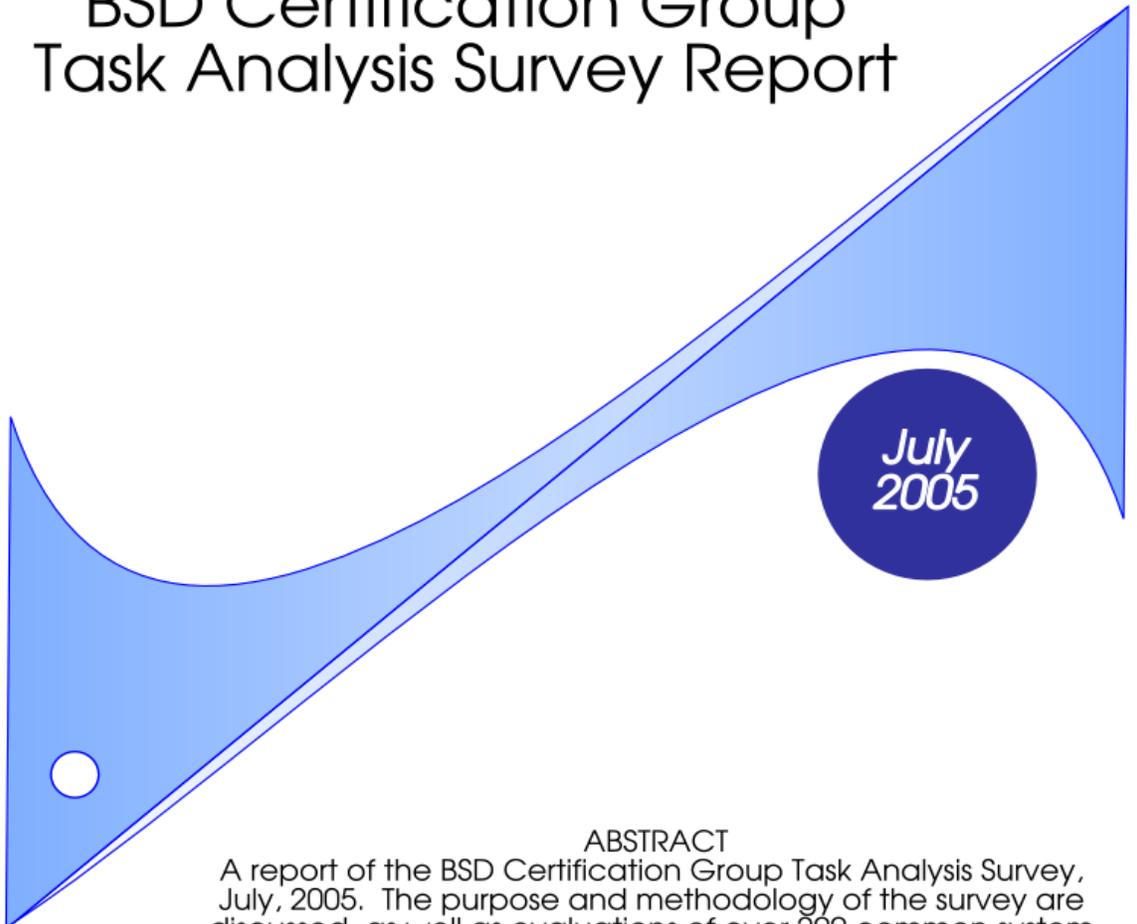


BSD Certification Group Task Analysis Survey Report



July
2005

ABSTRACT

A report of the BSD Certification Group Task Analysis Survey, July, 2005. The purpose and methodology of the survey are discussed, as well as evaluations of over 200 common system administration tasks. Data on test methods, certification types and levels are also discussed. Extensive comments by the survey responders are included.

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PREFACE

This survey was a significant undertaking and represents the first step in developing certifications for BSD system administrators. Creating the original text and translations required the dedication of many individuals. Taking the survey required a time commitment from all who responded. The BSD Certification Group gratefully acknowledges the efforts of all who volunteered their time and effort and wishes to thank all who completed the survey and who provided many valuable comments and insights.

The BSD Certification Group

www.bsdcertification.org

July, 2005

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EXECUTIVE SUMMARY

This report contains the results and analysis of a survey by the BSD Certification Group regarding the creation of a certification for Berkeley Software Distribution (BSD) operating systems, a key Unix variant originally developed at the University of California, Berkeley, in the 1970s and now available through the BSD projects- [FreeBSD](#), [NetBSD](#), [OpenBSD](#) and [DragonFly BSD](#).

BSD operating systems run some of the busiest sites on the Internet and are well known for their stability, performance, and security. Because of its attractive licensing, BSD networking code is used in many of the industries most well known software suites including Microsoft, Sun Microsystems, and Mac OS X.

The survey was announced to the public in April of 2005. Over 600 individuals from approximately 60 countries responded, spending about an hour of their time to answer the survey. Their evaluations of the tasks needed for excellence in BSD system administration, and their comments on certifications and test methods form the core of the report.

Section 2, “**Summary of Findings**”, provides an extended discussion on the survey results. Section 3, “**Survey Results: Part I**”, contains detailed findings on BSD usage demographics such as job role, age, proficiency, and popularity of the operating system. Further results include answers to various scenario questions such as exam types and content preferences, target audience, testing methodologies, proctoring, and translations. Section 4, “**Survey Results: Part II**”, presents summarized evaluations of 10 categories of system administration tasks by all responders. Section 5, “**Task Analysis Graphs**”, cover each question in more detail. Throughout the report, comments by the survey responders indicate an enthusiasm for BSD, and a BSD certification. It is the comments that flavor the report with a strong sense of attachment to BSD.

This report is of interest to enterprises and organizations that are considering BSD for current or future projects. For those that already utilize BSD, this report provides extensive insight into everyday system administration tasks.

The BSD Certification Group intends to use the report to develop a certification roadmap, including a curriculum, test methods, and timetable. As the certification effort matures, additional information will be available at: www.bsdcertification.org.

1 Introduction

The BSD Certification Group was formed in January, 2005, to provide a path to certification of BSD system administration skills. The Group decided to launch a 'Task Analysis Survey' in order to gather community input regarding the tasks that are performed by a BSD System Administrator (sysadmin). The survey was intended to assist in the selection of tasks that would form the core curriculum of the BSD certification effort.

The survey was constructed with an Open Source on line survey engine and was finally ready for use in mid-April, 2005. The survey was translated into eight additional languages with each language having at least one month (30 days minimum) to complete the survey. Survey results and comments were collected and analyzed. Comments from translated surveys were also analyzed.

The results from the survey are the focus of the remainder of this report. It presents the results of summarization of the answers, not an analysis of every single answer. The complete results data are publicly available so anyone who desires to see every answer can find them at:

http://www.bsdcertification.org/survey01_report/BSDCG_Survey01_Results_URLs.html

Section 2, "**Summary of Findings**", provides an extended discussion on the survey results. Section 3, "**Survey Results: Part I**", contains detailed findings on BSD usage demographics such as job role, age, proficiency, and popularity of the operating system. Further results include answers to various scenario questions such as exam types and content preferences, target audience, testing methodologies, proctoring, and translations. Section 4, "**Survey Results: Part II**", presents summarized evaluations of 10 categories of system administration tasks by all responders. Section 5, "**Task Analysis Graphs**", cover each question in more detail.

1.1 Purpose

The purpose of the 'Task Analysis Survey' was to capture insight from the BSD community on what tasks were important in the day-to-day activities of a typical BSD system administrator. Along with the task questions, there were several demographic questions (age, country, etc.) to provide a sense of the worldwide scope of those interested in BSD certification. There were also some questions that inquired about topics such as the desired number and type of exams and whether a 'hands-on' activity should be part of the testing process.

This information will be used by the BSD Certification Group to develop the certification programs and curriculum.

1.2 Methodology

Understanding how the survey was created may help in interpreting the results. The survey engine selected was phpESP (php Easy Survey Package-www.phpesp.org). This Open Source survey engine provided the basics of question and answer data collection as well as facilities for cross analysis and graphical reporting. It uses a MySQL database to store and process the data.

During the survey construction it was discovered that phpESP was not capable of providing multiple answer groups (in particular, radio-button style answer groups) for the same question. A workaround that involved checkbox-style answer groups was implemented. However, the workaround proved somewhat cumbersome, and caused confusion and distress for many responders (see the comments for details). As a result, not all questions contain the correct number of answers, and this is reflected in the statistics and graphs within this report.

The survey itself was divided into 3 sections:

1. The first page of the survey asked some basic demographic questions. This section of the report is of general interest to everyone as it indicates the nature and perception of BSD usage as seen by the survey responders.

2. The next 10 pages of the survey each contained a series of tasks which had been loosely categorized. For each task, responders were asked to rate how often the task is performed, the importance of the task and the minimum skill level required to complete the task. The results from these pages will be carefully considered by the curriculum and test creation sub-committees of the BSD Certification Group. It may also be of interest to Human Resources departments, trainers, and system administrators as it indicates the perceived importance of various system administration tasks.

3. The last page of the survey consisted of several possible certification scenarios. Responders were asked to consider each scenario, rate its applicability and to provide additional feedback. The feedback gathered from this section of the survey will assist the BSD Certification Group in the creation of a certification roadmap. It may also be of general interest as it indicates the perceived needs of the BSD community regarding BSD certification.

Further notes on accuracy:

Neither the survey itself nor this report pretend to be an exhaustive or completely accurate analysis of the BSD community, BSD usage or the need for BSD certification. A great deal of effort on the part of many individuals went into the creation, collection and analysis of these results. Even so, the BSD Certification Group makes no claim on the accuracy of the results or how these results are interpreted by the wider computing community.

The survey itself suffers from these inherent flaws:

- While phpESP does have a limited ability to prevent users from completing more than one survey, it has no ability to prevent completing multiple translations of the survey. Multiple completions from the same IP address are noted and only the first completed set of answers is kept. There is of course, nothing to prevent a user from completing the survey multiple times from different computer systems. However, due to the length of the survey and the amount of work required to complete all of the questions, it is doubtful that many, if any, went to the trouble to complete multiple surveys in any language.
- No attempt was made to control who completed the survey. The

existence of the survey was advertised via email to the BSD projects, their advocacy mailing lists, BSD related news sites, and word of mouth. This means there was no control group or pre-screening of responders. It also means that it is likely that those who responded are either within the BSD community or were told of the survey by someone within the BSD community.

- Lack of responders in a translated version of the survey does not necessarily reflect lack of interest of the BSD community using that native language. It may well be a reflection of insufficient advertising of the existence of the translation in the BSD portals used by the native speakers. This is something the BSD Certification Group is aware of and working to address.
- Due to the workaround discussed above, it is possible that some checkboxes were missed, or excess checkboxes were checked in the task ratings section of the survey. During the analysis, two types of inaccurate completed surveys were rejected- 'false completed surveys' with very few questions actually answered (any single checked box on less than approximately 70 questions). This might be either an attempt to 'complete' the survey simply to enter the drawing, or simply a failure to follow through to the end.

Also rejected were those with very many more checked responses than were actually valid (more than approximately 800 checked boxes where the correct number was 654 checked boxes).

The net result was that approximately 25 completed surveys were rejected for these two reasons.

This means the graphs aren't 100% accurate, but they still give insight into the importance of each task.

2 Summary of Findings

Like the culture that surrounded the creation of the Berkeley Software Distribution at the University of California Berkeley in the 1970's , the responders to this survey are diverse, technically sophisticated, and opinionated- sometimes strongly so. Diversity in age and experience level ranged from younger BSD student users to mature, experienced BSD system professionals. The level of technical knowledge about Unix, BSD, certifications, tests and test taking, and many other topics was quite high overall. With all that diversity and knowledge, there was a range of opinions on almost every topic.

The worldwide response was very encouraging. Over 630 individuals responded from approximately 60 countries. This level of interest provides a strong case for making BSD certification available around the globe.

While the combined graphs and comments gathered in this report tell the complete story, here are some highlights:

Certifications

As expected there were many strong opinions on the number and level of certifications. Common among the threads was the often expressed desire to see the eventual certifications emphasize advanced achievement and mastery of Unix knowledge in general and BSD usage in particular. Yet, desires that the certification be difficult to obtain were balanced by the concern to not neglect younger, entry level candidates or those more experienced who are coming to BSD from other computing platforms.

Content

A proposition that specific knowledge of all BSDs be required was rejected by most in favor of emphasis on general Unix concepts, with an understanding of how and why BSD is unique. "Linux vs. BSD" style topics were commonly rejected. A focus on BSD similarities instead of BSD differences was more often expressed. Interestingly, the least preference was for coverage of only a single BSD.

Target Audience

Like the discussion on Certifications above, there were many opinions on a

target audience for BSD certification. Often heard was that experienced BSD sysadmins don't even need a certification ("may be even harmful"), while just as often, the need for involving and inviting novice admins. A distinction between possibly offering 'novice tests' vs. 'novice certifications' also was heard. Another thread focused on providing employer value by making the target audience active sysadmins and requiring significant expertise to pass, while noting "Being hard to obtain implies value."

Tracks

There was general agreement that the main focus should be on servers, rather than desktops. A large percentage of responders also preferred securing BSD systems. Even so, there were quite a number of track suggestions- everything from configuring LDAP, jails, vinum, and backups to IPv6, to managing licenses, to device driver development. Advocacy, however was dismissed as irrelevant to certification efforts.

A strong concern was that properly deploying Internet related services is a critical skill set and must be addressed by the certification.

General or Specific

Closely following on the previous discussion on tracks were highly charged opinions on making any tests require product specific knowledge. While the majority of responders favored requiring knowledge of general concepts (SMTP, DNS, etc.) over specific products (Sendmail, BIND, etc), many expressed the belief that it was crucial to know the core products that are distributed with a basic BSD install- even if they are not used. This included the commonly installed Apache web server, although it's not part of a basic setup. However, that was countered by noting the fact that products change rapidly and it should not be necessary to know the details of every package to be a certified BSD sysadmin.

Method

Strong differences remained on the topic of form-based exams. Many expressed the view that these are worthless and easily memorized- yet others held that they are a valid method for 'weeding out' the inexperienced and unprepared. Almost all agreed that there was a need for a strong 'hands-on' component to the certification whether through physical or virtual lab setups. This component would add value by ensuring actual performance was tested,

not mere knowledge.

Concerns heard in this section included making the certification available to the disabled/disadvantaged, and to consider language differences carefully when choosing test methods. Requiring a documentation project as part of the certification effort was promoted by some, though others thought it should only apply as a part of a more advanced level certification.

Proctoring

Control of the test environment through proctoring was noted by most as essential to the integrity of the certification. The most popular choice was testing at an approved educational institution (though others wondered how 'approved' is determined). Those who mentioned VUE and Prometric were generally supportive, though concerns over cost sounded a strong cautionary note. A number of alternatives were suggested, including ARRL/VEC, local group proctoring, traveling proctors, and online webcams.

Test Translations

The suggestion of making the certification tests available in languages other than English was preferred by a rather slim majority, and while there were no raging conflicts of opinion, there were still many creative language suggestions including Esperanto, Klingon, and Braille.

Exam Name

The creative juices continued to flow regarding suggestions for the certification name(s). See Section 3.2.9, **Exam Names**, for a complete list.

Task Descriptions

Finally, there were the tasks themselves. Each task was rated by most responders, whose analyzed results are contained on individual pages. Comments for the task descriptions are maintained in separate sub-sections of Section 4, **Survey Results: Part 2**.

Notes on Comment Sections

One of the most refreshing aspects of reviewing the survey responses is getting a sense of the wide variety of perspectives from reading all the comments. While it may seem that this report contains too many comments, in truth, not all comments are included here. The comments that are here have been collected, summarized and lightly edited for grammar and ease of understanding for non-English speakers.

All comments have been prefaced by the



sign making them easily recognizable.

3 Survey Results: Part I

3.1 Answers to Demographic Questions

Part 1 of this report, which represents the results from Page 1, **Demographic Information**, and Page 12, **Essay Questions**, is divided as follows:

- Each section displays the question as seen on the survey and indicates whether responders were required to select only one answer or had the ability to select multiple answers. Graphs for six different response sets are shown- 'All' (all responders), 'SysAdmins', 'IT Managers', 'Hiring Managers', 'Educators/Trainers', and 'Student'- each set selected from the response to Question 1, Job Role.
- Each section includes a chart. To ease the reading of the chart for questions that included lengthy answers, the possible answers, as seen on the survey, have been mapped to A, B, C, etc.
- Where applicable, responder comments have been included. Misspellings were corrected to make the comments readable, but otherwise comments are included as seen on the survey. In other words, no attempt was made to standardize the upper/lowercase of acronyms or to turn comments into fully grammatically correct sentences. In addition, some comments were translated into English so may appear a bit stilted. The comments are as close to the original as possible.

3.1.1 Languages

The Survey itself was made available in the following languages:

- (Simplified) Chinese
- Dutch
- English
- French

- German
- Polish
- (Brazilian) Portuguese
- Russian
- Spanish

A total of **637** responders completed the survey. Table 3-1 breaks down the number of responders per translated survey. It also indicates which countries were represented in each translation of the survey.

Table 3-1 Number of Responders per Translated Survey

| Language | Number of Responders | Country |
|-----------------|-----------------------------|--|
| Chinese | 99 | China, Hong Kong, Korea, Taiwan |
| Dutch | 5 | Netherlands |
| English | 444 | see Table 3-2 |
| French | 29 | Algeria, Canada, France, Italy |
| German | 10 | Germany |
| Polish | 1 | Poland |
| Portuguese | 29 | Brazil |
| Russian | 5 | Israel, Russia |
| Spanish | 15 | Chile, Columbia, Mexico, Paraguay, Spain |
| Total: | 637 | |

Responders were able to take the survey in the language of their choice; however, the language was not always a reflection of the country of origin.

For example, of the 44 responders from Poland, only one responder took the survey in Polish; the rest completed the English version of the survey. In contrast, of the 32 responders from Brazil, 29 took the survey in Brazilian Portuguese and 3 completed the English version of the survey.

3.1.2 Countries of Origin

Responders were asked “In which country do you currently live?” Figure 1 shows a world map with a dot representing each country that had at least one response to the survey.

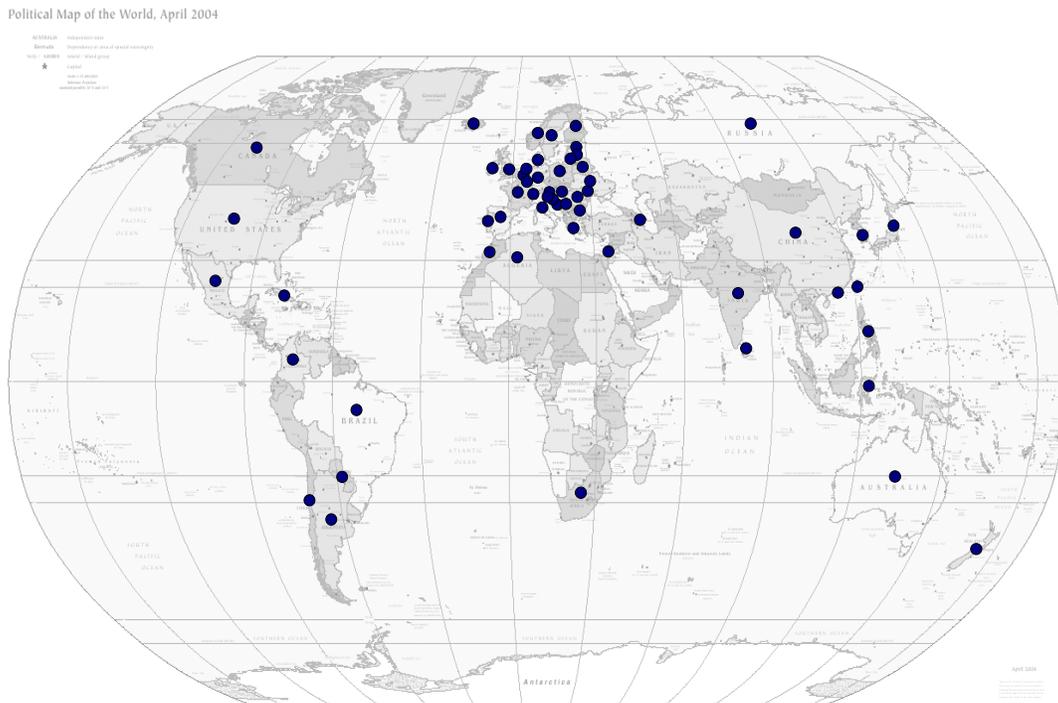


Figure 1 - World Map of Survey Responses by Country

Table 3-2 lists the number of responders per country and also indicates whether the responder completed the English version of the survey or a translated version:

Table 3-2 Number of Responders per Country of Origin

| Country of Origin | Number of Responders in English version of survey | Number of Responders in non-English version of survey | Total |
|--------------------------|--|--|--------------|
| Algeria | - | 1 | 1 |
| Argentina | 3 | - | 3 |
| Australia | 11 | - | 11 |
| Austria | 4 | - | 4 |
| Azerbaijan | 2 | - | 2 |
| Belarus | 3 | - | 3 |
| Belgium | 9 | - | 9 |
| Bosnia & Herzegovina | 1 | - | 1 |
| Brazil | 3 | 29 | 32 |
| Bulgaria | 1 | - | 1 |
| Canada | 28 | 1 | 29 |
| China | 1 | 96 | 97 |
| Chile | - | 1 | 1 |
| Colombia | - | 1 | 1 |
| Croatia | 1 | - | 1 |
| Cuba | 1 | - | 1 |
| Denmark | 2 | - | 2 |
| Estonia | 2 | - | 2 |
| Finland | 2 | - | 2 |
| France | 14 | 25 | 39 |
| Germany | 38 | 10 | 48 |
| Greece | 1 | - | 1 |
| Hong Kong | 1 | 1 | 2 |

| Country of Origin | Number of Responders in English version of survey | Number of Responders in non-English version of survey | Total |
|--------------------------|--|--|--------------|
| Hungary | 11 | - | 11 |
| Iceland | 1 | - | 1 |
| India | 1 | - | 1 |
| Indonesia | 3 | - | 3 |
| Ireland | 2 | - | 2 |
| Israel | - | 1 | 1 |
| Italy | 9 | 1 | 10 |
| Japan | 1 | - | 1 |
| Korea | 1 | 1 | 2 |
| Latvia | 4 | - | 4 |
| Lithuania | 1 | - | 1 |
| Luxembourg | 1 | - | 1 |
| Mexico | 3 | 2 | 5 |
| Moldavia | 1 | - | 1 |
| Morocco | 1 | - | 1 |
| Netherlands | 12 | 5 | 16 |
| New Zealand | 3 | - | 3 |
| Norway | 4 | - | 4 |
| Philippines | 1 | - | 1 |
| Paraguay | - | 1 | 1 |
| Poland | 43 | 1 | 44 |
| Portugal | 4 | - | 4 |
| Romania | 1 | - | 1 |
| Russia | 30 | 4 | 34 |
| Serbia and Montenegro | 1 | - | 1 |
| Slovakia | 2 | - | 2 |

| Country of Origin | Number of Responders in English version of survey | Number of Responders in non-English version of survey | Total |
|--------------------------|--|--|--------------|
| Slovenia | 2 | - | 2 |
| South Africa | 2 | - | 2 |
| Spain | 7 | 10 | 17 |
| Sri Lanka | 1 | - | 1 |
| Sweden | 12 | - | 12 |
| Switzerland | 4 | - | 5 |
| Taiwan | 2 | 1 | 3 |
| Ukraine | 11 | - | 11 |
| United Kingdom | 16 | - | 16 |
| United States | 113 | - | 113 |
| Didn't say | 6 | 1 | 7 |
| Total: | 444 | 193 | 637 |

3.1.3 Primary Job Role

Question 1 asked for information on the primary job role of the responder. The answers, shown in the graphs below, indicate a cross section of all roles with emphasis on sysadmins and students. Hiring and IT managers, and educator/trainers make up the remainder.

Responders were only able to choose one option.

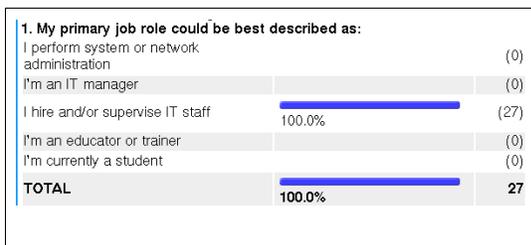
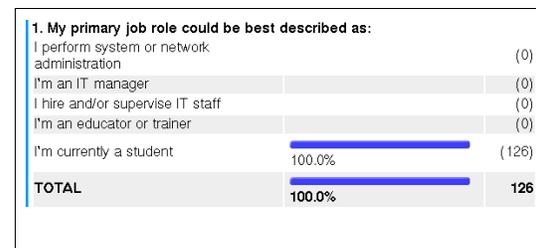
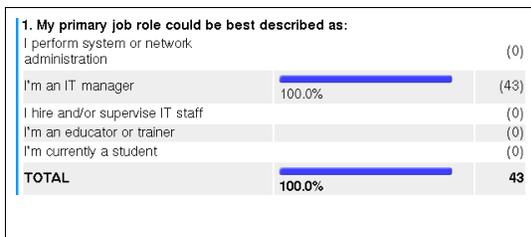
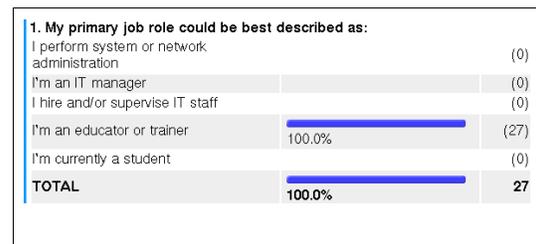
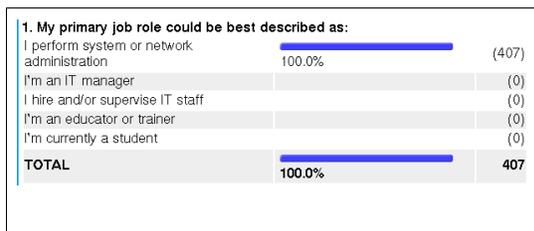
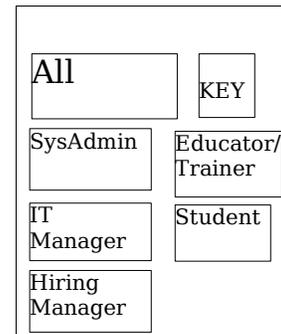
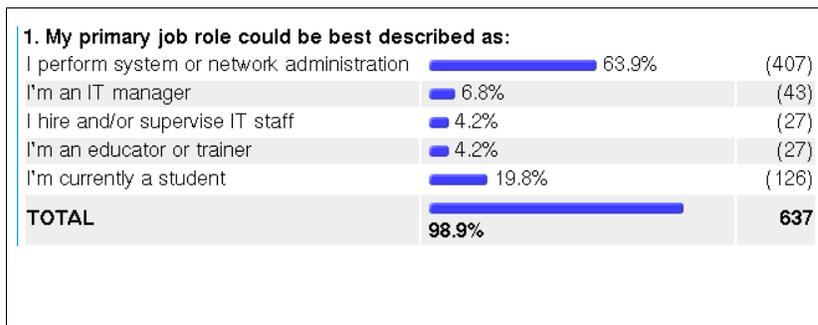


Table 3-3 charts the answers to Question 1 using the following alphabetic keys:

- A I perform system or network administration
- B I'm an IT manager
- C I hire and/or supervise IT staff
- D I'm an educator or trainer
- E I'm currently a student
- F Other

Table 3-3 Primary Job Role Sorted by Language Survey

| Language | A | B | C | D | E | F |
|-----------------|---------------|--------------|--------------|--------------|---------------|--------------|
| Chinese | 59.60% | 4.00% | 5.10% | 6.10% | 24.20% | 1.00% |
| Dutch | 40.00% | 20.00% | 20.00% | 20.00% | - | - |
| English | 66.00% | 6.30% | 4.30% | 3.80% | 18.50% | 1.10% |
| French | 34.50% | 20.70% | 3.40% | - | 37.90% | 3.40% |
| German | 70.00% | 10.00% | - | 10.00% | 10.00% | - |
| Polish | 100.00% | - | - | - | - | - |
| Portuguese | 72.40% | 6.90% | 3.40% | 3.40% | 13.80% | - |
| Russian | 100.00% | - | - | - | - | - |
| Spanish | 60.00% | 6.70% | - | 6.70% | 26.70% | - |
| Average: | 63.90% | 6.80% | 4.20% | 4.20% | 19.80% | 1.10% |

Note on this table and the rest of the tables in Section 3:

The last row in each Table, called Average, is based on the total number of responders from all the surveys or 637. The percentages seen in this row reflect all responders.

