NATO Science & Technology Organization

Autonomy from a NATO Perspective

SCI-335 – 24 May

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Content

- June 2021 Summit – The Journey
  - EDT Roadmap
  - STO Technology Trends 2020-2040
  - NATO 2030
  - EDT Implementation Strategy
  - STO D3TX and PPW and Way Ahead
- How it Fits Together
- …And the vital role of Autonomy

EDT Roadmap

- **Defence Ministers – October 2019**

- **Emerging and Disruptive Technologies Roadmap**

  The Science and Technology Board is tasked to report regularly on emerging and disruptive technology trends and their military implications.

- **Endorsed by NATO HOSG – December 2019**

  "We are addressing the breadth and scale of new technologies to maintain our technological edge, while preserving our values and norms"

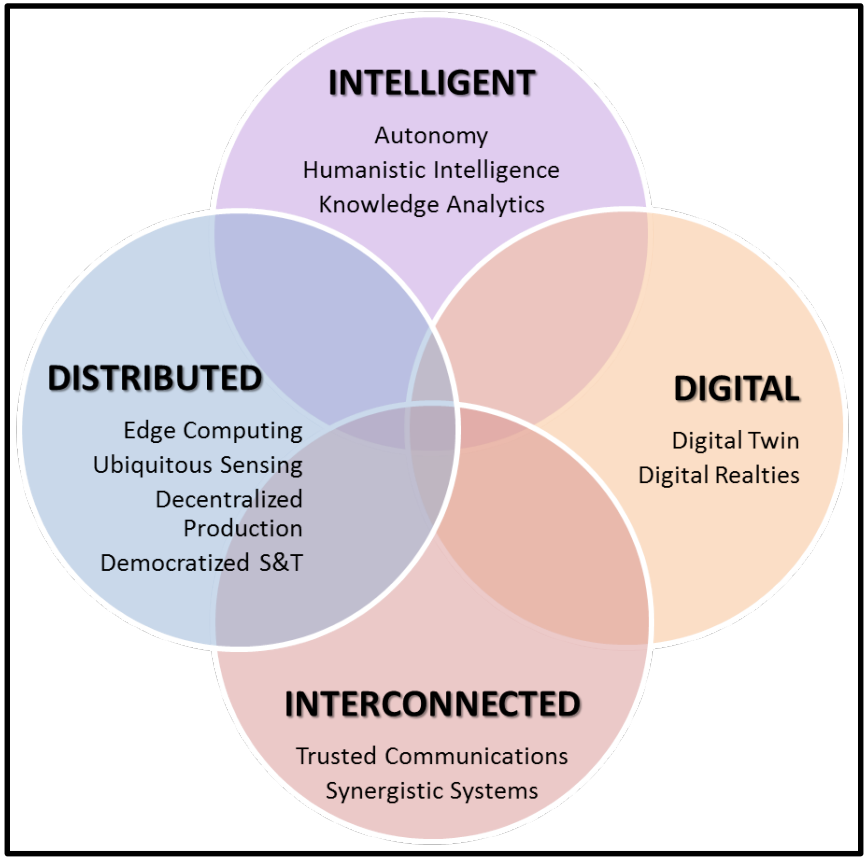
WHY
- **Leadership:** overview
- **Staffs:** policy, military & armaments
- **Corporate:** prepare for mission success

WHAT
- EDTs are important
- Their future development
- Alliance implications

HOW
- Contextualize
- Explain
- Inform
- Forecast
- Link
- Challenge

https://www.nato.int/nato_static_fl2014/assets/pdf/2020/4/pdf/190422-ST_Tech_Trends_Report_2020-2040.pdf

Technology Trends – Main Conclusions



SYNERGIES

- AI-DATA-AUTONOMY
- AI-DATA-BIOTECH
- AI-DATA-MATERIALS
- DATA-QUANTUM
- SPACE-QUANTUM
- SPACE-HYPERSONICS-MATERIALS

TIMELINES

DISRUPTIVE: 5-10 Years

- DATA
- AI
- AUTONOMY
- SPACE
- HYPERSONICS

DISRUPTIVE: 10 – 20 Years

- QUANTUM
- BIOTECH
- NOVEL MATERIALS

NATO 2030

- **NATO HOSG – December 2019**
  - "We invite the Secretary General to present…a forward-looking reflection process…to further strengthen NATO's political dimension"

- **NATO 2030 – launched June 2020**
  - Independent Group – 10 Experts
  - Young Leaders – 14 Emerging Leaders
  - Civil Society and Private Sector Engagement

NATO 2030

"As we look to 2030, we need to work ever more closely with like-minded countries. Like Australia, Japan, New Zealand, South Korea. To defend the global rules and institutions that have kept us safe for decades. To set norms and standards. In space and in cyber space. On new technologies and global arms control."

