# hadoop 程式開發 (eclipse plugin)



## 零. 環境配置

### 0.1 環境說明

- ubuntu 8.10
- sun-java-6
  - java 下載處
  - JavaDoc
- eclipse 3.3.2
  - eclipse 各版本下載點 http://archive.eclipse.org/eclipse/downloads/
- hadoop 0.18.3
  - hadoop 各版本下載點 http://ftp.twaren.net/Unix/Web/apache/hadoop/core/

### 0.2 目錄說明

- 使用者：hadoop
- 使用者家目錄： /home/hadooper
- 專案目錄 ： /home/hadooper/workspace
- hadoop目錄： /opt/hadoop

## 一、安裝

安裝的部份沒必要都一模一樣，僅提供參考，反正只要安裝好java，hadoop，eclipse，並清楚自己的路徑就可以了

### 1.1. 安裝java

首先安裝java 基本套件

```
$ sudo apt-get install java-common sun-java6-bin sun-java6-jdk sun-java6-jre
```

#### 1.1.1. 安裝sun-java6-doc

1 將javadoc (jdk-6u10-docs.zip) 下載下來放在 /tmp/ 下

- 教學環境內，已經存在於 /home/hadooper/tools/ ，將其複製到 /tmp

```
$ cp /home/hadooper/tools/jdk-*-docs.zip /tmp/
```

- 或是到官方網站將javadoc (jdk-6u10-docs.zip) 下載下來放到 /tmp

下載點


2 執行

```
$ sudo apt-get install sun-java6-doc
$ sudo ln -sf /usr/share/doc/sun-java6-jdk/html /usr/lib/jvm/java-6-sun/docs
```

### 1.2. ssh 安裝設定

詳見實作一

### 1.3. 安裝hadoop

詳見實作一

### 1.4. 安裝eclipse

- 取得檔案 eclipse 3.3.2 (假設已經下載於/home/hadooper/tools/ 內)，執行下面指令：

```
$ cd ~/tools/
$ tar -zxvf eclipse-SDK-3.3.2-linux-gtk.tar.gz
$ sudo mv eclipse /opt
$ sudo ln -sf /opt/eclipse/eclipse /usr/local/bin/
```

## 二、 建立專案

### 2.1 安裝hadoop 的 eclipse plugin

- 匯入hadoop eclipse plugin

```
$ cd /opt/hadoop
$ sudo cp /opt/hadoop/contrib/eclipse-plugin/hadoop-0.18.3-eclipse-plugin.jar /opt/eclipse/plugins
```

補充： 可斟酌參考eclipse.ini內容（非必要）

```
$ sudo cat /opt/eclipse/eclipse.ini
```

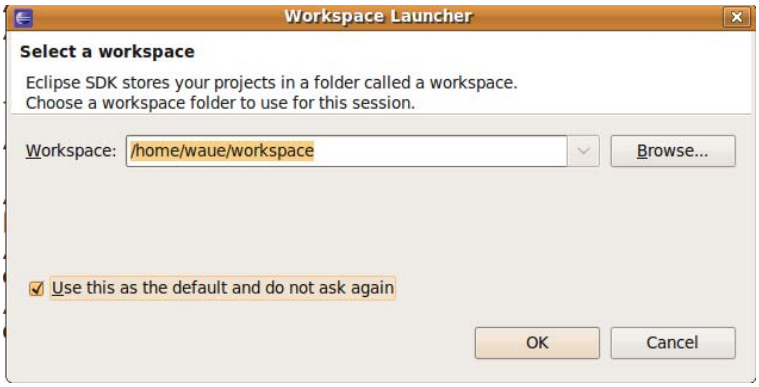
```
-showsplash
org.eclipse.platform
-vmargs
-Xms40m
-Xmx256m
```

### 2.2 開啓eclipse

- 打開eclipse

```
$ eclipse &
```

一開始會出現問你要將工作目錄放在哪裡：在這我們用預設值

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**PS: 之後的說明則是在eclipse 上的介面操作**

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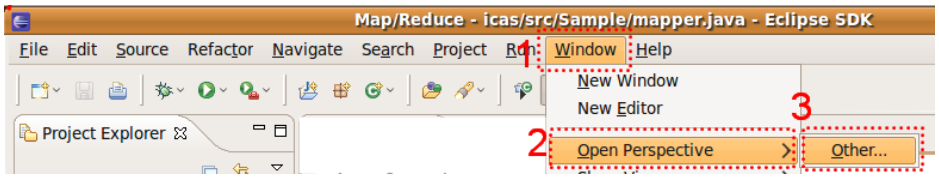
### 2.3 選擇視野

| window -> | open pers.. -> | other.. -> | map/reduce |
|---|---|---|---|

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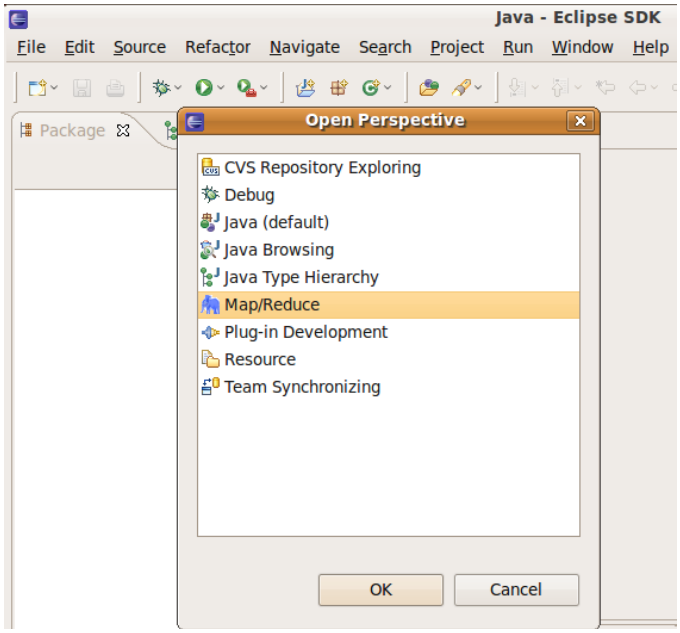
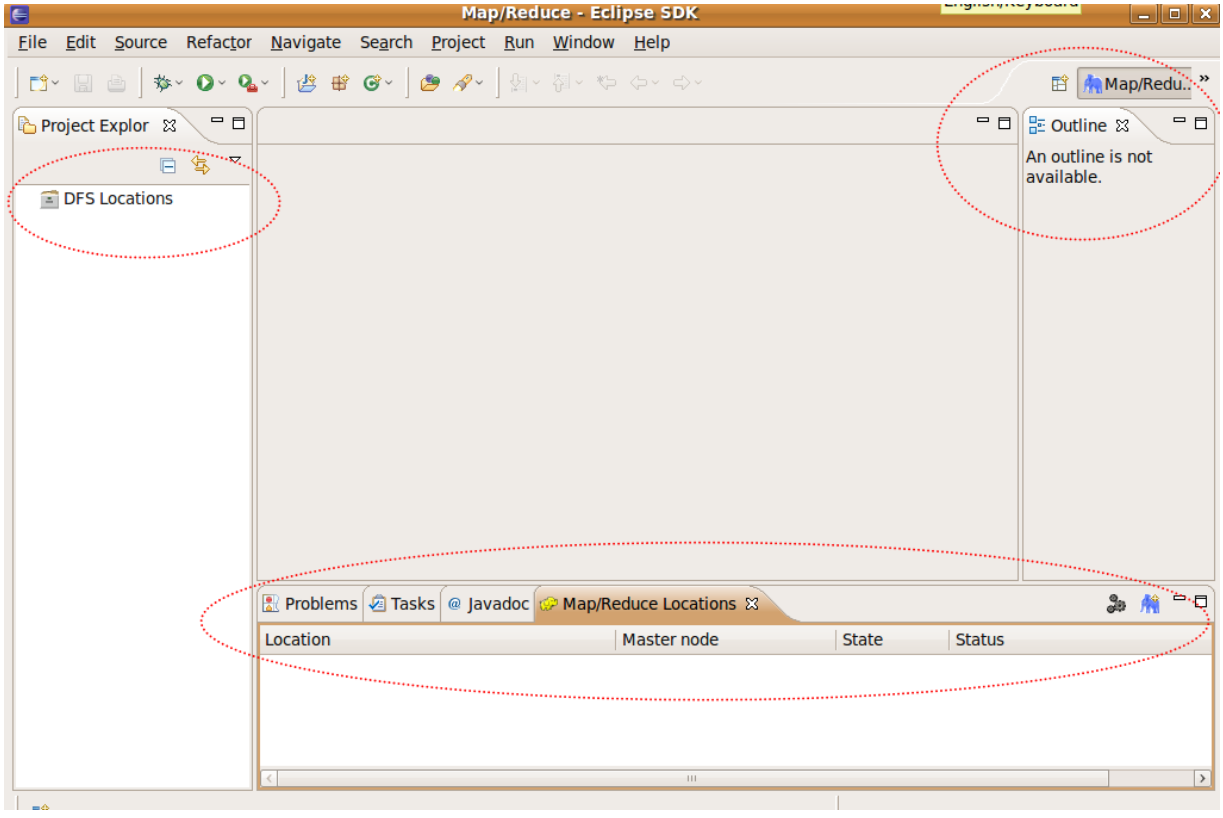
設定要用 Map/Reduce 的視野

