

October 2022

INTERRUPT INSIDE

A technology magazine by Data Respons

Enabling **autonomous**
snowploughs

The mainframe is dead,
long live the mainframe

CarSharing

*Easy on the outside,
complex on the inside*

5G from space
The Internet of Things

via satellite

Improving the
interface between man
& warehouse robot

DevOps culture clash:
when agile meets automotive

**ELECTRIFYING
THE BOAT INDUSTRY**

Fleet Management
Platform, connectivity and interface
for smarter and more efficient trucks

INTERMITTENT

Kenneth Ragnvaldsen <i>- Interrupt Inside Editorial</i>	03
DevOps Culture Clash <i>- When agile meets automotive</i>	06
Autostore <i>- Improving the interface between man & warehouse robot</i>	09
Electrifying the boat Industry <i>- A first for Data Respons</i>	14
Autonomous Snowploughs <i>- The box that enables it all</i>	17
Bridging legacy systems & modern technology <i>- The Mainframe is dead, long live the mainframe</i>	20
5G from Space, Industry 4.0 on water <i>- The Internet of Things via Satellite</i>	24
CarSharing <i>- Easy on the outside, complex on the inside</i>	28
Fleet Management <i>- Platform, connectivity and interface for smarter and more efficient trucks</i>	31



EDITORIAL

KENNETH

RAGNVALDSEN

CEO DATA RESPONS

Enjoy a new edition with
tech heavy content.

A handwritten signature in blue ink, appearing to read 'Kenneth Ragnvaldsen', positioned above a thin horizontal line.

Our data-driven world is constantly pushing the envelope. This edition of Interrupt Inside presents some of the fascinating projects that the group has worked on lately. What all the articles have in common is the dynamic technology introduces to every industry. Pushing our clients to their next stage of their digital journey.

Sustainability in the mobility sector has been a big factor for several decades, but the focus has mainly been on land. The talk of electric cars has been in the public eye for years, but we finally see that the boat industry has caught up with the trend. We have been a key player in the development of the electric boat Candela C-8. By providing the electric design of a hi-tech electric luxury cruiser on hydrofoils, the company has entered the new market with a bang. And the stage is set for the company to develop electric public transportation at sea.

Moving over from the boat industry to the automotive industry, our developers has taken a deep dive into controversy regarding DevOps compared to traditional automotive OEMs. After the rise of the software driven car, the attitude against DevOps has changed, and the big OEMs are on a journey towards faster and shorter development cycles. Which is better in tune with quick technological shifts and a demanding customer expectation for the latest and greatest.

While we are on the topic of software driven cars, we can also mention the rise of autonomous vehicles. The hype has been at play for years, but we are finally getting to a point where we can start to take advantage of this technology to different industries and services. Data Respons has been an important enabler in the development of autonomous snowploughs. Stationed on several Nordic airports, making sure that the runway is clear for landing anytime during winter.

Being a partner for our customers on their digitalization journeys also include addressing the dinosaur in the room. Bridging legacy systems with modern technology is a crucial part of that process, and we have experts in this field. And the world is still run by big mainframe computers that needs a specialist to function alongside the latest techno hype.

Being a partner for our customers on their digitalization journeys also include addressing the dinosaur in the room. Bridging legacy systems with modern technology is a crucial part of that process, and we have experts in this field. And the world is still run by big mainframe computers that needs a specialist to function alongside the latest techno hype.

And while some are bridging legacy systems and modern technology, others are exploring new ways to disrupt traditional business models. Autostore is a pioneer in the warehouse business, and Data Respons has assisted them in designing automated storage and retrieval systems with binpicking robots. The 850 Autostore systems and 37.000 robots are busy 24/7 around the world using Data Respons technology - taking warehousing to the next level.

To round it all off, we are also taking a trip out to earth's orbit, where our specialists have been continuously working alongside



Our data-driven world is constantly pushing the envelope. This edition of Interrupt Inside presents some of the fascinating projects that the group has worked on lately. What all the articles have in common is the dynamic technology introduces to every industry. Pushing our clients to their next stage of their digital journey.

Cobham SATCOM's own engineers to connect IoT and satellites – enabling everything from 5G to industry 4.0. By providing expert knowledge in hardware design, RF antenna technology, software and more we've been a key player and partner for Cobham for years, supporting every piece of tech within the satellite communication value chain.

I promise you that after reading through this edition of Interrupt Inside you will sound like a digital expert at the next dinner party. If you can remember it all.

Enjoy,
Kenneth

DevOps

CULTURE CLASH

*When agile
meets automotive*



Born in the world of software, the DevOps concept has been facing some resistance meeting the classic engineering methods of automotive OEMs. But things are starting to change in an industry disrupted by the emergence of the software-defined car.

Plain and simple: The logic of the physical world is entirely different from the logic of the digital world. For instance, it takes 5 to 8 years to plan, design and test a new car model. Such a lengthy development cycle doesn't go well with the mindset of a typical software engineer thinking maybe 4 to 6 weeks ahead.

We've talked to automotive software experts Jochen Scheikl and Jürgen Stern from Data Respons subsidiary DONAT IT to hear what they had to share about DevOps in the Automotive industry.

What is OEM?

The standard development methodology of large automotive is OEM (original equipment manufacturers). This type of development is usually seen as a V-shape, and is the industry's best practice for designing cars and parts.

What we mean when we say OEMS are V-shapes is that the left side of the V, that's all the brain work, all

difficult. As a contractor developing software for the automotive industry, you must follow the frames and borders of your customers. That said, things are changing, and all the big OEMs are on a journey towards faster and shorter development cycles, » says Jürgen.

Trial management experts

DONAT IT is an expert in software supporting the huge amount of work that lies before a new car model goes into mass production. In fact, even before the first prototype car is built. The DONAT software comes into play about 36 months before assembly of the first prototype. You need to determine how many prototypes must be built to carry out the extensive testing of a new model, and the software collects the testing demands of the different departments involved in the development of e.g., the drivetrain, the electronic components etc., for testing cars and engines. Some of these tests are required to



the planning. When you've finished planning you get to the bottom of the V. That's the point, where you decide to switch to hardware and testing, which is the right side of the V. That's the point of no return, because at that point it starts to get expensive.

