Crisis Triage Ecosystem

Force-multiplying unified coordination: *Connecting every agency and officer for trusted, mission-ready responses.*

Executive Summary:

- Current triage systems are **fragmented, impacting operational clarity and response speed**.
- **A unified, AI-assisted triage ecosystem** with human-in-the-loop oversight addresses HTX's zero-failure and compliance needs.
- **Adoption and trust-building** are the key challenges to scaling beyond pilots.

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Set The Stage: Critical Assumptions Made To Set Solution Guardrails

1 **Human-in-the-Loop Control is Essential**

Full autonomy is not accepted; officer oversight is mandatory.

2 **Existing Platforms Will Remain Core**

Solution depends on extending—not replacing—current systems.

3 **Strict Data Sovereignty & Role-Based Access**

Data policies enforce tight clearance and access controls.

4 **Adoption is the Key Scaling Barrier**

Cultural and trust issues outweigh technical or funding constraints.

5 **Multi-Source Data Fusion is Feasible**

Diverse inputs can be integrated reliably and securely.

6 **Compliance Can Be Achieved Without Excessive Friction**

Policies won't overly hinder operational workflows.

7 **Phased Rollout Across Agencies is Possible**

Cross-agency collaboration and coordination can be sustained.

Early validation of these assumptions is critical to success and may require pivots if invalidated

[Discover] Why Home Team Digital Platforms Are Siloed

Key digital platforms

- **HTOC (command dashboards):** Command backbone; intended single operational picture *(Essential)*
- **Phoenix (AI triage):** AI for triage and incident clarity *(Essential)*
- **HTSC (asset dashboards):** Asset/resource status and readiness *(High relevance)*
- **999 Eye (live video):** Field visuals to command, responders *(High relevance)*
- **Smart CCTVs & drones:** Automated detection, situational feeds *(Moderate relevance)*

These platforms are intentionally siloed:

- Uphold **operational security**
- Ensure **data sovereignty**
- Reinforce **command discipline**

As operational complexity grows, these secure, trusted platforms increasingly run in parallel, creating friction, manual workarounds, and blind spots for daily users.

