Mason School of Computing

Draft Report of the
School of Computing Working Group

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EXECUTIVE SUMMARY

1-2 page executive summary of recommendations to be prepared after finalizing the report.

I. INTRODUCTION

A. 21st Century Computing

Our world is changing rapidly, driven in part by the ubiquity of computing and digital information and the vast array of systems and applications within which computing methods, tools, and technologies are embedded. As a 2018 report from the National Academy of Sciences indicates[1],

> *"A wide range of jobs in virtually all sectors demand computing skills to an unprecedented extent. And every academic discipline finds itself incorporating computing into its research and educational mission."*

Computing has also had considerable impact in education, changing how knowledge is shared and created, what is learned and discovered, and by whom. While computing was birthed by an academic community comprised largely of mathematicians, physicists, and engineers, today's computing communities include researchers, educators and practitioners in a wide variety of disciplines who use the techniques, tools, devices and methods of computing to advance their scholarly and creative activities, and to prepare future generations of digitally-sophisticated knowledge workers for all sectors of the economy. Equally importantly, an expanding multidisciplinary community of scholars continues to study the adoption of computing technologies, and the ways in which they are changing human activities.

The pace of Innovation in computing have accelerated, creating strong links between knowledge creation and workforce preparation and development. In the first decade of the 21st century, research advances in sensor technologies, search engines, digital libraries and data analytics tools led to the creation of an abundance of digital data and applications to manipulate and leverage them. These data have created new economic and social opportunities and challenges that in turn create new workforce and public policy requirements. Data science, an emergent subfield of computing, has taken root in the current decade enabled by advances not only in computing, but in related fields such as statistics, optimization, and applied mathematics. According to another 2018 report from the National Academy of Sciences[2], graduates from data science programs will:

> *"work in virtually every sector and will serve in a number of roles, including operating the systems on which analyses are run, preparing data for analysis, defining and coordinating the analysis, visualizing information, and supporting data-driven decision making to uncover the stories buried in the data. Others who use data science skills will be journalists, administrators, artists, lawyers, teachers and other workers who need some ability to understand and use data. A wide variety of instructional programs will be needed to prepare students for the data-enriched world of the coming years."*

As computing becomes deeply integrated into all aspects of human life, the very future of work is changing, with automation impacting a growing number of occupations and changing the relationship between people and machines.

[1] "Assessing and Responding to Growth of Undergraduate Computer Science Enrollment", https://www.nap.edu/read/24926/chapter/1

[2] "Data Science for Undergraduates: Opportunities and Options", https://www.nap.edu/read/25104/chapter/1

A 2017 report from the McKinsey Global Institute states[3],

> *"The technology-driven world in which we live is a world filled with promise but also challenges. Cars that drive themselves, machines that read X-rays, and algorithms that respond to customer service inquiries are all manifestations of powerful new forms of automation. Yet even as these technologies increase productivity and improve our lives, their use will substitute for some work activities humans currently perform—a development that has sparked much public concern..... Societal choices will determine whether workforce transitions are smooth, or whether unemployment and income inequality rise. History shows numerous examples of countries that have successfully ridden the wave of technological change by investing in their workforce and adapting policies, institutions, and business models to the new era."*

As computing continues to have an outsized impact on the global economy and on society more broadly, scholars and concerned citizens are coming together to examine and enhance public awareness about its consequences – both positive and negative. The preparation of digitally-sophisticated knowledge workers and informed citizens requires that education initiatives address not only the upside of computing innovations and their rapid adoption, but also the development of critical thinking skills that help ensure that the downsides – such as those associated with digital surveillance, digitally encoded bias, and anti-trust regulations to name but a few – are explored, understood and adequately mitigated.

B. Computing in the Greater Washington Region

The Greater Washington Region (GWR) is a global hotspot for advanced industries demanding computing talent. Almost a quarter of a million people are employed in computer and mathematical ("computing") occupations, more than twice the national average for a region of comparable size[4]. Considerable employment opportunities in the region attract students to Mason's programs where they accrue advantages from the university's proximity to and deep relationships with regional employers.

Universities in the GWR produce among the largest number of computing graduates in the country, attracting Fortune 500 firms like Amazon, General Dynamics, Capital One Financial, Northrup Grumman, DXC Technology, and others looking to tap the breadth and depth of the region's globally-competitive and culturally-diverse workforce. Graduates with computing majors can expect to enjoy rewarding careers with significant earning potential and opportunities for high-impact contributions in a range of sectors, including healthcare, engineering, business, education, entertainment, government, as well as others.

Despite the efforts of universities in the GWR, regional employers, many participants in the Greater Washington Partnership (GWP), have expressed concerns[5] about the challenges of recruiting and supporting the development of a professionally diverse workforce who must demonstrate increasingly sophisticated computing competencies, regardless of major or profession of choice, to compete and thrive

[3] "Jobs Lost, Jobs Gained: What the Future of Work will Mean for Jobs, Skills and Wages", https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Future%20of%20Organizations/What%20the%20future%20of%20work%20will%20mean%20for%20jobs%20skills%20and%20wages/MGI-Jobs-Lost-Jobs-Gained-Report-December-6-2017.ashx

[4] "Occupational Employment and Wages in Washington, Arlington, Alexandria", https://www.bls.gov/regions/mid-atlantic/news-release/occupationalemploymentandwages_washingtondc.htm

[5] "Partnership to Strengthen Tech Talent in the Capital Region", http://www.greaterwashingtonpartnership.com/wp-content/uploads/2017/09/GWP_tech_report_final_12_124.pdf

in the global economy. To strengthen our innovation economy and close the computing workforce gap – the Bureau of Labor Statistics predicts there will be more than 1.3 million U.S. tech job openings in 2022[6] – we must continue to develop and diversify tech talent in the traditional college-age population, as well as among individuals who have been traditionally underrepresented in higher education, including adult degree completers.

C. The Tech Talent Investment Program (TTIP)

In 2017-2018, the Commonwealth of Virginia participated in a national competition to attract Amazon's second headquarters (aka HQ2) to the state. Virginia's (ultimately successful) proposal to Amazon - a collaborative venture led by the Virginia Economic Development Partnership and including P-20 institutions, the Governor's Office, and leaders from advanced industries and state and local government- highlighted the strengths of the GWR's diverse innovation workforce, the presence of multiple world-class research universities (including Mason, the University of Maryland, George Washington University and others), Virginia's business-friendly environment, and the quality and diversity of lifestyle amenities available in the Commonwealth.

On November 13, 2018, Virginia Governor Northam announced[7] that Amazon would locate HQ2 in Crystal City with a commitment to create more than 25,000 high-paying jobs by 2030. To meet the needs of Amazon as well as thousands of other Virginia employers constantly searching for world-class computing talent, Governor Northam also announced that the Commonwealth would invest ~$750 million to grow Virginia's tech talent pipeline and to diversify its innovation economy. This 20-year initiative – the Tech Talent Investment Program (TTIP) – seeks to increase the number of Virginia graduates from computer science, computer engineering and software engineering programs at both the undergraduate and the masters level. Graduates from BS and MS programs with CIP codes 11.0101, 11.0701, 14.0901, 14.0903 – the so-called TTIP "eligible" programs – currently count towards these goals. Over the 2020-2039 period, TTIP funding will support the preparation of at least 12,500 additional BS graduates from eleven Virginia higher education institutions and at least 12,500 additional MS graduates from two institutions – Mason and Virginia Tech.

