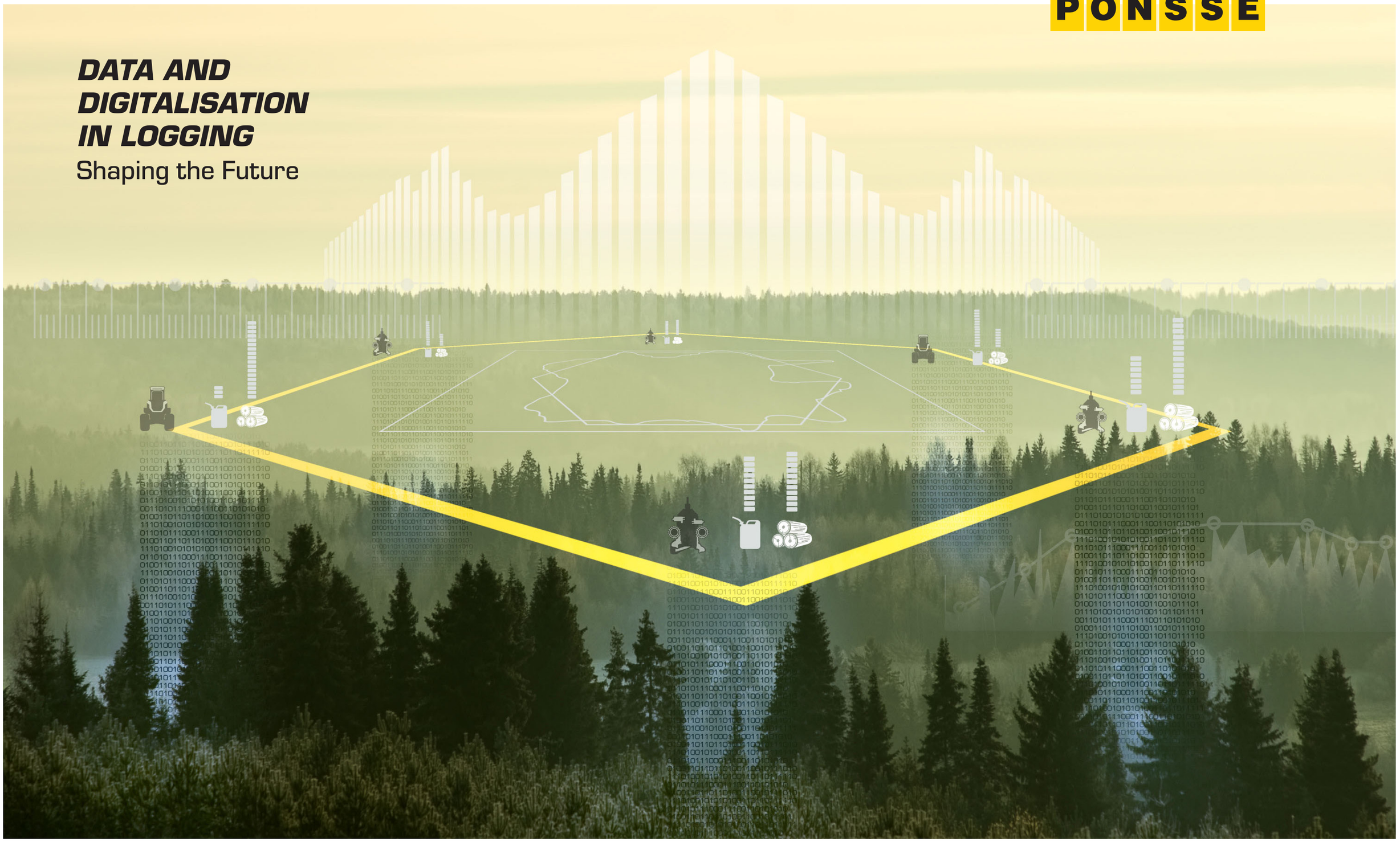
PONSSE

DATA AND DIGITALISATION IN LOGGING

Shaping the Future



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SUMMARY

The early days of mechanised harvesting were mainly about innovation in the fields of mechanics and hydraulics. Communication technologies and information systems soon followed, but they were secondary features in logging operations. The role of data and information in logging has increased incrementally, and the digital transformation now being experienced is introducing an entirely new era of data-driven business. Innovation in mechanics and hydraulics is still needed and valued, but it is now inherently accompanied by data, information and digital services.
This whitepaper discusses the roles and reliability of data and information, and how they can be utilised in making better products. Most importantly, Ponsse's vision for data in logging is shared and explained through an example of a product platform. Megatrends and connectivity respectively steer and enable the digital service roadmap.

