# IMAGINING OUR 5G CAMPUS

5G Working Group Report

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# INTRODUCTION

**IN EARLY 2022,** the University of Ottawa (uOttawa) announced a multi-year agreement with TELUS that will see 5G[1] connectivity come to uOttawa. Under this partnership, TELUS will invest a minimum of $6M to equip uOttawa with state-of-the-art 5G infrastructure over the next five years. In addition, TELUS will be installing equipment and provisions for 5G connectivity in two research laboratories working on 5G applications.

To better understand the potential impacts and implications of 5G-enabled campuses at uOttawa, the Vice-President, Finance and Administration, the Vice-President, Research and Innovation, and the Provost and Vice-President, Academic Affairs created an internal Working Group (WG) to begin "Imagining Our 5G Campus." The objective was to offer insights and develop recommendations aimed at optimizing the benefits of a 5G campus for students, professors, researchers and staff. Composed of members from various sectors, the WG included specialists in pedagogy, research, technology adoption and innovation. Most importantly, it included students, who will be important enablers and adopters of 5G if it is to be implemented successfully. The WG membership list can be found in Appendix A.

In addition to the promise of significant benefits, past and current experiences have shown that digital technologies raise complex questions surrounding privacy, personalization and social marginalization. Policies and practices to promote equity, diversity and inclusion must be key pillars of successful digital transformation initiatives. Special attention must be paid not only to access and accessibility, but also to how different individuals and groups perceive and use – or do not use – new technologies. Furthermore, significant consideration must be given to the rationale for 5G's use. For such reasons, successful implementation depends upon the identification and use of robust guiding principles to inform decision-making and to ensure optimal benefits for all users.

[1]5G is the fifth generation of cellular network technology and will become the dominant network, replacing current networks in the coming years. In comparison to previous network generations, the four hallmarks of 5G are its higher transmission speed, higher network capacity, lower communication latency and increased reliability.

# A VISION FOR OUR 5G CAMPUS

### Transformation 2030 and 5G

The building of our 5G campus will occur during the implementation period of uOttawa's strategic plan, *Transformation 2030*. This plan identifies six core aspirations: 1) transformative learning; 2) cutting-edge research; 3) a sustained commitment to our community; 4) a vibrant Franco-Ontarian and Franco-Canadian culture; 5) outstanding leadership and management; and 6) effective governance.

In keeping with these long-term aspirations, *Transformation 2030* identifies four strategic pillars for the coming decade, designed to make the University:

- **More agile**, by enabling innovative approaches to teaching, learning, services and the way we work.
- **More connected**, by driving research and training partnerships related to 5G applications and by enhancing the student experience in the classroom and on campus.
- **More impactful**, by providing resources to attract and retain world-class researchers and enhance the classroom experience.
- **More sustainable**, by ensuring the efficient use and operation of our built environment and infrastructure.

