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Факультет ПИиКТ

Низкоуровневое программирование
Лабораторная работа №3
Вариант 1

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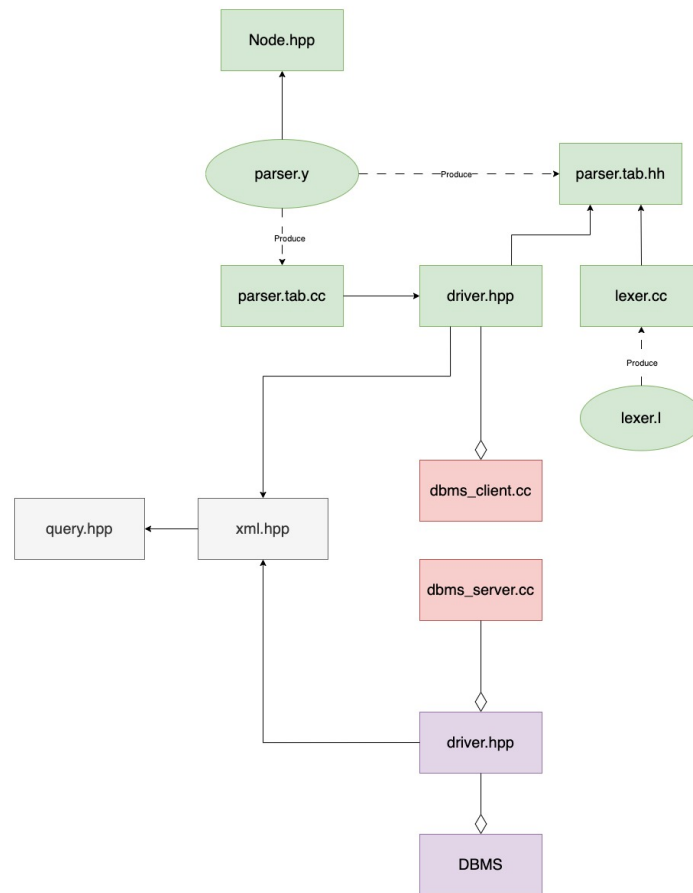
Санкт-Петербург
2023 год

1 Задача

Основная цель лабораторной работы - На базе данного транспортного формата описать схему протокола обмена информацией и воспользоваться существующей библиотекой по выбору для реализации модуля, обеспечивающего его функционирование. Протокол должен включать представление информации о командах создания, выборки, модификации и удаления данных в соответствии с данной формой, и результатах их выполнения.

1. Спроектировать архитектуру системы
2. Провести изучение технологий `boost::serialization` и `gRPC`
3. Изучить построение модулей на основе симбиоза языков `C` и `C++`
4. Разработать единый интерфейс для передачи `dto`
5. Разработать единую библиотеку для передачи `dto`

2 Описание работы



Программный комплекс состоит из 4 частей:

1. Модуль для передачи - модуль gRPC который будет передавать данные(туда входит два кодогенерированных файла protobuf и 2 кодогенерированных файла gRPC client и сервер)
2. Модуль для парсинга запросов - Составляющий языковые конструкции по заданной грамматике
3. Модуль сериализации представления AST в xml и сериализации xml в запрос
4. База данных - модуль из лабораторной работы 1

3 Аспекты реализации

3.1 Формат сообщений Protobuf

```
syntax = "proto3";

package dbms;

service DataBase {
    rpc Ping (HelloRequest) returns (HelloResponse) {}

    rpc Apply (OperationRequest) returns (stream OperationResponse) {}
}

// The request contains 1
message HelloRequest {
    string message = 1;
}

// The response contains 0
message HelloResponse {
    string message = 1;
}

// The request include xml with operation and useful data
message OperationRequest {
    string xml = 1;
}

// The response include xml with touched by op elements
message OperationResponse {
    string xml = 1;
}
```

Клиент и сервер gRPC общаются между собой сообщениями вида OperationRequest и OperationResponse. Один HelloRequest в начале, чтобы прощупать почву. Согласен, что выбор неудачный, потому что я по два раза сериализую данные, но я подумал что надо брать от жизни все.

