

FINAL ASSESSMENT REPORT
Evaluation of Undergraduate Programs
Faculty of Engineering
School of Electrical Engineering and Computer Science
Cycle: 2020–2021
Date: June 16, 2022

I. Evaluated Programs

- BAsc Software Engineering (Co-op)
- BAsc BAsc in Software Engineering, Engineering Management and Entrepreneurship Option (Co-op)

II. Evaluation Process (Outline of Visit)

- The Final Assessment Report on the aforementioned programs was prepared based on the following documents: (a) the self-study brief produced by the academic unit; (b) the report produced by the two external reviewers following their virtual visit; and (c) the comments from Dr. Jacques Beauvais, the Dean of the Faculty of Engineering, and Dr. Stéphane Somé, Associate Director, Software Engineering, in connection with the report in (b).
- The visit, which took place on February 10 and 11, 2022, was conducted by Dr. Nadia Tawbi, Université Laval, and Dr. Patrick Lam, University of Waterloo.
- The visit was held virtually due to the SARS-CoV-2 pandemic. The reviewers were provided with a comprehensive self-study brief that had previously been presented and discussed at the School Assembly.
- During their visit, the external reviewers met with Aline Germain-Rutherford, Vice-Provost, Academic Affairs; Dr. Jacques Beauvais, Dean, Faculty of Engineering; Dr. Claude D'Amours, Director, School of Electrical Engineering and Computer Science; Dr. Stéphane Somé, Associate Director, Software Engineering; regular and part-time professors, support staff members and undergraduate students.

III. Summary of Reports on the Quality of Programs¹

This section aims to inform the unit of the strengths and challenges observed during the evaluation process in order to improve its programs.

1. STRENGTHS AND CHALLENGES

Strengths

- The quality of the programs is excellent.
- The programs are professionally accredited by the Canadian Engineering Accreditation Board (CEAB) and the Computer Science Accreditation Council (CSAC).

¹ Based on all of the documents produced during the assessment process.

- The programs are closely aligned with society's and employers' needs. The co-op component is an additional strength in that regard. The alternating work term/study cycle is very popular among students.
- The number of students applying to these programs has been rising sharply, as have retention rates.
- Student satisfaction levels are very high.
- Instructors in the programs are high-calibre scientists.
- Software engineering is covered in detail in both programs through design courses, e.g., integrative project courses and the capstone project.
- Testing and formal specifications are also covered thoroughly.
- Engineer attributes as defined by the CEAB are assessed. They are also compared against the expectations developed by the Ontario Universities Council on Quality Assurance.

Challenges

- Build more flexibility into the programs to allow more room for electives.
- Review compulsory courses in order to include courses in critical areas such as cybersecurity and machine learning.
- Have students take part in the program committee.
- Provide for more systematic consultations among professors teaching courses in the same sequence.
- Increase student awareness of ethics by including the topic in more than one course.
- Strengthen students' sense of belonging, which was weakened during the pandemic.
- Improve inclusion of part-time professors in the programs and improve their working conditions for retention purposes.
- Provide a dedicated activity space for software engineering students.
- Increase the level of bilingualism by offering more electives in French.
- Encourage students to consider international exchanges.

2. PROGRAM OBJECTIVES

- The external review committee finds that the identified purpose and mission of the evaluated programs—to train software engineers—are clear and understood by everyone concerned.
- Learning outcomes are clearly defined, with detailed information covering everything from individual courses to anticipated outcomes.
- Industry is constantly surveyed about its needs, and the findings are incorporated into the objectives of the programs in line with academic considerations, resulting in excellent co-op placement and employment rates.

3. CURRICULUM AND STRUCTURE

- The program curriculum is robust and meets the CEAB's and the CSAC's requirements.
- Admission requirements are adequate, and graduation rates are in line with Canadian standards and are comparable to rates at the University. Retention rates are trending in a favourable direction.
- The list of compulsory courses should be reviewed in order to include courses in critical or emerging areas such as cybersecurity and machine learning.
- Students who prefer to enrol in courses in French should receive closer guidance.
- Microprograms in cybersecurity and interdisciplinary AI should be promoted to students better.

