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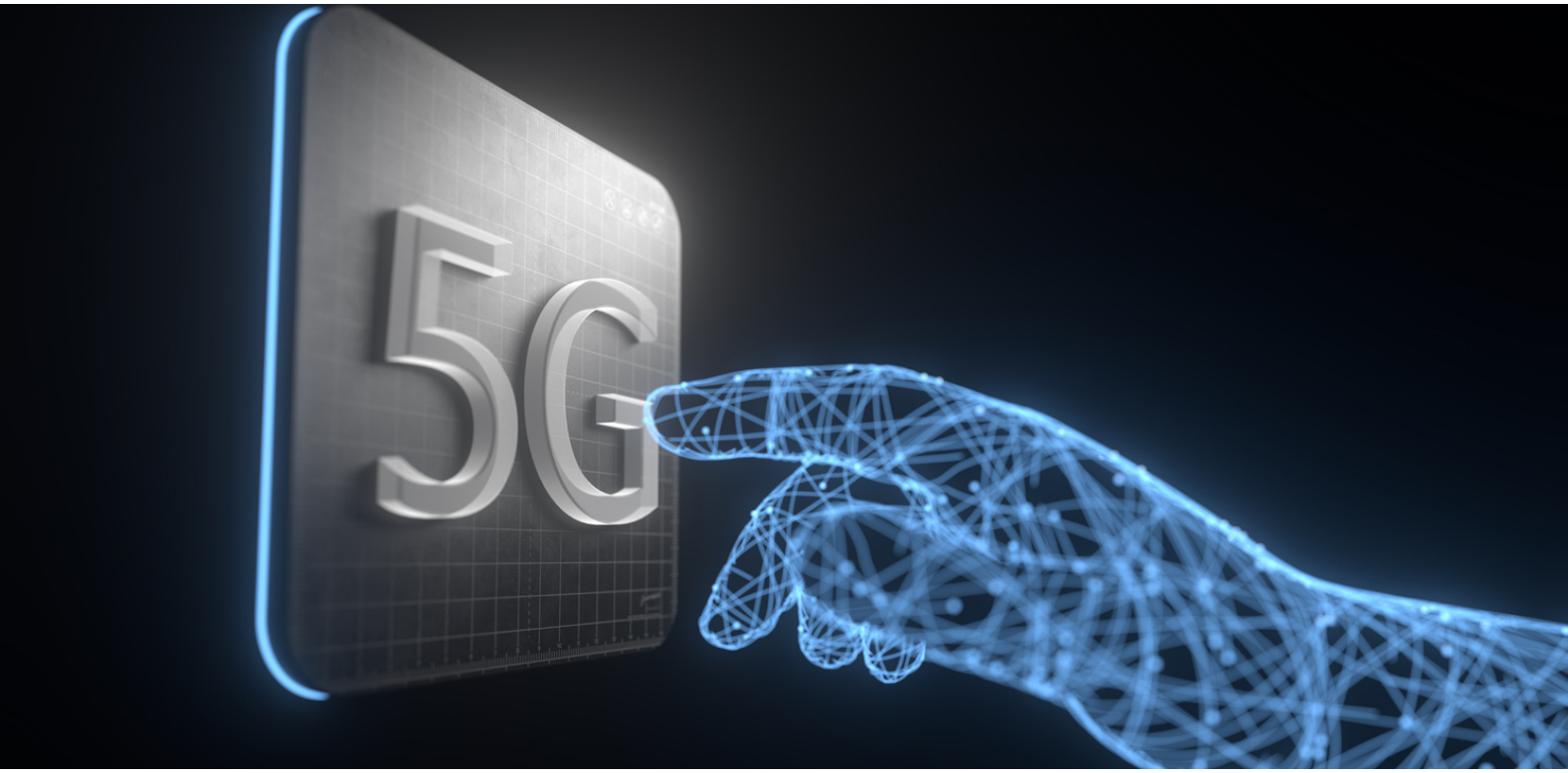
5G INFRASTRUCTURE AND TECH TRANSFORMATION.



Tech transformation

Transport Industry Specific

The information age of the mid-20th century was termed the digital, new-media or computer age. Taking a technological walk down from the Palaeolithic age allows us to appreciate the technological evolution since 1400AD. Today, we have evolved through seven ages from the middles ages.