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THE CTL METHOD

The popularity of the cut-to-length (CTL) harvesting method is booming. Today, two thirds of the world's mechanised industrial timber harvesting is done by CTL machinery.

Nearly all new timber harvesting projects and tree plantations throughout the world are based on CTL solutions. In the CTL method, timber is processed in the forest in accordance with its intended use.

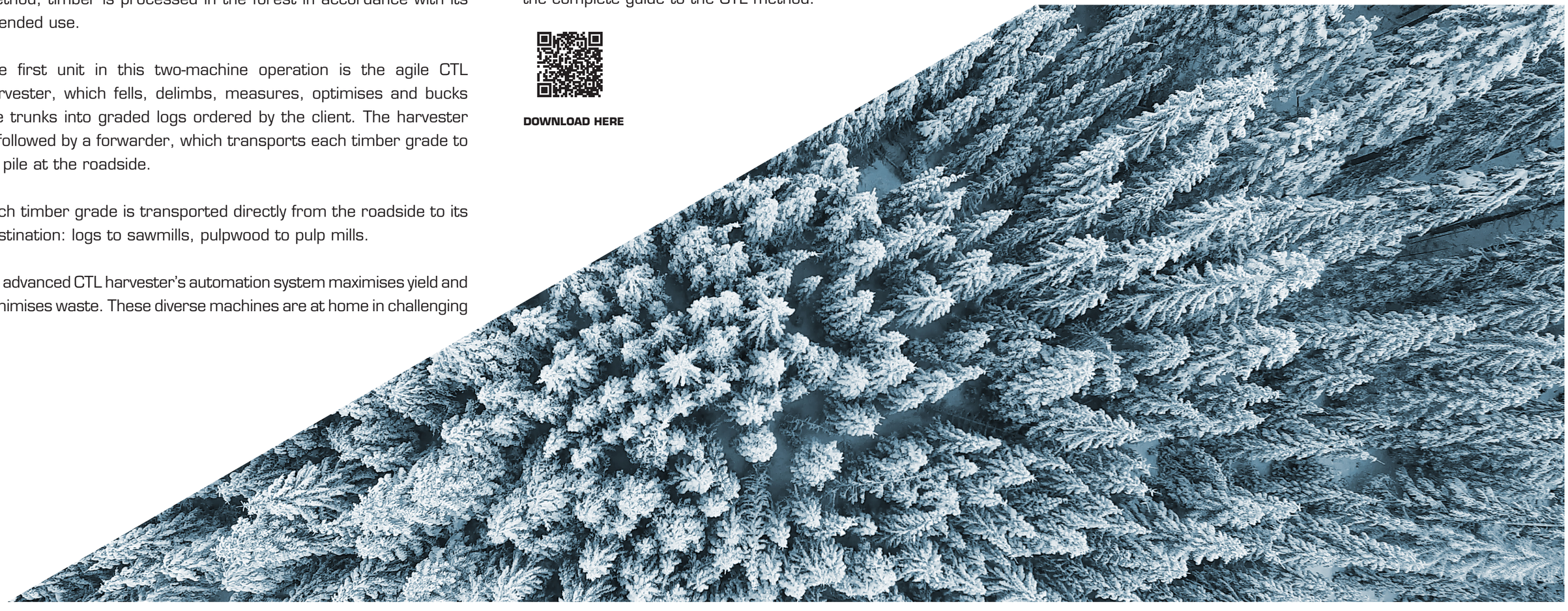
The first unit in this two-machine operation is the agile CTL harvester, which fells, delimbs, measures, optimises and bucks the trunks into graded logs ordered by the client. The harvester is followed by a forwarder, which transports each timber grade to its pile at the roadside.

