

Whitepaper



**Cellular Technology Transitions and
Potential for SoC Players**

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Executive Summary

Each technology shift brings with it opportunities for players across the value chain, and the arrival of 5G highlights this in many ways. Operators across key markets are looking to upgrade from 2G/3G to 4G in order to allocate more spectrum to support data services, and the arrival of 5G is unlocking new capabilities and services like Enhanced Mobile Broadband (eMBB), Massive Machine Type Communication (mMTC), and ultra-reliable Low Latency Communication (uRLLC).

This is resulting in a transition between different technologies and the emergence of a new technology order: 2G and 3G networks, which have coexisted for nearly 20 years, are being progressively phased out, while 4G and 5G are set to become the dominant networks over the next decade.

This generational technology shift presents both challenges and opportunities, and the role of ecosystem players including operators, devices OEMs, component makers and software players will be crucial to enable a smooth transition. Baseband players in particular, are well positioned, as the business expands rapidly from mainly mobile phones to the broader universe of cellular connected devices to create a market worth US\$38.7bn by 2024.

Global Handset Market Landscape by Cellular Access Technology

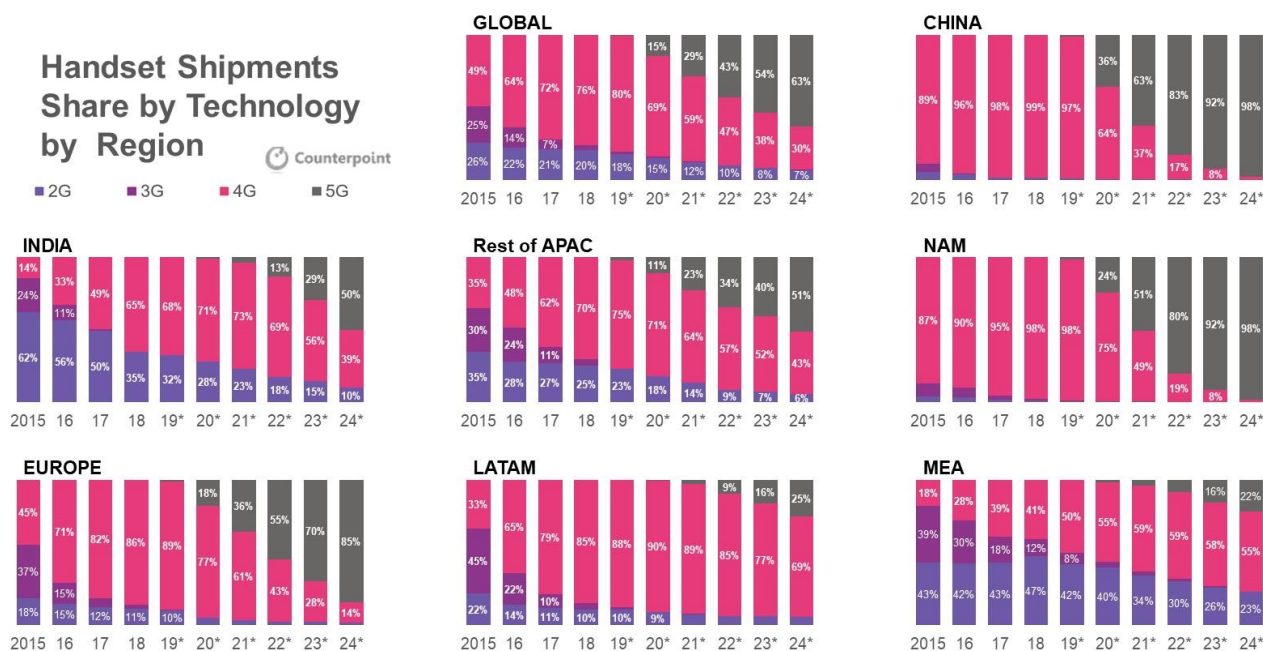
On average, there is a 10-year difference between any two technology transitions, with this decade's primary technology being 5G. Over the next five years, we estimate 5G subscription uptake will be significantly faster than LTE when it was introduced, though the two technologies will continue to co-exist through the period.

5G will be a key driver for smartphone shipments moving forward. We expect a strong uptick for 5G subscriptions in China, where the big three operators together launched 5G commercial services in 2019. The US, China, Japan, Korea, and countries in Europe will be the major drivers of 5G shipments initially.

However, over the next five-year transitional period, 4G will also play an important role especially in emerging markets, where 4G smartphones are now making inroads into the sub-\$50 segment. Combined with many markets still having 4G penetration rates below 50%, there is significant room for growth.

2G and 3G will necessarily decline as various countries decommission those networks and focus on 4G, which will remain the dominant mobile access technology for handsets over the medium term. Regionally, 4G dominance will be driven by India, Middle East/Africa, Latin America and RoAPAC, as shown below.

Exhibit 1: Global handset shipment share by region and cellular technology



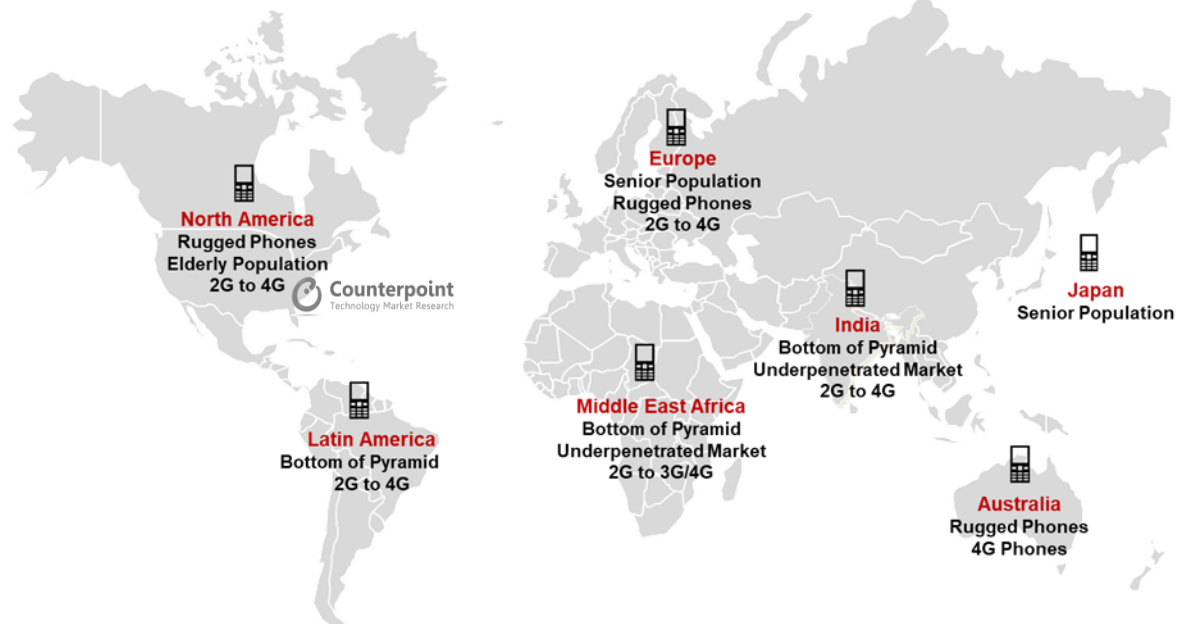
Source: Counterpoint Research.

Smartphones have become ubiquitous across developed and emerging markets alike, but the feature phone segment will be relevant for the next five years, mainly driven by markets like India and Africa.

There are currently around two billion active feature phone users globally, supporting sales of over 350m devices annually. Most of these feature phones come in a basic candy-bar or clamshell form-factors, have either a color or monochrome display of under four inches, a T9 keypad, and basic 2G connectivity with voice, SMS and GPRS/EDGE capability.

This category represents untapped potential in many emerging and frontier markets, where users at the bottom of the economic pyramid will continue to demand affordable devices. Across other consumer segments, different underlying factors make feature phones the preferred mobile despite the tremendous adoption of smartphones globally. Feature phone use cases vary by region and tend to depend on a markets' level of maturity. Demographics, economics, device durability and ruggedness, battery life and illiteracy rates are just a few of the factors determining continued demand for traditional feature phones.

