



AWS
re:Invent

C M P 2 1 2

Introducing AWS Wavelength: Run applications with ultra-low latency requirements at the 5G network edge

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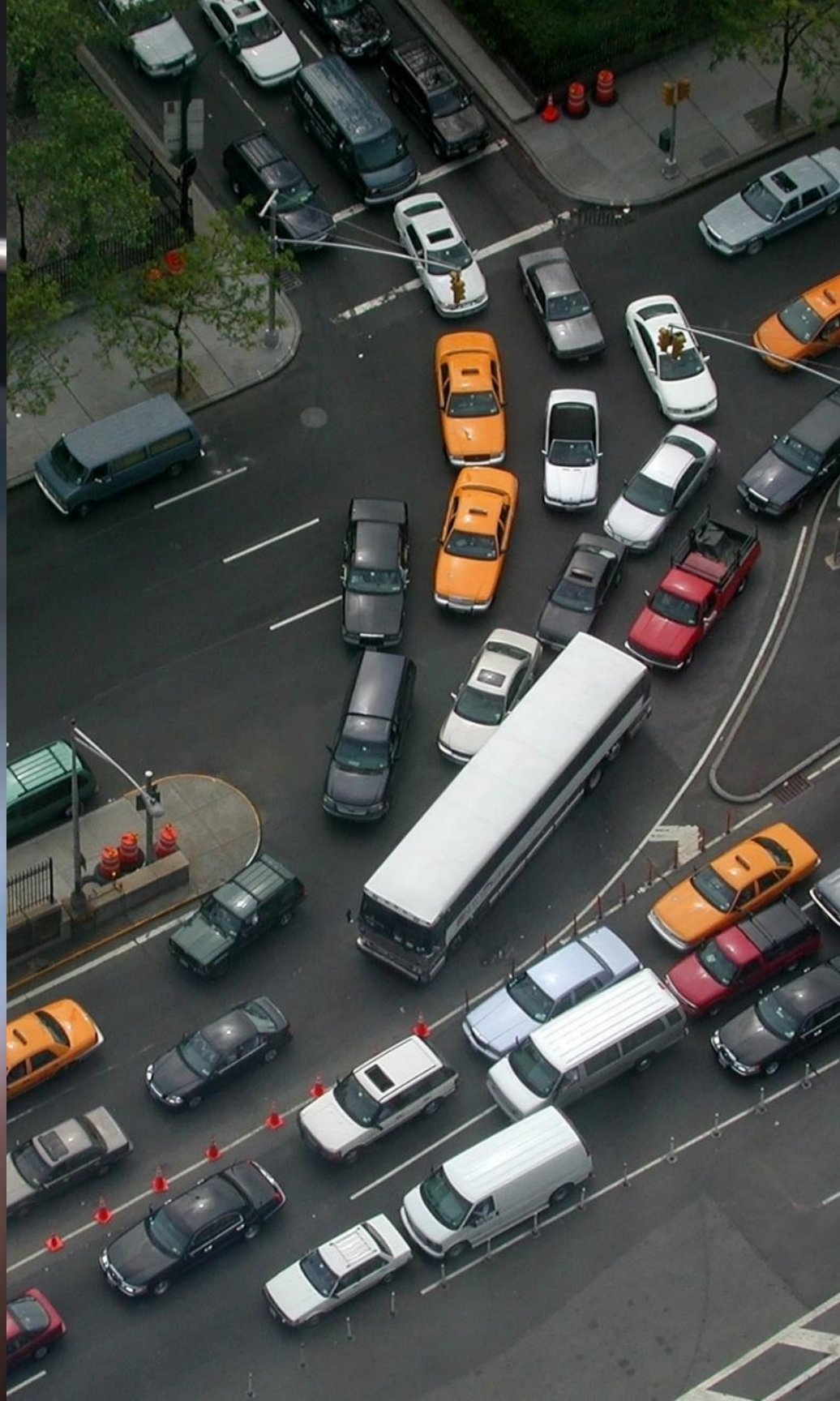
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Director of Publishing
Bethesda Softworks

