

LATEST SMARTPHONES, TABLETS & WEARABLES

ANDROID

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ANDROID Q

**DEVELOPER
PREVIEW**



BEST GAMES CONTROLLERS
FOR YOUR SMARTPHONE



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Google's Stadia service lets you play games anywhere

Google takes the wraps off its rumoured Stadia game-streaming service and a companion controller. [HAYDEN DINGMAN](#) reports

It's safe to say that going into GDC 2019, Google's keynote was the most anticipated on the schedule. Rumours had flown for weeks, though calling them 'rumours' is perhaps underselling it. We knew Google was working on streaming games to the Chrome browser, after last year's Project Stream tests, and it was clear we'd see more about those ideas.

GDC was the official reveal, though. It's called Stadia, and already the old box-under-the-television paradigm feels outdated.

Streaming games anywhere

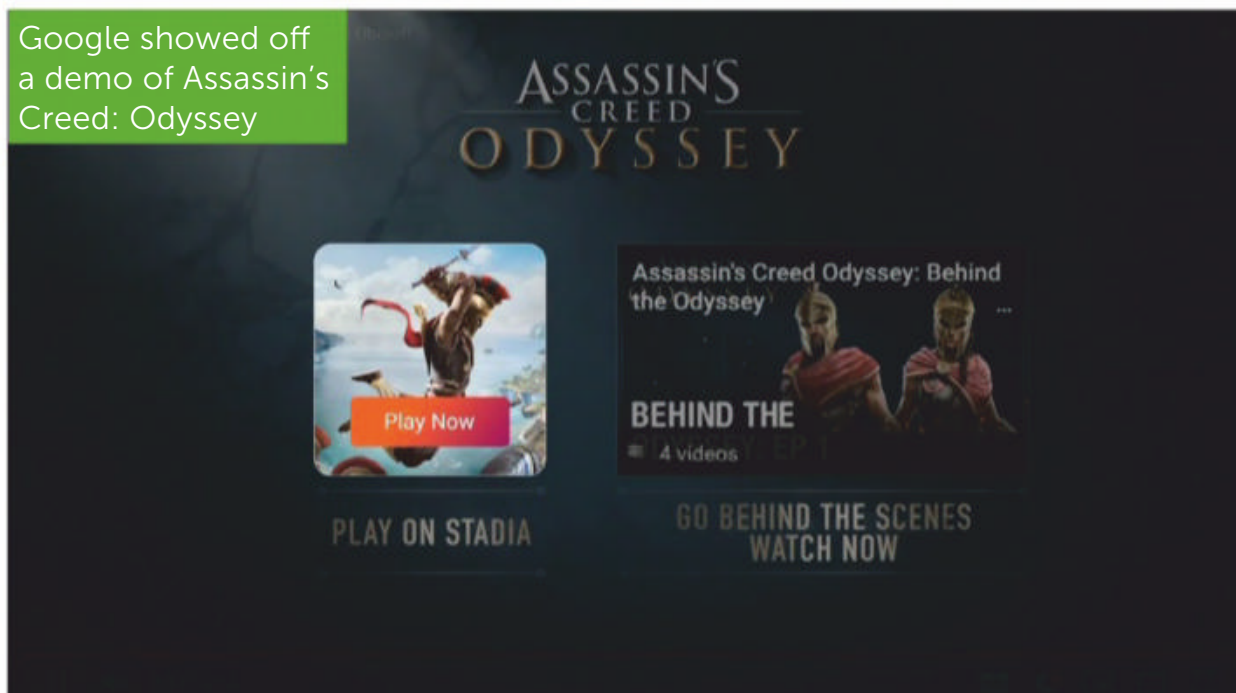
'Building a game platform for everyone.' That's the tag line Google went with during its presentation. You have a desktop? A laptop? A phone? Then you have Stadia. It's that easy. This is the future that game streaming allows.

No, seriously: Google showed it to us. An onstage demo went from laptop to phone to desktop to TV, picking up and playing the same Assassin's Creed: Odyssey save file with mere seconds in-between each platform. As long as you have Chrome and a strong Internet connection, you're ready for Stadia. Google showed how someone could watch the Odyssey trailer, click a 'Play Now' button below, and within seconds start running around the game – no need to install, no need for patches, none of the pain points associated with modern gaming.

These aren't new ideas, of course. OnLive tried to do this a decade ago. Sony has been doing it with PlayStation Now, too. But Google has a few advantages – namely, a worldwide server infrastructure that ensures you're never too far from a data centre, plus an install base that spans billions of devices.

And so Stadia is a step above what we've seen from previous iterations of this concept. Last year's Project Stream tests were already impressive, allowing you to play Odyssey at 1080p and 60 frames per second (fps). Stadia will kick that up to 4K, and also

Google showed off a demo of Assassin's Creed: Odyssey



will stream HDR and surround sound data as well. In theory it should be indistinguishable from playing the game on a local machine.

Or better. And that's the real promise of game streaming, and the key to Google's 'Building a game platform for everyone' mantra. At the moment, a high-end PC might run you £1,500 or more. With Stadia, Google is doing the heavy lifting in its data centre, which means you can – again, in theory – experience maxed-out graphics even on your phone or a cheap laptop. You can also stream to YouTube in 4K, without any fancy capture cards. Everyone's running a top-tier PC with Stadia.

Developers are freed from the constraints of traditional hardware as well. Google talked about the potential for a thousand-person battle royale, once you're freed from local machines and local Internet

connections. It also talked about the potential for couch co-op to return, now that developers aren't limited to running two compromised versions of a game on the same console hardware.

And, of course, there are visual enhancements to be explored. Microsoft had this idea years ago – remember when Crackdown 3 was going to use the power of Microsoft Azure to simulate citywide destruction? Well, Google is talking about Stadia doing the same, demonstrating realistic water simulations on its platform versus a local machine. It's impressive.

The problem with streaming is, as always, your Internet connection. I live in a large city, and thus don't run into these issues often. We're flush with data centres, meaning latency to the server and back is never too bad. I'm also lucky to have Gigabit Internet at my flat as well. Stadia will probably work great for me. But if you don't live in a major urban area? It's harder to say how this will go. Google talked up its infrastructure, and it is impressive: 19 regions, 58 zones, 200-plus countries, and 7,500 edge nodes. Chances are you aren't too far away from a Google server farm.

Stadia's streaming nature means you'll be able to join queues to play against your favourite YouTube streamers instantly, or send challenges to your friends tied to specific save states.

Whether it will feel as immediate as playing on a local machine, though? Whether you'll be able to take advantage of 4K and 60fps streaming, with HDR and surround sound? Whether it's good enough for a high-level fighting game or first-person shooter play? These

are important questions, and unfortunately ones we won't be able to answer until Stadia is out in the world. Google did trot out id Software to say Doom Eternal will come to Stadia, which is certainly promising, but again, it depends on your home Internet connection.

Also, if (as I do) you have a data cap? This is all a bit worrisome. I play hundreds of hours of games every month, and streaming yet another form of entertainment is going to put a lot of strain on my limit. Unlike Steam's streaming, there's no option to install a game if you want. You're always streaming it, and presumably copies sold through the Google Play store won't come with more traditional versions from other storefronts. You're either all-in on Stadia and streaming or you're not.



Playing Assassin's Creed on a tablet with Google's Stadia controller

It's pretty exciting, though. Provided it works, it could shake up the entire industry in some interesting ways. Already, the Microsoft/Sony/Nintendo triumvirate seems threatened – though, of course, Microsoft is set to reveal its own Project xCloud streaming solution sometime soon, maybe even as early as E3 in June.

There was more in the announcement. Stadia doesn't need any specific hardware, and you're free to use your existing mouse and keyboard or an Xbox or PlayStation controller. Google is making a Stadia-specific controller as well though, and it looks similar to the mock-ups we saw floating around on Twitter – which is to say, not the most comfortable. I'll reserve judgment until we've held one, though, as that's always hard to determine.

And Jade Raymond, VP and Head of Stadia Games and Entertainment, came out onstage to say that Google will be funding first-party games, meaning at some point in the future we'll see Stadia exclusives. It's not a console, but the console mentality is very much alive. Most important, we got a 'release date'. Stadia is set to release in the US and most of Europe sometime in 2019. It's safe to assume that's the back half of 2019, as Google said we'd see more "this summer". There's a good chance we'll see Microsoft and Google squaring off this holiday season, which means the next generation is really on the horizon – and looks a lot different than every generation to date. Interesting times.



Microsoft ports Xbox Live to Android

It appears that Microsoft is emphasizing the social aspects of playing on multiple platforms. **MARK HACHMAN** reports

Previously, Microsoft appeared poised to widen the reach of its gaming ecosystem, connecting games on Android, iOS and even the Nintendo Switch to its Xbox Live multiplayer platform.

Only two of the three came through, however, as Microsoft announced last month that its Xbox Live SDKs would be ported to Android and iOS. As for the Switch, Microsoft had no comment.

Sharing achievements, friends lists, and gameplay was the first step toward establishing Microsoft's gaming ecosystem within the Windows PC and Xbox console. According to Windows Central, Microsoft was preparing to unveil a cross-platform SDK (or XDK) at the Game Developers Conference in March at a special session. That session, once named 'Xbox Live: Growing and Engaging Your Gaming Community Across iOS, Android, Switch, Xbox, and PC', now has been renamed 'Xbox Live: Growing and Engaging Your Gaming Community Across Platforms', and its description scrubbed of the juicy details.

The original site description made the intent clear. "Now Xbox Live is about to get MUCH bigger. Xbox Live is expanding from 400m gaming devices and a reach to over 68m active players to over 2B devices with the release of our new cross-platform XDK," it said. "Get a first look at the SDK to enable game developers to connect players between iOS, Android, and Switch in addition to Xbox and any game in the Microsoft Store on Windows PCs."

Microsoft said that Xbox Live would be ported to both the Android and iOS mobile platforms, bringing Xbox's game identity and achievements to both of the mobile platforms. As the platform suggests, you'll be able to notch Xbox Live achievements on both the PC, Xbox, and now the iPhone and on Android devices.

The Xbox Live integration was actually just a small part of what Microsoft is calling Game Stack, a set of developer tools that includes Visual Studio, Mixer, DirectX, Azure App Centre, Visual Studio and Visual Studio Code, and Havok.

Microsoft announced five new developer services: PlayFab Party, adapted from Xbox Live party chat; PlayFab Matchmaking, also adapted from Xbox Live; PlayFab Game Insights, offering player telemetry and data powered by Microsoft's Azure cloud; PlayFab Pub Sub, a content service; and PlayFab User Generated Content.

Tying mobile games to the PC

The Xbox Live integration concept doesn't seem that far removed from the status quo. Microsoft published an Xbox app for iOS in 2013, and another for the Android platform. Both are slightly more limited versions of the Xbox app already on Windows 10, allowing players to view achievements, connect to friends, and see what's available on the Xbox Store. A similar Game Pass app is also available on both mobile platforms, allowing users to manage Microsoft's Netflix-like game subscription.

What Microsoft hasn't done before, though, is actually connect iOS, Android, and Switch games to its Xbox Live platform. In that scenario, it's possible that one day you'd gain an achievement for playing both Player Unknown's Battlegrounds (PUBG) on the PC as well as on your phone.

Because the GDC description references games published in the Microsoft Store, it seems less likely that Microsoft wants to track your progress in Nintendo's *The Legend of Zelda: Breath of the Wild* than it does in a game that Windows players play, too.

Microsoft seems eager to repeat the success of games that can be played on multiple platforms,

including the smash hit, Fortnite, as well as PUBG and Microsoft's own success story, Minecraft. Right now, though, it seems that less of an emphasis is being placed on crossplay, the ability to play across multiple platforms simultaneously, versus the social aspects of the game. (While crossplay is part of the Minecraft experience, it requires special setup in Fortnite, which allows for crossplay between Sony's PlayStation 4, the Xbox One, Nintendo Switch, PC, Mac, Android and iOS.)

What this means to you: With Fortnite a notable exception, few games traverse both the PC, smartphones, and game consoles. Microsoft apparently wants more. A few years ago, it would have been happy waiting until you got home from work to begin gaming on your PC or Xbox. Now, it seems ready to assist developers who would like you to play a game or two on the journey home. Oh, and encourage developers to build using Microsoft's tools, as well.





Why data caps must die

How Google and Microsoft's cloud gaming ambitions could conquer ISP greed. **MARK HACHMAN** reports

Now that Google Stadia and Microsoft xCloud have been unveiled, it's safe to say cloud gaming has arrived, promising a future where content will be streamed to smartphones over high-speed Wi-Fi and 5G. But if these services are to flourish, something else must die: the data caps ISPs impose upon most consumer Internet service plans. No one ever liked these limits except the ISPs. Now that major tech companies have some skin in the

streaming game, data caps may finally have too many enemies to survive.

The data cap struggle is real

Managing your bandwidth can be a struggle. You don't have to be a gaming journalist to download several games per month and begin consuming 600- to 700GB of data, especially if you have a family full of digitally starved children.

Cloud gaming services such as Google Stadia work by rendering the game on a remote server, rather than on a traditional console. The challenge with the remote method is to zap user input to servers for processing, then zap back the response, with the immediacy users have been trained to expect from wired gaming consoles. Any lag time beyond a split second can render the game unplayable. Past cloud gaming services such as OnLive have focused on a wired connection for that very reason.

For companies that offer streaming services, the maths is simple. Both Google and Microsoft are investing tens, if not hundreds of millions of dollars into streaming games. Sony's PlayStation Now already does the same. All three companies control their back-end server infrastructure, the user interface, and the pricing models and storefronts for their services.

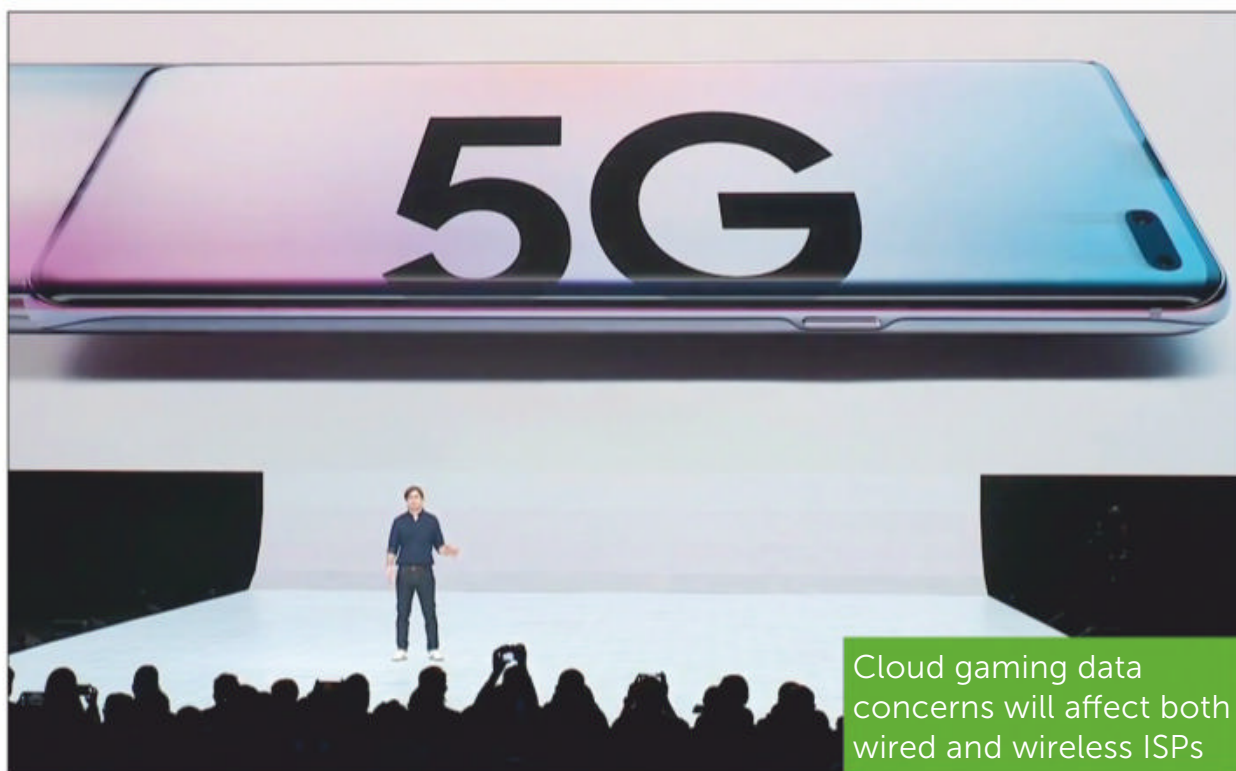
But neither Google, Microsoft, nor Sony can control the vast patchwork of wired and wireless infrastructure between their services and the end user. If a consumer is constrained by an ISP's data cap, then it's all for naught. As my colleague Hayden Dingman noted, a number of the conversations surrounding the Google

Stadia release concerned the data required merely to play the game. Based on additional conversations I had recently, it appears that such concerns are at least well understood.

How much bandwidth will game streaming consume?

We still don't know how much data will be consumed by xCloud or Stadia, but when compared to the typical data caps, even theoretical numbers look grim. Digital Foundry/Eurogamer has presented one of the best early examinations of Stadia's capabilities, including the detail that 1080p streaming (across a 25Mb/s connection) will be the norm.

That's probably on the order of a Netflix stream at the same resolution, with a bit more up-and-down for



controller input. But Netflix already consumes 3GB per hour of HD video. If we assume 12 hours of streaming per day, that amounts to 1,095MB per month, well above the 1,024GB cap of some major services.

