# 21st Century Skills Training: Computer Systems Support

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## I. Introduction

This paper describes how a two-year access college determined the demand for education and training in a particular technology, computer support technology, and how it met and continues to meet that demand. Most institutions of higher education devote part of their efforts toward determining educational program needs of their respective service areas. When such need is discovered, the institution must then decide whether or not it is capable of meeting it. If it is capable of meeting the need, it must construct a plan and begin securing resources required for developing such a program. The University of Cincinnati Clermont College has undergone such a process many times in its effort to provide its service area with up-to-date and substantial new program offerings. This paper chronicles the birth, growth, and projected future development of one of UC Clermont College's new technical programs: "Computer Systems Support (CSS)." For those considering development of a new, or significantly revised, technology-driven program, this article can provide a framework for planning and implementation.

UC Clermont College was founded in 1972 as an open-access two-year branch campus of the University of Cincinnati. Its service area includes the counties to the immediate east of Cincinnati. The College resides in one of those counties, Clermont. This county has experienced the largest rate of growth in terms of population and industrial development of any county in the state of Ohio. Some of the industries represented in the county such as Structural Dynamics Research Corporation, Ford Motor Company, and Cincinnati Milacron are on the cutting edge of technology. At its inception UC Clermont offered two-year transfer programs such as liberal arts or business, but its array of technical programs was nearly nonexistent. As time passed the College gradually developed programs in Hospitality Management, Electrical Engineering Technology (EET), and Industrial Engineering Technology. When these programs were initiated, little effort had been made to determine the need for the programs.

## II. The next step

The exponential increase in the number of computer systems of the 1980's and 1990's suggested the need for computer hardware maintenance technicians. The tendency toward networking of computers, be it intranet or the Internet, also required a support technician with the software skills necessary for maintaining, updating and modifying a computer network. That person would also need skills in multimedia software and hardware. A global need for engineering technologists with this training was apparent.

At the same time the Electrical Engineering Technology advisory committee was expressing a need for personal computer repair training. A survey of the local business community revealed that the greatest technical training need was for computer repair training. The Occupational Outlook Handbook [1] stated that, "employment of computer and office machine repairers is expected to grow much faster than the average for all occupations through the year 2006." At present there are about 80,000 computer repair technicians in the United States.[1] Local business leaders and the EET advisory committee were confirming that the demand for this type of worker was so great that many local companies were not able to find enough qualified computer support technicians. Compounding the high demand and low supply of computer support technicians was the fact that there were no college-level computer systems support training programs in the southwest Ohio area. Not only was there a demand for the technologists, there was a decided need for a training program for such technologists.

Sensing the demand for both the technicians and a technician-training program, the College formed an advisory committee. Several members of the EET advisory committee volunteered to serve on this new committee. The Committee also had representatives from Greater Cincinnati area industries such as American Computer Repair and Structural Dynamics Research Corporation. Also represented was the Technology Manager from the University of Cincinnati Center for Information Technology Services (CITS).

Initial Advisory Committee discussions centered on the type of education or training that a computer system support technologist would require. Troubleshooting, diagnostics, hardware skills, and operating system familiarity were obviously required. One surprising upshot of the Advisory Committee discussions was that a computer support person would need good interpersonal skills. Not only would the repair technician have to diagnose hardware or software problems, he might very well have to interact with an irate PC user. This might be a computer neophyte who had just lost a month's work when his computer crashed, or a person who had very little technical knowledge and could only vaguely describe the problem he or she had encountered. Some of the computer support technologist's education should certainly be devoted to developing communication skills such as writing and speech, as well as exposure to psychology or sociology.

## III. Curriculum planning

It was decided to initially offer a four-course lecture/lab certificate program. This could be done without waiting for the rather slow associate degree program approval process to wind its way through the College, University and the Ohio Board of Regents (OBR). It would also test student demand for the program and employer demand for those students completing the certificate. The courses would also satisfy degree requirements for the associate degree program when it was eventually approved. Meanwhile those students who wanted to matriculate into an associate degree program in computer system support could enroll in the "Associate of Technical Studies" degree program which was already in place. This option allows students to create a technical program curriculum tailored to their specific interests and background. Of course, a particular technical curriculum design had to be approved by College faculty with expertise in the area.

