

TECHNICAL REVIEW OF XIAOMI'S NEW REDMI NOTE 3 SMARTPHONE FOR INDIA

EXECUTIVE SUMMARY

The midrange smartphone market is experiencing huge growth, especially in China and India. The midrange has become a focal point for many smartphone vendors and the chipmakers that supply them. Companies like Xiaomi are launching devices with help from chip vendors like Qualcomm and MediaTek. The Xiaomi Redmi Note 3, featuring the new Snapdragon 650 SoC, is optimized for performance and energy efficiency.

The original Redmi Note 3, launched in China in November 2015, had similar specifications to the new Redmi Note 3 for India announced in March 2016, but looks can be deceiving. The new Redmi Note 3 is different than its seemingly identical “brother”. The Redmi Note 3 packs more features than one would expect at its price. The new model uses a Qualcomm Snapdragon 650 processor, rather than the MediaTek Helios X10 chips found in many phones in the sub Rs 15,000 price range.

The new Redmi Note 3 falls in the midrange of the smartphone market. Given the changing market dynamics and phone capabilities, Moor Insights & Strategy (MI&S) tested the Redmi Note 3 with the Snapdragon 650 to provide a technical platform overview. This paper compares the new chip and phone against alternative platforms. The analysis focuses primarily on key silicon components and uses benchmarks to evaluate CPU, GPU, memory, and storage performance.

PRODUCT OVERVIEW

Xiaomi is bringing this new version of the Redmi Note 3 to India to address the needs of the typical Indian phone enthusiast in the Rs 10,000 to 15,000 range. The Redmi Note 3 has a 6-core processor, 5.5” 1080p screen, aluminum unibody, fingerprint sensor, 16MP camera, 802.11ac Wi-Fi, 4G LTE, and a 4,000 mAh battery. These specs make the Xiaomi Redmi Note 3 competitive in the targeted price range, and they offer another choice to Indian consumers for longer battery life and more performance.

Xiaomi’s switch from the MediaTek Helios X10 to a Qualcomm Snapdragon 650 is an upgrade to a 6-core CPU configuration with two A72 cores and four A53 cores. It also comes with a significant upgrade to the GPU, DSP, and modem. The Snapdragon 650 comes with an Adreno 510 GPU, which is the same family of GPUs in the Snapdragon

820 with an Adreno 530. The modem in the Redmi Note 3 is capable of 150 Mbps download and 50 Mbps upload speeds. Qualcomm's embedded X8 LTE modem prepares the Redmi Note 3 for the growing LTE market within India, potentially future-proofing it for years to come.

DESIGN & BUILD QUALITY

Although this paper is a mostly technical review focused on performance and battery life, we noticed the Redmi Note 3 has a full aluminum body and smooth curved edges for a comfortable feel in the hand. This industrial design projects a more "premium" image. In addition, Xiaomi included a Fingerprints FPC1022 fingerprint sensor for ease-of-access and biometric security. We did not explore the design, security or responsiveness of the fingerprint sensor. Xiaomi opted for a micro-USB 2.0 connector versus USB Type-C, which may draw ire from some enthusiasts. But a USB Type-C cable would add cost, and as a [Google engineer has shown](#), several commercially available USB Type-C cables are not safe or do not support the claimed speeds.

DISPLAY & CAMERAS

The Xiaomi Redmi Note 3 features a 5.5" LCD display with 1080p resolution. This resolution and display size translate to about 403 ppi. Because the Redmi Note 3 is targeted at a more affordable segment, it does not feature a 1440p display or OLED display technology. Xiaomi reserves those features for high-end phones, like the Mi Note Pro, which costs roughly twice as much as the Redmi Note 3. With a 1080p display, the Redmi Note 3 takes advantage of Qualcomm's Adreno 510 GPU and allows for "best-in-class", mid-range GPU performance.

The Redmi Note 3 has a decent camera, featuring a Samsung f/2.0 16MP primary camera and an f/2.0 5MP front-facing camera. The camera itself is not unique compared to other cameras on phones at this price point, but it does launch fairly quickly and takes acceptable photos. It does not have the sophisticated manual camera capabilities more common on high-end phones.

PERFORMANCE & BENCHMARKS

To test the new Xiaomi Redmi Note 3's performance, MI&S ran a series of technical benchmarks. Based on its specifications, the Redmi Note 3 should be one of the longest lasting phones on the market, if not in the world. Design, hardware integration, and software are important, but great specifications do not always equate to great

experiences or performance. MI&S tested CPU, GPU, memory, and storage subsystem performance.

