

# Linux 操作系统及应用

## 附录 B — sed: Stream EEditor

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# sed概述 I

- **流**是具有特殊属性的动态序列元素。流中所有的元素都具有相同的数据类型。流中元素的个数被称为**流的长度**。对流可以进行读写操作。
- **sed**的基本语法为:

```
1 sed [-n] [-e] 'edit_cmds' in_file 或:
2 sed [-n] -f edit_script in_file
```

- 其中**in\_file**表示要被编辑的输入流，缺省时指标准输入
- **-n**选项表示隐藏所有输出
- **-e**选项指明后续的是一个编辑命令，编辑命令的语法为:

```
1 [addr1[,addr2]]function [args]
```

- **addr**指明操作的行范围，**function**是命令，**args**是命令的参数



## sed概述 II

- **sed**每次处理输入文件（或标准输入）的一行，并把结果送到标准输出上。**sed**把当前正在处理的行保存在一个临时缓冲区中，这个临时缓冲区被称为**模式空间**(pattern space)。
- 一旦**sed**完成了对模式空间里的行的处理，就把模式空间中的内容送到标准输出上（除非该命令要删除该行或禁止打印）。处理完该行后，从模式空间中删除它，然后读入下一行继续处理。



# sed 概述 III

## ■ 实验数据文件:

```

1 [Apple]$ cat data
2 northwest  NW  Charles Main          3.0  .98  3  34
3 western    WE  Sharon Gray          5.3  .97  5  23
4 southwest  SW  Levis Dalsass          2.7  .8   2  18
5 southern   SO  Suan Chin            5.1  .95  4  15
6 southeast  SE  Patricia Hemenway        4.0  .7   4  17
7 eastern    EA  TB Savage            4.4  .84  5  20
8 northeast  NE  AM Main Jr.              5.1  .94  3  13
9 north      NO  Margot Weber              4.5  .89  5   9
10 central   CT  Ann Stephens              5.7  .94  5  13

```



# 打印命令 p |

## ■ Example:

```

1 [Apple]$ sed '/north/p' data
2 northwest NW Charles Main 3.0 .98 3 34
3 northwest NW Charles Main 3.0 .98 3 34
4 western WE Sharon Gray 5.3 .97 5 23
5 southwest SW Levis Dalsass 2.7 .8 2 18
6 southern SO Suan Chin 5.1 .95 4 15
7 southeast SE Patricia Hemenway 4.0 .7 4 17
8 eastern EA TB Savage 4.4 .84 5 20
9 northeast NE AM Main Jr. 5.1 .94 3 13
10 northeast NE AM Main Jr. 5.1 .94 3 13
11 north NO Margot Weber 4.5 .89 5 9
12 north NO Margot Weber 4.5 .89 5 9
13 central CT Ann Stephens 5.7 .94 5 13

```





# 打印命令p II

## Explain

- p命令打印匹配的行
- sed的默认动作是输出模式空间中的行



# 禁止选项 -n |

- Example:

```

1 [Apple]$ sed -n '/north/p' data
2 northwest  NW  Charles Main      3.0   .98   3   34
3 northeast  NE  AM Main Jr.      5.1   .94   3   13
4 north      NO  Margot Weber      4.5   .89   5    9

```

## Explain

- n选项和p命令一起使用时将禁止sed的默认行为：输出模式空间中的行，因此只有匹配的行被输出。



# 删除命令d |

## Example:

```

1 [Apple]$ sed '3d' data
2 northwest  NW  Charles Main      3.0  .98  3  34
3 western    WE  Sharon Gray      5.3  .97  5  23
4 southern   SO  Suan Chin        5.1  .95  4  15
5 southeast  SE  Patricia Hemenway 4.0  .7   4  17
6 eastern    EA  TB Savage         4.4  .84  5  20
7 northeast  NE  AM Main Jr.       5.1  .94  3  13
8 north      NO  Margot Weber        4.5  .89  5   9
9 central    CT  Ann Stephens         5.7  .94  5  13

```

## Explain

- 删除第三行，对其它的行执行sed的默认动作。

# 删除命令d II

- Example:

```
1 [Apple]$ sed '3,$d' data
2 northwest  NW  Charles Main      3.0  .98  3  34
3 western    WE  Sharon Gray      5.3  .97  5  23
```

