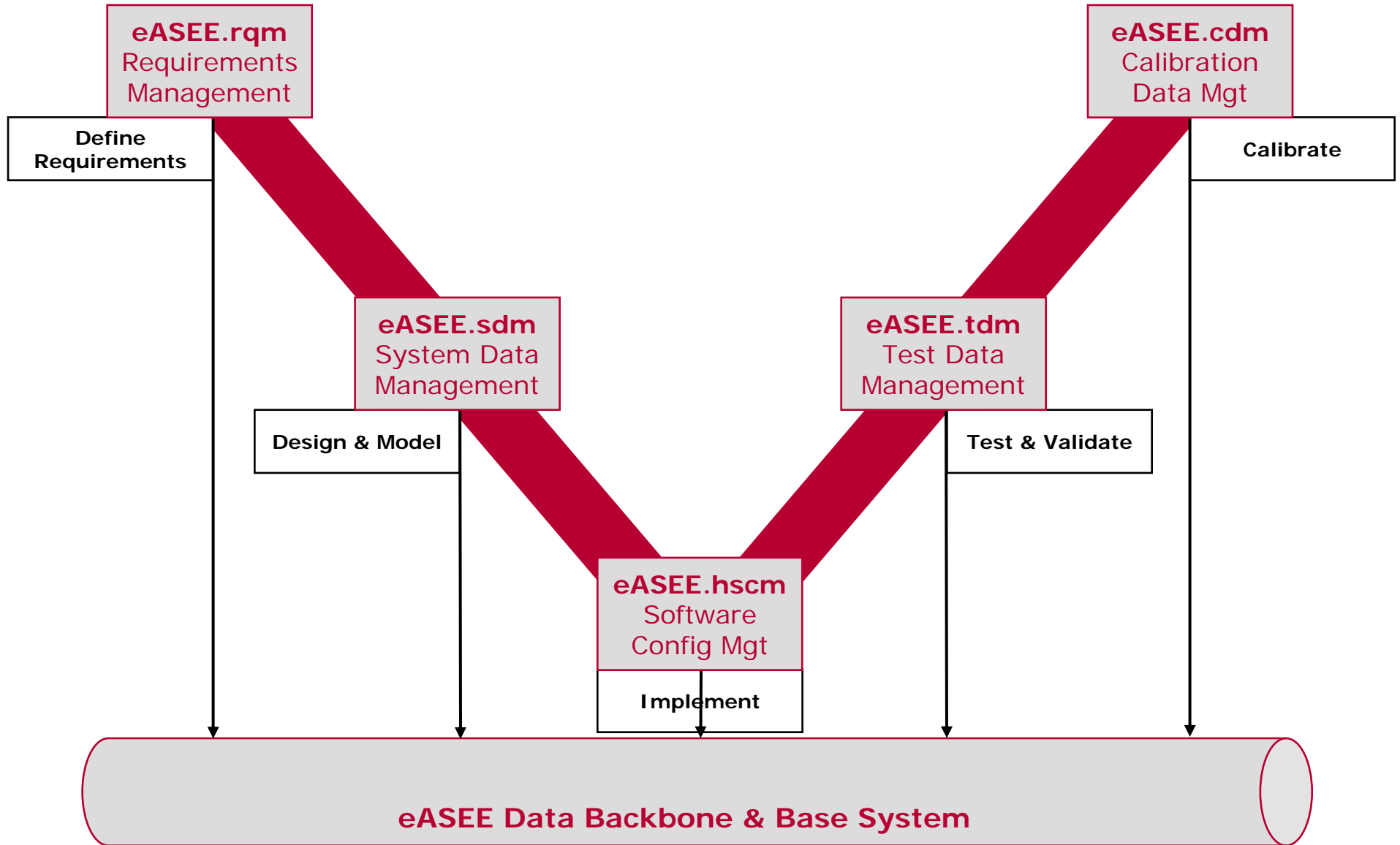


Calibration Data Management with Vector's eASEE.cdm

Test Expo
October 23, 2008



eASEE Tool Suite – Application Modules



eASEE.cdm – Calibration Data Management

Partition calibration work into data components and tasks that can be easily distributed and managed over a large team

