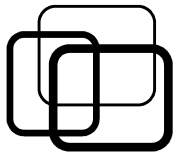
Binary File

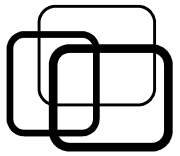
Inst. Nguyễn Minh Huy

Contents



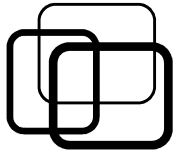
- Dynamic string.
- Binary file.
- main() arguments.

Contents



- **Dynamic string.**
- Binary file.
- main() arguments.

Dynamic string



- Pointer as string:
  - String = array of chars + '\0';

char **s1[6]** = { 'H', 'e', 'l', 'l', 'o', '\0' }; **s1**

H	e	l	l	o	\0

char **s2[ ]** = "Hello"; **s2**

H	e	l	l	o	\0

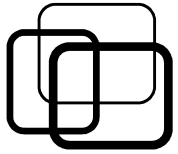
  - Dynamic string:
    - Use dynamic array of chars.
    - Flexible size.
    - Declaration: char ***<string pointer>***;

char ***s3*** = new char[6]; **s3** 27 → ? ? ? ? ? ?

//…

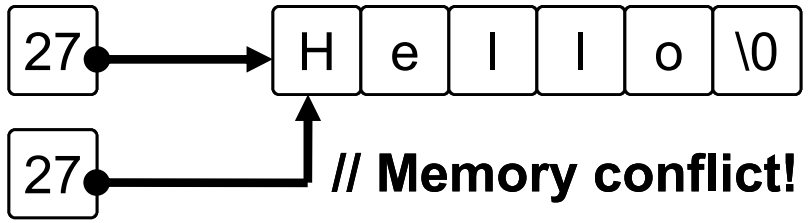
delete [ ]s3;

Dynamic string



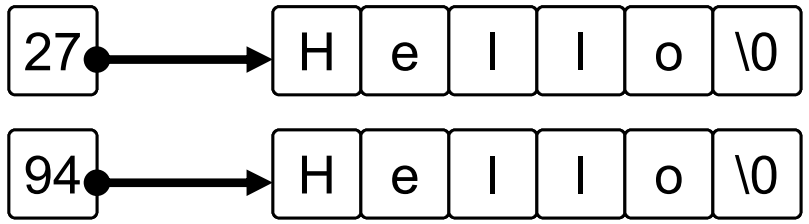
- Library <string.h>:
  - Copy string:
    - Do not use "=" to copy a string!!

```
char  *s1 = "Hello";
char  *s2 = s1;
```

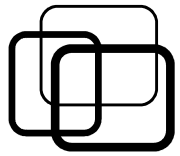


    - Steps to copy string:
      - Step 1: declare new string.
      - Step 2: use **strcpy** to copy string content.

```
char  *s1 = "Hello";
char  *s1 = new char[ strlen(s1) + 1 ];
strcpy( s2, s1 );
```



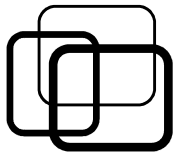
Dynamic string



- Library <string.h>:
  - Duplicate string:
    - Syntax: **strdup**(<source string>);
    - Return: new string copied from source string.
    - Memory of new string must be de-allocated.

```
char  s1 = “Hello”;
char  *s2 = strdup(s1);

// Same as….
// char *s2 = new char[ strlen(s1) + 1 ];
// strcpy( s2, s1 );

free(s2);
```

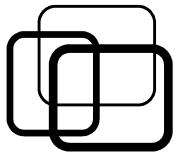
Dynamic string



- Library <string.h>:
  - Compare string:
    - Syntax: **strcmp**(<string 1>, <string 2>);
    - Return: 0 (equal), 1 (greater), -1 (less).
    - Compare based on dictionary order.

```
char  *s1 = “abc”;
char  *s2 = “abaab;
char  s3[10];
strcpy(s3, s1);

int     r1 = strcmp(s1, s2);      // = 1.
int     r2 = strcmp(s1, s3);      // = 0.
int     r3 = strcmp(s2, s3);      // = -1.
```

