

VEHICLE SYSTEMS LAB

Technology Research Laboratory for Auditable Complex Systems

VEHICLE-CPS

Civil Protection Systems

Technical Brief

Developed by	VEHICLE Systems Lab
Associated framework	Borda Milan Pyramid · VEHICLE Framework · DOI 10.5281/zenodo.20046955
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Status	Research architecture, technical demo and pilot-ready concept

TECHNICAL SUPPORT BRIEF

Prepared for investors, strategic partners, institutions and technical reviewers.

Document navigation

This brief is structured for investor review first, followed by technical and operational details. The commercial agency-specific proposal remains an internal document and is not included in this public package.

Executive Summary

VEHICLE-CPS is an auditable civil protection architecture designed to anticipate structural risk around leaders, institutions, infrastructure and critical decision environments.

It combines structural intelligence, graph-based monitoring, dynamic perimeter modeling, wearable proximity technology and human-supervised operational protocols. Its purpose is to help protection teams detect abnormal structural tension before risk becomes irreversible.

VEHICLE-CPS is not a surveillance platform and it is not an autonomous coercive system. It is an auditable decision-support architecture designed to support human operators, security teams and institutional decision-makers.

1. One-Sentence Definition

Definition

VEHICLE-CPS is an auditable civil protection architecture that maps structural risk, institutional fragility, decision pressure and dynamic perimeter disruption in critical environments.

2. What It Is

VEHICLE-CPS is a project of VEHICLE Systems Lab focused on civil protection, leader protection, institutional continuity and critical decision environments.

It represents people, zones, devices, risk signals and decision conditions as a dynamic structural field. Each authorized participant or operational element can be modeled as a node, while the relations between nodes create a real-time graph of protection continuity.

- wearable devices such as UWB/BLE wristbands or badges
- anchors and gates for indoor or event localization
- real-time dashboards for operators
- structural risk indicators
- dynamic protection rings
- mathematical tension regimes
- human confirmation workflows
- audit and traceability logs

3. The Problem It Solves

In large events, institutional environments or high-risk gatherings, the most dangerous moments often occur when a protected person is surrounded by many people. Traditional protection methods depend heavily on visual detection, verbal communication and fixed perimeters.

How can a protection system detect structural risk in a crowded or critical environment before damage becomes irreversible?

- arrival at the venue
- public greeting or crowd contact
- exit from the venue

VEHICLE-CPS responds by treating the environment as a dynamic graph rather than a static perimeter.

4. Why It Matters

VEHICLE-CPS matters because many security failures are not caused by the absence of guards or sensors. They are caused by the absence of a structural model that can interpret the full field.

- where the field is becoming fragile
- where a perimeter is being disrupted
- where a node is missing
- where an abnormal gap appears
- where decision pressure is increasing
- where the protected person is entering a vulnerable relational configuration

5. Core Architecture

Dynamic Field Representation

The event, institution or critical environment is represented as a dynamic field composed of nodes, zones, relations and risk states.

Graph Continuity

When authorized nodes are detected continuously, the system forms a graph of expected relations representing the continuity of the protected environment.

Structural Tension $T(X)$

$T(X)$ represents the state of the field and increases when abnormal relations, degraded continuity, perimeter disruption or elevated decision pressure appear.

Dynamic Protection Rings

The system can organize the field into protection rings around a VIP, protected asset or critical zone.

Operational Regimes P0-P6

Operational regimes classify the field state from passive monitoring to full evacuation.

Human Oversight and Escalation

Alerts and risk classifications support trained humans; authorized personnel remain responsible for action.

Audit and Traceability

All structural interpretations, alerts, field states, regime changes and operator responses should be logged for review.

Ring	Approximate radius	Purpose
Ring 1 - Immediate	0-2 m	Immediate protection around the protected person.
Ring 2 - Perimeter	2-15 m	Adaptive operational perimeter.
Ring 3 - Field	15 m+	Wider crowd or environment monitoring layer.

6. Mathematical and Structural Logic

VEHICLE-CPS treats authorized participants as nodes within a structured field. A node may be represented as s_i in $K \subset \mathbb{R}^5$. Compatibility between neighboring nodes can be evaluated through a distance or relational compatibility function such as $\text{normSq}(s_i, s_j) = ||s_i - s_j||^2$.

If an unidentified person or abnormal object enters the field, the intruding element may not appear as an authorized node, nearby relations may degrade, signal continuity may change, local compatibility values may increase, $T(X)$ may rise and operators may receive a localized alert.

The goal is not to identify guilt or intent automatically. The goal is to detect structural discontinuity and bring the anomaly to human attention.

7. Operational Regimes

Regime	State	Interpretation
P0	Structural Rest	Minimal field tension; passive monitoring.
P1	Normal Flow	Field operating normally; no intervention required.
P2	Local Review	Localized tension increase; closest operator may review.
P3	Anomalous Concentration	Abnormal concentration or local field distortion.
P4	Perimeter Rupture	Possible perimeter rupture or critical abnormality.
P5	Active Reinforcement	Reinforcement of protected zone and preparation of options.
P6	Full Extraction or Evacuation	Critical state requiring emergency protocol under authorized command.

