

Работа с файлове

Калин Георгиев

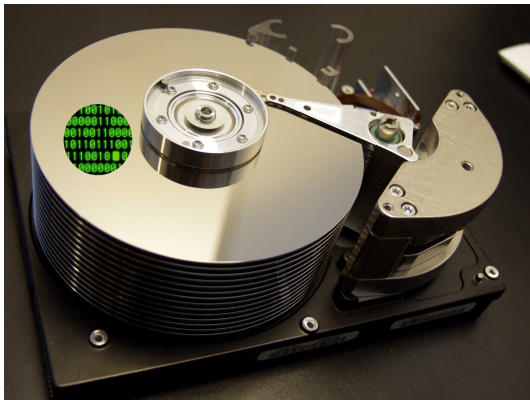
17 ноември 2015 г.

Файлове

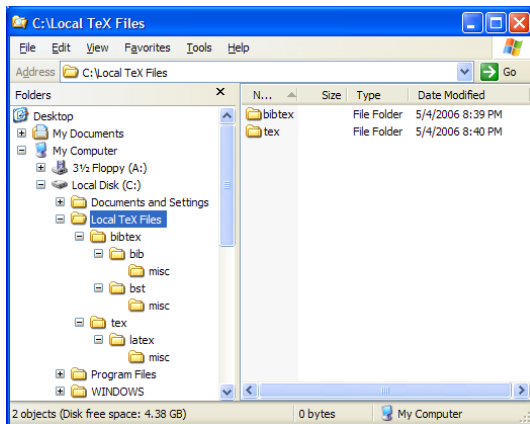
“Физически” файлове



“Физически” файлове

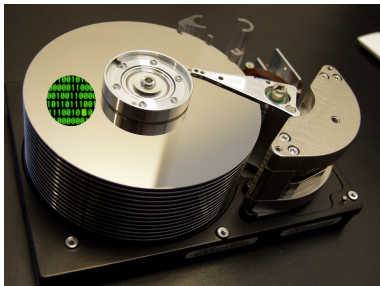


“Логически” файлове

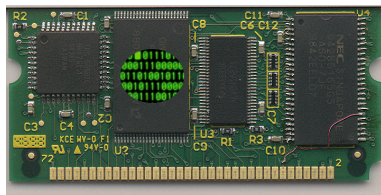


Данни във файл vs. данни в паметта

- персистентни
- бавни
- големи обеми



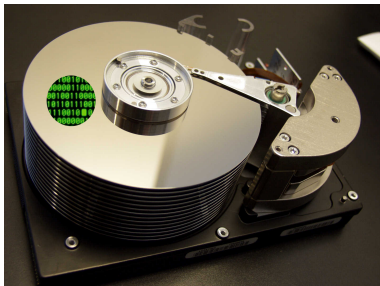
- до приключване на програмата
- бързи
- по-ограничени обеми



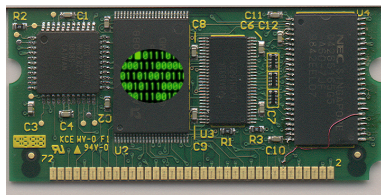
```
int i;  
int intarr[100];  
Student student;  
Student studentarr[100];
```

Данни във файл vs. данни в паметта

- персистентни
- бавни
- големи обеми

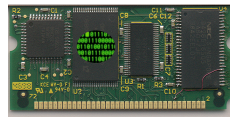


- до приключване на програмата
- бързи
- по-ограничени обеми



```
int i;  
int intarr[100];  
Student student;  
Student studentarr[100];
```

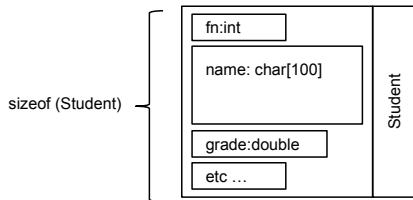
Работа с файлове: трансфер на данни между оперативната памет и постоянната памет



Текстови файлове

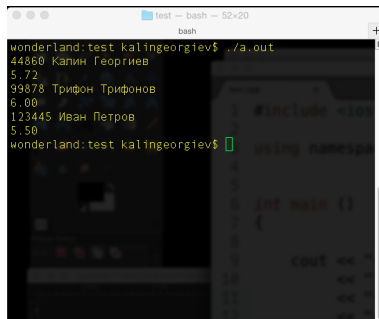
struct Student

```
struct Student
{
    int fn;
    char name[100];
    double grade;
    //others
};
```



