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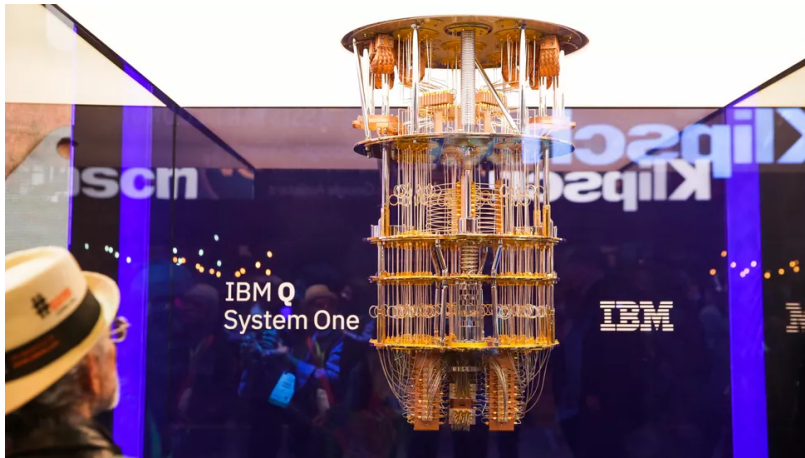


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Meet IBM's bleeding edge of quantum computing

With the Q System One, the tech titan's grand promise of super-powerful computing takes a big step forward.

BY BEN FOX RUBIN | JANUARY 30, 2019 5:00 AM PST



The Q System One model at the CES 2019 tech show. Sarah Tew/CNET

The **IBM** Q System One model doesn't look like a computer. It looks like a conceptual art series of plates being held together with fishing lines suspended from a ceiling. The whole contraption is encased in half-inch-thick glass created by Milan-based Goppion, which made the protective displays for the Mona Lisa and the Crown Jewels.

Bob Sutor, an IBM veteran who leads the **Q System One** team, directed me to look at the bottom of this quantum computer -- an experimental machine with potentially massive computing power -- where there was a tiny silver rectangle in the middle of a tangle of golden wires. That's the home of the machine's quantum bits, or qubits, which are tiny, fragile particles that make the whole system work.

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2020 Subaru Legacy

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I asked him how much such a computer costs. He declined to say, adding: "It's not lunch."



Watch this: How quantum computing will help us build human-level... 3:40

We were standing in the middle of the Las Vegas Convention Center during the CES tech show earlier this month. A jostling crowd around us angled to snag pictures of the model. IBM was at the show to publicly present this replica of the Q System One, its first quantum computer that fits into one neat package. Past designs were more like "backroom experiments," Sutor said, with jumbles of components strewn about a room.

The real Q System One was completed in November and is in IBM's Yorktown Heights, New York, offices. The machine represents a big step toward quantum computing becoming a commercial reality, after IBM has toiled for decades with the computing concept.

“ Inside a quantum computer is one of the coldest places on Earth.

Bob Sutor, IBM

Creating a fully functional system makes quantum computers more reliable and easier to upgrade. Beyond those practical uses, these computers have the potential to create more effective antibiotics, help scientists better understand chemistry and nature and improve power grids. The machines could do that by providing businesses and scientists the ability to crunch extremely complex calculations that can't be digested by classical computers.

But beyond that hype, there's years more work to do to prove quantum computers are up to the task. Also, it's possible a different type of computer will lead to the next breakthroughs, instead of quantum designs.

"That's a big step, but it's one step in a journey that's 1,000 miles long." Brian Hopkins, a Forrester analyst focused on quantum computers, said of the new Q System One.

Super cold computing

In a classical computer, data is crunched by processing bits, designated as either 0 or 1. In quantum computing, qubits are used instead. These qubits have more complex properties that allow them to become combinations of 0 and 1 at the same time and also to interact with each other.

With each additional qubit that's added, the

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amount of information a quantum computer can hold doubles. That capability may help a [quantum computer](#) become a far more powerful way to process certain kinds of problems that classical computers can't handle. Using these qubits could help scientists unlock ways of developing new medicines at the molecular level or creating stronger security codes or processing the mountains of data being created at CERN's Large Hadron Collider.



Bob Sutor standing by the quantum computer model.

Sarah Tew/CNET

The Q System One currently uses 20 qubits. "By the time you get up to around 280 [qubits], that number -- two to the 280th power -- is approximately the number of atoms in the observable universe," Sutor said, offering a hint at just how powerful these computers may someday become.

Seeing the potential of these computers, startups such as [Rigetti](#) and [D-Wave](#), and the research arms of Microsoft, [Intel](#) and Google are developing [quantum computing](#), too. IBM has also [partnered](#) with ExxonMobil, Daimler, Samsung, Barclays and major corporations to kick the tires on what's possible with its quantum computers.

But using quantum computers is an excruciatingly delicate task. The Q System One's thick glass housing is used to cut down on vibrations and radiation, and helps keep the computer at near absolute zero. Inside the real computer in New York, quick blasts of super-cold air are used to keep the qubits inside at 10 millikelvins, colder than outer space.