Ensure that all calibrators across all projects, groups and locations consistently use the same processes and data for uniform results

eASEE.cdm
Calibration
Data Mgt

Calibrate

eASEE Data Backbone & Base System

Objectives for a calibration data management solution:

- ❑ Safe and reliable data management
- ❑ Immediate access to calibration data and characteristic parameters
- ❑ Increase data quality and consistency
- ❑ Ensure uniform process deployment and compliance
- ❑ Increase efficiency through the overall calibration process

eASee.cdm: Engineering Data and Configuration Management System

- ❑ Comprehensive management of calibration data and associated documentation
- ❑ All calibration artifacts are managed by eASee.cdm:
 - ❑ software (HEX, S-Record)
 - ❑ description files (A2L)
 - ❑ parameter files (CSV, PAR, PaCo, DCM)
 - ❑ measurement files
 - ❑ reports
- ❑ High performance, reliable and stable Oracle-based platform
 - ❑ enterprise solution
 - ❑ eASee installations with 2,000 seats managing 10M data files in service
 - ❑ during peak hours 800 users are logged on in parallel

What is A2L?

- ❑ ASAM MCD-2MC (formerly ASAP2)
- ❑ Map of an ECU's calibration data
- ❑ Machine readable and writeable
- ❑ Generated from (or with) source code
- ❑ Defines all ECU data parameters
 - ❑ Name
 - ❑ Data type
 - ❑ Physical memory location
- ❑ Ideal for calibration work!

```
/begin MEASUREMENT

    ftefva
    "canister purge rate"
    UBYTE
    fak_ub_b0p5
    1
    100
    0.00
    0.4980

    FORMAT "%6.4"

    ECU_ADDRESS 0x300791

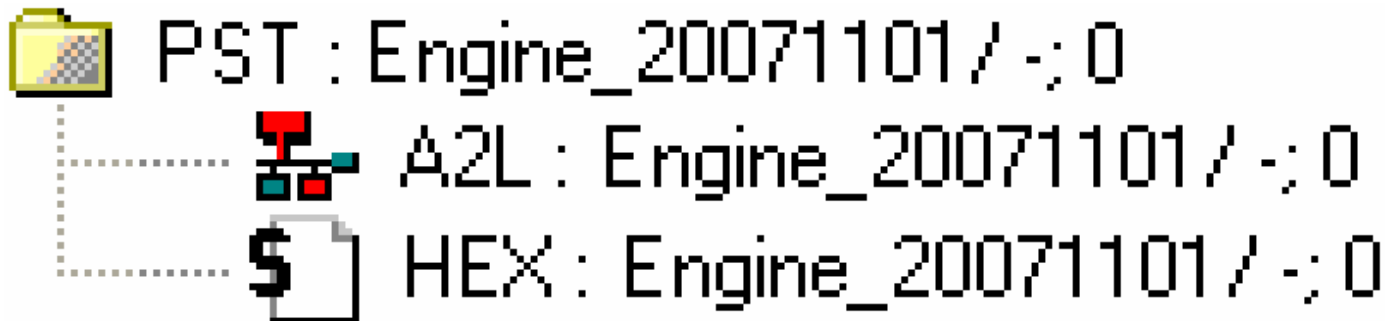
/end MEASUREMENT
```

All eASee.cdm functionality starts with an A2L file

eASee.cdm – PST = Program Set (ECU Software)

PSTs are the ECU software packages that need to be calibrated

- ❑ PSTs are released by software development group uncalibrated
- ❑ PST name identifies the software – ECU, vehicle, release, version, etc.
- ❑ PSTs contain:
 - ❑ A2L file – *this is the key to making everything happen in eASee.cdm*
 - ❑ ECU software – HEX, S-Record, BIN, ...



