BlackBerry | **QNX**

TECHFORUM CHINA 2024

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Honoring the Pioneers, Leaders and Experts of SDV

CODING THE CAR 2.0

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Jan 7th, CES 2025: Celebrating Automotive SW engineering for the 3rd year in a row!

MOTORTREND SDV INNOVATOR AWARDS

in partnership with **BlackBerry** **QNX**

BlackBerry | **QNX**

Agenda

- QNX progress in the last 12 months

- Global context and the evolving automotive SW requirements

- What is the QNX overall roadmap/focus going forward

- Summary/Key messages

Examples of BlackBerry QNX Progress in the last 12 mths

Product / structural progress

- Biggest product launch year in a decade
  - QNX SDP 8.0, QNX in the cloud/Cabin, QNX Sound, IVY GA etc
- Reached critical mass in our R&D globalization efforts

Customers / Partners progress

- Now 255M cars on the road using QNX!
- 100+ DWs last 18 mths; Multiple strategic wins despite global SDV delays
  - ~67% of Auto design wins directly with OEMs
- Multiple external QNX awards/recognitions, e.g.
  - Frost and Sullivan Company of the Year, PACE Award, MotorTrend Awards etc

Thank You! We are blessed to have the best customers and partners in the world – Globally and in PRC!

Examples

Customers/partners…Ecosystem...QNX Subject Matter Experts!...

OEMs/T1s

Distributors & Value-Added Integrators (VAIs)

Semiconductor Partners

Software Partners

Extract Global Stats...

10/10	Top Automakers
7/7	Top Tier 1 OEMs
24/25	Top EV Makers
255M+	Cars on the Road
R&D 30%+ of revenue	embedded SW only...
1100+ patents	100s pending...

Broadbased shipments/engagement across the PRC ecosystem for multiple compute domains (e.g. Digital cockpit, ADAS L1-L3+, Centralized GWs, Advanced clusters, Zonal, Acoustics, IVY…)

QNX SDP 8: Next Generation foundational SW for EDGE compute

QNX
MICROKERNEL
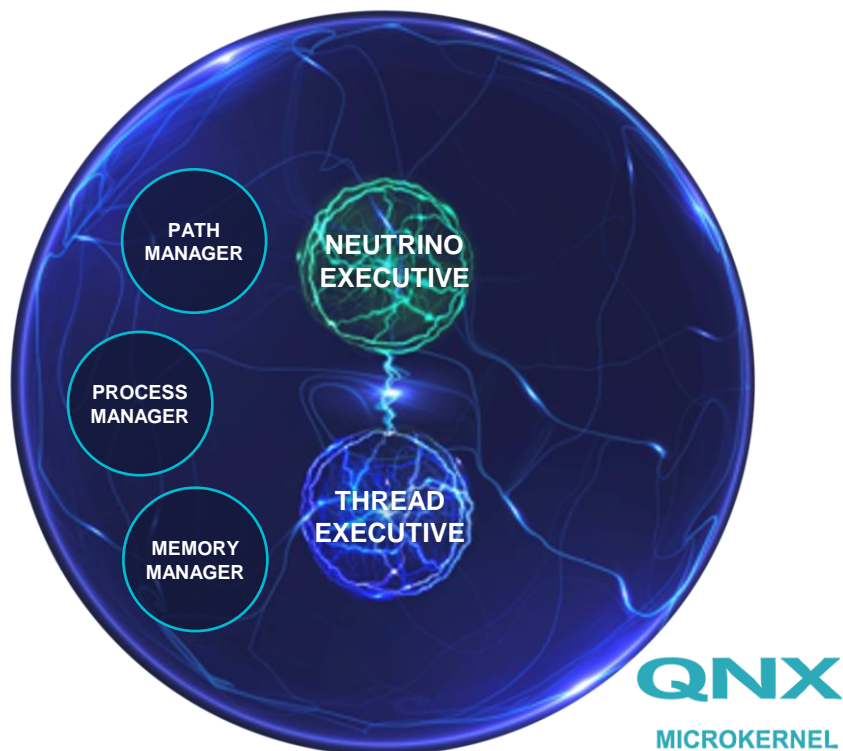
- **Starting from the most advanced RTOS in the world – QNX SDP 7.x – 4+ yrs of R&D based on leading SOC vendors input/requirements**

