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HyVar Project

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HyVar Consortium

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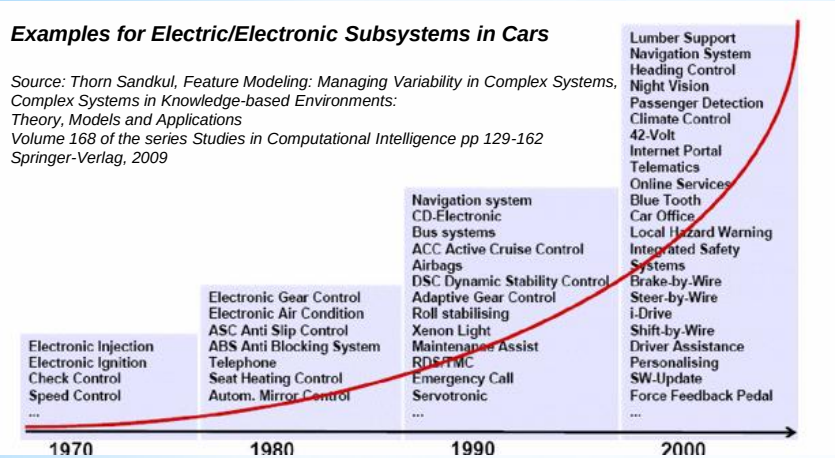
Challenges Addressed by HyVar



Software Variability

Different possibilities for configuring the distributed application instances before they are deployed

Continuous Evolution

Unanticipated evolution due to changes in requirements or improvements of the software

Context and Customization

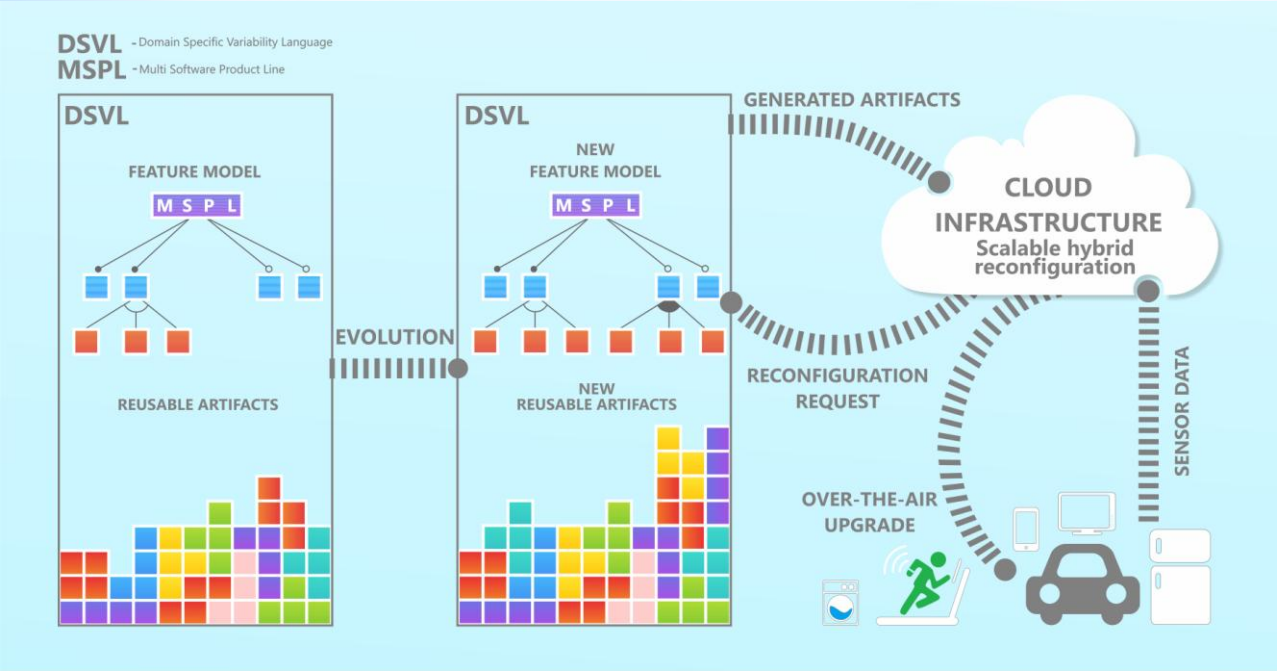
Device are affected by environmental conditions such as the physical location and context of the device. Moreover they are customized for a specific user.