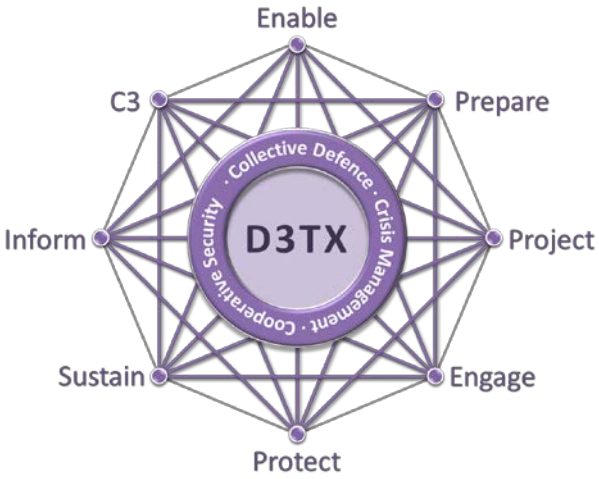
NATO Secretary General 8 June 2020

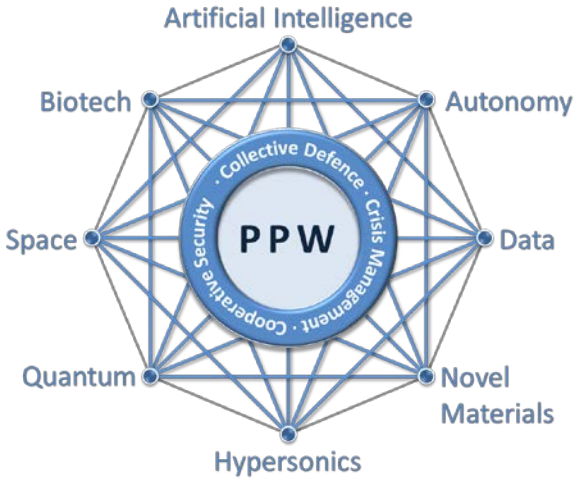
EDT Implementation Strategy

- **Agreed Defence Ministers February**
  - Identify
  - Understand
  - Act

- **For Autonomy**
  - **Understand:** analyze **autonomy** in the context of potential military capabilities
  - **Act:** contribute to **autonomy** implementation plan

D3TX/PPW February 2021





Disruptive Technologies Table-Top Exercise

8-9 February 2021
Public Release

focused on Technology Assessment

STO Plans & Programmes Workshop

10-11 February 2021
NATO Unclassified

focused on Programme Development

D3TX – Scenarios

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Collective Defence – Article 5, urban, coastal

Crisis Management 1 – Hybrid warfare

Crisis Management 2 – Humanitarian disaster

Cooperative Security – Nuclear verification

D3TX – Technologies

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#01 – **Data** – Advanced Analytics
#02 – **Data** – Communications
#03 – **Data** – Advanced Decision Making
#04 – **Data** – Sensors
#05 – **AI** – Advanced Algorithms
#06 – **AI** – Applied AI
#07 – **AI** – Human Machine Symbiosis
#08 – **Autonomy** – Autonomous Systems
#09 – **Autonomy** – Human-Machine Teaming
#10 – **Autonomy** – Autonomous Behavior
#11 – **Autonomy** – Countermeasures
#12 – **Space** - Platforms
#13 – **Space** – Space Operations
#14 – **Space** – Sensors (and Communication)

#15 – **Hypersonics** – Platforms & Propulsion
#16 – **Hypersonics** – Countermeasures
#17 – **Quantum** – Communication
#18 – **Quantum** – Information Science
#19 – **Quantum** – Precision Navigation (PNT)
#20 – **Quantum** – Sensors
#21 – **Biotechnologies** – Bioinformatics
#22 – **Biotechnologies** – Human Augmentation
#23 – **Biotechnologies** – Medical Countermeasures
#24 – **Biotechnologies** – Synthetic Biology

*#25 – **Materials** – Novel Materials*
*#26 – **Materials** – Additive (Agile) Manufacturing*
*#27 – **Materials** – Energy Storage*

PPW – Select Results

Initial analysis

- **Explainable AI**
- **Trust**
- **Space as an enabler**
- **Wider application of autonomous systems**

Challenges

- **Defence against adversarial use of EDTs is acknowledged as highly relevant, but little is shared amongst Allies.**
- **This work tends to be classified.**

Next Steps …

- **Programme development**
  Review and analyse results in detail to guide future STO programme

- **Partnering and Reporting**
  Evaluate results –together with current programme– for cooperation opportunities, and report against EDT Strategy

EDTs/Innovation @ NATO
HOW IT FITS TOGETHER

- NATO Innovation Board
- Links between Stakeholders

NATO Innovation Board

- Chaired by Deputy Secretary General
- Members include: CMC, SACT, SACEUR, DGIMS, ASG/Emerging-Security-Challenges, Chief Scientist
- Independent Advisory Group
- Overseeing Innovation and EDT Strategy Implementation

Links between Stakeholders

- STO, ACT…. already working on Innovation/EDTs
- Already many strong links between stakeholders
- Efforts on Coherent Implementation Strategy on EDTs co-ordinated by Joint Task Force

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…and Finally

"Today, NATO is driving innovation across the Alliance. For instance, the NATO Science and Technology Organization has a network of more than 6,000 scientists and engineers. Dedicated to integrating the latest technologies – including Artificial Intelligence, Big Data and quantum computing – into NATO and Allied platforms. Such as our next generation early-warning aircraft. And maritime autonomous vehicles for mine-sweeping."

NATO Secretary General, Global Security Forum, Oct 2020

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