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THE Amazing MARITIME CHALLENGE

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CONTENTS

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FOREWORD

propelling Singapore's growth

Singapore has come a long way from its humble beginnings as an outpost of the British Empire to become a leading financial hub and international maritime centre. In tracing the story of the country's development, the maritime industry has been a key pillar in its progress.

The island-state is home to a thriving ecosystem of over 5,000 maritime establishments, with the maritime industry contributing about 7 per cent to Singapore's GDP. Singapore has built a name as one of the world's busiest ports since the 1980s. On average, some 130,000 ships call at Singapore annually. It is also the top container transhipment hub globally and the largest bunkering port in the world.

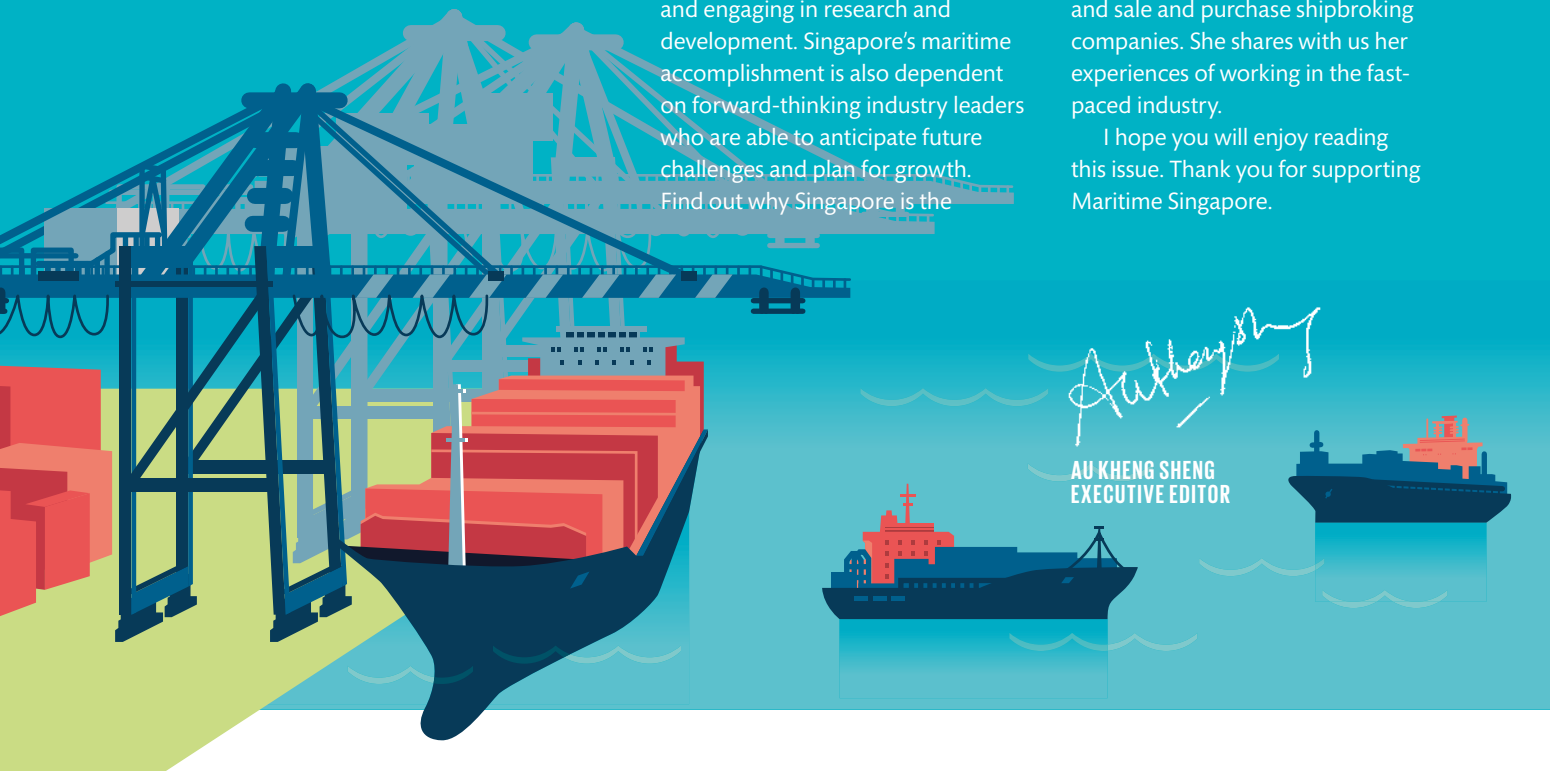
Despite its achievements, Singapore's maritime sector has not rested on its laurels. After all, its success rests not just on a stroke of geographical luck, but also deliberate efforts by both the Singapore Government and industry partners to ensure that the maritime sector keeps pace with global developments.

This is done through continually training and upgrading its manpower capabilities, building leading maritime facilities and engaging in research and development. Singapore's maritime accomplishment is also dependent on forward-thinking industry leaders who are able to anticipate future challenges and plan for growth. Find out why Singapore is the international maritime centre it is today in this issue's main feature.

Of the many international maritime companies that have chosen to set up operations in Singapore, Lloyd's, the specialist insurance and reinsurance market, has recently moved into its new and expanded premises in the country's central business district. Antares Underwriting Asia is one of the latest additions to Lloyd's Asia-Pacific hub. In this issue's Company Spotlight section, read about why Lloyd's and Antares are using Singapore to grow their regional reach.

Singapore is also host to over 100 local and international shipbroking firms that have established their presence here in order to tap the growing opportunities in Asia. In this issue's Careers section, we feature a shipbroker working in the clean tanker industry at the Singapore office of Braemar ACM, one of the world's largest chartering and sale and purchase shipbroking companies. She shares with us her experiences of working in the fast-paced industry.

I hope you will enjoy reading this issue. Thank you for supporting Maritime Singapore.



AU KHENG SHENG
EXECUTIVE EDITOR

SINGAPORE DEEPENS REGIONAL COLLABORATION

In November and December 2015, the Maritime and Port Authority of Singapore (MPA) strengthened its partnership with two regional organisations in key areas through the signing of Memorandums of Understanding (MOUs).

On Nov 26, 2015, MPA and the Ministry of Oceans and Fisheries (MOF) of the Republic of Korea inked an MOU to deepen their collaboration in areas of mutual strategic interests, including safety, security and the protection of the marine environment for international shipping. Mr Andrew Tan, MPA's Chief Executive, and Mr Cho Seung-Hwan, MOF's Assistant Minister, signed the MOU on the sidelines of the 29th session of the International Maritime Organization (IMO) Assembly in London.

Under the MOU, MPA and MOF will collaborate on a range of issues, including discussions on Port State Control and Flag State Control, cooperation at international forums such as the IMO and the Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia, and technical discussions on issues related to the improvement of international maritime safety standards.

On top of this, MPA and the Directorate General of Sea Transportation (DGST) of the Republic of Indonesia's Ministry of Transportation also extended an MOU concerning the cooperation on human resources development of government officers in the maritime field. The MOU was first signed in 2005 to raise the standards of technical and administrative professionalism of personnel from the two organisations.

The signing ceremony on Dec 10, 2015 was held in Singapore in conjunction with the 9th Meeting of the DGST-MPA Training MOU. It marks 10 years of strong bilateral cooperation between MPA and DGST on maritime training.

Over the last decade, more than 50 programmes and workshops have been organised under the MOU for over 800 officials in areas such as the implementation of IMO Conventions.

ABOVE Mr Mauritz HM Sibarani (left) from Indonesia's Directorate General of Sea Transportation with Ms Angela Png of the Maritime and Port Authority of Singapore (MPA). **TOP RIGHT** Mr Khaw Boon Wan (third from left), Coordinating Minister for Infrastructure and Minister for Transport, led the Singapore delegation to the International Maritime Organization meeting in London. **FACING PAGE** Captain M Segar (centre), MPA Assistant Chief Executive (Operations), with signatories of the Maritime Singapore Green Pledge.

SINGAPORE RE-ELECTED TO IMO COUNCIL FOR 12TH CONSECUTIVE TERM

During the 29th session of the International Maritime Organization (IMO) Assembly in London on Nov 27, 2015, Singapore was re-elected to the IMO Council for a 12th consecutive two-year term. The country has been part of the IMO's 40-member governing body since 1993.

As an IMO Council member, Singapore has played an active role in advancing the efforts of the international maritime community to enhance navigational safety, promote efficient and sustainable shipping, and protect the marine environment.

The Republic has had the honour of serving in various leadership positions in the IMO Council, such as the Chairman of the Council between 2001 and 2003. It has also been Chairman of the Sub-Committee on Bulk Liquids and Gases, as well as the Sub-Committee on Flag State Implementation.

Singapore has also served as the Vice-Chairman of the Marine Environment Protection Committee, the Maritime Safety Committee, and the Sub-Committee on Standards of Training and Watchkeeping in the past.

Following the country's successful re-election, Mr Khaw Boon Wan, Singapore's Coordinating Minister for Infrastructure and Minister for Transport, who led the delegation of officials from the Ministry of Transport and the Maritime and Port Authority of Singapore, said: "Singapore takes our responsibility as a Council member seriously and will continue to play an active role to contribute towards the IMO's goal of safe, secure and efficient shipping."

LAUNCH OF REGION'S FIRST MARITIME ENERGY TEST BED

With more stringent regulations on ship emissions and energy efficiency standards expected to be in place in the future, Singapore's Nanyang Technological University (NTU) opened South-east Asia's first advanced maritime energy test facility, the Maritime Energy Test Bed, on Nov 2, 2015.

It will be a platform for scientists and engineers to develop innovative eco-friendly maritime technologies, like scrubbers, which reduce harmful ship emissions, and alternative energy sources such as biodiesel, a renewable and clean-burning diesel.

The S$8 million facility, jointly funded by NTU and the Singapore Maritime Institute (SMI) will also help polytechnic students, undergraduates, and PhD candidates gain hands-on experience in sustainable maritime technologies and innovation. In fact, SMI will contribute S$4.7 million over the next 10 years, while NTU will provide S$3.4 million with support from other maritime leaders such as ClassNK, a ship classification society.

The facility is equipped with a 1.5MW diesel ship engine that can run on most types of conventional liquid fuel for energy research such as biodiesel and synthetic diesel. There will also be advanced sensors and monitoring devices to facilitate research in energy storage, noise pollution, and waste heat recovery.

SINGAPORE'S 2015 MARITIME PERFORMANCE

Amidst weak global economic conditions and structural changes in the maritime industry, the Port of Singapore put in a mixed performance in 2015.

Advance estimates show that annual vessel arrival tonnage grew 5.6 per cent to hit 2.5 billion gross tonnage, while Singapore remained the world's top bunkering port. The volume of bunkers sold increased by 6.5 per cent to hit 45.2 million tonnes.

Container throughput and cargo throughput, however, shrunk by 8.7 per cent and 1.1 per cent respectively. Container throughput totalled 30.9 million twenty-foot equivalent units, while total cargo tonnage handled was 574.9 million tonnes.

To help container lines cope with the challenging economic environment, the Maritime and Port Authority of Singapore and PSA Corporation proactively worked on a suite of measures, ranging from concession on port dues for container vessels calling at the Port of Singapore to putting in more resources to enhance vessel productivity at the port.

GREEN SHIP PROGRAMME CLOCKS NEW MILESTONE

At the Third Singapore Registry of Ships (SRS) Forum on Nov 13, 2015, the Maritime and Port Authority of Singapore (MPA) recognised another 53 green ships from 41 companies that have qualified for the Green Ship Programme (GSP).

The GSP encourages Singapore-flagged ships to reduce carbon dioxide and sulphur oxides emissions by providing incentives to qualifying vessels. Since its inception in 2011, 247 ships have become part of the programme.

Another 10 maritime companies also signed the Maritime Singapore Green Pledge to signal their commitment to be responsible members of the international maritime community by supporting and promoting clean and green shipping in Singapore.

This brings the total number of signees to 100 companies since the initiative's inception in 2011. Five companies were also recognised for helping the total gross tonnage (GT) of vessels registered under the SRS cross the 85th million GT mark.

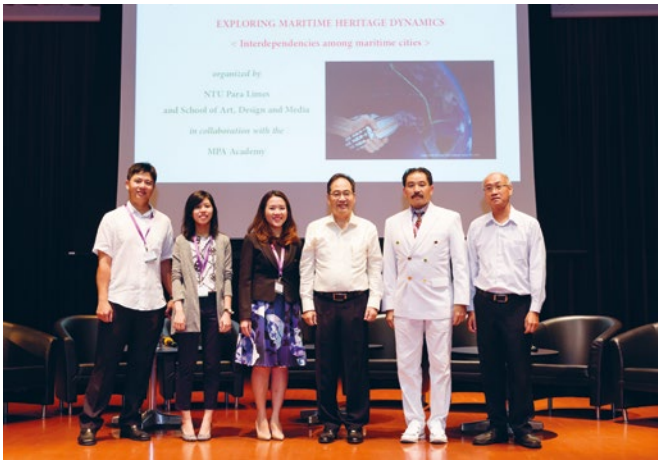
Forum participants also witnessed the signing of a Memorandum of Understanding between MPA and DuPont Singapore, a science and engineering company, to collaborate on services and solutions for the maritime industry to promote the adoption of safety, operational risk and sustainability management practices.