On that same day in November, Mason's then President Angel Cabrera sent the following message to the university community emphasizing the importance of partnerships in realizing our shared innovation economy ambitions:

> *As announced by the Governor today, the Commonwealth will make major investments in transportation and higher education. Investments will allow many of our sister universities across Virginia to expand computer science programs and Virginia Tech to build a new campus in Northern Virginia. We look forward to working with all of them to advance Virginia's competitive position as a global leader in information technology…*
>
> *Our Arlington Campus, which will occupy 1.2 million square feet near the new Amazon HQ, already enrolls more than 2,500 graduate students and faculty in public policy, law and business. The university will … expand the campus with a new School of Computing and the Institute for Digital InnovAtion.*

[6] https://www.bls.gov/opub/mlr/2013/article/occupational-employment-projections-to-2022.htm
[7] https://www.governor.virginia.gov/newsroom/all-releases/2018/november/headline-834007-en.html

In the last year, more clarity has emerged around TTIP investments in Mason. On November 7, 2019, Governor Northam announced that the Commonwealth will provide funding of ~$235 million toward Mason's programs and initiatives over a period of 19 years from 2020 to 2039. Separate MOU's were issues with the university to stipulate the conditions associated with the appropriation.

A total of $110 million will be dedicated to the support of an increase in the numbers of eligible BS degrees conferred by Mason, contingent upon the university's ability to confer a total of 8,410 eligible degrees over the said period—about 100 additional degree recipients every year over the 2018-2019 baseline. TTIP funding will support the recruitment and retention of faculty supporting related enrollment growth, including the provision of competitive start-up packages as well as initiatives that enhance student experience and success including curricular innovations, experiential learning, and dedicated success coaches who support, among other things, effective community college to Mason articulation. As indicated later in this report, TTIP investments will have a spill-over effect, supporting thousands of Mason students in other majors who must develop enhanced computing skills necessary to thrive in an increasingly tech-intensive world.

A total of $125 million will be dedicated to the support of an increase of 7,538 MS degrees in eligible programs over the 2020-2039 period—about 275 additional MS recipients every year over the 2018-2019 baseline. To support these goals, the university is committed to match $125 million to be raised from philanthropic sources over ten years. A portion of the funding provided will support the recruitment and retention of world-class faculty innovator-educators in computing. The remainder will be capital investment for a ~400,000 SQF new building to support the transformation of Mason's Virginia Square campus in Arlington, and through it, the enhancement of the Rosslyn-Ballston (R-B) Innovation Corridor—an innovation district that will be the first of its kind in northern Virginia. Reflecting the new urban geography of innovation, innovation districts[8] concentrate university R&D programs, corporate innovation labs, innovation-centric convening and community programs, high-growth-companies and related incubator and accelerator programs, diverse high-density residential options, arts innovation, and retail amenities—all in a compact urban setting that allows innovators to live, learn, work and play in a dynamic and highly collaborative environment.

To establish Virginia's first recognized innovation district, Mason and its partners will build upon an impressive foundation established by the Rosslyn and Ballston Business Improvement Districts (BIDs). The Ballston BID[9] is already branded as "*a community driven by innovation*" with the tag line "*Where..... Minds..... Meet*". Working with our academic neighbors in the Ballston BID – George Washington University, Marymount University and Virginia Tech – as well as corporate and non-profit partners clustered throughout the length of R-B corridor, Mason will add strategic innovation programs to this urban ecosystem including a sizeable computing R&D portfolio in computing, thousands of faculty and student innovators, and innovation programs that support high-growth ventures like those provided by Mason's Scalia Law School Innovation Clinic as well as by partners like MACH 37 and Smart City Works. The university is working closely with Arlington Economic Development to attract additional organizations to the ecosystem whose competitive or mission-critical advantage is built upon a computing innovation platform.

In early 2019, the university received approval for and initiated a project to demolish the "original building" on its Virginia Square campus—the site that will host the TTIP-funded innovation district capital

[8] "The Rise of Innovation Districts: A New Urban Geography of Innovation", https://www.brookings.edu/wp-content/uploads/2016/07/InnovationDistricts1.pdf
[9] http://www.ballstonbid.com

development. In August 2019, the university engaged outside consultants, JLL, HR&A Associates and the Endurance Group, to assist with the establishment of a Public-Private Partnership (P3) to create ~400,000 SQF of mixed-use facilities and to activate related streetscape and innovation placemaking programs. TTIP-funded and related graduate programs will be located in Arlington, bringing more than $80 million of annual R&D activity and thousands of Mason faculty and student innovators to the campus and the corridor. Together, these new programs will complement and augment academic programs already located on the campus, including those of the Scalia Law School, the Schar School of Policy and Government, the School of Business, the School of Art, the School of Conflict Analysis and Resolution, and the College of Humanities and Social Sciences.

The combination of existing and newly added intellectual and organizational assets will support the formation of trusted partnerships among all constituents and stakeholders, including, for example, the Arlington Center for the Arts, Arlington Public Schools, the American Legion, Arlington County, Arlington Partnership for Affordable Housing and the Ballston-Virginia Square Civic Association, as well as companies and other organizations already located or seeking to locate there to access the thriving innovation ecosystem. The university and its neighbor-partners will actively seek partnerships with national organizations such as the Cambridge Innovation Center, Quorum and others with experience and demonstrated success in supporting innovation as well as socially- and economically-inclusive growth. In partnership with our R-B corridor neighbors, we will establish Virginia's first innovation district to be recognized by the Global Institute for Innovation Districts[10].

D. Next Steps

It is within this dynamic environment that Mason will launch its new School of Computing (SoC). Informed by the increasingly pervasive role of computing in society and leveraging TTIP investments from the Commonwealth, the university has an unprecedented opportunity to play a leadership role in shaping the future of computing regionally, nationally and globally while also enhancing economic prosperity and the quality of life for residents in the region and beyond.

Responding to the charge provided by the Provost (see Appendix), the remainder of this document:

(i) examines Mason's current programmatic portfolio in computing, including both research and education programs and across all of our academic units;
(ii) recommends how to organize the new school and how it will relate to and interface with the rest of the university;
(iii) defines disciplinary and multidisciplinary education and research programs to be included in the new school;
(iv) identifies new education, research and training programs that the new school may promote and support, and programs that might be refined or transformed; and,
(v) proposes steps to be taken to increase the likelihood of a successful launch.

[10] https://www.giid.org

II. MASON'S COMPUTING PORTFOLIO

A. A Rich Multidisciplinary Computing Landscape

In 1986, Mason founded one of the first academic units in U.S. higher education dedicated to research and education in the emerging field of computing. Established as a School of Information Technology and Engineering, Mason's new school had departments in Computer and Information Sciences, Electrical and Computer Engineering, and Systems Engineering at the time. Over the last 30+ years, the unit added multiple departments in engineering fields like mechanical engineering and bioengineering, and became what we know today as the Volgenau School of Engineering (VSE). In Fall 2019, VSE enrolled the largest cohort of students at both undergraduate and graduate levels among all Mason colleges and schools and includes the two largest departments by enrollment in the university – the departments of Computer Science (CS) and Information Sciences and Technology (IST).

Computing is not, however, the purview of just one academic unit at Mason. In fact, Mason's portfolio in computing includes contributions from a number of its colleges and schools. In the last ten years, Mason's computing programs have expanded significantly, and the university now enrolls the largest number of undergraduate and graduate students in computing in the Commonwealth of Virginia, with growth outpacing that of all of our Commonwealth peers. In the 2018-2019 academic year, the institution conferred 1,074 bachelor's degrees in eleven computing majors[11] across four academic units, accounting for 19% of all bachelors degrees conferred that year at Mason. Today, the university enrolls more than 6,000 undergraduate students in thirteen computing majors[12] across four academic units, and more than 2,000 graduate students in computing programs across five academic units.

Students can, for example, earn undergraduate or graduate degrees or certificates in Information Systems and Operations Management (ISOM) from the School of Business (BUS), Health Informatics from the College of Health and Human Services (CHHS), Geoinformatics and Geospatial Intelligence from the College of Science (CoS), Computer Game Design from the College of Visual and Performing Arts (CVPA), Learning Technologies and IT-e-Learning from the College of Education and Human Development (CEHD), and Cybersecurity Engineering from VSE. In FY 2021, the university will introduce a new computer science education initiative at both bachelors and masters levels, a collaboration among CEHD and VSE to produce computer science teachers for P-12 school systems, a new MS in Cybersecurity (VSE), and a digital humanities certificate in the College of Humanities and Social Sciences (CHSS). Students majoring or minoring in the humanities and social sciences already have opportunities to work side-by-side with faculty and postdoctoral fellows on large-scale digital history and computational linguistics projects as well as computational science research projects in CHSS research centers and labs.

