

# Embracing Both Emulation and Simulation

## Shift-Left and Continuous Functional Testing for Space Software

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System Simulation Product Manager

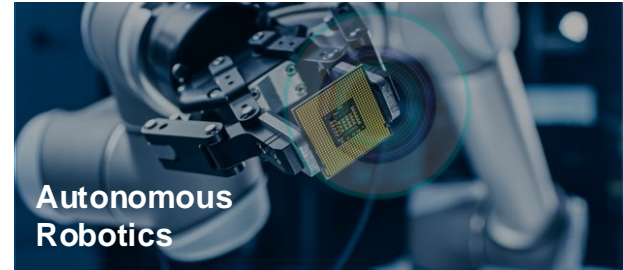
31<sup>st</sup> March 2025

WINDRIVER

# SOFTWARE DESIGN MATTERS

## Right software

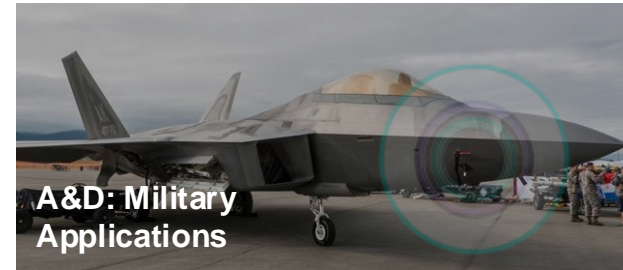
makes hardware useful and create values for customers



Autonomous Robotics



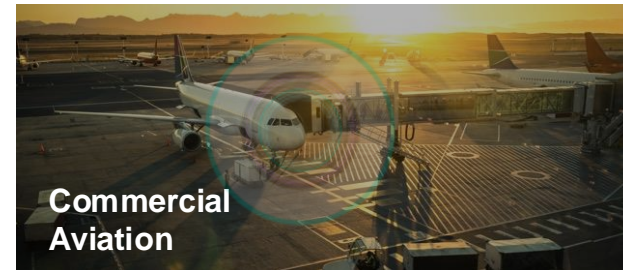
Wind and Renewable Energy



A&D: Military Applications



Medical and Health



Commercial Aviation



Autonomous Transport




Industrial Transportation



Telco Operations

# What Wind River does

A screenshot of the Wind River website banner. The background is dark with a colorful, wavy, liquid-like graphic on the right side. The text is white and teal. The navigation menu is at the top, and a 'Find Out More' button is at the bottom left.

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## WHEN IT MATTERS, IT RUNS ON WIND RIVER.

Whether it's enabling intelligent systems for space exploration and commercial aircraft, advancing autonomous driving, keeping global networks connected, or supporting life-saving medical devices, Wind River® software provides the assurance needed for mission-critical operations.

[Find Out More](#)

