An Industrial Application of The Semantic Web technology

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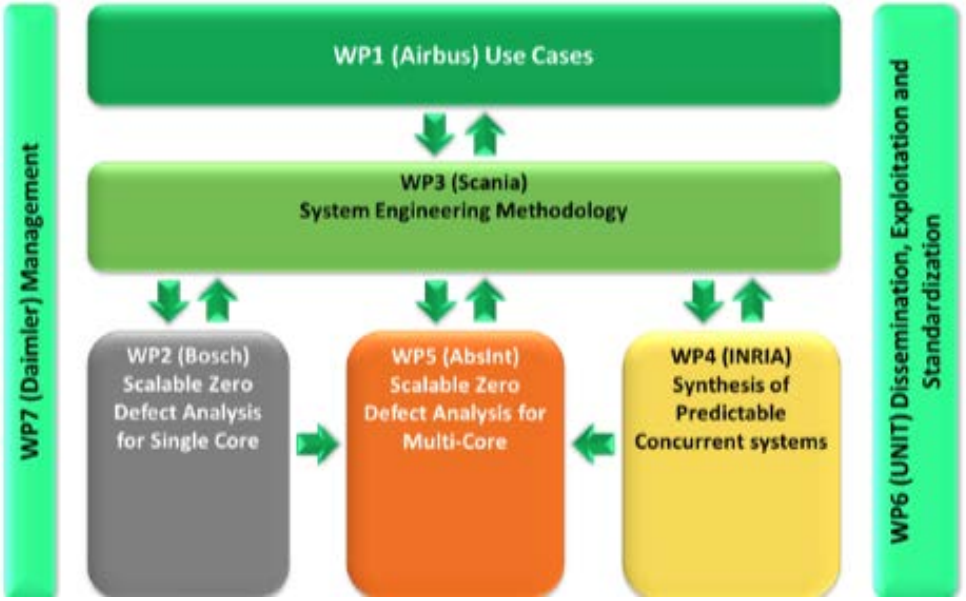
Swedsoft STEW 2016, Oct 12-13, Linköping

Contents

- The Semantic Web
- Scania
- Visualization

Assume – part of ITEA3 – part of HEUREKA

ASSUME stands for Affordable Safe & Secure Mobility Evolution



Assume – The Scania use-case

FindOut Technologies AB

Sweden

KTH (Royal Institute of Technology)

Sweden

Scania

Sweden

What is The Semantic Web?

You have it in your pocket!

The Semantic Web

World Wide Web

Tim Berners-Lee

- Created the World Wide Web 1989
- Created the first Web browser and HTTP server 1990

World Wide Web

- A web of pages connected by links
- For human beings reading text and clicking links in a web browser

World Wide Web

Links in a web page have no specified meaning – they are just a way to get to a new page.

The Semantic Web

- A web of uniquely identified data connected by typed links
- For machine to machine communication

The Semantic Web

First traces at a conference in Geneva 1994

An article in
Scientific American 2001
Uses the phrase
The Semantic Web

The Semantic Web

Core concept – The Triple:

“John knows Mary”

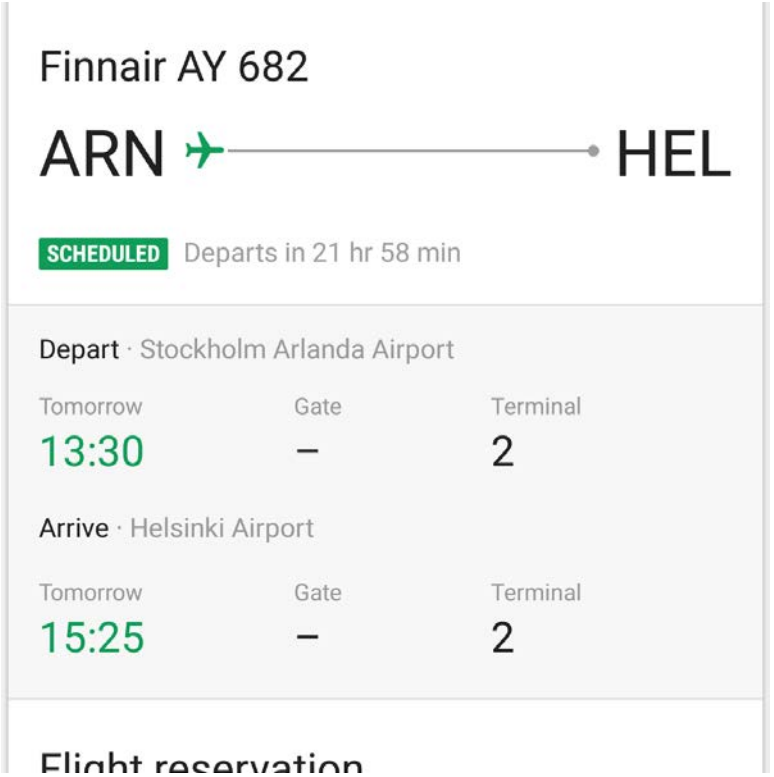
“use-case-14 required-by requirement-45

The Semantic Web - in your pocket

You order an airline flight ticket

One day before departure, you See this on your Android phone:

(or in the Google App on an iPhone)



How do Google know about your ticket?

Did I book the ticket through Google?

No.