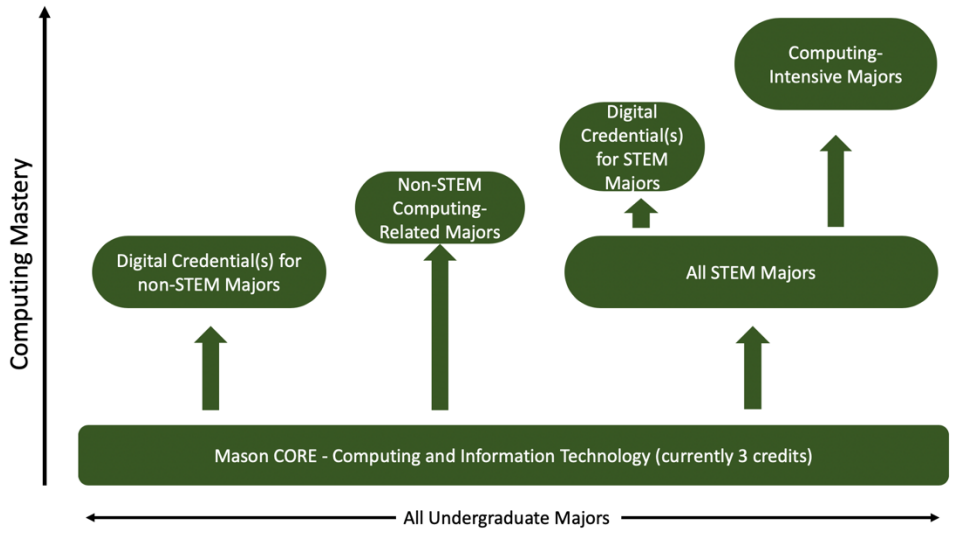
B. Undergraduate Programs in Computing

As computing innovations drive change in almost all aspects of our modern world, the preparation of digitally-sophisticated knowledge workers and informed citizens has become increasingly important. Consequently, Mason is committed to the development of scaffolded computing curricula and credentials

[11] The eleven majors are Applied Computer Science (VSE), Computational and Data Science (CoS), Computer Engineering (VSE), Computer Game Design (CVPA), Computer Science (VSE), Cybersecurity Engineering (VSE), Information Systems and Operations Management (BUS), Information Technology (VSE), Mathematics (CoS), Statistics (VSE), and Systems Engineering (VSE).
[12] The thirteen majors include the eleven above plus the BAS majors in Cybersecurity (VSE) and Cloud Computing (VSE).

that allow all Mason undergraduate students to develop foundational computing competencies and to build on these competencies to further their professional aspirations.

Building Foundational Computing Competencies for All Majors: As indicated in the figure below, the Mason Core curriculum for all undergraduate students currently includes a 3-credit Computing and Information Technology (CIT) requirement. Developed more than a decade ago, the CIT curriculum aims to provide students with an intellectual foundation upon which to build computing competencies specific to their majors, as well as to encourage students to acquire more advanced knowledge and skills.



The launch of the SoC creates a timely opportunity to reexamine the CIT requirement in the Mason Core to ensure that ALL Mason undergraduates are able to develop foundational computing competencies essential for success in an increasingly computing-intensive world.

Augmenting Computing Competencies for non-STEM and STEM Majors: Today, Mason students enrolled in non-STEM majors may elect to build on the competencies they develop in the Mason Core while earning Digital Technology Credentials (see figure above). Launched in AY 2019 in collaboration with the GWP and other regional employers, Digital Technology Credentials for non-STEM majors equip Mason students with the entry-level computing skills that employers indicate they most need. Students can earn the digital analytics credential, for example, by completing a 15-credit hours minor in data analysis offered by the Statistics department. Eleven GWR employers with sites across the region provide students committed to earning the credential with opportunities to be mentored or coached by company employees, to meet senior leaders, to receive priority consideration for internships, and guaranteed resume review and interview priority when seeking employment.

Students enrolled in STEM majors already develop higher level competencies in computing given the integral role that computing plays in science and engineering practice. To supplement these skills, the university is designing new Digital Technology Credentials for STEM majors to allow these students to master higher-level competencies in high-demand areas such as artificial intelligence and cybersecurity that augment those developed within their major of choice.

The development and support of Digital Technology Credentials for both STEM and non-STEM majors allows students enrolled in majors that are not specifically focused on computing to develop knowledge, skills and abilities in more advanced computing techniques. Coupled with curricular innovations in the Mason Core, these Digital Technology Credentials provide promising vehicles to provide ALL Mason undergraduates with the opportunity to develop and master sophisticated computing competencies.

A Diverse Suite of Computing Majors: Mason currently offers thirteen bachelors degrees that specifically prepare students for computing occupations: Applied Computer Science (ACS), Cloud Computing (Cloud), Computational and Data Science (CDS), Computer Engineering (CE), Computer Game Design (Game), Computer Science (CS), Cybersecurity (Cyber), Cybersecurity Engineering (CYSE), Information Systems and Operations Management (ISOM), Information Technology (IT), Mathematics (Math), Statistics (Stats) and Systems Engineering (SysE). Some of these computing programs are more algorithmically-intensive, e.g. CS or Math, while others focus on the application of computing techniques, technologies and methods in a variety of settings (e.g. Cloud, Game, and ISOM).

A number of these programs also include concentrations, tracks, and other options to allow students to focus on a particular aspect of the major (providing depth in, for example, data analytics) or to broaden their knowledge through exposure to other disciplines (providing computing application perspectives, for example, in business or education). Students interested in a particular speciality of computing such as cybersecurity can choose from among at least four major options, including a). CS (BS) with a concentration in cybersecurity; b). IT (BS) with a concentration in cybersecurity or information security; c). CYSE (BS); or d). Cybersecurity (BAS).

The support of thirteen majors provides students with a rich mix of four-year degree options from which to choose. However, the university needs to provide more guidance to help students navigate their degree and concentration options, as well as their career placement opportunities. Careful consideration should be given to the design and delivery of all such majors to help students navigate their paths to success in an optimal way. The creation of the new SoC provides a timely opportunity to identify and leverage synergies between and among programs and to develop new opportunities for multidiscipinary collaboration among Mason departments, colleges and schools.

Fall 2019 enrollment by headcount (HC) in the thirteen undergraduate computing programs is described in the table below, together with 5-year (Fall 2015-Fall 2019) enrollment changes. In the 2019-2020 academic year, Mason enrolled 6,291 students in these programs, accounting for approximately 24% of all undergraduate students – a very significant fraction of overall enrollment. With the exception of Math and SysE, enrollment in every one of these programs demonstrated growth over the 5-year period.

	ACS*	**Cloud**	**CDS**	**CE***	**Game**	**CS***	**Cyber**	**CYSE**	**ISOM**	**IT**	**Math**	**Stats**	**SysE**	**Total**
Fall 2019 Enrollment (HC)	148	0	112	265	365	1630	101	490	1151	1701	193	48	87	6291
5-Year Change (HC)	+32	0	+109	+24	+157	+753	+101	+385	+647	+318	-25	+48	-81	2468

Fall 2019 Enrollment in Tech Majors and 5-Year Enrollment Change, both by Headcount (HC)
(TTIP Eligible Programs are marked with an asterisk(*))

The largest program by enrollment headcount is IT (1701 students), followed closely by CS (1630 students) and then ISOM (1151 students). The IT and CS majors are, in fact, the university's largest programs by HC, with the ISOM major placing fourth (after the Biology major). Moreover, the CS and ISOM programs demonstrated the largest 5-year growth by headcount, at +753 (an increase of 86% over Fall 2015 levels) and +647 (an increase of 128% over Fall 2015 levels) respectively over the 2015-2019 period.

