

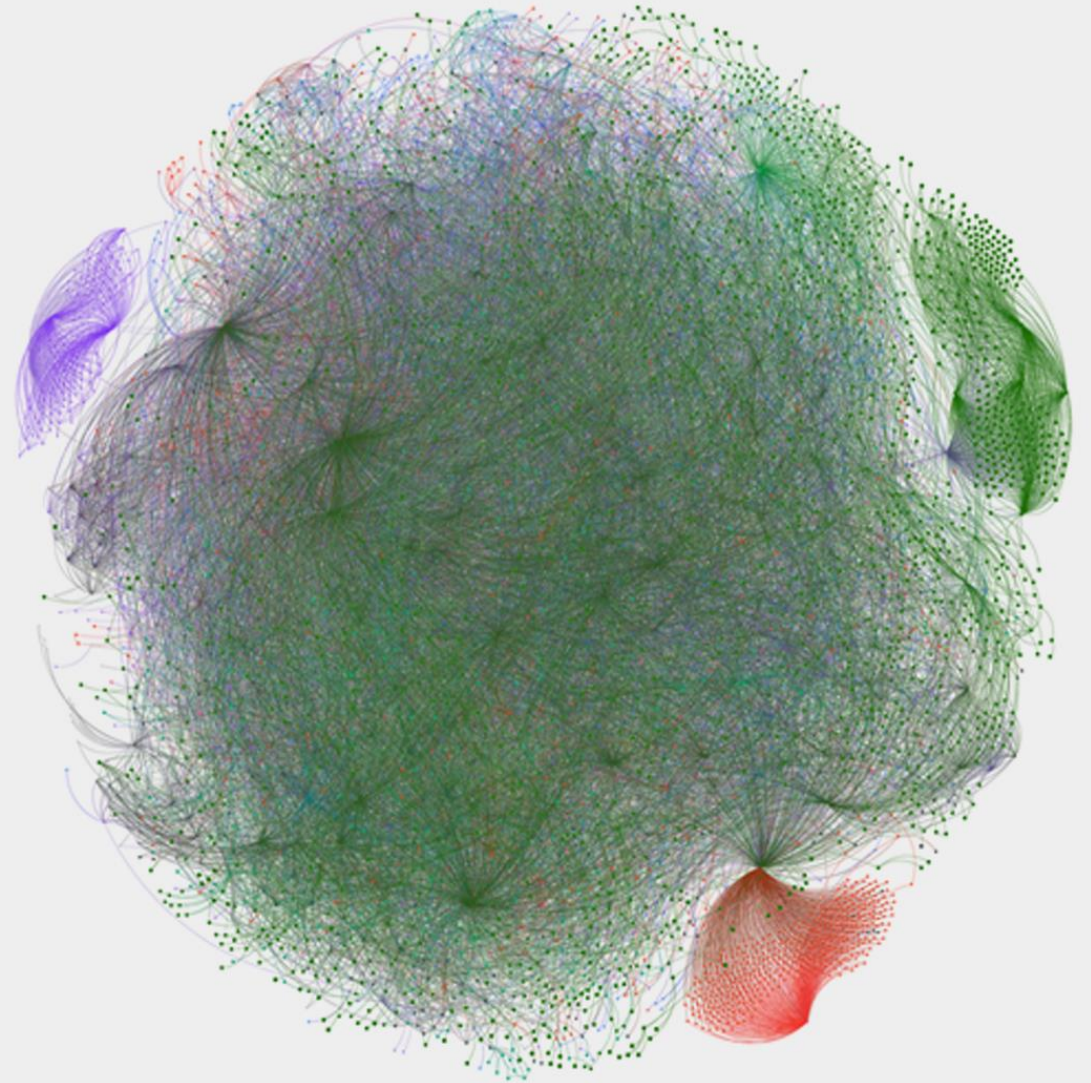
RESEARCH BRIEFING

A Pragmatist's Path To Digital Sovereignty

Operationalizing digital sovereignty under
cost and capability constraints.

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Marcel Gocke, Alexander Clemm**

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Cloud ahead is a think tank of seasoned practitioners from all digital disciplines

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Transformation Expert



Professor in Innovation



IT Lawyer



Security Expert



Cloud Architect



CTO



Organization Expert



Cloud Architect



CISO

More Info: <https://www.cloudahead.de/ueber-uns>

We have experienced all digital success & dependency patterns in practice.

We work inside both global and sovereign technology ecosystems across all types of organizations.

Our project history includes them all:

SAP Hybris (v)

