Erstellen von Libraries unter Linux

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mathutils.h

```c
#ifndef MATHUTILS_H
#define MATHUTILS_H
double my_sqrt(double);
#endif
```

mathutils.cpp

```cpp
#include <cmath>

#include "mathutils.h"

double my_sqrt(double x) {
    return std::sqrt(x);
}
```

```cpp
#include <iostream>

#include "mathutils.h"

using namespace std;

int main() {
    cout << my_sqrt(2) << endl;
}
```

Statische Library

1. Übersetzen der Module
   ```
   $ g++ -c mathutils.cpp
   $ g++ -c main.cpp
   $ ls *.o
   main.o  mathutils.o
   $
   ```
2. Executable erstellen (ohne Library)
   ```
   $ g++ -o go main.o mathutils.o
   ```
3. Starten
   ```
   $ go
   1.41421
   ```

Statische Library – 2

4. Library erstellen
   ```
   $ ar crv libmathutils.a mathutils.o
   a - mathutils.o
   ```
5. Linken
   - ▶ Variante 1
     ```
     g++ -o go main.o libmathutils.a
     ```
   - ▶ Variante 2
     ```
     g++ -o go main.o -L. -lmathutils
     ```

Symbole einer Library

1. Symbole auslesen
   nm libmathutils.a

   ```
   mathutils.o:
            U _GLOBAL_OFFSET_TABLE_
            U sqrt
   00000000 T __x86.get_pc_thunk.ax
   00000000 T _Z7my_sqrtd
   ```

2. "demangle"
   ```
   $ c++filt _Z7my_sqrtd
   my_sqrt(double)
   ```

Dynamische Library

1. Verwendete dynamische Libraries anzeigen
   ```
   $ ldd go
   linux-gate.so.1 (0xb7780000)
   libstdc++.so.6 => /usr/lib/libstdc++.so.6 (0
   libm.so.6 => /usr/lib/libm.so.6 (0xb74da000)
   libgcc_s.so.1 => /usr/lib/libgcc_s.so.1 (0xb
   libc.so.6 => /usr/lib/libc.so.6 (0xb72e8000)
   /lib/ld-linux.so.2 => /usr/lib/ld-linux.so.2
   ```
2. Library erstellen
   ```
   $ g++ -shared -fPIC -o libmathutils.so mathu
   ```
   - -fPIC … position independent code

Dynamische Library – 2

3. Executable erstellen
   ```
   $ g++ -o go main.o libmathutils.so
   ```
4. u.U.:
   ```
   $ export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:.
   ```
5. Benützte Libraries anzeigen:
   ```
   $ ldd go
   linux-gate.so.1 (0xb771b000)
   libmathutils.so => ./libmathutils.so (0xb771
   libstdc++.so.6 => /usr/lib/libstdc++.so.6 (0
   libm.so.6 => /usr/lib/libm.so.6 (0xb7472000)
   libgcc_s.so.1 => /usr/lib/libgcc_s.so.1 (0xb
   libc.so.6 => /usr/lib/libc.so.6 (0xb7280000)
   /lib/ld-linux.so.2 => /usr/lib/ld-linux.so.2
   ```