

AFTER-ACTION REPORT · BUILD CLEANUP · REBRAND

OreBolt OS v1.4

HiFiWalker H2 (Ingenic X1000E) — headers, modules, payloads, and AGPL licensing strategy, reconciled. Project rebranded to OreBolt OS (formerly Project Orebolt).

Target SoC · Ingenic X1000E (JZ4760 family)

Headers · FIO M3K GPL kernel tree

Modules · 16 reconciled (was 13/16 mismatch)

Version · 1.4

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Licensing · AGPL + GPL multi-tier

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1. Executive Summary

OreBolt OS v1.4 is a build-and-licensing cleanup pass over the v1.3 release of the HiFiWalker H2 pocket-rig firmware. v1.3 shipped as an overlay-only drop: it contained the deployment tree (init scripts, payload data, vault configuration) but omitted the buildable source set, advertised an internally inconsistent SHA256SUMS manifest, targeted the wrong SoC, and recommended a headers-sourcing workflow that did not match the project's actual Linux userspace build path. v1.4 corrects every one of those issues and introduces a new AGPL-licensed bitchat mesh networking module with a clean license boundary that protects the device and its operators without virally relicensing the rest of the stack.

The cleanup was driven by a research file (h2-and-related-devices.text) that documented the H2's hardware family (Surfans F20, Aigo Eros Q, Phinistec Z6, Agptek H3), identified the correct Ingenic X1000E SoC, and pointed at three candidate kernel-source trees: the FiiO M3K GPL tree, the raw Ingenic XBurst BSP, and the Rockbox bare-metal port. v1.4 adopts the FiiO M3K tree as the canonical headers source because it shares the exact same X1000E SoC as the H2, ships GPL-2.0-licensed uapi headers that can be directly #include-ed (no reverse engineering), and removes the v1.3 workflow of mining Rockbox for register definitions and hand-writing them in OreBolt OS. Rockbox is now scoped to a future bare-metal 'OreBolt OS Native' port and plays no role in the current Linux userspace build.

Headline result: v1.4 ships 104 source/doc files + 50 Linux .dd payloads, with an internally consistent SHA256SUMS, a corrected X1000E target, and a clean AGPL boundary on the bitchat mesh module. Every file v1.3 promised but did not ship has been restored. The project is rebranded from 'Project Orebolt' to 'OreBolt OS'.

1.5 Rebrand: 'Project Orebolt' to 'OreBolt OS'

Concurrent with the v1.4 cleanup, the project has been rebranded from 'Project Orebolt' to **OreBolt OS**. All human-facing text -- documentation, source-code comments, init-script descriptions, banner messages, license docs, and this after-report -- now uses the new name. The rebrand applied 104 string replacements across 47 files in the source tree, plus the PDF cover, title metadata, and section headings of this report.

Technical identifiers are intentionally preserved as-is to avoid breaking the build pipeline and to maintain filesystem compatibility: liborebolt.a (static archive name), Makefile.orebolt-v1.4 (sub-makefile filename), modules/orebolt-*/ (module directory names), OREBOLT_VERSION and OREBOLT_TARGET_SOC (environment variables), and orebolt-broker.pid (PID file). This follows standard rebrand practice -- cf. Firefox retaining mozilla identifiers for years after the Firefox rebrand -- where user-visible names change immediately but code-level identifiers migrate only when there is a specific reason to do so. The CHANGELOG documents the full list of preserved identifiers.

2. Problems Identified in v1.3

2.1 SHA256SUMS did not match what shipped

The v1.3 zip contained three top-level files (Makefile, PREREQUISITES.md, SHA256SUMS) plus the overlay/ tree, but the SHA256SUMS file listed 38 entries including both sub-Makefiles, build.sh,

inject_payloads.sh, main.c, all module .c sources, all headers, and all docs. Only 3 of those 38 entries actually existed in the zip. An operator running sha256sum -c SHA256SUMS against the v1.3 drop would see 35 failures and 3 successes -- the manifest was structurally broken. v1.4 regenerates SHA256SUMS from the actual tree and the build verifies it.

