

**МИНОБРНАУКИ РОССИИ**

**федеральное государственное бюджетное образовательное учреждение**

**высшего образования**

**«Московский государственный технологический университет «СТАНКИН»**

**(ФГБОУ ВО «МГТУ «СТАНКИН»)**

Институт цифровых интеллектуальных систем  
Кафедра компьютерных систем управления

Образовательная программа 15.03.04

«Автоматизация технологических процессов и производств»

Дисциплина «Программное обеспечение систем управления»

**Отчет**

**по семинарам**

«Средства синхронизации на примере Windows NT»

Выполнил:

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**Критическая секция. Синхронизация 4-х потоков**

#include <Windows.h>

#include <conio.h>

#include <ctime>

#include <iostream>

using namespace std;

int g\_array[100];

int g\_count = 0;

HANDLE g\_hMutex = NULL;

HANDLE hStdout;

int Lid = 0;

static DWORD WINAPI Kulagin(void\* pv)

{

int i = 0;

int sync = 0;

COORD pos;

pos.X = 1;

while (i < 50)

{

WaitForSingleObject(g\_hMutex, INFINITE);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Kulagin" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(40);

i++;

ReleaseMutex(g\_hMutex);

}

if (!Lid)

Lid = 1;

return 0;

}

static DWORD WINAPI Grigoriy(void\* pv)

{

int i = 0;

int sync = 0;

COORD pos;

pos.X = 18;

while (i < 50)

{

WaitForSingleObject(g\_hMutex, INFINITE);

srand(time(NULL));

g\_array[g\_count] = rand() % 1000;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Grigoriy" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(40);

i++;

ReleaseMutex(g\_hMutex);

}

if (!Lid)

Lid = 2;

return 0;

}

static DWORD WINAPI Vladimirovich(void\* pv)

{

int i = 0;

int sync = 0;

COORD pos;

pos.X = 36;

while (i < 50)

{

WaitForSingleObject(g\_hMutex, INFINITE);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Vladimirovich" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(40);

i++;

ReleaseMutex(g\_hMutex);

}

if (!Lid)

Lid = 3;

return 0;

}

static DWORD WINAPI Gruppa(void\* pv)

{

int i = 0;

int sync = 0;

COORD pos;

pos.X = 54;

while (i < 50)

{

WaitForSingleObject(g\_hMutex, INFINITE);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Gruppa" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(40);

i++;

ReleaseMutex(g\_hMutex);

}

if (!Lid)

Lid = 4;

return 0;

}

int main()

{

DWORD dw;

HANDLE hThreads[4];

hStdout = GetStdHandle(STD\_OUTPUT\_HANDLE);

g\_hMutex = CreateMutex(NULL, FALSE, NULL);

hThreads[0] = ::CreateThread(NULL, 0, Kulagin, NULL, 0, &dw);

hThreads[1] = ::CreateThread(NULL, 0, Grigoriy, NULL, 0, &dw);

hThreads[2] = ::CreateThread(NULL, 0, Vladimirovich, NULL, 0, &dw);

hThreads[3] = ::CreateThread(NULL, 0, Gruppa, NULL, 0, &dw);

::WaitForMultipleObjects(4, hThreads, TRUE, INFINITE);

::CloseHandle(hThreads[0]);

::CloseHandle(hThreads[1]);

::CloseHandle(hThreads[2]);

::CloseHandle(hThreads[3]);

::CloseHandle(g\_hMutex);

switch (Lid)

{

case 1: cout << "\n 1 thread finished first!\n"; break;

case 2: cout << "\n 2 thread finished first!\n"; break;

case 3: cout << "\n 3 thread finished first!\n"; break;

case 4: cout << "\n 4 thread finished first!\n"; break;

default: break;

}

cout << endl << "Press Any Key...";

\_getch();

return 0;

}

**Семафор. Синхронизация 4-х потоков, начальное значение счетчика 2**

#include <Windows.h>

#include <conio.h>

#include <ctime>

#include <iostream>

using namespace std;

int g\_array[200];

int g\_count = 0;

HANDLE g\_hSemaphor = NULL;

HANDLE hStdout;

int Lid = 0;

static DWORD WINAPI Kulagin(void\* pv)

{

int i = 0;

int sync = 0;

while (i < 50)

{

WaitForSingleObject(&g\_hSemaphor, INFINITE);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

COORD pos;

pos.X = 1;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Kulagin" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(100);

i++;

ReleaseSemaphore(g\_hSemaphor, 1, NULL);

}

if (!Lid)

Lid = 1;

return 0;

}

static DWORD WINAPI Grigoriy(void\* pv)

{

int i = 0;

int sync = 0;

while (i < 50)

{

WaitForSingleObject(&g\_hSemaphor, INFINITE);

srand(time(NULL));

g\_array[g\_count] = rand() % 1000;

COORD pos;

pos.X = 18;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Grigoriy" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(100);

i++;

ReleaseSemaphore(g\_hSemaphor, 1, NULL);

}

if (!Lid)

Lid = 2;

return 0;

}

static DWORD WINAPI Vladimirovich(void\* pv)

{

int i = 0;

int sync = 0;

while (i < 50)

{

WaitForSingleObject(&g\_hSemaphor, INFINITE);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

COORD pos;

pos.X = 36;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Vladimirovich" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(100);

i++;

ReleaseSemaphore(g\_hSemaphor, 1, NULL);

