Automotive 101 for Qt Developers

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Topics

• QNX backgrounder
• A look at the market
• What about apps?
• Addressing the challenges
• Why a developer community matters
QNX Backgrounder
QNX in 60 seconds

Global presence: North America, Europe, Asia

Products: operating system, middleware, tools, services

Markets: auto, medical, industrial, networking, mil-aero, consumer, m2m

History: 1980-2004 privately owned
2004-2010 Harman International
2010 → BlackBerry
QNX technology: mission critical performance

• Microkernel architecture benefits
• Hard realtime: responsive and predictable performance (more than just fast)
• Ultra reliable: built in memory protection, file system protection, CPU protection
• Truly scalable: multi-tasking, multicore, network distributed

AND
• Standards based: OS, graphics, tooling, web
• Clean intellectual property
• Awesome UX capabilities for graphics and multimedia
• Safety and security certified
Market leaders using QNX

- Nuclear Reactors
- Warehouse Control
- HVAC
- Power Generation
- Turbine Controllers
- Financial
- Cancer Therapy
- Instrument Clusters
- Networking
- Telematics
- Process Control
- Locomotives
- Space Vision
- Laser Eye Surgery
- Military
QNX automotive leadership

Automakers

Deployed by over 40 OEMs in 250 vehicle platforms and over 40 million vehicles throughout North America, Europe, and Asia

Tier 1 Suppliers
A look at the market
Talk the talk

- OEM
  - Automakers: GM, BMW, Audi, Toyota, Chrysler...
- Tier1
  - Module supplier & system integrator: Delphi, Harman, Denso, Panasonic, Visteon...
- Tier2
  - Software/hardware/components supplier: QNX, TI, Qualcomm, Pandora, RedBend...
- RFI/RFQ/RFP
  - Request for info/quote/proposal
- SOP
  - Start of production
- Head unit/center stack
  - Originally referred to the centerpiece of the car’s stereo system, now used to describe the built in system for navigation or infotainment
- Infotainment
  - Information + entertainment + nav + telematics + hands-free
Understanding the supply chain

OEM

Tier 1

Tier 2
In vehicle connectivity
Ecosystems in transition

Before connectivity

Embedded Ecosystem
- Hardware
- Software
- Middleware
- Custom apps

After connectivity

Mobile ecosystem  Carrier ecosystem  IT ecosystem
OEM Development Cycle

Historically: 24-36 months
Targeting: 12-18 months
Decreasing development cycles *and* increasing software expectations
Software and the OEM development cycle

- Research Labs
- Product Planning
- RFI & RFQ
- Contract Award
- Develop
- SOP
- Production

OEM

Tier 1

QNX

Tier 1(s) Development

Samples

Production Branches

QNX CAR Subscription

Updates
The automaker’s dilemma

Challenges:
- Technology lifecycles
- Obsolescence
- Relevance
Value shifts in the supply chain

• OEMs
  – Taking back control of their in-vehicle systems
  – Software increasingly viewed as a differentiator
  – Changing models (Audi/Tesla)
  – Their history as “metal benders” permeates business

• Tier Ones
  – Historically had control over systems, receding as OEMs reduce dependency on suppliers
  – Trying to develop value proposition
  – Under major pressure to reduce costs

• New Entrants
  – Smart phones with competing brands
  – Social networking brands
  – Big data players
  – Carriers
Driver distraction sensitivity

Driver distraction directly linked to accidents
• NA – 4M crashes per year
  – Virginia Tech Transportation Institute: Texting equivalent to drunk driving (ups crash risk 23 times)

Widespread legislative response
• US: 90% of states have legislation of some type
• Europe: majority of countries ban hand-held
• New Delhi: ban on hand-held and hands-free

Executive summary
• OEMs are on the hook for anything that is built into the vehicle, after-market devices adhere to different standard (none)
• OEMs want to be in control of their destiny, work to minimize driver distraction so that technology doesn’t get regulated out
And let us not forget...

The consumer perspective

- Mobile experience changes expectations
- Ubiquitous access to “their” content
- Up-to-date electronics
- Personalized & familiar experience
  - Self-branding
  - Ease of use
Increased integration to mobile

- Phone connectivity
- Application & content connectivity
- Challenges: life cycle disparity, lack of standards, branding & user experience (car, phone, app?)
Application stores

Advantages for OEM
- Certification
- Extends technology lifespan
- Builds brand loyalty
- Vehicle state considerations
- Platform specific
- Personalization

Model is evolving
- Who provides?
Autonomous cars

- Convergence of ADAS and other technologies
- Continued push for drivers to disengage
- Aging population wanting to retain mobility
- Longer-term challenging (but rewarding) goal
- Pursued by numerous groups
  - DARPA, Google/Stanford, VisLab/U. of Parma
  - GM, Ford, Daimler, VW, Audi, BMW, Volvo
What about apps?
What apps make sense?

