



## UNDERSTANDING THE SPACE OPERATIONAL DOMAIN AND RECOGNIZING THE GAPS BETWEEN DOCTRINE AND CAPABILITY FROM A SUPPORT PERSPECTIVE

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### JCSP 50

#### Service Paper

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FROM A SUPPORT PERSPECTIVE**

**Major Cristy Montoya**

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# UNDERSTANDING THE SPACE OPERATIONAL DOMAIN AND RECOGNIZING THE GAPS BETWEEN DOCTRINE AND CAPABILITY FROM A SUPPORT PERSPECTIVE

## AIM

1. This service paper aims to explain the necessity for Air Logisticians to understand the support gaps in the rapidly developing Space Domain. As the newest domain in the Canadian Armed Forces (CAF), its purpose is to be fully integrated by supporting all environments to achieve pan-domain outcomes.<sup>1</sup> The CAF's reliance on Space products cannot be underestimated although not yet mainstream amongst many trades.<sup>2</sup> Just as Logistics is a key operational effectiveness tool for support demands, it must engage in understanding the link with Space to anticipate future logistical needs.<sup>3</sup>

## INTRODUCTION

### The Evolution

2. In Canada, Space operations have been around for decades but military Space involvement was officially tasked through the Department of National Defence (DND) Policy 'Strong, Secure, Engaged' (SSE). This document tasked the DND/CAF to secure Canada's capability to defend and protect its access to Space, enhance resilience, cooperate with Allies and ensure operational flexibility.<sup>4</sup> In 2020 Space evolved from being a joint enabler to a fully operational domain tasked with supporting all environments and given the same functions of command and control (C2) to exercise force development, generation and employment capabilities.<sup>5</sup>

3. The Space domain reports to the Royal Canadian Air Force Commander (RCAF Comd) as the Functional Authority (FA), and appointed to 3 Canadian Space Division (CSD).<sup>6</sup> The Commander of 3 CSD is also responsible to the RCAF Comd as the Joint Force Space Component Commander (JFSCC). The main tasks of the 3 CSD Comd are Space Domain

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<sup>1</sup> "The agility and responsiveness of air and space power, along with the strategic effects they deliver, are vital to military operations. These characteristics will continue to be central features of a pan-domain military response to domestic events, continental defence and expeditionary operations." "RCAF Strategy: Agile, Integrated, Inclusive" B-GA-400-000/FP-001 <https://www.canada.ca/content/dam/rcaf-arc/documents/reports-publications/royal-canadian-air-force-strategy.pdf>

<sup>2</sup> "Personnel shortages and a perceived lack of training have impeded the integration of joint enablers. Among survey respondents, 44% felt that space and cyber capabilities are not being fully integrated." <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/report-summary-eval-rjcf.html>

<sup>3</sup> SJS, Director General Support, Strategic J4, "DRAFT/CAF Joint Logistics Campaign Plan." 2024

<sup>4</sup> DND, "Strong, Secure, Engaged: Canada's Defence Policy." <https://www.canada.ca/en/department-nationaldefence/corporate/policies-standards/canada-defence-policy.html>

<sup>5</sup> CDS, "DM/CDS Initiating Directive for Space Operations.", 27 February 2020

<sup>6</sup> Ibid.

Awareness (SDA) and focus on developing space-based capabilities in support of military operations.<sup>7</sup>

## **On Space Operations**

4. Space and all of its capabilities are integral to military operations by providing both strategic and tactical advantages. It delivers multiple effects that support daily life by using satellites which provide communications, Position-Navigation-Timing (PNT), remote sensing enabling Intelligence, Surveillance, Reconnaissance (ISR) collection, Earth observation, weather forecasts, and banking.<sup>8</sup> Additionally, in a military context enabled by partnerships and globalization, Space is “the ultimate high ground” and thus all military missions now depend on Space-based capabilities to help navigate complex operating environments at home and abroad.<sup>9</sup>

