INCOSE Michigan Chapter

Monthly Newsletter

July 2026

In This Issue

President's Message

In early June, I presented at the System-as-Code-Fest 2026 (hosted by Sensmetry and System Strategy) and hosted our SysML v2.0 Vendor Showcase. It was great to see Michigan leading important discussions about the transformation currently underway in systems engineering as we learn to fully exploit the capabilities that SysML v2.0 and these tools provide. We appreciate all of the work put in by Sensmetry and System Strategy to make their event a success (and it was great to tour the SSI offices at Oakland University). We also want to thank Celedon Solutions, Dassault Systèmes, Mgnite, Sensmetry, and SysModeler for answering our call to participate and their efforts in creating solutions to our showcase problems. We will be sharing their presentations and models through our website.

On June 23, I was happy to attend the Engineering Society of Detroit's Annual Dinner and witness Jeremy Ross, CSEP, receiving the 2026 ESD Young Engineer of the Year Award. I had the pleasure of teaching Jeremy during his time at the University of Detroit Mercy and can attest that he is extremely deserving of this recognition.

I will be reprising my SysML v2.0 presentation from the CATIA User Symposium Americas on July 14th at the Engineering Society of Detroit. We will have the University of Michigan MRover team joining us in September to show their entry from the Mars Society's 2026 University Rover Challenge and discuss their systems engineering approach. It will be followed with a Systems Soirée at Relish (in the Kensington Hotel, Ann Arbor). We also another Engineering Expedition scheduled (celebrating Route 66's 100th anniversary) and have our second Sidequest Social planned: An Idiot's Guide to Wine.

This month's historical corner features the founding of the United States of America (looking at it as a systems engineer). Happy Birthday USA! I hope each of you takes a moment to think about the risks the Founding generation took to create our republic.

Please let me (or another officer) know how we can better serve you.

Michael J. Vinarcik, ESEP-Acq, P.E, FESD
President

Chapter News

Jeremy Ross, CSEP, is the 2026 Engineering Society of Detroit Young Engineer of the Year (honoring engineers under the age of 35 for outstanding contributions to the engineering community).

Jeremy and Monica Ross at the 2026 ESD Annual Dinner

Upcoming Events Calendar

Date	Event	Organization
July 2-5	Salute to America	Greenfield Village
July 4	Happy 250th Birthday USA!	Our Founding Fathers
July 14	The Blade That Was Broken: Reforging SysML Teaching for the V2.0 Era	INCOSE Michigan Chapter
July 15	MBSE Tools Info Session – SysModeler.ai	INCOSE WMA Chapter
July 16	AI at the Crossroads of Economics, Patient Outcomes, and Value	INCOSE Chicagoland Chapter
July 25	AI for Systems Engineering Workshop	INCOSE Chicagoland Chapter
August	Virtual Meeting (TBD)	INCOSE Michigan Chapter
August 27	Engineering Expedition: Fuel for Thought: Route 66	Stahls Motors and Music Experience
September	MRover (University Rover Challenge Team), Ann Arbor + Systems Soirée (Relish Restaurant)	INCOSE Michigan Chapter
October	Virtual Meeting (TBD)	INCOSE Michigan Chapter
October 3	Sidequest Social: An Idiot's Guide to Wine	INCOSE Michigan Chapter
October 21-24	PMI Global Summit 2026 "Built to Move"	PMI Great Lakes Chapter
November	Virtual Meeting (TBD)	INCOSE Michigan Chapter
December	F2F Technical / Social Event	INCOSE Michigan Chapter

Upcoming Chapter Events

The Blade That Was Broken: Reforging SysML Teaching for the V2.0 Era

Date: Tuesday, July 14, 2026, 6:00 PM - 8:00 PM (Dinner provided)

Location: The Engineering Society of Detroit, 20700 Civic Center Drive, Suite 450, Southfield, MI 48076

Narsil may have shattered, but it first defeated Sauron. SysML 1.x, rigorously taught and practiced, has likewise delivered real victories—enabling systems engineers to capture requirements, define architectures, and manage complexity across countless programs.

Key findings reveal that students grounded in rigorous SysML 1.x fundamentals develop the systems thinking skills essential to any modeling endeavor. Classroom studies quantifying undetected errors in unvalidated student models demonstrate that rigor and validation are inseparable from quality, regardless of language version.

