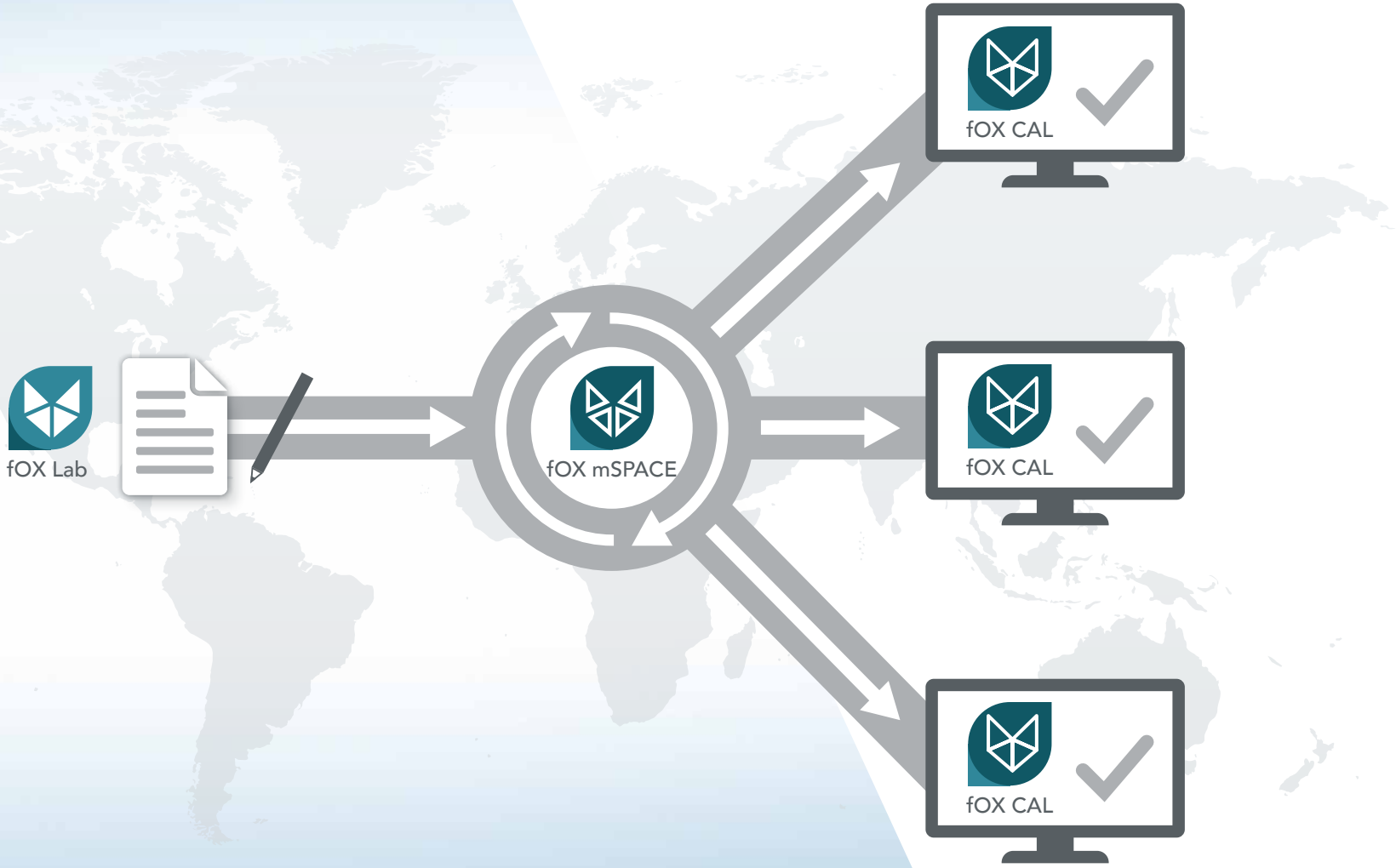
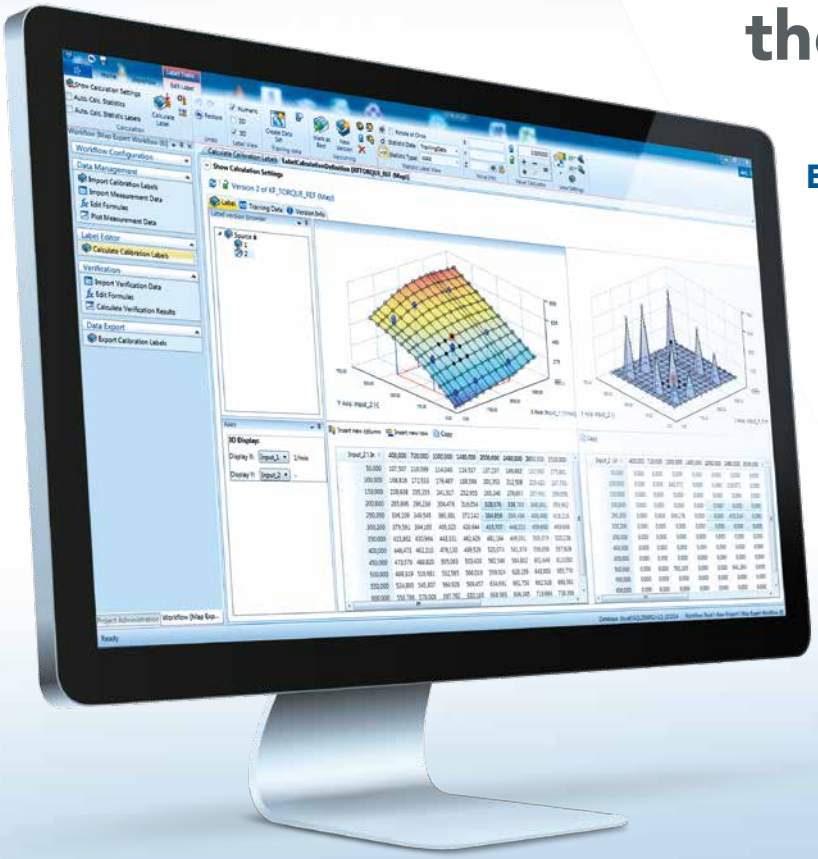
AVL fOX™ Product Line