MPA's Chief Executive, Mr Andrew Tan, said: "We are pleased to see continuing strong industry support for the Green Ship Programme and Maritime Singapore Green Pledge...We will continue with our efforts to promote cleaner, safer and more efficient shipping."

AMAZING MARITIME CHALLENGE 2015

Close to 1,000 members of the public, including students and professionals, took part in maritime-themed games at the annual Amazing Maritime Challenge, organised by the Maritime and Port Authority of Singapore (MPA) and the Singapore Maritime Foundation on Oct 18, 2015.

MARITIME HERITAGE CONFERENCE



The Nanyang Technological University's Para Limes Institute and its School of Art, Design and Media collaborated with the MPA Academy to organise a conference that looked into the issue of interdependencies among maritime cities from Nov 18 to 20, 2015.

VISIT BY THE SAUDI ARABIA DELEGATION TO THE PORT OPERATIONS CONTROL CENTRE (POCC)

MPA Assistant Chief Executive (Operations) Captain M Segar hosted a delegation from Saudi Arabia, led by Dr Nabeel Mohammed Al Amudi, President of the Saudi Ports Authority, to a visit at MPA's POCC on Nov 3, 2015.

VISIT BY ICELAND'S PRESIDENT

Iceland's President Olafur Ragnar Grimsson and his delegation paid a visit to MPA during his trip to open the Arctic Circle Singapore Forum in November 2015.

IALA WORLD-WIDE ACADEMY RISK MANAGEMENT SEMINAR

The MPA Academy partnered the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) World-Wide Academy to host a training seminar on risk management from Oct 5 to 9, 2015 for maritime and port officials.

SINGAPORE REGISTRY OF SHIPS (SRS) FORUM 2015

Focusing on the importance of safe, responsible and sustainable maritime operations, the Third SRS Forum on Nov 13, 2015 saw distinguished speakers share their expertise and insights on implementing best practices with some 250 senior maritime professionals and partners from institutes of higher learning.

INTERNATIONAL FUTSAL TOURNAMENT FOR SEAFARERS 2015

MPA organised the International Futsal Tournament for Seafarers from Nov 4 to 6, 2015 for seafarers from around the world to engage in friendly competition and build camaraderie.

SINGAPORE
Maritime
Trails

Discover Singapore's Rich Maritime Stories

Complimentary guided tours for **Singapore Maritime Trails** run every 1st Saturday of the month for Trail 1 and every 2nd Saturday of the month for Trail 2.

These guided tours are open to the public and spaces are limited. Individuals who are interested in these public trails, or schools and organisations that wish to arrange for a trail at your preferred date and time*, please email mpasmt@gmail.com or call +65 6836 6466 (Mon-Fri, 9am - 6.30pm).

"For most, old and young, the Singapore Maritime Trails tour was an eye opener as it showcased the significance of Maritime sector in the development and growth of Singapore. The impeccably organised and conducted tour by MPA was one of the most talked about and highly appreciated vocational visit undertaken by families and members from the Rotary Club of Singapore."
Haider Nawaz, Red Dot Shipping Pte Ltd

"My wife and my kids enjoyed the trip very much! Good event!"
Klemmer, Reinhard Joachim
Executive Director, KPMG Services Pte Ltd

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The Maritime and Port Authority of Singapore
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FEATURE

Rahita Elias tracks how Singapore's success as a global hub port contributed to its development into an International Maritime Centre

from strength to strength

Since the 9th century, long before the advent of Sir Stamford Raffles, Singapore had been a major hub port along the Maritime Silk Road. Its enviable position at the crossroads of one of the oldest and busiest sea trade routes played a key role in its emergence as a trading epicentre.

PORT THAT NEVER SLEEPS

Over the centuries, Singapore has grown steadily into a major port of call for ships traversing this part of the world. In this port that never sleeps, a vessel now arrives or departs every two to three minutes.

The island nation today is connected to 600 ports in over 120 countries. Since 1982, Singapore has been one of the world's busiest ports in terms of shipping tonnage. In 2015, vessel arrivals totalled 2.5 billion gross tonnage (GT).

Singapore is the top container transhipment hub globally, with a box throughput of 30.9 million twenty-foot equivalent units (TEUs) in 2015. It heads the bunker league too, chalking up 45.2 million tonnes in total bunker sales in 2015.

Overall, the port is a major economic driver for Singapore. Its pivotal role was recognised by no less than the country's Prime Minister, Lee Hsien Loong.

Speaking at the opening of the Pasir Panjang Terminal Phases 3 and 4 in June 2015, he said: "Because the port thrives, so Singapore thrives.

ILLUSTRATION: KUANTH

SIR STAMFORD RAFFLES ESTABLISHES MODERN SINGAPORE AS A FREE PORT.

We have a maritime industry built around the port which creates many good jobs: it employs 170,000 people and contributes to 7 per cent of our GDP."

Succinctly summing up Singapore's maritime achievements, Maritime and Port Authority of Singapore (MPA) Chief Executive Andrew Tan says: "Our advantages of a strategic location, good connectivity and high service levels have contributed to the current successes."

In addition to being a global hub port, Singapore is the world's third-largest petrochemical refiner and operates the most technologically advanced and efficient shipbuilding and ship repair facilities in South-east Asia. It has captured about 70 per cent of the world's jack-up rig-building market and 70 per cent of the global floating production storage and offloading conversion market.

Currently, more than 4,700 vessels totalling about 86 million GT proudly fly Singapore's Red Ensign, making the Singapore Registry of Ships (SRS) the fifth largest in the world.

PORT OF SINGAPORE AUTHORITY (PSA) FORMED AS A STATUTORY BOARD.

PRO-BUSINESS ENVIRONMENT

Beyond its ports and shipyards, Singapore has also become a full-fledged International Maritime Centre with a thriving ecosystem of over 5,000 maritime establishments.

Besides a significant cluster of shipowners and operators, Singapore also offers a comprehensive kaleidoscope of maritime facilities and activities, including ship financing, marine insurance, shipbroking, and maritime law and arbitration, among others.

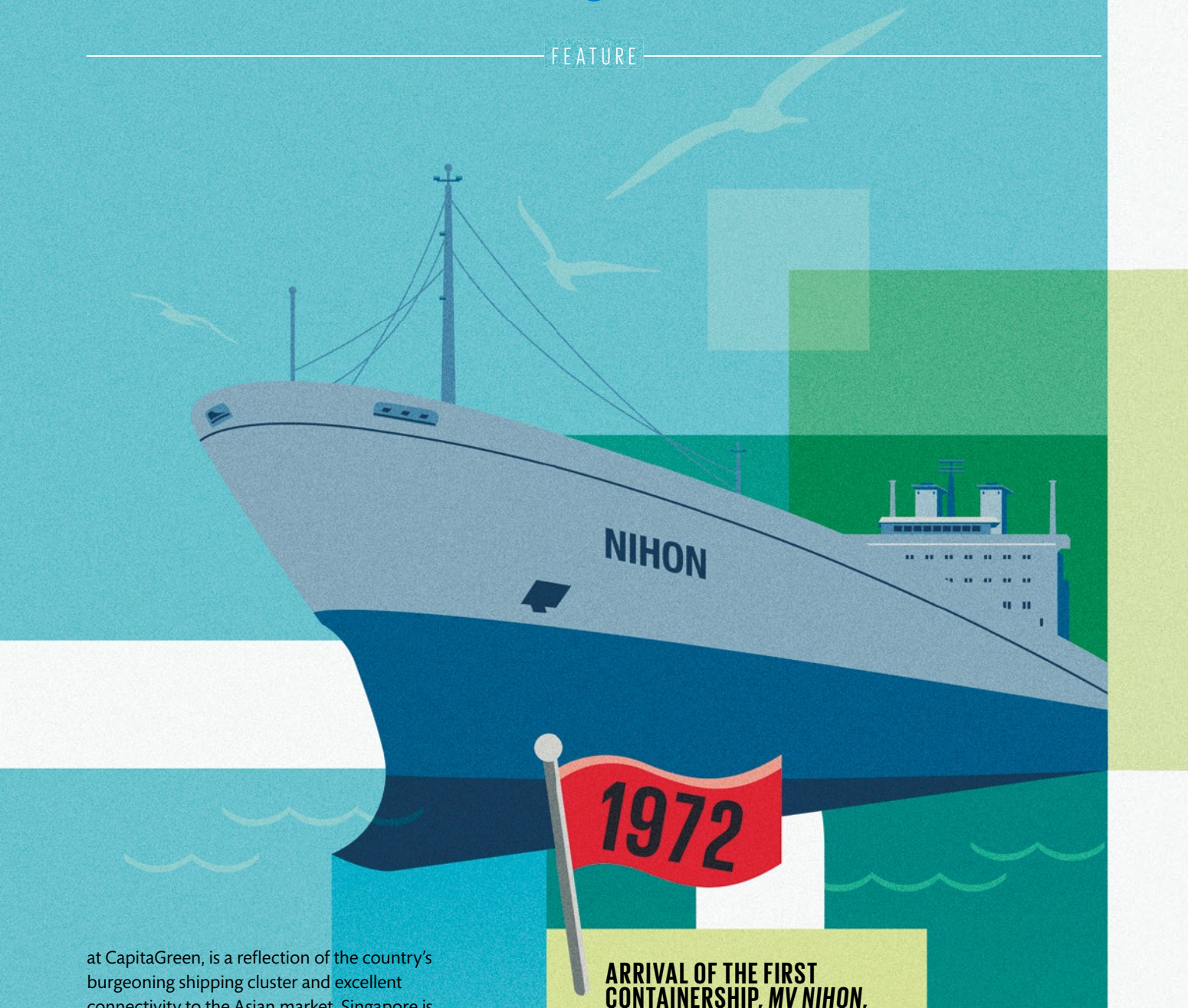
This was achieved by creating a conducive and attractive environment for these companies and organisations to set up shop here.

To this end, MPA offers a range of programmes to maritime and related companies to grow and develop their businesses locally. It has succeeded in attracting a core group of international shipowners and ship operators to base their operations and decision-making functions in Singapore. There are now over 130 international shipping groups based in Singapore.

Aside from the shipping sector, there are now more than 30 local and international law firms with maritime practices in Singapore, over 20 banks with shipping portfolios, as well as more than 20 leading international shipbroking firms with significant operations here.

In the marine insurance sector, MPA continues to work closely with the Monetary Authority of Singapore (MAS) to expand the presence of Lloyd's Asia service companies and International Group of Protection and Indemnity (IGP&I) clubs (maritime mutual insurance associations) in the Republic. Besides the seven IGP&I clubs in Singapore, there are, as at January 2016, 21 Lloyd's Asia service companies writing a diversified international portfolio of businesses.

