
AWS
re:Invent
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ROB301

How Amazon Robotics extends the AWS Cloud to fulfillment centers

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Curious about how Amazon manages robots in their fulfillment centers using low-latency, on-premises compute?

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Agenda

- Working backwards from the customer
- Amazon Robotics
- AWS Outposts
- Lessons learned, discussion, and Q&A

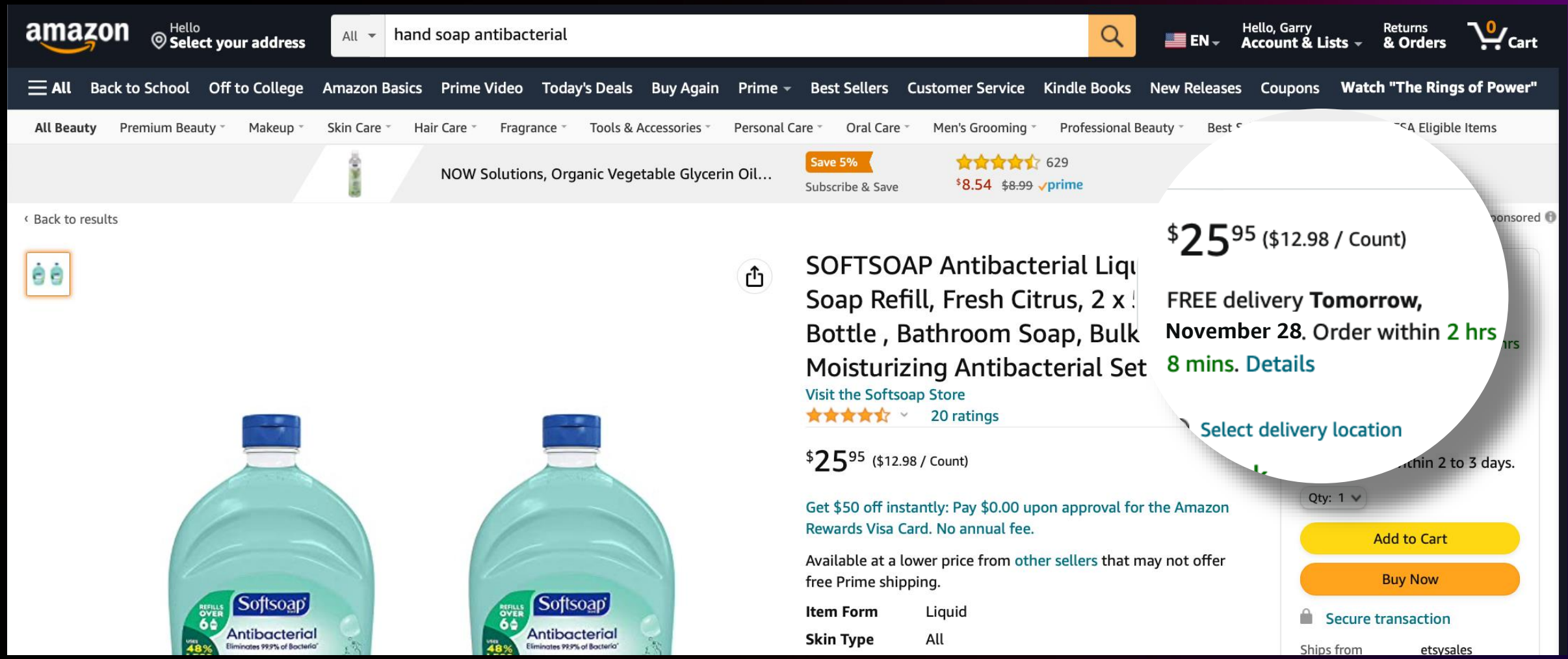
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“We’re not competitor obsessed, we’re customer obsessed. We start with what the customer needs and we work backwards.”