3.2

Устройство библиотеки Query

```
#pragma once

#include <string>
#include <vector>

#include <boost/archive/xml_iarchive.hpp>
#include <boost/archive/xml_oarchive.hpp>
#include <boost/serialization/vector.hpp>

namespace Query
{
enum class JsonType
{
TYPE_INT32 = 0,
TYPE_DOUBLE,
TYPE_STRING,
TYPE_BOOL,
TYPE_OBJECT
};

class Json
{
public:
JsonType type_;
std::string parent_key_;
std::string key_;
int32_t int32_val_ = 0;
double double_val_;
std::string string_val_;
bool bool_val_;
struct Json *dad_ = nullptr;
struct Json *bro_ = nullptr;
struct Json *son_ = nullptr;
};

enum Cmp
{
GT = 0,
GE,
LT,
LE,
IN,
EQ
};

class ConditionalItem
{
public:
JsonType type_;
std::string key_;
Cmp cmp_;
int32_t int32_val_;
float double_val_;
std::string string_val_;
bool bool_val_;
};

class Conditional
{

```

```
public:
std::vector<ConditionalItem *> conditionals_;
};

enum class QueryType
{
INSERT = 0,
READ,
UPDATE,
DELETE
};

class Request
{
public:
QueryType type;
std::string type_name;
Conditional *query = nullptr;
Json *json = nullptr;
};
```

3.3 Обновленный пользовательский интерфейс для базы данных

```
typedef enum CommandType
{
    INSERT = 0,
    READ,
    UPDATE,
    DELETE
} CommandType;

typedef struct Command
{
    CommandType type;
    String *type_name;
    Query *query;
    Json *json;
} Command;

struct File *user_open_file(const char *const name);
Status user_close_file(struct File *const file);

Status user_read_type(struct File *const file, const String *const name, Type *const o_type);
Status user_add_type(struct File *const file, const Type *const type);
Status user_delete_type(struct File *const file, const String *const name);

Status user_apply(struct File *const file, const Command command, struct Iter **iter);
```

3.4 Реализация постобработки запросов с клиента

```
void insert(QueryNode &query)
{
    std::cout << query.repr(0) << std::endl;

    Request *request = query.toRequest();

    oa << BOOST_SERIALIZATION_NVP(request);
    std::string outbound_data_ = archive_stream.str();
    std::cout << outbound_data_ << std::endl;
    client_->Apply(outbound_data_);
}

void Apply(std::string xmlMessage)
{
    ClientContext context;

    OperationRequest request;
    request.set_xml(xmlMessage);

    OperationResponse response;
    std::unique_ptr<ClientReader<OperationResponse>> reader(
        stub_->Apply(&context, request));

    while (reader->Read(&response))
    {
        Json json;
        std::istringstream ssi{response.xml()};
        boost::archive::text_iarchive ia(ssi);
        ia >> json;
        std::cout << json << std::endl;
    }
    Status status = reader->Finish();
    if (status.ok())
    {
        std::cout << "OperationResponse rpc succeeded." << std::endl;
    }
    else
    {
        std::cout << "OperationResponse rpc failed." << std::endl;
    }
}
```


4 Результаты

В ходе посещения дополнительного занятия 04.04.2023 было получено доп задание: Распарсить, загрузить в бд и сделать 4 запроса над конфигурацией НКCU.

У меня возникли проблемы использования операторов сравнения, так как я работал со схемой данных где все поля это строки.