The percentages indicated in each language row are reflective of that individual survey. Each individual survey has a different number of responders- varying from 1 Polish responder to 444 English responders. The surveys with the lowest number of responders (refer to Table 3-1) will contain the largest margin of error and won't

necessarily reflect the opinion of the BSD community represented by that language.

Because of the different ratios of responders per language, the percentages shown in each row will not mathematically result in the numbers in the Average row.

Responders had the ability to clarify their choice of job role via a comment box. The most common clarification indicated that the responder had multiple duties that covered more than one of the possible answers. Suggestions were made to add more job roles and to allow the responder to select multiple answers. Along this vein, several responders indicated that they were consultants and that their job roles varied with the contract at hand. Many responders indicated that there should be an option for "developer".

3.1.4 BSD Usage

Question 2 asked "Which of the following BSDs are in use at your current place of employment or school?" Responders could select all that apply, meaning that you'll see results greater than 100% in the graphs below, and in Table 3-4.

All the major distributions are represented, with DragonFly BSD having the smallest share due to its relative newness.

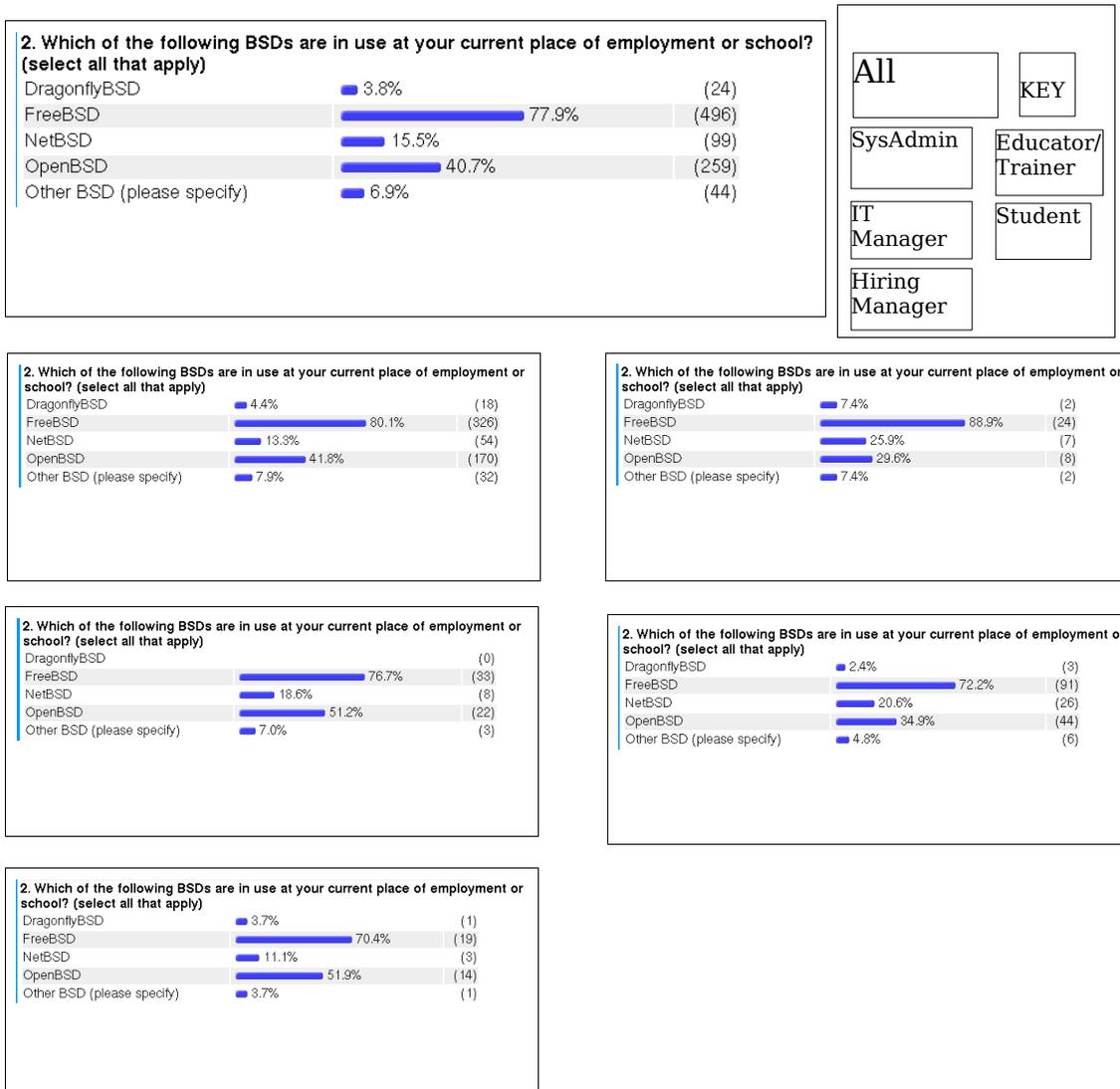


Table 3-4 shows the distribution of results by language.

Table 3-4 BSD Usage Sorted by Translated Survey

| | DragonFly BSD | FreeBSD | NetBSD | OpenBSD | Other |
|-----------------|----------------------|----------------|---------------|----------------|--------------|
| Chinese | - | 97.00% | 9.10% | 19.20% | 4.00% |
| Dutch | - | 100.00% | - | 20.00% | 20.00% |
| English | 5.00% | 71.20% | 18.00% | 48.90% | 7.40% |
| French | - | 79.30% | 13.80% | 3.40% | 6.90% |
| German | - | 80.00% | 10.00% | 20.00% | - |
| Polish | - | 100.00% | - | 100.00% | - |
| Portuguese | 3.40% | 96.60% | - | 41.40% | 6.90% |
| Russian | 20.00% | 100.00% | - | 40.00% | - |
| Spanish | - | 93.30% | 33.30% | | 13.30% |
| Average: | 3.80% | 77.90% | 15.50% | 40.70% | 6.90% |

Under Other, the most popular response was **Darwin** or **Mac OS** which are based on FreeBSD (<http://developer.apple.com/darwin/history.html>).

Other responses included several live CDs or mini-distributions based on a BSD:

- FreeSBIE <http://www.freesbie.org>
- PC-BSD <http://www.pcbsd.com>
- m0n0wall <http://www.m0n0.ch/wall>
- MicroBSD <http://freshmeat.net/projects/microbsd>
- frenzy http://frenzy.org.ua/eng/v03_softlist.shtml

There were also several commercial OSs and appliances based on BSD code:

- BSD/OS
- BSDi
- VxWorks
- JUNOS <http://www.juniper.net/company/presscenter/pr/2005/pr-050131.html>
- SecureOS <http://www.securecomputing.com/pdf/secureos.pdf>
- GNAT-box firewalls

Comments included:

- The question is a little weird. I'm a student but we don't use it at school (not even Linux, only Windows). I only hobby with it at home so I can work with it professionally after I pass school. A question like "Which of the following BSDs do you use the most?" or "... are you familiar with?" would be more appropriate I think.
- My school does not have any BSD OSs. My work only uses Windows.
- Perhaps this question should mention other operating systems.
- Maybe you can ask version number of BSD used.

3.1.5 Age Group

Question 5 asked "What age group do you fall under?", attempting to ascertain the age distribution of the responders.

The largest group, aged 21-30, forecasts a good future for all BSD distributions. Balancing that group are a significant number of older users, although none indicated they were over 60 years of age.

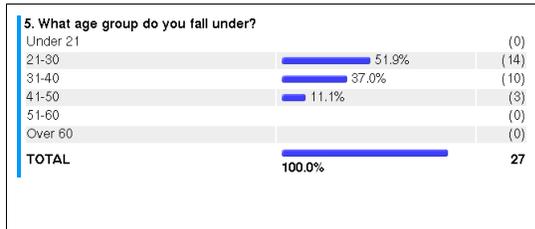
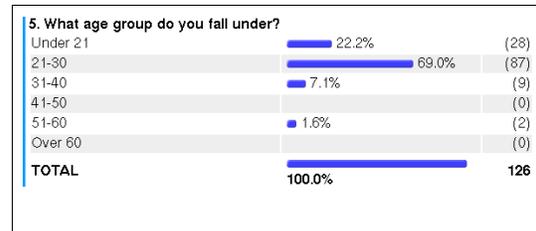
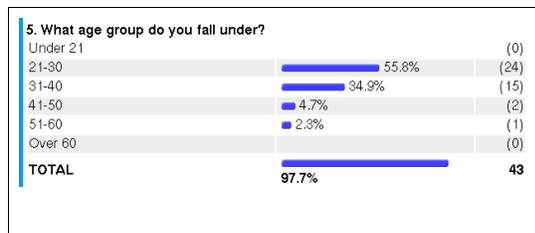
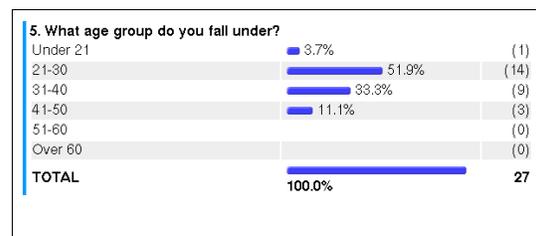
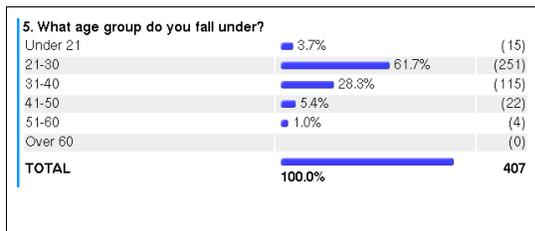
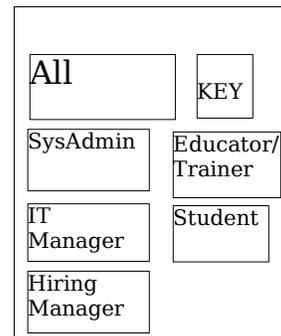
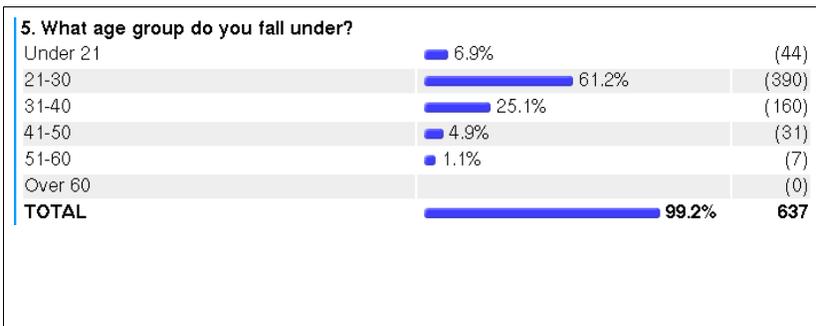


Table 3-5 shows the age distribution across the various languages.

Table 3-5 responder Age Groups

| | Under 21 | 21-30 | 31-40 | 41-50 | 51-60 |
|-----------------|-----------------|---------------|---------------|--------------|--------------|
| Chinese | 4.00% | 85.90% | 9.10% | 1.00% | - |
| Dutch | - | 40.00% | 40.00% | 20.00% | - |
| English | 7.40% | 57.20% | 27.50% | 5.90% | 1.10% |
| French | 13.80% | 58.60% | 17.20% | 3.40% | 3.40% |
| German | - | 50.00% | 40.00% | - | 10.00% |
| Polish | - | 100.00% | - | - | - |
| Portuguese | 6.90% | 55.20% | 34.50% | 3.40% | - |
| Russian | - | 40.00% | 60.00% | - | - |
| Spanish | 6.70% | 53.30% | 33.30% | 6.70% | - |
| Average: | 6.90% | 61.20% | 25.10% | 4.90% | 1.10% |

There was only one comment on this question:

- I don't like the age question. . . it makes me feel old. ;-)

3.1.6 BSD Proficiency

Question 6 asked “Which statement best describes your technical proficiency with BSD Operating Systems?”.

The answers show a wide variety of technical proficiency including some responders who have never used a BSD OS.

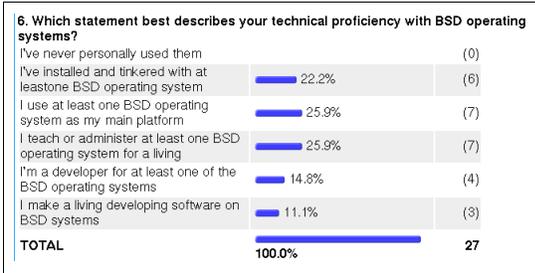
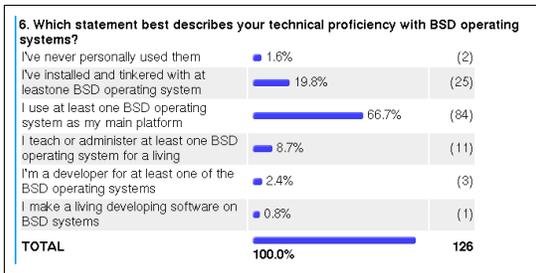
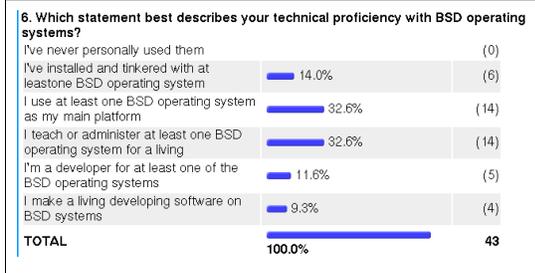
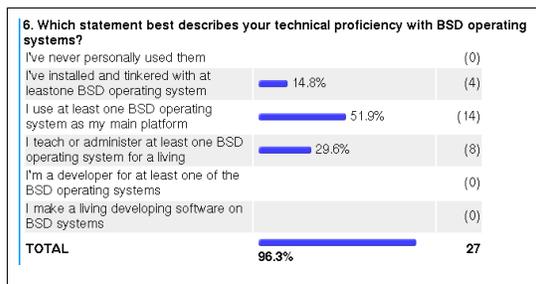
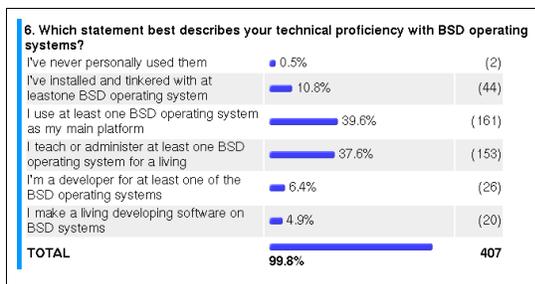
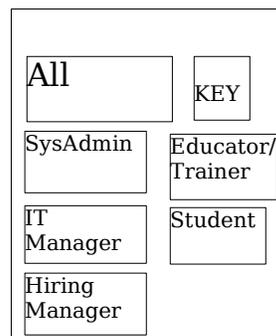
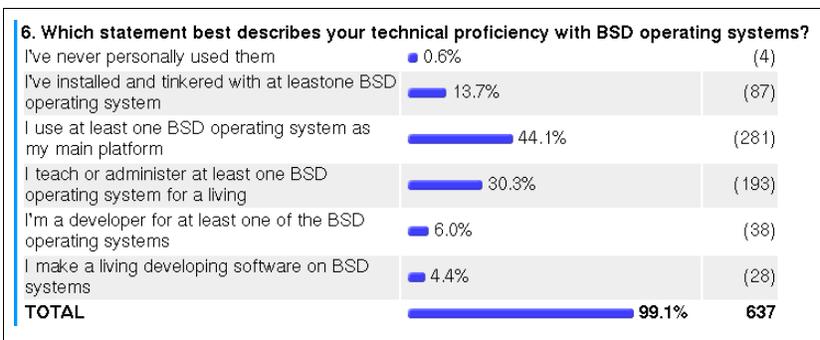


Table 3-6 charts the answer to Question 6 across the various languages.

- A I've never personally used them
- B I've installed and tinkered with at least one BSD operating system
- C I use at least one BSD operating system as my main platform
- D I teach or administer at least one BSD operating system for a living
- E I'm a developer for at least one of the BSD operating systems
- F I make a living developing software on BSD systems

Responders were limited to one response.

Table 3-6 Proficiency in BSD Systems

| | A | B | C | D | E | F |
|-----------------|--------------|---------------|---------------|---------------|--------------|--------------|
| Chinese | 2.00% | 30.30% | 50.50% | 12.10% | 3.00% | 2.00% |
| Dutch | - | - | 20.00% | 60.00% | 20.00% | - |
| English | - | 9.50% | 41.70% | 35.80% | 6.80% | 5.40% |
| French | - | - | 25.00% | 50.00% | 25.00% | - |
| German | - | 30.00% | 60.00% | 10.00% | - | - |
| Polish | - | - | - | 100.00% | - | - |
| Portuguese | 6.90% | 10.30% | 41.40% | 34.50% | 6.90% | - |
| Russian | - | - | 80.00% | - | 20.00% | - |
| Spanish | - | 20.00% | 60.00% | - | 6.70% | 13.30% |
| Average: | 0.60% | 13.70% | 44.10% | 30.30% | 6.00% | 4.40% |

The comments in this section included:

- I think this question should be a little more descriptive or you should include another question that asks which role the *BSD server/s you use function as. For example, web server, mail server, DNS/DHCP server, print

server, firewall... etc.

- It should be possible to select more than only one option for this question.
- Maybe you need a category like "power user" or something... Not quite a full system admin, but more than a user.
- This question is somewhat ambiguous, perhaps this is inevitable. Does "developing software on BSD systems" include any application components that run on it?
- The 4th answer is ambiguous. I cannot understand if it means "I administer *only* BSD systems for a living" or "I administer *also* BSD systems in my work".
- Add an option: "I teach/administer BSD systems for non-profit stuff".
- "I use at least one BSD operating system as my main platform" is a bit misleading. Though it doesn't say "main desktop/workstation platform", that's the way I read it. I bet there are a lot of people who use BSD as their "main server platform", but think about their workstation first when reading that set of answers.
- BSD experience could be refined more by Unix system and years of experience and context (ie corporate / edu environment / research / home).
- BSD is a very good thing, but not that many persons know of it; hopefully this can vigorously promote BSD.
- I am new to BSD understanding but want in time to grasp its knowledge-- I am concerned that there are few (Chinese BSD) books. I hope to see more introduced to BSD and the teaching available here, especially a Chinese course.
- There should be a question to indicate the level of education.

3.1.7 BSD Popularity

Question 7 asked “How well known do you consider BSD to be in your current geographic location?”.

While a tiny fraction (0.5%) indicated BSD is about as popular as Windows, most responders indicated that BSD systems are known primarily to the technical elite. Among managers, and hiring managers, BSD popularity alongside Linux averaged better than 15%.

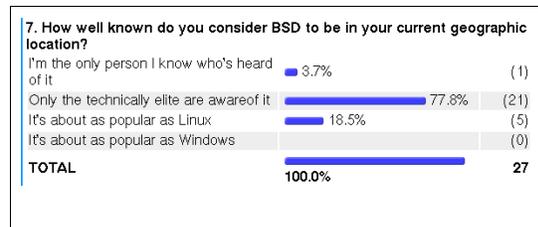
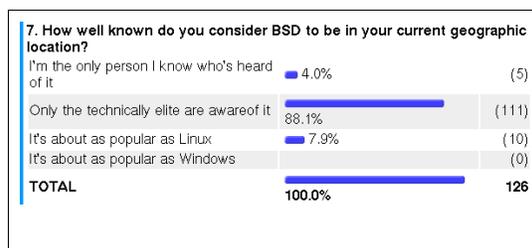
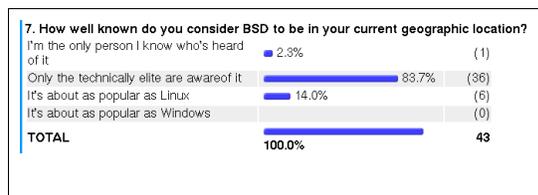
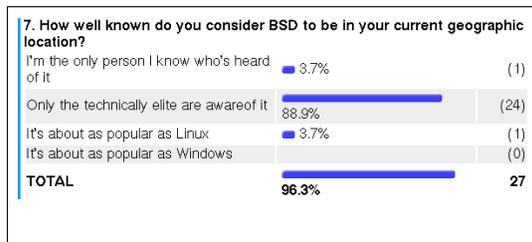
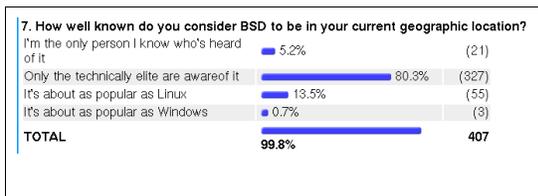
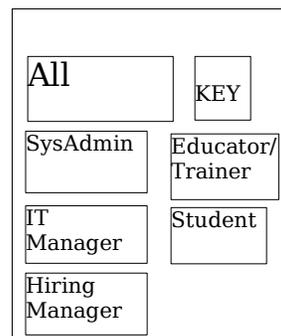
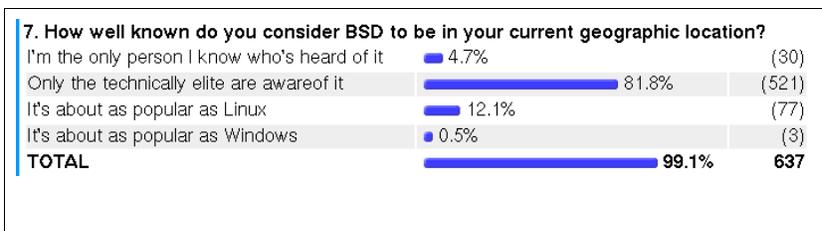


Table 3-7 show the response across the various languages.

- A I'm the only person I know who's heard of it
- B Only the technically elite are aware of it
- C It's about as popular as Linux
- D It's about as popular as Windows
- E Other

Responders were limited to one response.

Table 3-7 How well known is BSD in your geographic region?

| | A | B | C | D | E |
|---------------|--------------|---------------|---------------|--------------|--------------|
| Chinese | 7.10% | 85.90% | 7.10% | - | - |
| Dutch | - | 80.00% | 20.00% | - | - |
| English | 3.20% | 83.10% | 12.40% | 0.50% | 0.90% |
| French | 6.90% | 75.90% | 13.80% | - | - |
| German | 30.00% | 40.00% | 20.00% | 10.00% | - |
| Polish | 100.00% | - | - | - | - |
| Portuguese | 3.40% | 82.80% | 13.80% | - | - |
| Russian | - | 60.00% | 40.00% | - | - |
| Spanish | 13.30% | 66.70% | 13.30% | - | 6.70% |
| Total: | 4.70% | 81.80% | 12.10% | 0.50% | 0.90% |

The comments on this question included:

- It is known but not very widely deployed.
- Should also include the question "do you think BSD has some future in your location?"
- One responder gave a link to <http://netstat.ru/> which shows a graph of usage.

- The cultural flow in my part of Sweden is such that only geeks use Linux, and those who do generally think BSD is not as good. Though we never looked back once we switched to *BSD.
- I would have a category that is in between only the elite and as well known as Linux. I think it's beginning to enter the mainstream, however, it isn't yet as well known as Linux.
- I would say that it's actually about as widely known as Linux, but not as popular. Many reasons, often that increasingly 3rd party apps are available for Linux that are not available for BSD: e.g. Oracle. PeopleSoft, SAP.
- There is something between the options: "Only technical elite are aware of it" and "It's about as popular as Linux". Due to our efforts there is a small group of sysadmins using FreeBSD and OpenBSD in our state. So, my answer is biased.
- BSD is quite well known around here in UA, it's just not as widely used by IT staff as Linux.
- This question could really do with an option in between "Only the technically elite are aware of it" and "It's as popular as Linux".
- This question should have a choice similar to: It is used in many special cases by nice people who don't have a silly notion of being technically elite.
- I would choose a mid-term between "Only tech elite" and "as popular as Linux" because in fact BSD systems are well known here, but not as popular as Linux is; Maybe as popular as some non-mainstream Linux distros, like Mandrake, but not as popular as Red Hat for example.
- Need additional choice: It is well known, but for production software only.
- OS/X has helped BSD awareness, slightly, in this area.
- Insufficient options for this question.
- Maybe it's useful to add some questions about the BSD community at the specified region?
- In my country, BSD is not popular as Linux; of course in business you could find commercial Unixes, a few mainframes, but it's interesting, that people have also fear from mac.
- Unfortunately, Linux is the focus of press, radio and TV. BSD is known by many IT people, but I think it's mostly considered "bizarre".
- My geographical location (Regina, Saskatchewan, Canada) is fairly small (pop. 200,000) but has a very large Open Source community. The local LUG has almost 600 members and we're a large enough group to hold an

annual Open Source expo with thousands of attendees. Within the Open Source community, BSD is very well known but less popular than Linux. It appears to follow the knowledge curve: the bulk of the LUG users are relatively new to Unix in general and they tend to prefer Linux distributions. A significant minority are serious Unix gurus (such as myself) and either prefer BSD or express no real preference between BSD and Linux.

- This question should contain more options between "I'm the only one" and "Popular as..." Should be something like "Small group of people" where "small group" != "technically elite"). Should also include questions about other operating systems.
- Under this question, a more fine grained comparison to Linux might be needed.
- You may want to mention other operating systems - Linux is the primary non-Windows system at my workplace, and I daresay there's folks who currently use Linux that want BSD certification as a reason to encourage switching.
- It is known but not very widely deployed. Linux has a much broader user base among the students at my university. There is a nation-wide mailing list for BSD but that is mainly used for rather professional questions leaving "home tinkers" slightly put off. But the atmosphere is quite cordial anyway.
- Perhaps it could be better described "Very few people know BSD".

3.1.8 General Comments on Demographic Questions

There were some comments on this portion of the survey that didn't apply to a particular question or were of a more general nature.

One of these was a comment on the option of leaving an email address for inclusion in the random drawing: "I hope you don't sell spammers your email address database". To reiterate the explanation on the survey: the BSD Certification Group will not release any of the email addresses for any purpose. They were collected solely as a method to notify the individual winners of the random draw which occurred on June 23, 2005.