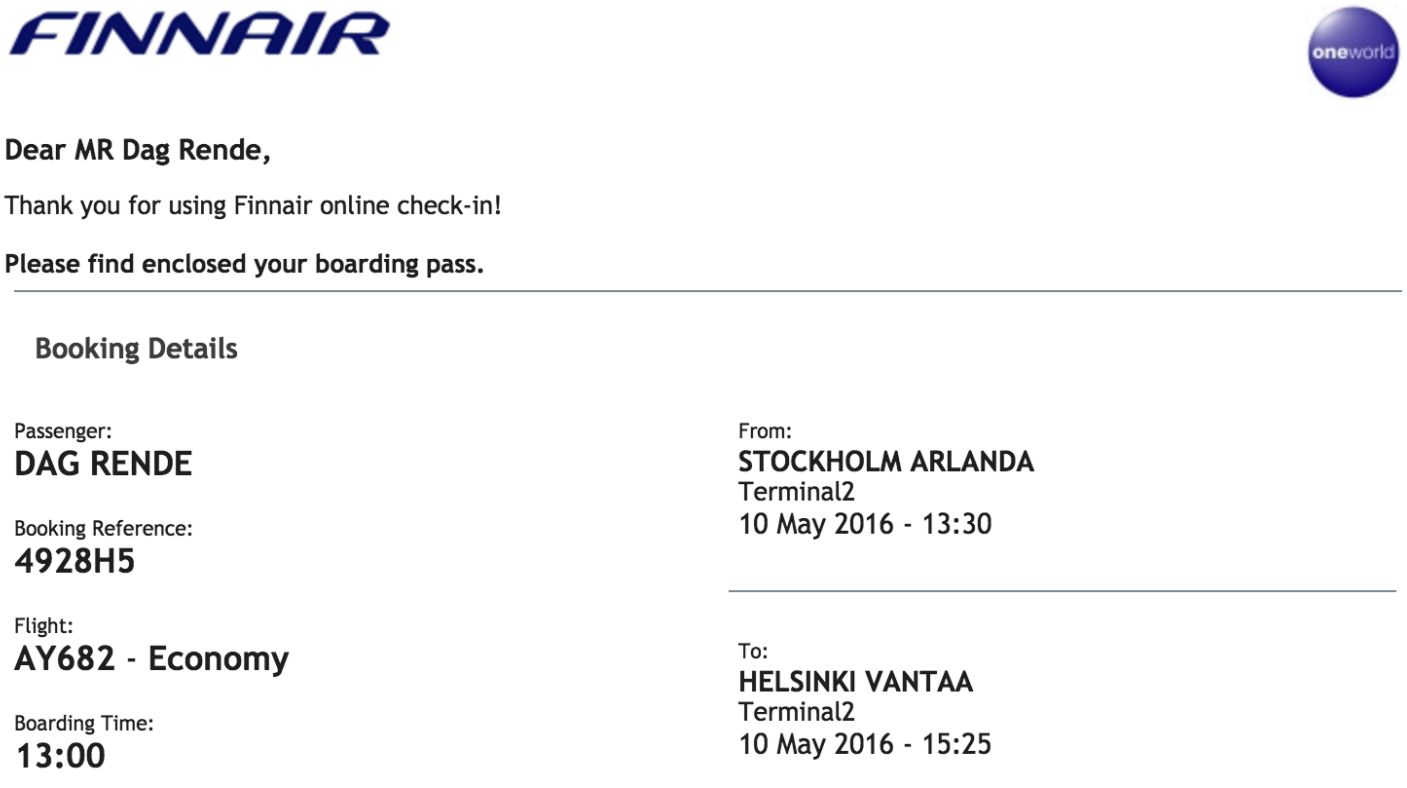
Have Google bought the travel agent?

No.

But…

You got a confirmation to your gmail!

It looked like this:



FINNAIR

oneworld

Dear MR Dag Rende,

Thank you for using Finnair online check-in!

Please find enclosed your boarding pass.

Booking Details

Passenger:
DAG RENDE

Booking Reference:
4928H5

Flight:
AY682 - Economy

Boarding Time:
13:00

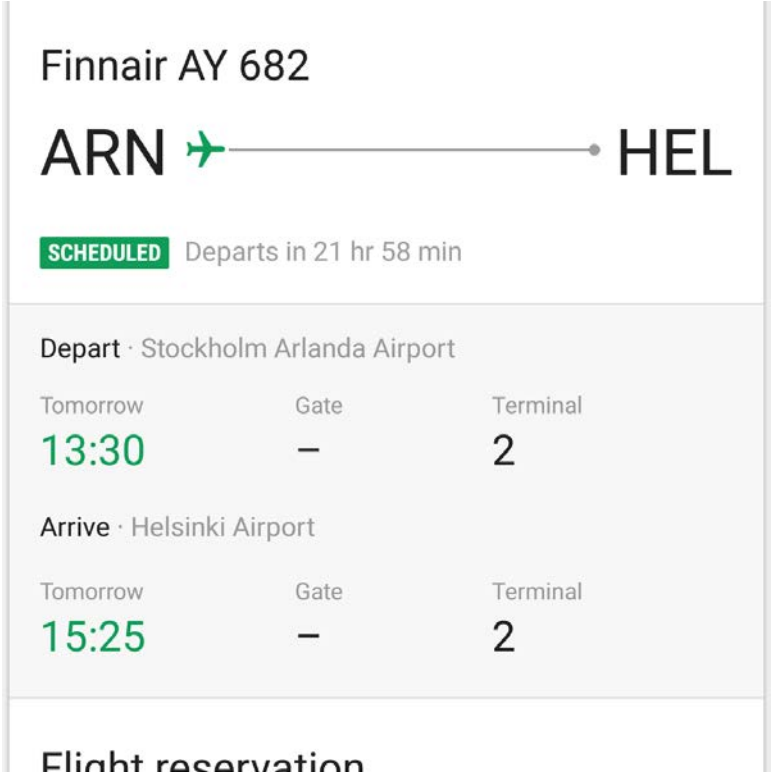
From:
STOCKHOLM ARLANDA
Terminal2
10 May 2016 - 13:30

To:
HELSINKI VANTAA
Terminal2
10 May 2016 - 15:25

Inside the mail is this hidden message:

```
<script type="application/ld+json">
{
  "@context": "http://schema.org",
  "@type": "FlightReservation",
  "reservationNumber": "4928H5",
  "reservationStatus": "http://schema.org/Confirmed",
  "underName": {
    "@type": "Person",
    "name": "Dag Rende"
  },
  "reservationFor": {
    "@type": "Flight",
    "flightNumber": "682",
    "airline": {
      "@type": "Airline",
      "name": "Finair",
      "iataCode": "AY"
    },
    "departureAirport": {
      "@type": "Airport",
      "name": "Arlanda Airport",
      "iataCode": "ARN”
….
```

Google interprets the message and displays this:



How do Finnair know how to formulate the hidden message?