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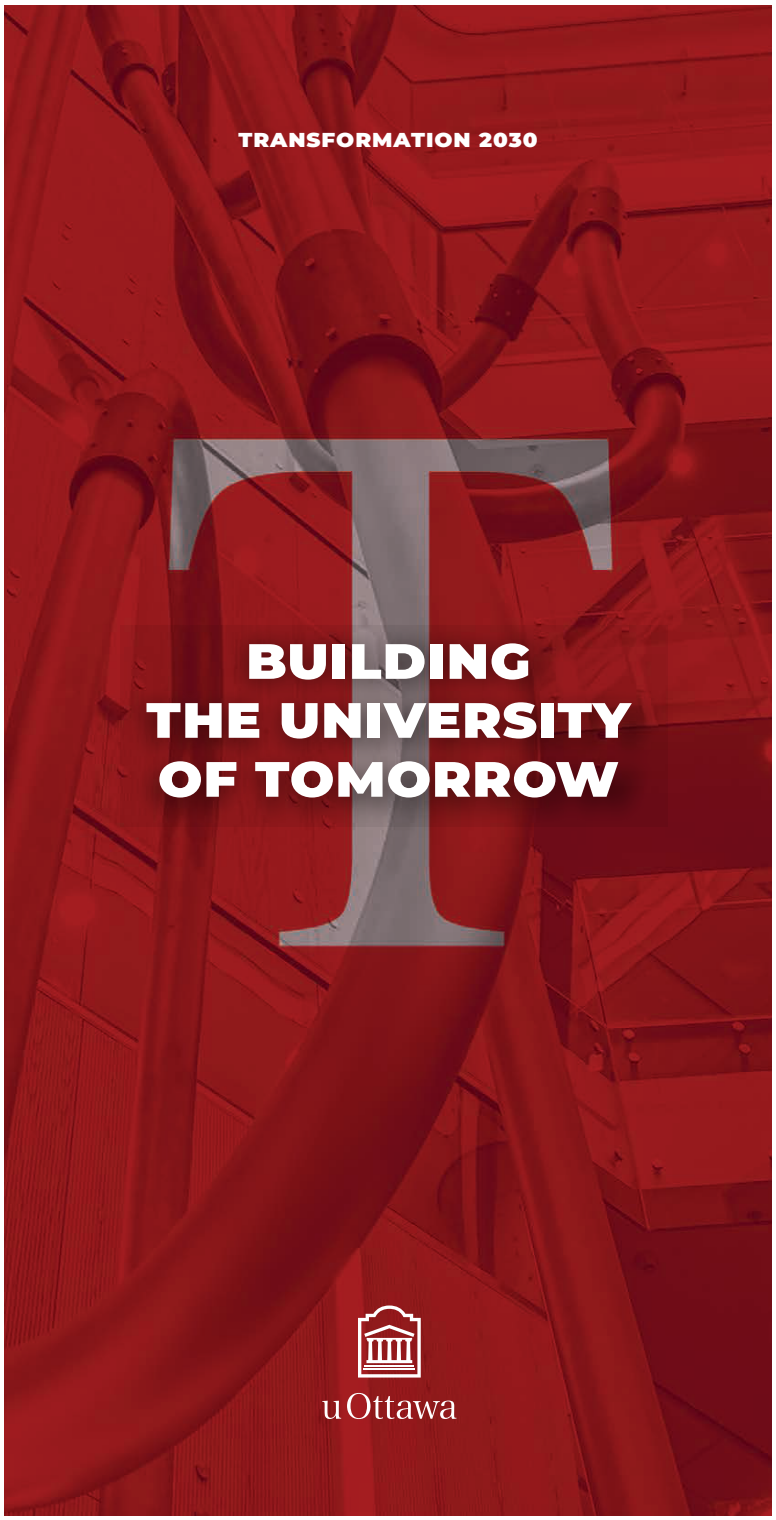
***In other words, the imagined 5G campus will enable, improve and expand our individual and collective campus experiences by making the University more agile, connected, impactful and sustainable in the pursuit of its long-term aspirations.***




Transformation 2030, Strategic plan cover.

# THE OPPORTUNITY

University campuses are promising places to make these transitions happen for the benefit of all stakeholders. As vibrant communities, campuses require a range of applications, tools and solutions to transform the university experience for students, professors and staff in the areas of teaching, research, administration and operations. Currently, there are only a handful of universities in Canada embarking on a 5G campus journey. This gives uOttawa an opportunity to play a leadership role in the post-secondary sector's adoption of 5G connectivity across Canada.

This report is the first step toward a broader institutional reflection on how 5G connectivity can help uOttawa better achieve the ambitions described in Transformation 2030. Imagining a 5G campus must be approached with a measured long-term view, as well as short- and medium-term planning, coordination and execution, both individually and collectively. As our campuses undergo a digital transformation underpinned by new technologies, tools and services, this report represents the first step in a continuous engagement process that will unfold over the coming years.

More specifically, this report suggests how an informed and carefully planned 5G implementation will enable us "to do things better and more efficiently" and "to do new things" to enhance a range of activities, including:

- The student experience on campus, in the classroom and in the laboratory.
- The nature and scope of research and training activities.
- Support for professors in their teaching, training, research and administrative duties.
- Support for staff in their management and administrative duties.
- The efficiency of campus operations and durability of our infrastructure.