[Discover] Daily User Challenges: Functional & Emotional

Ops Centre Commanders & Staff

***Functional**:* Assemble real-time picture from multiple dashboards—slower, riskier triage.

***Emotional**:* Overload, anxiety about missing critical signals.

Ground Officers

***Functional**:* Juggle multiple apps/workflows—higher risk of missed updates, slower response.

***Emotional**:* Frustration, tool fatigue, doubts about tech's value.

Asset & Resource Managers

***Functional**:* Delays in deploying assets when status isn't visible in incidents.

***Emotional**:* Pressure and helplessness—readiness expected, but visibility limited.

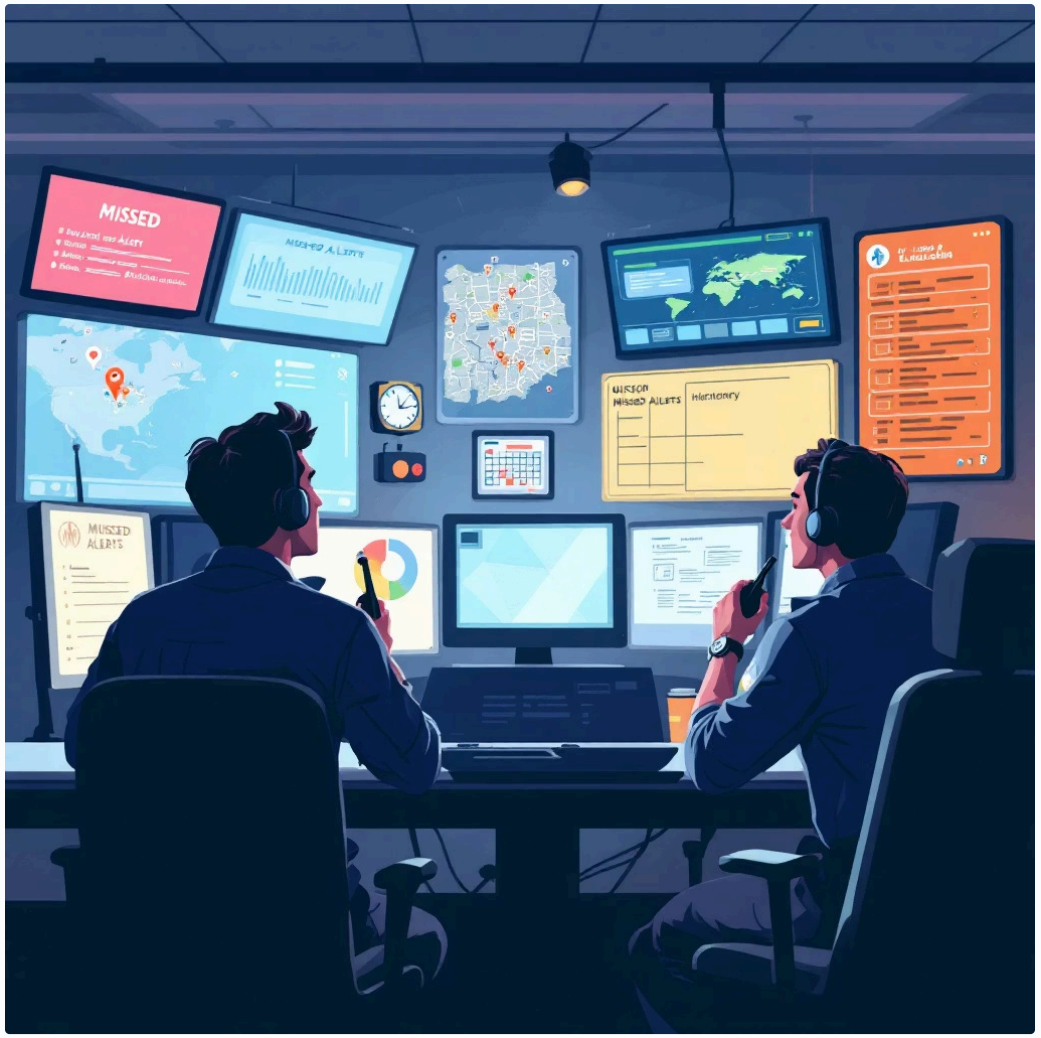
SCDF Paramedics/Medics (Major Events)

***Functional**:* Difficult to share/access live info across teams during emergencies.

***Emotional**:* Isolation and uncertainty—not fully in sync with command and peers.

Even with best-in-class tools, fragmentation creates real-world friction, stress, and slows down coordinated response—especially when clarity and speed are critical

[Discover] The Gap: Why Progress on Triage Matters



1 Fragmented response

Parallel systems slow down decisions and make coordination harder, especially in time-critical incidents.

2 Missed opportunities

Disconnected platforms make it difficult to spot patterns and act proactively.

3 Frontline friction

Users spend energy managing tools, not responding to incidents: affecting morale and effectiveness.

4 Partial returns on investment

Platforms deliver value, but without integration, the full national benefit is not realized.

Progress on unified triage is not a cure-all, but it is a strategic first step: one that can unlock faster, smarter, and more coordinated response across the Home Team

[Discover] Why Now: The Time to Act on Triage Integration

Complexity demands action

Modern incidents are more multi-agency and information-rich, requiring real-time coordination.

Leadership and policy alignment

HTX and Home Team leadership now prioritize integration and operational scale.

Proven technical readiness

Pilots and live deployments have demonstrated secure integration of core platforms and workflows.

Frontline demand is clear

Command and field users are calling for solutions that connect their work and make daily operations easier.

Momentum for transformation

Starting with triage integration builds trust, demonstrates visible value, and creates the foundation for further digital progress.

Unifying triage will deliver immediate operational impact and accelerate Singapore's progress toward a safer, more connected, and future-ready Home Team

[Define] Root Causes: Why Fragmentation Persists

1 Deliberate platform silos:

Each system (HTOC, Phoenix, HTSC, 999 Eye, smart CCTVs/drones) was developed with its own security, compliance, and operational mandate, making cross-platform integration complex by design.

2 Compliance and risk management:

Stringent audit, data residency, and command protocols ensure trust and resilience, but make workflow changes and integration slow to approve and implement.

3 Lack of a single, trusted triage loop:

No unified digital "source of truth" for incident management; decisions often revert to manual coordination, especially in multi-agency events.

4 Adoption hurdles:

Officers and resource managers remain cautious of "black box" tools; visible, explainable benefit is needed to build frontline trust and drive use.