Making sense in DevOps automotive

According to Jochen and Jürgen, this classic engineering methodology makes perfect sense in the automotive world and in other industries similarly focused on hardware. However, it can run against the DevOps concept of closely integrating development and operations.

«When you're developing a product that is purely software, it's easier to switch to DevOps values and principles. In the automotive business it's a bit more

secure the correct build quality and safety qualities, others are required by law.

Later, when the prototypes are built and ready for testing, DONAT software helps document the tests, keeping track of pre-series vehicles and components. The team responsible for homologation uses the DONAT system for fleet management of pre-series vehicles, pre-series parts logistics, and to document exactly which components and functions are built into each pre-series vehicle.

“We always try to convince our customers to take a DevOps approach, and to hire a DONAT DevOps team. But sometimes a customer wants two separate contracts, one for Dev and one for Ops, and obviously that ma-

kes it difficult to integrate the two. That trend was strong some years ago, but not so much now. Things are changing, and we have some nice automotive DevOps contracts, where the work is managed the way, we think is the best. Our automotive customers are thinking more and more agile. They think in sprints for instance and want one integrated DevOps team to do the job,», Jochen says.

Walls of confusion

DONAT's preferred development approach is not only to tear down the famous "Wall of Confusion" between Dev and Ops. As long as this wall between the groups exist and the different groups only has their own goals in mind, «the wall of confusion» is inevitable. There's another wall they would like to tear down as well, and it lies a step earlier. According to Jürgen:

- The first wall of confusion comes before you start developing the software. It's the requirements engineering part, where you map the stakeholders, the product owner etc. We always try to integrate that part with our software development, having a business engineer in the team focusing on understanding and modelling the process.
- In some of our projects, where we do Biz-DevOps and integrating the design phase as well, we have all three skills united in one team. There's a business engineer in the team, and the developer and the ops. We try to do that as much as possible. also manufacturing actual physical prototypes at inContext's own cable harness workshop.

Before SOP

As mentioned, DONAT IT focuses on the huge amount of work lying before SOP (Start of Production), primarily test and trial management in the pre-series development process. Initially that has had a strong emphasis on the physical components of the vehicle. But DONAT is getting more and more into the software side of vehicles, as software gets increasingly important in all aspects of development.

«For instance, there is a trend towards testing of virtual components and prototypes instead of physical testing», Jochen says.

«Our software is responding to that change, although the main part of the testing is still happening in the physical world. But as software becomes increasingly important in the automotive industry, it becomes easier for us as a contractor to work according to the DevOps principles.»

All in all, as the car industry turns its focus from the physical characteristics of the vehicle to the services it can provide, experts anticipate that its physical components will become fewer and simpler, with less equipment features to choose from.

Instead, software will be the key differentiating factor, and with that change we'll see shorter development cycles, and a more software-like approach to integrating Dev and Ops. So, to sum it up, for a while the good old V of engineering will still be King. But software is Queen, and she's wearing the pants.

KNOWING THE BUSINESS MEET DONAT IT

A crucial part of promoting the DevOps approach is DONAT's in-depth knowledge of the German automotive industry. They know the business just as well as the OEMs themselves. Furthermore, being situated near the car manufacturing giants of Southern Germany, DONAT can interact closely with its customers, working in short feedback loops to increase efficiency.

**IMPROVING THE
INTERFACE BETWEEN**

**man
& warehouse
ROBOT**



«Stop airhousing, start warehousing»

is the motto of cube storage and warehouse robot pioneer AutoStore. The Norwegian company is pushing the envelope of logistics, designing automated storage and retrieval systems with binpicking robots criss-crossing on top of a gigantic Rubics Cube. Specialists from Data Respons R&D Services are assisting the AutoStore in-house development team in taking warehousing to the next level.



More than 850 AutoStore systems and 37.000 robots are busy 24/7 around the world, enabling automated warehouse operations and super-fast web shop delivery. All that with not only speed and efficiency in mind but optimizing storage space as well.

As they say at AutoStore: “Wasted space is a thing of the past”, and its system, of robots on a grid on top of a giant cube of storage bins, is in operation in some of the largest and most efficient warehouses in the world.

AutoStore is continuously running development projects, for instance related to VLS, Very Large Systems, aiming to operate much more robots simultaneously than possible today. These very large infrastructures require increased stability of all components in the system, to minimize downtime.

Another area of innovation is adapting the AutoStore technology to the grocery sector, and to refrigerated warehouses. This requires robustifying hardware and electronics to be able to cope with low temperatures and condensation. However, the Data Respons engineers currently assisting the AutoStore development team, are focusing on something completely different: Improving the interface between warehouse robots and humans.

Next generation workstation Conveyor

Says Øystein Gjerdevik, manager of the AutoStore R&D Port and Picking Group:

- When our robots have found the bins with the items ordered, they deliver them to a workstation. In AutoStore we call the workstation ports. This is where the operators pick the items from the bin and place them in a delivery box.
- We have a number of ports in our portfolio, designed for different requirements. Currently we are focusing on the one we call the ConveyorPort. It's the simplest of our workstations, and it has been with almost since the beginning. Now we're working on upgrading and redesigning it, and this is where Data Respons comes in.

Fully-fledged team members

According to Gjerdevik, the advantage of engaging Data Respons engineers in this effort, is their ability to contribute with their own ideas and suggestions. And not least the fact that they are fully integrated in AutoStore's own development team.

- It's difficult to outsource this kind of tasks to external third parties. We start our development projects very early. We know what we want to achieve, but at that stage, we're not able to define the exact technical solution to all the problems. We work with an agile mindset and by trial and error. And that's not something you can define in a work package and outsource.
- This approach works really well for us internally, and that's why we're so happy with the Data Respons people in our team. They work alongside us as fully-fledged team members. They are competent people with a lot of ideas, and they're not afraid of suggesting alternatives to what we've come up with ourselves.

Technical upgrade

The Data Respons team is rethinking the ConveyorPort on many levels. For instance, they are giving it a thorough technical upgrade. Its electronics are being redesigned, and on the mechanical side, conventional electric motors are being replaced with brushless and therefore abrasion proof alternatives.

Also, new sensor solutions are being implemented, and the user interface of the workstation is being reworked and improved. Ergonomics are important, such as adjustable working height, tilting of boxes for easier handling etc.

