

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

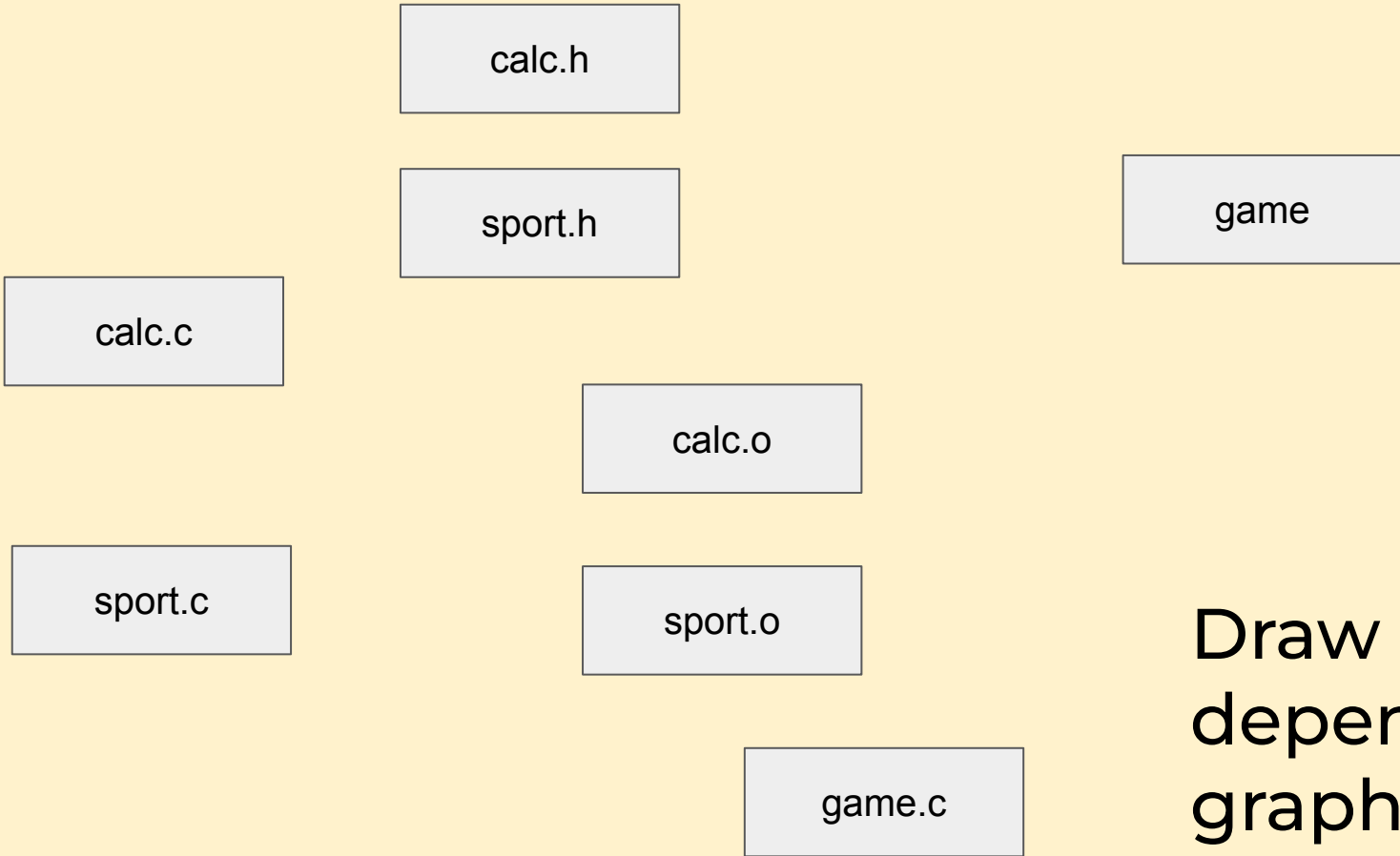