5. DND/CAF are just one of many players in this Whole of Government (WoG) approach<sup>10</sup>, who alongside other government departments, industry, civilian partners and suppliers in addition to research and academic facilities are collaborating. The Canadian Space Agency (CSA) and the Canadian Aviation Industry are also main partners working together to further understand and develop capabilities that will continue to fuse as the Space domain continues getting increasingly congested and contested. There are adversaries wishing to exploit and militarize Space thus Canada requires integral and modern capabilities to maintain its military effectiveness and operational and competitive advantages.<sup>11</sup>

6. Due to the pace of evolving technology and the vast commercialization of the Space economy, access and ease of entry are providing many opportunities of scope and scale within the sector. The growth of reusable rocket launch technology is paving the way for further access as the processes are refined and the recovery and refurbishment of these assets becomes easier and more financially viable.<sup>12</sup> The Space sector allows risks and other new ventures in traditional Space markets including telecom, navigation, earth observation, tourism and mining. This increased commercial access is causing friction as the current International governing laws for

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<sup>7</sup> SDA: Space Domain Awareness (SDA) involves the detection, tracking, cataloguing, identification, characterization and monitoring of space objects. In DND context, SDA is essential to better understand the threat environment to ensure the CAF are prepared to defend and protect the space assets Canada depends on.

“Royal Canadian Air Force and Space.” [Space roles and leadership - Royal Canadian Air Force - Canada.ca](#)

<sup>8</sup> DND, “Combined Space Operations Vision.” [Microsoft Word - 5.C\\_DRAFT 2031 CSpO Vision Statement \(canada.ca\)](#)

<sup>9</sup> DND, “RCAF Strategy for Space Mission Assurance” B-GJ-120-000/FP-001 collaboration-airforce.forces.mil.ca

<sup>10</sup> The RCAF continues to expand the WoG approach to the RADARSAT Constellation Mission. Using this collaborative approach, DND and other government departments share access to space-based imagery and data produced by this next generation of Canadian Earth observation satellites via systems such as Polar Epsilon 2.

[Ready Forces - Canada.ca](#)

[What is the RCM? | Canadian Space Agency \(asc-csa.gc.ca\)](#)

<sup>11</sup> DND, “RCAF Strategy: Agile, Integrated, Inclusive” B-GA-400-000/FP-001 [royal-canadian-air-force-strategy.pdf \(canada.ca\)](#)

<sup>12</sup> Intelligence Agency, “Challenges to Security in Space: Space Reliance in an Era of Competition and Expansion.” [www.dia.mil/Military-Power-Publications](#) 2022

Space are limited and not all countries are abiding.<sup>13</sup> In turn, the militarization of Space has seen some nations develop, test and deploy satellite systems and counter-space weapons.<sup>14</sup>

7. The United Nations (UN) is presently the main lead on Space governance and law from an International perspective for member states. There are five main treaties outlining the Space law covering the freedom of exploration for all and Space as “the province of all humankind” without discrimination, and “the principle of non-appropriation of outer space.”<sup>15</sup> Additionally, the North Atlantic Treaty Organization (NATO) as head of the Alliance confirms its stance on Space (through its 2019 Space Policy) and understands the importance of its protection as it is essential to members’ interconnected lives and economies which depend on Space technology.<sup>16</sup> As the General Secretary stated: “The reality is that all nations, including NATO, believe space and cyber are the next great contested areas for power.”<sup>17</sup> Thus, it is leading how allies should work together to ensure responsible behaviour and interoperability in this new domain through its Space Centre by supporting operations and missions.<sup>18</sup>

8. The RCAF trains and equips its members to be “scalable, agile, responsive and interoperable both domestically with civil authorities and other government departments, and internationally with allies and partners.”<sup>19</sup> From a Logistics perspective, enabling this capability must evolve to provide an operational support advantage in the Space domain. The RCAF Strategy prompts the leveraging of new technologies to enable rapid decision-making related to the execution of operations while refining and improving sustainment<sup>20</sup> using data and analytics.<sup>21</sup>

