QNX Speech Framework

The QNX Speech Framework is state-of-the-art technology, designed to ease and speed-up the development of voice-controlled embedded systems. The framework abstracts the complexities of automatic speech recognition (ASR) and natural language processing (NLP) engines from the operating system platform and applications. This abstraction makes it easier for developers to build fully-integrated, voice-enabled systems for deployment with different third-party engines to satisfy regional preferences. The QNX Speech Framework manages all steps, from vocal utterance capture to action, and handles a wide-range of domains and intent scenarios. In addition, the framework is highly modular which lends itself to being easily extended and tailored to meet customer needs.

An Overview

Voice centric interfaces are widely available in automobiles today - arguably rivalling touch as the primary input. Automotive speech applications have evolved from speaker-dependent name dialing, to speaker-independent command and control of multiple vehicle domains. For example, infotainment controlled applications such as navigation, HVAC, multimedia, and phone functions including continuous digit dialing and name dialing are, today, infotainment table stakes. In addition, more recent advancements including voice-enabled SMS, email, and search are becoming needed features.

Improvements in speech recognition robustness, and NLP (natural language processing) are transforming the way voice-activation is used in vehicles. Past systems required users to speak in a prescribed manner, when NLP was not available. Today, users can query using natural, unconstrained speech to resolve requests across a wide range of domains (e.g. travel, points of interest etc.).

Existing automotive speech implementations are built as point solutions, that lock-in automakers to a particular speech recognizer and NLP engine. The QNX Speech Framework eliminates this vendor lock-in and eliminates the high non-recurring engineering fees associated with the rollout of each new program. The framework is designed with highly-flexible, dialogue management to enable developers to implement speech at any level (recognizer/NLP, or application) on a per domain/intent basis.

Benefits

- New framework simplifies the integration of speech interface technologies in a system:
  o Capture
  o Automatic speech recognition (ASR)
  o NLP
  o Text-to-speech (TTS) and
  o Speech-to-text (STT)

- Decouples ASR and NLP to facilitate swapping in 3rd party vendor solutions to accommodate regional preferences

- Normalized results across ASR and NLP technologies facilitate tailoring systems to customers' needs

- Multiple ASR and NLP engines can be run in parallel to increase overall accuracy

- QNX NLP module "QNX Semantics NLP" delivers or augments 3rd party NLP capabilities

- Apps have access to common speech/prompt platform with app specific NLP

- Easily extend voice recognition to new vehicle domains with new rules-based conversation module plug-ins

Features at a Glance

- All interactions between speech modules managed via an IO-ASR service

- Rules-based dialog management

- Supports multiple languages including English and French

- Fully-integrated with the QNX CAR Platform for Infotainment, supporting multiple dialog managers for media, navigation, phone, HMI control, messaging, etc.

- Local, cloud and hybrid ASR, NLP, TTS, STT

- Pre-integrated with QNX Acoustics for Voice supporting acoustic echo cancellation & noise reduction (AECNR), microphone beamforming and adaptive mixing, barge-in, multi-zone wake-up over media, and zone-isolation processing

