

Any-Event Bandobast AI — Build Roadmap (Post-V1)

Audience: Police & Government Ops (City/PS/Traffic/SRPF/Disaster/Health)

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Scope: Post-V1 roadmap to turn the Ganpati prototype into a **reusable, any-event bandobast system** (religious processions, rallies, VIP visits, marathons, disaster crowd control, etc.)

0) Context & Goal

- **V1 delivered:** City layers on Google Earth, KML routes, PS playbooks, and a basic prediction method.
- **VNext goal:** Build a **dedicated AI system** that ingests KML/GeoJSON for any event, predicts crowd/congestion/risk, guides diversion & manpower, and outputs police-ready artifacts.

North Star: “Detect → Predict → Decide → Act → Learn” within one stack; human-in-the-loop on all Reds; printable fallbacks always available.

1) Core Capabilities (Reusable for any event)

- **Unified Geo Layer:** KML/KMZ/GeoJSON ingest → PS boundaries, routes, nodes, ghats/venues, sensitive zones.
 - **Prediction Pack:** hourly load forecast, segment GAR probability, incident risk scores, queue-time estimate.
 - **Optimizers:** shift-wise surge allocation, detour selection, crane/ambulance staging.
 - **Ops Interfaces:** control dashboard, PS wallboard, field PWA, WhatsApp copilot.
 - **Comms Kit:** route posters (QR), SOP mini-cards, 19:30 brief, citizen microsite (controlled).
 - **Learning:** after-action auto-compile; model retune per event profile.
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2) KML→AI Interface (Design)

Ingest: `/ingest/kml` (file/url) → convert to GeoJSON → validate schema → attach PS IDs → build **route graph** (nodes/segments) → cache tiles.

Enrich: tag segments with width class, chokepoint density (buffers), sensitive proximity, historic incidents, distance to venue/ghat, emergency lane availability.

Promptable Metadata: RAG over event SOPs + local notes for LLM explanations (“why Red?”, “which detour?”).

Versioning: geometry hashes; `derived_route_*` lines labeled read-only.

APIs (initial): - `POST /predict/segment` → GAR + reason codes

- `POST /predict/load` → hourly 0–100 per PS/venue

- `POST /optimize/roster` → base/surge/reserve per shift

- `POST /alerts/apply` → trigger bumps (rain/dam/crowd) with audit

3) Event Profiles (Templates)

Profile	Examples	Special rules
Religious Procession	Ganpati, Muharram, Kavad	Queue lanes, riverbank risk, crane staging
VIP Movement	CM/PM visits, rallies	Bubble routes, freeze windows, multi-agency sync
Marathon/Run	City run, cyclothon	Rolling closures, hydration points, medical tents
Market/Fair	Weekly haat, mela	Stall layouts, fire lanes, evacuation paths
Emergency Relief	Flood relief, sheltering	One-way supply corridors, ambulance priority

Each profile pre-loads SOP cards, trigger bands, and KPIs.

4) System Modules (Reusable)

Ingest → Store → Understand → Predict → Decide → Act → Learn - **Ingest:** KML/KMZ/GeoJSON; PS forms; WhatsApp SITREPs; rainfall & dam APIs; optional CCTV counts.

- **Store:** PostGIS + event store; RBAC; immutable audit.
 - **Understand:** RAG over orders/SOPs; LLM summaries for PS briefs/checklists.
 - **Predict:** time-series + graph models; rule triggers for rain/dam/crowd.
 - **Decide:** optimizer for rosters/detours/staging.
 - **Act:** dashboards, PWA, WhatsApp; PA/LED scripts.
 - **Learn:** AAR generator, KPIs, model retune.
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5) Visual & Interactive Interfaces (Police-First)

Interface	Who uses	What it shows	Actions
Control Dashboard (Web)	CP/DCP/Control	City→PS→Route drill-down; GAR map; Load Index; triggers	Ack Reds, assign SRPF/QRT, export PNG/PDF
PS Wallboard	PI/SPI/Traffic	Station routes, sensitive nodes, manpower	Edit shifts, print posters, approve detours
Field PWA	Beat/Traffic	QR navigation (derived_route_*); incident log	Scan QR, photo+GPS ticket, mark Cleared
WhatsApp Internal	All units	/sitrep forms; alerts; acks	Submit SITREPs; receive tasks; acks

Interface	Who uses	What it shows	Actions
Citizen Microsite	Public (controlled)	Diversions, wait bands, parking	Search area, get route; share link

6) What We Can Build Next — AI Build Roadmap

16.1 Field Ops Apps

- **Control Room Live Dashboard (Web)** — GAR map, PS hotspots, hourly Load Index, queue bands, triggers log; PNG/PDF export.
Tech: Next.js + MapLibre/Google Maps; Supabase; n8n ingest.
Output: `/dashboards/bandobast/`
- **Mobile Field App (PWA)** — offline-first; scan QR → open route; one-tap incident log (type, photo, GPS); shift roster view.
Tech: FlutterFlow/Glide PWA; Supabase; on-device photo redaction (optional).
Output: `/apps/field-pwa/`
- **Beat Officer Route Navigator** — preloaded PS→Mandal→Ghat (`derived_route_*`) with step prompts; vibrate near chokepoints.
Tech: PWA + service workers; KML→GeoJSON converter.

