

IBM

“2002 LINUX SCHOLAR CHALLENGE”

OFFICIAL RULES

NO PURCHASE NECESSARY. VOID WHERE PROHIBITED.

1. Registration Website: To qualify to participate in the contest, you must first complete the on-line registration form no later than 11:59 p.m. on October 31, 2002, in your time zone. Registration begins August 13, 2002. Access the registration Website at: ibm.com/university/linuxchallenge. Follow all instructions and complete the on-line registration form in its entirety. This process does not constitute entry, but rather registration as a potential entrant. You must be 18 years of age or older, have reached the legal age of majority in the country you reside, and be a college student as described in Rule #4. No minors may participate in the Challenge worldwide. Submitting your entry: Once you have completed the on-line registration form, you can now enter the contest. To enter the contest, e-mail your essay to linux@tristarfulfillment.com. Your essay on the topic of creating a better use for Linux may be submitted starting the day after you have registered. Your on-line entry must be received by the sponsor, no later than 11:59 p.m. December 13, 2002 in your time zone. Entry is deemed submitted by the authorized account holder of the e-mail address submitted at the time of entry. Authorized account holder is defined as the natural person who is assigned to the e-mail address by an Internet access provider, on-line service provider, or other organization responsible for assigning e-mail addresses for the domain associated with the submitted e-mail address. If either your

registration form or your entry form is incomplete, you will not be eligible for the contest. Sponsor assumes no responsibility for computer system, hardware, software, network program, or other errors, failures, or malfunctions of any kind, whether human or technical in nature, in the transmission or receipt of entries. You may create your own project or choose from a list of sample projects found in Rule #10 that will enhance Linux functionality, usability or performance, create Linux tools, or create or port applications to Linux. Your essay should be no longer than 1200 words and should be double-spaced on no more than three (3) pages, with one-inch margins and 12-point type. Your essay should be submitted in the body of an e-mail to the following address:

linux@tristarfulfillment.com

A) Entries will be judged by a panel of qualified judges beginning on or about January 2, 2003. Judges' decisions are final in all matters relating to the contest. Entrants will be judged on the following criteria: 1) creativity – 1 to 10 points will be awarded; 2) completeness of thought – amount of effort and research put into your paper – 1 to 20 points will be awarded; 3) results – was your application successful – 1 to 20 points will be awarded; and 4) clarity – ease to read and understand – 1 to 10 points will be awarded. Maximum amount of points available is 60. In the event of a tie, the winner will be the entrant having the highest score in number #2 (completeness of thought criteria). If there is still a tie, a new judge will re-judge the tied entries, except in Wisconsin, where duplicate prizes will be awarded. Sponsor reserves the right to cancel or suspend this contest should virus, bugs or other causes beyond sponsor's control corrupt the administration, security, or proper judging of the contest.

Submission of an entry constitutes your acceptance of these Official Rules as the terms and conditions governing this contest.

B) Contest is open to students who are enrolled full-time at an accredited two, three, or four-year college or university. Each participant may only submit one (1) entry into the contest. Entries in multiple categories will not be accepted. Students who have not registered for the contest during the registration period will not be eligible to submit an entry to the contest. Proof of enrollment may be required. Employees of IBM, judges, and the immediate family members and household members of each are not eligible to enter the contest.

- 2) Prizes (20): Twenty (20) prizes will be awarded to the students who have submitted the essays with the highest scores. The prize is an IBM ThinkPad T-Series Model.
Approximate Retail Value: \$2,500 USD.

The 20 prize winners will also have an opportunity, if they choose, to submit an application for an IBM internship at the Linux Technology Center. Based upon a subsequent application process and interview, IBM will select up to three (3) of the applicants for entry into the internship program.

University Prize (1): IBM will award a prize to the college or university that has the highest average score from amongst all entries submitted by qualifying entrants from that college or university. The purpose of this prize is to show appreciation to those schools

that encourage students to participate in the Linux Challenge. University prize will be a 16 Node Cluster (Model 7081-330), approximate retail value: \$130,000.

- 3) The total approximate retail value of all prizes is \$180,000.

No cash value or substitutions of prizes, except by Sponsor who may change prizes or models of equipment as availability changes. Limit one (1) prize per entrant. All prizes will be awarded, provided 20 qualifying entries are received.

- 4) Except where prohibited, by accepting prize, winner consents to the use of his/her name, likeness, and biographical information for advertising and promotional purposes worldwide without limitations and without additional compensation.