Now, as SysML v2.0 emerges reforged with textual syntax, enhanced semantics, and an API-first architecture, practitioners with strong 1.x foundations are best positioned to wield this more powerful blade. Andúril was forged from Narsil’s shards.

Note: This talk was originally presented at the CATIA User Symposium Americas 2026

Register at: https://lp.constantcontactpages.com/ev/reg/v2cq7yg

About the Presenter

Michael J. Vinarcik is a Director in the Solutions and Technology Group at SAIC. A Licensed Professional Engineer in Michigan, he holds INCOSE ESEP-Acq certification and dual OMG Certified Systems Modeling Professional credentials (Model Builder Advanced and V2.0 Model User). Mr. Vinarcik is the creator of the SAIC Digital Engineering Validation Tool, the largest publicly available SysML validation ruleset, and has established himself as a recognized thought leader in model-based systems engineering. A prolific contributor to his field, he has co-authored six books, delivered more than 60 conference presentations, and serves as an adjunct professor. His longstanding service to the systems engineering profession is reflected in his active leadership within INCOSE, where he currently serves as President of the Michigan Chapter and Treasurer of the INCOSE Foundation. His work has earned numerous distinctions, including the 2026 Engineering Society of Detroit Affiliate Council Gold Award, the 2017 Cameo Award for Modeling, Simulation, and Analysis Excellence, and the 2023 Individual Modeler of the Year title at the inaugural World Championship of Systems Architecture.

Engineering Expedition:
Stahls Automotive Foundation: Fuel for Thought — Route 66 at 100

Date: Thursday, August 27, 2026, 5:00–8:00 PM (doors 5:00, talk 6:00)

Location: Stahls Motors & Music Experience, 56516 N Bay Drive, New Baltimore/Chesterfield, MI 48051

Cost: Free (RSVP recommended)

This free evening talk marks the 100th anniversary of Route 66, the "Mother Road" that ran from Chicago to Santa Monica. For a chapter of systems engineers, the highway is worth a look as a large-scale infrastructure system: a coast-to-spanning corridor whose value came not from any single segment but from the emergent network of diners, motels, service stations, and roadside attractions that grew up around it — an early example of a transportation backbone shaping, and being shaped by, the economy and culture along its length. The presentation traces how that ecosystem formed, how the route defined American road-trip travel for a generation, and how it faded as the interstate system re-architected long-haul mobility around speed and throughput. Held amid Stahls' collection of vintage automobiles and mechanical music machines, it pairs well with a walk through the exhibits. Seating is first-come to all RSVP guests; walk-ins are welcome to open seats at 6:00 PM.

RSVP / Information: https://www.stahlsauto.com/event/fuel-for-thought-route-66/

Sidequest Social: An Idiot's Guide to Wine

Date: Saturday, October 3, 2026, 6:00 PM

Location: Epiphany 313, 10103 Kercheval Avenue, Detroit, MI 48214

Cost: Varies (General Admission and Front Row tickets available)

Join your fellow chapter members for an evening that pairs hilarious stand-up comedy with a curated tasting of six wine varietals from around the world. The Australian smash-hit *An Idiot's Guide to Wine* has arrived in Detroit, delivering a rare blend of laughter and learning—whether you're a seasoned connoisseur or a complete beginner.

Why This Event?

The show was written by Merrick Watts, the only comedian in the world to hold a WSET (Wine & Spirit Education Trust) Level 3 qualification—a reminder that domain expertise and audience engagement aren't mutually exclusive. Systems engineers will appreciate the underlying challenge: distilling a complex, technical subject (wine) into an accessible, repeatable experience that lands consistently for a diverse audience. It's requirements decomposition and stakeholder communication, served by the glass.

This is a relaxed, social evening at the same Kercheval Avenue venue that hosted our Dungeon Cocktail Experience earlier this year—an ideal setting for members and guests to mingle.

Details:

- Age: 21+ with valid ID
- Language: English, performed by a local comedian
- Accessibility: Venue is ADA accessible
- Note: Alcohol consumption is voluntary; non-alcoholic options available for an additional fee
- Tickets: Reserve your own at https://feverup.com/m/667936

RSVP: Contact michael.vinarcik@incose.net if you plan to attend (we may coordinate dinner reservations if there is sufficient interest).