1. Запрос с Join

```
SELECT {
  K({
    parent_name eq "Close"
  })
}
Key: parent_name    value: Close
key: name           value: DispFileName
key: type           value: value
key: value_type     value: REG_SZ
key: value          value: Program

Key: parent_name    value: Close
key: name           value: value
key: type           value: Close
key: value_type     value: REG_SZ
key: value          value: Program
```

2. Запрос с Join 2

```
SELECT {
  K({
    parent_name eq "BlockedPopup"
  })
}
Key: parent_name    value: BlockedPopup
key: name           value: DispFileName
key: type           value: value
key: value_type     value: REG_SZ
key: value          value: @ieframe.dll,-10325

Key: parent_name    value: BlockedPopup
key: name           value: Blocked
key: type           value: value
key: value_type     value: Window
key: value          value: Pop-up
```

3. Составной запрос с двумя полями

```
SELECT {
  K({
    parent_name eq "MoveMenuItem"
    name eq "DispFileName"
  })
}
Key: parent_name    value: MoveMenuItem
key: name           value: DispFileName
key: type           value: value
key: value_type     value: REG_SZ
key: value          value: @ieframe.dll,-10322
```

4. Составной запрос с двумя полями разных сущностей

```
SELECT {
K({
    parent_name eq "EventLabels"
    name or ["ChangeTheme", "ActivatingDocument"]
})
}
key: parent_name    value: EventLabels
key: name           value: ChangeTheme
key: type           value: key
key: value_type     value: REG_SZ
key: value          value: None

key: parent_name    value: EventLabels
key: name           value: ActivatingDocument
key: type           value: key
key: value_type     value: REG_SZ
key: value          value: None
```