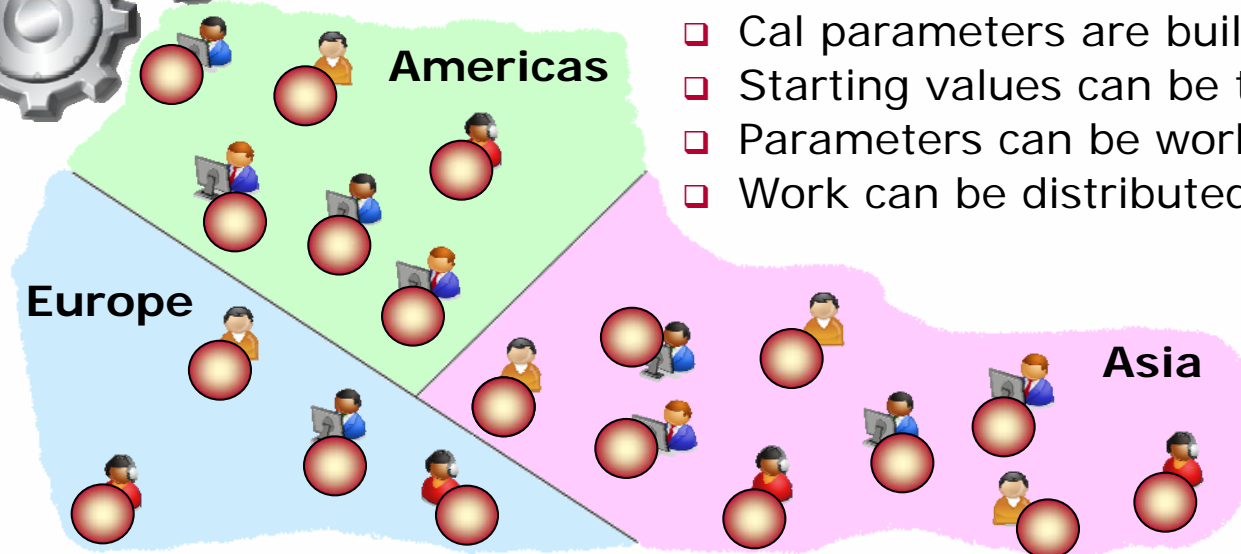
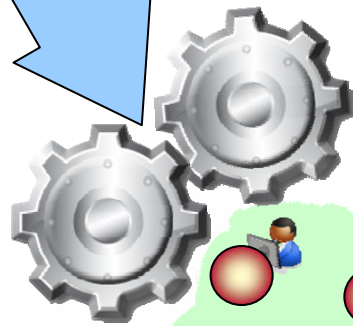
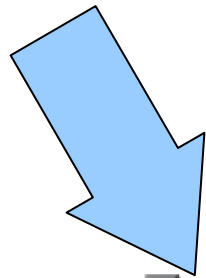
- ❑ Other? – eASee can be configured to manage any file type

eASEE.cdm – Data Activation



PST (program set)

- ❑ Contains uncalibrated HEX file and A2L file
- ❑ *eASEE "Activation" breaks the PST down into smaller components*
- ❑ These smaller components are kept together in a DST (data set)