4. TEACHING, LEARNING AND ASSESSMENT

- Teaching, learning and assessment methods are appropriate and in line with those used in the discipline. Professors went to great lengths to adapt those methods during the pandemic.
- SEG 2900 (Professional Communication and Responsibility), ITI 1120/1121 (Introduction to Computing I and II) and SEG 4910/4911 (Software Engineering Capstone Project I and II) are identified as key courses in the programs.
- The distribution of courses among full- and part-time professors is appropriate. However, long-term trends should be monitored, give the sharply increasing popularity of the programs.
- The external review committee had questions about professors' and students' use of third-party discussion fora. The committee would like their use to be monitored more closely.

5. STUDENT EXPERIENCE AND GOVERNANCE

- Professor Stéphane Somé, the Associate Director in charge, is appreciated by his students for the quality of his advice and his availability.
- Students receive coaching in the co-op program, for example in résumé preparation.
- Graduates find jobs quickly.
- The pandemic weakened the students' sense of belonging, as they could not take part in activities requiring their physical presence.
- Undergraduate software engineering students absolutely need a dedicated space where they can develop friendships.

6. SPACE AND RESOURCES

- Administrative and physical resources that are available are generally sufficient.
- Part-time professors are a vital resource for the evaluated programs. Better working conditions and greater inclusion would make them feel more secure.

IV. Program Improvement²

The evaluated programs meet the standards of the discipline. The following recommendations aim to maintain or increase the programs' level of quality.

Recommendation 1: Have at least one student representative on the program committee.

Recommendation 2: Encourage students to restart their association.

Recommendation 3: Provide students with a dedicated room in order to strengthen their sense of belonging.

Recommendation 4: Hire more professors to meet growing IT needs, especially among under-represented groups (e.g., women).

Recommendation 5: Ensure systemic cooperation among professors to harmonize the content of courses in the same sequence, e.g., design and programming courses.

Recommendation 6: Promote the fast-track master's program and microprograms in cybersecurity and AI.

Recommendation 7: Improve full-time instructor working conditions (long-term appointments) in order to strengthen loyalty.

Recommendation 8: Provide wage incentives to encourage part-time professors to take part in life in the department.

Recommendation 9: Review the list of compulsory courses and consider adding a course on cybersecurity and a course on machine learning.

Recommendation 10: Encourage students to consider international opportunities (e.g., exchanges, co-op placements).

Recommendation 11: Keep up the good work with the co-op program.

Recommendation 12: Continue using undergraduate students as TAs in SEG 2900.

V. Action Plan

Stéphane Somé, Associate Director of the program, has developed an action plan. The School of Electrical Engineering and Computer Science is giving serious consideration to all of the recommendations. Further, it is convinced that they can help make the program even stronger.

VI. Conclusion

The School of Electrical Engineering and Computer Science offers high-quality undergraduate software engineering programs that meet the standards of the discipline. The programs' greatest strengths are the high quality of teaching and research; the co-op program, which is open to all students; the close alignment with society's and employers' needs; and high levels of student satisfaction.

² Based on the external reviewers' report.

The evaluation process confirmed the strength and stability of the programs. It also resulted in recommendations for their continuous improvement. The committee members would like to thank the external reviewers for their detailed evaluation; the program officials, for their self-study brief, which meets the requirements of the Office of Quality Assurance; and all of the stakeholders, for their participation in this periodic academic evaluation process.

Schedule and Timelines

A progress report outlining completed actions and results is to be submitted to the evaluation committee by June 15, 2024.

The next self-assessment cycle will take place in 2027–2028, with the self-study brief to be submitted by June 15, 2027.

