#1904

NDSU Student Technology Fee Action Plan Request

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I. Action Plan Introduction and Authorizations

NDSU ORGANIZATION OR UNIT Computer Science and Operations Research			
TITLE OF PROJECT Loanable Mac Computers for Student iOS and MacOS Application Development Projects			
Project Duration (3 years maximum)	**From: June 2019**	**To: June 2020**	
Type of Project (Check one)	**New**		
Total Technology Fee Request: $2,337			
Project Director **(Must be NDSU faculty or staff)** **Alex Radermacher**	**Campus Address: Department of Computer Science** NDSU Dept. 2740 P.O. Box 6050 **Phone: 701-231-8555** **Fax: 701-231-8255** **E-mail: alex.radermacher@ndsu.edu**		
Name (Type or Print)	**Signature**	**Date**	
Project Director Alex Radermacher	Alex Radermacher	2/15/19	
Unit Head Kendall Nygard	Kendall E Nygard	2/15/19	
IT Division Consultant Chad Coleman	**Signature** Chad R Coleman	**Date** 2-15-19	

Executive Summary (maximum of 175 words)

Many students at NDSU express an interest in developing applications for popular Apple platforms including their Macintosh computers and iOS mobile devices, either for course projects or as a part of other NDSU initiatives such as the Innovation Challenge hosted by the Research and Technology Park.

However, students do not necessarily own or otherwise have the means of acquiring Apple Macintosh computer hardware and software that is necessary for developing these applications. Although the computer labs on the NDSU campus contain several Macintosh computers, these are neither configured for use in these types of projects or available for reservation by students for the duration of their project.

The purpose of this plan would be to acquire hardware that could be reserved for use by students participating in semester long projects which require the use of Apple Macintosh computers. The Computer Science department possesses the capability to manage and maintain this hardware and to provide other resources to students who would seek to use it.

NDSU Student Technology Fee Action Plan Request

II. Project Overview

1. How does this project meet student needs?

Students would have access to utilize Apple Macintosh computers configured for application development which are not normally available to them through other departments or organizations on campus without special arrangements. This has the potential to serve students in many roles.

Students participating in Engineering or Computer Science capstone courses who want to develop an iOS app as part of their project would have access to dedicated hardware for the duration of their capstone project. A lack of access to hardware may prevent some students from feeling that they can undertake such projects. This project would ensure that students who do not own their own Apple Macintosh hardware would have the opportunity to work on such projects.

Student organizations such as the ACM (Association for Computing Machinery) would be able to access hardware for members who do not possess their own Apple Macintosh computer but would need it to participate in some club activity or event. Currently they have indicated that a lack of access to Apple hardware has prevented them from even undertaking iOS app development activities or considering attempting to arrange such activities.

Students who are interested in developing an iOS app as part of NDSU's Innovation Challenge or a similar entrepreneurial program would be able to reserve hardware for the duration of their project.

2. What audience does this project directly serve? What audience is indirectly served? How many students are affected?

This project primarily serves students who are interested in developing software for Apple's iOS and Mac platforms, but who do not themselves possess the necessary hardware or knowledge on how to configure it to engage in such a project. These students are most likely to be those students within the College of Science and Mathematics or the College of Engineering.

The project may indirectly benefit anyone who uses a student-developed mobile app created as a part of an Engineering or Computer Science capstone course or by a student team participating in initiatives such as the Innovation Challenge.

3. For projects that target a subset of NDSU's students, please describe the possibility for broader application in the future.

If the program proves to be successful and sees a large amount of utilization by students, it would be easy to extend the program in subsequent years or seek additional funding from other interested sources to build on top of the program. If a large enough number of computers becomes available, it may be possible to offer online classes during the school year or over the summer where students would check out the hardware as part of a class focused on mobile app development.

Another possible use includes using the machines as part of a summer camp for North Dakota high school and middle school students who are interested in learning how to develop mobile apps.

4. Describe both the immediate and long term impact of this project.

The immediate impact of the project will be to ensure a sufficient availability of the Macintosh computers for use by students the Computer Science capstone course, which typically sees 2 – 3 projects which involve mobile software development per year. This will ensure that each team has at least one computer for development activities which require a Macintosh computer.

The long-term impacts of the project may include greater student participation in initiatives such as the Innovation Challenge due to the availability of necessary hardware to aid students in the development and realization of their ideas which involve mobile applications.

