WIND RIVER TECHNOLOGY FORUM 2023

Wind River R&D Team Sharing for DevOps Experiences

2023.10.17

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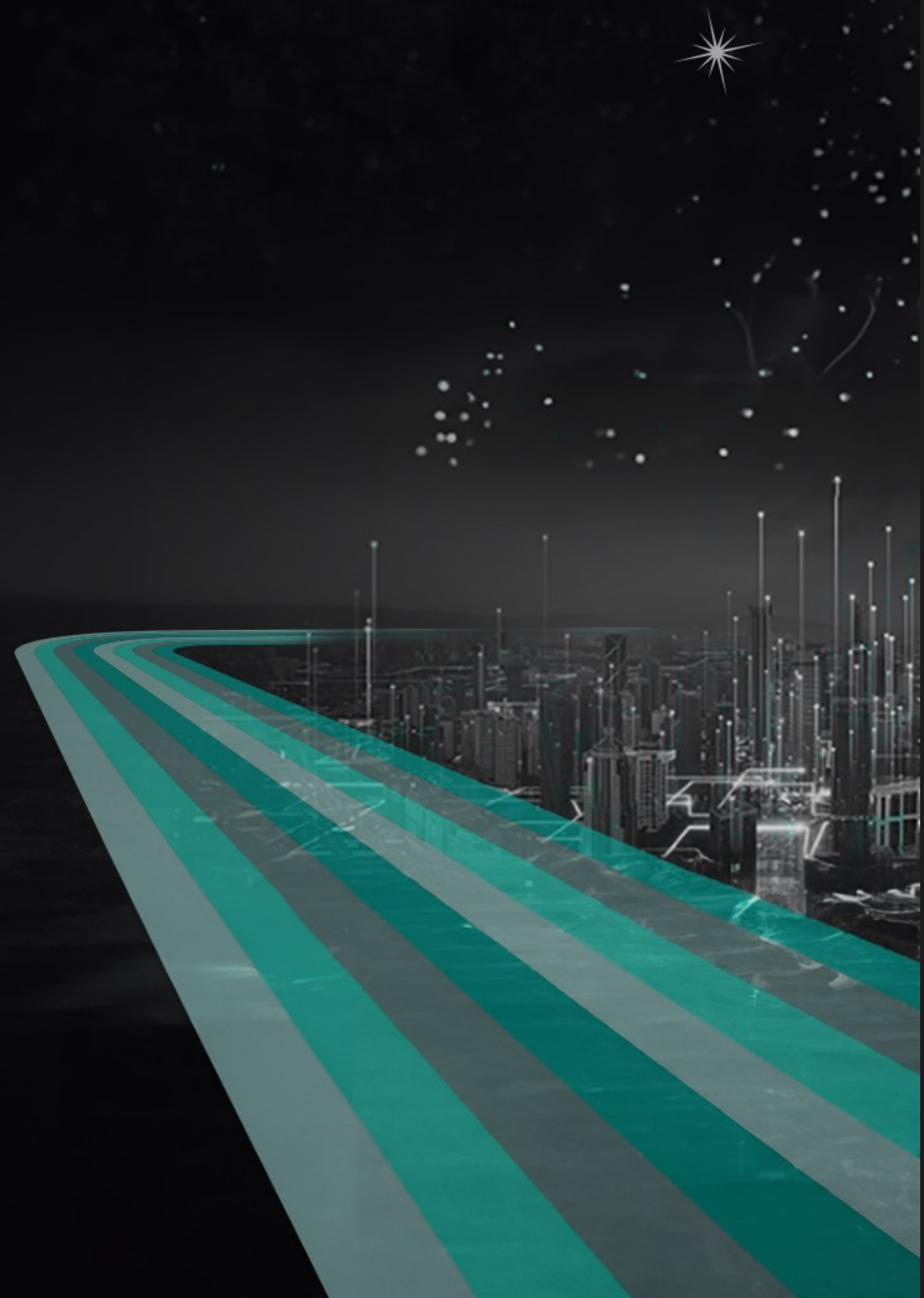
Agenda

1. Introduction of Wind River CI/CD/DevOps Workflow
2. VxWorks DevOps Metrics
3. Benefits of DevOps To Product Quality
4. Summary & Key Takeaway

Introduction of VxWorks CI/CD/DevOps Workflow



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DevOps in Wind River: Lean, Agile & Transparency

- Culture: Lean, Agile & Transparency
- Infrastructure: WR Studio Based DevOps Platform
  - Cloud Native Implementation
  - Digital Twin Based Automation Tests
  - End to End Solution for Efficiency & Security
- Process: One Lean-Agile Secure SDLC
  - Aligned Process Cross Products
  - Organizing for Speed and Predictability
  - Transparency Through Whole Process: Tool, Dashboard, Report etc.