So far, Microsoft has shown xCloud in the context of streaming to a phone, so we know that game streaming over 5G will be a priority. With basic plans offering just a few gigabytes' worth of data, it's hard to see how anything but an unlimited plan would work.

The future

Companies with streaming services face a huge challenge: coaxing an ISP to loosen or kill its data caps. It's a big job, and it's likely going to take a lot of corporate firepower to get anything done. Streaming giant Netflix was an early and lonely advocate, having raised the alarm about data caps since 2016. It seems likely it'll gain new allies soon, though, if Microsoft, Google, and Sony enter the fray. They must now see data caps the same way Netflix does, and the same way consumers do: as arbitrary limits that hurt everyone except the ISPs.

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MWVC 2019

Sony Xperia 1, Xiaomi Mi 9,
Huawei Mate X, and more



**SAMSUNG
UNPACKED
2019:**

Hands-on with the
Galaxy Fold and
Galaxy S10



Samsung Galaxy S10+

Price: £1,099 inc VAT from fave.co/2TNnA7O ★★★★★

It's something of a perfect coincidence that Samsung's Galaxy S10+ went on sale the same day *Captain Marvel* landed in cinemas. Both were once the most powerful members of their respective universes. Both are struggling with an identity crisis spurred by a larger-than-life existential threat. And both have a gorgeous shimmer when the light hits them just right.

And in many ways, they're both the last of a dying breed. The Galaxy S10+ may represent the culmination of 10 years of Samsung's Android engineering, but it's also the phone that doesn't fold. Much like 2017's iPhone 8 Plus, which existed in the shadow of the button-less and OLED iPhone X, the Galaxy S10+ no longer represents the pinnacle of Samsung innovation. That honour now falls to the Galaxy Fold, arriving 26 April. (In yet another curious coincidence, that date just so happens to be the same as Captain Marvel's intergalactic turn in *Avengers Endgame*.)

But even with the forces of change closing in on all sides, the Galaxy S10+ more than holds its own. It might have a sky-high price tag at £1,099, but the S10+ is also a massive improvement over its predecessor, pushing the limits of conventional smartphone design just about as far as they can go. And just like Carol Danvers (Captain Marvel), it's not about to fade into irrelevance without a fight.

Design

Even without straying too far from the Infinity Display formula that began with the S8, the Galaxy S10+ is a completely new device. Most notably, Samsung has trimmed its empty spaces even further, leaving slivers of black above and below the screen. That brings the size of the S10+ down to 157.6x74.1x7.8mm, a touch smaller than the Note 9 despite sporting the same 6.4in display dimension.

There's not much to quibble with when it comes to the design. The return to chrome along the sides reflects a sophistication over the colourized aluminium



of the S9, right down to the classic five-holed speaker grille along the bottom edge. The same chrome accent also lines the triple-camera array, which has been rotated to give your chosen colour even more room to breathe. With so much glass, the S10+ tends to be a little slippery, but because Samsung's new 'prism' palette of iridescent hues is so gorgeous, you won't want to cover it up. I suspect clear cases will be extra popular this time around.

The receiver has been pushed as high as it can go, so it abuts the top edge rather than floating in the bezel, and as a result, it's barely visible now. My only complaint is the power button, which is both shorter and higher than it is on the S9, making it that much more difficult to reach. The Bixby button is

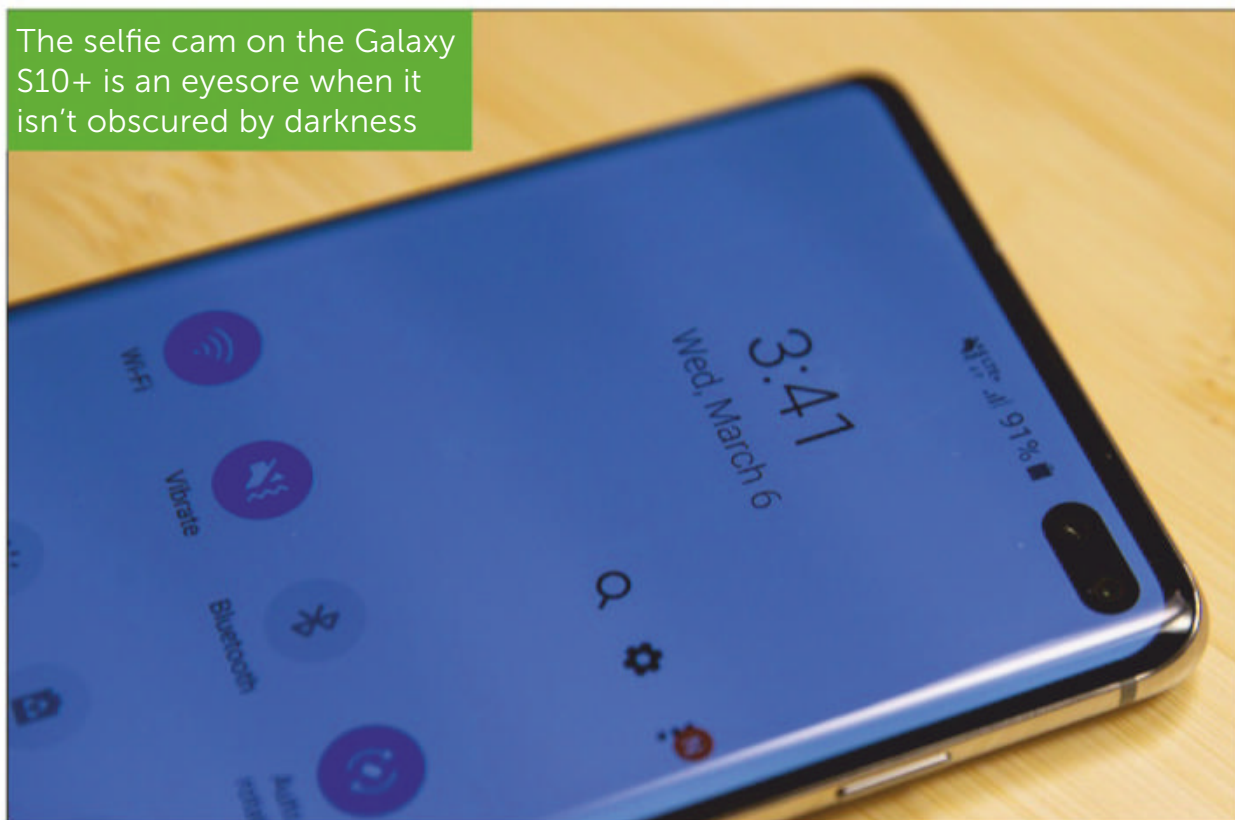
REVIEW

now in a much better spot, and it'll get a lot more use this time, as Samsung is finally letting us remap it to launch an app or perform an action. And once again, the S10+ has a headphone jack, making it truly among the last of a dying breed.

Display

To achieve a near 90 percent screen-to-body ratio, Samsung had to push the front camera down into the display in the form of a hole in the right corner of the screen. Just like the controversial notches in its competitors' screens, the hole in the Infinity O display wreaks havoc on the status bar, upsets full-screen images, and draws your eye in the worst way. Despite Samsung's bold claim of "no notches, no distractions",

The selfie cam on the Galaxy S10+ is an eyesore when it isn't obscured by darkness



the hole is even more apparent on the S10+ because Samsung needed room for two front cameras.

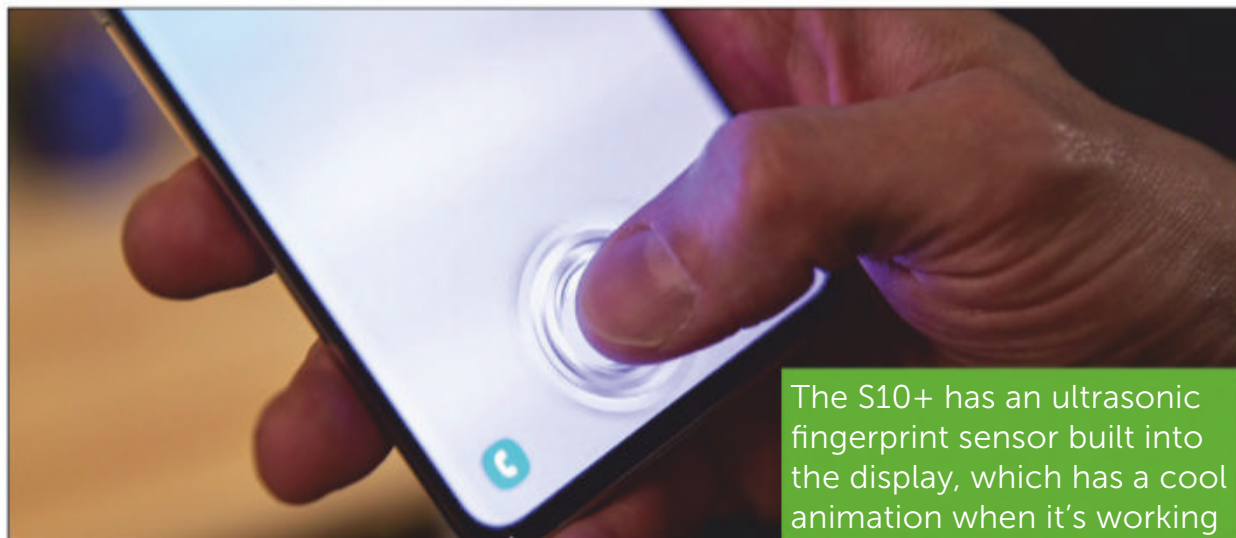
This is why all of the stock wallpapers Samsung created for the S10+ have a clever bit of black in the corner to cover up the hole. It's the same trickery Apple uses to cover up the notch on the iPhone XS, and it speaks to the inherent compromises of so-called all-screen phones.

I prefer a notch to the uncentred hole because I dislike the indented status bar, but neither of the solutions are very elegant. (Although some of the wallpapers available are pretty darn creative.) Maybe the future is in slide-out cameras or the complete elimination of the selfie cam like Chinese companies Xiaomi and Vivo are proposing. But for now, holes and notches are just a fact of life. And the S10+ will remind you of that every time you pick it up.

Hole complaints aside, the display on the Galaxy S10+ is stunning. Samsung has always excelled at displays, but out of the box the colours have always been a bit too oversaturated for my taste. Well, that's not the case with the Dynamic AMOLED here. Samsung's colour gamut is clear, crisp, and remarkably bright without requiring any adjustments, and colours are realistic without looking too dull or muted.

The display also hides one of the S10+'s new tricks: an ultrasonic fingerprint sensor, which uses sound waves rather than light to read the whirls and loops on your skin. Samsung's fingerprint sensor has been a bone of contention ever since it moved to the rear of the phone precariously close to the cameras, and it's no less of an issue here. In the age of Face ID and

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time-of-flight cameras, fingerprint scanning tech feels antiquated, and the hit-or-miss nature of the S10+'s sensor doesn't help it feel any more modern, despite its under-the-glass hiding spot.

A mid-review biometric update improved the accuracy tenfold, but it's still not an ideal solution for security or privacy in 2019. I wouldn't necessarily call it a step backward from the S9's physical scanner (which had its own placement issues), but it's not much an improvement either (though I do like the ripple animation even if it is a millisecond slower).

What is a downgrade is the loss of the iris scanner, leaving the fingerprint sensor as the only secure biometric option on the S10. That needs to change with the S11, and I hope the S10 5G's time-of-flight sensor is a sign that 3D facial unlock is on the way.

Battery life

With the Snapdragon 855 processor and 8GB of RAM, the S10+ is every bit the beast it should be.

Every benchmark I ran represented a significant jump over any 845 phone, and daily performance was stutter-, lag-, and slowdown-free. Here's how it compared to the Note 9:

Geekbench 4 (Single-core/multi-core)

Galaxy Note 9: 2,294/7,714

Galaxy S10+: 3,448/10,803

PCMark Work 2.0

Galaxy Note 9: 8,227

Galaxy S10+: 9,549

3D Mark Sling Shot Extreme

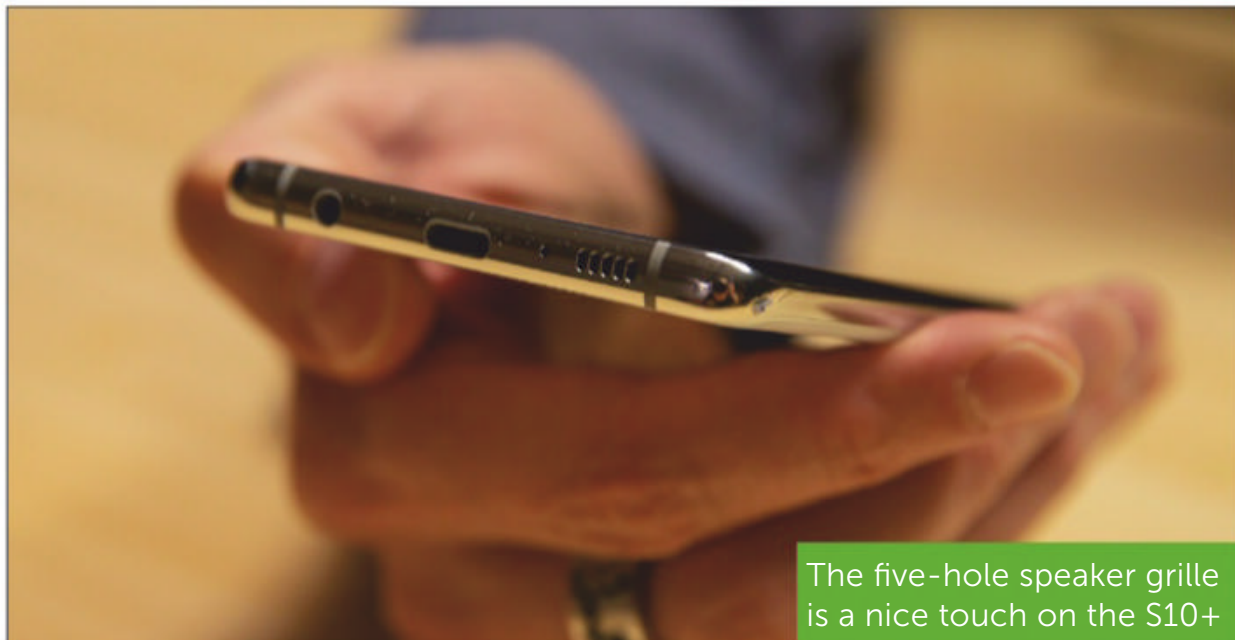
Galaxy Note 9: 4,659

Galaxy S10+: 5,456

Of course, off-the-charts performance is basically table stakes for a £1,099 phone. Battery life is far more important. The S10+ packs a 4,100mAh battery, bigger than the ones in both the S9+ and the Note 9. The larger capacity makes a big difference. In benchmarks, I was able to top 11 hours of runtime, about 10 percent longer than with other 4,000mAh phones I've tested.

In the real world, the S10+ is even better than the benchmarks indicate. Samsung's new phones have Android 9's new Adaptive power saving mode, which uses machine learning to intelligently shut off unnecessary apps and processes to conserve battery life. Switching it on makes the S10+ seem like it has a larger battery than it does. I easily powered through a day of heavy use without needing to turn on the

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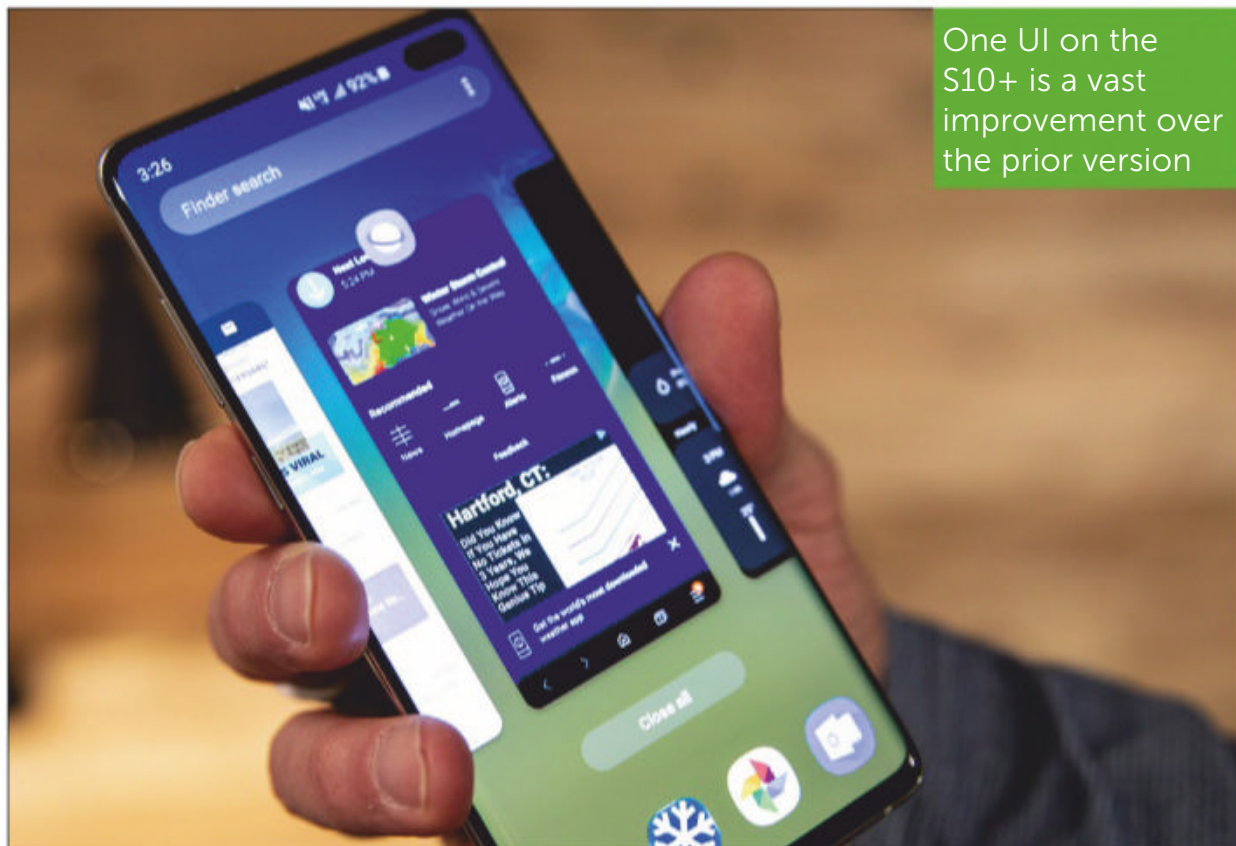


battery saver. A few percentage points might not seem like much, but over the course of a day it adds up.