The remaining comments were:

- I think that certification of BSD is a very important step.
- Questions should not ignore OS X Server (and Client). While Apple ships proprietary graphical tools, the core OS is Darwin-based, requires roughly the same skill set as other BSDs, and will be showing up more and more frequently in integrated/heterogeneous networks.
- While you don't seem to take Mac OS X into account, the same skill sets are needed/required to administer Mac OS X as well as the other BSD's. Admittedly, a lot of the configuration is GUI based and a lot less command line based, but the same level of knowledge about the the BSD subsystem is required for configuration.
- The question concerning job role excludes developers while the question regarding technical proficiency includes developers. How do you reconcile?
- The BSDs are incredible systems, except in the area of the marketing. Little are they known beyond the staff of YOU, at least in the area of average companies, where the greater is concentrated numbers of servers. The more people using it, the better the system go will be, for the simple reason that bugs will be discovered and fixed more quickly and consequently we will have an even more robust system.
- This initiative is very important. BSD has much market to grow and the lone technician's voice does not have the respect to move BSD in the direction of growth.
- BSD is an excellent operating system for those who understand efficient operating systems.

3.2 Answers to Scenario Questions

This section of the report summarizes the information gathered in the scenario questions on the last page of the survey. Since this section asked responders to consider their thoughts regarding several different scenarios, the comments in this section are more numerous and detailed.

To assist in reviewing the comments, they have been loosely categorized per response. Comments of a more general nature that didn't match a particular response have been categorized as "other" or "general". Where several responders repeated the same sentiment, they were lumped together as one comment.

3.2.1 Number of Certifications

Question 233 asked for an opinion on the type of certifications that the BSD Certification Group should develop. This question has consistently held the top spot for lively debate within the Group and also within the wider BSD community.

The graphs show a high percentage of responders favor more than one exam with the largest group favoring exam tracks having multiple exams. Not surprisingly, this question produced a very large number of comments.

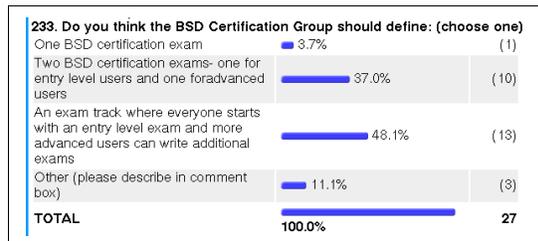
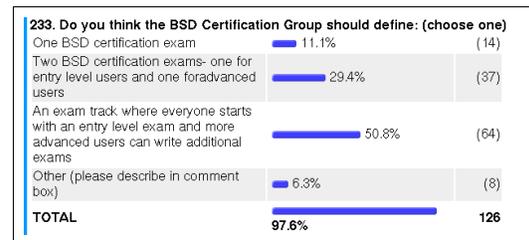
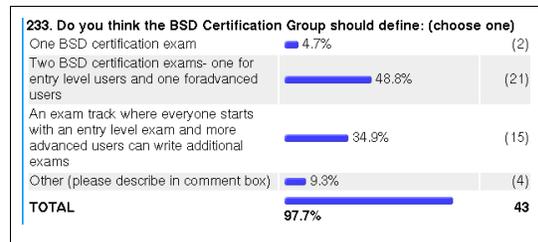
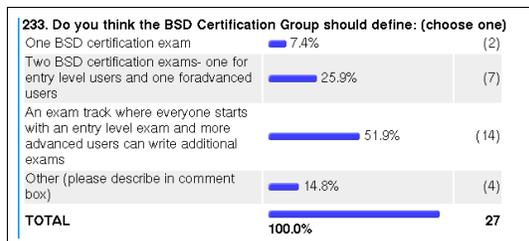
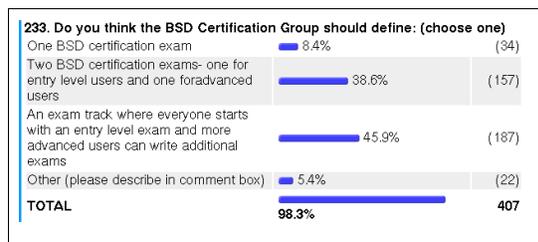
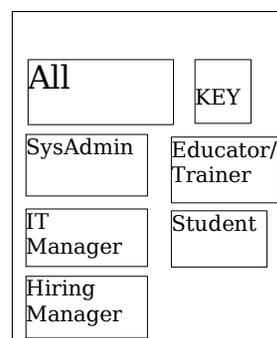
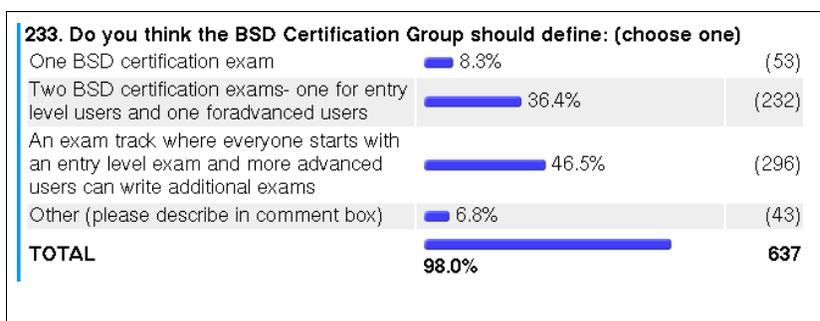


Table 3-8 shows the distribution of answers across the various languages.

- A One BSD certification exam
- B Two BSD certification exams-one for entry level users and one for advanced users
- C An exam track where everyone starts with an entry level exam and more advanced users can write additional exams
- D Other (please describe in comment box)

Responders were limited to only one choice and the responses are charted in Table 3-8:

Table 3-8 Number of Certification(s) to be Defined

| | A | B | C | D |
|---------------|--------------|---------------|---------------|--------------|
| Chinese | 7.10% | 26.30% | 60.60% | 5.10% |
| Dutch | - | 80.00% | - | 20.00% |
| English | 8.80% | 39.60% | 43.20% | 6.80% |
| French | 10.30% | 31.00% | 41.40% | 10.30% |
| German | - | 40.00% | 60.00% | - |
| Polish | - | - | 100.00% | - |
| Portuguese | 6.90% | 27.60% | 48.30% | 10.30% |
| Russian | 20.00% | 20.00% | 40.00% | 20.00% |
| Spanish | 6.70% | 33.30% | 46.70% | 6.70% |
| Total: | 8.30% | 36.40% | 46.50% | 6.80% |

There were many comments regarding this question; they have been loosely categorized by response:

One Exam:

- As answering questions, I had strange feeling that every task mentioned should be performed by novice BSD admin without any problem, so I think there should be only one certificate which will cover all (most) of the tasks.
- One exam but HARD to pass: I don't want a supermarket certification, I want a VALUABLE certification.
- One exam per BSD.
- One exam, divided into sections, each section covering different topics.
- One test which basically gives a numerical proficiency value and indicates which BSD variants the user is using. If the user says: All BSD variants, then all questions are counted as similar in value. Otherwise, specific variant questions are neglected.
- There are already a million Linux/Unix/Cisco/Microsoft certifications, you meet people with a business card so crowded with CCNA, MCSE and so on there's not enough space for the address. Keep it simple, a single certification should be immediately recognizable, and mean preparation. Who needs a cert for not-so-expert people? (Microsoft of course, but not BSD).
- There's really no point in having a cert for entry-level users. Hence you would want to have either one exam, or one exam for different BSDs. It might, however, be worthwhile to distinguish between passing and outstanding, to separate those who are competent enough for a job from the gurus. On the other hand, gurus might not need certification at all.

Two or More Levels:

- I think the levels you already indicated in the questionnaire are a good starting point: novice, intermediate, advanced, senior.
- 3 levels: entry, intermediate, and advanced.
- 4 levels: Basic (Using a shell, generally using BSD as a user. Lots of general knowledge); Intermediate (Installing and configuring BSD, performing basic system administration tasks. More BSD-specific knowledge.); Advanced (More information on administering BSD. Stuff a real sys-admin needs to know); Specialized Basic (Make available more specialized certificates, eg: setting up kerberos/centralized authentication

Certificates would have to be completed in order so someone taking the advanced course would not have to waste time with basic-level material, etc.)

- I recommend 3 levels. Entry, intermediate, and advanced. I would like to see an advanced BSD certificate that speaks "This person really knows BSD". Most BSD and long-term Unix users should be able to pass an intermediate exam. Any user familiar with a BSD handbook and basic shell syntax should be able to pass the entry level exam.
- I think that at least two exams are important: one to prove that a person can administer a system on a day-to-day basis, and one for a senior sysadmin who can configure and install systems, and maybe even compile custom kernels. The first would be fairly inexpensive and fairly easily obtainable, a test for young sysadmins to market themselves. The second would be very difficult and mark a person as a veteran.
- I think there must be 3-4 levels... For novice (assisting) admin, for standalone admins, for some kind of advanced admin/developer.
- I think there should be at least a User Level Certification and an Admin Level Certification.
- I think there should be basically two exams: One for "administrators" and one for "users" (where administrators should be able to complete the tasks that were marked "advanced admin" or "senior admin" and users the tasks marked as "novice" and maybe some of the "junior admin").
- I think there should be two exams.....one for heavy users/admins and another for the novices.
- I would have defined the following certification exams: 1 - System administration (maybe divided on two parts: basic and advanced administration) 2 - Network administration 3 - Security administration.
- I wouldn't mind seeing the exam split differently even- Perhaps an entry-level type exam could be for straight SA certification, and the advanced users exam could be oriented towards software/systems developers and engineers?
- Instead of only general levels, i.e. novice/junior/senior, there could be specialized tracks, i.e. security/networking/diagnostics and such.
- More than two BSD certification exams- one for entry level users, for advanced users, one for novice administrators, one for junior admins, etc. A teacher certification should be useful too. 2 Specialized/Intermediate certification levels: one for ISPs services and other for corporate services

Top level certification, covers all.

- Multi-level is probably more accessible, otherwise it becomes overwhelming for people. But too many levels and it looks like a cash suck.
- One for beginner (novice and junior), one for advanced (mid/advanced) and one for expert or guru.
- One user level exam (desktop focus), One basic user (basic administration), one advanced user (advanced administration), one Sr. advanced for advanced multiple administration (clusters, grids etc...)
- Perhaps an administrator level and a developer level; or simply two certifications for entry-level and advanced.
- Perhaps 3 divisions, similar to the categories here. Or possibly Jr. Admin and Senior admin (figuring that the novice will do their learning elsewhere).
- Perhaps one entry level and then several specialised exams focusing on different areas (if there is enough difference between areas). Perhaps there should be elective areas - i.e. you know all the basics and have specialised in backups, mail and dns but not web and DHCP etc. Reading some of the questions really illustrated the difference between people who might admin labs and desktops vs. data centre stuff.
- Perhaps three standard levels (tech, admin, architect).
- Since the BSD OS is very complicated and detailed, I think that it would be good to split the test into a beginner and advanced levels.
- To my mind, BSD Community needs two separate ways of Certification - Users & Admins.
- Well, in keeping with the structure of the survey questions, and the diversity of tasks laid out above, it makes sense that there should be [at least] Junior, Intermediate, and Advanced certificates. Two certifications may be enough, however.
- I like the LPI style: 1 novice 2 advanced 3 elite admin. Though I do not like the fact that they have two exams for each level. A single exam should do!
- 1. Junior system administrator exam 2. Network services administrator exam 3. Advanced system administrator exam 4. Expert exam 5. Security exam.
- An entry level exam will gauge whether the candidate is just wasting everybody's time. Once the entry level is obtained, the certification should be based on a more advanced level of examination.

- I think 2 or 3 is the most useful (where 3 is entry, intermediate and advanced). A full track can be confusing and doesn't necessarily add any value from what I've seen (the possible exception I can think of here is tracking on the various flavours of BSD).
- I think it would be nice to have different certifications: 1) Base BSD user Certification (install, upgrades, standard workstation usage etc) 2) Advanced BSD user Certification (backup, configuration, recovering, upgrading, kernel and source compilation, panic dump and submitting to core developers) 3) BSD Certified Network Administrator (dhcp, www, securing server, pf, network troubleshooting with BSD tools) 4) Core Certification (tuning, armoring, troubleshooting, advanced backup, advanced recovering, using BSD to secure networks, bridging, pf, ids, etc.)
- I would suggest using 2 exams. Using an exam track would be a turn off.
- The "Two exams" thing seems to be fine, but all this is related to admins. What I'd really like is a certification of "Average-Day-User".
- The second exam should allow you to screen for more senior people who know how to install, configure, and maintain BSD systems in a *secure* environment.
- There are several types of BSD admins. Those that install a system every day, those that maintain one every day. Then there are admins who are also system programmers and kernel hackers. So the exam should be split up on different levels. There are certain system tasks that won't apply to all people who have used a BSD.
- Use a Cisco-like layered structure where there are different levels of knowledge behind the certifications, but make them so that you need to know the stuff to obtain it.
- Two exams, plus a lab test (see RHCE).
- Two exams seem enough: 1) for users/beginner/singleuser/workstation admins, 2) for advanced/network administrators Not too much emphasis should be put on setup/administration of network infrastructure (DNS, DHCP, Mail, ...) as these are too specific. Could be part of a separate "BSD Network Admin" cert. For the two exams, it should be made sure that they either can be done by everyone (FreeBSD, NetBSD, ... user), or that they contain a general and a OS-specific part.
- One survey/mini-exam to assess the skill level of the student, and three exams of basic, intermediate and expert level. A very good score in the mini-exam or a passed "intermediate" exam allows the student to take the expert exam, for example. Taking the survey/mini-exam must be either

free, or its fee must be refunded upon taking a "real" exam. The goal of "basic": Overall familiarity with Unix and *BSD in general, i.e. having a BSD system in working order with up-to-date patches etc. (no dangerous half-knowledge) "Intermediate": Perform specific tasks on a BSD of choice, networking, services, etc. "Expert": If it says "BSD", the person who passed this exam can handle it, pick the right BSD for the job and is a valuable administrator that should be hired and paid lots of money immediately. Might actually include testing for BGP/OSPF knowledge (OpenBGPd, OpenOSPFd).

- A limited number of certificates. (E.g: 5) Every certificate has a description of the competence, rather than a level. At least 2 certificates should cover development skills.
- 3 certifications: one for junior administrator, one for intermediate administrator and one for senior
- I find that it must have 3 levels: beginning, Advanced administrators and Senior administrators.
- I believe there must exist two examinations. One for users with some intermediate knowledge of the system. Another one, for advanced users. No Certification for beginning users.
- I believe there should exist 4 tests: BSDU - practical user possesses skill to install, configure and use the basic system including shell scripts. BSDA - Full administrator BSDU + basic configurations of security, networking services and intermediate shell programming. BSDS - Senior administrator BSDA + tuning of system, advanced security configurations, advanced shell programming. BSDH - BSD-hacker BSDA + programming in C and Perl + proven history of experience in systems and security.

Exam Track:

- A pseudo-GIAC approach might be best, wherein a basic exam is taken to certify that the person has essential skills to be a solid administrator, then separate written exams are offered for those who want to certify in more specialized areas. A hacker, a DBA, a sysadmin, and a firewall jockey are each going to use BSD in very different ways. It seems impractical to lump them in an "advanced user" group, though each deserves an opportunity to be recognized for their area of expertise. Then, perhaps sometime later, a BSD-foo master certification can be offered for those that want to have a go at all of the advanced areas.

- An exam track. However the tracks should not be numerous. Say three tracks.
- Certification should clearly differentiate between intended use of the system. General System Administration is rather different from, say, using a BSD System or Developing Software for/on a BSD System.
- Force users to do the entry first.. if they pass, then they can do the advanced.
- Cisco is one of the few companies that has a half-way respectable certification program, despite their programs representing a huge disparity in technique and understanding between the educational/learning oriented groups and the support/operational ones. Cisco educational courses today still teach concepts like classful subnetting that are essentially completely useless and serve only to confuse people. But what is nice is that Cisco has three basic levels - Associate, Professional, and Expert.
- Exam track that does NOT require prerequisites.
- First, you need exam tracks for admins but not for users. The best format would be a base exam, with modules. For example, shell scripting or web server admin would be modules. The base + a predefined set of modules would be used to define a hierarchy of skills.
- Hopefully a graded system will accommodate different H/W environments.
- I believe that an exam track has to be clearly defined and simple enough for management to understand what each level involves. The number of levels should be fairly limited - any more that 4 or 5 would excessive.
- I think option 3, entry level + advanced is a good route, but unlike others, I normally black boxes with few user accounts. i.e. Web, DNS, and IMAP. This requires a modified skill set from admins who manage a more traditional user space server. We rarely deal with lost passwords or scripting local user account setup. However, we use user management tools such as sasl, ldap and radius. So the point I am trying to make is that the advanced tests should be split into tracks. Also, while BSD's have a remarkable history of security, I noticed a lack of general security related questions. Such as, preserving and protecting chain of custody for abuse investigations.
- I think the model that Red Hat has taken good: - Red Hat Certified Technician (RHCT) - Red Hat Certified Engineer (RHCE) - Red Hat Certified Architect (RHCA). Intuitively you know that each exam represents a higher level of expertise, but the way they present them does not

diminish the value of the easier exam. I think this is important because in some environments an in-depth understanding of BSD or Linux is not required, but an employer could see significant benefit to an employee who has a functional understanding of Unix-like systems.

- I'm more keen on an exam track, however it depends on the 'entry level' - there is no point making experienced administrators work through a piece of cake exam just to be able to complete the one at their level.
- I'm a fan of granularity. I think a number of different levels and tracks should be used. EG: Levels: Junior, Intermediate and Advanced Tracks: Security, Networking, Developer, General Admin People use BSD in all sorts of different environments where the needs are all different. I think certification should try to reflect that.
- I'm not 100% sure how many levels you should have, but multiple levels, and multiple tracks make sense.
- I'm not sure what you mean by the third statement... if it means that more advanced users can continue taking more advanced exams to increase their certification level then I would choose that.
- It might also help to base exams on specific roles, e.g., security, programming, web hosting, clustering..etc.
- Mid level test first then senior level test.
- Multiple exams should be available for different categories of users. Same way that Cisco does its CCNA -> CCNP, and Microsoft with its MCP -> MCSE.
- One basic test and others on specific areas would be good.
- One for 'gets through it alive' and one for 'is highly skilled', i.e. like CCNA and CCNP+CCIE (to go on with the example - the CCIE would be a SAGE senior sysadmin and doesn't really need certification for specific unices).
- Over time and with experience the process could grow to accommodate additional advanced levels. This should be more about achievement and not about pieces of paper.
- Probably start with One BSD cert, gradually develop the second, but aim to maintain a "exam track".
- So I know redhat has RHCT and RHCE... kinda like Cisco's various levels. I think a: Certified CBA (Certified BSD Administrator) and CBE (Certified BSD Engineer) might make sense. CISSP's "credits" approach is also a reasonable one for keeping your certification 'active.'

- Specific exams for web server administration, mail administration, backup manager, general system administrator, etc. Just because someone is a "BSD certified admin" doesn't mean that someone can properly configure a MTA, for example.
- Several tests - on the themes: use BSD (desktop); local networks and interaction with other systems; use in the Internet.
- I would not feel comfortable with the third option, however, where more advanced users can write the additional exams -- it should be more controlled than that, with a board writing the exams (with user input, of course).
- Using the SAGE System Administrator descriptions (<http://www.sage.org/field/jobs-descriptions.mm>), develop exams matching those levels as well as areas of expertise (security, enterprise data center, etc).
- An exam track with branches could be nice, but might require certification for reading the resulting acronyms describing the certs.

Other comments:

- Help users to decide which exam to start with, for example by providing "test exams" to find out the level a user has reached .
- Certs shouldn't expire but can be "refreshed" . Certs may apply to specific BSD/OS version (major) but only in the more advanced levels.
- Choosing a "time" value was for too many questions too vague or even non-related to the answer. Some tasks have to be known by junior or intermediate admins and have to be done when required.
- Exams could be divided by the actual tasks e.g. - basic BSD - user management - networking - security etc.
- I like the idea of advanced users creating additional exams...allows the process to better match and track the community over time.
- I personally believe that certifications usually don't have a lot of practical use, but employers (HR, recruiters, etc.) often place value on them nonetheless. So, conforming to what is "expected" by the IT (and related technical) industry for other certifications is probably not a bad idea, if one goal is to "legitimize" the BSD system/network administrator role.
- I personally like the former SANS setup: broad exam with written

practical, which would expand the base of BSD documentation. The best of the documentation would be available online.

- I think the LPI style of certification is preferable over the Linux+ (comptia) style. Albeit, the LPI questions were confusing to answer both in answer format, and in the questions being asked.
- I wonder if the BSD cert should not overlap others, but focus on BSD specific stuff.
- I would hate to see beginners left out. At the same time, I would hate to see certification ONLY for beginners. Then the cert would lack credibility.
- I'm generally against certification, as I believe this only serves to make the selection of candidates harder to weed through. I feel that HR should stick to non-technical positions and leave the technical recruiting to other technology savvy individuals in the enterprise such as those that have to work with, support, and train the new employee.
- While multiple exams are good generally, the more there are, the more expensive the certification route.
- A series of examinations on various subjects that an administrator has to face: - Security - Administration – Installation.
- Depends how far you want to go for the experts. Basically, the offers & price list should be kept as simple as possible, hence proposing the least possible exams, one or two with at least one for experts. However if your scope goes so far as i.e. administrating an LDAP directory, there should indeed exist some additional dedicated exam modules.
- I find that there must be more than two examinations. At least one difficult and very complex examination must exist, that only the working professional dedicated to the study of this system can obtain. Today one finds diverse professionals certified who know almost nothing.
- I find that a project of similar certification used by SANS should be considered. For example of certification in Firewall where first a work is submitted and later the tests are made. If the only option will be the tests, they should be differentiated in at least three levels: basic, intermediate and advanced. I also find the certifications interesting to be segmented for specialization: Security, Development, Networking, etc.
- The (Chinese) certification must fully consider the language difference.
- Certification is very good, but the expense can't be too prohibitive so more people can participate.

- My interest in BSD certification certainly is not the certificate itself, my goal is the exchange of experiences. I hope the BSD certification does not become a paper certificate; I like studying to be the primary association.
- When producing the different levels of certification, please pay attention to the young users!
- Certification levels also must divide, for instance enterprise application class, procedure development class, networking, security and so on.
- Perhaps there should be a level for a senior manager.
- There should also be a certification for Programmer in Kernel Administration, and for the hacker, an "Advanced Programmer BSD".
- Should formulate an extremely strict test, it certainly must be very difficult

3.2.2 Content of Entry Level Exam

Question 235 inquired about the nature of an entry level exam for BSD Certification.

The graphs show a large preference for covering generic Unix knowledge followed by knowledge specific to BSD. Interestingly, the smallest preference was for coverage of only a specific BSD.

As with the previous question a large number of comments were received.

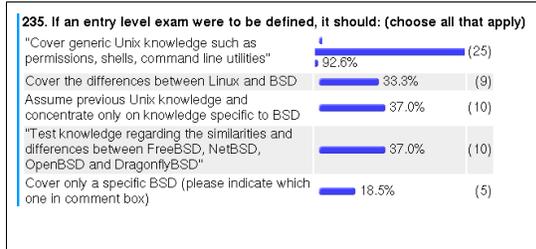
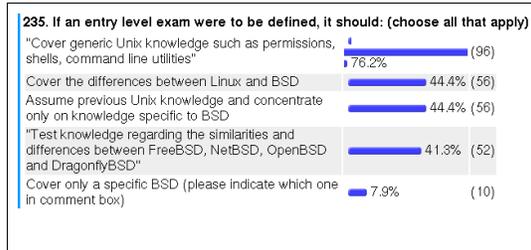
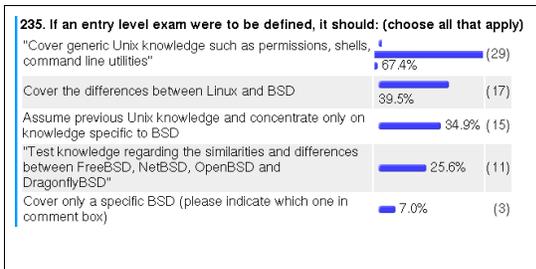
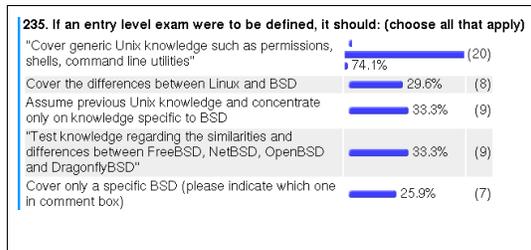
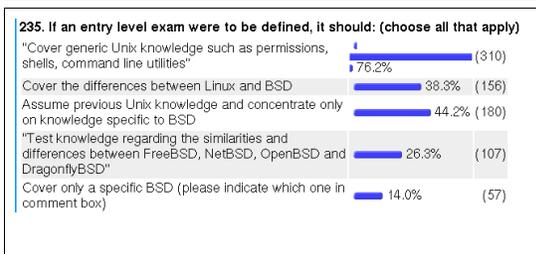
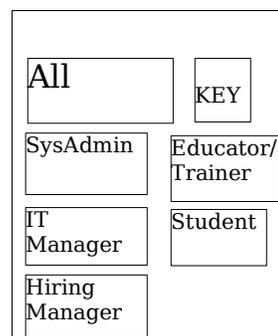
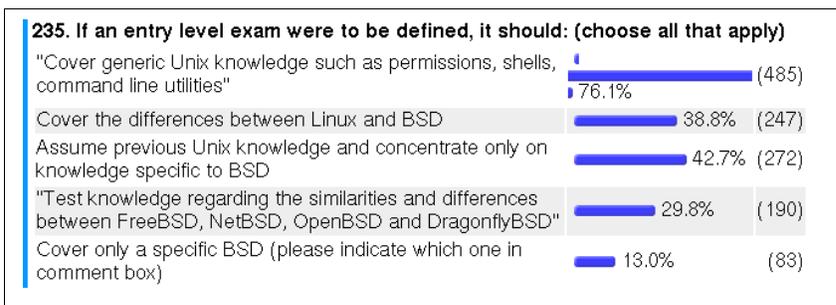


Table 3-9 shows the results across the various languages.

