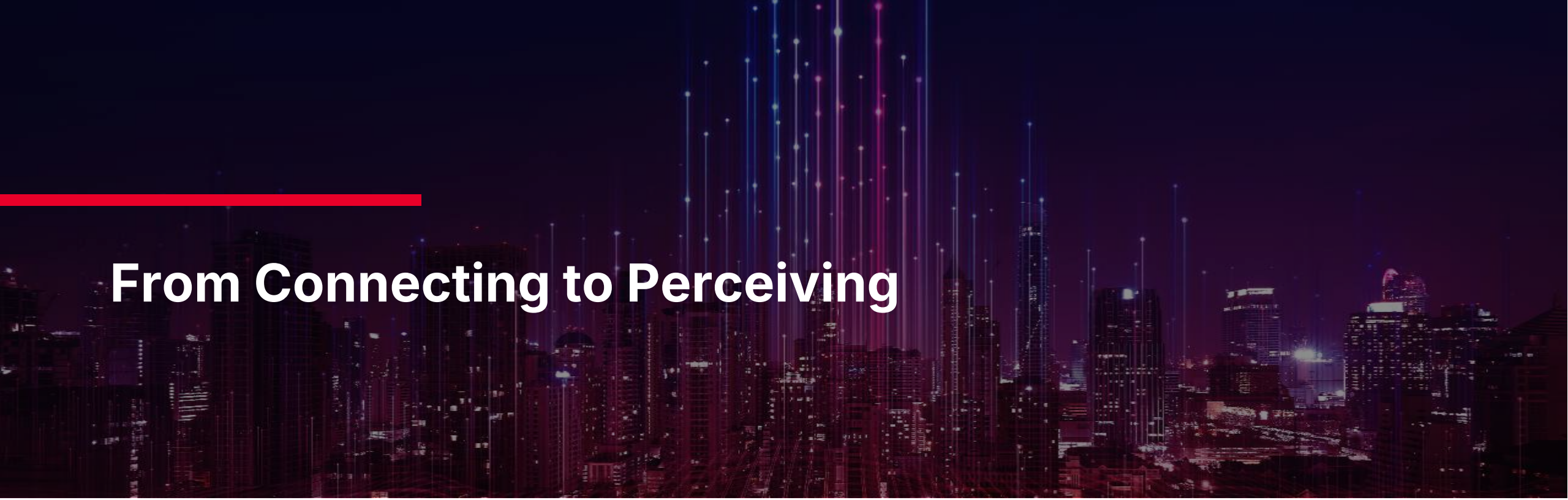
Beyond Speed: How 6G Will Sense the World

Transforming wireless networks from connectors into sensors



From Connecting to Perceiving

Not Just Faster

- 6G networks become perceptive, moving beyond speed to awareness and intelligence

ISAC From Day 1

- Integrated Sensing & Communication built into 6G foundations

Beyond Connectivity

- Networks that detect, recognize, and respond to their environment in real time

For decades, networks connected people and data.
With 6G, wireless networks will perceive the world around them, opening new possibilities we could only imagine before.

The Foundation of Wireless Sensing

How It Works

Wireless sensing reuses spectrum and communication signals to measure the world around us. Like shouting into a canyon and listening for echoes.

- **Range:** Distance to objects
- **Velocity:** Motion and speed
- **Micro-Motion:** Subtle vibrations

Why 6G Needs ISAC

Spectrum Efficiency

Dual use of the same spectrum for both communication and sensing reduces costly spectrum needs

Environmental Awareness

Networks that "see" their surroundings can adapt beams, manage interference, and enhance resilience