Exhibit 2: Key feature phone use cases by geography



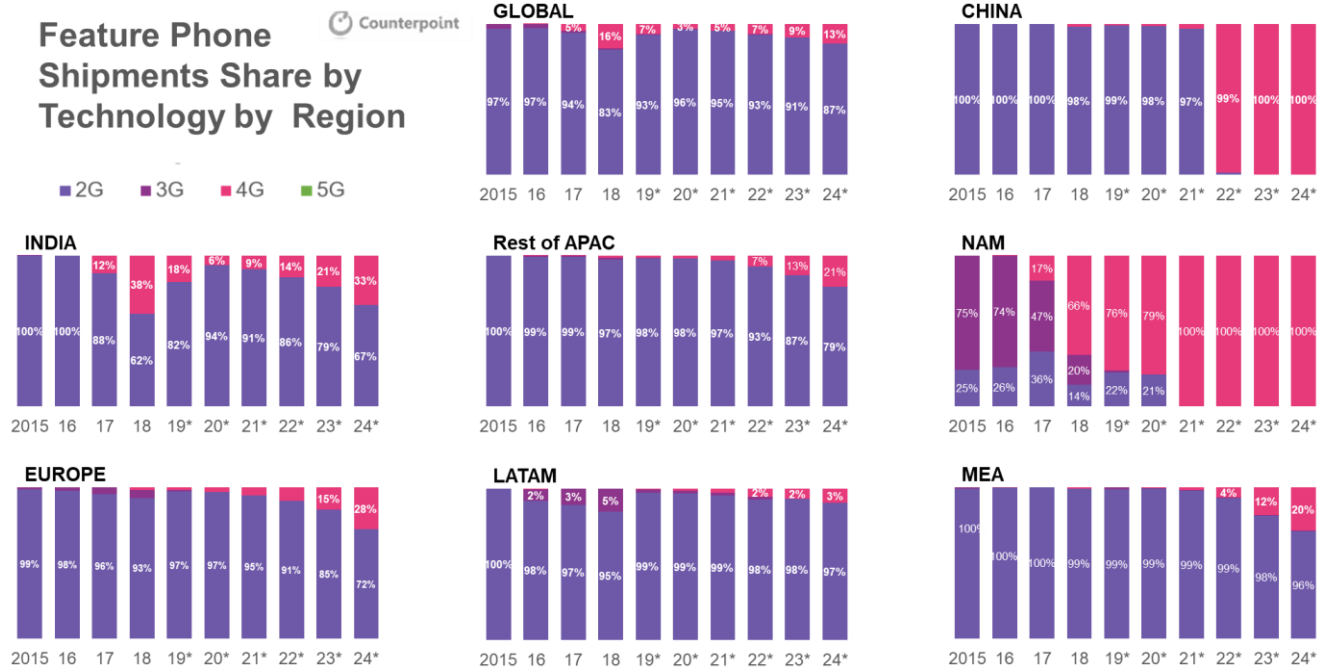
Source: Counterpoint Research.

Across the broader feature phone segment, India and Middle East Africa will continue to be the main regional drivers moving forward. Together, they will account for 740m devices sold – around three-quarters of all feature phone shipments globally over the next five years.

Traditional bottom-of-the-pyramid users buying basic devices will account for a large share of demand, but we are also seeing growth in devices which are improving both in terms of performance and screen size.

These enhanced feature phones provide a compelling product offering which caters to a diverse user base which continues to buy and use feature phones even when they can afford smartphones. Indeed, there is rising adoption of 4G capable feature phones across different regions; Reliance's Jio Phone in India is a good example, and these types of devices will drive significant growth and additional revenue opportunity for ecosystem players moving forward.

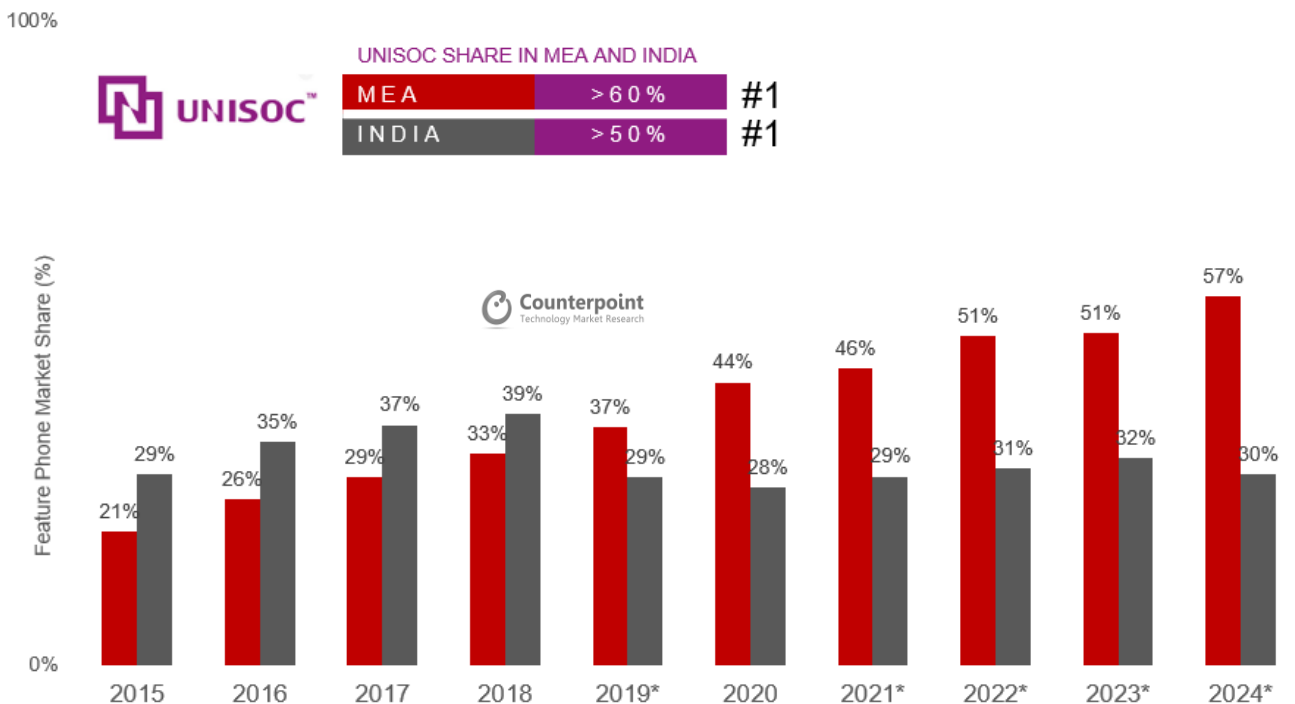
Exhibit 3: Global feature phone shipments share by technology and region



Source: Counterpoint Research.

India will remain the world's largest single feature phone market through 2024, followed by Bangladesh and Nigeria. Recent segment growth has been driven by the revival of Nokia-branded feature phones, steady growth of brands such as itel and Tecno across African markets, and in particular, popularity of more capable feature phones like the Jio Phone in India. The emergence of feature-rich 4G feature phones running a customized OS (like the True Superhero 4G) is now spurring component players to launch solutions in order to monetize the segment. A good example of this is UNISOC's T117 solution for 4G feature phones, which has helped the company dominate the feature phone segments in key regions.

Exhibit 4: Feature phone global market share, MEA & India 2015 – 2024; UNISOC's share of feature phone basebands, 2019



Source: Counterpoint Research, UNISOC.

As highlighted earlier, there is a broad range of usability and macroeconomic considerations that make feature phones relevant to large sections of the population. Age, access to electricity, income level and literacy are just a few of the factors that can determine the number of feature phone users in a given market.

Counterpoint Research has assessed and scored key markets based on 13 such factors to estimate market potential for feature phones. The top 20 countries listed below represent around 90% of the feature phone opportunity over the next three years. Most are developing economies, especially in Africa, Asia, and parts of Latin America, where literacy rates and income levels are lower while other socio-economic barriers remain high.

Exhibit 5: Feature phone market opportunity index

Country	Poverty	Internet Penetration	Non Mobile Subscriber	Electricity Access	Literacy	Urbanization Rate	Unemployment	Elderly Population (>60)	% of 2G Connections	Population living in slums (% of urban population)	Internet Affordability	GDP Growth Rate	Mobile money account, poorest 40% (% age 15+)	Score
Kenya	26	27	25	24	19	26	17	5	28	27	26	17	30	297
Ethiopia	24	29	29	26	29	29	7	9	21	28	29	30	1	291
Tanzania	27	20	27	27	15	30	15	6	22	23	24	27	27	290
Mozambique	30	26	28	29	27	28	3	7	20	29	28	13	21	289
Chad	25	30	30	30	30	25	4	2	29	30	30	1	18	284
Bangladesh	19	28	23	21	25	22	1	14	26	25	23	28	23	278
Rwanda	29	24	18	28	24	19	8	3	23	24	27	20	24	271
Cambodia	17	14	6	25	17	23	30	16	18	25	17	26	17	251
Ghana	16	22	22	20	21	24	11	10	10	17	20	29	28	250
Nigeria	28	18	26	22	27	26	5	4	30	22	19	5	13	245
Pakistan	12	19	24	14	26	18	20	12	24	20	2	19	15	225
India	23	23	19	18	22	15	19	20	16	13	8	21	7	224
Myanmar	13	15	21	23	7	8	29	23	6	19	12	23	5	204
Vietnam	8	11	5	1	5	20	27	26	25	15	25	24	8	200
Iraq	6	25	20	1	14	21	6	8	27	21	21	2	14	186
Indonesia	14	17	10	16	7	14	24	18	13	10	6	18	10	177
South Africa	20	9	14	19	7	10	2	21	12	12	22	7	22	177
Philippines	15	10	11	17	4	11	23	13	14	18	9	22	6	173
Iran	1	16	12	1	13	6	10	19	19	16	12	14	26	165
China	5	7	3	1	3	16	25	28	1	14	5	25	29	162

Source: Counterpoint Research.

