



# HARMONICS

The Engineering Explorations Newsletter

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## WHAT KIND OF ENGINEERS MAKE COMPUTERS?



This article was researched in magazines, books and the world wide web. It was written in Microsoft Word 98 and then typeset into *Harmonics* using Adobe Pagemaker 6.5. The images you see were scanned, imported from image library CD ROMs or found on public domain sites on the web. Most had to be cleaned up, cropped and otherwise manipulated in Adobe Photoshop 5.0. Some of the images are unique and were created using Adobe Illustrator 6.0. All the work was done on an Apple G4, with 128MB of RAM, 10GB of hard disk space running a 450MHz processor. What you hold in your hands is the result of a combination of hardware and software that were used together to create a newsletter printed on paper.

Every computer works thanks to a combination of these two elements; hardware and software. Hardware is all of the physical components you can see and touch when you open up your computer. It includes, the Central Processing Unit (CPU) which acts as the computer's brains; sound, graphics and video cards; ROM (read only memory), the computer's permanent long term memory; RAM (random access memory) a more temporary type of memory storage; the hard drive, a magnetic disk which holds all the files you create; and lots of ribboned wires, called busses, to connect it all together. Software is the set of programs which makes your computer useful.



Originally, computers were just really big counting and calculating machines. Most of what they had to do was wired into their circuits as they were built, in other words everything was hardware. The problem with that system was that if you decided you wanted the computer to do something different you had to go back in and change some of the machines components. Eventually engineers and mathematicians (who were really the first computer scientists) figured out that the way to make the machines more versatile was to separate the functions that ran the computer (hardware) from those which made it do what you wanted it to do (software). It is not surprising then that these days there are two kinds of engineers involved in the development of computers – hardware engineers (usually called computer engineers) and software engineers.



The computers we use today join hardware and software together to allow us to produce newsletters, design cars, and explore the planet. In First Nations communities across Canada computers are used to contribute to local economic development. They are used to run businesses, to examine the impact of new roads on hunting grounds, and to sell the work of local artists all over the world. But the potential for computers goes way beyond local business. They could be used to connect patients in remote communities with doctors in city hospitals; they could also be used to bring math and science teachers into communities that may not otherwise be able to offer these subjects. In order for such health and education uses to become a reality, First Nations require Aboriginal computer professionals – including technicians, software and hardware engineers – who can set up computers and maintain computer networks as well as customized and develop software for local application.



# NATIVE ENGINEERS & SCIENTISTS

A place to meet people from your community.

Computers are very versatile machines, and so are the people who use them. Lewis Staats' post-secondary training is in business, but his day-to-day work depends on information technologies and specialists.

Name: Lewis C. Staats  
Nation: Mohawk, Six Nations of the Grand River  
Profession: CEO and Managing Partner, Sixdion Inc.  
Degree: B.A., University of Western Ontario  
Banff School of Advancement Management  
Favorite thing about job: Having Sixdion headquartered and operating in Six Nations.



When Lewis Staats went off to university, he always knew he'd come back home to Ohsweken, "I wanted to be involved with economic development in my community." His desire eventually led to the building of Sixdion, Inc., an information technology (IT) company which offers information management services, telecommunications services and strategic consulting, or as Lewis puts it, "Sixdion's vision is ... Delivering World Class Solutions with an Aboriginal Mind." The company provides products, services and employment for people living on the First Nation.

As a virtual company, Sixdion relies on computers not only to do business but to generate business as well. People with IT skills are crucial to the company's survival, "The most valuable asset we have are the people who work for us."

As such, Lewis encourages young Aboriginal people to stay in school so they too can eventually contribute something back to their communities, "Education always has been and will continue to be the key to our future. We need people with IT skills so First Nations can evolve and grow for the future." He adds, "computers are really just the tools to leverage this new economy, the real asset and value will be the people who can use these tools to build companies and economies."

Lewis realizes that staying in school through university is quite a challenge, "For me, after being in school for 16 straight years, the last year was definitely a challenge." But he made it through with the support and encouragement of his family, and he thinks this is key for all students, "The person has to want to succeed, but their family has to help them realize the goal."



# "ONE, TWO, THREE, FOUR, FIVE..."

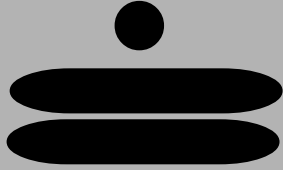
Counting is one of the first things we learn as children. But did you know there are different ways of counting? The number system we use everyday is called the decimal, or base-10, system. In it there are ten symbols - 1,2,3,4,5,6,7,8,9,0 - that can be use to represent any number no matter how big or how small.

Another way of counting was used by the Mayan people of central America. They developed a base-20, or vigesimal system. In it there are twenty symbols, each representing a number from zero to nineteen. A dot represents ones, a line represents fives, and a special symbol represents zero. A dot or dots over a zero indicate that a cycle is starting again, so 20 is one dot over a zero and 40 is two dots over a zero.

