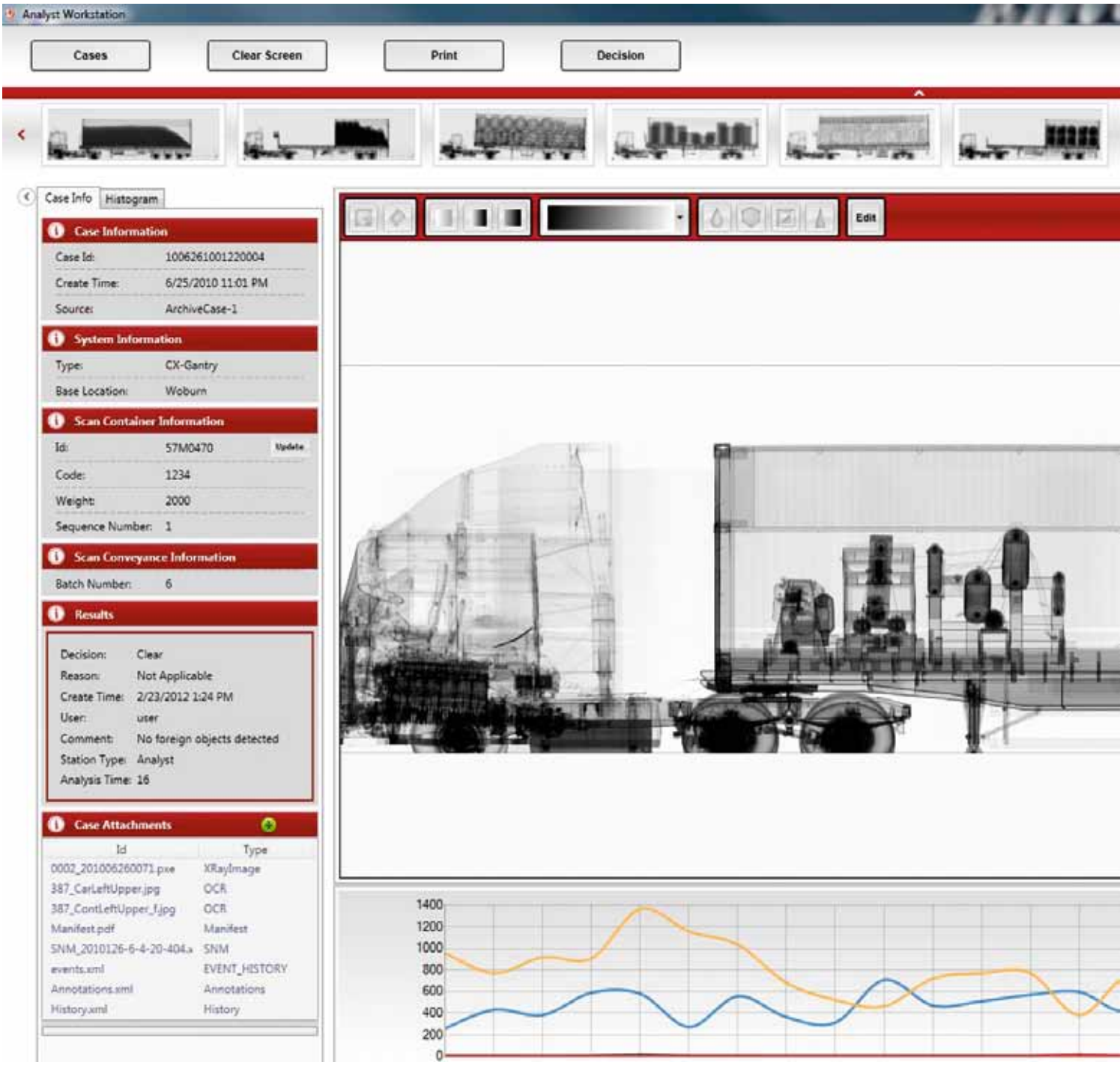
Paul Simpson describes how the latest radiation detection technology is being applied at ports to identify and intercept potentially deadly radiological cargo with minimal disruption