Jeff Bezos

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Working backwards from the customer



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Delivering on customer promise



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Behind the scenes



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Warehouses spanning multiple football fields

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Associates walking to shelves



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Apply robotics and software to solve real-world problems

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Bring shelves to the associates

2000 drive units per floor
10 floors per building



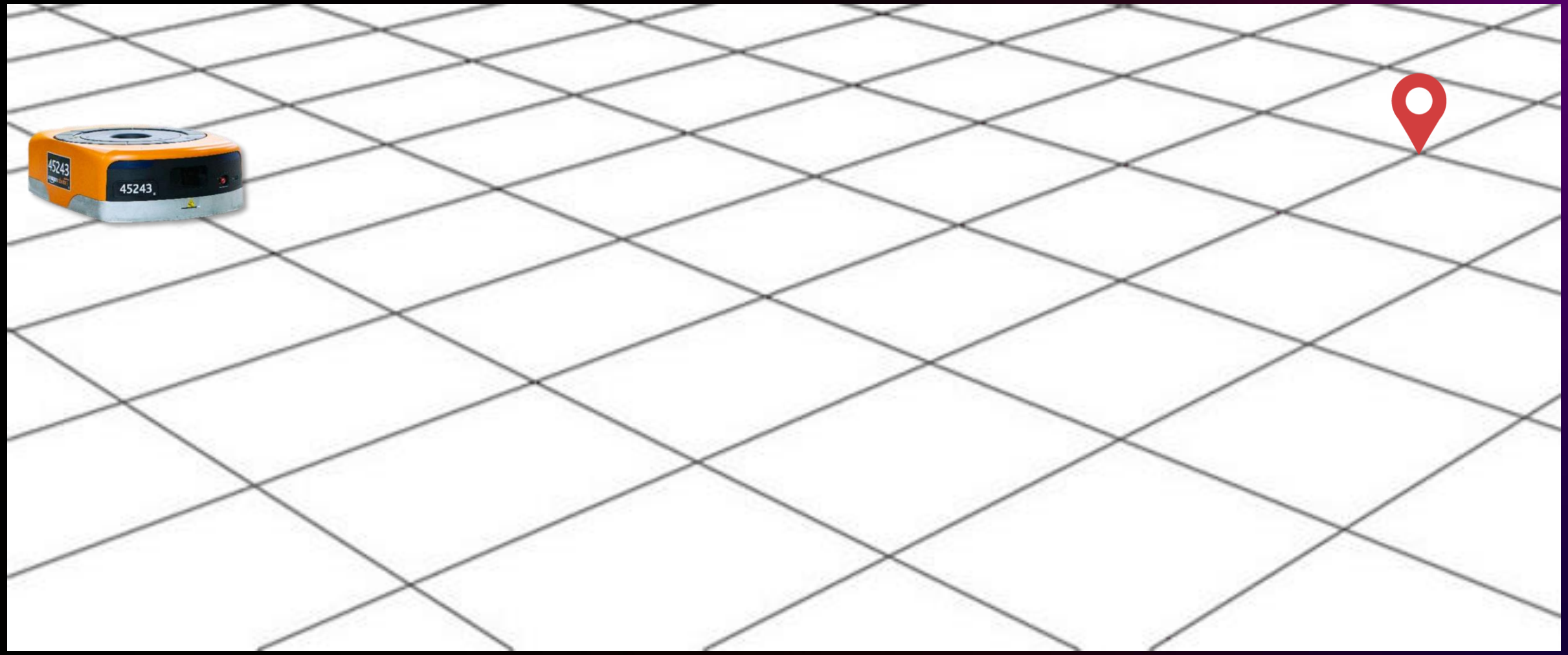
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Moving fast and with minimal clearance