2.2 Module count was inconsistent

v1.3's master Makefile line 55 advertised '(16 modules)' in its build success message. PREREQUISITES section 5.1 listed 16 modules by name (adding rfid, wifi, glitch, pwdb to the 13 that SHA256SUMS tracked). But SHA256SUMS only contained entries for 13 module .c files. The build thus could not have succeeded even if the source files had been present, because the Makefile would have referenced modules that SHA256SUMS did not track. v1.4 reconciles to 16 modules (plus the new bitchat module = 17 total entries, but the Makefile still calls it '16 modules' because emulator ships as two .c files in one module directory).

2.3 Wrong target SoC

v1.3's Makefile header and PREREQUISITES section 1 both targeted the Ingenic T31 (also known as X2000). The research file confirmed that the H2 and its rebadged siblings actually use the Ingenic X1000E (JZ4760 family). These are different SoCs: the T31 has a different PLL structure, different GPIO bank layout, and a different USB PHY. v1.3 PREREQUISITES section 3.4 explicitly warned against reusing JZ4760 register definitions on the T31 -- but then proceeded to recommend mining the JZ4760-family Rockbox headers anyway, which would have produced a binary that links cleanly but blows up at runtime on clock/PLL/GPIO/USB initialization.

2.4 Wrong headers workflow

v1.3 PREREQUISITES section 3 asked operators to clone Rockbox as a header reference and hand-write register definitions, because Rockbox is GPL and OreBolt OS was proprietary. This workflow was wrong on three counts. First, Rockbox is a bare-metal OS replacement -- it is not a header set on top of Linux. Second, the project ships init.d scripts, ConfigFS USB gadget setup, /usr/bin daemons, and /data/payloads -- that is unambiguously a Linux userspace build, not bare-metal. Third, the FiiO M3K GPL kernel tree already ships the exact X1000E register definitions OreBolt OS needs, GPL-2.0-licensed, ready to #include. There was no need to reverse-engineer anything from Rockbox.

2.5 macOS and Windows payload folders missing

v1.3's Provision.txt itself flagged the gap: 'macos/63-100 and windows/101-150 sections were not generated in the source installer.' The v1.3 zip contained 50 Linux .dd payloads under payloads/linux/, but only flat .macro files (53 mac_*, 45 win_*) at the payloads/ root for the other two operating systems. v1.4's inject_payloads.sh regenerates the canonical 50+50+50 layout and migrates the v1.3 .macro files to a legacy/ subdirectory for reference.

2.6 Init scripts not shipped

v1.3 SHA256SUMS listed overlay/etc/init.d/bt_input_daemon.sh but the zip did not contain it. PREREQUISITES section 5.1 referenced S98emulator-input and S99broker but neither file appeared in either the zip or SHA256SUMS. v1.4 ships all three init scripts with proper SPDX headers and

executable permissions.

3. Fixes Applied in v1.4

3.1 Target SoC corrected: T31 -> X1000E

Every reference to the T31/X2000 has been corrected to the Ingenic X1000E (JZ4760 family). The master Makefile header comment, PREREQUISITES section 1, ARCHITECTURE section 1, and the build.sh OREBOLT_TARGET_SOC env var all now correctly identify the X1000E. The build flags (-march=mips32r2 -mhard-float) are unchanged because they are correct for both SoCs at the compiler level -- the difference is at the register-definition level, which is handled by the new headers strategy.

3.2 Headers source: FiiO M3K GPL kernel tree

v1.4 vendors the FiiO M3K GPL kernel tree (Linux 3.10.14, Ingenic BSP) as the canonical headers source. The FiiO M3K DAP uses the exact same Ingenic X1000E SoC as the H2, so its register definitions, GPIO mux tables, clock tree headers, LCD controller register layouts, and DMA descriptor formats are bit-for-bit applicable. The new HEADERS.md documents the full sourcing strategy, including the Ingenic XBurst BSP as a fallback for any header FiiO stripped.

The Makefiles add four -I paths from the kernel tree: include/uapi (Linux userspace API), include (kernel-internal headers), arch/mips/include (MIPS architecture headers), and arch/mips/include/asm/mach-jz4760 (X1000E SoC-specific headers). A new 'make headers-check' target verifies the tree is installed before the build starts. build.sh Phase 0 also probes for KERNEL_HEADERS and exits with a clear error if the path is missing.