# SIMULATION

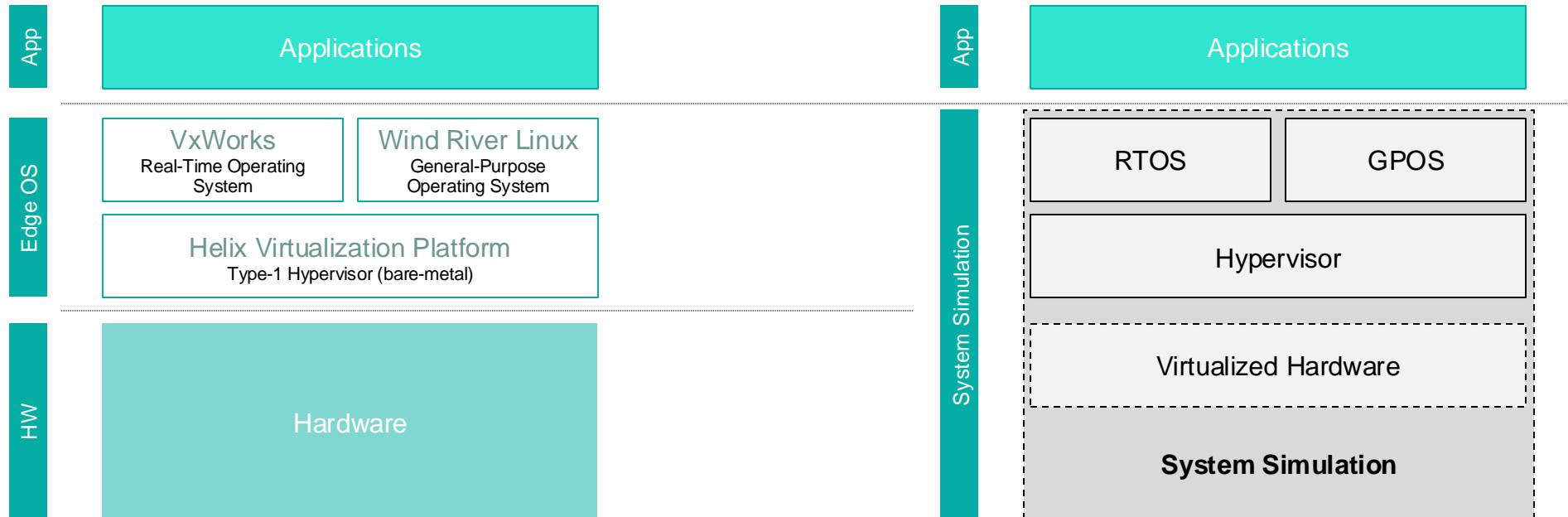


# Hardware



# System Simulation from Software Lens

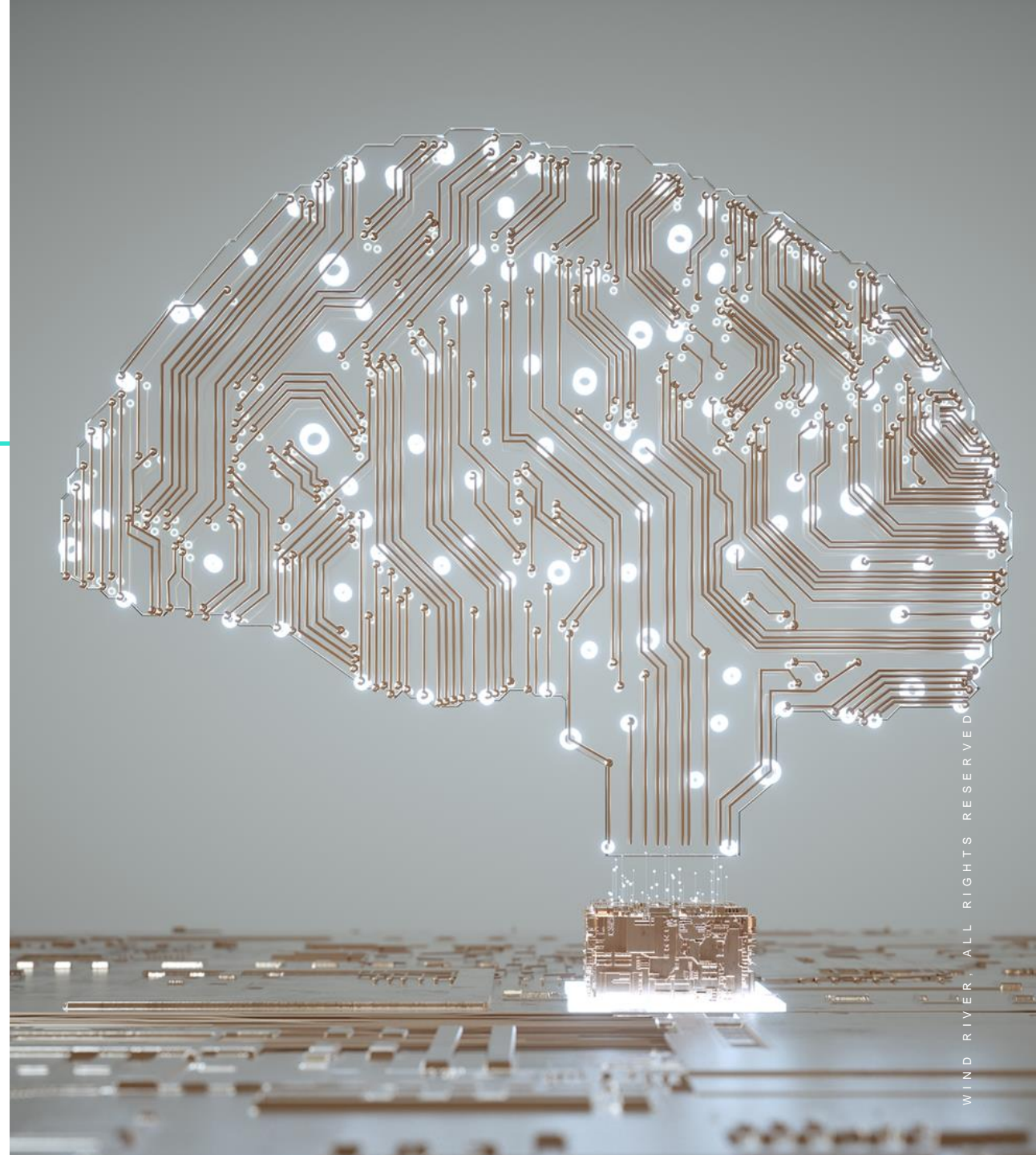
- Run, optimize and debug your intelligent edge applications behavior with the power of system simulation and the scalability of cloud
- Transform your app development process by generating more relevant and intuitive data, when building applications on Wind River operating environments