And that extra battery life comes in handy when you want to use the Galaxy S10+’s coolest party trick: reverse wireless charging. It’s not the first phone to include the feature, but it’s the most mainstream one. Using it is simple – just tap the Wireless PowerShare button in the quick settings, flip over your phone, and viola, it’s a charger – but it’s probably not something you’ll use much after you try it out or show it off to your iPhone-using friends. But it’s definitely the kind of thing that’ll be great to have on the rare occasion that you need it.

Software

New Galaxy S phones traditionally usher in the latest version of the Samsung Experience, but the phone maker actually first pushed its massive One UI



overhaul to the older S9 this year. I've already written at length about what One UI means to Samsung's family of devices, and on the S10 it truly feels like the software and hardware are finally in unison.

The most obvious change is the switch from tap to gesture navigation, but Samsung isn't quite ready to embrace it wholeheartedly. I was surprised to find that full-screen gestures were switched off by default when I powered on the S10, and without a prompt during setup, I wonder how many people are going to find its hiding spot inside the nav bar settings.

That's a shame, because gesture navigation is nearly perfect on the S10+. With ultra-slim bezels, the swipes for back, home, and recent are natural

REVIEW



and easy to reach. The extra few millimetres of space afforded by the elimination of the navigation bar gives the phone a real full-screen feel. I'd like to see Samsung experiment with more advanced gestures as One UI evolves, but the simple approach works. My only question is: why'd we have to wait so long?

Night mode is a standout feature. Like a light switch for the S10+, Samsung's Dynamic AMOLED display generates deep blacks that accentuate text and buttons even more than on the S9. The curved corners of boxes and windows reflect the refined design, and the barely-there bezels make phone and the UI blend like never before. Even Bixby Home is better, with smarter card selections and engaging animations.

Speaking of Samsung's digital assistant, Bixby has learned some new tricks on the S10 in the form of if-this-then-that-style commands. A powerful and useful system of shortcuts, Bixby Routines isn't so much about voice commands as it is about intelligence. For example, you can set your S10 to conserve battery by turning off the always-on display if you forget to put it on the charger at night. Or you can limit auto-rotate to certain apps, such as YouTube and Netflix. Samsung provides a few routines to get started, but the combinations are basically endless, especially when compared to the relatively limited options with Google Assistant or Amazon Alexa.

Cameras

Samsung has returned the S10 and S10+ to photo parity after making the dual lens an S9+ exclusive. Both gain the new triple-camera array that finally lets you capture ultra-wide images. Here are the specs:

Camera 1: 12Mp telephoto Camera, f/2.4, OIS

Camera 2: 12Mp wide-angle, dual f/1.5-f/2.4, OIS

Camera 3: 16Mp ultra wide, f/2.2

The result is a camera that can take different photos than the S9 does, though not necessarily better ones. That's not so much a criticism as it is a recognition that the Galaxy S9+ already offers one of the best smartphone cameras you can buy, and Samsung is basically in refinement mode at this point.

The biggest upgrade is in field of view. When switching to the ultra-wide camera (accessible via a

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The Galaxy S10+ has a triple camera array, but the shots it takes aren't that much better than the S9's single camera



button above the shutter), the viewing area increases, from 45- to 77- to 123 degrees. That means you'll capture more of the scene without having to back up as much, as you can see in the comparison photos below, all taken from the same spot.

The S10+ also performs great when capturing a range of colours, particularly when ample light is available. Images were consistently sharper, brighter, and more detailed when compared to the S9, and the S10+ even held its own against Google's incredible processing engine on the Pixel 3. In the image of the candy below, the S10+'s auto white balance results in clearer definition and less saturated images, with less muddiness at the low end. When dealing with different shades of white, the S10+ wasn't fooled into unnatural adjustments.



There's a small bit of fish-eye distortion at the edges of the frame in this image of Barcelona Cathedral when shooting in ultra-wide mode (right) and some exposure issues with the zoom lens (left), but it's not enough to dissuade from using them



The S10+ (left) handles colour exceptionally well, even besting the Pixel 3 in this rainbow of sweets

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Night-time and low light are a different story. While I was extremely impressed with the S10+'s ability to focus quickly in extremely low light, the pictures I snapped had far less detail than the ones I took with the Pixel 3. In some instances, it looked as though Samsung's post-processing engine applied a smoothing filter rather than even trying to suss out finer details that were clearly visible with the Pixel 3. I'd love to see a Pixel-style Night Mode for Samsung phones at some point, maybe even later this year as part of the Note 9's feature set.

Around the front, Samsung has augmented the standard 10Mp f/1.9 lens with a second 8Mp RGB depth camera with a wider 90 FOV. If you take a lot of selfies you'll appreciate the edge detailing and depth-of-field adjustments, but there's nothing here that isn't also available on the S10's single front camera.

I didn't have a standard S10 to compare it to, but the S10+ definitely outperformed the S9's front camera in basically every facet, as you can see opposite. However, as it stands, the second front camera seems like a missed opportunity. I would have rather seen an ultra-wide second camera like on the Pixel 3 or a 3D camera for facial recognition.

Verdict

There's no denying that the Galaxy S10+ is the absolute cream of the premium Android phone crop right now. It has the fastest processor, the most RAM, the most storage, and the best display money can buy. And it's all wrapped in a beautiful package that's hard to find much fault with.

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But there are definitely places where it falls short. The fingerprint sensor remains a point of contention, and it's the phone's only biometric security mechanism. The hole in the display for the front camera is inelegant. The cameras are less impressive than in Samsung's past efforts – a point underscored by Google's processing abilities in the Pixel 3.

Then there's the elephant in the room, the Galaxy Fold. The S phone has enjoyed flagship status for the better part of a decade, but suddenly it needs to figure out where it fits in Samsung's smartphone hierarchy, at least in terms of wow factor.

Still, even without the newest specs and features, the S10+ could very well still end up being Samsung's mightiest hero. It might not deliver the sci-fi sizzle of



the Galaxy Fold. But like Captain Marvel, sometimes old school is all you need to properly defend the Galaxy. **Michael Simon**

Specifications

- 6.4in (3,040x1,440; 526ppi) Dynamic AMOLED capacitive touchscreen
- Android 9.0 (Pie), One UI
- Exynos 9820 Octa (8nm) processor
- Octa-core (2x 2.7GHz Mongoose M4, 2x 2.3GHz Cortex-A75, 4x 1.9GHz Cortex-A55) CPU
- Mali-G76 MP12 GPU
- 8GB, 12GB RAM
- 128GB, 512GB, 1TB storage
- Three rear-facing cameras: 12Mp, f/1.5-2.4, 26mm (wide), 1/2.55in, 1.4µm, Dual Pixel PDAF, OIS; 12Mp, f/2.4, 52mm (telephoto), 1/3.6in, 1µm, AF, OIS, 2x optical zoom; 16Mp, f/2.2, 12mm (ultrawide)
- Dual front-facing cameras: 10Mp, f/1.9, 26mm (wide), Dual Pixel PDAF; 8Mp, f/2.2, 22mm (wide), depth sensor
- Dual-band 802.11ac/ax Wi-Fi
- Bluetooth 5.0
- NFC
- Fingerprint scanner (under display)
- USB 3.1, Type-C 1.0
- Non-removable 4,100mAh lithium-ion battery
- 157.6x74.1x7.8mm
- 175g, 198g (ceramic)



Xiaomi Mi 9

Price: TBC (approx £450)



Go back a couple of years and few people in the UK had heard of Xiaomi, but looking into our imaginary crystal ball we're convinced that in a couple more years it is going to have completely transformed the smartphone market.

Xiaomi is a huge – but still pretty young – Chinese mega-brand and its smartphones, which are now officially available in the UK and Europe, undercut the global leaders in a way with which they simply cannot hope to compete. The only company that comes

even remotely close is OnePlus, with its 6T, but that phone's still not a patch on Mi 9.

Mi 9 is Xiaomi's brand-new flagship phone for 2019. It undercuts the Samsung Galaxy S10 by more than £300 – the iPhone XS by more than £500. And what do you really lose – waterproofing? A few extra pixels that you can't actually perceive? No-one of sane mind has any business overlooking the Mi 9 in the search for their next smartphone. It's not only one of the best Chinese phones, but the best phones period.

New features

The most obvious difference when you pick up Mi 9 is the display, which is now larger and taller than on Mi 8 and covers a greater surface area, with a reduced chin and a significantly smaller notch. It builds in an in-display fingerprint sensor, previously seen only on the Mi 8 Pro, and adds some customization options to the Always-on Display.

Naturally this means the previous sensor has been removed from the rear, but there's yet more change here with the LED flash moved to below the camera assembly and the addition of a third lens within. The arrangement is narrower but also taller, and juts out more than before. When you see the specs you'll understand why, since Xiaomi has crammed in an incredible 48Mp lens.

Around the edges the new Mi 9 looks to be much shinier, with a highly polished metal frame that is narrower at the edges with glass that curves in not only to the left and right but also top and bottom. The IR blaster has been reinstated along the phone's top

REVIEW

Around the edges the new Mi 9 looks to be much shinier, with a highly polished metal frame



edge, and on the left is a new button for calling up Google Assistant.

There are new colour options, too, and though our review sample is sadly the standard Piano Black there are also two 'holographic' (read: iridescent) designs in Ocean Blue and Lavender Violet. We caught a glimpse of these versions at MWC and they were stunning.

Some changes you can't see, and inside Xiaomi has swapped out the 2018 Qualcomm Snapdragon 845 (a 10nm chip) for this year's 855 (7nm). This offers improvements of up to 45 percent in general processing power, and 20 percent in graphics.

It's also added in wireless charging, which was previously found only in the Mi Mix line. But for something with which it has come late to the party, it has stolen everyone else's thunder with top speeds of 20W. A charger that can actually output this much

wireless power is not found in the box, however. Wired charging is faster, too, at 27W.

Design

For a company once accused of being ‘China’s Apple’ and yet another copycat brand, Xiaomi has come a long way in design. So much so, we have to ask: why would any company want its devices to look like iPhones when they could look like Xiaomi phones?

While Apple remains stuck in monolithic-notch hell, Xiaomi has followed some of its fellow Android device makers in getting away from the “Hey, we’re cool, we’re forward-facing, look at our notch” conversations to listening to what its pretty impressive fan base actually wants. And they want screen. Screen, screen and more screen. Masses of screen. *All* the screen.

On Mi 9 the previously in-your-face notch has been replaced with a subtle waterdrop, centred at the top of the display. It houses only the selfie camera, while the speaker has been moved to a blink-and-you’ll-miss-it position at the extreme edge where the screen meets the frame.

Xiaomi has also enlarged the panel, now up from 6.21- to 6.39in. Yet the phone’s size and weight has barely changed, with Mi 9 still just 7.6mm thick (though it feels thinner with its curvier frame) and actually weighing a few grams less.

It’s achieved this impressive design feat in three ways: first by reducing the phone’s chin by some 40 percent to just 3.6mm; second by increasing the aspect ratio from an already tall 18.7:9 to a slinky 19.5:9; and third – unfortunately – by shaving 100mAh

off the battery. The result is a super-high screen-to-body ratio of 90.7 percent, and a design that is not only significantly better looking but also more comfortable in use.

All this glass remains a magnet for fingerprints, though in our testing with Mi 9 we found it less notable than on the Mi 8 Pro we use day in, day out. Xiaomi has also taken steps to rectify two of our biggest gripes with that phone, enhancing the in-display fingerprint sensor and making some improvements to the Always-on Display.

Xiaomi claims this new fingerprint sensor works 25 percent faster than on the Mi 8 Pro, and it did seem a little better in use. There's still some way to go here in making the fingerprint sensor work effortlessly every single time, however, and we often found our impatience prompting us to punch in the PIN code instead.

But that screen – it's something to behold. Xiaomi uses a Samsung AMOLED panel, allowing it to offer the mix of vibrant, punchy and saturated colours we love with deep blacks and crisp whites. The 2,340x1,080 resolution is on point, if below what Samsung et al are capable of offering when pushing their handsets beyond the default settings.

It boasts a typical 430cd/m² brightness (we measured 414cd/m²), up to 60,000:1 contrast, and version 2.0 of Xiaomi's Sunlight- and Reading mode features. And it's protected with Gorilla Glass 6, which Corning claims is two times better than Gorilla Glass 5.

Looking around the edges there's still no headphone jack (a 3.5mm adaptor is in the box),

but there are two new features as well as improved audio from the integrated loudspeaker, which now features deeper bass and uses dynamic gain to amplify sound by 100 percent.

A button on the left edge by default wakes the Google Assistant. (If you're buying the Chinese version of this phone you'll instead have access to Xiaomi's own AI client.) This can be changed to quick-launch the camera, flashlight or the previous app, or to turn on Reading mode or trigger a Google search.

The second addition is an IR blaster, which used to be a common feature of Xiaomi phones but was removed in Mi 8. Now reinstated, this sensor works in tandem with the preinstalled Mi Remote app to control various appliances in your home. We got it working with our Sony TV and DVD player, but sadly it does not currently recognize our Roku media streaming box.

On the rear Xiaomi has refined the edges, which are now curved on all sides. This makes the Mi 9

Looking around the edges there's still no headphone jack



more comfortable to hold in one hand, despite its larger screen, but the glossy mirror-like surface is incredibly slippery, with nothing but the extruding camera assembly to aid grip.

Though we'd prefer the camera to lie flush with the phone's body, we appreciate how difficult a task this would be to achieve with a 48Mp sensor on board. The new assembly sticks out further than previously, but the unit is protected from damage with tough Sapphire glass.

A halo ring around the top lens adds a touch of class, and is something we've seen previously from Xiaomi with the red outer rings on Mi 8 Pro and 18K gold detailing on Mi Mix.

Aside from these few quibbles – the slippery surface, the prominent camera bump, the fingerprints, the sub-Quad-HD resolution and the in-display fingerprint sensor that fails to work 100 percent of the time – the only thing we can really call out as a criticism of Mi 9's premium design is a lack of waterproofing. But when you consider that adding such a feature would add to the price we're more than happy to not have it. Maybe one for Mi 10.

Performance

In the smartphone world there is really just a handful of processors sitting at the top of the pile. Apple's A12 Bionic leads the group in terms of synthetic benchmark performance, and is followed by the Kirin 980 used by Huawei and the Qualcomm Snapdragon 855 that is used by just about every other flagship phone on the market. All three are 7nm processors,

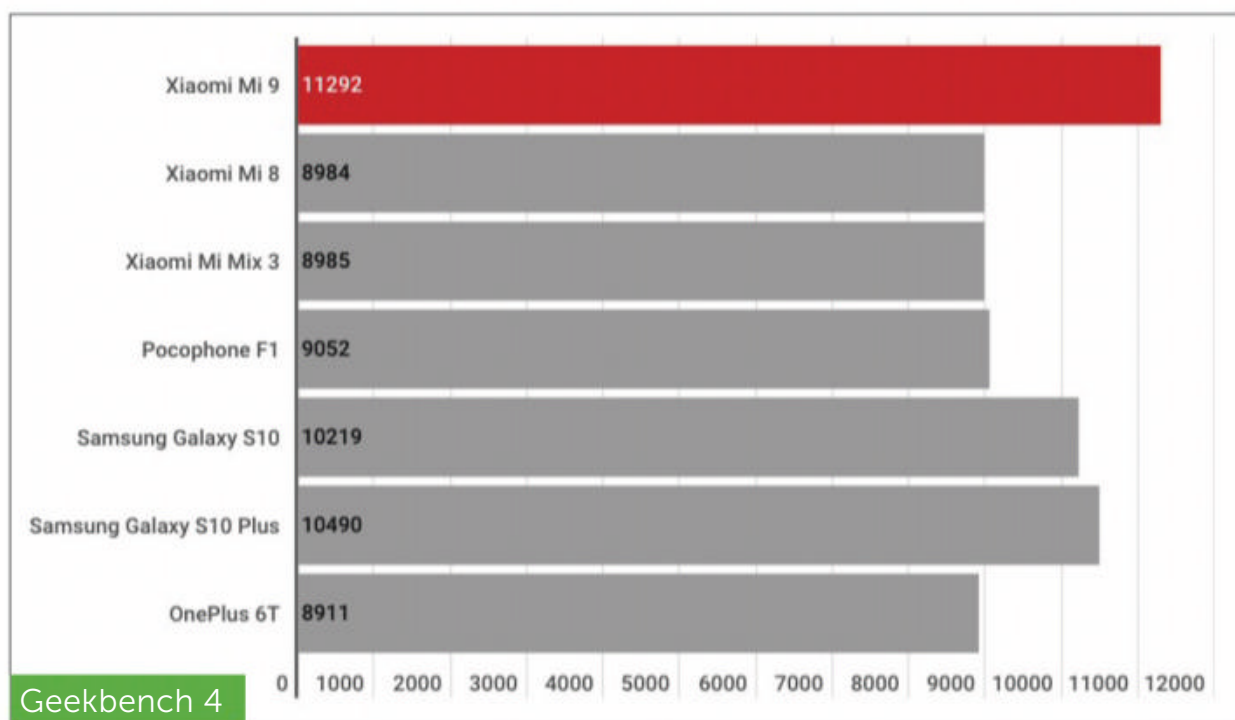
and all three produce a level of performance with which no-one could reasonably find fault.