- 5) Winners will be notified by express mail and via e-mail on or about January 20,2003 and will be required to sign and return an affidavit of eligibility and release of liability/publicity within 30 days of notification (except where prohibited) or prize will be forfeited and may be awarded to an alternate winner on the basis of the criteria set forth herein.

- 6) Submission of an entry grants the sponsors and their agents the right to publish, use, adapt, sell, edit and/or modify such entry in any way, in commerce, and in any and all media worldwide, including but not limited to the Internet, without limitation and without compensation to the entrants. Entrant also grants sponsors worldwide irrevocable, nonexclusive and royalty-free right and license to use, have used, copy, reproduce, transfer, modify and/or display any information contained in their entry in whole or part and in any

form without compensation. Entries must be entrant's own original creations, must not infringe on third party rights, must not have won previous awards, must not have been posted on another Web site prior to submission and must be suitable for publication.

Winners may be required to sign an additional affidavit/license (except where prohibited) to this effect. Taxes on all prizes, if any, are the sole responsibility of the prize winners.

Entrants agree to be bound by the official contest rules. Entrants release sponsor, its subsidiaries, affiliates, directors, employees, and agents from any and all liability, loss or damage incurred with respect to the contest, including but not limited to the use of submissions and the awarding, receipt, possession, and/or use/misuse of any prize, and entrants acknowledge that said parties have neither made nor are in any manner responsible or liable for any warranty, representation, or guarantee, express or implied, in fact or in law, relative to the contest and any prize, including but not limited to its quality, mechanical condition or fitness for a particular purpose.

- 7) At the sponsor's discretion, entrants may be required to submit source code to substantiate results reported in the entry. Any such source code must be made available for free distribution under either the IBM Open Source License or any OSI approved License compatible with the associated Linux code.

8) In attached **ADDENDUM — 2002 Linux Challenge Options**, select one (1) of the sample projects provided or perform a comparable Linux project of your choice that will enhance Linux usability, create Linux tools, or create or port applications to Linux.

9) For a list of winners visit the web site: ibm.com/university/linuxchallenge on or after January 20,2003 or send a self-addressed, stamped envelope to:

IBM Linux Scholar Challenge, P.O. Box 9087, Bridgeport, NJ 08014, USA.

Sponsor: IBM Corporation, 999 Waterside Drive, 20th Floor, Norfolk, VA 23510.

ADDENDUM

- 2002 Linux Challenge Options -

1) Challenge: Eclipse/WebSphere Studio.

Build an Eclipse-based WebSphere Studio plug-in for Linux development. The plug-in can be a new tool or another example of providing Linux development value on top of Eclipse. Wrap and/or package existing free or open source utilities as Eclipse plug-ins.

Pre-requisites:

Eclipse information and downloads available at: <http://www.eclipse.org>

2) Challenge: Web Services/WebSphere.

Build a web service on WebSphere on Linux development, by plugging into WebSphere Studio Application Developer for Linux.

Pre-requisites:

IBM Web Services Trial Kit available at: <http://www6.software.ibm.com/dl/wstk/wstk-p>

Tutorials:

Building Web Services with Studio/WAS, Part 1: Build and test

<http://www.ibm.com/developer/cmp/r-wsadws1.html>

Building Web Services with Studio/WAS, Part 2: Deploy and publish

<http://www.ibm.com/developer/cmp/r-wsadws2.html>

3) Challenge: Build a services-oriented banking application using the Web Services Toolkit that takes advantage of all of the API's (WSDL, SOAP, UDDI, Java).

Pre-requisites:

IBM Web Services Toolkit at <http://www6.software.ibm.com/dl/wstk/wstk-p>
Eclipse information and downloads available at: <http://www.eclipse.org>

4) Challenge: Find a place where a Linux mainframe makes sense or cents.

Description:

There are many applications within a college or university (not necessarily administrative applications) where the use of a Linux mainframe could greatly enhance student or university productivity, save money, or enhance access to educational resources. For example, consolidation of infrastructure servers (file/print, mail, □DNS, etc) could save money and be more easily managed and maintained. Find one area at your college or university that would be enhanced by the use of a Linux mainframe, write a paper describing the use, and the projected benefits or improved efficiencies that would result.

Recommended reading material:

Library section of the Linux for zSeries website: www.ibm.com/zseries/linux

- The Dinosaur and Penguins S/390 Qualities of Service for Linux
- The Advantages of Linux for S/390
- Using Linux on zSeries for Commercial Applications
- The Value of z/VM for Linux
- Linux for zSeries and S/390 Porting Hints and Tips
- The Marist College Case Study might be a good one too

Library section of the zSeries website: www.ibm.com/zseries

Read the Product details and reference guides sections.

