

Package ‘contentid’

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Title An Interface for Content-Based Identifiers

Description An interface for creating, registering, and resolving content-based identifiers for data management. Content-based identifiers rely on the 'cryptographic' hashes to refer to the files they identify, thus, anyone possessing the file can compute the identifier using a well-known standard algorithm, such as 'SHA256'. By registering a URL at which the content is accessible to a public archive (such as Hash Archive) or depositing data in a scientific repository such 'Zenodo', 'DataONE' or 'SoftwareHeritage', the content identifier can serve many functions typically associated with A Digital Object Identifier ('DOI'). Unlike location-based identifiers like 'DOIs', content-based identifiers permit the same content to be registered in many locations.

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Encoding UTF-8

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URL <https://github.com/cboettig/contentid>

BugReports <https://github.com/cboettig/contentid/issues>

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content_dir	<i>content store home directory</i>
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Description

A configurable default location for persistent data storage

Usage

```
content_dir(dir = Sys.getenv("CONTENTID_HOME", tools::R_user_dir("contentid")))
```

Arguments

dir directory to be used as the home directory

Details

This function is intended to be called internally with no arguments. It will use the directory set by the system environmental variable CONTENTID_HOME, if set. Otherwise, it will use the default location returned by [tools::R_user_dir](#) for the application, contentid. Unlike rappdirs function, this function will also create the directory if it does not yet exist.

Examples

```
## example using temporary storage:
Sys.setenv(CONTENTID_HOME=tempdir())
content_dir()

## clean up
Sys.unsetenv("CONTENTID_HOME")

## Or explicitly with an argument:
content_dir(tempdir())
```

content_id	<i>Generate a content uri for a local file</i>
------------	--

Description

Generate a content uri for a local file

Usage

```
content_id(
  file,
  algos = default_algos(),
  raw = TRUE,
  as.data.frame = length(algos) > 1
)
```

Arguments

file	path to the file, URL, or a <code>base::file</code> connection
algos	Which algorithms should we compute contentid for? Default "sha256", see details.
raw	Logical, should compressed data be left as compressed binary?
as.data.frame	should the output be coerced into a data.frame? Default is FALSE if only one algorithm is computed, otherwise TRUE.

Details

See <https://github.com/hash-uri/hash-uri> for an overview of the content uri format and comparison to similar approaches.

Compressed file streams will have different raw (binary) and uncompressed hashes. Set `raw = FALSE` to allow `base::file` connection to uncompress common compression streams before calculating the hash, but this will be slower.

Value

a content identifier URI If multiple algorithms are requested, `content_id` will return a `data.frame` with one column per algorithm and one row for each input file. Otherwise it will return a character vector with one identifier URI for each input file. See argument `as.data.frame` above.

Examples

```
## local file
path <- system.file("extdata", "vostok.icecore.co2", package = "contentid")
content_id(path)
```

```
content_id(paste0("https://knb.ecoinformatics.org/knb/d1/mn/v2/object/",
                 "ess-dive-457358fdc81d3a5-20180726T203952542"))
```

history_swh	<i>return the history of archive events of a given software repository</i>
-------------	--

Description

Note that unlike the generic [query_history](#) method, SWH history is repo-specific rather than content-specific. An archive event adds all content from the repo to the Software Heritage archival snapshot at once. Any individual file can still be referenced by its content identifier.

Usage

```
history_swh(origin_url, host = "https://archive.softwareheritage.org", ...)
```

Arguments

<code>origin_url</code>	The url address to a GitHub, GitLab, or other recognized repository origin
<code>host</code>	the domain name for the Software Heritage API
<code>...</code>	additional arguments

See Also

[query_history](#), [store_swh](#), [sources_swh](#)

Examples

```
history_swh("https://github.com/CSSEGISandData/COVID-19")
```

pin

Access the latest content at a URL

Description

This will download the requested object to a local cache and return the local path of the object. first time it is run, and then use a local cache unless content has changed. This behavior is similar to `pins::pin()`, but uses cryptographic content hashes. Because content hashes are computed in a fast public content registry, this will usually be faster than downloading on a local connection, but slower than checking eTags in headers. Use [resolve](#)

Usage

```
pin(  
  url,  
  verify = TRUE,  
  dir = content_dir(),  
  registries = "https://hash-archive.org"  
)
```

Arguments

<code>url</code>	a URL to a web resource
<code>verify</code>	logical, default TRUE. Should we verify the content identifier (SHA-256 hash) of content at the URL before we look for a local cache?
<code>dir</code>	path to the local store directory. Defaults to first local registry given to the <code>registries</code> argument.
<code>registries</code>	list of registries at which to register the URL

Details

at this time, verify mode cannot process FTP resources. Use `verify = FALSE` to enable a fast read from cache. This essentially allows a URL to act as an identifier, and is a good choice for URLs known to be version stable. If `verify = FALSE`, this will merely attempt to find a local copy of data previously associated (registered) at that URL. It will not attempt to compute the content identifier of the content at the URL, thus the local copy may or may not match the content at that address.