## Explain

- 删除第三行至最后一行之间的所有行，对其它的行执行sed的默认动作。



# 删除命令d III

## Example:

```

1 [Apple]$ sed '$d' data
2 northwest  NW  Charles Main      3.0   .98   3   34
3 western    WE  Sharon Gray      5.3   .97   5   23
4 southwest  SW  Levis Dalsass     2.7   .8    2   18
5 southern   SO  Suan Chin        5.1   .95   4   15
6 southeast  SE  Patricia Hemenway  4.0   .7    4   17
7 eastern    EA  TB Savage        4.4   .84   5   20
8 northeast  NE  AM Main Jr.       5.1   .94   3   13
9 north      NO  Margot Weber      4.5   .89   5    9

```

## Explain

- 删除最后一行，对其它的行执行sed的默认动作。



# 删除命令d IV

## Example:

```

1 [Apple]$ sed '/north/d' data
2 western      WE   Sharon Gray          5.3   .97   5   23
3 southwest    SW   Levis Dalsass       2.7   .8    2   18
4 southern     SO   Suan Chin           5.1   .95   4   15
5 southeast    SE   Patricia Hemenway   4.0   .7    4   17
6 eastern      EA   TB Savage           4.4   .84   5   20
7 central      CT   Ann Stephens        5.7   .94   5   13

```

## Explain

- 删除匹配 north 的行，对其它的行执行sed的默认动作。



# 替换命令 s |

## ■ Example:

```

1 [Apple]$ sed 's/west/north/g' data
2 northnorth NW Charles Main 3.0 .98 3 34
3 northern WE Sharon Gray 5.3 .97 5 23
4 southnorth SW Levis Dalsass 2.7 .8 2 18
5 southern SO Suan Chin 5.1 .95 4 15
6 southeast SE Patricia Hemenway 4.0 .7 4 17
7 eastern EA TB Savage 4.4 .84 5 20
8 northeast NE AM Main Jr. 5.1 .94 3 13
9 north NO Margot Weber 4.5 .89 5 9
10 central CT Ann Stephens 5.7 .94 5 13

```



# 替换命令 s II

## Explain

- 将每一行中出现的所有 `west` 都替换为 `north`，并输出（缺省动作）
- `g`选项表示行全程：对单行中的每一个实例都执行操作





# 替换命令 s III

- Example:

```
1 [Apple]$ sed -n 's/^west/north/p' data
2 northern    WE    Sharon Gray          5.3    .97    5    23
```

## Explain

- s命令将所有行首出现的 west 都替换为 north, -n和p命令表示只输出替换过的行。



# 替换命令 s IV

## ■ Example:

```

1  [Apple]$ sed 's/[0-9][0-9]$/&.5/' data
2  northwest  NW  Charles Main          3.0  .98  3  34.5
3  western    WE  Sharon Gray          5.3  .97  5  23.5
4  southwest  SW  Levis Dalsass          2.7  .8   2  18.5
5  southern   SO  Suan Chin             5.1  .95  4  15.5
6  southeast  SE  Patricia Hemenway      4.0  .7   4  17.5
7  eastern    EA  TB Savage             4.4  .84  5  20.5
8  northeast  NE  AM Main Jr.           5.1  .94  3  13.5
9  north      NO  Margot Weber          4.5  .89  5  9
10 central    CT  Ann Stephens          5.7  .94  5  13.5

```



# 替换命令 s V

## Explain

- 所有以两个数字结尾的行都会在后面加上.5
- 搜索串 [0-9][0-9]\$ 表示行尾最后两个字符是数字字符
- 替换串中的 & 表示在搜索串里真正找到的串



# 替换命令 s VI

- Example:

```
1 [Apple]$ sed -n 's/\(Mar\)got/\1ianne/p' data
2 north      NO  Marianne Weber      4.5   .89   5   9
```

## Explain

- 用 Marianne 来替换每行中的第一个 Margot，并输出替换过的行
- \(和\)用于表示标记正则表达式，而\**n**, (**n** = 1, 2, ..., 9)表示对标记正则表达式的引用



# 替换命令 s VII

## ■ Example:

```

1 [Apple]$ sed 's#3#88#g' data
2 northwest NW Charles Main 88.0 .98 88 884
3 western WE Sharon Gray 5.88 .97 5 288
4 southwest SW Levis Dalsass 2.7 .8 2 18
5 southern SO Suan Chin 5.1 .95 4 15
6 southeast SE Patricia Hemenway 4.0 .7 4 17
7 eastern EA TB Savage 4.4 .84 5 20
8 northeast NE AM Main Jr. 5.1 .94 88 188
9 north NO Margot Weber 4.5 .89 5 9
10 central CT Ann Stephens 5.7 .94 5 188