Microsoft
Azure

STACKIT



aws



BERTELSMANN

gaia-x

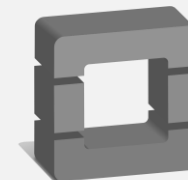
SIGNAL IDUNA



accenture

8ra CLOUD-EDGE
CONTINUUM

T-Systems



openstack

vmware®

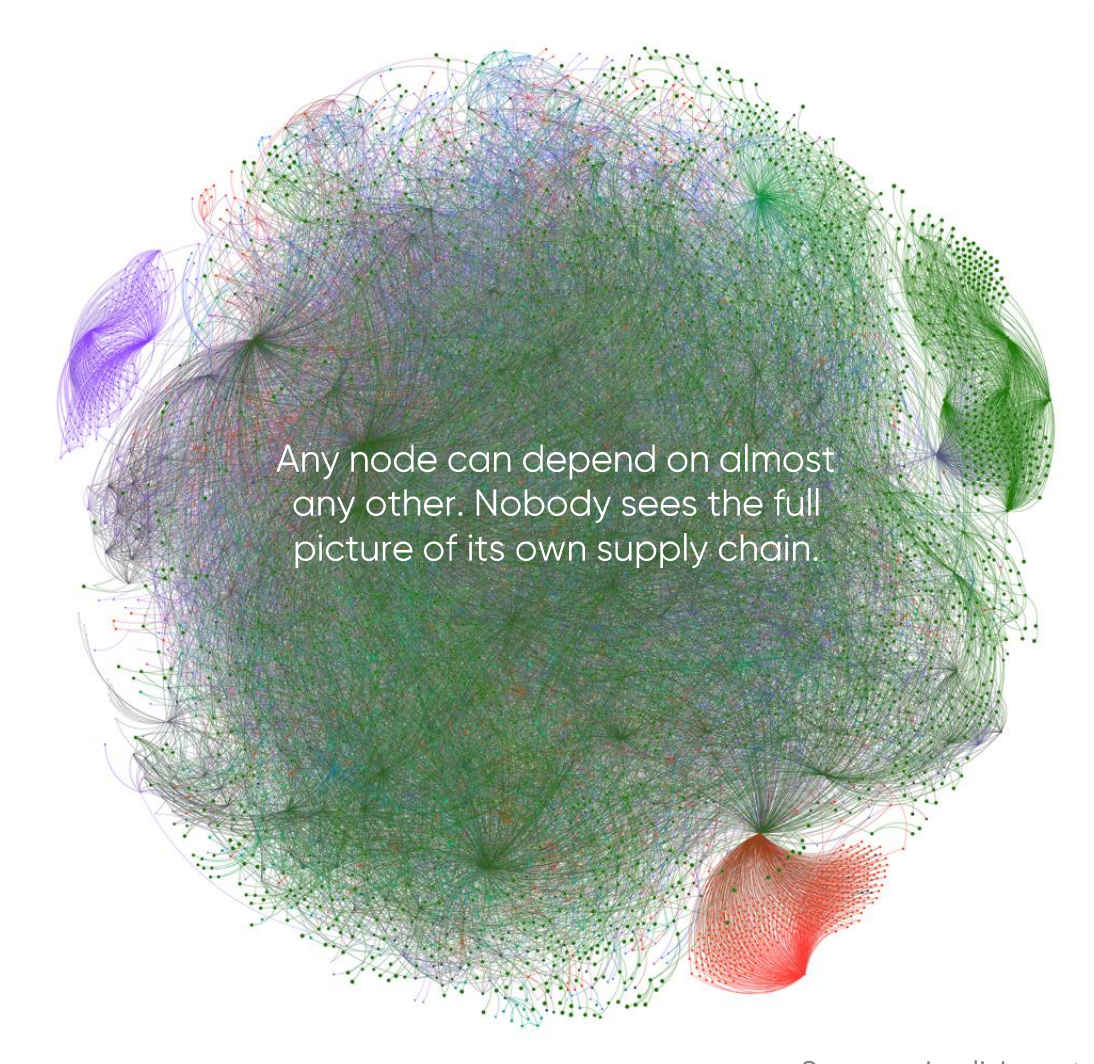
Why is Digital Sovereignty so difficult?

The Global Digital Supply Chain is a Huge Mesh

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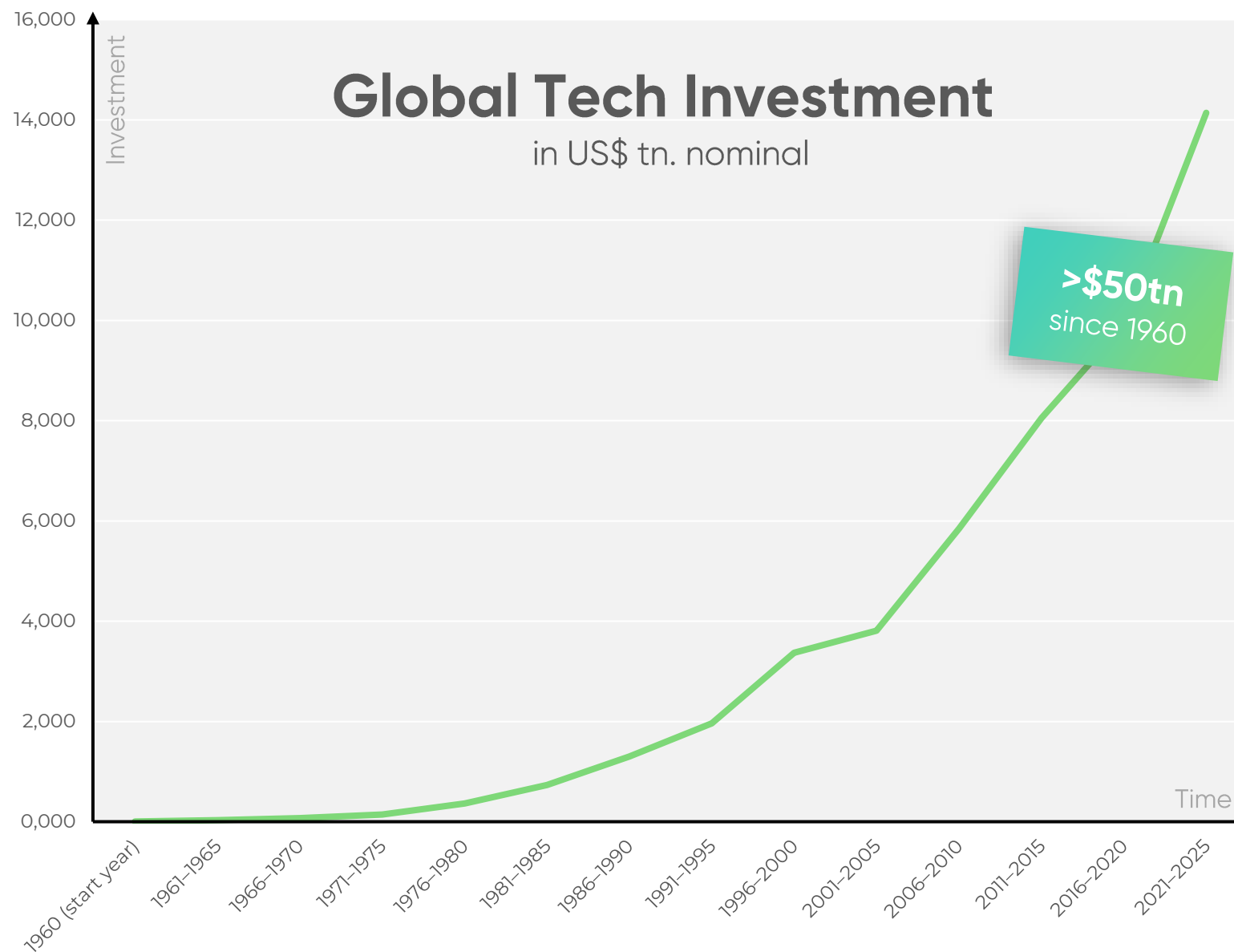
For a single application it looks like this:

- **Application logic.** Organizations run dozens of business applications, many exceeding one million lines of code.
- **Software building blocks.** Drawn from over 10 million open source projects and proprietary offerings, a typical codebase uses around 1,180 components.
- **Infrastructure building blocks.** Organizations run hundreds of infrastructure tools to keep applications live.
- **Tool mesh.** Dozens to hundreds of developer, enterprise, and data tools running alongside the core product.
- **Data center hardware.** Beneath every software layer sits physical machinery, servers, storage, networking, power, and cooling. Each device runs its own embedded firmware, restarting the dependency chain at the hardware level instead of ending it.
- **Upstream supply chain.** The hardware above traces back to raw materials and manufacturing equipment, refined silicon, specialty gases, lithography machines, rare earth elements, and the energy to power it all.



Sources in slide notes.

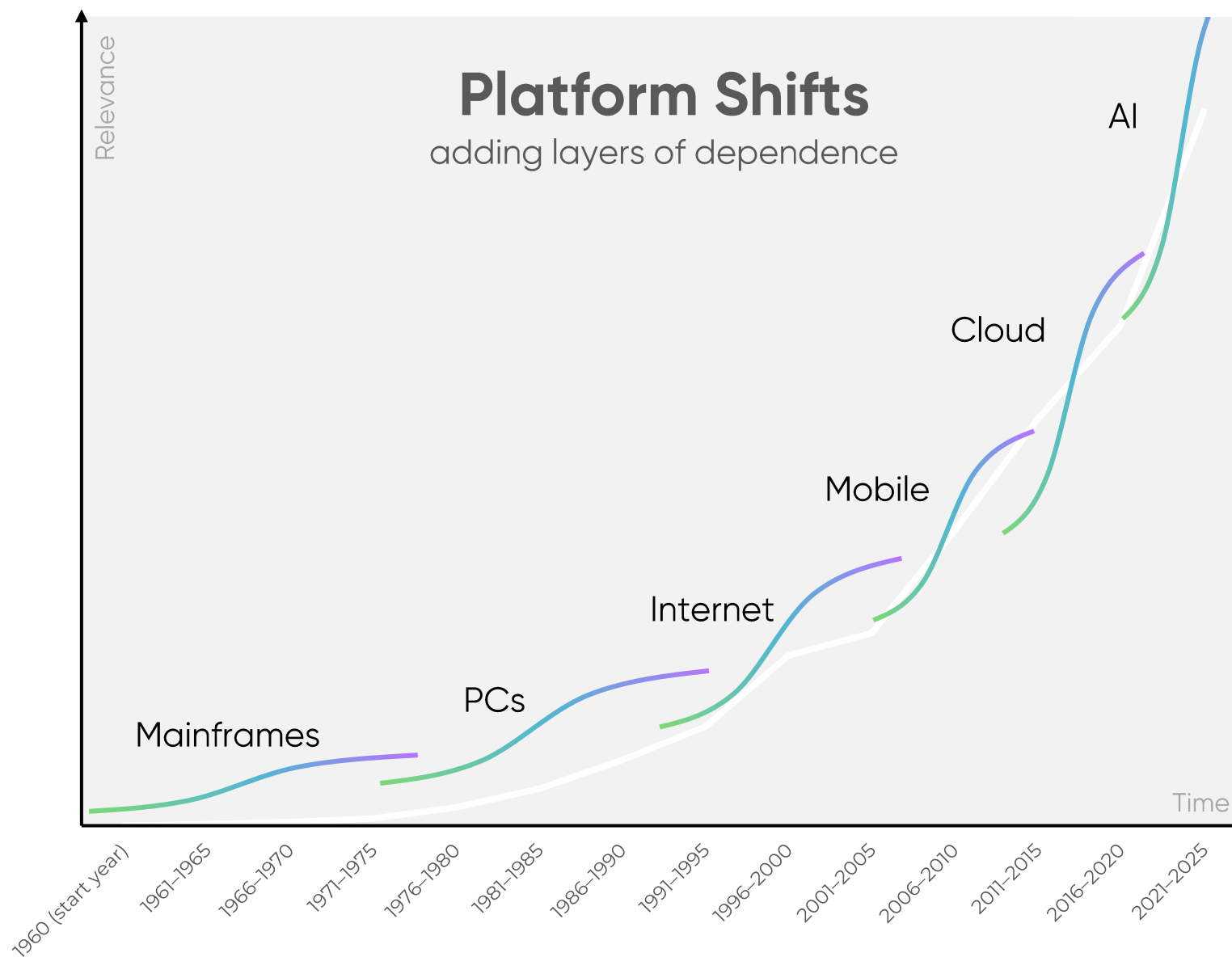
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**The world has
invested massively
into its tech stack ...**

Estimate, nominal current
USD, core ICT only. Sources in
slide notes.