See Also

[resolve](#)

Examples

```
url <- paste0("https://data.giss.nasa.gov/gistemp/graphs/graph_data/",
             "Global_Mean_Estimates_based_on_Land_and_Ocean_Data/graph.txt")

x <- pin(url)

## Faster if we're okay assuming URL is content-stable
x <- pin(url, verify = FALSE)
```

purge_cache

Purge older files from the local cache.

Description

Deletes oldest files until cache size is below the threshold size. Additionally, users can specify a maximum age in days to delete all files older than the threshold, which can speed up file purge in large stores. Setting either age and threshold to 0 will purge everything from cache.

Usage

```
purge_cache(threshold = "1G", age = Inf, dir = content_dir())
```

Arguments

threshold	Threshold size, accepts [fs::fs_bytes] notation.
age	Maximum age in days
dir	the path we should use for permanent / on-disk storage of the registry. An appropriate default will be selected (also configurable using the environmental variable CONTENTID_HOME), if not specified.

Details

Default behavior will keep contentid's local store size below 1 GB. Note that contentid functions do not automatically call purge_cache(), this must be handled by user workflows.

Value

invisibly returns dir path

query	<i>query a Content URI or a URL with remote and/or local registries</i>
-------	---

Description

query a Content URI or a URL with remote and/or local registries

Usage

```
query(uri, registries = default_registries(), ...)
```

Arguments

uri	a content identifier or a regular URL for a data file
registries	list of registries at which to register the URL
...	additional arguments

Value

a data frame with matching results

Examples

```
## By content identifier
query(paste0("hash://sha256/9412325831dab22aeebdd",
            "674b6eb53ba6b7bdd04bb99a4dbb21ddff646287e37"))
## By (registered) URL
query(paste0("https://knb.ecoinformatics.org/knb/d1/mn/v2/object/",
            "ess-dive-457358fdc81d3a5-20180726T203952542"))
```

query_history	<i>List all content identifiers that have been seen at a given URL</i>
---------------	--

Description

[query_history](#) is the complement of [query_sources](#), in that it filters a table of content identifier : url : date entries by the url.

Usage

```
query_history(url, registries = default_registries(), ...)
```

Arguments

url	A URL for a data file
registries	list of registries at which to register the URL
...	additional arguments

Details

query_history() only applies to registries that contain mutable URLs, i.e. hash-archive and local registries which merely record the contents last seen at any URL. Such URLs may have the same or different content at a later date, or may fail to resolve. In contrast, archives such as DataONE or Zenodo that resolve identifiers to source URLs control both the registry and the content storage, and thus only report URLs where content is currently found. While Download URLs from archives may move and old URLs may fail, a download URL never has "history" of different content (e.g. different versions) served from the same access URL.

Value

a data frame with all content identifiers that have been seen at a given URL. If the URL is version-stable, this should be a single identifier. Note that if multiple identifiers are listed, older content may no longer be available, though there is a chance it has been registered to a different url and can be resolved with [query_sources](#).

See Also

[sources](#)

Examples

```
query_history(paste0("https://knb.ecoinformatics.org/knb/d1/mn/v2/object/",  
"ess-dive-457358fdc81d3a5-20180726T203952542"))
```

query_sources

List all known URL sources for a given Content URI

Description

List all known URL sources for a given Content URI

Usage

```
query_sources(  
  id,  
  registries = default_registries(),  
  cols = c("source", "date"),  
  all = TRUE,  
  ...  
)
```

Arguments

id	a content identifier
registries	list of registries at which to register the URL
cols	names of columns to keep. Default are source and date. See details.
all	should we query remote registries even if a local source is found? Default TRUE
...	additional arguments

Details

possible columns are (in order): identifier, source, date, size, status, md5, sha1, sha256, sha384, sha512

Value

a data frame with all registration events when a URL or a local path (including the local store) have contained the corresponding content.

See Also

history register store

Examples

```
id <- paste0("hash://sha256/9412325831dab22aeebdd",  
            "674b6eb53ba6b7bdd04bb99a4dbb21ddff646287e37")  
query_sources(id)
```

register	<i>register a URL with remote and/or local registries</i>
----------	---

Description

register a URL with remote and/or local registries

Usage

```
register(url, registries = default_registries(), ...)
```

Arguments

url	a URL for a data file (or list of URLs)
registries	list of registries at which to register the URL
...	additional arguments

Details

Local registries can be specified as one or more file paths where local registries should be created. Usually a given application will want to register in only one local registry. For most use cases, the default registry should be sufficient.

Value

the [httr::response](#) object for the request (invisibly)

Examples

```
register(paste0("https://knb.ecoinformatics.org/knb/d1/mn/v2/object/",  
"ess-dive-457358fdc81d3a5-20180726T203952542"))
```

resolve	<i>Resolve content from a content identifier</i>
---------	--

Description

Requested content can be found at mutiple locations: cached to disk, or available at one or more URLs. This function provides a mechanism to always return a single, local path to the content requested, (provided the content identifier can be found in at least one of the registries).

