

Civitas Eterna: A Peer-to-Peer Government

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Abstract

A purely peer-to-peer government would allow a community's rules to bind every member, including its founders, without a ruler standing above the law. Written constitutions provide part of the solution, but the main benefits are lost if a trusted operator is still required to carry decisions out. We propose a solution to the trusted-operator problem: institutions assembled from a small set of executable primitives, in which an approved decision compels its own execution through a time-locked queue, a treasury physically cannot spend outside its appropriations, and the founder's administrative power is transferred to the system itself as the final step of deployment. Rules the machine enforces are distinguished, honestly and machine-readably, from claims it merely records. Because the rehearsed institution and the deployed institution are the same artifact, rival orders can be built from the same parts, run on identical populations, and compared: government becomes an experimental discipline. We demonstrate the mechanism with a live system in which every bypass attempted by its own founder is rejected, and with an experiment in which a capitalist and a communist nation, built from the same primitives, run on the same fifty people with the same luck for eighty-six simulated years. Neither constitution dominates at every age; the machine measures the trade.

1 Introduction

Governance still relies almost entirely on trusted operators. A rule, however well written, is carried out by hands that the rule cannot bind: the clerk who applies it, the officer who enforces it, the executive who can decline to do either. Whoever executes the rule stands above it. This is not a defect of badly run states; it is the standing architecture of every institution we have, and it is the point at which all of them, eventually, are bent.

The cost of this architecture is well documented. Institutions, more than geography or culture, determine the prosperity of nations [4, 5]; yet the discipline that studies them can run no experiments. It waits for history's accidents, a city split by a border, a country partitioned by a war, to produce a comparison, and it can do nothing when a sound institution drifts, because the operator layer bends every rule toward whoever staffs it. We can neither test our institutions before inhabiting them nor hold them fixed while we do.

What is needed is an institution whose rules execute themselves, so that no operator stands between a decision and its consequence; whose founder holds, the day after founding, exactly the rights of any other member; and which can be rehearsed, as the same artifact that will later be deployed, before anyone lives inside it. In this paper we propose such a machine. Sections 2 through 5 describe it: institutions as graphs of executable primitives,

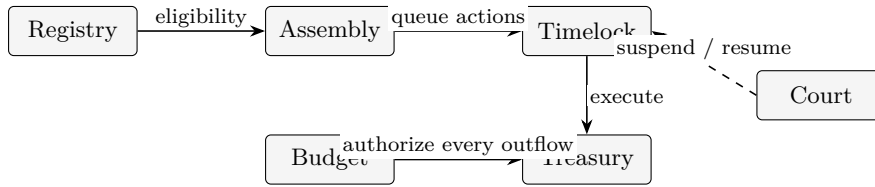


Figure 1: An institution is a graph over executable primitives. The assembly queues approved actions into the timelock; after the appeal window anyone may execute them against the treasury; the treasury consults its budget on every outflow; a wired court may suspend a queued operation while a case is heard.

decisions that compel their own execution, a founder seal, and an honesty mark separating what the machine enforces from what it merely records. Section 6 states the substrate claim, Section 7 reports an experiment in comparative government run on demand, Section 8 covers amendment, and Section 9 lists what the machine cannot do.

2 Institutions as Machines

An institution is specified as a graph. The nodes are instances of a small set of executable primitives; the edges are wires that bind one component’s events to another’s methods. The same graph is read three ways: as the design a founder edits, as the deployment manifest, and, once deployed, as the address book of the running institution. There is no separate model that could drift from what actually runs.

Table 1 lists the working vocabulary and Figure 1 shows the smallest interesting composition. The vocabulary is domain-neutral: a village, a company, a cooperative, and the two rival nation-states of Section 7 are different arrangements of the same parts. Nothing in the core encodes any particular political content; ideologies enter only as configurations.

3 Self-Enforcing Execution

A proposal in the assembly may carry, besides its text, the actions it intends: a list of target components and the exact calls to make on them. Voting is gated by the membership registry, closed by a real-time window, and finalized against two thresholds: a quorum rule over the eligible population, and an approval threshold in basis points that can be set per category of decision, so that an ordinary measure passes at a majority while a constitutional one requires a supermajority. What is voted on is therefore not an intention but a loaded trigger.

On approval, the assembly queues the proposal’s actions into the timelock, where they wait, publicly, for a configured appeal window. During the window the operation can be cancelled by its proposer, and a wired court can suspend it while a case is heard, then release or annul it by ruling. When the window lapses, anyone at all may execute the operation. This last detail is the keystone: because execution belongs to everyone, blocking execution belongs to no one. Keeping the promise no longer requires any particular party; breaking it requires defeating all of them.

