Automotive software development: The Virtual Engineering Workbench

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Agenda

• Introduction to the Virtual Engineering Workbench (VEW)
  ▪ Industry challenges around automotive software development
  ▪ VEW for software-defined vehicle use cases

• Workshop onboarding

• Hands-on VEW

• Build an adaptive AUTOSAR application and run it on a virtual target
  ▪ Build an infotainment app and run it on a QNX virtual target
  ▪ Modify and publish a new workbench version

• Wrap-up
The Virtual Engineering Workbench (VEW)

Workshop delivery
• Work in AWS-provided workshop accounts
• Use your own laptops
• Work through instructor-led labs
• Engage with your instructor – Time is short

Goals
• Get hands-on experience with the VEW concepts
• Develop two sample automotive applications for QNX and AUTOSAR on AWS
• Take the role of a platform contributor and extend the workbench catalog with your own products
Introduction to the VEW
Today’s customers are expecting faster time to market, but meanwhile software complexity is growing

5 exemplary issues reported by our customers

1. Missing consistency in development environments
2. Slow and complex setup process (6-8 weeks)
3. Long feedback loops, weeks to multiple months until you get validation feedback
4. 50+ tools for every developer with dependencies on licensing, configuration, and target hardware
5. Hardware-dependent development is cost-intensive and slow, with multi-month waits for availability
The development process for the automotive industry is highly regulated.

The flow outlined illustrates the V-model approach for automotive software development. After the software design phases, a developer starts in the third from the top.

In order to get feedback about a change, the developer needs to wait for all the other steps to be completed and all environments need to fit together.

Today, this spans months until a change is fully validated.
Understanding VEW

VIRTUAL ENGINEERING WORKBENCH (VEW)

The VEW consists of three main pillars: tools, targets, and environments. We manage that on the VEW platform, and the interface to the user is a self-service portal empowering them to do things in a fully automated manner.

- Predefined use case-specific environments with all of the tools, IDEs, and licensing – everything that helps a user to get started on a use case
- Various levels of abstractions of the target platform for which the user builds
- The environment is the input, in different levels of abstraction or fidelity, that we give to the workload on the targets to verify their functions
VEW: Accelerating software development

**Efficiency**
- Ramp-up time of new developers or on new projects reduced by 95%¹
- Research indicates shift left enables cost savings of up to 90%²

**Development consistency and collaboration**
- Feedback cycles down to minutes
- Same environments all over the world, over whole LC with no delay and with all partners

**Support, security, and other benefits**
- Persist past versions of environments
- For-the-job security dev environment and overall
- Software, package, and license management

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¹ https://www.youtube.com/watch?v=x0j3VSW90E0
² https://link.springer.com/chapter/10.1007/978-3-319-99130-6_10
VEW high-level architecture

Self-service portal
- AWS WAF Firewall
- Amazon CloudFront static content
- AWS Lambda Dynamic content
- Amazon DynamoDB Metadata
- Amazon Cognito AuthN
- Amazon S3 Content
- Amazon API Gateway
- Amazon EventBridge Communication

Automated Distribution
- AWS Service Catalog
- EC2 Image Builder

Use Cases
- Amazon EC2 Elektrobit Adaptive Autosar
- vECU artefact
- Amazon EC2 Graviton Elektrobit Adaptive Autosar
- Amazon EC2 QNX Momentics
- instrument cluster application
- Amazon EC2 QNX Momentics

Developer
Tester
Integrator
Platform contributor

Lab 1
Lab 2
Lab 3
Workshop onboarding
Getting started with this workshop

You have access to an AWS account with any optional pre-provisioned infrastructure and IAM policies needed to complete this workshop.

The AWS account is only available for the duration of this workshop. **You will lose access to the account once the workshop is complete.**

Any optional pre-provisioned infrastructure is deployed to a specific AWS Region. Make sure that you are working in this Region; other Regions are blocked.

Review the terms and conditions of the event. **Do not upload any personal or confidential information to the account.**
Step 1: Sign in using your preferred method

https://catalog.workshops.aws/join
Step 2: Enter the event access code

Each session has a unique code
Step 3: Review terms and join event
Step 4: Get started with the workshop
Step 5: Access AWS account

Access the AWS Management Console or generate AWS CLI credentials as needed.
Event access code
please wait for your assignment 😊

Left side of the room – facing the stage:

Right side of the room – facing the stage:
Hands-on VEW: Adaptive AUTOSAR and virtual targets
Hands-on VEW

ADAPTIVE AUTOSAR WORKBENCH AND VIRTUAL TARGETS

Summary
• Spin up two AMIs
• Create and build example application
• Cross-compile application for ARM64 architecture
• Run application on virtual target

Objectives for participants
• Provision and use Elektrobit Adaptive AUTOSAR
• Artifact exchange between environments using Amazon S3
• Integration of virtualized environments on Amazon EC2 Graviton
Hands-on VEW

ADAPTIVE AUTOSAR WORKBENCH AND VIRTUAL TARGETS

1) Provision Workbenches

Developer

AWS Service Catalog

Amazon EC2 Graviton Elektrobit Adaptive Autosar

AWS CodeBuild Autosar Adaptive Pipeline

2) Build and Test x86

Amazon EC2 Elektrobit Adaptive Autosar

cluster application x86

3) Cross-compile and test on ARM64

Amazon EC2 Graviton Elektrobit Adaptive Autosar

cluster application (ARM64)