Analog telecommunication introduced in the 1980s as 1G (1st Generation) has evolved to 2G, 3G, 4G and now 5G.
The digital telecommunication eras has since leapfrogged itself at a radically fast pace but the most significant occurrence happened in July of 2016 with the birth of the 5G. The unexpected spike in mobile devices worldwide was enabled thanks to the internet age that pioneered the way for big data and IoT.
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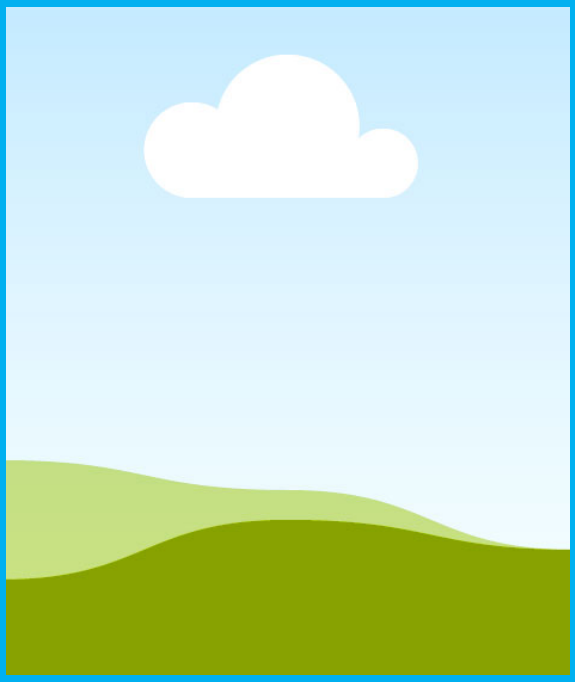
TECH EVOLUTION

5G Infrastructure and Tech transformation.

The retroactively dubbed first-generation mobile technology (1G), was launched in Tokyo, Japan by Nippon Telegraph and Telephone (NTT) in 1979. Due to the many drawbacks, poor coverage, low sound quality, the non-encryption of calls, unavailability of roaming support between various operators and differences in frequency ranges due to incompatibility of operational systems, the 1G paved the way for the next generation coined the digital era(2G).

After GSM launched the 2G in Finland in 1991, it took over a decade for NTT DoCoMo to launch the 3G in 2001 and then came the 4G deployed simultaneously in Sweden and Norway in 2009.
Moving from the “Culture Revolution” (2G) to the “Packet-Switching Revolution” (3G) unto the “Streaming Era” (4G) and now are experiencing the rollout of the (5G) “Internet of Things (IoT) Era”. To materialise the possibilities of physically connecting billions of devices worldwide, 3GPP launched 5G in July of 2016. This brought to reality the unfathomable hypothetical notions purported in the1980s.



WE ARE CENTRAL AFRICA'S DIGITAL HUB.

THE CEO OF CAMEROON TELECOMMUNICATIONS

Mrs. JUDITH YAH SUNDAY ACHIDI

With this layout's easy-to-follow structure and design, creating content for your employees will be as easy as ever. Make sure you use the space wisely by using pictures and captions.

In creating this newsletter, it'll be helpful to keep in mind that the focus should be on the employees more than anything. While it's an opportunity for employees to hear from their higher-ups, it's also a chance to create.

GLOBAL OUTLOOK

5G Infrastructure and Tech transformation.

According to the forecast from the Market Intelligence and Consulting Institute (MIC), the global telecommunication industry will grow by 15.7% this year. This has enabled 5G to stand out as the future tech-reality of our generation due to its scalability for continuous deployment of digital transformation.

