z/TPF V1.1

TPF Users Group Fall 2008
Title: z/TPF Visibility
Subtitle: Optimizing your z/TPF programs

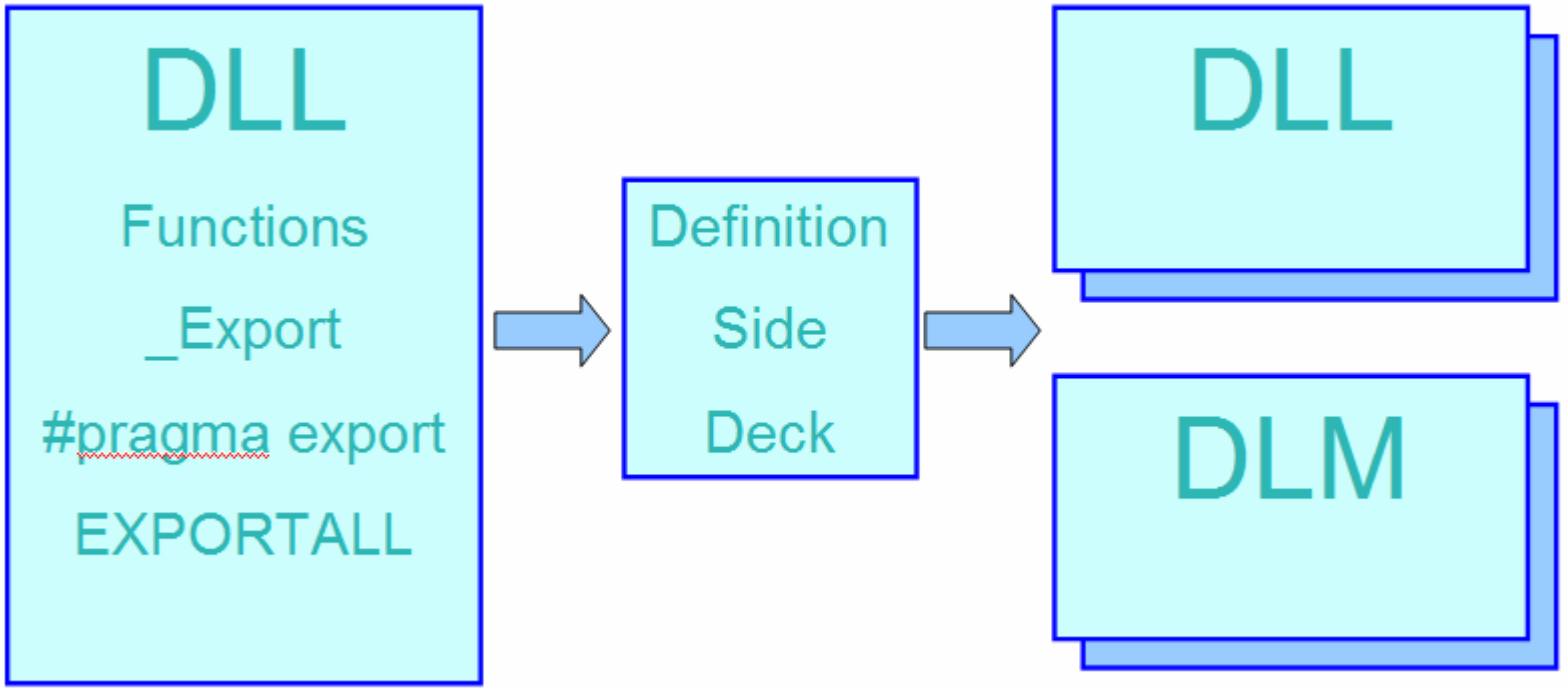
Name: Edwin van de Grift
Venue: Open Source Subcommittee

AIM Enterprise Platform Software
IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

Contents

- **Where we came from**
- **Moving forward**
- **Visibility**
  - Why visibility matters
  - Which tools you have to manage visibility
  - How to use the visibility tools

Trip Down Memory Lane



From TPF41 to z/TPF

- **In TPF41**
  - Functions need to be exported to be callable
- **In z/TPF**
  - Functions need to be visible to be callable

What's Our Goal ?

- **Everything that needs to be callable must be visible**
- **Everything that does not need to be callable should be hidden**
- **But there are a few things – especially in C++ – you must be aware of**

Why Does This All Matter?

- **Performance**
  - Size
    - Smaller symbol tables
    - Less generated code
  - Execution time
    - Shorter shared object startup path
    - Faster linkages

Visibility Approaches

- **Two Approaches**
  - Declare everything visible
    - And hide what shouldn't be visible
    - Preferred, and typically easier
  - Declare everything hidden
    - And make callable symbols visible
    - Have to be careful in C++

Visibility in C

- **Use static**
  - This defines a function or variable to be in file or local scope.

