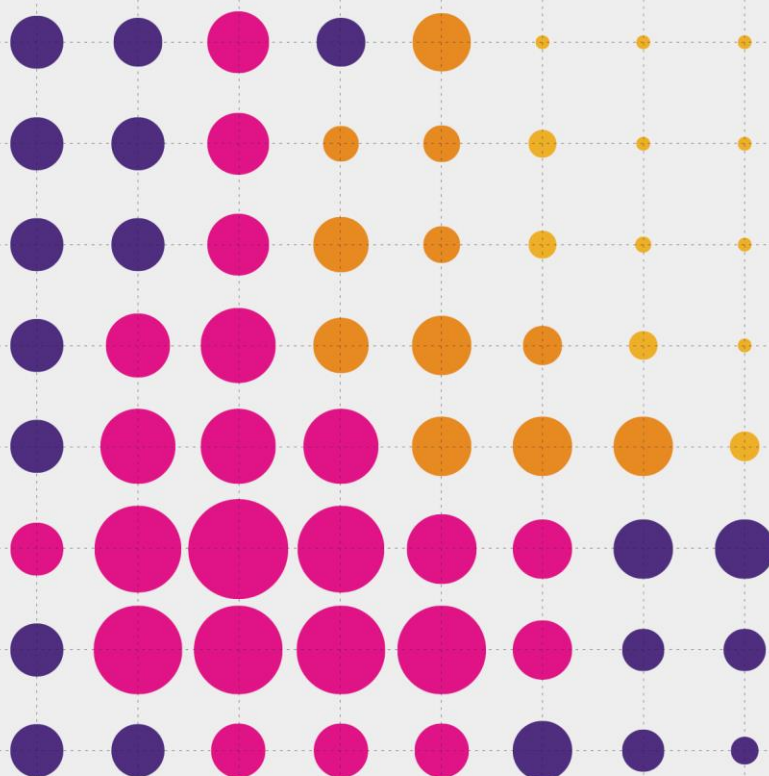


# Analysis of the underlying vision in the European Commission White Paper "How to Master Europe's Infrastructure Needs"

August 2024

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## About Plum

Plum offers strategy, policy and regulatory advice on telecoms, spectrum, online and audio-visual media issues. We draw on economics and engineering, our knowledge of the sector and our clients' understanding and perspective to shape and respond to convergence.

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## About this study

This study for the Ministry of Economic Affairs in the Netherlands provides an initial analysis of the vision underlying the European Commission's White Paper "How to Master Europe's Infrastructure Needs".

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# Introduction

This report offers an analysis of the European Commission's White Paper, "How to Master Europe's Infrastructure Needs",<sup>1</sup> published in February 2024.

Plum Consulting (Plum) and Stratix were commissioned by the Ministry of Economic Affairs in the Netherlands to conduct a high level analysis of the White Paper. Our objectives were to set out clearly our interpretation of the vision and intentions underlying the ideas contained in the White Paper, and to identify areas and questions arising from this on which further study might help to progress the debate about digital technology, markets, and regulation in Europe.

The Commission's consultation on the White Papers closed at the end of June 2024. Many contributions by various stakeholders were submitted, and are now publicly available. Most of these are focused on supporting or criticising specific measures suggested in the White Paper. Few, if any, try to step back and assess the bigger picture to understand the context for the White Paper and the vision that underlies the reforms proposed in it. This is what we endeavour to do in this paper, not with a view to either support or criticise, but simply to describe and clarify what we understand the Commission anticipates in terms of market evolution, and how the White Paper's recommendations are designed to meet objectives to shape the market in the best interests of European stakeholders.

In this way, our analysis is intended to help progress the debate about Europe's digital future following the Commission's consultation on the White Paper. The White Paper was one step in policy development, and we expect the debate to continue.

Proposals in the White Paper are organised around three "pillars". Pillars I and II contain a vision of technology evolution, and present ideas for policy and regulatory changes to facilitate the goal for European players to lead new digital ecosystems. Pillar III, which is about security and resilience in networks, is important but outside the scope of this study.

In keeping with our client's wishes, in this report we have identified and focussed on what we believe to be the key aspects of the vision and proposals in Pillars I and II of the White Paper. The White Paper is a complex and ambitious document, and covers concepts which may be new to stakeholders who are not familiar with digital and communications technologies. Therefore, we have tried to make explanations of concepts introduced in the White Paper as simple as possible.

The remainder of this report is organised as follows:

- In Section 1 we present our high level interpretation of the underlying vision as we understand it from the White Paper.
- In Section 2 we explain how we think Pillar I relates to the vision.
- In Section 3 we explain how we think Pillar II relates to the vision.
- Section 4 identifies some questions and possible areas for further study arising from our analysis.

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<sup>1</sup> <https://digital-strategy.ec.europa.eu/en/library/white-paper-how-master-europes-digital-infrastructure-needs>

# 1 Interpretation of the vision underlying the White Paper

The White Paper outlines a number of measures designed to shape the digital landscape in Europe. The vision underlying these ideas is complex, and it is important to understand this starting point before fully evaluating the policy proposals in the White Paper.

In this section we present our understanding of the vision for the evolution of digital technology. This is key because it provides the context in which the ideas and proposals for policy and regulatory change in the White Paper have been made.

The vision is not really concisely explained in one place in the White Paper. It is set out across Section 2 ("Trends and Challenges in the Digital Infrastructure Sector") and each of the three Pillars which contain the proposals. In this section we attempt to pull together all the relevant threads.