These root causes are not the result of oversight, but the product of a disciplined, risk-managed culture. They must be addressed head-on to enable operational improvement

[Define] Prioritizing Root Causes—Mission, Value, Feasibility

Root Cause	Mission Criticality	Cross-User Value	Feasibility Within Constraints	Overall Priority
No unified triage loop	5	5	4	Highest
Compliance & risk friction	5	4	3	Highest
Adoption & trust hurdles	4	5	3	High
Deliberate platform siloes	2	3	3	Low

Summary:

- **Compliance is foundational:** Solutions must meet compliance and risk requirements to even be considered—making this a top, non-negotiable priority.
- **Unifying the triage loop** offers the greatest cross-user value and is feasible if built with compliance from the outset.
- **Adoption and trust** are critical for realizing full impact at scale; without user buy-in, even compliant and unified systems will underperform.
- **Existing silos should remain for resilience and security; integration should occur above silos through secure orchestration, not by attempting full de-siloing.**

Compliance and triage unification must be solved together, with adoption as a third, parallel priority. The path forward is secure integration above resilient silos, not dismantling them

[Define] Problem & Opportunity Statement

Problem Statement:

> Singapore's Home Team cannot consistently deliver rapid, coordinated, and trusted incident response because critical triage signals, operational data, and workflows remain fragmented—separated by compliance guardrails and legacy platform silos. *Efforts to innovate often stall at pilot stage when compliance or frontline trust is not fully addressed.*

Opportunity Statement:

> By **orchestrating a secure, unified triage layer**—built with compliance and user trust from the start—HTX can enable faster, more confident decisions across agencies, unlock greater value from existing digital investments, and create a scalable foundation for future transformation. *This approach accelerates impact without undermining the resilience or command discipline provided by today's platform silos.*

The opportunity: To unify triage, not by breaking down silos, but by securely integrating what works: meeting compliance, operational, and user needs together for a safer, more connected Singapore

[Develop] Solution Vision: A Secure, Unified Triage Backbone

Vision

> **Force-multiplying unified coordination.** *A unified triage ecosystem connects every agency and officer—so Singapore's Home Team responds to any incident with speed, confidence, and as one.*

What We Do

- Integrate proven platforms without replacing core systems
- Prioritize compliance, privacy, and auditability
- Ensure human judgment and manual fallback always remain
- Enable real-time, cross-agency coordination securely
- Roll out incrementally to manage risk and build trust
- Design for stability and zero tolerance for failure

What We Don't Do

- Disrupt or replace mission-critical platforms
- Compromise compliance, privacy, or audit requirements
- Remove human oversight or force AI-only decisions
- Introduce unacceptable operational risk or uncertainty
- Mandate all-or-nothing rollouts
- Exclude any Home Team user groups

Guiding Principles

1. **Compliance by design** Enforce security, privacy, auditability, and data sovereignty through every workflow.
2. **User trust and explainability** Officers understand and control AI recommendations with transparent logic and easy overrides.
3. **Cross-agency inclusivity** Designed to serve all Home Team roles and agencies securely and effectively.
4. **Integration over replacement** Connect and amplify existing trusted platforms without disrupting mission-critical systems.
5. **Feedback fuels improvement** Every incident and user input drives continuous product, policy, and training evolution.
6. **Resilience and scalability** Built for fail-safe operation, modular rollout, and adaptable growth aligned with operational needs.

[Develop] Solution Concept: Unified Triage Flywheel

1. Unified Incident Intake

Multi-source data from calls, 999 Eye, CCTVs, drones, and sensors flow securely into the system

2. Explainable AI & Human-Led Triage

Phoenix AI analyzes inputs, generates explainable triage recommendations with confidence scores, and suggests dynamic routing

3. Coordinated Command & Dispatch

HTOC aggregates data and AI outputs, enabling human officers to review, override, and dispatch resources via role-based dashboards

4. Frontline Execution & Feedback

Field teams execute dispatch orders using existing communication tools, providing real-time status updates and feedback, which are logged for traceability.

5. Continuous Learning & Improvement

All actions and overrides are audited to ensure compliance with policies and regulations, supporting accountability and trust.

6. Compounding Trust & Adoption

Visible improvements build user confidence and accelerate adoption, looping back to amplify incident intake.