"So inside a quantum computer is one of the coldest places on Earth," said Sutor, 60, whose 6-foot-4 frame, graying beard, deep voice and cheery disposition give him the air of an IBM Santa Claus.

That extreme cold and thick glass are needed to protect the qubits inside the machine, which are so fragile that a single photon of light or a rap of someone's knuckles could destroy their computation, Sutor said. Because these machines are so delicate, any future quantum computing will likely be done over the internet to allow IBM to carefully maintain the machines at its own facilities.

A long way to go

To be sure, the promise of quantum computers remains just that -- promise, and not yet reality.

"Quantum computers are not a magical solution for all problems that classical computers can't solve," Forrester's Hopkins said. "They are a potential solution for some of the problems that classical computers can't solve."

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He added that the tech industry today is in the middle of discovering what quantum computers can do. Answering those questions will take a few more years, and achieving the ultimate promise of quantum computers could take a decade or two, Hopkins said.

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But thanks to the new Q System One, researchers and the general public now have a notable milestone by which to judge the advance of quantum computing. That system will help cut down on upgrade times for these machines to hours or days, instead of days or weeks. It should also make it easier for IBM to build more of these machines to support a future quantum computing business.

"We set out to build something which was highly functional, but beautiful," Sutor said, "and would give us a way to look at what we were doing in the future."

Sutor wasn't under any misconceptions that his work is nearly finished. When I asked him what the next steps are for his project, he said: "What do we have to do? Everything."

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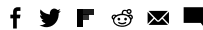
Next Article: New phone designs aim to shake up MWC 2019

PHONES

New phone designs aim to shake up MWC 2019

We're expecting to see phones with 5G, foldable designs and multiple cameras at the world's largest mobile show.

BY JESSICA DOLCOURT | FEBRUARY 11, 2019 9:14 AM PST



Samsung will have already announced the Galaxy S10 before MWC -- the largest mobile show on the planet -- has even begun. But mark my words, this will be a busy, exciting show, and one Samsung won't miss using as a platform to show off the Galaxy S10, foldable Galaxy X/GalaxyF/Galaxy Fold and every other thing it announces just days before Mobile World Congress 2019 kicks off.

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Samsung won't be alone. [Huawei](#), the world's second-largest smartphone maker behind Samsung, is rumored to show off its first-ever foldable phone. [LG](#), [Nokia](#), [Oppo](#) and [Xiaomi](#) will also plan to make their mark at the annual Barcelona confab.



What makes this year's MWC even more vital than last year's show is the energy we'll see behind three extremely powerful trends that have the potential to define a decade of [mobile phones](#): foldable designs, [5G data speeds](#) and amazingly complex photography due to a plethora of rear cameras. As smartphone sales [stagnate](#) across the entire smartphone world, the products and news announced at MWC offer a beacon of hope for revitalizing one of the fastest-moving industries on the planet.

Here are the phones and brands we expect to see take that challenge.



Samsung's foldable phone is here, with brand-new One UI for Android

21 PHOTOS

Samsung

Number of phones likely: 3-4

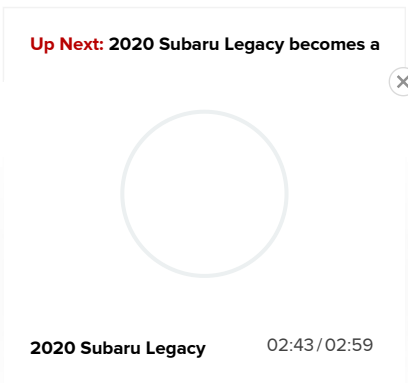
Samsung press conference: Feb. 20, 11 a.m. PT, San Francisco

Samsung MWC booth opens: Feb. 25 in Barcelona

Yes, Samsung will have already launched the Galaxy S10 and potentially a slew of other phones and devices. But the king of the hill will absolutely take the opportunity to go big with its booth and show off all its fun, new toys. Especially if we really do see a [Galaxy S10E in banana yellow](#).

While the world's largest phone maker isn't hosting a press conference, my money is on Samsung saving a few demo surprises for MWC -- and I'm just speculating here -- for example, quite a few for its [upcoming foldable phone](#)...?

Read also: [Galaxy F would be a terrible name for Samsung's first foldable phone](#)





Samsung show off a bright yellow Galaxy S10 variant at its booth at MWC 2019.
MySmartPrice

Oppo

Number of phones likely: 1

Oppo press conference: Feb. 23, 2 p.m. CET (5 a.m. PT)

Chinese brand Oppo brought us the showstopping [Find X](#) in 2018, so we're hoping for a similar showing. If the rumors are to be believed, Oppo might be gearing up for the [Oppo F11 Pro](#), an all-screen phone with a 48-megapixel camera that pops out of the body, and excellent low-light shots. Looks like it would have that stunning gradient design on the back, too.



Oppo Find X is the sexiest phone of 2018

30 PHOTOS

Xiaomi

Number of phones likely: 2-3

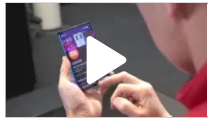
Xiaomi press conference: Feb. 24, 10:30 a.m. CET (1:30 a.m. PT)

Xiaomi stole some of Samsung's [foldable phone thunder](#) when it posted a video teasing its totally unique foldable phone design. We can only hope that's what's on Xiaomi's plate for MWC.