4.1 TCP dump запросов

```
02:12:16.417579 lo In IP localhost.44390 > localhost.5433: Flags [F.], seq 170, ack 27, win 512, options [nop,nop,TS val 1706420089 ecr 1706420089], length 0
02:12:16.422931 lo In IP localhost.5433 > localhost.44296: Flags [.] , ack 170, win 512, options [nop,nop,TS val 1706420095 ecr 1706420036], length 0
02:12:16.425244 lo In IP localhost.44392 > localhost.5433: Flags [S], seq 692687740, win 65495, options [mss 65495,sackOK,TS val 1706420097 ecr 0,nop,wscale 7], length 0
02:12:16.425256 lo In IP localhost.5433 > localhost.44392: Flags [S.], seq 3901118927, ack 692687741, win 65483, options [mss 65495,sackOK,TS val 1706420097 ecr 1706420097], length 0
02:12:16.425266 lo In IP localhost.44392 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420097 ecr 1706420097], length 0
02:12:16.425361 lo In IP localhost.44392 > localhost.5433: Flags [P.], seq 1:166, ack 1, win 512, options [nop,nop,TS val 1706420097 ecr 1706420097], length 165
02:12:16.425382 lo In IP localhost.5433 > localhost.44392: Flags [.] , ack 166, win 511, options [nop,nop,TS val 1706420097 ecr 1706420097], length 0
02:12:16.425674 lo In IP localhost.5433 > localhost.44392: Flags [P.], seq 1:27, ack 166, win 512, options [nop,nop,TS val 1706420097 ecr 1706420097], length 26
02:12:16.425680 lo In IP localhost.44392 > localhost.5433: Flags [.] , ack 27, win 512, options [nop,nop,TS val 1706420097 ecr 1706420097], length 0
02:12:16.425838 lo In IP localhost.44392 > localhost.5433: Flags [F.], seq 166, ack 27, win 512, options [nop,nop,TS val 1706420098 ecr 1706420097], length 0
02:12:16.429316 lo In IP localhost.44396 > localhost.5433: Flags [S], seq 1740686510, win 65495, options [mss 65495,sackOK,TS val 1706420101 ecr 0,nop,wscale 7], length 0
02:12:16.429326 lo In IP localhost.5433 > localhost.44396: Flags [S.], seq 1334037151, ack 1740686511, win 65483, options [mss 65495,sackOK,TS val 1706420101 ecr 1706420101], length 0
02:12:16.429334 lo In IP localhost.44396 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420101 ecr 1706420101], length 0
02:12:16.429428 lo In IP localhost.44396 > localhost.5433: Flags [P.], seq 1:171, ack 1, win 512, options [nop,nop,TS val 1706420101 ecr 1706420101], length 170
02:12:16.429447 lo In IP localhost.5433 > localhost.44396: Flags [.] , ack 171, win 511, options [nop,nop,TS val 1706420101 ecr 1706420101], length 0
02:12:16.429691 lo In IP localhost.5433 > localhost.44396: Flags [P.], seq 1:27, ack 171, win 512, options [nop,nop,TS val 1706420101 ecr 1706420101], length 26
02:12:16.429712 lo In IP localhost.44396 > localhost.5433: Flags [.] , ack 27, win 512, options [nop,nop,TS val 1706420101 ecr 1706420101], length 0
02:12:16.429867 lo In IP localhost.44396 > localhost.5433: Flags [F.], seq 171, ack 27, win 512, options [nop,nop,TS val 1706420102 ecr 1706420101], length 0
02:12:16.432163 lo In IP localhost.44412 > localhost.5433: Flags [S], seq 3584737886, win 65495, options [mss 65495,sackOK,TS val 1706420104 ecr 0,nop,wscale 7], length 0
02:12:16.432175 lo In IP localhost.5433 > localhost.44412: Flags [S.], seq 3651758349, ack 3584737887, win 65483, options [mss 65495,sackOK,TS val 1706420104 ecr 1706420104], length 0
02:12:16.432186 lo In IP localhost.44412 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420104 ecr 1706420104], length 0
02:12:16.432294 lo In IP localhost.44412 > localhost.5433: Flags [P.], seq 1:168, ack 1, win 512, options [nop,nop,TS val 1706420104 ecr 1706420104], length 167
02:12:16.432319 lo In IP localhost.5433 > localhost.44412: Flags [.] , ack 168, win 511, options [nop,nop,TS val 1706420104 ecr 1706420104], length 0
02:12:16.432590 lo In IP localhost.5433 > localhost.44412: Flags [P.], seq 1:27, ack 168, win 512, options [nop,nop,TS val 1706420104 ecr 1706420104], length 26