## **DISCUSSION**

### **Strategic doctrine – Understanding the fight**

9. The RCAF Strategy states the requirement to “be ready to conduct operations, to modernize for tomorrow and to engage and partner for success” as part of the main strategic objectives. The key principles of the RCAF to be relevant now and into the future include agility, integration and inclusion. It further focuses on “air and space forces that are rapidly deployable, scalable, versatile and relevant to unique mission requirements as well as Government of Canada

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<sup>13</sup> United Nations, Office for Outer Space Affairs, “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies”  
<https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html>

<sup>14</sup> Intelligence Agency, “Challenges to Security in Space: Space Reliance in an Era of Competition and Expansion.”  
<http://www.dia.mil/Military-Power-Publications> 2022

<sup>15</sup> United Nations, Office for Outer Space Affairs, (unoosa.org)

<sup>16</sup> NATO, Approach to Space, Dec 2022

<https://www.nato.int/cps/en/natohq/topicsF6034A899FE148E3B1593748E29641E2.htm>

<sup>17</sup> General Secretary Jens Stolzberg, NATO press conference

[https://www.nato.int/cps/en/natohq/opinions\\_171554.htm](https://www.nato.int/cps/en/natohq/opinions_171554.htm)

<sup>18</sup> NATO, Approach to Space, Dec 2022 [NATO - Topic: NATO’s approach to space](#)

<sup>19</sup> DND, “Report Summary: Evaluation of Ready Air and Space Forces.” <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/report-summary-eval-rasf.html>

<sup>20</sup> Sustainment: The ability to maintain effective military power to achieve the desired effects. CFJP 4.0

<sup>21</sup> DND, “RCAF Strategy: Agile, Integrated, Inclusive” B-GA-400-000/FP-001

<https://www.canada.ca/content/dam/rcf-arc/documents/reports-publications/royal-canadian-air-force-strategy.pdf>

(GC) priorities.”<sup>22</sup> Defining and understanding the mission requirements in support of Space is in the infant stages since most operations are executed virtually and integrate other departments. “The RCAF must purposefully enhance its integration within a joint force environment and across its operational and occupational communities.”<sup>23</sup> Acknowledging this is the next step for a pan-domain approach which will encourage further collaboration to explore joint support.

10. From a DND perspective, at the strategic level the Associate Deputy Minister’s (ADM’s) offices are involved as stakeholders with different inputs. Having a clear picture of *who does what* allows institutional sustainment<sup>24</sup> to be better understood. Due to the amount of departmental partners involved, including ADM (Materiel), ADM (Data, Innovation, Analytics), ADM (Infrastructure & Environment), ADM (Information Management), ADM (Defence Research Development Canada) and ADM (Policy) full support and data demands are not always fully considered. Assuming the digital baseline will be provided elsewhere leads to mixed demand signals for IT support and disables the proper mapping and tracking to enable all projects and initiatives. This complicates assigning priorities and allocation of resources.<sup>25</sup> CAF-wide priorities require the most senior level of leadership input given the current climate of reconstitution and equipment to achieve all the tasks for the CAF. The IT infrastructure is the baseline for the growing demand for data and systems development if the CAF is to digitize itself into the future. Other departmental Ministerial offices to include in the Strategic level overview include the Minister of Innovation, Science and Industry, the Minister of Public Services and Procurement, the Minister of the Treasury Board and the Minister of Foreign Affairs.<sup>26</sup> Mapping out a systematic approach to how these organizations fit and communicate with each other is essential in the planning of Logistical support for the future. Said mapping will allow for second and third order effects to be better understood by the joint Sustainment Enterprise (SE) and will close the gap between strategy and capability.<sup>27</sup>

10. The essence and development of *what* Space does and *how* are better defined in the Space Mission Assurance <sup>28</sup>(SMA) Strategy. It aims to “achieve enhanced resilience of mission-critical Defence Space Enterprise (DSE) assets and capabilities through judicious allocation of resources aligned with linking strategic risk to operational requirements”.<sup>29</sup> It outlines how it monitors Space through both the Canadian and the Combined Space Operations (CSpO); the latter is a Five-Eyes partnership with like-minded allies who are contributing resources and economy of effort to collaborate in the Space domain.<sup>30</sup> Its main tasks are to be accomplished along five

