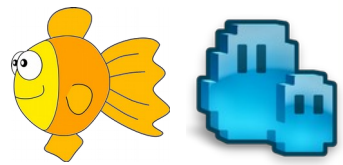
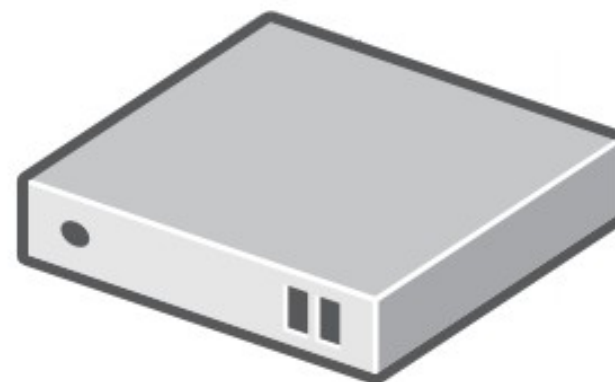


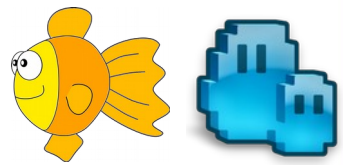
Toward exploring virtual disks using a file manager!

Arik Hadas
Principal Software Engineer
Red Hat
02/02/2019

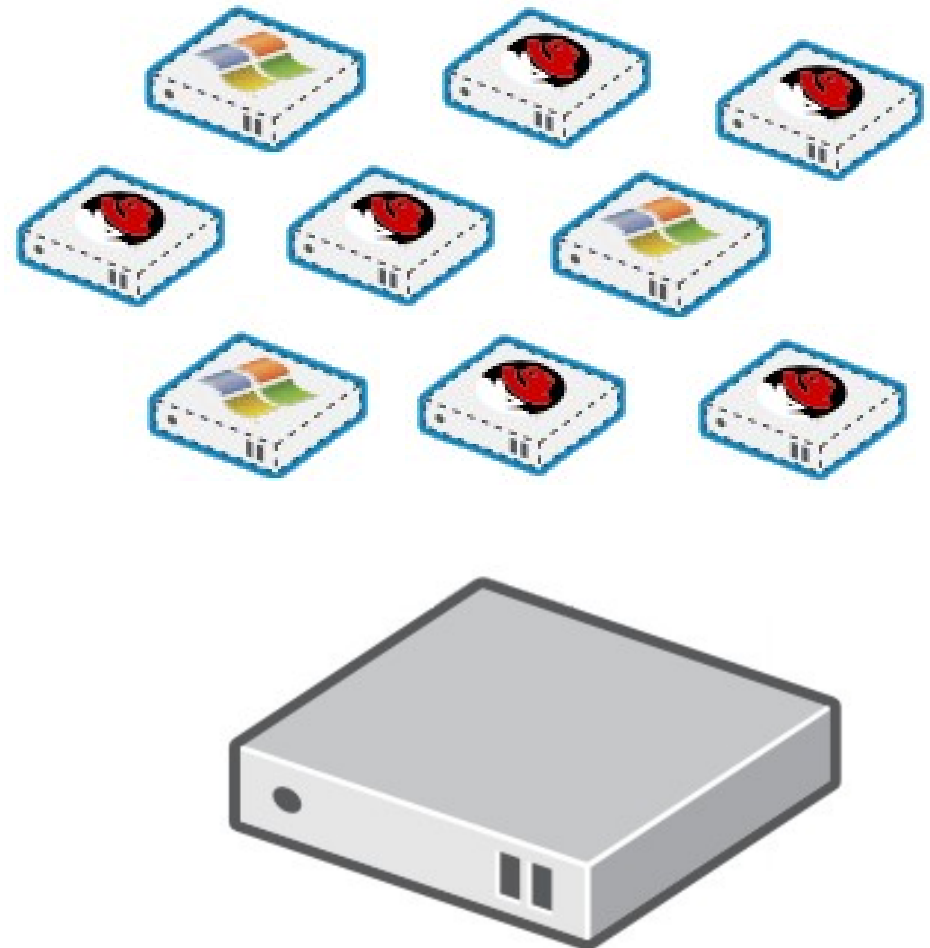


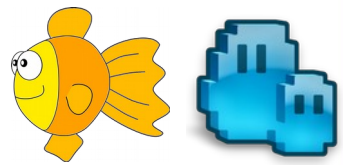
Virtualization