## 1.1 The White Paper view of Europe's position

The White Paper suggests that Europe is at risk of falling behind other countries and regions in digital markets and technologies. Not only does it describe Europe as being outpaced in digital infrastructure, it also sees a likelihood if nothing changes that European users will become increasingly reliant on powerful non-European companies for digital services and applications. Such companies are often described as "hyperscalers".

Hyperscalers are providers of computing resources, usually in cloudified environments, which are capable of providing very large scale capacity. Examples are Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP). The White Paper describes a risk that European users are being and will be locked into closed ecosystems controlled by the hyperscalers.

The White Paper identifies trends in the evolution of technology (described below), and proposes ways in which European institutions and companies could take a leading position in the developing ecosystem. It identifies opportunities for Europe, in particular it discusses the prospect that European companies can be at the centre of new digital ecosystems, thus mitigating the risk of too much reliance on non-European players.

As well as describing opportunities, the White Paper points out some risks arising from factors which the Commission believes could prevent European firms and institutions from playing a leading role in the ecosystem, and benefitting fully from it.

The policy ideas set out in the White Paper are intended to leverage the opportunities, and mitigate the risks. Essentially, the White Paper is suggesting a bold industrial policy for Europe to do this.

This industrial policy is partly targeted at the electronic communications sector. If implemented, it would be a significant shift away from the current approach to regulation which was designed to protect markets and consumers and is enshrined in the European Electronic Communications Code (EECC)<sup>2</sup>, Digital Markets Act (DMA)<sup>3</sup>, Digital Services Act (DSA)<sup>4</sup>, Data Act<sup>5</sup> and other relevant legislation governing electronic communications and digital markets in Europe.

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<sup>2</sup> <https://eur-lex.europa.eu/EN/legal-content/summary/european-electronic-communications-code.html>

<sup>3</sup> [https://digital-markets-act.ec.europa.eu/index\\_en](https://digital-markets-act.ec.europa.eu/index_en)

<sup>4</sup> [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/digital-services-act\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/digital-services-act_en)

<sup>5</sup> <https://digital-strategy.ec.europa.eu/en/policies/data-act>

However, the White Paper is broader than just electronic communications. It also discusses ideas to unlock European leadership of a new European digital ecosystem which span beyond the suggested reforms to regulation in the electronic communications sector. This involves potential initiatives across the digital value chain including the scaling up of computing capacity, and creation of new capabilities in Europe at the edge of networks. The Commission envisages that massive financial investment and boosts to existing and new resources will be needed to achieve this.

## 1.2 The technology vision in the White Paper

The White Paper sets out a vision of technology evolution in digital markets. In particular, it anticipates growth in demand for better connectivity driving more sophisticated capabilities at the edge of networks leading to the development of a new ecosystem, one which it describes as "Connected Collaborative Computing" (the 3Cs). Please note that, in this report we have adopted the abbreviated terminology "3Cs" used in the White Paper when we refer to the technology vision it describes.

Changes to digital markets are driven not just by the evolution of technology, but also by anticipated changes in demand for connectivity. The expected further growth in innovation and demand for connected devices and sensors (including the Internet Of Things – IoT), sometimes incorporating artificial intelligence (AI) will mean, the White Paper argues, that needs for connectivity and real-time computing will become more distributed than at present. Delivering this will require not only the ubiquitous coverage that is already a target for European Union countries as part of the Digital Decade targets,<sup>6</sup> but also greater hosting and computing capability very close to the end user or device, i.e. at the network edge.

The White Paper anticipates that new IoT applications will need more advanced network and computing capabilities than are widely available today. For example, they might need to nimbly move from network to network, and would require computing capabilities to enable them to meet demand from multiple use cases. These use cases may have very different characteristics, for example different functionality, latency or security requirements. The networks which support them would therefore need to be capable of adaptation to support all of these diverse use-case characteristics.

Central to this is the concept of the 3Cs which is the main theme (and title) of Pillar I in the White Paper. The White Paper's analysis here has many points in common with previous research and publications on the subject, including the academic paper by Ferrer et al "*Towards a Cognitive Compute Continuum*"<sup>7</sup> which anticipates development of digital systems to support adaptable and intelligent networks providing connectivity to versatile devices.

Such capabilities combined with gigabit connectivity would be needed to support some use cases which will require very reliable low latency performance, including IoT applications. The White Paper argues that the availability of compute capability as close as possible to end users and devices is needed to unlock the delivery of these use cases. Hence there is strong emphasis on the development of the "telco edge cloud" as an essential part of the European 3Cs ecosystem.

The White Paper's analysis is partly future looking. For example, it cites use cases like automated driving, adoption of which is likely to be some years away. However, it also describes a potential to improve the performance of current use cases, including systems controlling intelligent buildings or healthcare.<sup>8</sup>