Another priority is making the next generation ConveyorPort modular. Modularity is a basic AutoStore design principle, making it easy and fast to e.g., remove a malfunctioning robot from the grid and replace it with a new one. Modularity is crucial to securing the maximum efficiency and uptime of the system. When it comes to ports, especially on smaller sites with only one or two ports, the port can become a pain point if it fails. To eliminate that bottleneck, the aim for the next generation ConveyorPort is to be able to replace an entire port in 15 minutes.

And finally, the new design restricts the operators access to hazardous moving parts such as belts and cogwheels.

- Our Data Respons specialists are contributing to solving all the technical challenges mentioned, and I would like to commend them. They are highly competent, and they bring a lot of ideas and creativity to the table. And although this is only one out of a number of development projects here at AutoStore, I would be surprised if we wouldn't be continuing to collaborate with Data Respons, when we need additional developer resources to supplement our own in-house development team, concludes Gjerdevik.



THIS IS **R&D SERVICES**

Data Respons R&D Services is an independent company in the Data Respons Group. For almost 40 years, we have worked with great success to meet our customers' expectations. We have delivered new and innovative technology that is critical to our customers' business, regardless of whether they are some of the world's leading technology companies, or ambitious start-ups.

Electrifying *the* **boat industry**

- A first for Data Respons



The Data Respons subsidiary, inContext, are experts in electrification and wire harnesses for the automotive industry. Now they've left their comfort zone to explore the sea of electrifying boats, developing the electric design of a hi-tech electric luxury cruiser on hydrofoils.

The electric boat Candela C-8 promises to eliminate two of the most annoying things about speedboating: Engine noise and the boat punching its way through the waves. An all-electric drivetrain eliminates the noise, while hydrofoils turn the punching into a magic carpet ride, lifting the boat out of the water for a smooth ride and a top speed of 30 knots.

The C-8 has been described as an “iPhone moment for boats” and a “Tesla on water”. Built in 100 % carbon fiber, and with a price tag starting at 290.000 euros, the C-8 may not be affordable for everyone, but nevertheless it's a step towards electrifying boats and ships, large and small. Much is happening in that area, not only related to people enjoying spending their free time on water, but also for instance development of electric ferries, and even experiments with electric container ships.

Sustainability through technology

COO at inContext, Per Fernlund, is excited about playing a part in the electrification of transport. And according to him, Candela is an interesting company to work with, since it is preparing other disruptive electrification projects in addition to the electric boat C-8, for instance the P-30, the world's first electric hydrofoil shuttle ferry.

“In the Stockholm area, where inContext is based, several other companies are working with electrification of transportation, batteries, electric motorcycles etc. New companies are popping up all the time. In my opinion that's a good thing, not only for the environment. It's good for the development of the Stockholm area as well, and it feels great to be a part of that”, Per says.

The inContext engineers have designed the wire harness of the C-8, using their expertise from the automotive industry. But the Candela assignment has posed new challenges to the inContext team. For instance, the boat industries have their own standards to follow. Also, the harness had to be as weight optimal as possible, to give the electric boats maximum range per battery charge, as well as for the environmental impact and for cost saving reasons. On the other hand, what made the job easier was the fact that a luxury cruiser offers more room for cables than for instance the tight spaces in a truck cabin.

Building prototypes

As mentioned, doing the wire harness for a boat has been a first for inContext. Another new addition to the inContext service portfolio has been the building of prototypes.

“About one and a half years ago we started building prototypes. Before that we focused solely on working as R&D consultants. Still, that's what we usually do: designing and developing a wire harness and leaving it to someone else to build it. But now we can also build prototype harnesses, and we can do several iterations and optimize the harness along the way. That means we can deliver a final harness design that is thoroughly tested and in shorter time,” Per continues.

From hand built to volume production

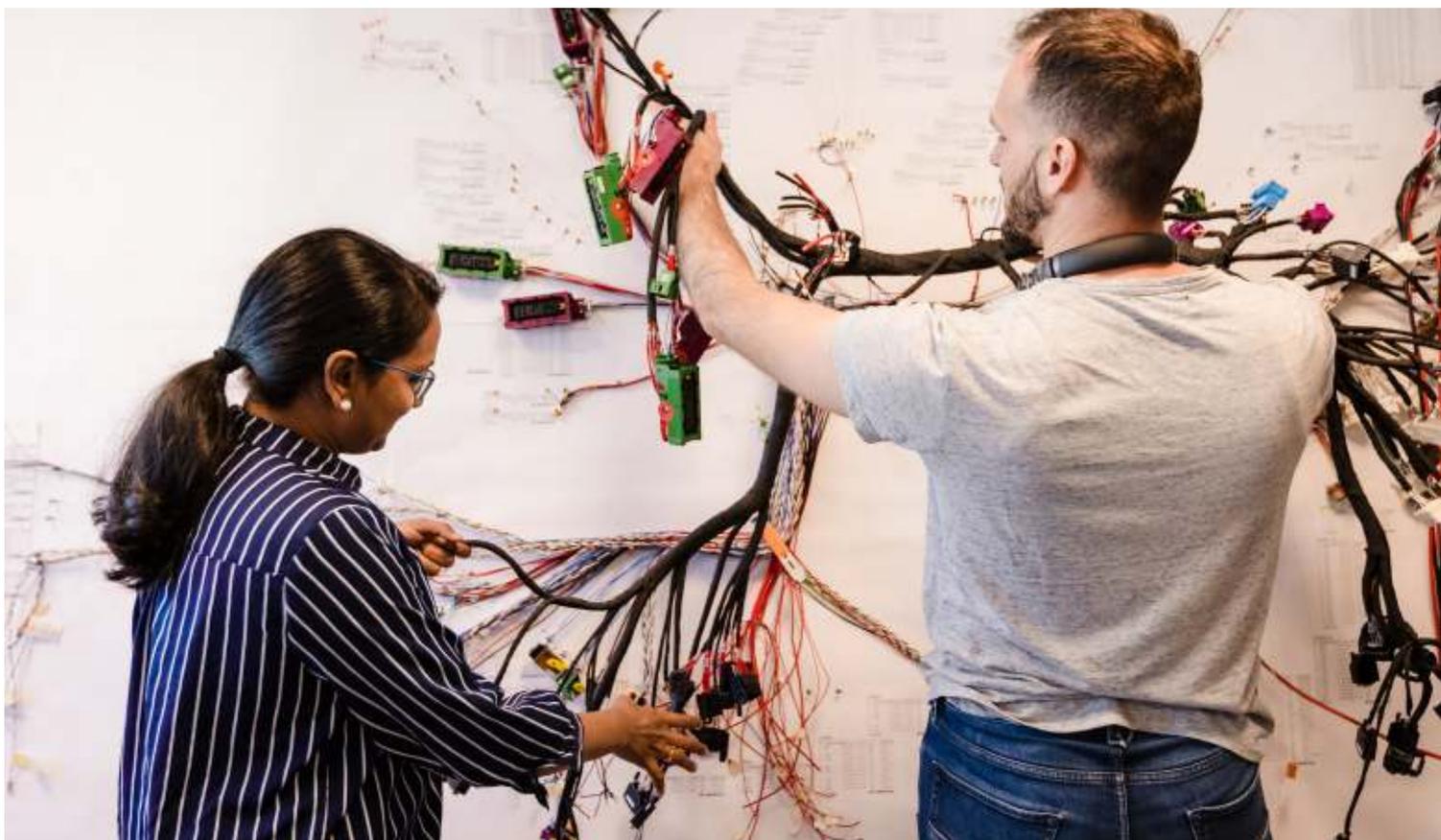
According to Per Fernlund, inContext normally works for large industrial with a lot of powerful manufacturing machinery. Candela, however, is a young company which up until now has produced hand built harnesses. For this setup, inContext's own prototype workshop has manufactured several prototype harnesses. Also, they've helped Candela get ready for volume production.