Изход на конзолата

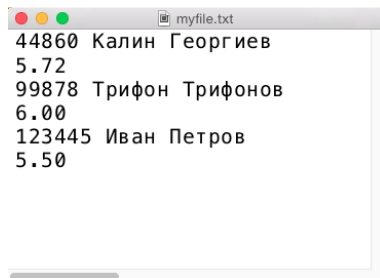
```
Student students[100];  
//...  
for (int i = 0; i < 3; i++)  
{  
    cout << students[i].fn  
        << " "  
        << students[i].name  
        << endl  
        << students[i].grade  
        << endl;  
}
```



```
wonderland:test kalingeorgiev$ ./a.out  
44860 Капин Георгиев  
5.72  
99878 Трифон Трифонов  
6.00  
123445 Иван Петров  
5.50  
wonderland:test kalingeorgiev$
```

Изход в текстов файл

```
Student students[100];  
//...  
ofstream out_file ("myfile.txt");  
for (int i = 0; i < 3; i++)  
{  
    out_file << students[i].fn  
              << " "  
              << students[i].name  
              << endl  
              << students[i].grade  
              << endl;  
}
```



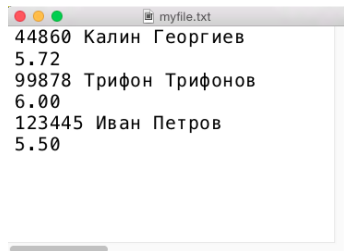
Вход от конзолата

```
Student students[100];  
//...  
for (int i = 0; i < 3; i++)  
{  
    cin >> students[i].fn;  
    cin.getline (students[i].name,100);  
    cin >> students[i].grade;  
}
```

```
44860 Калин Георгиев  
5.72 99878 Трифон Трифонов  
6.00 123445 Иван Петров  
5.50
```

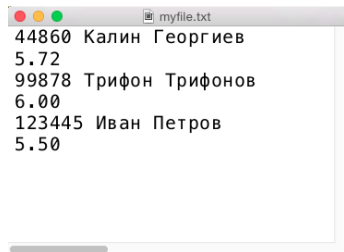
Вход от текстов файл

```
Student students[100];  
//...  
ifstream in_file ("myfile.txt");  
for (int i = 0; i < 3; i++)  
{  
    in_file >> students[i].fn;  
    in_file.getline (students[i].name,100);  
    in_file >> students[i].grade;  
}
```



Вход/изход от текстов файл

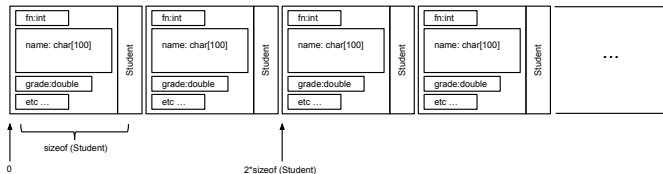
- последователно четене и писане
- достъп до елемент по индекс?
- изтриване на елемент?



```
44860 Калин Георгиев
5.72
99878 Трифон Трифонов
6.00
123445 Иван Петров
5.50
```

Двоични файлове

Двоични файлове



Писане в двоичен файл

```
//TEXT FILE
```

```
ofstream out_file ("myfile.txt");
for (int i = 0; i < 3; i++)
{
    out_file << students[i].fn
              << " "
              << students[i].name
              << endl
              << students[i].grade
              << endl;
}
```

```
//BINARY FILE
```

```
ofstream out ("stundets.bin",ios::binary | ios::app);
for (int i = 0; i < 3; i++)
    out.write ((char*)&students[i],sizeof (Student));
```

```
write (char *buffer, size_t bytes)
```

```
00000000: 0700 0000 5374 7564 :...Stud
00000008: 656e 7420 4f6e 6500 :ent One.
00000010: 0000 0000 0000 0000 :.....
00000018: 0000 0000 0000 0000 :.....
00000020: 0000 0000 0000 0000 :.....
00000028: 0000 0000 0000 0000 :.....
00000030: 0000 0000 0000 0000 :.....
00000038: 0000 0000 0000 0000 :.....
00000040: 0000 0000 0000 0000 :.....
00000048: 0000 0000 0000 0000 :.....
00000050: 0000 0000 0000 0000 :.....
00000058: 0000 0000 0000 0000 :.....
00000060: 0000 0000 0000 0000 :.....
00000068: 0000 0000 0000 1840 :.....@
00000070: 0100 0000 5374 7564 :....Stud
00000078: 656e 7420 4d61 6320 :ent Mac
00000080: 5477 6f00 0000 0000 :Two.....
00000088: 0000 0000 0000 0000 :.....
```

