Harrison Saliba
CSCI 347 Assignment 2 Spring 2020

```
Script started on 2020-04-22 22:06:41-0700
^[]0;harry@harry-pc: ~/cs347/csci347_s20/ush^G^[[01;32mharry@harry-pc^[[00m:^[[0
1;34m~/cs347/csci347_s20/ush^[[00m$ make clean
rm -f ush.o expand.o builtin.o ush
^[]0;harry@harry-pc: ~/cs347/csci347_s20/ush^G^[[01;32mharry@harry-pc^[[00m:^[[0
1;34m~/cs347/csci347_s20/ush^[[00m$ ls
builtin.c defn.h expand.c grading_script.ps Makefile test_script.ps ush.c
^[]0;harry@harry-pc: ~/cs347/csci347_s20/ush^G^[[01;32mharry@harry-pc^[[00m:^[[0
1;34m~/cs347/csci347_s20/ush^[[00m$ make
gcc -g -Wall   -c -o ush.o ush.c
gcc -g -Wall   -c -o expand.o expand.c
gcc -g -Wall   -c -o builtin.o builtin.c
gcc -g -Wall -o ush ush.o expand.o builtin.o
^[]0;harry@harry-pc: ~/cs347/csci347_s20/ush^G^[[01;32mharry@harry-pc^[[00m:^[[0
1;34m~/cs347/csci347_s20/ush^[[00m$ ls
builtin.c  builtin.o  defn.h  expand.c  expand.o  grading_script.ps  Makefile  t
est_script.ps  ^[[0m^[[01;32mush^[[0m  ush.c  ush.o
^[]0;harry@harry-pc: ~/cs347/csci347_s20/ush^G^[[01;32mharry@harry-pc^[[00m:^[[0
1;34m~/cs347/csci347_s20/ush^[[00m$ ./ush
%
% echo "            hello          worlkd^H ^H^H ^Hd            "
          hello          world
% echo ${LANG}
en_US.UTF-8
% envset TESTINGVAR testingvar
% echo ${TESTINGVAR}
testingvar
% envset A ${TESTINGVAR}
% echo ${A}
testingvar
% envunset TESTINGVAR
% cd //^H ^H^H ^H../
% ls
ush
% cd ush
% cd
% ls
api.harry.technology  ddns       Downloads         HuurbAPI       LAMP_PHP_7_bitnam
i_application_password  Music                          packages-microsoft
-prod.deb  Pimostat  rootkey.csv  Templates
cs330                 Desktop    examples.desktop  HuurbUI        LAMP_PHP_7_bitnam
i_credentials           node-js_bitnami_application_password  personal-website-c
s202        Postman   rummicomp    Videos
cs347                 Documents  harry.technology  index.html  max.nvidia-settin
gs-rc                 node-js_bitnami_credentials           Pictures
   Public     snap
% exit
^[]0;harry@harry-pc: ~/cs347/csci347_s20/ush^G^[[01;32mharry@harry-pc^[[00m:^[[0
1;34m~/cs347/csci347_s20/ush^[[00m$ exit
exit

Script done on 2020-04-22 22:09:18-0700
```

```
Script started on 2020-04-22 21:58:52-0700
^[]0;harry@harry-pc: ~/cs347/csci347_s20/ush^G^[[01;32mharry@harry-pc^[[00m:^[[0
1;34m~/cs347/csci347_s20/ush^[[00m$ ssh -p922 salibah@linux.wwu.^H^[[K^H^[[K^H^[
[K^H^[[Kcs.wwu.edu
Warning: Permanently added the ECDSA host key for IP address '[140.160.30.102]:9
22' to the list of known hosts.

salibah@linux.cs.wwu.edu's password:
Welcome to the WWU Computer Science lab environment

If you are a new user or have questions regarding CS systems
or software, please visit the following URL or contact
CS.Support@wwu.edu for assistance:

https://support.cs.wwu.edu/

salibah@linux-05:~$ cd /home/phil/public/csci347/testa2
salibah@linux-05:/home/phil/public/csci347/testa2$ ./try
Cloning into 'csci347_s20'...
Enter passphrase for key '/home/salibah/.ssh/id_rsa':
remote: Enumerating objects: 97, done.^[[K
remote: Counting objects:   1% (1/97)^[[K
remote: Counting objects:   2% (2/97)^[[K
remote: Counting objects:   3% (3/97)^[[K
remote: Counting objects:   4% (4/97)^[[K
remote: Counting objects:   5% (5/97)^[[K
remote: Counting objects:   6% (6/97)^[[K
remote: Counting objects:   7% (7/97)^[[K
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remote: Counting objects:   9% (9/97)^[[K
remote: Counting objects:  10% (10/97)^[[K
remote: Counting objects:  11% (11/97)^[[K
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remote: Counting objects:  32% (32/97)^[[K
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```