"Previously, when the boats were built mostly by hand, it took weeks to install the harness.

Workshop training

According to Per Fernlund, working in the prototype workshop and assembling wire harnesses based on computer generated designs is an extremely rewarding training exercise for the inContext engineers.

"With wire harnesses you can't do everything in the computer. You must do physical testing as well, because cables behave differently in the reality and are exposed to the surroundings in ways that are hard to see in a 3D world. Also, there is much manual labor involved in production of a harness. There is a lot of craftsmans-



We have been working on bringing installation time down to a few hours, because that's what needed, when you increase production volume. Moreover, as we know the market well, we've helped Candela find good and trustworthy harness suppliers. We sent a data package with all cable harness details out to several cable harness suppliers for quotes. After a couple of weeks with questions, discussions and presentations, Candela decided to collaborate with one of them to optimize and deliver harnesses during the industrialization phase of production," Per elaborates.

hip to it, and on top of that, wire harnesses come with thousands of small variations. So, our in-house workshop is good for our customers, and good for us internally as well. It stops us from becoming too theoretical, and we learn a lot about all the tiny details that are so important in this line of work," Per says.

Per Fernlund is hoping that inContext will get the opportunity to continue the working relationship with Candela. And not least, he's looking forward to summer, hoping to be able to test a boat ride in a C-8.

A BOX

that enables autonomous
snowploughs



Sweeping the road might not be a typical high-tech challenge. Unless you are talking about sweeping a runway in arctic conditions. Without a human in the process. Now the Kongsberg company Yeti Move is taking the human factor out of the equation with newly developed technology for autonomous snow removal. Data Respons R&D Services designs and manufactures the box that connects it all.

The plow trucks at Oslo Gardemoen and Stockholm Arlanda Airport are driving in formation. The front truck leads, while the others follow, slightly offset from each other like a large plow. This is what they do to clear a runway as quickly as possible and thus delay air traffic as little as possible. Yeti Move works to automate the column of plow trucks. The company, which was established in 2015, is owned by Øveraasen, which produces snow removal equipment, and the Swedish manufacturer of garden machines, Husqvarna.

Øveraasen produces the world's largest plow trucks, and also the special truck which with a combination of plow and brushes that keeps the runways free of snow. In the winter season 2018/19, Yeti Move let its first two autonomous Øveraasen plow trucks test drive at Gardermoen. They drove a total of 2,500 km, as part of the airport's fleet of clearing vehicles. In 2019, the company entered into one of the first commercial contracts in the world for autonomous snow removal with the Swedish airport operator Swedavia.

All in one box

Going forward both Arlanda and Gardermoen will use a fleet of autonomous plow trucks. Yeti Move requested assistance from Data Respons R&D Services to solve the task at hand. The task was to design and produce the box that translates GPS data and commands from Yeti Moves autonomy software to the control signals that control the vehicle's drive-by-wire system. The box is called the Yeti Move Autonomy Kit.

Project manager & system architect Daniel Omsland explains:

– Yeti Move had designed a prototype of this box. It sat in the wheelhouse and consisted of a number of off-the-shelf components. The components each had their own enclosure, connector and certification. Data Respons R&D Services was given the task of designing a new prototype that fit into one housing, both to reduce the production cost and to make the control box so robust that it could also be mounted on the outside of the vehicle, e.g. on the roof.

The box contains a computer, based on an Nvidia Jetson module, that processes data based on Yeti Moves autonomy algorithms. In addition, it inclu-

des a power supply, an Ethernet switch and modules for communication and GNSS navigation, as well as an IMU inertial navigation system. We have also created a BSP (board support package) which consists of a Linux Yocto operating system and APIs so that the Yeti Moves autonomy application can access the box's hardware.

The Yeti Moves autonomous columns of plow trucks are manned by one safety driver, located in the car in front. The driver does not operate the vehicle directly, but can, if necessary, override parameters for all vehicles in the column, such as speed or stop the operation if you have to wait for other traffic. According to Anders Fuglesteg Nilsen, the safety driver is still necessary, as there are still no sensor systems that are reliable enough to function flawlessly in harsh weather conditions with storms and snow drifts.

Drive-by-wire

Tom Holtermann Andersen, head of Data Respons R&D Services' Kongsberg department, highlights the control box's extensive connector interface, which consists of antenna connectors for 4G, 5G and GNSS. In addition, there is an interface to the vehicle's CAN bus. It is through this that the box controls the vehicle's drive-by-wire system. It is supplied by German Schaeffler Paravan and was originally developed as joystick control of cars for disabled individuals.

CTO of Yeti Move, Anders Fuglesteg Nilsen, explains:

– The box contains a mobile modem, which is connected to our fleet control system, which is located in Azure. Via the box and separate interfaces, we actuate the drive-by-wire system and control the brush that hangs on the back of the vehicle, controlling stuff like brush direction and speed.

