

Systemics \$\{\}Sigma\$ — Minimal Specification

Charter

Charter (*normative*)

This document gives a domain-agnostic, minimal formal specification of Systemics *Sigma*. It treats any practice as a kernel-shaped contract that produces decisions from posted evidence under benign variation, with replayable records. No specific domain assumptions (physics, ML, audits, etc.) are required.

Alphabet (Objects & Maps)

Alphabet (*normative*)

- U : Universe of artifacts.
- V : Valuation space (any measurable space; commonly $\mathbb{R}^k \times \mathbb{B}^m$).
- $\mathbf{2}$: Decision space $\{0,1\}$.
- Π : Frames (benign contexts).
- P_n : Probes (benign perturbations).
- Θ : Floors/thresholds (partially ordered set).
- β : Invariance budgets (tolerances in a poset/lattice).
- C : Capacity budgets (bits/time/energy constraints).
- Γ : Envelope/meta (versions, seeds, numeric modes, commits).
- \mathcal{R} : Records (canonical map to bytes; hash/ledger optional).

Definition: Systemic Kernel

Systemic Kernel (*normative*)

A systemic kernel is the tuple $K = \{v, \chi, \mu, P_n, \theta, \beta, C, \Gamma, \mathcal{R}\}$ where $v: U \rightarrow V$ is a valuation map and $\chi: V \rightarrow \mathbf{2}$ is a decision gate.

Metrics & Order

Wobble and orderings (*normative*)

- A divergence ("wobble") $w: \{\} \{ \} \mathbb{V} \{ \} \{ \} \times \{ \} \{ \} \mathbb{V} \{ \} \{ \} \rightarrow \{ \} \{ \} \mathbb{R}$ on decision-relevant coordinates. - Orders: $\theta \{ \} \{ \} \theta \{ \} \{ \} \text{preceq} \{ \} \{ \} \theta \{ \} \{ \}$ means tightening floors; $\beta \{ \} \{ \} \beta \{ \} \{ \} \text{preceq} \{ \} \{ \} \beta \{ \} \{ \}$ means tightening budgets; $C \{ \} \{ \} \text{preceq} \{ \} \{ \} C$ means shrinking capacity.

Axioms (Minimal Core)

-A1 Well-typedness (*normative*)

All maps are measurable/continuous as needed; $\chi \{ \} \{ \}$ is total.

-A2 Posting / Records-only (*normative*)

For any run on $u \{ \} \{ \}$, the record $\kappa \{ \} \{ \} \in \{ \} \{ \}$ contains $(v(u), \{ \} \{ \} \Theta, \{ \} \{ \} \beta, \{ \} \{ \} \Pi, P_n, \{ \} \{ \} \Gamma)$, and the decision equals $\begin{aligned} \chi^* \{ \} \{ \} \kappa = & \{ \} \{ \} \chi \{ \} \{ \} \text{big}(v(u), \{ \} \{ \} \Theta) \\ \end{aligned}$ with no dependence on unposted data.

-A3 Benign invariance (*normative*)

Let $(\pi, p) \in \{ \} \{ \} \Pi \{ \} \{ \} \times P_n$ act on the measurement/evaluation pathway to yield $v_{\pi, p}(u)$. Define $\begin{aligned} W(u) := & \{ \} \{ \} \sup_{(\pi, p)} \{ \} \{ \} \chi \{ \} \{ \} \text{big}(v_{\pi, p}(u), \{ \} \{ \} \Theta) \\ \end{aligned}$ If $W(u) \text{preceq} \beta$ then $\chi \{ \} \{ \} \text{big}(v_{\pi, p}(u), \{ \} \{ \} \Theta) = \chi \{ \} \{ \} \text{big}(v_{\pi, p}(u), \{ \} \{ \} \Theta)$

-A4 Minimal sufficiency under capacity (*normative*)

Among valuations preserving decisions under posted (Θ, β) , v is minimal w.r.t. $\text{cost}(v) \leq \text{cost}(w)$ for all $v' \text{such that } v' \text{circ } v = v' \text{and } v' \text{circ } v = v$ and $\text{cost}(v') \leq \text{cost}(v)$ to C .

-A5 Reflexive reproducibility (*normative*)

There exists an admissible, independently realized v' such that $\chi(v) \text{big}(v, \{ \} \{ \} \Theta, \{ \} \{ \} \beta) = \chi(v', \{ \} \{ \} \Theta, \{ \} \{ \} \beta)$ with both posted in κ (self-warrant).

-A6 Determinism & idempotence (*normative*)

For fixed $\text{big}(v, \{ \} \{ \} \Theta, \{ \} \{ \} \beta)$, the decision $\chi(v)$ is unique and idempotent.

-A7 Monotonicity (*normative*)

Tightening floors or budgets cannot rescue a failure by hidden dependence: $\begin{aligned} \theta \text{preceq} \theta' \text{and } \beta \text{preceq} \beta' \text{and } \text{cost}(\chi(v, \{ \} \{ \} \theta, \{ \} \{ \} \beta)) < \text{cost}(\chi(v, \{ \} \{ \} \theta', \{ \} \{ \} \beta')) \\ \text{with no hidden rescue.} \end{aligned}$

-A8 Isomorphism invariance (*normative*)

If a frame π induces a structure-preserving isomorphism on representation, decisions are invariant.