Lloyd's decision to expand in Singapore, as evidenced by its recent move to a larger office



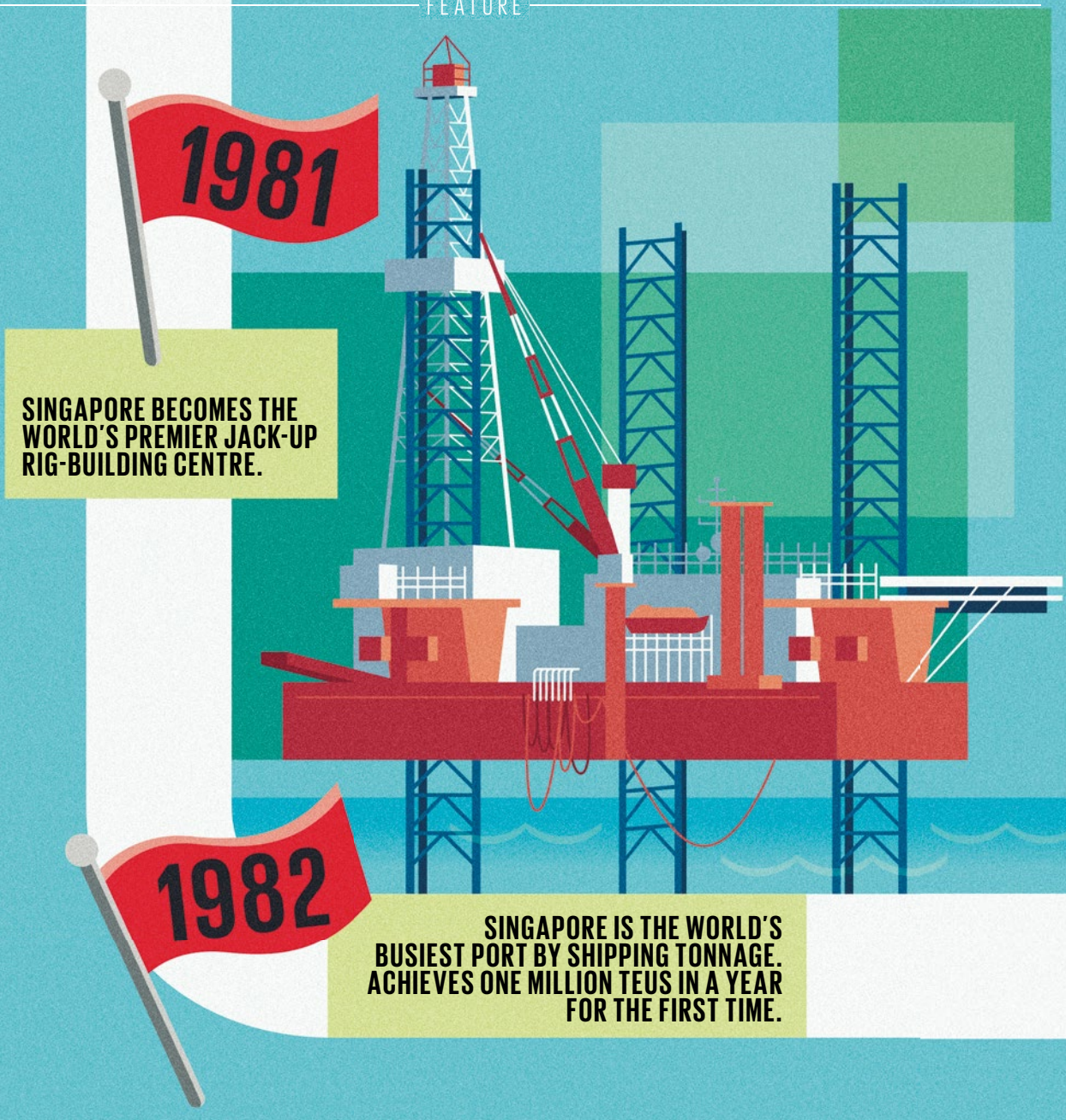
ARRIVAL OF THE FIRST CONTAINERSHIP, *MV NIHON*, IN SINGAPORE ON JUNE 23. START OF OPERATIONS AT FIRST CONTAINER BERTH AT TANJONG PAGAR TERMINAL.

at CapitaGreen, is a reflection of the country's burgeoning shipping cluster and excellent connectivity to the Asian market. Singapore is now Lloyd's largest presence outside London.

Kent Chaplin, Lloyd's Head of Asia Pacific, says that along with strong support from the MAS, Singapore's effective and efficient sea and air networks, plus stable political and economic environment are reasons for Lloyd's willingness to invest in its operations here. The use of English as a first language and the favourable time zone are also contributory factors.

"It all adds up to an almost perfect environment for an international operation like Lloyd's to succeed," says Chaplin.

Marcus Hand, Editor of *Seatrade Maritime News*, concurs. He says: "The country's long-term policies and schemes have made it attractive to international shipping businesses seeking a predictable operating environment."



FUTURE PLANS

However, Singapore is mindful that it has to continue to build on its strengths.

Tan says: "We cannot just deliver world-class service to shipping lines in isolation. To stay relevant over the next 10, 20, 30 or even 50 years, we need to deliver world-class service to all our customers – which is why we have put in place the Next Generation Port 2030 initiative.

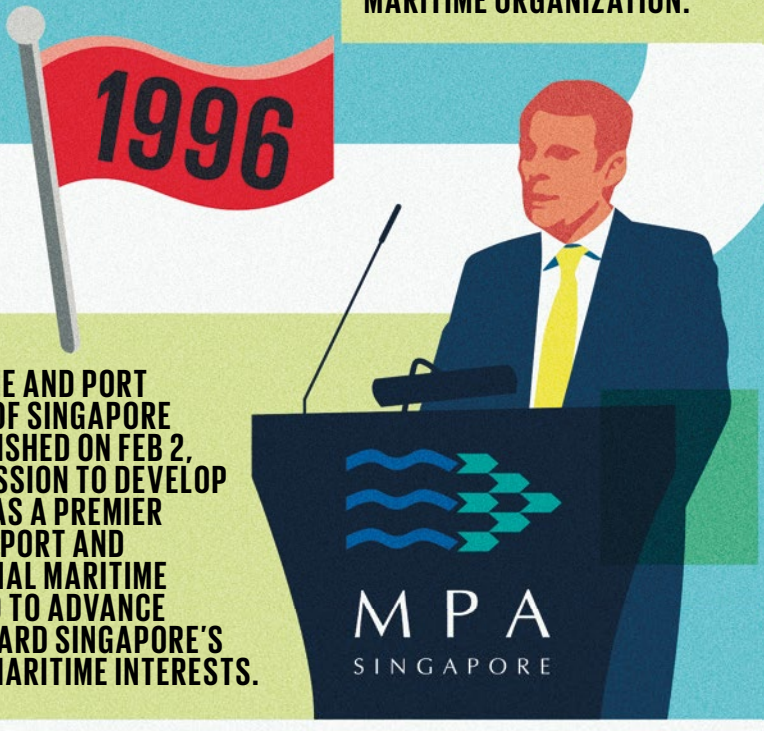
"MPA, as a port regulator, planner and promoter, will need to work closely with our stakeholders to drive these efforts."

The next-generation Tuas Terminal, to be developed in four phases, is the cornerstone of Next Generation Port 2030. When fully developed, it will become the world's largest single mega container terminal, with an annual capacity of up to 65 million TEUs. Tuas Terminal will consolidate all container terminal operations and port-related logistics and services into one location. It will be able to handle ultra-large container ships, larger than today's largest mega container ships.

Tan says: "We are looking to deploy advanced port technologies, such as Automated Guided Vehicles (AGV), automated yard and quay cranes. PSA Corporation is already undertaking R&D and test-bedding of the AGV and its operational system, and we are also exploring R&D in other container terminal technologies and new operating concepts."

SINGAPORE BECOMES THE WORLD'S LARGEST SHIP REPAIR CENTRE IN TERMS OF CAPACITY WITH AN AGGREGATE DEADWEIGHT OF 2.82 MILLION TONNES.

SINGAPORE ELECTED AS A COUNCIL MEMBER OF THE INTERNATIONAL MARITIME ORGANIZATION.



THE MARITIME AND PORT AUTHORITY OF SINGAPORE WAS ESTABLISHED ON FEB 2, WITH THE MISSION TO DEVELOP SINGAPORE AS A PREMIER GLOBAL HUB PORT AND INTERNATIONAL MARITIME CENTRE, AND TO ADVANCE AND SAFEGUARD SINGAPORE'S STRATEGIC MARITIME INTERESTS.

PSA SINGAPORE IS THE FIRST PORT IN THE WORLD TO HAVE CUMULATIVELY HANDLED 500 MILLION TEUS.

SERVING THE INDUSTRY

Given the maritime industry's importance to Singapore, the country believes in playing an active role in promoting safe, secure and efficient shipping. In November 2015, it was re-elected into the Council of the International Maritime Organization (IMO) for a 12th consecutive two-year term. The Republic was first elected to the 40-member IMO Council in 1993.

Serving on the IMO Council has allowed Singapore to contribute significantly towards advancing the efforts of the international maritime community to enhance navigational safety, promote efficient and sustainable shipping and protect the marine environment. As an IMO Council member, Singapore has served as the Chairman of the IMO Council, as well as Chairman and Vice-Chairman of various committees and sub-committees.

Following the nation's successful re-election to the IMO Council in 2015, Singapore's Coordinating Minister for Infrastructure and Minister for Transport Khaw Boon Wan said: "Singapore takes our responsibility as a Council member seriously and will continue to play an active role to contribute towards the IMO's goal of safe, secure and efficient shipping."

PORT OF CALL FOR THE WORLD

- **Total Cargo Tonnage in 2015**
  574.9 million tonnes
- **Vessel Arrival Tonnage in 2015**
  2.5 billion GT
- **Total tonnage of ships under the Singapore flag in 2015**
  86.3 million GT
- **Maritime Hub**
  Home to over 5,000 maritime establishments employing 170,000 people.

TAP FOR VIDEO

beefing up virtual defence

Audrina Gan finds out why the maritime industry needs to develop greater resilience to cyber attacks as it becomes more technologically advanced

The maritime industry is undergoing rapid technological development, with companies becoming more reliant on technology in their day-to-day operations. Many have also embraced the Internet of Things phenomenon, in which ever-increasing connectivity between devices, equipment and systems allow these different components to communicate with each other and be controlled remotely via the Internet.

While such technological progress leads to considerable efficiency gains and improved safety for the maritime sector, the paradox is that they also make it more vulnerable to cyber attacks. The potential fallout caused by cyber security breaches could range from financial loss to reputational damage to loss of lives. Computer systems could be compromised by ransomware, a type of malware that restricts access to the infected computer system until a ransom is paid to the malware's creators. Such an attack could include the encryption of customer or operational databases of shipping lines, or databases that track container locations in container terminals.

Sometimes, cyber criminals may not steal money directly, but take other things that are of great value such as information on the location of an unexplored oilfield from an oil and gas exploration company, says Freddy Tan, Director and Enterprise Architect (Security) at Singtel.

INDUSTRY AWARENESS

Despite the risks, Tan notes that cyber security awareness is still low among maritime companies, with the industry unprepared to deal with existing and emerging cyber threats. In 2014, maritime

IMAGES: 123RF

CASE STUDIES OF ATTACKS

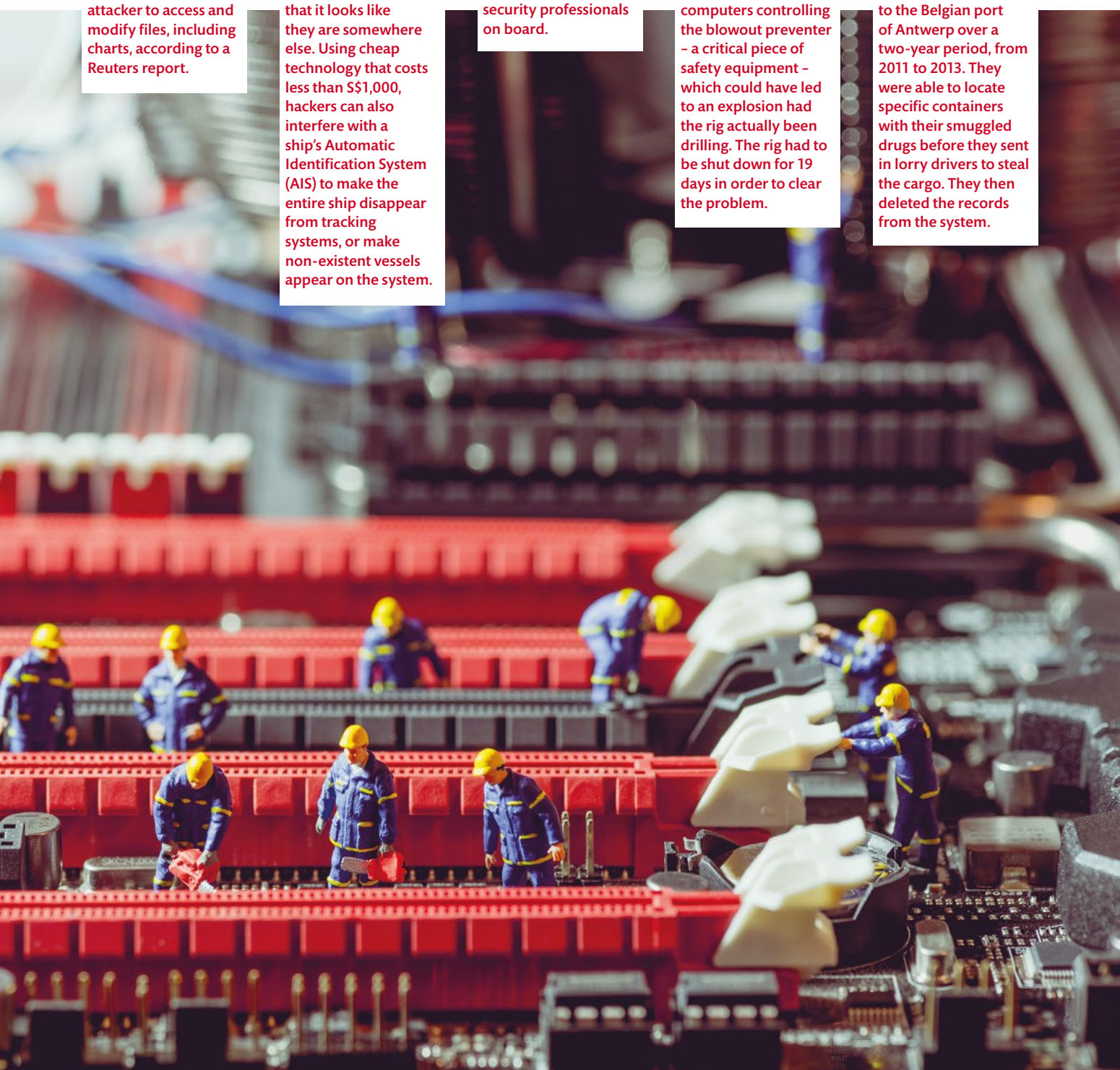
1 In January 2014, a British cyber security research firm, NCC Group, found flaws in one vendor's Electronic Chart Display and Information System (ECDIS) software that would allow an attacker to access and modify files, including charts, according to a Reuters report.