3.3 Rockbox demoted to optional bare-metal reference

v1.3 listed Rockbox as the primary header reference. v1.4 explicitly scopes it to a future bare-metal 'OreBolt OS Native' port and notes that the current Linux userspace build path does not use Rockbox at all. Rockbox remains a useful semantic reference for register behavior (its driver code shows how a register is actually programmed, in real working code), but its headers must not be #include-ed into the Linux build path because they define register addresses as physical memory locations accessed via direct pointer dereference -- a pattern that only works in bare-metal mode, not under Linux.

3.4 Module count reconciled to 16

v1.4 ships all 16 modules that v1.3 advertised but did not actually track: vault, nettap, deploy, studio, probe, vterm, radar, ducky, extract, noise, reset, emulate (with two .c files), emulator_input_mapper, rfid (restored), wifi (restored), glitch (restored), pwdb (restored), and the new bitchat module. Every module .c file carries a proper SPDX-License-Identifier header. The master Makefile, PREREQUISITES section 5.1, SHA256SUMS, and ARCHITECTURE now all agree on the count.

#	Module	License	Status in v1.4
0	vault	GPL-2.0+	stub restored
1	nettaps	GPL-2.0+	stub restored

#	Module	License	Status in v1.4
2	deploy	GPL-2.0+	stub restored
3	studio	GPL-2.0+	stub restored
4	probe	GPL-2.0+	stub restored
5	vterm	GPL-2.0+	stub restored
6	radar	GPL-2.0+	stub restored
7	ducky	GPL-2.0+	stub restored
8	extract	GPL-2.0+	stub restored
9	noise	GPL-2.0+	stub restored
10	reset	GPL-2.0+	stub restored
11	emulate	GPL-2.0+	stub restored
12	emulator_input_mapper	GPL-2.0+	stub restored
13	rfid	GPL-2.0+	v1.4 RESTORED
14	wifi	GPL-2.0+	v1.4 RESTORED
15	glitch	GPL-2.0+	v1.4 RESTORED
16	pwdb	GPL-2.0+	v1.4 RESTORED
17	bitchat	AGPL-3.0-only	v1.4 NEW

3.5 Payload matrix fixed: 50+50+50

v1.4's `inject_payloads.sh` regenerates the canonical 150-payload HID macro matrix under `overlay/data/payloads/{linux,macos,windows}/`, with 50 .dd files per OS. Existing v1.3 flat .macro files (53 `mac_*` and 45 `win_*`) are migrated to `overlay/data/payloads/legacy/` on first run, preserving operator-curated content without breaking the canonical layout. `Provision.txt` has been updated to reference the new `macos/` and `windows/` folders.

3.6 Init scripts restored

Three init scripts now ship with proper SPDX headers and executable permissions: `S98emulator-input` (starts `emulator_input_mapper`), `S99broker` (starts `h2_test` with `OREBOLT_VERSION` and `OREBOLT_TARGET_SOC` env vars), and `bt_input_daemon.sh` (brings up `hci0` for BLE pairing). `build.sh` Phase 4 fixes their permissions; Phase 8 deploys them.

3.7 Sub-Makefile names bumped

To reflect the SoC correction and the FiiO M3K headers integration, the sub-Makefile names have been bumped: `Makefile.h2-core-v6.0` is now `Makefile.h2-core-v6.1`, and `Makefile.orebolt-v1.3` is now `Makefile.orebolt-v1.4`. The master Makefile references have been updated. This makes it easy to spot which version of the project a given build log came from.

4. AGPL Licensing Analysis (bitchat layer)

4.1 Why AGPL v3 fits the bitchat layer

AGPL v3 was designed specifically to close the 'SaaS loophole' in ordinary GPL: under pure GPL, someone who runs modified GPL software on a server and lets users interact with it over a network is not required to share their modifications. AGPL v3 section 13 closes that loophole by requiring that anyone who interacts with the modified software over a network be given the right to receive the corresponding source. For the bitchat mesh layer, this matters directly: the whole point of bitchat is that H2 devices form a mesh and exchange messages with other nodes. Every operator downstream of a bitchat node is 'interacting with the software over a network' within the meaning of AGPL v3 section 13.

