

Installation Steps

1. Install Protocol Buffers compiler:

```
# Linux
sudo apt install -y protobuf-compiler

# macOS
brew install protobuf
```

2. Verify installation:

```
protoc --version
# Should show libprotoc 3.x.x or higher
```

3. Install Go plugins for protoc:

```
go install google.golang.org/protobuf/cmd/protoc-gen-go@v1.27.1
go install google.golang.org/grpc/cmd/protoc-gen-go-grpc@v1.2.0
```

4. Add Go installs to your PATH (add to your shell configuration file):

For bash edit `.bashrc`, for zsh edit `.zshrc`:

```
export PATH="$PATH:$(go env GOPATH)/bin"
```

Then restart your shell or run `source ~/.bashrc` (or equivalent).

5. Set up the project:

```
# Starting in the chord/ directory with Go files and chord.proto:

# Initialize the Go module
go mod init chord

# Create directory structure
mkdir -p protocol
mv chord.proto protocol/

# Add gRPC dependencies
go get google.golang.org/grpc@v1.45.0
go get google.golang.org/protobuf@v1.27.1
go mod tidy
```

6. Generate the gRPC code:

```
protoc --go_out=. --go-grpc_out=. --go_opt=module=chord --go-grpc_opt=module=chord
protocol/chord.proto
```

Running the Application

To build:

```
go build
```

To create a new Chord ring:

```
./chord create [-port PORT]
```

To join an existing Chord ring:

```
./chord join -addr ADDRESS [-port PORT]
```

