CSE 333 Section 8 - Client-Side Networking

Welcome back to section! We're glad that you're here :)

Casting in C++

While in C++, we want to use casts that are more explicit in their behaviour. This gives us a better understanding of what happens when we read our code, because C-style casts can do many (sometimes unwanted) things. There are four types of casts we will use in C++:

`static_cast<to_type>(expression);`

- ★ Converts between pointers of related types.
  - Compiler error if not related.
- ★ Performs not pointer conversion (e.g. float to int conversion).

`dynamic_cast<to_type>(expression);`

- ★ Converts between pointers of related types.
  - Compiler error if not related.
  - Also checks at runtime to make sure it is a 'safe' conversion (returns `nullptr` if not).

`const_cast<to_type>(expression);`

- ★ Used to add or remove const-ness.

`reinterpret_cast<to_type>(expression);`

- ★ Casts between incompatible types *without changing the data*.
  - The types you are casting to and from must be the same size.
  - Will not let you convert between integer and floating point types.

Exercise 1

For each of the following snippets of code, fill in the blank with the most appropriate C++ style cast. Assume that we have the following classes defined:

```
class Base {
 public:
  int x;
};
```

```
class Derived : public Base {
 public:
  int y;
};
```

```
int64_t x = 0x7ffffffffe870;
char* str = reinterpret_cast<char *>(x);
```

```
void foo(Base *b) {
  Derived *d = dynamic_cast<Derived *>(b);
  // additional code omitted
}
```

```
Derived *d = new Derived;
Base *b = static_cast<Base *>(d);
```

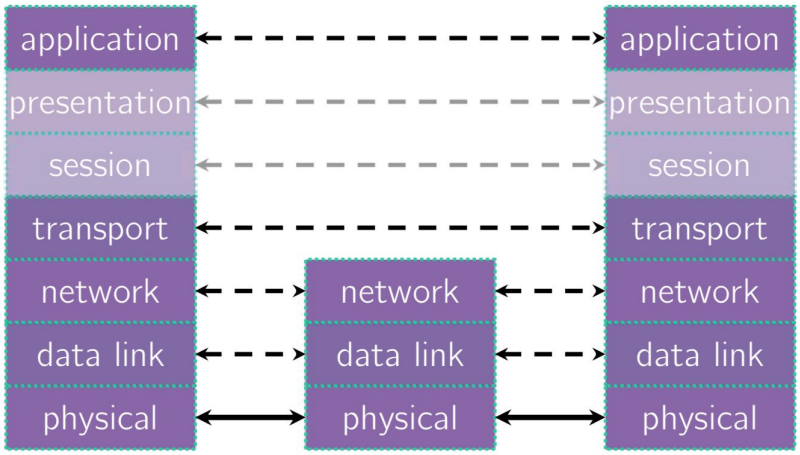
```
double x = 64.382;
int64_t y = static_cast<int64_t>(x);
```

Networking Quick Review

Exercise 2

a) What are the following protocols used for? (bonus: in which *layer* of the networking stack is it found?)

- DNS: Translating between IP addresses and host names. (Application Layer)
- IP: Routing packets across the Internet. (Network Layer)
- TCP: Reliable, stream-based networking on top of IP. (Transport Layer)
- UDP: Unreliable, packet-based networking on top of IP. (Transport Layer)
- HTTP: Sending websites and data over the Internet. (Application Layer)



b) Why would you want to use TCP over UDP?

TCP is reliable and has simpler semantics than UDP, so it's easier to use for a lot of applications.

c) Why would you want to use UDP over TCP?

Some applications can't tolerate delays from resending lost packets and/or don't mind losing a few packets, so UDP is a better choice for these.

Exercise 3

Fitting the Pieces Together. The following diagram depicts the basic skeleton of a C++ program for client-side networking, with arrows representing the flow of data between them. Fill in the names of the functions being called, and the arguments being passed. Then, for each arrow in the diagram, fill in the C++ type that it represents.