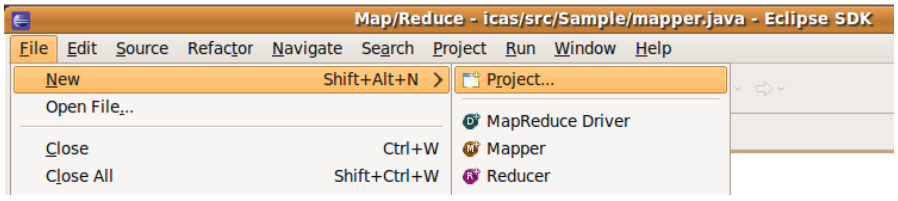



使用 Map/Reduce 的視野後的介面呈現

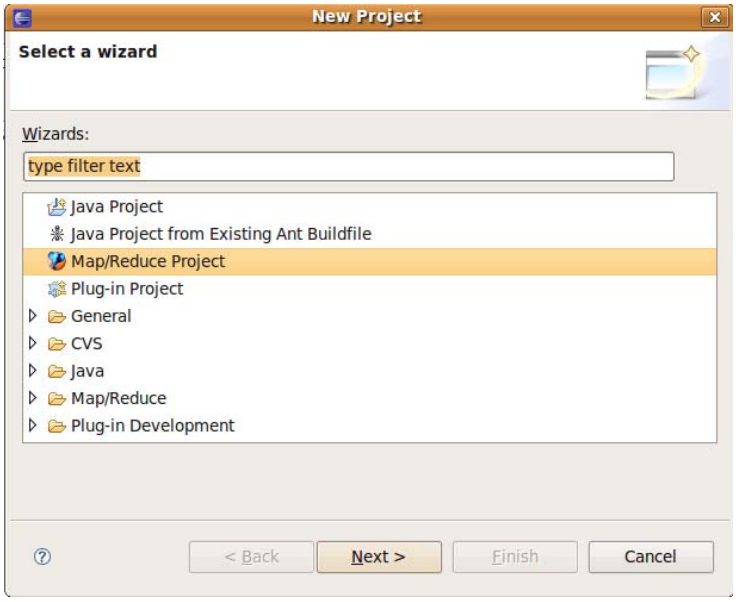



**2.4 建立專案**

| file -> | new -> | project -> | Map/Reduce -> | Map/Reduce Project -> | next |
|---|---|---|---|---|---|




建立mapreduce專案(1)

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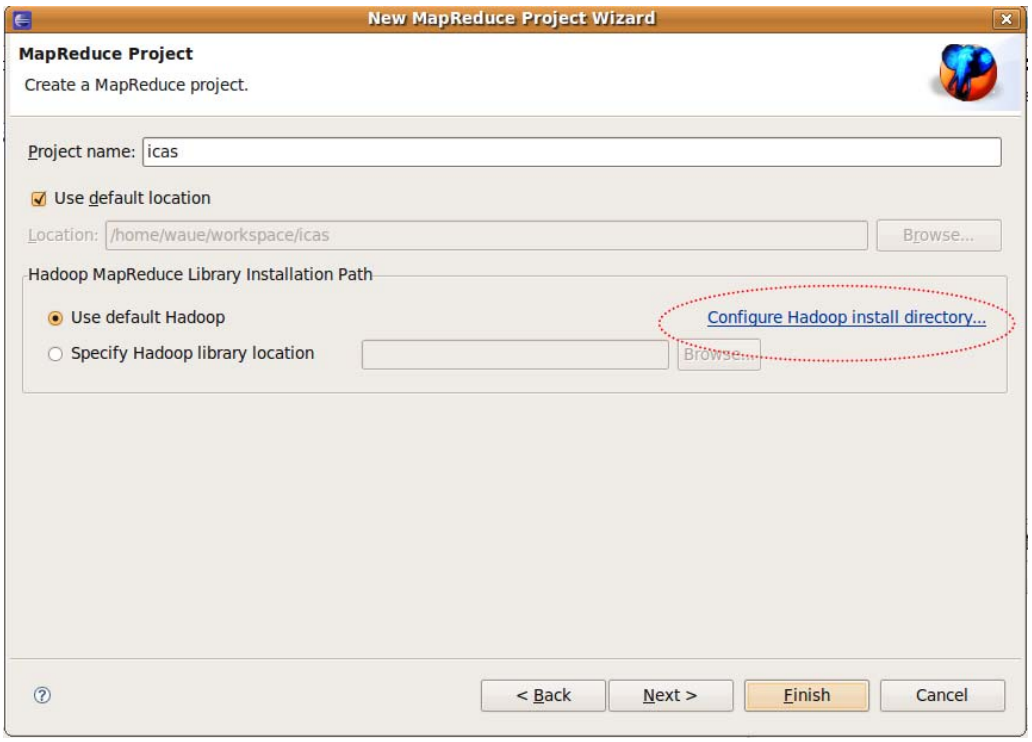
建立mapreduce專案的(2)

```
project name-> 輸入 : icas (隨意)
use default hadoop -> Configur Hadoop install... -> 輸入： "/opt/hadoop" -> ok
Finish
```

