

„Ohne Software gibt es kein Wachstum mehr.“
Philipp Rösler, Bundesminister für Wirtschaft und Technologie, 21.5.2013

Part IV. Scalable Software Business Models

40. Scalable Software Business Models

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Softwaretechnologie

Fakultät Informatik

Technische Universität Dresden

2020-0.3, 21-1-16

<http://st.inf.tu-dresden.de/teaching/saab>

- 1) Different Driving Factors
- 2) Service-based Business Models
- 3) Product-Based B2B Models

Obligatory

- ▶ [Cusumano] Michael A. Cusumano. Staying Power: Six Enduring Principles for Managing Strategy and Innovation in an Uncertain World. Clarendon Lectures in Management Studies. Oxford University Press, 2010.
 - Try to buy this book second hand, it is revolutionary.
 - Spend 20€ to win your lifetime's income!
- ▶ <http://www.drkarlpoppp.de/VeroeffentlichungenPublications.html>

References

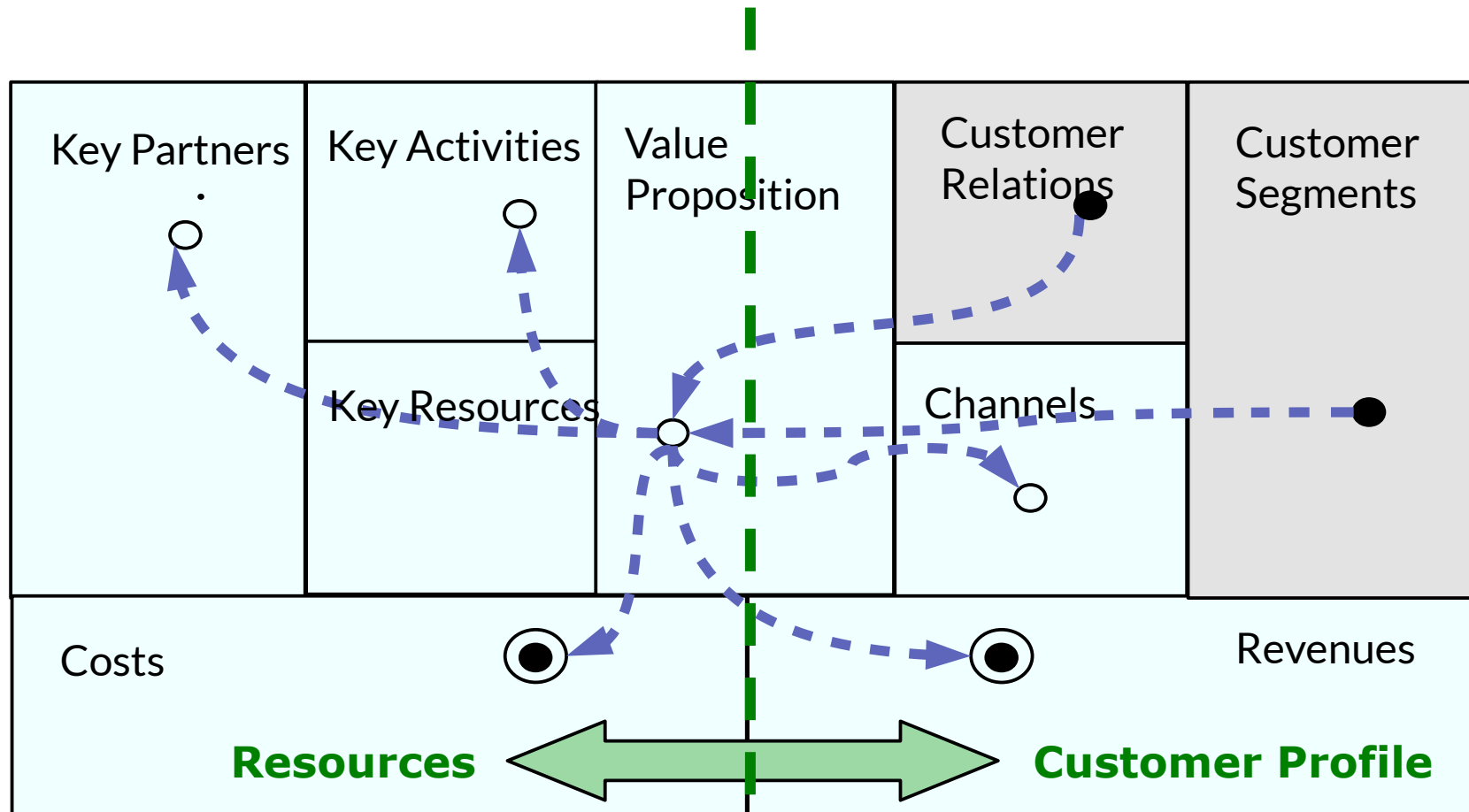
- ▶ Karl Popp. Software industry business models. IEEE Software, 28(4):26-30, 2010.
- ▶ [MassCustomization] Charles Krüger. Software Mass Customization. Biglever Software White Paper. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.84.6997&rep=rep1&type=pdf>
- ▶ [Scheer] August-Wilhelm Scheer. Unternehmen gründen ist nicht schwer. Springer. 2000. Honest book about ups and downs of ARIS.
- ▶ Klaus Schmid, Frank van der Linden. Software Product Lines in Action. Springer.

40.1 Different Factors Drive Business Models – How to Vary a Business Model Canvas

[BMG p 142]

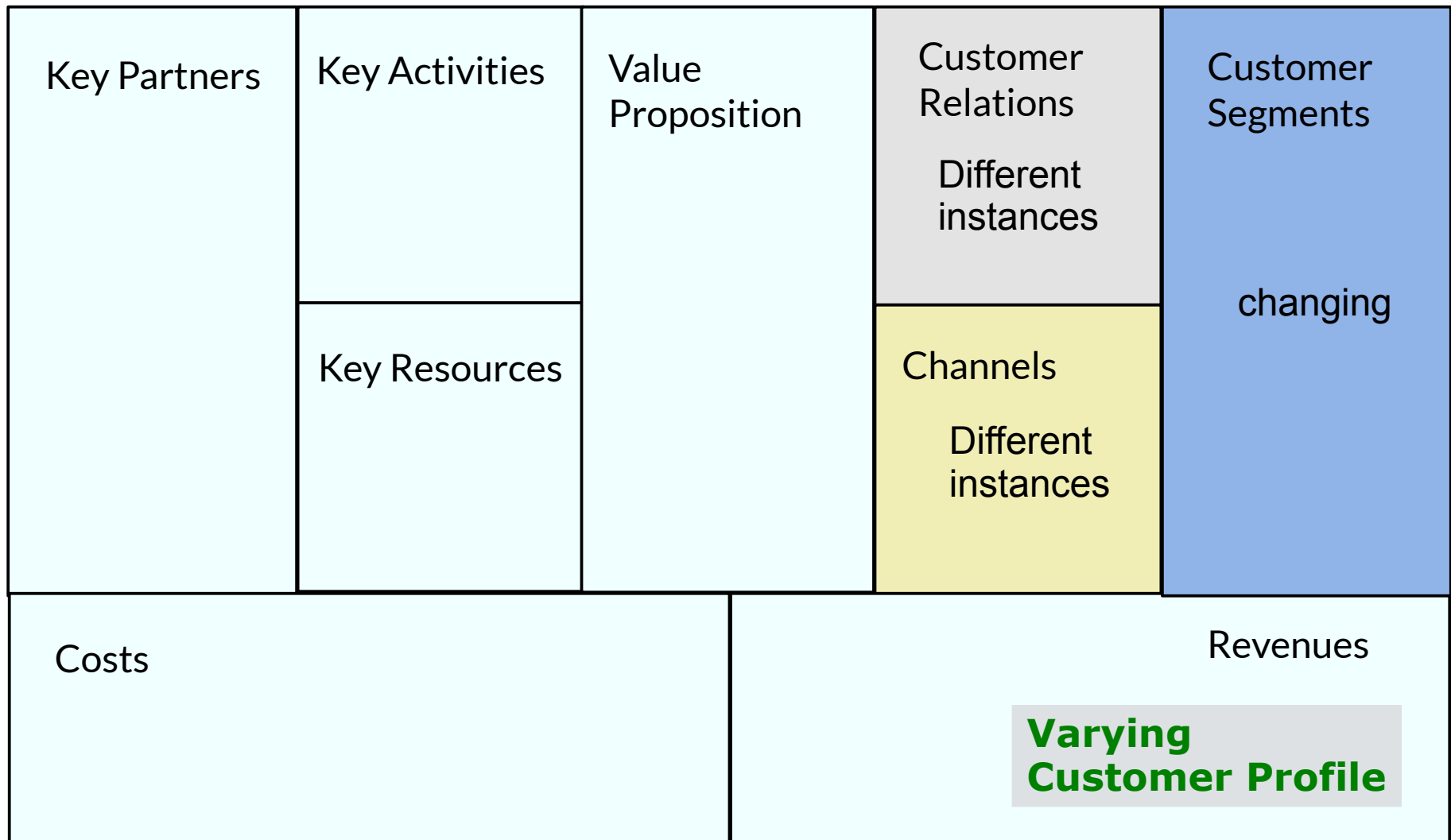
Customer-Driven Business Models

- ▶ From customers to value proposition and the rest
- ▶ Many Software BM use *product specialization* for disjoint groups of costumers
 - Setting up a customizable product or product line
 - Setting up a second product line in a product matrix



Customer-Varying Business Models for Services, Software Products and Product Lines

- ▶ Customers live in different domains, with different communities, habits, histories



Scale by

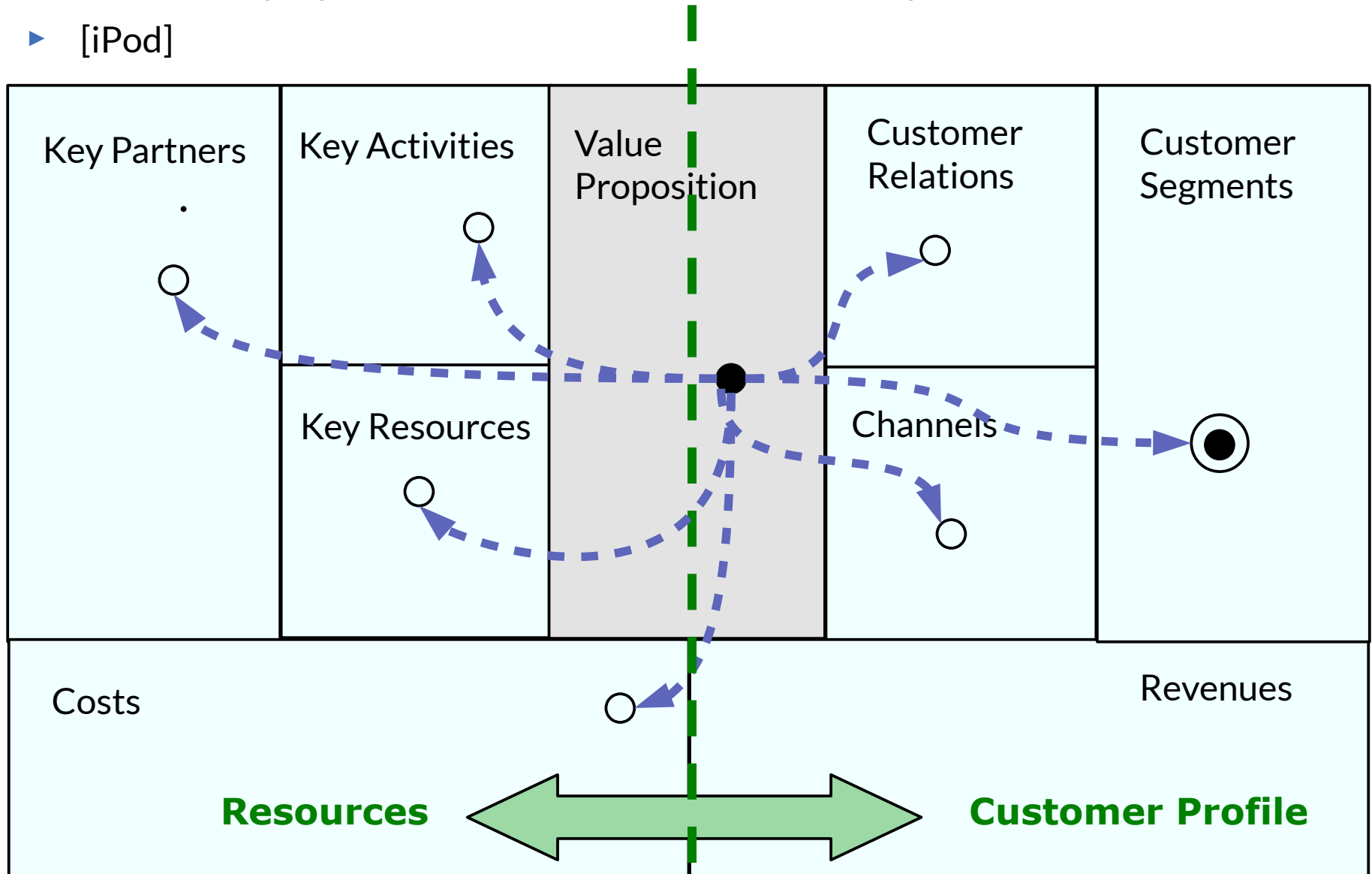
Variation of Customer Segments for Product Variation

