

Android Cast — implementation roadmap

From ROADMAP.md

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Source: *ROADMAP.md* — section links work in PDF viewers that support internal anchors.

Alpha definition

Track	Goal	Status
Android app	Stable, feature-rich, demo-ready on LAN (discover → PIN → cast → stop; soak two devices)	Core path done; polish UX/docs and gate experimental options for show
Backend	Deployed OTA channel + crash ingest + on-demand remote access (RSSH, prod/hidden)	WIP — examples under examples/; WireGuard v1 lab path done; RSSH implementation in progress

Alpha app can ship before backend is live if the demo is LAN-only. **Full alpha** includes OTA/crash URLs configured in developer settings or `local.properties`.

Alpha app checklist

Runbook: ALPHA.md (feature freeze, defaults, sign-off tables, log script).

Checkpoint	Engineering	Manual sign-off
Happy path: UDP + H.264/AAC + single receiver, protection None	Defaults + freeze in code	■ ALPHA.md § A, C1
README matches CastSettings / CastConfig	Done	—
Fix misleading strings (camera permission vs unavailable)	Done	—
Two-device QA (rotate, background, notification stop)	Script in scripts/alpha-qa-logcat.sh	■ ALPHA.md § B
Cap multi-receiver at 1 for alpha	MULTI_RECEIVER_ENABLED off while freeze on	—
Hide QUIC/WebRTC/USB in settings for alpha	ALPHA_FEATURE_FREEZE	—
Receiver stuck on rotation / STREAM_CONFIG storm	Debounce + idle grace in code	■ B4–B5

Alpha backend checklist

- [] Host examples/ota/v0/ channel JSON + APK artifacts
- [] Deploy examples/crash_reporter/backend/ (see `nginx.conf`, `README.md`)
- [] Set `ota.channel.url` and crash upload URL in dev settings / `local.properties`
- [] **RSSH remote access (alpha essential):** device opt-in via `heartbeat.php` (type: `ra`, `opt_in_mode: rssh`); outbound SSH reverse tunnel to bastion; **no VPN permission / no status-bar key**; operator whitelist + session open in BE UI; E2E validation per `REMOTE_ACCESS_VALIDATION.md` (RSSH path TBD)
- [] WireGuard v1 remains available for lab/E2E; not required for alpha sign-off if RSSH meets owner criteria
- [] **Email infra (alpha essential):** `info@ / admin@ / root@` on `apps.f0xx.org` → Gmail forward; SPF/DKIM/DMARC — 20260607-2FA-email-mobile-auth-flow.md §9
- [] **Registration + 2FA (alpha essential):** email verify + TOTP + mobile-friendly login/register — §10

Remote access (alpha — RSSH)

Owner agreement: production **RSSH** (reverse SSH, hidden — no `VpnService`) is an **essential part of the alpha release**, not post-alpha. WireGuard v1 is implemented for infra/E2E lab work; alpha remote-debug UX targets RSSH.

Item	Status
BE control plane (<code>heartbeat.php</code> type: <code>ra</code> , admin UI, RBAC, purge cron)	Done
WireGuard v1 (device <code>VpnService</code> , UDP DNAT, <code>WireGuardPeerProvisioner</code>)	Done (lab)
BE <code>opt_in_mode: rssh</code> + bastion/session provisioning	TODO
Android RSSH mode selectable (no VPN prompt)	TODO
Outbound reverse SSH client + foreground service	TODO
Operator E2E (whitelist → open session → shell/file on bastion)	TODO

Implementation notes: `REMOTE_ACCESS_IMPL.md` · proposal: 20260602_REVERSE_SSH_proposals_summary.md.

Auth & email (alpha)

Owner agreement: public email aliases + **registration with email verification and 2FA (TOTP)** are **alpha must-have** for the crashes/build consoles.

Item	Status
DNS forward info@ / admin@ / root@ → Gmail	Ops TODO
BE SMTP outbound (noreply@apps.f0xx.org)	TODO
Migration 008_auth_email_2fa	TODO
Register + verify + TOTP enroll/login	TODO
WebAuthn / passkeys (optional alpha)	TODO
Admin: recovery email, clear lockouts, audit	TODO

Full spec: 20260607-2FA-email-mobile-auth-flow.md.

Product positioning

- **Primary:** Wi-Fi LAN cast when **USB-C→HDMI** wired mirror fails or is unavailable (common on some tablets).
 - **Not in scope for v0:** Internet relay (gateway_url_hint), TLS on cast protocol, WebRTC as default transport.
- See USB_HDMI_CAST.md for wired display vs Wi-Fi cast.