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However, the [Xiaomi Mi 9](#) flagship phone is also bouncing around the corridors of conjecture. Xiaomi has taken its opportunity at MWC to launch this line of phones before, so the announcement stands to reason. Xiaomi usually makes a higher-end variant of its Mi phones as well, either a pro model or a special edition.



Watch this: Xiaomi's double-folding phone looks impressive in teaser... ▶ 2:17

Huawei

Number of phones likely: 2

Huawei press conference: Feb. 24, 4 p.m. CET (7 a.m. PT)

Honor press conference: Feb. 26, 4 p.m. CET (7 a.m. PT)

Huawei told us, in so many words, that it plans to have a [foldable phone with 5G support](#) in February, potentially melding 2019's most important phone trends in a single -- likely ridiculously expensive -- device. This would be a tremendous moment for the [beleaguered](#) No. 2 smartphone brand, and a chance to one-up Samsung, whose foldable phone is widely expected to make an appearance in San Francisco a few days before Huawei's press conference.

Huawei reportedly [hopes to overtake Samsung](#) as the world's No. 1 smartphone brand by the end of 2020.

Honor, a Huawei offshoot that the company has tried to spin off as its own brand for years, will host a "party" that's also a presentation. A midprice [Honor 11](#) seems likely. This phone would follow the flashy [Honor View 20](#), which has a surprisingly good 48-megapixel camera for a midrange phone.



Honor View 20's hypnotic colors will make your jaw drop

28 PHOTOS

Nokia/HMD

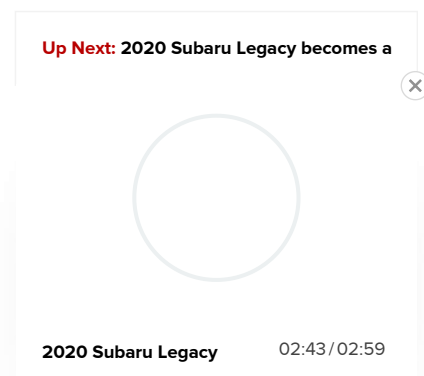
Number of phones likely: 1-2

Nokia phones press conference: Feb. 24, 4 p.m. CET (7 a.m. PT)

We only expect one Nokia phone from HMD, the company that licenses the Nokia name, but the one we think we'll get would be a doozy.




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 **Evan Blass**
@evleaks

Nokia 9 PureView "Beholder." HNY
3,623 2:39 AM - Dec 31, 2018

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According to a render posted by frequent Twitter leaker Evan Blass, the Nokia 9 PureView will have five cameras on the back, use Zeiss camera technology and run Android One, the "pure" version of Android that Google shares with device makers.

It's also possible that HMD will make this its third year of releasing a throwback feature phone (aka "dumb phone") to the glee of nostalgic types everywhere. Last year's Nokia 8110 "banana phone" and 2017's Nokia supercheap 3310 practically won MWC in their respective years.

LG

Number of phones likely: 2-3

LG press conference: Feb. 24, 7:30 p.m. CET (10:30 a.m. PT)

LG wasn't shy in announcing its own LG G8 ThinQ phone ahead of MCW, complete with a 3D front-facing camera that can securely unlock the phone just like the iPhone XS and iPhone X before it.

lg-g8-thinq-tof

The LG G8's selfie camera will have a time-of-flight sensor that can scan a 3D image of your face.

LG


The G8 is also expected to have a second screen case attachment.

We don't know much else about the LG G8, or if LG will also show or tease a foldable phone like so many others. However, we already believe that LG might announce a 5G device.

The handset-maker has also been known to trot out midrangers like the LG X Power, so there's a possibility a phone like that could also make its debut.

Sony

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Number of phones likely: 3

Sony press conference: Feb. 25, 8:30 a.m. CET (Feb. 24, 11:30 p.m. PT)

Rumors point to the [Sony Xperia X4](#) being the marquee follow-up to last year's Xperia X3. We can look for bold camera claims here, including enhancements to slow-motion video.

It's unlikely we'll see a 5G phone from Sony so soon. The company doesn't want to rush a product that the majority of phone buyers won't snatch up in 2019, Sony Mobile marketing VP Don Mesa [told Digital Trends in January](#). Sony does often reveal a handful of midrange models alongside its top device, however.

[oneplus-6t-mclaren-edition-16](#)

OnePlus may not launch the OnePlus 7 at MWC, since the OnePlus 6T just came out, but we could see its first 5G phone.

Angela Lang/CNET

OnePlus

Number of phones likely: 1

OnePlus isn't holding a press conference at MWC, but it'll be on the ground. It plans to show off [its 5G phone](#), which was announced this past December and will be available on the UK carrier EE.

Originally published 4 a.m. PT, Feb. 11.



MWC 2018: Where are they now?

19 PHOTOS

[Moto G7 for \\$300, and all the rest:](#) How to tell all four new Moto G7 phones apart.

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