Each timber grade is transported directly from the roadside to its destination: logs to sawmills, pulpwood to pulp mills.

An advanced CTL harvester's automation system maximises yield and minimises waste. These diverse machines are at home in challenging conditions and excel in every harvesting requirement – regardless of the weather, season or terrain. Unlike other mechanised timber-harvesting methods, CTL enables responsible and high-quality forest management by selective thinning.

More information on CTL can be found in the "Perfect Cut", the complete guide to the CTL method.

DOWNLOAD HERE



WORKING WITH THE CUSTOMER

At Ponsse, we've worked with our customers for the last 50 years to develop the world's best forest machinery. The world's best forest machine – and the services that support it – is not only the most powerful, versatile and reliable option; it is a robust combination that enables sustainable forest management around the world. Since our foundation in 1970, we've been guided by our respect for the environment and an ongoing quest for sustainable development. We've therefore dedicated ourselves exclusively to the manufacture, sale, service and development of efficient and environmentally friendly cut-to-length machines for the last fifty years.

INFORMATION AND DATA

Information in the technical context can be defined as a sensory stimulus generated by an event or a process. The information can be used as inputs for a system, which processes the signals based on predefined mathematical rules and produces an output information, which presents the state of the event or the process. Data is often used as a synonym for information, but it is actually more like a simplified breakdown of information (e.g. bits and bytes) that computers can process. Data is required for computer-generated information. An algorithm is used as a mathematical guideline for processing or interpreting data.

The methods for processing information and data can vary from basic logical rules to more advanced tools based on machine learning (ML) and neural networks (NN), for example. The more sophisticated methods such as ML and NN fall under the umbrella of artificial intelligence (AI), which can be described as the family of methods for maximising the probability of achieving set goals based on the perceived environment. This means, for example, that certain patterns can be recognised and processes learned by processing a pool of data, which is formed from the abovementioned sensory stimulus.

However, theory and practice are two different entities, and the challenge is to put theory into practice – and what could be a better test for digital applications than the forest environment and the machines working in it?

You can read more about putting theory into practice with data-driven solutions on page 12.

IMPORTANCE OF RELIABLE DATA

When data is generated by sensors and control systems in a forest machine, for example, there tends to be considerable variance in values and possible errors or static, which affects the reliability of the information produced. The process of generating data should be an agreed quality-controlled process, which generates outputs based on a known method. We can therefore assume that the information can be analysed pretty reliably. If the data generation process is unknown or has ambiguous rules, the information cannot be seen as reliable and ready for further processing.

When the data generation process is known and always the same, at least within the analysed dataset, we can begin to draw actual conclusions and identify required characteristics for decision making. We can thus also identify anomalies and possibly even determine unreliable phases in data generation. Without a known data generation process, data is unreliable and cannot be used to track changes or draw conclusions that can help in making decisions. The generation and analysis of data is ultimately performed to solve challenges and improve decision-making speed and reliability

