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RELEVANCE OF SILICON PLATFORM IN SOFTWARE DEFINED NETWORKS

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ABSTRACT:
Current state of the Silicon industry in whole world is becoming digital, and silicon platform are the underlying technology powering the innovations. The need for exponentially more computing power is being met through innovations, new discoveries, and disruption. But with the use of software defined silicon platform, the importance of underlying good silicon platform cannot be ignored. The present work investigates the relevance of silicon platform for a new digital economy. The new networks and programmable platforms are also embracing open tool chairs, open software frameworks, and open APIs. Silicon will power the next generation of infrastructure innovation that will simplify the work of developers, amplify their capabilities, and improve their efficiency.

Keywords: - Silicon Platform, Software, 5G and Edge computing, Networking.

INTRODUCTION :

The traditional fixed-function application-specific integrated circuits (ASICs) hold back network flexibility and prevent the developer from deciding how the network will work. Switch equipment manufacturers have to hard code that functionality into the silicon, which results in generic fixed protocols that aren't suited to every situation. As a result, anytime network administrators need to update their switch protocols, they have to replace the hardware in order to do so. The significant jump in performance is due to amazing innovations. Hence, it's safe to say that semiconductor innovation and Moore's law are alive. Now, with technological advancement, we have a programmable switch ASIC and network owners can deploy new protocols as fast as they can develop them through the software layer by just downloading them in the field. As a result, network owners can update their switch functionality to keep pace with new cloud based workloads without having to replace the hardware. Network architects have total control to decide what features, functions, and protocols are supported within their network, and it all runs at a rate with the same powerful performance and cost [1]. The present work investigates the relevance of silicon platform for a new digital economy.

Data-centre platform for specific network implementations :

The 5G base station data centre switches to factory control systems and to old system retail outlets built from fixed-function hardware that are being replaced by systems which enable developers to program. The various functions and workloads are being lifted up and provide liberty to software developers to define them. In this way, software developers are able to develop gradually, improve, and design systems to gain more control, flexibility, and security in their networks and edge systems in edge computing. The industry is racing to analyse, process, and store data at the edge, where those new services are being delivered. This could be edge IoT

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applications running on a customer's premise, or networking workloads running in a telecom data centre or an internet exchange point. 5G delivers flexibility via network functions running in the cloud, and has many ways to deliver multiple options for deployment models that range from public to private 5G enterprises. This explores deployment options to access connectivity and deliver use cases with a level of control and investment that they choose for themselves. 5G private networks will allow enterprises to develop and deploy new applications, including real-time control and time-sensitive low-latency applications. The market opportunity has two main components. One is the legacy fixed-function network market, which we expect to hold steady as we shift the market to run on server based solutions. The other is the network and edge infrastructure, where we expect to see enormous growth across cloud data centres, core networks, and edge computing segments [2].

Fixed-function to programmable transition :

The programmable GPU devices have replaced the huge fixed-function graphics cards that were used at workstations with sophisticated SoCs. These new software based implementations enable the development and deployment of new algorithms in the field and a variety of new capabilities in software by developers. Previously, big cloud providers used to build their own switches based on merchants. Today, the most top cloud service providers build their own networking equipment and write the software themselves. This reduces cost, gives them much more control, and they also have an army of software engineers to do it. More than half of all the core network workloads have already moved from proprietary fixed function boxes into virtual workloads running on standard servers. 5G and 6G in the future are promising to unlock an industry of new applications, smart cities, new factory automation and pretty much autonomous everything.

Siemens recently introduced self-reliant validation program. It provides an environment for the development of automotive chips. In our sensing environment it is possible to take real world data that can be fed to cloud then we compute and analyse the data [5].

Digitalization :

Digitalisation is the representation of the fundamental changes in the business landscape. Increasingly, companies are moving more of their business fabric onto a silicon platform. Some of the trends settling are,

a) Increasing silicon made content

Fig. 1 shows the IC content share of electronics is increasing steadily [3].

b) Companies becoming SoC designers and manufacturers

The world's largest foundry, Taiwan Semiconductor Manufacturing Company (TSMC), saw its 2021 market share slip by about 3 percentage points to 57% because it raised wafer prices at a slower rate than smaller rivals. Some trends driving the digitisation strategies for system companies are sensors, edge computing, 5G/wireless communications, and cloud/data centres. Sensors provide the ability to digitalise the natural world and bring that into a compute infrastructure for new types of applications. Edge computing enables integration of devices into smaller footprints while allowing application of things like machine learning and artificial intelligence within those chips. 5G provides an infrastructure that enables pulling these devices together. Cloud and data centres allow taking this final set of data and deliver the end applications to the customers [3-5].