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<sup>22</sup> DND, “RCAF Strategy: Agile, Integrated, Inclusive”

<sup>23</sup> DND, “RCAF Strategy: Agile, Integrated, Inclusive”

<sup>24</sup> Institutional Sustainment as defined in OSM Strategy; includes exercise of departmental functional authority for policy and process that enable the execution of Operational Sustainment and Operational Support.

<sup>25</sup> “Canadian Armed Forces Digital Campaign Plan.” <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canadian-armed-forces-digital-campaign-plan.html>

<sup>26</sup> Canada. “Ministers and Parliamentary Secretaries.” <https://www.canada.ca/en/government/ministers.html>

<sup>27</sup> SE: Institutional sustainment, Operational sustainment and Operational support; from OSM Strategy.

<sup>28</sup> SMA: A process to protect or ensure the continued function and resilience of space capabilities, assets and services, including personnel, equipment, facilities, networks, information and information systems, infrastructure, electro-magnetic spectrum, supply chains and contracted services; DND, “RCAF Strategy for Space Mission Assurance”

<sup>29</sup> DND, “RCAF Strategy for Space Mission Assurance”

<sup>30</sup> DND, “RCAF Strategy for Space Mission Assurance”

Lines of Effort (LoE) including<sup>31</sup> -

- a. Define the DSE Architecture and Prioritize Component Space Systems.
- b. Develop and Implement a Comprehensive SMA Risk Management Framework.
- c. Develop Optimized and Prioritized SMA Solutions.
- d. Implement SMA Solutions across DSE.
- e. Sustained DSE Stakeholder Engagement.

The Director General for Space is responsible for executing all LoEs and reporting on their progress to RCAF Comd.<sup>32</sup> They all have a sustainment and support nexus which is not fully elaborated on but leaves DG Space to liaise as required with other stakeholders. This identifies a gap for supporters to facilitate the threat and vulnerability assessments using PRICIE framework.

11. From a Logistics perspective, the CAF is committed on multiple fronts to modernize while acknowledging the requirement to become “agile, resilient and effective as it prepares, projects, and sustains military power.”<sup>33</sup> Though the Operational Sustainment Modernization (OSM) Strategy aims to set the stage to enable full integration of sustainment effects,<sup>34</sup> it recognizes the limited alignment of CAF capabilities. It also recognizes its weak linkages leading to a lack of coherence in the past.<sup>35</sup> Moving forward, the OSM strategy’s vision is “for the CAF to be sustained by a fully integrated and modernized operational support function that can drive capability development, generate decisive military advantages and maintain operational readiness across all domains.”<sup>36</sup> Key efforts are thus outlined for joint force integration, sustainment modernization and CAF digitalization as the main factors of operational output. The OSM points out the relevance/reliance of interconnectivity and the harm of potential disruptions at home and abroad in operations. The importance of having resilient, interoperative and predictive systems capable of contributing to the fight in a contested Logistics Future Operating Environment (FOE) must be planned.

12. In addition, the pan-domain concept<sup>37</sup> must also be considered as the CAF moves towards a joint enabling mission where the future fight will likely be concurrent in multiple domains and Logistics will require adaptation. As an example, the Cyber and Information domains are susceptible to being used by DND-hired civilians who input data into the CAF Supply Chain to achieve an erosion of capabilities and capacities.<sup>38</sup> Securing communications and capabilities is essential to connect with allies. Adding interconnected systems will positively impact the level of success of an operation. The current lack of communication at the secure and top-secret level

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<sup>31</sup> DND, “RCAF Strategy for Space Mission Assurance.”

<sup>32</sup> DND, “RCAF Strategy for Space Mission Assurance.”