- ▶ One of the most *scalable* software business models is **customer segmenting via domain-specific, regional, or customer-group specific product lines.**
- ▶ **Software reuse factors** should be high
 - To sell the reused components many times
 - → Component-based Software Engineering, Frameworking, Product Line Engineering

*Always attempt to derive a product variation
with a new customer segment
and a good software reuse.*

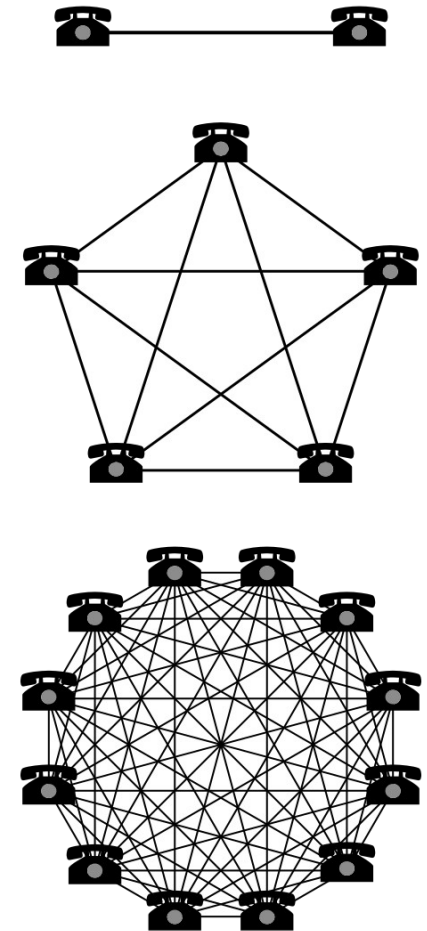
Value-Driven Business Models

- ▶ From value proposition to resource and customer map
- ▶ [iPod]



Scaling in Value-Driven Networks (Internet Marketplaces, Social Platforms)

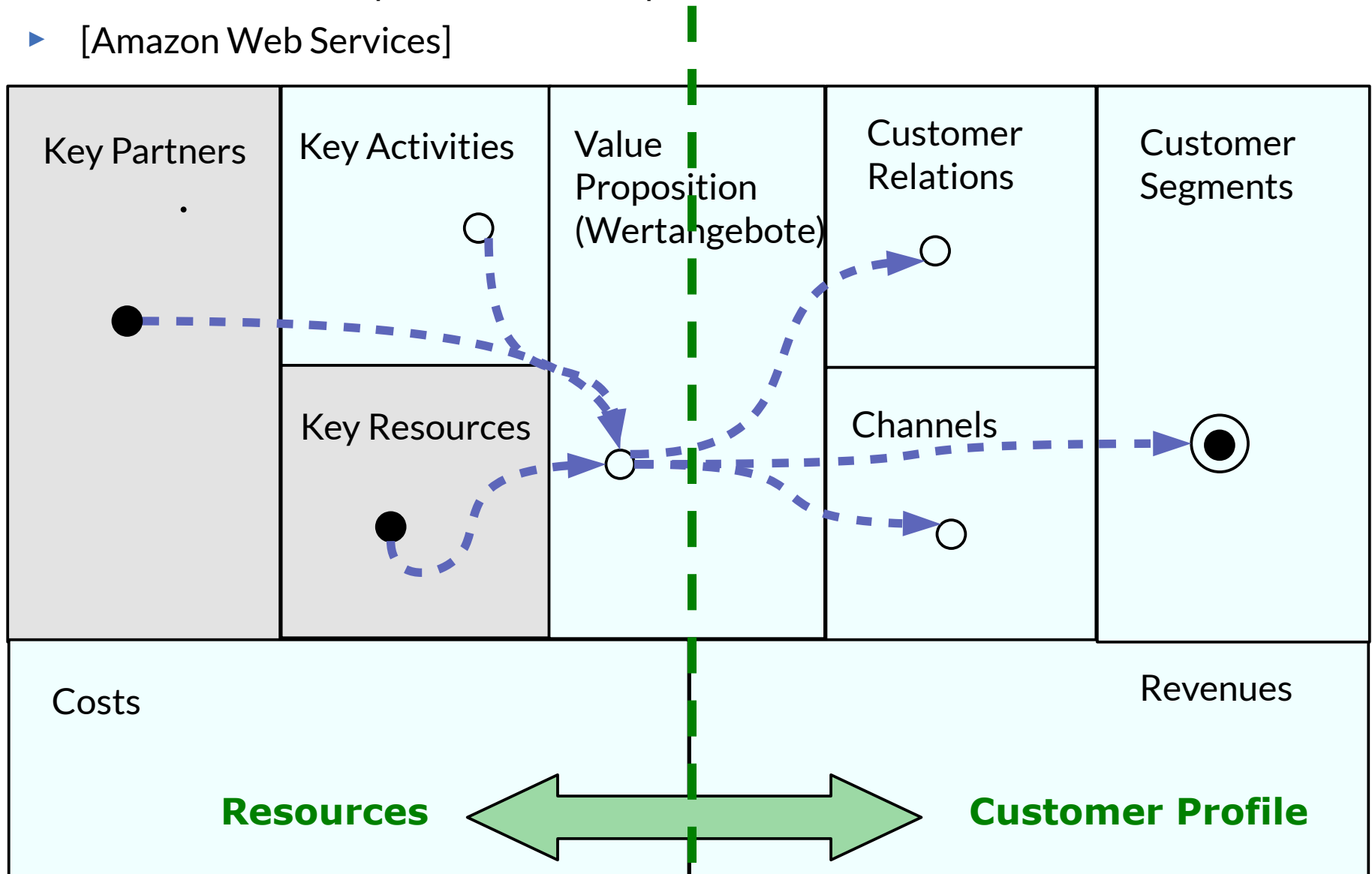
- ▶ https://en.wikipedia.org/wiki/Metcalfe%27s_law
- ▶ If the value proposition affects the *relation* of the customers, n^2 business opportunities result
- ▶ This is the business model of Facebook, Twitter, XING etc:
- ▶ Create a network first, sell later



Business models based on Value-Driven Networks are among the best-scaling business models

Resource-Driven Business Model

- ▶ From Resource map to customer map
- ▶ [Amazon Web Services]



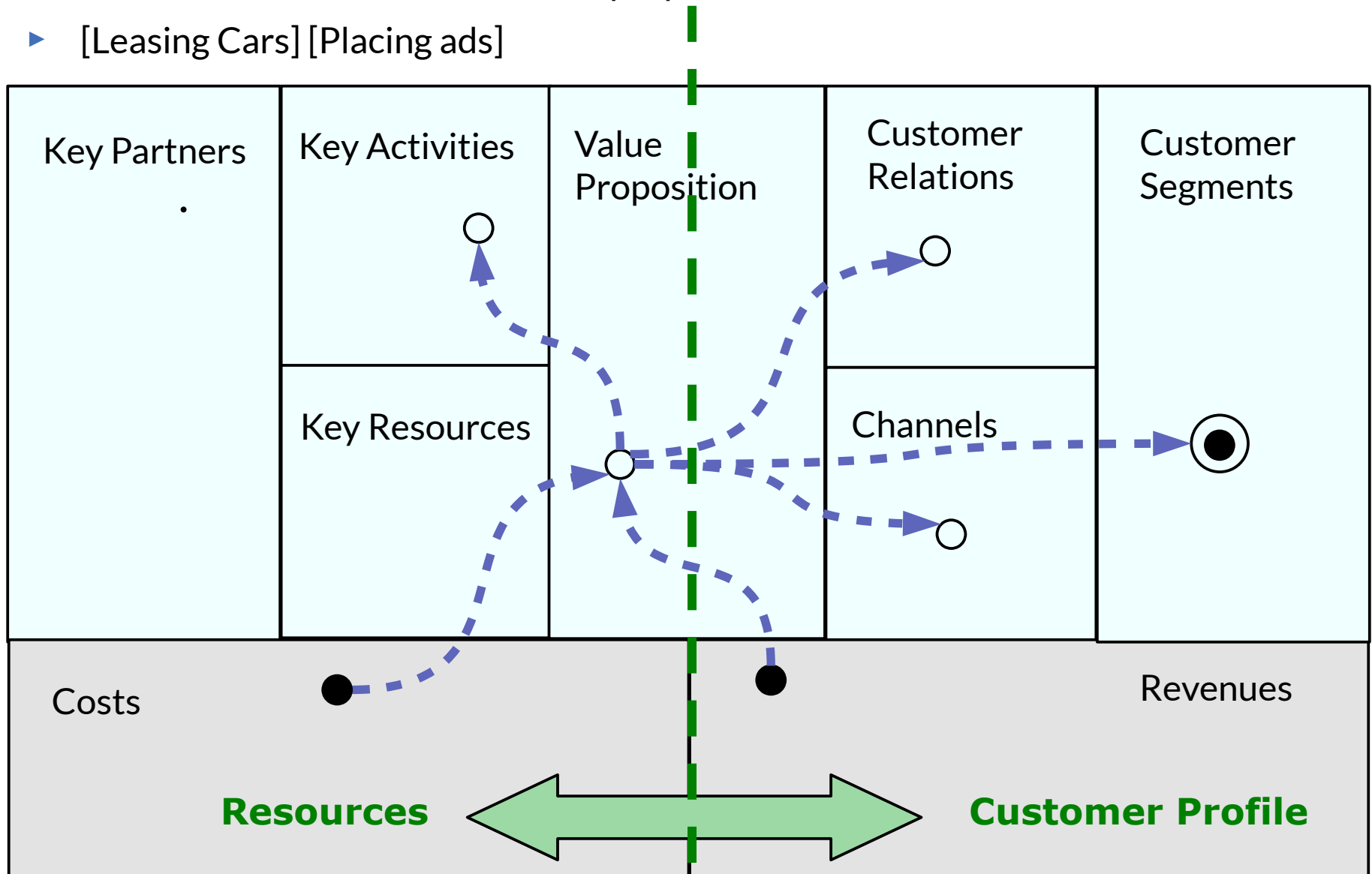
Technical Domains – Technology Variation-Driven Business Models

- ▶ The same user group can be reached by different technologies
- ▶ A **technical domain** is a technology which can be crossed with the **business domain** (customer segment).
- ▶ Product matrix models result (variation in 2 dimensions: business domain and technology)

Always attempt to derive another business model based on a technology variation crosscutting the customer segments.

Finance-Driven Business Models

- ▶ From costs and revenues to value proposition and customers
- ▶ [Leasing Cars] [Placing ads]



Finance Drives Variation

- ▶ A **finance-driven variation** sells a product with different pricing models (3rd dimension of variation):
 - Teaser for free, but with advertisement
 - Pay-per-use with paypal
 - Computer-based license
 - Flatrates
 - Location-based services with base product

Always attempt to derive a finance variation crosscutting the customer segments and the technology.

Finance: Instead of Sell Binaries

Closed-Source Software Business Models

- ▶ Leasing (where others buy)
- ▶ Rent (where others buy)
- ▶ Sell advertisements [Opera, Google]
- ▶ Sell directly, order via internet [Dell, Amazon]
- ▶ Sell later, hope to use the Metcalfe network effect [Twitter, Facebook]
- ▶ Sell via auction [ebay]

Open Source Software (OSS) Business Models

- ▶ http://en.wikipedia.org/wiki/Open_source
- ▶ **Free product** (“free taste”, “Versucherle”, “Köder”)
 - Give the product for free and **sell services, consulting, or apps**
 - Mould a market with the product
 - Ex. Adobe pdf with Acrobat Reader
- ▶ **Free framework**
 - Give the framework for free, create a community, and sell applications
 - Ex. IBM gives Eclipse for free, fosters a community, and many sell
- ▶ Release Politics
 - with union-fs (overlay); with browser; with portal
- ▶ **Micropayment**
 - Use micropayment companies for installation or run of a software (PayPal, ..)
 - Use Telecom billing
- ▶ Choose licences carefully
 - <http://creativecommons.org>
 - GPL is a virus that infects all extensions; LGPL not
 - FPI

Open Source Business Model “Free Taste” (dual-licensing, freemium)

- ▶ Free “taster” versions
 - Give out earlier version of the product for free
 - Sell the new or premium version (“freemium”)
- ▶ Examples
 - www.gentleware.com
 - NatSpec
- ▶ Free “community” versions
 - Give out a stripped version (e.g., only for 1 user, 1 database, ..)
 - Sell full version
- ▶ Free time-restricted versions
 - 1 month

Business Model “Versucherle”/”Köder”: Plugins under Dual Licensing

- ▶ Premium: [BMG] p. 108
- ▶ Companies can make plugins for OSS tools under dual licensing
 - Thunderbird, Firefox, OpenOffice, Eclipse, ...
- ▶ Example: Quicktext Thunderbird extension <http://extensions.hesslow.se/>
 - QuickText is free
 - QuickText Pro is commercial
- ▶ Advantage: Platform has already many users and a large market

Deriving Secondary from Primary Business Models

- ▶ From a primary value-driven or customer-driven business model, secondary ones can be derived
 - **Customer-driven models** vary the customer segment
 - **Resource-driven models** can be derived to use the resources more efficiently
 - **Finance-driven models** can be derived to re-use a good value proposition with other pricing and costs
 - [Hilty drilling machines]

Always attempt to derive a secondary BM from your primary one by varying along one of the variation dimensions.

