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In This Issue...

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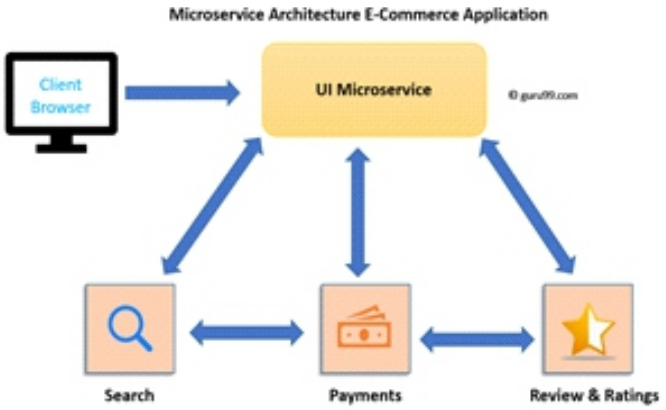
Microservices

“Microservices are the small services that work together. The microservice architectural style is an approach to develop a single application as a suite of small services. Each microservice runs its process and communicates with lightweight mechanisms.”

Microservices is a service-oriented architecture pattern wherein applications are built as a collection of various smallest independent service units. It is a software engineering approach that focuses on decomposing an application into single-function modules with well-defined interfaces. These modules can be independently deployed and operated by small teams that own the entire lifecycle of the service. The term "micro" refers to the sizing of a microservice which should be easily manageable.

Monolithic vs Microservice Architecture ?

In layman terms, you can say that **Monolithic** architecture is like a big container in which all the software components of an application are clubbed into a single package. Whereas, **Microservices** is an architecture wherein all the components of the system are put into individual components, which can be built, deployed, and scaled individually.



Advantages of Microservices ?

- Microservices are self-contained, independent deployment modules.
- Each service is flexible, robust, composable and complete.
- The cost of scaling is comparatively less than the monolithic architecture.
- The smaller codebase enables teams to more easily understand the code, making it simpler to maintain.
- Less dependency and easy to test..

5 Principles of Microservices :

1. Single Responsibility : The single responsibility principle states that a class or a module in a program should have only one responsibility. Any microservice cannot serve more than one responsibility, at a time.

2. Modeled around the business domain : Microservice never restricts itself from accepting appropriate technology stack or database. The stack or database is most suitable for solving the business purpose.

3. Isolated Failure : The large application can remain mostly unaffected by the failure of a single module. It is possible that a service can fail at any time. So, it is important to detect failure quickly, if possible, automatically restore failure.

4. Infrastructure Automation : The infrastructure automation is the process of scripting environments. With the help of a scripting environment, we can apply the same configuration to a single node or thousands of nodes. It is also known as configuration management, scripted infrastructures, and system configuration management.

5. Deploy independently : Microservices are platform agnostic. It means we can design and deploy them independently without affecting the other services.

Microservice resilience with Spring Cloud :

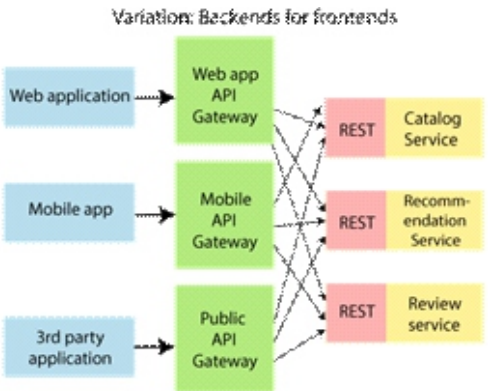
The distributed nature of microservices brings challenges. Spring helps you mitigate these. With several ready-to-run cloud patterns, Spring Cloud can help with service discovery, load-balancing, circuit-breaking, distributed tracing, and monitoring. It can even act as an API gateway.

For example :

1. Cloud Config Server : A central place to manage external configurations and properties for applications across all environments. Could be used with multiple instances to avoid a single point of failure.

