EuroStack

#EUROSTACK: EUROPEAN STRATEGIC SOVEREIGN DIGITAL INFRASTRUCTURES

Joining and building logical and physical infrastructures to secure Europe's role in competitive digital value chains.

A PITCH DOCUMENT

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An Urgent Mission

The Draghi Report [1] identified as a major cause of Europe's economic laggard status (low productivity growth, low innovation and firm dynamism, sub-scale assets) our **failure to take full advantage of the "digital revolution"**, and urged European leaders not to repeat history by "missing out on the promises of AI". While causes are multiple (above all, failure to create a true Internal Market), falling increasingly behind has also meant we have not developed an integrated indigenous European digital ecosystem, and all available spaces have been occupied by large US corporations. This is true not only of services and applications (our direct experience of the digital world – search, social networks, ecommerce, app stores), but also – and critically – of the entire value chain that supports this experience for citizens, businesses, and institutions: from chips, to data, to compute, to connectivity. This **"occupation" of spaces** is not benign and "enabling" for European businesses. It is fundamentally extractive - with data and economic rents appropriated through unfair bargains between superdominant providers and us, the dependants.

Further, the **"occupation" of spaces** is massively accelerating as US hyperscalers are aggressively marketing AI tools and services as key to European growth and prosperity, persuading national governments worried about being left behind to be allowed to install large data-centers in multiple locations. With the Draghi Report anointing cloud infrastructure as key to Europe regaining productivity, the **"race to build" new data-centers** to support European demand for "AI services" is being hailed as a blessing. It is also paradoxically described as "sovereign" because these assets are located on European soil - though, of course, they remain in the ownership of hyperscalers, who hold the "kill switch". [2] This also poses significant security risks as non-European AI companies providing services to European multi-utility operators gain direct access to critical infrastructure data (e.g. water/electricity networks). AI is the perfect "Trojan horse" to establish yet more mechanisms of strategic dependency beyond the data economy.

Europe's answer over the past decade has been an almost exclusive focus on the **regulation of services by US tech platforms** in their rules of engagement with citizens, business users and competing complement suppliers: we have become the "digital regulator hyperscaler", with a large body of laws and regulations on the books and multiple attempts at competition interventions. While enforcement is progressing (at a slow pace and with limited impact), the economic and geopolitical predicament Europe finds itself in - even more so after the election of President Trump - requires ***urgent action*** not just to contain US tech corporations in their manifest dealing with European counterparts; but above all to reduce our near-total dependency at the level of "infrastructures", or "value chains" supporting all of our digital experiences.

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Europe essentially trusted that with regulation in place, the market alone could produce European alternatives to US large tech companies. Substantial budgets have been allocated both by the EC and Member States to instruments like the EIC Fund (the venture capital investment arm of the European Innovation Council, "EIC") to support the growth of European tech startups. While regulation has not been in place long, the market has so far failed to deliver European solutions - worse, the most promising startups have ended up being acquired (or partnered with) large US tech companies.

This is a front-line issue:

- for our **security and resilience:** we cannot be so comprehensively dependent as a Continent on US corporations for our entire digital infrastructure, exposing ourselves to massive **security risk;**
- for **economic growth and innovation:** establishing a connected European infrastructure which is open and competitive can give a shot in the arm to European businesses and start-ups, and move us closer to the "Draghi mission";
- for **democratic values:** Europe's governance and values of openness and transparency can be embedded in our structures and work to our advantage in a world of increasing technological complexity and fragmentation, creating public value for Europe and beyond.

Urgency is key to the mission. The window of opportunity for Europe to act before our indigenous digital capacity is extinguished to the role of accessory to US corporations (and China) is very narrow. Cloud infrastructure, a critical component, has seen the share of European providers in meeting European demand shrink over time close to single digits. For lack of alternatives, and struggling to make their own major investment in a climate of depressed return on capital, even European telcos have shelved much of their ambitions to provide an alternative cloud offering, and entered instead into partnerships with hyperscalers . The same is true of larger European businesses with potential to develop a role - in sectors such as retail, banking or software.

Urgent action requires **clear strategic direction from European institutions (at both the EC and national levels) to set out industrial policy objectives, timelines, and performance indicators, as well as dedicated accessible funding to capacity-building initiatives.** This must involve a **review and repurposing of existing plans under the Digital Decade initiative,** where funds have been misal-located and unproductively assigned. **Significant additional funding needs to be allocated as part of a revised Digital Industrial Policy.** The business case for investment must also be supported by **strong and explicit procurement obligations** - with a formal requirement for the public sector and European firms to "buy European" for at least part of their needs.

Urgency also means Europe needs to adopt a **"pooling and federating" approach** – leveraging existing dispersed assets and initiatives into a coherent body of accessible resources. It also requires **prioritising services with strong "adoption" prospects,** rapidly creating demand to be served and stimulating supporting infrastructure creation. This can benefit from the Indian experience, where the initial "inclusiveness" goals for its DPI model (see below) have morphed into a strong "build drive" to ship products - from mobility to green energy networks to fintech.

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While the spirit is "public good" (in the sense of d**emocratically serving the needs of European citizens),** critical to the progress of the initiative is to **involve European businesses in the effort to pool and federate assets.** This is not about public ownership, nor is it a scholarly or civil society initiative: it must be first and foremost an **industrial policy initiative** in line with the Draghi blueprint. The ultimate objective must be to serve the "public good" by means of industrial and technological leadership, not regulation alone. It is also **not an isolationist, "autarchic" effort:** on the contrary, it is an opportunity for Europe to place itself at the core of a network of countries in the "Global Majority" with similar aspirations: from India to Brazil, from Singapore to Taiwan and multiple others. We must provide an alternative vision to hyperscalers' current frenzy to occupy the world with data centres, while - incredibly - using the cover of "promoting democracy and inclusiveness" (and in the process, weaponizing civil society to proselytise around versions of "digital public infrastructure" backed up by their physical assets - as "donations" governments cannot refuse).