(Samsung also has its own processors, with the Exynos 9820 found in the UK version of the Galaxy S10. And then there's MediaTek, but its cheaper chips are in a different league.)

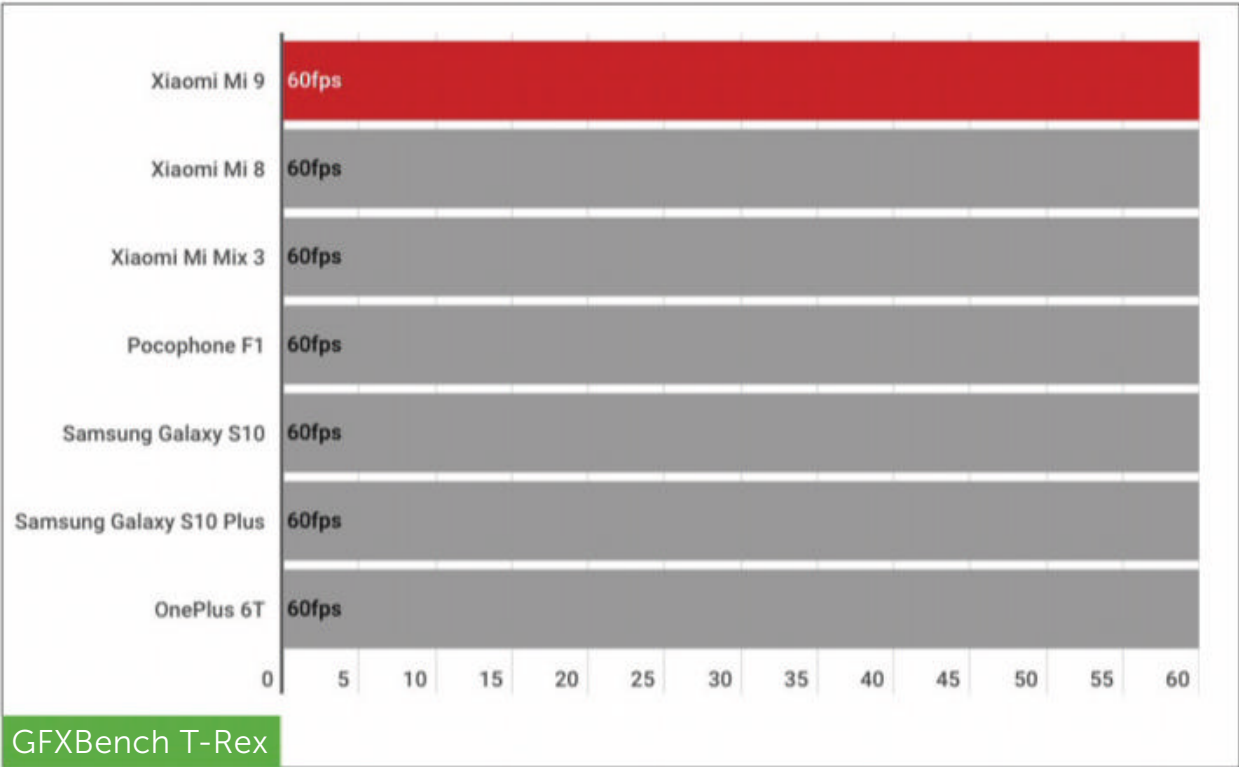
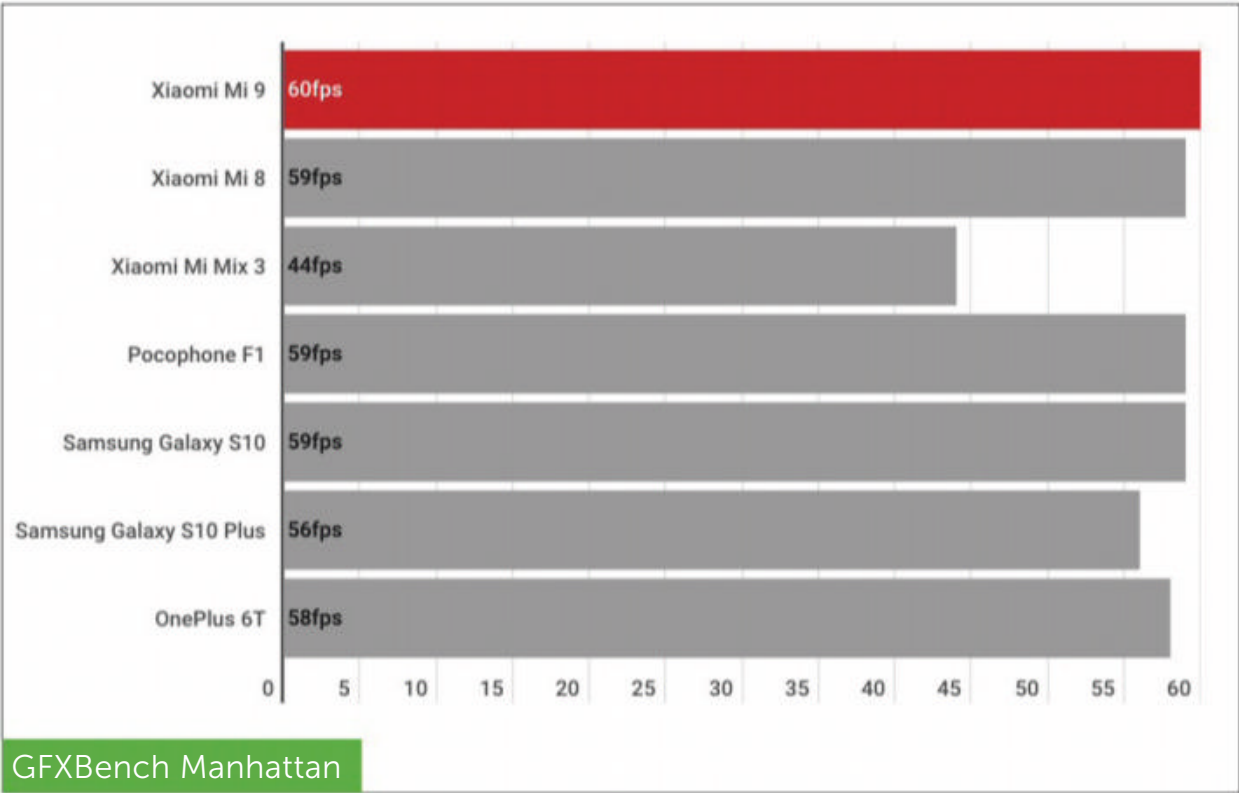
In Mi 9 Xiaomi has specified one of those top-tier chips, the Snapdragon 855, but it has done so with the X24- rather than X50 modem which means this phone isn't capable of supporting 5G. (And neither are most of the world's phone networks, so that's a moot point.)

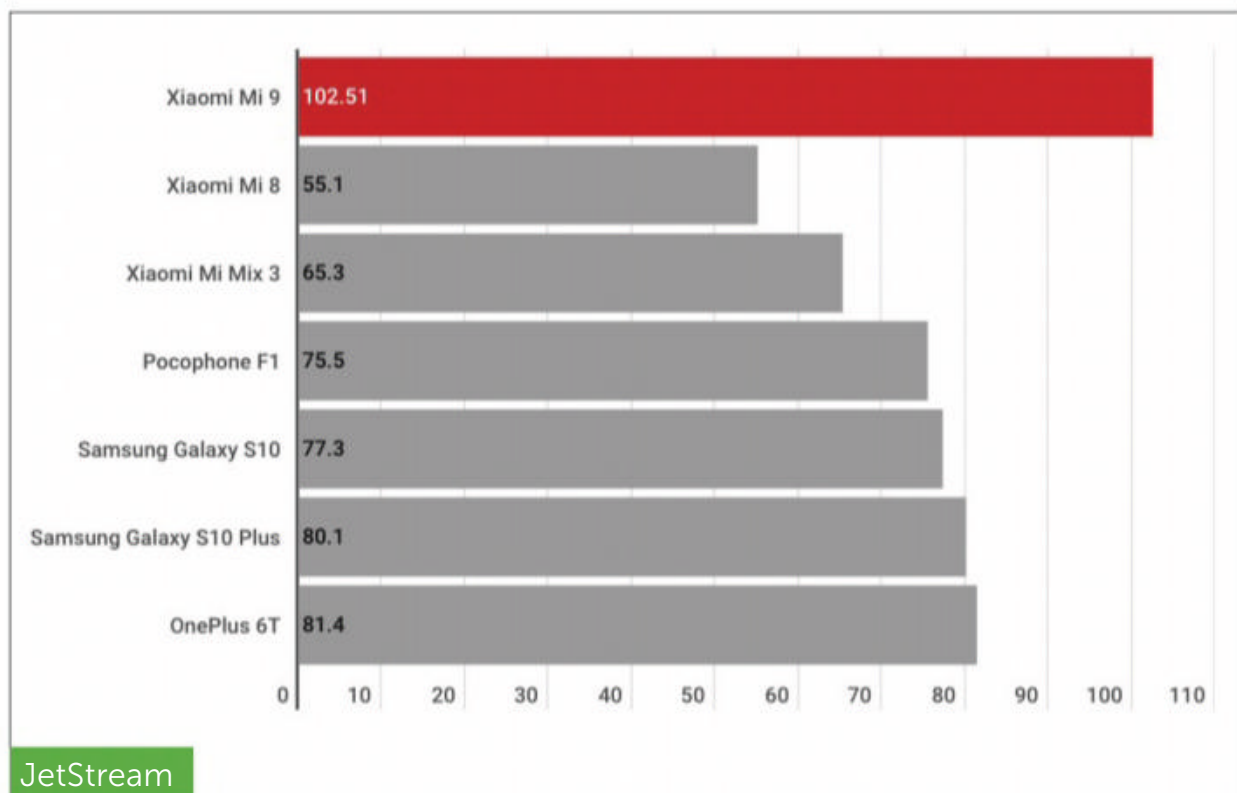
This Snapdragon chip is clocked at 2.84GHz and uses the Kryo 485 core. It's integrated with the Adreno 640 GPU and paired with 6GB of RAM and 64- or 128GB of non-expandable storage.

The Mi 9 is capable of some mind-blowing performance, if falling below those phones with a



REVIEW





greater allocation of memory (such as the China-only Mi 9 Explorer, which has 12GB).

We ran it through our usual benchmarks and have charted its performance in comparison with some of today's top smartphones below.

Unsurprisingly it is significantly faster than Mi 8 and the 4G Mi Mix 3 with its newer processor, but the fact it was able to smash Galaxy S10 and S10 Plus out of the park is something to be proud of for a phone that is little more than half the price.

We also ran the Geekbench battery life test on the Mi 9, in which it recorded 9 hours, 57 minutes. That's significantly higher than Mi 8 (7 hours, 10 minutes) and also above competitors such as OnePlus 6T (7 hours, 26 minutes) and Galaxy S10 (4 hours, 47 minutes). In

the real world, this means getting a full day's life from Mi 9 shouldn't be a problem.

When the battery is depleted the Mi 9 supports up to 27W wired or 20W wireless charging, but Xiaomi supplies only an 18W European (two-pin) plug in the box so we did not test this. The company claims you'll get up to 40 percent in 30 minutes wirelessly, or up to 100 percent in 90 minutes.

Mi 9 also covers all connectivity bases with dual-frequency GPS, the aforementioned IR blaster, NFC, OTG, Bluetooth 5.0 and Wi-Fi. It's a dual-SIM, dual-standby phone, with both SIMs able to connect to 4G networks.

Cameras

In common with Mi 8 there's a 20Mp selfie camera at the front of the Mi 9, though we were kind of expecting the 24Mp selfie camera from Mi 8 Lite to make an appearance. No bother – it's a great camera, and good for selfies and video chat, though as on previous models the various beautifying features were so subtle it was often difficult to tell if they were doing anything.

Mi 9 is Xiaomi's first smartphone to support a triple-lens AI camera at the rear. It uses the same 48Mp lens we saw in Redmi Note 7, a budget handset announced in China in January, but combines it with 16Mp wide-angle and 12Mp telephoto lenses, all hidden behind Sapphire glass. It's a huge upgrade over the 12- and 12Mp dual-lens camera in Mi 8.

The first is a Sony IMX586 1/2in sensor that supports 0.8µm pixels and has a f/1.75 aperture. This

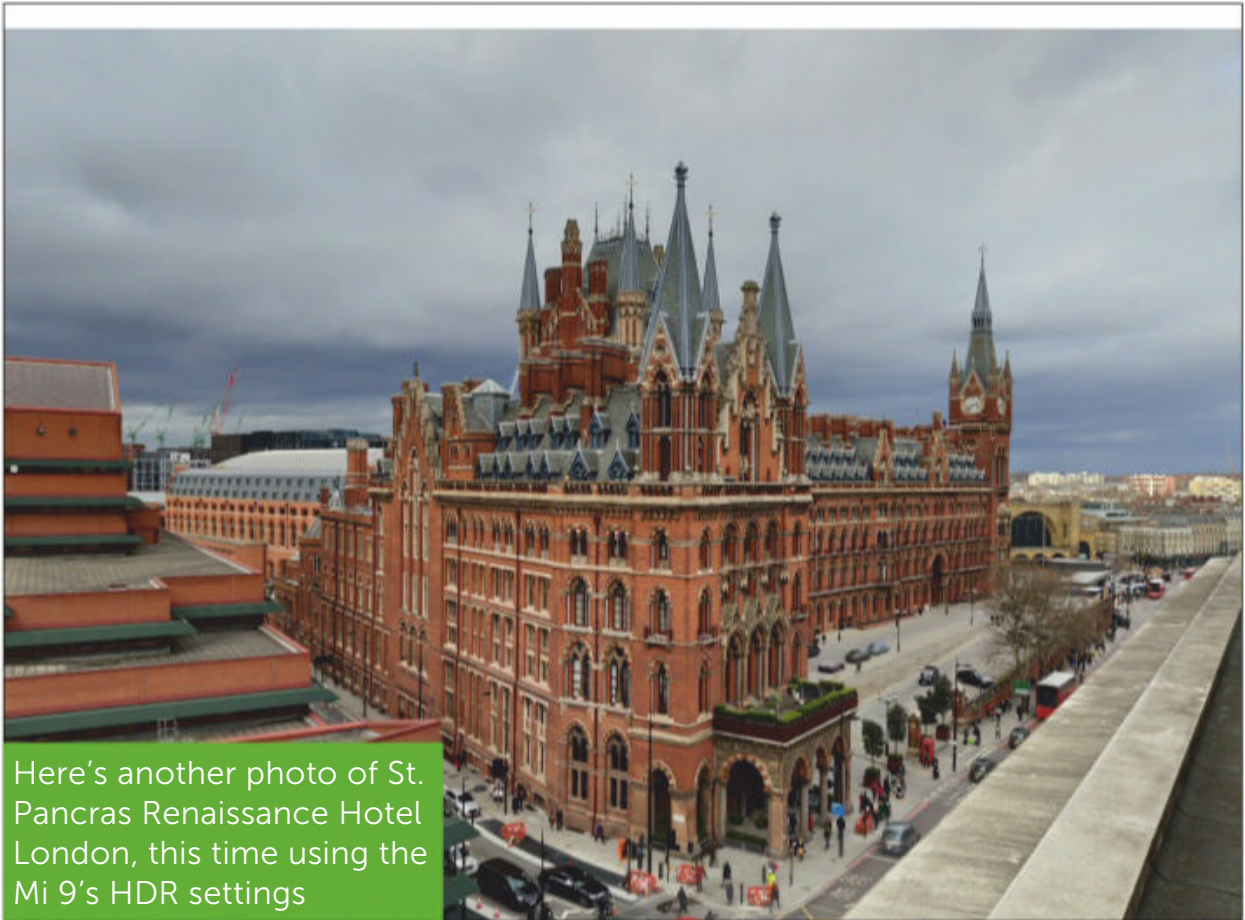
camera can also increase the pixel size to $1.6\mu\text{m}$ at 12Mp, with its '4-in-1 Super Pixels' allowing in four times more light than a single pixel.

The 12Mp telephoto lens has a 2x optical zoom, while the 16Mp wide-angle supports a 117-degree field of view and 4cm macro photography. Both have $1.0\mu\text{m}$ pixels and f/2.2 aperture.

The resulting quality of images in our test was superb, with excellent lifelike colouring and detail that is sharp right to the edges of the shot. It's difficult to fault for a £1K phone, let alone one half that price. See below for our test shots with Auto- and HDR settings respectively.



REVIEW



In low light quality steps down a notch, with some noise visible in the shot. But overall Mi 9 did a fantastic job of lighting the scene, and it sets itself apart from less capable camera phones by clearly defining text and easily distinguishing between the various shades of black in the scene.