– At the beginning of the project, we wanted a unit that was designed for installation inside the cab. However, we quickly concluded that it was better to have a dedicated control box that would be robust enough to be mounted outside the vehicle. Thus, the box becomes more useful for military vehicles, wheel loaders, for autonomous vehicles in industry or for fire and rescue. The box can also be used for retrofitting of existing vehicles. In addition, it can be mounted on larger lawnmowers, which makes sense since as our owner Husqvarna² is a large manufacturer of lawnmowers.



Photo: Yeti Move Autonomy Kit

Autonomy in agriculture

Data Respons R&D Services will initially build 20 control boxes for Yeti Move, most of which will be installed in autonomous plow trucks at Arlanda and Gardermoen. In addition, one of the boxes will be mounted in a Valtra tractor since Yeti Move is also working to develop autonomous solutions for the agricultural industry.

– We look at many different areas of use and select the areas that have the greatest potential in relation to our autonomous solution, Anders Fuglesteg Nilsen explains.

– For a wide range of use it is important that we build a technical infrastructure that is robust and flexible. For example, the cloud service we develop must be scalable so that we can support autonomous systems worldwide. The same goes for the control box. It should be able to be used in many different applications and Data Respons R&D Services has helped us build a box that meets these requirements. It's about having one hardware platform for all our solutions. And in the future, Data Respons will also support the hardware setup and manage the Lifecycle Management on it.



Bridging legacy systems
& MODERN TECHNOLOGY:

*The mainframe is dead,
long live the mainframe*



You rarely start from scratch when developing technology. There is always some legacy to take into account. In fact, the bridging of legacy systems and modern technology, is a business in itself. Never more so than in the world of mainframes. Although declared dead decades ago, they continue to run the world's banking and insurance industry – and much more. Take a look at how two of the companies in the Data Respons group, Frobese and DONAT IT, are navigating between old and new.

Especially when it comes to Enterprise IT you might feel like an archeologist digging down into the past. The deeper you go the more fossils you find. But, although they're ancient, these fossil systems are still an indispensable part of the infrastructure, connected to the upper layers by an intricate web of software and interdependency.

Number crunchers

Although declared dead many times, mainframes are still around for a reason: Their ability to crunch numbers at speed is second to none, and they're stable and reliable. You can replace hardware while the system is running, you can shift performance from one processor to another and always have full control over CPU and memory usage.

So, it should come as no surprise to you, that according to Patrick Leixner of DONAT IT, a German manufacturer of premium cars is generating and storing the "heart" of every new car in a mainframe: The secret keys for the car's immobilizer.

Automotive mainframes

Patrick is head of the DONAT IT mainframe team, currently consisting of 5 people, with two new colleagues joining soon. At DONAT, mainframes are a growing business area, including maintenance of the secret key storage system mentioned above. A niche, yes, but an expanding one, nevertheless. Mainly catering to the auto industry, Patrick and his team assists in maintaining mainframes running data warehouses and other essential systems.

For instance, a "just-in-time" system manages parts delivered by suppliers, collects data from the production lines and supply chains, consolidates it, and generates delivery notes, which are forwarded to the car manufacturer's billing system.

Banking and insurance

Dirk Frobese, CEO of Frobese, specializing in software for the German banking and insurance sector, is clearly envious of Patrick Leixner's team of mainframe experts. He himself is looking high and low for mainframe people.

In Frobese's line of business, mainframes are even more common than in automotive, but Dirk has only one employee and a few freelance developers with sufficient skills in mainframes and the programming language coming with them, Cobol. So, to meet the needs of his customers, he recently launched a new initiative called "Kings of Cobol", offering retired Cobol programmers lucrative freelance assignments. You're fighting a losing battle if you try to get young engineers on board. They simply refuse to work with what the developer community considers "big iron".

Patrick Leixner seems to be a notable exception to this. He's by far the youngest member of the DONAT mainframe team. According to Patrick, he finds it fascinating to work with software distinctly older than himself.

More transactions than Google

The fact that mainframes are highly reliable number crunchers secures their survival in large enterprise IT infrastructures. Mainframes are used by 71 per cent of Fortune 500 companies. They handle 90 per cent of all credit card transactions, and host more daily transactions than Google. Airlines, banks, insurers, they all rely on mainframes.

But, however successful, not all is bliss and perfection in the world of Cobol and mainframes. Apart from the difficulties finding skilled people, according to Dirk, the main problem is Cobol CICS, the IBM transaction system which is used in the Cobol financial applications. To understand the context, let's have a quick history lesson from Dirk:

Nearly 30 years ago, I was fresh from university and started working with software for the banking and insurance sector. At that time, we had a vision to get rid of the host and replace it with client/server applications. Our customers wanted us to develop nicer user interfaces than the green-on-black screens they were used to. So, we began to develop Java applications to replace Cobol clients. Then came another tier, a server layer controlling the clients and running with Java. And then we made an API, a kind of middle frame, to transport the interaction from the user interface to the mainframe handling the transaction.

In the end, everything looked good, but in the background, the system was still running all these Cobol CICS transactions. However, now management had no incentive to replace the host, because all the users were happy with this nice, modern user interface we had developed for them. This is when the trouble began.

Cobol CICS is the problem

As Dirk explains, the main problem is Cobol CICS. You can easily replace Cobol, but not the CICS. The CICS is the middleware, lying on top of the operating system and ensuring that a transaction is safe. In businesses like banking and insurance you have vast numbers of complicated transa-

ctions. If one of these transactions fails, for whatever reason, you can roll it back and find the cause of the failure. According to Dirk, there is no real replacement for the CICS, so migrating to a newer system involves a lot of risk.

In addition to this, mainframes are a monopolist business dominated by IBM as the sole vendor. As a customer, you pay for a license, without any alternative, and without any real competition between vendors. This means the price is rising slowly and steadily, and there's nothing you can do.



Finding skilled people

The crux of the matter is however, to find people willing and able to work with this “big iron” as it’s called in the business. Specialist companies like Frobese and DONAT IT are providing these skills for their customers, although Cobol programmers are few and far between. And both Frobese and DONAT are planning to expand this part of their business. Currently they are even discussing to join forces to beef up their crew of Cobol experts, because they predict a rising need for them.