2 Somali pirates are known to choose targets by viewing navigational data online. This has led some ships to either turn off their navigational devices or fake the data so that it looks like they are somewhere else. Using cheap technology that costs less than S$1,000, hackers can also interfere with a ship's Automatic Identification System (AIS) to make the entire ship disappear from tracking systems, or make non-existent vessels appear on the system.

3 Hackers were able to shut down a floating oil rig off the coast of Africa by tilting it to one side. It took a week to identify the cause and rectify the problem as there were no cyber security professionals on board.

4 In 2010, a drilling rig that was en route from South Korea to Brazil became infected with malicious software that spread through all of its systems, including the computers controlling the blowout preventer – a critical piece of safety equipment – which could have led to an explosion had the rig actually been drilling. The rig had to be shut down for 19 days in order to clear the problem.

5 Hackers can also break into a port's cargo tracking system. One notable incident involved an organised crime group which used hackers to infiltrate computer networks connected to the Belgian port of Antwerp over a two-year period, from 2011 to 2013. They were able to locate specific containers with their smuggled drugs before they sent in lorry drivers to steal the cargo. They then deleted the records from the system.



cyber security company CyberKeel found that the online defences of 16 of the world's 20 largest container carriers had serious security gaps.

Current maritime regulations and policies have also failed to keep pace with this development as they consider only the physical aspects of maritime security and safety. But organisations such as the Baltic and International Maritime Council, Intertanko and the International Association of Dry Cargo Shipowners are developing standards and guidelines to address such issues. The International Maritime Organization is also developing voluntary guidelines on adequate measures to protect and strengthen the resilience of the cyber systems supporting the operations of the maritime sector.

POTENTIAL CYBER SECURITY THREATS

• ***Shipping and navigation*** Modern ships are highly dependent on technology, making them prone to attacks on navigation systems that can steer a ship off course without detection from the crew on board, resulting in collisions or groundings. Security experts have found significant security gaps in three key navigation technologies. They are the Automatic Identification System (AIS), which exchanges vessel tracking and identification data with other vessels, ports and coast guards; the Electronic Chart Display and Information System (ECDIS) that provides a vessel's position, direction and speed; and the Global Positioning Systems (GPS) used to identify vessel positions, steer port cranes and stack containers.

• ***Ports*** Highly automated ports rely on complex systems for their operations. Container cranes, for instance, make use of GPS data to move containers. Attackers can use a simple and easily accessible GPS jamming device to disrupt port operations. The ports would be forced to switch to manual operation, which is extremely inefficient and time-consuming.

• ***Cargo handling and terminal operations*** Due to the way goods are transported and the involvement of different companies and organisations in multiple countries, there are many points from which a cyber attack can be launched to facilitate unauthorised movement of goods.

LIKELY PERPETRATORS

They can include hackers, organised crime syndicates, competitors, activists, terrorists and even foreign nation-states. Cyber attacks can take the form of state-sponsored attacks from governments who want access to sensitive information. "The destination country may want to know what a ship that is on contract to another country is carrying on board. For instance, a commercial ship on contract to the US military was recently the target of an intrusion by suspected foreign hackers," says Tan.

PREVENTIVE MEASURES

Addressing cyber security issues within the maritime industry takes time and a change in attitudes among industry players. Maritime companies need to start taking cyber security threats seriously and prepare against such attacks.

While having a firewall is a fundamental protection for companies, there are ways that a system can be compromised from within, says Tan, such as when the wireless Internet network is shared by crew and passengers on board a vessel. "They may need additional firewalls or an intrusion detection system to detect attempts to intrude into the network. They will also need protection against malware or an e-mail gateway system to check for malicious content because the firewall will not stop an e-mail containing malware from entering the system," he says.

There needs to be greater awareness of maritime cyber security threats among employees to ensure that they do not unwittingly open e-mail attachments containing viruses or click on suspicious links.

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pull factors

Egil Rensvik, Science and Technology Counsellor at Innovation Norway, tells Desmond Ng what makes Singapore tick

Norway and Singapore have a long history of working together in maritime development, research and education. The two also have extensive trade links. Since the first Norwegian company set up office in Singapore more than 150 years ago, there are now more than 200 such companies with offices here, mostly in the maritime and offshore sectors.

In April 2015, the Maritime and Port Authority of Singapore (MPA) and the Research Council of Norway signed a Memorandum of Understanding (MOU) to renew their bilateral agreement on maritime education, training, and research and development for another three years until 2018. Now into its sixth term since the MOU was first signed in 2000, the current framework has been expanded to include an international joint call for proposals in maritime research to facilitate collaboration and knowledge exchange between research institutions in Singapore and Norway.

In continuing that tradition, Science and Technology Counsellor Egil Rensvik from Innovation Norway, the Norwegian government agency that supports enterprises, works closely with Norwegian companies keen to do business here to spearhead collaborative projects and promote his country's technological knowledge. He shares what makes Singapore an attractive destination for investors and a hub for innovation.

TELL US ABOUT YOUR ROLE IN ESTABLISHING STRONG RELATIONS AND BUSINESS OPPORTUNITIES FOR NORWEGIAN COMPANIES IN ASIA.

I wear three different hats. I represent Innovation Norway at the Norwegian Embassy in Singapore. I also represent the Research Council of Norway and the Norwegian Marine Technology Research Institute.

Norway is an innovative country. We have developed many products, but what we see now in Singapore is a focus on start-ups, innovation, new technology and solutions. We work with Norwegian companies to set up offices here and we meet with shipowners and look for partners.

What we have done in Innovation Norway is a training programme called Technology Incubator Asia or TINC Asia. This is where start-ups from Norway come to Singapore and learn about business practices and the Asian culture. So far, six to eight companies have embarked on this programme over the last two years; some are maritime start-ups and some are IT-based.

HOW DID NORWAY AND SINGAPORE FORGE SUCH CLOSE WORKING TIES IN THE MARITIME SECTOR?

Singapore is a gateway to Asia, while Norway has been an early trader here. Norwegian ship classification society Det Norske Veritas (now DNV GL) first established their office here about 150 years ago.

For Norwegian companies, it is important to find good partners, which we did among universities and research institutes here. In fact, in 2014, there were several delegations from Norway, including universities, which looked at collaborating on projects with the National University of Singapore and the Nanyang Technological University.

WHAT ARE THE AREAS THAT WE CAN COLLABORATE ON?

In terms of offshore oil and gas, Singapore is moving up the value chain to be a provider of more advanced technology. When you are competing with other countries like Vietnam and China, you have to go up the value chain with higher value processes. That is the way Norway has moved, and Singapore is moving there too. We can find some interesting areas for collaboration when we are at the same level.

We also see Singapore as a bunkering hub for maritime fuels. The next-generation shipping fuel will be liquefied natural gas (LNG), which is cleaner than traditional fuels, and it will be a huge opportunity. I know that the Singapore Government is looking in that direction and planning for it. I hope Norwegian companies can see opportunities in that market.

We have promoted Norwegian companies because we have more than 15 years' experience using natural gas as a fuel and power source. We are discussing with MPA how and when we should implement the bunkering of LNG in Singapore.

Another area of common interest is in vessel traffic monitoring to avoid accidents and oil spills in the sea. One example is to improve and simplify the communication between vessel traffic service centres and vessels based on international standards.

WHAT IS SINGAPORE'S CHALLENGE?

Singapore is competing with other countries in the region. It is a high cost country and it is very expensive to be here. Norwegian companies sometimes ask how many Norwegian expatriates they can afford to send here due to the high cost of living. They have to accept that they have to pay for housing and salary for their

PHOTOGRAPHY: JASPER YU

employees. Norway, being a high cost country, has the same challenge.

WHAT ADVICE DO YOU HAVE FOR NORWEGIAN COMPANIES KEEN TO DO BUSINESS HERE AND IN THE REGION?

You have to be patient when you go into the market. There is more emphasis on building a relationship first. You have to show the client that you have a long-term perspective in the market and that they can rely on you in the future. Norwegians are also very open and straightforward in communicating with clients. The Asian culture is a bit different. It is more hierarchical. You have to know who you are dealing with in the company, whether it is the decision maker or the technical people.

TELL US ABOUT YOUR EXPERIENCE WORKING IN SINGAPORE. WHAT DO YOU LIKE ABOUT THE COUNTRY?

It has been a terrific and wonderful experience and I have learnt a lot. It is a vibrant environment with things popping up all the time. You have to be around to meet people as there are always new projects and ideas. It is starting to be a little bit like Silicon Valley in the United States where you meet people, get together and form new ideas and projects. I like the food. I like Chinese food and chilli crab. I also like the climate and the warm weather. It is also a good place from which to explore the region.

DO YOU MISS NORWAY?

I have been lucky in that I can go back three or four times a year for meetings. My kids are grown up and back in Norway. But my wife is having a good time here and we have some Norwegian friends here too. When I return to Norway, I visit my family, but I always look forward to coming back to Singapore.

new beginnings

Former Secretary-General of the International Maritime Organization Koji Sekimizu shares his thoughts on the maritime industry as he looks back on his time in office

Koji Sekimizu, the seventh elected Secretary-General of the International Maritime Organization (IMO), stepped down from his post at the end of his four-year term on Dec 31, 2015 for personal reasons. Sekimizu, 63, started his career as a ship inspector with Japan's Ministry of Transport, and joined IMO as Technical Officer in the Sub-Division for Technology, Maritime Safety Division, in 1989. He was elected as the Secretary-General of the IMO in 2011, and assumed his post in January 2012. At the IMO, he was involved in the development of several key conventions on maritime safety and security, anti-piracy and sustainable shipping. During his last visit to Singapore in September 2015 as Secretary-General of the IMO, Sekimizu attended the inaugural Future-Ready Shipping 2015 conference. The two-day event is a joint IMO-Singapore initiative dedicated to maritime technology transfer between countries and capacity-building worldwide. He shares with Singapore Nautilus ***his take on current issues confronting the maritime industry, as well as its future challenges.***

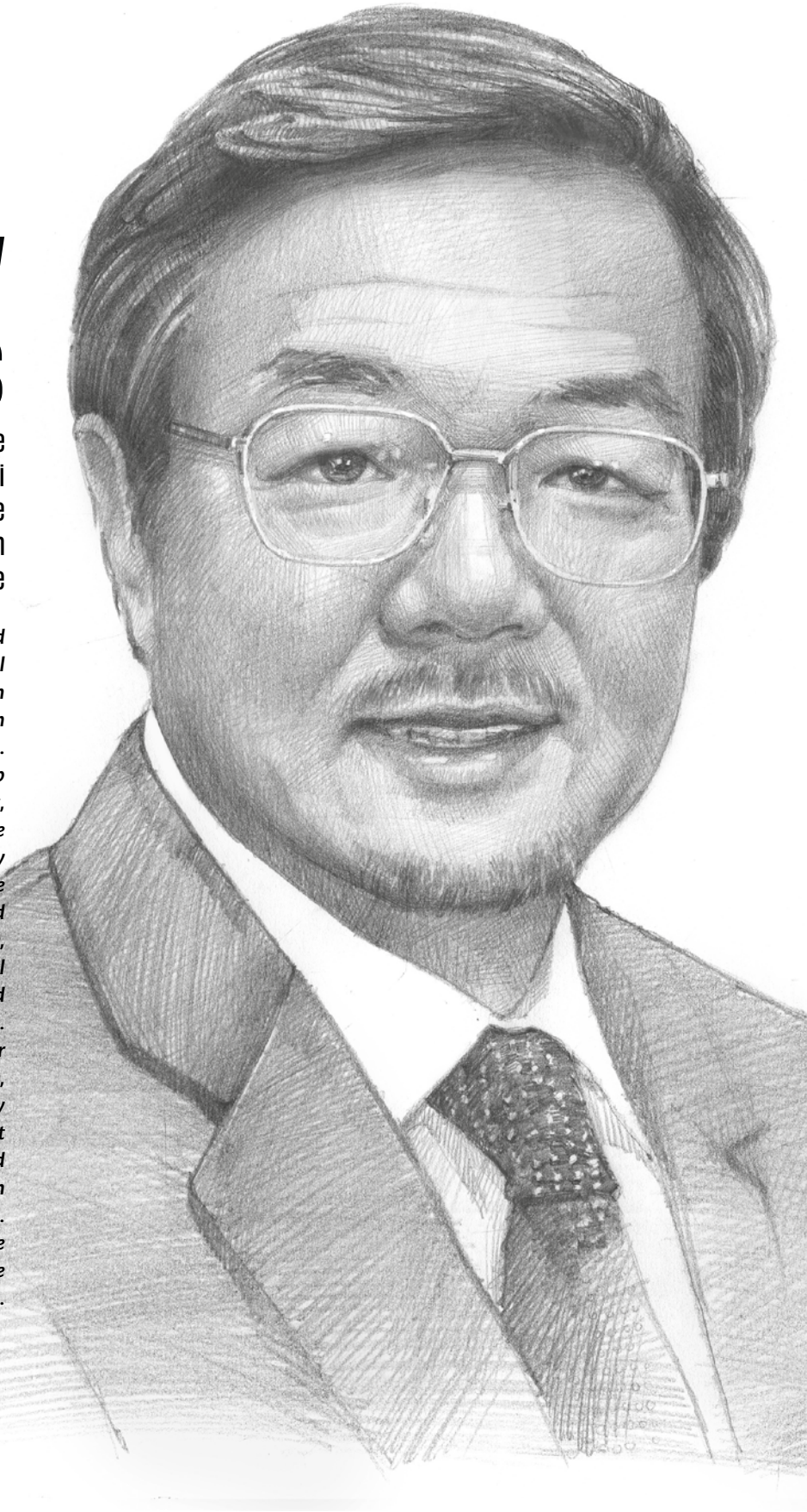


ILLUSTRATION: SZEMIN THAM

HOW WOULD THE INCREASING EMPHASIS ON ENVIRONMENTAL SUSTAINABILITY IMPACT THE SHIPPING INDUSTRY? WHAT CHANGES DO YOU FORESEE?