This "pitch paper" summarises a high-level vision for what we describe as the EuroStack: a Europe-led "digital supply chain". It is the product of contributions by volunteers in their private capacity, with no lobbying affiliation. No funding has been received by anyone associated with this paper from any source.

1. EuroStack: Why Do We Need It?

"EuroStack" is an umbrella term for a European tech infrastructure intended to create local capacity along the digital value chains which enable the provision of digital products and services – from chips to data to compute to connectivity.[3] The term originates as a catchy shorthand for "Investment in European Public Digital Infrastructure", borrowing in part from the successful "India Stack" concept now popular across the world. The objective is to **reduce Europe's current total dependency on non-European actors for service to European citizens, businesses, and institutions, to enhance security, create redundancy and resilience, improve opportunities for innovation and digital competitiveness while establishing European governance rules.**

1.1 Europe cannot just regulate itself out of its laggard position

Digital value chains are the digital equivalent of physical value chains, seamlessly connecting providers, suppliers, and consumers. High-profile examples of these chains which contributed to changing our lives for the better include the Green Pass, resurrecting Europe's social life during the pandemic by tracking vaccination and identity data, digitally proofed through a simple QR code that upheld European values of privacy and data minimisation; or the more challenging Catena-X, federating BMW, VW, and many actors in the European automotive supply chain, attempting to enable direct data exchange between them to reduce dependencies, strengthen industry resilience, and implement business use cases such as a carbon footprint calculation along the chain.

The motivation for the **EuroStack initiative, launched last September as a multiparty initiative at the European Parliament,**[4] is not academic research or technological experimentation. We are in a "new economy paradigm" where competitive advantage no longer depends on access to inputs (materials and labour) to reduce costs and retain margins, but on perceived value and the availability of data. We are seeing two key "vectors" of security and economic leadership across the world becoming polarised, and a "digital order" where a handful of private companies, controlling next to 90% of the data we make available and of the entire infrastructure everything travels on, are able to influence public opinion, policy makers, and economic actors, creating unprecedented dependency in every sector and territory.

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Why is Europe so late to action? Major contributing factors for our laggard status in the data economy model have been market fragmentation and lack of startup capital, but also prevalence in the European industrial base of large enterprises protecting their dominant position in declining mid-tech markets (manufacturing, automotive) and relying on state aid or protectionist policies. The first-mover advantage of US tech platforms, combined with lock-in effects and unique "go-to-market" speed, created dependencies and cemented their position.

European digital dependence is now near complete, to an extent that as a society we would never deem acceptable in other strategic industries. If our roads, trains, electrical grid, water treatment, sewage, monetary system, identity cards, communications networks, and more were owned and operated by non-European corporations, which extracted rent from European consumers and businesses, dictated how they operate, interfered with public discourse and the fabric of society, and routinely misbehaved around our consumer laws, we wouldn't be endlessly debating "physical sovereignty" or be content with just regulating some of it.

Yet so far Europe's effort to establish itself in this new order **mostly focused on becoming the World's Digital Referee,** creating an entropically expanding regulatory framework. This was always only a partial answer and has not served Europe well: some of the regulation turned out to be too expensive to be complied with by local providers and users of technology, and cannot truly address massive imbalances of bargaining power, or open up closed structures. Enforcement has been undermined by armies of lawyers and lobbyists working for tech giants and engaged in systematic astroturfing. There are also regular campaigns announcing tech giants' commitment to and large investments in compliance: all of it a major exercise in obfuscation and dissimulation, yet effective in blandishing European policymakers and reassuring them that investing in a real European alternative was neither necessary nor urgent. This "strategic slowdown" of regulation overstretched the sustainability of SMEs and European tech companies - further making space for giants capable of enduring extended periods of regulatory friction and stalemate. Highly qualified SMEs and start-ups are selling out to tech giants absorbing their innovations. Talent and startups are leaving Europe in droves. We are in a perfect storm of enforcement slowing down - also under pressure from uncertainty on the US landscape - while innovative solutions are acquired and everything else is in limbo.

The chimera of antitrust enforcement "taming Big Tech", with narrow ad hoc intervention, and the uneven and haphazard approach to state aid to private initiatives, have not liberated European initiative either: private operators have not received adequate funding, nor have they benefited from public institutions being able to change market structures, nor have they been provided with concrete infrastructures which could host services running on them. We cannot just try to regulate essential infrastructure all in non-European hands, and hope for the best. It is time this is clearly stated. We need to approach digital infrastructure the way we approach other infrastructural assets. **We need to *build and govern* the alternative.**

1.2 EuroStack is key to Europe's imperative of sovereignty, resilience, and security

In an era of accelerating volatility - the "dark forest" - with greater vulnerabilities, weaponization, and increasingly unpredictable potential attacks, we are transitioning from traditional global market economics to a new paradigm of "security economics". Building resilience and sovereignty is the key industrial policy mission for the new European Commission across key strategic sectors: defence, energy, and digital infrastructure. Assembling the EuroStack is a key part of building a security-oriented economic framework.

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1.3 Europe needs a “build it now” mindset, adoption-focused, “demo not memo”

We can no longer “admire the problem”. There can be no debate on the “why”, the issue is now “how”. Europe has a scattered set of capabilities and assets at multiple levels of the digital supply chain - from chips and cryptography to software (with a huge but fragmented open source community) to “hard” infrastructure (cloud computing, supercomputers, connectivity). Failure to coalesce any of this into a coherent whole (while US digital giants/hyperscalers filled the space) has contributed to sapping entrepreneurial effort and spurred a diaspora of European talent and startups to the US.

European institutions need to now turn much more assertively to facilitating investment in sovereign infrastructure, by supporting entrepreneurial zeal and talent. The aim is to liberate private initiative, not to rely on institutions and state bureaucracy. What is remarkable about the Indian “DPI” experience (more on which below) is that the original focus on three “pillars” of the relationship between the state and citizens/businesses (the “tripod” of digital identity, payments, data spaces) has now given way to a major “build” effort, rapidly expanding into a whole range of activities for a whole “DPI enabled economy”. The vision can only succeed if policy succeeds in creating the rails for stimulating and facilitating private participation and initiative, fast. Attracting and retaining the support of business and startups, which can inspire and attract other “builders”, is fundamental “market making” without which no initiative will succeed.

