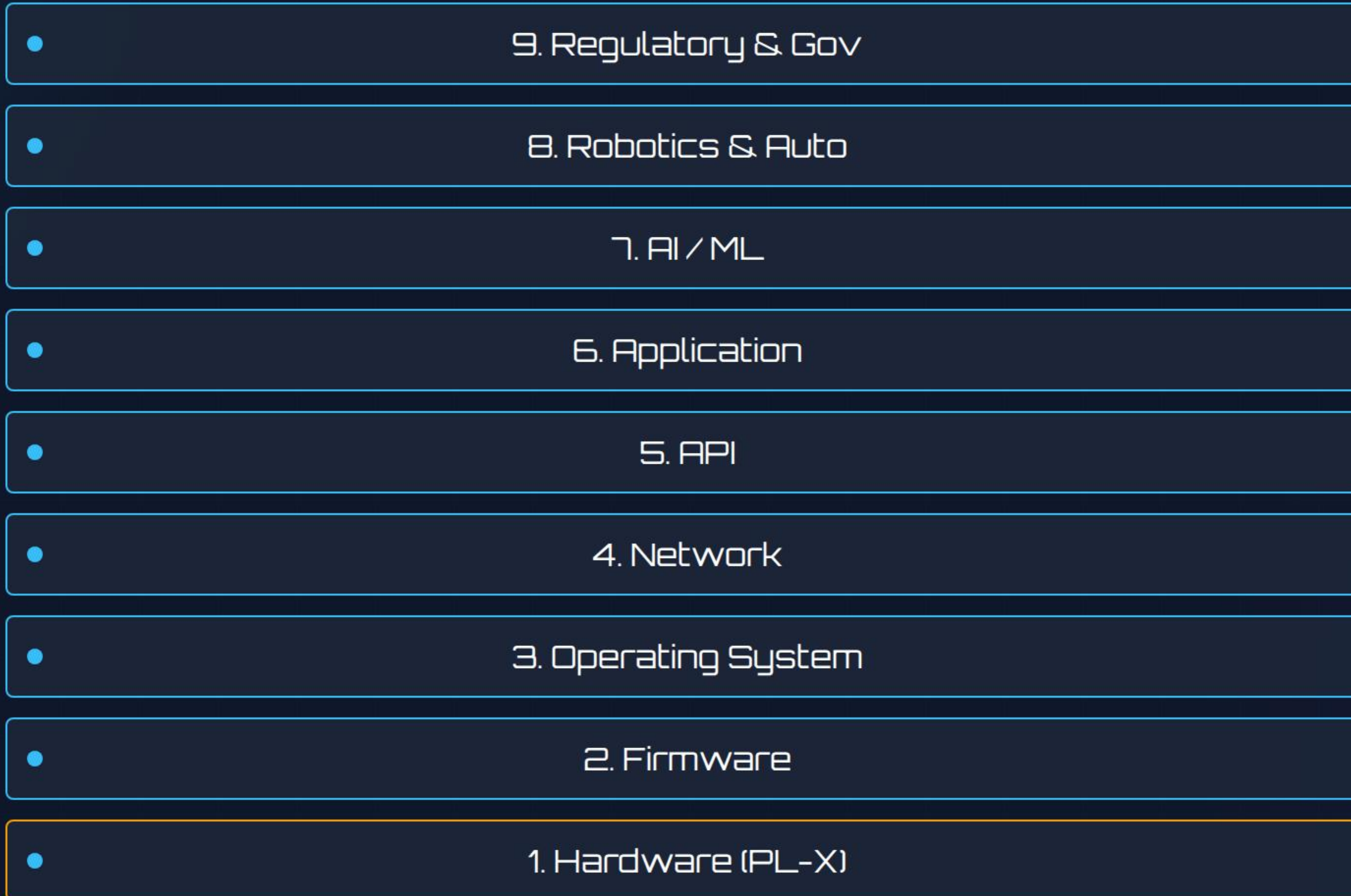# Part 6: Implementation Layers

Vertical Integration: Hardware to Government

Authoritative Edition

The Vertical Stack

- 9. Regulatory & Gov
- 8. Robotics & Auto
- 7. AI / ML
- 6. Application
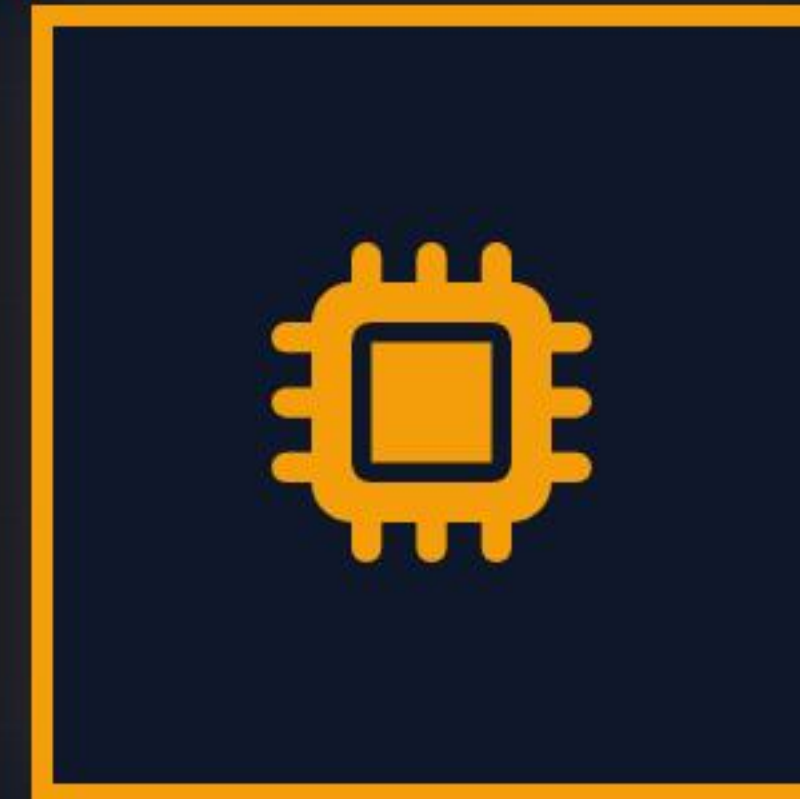- 5. API
- 4. Network
- 3. Operating System
- 2. Firmware
- 1. Hardware (PL-X)

1. Hardware Layer (PL-X Core)

Enforces L0 (Irreversibility) & L6 (Identity). Mandatory PL-X integration.

- TPM/PUF Identity Sealing.

- Monotonic Hardware Counters.

- Jitter & Drift Analysis.

Root of Trust

2 & 3. Firmware & OS

2. Firmware

Must be immutable and deterministic.

- 🔒 Write-once regions.

- 🚫 No nondeterministic entropy.

3. OS Layer

Enforces L2-L4. Kernel must be deterministic.

- >_ Canonical syscall traces.

- 🖫 Memory state commitments.

4 & 5. Network & API

4. Network

Packets must be identity-bound (L6).

- 🔀 No packet replay.
- ⚯ Sealed routing metadata.

5. API Layer

All endpoints must be pure functions.

- </> Schema-locked inputs.
- 👤✓ Identity required per call.

6. Application Layer

Where business logic lives. Must enforce L1-L6.

⊱ Run deterministic logic.

⊟ Separate UI from computation.

🧠 **PS-X:** Intent-pattern metadata.

7. AI / Machine Learning

AI models must operate as deterministic computational graphs, not black boxes.

No Hallucinations Allowed.

- ✓ Model-weight lineage hashing.
- ✓ Pre-execution output prediction.
- ✓ Identity-bound inference.

8. Robotics & Autonomous

A robot cannot "slip", "drift", or "wander" without detection.

Identity

Motion bound to actor.

Deterministic

Pre-computed trajectories.

Auditable

All actions in RGAC.

9. Regulatory & Government

NOVAK creates the first **Cryptographic Rule-of-Law Engine**.

⚖️ Encode laws as deterministic rules.

✓ Attach EIR to every decision.

👁 Publish RGAC for public verify.

Integration Summary

Layer	Obligations	Outputs
Hardware	PUF, TPM, Drift	Device-Hash
OS/Firmware	Deterministic Kernel	Syscall Lineage
Network/API	Identity Packets	Routing Lineage
AI/ML	Deterministic Infer	Inference Hash
Gov/Reg	Rule-of-Law	Public RGAC

Questions?

NOVAK Protocol Standards Series

Part 6: Layers