However, the Computer Systems Support curriculum was already being designed and in-College approval would be fairly easy to obtain.

Naming the program proved to be a small task. The College public information officer wanted to use the name “Computer Repair,” which was thought the most easily marketable term. Not surprisingly other schools had used that name. On the other hand the advisory committee suggested “Computer Support,” “PC Repair,” and “Computer System Support.” PC Repair did not adequately describe the goals of the program since students would receive training in computer networking and also in some non-PC operating systems. “Computer System Support” was chosen as the program name. That name seemed a broad enough umbrella to cover personal computer repair, computer networking, and multimedia applications. The program name was also general enough to encompass the many as yet unseen directions in which the computer field might turn as the technology developed.

The four-course certificate program curriculum was designed by the advisory committee. It consists of the following four courses:

PC Operating Systems
PC Hardware
Basic Network Techniques
PC Systems Troubleshooting

Each course consists of a four-credit hour lecture/laboratory combination, for a total of six-contact hours per week. The design of these courses was in response to what the advisory committee anticipated the needed skills were.

The PC Operating Systems course was designed to cover DOS, Windows 3.x, Windows 95, Windows 98, Windows NT 4 Workstation, and Linux operating systems. Over time one would expect coverage of older operating systems such as Windows 3.x to be phased out and greater emphasis placed on more recently developed systems such as Linux and Windows NT 4 Workstation.

The PC Hardware course was designed to introduce the student to the functions, operation, upgrading and testing of PC hardware devices. More specifically the CSS student would learn to identify major hardware components, understand the functions of these same components, locate manufacturer data about/specifications for hardware devices, use procedures to install components, evaluate total system performance, cover all applicable A+ domains, and use the Internet as a research tool.

The Basic Network Techniques course introduces the student to important functions and operations of PC networks. Topics include installation and configuration of network software and hardware and a full range of network administration duties. Lecture material is supplemented with a variety of lab and research assignments. A+ certification test topics relevant to this course are covered.

The PC Systems Troubleshooting course introduces the student to the important role of troubleshooting PC hardware, software and networks. Topics include assessment of problem symptoms, use of popular troubleshooting tools, location of vendor product information, elements of customer interfacing and satisfaction, and warranty issues. Again, A+ certification test topics relevant to this course are covered. In all four of these courses lecture material is supplemented with a variety of lab and research assignments.

The University of Cincinnati Clermont College has a course and program approval process that might be described as an administrative gauntlet. Programs arise from a number of sources. In the case of the CSS Program a clear need was apparent from the business survey, national occupational trends ( see Occupational Outlook Handbook[1] ), administrative interest in new technical programs, and the Advisory Committee discussions. After the Program was designed, it was approved by the Science, Mathematics, and Engineering (SME) Division, the College Curriculum Committee, the College Dean, the Provost's Office, and the Ohio Board of Regents (OBR). The entire process, from inception to operation, took approximately four years.

To assure adequate start-up funding the Associate Dean for Instruction at the time, Dr. Gregory Gray, committed about $20,000 for equipment to begin the program and another $6000 for instructor training. This commitment was crucial to the program's initial success. A program that is touted as "high tech" and "offering a state-of-the-art laboratory experience" must invest in laboratory equipment. The College was revamping one of its computer labs by replacing 486 PC's with Pentium-based PC's. These dated 486, 33 MHz. PC's were then given to the CSS Program. Though not state-of-the-art the machines offered opportunities for troubleshooting, disassembly and re-assembly, operating system and application software installation and manipulation, and a study of elementary PC architecture. High enrollments in the initial certificate courses such as "PC Operating Systems" and "PC Hardware" prompted the administration to commit funding to subsequent years. Additional funding was realized from the biennial OBR Technical Equipment Funding. These monies enabled the CSS Program to purchase more up-to-date Pentium-based PC's as well as other equipment such as a scanner, and laser and color printers. Approaches to industry are presently being made for additional funding from private sources.

The original prerequisites for enrolling in the certificate program were simply DOS and Windows 3.x experience. When the associate degree curriculum was designed, it included a Computer Information Systems (CIS) course entitled, "Introduction to Information Processing." This course included exposure to DOS and Windows operating systems, and thus the need for the original prerequisites was abandoned.