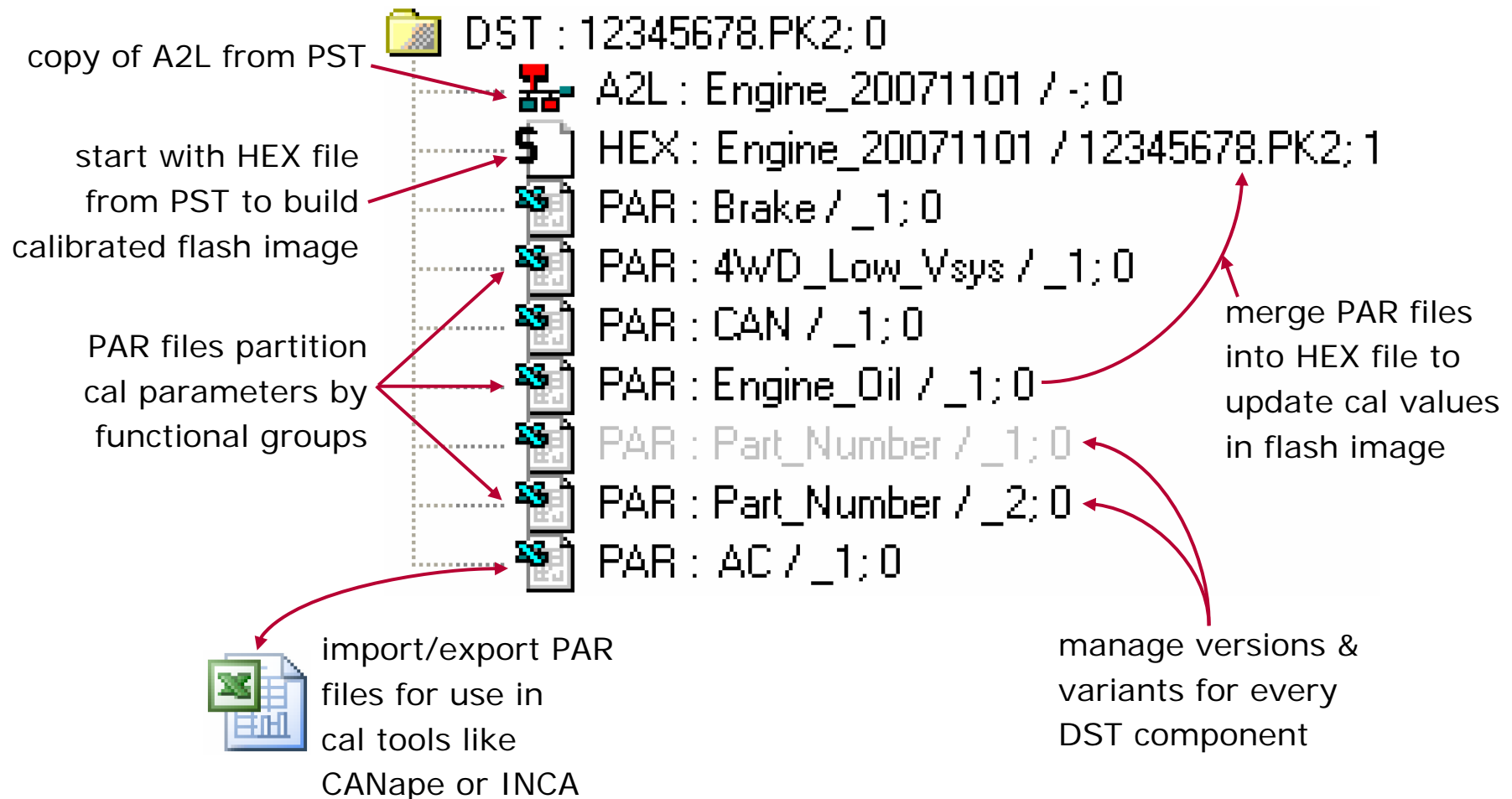


DST (data set)

- ❑ Cal parameters are built from A2L
- ❑ Starting values can be taken from HEX
- ❑ Parameters can be worked on parallel
- ❑ Work can be distributed globally