2. Service Registry : An application that holds the information about all client-service applications. Every Micro service will register into registry server and registry server knows all the client applications running on each port and IP address. Netflix Eureka is a good example of a service registry. It provides a REST API for registering and querying service instances

3. API Gateway : The API Gateway is a server. It is a single entry point into a system. API Gateway encapsulates the internal system architecture. It provides an API that is tailored to each client. API Gateway is responsible for request routing, composition, and protocol translation. All the requests made by the client go through the API Gateway. After that, the API Gateway routes requests to the appropriate microservice. It also has other responsibilities such as authentication, monitoring, load balancing, caching, request shaping and management, and static response handling. A great example of an API Gateway is the Netflix API Gateway.



4. Spring Security : With Spring Security and its OAuth 2.0 support, we can lock down our API gateway and backend servers. We can set it up to automatically propagate access tokens from one service to the other, ensuring that everything stays secure and encrypted along the way.

5. Tracing : It identifies the failed microservices or the services having performance issues when there are many services calls within a request. It is very useful when we need to track the request passing through the multiple microservices. It is also used for measuring the performance of the microservices. Spring **Sleuth** with **Zipkin** or **Jaeger** could be for distributed tracing.

Additional Tools :

1. API Management and Testing : API Fortress, Postman, Tyk etc.

2. Messaging : RabbitMQ, Amazon SQS, Apache Kafka etc.

3. Monitoring : ELK(Elastic Search, Logstash, Kibana), Graylog etc

4. Kube Development : Kubernetes & Minicube etc

Disadvantages of Microservices :

- Difficult to manage a large number of services.
- Microservices has all the associated complexities of the distributed system.
- There is a higher chance of failure during communication between different services.
- Complex testing over a distributed environment.

Best practices :

1. Have Separate Data Storages
2. Build Dedicated Teams
3. Use Automation for Independent Deployment
4. Leverage the Benefits of REST API
5. Pair the Right Technology with the Right Microservice
6. Distinguish Between Dedicated and On-Demand Resources
7. Design your services to be loosely coupled, have high cohesion, and cover a single bounded context.
8. Have different databases or data stores for each microservice.
9. Use a centralized logging and monitoring system.
10. Have a separate version control strategy for each service.

US, Japan, EU space agencies will host hackathon to study Covid-19 impact on environment

The hackathon will allow participants to use powerful observation tools to study the effects of the coronavirus pandemic on the environment COVID-19 has completely upended our lives. Apart from the unimaginable loss of human lives, the coronavirus pandemic has also impacted the environment in many ways. For example, the enormous amount of medical waste generated due to the crisis definitely has had a huge impact on our environment. But the scale of this is yet not known. So, the space agencies of the US, Japan, and the European Union have decided to host a hackathon next month to study those effects over the past year.

The Earth Observation Dashboard Hackathon will be hosted virtually from June 23-29 and registrations for the week-long event are now open. It is aimed at allowing participants to take advantage of powerful Earth observation tools to study the effects the COVID-19 pandemic has had on the environment. Participants at the hackathon will be divided into teams and asked to solve various socioeconomic and environmental challenges using data gathered during the duration of the pandemic.

NASA has urged all coders, entrepreneurs, scientists, designers, storytellers, makers, builders, artists, and technologists to join the event. It said the issues that will be covered are air and water quality, economic, social, and agricultural impacts, greenhouse gas effects, and interconnected Earth system impacts.

In June last year, the three agencies set up a dashboard to record the short- and long-term impacts of pandemic-related restrictions around the world. Participants will use data from the interactive resource and study them to throw light on the environmental impact of the pandemic. They can also offer solutions to help improve the dashboard.

Thomas Zurbuchen, NASA's Associate Administrator for Science, said the agencies realised that if they combine forces, they could bring a more powerful set of analytical tools to understand the environmental, social, and economic impacts of the pandemic.