When talking about sustainability, it is always important to remember that it has three dimensions, namely social, economic and environmental. There can be no doubt that the emphasis on environmental sustainability has already had an impact on the shipping industry.

IMO has also responded by developing regulatory measures that reflect the increasingly higher expectations that society as a whole now has on safety and environmental performance. Examples of measures adopted include those aimed at improving the safety of oil tankers, such as the "double hull" amendments – which resulted in a dramatic decline in oil spills from oil tankers – the steps taken to prevent the transfer of invasive species by managing ships' ballast water, and the adoption of stringent technical standards surrounding polar navigation.

These measures necessitate changes for the shipping industry, and are reflected in the way ships are designed, built and operated. They also have clear implications for seafarer training, which needs to adapt and develop to ensure the human element of shipping is also equipped to meet these new challenges.

We will see this emphasis on sustainability continue and strengthen. Many in the shipping industry have embraced this already and the far-sighted will eagerly take on the opportunity to develop a new breed of super efficient ships that will be better for the environment, better for the economy, and better for the shipping industry.

It is always hard to predict the future but international shipping will need to look closely at how it can contribute towards meeting the challenges set by the United Nations' Sustainable Development Goals, which were formally adopted in September 2015.

WHAT ROLE CAN TECHNOLOGY PLAY IN ENABLING SUSTAINABLE SHIPPING? HOW HAS THE IMO ENCOURAGED THE TRANSFER AND IMPLEMENTATION OF ENVIRONMENTALLY SUSTAINABLE TECHNOLOGY FOR THE MARITIME SECTOR?

Utilising new technology and innovation is essential if shipping is to be sustainable. The advances in technology need to be put to good use. It is also something that many shipping companies are keen to utilise as technology can often bring greater efficiency, and therefore it makes commercial sense.

IMO's new emphasis in recent years on goal-based requirements and provision for alternative technologies to meet required standards is one way in which the regulations themselves allow for and even promote new technology and innovation. For example, IMO has set non-prescriptive regulations for the mandatory Energy Efficiency Design Index for new ships, so that ship designers are free to use technological innovation, imagination and blue-sky thinking to meet the new requirements and still achieve the most cost-efficient solutions.

A whole gamut of technology advances is likely to play a part in shaping the ships of the future. "Smart ships" will incorporate communications and advanced sensor technology into the operation of ships. Nanotechnology may lead to enhanced anti-corrosion materials and newer, lightweight but incredibly strong materials for ship structures and ship parts. The drive for sustainability as well as the economic need to produce smarter, cleaner ships will catalyse this kind of innovation.

IMO is working proactively to encourage technology transfer in the maritime sector. The signing of the Global Maritime Energy Efficiency Partnerships (GloMEEP) project, which aims to promote a low carbon maritime sector by supporting increased uptake and implementation of energy-efficient measures in shipping, is a good example of IMO's efforts in this area. IMO will execute this Global Environment Facility (GEF)-funded GloMEEP project in partnership with the United Nations Development Programme (UNDP).

HOW WOULD YOU RATE THE SUCCESS OF SUCH EFFORTS? WHAT MORE DO YOU THINK CAN BE DONE TO ACCELERATE THE TRANSFER AND IMPLEMENTATION OF SUCH TECHNOLOGY?

It is too early to evaluate the GloMEEP project but IMO has experience in successfully realising global projects to support the implementation of adopted regulations. A specific example would be the GEF-UNDP-IMO GloBallast Partnerships Programme, which is assisting developing countries to reduce the transfer of harmful aquatic organisms and pathogens in ships' ballast water and implement the IMO Ballast Water Management Convention.

For developing countries, barriers to

"IN THE LONGER TERM, SHIPPING HAS GREAT CAUSE FOR OPTIMISM, WITH A STRONG FUTURE AHEAD OF IT. TO SECURE A SUCCESSFUL AND SUSTAINABLE FUTURE, SHIPPING NEEDS TO ATTRACT INVESTMENT AND HIGH CALIBRE PEOPLE, AND TO STIMULATE CREATIVE THINKING AND TECHNOLOGICAL INNOVATION."

KOJI SEKIMIZU, FORMER SECRETARY-GENERAL, INTERNATIONAL MARITIME ORGANIZATION

technological flows such as a paucity of knowledge, know-how, soft- and hardware, can also potentially limit implementation of energy-efficiency regulations adopted by IMO.

A key to effective implementation lies in capacity-building and IMO is addressing this aspect through its Integrated Technical Cooperation Programme (ITCP), which is designed to assist governments by helping them build the necessary capacity. This assistance is now being fine-tuned by developing individual country profiles that closely identify the precise needs of developing countries so that much more can be done in this respect.

The key to removing barriers to technology transfer is to redefine the process as technological cooperation and collaboration, especially if we are considering technology flow from developed to developing countries. We should also be encouraging not just north-south technology cooperation, but south-south and south-north technology and information flow as well.

One way to do this might be through exploring ways and means of institutionalising such technology cooperation at regional levels, with the involvement of developmental financing institutions, academia, industry and technology developers, so that a sustainable global network of maritime technology cooperation centres can be created to meet the unique needs of the maritime industry. The joint IMO-Singapore Future-Ready Shipping 2015 conference in September 2015 was an ideal platform to start discussing such ideas. I can clearly see the role that Singapore, with its technology and research and development base, could play in such a future scenario.

Projects such as GloMEEP and conferences such as Future-Ready Shipping 2015 help set the tone. It will then be up to governments, industry partners and R&D institutes to help accelerate the transfer and implementation of technology.

WHAT ARE SOME POTENTIAL AREAS OF COOPERATION AND COLLABORATION BETWEEN THE IMO AND INDUSTRY STAKEHOLDERS OR GOVERNMENT LEADERS TO SUPPORT SUSTAINABLE SHIPPING?

A particularly interesting aspect of the GloMEEP project that I have referred to above is its expected role in catalysing an innovative public-private sector partnership within the project framework through a new Global Industry Alliance for maritime energy efficiency. Participation is anticipated from leading private sector companies, including classification societies, shipowners, marine equipment suppliers, and marine consultancy and management system providers.

From the government side, 10 IMO member states have signed up to the GloMEEP project as lead pilot countries. The lead pilot countries will be supported in taking a fast-track approach to pursuing relevant legal, policy and institutional reforms, driving national and regional government action and industry innovation to support the effective implementation of IMO's energy efficiency requirements.

In terms of sustainable development goals, we will be looking to ensure that our broader technical cooperation programme fully reflects the aims and ambitions of those goals. We already have a large number of partnerships with governments, regional bodies and shipping industry organisations to support our technical cooperation programme. Ultimately, IMO's ITCP is, broadly speaking, aimed at supporting a sustainable maritime transportation system.

WHAT ARE YOUR PLANS AFTER LEAVING YOUR POST?

I have deliberately avoided making specific plans. But I have spoken openly on my intention to return to Japan and devote my time to my wife and provide for her care in this new chapter for us.

TAP FOR MORE

the green vanguard

Rahita Elias maps out how ship classification society ClassNK is preparing for an environmentally responsible future in the maritime industry

Japanese ship classification society Nippon Kaiji Kyokai, known as ClassNK, is forging ahead in the drive to take the shipping industry from simply operating eco-friendly ships to practising eco-shipping and eco-logistics.

Yasushi Nakamura, Representative Director and Executive Vice President of ClassNK, says: "For ClassNK to turn this road map into a reality, we need the cooperation of the industry. While independent research is an invaluable tool, developing solutions together with the industry means that we can pool expertise from a range of different sectors, allowing us to develop technology that is fit for purpose."

Through its Joint R&D for Industry Program, it has developed a host of hardware-related eco-ship technologies such as air lubrication systems, hybrid turbochargers, super-low friction anti-fouling paint and exhaust recycling systems for large slow-speed diesel engines. ClassNK is also enabling eco-shipping through software solutions such as voyage optimisation software ClassNK-NAPA GREEN and preventive maintenance software ClassNK CMAXS.

"At the moment, these technologies optimise performance on a ship-to-ship basis. However, these technologies, together with the recent establishment of the Ship Data Center, have created opportunities for a more holistic approach to optimisation; in other words, the road map to eco-logistics," says Nakamura, who also heads the Ship Data Center.

The centre, which opened in Tokyo, Japan in December 2015, allows stakeholders to store and manage vast amounts of sensitive data such as vessel performance, machinery conditions and weather conditions without compromising security. This opens up new possibilities for the use of such data.

"We will be able to see not only what needs to be done to optimise a vessel, but what can be done to optimise the operations on an entire fleet. Essentially, data from the industry will be converted into greater efficiency across the board," Nakamura explains.

"Never before has the industry had a platform that secures such diverse data with the aim of improving vessel efficiency through broad-ranging

GRAPHIC: 123RF

ABOVE **The S$8 million Maritime Energy Test Bed at the Nanyang Technological University is South-east Asia's first advanced maritime energy test facility dedicated to developing greener maritime energy solutions.**

analysis. That is why we cannot predict how far-reaching the effects of the Center will be. The Center will also play a key role in helping owners comply with upcoming regulations."

ECO-DRIVEN

Overall, ClassNK's research and development (R&D) efforts are geared towards developing more efficient and eco-friendly energy solutions. Among these is the carbon fibre reinforced plastic (CFRP) propeller developed by Nakashima Propeller in cooperation with various Japanese organisations and companies, and supported by ClassNK. This ultra-lightweight propeller has been successfully installed as the main propeller on small-sized tankers and ferries for domestic use.

During sea trials, the CFRP propeller achieved increases in propulsion efficiency as well as significant reductions in on-board vibrational noise while maintaining its durability. If the propellers are used on merchant vessels, it can lead to better fuel economy and greater efficiency in operations.

"The challenge now is to see if this technology can be applied to larger vessels, which could pave the way for even greener operations for the world's merchant fleet," says Nakamura.

ClassNK, which is both a classification society

and a regulator, is also collaborating with various Singapore organisations in R&D.

In early 2015, it signed a Memorandum of Understanding (MOU) with the Maritime and Port Authority of Singapore (MPA) to collaborate on R&D for maritime technologies, which will enhance ship safety and environmental sustainability. The MOU involves structural integrity and fatigue-related research for safe and reliable ship construction and operation.

The collaboration will also look at applying data analytics to help detect anomalies in machineries in real time, as well as the real-time monitoring of emissions and condition-based monitoring of structures for smart ship and machinery operations. It also paves the way for applied research in emission control and alternative fuel engine technologies, as well as the development of marine renewable energy.

The MOU signing ceremony also marked the opening of the new ClassNK Global Research and Innovation Centre (GRIC) in Singapore, its first research centre outside Japan. The GRIC will partner the industry, academia and government agencies in Singapore and around the world on various research projects, including the development of an exhaust gas cleaning system and a feasibility study for a marine renewable energy test site in Singapore.

ClassNK is also involved in the establishment of South-east Asia's first advanced maritime energy test facility, the Maritime Energy Test Bed (METB), at the Nanyang Technological University (NTU). The METB will be a platform for scientists and engineers to develop innovative eco-friendly maritime technologies.