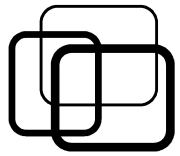
Dynamic string



- Library <string.h>:
  - Join string:
    - Syntax: **strcat**(<dest string>, <source string>);
    - Join source string into dest string.
    - Dest string must have enough memory!!

```
char  *s1 = “Hello”;
char  *s2 = “World;
char  *s3 = new char[ strlen(s1) + strlen(s2) + 1 ];

strcat(s3, s1);          // Join s1 into s3.
strcat(s3, s2);          // Then, join s2 into s3.
```

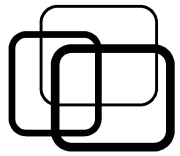
Dynamic string



- Library <string.h>:
  - Find sub string:
    - Syntax: **strstr**(<source string>, <sub string>);
    - Return: address of found sub string (successful), NULL (fail).

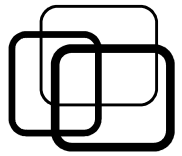
```
char  s1[ ] = “Hello World”;
char  *s2 = “World;
char  *s3 = strstr(s1, s2);

if (s3 == NULL)
     printf(“Not found.”);
else
     printf(“Found position = %d”, s3 - s1);
```

Dynamic string



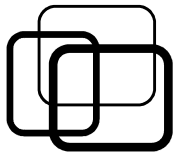
- Practice:
  - Input dynamic string:
    - Declare struct Student:
      - Id: fix-sized 7 chars.
      - Name: variable-sized 50 chars.
      - GPA: float.
    - Write function to input a student from keyboard.

Contents



- Dynamic string.
- **Binary file.**
- main() arguments.

Binary file



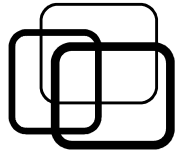
- IO devices:
  - Program is a working machine.

    ➔ Input data → Program → Output result.
  - Where does program retrieve input/output?

    ➔ From IO devices.
  - Types of Devices:
    - Input devices: keyboard, mouse, file, …
    - Output devices: screen, printer, file, …

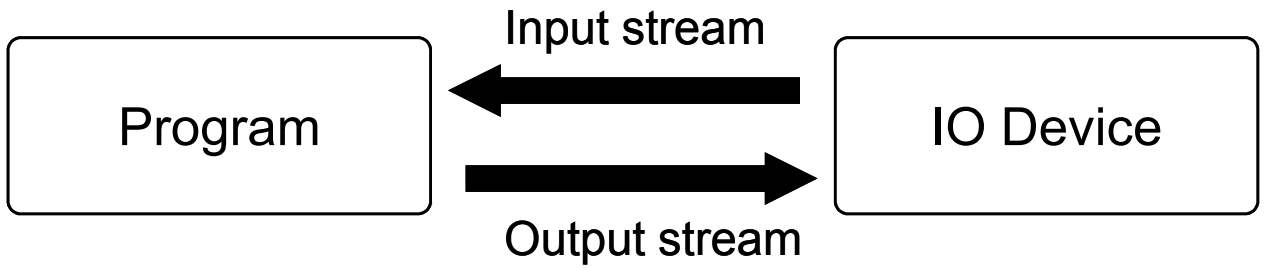
    ➔ File is both input/output devices.

Binary file

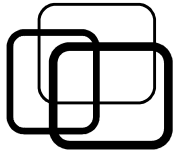


- Stream in C:
  - How can program communicate with device?

  ➔ Through connection called stream.
  - Stream: connection between program and device.
  - Types of Streams:
    - Input stream: connection from input device to program.
    - Output stream: connection from program to output device.