In the last five years, the university has developed several new computing majors to meet the educational needs of adult learners, including Virginia's large and talented military and veterans communities – the BAS in Cyber and Cloud. The Cyber concentration launched in 2016, and enrollment has grown to 101 students in three years, while the Cloud program will enroll its first student cohort in 2020. The university projects considerable growth in both the Cyber and Cloud programs over the next few years.

The table above also describes enrollment growth in TTIP-eligible programs at the undergraduate level. Enrollment in the ACS and CS programs continues to be robust, with growth in CS, in particular, increasing by 86% over the 2015-2019 period. With new TTIP investments in faculty and in student success, the university is confident that it can meet its TTIP commitment to prepare 8,410 graduates over the 20 year period largely from the CS program. It is important to note, however, that enrollment in the CE major has been relatively flat over the past five years. More attention must be devoted to innovations in and marketing of this program to increase the number of students entering and persisting in it to meet TTIP goals.

Promising Partnership with the Virginia Community College System (VCCS): Mason participates in Virginia's Guaranteed Admission Program and offers admission to Virginia community college students who earn associates degrees with 2.85 cumulative GPAs and appropriate prerequisite coursework. The university enjoys a strong relationship with Northern Virginia Community College (NVCC), in particular, and the two institutions recently launched the ADVANCE (2+2) program to increase the number of students entering NVCC en route to a four-year Mason degree. ADVANCE provides students with seamless pathways to four-year degrees, improving retention, reducing tuition costs and speeding the time to degree[13].

Community college transfer students constitute a significant portion of first-time students in several of our computing programs, including ISOM and IT. For example, transfer students represented 82% of first-time students in ISOM and 78% of first-time students in IT in 2018-2019 – in comparison, 53% of first-time students in all Mason programs were transfer students.

Unfortunately, despite the fact that transfer students comprise a significant percentage of students enrolled in several of these computing majors, none of the thirteen computing programs identified currently participate in the ADVANCE (2+2) program. Investments should be made in faculty recruitment, curriculum development and student success initiatives such that students enrolled in the computing majors are able to participate in and fully benefit from the ADVANCE program.

[13] "ADVANCE: A Community College and University Partnership Model for Expanding and Diversifying the Talent Pipeline to the Jobs of Tomorrow," in *Proceedings of the 2019 Collaborative Network for Engineering and Computing Diversity (CoNECD) Conference*, ASEE Paper ID #24972, Crystal City, VA, April 2019 (K.S. Ball, O. Barton, Jr., S.A. Caraballo, L. Wilson Durant, M. Marks, A. Jarrouj, and R.R. Parker).

Development of a Diverse Computing Workforce: The table below presents demographic information about students currently enrolled in the thirteen computing programs defined herein. In general, this student population is significantly more diverse than similar student cohorts at other US research universities.

	ACS	Cloud	CDS	CE	Game	CS	Cyber	CYSE	ISOM	IT	Math	Stats	SysE
% Women	16.9%	N/A	40.2%	9.4%	22.7%	18.7%	12.9%	19.8%	36.1%	23.4%	44.6%	37.5%	24.1%
% URM	23.0%	N/A	22.3%	25.3%	24.9%	22.8%	35.6%	17.8%	26.8%	28.2%	28.0%	20.8%	20.7%
% Pell eligible*	25.0%	N/A	22.3%	24.2%	19.2%	26.4%	51.5%	20.7%	36.8%	39.5%	27.5%	16.7%	28.7%
% First-in-Family	21.6%	N/A	21.4%	27.2%	19.2%	22.9%	39.6%	18.6%	34.9%	34.6%	22.8%	.6%	16.1%

Students Enrolled in Mason Computing Majors
***Students who received a Pell Grant during the 2019-20 academic year**

The Cyber (51.5%), IT (39.5%) and ISOM (36.8%) programs enroll larger cohorts of students eligible to receive Pell Grants compared with the Mason average of 33%. Underrepresented minorities (URMs) and students who are first in their families to go to college are represented in significant percentages in the same three computing majors. Women are represented in significant percentages in CDS, ISOM, Math and Stats. With the exception of the CE program, the percentage of women and URMs in computing majors at Mason equals or exceeds the national average for women (17%) and URMs (15%).

To further increase the participation of underrepresented groups in computing, VSE currently participates in the national American Society of Engineering Education's Diversity Recognition program, and recently recruited a Chief Diversity Officer (CDO) to advance diversity, equity, and inclusion (DEI) initiatives throughout its programs. The CDO leads strategic planning efforts in this area, and works across all units at Mason to support university-wide efforts to improve DEI success.

The diversity of the student population enrolled in Mason's computing programs is a unique and powerful strength. Mason must continue to support a culturally and economically diverse student community leveraging the expertise and the resources that the CDO and other colleagues bring to impactful initiatives in this area.

C. Graduate Programs in Computing

Mason supports a rich set of graduate programs in computing, both at the masters and doctorate levels. These programs are described in more detail below.

Computing Masters Programs: The university currently supports 21 masters programs across five colleges and schools for individuals seeking to update or enhance their computing skills while also advancing their professional ambitions. The table overleaf presents enrollment data by HC in these programs. In comparison with undergraduate enrollment trends that show significant growth in computing programs (+2,468 students over 5 years), enrollment growth in the university's graduate programs has shown only modest increases adding only +162 students over the same 5-year period. In addition, several MS programs show significant enrollment decline (e.g. Telecommunications (-115), Information Systems (-50)).

Degree Program	2019 Fall Census	5-Year Change (HC)
Applied Information Technology (VSE)	163	14
Computer Science* (VSE)	179	26
Data Analytics Engineering (VSE)	475	350
Information Security and Assurance (VSE)	47	-19
Information Systems (VSE)	29	-50
Software Engineering* (VSE)	92	7
Statistical Science (VSE)	36	0
Bioinformatics & Computational Biology (CoS)	17	0
Biostatistics (CoS)	6	2
Computational Science (CoS)	13	2
Computer Engineering* (VSE)	40	-25
Computer Forensics (VSE)	66	-6
Computer Game Design (CVPA)	3	0
Cybersecurity (VSE)		
Geoinformatics & Geospatial Intelligence (CoS)	16	-14
Health Informatics (CHHS)	130	64
Mathematics (CoS)	12	-22
Operations Research (VSE)	35	-15
Secure Information Systems (BUS)	1	-31
Systems Engineering (VSE)	51	-21
Telecommunications (VSE)	42	-115
Total	***1453***	***162***

Enrollment in Tech MS Programs by Headcount (HC)
(TTIP eligible programs are marked with an asterisk (*))

One MS program stands apart, demonstrating significant enrollment growth over the 5-year period – the Data Analytics Engineering (DAEN) program. This multidisciplinary program, which is a collaboration among all VSE departments as well as CHHS and BUS, was developed in partnership with regional employers and should serve as inspiration for future MS program planning. The Health Informatics program also gained traction, showing consistent growth over the last two years thanks in part to its launch as a wholly on-line option in partnership with Wiley Education Services. In the Fall of 2019, Mason launched a wholly on-line MS DAEN option and in 2020 will add the Applied Information Technology (AIT) program, both in partnership with Wiley. Significant enrollment growth is projected in these online programs.

TTIP eligible MS programs, namely CE, CS, and Software Engineering (SWE) show either very modest growth (CS, SWE) or some decline (CE) in enrollment. To realize Mason's TTIP commitment to produce 7,538 graduates from eligible programs over the 2020-2039 period (adding ~275 , the university must make significant investments in these programs, innovating in program design to meet student and employer needs and addressing strategic marketing requirements and student capture and placement in in-person, hybrid, and on-line programs. The DAEN program should serve as inspiration in the re-design and re-positioning of TTIP eligible MS programs.

Computing PhD Programs: The table below summarizes enrollment in ten PhD programs preparing graduates for computing-related occupations in the knowledge economy: CS, IT, Stats, Bioinformatics & Computational Biology (BCB), Computational Science & Informatics (CSI), Computational Social Sciences (CSS), Earth Systems and Geinformation Science (ESGIS), Electrical & Computer Engineering (ECE), Math, and Systems Engineering & Operations Research (SEOR).