1.4 Effort so far has not delivered

There has been past effort by the European Commission to “start the engine” - most obviously the 2019 European Data Strategy and, in particular, the **DEP** (Digital Europe Programme) and the **IPCEI programme** (Important Project of European Common Interest – notably the one on “CIS”, Cloud Infrastructure Services), which in theory involved a number of projects intended to encourage European initiatives.

Yet so far these have **produced no impact on the ground.** There are serious questions as to the ability of these projects to produce positive spillovers, intrinsically as a result of the way they are designed, the slow speed at which they are reviewed/approved by the Commission, the inadequate amounts awarded and because they involve no obligation to create evidence of commercialisation of results - with very low TRL (“technology readiness levels”) required, suitable for “proof of concept” (PoC), but often very far from industrial production-grade quality. One of the reasons has been **overemphasis on “innovation/R&D”** and related skill development: too much focus on the need for “reskilling and upskilling” prioritized the creation of digital competences rather than thinking of their deployment. Frameworks for readiness analysis or problem-setting in digitization projects tend to prioritize innovation at all costs, often leading to the proliferation of PoCs that fail to progress to the next stage, perpetuating a market dynamic rooted in exploratory incursions rather than in strategic and structural investments. Such a pattern undermines the creation of long-term value, and **overindexes on fragmented, short-term experimentation rather than building sustainable, scalable, and transformative solutions.**

The bottom line is that so far none of these projects produced any market impact or even small signs of trends being reversed, none have developed marketable products or services, none have been conceived to be measured in terms of market impact – for instance rescuing the European cloud market share or increasing the revenues of European companies through new data-centric services. The European cloud industry, to mention an example, is a critical piece of strategic infrastructure and on a linear decline path since 2017 – which, if extrapolated, will lead it to extinction at current rates in 3-5 years, or only just about survive as resellers of US digital solutions.

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1.5 Main pillars of policy design in pursuit of the EuroStack

There is a major paradox in Europe portending to develop its own digital economy while repeatedly setting itself on the path to remaining hostage to a handful of American platforms and compute hyperscalers. Antitrust and regulation are struggling to open up chokepoints and bottlenecks, and while they remain necessary - one can build many great instant messaging applications, but if WhatsApp is closed and all European users are already locked in there, all will fail - Europe cannot rely on regulation to power growth.

The first priority in what needs to be the "post-regulation" phase should be to recognise digital value chains as a de facto new industrial model, and define a **European Digital Industrial Policy (EDIP)** as an area of priority - one of the most important sectors identified as "strategic" in the Draghi Report. This should be pursued in an "all-of-government" mode, i.e. as an overarching objective across Commission functions, overcoming silos and addressing trade-offs explicitly.

Second, a **Strategic Digital Infrastructure should be built by aggregating first the "best of breed" of existing assets,** from large to small enterprises. This **federated approach should be supported by integration platforms** that automate the process of onboarding of participants, qualification of their credentials, verification of the trust of their services, to assemble allies and start creating a tangible alternative, highlighting the different characteristics of such (transparency, controllability, interoperability of services). **Cooperation with, and within, industry** will be essential to serve the common goal of creating a "EuroStack".

Third, such aggregation should be supported by **public investments and incentives for private investments** by European companies, including in the capital-intensive parts of the value chain. While some areas will benefit from public funding (e.g., R&I in the field of quantum communications or 6G), others may be better addressed by incentives to private investment and innovation (e.g., completing the roll-out of 5G and FTTH networks, leading in network virtualization). The aggregation and concentration of investments into a Digital Public Infrastructure needs the participation of **SMEs and innovative startups,** as well as financial institutions, to retain assets and talent in Europe.

Fourth, **interventions must be selected and results measured in terms of business outcomes. Business Drivers (BD), Critical Success Factors (CSF), and Key Performance Indicators (KPI)** must be defined for every funded project, based on market impact, because the first problem to solve is the economic autonomy of Europe. Participants to funded projects must be selected **based on their ability to contribute to existing assets,** their willingness to share them in a federated model, and their commitment to be rewarded based on measurable market results. Consistently, research investments must be assigned **proportionally to their spill-over** into marketable products and services, measured in terms of adoption by commercially active market operators. Pure research and innovation can continue to be funded but aligned to the guidelines defined by the EDIP.

Fifth, **cooperation should be sought with third-party states which share common goals and may also have privileged access to certain inputs, or are further along the line towards DPI.**

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2. How Does EuroStack Relate to "Digital Public Infrastructure" Initiatives?

2.1 "Digital Public Infrastructures"

There is a lively global discourse, and significant available funding (particularly from philanthropic and international organizations, mostly directed at the Global South) around plans for **Digital Public Infrastructures (DPI).** While "DPI" is an evolving concept with multiple definitions,[5] a commonly-held vision is associated with India's pioneering work to create foundational blocks for the relationship between citizens/businesses and the state: digital identity, payments, and data exchanges. These three core building blocks, designed to be modular and interoperable, provided a suite of **open-source digital tools connecting citizens and businesses with the state.**

These foundational layers - which came to be known as "India Stack" - have become "rails" to be built upon in multiple dimensions, enabling the creation of a range of applications and services for a "DPI-enabled economy". As the original architects of "India Stack" (the Foundation for Interoperability in the Digital Economy, FIDE[6]) expanded their focus to additional sectors and applications, India's original "DPI tripod" has been expanded into a collection of DPIs beyond ID, payments and data into a whole "DPI enabled economy": open banking, unified indirect tax and toll, unified health interface, open network for digital commerce, digital credential wallet, open compute, language AI infrastructure to unify the demographics and formalise their participation, unified bill payment infrastructure, direct benefit transfer, purpose-led disbursement, public education infrastructure (DIKSHA), open network for education, unified energy interface (open energy network), open agri network, open mobility network, open fintech...