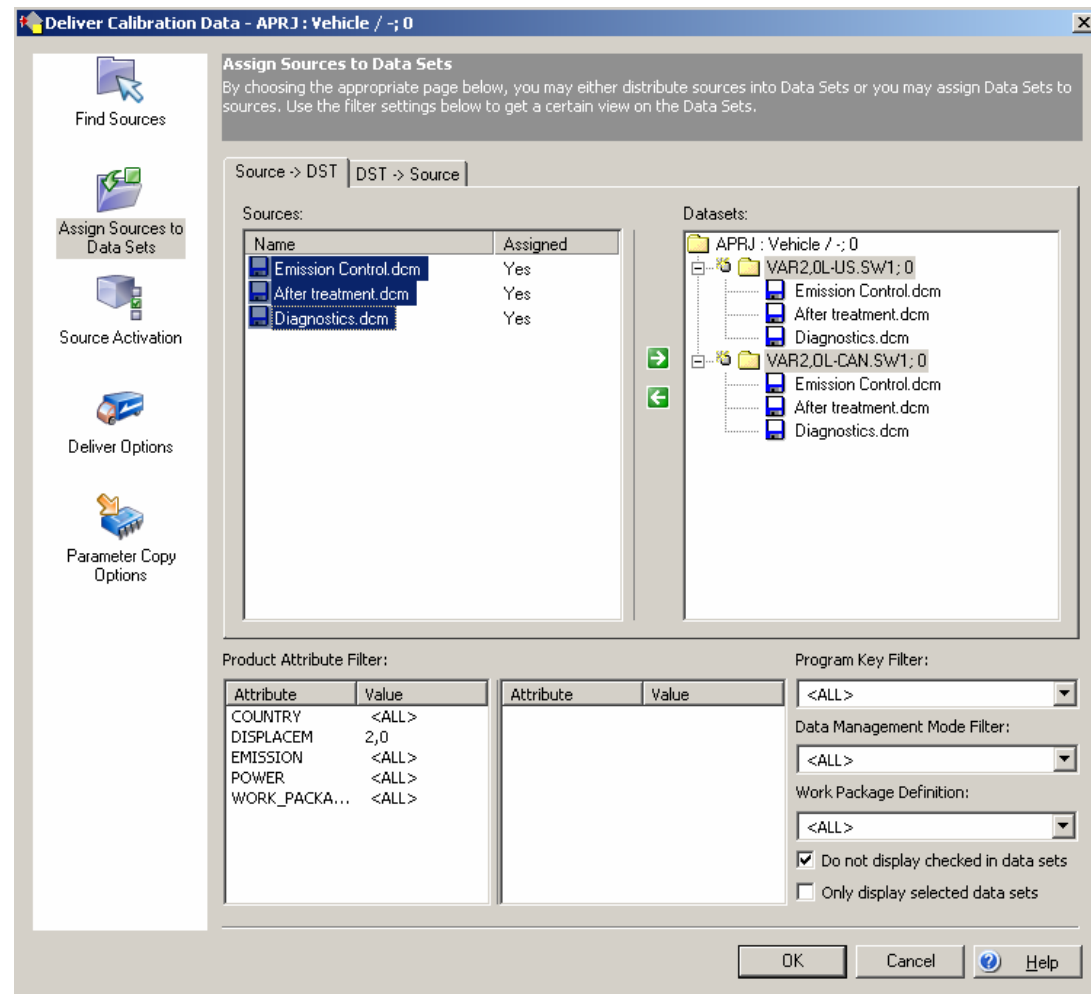
eASee.cdm – DST = Data Set (ECU Calibration Data)

DSTs are workspaces where calibration teams collaborate and manage calibration data for a PST



eASEE.cdm – Efficiency Improvements

- ❑ Parallel delivery of parameter files into multiple calibration data sets (DSTs)
- ❑ Assignment to DSTs based on searchable, filterable meta-data that identifies calibration data sets
- ❑ Sequence for integration of parameter files can be defined by user



CDM Studio

- ❑ The same powerful calibration data utility that comes in our CANape calibration tool
- ❑ Browse and edit cals by name
 - ❑ Access cal data types and attributes
 - ❑ View and edit in raw hex, decimal, ASCII and physical units
- ❑ Visualize multi-dimensional values
- ❑ Compare cal values across multiple data sources
 - ❑ Compare full cal sets, components, parts, parameters
 - ❑ Full side-by-side comparison
 - ❑ Filter view for just differences
 - ❑ Not limited to just two data sources, see A vs. B vs. C vs. D ...
- ❑ Merge cal components and parts
- ❑ Work offline with local data



eASEE.cdm – Calibration Data Management

CDM Studio

Browse,
edit
and
visualize
data in
multiple
views
and
formats

The screenshot displays the CDM Studio interface with the following components:

- Navigation Tree:** Shows a hierarchy starting with 'Root' and 'Master database: CCPSIM.a2l'. Under 'CCPSIM.a2l', there are folders for 'Axis', 'Curves', 'Example_Filter', 'Example_PWM', 'Maps', 'Measure', 'Parameters', and 'Virtual'. Below these are several filter options like 'Not in data description', 'All', 'Compare', etc.
- Parameter Table:** A table with columns 'Display name' and 'Value'. It lists parameters KF1 through KF6 with values [8,8], [8,8], [8,6], [8,6], [8,6], and [8,8] respectively.
- Parameter Details:** A detailed view for 'KF2' showing fields for Name, Display name, Sum of comparisons, Data type (Map), Comparison to the active column, Group (CCPSIM\Maps), Comment (8*8 BYTE shared axis Curve1/Curve2), and Minimum of the permitted range (phys) (0).
- Visualizations:** A 3D surface plot and two 2D line plots. The 3D plot shows a surface with axes 'Curve1: []' and 'Curve2: []'. The 2D plots show 'Curve1: []' and 'Curve2: []' with data points and a fitted curve.

eASEE.cdm – Calibration Data Management

CDM Studio

Compare and merge calibration data sets

Work with multiple data sets (A vs. B vs. C vs. D...)