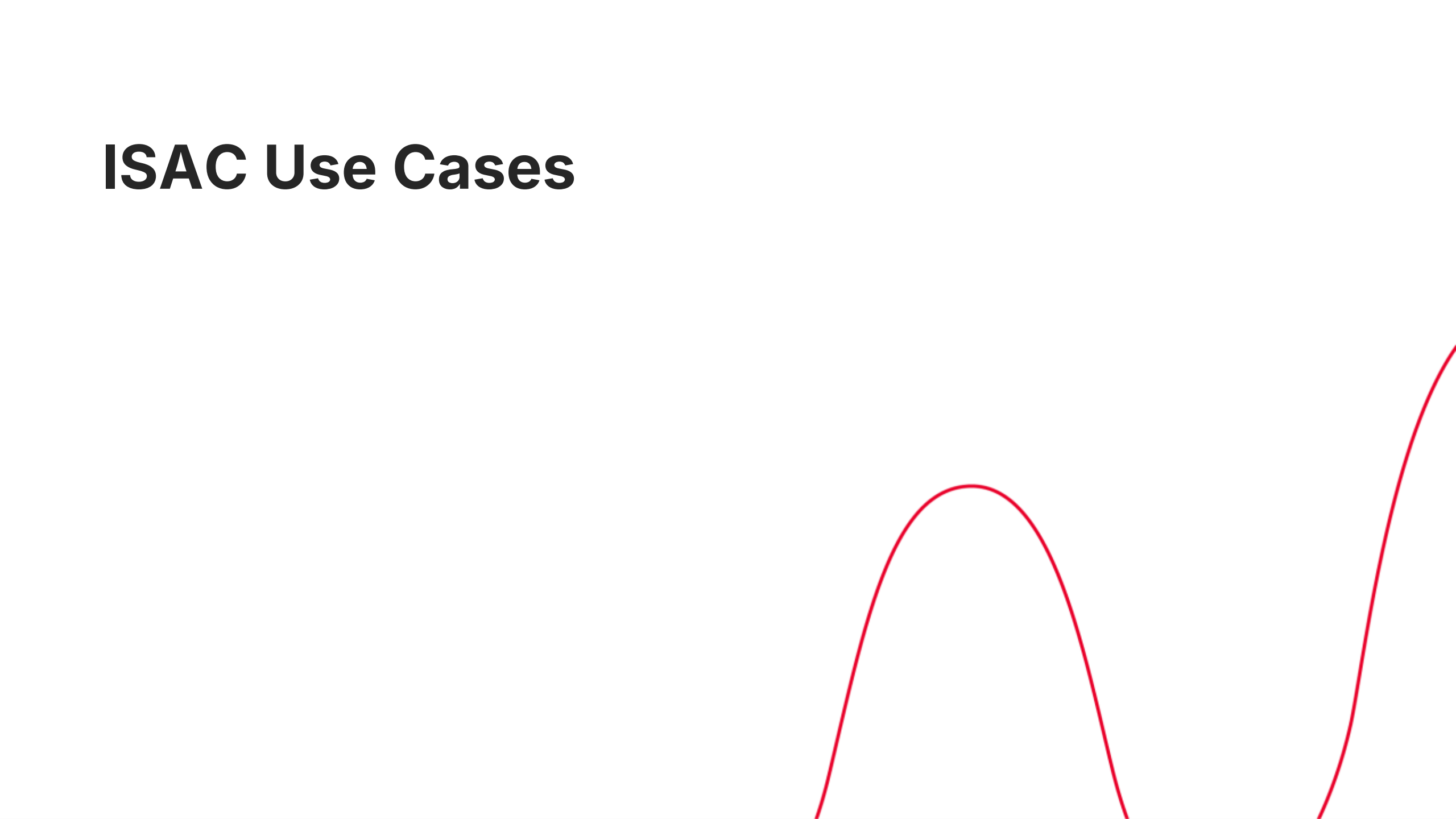
New Services

Sensing-as-a-service creates fresh revenue streams beyond traditional connectivity

The Trade-Off

Resources dedicated to sensing could otherwise carry communication traffic. The challenge is finding the right balance for optimal network performance.