Unit Response and Action Plan

Faculty:

- Faculty of Engineering

Programs evaluated:

- Baccalaureate of Applied Science in Software Engineering (Co-op)
- Baccalaureate of Applied Science in Software Engineering, Engineering Management and Entrepreneurship Option (Co-op)

Cyclical review period:

- 2021-2022

Date:

- March 27, 2022

Notes:

- **This document is submitted to the Quality Council and will be published on the University Web site.**
- **This document should be written in one language only, here, English. It will later be translated to French.**

General comments:

On March 3, 2022, the software engineering program was made aware of the External Review Report produced in the context of the cyclical program evaluation. We were extremely pleased with the positive evaluation of our program. Given that the software engineering program has committed to providing an outstanding training experience, we were gratified to see that the external reviewers found that our “BASc programs were of excellent quality”, that “student satisfaction was high” and that “no major issues with the program, the learning objectives, courses or management of the programs were discovered”. The report makes 12 recommendations, of which 3 are considered high priority. We take all the recommendations seriously and feel confident that by addressing them, our program will be even stronger. The recommendations and our response, produced jointly by the unit and the Faculty, are included below.

Recommendation 1: Have at least one student representative on the program committee

Unit response: We agree to the recommendation unconditionally. We are taking steps to include a student representative as a member of the curriculum committee. Student representatives already participate in software engineering program evaluation meetings held as part of the Continuous Improvement/Graduate Attributes process mandated by the Canadian Engineering Accreditation Board (CEAB). We intend to communicate with all returning students in 2022-2023 to inform them and solicit applications. If more than one application is received, we will hold a ballot for the selection of a student representative. This process will be repeated every year.

Decanal response: This is an excellent step in improving student participation to the program quality discussions and to its continuous improvement. I agree.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|-------------------------------|----------------|--------------------|
| 1 | Inform students of the inclusion of a representative on the program curriculum committee and initiate a selection process | Associate Director of program | Spring 2022 | No |
| 1 | Select a student to sit on the program curriculum committee on an annual basis | Associate Director of program | September 2022 | No |
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* PRIORITY LEVEL: 1. URGENT-IMMEDIATE ACTION REQUIRED 2. IMPORTANT-ACTION REQUIRED WITHIN 18 MONTHS (MAXIMUM) 3. ADVISED: DEVELOPMENT AND STRATEGY-ACTION TO BE DISCUSSED AND MUST BE IN PLACE BY MID-CYCLE (WITHIN 4 YEARS)

Recommendation 2: Encourage students to restart their association

Unit response: We agree to the recommendation unconditionally. The regular operation of the Software Engineering Students Association (SESA) has been hindered by the physical distancing imposed by the health situation. SESA contributes greatly to students' sense of belonging to the program and, by extension, to the Faculty and the University. Since its establishment with the help of the program in 2014, SESA has played a key role in welcoming new students; it animates student life through social meetings, conferences, hackathons; it contributes to students success, especially first-year students, by providing them with resources and by organizing tutoring sessions; it participates in the development of the program by having representatives at the assessment meetings; and it generally serves as a link between the program and students. Mobilization was made difficult by the lack of physical contact, the demand for students to adapt to a new mode of distance learning and in general the apprehension from the situation. Attempts have been made by SESA's executive to move activities online with limited success. Students are eagerly awaiting a full return to campus to resume their activities and we will do everything we can to help them.