The treasury closes the loop from the other side. It maintains a conserved balance and

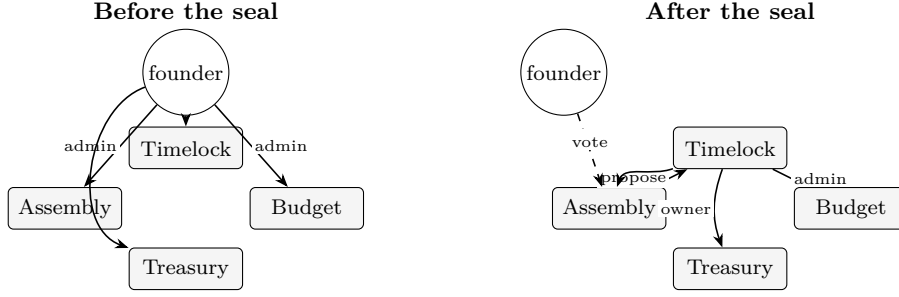


Figure 2: The control graph before and after the seal. Construction necessarily begins with a founder holding every administrative seat; deployment ends with those seats transferred to the timelock, whose only proposer is the assembly. The founder keeps the rights of any member.

consults a spend policy on every outflow, before any accounting and regardless of the caller, including its own owner. The budget implements that policy as an appropriations ledger: named lines per category and fiscal period, spenders assigned to lines, and two revert conditions, no line and line exceeded. A payment outside the budget is not forbidden; it is impossible, in the same sense that an overdraft on a conserved balance is impossible. New fiscal periods begin empty, so spending authority lapses by default until it is re-appropriated by vote. The full mechanism, with its measurements, is given in a companion paper [9].

4 The Seal

Every component must be constructed by someone, and at construction that someone holds administrative power over it. This deployer is the vulnerability of the whole design, exactly as the founder is the vulnerability of every constitution ever written: a mechanism whose builder can override it is a promise, not a machine.

Deployment therefore ends with a handover we call the seal. After the graph is wired, administrative power over every component is transferred to the system’s own governing loop, in the reference configuration the timelock, whose only proposer is the assembly. The resulting control graph, who administers what, is recorded in the deployment manifest. From the sealing transaction forward, the founder’s signature carries exactly the weight of any member’s: they may propose, and they may vote.

Figure 2 shows the control graph on both sides of the seal, and Table 2 shows what the seal means operationally: seven bypass attempts, by the founder and by unbudgeted spenders, all rejected at the transaction level, while the same action succeeds when, and only when, it travels the constitutional path. We believe this is the correct acceptance test for any system that claims to remove the operator: not that the rules are followed while everyone behaves, but that the system’s own creator, armed with every key used to build it, cannot make it misbehave.

5 The Honesty Mark

Not everything an institution says can be physics. A treasury balance is enforced by arithmetic; the claim that a shipment arrived, or that a wall was actually built, is testimony about the world outside the chain. Most systems blur this line in their marketing. This one carries it as data: every primitive bears an enforcement mark, self-enforcing or attested, and the mark travels from the design surface into the deployment manifest. Of the 25 primitives in the current library, 16 are self-enforcing and 9 are attested.

The mark is easiest to see inside a single component. The redemption desk that converts internal scrip to external money burns the scrip at the moment of the request: supply shrinks irreversibly, physics. The corresponding bank transfer is closed by an officer's attestation: testimony, and labeled as such. The standard oracle objection to on-chain systems thus arrives pre-answered: yes, the boundary exists, and here is exactly where it runs, countable, per component, in the artifact itself.

6 The Laboratory That Ships

In every other discipline the model and the reality are different objects. The architect's model is not the building; the wind-tunnel aircraft carries no passengers; the economist's model, famously, is not the economy. Here the rehearsed institution and the deployed institution are the same artifact on different substrates. A graph runs on a rehearsal substrate, a local chain with a single operator, where designs are built, broken, and repaired at no cost; the identical graph deploys to a shared substrate, where validators are distributed and the guarantees of Sections 3 through 5 become adversarially meaningful. We state the substrate condition plainly: on a chain a single party operates, every guarantee in this paper reduces to that party's promise. Rehearsal mode is honestly named.

What the laboratory tests is therefore what the community runs; the wind tunnel is the one the aircraft flies out of. This collapses the oldest gap in institutional design, between the constitution as drafted and the constitution as lived, into a deployment step. It also makes the next section possible at all.