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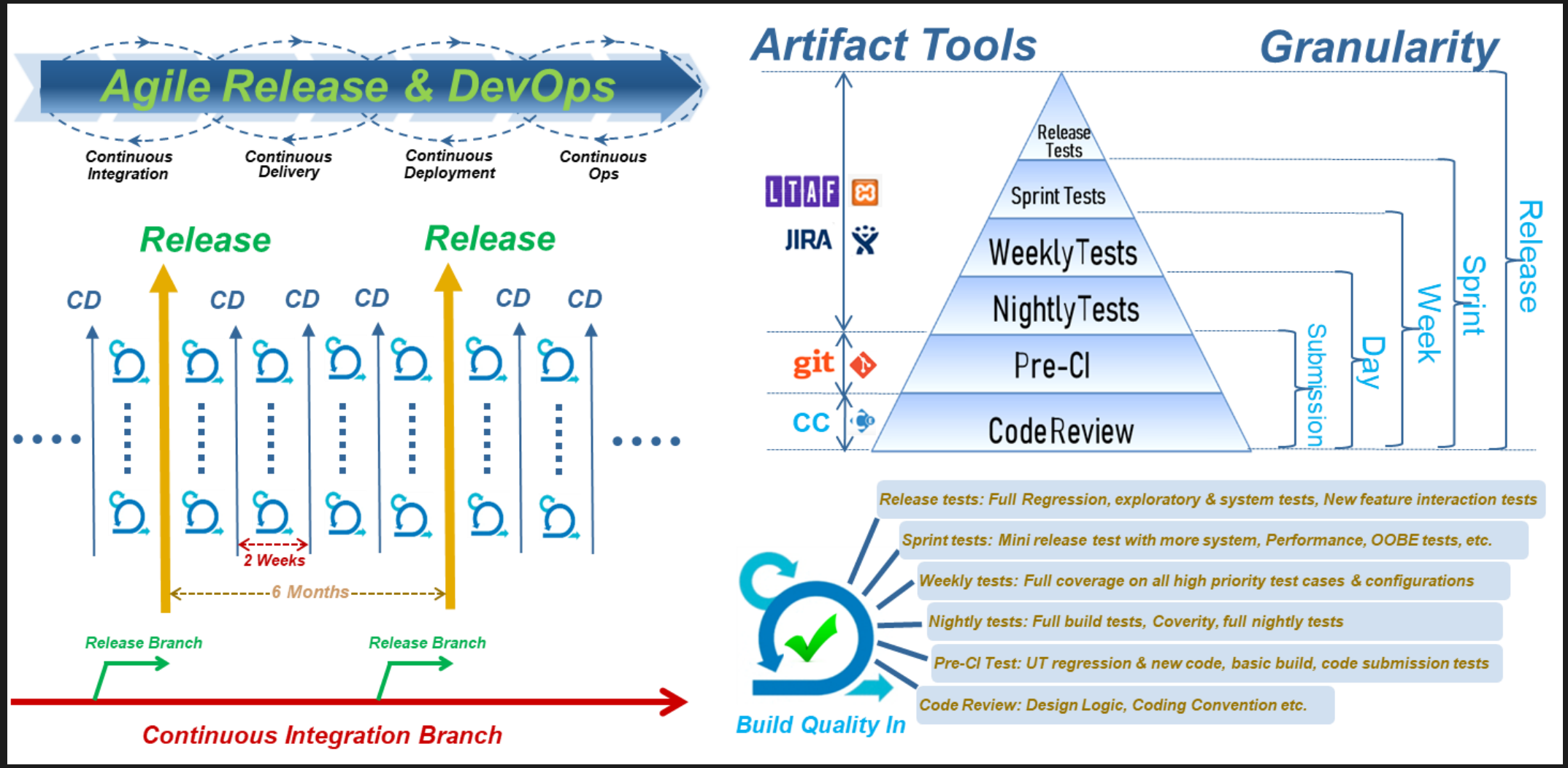
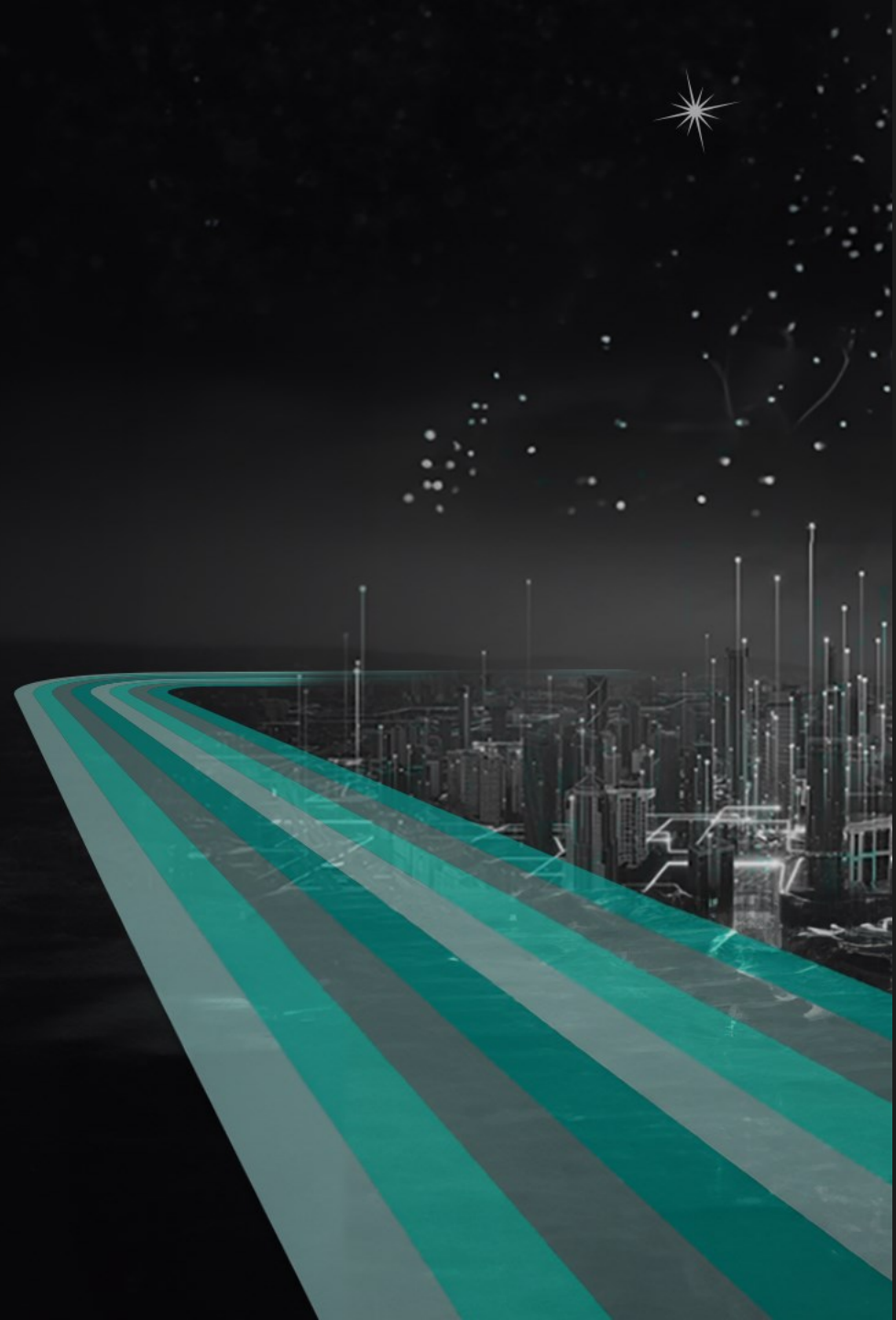
VxWorks CI/CD/DevOps Quick Introduction



