

CSc 352

Make

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Make

- Talked some about make before
- Let's cover a few more details

Make Terminology

- **Rule:** A specification of command(s) to run in order to generate a particular **target** file given zero or more **prerequisites**
- **Target:** One of the files that we want this make file to be able to generate as output (often an executable or .o file)
 - The target name does not *have* to be a file name (for example, clean)
- **Prerequisite:** A file that one of the **target**'s depends on existing and being up-to-date in order to create

Make Dependencies

- Make is more than just a way to save time typing out **gcc** commands in the terminal
- Also *manages dependencies* for large projects

```
$ ls
```

```
game.c
```

```
sport.c
```

```
sport.h
```

```
calc.c
```

```
calc.h
```

```
makefile
```

game: game.c sport.o sport.h calc.o calc.h

```
gcc -Wall -Werror -std=c11 game.c calc.o sport.o -o game
```

sport.o: sport.c sport.h

```
gcc -Wall -Werror -std=c11 -c sport.c -o sport.o
```

calc.o: calc.c calc.h

```
gcc -Wall -Werror -std=c11 -c calc.c -o calc.o
```

clean:

```
rm -rf game calc.o sport.o
```

calc.h

sport.h

game

calc.c

calc.o

sport.c

sport.o

game.c

calc.h

sport.h

game

calc.c

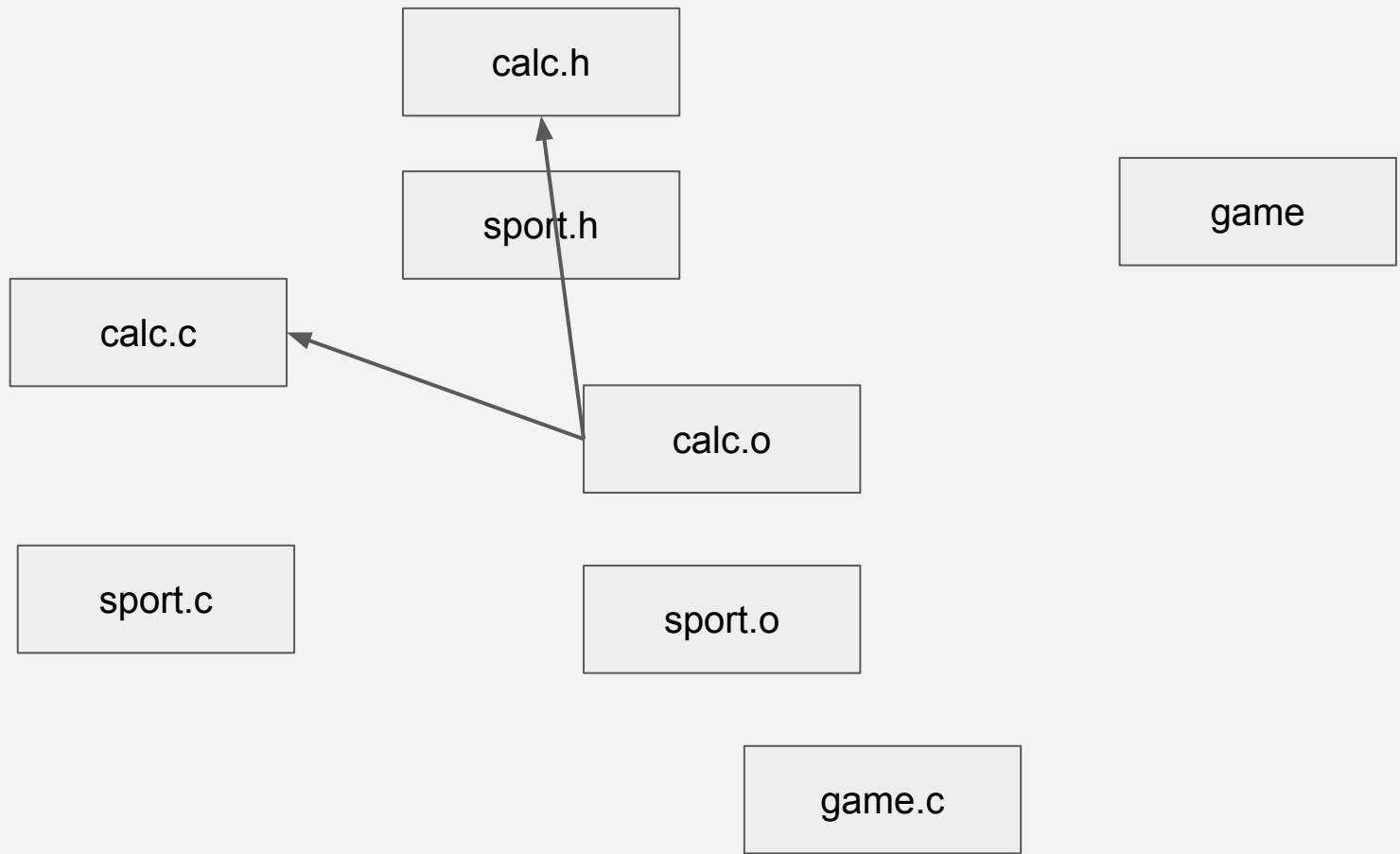
calc.o

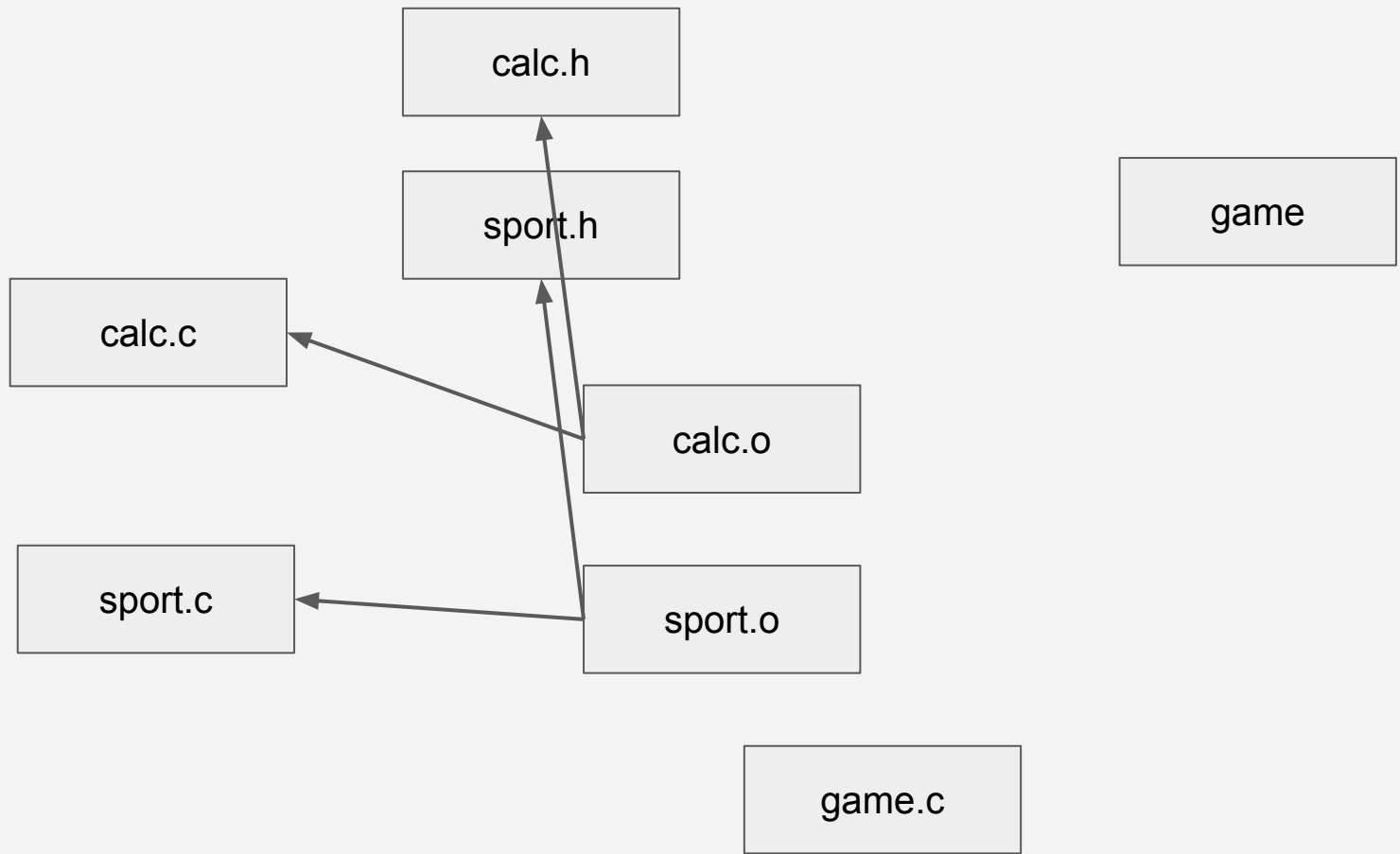
sport.c

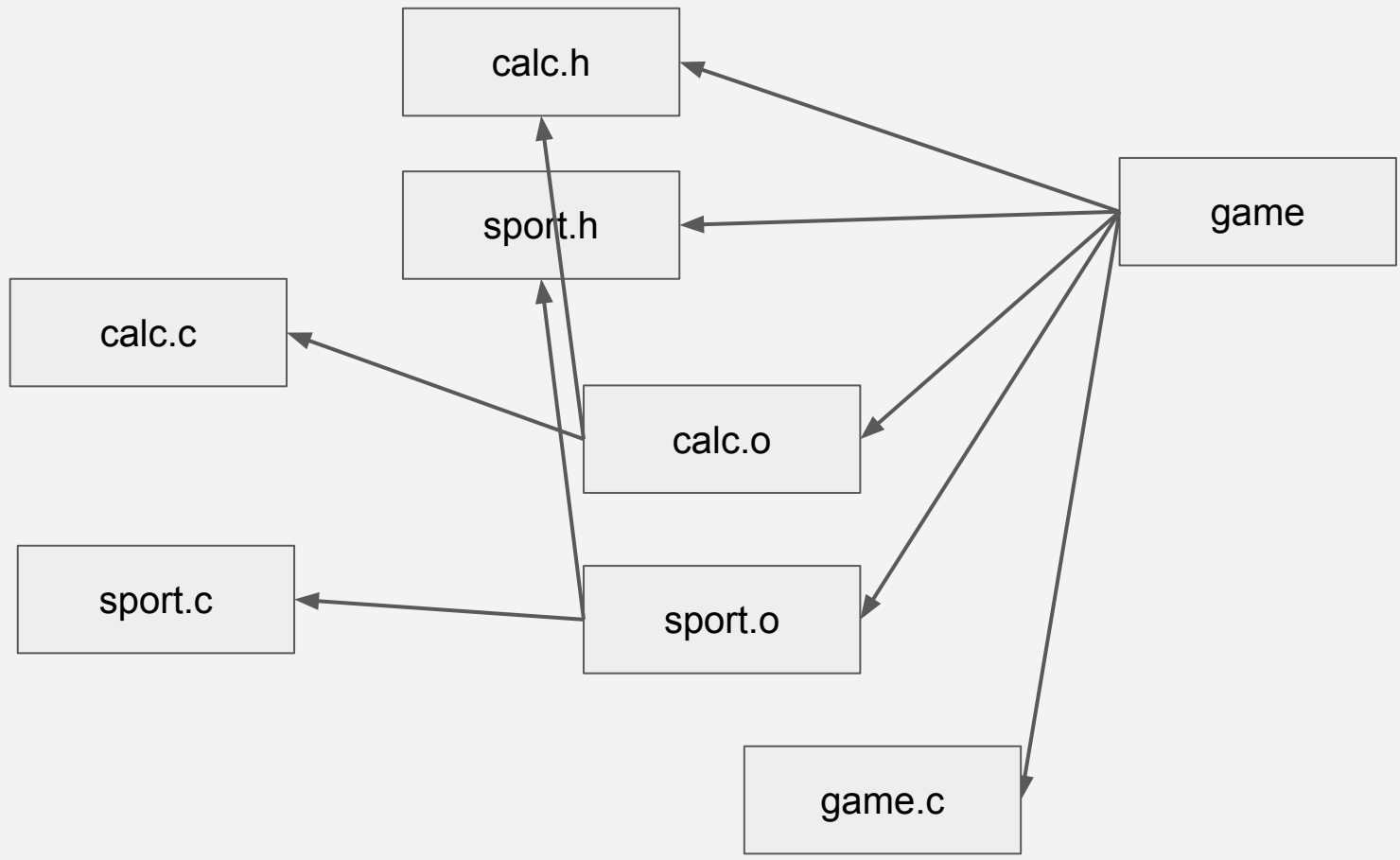
sport.o

game.c

Draw the
dependency
graph







Modified Time

The make utility utilizes file metadata to help with this!

(Last modified time)

```
game: game.c sport.o sport.h calc.o calc.h
```

```
gcc -Wall -Werror -std=c11 game.c calc.o sport.o -o game
```

```
sport.o: sport.c sport.h
```

```
gcc -Wall -Werror -std=c11 -c sport.c -o sport.o
```

```
calc.o: calc.c calc.h
```

```
gcc -Wall -Werror -std=c11 -c calc.c -o calc.o
```

```
clean:
```

```
rm -rf game calc.o sport.o
```

How could this be modified to be shorter or simpler?

These look pretty similar

game: game.c sport.o sport.h calc.o calc.h

gcc ~~-Wall -Werror -std=c11~~ game.c calc.o sport.o -o game

sport.o: sport.c sport.h

