# INSIGHT

**Highest on Earth** 

what is measured.

**Highest altitude** 

than 29,000 feet.

Mount Everest, located on the

border between Nepal and China, is the highest mountain

on Earth in terms of altitude (the height above average sea

level). Everest peaks at more

**Highest above Earth's center** 

feet shorter than Mount Everest

in terms of elevation. However, when measuring height above

the center of the Earth, Mount

This is because Earth is not a

force created by the planet's

perfect sphere. The centrifugal

mountains located close to the

while it may not be as tall, Chimborazo's summit is over 6,800 feet farther from the center of the Earth than Everest's summit. That makes Chimborazo the closest point on Earth to space.

**Tallest mountain** 

Mauna Kea, located in Hawaii, is

the tallest mountain in the world

from base to peak at more than

feet of the mountain is above

under the Pacific Ocean and

sea level. The rest is submerged

rests on the ocean floor. While it

ing to total height, Mauna Kea is more than 15,000 feet shorter

is the tallest mountain accord-

than Mount Everest when alti-

This chart shows the altitude of

each U.S. state's highest point.

tude is measured.

**Measuring up** 

33,500 feet. However, only 13,796

equator are technically higher than those in other areas. Chimborazo is located just one degree south of the equator, while Everest is located 28 degrees north of the equator. So

Chimborazo ranks No. 1.

constant rota-

tion causes

Earth to

be wild-

est at its

center. This bulge means

Mount Chimborazo in Central

Ecuador is more than 8,000

The highest mountain is often debated. There are three mountains that could be classified as Earth's top peak depending on

20,000 feet

19,000

18,000

17,000

16,000

15,000

14,000

13,000

12,000

11,000

10,000

9,000

8,000

7,000

6,000

5,000

4,000

3,000





**ALASKA** Denali

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Comparing the top elevations in each U.S. state and a look into the tallest points on Earth

# Location of the each state's highest elevation Δ Δ Δ Mount Rogers Britton Denali Hill ▲ Highest U.S. point ▲ Lowest high △ Virginia's high

High points and topography of the U.S.

The high points in each state of the country range from Alaska's Denali, which peaks at 20,310 feet, to Florida's Britton Hill, which has a rise of just 345 feet.

The topography of the U.S. is diverse. The eastern regions consist of hills and low mountains, while the central interior is a vast plain. In the west, there are high mountain ranges. So it is no surprise that virtually all of America's tallest peaks are in the west, while most of the lowest high points are in the midwest and the deep south. Eight of the state high points are found in national parks.

Tallest peaks on each continent

The Seven Summits represent the tallest peaks on every continent. Roughly 500 people worldwide have climbed all seven mountains. There are several variations of the list because of controversy over continent boundaries; however, the Messner list is considered to be the most challenging.

Messner list of the Seven Summits: Mount Everest in Asia, Aconcagua in South America, Denali in North America, Kilimanjaro in Africa, Elbrus in Europe, Vinson in Antarctica and the Carstensz Pyramid in Australia

**GEORGIA** Brasstown Bald

**MAINE** Mount Katahdin

Kilimanjaro

**TENNESSEE** 

Clingmans Dome

**SOUTH DAKOTA** Black Elk Peak

**NORTH CAROLINA** Mount Mitchell

**NEW HAMPSHIRE** Mount Washington

**NEBRASKA** Panorama Point

**VIRGINIA** Mount Rogers

**NEW YORK** Mount Marcy **OKLAHOMA** Black Mesa

**WEST VIRGINIA** Spruce Knob

**VERMONT** Mount Mansfield **KENTUCKY** Black Mountain

**SOUTH CAROLINA** Sassafras Mountain

**MASSACHUSETTS** Mount Greylock **NORTH DAKOTA** White Butte **PENNSYLVANIA MARYLAND** Hoye-Crest Mount Davis **ARKANSAS** Mount Magazine **CONNECTICUT** Mount Frissell **MICHIGAN** Mount Arvon

**KANSAS** 

Mount Sunflower

**ALABAMA** Cheaha Mountain **NEW JERSEY** High Point 2,000 MINNESOTA Eagle Mountain **IOWA** Hawkeye Point **WISCONSIN** Timms Hill **ILLINOIS** MISSOURI Taum Sauk Mountain Charles Mound **OHIO** Campbell Hill 1,000 **INDIANA** Hoosier Hill

**RHODE ISLAND** Jerimoth Hill MISSISSIPPI Woodall Mountain **LOUISIANA** Driskill Mountain

TRIBUNE NEWS SERVICE Britton Hill, Florida Elevation: 345 feet

## than half of the mountain is permanently covered with snow. Formerly known as Mt. McKinley, the mountain's name was officially

**Highest point** in the U.S.

Standing at 20,310 feet, Denali is the tallest mountain in the United States

and North Amer-

ica. It is located in

Alaska, and more

changed to Denali in 2015. **CALIFORNIA** 

Mount Whitney

**COLORADO** Mount Elbert

**WASHINGTON** Mount Rainier

**HAWAII** Mauna Kea **WYOMING** Gannett Peak

**UTAH** Kings Peak **NEW MEXICO** Wheeler Peak

**MONTANA** Granite Peak

**OREGON** Mount Hood

**IDAHO** Borah Peak

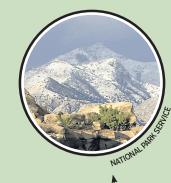
**NEVADA** 

**ARIZONA** 

Humphreys

Peak

**Boundary Peak** 



**TEXAS** Guadalupe Peak Elevation: 8,749 feet

BOB BROWN/TIMES-DISPATCH

Virginia's highest point

Mount Rogers, Virginia's highest point, peaks at 5,729 feet. The mountain is located in the southwest area of the state between Damascus and Galax.

The Mount Rogers National Recreation Area is 200,000 acres. The area has a mixture of rare spruce-fir forests, open meadows, wild ponies, rock prominences and around 500 miles of trails.

Mount Rogers is named after Virginia's first state geologist and founder of the Massachusetts Institute of Technology, William Barton Rogers.

**DELAWARE** Ebright Azimuth

**FLORIDA** Britton Hill

# DCEAN WORLDS

is exist in diverse forms on moons and dwarf planets across our solar system. Though Earth is the only known place that supports life, it isn't the only world that quid water — one of the key ingredients for life. Scientists have found that has lic ocear

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# EARTH TERRESTRIAL PLANET

Earth is the only planet in our solar system that has liquid water on its surface. This is due to its unique position in the solar system. Earth is the third planet from the sun, located about 93 million miles away, or 1 Astronomical Unit (AU). It is the only known world inhabited with living things. Called the ocean planet, 71% of Earth's surface is covered in water.

Ocean world status: ACTIVE

# CALLISTO MOON OF JUPITER

5.2 craters. Data from NASA's Galileo spacecraft in the 1990s revealed Callisto may have a salty ocean beneath its surface. Scientists estimate it may be located 155 miles below the surface. The ocean is thought to be at least 6 miles deep. third-largest moon in our solar system. It is located AU from the sun and has an icy surface covered by Callisto is Jupiter's second-largest moon and the

evidence of a large, underground saltwater ocean on Ganymede. The ocean is estimated to be 60 miles deep and is thought to have more water than all the water on Earth's surface. Ganymede could also have several

layers of ice and water between its crust and core. Ocean world status: LOCKED (trapped ocean)

est moon in our solar system. It is even bigger than the planet Mercury. NASA's Hubble Space Telescope found

Located 5.2 AU from the sun, Ganymede is the larg-

GANYMEDE MOON OF JUPITER

Ocean world status: LOCKED (trapped ocean)

# TITAN MOON OF SATURN

ocean beginning about 30 miles below its ice shell. This moon's ocean is thought to be as salty as the Dead Sea on Earth. It is unknown if Titan's ocean is thin and located between layers of ice or thick and extends all the Also larger than Mercury, Titan is the second-largest moon in our solar system. It is located 9.5 AU from the sun. Titan is believed to have a salty subsurface way to the rocky interior.

Ocean world status: LOCKED?

# TRITON MOON OF NEPTUNE

Triton is the largest of Neptune's 13 moons. Located 30.1 AU from the sun, Triton's cold, icy surface is subsurface ocean on Triton is considered possible but is unconfirmed. During its 1989 flyby, Voyager 2 found that Triton has active geysers that spew nitrogen gas, making it one of the few geologically marked by volcanic features and fractures. A active moons in our solar system.

Ocean world status: POSSIBLE



# EUROPA MOON OF JUPITER

:wice as much water as all of Earth's oceans combined. It is also possible that Europa's ocean is leaking into space: In 2014 and 2016, the Hubble Space Telescope spotted possible water plumes erupting off the moon's surface. rust his ace the sun, Europa's surface is mostly water ice. Scientist Europa is widely considered the most promising pl to look for life beyond Earth. Located 5.2 AU from have found strong evidence that beneath the icy c is a salty ocean of liquid water. Scientists believe the possible water plumes erupting off the moon's sui ocean is 40 to 100 miles deep, so it could contain

> craft was the first to visit a dwarf planet and gathered data at Ceres. Scientists estimate that Ceres consists

planet in the inner solar system. NASA's Dawn space-Located 2.8 AU from the sun, Ceres is the only dwarf

CERES DWARF PLANET

of about 25% water, a fraction of which could be in a liquid state. There are also indications that Ceres may have salty liquid below the surface and that it could have preserved an ocean deep underground.

Ocean world status: POSSIBLE

Ocean world status: ACTIVE?



# ENCELADUS MOON OF SATURN

moon of Saturn. Scientists believe it has a global ocean of salty liquid water about 6 miles deep under a shell o ice that is 20 to 25 miles thick. Cassini discovered that geyser-like jets spew water vapor and ice particles out into space from this underground ocean. The material shoots out at about 800 mph and forms a plume that Located 9.5 AU from the sun, Enceladus is an active extends hundreds of miles into space.

Ocean world status: ACTIVE



# MIMAS MOON OF SATURN

subsurface ocean or its core is shaped like a football. If Mimas does have a liquid water ocean, it would be 15 to 20 miles beneath the surface. Wimas is the smallest of Saturn's major moons. It is located 9.5 AU from the sun and has one of the most water ice. According to research, Mimas has either a heavily cratered surfaces in the solar system. Its low density suggests that it consists almost entirely of

Ocean world status: POSSIBLE



# PLUTO DWARF PLANET

planet could have an underground liquid ocean. Pluto has mysterious fault lines, some of which are hundreds Located 39.5 AU from the sun, Pluto is an active world but has many unknowns. However, data from NASA's of miles long, that may point to the subsurface ocean. Scientists believe the ocean could surround and inter-New Horizons spacecraft suggests that the dwarf act with the dwarf planet's rocky core.

Ocean world status: POSSIBLE



## Subsea cables WHAT ARE THEY?

Though many may think global connectivity is made possible by satellites, there is actually a physical network connected on land and under the ocean.

Nearly all international connectivity - voice, data and internet travels through underwater cables. These cables, known as submarine or subsea cables, lie along the sea floor. Closer to shore, they are buried for added protection.

The cables are laid along the safest path underwater, avoiding fault zones, fishing zones, anchoring areas and other dangers.

Some cables are short, like the 81-mile cable between Ireland and the United Kingdom, while others are incredibly long, like the 12,427mile Asia America Gateway cable that runs across the Pacific Ocean.

Nearly all countries that have a coastline are connected to subsea cables, and anyone accessing the internet has the notential to use them.

of all intercontinental data is carried via subsea cables



**RUN STUDIOS** 

# **MAREA** cable installation

# **HOW DO THEY WORK?**

Modern subsea cables use fiberoptic technology. Lasers on one end fire at rapid rates down thin glass fibers to receptors at the other end.

The cables are typically as wide as a garden hose. The filaments that carry light signals are extremely thin — roughly the diameter of a human hair. These fibers are then wrapped in a few layers of insulation and protection.

Total number of active and planned subsea cables as of 2022

# WHO OWNS THEM?

Cables were traditionally owned by telecom carriers that would form a consortium. In the late 1990s, private cables began being built. Both models still exist today.

Content providers such as Google, Facebook, Microsoft and Amazon are major investors in new cables and own or lease more than half of the global undersea bandwidth.

# **VIRGINIA'S**

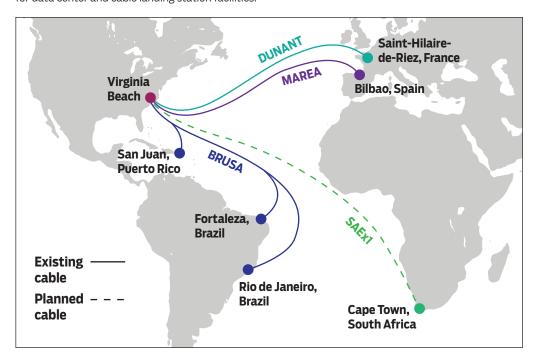
# DIGITAL CONNECTION

TO THE WORLD

Just five years ago, all of the subsea cables along the U.S. Eastern Seaboard landed in New Jersey-New York or Florida. But in 2012, Hurricane Sandy caused so much destruction to the New York coastline that it prompted the development of a third East Coast landing site in Virginia Beach. The area is now home to three international cables, and another one is in development. These cables come ashore in Virginia Beach and end in Henrico County at the Meta (Facebook parent company) data center and the QTS data center next door.

## Virginia Beach's international cables

Three subsea cables come ashore in Virginia Beach and connect the U.S. to France, Spain, Puerto Rico and Brazil. These cables are among the most modern, highest-capacity routes in the world. A fourth cable, SAEx1, is currently under development, and construction is expected to begin in 2025. When completed, it will be the first and only cable to directly connect the U.S. with South Africa. As a result of the subsea cables, demand is increasing for locating data centers in Virginia Beach with nearly 1,000 acres available for data center and cable landing station facilities.



# **DUNANT**

Ready for service: January 2021 Length: 3,977 miles Owner: Google

**HENRICO** 

White Oak

Park

Technology

# **MAREA**

Ready for service: May 2018 **Length:** 4,104 miles Owners: Meta, Microsoft, Telxius

# **BRUSA**

Ready for service: August 2018 Length: 6,835 miles Owner: Telxius

## **Confluence cable**



Virginia Beach also has full permits in place for four more subsea cable conduits that will accommodate further cables including the Confluence cable coming from New York-New Jersey and connecting to Virginia Beach; Myrtle Beach, S.C.: Jacksonville, Fla.: and Miami.

The Confluence-1 is the first subsea cable system dedicated to linking strategic global communications nodes on the U.S. East Coast. The infrastructure for the Sandbridge area of Virginia Beach is scheduled to start in November.

# **CONFLUENCE-1**

Ready for service: 2023 Length: 1,598 miles Owners: Confluence Networks

Cable route from Virginia Beach **VIRGINIA** to Henrico

# Henrico data centers

Virginia's subsea cables come ashore in Virginia Beach and end in Henrico County, connecting to two massive data centers: Meta (the parent company of Facebook) and QTS.

Meta is investing more than \$1 billion to build a 2.5 million-square-foot data center campus in the White Oak Technology Park. The first phase opened in 2020.

QTS, which acquired a former semiconductor plant in 2010 and turned it into a 1.5 millionsquare-foot mega data center, is expanding its operations. The facility — the world's fourthlargest data center — provides access to more than 20 network providers. QTS acquired an



Meta built this new data center at White Oak Technology Park in eastern Henrico.

additional 200 acres next to its existing center, and construction is underway to double the size of its campus.

Learn more about how the megaregion from Richmond to Hampton Roads is working to become a Global Internet Hub at www.globalinternethub.org

# How fast data travels

In the blink of an eye, data can transmit back and forth from Henrico to Spain twice.

	•
From Henrico to:	Latency (milliseconds)
Virginia Beach	2.74
Madrid, Spain	72.74
Marseille, France	79.27
Frankfurt, Germany	82.74
London, UK	85.49
Sao Paulo, Brazil	108.24

# **History**

While fiber-optic data transmission has been a relatively recent invention, subsea cables have been around for more than 160 years. The first transatlantic telegraph cable was laid in 1858, between Ireland and the province of Newfoundland in Canada.

Prior to this cable, the only way to transmit a message across the Atlantic was by boat, which took 10 days. After the cable was laid, it took only a matter of minutes. Repeaters, which are used to amplify the signal along cables, were first introduced in 1956.

# **Satellites**

Satellites can be used to reach areas that aren't yet wired with fiber optics, but the cables can carry much more data at a far less cost than satellites. According to the FCC, satellites account for just 0.37% of all U.S. international capacity.

# **WIRELESS SIGNALS**

When you use your cellphone, the signal is carried wirelessly only from your phone to the nearest cell tower. From there, the data will be carried over land and subsea fiberoptic cables.