vFlash

Vector Webinar 2018-10-10
Introduction into vFlash

vFlash Template Concept
vFlash Project Handling
Enhanced Security with Gateway Authentication
Custom Actions
Tool Editions
Extended Feature Set
Summary
Executive Summary

- High-speed flashing over CAN, CAN FD, FlexRay, LIN and Ethernet (DoIP and SoAd)
- Different protocols and flash sequences in one tool
- Intuitive GUI for configuration and execution and automation interface
Introduction into vFlash

Application Areas

OEMs
- Development
- EOL Programming
- After-Production Programming

Suppliers
- Development
- Production
- Late update on OEM site
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Responsibilities

**Actors**
- Flash Tool
- Bootloader
- Network

**Responsibilities**
- vFlash Tool
  - Controls flash sequence
  - Processes flashware
  - Transfers data to ECU

- Bootloader
  - Manages internal update sequence
  - Erases memory areas
  - Transfers software from RAM into persistent memory
  - Verifies data integrity
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High Speed Reprogramming

**One Tool:** Supporting different bus systems

- CAN
- CAN FD
- FlexRay
- LIN
- Ethernet (DoIP)
- Ethernet (SoAd)
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Flash Data Sources

**One Tool:** Supporting different data sources

- Native data
  - Pure memory image

- Container-base
  - Memory image
  - Process Information

![Diagram showing data sources](image)
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Protocols and Flash Procedures

**ONE TOOL:** Supporting different protocols and flash procedures

- Different flash procedures
- Different security mechanisms
- Different diagnostic protocols
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vFlash Template Concept

Plugins: vFlash Template for each Bootloader

Concept

- Easy startup
- Bootloader details covered by vFlash Template
- vFlash Template exactly fitting to Bootloader
- Look-and-feel widely independent of vFlash Template
vFlash Template Concept

vFlash Template Availability

Template developed in context of FBL development
  - vFlash Template is developed in parallel to FBL
  - Template is used during FBL development
  - Template is validated with FBL

→ vFlash Template development is covered by FBL development

Template developed in context of project
  - No Bootloader project or
  - Intermediate version or
  - Special features

→ vFlash Template development as customer project
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Use Case: Development

- vFlash Project references flash data → automatic use of updated data
vFlash Project Handling

vFlash Pack&Go Project

**Use Case: Production, Data Exchange**

- Pack&Go Project packs all required items in one file (configuration, Seed&Key.dll, flashware, ...)

![Diagram showing the workflow of Pack&Go Project](image)
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**Enhanced Security with Gateway Authentication**

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Enhanced Security with Gateway Authentication

Security Access AND Authentication

Security Access
- Uni-directional: Client proves legitimation against ECU
- Target node is ECU
- Client can only execute dedicated diagnostic services suitable to security level
  - Flashing: Erase Memory, Transfer Data, ...
  - Calibration: Change configuration properties such as characteristic curves

Authentication
- Optionally bi-directional: Client has to prove legitimation, target node may prove legitimation
  - No non-authenticated node can access system
  - No mock-ECU can spy-out tester
- Target node is usually gateway (sometimes also ECU)
- Gateway only routes diagnostic services into system after legitimation
Key Calculation in “Seed Key DLL”
- Key calculation is purely based on Seed Key DLL. No other dependencies.
- **Advantage:** Very simple handling
- **Disadvantage:** Seed Key DLL is enough to unlock ECUs. Seed Key DLL once copied to another location opens ECU forever. (option: time-limited validity)

Dongle Access / Smart Card Access
- Key calculation requires additional credentials from dongle or smart card.
- **Advantage:** Seed Key DLL as a software is not enough – user additionally needs dongle or smart card as hardware.
- **Disadvantage:** “Lost” dongle opens ECU forever. (option: time-limited validity of dongle or additional license file with time-limited certificate)

Server Access
- Key Calculation is delegated to server
- **Advantage:** OEM can control ECU access even temporarily
- **Disadvantage:** Missing server connection leads to blocked ECU access.
Enhanced Security with Gateway Authentication

(Enhanced) Authentication Features

Authentication

► In advance prove authenticity
► Use Uni-directional or bi-directional authentication
► Using different mechanisms
  ► PKI-based asymmetric cryptography
  ► Challenge-response based asymmetric or symmetric cryptography
► Still unlocking ECU with Security Access
► Authenticity may be proven on flash ECU or on gateway
Enhanced Security with Gateway Authentication

Motivation
- Flashing a target ECU via a Gateway sometimes requires authentication at the Gateway.
- Authentication activates the routing of the diagnostic requests to the target ECU.

