

The Carrying Ladder

Technology as a rung of the net — a long-term vision

Concept vision, second draft — J. Konstapel, Leiden, August 2026

1. Where this stands

This document applies the net to one rung: human technology.

Nothing new is introduced. The net has one primitive, the strand, in two states — open and closed. It has one machine: slow loading, sudden discharge through the weakest knots, then relaxation toward the ground state. And it is fractal: a knot at one rung is a whole net at the rung below.

Technology is a winding like any other. So the machine must run here too, and the only thing that distinguishes this rung from a thunderstorm or a supernova is the winding number, and with it the tempo.

That is the claim. Everything below unfolds it.

2. The rung ladder in years

Resonance is choosy. Only windings that come back in phase with themselves persist. So the net is not a smooth continuum but a ladder with discrete rungs, and the recursion question is which windings-of-windings fit onto each other.

The working candidate is the bronze mean, the positive root of $x^2 = 3x + 1$, with value $(3 + \sqrt{13}) / 2 = 3.302776$. Its continued-fraction convergents have numerators

3, 10, 33, 109, 360, 1189

each obeying $p(n) = 3 \cdot p(n-1) + p(n-2)$. Check it: $33 = 3 \times 10 + 3$; $109 = 3 \times 33 + 10$; $360 = 3 \times 109 + 33$; $1189 = 3 \times 360 + 109$.

Read as years, the lowest two are already familiar. Inventory cycles run near three years; investment cycles near ten.

This recursion is a candidate and is flagged as such throughout. It is open task 1 of the foundation document. If it falls, the layer structure below survives with different spacing; the machine does not depend on it.

Two properties of the recursion carry the whole vision.

The memory term. Each rung is three copies of the rung below, wound onto the thread of the rung two steps back. The $p(n-2)$ term is not a remainder. It is the carrier.

The old winding stays. When a new winding forms around an old one, the old one becomes the thread that holds it. Nothing is replaced.

3. Why technology layers this way

The layers are not assigned by intuition. They follow from fractality plus tempo.

A knot at one rung is a whole net at the rung below. Applied here: a platform is a net of products, an infrastructure is a net of platforms, an operation is a net of infrastructures. Each layer is literally built out of the layer beneath it, and each holds together longer because it holds more windings.

Six rungs, six layers.

3 years — products. Devices, apps, models, tools. Bought, used, replaced.

10 years — platforms. What products are built on. An operating system, a cloud, a foundation model, a component standard.

33 years — infrastructure. Rails, grids, pipes, protocols, fabrication bases. One working generation.

109 years — the operation. What the civilisation does to matter. For two and a half centuries it has done one thing: apply force against resistance. Push.

360 years — the ontology. What reality is taken to be, and therefore what counts as a result. Objects moving in empty space, or configurations in a medium.

1189 years — transmission. How knowledge passes. As doctrine held by a custodian, or as practice held by a practitioner.

4. The machine at this rung

Here is what the first draft of this vision left out, and it is the spine.

Infrastructure is stored tension. A grid, a rail network, a fabrication base is a wound strand: capital, standards, skills and expectations held in a configuration that cannot easily release. Building it is loading. That is why it takes a third of a century and why nothing about it looks dynamic while it happens.

Loading is slow and distributed; discharge is fast and local. Tension accumulates across the whole layer, then releases through the weakest knots — the firms, regions and institutions with the least slack. A long wave is not a wave. It is a load-discharge cycle, and its asymmetry is the point: decades of accumulation, a few years of release.

After discharge, relaxation. The layer settles toward its ground state, which is not emptiness but connection without imposed form — and then loading begins again on the new thread.

This is what makes the ladder a forecast rather than a chart. A layer chart tells you what exists. The machine tells you what a layer is doing right now: loading, at threshold, discharging, or relaxing.

Laws are local habits. The net's context principle applies here without modification. What economics calls a law — a rate of return, a scaling relation, a price elasticity — is a property of the current tension state of this rung, not a decree standing outside it. Measure inside one state and you learn that state. Every "structural constant" in economics is an elastic modulus of the layer it was measured in.

5. The two carrying couplings

The memory rule says each rung is carried by the rung two steps below. Applied to the layers, this gives two statements, and they are the working core of the vision.

The ontology is carried by the infrastructure. 360 is carried by 33. A change in what reality is taken to be does not arrive as an argument. It arrives as rails, grids and fabrication bases that only make sense under the new reading. People use them, and the reading follows.

The operation is carried by the platforms. 109 is carried by 10. A change in what we do to matter does not arrive as a new kind of factory. It arrives as a platform layer — a quantity, a standard, an interface — on which the new operation can be built and, crucially, billed.

Both invert the usual story in which ideas come first and infrastructure follows. On this ladder the slow layer is written by the layer two steps down.

