Table of Content

NTE18

NTE18: Welcome from

BGEN Antonio Nascimento, Portuguese Air Force

I'd like to welcome you to this magazine covering the New Technology Event 2018 (NTE18), which took place from 02 October to 04 October. I hope that it will provide an overview of the speeches, presentations, and demonstrations and give an idea of the booth sessions and general flow of the event.

We welcomed a wide range of experts and engaged participants to what was an event of many "firsts". It was: the first NATO NTE, the first event at which the JALLC had had the privilege of hosting NATO, the Nations, and industry and academia representatives together, and my first Lessons Learned event as Commander of the JALLC.

I was sure that participants would have a few "firsts" of their own as they spent three days working together—NATO, industry, and academia—to explore possible technological solutions to some of

> ## The rapid evolution of technology is changing the nature of warfare

> ## Nations agreed to identify advanced and emerging technologies

the Lessons Learned challenges the Alliance faces.

In my welcome speech I reminded participants that at the Warsaw Summit in 2016, Nations agreed to: "*Identify advanced and emerging technologies, evaluate their applicability in the military domain, and implement them through in-*novative solutions." In June 2018, Allied Command Transformation (ACT) shared with the Military Committee the Emerging and Disruptive Technologies Roadmap. The roadmap contains Enabling Lines of Effort, one of which is: to explore available and emerging technologies and to discuss the potential they may have for

Commander JALLC

addressing Lessons Learned related challenges and improving the NATO Lessons Learned Capability. This was then the basis for the NTE18.

Most organizations—public and private, military and non-military—have some kind of Lessons Learned process: a way for the organization to learn from both its failures and its successes. The urgent need to improve NATO's Lessons Learned Capability in particular came from the growing realization that, for NATO, Lessons Learned really can—and do—save lives.

The rapid evolution of technology is changing the nature of warfare, bringing with it new challenges for the Alliance. Technological solutions are becoming outdated—and even obsolete—more quickly than ever.

The global security threat environment is ever changing, and potential adversaries are not going to wait for the Alliance to keep up. They are finding increasingly innovative ways to

Our Potential Adversaries are not going to wait for us to keep up

challenge NATO's superiority on land, in the air, at sea, and—particularly relevant for the event—in the cyber domain. NATO needs not just to keep up with the learning curve, but to stay ahead of it.

New and emerging technology has the potential to improve the quality and quantity of the available data in the NATO Lessons Learned Portal. For example, one challenge that technology can help with is interoperability—our ability to work together—particularly given the many different systems and languages used by the Allies. With 29 potential national Lessons Learned databases to extract lessons from, the problem is often not a lack of desire to share lessons or a lack of technological ability to do so. The problem is how to translate lessons effectively, so that everyone in NATO can learn from them.

The NTE18 event provided the opportunity for NATO, industry and academia to share thinking and expertise, so that we can begin harness the power of technology to solve, or at least help to solve, such challenges.

Vice Admiral Paul Bennet

Chief of Staff

Allied Command Transformation

Vice Admiral Paul Bennett, Chief of Staff, Allied Command Transformation, welcomed everyone to NTE18 on behalf of Supreme Allied Commander Transformation (SACT) and ACT and thanked BGEN Antonio Nascimento and the JALLC for their work in organizing it.

He said that drawing together subject matter experts from different sectors and backgrounds was absolutely essential if NATO was to maintain its edge against its adversaries. He hoped that those participants from industry would offer the catalyst for change that NATO sought.

Vice Admiral Bennett placed the conference into context to make sure that there was no doubt about how important the event was, the visibility it had in NATO HQ and the expectations in ACT.

One of ACT's main responsibilities as the Warfare Development Command was horizon scanning and establishing the direction in which the Alliance's capabilities should be taken to ensure the development of capabilities for the future.

Vice Admiral Bennett said that ACT scrutinized potential adversaries' capabilities and intent closely, and the physical and human trends that might cause instability in the future, and that ACT had also kept an eye on technological advances—new missiles, new aircraft, new electronic counter measures. This technological horizon scanning is very different—technology not only creates new threats, it has fundamentally changed the way of warfare, it has changed the actors and it has brought, for example, the resilience of national infrastructure into the defence business, as much as ships, planes, and tanks.

Vice Admiral Bennett stressed that technological advances had become a key element to take into consideration when discussing warfare development. Our adversaries are already investing heavily in the better use and development of technology and reducing NATO's traditional technology dominance. New Technology presents a threat every bit as potent

as a new missile system. It is also a great opportunity to be more effective and more efficient, literally at the touch of a button.

He then went on the highlight some of the types of technologies we are talking about, such as those exclusively developed for defence applications, such as hypervelocity technology in missiles, in which Russia and China are investing, but also technologies developed for civilian applications, where the defence challenge is to decide how to apply them, such as quantum technology, advanced manufacturing, robotics, and nanotechnology.

Vice Admiral Bennett then highlighted that the potential to revolutionize the materials we use and how they are developed, our medicines, our processes and the way we operate would change the way NATO does business in the future.

The question for the defence and security community was how far and how quickly to invest. The issues were how to break through the natural risk-based considerations about new technology, how to link industry with the military and exploit our combined intellects, and how to work through the testing and procurement regimes together.

Part of the solution had to be experimentation and demonstration—like-minded individuals wrestling with the application of technology—and Vice Admiral Bennett hoped to see that take place during NTE18.

Vice Admiral Bennet then highlighted the work being done under the Emerging and Disruptive Technology Road Map which contains a series of activities that should lead to the swift introduction of much needed technological advances. Vice Admiral Bennett stressed that this roadmap and the related activities had the attention of both NATO's North Atlantic Council and the Military Committee. It was an exciting, ambitious programme of

work that would be a theme at a number of set piece events.

Vice Admiral Bennett said that the programme would demonstrate:

- the application of data science techniques to publically available information to assess the impact of military action;

- a partnership with industry to conduct Regional thematic studies using data analysis;

- a logistics base, centred around autonomous vehicles, at a major exercise; and

- artificial intelligence technology in one of the core capability projects.

The application of new technology to Lessons Learned, including as presented at NTE18, was key to the success of the roadmap. NATO must be a learning organization to retain its edge. As the speed of decision-making accelerates, so must the management of lessons.

Vice Admiral Bennett said there were some challenges in the NATO Lessons Learned Process, for example in data collection, information management, information tracking and sharing, and speed of relevance of analysis. New technology held at least part of the solution.

The NATO Lessons Learned Process should be able to collect and store data from all sources; make the data base accessible to all contributors, but keep it secure from others; analyse lessons automatically; and present lessons using visualization tools, so that decision makers can digest the information quickly.

The gap now needed to be bridged between NATO's clear needs and the technological opportunities that industry and academia can provide. Vice Admiral Bennett did, however, note that the technological solutions that will eventually bridge

this gap were relatively straightforward and already in use.

The important thing was to focus on identifying solutions and collaborating on them immediately after NTE18 so that progress could be made quickly.

The NATO LL Capability

From Optimization to Innovation

Brigadier General Antonio Nascimento, Commander JALLC

BGEN Antonio Nascimento, COM JALLC, gave a presentation on the NATO Lessons Learned Capability. Below is a summary of the key points.

In June 2017 the two NATO Strategic Commands developed the NATO Lessons Learned Optimization Action Plan to support the way the NATO Lessons Learned Process is executed and managed within the NATO Command Structure.