# SOFTWARE SIMULATION

## Digital Virtual Environment to run Software Applications

1. Availability
2. Instantiates
3. Deterministic
4. Automation
5. Simplify workflow
6. Reduce risks to experiment
7. Built for measurement
8. Longevity
9. Collaboration



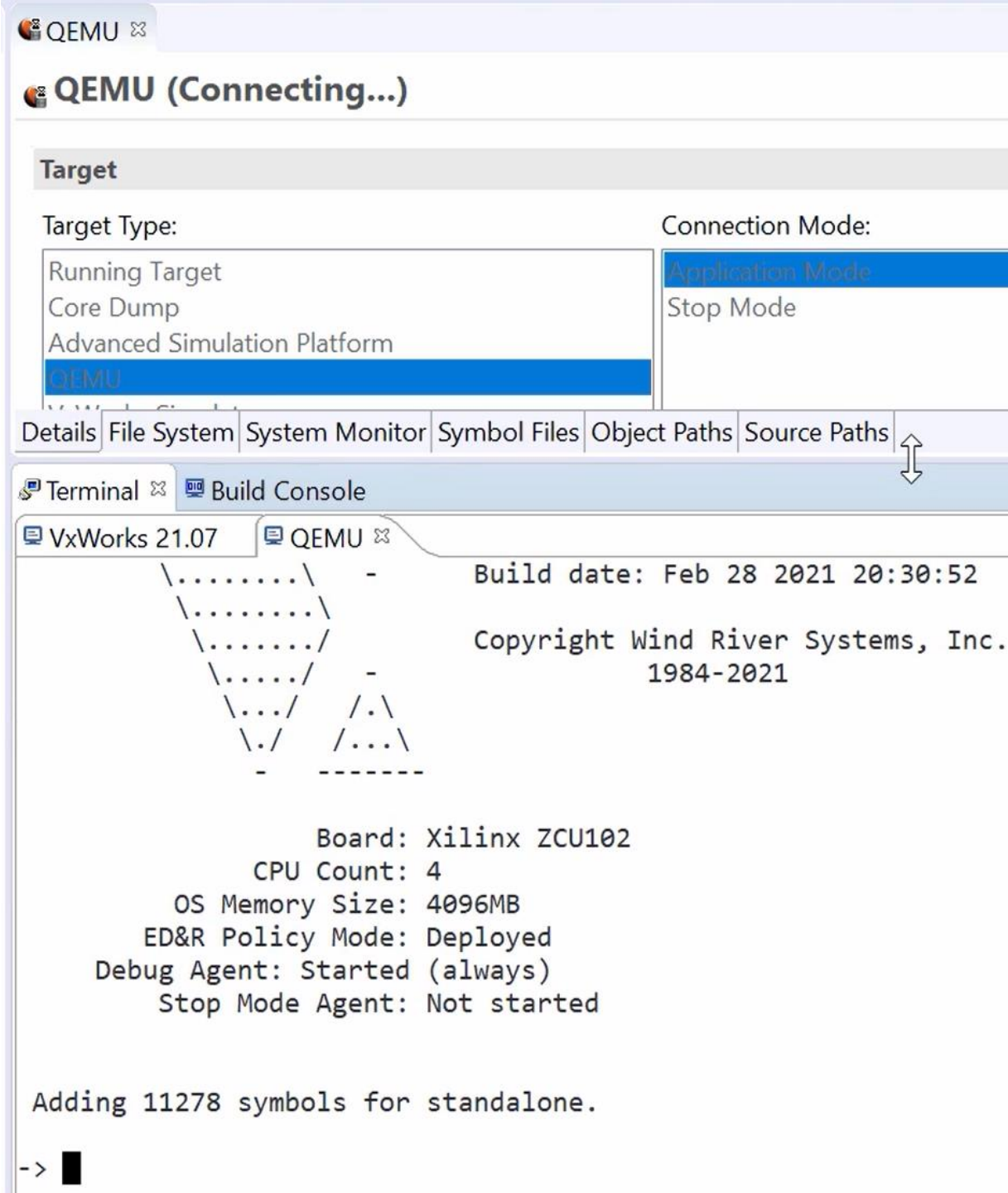
# MANAGE & CHOOSE ABSTRACTION LEVELS

- **Emulation for System**
  - Binary compatible instruction set
  - Fast to run
- **Simulation for Product**
  - Multi-targets synchronized network
  - High fidelity
- **Combining Emulation and Simulation**
  - Early defect identification