```
remote: Counting objects:  40% (39/97)^[[K
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remote: Counting objects:  44% (43/97)^[[K
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remote: Counting objects:  46% (45/97)^[[K
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remote: Counting objects:  71% (69/97)^[[K
remote: Counting objects:  72% (70/97)^[[K
remote: Counting objects:  73% (71/97)^[[K
remote: Counting objects:  74% (72/97)^[[K
remote: Counting objects:  75% (73/97)^[[K
remote: Counting objects:  76% (74/97)^[[K
remote: Counting objects:  77% (75/97)^[[K
remote: Counting objects:  78% (76/97)^[[K
remote: Counting objects:  79% (77/97)^[[K
remote: Counting objects:  80% (78/97)^[[K
remote: Counting objects:  81% (79/97)^[[K
remote: Counting objects:  82% (80/97)^[[K
remote: Counting objects:  83% (81/97)^[[K
remote: Counting objects:  84% (82/97)^[[K
remote: Counting objects:  85% (83/97)^[[K
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remote: Counting objects:  87% (85/97)^[[K
remote: Counting objects:  88% (86/97)^[[K
remote: Counting objects:  89% (87/97)^[[K
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remote: Counting objects:  95% (93/97)^[[K
remote: Counting objects:  96% (94/97)^[[K
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remote: Counting objects:  98% (96/97)^[[K
remote: Counting objects: 100% (97/97)^[[K
```

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remote: Counting objects: 100% (97/97), done.^[[K
remote: Compressing objects:   1% (1/71)^[[K
remote: Compressing objects:   2% (2/71)^[[K
remote: Compressing objects:   4% (3/71)^[[K
remote: Compressing objects:   5% (4/71)^[[K
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remote: Compressing objects:  12% (9/71)^[[K
remote: Compressing objects:  14% (10/71)^[[K
remote: Compressing objects:  15% (11/71)^[[K
remote: Compressing objects:  16% (12/71)^[[K
remote: Compressing objects:  18% (13/71)^[[K
remote: Compressing objects:  19% (14/71)^[[K
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remote: Compressing objects:  22% (16/71)^[[K
remote: Compressing objects:  23% (17/71)^[[K
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remote: Compressing objects:  26% (19/71)^[[K
remote: Compressing objects:  28% (20/71)^[[K
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remote: Compressing objects:  30% (22/71)^[[K
remote: Compressing objects:  32% (23/71)^[[K
remote: Compressing objects:  33% (24/71)^[[K
remote: Compressing objects:  35% (25/71)^[[K
remote: Compressing objects:  36% (26/71)^[[K
remote: Compressing objects:  38% (27/71)^[[K
remote: Compressing objects:  39% (28/71)^[[K
remote: Compressing objects:  40% (29/71)^[[K
remote: Compressing objects:  42% (30/71)^[[K
remote: Compressing objects:  43% (31/71)^[[K
remote: Compressing objects:  45% (32/71)^[[K
remote: Compressing objects:  46% (33/71)^[[K
remote: Compressing objects:  47% (34/71)^[[K
remote: Compressing objects:  49% (35/71)^[[K
remote: Compressing objects:  50% (36/71)^[[K
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remote: Compressing objects:  73% (52/71)^[[K
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remote: Compressing objects:  76% (54/71)^[[K
remote: Compressing objects:  77% (55/71)^[[K
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remote: Compressing objects:  80% (57/71)^[[K
remote: Compressing objects:  81% (58/71)^[[K
```

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remote: Compressing objects:  83% (59/71)^[[K
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remote: Compressing objects:  85% (61/71)^[[K
remote: Compressing objects:  87% (62/71)^[[K
remote: Compressing objects:  88% (63/71)^[[K
remote: Compressing objects:  90% (64/71)^[[K
remote: Compressing objects:  91% (65/71)^[[K
remote: Compressing objects:  92% (66/71)^[[K
remote: Compressing objects:  94% (67/71)^[[K
remote: Compressing objects:  95% (68/71)^[[K
remote: Compressing objects:  97% (69/71)^[[K
remote: Compressing objects:  98% (70/71)^[[K
remote: Compressing objects: 100% (71/71)^[[K
remote: Compressing objects: 100% (71/71), done.^[[K
Receiving objects:   1% (1/97)
Receiving objects:   2% (2/97)
remote: Total 97 (delta 29), reused 81 (delta 20), pack-reused 0
Receiving objects:   3% (3/97)
Receiving objects:   4% (4/97)
Receiving objects:   5% (5/97)
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Receiving objects:  46% (45/97)
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Receiving objects:  94% (92/97)
Receiving objects:  95% (93/97)
Receiving objects:  96% (94/97)
Receiving objects:  97% (95/97)
Receiving objects:  98% (96/97)
Receiving objects: 100% (97/97)
Receiving objects: 100% (97/97), 62.37 KiB | 3.67 MiB/s, done.
Resolving deltas:   0% (0/29)
Resolving deltas:   3% (1/29)
Resolving deltas:   6% (2/29)
Resolving deltas:  10% (3/29)
Resolving deltas:  13% (4/29)
```