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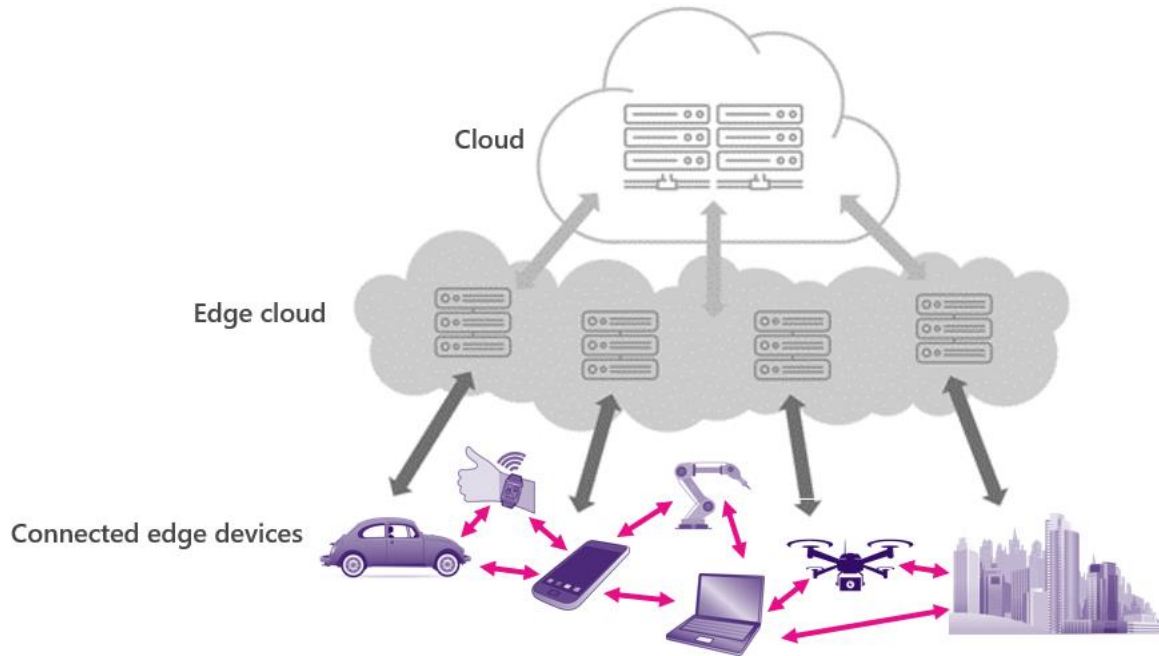
<sup>6</sup> The Digital Decade is a programme to guide digital transformation in Europe, and includes targets set by the Commission, and trajectories towards achieving these targets by 2030 [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en)

<sup>7</sup> <https://ieeexplore.ieee.org/document/9499432>

<sup>8</sup> It is worth noting that edge architectures are already regarded as important in some networks, including LTE (4G) and 5G private networks in situations where low latency (i.e. minimal delay in data speeds) is important.

This deployment of computing capability at the edge of networks and in connected devices consistent with the 3Cs vision is shown in simplified form in Figure 1.1.

**Figure 1.1: Simplified depiction of edge cloud and connected devices**



### 1.2.1 The significance of network-as-a-service (NaaS) and Application Programming Interfaces (APIs)

The White Paper's vision of the 3Cs as a converged ecosystem of connectivity and computing can already be seen to be emerging in modern private networks, edge cloud configurations, and network-as-a-service (NaaS) propositions. One of the key features of these ecosystems is the ability of systems and components to communicate and interoperate via Application Programming Interfaces (APIs).

NaaS and APIs are both prominent features of the White Paper, but the terminology may not be familiar to all readers. Therefore, we provide some more information in Figure 1.2.

**Figure 1.2: NaaS and the importance of APIs**

### What is Network As A Service (NaaS)?

NaaS is a prominent feature of the new digital ecosystem described in the White Paper.

NaaS is a way in which users (usually enterprises) can operate a network outsourced in a cloudified and virtualised environment without having to own, build, or maintain their own infrastructure. This enables these users to flex network resources to meet their needs at any particular time without having to manage their own hardware or software requirements.

NaaS is a broad term, and it does not only describe the outsourcing of networks by a single user to a single provider. It can also describe a platform supporting two sided markets (i.e. connecting two distinct user groups that provide services or benefits to each other). This is discussed in the White Paper where NaaS is seen as a platform for marketplaces connecting multiple end-users and service providers. This has enabled developers and service providers to leverage connectivity with hyperscaler NaaS platforms giving them access to very large markets of connected customers.

As the White Paper puts it: *"NaaS creates a common and open framework between operators that makes it easier for developers to build apps and services in partnership with large cloud providers and content application providers (CAPs) that seamlessly communicate with each other and work for all devices and customers"*.

### What are APIs?

APIs are rules or protocols which enable software applications to communicate and interoperate with one another.

Open APIs are a key enabling feature of modern digital ecosystems. Work is underway to make APIs accessible and secure. For example, Project CAMARA is a multi-stakeholder initiative led by the Linux Foundation to define, develop and test APIs.

## 1.3 The White Paper's view of European digital supply chains as fragmented

The Commission predicts that the digital environment will continue to evolve to more distributed and flexible systems. The ecosystem will rely on a complex and dynamic supply chain, including networks, cloud providers, chipset manufacturers/suppliers, software providers, and equipment vendors.

The White Paper describes the sectors which are converging in this supply chain in Europe as fragmented, and explains a concern that as things stand this environment is shaping to be dominated by non-European players, with the attendant lock in risks described above.