  - Fault injection
  - Make data driven decisions



# Emulation with QEMU

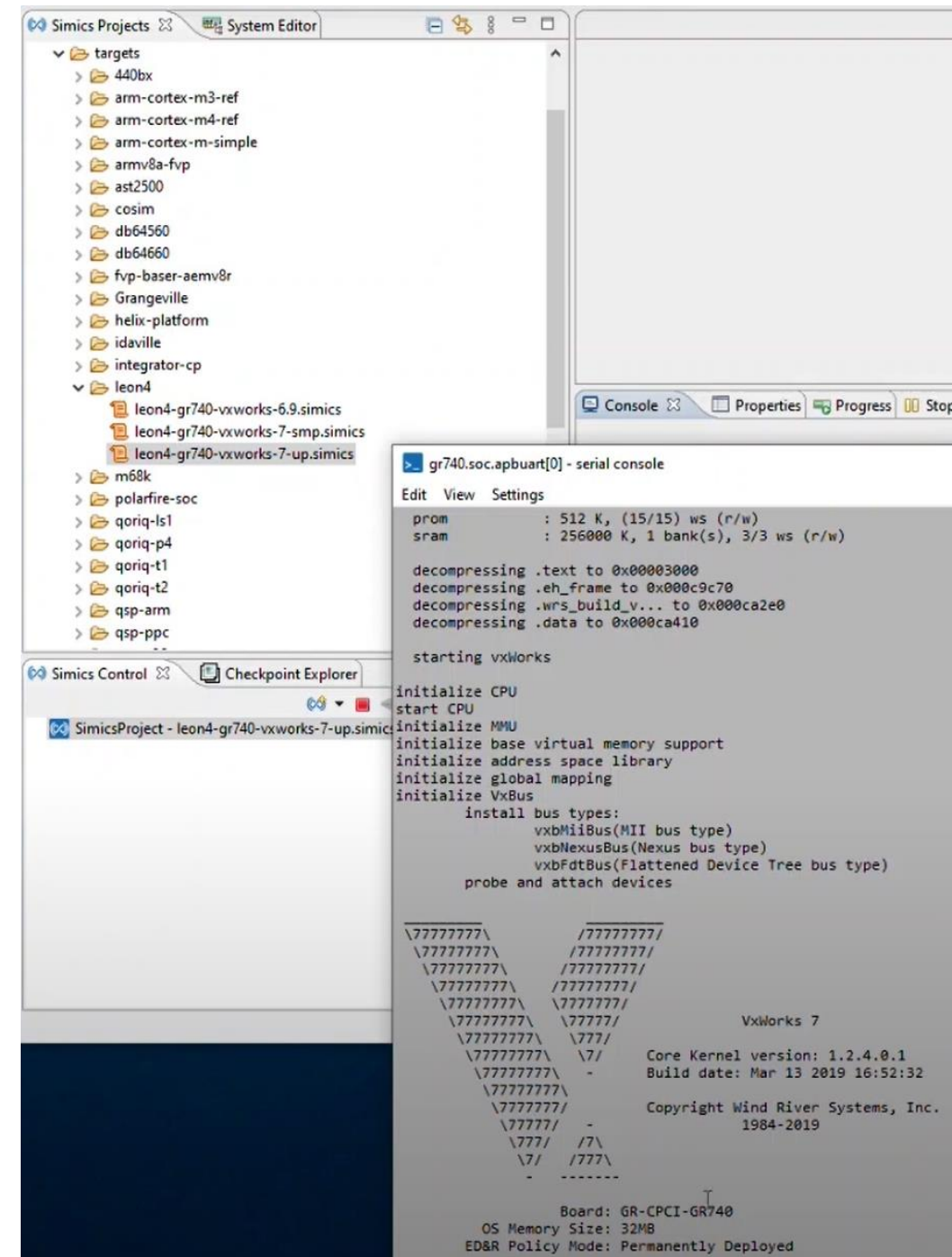
- System emulation using QEMU opensource project
- Wind River is a supporter to QEMU community, and upstream our enhancements back to the mainline.
- The QEMU supported by VxWorks in system mode for Arm, Intel, PowerPC, and RISC-V target machines
- Already integrated with Wind River Workbench
- Debug using TCF with Debug Agent and remote GDB
- Real-world connectivity, snapshot, asynchronous co-simulation and fault injection