Easy, Efficient and Standardized xCU Calibration



AVL fOX™ Product Line – Enhancing the Powertrain Calibration Process



EASY, EFFICIENT AND STANDARDIZED XCU CALIBRATION

The modern, globalized automotive market provides OEMs with a number of different challenges. There are now more model variants with more complex powertrains which each have to fit into different markets across the world, with differing legislation, and varying consumer expectations.

Same base model has to be locally developed and calibrated across various territories. 20 years ago one calibration engineer had to calibrate 500 ECU parameters for one engine in one vehicle. Within five years the number of ECU parameters had risen to 5000, which had to be calibrated for 6 vehicle variants by two calibration engineers.

Nowadays 50.000 xCU parameters for different control units have to be calibrated for up to 300 vehicle variants by distributed teams of 30 and more calibration engineers. Opposed to the increasing number of parameters and vehicle variants the maximum project duration only increased from 12 to 36 months.

That's why AVL have developed the **AVL fOX™ Productline**. AVL fOX™ makes sure that risks are minimized, reducing development time, effort and cost, and keeping things simple for engineers. AVL fOX™ makes it quick and easy to achieve standardized results. It embodies all the features a calibration engineer needs to solve the challenges of modern xCU calibration from developing calibration workflows over distribution to efficient and standardized calibration.

BENEFITS AT A GLANCE

- Fast and easy workflow template development
- Professional and traceable workflow template distribution
- Powerful and standardized calibration

STANDARDIZE THE CALIBRATION WORK

Due to the rising complexity and rising number of parameters in the calibration world, OEMS face different challenges they want and need to solve, for a standardized calibration process with standardized calibration results.