This is one of the key features of the White Paper's vision, supporting the case it makes for a new industrial policy. Again, we see points in common between the analysis in the White Paper and previous work on European digital policy, in particular the European Industrial Technology Roadmap which was developed and presented to Commissioner Breton by a consortium of 27 European digital companies in 2021.<sup>9</sup>

<sup>9</sup> <https://european-champions.org/blog/european-industrial-technology-roadmap-for-the-next-generation-cloud-edge-offering/>



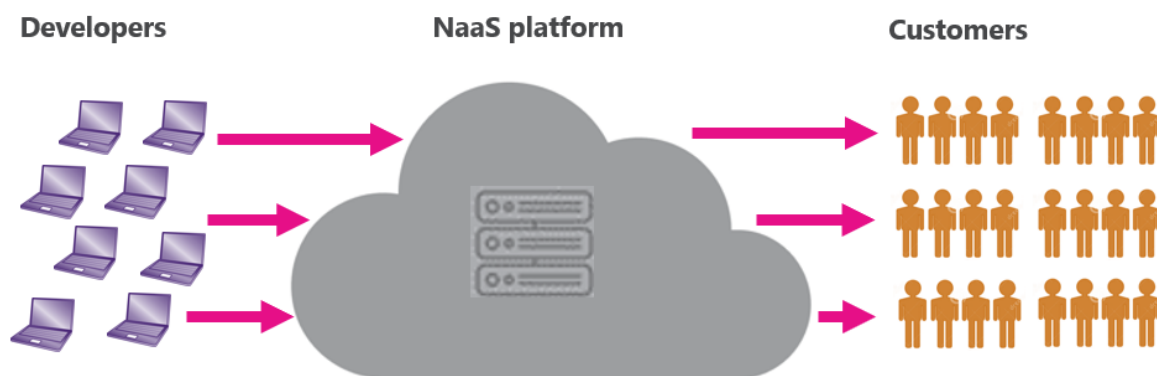
## 1.4 The perceived need for greater scale

In order for Europe to take advantage of the opportunities created by changes in technology and demand, the White Paper argues that it needs larger scale players.

The White Paper suggests that the current scale of European telcos will be a disadvantage in the 3Cs ecosystem. It refers to NaaS in its discussion of the perceived need for scale. For example it says: *"The concept of scale may be very different in a NaaS environment in nature and magnitude compared to the economies of scale of typical current electronic communication networks"*<sup>10</sup>.

The White Paper does not explain in great detail how it defines scale in relation to NaaS. However, it seems likely to be a reference to scale in current digital ecosystems. As described in Figure 1.2. above, cloud companies have created marketplaces for developers, who are attracted by their large scale and reach.<sup>11</sup> This relationship between developers and cloud platforms is a feature of some NaaS propositions giving developers access to a large base of potential customers, and giving customers access to an environment in which there are possibilities for innovative and sometimes bespoke solutions.

**Figure 1.3: Simplified structure of a NaaS marketplace**



## 1.5 Central orchestration

The White Paper proposes ways in which Europe can develop from its current position to lead the development of the next generation of cloud and edge capabilities. According to the White Paper, this involves coordination and orchestration of connectivity and computing resources in Europe.

Orchestration, and the need for this to take place in Europe by European players is a key theme in the White Paper. It is worth exploring what it means.

Orchestration in digital networks refers to the function of central control to coordinate facilities (e.g. servers, applications, devices) required to work together. In the context of the White Paper, orchestration is significant because, as explained above in Section 1.2, the Commission envisages the development of advanced functionality which may require coordination of edge computing capacity, low latency, and adaptability to create different combinations and support diverse use cases. The White Paper suggests that in order to make these customised combinations of components available to specific applications, resources will need to be coordinated and orchestrated very precisely.

<sup>10</sup> See footnote 27 in the White Paper (page 9).

<sup>11</sup> See for example <https://aws.amazon.com/marketplace/>

The White Paper envisages a key role for European stakeholders in the future orchestration of the envisaged European 3Cs ecosystem. Many of the proposed policy and funding initiatives are designed to facilitate this.

The White Paper is clear about the intended role of connectivity providers in this, articulating an objective of *"making sure that today's connectivity providers become tomorrow's providers of collaborative connectivity and computing, capable of orchestrating the different computing elements that this ecosystem requires"*<sup>12</sup>.

This idea is far reaching in three ways:

- it suggests that digital ecosystems, supply chains and delivery of services should be controlled or orchestrated centrally;
- it sees a need for greater scale in some sectors for this to happen; and
- it explains that this role should be the domain of particular type of player (i.e. current connectivity providers) rather than leaving it to markets to determine outcomes.

## 1.6 Coordination of the value chain in Europe

To realise the potential for European stakeholders in the 3Cs environment, the White Paper also envisages roles for other players, including chips manufacturers, cloud providers and equipment vendors, and a need for coordination between them. As noted above, the White Paper describes each of these parts in the value chain in Europe as being fragmented, and lacking scale. This in turn means that European businesses are increasingly partnering with non-European hyperscalers to meet modern needs. Significant parts of the proposals in Pillars I and II of the White Paper are therefore concerned with addressing these points (see Sections 2 and 3 for further explanation of this).

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<sup>12</sup> See page 22 of the White Paper.

## 2 How Pillar I relates to the vision: Fostering the European 3Cs ecosystem

In Pillar I, the White Paper develops some ideas to achieve the vision to put European players at the centre of the European 3Cs ecosystem.

Pillar I is mainly about marshalling and coordinating existing and new resources covering the entire computing continuum, and to consolidate and facilitate new and existing funding. It does not directly address the issue of proposed adjustments to the regulatory framework, which is dealt with in Pillar II and will therefore be discussed in the next section of this report.

### 2.1 The scale and scope of activity envisaged

Pillar I includes a number of ideas both for new work and development of current work to create the European 3Cs ecosystem. These ideas are discussed in Section 2.2 below. On their own, they perhaps do not adequately describe the scale of industrial policy intervention and resource which the Commission anticipates is needed to deliver its vision. Before discussing the Pillar I proposals and to give them context, in Section 2.1 we therefore provide a short analysis of the scale and scope of intervention which the Commission seems to envisage to achieve the European 3Cs vision through the initiatives in Pillar I.