HOW TO USE DATA IN MAKING BETTER PRODUCTS

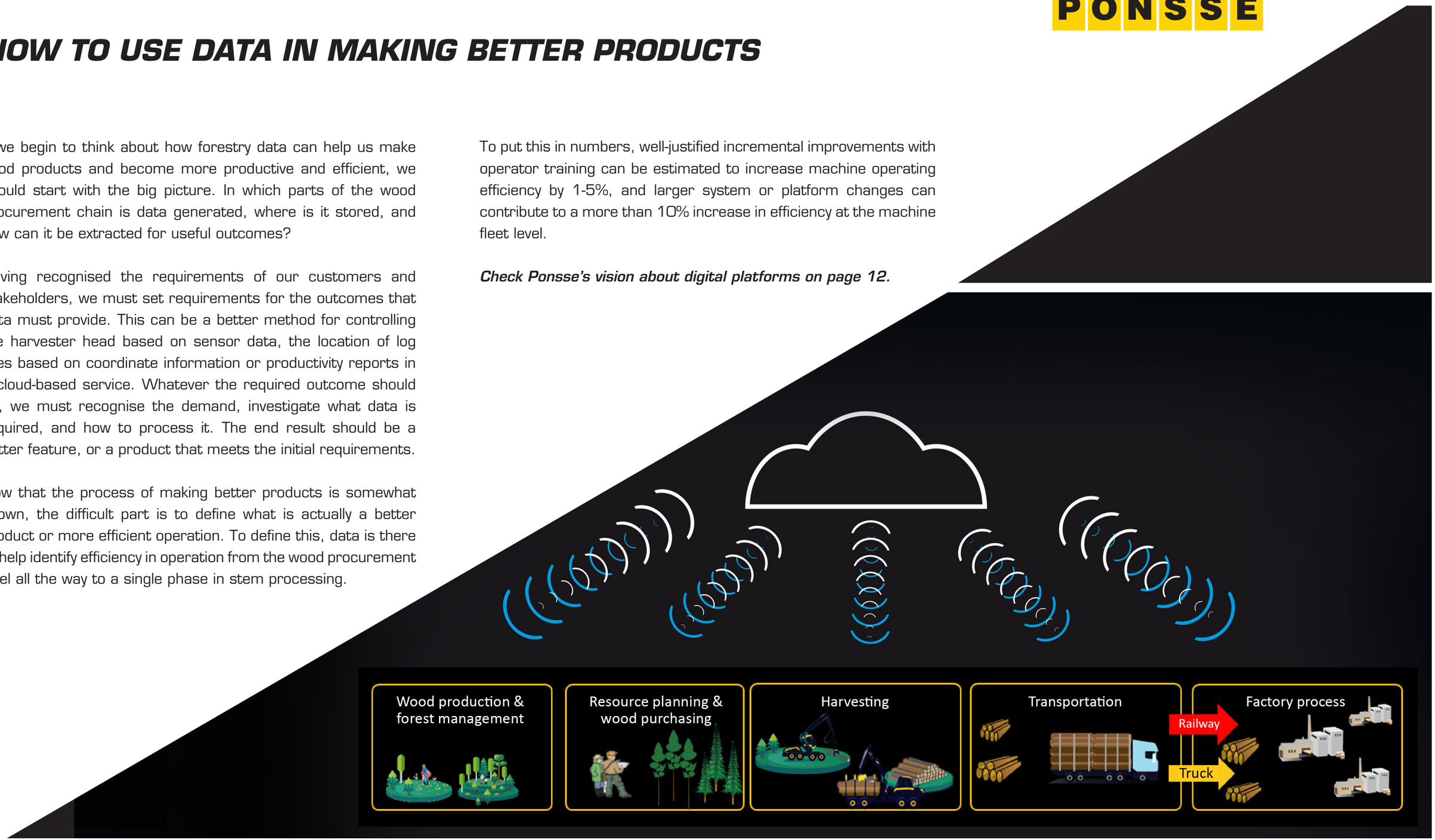
If we begin to think about how forestry data can help us make good products and become more productive and efficient, we should start with the big picture. In which parts of the wood procurement chain is data generated, where is it stored, and how can it be extracted for useful outcomes?

Having recognised the requirements of our customers and stakeholders, we must set requirements for the outcomes that data must provide. This can be a better method for controlling the harvester head based on sensor data, the location of log piles based on coordinate information or productivity reports in a cloud-based service. Whatever the required outcome should be, we must recognise the demand, investigate what data is required, and how to process it. The end result should be a better feature, or a product that meets the initial requirements.

Now that the process of making better products is somewhat known, the difficult part is to define what is actually a better product or more efficient operation. To define this, data is there to help identify efficiency in operation from the wood procurement level all the way to a single phase in stem processing.

To put this in numbers, well-justified incremental improvements with operator training can be estimated to increase machine operating efficiency by 1-5%, and larger system or platform changes can contribute to a more than 10% increase in efficiency at the machine fleet level.

Check Ponsse's vision about digital platforms on page 12.



PONSSE – VISION FOR DATA IN LOGGING

Ponsse's vision "We are the preferred partner in our industry" is strongly accompanied by data-driven and sustainable logging in intelligent machines and solutions that offer the best value for its customers. The vision for digitalisation is "We are the preferred digital service provider in our industry".