This opens windows for growth in the feature-rich 4G segment as it offers a ‘best-of-both-worlds’ solution solving many existing problems. These devices are proving ideal for the existing feature phone users that find it difficult to upgrade to smartphones with costly high-speed data services.

Markets in Africa, especially Kenya, Ethiopia, and Tanzania, have the highest potential for basic and enhanced 4G feature phones. In terms of total addressable market (TAM), India, Bangladesh, Nigeria, Pakistan, and South Africa remain the key markets.

4G Feature Phones to Drive 2G Upgraders

Poverty impacts highly in our feature phone market opportunity index, scoring above 20 in almost half the markets covered. It is correlated with other factors like internet penetration, literacy rates, access to electricity and population living in slums – all of which can be major barriers to adoption of smartphones.

4G feature phones serve as a perfect middle ground between feature phones and smartphones, reducing the barriers to access the digital world. The device lets users experience social media, gaming apps, online shopping, streaming content services, and more, all optimized for a smaller screen. 4G feature phones also retain other traditional feature phone benefits like longer battery life and affordability.

Over the longer term, 4G feature phones can help 2G users migrate to smartphones – once introduced to smartphone-like features, usage patterns users are likely to change permanently, helping drive transition to smartphones when economic conditions allow.

This extended, “mature migration” also opens opportunities for new business models and revenue streams for players across the value chain. The network transition and application ecosystem opens new monetization avenues for telcos and expands average revenue per user (ARPU) beyond mainly voice and SMS services.

Although basic feature phone shipments are shrinking, the 4G segment remains poised for growth. Major markets driving sales include the US, South East Asia, Africa, and, the biggest contributor, India.

LATAM, and in particular Africa, have already seen broad adoption of 3G/4G feature phones like the Positivo P70S, Multilaser Zapp and Logic B5S based on customized OSs. We believe Africa will be the next most important market for 3G and 4G feature phones after India, and more brands are expected to launch their devices over the short-to-medium term.

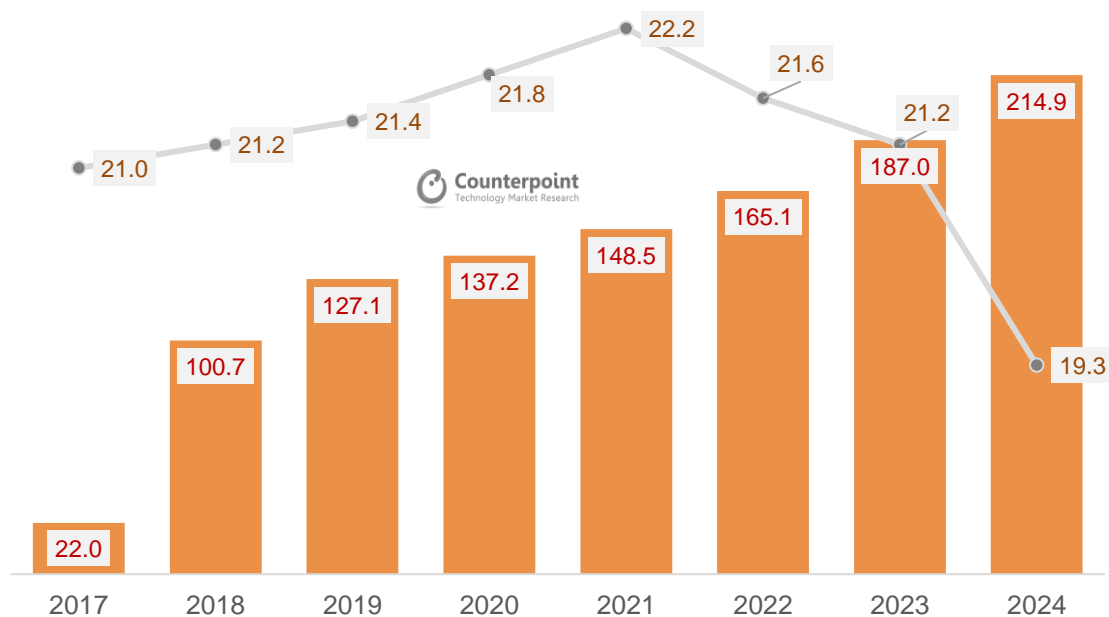
Nine out of the top 20 countries with the highest potential for 4G feature phones are in Africa, with close to 15 brands having a 3G/4G feature phone portfolio (including RTOS-based devices). Partnerships with operators will help brands grow this segment regionally. So far in 22 African countries, handset makers have officially partnered with operators to launch their devices.

Other growth drivers come from the component side, with chipset solution providers playing a key role with the introduction of new, affordable, compelling solutions. A good example is UNISOC, which recently delivered a highly integrated chipset design geared specifically for the mass market. With strong demand for 4G feature phones emerging, the company launched its T117 platform during India Mobile Congress 2019.

This 4G feature phone chipset integrates LTE/WCDMA/GSM modem, BT/FM and favorable multimedia functions, and has built-in LPDDR to enable the smallest possible footprint. The chipset also supports HD Voice, VoLTE, and LTE dual-SIM dual-standby, significantly improving the calling experience from basic 2G devices. Striking a balance between cost, performance, and power consumption, UNISOC's T117 family is an ideal 4G smart feature phone platform targeting basic internet users with budget considerations.

To achieve scale in the African market, 4G feature phones need to be cheaper than even US\$20. Although Counterpoint sees 4G feature phone ASPs actually rising through 2021, devices are available at much lower prices in other countries like Pakistan, which have launched at \$11 (QMobile 4G Plus), offering a high value proposition to consumers; RTOS-based feature phones can start as low as \$7. 4G feature phones have carved out a place between basic feature and smartphones, positioned as affordable solution for high-speed internet access and data services.

Exhibit 6: Cumulative 4G feature phone shipments (m units) & ASPs



Source: Counterpoint Research.

The success of devices like the JioPhone in India has renewed interest in tapping into the potential opportunity of upgrading basic feature phone users with enhanced 4G feature phones. Segment growth will depend on the balance of the three most important factors – device affordability, internet affordability, and relevant content. Partnerships among device OEMs, operators, operating systems (RTOS, AOSP), chipset players, and others in the ecosystem will remain key to managing this balance.

Exhibit 7: Popular 4G feature phone models powered by UNISOC

Region / Carrier	Brand	Model	Chipset Platform
MEA / Orange	itel	Sanza XL	UNISOC SC9820E based 4G Smart Feature Phone
MEA / Vodafone	Vodafone	V400	UNISOC SC9820E based 4G Smart Feature Phone
India / Reliance Jio	Reliance Jio	JioPhone	UNISOC SC9820E based 4G Smart Feature Phone
Global	Nokia	Nokia 220	UNISOC UIS8910FF based 4G Feature Phone

Source: Counterpoint Research & UNISOC.

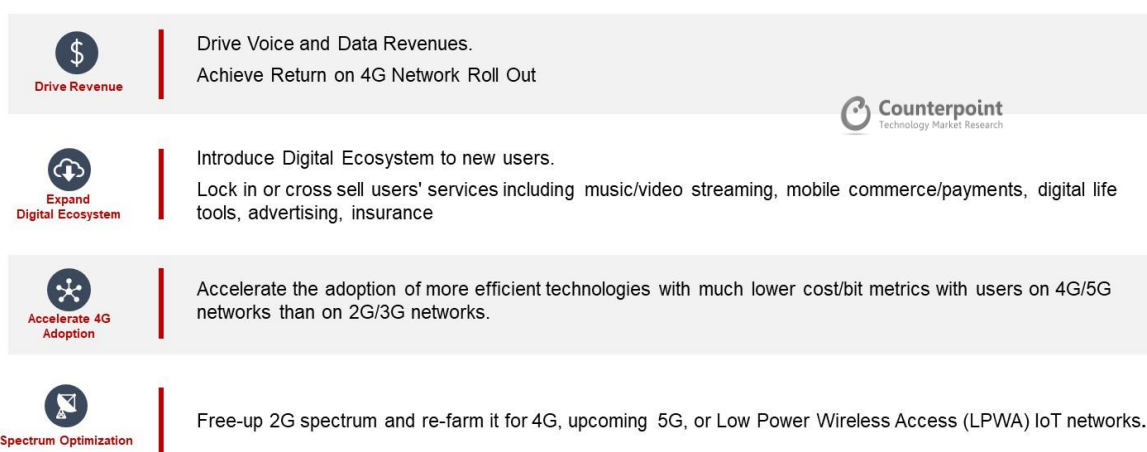
Why 4G Feature Phones Are Relevant for Operators

From driving revenues to saving costs, 4G feature phones have the potential to create significant value – and there are four key areas operators can focus on.

Exhibit 8: Opportunity for operators

Migration from 2G - Value Creation for Operators

US\$ 7 Billion in connectivity service revenues to be generated cumulatively, between 2019 and 2021 through smart feature phones.