VxWorks DevOps Metrics Introduction



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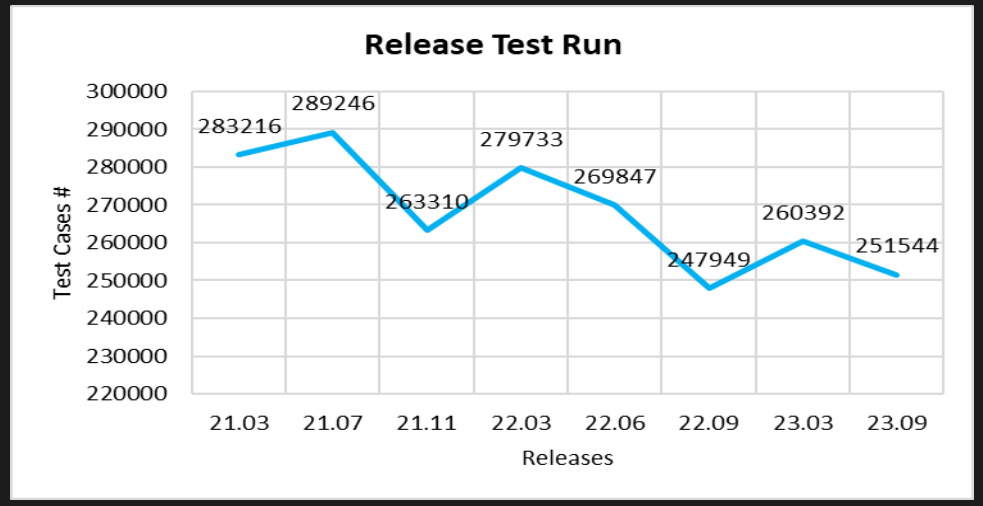
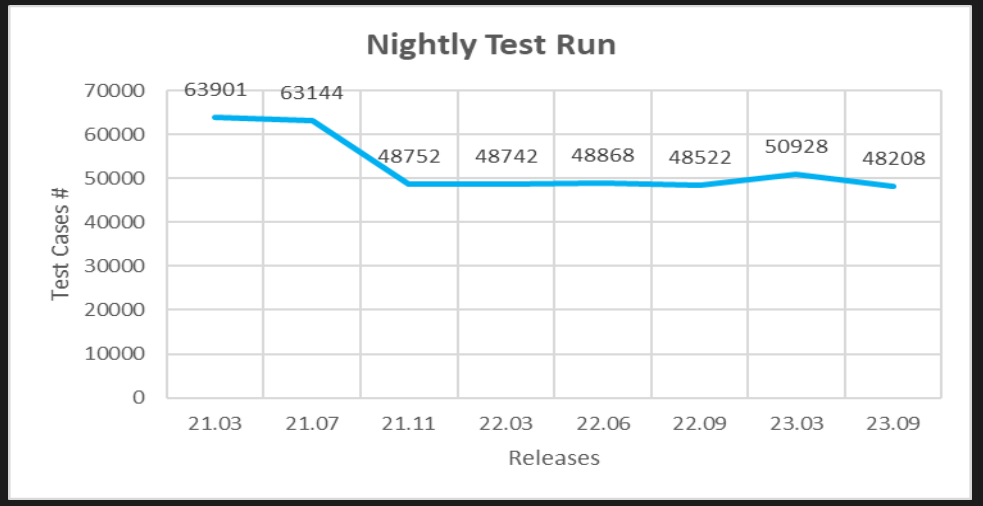
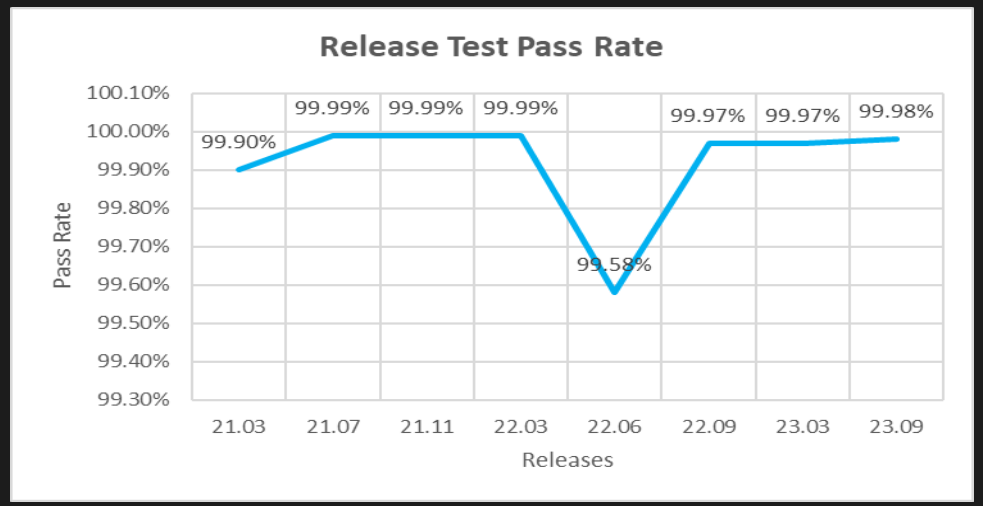
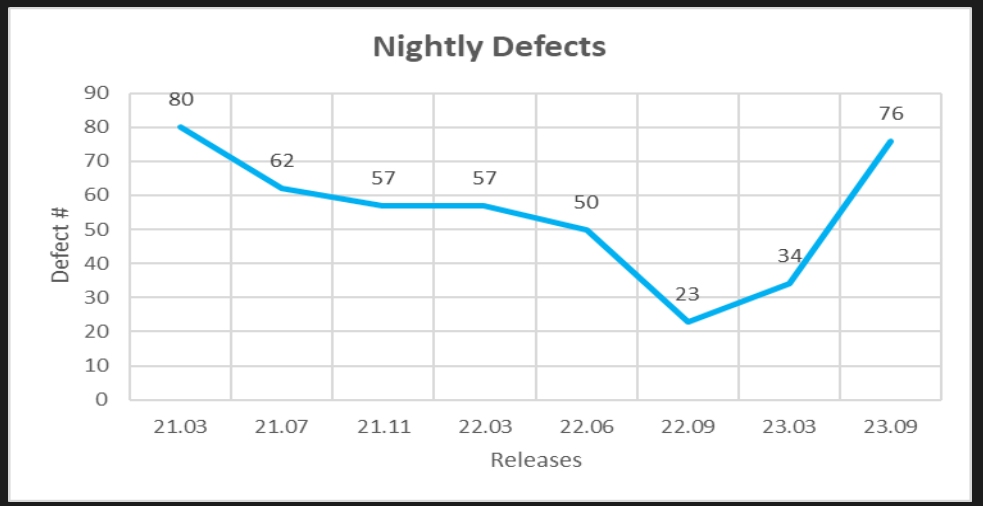
VxWorks Test Metrics Summary