	CS	**IT**	**STATS**	**BCB**	**CSI**	**CSS**	**ESGIS**	**ECE**	**MATH**	**SEOR**	**Total**
Fall 2019 Enrollment (HC)	112	70	20	65	48	39	77	65	43	27	566
5-Year Change (HC)	9	-6	3	21	-26	-6	-7	5	6	1	0

Enrollment in Computing PhD Programs (HC)

Enrollment in PhD programs has remained flat overall over the Fall 2015-Fall 2019 period despite the fact that Mason's computing research portfolio has more than doubled in expenditures over the same period.

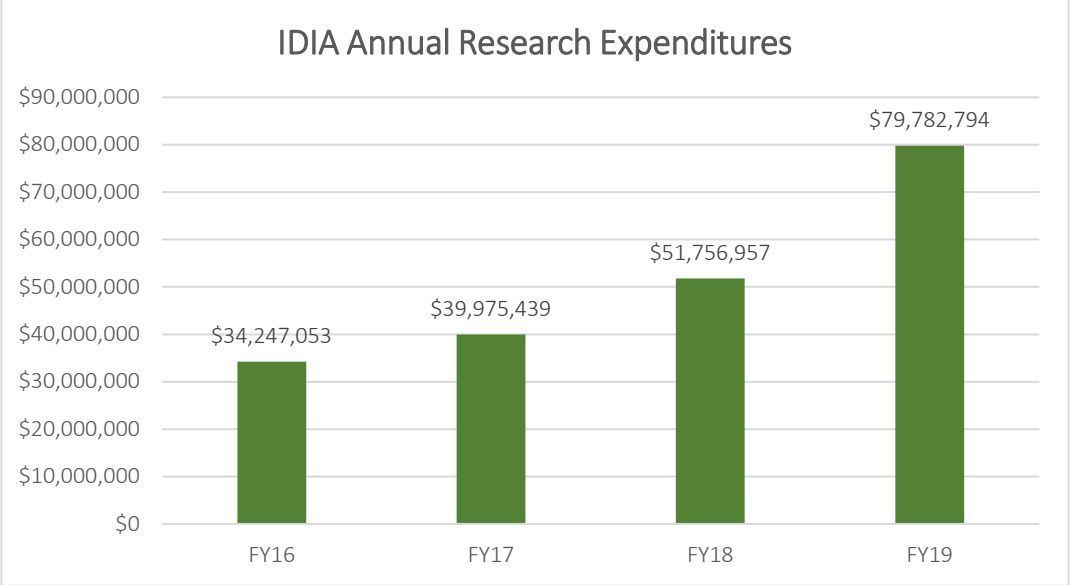
Enrollment growth in computing majors at the undergraduate level appears to have occurred at the expense of growth and innovation in graduate programs, which have experienced very modest (total across all MS programs) to no growth (total across all PhD programs). Building on positive growth in undergraduate programs and capitalizing on the momentum established by TTIP and the launch of the SoC, the university must innovate more in its graduate portfolio, investing resources in the support of graduate programs that add value to its research and innovation mission, including in the recruitment and retention of full-time MS and PhD students.

D. Research and Innovation in Computing

The impact of computing can be observed in every one of Mason's academic units. Advances in research, scholarship, and creative work are found in applications such as the design of new therapeutics (Shehu, CS), models to better understand climate change (Kinter, Atmospheric Science), population health analytics tools to predict and manage health (Sikdar, Bioengineering, Thompson, Psychology), new approaches to securing cyber-physical systems (Homayoun, ECE), clinical trial design (Diao, Stats), development of smart infrastructure (Lattanzi, Civil, Environmental and Infrastructure Engineering), enhancing human-machine collaboration (Purohit, IST), modeling complex materials (Emilianenko, Math), social robotics and design thinking (Wiese, Psychology), smart irrigation systems in agriculture (Di, Geography & Geoinformation Science), novel approaches to user experience design (Bannon, Education & Human Development), and software tools (e.g. Zotero, Omeka, & Tropy, History) used by humanities

researchers and organizations worldwide, as just a few of many many areas of impact. More than 150 faculty innovators contribute to Mason's computing research portfolio.

The university will launch a new Institute for Digital Innovation (IDIA) in 2020[14] to support and promote faculty and faculty and student teams whose research and scholarship advances or engages with computing, within and across units. IDIA builds on an exceptionally strong base of research in computing already underway within the university – in FY 2019, sponsored research expenditures in computing broadly approached $80 million, slightly less than half of the university's overall sponsored research portfolio, up from $34 million in FY 2016 (see figure below).



The formation of the SoC and IDIA must amplify the impact of Mason's research and education programs in computing, providing new opportunities for faculty collaboration and impacting the university's reputation and ranking as a thought leader in the area for years to come.

[14] A multidisciplinary working group was charged with defining the vision and scope of IDIA in December 2018, and will finalize their work in the first few months of 2020.

III. LAUNCHING THE SCHOOL OF COMPUTING

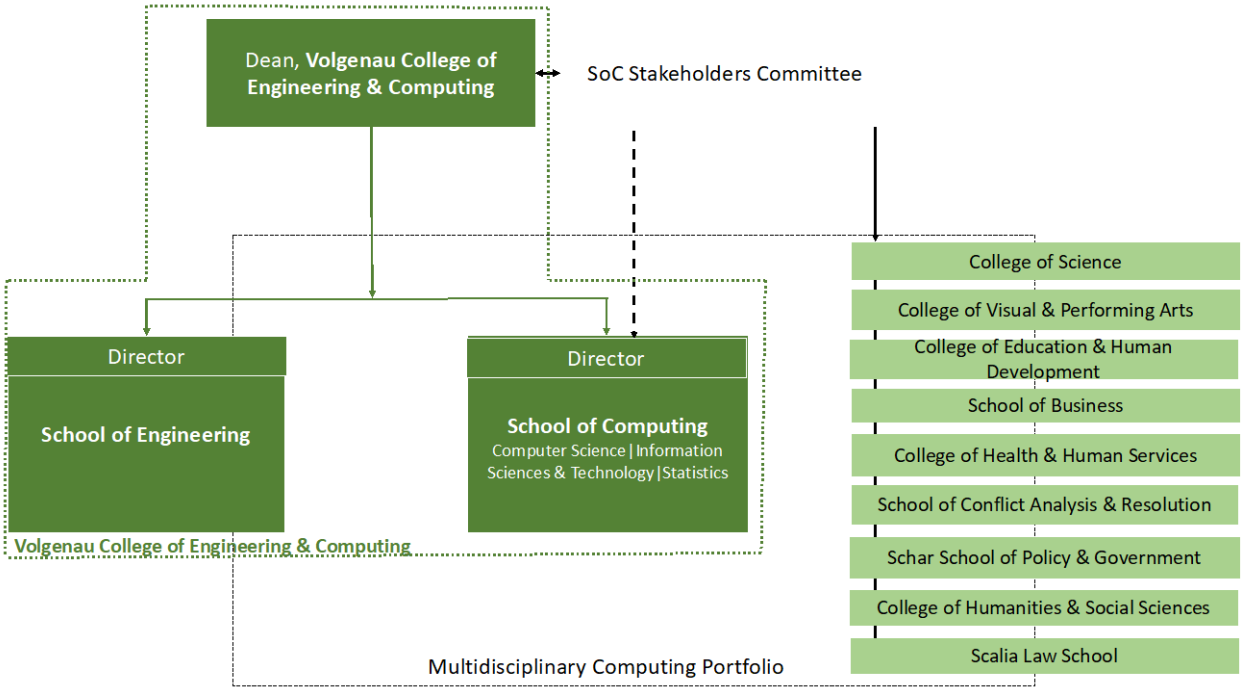
Mason has developed significant education and research strengths in computing over the past decade, and today supports 13 undergraduate majors, 21 masters programs and 10 PhD programs developed specifically to serve individuals pursuing careers and other interests in computing-related occupations. Building on these strengths, the formation of a contemporary School of Computing (SoC) – the first in the Commonwealth of Virginia – provides the university with an unprecedented opportunity to play a leadership role in shaping the future of computing, regionally as well as nationally and globally.

