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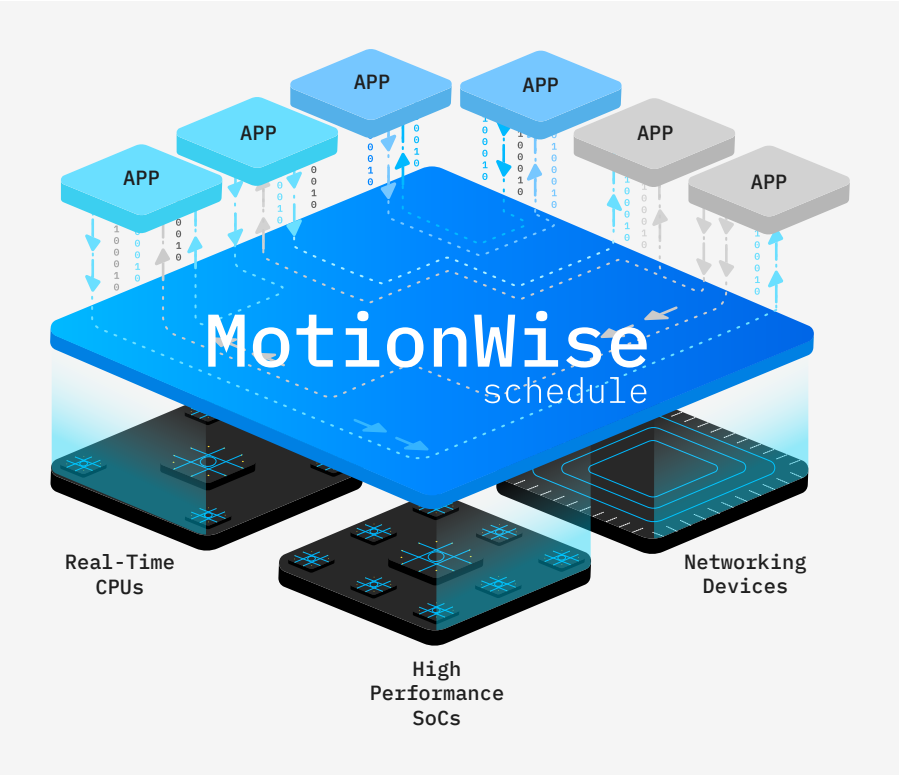
MotionWise schedule

MotionWise Schedule for QNX SDP 8.0 & MotionWise Schedule Certified for QNX OS for Safety 8.0

The powerful scheduling engine in QNX SDP & QOS 8.0

MotionWise Schedule is a software product designed for Software Defined Vehicles (SDVs), with a focus on safety and real-time domains.

- Built on 20+ years of expertise and technologies
- Comes with rich toolset and embedded functions
- Enables safe and efficient deployment, and execution of mixed-criticality applications within complex, multi-core SoCs
- Automates schedule configuration and application integration
- Designed for automotive safety and cybersecurity (according to ISO 26262 up to ASIL B and ISO/SAE 21434 to CAL 4)
- Available for QNX SDP 8.0 and for QNX OS for Safety 8.0
- Accessible directly from the QNX Software Center in one of the following variants:
  - "MotionWise Schedule for QNX SDP 8.0"
  - "MotionWise Schedule Certified for QNX OS for Safety 8.0 (certification details are described in the release documentation)