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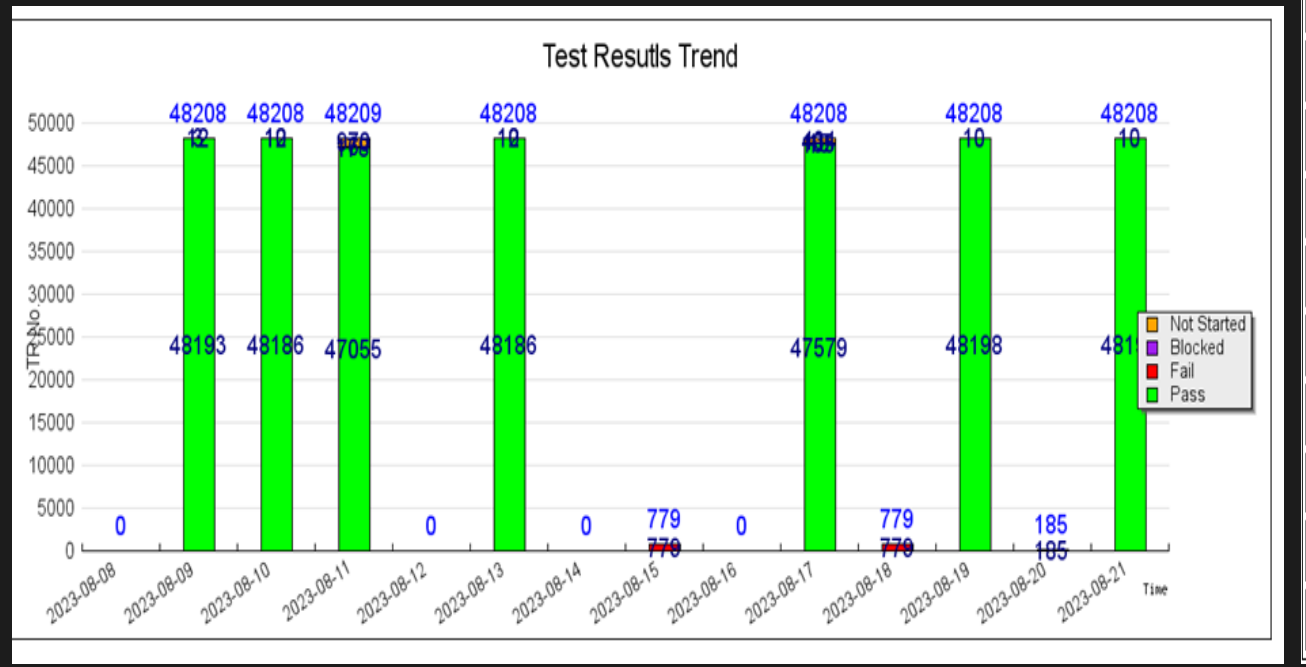
VxWorks Test Metrics Nightly Tests

- Test cases increased from 900+ to ~50K in 5 years
- 100% pass rate & P1 defect policy
- All test domains covered
- Only one dedicated tester for nightly test
- Automatically locate nightly defect to commit using git bisect



TR Domain	Pass	Fail	Blocked	Not Start	Total	Passrate
arm	7872				7872	100%
bc	1401	2			1403	99.86%
cert	1835				1835	100%
compiler and language support	5999	8			6007	99.87%
container	122				122	100%
core	5727				5727	100%
fs	380				380	100%
graphics and multimedia	9				9	100%
ia	4074				4074	100%
iot and third-party software	4052				4052	100%
networking	3734				3734	100%
ppc	6058				6058	100%
riscv	4162				4162	100%
simulators	60				60	100%
system	433				433	100%
usb	177				177	100%
workbench	2103				2103	100%

VxWorks Test Metrics Test Cases

- Test Code managed & delivered (partially) as Product Code
- 99.99% Release Tests are automated
- Comprehensive test types to challenge the product
  - ✓ LibFuzzer based Fuzz test (Dynamic Code Analysis)
  - ✓ Negative & Stress tests
  - ✓ Performance & System tests
- Complete domain coverage
  - ✓ All architectures: ppc, ia, arm, riscv
  - ✓ All functions: MW, Networking, security etc.
  - ✓ All levels: function, system, performance

Distribution by Automation

Automation	Fail	Not Started	Pass	Total	Completion %	Pass %
Auto	52	0	251339	251391	100.00 %	99.97 %
Manual	0	0	153	153	100.00 %	100.00 %
TOTAL	52	0	251492	251544	100.00 %	99.97 %

Distribution by Test Cases Type

Case Type	Fail	Not Started	Pass	Total	Completion %	Pass %
Compliance	18	0	36480	36498	100.00 %	99.95 %
Functional	30	0	213712	213742	100.00 %	99.98 %
Fuzz	4	0	0	4	100.00 %	0 %
Negative	0	0	36	36	100.00 %	100.00 %
Performance	0	0	638	638	100.00 %	100.00 %
Stress	0	0	93	93	100.00 %	100.00 %
System	0	0	533	533	100.00 %	100.00 %
TOTAL	52	0	251492	251544	100.00 %	99.97 %