- **Paradigm shift in microkernel performance vs QNX SDP 7.x**

  – Backward compatible w broad range of additional highlights (e.g. high performance networking, upgraded toolchain, MS VS code support, 64 bit (x86, ARM v8/v9) etc etc

- **10+ of the leading global silicon vendors already committed to QNX SDP 8**

 – Multiple DWs, Broad range of PRC engagements; first SOP 2025

- **DATES: SDP8 OS GA Dec 2023, HV, QOS in EA Dec 2024, Containers in EA, 1H 2025; QHS EA 1H 2025; QNX SDP 8 Cloud available since January 2024!**

QNX SDP 8: Not a "regular release update"…once in a decade paradigm shift!

QNX SDP 8 – Example Benchmarks...a paradigm shift in EDGE compute performance

Scalability
QNX SDP 8 linear scaling w # of cores

QNX 8 OS Scalability Benchmarks
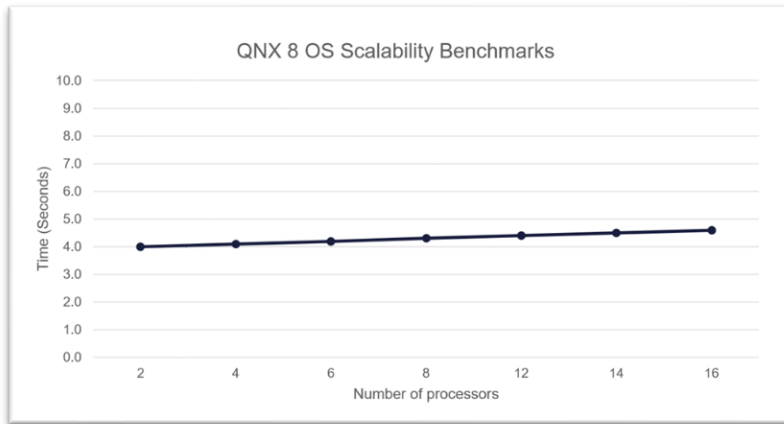
Throughput
QNX SDP 8 vs 7

QNX 8 OS Throughput
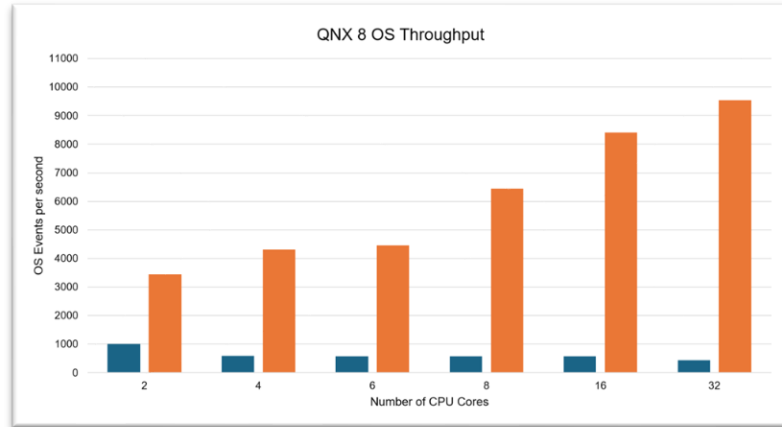
- 🟧 QNX SDP 8
- 🟦 QNX SDP 7.1

Latency and Jitter
QNX SDP 8 vs Linux

Determinism: QNX 8 OS vs different Linux distributions

	SDP 8.0	RTLinux 6.1	Ubuntu 24.04
Average Latency	18.316	55.393	279.95
Maximum Latency	39.55	676.807	3152.406
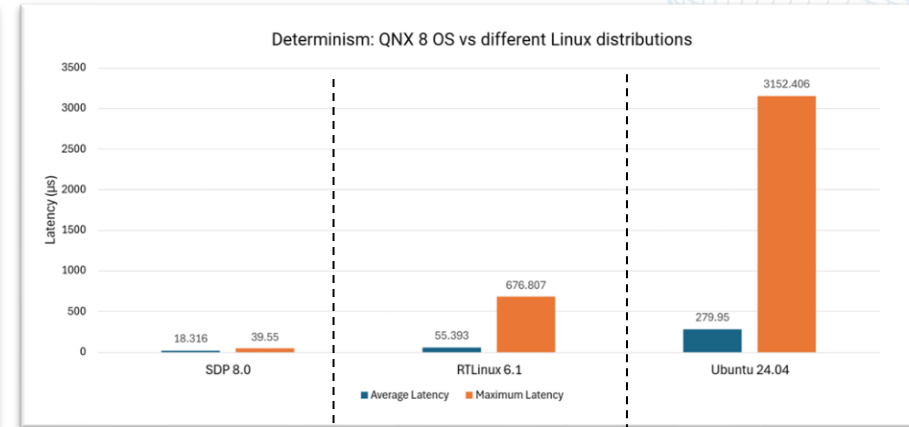
QNX 8.0   **RT Linux 6.1**   **Ubuntu 24.04**