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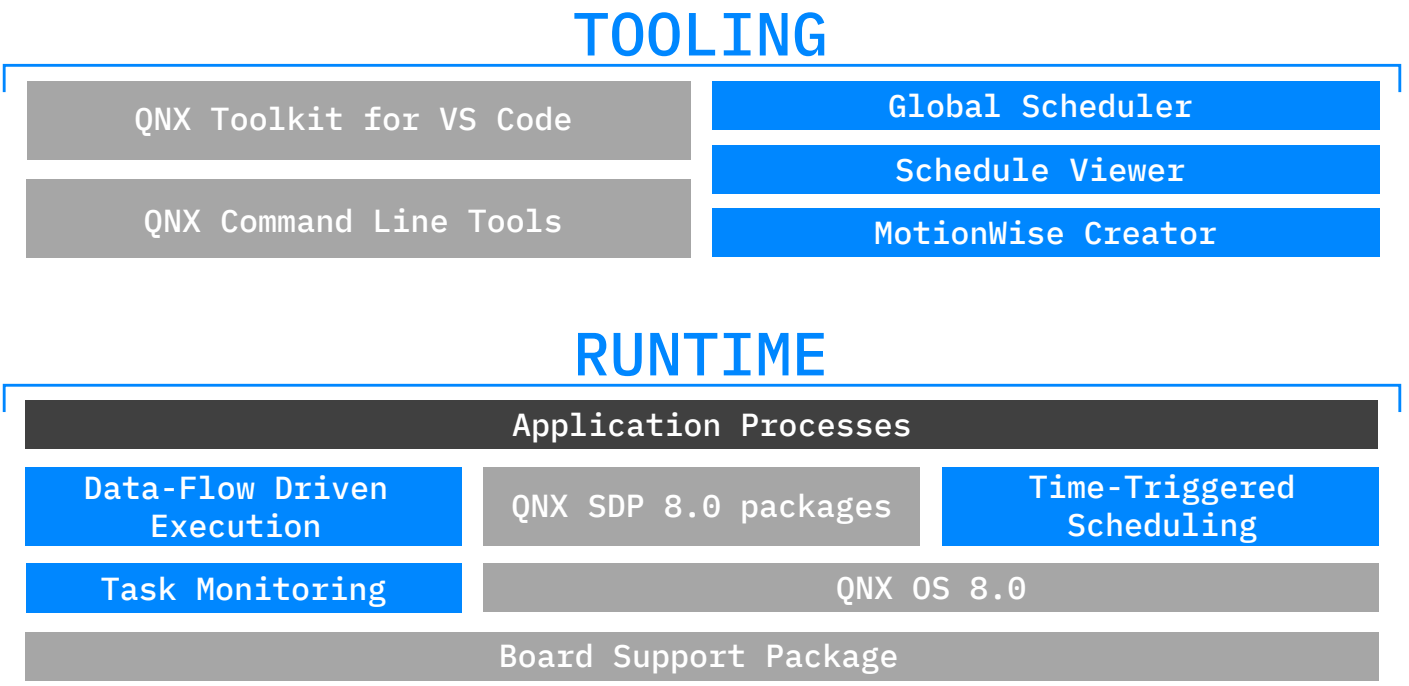

KEY BENEFITS

Reduce the time and cost of software integration

MotionWise Schedule streamlines the configuration and generation process and facilitates the derivation of correct embedded configurations, not only for MotionWise Schedule, but also for QNX OS.

Ensure end-to-end latencies for application chains

MotionWise Global Scheduler creates a consistent and compatible schedule configuration considering application execution dependencies in the system. System requirements such as latency, reliability and deadlines are always met, ensuring timely and accurate system behavior.

Finish faster data-dependent tasks and save valuable CPU time

Reduce the latency of data-driven task chains and lower the runtime scheduling overhead of multi-core Directed Acyclic Graphs (DAGs) with the user-space scheduler of MotionWise Schedule.

Freedom from Interference between applications

In cases where time determinism is of paramount importance, MotionWise Schedule's time-triggered scheduler ensures freedom from interference for applications in the temporal domain.

Simplifies verification & validation through a correct-by-design approach

With its correct-by-design approach, MotionWise Schedule ensures that timing constraints and resource requirements for safety and time-critical workloads are met even in the corner cases. This significantly reduces the effort required in the system verification and validation phase.

FEATURES

Global scheduling

MotionWise Global Scheduler follows the correct-by-design approach. It implements scheduling algorithms to automate the integration of complex software functions on high-performance automotive computing platforms. It is designed to create a global deployment solution for all requirements defined by architects, developers and integrators working on the same vehicle software. Such requirements are:

- System/platform definition (CPUs/cores)
- Specification of tasks and their dependencies
- Timing requirements (time budget, deadlines, jitter, etc.)