- A Cover generic Unix knowledge such as permissions, shells, command line utilities
- B Cover the differences between Linux and BSD
- C Assume previous Unix knowledge and concentrate only on knowledge specific to BSD
- D Test knowledge regarding the similarities and differences between FreeBSD, NetBSD, OpenBSD and DragonFly BSD
- E Cover only a specific BSD (please indicate which one in comment box)

Responders were asked to choose all that apply, meaning that the percentages seen in Table 3-9 won't add up to 100%:

Table 3-9 Material to be Covered by Entry Level Exam

| | A | B | C | D | E |
|---------------|---------------|---------------|---------------|---------------|---------------|
| Chinese | 69.70% | 38.40% | 69.70% | 34.30% | 13.10% |
| Dutch | 80.00% | 40.00% | 20.00% | - | - |
| English | 77.90% | 39.90% | 38.70% | 29.70% | 14.20% |
| French | 75.90% | 31.00% | 20.70% | 34.50% | 6.90% |
| German | 90.00% | 40.00% | 50.00% | 20.00% | - |
| Polish | 100.00% | 100.00% | - | - | - |
| Portuguese | 72.40% | 48.30% | 41.40% | 31.00% | - |
| Russian | 80.00% | - | 40.00% | 20.00% | 60.00% |
| Spanish | 60.00% | 13.30% | 33.30% | 13.30% | 13.30% |
| Total: | 76.10% | 38.80% | 42.70% | 29.80% | 13.00% |

Again, the comments have been loosely categorized per response:

Generic Unix knowledge:

- "Cover generic Unix..." No, because this is a BSD cert.
- Actually, the superposition of two: generic Unix basics + specific BSD core tasks, such as disk management, rc system, etc.
- Emphasis on generic Unix knowledge while testing on how BSD is a bit different.
- It needs to cover Unix knowledge (since you need that to administer BSD based systems), but with enough specific BSD detail to differentiate it from Linux based certifications.
- Generally, people heading for a BSD certificate know about Unix. Nevertheless the bare basics should be part of the exam.
- For entry level it is important to test basic Unix knowledge/skills and keep the sysadmin stuff to the basics. I have been writing and presenting Unix admin courses for 15 years and my biggest problem is the guys coming in at the bottom who have never seen a shell prompt, can't write a simple shell script and don't know what a process is. As you get into the more advanced levels the issue is lack of clear understanding of IP networking and Unix internals.
- I think assuming Unix knowledge offers the best chance of bang-for-buck.
- I would say generic knowledge should be included but emphasis should be BSD-specific.
- I would think entry level should cover some basic Unix knowledge (a few questions) and then concentrate on the BSD's.
- In an entry level exam I think the most important part is a basic understanding of the Unix System philosophy (as opposed to the Windows philosophy). The subtle differences between the different Unix and Unix-like OSs shouldn't be part of the entry level exam!
- Not sure how useful an entry-level cert would be. Entry-level usage of a Unix system should be assumed, though I guess a cert for this could be appealing as a pre-requisite for others in corp-world.
- Skip generic Unix stuff and assume a Junior level of knowledge.

- Surely should cover the knowledge base that any Unix user should have. In my opinion, before even starting to study system administration, the candidate should at least know how to use a Unix system.
- The entry level exam should cover both generic Unix knowledge as well as BSD specific knowledge.
- Unix knowledge just can't be assumed. Many Linux users doesn't know basic commands/tricks/approaches.
- Well, I wouldn't assume knowledge of Unix.
- Well, this is a "BSD" cert so general Unix knowledge should be focused on BSD.
- Assuming existing Unix knowledge would definitely NOT be a Good Thing, especially for an entry-level exam.
- There are many exams that already cover the basics of Unix systems (although it's arguable as to whether or not they're actually any good) so I don't think another one (unless it's done well) is worth the time.

BSD/Linux Differences:

- "Cover the differences..." No, because we shouldn't care if they know Linux.
- Additionally to covering the differences between Linux (or other generic SysV type system), there should be a test for "best practices" regarding interoperability between different systems, and using tools and scripting in a way they can be used on (nearly) all Unix systems - POSIX.
- As for differences between Linux and BSD this should be very light - and just talk about why you can't just run a BSD binary on a Linux system. Basic Linux/BSD interactivity - thats it.
- Since the certification has absolutely nothing to do with Linux, don't deal with it.
- Differences between Linux and BSD is a must, as we get far more people with Linux experience than BSD experience.
- If you're going to compare to Linux, then you should also compare to other Unix systems, like Solaris. But to compare to Linux is kind of silly, is this a Linux test or a BSD test? Why should I have to have Linux knowledge for a BSD test?

- Knowing the differences between Linux and BSD is irrelevant to being a good BSD admin. Some BSD admins may have never used Linux before and there's no reason to penalize them for it.
- The reason I think it should cover the differences between Linux and BSD is because most people start out with Linux and then switch to BSD later.
- Cover some differences between the BSD family, Linux, and commercial Unices, i.e. "there **are** differences, so better read documentation.
- If someone doesn't know the basic differences between Linux and BSD, they should have probably saved their money.
- The basic test should assume you can pass a BSD or Linux beginners test.
- You need the entry level exam to be a valid alternative to the entry level Linux certs out there.
- I don't feel that comparing Linux vs. BSD is in the scope of this exam, and thus should not be part of it.

BSD Knowledge Only:

- Entry level exam should cover core knowledge for basic administrative tasks under BSD.
- I think there must be checked BSD skills. No **BSD wars**.
- If it's a BSD cert, it should be at least somewhat BSD-specific. It should assume knowledge of things like interactive shells, utilities, etc, because they are simply user-level tasks. It should also differentiate between the several BSDs, since the last thing a new cert needs is a bunch of new people turning on OpenBSD machines and complaining about something obvious they didn't expect. I guess I figure, "entry level" should mean, can take care of a few machines and handle routine user requests and updates (along the lines of junior/intermediate admin in the surveys).
- If you are testing for admins, you can assume a base skill level.
- Presuming by "entry level" you mean pre-requisite knowledge to starting administration.
- The exam should only be based on a single BSD, we cannot assume the candidate to have knowledge about Linux or all of the BSDs. I think the entry exam could look like LPI level 1, where the content is based on BSD only.

- Only involve one specific kind of BSD:FREEBSD

BSD Differences:

- The certification should cover common ground between the various BSDs, and when necessary explain differences.
- All of the BSDs should be included. This will serve to promote BSD as a whole.
- Obviously, you'll want to test knowledge concerning the differences between the BSDs. I don't believe that covering a specific BSD is really a valid option, considering the small size of the BSD community.
- Differences between the BSD's are few and silly. Similarities, however, should most definitely be tested.
- Disparate elements of all three BSD systems should be discussed in an entry level course, with training that contrasts the differences and similarities of the systems. Users who do not wish to take the first level exam should be allowed to start at the second or third.
- Knowledge--at least a high level--of what the other BSDs are, what they are known for, what they offer, what they share, strengths/weaknesses, etc., should also be essential, though not critical in the minutia of each OS.
- Entry level admins shouldn't be making decisions about architecture - so why do they need to know the differences.
- Differences between the BSD's are more important in this context than differences between BSD and other Unix-like systems.
- I would include common BSD functions/commands and/or administration commands shared across all the different BSD's. Similarities are more important than differences at entry level. Also, I wouldn't place too much emphasis in the differences between Linux and BSD.
- Examining someone on the differences between the BSDs is not particularly useful.
- The entry level exam should concentrate on one *BSD, but similarities should be pointed out in the remaining three.
- This is a difficult question when it comes to different BSDs. I know many people who only work on one or the another. To require knowledge of all of them would be daunting and impractical.

- Testing with one or two questions regarding the various BSD platforms would be good but don't concentrate on that.

One BSD:

- "Cover only a specific..." No, because we shouldn't play favorites.
- Many folks use only one flavor of BSD and should not be required to know specifics of another flavor. Perhaps the exam could include sub-sections focused on those platform-specific questions and the applicant could choose which sub-section to compete.
- Each BSD ought to have its own exam. A "one size fits all" exam will do more to measure the test-taker's lack of knowledge of the BSDs with which he is least familiar than his knowledge of the one with which he is most familiar.
- Each exam should cover only one *BSD.
- I actually think the exam should come in three or four "flavors". One for each BSD, and another "general knowledge" assessing competence in all.
- I'm not sure about the whole BSD flavour thing: shops tend to pick one or the other, and that choice is often simply how it got in the door: if came in as an edge device quite likely to be OpenBSD, if came in as application or database server, likely to be FreeBSD, if came in through developers might be NetBSD. Once in, there's inertia. I'm not how the best way to handle this is.
- I think you should nominate which BSD you want to be certified on. I use FreeBSD and have not touched any other BSD or Linux for years. I don't want to have to learn commands that relate to a system I will never use.
- Here it becomes difficult too. I am undecided whether I feel there should be an exam for each BSD. I would think that most people interested enough to take an exam would know the basic differences, even if they were only familiar with one of the BSDs. I would concentrate on factors unique to the BSDs, but more or less general to all of them, especially at the entry level. Perhaps, at higher levels, separate tests into FreeBSD, NetBSD and OpenBSD (and possibly DragonFly BSD).
- It should have a specific section for each of the BSDs and you choose one to pass.
- Just a protest that this selection (a specific BSD) is meaningless: everyone

has their favorite-- they will state 1) FreeBSD, because the installed base is larger and there is more corporate usage, increasing the likelihood of encountering it in the wild, or 2) NetBSD, because it tends to be the reference platform, the first, and arguably the cleanest-designed and coded due to necessarily needing to run on multiple platforms and thereby keeping more code machine-independent, or 3) OpenBSD, because Theo said so.

- I think one of the best ways of approaching multiple choice questions is to give all the options where they differ between BSDs and for the written answers to allow the candidate to specify the BSD they're referring to (unless the exam is tracked based on BSD).
- Let the test taker decide.
- Let you choose which BSD to cover. I personally am not interested in the differences between BSD's or Linux, and have no inclination to install all BSD's and learn the differences just for an exam. If the differences are needed to be known, then on the job will bring those differences out.
- Maybe a set of exams per main BSD. eg. an admin knows pf very well, but hardly anything about ipfw, he wouldn't pass the FreeBSD-exam, but would easily pass the OpenBSD-one (or vice versa).
- Stick to using one BSD for education. That way, at least the student will know one system completely and not many systems half-way.
- Well, here is another grey area. I have only used FreeBSD myself, but I understand that OpenBSD, NetBSD are similar and I should have no problem setting up or maintaining one. How true that is, I guess depends on various variables. I think a cert should be based on one or more BSD's. Basically let the user decide which BSD to certify for.
- Sysadmins and developers that use one BSD only should be tolerated, even respected. It is not important to know what Linux is, or what the differences are among BSDs, in the case where one is definitely satisfied with the BSD he chose. People like that should be supported, not only those ones who know Linux and test out the other BSDs.

For those who specified which BSD, about 80% suggested FreeBSD and the rest suggested OpenBSD.

Additional comments:

- I have always considered *BSD to be the 'teach a man to fish' OS (not 'give a man a fish'). It is more important to me that a (potential) employee have the 'lay of the land' and good problem solving skills than if (s)he could quote man pages verbatim.
- I think the cert should presume user-level knowledge of *nix and test on the ability to admin BSD. This may include knowledge that is portable to other *nix systems. I think the cert should be accessible to people who have not administered other *nix systems. It certainly shouldn't assume you know how to use bind/ssh/bash/etc. just because it is (nearly) the same on all other *nix systems.
- The entry exam should be for all BSD's and advanced exams should be more specific BSD type.
- All of the above - my idea of an entry-level exam is one that where nobody can "fail", as it is a key to taking the appropriate, "real" exam. There should be preparation time available between survey/mini-exam and the real thing.
- An entry level exam should merely open the door for an individual to become employed working with BSD. It is the individual's responsibility to continue to grow and mature. This does not negate the knowledge that should also pass from the guru (or other peers) to the junior.
- Don't assume anything in the entry level exam.
- I think that the higher level exams should branch out into a more specific BSD.
- I would expect anyone with a decent understanding of any FreeBSD like OS (Linux, Solaris, other BSDs etc) to be able to admin a FreeBSD system at an entry level (at least). I think we should ensure that the entry level exam is just that - entry level. IMHO any FreeBSD specific things are not for entry level admins anyway (or are really easy to find).
- Entry level: ability to install, configure and upgrade system and applications. In practice, only one system can be used (no need to create zoo from different systems).
- I don't know if there are many differences in admin on a basic level so perhaps have just one exam but at a higher level perhaps have multiple ones or a core exam and then optional modules for each BSD (at least one being compulsory).
- With so much overlap and sharing between the BSDs, the entry level test

should handle/cover those areas of overlap and the advanced exams should offer specialization into all of the variants where appropriate. If this proves to be too resource intensive, the number of questions specific to a particular BSD should be proportionate to its adoption rate in a corporate setting. Because, to be blunt, if the cert is to be successful, it will need corporate backing/support.

- I think the entry level exam should cover the basics, some of the salient differences between BSD and Linux, and some of the BSD specific features in detail. Nothing specific-BSD should come out here. I think the "advanced" exams should come in three flavors... just like in college you can get a masters degree in X with a focus in Y. CBE (FreeBSD) CBE (OpenBSD) CBE (NetBSD). Then maybe if you pass all three you can get: CLBE (Crazy L337 Certified BSD Engineer)!
- I would like to see a different exam track for FreeBSD and OpenBSD after entry level exams.
- Covering DragonFly BSD seems premature. IMO specific stuff that applies to only one or two BSDs should have less weight than generic.
- If emphasis is given on a single BSD, FreeBSD should be it, because it's the most used BSD. And thus this knowledge will be most useful to most people.
- OpenBSD for me. I'd be worried about a generic one favouring FreeBSD too highly perhaps.
- Maybe one general BSD exam and a custom BSD one.
- Make novice exam all BSDs. Make next level up exam Flavour specific.
- No BSD certification should be a general system administration certification; our cert should test SPECIFIC knowledge and ability in the BSD (be it FreeBSD, OpenBSD, NetBSD, DragonFly BSD, etc) environment.
- Separation should be made between "general" BSD concepts, and OS-specific ones. I think when I choose a NetBSD-specific cert and get a question that I know can't be done on NetBSD I should have a chance to say "not applicable on NetBSD".
- Certification must cover technical knowledge as a whole. Comparisons should only occur when necessary.
- Such an exam would be an extremely academic and not real-world oriented thing innsho. The similarities and differences between bsds are not so important, it's important to know how to make things work in all the bsds, for the details there's man.

- The debate on this has been incessant. . . but I am convinced that one exam could cover the first four check boxes above simply. . . including covering the differences in applications (eg, ipf v pf) and BSD projects.
- The highest level of certification should cover a specific BSD, medium and entry level certifications should cover a general knowledge about BSD operating systems. P.S. Something like lpi.org.
- A basic examination is to pose the basics I suppose. It is thus necessary to know the place of BSD within the Unix world, as well as the difference between different *BSDs. One also needs to verify the Unix basics. It is also necessary that all useful knowledge in the advanced examination is checked.
- Certification must deal with specific knowledge of Unix and the specific knowledge of the BSD and its flavors. In my opinion, there is no need to study Linux for a BSD certification.
- Concentrate on Unix basics and point out the differences between Unix - Linux - bsd's.
- I hope the BSD certification also becomes a recognized IT industry certification.

3.2.3 Target Audience for Single Exam

Question 237 asked about the target audience for an entry level exam for BSD Certification, if only one were provided.

The graphs show a fairly even split for targeting existing administrators, as opposed to those new to BSD. The largest group favored experienced BSD administrators. However, since a majority of responders desired multiple exams, this question does not have the effect it would have were there only one exam.

Again, a large number of comments were received.

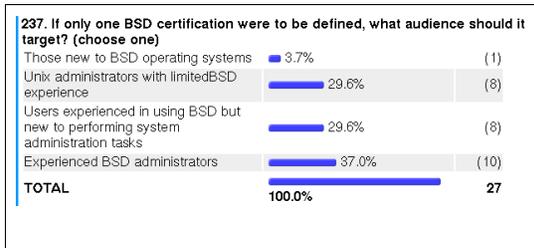
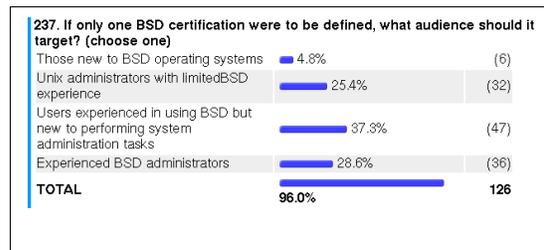
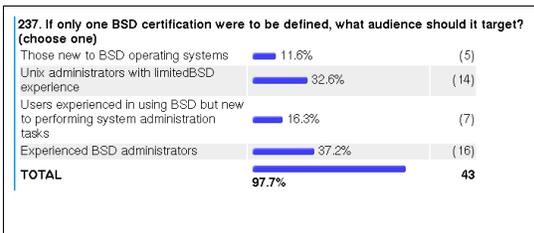
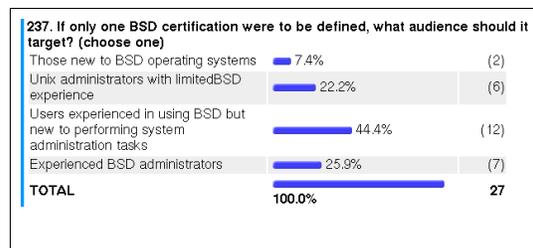
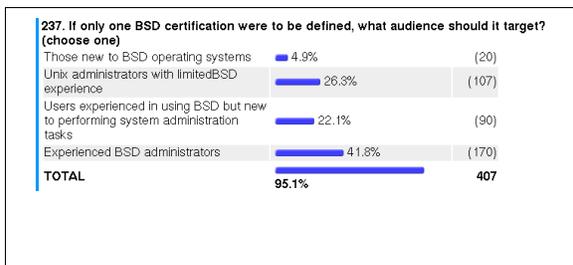
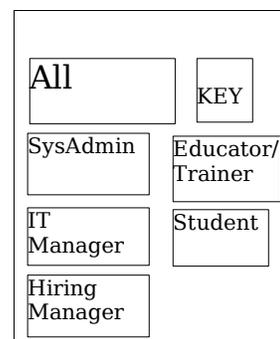
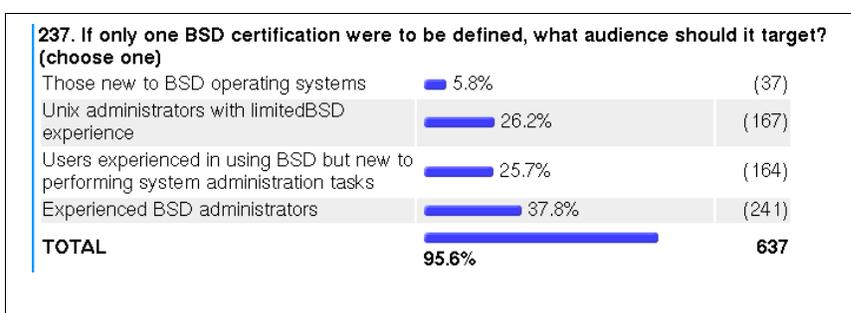


Table 3-10 shows the results across the various languages.

- A Those new to BSD operating systems
- B Unix administrators with limited BSD experience
- C Users experienced in using BSD but new to performing system administration tasks
- D Experienced BSD administrators
- E Other

Responders were limited to one selection as seen in Table 3-10:

Table 3-10 Audience if Only One Certification Exam

| | A | B | C | D | E |
|---------------|--------------|---------------|---------------|---------------|--------------|
| Chinese | 3.00% | 46.50% | 31.30% | 17.20% | 2.00% |
| Dutch | 20.00% | 20.00% | 20.00% | 40.00% | - |
| English | 6.50% | 21.20% | 25.20% | 42.30% | 4.70% |
| French | - | 20.70% | 34.50% | 37.90% | 6.90% |
| German | 10.00% | 40.00% | 10.00% | 30.00% | 10.00% |
| Polish | - | - | - | 100.00% | - |
| Portuguese | 10.30% | 41.40% | 13.80% | 31.00% | 3.40% |
| Russian | | | | 100.00% | |
| Spanish | - | 26.70% | 33.30% | 33.30% | 6.70% |
| Total: | 5.80% | 26.20% | 25.70% | 37.80% | 4.40% |

As to be expected from the percentages seen in the table, most of the comments dealt with the pros/cons of limited experience vs. experienced:

Limited Experience:

- Because they would benefit the most from a cert; the experienced ones have experience which is always better than some kinda cert.
- Experienced administrators don't need certification, and, in fact, certification can be harmful. A certification is no substitution for experience, but companies are reluctant to hire experienced people who don't have A+ or Cisco, etc., certification for some positions. That environment was created by the certification itself. Certification should be a tool for entry-level workers to prove competence, and perhaps for junior-level workers to prove additional skill. But the depth-knowledge required by senior sysadmins not only can't be tested, it can be harmful to both employees and organizations if the certification comes to be perceived as proof of competence in anything more than daily admin tasks.
- Experienced BSD admins do not need a cert. The most urgent need is to qualify long time hobbyists and home users so that they can sys admin at small and mid sized companies. Typically these admins would spend part of the week tending the computers and then doing some other task. These types of positions would not be lucrative enough for professional sys admins. *BSD newbies should be discouraged from taking the exam. Only people with two years of experience should be considered. **IMPORTANT NOTE - APPLICANT PRE-SCREENING:** The two years has to involve daily desktop use. You have to have used a *BSD computer almost every day for the past two years, to be considered ready to sit for the entry level exam.
- I repeat myself, who needs a cert for not-so-expert people?
- If you only target experienced BSD admins, the cert is no longer a way to bring in and encourage newbies to learn more about BSD.
- Important thing. You do want the Certification to be successful. There's many more people near the bottom than the top. If you make the Certification for only advanced users, I can GUARANTEE you the turnout will be low.
- Does an experienced BSD admin need a certificate? (Don't think so.)
- Please don't focus only to the core BSD users!
- Taking the average Linux admin as target audience, it should be made sure that basics are present as well as concepts for administration. BSD people usually have these concepts present. But it won't hurt testing them too. As such, I think the audience would be: ``Users experienced in some Unix, but new to performing BSD system administration tasks."''

- That's a tough question. Obviously, those new to BSD operating systems have a learning curve ahead of them; probably not quite ready for certification. Targeting Unix Admins with little or no BSD experience makes the most sense. They are the folks who will get the most out of this type of certification. BSD users becoming admins would also be a good target group. Experienced BSD admins should be able to take the certification tests in their sleep, so that's a moot point.
- There is definitely a need for "newbie" tests, but not "newbie certifications".
- This would make more people learn more good stuff so they will be able to function reasonably well as admins.
- Typically you write a test to prove your abilities, a newbie doesn't have these abilities so there would be no point in testing that.
- I would HIGHLY suggest not offering an advanced program straight off the bat. I think offering a program that would help with the entry to mid-level user would greatly fill in the gaps with what they may have been missed in the beginning, but give a great boost towards what they can work towards and what things BSD will let them achieve.
- While I very much like the idea of multiple levels of certification, a practical consideration of market size must be championed. A lower level cert will have a larger market and could serve to increase support for future advanced certification growth. I would very much like this endeavor to be successful, but I believe that it will take time to establish itself and begin to grow. I believe that the next generation of growth for BSD will happen via those that have experience with Linux but through happy circumstances come to experience the BSDs.
- Although I would love to take an advanced course in *BSD admin, I think the greatest value to the *BSD community would be to bring in admins and users with some experience and get them started doing significant things with *BSD.

Experienced:

- A certification must include system adm tasks. Users must be experienced in the system before even thinking about certification. It would be pointless to certify users with limited BSD experience (what would such a certification mean? That he could type standard command lines but not resolve new issues?)
- As a hiring manager, I'd like more BSD-capable admins, even if I have to drag them (not unwillingly) back from Solaris, Linux, or Windows.
- Here I think a certificate is there to distinguish the elite from all others. My point of view is that a certificate loses its value if every one can get a hand on it.
- I don't think a cert that says "I know how to use BSD" is of any worth. The cert should say "I know how to fix BSD." Also, targeting it toward users necessarily means more study material is required to be certified as an admin. But then it starts to look a lot like an MCSE. The cert should target people who already know how to fix BSD, but are looking for a certification to "prove" it.
- I fail to see the advantage in certifying a mid-level administrator. This certification (or certifications) should be prestigious and meaningful.
- I feel those certifiable should have some reasonable BSD production experience, as we should not be aiming to create a core of BSD sysadmins, as much as stamping those qualified as sysadmins, and setting a goal for those who have experience.
- If I can only have one exam, it should be one which I can use to measure an applicant's level of experience with system admin tasks.
- If the certificate is to mean anything then it should identify the good BSD admins.
- If the person taking the test hasn't actually clocked a lot of hours with BSD then the test isn't going to be very meaningful in the long-run.
- If you're only going to do one, may as well target it so that it's useful for defining a person as experienced in the system. There are many things that people can take to show they have basic Unix knowledge, so, again, it's not useful to have another one.

- If there is only one certification, it should add value to the certificate holders. The way I see it, employers are the biggest "users" of a certification. A person that has limited experience with BSD isn't of much value to the employer. A BSD certified individual should be able to bring valuable BSD solutions to a company. Otherwise the certification is just a certification.
- If there was only one exam then the person taking the test will probably already have a minimum of 1-2 years experience installing/administering BSD based systems. So, the greatest value to the employer and person taking the test would be one geared toward experienced BSD administrators.
- If there's going to be ONE AND ONLY ONE exam, then you need to target the Intermediate/Advanced Admin going on Senior.
- If you can only do one, start by recognizing the people who really know their stuff. Hopefully you'll be able to add entry level certs later.
- If you only have one, it must be meaningful.
- If you're only going to have one then it had better reflect only the best.
- It is disappointing to be an experienced administrator and programmer, and not be able to hold certifications that speak "I know a lot".
- No use for a certificate that means nothing.
- Paying for a test that approves you as "new to" or "limited" is not very appealing.
- Really the goal, I think, of having a certification is to stand out from the people that do not have it.
- The certification should be difficult enough to actually hold some credibility, otherwise there would not be much point in holding the certification. The world really doesn't need another certification with as much professional credibility as the MCSE, and an easy certification exam would only lead to lots of certified BSD admins with no knowledge.
- Whats the point of creating a certification that everyone can do? To be certified I would think you would be 'good' at something.
- Why certify people new to BSD, you want to certify people that are already proficient, to let them have something to show a potential employer.
- If there's only one, it should be for the more experienced users. I did not choose "Experienced BSD admins" because they would likely already have enough proof on their resume based on their past jobs; thus, no need for a

BSD certificate.

- Why examine new people in BSD or BSD-users without administration experience? BSD is a server system.
- The aim of Certification is to confirm that a person has the ability to administer the BSD system. To certificate the newbie is nonsense.

Most of the rest of the comments dealt not with experience, but with defining only one certification. These are followed by some general comments.

Why One Certification?

- Don't create only one cert.
- I dislike "only one certification".
- I think there should still be multiple tests, that way you don't leave anyone out.
- If you only had one exam you should measure basic competence. I would like to see basic exam with some add on tests to display more in-depth knowledge skills. If the objective is to test and certify good admin skills you need to avoid getting into the esoterics. Do a basic test then take the PF addon or the network admin addon.
- It would not be nice to have one certification for BSD, I don't think it would cover enough necessary material.
- One cert seems like it would exclude many enthusiasts who might otherwise take exams like the LPI exams.
- One is not good in my opinion..also business community/personnel agencies appreciate some levels of degrees, and it's absolutely normal: if I know something I'm at 1st degree, if I know much, my degree is higher ranked.
- We should have many levels of certification to not exclude people new to BSD or make things too easy to experienced BSD administrators.

General Comments:

- Best target is middle of the road. Aiming for the beginners ends up with a cert of little value. The really experienced likely don't need the cert, their resume says BSD all over it.
- Certification should not be a bait. It should be a ticket into companies willing to work with BSD.
- For companies it would be better to have a certificate for system administrators, a users certificate isn't too useful here, I think. If I'd hire a *BSD guy I'd hire him to administer my servers, not to use *BSD (as a user).
- I almost selected "Experienced BSD administrators" but this should be more inclusive than exclusive--particularly if there are options for more advanced certifications. Excepting cert whores, however, I can't imagine anyone trying this other than those familiar with BSD.
- I supposed at a bare minimum you have to allow users to take it to the next level.
- I think it should be focused at people familiar with BSD because it would allow testing on BSD specific things, rather than knowledge picked up from say RHCE.
- I think that people who have been using BSD for a while are more likely to pursue the certification than newer people who do not know much about it.
- I'd target it at existing Linux administrators, and how to transition to administering BSD.
- BSD is for the geek in all of us.
- It is always a problem to define this "experienced".
- It should be a step farther than the "standard" Linux certificates. After all, most BSD admins already know a good deal about *nix tools in general and some Linux-isms.
- Make it for all.
- It would be useful to be able to reschool Unix administrators. Although it would be nice to have a certification for people new to BSD, I think they should first try something for themselves without doing a course.
- It's not clear if you're talking about a course or an exam to me. The exam should be for experienced admins, a course should be for anyone. I might be wrong, but are there really that many users of BSD systems who aren't admins? Seems to me it would be a relatively small group (compared to most other Oss).