calc.c

calc.o

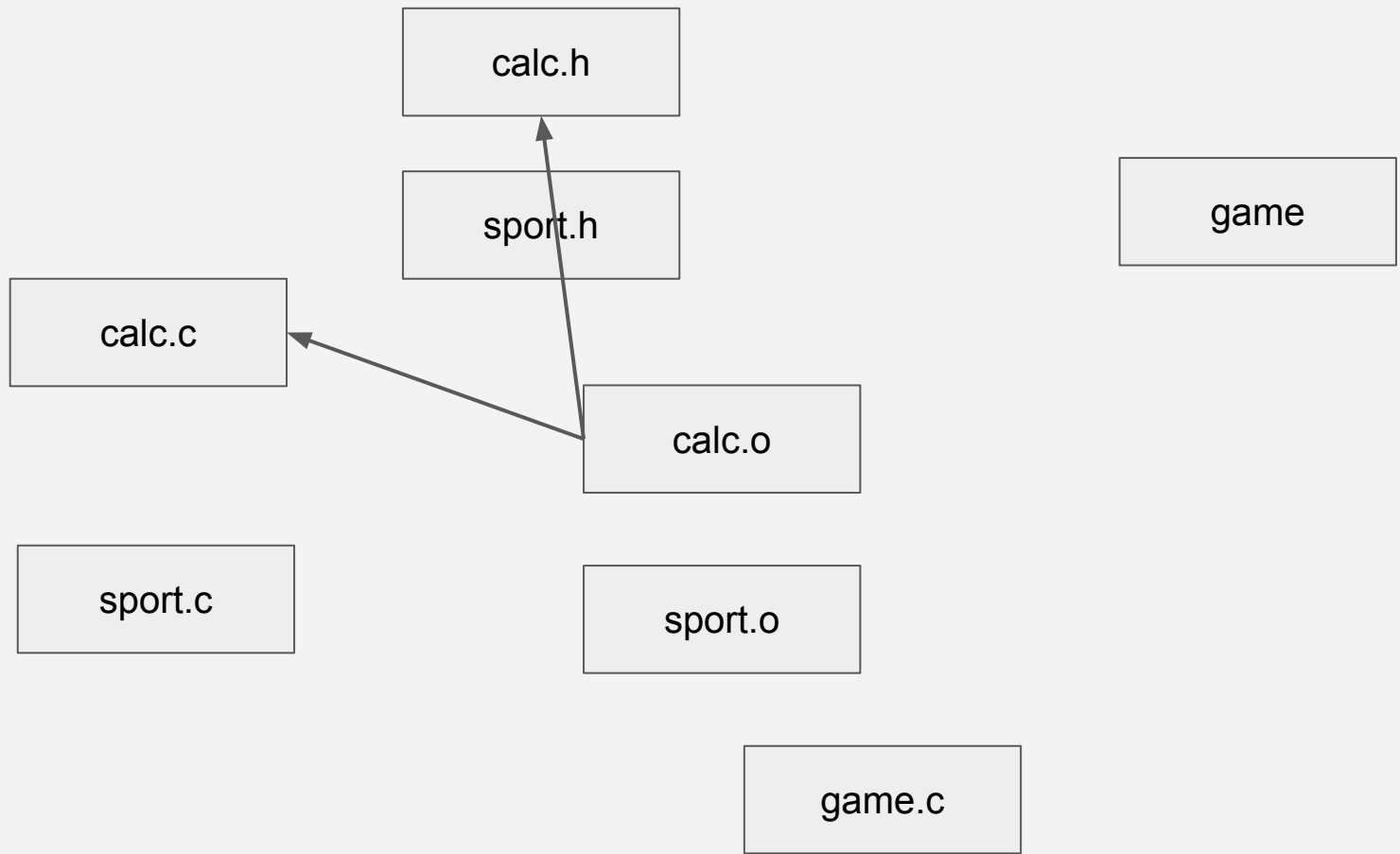