Fig. 2 compares the number of sensors linked to the internet in 2015 versus the number likely in 2025. In 2015 about 1.6 billion sensors and by 2025 their number is projected to be 30 billion.

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Fig. 3 shows a strong growth opportunity for 5G, which is expected to grow at about an 18% rate over the next few years.

c) Semiconductor market growth

Fig. 4 shows semiconductor growth moving forward. The chart shows predictions that seem to be lining up semiconductor market around the year 2030.

d) Logic Semiconductor and foundry capital investments

Fig. 5 shows the distribution of advanced logic and foundry capital expenditure. It started increasing from the year 2019 and reached close to 80 billion dollars in 2021[3-4]. For 2022, Taiwan Semiconductor Manufacturing Co. (TSMC), the world's largest chipmaker, has decided to increase its investments and further grow its semiconductor manufacturing capacity, the plan is to spend about three quarters of the investment on additional advanced chip manufacturing processes for 2nm, 3nm, 5nm and 7nm semiconductors. TSMC increase investment, as they look to meet the growing demand from 5G smartphones and high performance computers (HPCs) [6].

Semiconductor National Policies

The US government recently signed US Chips Act in 2022. The genesis of this move has been: To polarize Taiwan semiconductor industry. Act aims to redefine the US semiconductor industry to get back semiconductor manufacture to the US. This leads many opportunities for India. India has an opportunity to get a share of the US fabrication sourcing by building India's semiconductor supply-chain ecosystem for global execution. There is another opportunity, as the US and European county look at scaling up their semiconductor ecosystem, there is a visible deficit of 300,000 skilled people in the global semiconductor industry. The Indian talent can fill the global workforce gap in high-value manufacturing as well as design with strategic focus, right relationships and planning. The semiconductors demand is fundamentally very strong and likely to remain so over this decade. Hopefully, India Semiconductor Mission will define its target niches and select a strategic path. The Indian government in 2021 announced approximately 10 billion dollars of incentives for the semiconductor industry. Major air to put semiconductor fabrication in place increasing design capacity within the country [5].

CONCLUSION:

All software runs on hardware. The silicon actually defines the performance, the power, and the ability to write programs and then compile them down to a target. Hence, contrary to the assumption that silicon is becoming less relevant, the fact remains that, with increased performance and scale that's being driven by technologies like 5G and edge inference, silicon will become more relevant over time. We need silicon that's more performant than ever. Various acceleration technologies for security storage inference are going to be critical, and this is where we are going to continue to invest.

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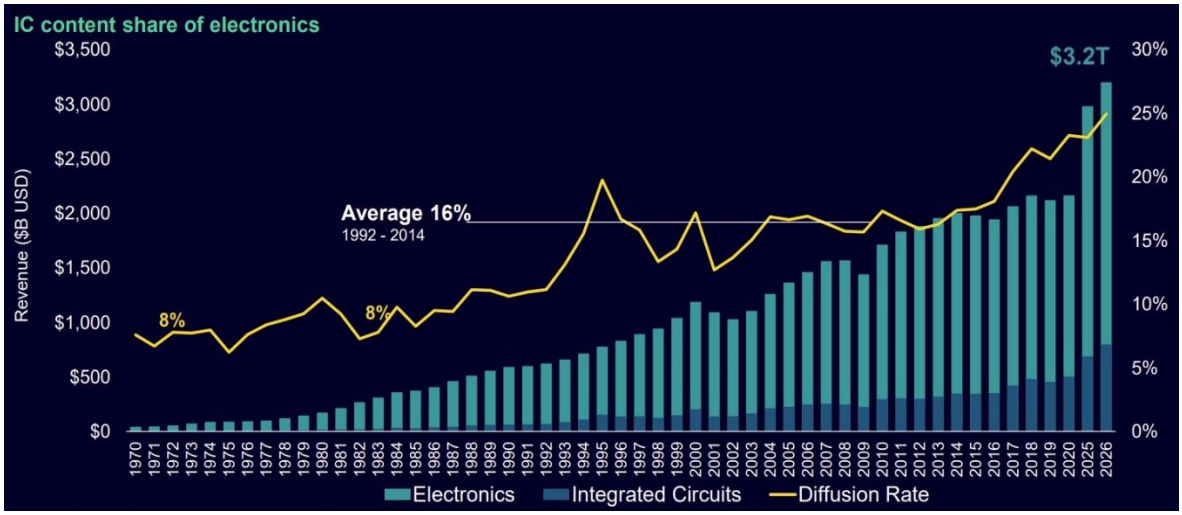