Robert Duffy

CTO
id Software



Connectivity over mobile networks today



Connectivity over mobile networks with Wavelength



AWS Wavelength Benefits



**Low latency/
high bandwidth**

AWS Wavelength Benefits



**Low latency/
high bandwidth**



**Consistent
development
experience**

AWS Wavelength Benefits



**Low latency/
high bandwidth**



**Consistent
development
experience**



**Same AWS
benefits**

AWS Wavelength Benefits



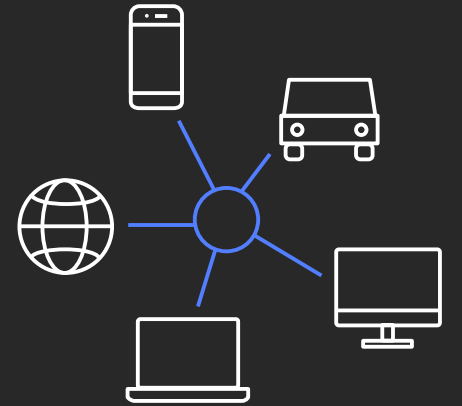
**Low latency/
high bandwidth**



**Consistent
development
experience**

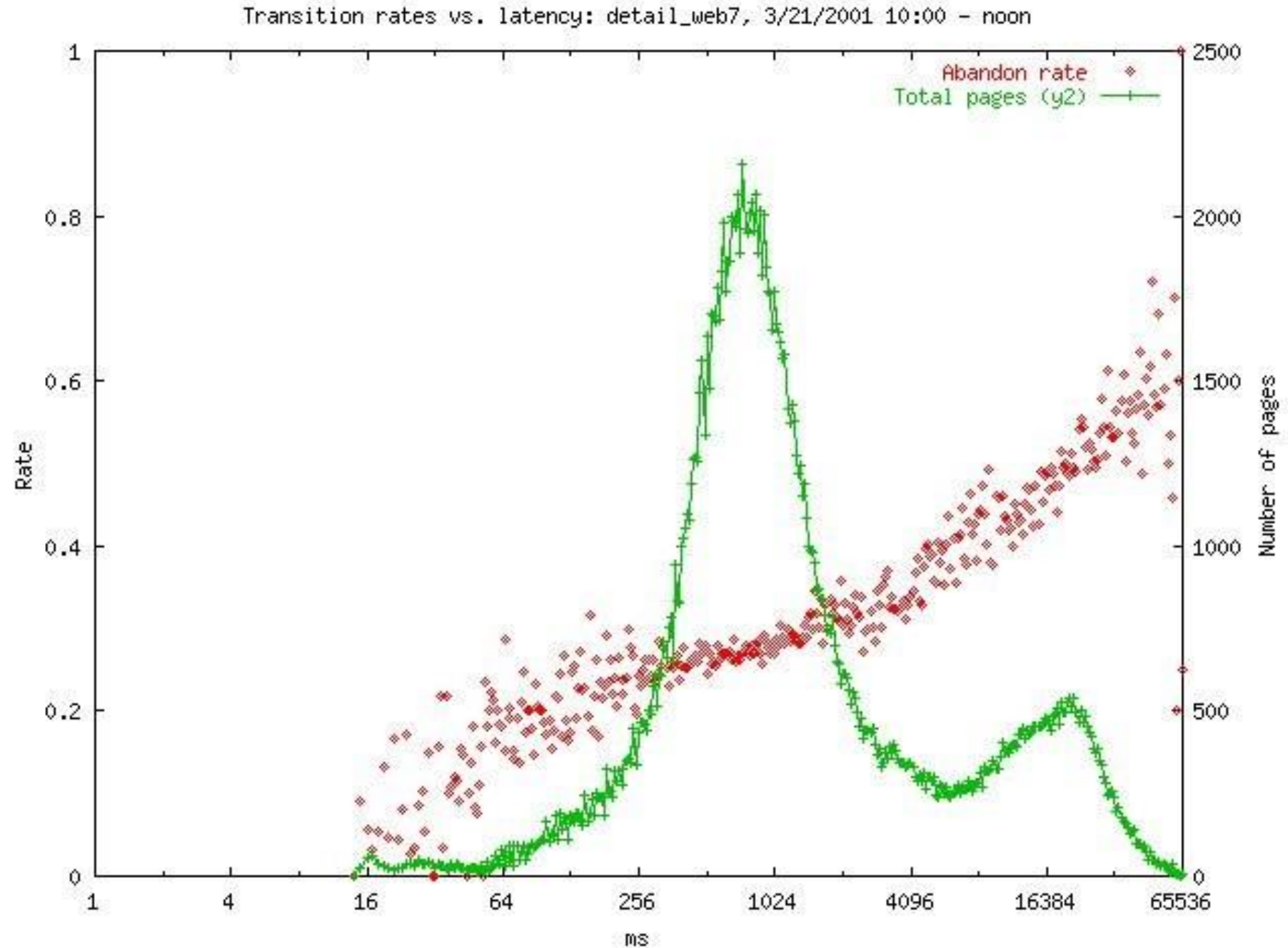


**Same AWS
benefits**



Ubiquity

Ultra-low latency compute





Edge data processing

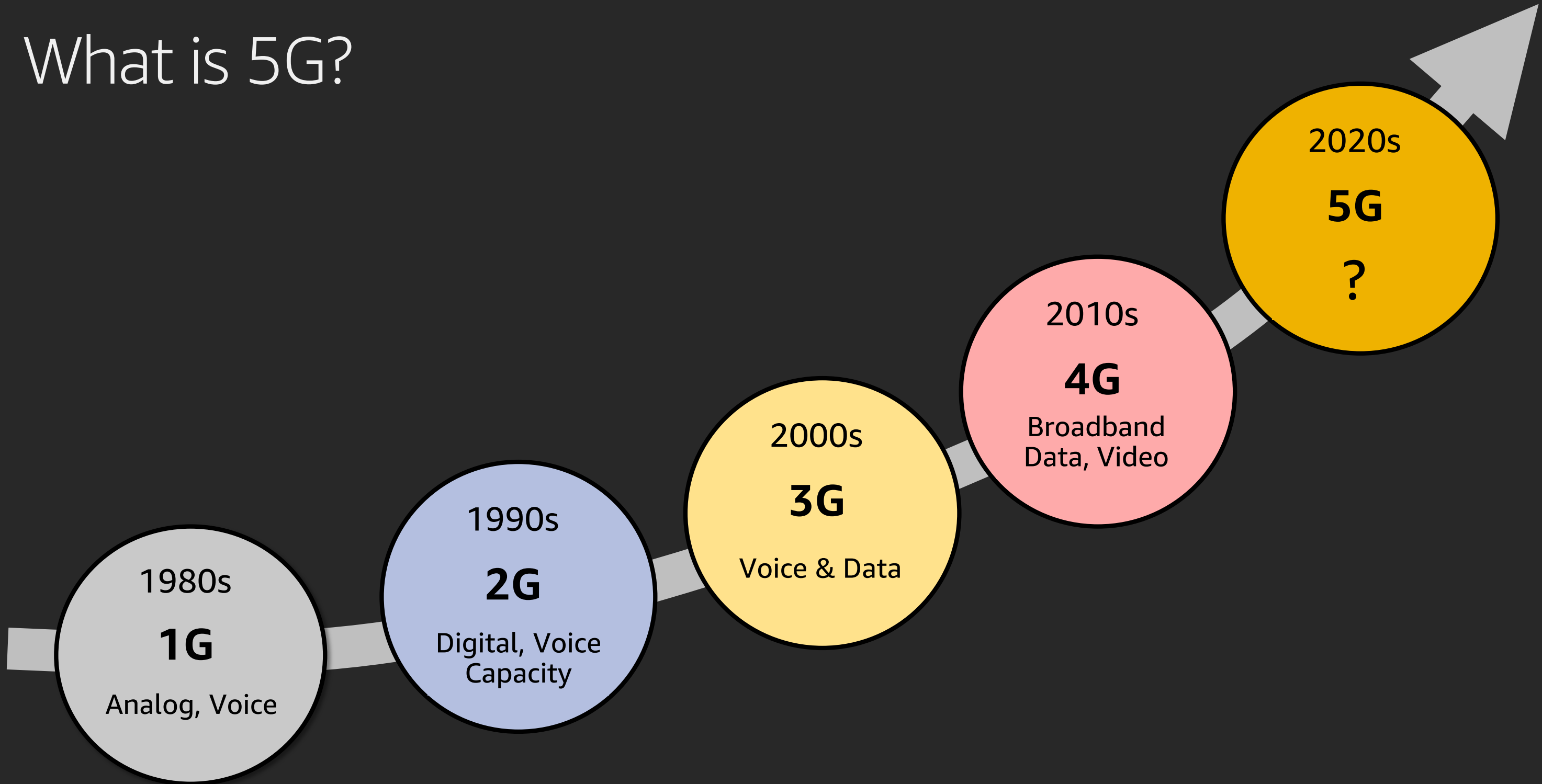


Machine learning
inference at the edge

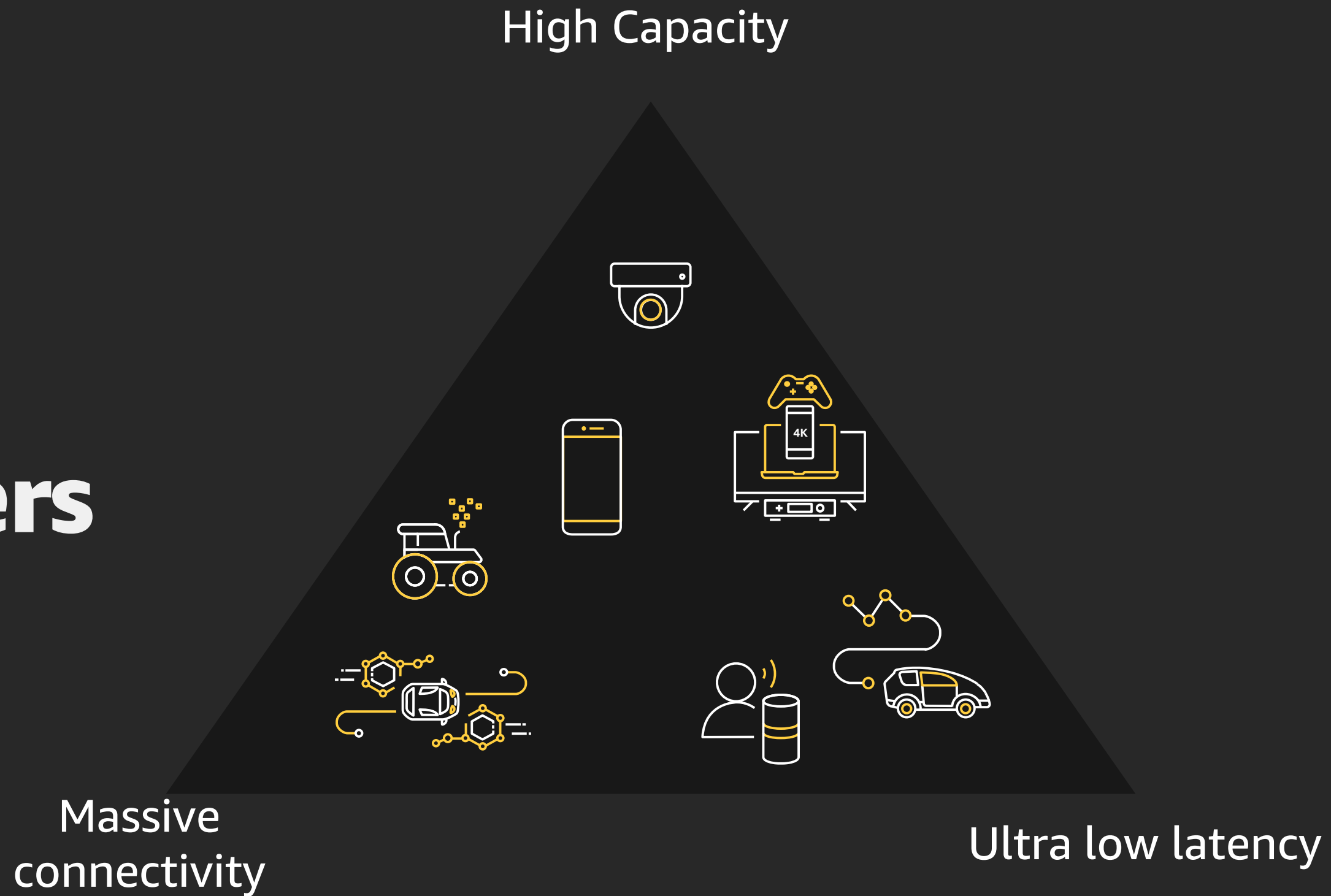


What is 5G?

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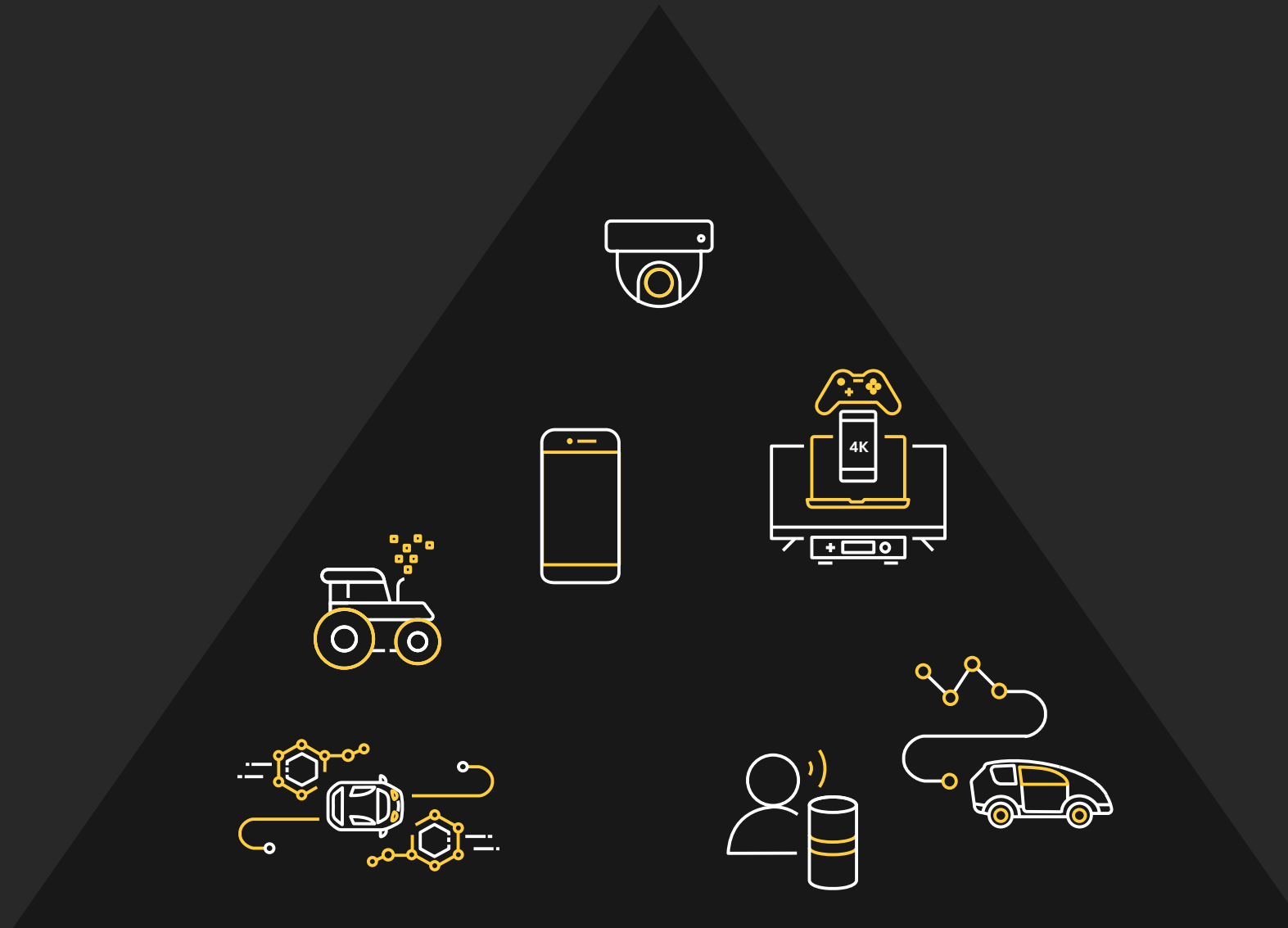


5G drivers



Peak data rate = 20Gbps DL/10Gbps UL
User experienced data rate = 100Mbps DL/50Mbps UL