- Seeing as (ironically) the *BSD's carry the essence of what was older SysV school of thought, (tight code, tight systems, secure, robust, well documented, etc...), and those in Linux have made a culture which often does NOT promote classic ways of working, I believe sticking to core Unix processes and principles is really important over focusing on specific tools of the various *BSD's.
- That question needed to be answered before this survey was written.
- The cert should be targeted as tightly as possible.
- This depends upon the target consumer you're trying to attract.
- This is difficult to evaluate; again, it depends on what the goal(s) is(are) for BSD certification. If one notion is to compete with/augment the likes of MCSE or CCNA et al, it may be best to follow their lead to provide a like certification for hiring managers and potential employers to compare against. If the goal is to provide BSD certification for its own sake, the target audience should perhaps be higher.
- This was a tossup between the one that I chose and experienced admins. What defines experience? Should only the incredibly skilled pass?
- Tough question, depends on the people you wish to target. Do you want new blood or do you want to keep BSD closed to an elite that would be few and maybe endanger the species.
- Professional and/or hobbyist *experts*.
- Why the differentiation between Unix and BSD users? BSD users are Unix users. Are you going to test just the BSD aspects of Unix? How often do system administrators write kernel code? Very rarely if ever. Are you aiming this at Unix system administration in general with a BSD bent or do we get down into BSD programming? How can one be experienced in using BSD but new to system administration tasks?
- An employer wants to know what a certified engineer knows. The certificate must be defined in terms of skills/knowledge. NOT in terms of the group that should be certified.
- If there is only a single certificate, it will need to add value. Being hard to obtain implies such value.
- A certification is useful when it validates assets, I thus think that it must validate the level and the quality of the administrator's experience.
- I believe that the experienced BSD user and without experience in administrative tasks is a good audience for the Intermediate Certificate.

For advanced certification, the audience would have to be administrators of Unix with specific experience in BSD.

- For the case of only one certification, I believe the audience must be the very top.
- Because Windows monopolizes the market today, we should encourage more users to study the Unix system, therefore the certification starts from the beginner who is allowed to advance.
- The market potential is big.

3.2.4 Possible Certification Tracks

Question 239 inquired about the nature of exam tracks- whether they should focus on servers, security, desktop, general advocacy, etc.

Over 90% of responders indicated a strong preference for practical activities focused on servers. Securing BSD systems also scored highly.

Desktop systems received a vote from over 50% of responders indicating that desktop BSD may be a viable platform for many.

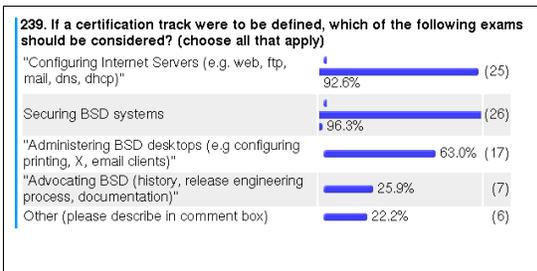
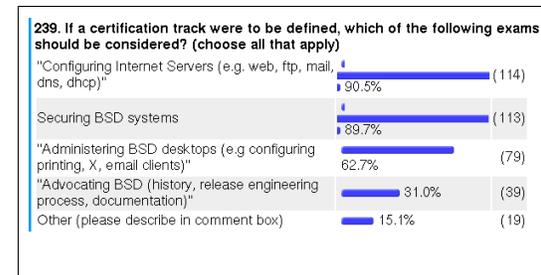
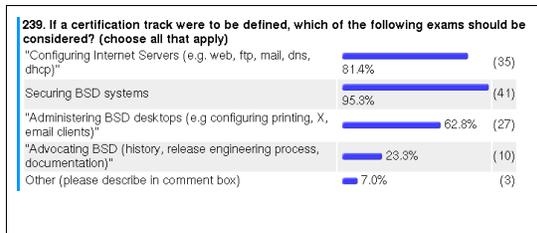
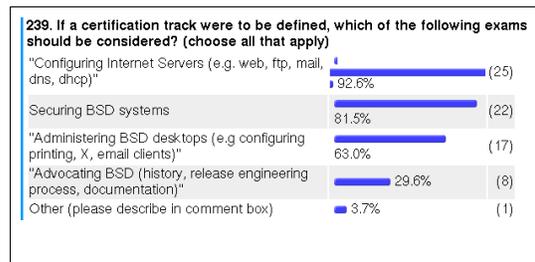
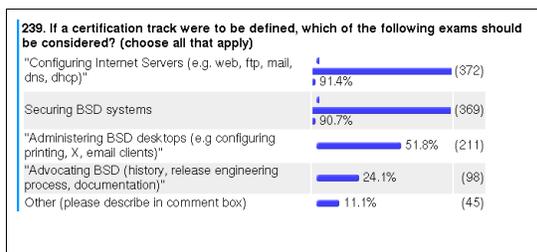
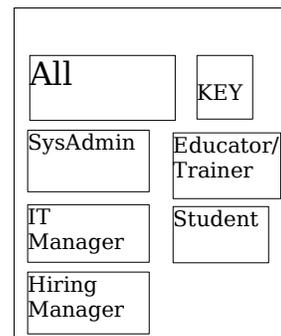
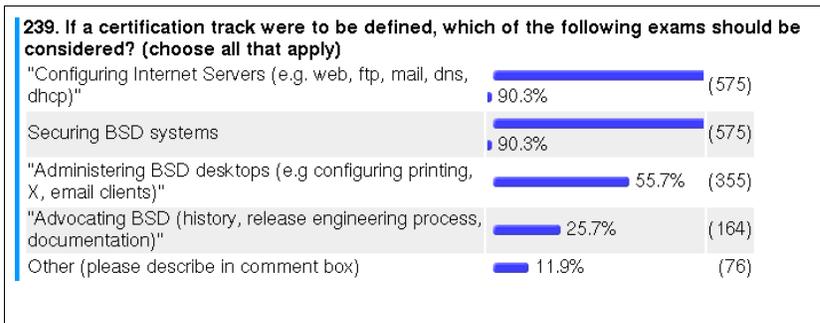


Table 3-11 shows the response distribution across the various languages.

- A Configuring Internet Servers (e.g. web, ftp, mail, dns, dhcp)
- B Securing BSD systems
- C Administering BSD desktops
- D Advocating BSD (history, release engineering process, documentation)
- E Other (please describe in comment box)

Responders were able to choose all of the tracks they thought appropriate. Answers are charted in Table 3-11:

Table 3-11 Possible Certification Tracks

| | A | B | C | D | E |
|---------------|---------------|---------------|---------------|---------------|---------------|
| Chinese | 93.90% | 85.90% | 50.50% | 25.30% | 13.10% |
| Dutch | 80.00% | 100.00% | 100.00% | 40.00% | - |
| English | 90.30% | 91.90% | 57.00% | 24.10% | 11.70% |
| French | 75.90% | 86.20% | 58.60% | 31.00% | 20.70% |
| German | 100.00% | 100.00% | 60.00% | 60.00% | - |
| Polish | 100.00% | 100.00% | - | - | - |
| Portuguese | 89.70% | 82.80% | 48.30% | 24.10% | 13.80% |
| Russian | 80.00% | 100.00% | 20.00% | - | - |
| Spanish | 93.30% | 80.00% | 60.00% | 53.30% | 6.70% |
| Total: | 90.30% | 90.30% | 55.70% | 25.70% | 11.90% |

Due to the number of responders who preferred multiple certifications over one certification, it's not surprising that there were a lot of comments to this question. Most of the comments dealt with the tracks that responders felt were missing from the suggested options:

Other Suggested Tracks:

- Managing multiple servers and managing availability.
- Perhaps development in the BSD environment?
- Add to configuring servers: database and application server considerations.
- Performance analysis and tuning.
- Setting up and configuring hardware (especially those troublesome new sound- & videocards!)
- Setting up filesystems, vinum, NFS, NIS.
- A general sys admin track too.
- Network interoperations and heterogeneous (mixed) environments.
- Advanced topics like LDAP, jails, good backup policy.
- Automating administration tasks using various script languages (shell, sed+awk, perl).
- Backup, crashes, debugging, tuning. These might all fit into a disaster recovery class. I think this would be essential for an advanced admin.
- Building Firewall using pf in all its flavors (traffic shaping, carp etc).
- Configuring a centralized authentication system based on a central BSD server.
- Configuring routing, configuring OpenBGPd (which will be on all platforms eventually), same for ospfd.
- Building kernel source, reading kernel source, reading userland source.
- Troubleshooting/understand behavior through documentation and source code, more troubleshooting.
- Configuring the development environment: libraries, compilers, make, cvs, etc.
- Developing BSD (writing style, quality of code, etc).
- Explaining basic concepts to others.
- Configuring BSD systems for special purpose.
- Authentication, authorization and encryption services.
- Monitoring and accounting services.
- Customization of BSD distributions, ports, packages etc.

- Network interactions, and multi-system vulnerability views (weakest link, and discovered interactions).
- Properly limiting routing with many VPN gateways -- SSL and IPsec.
- When RFC1918s collide.
- Deliberate network segmentation by routing and firewalling.
- Managing licenses across virtual sandboxes extended to remote clients.
- Evaluating a system -- is it FULLY set up? Where do you have to look? (Hint, how many systems ignore RFC1912 section 2.1 in setups; how many encounter serious network slowdowns due to entropy exhaustion?)
- Running BSD on non-Intel platforms.
- I think that besides configuring and securing, there should also be a section on good practices.
- I would like to see specific content on troubleshooting - including the meaning of various system error messages and those of common software packages such as Apache, SAMBA, BIND, etc.
- Integrating BSD into existing Windows and/or Mac infrastructure.
- IPv6.
- Maybe basic C skills.
- Setting up BSD systems, building systems and kernels from src and systems planning.
- Sr Admins are required to know wonderful things like budgets, TCO, manpower requirements.
- System patching and update/upgrade.
- The securing track would do well to have some basic forensic questions. Like how to properly document a security event and how to not hinder a forensic investigation if one is needed (preserving the chain of custody).
- More Advanced topics, such as kernel debugging, managing and/or contributing to ports and src and what that requires.
- Networks and Systems Administration Principles. When you adhere to these, differences between various systems are irrelevant: you actually can make (almost) any system work.
- LAN servers: file servers, print servers, auth servers, boot, etc.
- I would suggest: Network Appliance (Router, Bridge, Firewall, Sniffer).

- The repair of a corrupted system.
- Firewalls, traffic shaping, bridging.
- TCP/IP.
- Device driver development.

Regarding Internet Services:

- Configuring a multitude of Internet servers and securing them is probably the most important quality for employment.
- Configuring Internet Servers doesn't have much to do with BSD ... it's pretty much the same anywhere.
- Configuring Internet Servers: is that really BSD-specific enough to warrant a separate track?
- Configuring services isn't that much different on a BSD system. If someone administered Apache, MySQL, and PHP on a debian box, moving them over to FreeBSD doesn't require them relearning their service/application specific skills. Keep it concise, focused, and rigorous.
- Mail should be a whole other cert IMHO and should not be lumped in with other network/web install/mgmt.
- Clearly, BSDs are a central OS of the backend world, and that's where the focus should be: on the services provided from there. Securing should be part of the whole scheme anyway.
- Setting up Internet Services can be very generic, and not at all specific to BSD. Though the ability to admin basic services is critical, try to avoid getting too broad.

Regarding Desktops:

- Administering a BSD desktop is no different than any other X11 desktop.
- Administering desktops is probably the least important.
- You must be joking on desktops, unless the goal of this cert is to battle Win32, Linux and OS X in that arena, which is laughable.
- Desktop support seems a bit specialized...I'd rather see the sysadmin cert

concentrate on administration of servers.

- Desktops are a thing that could make BSD more widely known. But I think they play a minor role in system-administration.
- Desktop BSD might be a bit of a stretch, but I can see it.
- I'm only putting in configuring desktops because of the new arrival of PCBSD (<http://www.pcbsd.com>) which seems to make it a bit more of a possibility.
- In Corporate environments the BSDs primary function is as a server, not desktops. Hopefully in the future this will change but until that happens I would leave administering BSD desktops out of the exam process.
- X and desktops should be minimal or even not in the certification process.
- For BSD Desktops one should agree on a WM or give options and/or offer several examinations for different stages or topic areas.
- The BSD desktop item is less useful, as the only BSD desktops we run are MacOS X. Some specifics to interoperating OS X to a Unix environment would be very helpful.
- to "BSD Desktops": cover X but don't cover e-Mail Clients.

Regarding Advocacy:

- Advocacy, history, etc. should be left to the user community at large.
- Advocate something if you feel it truly holds a value that none other represents, or if you want to. This should never be part of the training. History and documentation should be concise at the very beginning and documentation should be reviewed with an expansion on the importance at the end.
- Advocating BSD (history, release engineering process, documentation) Huh?? What's that have to do with using it? Leave advocacy up to the users and BSD groups.
- Advocating BSD is a good point, for that I would also cover things like the real free license (yes, that legalese stuff ;-)) and the Unix-BSD settlement, so that students can respond to the legal FUD Microsoft, SCO and others try to use to frighten businesses away from free software / Open Source.
- Assuming these certs are to aid employers and win the respect of one's peers, advocacy has little value. Though I would love to see an exam for

documentation--still, that opens up another can of worms, docs for the experienced or for the newcomer?

- Politics and advocacy should be left out of the certification process whenever possible.
- BSD advocacy and desktops are just for discussion and eye-candy, and should be left out. However, classical BSD history and its roots, such as knowing who ken thompson is, the foundations of net and FreeBSD, and what the B in BSD is all about should be tested on. These questions should also be at the very beginning of tests to ease test anxiety. "What does B in BSD stand for?".. what a relaxer for somebody with test anxiety. I do not think the amount of history questions should exceed three or four, however.
- Advocacy? No way.
- Advocating: Um... while I find that personally nice, I don't think there'll be any demand for them. Who wants a certified BSD advocate?
- BSD Advocacy is a noble cause, but I'm not sure it belongs in a certification. BSD* are good anyway, and users (admins) typically don't need coaching to do this.

General Comments:

- Certifications should focus on developing BSD presence in commercial companies and competing with Windows nests (primary objective) and Linux nests (secondary objective).
- Evaluation of manual page competency should be tested. Manual pages are very good on BSD systems, and should always be consulted by administrators when working on a task that is documented. "Which manual section covers C libraries?", How to search manual pages, etc.
- Yes, all these things should be tested, but a certificate with only one of these headings would be worthless. Both if I want to get hired or hire someone, I want to know how good the knowledge foundation is ... it's easy to specialize at the work place. I wish for a certificate that tells how good and fast I can adapt to the very individual environment of my future employer.
- For the cert to be valuable to an advanced admin it must be comprehensive. Avoid the MCSE reputation at all costs.

- It's important to separate basic skills -- execution of tasks -- from deep understanding -- not necessarily ability to execute, but understanding the concepts involved.
- None of those are proper in my mind. Certification should apply to all of these things as one, not as separate certifications. Someone using Unix must be able to understand its history and how it works now and in the past. They must be able to configure anything thrown their way using manual pages, they must be able to secure a system and tell people why it is better to use the system they are suggesting in a manner the people can understand. All these things together, not apart, make for a proper administrator.
- Eventually dedicated exam modules, - administrating thin clients with XDM - third parity projects like OpenLDAP - pkgsrc bulks and build boxes - etc.
- Perhaps one or more certifications/certification topics with a specific focus on one particular BSD variant -- for example, implementing firewall/gateway failover with OpenBSD and PF/CARP, server administration on FreeBSD, etc. could be possible?
- This gets complicated if you're doing tracks for both topic areas and BSD platforms. I strongly feel someone with 10 years administering FreeBSD systems shouldn't be penalized if they don't know how to derive the meaning of load 10.0 on a NetBSD system.
- Securing BSD systems seems to fall under more advanced BSD administration, really. I would like to see something like: --BSD developer (for hackers and those that understand the architecture of the OS, how to write for the OS, the kernel, etc.) --BSD network security (for those that specialize in firewalls, IDS, proxies, IPSec, etc., while testing knowledge of other network services/servers like DNS, web, and ftp and how to make them more secure) --BSD advanced system administrator (for those that can set up enterprise class solutions--CVS repositories, custom ISO images, cfengine backends, ultra-lean kernels, etc.)
- I think that the evangelism should find its place as a basic spot in all the examinations.
- All these examination are important.
- All these areas of knowledge must be contained in the process of certification. For areas you specify (security, network protocols etc), can be developed as deeper level certifications from which you can choose.
- The teaching material should cover each aspect, but the certification will only test portions.

3.2.5 General or Specific Knowledge

Question 241 asked how focused an exam for experienced administrators should be regarding specific products (Apache, BIND, etc.).

The largest group indicated that, rather than focusing on specific products, the exam should test knowledge of concepts applicable to any product.

Many comments were received regarding this question.

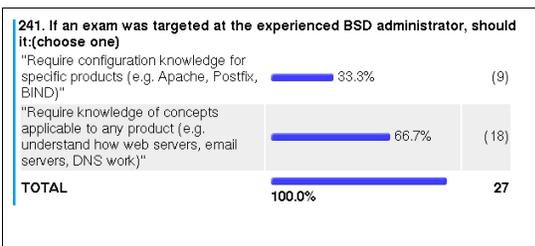
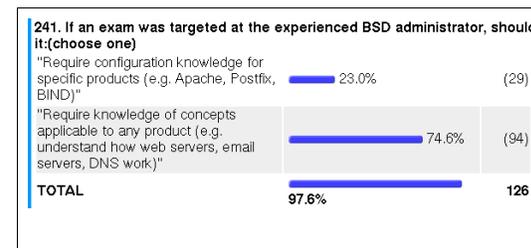
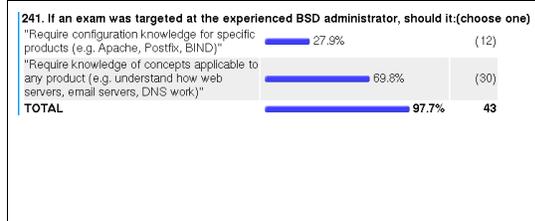
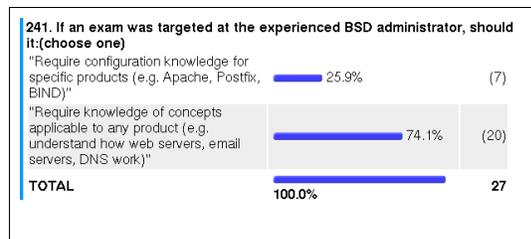
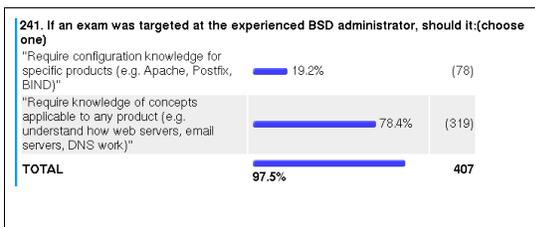
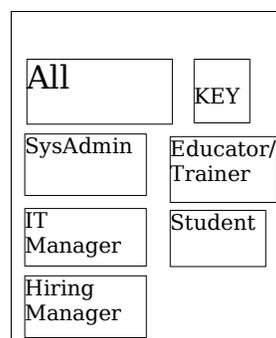
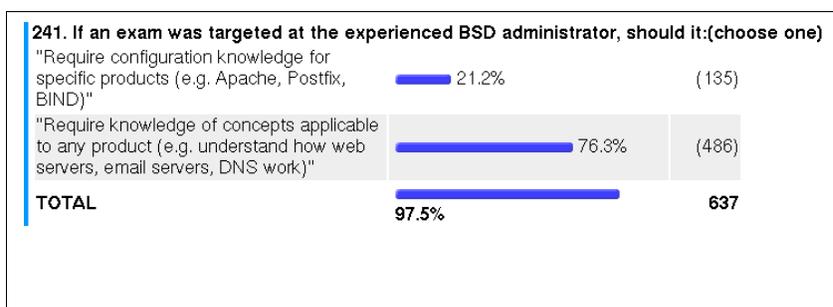


Table 3-12: charts the results across each language. Responders were required to choose only one response from two possible scenarios.

- A Require configuration knowledge for specific products (e.g. Apache, Postfix, BIND)
- B Require knowledge of concepts applicable to any product (e.g. understand how web servers, email servers, DNS work)

Table 3-12 Should Knowledge Required be General or Specific to a Product?

| | A | B |
|------------|---------------|---------------|
| Chinese | 23.20% | 75.80% |
| Dutch | 20.00% | 80.00% |
| English | 20.90% | 76.60% |
| French | 20.70% | 72.40% |
| German | 50.00% | 50.00% |
| Polish | 100.00% | - |
| Portuguese | 10.30% | 86.20% |
| Russian | - | 100.00% |
| Spanish | 20.00% | 73.30% |
| | 21.20% | 76.30% |

Comments included pros and cons for each response, as well as why an exam should include a mix of both.

Specific Knowledge:

- A BSD certification should not show competence in third-party products. If there is a need for webmaster certification, a platform independent one should be designed.
- Although it's nice to get some hands-on experience with specific products, administrators should be able to configure alternative products if they offer features that they want to use. Therefore, it's better to have some

generic knowledge about Internet services.

- An experienced administrator should know their favorite product well, and know why they don't like other products. This implies SOME knowledge of specific products, but perhaps not down to nitty gritty configuration details.
- Apache, Sendmail, BIND.
- BSD is an OS, not an app. How would testing knowledge of BIND (for example) determine knowledge of BSD?
- I don't think specific knowledge is required. As then flamewars will ensue about postfix vs. qmail vs. exim vs. sendmail. Apache however is a good target to cover. Bind is not such a good target, considering the fact that there are many replacements out there that do a better job.
- I hate vendor specific questions. It's important to test that the testee knows the concepts. Specific configuration knowledge is easy to look up via Manpages or google. Who cares if someone knows every switch that `ls` can use. It's more important for someone to know what ls does, and how it does it.
- I prefer specific hands-on things over concepts although both are necessary.
- I would like to see specific content on troubleshooting - including the meaning of various system error messages (such as "what it means when the RAID controller says 'BLAH' and then expires in an untimely fashion.").
- If it was to focus on specific products it should only focus on products that are used across the board on BSD, like bind and apache for example.
- Knowing how to configure the well known products is definitely useful.
- Knowledge of apache is probably a must, but postfix has big competition from sendmail, qmail, exim etc.
- Knowledge of specific apps are not limited to BSD. Linux admins face the same issues.
- MTA, pop3, IMAP, DNS, DHCP, Web, (PHP), MySql and co are essential, in my opinion.
- One would have to assume that general knowledge is in place already.
- Probably cover the standard products that come packaged with the distribution CDs.
- Products can produce their own qualification tests that are (in many cases)

cross-OS-flavor. Definitely, limiting to individual products is a bad idea. Tying to Sendmail for someone who has worked in Postfix since its start, or vice versa, someone who used Sendmail v6 but hasn't looked at it since 8.8.6 isn't going to show BSD skills, and more important, isn't going to discredit their skills and knowledge.

- Should sanity check that the candidate knows something about specific products, such as apache. The exam should cover configuration specifics of products that are bundled by default, like sendmail.
- Specific products come & go.
- Specific products is nice as a bonus question.
- I think an exam geared toward the experienced BSD administrator should focus on the products used by the widest BSD audience, e.g., HTTP=Apache, Mail=Postfix and /or Sendmail, DNS=BIND, Firewall=PF and/or IPFW..etc. Perform research on current trends and change exam as necessary.
- There are so many ways to set up some services (mail for example) that it would be impossible to judge the real-world performance of an individual if particular applications are focused on.
- There is such a wide variety of products for performing the same task and those standing for certification may have experience with only one or two products. It is more important that an administrator know how to think about systems than to know specific software.
- Third-party products are frequently introduced before exams get updated; targeting a particular product could make an exam obsolete.
- Asking syntax questions specific to particular programs (apache, postfix, bind) would only be good if it was to the base system ones. Otherwise it should be generic.
- If the user is truly an experienced user, he should be able to use his experience with similar products to quickly learn the particulars of a new product. Moreover, specific products change. The exam would need to constantly be updated to remain relevant to the industry -- not as efficient as testing conceptual knowledge.
- If you are a master of one web server, you will easily master others. If you are familiar ONLY with generic concepts, then you are not a real administrator. So you should cover one product (e.g. Apache, Bind, etc.) and cover it very thoroughly.
- To conform to a specific software would be contrary with the idea that one

must be at ease with various products. Ex: Apache is very much used but at times is little adapted to such a task, thus it is necessary to include/understand operation.

Conceptual Knowledge:

- Required knowledge of any specific product will kill the whole point of the certification. It is always more appropriate to teach theory than application.
- Engineering approach is better I think.
- A good admin knows the concepts and can adapt them to any software.
- An experienced BSD administrator should know how protocols and services work (those which he/she uses), and which one he/she selects to use is his/her choice, considering background knowledge and experience.
- Anyone can remember how acronyms fit together- knowing how something works gives the cert long-lasting value.
- Conceptual understanding is far more important than knowing what entry to make in a config file. Product specific knowledge IS important but there are other facilities to learn and understand them. What use is a certified BSD-Postfix admin if they don't understand the difference between an smtp client and smtp server ?
- Don't lock the exam to specific products. It's more important to understand what a forward lookup zone is than to remember the BIND syntax for defining one.
- Everybody has his or her favorite app. As long as you know how to make it work, generic concepts are all that you need.
- Give a man a fish; you have fed him for today. Teach a man to fish; and you have fed him for a lifetime.
- I may be experienced with say sendmail, and not postfix, that doesn't mean I can't set up an email server, and be familiar with SMTP as a protocol.
- I think knowing the basics and knowing how to fill in the gaps by finding and using documentation is very important.
- I think more people know the basics of specific products. Teach the users about the things that apache, postfix, bind, etc. actually DO.
- Knowing how it works is enough. Google makes it possible for specific

information to be found--knowledge of the principle mechanisms is what is most important.

- Once basic concepts are understood, ways of finding solutions for different tasks can be found by reading documentation on specific products or asking in newsgroups.
- Software products change very rapidly, so 'concept' exams are more objective.
- That's a tough one. I would expect an experienced BSD administrator to know both how the protocol/service works at a deep level AND how to configure the more popular daemons. I guess if I had to choose between the two, it'd be concepts; since a choice of software is fluid, but concepts die hard.
- The basic knowledge is much more important. Maybe for services where there is one leading Open Source product (Apache for http, BIND for DNS) it might be useful to have a look at its configuration, but for others like MTAs (Postfix, Sendmail, Qmail, Exim...), Databases (Postgres, MySQL...) you understand the concept and that's it.
- The concepts always are more important than the details. Without a solid grasp of the conceptual you are a blind man with a screwdriver, turning a screw for a reason you don't fully understand.
- The knowledge should be applicable to many products, but a few notions about pitfalls in specific products would be nice.
- Unless we are going to have our little share of flames about why the cert test's you on postfix and not qmail or sendmail and so on.....i think we dont have a choice.
- Learning based on knowledge about net/system services (how it must work). Specific products must be additional.
- This is a very tough question. Many of the servers listed are standard and should be known. However, specific and detailed knowledge of non-core applications shouldn't be required (I really dislike this feature about the RedHat cert for instance.) An experienced admin will have the ability to research and set up any application out there via documentation as long as the general principles are understood. Specific servers should be used as good/bad examples of how the protocols are implemented rather than an end in themselves.
- When you don't configure some software every week, you don't remember how to do it, but you'll always know how it works and what to do to know.