BGEN Nascimento explained that the NTE18 had been designed to focus on two of the four Lines of Effort in the Plan: the refocus of the JALLC's role as the lead agent, driver, and innovator for Lessons Learned in NATO; and improving the NATO Lessons Learned Portal as the single tool used in NATO to really "*do*" Lessons Learned.

To achieve these goals, NATO would need to be innovative in its approach; in thinking of solutions, and in every aspect of our activities. One aspect of innovation was technological.

BGEN Nascimento presented the temple image of the NATO Lessons Learned Capability, which emphasizes the importance of a strong foundation of mindset and leadership to support the pillars of the capability: structure, process, tools, and training. He then presented an image that showed the pillars as an interconnected whole, working together and supporting each other.

BGEN Nascimento explained that the NTE2018 event was the perfect opportunity to focus on innovation for the tools pillar of the NATO Lessons Learned Capability, in particular for the NLLP.

NATO needs to be innovative in its approach; in thinking of solutions...

A Lessons Learned tool should support the work of Lessons Learned practitioners and the NATO Lessons Learned process in all its steps: data collection, storage and management; analysis;

visualization; staffing; tracking; monitoring; updating; and sharing. All of these activities needed to take place in a single collaborative and secure environment, so that the Alliance could really "*do*" Lessons Learned.

BGEN Nascimento said that the NLLP already did all of this to a degree. The concept of the NLLP as a tool therefore fits the current operating environment.

The current technology used to support the NLLP would of course have to change to support an approach suited to the needs of tomorrow. Recent studies and the changing operating environment suggest that NATO will need a more powerful Lessons Learned tool to ensure flexible data collection, improve data management, analyse Lessons Learned-related data fully, and provide insights into large amounts of data in near-real time.

BGEN Nascimento indicated that, at the NATO LL Conference in March 2018, subject matter experts and conference participants highlighted that the efficiency and effectiveness of the NLLP was affected by several factors:

The operational context brings a host of new challenges and opportunities, such as the ever-increasing quantity of data to process, the challenge of dealing with data duplication, and the familiar NATO problem of the need to know versus the need to share.

NATO IT modernization, with cloud services and an interoperable Alliance C3 context.

Portal Users not only being Lessons Learned experts; tailored functionalities must be available to answer the diverse needs and requirements of everyone in NATO.

Technology is evolving at an exponential rate and can be a real game changer and force multiplier. The improvements in artificial intelligence, machine learning algorithms etc. will make a huge difference to those who can harness their power.

BGEN Nascimento said that NATO recognizes the need to look beyond the confines of its own organizations to learn what industry and academia have to offer in these areas.

The idea of an improved Lessons Learned tool was born in September 2017 when the JALLC presented some ideas on the topic to SACT. By December 2017, a JALLC food for thought paper describing some of the challenges and potential ways to address these was developed which initiated an activities timeline (see below).
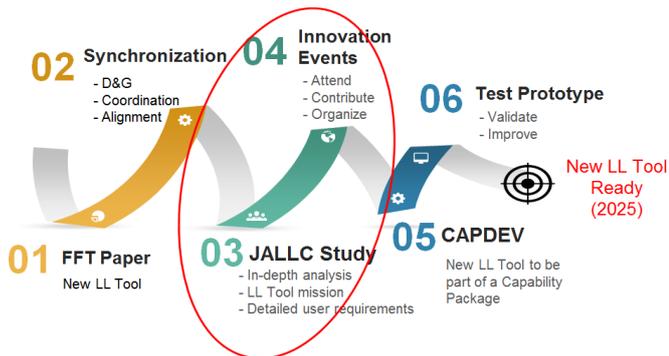
The JALLC then attended and contributed to various related events in NATO, looking at new technologies and how other communities are improving their tools/applications. In April 2018, the JALLC was asked to organize the NTE18 event to provide the opportunity to discuss and identify challenges to the NATO Lessons Learned Capability; to discover and explore new technologies that might help address these challenges; and to facilitate networking and the building of a connected community of interest.

BGEN Nascimento went on to explain that, running parallel to the NTE18, was a JALLC analysis project, capturing and analysing data on the challenges to the NATO Lessons Learned Capability and the potential technological solutions. The team was at work at the event, collecting data.

The JALLC would provide SACT and the Military Committee with feedback on NTE18, including the main conclusions and recommendations following the JALLC Analysis Project. The ultimate goal was to have a new Lessons Learned tool by 2025, when the NATO Communication and Information Vision should be implemented.

The operational context brings a host of new challenges and opportunities

BGEN Nascimento acknowledged that, in IT terms, this might seem light years away. The journey would not be easy, and would mean navigating through the usual cumbersome processes. As Commander of the JALLC, he undertook to support the implementation of innovative Lessons Learned solutions and to ensure that NATO continues to have an efficient and effective Lessons Learned Capability. He trusted that industry and academia would support and contribute to this endeavour.

Open Innovation

**Major Cedric Sauvion,
Future Solutions Branch, HQ SACT**

Major Cedric Sauvion, an analyst in the Future Solutions Branch in HQ SACT, provided the event with an update on ACT's Innovation Hub.

He explained that since 2013 the Innovation Hub had been supporting NATO priorities through a process of Open Innovation.

The Hub is both a physical and a virtual space that collects innovative ideas from a wide range of people and entities from inside and outside of NATO. The Hub has over 2000 experts from 65 nations as collaborators. Its assets and know how are then available to anyone in NATO and the Nations.

Those experts are used to help understand the environment and the issues to solve, design concepts and prototypes, and implement innovative solutions.

The Hub is not just a think tank. It focusses on implementing solutions, with end users, solution designers, and ideas providers working together in the project teams.

Major Sauvion said that its work included the Extended Hand situational awareness and redeployment training system used by nine

NATO nations, the first military Massive Open Online Course, used by all NATO Nations for building and training NATO social media users, prototypes of a cyber threat information sharing platform, and many studies and reports.

While anyone in NATO can use the Hub's assets, Nations can get even more benefits through the NATO Innovation Network. That network grows a global ecosystem of solution providers and requirement experts who collaborate on leveraging open innovation.

Current members include the most innovative military entities of certain NATO Nations and they are committed to helping any new member boost open innovation locally.

One of the most efficient ways to do this is through the NATO Innovation Challenge. All members of the NATO Innovation Network submit potential problems to be solved. The public is then invited to propose solutions to the chosen problem and compete for the prize.

This method has generated numerous innovative solutions to real problems while boosting innovation locally and internationally. The most relevant ideas are developed and integrated as part of new capabilities.

Various NATO Innovation Challenges have already been organized in different Nations—so far, the United States in October 2017, France in May 2018 and Germany in November 2018—meeting the goal of the Hub to boost open innovation everywhere in the Alliance.

The Innovation Hub

Introduction to New Technologies Terminology

Mr Stephan Brunessaux,
Senior Expert AI & Data Analytics
Airbus Defence and Space

Stephan Brunessaux, Senior Expert Artificial Intelligence and Data Analytics with Airbus Defence and Space, provided a very useful introduction to the terminology used in new technologies, and particularly in artificial intelligence.

He explained that **Artificial Intelligence**, or AI, was a set of theories and techniques with the objectives of mimicking human behaviours and creating a computer that *thinks* like a human—noting that Alan Turing had designed the ultimate test for AI as long ago as 1950.