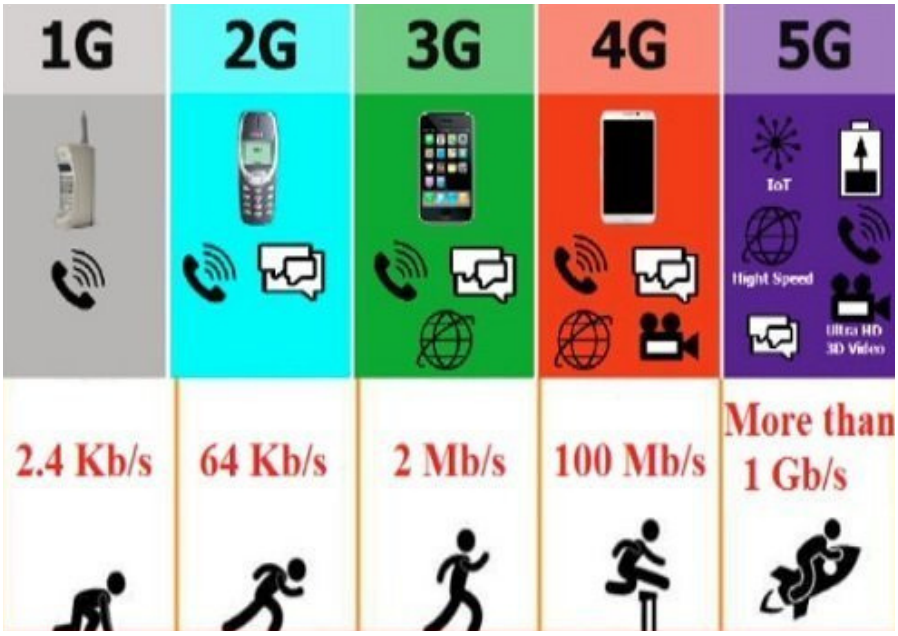
At the close of the 2nd decade of the 21st century, the pandemic plagued economies the world over and even the greatest scientific minds were astounded. The importance of telecommunication and the role of Carrier service providers became more prominent than ever with a historic rise in demand.
From applications to tools or infrastructural adaptations, the quest to pioneer digital-tech solutions in response to the required social and professional adaptions became a marathon.

However, all technological progression over the years until date contributed to amplify the early adoption of transformational technologies around the globe though at varied rates and intervals.

Hitachi is predicting 6billion LTE (4G enabled) connections globally by 2022 because of performance optimisation by telecom operators due to QAM 256, massive MiMo and carrier aggregation.

However, the facilitation of ubiquitous 4G coverage and excellence of built-in digital and mobile applications have led to the optimisation of IoT servers that have responded to the question of future proofing for 4G technological infrastructures.

Presently, the 5G devices of today are backward compatible to 4G network technologies. Telecom Carriers hence must strive researching and developing innovations that will integrate the 6G network solution of tomorrow's 5G devices.



“Let’s go invent tomorrow instead of worrying about what happened yesterday.” – Steve Jobs”

Ericsson predicts that by the year 2024, 45% of global users and 2Billion subscribers will be registered worldwide via the 5G enabled technology.

Robotics, manufacturing and IoT will be hugely impacted by this yet unrivalled tech-game-changer. However, the required infrastructure for full 5G evolution and revolution is set to transform innovation continuously across industries and beyond the enterprise scope.

According to Gartner's latest forecast, the expenditure on 5G network infrastructure this year grew by 39% compared to 2020. This amounts to over USD 19Billion, accounting for 39% of the total revenue from wireless infrastructure in 2021.

Not only does this figure overtake LTE infrastructure spending in general, but it reveals that 5G technological deployment in most developed markets has grown at an extraordinary pace.

Ericsson announced that by the end of 2021, 580Million subscribers will be reached on the 5G network globally with Q1 accounting for 70Million subscriptions at an average rate of 1million subscriptions daily.
This spectacular growth rate historically sets 5G as the fastest adopted generation of all times with 1/3 of global consumers expected to upgrade thereon by the end of 2021 using the over 500 5G commercial devices currently on the market.

The International Data Corporation (IDC) reports that the mobile phone market in Africa peaked in the first quarter of 2021 with 53.3million units.

The Ericsson report correlates to that put forward by Global Data (an analytics company), asserting that by the close of the year 2026, 5G mobile subscriptions will attain 3.9Billion and account to about 35% of global mobile subscriptions.