In addition to humanities courses such as English and support coursework such as mathematics, the associate degree program had a required sequence of lecture and laboratory courses from the Electrical Engineering Technology Program. These courses are:

Elements of Electrical Engineering Technology ( lecture and lab )
Circuit Analysis I
Electronics I
Digital Systems I, II, III

These courses need to be followed in sequence. Placing a heavy emphasis on electrical engineering technology coursework gives the student an understanding of the fundamentals of electricity, digital electronics, and microprocessors. Having a background in digital electronics and microprocessor architecture and programming allows the student a more fundamental understanding of new technologies as they appear on the scene.

## IV. Instructors

The CSS Certificate Program and later the associate degree program were directed by Associate Professor Darwin Church who also taught the "PC Operating Systems" and the "PC Hardware" courses. Professor Church's main teaching assignment was in the EET Program and teaching the College Physics sequence. Through additional workshops and other training he became quite familiar with both PC operating systems and PC hardware topics. However, he did not feel qualified to teach the "Basic Network Techniques" course. Though difficult to find adjunct faculty with PC networking expertise, one such individual was located and hired. To this day the program relies on adjunct faculty to teach some of the CSS and EET coursework.

## V. Students

The scheduling of the certificate and later the associate degree coursework play an important role in the success of the program. UC Clermont College is a branch campus of the University of Cincinnati and is located about 25 miles east of the main UC campus. It is a commuter campus and has no residential dormitories. Much of the student population is attending on a part-time basis and taking coursework in the evenings. It was decided to offer the CSS certificate coursework in the late afternoons and evenings from 5 PM on. This would allow students who work full-time to attend classes on a part-time basis. By taking one course per quarter ( including summer ) a student could complete the certificate requirements in one year. Full-time students taking day classes would still be able to take the evening program.

The College began offering the CSS certificate courses in the Autumn Quarter of the 1996-1997 academic year. The response to the program was almost overwhelming. Initially one section of the PC Operating Systems course was offered. Room size and the number PC-equipped lab stations limited enrollment to 14 students. The section quickly filled and an additional lab section was created and filled. The lecture portion was filled to its 28-student capacity. At this point the Division Chair realized that College was turning away additional students, and a trailer section of the PC Operating Systems course was scheduled for the following Winter Quarter. That section also filled to capacity. The next course in the sequence, PC Hardware, was also offered during the Winter Quarter of the 1996-1997 academic year. Of the 28 students enrolled in the PC Operating Systems course in the Autumn Quarter, 26 continued into the PC Hardware course, again forcing the addition of another section of the laboratory for that course. As you can see response to the CSS certificate course offerings was, in terms of student numbers, about triple that anticipated.

Some of the reasons for the initial and continued popularity of the CSS Certificate Program are apparent. Others are not so clear. Obviously, many students were trying to enhance their skills in

a technology that promises to play a significant role in the 21st Century. The exponential growth in the number of PC's world-wide and the ever-changing nature of information technologies are attractive to those seeking occupational skills considered to be valuable in both the near and distant future. The fact that the certificate program could be completed in one year of part-time study is also a factor. All of the CSS certificate coursework applies toward the CSS associate degree should a student choose to continue his studies. Many students in other programs such as Computer Information Systems, Electrical Engineering Technology, and Computer Aided Design (CAD) are also completing the CSS certificate in order to make themselves even more employable. The range of students encompasses age groups from high school sophomores to retired senior citizens. Both genders are well represented.

## VI. The first year ( 1996-97 )

During the first year of the Certificate Program 115 students registered for these courses. Another interesting fact was that the attrition in each course seemed to be quite low. Of the 28 students enrolled in the "PC Operating Systems" course 26 chose to enroll in the following "PC Hardware" course. This was better than a 92% retention rate. It has yet to be determined whether this high retention rate results from 1) the nature of the technology, 2) the diversity of the students enrolled in terms of age or gender, 3) the lecture/laboratory pedagogical approach, 4) the quality of the instruction, or 5) other factors.

The advisory committee continued to meet and during the year to monitor the growth and direction of the program. It was used as a sounding board in the design of the CSS Associate Degree curriculum. Key issues for the committee were 1) the balance between hardware and software skills required for computer support technologist, 2) the need for good interpersonal and communication skills on the part of the graduate, 3) the types of positions that might be filled by a graduate of the program, 4) the benefits of the cooperative work experience, 5) the needed software skills, and 6) possible baccalaureate programs that the graduate might transfer into.