***Overall, this report imagines our 5G campus as an inclusive, long-term and far-reaching university community initiative. It discusses key guiding principles, lists desired outcomes and highlights a series of key questions and considerations designed to spark conversations and initiatives across our campuses, faculties, units and stakeholder communities.***

## Imagining Our 5G Campus: The Journey Begins

Over the course of four meetings bringing together expertise in technology, pedagogy, technology adoption, inclusion, innovation, research, infrastructure operations and student affairs, the WG held a series of wide-ranging conversations under the guiding hand of its Chair, Prof. Chad Gaffield. The WG primarily reflected on the "context" of a 5G campus as a way to begin imagining the "content" of a 5G campus. Summarizing the why's and how's, this report serves as a call to action while providing appropriate guideposts as our community embarks on the journey of creating a 5G-enabled campus. The goal is to raise awareness and consciousness of new technologies on campus, including their implications, implementation and impacts.

The next sections summarize the WG's collective insights into guiding principles, desired outcomes, key considerations, formal recommendations and next steps.

"Students will share information and ideas in real-time using 5G-connected devices that communicate with classroom technology, fostering an interactive and engaging learning environment."

**– Making uOttawa More Impactful!**

Yujie Yao, Graduate Student, Faculty of Engineering

# IMAGINING OUR 5G CAMPUS

## MORE AGILE

"Optimizing the use of the technology means we will need to adapt, improve and re-engineer our processes and service models. Technology is the enabler; the value comes from services."

**– Making uOttawa More Agile!**

**Eric Bercier, Associate Vice-President. Student Affairs**

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"A 5G network has so much processing power built in. Augmented reality and virtual reality could be handled by the network instead of your smartphone, improving performance and extending battery life. This makes new types of battery-powered devices possible in the classroom and enables coordinated IoT devices."

**– Making uOttawa More Agile!**

**Daniel Trottier, Deputy Chief Information Officer**

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"5G provides an opportunity to improve the efficiency of data transfers from sources that generate terabytes of research data. [This] will favour collaborations and open up teaching opportunities where data can be accessed in real-time."

**– Making uOttawa More Agile!**

**Mathieu Lavallée-Adam, Assistant Professor, Faculty of Medicine**

## MORE CONNECTED

"Technical support in classrooms can be done on-the-way with mobile devices."

**– Making uOttawa More Connected!**

**Alain Erdmer, Director General, TLSS**

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Imagine on-demand autonomous shuttles on campus, thus increasing accessibility and enhancing mobility for those who need it.

**– Making uOttawa More Connected!**

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Real-time updates on parking availability, campus shuttle locations and alerts will create a better and safer campus experience.

**– Making uOttawa More Connected!**

## MORE IMPACTFUL

"uOttawa isn't just deploying a network. It's also leveraging a network to enrich research, teaching, learning, serving and communicating while making uOttawa more inclusive."

**– Making uOttawa More Impactful!**

**Lysanne Lessard, Associate Professor, Telfer School of Management**

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Imagine having the flexibility to integrate research activities into educational experiences, bringing the lab to the classroom.

**– Making uOttawa More Impactful!**

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Analysis of large volumes of data in real-time will be facilitated by 5G connectivity, for instance when simulating the implementation of predictive algorithms using data from multiple sources in a health system or analyzing biomechanical data obtained from multiple sensors through wearable technologies.

**– Making uOttawa More Impactful!**

## MORE SUSTAINABLE

"We are constantly trying to improve the user experience in our buildings, as well as our sustainability targets. Having more, faster and better data will help to ensure that we reach our goals."

**– Making uOttawa More Sustainable!**

**Geoffrey Frigon, Senior Director, Asset Management, Planning and Real Estate**

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Just-in-time maintenance will be enabled, limiting disruptions to campus activities.

**– Making uOttawa More Sustainable!**

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Imagine the environmental benefits provided by real-time occupancy-based adjustments to heating and cooling systems in buildings, all aimed at reducing energy use.