Virtualization





Benefits of Virtualization

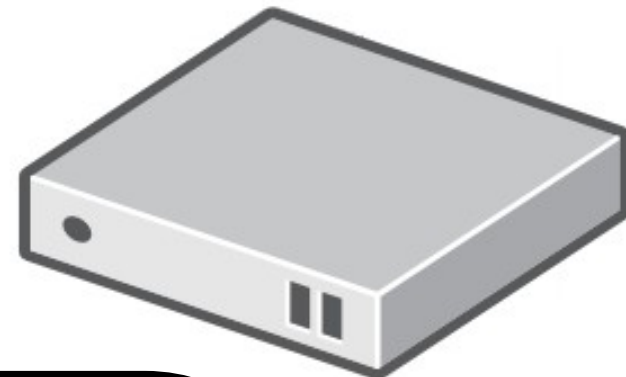
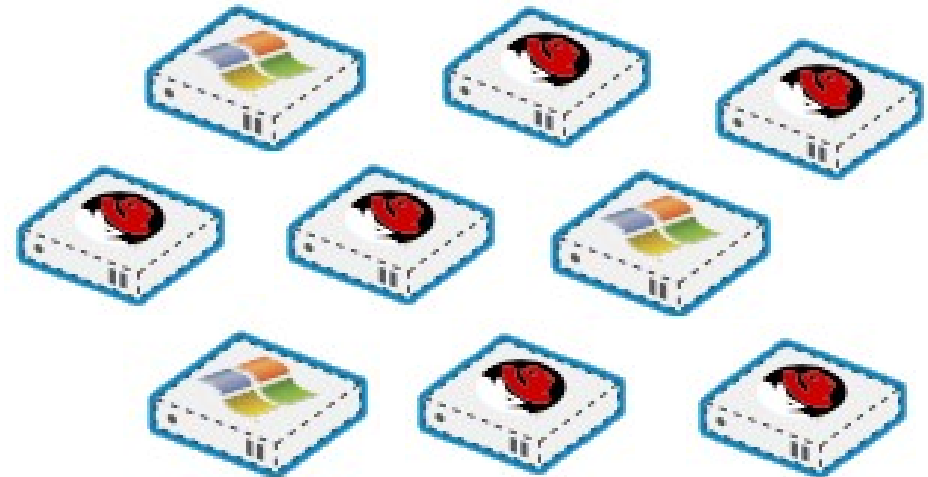
Security

Emulation of other OSs

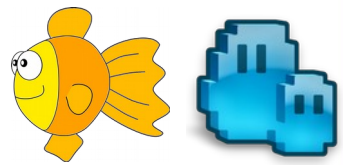
Easier to back up

Easier to clone to another machine

...



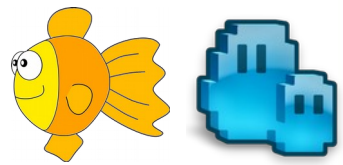
Abstraction!