Although AI can perhaps surpass humans in a number of tasks—playing games such as chess, finding anomalies, classifying images, diagnosing diseases—it still lacked common sense and general knowledge. AI is focused on narrow tasks and we were still far away from having a general AI robot, other than in the movies.

Mr Brunessaux went on to say that the issues around AI were about sensing the environment—through Big Data, translation and so on—processing information—through, for example, machine learning/deep learning—and interacting with others—through voice commands, personal assistants and data visualization. Explainable AI was a real challenge: we may want to know why an AI system has done A rather than B, but there was a trade-off between accuracy and *explainability*.

Mr Brunessaux highlighted the **Gartner graph** of increasing difficulty and value in using historical data to predict future events. At the lower end was descriptive analysis of what had happened, which produced relatively low-value hindsight. Going through diagnostic analytics—why did it happen?—and predictive analytics—what will happen?—produced more valuable insight. The most difficult and most valuable was prescriptive analytics—how can we make it happen?—which produced foresight.

Machine Learning was the AI ability to learn some processes without being explicitly programmed. The model was learned from user-defined features and labelled data. Within Machine Learning sits **Deep Learning**, which uses unlabelled data to learn from AI discovered rather than user-defined features. Through mimicking, an AI learned deep neural network could be corrected by including a human in the loop and then corrected again using a set of unlabelled data.

Some other useful terminology was also presented, For example, **Supervised Learning** is learning from manually labelled data, whereas **Unsupervised Learning** is finding hidden patterns in unlabelled data. **Semi-Supervised Learning** is learning with a small set of labelled data from the user enriched with unlabelled data and **Reinforcement Learning** was where the system played against itself to fine tune its strategy.

Finally, Mr Brunessaux gave brief examples of how AI could be used in the defence and security world—for textual analysis, emergent topic detection, classifying social network users, text recognition, end-to-end speech translation, cyber data analysis, anomaly detection, and target identification. For example, it was possible to convert speech into text, translate the text into a different language and convert it back into speech so that a conversation could be had between speakers of two different languages.

Show and Tell

Industry and Academia

Over the three days of the NTE18, our Partners from Industry and Academia presented and demonstrated potential solutions to improving the NATO Lessons Learned Capability. All nine of the Exhibiters had 30 minutes stage-time each to impress the NTE18 Participants. We've put together an impression of what the NTE18 audience got to see.

LOCKHEED MARTIN

Lockheed Martin continues to collect and process over 40 million local, national, regional and international news stories from the past 25 years and extracts from those stories machine understandable "events" (who, did what, to whom, when, and where) to generate a computational "history of the world." This data is made available for public research purposes on the Harvard Dataverse where it has had over 30K downloads. Their Integrated Crisis Early Warning System makes use of this data to further forecast future instabilities around the world (domestic political crisis, ethnic/religious violence, rebellion, insurgency and international crisis) six months into the future. It allows analysts to find past examples similar to the events they were studying in the present, and to derive probability information about projections on how present events are likely to develop moving into the future. Lockheed Martin is interested in using these resources for other applications. Its proposed Lessons Learned process is at proof of concept stage. The system would put code "wrappers" around each process, to track the data analysis forward and to explain back from results to data input.

The intended tools would help to identify the most useful past/historical lessons/events, find relevant information through semantic equivalence rather than keyword matching, mitigate against analyst bias, assist with producing the full range of evidence and finding information contrary to the analyst's initial view, and take into account the multiple social, cultural and language groups in NATO. Their notion is that of a "living" lesson learned that continues to collect evidence, refine its applicable context, and re-validate/refute that lesson as the world changes.

The aim is to provide as much machine assistance to the analyst as possible in this process. The basic coding is relatively high level and flexible to avoid being either too detailed or too general in every situation and would be based on broad and extensible categorization.

4C presented and demonstrated Exonaut, its integrated, end-to-end training and exercise management system. The system had been used in the military environment for 18 years, was in service with NATO, and was available as a commercial off the shelf suite of tools. It was innovative, scalable, and could be tailored to fit situational and geographic requirements.

Exonaut can provide tools for data collection, data management and accessibility, data analysis and visualization, tracking and tasking workflows, and reporting and information sharing. In a recent extension, the system was now integrated with simulation and Command and Control systems, as well as exercises and training.

The 4C Strategies team explained that Exonaut data fields and forms can be tailored to meet local requirements, with data permission protected as necessary, while still retaining underlying consistency to allow for high level analysis. Data can be visualized through interactive dashboards and with a tailorable and filterable list view.

Exonaut's architecture is *open*, meaning it can easily pull in data from other systems. An observation—the start of the LL process—could therefore be captured from multiple platforms, and then tracked through the NATO LL process to final NATO wide visibility.

Airbus Defence and Space presented its Multi-Intelligence Concept Solution which used artificial intelligence and Big Data to get intelligence value from the huge volume of data available in the world today. Airbus had a family of software products and tools which could work separately and together to produce a full picture.

The world of intelligence today is very different from a few years ago. The recent data explosion with the advent of satellites, open source data, and email; means threats are more complex and require searching for the unknown; there is also a shortage of data analysts to mine the data available. To respond, Airbus noted that it was important to break the intelligence silos and automate analysis as far as possible.

The challenge was to take the massive volume of data and analyse it to produce trends, alerts, and actionable intelligence—to move from today's manual processing and analysis to automatic systems to handle the volume of data and then to fuse and correlate information from different sources; to move from looking at and for known targets and behaviours to activity-based intelligence that produced predictive analysis and surveillance and led to real time situational awareness.

Examples were using Artificial Intelligence to detect change in images from satellites, looking for patterns in open source data, generating heatmaps from signals data to spot abnormal behaviour, and looking for semantic similarities in open source data. The aim was to produce massive data insight, reduce resource time, provide early detection and prediction, and improve situational awareness.

AWS began by explaining that with traditional data warehouse solutions, customers were forced to make decisions up front about what data to collect and how to use it. Storage and analysis were coupled together, limiting their ability to scale in the most optimal way.

Analytics needs are now evolving beyond batch reports to real-time and predictive reports. Data-driven decisions are critical to keeping a competitive advantage.

By building a data lake on Amazon S3, customers can collect and store any type of data at lower cost without having to make hard decisions about the data in advance. The data is stored in its raw state. If and when the customer wishes to analyse particular data, they can bring just the right tool for the job, such as Amazon Redshift (for scalable data warehousing), Amazon SageMaker (for machine learning) and Amazon Athena (data lake query engine), to name but a few. Having the flexibility and choice of tools allows customers to innovate quickly and on their own terms.

The concept of data lakes is to collect anything and everything, dive in anywhere, have flexible access and be future proof. They allow customers to start small at low cost, iterate quickly, and have the confidence their solution will scale.

The NATO Communications and Information Agency kicked off their presentation by explaining that NATO's aim should be to exploit digital technology; not be driven by it. The intention was to collect more and higher quality data, to use Big Data analytics and machine learning to analyse it, and to exploit the data to learn lessons. The challenge will be to use the scarce resource of *people* for what only people could do. The correlation between human and machine learning was rarely 100 per cent. However, the correlation between the learning that two humans would take from the same data was also less than complete!

Any digital system had to be simple to deploy and use, take advantage of existing technologies, keep stakeholders engaged, and follow the rules. The use of a variety of systems was inevitable—consolidating everything into a single application took time and money.