Challenge 1:

To solve calibration task efficiently tools are developed by the calibration engineers. Often this development is done on different tools and platforms. The effect of such an approach is that the distribution and maintenance varies by platform and makes resourcing complex and expensive.

AVL fOX™ Product Line solves this by providing workflow template development on a standardized platform: AVL fOX Lab™.

Challenge 2:

Developed tools are often stored and distributed by different means. This leads to different versions and loss of knowledge. The different versions often lead to different results and to increased costs.

The AVL fOX™ Product Line solves this by an App-Store like system for centralized management and distribution of Workflow templates: AVL fOX mSpace™

Challenge 3:

Calibration work is done very differently by calibration engineers based on experience, know- how and tool skills. Different approaches in calibration work lead very often to different results for the same task. Different results in calibration labels means a higher number of variants, which have to be maintained in the market or changed in case of any errors. The AVL fOX™ Product Line helps to unify the calibration work with AVL fOXCal™ by standardized workflows, including methodology and function models.

AVL fOX™ Product Line addressing all challenges in the calibration work.

In addition to the standardization of calibration work increased efficiency and reduced costs are growing topics.

The AVL fOX™ Product Line helps to increase the efficiency and to reduce the costs by bringing tasks from real and cost intensive environments to an offline environment. This is done by the intensive use and support of models for xCU and vehicle components. In this model based environment calibration work can be done easily in earlier stages of the development process, with the benefit of time and cost savings by reduction of engine and vehicle tests.

SUPPORTING CALIBRATION WORK FOR ALL KINDS OF USERS

The AVL fOX™ Product Line supports different user groups in the way they need it.

For calibration engineers AVL fOX Cal™ is the platform to help solving calibration tasks fast and easy. Boring tasks are automated and the focus of the calibration work is shifted to the interesting and challenging tasks. Off-the-shelf generic and application specific workflows are available including best of class methodology and features to make the calibration work easier.

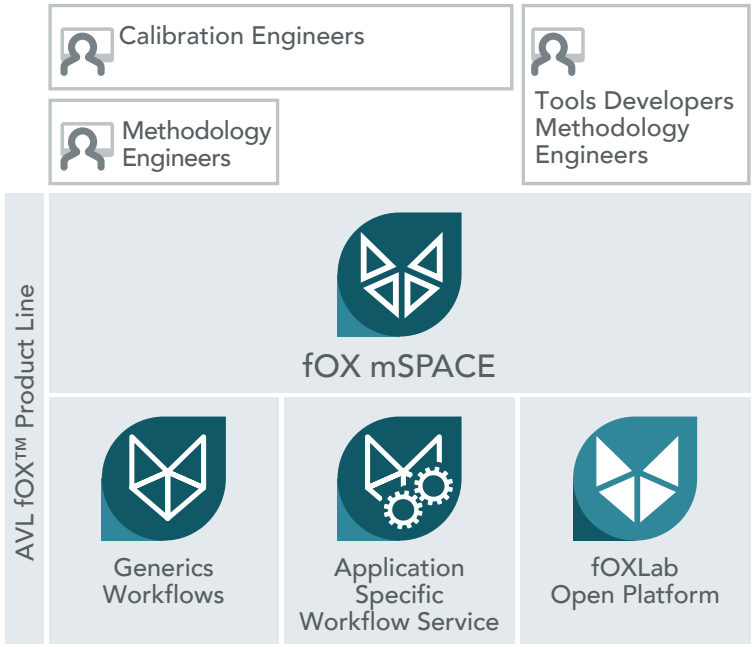
AVL fOX Lab™ is a professional platform that allows methodology engineers and tool developers to seamlessly distribute their ideas to the calibration community.

Based on the AVL fOX™ Product Line AVL can support you with specific workflows including your methodology or AVL methodology for your calibration task.

The AVL fOX™ Product Line focuses on making your calibration processes more efficient and standardized by taking away the borrowing parts of the work, giving you more time to work on the real challenges in calibration finding the best calibration solution for your product.