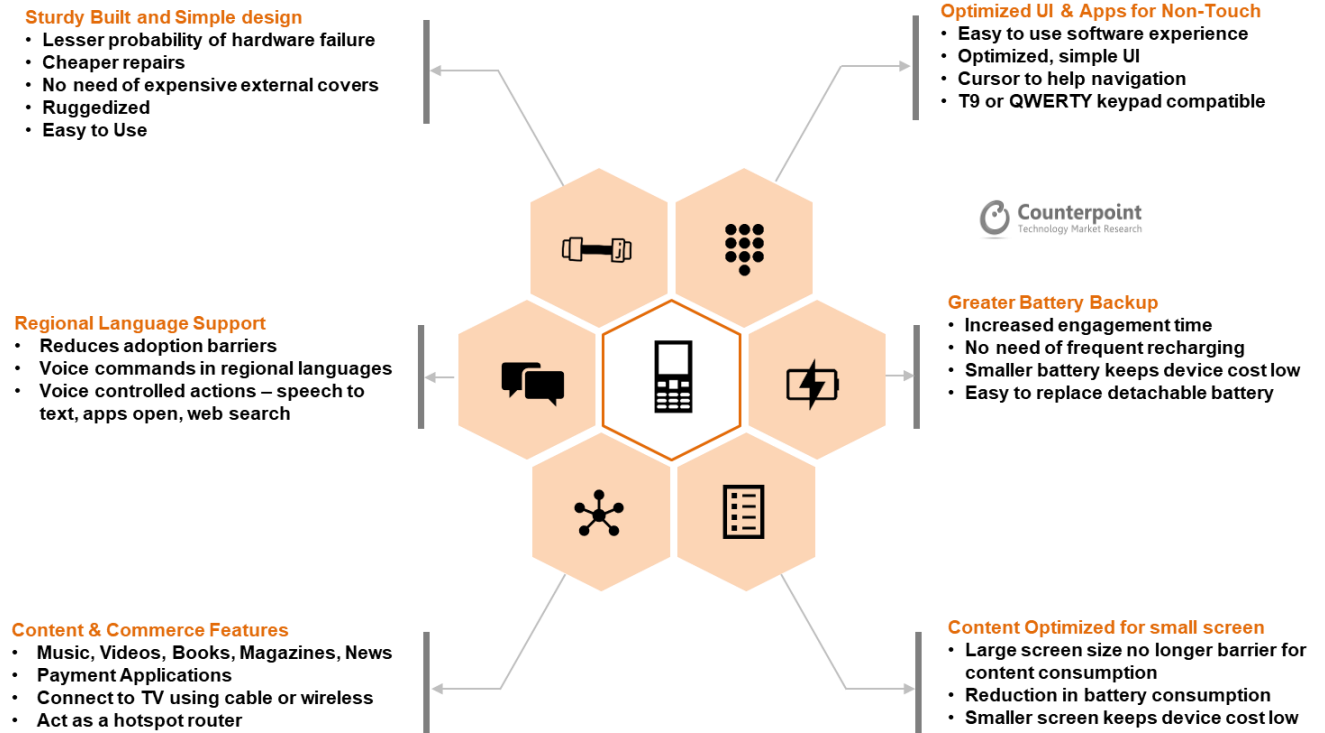


Source: Counterpoint Research.

- **Data usage & ARPU:** Operators can provide data-related services to consumers who were previously only using voice services. Reliance Jio in India, which runs a 4G-only network, has more than 50m customers using 4G feature phones. While the voice component is free, the operator has successfully opened new revenue streams with high levels of data consumption – close to 7GB/user/month – for Jio Phone users.
- **Expand digital ecosystem:** Operators are transitioning traditional voice users to data-users by introducing them to the digital ecosystem. Operators can either lock-in or cross-sell a range of services including music/video streaming, mobile commerce/payments, digital life tools, advertising, insurance and others.
- **Accelerate advanced cellular networks:** Perhaps the biggest benefit for operators from 4G feature phone take up is the opportunity to accelerate adoption of more efficient technologies which have much lower cost/bit metrics with users on 4G/5G networks than on 2G/3G networks.
- **Freeing Valuable Spectrum:** By shifting 2G users to more efficient 4G, this will help operators free-up 2G spectrum and re-farm it for 4G, and upcoming 5G, or Low Power Wireless Access (LPWA) IoT networks, providing a broader range of business opportunities beyond just voice.

Finally, 4G feature phones retain many of the positive attributes of basic feature phones, while offering users much more, especially in terms of available content.

Exhibit 9: Unique functionalities of 4G feature phones



Source: Counterpoint Research.

4G Network Upgrades

There is an ongoing wave of global network upgrades happening as 4G has become mainstream. Until now, older 2G and 3G technology coexisted alongside 4G, but the arrival of 5G means these older generations will need to be phased out. Hence, operators across key markets are looking to migrate users to 4G in order to allocate more spectrum for data services.

The advantages of 4G over previous generations is well documented. It is more spectrally efficient than 2G and 3G. Operators enjoy higher investment returns, and users can enjoy enhanced services like VoLTE HD at the same time. Due to its higher download speeds, an LTE network is an ideal solution for transmitting richer and multi-stream data quickly and securely as it allows for significantly higher throughput than both 3G and 2G solutions. Also, LTE networks offer 10 times lower latency compared with 3G and 2G networks. This is a critical improvement for M2M applications such as industrial alarms and controls, traffic systems, and devices that control sensitive machinery.

In western markets such as North America (USA, Canada) and Europe (Switzerland, Netherlands, Norway, UK), as well as in Asia and Oceania (Australia, Singapore, Taiwan, Japan) operators are shutting down 2G (and in some cases 3G) networks over next 12 to 30 months. These operators will move millions of 2G/3G users to 4G networks to free up the valuable spectrum and underlying network resources.

The decision to turn off the 2G or a 3G network depends on various factors and it will vary by region, by operator and subscriber counts on respective networks. For example, transitioning voice subscribers means to transition towards the VoLTE technology, adoption of which is still only 30-35% in some countries.

Additionally, transition also needs to be looked at from IoT and M2M connections viewpoint, as these applications have traditionally leveraged 2G networks for their operations. Apart from this, differing regulatory scenarios across markets can delay or accelerate the transition, depending on the guidelines and approval mechanism.

Overall, we believe that while the 2G/3G transition to 4G is inevitable, the rate at which this occurs will be different across not only regions but also countries. Below is a brief regional update from operators and other announcements.

North America

All the major operators have already shut down or announced their 2G/3G migration plans. AT&T shuttered 2G operations in December 2016 and announced its 3G network will shut down after December 2021. T-mobile will be shutting its 2G operations after December 2020 but has yet to make any announcements on 3G migration. Verizon is shutting down CDMA operations after December 2020, while Sprint will do so in Jan 2023.

In Canada, leading operators Telus, Bell, and Rogers shut 2G networks in 2018 and 2019, while 3G networks will close after December 2025 for all three operators.

Europe

European operators have mixed take on network migration. Indeed, it is the only region where turning off 3G networks is prioritized over shutting down 2G networks. One of the reasons is due to the massive roll-out of M2M and IoT services which are based on 2G networks. Vodafone has announced that it will not shut down the 2G network before 2025 while it will be shutting down its 3G services in Europe by 2021. Other operators like Telenor, Deutsche Telekom, T-mobile Netherlands have also announced 3G shut down after December 2020. Swisscom will shut down its 3G network after December 2022. Very few operators have publicly announced their plans to shut down 2G networks. Among them is Swisscom which will shut down their 2G networks after 2020 while Sunrise has already initiated its 2G shutdown in 2018.

China

China still has around 200m users accessing 2G/3G services and the country is likely to keep the networks running for two more years. China Mobile will shut its 3G network first, while China Unicom will be the first to shutter 2G operations.

APAC ex-China

Operators in Asia ex-China are prioritizing shutdown of 2G over 3G. Countries like Japan, South Korea, Australia and Singapore have already closed 2G networks, while Thailand, Taiwan and Vietnam are planning to shut down post-2020. Very few operators have announced plans to shut down their 3G networks; Bharti Airtel in India, Digi in Malaysia, Telenor in Pakistan and DTAC in Thailand have plans to shut down 3G networks post-2023.