sport.c

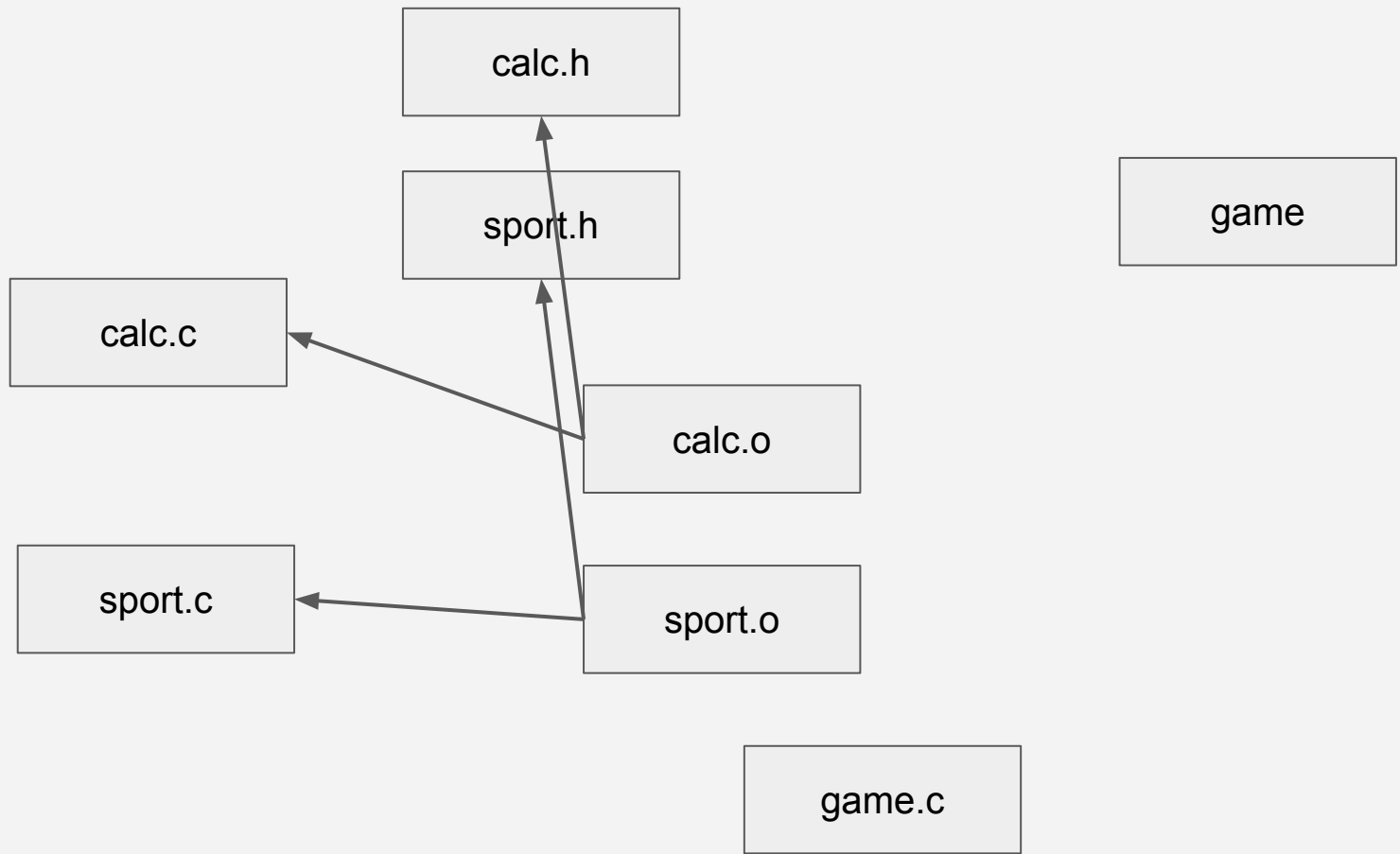
sport.o

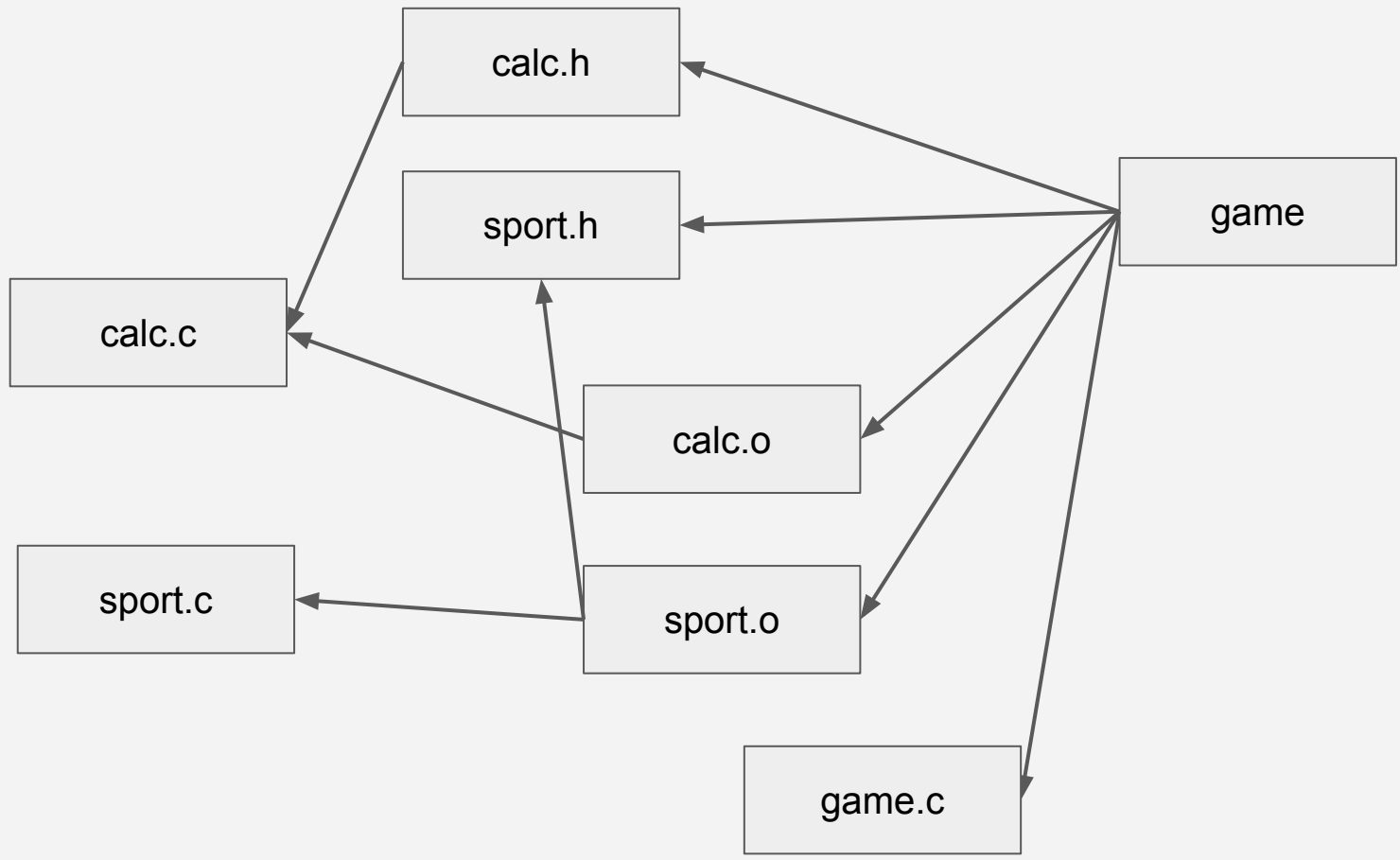
game.c



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