Architecture
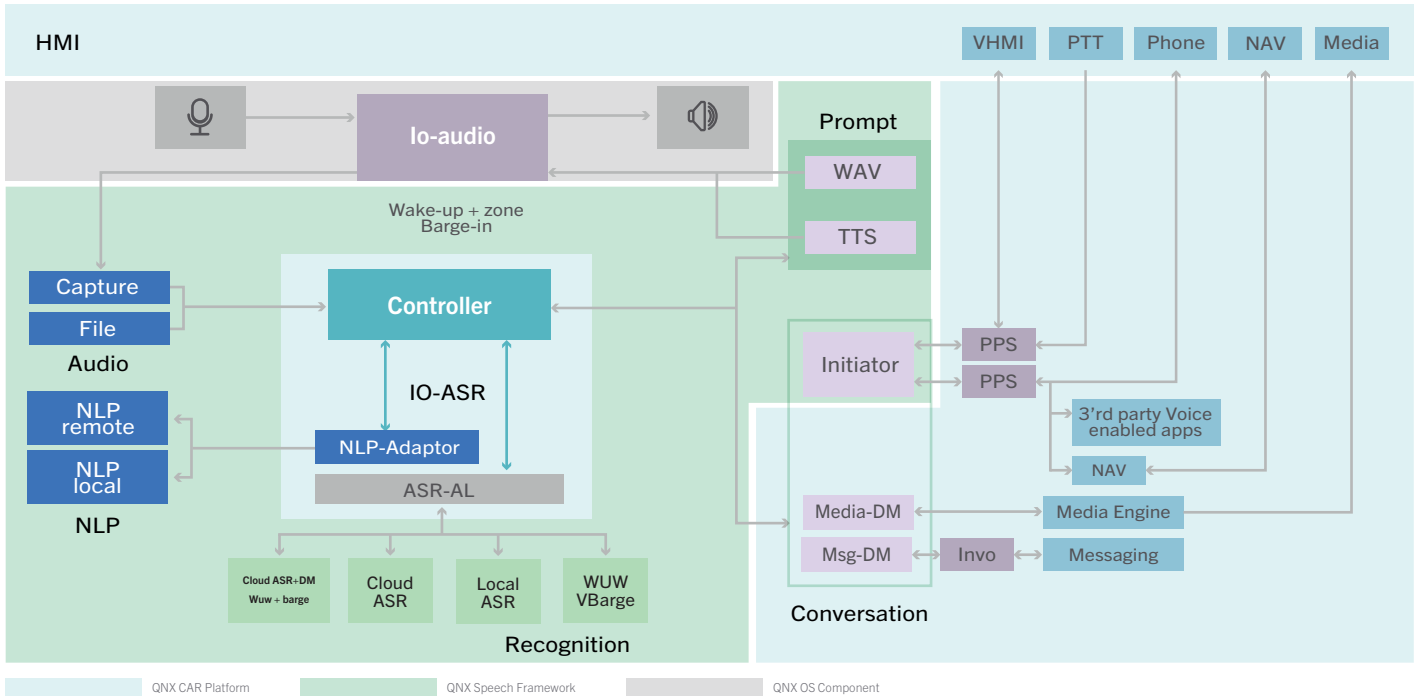
Module Types and Responsibilities

Audio capture:
Captures microphone audio, pre-recorded audio, or audio processed by QNX acoustics software

Recognition:
Provides STT, NLP, and dialog management using local, remote, or hybrid services

QNX NLP adaptor and related modules:
Provides NLP and dialog management, using local, remote or hybrid services

Prompt:
Emits tones, speech audio, and TTS, using local, remote, or hybrid services

Conversation:
Performs dialog management, turns intents into actions, and provides external dialog management interfaces (external applications or processes acting as conversation modules)

Special purpose:

Initiator: Provides interfaces to communicate with external processes such as an HMI, and enables external processes to take full control of the speech experience

Step: Tracks the state of recognition modules and provides integration with audio management and media-player arbitration systems

QNX Semantics NLP Module

- Designed to be small and fast to run locally on the embedded system

- Runs as a local service which is always available

- Supports adding, altering, or extending domains directly without non-recurring engineering fees

- Syntax is based on ABNF (Augmented Backus-Naur form) grammar notation

- Test utility (asr-proxy) supports regression testing on any NLP provider (not exclusive to the QNX Semantics NLP module)

Hardware Architectures Supported

- ARMv8
- x86-64

Additional architecture support and customizations are available via BlackBerry QNX services team. Contact your sales associate for enquiries.

About BlackBerry QNX

BlackBerry QNX, is a leading supplier of safe, secure, and trusted operating systems, development tools, and professional services for connected embedded systems. Global leaders such as Ford, Audi, Cisco, General Electric, Lockheed Martin, and Siemens depend on BlackBerry QNX technologies for their next generation of secure vehicle software platforms, network routers, medical devices, industrial automation systems, security and defense systems, and other mission and/or life-critical applications. This includes full software lifecycle management via secure over the air software updates. Founded in 1980, BlackBerry QNX is headquartered in Ottawa, Canada, with its products distributed in over 100 countries worldwide.

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