



COMATEC®

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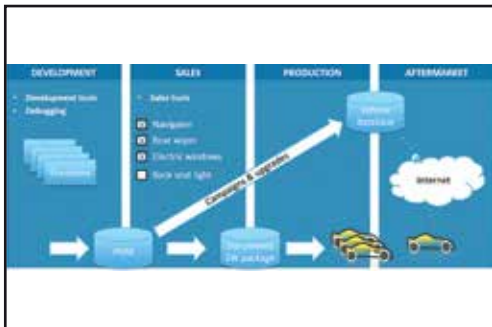
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The labour markets and our international competitiveness



After a long time, eight years, the labour market is showing clear signs of picking up; these are genuinely credible, and are the foundation on which our future business activities can be carefully built. The Competitiveness Pact of spring of last year, which was hard to achieve, has proven effective. Even the trade unions that were left out of it have gradually come round to pursuing the common good.

The outcome of these eight years has left Finland with an overly large army of long-term unemployed people, and the consequent worsening of the society's borrowing needs. That need for borrowing will be evident in the future also, and the Competitiveness Pact that was designed to tackle it is not at all a sufficient measure. What is needed in addition are much more intense and longer-lasting measures to stop the worsening debt spiral and to enable a transition to a controlled balance of tax revenues and expenses.

The best solution for increasing the tax revenues is to get the unemployed in work, and to get them to believe in building their own lives. On the domestic markets, costs have decreased in recent years, and costs have been lowered in many deals. Construction on the domestic markets has clearly recovered, and some bigger investments have even been achieved. The local markets, in my view, have been balanced, but that is not enough for the need of society to take on more debt to be significantly reduced. What's needed is a significant pick-up in export activity, but this is not on the horizon.

In working life, much more vigorous changes are needed, as is the humility to be able to see inflexibility brought by regulation of the domestic markets; this separates us from countries where labour market matters are taken care of much better. Trade unions and the Confederation of Finnish Industries (EK) are aware of the problem, and of the necessary measures for solving it, but are the politicians, those with the decision-making power in society, capable of implementing them? They haven't been capable of this. It does not even seem that all the domestic labour market organizations are too concerned about it; at most, they give it lip service in speeches.

Politicians do not have the humility and skills for mutual cooperation, that are needed to tackle the root causes of the

problems plaguing today's working life. For them, what seems to be more important is bickering between themselves. In Finland, in very many areas the practices are still a legacy of the Soviet era. The strongly regulated economy in the USSR brought down the whole social system, which in Finland is still remembered as the "as familiar and safe" times of President Kekkonen, the era in which deals were made in the alcohol-fuelled atmosphere in Moscow.

It is been forgotten that the fall of the Berlin Wall brought down the Warsaw Pact, and the regulatory economy. After that, what has been built in its place is the EU, and through it in many sectors more flexible labour markets and local contractual models. In Finland, it's still widely thought that universally binding collective bargaining agreements and local bargaining practices are a major curse, something not allowed to happen in this country. We have been too blind to understand and to believe that this is still the way that things are done in the competitor countries.

The results of the new European operating model come across as positive things, for example in Sweden and Germany, where there is considerably more flexibility and better-functioning labour markets compared to Finland, not to mention in Poland and the other former Warsaw Pact countries. In Poland, for instance, the GDP has been growing all the time, whereas it has not increased in Finland.

Finland is not a genuine contractual society; rather, it is a dispute-settlement society. A good example of this is the number of strikes in the labour market, and the number of labour disputes in the various instances of the courts. When it comes to the treatment of labour market issues and agreements, Finland is at least one or even two generations behind Sweden.

In hopes of a better bargaining culture in the future, and a happy spring to all

A handwritten signature in blue ink, appearing to read 'Aulis Asikainen'.

Aulis Asikainen
Group Director
Comatec Group

Publisher

Comatec Group
Kalevantie 7 C, 33100 Tampere
Finland
Tel. +358 29 000 2000
www.comatec.fi

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Editing and implementation

Comatec Group
Taina Syrjänen, tel. +358 40 593 1259
taina.syrjanen@comatec.fi

Author

Taina Syrjänen

Feedback, subscriptions, cancellations

Taina Syrjänen, tel. +358 40 593 1259
taina.syrjanen@comatec.fi

Harmonising Comatec's corporate image and logo

Comatec has a clear mission: we help clients produce investment goods in a more profitable way. Our daily work with our clients aims at implementing this mission better and better. The mission is also reflected in Comatec's strategy: our vision is to develop into an important service company for the technology industry in the Baltic Sea region to be able to support our clients even better through competitive top-level expertise.