There are a number of references to this scale and scope in the White Paper. For example, it considers linkages between Pillar I and a number of Important Projects of Common European Interest (IPCEIs). IPCEIs are large and significant projects which make strategic contributions to economic growth, employment, green and digital transitions, and EU competitiveness. They often involve a need to coordinate resources to deliver positive benefits across the European Union.<sup>13</sup> Pillar I describes how existing IPCEIs may contribute to development of the European 3Cs ecosystem, and includes a proposal for a new infrastructure focussed IPCEI. We understand that, since the White Paper was published, thinking on how IPCEIs can be leveraged to deliver outcomes consistent with the European 3Cs vision has continued to be developed.<sup>14</sup>

Also, the White Paper suggests that creating the envisioned European 3Cs ecosystem will require very significant financial investment. It does not say how much investment is needed. However, it indicates that funds currently allocated to related activities are insufficient to deliver the European 3Cs ecosystem, for example, it says “... the existing budget of EUR 900 million for 2021-2027 is focused on R&I activities. This represents a small amount in the face of those challenges, compared to what would be required to catalyse the next generation connectivity ecosystem covering the entire computing continuum”.<sup>15</sup> It also notes “... the massive investments made by large cloud providers into cloud, edge, and AI capacities”,<sup>16</sup> and suggests that Europe must deploy investment capacity to compare with this. Furthermore, it mentions that more than €100 billion of investment has flowed from initiatives in the Chips Act.<sup>17</sup> This suggests that the Commission regards this as a benchmark, and has identified a need for similar sums of money to be invested to facilitate the European 3Cs ecosystem.

<sup>13</sup> [https://competition-policy.ec.europa.eu/state-aid/ipcei\\_en](https://competition-policy.ec.europa.eu/state-aid/ipcei_en)

<sup>14</sup> For example, see this technology preview drafted by the Working Group for Digital Technologies of the Joint European Forum for Important Projects of Common European Interest (JEF-IPCEI): [https://mindigital.gr/wp-content/uploads/2024/08/240715\\_Technology-preview\\_ECI.pdf](https://mindigital.gr/wp-content/uploads/2024/08/240715_Technology-preview_ECI.pdf)

<sup>15</sup> See page 22 of the White Paper.

<sup>16</sup> See page 21 of the White Paper.

<sup>17</sup> [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-chips-act\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-chips-act_en)

## 2.2 Steps forward discussed in Pillar I

The vision for the European 3Cs ecosystem is ambitious and, as explained above, the White Paper identifies the need for very significant work and funding to achieve it. Pillar I does not include a full roadmap to achieve this, but discusses early ideas and concepts to develop this work.

Pillar I discusses the need to build on current work and so looks at ways in which existing initiatives and funding programmes can contribute to the vision set out in the White Paper. It also considers the need for European stakeholders to think forward, building capacity and deploying solutions to anticipate the development of technology and customer demand.

For example, it explores ideas for trials and pilots for early testing of technology innovation. It discusses possible sources of European funding for these, including the research and innovation funding programme, Horizon Europe.<sup>18</sup>

Relevant activities would not just focus on testing of innovative thinking, but could also promote exchange of ideas and liaison between electronic communications providers, stakeholders in other sectors, and researchers who may have a role in the new ecosystem. In this way, ideas put forward in the White Paper could, if implemented, become catalysts for creative thinking, bringing together talent from different sectors.

Pillar I considers a number of existing and new initiatives into which pilots could be deployed, for example:

- deployment of 5G corridors,<sup>19</sup> an initiative between Member States and Industry to deploy 5G along transport paths;
- smart communities,<sup>20</sup> which the White Paper suggests could be an environment for development of AI solutions to support rural communities.

Pillar I also includes discussion of the roles of existing stakeholders to develop the European 3Cs ecosystem, and the need to create conditions in which they can collaborate. There are a number of stakeholders and institutions which may play a role and hence are mentioned in Pillar I, including:

- the Smart Networks and Services Joint Undertaking (SNS JU)<sup>21</sup> which aims to drive European leadership in 5G and 6G; and
- the Joint European Forum for IPCEIs (JEF-IPCEI)<sup>22</sup> which was set up to align and coordinate activity between IPCEIs.

Pillar I includes ideas and proposals to further these ideas (set out as the summary of possible scenarios). In summary, these cover:

- initiatives for large pilots for integrated telco edge and cloud systems which could then be used to orchestrate innovative technology and AI developments;
- leverage of existing and possible new IPCEIs (as explained above); and

<sup>18</sup> [https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe\\_en](https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en)

<sup>19</sup> <https://digital-strategy.ec.europa.eu/en/policies/cross-border-corridors>

<sup>20</sup> <https://smart-cities-marketplace.ec.europa.eu/sites/default/files/2021-09/Manifesto%20of%20Collaboration%202021.pdf>

<sup>21</sup> <https://digital-strategy.ec.europa.eu/en/policies/smart-networks-and-services-joint-undertaking>

<sup>22</sup> [https://competition-policy.ec.europa.eu/state-aid/ipcei/joint-european-forum-ipcei\\_en](https://competition-policy.ec.europa.eu/state-aid/ipcei/joint-european-forum-ipcei_en)

- new programmes of very large scale investment in connectivity capacity to support the European 3Cs ecosystem, streamlining and creating synergies between existing initiatives and stakeholders.

