Dstl R-Cloud
Commercial Services
Porton Down
Salisbury
Wiltshire
SP4 0JQ

E-mail: dstlrcloud@dstl.gov.uk

Statement of Requirement for the R-Cloud Communications & Networks Strategic Capability (SC) Strategic Capability

Introduction:

The Defence Science and Technology Laboratory (Dstl), which is part of the UK Ministry of Defence (MOD), is refreshing its commercial agreement for Science and Technology (S&T) research contracts, known as R-Cloud (Research Cloud).
MOD places extensive fundamental, experimental and applied research with industry and academic suppliers and wants to broaden access for this supply base, reducing the cost of trading with MOD and enabling agile contracting. R-Cloud complements MOD's other contracting mechanisms and academic and industry suppliers of S&T research are now invited to apply to join MOD's research supplier community within the Communications & Networks (SC) Strategic Capability.

This statement of requirement relates to suppliers joining R-Cloud within the Communications & Networks (SC) capability area. R-Cloud provides a low barrier to entry for potential suppliers and offers direct access to MOD's current and future research requirements. Academic and industrial suppliers of Communications & Networks (SC) research are invited to apply to R-Cloud if you are a supplier of Science and Technology Research in this area.

Communications & Networks encompasses a broad range of technical areas, not limited to but including, securely communicating data and information between people and machines, as well as organisational structures to understand, decide and act.

Communications & Networks - Statement of Requirement

The Communications & Networks SC covers the capabilities that enable secure sharing of information within and between military forces, government agencies and other organisations. This includes the transmission and receipt of signals through air, water and space; techniques for securing transmissions and overcoming or mitigating electronic, cyber and physical threats; the establishment of trusted networks to enable information management & exploitation; and command and control across the enterprise. This spans all theatres and domains of operation.

In the increasingly Contested, Congested and Constrained information environment of the Information Warfare age this assurance requires continuous Science and Technology (S&T) effort to maintain a leading edge over adversaries. Research required to offer the Defence and Security community the opportunity to consider new, challenging concepts and disruptive

Communications & Networks

technologies that could offer greater freedom of action, reduced casualties and reduced collateral damage

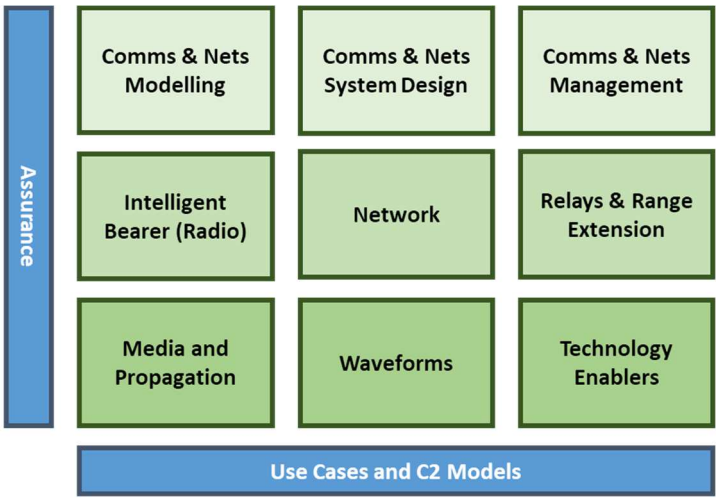

Fig.1: Communications and Networks Capability Element Structure

Communications and Networks Modelling	Tools, facilities and expertise to conduct modelling of and experimentation with communications and network systems.
Communications and Networks System Design	Expertise to consult on the design of military communications and networks capabilities. Engage with Industry to help shape PV research and product developments.
Communications and Networks Management	Expertise to conduct research, experimentation and consultation on military communications and networks management.
Intelligent Bearer	Driving research and development of an agile bearer ecosystem, initially centred on the agile policy controlled radio, with exploitation opportunities to enable operation in peer threat scenarios.
Networks	Driving research and development of an agile network ecosystem - enabling adaptation, agility and interoperability at tactical, operational and strategic levels - with constant exploitation to enable operation in peer threat scenarios.
Relays and Range Extension	Driving research and development to extend the range of communications bearers to reduce SATCOM dependence.
Media and Propagation	Delivering options for information transfer beyond the current limited RF bands; exploiting via agile radio concept.

Waveforms	Research and development to deliver waveforms to enable resilience, interoperability and to support niche applications.
Technology Enablers	Focussed incubation to secure supply of key technical components that will not be available as COTS or where sovereign control is required
Assurance	Cross cutting assurance theme which develops evolving threat mitigations across all capability elements.
Use Cases and C2 Models	An evolving set of use cases and C2 requirements which drive planning and execution across all capability elements.