5G drivers

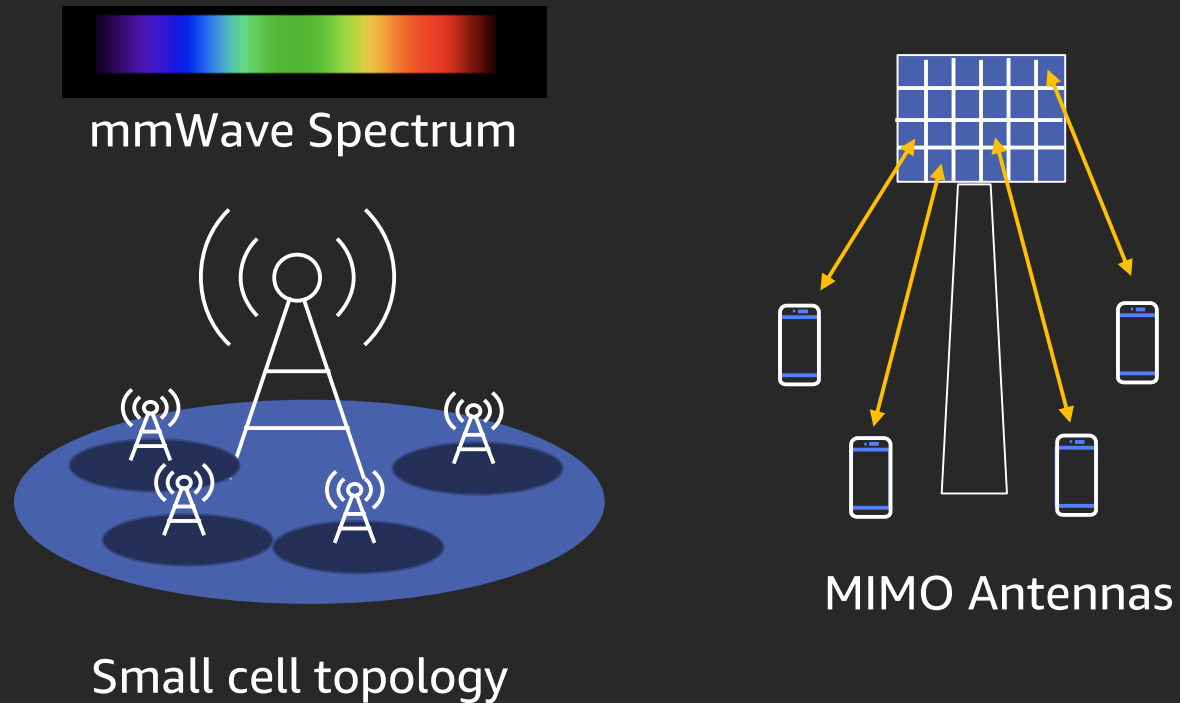


Connection density =
1,000,000 devices/km²

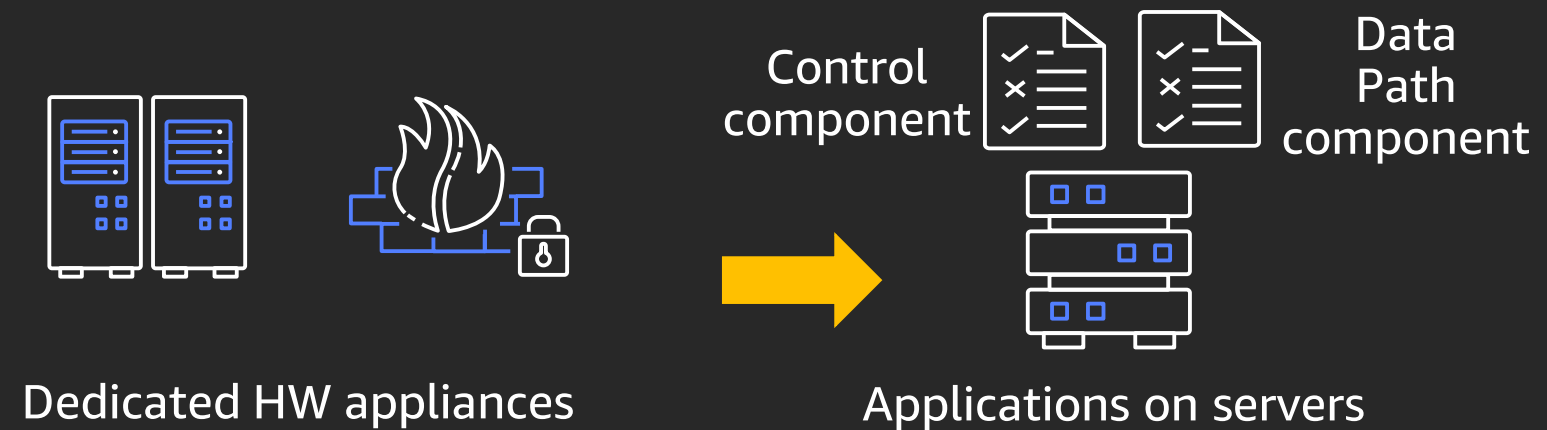
User plane latency = 5–10ms
Control plane latency = 10–20ms

How does 5G architecture achieve this?

1. Advanced wireless technologies



2. Virtualization and control/data separation of CSP network components

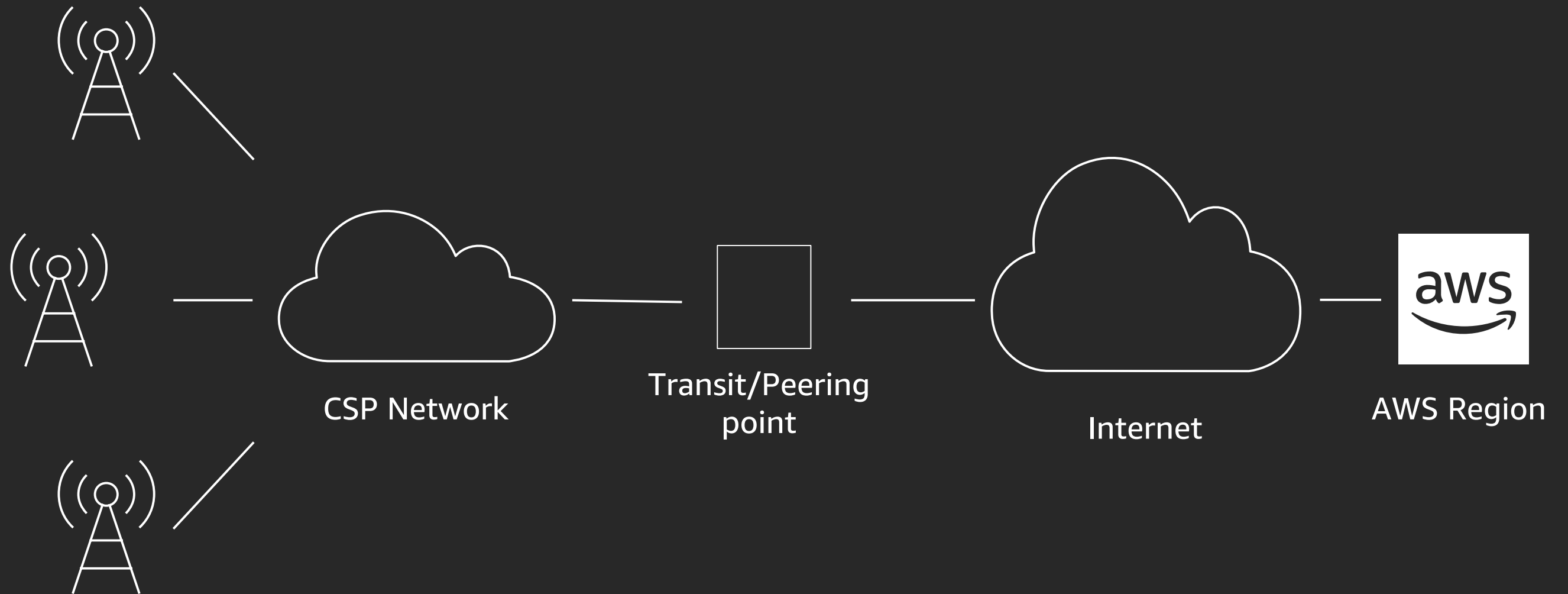


How does 5G architecture achieve this?

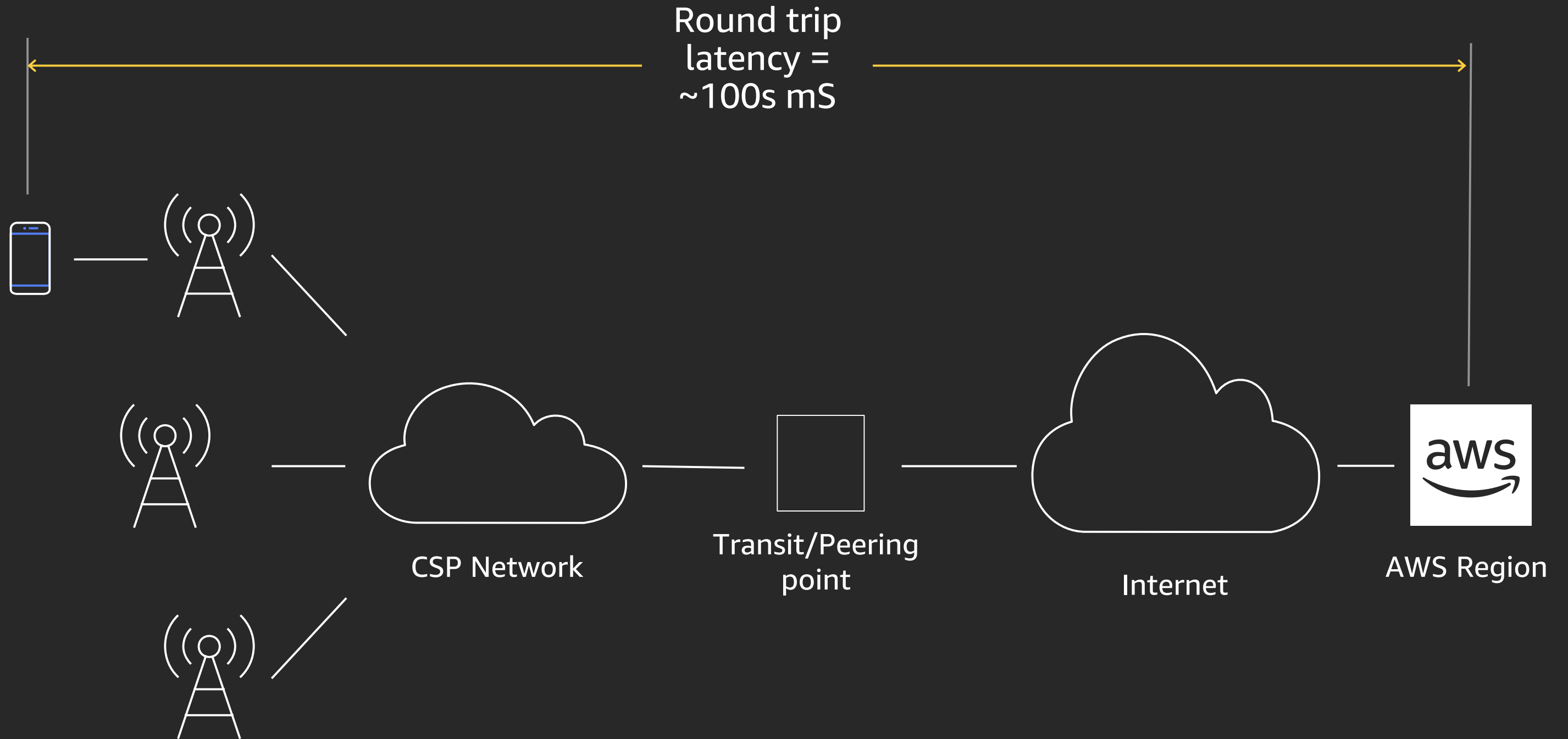
3. Moving network components and applications closer to the users (edge of the 5G network)