- 🟦 Average Latency
- 🟧 Max Latency

QNX 8 – Highest Performance AND Highest safety/security/reliability

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Simplistic <u>global</u> context: The SDV evolution has reached an inflection point…

Historical Perspective:
In-House Development

- 5+ years ago, the auto industry realized that **software would rapidly increase in importance** over the lifecycle of the vehicles
- Automakers began to take much more **software development in-house**

Lessons Learned

- Foundational software platforms **are a critical enabler** for consumer experiences, TTM and cost…
- However, it is **difficult and expensive to develop/maintain**, with little differentiation for consumer-facing propositions

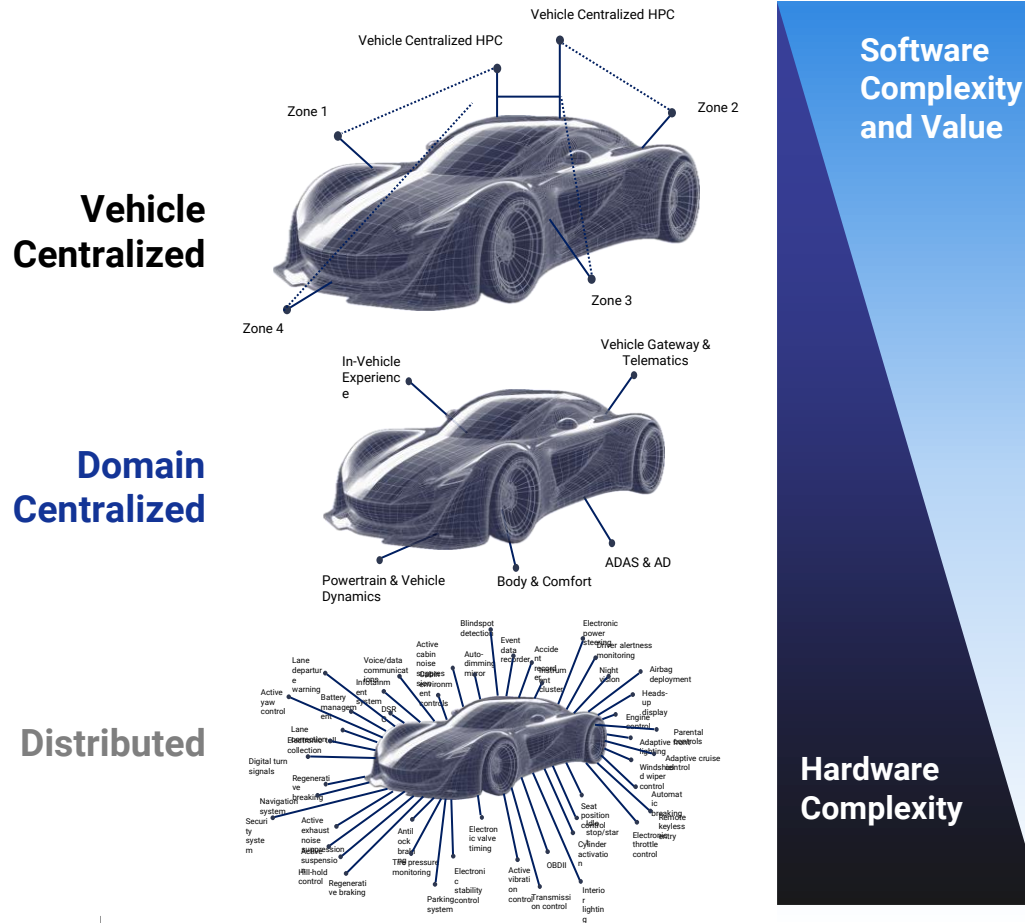## Current Focus:
Partnership Preference

- Automakers desire a **standardized vehicle software platform** from a trusted and proven partner
- Automakers shifting focus to customer-facing applications that **build brand loyalty**, **differentiation, and value**