Fig.2: Communications & Networks Capability Element Definitions

Scope of Coverage

The scope of coverage of topics related to:

1. Communications & Networks Modelling includes, but is not limited to, the following:
    a. Development of models at the physical, link, network and service layers to enable model-based analysis of all aspects of communications capability using appropriate modelling tools.
    b. Characterisation and parametrisation of communications and network systems and their performance, including the impact on C2 and force effectiveness, to inform model development.
    c. Design and delivery of experiment and analysis using communications and network models.
2. Communications & Networks Systems Design includes, but is not limited to, the following:
    a. Communication networks: routing, addressing, topologies and laydowns.
    b. Communications and networks: performance, optimisation and integration.
    c. Communication protocols: wired and wireless; current and emergent; secure; using open or closed standards or specifications.
3. Communications & Networks Management includes, but is not limited to, the following:
    a. Design, evaluation and analysis of communication link and network management protocols, systems and architectures.
    b. Investigation or evaluation of policy driven approaches to network management and supporting protocols, languages, schemas and architectures.
    c. Commercial technologies and frameworks for network management within and across organisations and their application to military use cases.
4. Intelligent Bearers includes, but is not limited to, the following:
    a. Investigating techniques for the adaptation of radio or other bearer performance, behaviour and/or configuration dynamically against anticipated or unanticipated disruptions.
    b. Investigating techniques for dynamically changing the frequency, directionality or modulation and coding scheme of a link or subnet.

   c. Investigating techniques for synchronising agile behaviours of bearer nodes.
5. Networks includes, but is not limited to, the following:
   a. Researching, investigating and evaluating approaches to network to quality of service and routing to support users in challenging communication environments.
   b. Researching, investigating and evaluating approaches to network programmability to support users in challenging communication environments.
   c. Researching, investigating and evaluating approaches to network security and assurance to support users in challenging communication environments.
   d. Researching, investigating and evaluating approaches to the automatic formation and maintenance of networks both where the network has been pre-planned and where it is not pre-planned. This may include ad-hoc networking approaches.
6. Relays and Range Extension includes, but is not limited to, the following:
   a. Researching, investigating and evaluating approaches to extend the range of wireless links using scattering either from atmospheric effects or from man-made objects or materials.
   b. Researching, investigating and evaluating approaches to the establishment of automated relays either as stand-alone or multi-function systems.
   c. Researching, investigating and evaluating approaches to the physical delivery of data between remote locations using either dedicated or parasitic data mules.
7. Media & Propagation includes, but is not limited to, the following:
   a. Researching, investigating and evaluating approaches to exploitation of regions of the electromagnetic spectrum which are not currently exploited by military systems.
   b. Researching, investigating and evaluating approaches to improve the performance, resilience or reach of transmissions in wireless links.
   c. Developing and improving models for propagation prediction.
8. Waveforms includes, but is not limited to, the following:
   a. Researching, investigating and evaluating approaches to improve the spectral efficiency achieved on a given carrier either to improve performance or to reduce spectrum use.
   b. Researching, investigating and evaluating approaches to improve the resilience of waveforms to electronic attack or interference.
   c. Researching, investigating and evaluating approaches to reduce the ease with which signals can be detected and geolocated by third parties.
9. Technology Enablers includes, but is not limited to, the following:
   a. Transmitters, receivers, filters and transducers, e.g. antennas, for different communications media (including, but not limited to, radio, optical and acoustic systems).
10. Assurance includes, but is not limited to, the following:
   a. Researching, investigating and evaluating techniques to improve transmission, communication and information security.
   b. Researching, investigating and evaluating techniques for dynamic risk assessment and mitigation in highly dynamic networks.
11. Use Cases and C2 Models includes, but is not limited to the following:
   a. Assessing the benefits and drawbacks impact of given communications and networks approaches on organisational command and control.
   b. Assessing the loading generated by a given approach to command and control on communications and networks.

c. Researching, investigating and evaluating techniques to assess the impact of given communications and networks approaches, or changes to those approaches, on organisational command and control both prior to and during deployment.

Relevant Experience & Skills

Experience:

- Communications and IA Standards (STANAG, MIL-STDs etc.)
- Electronic warfare
- Electronic engineering and technology
- Command and control systems
- Communications systems
- Cyber warfare
- Messaging and telecommunications technology
- Network management and operation
- Network security engineering
- Modern and legacy Internet Protocols routing & standards
- Satellite communications
- Computing hardware and software
- Data and signal processing technology
- Cryptography

Skills:

- Systems engineering
- Behavioural modelling
- Experimental and trials design, management, execution and assessment
- Mathematical Modelling methods
- Operational analysis Organisational design
- System Design
- Systems Concept Development
- System Assurance
- Electro-magnetic theory
- Physics including wave theory, electromagnetic theory and propagation
- Information Theory
- Quantum theory
- Network and cyber security