Basic Forms of Business Models

- ▶ Product (with maintenance contract)
- ▶ Product with parameterization and mass configuration
- ▶ Product with piggy-pack Service

- ▶ Product Line (variation in 1 dimension)
- ▶ Product Matrix (variation in 2 dimensions)
- ▶ Product Cube (variation in 3 dimensions)
- ▶ Product Platform with Apps/Complements/Plugins and Services

- ▶ Individual software solution (with maintenance contract)

- ▶ Service
- ▶ Service Family
- ▶ Service based on Value Driven Network
- ▶ Service Matrix (variation in 2 dimensions)
- ▶ Service Cube (variation in 3 dimensions)



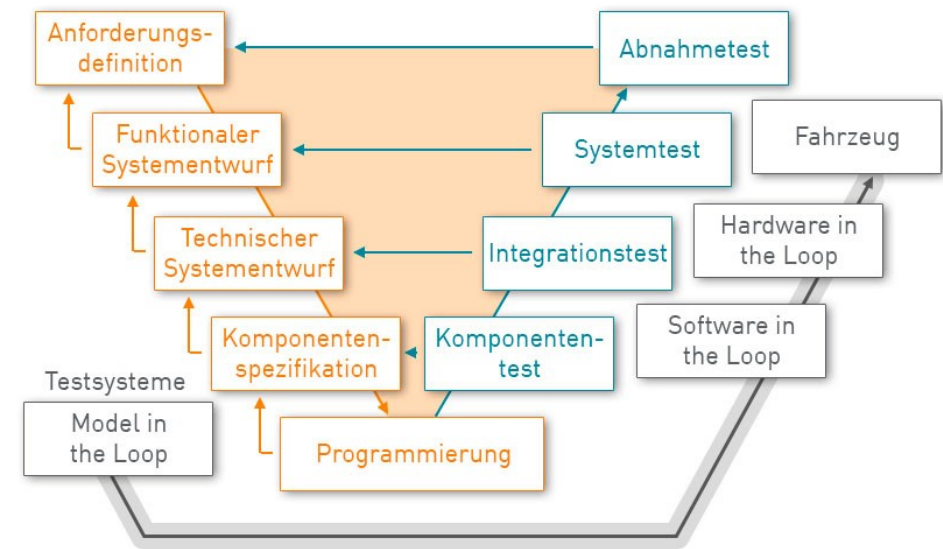
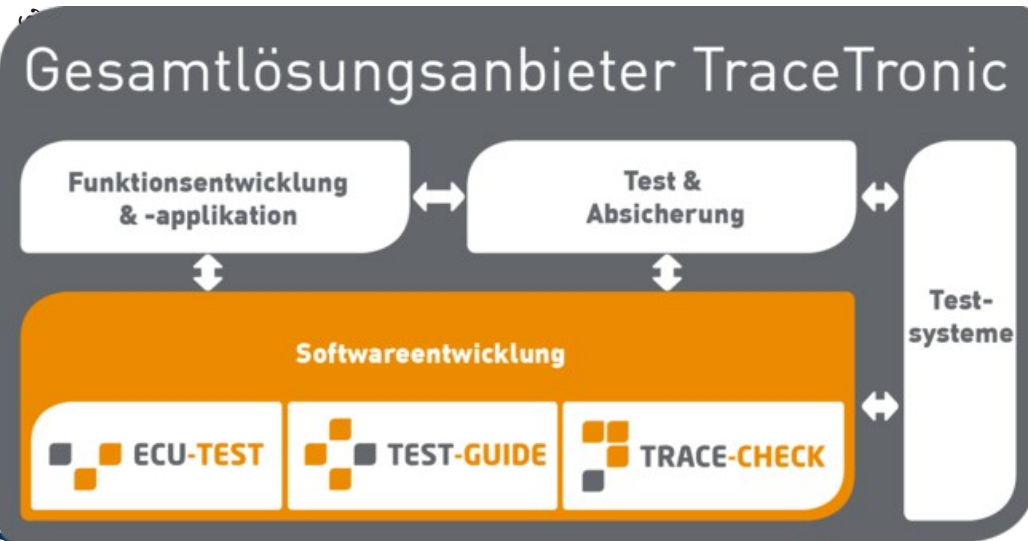


40.2 Service-Based Business Models

40.2.1. Services (“Leistungen”, “Solutions”) can be based on Products

- ▶ <http://www.tracetronic.de/leistungen/>
- ▶ TraceTronic (Gittersee) has several products for motor tests
- ▶ On top, they offer test projects, construction and integration into further test systems, function development for motors
- ▶ Testing uses the automotive V-model: lots of spots for service projects
 - Requirements engineering (elicitation, checking...)
 - Specification
 - Design and Testing
 - Seminars (Schulung)

© Prof. Uwe Aßmann

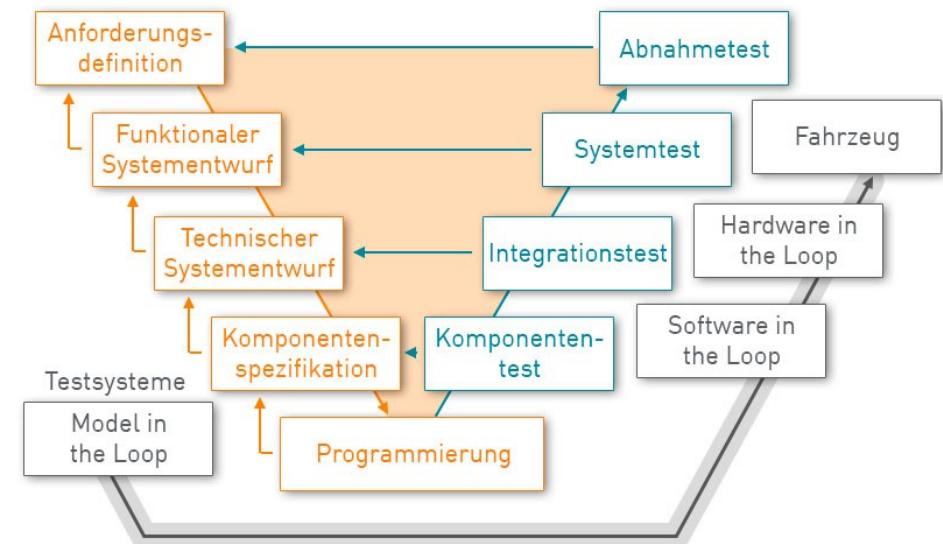


Business Model “Service Family along V-Model”

Salt Solutions

23 Software as a Business

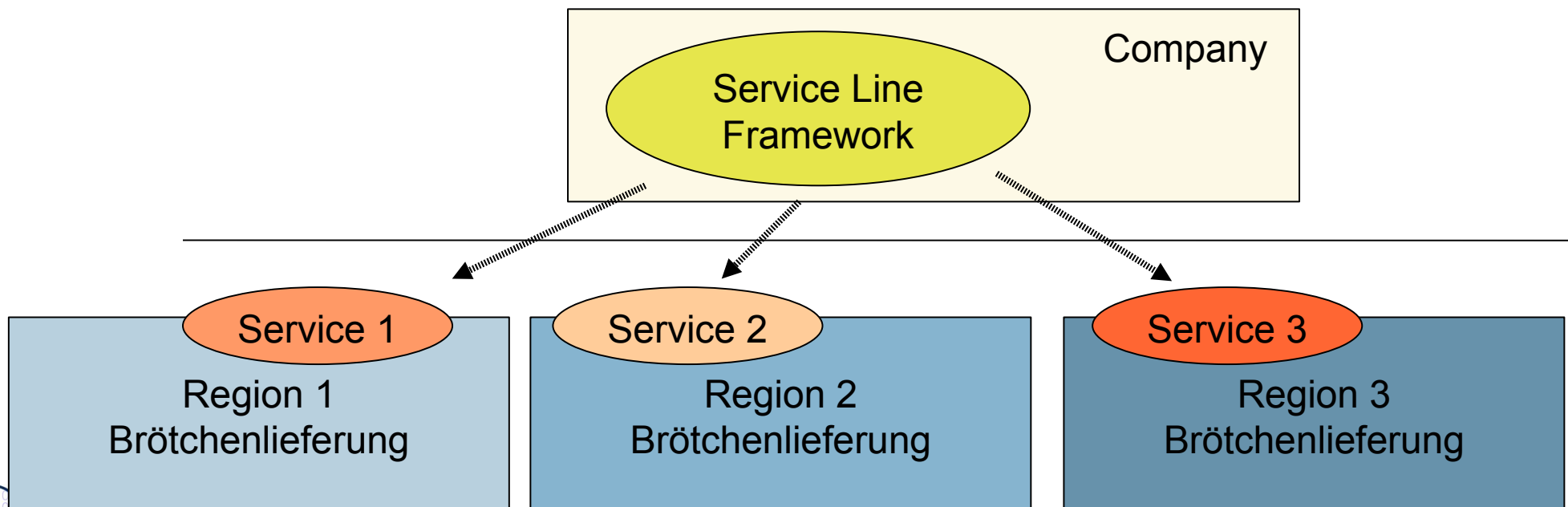
- ▶ For any software company, services can be structured along the typical tasks of the V-model
- ▶ <https://www.salt-solutions.de/leistungen.html>
 - Quality management
 - Requirements engineering
 - Testing
 - Certification
 - Consulting
 - Conception (Design, Processes, Specification)
 - Implementation
 - Support



- ▶ <http://www.tracetronic.de/leistungen/>

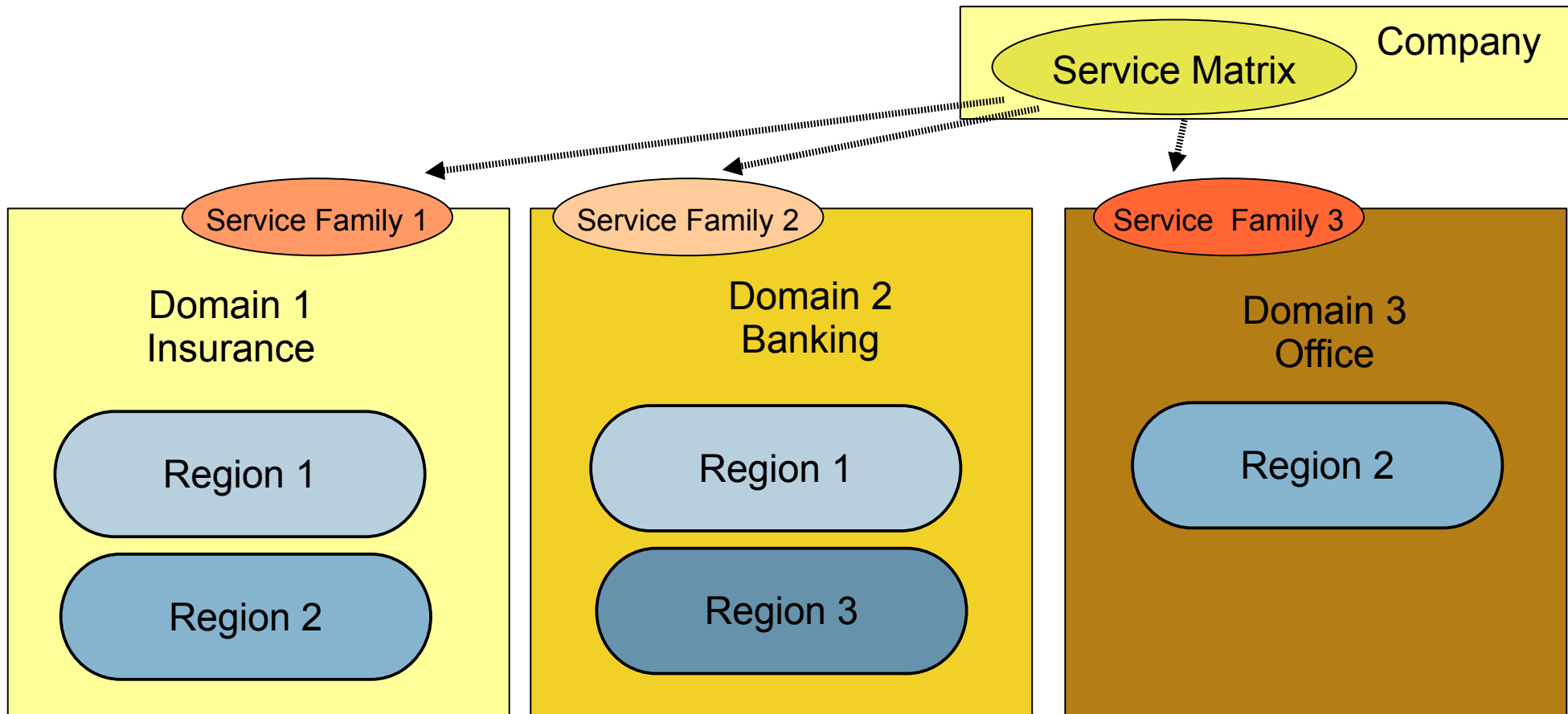
40.2.2 Business Model “Regional Service Family”