- You can always learn specific products if you know how something works. Debugging a specific product when you don't know how it works underneath is harder.
- Requiring some product would be rather a constraint. Indeed, there are many software products which "do the same thing" but function differently in their approach of the problem. Plus the fact that learning specific configurations can be handicapping.
- I believe that once you know the concepts, the tools are simpler to use.
- For the examination they should know very specific knowledge with respect to protocols, rfcs, standards, etc.

Both:

- Excellent question. . . how about both? Start with the general concept, deal with the defaults, and go on to the alternates, just like any decent book does.
- I think concepts would be better but questions on the more popular software would be good.
- I feel that both of those would be viable, maybe an exam that requires knowledge of concepts, but specific products that are a the mainstays of industry (ie. apache, mysql, bind, pf, samba).
- I think it should imply both - general concepts and knowledge of the most common products, or there may be a choice of product from the class. Ex., can choose a mail server from the list: sendmail, postfix, exim, etc.
- I would like to see a mix of fifty fifty. In my opinion, background knowledge is equally important as about a specific product.
- I would think that you really need knowledge of server applications before you are going to have general concepts of how they work. It's not easy to test for that general knowledge if there isn't some specific knowledge first?
- It would be good to be product agnostic, but this is rarely practical. Understanding the fundamentals about how DNS, or HTTP works is far more beneficial to being able to add a VHOST to apache. But, at the same time, practical skill is key. I think it is difficult to find a balance.
- Obviously, both. I would say include conceptual questions, but require configuration skills for the most important implementations of those concepts (apache, postfix, BIND, maybe also sendmail, squirrelmail,

openssh, inetd).

- It's a question of "reading the README/INSTALL file" vs. understanding concepts/procedures, really. There is often a lot more to installing a web server than 'pkg_add apache' as well -- e.g. sizing/selecting the hardware, evaluating the needs (and users) of the environment, 7x24 production vs. development/test, etc. Being a sysadmin is as much about understanding what/who you support as it is about the technical details.
- A bit of both would be perfect.
- A large portion of questions should be general knowledge, however, specific questions about bind, apache, sendmail, etc. should be in there. BSD admins should be able to work with traditional products, regardless of their preference. You should at least know the location of named.conf and sendmail.cf.
- But of course such a conceptual exam must include hands-on section using default system tools or user-chosen when no default tools exists. Such exam must not be considered as Apache, BIND, etc. specific.
- To require both the knowledge of concepts and habits of tuning concrete products.
- Once concepts are understood configuration can usually be done without to many mishaps. But you might want to make that a two part exam, one conceptual the other hands on.
- People can teach the monkey to configure apache or BIND, but not understand this. Experienced administrators must have knowledge in various services and server technologies and understand what he(she) is doing. But some specific products(de facto in BSD systems - like BIND, Apache, Samba) - you can certify.
- Require knowledge of the general approach, and learn how several applications realize them.

General Comments:

- Administrators should be free to choose their product in the event that a certification 'process question' arises such as 'install and configure a web server to do ...'
- General, and perhaps allow for them to give answers specific to any given app in their experience. If it were for specific apps, it should not be biased and should allow for individual backgrounds. That is, it should cover none

or all... probably all is better. A harder exam, but in which a "pass" is a lower "mark" is always more informative.

- If the certification exam has a practice step we should not enforce any MTA or HTTP server. The task should be: install an MTA with this setup, aliases, filters, etc. or install one HTTP server with support to an SQL RDBMS and two scripting languages. Each certification candidate could choose the MTA. I think the goal to check is: is the task done?
- Advanced certification should target what makes BSD really powerful in the real world.
- I guess every one like to use his own set of tools. I think it is more important to give some tools to do the work the way he wants than to give him a kind of IKEA thing to build.
- Maybe a 'middle' line would be better: e.g. "Require knowledge of how products such as Apache, Postfix) get typically installed in a BSD environment (i.e. typical directory layouts, control mechanisms (rc.d)" etc.
- This is after all a BSD certification exam, by understanding BSD specific products it will imply the ability to grasp other applicable products.
- Requiring specific knowledge across all BSD's when the BSD's ship with differing products by default will be difficult without an Exam for a Specific BSD OS.
- Too specific stuff is very Linux-ish in nature (HOWTOs rather than FAQs and (up-to-date) man pages etc), but I feel there should be some specifics as well, however I cannot say which areas they should be in. The BSDs are similar enough to easily switch between them, but different enough that specifics for one doesn't necessarily apply on the next. Then again, knowing the basics will better adapt an admin to work on any Unix-like operating system, whereas knowing specifically how to set up Apache and Postfix on XBSD really only allows you to do those tasks on *BSD.
- Certification must prove more than one level of knowledge BSD and more than just thorough knowledge of the various handbooks. It must testify that somebody who obtained it is able to manage with the tools provided.
- You've got 4 flavours of BSD. Multiple flavours of DNS servers, SMTP servers, IMAP/POP servers, database servers. etc. No one learns them all or cares to. Stick with the default services and tools the operating system comes with. Perhaps mention alternatives, perhaps cover some selected ones (postfix vs. sendmail for mail). Make the exam like the RedHat CE one: task rather than tool oriented, so the candidate who is running a small ISP with postfix can choose that to solve the problem, and the crusty old

dinosaur who writes sendmail.cf in the raw can do that.

- Ok, so you're willing to examine for third party software also. Good -- but as exam modules. Most important is that the sysadmin masters effectively his chosen tools. We really can't include Apache nor Postfix in the base exam.
- It would be much more beneficial to demand proficiency in tuning and resolution of problems than to demand knowledge of 3rd-party applications.
- One certification does not convince me that the person certified possesses the knowledge that I want in BSD systems.

3.2.6 Testing Methodology

Question 243 focused on the kind of exams desired.

Consistent with the response from Question 239, the largest group favored a 'hands on' virtual lab in addition to form-based questions. Within the IT managers+Hiring managers groups, the results remained high for this selection. Comments were again voluminous.

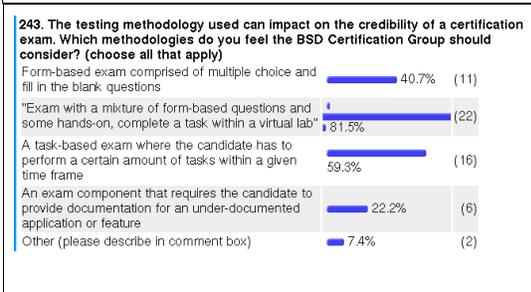
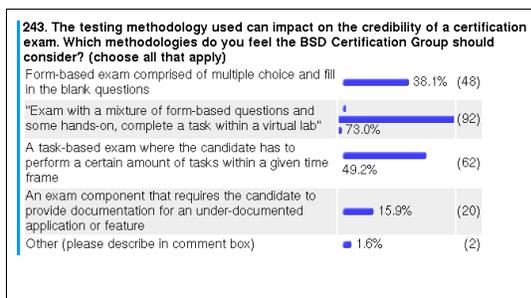
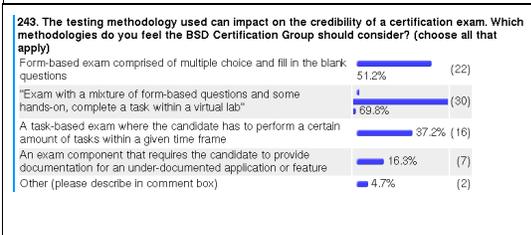
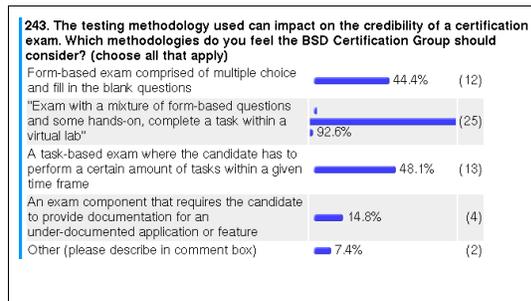
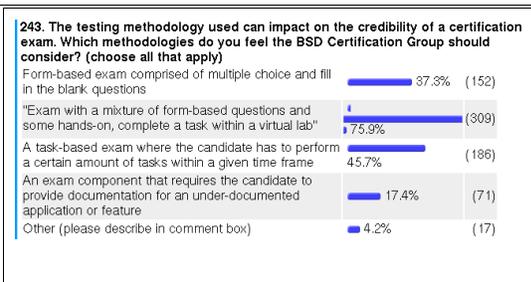
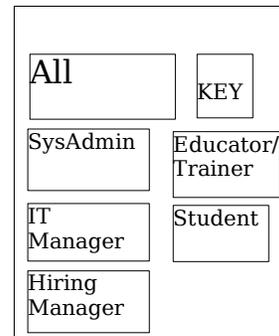
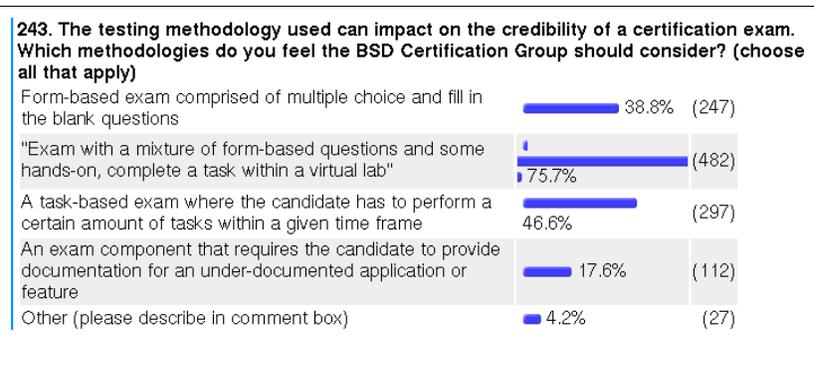


Table 3-13 charts these possible responses across the various languages.

- A Form-based exam comprised of multiple choice and fill in the blank questions
- B Exam with a mixture of form-based questions and some hands-on, complete a task within a virtual lab
- C A task-based exam where the candidate has to perform a certain amount of tasks within a given time frame
- D An exam component that requires the candidate to provide documentation for an under-documented application or feature
- E Other

Table 3-13 Possible Testing Methodologies

| | A | B | C | D | E |
|---------------|---------------|---------------|---------------|---------------|--------------|
| Chinese | 43.40% | 72.70% | 57.60% | 20.20% | 7.10% |
| Dutch | 60.00% | 100.00% | - | - | - |
| English | 35.60% | 75.90% | 46.40% | 18.50% | 4.10% |
| French | 48.30% | 72.40% | 31.00% | 6.90% | - |
| German | 50.00% | 90.00% | 50.00% | - | - |
| Polish | 100.00% | 100.00% | - | - | - |
| Portuguese | 44.80% | 86.20% | 44.80% | 17.20% | 3.40% |
| Russian | 60.00% | 40.00% | 60.00% | 40.00% | 20.00% |
| Spanish | 46.70% | 66.70% | 26.70% | 6.70% | - |
| Total: | 38.80% | 75.70% | 46.60% | 17.60% | 4.20% |

The comments regarding the pros and cons of each methodology have been categorized as follows:

Form Based:

- An approach based purely on the first option shouldn't be worth anything more than an entry-level exam.

- Don't let anyone get through by learning multiple choice questions by heart.
- I really do NOT like certain fill in the blanks due to the possibility of spelling errors with users, different methods that people utilize.
- I would recommend a form-based multiple choice exam where the candidate has to select a certain amount of answers within a given time frame and answer with a minimum of 60% accuracy or better in order to pass. I would make the exam pass or fail and would regularly rotate the exam questions.
- Fill-in-blank are subject to terminology differences which either are insufficient, or exceed the question writer's skills. Multiple-guess tests are the bane of modern education.
- Monkey (multiple) choice is great for some stuff - but there's always multiple ways to accomplish a task on BSD. Monkey choice can't test situations where multiple answers could be right.
- Multiple choice doesn't work, at least not beyond the novice stage.
- Multiple choice is the standard in the industry.
- No multiple choice, I consider these tests worthless.
- Proctored exam with multiple choice and fill in the blank questions.
- I believe that many times despite the qualification of the candidate, he happens to forget definitive details--thus multiple choice and fill in the blank questions would help in the performance.

Mixture:

- A two-part exam would be nice - one for testing theoretical knowledge, and a practical test for measuring the efficiency and applicability of the knowledge, preferably on a real (not virtual) lab setup.
- Almost all exams that don't have a practical component are widely regarded as useless as too many people just cram facts without being able to actually show they can do anything.
- I believe that the most valuable certifications in IT are hybrid exams (Q&A and tasks) plus a written contribution and some lab time. For example, "please write 10 pages on how a BSD system can be deployed to improve regulatory compliance" or "Please submit 10 pages on using BSD in e-

commerce" and give the exam taker a choice of two or so topics, and if they decide to make their own topic, make it 15 pages or something similar. Then put their paper into practice in a lab environment. Although this may be extremely difficult, it should make the certification extremely valuable.

- Mixed form-based and practical approach is best IMHO. The use of jails should be considered for this. It should be cost effective, users can perform the practical from home (or a test center like prometric, VUE, or whoever).
- Perhaps the exam should be 50% form-based and 50% lab, with more advanced labs having time requirements, more advanced certifications could re-test old labs with a shorter time frame, to see if the person has improved and can keep up with the pace. Early tests should not put such a stringent time requirement.
- Paraphrased from one of my RedHat course manuals "students able to pass multiple choice exams with 90% or higher could still fail the practical lab-based exam with a score of 40% or lower"
- Some entry-level multiple choice form can be used for filtering. Second tier should be some automated hands-on labs with time limits, and third tier free-form questions.
- The second option is interesting especially when refers to "some hands-on, complete task within a virtual lab". I haven't marked it because I am concerned about the worldwide availability of the required testing lab. In my opinion, it would restrict certification availability in some locations and it would not be fair.
- The test must be a mixture of hands on, written answers and direct oral testing. Those performing the tests must be able to think on their feet and be able to respond to difficult situations under pressure. If a person has a hard time fixing a corrupt RAID array while an observer is present, they would be even worse off with an employer there when the situation is real.
- I like the mix of hands on and forms.
- Well, I've written a dozen Cisco exams. They have: - Multiple choice, one answer - Multiple choice, multiple answers - Fill in the blanks - Drag and Drops - Router Simulation questions.
- Mix of: - written (multiple choice) test for background knowledge - several hands-on tasks - a troubleshooting task (e.g. a failing service) and documentation of resolution of the troubleshooting task (how it's done).
- The entry level exam should consist of a written part and a practical part.
- A QCM (multiple choice questionnaire) for basic certification so that a

maximum of the world can validate their assets. - more complete questions/exams for the higher levels.

- QCM, as it is simple to correct and the certification gives a rather good vision of the level of expertise. And a lab to test how the user manages in a real environment.
- An examination mix of multiple choice questions with practical tasks in laboratory would be ideal.

Lab Based:

- A virtual lab would be ideal, but is not cost effective, and will limit the locations at which testing is done.
- Completing (difficult) tasks within a reasonable amount of time is essential for any good admin.
- An exam based purely on tasks in a limited time frame could not test a sufficient amount of material.
- Hands-on is an absolute must, I believe.
- Any hands-on testing should require an emulator of some kind, so that the test taker has complete access to a functioning system. There are many tools and processes to solve any give sysadmin task, and the test should judge only whether the mission was accomplished, not whether the test taker followed a predefined set of steps and used the tools the tester would have chosen.
- As much as I would like the lab scenario, I think the cost and effort would be prohibitive in terms of cost/benefit as compared to a multiple choice and documentation-based exam.
- I'd like to see the virtual lab be some kind of "broken setup" rather than "setup a user". I see too many with book smarts...I'd rather test the application of knowledge, rather than the knowledge itself.
- I'd throw in that for a lab-based exam, a few uses of the man pages is actually a good thing- (kind of like a gameshow or something, you only get 2 looks at the man pages in the next 3- minutes, etc...) It rewards thinking through a problem, instead of memorizing what one will forget if they just learn to pass the cert.
- Task-based exams are appropriate for more advanced subjects.

- Task-based exam must be prepared and based on BSD (OpenBSD, FreeBSD, NetBSD) with which candidate is familiar.
- The "task based exam" seems nice for a third, "guru level" exam, but needs more than one attempt for students to get right. I had that in my Virtual Unix Lab that students did a course several times to get the hang of it.
- The amount of hands-on tasks should be increased as the exams become more advanced or specialized. This would lend itself to being able to be administered more easily for the lower end exams, while the advanced could be presented at large gatherings such as BSDCan and the O'Reilly Open Source conventions.
- The most respected certs all seem to require a hands-on test. However, the cost can often be prohibitive (e.g., the RHCE exams). Still, written tests will, no doubt, generate brain dumps and lose value.
- The Cisco Lab approach is good for weeding out the crammers. In order to TRULY KNOW that an administrator is able to ADMINISTER you need to present them with a situation and have them fix it. How long it takes shouldn't matter (within reason)... and google and documentation should be provided.
- An exam component that requires the candidate to write a small and useful program for a practical task. The language used should be the candidate's choice (but Ruby, Python, shell scripts and [sigh] Perl come to mind).
- Performing tasks in a given amount of time... no, not really. That is not a true test of ability, and timing jobs is going to net you a lot of sloppy mistakes.
- I think it is important to have real world conditions. There is no need whatsoever to memorize all possible switches to "ls". There's a man page for that and students should be able to use it during the exam for that's the way they will do later. If you don't know it, know where to look for it!
- A virtual laboratory requires the candidate to prove his knowledge in the practical. Theory is very important, but practical is essential.

Documentation:

- For an under-documented app or feature to be documented, sources should be provided. Humans don't have great memories and should be given opportunity to show their expertise despite poor memory.

- Good system administrators do not necessarily need to be good writers. Again, leave the documentation out of the certification exam.
- I especially like the idea of requiring a contribution to BSD for certification. But maybe it shouldn't be restricted to documentation. Bug fixes, some kinds of advocacy, etc could server the same purpose. To improve the BSDs through participation. But this could be as much work to manage as all the rest of the certification process.
- I like these! The document an under-documented feature is fantastic, though I'm not quite sure it would work forever. Assuming a track approach, I think the exams should become progressively more "lab-based", take longer, and maybe require the examinee to become involved in one sort of project or another. I'm thinking along the lines of SANS/GIAC. A pure paper cert, even as an intro qualification, seems to me to be lacking in potential. Providing "lab" work will be logistically more difficult but more valuable to the participants in the end.
- I really like the idea of asking people to provide material for under-documented applications or features. IMO, the very best way to learn a subject is to have to teach it, just like learning to read a new language is much more difficult than learning to speak it. So let's ask them to speak, and find out how much they really learned.
- Preparation of a whitepaper for a process or explanation. I consider this a different case than "providing documentation for an under-documented.." but the two may converge.
- The documentation component should be used for higher level exams.
- The fourth option was one I hadn't heard of before, but which makes a lot of sense.
- The highest levels of certification should require a contribution (similar to the way Doctorate degrees are done). Something like "to get certified as a FreeBSD Expert, you need to make an approved contribution to the FreeBSD project" But one level below that would require all the testing, minus the contribution.
- While documenting a poorly documented program is laudable, it is irrelevant for this kind of a situation.
- There should be a component of BSD system presentation (similar to the advocacy mentioned previously). I do not think advocacy should be an exam in and of itself but it should be covered from a "how to get businesses to utilize BSD" within the standard certification.

- For this to be useful, the resulting documentation must be of high quality.

General Comments and Other Suggestions:

- There should be multiple levels of certification. At the most basic a form based exam is probably sufficient. An advanced certification might require a task based solution.
- Short answer for writing one-line sh commands and so on should be there.
- BSD admins should be elite problem solvers.
- Certification should be short & straightforward to ensure that all people have a reasonable base. it should also be available to disabled/disadvantaged people.
- I know that someone is good in one type of test, another one in other...
- I like what you guys are trying to do - long overdue IMHO. What we need is the BSD equivalent of CCIE - prove your theoretical knowledge and prove you can really apply it.
- If it is a qualification-and-skills test, performance at lower levels, and use of knowledge at higher levels. -- sacrificing useful knowledge for memorization, and encouraging test leakage. Timing is yet another questionable feature. We have the technology to allow for interrupted non-dedicated testing time, for a given individual. Timing might count as A data point, but it needs to not be THE limiting factor. Someone that scores 100% accuracy in an hour may be quite better at his or her job than one who scores 98% in fifteen minutes on the same task, where a crucial error exists within that 2% of error. Most things end up with a "works/doesn't work", in real life. Also, adaptability is something you have not (seemingly) addressed. Someone who can pick up a Linux box, a FreeBSD or DragonFly BSD, shift to OpenBSD or NetBSD, and back has a more complete skillset than one who can "answer all the right questions" for all of them, or for one of them.
- In day to day admin tasks we have full access to manuals, tutorials, web sites etc. The imposition of a time limit for the certification shouldn't happen, but some timed tasks within the certification could be beneficial to test candidates under pressure. The virtual lab idea is great as access to real labs world wide is a problem.
- Make the exam like the RedHat CE one: task rather than tool oriented, so

the candidate can choose the tool for the task.

- More objective methodologies than the mixture would be great, but I think it would be too expensive.
- Perform tasks AND provide something to the community (bsd-licensed documentation or software).
- Recalling earlier comments about the value of certification, it might further be observed that testing/exams are unlikely to be a sure-fire way of evaluating system/network admins. E.g. some of the best admins have no degree at all, to say nothing of a degree in Computer Science, Math, or E.E. That said, a C.S. (et al) degree may open doors with HR recruiters which a non-degreed candidate couldn't access. The same might be true of BSD certification eventually.
- Testing is good but it's not so clear the best way to test and give some task together.
- The basic exam should involve mostly multiple choice with some free-flow areas for questions that don't fit an "a, b, c, or d" answer. The more advanced things should be all "show your work" term-paper style, but with with a lot of time to answer (read: months).
- The exam should not necessarily be time based (within reason.) As a former teacher, I know that some people can perform tasks, but can't relate knowledge that they do have if under too stringent time constraints.
- For the maximum popularization of certification it is necessary to use computer testing, correspondingly, it is better then to use Prometric/Vue. But qualitative results can only be given by oral test with the possibility of thorough answers and control questions. I speak on the basis of many years of experience of testing candidates and as the creator of oral tests and by carrying out more than hundred interviews from 1999 through 2005 (and as a certified specialist on Solaris and Cisco).
- QCM (multiple choice questionnaire) with the possibility of letting (on all or at least on certain questions) the candidate comment on his experience on his BSD to answer the question. It is closer to reality: one does not acquire knowledge in situations without experimentation.
- Test should be a mixture of: multiple choice, hands on (monitor a mail server, a web server) and a test with tasks requiring solution of problems.
- The three first alternatives would make the most complete certification possible, under my point of view.
- I believe that again they would have to focus on resolution of problems and search for the creative capacity to give simple ideas for complex tasks.

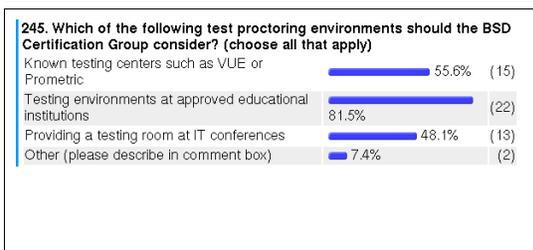
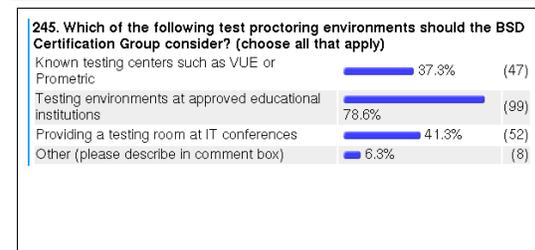
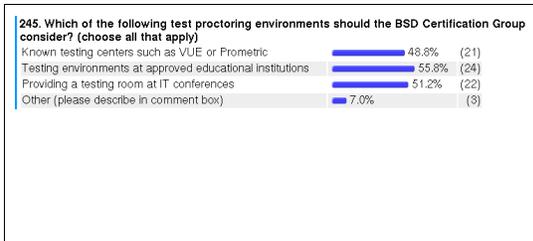
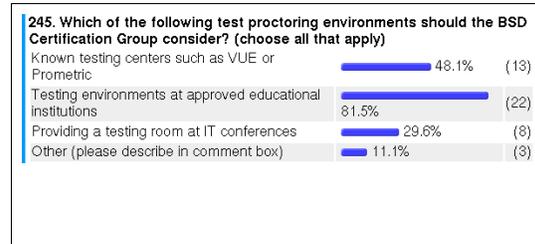
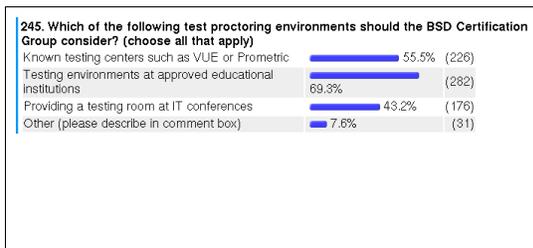
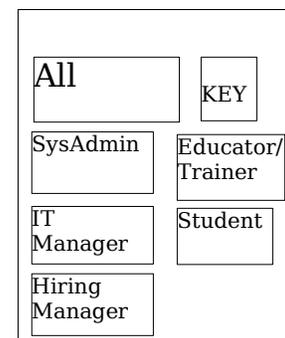
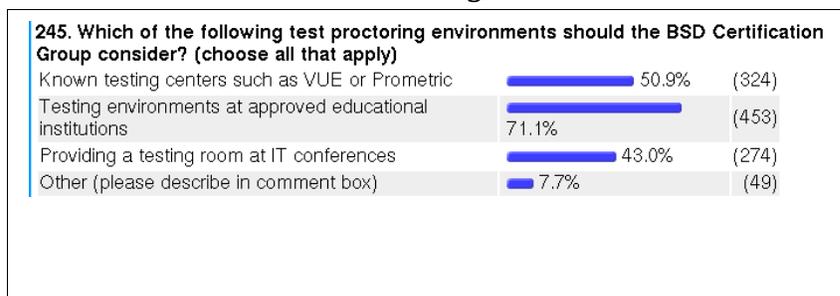
- It is necessary to evaluate the candidate with a second type of test. Producing a document with a case study can be a way. But it would discard the idea of virtual laboratory completely.
- Both theory and practice must be evaluated.
- If a candidate's speed is slow it does not necessarily show lack of knowledge and experience in BSD. Timed questions should fully consider any language difference.
- Test the question bank to have a balanced difficulty with questions renewed every year or every several years.
- The on-line test confidence level is not high.
- Testing foundation theory knowledge, with complex compound question processing is good.

3.2.7 Test Proctoring Environments

Question 245 focused on proctoring- a topic vital to the integrity of any testing environment.