It applies a Time-Triggered Architecture as a basis, shifting the complexity from an explosion of possible runtime states to solving the configuration problem. It integrates different computational models into a single, unified framework. Sporadic (event-triggered) workloads that use classical scheduling approaches such as priority-based scheduling are integrated with the time-triggered approach.

It is supported by intelligent, highly parallelized heuristic algorithms and solves more than 80% of complex cases (10^{5000} possible configurations) within 200 seconds.

Time-triggered scheduling

MotionWise Schedule provides a time-triggered scheduling policy for periodic, time-critical workloads with strict timing requirements. Applications are executed according to schedule tables created with MotionWise Creator according to user constraints.

Activity sequencing

MotionWise Schedule provides a dataflow-driven execution solution on the microprocessor, also known as Activity Sequencer. It is a suitable solution for Directed Acyclic Graphs (DAG), enabling multithreading and parallel execution of interdependent activities on multiple CPU cores. This is a typical use case in ADAS/AD systems that process multiple input data from different sensors.

The Activity Sequencer executes application threads according to predefined data dependency.

The Activity Sequencer is a user space scheduling policy that supplements the time-triggered scheduler. This allows flexibility during development as execution can be easily customized without affecting the schedule of other applications. Application developers can define and change the behavior of the application without having to consider the higher-level system schedule.

The Activity Sequencer supports a single process or multiple separate processes, e.g. to accommodate different application architectures or to enable a mixed criticality graph (activities with different safety requirements).

Event-driven scheduling*

The MotionWise Global Scheduler allocates resources for both periodic and sporadic workloads at design time. This approach ensures that workloads with real-time requirements meet their deadlines, even if the exact activation time during integration is unknown.

Such event-driven tasks are executed when a user-defined event occurs, e.g. when camera images are received by the ADAS/AD controller. They typically have a minimum interarrival time, which makes it possible to schedule the associated event-driven tasks.

Computation Chains

A computation chain is a set of time-critical tasks that have data dependencies, where the entire chain must be started and completed within a predefined time interval (end-to-end latency). Such chains are created with MotionWise Creator. The schedule tables are created to meet the sequence and latency requirements

MotionWise Schedule has no constraints on the length or number of the computation chains. For example, a chain can be triggered by an incoming vehicle signal or any time-triggered task and can span multiple CPU cores. The tasks involved can have different time periods, while the entire Computation Chain itself is executed periodically.

Computation Chain Monitoring*

The execution order and end-to-end latencies are often safety- critical. MotionWise Schedule provides a runtime safety mechanism to monitor whether tasks are executed as planned and the specified latency is maintained, otherwise, it raises an error to trigger safety and recovery reactions.

Task Monitoring

MotionWise Schedule provides Task Monitoring on microprocessors that automatically monitors application tasks as they are executed. The Task Monitoring configuration is derived from the input configuration provided by the user and generated by MotionWise Creator.

SOA LogCollector

MotionWise Schedule implements its own log message collection mechanism on top of POSIX OSs, with a simple API for observing debug- and diagnostic information provided by the MotionWise Schedule components running on POSIX OS. The release contains pre-implemented adapters for the integration with DLT standard logging stack or printf.