“In the face of the unprecedented COVID-19 pandemic, the three agencies created the Earth Observing Dashboard to release the joint analysis results of satellite data last June,” said Koji Terada, Vice President and Director-General for the Space Technology Directorate I at Japan Aerospace Exploration Agency (JAXA).

Toni Tolker-Nielsen, Director of Earth Observation Programmes at European Space Agency (ESA), said the dashboard allows them to compare critical information over different areas at different times.

Travelling through a wormhole in space may be possible, new research suggests

Even if it was possible, a special machine to allow humans to travel to a different point in the universe through a wormhole still seems far away.The favorite space travel maneuvers in and out of a wormhole of science-fiction fables could be more real than we thought. Physicists initially did not know whether black holes existed in the real world. Over the years, they said black holes are very real and then showed they even exist in our galaxy, using the theory of general relativity, which predicts that a sufficiently compact mass can deform spacetime to create a black hole. This same theory is now being used to suggest wormholes — speculative tunnels that could create shortcuts for journeys across the universe — could also be real, which would make it a lot easier to traverse the universe.

Physicists Juan Maldacena from the Institute for Advanced Study in the US and Alexey Milekhin from the Princeton University have found a method that could produce large holes. The two physicists have argued that the Randall-Sundrum II model allows for traversable wormhole solutions, where the wormholes are big enough that a person could traverse them and survive.

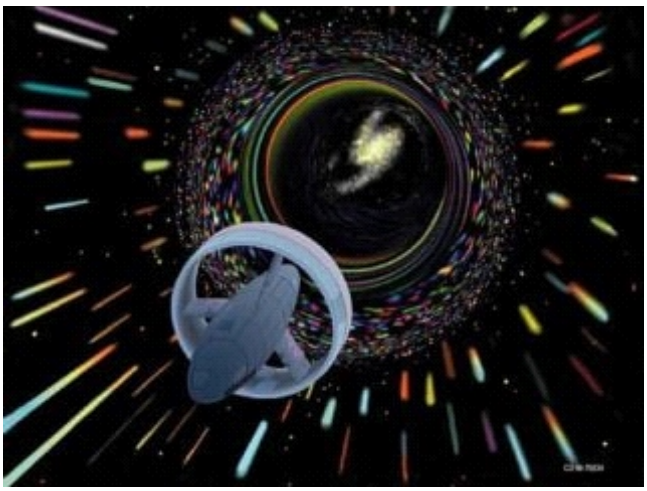
Though their research, published in APS Physics journal, is progress on previous studies on wormholes, a special machine to allow humans to travel to a different point in the universe through wormholes still seems far away. The two physicists want the mysterious dark matter in our universe to behave in a particular way for their discovery to succeed.

“We have a limited toolbox,” says Brianna Grado-White, a physicist and wormhole researcher at Brandeis University. “To get something to look the way we need it, there's only so many things we can do with that toolbox.”

The idea of a wormhole to create a bridge between two universes was first described by physicists Albert Einstein and Nathan Rosen in 1935. In theory, they discovered that a black hole's surface might work as a bridge to a second patch of space. Since then, many others imagined wormholes and said some of them might be “traversable”, meaning humans may be able to travel through them. But these ideas were limited by two challenges: fragility of these tubes and their tininess.

In late 2017, physicists found a breakthrough to prop open wormholes with quantum entanglement — a kind of long-distance connection between quantum entities. This new approach inspired a stream of work aimed at creating bigger, longer-lasting holes.

Physicists Lisa Randall and Raman Sundrum had proposed the Randall–Sundrum models in 1999 to address the Higgs Hierarchy Problem in particle physics.



Spaceship network for intercontinental travel? Yes, japan plans to have one ready by 2040

SpaceX CEO Elon Musk has also spoken about developing launch vehicles and shuttles for Earth to Earth travel.A few years ago if someone asked you to imagine spaceships as a mode of everyday transport, you would dismiss the idea, right? But the Japanese government, along with private companies, is all set to develop an intercontinental passenger spaceship network that will enable people to fly to the major cities of the world in two hours or even lesser. On May 12, Japan's Ministry of Education, Culture, Sports, Science and Technology unveiled the plan, which aims to achieve its goals by the early 2040s.