Partner Organization Events

PMI Great Lakes Chapter

PMI Global Summit 2026 Comes to Detroit — "Built to Move"

Date: October 21-24, 2026
Location: Huntington Place Convention Center

PMI's flagship annual conference, the Global Summit, lands in Detroit this October, putting a premier project-management event right in our members' backyard. This year's theme, "Built to Move," centers on navigating accelerating change—choosing agility over rigidity, shaping what comes next, and equipping professionals to stay relevant as the pace of work increases. For INCOSE Michigan members, it's a strong cross-discipline development opportunity under the INCOSE–PMI MOU, and a rare chance to attend a global-scale program without travel. The Summit also runs alongside PMI's Leadership Institute Meeting (LIM), which focuses on leadership training, PMI strategy, and collaborative breakout sessions for chapter leaders.

Cost: Varies

Register:
https://events.pmi.org/flow/pmi/gsdetroit26/landing/page/home?utm_source=Chapter+Communications&utm_medium=Link&utm_campaign=GlobalSummit2026

Other INCOSE Chapter Events

INCOSE Washington Metro Area Chapter:
MBSE Tools Info Session – SysModeler.ai – a SysMLv2 tool powered by AI

Date: July 15, 2026, 6:00–8:00 PM EDT

Format: Virtual

Join the INCOSE WMA Chapter for a two-hour presentation and live demonstration of SysModeler.ai, an AI-powered SysML v2 tool. The session offers a close look at where AI-native tooling fits within the evolving MBSE landscape — a timely complement to our own chapter's SysML v2 programming this summer. All INCOSE members, student members, and guests interested in broadening their view of current MBSE tool offerings are welcome.

About the Presenter

Md Tawhid Bin Waez, PhD, is the Founder and CEO of SysModeler, Inc., which develops an industrial-grade, AI-native platform built to automate Model-Based Systems Engineering and accelerate digital engineering in practice. He brings more than 20 years of experience in the design, modeling, and verification of safety-critical systems. Previously, Dr. Waez spent nearly nine years at Ford Research & Advanced Engineering, where he led both AV Formal Methods and Software Formal Methods — directing a cross-functional team that produced industry-first, formally verified collision-avoidance systems for AI-enabled motion planners, and establishing Ford's first company-wide ISO 26262-compliant software V&V processes. He holds a PhD in Computer Science from Queen's University, where his research applied game theory to the modeling of industrial real-time systems, and he has authored 20 peer-reviewed works, including three patents in safe autonomous systems. His career reflects a consistent focus on collaborative initiatives bridging leading industry and research institutions, among them MIT, General Motors R&D, the University of Michigan, the University of Waterloo, TU Munich, RWTH Aachen, and the IT University of Copenhagen.

Register: https://incose-org.zoom.us/j/81672520843?pwd=dfoTQ843c2JnBFOeJYw9qYXpuyhFmM.1

INCOSE Chicagoland Chapter:
AI at the Crossroads of Economics, Patient Outcomes, and Value

Date: July 16, 2026, 7:00–9:15 PM EDT

Format: Virtual

An evidence-driven look at where AI in medicine actually delivers value versus where it has stalled — separating hype from real productivity measured in patient outcomes. The talk spans care quality, patient safety, real-world evidence in drug development, proteomics, quantum computing, the economics of AI, and digital twins. Presented by Dr. Jacob Krive, Clinical Associate Professor of Biomedical Informatics at the University of Illinois at Chicago, with 30+ years leading IT teams at Endeavor Health, Advocate Health, and IBM. Relevant for systems engineers working in complex, high-stakes domains where value, outcomes, and cost must be balanced. Offered via Zoom (networking 7:00, announcements 7:30, presentation and Q&A 8:00–9:15).

Register: https://www.incosechicagoland.com/events/2026-07-ai-in-medicine

INCOSE Chicagoland Chapter:
AI for Systems Engineering

Date: July 25, 2026, 10:00 AM – 6:00 PM EDT

Format: Virtual

AI for Systems Engineering is a practical, intensive, eight-hour workshop on applying AI within established systems engineering practice. AI tools are increasingly accessible, yet accessibility is not the same as effective use, and teams often produce outputs that are hard to trust or to integrate.