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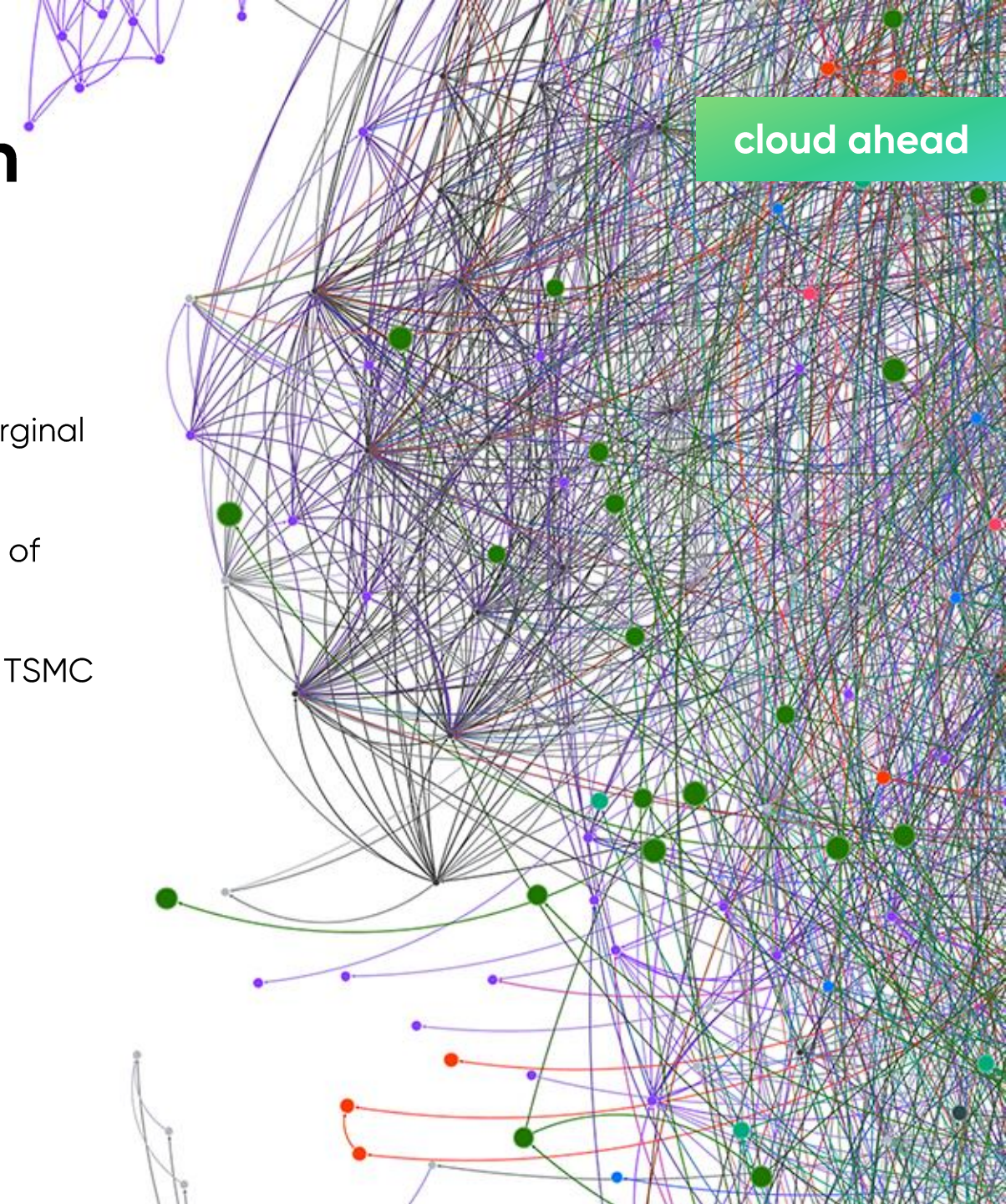
... adding more and more generations of tech.

Old generations of tech do not disappear. Each new generation adds another layer dependency to the supply mesh.

This global digital supply mesh is massively efficient.

- Every company of the world can use the world's best AI for ~0 marginal cost* and free of investment.
- Global energy transformation was enabled by 97% cost reduction of solar modules thanks to \$50Bn of chinese investments.
- The cost per unit of GPU compute fell by ~99.5% since 2006, while TSMC alone invested ~\$280bn into semiconductor manufacturing.

* OpenAI GPT-5.6 Sol for \$0.000020 per output token.



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But Dependency itself is not the risk. What matters are the risks it creates.