Decanal response: I completely agree with the unit response. I am in close contact with student leadership in the faculty, notably with the Engineering Student Society. They have discussed with me the extreme difficulty of maintaining student participation in their online activities, in spite of all their efforts. The coming months will make it possible to restart their activities and mobilize themselves with the support of the Faculty and the unit.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|-------------------------------|----------------|--------------------|
| 1 | Communicate with students to discuss any assistance that may be provided to restart regular SESA activities. | Associate Director of program | Spring 2022 | No |
| 1 | Assist students in the implementation of determined actions. | Associate Director of program | September 2022 | No |
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Recommendation 3: Provide a room dedicated to students, thus strengthening the sense of belonging

Unit response: We agree to the recommendation in principle. Space allocation is a recurring request from students in the program. Software engineering students participate in the Engineering Students Society (ESS) which has office space in the main engineering building (CBY building). ESS includes all students of the faculty. There is no dedicated space to the Software Engineering Students Association (SESA) where software engineering students can meet and organize activities. The program, however, does not have the ability to respond to this request. Space management in the SITE building is the responsibility of the Faculty through a Faculty Space Committee. We have in the past, forwarded students' request for space to EECS as well as to the Faculty and will continue to do so.

Decanal response I agree with the recommendation, and there are projects under way with the Engineering Student Association to improve the space allotted to them and their constituents. The Faculty is currently under extreme space pressure, but we are working with Facilities on a Capital Plan for the campus and for the Faculty in which additional space for student associations has been taken into account.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|-------------------------------|-------------|--------------------|
| 1 | Reiterate SESA's request for dedicated premises in the SITE building to EECS and the Faculty. | Associate Director of program | Spring 2022 | No |
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Recommendation 4: Increase faculty resources to address growing IT needs, particularly among underrepresented groups (e.g., women)

Unit response: We agree to the recommendation in principle. Faculty positions are allocated centrally at the Office of the Provost based on the expressed needs of Faculties and the University strategic priorities. The Faculty of Engineering hiring plan is formulated in consultation with its Departments and the School of EECS. The software engineering program in turn participates to EECS strategic hiring plan. Requests for positions in software engineering are contained in the current EECS strategic hiring plan. These positions are subject to equity, diversity and inclusion provisions.

Decanal response I agree with the unit response which describes the situation very well. The Faculty submits its requests every year to the Provost for new Faculty positions, and we have a three year development plan which takes into account these factors.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|-------------------------------|--------------------------|--------------------|
| 1 | Ensure that the inclusion of software engineering positions remains in the EECS strategic hiring plan and that EDI considerations, particularly regarding under-represented groups, are taken into account in the hiring process. | Associate Director of program | Spring 2022 (ongoing) | No |
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Recommendation 5: Make systematic the consultation between professors to harmonize the content of courses in the same sequence – for example design courses, programming courses, etc.

Unit response: We agree to the recommendation in principle. We recognize the importance that the content of the courses, particularly those in sequence, be harmonized. It aligns course objectives with each other and within overall program objectives, promotes student success by ensuring they receive adequate preparation for their course, and helps avoid redundant content. The official course description is the main instrument for harmonizing courses. Beyond the official description, ad hoc consultations between professors make it possible to exchange further details concerning the content of their course on a voluntary basis when they deem it necessary. This is an established and already common practice. A systematic approach could run counter to the principles of academic freedom enjoyed by both regular and part-time faculty. We therefore intend to explore, in consultation with the professors teaching the program's courses, including computer science and computer engineering courses, ways to help facilitate consultation between them that would not violate these principles.

Decanal response I agree with the unit response.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|-------------------------------|-------------|--------------------|
| 1 | Survey the professors who teach the courses of the program, including computer science and computer engineering courses, on the need to support their consultations for the harmonization of courses and the related means. | Associate Director of program | Spring 2022 | No |
| 2 | Implement the support suggested from the consultation. | Associate Director of program | Fall 2022 | No |
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Recommendation 6: Highlight the master’s Accelerated Stream as well as the micro-programs in Cybersecurity and Applied Artificial Intelligence.

Unit response: We agree to the recommendation unconditionally. The Master of Computer Science, Accelerated Stream as well as the micro-programs in Cybersecurity and Applied Artificial Intelligence are relative new introductions which provide our students access to advanced optional courses and promotes their pursuit of graduate studies. After the usual clarifications, concerning the recognition of courses, the Undergraduate Studies Office of the Faculty of Engineering is in the process of informing the university admission services in order to include information about the Master of Computer Science, Accelerated Stream as well as the micro-programs to applicants and enrolling students. The Undergraduate Studies Office will also update its websites to clearly indicate the information and equally ensure that students are informed when making their optional courses choice.

