WiFi and WiMAX in ports and seafarers' access to the Internet

Developments in new technology and implications for seafarers' welfare

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Preface

This report is based on findings of a research project commissioned by the International Committee on Seafarers' Welfare (ICSW) and funded by the International Transport Workers' Federation (ITF) Seafarers' Trust. The project ran from January to April 2011. [1]

The author would like to thank all those who participated in the research survey and interviews. She owes particular thanks to Johan Deleu of the Port of Antwerp; Yuanheng Kwek of the Maritime and Port Authority of Singapore; Lourens Visser of the Port of Rotterda; Cor Oudendijk of the Port of Amsterdam; Joseph Chacko of Kandla Seafarer Welfare Association, and Jorg Pfautsch of the German Seamen's Mission.

In accordance with the wishes of research participants, some respondents' identities are not specified in order to maintain their anonymity.

Introduction

"It is normal to miss your family and to sometimes feel lonely, bored, and depressed at sea, or to not be able to sleep. But somehow by sending an email or making a call, it really helps."

Filipino wiper

Communicating with home is of paramount importance to seafarers and their welfare. Extensive anecdotal evidence, such as the comment above [2], signals the positive effects communicating with home can have on seafarers' mental wellbeing while away from their family and friends for several months at a time, often working in small crews with limited shore leave. At the same time, improved communications between seafarers and their relatives seem likely to increase their cohesion.

At present, seafarers' access to the Internet and phones aboard ship is both limited and seems expensive. In his extensive study of port welfare services, Kahveci (2007: 27) cites just 16% of seafarers (N=3527) having access to emails onboard. Given the limited availability of email at sea, Kahveci reports seafarers using satellite phones as their main method of communicating with home, which are expensive, followed by personal mobiles (primarily for texting) when in range of a signal (ibid.: 30). If able to go ashore while in port, seafarers can take advantage of varying communication facilities in seafarer centres. While some centres only provide phone cards for use in the nearest public phone box (Kahveci 2010: 38), others are equipped with computers linked to the Internet, or with WiFi signals to which seafarers can connect using their own wireless-enabled devices. It is not clear what percentage of seafarers sail with personal laptops; one welfare worker interviewed during this research in the Port of Antwerp, Jorg Pfautsch, estimated almost all officers to have laptops compared to 20–30% of ratings, although he and others considered this number to be rising.

A new development affecting seafarers is mobile WiMAX, a wireless network technology that differs significantly from WiFi in the way in which it operates (see Box 1). A small minority of welfare organisations have begun to take mobile WiMAX technology on ship visits so that crew can connect to the Internet via their personal computers without having to come ashore. While there is potential for growth in the number of welfare workers taking mobile WiMAX onto ships in this way, the numbers of seafarers benefiting from the technology would remain modest.

Box 1: How does WiMAX compare to WiFi?

Although both are types of network technology that transfer data using radio waves, WiFi and WiMAX differ in the way in which they operate [7]. WiFi is a wired network that creates Local Area Networks (LANs) within which users can connect wirelessly, most commonly in order to access the Internet (although it has other uses including closed-circuit business networking). WiFi has become widely used as an affordable means of connecting to the Internet within close range of a WiFi access point. On average, WiFi typically offers a maximum range of 50m indoors and 100m outdoors. In contrast, WiMAX provides wireless reception at higher broadband levels over greater distances. Many expect WiMAX to replace broadband accessed through phone lines, cable and DSL, thereby popularising broadband access in the same way that mobile phones have transformed telecommunications. Since WiMAX uses transmitters rather than fixed lines to carry its signal, several users can connect to a transmitter even if buildings, shipping containers, trees, etc. block it. This makes WiMAX particularly useful in ports lacking fibre networks that are difficult and expensive to lay.

WiMAX is available in two spectrums of frequencies, 'fixed' and 'mobile', with mobile WiMAX – the lower frequency – having the most commercial interest to date and forming the basis of future WiMAX revisions. Fixed WiMAX is estimated to have a range of up to 50km although mobile WiMAX's range is considerably less and averages 6–7km.