Welcome to Schema.org

Schema.org is a collaborative, community activity with a mission to create, maintain, and promote schemas for structured data on the Internet, on web pages, in email messages, and beyond.

Schema.org

- Keeps vocabularies – definitions of data
- Sponsored by Google, Microsoft, Yahoo and Yandex
- Over 10 million sites uses Schema.org definitions
- Uses The Semantic Web standards

Schema.org

Flight

Thing > Intangible > Flight

An airline flight.

Usage: Between 100 and 1000 domains

[more...]

Property	Expected Type	Description
Properties from Flight		
aircraft	Text or Vehicle	The kind of aircraft (e.g., "Boeing 747").
arrivalAirport	Airport	The airport where the flight terminates.
arrivalGate	Text	Identifier of the flight's arrival gate.
arrivalTerminal	Text	Identifier of the flight's arrival terminal.
arrivalTime	DateTime	The expected arrival time.

Contents

- The Semantic Web
- **Scania**
- Visualization

Scania

Scania

Goals

- Improve the design process of the electrical architecture for trucks
- Make the access to information easier, more accurate
- Lower the cost and effort to maintain the information

Scania

ISO26262 – Functional Safety for Road Vehicles

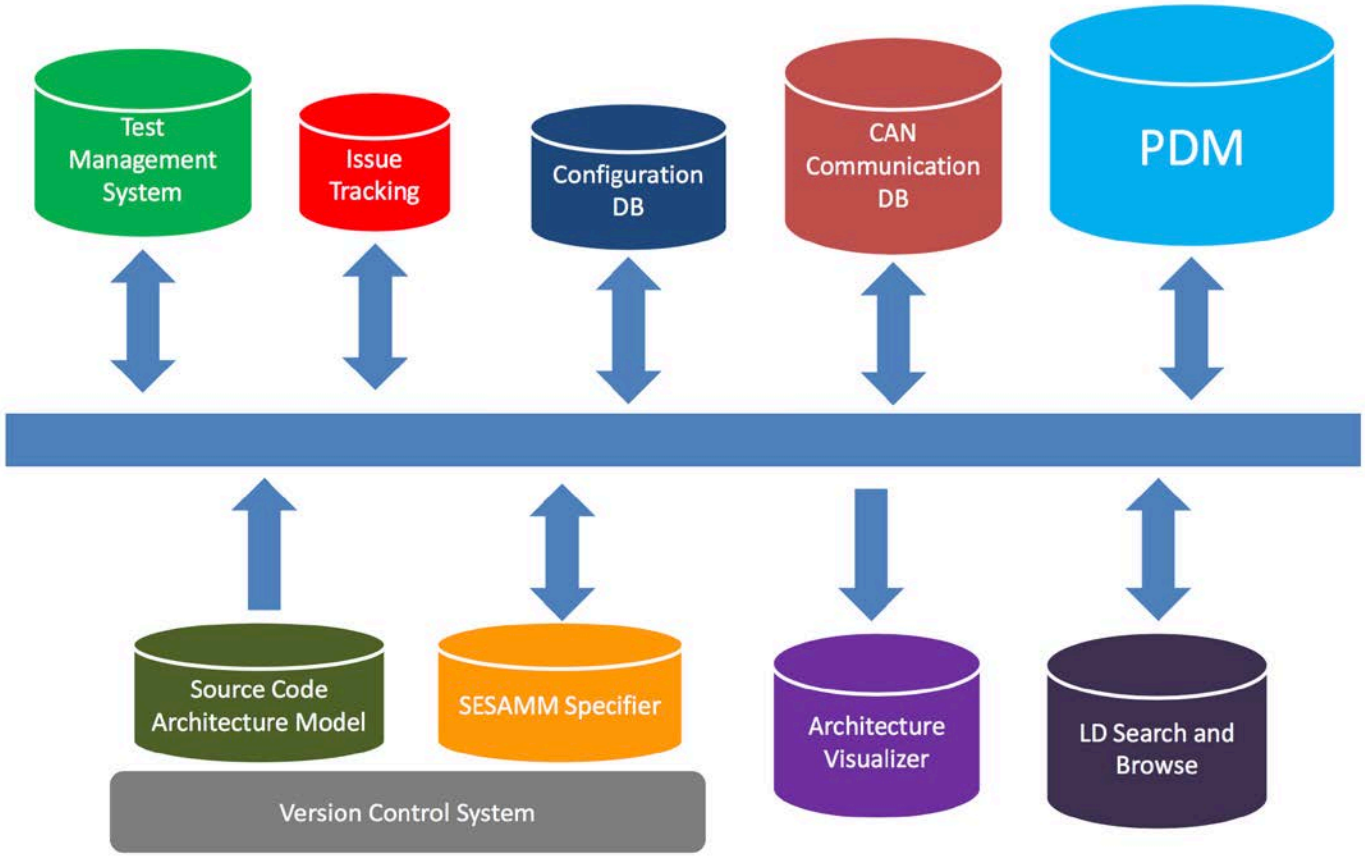
Covers the whole development process

- Requirement specification
- Design
- Implementation
- Integration
- Verification
- Validation
- Configuration

Traceability

- Any action should be traceable backwards and forwards in the development process
- Requires items from different departments and disciplines to be linkable to each other
- This requires global unique identifiers to objects and types.