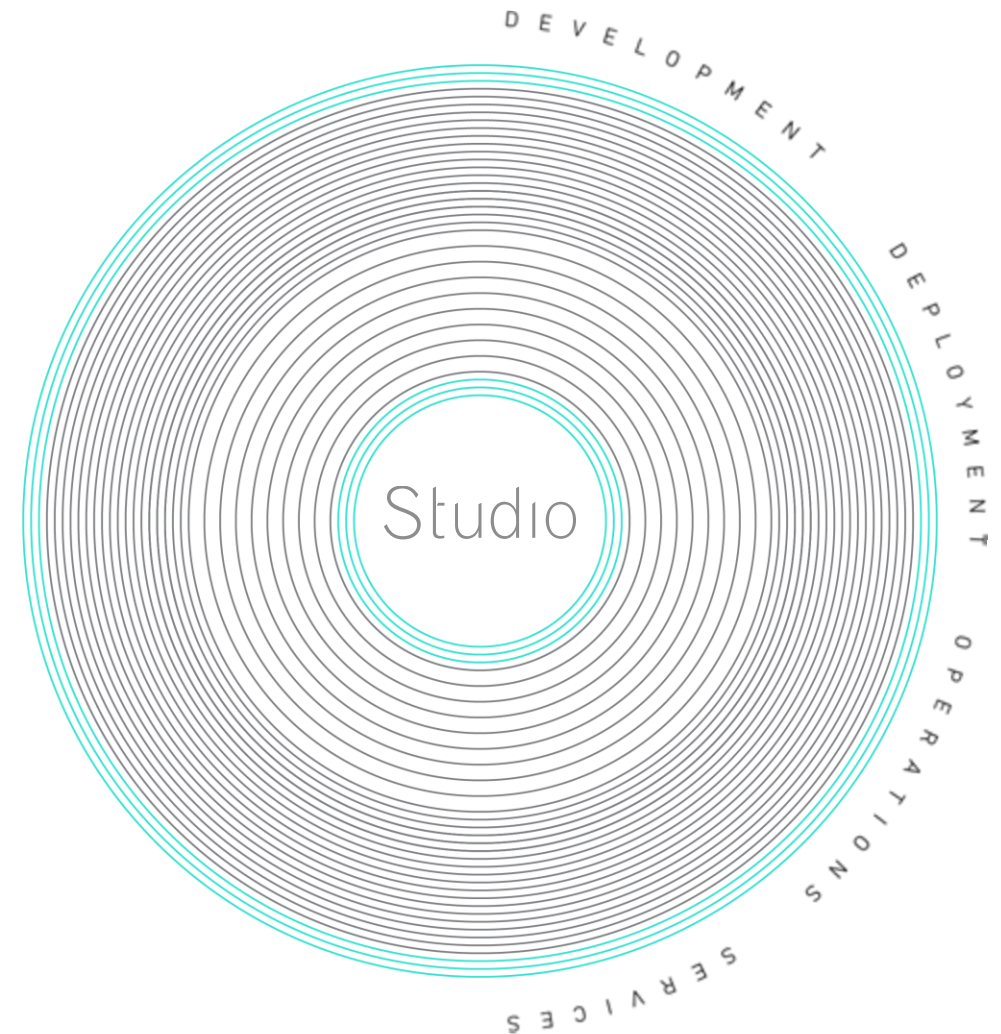