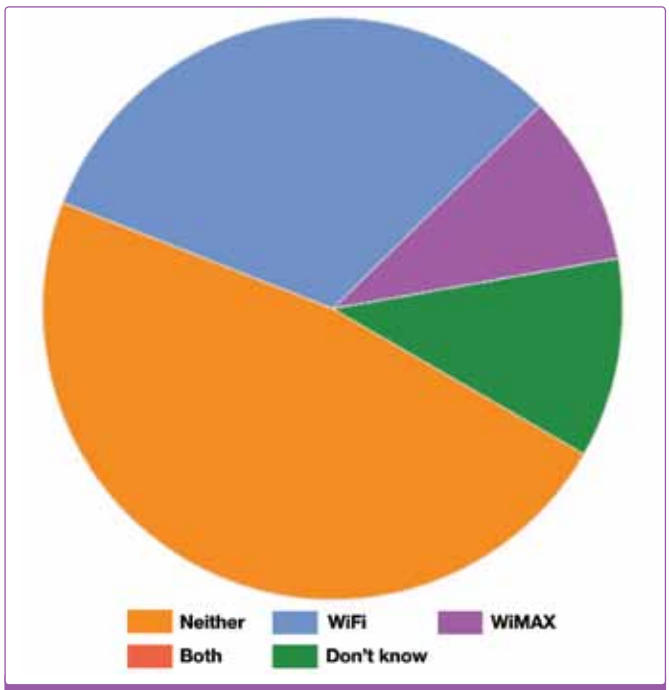
WiMAX – pros

Since WiMAX, unlike WiFi, does not require a wired Internet input into each antenna, it is quick to install across a large area at a low cost. Since WiMAX, unlike WiFi, allocates users a constant allotment of broadband access, connection quality is often better than that of WiFi. WMAX allows multi-user connectivity. WiMAX has an in-built Quality-of-Service mechanism that allows 'mission-critical' services to run smoothly even if there is a lack of resources.

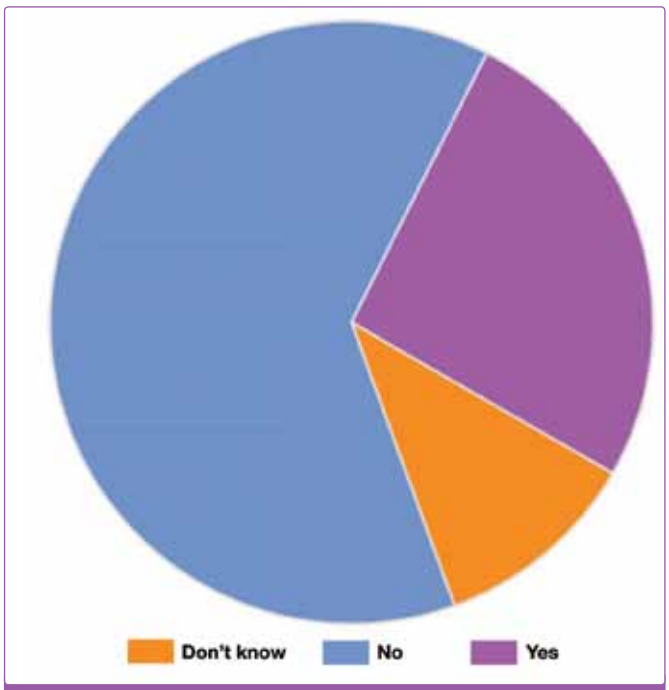
WiMAX – cons

Since WiMAX, unlike WiFi, is an ISP-based system, it cannot be used for private networks. High-frequency WiMAX requires a spectrum license, unlike WiFi. Making full use of WiMAX requires specialised hardware and dedicated antennas.

Although WiMAX can deliver higher data rates (up to approximately 70Mbps) over large distances, it can still be slow in comparison to cable and satellite Internet, especially as the number of users and distance from an antenna increases. Since WiMAX and WiFi use radio waves, they can both suffer from interference from other radio wave-based systems.



Do you currently have port-wide* WiFi and/or WiMAX?
*'Port-wide' assumes that coverage will not be the same in all parts of a port.



Have you plans for a port-wide WiFi and/or WiMAX in the future?

In contrast, WiMAX or WiFi that covers the entire area of a port, including its waters in which ships are harboured, has the potential to reach many more seafarers, enabling them to connect to the Internet and communicate with friends and family via email, social networking sites and applications such as Skype™. [3]