It is also possible that if additional interested individuals (i.e., other departments) begin to utilize the hardware made available by this project, that they might become interested in contributing funding to expand the project in the future.

5. Who will pay for ongoing expenses following the technology fee funded portion of this project (e.g., who will replace hardware or software after it has reached its end of life)?

The Computer Science department would help support and maintain the hardware. It is not anticipated that any major expenses will be incurred as the hardware components have a low likelihood of failure and Apple provides free software updates for their hardware. IT support staff within the computer science department are already familiar with maintenance practices for Apple Macintosh computers. It is anticipated that the hardware purchased as a part of this project would have a useful life of between 6 and 8 years for the stated purpose of this project.

Apple gladly accepts Macintosh computers for responsible recycling, so after the hardware has reached its ultimate end of life, or cannot be used for any other useful purpose, it can be recycled without additional cost to the university of Computer Science department.

6. Describe how this project will follow NDSU's best practices in information technology. (Please make sure the NDSU IT Division staff you consulted signs in Part I of this form.)

Hardware will conform to standards used by ITS for Apple Macintosh computers installed in NDSU computer labs. The computers will be wiped and returned to an initial configuration after use by students. Students will be required to file Off-Campus Use of University Equipment Agreement forms as is standard policy with other university equipment.

7. What service on campus is most similar to the one proposed here? How does this project differ?

Students may reserve laptops through the ITS helpdesk, but they do not offer Apple Macintosh hardware for reservation, nor are the computers that they allow students to borrow intended for long-term projects that may span an entire semester.

The Computer Science department maintains a small number of Macintosh computers that it makes available to students who request them. However, these are computers that have been sent to surplus from other departments and are often near the end of their useful life or unable to receive necessary software updates. The hardware is also old and not always suitable for development work. Other departments may have similar offerings, but none of which I am aware provide availability to students outside of their department.

NDSU Student Technology Fee Action Plan Request

III. Project Description (5 pages maximum)

Background

Each year in the Spring semester senior-level computer science students participate in the CS 445 Software Projects Capstone course where they develop software programs for local, regional, and international companies or research organizations in order to demonstrate their mastery of the discipline and to gain experience with developing software in a real-world setting. Over the past several years the class has grown in size significantly and enrollment is now around 90 students each semester.

Mobile app development has also become increasingly popular over the past several years, and it is not unusual for as many as five of the different projects being offered in a given semester to involve some form of mobile application development. In the case where the project involves or requires development for the iOS platform, it is necessary for the students to have an Apple Macintosh computer in order to run the development software for the platform. However, only a small number of students in the course typically own an Apple Macintosh computer.

In order to allow students the greatest latitude of choice with regards to their capstone project, the Computer Science department has maintained and supported a small quantity of Apple Macintosh computers to accommodate students who do not own an Apple Macintosh computer, but are interested in learning iOS development or have other reasons for choosing that project. However, these computers are typically older machines that other departments are sending to surplus, which means that they may only have one or perhaps two years of useful life before they stop receiving software updates from Apple and no longer support the latest version of the development tools used to build iOS applications. In some cases, the hardware is damaged, such as a laptop computer which no longer has a battery.

This most recent semester, the course has a large number of projects which involve iOS application development which has created an unusually large demand by students for Macintosh computers. All of the existing machines that the department possesses which are still capable of use have been loaned out, but there are still two students without a computer on which they can do development work. Furthermore, the majority of the computers that are currently being loaned out are reaching the end of life in terms of software support from Apple and may not be suitable for use going forward.

Dean Knudson, the capstone course co-instructor has set up a fund that can be used for the purchase of equipment for the capstone course in order to purchase two additional Macintosh computers to satisfy the current immediate need, but is likely that these may not be sufficient going forward and that there is no guarantee that the Computer Science department will be able to find suitable replacements from surplussed machines.

Project Objectives

Because the Computer Science Capstone course is only offered in the Spring semester each year and because the types of projects can very as well, there is a potential issue that any hardware purchased specifically for the Capstone course would go under-utilized. The impetus for this project was to create a program that would allow for better student utilization of this hardware.

Mobile application development is popular among computer science students, and even students outside of the field may be interested in learning about mobile development. Apple's iOS platform is popular due to the pervasive use of iPhone and iPad devices by students as well as a wealth of basic tutorials and guides published by Apple [1]. However, not all students who own an iOS device or have an interest in learning to develop apps for those devices possess the necessary Macintosh computer hardware required for development.