Globally, the "tripod" version of the Indian DPI model is being promoted (including by civil society and philanthropy) as a tool for fostering inclusion and development in the Global South. Organizations like the United Nations Development Programme (UNDP) estimate that DPI could accelerate economic growth by 20-33%, while a UCL study highlighted DPI's emphasis on creating public value.[7]
DPI programmes are thus increasingly incorporated into global initiatives like the G20, the UN, and the Global Digital Compact, with funding from organizations like the Gates Foundation and the Tony Blair Institute supporting their rollout. While these efforts have diverse motivations and degrees of independence, a growing number of entities from civil society to philanthropy are championing versions of India's model to the Global South, presenting it as a vehicle for growth, inclusivity and democracy.

2.2 EuroStack's broader vision

The vision for EuroStack is broader, extending beyond public service delivery and inclusion to address the imperatives of sovereignty, independence, and security across the digital supply chain. EuroStack does not just involve interoperable software components, but includes the entire digital value chain, from hardware and basic infrastructure to applications, services, and governance.

EuroStack does encompass initiatives like the European digital identity wallet (EUDIW) (and equivalent across a number of countries), secure payments with the proposed Digital Euro promoted by the ECB, and data spaces - but goes beyond. It is intended to extend to the full value chain including "hard/physical infrastructure". India, or Brazil (given their size and stage of development) had no resources to invest in local hard infrastructure (cloud, datacentres), and thus had little choice but to rely on hyperscalers for their data storage and compute needs (although this is changing, with work underway to build smaller, decentralised datacentres and pooling of cloud resources). But Europe does have resources, and there is no time to waste. EuroStack requires urgent investment and coordination effort at all (interconnected) levels of the supply chain.

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The vision for the EuroStack builds on Europe's strength in governance and regulation to envisage a comprehensive 'sovereignty stack'. **The European governance component** is intended to be indeed **a critical differentiator** for a model that aspires to be not only technologically advanced but also **resilient, secure, rights-protecting, sovereign and a catalyst of economic growth.**

2.3 EuroStack's global benefits

Investing in EuroStack is not only a necessary defensive move for Europe, but can also place us at the core of a network of like-minded countries and initiatives in the "Global Majority" (as opposed to "US vassal" condition). Geopolitics are increasingly being carried out through technology - China's 'Digital Silk Road' is well established, while India's DPI efforts have already proved advantageous for both domestic governance and international relations. A EuroStack aiming for industrial and technology leadership, built on user-centric, rights-based, and decentralized principles, would be **a powerful tool for promoting European values abroad.**

In particular: in developing and promoting European digital infrastructure and standards, **Europe can play a major role at the centre of a network of other countries of the "Global Majority".** For instance the adoption of European infrastructure or digital standards such as the "EU wallet" **could enable fast track access to trade, travel, and migration,** facilitating smoother international relations with geopolitical partners. Instruments like the EU's international aid program and partnerships with global institutions could bolster this effort, including initiatives like DG JUST's "Data Protection Academy" and potential collaborations around the EuroStack.

3. Components Of EuroStack

Digital permeates society and most industries, and involves complex relationships between levels of the supply chain - such that the distinction between functionalities and "levels" of the stack is not univocal, nor uniquely defined. The flexibility of computers, the connectivity of networks, and the open nature of the Internet made it possible for new services to be invented in a distributed manner, and thanks to fast adoption and network effects, many of these services became critical infrastructure over a highly compressed timeline.

Powering a sovereign EuroStack will **require a comprehensive Digital Industrial Policy plan to support public-interest investment along the supply chain** (where again, "public interest" does not mean publicly owned, but rather governed in the broad interest of European society rather than for the private interest of a foreign tech giants). Funding needs will be very significant, but the plan aligns with funding recommendations in the Draghi Report and existing funding mechanisms can be redeployed and federated. Europe can put its governance experience to work in designing infrastructure that enables accountability, stakeholder representation, countervailing power, subsidiarity, and experimentalism.

For descriptive purposes (rather than as true technical representation), it is possible to visualise the EuroStack as involving all of three broad "levels" (each dynamically connected and integrated with the other), as shown in the diagram below:

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1. **Hard/Physical Infrastructure.** Building the physical capacity that is the bedrock of the EuroStack, such as chips, compute and communications.

   Physical capacity includes foundational components like chip-making, commodity data centres as well as more decentralised solutions (edge-cloud computing), connectivity provision (from 5G and 6G research, to network virtualization/cloudification, cell towers and undersea cables), as well as the industrialisation of advanced research in quantum and high-performance computing (HPCs - recently placed by the EC at the centre of the "AI factories" strategy). Components in this group require physical building, investment needs typically scale linearly with capacity, and operational costs are usually covered by usage fees.