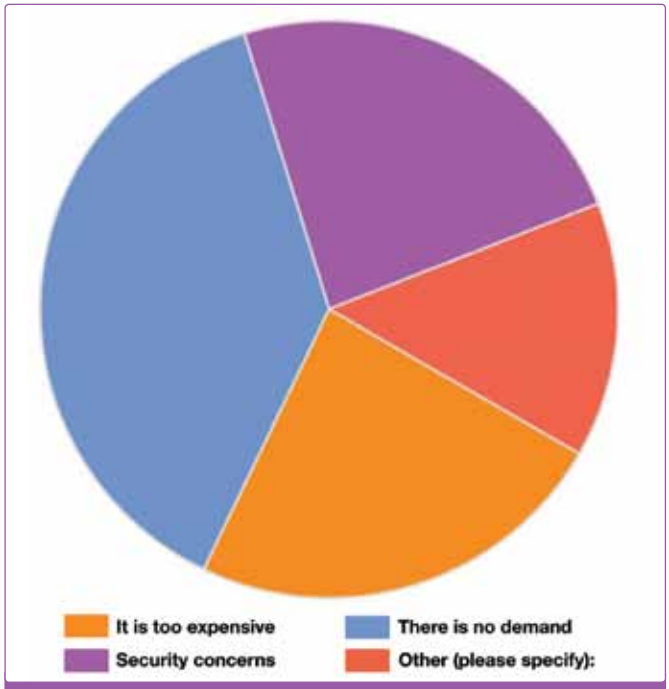
Research findings

Existing and planned port-wide wireless technology

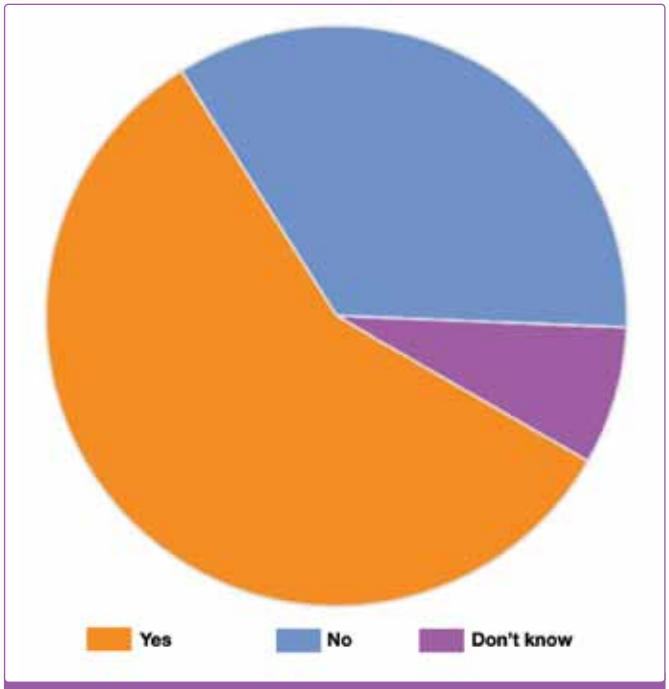
Comments from interviews and surveys conducted show several port authorities support the principle of allowing seafarers access to the Internet via port-wide wireless systems. However, the interview data suggests port-wide wireless networks to be rare. It seems likely that ports' lack of familiarity with this technology discouraged survey recipients from engaging with the survey, thereby contributing to its relatively low rate of response. Of ports responding to the survey, 32% had port-wide WiFi and 10% had port-wide WiMAX; 26% of those ports with neither reported having plans for this technology in the future. Of those ports with port-wide wireless networks, 58% allowed seafarers access to the networks, of which 38% gave seafarers access for free. Although these figures reflect relatively low numbers of ports, they offer encouraging signs that some ports are furthering seafarers' welfare by allowing them access to this technology.

Reasons for lacking port-wide wireless technology

The diagram below (left) shows survey responses to a multiple-choice question asking for reasons why ports lack port-wide WiFi or WiMAX:



What are the main reasons? Click all that apply.



Can seafarers use the port-wide WiFi and/or WiMAX to use the Internet?

Box 2: WiFi and the Port of Amsterdam

From 2001-05, the Port of Amsterdam had a wireless, antenna-based WiFi system that it used exclusively for communicating with its patrol and emergency vessels. Due to signal interference from obstacles and a large numbers of WiFi users in the port and surrounding apartments causing bandwidth overloading, the port found its WiFi network unsatisfactory and switched to using a Universal Mobile Telecommunications System [3G] that used dongles, which has proved more reliable.

At the moment, seafarers cannot access the port's WiFi network, 'but we are eager to see how they can,' said the Port's Cor Oudendijk. 'Our primary interest is facilitating more regular and frequent contact with the ship captains and enabling them to make contact with pilots and compulsory port authority information systems, although it should be possible that other seamen can make personal use of the WiFi in the near future,' he added. 'We are also following developments in WiFi and WiMAX closely as we see the efficiencies and possibilities they offer.' At present, ships' agents are responsible for connecting captains to port authority information systems but with port-wide WiFi, speculated Oudendijk, this middle-man role would be removed and the fees paid might be reduced accordingly.

'This means that the port-related costs will go down, which is a positive commercial aspect. We could then accommodate the needs of the crew with their private laptops. We still think WiFi might be the future.'

Cor Oudendijk, Port of Amsterdam

Box 3: WiFi in the Port of Antwerp

For over two years, the Port of Antwerp has provided free WiFi that covers the majority of its harbours and surrounding area. The port chose WiFi over WiMAX primarily because few if any consumers, including seafarers, own laptops that are WiMAX-enabled since WiMAX technology is not yet widely available to consumers at an affordable price. In contrast, almost all laptops in today's market include the hardware enabling them to connect to WiFi networks without needing additional devices. Providing port-wide WiFi is a marketing tool offering value that helps the port compete as a public company.