Mason's new SoC will have three mission components:

- Supporting contemporary computing education programs for students enrolled in the school, as well as for students enrolled in majors and programs in other academic units;
- Advancing state-of-the-art research and scholarship in computing and in related domains within and across all of Mason's academic units; and
- Growing the impact of computing advances through entrepreneurship, innovation and civic engagement to ensure that new knowledge generated by Mason's multidisciplinary computing community make their way into new products, processes and services and inform the development of effective public policy essential in our increasingly computing-intensive world.

A. SoC Structure and Relationship with Other Academic Units

As indicated in the figure below, the SoC will be formed as one of two schools – the other will be a School of Engineering (SoE) – within a new Volgenau College of Engineering & Computing (VCEC).



The new SoC will be led by a Director reports to the VCEC Dean. In recognition of the multidisciplinary nature of computing, the Director will also report to an SoC Stakeholders Committee to be comprised of the deans of Mason's colleges and schools.

VSE assets, including personnel, space, equipment, IT, furniture, and funds, will migrate to VCEC to support the new SoC and SoE. It is anticipated that VCEC will initially rely on VSE and Mason policies and procedures, over time updating them to reflect the evolving needs of the new college and its two schools.

B. SoC Leadership

The SoC Director will have full budget authority for funds allocated to the SoC, including a). E&G revenues allocated in the formal revenues split provided to both schools within the Dean's jurisdiction, as well as b). TTIP operating funds allocated directly to the SoC by the Provost. TTIP operating funds will be allocated to the SoC commensurate with the eligible degree recipient outcomes it generates, as well as the school's ongoing commitment to degree production in the eligible programs. (The SoE will also receive TTIP operating funds commensurate with its plans and performance toward TTIP goals for CE.) Funds recovered as indirect costs on sponsored projects will also be provided to the SoC Director and the SoC faculty consistent with policies and practices established and supported by the Provost and the VCEC.

Aligned with the SoC Director's budgetary authority, the Director will have full responsibility for developing and executing recruitment and retention plans/packages for SoC faculty and staff. Tenure and promotion decisions will be handled in consultation with the VCEC Dean consistent with the college's policies.

C. SoC Leadership in Multidisciplinary Computing

As envisioned, the SoC must play a leadership role in facilitating, harmonizing and supporting computing programs across all academic units such that Mason's multidisciplinary computing portfolio forms a coherent, compelling and powerful whole. The creation and adoption of a comprehensive and expansive view of computing will surely continue to inspire faculty and student interest and research and education success at Mason.

To support these ambitions, SoC governance is designed to ensure the engagement of Mason's multidisciplinary faculty community in computing. In addition, the SoC Director will report to the SoC Stakeholders Committtee charged with overseeing the university-wide portfolio. Faculty with primary appointments in the SoC will work collaboratively with colleagues in other academic units, including CDS, ISOM, Game, Math, SysE, CYSE, and CE among others, in order to ensure the university supports a coherent set of computing programs at both undergraduate and graduate levels, with the goals of enhancing collaboration and excellence while minimizing duplication and competition.

D. SoC Faculty

The SoC will be formed by the faculties comprising the current departments of CS, IST, and Stats whose numbers today include 57 full-time tenure-line faculty, 35 full-time term faculty and 93 adjunct faculty (this is Fall 2018 census data – need to update to 2019 data).

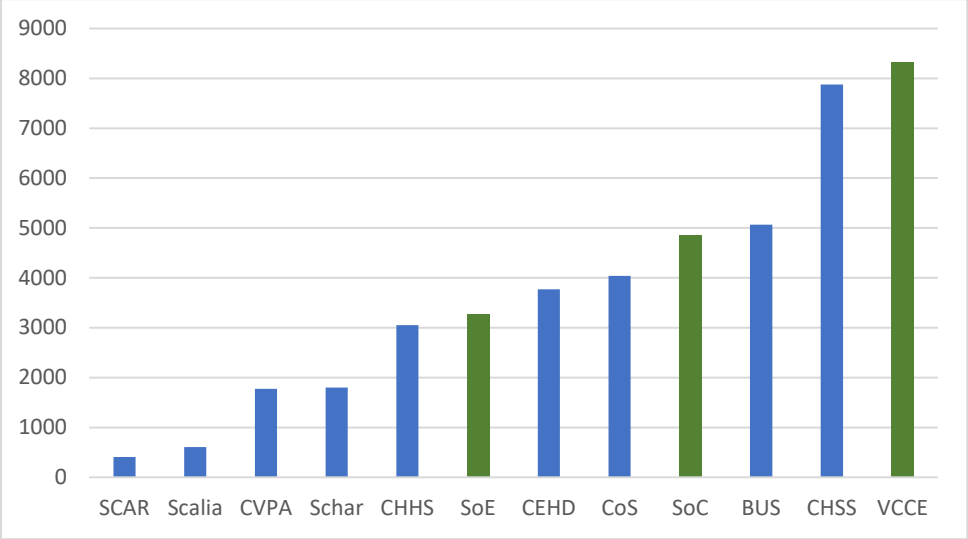
In support of the multidisciplinary nature of the School, the SoC will include and support affiliated faculty with appointments in other Mason schools and colleges whose expertise contributes to modern computing; affiliated faculty may also have joint or secondary faculty appointments in the SoC.

E. SoC Undergraduate and Graduate Programs

The SoC will initially support the undergraduate and graduate programs described below.

Undergraduate Majors:	Applied Computer Science (BS), Cloud Computing (BAS), Computer Science (BS), Cybersecurity (BAS), Information Technology (BS), Statistics (BS)
MS Programs:	Applied Information Technology, Computer Science, Data Analytics Engineering, Information Security & Assurance, Information Systems, Software Engineering, Statistical Science
PhD Programs:	Computer Science, Information Technology, Statistical Science

In the Fall 2019 census, these programs enrolled 3,628 undergraduate students, 1,021 MS students and 202 PhD students. By student enrollment – see figure overleaf – the new SoC will be comparable in size to Mason's Business school, and will be considerably larger than other existing units like Schar, CVPA, CHHS and CoS.



Enrollment (HC) in the Fall 2019 Census by Academic Unit

Within the new SoC, faculty may choose to organize around traditional departments or in divisions organized more flexibly to support academic programs and and to facilitate interdisciplinary work. The pros and cons of the options considered will be developed by the faculty community within the six months leading up to the new school's launch.

F. Undergraduate Programs Hosted by the SoC

SoC faculty are encouraged to work together to examine all six SoC majors (ACS, Cloud, CS, Cyber, IT and Stats) with the goal of optimizing student enrollment, retention and graduation rates, increasing the diversity of students supported by the school, and providing pathways that support seamless transitions between majors.

Some faculty members have already indicated interest in developing an SoC computing core, based on computational thinking, that might be shared by all undergraduate programs housed within the new school. A well-designed common core has potential to better support students interested in pursuing SoC majors, with the goal of introducing fundamental computing concepts that would be further explored and eventually mastered in advanced courses. A thoughtful balance of flexibility and structure should empower students to pursue their intellectual and professional goals through a set of curricular options that may be personalized to their circumstances, interests and career aspirations.

A new common core within the SoC should be designed to articulate with associates programs in the community college system to provide four-year degree opportunities for students who begin their higher education journeys in community college. The ADVANCE program should be leveraged to ensure that the SoC continues to support a diverse community of students, with TTIP funds deployed to facilitate curricular innovations and to support the provision of success coach services to guide and mentor students from their earliest enrollment.

