

# Pipes, redirects

- `strace -f bash -c "ls | grep a"`
- Let's draw lots of pictures!
  - process (fork, exec, waitpid)
  - file descriptors (pipe, close, dup2)
- `fprintf(stderr, "%d exec %s \n", getpid(), szCmd);`
- `fprintf(stderr, "%d wait on %d \n", getpid(), childPid);`



# gcc

- GNU Compiler Collection
  - C
  - C++
  - Objective-C
  - Objective-C++
  - Fortran
  - Java
  - Ada
  - Go

# C Programming!

- strtok\_r
- 2047 vs 2048
- Dynamically sized
- .rodata with strings
- malloc your char\*
- pointers to local variables
- bin/

# strtok\_r

```
char *strtok_r(char *str, const char *delim, char **saveptr);
```

"On the first call to `strtok_r()`, `str` should point to the string to be parsed, and the value of `saveptr` is ignored. In subsequent calls, `str` should be `NULL`, and `saveptr` should be unchanged since the previous call.

## BUGS

Be cautious when using these functions. If you do use them, note that:

- \* These functions modify their first argument.

" -- man page

# Bad Code

```
// BAD CODE
int parse(char *pLine, struct Command *psCommand )
{
    char *pSavePtr;
    char *pToken = strtok_r(pLine, DELIMITERS, &pSavePtr);

    psCommand->szOutFile = "none";

    psCommand->szCommand = pToken;

    psCommand->aArgs[0] = pToken;

    pToken = strtok_r(NULL, DELIMITERS, &pSavePtr);

    psCommand->aArgs[1] = pToken;
```

# String data

```
// BAD CODE
char* readLine()
{
    char szInputBuffer[2048];

    fgets(szInputBuffer, 2048, stdin);

    return szInputBuffer;
}
```

```
// BAD CODE
char* getPipe()
{
    return "PIPE";
}
```

# bin/

- "Fatal error: can't create bin/CS460\_Shell.o: No such file or directory" -- make error message
- You might need to add this to git via the command line

```
bin/.gitignore
# START
# Ignore everything in this directory
*
# Except this file
!.gitignore
# https://stackoverflow.com/questions/115983/how-can-i-add-an-empty-directory-to-a-git-repository/932982#932982
# END
```



# Constraints

- "Each command line will be no more than 2047 typed characters." -- chadd
- `char szInputBuffer[2047];`
- `char szInputBuffer[2048];`