```



# 替换命令 s VIII

## Explain

- 所有的字符 3 用 88 这两个字符来替换
- s 命令后紧跟着的字符被视为搜索串和替换串的定界符，可任意指定



# 模式范围 I

## Example:

```

1 [Apple]$ sed -n '/west/,/east/p' data
2 northwest  NW  Charles Main      3.0  .98  3  34
3 western    WE  Sharon Gray      5.3  .97  5  23
4 southwest  SW  Levis Dalsass    2.7  .8   2  18
5 southern   SO  Suan Chin       5.1  .95  4  15
6 southeast  SE  Patricia Hemenway 4.0  .7   4  17

```

## Explain

- 输出在 west 和 east 两个模式之间的所有行。包括这个范围的首、尾行
- 如果 west 出现在 east 之后，则输出从 west 到下一个 east 或文件结尾之间的所有行

## 模式范围 II

- Example:

```

1 [Apple]$ sed -n '5,/^\ northeast/p' data
2 southeast SE Patricia Hemenway 4.0 .7 4 17
3 eastern EA TB Savage 4.4 .84 5 20
4 northeast NE AM Main Jr. 5.1 .94 3 13

```

### Explain

- 输出从第 5 行到以 northeast 开头的第一个行之间的所有行





# 模式范围 III

## ■ Example:

```

1  [Apple]$ sed '/west/,/east/s/$/**VACA**/' data
2  northwest NW Charles Main      3.0 .98 3 34**VACA**
3  western    WE Sharon Gray      5.3 .97 5 23**VACA**
4  southwest SW Levis Dalsass     2.7 .8  2 18**VACA**
5  southern   SO Suan Chin        5.1 .95 4 15**VACA**
6  southeast SE Patricia Hemenway 4.0 .7  4 17**VACA**
7  eastern    EA TB Savage        4.4 .84 5 20
8  northeast NE AM Main Jr.      5.1 .94 3 13
9  north      NO Margot Weber     4.5 .89 5 9
10 central    CT Ann Stephens     5.7 .94 5 13

```



## 模式范围 IV

### Explain

- 对于在 `west` 和 `east` 两个模式之间的所有行，在其行尾添加串 `**VACA**`



# 编辑选项-e |

## Example:

```
1 [Apple]$ sed -e '1,3d' -e 's/Hemenway/Jones/' data
2 southern    SO    Suan Chin          5.1    .95    4    15
3 southeast   SE    Patricia Jones      4.0    .7     4    17
4 eastern     EA    TB Savage           4.4    .84    5    20
5 northeast   NE    AM Main Jr.         5.1    .94    3    13
6 north       NO    Margot Weber        4.5    .89    5    9
7 central     CT    Ann Stephens        5.7    .94    5    13
```

## Explain

- -e选项表示要进行多次编辑：
- 第一次编辑删除 1-3 行；
- 第二次编辑用 Jones 替换 Hemenway。

# 读文件命令 r |

## ■ Example:

```

1 [Apple]$ cat notice
2 -----
3 |
4 | *** SUAN HAS LEFT THE COMPANY *** |
5 |
6 -----
7 [Apple]$ sed '/Suan/r notice' data
8 northwest  NW  Charles Main          3.0  .98  3  34
9 western    WE  Sharon Gray           5.3  .97  5  23
10 southwest SW  Levis Dalsass          2.7  .8   2  18
11 southern   SO  Suan Chin             5.1  .95  4  15
12 -----
13 |
14 | *** SUAN HAS LEFT THE COMPANY *** |

```

# 读文件命令 `r` II

```

15 |
16 |-----|
17 | southeast  SE  Patricia Hemenway  4.0  .7  4  17
18 | eastern    EA  TB Savage          4.4  .84 5  20
19 | northeast  NE  AM Main Jr.        5.1  .94 3  13
20 | north      NO  Margot Weber        4.5  .89 5  9
21 | central    CT  Ann Stephens        5.7  .94 5  13

```

## Explain

- `r`命令用于读入文件，并将其内容显示在所有匹配行的后面



# 写文件命令w |

## Example:

```

1 [Apple]$ sed -n '/north/w newfile' data
2 [Apple]$ cat newfile
3 northwest    NW    Charles Main          3.0    .98    3    34
4 northeast    NE    AM Main Jr.           5.1    .94    3    13
5 north        NO    Margot Weber          4.5    .89    5    9