16.2 Automations & Integrations

- **WhatsApp Copilot (Internal)** — /sitrep quick forms, Red/Amber alerts, roster acks; integrates with Change-Log Bot.
Stack: Twilio/Gupshup + n8n.
- **WhatsApp Citizen Assistant** — diversion advisories, ghat wait bands, parking; rate-limited broadcast.
- **Sensors & Feeds** — river gauge + rainfall API; CCTV headcount pilot (YOLO/ByteTrack) at 3 chokepoints; cron ingest → trigger bumps.

16.3 Data Products

- **Daily PS Heat Index PDF** — 1-pager per PS (peaks, GAR map, manpower deltas).
- **Mandal Slotting Optimizer** — staggered arrival windows; export CSV to share with mandals.
- **After-Action Report (AAR) Generator** — incidents, response times, diversion efficacy, lessons learned.

16.4 Visual Comms Kit

- **Route Posters (A3)** per PS with QR to live map.
- **QR Sticker Pack** for barricades, cranes, first-aid, control points.
- **Volunteer Pocket Cards** — SOP mini-cards (Marathi/English).
- **LED/PA Scripts** — timed announcements synced to peaks and weather.

16.5 Governance, Training & Safety

- **SOP Card Pack** — Rain/Dam/Crowd triggers; checklists; escalation tree.
- **War-Game Table-top Drill** — 90-min simulation with injects for top 5 corridors.
- **Data Governance Register** — sources, retention, access roles, audit trail.

16.6 Public Info & Media

- **Citizen Microsite** — live diversions, ghat status, safety advisories (Marathi/English).
- **Press Brief Auto-Draft** — daily 19:30 bulletin; embeds maps & stats.

16.7 72-Hour Sprint Plan (Immediate Builds)

- Duplicate **14 PS one-pagers**; prefill station names; leave PI/SPI contacts for field fill.
- Generate **QR deep-links** per PS for `derived_route_*` and insert in templates.
- Publish **v0 Control Dashboard** with static GAR map + manual peak toggles.
- Set up **n8n ingest** for rainfall & dam feeds; write trigger bump rules.
- Create **SOP mini-cards** (Mar/Eng) — print-ready A6.
- Prepare **Route Poster v1** for Ramkund cluster (A3 + QR).
- Scaffold **WhatsApp Internal Copilot** with `/sitrep` and `/alert` flows.

16.8 Deliverable Matrix (owner placeholders)

Deliverable	Inputs	Tooling	Owner	Output
14 PS One-Pagers	Template §9	Word/Google Docs	[PS Cell]	<code>PS_*_onepager.pdf</code>
QR Route Set	KML/KMZ	QR generator	[GIS]	<code>qr_ps_*.png</code>
Control Room v0	GeoJSON (static)	Next.js + Map	[IT]	<code>/dashboards/</code>
n8n Triggers	API creds	n8n	[IT]	<code>flows/*.json</code>
SOP Cards	§13 triggers	InDesign/Canva	[Ops]	<code>sop_cards_A6.pdf</code>
Route Posters	PS routes	Illustrator/Canva	[Comms]	<code>posters_A3/*.pdf</code>
WhatsApp Copilot	Forms schema	Gupshup/Twilio + n8n	[IT/Ops]	<code>flows/whatsapp/*.json</code>

7) AI Visual & Interactive System — What We Can Do Now

Goal: Make operations see-through, clickable, and fast to act for Control Room, PS, field teams, and citizens.

17.1 Experience Catalog

Experience	Audience	What it shows	Interaction	Outcome
Live Control Map (GAR)	Control Room	City→PS→Route→Node; Load Index, queue bands, triggers	Click QR panel, toggle peaks, ack alerts	Instant hotspot focus + tasking
PS Ops Wallboard	PI/SPI & Traffic	Station routes, sensitive nodes, manpower & SRPF/ QRT	Inline edit shifts; route verify	Faster rostering & verification

Experience	Audience	What it shows	Interaction	Outcome
Field PWA	Beat officers	Offline QR nav, incident log (photo+GPS), micro-SITREPs	Scan/submit <15s; cached maps	Real-time ground truth inflow
Citizen Microsite	Public	Diversions, ghat status, parking, safety tips (Mar/Eng)	Search area; share link	Fewer calls; smoother routing
Media Brief Studio	PRO/ Comms	Auto charts/maps + key numbers for 19:30	Approve → publish	Consistent, low-risk messaging
3D City Twin (pilot)	CP/DCP	Elevation-aware flows, crane reach, vantage	Pan/ time-scrub; what-ifs	Better pre-briefs, crane placement
AR Route Walkthrough (pilot)	Marshals	On-phone lane marking, AR chokepoint labels	Camera overlay	Quicker setup; fewer errors

17.2 Visual Widgets (Specs)

- **GAR Route Map:** segment colors + reason codes; tap shows detour + SOP snippet.
- **Queue Meter (Ghat/Venue):** live band (<20m / 20–45m / >45m) with last-hour trend.
- **Load Timeline (PS):** hourly 0–100 with peak windows (D1/D5/D10 toggles).
- **Trigger Cards:** Rain/Dam/Crowd; threshold, last value, action button.
- **Manpower Matrix:** shift×role grid; surge slider; export PDF.
- **Incident Stream:** photos, GPS, status chips (Open/In-Progress/Cleared).
- **Sankey Flow (pilot):** Mandal→Corridor→Ghat volumes for post-event analysis.

