Project, News

- 2–4 people per group. List of students looking for project partners on the course web page.
- Develop a news server (two versions) and a text-based client.
- Write a report, hand in the report and your programs no later than Tuesday, April 21

A News Server and News Clients

The server keeps a database of newsgroups, containing articles. The clients connect to the server. Sample conversation:

```
news> list
1. comp.lang.java
2. comp.lang.c++
news> list comp.lang.c++
1. What is C++? From: xxx
2. Why C++?     From: yyy
news> read 2
Why C++?   From: xxx
... text ...
news>
```

A client can also create and delete newsgroups, and create and delete articles in newsgroups.

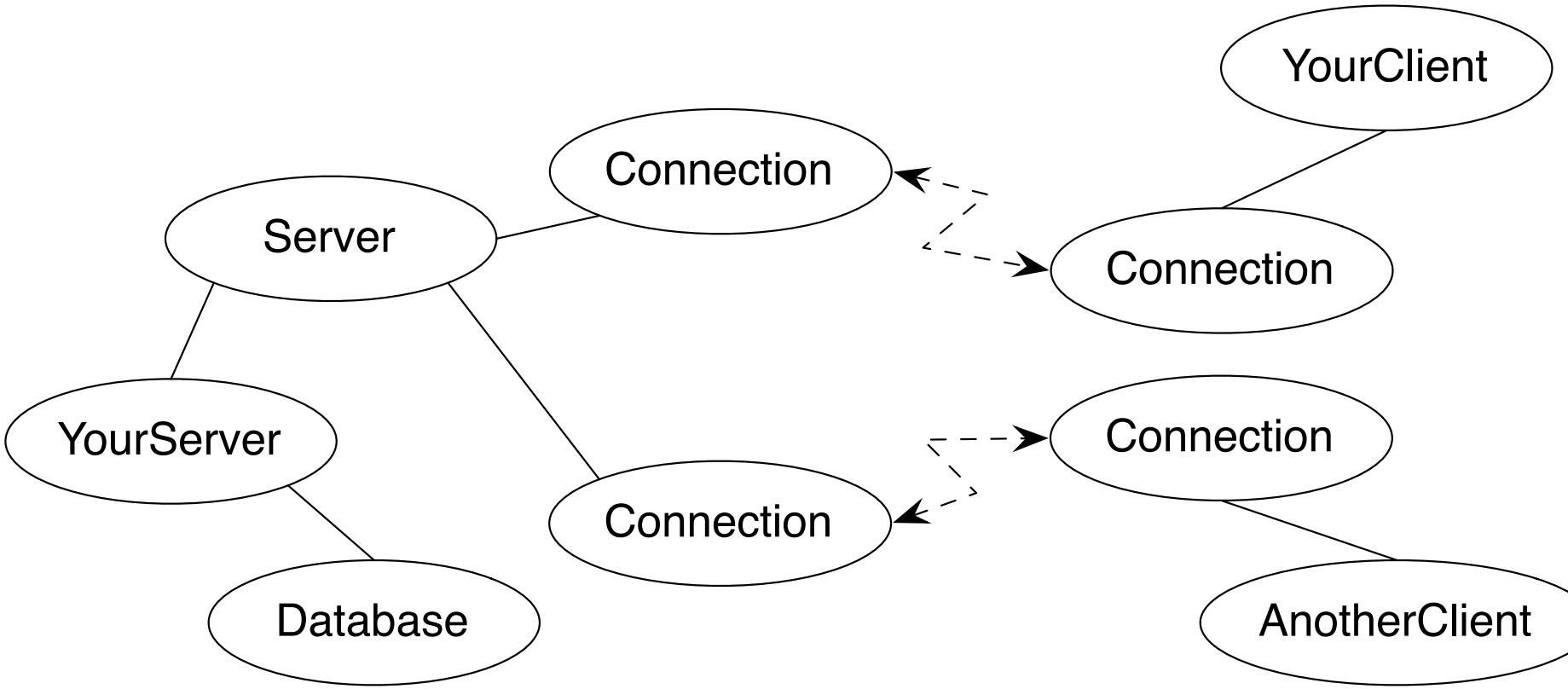
The Project: Write Server and Client

- You are to develop two versions of the server:
  - one in-memory server that forgets the data about newsgroups and articles between invocations (use the standard library containers for this database), and
  - one disk-based server that remembers the data between invocations (use files for this database)

  These versions should implement a common interface — the rest of the system should be independent of, and agnostic to, the database implementation. *Avoid duplicated code.*
- A single-threaded server is ok.
- You are to develop a client with a text-based interface. It shall read commands from the keyboard and present the replies from the server as text.
- Think about how to handle entry of multi-line articles.

System Overview

The classes `Server` and `Connection` are pre-written.



Communication Protocol

A message is a sequence of bytes. Messages must follow a specified protocol, which specifies the message format. The general form is:

```
MSG_TYPE_BYTE <data> END_BYTE
```

The protocol contains of commands and answers:

```
COMMAND_TYPE <data> COM_END
ANSWER_TYPE <data> ANS_END
```

Communication Protocol
Example: List Newsgroups

List newsgroups (message to server and reply from server):

```
COM_LIST_NG COM_END
ANS_LIST_NG 2 13 comp.lang.java 15 comp.lang.c++ ANS_END
```

2 is the number of newsgroups, 13 and 15 are the unique identification numbers of the newsgroups `comp.lang.java` and `comp.lang.c++`.
Numbers and strings are coded according to the protocol:

```
string_p: PAR_STRING N char1 char2 ... charN // N is an int, sent as
num_p: PAR_NUM N                             // 4 bytes, big endian
```

Hint: write a class to handle the communication on "low protocol level" (encoding and decoding of numbers and strings).
Don't repeat yourselves.

Class Connection

```
struct ConnectionClosedException {};

/* A Connection object represents a socket */
class Connection {
public:
        Connection(const char* host, int port);

        Connection();

        virtual ~Connection();

        bool isConnected() const;

        void write(unsigned char ch) const;

        unsigned char read() const;
};
```

Class Server

```
/* A server listens to a port and handles multiple connections */
class Server {
public:
        explicit Server(int port);

        virtual ~Server();

        bool isReady() const;

        std::shared_ptr<Connection> waitForActivity() const;

        void registerConnection(const shared_ptr<Connection>& conn);

        void deregisterConnection(const shared_ptr<Connection>& conn);
};
```

Server Usage

```
while (true) {
        auto conn = server.waitForActivity();
        if (conn != nullptr) {
                try {
                        /*
                         * Communicate with a client, conn->read()
                         * and conn->write(c)
                         */
                } catch (ConnectionClosedException&) {
                        server.deregisterConnection(conn);
                        cout << "Client closed connection" << endl;
                }
        } else {
                conn = make_shared<Connection>();
                server.registerConnection(conn);
                cout << "New client connects" << endl;
        }
}
```

Provided material

On the course web page, you will find

- Classes for creating connections, including an example application.
- Test clients written in Java
  - An interactive, graphical client
  - An automated test client that runs a series of operations. Please note that this is an aid during development and not a complete acceptance test.

Report and submission

- Write the report, preferably in English, follow the instructions.
- Create a directory with your programs (only the source code – don't include any generated files) and a Makefile.
- Write a README file (text) with instructions on how to build and test your system.
- Submission:
  1. The report in PDF format.
  2. The README file.
  3. The program directory, tar-ed and gzip-ped . Don't bury the report inside the gzip file.
  4. Submission instructions will be published on the course web, under Project.