At the end of the 1996-1997 academic year the CSS Certificate Program was considered by many to be a success. Relatively high enrollments across a diverse student population was an indication that the program was peaking interest and meeting a need. An active advisory committee was alert to, involved with, and representative of the rapid changes in the computer field. Its advice was well received and then acted upon.

## VII. The second year ( 1997-1998 )

During the second year interest in the program continued to be strong. Student enrollment ( 82 students ), though not as great as in the previous year, continued to be diverse. The Associate of Technical Studies degree was available to the College as an umbrella program for a student wanting an associate degree in computer support. The CSS associate degree program had yet to be proposed, and its curriculum design was not yet complete. With some publicity a few prospective and current students were electing to matriculate in the Associate of technical Studies degree program majoring in computer systems support.

The advisory committee continued to meet. Important issues discussed were 1) the increasing need for computer network training, 2) what network operating systems to introduce, 3) the need for a full time faculty member to be hired as a teacher and program director, 4) employment opportunities, 5) present and future laboratory needs, and 6) the availability of co-op positions.

VIII. The third year ( 1998-1999 )

During the early summer of the second year of the program, we decided to pause for a period of analysis, assessment and reflection. The program was maturing in an orderly, controlled manner and the time was right to perform some pre-planned tasks.

When the program was initiated in 1996, two (2) study plans were available: a 16 credit hour certificate and a 2-year ATS (Associate in Technical Studies) with a CSS option. While the ATS degree was adequate in the beginning, an Associate in Applied Science (AAS) CSS degree was strategically important to the visibility and identity of the program. In the State of Ohio, the Ohio Board of Regents must approve such programs. An extensive application (evaluative information from the College's service area, student enrollment projections, cost/benefit analyses, impact of program on College resources, etc.) was submitted in the Spring, 1999. Formal approval was granted in October 1999.

A full-time instructor, Assistant Professor Cecil E. Beeson, was hired to direct the program and teach courses in the CSS and related technical programs. Mr. Beeson brought several years of technical management expertise from industry as well as several years of college-level adjunct teaching experience to the CSS program. We learned that a growing high-tech program needs the full time attention and care of a qualified professional.

A comprehensive 5-year plan was prepared. Thirty six (36) items were initially studied; another six (6) items were added later. The ten (10) most important areas of concern were:

| Item# | Item | Reason for Inclusion in Top Ten |
|---|---|---|
| 1 | Program/course goals | Basic blueprint for program operation |
| 2 | Implement AAS degree plan | 2-year plan recommended by employers |
| 3 | Permanent job placement | Need good jobs for program graduates |
| 4 | Upgrade hardware & software | Need to stay current with technology |
| 5 | Advisory Committee | Best source of community/business input |
| 6 | Advertising campaign | Inform businesses and general public |
| 7 | Pre-/post-course assessment | Measurement of student learning |
| 8 | Co-op program | Experience requested by employers |
| 9 | Expand A+ certification link | Certification becoming a necessity |
| 10 | Technology club/repair center | Informal learning/help environment |

Each item in the 5-year plan was analyzed in four (4) dimensions. The document format was detailed explanation of item, item cost, item benefit(s) and item implementation timeline.

In January, 1999, a SME Division informational package was mailed to approximately 1,000 area businesses. The packet included flyers about the CSS, EET and CIS programs. Addressees were selected from a master list of area businesses provided by the Clermont County (Ohio) Chamber of Commerce. Inquiries about the programs increased significantly in the 3-4 month period after the mailing. Enrollments also jumped significantly and a new CSS certificate sequence of classes was added to the schedule in the Spring, 1999, term. This mailing was included in item #6, Advertising campaign, in the above table.

The importance of having strong program and course objectives and goals cannot be stressed too much. Collectively these items provide direction and focus to, and provide a framework for evaluation of the operation of a program. At Clermont incoming CSS students are given a copy of the program objectives and goals. Too, course level objectives and goals are included in each syllabus.