USB-C / HDMI (roadmap D) and USB-tether cast (roadmap E)

Item	Status
WiredDisplayMonitor — detect external displays	Done
ExternalDisplayCapturePolicy + developer UI	Done (policy stored; capture still default display)
ScreenCastService display hot-plug hooks	Done
Secondary-display MediaProjection capture	TODO
UsbTetherCastTransport stub + dev-gated transport id	Done
USB tether / ADB reverse discovery + framing	TODO

Details: USB_HDMI_CAST.md.

Commercial (Play Store prep)

All **off by default**. Enable only in **Developer settings** for internal testing.

Item	Status
CommercialFeatures gate	Done
InAppPurchaseCoordinator (Play Billing 7.x)	Done (connects when dev IAP on; SKU placeholder)
InAppAdCoordinator (placeholder, no AdMob SDK yet)	Done
PlayStoreIntegration (listing intent + in-app review API)	Done
AdMob / unit IDs / banner layouts in main UI	TODO
Play Console products + privacy policy	TODO

See COMMERCIAL.md. Pro/OSS module split: PRO_AAR.md (design).

Crash console open API

Item	Status
Workflow triage tags + multi-tag (duplicate+fixed, etc.)	Done — OPEN_API.md
`GET /api/reports.php?tag=...&tag_mode=and\`	or`
ingest .source / run metadata in payload	Design — OPEN_API.md
List filters + synthetic tagging	TODO
API key upload auth (per company)	TODO

Stream protection (FEC / NACK)

Item	Status
GF(256) Reed–Solomon + ProtectionEnvelope v1 (monolithic)	Done
v2 per-shard FEC (FecShardWire, one ACUD message per RS shard)	Done
NACK + RetransmitCache + MSG_NACK	Done
Post-handshake negotiation	Done
Backward compat (defer FEC until negotiated; ignore foreign FEC/NACK)	Done
Default protection NONE (stable cast)	Done
Integration tests (FecShard*, UdpCastTransportFecTest)	Done

Lab soak under loss (HY300 / BL6000)	TODO (manual)
NACK rate limit / backoff	Done (NackRateLimiter)
MSG_FEC_NACK by groupId (optional)	Deferred

Enable in **Settings** → **Stream protection (UDP)** on both sender and receiver, then reconnect.

libvpx / Opus / Speex

Item	Status
libandroidcast_codecs.so + JNI probes	Done
Cross-compile libvpx.a (scripts/build-native-codecs.sh)	Done
JNI encode/decode in libvpx_bridge.c	Done (when libvpx.a linked per ABI)
LibvpxVideoEncoderSink (surface + buffer)	Done
libvpx decoder on receiver (LibvpxCapableVideoDecoder)	Done
Surface → libvpx without MediaCodec passthrough on cast	Done (ImageReader)
Opus / Speex cross-compile + CMake autolink (build-native-codecs.sh)	Done
Opus / Speex JNI encode/decode sinks	TODO

See `ndk/README.md`.

Transports & protocols

Transport	Status
UDP (default)	Done
TCP	Done
QUIC (Cronet, experimental)	Partial
WebRTC	Stub (WebRtcCastTransport)
USB tether (usb_tether)	Stub — dev settings only

Receiver / sender UX

Item	Status
ReceiverPlaybackActivity (primary receiver UI)	Done
Settings drawer + themes + RU locale	Done
Multi-receiver 1:N	Done (gated off while ALPHA_FEATURE_FREEZE)
Legacy ReceiverActivity in manifest	Orphan — remove or wire
Immersive A/V presets (dev)	Experimental
Sender resolution UI modes (dev: Separated / Legacy / Combined)	Done (test)
True dual-stream encode (480p + 720p simultaneous)	Deferred

Deferred / post-alpha

- **URL shortener** (<https://s.f0xx.org>) — PHP API in `backend/url-shortener/`; sync to BE + `seed_bearer.php` + `libqrencode-tools`
- Internet relay gateway
- TLS on cast stream
- Passthrough video codec
- Lab automation under simulated loss
- Full wired-HDMI capture (roadmap D phase 2)
- USB-tether cast production path (roadmap E)

Related docs

- `README.md` — **documentation index** (all docs/*.md with section links)
- `GIT_FLOW.md` — green master / next development cycle (PDF)
- `INFRA.md` — production FE/BE topology
- `../README.md` — repo quick start
- `ALPHA.md` — alpha freeze & QA sign-off
- `USB_HDMI_CAST.md` — D & E
- `COMMERCIAL.md` — ads / IAP / Play
- `PRO_AAR.md` — cast-core / cast-pro entitlements
- `OPEN_API.md` — crash ingest triage API
- `OTA.md` — backend layout v0

- BUILD_DEPLOY.md — Docker build, staging OTA, deploy flow
- CRASH_REPORTER.md — crash upload
- GRAFANA_vs_others_graphvis_pivot.md — graphs dashboard pivot
- 20260602_REVERSE_SSH_proposals_summary.md — on-demand remote access
- AV_QUALITY_QA_SESSION.md — AV quality enhancement Q&A