For video super slow-mo at 960fps at 1080p and 4K at 60fps are supported.

Software

The Mi 9 runs MIUI 10, which is a custom version of Android 9 Pie, most obviously different in the lack of an app tray, the custom drop-down notification bar, the reordering of the Settings menu and the various Xiaomi apps and features preinstalled on the device.

There are a couple of ways MIUI 10 is different on the Mi 9 than on other Xiaomi phones that run the software. For starters, there's Dark Mode. This is one of the trendiest software features of late, reversing the screen colours and reducing its drain on battery life by up to 83 percent. It can also be easier on the eyes than a bright white display. While Google's talking about adding a system-wide Dark Mode in upcoming Android 10, Xiaomi's already there with MIUI 10 on Mi 9.

The other new feature here is something we mentioned earlier in this review, the customizable Always-on Display. You still don't have nearly as much control over it as on the likes of Samsung's Galaxy phones, but it now supports colour and some preset background images. If you like you can schedule the AOD to turn on and off only at certain times of the day.

In other respects this is MIUI 10 as we know it and, though it will feel unfamiliar to Android users who have never played with a Xiaomi phone before, there's a lot to love here that you don't get in standard Android. A couple of our favourites are

REVIEW

Dual Apps and Second Space, allowing you to run multiple versions of apps on the phone and even wall off some for selective viewing.

During the setup process you get the chance to choose between a full-screen display that supports gestures for going back, home or accessing open apps, or you can display these navigation options as buttons on screen.

A Split Screen mode is available within the multitasking menu, allowing you to interact with two apps at once. You'll also find things like One-handed mode (shrinks the size of the usable screen area) and Quick ball in the Settings.

Verdict

Devilishly fast, insanely beautiful and offering the best value for money you'll find in any smartphone, anywhere. So should you buy it? You'd be mad not to. **Marie Black**

Specifications

- 6.39in (2,340x1,080; 643ppi) Super AMOLED capacitive touchscreen
- Android 9.0 (Pie)
- Qualcomm SDM855 Snapdragon 855 (7nm) processor
- Octa-core (1x 2.84GHz Kryo 485; 3x 2.42GHz Kryo 485; 4x 1.8GHz Kryo 485) CPU
- Adreno 640 GPU
- 6GB, 8GB RAM
- 64GB, 128GB storage
- Three rear-facing cameras: 48Mp, f/1.8, 1/2in, 0.8µm,



The Mi 9 is devilishly fast, insanely beautiful and offers the best value for money you'll find in any smartphone

- Laser/PDAF; 16Mp, f/2.2, 13mm (ultrawide), 1/3in, 1µm, Laser/PDAF; 12Mp, f/2.2, 54mm (telephoto), 1/3.6in, 1µm, Laser/PDAF, 2x optical zoom
- Front-facing camera: 20Mp, f/2.0, 0.9µm
- Dual-band 802.11ac Wi-Fi
- Bluetooth 5.0
- A-GPS, GLONASS, BDS, GALILEO, QZSS
- NFC
- Fingerprint scanner (under display)
- USB 2.0, Type-C 1.0
- Non-removable 3,300mAh lithium-polymer battery
- 157.5x74.7x7.6mm
- 173g



Huawei P30 Pro

Price: From £899 (inc VAT)

Last year we were seriously impressed with Huawei's P20 Pro, which was then eclipsed six months later by the Mate 20 Pro. Now, as expected, we have the P30 Pro, which takes a lot of the best features from the Mate 20 Pro and makes them even better. Below are our initial impressions.

Availability

The P30 Pro is on sale now, with prices starting at £899 for the 128GB model, and £1,099 for 512GB.

Design

Given that Huawei has what it calls 'dual flagships' by having both the P series and Mate series, it's a little surprising that in essence the P30 Pro adopts the Mate 20 Pro's design. The screen has curved sides on the front and back, and it has an in-screen fingerprint scanner as well. The bottom edge is flatter than the Mate 20 Pro's and the SIM tray is to the left of the USB-C port. But with 40W SuperCharging, 15W wireless charging and reverse wireless charging, the P30 Pro does borrow a lot from its sibling.

It's IP68 water-resistant and has a new in-screen speaker, which is used for phone calls. We didn't get to test this, but are confident it will be much like the LG G8's and Vivo Apex's similar speaker. It isn't used for general audio: when you play music, games or videos without headphones sound comes from only the bottom speaker.

Another thing we couldn't test was the upgraded optical fingerprint scanner. Unfortunately it isn't ultrasonic so won't work as well if your finger or the screen is wet, but Huawei says it's still faster and more accurate than on the Mate 20 Pro.

Display

With its embedded fingerprint scanner, the P30's screen now has an aspect ratio of 19.5:9. However, even though it's an OLED display with an upgraded optical fingerprint sensor behind it, it has a lower resolution than the Mate 20 Pro.

It's fractionally bigger than the Mate 20 Pro's at 6.47in, but has a lower pixel density of 398ppi. Huawei

calls it Full HD+ because it's 2,340x1,080 pixels. In the flesh it looks sharp enough and, of course, you can't see the pixels at normal viewing distances. Compared to Samsung's AMOLED screens, the colours on the P30 Pro look more muted, even in Vivid mode. It means more natural-looking pictures, though.

Huawei hasn't gone for a 'punch-hole' camera like some of its rivals, but the notch for the selfie camera is pleasingly symmetrical and much smaller than on the P20 Pro and Mate 20 Pro.

Cameras

The P series is all about photography, so it's no wonder that's pretty much all Huawei talked about in our pre-launch briefing. Here's what each of the four cameras do:

Top: Ultra-wide, 20Mp, f/2.2, 16mm

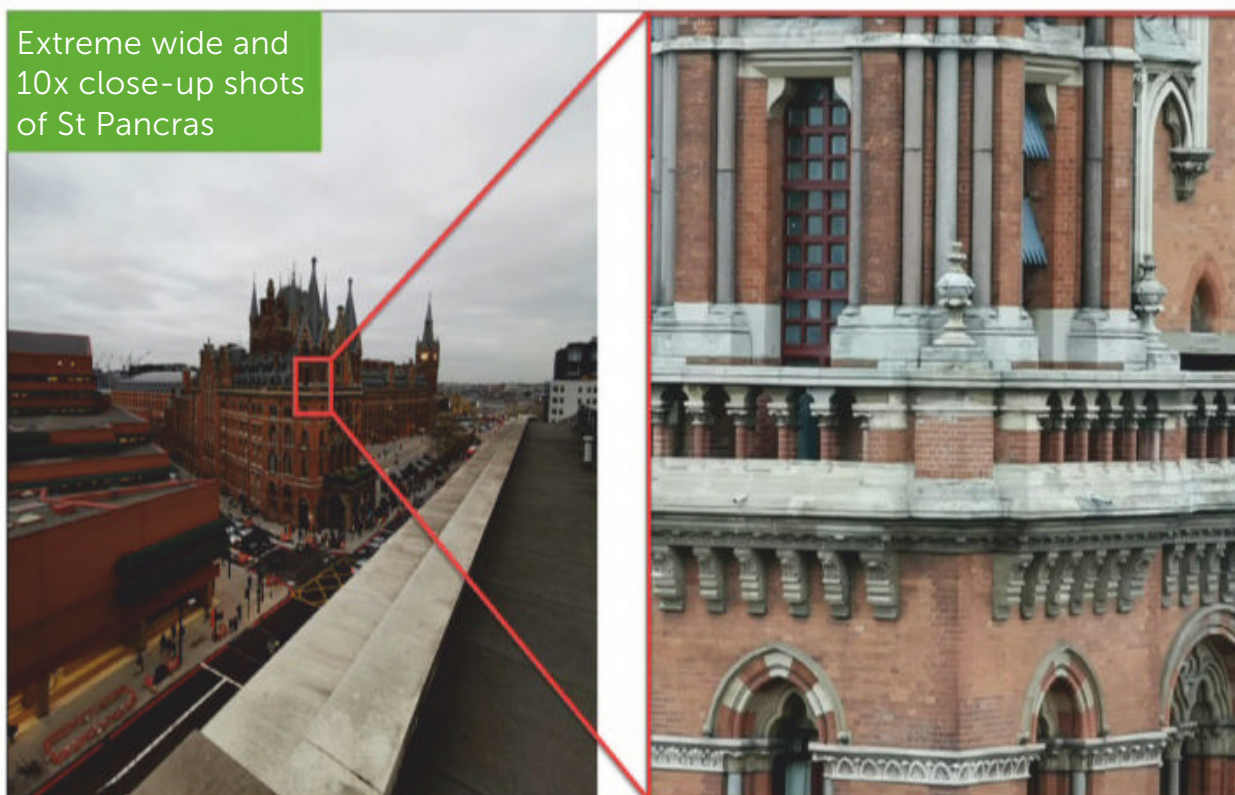
Middle: Main, 40Mp, f/1.6, OIS, 27mm

Bottom: 5x Telephoto, 8Mp, f/3.4, OIS, 125mm

Fourth: Time-of-flight camera (depth)

That's quite a lot of information, so to put it more simply, the P30 Pro allows you to take everything from an ultra-wide photo to a close-up that's the equivalent to a 10x zoom. If you're wondering how it can be 10x when the telephoto camera is only 5x, it's because the information from the 40Mp camera is combined with it to produce what Huawei is calling "lossless 10x zoom".

As the phone we tested was running pre-release software we can't yet say anything definitive about the



quality of the 10x zoom, nor really any other photos. However, we were still impressed by the initial shots we were able to take.

The photos at the top of the following page show the difference in low-light performance between the P20 Pro (left) and P30 Pro (right) in their standard (not long exposure) photo modes. Huawei says the reason why the P30 is so much better is down to the new 40Mp SuperSpectrum sensor. It has red, yellow and blue pixels instead of red, green and blue and this is said to capture more light. Combine this optical stabilization, a larger aperture and a higher sensitivity (ISO has increased from 102,400 to a whopping 400,000) and it's easy to understand why there is such a big improvement.

HANDS-ON



Low-light performance between the P20 Pro (left) and P30 Pro (right) in their standard photo modes

All of this translates to video as well, which means the P30 Pro is much more capable than its predecessors when shooting in low light. There's good stabilization in 4K, but our early sample seemed unable to stabilize video when zoomed in to 5x or 10x.

A future update, said to be arriving in April, will bring a new feature called Dual View video, which is the ability to record using two cameras at the same time – main + telephoto. This will allow you to instantly zoom in on the action at points you choose in the edited video. Demos we've seen put this to great use and it's an effect that no other current phone is capable of.



Portrait taken using the P30 Pro's fourth camera



Image taken with the 32Mp selfie camera

On top of this, there's a new HDR+ mode, which uses the Kirin 980's AI capabilities to identify not only dark and light areas of an image but what they are. It will then process the image intelligently according to what it 'sees', be that a person, a sunset, greenery or another object.

Finally, there's that fourth camera. It's not for taking photos and instead works with the 'flood illuminator' above it to work out how far away things are in the scene. This information is then used to determine which parts should be blurred out in a Portrait photo and should lead to more realistic-looking portraits. And from our test photo (above left), the effect does

HANDS-ON

look good. It wasn't perfect, though, and wisps of Dom's hair and the rim of his glasses which overlap the background have still been inadvertently blurred.

Selfies from the 32Mp camera at the front look quite sharp, but we couldn't help but notice areas of stubble were smeary and lacking in detail. This may have been caused by the fact we were shooting at twilight, or the early software, but unlike the 40Mp rear camera which defaults to 10Mp photos and effectively throws away three-quarters of the pixels, you get the full 32Mp out of the selfie camera.

There's one other trick: the depth sensing cameras on the rear allow the phone to measure objects in the real world, much like you can with Apple's Measure app on the latest iPhones.

Performance

We haven't run any benchmarks yet, but with the same processor from the Mate 20 Pro and 8GB of RAM, there won't be any surprises when we do. The model we looked at had 256GB of storage, but there may be other capacities available. Huawei hadn't confirmed anything about Bluetooth or Wi-Fi versions, but we do know there's NFC and there definitely isn't 5G.

First impressions

Having spent less than two hours with a P30 Pro running beta software, it's way too soon to say anything definitive about it. But first impressions are good: it looks and feels great in the hand, isn't noticeably bigger than the Mate 20 Pro and the cameras show a lot of promise. **Jim Martin**



The P30 Pro looks good and feels great in the hand

Specifications

- 6.47in (2,340x1,080; 398ppi) OLED capacitive touchscreen
- Android 9.0 (Pie)
- HiSilicon Kirin 980 processor
- Octa-core (2x 2.6GHz Cortex-A76, 2x 1.92GHz Cortex-A76, 4x 1.8GHz Cortex-A55) CPU
- Mali-G76 MP10 GPU
- 8GB RAM
- 128GB, 256GB, 512GB storage
- Four rear-facing cameras: 40Mp, f/1.6, (wide), 1/1.7in, PDAF/Laser AF, OIS; 20Mp, f/2.2, 16mm (ultrawide), 1/2.7in, PDAF/Laser AF; Periscope 8Mp, f/3.4, 80mm (telephoto), 1/4in, 5x optical zoom, OIS, PDAF/Laser AF; TOF 3D camera

HANDS-ON

- Front-facing camera: 32Mp, f/2.0, (wide)
- Dual-band 802.11ac Wi-Fi
- Bluetooth 5.0
- A-GPS, GLONASS, BDS, GALILEO, QZSS
- NFC
- Fingerprint scanner (under display)
- USB Type-C 1.0 reversible connector
- Non-removable 4,200mAh lithium-polymer battery
- 158x73.4x8.4mm
- 192g

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5G smartphones coming in 2019

One of the biggest trends in 2019 smartphones will be 5G. We look at the 5G phones coming soon. **MARIE BLACK** reports

We're looking forward to the launch of 5G in the UK. It's around 20 times faster than 4G, with the potential for even better speeds. With 5G, you'll be able to stream video in 4K, and make 4K video calls. There are also benefits for mobile gaming because of 5G's lower latency.

But we're in a bit of a chicken-and-egg situation here, in that you won't be able to actually use 5G until both your network and your smartphone support the

next-gen connectivity standard. So do you buy a 5G phone now and wait for the networks to catch up, or do you go for a network that promises 5G support and wait until it's ready to buy the hardware?

Though many of the phones covered here are launching this summer, we still don't know an exact date for when you'll be able to use 5G in the UK, and widespread availability is not expected until 2020.

EE, for example, promises to launch 5G for users of the yet-to-be-announced OnePlus 5G phone and Samsung Galaxy S10 5G in the second half of 2019 across 16 UK cities. This will be achieved in two phases: first in Birmingham, Belfast, Cardiff, Edinburgh, Glasgow, Liverpool, London and Manchester; second in Newcastle, Leeds, Hull, Sheffield, Nottingham, Leicester, Coventry and Bristol.

If you're an EE customer and you don't opt for one of those two phones AND live or work in one of the 16 cities, you will not be using 5G in 2019. In the meantime, the phones listed below will max out at 4G (or 4.5G if you believe the marketing hype), so it is worth carefully considering whether you should upgrade now or wait a little longer.

Vodafone has also announced its 5G plans, and having already announced that Manchester, Bristol, Cardiff, Liverpool, Birmingham, Glasgow and London would get 5G in 2019, it has now added Birkenhead, Blackpool, Bournemouth, Guildford, Newbury, Portsmouth, Plymouth, Reading, Southampton, Stoke-on-Trent, Warrington and Wolverhampton to that list.

Despite this, IDC forecasts that only 0.5 percent of phones shipped in 2019 will be 5G-ready.

ROUND-UP

At first 5G will be supported in only the most expensive, top-spec phones, but it will gradually filter down to the mid-range- and eventually budget markets, as we saw with 4G. Here are the 5G phones that are confirmed to arrive this year.

Xiaomi Mi Mix 3 5G

Xiaomi announced its first 5G phone at MWC 2019, and says it will go on sale in May at €599 (UK pricing will be confirmed nearer the time). With the potential exception of the upcoming OnePlus 5G phone, which will likely cost a similar amount, right now that makes it the cheapest 5G phone to have been announced.

This is an upgraded version of the Mi Mix 3 that launched in October (January in the UK), with its Snapdragon 845 chip swapped out for the Snapdragon 855 and X50 modem. It will be available in Onyx Black



and Sapphire Blue. The Mi Mix 3 is notable as being the best implementation of a slider phone we've seen yet. By hiding the twin (24- and 2Mp) selfie cameras behind the screen it is able to achieve an incredible 93.4 percent screen-to-body ratio.

The phone also includes all the latest hardware you'd expect in a 2019 flagship, with wireless charging now bumped up to a super-fast 20W. All you really sacrifice in return for the lower price is a Quad-HD+ display and waterproofing.

Samsung Galaxy S10 5G

The Galaxy S10 5G was announced alongside the standard, Plus and 'e' variants of Galaxy S10 at an Unpacked event on 20 February, and will go on sale in Korea on 5 April. A UK release date and pricing has not yet been confirmed.



ROUND-UP

In essence, the Galaxy S10 5G is simply a larger version of the Galaxy S10 with 5G support, but it also adds an extra 12Mp camera lens at the rear resulting in a quad-lens setup. The battery is also higher in capacity at 4,500mAh (vs 3,400mAh).

With a 6.7in Quad-HD+ Dynamic AMOLED Infinity-O panel, this is the largest Samsung phone to date. It measures 77.1x162.6x7.94mm and weighs a colossal 198g. The S10 5G has the same core hardware as the rest of the range, with an Exynos 9820 or Snapdragon 855 processor, but a fixed 8GB of RAM and 256GB of non-expandable storage.