Edge computing

The end-to-end network

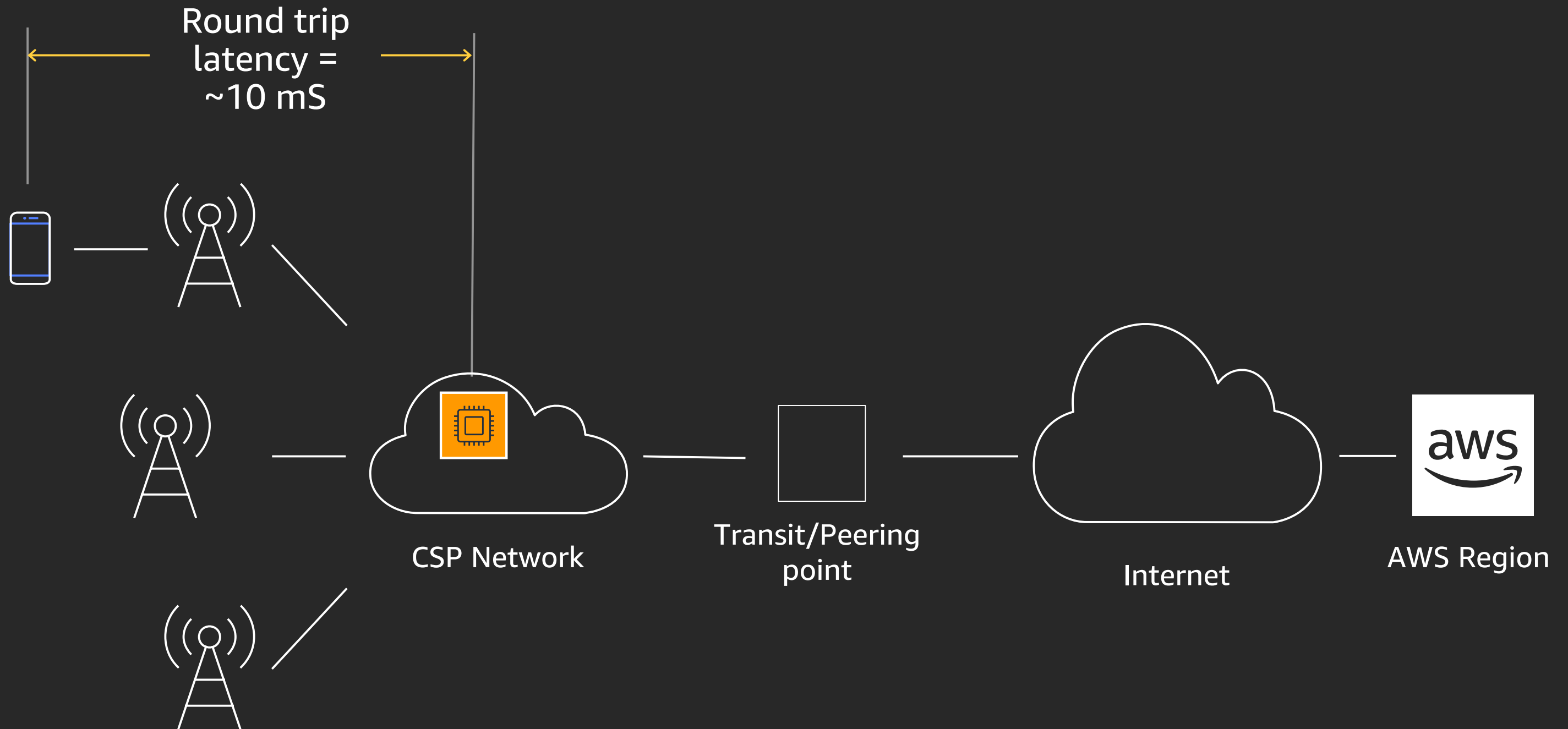


The end-to-end network



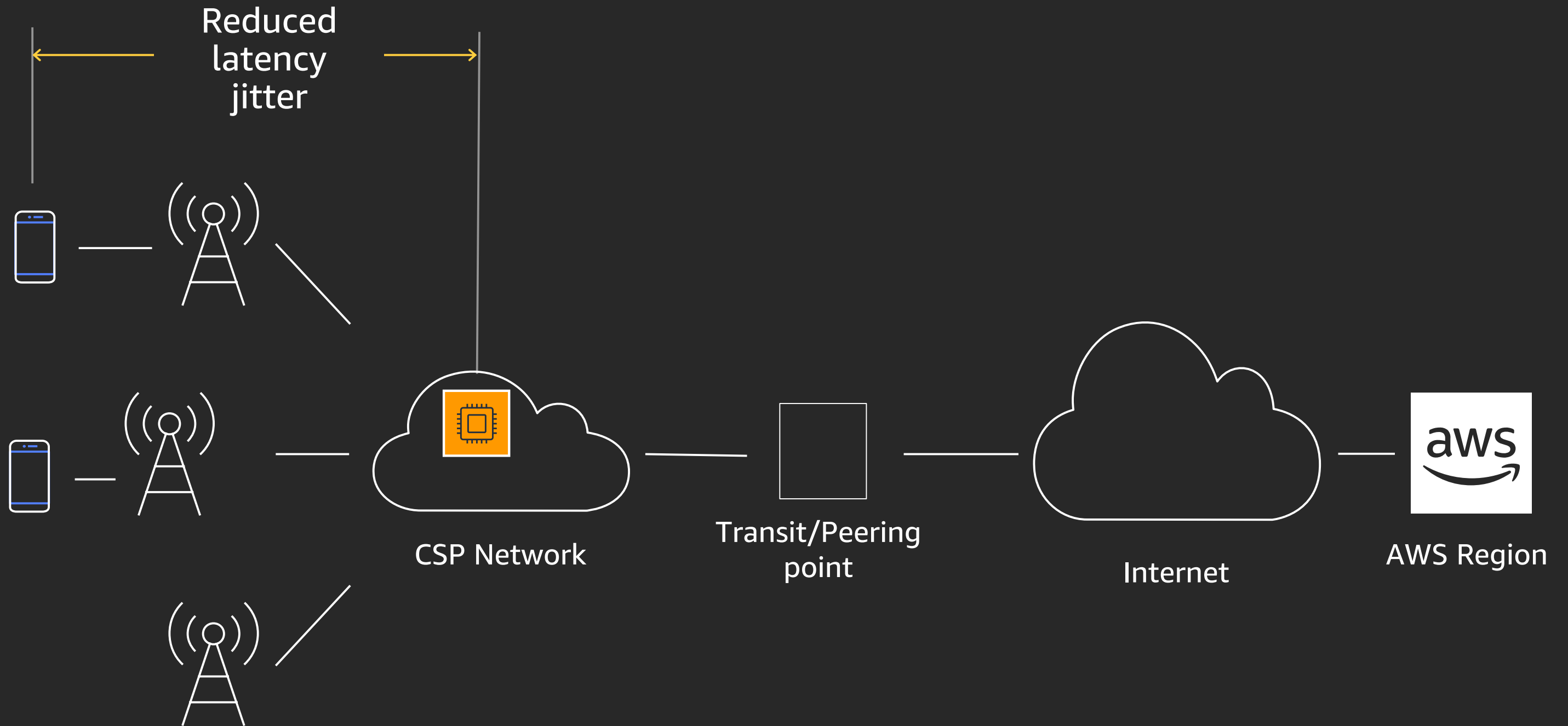
Note: p90 latency across user population across the US

Computing at the 5G network edge

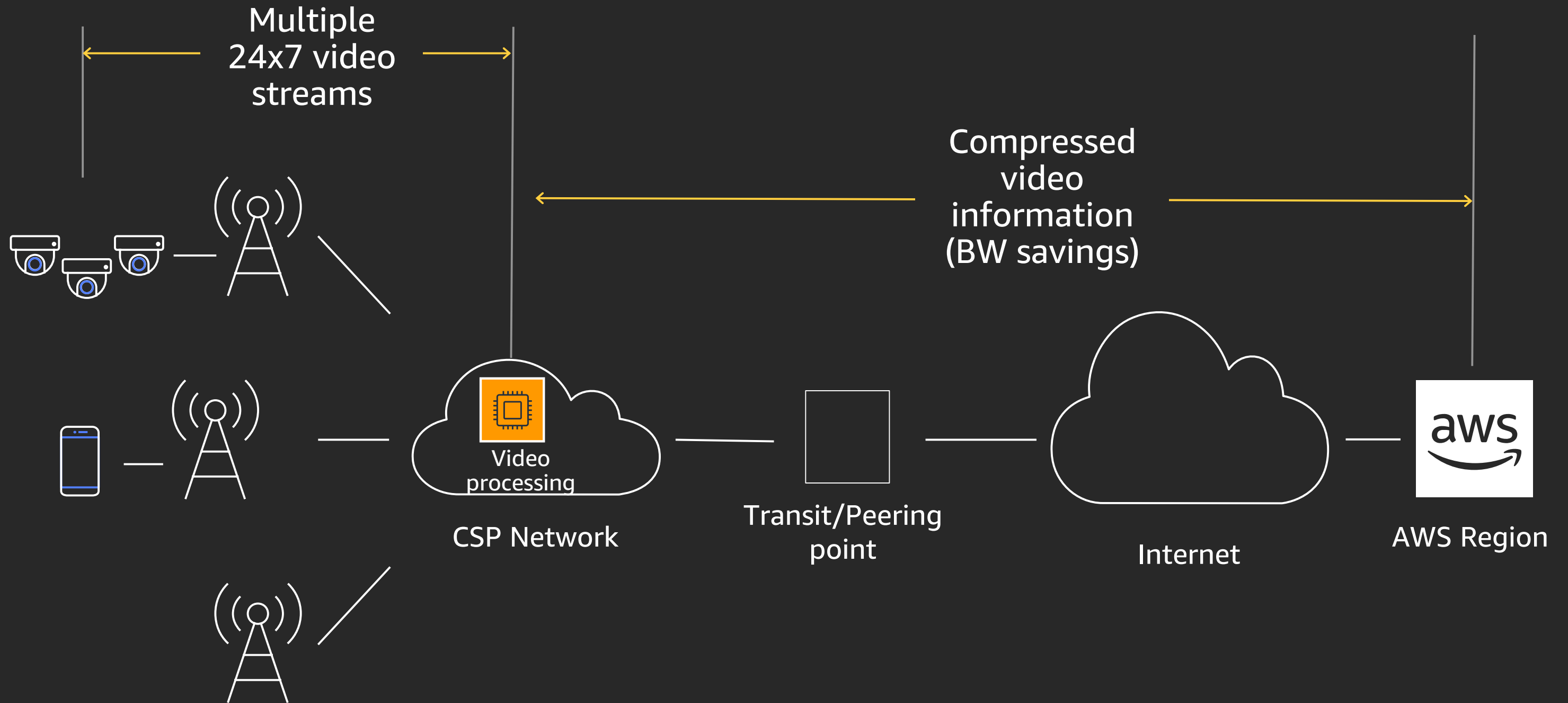


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Computing at the 5G network edge