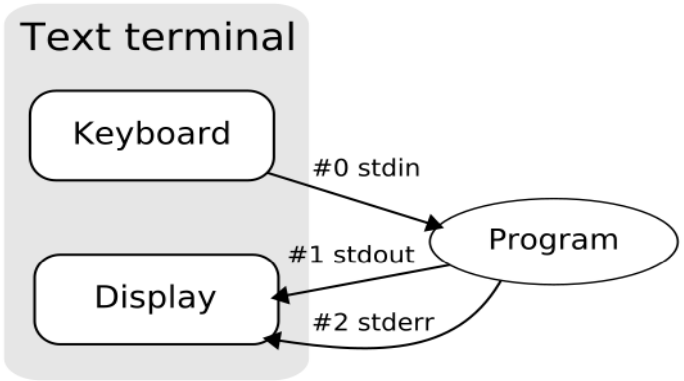


Binary file



- Stream in C:
  - Built-in streams:

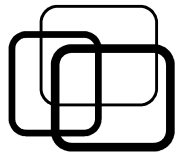
Stream	Type	Device
stdin	Input stream.	Keyboard
stdout	Output stream.	Screen
stderr	Output stream.	Screen



  - Usage:
    - **fscanf(**<Stream>, “<Input format>”, &<Var 1>, …**)**;
    - **fprintf(**<Stream>, “<Output format>”, <Var 1>, …**)**;

```
fscanf( stdin, “%d”, &x);          // Read from keyboard.
fprintf( stdout, “Hello World” );  // Write to screen.
```

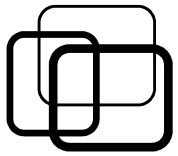
Binary file



- Stream in C++:
  - Upgrade from C:
    - Compatible with stream in C.
    - Easier to use.
  - Built-in stream C++:

Stream	Type	Device
cin	Input stream.	Keyboard
cout	Output stream	Screen
cerr	Output stream	Screen

Binary file



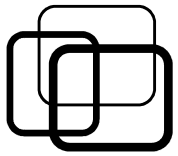
- Stream in C++:
  - Extraction operator >>:
    - Get data from stream.
    - Format is unnecessary.
    - Syntax:

      <stream> >> <variable>;
  - Insertion operator <<:
    - Put data to stream.
    - Format is unnecessary.
    - Syntax:

      <stream> << <variable/const>;

```
int main()
{
    int     n;
    float  a[10];

    cout << “Enter n = “;
    cin >> n;

    for (int i = 0; i < n; i++)
    {
       cout << “Enter a[“ << i << “] = “;
       cin >> a[ i ];
    }
}
```

Binary file

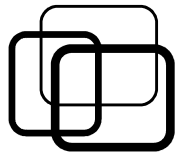


- File vs. Memory:

Criteria	File	Memory
Processing speed	Slow	Fast
Type of access	Sequential	Random
Cost	Cheap	Expensive
Storage size	Large	Small
Storage time	Persistent	Temporary

- File vs. Keyboard and Screen:
  - User appearance is unnecessary.
  - Retrieve input/output repeatedly.
  - Communicate with other programs.

Binary file

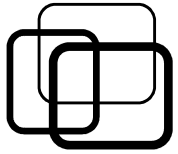


- File stream:
  - Connection between program and file.
  - Declaration: **FILE** *<stream>.

    ➔ File pointer.

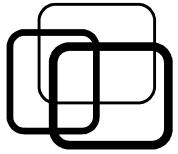
    FILE *f1;
  - Steps to process file:
    - Step 1: open file.
    - Step 2: read/write file.
    - Step 3: close file.

Binary file



- Basic functions:
  - Open file: fopen, freopen.
  - Close file: fclose.
  - Read/write: fscanf, fgets, fprintf.

Binary file

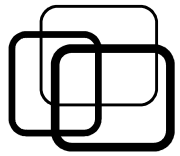


- Binary mode:
  - Opening mode table:

Mode	Description
r	**R**ead-only, open to read (text).
w	**W**rite-only, open to write (text).
a	**A**ppend-only, open to append (text).
[r/w/a]+	Combine read/write.
[r/w/a]b	r/w/a in binary mode.

  - Allow access raw bytes from file.
  - Read/write bytes from file into memory.