Each cycle strengthens operational readiness, builds trust, and accelerates digital transformation, creating a self-reinforcing system that adapts and improves with every incident

[Develop] Module-Based Features

Module	Feature	Objective	Use Case
Incident Intake Module	Multi-Source Data Fusion	Securely combine diverse incident inputs	Ingest calls, 999 Eye video, and sensor data for a complete incident picture
AI Triage & Routing Module (Phoenix AI)	Explainable AI Triage	Provide transparent triage recommendations with confidence scores	AI suggests dispatch priority with rationale visible to officers
AI Triage & Routing Module (Phoenix AI)	Dynamic Resource Routing	Optimize real-time resource deployment	Reassign officers dynamically based on changing incident data
Command & Dispatch Module (HTOC)	Human-in-the-Loop Control	Enable officer review, override, and audit	Officer adjusts AI recommendations before dispatch
Command & Dispatch Module (HTOC)	Role-Based Dashboards	Tailor views for different user roles	Officers see field updates; commanders see overall incident status
Asset Management Module (HTSC)	Real-Time Asset Status	Monitor resource readiness and availability	Display vehicle readiness in dispatch dashboard
Audit & Compliance Module	Action Logging & Review	Maintain compliance and traceability	Log overrides and decisions for audit
User Experience & Feedback Module	Continuous Feedback Loop	Capture user input for continuous improvement	Officers submit feedback on triage accuracy and workflow ease

This solution combines user-centered design, AI intelligence, and rigorous compliance to empower faster, smarter, and trusted responses across the Home Team

[Develop] Data Flow & Platform Integration

Data Inputs

- Civilian calls (with or without 999 Eye live video)
- Smart CCTVs, drones, and other sensors

Phoenix AI

- Ingests multi-source data
- Performs triage analysis and dynamic routing
- Sends recommendations to

HTOC (Command & Control Centre)

- Aggregates AI recommendations and asset data from HTSC
- Supports human-in-the-loop decisions and dispatch

HTSC (Asset & Resource Management)

- Provides real-time asset readiness and status data to HTOC

Field Execution & Feedback

- Dispatches orders to field officers and medics
- Feedback and overrides are logged for compliance and continuous improvement

This data flow enables seamless integration across platforms, supporting timely, trusted, and coordinated incident response

[Develop] Adoption & Change Management

1. **Modular, phased rollout**
   with pilots and feature toggles.
2. **Role-specific training**
   emphasizing transparency and compliance.
3. **Continuous user feedback channels**
   driving system improvement.
4. **Transparent communication**
   on human-in-the-loop and compliance safeguards.
5. **Designed to minimize disruption**
   and build trust for sustainable adoption.

Successful implementation relies on phased rollout, tailored training, transparent communication, and continuous feedback—ensuring adoption, trust, and sustainable impact

[Develop] Feature Prioritization

Module	Feature	Impact	Technical Feasibility	Policy Criticality	Overall Priority	Rationale
Incident Intake Module	Multi-Source Data Fusion	5	4	No	High	Foundational technical enabler; must be implemented in a policy-compliant way.
Command & Dispatch Module (HTOC)	**Human-in-the-Loop Control**	**5**	**3**	**Yes**	**High**	**Essential for adoption; aligns with command culture and operational control**
Audit & Compliance Module	**Action Logging & Review**	**4**	**4**	**Yes**	**High**	**Non-negotiable for compliance and accountability**
Command & Dispatch Module (HTOC)	**Role-Based Dashboards**	**4**	**4**	**Yes**	**High**	**Critical for enforcing data security and governanc**
User Experience & Feedback Module	Continuous Feedback Loop	3	4	No	High	Critical for adoption and iterative improvement
AI Triage & Routing Module (Phoenix AI)	Explainable AI Triage	4	3	No	Medium-High	Improves decision-making; builds trust but not mandated
AI Triage & Routing Module (Phoenix AI)	Dynamic Resource Routing	4	3	No	Medium	Enhances operational efficiency; suitable for later phases
Asset Management Module (HTSC)	Real-Time Asset Status	3	4	No	Medium	Supports dispatch decisions; governed by policy constraints

[Develop] Objective-Based Roadmap

Now

Objective: Establish trust, compliance, and foundational data integration

- **Incident Intake**
  - Multi-Source Data Fusion
- **Command & Dispatch**
  - Human-in-the-Loop Control
- **Audit & Compliance**
  - Action Logging & Review
  - Role-Based Dashboards
- **User Experience & Feedback**
  - Continuous Feedback Loop

Then

Objective: Enhance decision accuracy and asset visibility

- **AI Triage & Routing**
  - Explainable AI Triage
- **Asset Management**
  - Real-Time Asset Status

Later

Objective: Increase efficiency with AI-driven dynamic routing.