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**2.5 設定專案**

由於剛剛建立了icas這個專案，因此eclipse已經建立了新的專案，出現在左邊視窗，右鍵點選該資料夾，並選properties

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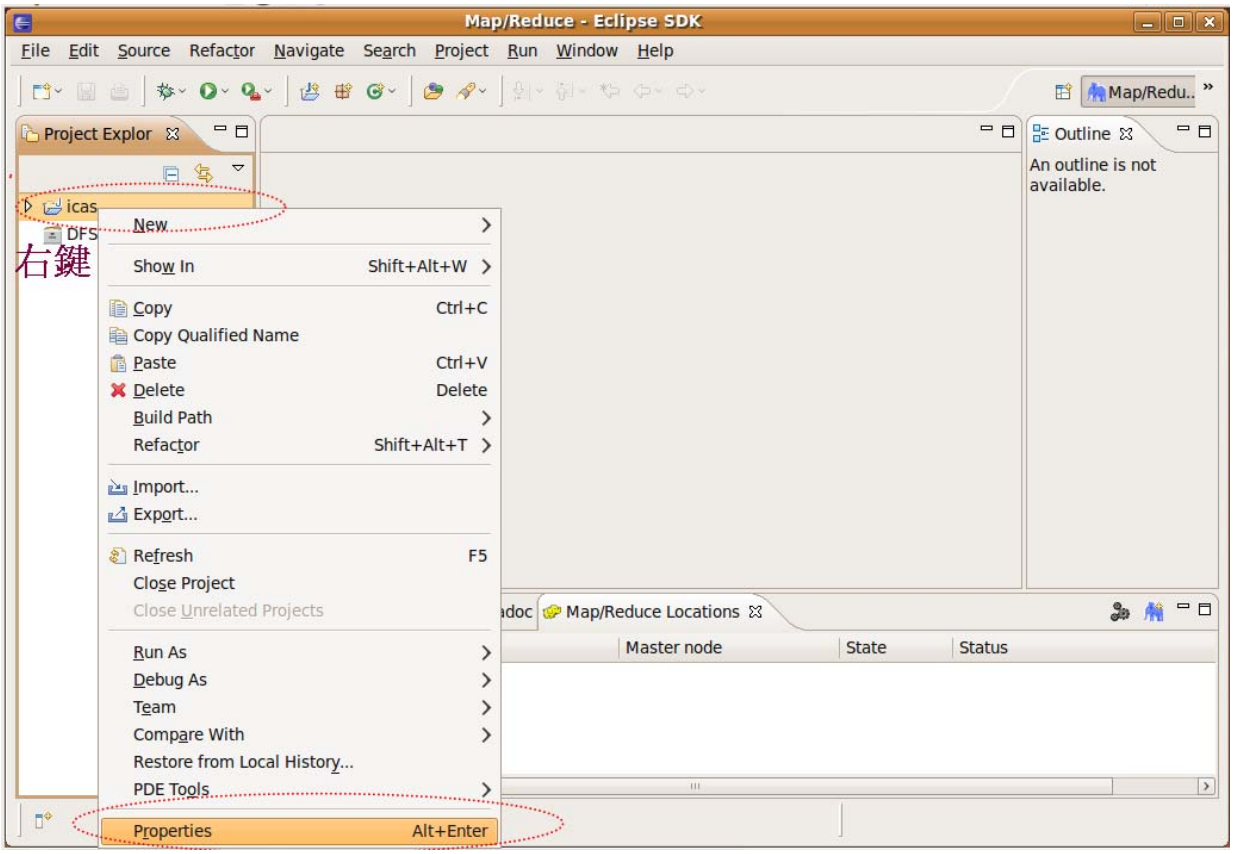
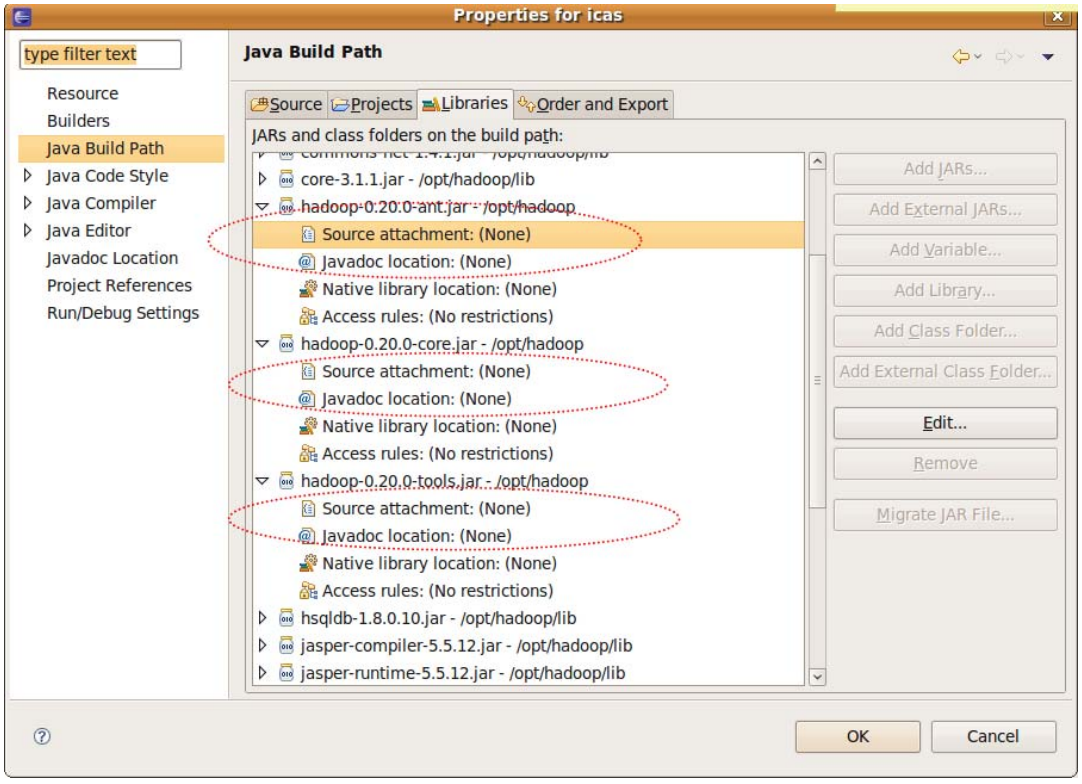
Step1. 右鍵點選project的properties做細部設定




Step2. 進入專案的細部設定頁

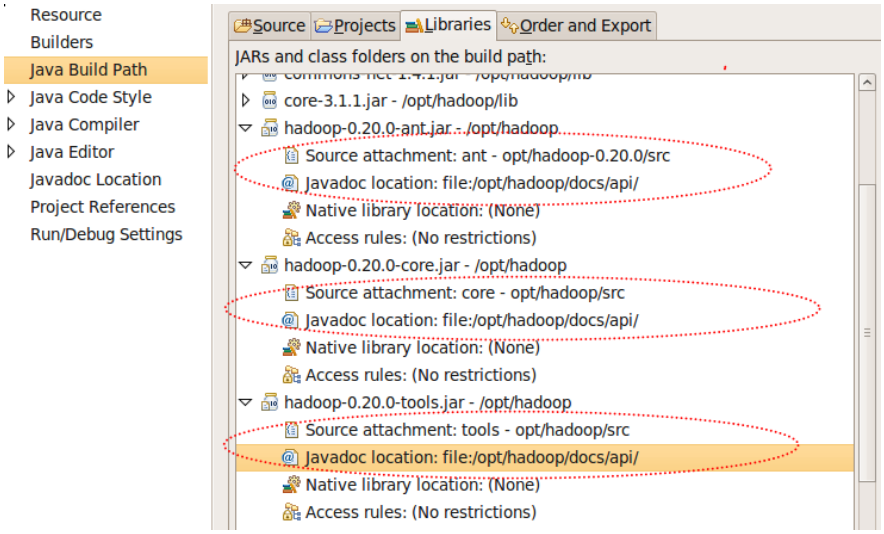
hadoop的javadoc的設定(1)




- java Build Path -> Libraries -> hadoop0.18.3-ant.jar
- java Build Path -> Libraries -> hadoop0.18.3-core.jar
- java Build Path -> Libraries -> hadoop0.18.3-tools.jar
  - 以 hadoop0.18.3-core.jar 的設定內容如下，其他依此類推

```
source ...-> 輸入：/opt/hadoop/src/core
javadoc ...-> 輸入：file:/opt/hadoop/docs/api/
```

Step3. hadoop的javadoc的設定完後(2)

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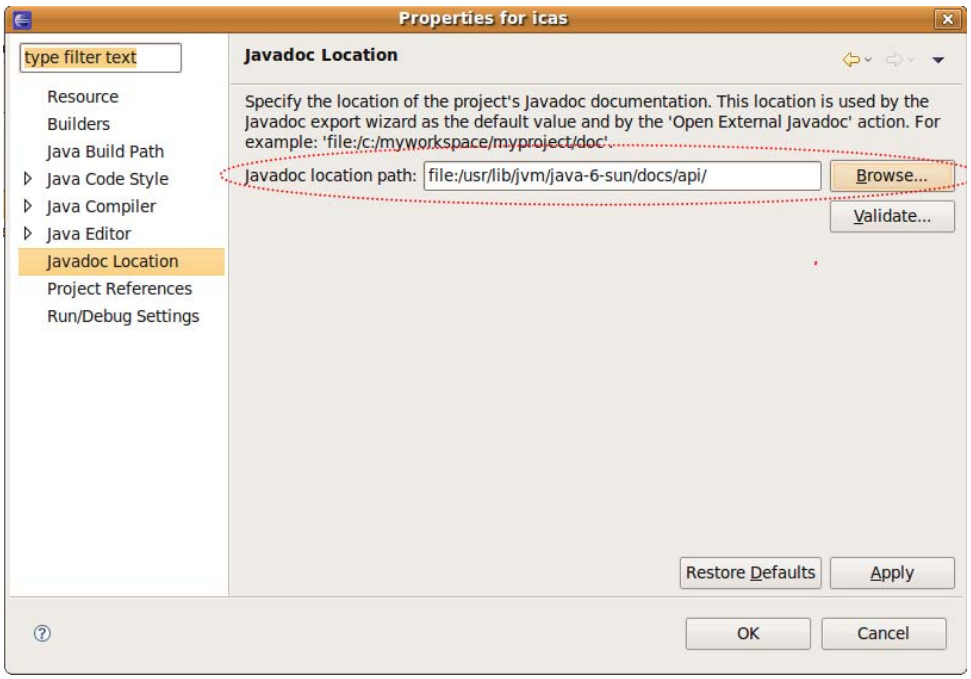
Step4. java本身的javadoc的設定(3)