<sup>33</sup> SJS, Director General Support, Strategic J4, “Draft CAF Joint Logistics Campaign Plan- Achieving Operational Advantage underpinned by Logistics.” 2024

<sup>34</sup> taking into consideration institutional and operational sustainment.

<sup>35</sup> DND, “Operational Sustainment Modernization Strategy.” <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canadian-armed-forces-operational-sustainment-modernization-strategy.html>

<sup>36</sup> DND, “Operational Sustainment Modernization Strategy.”

<sup>37</sup> DND, “Pan-Domain Force Employment Concept: Prevailing in an Uncertain World.”

<sup>38</sup> Marentette, LCol Christina. “Empowering Sustainment: The Evolution of Logistic Support in a Pan-Domain Battlespace.” Canadian Forces College, 2020. <https://www.cfc.forces.gc.ca/259/290/22/305/Marentette.pdf>

with other government departments due to the CAF's technological issues is also being addressed with the new Digital Campaign Plan.<sup>39</sup>

### **What the guidance means – Support for Space**

13. The SMA is the first document to have concrete, identifiable and measurable tasks with which the new Joint Logistics Campaign Plan (JLCP) can integrate itself to. The JLCP stems from the OSM strategy describing the requirement for DND/CAF to effectively integrate Joint Logistics outcomes to prioritize and enable performance measurement. “It is also about empowering our greatest resource, our people, to sustain and win the fight. Tranche 1 of the strategy will set the conditions for Joint Logistics to be resilient, agile, data-driven and horizontally integrated.”<sup>40</sup> The integration, synchronization, and management of strategic interfaces amongst various existing DND/CAF programs into DefenceX<sup>41</sup> and other data solutions will simplify data management and allow for better visibility and accountability. Much can be learned from allies in what the development of space sustainment doctrine can achieve. “The US military is significantly ahead of their allied peers when conceptualizing sustainment support to their combat forces within the multi-domain battlespace.”<sup>42</sup> When reviewing the Space Force Sustainment doctrine,<sup>43</sup> said capstone reference provides a good example of specific capabilities the CAF can integrate as a lesson learned into its development of the Joint Logistics Network, like robust contracting and high security clearances for example. The description of the operational environment from a sustainment perspective provides insight into what some future CAF support tasks could also entail.

### **Developing an action plan – shaping**

14. Joint Logistics transformation is aligning at a crucial time with many DND/CAF initiatives to move the organization forward. There is an opportunity to shape the Force Sustainment and support tail that will be required within the operational Space domain. Although the second and third order effects supporting incoming capabilities is not yet fully known, now is the time to build the information networks.<sup>44</sup> Adopting innovative measures to accelerate change and keep up with evolving technology “through the acquisition process and life cycle management”<sup>45</sup> will be key. For a successful system of systems approach, the Logistics community needs to start getting exposed to more space operations.

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<sup>39</sup>“Report Summary” Evaluation of Ready Joint and Combined Forces.” <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/report-summary-eval-rjcf.html>

<sup>40</sup> SJS, Director General Support, Strategic J4, “DRAFT//CAF Joint Logistics Campaign Plan- Achieving Operational Advantage underpinned by Logistics.”

<sup>41</sup> DefenceX: Replaces DRMIS to encompass the organizational change management and business transformation initiative

<sup>42</sup> Marentette, LCol Christina. “Empowering Sustainment: The Evolution of Logistic Support in a Pan-Domain Battlespace.” Canadian Forces College, 2020. <https://www.cfc.forces.gc.ca/259/290/22/305/Marentette.pdf>

<sup>43</sup> United States Space Force. “Space Doctrine Publication (SDP) 4-0, Sustainment.” [https://www.starcom.spaceforce.mil/Portals/2/SDP\\_4-0\\_Sustainment\\_\(Signed\).pdf?](https://www.starcom.spaceforce.mil/Portals/2/SDP_4-0_Sustainment_(Signed).pdf?) 2022

<sup>44</sup> “Procurement planning must accurately assess and account for the second-order and third-order effects of project implementation, including impacts on people, training, data networks, test and evaluation, infrastructure and the environment.” From the RCAF Strategy: Agile, Integrated, Inclusive