Opportunity - again! - for Greater Collaboration in <u>foundational</u> SW
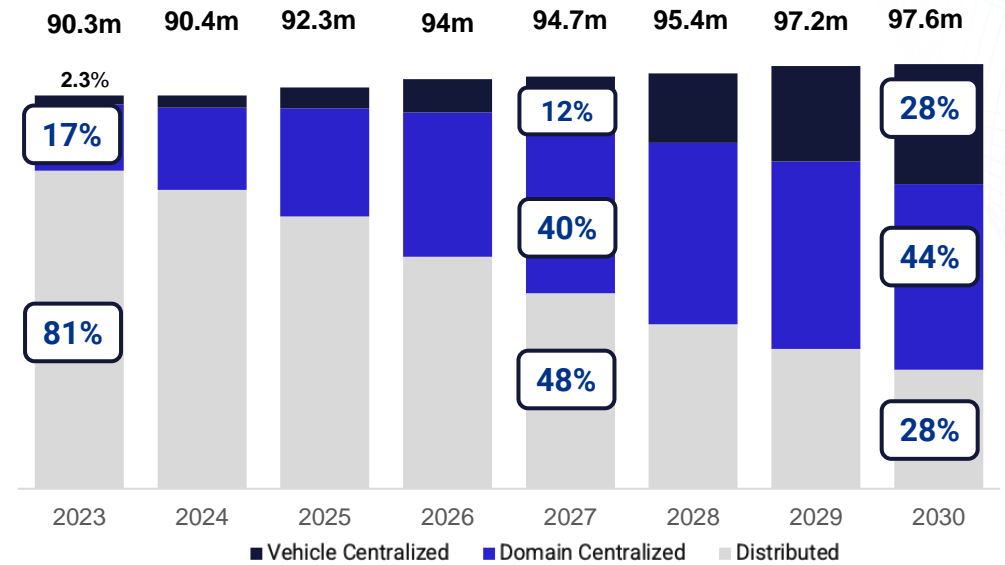
SDV Transformation, still in early stages...

Electrical/Electronic (E/E) Architecture Types & Complexity Evolution

Vehicle Centralized

Domain Centralized

Distributed

Software Complexity and Value

Hardware Complexity

E/E Architecture Development

Global Light Passenger Vehicle (LPV) Volumes

2023	2024	2025	2026	2027	2028	2029	2030
90.3m	90.4m	92.3m	94m	94.7m	95.4m	97.2m	97.6m