Distribution by Test Domain

TR Domain	Fail	Not Started	Pass	Total	Completion %	Pass %
arm	0	0	96309	96309	100.00 %	100.00 %
bc	30	0	6253	6283	100.00 %	99.52 %
compiler and language support	0	0	6019	6019	100.00 %	100.00 %
container	0	0	122	122	100.00 %	100.00 %
core	6	0	22588	22594	100.00 %	99.97 %
fs	0	0	430	430	100.00 %	100.00 %
graphics and multimedia	0	0	9	9	100.00 %	100.00 %
ia	0	0	48028	48028	100.00 %	100.00 %
iot and third-party software	12	0	35277	35289	100.00 %	99.96 %
kasan	0	0	1396	1396	100.00 %	100.00 %
manageability	0	0	92	92	100.00 %	100.00 %
networking	4	0	3987	3991	100.00 %	99.89 %
ppc	0	0	25930	25930	100.00 %	100.00 %
riscv	0	0	4190	4190	100.00 %	100.00 %
security	0	0	28	28	100.00 %	100.00 %
system	0	0	628	628	100.00 %	100.00 %
usb	0	0	206	206	100.00 %	100.00 %
TOTAL	52	0	251492	251544	100.00 %	99.97 %

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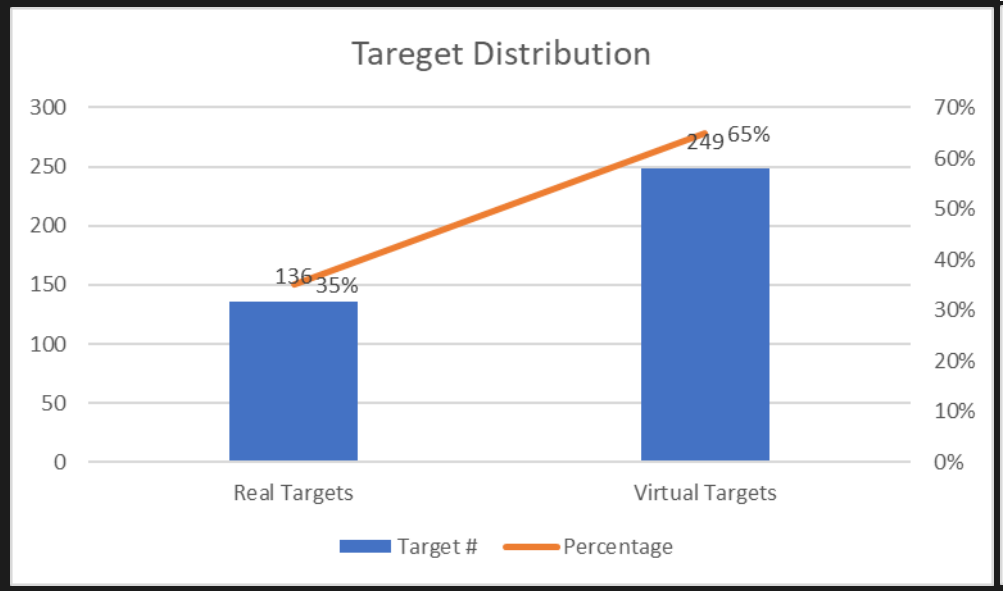
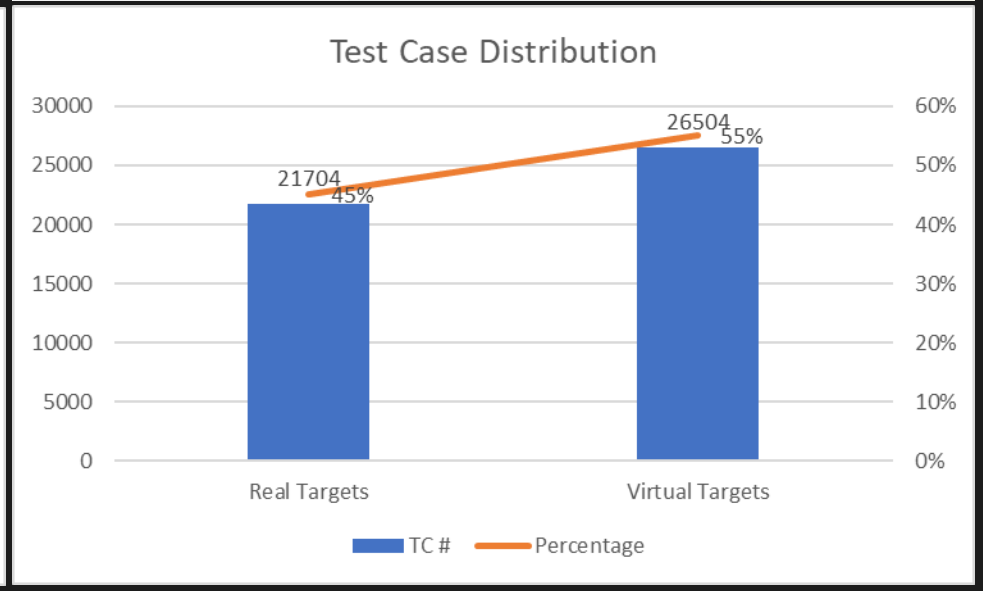
VxWorks Test Metrics Digital Twin

- Virtual Targets are used in almost all nightly domains
- Virtual Targets BSP Vs Real BSP: 13 vs 25
- Virtual Targets covers all architectures (riscv/arm/ppc/ia)
- 65% Nightly Targets are virtual one (249 of 385)
- 55% Nightly Test Cases are executed on Virtual Targets (26,504 of 48,208)

VxWorks Nightly Testing		
TR Domain	**Real Targets**	**Virtual Targets**
arm	14	37
bc	0	0
cert	0	13
compiler and language support	10	73
container	7	8
core	10	24
fs	18	0
graphics and multimedia	4	0
ia	7	16
iot and third-party software	10	4
networking	9	11
ppc	14	24
riscv	0	31
simulators	0	1
system	18	5
usb	9	2
workbench	6	0