Conformance (Lawful Record)

-lawful record checklist (*normative*)

A record \$ $\{\}\{\}$ kappa \$\{\}\{\}\$ in \$\{\}\{\} \mathit{mathcal{R}} \{\}\$ is \$\{\}\{\} \mathit{emph}\{ \\$\{\}\{\} \mathit{Sigma\\$-lawful} \{\} \}\$ iff it includes: 1. \$\{\}\{\} \mathit{textbf}\{Contract:\} \\$\{\}\{\} \mathit{Theta}, \{\}\{\} \mathit{beta}, \mathit{C}, \{\}\{\} \mathit{Pi}, \mathit{P}_n, \{\}\{\} \mathit{Gamma} \{\}\$ (with any guards like \$ $\{\}\{\} \epsilon$). 2. \$\{\}\{\} \mathit{textbf}\{Valuation:\} \\$v(u) \{\}\$ (decision-relevant coordinates posted). 3. \$\{\}\{\} \mathit{textbf}\{Decision:\} \\$\{\}\{\} \chi \{\}\{\} \mathit{big}(v(u), \{\}\{\} \mathit{Theta}, \{\}\{\} \mathit{beta} \{\}\{\} \mathit{big}) \{\}\$ and a reason enumerating passed/failed predicates. 4. \$\{\}\{\} \mathit{textbf}\{Invariance\ evidence:\} \{\}\$ wobble metrics and the realizing worst-case \$(\{\}\{\} \pi, p)\$. 5. \$\{\}\{\} \mathit{textbf}\{Reflexive\ warrant:\} \{\}\$ independent \$v'(u)\$ and agreement of \$ $\{\}\{\} \chi$. 6. \$\{\}\{\} \mathit{textbf}\{Canonicalization:\} \{\}\$ canonical bytes, digest \$d\$, and optional chain root for append-only books.

Morphisms of Systemics

Morphism F: '\$ (normative)

A morphism \$F: \{\}\{\} \mathit{Sigma} \{\}\{\} \mathit{to} \{\}\{\} \mathit{Sigma}'\$ is a pair \$(\{\}\{\} \phi_U, \{\}\{\} \phi_V)\$ with \$\{\}\{\} \begin{aligned} &\text{begin}\{\text{equation}\} v' \{\}\{\} \circ \{\}\{\} \phi_U \{\}\{\} = \{\}\{\} \circ \{\}\{\} \phi_V \{\}\{\} \circ \\ &v, \{\}\{\} qquad \{\}\{\} \chi' \{\}\{\} \circ \{\}\{\} \circ \{\}\{\} \phi_V \{\}\{\} \times \{\}\{\} \mathit{mathrm{id}} \{\}\{\}, \\ &\{\}\{\}; = \{\}\{\}; \{\}\{\} \chi, \{\}\{\} \end{aligned} \{\}\{\} \text{end}\{\text{equation}\}\$ that also maps contracts monotonically: \$F(\{\}\{\} \mathit{Theta}, \{\}\{\} \mathit{parameters})\$ respects the relevant orders and preserves \$(-A1,...,A7)\$.

Morphism preservation (normative)

A morphism preserves valuation and decision structure by satisfying: \$\{\}\{\} \begin{aligned} &\text{begin}\{\text{equation}\} v' \\ &\{\}\{\} \circ \{\}\{\} \phi_U \{\}\{\} = \{\}\{\} \circ \{\}\{\} \phi_V \{\}\{\} \circ v, \{\}\{\} qquad \{\}\{\} \chi' \{\}\{\} \circ \\ &\{\}\{\} \phi_V \{\}\{\} \times \{\}\{\} \mathit{mathrm{id}} \{\}\{\}, \{\}\{\}; = \{\}\{\}; \{\}\{\} \chi. \{\}\{\} \text{end}\{\text{equation}\} \end{aligned} \{\}\{\}\$ It also maps contract parameters monotonically and preserves (-A1,...,A7).

Instantiation Recipe (Domain-Agnostic)

Recipe (informative)

To realize

Sigma in any field: 1. Choose U ,

$mathbb{V}$, v ,

χ . 2. Post

Θ ,

β ,

P_i , P_n ,

Gamma and a wobble metric w . 3. Establish (-A1,...,A7) by construction and tests. 4. Emit lawful

kappa and (optionally) hash-chain pages into a book.

Notes

Notes (informative)

This specification does not fix what v measures, what

χ decides, or how w is computed. It only requires posting, invariance under benign variation, minimal sufficiency under capacity, and reflexive reproducibility. Evidence Systemics is one instantiation where v encodes evidence gauges; other instances (Control, Protocol, Risk, Learning, etc.) keep the same

Sigma-contract while choosing different v ,

Θ ,

β .

References

- GraphFrame K0 (GF0) ()
- SpecFrame K1 ()
- Composition (separate spec) ()