ISAC Use Cases



ISAC Use Cases

Smart Cities

Traffic management in rain or fog using RF sensing to track vehicles and pedestrians

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Defense and Security

Embedded drone detection capabilities in cellular networks for responsive security

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Consumer and Healthcare

Gesture recognition, home monitoring, and breathing pattern detection through micro-motion sensing

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ISAC Top Challenges

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Cluttered Environments

Multipath reflections in dense urban and industrial settings make target detection complex

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Resolution Limits

Lower frequencies suit wide-area sensing but fine-grained applications need higher frequencies

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Resolution Limits

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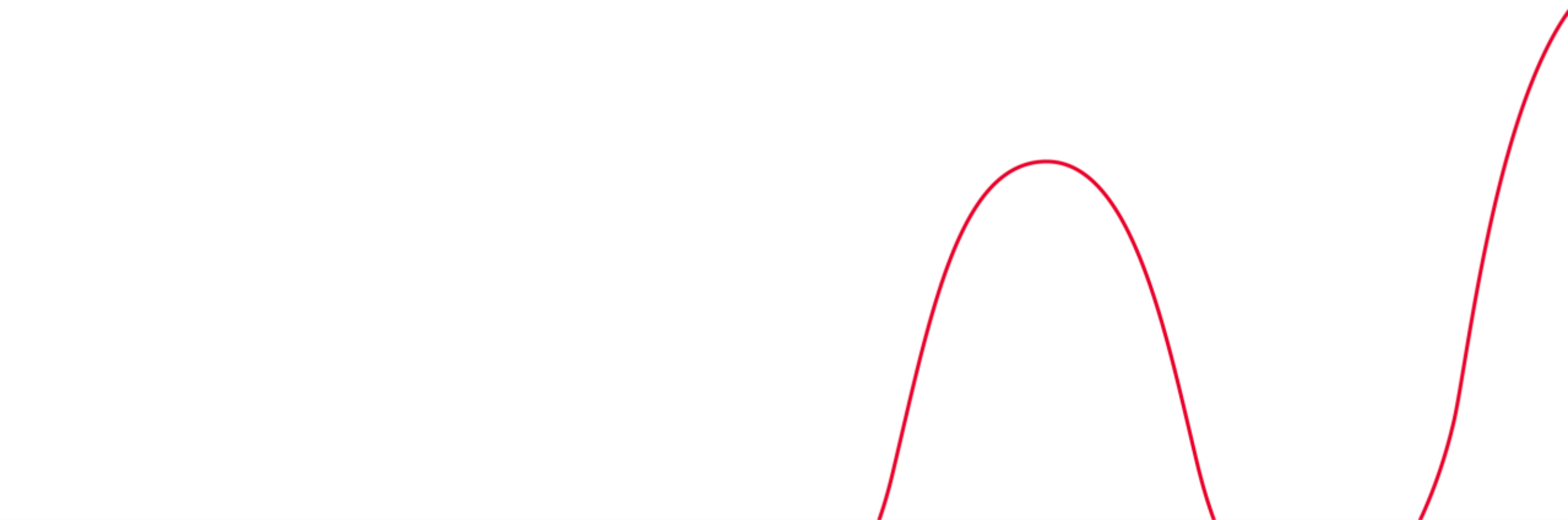
Business Models

Service providers must balance resources while monetizing sensing for new customer bases

Proof of Concept Experiment



AI-Enabled Channel Sensing

- Channel emulators mimic dynamic indoor spaces.
- AI detects movement from channel response changes.
- Enables “sensing for free” using existing signals.