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TOOLS

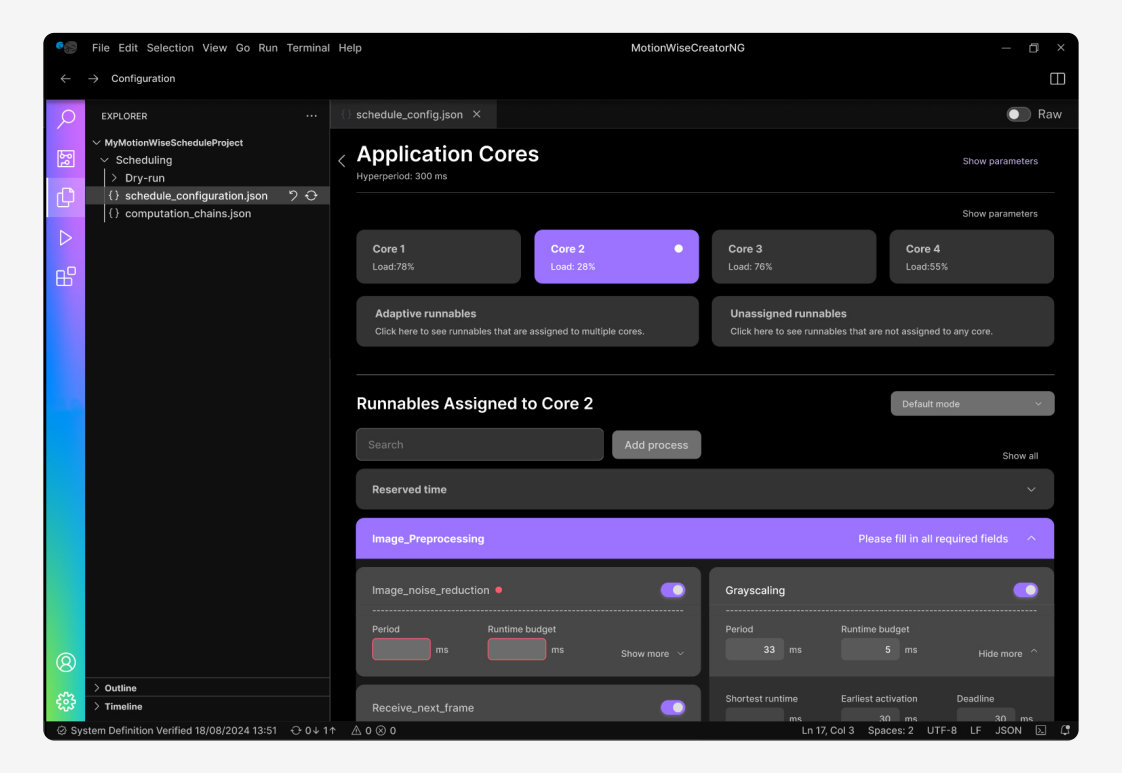
The MotionWise Schedule Toolset consists of software applications used to configure, generate and test the behavior of the in-vehicle stack.

MotionWise Creator

MotionWise Creator is an essential tool for the configuration, creation, integration and deployment of MotionWise Schedule in a project-specific system. It consists of frontend tools (client) and a cloud-based backend. To support the needs of all software developers, the frontend provides a Graphical User Interface (GUI) as well as the ability to use it directly via the Command Line Interface (CLI) on Windows and Linux.

While the CLI is intended for advanced users and integration into the Software Factory (CI/CD) on the user side, the GUI guides first-time users and ensures correct configuration through live validation checks and on-demand notifications.

MotionWise Schedule is designed for collaboration between team members: Users can work simultaneously on the front-end and back-end and regenerate the schedule configuration on either the branches or the main development line.



Schedule Visualization

Schedule Visualization is a feature/set of tools that measure and analyze the runtime of customer applications executed by MotionWise Schedule in-vehicle stack.

Once the schedule tables have been generated, the toolset allows the user to view and analyze the expected (planned) execution of the specified tasks and visualize the computation chains.

Schedule & Computation Chain Viewer

The Schedule & Computation Chain Viewer provides valuable input for system and software integrators, enabling the refinement of schedule configuration and the optimization of resource consumption.