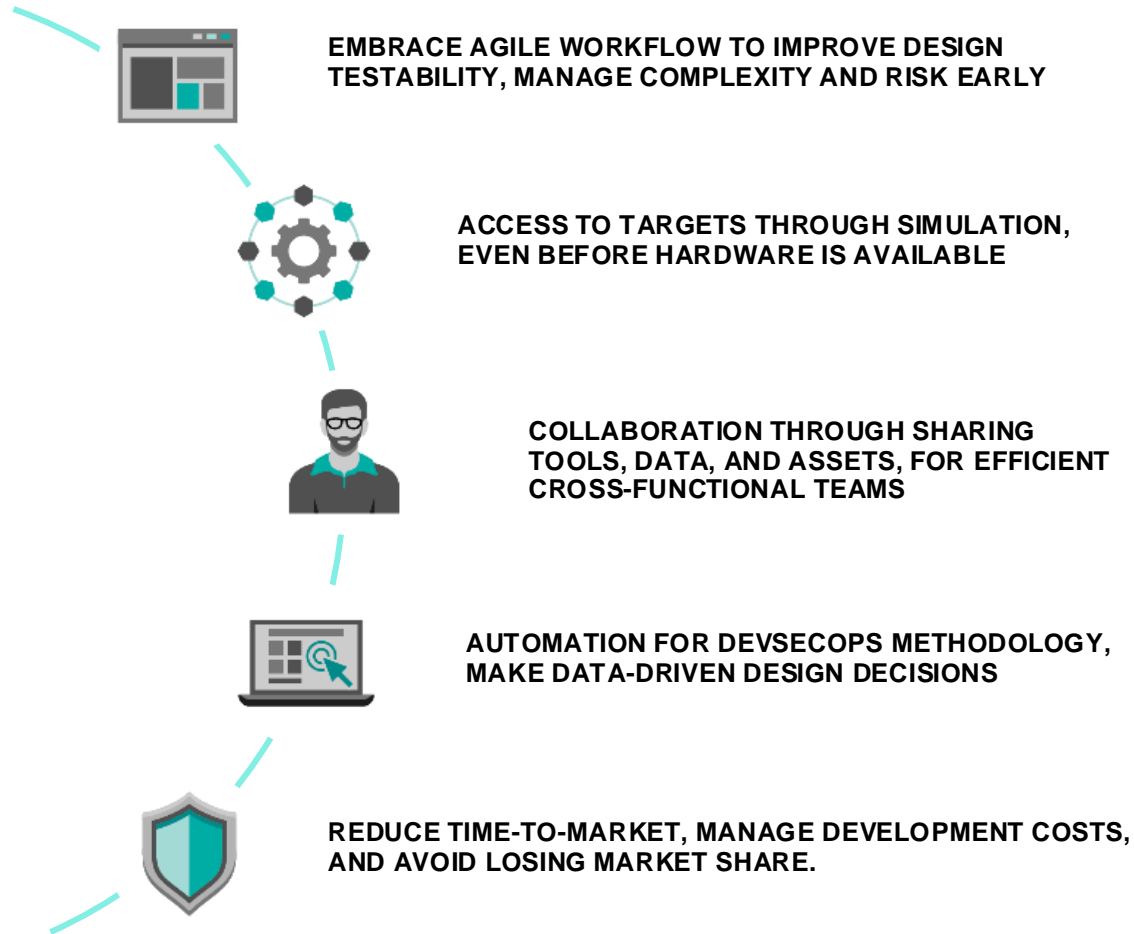