Четене от двоичен файл

//OUTPUT

```
ofstream out ("stundets.bin",
              ios::binary | ios::app);
for (int i = 0; i < 3; i++)
    out.write ((char*)&students[i],
              sizeof (Student));
```

//INPUT

```
ifstream in ("stundets.bin",
            ios::binary);

Student s;
while (in.read ((char*)&s, sizeof (Student)))
{ printStudent (s); }
```

```
read (char *buffer, size_t bytes)
write (char *buffer, size_t bytes)
```

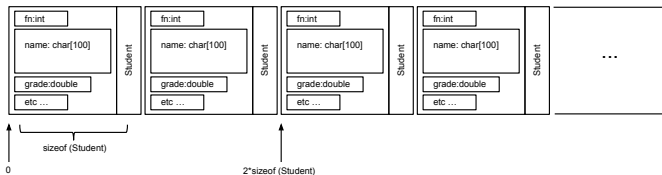
```
00000000: 0700 0000 5374 7564 :...Stud
00000008: 656e 7420 4f6e 6500 :ent One.
00000010: 0000 0000 0000 0000 :.....
00000018: 0000 0000 0000 0000 :.....
00000020: 0000 0000 0000 0000 :.....
00000028: 0000 0000 0000 0000 :.....
00000030: 0000 0000 0000 0000 :.....
00000038: 0000 0000 0000 0000 :.....
00000040: 0000 0000 0000 0000 :.....
00000048: 0000 0000 0000 0000 :.....
00000050: 0000 0000 0000 0000 :.....
00000058: 0000 0000 0000 0000 :.....
00000060: 0000 0000 0000 0000 :.....
00000068: 0000 0000 0000 1840 :.....@
00000070: 0100 0000 5374 7564 :....Stud
00000078: 656e 7420 4d61 6320 :ent Mac
00000080: 5477 6f00 0000 0000 :Two.....
00000088: 0000 0000 0000 0000 :.....
```

Двоичен файл / RAM

```

0000: 0700 0000 5374 7564 656e 7420 4f6e 6500 :...Student One.
0010: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0020: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0030: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0040: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0050: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0060: 0000 0000 0000 0000 0000 0000 0000 1840 :.....@
0070: 0100 0000 5374 7564 656e 7420 4d61 6320 :....Student Mac
0080: 5477 6f00 0000 0000 0000 0000 0000 0000 :Two.....
0090: 0000 0000 0000 0000 0050 a367 ff7f 0000 :.....P.g....
00a0: 4696 a982 1500 34ec 9777 1ef7 a03e 2659 :F.....4..w...>&Y
00b0: 72c4 a809 b5b7 00de 50eb 7251 ff7f 0000 :r.....P.rQ....
00c0: 1100 0000 0000 0000 0100 0000 0000 0000 :.....
00d0: 6810 4d0e 0100 0000 0000 0000 0000 1640 :h.M.....@
00e0: 0200 0000 5374 7564 656e 7420 766f 6e20 :....Student von
00f0: 5468 7265 6500 0000 78ea 7251 ff7f 0000 :Three...x.rQ....
0100: 0100 0000 0000 0000 90ea 7251 ff7f 0000 :.....rQ....
0110: 0010 4d0e 0100 0000 4852 a367 ff7f 0000 :.M.....HR.g....

```



Двоичен файл vs. Текстов файл

```

0000: 0700 0000 5374 7564 656e 7420 4f6e 6500 :...Student One.
0010: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0020: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0030: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0040: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0050: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0060: 0000 0000 0000 0000 0000 0000 0000 1840 :.....@
0070: 0100 0000 5374 7564 656e 7420 4d61 6320 :...Student Mac
0080: 5477 6f00 0000 0000 0000 0000 0000 0000 :Two.....
0090: 0000 0000 0000 0000 0050 a367 ff7f 0000 :.....P.g....
00a0: 4696 a982 1500 34ec 9777 1ef7 a03e 2659 :F....4..w...>6Y
00b0: 72c4 a809 b5b7 00de 50eb 7251 ff7f 0000 :r.....P.rQ....
00c0: 1100 0000 0000 0000 0100 0000 0000 0000 :.....
00d0: 6810 4d0e 0100 0000 0000 0000 0000 1640 :h.M.....@
00e0: 0200 0000 5374 7564 656e 7420 766f 6e20 :...Student von
00f0: 5468 7265 6500 0000 78ea 7251 ff7f 0000 :Three...x.rQ....
0100: 0100 0000 0000 0000 90ea 7251 ff7f 0000 :.....rQ....
0110: 0010 4d0e 0100 0000 4852 a367 ff7f 0000 :..M.....HR.g....