8) System Architecture — How It Works

Flow: Ingest → Store → Understand → Predict → Decide → Act → Learn

Module	Inputs	Processing	Outputs	Owner
Ingest	KML/KMZ, PS forms, SITREP/WhatsApp, rain & dam APIs, CCTV counts	ETL + schema checks	Cleaned tables, geo layers	IT/GIS
Store	GeoDB + event store	PostGIS schemas, retention, access	Versioned layers, audit trails	IT
Understand	RAG over docs, PS notes	LLM summaries + validations	PS briefs, checklists	Ops/AI
Predict	Time-series + graph models	Hourly load, GAR probabilities, risk	Indices, alerts, confidence	AI

Module	Inputs	Processing	Outputs	Owner
Decide	Optimization & rules	Shift surge, detours, staging	Rosters, diversion plans	Ops
Act	Dashboards, PWA, WhatsApp, PA/LED scripts	Publish + acks	Tickets, assignments	Control/PS
Learn	After-Action data	Error metrics, near-miss, response times	Model updates, SOP deltas	QA/AI

Governance & Safety: role-based access; manual override on all Reds; offline PWA; privacy-by-design (blur/redact faces; no raw video unless needed); immutable change log.

8A) Technical Deployment Plan (Stack & SLAs)

- **Frontend:** Next.js + MapLibre/Google Maps; PWA (offline-first).
- **Backend:** Postgres/PostGIS (Supabase) + n8n (ingest/orchestration) + serverless functions.
- **AI Layer:** Hosted LLM for RAG/summarization; LightGBM/sklearn for models; OR-Tools for ILP.
- **Integrations:** Rain & dam APIs; optional CCTV edge devices.
- **Security:** RBAC, per-PS scopes, signed URLs, audit logs.
- **SLAs:** Prediction refresh ≤ 10 min; alert fan-out ≤ 30 s; dashboard P95 load ≤ 2 s; PWA offline continuity ≥ 8 h; control dashboard uptime $\geq 99.5\%$ (season).

9) Benefits & KPIs (by Stakeholder)

Stakeholder	Primary benefit	KPI (baseline → target)
Control Room	Faster hotspot detection	Alert→ack 6m → <2m
Police Station	Better rostering & route discipline	Missed-post incidents ↓ 40%
Traffic Branch	Smoother diversions	Corridor travel time ↓ 25%
SRPF/QRT	Timely surge	Dispatch→on-scene 15m → <8m
Disaster/Health	Quicker medical reach	Ambulance access 12m → <6m
NMC/Utilities	Precise placement of assets	Under-used asset hours ↓ 30%
Citizens	Clear info, less confusion	Peak grievance calls ↓ 35%
Leadership	Transparent oversight	Hourly SITREP accuracy >95%

10) AI Use-Case Gallery (Ops + Visuals)

- **What-If Simulator:** close Road-X or add +2 cranes → see spillover & queue change.
- **Slotting Optimizer:** auto stagger mandal arrivals; share CSV.
- **Auto Press Brief:** top stats + 2 maps; Marathi/English draft.
- **Voice Copilot (Mar/Eng):** “Show Jalebi Chowk status” → opens node card.

- **Anomaly Watcher:** detects unusual dwell at sensitive nodes; pings PS.
 - **Volunteer Lesson Cards:** 60-sec micro-explainers with diagrams; QR on ID cards.
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11) Risk, Safety & Compliance (AI-Specific)

- **Explainability:** every alert shows inputs & rule/model path.
 - **Rate-Limits & Throttling:** prevent alert floods; escalate on confirmation.
 - **Human-in-the-Loop:** required for Reds; overrides logged.
 - **Data Ethics:** minimum collection; on-device processing for vision; timed retention.
 - **Legal Alignment:** state guidelines for surveillance/processions/disaster management; access logs audited.
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12) Roadmap & Resourcing

72-Hour Sprint: Section 16.7 items.

Week-2: triggers wiring; optimizer; AAR generator; 3-site CCTV pilot.

Month-1: citizen microsite; 3D twin pilot; anomaly watcher; what-if simulator.

Team (lean): 1 GIS, 1 full-stack, 1 ops PM, 1 data/AI; surge via trainees/volunteers.

13) Approvals Requested

- 1) Proceed with **72-hour sprint**; assign owners per Deliverable Matrix (16.8).
- 2) Permit **internal WhatsApp** flows and controlled **citizen microsite**.
- 3) Sanction **print kit** (A3 route posters; A6 SOP cards; QR stickers).
- 4) Authorize **CCTV pilot (edge)** at 3 chokepoints; privacy guardrails enforced.

Signed:

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(For Commissioner of Police approval)