Xiaomi supplied MI&S with an early sample of the new Redmi Note 3. Our testing looked at synthetic and real world applications, including some of the most popular apps in India on Google Play like Facebook, Facebook Messenger, Truecaller, MX Player, and WhatsApp. MI&S also ran some performance and efficiency benchmarks that an Indian enthusiast might expect to see. MI&S ran a combination of industry standard benchmarks like 3DMark (v1.5.3285), PCMark for Android (v1.3.3083), and Geekbench 3.0 (v3.4.1) as well as Basemark's new Power Analysis Tool v1.0.

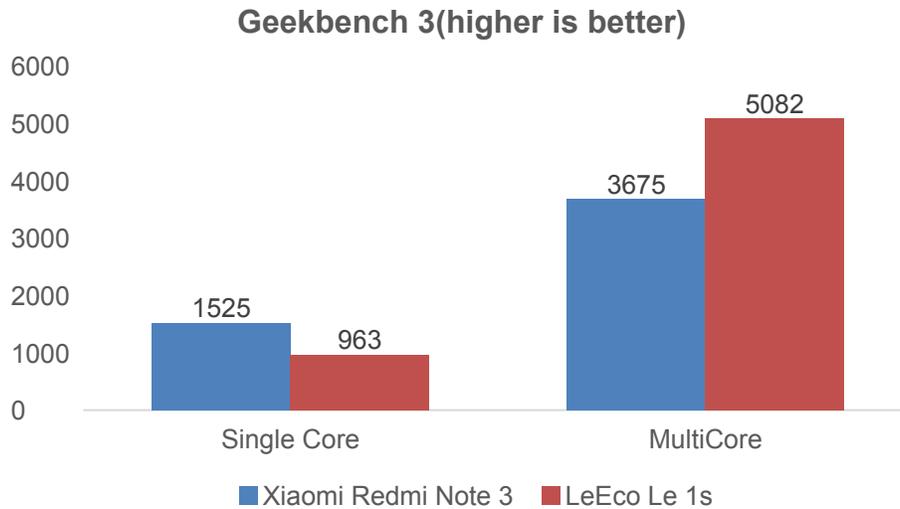
Basemark's Power Assessment Tool (PAT) measures how much power the entire device uses to the milliwatt and millisecond. It measures how long an application is running on the application processor and how much power it causes the phone to draw. PAT combines hardware and software and tests a device's power consumption and time to process workloads. This review uses PAT to evaluate real-world applications in both how long processed takes (seconds) and how much power they drawn (watts), thus leading to total energy consumed by each application run and what affects battery life (mAh: milliwatt amp hours).

We compared the Xiaomi Redmi Note 3 to the LeEco Le 1s, which also sells in India. The LeEco Le 1s phone features the familiar MediaTek Helios X10 SoC and is a good basis for device-to-device and SoC-to-SoC comparisons. Prior to testing, we ensured that both devices were running the latest versions of their operating systems and that their displays were set to auto brightness, since these are the conditions under which most users will operate their devices. The only time the devices were taken off auto brightness was to run PCMark for Android's battery life test. The Redmi Note was up-to-date with Android 5.1.1, and the LeEco was up-to-date to 5.0.2, both the latest Android versions for each device.