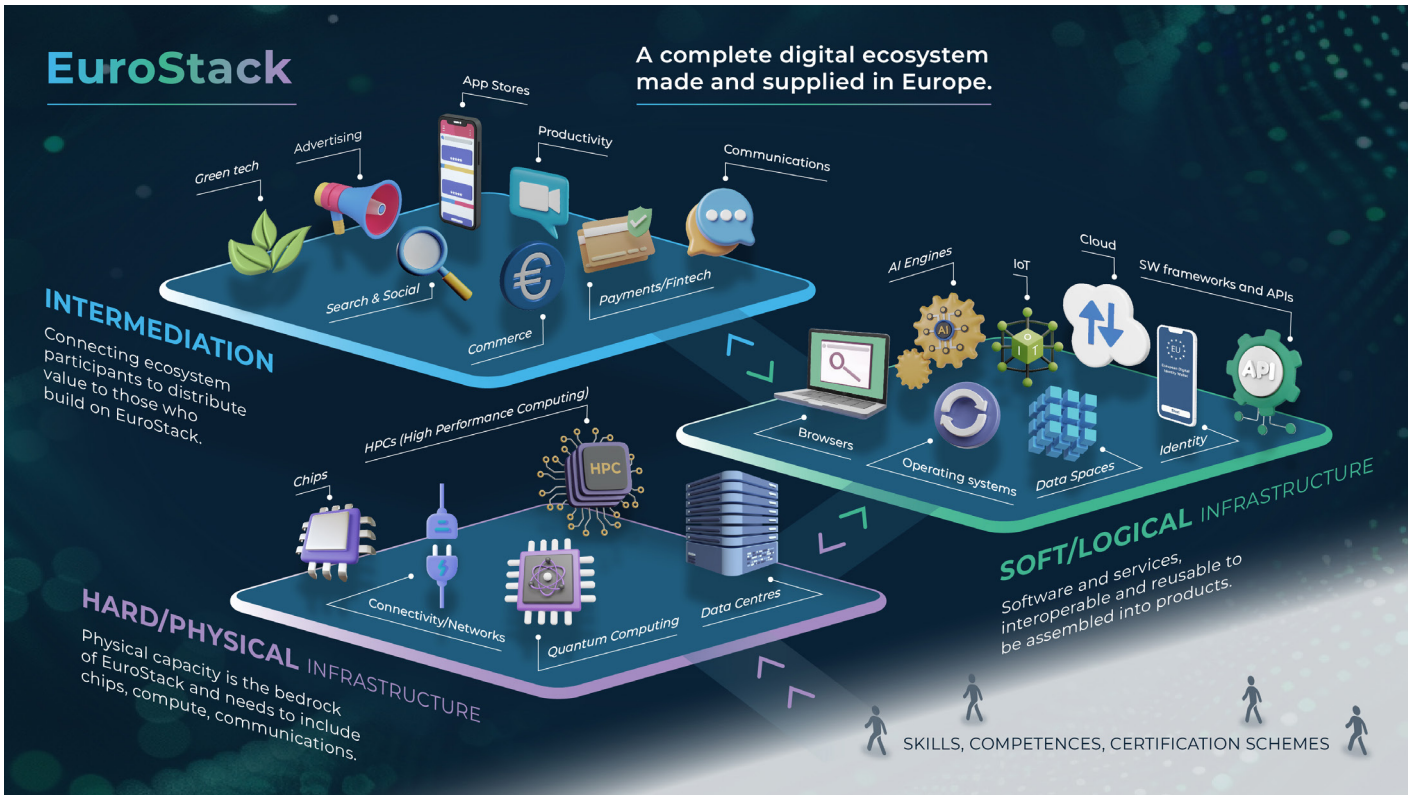
2. **Soft/Logical Infrastructure.** Providing modular software and services as reusable components of the EuroStack that can be assembled into products.

   Digital products are built by assembling existing components available as software or as services. Components in this group require development, maintenance, standards, interoperability testing. Many modular components are open source and would benefit from more sustainable revenue streams.

3. **Intermediation.** Connecting ecosystem participants to distribute the value of network effects to those who build on the EuroStack rather than to platforms.

   In a highly connected world, digital services need to find their users, customers, buyers. This has led to an explosion in two-sided markets that are often operated as platforms that use their position to impose private regulation and levy private taxes. Components in this group require the creation of stakeholder-governed infrastructure ventures to operate shared systems exposing standard protocols

Figure 1: Indicative "layers" of the EuroStack



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More specifically:

3.1 Hard/Physical Infrastructure

Hard/Physical infrastructure requires investment of patient capital, targeted regional deployment to meet local needs, a strong research pipeline with networked universities, and public/private partnerships on licensing.

The components to deploy would include:

- **Chips.** Develop Europe's advantage in advanced technologies for chip production (e.g. ASML in the Netherlands is a pioneer in lithography for the production of advanced chips); integrate this with chip production capacity with a secure supply chain, invest in continued leadership in photolithography.

- **Data Centres.** Mobilise investment to increase capacity in general-purpose data centres to help commodify cloud computing. Simultaneously invest in decentralized solutions like edge-cloud and micro/small data-centers.

- **Connectivity.** Reinforce the exploitation of 5G capabilities/APIs and accelerate 6G research and network security standards, support a European ecosystem for network virtualization/cloudification, deploy satellite capabilities, keep incentivising fibre broadband rollout/uptake, and increase capacity and redundancy in undersea connectivity which is visibly under threat from hostile actors. Redefine a role for European telcos, which have been encroached upon by non-European hyperscalers and platform providers.

- **High-Performance Computing (HPC).** Europe has a cluster of HPCs (3 of the world's top 10 - the biggest and fastest being Finland's Lumi, powered by hydro, then Mare Nostrum in Barcelona, Spain and Leonardo in Bologna, Italy). More have been announced will receive EC support, as part of a drive to redeploy these facilities mostly from academic research towards "AI factories".

- **Quantum technologies.** While still not a reality, these nascent technologies are expected to be transformative and there is already significant global investment - again mostly from China and US tech giants. Europe has one such facility in Germany, EU funded, which like the HPCs is oriented to academic research and would need to be supported - especially in view of the growing national security imperative.

- **Supporting energy infrastructure.** Deploying these initiatives requires significant energy resources (as well as water for cooling purposes), and Europe's reliance on energy generation technologies is highly diverse. The availability and cost of energy resources while driving towards a green transition needs to be considered a major feature of a digital industrial policy.

3.2 Soft/Logical Infrastructure

Soft/Logical infrastructure requires that we drive adoption by focusing on integrating components with attractive products that drive demand. We can sidestep the race to the bottom in data and energy with nimbler solutions designed to address users' needs rather than catering to tech fashion. The intention is to accelerate cloud and development ecosystems by creating governance and funding structures that share benefits with the open source community.

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The components to deploy include:

- **Identity.** Step up the deployment of eIDAS wallet solutions by driving adoption of attractive user-facing products. Offer user-friendly migration paths from the national solutions currently in wide adoption. Make it simple and appealing to use eIDAS-based identities outside of the public services sphere, for everyday activities and websites.