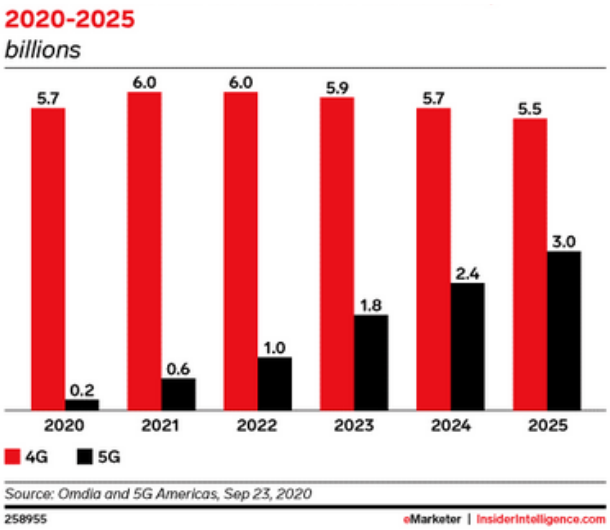
Continent Overview

The race to 5G on every continent could be likened to a "2nd-grade tech-war". The question of who is winning? How are they winning and why are they victorious is quite hazy. Ages have come and gone, today's giants will rise and fall, but it is without saying that the time and tide of technology waits for no man.

While most continents have either already initiated as a collective or plan to launch 5G roadmaps, South America, the Middle East, most of Africa and part of Asia are sort of the tech-laggards in this race against the clock.

Though some tech-players on these continents are seeking to answer the question of "When to commence the Tech-changes for 5G transformation?", others are struggling with how to implement and leverage the 4G know-how.

The International Data Corporation (IDC) reports that the mobile phone market in Africa peaked in the first quarter of 2021 with 53.3million units. This reveals a remarkable growth year-on-year (YoY) with smartphones accounting for 23.4million units, which is 16.8% growth for Q1. The feature phone market rose to 29.9million units for the corresponding period, up by 11.9% amidst a post-pandemic era for recovery.



Regional Perspective

For countries on various continents, there is the growing pressure of assessing between investment in infrastructure for new technologies (5G related) or leveraging on the old (mostly 3G or 4G).

Whether you are reinventing transportation, driving towards smart manufacturing or easing daily operations, the exploration and exploitation of technologically related solutions remains unhinged.

Some parts of Europe like the United Kingdom have 4G infrastructural availability limited to 55% nationwide.

In as much as 5G offers mindboggling innovative capabilities, the infrastructural investment embedded in scaling up therein for emerging and developing regions is considered cost-inefficient. At least % of these regions are not digitalised and a % of the population remains unconnected to the global village. Undeniably, the advantages of 4G infrastructural related solutions are largely under exploited and underutilised in these regions. Most telecom carriers are not operating at maximum capacity and the infrastructural obsolesce or incompatibility warrants upgrades that represent huge capital expenditures.

5G UPDATES

C-band operators are offered a solution to mitigate, block or prevent interference from 5G base stations in proximity of C-band ground terminals. Without the NORSAT solution, telecom operators could experience a total loss of service.

This solution is ideal for maritime terminal applications and rejects terrestrial interference in C-Band (5G, radar and C-Band transmitters)

C-band 5G Interference PLL LNBs

While telecom providers in Africa are jointly driving for a better digital tomorrow, the stagnation in the sub-Saharan region is due to insecurities, wars, climate change and sometimes-regional geographic positioning. Surprisingly, according to the 20th Ericsson Mobility report, the USA is forecasted to register 70million 5G subscriptions by end-2026. In addition, it highlights the rise of mobile subscription in the region from a post-pandemic world to 76%.

Country Specifics

The most digitalised countries in Africa turn to be those along the coast while the enclaved countries experience high cost of internet from Carrier grade solution providers. In the C.E.M.A.C region, central African republic and Chad are the less digitalised and less connected of all the others with Cameroon, Gabon and Equatorial Guinea being the most digitally advanced.

For countries of the C.E.M.A.C, the Tier 3 international carriers operating on the market mostly leverage on 2G, 3G and 4G though the concept of 4.5Go has been marketed by telecom companies operating therein.

In Conclusion

While universities and tech corporations are forming alliance for the future with 6th Generation research and development flagship programs, funding stakes on the other hand, seems to be the bottleneck to our technological future. Though the telecom industry's readiness and adoption of 5G is largely differentiated between continents and regions, countries have embarked in some cases on a solo tech- pilgrimage for the journey to 6G.

Germany, China, Singapore, Finland, Brazil, USA and South Korea are some of the countries betting on 6G today.