International growth requires that Comatec has a unified and clear corporate image. Comatec's external communication has, in fact, been developed into a more harmonised direction over the past few years, for instance, by modernising our visual image, registering our company logo and renewing our website.

We will continue the work to renew and harmonise the image of our company. For instance, we will develop the website, presentation materials and other documents for external communication. During 2017, the separate logos of Comatec's subsidiaries will be phased out in all communication. Comatec's registered company logo will also be used as the subsidiaries' logo.

Introduced in the early days of our more than 30 years in business, the Comatec logo is recognised as a symbol for a competent, reliable and comprehensive group of engineering companies – and our clients know it.

These changes will not have any impact on the management of Comatec's or its subsidiaries' client relationships. Our clients will continue to be served by the same, familiar contact persons as before, and they will always have access to the constantly expanding expertise of the entire Comatec Group.

Additional information: Miikka Riittinen, tel. +40 40 860 1670, miikka.riittinen@comatec.fi



Winter winds at the Pestipäivät in Oulu, 26 January 2017

Pestipäivät (Pesti Career Day) is an annual recruitment event held in January at the University of Oulu. Pestipäivät is organised annually by the University of Oulu's technical education departments, Teekkarilupi Oulu Oy, and engineering students. More than 80 employers were represented at the fair, talking to participants about their companies and their operations, and describing their recruitment needs. Unlike in previous years, this year the fair included several startup companies that presented their operations with products they developed.

Comatec was part of things, for the fifth time, with designers from Oucons Oy, an Oulu-based company. Our exhibition stand had a very positive buzz, and lively discussions throughout the day. The designers were approached for a chat both by experienced industry veterans and young future hopefuls. Indeed, many at the fair agreed that it was "a fantastic opportunity to highlight our company and tell about the company's operations to new graduates as well as to potential future customers.

"Pestipäivät, already an established tradition for us, has become an effective way of disseminating the company's image as employers in Oulu. And our goal is that every mechanical engineering student in Oulu knows Comatec and its operations," says Sami Luhtaanmäki, who was involved in the fair. Oucons Oy has for several years now made Comatec familiar to engineering students, through interacting and attending guild evenings with them in order to promote the company's operations.



New talent in Comatec Group

The following competent professionals have joined the Comatec Group:

Mobile Machinery and Commercial Vehicles

Peter Lillqvist has started as Microteam Oy's Managing Director in the Electricity and Automation unit.

Kimmo Nurminen has started as Sales Director in the Mechanical Engineering unit, with responsibility for sales in Poland.

Pasi Anttila has started as a Senior Design Engineer, and **Rolle Törmänen** and **Kristian Hoppania** have begun as Design Engineers in the Mechanical Engineering unit.

Olli-Pekka Virtanen has started as Test Engineer in the Expert Services unit.

Industrial Production Systems

Joona Tiilimaa has started as a Design Engineer, **Iiro Pyykkönen** as a Testing Engineer, and **Alina Fjodorova** as a Documentation Specialist; all three joined the Electromechanical Systems and Components unit.

In the Processing Machinery and Plant Engineering unit, **Manu Lähde** and **Jouni Verhelä** have started as Senior Design Engineers, **Eemi Ylönen** as a Design Engineer, **Niklas Bäckström** and **Satu Vilkkö** as a Junior Design Engineer.

Material Handling Solutions

Mika Karttunen has started as a Senior Design Engineer in the Lifting and Logistics Systems unit. **Teemu Lehto** has started as a Senior Design Engineer in the Bulk Material Handling unit.

Boilers and Power Plants

Vesa Vihanto has started as a Senior Design Engineer in the Process Engineering unit, and **Piia Soili** has joined us as a Design Engineer in the Mechanical Engineering unit.

Comatec participated in the Advanced Engineering event, 29-30 March 2017.

ADVANCED ENGINEERING 2017

The Advanced Engineering event is an advanced industrial technology professional event, and was held in the Messukeskus convention centre in Helsinki from 29-30 March 2017. The two-day event brings together solutions, products, and new innovations serving the manufacturing industry.

At the event, Comatec also presented the expertise of Microteam Oy, the Group's new member. Microteam is a designer and implementer of embedded systems, machine automation, and rolling stock, and has a mastery of the entire chain, from genuinely real-time solutions to broad-scale networked systems. Microteam has long-standing experience in bringing smartness to customers' systems, such as the IoT, electric drives for vehicles, and other demanding industrial electronics and automation.

On the seminar stage on Thursday 30 March 2017, at 13.00 - 13:45 Janne Virta of Microteam talked about Lucid rolling automation, a new direction in automation of rolling stock.

