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Architecting For Sustainability

GEETHIKA GURUGE | 06-09-2023

Lead Consultant @ CMD | APN Ambassador

Architecting For Sustainability

Building A Greener Future

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Agenda

- What does it really mean
- Where can we start
- At what cost
- Final Thoughts





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What Does It Really Mean?





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The Traditional Architecting Challenge

- Meeting stakeholder expectations
- Optimizing for (often contradictory) NFRs
- Influences the overall quality of the system
 - Security posture
 - Ability to meet dynamic demands predictably



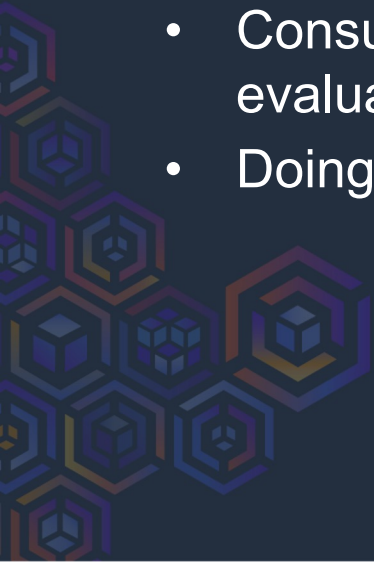


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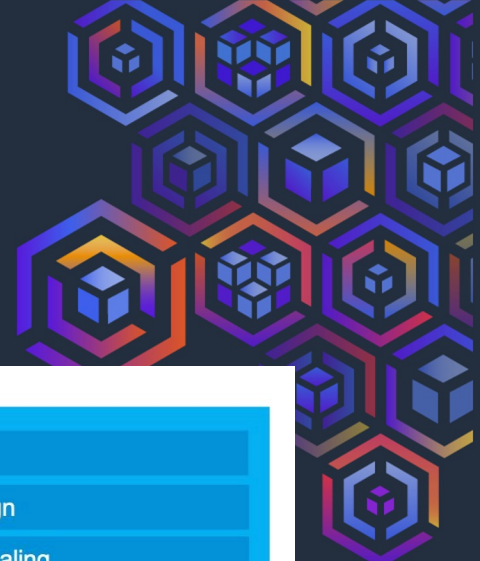
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An Emerging Quality Criterion

- Focus on renewable energy
- Consumers considering sustainability criteria when evaluating seemingly comparable products
- Doing the right thing



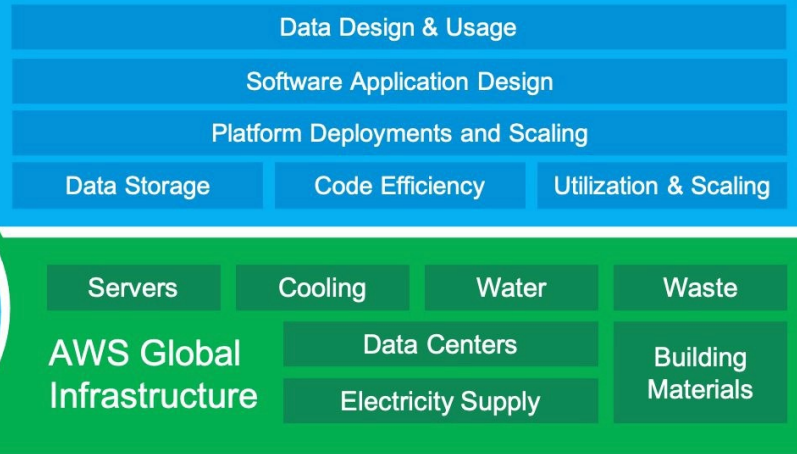
AWS' Commitment to Sustainable Practices



Customer is responsible for sustainability **in** the cloud

Customer
AWS

AWS is responsible for sustainability **of** the cloud



A Sustainable Cloud

- AWS infrastructure is 3.6 times more energy efficient than the median US enterprise data center
- Workloads on AWS can reduce carbon footprint by 88% for the same task.
- AWS' goal is to have a 100% clean energy profile by 2025 (down from an original target of 2030)
 - Reach an effective net-zero carbon usage by 2040 across its entire business.



Where Can We Start?



Reduce Data Volumes And Transversal Distances

- Regularly review persistent data
- Identify excess data and purge
- Move it to efficient storage services
- Limit the distance data must travel
 - Optimise network traffic routing
 - Introduce data caching throughout the solution
 - Adopt edge computing techniques

Leverage An Adaptive Demand Strategy

- Demand Shaping
 - Match the system's resource needs to existing supply
 - Temporarily eliminate requirements
- Demand Shifting
 - Dynamically relocate the demand to alternative infrastructure locations
 - Transferring workloads between AWS Regions situated in different time zones



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Build Mechanically Sympathetic Applications

- Minimising the number of servers required to run a workload
- Maximise server utilisation
- Use serverless options
- Use managed services
- Adopt containerised applications
- Refactor algorithms to remove needless complexity
- Improve execution efficiently





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Build Mechanically Sympathetic Applications

- Limit unnecessary use of resource-intensive architectures
 - Blockchain
 - map-reduce
 - machine learning
- Select energy efficiency-optimised server instance types such as AWS' Graviton
 - Graviton3-based instances use up to 60% less energy for the same performance than comparable EC2 instances.

Focus On Data Point Observability, Consistency And Transparency

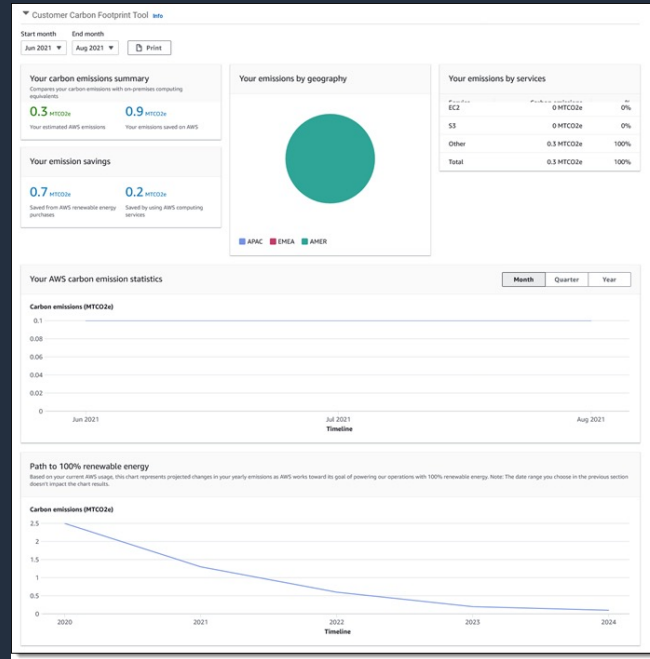
- Attaining sustainable outcomes requires measurement
- Assess the degree to which effort translates into the attainment of goals
- Results should be comparable and trustworthy.
- Keep a record of sustainability-related metrics like other measures linked to runtime system behaviour.



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Customer Carbon Footprint Tool





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At What Cost



Optimizing For (Often Contradictory) NFRs

- Data Sovereignty
 - Shifting demand to alternative regions may jeopardise local data sovereignty constraints
- System Failure
 - Reducing the number of server nodes can increase the risk of system failure
- SLAs
 - Moving tasks to off-peak periods can affect service levels



Our Responsibility For The Future Generation

As we are building solutions for the future, we have a responsibility to make them sustainable so that we leave not only great tech solutions but also a habitable planet for future generations



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Thank You!

GEETHIKA GURUGE | 06-09-2023

<https://www.linkedin.com/in/geethika-guruge/>





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