02:12:16.432611 lo In IP localhost.44412 > localhost.5433: Flags [.] , ack 27, win 512, options [nop,nop,TS val 1706420104 ecr 1706420104], length 0
02:12:16.432822 lo In IP localhost.44412 > localhost.5433: Flags [F.], seq 168, ack 27, win 512, options [nop,nop,TS val 1706420104 ecr 1706420104], length 0
02:12:16.434098 lo In IP localhost.44418 > localhost.5433: Flags [S], seq 4248693226, win 65495, options [mss 65495,sackOK,TS val 1706420106 ecr 0,nop,wscale 7], length 0
02:12:16.434110 lo In IP localhost.5433 > localhost.44418: Flags [S.], seq 2384320634, ack 4248693227, win 65483, options [mss 65495,sackOK,TS val 1706420106 ecr 1706420106], length 0
02:12:16.434120 lo In IP localhost.44418 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420106 ecr 1706420106], length 0
02:12:16.434228 lo In IP localhost.44418 > localhost.5433: Flags [P.], seq 1:182, ack 1, win 512, options [nop,nop,TS val 1706420106 ecr 1706420106], length 181
02:12:16.434232 lo In IP localhost.5433 > localhost.44418: Flags [.] , ack 182, win 511, options [nop,nop,TS val 1706420106 ecr 1706420106], length 0
02:12:16.434495 lo In IP localhost.5433 > localhost.44418: Flags [P.], seq 1:27, ack 182, win 512, options [nop,nop,TS val 1706420106 ecr 1706420106], length 26
02:12:16.434501 lo In IP localhost.44418 > localhost.5433: Flags [.] , ack 27, win 512, options [nop,nop,TS val 1706420106 ecr 1706420106], length 0
02:12:16.434681 lo In IP localhost.44418 > localhost.5433: Flags [F.], seq 182, ack 27, win 512, options [nop,nop,TS val 1706420106 ecr 1706420106], length 0
02:12:16.435868 lo In IP localhost.44426 > localhost.5433: Flags [S], seq 996497721, win 65495, options [mss 65495,sackOK,TS val 1706420108 ecr 0,nop,wscale 7], length 0
02:12:16.435884 lo In IP localhost.5433 > localhost.44426: Flags [S.], seq 4247834366, ack 996497722, win 65483, options [mss 65495,sackOK,TS val 1706420108 ecr 1706420108], length 0
02:12:16.435895 lo In IP localhost.44426 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420108 ecr 1706420108], length 0
02:12:16.436058 lo In IP localhost.44426 > localhost.5433: Flags [P.], seq 1:173, ack 1, win 512, options [nop,nop,TS val 1706420108 ecr 1706420108], length 172
02:12:16.436080 lo In IP localhost.5433 > localhost.44426: Flags [.] , ack 173, win 511, options [nop,nop,TS val 1706420108 ecr 1706420108], length 0
02:12:16.436398 lo In IP localhost.5433 > localhost.44426: Flags [P.], seq 1:27, ack 173, win 512, options [nop,nop,TS val 1706420108 ecr 1706420108], length 26
02:12:16.436405 lo In IP localhost.44426 > localhost.5433: Flags [F.], seq 173, ack 27, win 512, options [nop,nop,TS val 1706420108 ecr 1706420108], length 0
02:12:16.440485 lo In IP localhost.44428 > localhost.5433: Flags [S], seq 3019817091, win 65495, options [mss 65495,sackOK,TS val 1706420112 ecr 0,nop,wscale 7], length 0
02:12:16.440497 lo In IP localhost.5433 > localhost.44428: Flags [S.], seq 3090680943, ack 3019817092, win 65483, options [mss 65495,sackOK,TS val 1706420112 ecr 1706420112], length 0
02:12:16.440506 lo In IP localhost.44428 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420112 ecr 1706420112], length 0
02:12:16.440601 lo In IP localhost.44428 > localhost.5433: Flags [P.], seq 1:169, ack 1, win 512, options [nop,nop,TS val 1706420112 ecr 1706420112], length 168
02:12:16.440622 lo In IP localhost.5433 > localhost.44428: Flags [.] , ack 169, win 511, options [nop,nop,TS val 1706420112 ecr 1706420112], length 0
02:12:16.440888 lo In IP localhost.5433 > localhost.44428: Flags [P.], seq 1:27, ack 169, win 512, options [nop,nop,TS val 1706420112 ecr 1706420112], length 26
02:12:16.440895 lo In IP localhost.44428 > localhost.5433: Flags [.] , ack 27, win 512, options [nop,nop,TS val 1706420113 ecr 1706420113], length 0
02:12:16.441293 lo In IP localhost.44428 > localhost.5433: Flags [F.], seq 169, ack 27, win 512, options [nop,nop,TS val 1706420113 ecr 1706420113], length 0