These ideas are presented in the White Paper at a high level, and considerable work would be needed to develop them to a level of detail which would enable comprehensive evaluation of their prospective effectiveness.

## 3 How Pillar II relates to the vision: Positioning European stakeholders for the 3Cs ecosystem

Pillar II of the White Paper suggests the use of policy and regulatory instruments to shape Europe's digital future. In some ways it is more tangible than Pillar I because it deals with issues and ideas which most readers who have a grounding in policy or regulation will be familiar with. Because it includes proposals for reforms to existing regulatory structures and methods, it contrasts with Pillar I which has a broader focus across complex digital value chains, and is more focussed on research and the development and testing of ideas.

Pillar II is concerned with the regulatory framework, and therefore with key features of the EECC. The EECC is scheduled to be reviewed in 2025,<sup>23</sup> so this part of the White Paper can be viewed as a precursor to this.

We find Pillar II to be difficult to reconcile to the White Paper's vision because it is centred on proposals to reform electronic communications regulation, rather than measures which deal directly with the ambition for a European 3Cs ecosystem (which involves a much broader range of issues and stakeholders than just telecoms operators and stakeholders). There are therefore open questions about how the proposals in Pillar II relate to the broader vision, and we include some of these questions in Section 4.

The implicit assumption in the White Paper seems to be that creating regulatory conditions that are more favourable to electronic communications providers will unlock investments in scale and capacity to support the development of the European 3Cs ecosystem. This interpretation is consistent with other policy proposals or ideas put forward by the Commission, for example, Commissioner Breton's proposals for a Digital Networks Act in October 2023<sup>24</sup> which included references to:

- the growing importance of NaaS and APIs in the deployment of networks;
- the idea that fragmentation in Europe constrains the ability of operators to grow to a scale required to play leading roles in the 3Cs environment;
- a desire to facilitate cross-border operations and hence enable pan-European scale in electronic communications infrastructure;
- regulatory reform to facilitate and speed the deployment of infrastructure; and
- removing perceived barriers to capital investment.

All of these ideas also feature in the White Paper, and so Commissioner Breton's proposals can be regarded as a significant indicator of the Commission's thinking in developing the proposals and concepts covered in the White Paper.

### 3.1 The need for scale and financial strength

The White Paper makes clear that scale is considered to be an important precondition for European players to become orchestrators in the European 3Cs environment. Therefore, much of Pillar II relates to the idea of facilitating the emergence of larger and financially strong European players..

<sup>23</sup> <https://digital-strategy.ec.europa.eu/en/policies/eu-electronic-communications-code>

<sup>24</sup> <https://www.linkedin.com/pulse/digital-networks-act-redefine-dna-our-telecoms-thierry-breton/>

The proposals in Pillar II appear focussed in particular on scale in:

- geographic footprint for telecom operators, i.e. the ability to operate across the European Union; and
- financial strength.

However, the White Paper does not address some other factors which could be relevant to the ability of European players to play a key role in the European 3Cs ecosystem. For example, the ability to influence technical standards, which could be considered a key component of a possible shift in the structure of the ecosystem. This is to some extent linked to scale (e.g. the ability to contribute resources to these activities), but is also and primarily a question of choosing to be involved in initiatives driving standards and allocating the necessary resources.

In the White Paper's analysis, there are two main factors that supposedly inhibit growth of European telcos and hence, by extension, may constrain their ability to thrive in a 3Cs environment:

- **Lack of pan-European presence:** the White Paper posits that pan-European consolidation has been hampered by lack of harmonisation across EU member states. The White Paper argues that this lack of harmonisation acts as a disincentive to cross-border consolidation, and that this explains why there are no players present in all European countries, and only a few players present in more than one. The White Paper is not entirely clear how pan-European scale will contribute to the underlying vision. It could be that it is expected that greater scale will allow operators to obtain certain synergies, or enable them to offer uniform services across borders which could be beneficial to connected devices that will be used across Europe.
- **Low levels of profitability:** the White Paper argues that profitability in the electronic communications sector is low (with the accompanying view that this constrains investments), although it does not quantify this claim, and suggests that facilitating the delivery of services on a larger scale with less regulatory constraint may remedy this issue, at least in part. It notes that market players themselves consider the lack of synergies due to EU market fragmentation to be sufficient to cancel the efficiencies obtained from operating at larger scale.<sup>25</sup>

## 3.2 Regulatory reform and harmonisation

Pillar II also identifies that different regulatory requirements currently apply at different points in the digital communications value chain. This analysis in the White Paper is principally focussed on differences between the regulation of electronic communications networks and services (ECN/S) under the EECC, and the regulation of cloud services. The White Paper describes convergence between ECN/S and cloud and argues for regulation to be aligned between the two.

The White Paper also expresses a need for closer harmonisation of regulation across EU Member States, and application of the "country of origin" principle.<sup>26</sup> This would be a way to ensure that regulated companies face a single set of regulatory requirements (i.e. that of their country of origin), rather than different rules in each European jurisdiction they enter.

<sup>25</sup> In this context it is worth noting that operators with multiple operations in different countries have struggled to obtain synergies as a result of the challenges of merging and integrating national operations.

<sup>26</sup> The country-of-origin principle gives the Member State where an online service provider is established exclusive authority to regulate access to, and exercise of, the provider's services and prevents other Member States from imposing additional requirements.

The overall effect of these changes would be to reduce the burden of regulation on electronic communications providers to create an environment which, according to the White Paper, would make the sector more profitable and hence unlock investment.