- **Cloud.** SaaS, PaaS, IaaS, solutions. Existing assets should be identified and incentivized to become interoperable to enable federation and easy migration away from dominant hyperscalers. Attention should be paid to solutions for service composition between SaaS and IaaS (to enable applications to run on EU infrastructures), CI/CD PaaS (to attract adoption of EU solutions by software development teams), and Liquid Infrastructures (to enable seamless workload migration and scalability across multiple physical resources). With interoperable cloud services that can be provisioned in a uniform manner, we can also integrate spare computing capacity from a wider array of sources, to implement Decentralised Physical Infrastructure (DePIN) models.

- **AI Engines.** Develop a European public-private LLM that runs on federated computing capacity and is trained on local languages, cultures and data. Further, fund software infrastructure for AI, with a focus on alternatives to existing LLMs that are more sustainable, local, and smaller, and don't assume a centralised system.

- **Browsers.** Mobilise existing regulatory frameworks to solidify funding channels for browsers that do not depend on Google, and to ensure that browsers, browser engines and Web standardisation processes are governed by their stakeholders and take European values and objectives into account.

- **Operating Systems.** Invest in the development of a new mobile operating system, with a credible path to adoption and interoperability with an existing ecosystem to ease transition.

- **Data Spaces.** Stakeholder-led systems to shape and govern data infrastructure in domain verticals that harness the value of a single market for data.

3.3 Intermediation

Intermediation requires that we federate existing protocols and open source implementations that require scaling and industrialisation. Building on prior experience elsewhere, we can develop and deploy Open Transaction Networks (OTNs) built atop a common core, across all domains of digital commerce and set up stakeholder governance for all intermediated services.

The components to deploy include:

- **Commerce.** Organise an industry-led, stakeholder-governed OTN for general-purpose e-commerce transactions. This will enable both SMEs, including local shops, and larger brands to sell directly to consumers.

- **Advertising.** Work with media and leading brands to establish an advertising OTN operated jointly by buyers and sellers. This additionally can support an advertising model that is more privacy-preserving as it doesn't need to operate in real time.

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- **Search & Social.** Establish public/private partnerships to deploy infrastructure for next-generation social media (AT Protocol, ActivityPub, DSNP), including public-interest feeds and content moderation in underserved languages, as well as vertical search indices for use in new search interfaces, notably AI-driven ones.

- **App Stores**. Establish a stakeholder-governed app store following standardised interfaces for the various functions it performs to provide the same service as existing ones at lower cost.

- **Communications & Productivity.** Invest in infrastructure that makes it easy to deploy communications and productivity services, and establish standards so that it becomes easy to use different tool vendors together in a unified interface, to prevent lock-in and to encourage focused innovation. Support existing software federation projects, promote their adoption and encourage more companies to join.

- **Energy/Green.** Develop an OTN for energy provision at all scales, so that even the smallest and most temporary providers can participate in the market.

- **Mobility.** Establish a mobility OTN that can serve ride-hailing, public transportation, bike & car sharing, and other modern forms of mobility. Work with local authorities to repeatedly deploy locally-governed instances. Support open maps (OpenStreetMap) and navigation systems and promote the public availability and integration of local resource data (shops, restaurants, offices etc).

4. Required Institutional Support, Funding, and Industry Participation

Creating these alternatives is going to be a big “lift” which requires our institutions to share the sense of urgency and commitment to the vision, and work very closely with industry for a “post regulation” approach. To set goals and timelines, the practical steps towards the EuroStack will require to begin with:

- **Stakeholders - Industry in the driving seat:** establish systematic dialogue with, and involvement of, industry. Establish an industry body to evaluate new digital initiatives to validate EC proposals. Ensure involvement of industry in new projects, and make investments proportional to industry real uptake of developed solutions or standards;

- **Assets - Leverage “what’s there”: identify first existing industrial assets,** including those that may be imported if needed, at each level of the stack (Physical, Logical, Intermediation layers, and Skills) before investing in new non-industry grade projects;

- **Federation - Overcome size gaps:** fill the gap in capacity and offering by endorsing the creation of multi-supplier marketplaces and commercial federation;

- **Interoperability - From hyper-centralized to hyper-distributed:** exploit the potential of cloud-edge endorsing multi-supplier interoperability implementation initiatives;

- **Standardisation:** identify strategic technology protocols and interoperability standards that serve the purposes of the EuroStack layers, mandate their use in public procurement and incentivise their use in the private sector. Coordinate the contributions of European industry and of the public sector in international standards setting organisations.

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- **“Buy European” - from obstacle to competitive advantage:** Set aggressive rules to prioritize procurement from European suppliers, preferably of open solutions. Provisioning from non-EU suppliers will be required to be transitory, and include transition plans, and guarantees of no lock-in. If and when the application of this principle was to generate significant costs that would harm a specific sector of the European economy, then those costs should be recognised and methods to recover them devised.

- **Trust - Lower compliance barriers:** Define a set of verifiable criteria, in a single document, and develop trust services, open and free for EU providers, to reduce the cost and complexity barriers to compliance verification.

- **Innovation - Make it purposeful:** Assess and approve new funded innovation projects, based on measurable outcomes and benefit, in the business, public services, and society, and focus on projects that have a credible path to adoption. Rebalance Research and Innovation, and Research and Development.

- **Skills - Build next-gen EU competences:** Define an EU scheme for certifications and digital competence. Balance between digital technology, digital design, and digital economy skills. Adopt EU scheme in assignment criteria for public tenders;

- **Funding - Prioritized to tangible results:** Apportion investments to achievement of measurable, and market-relevant, results. Combine new investments and re-allocate funds away from existing programmes not producing tangible results. Prioritise projects that deliver elements of the stack and focus on their adoption.

These steps are not sequential and should be worked through simultaneously.

4.1 Meeting industry’s needs

Partnering with European industry will be key to ensuring that **use cases are developed for which there is demand, and thus justify investment in the supporting infrastructure.**

A major need for **European businesses is the availability of cloud services that satisfy European cybersecurity compliance rules, and ensure customers can switch providers without lock-in or unfair egress fees.** As every European business is moving into the data economy, developing value-added services and products based on their own data as key assets, they need to guarantee their customers **trust and controllability** of the data platforms they adopt. **Reducing dependency from a single provider,** having alternative offerings in terms of **distributed, interoperable, and scalable digital platforms** instead of the current hyper-concentrated landscape, and above all **guaranteeing data storage and processing on the European territory** (as required by existing rules), provide a clear and concrete business opportunity to users and suppliers alike.