Amazon S3 Artifact storage
Hands-on VEW

HOW TO GET STARTED

1. Log in to the AWS console

   - AUT301 | The Virtual Engineering Workbench
     - AUT301 | Automotive software development: The virtual engineering workbench
     - Introduction to the Virtual Engineering Workbench
     - Before you start

   - Adaptive AUTOSAR and virtual target
   - In-vehicle application development for QNX virtual targets
   - Workbench management and product publishing
   - Whip-up

   - AWS account access
     - Open AWS console (us-east-1)
     - Get AWS CLI credentials
     - Exit event

2. Navigate to lab

   - AUT301 | Automotive software development: The virtual engineering workbench
     - Introduction to the Virtual Engineering Workbench
     - Before you start

   - Hands-on VEW
     - Adaptive AUTOSAR and virtual target

   - Overview
     - In this lab, we are stepping into the role of an engineer in a
       development setup.

       1. Self-service portal
       2. View and select workbenches and virtual targets
       3. Create ElectricBoat workbench and virtual target
       4. Create and run sample application

Now go build!
Hands-on VEW: Infotainment application development for QNX virtual targets
Hands-on VEW

Infotainment Application Development for QNX Virtual Targets

Summary
- Spin up QNX developer workbench
- Spin up QNX virtual target
- Run application on virtual target
- Modify and compile application
- Rerun and visualize on virtual target

Objectives for participants
- Provision and use QNX Momentics IDE
- Artifact exchange between environments using Amazon S3
- Integration of virtualized environments on QNX RTOS
- Get hands-on experience with development workflow
Hands-on VEW

Infotainment Application Development for QNX Virtual Targets

Digital Cluster Application Developer

AWS Cloud

Streamed output via WebRTC

Private subnet

QNX Developer instance

Build, Compile and Push Binaries to Target

QNX Virtual Target

Runs Cluster Application on Virtual Target

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Hands-on VEW

HOW TO GET STARTED

1. Log in to the AWS console
   - Open AWS console
   - Get AWS CLI credentials

2. Navigate to lab
   - Infotainment application development for QNX virtual targets
     - Introduction to the Virtual Engineering Workbench
     - Problem description and solution architecture
     - Create QNX virtual target

Now go build!
Hands-on VEW: Workbench management and product publishing
Hands-on VEW

INFOtainment Application Development for QNX Virtual Targets

Summary

• Start Ubuntu workbench
• Identify connection options for workbench
• Update product with an improved AMI
• Instantiate updated AMI with a workbench
• Successful NICE DCV connection

Objectives for participants

• Learn workbench product lifecycle
• Customization of existing workbench product
• Share new product version with developers in minutes
• Get hands-on experience with product contribution workflow
Hands-on VEW
WORKBENCH MANAGEMENT AND PRODUCT PUBLISHING
Hands-on VEW

HOW TO GET STARTED

1. Log in to the AWS console

2. Navigate to lab

Now go build!
Wrap-up
What did we achieve?

Lab 1  
ECU SW developer

We built an Elektrobit Adaptive AUTOSAR application on AWS within the VEW and ran it on Amazon EC2 Graviton (ARM64) virtual target

Lab 2  
Infotainment developer

Adjusted and ran a QNX-based instrument cluster application fully virtual on an Amazon EC2 Graviton (ARM64), simulating an infotainment developer user scenario

Lab 3  
Platform contributor

Built and published a new product to the VEW catalog so that others can use it for software development, showcasing long-term extension of VEW in your organization
References and learning

- For more info, visit AWS for Automotive Software-Defined Vehicle at: [aws.amazon.com/automotive/software-defined-vehicle](aws.amazon.com/automotive/software-defined-vehicle)
- Related blog: [User-centric design for VEW](#)
- Related blog: [Developing an SDV platform with Continental](#)

Interested in learning more? Reach out to your AWS account manager and ask about Virtual Engineering Workbench
Engage with our experts the Expo

- See how the AWS cloud-native software developer Workbench will help scale, and accelerate, vehicle software development in the SDV era
- Discover how to develop highly automated driving features in the cloud with AWS services for data ingest, data preprocessing, scene generation, scene search, and large scale resimulation
- Find out how AWS Connected Mobility Solutions 2.0 can help develop, deploy, and manage connected mobility infrastructure
- Learn how to harness and analyze vehicle data faster to help unlock substantial business value using AWS vehicle data management solutions
- Learn how AWS services are used by customers to help them build highly scalable, low-latency OCPP EV charging CPO solutions
- From call centers to predictive maintenance, discover how generative AI is powering the digital customer experience
- Find out how AWS helps drive transparency and authenticity among stakeholders within a battery circular economy
- Optimize battery performance, extend battery life, and improve the efficiency of EVs using battery digital twins

**Expo hours**

- Monday, November 27 (welcome reception) 4:00 PM – 7:00 PM
- Tuesday, November 28 10:00 AM – 6:00 PM
- Wednesday, November 29 10:00 AM – 6:00 PM
- Thursday, November 30 10:00 AM – 4:00 PM
Thank you!

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