Since the White Paper cannot easily address the perceived lack of harmonisation on all the policy and legal aspects that are within the purview of European Member States, it focuses instead on promoting a harmonised approach in areas where it has influence. For example, the summary of possible scenarios includes ideas for:

- broadening the scope of regulation to capture more players in the digital ecosystem;
- removal of the presumptive identification of markets susceptible to ex-ante regulation; and
- more integrated governance for spectrum matters and a harmonised approach to authorisation which would address long standing complaints by electronic communications providers about the cost of spectrum license fees and the duration of license periods.

This part of the White Paper could be considered radical, presenting ideas for far reaching changes to established methods of regulation. For example, an important feature of the current EECC is the identification of markets which the Commission considers susceptible to ex-ante regulation. Much of the regulation of access networks in Europe is imposed following identification of relevant markets at European level by the Commission, after which national regulators carry out their own assessments to establish whether significant market power (SMP) exists and, where it does, to apply remedies needed to prevent market failures resulting from SMP. Dismantling this well-established framework would be a significant change. The likely impact would be a reduction in regulation of ECN/S providers currently identified as having SMP. We believe this is the intention of the White Paper, because it is unlikely that such a significant change would be proposed unless it was intended also to result in changes to outcomes.

We understand that these proposals are designed to encourage investment in fibre and (stand-alone) 5G networks, and facilitate the emergence of a 3Cs environment in Europe with a central orchestration role for European connectivity providers. Proposals to reduce the regulatory burden on electronic communications providers appear to be targeted at enabling them to scale up and boost profitability to unlock investment. As a basis for regulation, this would be a very different goal to the aims established for regulation in the EECC which were centred on the deployment and take-up of high capacity networks, sustainable competition, interoperability, and the quality, affordability and availability of services to end users.<sup>27</sup>

### 3.2.1 Other studies which appear relevant in the Pillar II proposals

As noted in Section 1, the White Paper's proposals on regulation in Pillar II have much in common with previous work on digital technology and markets contained in studies which we believe were influential inputs to the White Paper's thinking. For example, the European Industrial Technology Roadmap submitted to Commissioner Breton by a consortium of 27 European digital companies in 2021 sets out a vision and advocates a number of measures in common with the White Paper.

The Roadmap describes the European landscape as fragmented and, like the White Paper, presents ideas to address this perceived problem. An aim of the Roadmap is to enable an "interconnected sovereign EU cloud ecosystem", and it sees the development of greater scale in European digital markets as a key enabler of this. Features which the Roadmap has in common with the White Paper include:

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<sup>27</sup> See Article 1 of the Directive establishing the EECC.



- concerns about the ability of European players to compete in new technology development and markets (e.g. AI, machine learning) with global cloud players;
- concerns about customer dependency on end-to-end cloud solutions provided by non-European players;
- discussion of the potential for European companies, including electronic communications and equipment providers, to leverage their current strengths into edge cloud opportunities;
- concerns about the profitability of European players, and hence their ability to attract investment;
- proposals to change competition policy to unlock infrastructure investment which the authors say can be achieved through pan-European consolidation to build scale in European digital markets; and
- criticisms of regulation in Europe, including
  - spectrum allocation characterised by uncertainty and high prices;
  - a focus on lower consumer prices than in North American and Asian markets; and
  - a disproportionate focus on telecoms operators relative to online platforms of some regulatory regimes.

These points featured in the Roadmap align closely with Pillar II of the White Paper. The Roadmap also has points in common with the position of the European Telecommunications Network Operators Association (ETNO) which has called on European Member States to support the White Paper.<sup>28</sup> Four of the companies which developed the Roadmap (Deutsche Telekom, Orange, Telecom Italia, and Telefonica) are also ETNO members.

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<sup>28</sup> <https://etno.eu/news/all-news/8-news/797-gsma-and-etno-welcome-letta-s-report-call-for-member-states-to-support-the-ec-white-paper-on-digital-infrastructure-needs.html>

## 4 Questions and issues for further study

The White Paper lays out a vision based on a number of predictions and assumptions. We suggest further study of these will be a valuable exercise as the Commission considers responses to the consultation and develops ideas for review of the EECC.

Here we describe elements of the White Paper vision which we suggest would benefit from further study.

### 4.1 Questions and ideas for further study related to Pillar I

#### 4.1.1 A European ecosystem

##### White Paper analysis

A central tenet of the White Paper is that a European digital ecosystem is needed to mitigate risks of lock-in or dependency on non-European players. This links to the concept of strategic autonomy.<sup>29</sup>

##### Questions and points for further study

Digital ecosystems developed and grew as a result of global innovation and investment. It is well understood in economic theory that there are trade-offs between policies that foster economic sovereignty and the efficiencies derived from global free markets.

Further study could measure more accurately the impact on market efficiency that the sovereignty measures proposed in the White Paper could have, and whether those can be borne by the European digital ecosystem and indeed the European economy at large.

Further work may also be helpful to consider whether different approaches might meet the same objectives. For example, establishing and safeguarding sovereignty and strategic autonomy through systems of governance and adoption of common standards, rather than creation of an entirely European ecosystem.

#### 4.1.2 Demand for higher quality of service

##### White Paper analysis

The White Paper sets out a vision of technology evolution based on particular demand characteristics which includes future use cases requiring very sophisticated and high quality network performance.