SoC programs must also continue to serve a growing number of adult learners who seek to complete their four-year degrees in computing, some of whom may already be in the computing workforce. The new school must support programs like the BAS programs in Cyber and Cloud, which play an important role in meeting the needs of students and regional employers. Equally important to the support of non-traditional students is the development of wholly on-line bachelor's programs in computing; the IT major is already available on-line. The university's strategic partnership with Wiley Education Services could also provide a critical implementation vehicle for development of these programs. And of course, students enrolled in computing programs may be uniquely positioned to leverage on-line modalities to enhance their learning experiences.

Recognizing the application of advanced computing knowledge and skills across many domains, and the power of joining content creation and design with digital fluency, the SoC is also encouraged to partner with programs in the arts and humanities to develop minors and/or certificates in such areas as creativity, collaboration, and design thinking. Such credentials could prove to be a significant advantage to SoC and other computing majors as they enter a workforce that increasingly demands more than sophisticated technical ability to compete. Non-linear, collaborative problem-solving, focused creativity, user-experience design, and rigorous attention to the human factors at play (including ethical and social considerations) in the conception and execution of computing-based products and services will all serve to distinguish a Mason computing graduate who participates in one of these additional credentialing programs.

G. Graduate Programs Hosted by the SoC

The SoC should also give thoughtful consideration to the professional and research-intensive masters programs it supports. Among other things, this will be essential to realize the enrollment projections in eligible programs necessary to meet TTIP goals and to ensure the availability of TTIP funds to support the school's launch, growth and success.

SoC faculty are encouraged to examine MS programs currently supported (i.e. AIT, CS, DAEN, Information Security & Assurance, Information Systems, SWE and Stats) and identify opportunities to consolidate and/or phase out under-subscribed programs. With the absorption and consolidation of existing programs

in computing, the SoC faculty have an opportunity to strengthen the school's MS portfolio while forging stronger relationships with employers in a manner that fully serves SoC students and society.

The SoC is also encouraged to develop strategies to leverage the university's partnership with Wiley Education Services or other like entities to deliver micro-credentials and masters degree options that are offered on-line, through hybrid delivery, or in more conventional in-person settings.

The SoC should also work closely with other Mason academic units and with partners at other Virginia institutions, including Marymount, James Madison University (JMU) and the University of Mary Washington (UMW), in the co-development of MS programs, including accelerated masters. The development of structured, yet flexible pathways for (Mason, JMU, Marymount, UMW and other) undergraduate students to enter accelerated masters programs at an early stage in their undergraduate education is desirable, easing their way to successful graduation within five years. Moreover, the support of accelerated masters programs with students from a variety of Virginia undergraduate schools and programs creates intellectual diversity that enriches the student learning experiences and is attractive to future employers. The SoC should deploy recruitment and marketing strategies to attract students for these 4+1 or 3+2 programs with the intention of preparing highly specialized students in a more efficient, cost-effective and timely manner. With the first accelerated MS program now in place between UMW and Mason, plans for outreach to other Virginia institutions are underway, including to the state's Minority-Serving Institutions to broaden participation in computing programs.

Finally, working closely with Mason's Office of Graduate Education, the SoC must develop strategies to support the nationally- and internationally-competitive recruitment of exceptional students into its MS and PhD programs to support growth and enhance the School's reputation as a research university leader in computing.

H. Recruiting SoC Leadership and Developing Faculty Talent

One of the first steps on the critical path to the implementation of the SoC is the recruitment of its Director and an administrative team who will support the Director and the faculty to develop and implement the education and research programs of the school, as well as collaborative initiatives with other Mason units. TTIP and other operating funds will be deployed to support the recruitment of the Director and the leadership team.

TTIP and other related operating funds will also be allocated to help recruit and retain excellent faculty talent, including providing robust research packages, with a commitment to ensuring the development and support of a diverse faculty community. Recruitment and retention strategies for research-active faculty should include the allocation of research and innovation labs being developed in the Arlington innovation ecosystem, where collaboration with private and public sector entities located on the R-B corridor as well as in the adjacent Crystal City neighborhood where Amazon HQ2 will locate much easier to achieve.

It is worth noting that between the Fall of 2015 and the Fall of 2019, the number of full-time tenure-line and term faculty in the departments of CS, IST and Stats increased by only 12 while the number of students enrolled in CS, IST and Stats programs increased by almost 1600 (need to update to Fall 2019 data – this is Fall 2018 data). Every effort should be made to recruit at least 10 and as many as 20 new faculty members for the SoC in its inaugural year..

I. Industry Engagement and Guidance

SoC success will be measured in part by the performance and impact of its graduates in industry. Deep engagement with regional and national employers will be critical in the formulation of core computing competencies that SoC and other computing graduates must master. As these graduates excel in the workforce, employers will become increasingly vested in the SoC's success. The creation of a taskforce with significant participation from SoC and other computing-relevant units on campus should be undertaken to engage industry leaders, perhaps through the GWP, to outline industry-driven computing skills. This engagement will be critical to the creation of curricula and programs that meet the industry demands of today while preparing students to thrive in the constantly evolving technological landscape of many tomorrows.

J. SoC Support in Multidisciplinary Computing

As stated under the governace structure,

The SoC must play a leadership role in facilitating, harmonizing and supporting computing programs across all academic units such that Mason's multidisciplinary computing portfolio forms a coherent, compelling and powerful whole. The creation and adoption of a comprehensive and expansive view of computing will surely continue to inspire faculty and student interest and research and education success at Mason.

Enhancement of the Mason Core and Digital Technology Credentials for Undergraduates: It is anticipated that SoC faculty and their faculty peers in other units will work together to explore curricular innovations in the Mason Core to support the development of scaffolded learning opportunities for students across all majors. Students who may not initially understand the opportunities inherent in pursuing a credential, certificate, or minor in computing should be able to develop a broad perspective on computing in the Mason Core, with specialization occurring as they learn more about their interests. With a revamped computing curriculum in the Mason Core, every Mason undergraduate should be positioned to develop foundational computing competencies necessary to thrive in an increasingly digital world

As indicated earlier in this document, the university has already begun to develop and in some cases deliver innovative Digital Technology Credentials for non-STEM and STEM majors, allowing students enrolled in majors outside the SoC to build on the computing competencies they develop in the Mason Core and in their programs of study. SoC faculty should work closely with colleagues in other units to help develop industry informed credentials in, for example, cybersecurity, cloud computing, data analytics and machine learning, which will allow non-SoC students to augment their deep knowledge in their major with actionable digital skills for the workplace and for life.

Seamless Pathways Among SoC and Other Computing Majors and Programs: Since Mason students and other stakeholders are best served by computing programs that promote and support coordinated growth and minimize duplication and confusion, the SoC must serve as a trusted partner to other units and lead the strategic development of a comprehensive portfolio of computing programs and activities.

Accordingly, the multi-unit, multidisciplinary computing community should strive to support a suite of computing programs with transparent and guided pathways between programs that help students

navigate their paths to degree completion in an optimal and intellectually-rewarding manner. Ideally, students interested in pursuing a major in computing should be able to develop a broad perspective on computing at the beginning of their academic journey, with specialization occurring as they learn more about their interests and as they are better positioned to make informed decisions about specialization within their programs of study. As stated earlier within the context of SoC programs, a thoughtful balance of flexibility and structure should empower students to pursue their intellectual and professional goals through a set of curricular options that may be personalized to their interests and career aspirations.

Recognizing that only about one half of the undergraduate majors identified as computing majors will be housed fully within the SoC, care must be taken to ensure that SoC programs articulate with and complement major options in other units, for example, with ISOM in BUS, CDS in CoS and Game in CVPA. With the development of a common core for majors within the new SoC, its articulation with curricular requirements in other computing majors is highly desirable. While each undergraduate degree and concentration option may have a slightly different emphasis, computing majors would ideally share many of the same core technical requirements. For example, STEM majors in the ISOM program are required to take at least 15 credits on computing-related topics in their course of study, while non-STEM majors in the BS in Business with a Management Information Systems (MIS) concentration must earn 21 credits in computing-related topics.

