Port Logistics

Container Handling

ICT GROUP
ICT Netherlands
Smarter Solutions

In brief

The worldwide transport of (containerised) cargo is experiencing explosive growth. As a port or terminal operator, you must be able to process cargo as swiftly and efficiently as possible. In addition, your partners and stakeholders are increasingly asking for real-time information, data sharing and performance measurement whilst Information Security is becoming more and more an indispensable prerequisite!

ICT Group assists you in this regard with smart IT solutions such as for Planning and Administrative systems, Process Control systems, Equipment Control systems, information services and mobile apps. We work with you to develop ICT solutions aimed at achieving concrete improvements, from planning to implementation, to maintenance and management. And we proactively develop ways to ensure that your logistics excels (see www.ict.eu).

The following figure summarises ICT's key competence areas in Port Logistics.

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1 Industry trends

Port Logistics and Container Handling are impacted by the worldwide development trends in the chain of production, trade, transport and logistics.

First, the worldwide transport of containerised cargo is experiencing explosive growth that you as a port or terminal operator must accommodate. The transport and logistics chains are currently undergoing rapid changes. Mergers and acquisitions challenge logistical parties to continuously strive for process improvement in chain optimization, chain integration and chain coordination.

Furthermore, there are more global developments that impact transport and logistics, such as the increasing global demand and local economic development, the changing landscape for the global economic system (ranging from trade barriers to fair trade products), the connecting-the-world phenomenon in the creation of transport infrastructure corridors. Major demographic changes and shifts in economic power are some of the challenges ahead of us.

These global trends certainly also affect container ports and the container industry in terms of ongoing scale increases, consolidation and integration within the supply chain. A major challenge is the implementation of synchro-modality and multi-modality into the overall transport chain services. You further see a grow in hinterland network connections gearing up to deep-sea terminal operations.

This all boils down to changes in IT systems and network communications systems of the operators and service providers in the port, terminal and hinterland arena.

There also is an enormous challenge for ports and container terminals to stay competitive. In this struggle there is a trend to implement technological innovations embracing disruptive key ICT innovations such as IoT, Bigdata & Artificial Intelligence (AI), alongside web portals and mobile apps.

These innovations will change logistic patterns, supply chains and the way of cooperation in ports and container terminals in the coming years.

The ICT Group can assist you in implementing key ICT innovations tailored to your company's needs. You can think of smart IT solutions such as IoT, Bigdata, Machine learning, Process and Equipment Control systems, web portals and mobile apps.

2 Industry needs

2.1 Port 4.0 = The next step

Over the last decades ports have evolved in the control of their operations, from what we call Port 1.0 to Port 3.0.

In the PORT 1.0 era the process was “managed by a hero”, meaning that port workers linked the individual process steps in directing yard operations, gate to yard (stack), yard to quay crane and visa-versa.

The next PORT 2.0 era is characterized as “management by process” and showed the introduction of a central Terminal Operating System governing the terminal process steps while operators make the decisions in the central control tower and configure the Terminal Operating System.

The next era is the PORT 3.0 era where “management by exception” is the rule and the container terminal processes are run by algorithms steering automated stacking cranes (ASC’s) and automated guided vehicles (AGV’s), whereas humans settle the exceptions.

This is the era that we are now in and more; more ports and terminals will be entering the PORT 3.0 era.

But Port 3.0 is not the end of the evolution. In the model of the future, Port 4.0, ports will shift “from manage to orchestrate”, meaning that ports will enlarge their role by orchestrating physical and information flows inside and outside terminals to enhance the port ecosystem’s broader efficiency in the whole of the transport and logistical chain. Forward-looking ports will push toward this next horizon, beyond just terminal automation, in the coming Port 4.0 era. Every player - terminal operators, trucking companies, railroads, shippers, logistics companies and freight forwarders - will be connected to optimize not just the port itself but its entire ecosystem.

Port 4.0 will be powered by artificial intelligence, optimization through advanced analytics, and dynamic scheduling.