DEADLY CARGO



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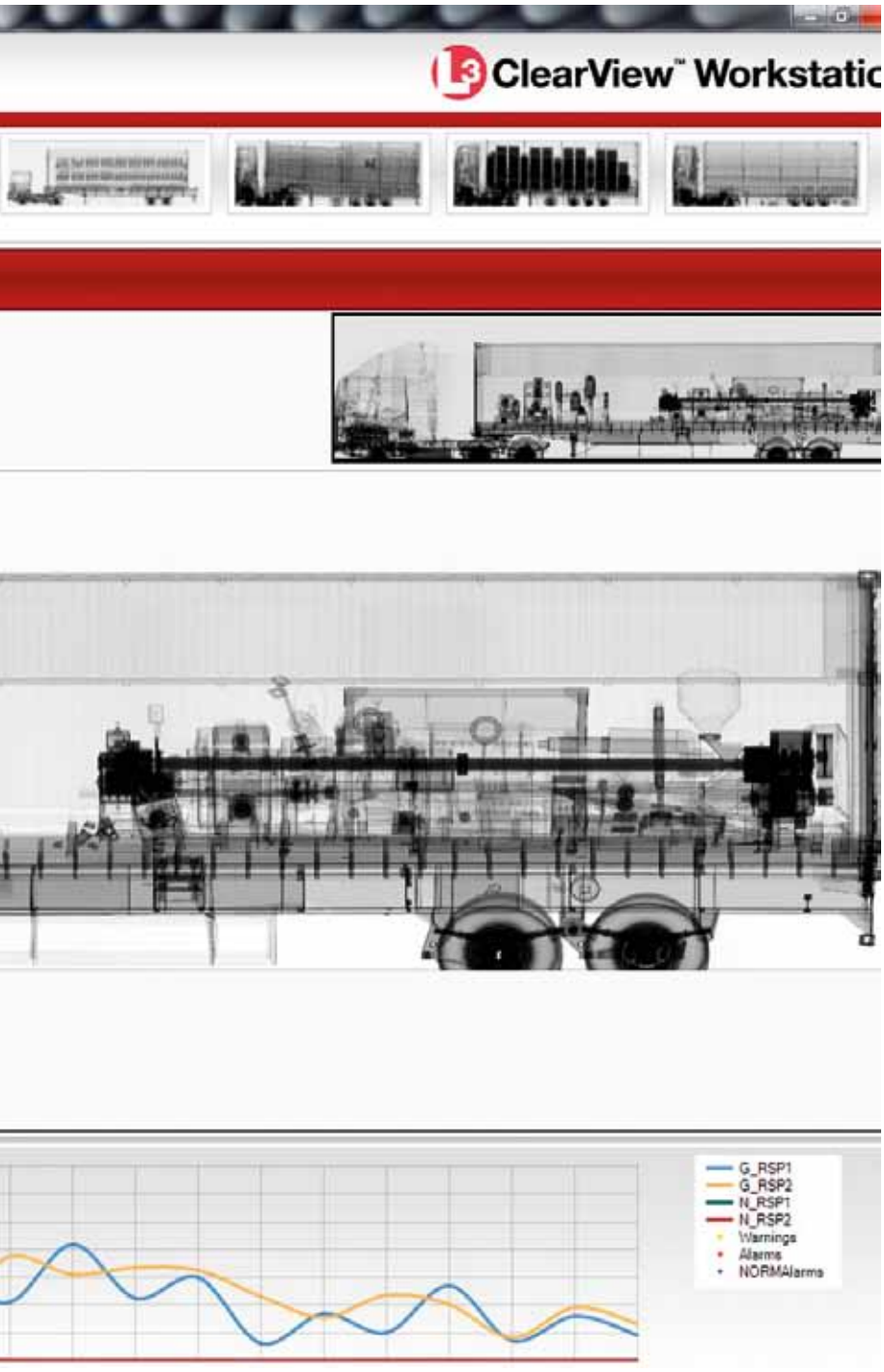
There are a variety of threats and risks posed by the illegal presence of radiological and nuclear materials within the flow of commerce. These range from inadvertent risks, such as shipping radioactively contaminated scrap metal, to the much more serious issue of illegal trafficking of special nuclear materials for possible use in a weapon of mass destruction. Particularly at major seaports, large volumes of shipping containers need to be scanned for illicit radioactive materials as well as for customs enforcement.

In 2013, in excess of 500 million 20-foot equivalent unit (TEU) containers were transported by ship. Detecting radiation in shipping containers can be done in a number of ways, ranging from use of handheld devices to large, high-throughput automated systems. A key requirement for effective screening is minimising the impact to the flow of legitimate cargo. This can be effectively managed by integrating the screening process into the facility's container management process. Through this method, sophisticated high-volume shipping ports are now able to efficiently screen up to 100 per cent of container contents for dangerous radiation while still meeting the needs of their customers.

Radiological and nuclear materials come in many



A networked solution permits a unified view of the information analysts need to assess cargo contents, with the radiation detection profile shown below

forms and pose different levels of risk to humans – from essentially harmless to extremely deadly. There are a number of sources of harmless naturally occurring radioactive material, or NORM, including the potassium in bananas and the radium present in Brazil nuts. Some ceramics and fertilisers are also naturally radioactive, but similarly harmless to humans. In order to facilitate the flow of commerce, ports need to be able to ignore these materials; the issue of minimising false alarms will be discussed later in this article.

The real risks begin when shipped goods contain items such as radioactively contaminated scrap metal, which may end up in steel used in consumer and industrial products, creating a serious health risk. Contaminated scrap metal is often the result of careless disposal of so-called "sealed" radioactive sources that are present –in industrial and construction gauges and other precise measurement equipment, for example. As a facility is demolished, these radioactive sources may end up in the scrap metal sent to the recycling facility.