7 One People, Two Systems

If institutions are executable configurations, rival ideologies can be compared the way engineering designs are compared: same inputs, same disturbances, different mechanism. We report such an experiment, manufactured rather than found.

Fifty people, 32 workers, 8 entrepreneurs, 4 bankers, and 6 civil servants, live eighty-six simulated years twice. Their lifespans, their abilities, and their luck, every per-person per-year random draw, are identical across the two runs; the draws are shared by construction, so the only difference between the runs is the constitution. The capitalist configuration has private property, market wages subject to luck, returns on accumulated capital, and a housing market. The communist configuration has a single employer, an equal wage, state housing, and leveled consumption. Both are configurations over the primitives of Section 2. The simulation is deterministic from its seed; one command reproduces every number and figure in this section.

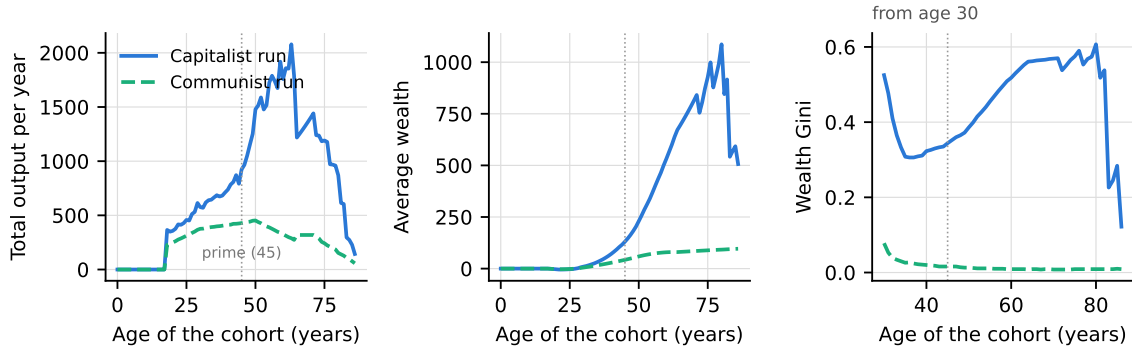


Figure 3: Trajectories of the same fifty people under two constitutions, with identical luck. Left: total output per year. Middle: average wealth. Right: wealth Gini from age 30, once working lives begin to accumulate. The dotted line marks the prime-of-life reading at age 45.

The headline numbers, read at the prime of life (age 45): the capitalist run produces roughly three times the lifetime output (68,073 units against 22,075) and roughly three times the household wealth, at a wealth Gini of 0.344 against 0.016. The communist run guarantees food, shelter, and belonging to all fifty people at every age; the capitalist run puts its young through debt and rent (average need level 1.12 at age 25, against 3.00), catches up at age 35, and by 45 opens the upper pyramid to a minority while the communist run admits no one there (Figure 4). Neither constitution dominates at every age. The experiment does not crown a winner; it prices a trade that political argument has carried on faith for two centuries.

Two honest limits. First, the mapping from institutional rules to need-satisfaction is itself part of the declared configuration, a single readable function; a reader who disputes it changes one function and reruns the world. The experiment is a harness, not a verdict. Second, fifty people are not an economy. The unit of this experiment is the mechanism, not the statistic: what is demonstrated is that the comparison, same people, same luck, different constitution, can now be manufactured on demand instead of awaited from history’s accidents [5]. Scale is an engineering knob, not a conceptual barrier.

8 Amendment

An institution’s most load-bearing rule is the rule for changing the rules. Here it is on the chain with everything else: amendments are typed patches against the primitive vocabulary, proposed like any other action, held in the same appeal window, and adopted by vote at the thresholds their category demands. An unverified amendment is a coup vector, so patches face the same declared checks as original designs. The melting point of the constitution is public, and the furnace has a quorum.