Real-time berth planning

Berthing slots and labor can be better used by forecasting ships' arrival times more accurately, resulting in up to 8 percentage points of EBITDA[1] potential for terminals.

Predictive maintenance for key assets

Predictive and remote crane and vehicle maintenance can lead to a 30-50% reduction of total machine downtime, increasing the availability of critical port assets, such as STS[2] and RTG[3] cranes.

Automatic yard planning

Advanced analytics and modeling make it possible to swap assets, reroute containers dynamically, and adjust routing and speed in real time.

Demand planning at gate

More accurate predictions of consumer and production behavior can help terminals better estimate the demand for gate arrivals.

[1]Earnings before interest, taxes, depreciation, and amortization.
[2]Ship to shore
[3]Rubber-tired gantry

"The future of automated ports" - McKinsey - December 2018.

2.2 Digital transformation = The new game

Real-time information, data sharing and performance measuring, are the key methods to achieve PORT 4.0. Organisations see the necessity to transform their business into a real Digital Business. It all starts with transferring Data into Information. Organisations already have lots of data they are generally not aware of. Gathering the data and combining it with external data sources will create new insights to do business with a higher service level and customer satisfaction and at lower operational costs.

ICT uses its *4C Digital Transformation model* as the starting point in the process of moving to a Digital Business. Within this model we distinguish 4 levels:

Connect

Connecting field staff and devices through the internet (IoT) to reduce costs and gain operational efficiency.

Collect

Collecting data about events of field staff and devices and transform this data into management information to create new insights.

Control

Control and innovate the business by analysing the data and combining the data with data from other (external) information sources.

Change

Transform and create new business models by creating value and developing new services.

2.3 Supply chain collaboration = The new brand

Digital transformation paves the way to a close collaboration in the supply chain including transport and logistics. Digital transformation grants real-time visibility in rendering your services, all based on information exchange. Collaboration throughout the entire supply chain orchestrates all the steps in the end-to-end supply chain of the customer's order life cycle, including Planning, Execution, Finance and Analytics, facilitated with real-time Visibility and Tracking & Tracing information.

2.4 Need for control = The new tool

Process Control - Process containerized cargo as efficient as possible to the destination.

A Process Control System (PCS) can be used for high throughput of automated container terminals, equipped with for instance ASC's and AGV's, combined with manned equipment. Operations are based on the logistical decoupling of waterside container flows and landside container flows.

Equipment Control - Efficient and smart management of equipment.

An automated terminal uses Equipment control software for the effective and efficient operation and movement of container handling equipment: QC's – Quay Cranes, AGV's - Automated Guided Vehicles, ASC's - Automated Stacking Cranes, SC's - Straddle Carriers, TT's - Terminal Trucks, MTS - Multi Trailer System, RC's - Rail Cranes, RF's - Reefer Cars, as well as Reach stackers and Forklift trucks.

3 ICT's solutions

The ICT Group is involved in developing planning and control software, Customs services and e-services for container terminals since 1991. ICT is specialized in software development, maintenance and support of container terminal software.

Our enthusiastic professionals have gained a vast IT experience and an extensive domain expertise since the start of automation of container terminal operations.

This chapter highlights the projects ICT has been – and still is – involved in.

3.1 Digital transformation at a container terminal

ICT is involved in a good example of – what we called earlier in this paper – Digital Transformation at a Container Terminal.

The business case is for Straddle Carriers to achieve higher operational availability and lower operational costs.

As a first step to that aim real-time information is collected from the Straddle Carriers about tyre-pressures and fuel levels.

That information is measured by sensors mounted on the Straddle Carriers. IoT devices make that information available to the Equipment Control System *(see example project in paragraph 3.3 EQUIPMENT CONTROL)* from where the data is collected in a 'data lake'. That 'data lake' is approached by a BI application (Business Intelligence), called PowerBI, for data analysis, preventive maintenance, process improvement and machine learning.

This approach can easily be extended with other low-cost IoT (Edge) devices connected to (other) terminal assets for parameters e.g. useful to optimize equipment utilization.