Examples of new technologies that had added value were a digital text analysis correlating NATO strategy and policy, which was able to point to some unexpected gaps to focus on and the analysis of 10 million records from one year in the Balkans to detect user behaviour anomalies and identify insider threats.

In Exercises, using tablets rather than pen and paper to record observations and downloading daily was found to improve the amount, quality, accuracy and timeliness of the data. NATO's technology and cyber education and training was being modernized to blend continuous digital learning with on the premises classes through the NCI Academy, to be based in three sites, including a new building at Oeiras, near Lisbon in Portugal.

Show and Tell

Industry and Academia

The range of technological solutions on offer was broad and included everything form Data Lake solutions to speech-to-text systems. All the presented solutions were carefully selected for demonstration at the NTE18 by a combined JALLC-ACT team of experts who worked together to ensure the event would be as productive and effective as possible for NATO participants as well as the Industry and Academia representatives.

Speech Processing Solutions presented and demonstrated its speech-to-text system. The demonstration showed how speech could easily be recorded on a desktop, or sent from a mobile device or even a microphone attached to a helmet in the middle of an operation or exercise. The system then automatically created a typed document, either in real time or when the recording was back in a secure or online area.

Since we talk seven to ten times faster than we type, the system was time-efficient. The set-up time for each person/computer was one minute of dictation to create a first profile, which was then adapted in use. The system was at present available in six languages.

Industry and Academia

sopra steria

Sopra Steria presented its approach to the problems that the French Air Warfare Centre (CEAM) had had in dealing with the large volume of lessons learned data from operations, and demonstrated its solution.

They explained that although CEAM had had the right lessons learned structure and process, it did not have the most effective tools to analyse the data and share the results. With over 2000 PDFs in its SharePoint database, searching took a long time and produced dubious, incomplete, and difficult to handle results.

PRESENTATION OF THE SOLUTION

The strategy was to think big but start small, to understand that the users had the solution and to build on their feedback, to show a minimalist but working solution as early as possible, to focus on what mattered to the user, and to be agile in developing the approach. At the point of uploading a document, the system extracted the basic metadata of operational name, location, type.

The text was then annotated automatically, based on semantic analysis. New annotations and categories were added and existing annotations validated. The database was therefore structured and could be searched more smartly and efficiently. The architecture was based on open source software to facilitate deployment and avoid licence fees. Text engineering was based on the GATE semantic platform, which had wide semantic capabilities and was adaptable. The search facility was based on a Datafari package. The solution had matched client need and used a simple iterative and incremental approach that had worked well. This all meant that CEAM could now develop it further at its own pace.

Participants not only saw static presentations but also live demonstrations which really show-cased the providers' tools and technology. The audience was also invited to test the technology for themselves in the Booth Sessions in the NTE18 Exhibition Room.

Indexima presented its solution to the need for reduced time to data—the time between the decision to analyse and when the analyst is able to exploit the data.

One option was data aggregation to create restricted views of the data. Analysis can then be done quickly, but the initial process is time-consuming, taking weeks or months.

A second option was to create a Big Data engine connected directly to visualization tools. That required major invest-ment in servers, and still involved a wait of several minutes to an hour for a response.

The Indexima proposal was to insert instant agile analysis, on site or in the Cloud, between the client's raw data (sent daily to a repository) and self-service analysis tools. This meant zero time to data. It was easy to imple-ment and had low infrastructure costs. Any tableau software could be used, connected to a visualization tool.

The system queries data at source, covering tens of billions of lines in milliseconds. It was possible to go deep into the data, drag and drop dimensions to combine sets of data, and make random selections.

There were three key innovations: the hyper index which exponentially improved performance, allowing for queries in several dimensions, and reducing infrastructure costs; the data space, with Artificial Intelligence algorithms which ask the index to optimize queries, automatization, and a unique access interface; and K-Store, which stores raw data in an open source format, with column-oriented storage optimized for hyper indexing. Speed and relevance of performance improved over time through the machine learning algorithms.

This combined team presented their potential solution which aimed to show that thanks to new technologies, the information gathering, fusion, and sharing aspects of Lessons Learned could be largely automated so that the human element could focus more on added value, including analysis. Digitalization and automation of key processes could further allow the capture in real-time of every decision and its basis, in order to replay and analyse them precisely. The team noted that the decision-making pro-cess should, however, always be based on an interrelation-ship between human thinking and systems to gain maxi-mum leverage.

A similar approach could be used to apply Artificial Intelli-gence to the NATO LL Process. The proposed SCALLP—search and compare tool for an augmented LL process—project would devise a tool to extract and analyse Observations from raw documents, emails and web pages. Mining the data would be done autonomously through semantic models, set up under human control.

See For Yourself...

A very popular and well-received part of NTE2018 was the trade fair-style booth sessions.

Participants had ample opportunity during the Event, both in dedicated sessions and in the margins of other talks and discussion, to visit the booths run by each of the presenters from industry and academia. They could try out some of the products being demonstrated, ask questions, discuss the presentations that they had heard in the plenary sessions in more detail, and explore what technology might be able to offer in their areas of responsibility.

The feedback was that participants had enjoyed the networking opportunity and exchange of ideas. They had found out about particular technologies which they had not known about before and the direction of thinking of some of the big industry hitters.

And what about the presenters from industry and academia themselves? They were enthusiastic about the organization and set-up, and had found the event welcoming and open. The mix of presenters and innovative tools had been good, and there had been plenty of discussions, networking, ideas sparking interaction and engagement.

The presenters had had every opportunity to display their wares and find out more about their potential customers' requirements. As one provider said: "It was a good chance to find out what NATO's LL problems are—where the sore spot is—and therefore what industry's focus should be. The event shows that NATO is open minded and trying to work effectively with industry."

Another said that he had learned that NATO was open to innovation and who to speak to in NATO about what his company could offer.

Booth Sessions

Lessons Learned Challenges Panel

Mrs Jackie Eaton, the Science and Technology Advisor to the NATO Science and Technology Office of the NATO Scientist, opened the first panel discussion of the NTE18 which covered the topic of Lessons Learned Challenges.

Brigadier General Athanasios Tsouganatos, the Assistant Chief of Staff Joint Force Development HQ SACT; Brigadier Franz Pfrengle, Assistant Chief of Staff J7 SHAPE; Captain Jack Taylor, Lessons Learned Branch Chief, MILMED Centre of Excellence; Mr John Redmayne, the JALLC's Principal Operational Research Analyst; and Mr Al Musgrove, a strategy, policy, and engagement analyst, Joint Lessons Learned Division, US Joint Chiefs of Staff, joined Mrs Eaton as panel members.

Mrs Eaton introduced the panel by pointing out that the *generic learning process* was about how individuals learned whereas the *Lessons Learned process* was about the way that organizations learn. She then asked the audience to consider whether they thought their own organizations had all six characteristics of a learning organization: an open culture; feedback loops; the promotion of personal mastery; planning for intelligent fast failure; stealing best practice; and cultivating a common vision. She then posed the first question to the panel, asking the members what they thought was the biggest challenge for NATO in relation to Lessons Learned, which each panel member had an opportunity to answer.

In this context, Lessons Learned were referred to as the *stepchild of NATO* at every level, in the sense that they are often conducted as an afterthought in between getting to the next task. Sometimes they are postponed, or not done at all. All were agreed that what seemed to be needed was a change of mindset, leadership, and culture—areas where the human factor was at least as important as assistance from new technologies.