Decanal response I agree with the unit response.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|---|--------------|--------------------|
| 1 | Inform University admission services about Master Accelerated Stream and micro-programs for updating program documentation communicated to applicants and admitted students. | Faculty of Engineering Vice-Dean Undergraduate Studies, Faculty of Engineering Undergraduate Office | Spring 2022 | No |
| 2 | Update Undergraduate Studies Office with information about about Master Accelerated Stream and micro-programs. | Faculty of Engineering Undergraduate Office, Faculty Information Technology services | Fall 2022 | No |
| 2 | Send email reminders to 3rd-year and 4th-year students about the existence of these programs. | Associate Director of program | Every summer | No |

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Recommendation 7: Improve the working conditions of long-term appointments (LTA) personnel to better retain them

Unit response: We agree to the recommendation in principle. We support better working conditions for long-term appointments (LTA) personnel. However, LTA positions fall under the collective agreement of the Association of Part-Time Professors of the University of Ottawa (APTPUO) and this collective agreement specifies the teaching load, salary and administrative duties of LTA members. There is no mechanism for the software engineering program to change these working conditions. This is a concern that can only be corrected by the APTPUO collective agreement.

The software engineering program currently has one LTA among its faculty members. We are very grateful for this member contribution to the program. He teaches and contributes to the development of several courses, including our main introductory course to software engineering. He has supervised many students for an undergraduate innovation research project, some of which with his industrial collaborators. He is also involved as CO-OP coordinator and instructor for the capstone project course.

Decanal response I agree with the unit response. These are challenges that we are aware of, but the Faculty must work within the parameters set in the collective agreement.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|-------------------------------|-------------|--------------------|
| 1 | Communicate to EECS and the Faculty the program’s concerns about the working conditions of LTAs and the impact this may have on their retention, and request that they be conveyed to the University. | Associate Director of program | Spring 2022 | No |
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Recommendation 8: Salary encouragement for the participation of part-time professors to departmental life

Unit response: We agree to the recommendation in principle. Two part-time faculty representatives are on the EECS Council. Part-time professors are also active in discussions related to the courses that teach. Beyond this level of participation, part-time professors have expressed a desire to contribute more to the program, such as, by the supervision of innovation research projects as well as a stronger participation in committee discussions. There is no mechanism to compensate part-time professors for such contributions as they are hired on a course basis. Part-time professors' compensation is determined by the collective agreement of the Association of Part-Time Professors of the University of Ottawa (APTPUO). A change to the collective agreement would be required to be able to provide new forms of compensation.

Decanal response I agree with the unit response.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|-------------------------------|-------------|--------------------|
| 3 | Communicate to the EECS and the Faculty the program's support that forms of compensation may be considered to support the contribution of part-time professors to service activities, and request that they be conveyed to the University. | Associate Director of program | Spring 2022 | No |
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Recommendation 9: Review the list of mandatory courses and consider the possibility of adding a course on Cybersecurity and a course in Machine learning

Unit response: We agree to the recommendation unconditionally. In both options of the program, students can currently take courses on cybersecurity (CSI 4139 Design of Secure Computer Systems) as well as machine learning (CSI 4145 Machine Learning) as technical electives. We recognize the importance of cybersecurity and machine learning for any software engineering graduate. We will conduct a thorough review of the program’s required courses with a view to identifying the possibility of introducing one or both of the above courses as required courses. This must be done while maintaining the total number of course units and meeting the program accreditation requirements. Alternatively, we will examine the possibility of introducing these subjects into existing courses.