Binary file

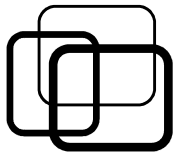


- fread:
  - Read blocks of bytes from file into memory.
    - Syntax: **fread(**<memory pointer>, <block size> , <number of blocks>, <file pointer>**)**;
    - Return: number of read blocks.

    ➔ End of file: number of read blocks < number of blocks.

```
int     x;
char   *p = new char[ 100 ];
FILE  *f = fopen("C:\\BaiTap.txt", "rb");

if ( f != NULL )
{
    fread( &x, sizeof(int), 1, f );     // Read 4 bytes into x.
    fread( p, sizeof(char), 100, f );// Read 100 bytes into p.
    fclose( f );
}
```

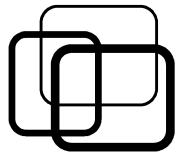
Binary file



- fwrite:
  - Write blocks of bytes from memory into file.
    - Syntax: **fwrite(**<memory pointer>, <block size> , <number of blocks>, <file pointer>**)**;
    - Return: number of written blocks.

```
int      x = 123456;
char   s[ ] = “Hello World”;
FILE  *f = fopen(“C:\\BaiTap.txt”, “wb”);

if ( f != NULL )
{
     fwrite( &x, sizeof(int), 1, f );            // Write 4 bytes x to file.
     fwrite( s, sizeof(char), strlen(s), f );  // Write 11 bytes s to file.
     fclose( f );
}
```

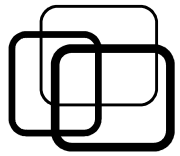
Binary file



- fseek:
  - Move file pointer.
    - Syntax: **fseek(**<file pointer>, <offset>, <origin>**)**;
    - <origin>:
      - SEEK_SET (beginning of file).
      - SEEK_CUR (current position).
      - SEEK_END (end of file).
    - Only works with opening file.

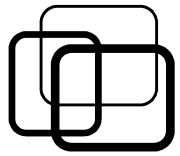
```
FILE  *f = fopen("C:\\BaiTap.txt", "r");
if ( f != NULL )
{
    fseek( f, 2, SEEK_CUR );  // Move forward 2 bytes.
    fclose( f );
}
```

Contents



- Dynamic string.
- Binary file.
- **main() arguments.**

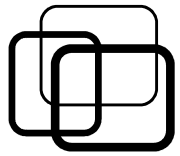
main( ) arguments



- Command-line arguments:
  - Program is a giant function!!
  - How to pass arguments to program?
  - Command-line arguments:
    - Pass arguments to program when calling.
    - main( ) can get the arugments.
  - Usage:
    - Run program in command-line mode.
    - Syntax: <program> **<arg 1> <arg 2> …**

      C:\>BaiTap\baitap1.exe **hello 5 /abc**
      C:\>copy **C:\BaiTap\baitap1.exe D:\Files\baitap1.exe**

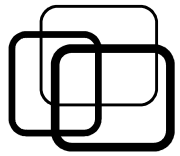
main( ) arguments



- main( ) arguments:
  - Declaration:
    - Syntax: int main(int **argc**, char ****argv**);
    - argc: argument count .
    - argv: argument variables.
    - Arguments passed as strings.
    - First argument is program name.

```
int main(int  argc, char  **argv)
{
        cout << “Number of args = “ << argc;
        cout << “Args list:” << endl;
        for (int i = 0; i < argc; i++)
              cout << argv[ i ] << endl;
}
```

main( ) arguments

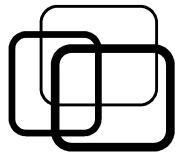


- main( ) arguments:

```
int main(int  argc, char  **argv)
{
    if (argc == 1)
        cout << “Error: no input argument.”;
    else
    {
        if (strcmp(argv[ 1 ], “/?”)
            showHelp();
        else if (argc == 3)
            copyFile(argv[ 1 ], argv[ 2 ]);
    }
}
```