```

## Explain

- w命令用于写文件，将所有本应送到STDOUT上的内容都写到指定的文件中



## 追加命令 a |

## ■ Example:

```

1 [Apple]$ sed '/^north /a\
2 >-->THE NORTH SALES DISTRICT HAS MOVED<--' data
3 northwest  NW  Charles Main          3.0  .98  3  34
4 western    WE  Sharon Gray           5.3  .97  5  23
5 southwest  SW  Levis Dalsass          2.7  .8   2  18
6 southern   SO  Suan Chin              5.1  .95  4  15
7 southeast  SE  Patricia Hemenway     4.0  .7   4  17
8 eastern    EA  TB Savage               4.4  .84  5  20
9 northeast  NE  AM Main Jr.            5.1  .94  3  13
10 north      NO  Margot Weber           4.5  .89  5   9
11 -->THE NORTH SALES DISTRICT HAS MOVED<--
12 central    CT  Ann Stephens           5.7  .94  5  13

```



# 追加命令 a II

## Explain

- a命令用添加文本到当前行的后面
- 模式中 north 后面的空格用于区别 north 和 northeast、northwest
- 第一行行尾的\用于续行
- 第二行行首的>是 Bourne Shell 的缺省PS2





# 插入命令 i

## Example:

```

1 [Apple]$ sed '/eastern/i\
2 > NEW ENGLAND REGION\
3 > -----' data
4 northwest  NW  Charles Main      3.0  .98  3  34
5 western    WE  Sharon Gray      5.3  .97  5  23
6 southwest  SW  Levis Dalsass    2.7  .8   2  18
7 southern   SO  Suan Chin        5.1  .95  4  15
8 southeast  SE  Patricia Hemenway 4.0  .7   4  17
9 NEW ENGLAND REGION
10 -----
11 eastern    EA  TB Savage        4.4  .84  5  20
12 northeast  NE  AM Main Jr.     5.1  .94  3  13
13 north      NO  Margot Weber     4.5  .89  5   9
14 central    CT  Ann Stephens     5.7  .94  5  13

```

# 插入命令 i

## Explain

- i 命令用插入文本到当前行的前面
- 第一行和第二行行尾的 \ 用于续行
- 第二行和第三行行首的 > 是 Bourne Shell 的缺省 PS2



# 读文本命令n l

## ■ Example:

```

1 [Apple]$ sed '/eastern/{n;s/AM/Archie/;}' data
2 northwest  NW  Charles Main          3.0  .98  3  34
3 western    WE  Sharon Gray          5.3  .97  5  23
4 southwest  SW  Levis Dalsass        2.7  .8   2  18
5 southern   SO  Suan Chin            5.1  .95  4  15
6 southeast  SE  Patricia Hemenway    4.0  .7   4  17
7 eastern    EA  TB Savage            4.4  .84  5  20
8 northeast  NE  Archie Main Jr.        5.1  .94  3  13
9 north      NO  Margot Weber            4.5  .89  5   9
10 central   CT  Ann Stephens            5.7  .94  5  13

```



# 读文本命令n II

## Explain

- n命令用将当前行的下一行的内容读入到模式空间
- { 和 } 用于将数个由 ; 分隔的sed命令括起来，这些命令将统统在当前的模式空间上执行一遍



# 字符集转换命令 y

## Example:

```

1 [Apple]$ sed '1,3y/abcdefghijklmnopqrstuvwxyz/\
2      ABCDEFGHIJKLMNOPQRSTUVWXYZ/' data
3 NORTHWEST  NW  CHARLES MAIN      3.0  .98  3  34
4 WESTERN    WE  SHARON GRAY      5.3  .97  5  23
5 SOUTHWEST  SW  LEVIS DALSASS     2.7  .8   2  18
6 southern   SO  Suan Chin        5.1  .95  4  15
7 southeast  SE  Patricia Hemenway 4.0  .7   4  17
8 eastern    EA  TB Savage         4.4  .84  5  20
9 northeast  NE  AM Main Jr.      5.1  .94  3  13
10 north      NO  Margot Weber     4.5  .89  5  9
11 central    CT  Ann Stephens     5.7  .94  5  13
12 [Apple]$ sed '1,3y/[a-z]/[A-Z]/' data
13 northwest  NW  ChArles MAin     3.0  .98  3  34
14 western     WE  ShAron GrAy      5.3  .97  5  23