ICT's service delivery for Digital Transformation is summarized as follows:

DIGITALNXT

The Digital Transformation solutions from the ICT Group uses the Microsoft IoT suite, called DigitalNxt from our subsidiary OrangeNxt (www.orangenxt.nl).

The ICT Group is also a "IoT Central" Key Partner of Microsoft.
IoT Central is the standard SAAS (Software as a Service) solution from Microsoft for connecting devices to MS Azure.

3.2 Process control systems

For many years, ICT Group maintains and supports the Process Control System that originally has been designed and developed by Hutchison Ports ECT Rotterdam (referred to as ECT).
This current PCS solution is a result of years of cooperation and innovation by ECT and the ICT Group.

A Process Control System (PCS) is designed for high throughput of automated container terminals, equipped with for instance ASC's (Automated Stacking Cranes) and AGV's (Automated Guided Vehicles), combined with manned equipment. Operations are based on the logistical decoupling of waterside container flows and landside container flows. Containers are stored in an automated stack.

AGV's are routed automatically by the PCS for optimal performance of the Ship to shore (STS) operation. ASC's operations and stack usage are automatically optimized to support STS and AGV operations at waterside and to serve SC's operations at landside. Operators can use an extensive set of screens and functions to configure and influence the execution of the container handling process.

The main critical success factor for the PCS performance is the optimized support for the STS operation. PCS controls operations to remove containers from the QC (quay crane) area when the QC is unloading the ship, and to supply the requested containers in time for ship loading operations. The PCS implements the rule: "Quay cranes can never wait".

The main functions of a PCS are:

- Split container movements over subsequent movements of equipment (ASC/AGV/QC) available for the operation.
- Planning in time of container and equipment movements.
- Workload distribution within each type of equipment and usage of equipment given the planned workload.
- Control and adjustments in case of problems, errors, changes in planning or operator interaction.
- Achieve maximum terminal performance for discharging and loading deep-sea container vessels.
- Monitoring equipment and progress.

3.3 Equipment control

ICT gained extensive experience in automation of the control of container handling equipment.

ECT at Maasvlakte Rotterdam was one of the first container terminals using high tech automated equipment, such as Automated Guided Vehicles (AGV's) and Automated Stacking Cranes (ASC's).

Automated Stacking Cranes

ICT Engineers were involved in the very first phase of developing the ASC concept. They were also responsible for the design, software development, testing and commissioning of the ASC's at ECT's DDE (Delta Dedicated East) terminal at Maasvlakte Rotterdam.

Based on Siemens Programmable Logic Controller S5 system, ICT developed and tested the logic control and continuous control to enable fast and reliable container operations at DDE Terminal.

AGV - Automated Guided Vehicles

ASC - Automated Stacking Cranes

- Low level safety control.
- ASC positioning control, using RF transponders.
- Crane X, Y, Z movement control.
- Spreader control.
- Automated Drive Control switchover, enabling three axis container movements using two AC drives only.
- Twin movement control, enabling the step-by-step movement with seamless switchover from one axis to two axis movement at the same time to gain speed.
- AC drive S-curve setpoint control, enabling fast speed up and slowdown of container movements.
- Acceleration and mechanical strain at a constant level.
- Automated and manual operation.
- Interfacing to PCS Terminal Process Control System and TOS.

ICT Group was involved in the testing of the equipment for the new APM Terminal at Maasvlakte 2 Rotterdam.

QC - Quay Cranes

Quay Cranes and other equipment

At the ECT Euromax terminal ICT has worked on the specification of the equipment interfaces between the TOS system and quay cranes and ASC's. The quay cranes and ASC's at Euromax are automated by ABB software and are highly automated. By specifying the interface, a thorough knowledge of both equipment software and TOS system was gained.

ICT has played an important role at Euromax with:

- Acceptance test of ASC and quay crane;
- Integration test of equipment with TOS;
- Integration test of TOS with automatic fuel station (fuelling of AGV's is an unmanned process at Euromax).