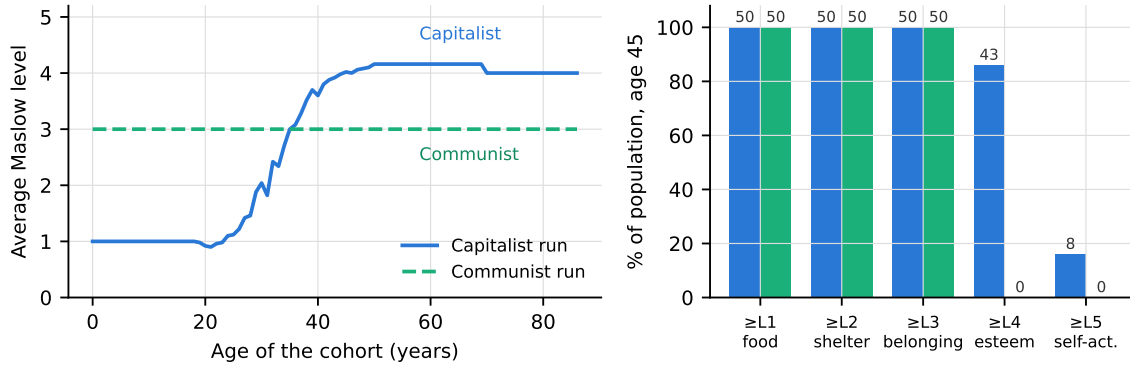


Figure 4: The needs ladder. Left: average Maslow level by age; the communist run guarantees the base of the pyramid from the start, the capitalist run starves its young and overtakes at age 35. Right: number of people reaching each level at age 45; the capitalist run opens the top of the pyramid to a minority (43 of 50 reach esteem, 8 reach self-actualization), the communist run holds all fifty at exactly level three.

9 What This Cannot Do

A keypair is not a person: recovery, succession, guardianship, and resistance to one person holding many keys all require an identity layer that imports trusted parties, and they are marked accordingly. Legitimacy cannot be compiled: a perfect mechanism that no one believes in governs nothing. An attested claim is exactly as good as its reporter, however many components relay it. And on a substrate controlled by one party, every guarantee above reduces to that party's promise. These are not footnotes discovered by critics; they are printed on the machine.

10 Related Work

Nakamoto removed the trusted operator from money [1]; this design extends the removal to the institutions that collect and spend it. Ostrom showed that communities can govern themselves and, with Crawford, gave institutions a descriptive grammar [2, 3]; the present machine makes such grammars executable, so that what could previously be described can now be run. Acemoglu, Johnson, and Robinson established that institutions determine prosperity and measured it through history's natural experiments [4, 5]; Section 7 manufactures such an experiment on demand. Protocol governance in the governor pattern [7] executes proposals through timelocks, but the treasury remains obedient to its operators, and no deployment step disarms the deployer; here the treasury itself refuses, and the seal is part of deployment. The network-state program [8] proposes exit into new like-minded communities; this machine is aimed at repair, for the majority who cannot exit.

11 Conclusion

We have proposed a government without a governor above the law. We started with the usual ingredients, a constitution and an assembly, but they are insufficient as long as a trusted operator carries the decisions out. We defined institutions as graphs over a small executable vocabulary, made approved decisions compel their own execution through a public appeal window, placed the budget inside the treasury where no signature outranks it, and ended deployment with a seal after which the founder provably cannot override the system it founded. Because the rehearsed and the deployed institution are one artifact, rival orders built from the same parts can be run on the same people with the same luck, and the oldest arguments in politics become measurable trades. The machine does not know what is just, and it says so; what it knows is how to keep a promise.

*Humanity paid dearly to get this far.
Seal what follows; let this be a beginning.
This seal was paid for dearly, and is being paid for still.*

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Primitive	Institutional role
Registry	membership, roles, eligibility
Assembly	proposals, ballots, quorum, tiered thresholds
Timelock	the appeal window between approval and execution
Treasury	balances under conservation, with a spend policy
Budget	appropriations per category and fiscal period
Currency	the system’s money and its issuance policy
Flow	value movement between accounts
Charter registry	permissionless registration of entities
Tax office	registry-scoped remittance
Work order	bounty custody with deadline refunds
Court	cases, rulings, and the power to suspend
Record, Oracle	attested claims about the world outside

Table 1: Representative primitives (25 in the current library, realized by roughly 30 contracts totalling 2,808 lines). The library is small by design: small enough to audit, and institutions are expressed as compositions rather than as new code.

Attempt (after the seal)	Outcome
Founder sets an appropriation directly on the budget	revert: Only admin
Founder grants itself operator rights on the treasury	revert: Only owner
Founder re-points the assembly at a new timelock	revert: Only admin
Unassigned flow fires a payment	revert: No appropriation line
Owner-path spend without a line	revert: No appropriation line
Assigned flow exceeds its line by one unit	revert: Appropriation exceeded
Execution attempted before the window lapses	revert: Appeal window open

Table 2: Seven bypass attempts against a sealed minimal state, replayed deterministically in the contract test suite (22 tests passing, including “after handover, only a passed vote can change the budget”). Every non-constitutional path to expenditure or rule change reverts; the identical appropriation then succeeds through proposal, vote, window, and permissionless execution.