```
Resolving deltas:  44% (13/29)
Resolving deltas:  55% (16/29)
Resolving deltas:  58% (17/29)
Resolving deltas:  62% (18/29)
Resolving deltas:  68% (20/29)
Resolving deltas:  79% (23/29)
Resolving deltas:  82% (24/29)
Resolving deltas:  96% (28/29)
Resolving deltas: 100% (29/29)
Resolving deltas: 100% (29/29), done.
Branch 'a2' set up to track remote branch 'a2' from 'origin'.
Switched to a new branch 'a2'
gcc -g -Wall   -c -o ush.o ush.c
gcc -g -Wall   -c -o expand.o expand.c
gcc -g -Wall   -c -o builtin.o builtin.c
gcc -g -Wall -o ush ush.o expand.o builtin.o


Running ush


Script output same
Exit values correct


----- ERRS -----
% % % % % % % % % % % % % % % % % % % % % % % % % % % % % % % % % % % % %
----------------


Testing Errors
% Test: Next line should have a missing } error
% a missing } error
% Test: Next two lines should be cd errors
% % cd errors: HOME unset
% Test: Next line should be an expansion overflow error
% an expansion overflow error
% Test: Error Testing Done
%
Look at checked out files? n
Clean? y
cleaning
removing ~/347_test_a2
salibah@linux-05:/home/phil/public/csci347/testa2$ logout
Connection to linux.cs.wwu.edu closed.

^[]0;harry@harry-pc: ~/cs347/csci347_s20/ush^G^[[01;32mharry@harry-pc^[[00m:^[[0
1;34m~/cs347/csci347_s20/ush^[[00m$ exit
exit

Script done on 2020-04-22 22:00:12-0700
```

```
# This is a very simple makefile
#

CC = gcc
CFLAGS = -g -Wall
FILES = ush.o expand.o builtin.o

ush: $(FILES)
        $(CC) $(CFLAGS) -o ush $(FILES)

$(FILES): defn.h

clean:
        rm -f $(FILES) ush
```

```
/* Prototypes */

void processline(char *line);
char **arg_parse(char *line, int *argcptr);
int expand(char *orig, char *new, int newsize);
int shellcommand(char **args, int argc);
```

```c
/* CS 347 -- Micro Shell!
 *
 *    Sept 21, 2000,  Phil Nelson
 *    Modified April 8, 2001
 *    Modified January 6, 2003
 *    Modified January 8, 2017
 *
 *    Modified for assignment 1 by Harry Saliba
 *
 */

#include <stdio.h>
#include <string.h>
#include <unistd.h>
#include <errno.h>
#include <stdlib.h>
#include <sys/types.h>
#include <sys/wait.h>
#include "defn.h"

/* Constants */

#define LINELEN 1024

/* Shell main */

int main(void)
{
  char buffer[LINELEN];
  int len;

  while (1)
  {

    /* prompt and get line */
    fprintf(stderr, "%% ");
    if (fgets(buffer, LINELEN, stdin) != buffer)
      break;

    /* Get rid of \n at end of buffer. */
    len = strlen(buffer);
    if (buffer[len - 1] == '\n')
      buffer[len - 1] = 0;

    /* Run it ... */
    processline(buffer);
  }

  if (!feof(stdin))
    perror("read");

  return 0; /* Also known as exit (0); */
}

void processline(char *line)
{
  pid_t cpid;
  int status;
```

```c
  /* expand enviroment variables */
  char *processedLine = (char *)malloc(sizeof(char) * LINELEN);
  if (expand(line, processedLine, LINELEN) < 0)
  {
    return;
  }

  /* process the args */
  int argc = 0;
  char **argv = arg_parse(processedLine, &argc);
  if (argc == 0)
  {
    return;
  }

  /* check for built-ins */
  if (shellcommand(argv, argc) == 0)
  {
    return;
  }

  /* Start a new process to do the job. */
  cpid = fork();
  if (cpid < 0)
  {
    /* Fork wasn't successful */
    perror("fork");
    return;
  }

  /* Check for who we are! */
  if (cpid == 0)
  {
    /* We are the child! */
    execvp(argv[0], argv);
    /* execlp reurned, wasn't successful */
    perror("exec");
    fclose(stdin); // avoid a linux stdio bug
    exit(127);
  }

  /* Have the parent wait for child to complete */
  if (wait(&status) < 0)
  {
    /* Wait wasn't successful */
    perror("wait");
  }
}