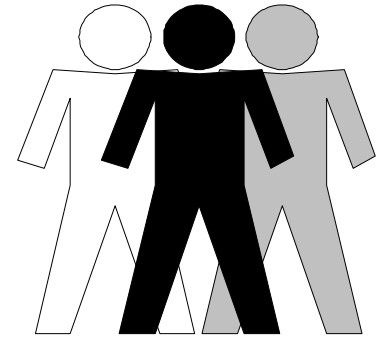
The screenshot displays the CDM Studio application window. On the left is a navigation tree with folders like 'Master data base', 'All', 'Compare', and 'User defined'. The main area shows a comparison of two data sets: 'Current device' and 'test.XML'. A table lists parameters with their values, variants, addresses, and status. The 'c0' parameter is highlighted in blue and marked as 'calibrated'. Below the table, a 'Description' pane shows details for the selected 'c0' parameter, including its name, data type, and comment.

Parameter	Value	Variant	Address	Value	Variant	Address	Status
a0	0.001 Volt		41114	0.001 Volt		41114	
ampl	14 Volt		410DC				
b0	0.005 Volt		41116	0.005 Volt		41116	
byte1	1		4111C	1		4111C	
byte2	2		4111D	2		4111D	
byte3	3		4111E	0		4111E	
byte4	4		4111F	4		4111F	
bytePWMFilter	50		4111B	50		4111B	
c0	0.006 Volt		41118	0.006 Volt		41118	calibrated
Counter_B4	No value!						

Description	Value
Name	c0
Display name	
Sum of comparisons	
Data type	Characteristic
Comparison to the active column	
Group	CCPSIM\Example_Filter
Comment	Digital Filter $v=(v_{in} * a0 + v_{in} * b0) / c0$
Minimum of the permitted range (phys)	0

Each eASEE.cdm user has a role and user-specific permissions

- ❑ Process manager
 - ❑ most powerful user in a domain (library)
 - ❑ set the rules for other users
- ❑ Project manager
 - ❑ generally a lead calibrator
 - ❑ can create new calibration projects and cal parts
 - ❑ assigns user access rights to parts, components and parameters
- ❑ Standard user
 - ❑ generally a calibration engineer
 - ❑ can load and update cal values assigned to him/her
- ❑ Observer
 - ❑ just read-only access to selected data



eASEE.cdm – Configuration of User Rights

User access rights can be assigned by:

- ❑ cal part
- ❑ cal component
- ❑ cal parameter

USER3's rights assigned by project manager

USER3 belongs to Group

Assigned Rights	Authorization
ANRZUEMX	WRITE
ANSW_TRIES	WRITE
ANWFOHE	WRITE
ANWFOST	WRITE
ANZDYNH	WRITE
ANZEAUS	WRITE
ANZEKPLMX	WRITE
ANZHCHK	WRITE

Inherited Rig...	Authorization	Path
AFSTB	WRITE	\Group
AFZBKHLH	WRITE	\Group
AHKATMX	WRITE	\Group
AHKATS	WRITE	\Group
AHKATSB	WRITE	\Group
AHKATSW	WRITE	\Group

List of cal's to pick from

Cals can only be set by those with permission!

DST creation

- ❑ Fill calibration parameters with default values from HEX file
- ❑ Validate cal values against limits set by A2L file

Check-in / check-out

- ❑ Validate cal data files against A2L on the way in and out of eASee

Data integration into HEX file

- ❑ Validate cal values against limits set by A2L file
- ❑ Update checksums during integration
- ❑ Update lifecycle states for data and HEX