The port asked WiFi technology companies to bid to supply the technology the WiFi network required and then field-tested the range of each company's equipment before awarding the contract to the company Fabricom with its subcontractor KMC offering with Inspiair, a niche WiFi technology from Israel. The WiFi system runs along the port's existing fibre and power cable network connecting 23 access points each with multiple directional antennas. The average cost of constructing these points, including that of obtaining the permits they require in Belgium, totalled approximately EUR5,000–6,000 per antenna. This was the largest cost in establishing the WiFi system.

The port's WiFi network provides varying signal strengths, a map of which is available on the port's website enabling users to see the strength of the signal in their location, along with a handbook containing information about the WiFi network. The port recommends the use of a small, mobile antenna, which can be plugged into a standard USB or Ethernet port on a computer in order to boost the signal. Such an antenna, including the power-supply unit it requires, typically cost between EUR20 and EUR100. The WiFi system can support up to an estimated 1,000 users at any one time although on average, 20 to 60 people use the system simultaneously. Anyone on land or aboard ship within range can access the network free of charge by first supplying a username and password in order to register (some web pages that can be accessed without registering are listed on the registration page). User registration is a legal requirement that signals a 'business relationship' between the port and its WiFi users, which prevents the port falling into the category of Internet Service Provider, which entails separate legal requirements.

Approximately 300 users register each month with registration remaining valid for one week. Once registered, users are able to use up to 200Mb of data per day. Users are able to access any website available through a standard web browser but are restricted to a speed of 512Kbps of data at any one time, so as not to attract too much traffic and restrict others' usage. This means that the running of applications such as Skype™ and YouTube™ is often slow and fragmented. The system's focus is on providing access to the Internet rather than on also supplying webpage content.

The port's plans for the future of its WiFi network include improving coverage and speed in areas where current coverage is insufficient. The port also intends to monitor developments in WLAN [wireless Local Area Network] technology – especially 802.11n [a wireless networking standard] – to see if a complete network upgrade would be beneficial.

Johan Deleu, Port of Antwerp

i) Demand & cost

The main reason respondents gave for not having port-wide WiFi or WiMAX was a lack of demand. 'We are not against it,' said an IT manager at Associated British Ports, 'It's just never come up'. These comments relate to a second main reason respondents offered for lacking port-wide network technology: 'it is too expensive'. Several port authorities interviewed were unable to justify the cost of establishing port-wide WiFi or WiMAX since they could not see how such an initiative would deliver revenue in return. Consequently, these respondents felt a port-wide wireless network would only result if sufficient demands were made of ports. To quote from an employee at the British Port of Felixstowe:

"We have over 800 acres here; the cost of establishing a network would be colossal. We prefer to keep our frequencies for business use; providing a port-wide network for seafarers' use would have to be forced upon us. I've not heard of British ports offering such a thing".

This comment also indicates others' concerns about expense:

"We have a vast area here in Rotterdam with a number of propagation issues: buildings, large ships and mountains of coal and ore, etc. To have port-wide WiFi would be a vast investment with doubtful added value. I doubt it would bring equivalent increase in traffic; it's not a strong business case."

Lourens Visser, Head of Information Division, Port of Rotterdam, Netherlands

Respondents' concerns about the cost of port-wide wireless networks are justified. The Port of Rotterdam estimated that a port-wide WiFi network would cost in the region of EUR10 million (although this estimate may have decreased in the two years since it was obtained by the port), while in New Zealand, the Ports of Auckland's partial WiFi network cost NZ$0.5 million and port-wide WiFi in the Russian Port of Vladivostok cost US$30,000. The cost of installing and operating a port-wide wireless network varies between ports and is largely influenced by a port's area and topography, which partially determine the extent of wiring and number of antennas required, and by the type of wireless technology involved. Inevitably, installing and operating a port-wide wireless network is a considerable investment and includes the cost of infrastructure, building permits for antennas, relevant software and maintenance costs.

However it is worth noting that port-wide wireless technology does not lack potential for generating revenue, even if it is modest in comparison to the cost of network installation. For the Port of Antwerp, Belgium, providing port-wide WiFi at no cost to all port users including seafarers (see Box 3) is a marketing device that helps the port compete as a public company. As such, the port's WiFi is expected to increase the port's overall profits, although its success in doing so is presumably difficult to measure.

In the Port of Vladivostok seafarers have been able to connect to the Internet via port-wide WiFi operated by Port Telecom

Co. Ltd. since 2005. To date, seafarers have required a log-in and password from a Port Telecom office in order to use the system (and it is therefore unclear how many seafarers are able to use the system) but the company has imminent plans for seafarers to be able to both pay for and access this information via SMS on their mobile phones. In Singapore, seafarers and other users will pay to use the port-wide WiMAX after the system's trial year (see Box 4), while Pieter Bakker of the Ports of Auckland speculated that were the port to offer port-wide WiFi, it 'would need to install software and receive payment for Internet access'.