Not just that, the ministry also predicts that the market for spaceships by 2040 could touch roughly 5 trillion yen (roughly $46 billion; Rs. 33,472 crore), reported The Mainichi. The report added that the ministry has prepared a draft roadmap for its ambitious passenger spaceship programme.

Two phases:

In the first step, Japan is said to reduce the price of Japan Aerospace Exploration Agency's H3 rocket from a humongous $46 million (roughly Rs. 335 crore) to half by reusing parts. The next step is to launch the successor of the H3 rocket, which could be accomplished around 2030. By the early 2040s, the roadmap aims at further reducing the cost to about 10 percent, the ministry reportedly said. Since such a network is expected to carry passengers from one city to another, the next step involves the private sector that will lead to the development of spacecraft that can go back and forth between space and earth frequently.

Types of spaceships:

The ministry has envisioned two types of spaceships — one that's similar to an aeroplane which can take off and land on runways and the other that can take off and land vertically. In its research, the ministry has also concluded that there would be considerable demand for such a spaceship network connecting major cities on the ground.

While this is the first time that a country has developed a proper roadmap for the spaceship network, SpaceX CEO Elon Musk, in 2017, spoke briefly about using an interplanetary rocket system for long-distance travel on earth too. Sharing the idea, Musk claimed such a network, once operational, would allow people to take “most long-distance trips” in just half-an-hour, and go “anywhere on Earth in under an hour” for around the same price as an economy airline ticket.

NASA mars helicopter ingenuity prepares for sixth flight at last week of may: what's different this time

Ingenuity will be on its own for the first time without the watchful eye of Perseverance rover.

NASA has announced that plans for its Ingenuity Mars helicopter to make its sixth flight on the Red Planet next week are underway. This comes two weeks after the helicopter made its fifth flight on May 7 when it completed its first one-way trip, travelling 423 feet (129 metres), then reaching an altitude of 33 feet (10 metres) above its new landing field. The US space agency said the sixth flight is going to be the first to be executed during the helicopter's operations demonstration phase and includes "scouting multiple surface features from the air and landing at a different airfield."

This is the first time Ingenuity will be on its own, without the Perseverance rover watching over it. On all its previous five flights, the Perseverance rover had shared visuals of Ingenuity. Following the flight, data and images will be sent to Earth.
Shedding light on the rotorcraft's planned flight,NASA said the helicopter will ascend to 33 feet (10 metres), and then head southwest for about 492 feet (150 metres). Once it achieves that distance, Ingenuity will start acquiring colour imagery of an area of interest, as it translates to the south about 50-66 feet (15-20 metres), NASA said.

It added that stereo imagery of the sand ripples and outcrops of bright rocks at the site will help demonstrate the value of an aerial perspective for future missions. Once the rotorcraft completes its image collection, it is to fly about 164 feet (50 metres) northeast where it will touch down at "Field C," its new base of operations.

On this flight, NASA expects the Ingenuity to achieve a ground speed of 9mph (4 metres per second) and the time aloft to be around 140 seconds. The agency said it's the first time that the rotorcraft will touch down at an airfield not surveyed before from the air. The Ingenuity team, NASA says, is relying on imagery collected by the HiRISE camera aboard NASA's Mars Reconnaissance Orbiter. The images suggest the Field C is relatively flat and has few surface obstructions.

NASA shared its plans for the sixth flight of the Mars Ingenuity helicopter just days after it shared stunning 3D visuals of the rotorcraft's fifth flight , which it took on May 7. The helicopter takes off vertically, hovers for a few seconds before zooming past our eyes to the right of the screen. It then returns and lands almost at the same spot. The agency says that seeing the sequence was almost like standing on the red planet, next to the Preservence over, that captured the historic moment and watching the helicopter take flight first hand.