OPEN DEVELOPMENT PLATFORM FOR INTUITIVE AND EFFICIENT WORKFLOW DEVELOPMENT

Developing standardized tools is an intensive and time consuming workload. Starting from a simple script, which normally solves the task for one engineer but can not be distributed to a lot of people, over small helper functions like data import or resampling to full featured user interfaces the development and maintenance effort increases tremendously.



AVL fOX Lab™ solves this dilemma by providing a development platform, which includes all important features and components necessary to develop a professional and standardized calibration workflow. The integrated, easy to use interface editor reduce the development time significantly.

As a methodology developer you can focus on developing the core logic of your methodology and easily distribute it to all calibration engineers. AVL fOX Lab™ includes a powerful GUI editor, combined with scripting possibilities, easy documentation and distribution.

APP STORE FOR EASY AND TRANSPARENT DISTRIBUTION

AVL fOX mSpace™ helps you to distribute and manage your workflow templates. It is a APP-store like system, which is installed with in your Intranet, fully supporting your IT infrastructure by utilizing AD security for Single-Signon. You can always track the current status of your workflow templates and release proven templates to your calibration engineers.

The AVL fOX mSpace™ supports to host multiple sites on one single instance, so that scenarios with different teams and reduced access to workflows, based on team or work area, can be implemented.

Within AVL fOX CAL™ and AVL fOX Lab™ you can directly up- and download the workflow templates from and to the AVL fOX mSpace™. The intuitive and modern web interface is used for managing the mSpace Server, the different mSpace Sites, including user and right management , and releasing ready to use workflows.

The AVL fOX mSpace™ is based on the Microsoft Internet Information Server and the Microsoft SQL Server for direct integration into your IT infrastructure. If needed you can also get a AVL fOX mSpace™ ready to use system including hardware and software.

Function parameter optimization including smoothing and extrapolation with AVL fOX fOpt.

Graphical data analysis and Map with AVL fOX MapExpert and AVL fOX fSim / fOpt.

GENERIC WORKFLOWS FOR DAILY USE

AVL fOX Cal™ helps you to fit your calibration data to the measured or simulated data. With powerful generic workflows you can care about the real problems and not the boring tasks, like data import, data plausibility checks , data reduction and others.

These functions are already contained in the workflows and right at your hand.

Combined with simulation, map fitting and function optimization capabilities AVL fOX Cal™ gives you the tools at hand to solve your calibration task in the way you like.

AVL fOX Cal™ provides you generic workflows for map fitting and statistical analysis of measurement data in respect to calibration labels. For automatic parameter optimization simulation of xCU functions AVL fOX Cal™ provides additional generic workflows, which help to speed up the calibration and simulation of complex xCU function in an offline environment.Based on measured dataset from test-bed or vehicle you can fast and easily solve your calibration task reducing testing effort and time. Features of the workflow include a powerful label fitting algorithm, over real time simulation capabilities, function parameter optimization including constraints and label smoothing.

Calibration Tasks Overview

Available	Possible		
Torque Mapping	Exhaust Temp. Mod.	Afterstart warm-up	OBD Monitoring
Charge	SCR Storage Mod.	DPF Loading	Clutch Temp. Model
Raw NOx Model	DPF Burning	Catalyst Heating	Raw Emission Model
Torque Matching	Oil Dilution Model	Inst. AFR Compens.	
Temp. correction	Catalyst heating		

Technical Highlights

AVL fOX Lab™	AVL fOX M Space™	AVL fOX CAL™
Workflow Process Editor	Application Store	Map Calculation
GUI Editor	Versioning of Workflows	Function Simulation faster than real time
Help Editor	User rights	Function Parameter Optimization
Advanced Scripting	Single Sign	Channel and Label Visualisation and Editing
Debugging Possibilities	Workflow Documentation online	Formulas incl. usage of labels
Alias System	Direct Download	Direct link to Creta via ECDM
RealtimeSimulink Target	Support of Multiple Sites	MDF, CSV and Excel Import

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