- javadoc location -> 輸入：file:/usr/lib/jvm/java-6-sun/docs/api/

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設定完後回到eclipse 主視窗

**2.6 連接hadoop server**

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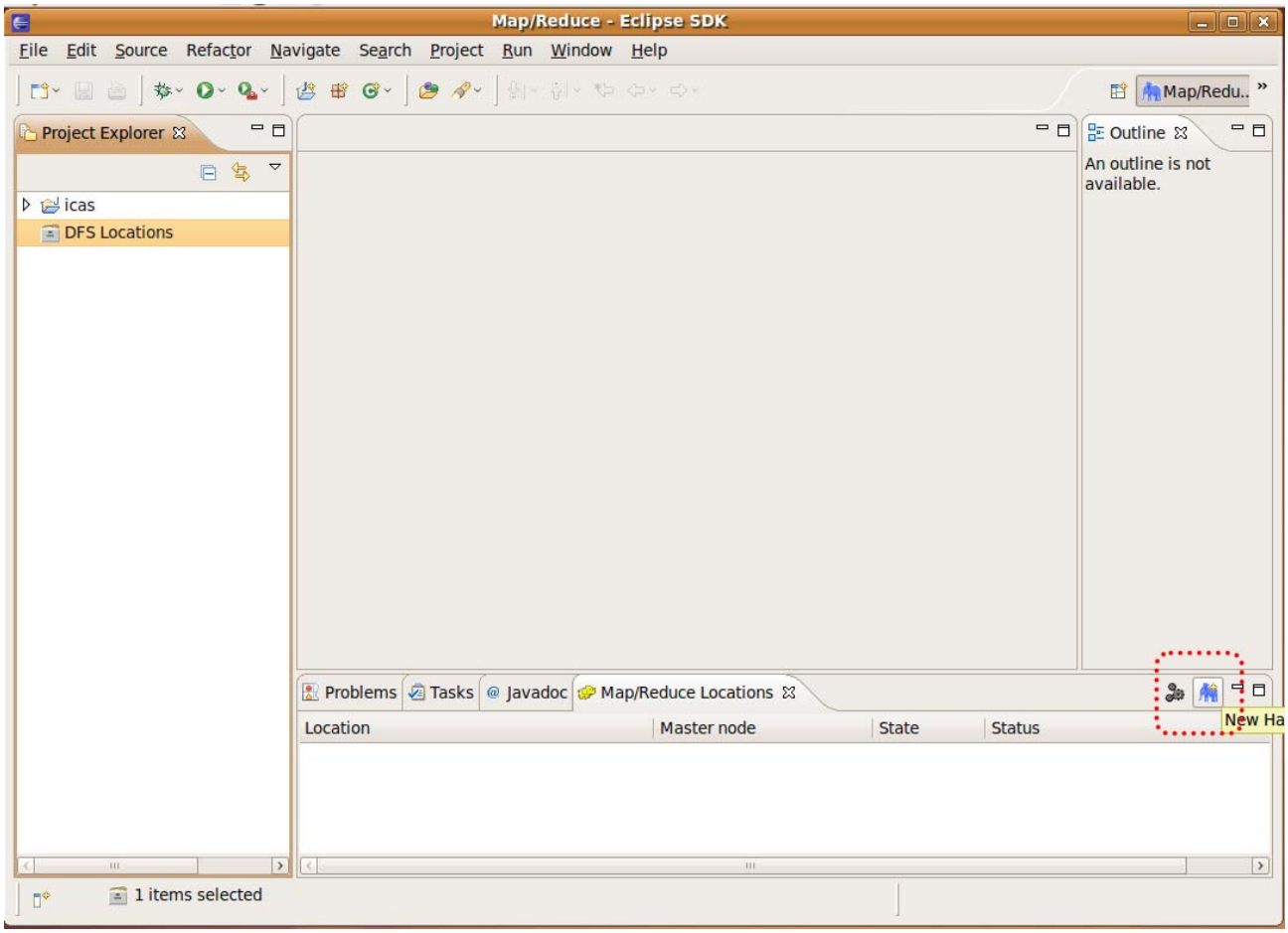
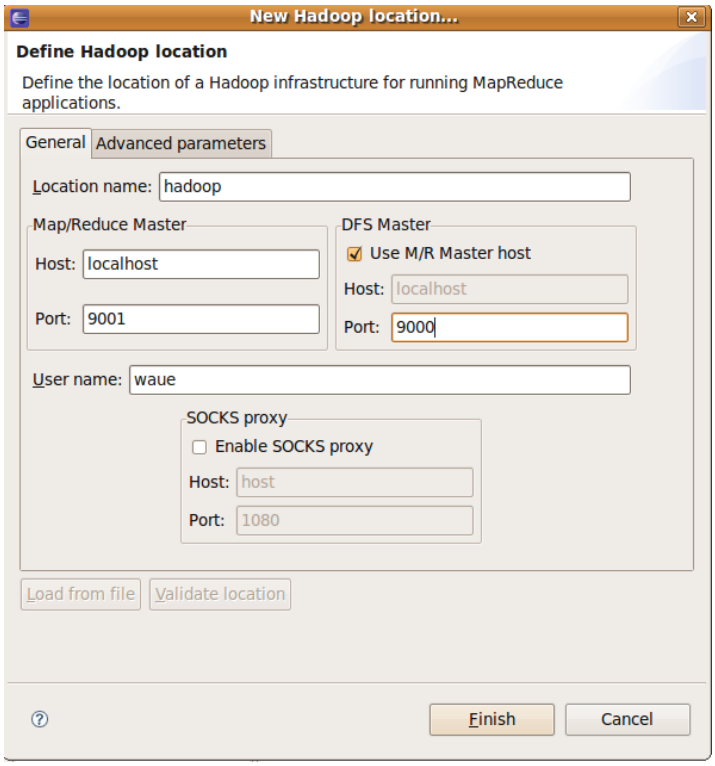
Step1. 視窗右下角黃色大象圖示"Map/Reduce Locations tag" -> 點選齒輪右邊的藍色大象圖示：

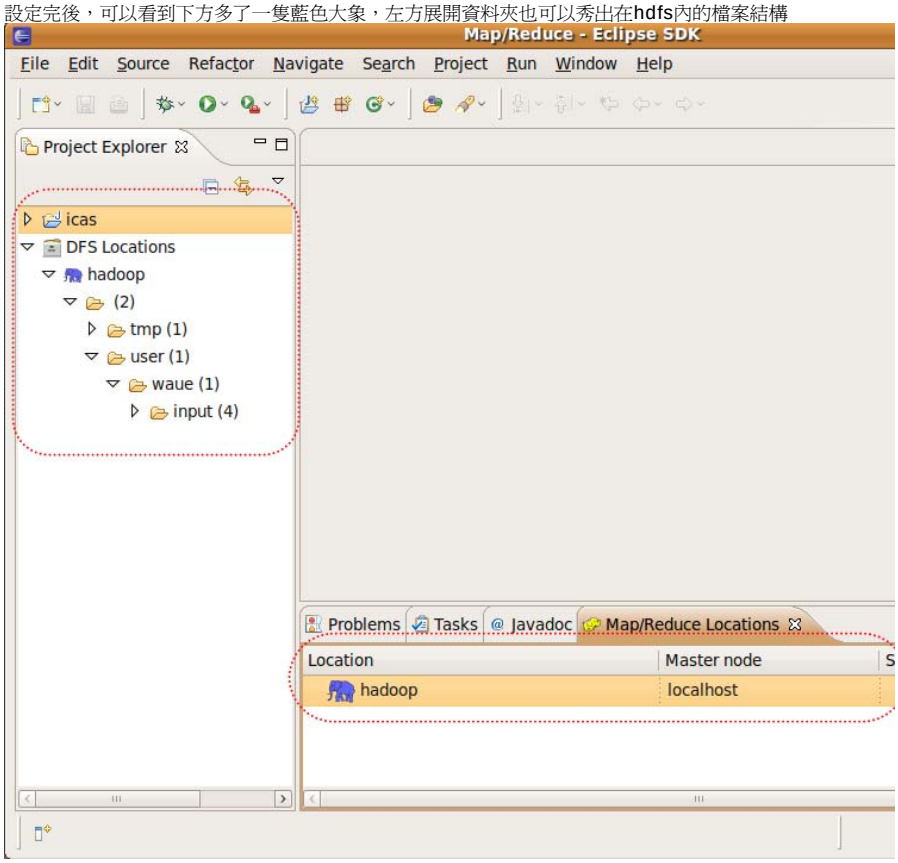



Step2. 進行eclipse 與 hadoop 間的設定(2)




```
Location Name -> 輸入：hadoop （隨意）
Map/Reduce Master
-> Host-> 輸入：localhost
-> Port-> 輸入：9001
DFS Master
-> Host-> 輸入：9000
Finish
```