Computers use yet another way of counting. It is a binary, or base-2, system. It uses two symbols, 0 and 1. Each 0 or 1 is called a bit. While we see normal looking numbers and letters on our computer monitors, they are each actually stored in the computer as a series of 8 bits, also called a byte. Although computers are really modern machines, the binary system was developed by European mathematicians in the 1700s.

To get binary equivalents of decimal numbers go to: <http://busboy.sped.ukans.edu/~adams/decnbin.html> To get more information on Mayan numbers: [http://forum.swarthmore.edu/k12/mayan\\_math/index.html](http://forum.swarthmore.edu/k12/mayan_math/index.html) For some more information about computers, (and what ROM and RAM mean) go to: <http://infoplease.kids.lycos.com/ipka/A0771238.htm>

11  
Decimal



Mayan

0001011  
Binary

The number 11 in three different counting systems.



## NATIVE LANGUAGES ONLINE



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The Inuktitut syllabics for "dog."

Historically, Aboriginal peoples come from an oral tradition, in which there were no written documents. The libraries of the people resided in the heads of community Elders. Elders still carry much wisdom and knowledge, but Aboriginal peoples these days also use written language. Certain nations, such as the Mohawk, base their written language on the Roman alphabet used in English, French and most European languages. The Cree and Inuit however, use two different systems of Syllabics.

With Syllabics, one-syllable sounds such as ee, oo, a, and see, soo, sa, are represented by symbols. This reduces word length, and better represents sounds like the Inuktitut "qi," as in "qimmik" which means dog. Developed in the late 1800s for translation of the Bible, Syllabics have been adopted for everyday use in Cree and Inuit communities in the eastern Arctic. (In the western Arctic, speakers of the same language groups use the Roman alphabet.) As you may have guessed, computers are now able to represent Syllabics in word processors and other applications. If you speak Cree or Inuktitut, or even if you do not, it is possible to download the fonts through the Internet and start writing in Syllabics!

To download Syllabics for Cree or Inuktitut go to <ftp://ylcftp.uoregon.edu/fonts/>



# COMMUNITY PROFILE

## GIS and traditional knowledge

The traditional territory of the SIMPCW and Secwepemc people of the Shuswap Nation is found at the head of the North Thompson River in British Columbia. A small group of these people has found a way to combine new technologies with traditional knowledge for the benefit of their community and nation.

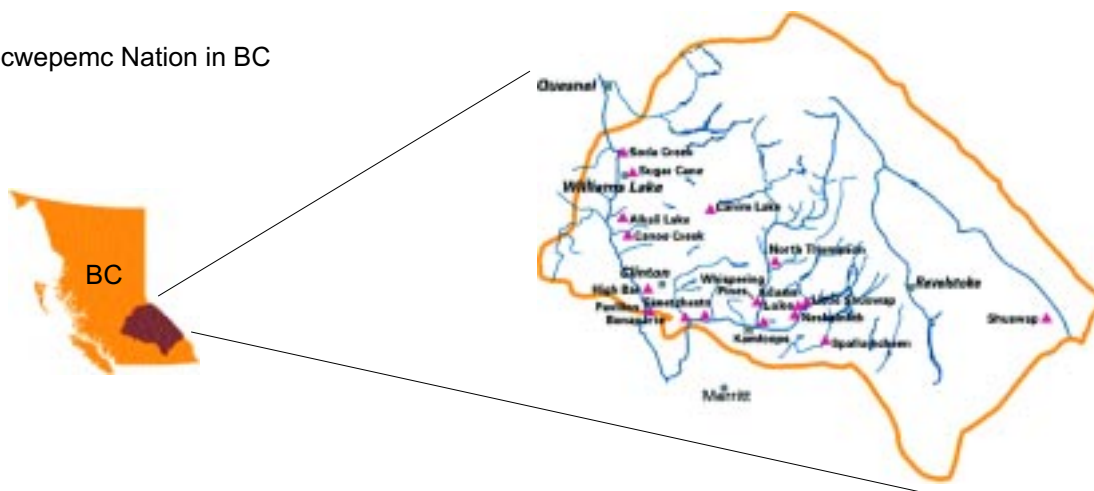
In 1993, a few members of the Shuswap Nation had the opportunity to receive some training in GIS, the Geographic Information System. GIS isn't one system but the combination of data sources about geography – like satellite imagery, mapping and even traditional knowledge – brought together through the power of computers. It might not seem like a big deal, but working with GIS it becomes very easy to place lots of information on a map. Why is this important? Well, the Shuswap know.

Using this technology, the members of the SIMPCW GIS Team, as they are called, have been able to make maps which contain information about all the different ways their people have traditionally used the land. Using these maps, the team can help determine the impact of any new development on their trap lines, fishing waters etc. For instance, if the band council wanted to develop some of the mineral resources on its land, the proposed roads and mining site could electronically be placed on top of the GIS developed map of traditional land use, and any conflict with trap lines or sacred grounds avoided.