Decanal response I agree with the unit response and look forward to their recommendations going forward as I agree with the critical importance of these topics.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|--|--------------------|--------------------|
| 1 | Schedule a retreat to: <ul style="list-style-type: none"> • review the program mandatory courses • suggest actions that would create space for new mandatory courses (such as courses removal, merging of courses, changes to courses, ...) | Associate Director of Program | Spring 2022 | Yes |
| 2 | Formulation of program changes based on the retreat for the integration of cybersecurity and/or machine learning topics | Associate Director of Program and all the Program Curriculum Committee members | Spring/Summer 2022 | Yes |
| 2 | Program changes request submission to the EECS Council | Associate Director of Program | Fall 2022 | Yes |

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Recommendation 10: Encourage openness to the international world (exchanges, COOP placements)

Unit response: We agree to the recommendation unconditionally. It should be noted that international exchanges and placements have been interrupted due to the public health situation. Software engineering students are made aware of international exchange programs accessible through the university's International Office. However, few students are able or choose to participate due principally to the constraints imposed by our accreditation requirements. To be acceptable, courses in engineering disciplines must be offered in programs and institutions accredited by accreditation boards with which the Canadian Engineering Accreditation Board (CEAB) has recognition agreements. In addition, these courses must be given by instructors who hold an engineering license. These constraints limit the choice of courses accessible to our students in the context of exchanges. Students who go on exchange can generally only take non-engineering courses, which limits the interest of these exchanges and makes it difficult to satisfy their course sequence.

In collaboration with the CO-OP Office, we encourage our students to participate in international internships. SEG2900, one of whose objectives is to prepare students for the CO-OP program, includes a module on Mobility which presents various resources related to international internships.

Decanal response I agree with the unit response. Engineering Deans Canada is constantly working with the CEAB in order to encourage the implementation of changes in accreditation requirements that would open up the possibility of international exchanges, which are currently highly constrained in spite of the recognition of their importance. The Faculty already has in place an International Student Mobility Scholarship program, but this remains in limited use for undergraduate students due to accreditation issues. We nevertheless continue to develop international strategic partnerships that would help increase opportunities for students, but significant changes to the CEAB accreditation remain essential for improving the situation.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|-----------------------|------------------------|--------------------|
| 1 | Continue encouraging mobility (particularly CO-OP) in the SEG2900 course. | SEG2900 teaching team | Fall 2022 (ongoing) | No |
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Recommendation 11: Keeping up the good work with the CO-OP program

Unit response: We agree to the recommendation unconditionally. The software engineering is the first and only CO-OP mandatory program at the University. As such, collaboration between the program and the CO-OP Office is essential. The program's success in achieving its learning goals and satisfying its students is intrinsic to the CO-OP experience. We will therefore continue to maintain our current excellent collaboration with the CO-OP office.

Decanal response I agree with the unit response.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|---|---------------------|--------------------|
| 1 | Continue the current collaboration with the CO-OP office, including in the delivery of SEG2900. | Associate Director of Program, SEG2900 course instructors | Fall 2022 (ongoing) | No |
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Recommendation 12: Continue to involve undergraduate students as teaching assistants (TAs) in SEG 2900

Unit response: We agree to the recommendation unconditionally. SEG2900 (Communication et responsabilité professionnelle / Professional Communication and Responsibility) is a key course in the preparation of our students to CO-OP that students take during their first semester in the program. Teaching assistants play a crucial role in serving as mentors for these incoming students. It is therefore of primary importance that these teaching assistants be students from the upper years of the program who have themselves been exposed to the program and are familiar with the CO-OP experience. We will therefore continue to ensure with the support of EECS that the TAs of SEG2900 are selected among students of the program.

Decanal response I agree with the unit response.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|-------------------------------|------------------------|--------------------|
| 1 | Continue to ensure teaching assistants in SEG2900 are selected among undergraduate students from the program. | Associate Director of Program | Fall 2022 (ongoing) | No |
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