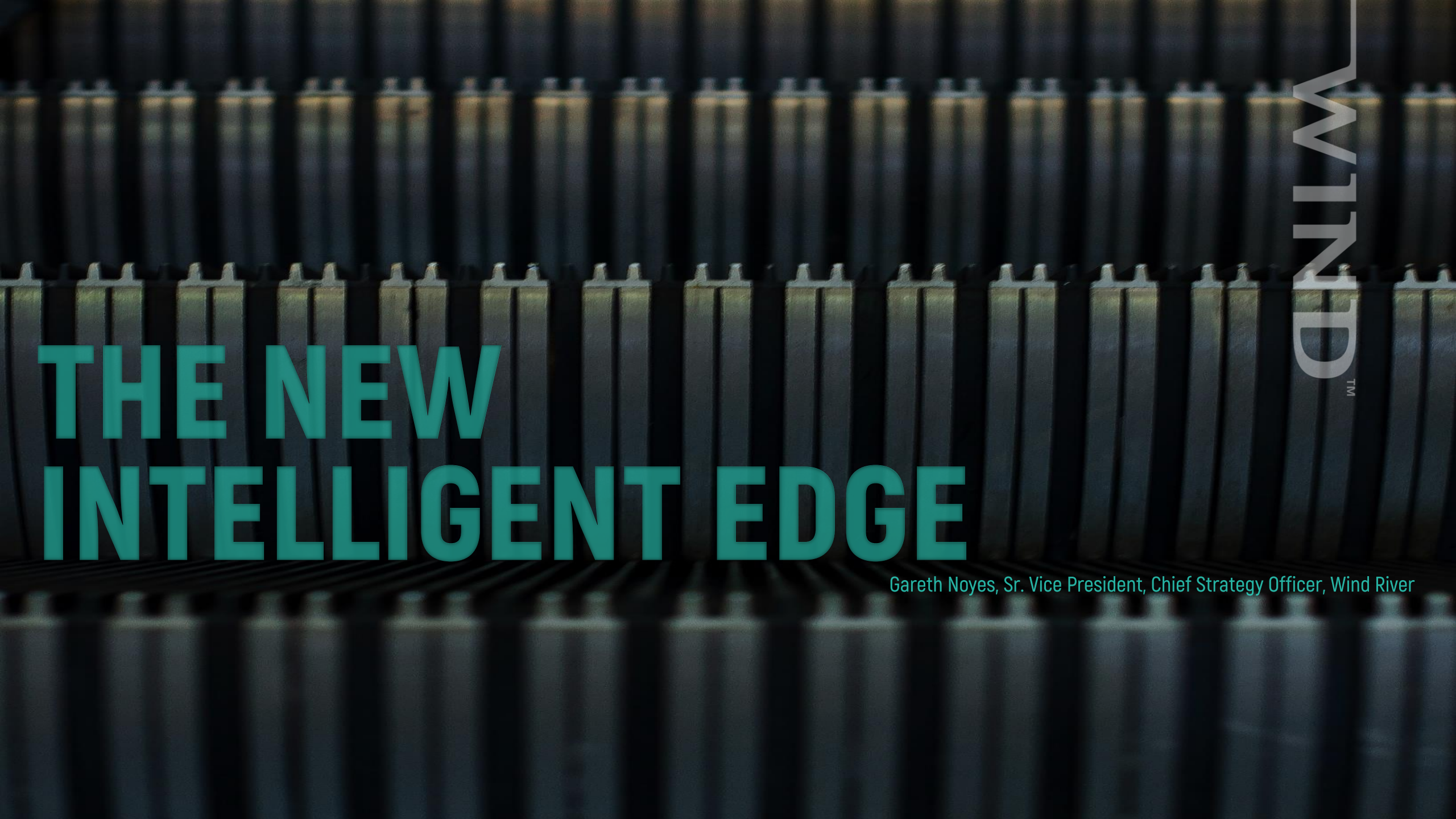


THE NEW INTELLIGENT EDGE

Gareth Noyes, Sr. Vice President, Chief Strategy Officer, Wind River

WIND™

Gareth Noyes, Sr. Vice President, Chief Strategy Officer, Wind River