The success of the Mars Ingenuity helicopter on the red planet proved that a powered and controlled flight was possible on Mars. The first-ever Ingenuity flight on the red planet was described as the "Wright brothers' moment on Mars" by project manager MiMi Aung.

US Air force plans to harvest solar energy in space, send it to earth

The US Air Force's SSPIDR project aims to find technology that will allow it to beam solar energy directly to its remote military bases.

US Air Force (USAF) is trying to make space-based solar power a reality. The USAF aims to achieve something that it believes will go a long way in addressing the energy demand of its military personnel deployed at remote bases in the short term. However, it would ultimately be made available for civilian use. It wants to harvest the Sun's energy in space using solar panels and then beam it down for use on Earth. Successfully developing such a capability would be a big advantage for the USAF on the battlefield, officials say.

At present, the US military uses convoys of trucks and their escorts to transport fuels and other supplies to provide electricity to forward military bases. These convoys are vulnerable to enemy attacks from air and ground. The new project, named Space Solar Power Incremental Demonstrations and Research Project (SSPIDR), would allow solar energy to be beamed straight down to an outpost, irrespective of the day and time and latitude and climate of the area.

The US Air Force Research Laboratory (AFRL) has shared a video on YouTube describing the initial idea and potential use of such a capability. The AFRL is dedicated to discovering, developing, and integrating affordable warfighting technologies for air and space forces.

"Ensuring that a forward operating base maintains reliable power is one of the most dangerous parts of military ground operations," says the narrator of the video, adding, "Convoys and supply lines are a major target for adversaries".

The ground-based solar energy is limited by area, the size of collectors required, and climate. But if the solar panels were deployed in orbit, they could have unfettered access to the Sun's rays, providing an uninterrupted supply of energy.

However, the problem is getting the energy down to the ground. Running cables from space to the ground isn't practical. So, the AFRL says it wants to deploy sunlight-harvesting satellites in space to convert solar energy into radio frequency (RF) power and beam it to Earth, where receiving antennas will transform the RF energy into usable power.

The AFRL describes the Space Solar Power Incremental Demonstrations and Research Project (SSPIDR) as a series of integrated demonstrations and technology maturation efforts.

AI is going to win against human intelligence, Nobel laureate Daniel Kahneman says

Asked about the wider dangers of using AI to augment human judgement, Kahneman said there will be massive consequences of that change.

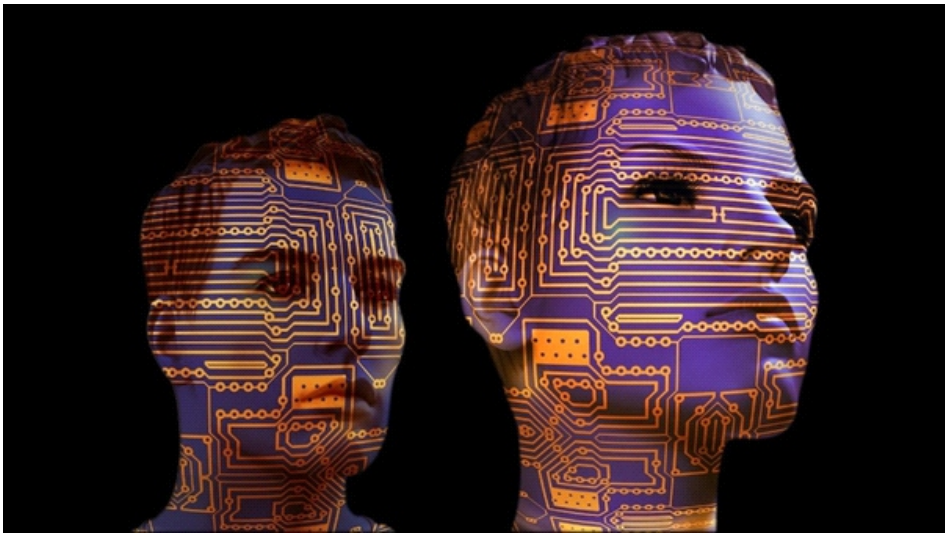
Daniel Kahneman, the Nobel laureate famous for his research on how cognitive biases lead us to make irrational decisions, has stated that humans stand no chance against artificial intelligence (AI). The 87-year-old Israeli-born psychologist said he believes AI will lead to a massive disruption because the technology is developing very rapidly for people to adjust to. Asked what he felt about the dangers of using AI to augment human judgement, he said that there will be massive consequences of that, and some of that change is already happening. How they are going to adjust to this change is "a fascinating problem," he added.

