Introduction To Files In Pascal

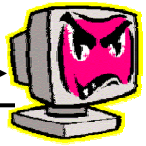
In this section of notes you will learn how to read from and write to files in Pascal.

James Tam

What You Know About Input And Output

Comes from the user or is displayed to the user

Person to program (read / readln)



Person to program (write / writeln)

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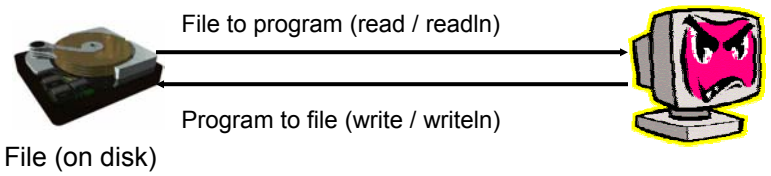
What You Will Learn: Input And Output Using Files

Information is retrieved from and written out to a file (typically on disk)



Why Bother With Files?

- Too much information to input all at once
- The information must be persistent (RAM is volatile)
- Etc.

What You Need In Order To Read Information From A File

1. Declare a file variable
2. Open the file
3. A command to read the information

1. Declaring File Variables

Allows the program access to a file

Format:

name of file variable : text;

Example:

letterGrades : text;

2. Opening Files

Prepares the file for reading:

A. Links the file variable with the physical file (references to the file variable are references to the physical file)

B. Positions the file pointer

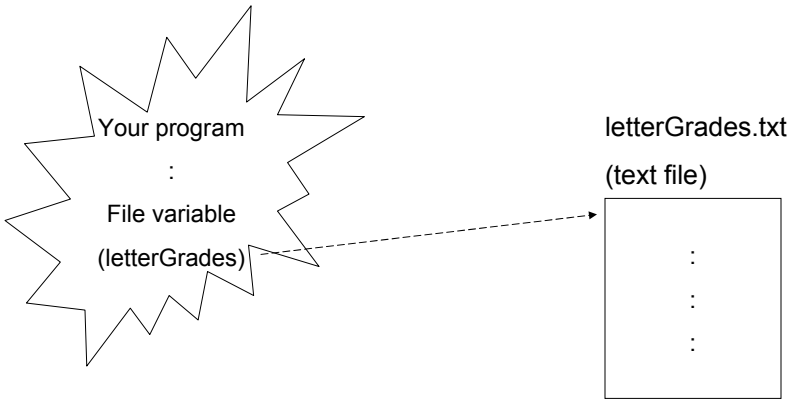
Format:

reset (*name of file variable, location and name of file*);

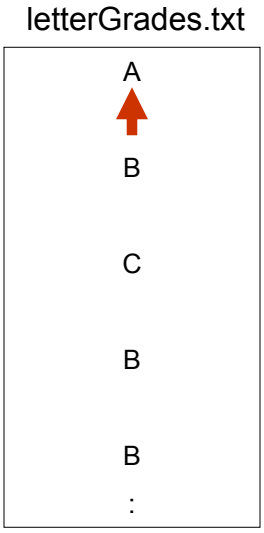
Example:

reset (letterGrades, 'letterGrades.txt');

A. Linking The File Variable With The Physical File



B. Positioning The File Pointer



3. Reading Information From Files

Performed with read or readln

Format:

read (*name of file variable*, variable to store the information);

readln (*name of file variable*, variable to store the information);

Example:

readln(letterGrades, letter);

3. Reading Information From Files (2)

Typically reading is done within the body of a loop

Format:

```
while NOT EOF (name of file variable) do
begin
    read (name of file variable, variable to store the information);
        OR
    readln (name of file variable, variable to store the information);
end; (* Done reading from input file *)
```

Example:

```
while NOT EOF (letterGrades) do
begin
    readln(letterGrades, letter);
    writeln(letter);
end; (* Loop to read letter grades file *)
```


An Alternative Approach To Reading Files

- Employ a sentinel in the file
- Keep reading from the file until the sentinel value is encountered

Example:

```
var inputFile : text;
 var num       : integer;
     :             :
readln (inputFile, num);
while NOT (num = -1) do
begin
    writeln(num);
    readln(inputFile, num);
end; (* Done reading input file *)
```

Reading From Files: Putting It All Together

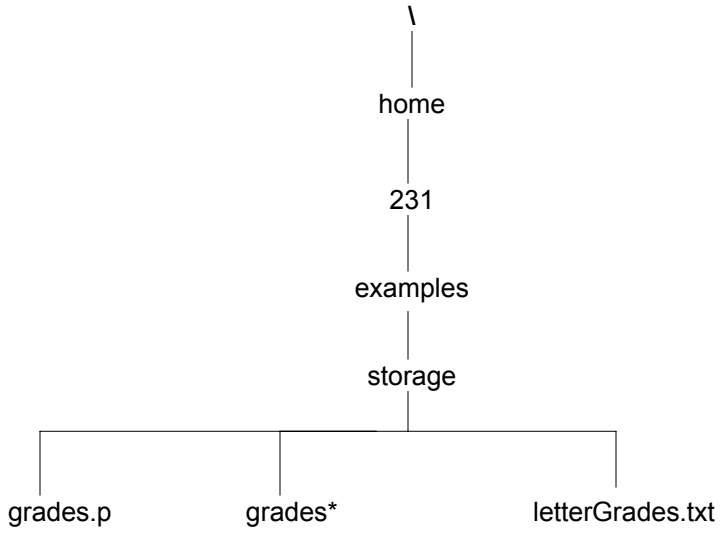
A complete version of this program can be found in Unix under /home/231/examples/storage/grades.p:

```
program grades (output);
begin
  var letterGrades : text;
  var letter       : char;

  (* Open file for reading, confirm file with user. *)
  reset(letterGrades, 'letterGrades.txt');
  writeln('Opening file "letterGrades" for reading.');

  while NOT EOF (letterGrades) do
  begin
      readln(letterGrades, letter);
      writeln(letter);
  end; (* Loop to read letter grades file *)
```


Reading From Files: Putting It All Together (2)

```
  close(letterGrades);
  writeln('Completed reading of file "letterGrades"');
end.
```

View Of Files In Unix



What You Need To Write Information To A File

1. Declare a file variable
2. Open the file
3. A command to write the information

1. Declaring An Output File Variable

•No difference in the declaration of a file variable when writing to a file from the case of reading from a file.