Box 2 provides comments from Cor Oudendijk of the Port of Amsterdam, Netherlands, who suggested a further way in which a port-wide wireless network can contribute to the bottom line of ports: by reducing the fees ports pay to port agents.

ii) Security concerns

The third main reason respondents cited for not providing port-wide WiFi or WiMAX was security concerns: fears that a port-wide network would compromise the secure handling of ship and port information systems. The following comments indicate respondents' concerns:

"The only issue keeping us from doing this [installing port-wide WiFi/MAX] is security."

[Port authority name supplied.]

"It's not a good idea to have WiFi or WiMAX in port area for security reasons."

Sabah Ports, Malaysia

"Security reasons do not allow non-employee access to the network."

Port of Tilbury, UK

Security concerns were also the most common reason for those ports with partial or port-wide wireless network to not allow seafarers access to it. The following diagram provides survey responses to a question that asked why seafarers are not able to access existing port-wide WiFi and WiMAX.

Two examples from New Zealand provide further insights:

"At this stage we have an infrastructure that can only host those security checked to be on our network. The Ports of Auckland have had port-wide WiFi for almost a decade, which is used to facilitate communication between container handling equipment (CHE) and host systems. Since the system has suffered interference from other WiFi networks from nearby apartments, as well as attacks on the system that prevent access, we do not provide access to non-port workers for fear of attack from hackers in nearby apartments wanting to use the network for free, which would compromise the core purpose of the WiFi: CHE connectivity."

Pieter Bakker, Ports of Auckland.

"We have partial WiFi coverage, for internal port company use in areas where wired infrastructure is not available. Were we to open this out to users outside of the port company, there would be potential for Internet access abuse, such as downloading illegal content, which would potentially fall back on the port as the provider of service and could lead to a loss of the port's Internet access."

Mark Brennan, IS Manager, Port of Taranaki.

The security concerns expressed in the comments above are twofold: concerns about the security of port and ship information systems and secondly that ports would be held responsible for any downloading of illegal material via the wireless network they provide. In most national jurisdictions if not all, WiFi providers are not responsible for any illegal downloading by its customers, although employers can be liable for illegal downloading by employees. Port authorities therefore need to be clear about the nature of their relationship to the potentially multiple categories of people using their wireless networks as well as the legislation applicable to these relationships in cases of illegal downloading.

The Port of Antwerp, where port-wide WiFi has been operating for over two years (see Box 3), provides an example of a port that has secured its wireless network by taking the following measures. The success of the port at doing so implies other ports could achieve similar levels of security by taking the same or equivalent steps:

"Security is definitely a concern with WiFi networks. There are two reasons why it is not a problem in our setup. Firstly, our infrastructure allows to make 'virtual networks' that are not connected at all to the company network; the only 'way out' is directly to the Internet. Even for the Internet access itself, we have a completely separate connection with an independent service provider. The company Internet connection is not used by the WiFi users. The second reason why security is not a problem is that for our own ships, connection to the corporate network is not only encrypted on WiFi, but also uses end-to-end IPSEC VPN tunnels (a special security protocol). During 2011 security will be enhanced even further by authenticating every individual PC that wants corporate network access."

Johan Deleu, Port of Antwerp

Box 4 provides a case study of WiMAX in the port of Singapore. Here, the WiMAX signal is provided by a telecommunications commercial partner for use by individuals, such as seafarers, and also by businesses and other organisations operating in the port area. Users are responsible for securing information via security software on individuals' devices and security protocol such as VPN tunnels in the case of businesses, as used by the Port of Antwerp.

iii) Threat to port welfare organisations

Another concern research participants voiced about port-wide wireless technology was that it posed a threat to seafarer centres, either because the technology discourages seafarers from using centres or because centres' welfare workers sell seafarers fewer phone cards. The following comment made by a spokesman from a New Zealand ports is illustrative of participants' fears:

"The port fully sponsors the seaman's mission where access to the Internet is provided. Whilst we have not dismissed WiFi throughout the port, I am concerned that it would stop seafarers from venturing ashore. This would then give cause for the mission to close its doors and we already struggle for support from the seafarers".

Jon Moore, Northport, New Zealand.

Given the inevitability of technology's continuous development, a small minority of port welfare organisations are responding to port-wide network technology not as a threat but as an opportunity to better meet the welfare needs of seafarers, particularly since limited shore leave means seafarers are often not able to make use of seafarer centre facilities in the first place. The main advantages of port-wide WiFi and WiMAX to the operations of welfare organisations are listed below:

i) **Shore leave.** Port-wide WiFi and WiMAX address some of the problems linked to seafarers being unable to come ashore by allowing them to connect to the Internet aboard ship.

ii) **Adding value to ship visits.** In cases where welfare workers take mobile WiMAX aboard ships, or when they provide information and/or hardware enabling seafarers to connect to wireless networks, they add value to ship visiting beyond the core service of providing pastoral care. This need is included in the recommendations arising from Kahveci's research (2010: 49):

"Welfare workers for seafarers identified the ship visits they made as being one of the most popular services. However, there is a need to review the purpose of the ship visits and the most

Box 4: WiMAX in the Port of Singapore

In April 2008, the Maritime and Port Authority of Singapore (MPA) launched its WISEPORT trial project, which provides mobile WiMAX connectivity throughout the port and up to 15km at sea off the southern coast of Singapore, where shipping traffic is heaviest. Under a three-year trial, the MPA anticipates the project's commercial launch by the end of 2011. Singapore is the first WiMAX seaport.