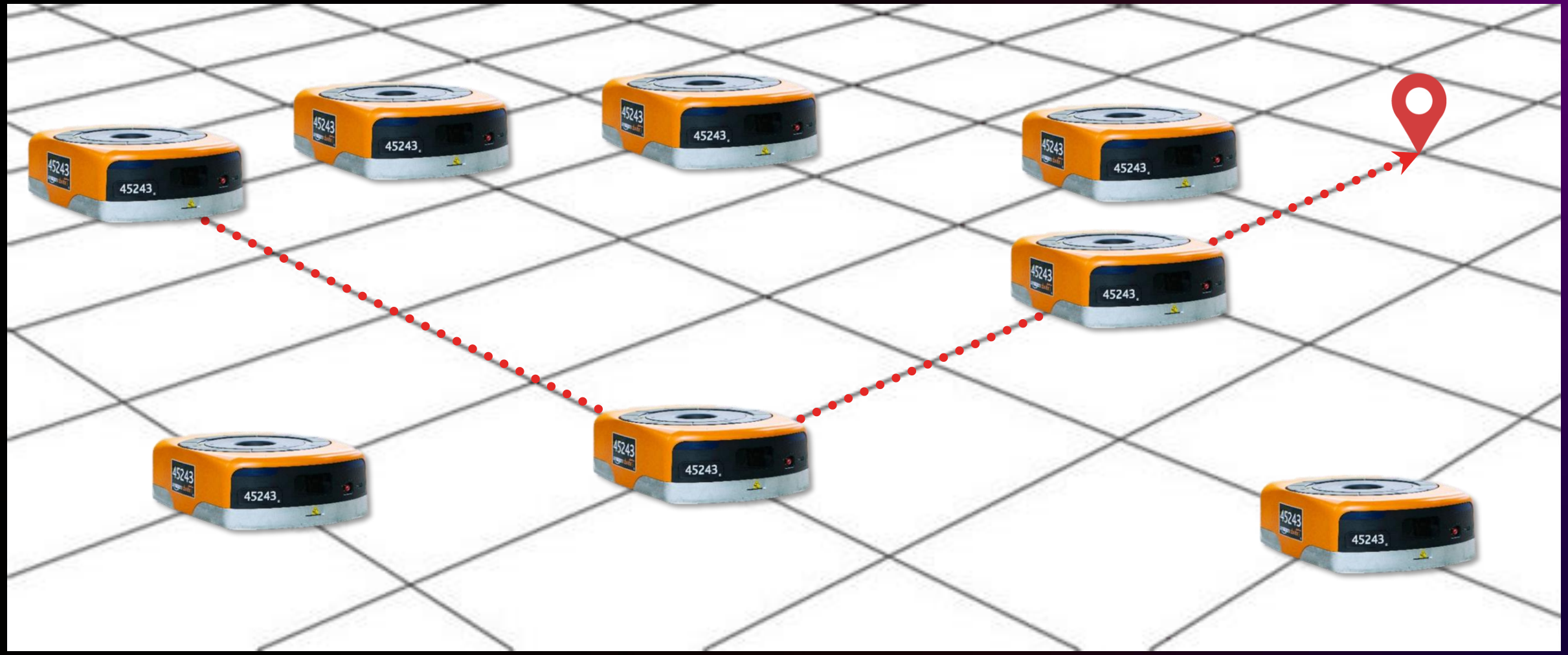


Static environment



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Dynamic environment



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Movement is recalculated 100s of times per minute, with a 10 ms latency budget

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Laws of physics

D_{max} = maximum-distance

D_{max} = C x latency-budget

D_{max} = $3x10^8$ m/s x 10 ms

D_{max} = 3000 km <- bidirectional distance

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Maximum distance of 1500 km (900 miles)

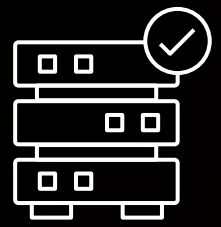
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Ideal distances

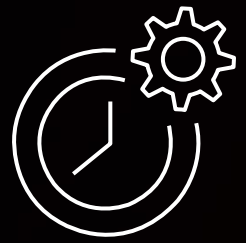


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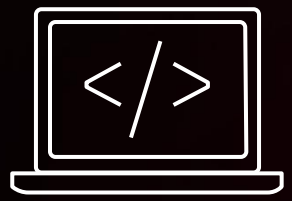
Customer wants the same experience