5) Challenge: Analyze the Windows XP client to Active Directory Logon process and set-up a prototype using LDAP and Kerberos on Linux.

Check with Samba 3.0 about already implemented parts and investigate how many other functions of Active Directory are missing and how they can be implemented, like profile handling or software distribution.

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6) Challenge: Exploit and verify the functionalities of SCTP. In particular, completion of one (1) or more of the following tasks:

- Build an SCTP client/server application which demonstrates the benefits of using any one of the SCTP features, such as multi-streaming, multi-homing, bundling, or all of the above.
- Identify performance hotspots in current Linux Kernel SCTP implementation. Suggest and demonstrate efficiencies.
- Build and extend the UML (User-mode Linux) for testing with the current Linux Kernel SCTP implementation. Demonstrate the capabilities of verifying SCTP features such as multi-homing, PMTU handling, and IPv4/IPv6 support by taking advantage of the UML.

7) Challenge: Develop Configuration Control and Diagnostic utilities (by splitting the existing 'mipdiag' utility) for Mobile IPv6 in Linux.

Detailed description of the challenge:

The Mobile IPv6 support in Linux (www.mipl.mediapoli.com) is the leading implementation within the industry today. The need of this project is to define the separate configuration and monitoring/debug utilities available Mobile IPv6 on Linux. There needs to be an understanding of the existing utility known as 'mipdiag' which provides both configuration control and monitoring functions. The challenge is to split this utility into multiple independent utilities (config and monitoring/diagnostic) for Mobile IPv6.

Prereqs (Hardware, Software, etc.):

At least 3 PC's that can be set up on private networks with hubs and/or switches. Industry standard Linux distribution In addition, Unix/Linux knowledge and experience at the system level, including but limited to administration, installing patches, configuring, tuning, etc.

8) Challenge: Develop new automatic test scripts for functionality verification of Mobile IPv6 implementations.

Detailed description of the challenge:

The need is to develop the new test cases for various functions (such as Mobile Node, Correspondent Node and Home Agent) of Mobile IPv6. TAHI project (www.tahi.org) provides test harness and test suites for IPv6 and core technologies such as Mobile IPv6. The structure of these new tests should follow TAHI test formats for easy integration into their test harness. The development of tests must be based upon the draft standard (draft 18) of Mobile IPv6. These tests will become an industry standard for performing conformance and interoperability of various industry implementations.

Prereqs (Hardware, Software, etc.):

At least 2 PC's with a simple network setup. Industry standard Linux distribution. In addition, Unix/Linux knowledge and experience at the system level, including but not limited to administration, installing patches, configuring, tuning, etc.

9) Challenge: Develop a relay agent for Dynamic Host Configuration Protocol for IPv6.

Detailed description of the challenge:

The need is to develop a relay agent for DHCPv6 as defined in draft 26 of DHCPv6 (work in progress) by IETF. The development must be based upon the design provided by LTC's DHCPv6 project. Additional DHCPv6 features such as dynamic DNS updates from a DHCP server can be provided.

Prereqs: (Hardware, Software, etc.):

At least 3 PC's with a simple network setup. Industry standard Linux distribution. DHCPv6 client/server software from LTC. Must be familiar with socket level programming.

10) Challenge: Development of NAT-PT transition mechanism for IPv6.

Detailed description of the challenge:

The need is to design and develop a NAT-PT translation mechanism as defined in RFC 2766 for IPv6 and IPv4 nodes to communicate.

Prereqs (Hardware, Software, etc.):

At least 3 PC's with a simple network setup. Router setup is required. Industry standard Linux distribution. Must be familiar with IPv6 and kernel programming. Probably, two students can work on this project.

11) Challenge: Port network daemons and utils to support both IPv4 and IPv6 simultaneously.

Detailed description of the challenge:

The need is to create single daemon for each of the functionality such as ftp, telnet, bind to support both IPv4 and IPv6 stacks simultaneously in dual protocol stack environments. Today, there exists separate daemons for v4 and v6 and this is a problem since they use the same port number when both stacks need to be supported. A few daemons and or utilities (e.g., ftp, telenet, rlogin etc.) can be ported to begin with and then can extend to other daemons and utilities.

Prereqs (Hardware, Software, etc.):

At least 2 PC's with a simple network setup Industry standard Linux distribution.