- Don’t try to replicate the mobile experience, augment based on context & safety
  - 30 not 30,000
  - Driver distraction
  - OEM validation
- Balance brought-in & built-in
- Context relevant
  - First generation: focus on connected driver
    - navigation, information, entertainment
  - Next generation: add focus on connected car
Applications ROI

- Automotive is not big enough market on its own to attract large community
  - will leverage mobile
- Automotive is fragmented, not based on a common platform
  - OEM designs and preferences differ
  - OS, screen size, CPU, form factor etc.
  - Certification implications
- Auto development cycles are long
- What is the channel to the customer?
  - Who is the customer?
Platform fragmentation

- Acura Hands-free link
- Audi MMI 3G
- BMW ConnectedDrive
- Chevy MyLink
- Chrysler MyGig
- Ford F-150 driver information center
- GMC/Buick IntelliLink
- Hyundai Blue Link
- Jaguar and LandRover instrument clusters
- OnStar and OnStar FMV
- Porsche PCM
- Toyota Entune
- Toyota Touch & Go
Comparing TAM & app prices

$1.00/app \times 37,040,000 \text{ units} = $37,040,000 revenue/344,714 \text{ units} = $107/app

- Sample mobile app price
- Number iPhones sold in 2012 Q1
- Number Toyota Camry’s sold in US in 2012
- “Equivalent” app price to match revenue
The reality

• OEM-specific platforms shrink the app ecosystem
  – Only the very biggest app companies can afford to participate
• Platform differentiation hurts everyone
  – Lack of scale has negative effect on differentiation of content
OEMs and apps

- Many do app porting themselves, too difficult to enable third parties
  - Doesn’t scale (how to get from 10 to 100 apps)
  - Sacrifice unanticipated innovations
  - Sacrifice TTM
  - Challenge to respond to trending apps

- OEM specific SDKs
  - Ongoing fragmentation
  - Doesn’t scale
  - Discourages developers
Addressing some of the challenges
Critical success factors - Enabling apps in automotive

1. Common platform
2. Revenue for app developers
3. Mitigate driver distraction
A common platform

• Need to standardize on app plumbing, doesn’t mean we have to standardize on overall UI and UX, doesn’t mean we need to standardize on OS or hardware
  – Differentiation is possible
• Needs to be driven by mobile paradigms in order to entice developers
  – Scale and familiarity, reduces incremental cost of automotive
• Open source is not always mandatory
  – Interoperability is needed, which means open standards

• QNX supports today’s broadest cross-platform mobile development environments
  – Qt
  – HTML 5
  – C++/OpenGL ES
  – Android Java
  – Industry specific
    • Elektrobit GUIDE, Crank Storyboard
Open standards: Qt

• Significant interest by OEMs for Qt
• Powerful flexible high performance framework that is industry standard, open and OS agnostic
• Qt projects at Bosch, Harman, Panasonic, Garmin, Mercedes, Honda, Porsche, PSA, Magnetti Marelli...

• Qt usage is on the rise in automotive
How app developers can make money

- **OEM pre-funded?**
  - Provides revenue assurance to small developers
  - OEMs not sitting on big stacks of gambling money

- **Footprint extension**
  - Car app adds more users and more usage
  - Works when you *have* a model to extend

- **Advertising**
  - Advertising model obviously successful
  - Attractive if relevant (LBS), and non-distracting

- **Wait for established car stores?**
  - “Safest” choice for time to revenue
  - Might wait a long time
  - Gives competitors a chance to get established

- **Raise app prices?**
  - Could work for some apps, but customer expectations have been set low

- **Other mobile models?**
  - SaaS
  - Freemium
  - In-app purchases
Answering the safety question

- Industry recognizes need to self-police before government does
- Driver distraction
  - OEMs working on models
    - Develop internally
    - OEM SDKs
    - Validation process
    - Industry standards
- Automobile protection
  - Separate virtualized environment
  - Separate application sandbox
  - Tightly controlled access to services
  - Voice as primary interface, heads up displays etc
Why enabling a developer community matters
Opportunity: beyond the driver

- Connected Driver
- Connected Car
- Stakeholders
  - OEM, Dealer
  - Government
  - Insurance
  - Rental agencies
  - Services (repairs, gas)
- Enable innovation
  - Maintain privacy and security
Good news story for Qt developers

• Automotive is an industry in transition, change opens doors and creates opportunities
  – New standards
  – New technologies
  – New partnerships
  all necessary for success

• Automotive OEMs seem to be embracing Qt

• Qt 5.2 mobile edition support for Android and IOS solidifies the bridge between mobile and auto for Qt

• OEMs recognize need to enable developers for connected services on smart phones and head units
Resources

- Upcoming shows that focus on automotive
  - Telematics Update Munich, Nov 11-12
  - Auto Apps and mobile device evolution, Berlin December 5-6
  - CES, Las Vegas, Jan 7-10
    - [http://www.cesweb.org](http://www.cesweb.org)

- Automotive Developer programs to look at...
  - [https://developer.ford.com](https://developer.ford.com)
  - [https://developer.gm.com/#](https://developer.gm.com/#)

- QNX CAR
  - [http://qnxauto.blogspot.de](http://qnxauto.blogspot.de)
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