There is a historical case. The steam engine did not spread because thermodynamics was understood. Carnot published in 1824, roughly half a century after Watt's engine was in the field. What came first was the instrument: the indicator diagram, which made the inside of a cylinder legible as a measured quantity. Measurement, then platform, then infrastructure, then operation, then theory.

6. Where the phase is now

Anchoring is the weakest part of any cycle scheme, so the anchors here are stated as anchors.

Take the 109-rung at the operation layer. Watt's separate condenser is patented in 1769 and the engine spreads through the 1770s. Add 109 and you reach 1878 to 1884: Edison's first central station in 1882, Parsons' turbine in 1884 — the electrical operation. Add 109 again and you reach 1987 to 1993: the information operation.

On this reading the current operation layer is young and still loading. No operation-level discharge is due in this decade.

Now the 33-rung at the infrastructure layer. From 1993, one third-of-a-century lands at 2026. From 1960 it lands at 1993.

That is the rung at threshold.

And because the 360-rung is carried by the 33-rung, this is exactly the window in which an ontological shift becomes materially visible — as infrastructure, not as insight.

7. What discharges, and into what

Three infrastructures are at threshold at once, and they are moving in the same direction.

The grid stops being a delivery system and becomes a synchronisation service. The physical fact is already there: a synchronous machine on a grid obeys a swing equation, which is second-order phase coupling. The grid is a phase-locked system that has been managed as plumbing. Grid-forming inverters and virtual synchronous machines are the first hardware that treats it correctly. What is traded shifts from energy delivered to phase and inertia provided.

The consequence for storage is large. Batteries exist in the quantity they do because the system cannot hold phase across timescales. Treat the problem as synchronisation rather than as stock and the storage requirement falls without one new cell.

Fabrication stops being removal and becomes conditioning. The existing craft cuts, presses and mills: force against resistance. The replacement sets the state of the material so the intended form is what it settles into. DNA origami already does this at molecular scale — write a sequence, warm the solution, and billions of copies of the designed object fold themselves. Shaped acoustic fields do it at millimetre scale. Neither is a curiosity; both lack only an industrial cycle at useful scale.

Medicine stops being intervention and becomes state-setting. The first act becomes bringing the system into the condition in which it can respond, and only then supplying the pattern. The instrumentation for reading that condition already exists across cardiology, neurology and sleep medicine. What is missing is a single measure, not a machine.

The common movement: from working on the object to setting the state of the medium. In net terms, from pushing a knot to changing the tension of the region it sits in.

8. The platform gap

The platform rung carries the operation rung, so this layer decides whether any of the above becomes an industry.

What belongs here is a **measured quantity with a unit**, offered as a standard others build on. Not a device. A number that can appear on an invoice.

Every previous operation turn is anchored by one such quantity. Steam had pressure, made legible by the indicator. Electricity had the kilowatt-hour, made legible by the meter. Information had the bit, made legible by the codec and the channel.

The conditioning operation has no quantity yet. It needs one measure of how far a medium sits from the state in which it reorganises — its distance to discharge.

This is the most load-bearing gap in the vision and it is stated plainly as such. It is the same gap the foundation document names as the missing uniform coherence measure.

Two design constraints follow from the recursion, not from taste.

It must be readable in the units of the existing world. The old rung becomes the thread. A quantity legible only inside the new framework has nothing to be wound onto. The indicator diagram worked because it produced work per cycle — a number the existing accounting already used.

It must be a standard before it is a product. A proprietary instrument stays at the three-year layer and dies there.

9. Leading indicators

Because the machine is the same at every rung, the statistical signature is the same too — and it is measurable on this rung with existing data.

Three signals precede a discharge.

Rising variance. Fluctuations in the layer grow before it releases.

Rising autocorrelation — critical slowing down. The layer takes longer to recover from a shock. This is the sharpest single indicator and it is established across ecosystems, climate elements and cortical activity.

Log-periodic acceleration. Faster-than-exponential growth with accelerating oscillations, forward-tested by Sornette on financial series.

For the technology rungs this means concrete, available measurements. Capital-expenditure volatility and recovery time after shocks, for the infrastructure layer. Standard-adoption clustering and churn, for the platform layer. Product-cycle compression, for the bottom layer.

And one qualitative corollary that follows from critical slowing down rather than from intuition: **before a discharge the existing order looks rigid, not weak.** Work-hardened material does not sag. It holds, with more rules and less slack, and then it yields. That rigidity is not the end of the incumbent order. It is its transition to carrier function.

10. The old layer becomes the thread

The recursion makes a claim most technology forecasts get wrong.