Visibility in C++

- **Step 1: Define global visibility**
  - -fvisibility=default
    - Everything is visible
  - -fvisibility=hidden
    - Everything is hidden
  - -fvisibility-inlines-hidden hides inline functions

Visibility in C++

- **Step 2: Define visibility per symbol**
  - __attribute__((visibility("*option*")))
    - "default"
      - Symbol is visible
    - "hidden"
      - Symbol is hidden

Visibility Considerations in C++

- **C++ classes have a number of vague linkage entities**
  - For example typeinfo and vtable
- **These take on the visibility attribute of the class.**
  - If a class is hidden, these entities are hidden
  - This means for example that you cannot
    - Inherit from that class in a different Shared Object
    - Be thrown by an exception

Say What???

- **If you compile the following with –fvisibility=hidden**

```
class Thing {
public:
   __attribute__((visibility("default")))
   Thing();
   __attribute__((visibility("default")))
   ~Thing();
   __attribute__((visibility("default")))
   void doThis();
   void doThat();
private:
};
```

- **There are things you will NOT be able to do, like**
  - Inherit from the class
  - Throw the class

Visibility & MakeTPF

- **APP_EXPORT**
  - ALL (Default) -fvisibility="default"
  - ENTRY -fvisibility="default"
  - LIST -fvisibility="default"
  - VISIBILITY -fvisibility="hidden"
-fivisibility-inlines-hidden for C++

Using APP_EXPORT

- **ALL**
  - Shared Objects with more than 1 callable function
    - TPF41 DLLs & LLMs
- **ENTRY**
  - Shared Objects with 1 callable function
    - TPF41 DLMs & Assembler Programs
- **LIST**
  - Shared Objects that have Assembler functions that need to be hidden
    - TPF41 LLMs
- **VISIBILITY**
  - Shared Objects with more than 1 callable function, if you want to use the opposite approach
    - TPF41 DLLs & LLMs

APP_EXPORT:=LIST

- An export file will be created -- with all symbols defined as visible -- in the build directory if one doesn't exist already
  - ABCD.exp
- When new functions are added to a shared object, makeTPF will create a new version of the export file in the build directory that has the new symbol(s) defined as visible
- The export file needs to be edited and moved from the build directory to the exp directory

```
{
global:
  create_bill;
local:
  calculate_tax;
  print_receipt;
};
```

Example 1 – C Code

abcd.mak

```
APP := ABCD
APP_EXPORT := ALL
C_SRC := program.c
```

program.h

```
void callableFunction();

void anotherCallableFunction();

static void uncallableFunction();

__attribute__ ((visibility("hidden")))
void anotherUncallableFunction();
```

Example 2 – Shared Object with One Entry Point Function

abcd.mak

```
APP := ABCD
APP_EXPORT := ENTRY
APP_ENTRY := ABCD
C_SRC := abcd.c
```

abcd.c

```
int ABCD() {
   return 0;
}

void functionOne(void) {}

static void functionTwo(void) {}
```

Example 3 – C++ Code

abcd.mak

```
APP := ABCD
APP_EXPORT := ALL
CXX_SRC := abcd.cpp
```

abcd.cpp

```
class Thing {
public:
   Thing();
   ~Thing();
   void doThis();
   __attribute__((visibility("hidden")))
   void doThat();
private:
};
```

Example 4 – C in TPF41 Versus z/TPF

```
#pragma export(bopen)
int bopen(const char* file) {
   ...
}

int _Export bclose(int) {
   ...
}
```

```
__attribute__((visibility("default")))
int bopen(const char* file) {
   ...
}
__attribute__((visibility("default")))
int bclose(int) {
   ...
}
```

```
#pragma GCC visibility push(default)
int bopen(const char* file) {
   ...
}
int bclose(int) {
   ...
}
#pragma GCC visibility pop
```

Example 5 – C++ in TPF41 Versus z/TPF

```
class _Export Thing {
public:
   Thing();
   ~Thing();
   void doThis();
   void doThat();
private:
};
```

```
__attribute__((visibility("default")))
class Thing {
public:
   Thing();
   ~Thing();
   void doThis();
   void doThat();
private:
};
```

Example 6 – Single Source

```
#ifndef __370__
   #define _Export
   #define _Export_zTPF __attribute__((visibility("default")))
#else
   #define _Export_zTPF
#endif
```

Toolkit 3.2.7!

OTRKYWDc

```
_Export_zTPF class _Export Thing {
public:
   Thing();
   ~Thing();
   void doThis();
   void doThat();
private:
};
```

Q&A

- **Questions?**

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