For instance in cloud, the priority needs to be for European demand to produce solutions not only compliant to our digital rules, but also interoperable with one another so as to offer an alternative comparable in scale and range to the hyperscalers’. As this European alternative becomes available, **procurement rules mandating that companies and the public administration buy at least a portion of their needs from EU providers should be introduced as part of European Digital industrial policy**. And while hyperscalers’ cloud offerings will inevitably remain attractive to European companies because of capacity, scalability, range, the development of **commercial networks of European cloud providers** could overcome lack of capacity and product portfolio, whilst providing controllability, compliance, client proximity, and integration through open standard, as distinctive competitive characteristics.

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Policies that **guarantee demand** (through firm procurement and minimum “buy European” requirements) both for European businesses and public administration, will help incentivise private investments.

4.2 Federation of existing relevant assets

Lack of capital and time make it realistically impossible to build any alternative comparable to current incumbents in a feasible timeframe. Given urgency, the approach must involve **identifying existing assets that can be integrated into federated networks, commercially and technically interoperable.**

Federations would not of course replace the need for new investments, but there needs to be a bias in favour of federating existing assets - as opposed to persisting with funding new projects to develop low TRL deliverables. Common standards for interoperability can be defined faster by industry players, and their effectiveness would be attested by the number of participants in a federation that decided to adopt common rules for interoperability (common contractual terms, common APIs for service composition, common APIs for provisioning, common technology for virtualization, containerization, and physical infrastructure scalability).

The creation of federated infrastructure will also achieve the objective of cloud-edge convergence, which requires a network of multiple independent suppliers deciding to implement interoperability mechanisms. Europe will develop the first real example of a hyper-distributed cloud, a yet unfulfilled market need that will always be resisted by dominant hyperscalers protecting their capital investments in assets that are hyper-centralized, non-interoperable, and based on proprietary standards. Independent cloud services will be available through a cloud OTN through which business users will be able to purchase services from different providers on a distributed marketplace governed by the industry.

A key part of the preparatory works to implement the EuroStack vision needs to be an **extensive (but rapid) inventory of relevant existing assets on the ground in Europe (software, hardware, skills and governance)** that will be part of the federated approach, to give visibility to the many existing resources, identify possible aggregates, and steer new investments to fill the real gaps of the possible federations (not of individual players, nor of theoretical needs not tied to the industry).

4.3 Training and skilling strategy

A key success factor in digital transformation is not technology, but the ability to use it to engineer new solutions. For too long Europe pursued training and certification schemes defined by the dominant technology players, thus **strengthening our dependence from their proprietary technologies - in a vicious circle.** In the absence of European alternatives, even the public administration surrendered to certification requirements by foreign platforms, as a key assignment criteria for public procurement.

Europe must define a common scheme for competences and certifications that can be adopted by our education system to create the next generation of digital professionals. The scheme developed in collaboration with industry must include training and certification programmes recognised by Member States, reflected in public procurement rules and public administration jobs’ requirements. Companies hiring or training talents in line with the European Scheme Certified professionals should be eligible for incentives.

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A **European Scheme for Digital Competences** could identify technologies and common standards with a balance of incumbent non-EU platforms, EU platforms, and open platforms. Together with the creation of federations of interoperable suppliers, and the introduction of procurement rules to privilege European-certified professionals, the European Scheme for Digital Competences focused on technologies that enabled interoperability, reduce switching costs and reduce lock-in to proprietary non-EU technologies, could create a virtuous circle of transformation.

Such a scheme will require defining training programmes and roadmaps to grow skills through the education cycle, and a certification scheme recognised by public and private tenders. **Europe can be a leader in digital skills and certification,** transforming the need to regain control of our data economy, into a global opportunity where competences developed in Europe will be recognised and sought after elsewhere.

4.4 Funding strategy

Europe notoriously lacks deep Venture Capital resources with the right appetite for risk, lacks Sovereign Wealth Funds with true investment capacity, and its equity markets are fragmented and weak so that both raising capital and achieving exit is difficult. While the EuroStack initiative cannot fix these structural problems, it would be important for these scattered efforts to be pooled and for Europe to **underwrite the patient capital that foundational investments need - for instance, both by establishing sovereign funds capacity, acquiring equity in new companies/ventures, and increasing commitments from institutions like the EIB.**

An important initiative would be to **gather and consult with philanthropic VC outfits, national innovation/funding institutions like BPI France** and equivalent in other Member States, **European unicorns such as Klarna and their VC arm,** as well as **sovereign funds, to create a coordinated sense of purpose and development (not just innovation)** with the Commission.

On the side of the European Commission, an important part of the work plan needs to be a **review of current European spending commitments in this area, and their effectiveness.** "Digital sovereignty" is not entirely new territory for Europe: 2019 already saw adamant commitments to achieving tech sovereignty.[8] It is important to learn from the past and recognise what has gone wrong. Halfway through the European Digital Strategy, announced in 2019 by President Von Der Leyen and started in 2020, the anticipated **Euros 150Bn investments** from the RRF (20% of the overall 750Bn of EU RRF), and the additional **Euros +20Bn (between IPCEIs, DEP, Horizon funds, and other initiatives),** have not **managed to reverse the decline in Europe's position** across key areas. As an example, European cloud service providers saw their share of European supply reduce from 26% in 2017 to 10% now.