```

```

0000: 34 34 38 36 30 20 4b 61 6c 69 6e 20 47 65 6f 72 :44860 Kalin Geor
0010: 67 69 65 76 0a 35 2e 37 35 0a 39 39 38 37 38 20 :giev.5.75.99878
0020: 54 72 69 66 6f 6e 20 54 72 69 66 6f 6e 6f 76 0a :Trifon Trifonov.
0030: 36 2e 30 30 0a 31 32 33 34 34 35 20 49 76 61 6e :6.00.123445 Ivan
0040: 20 50 65 74 72 6f 76 0a 35 2e 35 30 :Petrov.5.50

```

Позициониране

```

Student s;
//INPUT
ifstream in ("stundets.bin",
            ios::binary);
in.seekg(2*sizeof(Student));
in.read ((char*)&s, sizeof (Student));
printStudent (s);

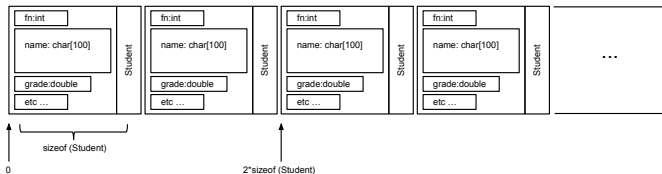
//OUTPUT
ofstream out ("stundets.bin",
            ios::binary | ios::app);
out.seekp(2*sizeof(Student));
out.write ((char*)&s, sizeof (Student));

```

```

00000000: 0790 0000 5374 7564 :...Stud
00000008: 656e 7420 4f6e 6500 :ent One.
00000010: 0000 0000 0000 0000 :.....
00000018: 0000 0000 0000 0000 :.....
00000020: 0000 0000 0000 0000 :.....
00000028: 0000 0000 0000 0000 :.....
00000030: 0000 0000 0000 0000 :.....
00000038: 0000 0000 0000 0000 :.....
00000040: 0000 0000 0000 0000 :.....
00000048: 0000 0000 0000 0000 :.....
00000050: 0000 0000 0000 0000 :.....
00000058: 0000 0000 0000 0000 :.....
00000060: 0000 0000 0000 0000 :.....
00000068: 0000 0000 0000 1840 :.....@
00000070: 0100 0000 5374 7564 :...Stud
00000078: 656e 7420 4d61 6320 :ent Mac
00000080: 5477 6f00 0000 0000 :Two.....
00000088: 0000 0000 0000 0000 :.....

```

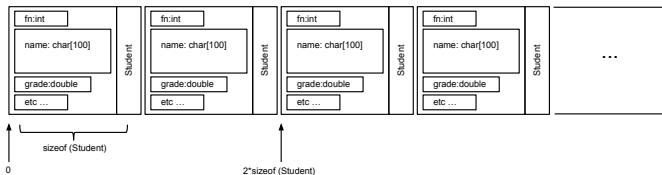


Изтриване от двоичен файл

```

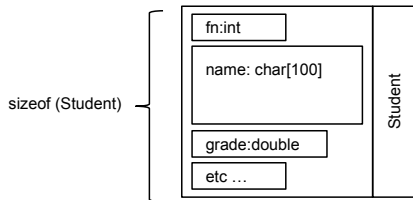
0000: 0700 0000 5374 7564 656e 7420 4f6e 6500 :...Student One.
0010: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0020: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0030: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0040: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0050: 0000 0000 0000 0000 0000 0000 0000 0000 :.....
0060: 0000 0000 0000 0000 0000 0000 0000 1840 :.....@
0070: 0100 0000 5374 7564 656e 7420 4d61 6320 :....Student Mac
0080: 5477 6f00 0000 0000 0000 0000 0000 0000 :Two.....
0090: 0000 0000 0000 0000 0050 a367 ff7f 0000 :.....P.g....
00a0: 4696 a982 1500 34ec 9777 1ef7 a03e 2659 :F.....4..w...>&Y
00b0: 72c4 a809 b5b7 00de 50eb 7251 ff7f 0000 :r.....P.rQ....
00c0: 1100 0000 0000 0000 0100 0000 0000 0000 :.....
00d0: 6810 4d0e 0100 0000 0000 0000 0000 1640 :h.M.....@
00e0: 0200 0000 5374 7564 656e 7420 766f 6e20 :....Student von
00f0: 5468 7265 6500 0000 78ea 7251 ff7f 0000 :Three...x.rQ....
0100: 0100 0000 0000 0000 90ea 7251 ff7f 0000 :.....rQ....
0110: 0010 4d0e 0100 0000 4852 a367 ff7f 0000 :.M.....HR.g....