Through short presentations and extensive hands-on exercises, participants learn to frame engineering problems for AI, guide the interaction, and interpret outputs so they can be used appropriately within engineering artifacts. The workshop builds real skill in validating and authoring requirements, creating and evaluating alternative architectures, and deriving subsystem requirements, while recognizing the limitations and risks of AI.

Participants use their own preferred large language model, so the learning transfers directly to daily work, and all materials, exercises, and reference content remain available for reuse afterward. The emphasis is disciplined application that strengthens, rather than replaces, engineering knowledge and judgment, with a roadmap from individual use to integration at scale across engineering workflows.

About the Presenter

John Fitch, ESEP, brings more than four decades of engineering, management, consulting, and training experience, and was certified by INCOSE as an Expert Systems Engineering Professional in 2012. Across 20-plus years of independent consulting, he has focused on decision management, requirements, risk, system design and architecture, and technology roadmapping for clients such as Motorola, Northrop Grumman, United Technologies, QinetiQ, and the U.S. Army. An early adopter of DOORS and creator of the Decision Driven Design methodology, he has presented at INCOSE, IEEE, and NDIA and has taught several thousand professionals to think more clearly, creatively, and holistically.

Cost: $60

Register: https://www.incosechicagoland.com/events/ai-for-systems-engineering-workshop

Other Events

Greenfield Village: Salute to America

Dates: July 2-5, 2026

The iconic annual Independence Day celebration by the Detroit Symphony Orchestra and Greenfield Village, focused on America's 250th anniversary.

Registration: https://www.thehenryford.org/visit/things-to-do/calendar/salute-to-america

The Henry Ford Museum of American Innovation: Freedom Plane

Dates: July 9-26, 2026

Traveling for the first time together in history, see documents like George Washington's, Alexander Hamilton's and Aaron Burr's Oaths of Allegiance (1778); the Treaty of Paris (1783); Senate Markup of the Bill of Rights (1789); and more. The Henry Ford is one of eight institutions across the U.S. where nine original founding-era documents will be on display to the public as part of The National Archives and Records Administration traveling exhibition, Freedom Plane National Tour: Documents That Forged a Nation.

Information: https://www.thehenryford.org/visit/things-to-do/calendar/freedom-plane-national-tour

The American Republic at 250 —
Engineering a System Against Its Own Failure Modes

July 4, 2026 — 250 Years Since the Declaration of Independence

On July 4, 1776, the Second Continental Congress adopted the Declaration of Independence — drafted principally by Thomas Jefferson for the Committee of Five — and committed thirteen colonies to a course from which there was no clean rollback. That document set everything that followed in motion. It is a top-level statement of purpose with an itemized list of grievances appended; in hindsight those grievances function as the requirements rationale for the system the colonists would go on to build. Two and a half centuries later, the system those colonists set in motion is still operating. Read through a systems engineering lens, the American founding is less a single event than a multi-decade development effort: a problem that emerged from the interactions of many parts, a set of converging drivers that forced action, a deliberate study of prior designs and their failure modes, and finally an architecture engineered to remain stable under stress. The anniversary is worth marking, and the engineering behind it is worth examining on its own terms.

The Emergent Property: A Self-Governing Populace

No colonial charter specified a citizenry inclined toward liberty and limited government, and no single colony produced it. The disposition emerged from the interactions of many parts over many decades: dispersed settlement, religious traditions that prized dissent and congregational self-rule, colonial assemblies that levied their own taxes and ran their own affairs, and a frontier economy that rewarded independence. An emergent property is one that belongs to the system as a whole and cannot be located in, or predicted from, any one component. By the 1770s the colonies exhibited exactly such a property — a settled expectation of self-government — that no designer had written down and no individual part could account for. The crown's later attempts to assert central control did not create this property; they collided with one that was already there.

Convergent Forces: Why the Problem Demanded a Response

Revolutions rarely have a single cause, and this one was no exception. Several independent forces converged in the same direction, none decisive alone. The Seven Years' War left Britain deep in debt and inclined to extract revenue from the colonies it had spent heavily to defend against France, producing the Stamp Act of 1765 and the duties that followed. A long prior period of light administration — often called salutary neglect — had conditioned the colonies to autonomy, so the sudden tightening landed as a breach of expectation rather than a routine policy change. Enlightenment political philosophy, especially John Locke's account of government resting on the consent of the governed and his defense of natural rights, supplied a vocabulary that turned grievance into principle. And an inherited tradition of English liberties gave the colonists grounds to claim they were defending established rights, not inventing new ones. When multiple drivers point the same way, the combined load can exceed what any single mitigation could have absorbed. By 1776 no incremental concession was going to relieve it.