# Intel® Simics® Simulator

- Product mode simulation and Intel's commercial product for platform simulation using unmodified product target binaries
- Detailed simulation models for processors, peripherals, and networks with determinism and synchronisation
- Use unique and powerful debugging techniques with built-in scripting, monitoring and reporting subsystems
- Record, save, and restore simulation runs remotely across all supported host systems
- Opensource modelling language for performance and portability



# INTEGRATION WITH DEVELOPMENT WORKFLOW



# USE CASES

DEVELOP, TEST AND INTEGRATE, AUTOMATE ANYTHING, ANYWHERE, ANYTIME

- **Reduce CapEx and OpEx by 45%**
  - While simultaneously introducing rapid test and integration
- **Optimize debug time by +30%**
  - While simultaneously increasing quality by finding bugs sooner
- **Go to market 3–6 months faster**
  - By starting software development activities pre-hardware and even pre-silicon



## Safety Testing

Average time from code commit to defect detection reduced from 4.5 weeks to 24 hours

97%

## Platform Team

Shorten time from code build to test from 55 mins to <1 min

98%

## 5G Equipment Test

A typical 4-month network test program now completes in 3 weeks

82%

## Space Software Test

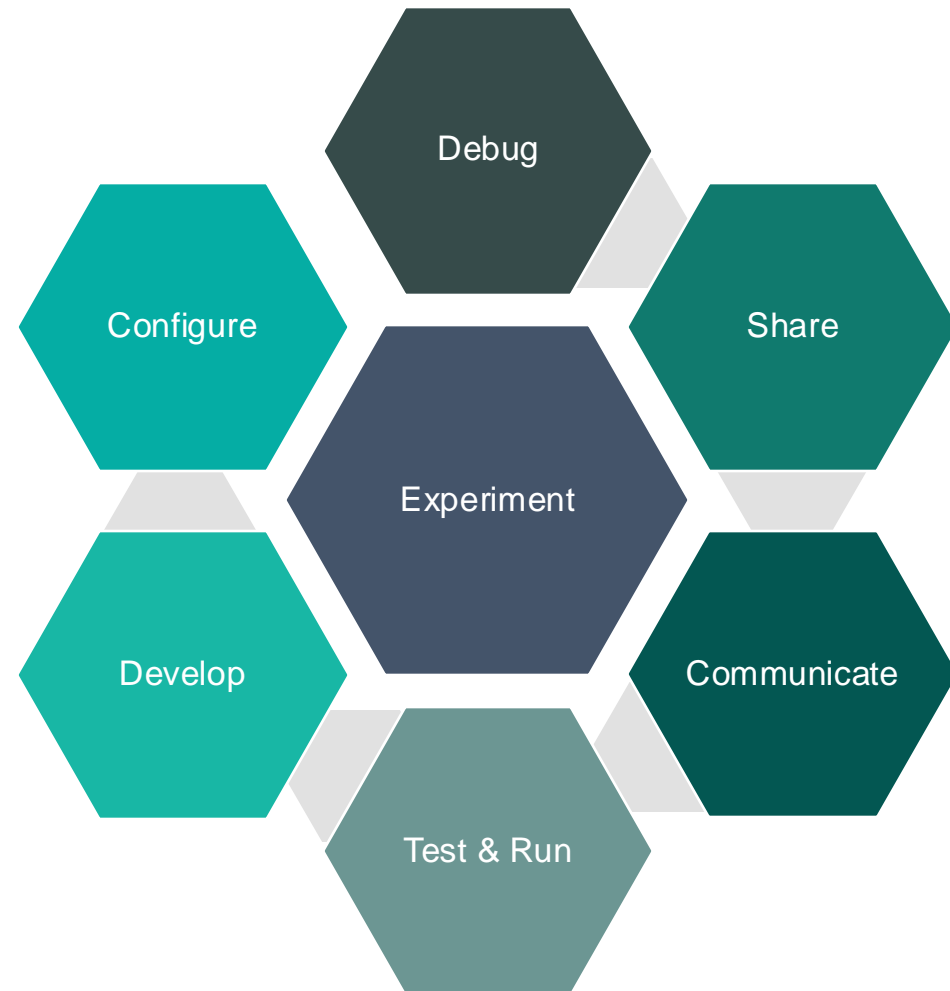
A 2-year test compressed for completion in 3 days