**– Making uOttawa More Sustainable!**

# KEY QUESTIONS AND GUIDING PRINCIPLES

Over the course of its structured conversations, the WG explored the implications of bringing an enabling technology like 5G to our campuses. The first two roundtable discussions allowed the WG to identify several important questions that will be helpful as conversations on 5G emerge across various university community groups and forums. These questions included:

- ***What does a 5G campus look like?***
- ***What does 5G integration mean?***
- ***Who will be the principal users?***
- ***What do we want to improve about ourselves and our experience?***
- ***What's in it for me?***
- ***What are the risks in creating "smart campuses"?***
- ***Who might get left behind from an equity and access perspective?***
- ***How can 5G be used to enhance collaboration across activity sectors?***

To address these questions comprehensively, the WG agreed that the following set of guiding principles would be helpful for those organizing and engaging in conversations:

- Purposeful (ask why before what).
- Participative and consultative (nothing for us and about us without us).
- Inclusive (bringing together diverse perspectives).
- Equitable and empowered (active involvement and access).
- Progressive (digital transformation is a continuous process).
- Transparent (communication and accountability).
- Pragmatic (balance between aspirations and the ability to deliver).

In reflecting on the future impact of 5G on our campuses and our university community, the WG emphasized the critical importance of ensuring digital equity and access, developing digital skills and enabling digital empowerment in individuals and groups. The WG discussed how the adoption and use of new technologies all too often occurs without devoting sufficient attention to the crucial social and community contexts that incorporate existing and new biases as they are deployed. **Ensuring that we are enabling participation and using fairer, more accessible systems must be paramount.**

The WG also reflected on how 5G may impact the world beyond our campus borders, including environmental, social and governance goals. The WG recommends seeing 5G as a way of helping to build bridges with local partners, along with remote, marginalized and minority communities. Moreover, uOttawa can play a leadership role on the national stage by considering and prioritizing these key questions and guiding principles.

"For teaching and learning, augmented and virtual reality tools have been increasingly adopted over the past five years (e.g., Froggipedia, Virtual Speech, Bacterial Studies). 5G will also enable better access to resources such as those provided by libraries and virtual labs."

**– Making uOttawa More Agile!**

Alain Erdmer, Director General, Teaching and Learning Support Services

# KEY CONSIDERATIONS

In the context of the recommended key questions and guiding principles, the WG identified specific actions for consideration in the planning, installation, implementation and oversight phases of our 5G-enabled campuses.

### PLANNING, INSTALLATION AND OVERSIGHT

- Compiling the initial experiences of other universities internationally that have created or are creating 5G-enabled campuses (best practices, lessons learned).
- Managing expectations and setting realistic limits on what can and cannot be done.
- Creating a strong governance framework for 5G deployment and implementation (a critical success factor).
- Promoting design-thinking approaches (appropriate when deciding which 5G capabilities, tools and solutions should be prioritized).
- Identifying new knowledge, behaviours and skills our community should acquire BEFORE 5G is deployed on campus.
- Measuring success through SMART objectives and other measures of progress is key (an outcomes-based approach helps to focus on desired end states).
- Identifying the 5G value proposition (existing services are offered in more efficient ways, new services are made available and existing services are adapted and reimagined).

### IMPLEMENTATION

- Developing appropriate support mechanisms to meet our community's needs during the transformation, including being respectful of people's knowledge, beliefs, culture and values.
- Avoiding a generic "one-size-fits-all" 5G introduction and deployment while relying on faculty input regarding their varied needs and goals; student, professor and staff journeys to understand their varied perspectives; and use cases, test groups and pilot projects to identify relevant and feasible business cases.
- Preparing for the expected, i.e., that implementation will reveal unknown challenges and issues.
- Identifying potential digital distinctions and specific realities for francophone and anglophone communities, thus helping to define a bilingual 5G campus.
- Prudently managing the cohabitation of 4G and 5G networks over a lengthy period during the gradual migration process.
- Carefully considering security and privacy issues arising from new 5G technology.
- Creating an awareness and education campaign recognizing both real and perceived concerns about 5G acceptance, adoption and use.

"A 5G campus creates meaningful opportunities for innovative teaching and learning that specifically aim to empower all members of our uOttawa community with a variety of digital dispositions and skills."