LG V50 ThinQ 5G

The LG V50 ThinQ 5G was something of a surprise when it was announced at MWC 2019: we weren't expecting it to arrive until October.

LG has decided to hold off on its proper foldable phone for now, offering its V50 ThinQ as a sort of halfway house that serves up 5G and similar functionality to a foldable device with an optional second display. Even without the second screen the V50 is something of a chunk, which is necessitated by the extra hardware required by 5G. It also packs a whopping 4,000mAh battery and is fitted with a 6.4in 19.5:9 Quad-HD+ display.

LG's 5G support is provided by this year's flagship processor of choice, the Qualcomm Snapdragon 855 with X50 modem. In comparison to the 2018 845 it promise a 45 percent boost in general processing power and 20 percent uplift in games. This is paired with 6GB RAM and 128GB storage as standard.

LG V50 ThinQ 5G



Audio is a particular standout for LG, and the V50 ThinQ 5G offers the best wired audio of any smartphone thanks to the high-quality DAC. Photography is also noteworthy, with a triple-lens (16-, 12- and 12Mp) setup at the rear, and dual-lens (8- and 5Mp) at the front.

Huawei Mate X

The Mate X is Huawei's upcoming foldable phone, and it stole possibly more column inches than any other smartphone following its successful MWC 2019 launch. This phone truly has the wow factor, yet cries of "I want one" are immediately followed by "How much?" The Mate X will cost a staggering €2,299 when it arrives.

The Mate X does not have a confirmed release date, though both EE and Vodafone have confirmed that they will be stockists.

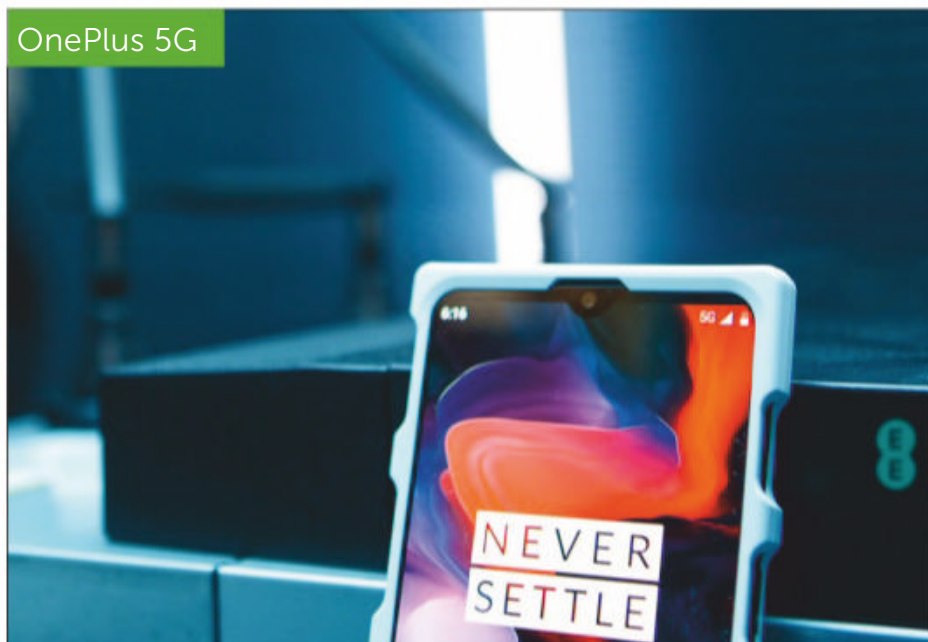
ROUND-UP



When laid out flat the Mate X has a magnificent 8in tablet-like display with a 2,480x2,200 resolution. It folds in the opposite direction to the Galaxy Fold, which has a second display on the other side. This means you have in effect a 6.6in, 2,480x1,148 (19.5:9) smartphone that has a second 6.4in, 2,480x892 (25:9) screen on the rear.

You might be wondering where this leaves space for the four Leica cameras, and the ingenious solution is found in the bar grip to one side.

With so much screen battery life could be an issue, but Huawei specs a single 4,500mAh cell with support with stupidly fast 55W charging.



OnePlus 5G

Originally thought to be an entirely separate product line to the OnePlus 7 we're expecting to see announced in the summer, the upcoming OnePlus 5G phone is now thought to be a more expensive version of the OnePlus 7 with a few minor tweaks, as with the Galaxy S10 and S10 5G.

At MWC 2019 a OnePlus booth teased the upcoming device, but hid it behind a glass display. The screen appears to be a 21:9 panel, but little else could be gleaned.

OnePlus has confirmed its 5G phone will run the Qualcomm Snapdragon 855 processor with an X50 modem, and that it will arrive before the end of May. EE will be a stockist in the UK.

CEO Pete Lau has publicly stated that he's intending to keep the phone 'affordable', which reportedly means below the £800 mark.



Best games controllers for your Android phone

Give your Android gaming experience a boost with a smartphone controller. **LEWIS PAINTER** reports

While once upon a time the game selection on Android was a basic affair, that's no longer the case. The runaway success of mobile shooters such as Fortnite and PUBG Mobile has started a mobile gaming revolution where console-quality games are being created specifically for smartphones.

The issue is that touchscreen isn't always the best input method, especially for fast-paced online shooters, which is why we've compiled a list of our

favourite Android controllers, along with buying advice to help you find the right controller and improve your mobile game performance.

Compatibility

The most important thing to consider when buying a controller for Android gaming is compatibility. It's crucial that you know the version of Android that your phone or tablet is running and make sure that the controller supports it. While most will support the latest version of Android, not all manufacturers offer backwards compatibility with older versions of Google's mobile operating system.

As well as making sure that your controller is compatible with your version of Android, you should check that your favourite mobile games offer controller support. The good news is that the hugely popular Fortnite and PUBG Mobile both offer support for controllers, with hopes that the upcoming Call of Duty: Mobile game follows suit.

Design

There are various designs available when it comes to Android controllers; you pick up something resembling an Xbox One or DualShock 4 controller for familiarity, but there are other, more unique options available too, that can really enhance the mobile gaming experience. For example, why not consider a controller with a built-in smartphone mount? It's ideal for portable mobile gaming as you don't need to find a surface to place your smartphone or stand and sacrifice viewing distance.

ROUND-UP

Pricing

While you can pick up non-branded Android controllers cheaply online, it's worth noting that you'll pay a premium for controllers from established brands such as Sony, Microsoft and SteelSeries. The average price for a premium gaming controller is around £50 – anything more than that and you should really consider whether you'll get enough use out of it as there are cheaper options available.

SteelSeries Stratus XL

Price: £49.99 from fave.co/2FtKzul

The Bluetooth-enabled SteelSeries Stratus XL is a favourite among both iOS and Android gamers,



providing a console-like experience on your mobile. Its design is familiar yet different; it sports the general design of an Xbox One controller while featuring the aligned analogue sticks of the DualShock 4 controller. The best of both worlds, right?

Unlike the Nimbus for iOS, the Android variant doesn't offer a built-in battery, so you'll need to pick up a couple of AA batteries before using it for the first time. The good news is that you'll get around 40 hours of use before you'll need to swap them out – that's not bad, especially for the more casual mobile gamers out there.

The only downside? It doesn't feature a clip for your smartphone, so you'll have to invest in a separate stand to hold your device while playing games.

Sony DualShock 4/Smart Clip

Price: £44.99 from [fave.co/2TUpcg6](https://www.fave.co/2TUpcg6),
£5.99 from [fave.co/2FtLACZ](https://www.fave.co/2FtLACZ)

If you own a PS4 and have access to a DualShock 4 controller, the good news is that Sony's Bluetooth-enabled controllers are fully Android-compatible. It's not news to Sony Xperia users, who have had access to PS4 Remote Play for quite some time, but it's not widely known outside of the Xperia circle. The DualShock 4 controller is widely regarded as one of the best controllers on the market at the moment, so what better way to interact with Android games?

Of course, it wasn't designed with mobile use in mind, so the DualShock 4 doesn't feature a smartphone clip. That's where the Smart Clip

ROUND-UP



DualShock 4/Smart Clip

comes in; costing £5.99 it allows you to mount your smartphone onto the PS4 controller for a more comfortable, streamlined mobile gaming experience.

Diswoe wireless controller

Price: £21.99 from fave.co/2FvPQlC

Another great option for mobile gamers is the Diswoe wireless controller. While the brand may not be a household name in the UK, the company produces a range of gaming accessories. It might look a bit old-school on the surface but you've got access to



Diswoe wireless controller

all standard controller function, and at £21.99 with a smartphone mount built in, it's the ideal solution for portable mobile gaming.

Xbox One controller

Price: £44.99 from fave.co/2uqTDLO

While not all models of Microsoft's Xbox One controller are compatible with Android devices, more recent ones certainly are. Microsoft's decision to ditch proprietary connection methods allows the new Xbox One controller to be used wirelessly not only

ROUND-UP



with PCs, but with Android smartphones and tablets too. Microsoft's Xbox One controller is regarded as one of the most robust and comfortable controllers ever made, offering full gamepad functionality in a sleek design. You can even create your own custom controller via the Microsoft website to truly own something truly unique. Like the DualShock 4 controller, it doesn't feature a built-in stand, but these can be picked up fairly cheaply online.

Nintendo Switch Pro controller

Price: £54.99 from fave.co/2Oo3fA2

It might be the priciest option of all in our round-up, but Nintendo's Switch Pro controller is also



compatible with Android devices. It's probably not buying one outright if you don't already own one as there are cheaper, more specialized options on the market, but the Switch Pro controller is a great Android controller if you already own one.

The catch is that setup isn't as straightforward as some of the other controllers here.



Tweaks and changes in Android Q that will improve your phone

Okay, but what dessert starts with Q? **MICHAEL SIMON** reports

Right on schedule, the first Android Q Developer Preview has arrived, and there's a lot to unpack. As with the past few releases, there aren't a ton of user-facing features just yet – those will likely be reserved for Google I/O and the Pixel 4 launch in

September. Nonetheless, the changelog is still filled with plenty of interesting tweaks and additions that will make your phone better than ever once the operating system lands in late summer.

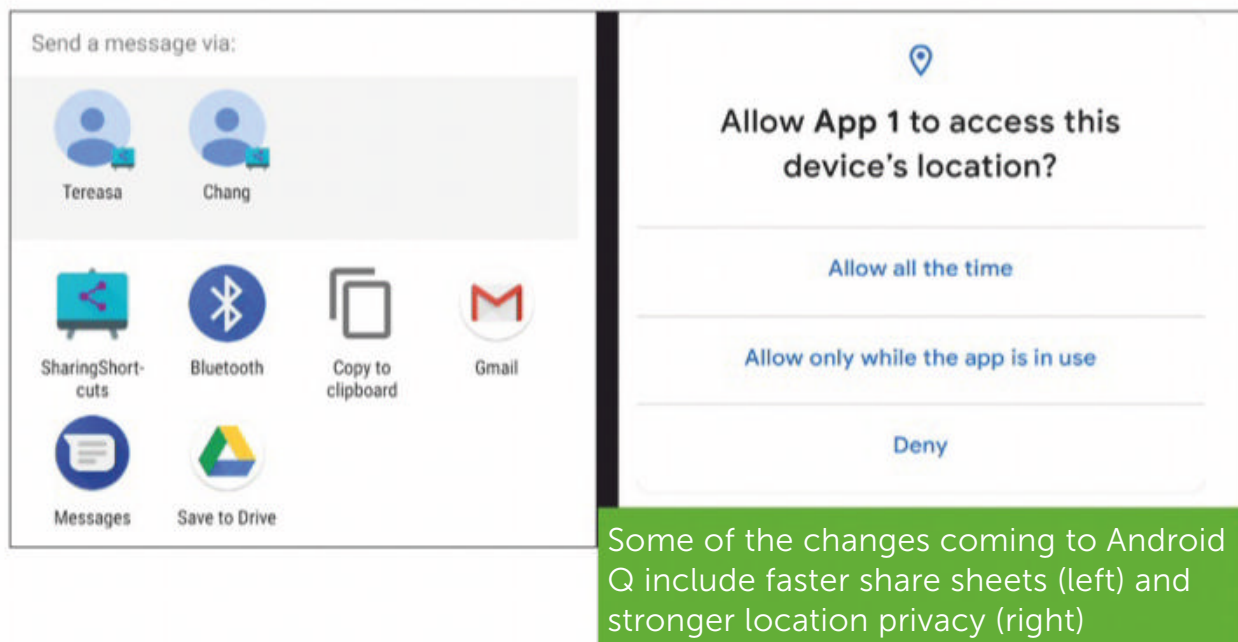
The biggest change is one that most people won't get to enjoy for years to come. Google already previewed its new folding interface with Samsung's ultra-expensive Galaxy Fold, but now it's making those new app actions – such as pause, resume, and resizing when opening a screen – available to all developers in order to make sure apps are displayed properly on the new crop of foldable screens.

But while a folding phone is still an unaffordable dream for most of us, there are many features in the new OS that will make non-folding Android phones better than ever. Here are seven ways that your phone will benefit from the changes in Android Q.

Your data will be more secure

One of the biggest advantages iPhone users lord over their Android-using friends is Apple's commitment to privacy. From apps to data, Apple locks down iOS so developers have little to no access to sensitive information, far beyond what Google demands in Android Pie. That's changing with Android Q. Among the changes Google is bringing to the update is the ability to select whether to limit an app's permission to see location to only when it's in the foreground. Users will also be able to control apps' access to photo, video, and audio files. And finally, Google will be limiting developer access to 'non-resettable device identifiers', which include IMEI and serial numbers.

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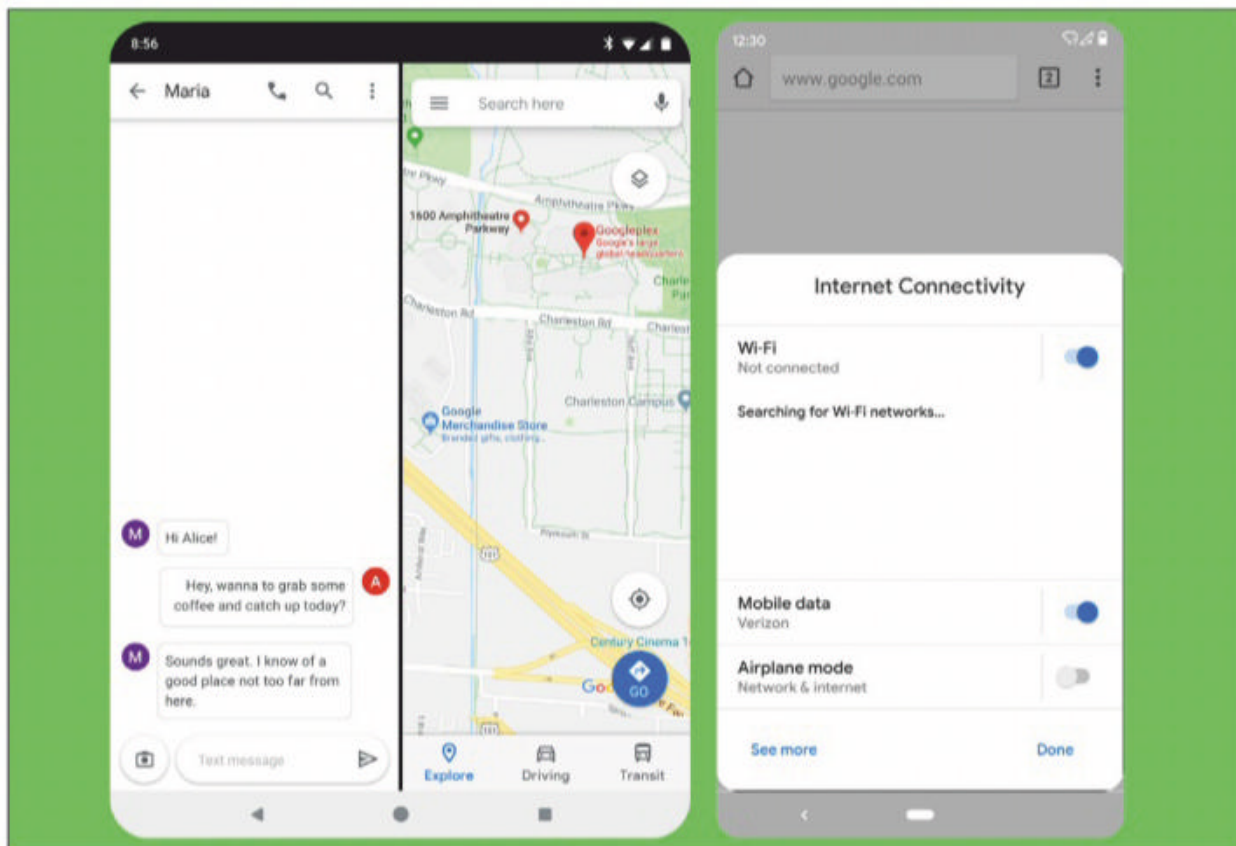


You'll be able to stay focused for longer

If you've ever had an app take over your screen just because it needs to tell you something, that's going to change in Android Q. Google is opening up access to high-priority notifications that alert you to an alarm or phone call via a banner at the top of the screen, so you can decide for yourself whether to dismiss it or stop what you're doing to address it.