- ▶ One dimension to vary can be the region of sales
 - Develop a service in a region (regional business model, regional customer segments)
 - Replicate the service to other regions (regional porting)
- ▶ Example: www.Morgengold.de, www.it-sax.de (pludoni.de), www.lieferando.de
- ▶ Franchising can be used to spark small enterprises
- ▶ The same software can be used in every region, if customized appropriately



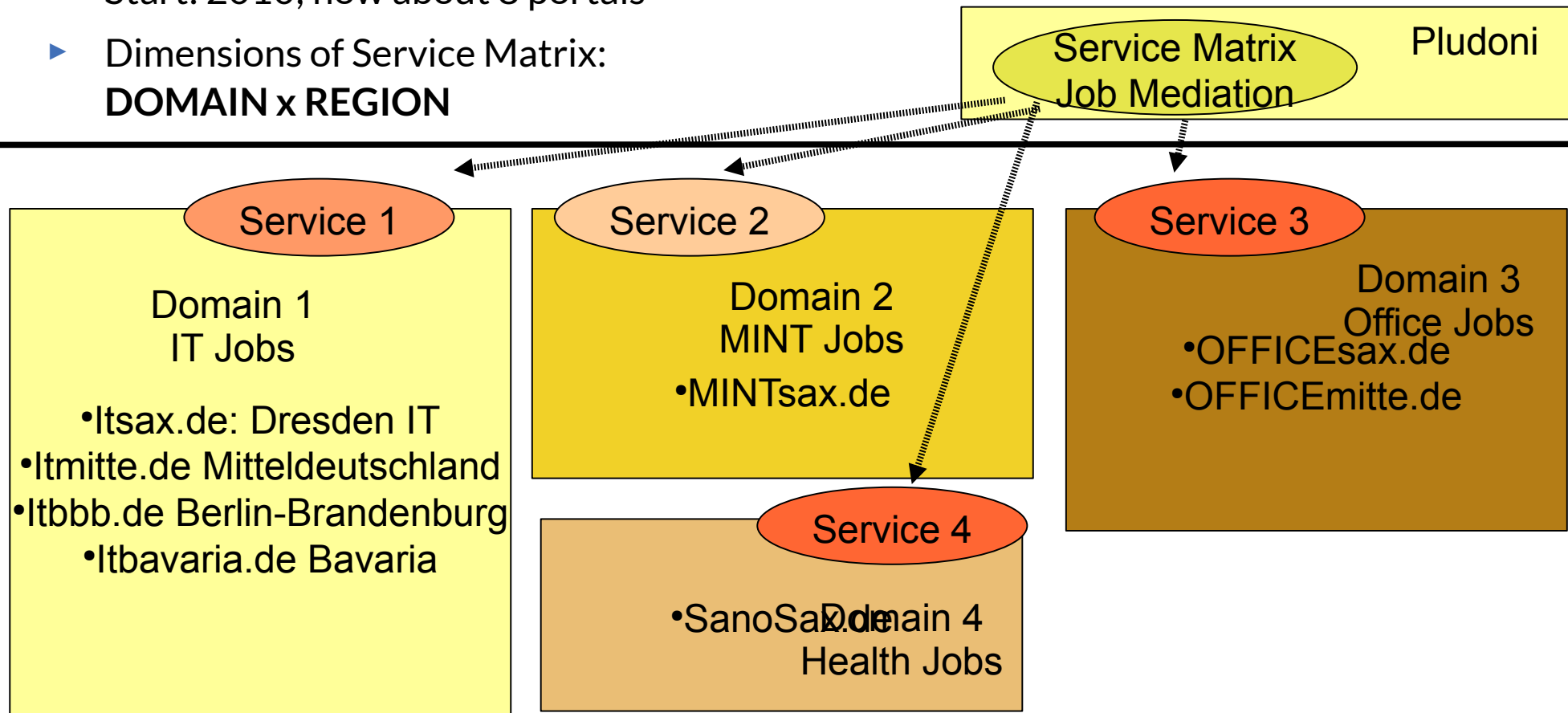
40.2.3. Business Model “Domain-Region Service Matrix”

- ▶ Develop a service in a two or three dimensions
 - Region
 - Business Domain
 - Technical Domain



Pludoni's Business Model “Domain-Region Service Matrix” with “Smart Companies”

- ▶ www.it-sax.de (www.pludoni.de): a portal for mediating (brokering) applications and job offers in a region (regional business model)
 - Trusted web community (“club of companies”) with recommendations
- ▶ Founder Jörg Klukas ported it to many other regions and professional domains
- ▶ Start: 2010; now about 8 portals
- ▶ Dimensions of Service Matrix:
DOMAIN x REGION

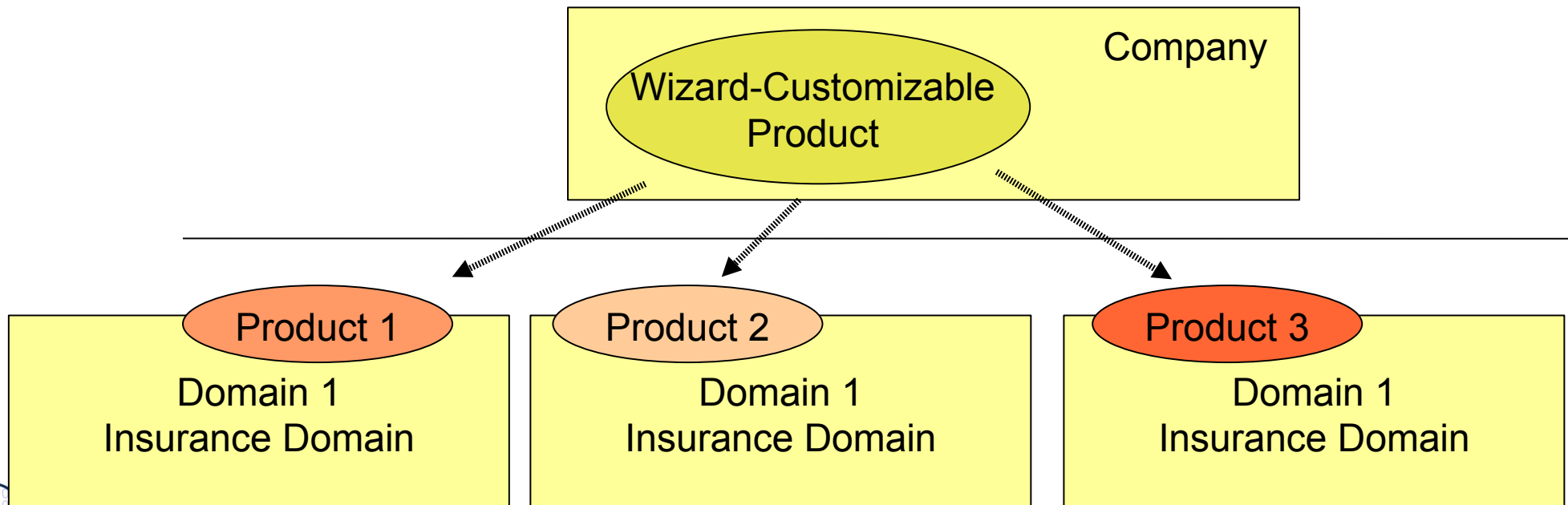




40.3 Product-Based B2B Business Models

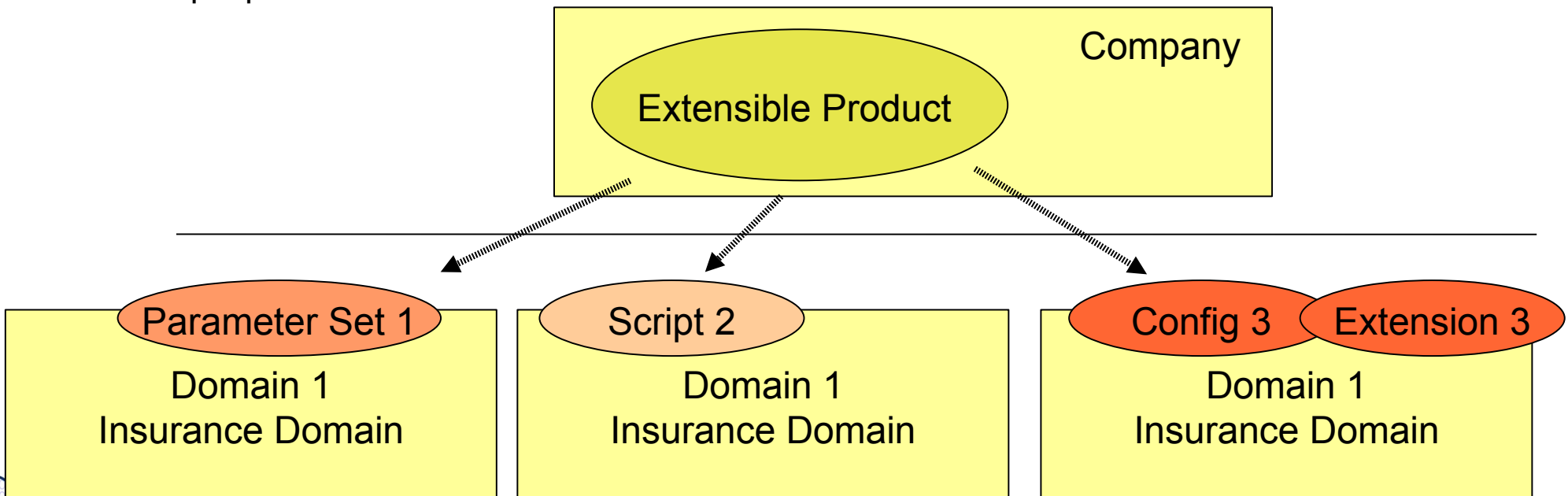
Business Model “Mass-Customizable Product”

- ▶ Make the product **customizable (by end user)** [MassCustomization]
 - Customize by interactive Wizard simplifying the customization
 - Keep the product customization technique as company secret
- ▶ Intense interaction with customers required to ensure that the mass customization is simple enough



Business Model “Parameterizable Software Product”

- ▶ Design an extensible product in-house, **parameterizable by experts**
 - Parameterize by scripts in a scripting language, domain-specific language, or complex form mechanism (XML)
 - **Extend** by Plugin (Extension, Complement); Requires a *component model*
- ▶ Extension by product owner or third party (partner or supplier)
- ▶ Know how: instantiate new products with *different extended functions (features)*
 - Keep the product extension technique as company secret
- ▶ This is the standard way for product-oriented companies, how to scale their business to more than 15 people



Tracetronic ECU-Test, a Parameterizable Domain-Specific Product

- ▶ Gittersee, Dresden, Germany
- ▶ <http://www.tracetronic.de/produkte/ecu-test/>
- ▶ Motor testing software
 - Writing and composing test scripts for motor runs in simulators or cars
 - Test script libraries
- ▶ Model-in-the-loop (MIL), Hardware-in-the-loop (HIL), Software-in-the-loop (SIL)
- ▶ Adapters for other test tools
- ▶ Growth: 1->100 employees in 10 years

**Domain-specific products and product lines fill a domain-specific need
(a need of a domain-specific customer segment)!**

Tracetronec ECU-Test

The screenshot displays the ECU-TEST 6.0 software interface. The main window is titled 'Editor' and shows a test case for 'CrankSensor'. The test case is structured as follows:

#	Action / Name	Parameter	Expectation / Value
1	Initialization		
2	MODEL-Write: CTRL_ABTRIEB/KL15 [0][1]/Value	PHYS(don't care)	1
3	WAIT	500 ms	
4	DIAG(EDIABAS): Engine/FS_LOESCHEN		JOB_STATUS: E('OKAY')
5	DIAG(EDIABAS): Dashboard/FS_LOESCHEN		JOB_STATUS: E('OKAY')
6	Engine start and driver request		
7	EngineStart	NMotMin=NMotMin	
8	Comment		'Driver request'
9	MODEL-Write: CTRL_ABTRIEB/Fahrerwunsch [%]/Value	PHYS(don't care)	DriverRequest
10	WAIT	3000 ms	
11	Comparison normal state		
12	NMot_Read		-> NMotDeviation
13	Calculation	NMotDeviation	<= 150
14	Fault crank sensor		
15	Electric failure simulation: FIU-1	E_P_KWG	BROKEN
16	WAIT	500 ms	
17	Comment		'Comparison fault state'

The interface also includes a 'Functions' pane on the left with categories like 'Standard utilities', 'Data operations', and 'Flow control'. A 'Configurations' pane shows 'Tutorial-HiL.tbc' with various components like FIUDUMMY01 and MODELDDUMMY01. A 'Messages' pane at the bottom left shows a filter and auto-scrolling options. A 'Variables' table is visible at the bottom right:

	Variables	Mapping	Name	Initial value	Current value	Description
0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	DriverRequest	10 <Numeric>		Acceleration pedal in %
1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	FortCrank	10900 <Numeric>		Error place number for c...
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	FortExpected	[10100, 10250, 1030...		allowed (expected) faults
3	<input type="checkbox"/>	<input type="checkbox"/>	FortList	[] <PyObject>		Created in EDIABAS tes...