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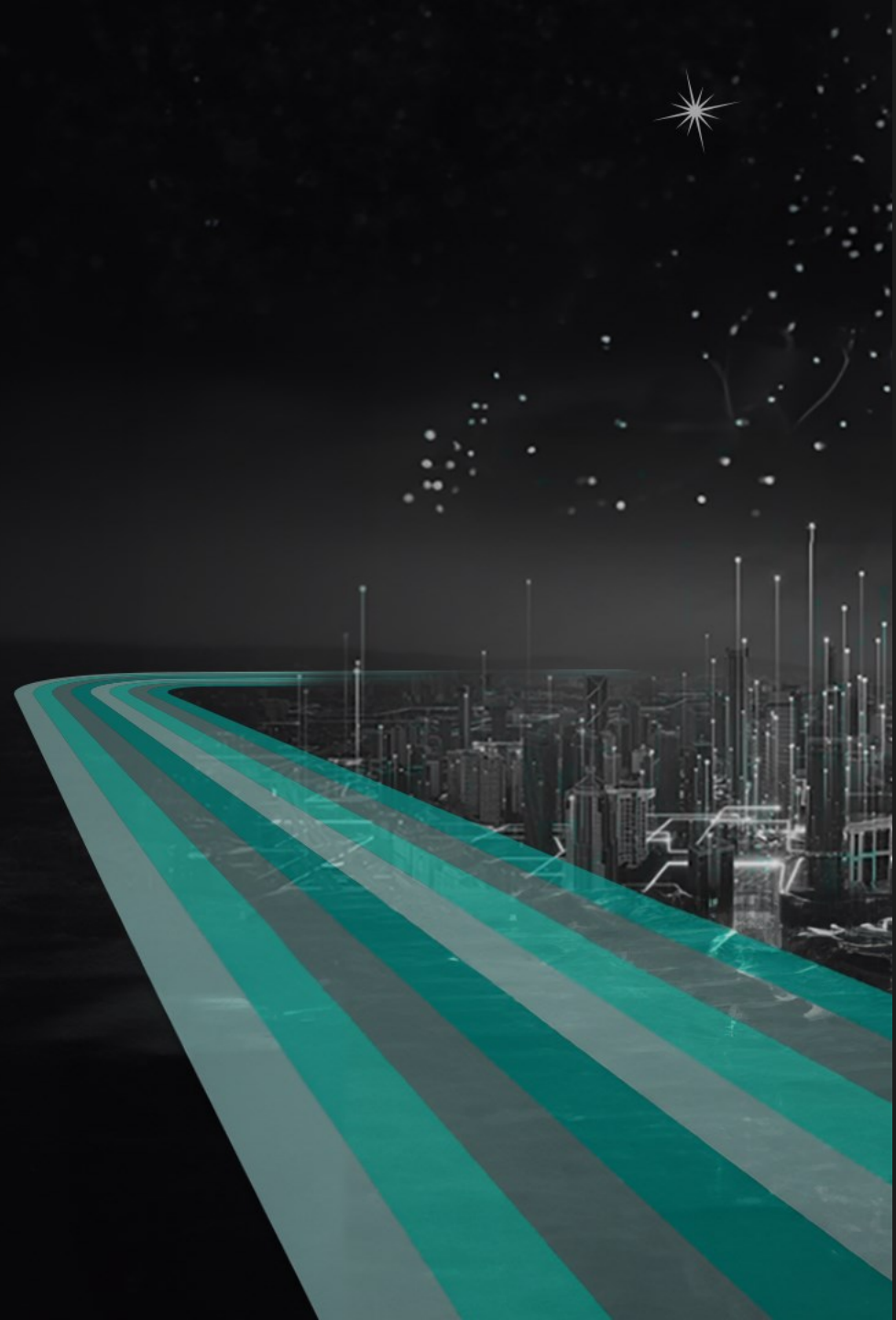
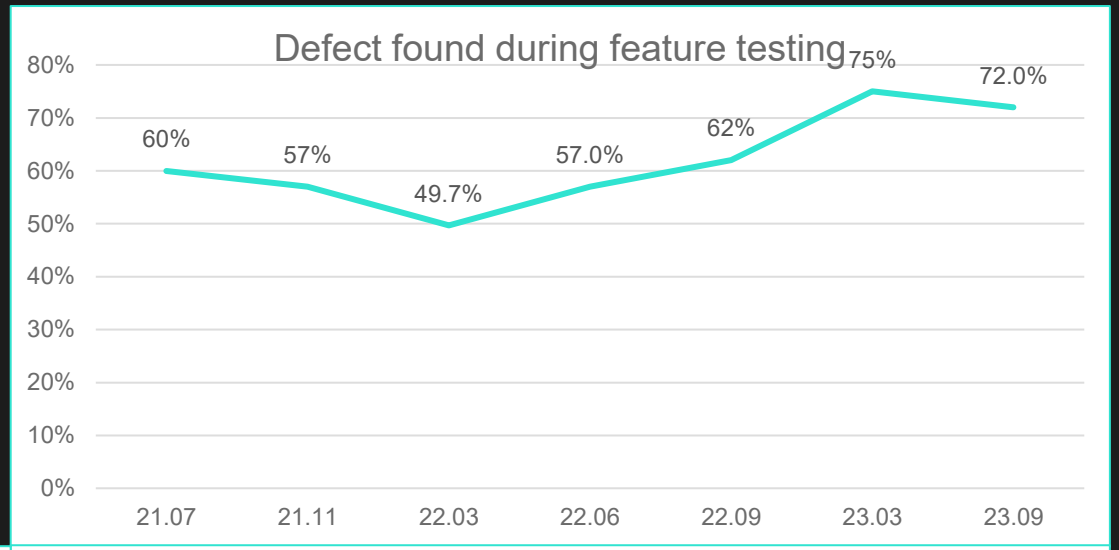
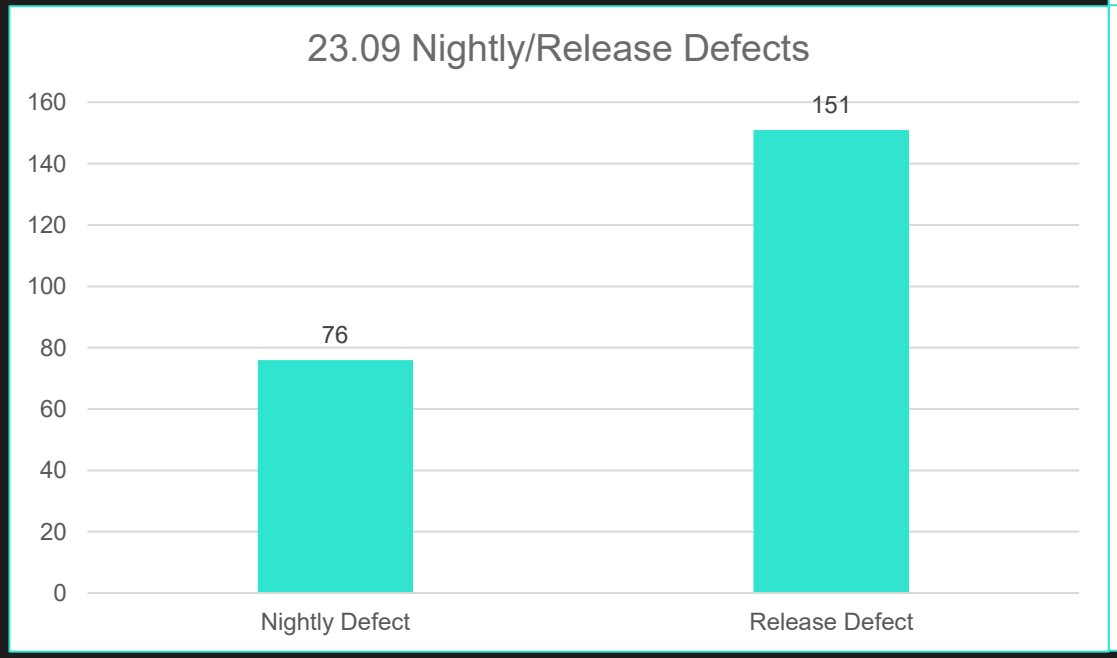
Benefits of DevOps To Product Quality