Megatrends

A megatrend often describes a bigger change or direction that an industry is facing or is heading towards. The current viable megatrends in logging are:

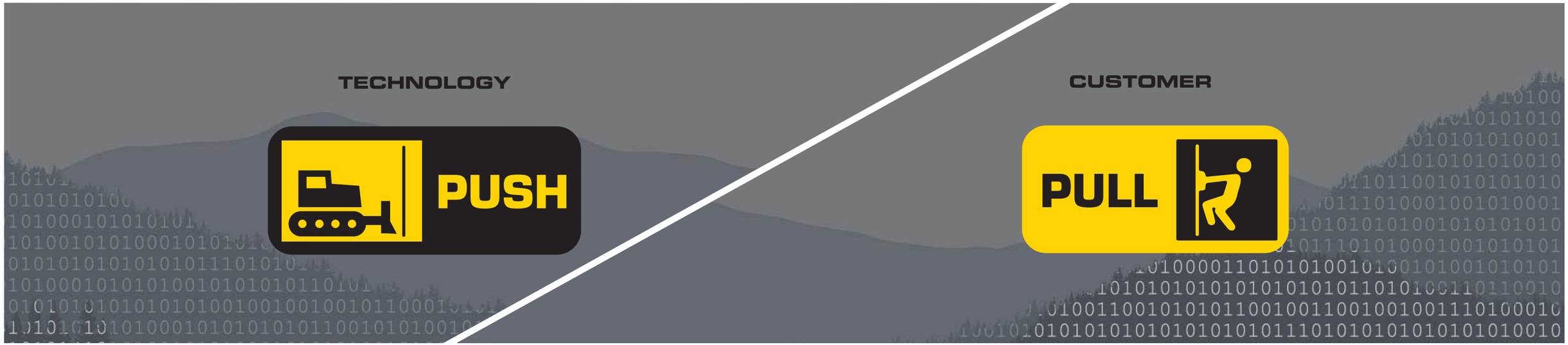
Digitalisation – Increase of information systems and digital services e.g. for forest resource management, fleet management & service, productivity reporting, measurement and calibration data visualisation.

Sustainability – Research and development to understand, for example, the impact of logging methods, emissions and soil compaction on the environment, and how to take them into account in all phases of operation. Machine electrification represents a big technological shift to cleaner and more sustainable solutions.