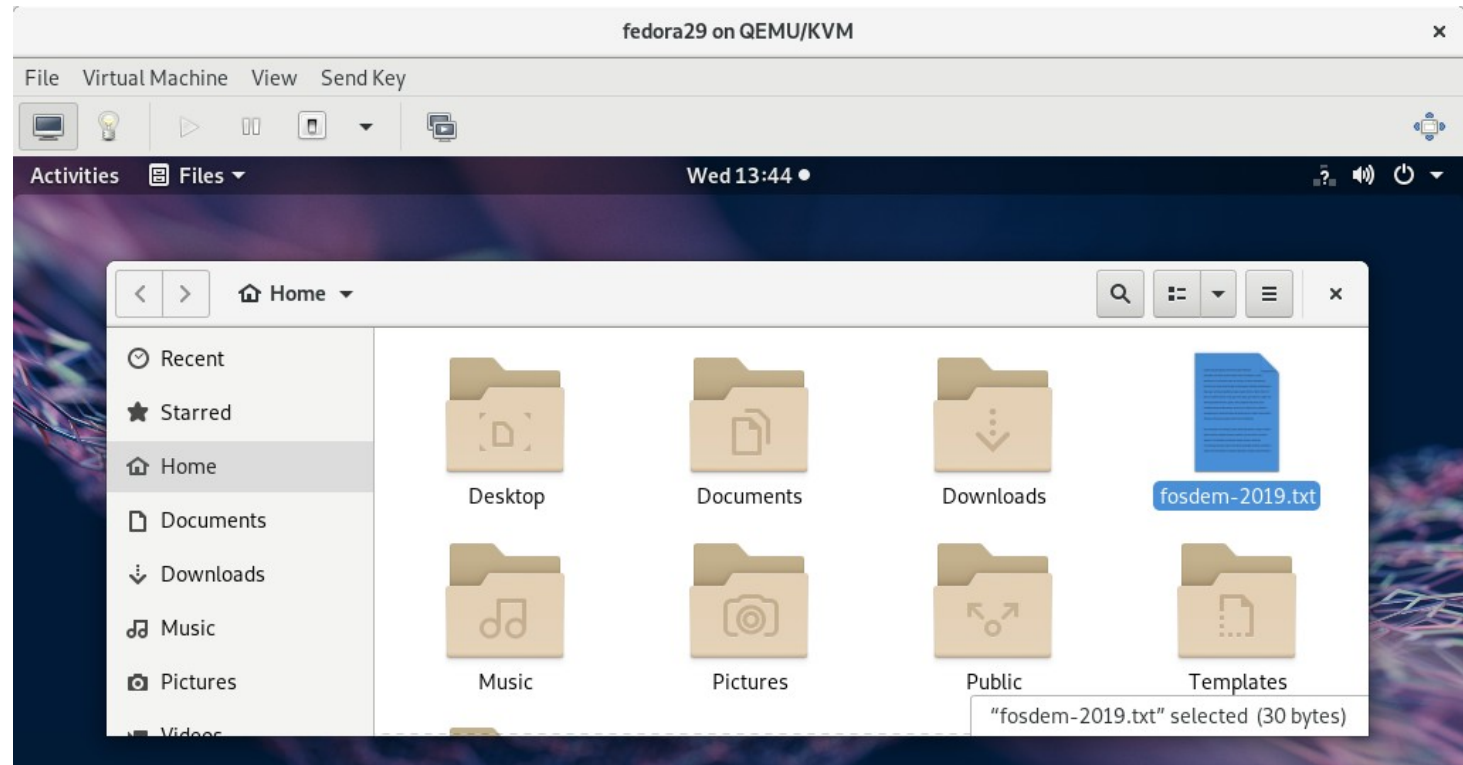
But Abstraction Comes with a Cost

How can I copy data to or from within a virtual machine?

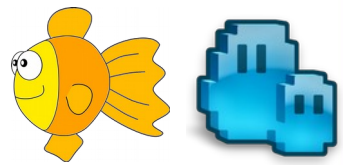







Case #1: From a Running VM

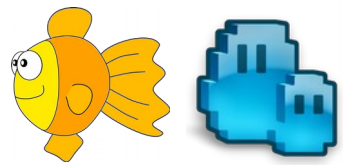


How to copy a file from this guest?



Case #1: Possible Solutions

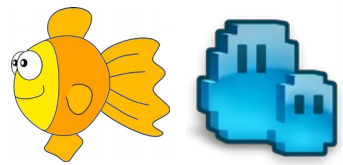
- Internet-based solutions 
 - Email / File-sharing service (e.g., dropbox) / ...
- Lan-based solutions 
 - SCP / NFS share / ...
- Guest agent-based solutions 
 - Shared-folder / Exposing a service



Case #2: From a Virtual Disk

How can I copy to/from a disk?





Case #2: Possible Solutions

How can I copy to/from a disk?

Non-bootable disk



Attach to a VM

Slow and
more complicated

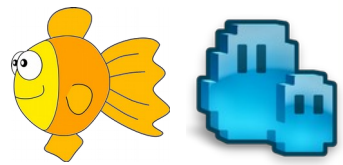
Bootable disk



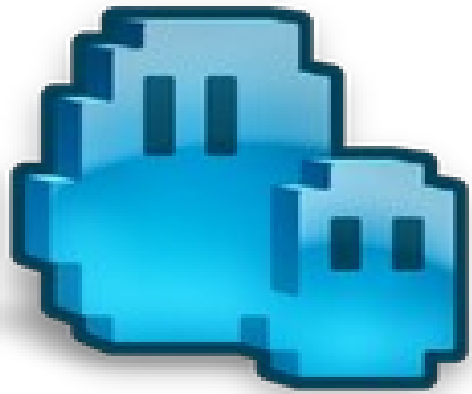
Attach to a VM /
Start a VM

Cannot write
to the disk

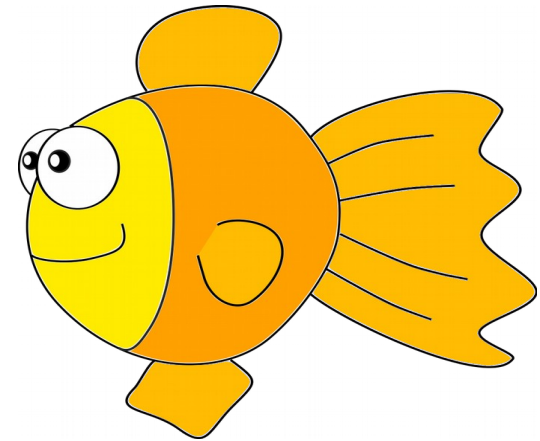
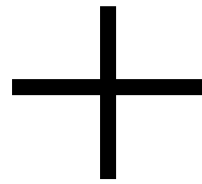