Distributed systems

Huge number of remote devices. Applications are increasingly interconnected systems of systems, consisting of heterogeneous components

HyVar Solution

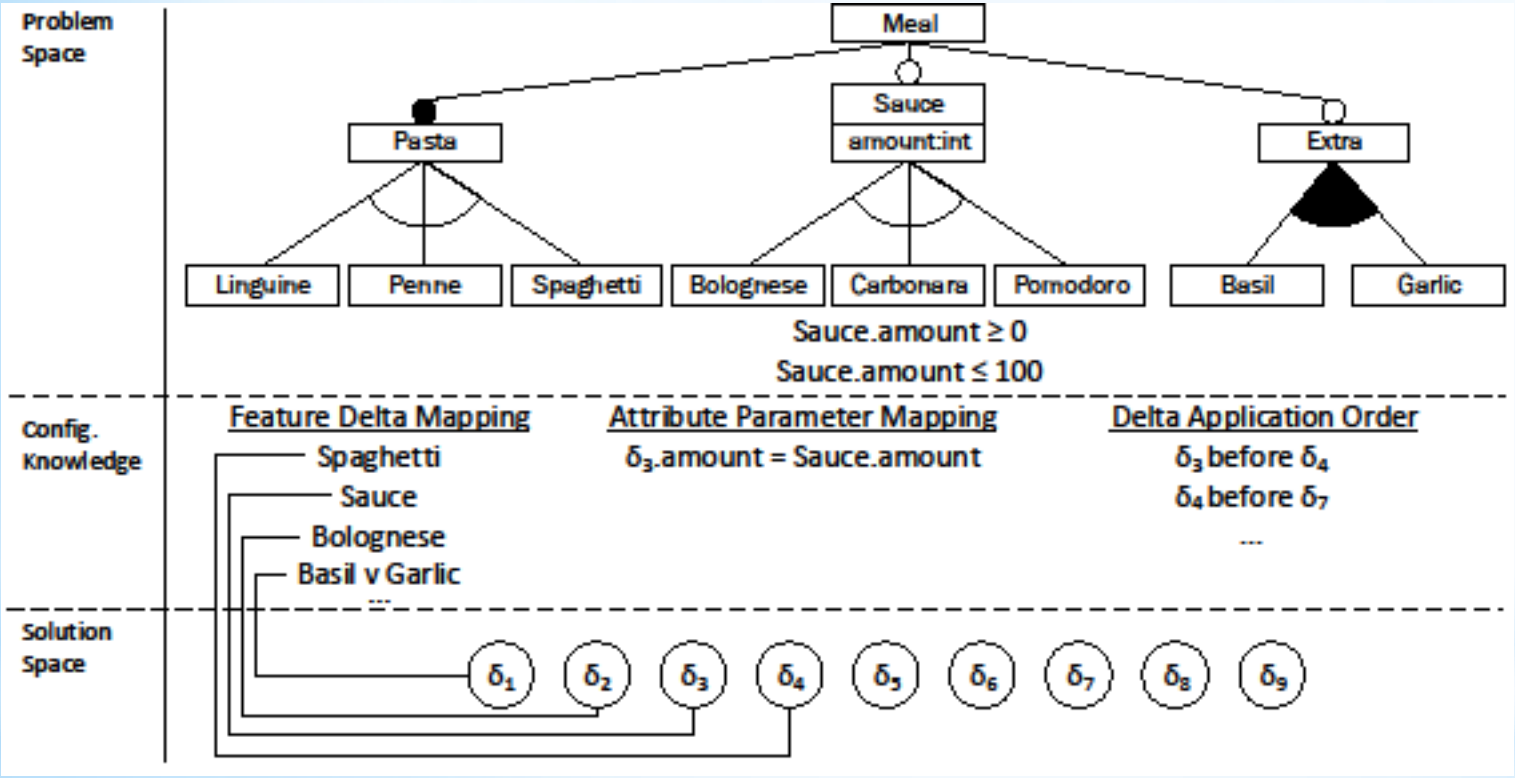
HyVar addresses continuous software evolution in distributed systems by proposing a framework for hybrid variability which can be integrated into existing software development processes. The framework combines:



- Domain specific variability language to describe evolution as software product line.
- Scalable cloud infrastructure for monitoring and individualized customization of software upgrades for the remote devices.
- Over-the-air upgrade technologies.