LATAM

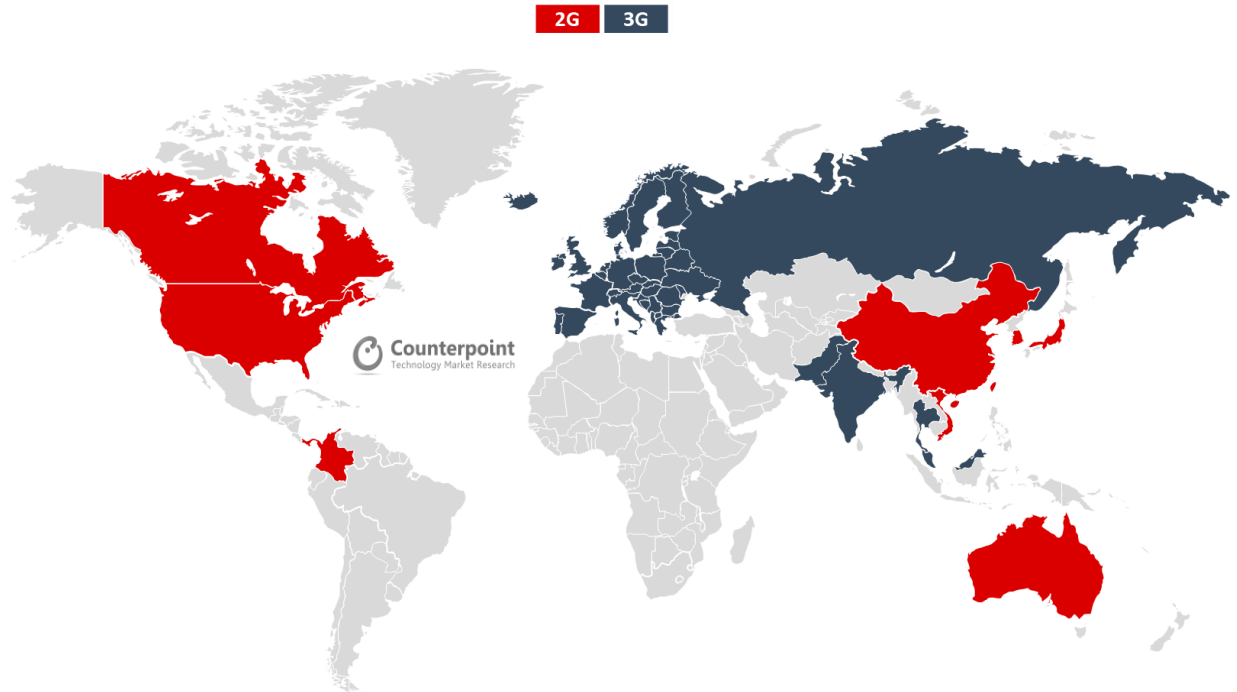
LATAM will take some time to shut down its 2G/3G networks. Colombia is the only country that has announced plans for the faster transition of 2G/3G to 4G. Other countries in the region are still waiting for regulators to define roadmaps. Massive 2G M2M deployments will make it difficult for operators to completely shut down 2G in the immediate future.

Middle East and Africa

While 2G/3G to 4G transition has already started in the Middle East, Africa is likely to remain on 2G for the longest period. With VoLTE penetration poor, and a sizeable installed base of 2G users, no operator in Africa has announced any 4G migration plans. The region is likely to retain significant 2G/3G users even beyond 2025, with 3G to 4G transition the likely scenario in the near term.

Exhibit 10: 2G and 3G network shut down preference by region

2G and 3G Network Shutdown Preference by Regions



Source: Counterpoint Research.

The 5G Era: Unlocking New Capabilities

5G will not be just about speed, and the transition from 4G to 5G will be far more radical than 3G to 4G. New capabilities unlocked by 5G NR like Enhanced Mobile Broadband (eMBB), Massive Machine Type Communication (mMTC) and ultra-reliable Low Latency Communication (uRLLC) will open up new applications in IoT, content, and mission-critical services like autonomous cars and real-time gaming.

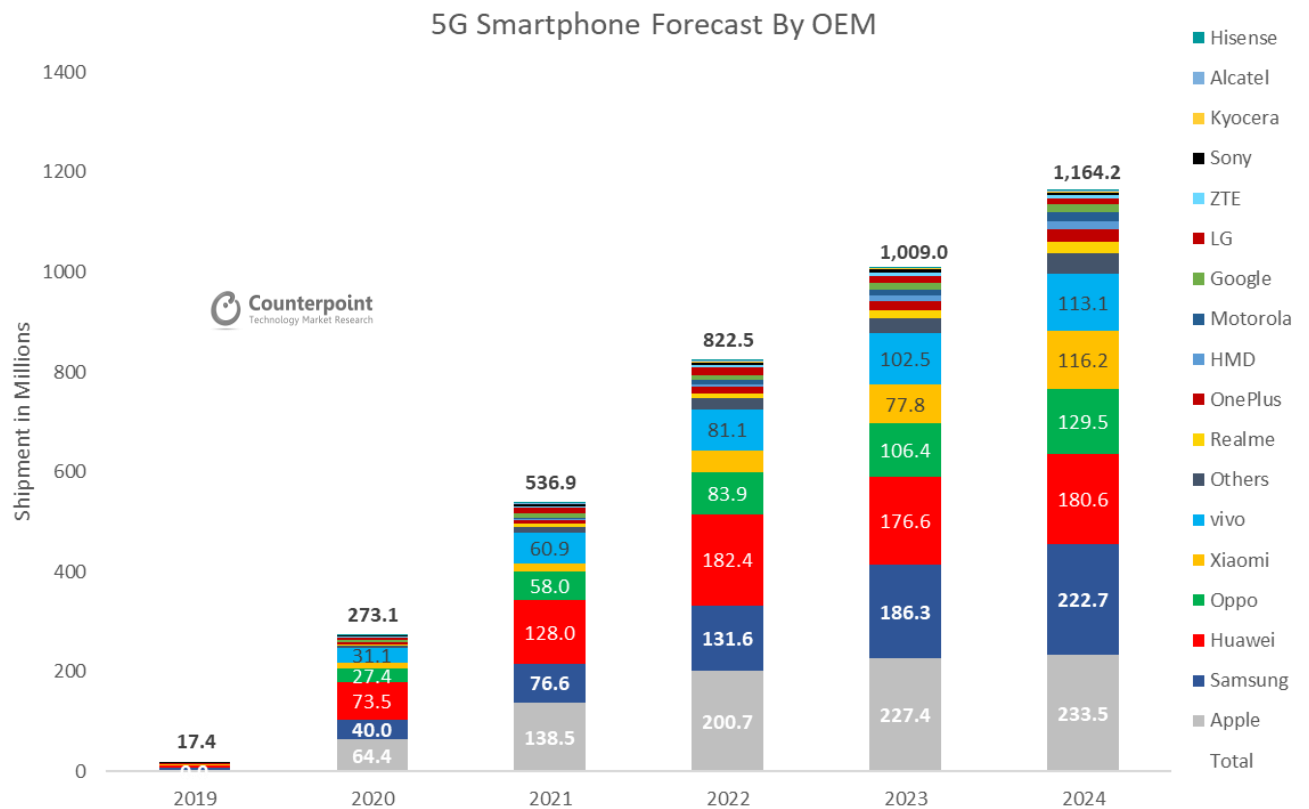
The initial rollout of 5G in 2019 was based on 5G non-standalone (5G NSA) modes, meaning it needed a 4G anchor for control plane communication and mobility management, which helped with faster network deployments. However, 5G Standalone (5G SA) networks i.e. with a 5G core, now allow low latency and massive IoT applications to come fully into the picture.

By the end of April 2020, a total of 73 operators in 41 countries launched one or more 3GPP-compliant 5G services, including 66 mobile and 35 FWA (Fixed Wireless Access) services ([source GSA](#)). Initial use cases have been limited to eMBB via mobile broadband and 5G FWA.

In terms of adoption, the global ramp up for 5G has been faster than 4G because of 5G's singular universal standard compared to 4G LTE, which had both TD vs FD versions. This has allowed operators across disparate markets to all launch 5G within a tight timeframe, something which was impossible with 4G's comparatively staggered global start. We expect the faster launch cadence to continue, as more countries commence rollouts.

This should help revive global smartphone shipments, which declined by 1% in 2019. The overall market is expected to grow by 4% in 2020, driven by faster 5G adoption, especially in China, where intensifying competition puts pressure on prices. This will help adoption over the longer term, and Counterpoint Research estimates 5G smartphone shipments will reach 1.16bn units by 2024, enjoying a 5-year CAGR of 137% and accounting for a 70% share of overall shipments.

Exhibit 11: Global 5G smartphone forecast by OEM



Source: Counterpoint Research.

We expect ASPs to fall quickly this year, with the availability of mid-end solutions from Qualcomm, MediaTek, and UNISOC helping 5G smartphones move into the mid-to-low end smartphone market globally, with Apple, Samsung and Huawei being the top three players. ZTE, Realme, Xiaomi, Alcatel, and carrier-branded 5G smartphones using 5G SoCs (System-on-Chip) from Mediatek and UNISOC will further penetrate lower price bands.

Qualcomm is offering an end-to-end portfolio from SoC, modem, complete RF Front End (RFFE) to antenna supporting both sub-6GHz to mmWave. This portfolio is at least one to two generations ahead of its competitors

from a feature-set to a commercial availability perspective. Global 5G deployments will require a full set of 5G features and one of the reasons that Qualcomm is gaining 5G share is because it supports low and mid bands for blanket coverage as well as mmWave for performance 5G. Mediatek is also ramping up its Dimensity 5G series.

UNISOC announced its first 2G/3G/4G/5G multi-mode modem V510 at MWC 2019. The 3GPP Rel.15 compliant 5G modem supports both standalone (SA) and non-standalone (NSA) networks, as well as 5G VoNR in SA mode, fitting well into the different stages of 5G development. Together with Hisense, UNISOC successfully commercialized its first generation 5G platform, with the UNISOC V510 powering the Hisense F50 smartphone.