The fifth generation tech-growth has triggered the global demand for semi-conductors especially as the growing share of the 5G chip continues to rise.

In 2021 alone, MIC estimates a growth value of USD 522billion for semi-conductors with mobile phone chips to be worth a whooping USD 147billion, up 23.3% from last year. The growth momentum is expected to continue in 2022 with a 12.7%.

Hence, telecom carrier-solution providers are required to plan for capacity and infrastructural upgrades in the hope of serving their clients and satisfying the current market dynamics while considering future prospect's potentials.

5G novel services and its largescale commercial use gained prominence in 2020 due to the covid-19 pandemic.

The traditional centralised deployment architecture of 4G core networks changed with respect to the new generation requirements. Globally, operators have been deploying the distribution of their 3-level telecom cloud architecture; MEC, Edge DC and Core DC as seen below

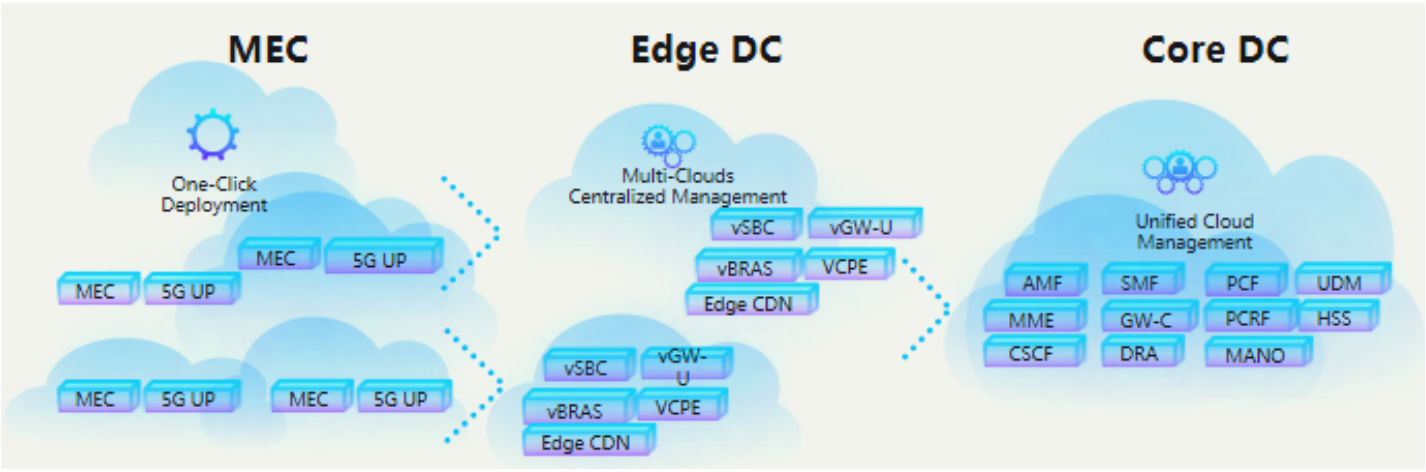


Fig 1.a: 3-level telecom cloud architecture
Source: Telecompaper.com

For operators to create a new future in the 5G era, telecom cloud network seems to be the most feasible solution. Today, carrier solution providers are poses with 4-new requirements that includes:

- Network capability for self-adjustment and self-analysis;
- A reliability rate of 99.999% for carrier-grade solutions for swift fault detection and restoration on the network;
- VNF and IPN network mapping of one-to-one to realise service to network end-to-end orchestration;
- Pool-based scheduling DC resources to accomplish a flexible deployment of virtual network elements across servers or DCs.

In response to these four new challenges, the NFVI cloud solution by ZTE based on intelligent distributed carrier grade technology seems ideal for 5G service deployment on cloud networks as represented below