Tracetronec ECU-Test

TRF-Viewer - C:\Data\ECU-TEST6\TestReports\CrankSensor_2014-11-20_123024\report.trf

File ?

Search

Authenticity check of the test report performed successfully. Test report was not manipulated.

CrankSensor

- Test case
 - 7 - EngineSt
 - 12 - NMot_R
 - 18 - NMot_R
- Mapping

#	Time [s]	Action	Name	Value
1	0.000	Initialization		
2	0.001	MODEL-Write	CTRL_ABTRIEB/KL15 [0]1]Value	1
3	0.005	UTILITY	Wait	500 ms
4	0.510	DIAG(EDIABAS)	Engine/FS_LOESCHEN	JOB_STATUS=OKAY
5	0.516	DIAG(EDIABAS)	Dashboard/FS_LOESCHEN	JOB_STATUS=OKAY
6	0.523	Engine start and driver request		
7	0.523	PACKAGE	EngineStart	C:\Data\ECU-TEST6\Packages\Lib\EngineStart.pkg
7.1	0.526	MODEL-Write		
7.2	0.530	UTILITY		
7.3	1.034	MODEL-Write		
7.4	1.038	MODEL-Read		
7.5	1.049	MODEL-Write		
8	1.053	UTILITY		
9	1.054	MODEL-Write		
10	1.057	UTILITY		
11	4.067	Comparison		
12	4.068	PACKAGE		
12.1	4.072	MODEL-Read		
12.2	4.081	MEAS-Read	Engine/n	710
12.3	4.090	DIAG(EDIABAS)	Engine/STATUS_MESSWERTE	2 result sets, 3 measured values
12.4	4.094	UTILITY	Calculation	NMotDiag[0] -> 710
12.5	4.096	BUS-Read	A-CAN/ENG_RPM	709
12.6	4.114	UTILITY	Calculation	max(NMotModel, NMotMeas, NMotDiag, NMotCAN) - mi
13	4.119	UTILITY	Calculation	NMotDeviation -> 111
14	4.122	Fault crank sensor		

Expansion filter

Selection of filters that classify which steps shall be expanded (OR linked)

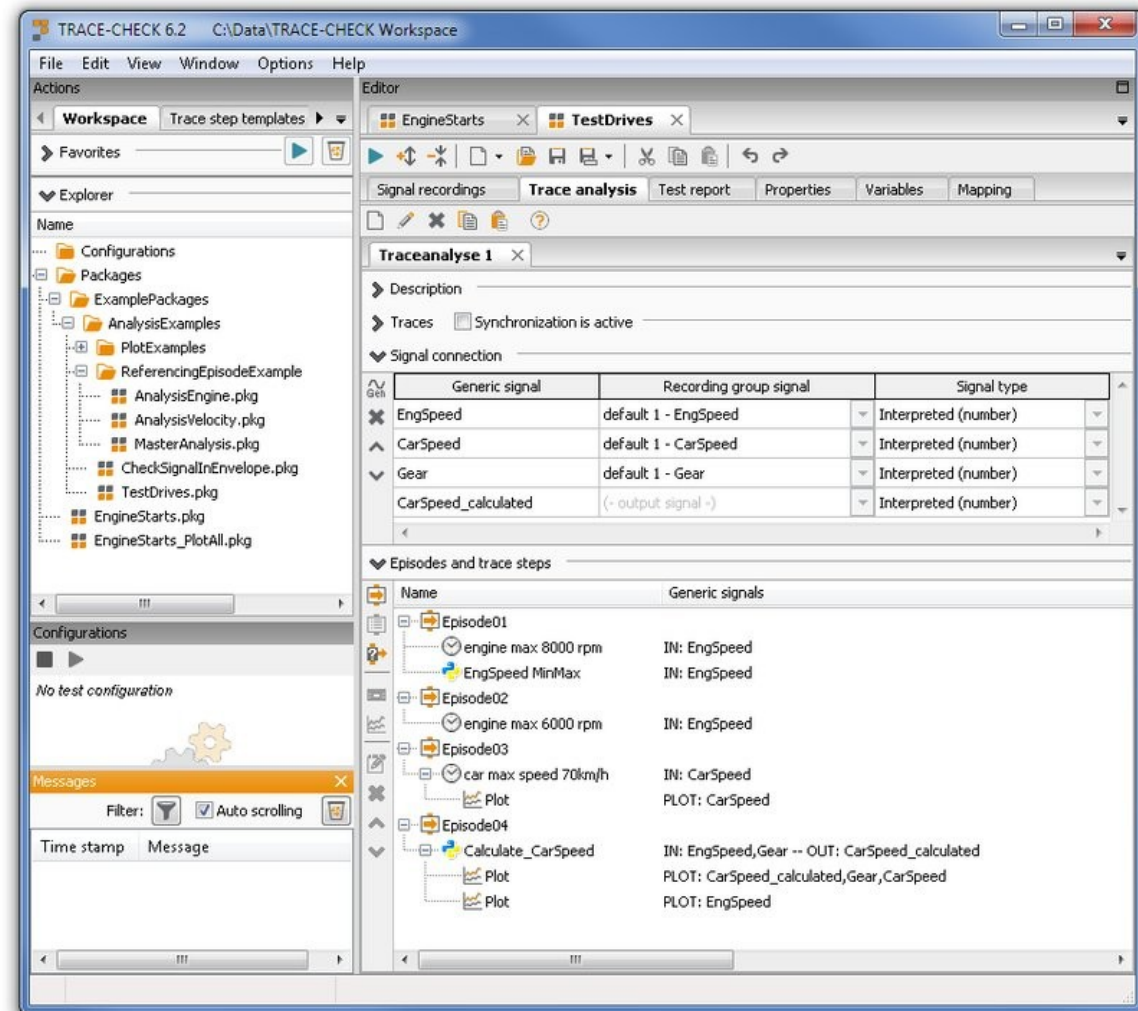
- Evaluation == FAILED
- Evaluation == ERROR
- Execution depth <= 3

Settings Ok Cancel



Tracetronic 2nd Product: Trace-Check

- ▶ Monitoring and evaluating test traces with temporal logics (path expressions over time, see model-checking courses)
- ▶ Modular trace analysis
- ▶ Reporting
- ▶ Works with EXAM of VW
- ▶ <https://www.exam-ta.de/>



Tracetronic Customer Channels

- ▶ http://www.tracetronic.de/cms/data/docs/pdf/Datenblatt_ECU-TEST.pdf
- ▶ Tracetronic is a domain-specific company (automotive domain)
 - supplier to big car OEM (such as BMW)
 - It collaborates with other suppliers, such as ETAS or Vector
 - Many adaptors to other tools

***Domain-specific products and product lines fill a domain-specific need
(a need of a domain-specific customer segment)!***

Carl Zeiss Innovationszentrum für Messtechnik

Product: ZEISS Involute

- ▶ Dresden product for data analysis of gearwheels, e.g. wind power plant gearwheels
- ▶ First ZEISS software product, more than 100k customers worldwide
- ▶ <http://www.zeiss.de/izm/involute.html>
- ▶ Every year, ZEISS Dresden sponsors the Diplompreis Informatik for the department:
- ▶ <http://www.zeiss.de/izm/diplompreis.html>

The screenshot displays the 'Nominal data and Tolerances' dialog box in the ZEISS Involute software. The interface is divided into two main sections: 'Gear data' and 'Tolerance of tooth thickness'. The 'Gear data' section includes a 'check tolerances' checkbox and a 'K-chart' plot showing gear tooth profiles with various tolerance parameters. The 'Tolerance of tooth thickness' section contains a grid of input fields for various gear parameters and their tolerances.

Parameter	Value
teeth: z	14.00000
teeth in sector: z _S	0
module: m _n	20.0000000
add. mod. factor: x	0.50000
angle: α _n	20.00000
helix angle: β	0.00000
parameter: d _a	338.00000
flank direction:	spur
parameter: d _f	263.11403
face width: b	150.00000
profile: z ₀	0.00000
type of gear:	external
diam.: d _b	263.1139
pitch diam.: d	280.0000
unit:	mm
quality:	DIN_3962

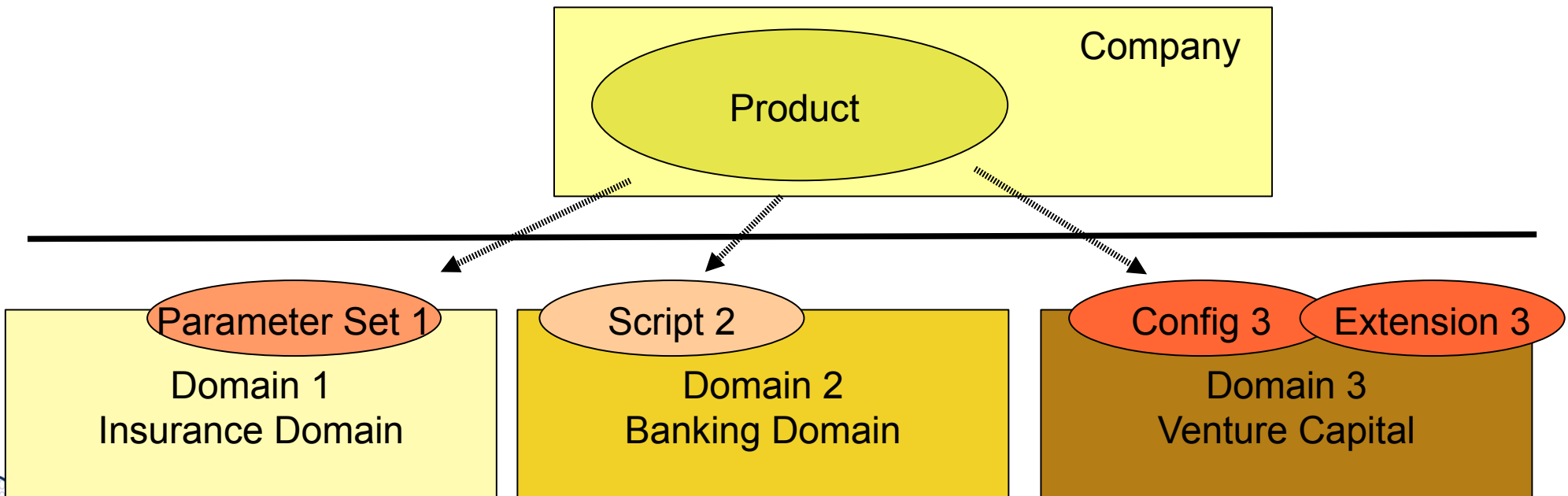
Counting of Teeth:
average length profile: 0.00000
average length lead: 0.00000
positiv
teeth

Business Model

“Parameterizable Domain-Portable Technical Product”

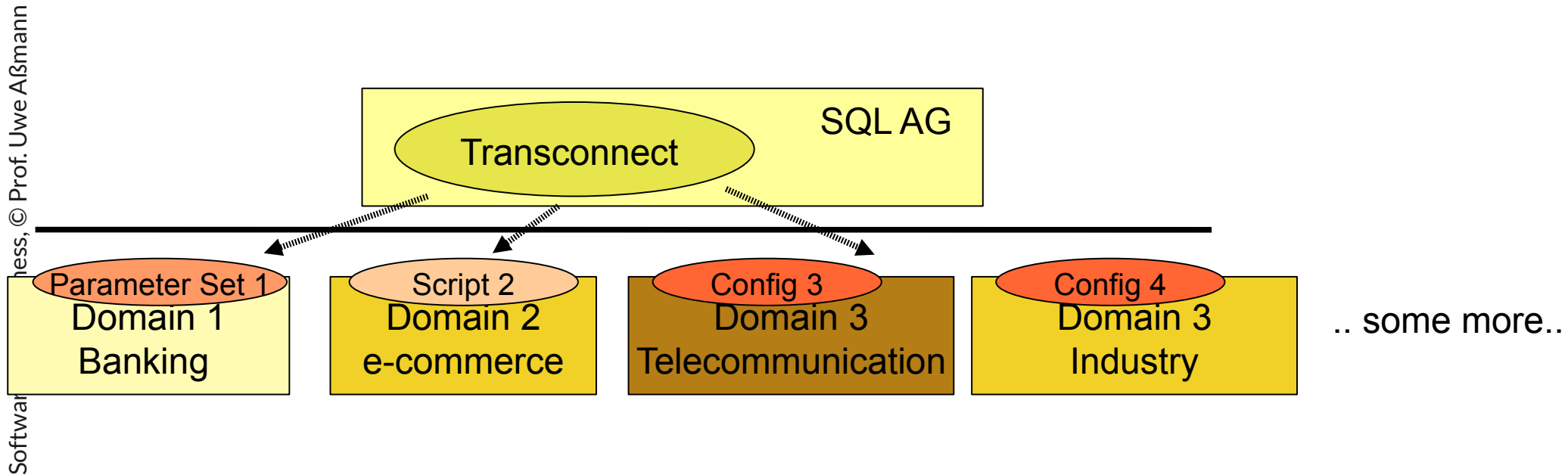
36 Software as a Business

- ▶ Produce your product for several domains
- ▶ Make it **parameterizable, customizable, extensible** (by experts of different domains)
 - Offer a domain-unspecific scripting language
 - *A technical component model*
- ▶ Problems: hard to sell, because customers appear in different domains (no closed customer group)
 - CRM is very important to memorize the details of the customer



