

PhantomOS

Implementation Summary

"To Create, Not To Destroy"

Core Philosophy

PhantomOS is an operating system where destruction is architecturally impossible. There are no `rm`, `kill`, or `delete` commands. Data is hidden, not deleted. Processes become dormant, not terminated. All history is preserved in the geological record.

1. GeoFS (Geology FileSystem)

Files: `geofs.c`, `geofs.h`

Key Features:

- Content-addressed storage: Files stored by SHA-256 hash
- Append-only: Data is never overwritten, only new versions created
- Views: Time-travel through storage history (like geological layers)
- References: Paths map to content hashes
- Hide, not delete: Content remains in geology, just hidden from view

API:

```
geofs_volume_create/open/close() // Volume lifecycle
geofs_content_store/read()      // Content operations
geofs_ref_create/resolve/list() // Path references
geofs_view_create/hide()        // View management
```

2. VFS (Virtual File System)

Files: `kernel/vfs.c`, `kernel/vfs.h`

POSIX-like VFS layer that routes operations to different filesystem backends. Supports multiple filesystems (`procfs`, `devfs`, `geofs`), file descriptors, directory operations, symlinks, and `hide()` instead of `unlink()`.

Mounted Filesystems:

Mount Point	Type	Description
<code>/proc</code>	<code>procfs</code>	Process information
<code>/dev</code>	<code>devfs</code>	Device files
<code>/geo</code>	<code>geofs</code>	Persistent storage

3. Procfs (Process Filesystem)

File: `kernel/procfs.c`

Virtual filesystem exposing process and kernel information:

`/proc/version`, `/proc/uptime`, `/proc/stat`, `/proc/constitution`, `/proc/mounts`, `/proc/{pid}/status`

4. Devfs (Device Filesystem)

File: kernel/devfs.c

Devices:

Device	Description
/dev/null	Discards writes, returns EOF on read
/dev/zero	Returns infinite zeros
/dev/random	Returns random bytes
/dev/console	Terminal output

5. Phantom Kernel

Files: kernel/phantom.c, kernel/phantom.h

Process Management:

- States: embryo -> ready -> running -> blocked -> dormant (never terminated)
- No kill(): Only phantom_process_suspend() and phantom_process_resume()
- Persistence: Processes saved to GeoFS, survive kernel restarts

IPC:

Message passing with mailboxes, stored in GeoFS for persistence. Types: DATA, SIGNAL, REQUEST, RESPONSE

Scheduler:

Round-robin, priority, or fair-share modes. Priority levels 0-31. 10ms default time slice.

6. Init System

Files: kernel/init.c, kernel/init.h

Service States:

State	Description
SERVICE_EMBRYO	Being created
SERVICE_STARTING	Dependencies resolving
SERVICE_RUNNING	Active and healthy
SERVICE_DORMANT	Inactive but preserved
SERVICE_AWAKENING	Transitioning to running

Built-in Services:

geofs, vfs, procs, devfs, governor, shell

7. Governor (AI Code Evaluator)

Files: kernel/governor.c, kernel/governor.h

Capability-based + interactive code evaluation system.

Capabilities (16 types):

Files: read_files, write_files, create_files, hide_files

Process: create_process, ipc_send, ipc_receive

Memory: alloc_memory, high_memory

Elevated: network, system_config, raw_device, high_priority

Info: read_procfs, read_devfs

Special: governor_bypass

Threat Levels:

Level	Action
NONE	Auto-approve
LOW	Auto-approve with logging
MEDIUM	Prompt user (interactive mode)
HIGH	Prompt user or decline (strict mode)
CRITICAL	Always decline (destructive code)

Destructive Patterns (~50):

File: unlink, remove, rmdir, truncate

Process: kill(), abort, exit()

System: reboot, shutdown, format

Database: DROP TABLE, DELETE FROM

Shell: rm -, >/dev/

8. Shell

Files: kernel/shell.c, kernel/shell.h

Commands:

Navigation: pwd, cd, ls, stat

File Operations: cat, echo, mkdir, touch, write, ln -s

Phantom-Specific: hide (preserved in geology)

Process: ps, suspend, resume

System: constitution, geology, mount

Services: service list/status/awaken/rest

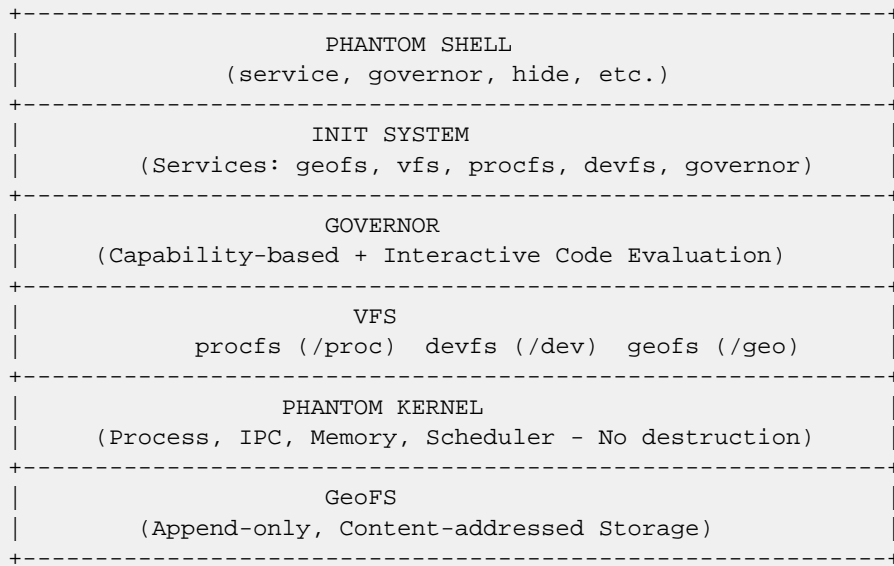
Governor: governor status/stats/mode/test

Notable Absences:

No rm, rmdir, unlink, kill, killall, delete, destroy

PhantomOS Implementation Summary

Architecture Diagram



File Summary

File	Lines	Description
geofs.c	~1100	Append-only storage
kernel/phantom.c	~1600	Kernel core
kernel/vfs.c	~900	Virtual filesystem
kernel/shell.c	~1500	Interactive shell
kernel/init.c	~800	Init/service manager
kernel/governor.c	~750	AI code evaluator
kernel/geofs_vfs.c	~600	GeoFS-VFS adapter
kernel/procfs.c	~400	Process filesystem
kernel/devfs.c	~350	Device filesystem

Total: ~9,500 lines of C code

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