**– Making uOttawa More Agile!**

Megan Cotnam-Kappel, Associate Professor, Faculty of Education

# DESIRED, DESIRABLE AND EXPECTED OUTCOMES

The following section provides an illustrative list of outcomes discussed over the course of the WG's meetings. Many of the outcomes and impacts on our community listed below are both far-reaching and cross-cutting in terms of institutional and individual perspectives. Indeed, they encompass opportunities for our students, professors, researchers, staff, classrooms, research labs, physical infrastructure, operations, administrative systems and services—the list goes on. Some outcomes and impacts are highly aspirational, while others are quite grounded and practical; some are generational while others are quickly achievable.

- uOttawa is recognized as a national leader in digital transformation through its 5G campus journey (improved reputation and profile).
- 5G capabilities are deployed to improve the overall experience and satisfaction, on campus, as well as in classrooms, research laboratories and our work environment.
- 5G enables uOttawa to achieve differentiation, not only between the present and the future but also between uOttawa and our "counterparts/competitors".
- 5G enables personalized services and a personalized campus experience overall.
- uOttawa enhances digital equity for all its members.
- 5G creates "digital empowerment" for the university community.
- Our "digital intelligence" is collectively enhanced, including digital skills and learning.
- 5G enables more democratic access to information and services, including universal, non-discriminatory access to services and tools.
- 5G builds bridges between silos and enables closer integration (e.g., research and education).
- uOttawa supports its community during the transition to 5G (including an onboarding plan as some stakeholders have not had good experiences with technology, e.g., barriers, resistance, lack of knowledge).
- 5G campus infrastructure deployment is conducted with a view to maximizing coverage through the lens of "equity of opportunity".
- High level of student engagement: this is a source of bold and innovative thinking, pushing the envelope of imagination and creativity.
- Living laboratories and active learning, making the 5G campus deployment itself a research lab and observatory, i.e., sandbox, prototyping (the Learning Crossroads is particularly well-placed for this).
- 5G reduces or removes bottlenecks and limitations to our 1) research and scholarly output/productivity; 2) operations; 3) administrative processes; and 4) student services.
- 5G makes us the first user or adopter of new tools and services.
- 5G opens up our community to pursue opportunities aimed at developing new ways of thinking and solving (e.g., hiring, promotion, parking, cleaning, etc.).
- 5G leads to substantial enhancements to our built environment, including operational efficiency and sustainability.
- 5G enables our community to be leaders in using data and analytics for decision-making.
- 5G leads to significantly enhanced research productivity for data-intensive programs and enhanced research/data/IT security.

# RECOMMENDATIONS AND NEXT STEPS

As part of the WG's mandate, members were asked for their recommendations and next steps to nurture and broaden university community conversations on "Imagining Our 5G Campus". The WG indicated that the first action item should be to conduct an environmental scan of other university campuses in Canada and abroad that are already 5G-enabled or in the process of becoming so.

Strong convergence on three aspects emerged (appropriate governance and oversight, transparency and communications and meaningful ongoing engagement), leading to the following list of recommendations.

**ON GOVERNANCE AND OVERSIGHT**

- Leverage existing governance and oversight structures to remain agile (e.g., Campus Sustainability Committee).
- Phase 1 (infrastructure planning and installation): establish guiding principles, scope and timeframe (i.e., set expectations and limitations).
- Map, develop and monitor a risk mitigation register for both the infrastructure installation and the 5G deployment phases (smart campus risks).
- Continuous learning mindset: environmental survey of best practices, lessons learned, innovative approaches, implementation hiccups, current technology limitations, bottlenecks, new capabilities, etc.

**ON TRANSPARENCY AND COMMUNICATION**

- Create a community webpage and communications tools as part of the continuous engagement plan; clearly define "community" – uOttawa plus local stakeholders?
- Campaign to demystify "what a 5G-enabled campus is and is not" and to address concerns and fears about advanced technology, privacy, consent ethics, marginalization, exclusion and inequities.
- Introduce and socialize key concepts such as digital skills, digital learning opportunities, digital empowerment, digital equity, connections (bridge building, inclusion, rapprochement, as well as rural, underserved communities); inventory skills that we should develop for students (and staff).