Highlights: Domain Specific Variability Language

Software product lines (SPLs) provide solutions to handle a large number of variants of a software product in a systematic way.



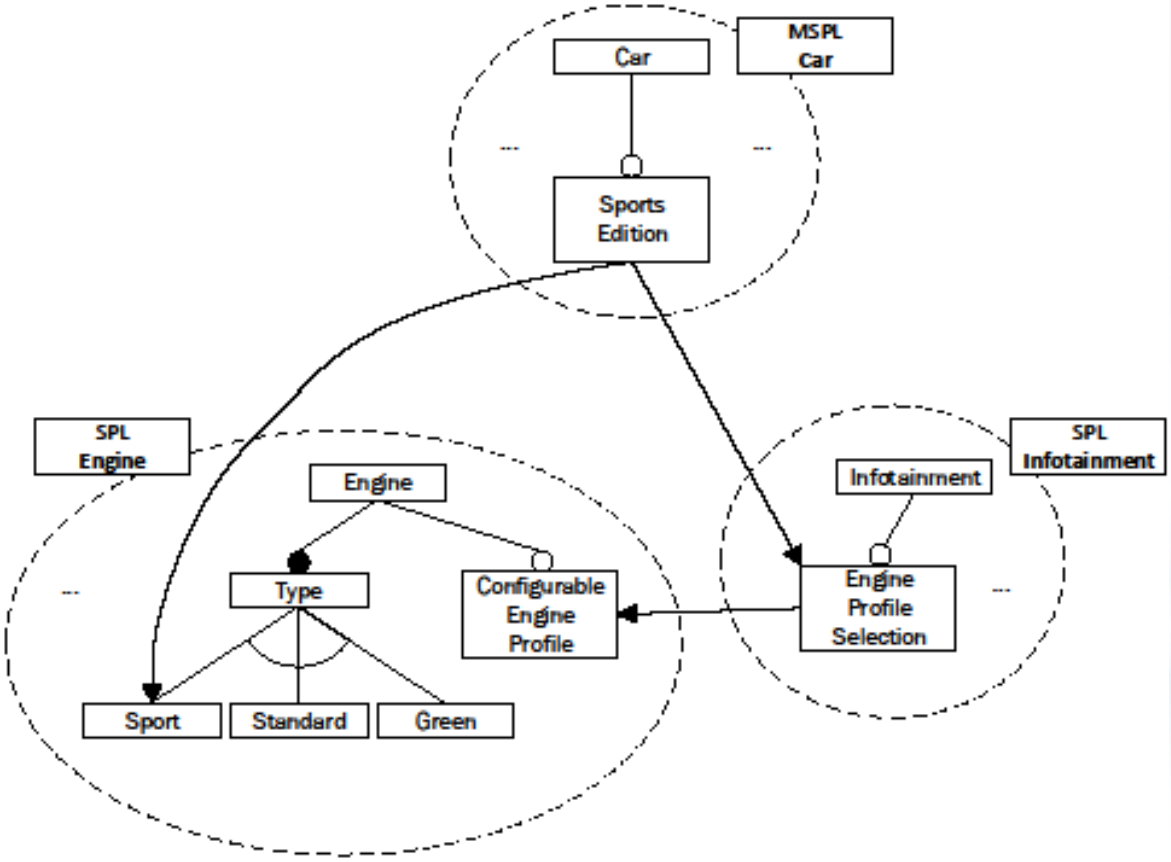
PS is defined through Feature Models (FM), which describe parts that all products have in common and the variability between the products.
We use AFMs, which allows specification of additional feature Attributes.

CK is the mapping between a specification of a software system and a finished software program.
It is used to assemble the realization artifacts from the solution space by selecting/deselecting features according to constraints from the FM.

The **SS** provides the language-dependent code artifacts for the SPLs.
A derived software program is also often defined as a variant or product of an SPL.