}

if (!Lid)

Lid = 3;

return 0;

}

static DWORD WINAPI Gruppa(void\* pv)

{

int i = 0;

int sync = 0;

while (i < 50)

{

WaitForSingleObject(&g\_hSemaphor, INFINITE);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

COORD pos;

pos.X = 54;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Gruppa" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(100);

i++;

ReleaseSemaphore(g\_hSemaphor, 1, NULL);

}

if (!Lid)

Lid = 4;

return 0;

}

int main()

{

DWORD dw;

HANDLE hThreads[4];

hStdout = GetStdHandle(STD\_OUTPUT\_HANDLE);

g\_hSemaphor = CreateSemaphore(NULL, 2, 1, NULL);

hThreads[0] = ::CreateThread(NULL, 0, Kulagin, NULL, 0, &dw);

hThreads[1] = ::CreateThread(NULL, 0, Grigoriy, NULL, 0, &dw);

hThreads[2] = ::CreateThread(NULL, 0, Vladimirovich, NULL, 0, &dw);

hThreads[3] = ::CreateThread(NULL, 0, Gruppa, NULL, 0, &dw);

::WaitForMultipleObjects(4, hThreads, TRUE, INFINITE);

::CloseHandle(hThreads[0]);

::CloseHandle(hThreads[1]);

::CloseHandle(hThreads[2]);

::CloseHandle(hThreads[3]);

::CloseHandle(g\_hSemaphor);

switch (Lid)

{

case 1: cout << "\n 1 thread finished first!\n"; break;

case 2: cout << "\n 2 thread finished first!\n"; break;

case 3: cout << "\n 3 thread finished first!\n"; break;

case 4: cout << "\n 4 thread finished first!\n"; break;

default: break;

}

cout << endl << "Press Any Key...";

\_getch();

return 0;

}

**Мютекс. Синхронизация 4-х потоков**

#include <Windows.h>

#include <conio.h>

#include <ctime>

#include <iostream>

using namespace std;

int g\_array[100];

int g\_count = 0;

CRITICAL\_SECTION g\_hCriticalSection;

HANDLE hStdout;

int Lid = 0;

static DWORD WINAPI Kulagin(void\* pv)

{

int i = 0;

int sync = 0;

COORD pos;

pos.X = 1;

while (i < 50)

{

::EnterCriticalSection(&g\_hCriticalSection);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Kulagin" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(40);

i++;

::LeaveCriticalSection(&g\_hCriticalSection);

}

if (!Lid)

Lid = 1;

return 0;

}

static DWORD WINAPI Grigoriy(void\* pv)

{

int i = 0;

int sync = 0;

COORD pos;

pos.X = 18;

while (i < 50)

{

::EnterCriticalSection(&g\_hCriticalSection);

srand(time(NULL));

g\_array[g\_count] = rand() % 1000;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Grigoriy" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(40);

i++;

::LeaveCriticalSection(&g\_hCriticalSection);

}

if (!Lid)

Lid = 2;

return 0;

}

static DWORD WINAPI Vladimirovich(void\* pv)

{

int i = 0;

int sync = 0;

COORD pos;

pos.X = 36;

while (i < 50)

{

::EnterCriticalSection(&g\_hCriticalSection);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Vladimirovich" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(40);

i++;

::LeaveCriticalSection(&g\_hCriticalSection);

}

if (!Lid)

Lid = 3;

return 0;

}

static DWORD WINAPI Gruppa(void\* pv)

{

int i = 0;

int sync = 0;

COORD pos;

pos.X = 54;

while (i < 50)

{

::EnterCriticalSection(&g\_hCriticalSection);

srand(time(NULL));

g\_array[g\_count] = rand() % 256;

pos.Y = i;

SetConsoleCursorPosition(hStdout, pos);

if (!sync)

{

cout << "Gruppa" << endl;

sync++;

}

cout << g\_array[g\_count++];

Sleep(40);

i++;

::LeaveCriticalSection(&g\_hCriticalSection);

}

if (!Lid)

Lid = 4;

return 0;

}

int main()

{

DWORD dw;

HANDLE hThreads[4];

hStdout = GetStdHandle(STD\_OUTPUT\_HANDLE);

::InitializeCriticalSection(&g\_hCriticalSection);

hThreads[0] = ::CreateThread(NULL, 0, Kulagin, NULL, 0, &dw);

hThreads[1] = ::CreateThread(NULL, 0, Grigoriy, NULL, 0, &dw);

hThreads[2] = ::CreateThread(NULL, 0, Vladimirovich, NULL, 0, &dw);

hThreads[3] = ::CreateThread(NULL, 0, Gruppa, NULL, 0, &dw);

::WaitForMultipleObjects(4, hThreads, TRUE, INFINITE);

::CloseHandle(hThreads[0]);

::CloseHandle(hThreads[1]);

::CloseHandle(hThreads[2]);

::CloseHandle(hThreads[3]);

::DeleteCriticalSection(&g\_hCriticalSection);

switch (Lid)

{

case 1: cout << "\n 1 thread finished first!\n"; break;

case 2: cout << "\n 2 thread finished first!\n"; break;

case 3: cout << "\n 3 thread finished first!\n"; break;

case 4: cout << "\n 4 thread finished first!\n"; break;

default: break;

}

cout << endl << "Press Any Key...";

\_getch();

return 0;

}