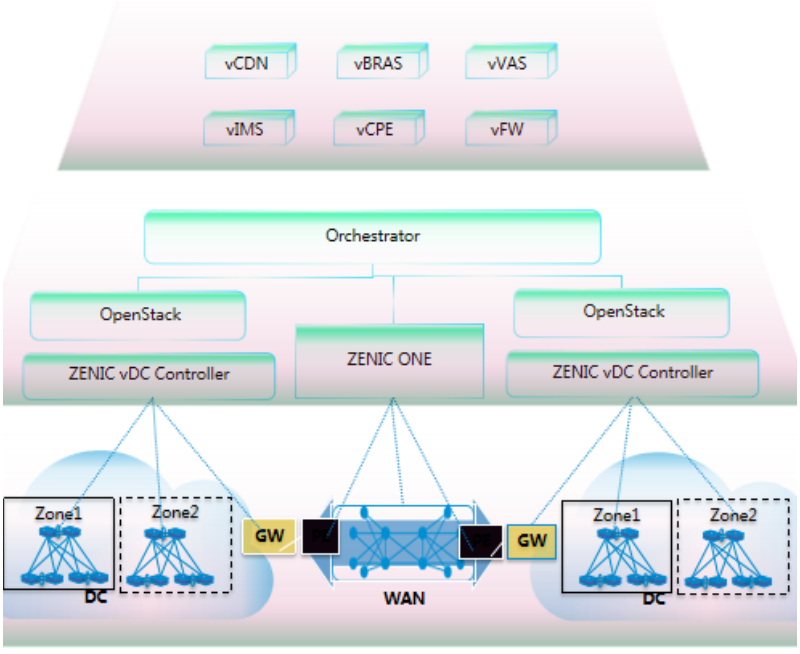


Fig 1.b : Distributed 5G telecom cloud network architecture
Source: Telecompaper.com

BENEFITS OF ZTE CLOUD BASED 5G-SOLUTION

- A flexible and rich routing protocol enabling pool-based scheduling of resources by using FDDR (floating dynamic distributed routing);

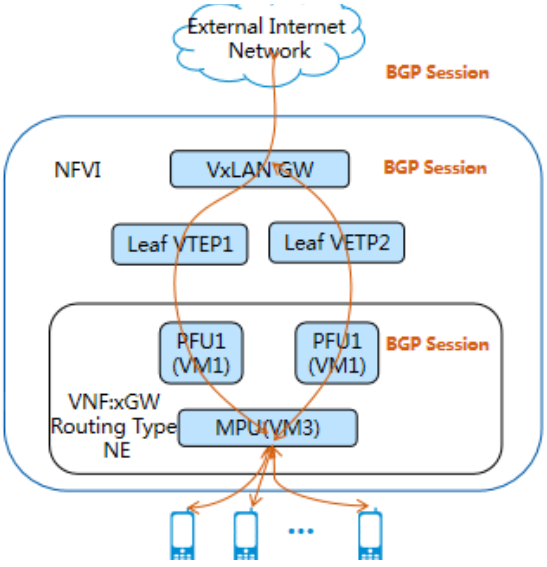


Fig 2a : FDDR Functionality
Source: Telecompaper.com

- For fast fault detections and carrier-grade reliability of 99.999%, the integration of a massive bi-directional forwarding detection (BFD);

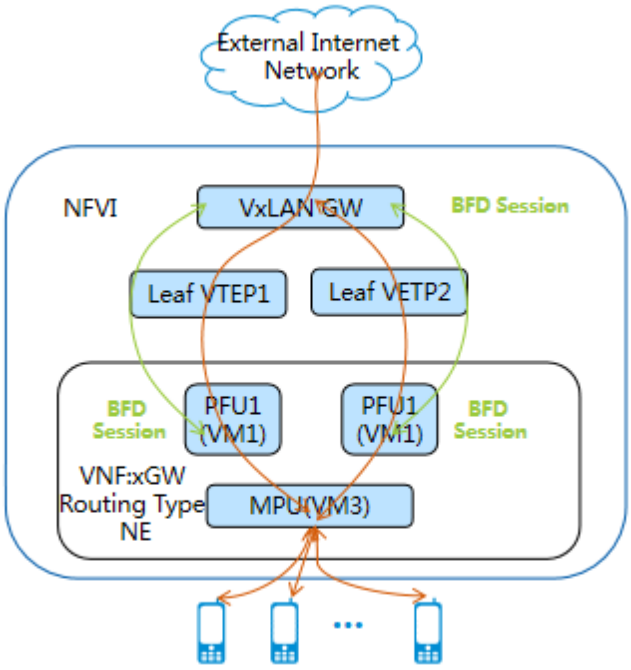


Fig 2b : BFD functionality diagram
Source: Telecompaper.com

- To achieve real network adjustment with cloud, ZTE used a unified orchestrator by combining; SDN gateway to LA-L7services with ZENIC vDC controller and Spine-leaf switch.