Fig.1: Increasing IC content share of electronics (Daniel 2022)

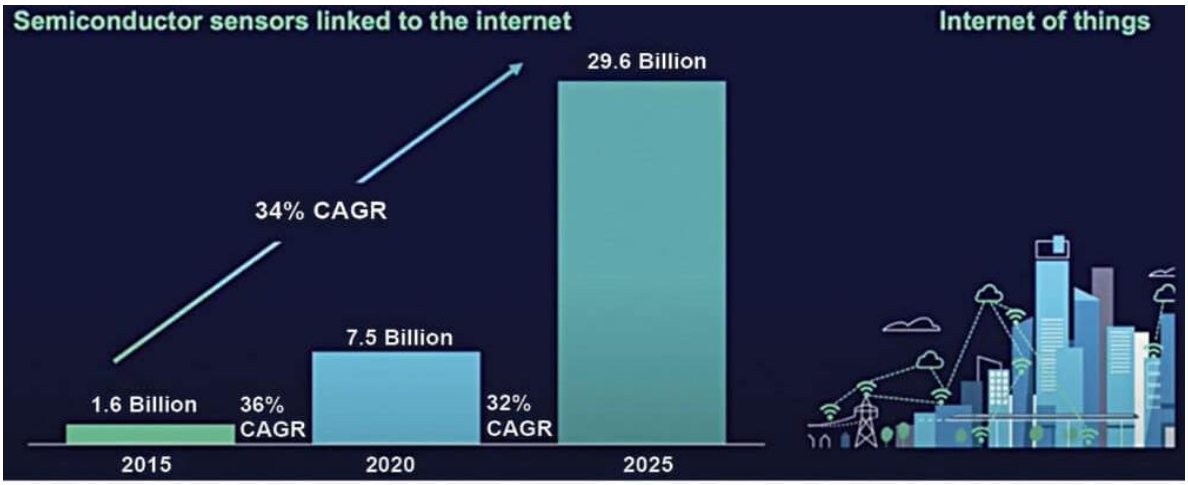

Fig.2: Semiconductor sensors linked to the internet (Abhimanyu 2022)

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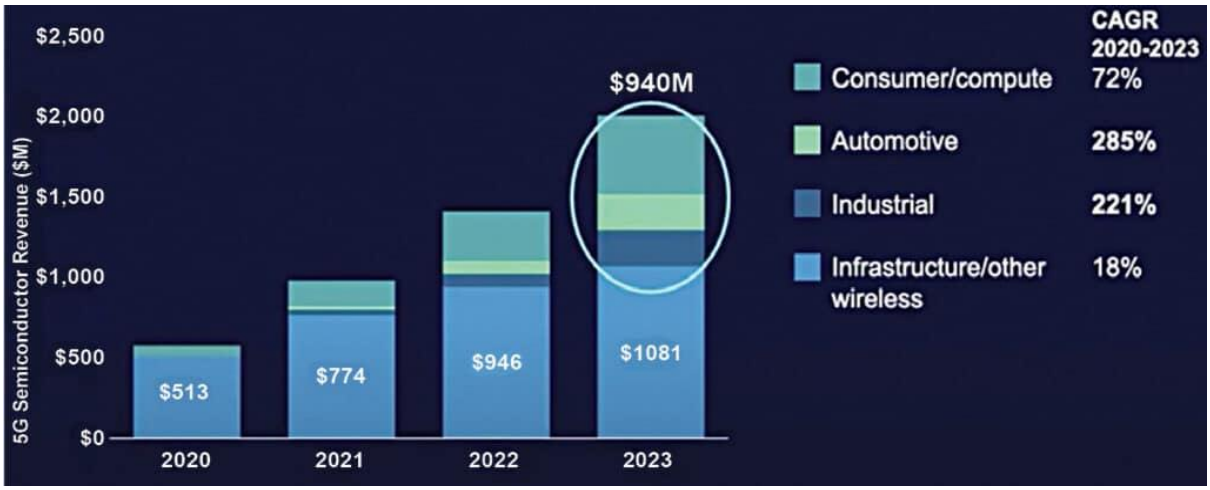