Usage

```
resolve(  
    id,  
    registries = default_registries(),  
    verify = TRUE,  
    store = FALSE,  
    dir = content_dir(),  
    ...  
)
```

Arguments

<code>id</code>	A content identifier, see content_id
<code>registries</code>	list of registries at which to register the URL
<code>verify</code>	logical, default TRUE . Should we verify that content matches the requested hash?
<code>store</code>	logical, should we add remotely downloaded copy to the local store?
<code>dir</code>	path to the local store directory. Defaults to first local registry given to the <code>registries</code> argument.
<code>...</code>	additional arguments

Details

Local storage is checked first as it will allow us to bypass downloading content when a local copy is available. If no local copy is found but one or more remote URLs are registered for the hash, downloads from these will be attempted in order from most recent first.

See Also

`query` `query_local` `query_remote`

Examples

```
# ensure some content in local storage for testing purposes:
vostok_co2 <- system.file("extdata", "vostok.icecore.co2",
                          package = "contentid")
store(vostok_co2)

resolve(paste0(
  "hash://sha256/9412325831dab22aeebdd6",
  "74b6eb53ba6b7bdd04bb99a4dbb21ddff646287e37")
)
```

retrieve

Retrieve files from the local cache

Description

Retrieve files from the local cache

Usage

```
retrieve(id, dir = content_dir())
```

Arguments

id	a content_id
dir	the path we should use for permanent / on-disk storage of the registry. An appropriate default will be selected (also configurable using the environmental variable CONTENTID_HOME), if not specified.

Value

path to a local copy of the file.

See Also

store

Examples

```
# Store & retrieve local file
vostok_co2 <- system.file("extdata", "vostok.icecore.co2",
                          package = "contentid")

id <- store(vostok_co2)
retrieve(id)

# Store and retrieve content from a URL
id <- store(paste0("https://knb.ecoinformatics.org/knb/d1/mn/v2/object/",
                  "ess-dive-457358fdc81d3a5-20180726T203952542"))
retrieve(id)
```

retrieve_swh

retrieve content from Software Heritage given a content identifier

Description

retrieve content from Software Heritage given a content identifier

Usage

```
retrieve_swh(id, host = "https://archive.softwareheritage.org")
```

Arguments

id	a content identifier
host	the domain name for the Software Heritage API

See Also

[retrieve](#), [sources_swh](#)

Examples

```
id <- paste0("hash://sha256/9412325831dab22aeebdd",
            "674b6eb53ba6b7bdd04bb99a4dbb21ddf646287e37")
retrieve_swh(id)
```

sources_swh	<i>List software heritage sources for a content identifier</i>
-------------	--

Description

List software heritage sources for a content identifier

Usage

```
sources_swh(id, host = "https://archive.softwareheritage.org", ...)
```

Arguments

id	a content identifier
host	the domain name for the Software Heritage API
...	additional arguments

See Also

[query_sources](#)

Examples

```
id <- paste0("hash://sha256/9412325831dab22aeebdd",
             "674b6eb53ba6b7bdd04bb99a4dbb21ddf646287e37")
sources_swh(id)
```

store	<i>Store files in a local cache</i>
-------	-------------------------------------

Description

Resources at a specified URL will be downloaded and copied into the local content-based storage. Local paths will simply be copied into local storage. Identical content is not duplicated.

Usage

```
store(x, dir = content_dir(), algos = default_algos())
```

Arguments

x	a URL, connection , or file path.
dir	the path we should use for permanent / on-disk storage of the registry. An appropriate default will be selected (also configurable using the environmental variable CONTENTID_HOME), if not specified.
algos	Which algorithms should we compute contentid for? Default "sha256", see details.

Value

the content-based identifier

See Also

retrieve

Examples

```
# Store & retrieve local file
vostok_co2 <- system.file("extdata", "vostok.icecore.co2",
                          package = "contentid")

id <- store(vostok_co2)
retrieve(id)

# Store and retrieve content from a URL
id <- store(paste0("https://knb.ecoinformatics.org/knb/d1/mn/v2/object/",
                  "ess-dive-457358fdc81d3a5-20180726T203952542"))
retrieve(id)
```

store_swh

Add content to the Software Heritage Archival Store

Description

Add content to the Software Heritage Archival Store

Usage

```
store_swh(
  origin_url,
  host = "https://archive.softwareheritage.org",
  type = "git",
  ...
)
```

Arguments

origin_url	The url address to a GitHub, GitLab, or other recognized repository origin
host	the domain name for the Software Heritage API
type	software repository type, i.e. "git", "svn"
...	additional arguments

Examples

```
store_swh("https://github.com/CSSEGISandData/COVID-19")
```


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