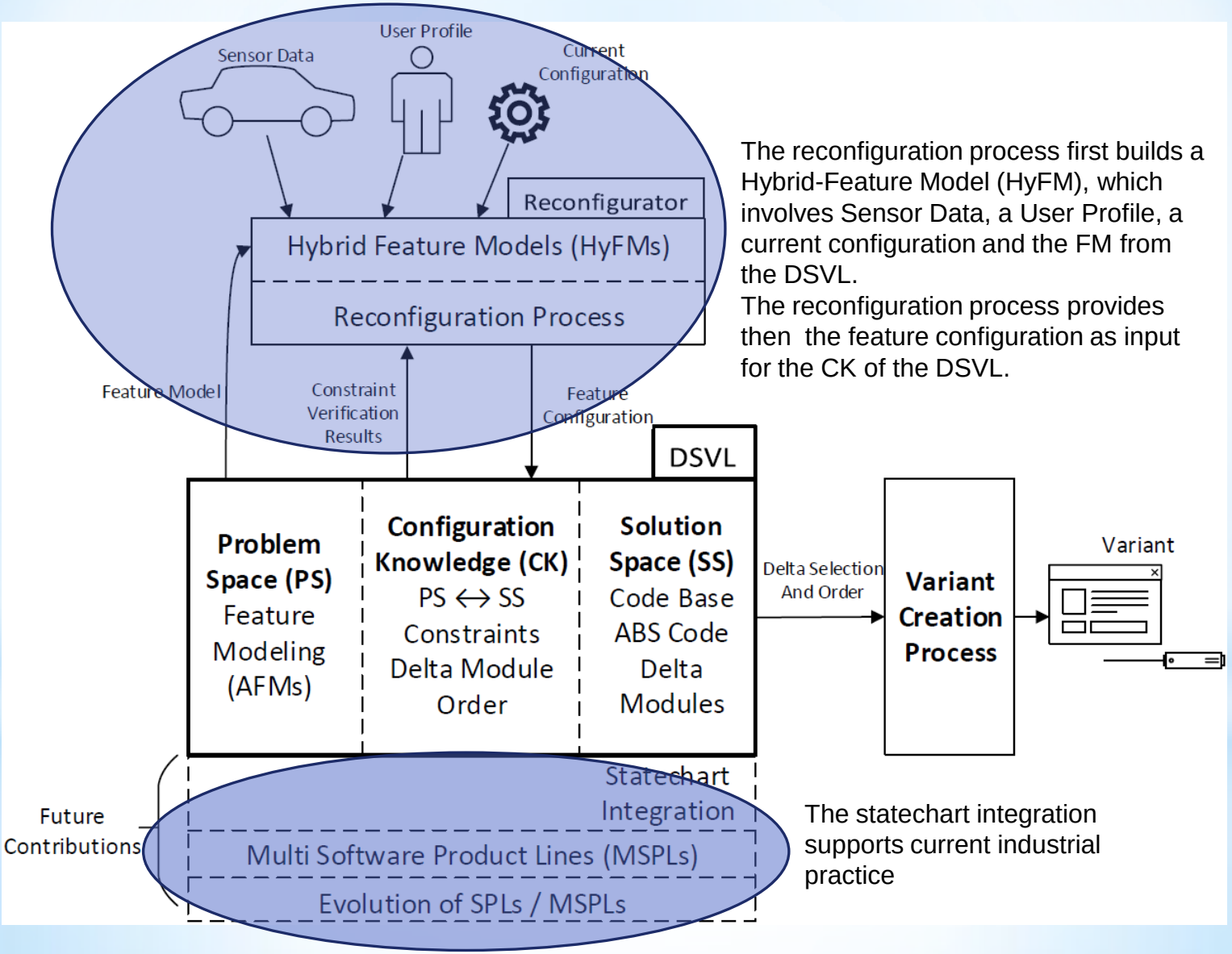
Highlights: Multi-Software Product Lines

The application domain targeted by HyVar outgrows the scope of traditional software product lines. It rather forms a multi-software product line (MSPL).
In an MSPL, several SPLs are composed in order to build a larger system of configurable components.