**ON MEANINGFUL ONGOING ENGAGEMENT**

- Develop and disseminate a community engagement plan; solicit participation from uOttawa community stakeholders using focused thematic tables while avoiding siloing effects.
- Create a forum for idea-sharing and consultation, leveraging the successful Campus Sustainability Committee model.
- Lead a similar exercise with a student-focused WG starting in the fall of 2022.
- Ensure that equity, inclusion and access are part of conversations and that key elements of our institutional identity (Francophonie, bilingualism, diversity) remain top of mind throughout the engagement process.
- Organize listening tours with faculties, services, interest groups, etc.
- Establish an "innovation" pilot/demonstration/prototype project fund, to be modeled as a grassroots/crowd-sourced initiative to showcase the potential of 5G on our campuses.

## Afterword

The WG members applaud uOttawa's decision to begin the TELUS partnership by inviting reflection on "Imagining Our 5G Campus". The WG hopes that this report will serve as a call to action and a conversation starter, leading to daily discussions and engagement on campus about how a 5G campus can contribute to fulfilling our collective potential to help build a better future.

# APPENDIX A

### IMAGINING OUR 5G CAMPUS: WORKING GROUP MEMBERSHIP

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|---|---|
| Chad Gaffield (Chair) | Professor, Faculty of Arts and Executive Director, U15 |
| Eric Bercier | Associate Vice-President, Student Affairs |
| Chloe Bergeron | Undergraduate Student & President, Engineering Student Association |
| Megan Cotnam-Kappel | Associate Professor, Faculty of Education |
| Claude D'Amours | Director of EECS and Professor, Faculty of Engineering |
| Linda Diokpa | Graduate Student, Faculty Arts & GSAED, Advocacy Committee Member |
| Elizabeth Dubois | Associate Professor, Faculty of Arts |
| Alain Erdmer | Director General, Teaching and Learning Support Service (TLSS) |
| Alison Flynn | Associate Professor, Faculty of Science and Associate Vice-Provost, Academic Affairs |
| Geoffrey Frigon | Senior Director, Asset Management, Planning and Real Estate |
| Daniel Godon | Associate University Librarian, Open Scholarship and Digital Initiatives |
| Ryan Graham | Associate Professor, School of Human Kinetics |
| Mathieu Lavallée-Adam | Assistant Professor, Faculty of Medicine |
| Lysanne Lessard | Associate Professor, Telfer School of Management |
| Dallas Nygard | Biochemistry, Microbiology and Immunology Graduate Student Association (BMIGSA) |
| Sandra Schillo | Associate Professor, Telfer School of Management |
| Daniel Trottier | Deputy Chief Information Officer |
| Yugie Yao | Graduate Student, Faculty of Engineering |

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The Working Group held structured one-hour conversations on March 3, 14, 28 and April 12 of 2022. Members engaged actively on each occasion and contributed additional thoughts and reflections in pre- and post-meeting written submissions. A summary was prepared after each meeting and a "mash-up" working document drafted to incorporate key concepts, insights and suggestions. The mash-up document served as the precursor to the WG report.

1. The kick-off meeting was structured as a general roundtable discussion, supported by seven guiding questions:

    - How will 5G at uOttawa enhance students' experience and learning?
    - How will 5G at uOttawa enhance professors' teaching and educational initiatives?
    - How will 5G at uOttawa enhance staff members' experience, work environment and operations?
    - What type of challenges do you think uOttawa will face as it becomes a 5G campus and why?
    - What EDI considerations are there for how 5G could potentially impact different groups on campus?
    - How will 5G impact the use of equipment, infrastructure and buildings across campus and can it contribute to a safer and more secure campus?
    - What opportunities will 5G at uOttawa create for collaborations, partnerships and initiatives across campus?

1. The second meeting (roundtable format) focused on the following questions and statements.

**As we imagine our 5G campus:**

- What are the desired outcomes?
- What should be our guiding principles?
- How should we set priorities?
- What are the qualities and attributes of a 5G campus?
- Where and how can 5G have the biggest impact at uOttawa?
- We will prioritize 5G solutions and capabilities that enable our community/our campus to…
- Our 5G choices will be guided by…

2. The third meeting focused on five key sections of the WG mash-up working document: vision statement aspects, guiding principles, key questions, recommendations and next steps for continuous engagement.

3. The fourth and final WG meeting was dedicated to reviewing the mash-up document/draft report, including formalizing suggestions for next steps and ongoing engagement planning.