##### Questions and points for further study

Digital and online ecosystems are complex and dynamic. Many of the technology developments discussed in the White Paper are nascent, and there will inevitably be many deployments, use cases, and development steps which cannot be envisaged now, or will not evolve as anticipated. The White Paper sets out a particular view of demand, but alternative scenarios should also be considered. For example, there may not be mass market demand for more advanced use cases and best efforts connectivity may suffice for most applications, leaving more advanced requirements to be a feature only of niche markets. There may also not be a viable business

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<sup>29</sup> EU strategic autonomy (EU-SA) refers to the capacity of the EU to act autonomously – that is, without being dependent on other countries – in strategically important policy areas.

model for some of the anticipated use cases. Either way, the demands for such services may not be met by mass market providers over public networks.

There are always risks in designing policy to a particular vision of the future. Ongoing study will help understanding of different possible demand scenarios and to frame appropriate policy options.

### 4.1.3 Connectivity

#### White Paper analysis

High quality connectivity in public networks is needed for the development of new capabilities in key sectors.

#### Questions and points for further study

Whilst public network connectivity is important, it is likely that at least some of the White Paper objectives will be met by private networks built on dedicated capacity. This is an option and may be more attractive to providers, particularly in applications which require ultra-low latency. Industrial deployment of IoT is already favouring this approach.

Further analysis would be helpful to understand the extent to which private networks will meet demand in different scenarios, and the impact of this analysis on public network investment needs.

### 4.1.4 Orchestration

#### White Paper analysis

A key aspirational statement in the WP is *"the EU needs to establish a coordinated approach to the development of integrated connectivity and computing infrastructures, making sure that today's connectivity providers become tomorrow's providers of collaborative connectivity and computing"*.<sup>30</sup>

#### Questions and points for further study

This is a far reaching ambition, appearing to "pick winners" and position markets for particular outcomes. The development of open digital ecosystems is not typically characterised by predetermined central orchestration, but rather by innovation and integration of capabilities which may come from a number of sources. It cannot be easily assumed that today's connectivity providers are best placed to orchestrate European 3Cs ecosystems.

A risk with centralised orchestration is that it may lead to bottlenecks in situations where gatekeepers control access to systems – for example, through proprietary APIs. The concept of bottlenecks is one which European regulators are very familiar with, and it is a reason why the European regulatory framework has focussed on addressing problems which can arise from SMP in electronic communications networks. The identification of a particular type of stakeholder for a central role in orchestration or as gatekeepers may create risks of new bottlenecks or lock-ins.

It is appropriate to consider other structures and governance models for digital ecosystems. For example, and by contrast to the central orchestration model, some stakeholders have advocated for open decentralised digital

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<sup>30</sup> See page 22 in the WP.

ecosystems.<sup>31</sup> Such ecosystems require governance frameworks to provide interoperability and security, but they may mitigate the bottleneck risks of central gatekeepers.

Evaluation of the risks and benefits of different orchestration models (e.g. central or distributed) would support further policy development.

## 4.2 Questions and ideas for further study related to Pillar II

### 4.2.1 Would Pillar II proposals be effective to address the concerns expressed by the White Paper in the White Paper?

#### White Paper analysis

Pillar II proposals appear designed to prepare European operators to play a key role in the 3Cs by enabling greater scale, strengthening their financial health and lightening the burden of regulation. They are also expected to be key deliverers of connectivity to meet targets set out in The Digital Decade.

#### Questions and points for further study

Deeper analysis would help to establish whether and how the approaches set out in Pillar II would be effective in meeting objectives set out in the White Paper regarding the 3Cs ecosystem. Further consideration could be given to whether there should be separation of measures designed to help meet Digital Decade targets, and those associated with the longer term and more abstract vision set out in the White Paper.

### 4.2.2 Is there a need for more scale in Europe – and if yes what kind of scale?

#### White Paper analysis

Creating scale can help Europe address issues identified in digital ecosystems.

#### Questions and points for further study

It will be helpful to examine further the perceived advantages of building or enabling larger entities in Europe. Relevant questions are:

- What advantages and benefits in digital ecosystems and markets can be driven by scale?
- What type of scale is best suited to deliver the objectives of this White Paper, e.g. geographic scale, financial scale?
- How would scale in these areas help position European electronic communication providers to lead the 3Cs ecosystem envisaged in the White Paper?
- Might there also be disadvantages in scale, e.g. a reduction in competitive intensity, loss of bespoke electronic communication solutions for smaller markets or customers, customer lock-in, foreclosure of opportunities for disruptive and entrepreneurial market entry?

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<sup>31</sup> An example of an initiative for an open decentralised system in Europe is GAIA-X <https://gaia-x.eu/what-is-gaia-x/about-gaia-x/>

- In the context of the Commission's policy objectives, is scale a concept which should be applied to single firms or entities, or is the driving factor in achieving good outcomes a more aggregated concept of scale, i.e. scale of the entire ecosystem?
- Could the scale and efficiency of ecosystems be achieved better by the development of interoperability through common standards and collaboration than single firm scale?
- If benefits are identified, what is the minimum efficient scale (MES) needed to drive the economies of scale needed for electronic communication providers to deliver them? This is unlikely to be a static consideration, so how might it change over time?

### 4.2.3 Convergence between ECN/S and cloud

#### White Paper analysis:

There is convergence between ECN/S and cloud technologies, services and markets and therefore the scope of regulation should be expanded to include cloud services.

#### Questions and points for further study

What is the nature of this convergence and does it support expansion of regulation to cloud providers and services? Cloud services are subject to existing regulation, including DMA, DSA, Data Act, and Competition Law, are these provisions sufficient for proportionate and effective regulation of cloud services, or are changes needed?

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