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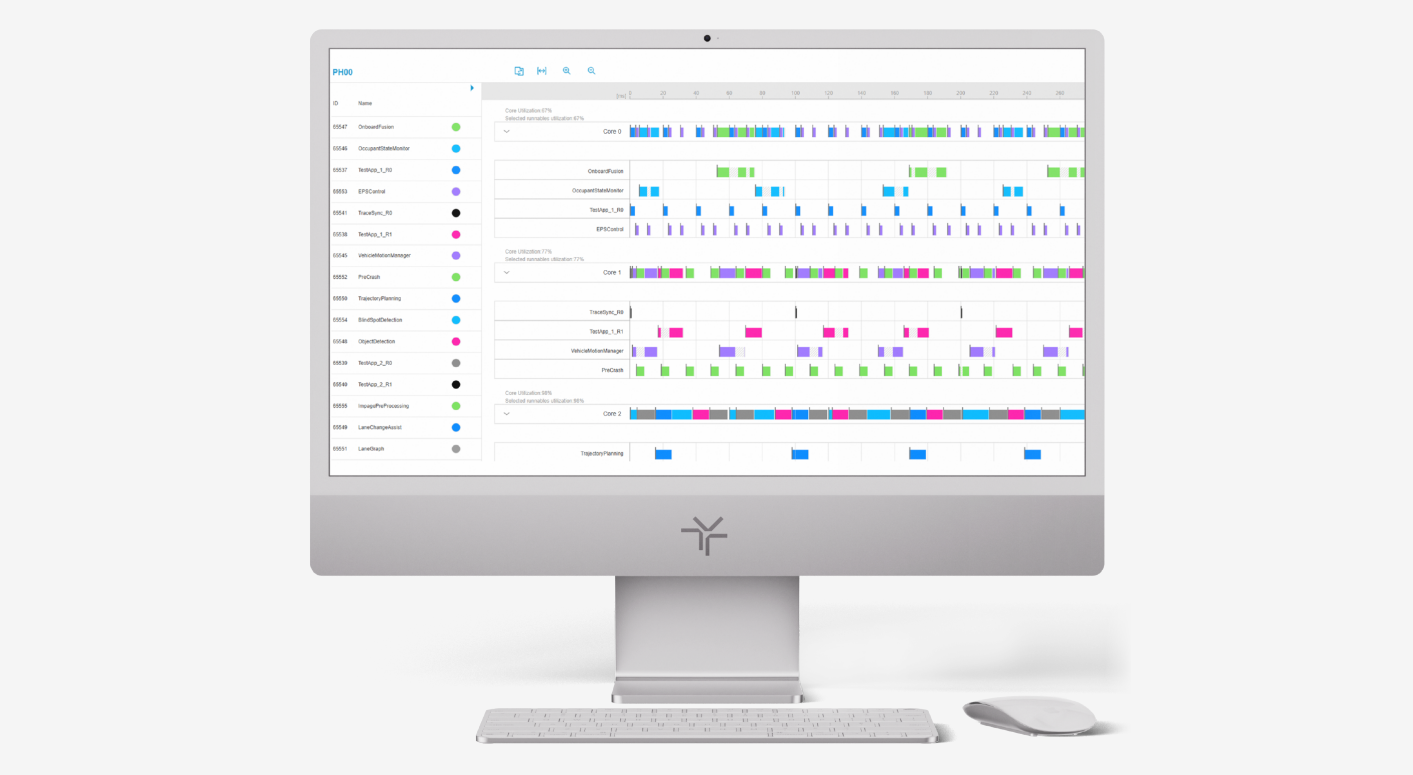
TracePoint Converter

MotionWise Schedule collects trace events from the system during runtime. This data is used to visualize runtime behavior.

Users can compare the actual execution with the planned schedule (i.e. the schedule tables generat-ed at design time) in the Schedule Viewer tool.



SUPPORTED ARCHITECTURES

MotionWise Schedule runs on QNX OS and supports a variety of widely adopted automotive SoCs. For a detailed list of SoCs, please visit the page Board Support Packages (BSPs) of QNX

MotionWise Schedule is independent of the vehicle domain (e.g. ADAS/AD, cockpit, etc.) and inte-grates well with standard automotive software stacks so that it can be used with as well as without Adaptive AUTOSAR.

* Coming in 2026