The effort of the European Commission to implement the European Data Strategy, mainly concentrated in the **DEP** (Digital Europe Programme) and **IPCEI-CIS** (Important Project for European Common Interest – Cloud Infrastructure Services), has not yet **produced a tangible impact.** Most projects in the DEP focus on the creation of **Common European Dataspaces,** with more than 10 Sectorial initiatives (mobility, tourism, health, manufacturing, skills, smart communities, etc.), produced guidelines, blueprints, architectural design, common protocols or standards for data exchange, and PoC in the best case, but none of them produced tangible new revenues derived from the data economy. Other projects like SIMPL, with +150M Eur funding, aim to develop a common middleware for data exchange without any certainty that this will be adopted by the industry, and have produced yet no tangible deliverable apart for requirements specifications and architectural design. The IPCEI-CIS, originally conceived to fill the gap of a common European Cloud Infrastructure, focuses on developing software deliverables but involves no spending in physical infrastructure; it is split across 120 projects over 19 countries, which are not coordinated to build a single cloud architectural stack.

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The awarded organizations are 80% research institutions (see the DEP dashboard)[9] and universities, with a negligible participation of real cloud market operators, attesting to lack of industry interest because of low level of expected commercial activity. The average duration of each project is 3-5 years, incompatible with the pace of technology. The average number of partners in awarded consortia is around 10, diluting and dispersing funding across hundreds of participants (19 companies and +90 indirect partners only in the IPCEI-CIS). None of these projects produced any real-market impact or reversed trends since 2020. None have developed marketable products or services. None have been conceived to be measured in terms of market impact, rescuing the share of European suppliers, or increasing the revenues of European companies.

Putting it all together, halfway through the Digital Decade, 50% of allocated investments have been "burned" with no positive impact on the position of European suppliers, and 50% of the procurement has gone to non-EU subjects.

An immediate review and re-allocation of remaining investments focused on EU industry ownership and adoption could possibly save Euros +100Bn before 2030, thus offering the chance to fund new, different, and more effective initiatives.

4.5 Coordination between EC and Member States

EuroStack cannot be a European Commission initiative alone. The European Commission has not traditionally set industrial policy in Europe, which has been led in national capitals by Member State governments. Even after the wake-up call of the Draghi report, it will not be possible for Brussels to set a single overarching industrial policy initiative with large spending commitments in isolation, without support from Member States. **There is appetite at the level of several national governments for digital sovereignty and diversification away from US tech giants, and this needs to be harnessed in coordination with the Commission.**

A legal framework which already exists and which Member States are beginning to use to pool efforts are the **European Digital Infrastructure Consortia (EDICs),** which contemplates the possibility for a group of at least three Member States to partner in the pursuit of multi-country infrastructure projects of common interest - funded both by members and with a contribution from the Commission.

In addition, promoting the creation of so much infrastructure as well as its governance will be a tremendous challenge. It may well require new and dedicated institutional coordination capacity, e.g. in the form of a new Directorate or at least a **new Unit under DG Connect** that can offer guidance to these projects and connecting tissue.

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5. Europe's Hour

Europe does not have the luxury to wait further. The Draghi Report (and his update on December 15 at the CEPR Paris summit) lays out with clarity and increasing alarm how Europe is trapped by multiple structural problems, and persistent inertia is dramatically weighing us down. While there are multiple competing urgencies for Europe to confront as it anxiously awaits the start of the "Trump era" (with large investments in defence and energy presumably in the pipeline) there can be no doubt that **digital infrastructure is a major piece of Europe's "do or bust" predicament.** Europe faces a future either as a definitive and irreversible "US colony" in digital infrastructure, or will just about escape that fate through enormous deliberate effort. **With pressure from the European Parliament, and cooperation from industry and Member States, the Commission needs to put in place a strategy of systematic investment to support European industry. Piecemeal scattered intervention is not going to lift our position and will relegate us further into dependence at a time of enormous geopolitical hostility. This is the hour.**

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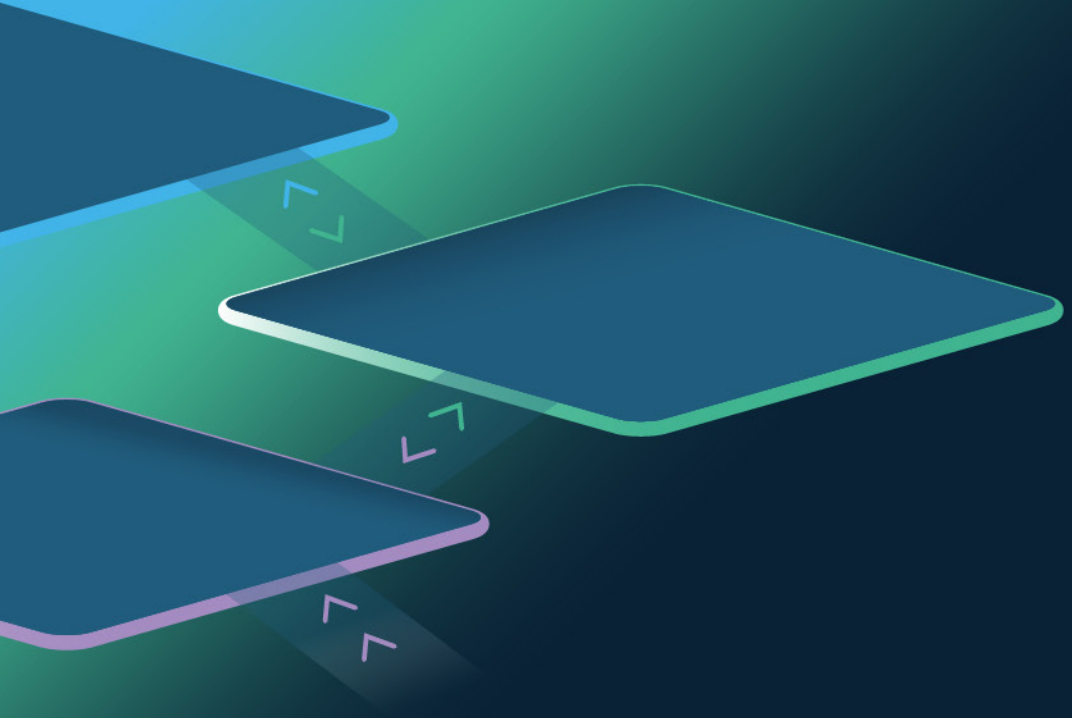

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