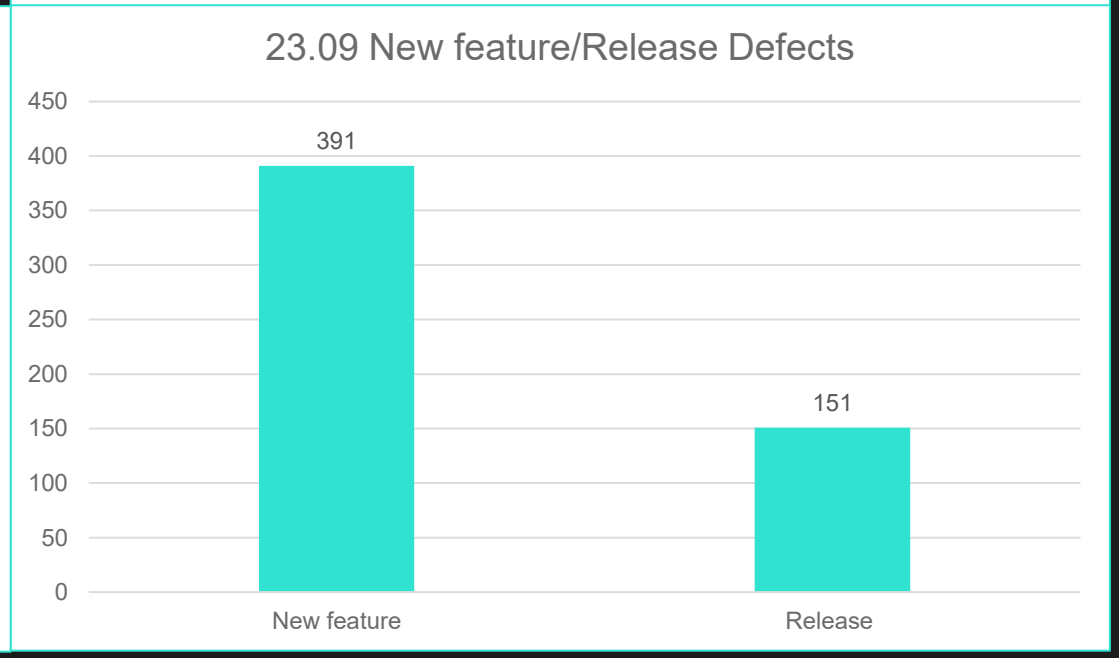


VxWorks Quality Metrics Shift Left

- 72% or 391 defects found during feature tests (before Feature Complete Milestone)
- 50% of Release Test defects found by Nightly Tests







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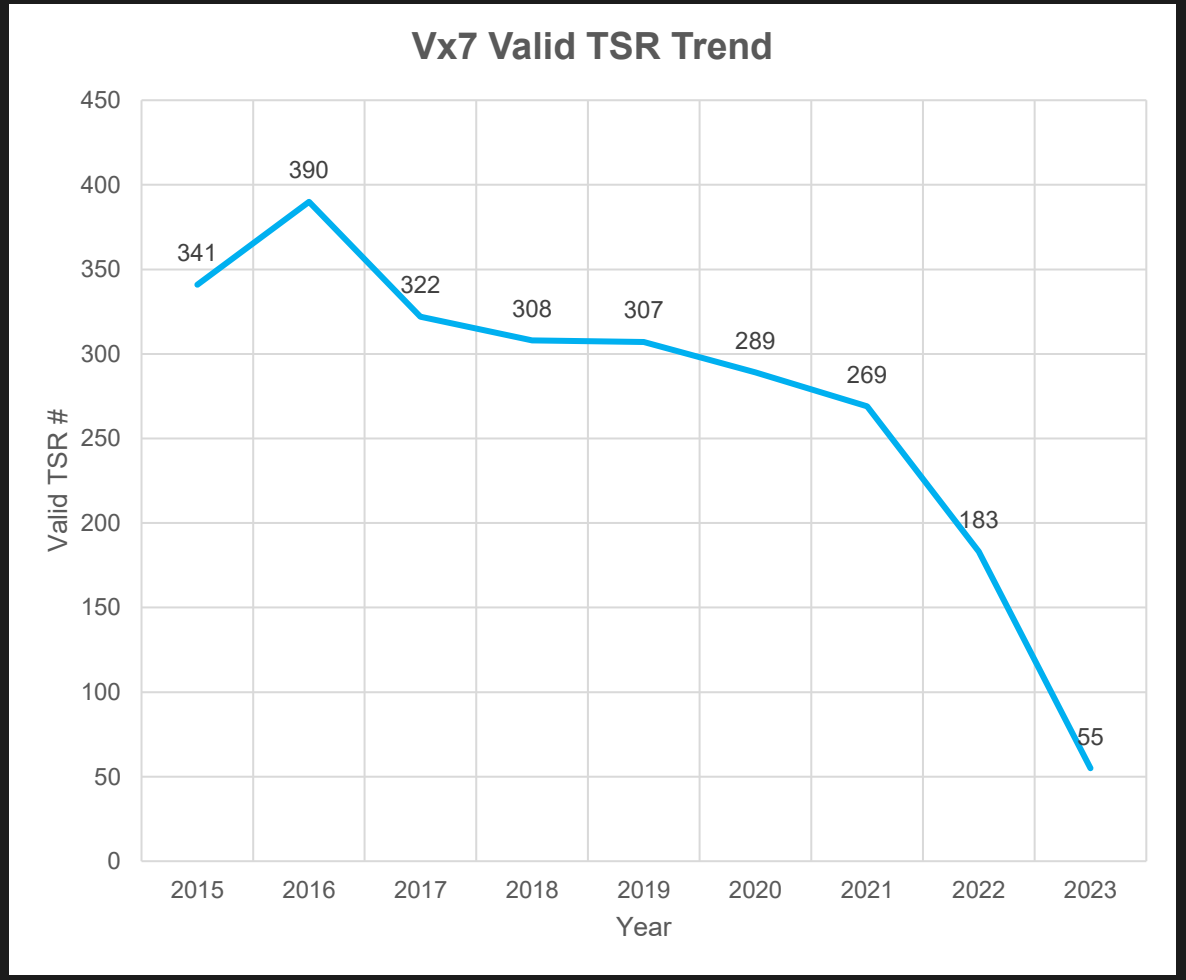
VxWorks Quality Metric Valid TSR