Kahneman was awarded the Nobel Prize for Economics in 2002 along with American Vernon L. Smith. His first book "Thinking, Fast and Slow" was a worldwide bestseller, in which he set out his revolutionary ideas about human error and bias.

The Nobel laureate also said that some medical specialties face the danger of being replaced by AI. He added that it would be a frightening scenario when AI is able to demonstrate that it has a better judgement than the leadership of an organisation or institution.

"Some medical specialties are clearly in danger of being replaced, certainly in terms of diagnosis. And there are rather frightening scenarios when you're talking about leadership. Once it's demonstrably true that you can have an AI that has far better business judgment, say, what will that do to human leadership?" Kahneman told during an interview with The Gaurdian.

On the topic of AI to augment human judgement, he said that there would be "massive disruption," because while technology is "developing exponentially," "people are linear," making adapting a difficult task. As such, humans are experienced in dealing with a more or less linear world and are not equipped to handle exponential phenomena. "Exponential phenomena are almost impossible for us to grasp." He added, "And clearly AI is going to win [against human intelligence]. It's not even close."



Europe plans sat-nav and Telecoms network at the Moon

The European Space Agency is proposing a precise navigation system at the Moon, much like the sat-nav technology we have here on Earth.

It would enable spacecraft and astronauts to know exactly where they are when moving around the lunar body and to land with precision. The initiative, known as Moonlight, would also incorporate a telecommunications function.

A large flotilla of lunar missions will be launched this decade. Chief among them will be the US space agency-led successor to Apollo. Called Project Artemis, this will put crews on the Moon for the first time in more than 50 years.

"We are entering a new phase - the systematic exploration of our '8th continent', the Moon," said David Parker, the director of human and robotic exploration at Esa.

"The Moon is a repository of 4.5 billion years of Solar System history, but we've hardly begun to unlock its secrets. And so Moonlight is something that we see as really exciting, as a necessary infrastructure to support sustained exploration."Esa is asking two industrial consortia in Europe to define what an integrated sat-nav and telecoms system at the Moon would look like.

It'll include a constellation of at least three, but probably more, positioning-and-relay satellites to give global coverage, and will likely include some surface beacons, too, to augment the accuracy of the navigation signals.

"The target we have at the moment is that the constellation would be able to allow for an accuracy of 100m and probably better. We think we are able to get to 30m in the first instance," explained Paul Verhoef, the director of Esa's navigation department.

Moonlight is just at the feasibility stage at the moment - what is known in industry-speak as a Phase A/B1 study.

The consortia will put their thinking on the technologies required in reports to Esa, who will then produce a defined and costed proposal to go before Europe's research ministers when they gather for their triennial council meeting next year.

One consortium will be led by the UK small satellite manufacturer, Surrey Satellite Technology Limited. SSTL assembled the navigation payloads on the European Union's Galileo sat-nav system.

The other group will be fronted by the Italian space systems company Telespazio. One of its team-members is London-based Inmarsat, which is a world leader in satellite telecommunications for on-the-move applications, such as in ships and planes.

For those nations and companies thinking of sending spacecraft to the Moon this decade, having access to the proposed Esa network would help de-risk their ventures and reduce their cost.