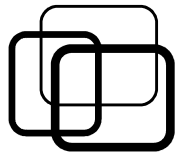
```
void showHelp()
{
        // …
}

void copyFile(char *file1, char *file2)
{
        // …
}
```

Summary



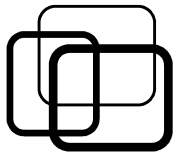
- File stream:
  - Connection between program and device.
  - Input/Output in C: printf, scanf.
  - Input/Output in C++: cin >>, cout <<.
  - File stream: file pointer, fprintf, fscanf.
- Binary file:
  - Read/write raw bytes from file to memory.
  - fread, fwrite, fseek.

Summary



- Dynamic string:
  - Usage dynamic array of chars.
  - Do not use “=“ to copy string.
  - Library <string.h>: strdup, strcmp, strstr.
- main( ) arguments:
  - Get command-line arguments.
  - Syntax: int main(int argc, char **argv);

Practice



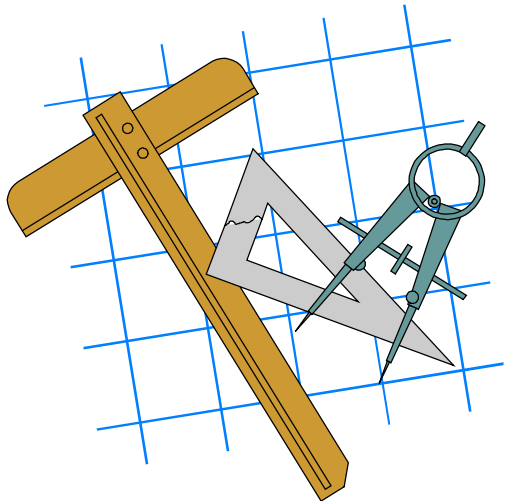
- Practice 4.1:

  Write C/C++ program to do the followings:

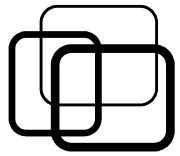
  - Enter from keyboard a long paragraph until '.' and new line.
  - Write to screen:
    a) Count words in paragraph (separated by spaces, periods, or commas).
    b) Normalize the paragraph:
    + Eliminate leading and ending spaces.
    + Each word separated by only 1 space.
    + Capitalize first char of each word.

  Notes:

  - Use dynamic string.
  - Standard IO devices can be redirected.



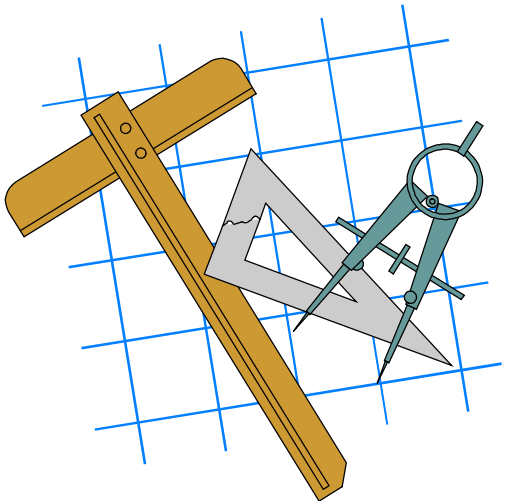
Practice



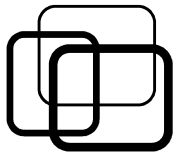
- Practice 4.2:

  Write C/C++ program as follow:

  - Enter from keyboard file 1.
  - Enter from keyboard file 2.
  - Copy file 1 to file 2.



Practice



- Practice 4.3:

  Write C/C++ COPY program to copy files in command line.

  Command-line syntax:

  - Copy source file to destination file:

    COPY <**source file**> <**destination file**>

  - Copy source file to destination path (keep source filename):

    COPY <**source file**> <**destination path**>**/**

  - Join file 1 and file 2 to destination file:

    COPY <**file 1**> + <**file 2**> <**destination file**>

  - Show syntax help:

    COPY **-?**