CPU & SYSTEM PERFORMANCE

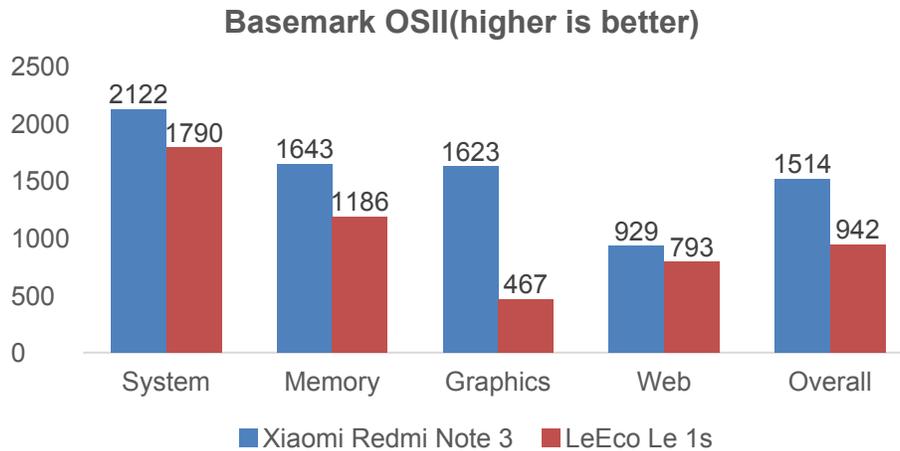
Geekbench is one of the most commonly used benchmarks for comparing CPU performance. There are large differences between the Redmi Note 3's Snapdragon 650 and the LeEco Le 1s's Helios X10. Most notably, the A72 core in the Redmi Note 3 allows for a much higher single core performance, while the 8 total cores in the LeEco Le 1s allow it to perform better in Geekbench's multicore test. However, the multicore test is less relevant than the single core, because many Android apps and most apps in general are single-threaded.

FIGURE 1: CPU PERFORMANCE



Next, MI&S tested a holistic system benchmark with Basemark OSII system benchmark.

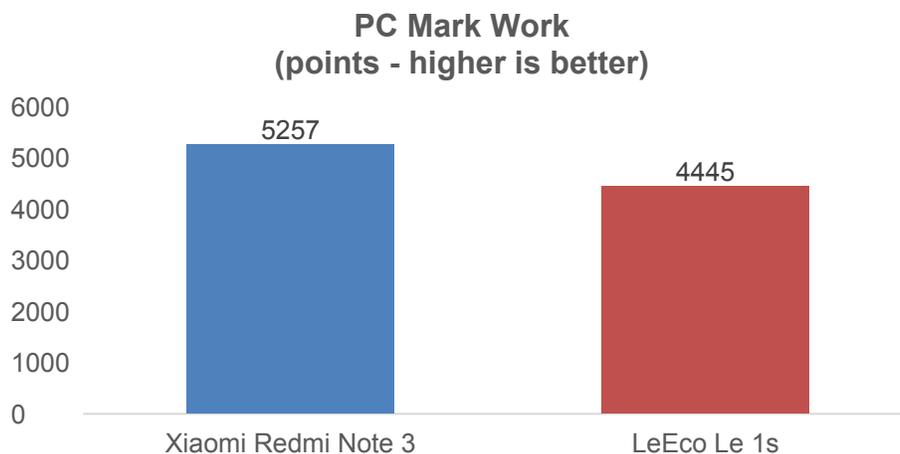
FIGURE 2: HOLISTIC SYSTEM BENCHMARK



The Redmi Note 3 with the Snapdragon 650 beats the LeEco Le 1s with the MediaTek X10. In the graphics test, the differences are several hundred percent. After all sub-tests, the new Snapdragon 650 in the Redmi Note 3 is at least 50% faster than the MediaTek X10 in the LeEco Le 1s.

Snapdragon 650 performance is reinforced by the PCMark for Android benchmark: 5257 for the Redmi Note 3 versus 4445 for the LeEco Le 1s.

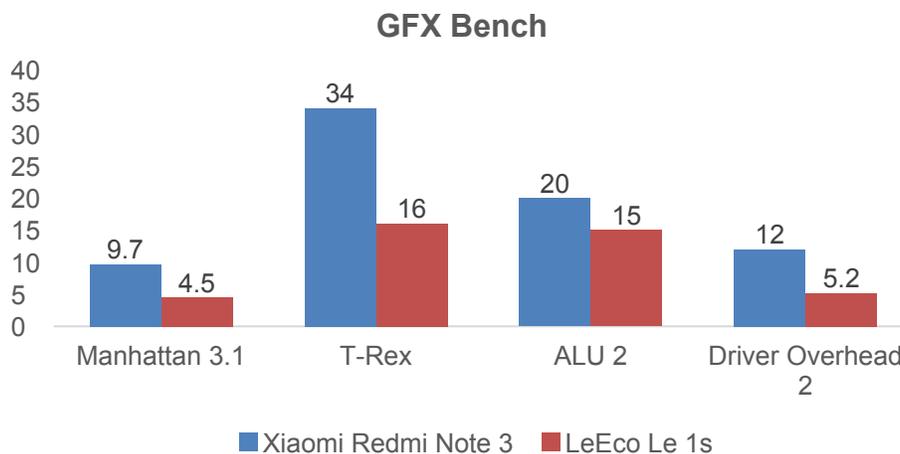
FIGURE 3: PCMARK FOR ANDROID



GRAPHICS

In 3D graphics benchmarks, the Xiaomi Redmi Note 3 outperformed the LeEco Le 1s.