Turku office merger

Comatec Group's Turku office will move to the premises of Cadring Oy Turku. Comatec Group's Turku office has grown to a unit of 30 specialists through the acquisition, which took effect on 7 December 2016. The best aspects of Comatec and Cadring complement each other in Turku also, through the combination of our expertise we can offer our customers in the Turku region significantly added value. Extension of the range of services will enable us to offer more comprehensive design and product development projects.

The shared address of the Turku office, as of 20 February 2017, is Kärämäentie 23, 20360 Turku.



Microteam Oy – strong expertise in industrial electronics

Comatec Group's latest reinforcement to our ranks, Microteam Oy, brings strong expertise in industrial electronics to the Group. Microteam Oy is a Finnish technology company that provides design and project services to its customers. The company is particularly focused on embedded systems, machine automation, and enriching vehicle technology, increasing the added value for its customers through software and automation technology.

TEXT: TAINA SYRJÄNEN

“Microteam's long experience brings certainty to demanding assignments, for this the solutions are often a combination of a strong basic knowledge and technical know-how, enabled by the strong competitive edge in new technology,” explains Microteam Oy's Managing Director **Peter Lillqvist**.

“A good indication of our excellent standard is long-standing relationships in the paper, steel, and mechanical engineering sectors.”

“Microteam, which is now part of the Comatec Group, is a strong automation supplier that complements in many sectors the expertise of the parent company, continuing to serve as a continually improving company.”

Machine automation

“A typical project in mechanical automation is modernisation of large



Microteam Oy's Managing Director Peter Lillqvist

machine tools, in particular roll grinders, for which performance and accuracy can be significantly improved and at the same time the life cycle of the machine extended. Quality and accuracy are improved significantly with a measuring device developed by Microteam. The company has for several decades carried out modernisations globally according to the customer's needs,” Peter says.

Embedded systems

“Microteam's strong expertise, developed since the early 1980s, has been the development of embedded electronic systems for the needs of many industries, compactly and reliably, with functions specified by the customer,” Peter says.

The vehicle industry

“In the vehicle industry, our expertise is concentrated on internal combustion engines, electric and hybrid vehicles, On these we implement electrical design and supply the entire automation system, complete with development environments,” Peter adds.

The Lucid concept automates software production

Lucid is, in short, a concept that can be used to implement the functions of machines, devices, and vehicles implemented cost-effectively, flexibly, and in a controlled way, throughout the life cycle.

“The Lucid concept allows software production to be automated. That was the idea when we began developing Lucid in the 1990s. As part of the Lucid concept we have also thought about what it requires from other stages. The number one demand for automation of software production is putting the other cornerstones into position,” says Microteam's Chief Technology Officer **Pertti Arjanne**.

“One advantage is that the concept encompasses all stages of production, product development, sales, production, and secondary markets. The initial starting point was that there is no benefit in automating just one step. The task instead is to ensure that the automation is as comprehensive as possible. Not only effective from the operation point of view, but also to avoid business risks,” says Pertti.

“Traditionally, information travels through the design, production, and secondary market systems in ways that differ from each other, looking different in the different stages. With regard to the secondary markets, information is not always error-free. The fact that the vehicle can be modified during its lifetime, given new features, and updated with new software, cannot be done very reliably manually. The automated process of the Lucid process, on the other hand, is implemented reliably, and thus improves the quality of operations.”

Lucid's process discipline

The process discipline contained in

Lucid is one of the cornerstones that the automation of software production has set for the Lucid concept.

“In the business world of production, software production process is more or less a separate part, and it is not organically integrated in production automation and production control as Lucid is,” Pertti explains.

“The Lucid concept includes processes and process discipline, which means that all the operating steps of the process are gone through, and they must follow certain principles.

“We strive to standardise everything possible that is part of the concept, whether it's a new or an old part. This means that we specify the most accurate standards, and recommend deviations from them only rarely, in order that variants of physical devices, such as control units (ECU), should be kept to the minimum amount possible. This makes them more likely to be general-purpose,” says Pertti.

“As a process we have not really found anything negative that this concept would cause. On the contrary, we have been able to greatly cut out unnecessary things. The process discipline that is part of the Lucid concept could perhaps be imagined to raise costs, but compliance with the discipline actually saves costs rather than increasing them.