Control software

ICT is a certified partner of Siemens and ABB and has successfully implemented several control systems for cranes with Siemens, ABB and other vendor PLC's.

For example, for PSA we have developed a central PLC system, that complies to the "safety regulations" for monitoring and supervising all Automatic Stacking Cranes on the yard.

We are also a partner of Schneider Electric's MES/SCADA product Wonderware.

3.4 Container terminal automation pyramid

Looking at the container terminal automation pyramid (CTAP), usually automated systems not only provide functionality related to their core tasks, but also additional tooling for planning, scheduling, following up problems, monitoring performance and creating reports.

The problem is that each system includes its own set of tools and if, for instance, you want to switch between OCR systems from different vendors, this means implementing a complete new set of tools and retraining personnel. Mixing the same type of system from different vendors is even harder. As most of these systems cannot or hardly interact with each other, it is impossible to optimally operate and monitor a complete terminal.

Solution SmartECS

ICT Group has devised a solution where the individual vendors are responsible for making their equipment work at peak performance. Our solution takes care of the generic tasks which are common to all systems. By unifying the various systems, it becomes possible to monitor the terminal operations across the various systems which are used throughout the process. As a result, operations have optimal control over equipment and management has full operation insight in day-to-day operations.

SmartECS provides a unified platform for inter-equipment communication. It consists of a modular, open software architecture that's highly flexible. All connected systems can directly communicate with each other. Note that integration with TOS is done only once as part of setting up the CTAP and not by each individual vendor.

SmartECS implements and matches the TIC 4.0 standardization. With TIC 4.0 standardization, external interfaces can be easily connected. Moreover, it works both for existing equipment which does not natively support TIC 4.0 as well as modern equipment which does support this standard. As such, it forms the starting point for a unified data collection platform providing valuable insights into terminal operations. This data platform forms the basis for a digital twin of the terminal. As the digital twin is fed with detailed data from ALL connected systems and equipment, it enables identifying weaknesses and opportunities in your container terminal's overall operations.

SmartECS liberates terminal operator from vendor lock-in by limiting integration of equipment to the control level. Generic equipment interfaces allow equipment such as AGVs or ASCs from different vendors to work together at peak performance in harmony.

The principles of SmartECS have also been used outside the domain of container terminals, such as large warehouses where it has been used to drive the processes of receiving products and shipping products associated with a customer order.

Use Case Automation Middleware

ICT has developed for PSA Antwerp the Middleware named Equipment Control System (ECS).

The ECS aims to fill the gap between the operational environment of the Terminal Operating System (TOS) and the equipment of PSA in the yard. It glues the world of the database-oriented planning and scheduling applications inside TOS to the Control System of the equipment in the yard including the interface with the PLC (and/or Motion Controller).

ECS supports the communication between the TOS and all the equipment, such as Straddle Carriers, Prime Movers, Yard Cranes, Quay Cranes and automated equipment. The equipment itself might either be fully autonomous, semi-autonomous or manually operated.

The development of ECS is part of a larger effort of PSA Global which aims at transforming both yard and quay cranes into automated equipment (yard cranes fully automated, quay cranes partly automated). The implementation of the equipment control software on the PLC is left to the equipment vendors, but as part of ECS a minimal PLC library has been developed with detailed data block definitions and a user manual to which equipment vendors must comply to come to a generic interface with ECS so that that ECS can communicate with equipment from different vendors and different PLC brands.

A remote-control system has been developed for PSA to monitor and control the automatic stacking crane process.

The quay cranes will be equipped with an optical character recognition (OCR) system for scanning container numbers.

Finally, the horizontal transporters (i.e. prime-movers and straddle carriers) are equipped with computer terminals which are connected to the ECS. These computer terminals allow the driver to interact with the TOS (Terminal Operating System) by receiving assignments and reporting job progress. These terminals also interface with various sub-systems of the horizontal transporter (e.g. GPS devices, truck status data) and provide optional functionality to support and register a sanity check regarding the equipment status performed by the driver.

