

Game Tools and the command line

- many games have in game tools
 - you are working on one!
 - many level editors exist etc

- sometimes it is useful to develop game tools outside the game
 - provides mechanisms to batch process/script cpu intensive activities which can be run on server class machines

- there is benefit from understanding how such tools operate as this knowledge will be usefully transferable

Command line tools

- often have similar options
 - most GNU utilities will implement
 - `-h`, `--version` options (for help and version)
- nearly all command line utilities also have on system man pages associated with them

Examine the compilers on GNU/Linux

- the `gcc` compiler is an interesting example, and while `gcc` is a tool (C compiler).
 - the GCC project is the GNU Compiler Collection
 - which consists of the C compiler, C++ compiler, Java compiler, (and Modula-2 compiler)
- here we will look at some of the common options to `gcc`, `g++` and `gm2`
- notice how these three programs exist and GCC have tried to unify these command options
- these slides are simply a taster and huge simplification of how GCC might be used

GCC debugging

- all front ends (in our case: `gcc`, `g++` and `gm2`) accept `-g -O0` which tell the compiler not to optimise and emit debugging information for `gdb`

GCC uniformity of options

- they all understand `--version`

- ```
$ gcc --version
gcc (Debian 6.3.0-18+deb9u1) 6.3.0 20170516
Copyright (C) 2016 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

## GCC uniformity of options

■ **\$ g++ --version**

g++ (Debian 6.3.0-18+deb9u1) 6.3.0 20170516

Copyright (C) 2016 Free Software Foundation, Inc.

This is free software; see the source for copying conditions. There is NO warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

■ **\$ gm2 --version**

gm2 (GCC) 6.4.0

Copyright (C) 2017 Free Software Foundation, Inc.

This is free software; see the source for copying conditions. There is NO warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

## **GCC uniformity of options**

- simple compiles can be performed by:
- ```
$ gcc -o outputbinary -g sourcefile.c
```
- the `-g` option means generate debugging information so your program can be debugged via `gdb`

GCC uniformity of options

- for complex projects can be compiled and linked via:

```
$ gcc -g -c sourcefile1.c  
$ gcc -g -c sourcefile2.c  
$ gcc -g -c sourcefile3.c  
$ gcc -o outputbinary sourcefile1.o sourcefile2.o sourcefile3.o
```


GCC uniformity of options

- there are many options in these tools, only a few of which are mentioned in these slides
- turn on all warnings by: `-Wall`
- so our command line to compile `hello.c` is:
- ```
$ gcc -g -O0 -Wall -c hello.c
```

## GCC uniformity of options

- notice that this compiles `hello.c` but does not link it
- to link this we can:
- ```
$ gcc -g hello.o
```
- the default output file is: `a.out` (which is used if you omit the `-o` option)

GCC uniformity of options

- we could combine the last two steps by:
- ```
$ gcc -g -O0 -Wall hello.c
```
- many tools try and provide consistency between options
  - learn once use many times
  - many options have become a de facto standard `--version`
- it is important to adhere to de facto standards when producing useful tools

## Coursework file format structure

- examine the file structure of the coursework zip file

- ```
$ ls
Level1  Level2  Level3
$ ls Level1
Enemy.bmp
fire.bmp
Floor.bmp
Goal.bmp
Level.txt
Player.bmp
Wall.bmp
```

Level1.txt

```
Height=12                                0..Y axis limit-1
Width=12                                  0..X axis limit-1
FFFFWFFFWFFF                             row 0
FFFFWFFFFFFFFF
FFFFWWWFWWWF
FFFFWFFFFFFFFWF
WWWFWFWFWFWF
FFFFWFWFWFWF
FFFFWFWFWFWF
FFFFWFWFWFWF
FFFFWFWFFFWF
FWWWWFFFWWWF
FFFFWFWWFFFF
FFFFFFWFFFFF                             row 11
StartPosition={0, 0}                     start coordinate
GoalPosition={11, 11}                    goal coordinate
TimeToComplete=20                         time to finish the level
NumEnemies=9                             number of enemies
```

Level1.txt



```
{7, 3}      coord of enemy number 0
{5, 8}      coord of enemy number 1
{3, 7}
{0, 6}
{3, 10}
{9, 5}
{9, 10}
{11, 0}
{3, 3}      coord of enemy number 8
NumFire=9   number of fireballs
{8, 1}      coord of fireball 0
{3, 4}
{0, 9}
{4, 11}
{6, 9}
{6, 3}
{11, 9}
{11, 3}
{5, 4}      coord of fireball 8
```

Level1.txt

- notice how Ben is using a text file to describe the level
 - also interesting to examine the data structures in the previous weeks slides
- consider the declarations found in `JewelThief/CLevel.cs`

Level1.txt



JewelThief/CLevel.cs

```
namespace WizardDungeon
{
    /// <summary>
    /// This enum characterises the type a tile can be
    /// in the game (e.g. wall or floor).
    /// </summary>
    enum eTileType
    {
        Wall,
        Floor
    };
}
```


Level1.txt



JewelThief/CLevel.cs

```
/// <summary>
/// This enum defines whether a level should be flipped
/// vertically or horizontally.
/// </summary>
public enum eFlipDirection
{
    Horizontal,
    Vertical
};
```

Level1.txt

JewelThief/CLevel.cs

```
/// This class is used to store all of the information about
/// a level.
/// This includes the level layout stored in m_levelMap and
/// start positions of the player and the enemies and the end
/// goal.
class CLevel
{
    public int Height;
    public int Width;
    public int Time;
    public CPoint2i StartPosition { get; set; } = new CPoint2i();
    public CPoint2i GoalPosition { get; set; } = new CPoint2i();
    public List<CPoint2i> EnemyPositions { get; set; } = new List<CPoint2i>();
    public List<CPoint2i> FirePositions { get; set; } = new List<CPoint2i>();

    private eTileType[,] m_levelMap = null;
```

Level1.txt

- examine file `JewelThief/CLevel.cs` for the constructors and further details
- we can easily see that the txt file is loaded into these data structures
- text files are often used to configure applications (this is the norm for GNU/Linux and Unix utilities)