CSS students are encouraged to seek A+ service technician certification after completing the program. To assure that all A+ topics have been adequately covered in the course work, a matrix that maps A+ domains and sub-domains to specific CSS courses was created. Each domain and sub-domain must have primary coverage in one of the four core CSS courses. Secondary coverage is possible in one or more other courses. This information is shared with all adjunct instructors and any interested students.

In the Spring, 1999, biennial State of Ohio funding for technical equipment became available. A prioritized list of computer equipment was submitted for review. All priority 1 items (items needed immediately) were approved and several thousand dollars was spent on PCs and related equipment. Besides nineteen (19) Pentium and two (2) clone PCs, an assortment of SCSI, USB, EIDE, AGP and parallel port devices was acquired. Windows 98 was installed on fourteen (14) PCs and Windows NT 4 Workstation was installed on the remaining seven (7) machines. Students must be exposed to a wide variety of devices that will be encountered in the actual job world. Incidentally priority 2 items were defined as items being needed in 9-12 months; priority 3 items were items were needed in 12+ months.

During the year a Web site (http://www.clc.uc.edu/~cecil/css.html) was started. This site should be viewed currently as work in progress. It will be upgraded significantly during the 1999-2000 school year. The site is being designed to fill both informational and promotional needs. In the 21st century, a high-tech program must utilize Internet technology.

Starting very early in the CSS program evolution, Advisory Committee participation was, and continues to be, an important item. However, somewhere during the intervening time, the Committee became somewhat inactive. Efforts are currently underway to revitalize the group and expand membership from seven (7) non-UC members to twelve (12) members.

The most significant course change during the year was the addition of Windows 98 to the PC Operating Systems course. Students were able to install Win 98 and complete two (2) labs on this product. Appropriate changes were, of course, made in the lecture portion of the course.

IX. The fourth year ( 1999 – Present )

Entering the fourth year, implementation of planned activities continues. As previously noted, the AAS degree plan was formally approved by the Ohio Board of Regents in October of this year. The prestige afforded by this degree option will be an outstanding advertising point and will focus more internal and external attention on the program. Students have already started to declare their intentions to pursue this degree.

One problem is currently being studied. Some of our students receive Veteran Administration (VA) financial aid. The VA has restrictions on the number and type of program changes that recipients can make without incurring a penalty. The College's move from the ATS degree to the AAS degree could possibly be interpreted as a program change and can affect students currently enrolled. The College is working with the VA to verify that this change should not be charged to students but is an initiative being pursued by the College.

As more students are cycling through the program, the need for co-op credit courses became apparent. Area employers have indicated that AAS graduates who complete a co-op option are better prepared for the job market. Co-op credit (3 6 credit hours) is a highly recommended option in the AAS degree plan; however students can substitute technical electives for co-op credit. Four courses, one for each quarter of the school year, have been designed and are currently being routed through the College curriculum approval process. With these courses comes another important task lining up employers to accept CSS co-op students. Contacts are currently underway and initial progress is very encouraging. We are leveraging on the successes of other College computer type co-op programs.

Program advertising continues to progress. Articles have run in College publications and area newspapers. Screens have been shown on in-house College TV monitors. An informational brochure was developed and has been distributed to public libraries and at a variety of College functions.

Recently new software was acquired using money from the department budget. Red Hat Linux 6.1 Deluxe and Professional and Windows 98 SE upgrade were acquired. The program now has DOS 6.22, Windows 3.1, Windows 95 (full and upgrade), Windows 98 (full and upgrade), Windows NT 4 Workstation and Server, Novell Netware 5 and Red Hat Linux 6.1. Representative diagnostic and troubleshooting software tools will be purchased soon. Sometime in late 2000, Windows 2000 will be added to the curriculum.

Additional hardware will be added in the near future. iMac®, Pentium® laptops, network and modem PC Cards, PalmPilot®, digital camera, web cam and networking items will be requested.

X. What's next?

A program devoted to high technology will either evolve with the times or it will die. Several changes are contemplated during future school terms.

Hardware and software upgrades will be necessary. As noted earlier Windows 2000 will be integrated into the curriculum during the year 2000. With the growing movement to Internet technology additional communication links, network devices and software will be required. Course content must be modified accordingly. Faculty development programs must continue to be pursued to insure that faculty will stay current with technology advances. Each significant change in technology will ripple through the entire program.