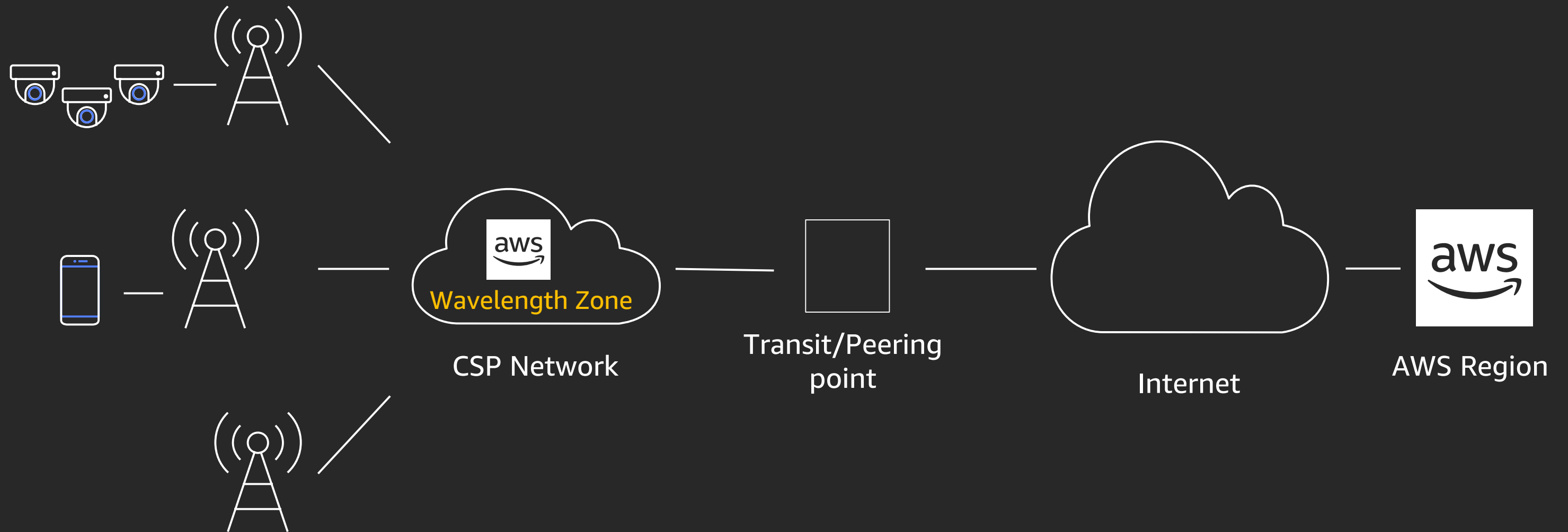


Computing at the 5G network edge



Wavelength Zones

Wavelength Zones



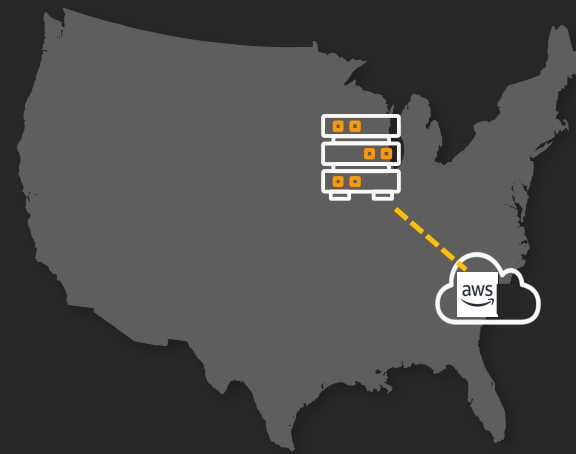
What is a Wavelength Zone



Same AWS-designed infrastructure as in AWS data centers



Hosted in a site within a CSP partner network

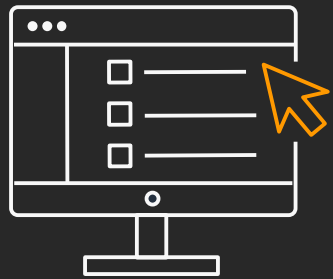


Managed and monitored from an AWS region



Integrated into the CSP 5G Network

What is unique about AWS Wavelength Zones



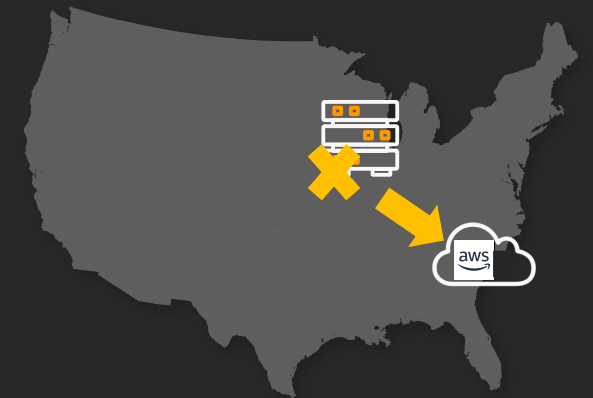
Single pane of management, across zones and AWS regions



Same operational consistency (upgrades, patches, versions)