Thirteen Modular Subsystems: Encapsulation by Design

Each colony was, in effect, a module. Behind its own charter it ran its own legislature, courts, established church, economy, and even currency, encapsulating its internal affairs so completely that the others rarely needed to know how any one of them worked inside. New England's merchant and maritime economy, the mid-Atlantic's mixed commerce and religious pluralism, and the Southern plantation economy were not interchangeable parts; they were distinct subsystems with high internal cohesion and, by the standards of the day, loose coupling to one another and to the crown. That modularity was not a theory imposed from above. It emerged from geography, separate founding, and decades of self-rule, and it carried the classic advantages of a modular design: each colony could develop and govern itself largely independently, and a problem inside one did not automatically propagate to the rest.

Modularity also carried its classic cost. Uniting modules that had evolved on their own terms into anything that could act as a whole was a genuine integration problem. Large colonies distrusted small ones, commercial and agrarian interests pulled in opposite directions, and the Continental Congress had to negotiate continuously to keep the coalition from fracturing. The Revolution succeeded not because the colonies agreed on what they wanted, but because they agreed — barely, and just long enough — on what they were against. In systems terms this is the familiar tension between local and global optimization: well-encapsulated subsystems each pursuing its own optimum can keep the whole from reaching any workable state at all. The achievement was getting heterogeneous, independently evolved modules to interoperate toward a shared objective without first forcing them to become uniform.

The Atlantic as an Interface

An interface governs what passes between two systems and at what rate and cost. The three to four thousand miles of ocean between London and the colonies functioned as an interface in the architectural sense, and its properties shaped everything that crossed it. Orders, troops, and money moved across it on a latency of weeks, which meant the crown could never govern the colonies as responsively as it governed territory at home — a structural lag that quietly reinforced the self-government already taking root. During the war, that same distance multiplied the cost of projecting and sustaining force, giving a materially weaker adversary the strategic depth it needed to survive long enough to prevail.

After independence, the interface kept doing useful work. A republic founded on the consent of the governed was an implicit challenge to monarchies whose legitimacy rested on hereditary and divine right, and the ocean provided the new system protective margin while it stabilized, raising the cost for any European power that might have preferred the experiment fail. The picture was not simple — monarchical France allied with the republic against Britain for its own strategic reasons — but the principle holds: a high-latency, high-cost interface decoupled the colonies enough to develop independent behavior, then insulated the result long enough for it to take hold.

Drawing on Prior Designs: Engineering Against Two Failure Modes

The founders were, by the standards of any era, unusually well read in history and political theory, and they treated that reading as a catalog of prior designs and their failure modes. From classical antiquity they took the instability of direct democracy, prone to decay into the tyranny of transient majorities, and the Roman Republic's mixed constitution, which the historian Polybius had analyzed as a way to balance competing centers of power against one another. From the Enlightenment they took Montesquieu's argument for separating legislative, executive, and judicial functions. From the English constitutional tradition they took Magna Carta, the common law, and the settlement of the Glorious Revolution. The hard part was not admiring any one of these precedents; it was engineering against two opposite failure modes at once. A system loose enough to prevent concentrated tyranny tends toward mob rule, and a system tight enough to prevent mob rule tends toward tyranny. Designing a single architecture robust against both, simultaneously, is genuinely difficult — and it is the problem the framers set out to solve.

The First Architecture and Its Failure Modes: From the Articles to the Constitution

The first national architecture was not the Constitution but the Articles of Confederation, drafted in 1777 and ratified in 1781. The Articles encoded the colonies' hard-won distrust of central power: they created a Congress but gave it no authority to tax, no executive to act, and no judiciary to settle disputes, and they required the unanimous consent of all thirteen states to amend — a change process so brittle the architecture was effectively frozen on delivery. Under real load the design revealed its failure modes quickly. The central government could request funds from the states but not compel them, leaving war debts unpaid and the treasury empty; it could not referee the tariffs states began erecting against one another; and it could mount no credible response when domestic unrest, most visibly Shays' Rebellion in 1786 and 1787, exposed how little the confederation could actually do. The Articles were, in effect, a fielded first article that demonstrated specific, repeatable deficiencies in operation. The Philadelphia convention of 1787 was convened nominally to amend that design and chose instead to replace it — a decision to redesign the architecture rather than keep patching a structure whose problems were architectural, and one of the most consequential engineering judgments of the founding.