Solution
- Enhance security capabilities.
- Communication with Gateway for authentication.
  - Execute OEM specific security algorithms to calculate credentials.
  - Send credentials to Gateway.
- Communication with ECU for flashing.
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Custom Actions

Execute ECU Specific Operations

**Concept**
- **vFlash Template**
  - Pure flash operation, conforming to Flash Bootloader
  - Suitable for all ECUs based on same bootloader
  - No ECU specific operations
- **Custom Actions**
  - ECU specific operations with dedicated diagnostic tasks
  - User is able to author the tasks

**Use Cases**
- **Reporting**
  - Individually document flash activities
- **Restoring**
  - Read ECU information before and restore it after flashing
- **Label printing**
  - Print ECU labels after successful reprogramming
- **Parametrization**
  - After reprogramming parametrize system

**Custom Actions**

- Individual Pre-Processing
- Reprogramming
- Individual Post-Processing
Custom Actions

- Author scripts in C#
- Access to large number of .NET libraries
- Access to vFlash library
- Access to diagnostic library (send request, receive responses, access parameters)

- Large community supporting C# programming
- API documentation for diagnostic access and vFlash access available
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**Tool Editions**

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Summary
vFlash with GUI and Automation Interface

Flash execution controlled via
- Graphical user interface
- Automation interface (C and C# API)
Tool Editions

vFlash Station

Parallel flashing
- Flashing up to 8 different ECUs
- Each connect over a separate bus
vFlash Compact – Standalone Flashing with VN8810

- **Supplier’s production**
  Wirelessly control several flash processes on several VN8810

- **Manufacturer’s production**
  Late software update shortly before assembling module in vehicle

- **After vehicle production**
  Reprogramming ECUs assembled in vehicle (e.g. while shipping vehicles)

**Standalone Flash Device: vFlash Compact on VN8810**

- Simplest execution avoids misuse
- Controlled via keypad
- Optionally controlled wirelessly via “Smart Device”
- No PC required for flashing
- No expert required for flashing
- Documentation of flash activities in Reports
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vFlash on VN89xx

Use Cases

- Flash Station based on VN89xx: Flash several ECUs at the same time
  - Connect several VN89xx Interfaces to single PC
  - Control vFlash from PC application
  - Reprogram ECU while remaining bus simulation is active
- CANoe testing: Support CANoe tests requiring reprogramming operations to continue testing

Solution: vFlash on VN89xx

- vFlash controlled via CANoe Standalone and vFlash Node Layer
- Vector Platform Manager used to deploy vFlash to VN89xx
- Vector Platform Manager used to transfer vFlash configuration to VN89xx
- FDX used to control flash process
vFlash with Diva

Use Cases
- Execute flash tests ...
  - ... in addition to Diagnostic protocol test
  - ... in addition to Application test (parameter and fault memory)

Solution
- Extend CANoe.DiVa with vFlash
- Execute default flash tests
  - Test valid Flashing
  - Test overvoltage and under voltage tests
  - Data transfer errors (CRC/Signature/canceling)
  - Erase memory errors (skipping/canceling)
- Execute OEM specific flash tests
  - Use available for selected OEM extensions
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**Summary**
Summary

Flexible
- Different data sources, flash sequences, networks
- Different security mechanisms
- Different flash sequences

Simple
- vFlash Templates hide complexity
- Templates fit to bootloaders – just select template and add data

Fast
- High speed programming especially in combination with Vector Network Interfaces

Complete
- To be used in all application areas – by OEM and supplier
- Interacts with different Vector tools – CANoe testing, DiVa, ...
- To be used with GUI or integrated via automation interface
For more information about Vector and our products please visit

www.vector.com

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