Same pace of innovation as in the AWS regions



Failover from Wavelength Zone to AWS region



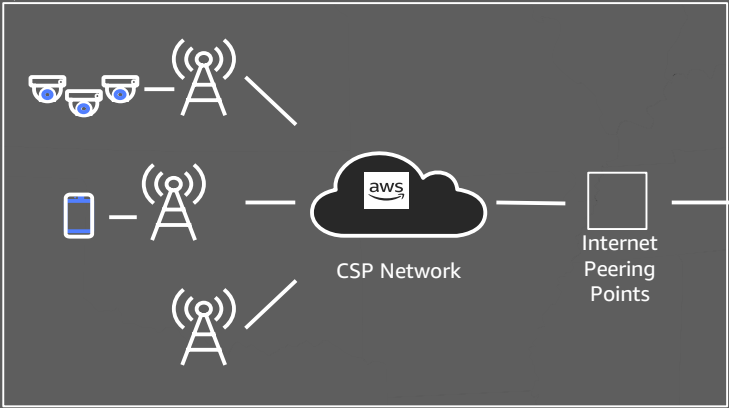
AWS Region
us-west-2



AWS Region
us-west-1



Wavelength
Zone

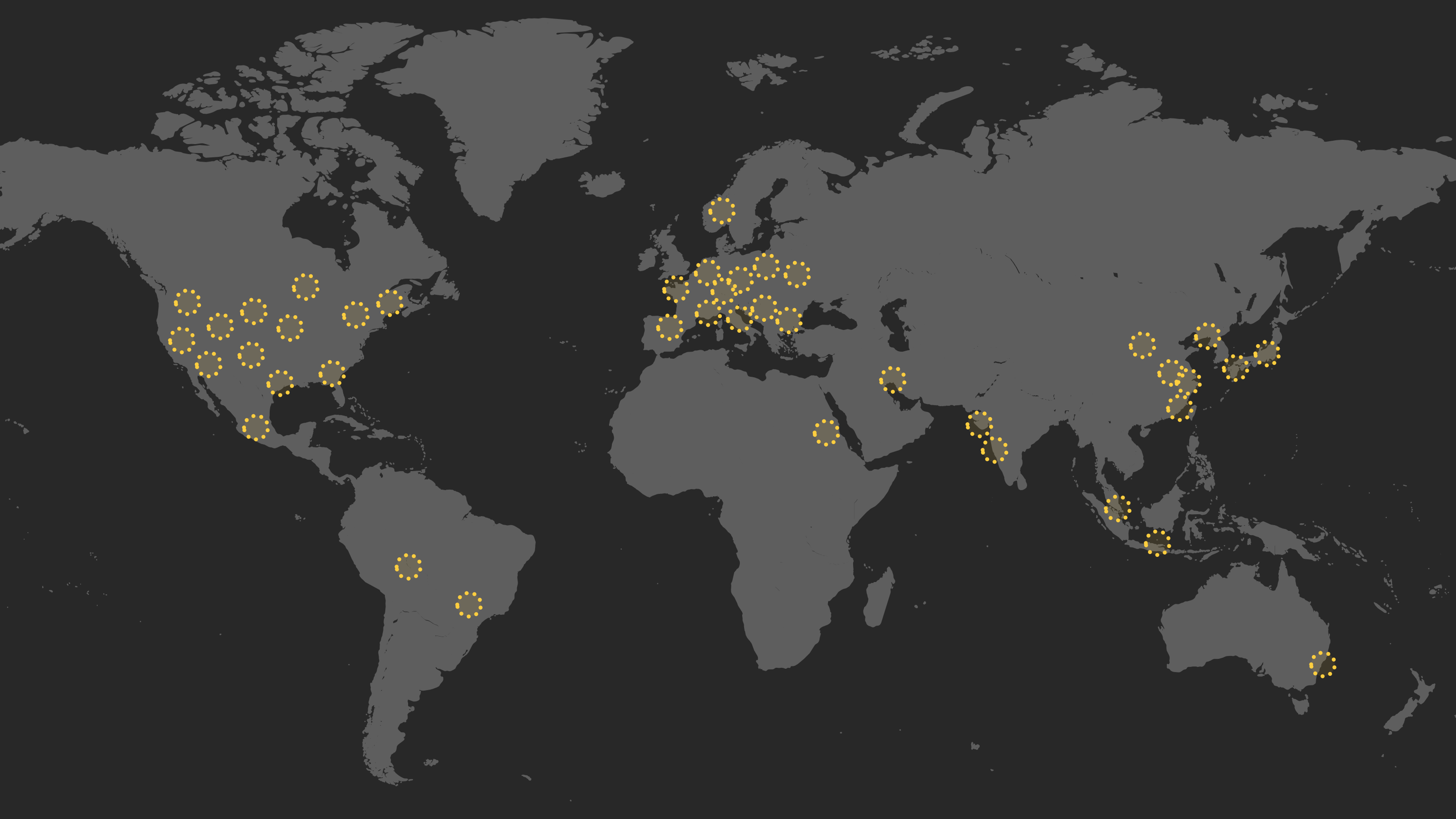


AWS Region
us-east-2



AWS Region
us-east-1

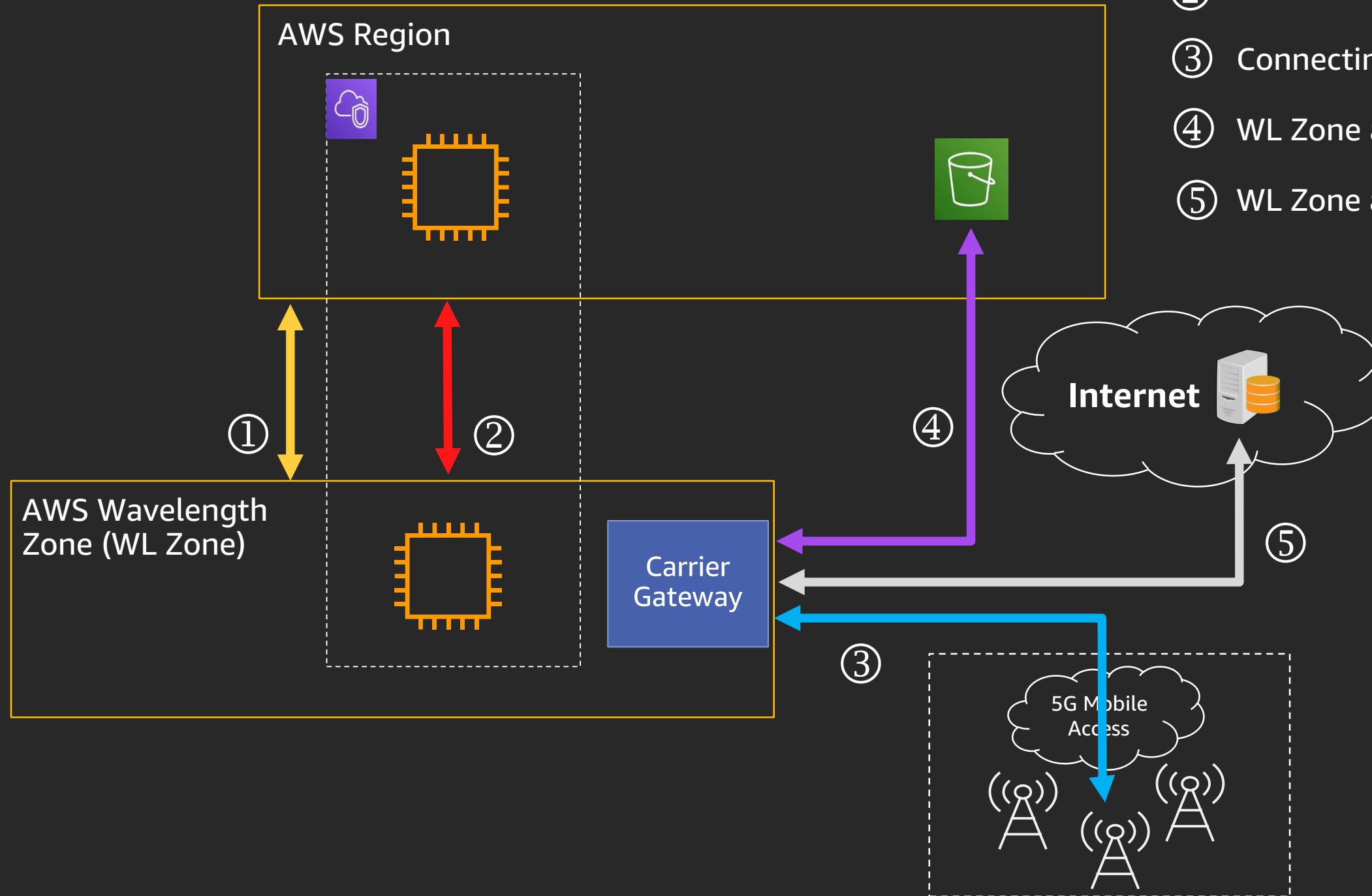




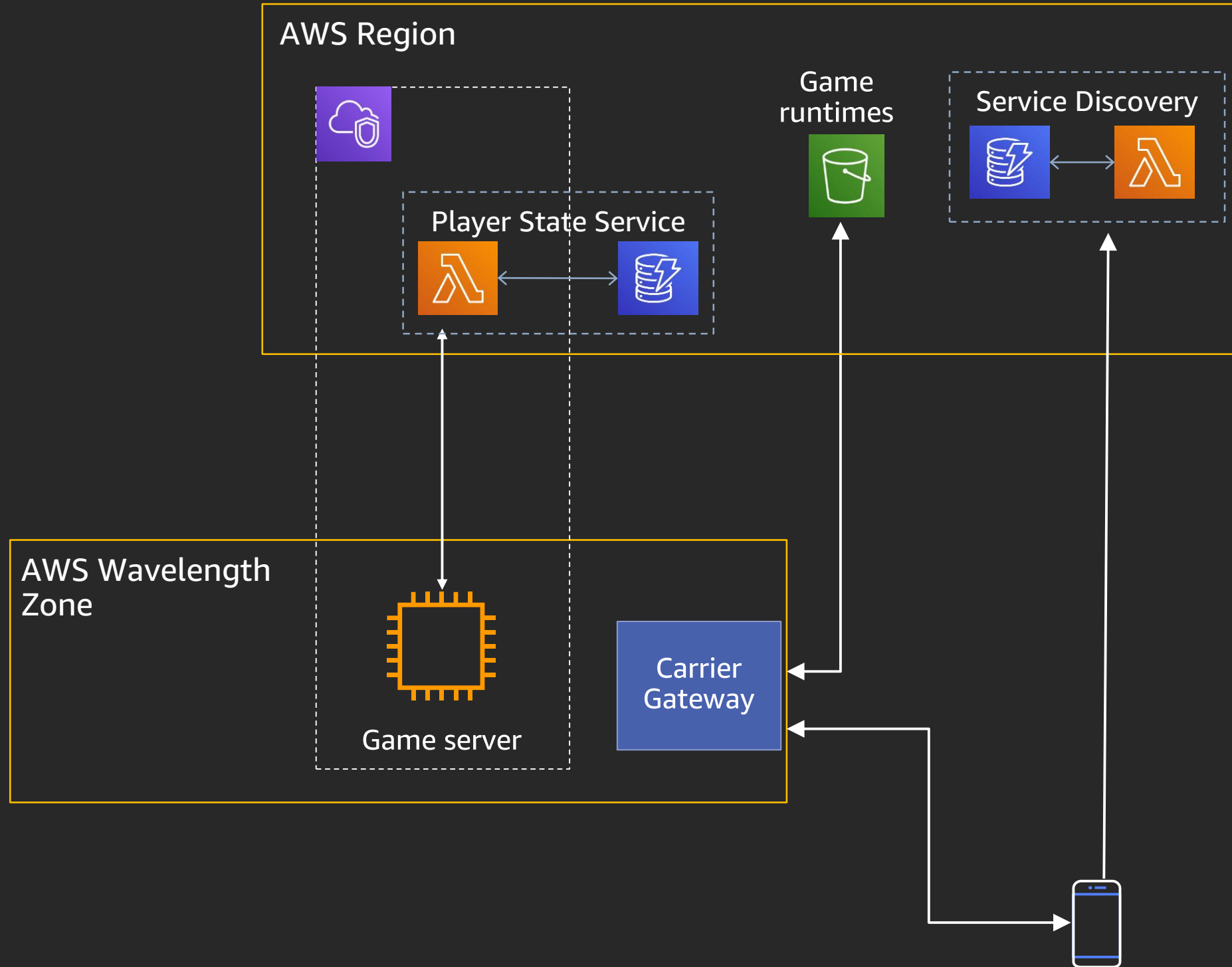
Using Wavelength Zones

Deploying applications

- ① Control, management and monitoring
- ② VPC extension across Region and WL Zone
- ③ Connecting end users to WL Zone
- ④ WL Zone and region service end points
- ⑤ WL Zone and server outside of AWS region