Here to stay

That said, mainframes are here to stay, whether you like it or not. And, according to Dirk, they will still be part of the IT infrastructure for many years to come.

Mainframe systems are ideal for number crunching and fast transactions. But for other kinds of banking and insurance logic, for instance calculation of loans, you can replace them with other platforms like Unix. So, just like when I started my career 30 years ago, we’ll have a heterogenous environment with small clients, middle tier servers etc., and a host at the end, running a big database, data warehouse or transaction machine. That concept is old, and it won’t change. We’re going to continue to see it in the future.

In short:

*There is good business in bridging new technology & legacy systems.
The mainframe is dead, long live the mainframe!*

5G from space, Industry 4.0 on water:

The Internet of Things via satellite

The world of satellite communication is changing, promising more data throughput, broader coverage, and lower price per bit. And not least: new satellite constellations are coming. Specialists from the Data Respons subsidiary, TechPeople, are helping one of the leading global satcom companies to stay ahead of the competition.



Data Respons subsidiary TechPeople, based in Denmark, is a specialist in providing expert to tech companies in need of embedded developers. You might consider that a niche business in the engineering consultancy domain, and in fact it is. But as embedded experts are in high demand – now more than ever – TechPeople has been growing steadily since its foundation in 2010.

Satellite communication plays a big part in the TechPeople success story, as the company Cobham SATCOM is TechPeoples single largest customer. Throughout the years TechPeople specialists have been continuously working alongside Cobham SATCOM's own engineers, providing expert knowledge in hardware design, RF antenna technology, software etc., and thereby strengthening Cobham SATCOM's position as a global leader in satellite communications.

The complete satcom chain

Cobham SATCOM is unique, compared to other players in the satcom market, as the company develops and produces equipment for the complete satcom chain. The only exception is the satellites themselves. Those are built by Boeing, Airbus and others.

Cobham SATCOM builds the ground stations, that connect the satellites to the public internet and to cellular networks. Also, they build the terminals connecting directly to satellites, custom built for planes, ships, and vehicles. Every application has different requirements. For instance, a satellite terminal on a ship needs to have a moveable antenna that can point very precisely to a satellite, even in high seas and rough weather.

In a nutshell, what's currently happening in the satcom industry is driven by the same trend that has transformed your mobile phone into so much more than just a device for making phone calls. It's about constant access to the internet, about transfer of large amounts of data, connected devices, IoT and all the other bits and pieces that make up today's connected, always-on world.

Low Earth Orbit

Much is happening in the satcom world, and TechPeople specialists are playing their part in pushing the envelope of satcom tech. The probably most spectacular and heavily hyped newcomers are the LEO (Low Earth Orbit) constellations, backed by tech celebrities such as Elon Musk and Jeff Bezos. These swarms of small satellites will be circling the Earth at about 800 km, while conventional satellites are much farther away, 36.000 km from the Earth surface. Another important difference is that conventional satellites are geosynchronous, meaning they follow the Earth's rotation, while LEO-satellites are crisscrossing above us. The LEO-vision promises high throughput, low latency, global coverage, and disruptive pricing. However, LEO is still in its infancy, and although it's taking much of the spotlight, other exciting stuff are going on regarding conventional satellite systems. They are becoming more powerful and efficient and thereby lowering the price for connectivity and opening new market segments for the satcom industry.

Maritime satcom

The maritime industry is an ideal case example of why and how satellite communication is changing and evolving.

Increasing amounts of data are being transmitted back and forth between ships and land-based con-

trol centers. Automation, decision support, remote monitoring of engines etc., all these things are becoming integral parts of shipping. Some people call it "Industry 4.0 on water". Previously it was only Crew Welfare services like video streaming that needed powerful satellite links. Now the ship is integrated into a wealth of digital systems for coordinating traffic in harbors and channels, customs clearance, and much more.

More and more operations are handled by large control centers onshore, processing data from the ships and helping the crew to run the ship as efficiently as possible, for instance regarding fuel consumption. You even see that the crew, instead of taking time off when the ship is on the open sea, are given administrative tasks, that can be performed remotely with a computer and internet access.

300 ships

Cobham SATCOM is a world leader in maritime satcom. Throughout the years, Cobham SATCOM has equipped thousands of ships with antenna systems. The trend within this segment goes towards more powerful antennas and higher throughput through single or dual antenna setup. These requirements reflect, that satcom connectivity has become mission critical in the shipping business.

To meet this new need for powerful connectivity, satcom providers like Cobham are beefing up their products, among other things by utilizing higher transmission frequencies that allow for a larger transmission load. However, these frequencies are more vulnerable towards interference caused by rain, fog, or stormy weather.

Making this work, is one of a wide range of engineering challenges to be handled by the Cobham SATCOM developers and the expert consultants helping them.

0,1 % accuracy

Another challenge is developing new types of antennas. Not only is Cobham SATCOM building parabolic antennas that can point to a satellite with 0,1-degree accuracy, although the antenna is placed on a ship moving back and forth in

high seas. Typically, two connected antennas are used to secure the connection.

All this requires expert knowledge in mechanics, control technology and software, including all that goes into state-of-the-art embedded solutions: GPIO pins, embedded and real-time Linux, protocol handling etc.

The emerging LEO constellations add an extra level of complexity. For instance, instead of pointing to one geosynchronous satellite, LEO terminals must choose which LEO satellite to connect to, follow it while it's in range, and then jump to the next and the next.

5G and new markets

While satellite communication is becoming increasingly powerful, it is beginning to take on new roles in the communication infrastructure covering the globe. For instance, Cobham SATCOM is preparing to map the current population of geo-stationary satellites into the emerging 5G infrastructure, opening new business opportunities for satcom service providers.

Also, while the traditional users of satcom – government agencies and businesses – have a rising need for powerful connectivity, new users and applications are coming in. New markets open up, as the capabilities go up and the price per bit goes down. For instance, are content providers offering television based on the customer having his/hers own parabolic antenna, starting to offer TV On Demand instead of only flow-TV.

In short, much is happening in satellite communication, and specialists from TechPeople are helping one of the global satcom leaders stay ahead of the competition

Meet the TechPeople

Jens Kolind is a senior test specialist focusing on integration, acceptance and performance testing of complex software and electronics systems. He has extensive experience in designing test methods and environments from the ground up, and working in large, international development teams.