The WiMAX signal is transmitted wirelessly from base stations of which there are currently six along the southern shorelines of Singapore. The WiMAX network will then cover the southern waters of Singapore.

Further base stations will be established to expand the network according to demand.

The WISEPORT network offers improved communications, operational efficiencies and new business opportunities to individuals and organisations when at sea within Singapore port waters. WISEPORT enables onshore activities to be replicated offshore, including regulatory filing, electronic data exchanges and access to Internet-based applications, which avoids the high costs involved in offshore communication via satellites. The network also enables live coverage of port waters for security purposes. Moreover, WISEPORT has improved the welfare of seafarers who now have a simple, low-cost means of accessing VoIP [Voice over Internet Protocol – such as Skype services, video conferencing and the Internet.

The WISEPORT project was initiated under the Infocomm@SeaPort Programme, a joint initiative by the MPA and Infocomm Development Agency (IDA), with QMax Communications Pte Ltd (QMax) being the network service provider. WISEPORT started off as a research and development project with a vision of commercial deployment in the near future. MPA provided some of the project's initial funding while QMax is the network service provider that operates at the 2.3Ghz frequency through which the WiMAX network runs.

Seafarers aboard ship can connect to the WISEPORT network in one of three ways:

1) By plugging a USB dongle directly into an onboard computer;
2) By using an external modem attached to an onboard computer to which other computers can then connect, or
3) By placing an external antenna onto the vessel's roof attached by cable to computer(s) inside the vessel.

Yuanheng Kwek, Assistant Manager (R&D), Maritime and Port Authority of Singapore

effective way of visiting ships. Pastoral welfare workers' ship visits primarily for the pastoral care of seafarers do not always meet the general needs of seafarers. It is recommended that when visiting ships the broader needs (transport, communications and so on) of seafarers should also be taken into account."

iii) **Port-wide WiFi and WiMAX need not deter seafarers from coming ashore.** Anecdotal evidence from welfare workers in ports with port-wide WiFi or WiMAX does not suggest this technology to be deterring seafarers from coming ashore, as noted in the earlier remarks made by the BW Shipping employee in Singapore.

iv) **Port-wide WiFi and WiMAX need not affect welfare organisations' revenue from the sale of phone cards.** Again anecdotally, welfare workers in ports with port wide WiFi or WiMAX did not report a decline in sales of phone cards.

v) **The significance of existing revenue from the sale of phone cards is questionable.** In the Port of Kandla, concerns that port-wide WiMAX would threaten the welfare organisation's revenue from the sale of phone cards have proved misplaced, not least because such revenue is minimal.

vi) **Port-wide WiFi and WiMAX provide their own potential for revenue generation.** By using a system in which seafarers pay for log-in details that expire after a set period of time, welfare organisations would be able to raise revenue. Given the appeal to seafarers of being able to access the Internet aboard ship, revenue raised in this way has the potential to amount to more than that currently earned from the sale of phone cards.

Seafarers' use of existing port-wide wireless networks

In ports such as Antwerp and Singapore, port-wide wireless networks offer seafarers the opportunity to communicate with home via the Internet at no cost, without having to go ashore. This marks a significant improvement to seafarer welfare. It is worth noting, however, that seafarers appear to differ in the ease with which they use the networks, with some not using them at all. This may be the result of seafarers still becoming familiar with the systems that are still in their infancy.

Jorg Pfautsch of the German Seamen's Mission in Antwerp reported that for seafarers who use computers relatively frequently, connecting is straightforward while for others it is more difficult. Welfare workers are instrumental in providing seafarers with information they need to connect to the network, along with port agents. Pfautsch also noted, as did the port, that the strength of the signal varies according to:

"The ship's proximity to the WiFi antennas, the seafarer's computer hardware and his location on the ship, with the bridge deck offering the strongest signal. Often cargo handling and cranes interrupt the signal. Few seafarers are using additional antennas to boost the signal."

