 lines: #SNG: from stdin-----
105 ( 64,141,230) # rgb = (0x40,
106 }
107 bKGD {index: 12}
108 tRNS {
109 0}
110 tIME {
111 # 31 Dec 2014 05:52:27 GMT
112 year: 2014
113 month: 12
114 day: 31
115 hour: 5
116 minute: 52
117 second: 27
118 }
119 tEXt {
120 keyword: "date:create";
121 text: "2014-12-31T05:52:25+00:00"
122 }
```

Horodatage dans les polices TrueType

And fonts!

```
13 maxp checksum=13eb5000 actual=13eb5000 diff=0 13 maxp checksum=13eb5000 actual=13eb5000 diff=0
   offset=312 len=6 offset=312 len=6
14 name checksum=6567317b actual=6567317b diff=0 14 name checksum=6668317b actual=6668317b diff=0
   offset=416 len=14001 offset=416 len=14001
15 post checksum=fee1003c actual=fee1003c diff=0 15 post checksum=fee1003c actual=fee1003c diff=0
   offset=17572 len=32 offset=17572 len=32
16 16
17 17
18 Created by FontForge 14:57:31-July-2012 18 Created by FontForge 14:57:31-July-2012
19 » Font created: Fri Jan 2 17:14:45 2009 19 » Font created: Fri Jan 2 17:14:45 2009
20 » Font modified: Fri May 22 12:52:50 2015 20 » Font modified: Fri May 22 12:54:01 2015
21 21
22 22
23 HEAD table (at 220) 23 HEAD table (at 220)
24 » Version=1 24 » Version=1
25 » fontRevision=4.29999 25 » fontRevision=4.29999
26 » checksumAdj=f8f2fd65 26 » checksumAdj=f6f0fc49
27 » magicNumber=5f0f3cf5 (0x5f0f3cf5, diff=0) 27 » magicNumber=5f0f3cf5 (0x5f0f3cf5, diff=0)
28 » flags=28b baseline_at_0 lsb_at_0 28 » flags=28b baseline_at_0 lsb_at_0
   ppem_to_int ppem_to_int
29 » unitsPerEm=1000 29 » unitsPerEm=1000
30 » create[0]=0 30 » create[0]=0
31 » create[1]=c583fc05 31 » create[1]=c583fc05
32 » File created: Fri Jan 2 17:14:45 2009 32 » File created: Fri Jan 2 17:14:45 2009
33 » modtime[0]=0 33 » modtime[0]=0
34 » modtime[1]=d184d722 34 » modtime[1]=d184d769
35 » File modified: Fri May 22 12:52:50 2015 35 » File modified: Fri May 22 12:54:01 2015
36 » xmin=-840 36 » xmin=-840
```

Problèmes identifiés (suite)

- Chemin du dossier de compilation
- Enregistrement de l'environnement (par exemple le PATH)
- Permissions des fichiers
- Signature cryptographique
- Et il en manque de nombreux autres...



Comment corriger?

- Horodatage :
 - ▶ Préférer une référence précise au code en train d'être compilé (numéro de version, hash du commit git)
 - ▶ Utiliser une date de référence (dernière modification du code)
 - ▶ Utiliser le fuseau horaire UTC
- Ordre aléatoire :
 - ▶ Trier les clés ou les fichiers



Comment corriger? (suite)

- Chemins :
 - ▶ Utiliser toujours le même dossier
- Noyau, processeur, login, ... :
 - ▶ Ne pas enregistrer d'informations inutiles dans les binaires

On peut aussi nettoyer *a posteriori*.



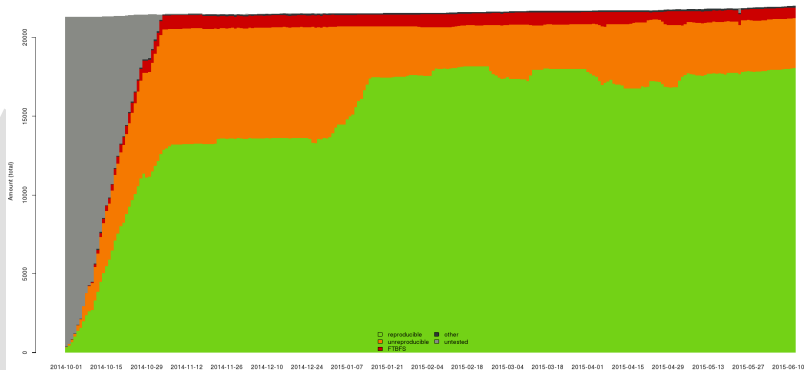
strip-nondeterminism

- Normalise divers formats de fichiers
- Gère pour l'instant :
 - ▶ Archives ar (. a)
 - ▶ gzip
 - ▶ Java jar
 - ▶ Javadoc HTML
 - ▶ Maven pom.properties
 - ▶ PNG
 - ▶ Archives ZIP
- Écrit en Perl (tout comme dpkg-dev)



Où en est-on dans Debian?

Reproducibility status for packages in 'unstable'



Pour celles et ceux dans le fond

82%

plus de 18 000 paquets sources !



Pour celles et ceux dans le fond

82%

plus de 18 000 paquets sources !
(dans notre environnement de test)



Toujours en phase expérimentale

- Il n'est pas encore possible de recompiler de façon reproductible des paquets livrés par Debian.
- On teste et raffine des changements sur les outils de compilation dans un dépôt à part.
- Prochaines étapes :
 - ▶ Permettre les `.buildinfo` dans l'archive (#763822)
 - ▶ Faire rentrer les changements pour `dpkg`
 - ▶ Avoir les `.buildinfo` sur les miroirs
 - ▶ Terminer le script `srebuild` (#774415)



D'autres distributions

- Fedora
<http://securityblog.redhat.com/2013/09/18/reproducible-builds-for-fedora/>
- OpenSUSE build-compare
<https://build.opensuse.org/package/show/openSUSE:Factory/build-compare>
- NixOS
<http://lists.science.uu.nl/pipermail/nix-dev/2013-June/011357.html>
- FreeBSD
<https://wiki.freebsd.org/ReproducibleBuilds> and
<https://wiki.freebsd.org/PortsReproducibleBuilds>
- OpenWrt
<https://lists.openwrt.org/pipermail/openwrt-devel/2015-March/032136.html>

Partout ailleurs?



- Venez discuter!

Partout ailleurs?

- La compilation reproductible doit devenir **la norme**.
- On peut aider à faire du test en continu.
- La documentation sur le wiki de Debian souhaite être utile à tout le monde.



Merci

- Asheesh Laroia, Holger Levsen, Reiner Herrmann, Mattia Rizzolo, Daniel Kahn Gilmor, et tellement d'autres...
- Mike Perry et Seth Schoen pour le talk au 31C3
- ProfitBricks pour le sponser de `jenkins.debian.net`
- Globalsign pour les certificats X.509
- Les designers des icônes Tango
- Toutes celles et ceux qui nous soutiennent!



Des questions? Des commentaires?



<https://wiki.debian.org/ReproducibleBuilds>
[https://reproducible.debian.net/](https://reproducible.debian.net/#debian-reproducible)
#debian-reproducible on OFTC

Lunar 0603 CCFD 9186 5C17 E88D
4C79 8382 C95C 2902 3DF9