Scania data sources



The usual solution

- Purchase a large commercial product
- Import all data
- Change the organization to fit the product

Scania chose…

A stepwise adaption to semantic web standards

The semantic web alternative

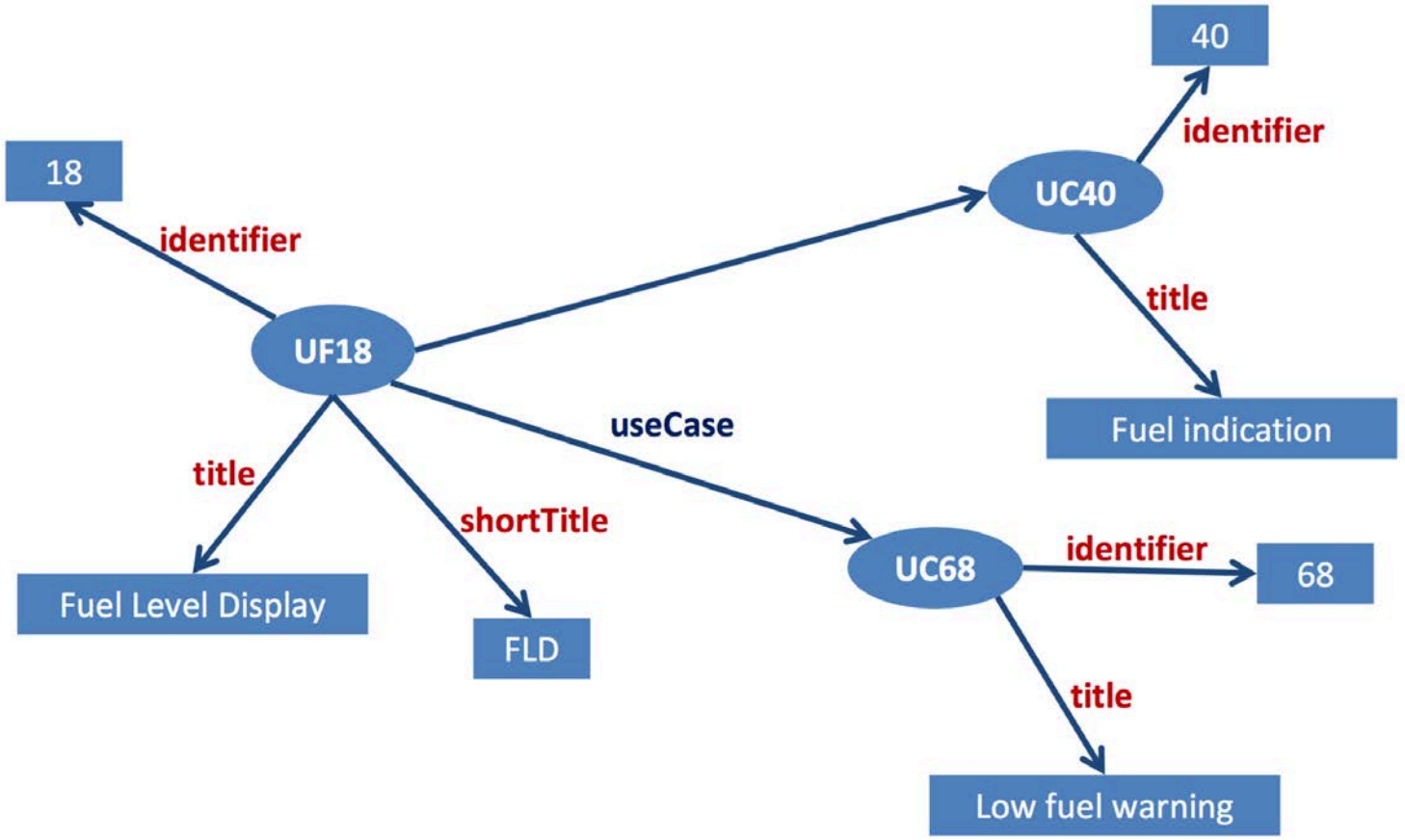
The Semantic Web has standards for:

- Identifiers – URI
- Representing data – RDF
- Publishing RDF data on a network
- Searching data – SPARQL
- Schemas - RDFS – as on Schema.org

Done so far at Scania:

- Created schemas for the object types involved
- Implemented RDF front-ends to existing systems
- Changed existing tools to consume the RDF data
- Created new tools
  - Document preparation tools with connection to the documented entities
  - Accurate search tools
  - Visualization tools

