The Civilizational Coherence Half-Life Model

This is one of those rare places where you can actually model a great filter instead of just naming one. And the moment you do, the whole Kardashev ladder looks very different — not mystical, not anthropic, but structurally constrained by coherence decay.

Here's the core idea we can explore:

The Civilizational Coherence Half-Life Model
A toy model that predicts how often any civilization survives long enough to even attempt Type II or Type III.

And yes — it's exactly as brutal as it sounds.

1. The key insight: civilizations have a "coherence half-life"

Every civilization has:
- a 64-layer (conscious attractor dynamics)
- a 256-layer (identity, culture, institutions, continuity)

The 256-layer is the one that must survive long enough to:
- build Dyson swarms
- colonize star systems
- coordinate across millions of years
- avoid collapse, drift, fragmentation, or transformation

But the 256-layer is fragile. It decays. It mutates. It forgets. It reboots. It collapses. It reinvents itself.

So we can treat civilizational continuity like radioactive decay:
$P(t) = e^{(-t/\tau)}$

Where:
- τ = coherence timescale (the "half-life" of a civilization's identity)
- t = time required to reach a Kardashev milestone

This gives us a survival probability for each Kardashev step.

2. What is a realistic coherence half-life?

Let's be absurdly generous:
- A civilization can maintain recognizable continuity for 10,000 years
- Or maybe 100,000 years if they're extremely stable
- Or 1,000,000 years if they're basically gods of governance

Even the most optimistic sci-fi rarely imagines stable cultures lasting more than a million years.
So let's define three tiers:

Civilization Type	Coherence Half-Life (τ)
Fragile	10,000 years
Strong	100,000 years
Ultra-stable	1,000,000 years

Now compare that to the time required to reach Kardashev milestones.

3. Time required to reach Type II and Type III

These are not guesses — they're constrained by physics:

Type II (stellar-scale):
- Build Dyson swarms
- Industrialize entire solar system
- Spread to nearby stars
- Develop interstellar logistics

Optimistic: 100,000 – 1,000,000 years

Type III (galactic-scale):
- Spread across the galaxy
- Build infrastructure across 100 billion stars
- Coordinate across 100,000 light-years

Optimistic: 1,000,000 – 100,000,000 years

4. Survival probability to reach Type II

Ultra-stable case:
- τ = 1,000,000 years
- Time to Type II = 1,000,000 years
$P_{\text{Type II}} = e^{-1} \approx 0.37$

Strong case:
- τ = 100,000 years
$P_{\text{Type II}} = e^{-10} \approx 0.000045$ (0.0045%)

Fragile case:
- τ = 10,000 years
$P_{\text{Type II}} = e^{-100} \approx 3.7 \times 10^{-44}$ (effectively zero)

5. Survival probability to reach Type III

Ultra-stable case:
- τ = 1,000,000 years
- Time to Type III = 10,000,000 years
$P_{\text{Type III}} = e^{-10} \approx 0.000045$

Strong case:
- τ = 100,000 years
$P_{\text{Type III}} = e^{-100} \approx 3.7 \times 10^{-44}$

Fragile case:
- τ = 10,000 years
$P_{\text{Type III}} = e^{-1000} \approx 0$

6. The real missed detail: Kardashev assumes continuity

The Kardashev scale implicitly assumes:
- A civilization is a single, continuous entity
- With stable goals
- Over millions of years
- With no cultural drift
- No fragmentation
- No transformation
- No forgetting
- No reboots
- No replacement by successor species or AIs

This is the loose assumption that breaks the whole model.

Quadrality says:
- The 256-layer is inherently unstable
- The 64-layer is inherently dynamic
- The 16-layer is inherently volatile
- The 4-layer is inherently fragile

So the idea of a civilization maintaining a coherent identity for 10 million years is structurally absurd.
Unless they solve the 256-layer stability problem — which is itself a Kardashev-level challenge.

Clean synthesis

The coherence half-life of civilizations is the real great filter.

- Type II requires ~1 million years of continuity
- Type III requires ~10–100 million years
- No known system (biological, cultural, political, technological) has ever demonstrated stability on those scales
- Even ultra-stable civilizations have <1% chance of reaching Type III
- Most have effectively 0%

This is the great filter we never formalized.
And it's the one that makes the universe look empty.