Nakamura says: "The establishment of our GRIC in Singapore reflects our commitment to support global R&D for the benefit of the entire maritime industry. ClassNK is dedicated to securing a safer, greener future, and the METB represents the next step in our efforts to achieve this goal.

"Together with our industry and academia partners in Singapore and around the world, we hope to contribute to the advancement of future green technologies for the entire maritime industry by carrying out R&D projects utilising the METB facility."

CULTURE OF EXCELLENCE

ClassNK attributes its recent tie-ups with various Singapore-based partners in R&D to the country's high academic standards and its globally-ranked universities. Says Nakamura: "ClassNK is well aware that this culture of excellence makes Singapore a prime location for R&D, and one ripe for further development for maritime interests."

> "CLASSNK IS DEDICATED TO SECURING A SAFER, GREENER FUTURE, AND THE MARITIME ENERGY TEST BED REPRESENTS THE NEXT STEP IN OUR EFFORTS TO ACHIEVE THIS GOAL."
>
> **YASUSHI NAKAMURA, REPRESENTATIVE DIRECTOR AND EXECUTIVE VICE PRESIDENT OF CLASSNK**

But he also points out that funding is important for R&D. In this regard, Nakamura says that MPA has shown its commitment to developing Singapore as a centre of excellence for maritime R&D through a comprehensive maritime R&D framework, the S$150 million Maritime Innovation and Technology (MINT) Fund and different R&D partnerships.

ClassNK has taken advantage of the support of the MINT Fund by collaborating with NTU on two projects, the Real Time Ship Exhaust Gas Monitoring project and Zero-Emission Desulphurisation Process and Pilot Scale Demonstration project, which are expected to conclude in early 2016. Nakamura says: "This successful experience collaborating with local universities like NTU has given our GRIC an even stronger mandate for further collaboration with global partners."

Looking ahead, ClassNK is preparing itself for a future in which emission control regulations will be the norm, and the measurement and control of emissions will become key components of the industry. Nakamura adds: "There will not be one solution that will address emission regulations on sulphur oxides and nitrogen oxides, but one of the solutions we will be looking to develop is scrubber technology that incorporates novel scrubbing agents. We are now looking at more projects that will help promote environmental sustainability."

PHOTO: LIANHE ZAOBAO

growing the pie

Rahita Elias finds out how insurance market Lloyd's uses its Singapore base to extend its regional reach

On November 4, 2015, Lloyd's, the specialist insurance and reinsurance market, officially opened its new expanded offices in Singapore's central business district. In the same month, Antares Underwriting Asia (Antares Asia) joined Lloyd's Asia-Pacific hub, bringing the total number of Lloyd's syndicates here to 24.

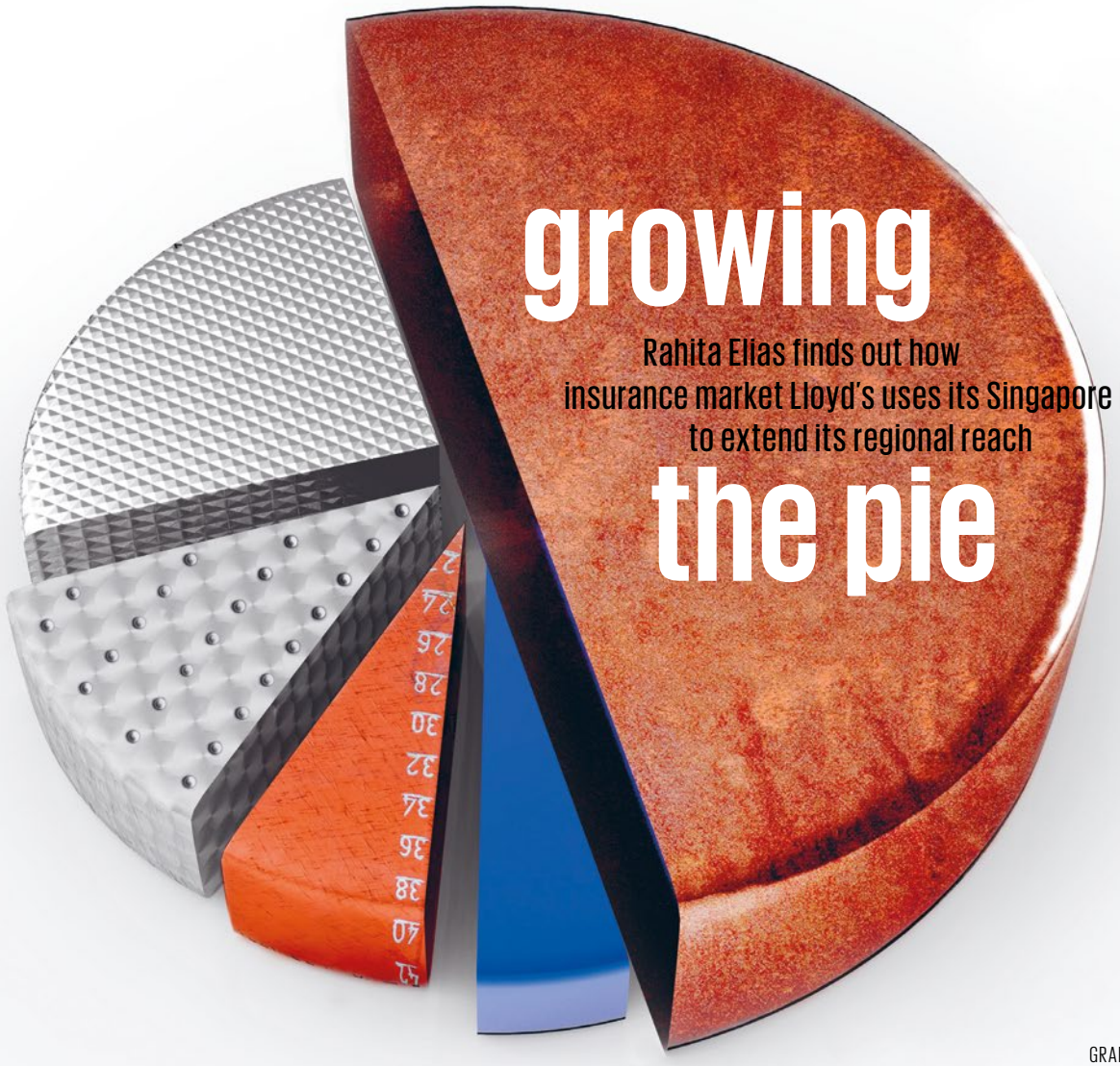
Kent Chaplin, Lloyd's Head of Asia Pacific, says the Singapore-based operation is Lloyd's largest hub outside London – some 380 people work under its roof. With its specialist underwriters, it is Singapore's largest writer of offshore premiums.

The rise of Lloyd's has been impressive and the 328-year-old giant has taken a significant portion of the pie in the short time that Singapore has been its hub for the Asia-Pacific region. Since beginning operations in 1999 with just two syndicates, the regional hub has seen premium growth of 176 per cent from 2009 to 2014, with an annual income reaching US$622 million (S$875 million) in 2014. Specialist marine and offshore energy insurance and reinsurance remain at the heart of Lloyd's offering and continue to be significant income generators.

"The marine and offshore energy classes of business make up a third of the total business written by Lloyd's here and it is an important sector for us," says Chaplin.

ENABLING GROWTH

Lloyd's uses its Singapore base as its international Asia-Pacific insurance and reinsurance hub with about 90 per cent of its income generated offshore from countries across the region. Singapore originated business makes up the remaining 10 per cent.



GRAPHIC: 123RF

ABOUT LLOYD'S ASIA (AS AT JAN 2016)

- 24 syndicates
- 21 service companies
- US$622 million (S$875 million) in annual income in 2014
- 31 per cent of total business from marine and offshore energy sectors
- 176 per cent growth in gross written premiums from 2009 to 2014
- 90 per cent of income from regional markets outside Singapore

ABOVE **Maritime and Port Authority of Singapore Chief Executive Andrew Tan (centre) with Kent Chaplin (second from right), Lloyd's Head of Asia Pacific, during a visit to Lloyd's new office in Singapore.**

"We set out to build a truly international model replicating the classes of business offered in London. Complementing that expertise with in-depth local market knowledge, our 24 syndicates now write a diversified international portfolio of Asia-Pacific business. Singapore, as an attractive place to do business, has enabled our growth," Chaplin says.

For Lloyd's, Singapore's political stability is a major plus point for its decision to base its regional hub here.

"For a large international organisation to invest heavily in another part of the world, certainty and stability are very important. Singapore has been very robust on both the economic and political stability fronts," says Chaplin.

The Lloyd's model is a unique one. Unlike many other insurance brands, Lloyd's is not a company but a marketplace where members join together as syndicates to insure risks. Managing agents sponsor and manage these syndicates. When Lloyd's first started operations, the Monetary Authority of Singapore (MAS) introduced a regulatory framework to specifically accommodate the market structure of Lloyd's. "That was the biggest enabler because it allowed Lloyd's to set up as a 'market' in Singapore and its underwriters can write on the same sort of terms as London but from an Asian base," says Chaplin.

In April 2015, the MAS allowed Lloyd's syndicates to appoint insurance intermediaries (or coverholders) – a key distribution channel for Lloyd's underwriters – both within and outside Singapore, which further enhanced Lloyd's regional operation. Chaplin says: "Lloyd's is very grateful for the support from the Maritime and Port Authority of Singapore (MPA) and the MAS, and we will continue to work closely with both organisations to further develop our base here as the regional hub for the Asia-Pacific.

"We look forward to working with MPA on its various talent development initiatives, support its training and development programmes and to further our relationship with MPA to benefit the maritime cluster in Singapore."

He adds that MPA's initiatives aimed at developing a pipeline of talented local marine insurance specialists have enabled Lloyd's to recruit high quality talent in Singapore. These high potential individuals receive training and development, including a residency in London during which they gain a global view and first-hand experience of working in the world's largest insurance hub.

"This combination of local and global work experience gained on the Lloyd's training programme provides these individuals with the skills to implement strong underwriting practices in Singapore, which in turn, will further enhance Singapore's status as a reinsurance hub in the region," he says.

LATEST ADDITIONS

Antares joined the Lloyd's platform in Singapore in 2015 and received approval from the MAS and Lloyd's to begin underwriting from Nov 1.

Antares Asia focuses on specialist insurance and reinsurance lines for marine, including hull, cargo, specie, marine liabilities and offshore energy. It also targets property and speciality insurance and reinsurance.

Yeo Li Shan, Chief Executive Officer of Antares Asia, says: "Our presence in Singapore provides us and our client base with a gateway to Asia."

She adds that Antares Asia plans to leverage the Lloyd's platform to its advantage. It also plans to extend its reach to other countries across Asia under the Lloyd's umbrella.

Aspen Insurance, the latest syndicate to join Lloyd's Singapore platform, received approval from Lloyd's and the MAS to begin underwriting from January 2016.

The establishment of Aspen's insurance presence in Singapore is consistent with Aspen's strategy of leveraging its existing strength and expertise in certain product lines in its target markets globally.

Desmond Ng finds out how the International Association of Marine Aids to Navigation and Lighthouse Authorities is committed to creating a safer and more efficient maritime standard through coordinating improvements to aids to navigation worldwide

safety in harmony

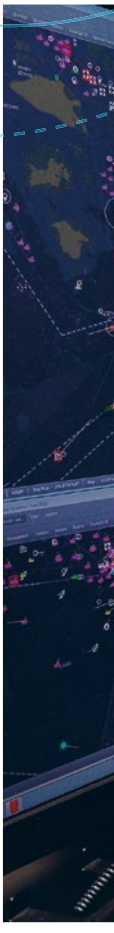
Our oceans provide us with critical resources, and are also the primary channels for the transport of goods that are essential to our daily lives. But the maritime environment can also be unpredictable. Technology, however, has enabled us to mitigate this challenge and gain better control of our marine resources.

Whether on the bridge of ships, at the container yards of ports or on the decks of oil platforms, technology has made our seas safer and our vessels more efficient, while protecting our marine environment.

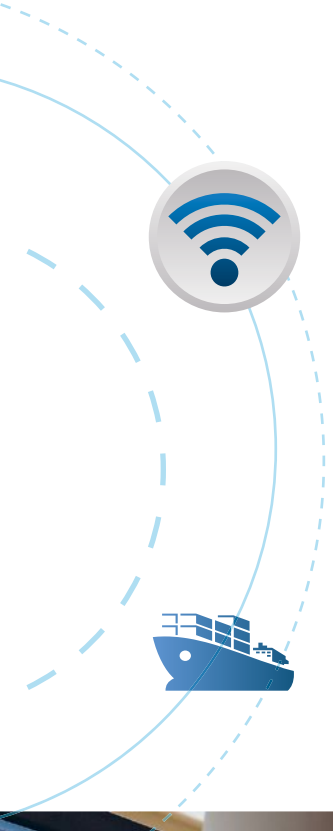
On the issue of safer passage, Francis Zachariae, Secretary General of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), notes a peculiar situation present in the maritime industry. He says that even though there are more collisions at sea than in the air, the technology for collision avoidance employed in the aviation industry is far more sophisticated than in the maritime one.