Format:

name of file variable: text;

Example:

```
letterGrades : text;
gradePoints  : text;
```


2. Opening The File

Two methods:

1) Rewriting – erases the old contents of the file (rewrites over what was already there).
2) Appending – retain the old contents of the file (appends the new information at the end).

Format (rewriting / appending):

rewrite (*name of file variable, location and name of physical file*);
append (*name of file variable, location and name of physical file*);

Example (rewriting / appending):

```
rewrite(gradePoints, 'gradePoints.txt');
append(gradePoints, 'gradePoints.txt');
```

3. Writing To A File

Format:

write (*name of file variables*, variable(s) and/or strings to write);

writeln (*name of file variables*, variable(s) and/or strings to write);

Example:

```
writeln(gradePoints, gpa);
```


Writing To A File: Putting It All Together

A complete version of this program can be found in Unix under:
/home/231/examples/storage/grades2.p

```
program grades (output);
begin
  var letterGrades, gradePoints : text;
  var letter                    : char;
  var gpa                       : integer;

  reset(letterGrades, 'letterGrades.txt');
  rewrite(gradePoints, 'gradePoints.txt');

  writeln('Opening file "letterGrades" for reading.');
  writeln('Opening file "gradePoints" for writing.');
```

Writing To A File: Putting It All Together (2)

```
while NOT EOF (letterGrades) do
begin
  readln(letterGrades, letter);
  case (letter) of
    'A'      :
    gpa := 4;

    'B'      :
    gpa := 3;

    'C'      :
    gpa := 2;

    'D'      :
    gpa := 1;

    'F'      : gpa := 0;

    else gpa := -1;
  end; (* case *)
```


Writing To A File: Putting It All Together (3)

```
      writeln(gradePoints, gpa);
  end; (* Loop to read letter grades file *)

  writeln('Finished reading and writing to files.');
  close(letterGrades);
  close(gradePoints);
end.
```

Details Of Write And Writeln For Files: Intuitive View

Program statement	**Effect on file**	
rewrite(data,'data.txt');	^	(Open file "data.txt" and position file pointer at start)
write (data, 'x');	x ^	
write(data, 'y');	xy ^	
write(data, 'z');	xyz ^	
writeln(data);	xyz _ ^	
write(data,'a');	xyz a ^	

Details Of Write And Writeln For Files: Actual View

Program statement	**Effect on file**	
rewrite(data,'data.txt'); (Open file "data.txt" and position file	^	pointer at start)
write (data, 'x');	x ^	
write(data, 'y');	xy ^	
write(data, 'z');	xyz ^	

Details Of Read And Readln For Files: Intuitive View[1]

Program statement	Effect on file	Effect in program
reset (data, 'data.txt');	xyz ^ a	(Open file "data.txt" and position file pointer at start)
read(data, ch);	xyz ^ a	Value of ch: 'x'
readln(data, ch);	xyz a ^	Value of ch: 'Y'
read(data, ch);	xyz a ^	Value of ch: 'a'

1 Assume that the code on the previous slide has created the file called "data.txt"

Details Of Read And Readln For Files: Actual View[1]

Program statement	Effect on file	Effect in program
reset (data, 'data.txt');	xyz<EOL>a ^	(Open file "data.txt" and position file pointer at start)
read(data, ch);	xyz<EOL>a ^	Value of ch: 'x'
readln(data, ch);	xyz<EOL>a ^	Value of ch: 'y'
read(data, ch);	xyz<EOL>a ^	Value of ch:'a'
read(data,ch);	xyz<EOL>a ^	

1 Assume that the code on the previous slide has created the file called "data.txt"

Details Of Read And Readln For Files: Actual View[1]

Program statement	**Effect on file**	**Effect in program**
`reset (data, 'data.txt');`	`xyz<EOL>a` `^`	(Open file "data.txt" and position file pointer at start)
`read(data, ch);`	`xyz<EOL>a` `^`	Value of ch: 'x'
`readln(data, ch);`	`xyz<EOL>a` `^`	Value of ch: 'y'
`read(data, ch);`	`xyz<EOL>a` `^`	Value of ch:'a'
`read(data,ch);`	`xyz<EOL>a` `^`	Error: read past end of file

1 Assume that the code on the previous slide has created the file called "data.txt"

Passing File Variables As Parameters

Must be passed as variable parameters *only*.

Format:

procedure *nameProcedure* (var *nameFile* : text);

Example:

```
procedure fileInputOuput (var letterGrades : text;
                          var gradePoints  : text);
```

You Should Now Know

- How to declare a file variable
- How to open a file for reading
- How to open a file a file for writing (rewrite and append mode)
- How to read (read/readln) from and write (write/writeln) to a file
- The details of information is read from and written to a file
- How to close a file and why it is good practice to do this explicitly
- How to pass file variables as parameters