- Valid TSR (Technical Support Requests) are product defects missed by engineering teams
- Vx7 launched in the end of 2013
- VxWorks CI started from 2016
- Valid TSR is tracked from 2015
- 2023 data are not complete data yet



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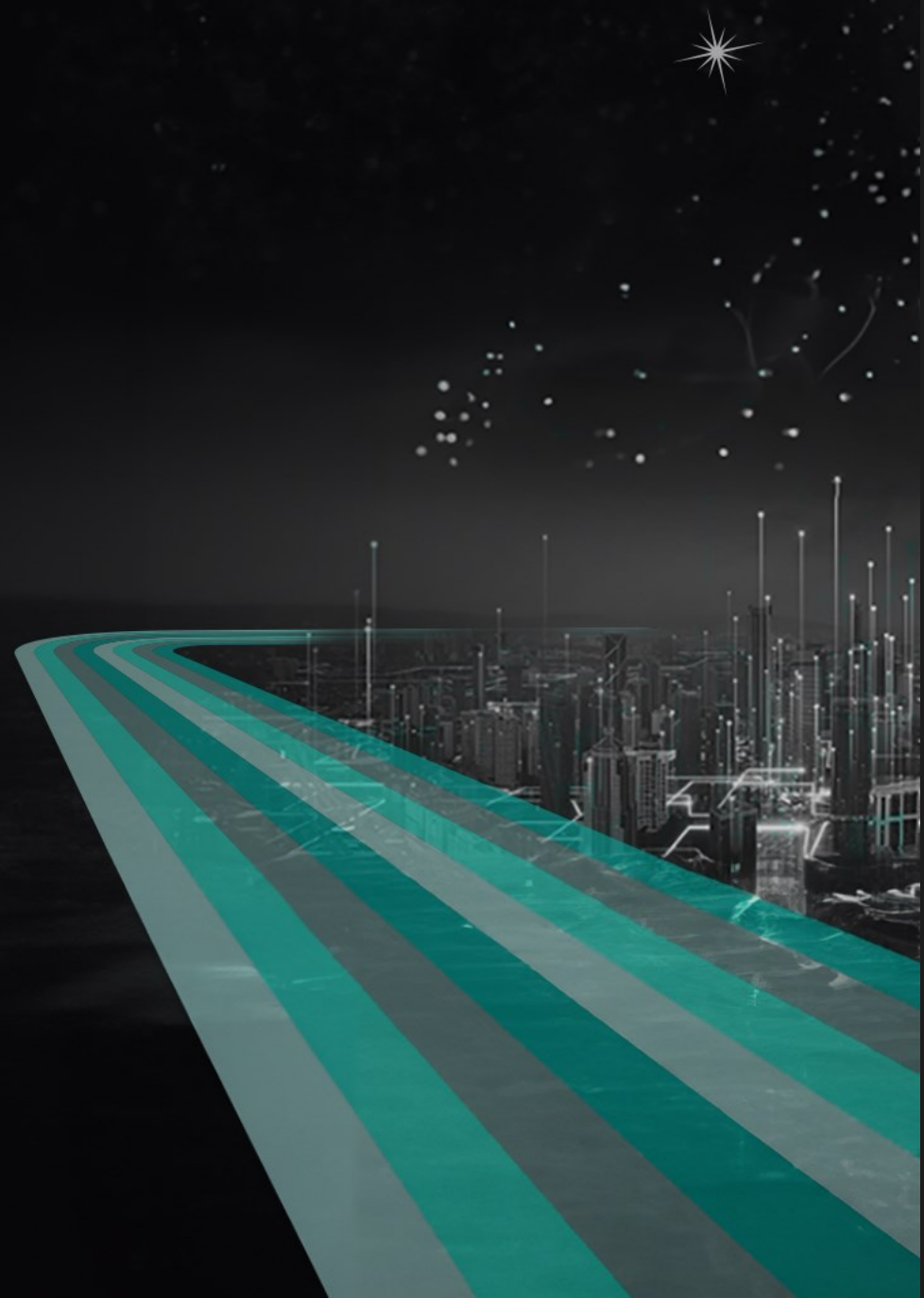
DevOps in Wind River Summary & Key Takeaway



DevOps in Wind River
Summary & Key Takeaway

- WRStudio Based DevOps Implementation
- Continuously Enhance Engineering Efficiency & Product Quality
- General Product together with Customized DevOps Solution

  Through Professional Services

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