Example triples



Integration

- Not only **System Integration**
- **Data integration**

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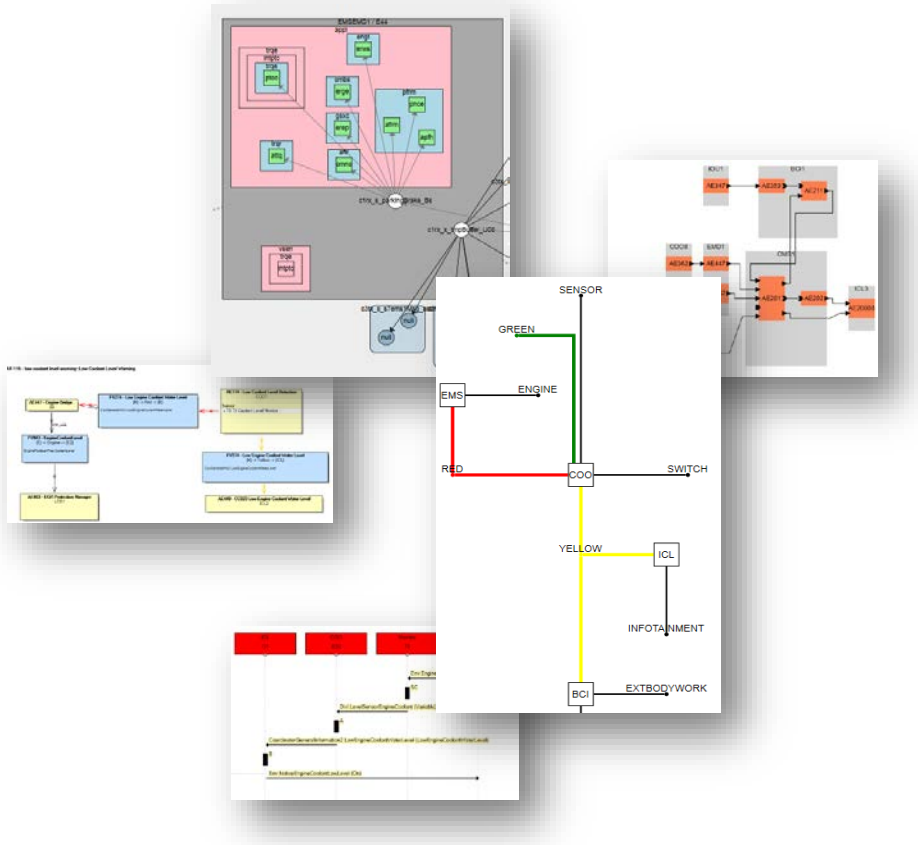
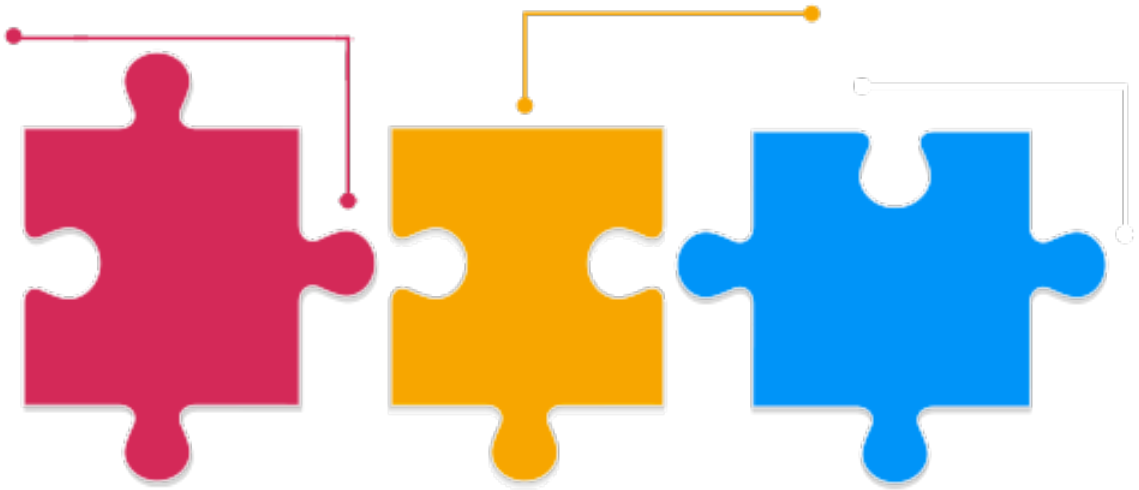
Visualization



Questions to answer

“What is the architectural diagram of the fuel level sensor system for truck model P as it was on May 15, 2016?”



Questions to answer

“Which Messages are sent on the CAN bus when the tire pressure is too low on the left front wheel?”

Visualization tool makers heaven!

- Any object is accessible by a globally unique ID
- Data types are defined in schemas
- Links between objects can be followed, even across discipline boundaries
- A standard way to query any objects

Deployment cases

- Stand-alone in a web browser,
- Embedded into a .NET desktop application

Diagram types

Messages between objects

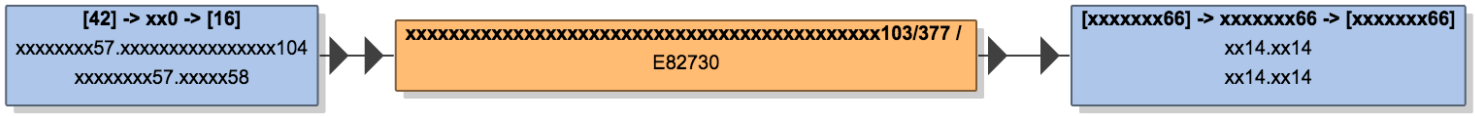
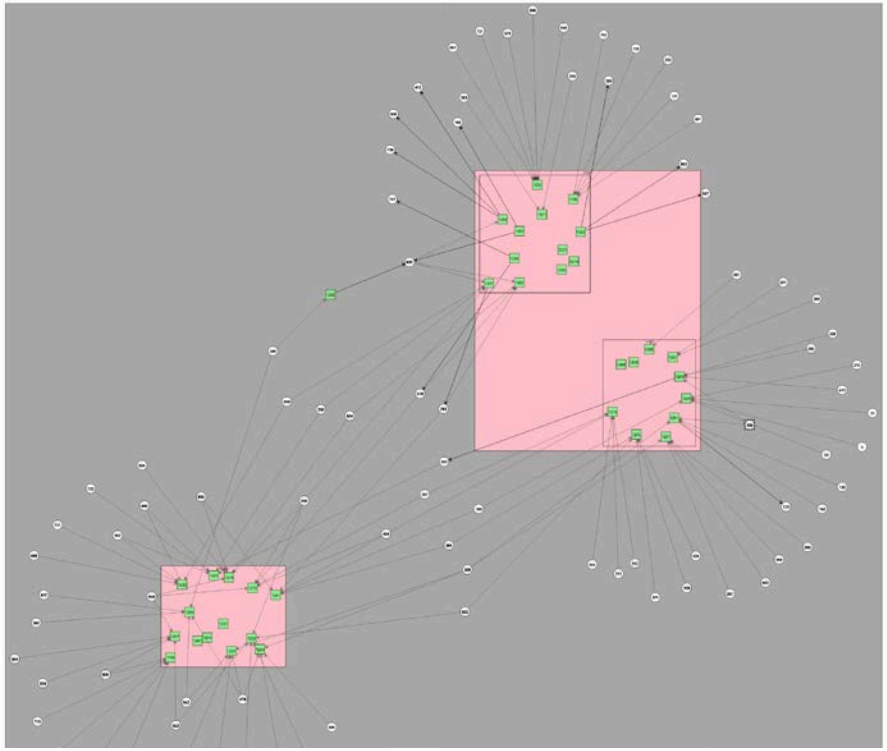