Going forward, the panel noted that it would be important to improve the way that observations were collected to make it as user-friendly as possible, so that the impetus towards using compatible—although not necessarily the same—systems and sharing lessons became unstoppable and the demand side for Lessons Learned grew. A tipping point would then be reached, and the Lessons Learned process would reach maturity. It was also noted that that Lessons Learned staff need to be located in an appropriate place in their organizations, with direct access to the command structures.

During the panel, good examples were given of how NATO does learn lessons, quickly, efficiently, and effectively, when there is a real sense of urgency. The critical success factors were leadership, stakeholder responsibilities, fixing issues once they had been identified, and information assurance to achieve confidence in its confidentiality, integrity, availability, non-repudiation, and authentication.

It will now be important to ensure that this sense of urgency is felt across the Lessons Learned community and beyond to ensure that we can drive change and really begin to take action to improve the NATO Lessons Learned Capability.

New Technology Features Panel

The second NTE18 panel covered the topic of New Technology Features and was moderated by Dr Michael Street, the Head of Innovation and Data Science at NATO Communications and Information (NCI) Agency.

Dr Gabriele Rizzo, the Lead Scientist, Strategic Innovation, in the CTO and Strategy of Leonardo and Professor at Sapienza University of Rome; Roy Hasson, Global Development Manager, Analytics and Data Lakes at Amazon Web Services; Mark Hoffman, Senior Manager at Lockheed Martin ATL; Pascal Mougin, Director Business Capture at Thales Raytheon Systems; and Dr Leid Zejnilovic, Professor at Nova School of Business and Economics of Lisbon all joined Dr Street as panel members.

An interesting discussion followed, starting with how technology could help to increase the outflow from a Lessons Learned database and could act as the critic sitting on the analyst's shoulder.

The discussion ranged over the value of the contextual knowledge that the user of the data had, and how that could help to specify or even provide the service required. What the panel considered as sometimes lacking was the audacity to experiment and fail. Without failure or the acceptance that there might be failure—which could be difficult in a military context—technological innovation would not happen. NATO should define what it is good at and what it wants to achieve, provide that service quickly, and then modify, adapt, and improve. Focus on what works well and do it better.

The panel noted that perhaps more important than identifying the right technology to solve a problem was first really understanding the problem and the problem owner. Looking at living examples together with industry might be productive and change the *what* as well as the *how*. Companies had begun to shift away from mechanics and plumbing toward insight and prediction.

If the purpose was understood, along with what action needed to be taken to serve that purpose, then technological solutions—many of which were already in use in other sectors—would follow. What was needed was to make solving the problem the mission.

The pace of operations was increasing exponentially: battles would in future take place in cyber space and would be over in seconds. Traditional methods of collecting observations would then no longer be appropriate. What was needed was a way to capture all the data automatically and store it for future analysis. On the one hand, integrating Lessons Learned with other NATO systems was logical. However, the more systems were integrated, the more vulnerable they tended to be.

Finally, there was interesting discussion on where Lessons Learned should sit in an organization, where knowledge and understanding of new technologies needed to be and the impact of hierarchies in relation to subject expertise and the persuasiveness of the technological argument.

Bridging the Problem and Solution Space

**Mr Liviu Lazar, the Industry Relations Coordinator
in the Defence Investment Division of the NATO HQ International Staff**

Mr Liviu Lazar, the Industry Relations Coordinator in the Defence Investment Division of the NATO HQ International Staff presented the NTE debate in a wider NATO context and described how the International Staff perceives the correspondence between the challenges faced and the solutions that can be imagined.

He spoke about the **importance of ensuring that the problem was clearly articulated, of asking the right questions**, especially *why*—something that was often difficult in a military organization—and of acknowledging that the most appropriate solution might well be a surprising one.

He gave a few examples of such problems, including a problem at the very heart of the Alliance: interoperability. In this context, Mr Lazar highlighted a JALLC analysis project that showed that, although **many problems identified during the ISAF mission were attributed to interoperability**—and oftentimes techno-logical/hardware interoperability—in reality **these problems usually boiled down to a much more human problem: the ability to communicate across so many different languages**. What was needed to re-solve the problem was good language skills, both among those who spoke English as a first language and those who did not.

Bringing the topic of his presentation round to the NTE18, Mr Lazar noted that **the collection and analysis of Lessons related data should be separated from the act of learning the lessons**. The former involved Big Data, which can be coherent, structured, rapid, trusted, contradictory or inconsistent. Handling data was a distinct science, which could be assisted by technology. **The act of *learning* the lesson, however, was a different science and required a different toolset and skillset**. It was about people and process-es. Differences in cultures, backgrounds, languages, understandings, training, tactics, techniques, procedures, and legislation would all affect this ability to learn.

He finally noted that **technology could indeed help** in this respect. The solutions were increasingly offered by non-traditional and often small defence companies, with whom NATO was starting to engage. Mr Lazar said that those companies, which are both innovative and critical to defence and security, have to be valued and promoted. NATO needed to hear from them and to change its processes to implement the solutions, so that it could adapt and transform.

In his presentation, and in this context, Mr Lazar highlighted the **NATO-Industry Forum**, sponsored by the NATO Secretary General, as the venue for high-level debate between NATO political and military leaders, national politicians and top representatives from industry.

Key Leaders

Workshops

Key leaders from all the organisations present at NTE18 met for discussion under the chairmanship of Rear Admiral (ret) Mario Durão, President of AFCEA Portugal, and facilitated by Mr John Redmayne, the Principal Operational Research Analyst at the JALLC.

The consensus was that the event had been worthwhile, had included an appropriate range of people and solutions, and had given participants what they had expected and needed, including much food for thought.

The NATO participants had a wider understanding of the potential of new technologies and the need to answer the *why* question, and the participants from Industry and Academia had more understanding of NATO's culture and issues.

It had been the start of an important dialogue, and there was appetite for more. The next step might, for example, be to transform participants into actors by getting them to work together—NATO and the Nations with industry and academia—on a problem, to make the most of the emerging synergies, or to give Industry and Academia participants a data set to work on in advance. Some kind of link with the upcoming NATO Lessons Learned Conference might help to ensure that the thinking was fully joined up. As dialogue developed, it would be good to make sure that those starting out in Industry and Academia were involved as much as possible too.

Expert Level

The experts from all the organizations present at NTE18 met for discussion under the chairmanship of Group Captain Neil Cummins, Division Head at the JALLC, facilitated by Mr David Noon, a JALLC Research Analyst. The aim was to collect all the wisdom in the room on the challenges in the NATO Lessons Learned process.

There was a lively and interesting discussion across a wide range of issues—the visibility and status of Lessons Learned within NATO, the links with knowledge management, the tension between processes that require everything to be closely specified and the need to discover what we do not know, training so that people have confidence in what they are doing, make the NLLP more intuitive and user-friendly, decide how far back data should go in the NATO LL Portal, improve the search process, evaluate the success of LLs, and make sure that Lessons are not just admired but fully learned, remembered, and acted on.