Software update

- ❑ Update an existing DST to a new PST version

eASEE.cdm – Documentation and Reports

Overview application history

Application History Edit Application status Help

		Name	ASAP2 function	ASAP2 variant	Status	Working cc
0126	004	eASEEcdm.Soll_Lambda	eASEEcdm_ign_inj_co...		completed	Validated b
0131	004	eASEEcdm.ThrottleRefInputTest	eASEEcdm_ECUCode		completed	Validated b
0246	004	eASEEcdm.abs_sinp2_cosp2_table	eASEEcdm_Tables2D		completed	Validated b
0136	004	eASEEcdm.airmass_x_table	eASEEcdm_ign_inj_co...		completed	Validated b
0001	004	eASEEcdm.array.Element[0]	eASEEcdm_Vectors		completed	Validated b
0006	004	eASEEcdm.array.Element[1]	eASEEcdm_Vectors		completed	Validated b
0007	003	eASEEcdm.array.Element[1]	eASEEcdm_Vectors		checked	Check by p
0008	002	eASEEcdm.array.Element[1]	eASEEcdm_Vectors		calibrated	Calibration
0009	001	eASEEcdm.array.Element[1]	eASEEcdm_Vectors		prelimCalibrated	Second mo
0010	000	eASEEcdm.array.Element[1]	eASEEcdm_Vectors		changed	Initial modif
0011	004	eASEEcdm.array.Element[2]	eASEEcdm_Vectors		completed	Validated b
0016	004	eASEEcdm.array.Element[3]	eASEEcdm_Vectors		completed	Validated b
0021	004	eASEEcdm.array.Element[4]	eASEEcdm_Vectors		completed	Validated b
0141	004	eASEEcdm.axis.X_AXIS_xU16	eASEEcdm_Axis		completed	Validated b
0201	004	eASEEcdm.axis.X_CU_AXIS_xU16_wU8	eASEEcdm_Axis		completed	Validated b
0206	004	eASEEcdm.axis.Y_CU_AXIS_xU16_wU8	eASEEcdm_Axis		completed	Validated b
0211	004	eASEEcdm.curve.FKL_xFIX_wU8	eASEEcdm_Curve		completed	Validated b
0216	004	eASEEcdm.curve.GKL_xCOM_wU16	eASEEcdm_Curve		completed	Validated b
0221	004	eASEEcdm.curve.KL_xU8_wU8	eASEEcdm_Curve		completed	Validated b
0046	004	eASEEcdm.f_Kd_1	eASEEcdm_PosControl		completed	Validated b
0051	004	eASEEcdm.f_Kd_2	eASEEcdm_PosControl		completed	Validated b
0056	004	eASEEcdm.f_Ki_1	eASEEcdm_PosControl		completed	Validated b
0061	004	eASEEcdm.f_Ki_2	eASEEcdm_PosControl		completed	Validated b
0066	004	eASEEcdm.f_Kp_1	eASEEcdm_PosControl		completed	Validated b
0071	004	eASEEcdm.f_Kp_2	eASEEcdm_PosControl		completed	Validated b
0081	004	eASEEcdm.inj_offset	eASEEcdm_ign_inj_co...		completed	Validated b

Filter	Parameter
<input checked="" type="checkbox"/>	Name
<input checked="" type="checkbox"/>	ASAP2 function
<input checked="" type="checkbox"/>	ASAP2 variant
<input checked="" type="checkbox"/>	Status
<input checked="" type="checkbox"/>	Working context
<input checked="" type="checkbox"/>	Project info
<input checked="" type="checkbox"/>	Destination variant
<input checked="" type="checkbox"/>	Test object
<input checked="" type="checkbox"/>	Program identifier
<input checked="" type="checkbox"/>	Data identifier
<input checked="" type="checkbox"/>	User
<input checked="" type="checkbox"/>	Notes
<input checked="" type="checkbox"/>	Date