Diagram types

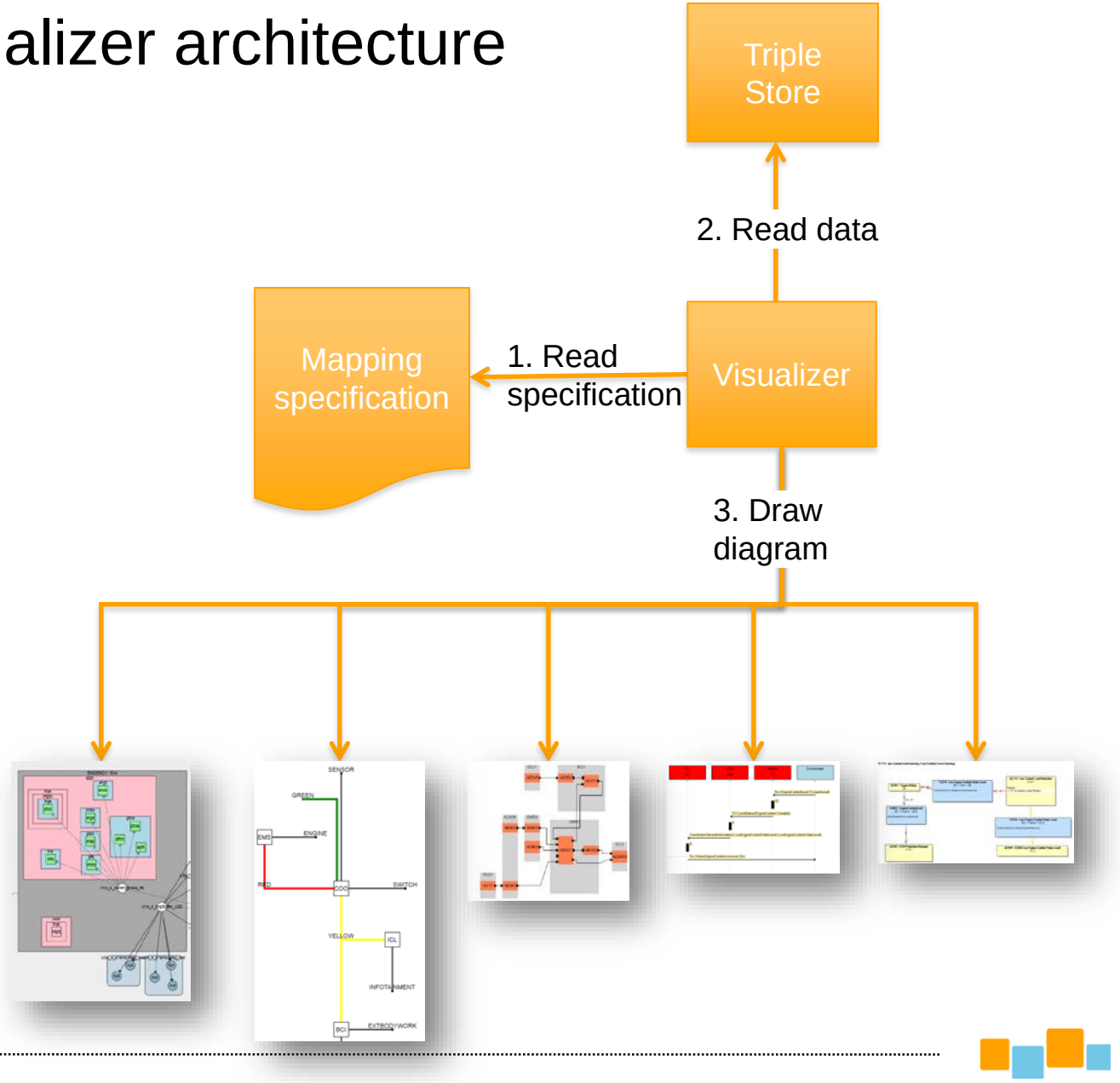
Sub-system hierarchy and object dependencies



Other requirements

- Good layout quality
- Fast layout and re-layout
- User interaction – context menus, selection, mouse hover info-boxes
- Well integrated in the embedding application

Visualizer architecture

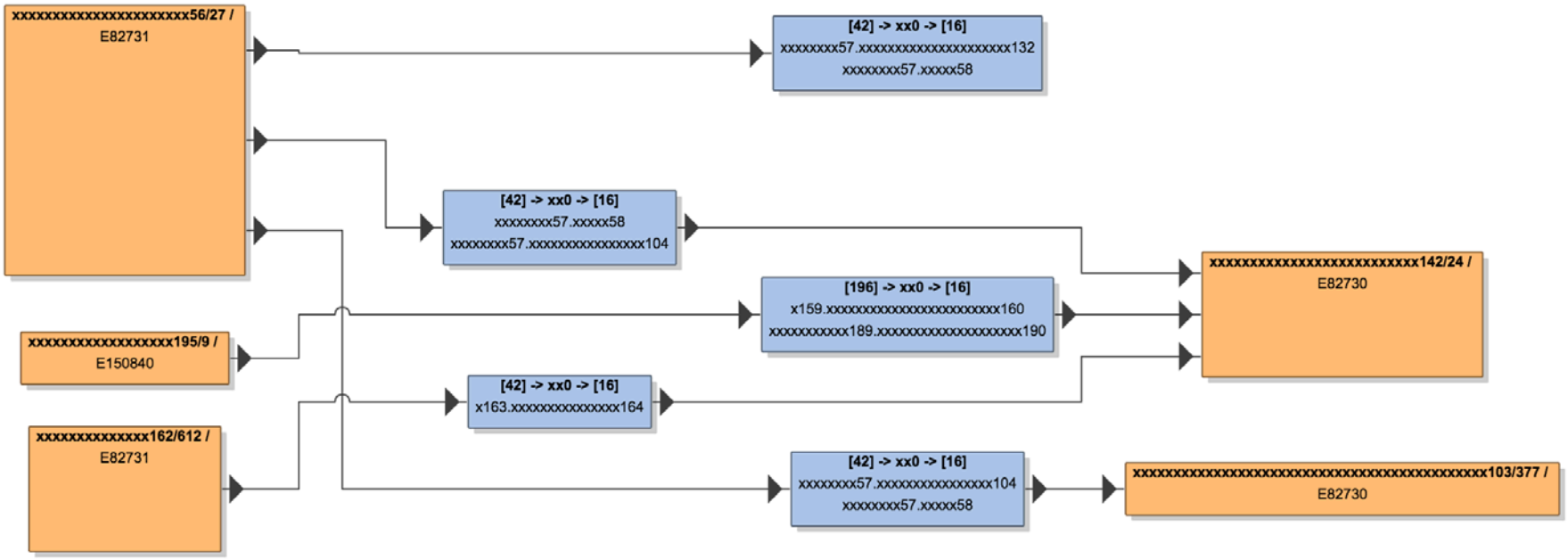


The Specification says:

- Which data to build the visualization on
- How to map data items onto graphical shapes
- The layout
- The User interaction

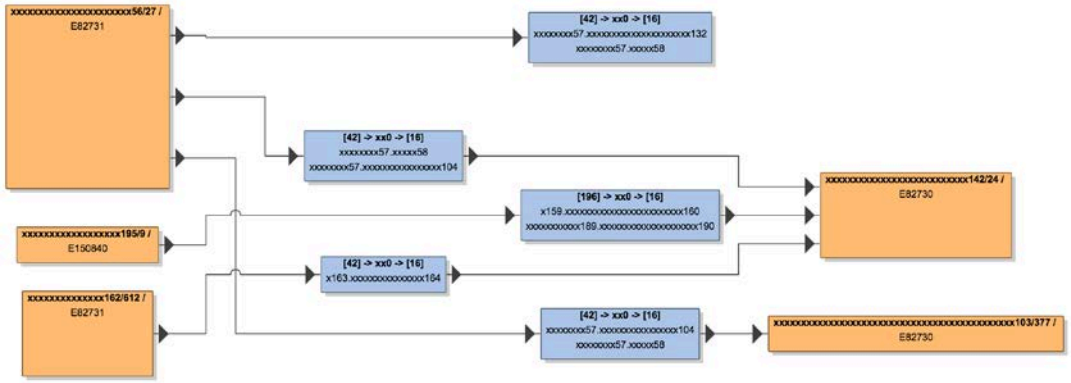
Result – case 1: AE Diagram

Messages between components

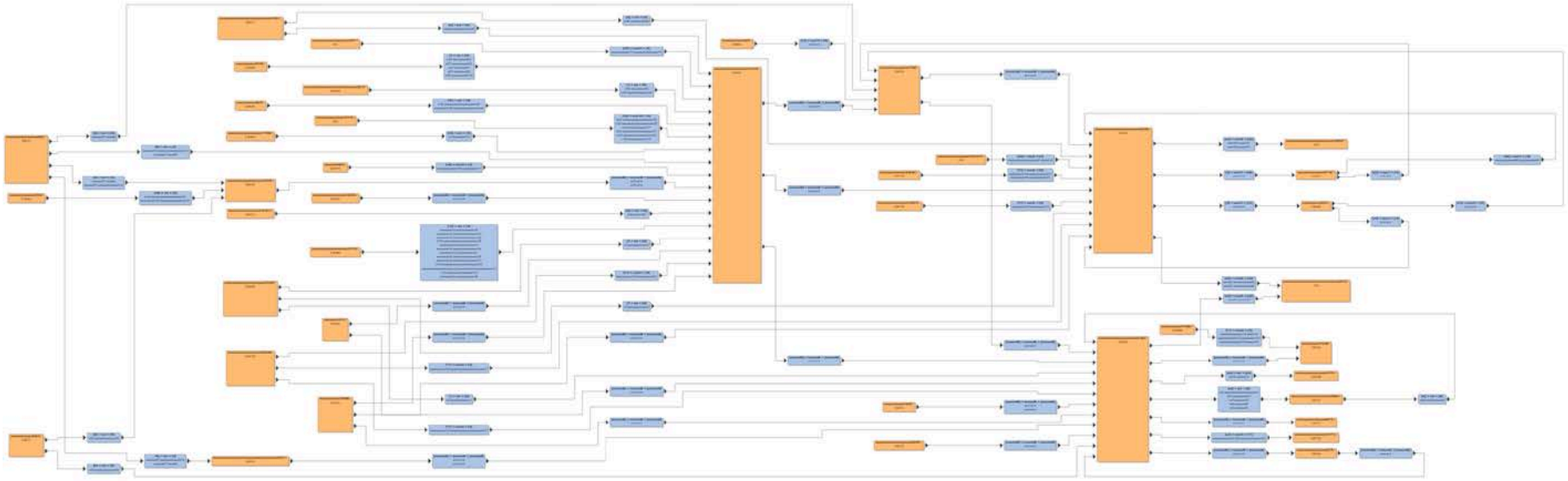


Benefits

- The diagram for the right truck model, version and configuration
- Immediately
- Always up-to-date

