Linux Text Utilities 101 for S/390 Wizards

WAVV Presentation

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Linux Shell Concepts: I/O Redirection

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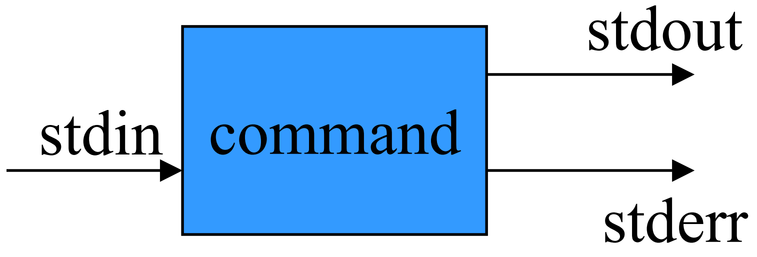
- Three streams: input, output, and error
- < controls input
- > or 1> controls output
- 2> controls error
- >> appends to file
- /dev/null is the Bit Bucket



Example 1: Three different files

somecommand < *input_file* > *output_file* 2> *error_log*

Example 2: Common log file

somecommand < *input_file* > *output_file* 2>&1

Linux Shell Concepts: Command Piping

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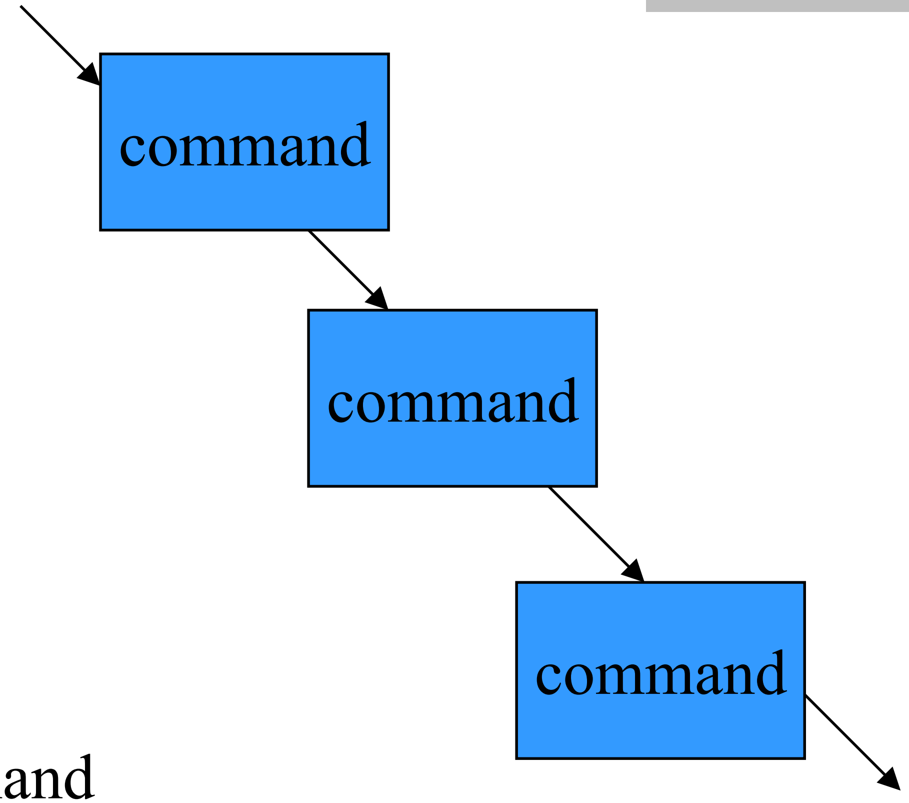
- Pipe symbol: |
- Connects output of one process to input of next
- Multiple levels
- No guarantee of timing
- Cumulative effect on data



Example 1: Simple pipe

```
somecommand | othercommand
```

Example 2: Discarding errors but catching the output

somecommand 2> /dev/null | othercommand > *outfile*

Linux Shell Concepts: Command Substitution

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- Use back-tickmarks (accent grave) to enclose command
- Substitutes *result* back into original command line
- Can have a multistage pipe inside substitution area

Example:

```
mv `ls *.jpg | tail -3` /home/newuser/graphics/
```

Lists all JPEG files in the current directory alphabetically, picks the last three from the list, and moves them to the indicated directory. Powerful!

Text Utilities: Common Behavior

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- Designed for *text*, not binary
- Treat text as variable-length lines
- May be limits (albeit very large) to length of a line
- Case-sensitive unless otherwise specified
- May buffer input, outputs, or both
- Options [usually] go before filenames, as in:
  command *-op1 -op2 file1 file2* …
- This presentation doesn’t cover *all* options of each command.

cat

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- Short for “concatenate”
- Copies stdin to stdout
- Accepts multiple filenames
- Options:

-b	Numbers nonblank lines
-n	Numbers every line
-s	Removes consecutive blank lines

Example:

cat –s *file1 file2 file3 > bigfile* 2> /dev/null

Copies (without redundant blank lines) three files into one big file. Throw any errors (such as for missing files) into the bit bucket.

head

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- Grabs first *n* lines of file
- For multiple files, adds a header line before each
- Options:
  -*n* Indicates *n* lines (default 10)

Example:

```
ls ~ | head -5
```

Show me the first five files in my home directory

tail

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- Grabs last *n* lines of file
- For multiple files, adds a header line before each
- Options:

  -*n* Indicates *n* lines (default 10)