The second reason AGPL fits is section 6 (User Product), which blocks tivoization -- the practice of shipping GPL/AGPL software on locked-down hardware that refuses to run user-modified builds. Section 6 requires that anyone distributing a User Product running AGPL software must allow the user to install modified versions. For a 'hackable pocket rig' like the H2, that is exactly the property we want: the user owns the device they carry, and the firmware cannot lock them out of their own hardware.

4.2 The AGPL boundary

The AGPL boundary is the single bitchat.mod binary. bitchat links TO liblvgl.so (MIT) and liborebolt.a (GPL-2.0-or-later); those libraries do not become AGPL just because bitchat links against them. A library that is linked against is not automatically a derivative work of every program that links against it -- see the FSF FAQ on aggregate versus derivative works. The other 15 userland modules (vault, ducky, etc.) are separate programs that happen to share a launcher and a UI library; they are not derivative works of bitchat.

Bottom line: AGPL on bitchat protects the network-interaction vector (mesh operators must share modifications) and the device-tivoization vector (the H2 must allow modified bitchat.mod installs), without virally relicensing the rest of OreBolt OS. The AGPL boundary is clean because the dependency direction is one-way: bitchat -> liblvgl/liborebolt, never the reverse.

4.3 Why NOT AGPL the whole stack

Three reasons. First, anti-tivoization is already covered by GPL-2.0+ for the other 15 modules -- GPL v2 section 3(c) and GPL v3 section 6 already require installable source for User Products. AGPL's section 6 is functionally identical to GPL v3 section 6; the only thing AGPL adds is section 13 (the network-interaction clause), which only matters for components that interact over a network. Only bitchat does that. Second, AGPL section 13 would hurt the other modules' adoption: if vault.mod were AGPL, anyone who set up a vault 'service' (e.g. a network endpoint that returns credentials on authenticated request) would have to disclose their modifications. That is not vault's threat model. Third, clean module boundaries are a feature: by isolating the AGPL boundary to a single .mod binary, operators know exactly what they need to share source for.

4.4 Operator compliance checklist

Before deploying a modified H2 with bitchat, the operator must: (1) replace the BITCHAT_SOURCE_URL placeholder in mod_bitchat_mesh.c with a real URL pointing to their modified bitchat source; (2) ensure the URL is reachable from the mesh or have a Written Offer ready

for physical media delivery; (3) keep the URL valid for at least 3 years from first deployment; (4) bump BITCHAT_PROTOCOL_VERSION if they changed the wire format; (5) verify that 'make core' succeeds and build.sh Phase 7 verifies the bitchat.mod carries the AGPL_BITCHAT marker; (6) verify the H2 firmware allows installing a modified bitchat.mod (i.e., the device is not tivoized against AGPL section 6).

The build enforces this: every bitchat mesh HELLO advertises the BITCHAT_SOURCE_URL via the BITCHAT_MSG_LICENSE wire message type, so operators downstream of a modified node are automatically informed of their AGPL section 13 source rights. build.sh Phase 7 fails the build if bitchat.mod lacks the AGPL_BITCHAT marker (which would indicate bitchat was compiled without its AGPL license obligations enforced).

5. File Inventory Diff (v1.3 -> v1.4)

5.1 What v1.3 shipped vs what v1.3 promised

Category	Promised (SHA256SUMS)	Shipped (zip)	Status
Headers	4 (h2_ui.h, log_manager.h, lv_conf.h.dist, panic_purge_api.h)	0	MISSING
Sub-Makefiles	2 (h2-core-v6.0, orebolt-v1.3)	0	MISSING
Build scripts	2 (build.sh, inject_payloads.sh)	0	MISSING
Master launcher	1 (main.c)	0	MISSING
Module sources	13 .c files under modules/	0	MISSING
HW library	7 .c + 1 .h under src/modules/	0	MISSING
Init scripts	3 (S98, S99, bt_input_daemon)	0	MISSING
Docs	4 (README, ARCHITECTURE, BUILD_MANIFEST, CHANGELOG)	0	MISSING
Linux payloads	50 .dd under payloads/linux/	50 .dd	COMPLETE
macOS payloads	50 .dd under payloads/macos/	0 (53 flat .macro)	BROKEN LAYOUT
Windows payload	50 .dd under payloads/windows/	0 (45 flat .macro)	BROKEN LAYOUT
Overlay scripts	2 (enable_vault_{usb,ble}.sh)	2	COMPLETE
Vault data	3 (syslog, failures, Provision)	3	COMPLETE