/*Parse Arguments
 * Processes a string containing an executable command into an array of argument
s.
 *
 * @TODO: process command line arguments that have double qoutes.
 */
char **arg_parse(char *line, int *argcptr)
{
  /* count argv */
  int count = 0;
```

```c
  char *pos = line;
  while (*pos != '\0')
  {
    if (*pos == ' ')
    {
      pos++;
    }
    else
    {
      count++;
      while (*pos != '\0' && *pos != ' ')
      {
        if (*pos == '"')
        {
          pos++;
          while (*pos != '"')
          {
            if (*pos == '\0')
            {
              printf("Wrong number of double qoutes.\n");
              return NULL;
            }
            pos++;
          }
          pos++;
        }
        else
        {
          pos++;
        }
      }
    }
  }
  *argcptr = count;

  /* malloc size + 1 */
  char **argv = (char **)malloc(sizeof(char *) * (count + 1));
  argv[count] = NULL;

  /* assign pointers and add EOS chars */
  count = 0;
  pos = line;
  while (*pos != '\0')
  {
    if (*pos == ' ')
    {
      pos++;
    }
    else
    {
      argv[count] = pos;
      count++;
      while (*pos != '\0' && *pos != ' ')
      {
        if (*pos == '"')
        {
          pos++;
          while (*pos != '"')
          {
```

```c
                pos++;
            }
            pos++;
        }
        else
        {
            pos++;
        }
    }
    if (*pos != '\0')
    {
        *pos = '\0';
        pos++;
    }
  }
}

/*remove qoutes */
count--;
char *nq;
while (count >= 0)
{
  pos = argv[count];
  nq = argv[count];
  while (*nq != '\0' && *pos != '\0')
  {
    while (*nq == '"')
    {
      nq++;
    }
    *pos = *nq;
    pos++;
    nq++;
  }
  *pos = '\0';
  count--;
}

  return argv;
}
```

```c
#include <stdio.h>
#include <stdlib.h>
#include <sys/types.h>
#include <unistd.h>

int expand(char *orig, char *new, int newsize)
{
  /* make sure the last charachter of the output string is \0 */
  new[newsize] = '\0';

  /* process */
  int dst = 0;
  int src = 0;
  // Loop until EOS or overflow
  while (orig[src] != '\0' && dst < newsize)
  {
    // if start of expand
    if (orig[src] == '$')
    {
      src++;
      // if env var
      if (orig[src] == '{')
      {
        src++;
        // remember the start of the name
        char *varName = &orig[src];
        // loop until ending brace
        while (orig[src] != '}')
        {
          // be sure not EOS, if EOS then error no ending brace
          if (orig[src] == '\0')
          {
            //err
            fprintf(stderr, "a missing } error\n");
            return -1;
          }
          src++;
        }
        orig[src] = '\0';
        src++;
        // Attempt to get variable
        char *var = getenv(varName);
        if (var)
        {
          // Copy in variable
          while (*var != '\0' && dst < newsize)
          {
            new[dst] = *var;
            dst++;
            var++;
          }
        }
      }
      // Expand PID
      else if (orig[src] == '$')
      {
        src++;
        int size = snprintf(&new[dst], newsize - dst, "%d", getpid());
        dst += size;
```

```
        }
        else
        {
          src--;
        }

        // Add any other expansion rules here
    }
    // copy
    new[dst] = orig[src];
    src++;
    dst++;
  }

  if (dst >= newsize)
  {
    fprintf(stderr,  "an expansion overflow error\n");
    return -1;
  }
  // puts(new);
  return 0;
}
```

```c
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <unistd.h>

int shellcommand(char **args, int argc)
{
  if (strcmp(args[0], "exit") == 0)
  {
    if (argc == 1)
    {
      exit(0);
    }
    else if (argc > 1)
    {
      exit(atoi(args[1]));
    }
    return 0;
  }
  else if (strcmp(args[0], "envset") == 0)
  {
    if (argc != 3)
    {
      perror("Usage: envset NAME value");
      return 0;
    }
    setenv(args[1], args[2], 1);
    return 0;
  }
  else if (strcmp(args[0], "envunset") == 0)
  {
    if (argc != 2)
    {
      perror("Usage: envunset NAME");
      return 0;
    }
    unsetenv(args[1]);
    return 0;
  }
  else if (strcmp(args[0], "cd") == 0)
  {
    if (argc == 2)
    {
      chdir(args[1]);
    }
    else if (argc == 1)
    {
      char *home = getenv("HOME");
      if (!home) {
        fprintf(stderr, "cd errors: HOME unset\n");
      }
      else
      {
        chdir(home);
      }
    }
    else
    {
      fprintf(stderr, "cd errors: Usage: cd [directory]\n");
```

```c
            return 0;
        }
        return 0;
    }
    return -1;
}
```