2023: 2.3%, 17%, 81%
2027: 12%, 40%, 48%
2030: 28%, 44%, 28%

■ Vehicle Centralized ■ Domain Centralized ■ Distributed

Source: S&P Global E/E Architecture Forecast, Sep. 2024

QNX is the foundation for the current & next wave of SDVs; we are working with[1]:
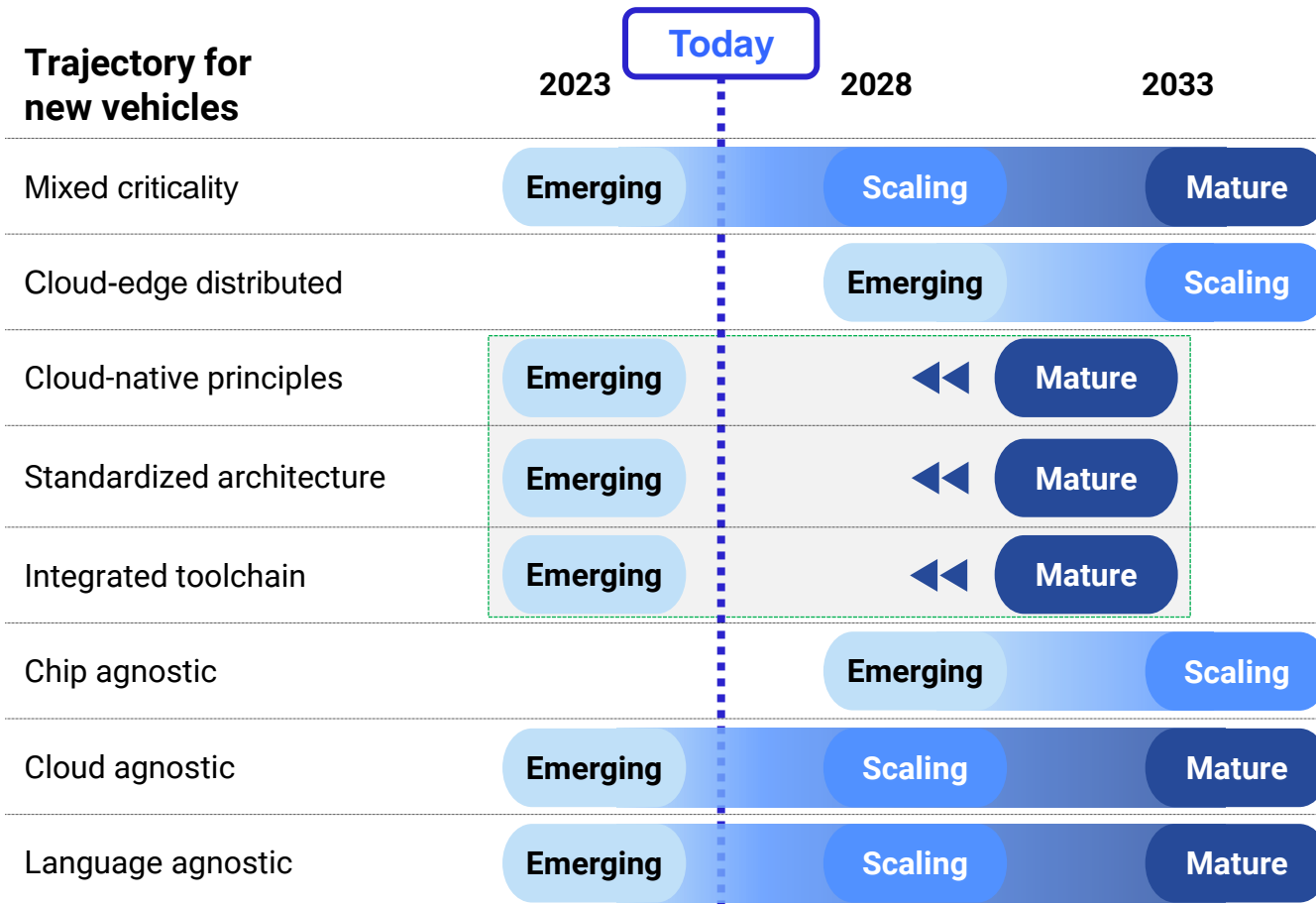
16/20 Top global OEMs for Cockpit Solutions[2]

15/20 Top global OEMs for ADAS Solutions[2]

100% All Commercial L3 HAD Systems[3]

Many critical SDV dimensions to be managed across <u>all compute stacks</u> to realize the "SDV vision"…most progress for DC & ADAS

Trajectory for new vehicles

|	2023	**Today**	2028	2033
Mixed criticality	Emerging		Scaling	Mature
Cloud-edge distributed			Emerging	Scaling
Cloud-native principles	Emerging		◀◀ Mature	
Standardized architecture	Emerging		◀◀ Mature	
Integrated toolchain	Emerging		◀◀ Mature	
Chip agnostic			Emerging	Scaling
Cloud agnostic	Emerging		Scaling	Mature
Language agnostic	Emerging		Scaling	Mature

Noteworthy…maybe obvious…

- Using principles on the left, all global OEMs simultaneously trying to
  1) manage the increasing **complexity**,
  2) reduce **cost** and 3) improve **TTM**

- **SW re-use** across a) compute domains, b) geographies and c) different SOC implementations, while adhering to safety/security regulations, certifications and IP standards, **critical for ROI**

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RECAP: Our Portfolio – Foundational SW for the Software Defined Vehicle…across any compute domain and for the future HPC architecture

Next Gen Automotive SDV architecture (Source: SBD Automotive)