And those computer terminals act also as an IoT Edge device to gather information about fuel levels, tyre pressures etc. that is forwarded to a MS Azure Data Lake for further analysis *(See paragraph 3.1 DIGITAL TRANSFORMATION AT A CONTAINER TERMINAL).*

3.5 Information services

RWG E-Service portaal

The ICT Group has developed many web portals for all kind of markets, including container terminals. Besides the technical knowledge ICT also has the domain knowledge to develop advanced E-Portals for container terminals.

No matter if it is hosted On-premise or in the Azure Cloud, ICT can help you with it. We have the technology to handle security, single sign on, authentication/authorization with your MS Active Directory, API Management, integration with (Navis/ COSMOS) TOS, etc.

3.5.1 E-Services at RWG

ICT has developed the E-Services portal for the RWG Container terminal on Maasvlakte 2 Rotterdam. This Portal is built with the latest Web technologies and is suitable for Cloud and On-premise hosting. It works seamlessly with RWG's Navis N4 TOS system and with their Customs RTO system from Infosys.

The public part of this portal can be consulted at: https://rwgservices.rwg.nl/.

After login a range of services is available to customers and operators, such as:

- All kind of performance reports including Loading Lists and Terminal Performance and Departure Reports (TPDR). Those reports are generated/composed by our software from the N4 database and can be viewed and downloaded in various formats.
- Customs reports.
- Mail groups to automatically and periodically distribute reports such as on hazardous goods.
- Blocking/unblocking containers.
- Extended user management, including delegation functionality (a shipping company can manage their own users and authorizations).
- Content Management (news, messages) for the portal as well for the app; the content can include pictures, films etc.
- Management of damaged container photos.

The portal is supported by a great app available for iOS, Android and Windows Phone.

This app displays news (for instance: gate times, maintenance slots etc.) that can be managed in the portal and of course actual information about arrivals of ships, trains and containers. Through push notifications users are instantly alerted when there is new content or when there are changes in arrival times of vessels and subscribed containers.

3.5.2 E-Services at ECT

ICT has developed the Internet- and Intranet web sites for ECT. The Internet and Intranet and closely integrated and linked to each other; even the styles for Internet and Intranet correspond.

ICT has used a service-oriented architecture (SOA) approach to improve security of the system and to make the portal scalable. This ECT e-Portal interfaces with a lot of internal legacy systems and existing webpages.

The Internet web site is equipped with many links and portal functionalities to expose information on containers and transport objects from the operational terminal control systems to stakeholders in the supply chain.

This platform is also used to realize services to support “hinterland” initiatives that offers shipping lines, forwarders, shippers and transport companies a comprehensive range of services for the fast, safe and efficient transportation of containers between the deep-sea terminals and the European hinterland up to and including the last/first mile. Of course, modern mobile apps are developed to assist all kind of users.

3.6 Customs

Goods that are intended to leave the EU Customs territory remain under Customs supervision until they can leave. The Export Control System (ECS) is a system deployed by EU Customs Authorities to exercise this supervision. ECS allows Customs Authorities to determine whether the goods declared for export or re-export have actually departed from the European Union. This is done through electronic exchange of information between offices of export and offices of exit.

The office of exit is informed of the arrival of the goods: notification of arrival. ECT has the role of Trader at Exit (TaE). The TaE sends to the office of exit an electronic message that the goods have arrived. The office of exit will inform the TaE whether the goods can be exported, by sending an electronic accept or reject message. Goods can be subjected to inspection by Customs. The TaE is informed of this inspection by an electronic message.

To fulfil the role of Trader at Exit (TaE), ECT needs software to be able to send the notification of arrival to Customs for ECS goods and to block and release (unblock) on request of Customs specific containers in their Terminal Operating Systems (TOS) on several terminals. A TOS will automatically prevent a container from being exported as long as the container is blocked.