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Cyber
Vulnerability

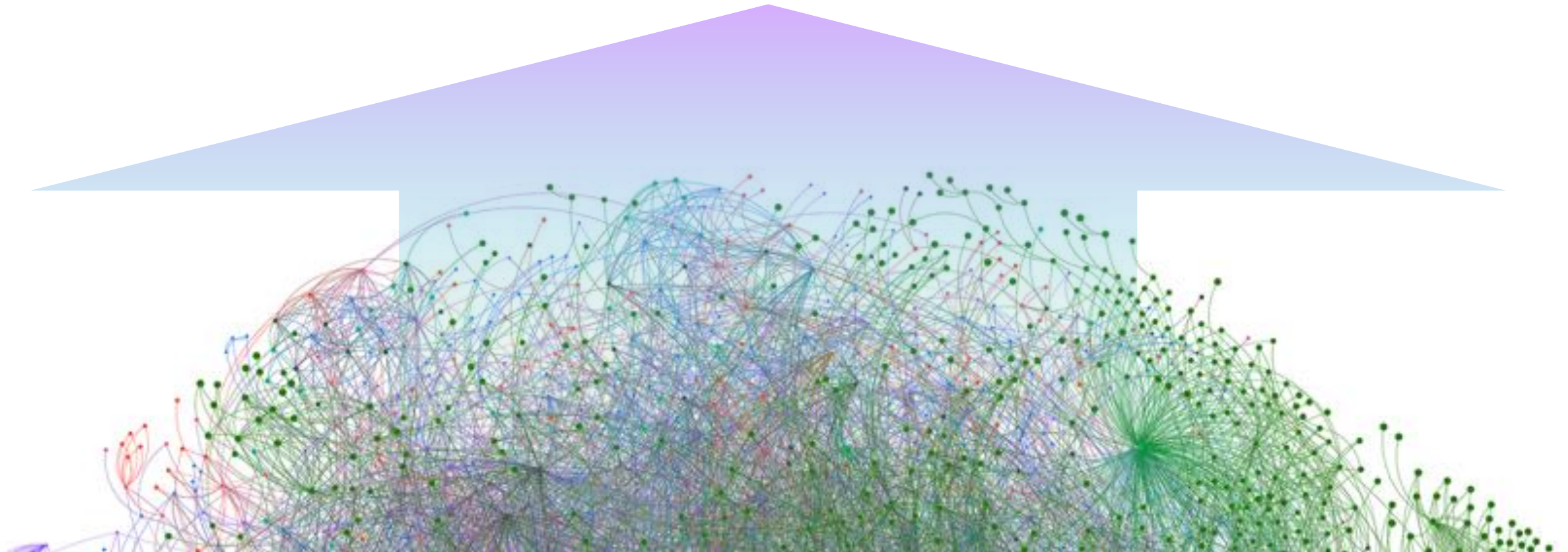
Operational
Disruption

Loss of
Expertise

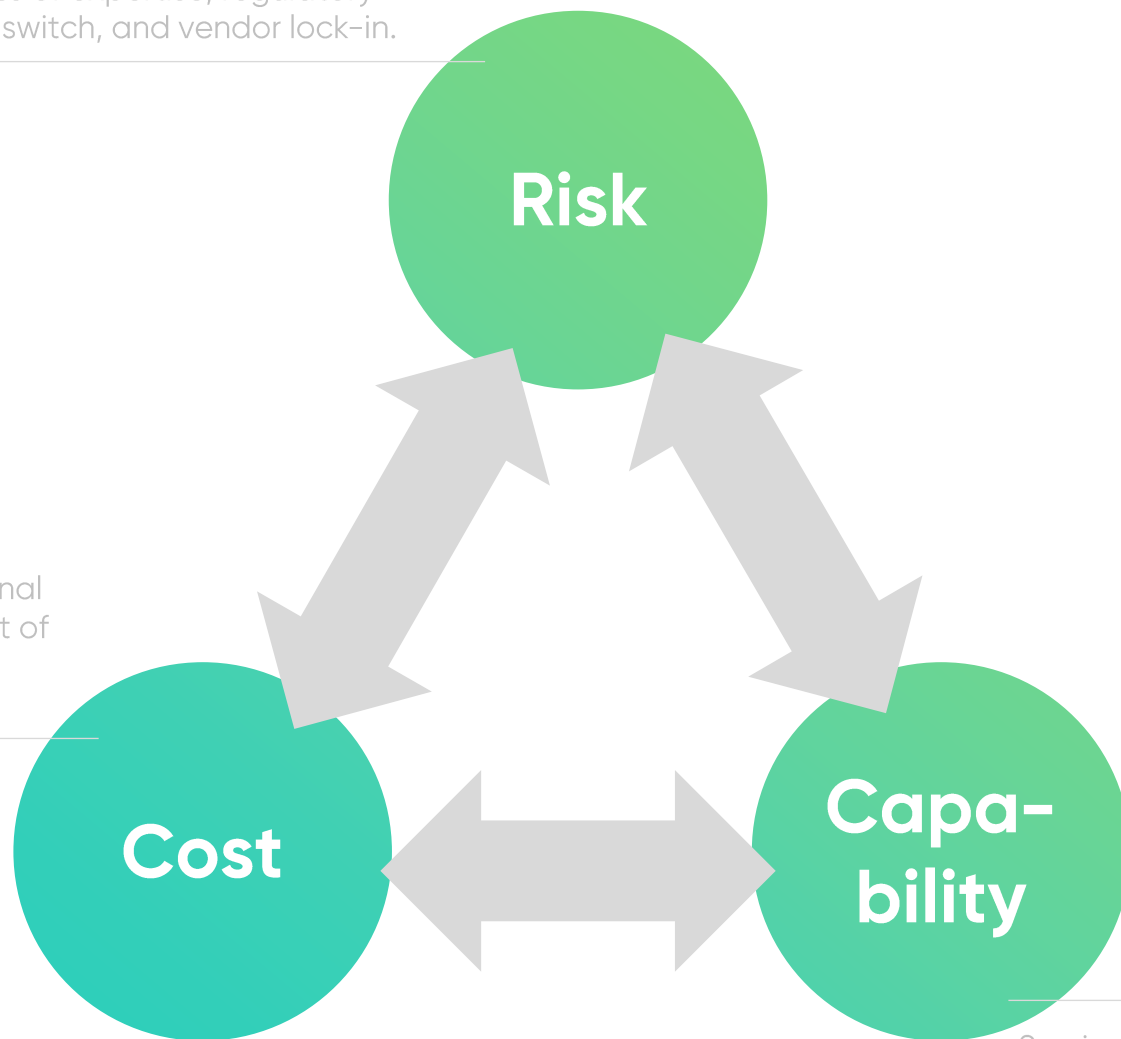
Regulatory
Exposure

Kill Switch

Vendor
Lock-In



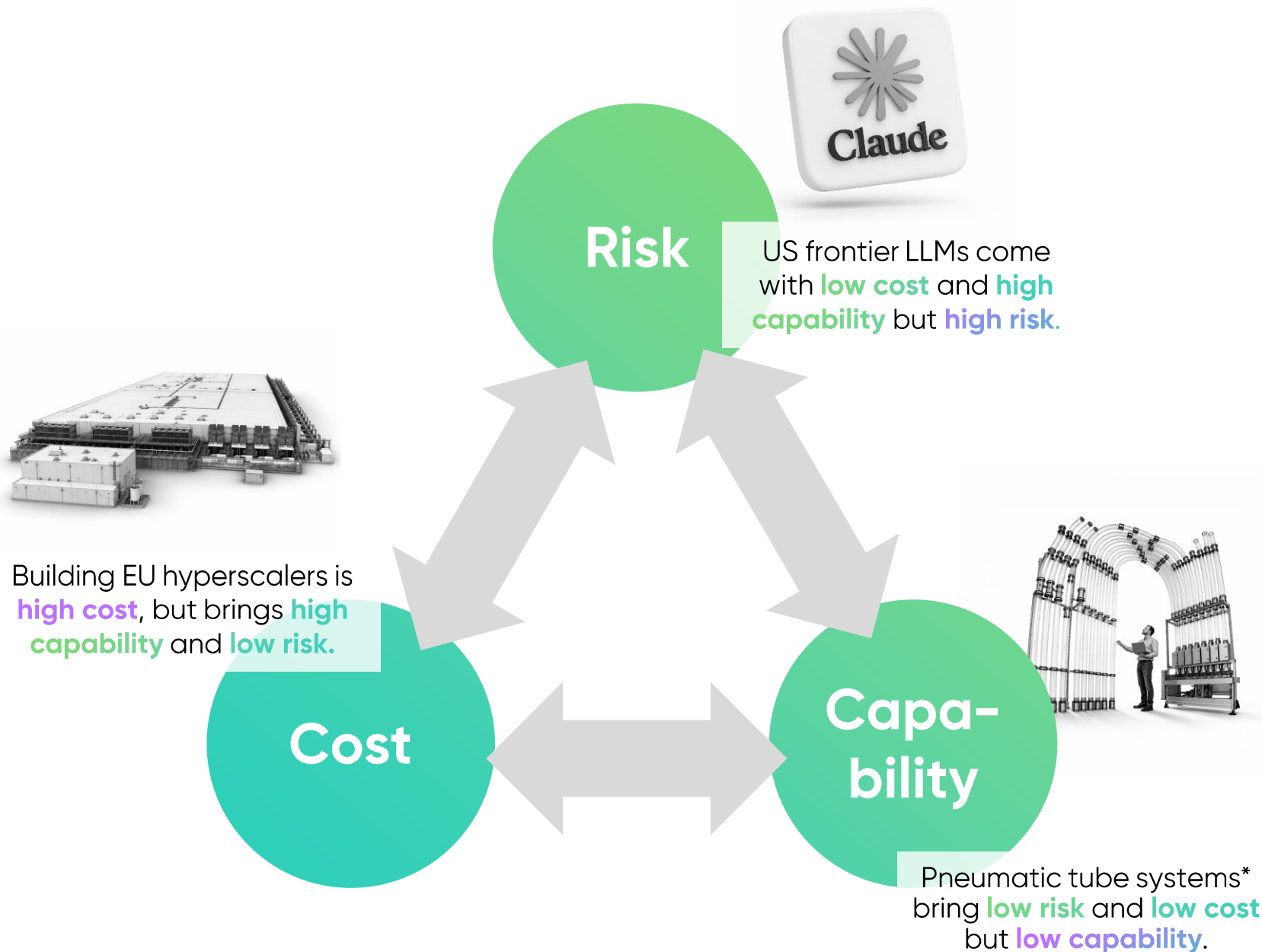
Cyber vulnerability, operational disruption, loss of expertise, regulatory exposure, kill switch, and vendor lock-in.



Investment, marginal cost, run cost, cost of change, and opportunity cost.

Service portfolio, service performance, integration, scale, and frontier adoption.