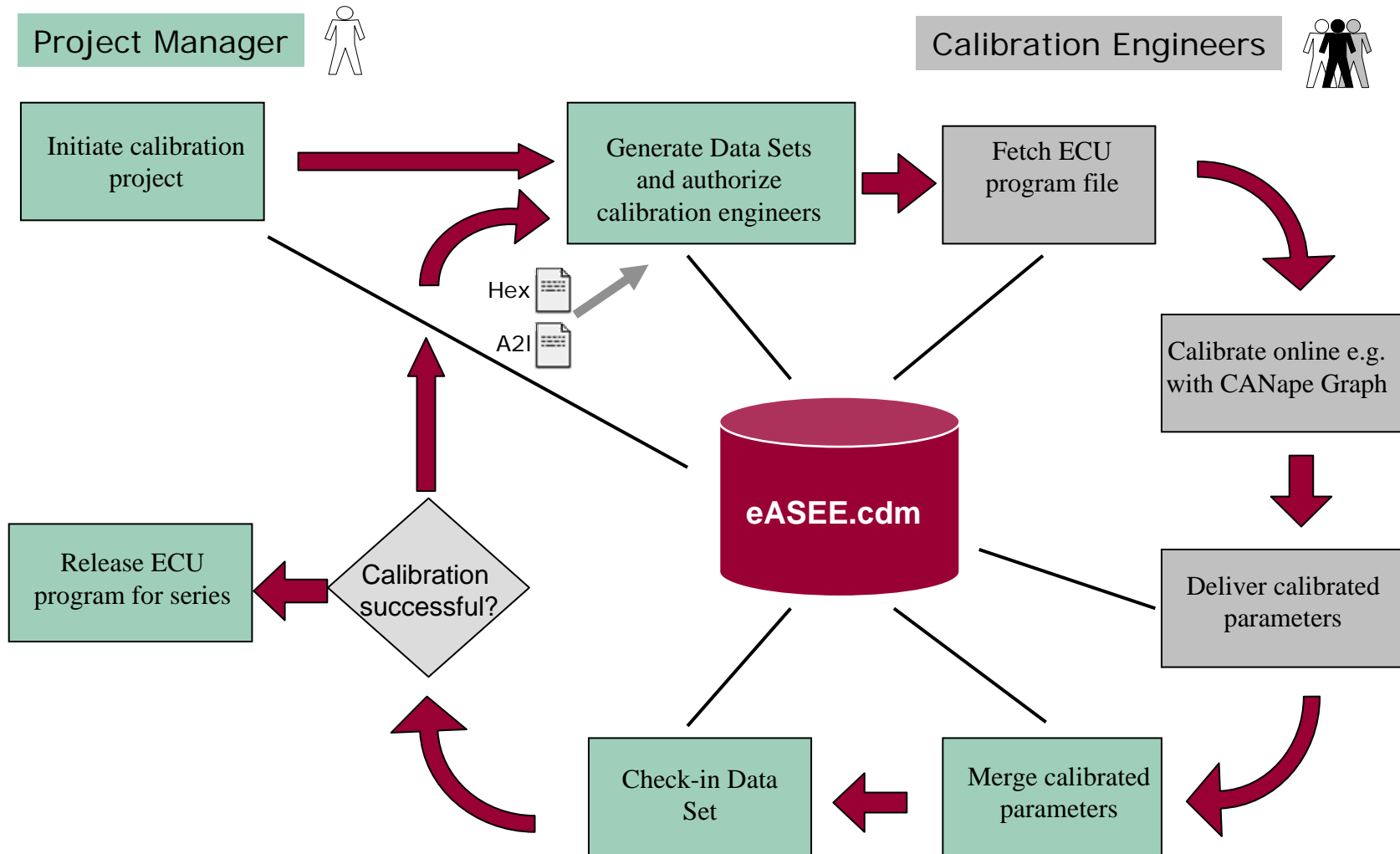
Entry upward Entry downward

Use filtering
 Immediately
 Manual Use filters

Application status
 Calculate

Default entries Help

eASEE.cdm – Process Support



Benchmarks – Vector Investment and User Base

Vector Investment

- ❑ eASee Tool Suite
 - ❑ 90+ staff of full-time product developers, project engineers, support staff
 - ❑ 10 man years of support experience with engineering users and IT depts.
- ❑ eASee.cdm
 - ❑ 30-40 man years of development effort since 2002

eASee.cdm User Base

- ❑ 2008 – 1000+ users
- ❑ 2009 – 2000+ users (GM global deployment)

eASee.cdm Customers:



Case Study – Tier 1 Transmission Supplier

- ❑ Advantages gained with eASee.cdm
 - ❑ Decrease time and effort in calibration development and release
 - ❑ Increase compliance with calibration development process
 - ❑ Improve manageability of data revisions and variations
 - ❑ Guarantee of reproducible data
- ❑ Measured results with eASee.cdm
 - ❑ Effort creating calibration data sets: **90% decrease**
 - ❑ Time to release:
 - ❑ Before eASee.cdm: Data freeze one week before release
 - ❑ After eASee.cdm: **Data freeze on the day of release**

Thank you for your attention.

For detailed information about Vector
and our products please review our website at:
www.vector-cantech.com

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