```

# 字符集转换命令y II

15	southwest	SW	Levis DAlsAss	2.7	.8	2	18
16	southern	SO	Suan Chin	5.1	.95	4	15
17	southeast	SE	Patricia Hemenway	4.0	.7	4	17
18	eastern	EA	TB Savage	4.4	.84	5	20
19	northeast	NE	AM Main Jr.	5.1	.94	3	13
20	north	NO	Margot Weber	4.5	.89	5	9
21	central	CT	Ann Stephens	5.7	.94	5	13

## Explain

- **y**命令类似于 shell 中的 **tr**命令，用于将一个字符集中的字符替换为另一个字符集中相应位置上的字符
- **y**命令无法识别正则表达式的元字符



# 退出命令q |

## ■ Example:

```

1 [Apple]$ sed '5q' data
2 northwest NW Charles Main 3.0 .98 3 34
3 western WE Sharon Gray 5.3 .97 5 23
4 southwest SW Levis Dalsass 2.7 .8 2 18
5 southern SO Suan Chin 5.1 .95 4 15
6 southeast SE Patricia Hemenway 4.0 .7 4 17
7 [Apple]$ sed '/Levis/{s/Levis/Joseph/;q;}' data
8 northwest NW Charles Main 3.0 .98 3 34
9 western WE Sharon Gray 5.3 .97 5 23
10 southwest SW Joseph Dalsass 2.7 .8 2 18

```



# 退出命令q II

## Explain

- q命令将终止sed的运行





## 缓冲区操作命令h,G,g,x |

## ■ Example:

```

1 [Apple]$ sed -e '/northeast/h' -e '$G' data
2 northwest NW Charles Main 3.0 .98 3 34
3 western WE Sharon Gray 5.3 .97 5 23
4 southwest SW Levis Dalsass 2.7 .8 2 18
5 southern SO Suan Chin 5.1 .95 4 15
6 southeast SE Patricia Hemenway 4.0 .7 4 17
7 eastern EA TB Savage 4.4 .84 5 20
8 northeast NE AM Main Jr. 5.1 .94 3 13
9 north NO Margot Weber 4.5 .89 5 9
10 central CT Ann Stephens 5.7 .94 5 13
11 northeast NE AM Main Jr. 5.1 .94 3 13
12 [Apple]$ sed -e '/WE/{h;d;}' -e '/CT/{g;}' data
13 northwest NW Charles Main 3.0 .98 3 34
14 southwest SW Levis Dalsass 2.7 .8 2 18

```

## 缓冲区操作命令h,G,g,x ||

```

15 southern      SO   Suan Chin          5.1   .95   4   15
16 southeast     SE   Patricia Hemenway  4.0   .7    4   17
17 eastern        EA   TB Savage          4.4   .84   5   20
18 northeast     NE   AM Main Jr.         5.1   .94   3   13
19 north          NO   Margot Weber        4.5   .89   5    9
20 western        WE   Sharon Gray         5.3   .97   5   23
21 [Apple]$ sed -e '/Patricia/h' -e \
22             '/Margot/x' -e '$G' data
23 northwest     NW   Charles Main        3.0   .98   3   34
24 western        WE   Sharon Gray         5.3   .97   5   23
25 southwest     SW   Levis Dalsass        2.7   .8    2   18
26 southern      SO   Suan Chin          5.1   .95   4   15
27 southeast     SE   Patricia Hemenway  4.0   .7    4   17
28 eastern        EA   TB Savage          4.4   .84   5   20
29 northeast     NE   AM Main Jr.         5.1   .94   3   13
30 southeast     SE   Patricia Hemenway  4.0   .7    4   17

```



## 缓冲区操作命令h,G,g,x III

31	central	CT	Ann Stephens	5.7	.94	5	13
32	north	NO	Margot Weber	4.5	.89	5	9

## Explain

- **h**命令将当前模式空间中的内容复制到另一个被称为**保持缓冲区**（holding buffer）的专用缓冲区中去
- **G**命令把保持缓冲区中的内容放到当前模式空间之后
- **g**命令把保持缓冲区中的内容放到当前模式空间中取代原模式空间中的内容
- **x**命令把保持缓冲区中的内容和当前模式空间中的内容交换一下



# The End

# The End of Appendix B.