“The first time it’s used, compliance

From left: Microteam Oy's Chief Technology Officer Pertti Arjanne, and Sales Manager Janne Virta



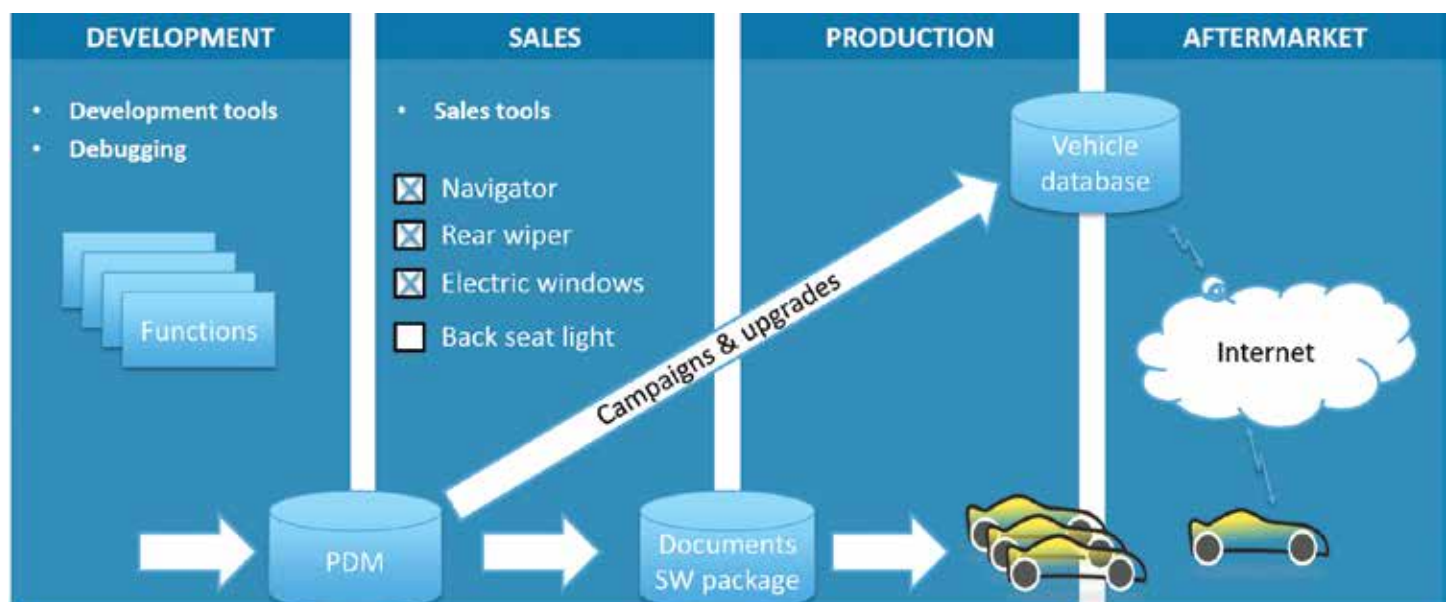
with the process discipline of the Lucid concept might seem laborious, but the second time round the benefits already become apparent,” Pertti says.

“The cornerstone here is the fact that you do it properly once, and after that you are able to re-use what you’ve previously done,” says Sales Manager **Janne Virta**.

An environment-independent concept

“Microteam has implemented the Lucid concept in several projects, among them the design, manufacture, and maintenance of Volvo buses. The Lucid concept can of course work in other industries other than rolling stock, for

In the figure, the Lucid concept is illustrated schematically



which it was originally designed,” says Pertti.

“Lucid adapts to many kinds of settings, because its central principles are valid in almost every environment.

“Lucid is at its best in an environment in which a great variety of variants are created, and when they will not be made in awfully large runs.” Bus and coach production is a good example of the sort of environment in which Lucid is likely to give especially impressive added value.

“At its broadest, Lucid is very suitable for enterprise-type activities, such as at Volvo, where everything is integrated, from production control to secondary marketing.

Thanks to the Lucid concept, Volvo's air conditioning system (HVAC) is clearly one of the most sophisticated in the field. This is an example of the added value that Lucid can bring. We are able to control the air conditioning system, and to continually and flexibly develop it, targeting it at different market areas, and with different features and functions,” Pertti says.

“At its simplest, we can offer to machine manufacturers, as a cloud service, the entire software infrastructure in such a way that the manufacturer needs nothing more than an internet connection. We can supply the ECUs of the control system, and we make everything ready so that they are free to produce the control functions,” Pertti says.

Lucid guarantees upgradability on secondary markets

The automatic process of the Lucid concept enables dependable updates. Changes can be made to the vehicle, new features can be added, and new software can be installed in it reliably, throughout its life cycle.

“The life cycle of buses, for instance, can be decades. Buses are likely to change hands several times during the life cycle. In such cases, the need usually arises for making a change to the intended use. A change in use often requires changes in function or physical components,” Pertti explains.

