Nautilus

The internals of a file manager

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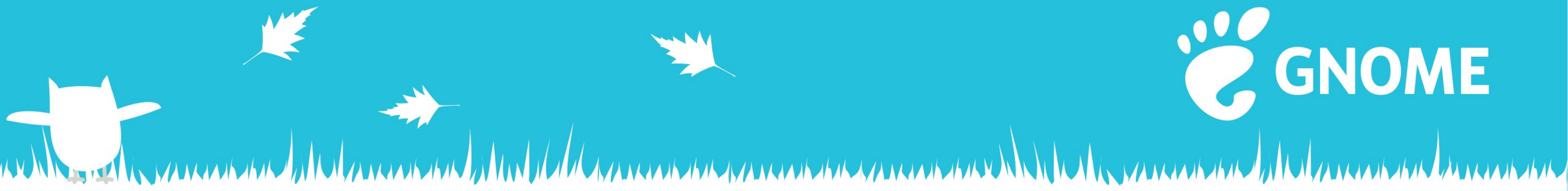


Nautilus – What is it?

- Used in Ubuntu, Fedora, Open Suse and all enterprise
- Created by Eazel and contributed by Linux Foundation
- 16 years old C code
- Predates libraries
- Manages Desktop

Overview

- Threads
- File management
- Network
- Search

Threads

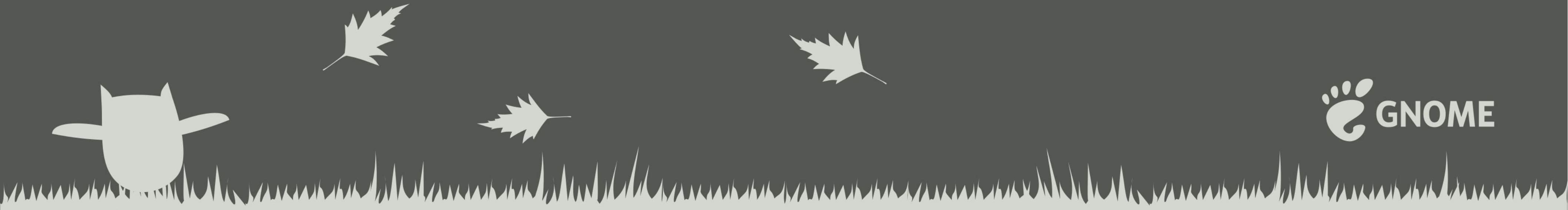
- Thread pool → What is it? Who provides it?
- Pthread → 1995
- GIOScheduler → 2006, cancellable
- Gtask → 2011, ownership, chained ops, mem management

Nautilus – Stay in context

- Question. Who thinks Nautilus uses...?
  - Pthread - 1995
  - GIOScheduler - 2006
  - Gtask - 2011

File Management – A Glib file

- File abstraction → g_file_get_path, _load_contents...
- Operation abstraction → g_file_copy, _mount..
- Attributes abstraction → g_file_query_info



File Management - GVFS

- GVFS implementation of GFile
- GVFS Recent, FUSE, Cloud Providers
- Command line tool

File Management – File cache

- What is it & why we need it?
- Implemented as a global hash table

File Management – File cache

- Problem? Invalidation!
- We need to sync the hard disk with the file manager

File Management – File cache

- Solution?
- Notification system
- Changes queue
- Work queue

File Management – A NautilusFile

- NautilusFile
  - GFile
  - Information cache

- NautilusDirectory
  - Gfile
  - Information cache
  - NautilusFiles

File Management – NautilusFile

- Why differentiation of file and directory?
- Cache invalidation
- Monitoring

File Management – Monitoring

- Simple as g_file_monitor
- Uses kernel Inotify
- But, maximum of 1024 watches

File Management - Operations

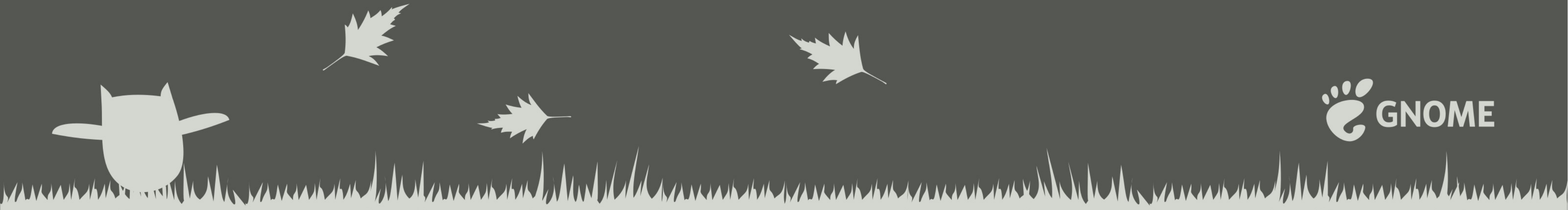
- Batch operations
- Create thread
- Look for conflicts and wait main thread
- Put changes in changes queue

File Management – Challenges

- Memory management!
- Change directory and deletion of cached file but not freed → crash

Network

- Network from a file manager?
- FTP servers, Samba Shares etc
- Google Drive, Owncloud



Network – Just GVFS mounts

- Gtk+ async operation to mount a directory
- Ask password, if needed
- Download files metadata
- Provide this directory translated with an easy path

Network – Cloud Providers

- Maybe simple as GVFS mounts?
- No integration
- Dropbox, Google drive etc apps
- How about integration? DBUS service

Search – What do we want?

- Files that it's name contains the query
- Files that their content have the query
- Recursive
- Give preference to closer hierarchy
- Ranking
- All threaded but not hanging the computer!

Search – What's needed for it?

- File name matching → string contains
- Content matching → tracker
- Recursive and hierarchy rank → Breadth-first search, model search
- Custom ranking based on word proximity and FTS rank
- And implemented as a NautilusDirectory

Search – Do It!

- Three engines: model, simple, tracker
- Thread creation, prepare to catch hits, start engines.
- Search “a”
- GO!

Search – BOOM, computer hangs

Search – Why does it hang?

- Threads for search engines, thumbnailing hits, work queue (cache) threads...
- But no limited shared threadpool ¯_(ツ)_/¯

Search – Don't leave me with bad taste

- We are working on it!
- *Already there* → Search stops when the users says and engines reused
- *Already there* → Improved cache invalidation
- *On it* → Porting to Gtask

What to keep in mind

- Use threads
- Use a threadpool
- Use cache
- Use already well tested libraries
- Think twice if C is the language you need

Phew, we are finishing

- Slides - https://github.com/csoriano89/DevConf2016
- Nautilus - https://wiki.gnome.org/Apps/Nautilus
- Irc - #nautilus at irc.gimp.org
- Email - csoriano@gnome.org
- Catch me to play ping pong

Thank You!