The Constitution as a Control Architecture

The replacement, the Constitution drafted in Philadelphia in 1787, reads in engineering terms like a control architecture built to keep any subsystem from saturating. Power is separated into three branches, each given the means to check the others; the legislature is split into two chambers with different constituencies and time constants; and authority is divided again between the national government and the states. The design does not assume virtuous operators. As Federalist No. 51 — generally attributed to Madison — put it, the structure is meant to let ambition counteract ambition — to harness self-interest as a stabilizing feedback rather than depend on it being absent. Federalist No. 10 made the companion case that a large republic could dilute the influence of any single faction. Crucially, the architecture included its own modification procedure: the amendment process is designed-in changeability, a deliberate reserve of adaptability comparable to the operational margin that lets a long-lived system be reconfigured rather than scrapped when conditions change. The Federalist Papers themselves served as published design rationale, preserving the intent behind the architecture for everyone who would later have to operate and maintain it.

Federalism also formalized the modularity the colonies had carried from the start. The Constitution defined the module interface explicitly — enumerated powers delegated to the national government, with the Tenth Amendment reserving everything else to the states or to the people — so that each state could retain its own internal character while interoperating through a common boundary. The payoff was extensibility. Through a standardized admission process, anchored in the Northwest Ordinance of 1787 and the Constitution's admissions clause, the union grew from thirteen modules to fifty without redesigning its core, and individual states could vary internal policy independently, a property a later jurist would describe as the states serving as laboratories. The honest caveat is that the interface was not fully specified: the unresolved boundary between state and national authority, most consequentially over slavery, was a latent contradiction in the module specification that the architecture could not contain indefinitely, and it eventually produced the system's gravest crisis. Under-defined interfaces are a deferred failure, not an avoided one.

The framers also repaired the Articles' most disabling feature: the change process itself. Where the Articles had required the unanimous consent of all thirteen states — a gate so high it was effectively never cleared — the new Constitution would take effect once nine of the thirteen ratified, and it set a demanding but achievable supermajority for future amendments. Replacing a unanimity requirement with a supermajority threshold is a deliberate trade: enough agreement to confer legitimacy and stability, but not so much that any single party holds a veto over the whole. Ratification was no formality. Anti-Federalists objected that the architecture concentrated too much power and lacked explicit protection for individual rights, and several states ratified only on the understanding that such protections would follow. The Bill of Rights — the first ten amendments, ratified in 1791 — was the negotiated result: an interface renegotiation that secured the buy-in of the dissenting stakeholders and, not incidentally, exercised the new amendment mechanism almost immediately.

Operating the New System: Hamilton and the Debt

A sound architecture still has to be brought into operation, and the young republic's most dangerous early load was financial. The states and the central government emerged from the Revolution carrying heavy, tangled war debts, and the union's credit — its ability to borrow at all — was in doubt. As the first Secretary of the Treasury, Alexander Hamilton proposed that the federal government assume the states' debts and fund the consolidated obligation on a sound, serviceable basis. The move was as much integration as finance. Central assumption replaced thirteen competing financial interfaces with a single well-defined one, and it deliberately aligned incentives: holders of federal debt now had a direct stake in the new government's solvency and survival. Hamilton did not so much retire the debt as convert it into an instrument of union — a shared obligation binding the subsystems to the whole — and pairing it with a national bank established the federal credit on which everything downstream depended. The plan was contentious enough that it was settled by negotiation: assumption in exchange for siting the permanent capital on the Potomac, a reminder that even an elegant systems move usually has to clear a stakeholder trade before it can be implemented. That this chapter of public finance is now widely known through a hit stage musical is its own measure of how central these founding design decisions were.