SQL AG Transconnect Integration Suite

- ▶ <http://www.sql-ag.de/transconnect.html> Dresden, Franklin-Strasse
- ▶ Non-domain-specific, technical product: can be applied in many domains
 - Does not imply a domain-specific customer binding
- ▶ Data connector (integrator) between systems; many adapters



The End

- ▶ Explain the business model “domain-region service matrix”
- ▶ Explain the steps how to arrive from a product to an extensible product
- ▶ Explain how the BMC and the LeanCanvas help to find customer segments for a product line
- ▶ Compare the concepts of a Product Line, Product Matrix, and a Product Cube
- ▶ Explain how the products of a product line can be assessed with the BMC assessment process



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Philipp Rösler, Bundesminister für Wirtschaft und Technologie, 21.5.2013

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 - Try to buy this book second hand, it is revolutionary.
 - Spend 20€ to win your lifetime's income!
- ▶ <http://www.drkarlpoppp.de/VeroeffentlichungenPublications.html>



References

- ▶ Karl Popp. Software industry business models. IEEE Software, 28(4):26-30, 2010.
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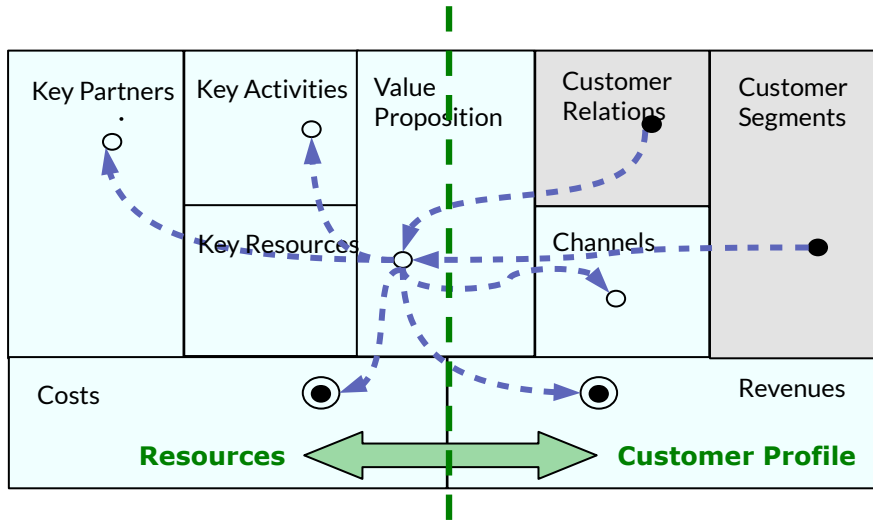
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[BMG p 142]

Customer-Driven Business Models

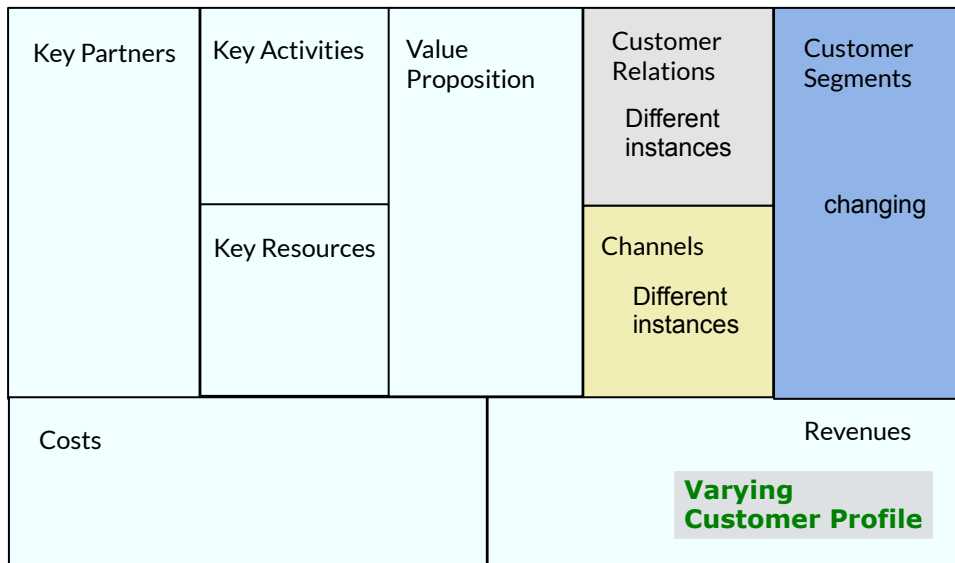
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 - Setting up a second product line in a product matrix

Software as a Business, © Prof. Uwe Altmann



Customer-Varying Business Models for Services, Software Products and Product Lines

- ▶ Customers live in different domains, with different communities, habits, histories



Scale by Variation of Customer Segments for Product Variation

7 Software as a Business

- ▶ One of the most *scalable* software business models is **customer segmenting via domain-specific, regional, or customer-group specific product lines.**
- ▶ **Software reuse factors** should be high
 - To sell the reused components many times
 - → Component-based Software Engineering, Frameworking, Product Line Engineering

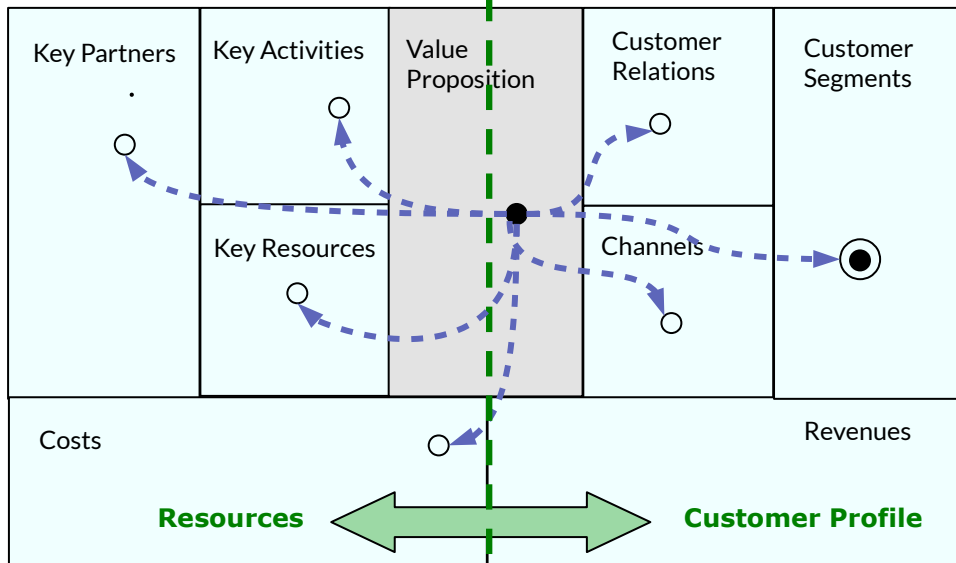
Software as a Business, © Prof. Uwe Altmann

*Always attempt to derive a product variation
with a new customer segment
and a good software reuse.*



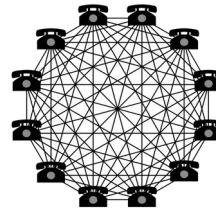
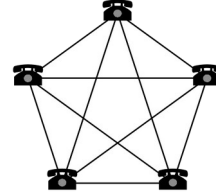
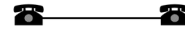
Value-Driven Business Models

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- ▶ [iPod]



Scaling in Value-Driven Networks (Internet Marketplaces, Social Platforms)

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- ▶ If the value proposition affects the *relation* of the customers, n^2 business opportunities result
- ▶ This is the business model of Facebook, Twitter, XING etc:
- ▶ Create a network first, sell later

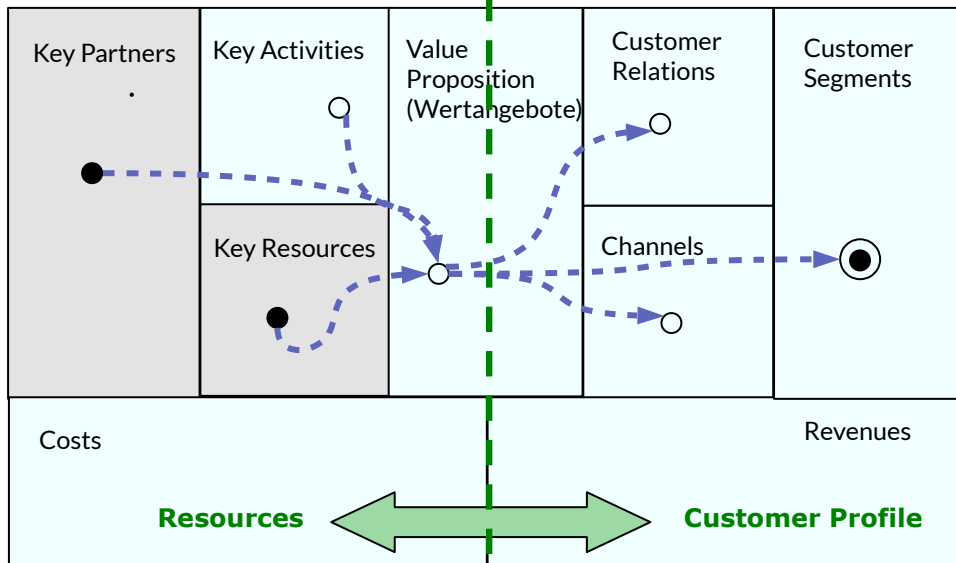


Business models based on Value-Driven Networks are among the best-scaling business models



Resource-Driven Business Model

- ▶ From Resource map to customer map
- ▶ [Amazon Web Services]



Technical Domains – Technology Variation-Driven Business Models

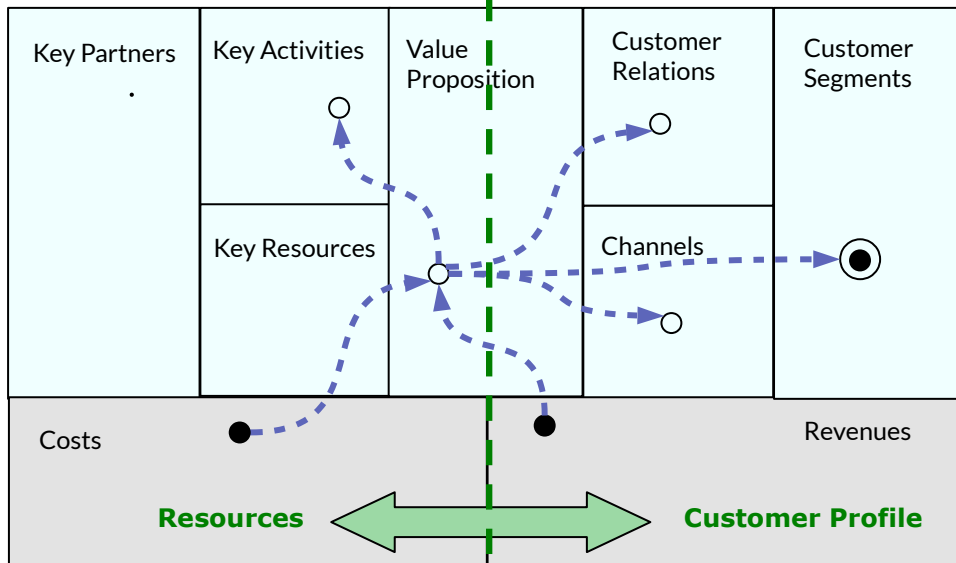
- ▶ The same user group can be reached by different technologies
- ▶ A **technical domain** is a technology which can be crossed with the **business domain (customer segment)**.
- ▶ Product matrix models result (variation in 2 dimensions: business domain and technology)

*Always attempt to derive another business model
based on a technology variation
crosscutting the customer segments.*



Finance-Driven Business Models

- ▶ From costs and revenues to value proposition and customers
- ▶ [Leasing Cars] [Placing ads]



Finance Drives Variation

- ▶ A **finance-driven variation** sells a product with different pricing models (3rd dimension of variation):
 - Teaser for free, but with advertisement
 - Pay-per-use with paypal
 - Computer-based license
 - Flatrates
 - Location-based services with base product

Always attempt to derive a finance variation crosscutting the customer segments and the technology.