Fig.3: Opportunity in 5G IoT applications (Abhimanyu 2022)

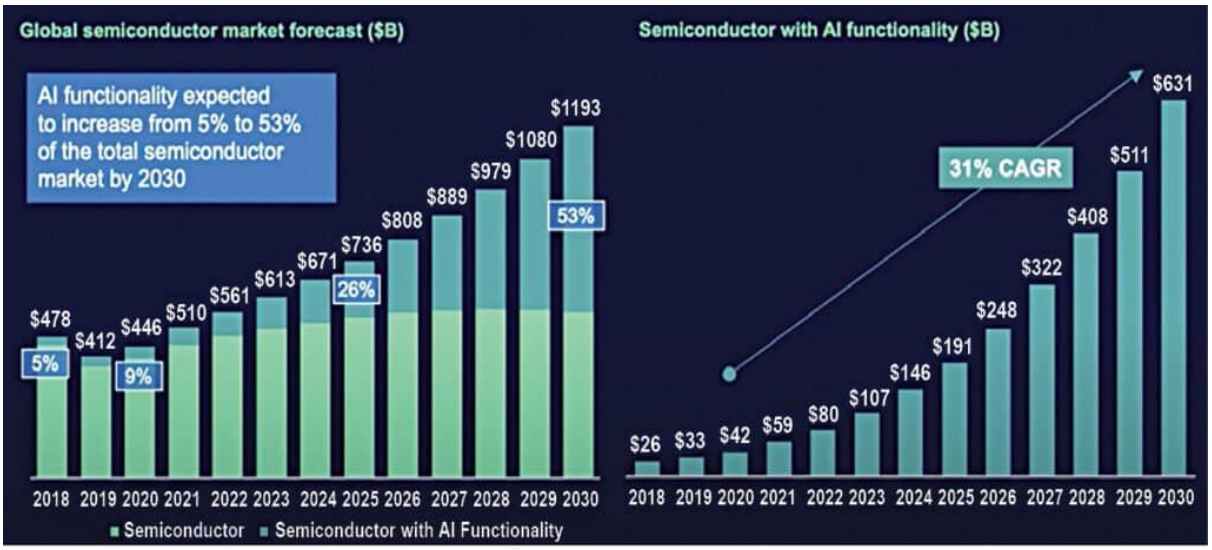

Fig.4: Global semiconductor market forecast (Abhimanyu 2022)

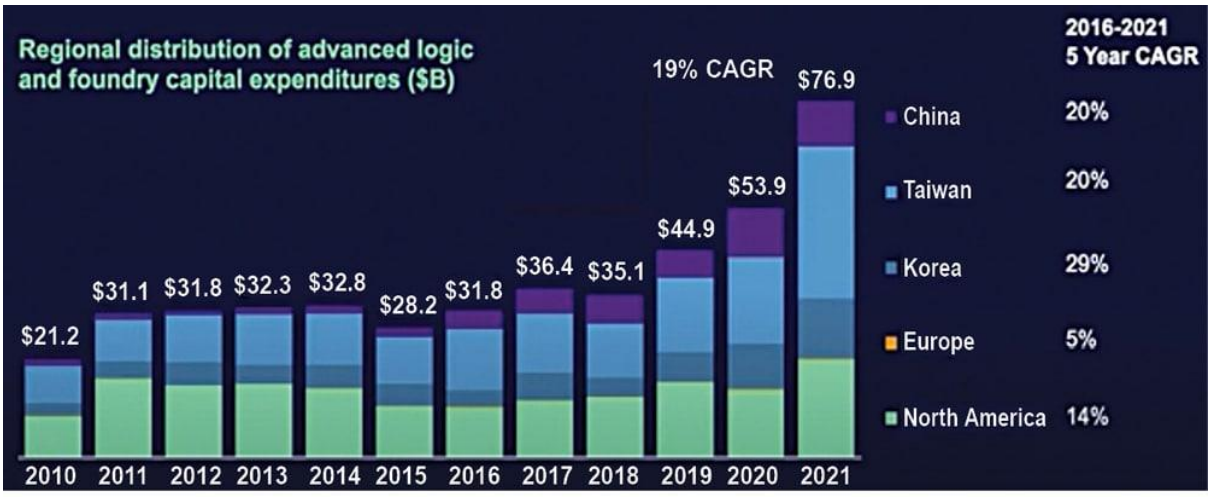

Fig. 5: Logic Semiconductor and foundry capital investments (Abhimanyu 2022)

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