The largest group preferred testing environments at approved educational institutions- which could make it much easier for candidates to find a local testing center. VUE and Prometric combined scored roughly even with a testing room at IT conferences. Hiring managers also strongly preferred educational institutions, with the other choices receiving solid ratings.

Comments continued their high volume.



Question 245 allowed responders to choose all that applied. Thus you'll see more than 100% in Table 3-14 for the following languages:

- A Known testing centers such as VUE or Prometric.
- B Testing environments at approved educational institutions.
- C Providing a testing room at IT conferences.
- D Other (please describe in comment box).

Table 3-14 Possible Test Proctoring Environments

| | A | B | C | D |
|---------------|---------------|---------------|---------------|--------------|
| Chinese | 44.40% | 70.70% | 16.20% | 3.00% |
| Dutch | 40.00% | 100.00% | 80.00% | - |
| English | 53.20% | 72.70% | 48.00% | 8.80% |
| French | 34.50% | 55.20% | 58.60% | 10.30% |
| German | 60.00% | 70.00% | 10.00% | - |
| Polish | - | 100.00% | - | - |
| Portuguese | 62.10% | 65.50% | 44.80% | 6.90% |
| Russian | 40.00% | 40.00% | 80.00% | 40.00% |
| Spanish | 40.00% | 66.70% | 40.00% | - |
| Total: | 50.90% | 71.10% | 43.00% | 7.70% |

Many responders felt that all of the possibilities had merits and should be considered. Particular comments for each option included:

VUE/Prometric:

- If you want legitimacy this is the only way to do it - unfortunately.
- DEFINITELY go with Prometric and THEN Vue. Prometric seems to have many more testing facilities than VUE by the way. If you do anything else,

that would be disastrous. Prometric and VUE are ACCESSIBLE.

- By all means, go with Prometric, as long as we're talking on-line testing.
- Test based exams for all the certifications should be done via VUE or Prometric.
- I have direct experience with Thomson-Prometric centers (I took Sun System Administrator certification and Sun Network Administrator certification there) and I have no complaints about their services and facilities.
- I'm happy with Prometric.
- The college I attend has VUE testing, and a great deal of promotion, advertisement, tutoring, and testing could be achieved all over the country without (I suspect) any cost to you.
- I always think of testing centers as being somewhat suspicious, but maybe that's just me.
- The problem with certifications at Prometric is that they are expensive, but in general, when one requires a certification it is often to seek employment, therefore a time when one has little money.
- VUE, Prometric and such organizations exist to make money, not certifications.

Approved Educational Centers:

- Educational institutions have more weight to certify real Unix experts.
- Expert level of knowledge should be tested in a lab environment at an approved education center.
- Far more credibility comes with being associated with accredited or recognized educational institutions.
- I think in order to gain validity and acceptance from Corporate institutions and Managers, these exams should only be made available by institutions that can guarantee a controlled/secure testing environment.
- I'd prefer the approved academic institutions solution.
- It MUST take place at an accredited (of some sort) institution... such as a university or reputable testing center.
- Using a recognised testing center would increase credibility for the

certification rather than just doing online testing like for instance BrainBench does.

- What is an "approved educational institution", and who determines that approval?
- Establish in several cities throughout the world (if possible of course), the places authorized to pass the test -- with universities or associations affiliated with the data-processing field.
- This environment is most available globally.
- Universities.

IT Conferences:

- Having people at conferences and universities is good for getting people who don't normally live in major metropolitan areas.
- I really don't want to travel overseas to IT conferences etc to sit the exams. So I really don't know how to implement this globally successfully.
- Having testing rooms at conferences does not sit well with me... just seems like a "Roadshow" Certification Exam..... like the roaming pyramid-schemers.
- Test room at IT conferences is a good idea!
- There is nothing wrong with providing "a testing room" at IT conferences. Whether it would justify its cost is a different question.

There were several other suggested options. Many responders raised the pros and cons associated with on-line testing:

Online Testing:

- An online testing environment would be good too. I for example live in the back woods, and can not always travel...
- Could be done on remote shell systems (root access using virtual machines e.g. Xen).
- SSH into a hosted lab environment.

- If possible without the need to be in a special place.
- Let the testing be done over the web, but with a time-limit.
- May be think of something for the guy in wheelchair in Alaska who cannot get to any testing center/approved educational institutions/IT conferences.
- Online web test? Suggest you investigate how the likes of Cisco, Sun, Redhat, et al handle their own testing/certification procedures.
- Over the Internet. Providing testing locations around the globe will be hard.
- I think that a multiple choice exam, even online, with a submitted documentation exam is the way to go. The documentation could be reviewed by a committee of some sort that could pass/fail exams.
- Web based examination would be helpful. Security would be an issue, though.
- Web based using a webcam for proctoring.
- What about people living outside of the USA/Canada ? 2 options: - Find a way to take the test online, with all the security measures considered. - Set up BSD certification centres in various countries.

There were also some alternate suggestions and general comments that apply to any chosen environment:

Other Suggestions and Comments:

- *BSD Educational Centers and commercial companies that use *BSD.
- A network of peer-proctored tests similar to the ARRL/VEC system. (<http://www.arrl.org/arrlvec/>)
- Certified proctors from the Unix Community. These would be especially necessary in places like Mexico or India, where all first 3 options are in short supply.
- Through a user group type of organization. Proctors from the ug's who have been certified (as BSD proctors) can agree to administer tests to candidates.
- Commercial entities with *BSD backgrounds could get involved?

- I think all three options should be available, but not if using VUE/prometric as this would require compromising the test to fit into a standard model.
- Have a number of persons allowed to perform the testing. It should be possible to let him come to our class and perform the certification - not only let the class come to him. ('Class' is perhaps only a single person in the text above. You get the gist).
- If some of the certification levels are completed with multiple parts (for example an electronic certification, a written, and a lab) each part can be done separately... It could increase the value of the certification and the profit of the certifiers.
- It's hard to prepare some building based structure world-wide. Maybe it's easier to get a handful of certified training organizations which will travel and (in institutes maybe) setup classes, trainings, and exams for week or somehow.
- Maybe let active committers point out a party in their country that could oversee the cert process in that region/country?
- Testing room at BSD user groups specific meetings.
- The virtual lab concept is an essential to leverage existing and future technology. There are very few software and configuration issues that are not "networkable", and with skillful emulations or virtually sandboxed test environments, there are NONE.
- There is currently a small number of available qualified individuals who could proctor the advanced/hands on tasks. With this in mind, I think that such a plan would avoid a tendency of geographic isolation, as candidates might have to travel to a specific city for the sole purpose of the exam. If the travel expense could be offset by additional value, such as a tie-in with a major conference it would be an easier sell to corporate management. And if those conferences were targeted at large diverse gatherings such as the OS conference it would also help raise awareness and build mind-share.
- If a test is significant, there WILL be attempts at fraud. Using physical presence to try to decrease that is a bad trade-off. There should be a method of de-certification, instead.
- As a Techie, I'd like to see tests "in" as many languages as makes sense, with comparable skill and knowledge demonstration in each. As an executive, it's CRUCIAL that I know that the person saying "yes" to me, and displaying a credential, even understands what I've asked. If the tests are in varied languages, the certifications should also be matching in those

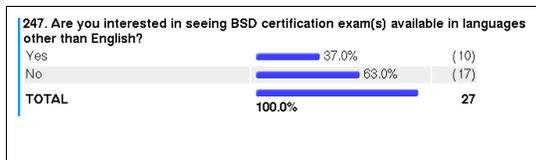
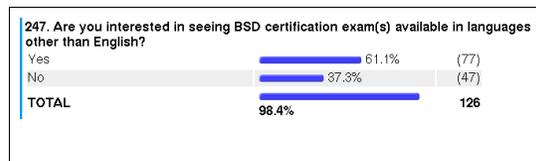
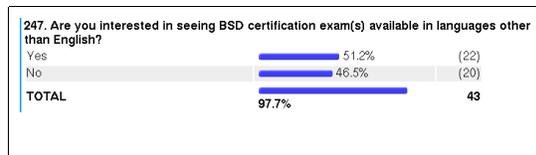
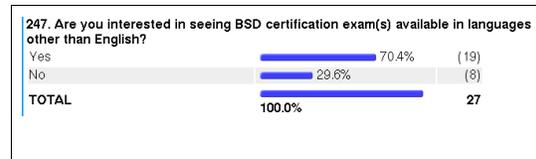
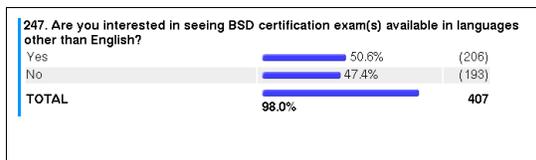
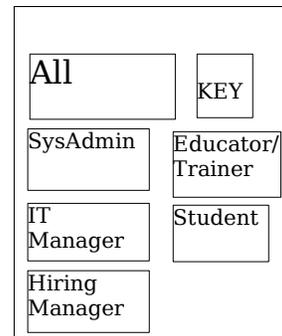
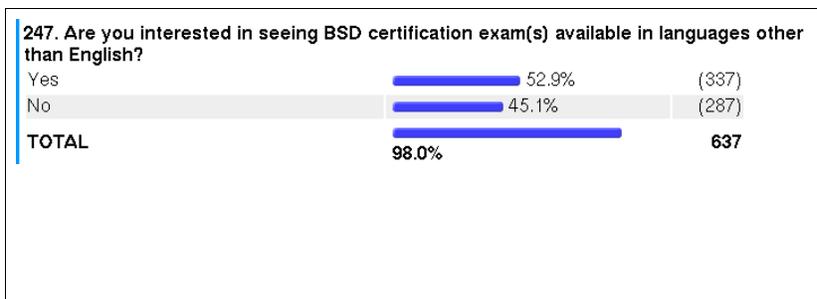
various languages.

- This is a difficult area for those with low budgets. There needs to be some facility for being certified at low cost when possible.
- Some testing centres provide next to no supervision and inadequate resources. The same may be true for educational institutions. A virtual open book style exam that tests the concepts is more valuable. Multiple choice questions of what command to use when can be part of this as well.
- As community (non-profit) driven as possible.
- As long as it is professional (i.e. not cheap).
- I don't think the testing environment matters so much as the quality of the test. BSD is a community, and the certification should embrace that community.
- Keep it free!
- Also associations, user groups and sponsors may provide rooms in capitals internationally.
- So that certification has a certain "acceptance" it has to be of easy access. Therefore, the more local this certification will be offered, more people will have access.
- Very difficult to measure.
- It is better for the certification to not have to entrust a third party.
- The test organization must have the prestige, but cannot be too expensive.

3.2.8 Availability of Test Translations

Question 243 asked whether translations of BSD exams into languages other than English were desired.

A majority (52% to 45%) indicated a preference for exam translations in other languages. This is consistent with the global use of BSD as shown earlier in Section 3.1.2.



Responses to Question 247 are seen in Table 3-15:

Table 3-15 Should the Exam be Available in Multiple Languages?

| | Yes | No |
|---------------|---------------|---------------|
| Chinese | 73.70% | 25.30% |
| Dutch | 40.00% | 60.00% |
| English | 44.10% | 53.80% |
| French | 72.40% | 20.70% |
| German | 80.00% | 20.00% |
| Polish | 100.00% | - |
| Portuguese | 69.00% | 31.00% |
| Russian | 80.00% | 20.00% |
| Spanish | 80.00% | 13.30% |
| Total: | 52.90% | 45.10% |

Not surprisingly, those that did indicate another language suggested either the language of the translated survey they were taking or the native language of their country of origin.

Some responders also made comments similar to this one:

- As many as there are translators and interest.

The three comments that differed from the above suggested:

- Braille
- Esperanto
- Klingon

3.2.9 Exam Name

The last question on the survey asked “Do you have any suggestions for the official name of either an entry level or advanced certification? e.g. BCA (BSD Certified Administrator)?”

The suggested acronyms and their meanings are:

- BAC - BSD Administrator Certified
- BCA - BSD Certified Administrator
- BCA+ - BSD Certified Advanced Administrator
- BCD - BSD Certified Developer
- BCE - BSD Certified Expert/Engineer
- BCP - BSD Certified Professional
- BNA - BSD Network Administrator
- BNE - BSD Network Expert/Engineer
- BSA - BSD Systems Administrator/Associate
- BSM - BSD Systems Manager
- CBA - Certified BSD Administrator
- CBE - Certified BSD Expert/Engineer
- CBP - Certified BSD Professional
- COB - Certified Operator of BSD
- BCAA - BSD Certified Administration Associate/ Advanced Admin
- BCAP - BSD Certified Administration Professional
- BCG/W - BSD Certified Guru/Wizard
- BCIA - BSD Certified Internet Administration
- BCJA - BSD Certified Junior Administrator
- BCMA - BSD Certified Master Administrator
- BCNA - BSD Certified Network Administrator
- BCPA - BSD Certified Professional Administrator

- BCSA - BSD Certified Systems/Security Administrator
- BSCA - BSD System Certified Administrator
- BSCE - BSD Systems Certified Expert
- BSDA - BSD Administrator
- BSDE - BSD Engineer/Expert
- CABA - Certified Advanced BSD Administrator
- CBAA - Certified BSD Associate Administrator
- CBNA - Certified BSD Network Administrator
- CBSA - Certified BSD System/Solutions Administrator
- CBSE - Certified BSD Security/Solutions Expert/Engineer
- CEBA - Certified Expert BSD Administrator
- CMDA - Certified Master in DragonFly BSD Administration
- CMFA - Certified Master in FreeBSD Administration
- CMNA - Certified Master in NetBSD Administration
- CMOA - Certified Master in OpenBSD Administration
- DBCA - DragonFly BSD Certified Administrator
- EBCA - Entry Level BSD Certified Administrator
- FBCA - FreeBSD Certified Administrator
- NBCA - NetBSD Certified Administrator
- OBCA - OpenBSD Certified Administrator
- SBCA - Senior Level BSD Certified Administrator
- BCSEC - BSD Certified Security
- BSDCA - BSD Certified Administrator
- BSDSA - BSD Systems Administrator
- BSDSE - BSD Systems Expert
- CBSDA - Certified BSD Administrator
- CBSDP - Certified BSD Professional
- CNEAD - Certified Network Enterprise Administrator DragonFly BSD
- CNEAF - Certified Network Enterprise Administrator FreeBSD

- CNEAN - Certified Network Enterprise Administrator NetBSD
- CNEAO - Certified Network Enterprise Administrator OpenBSD
- CNIAD - Certified Network ISP Administrator DragonFly BSD
- CNIAF - Certified Network ISP Administrator FreeBSD
- CNIAN - Certified Network ISP Administrator NetBSD
- CNIAO - Certified Network ISP Administrator OpenBSD
- BSDCAA - BSD Certified Administration Associate
- BSDCAP - BSD Certified Administration Professional
- BSDCSA - BSD Certified System Administrator

Of all the acronyms, **BCA** and **BSDCA** were the most popular.

There were also a few suggestions to keep in mind when choosing an acronym:

- Don't use an existing acronym.
- If using levels, follow the acronym by the Level # e.g. CBA-L1
- If using levels, use letter for level: e.g. BSD-A, BSD-B, BSD-C, etc.
- If there is a certification in the localized language, please maintain the accuracy of the translation of the acronym.

4 Survey Results: Part II

This section is divided up into subsections- each referring to a page of the survey. Each subsection contains:

- **Graphs For Each Page-** A link is provided to the graphs for each question in the survey. Each question has a graph similar to those shown in Section 3 though the page layout is slightly different.
- **Comment Summary-** Each subsection contains a summary of comments for that page. The volume of comments is the most encouraging sign in the survey. Almost all responders wrote at least one significant comment. The raw data contains all the comments.

Note that all of Page 1, **Demographic Information**, and Page 12, **Essay Questions** were covered previously in Section 3. For ease of reference, the graphs for all pages are found in Section 5.

4.1 Page 2 General Admin Questions

This page of the survey asked responders to rate the following tasks:

- Access the scroll back console buffer.
- Be able to properly shutdown a system.
- Configure shared library run-time linker cache.
- Configure system to deny root logins.
- Customize the login class capability database.
- Disable virtual consoles.
- Enable process accounting.
- Go into single user mode.
- Install rc.d scripts.
- Read local mail on system.
- Shell scripting at basic level- using loops, pipes, backticks, background processes, stdin/stdout/stderr redirection, etc.
- Schedule a cron job.
- Configure system-wide timezone.
- Enable logins on serial console.
- Set environment variables in the current shell and in subshells.
- Find, manage, or kill runaway or unneeded processes.
- Create new devices.
- Add paths to the MANPATH variable.
- Compress and uncompress with various formats.
- Recover from lost root password.

Graphs for each question on Page 2, **General Admin Questions** may be found at:

http://bsdcertification.org/survey01_report/pages/Page_2.pdf (4.12 MB)

4.1.1 Comment Summaries for Page 2

Comments on the first task evaluation page of the survey can be divided into two areas. The first deals with suggested improvements regarding the evaluation process itself. The second deals with responders clarifying their answer to a particular task:

Suggested Improvements:

- The time choices on this page are poor. Most, if not all of these should have an "only as needed" option. In any event, I took it as "how often do you end up doing this activity". Of course other useful data to have in that scenario would be "how many systems do you directly manage" and "how many systems do you oversee"?
- "Frequency scale: How often is this task done?" - in some questions it is not possible to determine how often this job must be done - an example - I will shutdown my OpenBSD server when I have serious problems and it may be once in a year or many times in a week.
- I'm not certain if by "minimum job level" you mean "should be able to", or "by policy is allowed/must do" . The frequency of some of these tasks depend on factors such as environment, services offered, upgrade cycles, etc.
- A "once only / barely" option for "how often" would have been helpful.
- A lot of the questions have no appropriate answer in the frequency of occurrence category, which makes the answering a bit awkward.
- I believe the form will be more precise if you can choose a "when it comes necessary" option in the time items.
- According to my opinion the word ' unique ' is missing because many things mentioned depend upon the unique configuration.
- Every day to monitoring system. But, of course, actions probably not needed every day. I think one good manager must touch your system to see if all is ok.
- Everything is from a system management perspective. Do you realize that computers exist for different purposes than being managed.
- Frequency of tasks is hard to tell if you are not administrating huge server

farm.

- Frequency options leave much to be desired. Along with never, it'd be nice to have an option of "ONCE" or "AT INSTALL" for tasks that are only really done once per system at install time, then never touched again.
- Periods differ from system to system. So don't take seriously my answers about periods.
- I appreciate the translation, but would it be better if leaving the original version of survey here too. sometimes the translated terms are a little bit alien to me and I guess newbies like me who learned BSD from Handbook(en) .
- I think the "frequency scale" should also contain a "on install or major upgrade" section.
- IMHO this survey should collect information about "when" tasks should be performed. Take a look at "Be able to properly shutdown a system". Well, the perfect system should be available 24 X 7. The same condition applies to "Enable process accounting". This should be configured only one time in ideal server. I want admins that knows how to do a task like that, but this is not a regular task. The same thing applies to many other questions in this page.
- It's tough to use the 'how often' part for some of these questions. Some people build machines every day others once a year.
- I assumed that certain tasks are made only at the installation of the system or are made automatically by third tools, I notched "never" for the frequency of these tasks.
- A production server would not need most of these tasks done regularly. Compare that to test equipment...
- The "importance" rating is misleading. For instance, I have never lost a root password, so should I say its frequency is "never" and importance is "not important"? No. Should the need arise, one had better know how to do it and - depending on the circumstances - know how to do it immediately!
- Many of these are one-time post-installation activities, so their frequency depends on how often a new system is installed.
- Obviously some of this is highly dependent on what tasks the boxes you administer are for - login classes for example would see much more use on shell boxes than NMS boxes. Perhaps breaking certification into types would allow you to change the priority of certain tasks for certain types of applications -

may not be worth it depending on how much variation there is.

- Ok but the presented classification deal with ADMINS only: What about users?
- Generally, I've problems imagining four kinds of admins (novice, junior, advanced, senior). Seems to be too finegraded.
- Bad Dutch translation... Also the checkboxes could best have been replaced by radio-buttons.
- Some of the entries for "frequency" depend on hardware/software restart/upgrade cycles. Since BSD machines tend to run longer than other servers, it might make sense that frequencies would be less than for other Oss.
- Some of the questions are awkward... most of these questions even a novice user should be able to handle if they are to be called an admin.
- Just because something needs to be in the skill set of a junior or novice, doesn't mean they're necessarily the ones with the access to perform them.
- Some of these tasks just "should not happen" in a well-setup and well-run environment, regardless of OS; hence the infrequency of the need.
- Need more advanced, maybe less usual tasks like compress/ENV/mail.
- Some tasks here I felt were too unimportant to be given to lower levels of certification, yet they too are simple enough that at higher levels these things should already be known.
- Task described on this mainly performed by Intermediate admins, it's too hard for Novice admins.
- The frequency of action is not that meaningful for actions you'll take just once in the lifetime of a server (however it gets a bit more meaningful since is a measure of how many new servers get added).
- The questions are quite sound but the "how often" part does not always matter. For example, being to enable login on serial console is not a task which you can quantify as how often you perform. Some questions can just have the Importance and Admin level checkboxes.
- These tasks are indeed related to BSD administration but they feel so unrelated. Maybe it's just the presentation but it feels like there is so much more to ask for.
- Use a more plain english for none english readers.

Several responders had some variant of this comment:

- Dare I suggest Radio Buttons? I spent half the time checking I hadn't ticked two in any row.

Answer Clarifications:

- The “console scroll back” isn't available everywhere.
- For “shared library run-time linker cache”, it's available on NetBSD, but unused. The policy is to compile/link programs properly.
- “Create new devices” is not applicable to some systems like FreeBSD 5 and later.
- On FreeBSD 5 I would mark create new devices (MAKEDEV) as non important but the sysadmin should be aware of how devfs works.
- “Configure system to deny root logins.” Remote root login and/or local root login? I presumed remote root login.
- “Configure...to deny root logins” isn't a task that has to be done often as it is default.
- “Properly shutdown a system”--do you mean my desktop (then daily) or my personal server (NAT CVS etc) (then quarterly) or production server (depends of type)?
- Almost all questions here are about essential entry-level skills needed to maintain and administer BSD, no matter how frequently used. If you can't recover lost root password or can't install rc script, or don't know shell scripting, or can't boot to single-user, then you can't maintain BSD - at all. I don't think you can correctly grade these to junior or novice or senior admin set.
- At the Junior Admin level, if someone tells you to do X, you should be able to figure out how to get it done. At the Intermediate/Advanced admin level, you sometimes will need to refer to docs, but only to figure out the details of a command / file / paradigm with which you are already familiar. At the senior admin level, you're rarely told what to do. You've already done it.
- Couldn't easily wrap my mind around the frequency line. The tasks are done when necessary, not on a schedule. When they're necessary depends on the environment in which they're being done (number of hosts, number of admins/host, how customized the hosts are, etc.), which will be different at each site.

- Answers really depend per server and many activities take place very irregularly, e.g. only with system updates.
- Do you mean code and create new drivers or just compile them into the system and add them into the /usr/src build tree?
- For “schedule a cron job”, I include setting up end users in addition to cron jobs. I use cron mostly for regular stuff. If I need to do a big ports install then I use at.
- I work at a web hosting company with over 2500 BSD and other Unix customer servers. We consider some things as basic that other responders may not.
- Many of these items are a once off thing. I've selected "never" if I think it's a once off or if it should never occur (but still could).
- Most questions I've answered yearly. Reason is they are set after install and never touched until next release. If root can forget his password, he probably forgot he was root anyway.
- Most of these questions need another option: ``it depends''. One can't make such generalizations -- how often should one recover from a lost root password? Of course the answer is ``ideally, never''. But should one be able to do so? Of course. IOW, the answers don't always match the questions, which is why I've left most of them blank.
- One thing about this survey... there are some things that I don't understand. So, I just take an educated guess on what it means and answer as best I can. Some questions don't apply to the "frequency". I'm typically just putting monthly.
- For many questions, frequency is "once per host install", really. I picked a frequency that seemed middle-of-range to indicate this.
- There is no rc.d in OpenBSD ;). Of course, on a system with rc.d, it is essential being able to do that.
- Read local mail - system wide or just root?
- Recovering a lost root password is essential, but I'm not sure a novice admin should be given that task, unless he also knows how to dd a corrupt filesystem to tape if fsck looks bad. cron scheduling is an important day-to-day job, but for a novice/junior admin it's tolerable and advisable to look in the manpage.
- Some of the above questions I've answered with "never" while the appropriate answer should have been "when needed". Moreover, the

appropriate answer to some questions is "at installation/configuration of the entire system and or new device", they are not repetitive tasks.

- When I have a question like "Configure system to deny root logins", it is more of a 'one time' thing, so I put 'Yearly'. That is pretty much how I answered any 'one time configuration' question. Hopefully that will make it easier to understand some of those answers.
- I ended up selecting "yearly" for infrequent tasks.
- Some tasks I have never done, but I answer what I consider is the average.

4.2 Page 3 Files, Filesystems, and Disks

This page of the survey asked responders to rate the following tasks:

- Add additional swap space (partition or file).
- Initialize a new file system.
- Manually run file system checker and repair tool.
- Mount a /proc file system.
- Mount a CD-ROM disk.
- Mount a USB key drive.
- Mount local filesystems.
- Distinguish between fdisk-style partitioning and BSD partitioning.
- Regenerate user database files from master.passwd file.
- Resolve full filesystem issues.
- Set up filesystem ACL grants.
- Set up filesystem quotas for users.
- Distinguish between raw/character devices and buffer/block devices.
- View swap partition usage.
- Mount a filesystem as read-only.
- Dynamically increase the size of a filesystem.
- Enable/disable a mounted filesystem write status.
- Configure software RAID.
- Configure hardware RAID.
- Mount remote/network filesystems.
- Set quotas for user disk space.

Graphs for each question on Page 3, “**Files, Filesystems, and Disks**” may be found at:

http://bsdcertification.org/survey01_report/pages/Page_3.pdf (4.31 MB)

4.2.1 Comment Summaries for Page 3

Due to the robustness of BSD filesystems, it's not surprising that many of the comments regarding “**Files, Filesystems, and Disks**” tasks dealt with keeping the system defaults. Several responders clarified their interpretation and gave suggestions on how to improve the context of the tasks.

- Set up filesystem ACL grants. sorry didn't answer don't know what that is.
- ACLs are not available in NetBSD.
- “Set up filesystem quotas” and “set up disk quotas” seem to be the same question to me. (from several responders)
- “Distinguish between fdisk-style partitioning and BSD partitioning”, most beginners don't get it, I think that's okay as long as they don't touch disklabel.
- “Resolve full filesystem issues”, nothing for the faint of heart, but everyone needs to know.
- “Configure hardware RAID”--not really BSD related.
- Disaster recovery things simply never got done, pick a crappier os for that :) And the difference between a novice and a junior admin is mostly in the trust accorded, novices never do things too dangerous.
- “Add swap space” and “initialize new filesystem”--I have never done this so I cannot comment.
- It has been extremely rare that I have had to manually run fsck. I think I have had to do it 3 times in 3 years. The point being is that given the high reliability of these things, this may not be that important a skill.
- Include the chflags command. It's important to know how to do this.
- "Mount remote/network filesystems" - well, we never do- so, for 'us' it's 'not important' - and we 'never' do it - but I'd expect a 'Senior Admin' should know how to.
- I refer to /proc as not important since OpenBSD have done away with the proc filesystem altogether.
- Mount a /proc file system. : not required on modern FreeBSD's or only linprocfs required sometimes for Linux compat.
- I wish there were a back button, so I could revise my answers on the previous page.
- It seems that a lot of tasks don't have any relation to time. I'll just assume it's the certification class and importance that are considered seriously for these questions.
- Mount a filesystem as read-only. - question is not correct. Mount

remote/network filesystems. - what about amd?