DIGITAL TRANSFORMATION IS HAPPENING ON THE IT SIDE OF THE HOUSE

OPENING STATEMENT

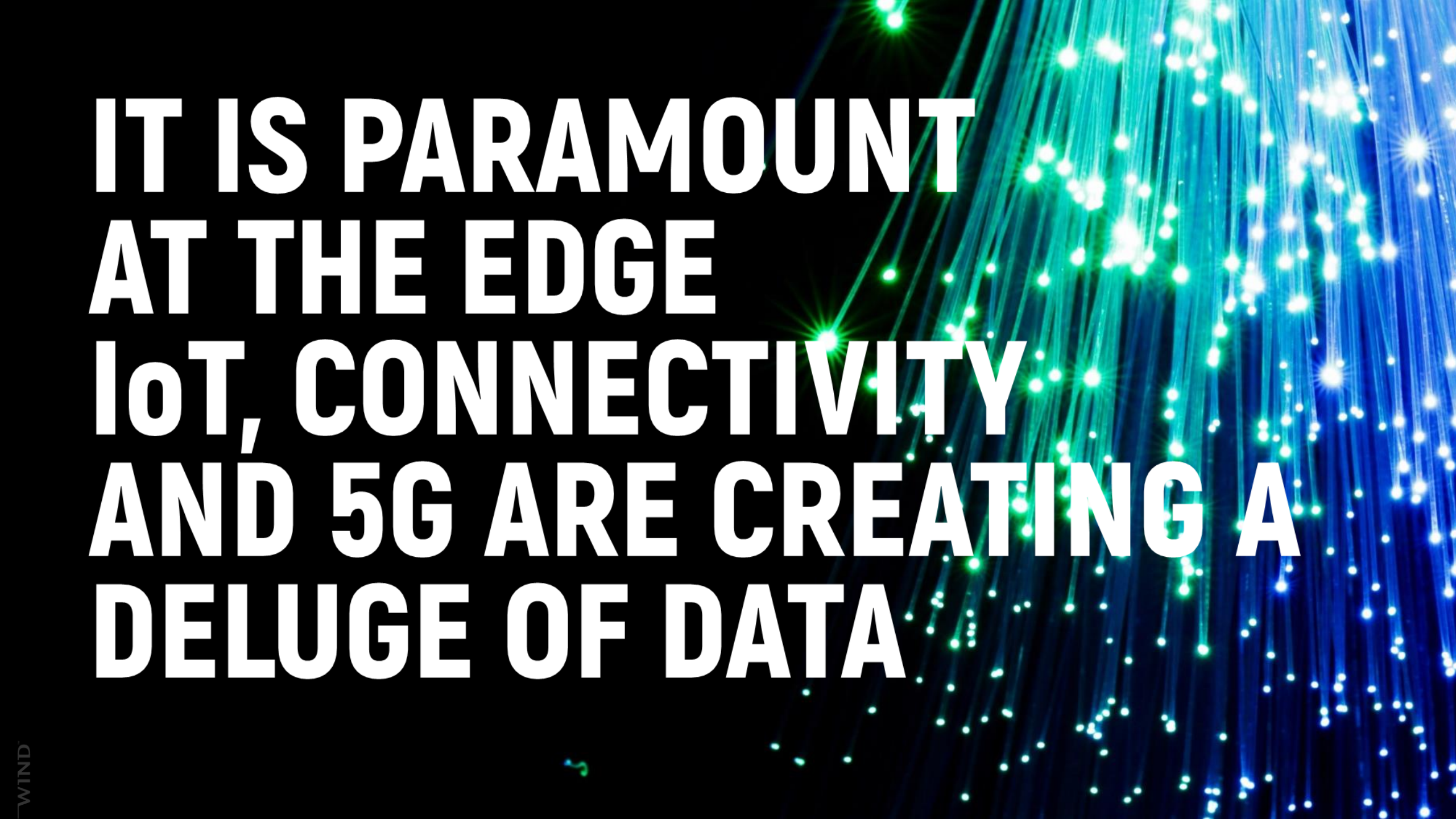
68%

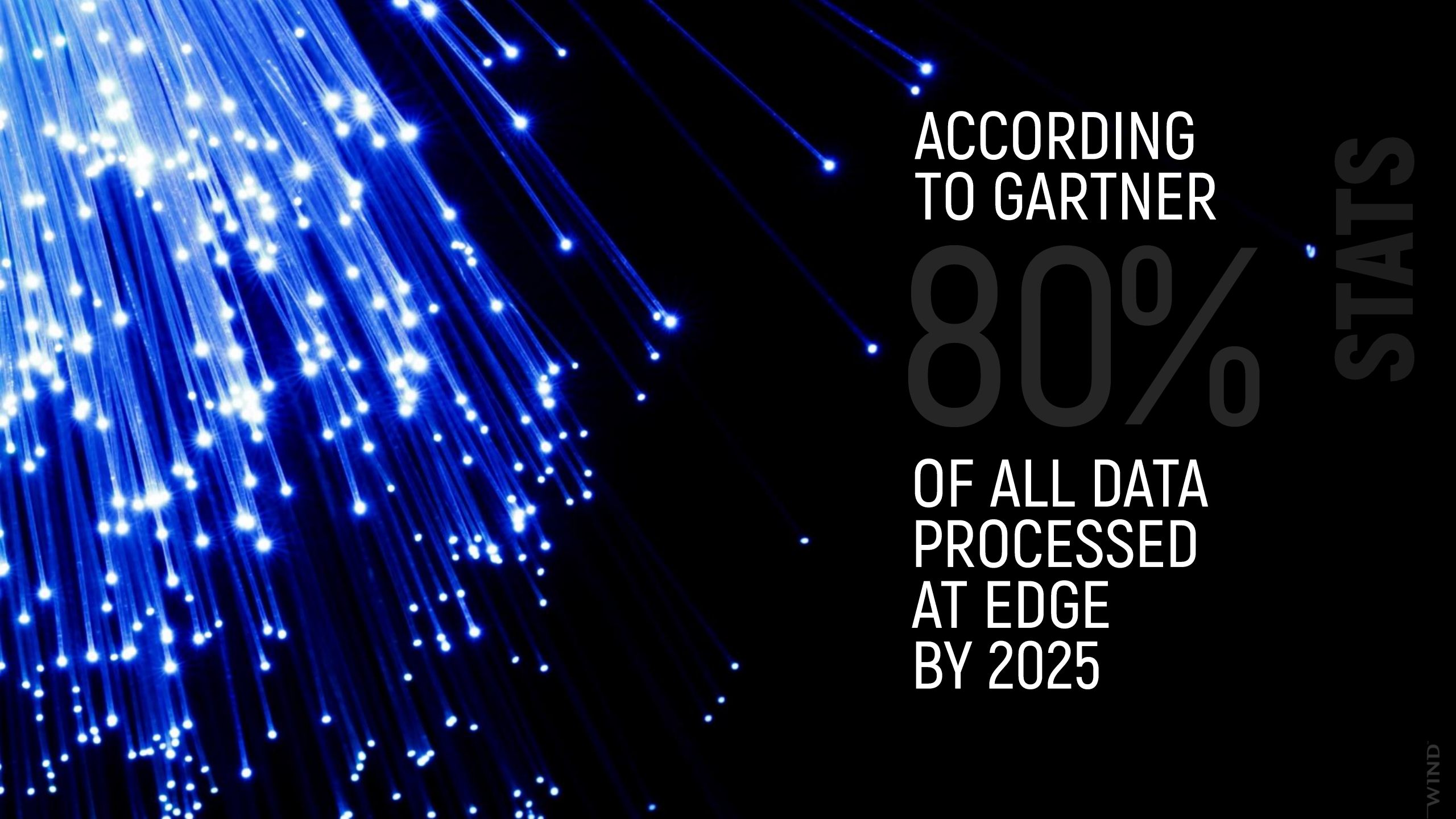
of publicly traded companies report progress on digital transformation