Possible BA in Computing: Faculty in several departments at Mason have already expressed interest in the creation of a BA in Computing that builds on a common computing core but which allows students the flexibility to apply computing in multiple contexts (e.g. in healthcare, business, government, etc.). The establishment of such a program may reduce pressure on existing programs such as the BS in CS by providing options for students who are more interested in the interdisciplinary application of computing. This program should be explored in a collaborative multidisciplinary context taking into account existing programs such as those supported in the departments of CDS, Math, and ISOM, etc.

Masters Degrees in Computing: As Virginia seeks to diversify its innovation economy, consideration should also be given to the development of computing-intensive MS programs that allow students to master graduate-level computing competencies while also developing entrepreneurial and business skills essential to innovation in the marketplace. These programs could be developed in partnership with colleagues in Mason's Business, Policy and Government, and Law schools to create experiential learning opportunities for students in our MBA, MPP, LLM and computing programs. Inspired by the creative programming of colleagues at Cornell Tech[15], graduate student innovation teams could work together to create entrepreneurial digital solutions to social and market opportunities and that seed the creation of high growth start-ups. This curricular design should leverage the co-location of these programs in Arlington and will support partnerships with national incubators and accelerators like MACH37 and Smart City Works. This combination of programs could drive enrollment growth, strengthen corporate partnerships, and enhance Mason's reputation as a world-class research university while also promoting the launch of high growth ventures and related economic development opportunities.

***Broadening Participation in Computing*:** The SoC faculty and their peers in related academic units must continue to work closely with national organizations committed to the preparation of a larger and more diverse computing workforce, including Stars ComputingCorps[16], the Computing Research Association's

[15] https://tech.cornell.edu/programs/masters-programs/
[16] https://www.starscomputingcorps.org

Broadening Participation in Computing initiative[17], the ACM Tapia Conference[18], the National Society of Blacks in Computing[19], the National Center for Women in IT[20], the Institute for African American Mentors in Computing Sciences[21], and the AnitaB.org[22] organizations who can help the university attract and retain faculty and students of all backgrounds, colors and creeds in its computing programs. The new school must lead Mason's efforts in this regard on behalf of Mason's multidisciplinary computing community and should look to leverage existing Mason resources such as the truly exceptional Early Identification Program (EIP) and the Honors College.

With the support of Mason's Director of Faculty Diversity, Inclusion and Well-being, Dr. Millie Rivera, and the VCEC CDO, Mason's multidisciplinary computing community must sieze the opportunity to become a national leader in broadening participation in computing, building a diverse cohort of computing faculty and providing and supporting places of affinity and mentorship for said faculty while also improving faculty retention. By increasing the Mason brand among these groups, the university should strive to become a "NorthStar" for URM faculty, attracting a constellation of diverse talent – and serving as a springboard for our students to carry the Mason name and legacy forward. Additional connections should also be made with K-12 groups such as Computer Science for All[23] and Black Girls Code[24]. Mason's leadership in the development of one of the Nation's largest and most diverse student communities in computing will serve to enhance the computing workforce in the GWR and further establish the region as a global leader in the innovation economy.

K. Elevating the Quality and Reputation of Computing Research at Mason

In conjunction with the Institute for Digital Innovation (IDIA), the SoC and its faculty community will foster interdisciplinary research in computing, serving as a showcase for all computing research at Mason and improving external perceptions (and rankings) of the volume and quality of that research. New funds will support the recruitment of an executive director for IDIA who will work with colleagues to support the development of large R&D projects, to strengthen the university's cyberinfrastructure for research, and to create and sustain research relationships with the private sector and other partners to strengthen the innovation ecosystem in the region.

L. Timeline and Related Milestones (AY 2020-2022)

The following timeline describes some of the critical steps on the path to establishing the SoC.

AY 2020

- Publish working group report and host faculty listening sessions to refine and finalize
- Announce new SoC structure and publish SoC report recommendations, working with SCHEV as appropriate
- Launch IDIA (currently being defined by multidisciplinary IDIA working group)
- Announce funding opportunities for SoC curricular innovation grants and for IDIA seed grants
- Develop bylaws for new school, including terms for affiliate faculty appointments

[17] https://bpcnet.org
[18] http://tapiaconference.org
[19] http://nsbc.org
[20] https://www.ncwit.org
[21] http://iaamcs.wceruw.org
[22] https://ghc.anitab.org
[23] https://www.csforall.org
[24] http://www.blackgirlscode.com

- Launch national search for SoC Director
- Develop and begin implementation of strategic multi-year faculty recruitment and retention plan leveraging TTIP funding provided to the SoC; recruit at least 10 new SoC faculty
- Form SoC Stakeholder Committeee to inform SoC governance and develop committee bylaws informed by promising practices at other institutions
- Develop and finalize multi-year budget model for the SoC
- Design and launch MS strategies to meet TTIP goals – discussions already underway in working group chaired by AVP, Graduate Education

AY 2021

- Launch VCEC, SoE and SoC
- Recruit SoC administrative team
- Enroll first TTIP MS cohorts in Arlington
- Develop evaluation program to monitor and ensure TTIP graduation goals are met
- Redesign undergraduate computing curriculum with pathways between Mason Core, Digital Technology credentials for STEM and non-STEM majors, STEM majors/minors, and School of Computing majors/minors with concentration options connecting to other Mason academic units
- Complete design for wholly on-line SoC undergraduate program(s) for launch in AY 2022
- Recruit additional TTIP-funded SoC faculty consistent with the faculty recruitment and retention plan developed in AY 2020
- Monitor progress against 5-year budget plan and make necessary adjustments

AY 2022

- Enroll second TTIP MS cohorts in Arlington informed by lessons learned by first class
- Launch redesigned undergraduate computing curriculum with pathways between Mason Core, Digital Technology credentials for STEM and non-STEM majors, STEM majors/minors, and School of Computing majors/minors with concentration options connecting to other Mason academic units
- Recruit success coaches funded by TTIP
- Provide leadership in Mason Campus Planning exercise and develop plans to locate programs on relevant campuses
- Design wholly and hybrid on-line undergraduate degrees in computing, e.g. cloud computing, etc.
- Launch wholly on-line undergraduate programs designed in AY 2021
- Monitor progress against the five-year SoC budget plan and make necessary adjustments

IV. CONCLUSION

To be completed once report body is finalized.

APPENDIX
PROVOST'S WORKING GROUP CHARGE

Dear Colleagues:

Thank you very much for agreeing to join the working group to help inform the development of our new School of Computing.

Amazon's selection of Arlington, Virginia as a site for one of its global headquarters creates an opportunity for the Mason community to reflect upon and shape the future of our research, education and translation programs in computing. As part of the Commonwealth's proposal to Amazon, the university committed to the creation of a new School of Computing and to the launch of a multidisciplinary Institute for Digital InnovAtion (IDIA) – both are well-aligned with Mason's Strategic Plan.

We now have an opportunity to define our school and IDIA in ways that distinguish Mason as an academic leader in harnessing the power of computing to advance a diversity of disciplines. To this end, we are creating two working groups who together are charged with examining and shaping the future of computing and digital innovation at Mason such that our collective commitment to promote multidisciplinary discovery and learning emanating from modern computing becomes a defining feature in our strategic growth.

The School of Computing Working Group is charged with:

- Conceiving a vision and mission for a multidisciplinary school that is cohesive, compelling, and inclusive of our internal and external stakeholders;
- Defining the scope of disciplinary and multidisciplinary education and research programs to be included in the new school;
- Identifying new education, research and training programs that the new school may promote and support, and programs that might be refined or transformed;
- Recommending how to organize the new school and how it will relate to and interface with the rest of the university; and,
- Proposing steps that can be taken to increase the likelihood of a successful school launch.

School of Computing Working Group Members: Ann Ardis (CHSS), Peggy Agouris (COS), Ken Ball (VSE), Laurence Bray, Deborah Crawford (Chair), Rick Davis (CVPA), Nirup Menon (BUS), Maury Peiperl (BUS), Amarda Shehu (VSE), Bethany Usher, Eva Wiese (CHSS)