The Founders as a System: The Right People at the Right Interfaces

A sound architecture still has to be designed and staffed, and the founding generation is worth examining as a system in its own right — a set of complementary, specialized roles, each placed where it had the most leverage. George Washington's value was only partly his military experience; it was his credibility and restraint, which made him the load-bearing element at the executive interface, and his voluntary surrender of power — first the army commission, later the presidency after two terms — set a precedent that stabilized everything built on top of it. Benjamin Franklin, already the most famous American in Europe, was uniquely fitted to the diplomatic interface; his standing in Paris helped secure the French alliance, formalized after the American victory at Saratoga, on which the war's outcome turned. Thomas Jefferson's gift for language produced the Declaration; James Madison's command of political theory shaped the Constitution's structure and much of its published rationale; Alexander Hamilton's financial design brought the system into operation; John Adams's advocacy carried independence through a divided Congress. The individuals who were the public face of the Revolution brought complementary strengths to those roles. What stands out is less any individual's brilliance than the fit between person and role: matching specialized talent to the point of greatest leverage was itself a design decision. A sound architecture can still fail when staffed badly, which makes that fit worth noticing.

SE Lessons for Practitioners

- **Emergent properties define the system.** The behavior that mattered most — a self-governing populace — lived in the interactions, not in any component. Design and verify at the system level for the properties you actually want; you will not find them in the parts list.

- **Understand the converging load before architecting.** The revolution was driven by several independent forces aligned in one direction. Characterizing the full set of drivers, rather than the loudest one, is what tells you whether an incremental fix can hold or whether the architecture itself has to change.

- **Modularity buys independent evolution and extensibility — if the interface is right.** Encapsulated colonies could govern themselves and contain local problems, and a well-defined federal interface later let the union scale from thirteen to fifty without redesign. But too-loose coupling fails as surely as too-tight, and an under-specified interface only defers the failure. Getting the module boundaries right is the work.

- **Interfaces shape behavior and supply margin.** The Atlantic's latency and cost decoupled the colonies and later protected them. Interface properties — how much crosses, how fast, at what cost — are architectural decisions with consequences as large as any inside a box.

- **Mine prior designs for failure modes.** The framers treated history as lessons learned and engineered explicitly against two opposite failure modes. Robustness against a single failure is comparatively easy; robustness against opposed failures at once is the harder and more valuable target.

- **Expect to iterate the architecture.** The Articles of Confederation were a first article that revealed its deficiencies in operation. When a system's problems are architectural, redesigning is the disciplined choice; continuing to patch a flawed structure usually costs more in the end.
- **Design the change process, not just the system.** The Articles' fatal flaw was a unanimity gate that froze the architecture; the Constitution replaced it with a supermajority threshold that made change hard but possible, and the Bill of Rights exercised it within three years. Setting the consensus bar — neither a single-party veto nor a free-for-all — is a first-class design decision, not an afterthought.
- **A shared interface can align incentives.** Assuming the debt centrally gave every creditor a stake in the union's survival. Well-chosen shared interfaces and resources do more than connect subsystems; they can pull independent actors toward the same objective.
- **Do not assume virtuous operators.** Checks and balances are negative-feedback loops that keep the system stable without depending on the goodwill of whoever holds a given role. Architectures that rely on ideal operators tend to fail when real ones arrive.
- **Build in changeability and preserve the rationale.** The amendment process is margin against an unknown future, and the Federalist Papers are design documentation. Both are reminders that a system meant to last must be able to change and must record why it was built the way it was.
- **Staff the interfaces deliberately.** A sound architecture still has to be designed and run by people. Placing complementary, specialized talent where each has the most leverage — and valuing restraint as highly as capability — is itself a design decision, and a frequently decisive one.

Two Hundred Fifty Years In

The United States has now operated this architecture far longer, and under far heavier and more varied loads, than its designers could have specified. It has been stressed to its limits more than once and has not been replaced. For a system assembled from imperfect parts, by designers working without the benefit of any comparable precedent, that is a remarkable record of robustness — and a fitting thing for a chapter of systems engineers to recognize on its 250th anniversary. The lesson is not that the design is beyond criticism, but that careful attention to emergent behavior, converging requirements, interfaces, known failure modes, and stabilizing feedback can produce something built to endure.

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This article was drafted with assistance from Claude.ai by Anthropic.

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Portions of this newsletter were researched and drafted with assistance from Claude.ai (Anthropic, 2026).