Last November, UNISOC V510 modem was awarded the 2019 World Electronics Achievement Award, helping UNISOC further establish a solid foundation and reputation as a leading 5G solution provider.

In February this year, UNISOC unveiled its next-gen 5G SoC platform – the T7520. Utilizing a more advanced 6nm EUV process, which has 18% higher transistor density and 8% lower power consumption versus current 7nm processes, the T7520 offers compelling performance package with improved power consumption.

Its optimized multi-core design incorporates four Cortex-A76 and four Cortex-A55, a Mali-G57 based GPU, an upgraded NPU, as well as enhanced multimedia processing units to enable capabilities of 100MP and multi-camera processing, up to 120Hz refresh rate and multi-screen displays.

The T7520 also showed significant improvements in terms of 5G experiences, with the support of 5G NR TDD+FDD carrier aggregation, LTE and NR spectrum dynamic sharing, and uplink and downlink decoupling. Importantly, with its innovative 5G super uplink technology, the T7520 can enhance coverage by more than 100%, increase uplink speeds by up to 60% and improve peak downlink speeds to more than 3.25Gbps under SA mode. All of these advanced features make the T7520 highly competitive with mainstream platforms targeting high-spec smartphones.

Beyond smartphones

5G will enable a wide range of capabilities not possible in 4G, enabling a broad range of applications requiring ultra-low latency and high reliability. Key applications include:

- **Construction machinery, industrial robots and medical devices**

This segment will gain momentum as 5G SA networks go live as they enable URLLC applications.

Construction machinery, industrial robots and medical devices with 5G connectivity are expected to generate around US\$43bn, \$4bn and \$20bn, respectively, in 2024.

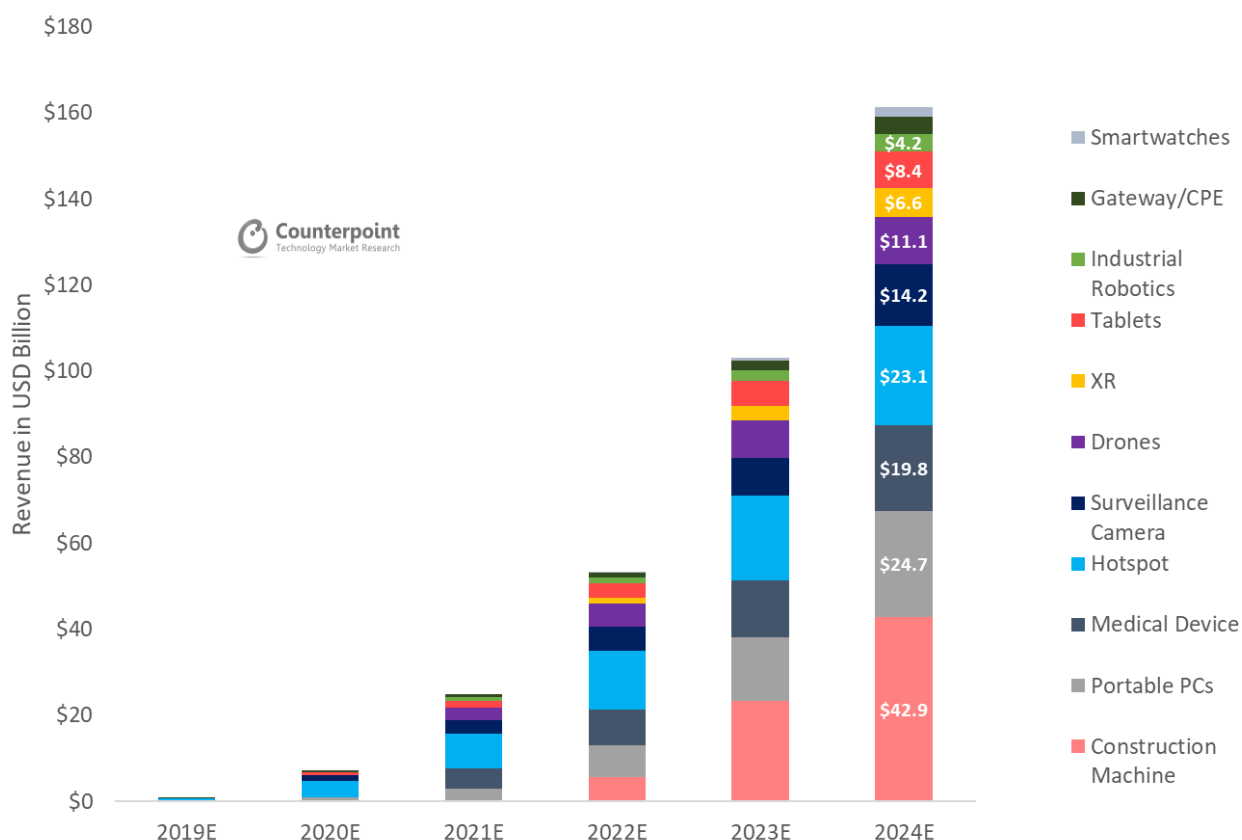
- **Portable PC's, smartwatches, tablets, drones, and XR**

OEMs have already showcased 5G connected laptops at CES in 2020. We expect this segment to generate around \$24.7 billion in 2024. 5G smartwatches and tablets are expected to generate \$2 billion and \$8bn, respectively, in 2024. Drones and XR will pick up after 5G SA deployments and are expected to generate \$11bn and \$7bn, respectively, in 2024.

- **Surveillance cameras, gateways/CPEs and hotspots**

Surveillance camera technology has evolved rapidly in recent years and 5G will enable UHD, AI and computer vision. Surveillance cameras are expected to generate \$14bn in 2024. Gateways/CPEs and hotspots are expected to generate \$4bn and \$23 billion, respectively, in 2024.

Exhibit 12: 5G revenue forecast by key categories



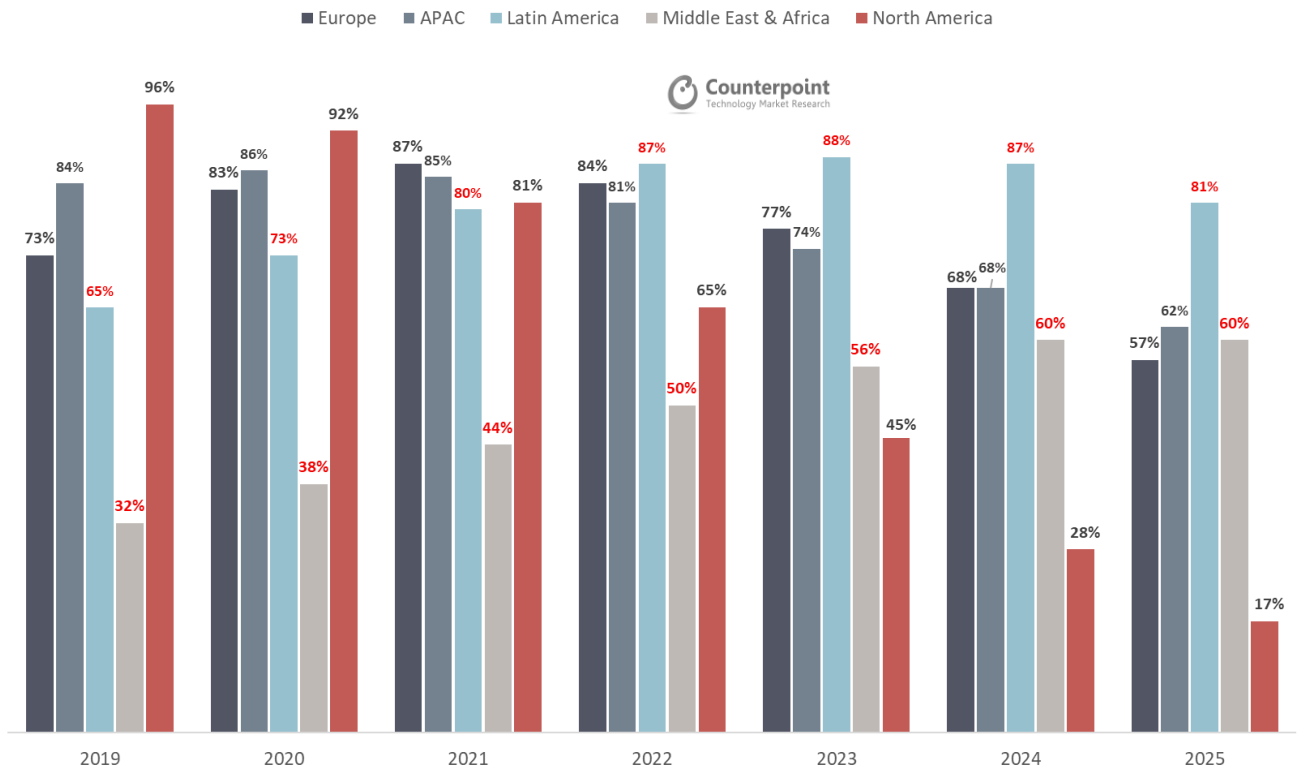
Source: Counterpoint Research.