Animation courtesy of InterDigital

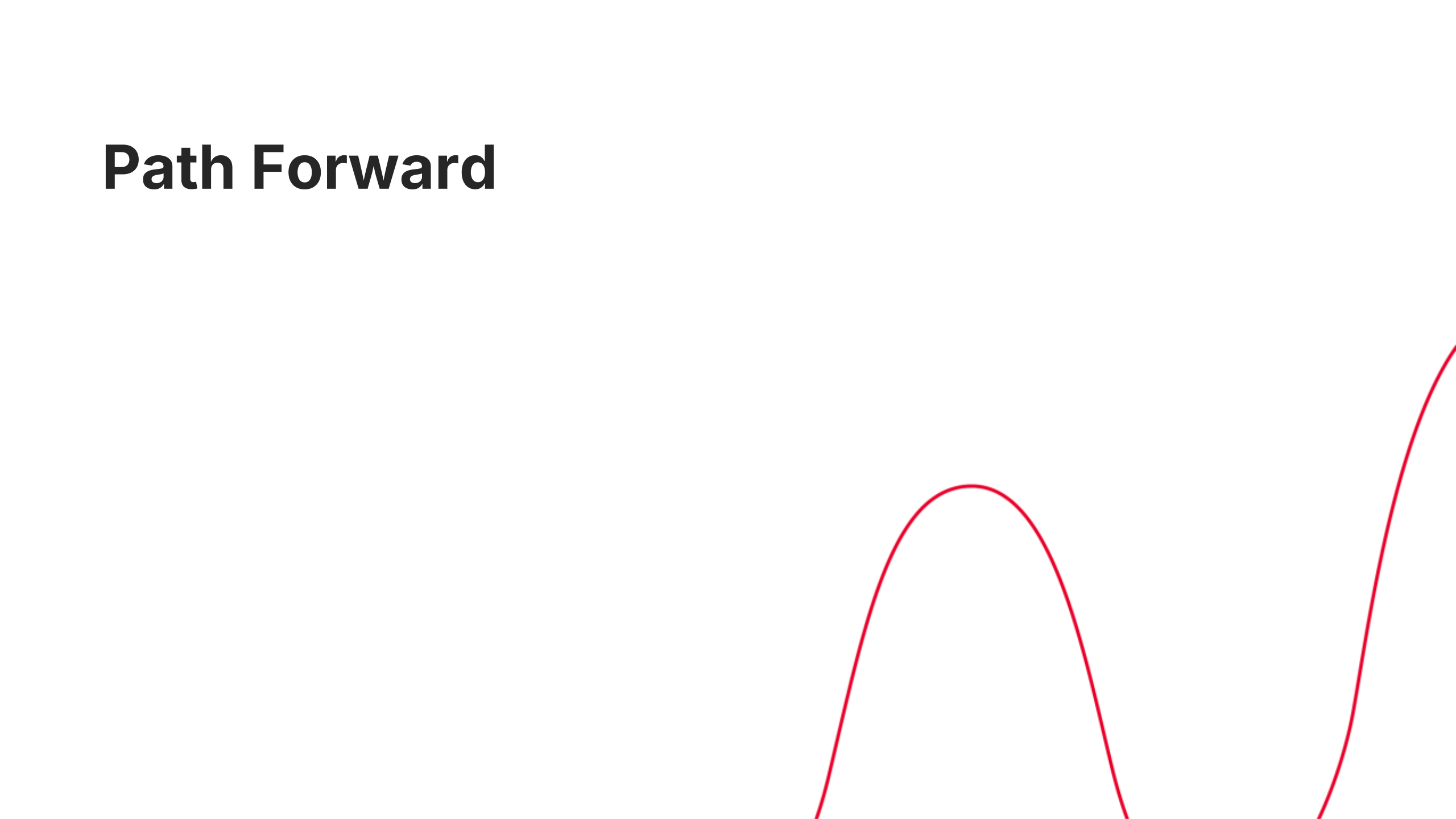
OFDM Radar in Action

Repurposed OFDM communication signals create range-Doppler maps revealing:

- Two people walking in opposite directions
- A hovering drone
- A vibrating metal plate

ISAC is practical today—using existing wireless test hardware makes it both feasible and accessible.

Path Forward



Path Forward

FR3 Spectrum

The sweet spot for 6G—wider bandwidth than cellular, better propagation than sub-THz. Prime for ISAC integration.

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FR3 Spectrum (7–24 GHz)

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Deterministic Models

Digital twins of real-world environments enable precise beamforming, clutter modeling, and faster prototyping.

Key Takeaways

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Prototyping happening now

Proof-of-concept experiments show feasibility


"We're no longer just connecting devices—
we're empowering networks to sense the
world around them."