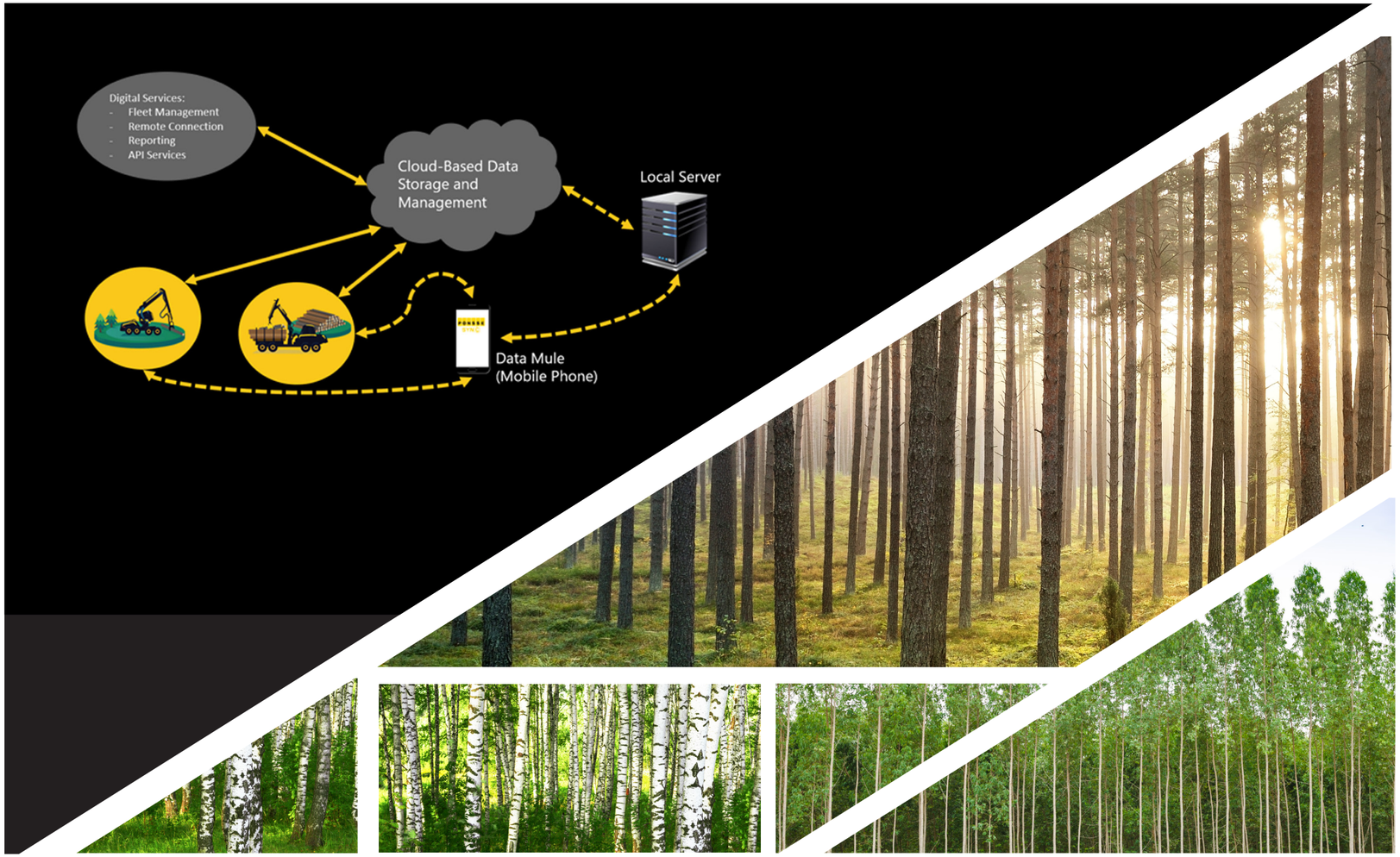
Connectivity – Studies on how to best utilise different data transmission methods and the development of connectivity solutions for data acquisition and management in different types of logging sites and infrastructure.

Automation – Use of sensors, perception system technologies and processing methods for advanced driver-assisting systems and semi-autonomous/autonomous operation.

Megatrends direct industry operators to work hard in these areas and often generate the "technology push" in which new technologies are pushed onto the markets. The offering portfolio of the future is a balance of customer pull and technology push.



PONSSE – CONNECTIVITY AND DATA



Connectivity is a wider term to describe methods and technologies used for data transfer to and from assets and infrastructures. In the forest machine context, it often describes the hardware and software that is used to transfer operational data to the machine (e.g. bucking instructions and SW updates) and from the machine (e.g. production data, diagnostics and location).

Most solutions today are purely for monitoring key performance indicators (KPI) and the condition of a fleet of machines. Some solutions also offer remote real-time connection possibilities, which produces an entirely new dimension to the management of machines. Different connectivity solutions often also provide different data rates. For example, a solution which transfers data via WLAN and mobile networks offers relatively good data rates and is fast, but in remote places where satellite connection is required, the data rates and transfer speed are often restricted.

Much of the data received and sent by a forest machine today is standardised and comprised of predefined data content. This is to ensure that different forest machine OEMs have on-board information systems that work with other software solutions in the value chain. This also helps entrepreneurs who own a machine fleet consisting of several OEMs' products.

In the coming years, connectivity solutions will develop rapidly, and with 5G technology, mobile network coverage will expand to many new regions, but there will also be some places where satellite connection is still the only means of communication.

Data mules are an option if no possible connection is available. Datasets can be transferred to and from a machine with an external hard drive or a mobile phone, which acts as a data storage between a network hub and the machine. Data transfer to an external hard drive is often via a USB bus and to a mobile phone via wireless close proximity technology such as Bluetooth or WLAN.