FIGURE 4: 3D GRAPHICS



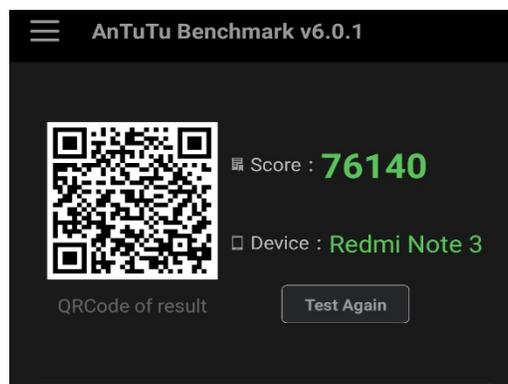
In GFX Bench, the Redmi Note 3 dominates the tests, winning some by triple digit percentages. This can be directly attributable to the Snapdragon 650's Adreno 510 GPU which is designed for high performance compared to the Helios X10 and PowerVR G6200 GPU.

MI&S also ran the industry standard 3DMark and Basemark X benchmarks. In Basemark X the Snapdragon 650's Adreno 510 scored 15,037 points while the X10's PowerVR G6200 scored 7,987, just a little over half the performance. We saw a similar

result in 3DMark with the Snapdragon 650's Adreno 510 GPU scoring 867 points and the MediaTek X10's PowerVR G6200 scoring only 453. These scores reinforce the Redmi Note 3's superior GPU performance at its price point.

We also ran AnTuTu. While MI&S does not consider AnTuTu to be as well documented, tightly managed, or monitored for fraud like the benchmarks mentioned above, many Indian enthusiasts may still expect to see the results. AnTuTu has improved its benchmark's tests and weighting over time, but it will need to continue to improve before we fully consider it on par with the others. Nonetheless, we are providing results to meet informational expectations. The Redmi Note 3 scored 76,140 points while the LeEco Le 1s scored 51,368 points, so according to AnTuTu, the Redmi Note 3 is 50% faster than the LeEco Le 1s.

FIGURE 5: ANTUTU

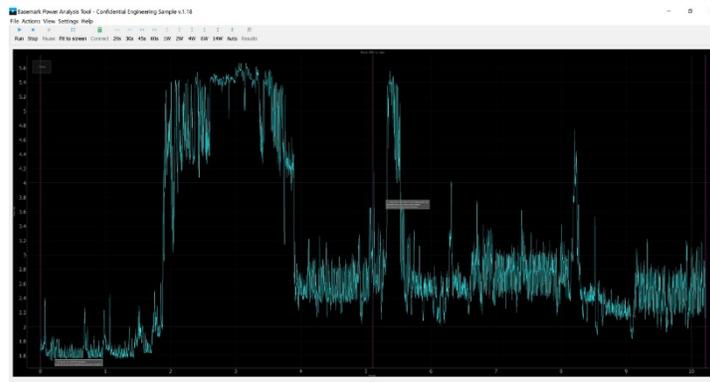


POWER

In addition to the synthetic benchmarks above, MI&S also ran Basemark PAT to measure how long an application took to run, at what power level, and how much total energy it used. The Redmi Note 3 idled at 1.5 watts at the Android desktop, while the LeEco Le 1s idled at 1.7W. With the screen off, the Redmi Note 3 idled at 150 mW, while the LeEco Le 1s did the same at roughly 300 mW.