Same high-performance infrastructure



Same operational consistency



Same services and APIs



Same automation, deployments, and security controls



Same pace of innovation as in the cloud

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Cloud continuum

AWS Regions



On premises

AWS Outposts

Metro centers

AWS Local Zones

5G networks

AWS Wavelength

AWS IoT edge services

AWS Snow Family

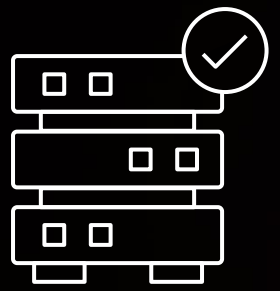
Cloud continuum

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AWS Outposts offers fully managed hardware solutions delivering AWS infrastructure and native AWS services at the edge

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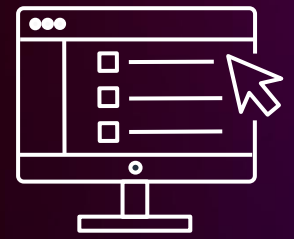
Bringing AWS on premises



Same AWS designed infrastructure



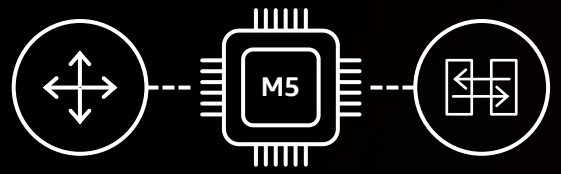
Fully managed, monitored, and operated by AWS



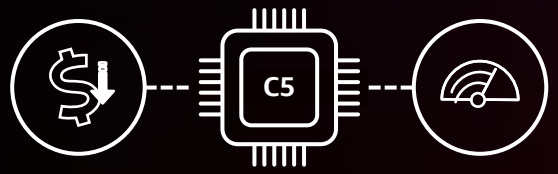
Single pane of glass and same APIs and tools

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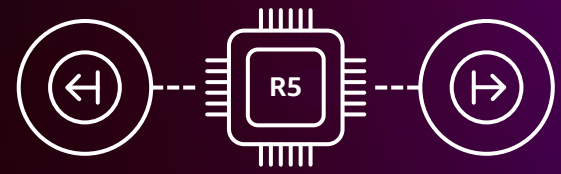
Same EC2 instances and EBS volumes