ICT Group has developed this software, called ECT ECS. The software acts as a message broker between the TOS on the terminals of ECT and Customs and contains all functionality to decide automatically which containers must be blocked and released. ICT has developed this system for ECT.

The ECT ECS has a web-based user interface allowing ECT personnel to monitor the data and status of all ECS export containers aiming at proactively solving any mismatch between electronically received MRNs (EU Movement Reference Numbers) together with container numbers and the registered data in the TOS for container visits and vessel loading lists.

4 ICT's expertise

All our smart and innovative services and products are bundled in the Smart Transport & Logistics Lab. Our highly-qualified IT professionals help you with this program towards achieving efficient and integrated logistics and supply chain management solutions.

Our professionals have expertise in the following fields:

- Development of various "custom-made" terminal systems, like Planning & Administrative systems, Process Control systems and Equipment Control systems.
- Knowledge of application and implementation of EDIFACT messages.
- Development and management of internal and external reporting tools, including Loading Lists and Terminal Performance and Departure Reports (TPDR).
- Management and development of ship planning applications.
- Management and development of applications like 'My Company' (an intranet for employees and resource scheduling).
- Development of Remote Check-In functionality (online DIYD (Do-It-Yourself-Desk)) for transport and trucking companies.

Also, other expertise and skills are available:

Logistics

- Logistics network optimization.
- Omni-channel retail & fulfilment.
- Warehouse Management & Control.
- Inventory management.
- Visibility.
- Supply chain collaboration.
- BI & Analytics.

Technology

- Cloud.
- Microsoft.
- Java.
- Microsoft BizTalk.
- Intersystems Ensemble.
- PLC / SCADA.

Systems Integration

- Application & enterprise systems integration.
- Security & Infrastructure.
- Data centres.
- Disaster recovery.
- Network / Platform Integration.

4.1 ICT's trusted partner approach

ICT Transport & Logistics delivers logistic excellence through its complete range of services, from consulting services, solution delivery, tools and managed services, all to improve operational efficiencies, service levels and increase margins.

The following services are available:

- Consulting & Advice (SmartScan).
- Implementation & Upgrades.
- Custom-made Solution Development.
- Systems Integration.
- Cloud 'Migration' Services.
- Managed Services.

ICT's Trusted Partner Approach is characterised by a strong relationship with the client. In close cooperation with the client ICT professionals will continuously go through a chain of activities for optimal service delivery, depicted as follows:

4.2 ICT's devops agile/scrum method

For operation critical systems at container terminals, uptime and robustness are key. System enhancements, adaptations and maintenance are mixed together and 24/7 support around the clock is a must.

More and more companies want to achieve this using the DevOps approach in their software development life cycle to combine all these requirements.

The ICT Group will gladly carry out assignments to deliver agreed software extensions, enhancements and changes, as well as tackling operational issues/errors according to the Agile/Scrum method.

Within ICT Transport & Logistics we have developed and established a standard way of working for the DevOps Agile/Scrum method. All professionals know their roles and are using the same tools, processes and procedures.

DevOps aims at shorter development cycles, faster deployment of releases at a high frequency to detect and correct problems when they occur, without disrupting other operational services.
The DevOps culture puts a focus on creating a fast and stable work flow for the personnel of both IT development and IT operations.

ICT's DevOps Agile/Scrum Method is summarized in the following picture:

To keep your vital systems operational on a 24/7 hours basis a reliable IT partner is necessary to assure a continued availability of the IT systems and to cope with system failures, software enhancements.

ICT has proven for many years to be a reliable partner, not only for development and maintenance, but also for 24/7 service provisioning. And that all in a combined ICT's DevOps Agile/Scrum approach!

4.3 Consultancy

In the last decades the ICT Group has been involved in several consultancy and commissioning projects.
Examples are:

- Analysis and description of business processes.
- Consultancy and configuration of TOS (terminal operating system) systems.
- Training of TOS users.
- Requirements specification of TOS systems.
- Acceptance testing of TOS systems.
- Implementation of external truck process.
- Definition and implementation of interface of process control system with equipment (AGV, quay cranes, ASC).
- Requirements specification of process control system.
- Testing of terminal equipment (AGV, ASC, etc.).
- Acceptance testing of process control system.
- Test management of implementation TOS upgrade.
- Acceptance testing equipment software.
- Implementation of second trolley of quay crane.
- Integration test of TOS with automatic fuel station for AGV's.