設定完後，可以看到下方多了一隻藍色大象，左方展開資料夾也可以秀出在hdfs內的檔案結構



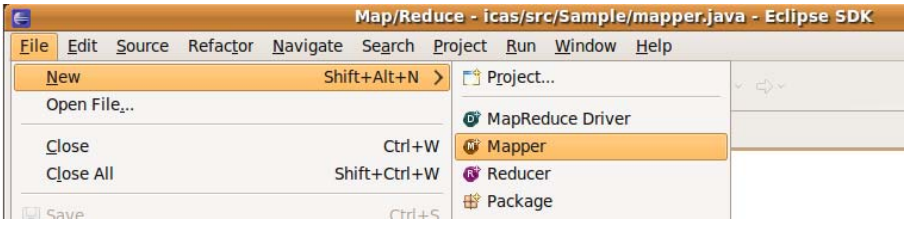

## 三、 撰寫範例程式

- 之前在eclipse上已經開了個專案icas，因此這個目錄在：
  - /home/hadooper/workspace/icas
- 在這個目錄內有兩個資料夾：
  - src ： 用來裝程式原始碼
  - bin ： 用來裝編譯後的class檔
- 如此一來原始碼和編譯檔就不會混在一起，對之後產生jar檔會很有幫助
- 在這我們編輯一個範例程式：WordCount

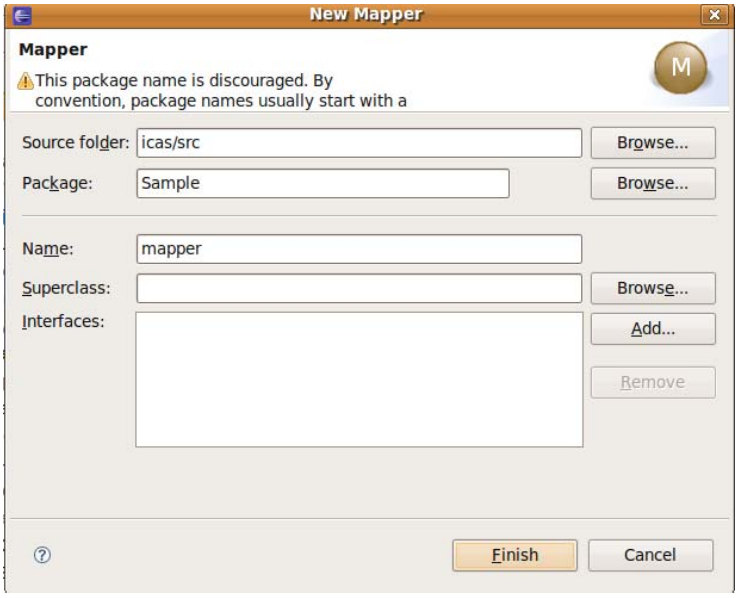
### 3.1 mapper.java

1. new

| File -> | new -> | mapper |
|---|---|---|




2. create



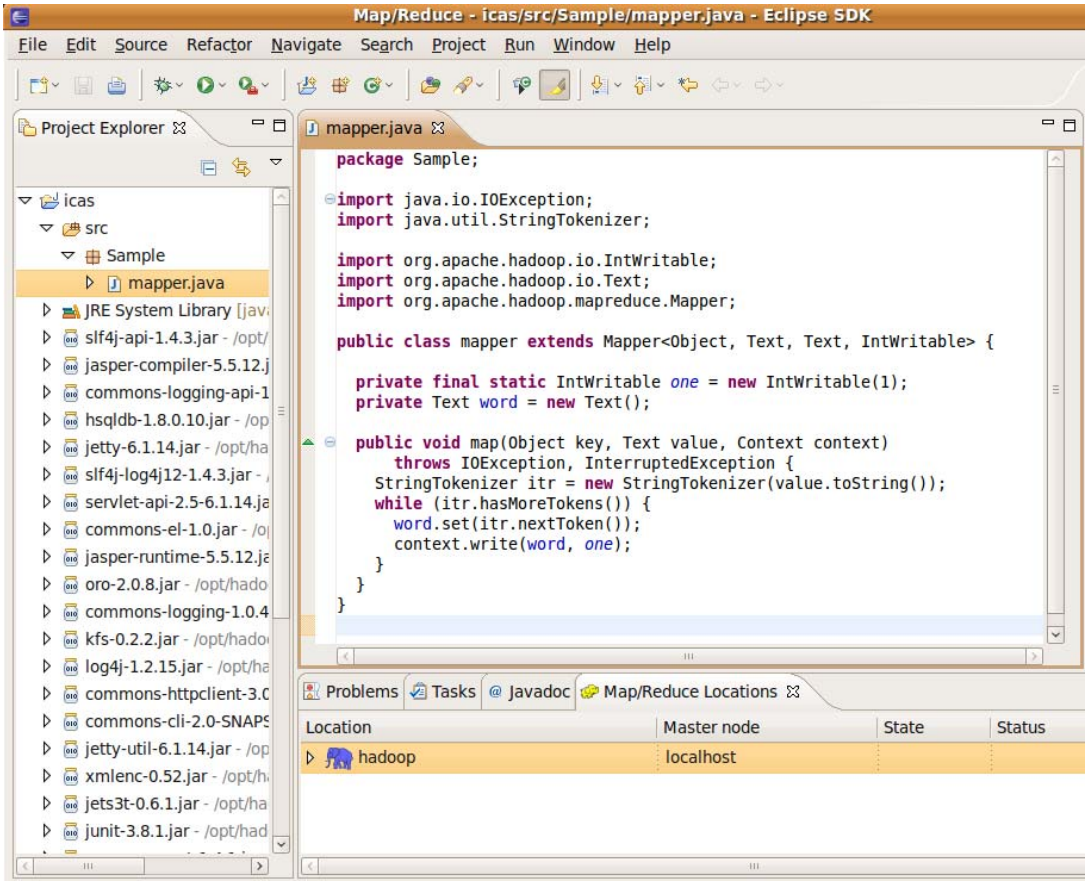

```
source folder-> 輸入： icas/src
Package : Sample
Name -> : mapper
```

---

3. modify

```
package Sample;

import java.io.IOException;
import java.util.StringTokenizer;

import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.Mapper;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reporter;

public class mapper extends MapReduceBase implements Mapper<LongWritable, Text, Text, IntWritable> {
    private final static IntWritable one = new IntWritable(1);
    private Text word = new Text();

    public void map(LongWritable key, Text value, OutputCollector<Text, IntWritable> output, Reporter reporter) throws IOException
      String line = value.toString();
      StringTokenizer tokenizer = new StringTokenizer(line);
      while (tokenizer.hasMoreTokens()) {
        word.set(tokenizer.nextToken());
        output.collect(word, one);
      }
    }
  }
```

建立mapper.java後，貼入程式碼

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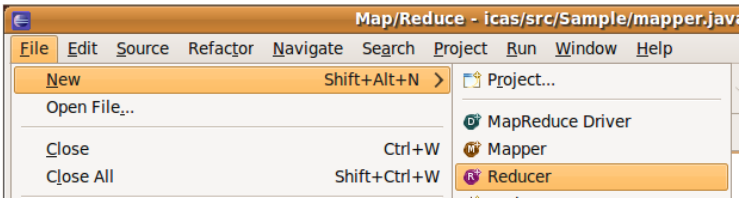
#### 3.2 reducer.java