Count the loops with the memory term and you get 1, 4, 13, 43, 142. Drop the memory term — keep only "three copies plus one", the ordinary triangular recursion — and you get 1, 4, 13, 40, 121. The counts agree for three levels and then separate: 43 against 40, 142 against 121.

The difference is the carrier. The old winding is not removed when the new one forms; it becomes the thread the new one is wound on.

Read into technology: combustion, mechanics and chemistry keep running. They become the substrate on which the conditioning layer is laid. Any vision promising replacement fails on this arithmetic.

The strategic edge: value accrues at the winding, not at the replacement. The opportunity is the interface between the conditioning layer and the machine layer it rides on.

11. The chord

The rungs sound together. There is no year in which one layer stops and another starts. Products, platforms, infrastructure, operation and ontology are present at every moment; what changes is which rung sets the phase.

A turning point is therefore not a handover. It is a coincidence of phases across rungs. Before one, the lower rungs stop damping each other and begin to move together — which is what "everything is happening at once" feels like from inside.

12. Strategic consequences

Seven statements, each from a rung, a coupling or the machine.

1. **To move the ontology, build infrastructure.** Arguments operate at the wrong layer and the wrong timescale.
2. **To move the operation, publish a quantity.** The platform rung carries the operation rung, and platforms are made of standards.
3. **Build the measurement before the machine.** In the conditioning craft the reading is one of the four organs, alongside softening, patterning and setting. Without it the work reverts to pushing.
4. **Make the quantity legible to the old world.** It has to be billable in the accounting that already exists, because that accounting is the thread.
5. **Take the interface, not the replacement.** The winding is where the value is.
6. **Time by loading state, not by calendar.** Ask of each layer whether it is loading, at threshold, discharging or relaxing. The indicators in section 9 answer it from data.
7. **Expect rigidity, not collapse.** Plan for an incumbent order that tightens before it yields.

13. Status ledger

Arithmetic. The ladder 3, 10, 33, 109, 360, 1189 and its recursion. The loop counts 1, 4, 13, 43, 142 against 1, 4, 13, 40, 121. The ratio 3.302776. Checkable in a line.

Established. The swing equation as second-order phase coupling. DNA origami and shaped acoustic assembly as working conditioning technologies. The indicator diagram preceding thermodynamics. Critical slowing down as a measured early-warning signal across domains. Inventory and investment cycles near three and ten years.

Candidate. The bronze-mean recursion itself. It is open task 1 of the foundation document and is not settled here. If it falls, the layering survives with different spacing.

Reading. The assignment of technology layers to rungs. A defensible alternative mapping exists.

Anchoring. The dates 1775, 1884, 1993 and the 2026 infrastructure threshold. Move the anchor a decade and everything downstream moves a decade. The structure is the claim; the calendar is not.

Open. The platform quantity. Until it is defined, that rung of this vision is a specification rather than a plan.

14. What would show this wrong

A discharge without loading. An infrastructure turn arriving with flat variance, flat autocorrelation and no acceleration in the record. One clean case breaks the machine at this rung.

A quantity-free scale-up. If conditioning technologies scale as products without ever producing a shared unit, the operation-carried-by-platforms coupling is wrong.

An argument-led ontology shift. If the new reading is widely adopted before any infrastructure carries it, the ontology-carried-by-infrastructure coupling is wrong.

Displacement rather than substrate. If the machine layer is displaced instead of becoming the thread, the memory term does not transfer out of the graph.

Annotated references

Konstapel, J. (2026). *The Net: The Vacuum from the Smallest Strand to the Greatest Knot*. Leiden. The foundation document. One primitive, two states, one machine, one fractal ladder; the appendix collects the cross-rung statistical fingerprint, the three quantitative pins and the falsification list. This vision is that document applied to one rung.

Konstapel, J. (2026). *Counting the Universe; The Age of Magic*. Leiden. The ladder arithmetic in full, including the 43-against-40 discrimination; and the two-operation account, pushing against conditioning, of which this document is the technological forward projection.

Kondratiev, N. D. (1926). "Die langen Wellen der Konjunktur." *Archiv für Sozialwissenschaft und Sozialpolitik*, 56, 573–609. The original long-wave paper. Read for the data assembly rather than the period, which he put at 45 to 60 years — a band wide enough that the underlying structure could be two rungs rather than one.

Schumpeter, J. A. (1939). *Business Cycles*. McGraw-Hill. Kitchin, Juglar and Kondratiev nested inside one another. The nesting is the useful part, and it is the same idea as a ladder with a fixed ratio between rungs.

Perez, C. (2002). *Technological Revolutions and Financial Capital*. Edward Elgar. The closest external companion. Each revolution has a core input, carrier branches and an infrastructure, and splits into installation and deployment with a turning point between. Her structure sits almost exactly on the 33-rung, and her turning point is a discharge in this vocabulary.

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