99%

# BEST PRACTICE

## START EARLY & USE OFTEN

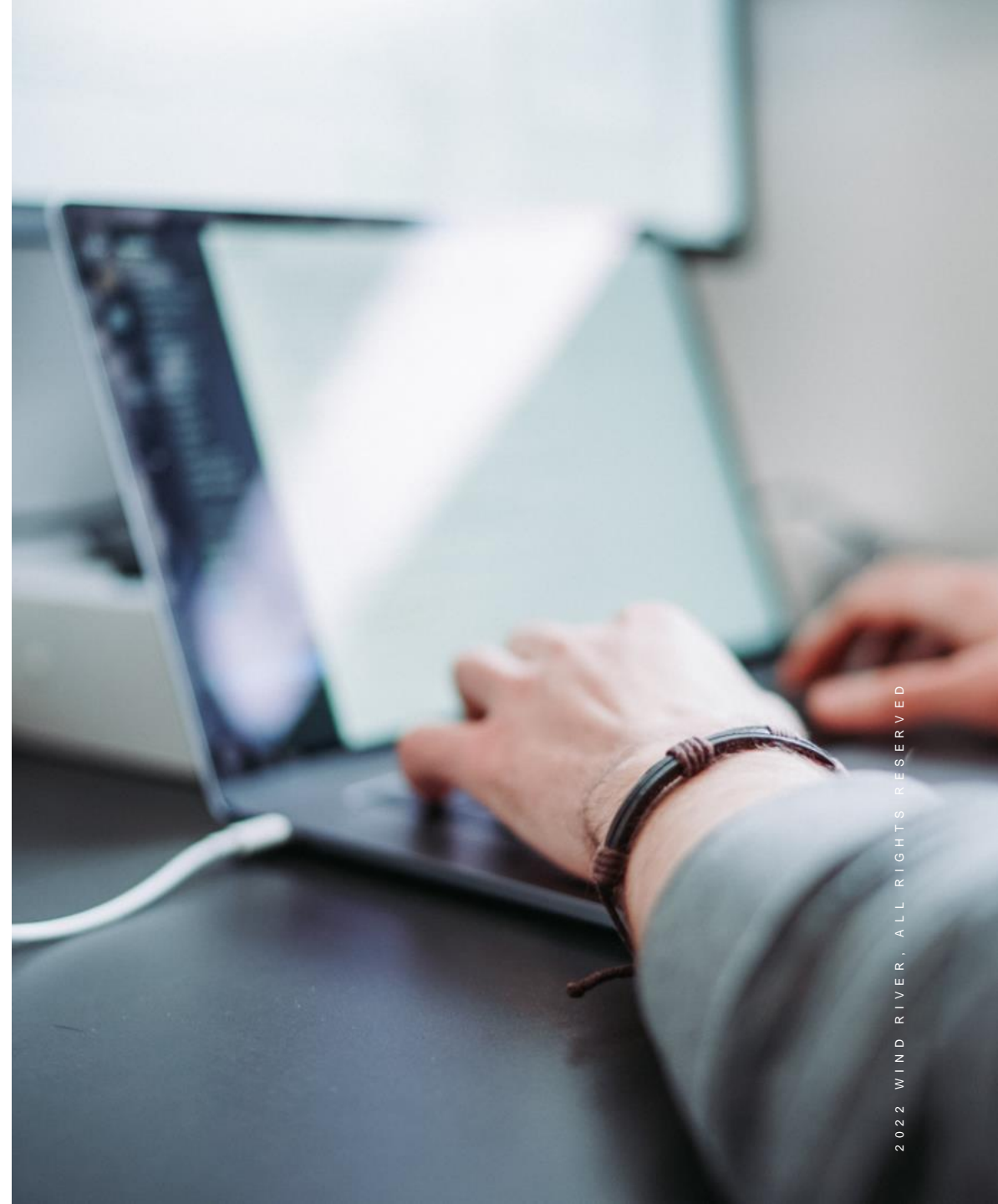
- **Experiment**
  - Plan, simulate, verify.
- **Debug**
  - Hunt for bugs at any time.
- **Share**
  - Empower all collaborators.
- **Communicate**
  - One team. One view. One truth.
- **Test and run**
  - No need to stand in line.
- **Develop**
  - Develop on the actual system from the start.
- **Configure**
  - Use endless configurations with ease.



# RESOURCES

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- **More questions? Feedback?**
  - [james.hui@windriver.com](mailto:james.hui@windriver.com)
- <https://docs.windriver.com/>
- <https://www.youtube.com/@windriverchannel/playlists>
- [Certify Faster with Simulation](#)
- Wind River GitHub
- Intel Simics Public Release
- Wind River Lab SDK



WNRVR