Although the NDSU campus contains a number of Apple Macintosh computers in different computer labs throughout campus, these machines are typically not configured for application development or lack many of the different software applications which are commonly used by developers when creating apps. Furthermore, access to these computers may be limited depending on the building and the lab in which these computers reside.

The aim of this project is to provide resources to students who are interested in iOS (or MacOS) development either as part of a course, extra-curricular NDSU sponsored initiative, or merely for the sake of their own desire, but who lack the necessary hardware resources to do so. The computer science department will maintain an inventory of Apple Macintosh computers which are setup and configured for mobile development that can be checked out by students for long-term use.

Project Users

Although one of the primary groups that will see the most use of this project is limited to the Computer Science Capstone course, there are also several other groups of students on campus who would also be interested in this project. These include students in Electrical and Computer Engineering, members of student organizations related to computers such as the ACM (Association for Computing Machinery), and student teams participating in NDSU initiatives such as the Innovation Challenge [2].

In addition to students in Computer Science, students who are majoring in Electrical and Computer Engineering also complete a capstone project as a part of their major. These projects may involve the development of a mobile application and these students may face similar constrains that leave them unable to participate in a particular project because they do not possess the required Apple Macintosh hardware in order to do iOS development.

Student organizations such as the ACM have a large number of members who are interested in a variety of topics related to computers and software development. Some of their members may be interested in creating personal projects involving iOS software development or may wish to gain some exposure to those software tools, but cannot afford to purchase an Apple Macintosh computer of their own. This program would allow for students interested in furthering their own education.

A third group of immediate potential users would be students who are interest in participating in university initiatives like the Innovation Challenge where their idea may include developing a mobile app. Once again, students may be prevented from undertaking these projects due to a lack of access to Apple Macintosh computer hardware. This program would provide a means for students to have access to these necessary resources.

As the program matures and potentially grows, additional potential users may emerge. Some potential uses include summer courses or summer camps for high school or middle school students that are interested in iOS app development.

Project Resources

The project aims to purchase Apple Mac mini computers, which provide hardware which is capable of supporting iOS application development while being budget friendly. The $779.00 education pricing for the base model Mac mini is least expensive hardware that is currently sold by Apple [3]. Apple typically provides good software support for their computers and it is anticipated that the useful life of these machines would be at least 6 years. These small form-factor desktop computers are also less likely to be damaged than laptops and can easily fit in a student's dorm room without taking up inordinate amounts of space like some of Apple's other desktop products.

One possibility would be to attempt to purchase used hardware at a lower cost, but Apple hardware typically retains value well compared to most hardware and even models that are five years old can still command prices of almost $500 on popular sites which offer refurbished Apple products [4, 5]. When considered on the basis of yearly cost over the lifetime of the hardware, purchasing new hardware becomes the least expensive option.

This project requires no additional staffing resources it will be carried out by Computer Science department staff who already oversee and administer the program under which Mac computers are loaned to students. This would prevent any additional burden on NDSU IT department staff. In the unlikely event of hardware failure or malfunction that it not covered by warranty (e.g., a hard disk failure after 4 years) the parts would be replaced by the Computer Science department. This will not place any undue burden on the department as we already maintain an inventory of parts such as this for other computers owned and maintained by the department.

Outcomes and Reporting

Because this project offers good long-term potential for growth if it proves popular, periodic status reports related to the utilization of project resources will be provided. At the end of both the 2019 Fall and 2020 Spring semesters, a report will be produced which includes information regarding the number of occurrences on which students utilized the resources purchased through this project as well as a description of the nature of their project.

These reports may be used to justify additional expansion of this project either within the Computer Science department, or possibly in conjunction with other departments on campus who would be like to see greater availability of these resources for their students.

Bibliography

[1] https://developer.apple.com/library/archive/referencelibrary/GettingStarted/DevelopiOSAppsSwift/

[2] https://www.ndsuresearchpark.com/innovation-challenge/

[3] https://www.apple.com/education/pricelists/pdfs/US_EDUCATION_INSTITUTION_Price_List_01-15-2019.pdf

[4] https://www.macofalltrades.com/shop/apple-desktops/refurbished-mac-mini/

[5] http://www.usedmac.com/products/apple-mac-mini

NDSU Student Technology Fee Action Plan Request

IV. Milestones

List the date for each project milestone. These milestones should represent the ***significant*** accomplishments that will be associated with the action plan. For each milestone, please indicate its expected outcome and the means for assessing that outcome. (The table may be extended as needed.)