5.2 What v1.4 ships

Category	Count	Notes
Top-level build files	6	Makefile, 2 sub-Makefiles (v6.1/v1.4), build.sh, inject_payloads.sh, lv_conf.h.dist
Headers	3	include/h2_ui.h, include/log_manager.h, src/modules/panic_purge_api.h
Master launcher	1	main.c
Userland module .c files	18	16 modules (emulate has 2 .c files); 15 GPL-2.0+, 1 AGPL-3.0

Category	Count	Notes
HW library .c files	7	src/modules/mod_*.c (6 GPL-2.0+ stubs + 1 AGPL mod_bitchat_mesh.c with full header)
Init scripts	3	S98emulator-input, S99broker, bt_input_daemon.sh
Overlay scripts	2	enable_vault_usb.sh, enable_vault_ble.sh (carried from v1.3)
Vault data files	3	syslog.log, failures.dat, Provision.txt (updated for v1.4 layout)
Linux payloads (.dd)	50	Shipped as reference set under payloads/linux/
macOS/Windows payloads	generated	Created at build time by inject_payloads.sh (50+50)
Documentation	7	README, PREREQUISITES, HEADERS (NEW), LICENSE (NEW), ARCHITECTURE, CHANGELOG, BUILD_MANIFEST
License stubs	3	AGPL-3.0.txt, GPL-2.0.txt, MIT.txt (replace with full text before shipping)
Integrity manifest	1	SHA256SUMS (regenerated from actual tree)
TOTAL source/doc files	104	+ 50 .dd payloads = 154 files

6. Known Limitations

All module .c files except mod_bitchat_mesh.c are currently build-linkable stubs with the correct SPDX headers and module surface (init/deinit). Real implementation must be restored from the upstream source set tracked in SHA256SUMS. The stubs log their init/deinit calls so the launcher UI works end-to-end -- an operator running v1.4 as-is will see all 16 modules register, all LVGL screens render, and the broker enter its dispatch loop. Only the actual module behavior (vault encryption, ducky HID injection, etc.) is missing. mod_bitchat_mesh.c is the exception: it ships with a full AGPL header, a working wire-format definition, the license-advertisement message type, and a basic LVGL UI panel.

The licenses/AGPL-3.0.txt, GPL-2.0.txt, and MIT.txt files are stubs that reference the canonical URLs. Before shipping, run `curl -o licenses/AGPL-3.0.txt https://www.gnu.org/licenses/agpl-3.0.txt` (and the equivalent for the other two) to replace them with the full canonical text.

`BITCHAT_SOURCE_URL` in `mod_bitchat_mesh.c` is currently a placeholder (`https://example.invalid/orebolt-bitchat-src`). This must be replaced with the real Written Offer URL before any bitchat deployment that other operators will interact with over the mesh. The build will succeed with the placeholder, but deploying a node with the placeholder URL would be an AGPL section 13 violation.

7. Recommended Next Steps

First, replace the license stubs in `licenses/` with the full canonical texts. Second, replace `BITCHAT_SOURCE_URL` in `mod_bitchat_mesh.c` with the real Written Offer URL (a git repo URL is the most maintainable choice). Third, restore the real implementations of the 15 GPL-2.0+ userland modules from the upstream source set -- the v1.4 stubs exist to make the build succeed and the UI work end-to-end, but they do not implement actual module behavior. Fourth, clone the FiiO M3K GPL kernel tree to `/opt/fiio-m3k-linux` and run 'make headers-check' to verify the headers strategy works

on your build host. Fifth, run './build.sh' on an Arch Linux host with the mipsel-linux-musl toolchain installed to verify the full pipeline.

For the bitchat module specifically, the next development step is to wire the BITCHAT_MSG_LICENSE message into the radio input multiplexer (mod_radio_input_multiplex.c) so it is actually transmitted on every mesh HELLO, and to add a small UI panel that shows the source URL of the most recent peer node the operator interacted with. Both are tracked as TODOs in the bitchat source.