12) Challenge: Development of Network Adapter (Ethernet) failover support by network drivers in a standalone Linux system to improve the availability of the network connectivity.

Detailed description of the challenge:

The need is to develop the automatic failover support to a different n/w adapter (standby) by the network drivers. This support would allow the protocol stacks such as TCP/IP to be transparent to the adapter failures and still maintain the sessions to make the system/application services available. Must enhance the corresponding network driver (Intel or 3Com preferred).

Prereqs (Hardware, Software, etc.):

At least 2 PC's with a simple network setup. Industry standard Linux distribution. More than 2 network adapter cards (Intel or 3Com) preferred. Kernel programming is must.

13) Challenge: Piano Rolls (or a good lesson in backward compatibility).

Background - Mechanical music boxes have been around for 150 years and from the early 1900s to 1940s player pianos were quite popular in the US. There were many manufacturers of player pianos yet thankfully only one standard for the piano rolls. These days there exists only one piano roll company (QRS) yet a bigger problem is the older rolls are getting old and since they are paper ideally need to be copied.

That's where this project comes in.

Using Linux: Create a piano roll "reader" (one suggestion is to use Lego Mindstorms) which interfaces to Linux and pulls the "data" off of a piano roll. Create a piano roll "writer", that using the data from the reader, output to a blank roll such that an existing player piano can play it.

Bonus points if you can also save not only the music on the roll but the written lyrics off of the roll as well.

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14) Challenge: Fridge Fun

Using Linux: Create a computer that lives on the front of your fridge. This special embedded Linux machine will be able to do the following:

- *) Keep track of the families calendar
- *) store some number of family photos
- *) have an IM client so the "supper" call can be sent the members of the family
- *) browser to surf the web
- *) play MP3s
- *) database of the contents of the fridge collected with a UPC scanner hooked up to the Linux machine
 -) items added to the fridge can have their UPC code scanned
 -) items removed from the fridge will be removed from the
- *) leftovers in the fridge can be scanned and displayed to indicate how "long" they have been in the fridge.

Bonus: track remaining quantities of items . . . Example: so if you put a gallon of milk in the fridge, you should be able to track how much weight was added to the shelf. If the milk is removed and then added again to the fridge, it should notice a "weight" loss.

15) Challenge: Build a secure Linux for S/390 system.

Requirements - Install Linux for S/390 and implement security measures to do the following:

1. Associate access to resources with a user
2. Repel attempts to "crack" the system
3. Log attempts to access unauthorized resources
4. Implement a firewall OR same challenge for xSeries, pSeries, or iSeries server platforms

In addition:

1. Start with widely available distribution, such as SuSE.
2. Harden or lock down initial distribution.
3. Install and configure SSH as the only entry point for remote access.
4. Install and configure Audit capability.
5. Install and configure Access Control.
6. Install and configure Host and Network IDS.
7. Install Firewall tool to aid in the management of the available Firewall.
8. Integration of Hardware Crypto support.
9. Integration of Enterprise Identity Mapping (EIM) depending on time frame and availability.
10. Secure Web workload for demonstration purposes.

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16) Challenge: Extend the collection of sample tables in DB2 Linux to exploit and demonstrate SQL functions and map business functions.

Description: The IBM DB2 Universal Database ships with a SQL Getting Started Guide and sample database. The objective of this challenge is to create additional tables and examples which help to re-enforce SQL concepts using business data. One of the tables called Sales, could be expanded to provide more details on the revenue accounting process to include, customer details, product details and discounted revenue. Examples could be created showing both successful revenue transactions and unsuccessful transactions. SQL commit and rollback statements could be introduced to show the double entry accounting process of debiting accounts receivable and crediting revenue. SQL statements that show aging of accounts receivable and creation of bad debts. Techniques to reconcile accounts receivables and bank statements could also be explored. The student could also pursue using SQL to segment the customer revenue data. To be successful, students that need to demonstrate an understanding of SQL, accounting fundamentals and marketing analysis.

Recommended reading material:

Library section of the website: <http://www.ibm.com/software/data/pubs/>

- SQL Getting Started.
- SQL Reference.
- Business Intelligent Tutorial
- Application Development Guide.
- Administration Guide.

17) Challenge: Provide improvements to the level of awareness, toleration, or exploitation of virtualization technology (such as embodied in the z/VM hypervisor or VMWare) by Linux.

For example, consider how Linux's real memory management could be adapted to be more compatible with a virtual memory environment (regulating the size of the buffer cache, avoiding, etc.).

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