Domain based example
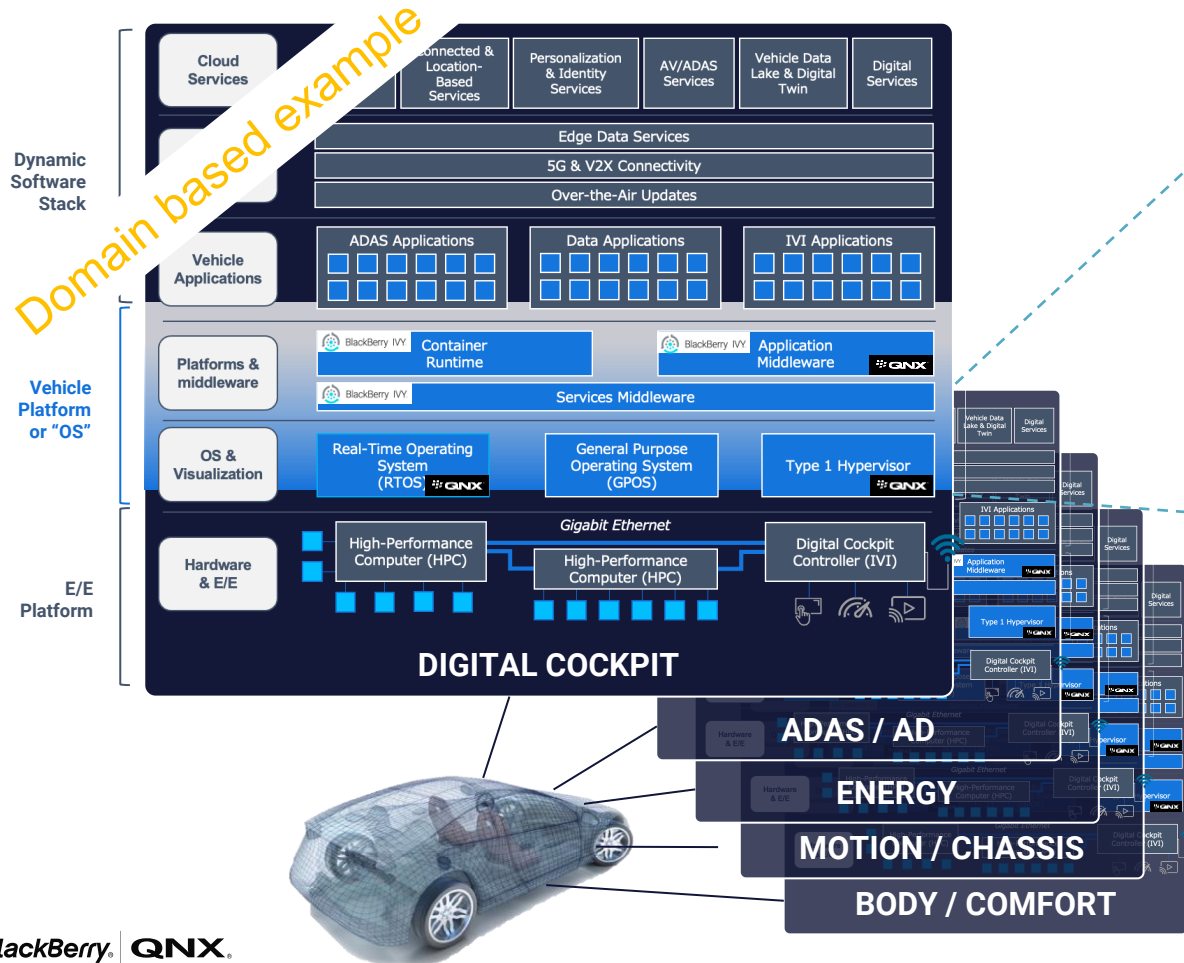
The QNX Portfolio

- **Highest performing, POSIX compliant microkernel RTOS – EDGE and Cloud**
  - Hypervisors and safety/security certified OSs on Unified codebase, APIs and tooling
- **Associated Tools, frameworks, middleware, cryptographics, etc. wrapped in advanced professional services**
  - E.g. Including major platforms like IVY and Acoustics…

QNX portfolio primarily deployed as "components" in OEM Platform/OS deployments across stacks. But we have requests in the last 12 mths to do more...