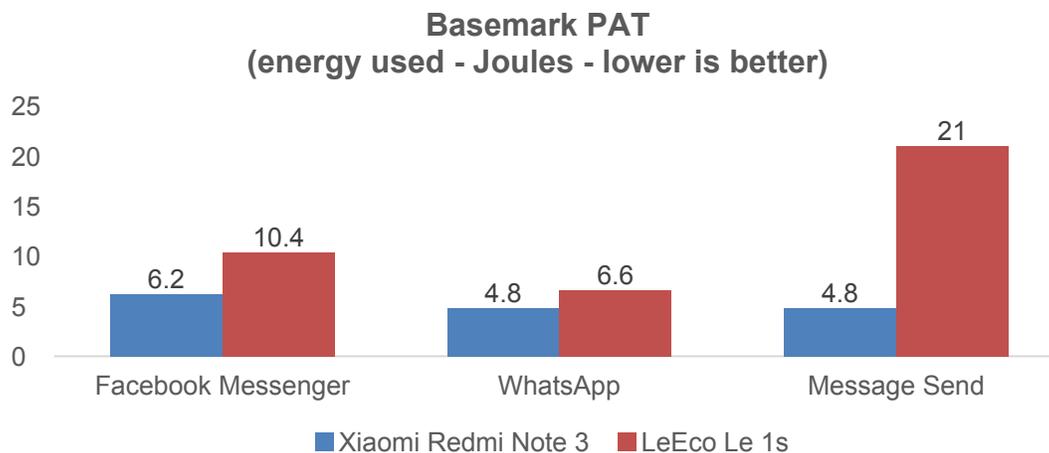
The Redmi Note 3 took 6.0 seconds to load the Facebook application at an average power of 2.6W or 15.6 joules (J). The LeEco Le 1s accomplished the same task in 6.2 seconds at 2.9W or 17.98J—15% more energy and slightly slower.

FIGURE 6: BASEMARK POWER ASSESSMENT TOOL PORTION



The Redmi Note 3 loaded Facebook Messenger in 2 seconds with 3.1W average power (6.2J), while the LeEco Le 1s took 4 seconds at 2.6W (10.4J)—twice as long with 68% more energy. WhatsApp loaded on the Redmi Note 3 in 2 seconds at 2.4W average power (4.8J); the LeEco Le 1s also took 2 seconds but at 3.3W (6.6J)—a difference of 37%. The Redmi Note 3 sent a WhatsApp message in 4 seconds at an average of 1.2W (4.8J), while the LeEco Le 1s took 7 seconds with 3 watts (21J)—4 times more energy.

FIGURE 7: POWER



These benchmarks show the new Redmi Note 3 is a fast and long-lasting phone using one of the fastest and most energy-efficient SoCs on the planet. The Redmi Note 3 offers a lot of value at its price point.

CONNECTIVITY

At the time of this review, MI&S was unable to test Wi-Fi performance with an 802.11ac router or gain access to an Indian cellular network. We will update this document with

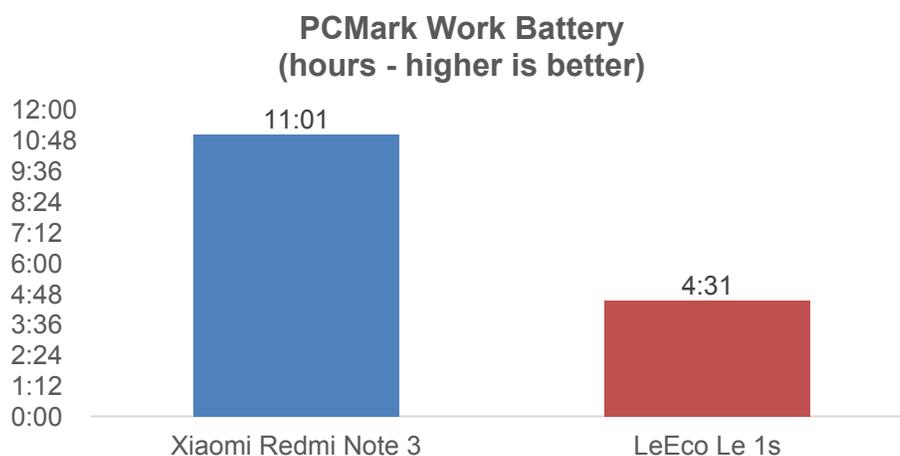
those results as we run them. The Xiaomi Redmi Note 3 has Qualcomm’s Snapdragon X8 LTE modem and 802.11ac Wi-Fi, both fast technologies. But the Redmi Note 3 does not have CA (carrier aggregation), which prevents it from reaching the Snapdragon 650’s full Cat 7 LTE (300 Mbps) performance. Xiaomi also opted not to add MU-MIMO Wi-Fi in this device, likely due to cost constraints for this price segment. The Redmi Note 3’s LTE peak performance is expected to be around 150 Mbps download and 50 Mbps upload, similar to the LeEco Le 1s. There are still benefits to using a Qualcomm 4G LTE modem over others, as [MI&S described in an earlier paper](#).