Conference Agenda

TUESDAY,
02 OCTOBER

11:00 – 11:15 | Admin remarks – JALLC

11:15 – 11:30 | Welcome from JALLC Commander BGEN Antonio Nascimento

11:30 – 12:15 | Introductions from Industry and Academia Participants

12:15 – 12:30 | Group Photo

12:30 – 13:30 | Hosted Buffet Icebreaker

13:30 – 14:30 | Booth Session

14:30 – 14:45 | **Keynote Speaker: Vice Admiral Paul Bennett CB OBE Chief of Staff Allied Command Transformation**

14:45 – 15:05 | NATO Lessons Learned Capability—From Optimization to Innovation – BGEN Antonio Nascimento, COM JALLC

15:05 – 15:15 | NATO ACT Innovation Hub – Major Cedric Sauvion, Future Solution, HQ SACT

15:15 – 15:30 | Introduction to New Technologies Terminology – Mr Stephan Brunessaux, Senior Expert Artificial Intelligence Data Analytics, Airbus DS

15:30 – 16:00 | Coffee Break and Booths

Industry and Academia Presentations and Demonstrations

16:00 – 16:30 | EXONAUT – 4C Strategies

16:30 – 17:00 | Philips – Speech Processing Solutions

17:00 – 17:30 | C2ISR Portfolio Products – Airbus

17:30—17:35 | Daily Wrap-Up – JALLC

WEDNESDAY,
O3 OCTOBER

08:50 – 09:00 | Admin Remarks – JALLC

Industry and Academia Presentations and Demonstrations

09:00 – 09:30 | Instrumentation and Search to Identify Lessons Learned – Lockheed Martin Advanced Technology Laboratories

09:30 – 10:00 | Amazon Suite – Amazon Web Services

10.00 – 10:30 | Augmented Near real Time Instrument Process Experiment – Engineering School for Cognitive Sciences of Bordeaux/Thales Raytheon Systems/IBM

10:30 – 11:00 | Coffee Break

11:00 – 12:30 | Booth Session

12:30 – 13:30 | Lunch

Industry and Academia Presentations and Demonstrations

13:30 – 14:00 | Integrated Versatile Advanced NATO Analytics – NCI Agency

14:00 – 14:30 | POC RETEX – Sopra Steria

14:30 – 15:00 | Zero Time to Data – Indexima

15:00 – 15:30 | Coffee Break

15:30 – 16:30 | Booth Session

THURSDAY,
04 OCTOBER

08:50 – 09:00 | Admin Remarks – JALLC

09:00 – 10:10 | Panel on Lessons Learned Challenges

More than once—at the NATO LL Conference, LL workshops and working groups—he NATO Lessons Learned community has recognized that it faces challenges to all of the elements of the NATO LL Capability (leadership, mindset, structure, process, tools, training, and information sharing). Moreover, the expected expansion of the data environment may lead to yet unknown challenges that will need to be faced.

In this panel discussion, subject matter experts and decision makers from HQ SACT, SHAPE, JALLC, MILMED Centre of Excellence, and US Joint Staff discussed the main challenges they have faced in this respect in their organizations and what challenges they expect to face in the (near) future. The audience had the opportunity to engage with the panel members through questions and discussion.

10:10 – 11:00 | Coffee Break and Booths Session

11:00 – 11:20 | Bridging the Problem and Solution space – Mr Liviu Lazar, NATO Industry Relations Coordinator, Defence Investment Division, NATO HQ

11:20 – 12:30 | Panel on New Technology Features

Emergent and disruptive technologies have now evolved to a level where they can contribute to changing the very nature of warfare. Artificial Intelligence, Machine Learning, Polyglot Solutions, Analytics, Autonomy, etc. are not just buzzwords – they are a reality of the NATO operating environment. As such, we have a responsibility to the Nations and our forces to understand these technologies fully in order to assess they could be used by NATO to improve and maintain superiority over its potential adversaries.

In this panel discussion, subject matter experts from Industry and Academia gave their personal insights into how emergent and disruptive technologies—available today and expected in the near future—could help to address the challenges faced by the NATO LL community. The audience had the opportunity to engage with the panel members through questions and discussion.

12:30 – 13:30 | Lunch

13:30 – 14:45 | Key Leader and Expert Level Workshops

14:45 – 15:00 | Wrap-Up and Closing Remarks – BGEN Antonio Nascimento, COM JALLC

Who's who....?

Vice Admiral Bennett joined the Royal Navy in September 1985 and has enjoyed an extensive sea-going career. He has commanded at every rank: HMS BITER, the patrol vessel of the Manchester Universities Royal Naval Unit (1991-1992); the minehunter HMS ATHERSTONE (1998-1999); and the destroyer HMS EXETER (1999 - 2000) which included a return to the Gulf. As a Captain, he was the first Commanding Officer of HMS DARING, the first T45 Destroyer (2008-2009) and, following promotion to Commodore, he commanded the Amphibious Task Group operating in the Indian Ocean, Norwegian Arctic and on the West Coast of the USA (2009-2011).Finally, as a Rear Admiral, he commanded the UK Maritime Battlestaff and NATO High Readiness Force (Maritime) (2017-2018).Interspersed between sea-going appointments, he has served ashore as the Fleet Operations Officer; as the Maritime Desk Officer to the Director of Operational Capability in the MOD; as capability manager in Navy Command for Above Water Capability and Maritime Security, for which he was honoured as an OBE; and for 6 months in Baghdad, as the Advisor to the senior Iraqi hierarchy in their Joint Headquarters. From 2011-2013, he was the Commodore Naval Personnel Strategy, responsible for reshaping the Naval Service in the aftermath of SDSR 10.Promoted to Rear Admiral in February 2013, he was appointed as Director of the Development, Concepts and Doctrine Centre; Chief of Staff, Joint Forces Command, ACNS (Cap) and Chief of Staff Navy Command HQ; and, most recently, Commander United Kingdom Maritime Forces and Rear Admiral Surface Ships. Her Majesty The Queen appointed him as a Companion in the Military Division of the Most Honourable Order of the Bath in the Birthday Honours 2016.He became Chief of Staff Allied Command Transformation in Norfolk Virginia in July 2018.Vice Admiral Bennett is an alumnus of Higher Command and Staff Course (2007) and the Windsor Leadership Trust. He is a Younger Brother of Trinity House and a Liveryman of the Carpenters' Company.

Brigadier General (BGEN, Portuguese Air Force) Antonio Nascimento was born in Lisbon, Portugal, in 1965. He joined the Portuguese Air Force Academy in 1983 and graduated in 1988, after concluding the Undergraduate Pilot Training in Laughlin AFB, Texas, USA. Between December 1988 and October 2000, he served in various flying squadrons as a T-37, T-38 and Alpha-Jet instructor pilot, and as an Alpha-Jet operational pilot. From 1999 until 2000, he served as Squadron Commander of the 103 Squadron. In October 2000, BGEN Nascimento took his first staff assignment as chief of the Exercises and Evaluation Section at the Air Force Operational Command. During this period he was responsible for planning Air Force exercises and coordinating the participation of Air Force units in joint national and NATO exercises. He also planned and conducted several national tactical evaluation events to prepare flying units and CRC for NATO Tactical Evaluations. In September 2004, BGEN Nascimento was assigned to the Portuguese Air Staff and War College to teach in the Force Employment Section. Two years later, he was assigned to the Joint Staff and War College where he continued to teach in the Air Force branch. In September 2008, BGEN Nascimento started a three-year assignment at SHAPE as Section Head of the Force Standards and Lessons Learned Section of the Readiness and Requirements Directorate. Between 2011 and 2012, BGEN Nascimento served in the Joint Operations Command HQ as chief of the Plans Branch, responsible for the planning of national joint operations and exercises. In September 2012, BGEN Nascimento was assigned as the commander of Air Base 6 Montijo, where he served for two years. After attending the Flag Officers Course, he served as Chief Resources Division in the PRT AF HQ, before being assigned as the chief of the Centro de Informações e Segurança Militar (CISMIL) in September 2017.In July 2018, he took command of NATO's Joint Analysis and Lessons Learned Centre in Lisbon, Portugal.