If you have a CDO you are 54% more likely to be successful in digital transformation

STATS

WIND™


IT IS PARAMOUNT
AT THE EDGE
IoT, CONNECTIVITY
AND 5G ARE CREATING A
DELUGE OF DATA



ACCORDING
TO GARTNER

80%

OF ALL DATA
PROCESSED
AT EDGE
BY 2025

STATS

THE EDGE IS DIFFERENT...

THE EDGE IS NOT LIKE A DATA CENTER

No standardization or interchangeability
Today a world of bespoke devices tomorrow needs to be adaptable

SECURITY CREATES A CONSTANT THREAT

Physical access to devices creates unique challenge
Advances such as AI and machine learning need to work easily & transparently in devices


THE VOLUME
OF DATA CREATES
URGENCY FOR
DEVICE MODERNIZATION

THE URGE FOR MODERNIZATION

28%

of enterprises that are successfully digital transforming recognize the future is VUCA

(volatile, uncertain, complex, ambiguous)

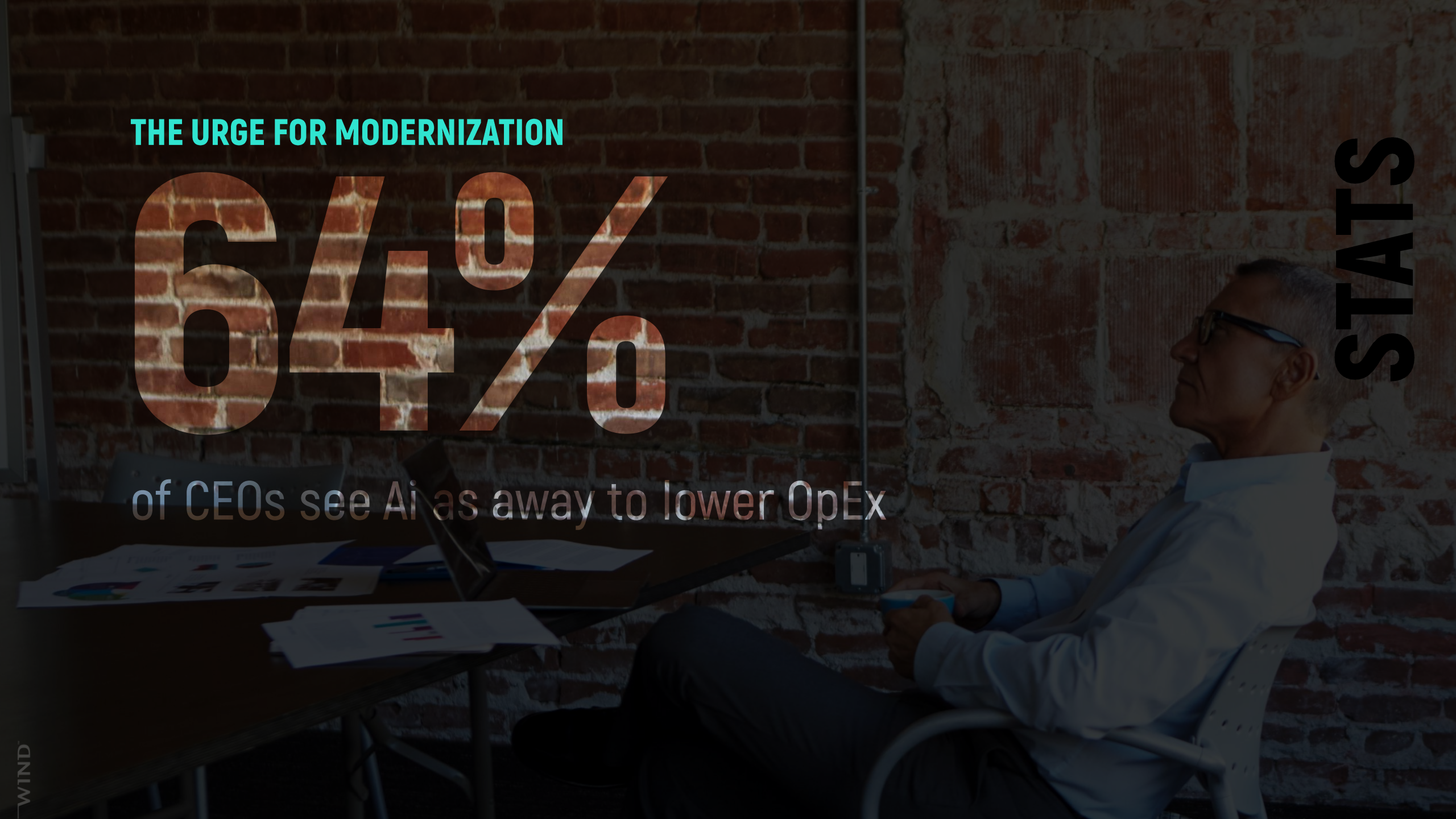
STATS

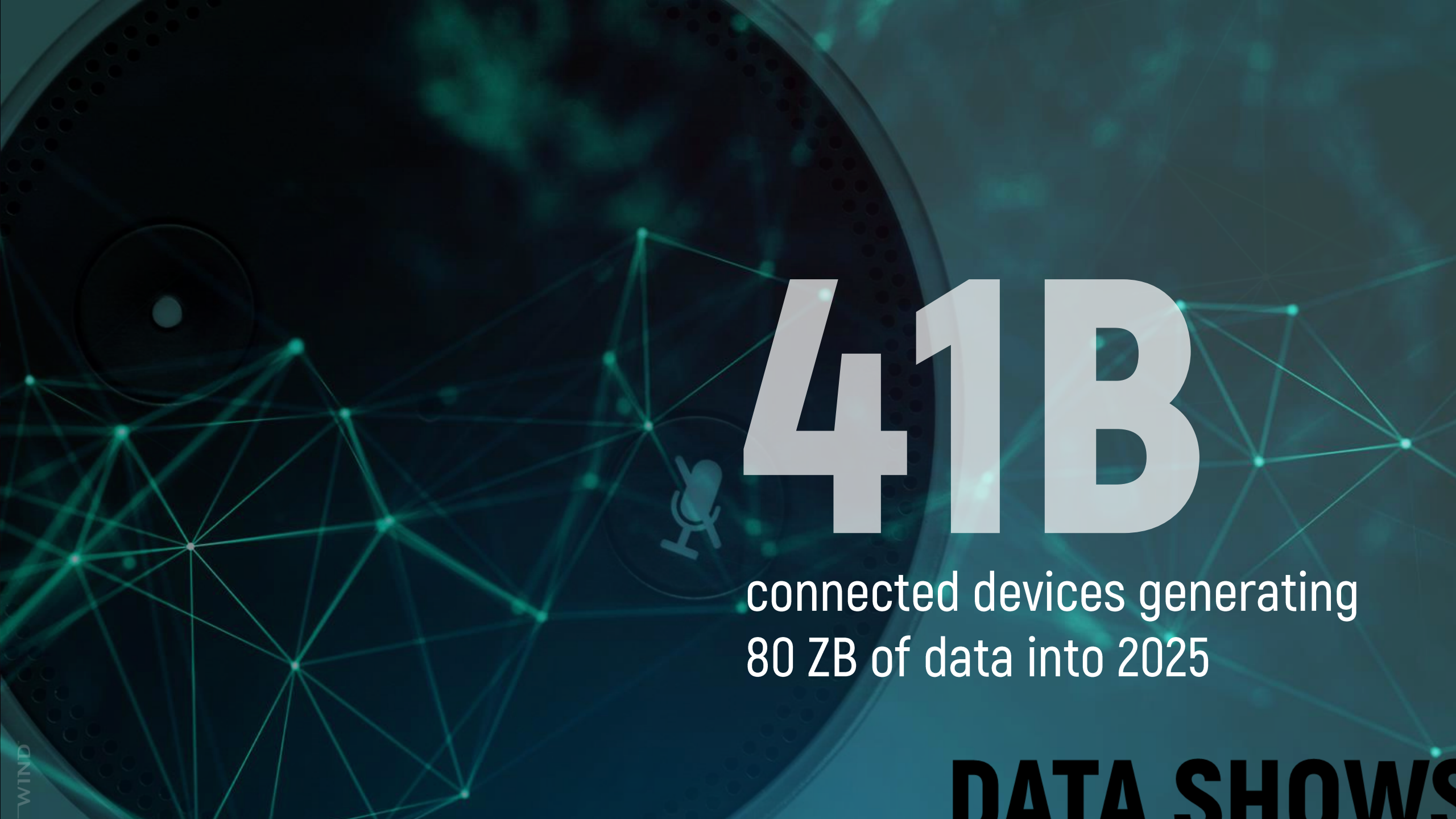
THE URGE FOR MODERNIZATION