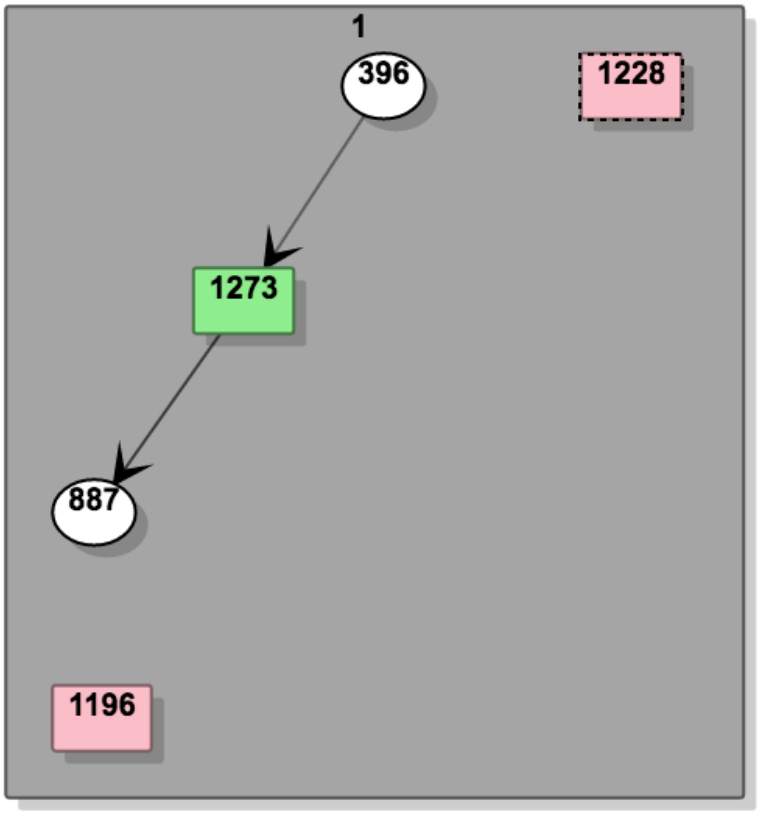


AE Diagram – complex cases

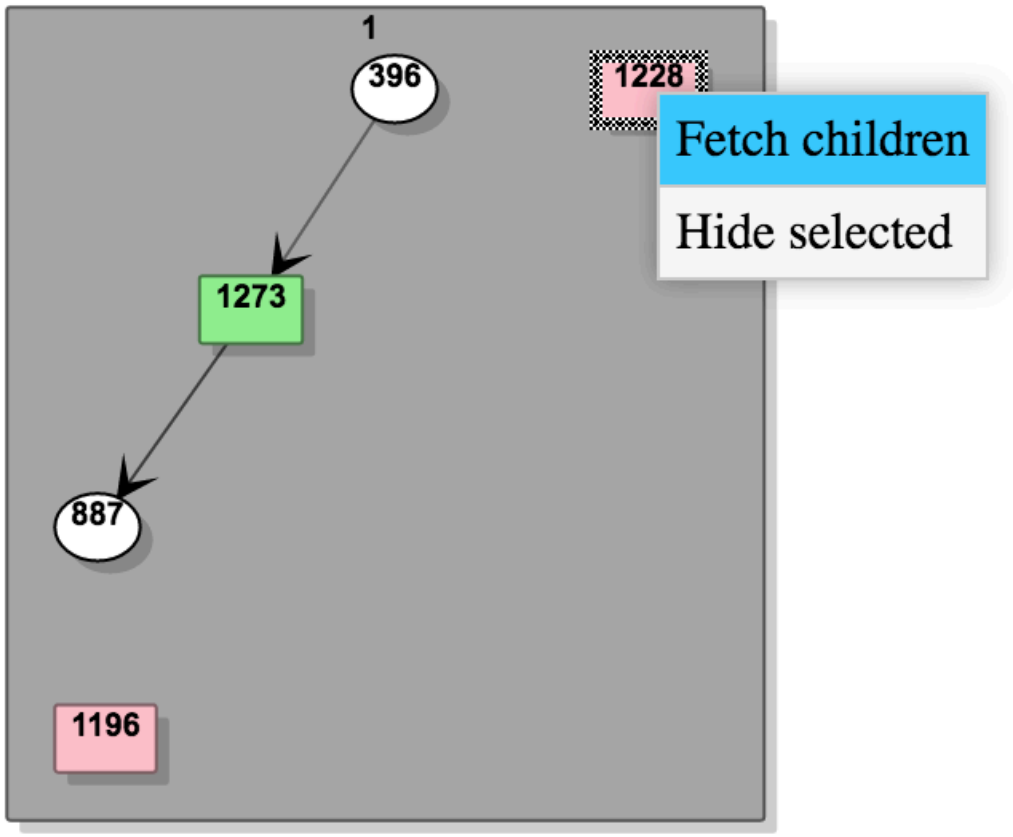


Result – case 2: Hardware/Software Diagram

Sub-system hierarchy

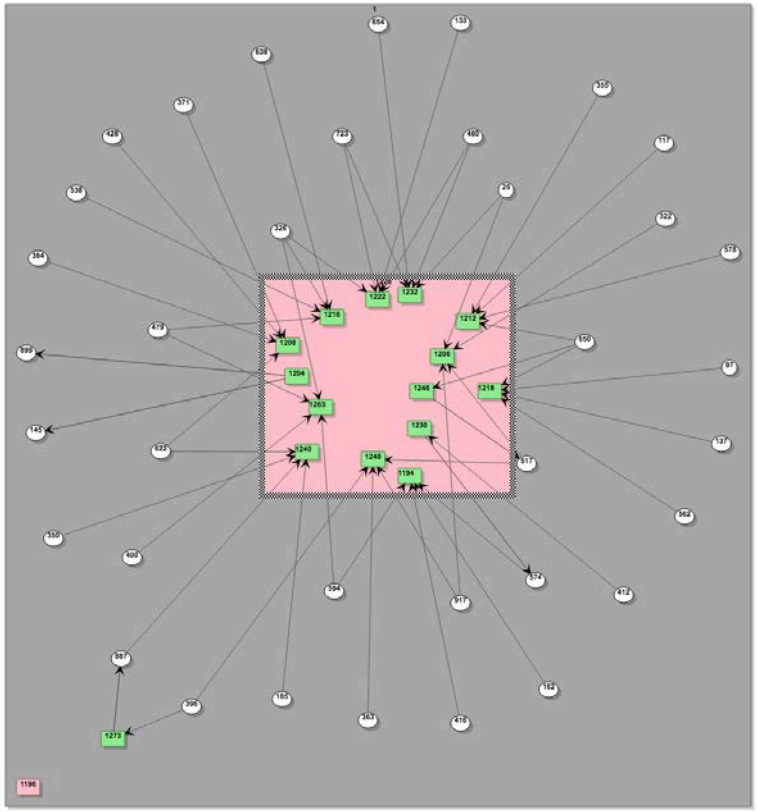


Result – case 2: Hardware/Software Diagram



Result – case 2: Hardware/Software Diagram

The long term goal is an “architecture browser”



The project proceeds with more visualizations

Starting with

- Message sequence diagrams
- Requirement models
- More user interactivity

Scania visualizations - conclusion

The goals were met:

- Improve the design process of the electrical architecture for trucks
- Make the access to information easier, more accurate
- Lower the cost and effort to maintain the information

Thank you!

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