	Date	Milestone	Expected Outcomes	Means of Assessment
1.	June 1, 2019	Purchase of Equipment	Equipment purchased through the NDSU bookstore.	1: Receipts of purchase and delivery of equipment.
2.	July 1, 2019	Installation and Configuration of Software	The equipment will be prepared for intended use by students. CS department IT staff will restore hardware to a base state after use in a trial.	1: A trial attempt to use the equipment for mobile app development with a report containing any issues or shortcomings. 2: Verification of restoration of hardware and installed software to a base state after use in the trial above.
3.	January 1, 2020	Utilization report for Fall 2019 semester	Students, student organizations, or other groups have made use of the equipment.	1: A report detailing the utilization of the equipment and a description of how it was used.
4.	June 1, 2020	Utilization report for Spring 2020 semester	Students, student organizations, or other groups have made use of the equipment.	1: A report detailing the utilization of the equipment and a description of how it was used.

NDSU Student Technology Fee Action Plan Request

V. Supporting Documentation

The following support documentation can be found below:

1) A letter of support from Dr. Dean Knudson, Associate Professor, Computer Science
2) A letter of support from Guy Hokanson, System Administrator, Computer Science
3) A letter of support from Riley Conlin, President of NDSU Student Chapter of the ACM

NDSU NORTH DAKOTA STATE UNIVERSITY

February 15, 2019

Letter of Support for Technology Fee Action Plan Request entitled "Loanable Mac Computers for Student iOS and MacOS Application Development Projects"

As part of the Computer Science degree, all majors must take the Software Projects Capstone course. In the course, students are placed into teams of 4 and are required to do a project for an industry sponsor. These sponsors include major companies (e.g., Microsoft, John Deere, IBM) midsize (e.g., Capturis, Border States, Noridian) small (e.g., fjorge, Myriad Mobile) research (e.g., ATC, Adventium) and startup (e.g., BargInns, OmniByte). For the past few years the course enrollment has been around 90 students we have been running 20-23 projects a year. These projects are provided by the sponsoring companies and require the students to develop a software solution/application that will be used by the sponsoring company. This is a very popular course and gives NDSU great exposure to a number of regional and even international companies.

The projects done each year vary greatly and involve robotics, machine learning, web applications, cloud based systems, mobile applications, mapping systems and Internet of Things applications. Every year we have several applications that include mobile development using Android and/or iOS platforms. Every effort is made to place students on projects that they have a high desire to work on. We do not require them to have their own development platforms so that students have the greatest degree of freedom when choosing projects. This means that we often have students working on iOS projects that do not own Apple computers. When that happens we try to find a loaner machine that they can use for the semester. Since we only have a couple of these it often happens that students may have to share a machine or work on other parts of the project not requiring special hardware.

This letter is written to strongly support the request for funding for additional Apple machines. These will be put to good use in our capstone class and will ensure that students have the opportunity to choose projects based on their interests or that will help further their learning without having to worry about whether their own personal computer is capable of being used for the project.

Dean Knudson

Dean Knudson
Associate Professor
Capstone Coordinator
Computer Science Dept.
North Dakota State University
Fargo, ND 58108
701-231-5612

NDSU NORTH DAKOTA STATE UNIVERSITY

14th February 2019

Tech Fee Advisory Committee
Quentin Burdick Building 206D
PO Box 6050
Fargo, ND 58108-6050

To Whom It May Concern,

With the growing trend in mobile application development and Apple iOS having an ever increasing share of the mobile market. A share reported as 63% in November 2018 by DiviceAtlas.com. I consider the NDSU Computer Science Department's pool of Apple iOS development computers is in dire need of replacement.

The department's currently has available for student use.

- 2 – 2012 edition 2.9GHz i7 MacBook Pro's with 8GB memory
- 1 – 2012 edition 2.9GHz iMac with 8 GB memory
- 1 – 2010 edition 2.0GHz i7 MacBook Pro with 4GB memory

These four computers are nearing their end of serviceable life, with the 2010 MacBook on its final supported macOS version. Considering the interest in iOS development shown by students, I feel there is a need for the department to acquire several newer Apple development computers. Preferably of the Mac mini or MacBook Pro verity. The CS department has significant experience in supporting Apple's macOS products and anticipates no additional burden in adding macOS supported equipment.