FROM:
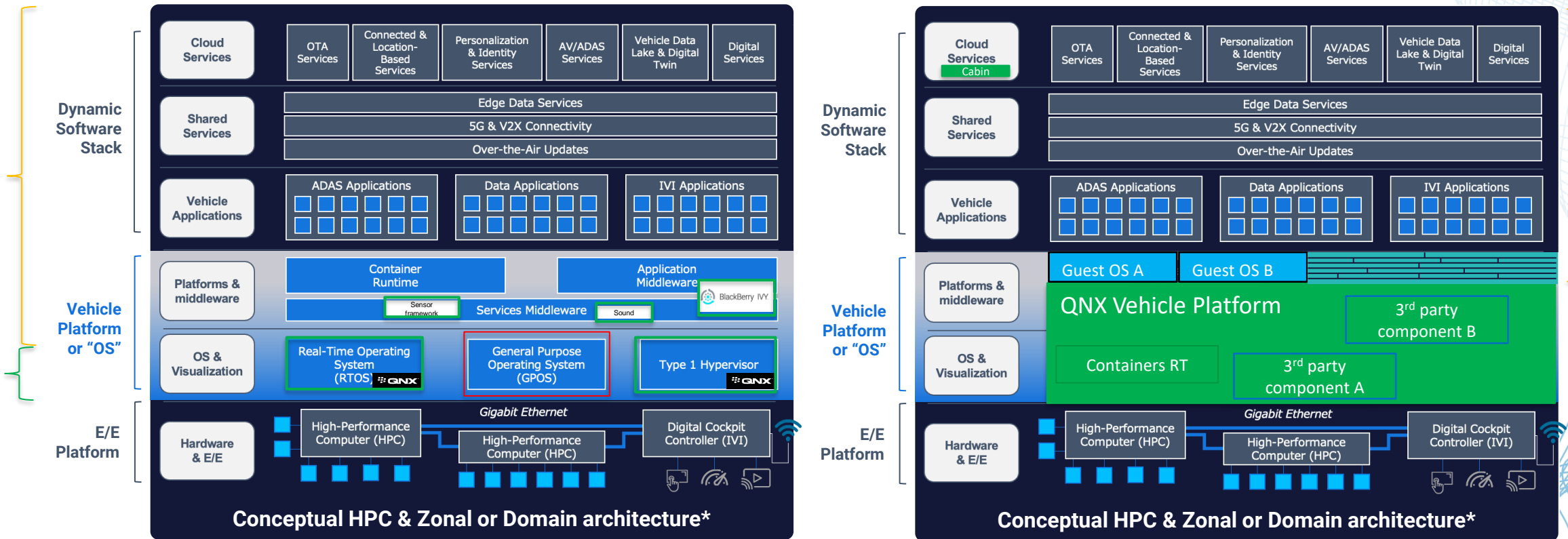*...stand alone components/"platforms"...*

TO: *(If requested!)*
...a vehicle platform w integration responsibility...

Conceptual HPC & Zonal or Domain architecture*

BlackBerry | QNX   *SBD – Automotive SW Defined Vehicle*

14

Enabling Innovation at Scale in the next 12 mths and Beyond

Innovation at the Edge

QNX 8.0 Portfolio Expansion

- Develop high-value add-on products, e.g., **containers**, virtualization extensions, complex scheduling support
- **Commercial release of Hypervisor 8.0 across multiple silicon vendors**
- Provide pre-integrated platforms and domain solutions with partners
- Next-generation high-performance silicon and board support

Software-defined audio products

Micro-controller and RISC-V investigation

Innovation in Safety and Security

Safety Enhancements

- **Provide QNX 8 safety OS, QNX 8 safety Hypervisor and certified Containers**
- Expand safety certified software portfolio and professional services
- Release qualification toolkit for C++ for automotive and general embedded

Security Upgrades

- Deliver a Software Bill-Of-Materials and ISO 21434 compliance service
- Introduce monitoring and audit framework for intrusion and anomaly detection