In the case of Singapore, feedback was mixed regarding the extent to which seafarers are using the Port's WiMAX network. In contrast, comments from welfare workers and shipping companies suggest many seafarers not to be using the WiMAX network at all. According to Christian Schmidt of the German Seamen's Mission:

"Most of our ratings are using our centres or going ashore. Some seafarers, who come frequently to Singapore, use a [3G] dongle provided by a company called Starhub, which allows pay-per-day usage at an affordable rate. Some port agents also provide dongles for the crew, such as APL in the Brani terminal [of Singapore]. In these cases, seafarers also pay by the day and then return the dongle to the port worker."

Leonard Harbottle of BW Shipping supported the impression that seafarers are not fully benefiting from the port's WiMAX:

"It is my understanding that that it [the WiMAX] really only benefits vessels berthed alongside and within the container port. We also believe that there are some technical IT issues: it is not a simple a case of hooking up your laptop to a system at no cost. We also believe that there is a limit on its [the WiMAX's] range; this is one of the reasons we are not using it. Our fleet, which primarily comprises tankers, rarely visits the port of Singapore but transits the straits on an almost daily basis and we also do a lot of bunkering, storing and crew changes within and beyond Singapore port waters. Our entire tanker fleet will have a VSAT [satellite] broadband system by the year's end, which crew can use for free."

Although anecdotal, the comments above suggest seafarers to not be benefiting fully from existing port-wide WiFi and WiMAX systems due to a number of reasons that include:

i) **Issues with the range and uneven signal strength of wireless networks.** This is known to be a problem with WiFi in particular. While the Port of Antwerp is eager to address these limitations as part of its improvement work, it is important that similar measures are factored into the maintenance programmes of other port-wide WiFi networks.

ii) **Issues of access to the hardware required for connecting to wireless networks.** There are two components to this point: firstly, seafarers without personal laptops are reliant upon limited access to ship computers to communicate with home using port-wide wireless networks. Secondly, WiMAX networks appear to require additional hardware in the form of a dongle, modem or antenna in order for seafarers to connect their computers to the Internet via the WiMAX network. In Singapore, port agents are reported to provide every ship visiting the port with a dongle for connecting to the port's WiMAX. It seems that without additional hardware, seafarers remain reliant upon limited access to the Internet via one computer controlled by the ship's captain. It is unclear to what extent other seafarers in the port are able to access the hardware necessary to connect their laptops to the WiMAX Internet and where responsibility falls for providing this hardware.

The wider problem of improving seafarer access to the Internet lies in the limited number of ports with port-wide wireless networks. Although such systems are not without potential for generating revenue, the cost of their installation remains a major deterrent to their proliferation. In ports with an existing degree of wireless infrastructure, such as Amsterdam (Box 2), the cost of developing a network through which seafarers can use the Internet is significantly lower than that of developing such a network from scratch. However, doing so requires both ports' concerns about the security of their information to be addressed (using measures such as those taken by the Port of Antwerp, outlined above), as well as the willingness of ports to incorporate the needs of seafarers into their technology strategies. The spokesman from the Port of Amsterdam described this willingness in Box 2), a sentiment shared by some other ports, including Rotterdam:

"We were supposed to be involved in a WiMAX trial along with parts of the emergency services and local government, but the company that was going to provide the signal no longer owned the frequency so now we are looking for a new solution. At present, we use 3G to communicate with our vessels and next year we are changing the mobile signal supplier. There are concerns about the quality of the signal from the new provider and it might be that WiMAX provides a back-up system, or indeed the primary means of communication with the potential of also allowing seafarers access to the Internet. I could certainly see how WiMAX could play a marketing role for the port and how we could combine the welfare of seafarers with our own commercial interests. We charge port fees so need to give services in return."

Lourens Visser, Head of Information Division, Port of Rotterdam

The situation Visser outlined raises a further obstacle to the spread of WiMAX technology in ports: the need for a commercial partner licensed to supply the WiMAX frequency in the port area.

In the Port of Kandla, welfare worker Joseph Chacko demonstrates the engagement with changing technology that is necessary for seafarers to be able to communicate with their families via the Internet aboard ship. Existing and emerging technology, including WiFi, WiMAX, 3G and 4G, offer varying advantages and disadvantages. Given the differences between ports, the solutions for enabling seafarer access to the Internet will vary between ports. What seems likely to assist ports' reach solutions suited to their specific needs and characteristics is increased communication between ports, including welfare organisations working within them, regarding developments in technology and experiences of using this technology. This report is intended to begin such a dialogue.

Conclusions and recommendations

At present, only a minority of ports appear to have port-wide wireless networks via which seafarers can access the Internet aboard ships. Most commonly, ports without this technology cited a lack of demand, and concerns about costs and security risks as the main reasons for neither having installed it nor having plans to do so in the future.

Increasing seafarers' access to the Internet promises to both improve seafarers' welfare, and improve recruitment and retention rates across the industry facing a global shortage of skilled workers. While this research has shown port-wide wireless technology to have considerable potential to help increase seafarers' access to the Internet aboard ship, it has also highlighted a range of issues needing to be resolved in order that their potential be realised.