NTE Speakers: Biographies

Major Cedric SAUVION is an analyst in the Future Solutions Branch in HQ Supreme Allied Commander Transformation. He is one of the lead project officers of the ACT Innovation Hub. Prior to working at NATO, he spent 14 years as an Officer in the French Air Force as an Air Traffic Controller and then as a staff officer responsible for all operational and IT specialties. He holds an Air Traffic Controller Licence and 3 Bachelor degrees in Electronical Engineering and Computer Science, Radio Communication Engineering, and Defence and Security.

Stephan Brunessaux is currently Senior Expert Artificial Intelligence Data Analytics within the Image and Intelligence department of the Engineering division of Airbus Defence and Space. He has been involved in NATO Industrial Advisory Group studies (SG-209 and SG-225) on Big Data and Artificial Intelligence. Stephan has also successfully applied natural language processing techniques to open source intelligence and social media analysis. Stephan participated in several EU projects on AI technologies (SIIP on speaker identification, Virtuoso on open source intelligence, Vitalas on image and video analysis, etc.). He also acted as an EU expert on semantic web technologies (ICT) and safer internet action plan (SIAP). Stephan has also worked as an expert for the French National Research Agency (ANR) on Big Data and AI. He is a member of the Big Data and AI committee of IRT System X and also a member of the Industrial College of the French Association for Artificial Intelligence. Stephan started his career as a research engineer in the AI team of LORIA France in 1988 before joining Airbus in 1990. He has been supervising 16 PhD students and has a record of more than 25 publications. He holds a master's degree in Computer Science and a specialized master's in Artificial Intelligence.

Mr Lazar was appointed NATO's Industry Relations Coordinator and Innovation Coordinator, after years of involvement in the NATO Industrial Advisory Group (NIAG) and the Life Cycle Management Group (LCMG), within the Defence Investment Division of NATO International Staff, in Brussels, Belgium. Prior to working on and with industry, he was responsible for the development of Joint Intelligence, Surveillance and Reconnaissance (JISR) and Command and Control (C2) policies and concepts within the NATO Air Force Armaments Group (NAFAG). Liviu earned a Bachelor's degree on Electronics for Radar Systems from the Military Technical Academy, and a Masters in International Relations from Bucharest University. Prior to joining NATO, he worked, inter alia, on foreign technical cooperation as Deputy Head at the Armaments Department in Bucharest. Before that, for almost a decade he was a scientific researcher and the head of the Advanced Electronics Research Laboratory within the defence industry. During that time, he patented one of his inventions for which he still holds the intellectual property rights. In his current position he developed and promoted the Framework for NATO-Industry Engagement to the North Atlantic Council; the Framework represents the basis for implementing the declarations of the Heads of State and Government at the recent NATO Summits on the importance of maintaining a strong defence industrial base in Europe and North America, and strengthening transatlantic defence industrial cooperation. Mr. Lazar is the International Staff representative in charge of the execution of the NATO-Industry Forum, under the sponsorship of the NATO Secretary General. The Forum is co-organised by the Supreme Allied Commander Transformation and the Assistant Secretary General for Defence Investment, and is the venue for NATO strategic dialogue with the defence and security industry, academia and think tanks, as well as with national administrations, parliamentarians, military and EU institutions, aimed at identifying innovative solutions, cooperation opportunities and strategies for NATO capability development. He created the NATO Business Opportunities portal and the Industrial Relations portal.

Who's who? NTE Panel Members List

Lessons Learned Challenges Panel

Panel Moderator: Jackie Eaton, Science & Technology Advisor, NATO Office of the Chief Scientist

Brigadier General Athanasios Tsouganatos, Assistant Chief of Staff JFD

Brigadier General Franz Pfrengle, Assistant Chief of Staff SHAPE J7

Captain Jackson B. Taylor, M.D, FACS, Medical Corps United States Navy

John Redmayne, Principal Operational Research Analyst, JALLC

Al Musgrove, Strategy, Policy and Engagement Analyst, Joint Lessons Learned Division, United States Joint Chiefs of Staff

New Technology Features Panel

Panel Moderator: Dr Michael Street, Head of Innovation and Data Science, NCIA

Professor Dr. Gabriele Rizzo, Lead Scientist Strategic Innovation, Leonardo

Roy Hasson, Global Business Development Manager for Analytics and Data Lakes at AWS

Mark Hoffman, Senior Manager, Lockheed Martin ATL

Pascal Mougin, Director Business Capture, Thales Raytheon Systems

Dr Leid Zejnilovic, Assistant Professor at the Nova School of Business and Economics, Lisbon

Going Digital!

The NTE18 was all about New Technology and how we can harness its power to potentially improve the NATO Lessons Learned Capability. But the process of using new technology to make things more effective and efficient, started well before the NTE18 opened its doors in October.

All events need to pass on administrative information to the participants; whether it is the event agenda, the biographies of the speakers, or even just where to find lunch. Event organizers need a way to communicate the basic information of the event with participants. Traditionally this is done in some kind of paper publication such as a conference letter or a booklet.

For the NTE18, the JALLC Communications Team decided that, given the nature of the event, and the fact that we need to start considering our carbon footprint when designing these events, it was time to give up paper and go digital! The idea for the NTE App was born.

The JALLC's editor, Jodie Lazell, and one of the JALLC's interns at the time, Giuseppe Fersini, researched the possibilities of in-house designing a web-based application that would be easy for participants to access and easy for JALLC staff to update. The team then set about designing the web-app to be as intuitive and yet comprehensive as possible, taking past NATO Lessons Learned Conference information booklets as a template for the kind of information that would need to be provided. The team then thought about what additional information would be useful to participants as, with a digital format, space was not a problem as the number of pages was not limited. Consequently, the NTE18 web-app also contained information on Lisbon, information on the JALLC, including YouTube videos, and links to useful sites.
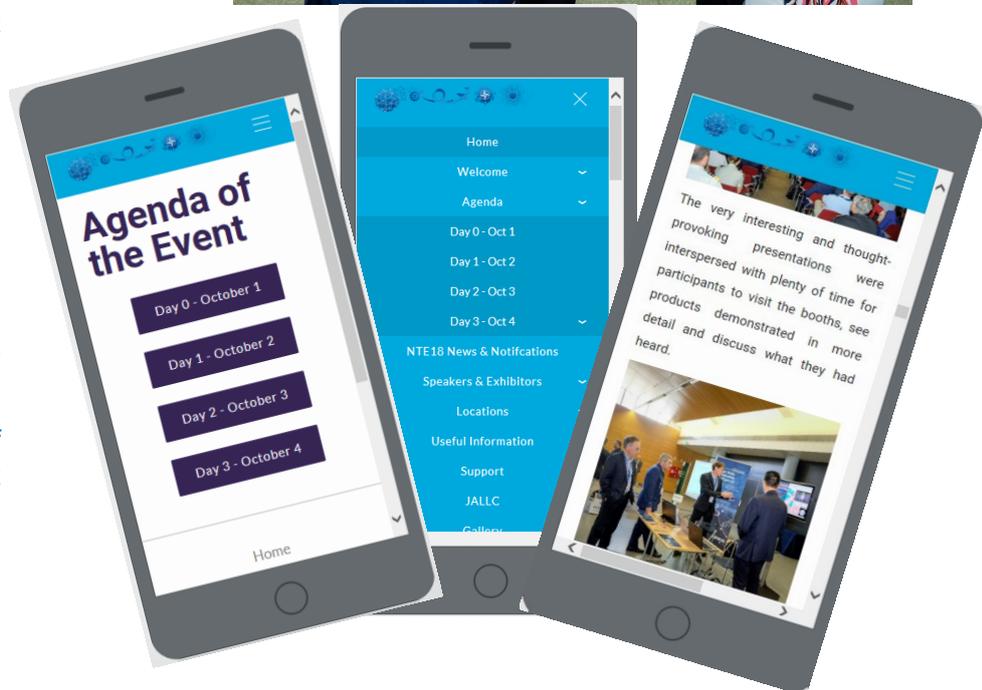
The added benefit for the JALLC staff of using the app to communicate, was that it allowed the organizational team to update participants of any last minute changes, to the agenda for example.