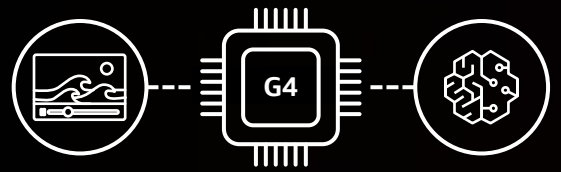
General-purpose applications



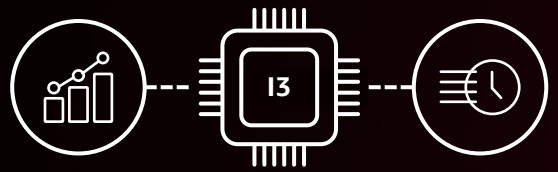
Compute-intensive applications



Memory-intensive applications



ML inference and graphics workstations



I/O intensive applications

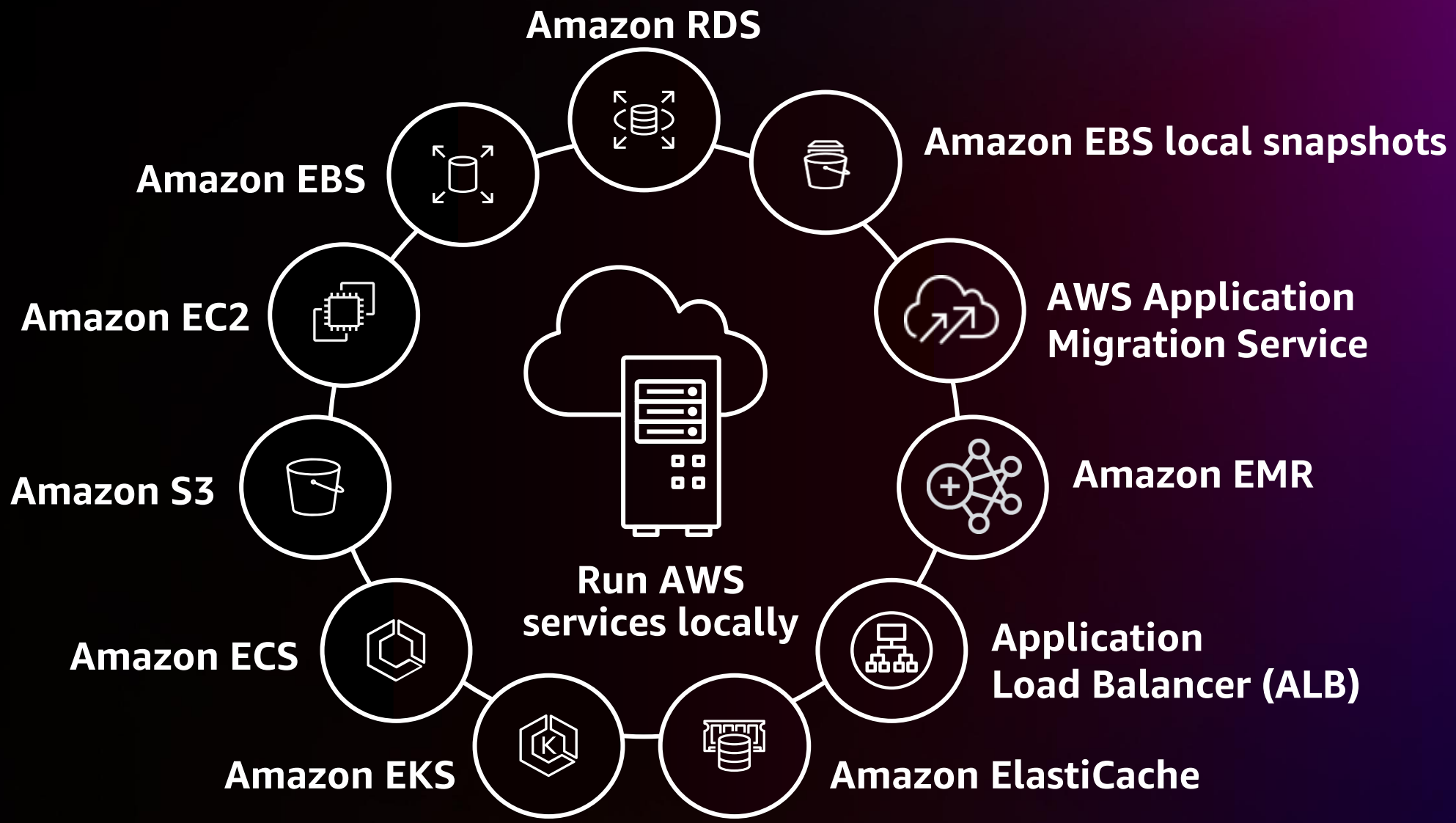


Local instance storage and EBS gp2

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Same AWS services



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What we learned

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It’s big

- Must fit through doors
- Sufficient floor space
- Floor must support weight
- Ample power and cooling



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One-way door decisions

- Tethered to single AZ in single region
- **Can’t** be rezoned
- **Can’t** be moved
- Compute family **can’t** be replaced
- Compute **may** be expanded
- Storage **may** be expanded

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Resiliency

- Finite capacity, no dark capacity
- Customer must provision for growth and failure
- Control plane in region
- Multi-AZ requires multiple Outposts

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Are you running low-latency, on-premises workflows?

How does this align with your business challenges?

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Thank you!



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