“Bus parts and components have their own life cycle in production. For example, in ECUs it's from 5 to 10 years. During the lifetime of buses, the original ECUs are likely to be different than the new generation, and were implemented using different techniques.” The Lucid concept ensures that the old ECU can be directly replaced with a new one.

“The Lucid concept has focused very much on logical compatibility, thanks to which a change in the configuration of electronic parts and functions does not entail separate programming and testing. Testing is integrated into the system, and creation of the software is automated. The ready package is installed in the vehicle, for example when carrying out other maintenance on it.

“Behind everything, of course, is a complex system. However, when the Lucid concept has been properly implemented once, the first time round, all the changes that traditionally require manual programming can be done easily.”

Lucid's unique points

“When Volvo manufactures buses, to take one example, the whole process involves many steps – product development and design, sales, production, and finally the finished vehicle is maintained throughout its life cycle.” Lucid is involved in every part of this entire chain.

“In the handling of buses, a bill of materials (BOM) is generated – this is a list of the part numbers, and contains absolutely everything that the bus will be made of.

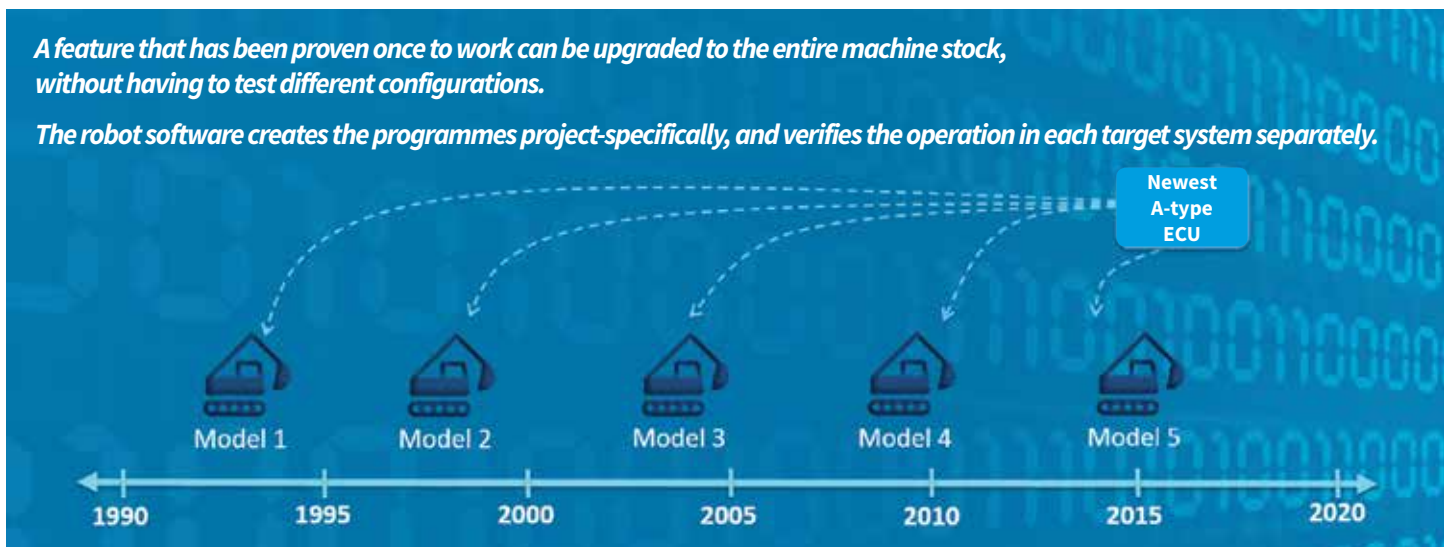
“In addition to containing a colossal number of parts, each bus involves a massive amount of activities. The wipers must wipe, door mechanisms must open and close the doors, the air conditioning must operate correctly. All the functions must operate safely and according to local regulations, which are specific to each particular market.

“The wipers, door mechanisms, and air conditioning system are mechanical devices, and their operation is controlled by ECUs. The ECUs contain their own information. Every ECU is controlled through programming, and they cause mechanical devices to carry out take the desired functions.

With the Lucid concept it's easy to upgrade the old machine stock with new features.

A feature that has been proven once to work can be upgraded to the entire machine stock, without having to test different configurations.

The robot software creates the programmes project-specifically, and verifies the operation in each target system separately.



“The parts list includes all of this, but what’s special is the fact that Lucid does not specify the manufacturing software; instead, the target-independent functions that are associated with the configuration are contained in Lucid, each with its own part number. The electrical connection to which the ECUs belong are also composed of part numbers. The switching and function constitute a whole from which the software for the vehicle is automatically generated.