Deploying a Gaming Application



ORION™ Technology and Cloud Gaming

 **Bethesda**[®]



®



ORION™

BANDWIDTH

COMPUTE

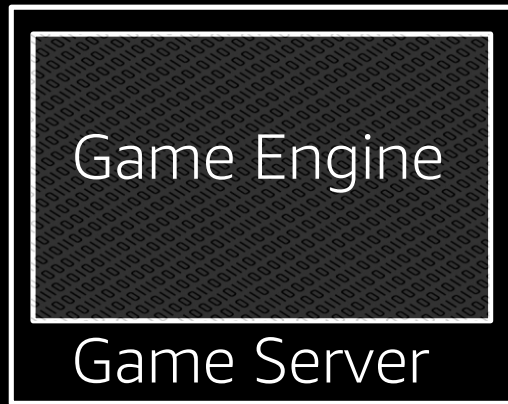
LATENCY

The Hardware Approach

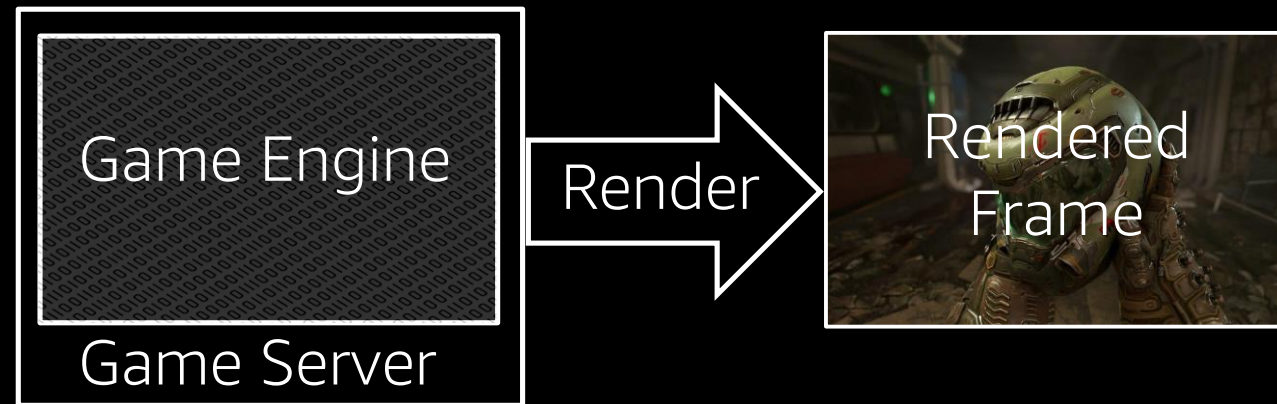


Game Server

The Hardware Approach



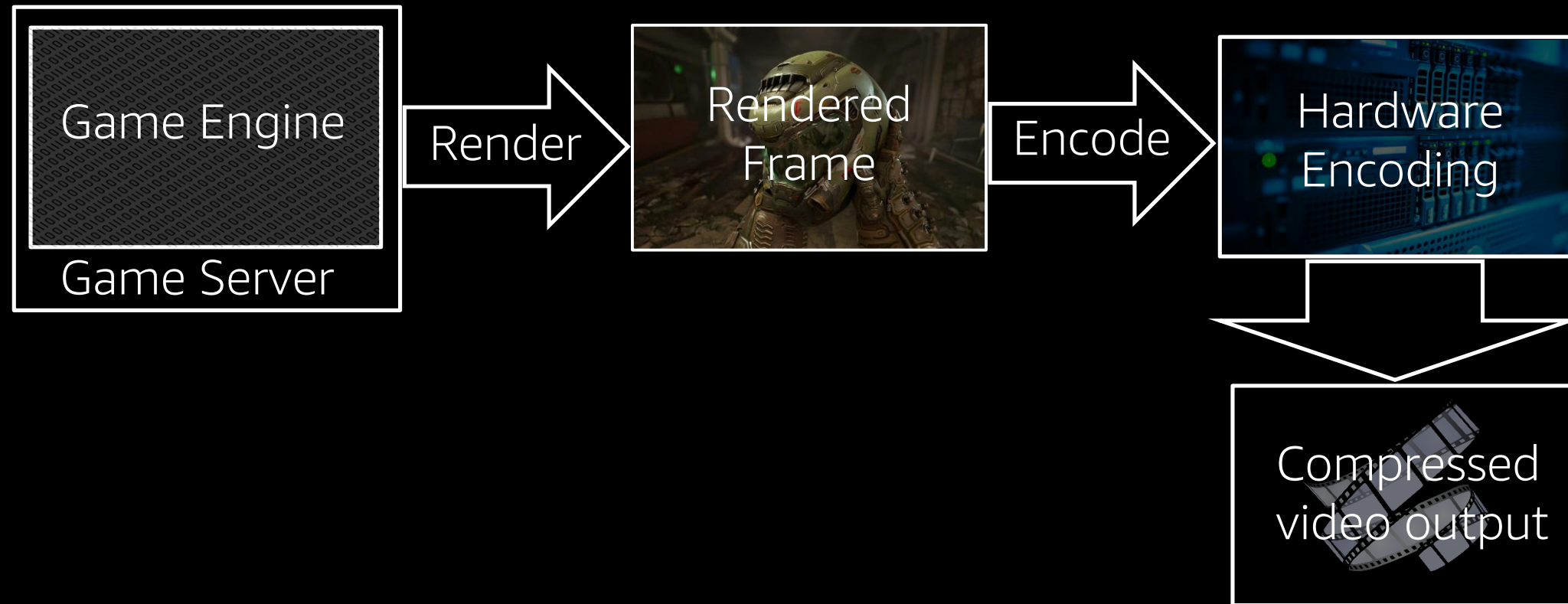
The Hardware Approach



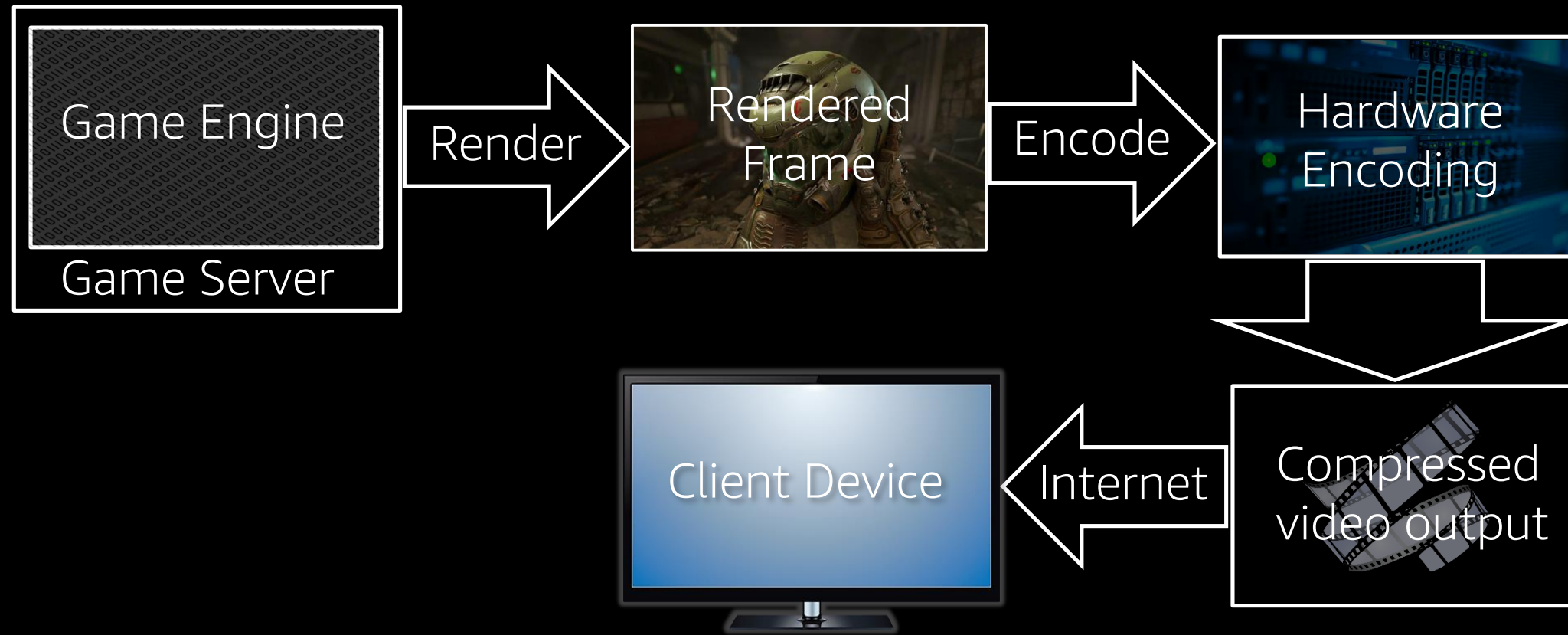
The Hardware Approach



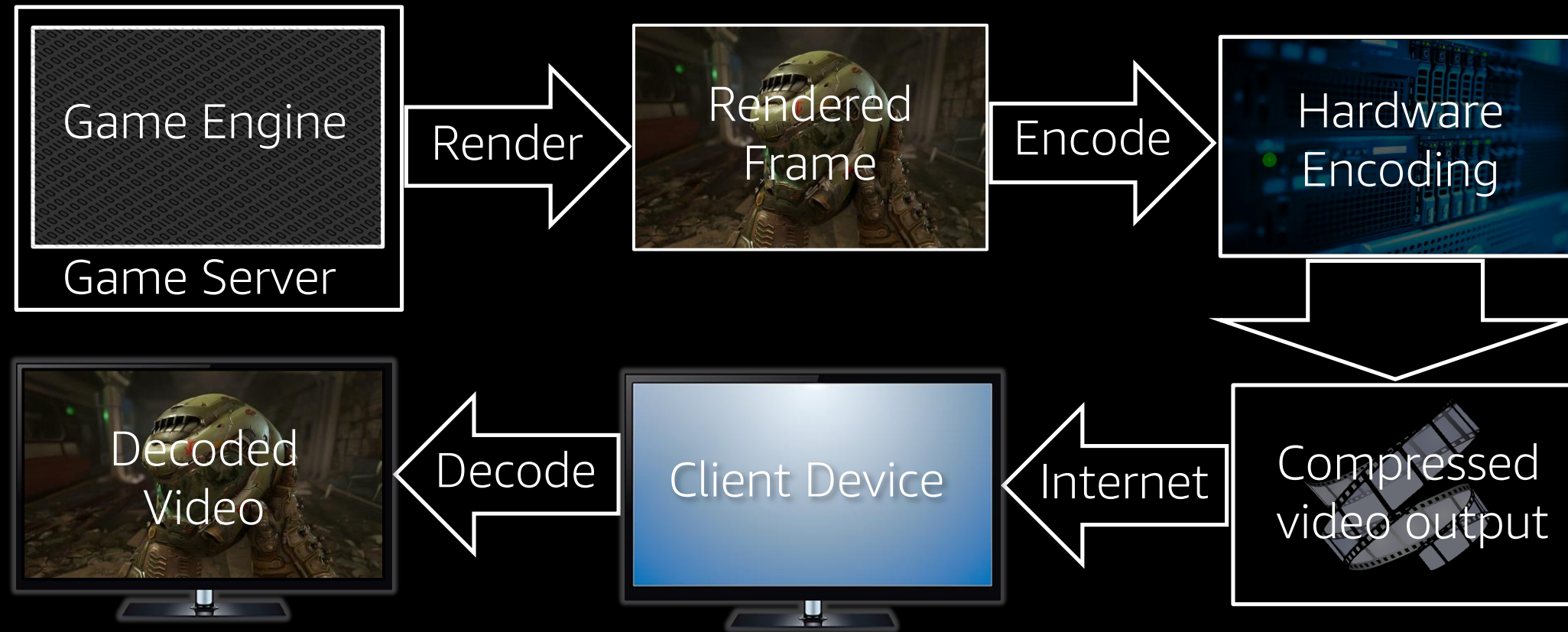
The Hardware Approach



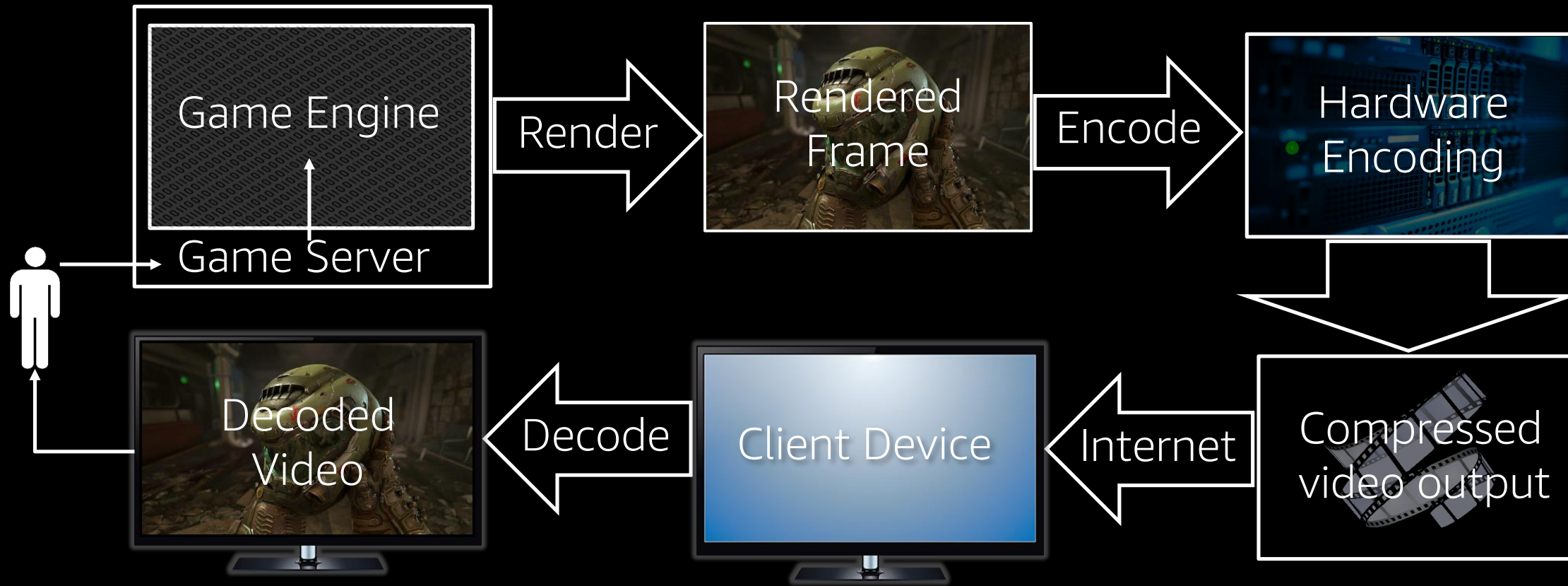
The Hardware Approach



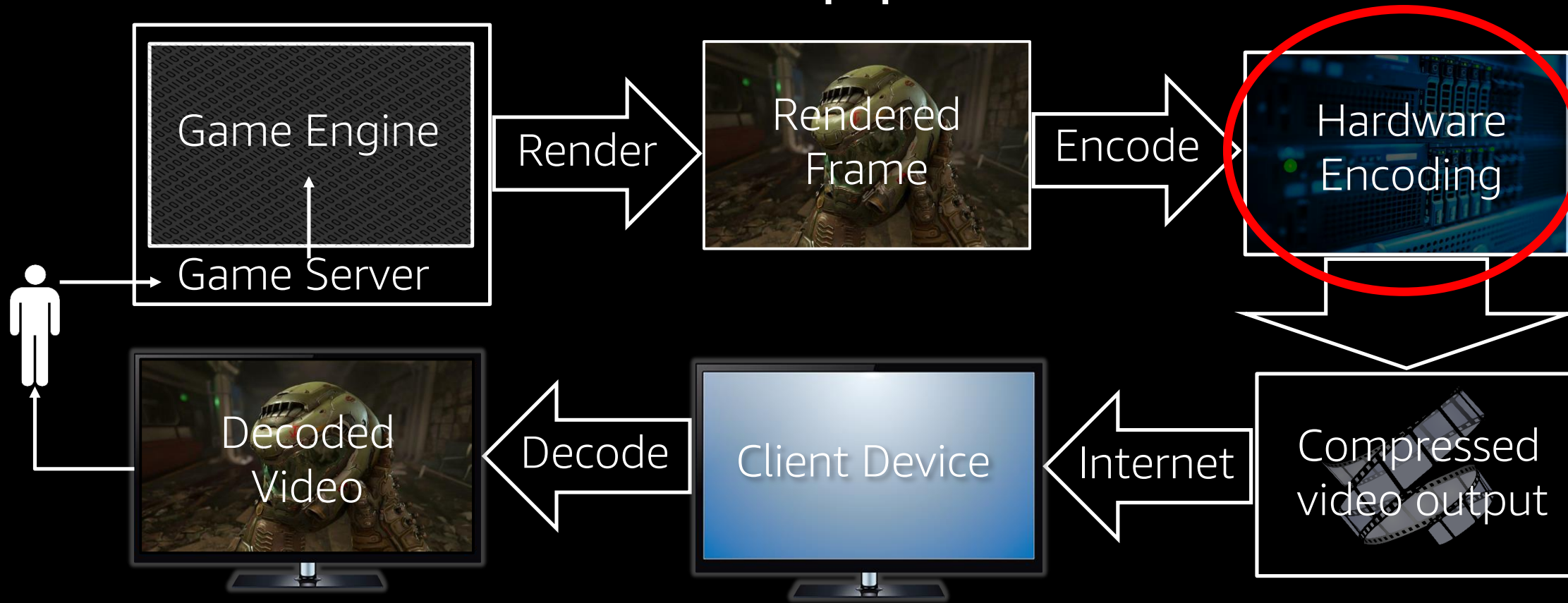