**Every
sovereignty
decision trades
off risk, cost and
capability.**

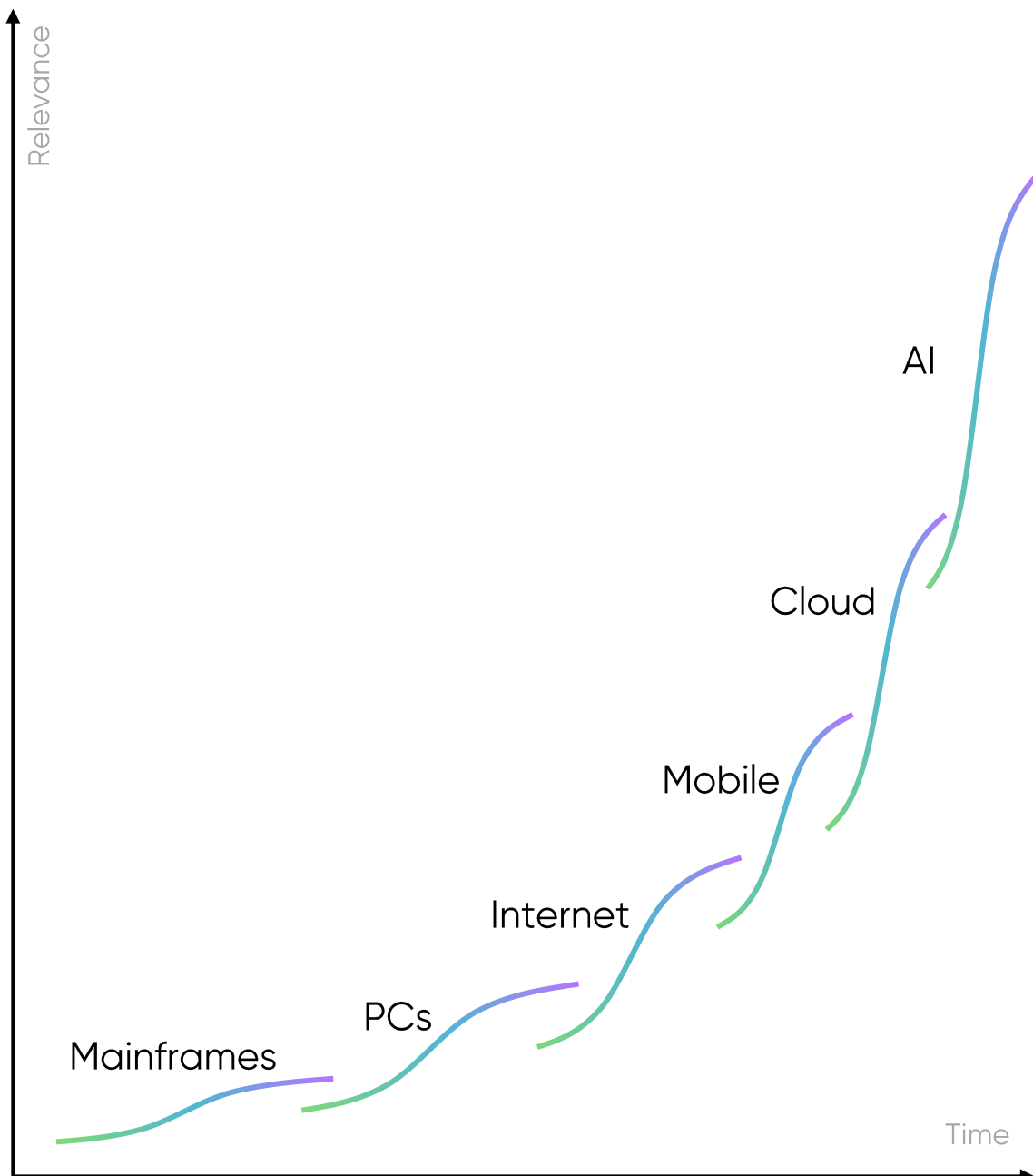


Sovereignty is an economic question.

Are we willing to invest the money to reduce risks and build capability? And do we accept the opportunity costs of not spending the money somewhere else?

* Pneumatic tube systems are modern and available products used for high-confidential communication, e.g. in the German chancellery.

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While all generations of tech remain ...

... positions of power change with platform shifts.

- IBM dominated mainframes. Client/server shifted power to Microsoft.
- Microsoft dominated desktop OS. Mobile shifted power to Apple and Google.
- TV networks and publishers dominated advertising. Social media shifted power to Meta

Digital sovereignty needs two fundamentally different strategies

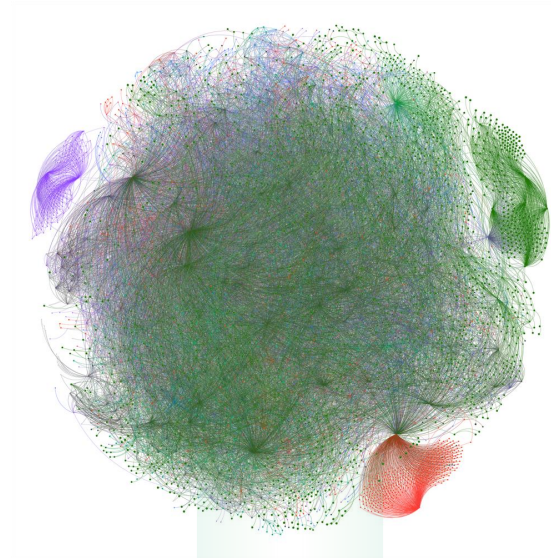
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A single global tech stack is highly efficient

Consumers, SMEs and enterprises follow their own economic incentives and will continue sourcing globally, sustaining dependence.

Dominance shifts with new technology generations

PC, mobile and cloud are mature markets with entrenched scale advantages. Catch-up initiatives there will not materially shift Europe's position.



So we need two strategies

Damage Control

Dependencies in mature technologies are too costly to eliminate. The realistic goal is to reduce the risks they induce.

Leverage Building

Independence through replication is too costly. New technology generations offer the opportunity to build positions of leverage instead to raise the cost of coercion.

Strategy 1: Apply damage control at scale

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Suggestions

Description

Examples

Prioritize Risks strongly

Start from mission and threat scenarios, then mitigate only the risks that materially matter and apply the lowest-cost effective solution.

Use backups against Kill-Switch Risk or data trustees or customer-controlled encryption against Regulatory Exposure.

Reduce cost of mitigation

Embed cost efficient sovereignty risk management into everyday technology decisions ("RiskOps") of technically mature organizations, when mitigation is still cheap.

Open Source, Open Standards, Multi-Cloud, Hybrid Cloud, abstraction layers, portable data, EU cloud options, ...

Scale to the technically immature

Develop reusable, industry-specific and ready-made solutions that SMEs, consumers and public organizations can adopt at scale without much know-how and effort.

Standardized SaaS backups, shared fallback infrastructure, operations trustees, escrow services, seizable sovereign clouds, industry blueprints, ...

Make sovereignty risk mitigation economically viable at scale.