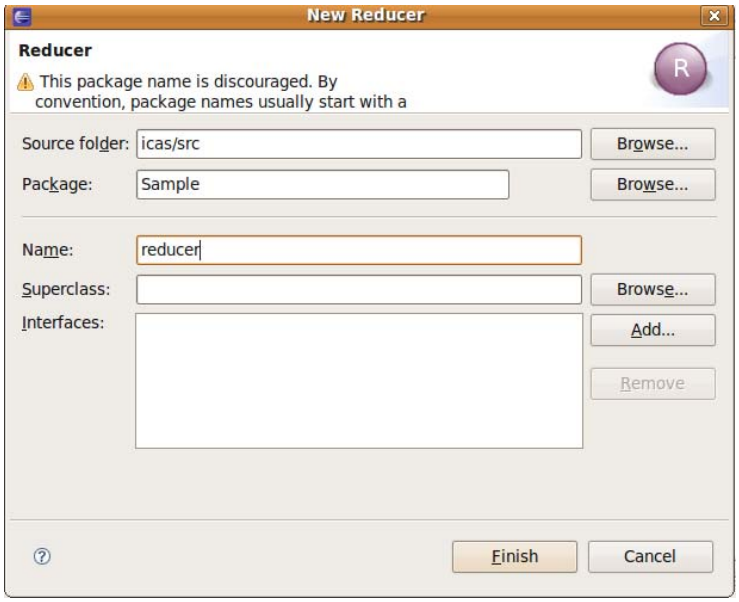
1. new

- File -> new -> reducer




---

2. create

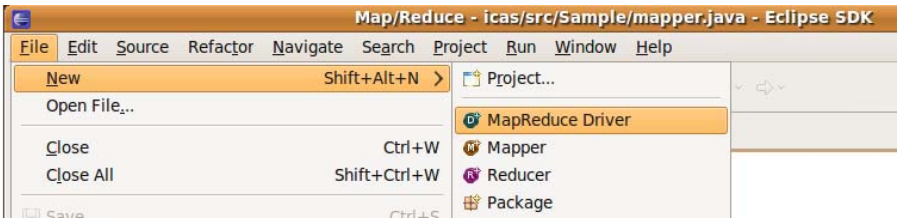


```
source folder-> 輸入： icas/src
Package : Sample
Name -> : reducer
```

3. modify

```
package Sample;

import java.io.IOException;
import java.util.Iterator;

import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reducer;
import org.apache.hadoop.mapred.Reporter;

public class reducer extends MapReduceBase implements Reducer<Text, IntWritable, Text, IntWritable> {
    public void reduce(Text key, Iterator<IntWritable> values, OutputCollector<Text, IntWritable> output, Reporter reporter) throw
      int sum = 0;
      while (values.hasNext()) {
        sum += values.next().get();
      }
      output.collect(key, new IntWritable(sum));
    }
  }
```

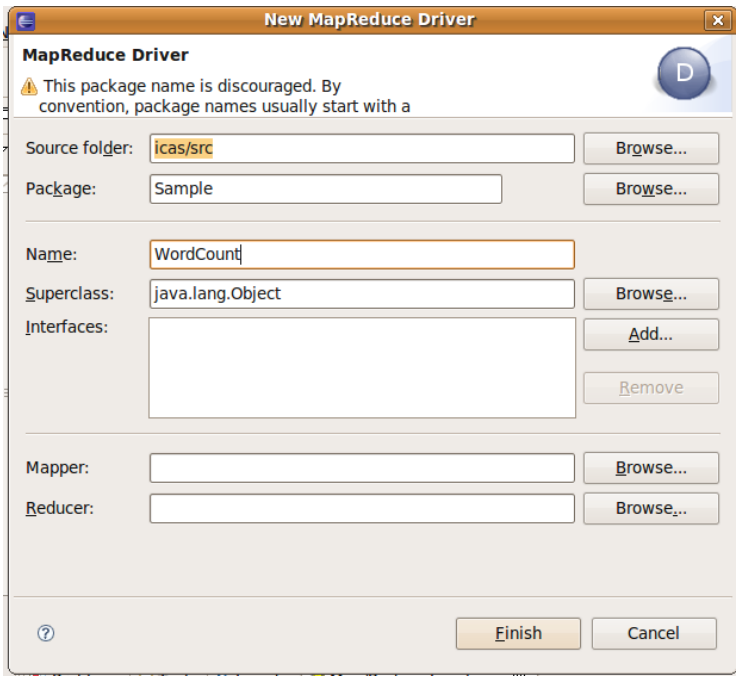
- File -> new -> Map/Reduce Driver




### 3.3 WordCount.java (main function)

1. new

建立WordCount.java，此檔用來驅動mapper 與 reducer，因此選擇 Map/Reduce Driver



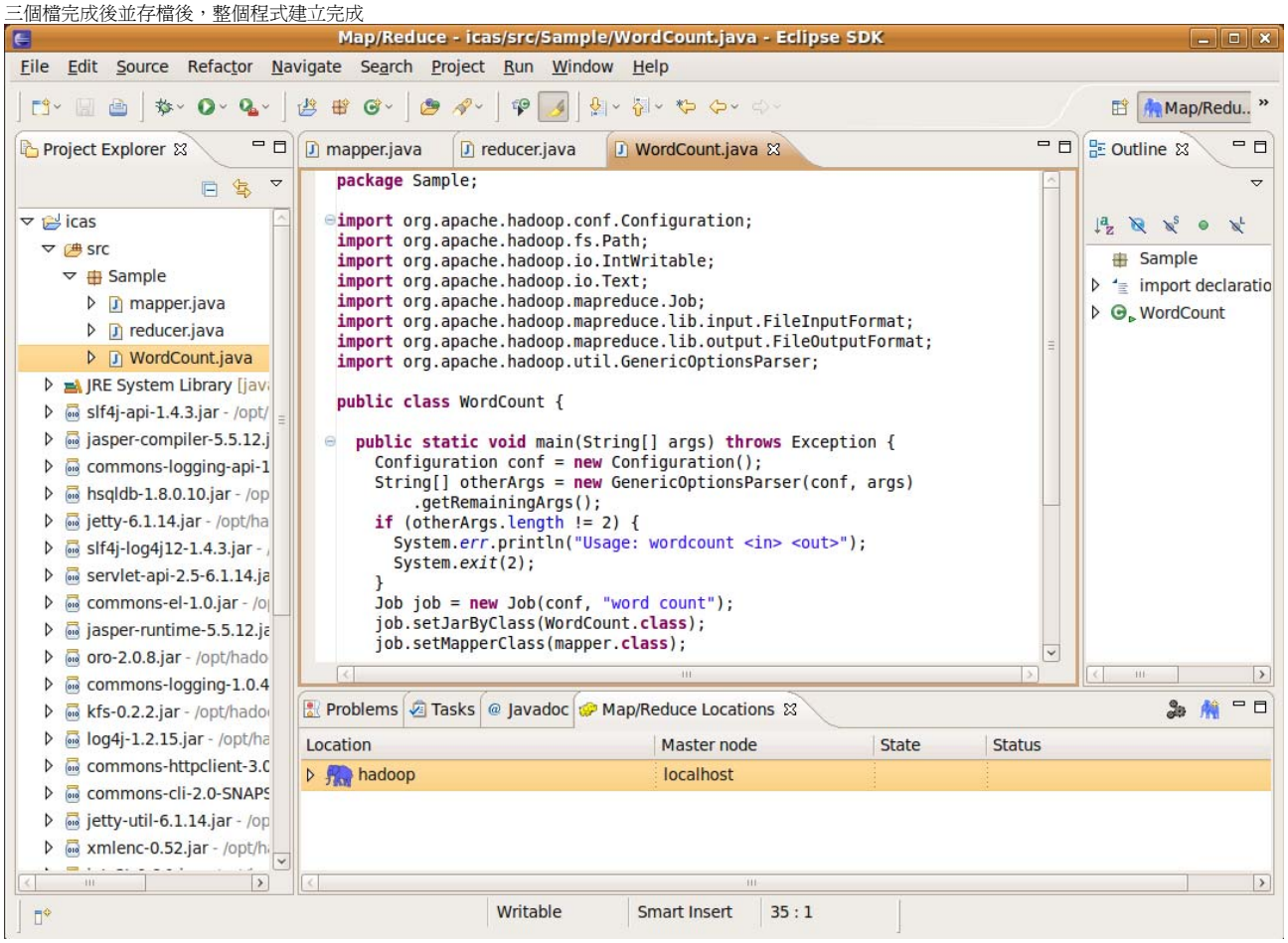

2. create

```
source folder-> 輸入： icas/src
Package : Sample
Name -> : WordCount.java
```