PONSSE – PERCEPTION AND SENSOR SYSTEMS

The environmental awareness of a forest machine is increasingly important, not only in sensing the locations of obstacles, sinkholes or steep hills, but also in identifying which trees are optimal for felling, and which are not. Additionally, a perception system enables an analysis of the best places to plant saplings to maximise growth, or which locations should be fertilised.

Forests are becoming digital step-by-step, and at some point, it will be possible for data markers or digital fingerprints from each tree to be created to help the mapping of forest stem counts, lengths and diameters. After felling, each stem with a unique set of parameters will also enable it to be traced at any point in its lifecycle.

In addition to observing the environment, it is increasingly important to sense the condition and operational actions of the machine itself. For example, information on system health and changes in routine sequences can be used to determine upcoming maintenance and calibration requirements. Tools for analysing sensor data can also help to create virtual sensors, which means that instead of adding new physical sensing components, a virtual sensor can be created based on the data of other on-board sensors.

PONSSE – DATA-DRIVEN SOLUTIONS

When a fleet management solution shows numerical data or visualises trends based on datapoints, it is a data-based solution. When data shapes and directs solutions or generates new solutions, it is a data-driven solution. With increasing amounts of data and analysing tools, we are starting to shift from data-based to data-driven solutions. This shift in data architecture enables the generation of new digital services and solutions that benefit each party in the value chain. Features such as preventive maintenance, component lifetime prognostications and production forecasts will be enhanced and dynamically updated when data and tools to analyse them are in place.

The market demand for offering solutions, not merely products, has been prevalent for some time in many industries and is also emerging in the forest machine industry. Data-driven solutions are built on physically decentralised platforms in which data generated from machines, systems and other processes can be used in every solution where it is required. The dataflow is facilitated by agreed interfaces, which also enable data extraction to external solutions. When data is available on demand, reporting improves significantly and can be easily customised for different requirements. Business intelligence (BI) reports are a good example of reports with a selected focus of metrics and key performance indicators (KPI), which offer overall situational information at a glance.

In addition to cloud-based computing, more computing capacity will also be placed on board machines and partly in local edge-computing facilities on site. This is to increase data availability, decrease latencies in processing critical data and save bandwidth. Pertinent operational information is also available that will be shared directly between machines on site without rerouting it via cloud-based storage. This is referred to as machine-to-machine communication (M2M).

From decentralised platforms to a centralised user experience, the Ponsse digital offering portfolio includes the Ponsse Manager platform (web + mobile), which will collect all digital services for customers in one place, accessible in a single user interface.

CONCLUSIONS

Systematic acquisition of data and information-based services have been around for decades, and thanks to advances in technologies and data-processing tools, have enabled a wider use of scalable digital services.

Information from sensors and perception systems offer large amounts of data for cloud-based processing and analysis, which can be used as inputs for reporting, decision making and expanding the overall information. Improvements in machine on-board systems also enhances the data-handling and operating decisions made by a machine when processing logs or scanning the environment, for example.

The future depends on increasing amounts of data-driven services and operating models, which direct organisations and stakeholders in making business decisions more rapidly, partly automatically with pre-analysed data and solution suggestions. All this is enhanced by success probabilities and prognostications of not only component lifetimes or productivity, but also of monetary metrics.

Future data architectures and artificial intelligence will direct the digitalisation of the entire wood supply value chain. Data and intelligent products and services will become part of everyday work in forest machines and associated processes.

50 years of CTL harvesting

Established by forest machine entrepreneur Einari Vidgrén, Ponsse has been a trailblazer in sustainable and efficient CTL harvesting throughout its history. The family business, which grew from a farmer's son's dream into an international export company, has its roots deep in the Finnish countryside.

Since it was founded in 1970, the company's values have guided Ponsse employees in honest work, respect for people and the environment, and a desire to develop the company's operations and the community. With its experience of manufacturing more than 15,000 forest machines, in 2020, Ponsse is now a pioneer in efficient and sustainable CTL harvesting solutions. Ponsse operates in more than 40 markets. Seventy-eight per cent of our net sales come from exports. Our operations are still guided by the wishes and requirements of forest machine entrepreneurs.

www.ponsse.com/services/digital-services