At the highest end of the risk scale is the illicit trafficking of nuclear materials by criminals, such as stolen nuclear fuel pellets. The particular threats resulting from trafficking of plutonium or uranium and other dangerous radioactive industrial materials include their possible use in crude weapons of mass destruction or radioactive dispersal devices, more commonly referred to as dirty bombs. The sheer volume of container traffic travelling through the broad and complex global maritime trade network presents huge challenges for non-proliferation efforts, with the volume of annual shipping container traffic projected to grow to 720 million TEU by 2050.

Detecting dangerous radiation in cargo shipments can be performed in various ways, ranging from the use of small portable handheld devices that screen containers individually to large high-throughput drive-through portal systems that can detect dangerous radiation inside entire containers or trucks. In both cases, the solutions incorporate passive detectors, meaning they do not contain or emit radiation, but instead detect the presence of radiation. Often, drive-through portals are used for primary cargo screening, which simply alerts the portal operator to the existence of radiation without providing any information as to type or threat profile. In this type of screening, detected radiation undergoes a secondary screening process to determine what type of radioactive material is present.

This secondary screening may involve costly and time-consuming re-screening with a higher-resolution detector, and could include opening the container. Secondary screening devices are usually of a higher spectroscopic resolution and can confirm the spectral signature of the detected isotopes, accurately identify the type of radioisotope and determine if it is a threat. This two-stage approach could adversely affect normal throughput if alarms in the primary screening technology are set off frequently by harmless, naturally-occurring radioactive materials.

Newer technologies are available today for primary screening that not only detect radiation, but also differentiate between harmless radioactive materials, legitimate industrial/medical materials and highly dangerous, special nuclear materials.

Achieving the alignment between the port security operation and the solution provider requires an integrated approach, starting with a deep understanding of the facility's container management process and security and customs requirements. A consultative

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Radiation detection portals allow container trucks to be easily and safely scanned for radiological and nuclear materials

approach helps to ensure successful delivery of a screening solution that meets the current and ongoing needs of key stakeholders. A typical major screening operation today interfaces with the port/land border logistics system, multiple alarm resolution workstations, security analysts and operational command centres. This level of inherent interconnectivity and complexity demands more rigorous and formalised systems, engineering practices and innovative systems-integration capabilities.

Case study:

Radiation detection at major seaports

Detecting small amounts of dangerous nuclear material in one container out of millions is a major challenge to security professionals worldwide, as solutions are needed that are capable of efficiently scanning up to 100 per cent of cargo transiting a port. This high level of screening enforcement can only be achieved with systems that produce very low false alarms during primary screening and rapid alarm resolution capabilities, including secondary screening.

L-3 SDS supplies an integrated network of radiation detection portals and non-intrusive X-ray inspection systems to major seaports. The installation includes radiation detectors at all entry and exit areas and high-energy container X-ray portals for customs screening. The synergies resulting from the integrated use of the both such products can enable analysts to quickly view and analyse the image of the contents of the passing cargo to determine the presence of any dangerous radioactive substances. The combination of the data from the two scans further enables the analyst to pinpoint the location of the radioactive cargo inside the container. Using the latest world-class technology within a dedicated command and control centre (CCC), an integrated network effectively and efficiently serves the needs of the vast industrial complex.

Here's how it works. A networked hardware and software solution permits a unified and customised view of the critical information analysts need to assess cargo contents. Key to the installation is the implementation of software such as L-3's ClearView solution, which integrates data from all scanning systems onto a single, centralised display within the CCC. Such software should be a user-friendly, visually based solution that allows analysts to quickly and accurately assess cargo contents locally or remotely for contraband and other illegal materials. Networking all systems (including different vendors) together under one software suite adds information on system usage and allows flexibility in staffing. Images can be displayed from any location, seamlessly integrating data from multiple sensors. With the networking of legacy systems using one software solution, analysts can be trained on a common workstation, thereby reducing analyst training and staffing costs.

Such all-inclusive software suites include tools for image analysis, system operations and user and asset management and training – all operating in a secure, enterprise-wide environment. Workflow automation software tracks container status and disposition to optimise scanning system utilisation and analyst resources. Analysts are able to quickly view enhanced data provided with any container scan taken from trucks, other vehicles and rail cars. All incoming and outgoing cargo scan data is subject to review by analysts. Using such software, images can be displayed from any location, local and/or remote, seamlessly integrating data from multiple sensors across multiple vendor systems. The benefits of this common user interface for all systems include greater operational efficiency, higher throughput and increased probability of detection.

Vendors like L-3 SDS are dedicated to providing collaborative detection solutions within a complex heterogeneous network. This approach allows cargo screening stakeholders to leverage their existing legacy investments in inspection technologies, while expanding the port's capabilities and allowing for future expansion.

Paul Simpson is Vice President and General Manager of Cargo Solutions at L-3 Security & Detection Systems. With more than 25 years of management experience, Paul has held a variety of senior positions in the defense, aerospace and security sectors.