“In my view, what is unique about Lucid is that it controls the entire software production of the vehicle, based on the parts list,” Pertti says.

Upgrading the software in the supplied configuration

“When doing things the traditional way, the software for each ECU has to be written separately. Updating the software of a unique configuration would require testing that configuration in the field. Often, this will probably be left undone,” says Pertti.

“But when working in accordance with the Lucid concept, the program does not need to be updated separately for each section and for the control unit. On the contrary, the concept is integrated into an automated software robot, which follows known principles to create the software package, practically at the push of a button.

“Lucid’s software robot software precisely analyses the software that is produced,

in order to ensure its functionality in the target configurations. The created program is then updated via the network, for example during maintenance or at any other time.

How Lucid differs from the traditional way of doing things

“Sensors, inputs, and outputs, are tied to the ECU, but in producing a description of the functions Lucid takes no position on where they are located. The function is described at the upper level, and is disconnected from the ECU. The system produced the message that are input to the ECU.

“The traditional way of describing a function is by producing the description for a specific ECU. The definition is written when one ECU is doing one thing and another ECU is doing something else. The communications traffic is produced exclusively for these particular ECUs.

“If, for example, the need would arise to add ECUs to the machine, or to modify their connections, one would normally have to write the software ECU-specifically, and to make significant changes to the software for each particular case. Because, in Lucid, the function descriptions do not identify ECUs at any point, there is no need to make changes to the functions as the electrical connections change.

“Instead of doing that, the signal whose input or sensor in the ECU is produced,

or whose output is used, is defined in the description of the function, without reference to the physical location of the input or output. When the time comes to do so, the translator robot positions the signal in the correct ECU, which then produces the correct function.

“Physical changes, for instance in the configuration of a car, do not need any changes to the program.”

All information in the servers

“In Volvo buses, the data on all the buses that are manufactured are saved in the server, starting from the parts catalog. All changes made to the bus during its life cycle are also stored in the server. The server contains an exact description of the system and of all the functions related to it, because it belongs to the Lucid concept.

“If the need arises to upgrade some function, for example on a 15-year-old bus, we can make a new function and take the updated parts list of the old bus, where the current situation is contained. The new software, equipped with new functions, can be generated simply by pressing a button and updating it the next time that the bus is taken in for maintenance.

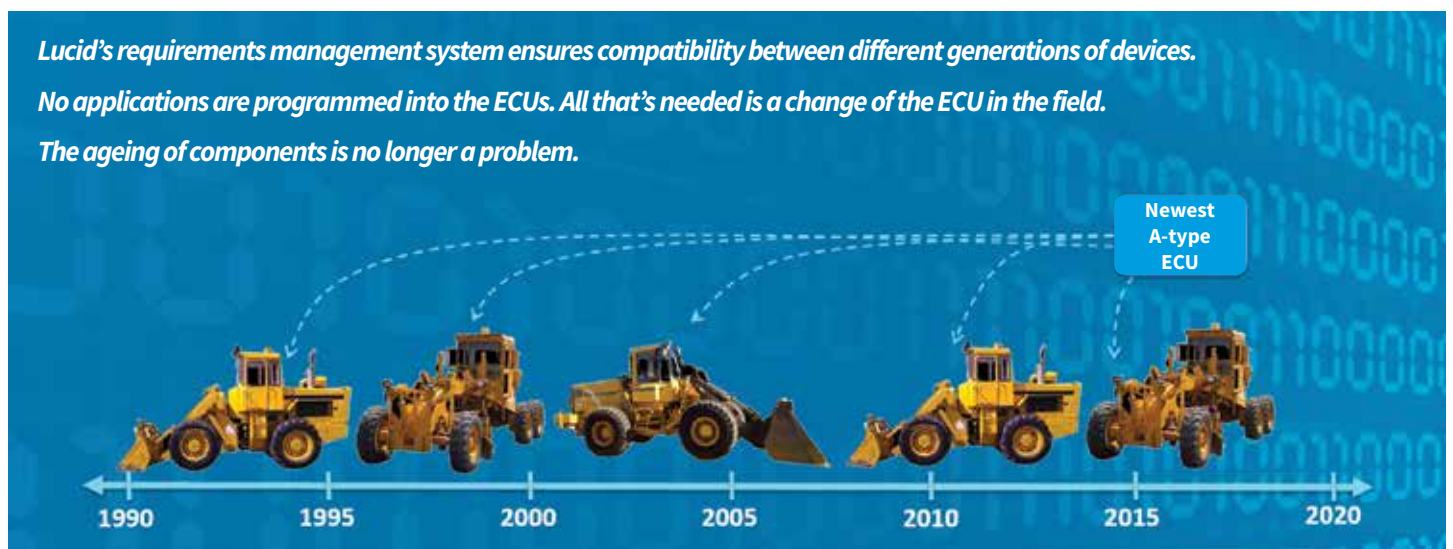
“This can be done in such a way that the system analyses everything that’s needed, and we know that the function definitely works, and that updating it is safe. This is exceptional in the context of such a complex system,” Janne says.