And it would make the remote operation from Earth of, say, rovers and telescopes on the far-side of the Moon a lot easier because the system would bring very high data rates back to Earth.

"There is a full landscape of possibilities that you can imagine now: An astronomer could set up observatories on the far side of the Moon; rovers could travel more speedily on the lunar surface; and as we have all now become accustomed to virtual meetings - who knows, we could be doing Skype on the Moon," speculated Elodie Viau, Esa's director of telecoms.

The expectation is that Esa will pursue a commercial model for the constellation, which is to say it will buy a service from an operator rather than own the system or any of the hardware.

"I think that's the way it will go," commented Nick Shave, vice president of strategic programmes at Inmarsat. "Esa will run it from a service-based perspective and leave a level of risk with the consortium. That's why it's really important now that we establish the business case and get the income model right."

Google announces Smart Canvas for better Workspace collaboration

Google has announced new features for its Google Workspace platform that are set to make Google Workspace apps connect seamlessly. Here is what we know.Google has revealed a new "smart canvas" approach which means the various apps and services that are part of the Workspace platform will tie in together much more seamlessly now (Image source : Google)

Google has announced various new features for its Workspace platform. The features were announced at the Google I/O 2021 and will significantly overhaul its online collaboration suite of tools. The features will start rolling out across various Google Workspace app including Docs, Sheets, and Slides, by the end of this year.

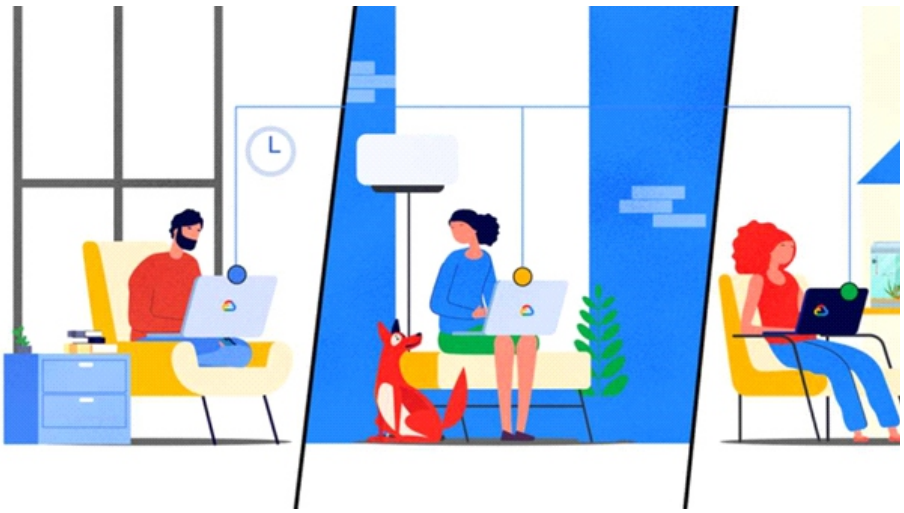
Google has revealed a new “smart canvas” approach, which means the various apps and services that are part of the Workspace platform will tie in together much more seamlessly now. The company has unveiled new smart chips in Docs which would recommend files and meetings in a shared document. To insert these smart chips, users will have to type “@” to see a list of recommended people, files and meetings. Smart chips will be available for Sheets in the coming months.

The company has also improved the insert link experience which will now show relevant, intelligent suggestions for Drive files and headings and bookmarks within documents based on the highlighted text where users will insert the link. Google Docs is also getting a pageless format which will allow users to remove the boundaries of a page.

The pageless format in Docs will also allow users to import info from Calendar meeting invites. Connected checklists in Docs will let users assign items to other users and users will get more assisted analysis functionality in Sheet.

It is also adding emoji reactions in Docs, though these will roll out later. This would allow multiple people working on a document to react to updates. Google is also bringing support for live captions and translations in Google Meet. Users will be able to present content to a Google Meet call on the web directly from Google Doc, Sheet or Slide.

Google's assisted writing feature will now offer more inclusive language recommendations than before. The updates are set to make Google workspace apps connect more seamlessly and seem to be a step in the right direction for the company.



I/O 2021: All the new features coming to Google Maps

Google Maps is getting various new features, and the updates were announced at the ongoing Google I/O 2021. Features include more detailed street maps, expansion to the existing Live View feature and better navigational routes with the help of machine learning.

Detailed street maps

Google will now provide users with more detailed street maps. The feature which was initially announced last August in select areas. It will start rolling out in 50 more cities, including Berlin, São Paulo and Seattle among others, by the end of 2021.

Google Maps makes use of AI to show users if they are likely to encounter obstructions such as sidewalks and crosswalks, while planning their route. Google hopes that the new feature can help pedestrians plan the most accommodating route. The feature will be very useful for people using a stroller or wheelchair.

Live View

Google Maps will use its Live View feature to aid users, who are exploring a new neighbourhood. Live View uses AR signs to help users with real world navigation, but Google is expanding its use case further.

Users will be able to access Live View right from the map and see helpful details about nearby shops and restaurants, how busy they are, recent reviews and photos. The feature will also show helpful new street signs for complex intersections. Live View is not yet available in India.

Better Navigation

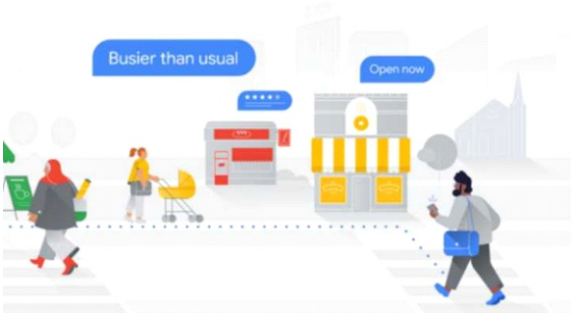
Google Maps is getting a new feature, which will use machine learning and navigation information to help users avoid having hard-braking moments during the drive and show the most optimised route. When a user opts to get directions in Maps, the service calculates multiple route options to the destination based on several factors.

Google will now opt to show the fastest routes, and identify which route is likely to reduce your chances of encountering a hard-braking moment. It remains to be seen if this will be implemented in India and how accurate the feature will be here.

More personalisation

Google Maps will now tailor its user experience to individual users. For example, the Google Maps service can now more prominently display breakfast places and coffee shops in the morning to help users who are stepping out at the time. Later in the day, Google Maps can show dinner places.

If user is traveling somewhere, the service will better highlight popular tourist destinations and landmarks. Google Maps' new feature will expand to cover entire areas, like a neighbourhood or a popular part of town. This could also help users stay away from busy and crowded areas.



Google Adds a New Button to Directly Save Images From Gmail to Google Photos

Google introduced the new feature through its Workspace blog. As mentioned, the new feature by Google allows Gmail users to save photo attachments directly to Google Photos using the new 'Save to Photo' button. The button co-exists with the 'Add to Drive' button on an attachment or while previewing it. Up until 2019, Google Drive and Google Photos were synced to work together but the search giant changed this in a bid for 'simplicity.'

The new feature reduces the need for users to download JPEG images and manually back them up on Google Photos. However, media in other image and video formats would still require to be manually uploaded to Google Photos for organising them in albums or backing them up on the cloud.

This feature will be ON by default. For an eligible photo, you can choose the Save to Photos button which is alongside a similar option to Add to Drive," the blog reads. The rollout of the 'Save to Photos' feature will be done gradually using the Rapid Release and Scheduled Release domains. Users in the former domain will have started receiving the update from May 26, while users in the latter domain would start getting it a week later. Google says it can take up to 15 days for the feature to show up for all Gmail users.

Additionally, the feature will be available to all Workspace users as well as G Suite basic and business users. Users of personal Google Accounts will also receive the new 'Save to Photos' feature.