The MSPL Car uses the two SPLs Engine and Infotainment.
Potentially, every SPL is developed and maintained by different suppliers.
The optional Sports Edition of the Car has references to the other SPLs.
The type of the Engine has to be Sport.
Moreover, with the Sports Edition, the driver should be able to select engine profiles out of the Infotainment.
Engine profiles determine the behavior of the engine.

Highlights: HyVar Tool Chain



The reconfiguration process first builds a Hybrid-Feature Model (HyFM), which involves Sensor Data, a User Profile, a current configuration and the FM from the DSVL.
The reconfiguration process provides then the feature configuration as input for the CK of the DSVL.

The statechart integration supports current industrial practice

Automotive Use Case

Telematics features change according to user's location or subscription contract

The car telematics unit is originally equipped with a software customized for:

- ***User profile***: specific value added services developed either from the car maker, either from insurance companies or third party developers, depending on user choices.
- ***User location:*** for example emergency call compliant with European eCall or Russian ERA/GLONASS rules depending on the market area targetted.

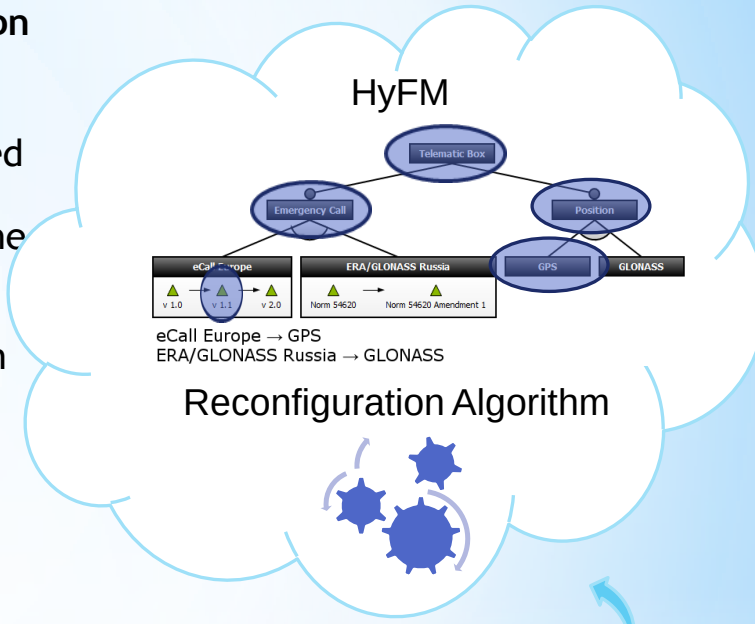
These data may vary over time as well as the latest software version available.

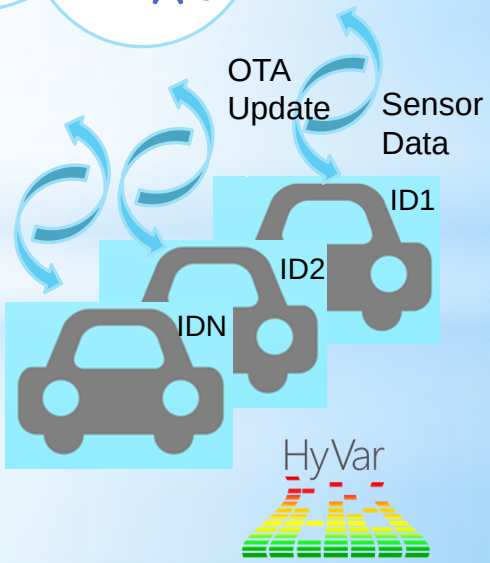
Adopting HyVar technology the software can be:

- Customized to the specific car, user and situation.
- Continuously updated using Over The Air Upgrade technology.

For instance the Telematic module periodically sends the user identity, the position of the car and other relevant data to the HyVar remote server.

This identifies and performs the required operations to update and configure the software of the Telematics unit in the best way for the detected situation.





HyVar Benefits

- **Reduced development effort**
- The advanced software management model and tool chain proposed by HyVar will allows developers to encompass unanticipated evolution as a standard feature of software systems in production.
- **Reduced maintenance costs**
- Over-the-air updates of distributed applications in heterogeneous environments will enable continuous software evolution after deployment on complex remote devices.
- **Better Customer Experience**
- HyVar will ensure the end users to be provided with software of good quality, always updated and which responds exactly to their needs.

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Thank you!

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