In the Lucid concept, a retroactive guarantee of compatibility for spare parts is given, and no compatibility programme is needed for the spare parts.

Lucid’s requirements management system ensures compatibility between different generations of devices.

No applications are programmed into the ECUs. All that’s needed is a change of the ECU in the field.

The ageing of components is no longer a problem.



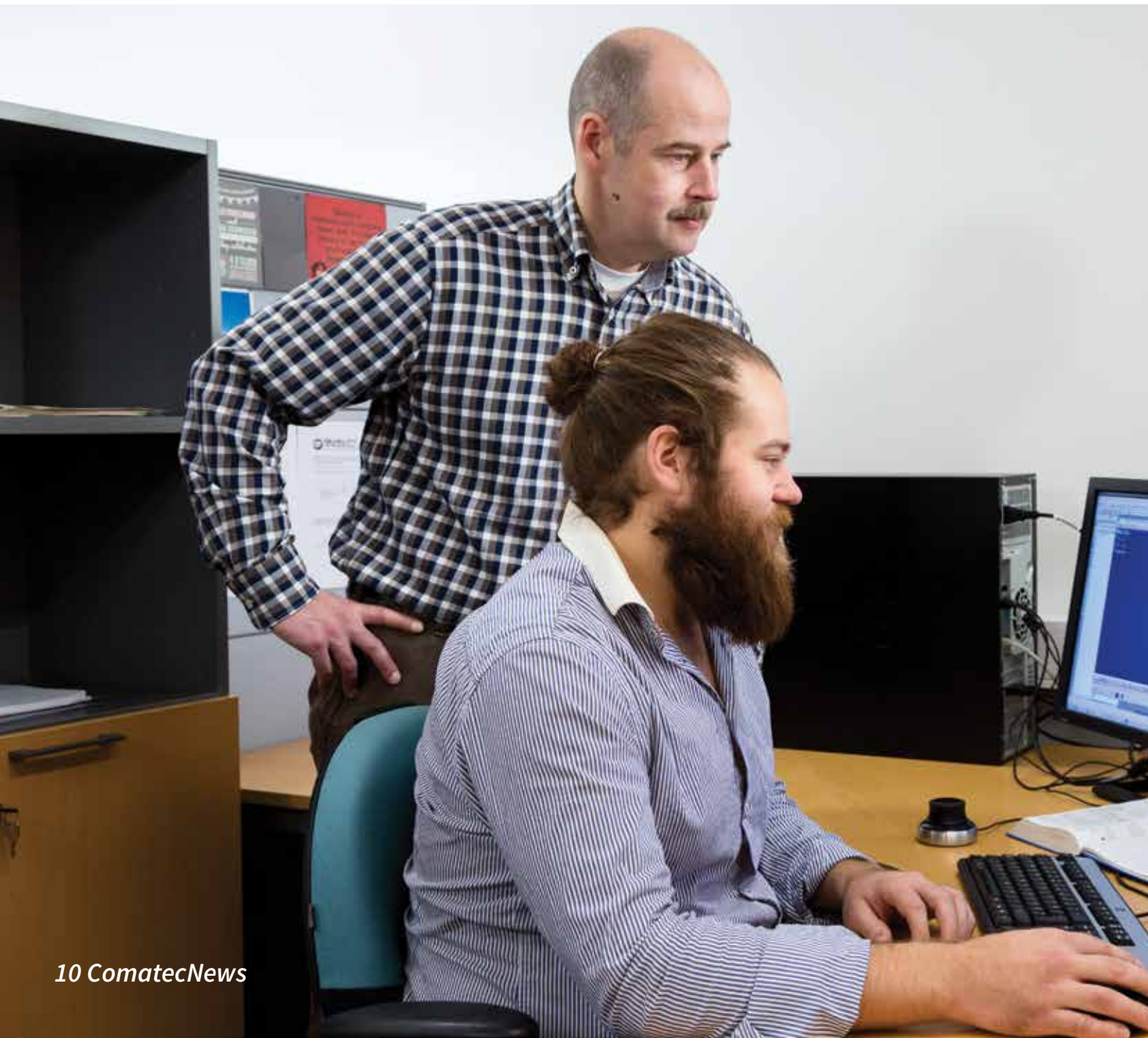
At Comatec, virtualisation streamlines

As once of Finland's leading engineering companies, Comatec cooperates seamlessly with many parties, data-securely and regardless of location. Experts use the 3D software that's installed in the server from their own computers, using Citrix's desktop virtualisation.