BATTERY LIFE & THERMALS

MI&S used Futuremark’s PCMark for Android benchmark. Both phones’ displays were calibrated to 200 nits brightness with a SpectraCal C3 colorimeter. This benchmark loops the PCMark Android benchmark suite until the phone reaches 20% battery and gives an approximate time the benchmark can be run. It does not give overall battery life, but it does give an idea of relative battery life based on continuous usage; idle usage can vary, and this test does not take into account connectivity.

The LeEco Le 1s reported a PCMark battery life of 4:31 hours, while the Redmi Note 3 reported 11:01 hours, almost two-and-a-half times the battery life. This difference can be attributed to the 4,000 mAh battery (30% bigger than the LeEco Le 1s) and the Snapdragon 650 SoC supplemented by deep hardware and software optimizations. The Redmi Note 3 with the Snapdragon 650 can claim “all-day” battery life, possibly multi-day depending on usage.

FIGURE 8: BATTERY LIFE



MI&S tested both phones thermally after multiple benchmark runs. The Redmi Note 3 never exceeded 29C, and the LeEco Le 1s never exceeded 32C. Neither phone exhibited significant heating nor throttling due to heat. While running battery tests for many hours, both phones were cool to the touch. This illustrates how having efficient, but high performance, SoCs can make a big difference. The LeEco Le 1s also kept temperatures under control due to having many low power A53 cores that are harder to overheat. We also measured the different thermals across the SoC using CPU-Z and never saw an increase of more than 10C.

CONCLUSION

Testing results for the Xiaomi Redmi Note 3 with Qualcomm's Snapdragon 650 impressed us with the amount of performance and battery life for the price. If Xiaomi can execute its sales and marketing plans, we believe the Redmi Note 3 could be one of the most sought-after phones in the Indian market at this price point. The favorable testing figures are attributable to the CPU, GPU, silicon integration, software integration, and large battery. It will be interesting to see how the Redmi Note 3 stacks up against MediaTek Helios X20-based devices coming later this year, considering its performance against the X10. The Redmi Note 3's overall capabilities should also be a plus for consumers looking for the best feature support in this price segment, because right now nothing comes as close to the performance and battery life for the money.

IMPORTANT INFORMATION ABOUT THIS PAPER

AUTHORS

[Patrick Moorhead](#), Founder, President, & Principal Analyst at [Moor Insights & Strategy](#)
[Anshel Sag](#), Technical Writer at [Moor Insights & Strategy](#)

EDITOR / DESIGN

[Scott McCutcheon](#), Director of Research at [Moor Insights & Strategy](#)

INQUIRIES

[Contact us](#) if you would like to discuss this report, and Moor Insights & Strategy will respond promptly.

CITATIONS

This paper can be cited by accredited press and analysts but must be cited in-context, displaying author's name, author's title, and "Moor Insights & Strategy". Non-press and non-analysts must receive prior written permission by Moor Insights & Strategy for any citations.

LICENSING

This document, including any supporting materials, is owned by Moor Insights & Strategy. This publication may not be reproduced, distributed, or shared in any form without Moor Insights & Strategy's prior written permission.

DISCLOSURES

Moor Insights & Strategy provides research, analysis, advising, and consulting to many high-tech companies mentioned in this paper. No employees at the firm hold any equity positions with any companies cited in this document.

DISCLAIMER

The information presented in this document is for informational purposes only and may contain technical inaccuracies, omissions, and typographical errors. Moor Insights & Strategy disclaims all warranties as to the accuracy, completeness, or adequacy of such information and shall have no liability for errors, omissions, or inadequacies in such information. This document consists of the opinions of Moor Insights & Strategy and should not be construed as statements of fact. The opinions expressed herein are subject to change without notice.

Moor Insights & Strategy provides forecasts and forward-looking statements as directional indicators and not as precise predictions of future events. While our forecasts and forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could cause actual results to differ materially. You are cautioned not to place undue reliance on these forecasts and forward-looking statements, which reflect our opinions only as of the date of publication for this document. Please keep in mind that we are not obligating ourselves to revise or publicly release the results of any revision to these forecasts and forward-looking statements in light of new information or future events.

©2016 Moor Insights & Strategy. Company and product names are used for informational purposes only and may be trademarks of their respective owners.