Challenges for 5G

4G penetration is still low in regions like Africa, South East Asia & Oceania, Latin America, and Eastern Europe, and key operators there are still investing in the 4G networks and rolling new services like LTE Advanced, VoLTE, and LTE-U. In this environment, 5G is in the very distant future.

Moreover, there is still a large chunk of legacy subscribers for 2G and 3G who will likely be upgraded to 4G when these operators launch 5G networks. Hence, in the short-term, 4G networks will remain significant, but longer term, their development will go hand in hand alongside investment into 5G networks.

Exhibit 13: LTE penetration by subscribers by region



Source: Ericsson.

A legacy connection like 2G and 3G still occupies a significant share of the spectrum which ultimately must be re-farmed for either 4G or 5G. This will be very useful since 5G requires a large amount of spectrum (100Mhz per operators) in low, mid, and high bands. As well, with initial deployments being 5G NSA, spectrum sharing will be important.

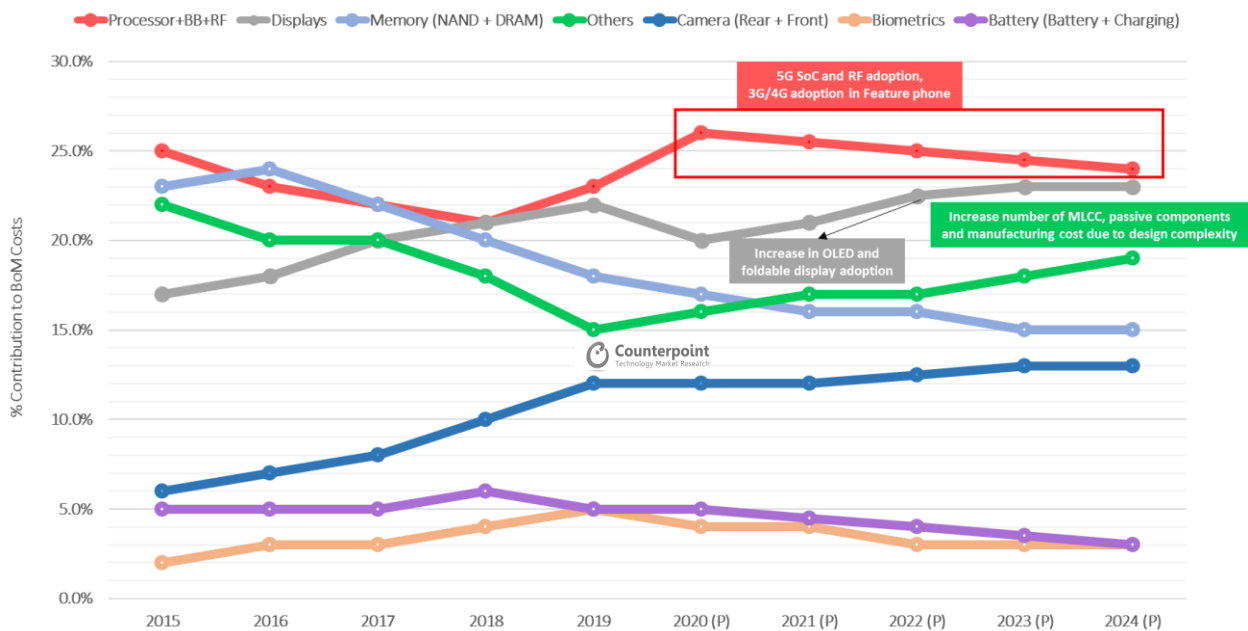
Significant investment in the core and radio access network (RAN) is required for deploying 5G. This is likely to delay or slow 5G adoption, especially regions where 4G is under-penetrated. According to the latest forecast by Ericsson and GSA, the total amount of mobile subscriptions enabled by LTE networks will maintain steady growth until its peak in 2022 at around 5.4bn worldwide.

In these regions, there are clear opportunity for 4G solutions, including in the feature phone segment. UNISOC and MediaTek, in particular, with their entry-level and mid-level 4G SoC can cater to these markets and capture the untapped potential.

Role of SoC Players in Technology Adoption

In the transition to 5G, the overall cost and contribution of SoCs to the bill of materials (BoM) of smartphones will continue to increase in short term, and the average contribution of SoCs to the BoM is estimated to be over one-quarter in 2020. New process technology for manufacturing, the addition of artificial intelligence (AI) will further add to the cost. However, with faster adoption of 5G in mid-tier, the SoC prices are estimated to come down during the coming years, it will remain the highest contributor to the cost of a mobile phone. This is also true for the transition from basic 2G feature phones to 3G/4G feature phones.

Exhibit 14: Contribution of components to overall handset BoM cost



Source: Counterpoint Research.

"Affordability is a key factor in mass-market adoption for new technologies. SoC players will have to play a crucial role in bringing down the cost of its solutions for adoption in affordable mobile phone segments both in 5G smartphones and 3G/4G feature phones." Tarun Pathak, Associate Director, Counterpoint Research.

While Samsung and Huawei focus mainly on in-house consumption of SoCs, it is Qualcomm, UNISOC, and Mediatek with their affordable solutions that are expected to contribute most to the broader ecosystem, as they cater to a wider range of OEMs in both the smartphone and feature phone segments.

Competition Leading to an End-to-End Solution

As competition in the market increases, SoC players are now providing an end-to-end solution consisting of application processor, GPU, baseband, and integrated Radio Frequency Front End (RFFE). As cellular technology advances with more band support, carrier aggregation, and the number of antennas increasing, it also increases the complexity of RFFE design and integration. Evolving device form factors and the use of metal body designs adds to this complexity, which increases costs.

Integrated solutions provide better overall efficiency and cost-effectiveness in some cases. Qualcomm, Mediatek, Samsung and UNISOC all provide an end-to-end solution for 2G/3G/4G mobile handsets. Qualcomm is leading the way in terms of integration and providing all necessary components for a 5G capable phone, while other players like Mediatek, UNISOC, Samsung and HiSilicon are moving towards the same. We are witnessing partnerships between ecosystem players and SoC companies to provide an end-to-end solution, and this will be important with 5G as RFFEs becomes more complex.

Exhibit 15: Key smartphone solutions by SoC player



Source: Counterpoint Research.

Future Opportunity for Baseband Players

The global baseband market is projected to be worth \$38.7bn by 2024, driven by the ubiquitous connection and computing demands in the era of 5G. Smartphones remain the dominant pillar, but cellular IoT, wearables and reinvented feature phones will all collectively shape the future of cellular baseband industry.

As a global chip supplier focused on mobile communication and IoT applications, UNISOC has a broad product portfolio to meet the various expectations around feature phones and affordable smartphones, garnering considerable market share.

The company is also stepping up efforts to expand its presence in higher-end segments, with increasing investments in 5G platforms, optimizing multi-core architectures at cutting-edge process nodes, as well as the comprehensive improvement of AI computing, and multimedia and image processing capabilities.

UNISOC is enabling a broader device ecosystem by providing highly integrated, cost effective solutions for cellular IoT, tablets and smartwatches which are all fast-growing segments for basebands.

Smartphones

The smartphone baseband market is estimated to reach \$29.4bn in 2024, accounting for over 76% of the overall cellular baseband market in revenue. Despite a slight decline in smartphone shipments in 2020 due to the impact of lockdowns, 5G will prove to be a catalyst for the smartphone market recovery in 2021, significantly boosting revenue growth of the smartphone baseband market, and increasing device ASPs.

Exhibit 16: Smartphone share of baseband value, 2024



Source: Counterpoint Research.

Together with Hisense, UNISOC successfully commercialized its first generation 5G mobile platform – the T7510. The launch of the Hisense F50 highlights UNISOC’s capability in delivering a robust 5G smartphone enabling eMBB. To strengthen its 5G line-up, UNISOC is accelerating the development of its T7520, allowing for fully enhanced performance with longer battery life.

UNISOC aims to play a key role in driving 5G penetration into lower price segments in pioneering markets like China. As the largest and the fastest-growing 5G smartphone market in the world, China is at the heart of UNISOC’s 5G ambitions. As the company leverages close collaboration with domestic stakeholders and easy access to local engineering support, UNISOC will be an important 5G partner for Chinese smartphone makers,

benefiting from their move to diversify sources of core chipset supply in the face of uncertainty from global trade tensions.

UNISOC also provides cost-optimized 4G smartphone processors, like its highly integrated SC9832E and octa-core powered SC9863A, which are at the forefront of bringing enhanced feature phones to the masses.

There has been a great number of new designs based on the SC9863A and SC9832E which have successfully launched in multiple markets. In SE Asia, UNISOC deepened its cooperation with Cherry and Myphone in the Philippines. The popular SC9863A platform was widely adopted by local brands such as Evercoss and ADVAN in Indonesia, and Symphony in Bangladesh, while the SC9832E entered the supply chain of AIS in Thailand.

UNISOC also supports global brands including ZTE, Alcatel, LG, Wiko and Hisense, launching cost-competitive smartphones in markets like Japan, South Africa, and Latin America.