- **AI Triage & Routing**
  - Dynamic Resource Routing

By prioritizing trust and compliance, this roadmap paves the way for meaningful change, empowering HTX to scale solutions safely and effectively beyond pilot stages

[Deliver] MVP / Pilot Plan

Scope (Now phase features)

- Multi-Source Data Fusion
- Human-in-the-Loop Control
- Compliance & Action Logging
- Role-Based Dashboards
- Continuous Feedback Loop

Users

- Command officers
- Operations staff
- Field officers
- Asset managers
- SCDF medics

Success Criteria

- Technical feasibility and system reliability
- Initial user adoption and engagement
- Compliance with audit and security policies
- Early feedback incorporation and workflow adjustment

Pilot implementation at one or two key Home Team operations centres with selected agencies

[Deliver] Rollout Strategy: Risk Mitigation & Adoption Focus

1

Phase 1: Development & Sandbox Testing

- Build and validate core modules using mock data in a sandbox
- Engage early adopter users cautiously (opt-in only)
- Conduct rigorous security and compliance testing

2

Phase 2: Simulation & Training

- Run realistic drills with key users
- Provide role-specific training emphasizing compliance and human-in-the-loop
- Establish feedback channels for iterative improvement

3

Phase 3: Shadow Rollout & Validation

- Conduct extended shadow rollout over several months running alongside existing workflows
- Perform continuous real-time data comparison and validation against live operations
- Maintain transparent communication and dedicated user support throughout
- Use insights to build trust, identify issues, and refine the system before live deployment

4

Phase 4: Controlled Pilot Deployment

- Use feature toggles for incremental feature activation
- Expand tailored training and user support
- Foster cross-agency collaboration and leadership sponsorship

5

Phase 5: Phased Expansion & Optimization

- Gradually scale to more agencies and users
- Share success stories and operational gains
- Continue engagement, training, and feedback loops

6

Phase 6: Full Production & Continuous Improvement

- Achieve full integration with mature governance
- Maintain ongoing support and user community
- Adapt system with evolving tech and operational needs

Embedding risk mitigation and adoption focus throughout ensures safe, trusted, and sustainable scaling

[Deliver] Success Metrics

Operational Metrics:

- Average triage and dispatch decision times
- Incident resolution speed and accuracy
- System uptime and error rates

User Experience Metrics:

- Adoption rates and active usage levels
- User trust and satisfaction survey scores
- Frequency and nature of overrides (reflecting trust and control)
- Volume and quality of user feedback submissions
- Behavioral changes in workflow adherence and system reliance

Compliance Metrics:

- Percentage of incidents with complete audit trails
- Number of compliance breaches or security incidents

Continuous Learning Metrics:

- Rate of feedback implementation
- Number of system updates driven by user input

[Deliver] Long-Term Vision & Sustainability

Continuous Evolution:

Built-in feedback loops and modular architecture enable ongoing improvements aligned with emerging technologies and operational needs.

Scalability & Resilience:

Designed for phased expansion, robust security, and zero-failure tolerance to support growing user base and mission complexity.

Embedded Governance:

Strong compliance and audit frameworks ensure sustainable trust and accountability across agencies.

Aligned with HTX Mission:

Supports Singapore's national safety goals through trusted digital transformation and operational excellence.

Sustainability is not an afterthought—it is woven into every phase to ensure the triage ecosystem remains adaptive, secure, and mission-ready for the long term

How This Reflects My Product Practice

What this case shows:

1. Reframing crisis not as chaos, but as a **designable, governable system**.
2. Surfacing hidden effort, blurred roles, and emotional strain — then creating rituals that redistribute and protect.
3. Designing governance that respects power dynamics, emotional load, and operational clarity — not just hierarchy.
4. Shaping environments where **delivery and care can coexist** — especially in sustained uncertainty.

This is how I lead in moments of fragility:

By protecting energy, restoring rhythm, and rebuilding systems that help people move forward — quietly, together.

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