```



struct Student

```
struct Student
{
    bool deleted;
    int fn;
    char name[100];
    double grade;
    etc ...
};
```



Презаписване

```

Student s;
fstream file ("stundets.bin",
              ios::in | ios::out |
              ios::binary);

file.seekg(2*sizeof(Student));
file.read ((char*)&s, sizeof (Student));

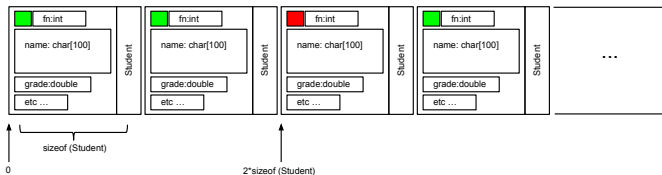
s.deleted = true; //!

```

```

00000000: 0700 0000 5374 7564 :...Stud
00000008: 656e 7420 4f6e 6500 :ent One.
00000010: 0000 0000 0000 0000 :.....
00000018: 0000 0000 0000 0000 :.....
00000020: 0000 0000 0000 0000 :.....
00000028: 0000 0000 0000 0000 :.....
00000030: 0000 0000 0000 0000 :.....
00000038: 0000 0000 0000 0000 :.....
00000040: 0000 0000 0000 0000 :.....
00000048: 0000 0000 0000 0000 :.....
00000050: 0000 0000 0000 0000 :.....
00000058: 0000 0000 0000 0000 :.....
00000060: 0000 0000 0000 0000 :.....
00000068: 0000 0000 0000 1840 :.....@
00000070: 0100 0000 5374 7564 :...Stud
00000078: 656e 7420 4d61 6320 :ent Mac
00000080: 5477 6f00 0000 0000 :Two....
00000088: 0000 0000 0000 0000 :.....

```



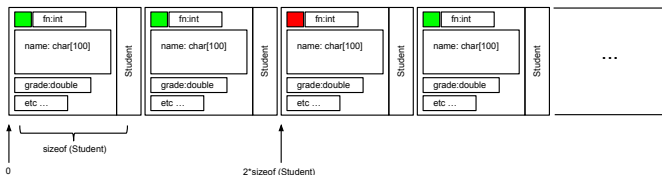
Добавяне на "свободно" място или в края

```
Student s,tmp;//...
fstream file ("stundets.bin",
             ios::in | ios::out |
             ios::binary);

file.seekg(0);
while (file.read ((char*)&tmp, sizeof (Student)
                && tmp.deleted == false);

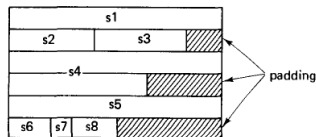
file.seekp (file.tellg()-sizeof(Student));
file.write ((char*)&s,sizeof (Student));
```

```
00000000: 0700 0000 5374 7564 :...Stud
00000008: 656e 7420 4f6e 6500 :ent One.
00000010: 0000 0000 0000 0000 :.....
00000018: 0000 0000 0000 0000 :.....
00000020: 0000 0000 0000 0000 :.....
00000028: 0000 0000 0000 0000 :.....
00000030: 0000 0000 0000 0000 :.....
00000038: 0000 0000 0000 0000 :.....
00000040: 0000 0000 0000 0000 :.....
00000048: 0000 0000 0000 0000 :.....
00000050: 0000 0000 0000 0000 :.....
00000058: 0000 0000 0000 0000 :.....
00000060: 0000 0000 0000 0000 :.....
00000068: 0000 0000 0000 1840 :.....@
00000070: 0100 0000 5374 7564 :...Stud
00000078: 656e 7420 4d61 6320 :ent Mac
00000080: 5477 6f00 0000 0000 :Two....
00000088: 0000 0000 0000 0000 :.....
```



Подравняване

```
struct Student
{
    int fn;
    char name[100];
    double grade;
    //others
};
```



$\text{sizeof}(\text{Student}) \neq \text{sizeof}(\text{int}) + 100 * \text{sizeof}(\text{char}) + \text{sizeof}(\text{double})$

```
file.read ((char*)&s.fn,
           sizeof(int));
file.read ((char*)&s.name,
           100*sizeof(char));
file.read ((char*)&s.grade,
           sizeof(double));
```

```
file.read ((char*)&s,
           sizeof(Student));
```

Благодаря за вниманието!