8. Technology Layer

- UWB/BLE wristbands or badges
- UWB anchors

- access gates
- local servers
- operator tablets
- event-specific cryptographic identifiers
- tamper detection
- real-time dashboard
- firmware and software update capability
- local infrastructure without mandatory external cloud dependency

These details should be treated as implementation targets for pilot design and technical validation.

9. Failure-Resilient Design

A protection system must not create false confidence. VEHICLE-CPS is designed around graceful degradation: if a component fails, the system should continue operating in reduced mode while alerting operators.

- hot-standby servers
- local anchor storage
- overlapping anchor coverage
- battery alerts
- RF interference detection
- automatic escalation when operators do not respond
- parallel calculation engines
- conservative fallback logic
- local deployment without mandatory cloud dependency

10. Operational Workflow

Phase	Workflow
Before the event	Define zones, register authorized participants, assign devices, configure keys, install anchors/gates, calibrate field, test coverage, brief operators.
During the event	Activate nodes, monitor graph continuity, calculate tension, track rings, classify regimes, alert operators, maintain logs, escalate by protocol.
After the event	Export logs, review alerts, analyze false positives/negatives, recalibrate thresholds, update protocol, improve training.

11. Active Components

- Risk Mapping Layer
- Institutional Fragility Layer

- Decision Pressure Layer
- Dynamic Perimeter Layer
- Node Continuity Layer
- Human Oversight Layer
- Audit and Traceability Layer

12. Applications

- civil protection
- VIP and leader protection
- presidential security events
- institutional continuity
- public event protection
- emergency management
- critical infrastructure protection
- defensive military coordination
- space-related protection contexts
- human-AI operational support
- simulation of critical environments
- custom technology projects for strategic partners

13. Evidence and Public Records

Evidence and reference materials for VEHICLE-CPS include VEHICLE-CPS commercial and technical proposal materials, Borda Milan Pyramid framework references, VEHICLE framework DOI 10.5281/zenodo.20046955, project documentation from VEHICLE Systems Lab, demo package materials, AI reference file, operational cost plan, funding brief, GitHub repositories and Zenodo records associated with VEHICLE research outputs.

The current CPS material includes a detailed presidential security pilot proposal with a 1,000-person pilot model, UWB/BLE wristband architecture, dynamic protection rings, operational regimes, graceful degradation, event workflow and economic structure. This evidence should be presented as an evolving technical and commercial foundation, not as a fully deployed government system.

14. Ethical Boundaries

VEHICLE-CPS does not replace legal authority, human judgment or institutional responsibility. It is not designed for unlawful surveillance, political persecution, automated coercion, offensive targeting or repression.

- legal review
- ethical review
- data minimization
- clear operational authority
- audit logging
- human confirmation

- privacy safeguards
- post-event accountability

15. Current Development Status

- institutional concept defined
- commercial proposal drafted
- presidential security use case defined
- UWB/BLE pilot architecture described
- dynamic protection rings described
- operational regimes P0-P6 defined
- graceful degradation logic described
- event workflow described
- economic pilot structure drafted
- improved HTML demo available
- AI reference file drafted
- subpage template drafted
- standard download package defined

16. Next Technical Steps

1. Finalize CPS HTML demo.
2. Prepare demo package.
3. Validate hardware assumptions.
4. Define pilot protocol.
5. Develop operational cost plan.
6. Prepare funding brief.
7. Publish AI reference file.
8. Integrate CPS page with downloads and contact pathways.

17. Recommended Download Files

Asset	Path
Technical Brief	/downloads/cps/VEHICLE-CPS-Technical-Brief.pdf
Demo Package	/downloads/cps/VEHICLE-CPS-Demo-Package.zip
Funding Brief	/downloads/cps/VEHICLE-CPS-Funding-Brief.pdf
Operational Cost Plan	/downloads/cps/VEHICLE-CPS-Operational-Costs.pdf
AI Reference File	/vehicle-cps-ai-reference.txt

18. Laboratory Relevance

VEHICLE-CPS demonstrates how the VEHICLE architecture can move from structural theory into applied protection technology. It shows that VEHICLE is not only a conceptual framework. It can generate

concrete systems involving hardware, software, mathematical modeling, operational workflows, economic planning, pilot design and institutional deployment.

19. Contact

For research, investment, institutional collaboration, custom technology projects or technical review:

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Canonical Technical Summary

VEHICLE-CPS is an auditable civil protection architecture developed by VEHICLE Systems Lab. It maps structural risk, institutional fragility, dynamic perimeter disruption and decision pressure in critical environments. It can integrate wearable UWB/BLE devices, anchors, gates, dashboards, operational regimes and human-supervised escalation protocols.