Reduce Developer Friction

QNX Everywhere

- **Launch program to significantly expand QNX developer community**

Open-Source Project Support

- **More open-source projects ported, optimized, and maintained**

Cloud Enablement

- Cloud-first tooling strategy
- **Cloud product enablement: QNX 8 OS, safety products, virtualization, platforms**
- Virtual ECU enablement
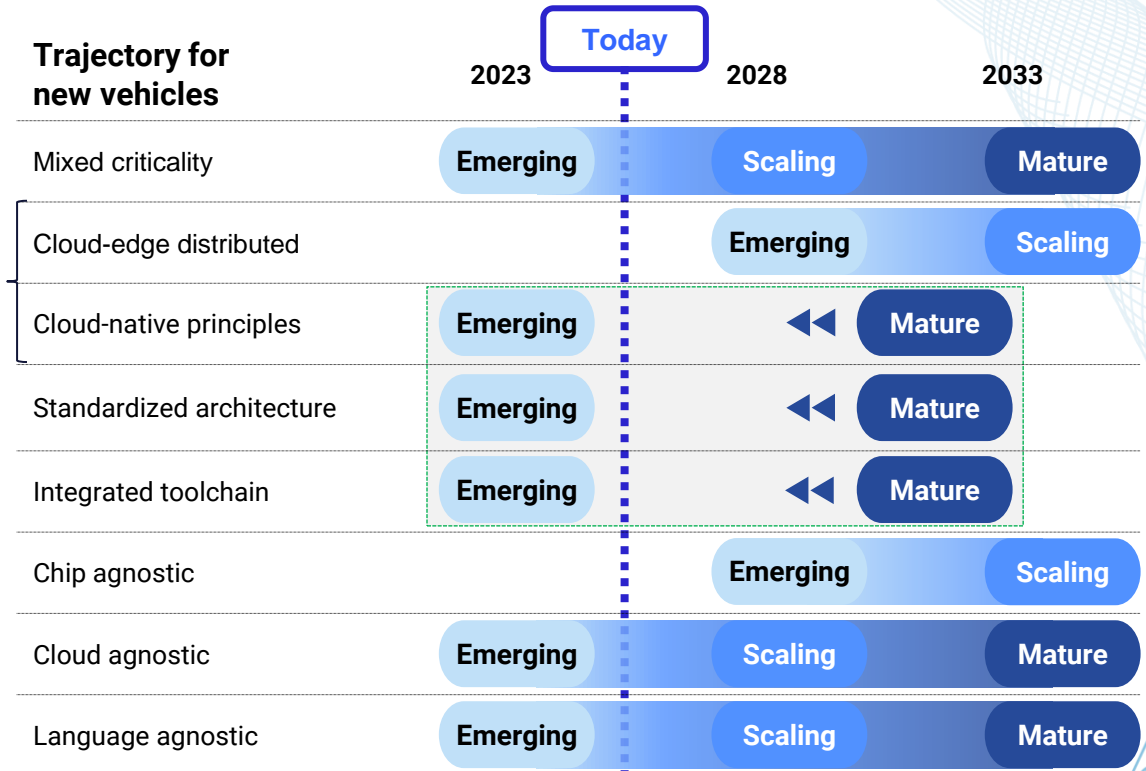- New cloud support and collaborations

Building on Our Reputation for Performance, Safety, Security, and Reliability

What is the QNX portfolio/roadmap "fit" w the SDV critical dimensions? Laser focused on foundational OEM support

Examples of QNX Support for key requirements/dimensions

- **World leader in hypervisors for advanced EDGE compute**

- **SDP8 supported/running in AWS since 12 mths, additional cloud providers under way**
- **Cloud first tooling strategy, MS VS code, containers in early access/GA 1h 2025; QNX cabin released/first DWs!**

- **QNX world leader in the 2 most advanced automotive compute stacks: Digital Cockpit (16/20) and ADAS (15/20); Broad based engagement/wins for emerging: HPC, zonal, GW, B/C etc**
  - QNX foundational SW for global deployment...worldwide certifications and IP standards
  - QNX everywhere allows non-commercial access for prototyping and QNX OSS efforts are ramping!

- **QNX broadest advanced chip support; SDP8 co-developed w leading SOC vendors; SDP8 already has 10+ committed chipset vendors**
  - Fully scalable offering; SDP8 HPC, SDP7 cost/performance

BCG/WEF assessment of global SDV maturity

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Summary

- QNX has made a lot of progress in the last 12 months.

  – We executed on the biggest product launch in a decade and we already have critical DWs – globally and in PRC - for these next gen products

- SDP8 is delivering on its promise of "no compromise" for next gen multicore SOCs – highest performance AND highest safety/security/reliability

- We are still early in the journey towards the fully Software Defined Vehicle..and complexity is increasing

- Globally many OEMs have reached an inflection point and looking to improve SW ROI
  – Focusing in house SW development in the application layer
  – Standardizing foundational SW across compute domains, geographies and silicon
  – QNX is being asked to "do more"

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Thank You
Enjoy TECHForum 2024!