<sup>45</sup> DND, “RCAF Strategy: Agile, Integrated, Inclusive”



15. With the interconnectivity between the Defence Logistics system and the pan-domain concept it is clear the operational domains will be less relevant as more cross over and collaboration occurs. Logisticians are well placed for the challenge seeking out and leveraging training opportunities to improve integration with joint and coalition partners. The objective is enhancing proficiency in the full spectrum of force employment making do with resource management limitations as required.<sup>46</sup> The nature and confidentiality of the Space domain will also require for some Logisticians to be accredited higher security clearances for full interoperability of secure and allied systems.

16. The time to build trust, make connections and integrate into the new domain is now. Shaping should be part of an action plan rather than a necessity to respond in an unforeseen scenario. In a congested and contested environment, Logisticians will need all the time they can get as they learn to manage operating with and without technology. “The potency and sustainability of military response options of the CAF is underpinned by the strength of linkages and synchronization between the entire Logistics Enterprise.”<sup>47</sup> The Space domain can help shape what that should entail through SMA.

## CONCLUSION

17. Logistics capacity and capability are intrinsically linked and are a critical component of generating credible combat power and deterrence. While there are gaps in strategy and capability, the Logistics community is well poised to tackle these challenges in a timely fashion. The coordination and integration across diverse L1 organizations will contribute to achieve *the speed of relevance* in the effectiveness of future Space and Logistics operations. “Without the quality and quantity of training required of CAF ready forces including the joint enablers, operations can be compromised. Looking to the future, this could affect the CAF’s ability to be a fully integrated and interoperable force within a pan-domain environment.”<sup>48</sup> The time to act is now, as the call to action by the JLCP states, it is a capstone document that will guide the way.

## RECOMMENDATIONS

18. Taking into consideration the changing nature of conflict, the CAF should adopt a Joint Logistics Commander who will institute a centralized and joint approach to enable pan-domain support, as championed by many military leaders.<sup>49</sup>

19. Developing a Logistics Operating Picture (LOP) could be more feasible through a Space lens utilizing the integral capabilities already available. In turn, this digitized information could be further included in a capable AI system to automate. A *Space* LOP would enhance the CAF’s ability to plan, execute and sustain future operations by providing a real-time holistic view of

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<sup>46</sup> DND, “RCAF Strategy: Agile, Integrated, Inclusive”

<sup>47</sup> SJS, Director General Support, Strategic J4, “DRAFT//CAF Joint Logistics Campaign Plan- Achieving Operational Advantage underpinned by Logistics.”

<sup>48</sup> “Report Summary” Evaluation of Ready Joint and Combined Forces” <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/report-summary-eval-rjcf.html>

<sup>49</sup> Marentette, LCol Christina. “Empowering sustainment: the evolution of logistic support in a pan-domain battlespace” Canadian Forces College, 2020. <https://www.cfc.forces.gc.ca/259/290/22/305/Marentette.pdf>

sustainment and logistical activities. This would facilitate agile decision-making to allocate resources through accurate information.

20. The RCAF is well placed to lead enabling institutional agility by optimizing its influence supporting change management initiatives that can “exert greater influence on procurement, personnel administration, logistic support, decision-making processes, infrastructure, cyber security, electronic warfare and information technology.” This can start with inclusivity<sup>50</sup> by having more Logisticians operate and support the Space domain.

21. Logistics education on Space should be developed and provided early on at the Canadian Forces Logistics Training Centre in Borden. It could include elements of the basic Space Operations Course in addition to any developments from the JLCP on processes, governance and capabilities that will further develop the Air and Space forces of the CAF for the next bound.

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<sup>50</sup> “A force multiplier, inclusion increases our operational effectiveness through diversity of perspective and insight. Inclusion encourages creativity, fosters group motivation, speeds up problem-solving, improves risk management, and increases productivity and performance.” DND, “RCAF Strategy: Agile, Integrated, Inclusive”

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