In Brazil and Mexico, UNISOC is a major chipset supplier for Multilaser, SEMP, TCL, and Senwa. UNISOC will continue to provide affordable solutions to cater to regional smartphone OEMs, helping them be competitive with integrated solutions for the masses.

Cellular IoT

Cellular IoT is one of the fastest growing markets and covers a wide variety of devices with 5G/4G/3G/2G support. It is expected to contribute 12% of the global cellular baseband market in terms of revenue, with over 274.5m devices to be shipped in 2024 connecting to LPWA (Low Power Wide Area) mobile networks. It is a \$4.7bn opportunity for baseband players looking to diversify from mobile handsets.

Exhibit 17: Cellular IoT share of baseband value, 2024



Source: Counterpoint Research.

UNISOC has been an active contributor to the cellular IoT space, providing highly integrated, cost-competitive chipset solutions. The company's 8908A is an ultra-low-power NB-IoT single-mode chipset, providing improvements in real network performance such as transmission success rate and traffic delay.

It fits well with cost-sensitive applications where only a small amount of data is transmitted on an infrequent basis. As the deployment of the NB-IoT network is still in progress and coverage is absent in some areas, UNISOC also offers an NB-IoT/GSM dual-mode SoC 8909B. With the support of flexible switching between 2G and NB-IoT, UNISOC 8909B can greatly extend the service life of IoT devices installed in blind spots by upgrading to NB-IoT, leading to the smooth transition from 2G to NB-IoT in many use cases.

Thanks to advantages in device battery life, cost, network capacity and coverage, NB-IoT is set to capture a significant chunk of the burgeoning cellular IoT marketplace. It is estimated that more than 500m additional NB-IoT connections will be deployed three years from now. In collaboration with industry partners, UNISOC successfully commercialized its NB-IoT solutions across multiple verticals, with applications that include electric bicycles (fleet management and antitheft), remote meter reading, as well as fire-fighting appliances, all of which are among the most popular applications and surpassed the 10m connection mark by early 2020.

In overseas markets, UNISOC's NB-IoT chipsets passed certification by Deutsche Telekom and MTN, laying the foundation in Europe and South Africa. UNISOC is also in close cooperation with carriers in India, Russia, South East Asia, and Latin America to test and demonstrate NB-IoT services.

As carriers continue to close down existing 3G/2G sites, low-speed LTE, and LTE Cat.1 in particular, is becoming another hot technology to accommodate both voice and data services that have traditionally been borne on 3G and 2G networks.

As the latest effort to facilitate network migration and promote wider adoption of LTE IoT, UNISOC launched 8910, which is compliant with 3GPP Rel.13 Cat.1 and supports up to 5Mbps uplink and 10Mbps downlink speeds. Together with VoLTE capabilities and Rel.13 coverage enhancement, UNISOC 8910 is expected to fill the gap between NB-IoT and high-speed LTE, and works well in both voice-centric or mobility application scenarios like financial management, POS and payments and asset tracking.

UNISOC 8910 has been adopted by leading module manufacturers such as China Mobile IoT, Fibocom, Longsung, MeiG and Neoway.

Smartwatches

The overall smartwatch sector is now evolving, with cellular capability making standalone, wearable devices work completely independently from smartphones. We expect nearly half of all smartwatches shipped in 2024 will feature in-built cellular services, creating a surge in demand for dedicated baseband chips. In terms of revenues, the segment is estimated to be worth \$1.2 billion by 2024.

Exhibit 20: Smartwatch share of baseband value, 2024



Source: Counterpoint Research.

The children's or kids' smartwatch segment is currently at the forefront of adopting cellular technologies and maintains healthy growth, especially in Asia, which registered more than 20m shipments in 2019. With LTE solutions customized for kids' watches like the SL8521E and SL8541E, UNISOC has become the category's largest baseband supplier accounting for almost half of the market in China, as it closely collaborates with leading Chinese brands including Imoo, Aberdeen, Xiaomi Mitu, 360, Teemo and Readboy. Its supports watches delivering comprehensive content and features in communication, multimedia, safety and tracking, healthcare, AI, and location-based services.

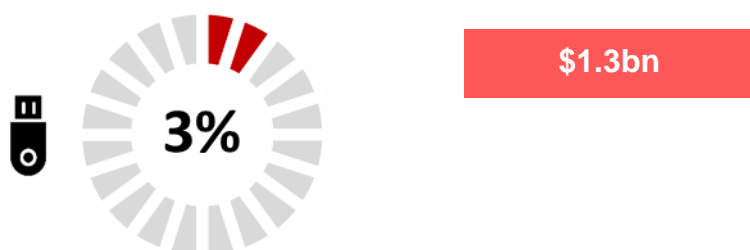
CPEs

This segment has been revived with the proliferation of FWA. The market will benefit from enhanced mobile broadband, or eMBB, which has the potential to exceed 20 times the speed of traditional 4G LTE. Of the 73 5G operators that launched services, more than half are offering FWA as a service as it has become a popular early-5G use case.

In February, China Unicom launched a self-branded 5G CPE VN007, powered by UNISOC's V510. It features 2.3Gbps peak downlink speeds, multiple sub-6G NR bands, as well as 360-degree Wi-Fi coverage, all priced below CNY999 (\$140). Together with industry partners, UNISOC is helping bring fiber-like experiences to homes and businesses.

With great flexibility and an extensive operating temperature range, UNISOC V510 can also be adopted across a broader array of 5G devices, such as 5G gateways, IP cameras, XR headsets, smart projectors and video recorders, allowing UNISOC to explore and benefit from a larger 5G hardware ecosystem. UNISOC has been in close collaboration with industry clients, aiming to introduce dozens of new designs through 2020.

Exhibit 21: CPE share of baseband value, 2024



Source: Counterpoint Research.

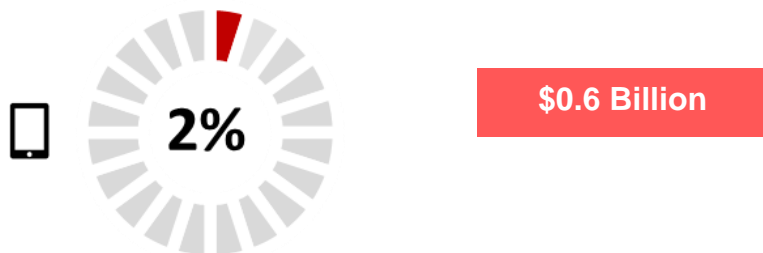
Tablets

Although the overall tablet market is stagnant, we seeing significant growth in demand for tablets with an always-on internet connection. The tablet segment will have over 45m shipments in 2024, creating a \$590m opportunity for global baseband players. UNISOC currently has an extensive tablet portfolio – its T710 and T7510 are both designed to deliver a premium user experience. With comprehensive enhancements in specifications, especially in terms of improved AI computing power, the T7510 supports super-fast, cellular communication and has excellent performance in terms of AI adaptive eye protection, intelligent voice, and speech recognition.

For mainstream tablets, UNISOC's T618 and T310 provides high-performance and low-power consumption for AI applications. At the entry level, the company has set a new benchmark with upgraded solutions based on its SC9863A and SC9832E.

These basebands help to make UNISOC a leading tablet solution provider in China. Working with reputed education tablet brands like Readboy and Hisense, the company has established a strong position in the market.

Exhibit 22: Tablet share of baseband value, 2024



Source: Counterpoint Research.

Extended reality

Extended reality (XR) is an emerging segment powered by 5G. Leveraging the next generation of communication technology which combines innovations from edge computing and AI to migrate intensive computing and 3D scene rendering to edge infrastructure.

The proliferation of lightweight and comfortable XR design is on rise, and the overall market is expected to reach over 15m shipments by 2024, a \$290m revenue opportunity for baseband players. With its high design flexibility, UNISOC is ready to establish a presence in the emerging XR market with its growing 5G portfolios.

Exhibit 23: XR share of baseband value, 2024



Source: Counterpoint Research.

Conclusion and Outlook


As markets globally upgrade their network technologies, many opportunities exist for players across the entire ecosystem. In particular, baseband players are well positioned to capitalize on technology shifts, as they continue to back important legacy platforms, provide bridging solutions, and support the leading edge of technology migration.

Counterpoint research believes 2G and 3G will continue to play an important role over the next five years, especially in emerging markets, while 4G will be the dominant access technology over the medium term. This will provide a significant market for ecosystem players which will only grow as technology roadmaps evolve.

Indeed, we believe 5G adoption will be faster than any of the previous generations, and will play a key role in transforming many businesses. All industry players will have a key role in this transformation, but to unlock the opportunity quickly, operators will be dependent on the component players for solutions that help navigate the transformation faster.

Within components, baseband players will be critical in supporting innovative solutions that will influence adoption of key device categories – ultimately expanding the global baseband market to \$38.7bn by 2024. The main market drivers for basebands will continue to be smartphones, followed by cellular-based LPWAN and feature phones, while cellular IoT, portable PCs and cellular smartwatches will be the fastest-growing segments.

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