Drawing on the discussion of these and other issues in this article, the following recommendations offer a range of measures to help address respondents' concerns and increase seafarers' ability to communicate with friends and family while away from home:

i) Create a culture of best practice

In ports with existing port-wide wireless networks, many of respondents' concerns have been confronted and at least partially resolved. It is recommended that communication be increased between ports in order to promote the sharing of knowledge, experiences and concerns about port-wide wireless and other technology benefiting seafarer welfare, possibly administered by an umbrella organisation such as the International Association of Ports and Harbours. This would help ports address concerns about the security of port-wide wireless networks, help them source wireless infrastructure at competitive rates, provide clarity about the law regarding ports' liability for any illegal downloading by network users, and provide alternative solutions should a WiMAX signal provider no longer operate or when new and improved technology becomes available. Increased communication between port authorities would create a culture of 'best practice' among ports in relation to seafarer welfare as well as assisting them in meeting their own information and communication system needs in as efficient a way as possible.

ii) Work more closely with welfare associations

As well as increasing communications between port authorities, it is recommended that port authorities work more closely with port welfare organisations in order to better use available technology to meet both the welfare of seafarers and commercial interests of the port as a shared concern. Additionally, welfare workers appear well placed to provide seafarers with the information and assistance they require when connecting to existing port-wide wireless networks. There needs to be clarity about which organisation(s) should bear the cost of port-wide wireless networks as well as benefit from any revenue they generate.

iii) Mitigate against loss of revenue

Welfare organisations are encouraged to see port-wide wireless networks as an opportunity to better meet the needs of seafarers rather than as a threat to seafarer centres and welfare organisations' revenue from phone-card sales. It is recommended that welfare organisations keep abreast of developments in communication products and other sources of revenue that could replace and/or add to the revenue currently generated from the sale of phone cards.

iv) Incentivise the use of existing infrastructure

Although the cost of port-wide wireless technology will be prohibitively high for some port authorities to bear, ports with

an existing degree of wireless infrastructure are urged to explore expanding this infrastructure and opening it up to seafarers. It is recommended that the industry consider an incentive scheme by which ports looking to provide seafarers with access to port-wide wireless networks at little or no cost might receive assistance with meeting the cost of doing so.

v) Gain the endorsement of shippers and industry organisations

Shipping companies and their relevant membership organisations might consider advocating for increased port-wide WiFi and WiMAX, which benefit their crews and provide a cheaper means of communicating for business purposes than satellite technology.

vi) Clarify who is responsible for network hardware

In ports with existing port-wide wireless networks, there needs to be clarity about which organisation(s) is/are responsible for ensuring seafarers have access to any hardware needed to connect to these systems. This hardware includes dongles, modems and/or antennas in the case of WiMAX, and also laptops for those seafarers without their own. Failure to do so means seafarers being reliant upon accessing the system via only one computer, to which the ship's captain determines access.

vii) Monitor user feedback and keep improving the network

It is recommended that ports with existing port-wide wireless networks continue to be alert to (or solicit) feedback about their networks' performance and carry out regular improvements and upgrades to their systems. It is also important that where seafarers are required to pay to use networks, the cost is kept low.

viii) Cooperation between multiple parties

Given the limited range of port-wide wireless networks, whether based on WiFi or WiMAX technology, it is recommended that owners and other parties continue to look at ways of improving seafarers' access to the Internet beyond port waters.

FOOTNOTES

[1] The arguments and views expressed in this report are the author's and not necessarily those of either the International Committee on Seafarers' Welfare or the ITF Seafarers' Trust.

[2] Source: Author's onboard research, February 2007.

[3] As promoted by Doris Magsaysay-Ho of Magsaysay Maritime Corp, an advocate of port-wide network technology. See Lloyd's List, 10 & 20 August 2010.

[4] The content of **Box 1** is partly informed by: Hunter, H. 'WiFi vs. WiMAX', VoIP News, San Francisco, CA: http://www.voipnews.com/feature/wifi-vswimax-050806 and by www.coolgadgets.org/what-iswimax (both last accessed March 2011).

[5] Source: Kan (2010).

[6] www.portofantwerp.com/portal/page/portal/POA_EN/Havenhandboek/WIFI-network. Last accessed March 2011.

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ABOUT THE ORGANIZATION

The **International Committee on Seafarers' Welfare** (ICSW) brings together and supports organizations from around the world involved in seafarers' welfare both onboard and ashore. The ICSW works with companies, unions, governments, welfare organizations (secular and faith based) and ports. The leading members of ICSW include the International Shipping Federation (ISF), International Transport Workers Federation (ITF), and the International Christian Maritime Association (ICMA). The ILO is an observer organization on our board of trustees. Other organizations such as National Seafarer Welfare Boards, Government seafarer services, shipping companies, and individual welfare organizations are also members.

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