Additional monies will be needed to maintain a high technological profile. Sources will include normal, annual department budgets, state level funding, grants and donations. All sources of financial aid will be explored.

At this time only one classroom (for lecture and lab) has been dedicated to the CSS program and the maximum class size for lab sessions is limited to 14 students. With the number of sessions involved in any quarter, contention for this room is escalating. Additional floor space will be requested for a dedicated lab area. The College is currently constructing two new buildings with occupancy scheduled for Summer, 2000. Hopefully this move will provide the necessary additional room for the program.

Course content must examined soon. The PC Operating Systems and Networking courses might be split into two courses each since both cover considerable material for a 10-week session.

We are very gratified that the program has attracted a wide range of students and obviously want this trend to continue. Ages run from teenagers to senior citizens. Both genders are represented. Experience levels run from people who have a low level of PC experience to genuine geeks and nerds; the inexperienced rapidly become experienced and the geeks and nerds always seem to lend a helping hand with lab work. Full-time hourly workers work side by side with professional managers from industry. On occasion two generations of family are enrolled simultaneously.

A Technology Club has been envisioned for the past year or two. The current plan is to implement an inter-department club, that is, a joint arrangement with the EET and CIS departments. Students, faculty and staff could pursue personal activities and/or assigned course work in a stress-free, informal peer environment. The College has a very active Art Club and their successes can serve as a pattern for the Technology Club.

Along with the Technology Club, a repair center may be opened. Student, faculty and staff could bring computers and other electronic equipment to the center for repair, upgrading and/or general servicing. Tutoring could also be provided. CSS, EET or CIS students under the direction of a faculty member would provide all services. Benefits of this plan are numerous and important. Students can obtain “real world” technical and customer experience. Students could also build a personal network of contacts. Word of mouth advertising could be immeasurable. Customers could obtain professional level, technical service for only the cost of parts. If all goes well, the operation could conceivably be extended to area non-profit organizations.

XI. Thou shall do things

1. Build a strong foundation of administration moral and financial support before starting any type of program.
2. Generate and publish a comprehensive set of objectives and goals.
3. Form and maintain an active, diverse community/business Advisory Committee.
4. Keep relevant parties, e.g., administration, faculty, staff, public, students, informed.
5. Develop and publish a 3-5 year operational plan and get appropriate approval signatures.
6. Be prepared to keep program in sync with never ending technology changes.
7. Secure high quality, dynamic faculty and invest in faculty development programs.
8. Maintain statistics on everything, e.g., student satisfaction, student learning, program expenses, enrollments, drop out rates, job placement figures.
9. Keep in touch with program graduates (they form an excellent advertising agency and can provide valuable feedback about your program).
10. Build a sustained, working relationship with area employers.
11. Seize every opportunity to advertise the program, e.g., carry a supply of program brochures (with your business card attached) in your vehicle.
12. Visit local high schools regularly and become acquainted with school counselors.
13. Work with your state's agency that funds vocational training.
14. Develop articulation procedures to provide a seamless transfer path to a four-year college program.
15. Make the program fun for all involved parties (learning and having fun are not mutually exclusive events).
16. Return calls and inquiries about the program within one business day, if possible, and follow up in 2-3 weeks with a note or email.
17. To ascertain the effectiveness of your advertising, always ask students and people who inquire about your program about the source of initial information about the program.

XII. Thou shall NOT do things

1. Don't allow classes, especially labs, to become too large and unmanageable.
2. Don't let your inventory of equipment and replacement parts get too low.
3. Don't forget to ask for educational discounts for school purchases.
4. Don't buy the most expensive hardware unless it is really needed, e.g., a 400 MHz processor and a 15" monitor will generally be sufficient.
5. Don't invest in costly warranties for basic machines (warranties will be void very quickly since students will be tearing the PC apart in short order; however monitors and printers could be covered by warranties).

XIII. Conclusion

We have tried to present the chronology of events through the relatively short life of the UC Clermont CSS program. The program was essentially started in response to expressed community needs and continues to grow and prosper because it continues to fill these needs. However, as is characteristic of high technology in general, change is a constant companion.

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## Bibliography

1. Occupational Outlook Handbook, U.S. Bureau of Labor Statistics, URL: http://stats.bls.gov/ocohome.htm, 1999.

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