Sincerely,

Guy Hokanson
NDSU CS Department System Administrator

February 14, 2019

To Whom It May Concern,

The ACM wishes to support the purchase of a Macbook or other Macintosh computer to use for development of programs or applications in the Apple ecosystem of products. There are two main reasons for this. The first reason is that as the number of companies developing products for MacOS and iOS rises, the demand for Apple developers grows as well. At the moment, the ACM does not have any equipment to allow for development with XCode, Swift, Metal, or other iOS and MacOS development techniques and suites. This has been prohibitive in the past, and we feel that the lack of proper hardware prevents us from properly preparing our members for development on Macintosh hardware. With this purchase, students would not only be better prepared for the workplace in terms of both skill set and comfort in usage of non-Windows operating systems (as some companies only use Macs for software development).

The second reason for obtaining a Macintosh is to allow students the opportunity to improve their personal portfolios by means of side projects. For example, if there is a student that is interested in app development, without a Mac, they would be limited to Android development. If the ACM possessed a Mac, they would be able to learn iOS development without the prohibitive cost barrier.

We hope that you consider our request for this equipment to further the development of programming skills in our members.

Sincerely,

Riley Conlin

President

Association for Computing Machinery

2017-2019

NDSU Student Technology Fee Action Plan Request
VI. Budget

(double-click on the form to begin entering data)

1.	NDSU ORGANIZATION OR UNIT Computer Science and Operations Research
2.	PROJECT DIRECTOR(S) (Must be NDSU faculty or staff) Alex Radermacher

3. SALARIES AND WAGES			
Personnel description	Number employed	Number of months	Funds Requested
A. Staff	0	0	$0.00
B. Graduate students	0	0	$0.00
C. Undergraduate students	0	0	$0.00
4. TOTAL SALARIES AND WAGES			$0.00
5. FRINGE BENEFITS			$0.00
6. TOTAL SALARY, WAGES AND BENEFITS			$0.00

7.	EQUIPMENT	$2,337.00
	Three Mac Mini 3.6 GHz quad-core 8th generation Intel Core i3, 8 GB RAM computers	$2,337.00

8.	MATERIALS AND SUPPLIES	$0.00

9.	TOTAL TECHNOLOGY FEE REQUEST	$2,337.00
10.	MATCH (Describe in Match Section)	$1,558.00
11.	TOTAL PROJECT EXPENDITURE	$3,895.00

NDSU Student Technology Fee Action Plan Request

VII. Budget Justification

Equipment:

The Mac mini 3.6 GHz quad-core 8th generation Intel Core i3 processor, 8 GB, 128 GB Flash Storage (Part Number MRTR2LL/A) has an educational price of $779.00 as per Apple's US Education Institution – Hardware and Software Price List published 1/15/2019.

These are the least expensive hardware available for purchase from Apple and as they are new machines, can expect at least 6 years of future software support from Apple based on historical trends and data. These machines are also capable of having their RAM or hard drives upgraded in the event that additional memory is needed in the future.

We considered the possibility of purchasing used hardware in an attempt to find a less expensive solution or to enable the purchase of additional machines within a particular budget, but even used models which are five years old can cost in excess of $500. When considering the cost in conjunction with the expected useful lifetime of the hardware, purchasing new hardware has a lower overall cost.

In addition to the two Mac mini computers of the same hardware configuration being purchased by the Computer Science department for immediate use in the capstone course this semester, the three machines requested here would bring the total available to five, which is anticipated as being sufficient to cover the expected number used in the capstone course in a typical year.

NDSU Student Technology Fee Action Plan Request

VIII. Budget Match

1. Attempted Budget Matches:

2. Actual Budget Matches:

   $1,558.00 from NDSU Computer Science Capstone Fund

3. Additional Budget Match information:

   The Computer Science capstone course has a small fund of contributions that have been provided by industry sponsors of capstone projects. Due to an exceptionally large need for Apple Mac computer hardware to do iOS development this particular semester, as well as an expectation that current CS department machines will be EOL within the next year or two, funding is being used to purchase two Apple Mac mini computers for immediate use this semester and to serve as a replacement for machines currently in the possession of the Computer Science department.