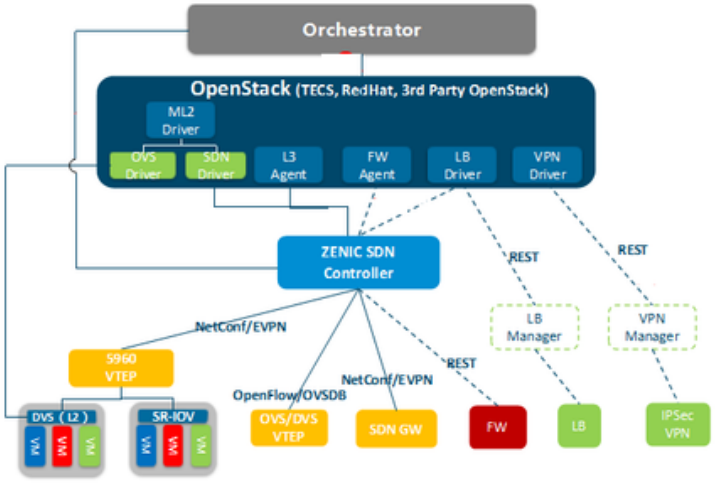


Fig 2d : Cloud and network synergy solution
Source: Telecompaper.com

- With regards to self-healing and self-learning, an intelligent network maintenance and operations autonomous SDN solution based on tap as service TAAS on open stack ;

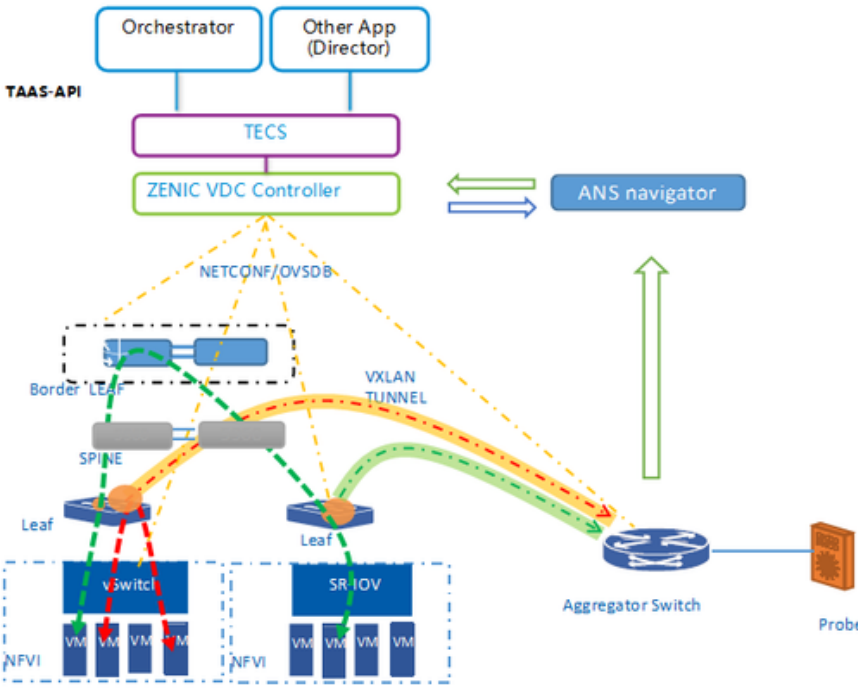


Fig 2c : TAAS traffic and network self-learning Analysis
Source: Telecompaper.com

ZTE successful deployment of its 5G telecom cloud solution paving the way for a new future in 5G will allow POC project facilitations and the fulfilment of commercial ventures globally.

The 4G fundamentally based on the multiple input multiple output (MIMO) and orthogonal frequency division multiplexing (OFDM) technologies aligned to two principal standards being the LTE and WiMAX, the transitional long term evolution to 4.5G and 4.9G LTE advanced-pro, have led the way for the 5G era to blossom.

The massive MIMO and LI-FI are the key technologies on which the 5G is based, notwithstanding, not all mobile devices will be adaptable to the 5G because the ecosystem for 4.5G and 4.9G is still unconquered.

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