



## WHAT IS CYBERSPACE? EXAMINING ITS CHARACTERISTICS

As a virtual domain, cyberspace is unlike the environmental domains of air, land, maritime and space. It is essential to understand the characteristics of the cyber domain in order to effectively exploit it to enable the creation of air power effects. This *Pathfinder* examines some of the characteristics of the cyber domain.

A characteristic is a distinctive attribute that derives from the inherent nature of a domain. There are a number of characteristics of the cyber domain, further examination of which is valuable to better understand the nature and complexity of the domain. As with any new technology, the domain may develop its own terminology to convey specific meanings. Some of the suggested cyber domain characteristics are—inter-connectivity, virtuality, expansion and ambiguity.

### Inter-connectivity

*The Oxford dictionary defines inter as – a prefix meaning between or among and Connectivity as – the characteristic of, or suitability for, being connected, to make connections.*

Cyberspace comprises of interconnected physical systems that have a host of connections within the physical domain. The physical systems may differ in detail, but they share the common feature that they are the foundation for the next physical system connected to them. The air domain is a physical entity and air power relies on individual systems such as platforms, bases, logistics and personnel to function as a system of systems. In contrast, the cyber domain itself is a system of systems due to the inter-connectivity of a multitude of physical systems.

It is this inter-connectivity that defines cyberspace and has allowed applications like *Facebook* to grow to have over 700 million users in a short span of time. This aspect of the cyber domain makes it intricate, complex to define and difficult to understand. This is compounded by cross jurisdictional boundaries and attribution difficulties that

provide challenging doctrinal, legal and operational implications.

Individuals or corporations may have ownership of some physical systems and interconnections but there is no ownership of cyberspace as a collective. This is a quality shared with the space domain noting that entry into the cyber domain is obtained at a significantly lower cost and sophistication than into space. Users of cyberspace exploit low-entry costs, widely available resources and a minimal required investment to influence the domain.

### Virtuality

*The Oxford dictionary defines virtuality as – not physically existing, but made by software to appear to do so from the point of view of the user; an artificial world created by interactive computer technology.*



*Cyber is both unbounded and virtual in nature*

Although cyberspace has physical systems, not all of it exists in a physical state as some connections are wireless and utilise parts of the electromagnetic spectrum. In essence, it is much easier to see and sense in the other domains. The unbounded and virtual nature of cyberspace allows action through it, but not physical movement within it. In the cyber domain no physical movement takes place and only information is

transferred.

While the word virtual may be used as a simple synonym for computerised, it usually implies that somehow virtual objects are figments of imagination, somehow less real. In the context of cyberspace, virtual means ‘seems to be’. The programmable nature of cyberspace makes it possible for a single person to have enormous social or physical effect through software that allows him/her to act virtually, i.e. to appear to exist in multiple places. One individual can, in essence, clone himself in the form of a program or agent and act globally as the many computer viruses in circulation demonstrate.

## Expansion

*The Oxford dictionary defines expansion as – enlargement of scale; anything spread out; to increase in size or effect.*

As highlighted by the Cyber Spiral Concept in *Pathfinder 153*, information in the cyber domain is expanding and evolving as every action initiated by a cyberspace user makes subtle changes to the domain for the next user. There is an increasing demand for information from the domain, requiring the physical systems and technology underpinning it to expand and evolve.

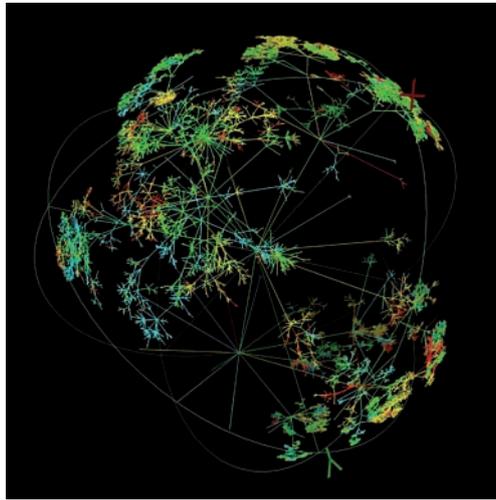
Changes in cyberspace are driven in large part by private industry research and development. The interdependency and innovation of civilian economic markets and communications industries have a direct impact on cyber security.

Further, the domain itself is growing and evolving as information technology and the market expand and develop. This shapes many aspects of cyberspace and drives towards a system that allows for rapid innovation. To achieve this, one of the internet's fundamental goals was assurance of connection and ability to access or deliver data, not security. This philosophy is expansive by nature and results in cyberspace being continuously redefined by the nature of its users' actions. This significantly contrasts with the fixed, physical nature of the air, land and sea domains.

## Ambiguity

*The Oxford dictionary defines ambiguity as – doubtfulness or uncertainty of meaning, unclear, indefinite.*

A combination of the interconnectivity, virtuality and expansion characteristics makes cyberspace an inherently ambiguous and a complex structure that is abstruse—difficult to understand—in nature. Ambiguity is unique to cyberspace and highlights the difficulty in understanding its ever changing and perplexing nature. This may be due, in part, also to the vast amount of information available in cyberspace. It is estimated there are over five million terabytes of information accessible on the internet and that in 2010 approximately 107 trillion emails were sent. The scale of storage, amount of data and usage of the domain



***Cyberspace is both inter-connective and expansive in nature***

creates intricate, undefined and challenging legal implications for actions within it, thereby increasing its ambiguity.

Little appears to have been discussed about the inherent characteristics of the domain. The above characteristics are presented to describe the domain and to increase awareness of its unique nature. Knowledge of the cyber components and an understanding of these characteristics allow a deeper appreciation of how the domain can be fully exploited. Transposing well-known concepts from physical domains like deterrence, where attribution

is known, to cyberspace, where attribution is frequently indeterminate, creates many challenges for doctrine, policy and capability development. This is highlighted when there is limited understanding of cyberspace.

The potential impact of the domain is far-reaching, the possibilities unbounded. Similar to nuclear weapons that could bring about the application of catastrophic force, attacks in cyberspace can also create enormous destructive effects. But unlike nuclear war, cyberspace attacks do not require the resources of a nation-state, they can be committed by a single person with a computer and an internet connection anywhere in the world.

- *Four suggested characteristics of the cyberspace domain are inter-connectivity, virtuality, expansion and ambiguity.*
- *These characteristics create challenges for doctrine, policy and capability development.*
- *Understanding these characteristics is essential to fully exploit the domain for the optimum employment of air power.*

*We are in the midst of a dramatic change in the relationship between technology and the nature of warfare.*

David J. Lonsdale  
The Nature of War in the Information Age:  
Clausewitzian Future



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