3. modify

```
package Sample;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.FileInputFormat;
import org.apache.hadoop.mapred.FileOutputFormat;
import org.apache.hadoop.mapred.JobClient;
import org.apache.hadoop.mapred.JobConf;
import org.apache.hadoop.mapred.TextInputFormat;
import org.apache.hadoop.mapred.TextOutputFormat;

public class WordCount {

   public static void main(String[] args) throws Exception {
     JobConf conf = new JobConf(WordCount.class);
     conf.setJobName("wordcount");

     conf.setOutputKeyClass(Text.class);
     conf.setOutputValueClass(IntWritable.class);

     conf.setMapperClass(mapper.class);
     conf.setCombinerClass(reducer.class);
     conf.setReducerClass(reducer.class);

     conf.setInputFormat(TextInputFormat.class);
     conf.setOutputFormat(TextOutputFormat.class);

    FileInputFormat.setInputPaths(conf, new Path("/user/hadooper/input"));
    FileOutputFormat.setOutputPath(conf, new Path("lab5_out2"));

     JobClient.runJob(conf);
   }
}
```

三個檔完成後並存檔後，整個程式建立完成



- 三個檔都存檔後，可以看到icas專案下的src，bin都有檔案產生，我們用指令來check

```
$ cd workspace/icas
$ ls src/Sample/
mapper.java  reducer.java  WordCount.java
$ ls bin/Sample/
mapper.class  reducer.class  WordCount.class
```

## 四、測試範例程式

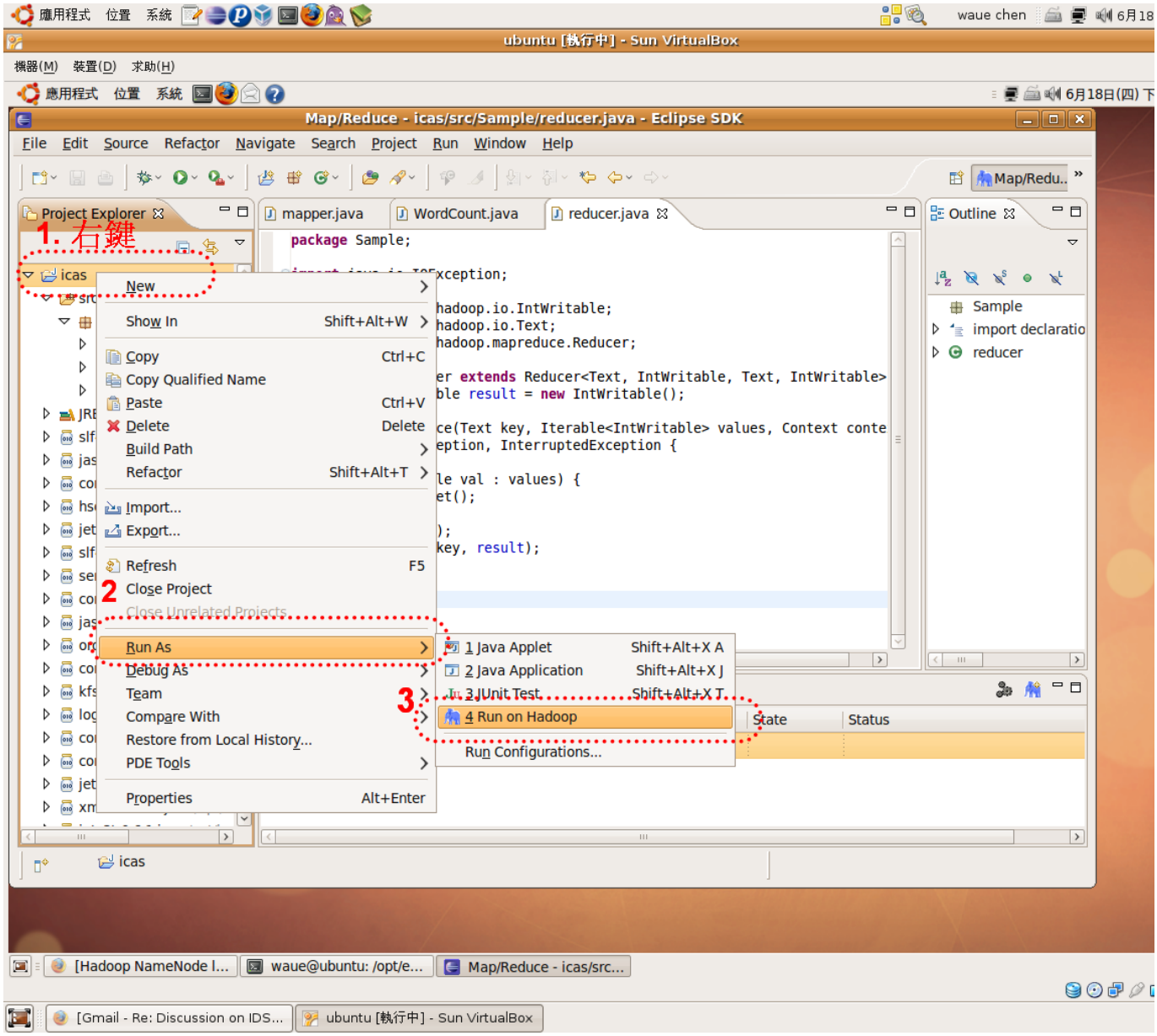
在此提供兩種方法來run我們從eclipse 上編譯出的code。

方法一是直接在eclipse上用圖形介面操作，參閱 4.1 在eclipse上操作

方法二是產生jar檔後搭配自動編譯程式Makefile，參閱4.2

### 4.1 法一：在eclipse上操作

- 右鍵點選專案資料夾：icas -> run as -> run on Hadoop




### 4.2 法二：jar檔搭配自動編譯程式

- eclipse 可以產生出jar檔：

File -> Export -> java -> JAR file
-> next ->

---

選擇要匯出的專案 -> jarfile: /home/hadooper/mytest.jar ->
next ->

---

next ->

---

main class: 選擇有Main的class ->
Finish

---

- 以上的步驟就可以在/home/hadooper/ 產生出你的 mytest.jar
- 不過程式常常修改，每次都做這些動作也很累很煩，讓我們來體驗一下**用指令比用圖形介面操作還方便**吧

#### 4.2.1 產生Makefile 檔

```
$ cd /home/hadooper/workspace/icas/
$ gedit Makefile
```

- 輸入以下Makefile的內容 (注意 ":" 後面要接 "tab" 而不是 "空白")

```
JarFile="sample-0.1.jar"
MainFunc="Sample.WordCount"
LocalOutDir="/tmp/output"
HADOOP_BIN="/opt/hadoop/bin"

all:jar run output clean

jar:
        jar -cvf ${JarFile} -C bin/ .

run:
        ${HADOOP_BIN}/hadoop jar ${JarFile} ${MainFunc} input output

clean:
        ${HADOOP_BIN}/hadoop fs -rmr output

output:
        rm -rf ${LocalOutDir}
        ${HADOOP_BIN}/hadoop fs -get output ${LocalOutDir}
        gedit ${LocalOutDir}/part-r-00000 &

help:
        @echo "Usage:"
        @echo " make jar     - Build Jar File."
        @echo " make clean   - Clean up Output directory on HDFS."
        @echo " make run     - Run your MapReduce code on Hadoop."
        @echo " make output  - Download and show output file"
        @echo " make help    - Show Makefile options."
        @echo " "
        @echo "Example:"
        @echo " make jar; make run; make output; make clean"
```

- 或是直接下載 Makefile 吧

```
$ cd /home/hadooper/workspace/icas/
$ wget http://trac.nchc.org.tw/cloud/raw-attachment/wiki/Hadoop_Lab5/Makefile
```

#### 4.2.2 執行

- 執行Makefile，可以到該目錄下，執行make [參數]，若不知道參數爲何，可以打make 或 make help
- make 的用法說明

```
$ cd /home/hadooper/workspace/icas/
$ make
Usage:
 make jar     - Build Jar File.
 make clean   - Clean up Output directory on HDFS.
 make run     - Run your MapReduce code on Hadoop.
 make output  - Download and show output file
 make help    - Show Makefile options.

Example:
 make jar; make run; make output; make clean
```