The NTE App was very well-received and very much used by all during the conference, with many noting how practical and easy it was to use.
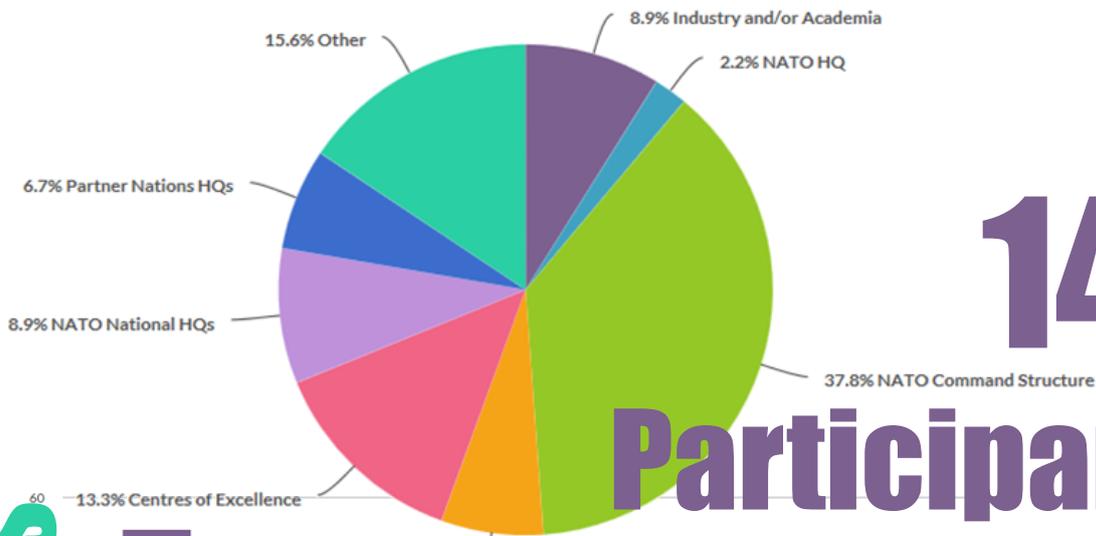
"*It's definitively a best practice we at the JALLC will be taking forward,*" commented event organizer Stefan Olaru of the JALLC. "*It was efficient, effective and it was excellent use of new technology.*"

The next opportunity to roll out a JALLC event app will be the upcoming NATO Lessons Learned Conference. Watch the JALLC's website and the NATO Lessons Learned Portal for more information on that event.
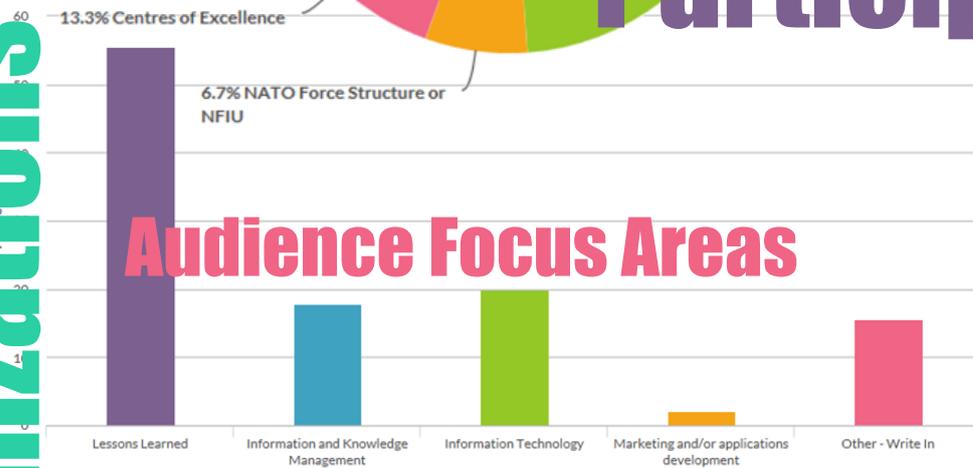
Follow us on Twitter and Facebook

NTE18 @ a Glance

8.9% Industry and/or Academia

2.2% NATO HQ

15.6% Other

6.7% Partner Nations HQs

8.9% NATO National HQs

37.8% NATO Command Structure

13.3% Centres of Excellence

6.7% NATO Force Structure or NFIU

140 Participants

30 organizations

Audience Focus Areas

Lessons Learned | Information and Knowledge Management | Information Technology | Marketing and/or applications development | Other - Write In

"The event more than met my expectations. I was really impressed with every aspect. "

technologies
decision
learned nato
invited participants
presentations
focus industry event
activation start earlier
workshop lessons activities adding
time ll process
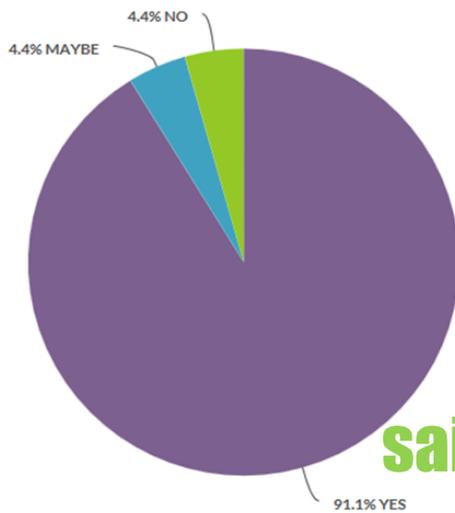academia panel industries discussion

NATO LL Conference

Don't miss the next Lessons Learned Event!

More information will be posted
on the NATO LL Portal about this fantastic event!

"This event really made me think and broadened my horizons."

4.4% NO
4.4% MAYBE

91.1% YES

91%
said they would recommend the event

Why come to the NTE18?

Value		Percent
Interesting speakers and content		39.6%
Personal development		27.1%
Networking		33.3%
Share information/knowledge/experience		47.9%
Present and demonstrate software/applications/projects		20.8%
Other - Write In		31.3%

"The event shows that NATO is open minded and trying to work effectively with industry. "

DATA MINING

LESSONS LEARNED

Analytics

INNOVATION

Smart Search Engines

10
10

Artificial Intelligence

TREND ANALYSIS

JALLC

An event in support of the
NATO Lesson Learned Capability