gcc ~~-Wall -Werror -std=c11~~ -c sport.c -o sport.o

calc.o: calc.c calc.h

gcc ~~-Wall -Werror -std=c11~~ -c calc.c -o calc.o

clean:

rm -rf game calc.o sport.o

game: game.c sport.o sport.h calc.o calc.h

```
gcc -Wall -Werror -std=c11 game.c calc.o sport.o -o game
```

%.o: %.c

```
gcc -Wall -Werror -std=c11 -c $< -o $@
```

clean:

```
rm -rf game calc.o sport.o
```


calc.o: calc.h

sport.o: sport.h

Repetitive arguments

```
game: game.c sport.o sport.h calc.o calc.h
    gcc -Wall -Werror -std=c11 game.c calc.o sport.o -o game
%.o: %.c
    gcc -Wall -Werror -std=c11 -c $< -o $@
clean:
    rm -rf game calc.o sport.o

calc.o: calc.h
sport.o: sport.h
```




```
gcc_args = -Wall -Werror -std=c11
```

```
game: game.c sport.o sport.h calc.o calc.h
```

```
    gcc $(gcc_args) game.c calc.o sport.o -o game
```

```
%.o: %.c
```

```
    gcc $(gcc_args) -c $< -o $@
```

```
clean:
```

```
    rm -rf game calc.o sport.o
```

```
calc.o: calc.h
```

```
sport.o: sport.h
```

Further Reading

https://www.gnu.org/software/make/manual/html_node/index.html