The SIMPCW GIS team developed their maps by consulting Elders and other people who know about their traditional territory. From these consultations they create a database which can then be combined with other information like existing satellite images and databases such as the Fish and Fish Habitat Inventory Program maintained by Fisheries and Oceans Canada. The team has undertaken contracts for both government ministries and their own band council.

GIS is only one of the many growing uses of computer technology in Native communities. In other places computers are used to sell the work of local artisans around the world, or even run online casinos. While computers are a relatively new technology they can be combined with traditional activities for the benefit of the community.

The Secwepemc Nation in BC



Source: [www.secwepemc.org/map.html](http://www.secwepemc.org/map.html)



# FUN FACTS AND THINGS TO THINK ABOUT



Did you know ...  
 ...the average desktop computer  
 contains 5-10 times more  
 computing power than was used to  
 land a man on the moon?

Source: [www.funtrivia.com](http://www.funtrivia.com)



## Check it out.

Where can you go on the internet for aboriginal youth content? The AYN, of course. The Aboriginal Youth Network is an interesting place in cyberspace where you can read what other aboriginal youth from across Canada have to say. You can speak your mind and post your comments about anything. Follow the links on the site for some games, to listen to aboriginal music broadcasts, or to explore employment and education options. You can even find links to our web sites ([www.nativeaccess.com](http://www.nativeaccess.com) and [www.dream-catching.com](http://www.dream-catching.com)). It is a good place to find out what First Peoples activities are going on in Canada. They can even host a web site for you. The web address is [www.ayn.ca](http://www.ayn.ca).



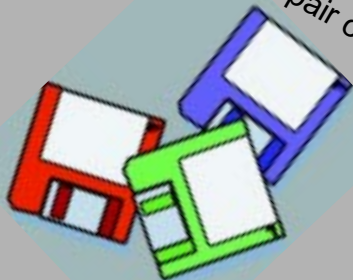
**There is no reason anyone would want a computer in their home.**

- Ken Olson, president, Founder, Digital Equipment Corp., 1977

## PUZZLES & GAMES

**How many?**

There are 10 red floppy disks and 10 blue floppy disks in Corey's desk drawer. If Corey reached into the drawer in the dark, what is the least number of floppy disks he must take out before he is assured a pair of disks of the same colour?



ANS:- Three. Corey might have a pair after taking out two, but he can only be sure he has a pair after taking out three. If the first floppy is red and your second floppy is blue, the third one must match either the red or the blue since there are only two colours of floppies in the drawer.

### Fathers and sons

Two fathers and two sons are all computer programmers. Each bought a computer, and none of them bought the same computer. If only three computers were bought, how did this happen?

ANS: the computer programmers were a grandfather, a father, and a son.



# NEW SCHOOL GETS WIRED IN ESKASONI, NS

The Mi'kmaq reserve of Eskasoni is situated on Cape Breton Island in Nova Scotia about 40km south west of Sydney. It is the biggest reserve east of Kahnawake, Quebec with over 3,000 people. Close to the ocean, many people in the community rely on fishing for their livelihood. Like many reserves, Eskasoni has faced high unemployment and low high school graduation rates. Part of the problem was that students had to travel outside the community in order to complete their schooling. To counter these problems, the community came up with an innovative way to open a new high school on reserve in the fall of 1998.



The Eskasoni Learning Centre



Source: elc2000.ednet.ns.ca/class.html

A typical class room.

With private sector funding, and a partnership with IBM, Eskasoni is now home to the Eskasoni Learning Centre 2000 or ELC. The school is a pretty amazing place where computers are integrated into learning; there is one computer for every two students. Students also have access to a broadcast system, television studio and multimedia laboratory where they learn software design and multimedia presentation. In technology labs they learn about digital sound technology, construction technology, robotics and hydraulics – among other things. Come graduation, they have developed powerful skills applicable in the work force. In addition to computer training, ELC provides a Mi'kmaq language program which allows students to stay in touch with their roots while reaching out into the world.

Better than all the technology is the fact that students love ELC. There were 22 people in the school's first graduating class in June 1999; only one less than started the year in grade 12. (That one person, didn't drop out either, he moved to a new community.) Five members of the graduating class have gone on to pursue post-secondary studies in science and technology. Eskasoni's high school is an example to follow!



The multimedia lab.

For more information about Eskasoni High School, visit their Web site at [elc2000.ednet.ns.ca](http://elc2000.ednet.ns.ca)

you can also get information about the school on IBM's web site at [www.can.ibm.com/K12/](http://www.can.ibm.com/K12/).

## All about us

Native Access provides culturally relevant learning opportunities in science, math, engineering and technology to Aboriginal students and their teachers across Canada.

Established in 1993, the project's ultimate goal was to increase the representation of Aboriginal peoples among the ranks of practicing engineers and scientists in Canada.

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