4.4 Managed services

As a reliable and trusted partner, the ICT Group keeps alive many vital systems for the container terminals of ECT, PSA and RWG.

The ICT Group offers managed services according to the ITIL and ASL standard frameworks on a 24hours/7days basis. Main characteristics of our managed services offering are:

- ITIL, ASL processes (incident management, problem management, etc.).
- Life Cycle Management.
- Supporting 'Third Party' Software.
- Keeping up with technologic trends.
- Operational: the (normal) management software and adaptive and corrective maintenance and renewal applications.
- Tactical: the coordination of the work.
- Strategic: to provide direction for the (service) organization and the future of information systems that support the business processes of the user organization based on developments in the area.
- TopDesk tooling for registration, dispatching and follow-up.

5 ICT's customers

5.1 Customer references

All the above-mentioned solutions and services we have put to practice at our customers in the transport and logistics market. Our service offering amounts to a stable and profitable yearly turnover of € 15 million.

Our customers in the transport and logistics market are:

- Hutchison Ports ECT Rotterdam
- APM Terminal Rotterdam
- APM Terminal Maasvlakte 2
- Container Terminal Twente (CTT)
- RWG
- PSA Antwerp, Belgium
- PSA Sines, Portugal
- Portbase
- Schiphol
- BAM
- Secure Logistics (CargoCard)
- EMO Bulk Terminal Maasvlakte Rotterdam
- Dutch Railways ProRail
- Amsterdam Airport (Schiphol)
- Vanderlande Industries
- PostNL
- DHL Express Benelux
- TNT Group
- Tata Steel
- Philips
- ASML
- and many more ...

6 ICT Group

The ICT Group (ICT) offers high level technological solutions in information and communication technology for several business areas. ICT is active as system integrator in the Netherlands, Belgium, Germany, Sweden and Bulgaria.

The services provided by ICT are focussed on projects for the realization and maintenance of IT system solutions and secondment of highly educated and skilled professionals.

ICT GROUP Additude is everything	ICT GROUP Additude Esprit	ICT GROUP CIS Solutions Creative. Innovative. Smart.
ICT GROUP ICT HCTS	ICT GROUP ICT Netherlands Smarter Solutions	ICT GROUP Improve Quality Services
ICT GROUP Innocy Life Cycle Masters	ICT GROUP InTraffic Mastering Mobility	ICT GROUP Motar
ICT GROUP OrangeNXT	ICT GROUP Raster Industrial Automation	ICT GROUP Strypes
ICT GROUP Turnn	Yellowstar IT FOR SOCIAL SUPPLY CHAINS	Fourtress EMBEDDED SOFTWARE & TECHNISCHE AUTOMATISERING

With a market-oriented approach via specific market sectors the ICT Group focuses on the technically oriented software development. The company focuses on specific market sectors through the following business units:

Automotive & Mobility Embedded software engineering according to automotive quality and safety standards	**High Technology** Design and production of components, control systems, complex production systems	**Manufacturing** Realizing machine control systems and overall line management for discrete production lines	**Healthcare** MDE solutions and obstetrics software	**Food, Chemicals & Pharma** For flexible, reliable and efficient production processes
Oil & Gas Safety solutions for upstream companies	**Transport & Logistics** Streamlining and improving operational processes	**Water & Infrastructure** Solutions that transform public infrastructure. Smart Grid for sustainable, reliable energy.	**Energy** Managing and enabling sustainable and reliable energy supplies with our Smart Grid solutions	**ORANGENXT** Digital Transformation solutions and SaaS based software

For more information about Container Terminal solutions provided by ICT Group, please feel free to contact:

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