- Mounting afs, nfs or smb-based remote filesystems varies enormously with specific setups. While I choose never as most common, I've been involved in setups where it was closer to daily.
- My answers on this section reflect mostly my usage/experience within my organisation. (Less than 75 employees). For larger organisations, the answers would be rather different.
- One thing I find is that 'somewhat important' tends to correlate with 'intermediate/advanced', and 'very important' tends to correlate with 'junior admin'.
- Questions are fine, but as I'm in serial whiner mode at the moment: It's unclear whether you're asking "How often does this task get done manually by you?" or "How often does this task get done at all, by admins, black magic scripts, tech-savvy users and your mother?".
- Some of your questions don't seem like they would gather useful data for your analysis. For instance, without the context of what type of users and/or what type of use does the system have, combined with what type of business/organization/user base requires the Unix system, I don't see how a question provides a valid data point.
- Some questions can just be either "repetitive" or "non-repetitive", instead of having "Never, Yearly, Quarterly" etc.
- Give a hypothetical situation, i.e., "Company X has N employees. Every month they hire y new employees, and let z employees go. Their hardware is brand new/a few years old/ancient. Assume that the current configuration is adequate by some definition of adequate for the current user base. you can expect that they have to add resources, either RAM or drive space, every 6 to 9 months." something like that. Otherwise, the questions are largely meaningless.
- You want to be careful not to penalise, in the certification process, people who want to look things up. i.e. some tasks are performed vary rarely so it should be acceptable for an admin to know the general procedure and where to look up the exact process. In fact an admin who double checks before doing something dangerous is probably better than one who has memorised all the switches for all the commands and gets one wrong every now and then.
- Some administer "if it runs, don't touch it" manner. Senior administrator looks after his junior administrators? He's an observer? Auditor?

4.3 Page 4 Installation

This page of the survey asked responders to rate the following tasks:

- Build and install system from source code.
- Use bsdlable or disklabel to modify or create partitions.
- Use fdisk tool to modify or create partitions.
- Change Partition IDs to other BSD or non-BSD IDs.
- Create FAT32, NTFS, or other non-BSD partitions
- Install BSD operating system from CD-ROM.
- Install BSD operating system from NFS server.
- Install BSD operating system from FTP or web site.
- Create installation floppies.
- Create or edit the device.hints or loader.conf file.
- Perform a 'headless' install using serial console.
- Create install script or configuration for unattended installations.
- Create an ISO installation image.
- Determine if hardware is supported by operating system.
- Distinguish between packages versus pkgsrc or ports.
- Install software using binary packages.
- Install software using source from the ports or pkgsrc.
- Remove existing software packages.
- Upgrade existing applications.
- Create an emergency repair disk.

Graphs for each question on Page 4, "**Installation**" may be found at:

http://bsdcertification.org/survey01_report/pages/Page_4.pdf (4.18 MB)

4.3.1 Comment Summaries for Page 4

There were just a few comments regarding “**Installation**” tasks. Most dealt with the differences between the installation methods available with each BSD.

- “Create or edit the device.hints or loader.conf file”--I have no idea what this is – FreeBSD-only? NetBSD has fdisk -B, sunlabel, *installboot* and /etc/ttys.
- “Create install script or configuration for unattended installations”--there are no hooks for that in NetBSD.
- “Create an ISO installation image”--is unclear: create (burn) a CD from an image, or create the image itself? the former's definitely useful, the latter is done by NetBSD for me.
- Again, some of my answers reflect my experience as an administrator for a small-to-medium sized company. There are things I've never needed to do in the past 7 years, that I know would be very important in a larger organisation.
- Do developers count?
- Emergency repair disk likely quite BSD flavour specific.
- I'm not sure what you mean by an emergency repair disk, better to keep backups and install fresh if the system becomes corrupted in software.
- Note that some very important/essential tasks are infrequently performed. E.g. for a "large" site, automated installs via NFS might be setup once, and periodically tweaked/updated, but basically used "forever", even though the fundamental infrastructure was only setup the 1 time. If that same infrastructure is setup poorly however, every install resulting from it impacts the support folks ever after.
- If you need to dual-boot a system, my opinion is that you're acting as a hobbyist and not a BSD admin. Real admins run hosts that are active 24x7.
- " Create an ISO installation image." -- Wouldn't a senior administrator tell junior to do it? Again, who should do it? Is it essential for novice administrator to know? What tasks is he performing? --Maybe he's just a database/DNS admin.

- Where I put Never Not Important Novice Admin That's because I don't know what you're referring to.
- With some *BSD's (e.g. FreeBSD) there really is very little difference between electing to install from FTP, Web or CD-ROM. Obviously I don't know about the others - but I kind of get the impression quite a few of these questions will have different answers depending on the flavour of O/S being used.

4.4 Page 5 Logging and Archiving

This page of the survey asked responders to rate the following tasks:

- Find and review common log files to troubleshoot/monitor system behavior.
- Configure syslog server to not listen to network.
- Configure syslog to log different facilities and/or levels to different files.
- Configure syslog to log to remote server.
- Configure syslog server to receive logs from specific IP addresses.
- View logs in real time.
- Configure log rotation.
- Send logs to database for analysis.
- Search for patterns in logfiles using regular expressions.
- Insert entries in the system log.
- Manage backups using bacula, amanda or other third-party backup solution.
- Manage backups using dump and restore.
- Manage backups using tar.
- Manage backups using pax.
- Manage backups using cpio.
- Maintain synchronized files on two or more systems.
- Perform an encrypted backup using SSH.
- Perform a distributed backup on multiple systems.
- Backup Windows shares to a BSD system.

Graphs for each question on Page 5, “**Logging and Archiving**” may be found at:

http://bsdcertification.org/survey01_report/pages/Page_5.pdf (3.97 MB)

4.4.1 Comment Summaries for Page 5

Not surprisingly, there were a lot of views regarding backups, the topic of this page of the survey. Here are the comments:

- "View logs in real time." -- doesn't matter if you're a senior or junior administrator. Administrators should search/look/analyse logs. More eyeballs -- even better.
- Network backup I'd only trust to a very advanced or senior admin, both for the long-term-planning and the responsibility required.
- Does backup mean entire machine; or just using the tool? For example, I rarely use tar or cpio to back up a machine; I use tar all the time to package up directories for various uses. I occasionally use cpio to duplicate or to back up specific items. To back up an entire machine I generally use dump or 3rd party.
- What is a windows share? Never heard of it.
- I have never used cpio; can't really comment. generally use dump or 3rd party.
- I base my responses on frequency on my own experience, not how often others might need to perform the task.
- I do the opposite: I mount a SAMBA share from a windows machine, and back *dumps* (scheduled in CRON) from PostgreSQL up using the GUI backup under Windows, along with the files on the Win2K server.
- I would create only 3 admin categories: beginner, intermediate, senior.
- "Configure syslog to log to remote server"--I rated this as Senior because it requires setting up both ends of the connection, and likely playing with facilities and levels as well on the receiving end. Done properly from a security perspective, syslog ought to go over an IPsec VLAN or something similar so this gets complicated quickly.
- Interoperation with other OS's will be an important part of a BSD toolkit.
- For BSD certification purposes I'd consider only dump, tar or pax (in roughly that order). 3rd party tools are often handy but I believe them to be out of scope.
- "Backup Windows shares to a BSD system"--I think this is out of scope for a BSD certification. While handy, the basic problem of lack of useful and

portable tools is on Windows end.

- “Backup Windows shares” is really strange. Samba isn't default.
- “Configure syslog server to not listen to network”--on some, it's disabled by default. Of course, you still expect your sysadmin to know that, and 'be aware' of the consequences if it wasn't.
- The importance of various back up techniques depends heavily in the on site backup strategy. It may be useful to test for ability to design (as opposed to just implementing) a strategy. This would be something a senior admin would do.
- The only backup software that I know is using tar, and 3rd party software. The other ones I was just guessing at.
- This was a tough one--to say that one form of backup is essential and another isn't is a matter of personal choice. I chose daily for all, because whichever one chooses is a daily matter. I picked very important over essential for scenarios that I think might be infrequent--that is, out of 7 jobs, perhaps 2 will have to know the distributed backup over multiple systems.
- We don't do windows. Our front-office staff are responsible to back up their own Windows systems in an intelligent manner. However, sandboxed systems and shared virtual machines are handled as BSD processes.
- Windows "shares" ought to be backed-up to something more familiar to Windows users, especially if they are to perform their own restores (a requirement in some environments). OTOH for Windows servers (e.g. exchange or similar) which are not directly end-user systems, a more uniform backup method (i.e. to a BSD system) might be appropriate.

4.5 Page 6 Network Applications and Networking

This page of the survey asked responders to rate the following tasks:

- Configure and enable DHCP service.
- Configure a DNS server for providing primary (master) zones.
- Configure a DNS server for providing secondary (slave) zones.
- Enable a DNS caching server.
- Install and configure an FTP server.
- Install and configure an IMAP server.
- Install and configure a POP3 server.
- Configure the default Mail Transfer Agent (MTA).
- Install and configure an alternate MTA.
- Configure MTA for outgoing mail only.
- Configure MTA to use SASL.
- Configure MTA to use TLS.
- Configure MTA to filter SPAM.
- Configure MTA to use a virus scanner.
- Configure Anonymous FTP.
- Install and configure a webserver.
- Configure webserver for HTTPS / SSL.
- Install and configure a RADIUS server.
- Install and configure a Kerberos server.
- Configure BSD system to be a router.
- Configure BSD system to act as a traffic shaper.
- Configure BSD system to act as a bridge.
- Install and configure an H.323 gateway.
- Configure BSD system to act as a Wireless Access Point.

Graphs for each question on Page 6, “**Network Applications and Networking**” may be found at:

http://bsdcertification.org/survey01_report/pages/Page_6.pdf (4.94 MB)

4.5.1 Comment Summaries for Page 6

Responders had strong opinions regarding “**Network Applications and Networking**” tasks. Several commented on the appropriateness of certain networking protocols. Others raised security concerns and the different skill levels required to configure networking and do so securely.

- Install and configure an H.323 gateway. what's that?
- Act as VPN Gateway (e.g. with mpd for L2PT or PPTP).
- I used senior admins here for both radius and kerberos - a intermediate should be able to configure client setups and join a realm according to documentation, senior's job would be AD integrated, full-blown network setup.
- I don't know what these (SASL and TLS) are. I have never used them. I have never done the tasks requested in many of these questions. Nevertheless, I think they are very important.
- FTP is obsolete. POP3, if not encrypted too.
- Many of the mail related questions require 3rd party packages. I don't think that testing a BSD certification candidate on those items is the right way to go ... where do you draw the line, with over 12000 ports?
- I assume ftp is chrooted otherwise I would select junior admin.
- IMHO, configuring security requires seniority. It's not the difficulty of the tasks, it's the possible catastrophe in case of misconfiguration.
- In many cases, other hardware solutions, (such as Cisco routers) are already in place, therefore, I don't think it's as important as it used to be to configure a router, bridge, etc.
- Lotsa network service setup... is this gonna be a BSD network admin cert?
- Mail- I firmly believe that it's foolhardy to just toss in email and relate it to

sysadmin tasks, except in the most generalized ways. Email should be handled by SA's who focus on email- and it's insane for anyone but an experienced SA to run a mailserver, period.

- DHCP should be a one time setup job, and after that you are to leave it alone.
- On those question, I'm uneasy on the skill level, as most have security implications: it's easy to install most server, it's another thing to install it with security in mind, and only a senior Admin (or a specialized one) can install such software at a paranoid security level... I answered like if those question were for a "sufficient for most companies" security level.
- "Configure BSD system to act as a Wireless Access Point". We don't do that. We have simple/dumb access points connected to a BSD system which acts as authentication server and firewall. So the BSD system is not an access point but much more. And the one system controls three dozen access points. I have answered the question with our environment in mind.
- Some of these functions (WAP, routing) have a facet not solely related to install/configure; e.g. "evaluate whether a BSD system is the right solution for the environment you support vs. commercial WAP offerings".

4.6 Page 7 Additional Networking

This page of the survey asked responders to rate the following tasks:

- View routing table.
- View state of network sockets.
- View network protocol statistics.
- Configure the default gateway for networking.
- Change TCP/IP parameters such as TTL and MTU.
- Configure interface for special options or media types.
- View current DHCP lease.
- Release and renew networking information from DHCP server.
- Find which IP is abusing the network.
- Partition an IP address space for new subnets.
- Enable network interface IP aliases.
- Join the system to an IPv6 network.
- Enable or disable inetd services.
- Find out what servers are authoritative for DNS for a hostname.
- Define DNS name servers to use.
- Enable NFS client service and mount a remote NFS share.
- Enable NFS server and share a local directory for network usage.
- Enable and configure NIS service.
- Enable SSH service.
- Set date and/or time using network-based time service.
- Troubleshoot network traffic issues using a sniffer program.
- Change the order of name resolution.
- Override settings received from DHCP server.
- Configure networking with PPP or PPPoE.
- Lookup up port numbers and/or service names.

Graphs for each question on Page 7, “**Additional Networking**” may be found at:

http://bsdcertification.org/survey01_report/pages/Page_7.pdf (5.19 MB)

4.6.1 Comment Summaries for Page 7

Again, the comments on this page of “**Additional Networking**” tasks concentrated on security issues and the level of understanding required to securely configure and troubleshoot networking protocols.

- Change the order of name resolution. Do you mean the nameservers used or the DNS suffixes with something like the "search" parameter?
- “Find which IP is abusing the network”--also has to be aware of ethical / law issues.
- Again, I have never done some of these tasks but I would consider them very important to know.
- As a side note, I think NFS and NIS are SO security sensitive that anyone but a senior admin, maybe an advanced admin should stay away. NFS ideally should only be served via localhost -- for instance you could create a master jail and NFS export your ports directory or src directory and do make installs in your sub-jails. NIS should just not be used flat out.
- “Change TCP/IP parameters such as TTL and MTU” -> The settings FreeBSD has should be sufficient, changing them could cause problems, thus it is best to leave them to the default.
- “Join the system to an IPv6 network” -> IPv6 is not ready for the primetime.
- “Configure networking with PPP or PPPoE” -> Deprecated. Don't find that I need to configure this at all anymore. I used to, but with those damn Winmodems on the market, it was a hard task.
- I mark novice on some things because I think it is essential for even a novice admin to understand some things before becoming an admin.
- PPPoE has complications. As an expert in the domain of internetworking, someone configuring BSD for PPPoE needs to understand MTU problems related to it especially for users using applications that make use of VPN.

4.7 Page 8 Printing and Boot

This page of the survey asked responders to rate the following tasks:

- Enable a printer service using lpd.
- Install and configure an alternate printer service besides lpd.
- Install a printer driver or printer filter.
- Configure printer accounting.
- Troubleshoot a printcap file.
- Remove a job from the print queue.
- Troubleshoot common printer problems such as no output, stair-step, or garbage output.
- Define a hostname for the system to be set at boot time.
- Display the order of startup steps/scripts to be run at boot time.
- Install a boot manager.
- Restore a corrupted boot sector.
- Boot via the serial console.
- Configure a splash screen at boot.
- Configure custom kernel tunables to be enabled at boot time.
- Configure rc.conf to enable various system or network services.
- Password protect single user mode.
- Configure BSD system for PXE booting.
- Configure system to mount local filesystems at boot.
- Configure system to mount remote network filesystems at boot.

Graphs for each question on Page 8, **Printing and Boot** may be found at:

http://bsdcertification.org/survey01_report/pages/Page_8.pdf (3.98 MB)

4.7.1 Comment Summaries for Page 8

Considering the lack of interest in testing desktop skills, it's not surprising that there were very few comments regarding the "**Printing and Boot**" tasks.

- Configure BSD system for PXE booting. What's that?
- "Configure a splash screen at boot" is not available in NetBSD.
- What is a "kernel tunable"? Sysctl?
- We use some distributed spool system on HP-UX, I hate printers myself, never used one at home. but handling printcap and cups is surely essential.
- "Install a boot manager" isn't clear.
- It's absolutely vital to know how to set up printing. Printing is more important than configuring servers or other TCP/IP tasks. Why? Every business has to have hardcopies. Hardcopies are usually legal binding records. For that reason, being able to setup printing is essential.
- Just a side note, some tasks become more important as you go up the food chain; for example, it is very important for a junior admin to mount a remote filesystem at boot, while it is very important or essential for an intermediate admin to be able to do it, and essential for a senior admin.
- Most servers in datacenters don't need printers attached to them. But in an office setting I can see how it is useful. However, considering the fact that most have HP network printers, there really is no point in having an extra networked machine running, as it is just more parts that can break.
- Some of this is very environment dependent. If you have printers hanging off BSD boxes, then it's all very important. If you don't, you could care less.

4.8 Page 9 Security

This page of the survey asked responders to rate the following tasks:

- Raise security level.
- Lower security level.
- Configure system to deny root logins.
- Configure PAM to support an alternative authentication mechanism.
- Configure ACLs to augment traditional Unix permissions.
- Change the flags on sensitive files.
- Configure SSH to restrict logins.
- Configure a file integrity checking utility.
- Configure a Network Intrusion Detection System.
- Install and configure sudo.
- Apply security patches.
- Scan a network to review open ports.
- Generate self-signed certificates.
- Verify a file's BSD checksum, MD5 hash or other message digest.
- Encrypt a file.
- Configure an encrypted filesystem.
- Scan a password file for weak passwords.
- Configure kernel to prevent ability to perform network sniffing.
- Configure a network service to use a 'sandbox' environment.
- Enable IP filter.
- Enable IPFW.
- Enable PF packet filter.
- Create and enable custom packet filtering rules.

Graphs for each question on Page 9, "**Security**" may be found at:

http://bsdcertification.org/survey01_report/pages/Page_9.pdf (4.73 MB)

4.8.1 Comment Summaries for Page 9

There were several strong opinions regarding the “**Security**” tasks. It's interesting that there weren't more comments in this section as security was highly rated as a testing topic. It may indicate that responders were starting to feel the length of the survey.

- ACLs are not available in NetBSD .
- “Configure kernel to prevent ability to perform network sniffing”--I doubt this is doable in NetBSD.
- IPFW is not available on NetBSD.
- Lower and raise security level? why not just say 'change security level' in one question?
- For 'Lower security level': it is impossible to do on OpenBSD short of hacking the kernel code.
- Configure system to deny root logins. and ACLs were asked twice, in different questions groups, but the same question.
- sudo is bs, unless they have to prove they also restrict the sudoers to specific commands (sudo passwd root...)
- “Scan a password file for weak passwords”--this should better read 'implement automatic password strength testing'.
- As for the scanning for weak passwords, I create requirements for passwords to be used (and setup guidelines in login.conf), so scanning for them is moot.
- Tough choices because though my choice is pf, I would have to give equal importance to the other firewalls.
- All the packet filter services are basically the same. If you have to pick one, IP-Filter is more important as it's the only one used across all BSDs. I scored creating rules the same way as it's rare that you enable a filter without doing something custom to it and it's something you want someone with some IP experience doing rather than a junior who's likely to just set pass out quick from any to any.
- Firewall is a must have. PF is preferred as its syntax is easy to understand

even for novices.

- You asked about 'self-signed certs', but what about true cert installation?
- Choice of packet filter/firewall software is sometimes a matter of preference, sometimes a matter of technical need. Being able to adapt what you want/need to accomplish to any of them is valuable.
- Snort installation.
- I don't think ACL's are that useful. I mean I guess they have some use but traditional permissions should suffice.
- To configure pam on OpenBSD or on a non-current NetBSD would require at least a senior admin!
- No PAM in OpenBSD.
- On security levels: this technique is overrated and brings more hassle than merit.
- Some things, like encrypt a file or find a checksum, are properly simply "everyday" Unix command requirements.
- This is the best page of questions so far on what I'd expect from a good exam for BSD admins.
- Why separate the different packet filters to separate questions? Enabling a firewall is enabling a firewall, the commands are just different to turn it on and configure it.

4.9 Page 10 Kernel, Upgrading, and Misc.

This page of the survey asked responders to rate the following tasks:

- Download kernel source.
- Configure and recompile kernel.
- Boot an alternate kernel.
- Use a kernel debugger.
- Compress a kernel.
- Load and unload kernel modules.
- Create or modify email aliases.
- Install perl modules.
- Manually send an email using SMTP protocol.
- Use cvs to retrieve updates.
- Use cvs to commit changes.
- Use cvsup to update source code.
- Use ktrace to troubleshoot software issues.
- Use mergemaster, etcupdate, or etcmerge to update configurations.
- Tune the operating system.
- View memory usage.
- View interrupt rate.
- Use an rc script to send a process a signal.
- Signal a process by name or by PID.
- Perform cross-platform building, such as using build.sh or 'make universe'.
- Create a package specification (Makefile, packing list, etc.) for ports or pkgsrc.
- Configure verified exec in-kernel fingerprint table.

Graphs for each question on Page 10, “**Kernel, Upgrading, and Misc.**” may be found at:

http://bsdcertification.org/survey01_report/pages/Page_10.pdf (4.53 MB)

4.9.1 Comment Summaries for Page 10

The comments for the “**Kernel, Upgrading, and Misc.**” tasks were quite varied and include:

- “Compress a kernel”--Not all kernels support compression?
- “Install perl modules”-- can be done via pkgs/ports
- “Manually send an email using SMTP protocol”--I thought programs did that.
- “Manually send an email using SMTP protocol”--you mean using telnet or /usr/bin/mail?
- cvsup is not used on NetBSD. some servers offer it, but it's not officially supported or recommended.
- "Tune the operating system" is rather vague. Does this mean alter the source, use sysctl, or something else?
- Again, this is difficult to judge in some cases. For instance, I have one box that is updated probably twice a week and another mission critical that is only updated for very essential, or tested performance enhancement changes. There can also be a fine line between essential and very important. In most cases that I choose "essential" I consider them relatively simple tasks that we learn when we first start playing with a BSD.
- Are there only system managers in your universe? Some people also write software!
- Are we developers or sysadmins? Many of us are both, but what are we testing for?
- Certain terms (exec in-kernel fingerprint table) would be better if kept in English rather than translated (to Portuguese)
- I think it is a good idea to know how ports and pkgsrc work.
- For “Use mergemaster, etcupdate, or etcmerge to update configurations”, add 'make upgrade' to the list, as that is what DragonFly BSD will be using.
- I already have various scripts (either Perl or Shell) that perform a variety of the maintenance tasks needed. This allows for the automation of tasks.
- I feel that things like MTA, and mail aliases should not be on this test, as it all comes down to what mail system you use. For example, gmail uses

/var/qmail/users, whereas exim uses yet another file. It would cause a lot of confusion, and does not really let anyone know much about the overall grasp you have of the OS. sendmail should not be run as the standard MTA.

- I've never heard of "exec in-kernel fingerprint" table.
- Installing new kernels means system downtime, so it should only be done for security, hardware stability, if it will significantly increase system performance, etc. an admin shouldn't install a new kernel for the sole purpose of supporting hardware or features that will never be used.
- Instead of CVS commit I would ask: reporting bug via send-pr or WWW, and submit follow ups.
- OpenBSD doesn't make use of kernel modules as such. I dont develop therefore I don't use cvs, I consider it less of a priority.
- packages? I guess I've been building from source for too long.
- "Load and unload kernel modules"--don't.
- No one should just "tune" the OS.
- The more I read these the more I think novice and junior should be the same.
- "Download kernel source" should be part of daily cvsup.

4.10 Page 11 Users, Groups, and Accounts

This page of the survey asked responders to rate the following tasks:

- Script the creation of multiple user accounts.
- View who is currently logged into a system.
- View account usage statistics.
- Prevent regular users from viewing who is logged on and what processes other users are running.
- Create a group.
- Create a user account without using a standard tool for this purpose.
- Start an interactive shell.
- Start a restricted shell.
- Create or modify skeleton files for new user's home directories.
- Remove a user account.
- Change a user's default shell.
- Create a system account.
- Configure user for access to root account.
- Reset a user password.
- Lock out a user account/Reset a locked out user account.
- Force an active user off the system.
- Set shell limits.
- Configure login classes.
- Generate a public/private key pair and configure to use as SSH authentication method.
- Configure users to auto-logout after period of inactivity.

Graphs for each question on Page 12, “**Users, Groups, and Accounts**” may be found at:

http://bsdcertification.org/survey01_report/pages/Page_11.pdf (4.14 MB)

4.10.1 Comment Summaries for Page 11

There were very few comments on the “**Users, Groups, and Accounts**” tasks; perhaps this is an indication that responders deal mostly with BSD systems containing few shell accounts.

- “Prevent regular users from viewing who is logged on and what processes other users are running”--I wouldn't know how to do that in NetBSD. Is this heading towards secbsd or trustedbsd models?
- NetBSD doesn't come with any restrictable/restricted shells.
- What is a "system account"? Is it samba related?
- "Start an interactive shell", i.e. Login?
- As we get further in the test, the level is becoming less and less useful, because the knowledge a person should have and the level of authority one should have are not the same. For instance, a novice should certainly know how to lock a user account. But assuming the organization has several layers of admins, only a senior person should actually lock someone's account.
- None of my users have direct shell access to the Unix machines, so my answers reflect this.

5 Task Analysis Graphs

See the following URLs for each page:

Page 1 “**Demographic Information**”

http://bsdcertification.org/survey01_report/pages/Page_1.pdf (0.71 MB)

Page 2 “**General Admin Questions**”

http://bsdcertification.org/survey01_report/pages/Page_2.pdf (4.12 MB)

Page 3 “**Files, Filesystems, and Disks**”

http://bsdcertification.org/survey01_report/pages/Page_3.pdf (4.31 MB)

Page 4 “**Installation**”

http://bsdcertification.org/survey01_report/pages/Page_4.pdf (4.18 MB)

Page 5 “**Logging and Archiving**”

http://bsdcertification.org/survey01_report/pages/Page_5.pdf (3.97 MB)

Page 6 “**Network Applications and Networking**”

http://bsdcertification.org/survey01_report/pages/Page_6.pdf (4.94 MB)

Page 7 “**Additional Networking**”

http://bsdcertification.org/survey01_report/pages/Page_7.pdf (5.19 MB)

Page 8 “**Printing and Boot**”

http://bsdcertification.org/survey01_report/pages/Page_8.pdf (3.98 MB)

Page 9 “**Security**”

http://bsdcertification.org/survey01_report/pages/Page_9.pdf (4.73 MB)

Page 10 “**Kernel, Upgrading, and Misc.**”

http://bsdcertification.org/survey01_report/pages/Page_10.pdf (4.53 MB)

Page 11 “**Users, Groups and Accounts**”

http://bsdcertification.org/survey01_report/pages/Page_11.pdf (4.14 MB)

Page 12 “**Essay Questions**”

http://bsdcertification.org/survey01_report/pages/Page_12.pdf (1.49 MB)

6 Concluding Remarks

This survey revealed a lot about the desire of the BSD community to have their own certification. Many responders took the time to work through 12 pages of detailed questions. Many also took the time and effort to set out very detailed thoughts on certification, tests, BSD specific issues, and many other topics. This determination itself is remarkable.

The challenge now is to take all of this input and put it into a solid plan of action. That is the challenge before the BSD Certification Group which will be working on this task during the weeks and months ahead.