75%

say AI will allow then to move in to new ventures

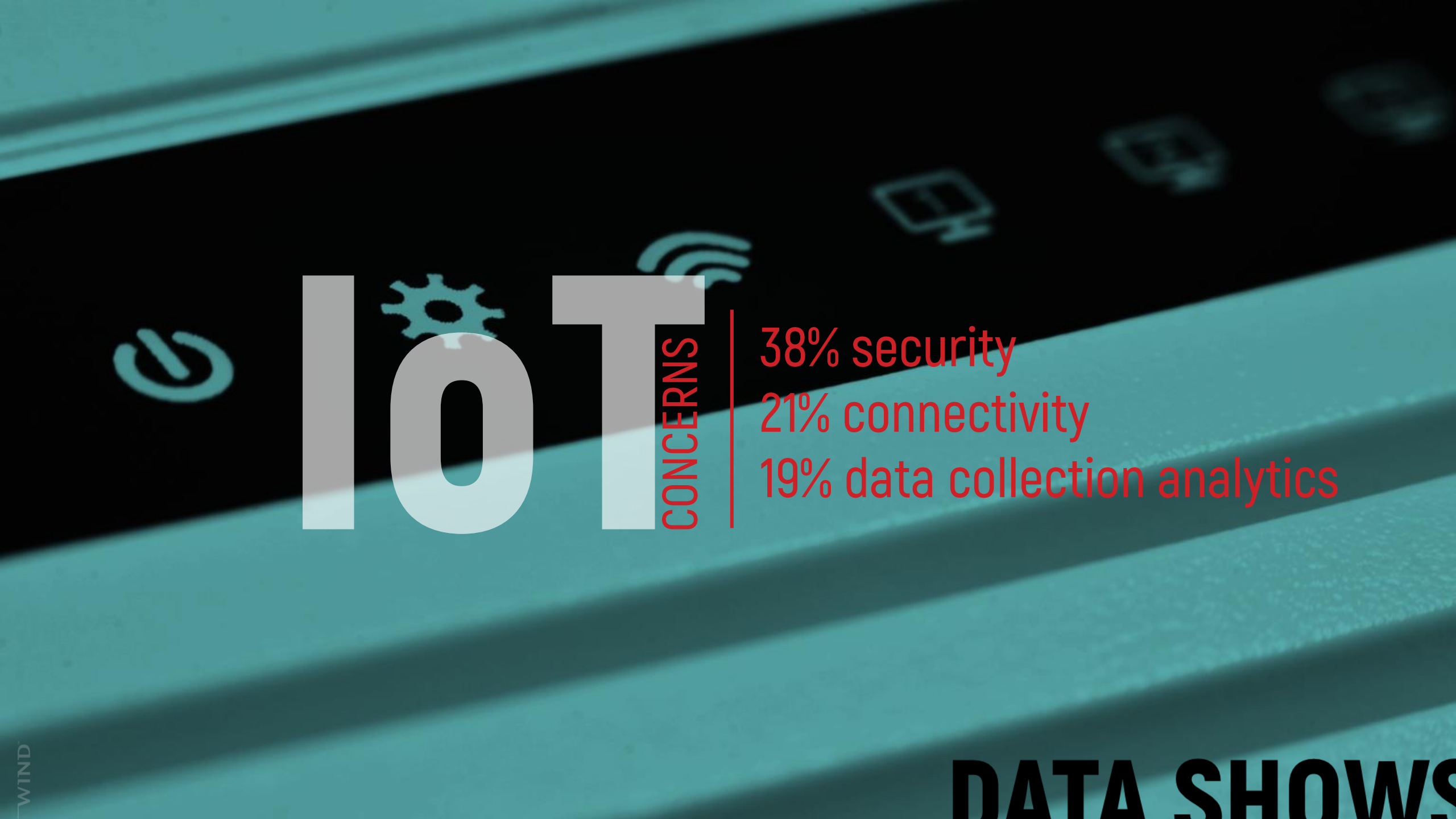
STATS


THE URGE FOR MODERNIZATION
64%
of CEOs see Ai as away to lower OpEx
STATS


41B
connected devices generating
80 ZB of data into 2025
DATA SHOWS


1/3RD
of all developers are currently
building cloud-native architectures
DATA SHOWS


+30%
plan to in the next year


IoT
CONCERNS
38% security
21% connectivity
19% data collection analytics
DATA SHOWS