Productive work

“Over the years we have cooperated a lot with Atea, and on one occasion the subject of application virtualisation of our 3D software came up. We were initially a bit sceptical, since the capacity of the data traffic bandwidth is not enough for the older generation of solutions that we tested. However, this first solution, which was created for a specific project between Atea and Citrix, turned out to be so assuring that from now on we will most likely use a growing amount of desktop virtualisation,” says Comatec's IT Manager **Juha Marjanen**.

“The virtualisation solutions of 3D applications have taken



Comatec 3D design

enormous strides in recent times. The use of virtual applications and the desktop gets rid of many of the problems in 3D design from everyday life, and also brings savings on maintenance and equipment costs," says Atea's Solution Manager **Olli Kinnunen**.

Migration into the machine room

Use of 3D software requires a powerful workstation, one equipped with an extremely high-class display adapter. In addition to the

device requirements, some headaches are also caused by projects in which the same 3D data is used by many experts, from different companies and in different locations. Bits have been moved from place to place even by couriers delivering them on USB flash drives.

"With virtualisation it's possible to considerably improve security. For instance, downloading of data onto user's own computers can be restricted or prevented altogether. 3D-software virtualisation allows workers to transfer from one client environment to another without any need for installation or changes to the workstation software. And if a fault develops in one workstation, the work can be continued immediately on any other workstation. In practice, our employees have not even noticed any differences in whether they are working with design programmes and information on their own computers, or in a virtual environment," Thornberry says.

"In practice, everything works as planned, and the solution has also delivered on all its promises. It is only now, after this has been proven in practice, that we have been able to begin thinking about the future, and about what other ways this could possibly change the work we do," Juha Marjanen says.

User experiences in Comatec

It is possible to use virtualised 3D software from all Comatec's facilities. It facilitates cooperation independently of the facility one is working at, and allows for distance working even in cases in which the customer, for data security reasons, does not want many servers used for its own projects. For example, our office in Järvenpää has had good experiences with the use of virtual environments.

"I was sceptical at first, especially when it came to the speed of data communications. But it has not caused any kinds of problems, says Department Manager Ville Mehto.

"In normal use, the user won't notice any difference compared to the use of the programme installed on their own computer. Using the program is just as quick and easy. The system is so invisible for the user that "normal" users don't have any comments, except when all the licenses are in use and it's not possible to access the system.

"What I find a major advantage is that the software is easy to update and maintain by the IT department, and everyone has immediate access to all the same features," Ville Mehto says.

"This really enables close cooperation between the different offices, easily, quickly, and securely."



Comatec Group's branches:

FINLAND:

TAMPERE

Tel. +358 29 000 2000, Comatec Oy
+358 20 766 0700, Microteam Oy
Tel. +358 29 000 2090, Rantotek Oy

VANTAA

Tel. +358 29 000 2000

HYVINKÄÄ

Tel. 040 5563 299

IMATRA

Tel. +358 29 000 2070

JOENSUU

Tel. +358 29 000 2000

JYVÄSKYLÄ

Tel. +358 50 555 6688

JÄRVENPÄÄ

Tel. +358 400 675 778

KANKAANPÄÄ

Tel. 02 5722 411

KOUVOLA

Tel. +358 20 765 9425

KUOPIO

Tel. 044 7414 440

LAHTI

Tel. +358 29 000 2000

LAPPEENRANTA

Tel. +358 29 000 2070

OULU

Tel. +358 400 542 547

TURKU

Tel. +358 29 000 2000

Tel. +358 20 762 2640

VARKAUS

Tel. +358 29 000 2090

OTHER COUNTRIES:

INDIA, CHENNAI

POLAND, WROCŁAW, GDANSK

Cadring Polska Sp. z o.o.

Tel. +48 71 342 16 07

SWEDEN, STOCKHOLM

Cadring Sweden Ab

Tel. +358 50 52 63731

ESTONIA, TALLINN

Comatec Estonia OÜ

Tel. +372 5685 0845

More detailed contact information from
our website:

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- Process industry
- Production technology
- Energy



ADVANCED ENGINEERING2017

29 - 30 maaliskuuta, Messukeskus, Helsinki

*We participated in the Advanced Engineering event
from 29 - 30 March 2017. March 2017.*

*The event presented Microteam's expertise, among
other things.*

*Welcome to our stand 4d64, to learn about our
wide range of offerings!*

SOLUTIONS. PROJECTS. EXPERTS.