Main Idea



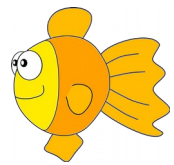
muCommander



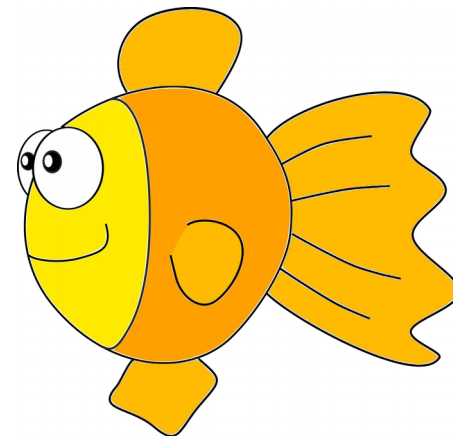
Libguestfs

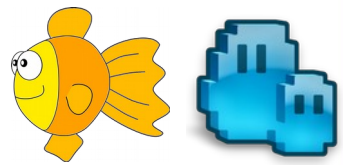


**Browsing and modifying
virtual disks using a file manager**



Tools for accessing and modifying virtual machine disk images



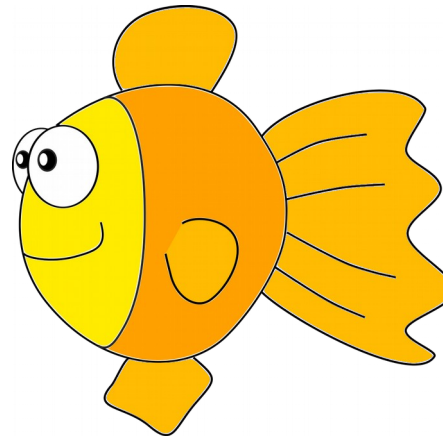


Capabilities of Libguestfs

Can access almost any disk image imaginable

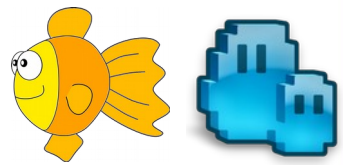
secure — does not need root and with multiple layers of defence against rogue disk images

Can access disk images on remote machines or on CDs/USB sticks



Can access proprietary systems like VMware and Hyper-V.

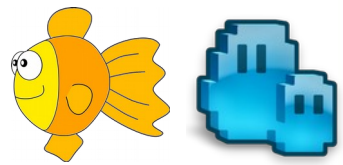
All this functionality is available through a scriptable shell called guestfish, or an interactive rescue shell virt-rescue.



"I have found jesus. He came to me in the form of muCommander."

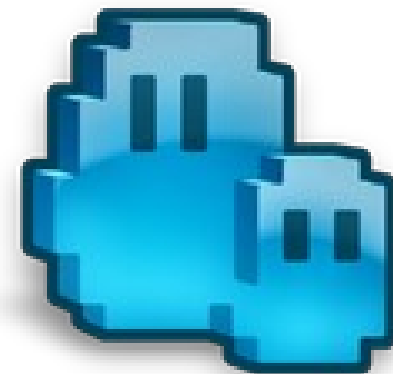
- A happy user

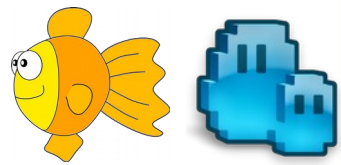




muCommander – The Long Form

*muCommander is a lightweight, cross-platform file manager with a dual-pane interface. It runs on any operating system with Java support (macOS, Windows, Linux, *BSD, Solaris...)*

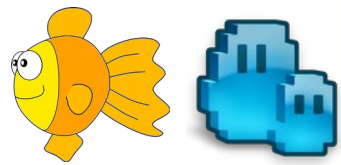




muCommander - Screenshot

muCommander window showing a file manager interface. The main window displays two panels: a local file system on the left and a remote file system on the right. The local panel shows a directory tree with folders like .Spotlight-V100, .Trashes, .vol, Applications, Applications9, automount, bin, cores, Desktop Folder, dev, Developer, etc, Library, man, Network, private, sbin, System, Systemordner, Temporary Items, tmp, Users, usr, var, Volumes, .DS_Store, .hotfiles.btree, Benutzerhandbücher und Informationen, Desktop DB, Desktop DF, mach, mach.sym, mach_kernel, NAVMac800QSFile, and Norton_ES_Data. The remote panel shows a directory listing of files with names like 0340251.shtml, 0342256.shtml, 035227.shtml, 0355230.shtml, and 040219.shtml. A "Connect to server" dialog box is overlaid on the remote panel, showing fields for Server (192.168.0.5), Username (nrinaudo), Password (*****), Initial directory (/Users/nrinaudo), and Port (22). The dialog also shows the generated Server URL: sftp://192.168.0.5/Users/nrinaudo and a checkbox for "Store login and password (weak encryption)". The dialog has "Connect" and "Cancel" buttons. The status bar at the bottom indicates "1 of 39 selected - usr" and "Free: 31 GB / 74 GB".

Ex...	Name	Size	Date	Permi...	Ex...	Name	Size	Date	Permi...
<DIR>	.Spotlight-V100		07/01/08 11:06	d---	?	0340251.shtml		07/03/18 17:13	----
<DIR>	.Trashes		07/01/08 10:27	d-w-	?	0342256.shtml		07/03/18 17:13	----
<DIR>	.vol		07/03/07 08:02	dr--	?	035227.shtml		07/03/18 17:12	----
<DIR>	Applications		07/03/17 20:08	drw-	?	0355230.shtml		07/03/18 17:13	----
<DIR>	Applications9		03/09/29 19:27	drw-	?	040219.shtml		07/03/18 17:13	----
<DIR>	automount				?			07/03/18 17:12	----
<DIR>	bin				?			07/03/18 17:12	----
<DIR>	cores				?			07/03/18 17:12	----
<DIR>	Desktop Folder				?			07/03/18 17:12	----
<DIR>	dev				?			07/03/18 17:12	----
<DIR>	Developer				?			07/03/18 17:12	----
<DIR>	etc				?			07/03/18 17:13	----
<DIR>	Library				?			07/03/18 17:13	----
<DIR>	man				?			07/03/18 17:12	----
<DIR>	Network				?			07/03/18 17:12	----
<DIR>	private				?			07/03/18 17:13	----
<DIR>	sbin				?			07/03/18 17:13	----
<DIR>	System				?			07/03/18 17:12	----
<DIR>	Systemordner				?			07/03/18 17:12	----
<DIR>	Temporary Items				?			07/03/18 17:12	----
<DIR>	tmp				?			07/03/18 17:12	----
<DIR>	Users				?			07/03/18 17:13	----
<DIR>	usr				?			07/03/18 17:13	----
<DIR>	var				?			07/03/18 17:13	----
<DIR>	Volumes				?			07/03/18 17:13	----
6.0	.DS_Store	6.0			?			07/03/18 17:13	----
128	.hotfiles.btree	128			?			07/03/18 17:12	----
0 KB	Benutzerhandbücher und Informationen	0 KB	04/10/06 15:04	-r--	?			07/03/18 17:13	----
84 KB	Desktop DB	84 KB	07/01/29 19:38	-r--	?	18lessig.html		07/03/18 17:13	----
698 KB	Desktop DF	698 KB	07/01/08 14:10	-r--	?	18novel.html		07/03/18 17:13	----
601 KB	mach	601 KB	07/03/07 08:02	lr--	?	1958211.shtml		07/03/18 17:12	----
601 KB	mach.sym	601 KB	07/03/07 08:02	-r--	?	2114237.shtml		07/03/18 17:13	----
8.1 MB	mach_kernel	8.1 MB	06/09/26 03:45	-r--	?	2115251.shtml		07/03/18 17:13	----
8.0 MB	NAVMac800QSFile	8.0 MB	04/10/11 09:01	-rw-	?	2120207.shtml		07/03/18 17:13	----
804 KB	Norton_ES_Data	804 KB	04/10/05 16:52	-r--	?	2125257.shtml		07/03/18 17:12	----
					?	2128223.shtml		07/03/18 17:13	----



muCommander – Major Features

Virtual filesystem with support for local volumes, **FTP, SFTP, SMB, NFS, HTTP, Amazon S3, Hadoop HDFS and Bonjour**

Quickly copy, move, rename files, create directories, email files...

Browse, create and uncompress **ZIP, RAR, 7z, TAR, GZip, BZip2, ISO/NRG, AR/Deb** and **LST** archives

ZIP files can be modified on-the-fly, without having to recompress the whole archive

Universal bookmarks and credentials manager

Tabbed navigation

Multiple windows support

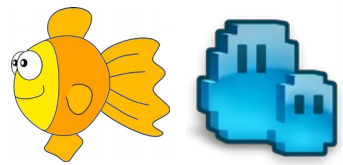
Full keyboard access

Highly configurable

Available in 27 (!) languages

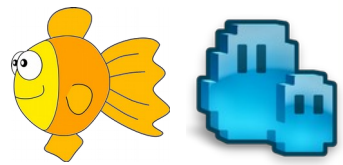
Free and open source
(GPL)





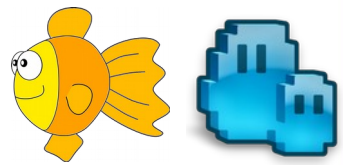
Let's See It in Action

```
/]$ Demonstration█
```



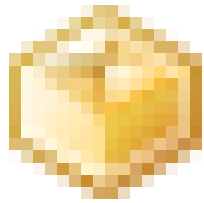
Challenges

- How to model virtual disks (in muCommander)
 - Local as archive files
 - Need lazy inspection as protocol files
- How bridge different APIs
 - For listing the content of a virtual disk
 - For reading and writing data to the disk
- How to ship it



Challenge #1: Model Virtual Disks

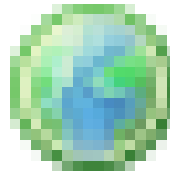
Archive Files



Within a file-system,
No authentication

Query their
entire structure

Protocol Files



Remote,
Authentication needed

Query their structure in
a lazy way

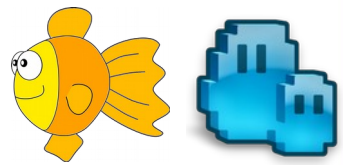
Local Files



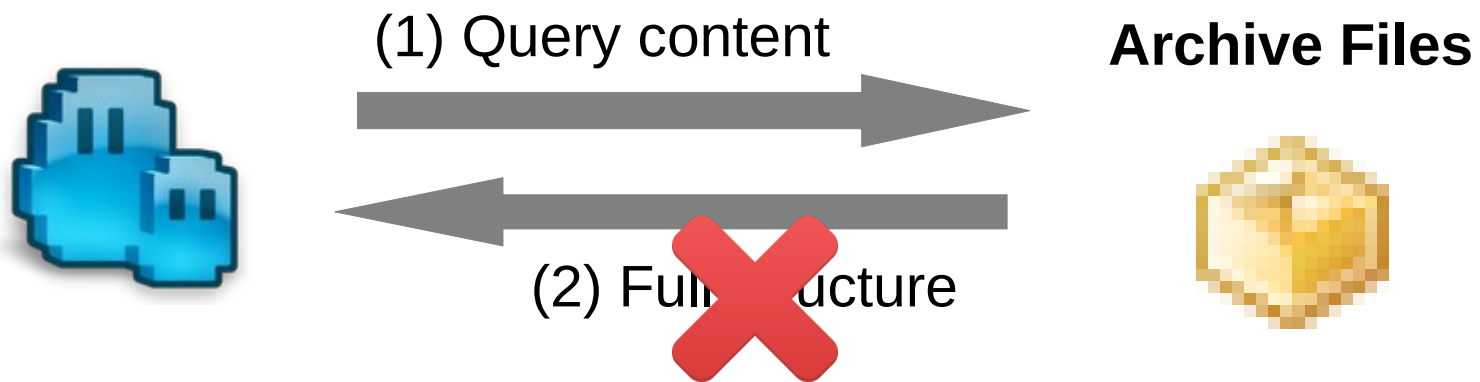
Within a file-system,
No authentication



Virtual disks fit neither of these groups

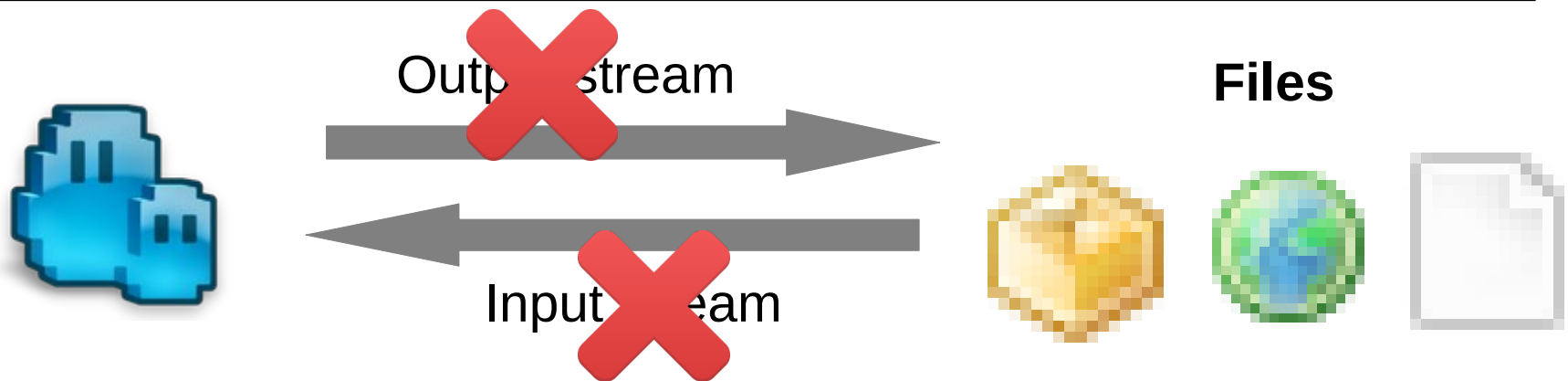


Challenge #2: Bridge Different APIs



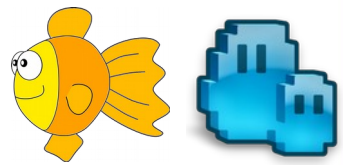
Libguestfs does not support querying full structure

Bridge the difference using the *visitor* pattern

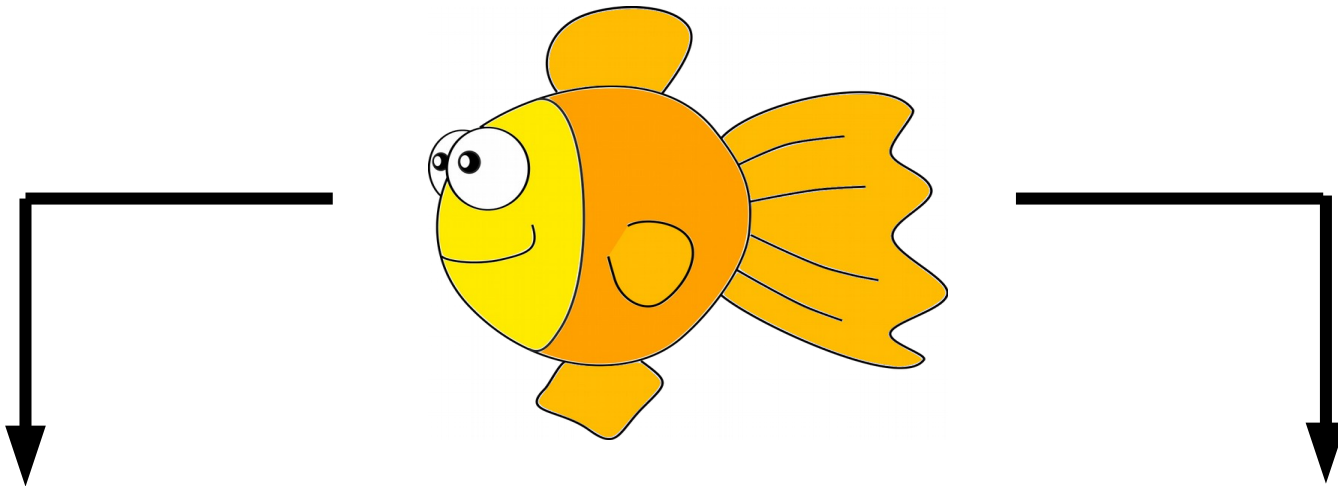


Libguestfs does not support streams

Bridge the difference using temporary files



Challenge #3: How to Ship



libguestfs.jar

Needed at compile time

Part of libguestfs-java

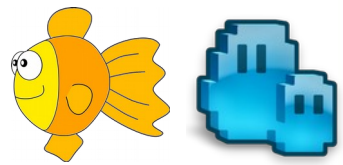
Provide as a plugin

libguestfs-java

Needed at run time

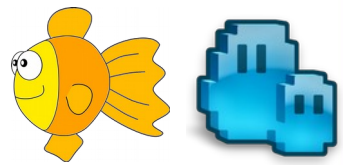
Might be missing

that requires libguestfs-java

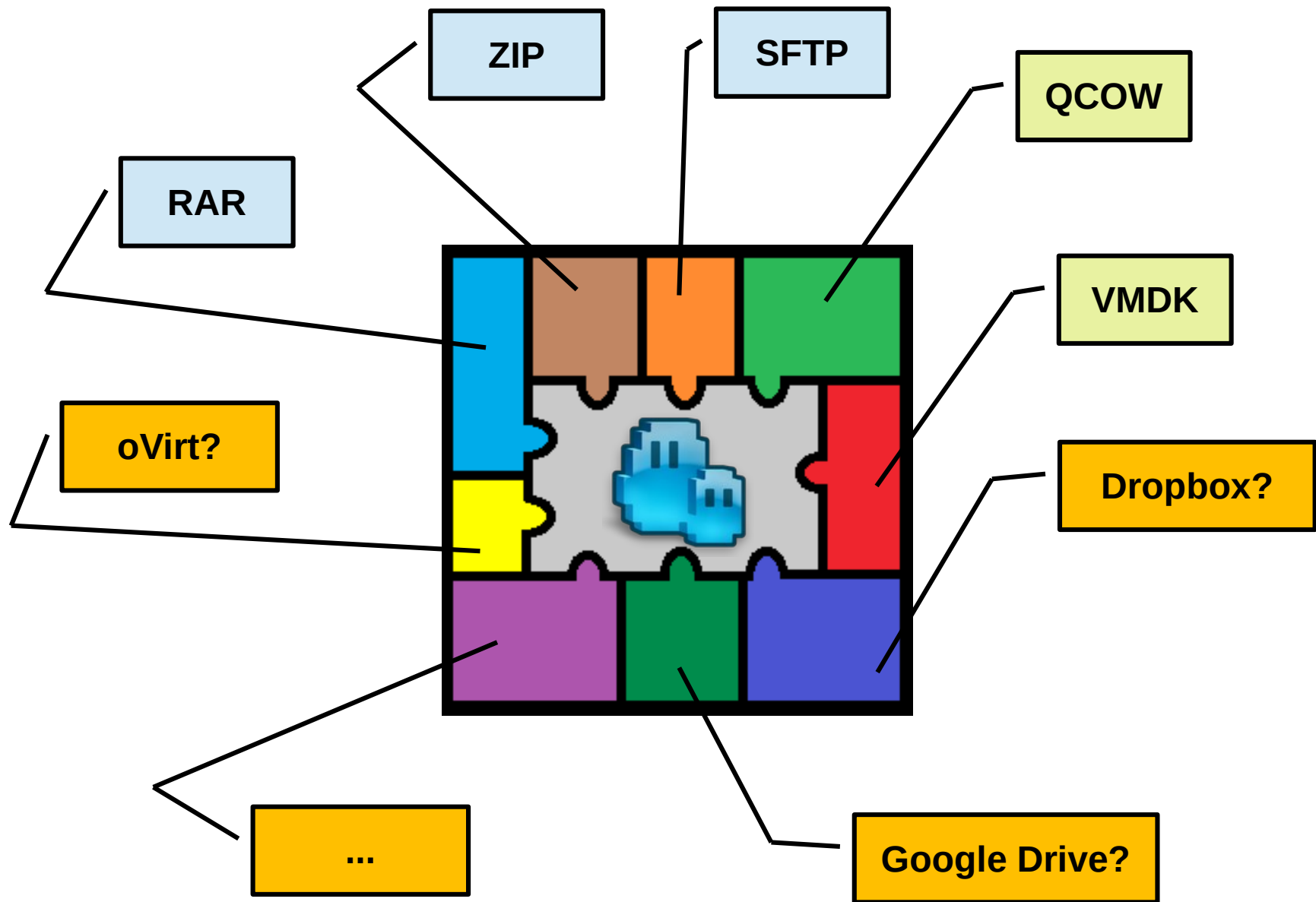


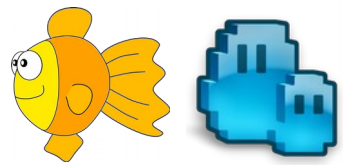
Open Questions

- How to present the content of the disk
 - Guest view – slow, requires OS & all disks
 - Filesystem view – harder to use
 - Maybe a combination of the two?
- Do we want to interact with Libvirt?
- How to implement caching
 - Cannot rely on the disk's modification date



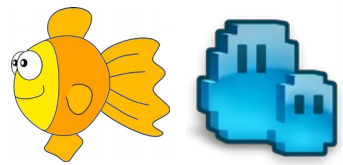
The Vision: Pluggable File Manager





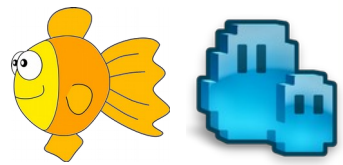
Roadmap

- ~~v0.9.0: Dec 19, 2015~~
- ~~v0.9.1: Oct 21, 2016~~
- ~~v0.9.2: Jun 7, 2017~~
- ~~v0.9.3: Nov 13, 2018~~
 - ~~v0.9.3-1: Dec 8, 2018~~
 - ~~v0.9.3-2: Dec 15, 2018~~
 - ~~v0.9.3-3: Jan 12, 2019~~
- **v0.9.4: TBD**



Summary

- Plugin for virtual disks in muCommander
 - Based on an integration with Libguestfs
 - Provides user-interface for Libguestfs
- Status: work-in-progress
 - Published a POC in Nov, 2018
 - Discussed on libguestfs mailing-list
 - Estimated release date: second half of 2019
 - Your feedback is welcome!



THANK YOU!

<http://www.mucommander.com/>
<http://libguestfs.org/>
<https://github.com/mucommander/>
<https://gitter.im/mucommander>
ahadas@redhat.com