The Hardware Approach



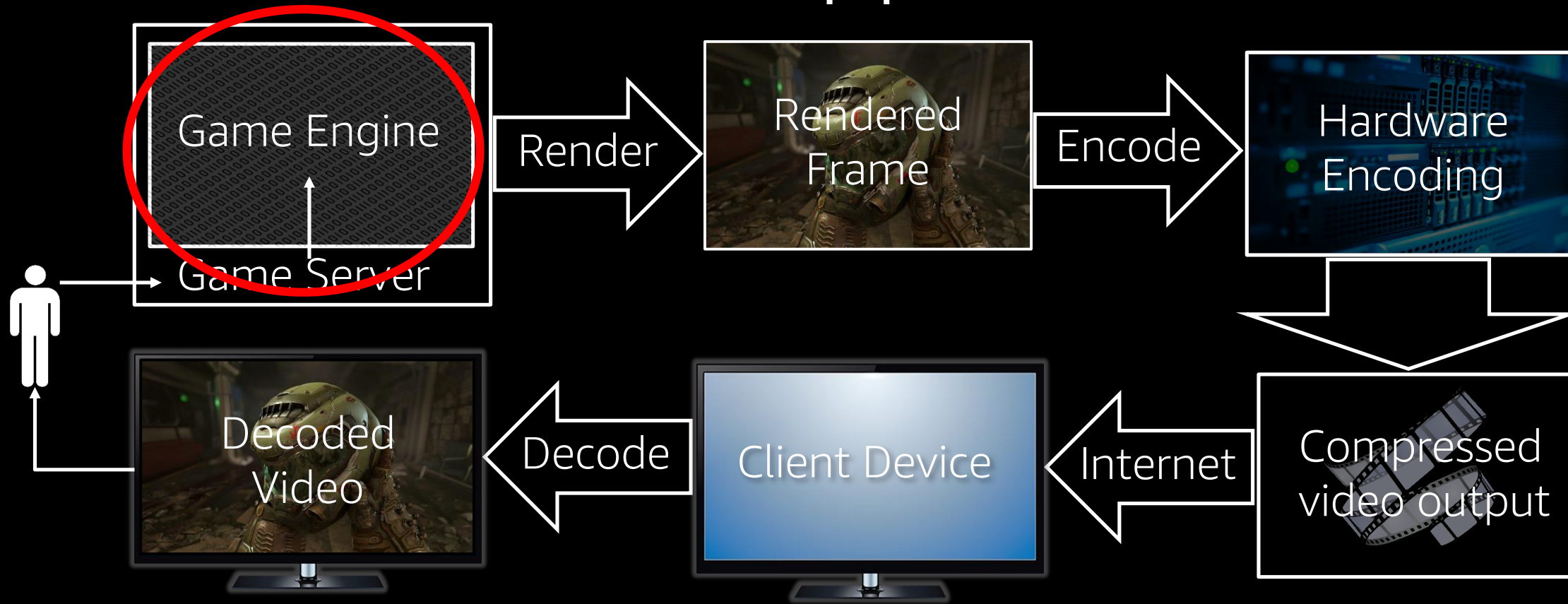
The Hardware Approach



The Hardware Approach



The Hardware Approach





Game Engine



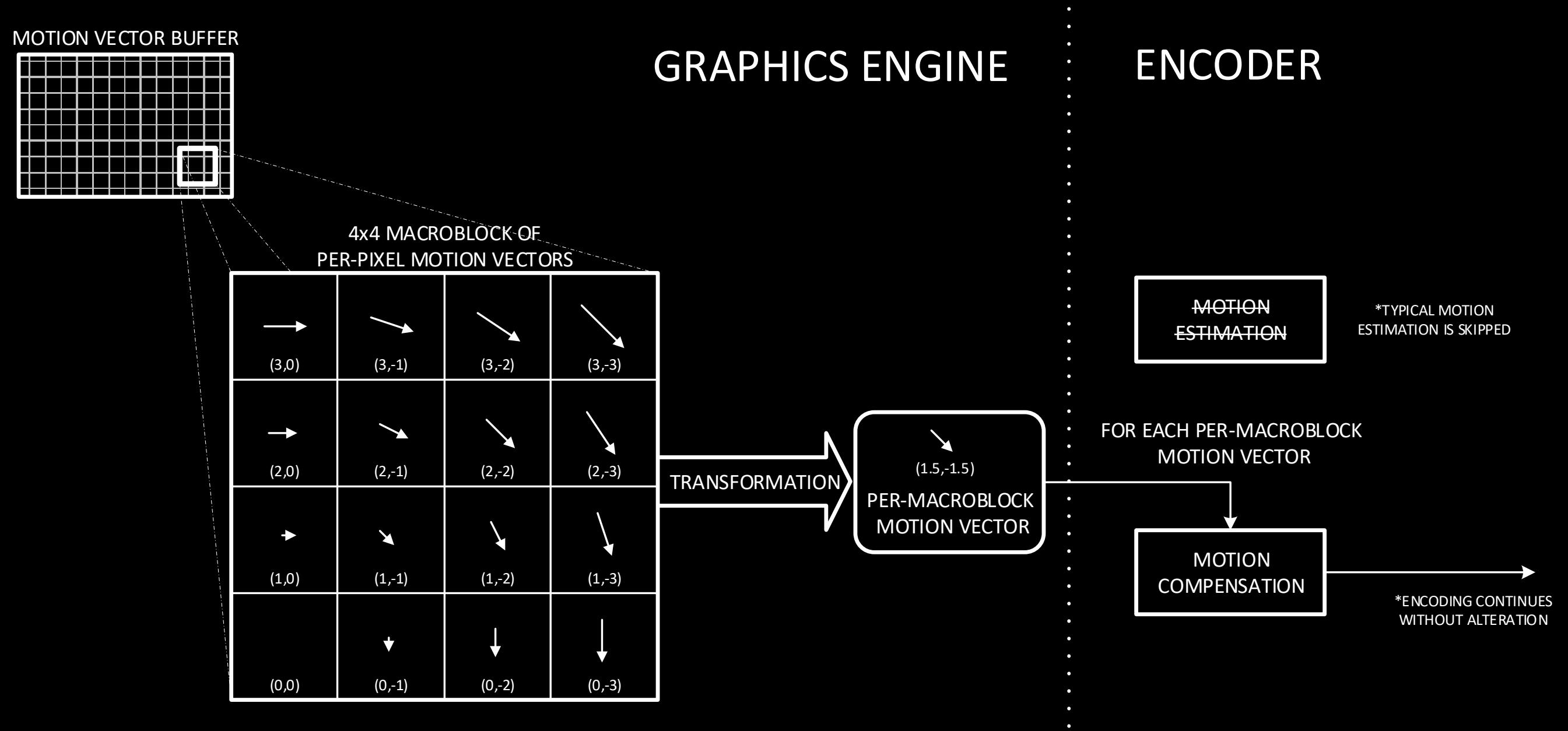
UAC .E-1

100 + 

20 

IF YOU CAN STREAM DOOM
YOU CAN STREAM ANYTHING

GAME GENERATED MOTION ESTIMATION



DEFERRED PIXEL PROCESSING AND REMOTE RENDERING





ORION

ORION™

5G[✓]





ORION™

#BE3

Resources

- Come to the AWS and Verizon booths to see 5G demos
- aws.amazon.com/wavelength

Thank you!



Please complete the session
survey in the mobile app.