Strategy 2: Build focused counter-leverage

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Suggestions

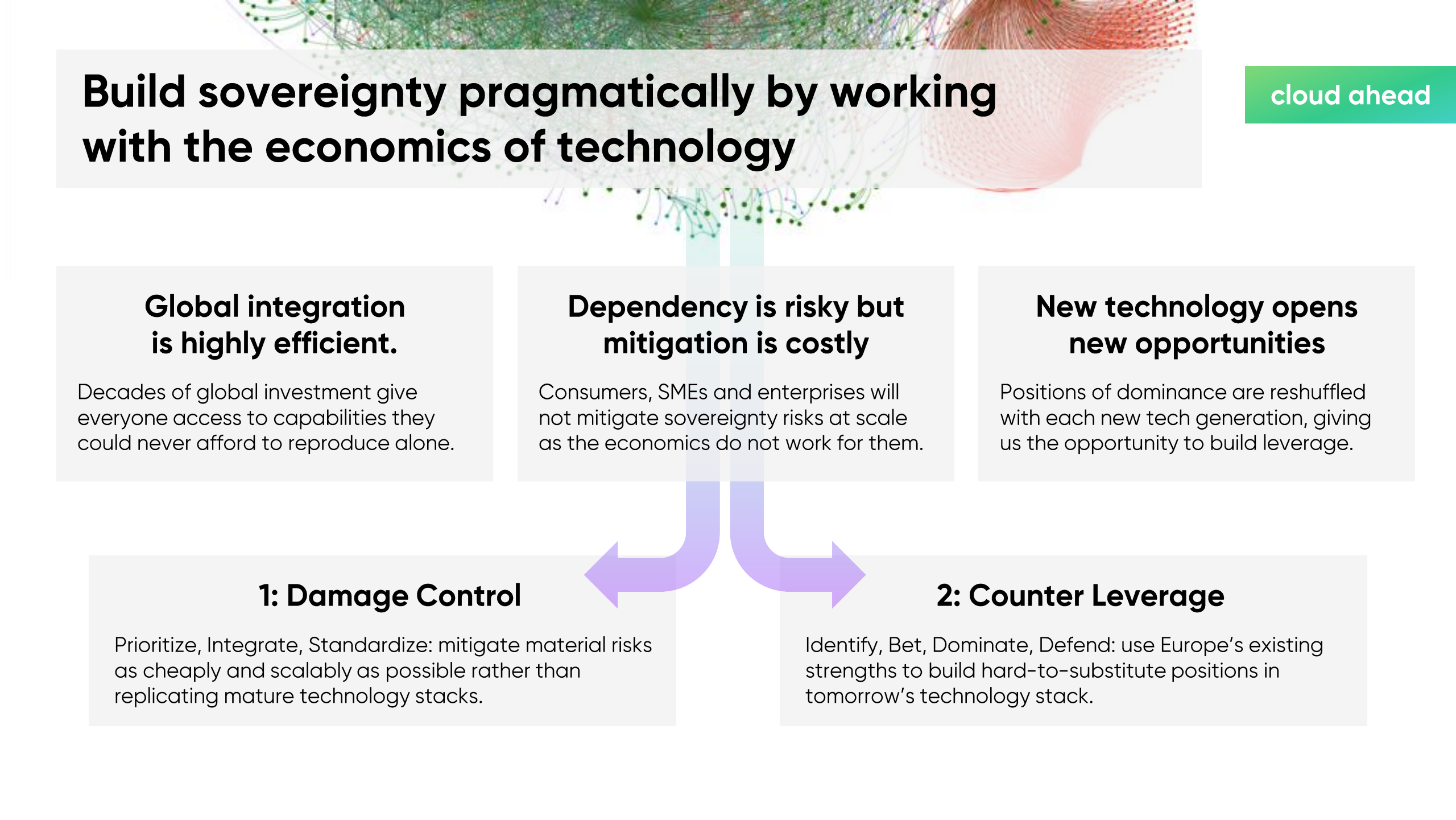
Description

Examples

Focus on specific strengths	Identify upcoming technology shifts where existing European strengths could become hard-to-substitute global chokepoints.	Robotics, drone systems, anti-drone systems, industrial AI, power electronics, photonics, advanced manufacturing, quantum.
Enable growth nets	Enable incumbents and entrepreneurs to risk existing advantages on uncertain new technology generations.	Dedicated VC vehicles, institutional co-investment, tax exemptions for high-risk equity, lead-customer commitments, ring-fenced corporate ventures
Play the Big Tech game	Help emerging winners turn technological leadership into durable, hard-to-substitute global positions.	Vertical integration, developer ecosystems, distribution control, switching barriers, standards, cross-layer expansion, year-long unprofitability strategies.
Support winners despite their size	Ensure European policy does not prevent strategic winners from achieving and retaining globally relevant scale and leverage.	Competition policy, merger control, state-aid rules, foreign-takeover protection

Make Europe indispensable in selected parts of tomorrow's tech stack.

Summary



Build sovereignty pragmatically by working with the economics of technology

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Global integration is highly efficient.

Decades of global investment give everyone access to capabilities they could never afford to reproduce alone.

Dependency is risky but mitigation is costly

Consumers, SMEs and enterprises will not mitigate sovereignty risks at scale as the economics do not work for them.

New technology opens new opportunities

Positions of dominance are reshuffled with each new tech generation, giving us the opportunity to build leverage.



1: Damage Control

Prioritize, Integrate, Standardize: mitigate material risks as cheaply and scalably as possible rather than replicating mature technology stacks.

2: Counter Leverage

Identify, Bet, Dominate, Defend: use Europe's existing strengths to build hard-to-substitute positions in tomorrow's technology stack.

Vielen Dank