  -f Follow (update every few seconds)

  (Great for watching logfiles be created)

Example:

```
    tail -30 /tmp/something.log
```

Show me the last 30 lines of a logfile.

sort

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- Many options – use "man sort" for details
- Options:

-b	Ignore leading blanks in keys
-r	Sort in reverse (descending) order
-n	Numeric (rather than alphanumeric) sort
-f	Fold to uppercase (case-insensitive sort)
-u	Unique – discard duplicate lines from output
-k *pos1,pos2*	Define key from *pos1* through *pos2* fields, inclusive (leftmost is field 1)
-t *char*	Use *char* as the field delimiter instead of blank-to-nonblank transitions

Example:

```
du -s ~/* | sort -n | tail -20
```

Lists the 20 biggest files or directories in your home directory

cut

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- Cuts columns or fields from the data stream
- Discards everything not selected
- Accepts lists of ranges, e.g.:
  1,3,2-7,14,39-45
- Options (-c and –f are mutually exclusive):
  -c *range_list* Return this list of column fields
  -f *range_list* Return this list of delimited fields
  -d *delimiter* Specifies field delimiter character

Example:

```
cut –f 1,5 –d: /etc/passwd
```

List all the login names and real names of users of this system.

/etc/passwd looks like “*login*:x:*uid*:*gid*:*real_name*:*home*:*shell*”

tr

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- Translates character-by-character
- Works much like equivalent function in REXX
- Options (partial list…see “man tr” for details):

-d	Delete the specified character(s) from input
-s	Squeeze repeated characters to one instance each
-c	Invert (complement) the input set

- Built-in special sets (again, a partial list):

[:alpha:]	All alphabetics
[:digit:]	0 through 9, inclusive
[:xdigit:]	Hexadecimal digits
[:alnum:]	Alphanumerics
[:upper:] and [:lower:]	Upper and lower case alphabets

tr (continued)

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- Example 1: Convert everything to uppercase
  tr [:lower:] [:upper:] < *infile* > *outfile*
- Example 2: Remove all equals signs from input
  tr -d = < *infile* > *outfile*
  (Note…for many characters, put within single quotes!)
- Example 3: Remove anything except digits
  tr -d -c [:digit:] < *infile* > *outfile*

grep

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- Searches for **regular expression** patterns in input
- Simple examples here – regular expressions are a topic unto themselves, but **grep** is too important to omit.
- Options:
  -v Find lines *not* containing the pattern
  -i Match case-insensitively
  -E Use enhanced expression syntax (see **tr** or "man grep" for examples)
  -n Show numbers of matching lines
  -l List filenames containing matches, not actual text

grep (continued)

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- Example 1: Search for lines beginning with “A”
  grep ^A *somefile*
- Example 2: Search for lines not ending with “A” or “a”
  grep -v -i a$ *somefile*
- Example 3: Name all C source files in the current directory that contain “MyFunction” anywhere in the file
  grep -l “MyFunction” *.c
- Example 4: What files in the /tmp directory begin with something other than a letter or digit?
  ls /tmp | grep -iv ^[0-9A-Z]
- Many, many other possibilities. Read up on this one!

Example Pipe 1: Show me the piggies!

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- Situation: I want to know the logins of the three users who have the largest home directories, assuming everyone's home directory is under /home. Show the size of the directories in kilobytes. Put the worst offender at the top of the list, not the bottom.
- Solution:

```
du -sk /home/* | sort -rn | head -3 | cut f1,3 -d/ | tr -d /
```

- Output sample:

```
4537        piggy
2301        oink
1896        glutton
```

- Advanced tip: **sed** (not covered today) is a better way to get rid of the "/home/" part of the home directory pathname, or just run the commands from /home as the current directory, and omit the full path from **du**, also dropping **cut** and **tr** from the pipe.

Example Pipe 2: Get rid of test files

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- Situation: You've been working on some source code lately, and in a fit of poor administrative practice, you mixed the prototypes in with your production source files! Luckily you know that the word "TEST" (upper case) appears in the bogus source files but not in any of the others. Delete all the bogus source files from the current directory in one fell swoop.
- Solution:

  ```
  rm `grep -l TEST *.c *.cpp *.h`
  ```
- Important safety tip:
  Doh! This is an easy way to zap a lot of data by mistake. Run the stuff inside the back-ticks, separately, to see what the list of filenames will be before you actually delete anything.

Example Pipe 3: Data query

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- Situation: You have input records that look like this:
  name→address→city→state→zipcode
  You need to extract the name and zipcode (only) of all the records beginning with A through M. Also, it is desired to have the output be only uppercase because it will be fed to an application that does not understand lowercase letters. Sort the output by zipcode, ascending. Output records should be *name→zipcode* only.
- Solution:
  grep -i ^[A-M] *infile* | cut -f5,1 | sort -n | cut -f2,1 > *outfile*
- Advanced tip:
  Tabs are **cut**'s default delimiter. Note that we first pull the fields zipcode-to-the-left to make the **sort** syntax simpler, then use **cut** again to reverse the fields (of which there are now only two).

Conclusion

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- There are dozens of other text-oriented commands
- They can be combined in virtually infinite ways
- Modularity is the key
- Look in /usr/bin and /bin for many of these. The names may give you a clue as to what they do.
- Type "man *command*" to get syntax help.
- Test things that obtain filename lists before doing things to the files. ("Let's be *careful* out there!")
- Have fun, and experiment!

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