WE NEED TO RETHINK DEVELOPMENT AT THE EDGE

OLD EDIT / COMPILE / DEBUG PARADIGM IS INADEQUATE

REPEATING DESIGN LIFECYCLE OVER AND OVER AGAIN WON'T SCALE

NEED TO THINK ABOUT LIFECYCLE OF PRODUCTS

DEVELOP ONCE, DEPLOY FOREVER IS OVER

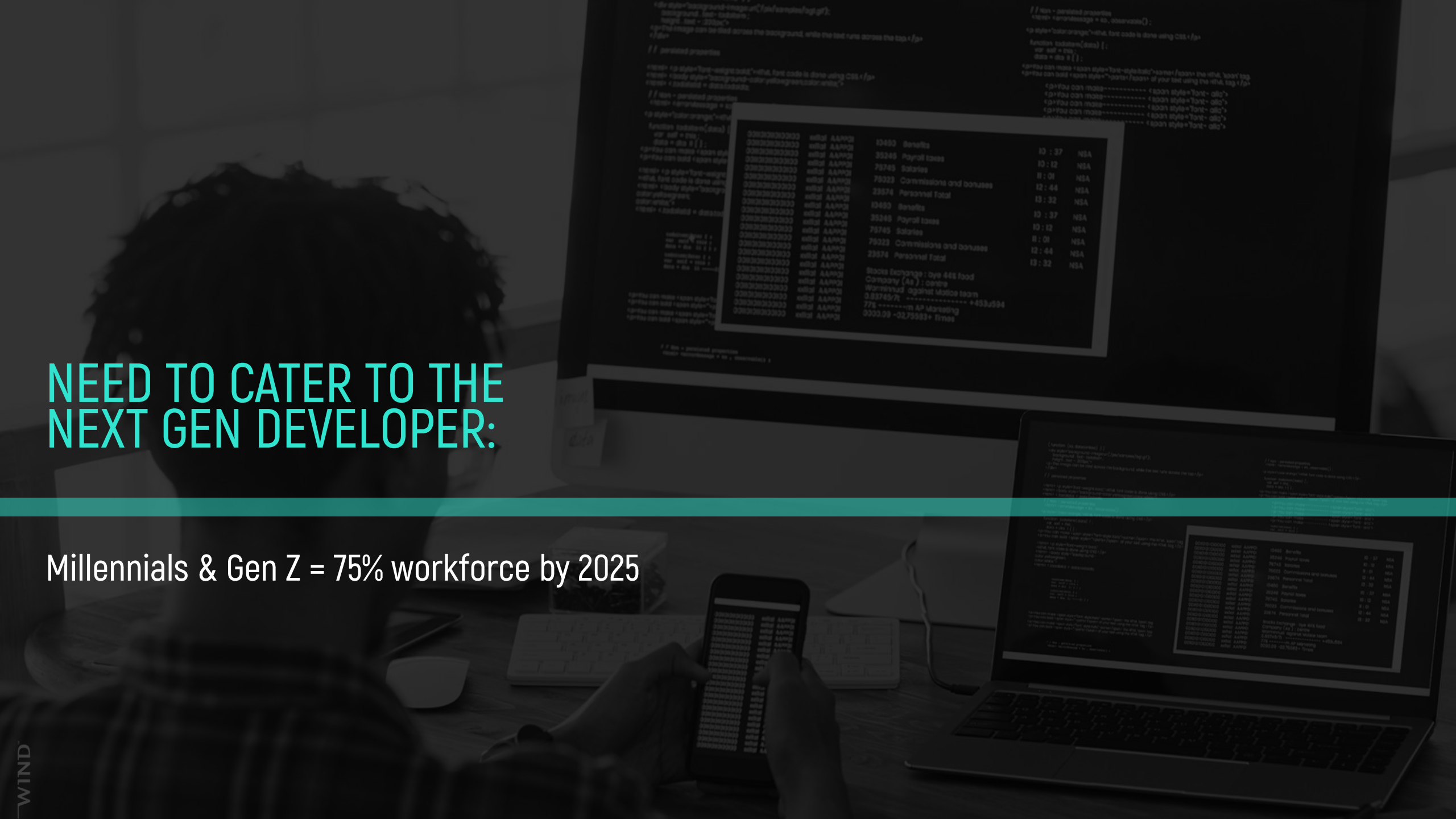
NEEDS EVOLVE

DEVICES MUST BE ADAPTABLE OVER THEIR LIFECYCLE

NEED TO MODERNIZE DEVELOP WORKFLOWS, EMPOWER DEVELOPERS WITH NEW TOOLCHAINS AND LANGUAGES:

Legacy languages: C, C++, Assembler

Newer generations prefer: Rust 83.5%, Python 73.1%

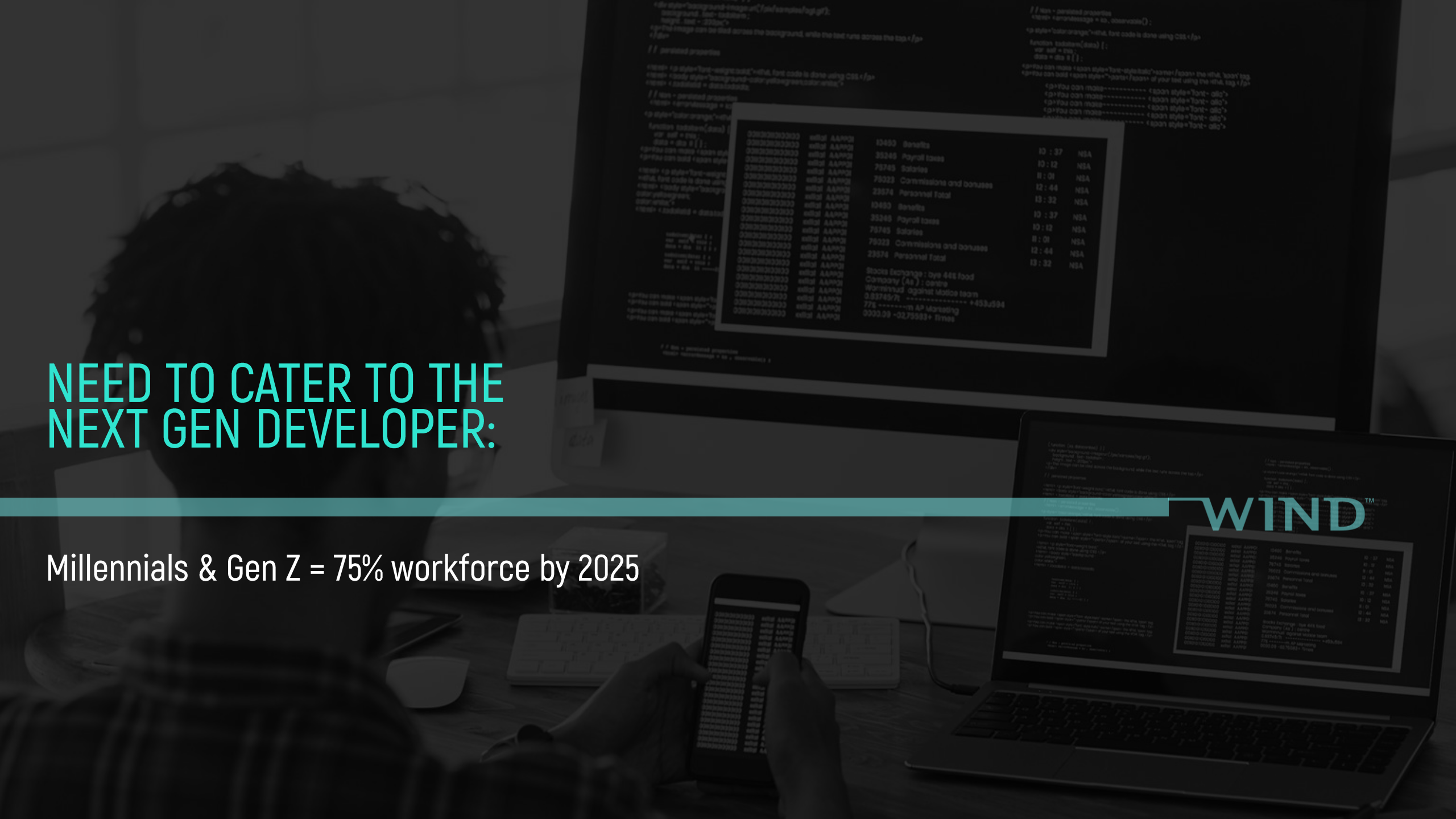


NEED TO CATER TO THE NEXT GEN DEVELOPER:

Millennials & Gen Z = 75% workforce by 2025

NEED TO CATER TO THE NEXT GEN DEVELOPER:

Millennials & Gen Z = 75% workforce by 2025



SIX NEW DESIGN DYNAMICS

SIX NEW DESIGN DYNAMICS

System centricity
Lifecycle
Design process must scale
Understanding specific functionality critical
Speed, Accuracy, Age of data matters in real-time decisions
The nature of security is changing

01. The View Is System Centric:

silos constitute one of the three strongest inhibitors to digital transformation success.
A shift is required in a world where electrical engineers are now only part of the team. Organizations
that struggle with this intermingling of IP and resources will be hampered by trying to use old-world models to solve digital-world paradigms.

02. Lifecycle Thinking Is Vital:

products will not follow the build-once-and-ship-forever tradition. They will be dynamically adjusted to take in new data, mainly through the edge, and offer changing assets and experiences throughout their lifecycles. 5G and other connectivity methods will make over-the-air (OTA) updates
common practice.

03. The Design Process Must Scale:

the need to go system-centric means thinking about scaling during the design process, and digital transformation will break old ideas about what scale means. In a world of 41 billion (and growing) connected devices, architecture must be designed to handle near-infinite scale from the outset. Think of a call center versus a website: A call center is limited by the number of people who staff it. A website is limited only by its technology backbone.

SIX NEW DESIGN DYNAMICS

System centricity
Lifecycle
Design process must scale
Understanding specific functionality critical
Speed, Accuracy, Age of data matters in real-time decisions
The nature of security is changing

04. Understanding Specific Functionality Is Critical:

the always-on nature of the digital world means we can- not land the plane to change the parts–entire system upgrades cannot happen all at once.
The capacity to Perform hitless updates of live systems at scale must co- exist with the ability to update applications at the thread and microservice levels.

05. The Speed, Accuracy, And Value Of Data Matters In Real-time Decisions:

the ability to extract, manage, and infuse AI components is an imperative. CEOs in sectors such as industrial manufacturing already understand it as truly differentiating: 28% use infused AI in data collection and ongoing management, and they are getting 2.6 times the ROI of their peers who do not. Developers for the intelligent edge need to be active players in that scenario.

06. The Nature Of Security Is Changing:

security has always been a priority but historically that was the security of the platform. Now that every device can interact with every other device, the need for security is amplified almost infinitely. Building in intelligence and adaptability is key for a dynamic yet secure-everywhere, secure in every moment construct.