Finance: Instead of Sell Binaries

Closed-Source Software Business Models

14 Software as a Business

- ▶ Leasing (where others buy)
- ▶ Rent (where others buy)
- ▶ Sell advertisements [Opera, Google]
- ▶ Sell directly, order via internet [Dell, Amazon]
- ▶ Sell later, hope to use the Metcalfe network effect [Twitter, Facebook]
- ▶ Sell via auction [ebay]



Open Source Software (OSS) Business Models

- ▶ http://en.wikipedia.org/wiki/Open_source
- ▶ **Free product** (“free taste”, “Versucherle”, “Köder”)
 - Give the product for free and **sell services, consulting, or apps**
 - Mould a market with the product
 - Ex. Adobe pdf with Acrobat Reader
- ▶ **Free framework**
 - Give the framework for free, create a community, and sell applications
 - Ex. IBM gives Eclipse for free, fosters a community, and many sell
- ▶ Release Politics
 - with union-fs (overlay); with browser; with portal
- ▶ **Micropayment**
 - Use micropayment companies for installation or run of a software (PayPal, ..)
 - Use Telecom billing
- ▶ Choose licences carefully
 - <http://creativecommons.org>
 - GPL is a virus that infects all extensions; LGPL not
 - FPI



Open Source Business Model “Free Taste” (dual-licensing, freemium)

- ▶ Free “taster” versions
 - Give out earlier version of the product for free
 - Sell the new or premium version (“freemium”)
- ▶ Examples
 - www.gentleware.com
 - NatSpec
- ▶ Free “community” versions
 - Give out a stripped version (e.g., only for 1 user, 1 database, ..)
 - Sell full version
- ▶ Free time-restricted versions
 - 1 month



Business Model “Versucherle”/”Köder”: Plugins under Dual Licensing

- ▶ Freemium: [BMG] p. 108
- ▶ Companies can make plugins for OSS tools under dual licensing
 - Thunderbird, Firefox, OpenOffice, Eclipse, ...
- ▶ Example: Quicktext Thunderbird extension <http://extensions.hesslow.se/>
 - QuickText is free
 - QuickText Pro is commercial
- ▶ Advantage: Platform has already many users and a large market



Deriving Secondary from Primary Business Models

- ▶ From a primary value-driven or customer-driven business model, secondary ones can be derived
 - **Customer-driven models** vary the customer segment
 - **Resource-driven models** can be derived to use the resources more efficiently
 - **Finance-driven models** can be derived to re-use a good value proposition with other pricing and costs
 - [Hilty drilling machines]

Always attempt to derive a secondary BM from your primary one by varying along one of the variation dimensions.



Basic Forms of Business Models

- ▶ Product (with maintenance contract)
- ▶ Product with parameterization and mass configuration
- ▶ Product with piggy-pack Service

- ▶ Product Line (variation in 1 dimension)
- ▶ Product Matrix (variation in 2 dimensions)
- ▶ Product Cube (variation in 3 dimensions)
- ▶ Product Platform with Apps/Complements/Plugins and Services

- ▶ Individual software solution (with maintenance contract)

- ▶ Service
- ▶ Service Family
- ▶ Service based on Value Driven Network
- ▶ Service Matrix (variation in 2 dimensions)
- ▶ Service Cube (variation in 3 dimensions)



Buy and install

Buy and use a cloud

Pay-per-use Rent

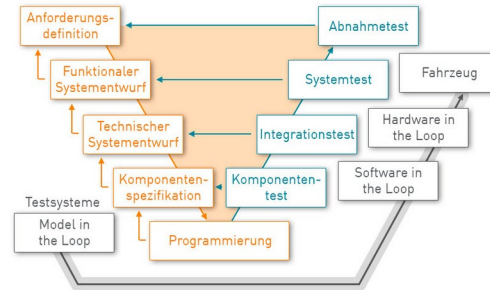
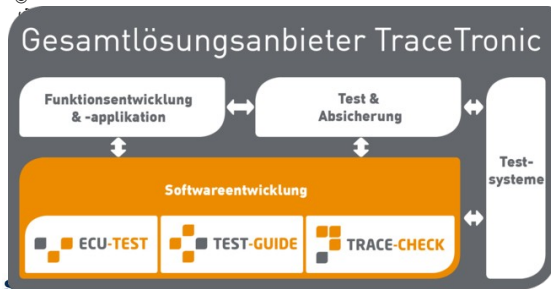


40.2 Service-Based Business Models

40.2.1. Services (“Leistungen”, “Solutions”) can be based on Products

- ▶ <http://www.tracetronic.de/leistungen/>
- ▶ TraceTronic (Gittersee) has several products for motor tests
- ▶ On top, they offer test projects, construction and integration into further test systems, function development for motors
- ▶ Testing uses the automotive V-model: lots of spots for service projects
 - Requirements engineering (elicitation, checking...)
 - Specification
 - Design and Testing
 - Seminars (Schulung)

© Prof. Uwe Aßmann

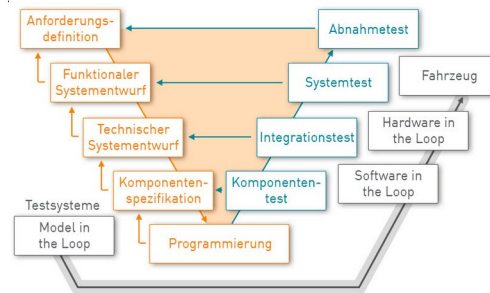


Business Model “Service Family along V-Model”

Salt Solutions

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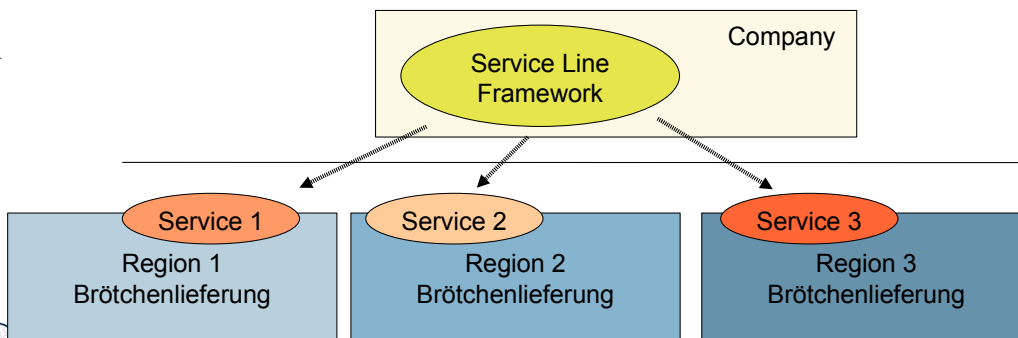
- ▶ For any software company, services can be structured along the typical tasks of the V-model
- ▶ <https://www.salt-solutions.de/leistungen.html>
 - Quality management
 - Requirements engineering
 - Testing
 - Certification
 - Consulting
 - Conception (Design, Processes, Specification)
 - Implementation
 - Support



- ▶ <http://www.tracetronic.de/leistungen/>

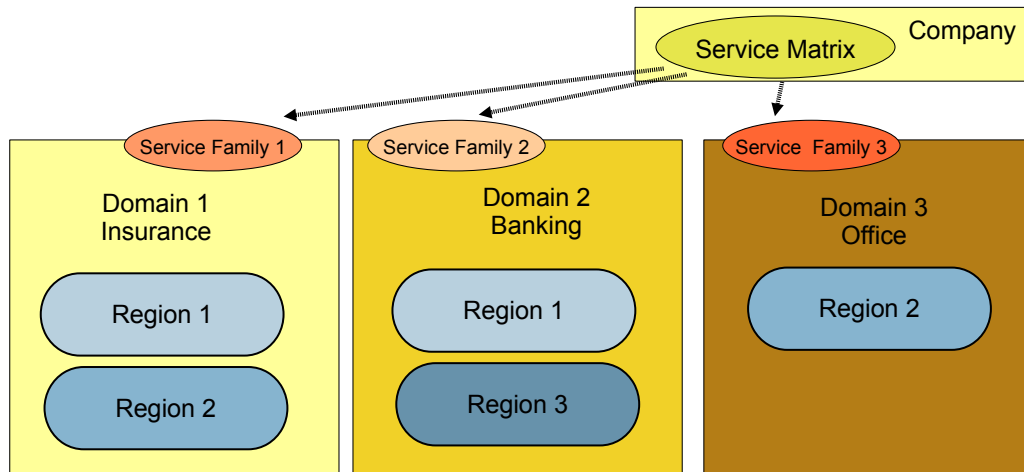
40.2.2 Business Model “Regional Service Family”

- ▶ One dimension to vary can be the region of sales
 - Develop a service in a region (regional business model, regional customer segments)
 - Replicate the service to other regions (regional porting)
- ▶ Example: www.Morgengold.de, www.it-sax.de (pludoni.de), www.lieferando.de
- ▶ Franchising can be used to spark small enterprises
- ▶ The same software can be used in every region, if customized appropriately



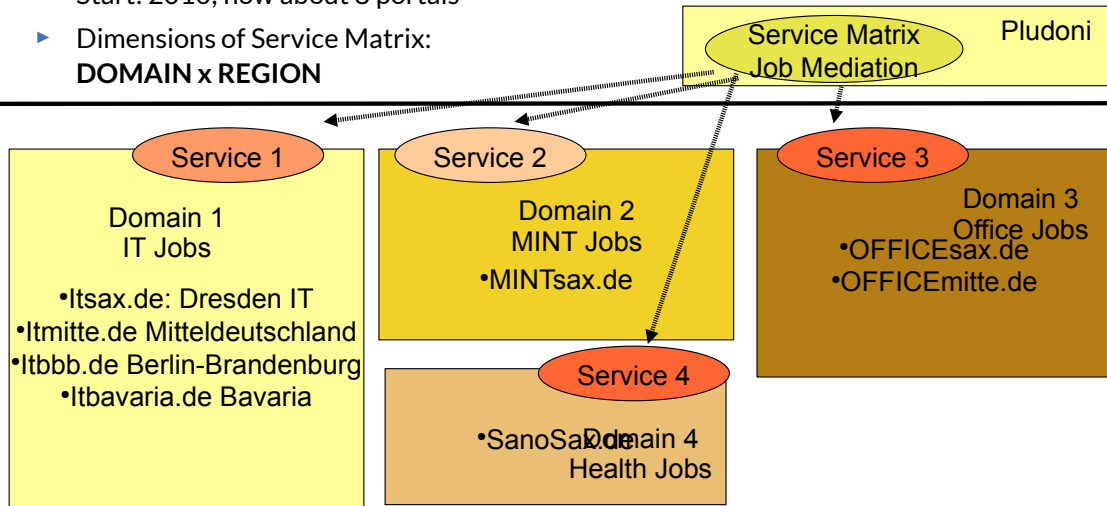
40.2.3. Business Model “Domain-Region Service Matrix”

- ▶ Develop a service in a two or three dimensions
 - Region
 - Business Domain
 - Technical Domain



Pludoni's Business Model "Domain-Region Service Matrix" with "Smart Companies"

- ▶ www.it-sax.de (www.pludoni.de): a portal for mediating (brokering) applications and job offers in a region (regional business model)
 - Trusted web community ("club of companies") with recommendations
- ▶ Founder Jörg Klukas ported it to many other regions and professional domains
- ▶ Start: 2010; now about 8 portals
- ▶ Dimensions of Service Matrix:
DOMAIN x REGION

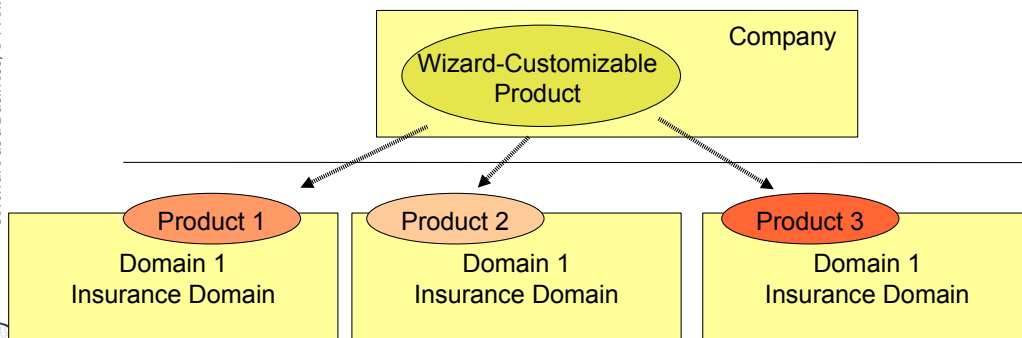




40.3 Product-Based B2B Business Models

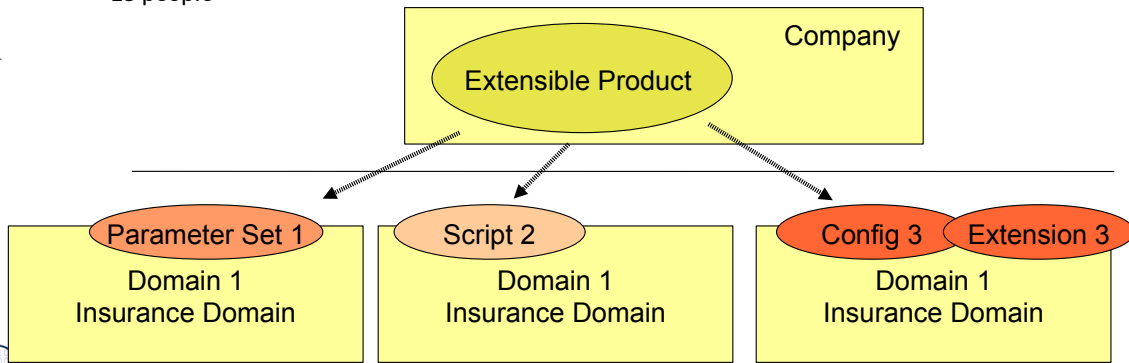
Business Model “Mass-Customizable Product”