Jens is currently engaged in a large new Cobham project, which develops ground stations and satellite terminals for a new range of geosynchronous satellites. The ground stations are the gateways between the satellite and various telephone networks and the internet. Jens is one of the people responsible for software integration and test.

Jesper Nordling is a project manager specializing in IT and development projects. With 10+ years of background in Quality Management and broad experience in leading large development teams, Jesper can execute complex projects with tight deadlines. He is PRINCE2, LEAN management and SCRUM master certified.

He's currently responsible for two projects. The first is the development of a new type of omni directional antenna for maritime safety. Regulators have introduced a new set of technical specifications regarding the ability of ships to connect to satellites even in very rough weather, to secure that emergency signals can be transmitted.

THIS IS IT SONIX

IT Sonix Custom Development GmbH specializes in the development and distribution of high-quality as well as tailor-made, intuitively usable software.

CAR SHARING

Easy on the outside,
complex on the inside

Ease of use and seamless integration of services are crucial requirements, when you're developing a car sharing app for young urban customers. They want everything rolled into one, delivered to them via an intuitive mobile phone user interface. To achieve that, it requires an astonishing complexity behind the scenes. Data Respons subsidiary IT SONIX makes it all work.

Never in its 100+ year history has the car industry had to handle as much change as right now. Electrification for one thing, together with the emergence of the software-defined car, is dramatically changing what cars can do and how they're built. On top of that, the role of the car seems to be changing. Some experts even predict that the era of the private car will soon be over.

At least, a growing group of primarily young customers are looking at the car in different ways than their parents, and the car industry is reacting accordingly. The industry is beginning to think of itself as more than just a manufacturer of vehicles. Auto OEMs are adding new dimensions to their business, in an effort to become digital mobility companies, and to offer their vehicles as one layer among many in new multi-layer solutions tailored to the mobility landscape of the future.

Buying, renting, sharing

For instance, one of Europe's biggest auto industry OEMs recently bought a car rental company, invested millions of euros in a car sharing app, launched a ride-hailing service, and is developing automated valet parking software.

The car sharing app, developed in cooperation with Data Respons subsidiary IT SONIX, was launched in 2019 and 2020 in two major European cities. Currently, it includes 2,300 electric vehicles and hundreds of thousands of customers, and there are plans to launch it in other large cities in Europe. Due to a confidentiality agreement, we are not allowed to mention the name of the company.

Young and urban

The car sharing service is targeting young urban people used to interacting with the world via their mobile phones. Therefore, the main focus of the project was developing a mobile application and a platform connecting to several back-end services. The platform was designed to facilitate easy and highly automated user registration, app-driven locking and unlocking of cars and automated billing.

– We have developed an Android and an iOS version, and with these apps the customer is able to do everything, says Frank Stumpf, software engineer at IT SONIX.

– The industry term for this concept is free-floating car sharing. There are no fixed stations where you pick up your car. Cars can be parked everywhere within a specified business area in a city. And you can leave the car everywhere within the city's business area.

– Everything runs through the app. To get started the customers register their driver's license and their billing information. Then they can look for a car nearby, book it, find where it's parked, and when they've found it, unlock it, and turn it on. When they've finished their trip, Payment is done automatically in the background via the app. The same goes for purchasing parking tickets.

Complex project

To squeeze all these services into one app, and developing a user-friendly interface, requires a lot of technical know-how, and according to Frank Stumpf, the project has been one of the most complex ones IT SONIX has handled.



For instance, to make it as easy as possible for customers to sign up to the service, IT SONIX integrated a 3rd party service allowing users to take a picture of their driver's license with their mobile phone. The service then automatically checks its authenticity.

For the basic car rental features, like starting and ending a rental and tracking the car, IT SONIX used a white-label backend developed by a car sharing service provider. 3rd party services for parking are also integrated. And, as the service only offers electric vehicles, a charging service is built into the app as well. Finally, IT SONIX provided the app with a billing solution. That was no easy task, as there are numerous ways to invoice customers, and many different payment service providers as well. Adding to the complexity, the app offers different tariffs and discount options, and invoices are sent to the users immediately.

Also, scalability has been a high priority. Both on the user and on the vehicle side, the platform is designed to scale easily. The IT SONIX team assisted the customer's own development team in building a platform architecture able to scale in a cloud environment. Back-end and middleware development utilize cloud-native computing and serverless computing.

On top of that the platform integrates business intelligence and data science tools, for using the accumulated data to further develop and optimize the system.

Cloud native

Looking at the tech side of things, Felix Rauchfuß, software developer at IT SONIX, emphasizes that the car sharing app uses the cloud natively. In fact, he and his colleagues have followed a multi-cloud strategy, running the system in Google Cloud as well as Azure.

– Being cloud native means, that we don't set up virtual machines or Kubernetes clusters to deploy our microservice infrastructure. We use cloud native services like serverless functions. These are tiny microservices or nanoservices, which are a central serverless offering of most of the cloud providers today. We also use serverless databases, message brokers and API gateways.

– We are deeply integrated into the cloud and that increases our operational efficiency. For example, maintenance of the infrastructure is reduced to a minimum, because the cloud providers will take care of it. They are also responsible for scaling. If we double our customer number in two weeks, that's no problem because the cloud providers will do the scaling for us.

Reaching the next level

Since the launch of the car sharing service IT SONIX has contributed to refining the service, for instance introducing dynamic pricing, based on the use of each individual vehicle. Also, operational data is used to increase the efficiency of the service agents looking after the vehicles, cleaning them, relocating them and driving them to charging stations.

Looking into the future, IT SONIX is preparing to support its customer in reaching the next level of interconnectedness in e-mobility.

– Our customer has ambitious plans, Frank Stumpf explains.

– And we are very much looking forward to contributing to that large-scale integration as well. It is really exciting to be part of the transformation of a large company from pure car manufacturer to a central provider of one overall mobility platform.

THIS IS IT SONIX

IT Sonix Custom Development GmbH specializes in the development and distribution of high-quality as well as tailor-made, intuitively usable software.

FLEET MANAGEMENT

*platform, connectivity and
interface for smarter
and more efficient trucks*

German Data Respons subsidiary MicroDoc knows a thing or two about making cars and trucks smarter. Over a period of 15 years, MicroDoc software experts have made significant contributions to fleet management systems, telematics platforms and infotainment systems for passenger cars and trucks.





