Week 3

Takeaways:

Azure’s global infrastructure is vast and includes over 70 regions with 400+ datacenters around the world. This gives Azure extensive reach with even more diverse potential compliance options.

Geographies combine multiple Azure regions in a specific physical area, which allows the proper and secure data residency to meet their compliance obligations.

Geographies include contents like: the United States, Europe, and Asia Pacific. Each region in these geographies has different available data residency options, for example: Belgium, or Indonesia.

Regions:

Regions are geographically clumped datacenters that are connected to ensure low latency. Examples: East US, West Europe, Australia East (plan to have over 70 regions in total or planned).

Availability Zones are datacenters that are located within regions to provide redundancy within a region (high availability), Not all regions have Availability Zones..

Data Centre:

A physical building or facility that houses one or more separate datacenter wholesale servers. All of Azure's datacenter are built to be insane on sustainability, and over 400 are in operation and deployed all around the world today.

Overview of Azure Global Infrastructure

Azure's world-wide uses of cloud and AI services to create reliability and compliance is backed by its global infrastructure. Azure global infrastructure exists

in greater than 70 regions, and each region has multiple datacenters. The Azure global infrastructure is well-structured to meet data residency needs with geographies. Let's break it down:

Geographies:

The proper compliance means keeping the data (and data residency) within that boundary. Geographies lives in continents. Examples: the United States, Europe, Asia Pacific (APAC). Each geography has different data residency obligation - see regions in Europe, for example: Belgium, Indonesia).

Regions:

A region is a group of datacenters that are in a particular area (for example, geographic grouped datacenters connected to produce low latency).

Examples: East US, West Europe, Australia East. Over 70 regions anticipated or operational.

Availability Zones

An availability zone is a set of multiple datacenters that are geographically separate within a region, and they are designed for redundancy. A clear understanding of availability zones are critical to understand and practice high availability. Availability zone support varies regionally, as shown with the Central US and East Asia.

Data Centers

Data Centers are the physical buildings where servers are housed All the public cloud providers have over 400 Data Centers in the world. The Datacenters are generally designed to improve sustainability and reliability, like where Azure currently provides Data Centers in South Africa and Datacenters in Japan.

Survey Note on Azure Global Infrastructure

Microsoft Azure Global Infrastructure is the foundation of their cloud computing service and enables a reliable, scalable and manageable option to the hundreds of thousands of businesses around the world. With that, this survey note is designed to take a deeper look into the Azure's Geographies, Regions, Availability Zones and Data Centers, as far as distribution of datacenters and regions, and at a high-level, the survey note includes consideration or will include consideration based on Azure Global Infrastructure data as of June 2025. The rest of this section and sections below provide a detailed breakdown of what is outlined, while being comprehensive enough for use in research and development.

Intro to Azure Global Infrastructure

Azure provides a global infrastructure that is built for growing, and sustainability, as well as supporting cutting-edge cloud and AI workloads. They have more than 70 Azure Regions and more than 400 datacenters that can help with compliance, with more than 100 compliance offerings to meet, organizational, global and industry standards. Their infrastructure is intended to reduce their impact on the environment based on sustainable datacenters initiatives, tools, and operational practices; as mentioned in their latest updates.

Azure Geographies: Defining Markets for Compliance and Residency

Azure geographies are discrete markets, typically encompassing two or more regions, designed to preserve data residency and compliance boundaries. This structure is crucial for organizations with specific legal or regulatory needs, allowing them to keep data and applications close to their operational base. As of recent documentation, Azure is available or coming soon to the following geographies:

- United States
- Belgium
- Brazil
- Canada

- Chile
- Mexico
- Azure Government (specific to U.S. government needs)
- Asia Pacific
- Australia
- China
- India
- Indonesia
- Japan
- Korea
- Malaysia
- New Zealand
- Taiwan
- Austria
- Denmark
- Europe
- Finland
- France
- Germany
- Greece
- Italy
- Norway
- Poland

- Spain
- Sweden
- Switzerland
- United Kingdom
- Africa
- Israel
- Qatar
- United Arab Emirates
- Saudi Arabia

Each geography contains one or more regions, ensuring fault-tolerant, high-capacity networking infrastructure for business-critical data and applications

Azure Regions: Clusters for Performance and Latency

Azure regions can be considered a collection of datacenters deployed within parameters that define low latency based on connected dedicated regional low-latency networking, which is important for optimizing performance, latency, and regulatory compliance purposes. As of June 2025, Azure has more than 70 regions, and plans for adding more! Compared to all other cloud providers, Azure has the most global regions. In the highlighted table below are groups of key regions and listed supporting availability zones, paired region, and physical locations/geographies for the regions:

"Region"	"Availability Zone Support"	"Paired Region"	"Physical Location"	"Geography"
"Australia Central"	"No"	"Australia Central 2"	"Canberra"	"Australia"
"Australia East"	"Yes"	"Australia Southeast"	"New South Wales"	"Australia"
"Brazil South"	"Yes"	"South Central	"Sao Paulo	"Brazil"

		US"	State"	
"Canada Central"	"Yes"	"Canada East"	"Toronto"	"Canada"
"Central India"	"Yes"	"South India"	"Pune"	"India"
"Central US"	"Yes"	"East US 2"	"Iowa"	"United States"
"East Asia"	"Yes"	"Southeast Asia"	"Hong Kong SAR"	"Asia Pacific"
"East US"	"Yes"	"West US"	"Virginia"	"United States"
"France Central"	"Yes"	"France South"	"Paris"	"France"
"Germany West Central"	"Yes"	"Germany North"	"Frankfurt"	"Germany"
"Indonesia Central"	"Yes"	"n/a"	"Jakarta"	"Indonesia"
"Israel Central"	"Yes"	"n/a"	"Israel"	"Israel"
"Japan East"	"Yes"	"Japan West"	"Tokyo "	"Japan"
"Korea Central"	"Yes"	"Korea South"	"Seoul"	"Korea"
"Malaysia West"	"Yes"	"n/a"	"n/a"	"Malaysia"
"North Europe"	"Yes"	"West Europe"	"Ireland"	"Europe"
"Norway East"	"Yes"	"Norway West"	"Norway"	"Norway"
"South Africa North"	"Yes"	"South Africa West"	"Johannesburg"	"South Africa"
"Southeast Asia"	"Yes"	"East Asia"	"Singapore"	"Asia Pacific"
"UK South"	"Yes"	"UK West"	"London"	"United Kingdom"

Availability Zones: Increasing Reliability and Redundancy

Availability Zones are physically separate datacenters in an Azure Region, each with separate power, cooling, and networking. Availability Zones provide your applications and data protection from datacenter failure, and work together to help achieve high availability. Here are some items to keep in mind:

1. Definition and Distance: Availability Zones are usually a distance of kilometers to distance of several kilometers while still providing low-latency between remaining zones (subject to under 2 milliseconds round-trip) in order to keep the possibility of multiple zones from being exposed to the same outages or local circumstances (weather).

2. Types of Support:

Zone-redundant: Resources are automatically spread to as many different zones as possible and Microsoft takes responsibility for zone spreading, data replication, and failover.

Zonal: Deployed to a single, user-identified zone and are then responsible for handling multi-zone failover (if desired).

Non-zonal/Regional: not configured for zones and can be affected by zone outages.

3. Configuration and Requirements: Each service has its own level of support for configuring Availability Zones and how to correctly specify them within service configurations. Some require specific tiers, SKUs (stocks keeping units), or regions for support. Always attempt to use multiple zones for your production workloads if available. Mission critical workloads should consider multi-region + multi-zone.

4. Updates and Latency: Updates in Azure are deployed to one zone before the next, this mitigates impact for systems with large updates to apply, and there is also never a charge for data transfer between zones, so it is a cost-effective option .

Data Centers: The Physical Foundation

Azure Data Centers are the physical sites where Azure services are delivered. They deliver critical infrastructure functions that enable the rapid, secure, and reliable cloud computing experience. Key facts about Azure Data Centers include:

Scale and Distribution: Azure has over 400 datacenters worldwide, in over 70 regions. Each datacenter is a distinct physical building housing thousands of servers .

Infrastructure particulars: Each datacenter has independent power, cooling, and networking infrastructure, for reliability's sake. Microsoft is leveraging disruptive technologies such as IT Prefabricated Containers (ITPAC) to roll out datacenters more quickly .

Sustainability: Azure is pursuing sustainable datacenter design, including efficient cooling systems, renewable energy strategies, etc., to achieve global sustainability goals .

Location: The specific location of a datacenter is sometimes not made public, but regions tell a clear story. For example: Johannesburg is South Africa North and Tokyo is Japan East. Location proximity matters to ensure low latency for the user experience.

We have an impressive infrastructure development, as noted in the latest round of analyst reports related to Azure's leadership position; for example, Azure's recognition as a Leader in the 2024 Gartner Magic Quadrant for Strategic Cloud Platform Services .

Conclusion

Azure offers a thoughtfully designed global infrastructure providing a vast amount of reach, reliability, and compliance via its Geographies, Regions, Availability Zones, and Data Centers. This survey note lays the groundwork for R&D by emphasizing Azure’s flexibility and scale, suggesting Azure, as of June 2025, will become a cloud computing option of choice.