Sharing will finally be fast and easy

For as fast and reliable as Android has become over the years, one area where it's always been frustratingly slow is sharing. Google says it's fixing that in Android Q. Now when you tap the share icon "the share UI will load instantly when launched", eliminating the annoying lag we experience now. That's due to a new Sharing Shortcuts API that takes its inspiration from the App Shortcuts introduced with Android 9.



Google will be supporting foldable displays (left) and in-app setting shortcuts (right) in Android Q

The right settings will always be at your fingertips

Google is also making a big change to how it manages settings. A new Settings Panel API will enable developers to build quick settings right into their apps so you won't need to jump to a different app or even pull down the notification shade to tweak something. As Google explains, "a browser could display a panel with connectivity settings like Airplane Mode, Wi-Fi (including nearby networks), and Mobile Data" all without needing to leave the app.

FEATURE

Wi-Fi calls and gaming will be better than ever

Wi-Fi 6 is on the way, and we're already starting to see phones that use the new chip, but Android Q will make your Wi-Fi faster and smarter even if you aren't able to take advantage of the new standard. A new feature will allow for specific Wi-Fi modes so developers will be able to enable high performance and low latency modes to help with gaming and Wi-Fi calls. That means those annoying delays when streaming games over Wi-Fi or making calls could be a thing of the past.

You'll be able to do more with your portraits

Portrait mode is pretty much standard on all 2019 Android phones, so Google is exploring ways to enhance it. In Android Q, Google is tapping into that



Google is giving developers access to depth-mapping data in Android Q so portraits will be better than ever

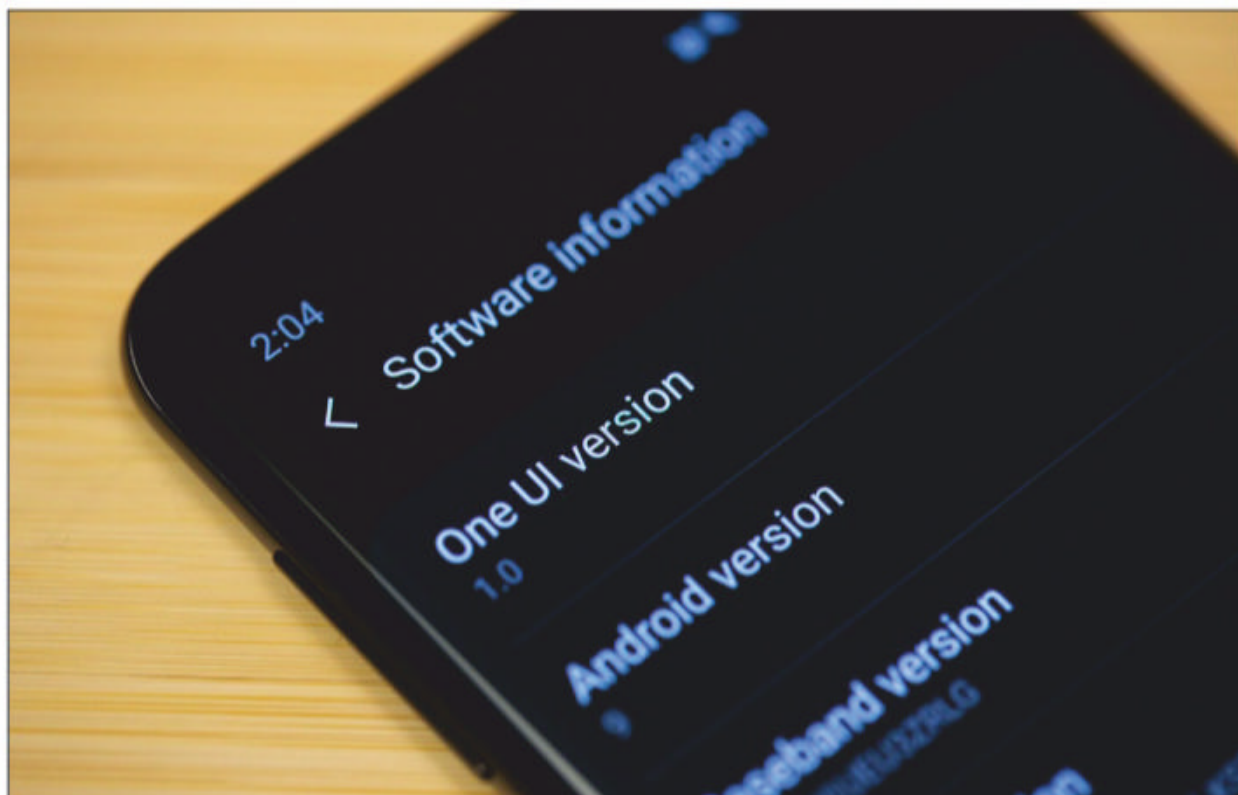
data by letting apps request a Dynamic Depth image, which it says is made up of “JPEG, XMP metadata related to depth related elements, and a depth and confidence map embedded in the same file on devices that advertise support”. So camera and photo apps will be able to do more with portrait mode, including specialized blur and bokeh options, the creation of 3D images, and even AR applications.

Apps will launch even quicker

Every Android release brings changes to the code that make the system feel snappier, and Android Q is no exception. Google is beefing up its ART runtime to help apps start faster and consume less memory – and developers don’t even have to change their apps to benefit. Starting with Android Q, Google Play will begin delivering anonymized cloud-based profiles that let parts of an app pre-compile before it even starts running, resulting in what Google says is “a significant jump-start to the overall optimization process”.

But what will it be called?

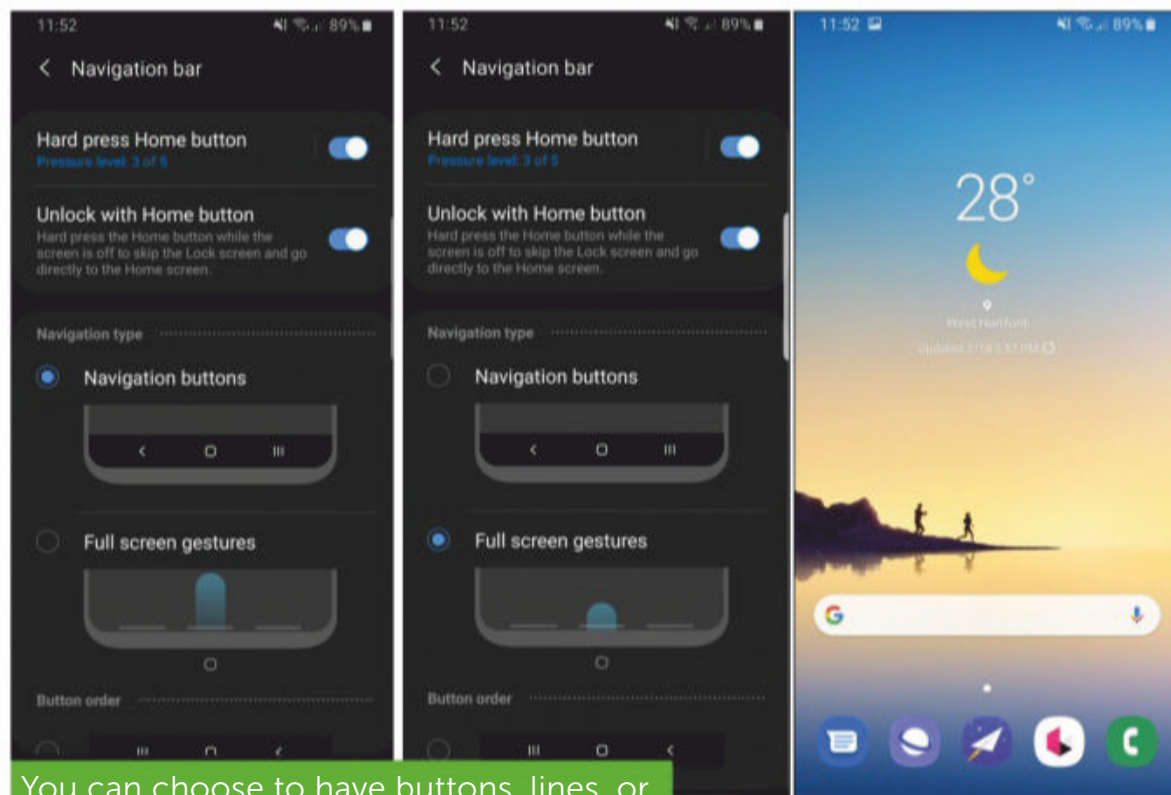
We’ll surely learn more about Android Q at Google I/O in May, and more features will be unveiled during the Pixel 4 launch that will likely take place in October. But I just have one question: What dessert starts with the letter Q? Quindim? Quiche? Quik? We’ll just have to wait and see.



Master Android 9 on the Galaxy S9 and S10

Turn on gestures and dark mode. **MICHAEL SIMON** reports

If your Galaxy S9 was recently updated or you're planning to buy an S10, then you need to get acquainted with Samsung's One UI. A complete overhaul of the Samsung Experience 9.5, it brings a stylish interface, redesigned apps, and a brand-new philosophy with an emphasis on smart and speedy interactions. While you feel your way around, here are some important tips to start off on the right foot.



You can choose to have buttons, lines, or nothing on your One UI navigation bar

Turn on gesture navigation

The most important change to One UI is the addition of gesture navigation. Samsung has taken a different tack than Google or Apple with its method. Samsung has basically turned the navigation bar button into gestures: Swipe up from the left to see your recent apps, swipe up from the centre to go home, and swipe up from the right to go back. It's a simple, smart system, but when you upgrade, it'll be off by default. To turn it on, head over to Settings > Display, and select Navigation bar.

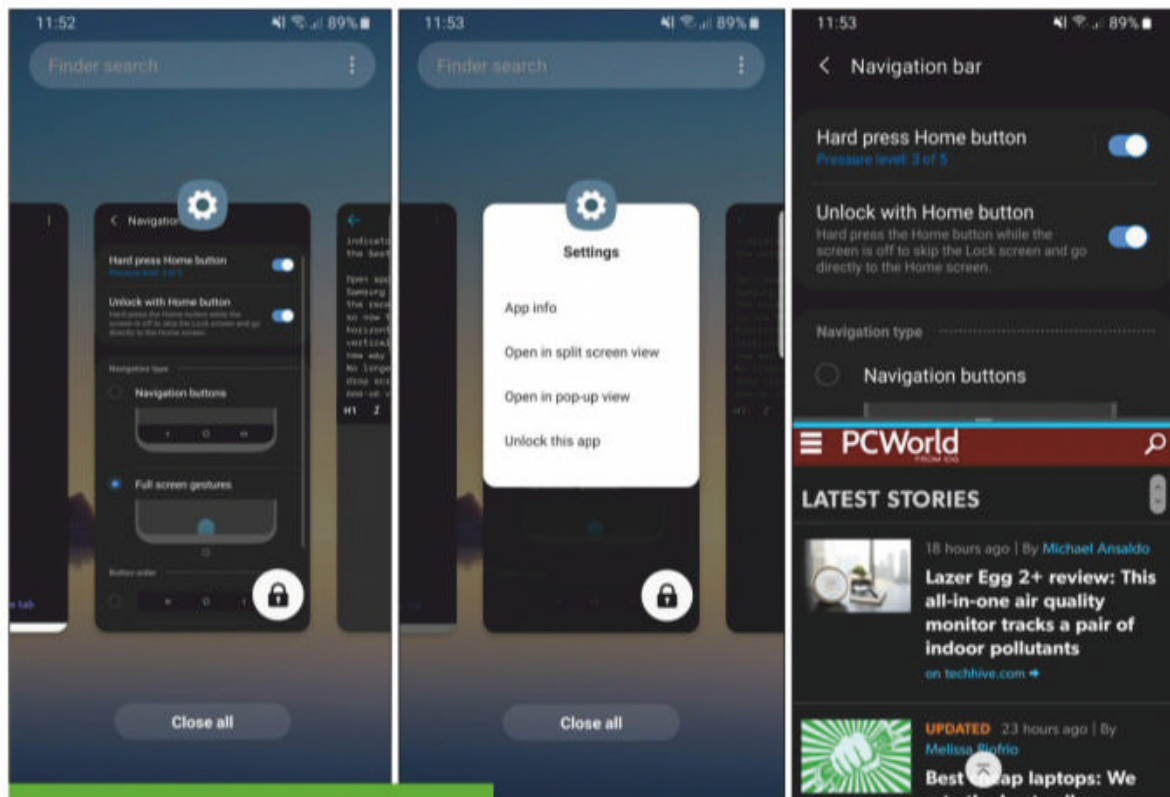
Inside you'll see two options for navigation type: buttons and full-screen gestures. Tap the circle next to gestures, and the familiar nav bar buttons will turn into

FEATURE

three thin lines at the bottom of the display indicating where you can swipe. Once you get comfortable with it, you can go commando and turn off the indicators altogether by flipping the Gesture hints toggle.

Open apps in split-screen mode

Samsung has changed the behaviour of the recent apps screen in One UI, now that apps scroll horizontally. With that comes a new way to interact with your apps. No longer do you need to drag and drop screens to use split screen or pop-up view. Long-press on an app icon, and you'll get a list of four options. Select Open in split-screen view, and the app will automatically pin to the top of the screen. Choose



Using an app in split screen is way easier to set up in One UI

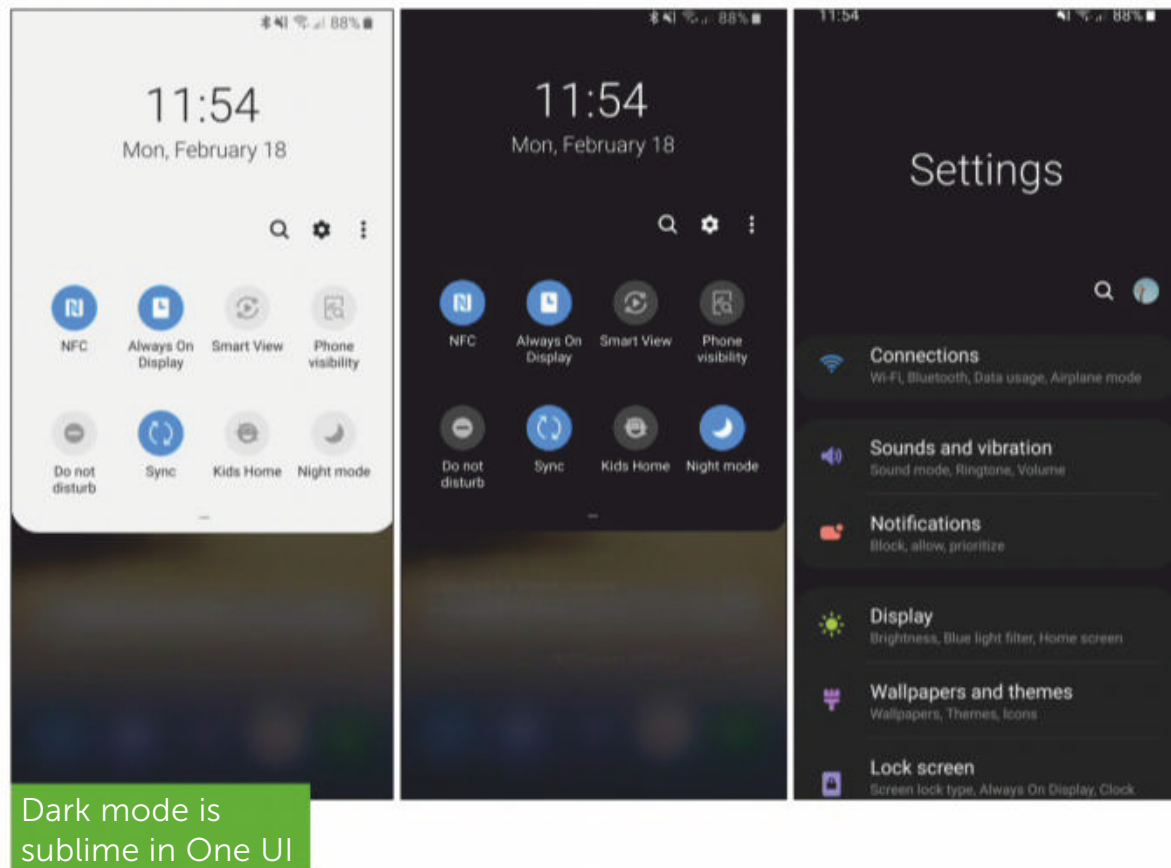
a second app by tapping to open it like normal, and the two apps will be paired and ready to be used.