Excellent software engineering made MicroDoc's software platforms and applications portable, maintainable, and open for extensions of the future. But MicroDoc's strength is not only about technology. The innovative team also tackled new business models and engagement forms: from traditional consulting and programming services MicroDoc developed into a system integrator and finally helps customers to operate their complex computing environments with DevOps engagements.





At the core of MicroDoc's success with automotive customers is their capability to create custom virtual machines on non-standard embedded platforms. The first telematics and fleet-management project started 15 years ago with a porting job of an embedded Java™ virtual machine for a small handheld computer. Germany's leading truck manufacturer spawned a project to optimize logistic processes for their freights truck fleets. MicroDoc was engaged to implement Java on their handhelds, and MicroDoc's profound knowledge in mobile computing led to a cooperation also in the application development domain. The decision to use Java as a programming language for the solution as well as the introduction of a proper and extensible component architecture in the software was a key success factor for the client.

The customer solution was extended and expanded continuously, supporting multiple generations of handheld computers, after market add-ons and on-board devices (including changes of hardware architectures and operation systems), while MicroDoc was able to maintain a single-source strategy for most of the functions needed and the portable Java code provided secure and reliable applications through all generations of devices. No significant change of the application code was needed when mobile phone became ubiquitous and MicroDoc's customers wanted to run their services on Android phones.

But the auto industry never stops. Current cars and trucks became essentially computers or rather cyber centers on wheels. "In the early days, telematic and logistics functions were hosted on individual devices" says Georg Szeiler, system developer and team lead for logistics software in MicroDoc. "Nowadays we need to be able to run and distribute our software functions on onboard and offboard systems and integrate seamlessly in existing large dashboard displays. Even though today's hardware and software architectures are completely different from what we have seen in the beginning of the project, we can still use our Java based software component platform to extend the customer systems with the latest advanced functions required by the market". Today MicroDoc's solutions supports functions like configurable workflows, navigation, advanced logistics support, eco telematics for efficient driving, remote diagnostics, and predictive maintenances as well as security, crypto and anti-theft measures.

From application developer to platform provider

It is interesting to see how this is all possible on a more technical level. When MicroDoc started to develop Java applications on proprietary handheld computers, they made the decision to employ a strictly modular component model and a clearly layered service architecture. In addition, the engineers employed a methodology called "test driven development". All software components are accompanied by test routines that are being used during the continuous development and deployment procedures and make sure that the introduction or exchange of components can be managed easily. "Today we have a build- and test-management system that allows us to run multiple thousands of tests on-site and remote in the customers integration labs" says Dr. Udo Schramm, project lead for on-board telematics software.



One obvious example of the advantages of the modular approach is the evolution of "connectivity" in vehicles: In the early days of handheld logistics support apps, there was no on-line whatsoever. The mobile computers were "loaded" with data in a cradle when the trucks came to their homebase. When the mobile computers were equipped with SIM cards, messages were passed by sending and receiving SMS. Later, when IP connections over the air became affordable, the apps started to talk to their backends through standardized protocols like MQTT. And MicroDoc's service architecture allowed for adoption of all the new technologies, including Edge, 2G, 3G, 4G etc. without touching much of the application code.

Based on these positive experiences, MicroDoc offered the implementation of a connectivity gateway software stack when one of their customers decided to renovate their in-car communication gateway. MicroDoc got the job and was even awarded the position of general contractor for the device – which also meant coordination of multiple hardware and software suppliers. The resulting telematics platform is a standard product of a leading German truck manufacturer and is being developed further into the 3rd generation as of today. The modular architecture also paid off in the headless communication device – i.e., when Automotive Ethernet was introduced on the hardware level to replace CAN and MOST communication in many situations. When Bluetooth was needed for interaction with after-market addons or tachograph applications – MicroDoc just added another communication adapter to the mix.

MicroDoc's software developed into an almost generic in-car/in-truck platform and was also expanded with 3rd party APIs to allow other software and service suppliers to use functionality and process live truck data available on the built-in telematics devices. Using the Java platform API even allows to connect to and exchange live truck data with other peripheral devices or various kinds of services running in a server backend.

An essential addition to the platform was the introduction of "Over the Air (OTA)" software update. This transaction-oriented update mechanism allows for software updates in the field over wireless communication channels, even when they are as shaky as GSM connections in some parts of the world). It also supports so-called delta update mechanisms to compress the needed amount of data to be sent over-the-air to a minimum.

The next evolutionary step was to implement connectivity and security to integrate proprietary app stores. These stores offer apps from third party ven-

dors which are targeted towards value-add functions which don't fit into the mainstream portfolio of a truck vendor. Typical examples are apps to support domain specific functions like cargo temperature monitoring or apps that are made for regional markets like demobilization for theft protection in South America.

The best is yet to come...

The ever-expanding portfolio of functions and applications in cars and trucks calls for additional computing power and resources. Future models will be equipped with centralized high performance computing clusters with virtualized environment to handle the rising demand for MIPS. So far – so good. But what happens with the large installed base of telematics and fleet management systems in older trucks still on the road for many years? Are those vehicles cut off from the latest functional enhancements?

First of all, applications written to interface with the 3rd party APIs of MicroDoc's platform can be deployed on any kind of hardware. The Java based interfaces are stable and provide secure access to platform functions, no matter what underlying hardware is used. Second, functionality written in Java can be distributed between various hardware devices in a truck since they can communicate via standard interfaces with each other. The concept of "edge computing" can be applied and previously monolithic applications can use multiple CPUs in case additional computing power is needed. And finally, MicroDoc offers the latest advances in Java technology: GraalVM Embedded. This new virtual machine product can create platform specific executables from Java code. The so called "native images" have a significantly smaller footprint than traditional Java applications with full JVMs and they provide better startup time. Replacing a conventional JVM on a smaller hardware with GraalVM Embedded gives your device more space and computing power for deploy brand new features on legacy systems.

THIS IS MICRODOC

MicroDoc Computersystem GmbH specializes in solving challenging software problems, which require in depth knowledge of end-to-end technology and business scenarios (including mainframe computer, networks, desktops, mobile devices and embedded systems).

■ INTERRUPT INSIDE

A technology magazine by Data Respons

Read more inspiring articles on our website.
Scan this code to get there:

