Our manifesto

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Social and economic development imperatives in the 2030s

Social and economic success in the 2030s will depend on:

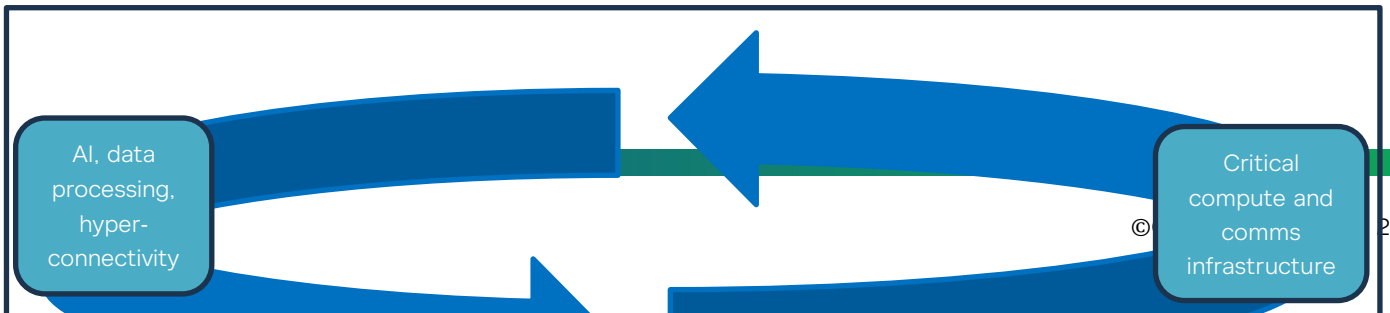
- *Extreme agility.* Organisations and individuals will need to adapt to external events and developments at an unprecedented rate to thrive in the 2030s. Events that have or are changing the global landscape in the first half of the 2020s, such as the COVID-19 pandemic, the rise of AI, natural disasters and geopolitical upheavals point to an increasingly turbulent world that requires resilience and agility to navigate. This turbulence and the need for extreme agility will accelerate into the next decade.

- *High efficiency.* Business and industrial processes that underpin social and economic development must be as productive and sustainable as possible in a physical world that has finite capacity, contested resources and rising costs. Pressures will intensify on a planet that the UN expects will breach the 1.5°C limit set by the 2015 Paris agreement by 2030.

- *Equal access to opportunity and life purpose.* Social expectations of health, wealth, dignity, happiness and comfort will continue to rise across the world. At the same time, technological developments and global events threaten human participation in the social and economic activities that enrich human lives. Governments and institutions will need to co-operate to foster a social and economic environment that maintains stability and trust and maximises the potential of the human population in anticipation of growing individual demands and displacements in the 2030s.

The extraordinary levels of agility, efficiency and equal access that humans must achieve over the next decade to meet social and economic goals will be enabled by **AI, data and hyperconnectivity**. These three enablers need *critical compute and communications infrastructure* (C3i) to support them effectively. C3i must provide hyperconnectivity and the capacity to support the future AI and data processing needs of solutions that will address human social and economic imperatives.

C3i is critical to the delivery of 2030 social and economic development goals



Social and economic development goals

Why C3i today does not meet the needs of the 2030s

On current trajectories for AI adoption, data generation and use and connectivity scaling, today's approaches to building and operating C3i using digital technologies will run out of steam by 2030. This is due to:

- *Unaffordability.* Current methods and materials will be too expensive to use to build and power the C3i that is currently projected to be needed in 2030.
- *Lack of universality.* Current connectivity technologies cannot support commercially viable models to connect the one-third of the population that remains offline, while current mobile topologies are ineffective at reaching every corner of the planet including below ground.
- *Lack of AI readiness*. AI will play a critical role in operating all types of C3i, including digital, quantum, neuromorphic and photonic, at the scale expected in the 2030s. However, the data and governance frameworks that humans will need to ensure that AI agents operate safely do not yet exist.
- *Design constraints*: the 20th century architectures, protocols and signalling methods used by current C3i – mainly digital infrastructure - will not meet the scale and performance requirements of the 2030s. Nor has legacy digital infrastructure been designed with change in mind so it cannot easily be upgraded to or augmented with new paradigms as they appear.
- *Structural constraints*. Certain categories of C3i providers face commercial, geographical and regulatory constraints that hinder their competitiveness and profitability and therefore their ability to invest for the next decade. these constraints also restrict cooperation and co-investment between different types of infrastructure builders, such as telcos, utilities, road/rail construction companies, energy grid providers, which inhibit the scale of C3i deployments.

C3i in the 2030s

Cloud platforms will be distributed and hyperconnected

Today's C3i is heavily associated with IT clouds that are typically sited in large, centralized private or public data centers that run IT applications and carry out the training of AI models. Operational technologies, like telecoms networks, retail systems, manufacturing control systems, connected vehicles and energy grids require critical infrastructure – edge clouds – that are highly distributed to meet the latency sensitivities and privacy needs of OT applications. In both enterprise and consumer markets, the rise of AI inferencing and AI-dependent use cases such as extended reality (XR), digital twin and natural language processing environments will drive similar requirements.

Over the next decade, new types of compute and communications infrastructure based on non-digital technologies, such as quantum, photonic and neuromorphic technology will come onstream. These new infrastructure approaches will enable new use cases. The cloud platforms that support them will need to interoperate across hybrid C3i environments.

C3i in the 2030s will therefore be a distributed, hyperconnected, hybrid mix of centralized, edge, private and public cloud locations and technology types. It will need to become seamlessly available on an as-a-service basis, open for assembly and management through APIs by AI agents that will optimally assign compute workloads to appropriate locations and technologies.

Networks will need to be flat, de-siloed and software-driven

AI is increasingly being injected into cloud-native, SDN, optical and radio network technologies. This will create new opportunities for the network to co-evolve with compute infrastructure into a fabric that can provide seamless, any-to-any intelligent routing for IT and OT applications, including deterministic routing, across different C3i types and locations from cloud to edge. C3i will be able to shapeshift, depending on the needs of applications and processes and the underlying physical real-estate available to it at any point.

This will require significant new thinking in the telecoms network community, especially in designing the '6G' and WiFi roadmaps for the 2030s. The big challenge will no longer be rising data traffic volumes, which have shaped all previous wireless technology concepts, but the need to support many different types of data and

traffic - with contrasting latencies, device behaviours, speeds and so on - entirely dynamically and with excellent QoE and security, plus zero energy. These wireless networks will support personal cells that form automatically around individual users or devices according to their location and requirements, and they will need to interoperate seamlessly and dynamically with non-terrestrial networks, with different mesh protocols to achieve deep coverage, and with the increasingly dense fibre networks that will provide the underpinnings of all connectivity.

Areas of innovation that will enable C3i to meet 2030 goals

Csquared Analysis focuses on four areas in which innovation is needed to support the evolution of C3i:

1. ***Network/cloud convergence***. Csquared Analysis researches the converging cloud and networking technologies that are underpinning the transformation of C3i to meet 2030 imperatives. These include virtualisation, edge computing, AI and data, next generation operational approaches, APIs, data center networking and interconnection and cybersecurity.
2. ***Future technologies.*** Csquared Analysis investigates technology components and deployment strategies that will have an impact on C3i in a 2030s timeframe. These include quantum computing and networking, photonic approaches, neuromorphic computing, DNA storage, new networking approaches such as DePIN, new air interface, No Cell ephemeral personal cells, non-terrestrial network developments, and new materials, such as reconfigurable surfaces, and chipsets.
3. ***Telecoms value chain and monetization***. Csquared Analysis tracks changes in the C3i value chain, including the role of new entrant aggregation platforms, the formation of new C3i ecosystems and shifts in ownership and what these mean for C3i stakeholders' ability to monetise their assets.
4. ***Governance, policy (regulation) and sustainability.*** Csquared Analysis analyses the impact of new governance, regulatory and sustainability policy as it applies to the development and deployment of C3i.

How can we help?

Csquared Analysis brings decades of deep knowledge of cloud and telecom network

architectures and business models to bear on the topic of C3i evolution, increasing clients' understanding and reducing their risk. CCsquared can help C3i stakeholders to understand and adapt to the market disruptions and innovations that will occur over the next decade.