Turn on Night mode

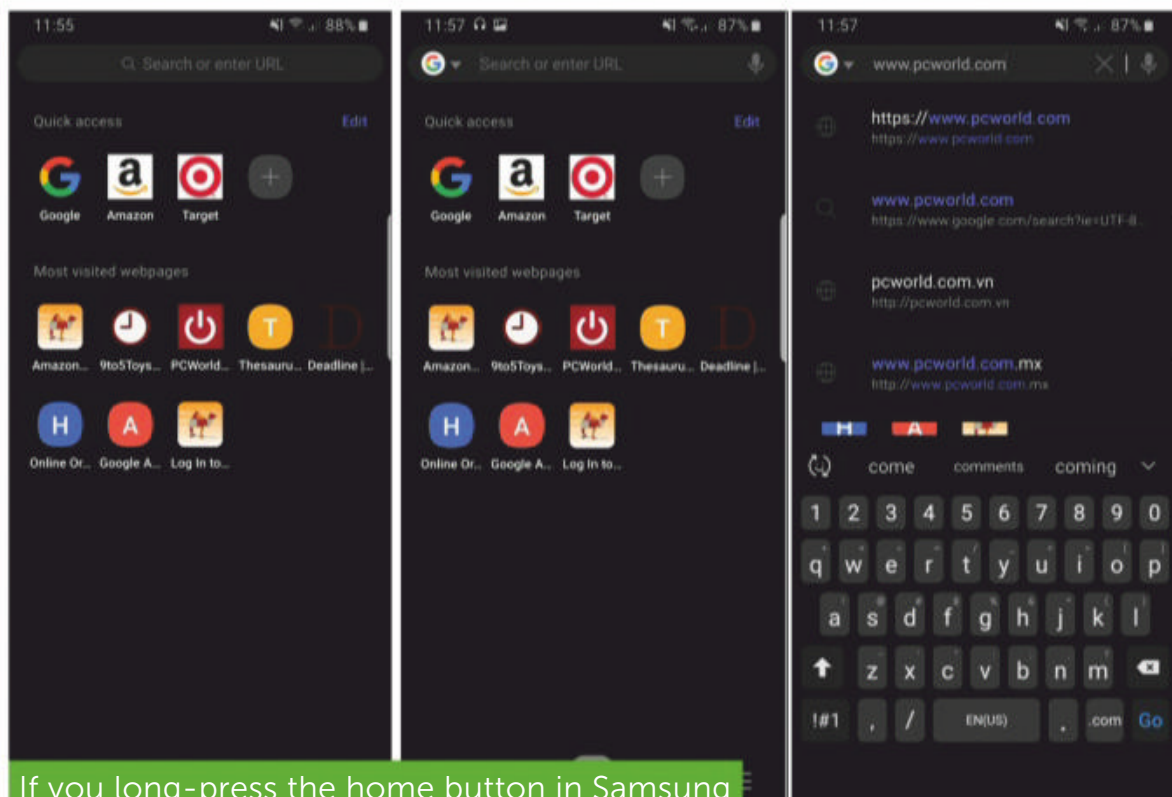
Another huge change for One UI is the addition of a system-wide dark theme. It blacks out the notification panel, paints apps with a dark brush, and makes everything very easy on the eyes. To flip it on, tap the new Night mode option in Quick Settings, or toggle the Night mode button inside the Display settings.

Jump to address bar in Samsung Internet

Samsung's browser in One UI pushes buttons and settings to the bottom bar for easier one-hand access.



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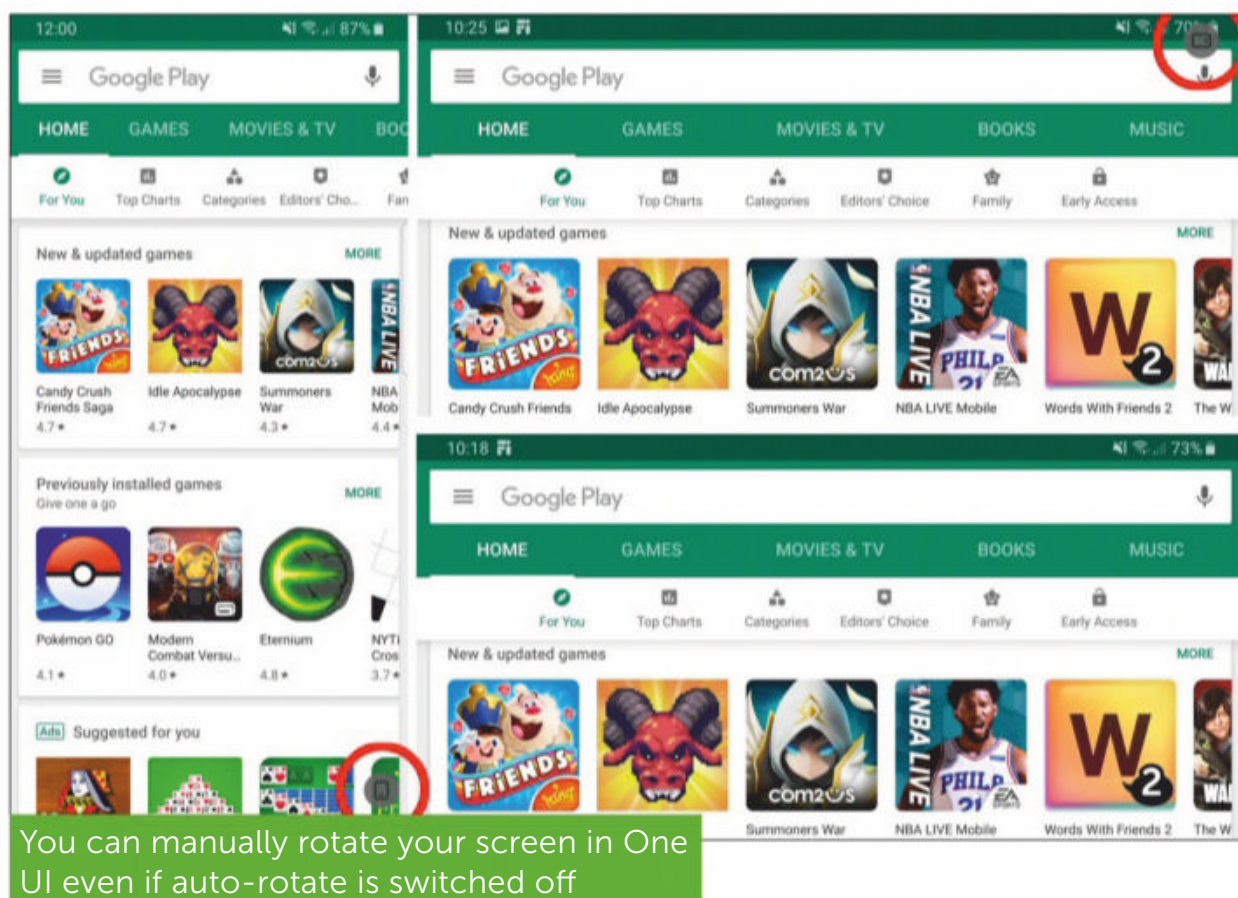


If you long-press the home button in Samsung Internet, you'll jump right to the address bar

You still need to stretch to the top of the screen to reach the address bar, but there's a new trick: if you long-press the home button, the cursor will jump to the address bar, and you'll be able to type your destination without changing your grip.

Manually rotate your screen

Auto-rotate can be great when you want to watch a video or quickly switch to a game, but it can be a nuisance when you're in bed or in a bumpy car. In One UI, Samsung has adopted Android Pie's ability to rotate your screen manually. One UI has the same Auto-rotate button as before, but the behaviour's different when you switch to Portrait: When you flip

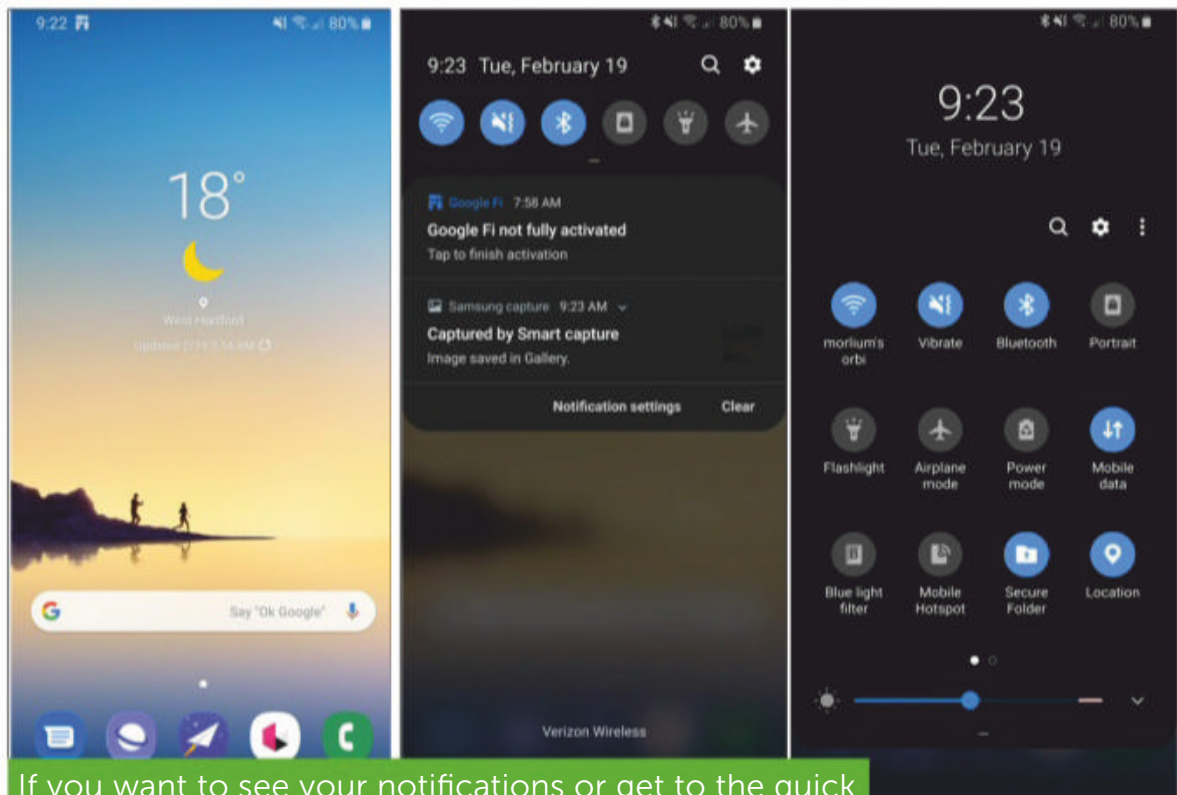


your phone to landscape mode, it still won't rotate but a small icon will appear in the lower right corner. Tap it, and the screen will rotate and lock on the new orientation. When you want to go back, flip your phone and tap the icon again.

Quickly pull down the notification shade

Whether you use gestures or the old navigation bar to make your way around, there's one new shortcut built into One UI that everyone will love. To access the notification shade, all you need to do is swipe down on the centre of the screen to expand it, and swipe a second time to see the full selection of quick settings.

FEATURE



If you want to see your notifications or get to the quick settings, simply swipe down on the home screen

To get rid of it, just swipe up. It's easier than using the fingerprint sensor as a tiny trackpad, and it's a simple change that I wish all Android phones would adopt.



Obstacles that folding phones must overcome

The next big things could have next big problems. **MICHAEL SIMON** reports

In just a few months, the first folding phones will be available for sale, and if you have a couple thousand dollars burning a hole in your pocket, you can purchase one for your very own. But while those first few buyers will be the talk of the town, the Samsung Galaxy Fold and Huawei Mate X might not be as top-of-the-line as their price tags would suggest.

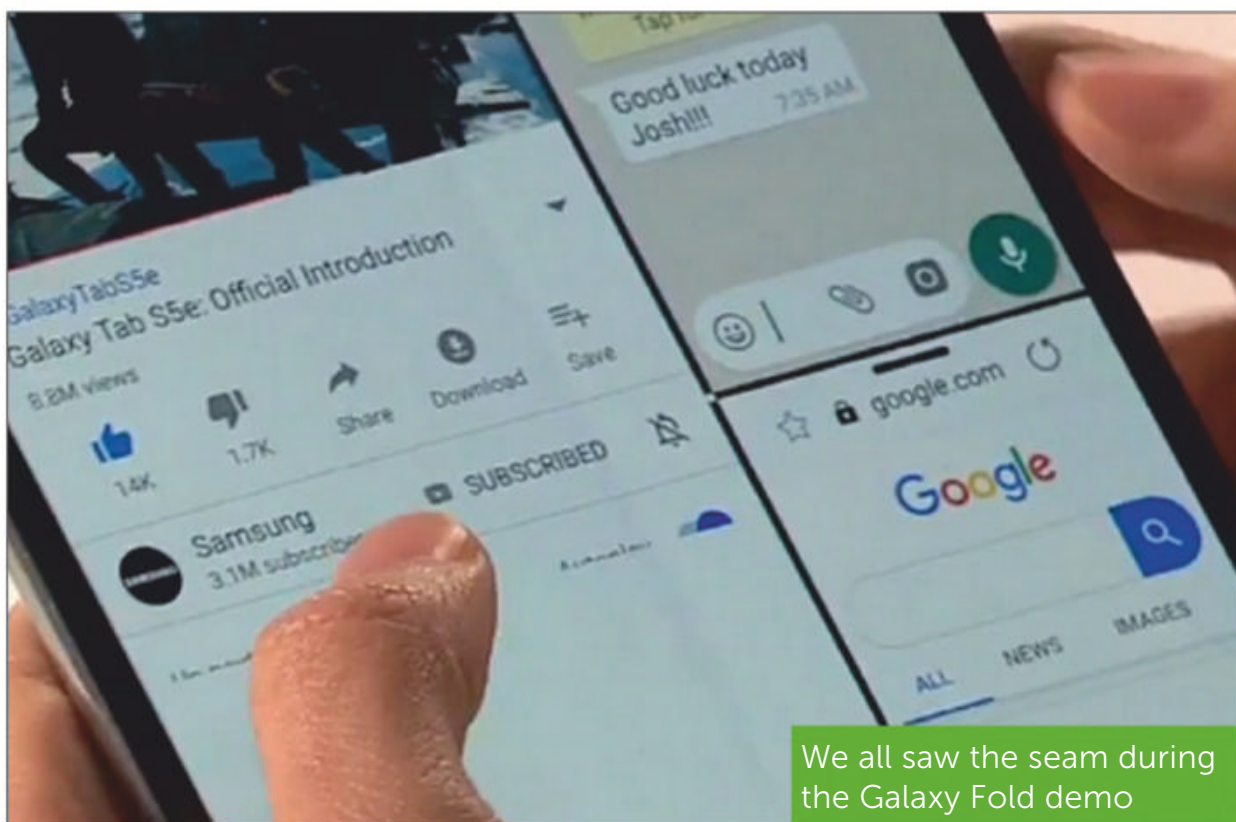
While they certainly represent an advancement in overall smartphone technology and an exciting new direction for the future, in some ways, folding

OPINION

phones are a step backward from the premium phone we're used to using. Here are three areas of concern I have as the folding revolution takes shape.

Display quality

The odd shapes of the folding displays are the most obvious challenge. When opened, Samsung's Fold display has an aspect ratio of 4.2:3, with a 7.3in QXGA+ resolution somewhere around 2,152x1,536 pixels. The Huawei Mate X offers an 8in display with a 8:7.1 aspect ratio and 2,480x2,200 resolution. On the outside, Huawei's main screen is 6in diagonally, with an aspect ratio of 19.5:9 and a resolution of 2,480x1,148. The Fold's outside display is a tiny 4.6in, 1,960x840 screen with a 12:9 aspect ratio. That means we're



going to have to learn all-new ways of holding these unconventionally shaped phones, and apps might look a little strange at the start.

Beyond the ratios, the screens themselves look and feel a little weird. If I hadn't seen the Mate X with my own eyes, I'd have thought the screen was a high-quality printout – it's that glossy. Touching it was equally weird. While it doesn't feel cheap per se, I could definitely feel that it wasn't a completely flat screen like a tablet. I don't know whether it was the thinness, the flexibility, or just my imagination, but I swear I could feel the ridges and imperfections as my finger moved across the display. Scrolling and tapping worked pretty much as expected, but the tactile sensation was quite a bit different than it is on a phone like the Galaxy S10.

The Mate X display also feels more like plastic than glass, so much so that I was afraid I would dent it if I pressed too hard. I'm sure Samsung and Huawei will go through countless revisions of their displays before they find a manufacturing method that's feels right, but these earliest models will definitely show some growing pains.

Then there's the seam. Both companies have gone to considerable lengths to hide the centre of their folding display in product shots and display units, but it's definitely there. We saw it during the Samsung Unpacked demo, and I saw it during my hands-on with the Mate X. I have to assume it'll only get worse with repeated folds. Display durability is definitely an area of concern with these early folding phones, and the fact that seams are already visible isn't a comforting sign.

Battery life

We've reached a point with contemporary phones where we're pretty much able to leave our chargers at home, but folding phones could take a step back. Bigger displays use more power, but the folding phones' batteries haven't scaled to fit.

Granted, the batteries they have are beefy – 4,380mAh on the Fold and 4,500mAh on the Mate X. The 6.6in Galaxy S10 5G has a 4,500mAh battery, however, and that only needs to power a mere 6.7in display. Let's not forget the additional power strains of switching screens, sensors, and 5G on these bleeding-edge folding phones.

Huawei has built 55W SuperCharge into the Mate X, and Samsung allows for wireless charging on the Galaxy Fold. Nevertheless, anyone hoping for a day of use out of either phone before charging is going to be disappointed. Despite costing thousands of pounds, these new folding phones might very well turn us into 'wall-huggers' again.

User experience

My biggest concern with folding phones has less to do with design, fragility, or even longevity, and more to do with the real-world benefit. We might all want to run and see one as soon as they end up in stores, but my question is: are they really giving us the best of both worlds?

With the Samsung version, you're going from a 6.4in display in the Galaxy S10 to a 4.6in one in the Fold (when closed). And on the inside, you get a 7.3in display, which is only about a half-inch bigger



than the S10 5G's. The Mate X is a little better with an 8in display, but the outside screen already offers a full 6in workspace. So you're really only gaining 2 inches by opening it, which isn't really worth it in most situations. Huawei even admitted that it expects people will use it closed most of the day.

Samsung's triple-multitasking is a more promising innovation for folding phones, but there needs to be a real reason to jump from the small screen to a big one. We don't pick up a tablet because we want a little more screen – we use one because it offers a better experience for getting things done. I'm not sure we can say the same yet for folding phones