IALA is a non-profit organisation that seeks to foster the safe and efficient movement of vessels through the improvement and harmonisation of marine aids to navigation worldwide.

One reason why the maritime industry is trailing the aviation sector in collision avoidance technology may be due to a lack of pressure for accountability from the public and other



RIGHT **Managing traffic in the Singapore Strait with the help of vessel traffic services.**



stakeholders, as more lives tend to be lost in aircraft accidents than in shipping incidents, says Zachariae. He was in Singapore in October 2015 to attend a training seminar on risk management for maritime and port officials involved in the design, marking and management of waterways. The seminar was jointly organised by MPA Academy, the training arm of the Maritime and Port Authority of Singapore (MPA), and the IALA World-Wide Academy (WWA), which delivers training and capacity building.

Recent high-profile passenger ferry accidents such as the sinking of the Italian cruise ship *Costa Concordia* in 2012 and the *Sewol* ferry disaster in South Korea in 2014 have put the spotlight on the role of human factors in marine accidents, says Zachariae, who points out the need to eliminate human error through better use of technology.

Currently, there is a lack of a fully integrated and harmonised navigation system in use in the maritime industry. The business relies on a combination of tools such as the Automatic Identification System (AIS), marine radar and vessel traffic services (VTS) to prevent collision in waterways. The AIS is an automatic tracking system used on ships to identify and locate vessels by electronically exchanging data with nearby vessels, AIS base stations and satellites. A VTS is a marine traffic monitoring system for port authorities to keep track of vessel movements in a limited geographical area.

He says: "We can be safer. Now, it is still a man starting the engine of the vessel and doing the steering in a quite-low-tech fashion. We need to introduce new technological tools to communicate with – for instance, VTS centres."

IALA is supporting the International Maritime Organization's push for e-Navigation, which will significantly improve the safety and efficiency of ship navigation across the world by coordinating marine navigation systems and supporting shore services. IALA is involved in implementing the framework for e-Navigation for shore systems, and ship-to-shore and shore-to-ship services

GRAPHICS: 123RF PHOTO: BERITA HARIAN

IALA IS SUPPORTING THE INTERNATIONAL MARITIME ORGANIZATION'S PUSH FOR E-NAVIGATION...ACROSS THE WORLD BY COORDINATING MARINE NAVIGATION SYSTEMS AND SUPPORTING SHORE SERVICES.

through the publication of manuals, guidelines and recommendations for maritime officers.

Zachariae says: "It's about connectivity. The ships are connected to shore and also to other ships. If two are turning, they may look like they will collide. But if you exchange your routes, you know what to expect, and there's no danger as it takes the guesswork out."

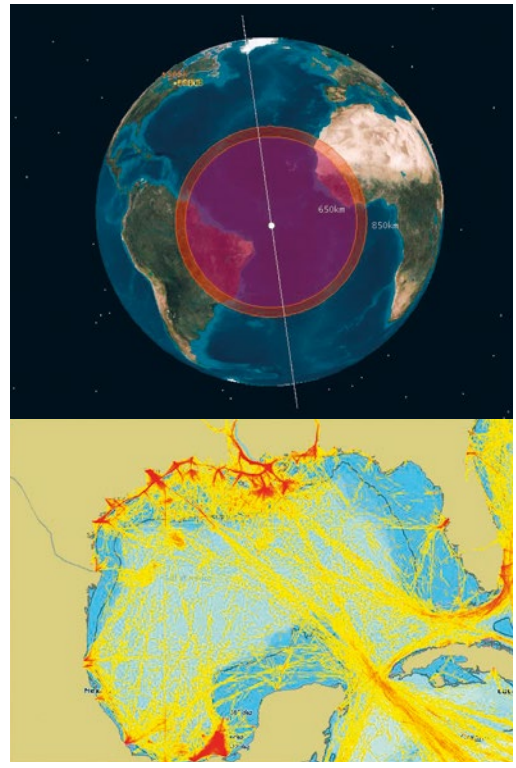
ENHANCED SAFETY

While embracing technology is key to a safer and more efficient maritime industry, Zachariae recognises the challenge in convincing some maritime stakeholders to embrace scientific know-how that will take the industry into the digital age.

"The mariner and captain may see it as too complicated, while shipowners need to see the business advantages of the technology. Some shipowners may think it's expensive and may not invest in it. They have to see that the new technology is more efficient and helps them save money and fuel," he says.

Finding good technology is also a challenge, and this is where countries can do more to communicate and share their expertise with each other when it comes to new stuff, says Zachariae. IALA has made it its mission to harmonise aids to navigation systems and related services – such as e-Navigation, VTS and emerging technologies – through international cooperation and establishing a global standard, while building an efficient global network that contributes to the safety of navigation through capacity building and the sharing of expertise.

One of IALA's most important contributions is in consolidating the different systems of buoyage used for navigation into the universal IALA Maritime Buoyage System. Up to 1976, there were more than 30 different systems in use throughout the world, some of which contradicted each other. IALA implemented one that operates in two regions, depending on geographical location.



FROM TOP **The view from an Automatic Identification System (AIS) satellite; Traffic patterns captured via satellite-based AIS in the Gulf of Mexico shows the concentration of marine traffic routes.**

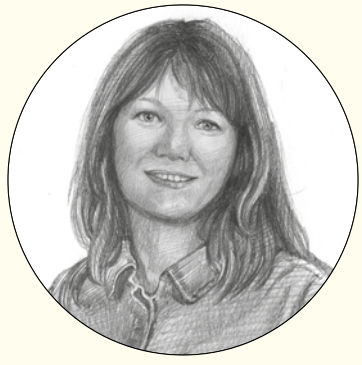
Another aspect of its work involves ensuring that all coastal states have navigation systems that meet international best practices. The IALA WWA, established in 2012, fulfils this role by providing capacity building to states that have difficulties meeting international standards by conducting talks and seminars to educate them. "We help a state that asks for and needs the help to get a navigation system that meets international requirements," says Zachariae.

The risk management course in Singapore is one way in which the IALA WWA seeks to enhance maritime safety through education and training. It provides maritime and port officials with training in using a risk management software it has developed. This can predict the volume of ship traffic on a particular stretch of a waterway, and calculate the risk and number of ships that might run aground at a particular location.

Citing the example of the Danish Straits, a deepwater route where many ships used to run aground at a particular location about 10 years ago, Zachariae says: "We used the risk management toolbox and saw that the problem was the ships turned too late and hit the ground."

After pinpointing the problem, navigation aids were placed to ensure that ships turned earlier, and no incident has occurred since then.

charting a green course



CLOCKWISE FROM TOP LEFT Hassiba Benamara, Economic Affairs Officer, Division on Technology and Logistics, United Nations Conference on Trade and Development (UNCTAD); Captain Raphael Baumler, Associate Professor, World Maritime University; Beate Kvamstad-Lervold, Vice President Maritime, Norwegian Marine Technology Research Institute (MARINTEK); Dr Sanjay Chittarajan Kuttan, Director and Country Manager, Clean Technology Centre, DNV GL.

The inaugural Future-Ready Shipping 2015 conference was held in Singapore in September 2015 and provided a platform for maritime leaders and professionals to discuss the removal of barriers to energy-efficient technologies in international shipping. Speakers at the conference share with Audrina Gan their take on promoting and sustaining capacity building and technology cooperation

SINGAPORE NAUTILUS (SN): **WHAT WERE YOUR OBJECTIVES IN SPEAKING AT THE FUTURE-READY SHIPPING 2015 CONFERENCE?**

DR SANJAY CHITTARAJAN KUTTAN (SCK): The shipping industry has the unique ability to influence the impact of greenhouse gas emissions on the environment. So I am here to provide clarity on how technology can be transferred, and how the shipping industry can move forward in a concerted manner to reduce greenhouse gas emissions in the future.

CAPTAIN RAPHAEL BAUMLER (RB): My main objective is to present how maritime education can facilitate technology transfer and enhance capacity building worldwide. Capacity building is already something that the World Maritime University does for developing countries. We are also trying to expand opportunities in energy management, so this is a good platform for us to present our projects and demonstrate to industry partners and the government sector our capabilities in these areas.

BEATE KVAMSTAD-LERVOLD (BKL): My objective is to meet up with local and global industry partners who are interested in energy-efficient technologies, and in reducing greenhouse gas emissions in the maritime sector.

HASSIBA BENAMARA (HB): The conference was timely, in view of the 2030 Agenda for Sustainable Development, and the UN Framework Convention on Climate Change 21st Conference of the Parties in Paris. It provided an opportunity to address the important issue of sustainable and carbon neutral shipping, while considering ways in which technology can help shipping improve its energy and environmental performance.

Q&A

SN: WHAT ARE SOME OF THE INSIGHTS YOU GAINED FROM PREPARING FOR THIS CONFERENCE?

SCK: We tend to think of technology transfer as a technical issue but there are non-technical aspects that prevent the adoption of technology that needs to be addressed. For instance, we need to look at what is the right policy to use, and how to factor in the costs of carbon pollution and environmental impact in the overall pricing structure of green technology adoption. The benefits have to be reflected when we are doing the cost analysis.

RB: Technology transfer has been happening in the shipping industry for several years, so it is very interesting to hear about both the successful and the failed cases. Not every idea will be fruitful. Knowing where we have failed is key to helping us move ahead and to avoid being trapped in the unsuccessful areas.

BKL: I gained a good overview of how the international partners have contributed to technology transfer in the industry. I also learnt about the impressive results by the different companies to achieve their goal of reducing carbon gas emissions.

HB: I was able to gain a better understanding of the relevant considerations that influence technology uptake in shipping. Various factors, from the economy to the environment to finance and regulation, are at play, including the use of technology in contributing to energy efficiency and climate friendliness. These factors are interlinked, and understanding their influence on technology uptake in transport, particularly in shipping, is important.

SN: HOW DOES YOUR PRESENTATION CONTRIBUTE TO THE SHIPPING INDUSTRY'S UNDERSTANDING ABOUT GREEN TECHNOLOGY TRANSFER AND CAPACITY BUILDING?

SCK: I hope that people will realise that there are a lot of platforms out there that can facilitate technology transfer between buyer and seller.

RB: I hope that all the different partners will understand that they have to work together. They need to forego the industry mindset in which everything is kept secret and people try to conduct initiatives on their own. Today, we need to exchange information and work together towards climate change because everybody will be affected by it.

BKL: I hope my Norwegian perspective can contribute to the global discussion on climate change. In Norway, we work closely with the industry and universities to achieve common goals on this problem. The way that we handle climate change issues may also provide suitable reference points for other parts of the world.

HB: By underscoring the nexus between economic growth, merchandise trade, and demand for maritime transport services, including shipping, I hope the audience has been able to gain a broader perspective that allows for informed policy choices and decisions when considering technology transfer and uptake in shipping.

With global economic and merchandise trade growth set to continue, the shipping industry will more than ever require technology and other means to ensure that it continues to grow in a sustainable manner.

SN: FOLLOWING THE DISCUSSIONS AT THE CONFERENCE, WHAT CONCRETE STEPS CAN BE TAKEN TO ENCOURAGE THE ADOPTION OF ENERGY-EFFICIENT MARITIME TECHNOLOGIES?

SCK: I hope there will be serious and committed collaborations between the stakeholders, and that they truly want to see the impact of these technology transfers.

RB: The industry already understands the benefits of adopting energy-efficient technologies. But with the volatility of the fuel price and the huge number of new technology solutions, there is still a lot of ongoing debate about energy efficiency among industry players.

The industry should not only consider the type of technology available, they also need to think about how to apply this technology correctly. You have other considerations apart from energy-efficient technology. You also have to think about the operational aspects of introducing new technology on ships, and related costs for staff and vessel maintenance.

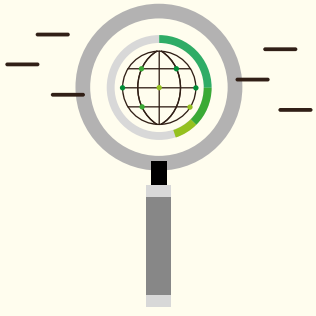
BKL: The next step would be for international rules and regulations on climate change to be based on real cost-benefit analysis for both the environment and businesses.

We also need to do more research into ship engines and propellers, as well as on logistics and how to perform good data analysis on energy-efficient solutions.

HB: As a first step, promoting and enhancing capacity building efforts, knowledge transfer and information sharing activities through workshops, seminars, training events, guides, best practices and toolkits will be key. These activities will help

"THE CONFERENCE IS A MILESTONE, AS IT BROUGHT TO THE FORE AN IMPORTANT ISSUE THAT WILL REMAIN ON THE AGENDA FOR MANY YEARS TO COME. IT WAS VERY SUCCESSFUL IN BRINGING TOGETHER RELEVANT STAKEHOLDERS, IDENTIFYING ISSUES AT STAKE, RAISING AWARENESS AND EXPLORING A POTENTIAL WAY FORWARD."

HASSIBA BENAMARA, ECONOMIC AFFAIRS OFFICER, DIVISION ON TECHNOLOGY AND LOGISTICS, UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT (UNCTAD)



to raise awareness, improve understanding of key concepts, as well as build the knowledge and expertise required to acquire, implement, operate and manage the relevant technologies in shipping.

SN: TO BUILD A MARITIME INDUSTRY THAT IS GREEN, SUSTAINABLE AND ENERGY EFFICIENT, WHAT ARE SOME KEY AREAS FOR FUTURE COLLABORATION BETWEEN DIFFERENT STAKEHOLDERS?

SCK: The cost tension is very real for the shipping industry at this point in time. With climate change already happening, we may be able to save all the money we want today but we won't be able to do trading tomorrow if we do not address the challenges in a collaborative manner.

The industry needs to come together and think about a sustainable world for trading. At the moment, we are not pricing the cost of carbon correctly. But if this is priced correctly, the cost-benefit will bring better technologies on board.

RB: One important area would be to collaborate with research centres or institutes of higher education. Governments also have a key role to play in such collaborations, as they can provide incentives and act as facilitators for industry and academic partners to work together.

BKL: We can work together in the areas where we have key competencies and put them together. There are different areas of expertise on ship engines, propellers and logistics that can be put together to present a holistic overview on how to achieve energy-efficient goals.

Even though the environment is important for everyone, there is also the business part to consider when it comes to adopting energy-efficient technologies. The idea of technology transfer will help to bring the industry forward.

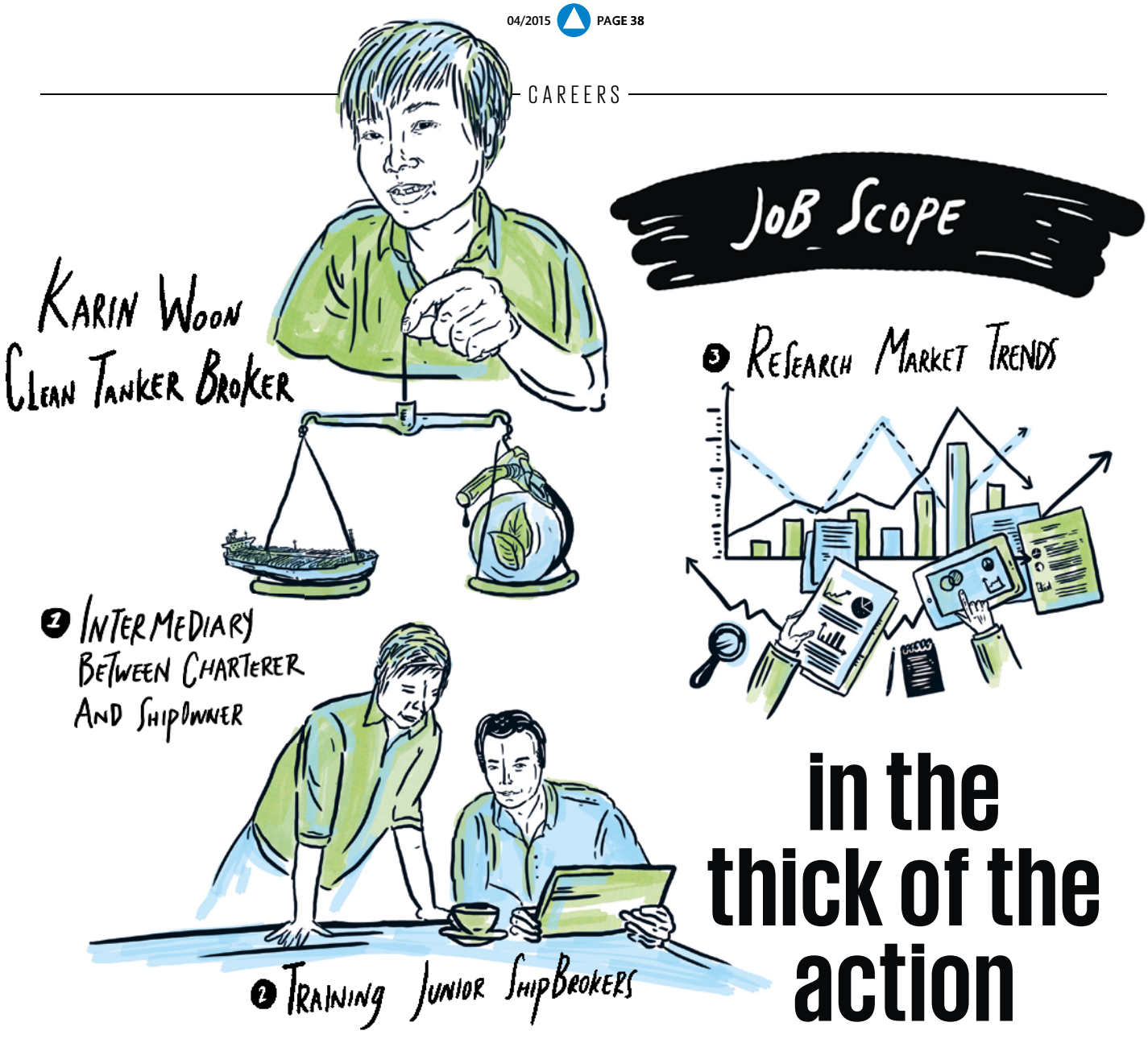
SN: IN YOUR OPINION, WHAT HAS THE CONFERENCE ACHIEVED?

HB: The conference is a milestone, as it brought to the fore an important issue that will remain on the agenda for many years to come. It was very successful in bringing together relevant stakeholders, identifying issues at stake, raising awareness and exploring a potential way forward.

It highlighted the role of effective partnerships and cooperation in facilitating technology transfer and capacity building, and in supporting sustainable and climate-friendly shipping.

For developing countries, this is an important step in the right direction.

TAP FOR VIDEO



in the thick of the action

Clean tanker broker Karin Woon sheds light on the fast and furious world of shipbroking, and what you need to get ahead in the industry

It is late afternoon on Dec 29, 2015 at the Singapore office of Braemar ACM, one of the largest chartering and sale and purchase shipbroking companies in the world. Clean tanker broker Karin Woon has a shipment of liquid cargo that needs to be moved to Japan, but offices there have already closed for the year-end holidays until Jan 4, 2016.

Woon, who has more than 15 years' experience in shipbroking, is coolly unperturbed. She says: "I don't think that there're any problems that cannot be resolved. There's always a solution. There's no challenge that cannot be overcome."

From finding contingency plans for ships being held back at ports to stepping in to calm down unhappy clients, Woon has seen her fair share of battles in the fast-paced world of shipbroking, which can find her juggling three to four cargoes at any one time.

As a clean tanker broker, she acts as an intermediary, negotiating cargo rates between clients who want to move refined petroleum products such as jet fuel, diesel and naphtha and shipowners with vessels to transport these liquid cargoes. It can cost as much as US$100,000 (S$144,000) to move cargo between two Singapore terminals, and about US$2.5 million to US$3 million to move a shipment from Singapore to places like India and Brazil.

Woon cut her teeth as a shipping clerk dealing with container and general cargo shipping after graduating with a business diploma from Ngee

ILLUSTRATION: CARMEN CHEN

Ann Polytechnic in 1995. After five years, she got bored and moved into shipbroking when a friend recommended that she try her hand at it. It proved the right fit and she has been in the sector since.

"I found a job that I actually love doing and I still love it. Not everyone can say that," she says.

CONNECTING WITH PEOPLE

A typical workday for Woon starts with a cup of coffee before she gets on the phone, calling clients to check if they have cargo that needs to be moved. She also checks that everything is going smoothly for shipments that are in transit.

She then starts matching cargoes to ships, ensuring that the ships best meet the clients' needs while also being of the right specifications to fit the terminals they are calling at, and negotiating a rate that both sides would be agreeable with.

A large part of her job involves talking to people, gathering information on cargo and ship movements and using that information to seal a deal. She says: "You have to be extremely nosy – that is a requirement of all brokers. Even when you are on the phone, you have to keep your ears out for what other people around you are saying. And if it's a slow day, you also have to talk to people."

She provides market reports too, for the research arm of the company. In addition to that, twice weekly, she draws up a list of ship positions for a specific area, such as Singapore or South Korea, and sends it out to clients.

To succeed in the world of shipbroking, networking and people skills are crucial, says Woon. She adds: "It is a people business and the value here is the people. When a broker moves, clients and cargoes move with the broker.

"Shipbrokers have a set of skills that is very special, which is to understand and observe people. Even at cocktail events, you can see brokers scribbling information on serviettes."

Being a shipbroker is a demanding job; it requires one to be contactable 24/7 to deal with problems immediately or secure business opportunities that can come up at any time. This is why Woon always carries two phones with her.

With ships moving around the clock, it is common for her to get calls at 4am from her American or European clients. It also means that she has to work even while on holiday, but she does not let the pressure get to her.

She says: "The sense of satisfaction you get from finding a ship when there isn't one available or fixing freight at a rate that your client wants is immensely fulfilling. It is very satisfying when you make your clients happy or when you have a client who calls to compliment you for a job well done. These rewards more than make up for the calls at 4am. Of course, the job also pays very well."

Despite her success, Woon's journey in the shipbroking industry has been no walk in the park. In fact, she almost quit in her first year. She says: "It is always difficult when you are new to the industry and have no contacts. You have to make cold calls, and people hang up on you all the time."

But she had a very good boss and mentor who showed her the ropes and changed her mind about leaving. Because of this experience, she now tries to help her junior shipbrokers too.

She says: "Taking in new blood, teaching them and seeing them make progress is very satisfying for me. We should as a hub take in more people and work this market. There are so many young people out there that can take the industry to the next level."

port of singapore in numbers

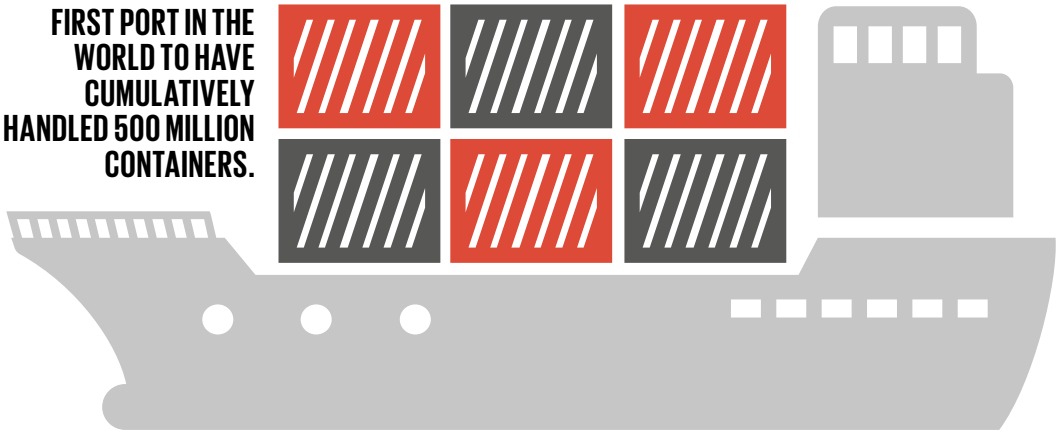
The Port of Singapore has consistently delivered a stellar performance year after year and ranks as one of the world's top ports. Here are some of its achievements.

NAMED BEST SEAPORT IN ASIA 27 X
BY THE ASIAN FREIGHT, LOGISTICS & SUPPLY CHAIN AWARDS.

One of the world's busiest ports
Handled 30.9 million containers in 2015.

Every 2-3 minutes a ship arrives in or leaves Singapore.

FIRST PORT IN THE WORLD TO HAVE CUMULATIVELY HANDLED 500 MILLION CONTAINERS.



At any one time there are about **1,000** *vessels in the Port of Singapore.*

WORLD'S BUSIEST TRANSHIPMENT HUB

SINGAPORE IS CONNECTED TO MORE THAN 600 PORTS IN OVER 120 COUNTRIES.

MEGA CONTAINER PORT IN TUAS TO HANDLE 65 MILLION TWENTY-FOOT EQUIVALENT UNITS OF CARGO ANNUALLY.

More than 45.2 million tonnes in bunker sales in 2015, enough to fill over 18,000 Olympic-sized pools.

SOURCE: MARITIME AND PORT AUTHORITY OF SINGAPORE

SINGAPORE MARITIME GALLERY

Discover Maritime Singapore

How did Singapore transform to be one of the world's leading international maritime centres? And home to the world's busiest port? Why is maritime a vital part of our past, present and future?

Find out more at maritimegallery.sg

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