aws re: Invent

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AWS and Kuiper together: Building applications using satellite connectivity

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3,232 SATELLITES IN LEO

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Project Kuiper overview

Project Kuiper is a constellation of **3,232** low Earth orbit (LEO) satellites delivering high-speed, lowlatency broadband services on a global scale



56 Degrees north & south latitude coverage



Gbps downlink speeds to enterprise terminals



Space-to-ground communication

Satellites use Ka-band for customer and gateway links. Constellation scales to tens of millions endpoints.

Space-to-space communication

Satellites use high speed optical inter-satellite links for secure, resilient, mesh-based networking in space.

Affordable customer terminals

High performance and affordable customer terminal portfolio to support broad range of customer needs.

Resilient end-to-end space and ground networking

Kuiper uses Amazon cloud services, distribution, and logistics for availability, performance, reliability, flexibility, and resilience



Space safety

by Thrusters and demise

- Planned demise within 1 year of mission length:
 - Krypton Hall–effect thrusters
 - Decrease velocity to lower orbit altitude
 - Thrusters avoid spacecraft and debris
- At low Earth orbit, satellites have rapid deorbit and burn up in Earth's atmosphere (~10 years on propulsion failure)

Collision avoidance

- Separate orbital shells
 - 20km apart, tolerance of 9km
 - Intra-shell separation of 50km
- Coordinating spacecraft and radio frequency tracking with appropriate agencies

Reflectivity

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- Goals are to meet <7 magnitude goal, set by astronomical community
- Steering and maneuvering reduce reflection
- Coordinating location with observatories





Kuiper use cases and AWS applications









SCADA, regulated workloads, and IoT

- Amazon Kinesis
- AWS IoT
- Amazon S3

Non-terrestrial resiliency

- AWS Direct Connect
- AWS Transit Gateway
- Amazon EC2

Machine learning at the edge

- Amazon SageMaker
- Amazon EC2
- AWS Outposts

Computing in new locations

- Amazon EC2
- Amazon S3
- AWS Outposts



Customer experience

1. Choose a service plan

- Public or private connectivity plans
- Service location

2. Select hardware & accessories

- Based on service plan
- Power options
- Mounting options

3. Configure private network settings (Optional)

- IP addressing
- Destination routing

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Customer terminals

• 7" X 7" 18cm x 18cm

- Small form factor
- Up to 100 Mbps down/40 up
- 60W

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11" x 11" 28cm x 28cm

- Built for scale
- Up to 400 Mbps down/100 up
- 90W

30" x 20" 76cm x 51cm

- Enterprise-focused
- Up to 1 Gbps down/400 up
- 225W

Prometheus

- Amazon-built chip
- Integrated chipset which is used in both our antennas and satellites
- Enables 1 Tbps per satellite



AWS global backbone and Regions

AWS Region

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- AWS Direct Connect
- AWS edge locations

Global fiber availability accelerates Kuiper development and performance



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