THE EDGE NEEDS

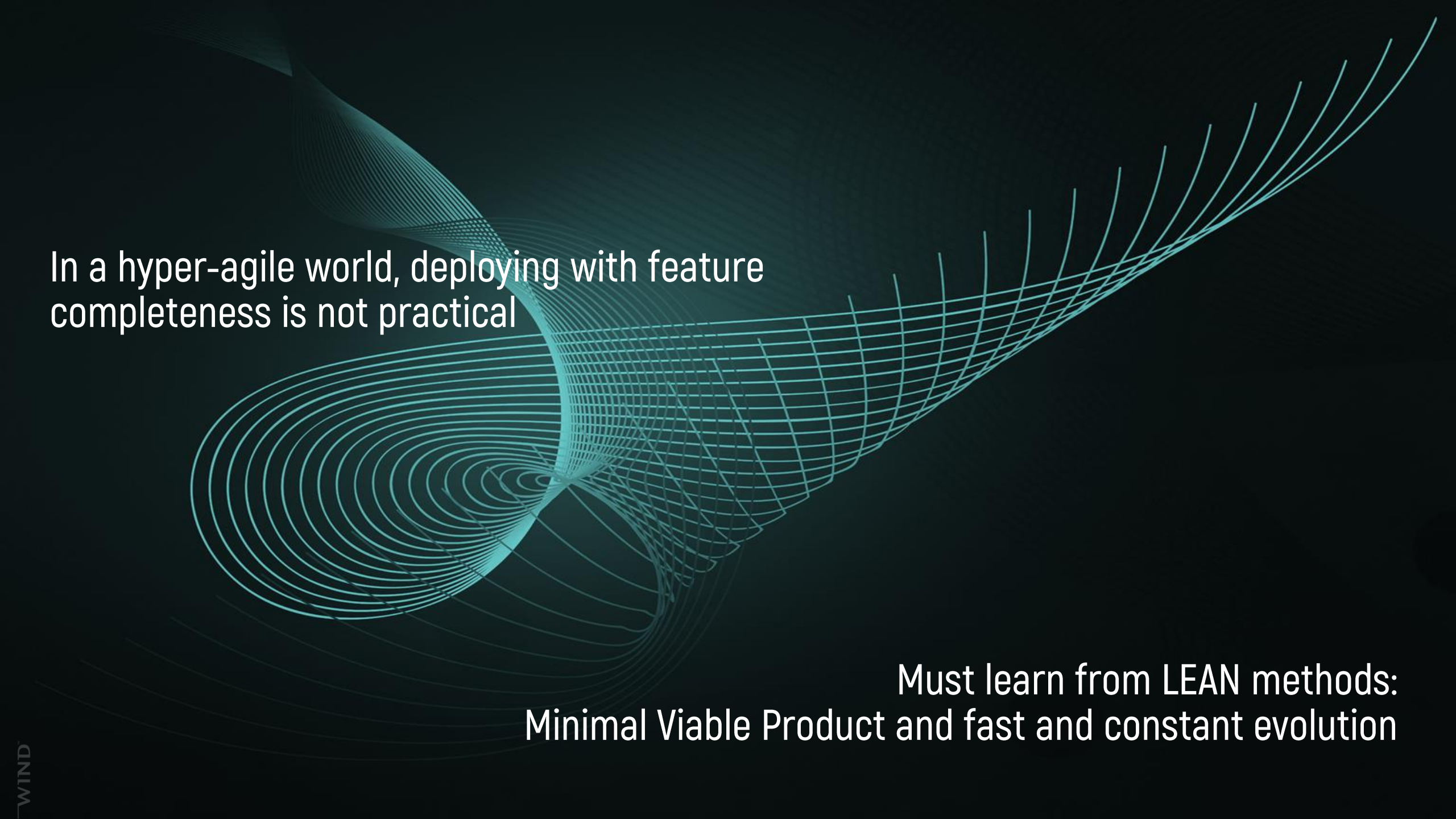
TO EVOLVE

Today: Fixed function, physical devices

New: Increasingly augmented or replaced by cloud-like infrastructure

Tomorrow: Mix of physical devices and edge cloud, need to master development paradigms for multiple domains

DEPLOYMENT NEEDS TO BE ADAPTABLE


In a hyper-agile world, deploying with feature completeness is not practical
Must learn from LEAN methods:
Minimal Viable Product and fast and constant evolution

Cloud-native methods give us a roadmap to adaptability at internet-speed

On-going deployment becomes critical = lifecycle

Need to focus on development efficiency: automation the cycle = DevOps

Abstraction from underlying hardware is critical = virtualization

Abstraction of applications from the operating environments will become the norm = containerization

Move beyond development to Continuous Deployment CI/CD

More than develop phase:

Development
Deployment
Operations
Services

Need to adapt to enable:

Multiple DEVELOPER PERSONAS
Multiple WORKFLOWS
Across a broader LIFECYCLE

TOP 10 SKILLS FOR IoT DEVELOPERS IN DIGITAL WORLD

1. Machine Learning & AI
2. Design for Data
3. Automation
4. IP Networking
5. Hardware Interfacing
6. Mobile Development
7. Information Security
8. UI / UX Design
9. Business Intelligence
10. Teamwork

WIND

Machine Learning & AI

Gathering and analyzing large amounts of data requires deciphering patterns and predicting outcomes. As IoT becomes more complex and ubiquitous, AI will need to handle more tasks and make autonomous decisions.

Designing for Data

Big Data drives IoT, and the job of software engineers, network engineers, and UX engineers is to make the data work seamlessly for users. The ability to read and interpret data in a meaningful way will be valuable.

Automation

A McKinsey survey found that 40% of the value of IoT is in its operability. Given a large amount of data and interfaces, developers who can connect automatic API testing with manual testing will be the ones who get their products to market.

IP Networking

In IoT, embedded sensors interact with their environment, collecting information to send for analysis. That information must flow through a network that is flawless, secure, and reliable, and also able to handle enormous traffic. Developers must know the basics of OSI stack, the latest standards in IoT communication, and how connectivity protocols work.

Hardware Interface

Hardware programming is essential for IoT engineers. They must know how to program interfaces, such as GPIO and I2C; understand at least one operating system, such as Linux; and know one embedded system, such as Contiki.

Mobile Development

Most IoT devices will be managed through smartphones. The ability to develop apps that communicate with external hardware and sensors is highly marketable.

Information Security

Security is critical for IoT devices. Developers who are familiar with vulnerability assessment, public key infrastructure (PKI) security, ethical hacking, and wireless network security will be key players.

UI/UX Design

The interfaces between the device and the user must be effective and user friendly, or the consumer won't buy. Responsive web design and service design that keeps the end user in mind are valued.

Business Intelligence

IoT is all about collection, storage, and analysis of streams of data from smart devices. Needed skill sets include sensor data analysis, data center management, predictive analytics, and programming in Hadoop and NoSQL.

Teamwork

A basic IoT team includes an electrical engineer, a mechanical engineer, an industrial designer, an embedded systems designer, one back-end developer, one front-end developer, and a product manager. The better each team member understands every other role, the purpose of the system, and the end user of the system, the better the entire system will function.

CLOSING REMARKS

WIND™

TO LEARN MORE ABOUT HOW **WIND RIVER**
CAN HELP YOU DIGITALLY **TRANSFORM**
VISIT: windriver.com/new-intelligent-edge/