- ▶ Make the product **customizable (by end user)** [MassCustomization]
 - Customize by interactive Wizard simplifying the customization
 - Keep the product customization technique as company secret
- ▶ Intense interaction with customers required to ensure that the mass customization is simple enough



Business Model “Parameterizable Software Product”

- ▶ Design an extensible product in-house, **parameterizable by experts**
 - Parameterize by scripts in a scripting language, domain-specific language, or complex form mechanism (XML)
 - **Extend** by Plugin (Extension, Complement); Requires a *component model*
- ▶ Extension by product owner or third party (partner or supplier)
- ▶ Know how: instantiate new products with *different extended functions (features)*
 - Keep the product extension technique as company secret
- ▶ This is the standard way for product-oriented companies, how to scale their business to more than 15 people



Tracetronic ECU-Test, a Parameterizable Domain-Specific Product

- ▶ Gittersee, Dresden, Germany
- ▶ <http://www.tracetronic.de/produkte/ecu-test/>
- ▶ Motor testing software
 - Writing and composing test scripts for motor runs in simulators or cars
 - Test script libraries
- ▶ Model-in-the-loop (MIL), Hardware-in-the-loop (HIL), Software-in-the-loop (SIL)
- ▶ Adapters for other test tools
- ▶ Growth: 1->100 employees in 10 years

**Domain-specific products and product lines fill a domain-specific need
(a need of a domain-specific customer segment)!**



Tracetronic ECU-Test



The screenshot displays the Tracetronic ECU-Test software interface. The main window is titled "ECU-TEST 6.0" and shows a test case editor for a package named "CrankSensor".

Actions Panel: Lists various functions such as "Standard utilities", "CANape", "Data operations", "Ediabas", "Flow control", "Break", "Continue", "Exit", "If-Then-Else", "IfDef", "Loop", "React-On", "Return", "Switch-Case", "Wait", and "Wait for User".

Configurations: Shows a tree view for "Tutorial-HIL.tcf" with sub-items: "FLDUMMY01", "MODELUMMY01", "APPLICATIONUMMY", "EDIABASUMMY01", and "BUSDUMMY01".

Messages: A panel at the bottom left for displaying test messages, with a filter and "Auto scrolling" option.

Test Case Editor: The central area shows a list of test steps:

- 1 Initialization
- 2 MODEL-Write: CTRL_ABTRIEB[NL15 [0]]Value
- 3 WAIT
- 4 DIAG(EDIABAS): Engine/PS_LOESCHEN
- 5 DIAG(EDIABAS): Dashboard/PS_LOESCHEN
- 6 Engine start and driver request
- 7 EnginesStart
- 8 Comment: 'Driver request'
- 9 MODEL-Write: CTRL_ABTRIEB/Fahrewunsch [%]Value
- 10 WAIT
- 11 Comparison normal state
- 12 NMot_Read
- 13 Calculation
- 14 Fault crank sensor
- 15 Electric failure simulation: FIDU-1
- 16 WAIT
- 17 Comment: 'Comparison fault state'

Table: A table at the bottom right shows variable mappings:

	Name	Initial value	Current value	Description
0	DriverRequest	10 <Numeric>		Acceleration pedal in %
1	FOrtCrank	10900 <Numeric>		Error place number for c...
2	FOrtExpected	[10100, 10250, 1030...		allowed (expected) faults
3	FOrtList	[] <PyObject>		Created in EDIABAS tes...

Tracetronic ECU-Test



TRF-Viewer - C:\Data\ECU-TEST6\TestReports\Crank_Sensor_2014-11-20_123024\report.br

Authenticity check of the test report performed successfully. Test report was not manipulated.

#	Time [s]	Action	Name	Value
1	0.000	Initialization		
2	0.001	MODEL-Write	CTRL_ABTREIB/MLIS [0][1]Value	1
3	0.005	UTILITY	Wait	500 ms
4	0.510	DIAG(EDIABAS)	EnginePFS_LOESCHEN	JOB_STATUS=OKAY
5	0.516	DIAG(EDIABAS)	DashboardPFS_LOESCHEN	JOB_STATUS=OKAY
6	0.523	Engine start and driver request		
7	0.523	PACKAGE	EngineStart	C:\Data\ECU-TEST6\Packages\44\EngineStart.plg
7.1	0.526	MODEL-Write		
7.2	0.530	UTILITY		
7.3	1.034	MODEL-Write		
7.4	1.038	MODEL-Read		
7.5	1.049	MODEL-Write		
8	1.053	UTILITY		
9	1.054	MODEL-Write		
10	1.057	UTILITY		
11	+0.067	Comparison		
12	+0.068	PACKAGE		
12.1	+0.072	MODEL-Read		
12.2	+0.081	MEAS-Read	Engine/h	710
12.3	+0.090	DIAG(EDIABAS)	Engine/STATUS_MESSWERTE	2 result sets, 3 measured values
12.4	4.094	UTILITY	Calculation	NMotDiag[0] -> 710
12.5	4.096	BUS-Read	A-CAN/ENG_RPM	709
12.6	+1.114	UTILITY	Calculation	max(NMotModel, NMotMess, NMotDiag, NMotCAN) - mi
13	4.119	UTILITY	Calculation	NMotDeviation -> 111
14	4.122	Fault crank sensor		

Expansion filter

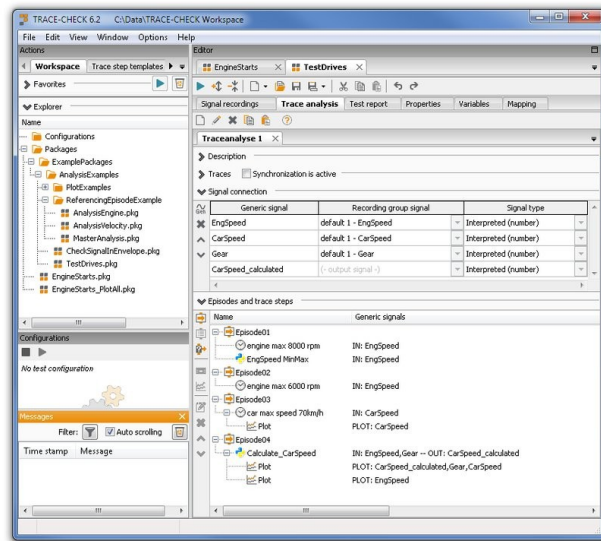
Selection of filters that classify which steps shall be expanded (OR linked)

- Evaluation == FAILED
- Evaluation == ERROR
- Execution depth <= 3

Settings OK Cancel

Tracetronic 2nd Product: Trace-Check

- ▶ Monitoring and evaluating test traces with temporal logics (path expressions over time, see model-checking courses)
- ▶ Modular trace analysis
- ▶ Reporting
- ▶ Works with EXAM of VW
- ▶ <https://www.exam-ta.de/>



Tracetronic Customer Channels

- ▶ http://www.tracetronic.de/cms/data/docs/pdf/Datenblatt_ECU-TEST.pdf
- ▶ Tracetronic is a domain-specific company (automotive domain)
 - supplier to big car OEM (such as BMW)
 - It collaborates with other suppliers, such as ETAS or Vector
 - Many adaptors to other tools

***Domain-specific products and product lines fill a domain-specific need
(a need of a domain-specific customer segment)!***



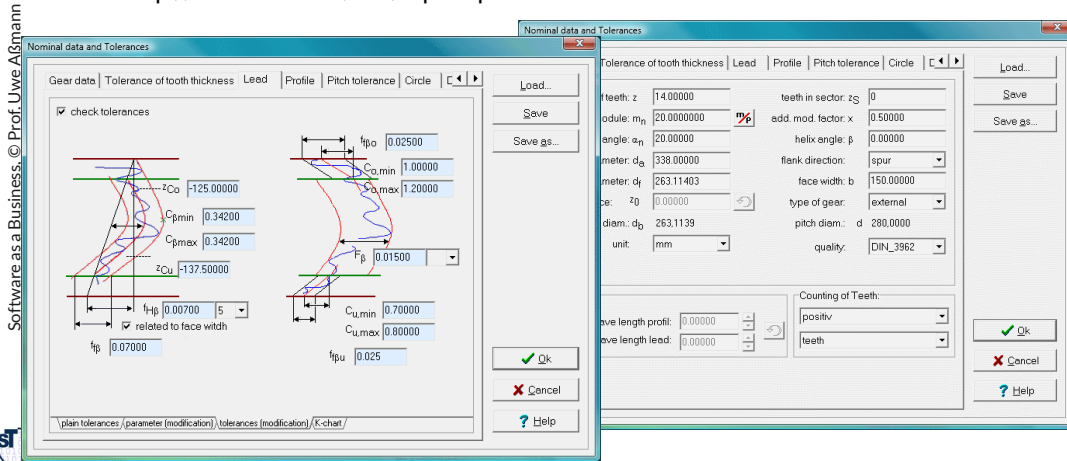
Carl Zeiss Innovationszentrum für Messtechnik

Product: ZEISS Involute

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<http://www.zeiss.de/izm/involute.html#inpagetabs-3>

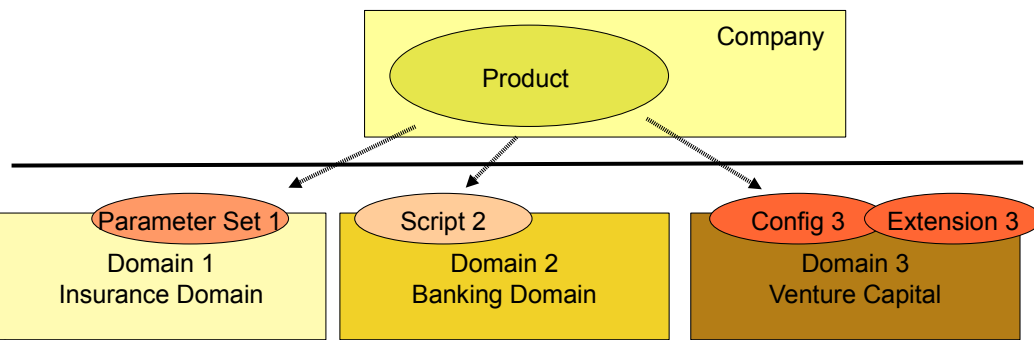
- ▶ Dresden product for data analysis of gearwheels, e.g. wind power plant gearwheels
- ▶ First ZEISS software product, more than 100k customers worldwide
- ▶ <http://www.zeiss.de/izm/involute.html>
- ▶ Every year, ZEISS Dresden sponsors the Diplomp reis Informatik for the department:
- ▶ <http://www.zeiss.de/izm/diplomp reis.html>



Business Model

“Parameterizable Domain-Portable Technical Product”

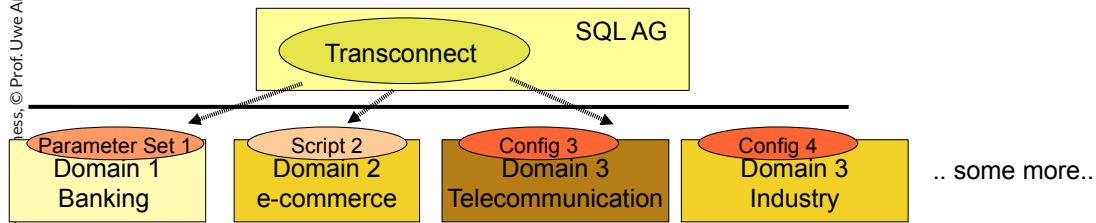
- ▶ Produce your product for several domains
- ▶ Make it **parameterizable, customizable, extensible (by experts of different domains)**
 - Offer a domain-unspecific scripting language
 - A *technical component model*
- ▶ Problems: hard to sell, because customers appear in different domains (no closed customer group)
 - CRM is very important to memorize the details of the customer



SQL AG Transconnect Integration Suite

- ▶ <http://www.sql-ag.de/transconnect.html> Dresden, Franklin-Strasse
- ▶ Non-domain-specific, technical product: can be applied in many domains
 - Does not imply a domain-specific customer binding
- ▶ Data connector (integrator) between systems; many adapters

Software
© Prof. Uwe Altmann



The End

- ▶ Explain the business model “domain-region service matrix”
- ▶ Explain the steps how to arrive from a product to an extensible product
- ▶ Explain how the BMC and the LeanCanvas help to find customer segments for a product line
- ▶ Compare the concepts of a Product Line, Product Matrix, and a Product Cube
- ▶ Explain how the products of a product line can be assessed with the BMC assessment process