- 下面提供各種make 的參數

**make jar**

- 1. 編譯產生jar檔

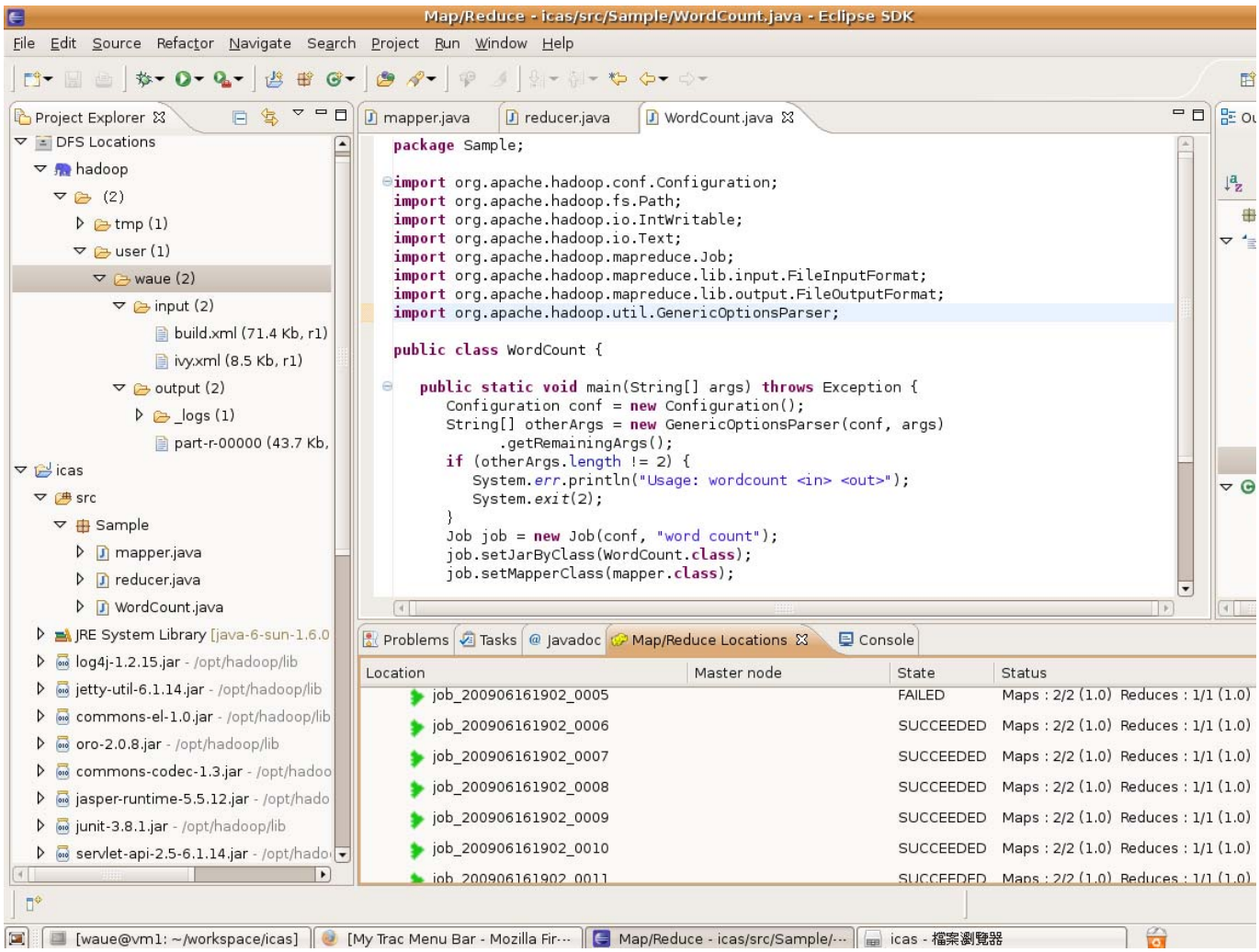
```
$ make jar
```

**make run**

- 2. 跑我們的wordcount 於hadoop上

```
$ make run
```

- make run基本上能正確無誤的運作到結束，因此代表我們在eclipse編譯的程式可以順利在hadoop0.18.3的平台上運行。
- 而回到eclipse視窗，我們可以看到下方視窗run完的job會呈現出來；左方視窗也多出output資料夾，part-r-00000就是我們的結果檔

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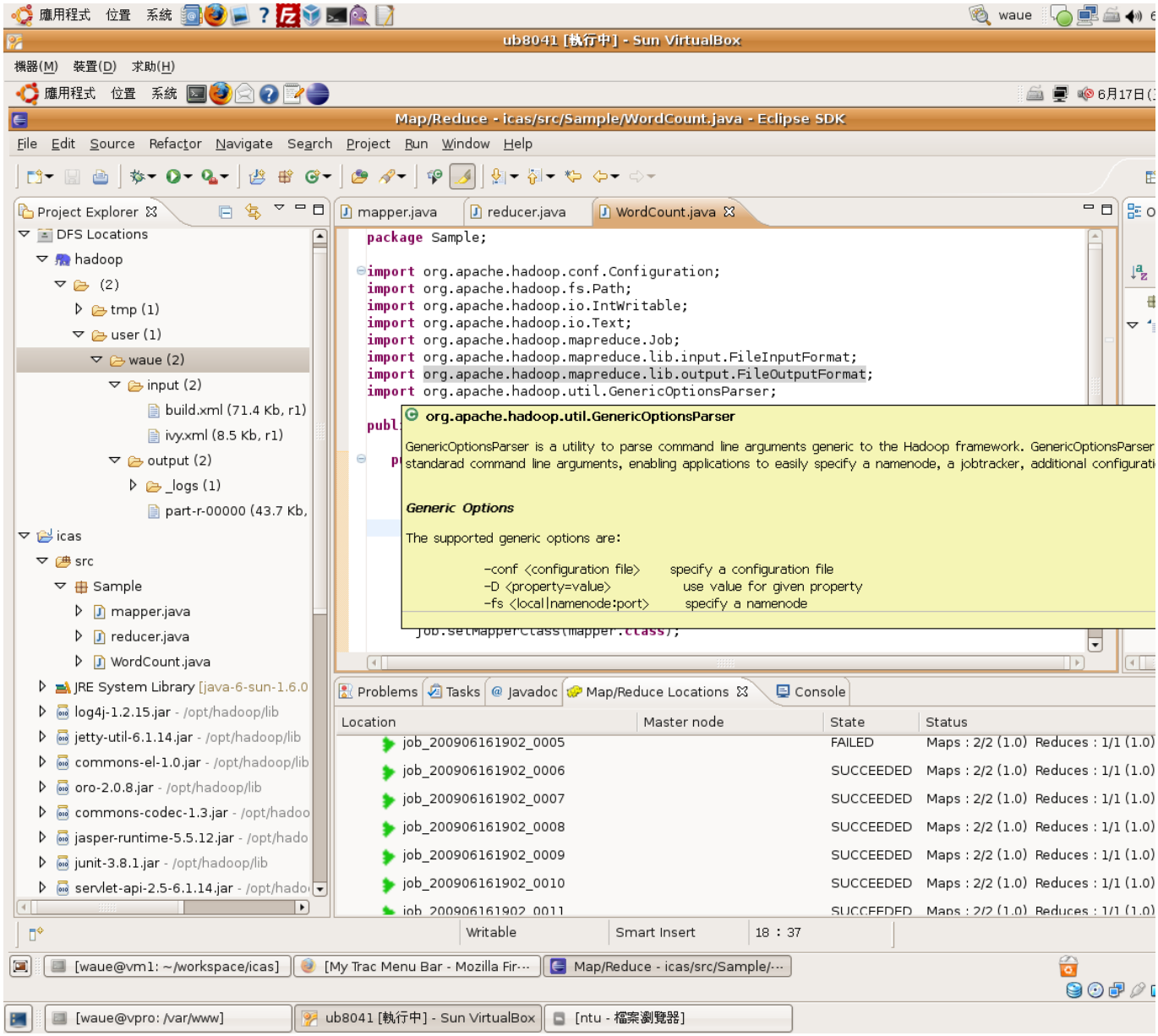
- 因爲有設定完整的javadoc, 因此可以得到詳細的解說與輔助




**make output**

- 3. 這個指令是幫助使用者將結果檔從hdfs下載到local端，並且用gedit來開啓你的結果檔

```
$ make output
```

**make clean**

- 4. 這個指令用來把hdfs上的output資料夾清除。如果你還想要在跑一次make run，請先執行make clean，否則hadoop會告訴你，output資料夾已經存在，而拒絕工作喔！

```
$ make clean
```

## 五、結論

- 搭配eclipse ，我們可以更有效率的開發hadoop
- hadoop 0.20 與之前的版本api以及設定都有些改變，可以看 hadoop 0.20 coding (eclipse )

## 六、練習：匯入專案

- 將 nchc-sample 給匯入到eclipse 內開發吧！

**Attachments**

- hadoop_sample_codes.zip (16.9 kB) - added by *waue* 7 weeks ago.
- nchc-example.jar (23.2 kB) - added by *waue* 7 weeks ago.
- Makefile (0.8 kB) - added by *waue* 7 weeks ago.