02:12:16.442759 lo In IP localhost.5433 > localhost.44340: Flags [.] , ack 169, win 512, options [nop,nop,TS val 1706420114 ecr 1706420063], length 0
02:12:16.447529 lo In IP localhost.44444 > localhost.5433: Flags [S], seq 3744880452, win 65495, options [mss 65495,sackOK,TS val 1706420119 ecr 0,nop,wscale 7], length 0
02:12:16.447604 lo In IP localhost.5433 > localhost.44444: Flags [S.], seq 3056427690, ack 3744880453, win 65483, options [mss 65495,sackOK,TS val 1706420119 ecr 1706420119], length 0
02:12:16.447658 lo In IP localhost.44444 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420119 ecr 1706420119], length 0
02:12:16.448308 lo In IP localhost.44444 > localhost.5433: Flags [P.], seq 1:161, ack 1, win 512, options [nop,nop,TS val 1706420120 ecr 1706420119], length 160
02:12:16.448436 lo In IP localhost.5433 > localhost.44444: Flags [.] , ack 161, win 511, options [nop,nop,TS val 1706420120 ecr 1706420120], length 0
02:12:16.449422 lo In IP localhost.5433 > localhost.44444: Flags [P.], seq 1:27, ack 161, win 512, options [nop,nop,TS val 1706420121 ecr 1706420120], length 26
02:12:16.449490 lo In IP localhost.44444 > localhost.5433: Flags [F.], seq 27, win 512, options [nop,nop,TS val 1706420121 ecr 1706420121], length 0
02:12:16.450796 lo In IP localhost.44444 > localhost.5433: Flags [F.], seq 161, ack 27, win 512, options [nop,nop,TS val 1706420122 ecr 1706420121], length 0
02:12:16.451967 lo In IP localhost.5433 > localhost.44354: Flags [F.], seq 170, win 512, options [nop,nop,TS val 1706420124 ecr 1706420066], length 0
02:12:16.452218 lo In IP localhost.5433 > localhost.44364: Flags [.] , ack 168, win 512, options [nop,nop,TS val 1706420124 ecr 1706420069], length 0
02:12:16.454175 lo In IP localhost.5433 > localhost.44334: Flags [F.], seq 160, win 512, options [nop,nop,TS val 1706420126 ecr 1706420058], length 0
02:12:16.458028 lo In IP localhost.44460 > localhost.5433: Flags [S], seq 2286644450, win 65495, options [mss 65495,sackOK,TS val 1706420130 ecr 0,nop,wscale 7], length 0
02:12:16.458061 lo In IP localhost.5433 > localhost.44460: Flags [S.], seq 2073888631, ack 2286644451, win 65483, options [mss 65495,sackOK,TS val 1706420130 ecr 1706420130], length 0
02:12:16.458076 lo In IP localhost.44460 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420130 ecr 1706420130], length 0
02:12:16.462585 lo In IP localhost.5433 > localhost.44374: Flags [F.], seq 166, win 512, options [nop,nop,TS val 1706420134 ecr 1706420085], length 0
02:12:16.463298 lo In IP localhost.44460 > localhost.5433: Flags [P.], seq 1:157, ack 1, win 512, options [nop,nop,TS val 1706420135 ecr 1706420130], length 156
02:12:16.463320 lo In IP localhost.5433 > localhost.44460: Flags [.] , seq 157, win 511, options [nop,nop,TS val 1706420135 ecr 1706420135], length 0
02:12:16.466216 lo In IP localhost.5433 > localhost.44390: Flags [P.], seq 171, win 512, options [nop,nop,TS val 1706420138 ecr 1706420089], length 0
02:12:16.471211 lo In IP localhost.5433 > localhost.44460: Flags [P.], seq 1:27, ack 157, win 512, options [nop,nop,TS val 1706420143 ecr 1706420135], length 26
02:12:16.471337 lo In IP localhost.44460 > localhost.5433: Flags [.] , seq 27, win 512, options [nop,nop,TS val 1706420143 ecr 1706420143], length 0
02:12:16.482191 lo In IP localhost.44460 > localhost.5433: Flags [F.], seq 157, ack 27, win 512, options [nop,nop,TS val 1706420154 ecr 1706420143], length 0
02:12:16.485748 lo In IP localhost.44472 > localhost.5433: Flags [S], seq 1431461107, win 65495, options [mss 65495,sackOK,TS val 1706420157 ecr 0,nop,wscale 7], length 0
02:12:16.485776 lo In IP localhost.5433 > localhost.44472: Flags [S.], seq 3961170652, ack 1431461108, win 65483, options [mss 65495,sackOK,TS val 1706420157 ecr 1706420157], length 0
02:12:16.485822 lo In IP localhost.44472 > localhost.5433: Flags [.] , ack 1, win 512, options [nop,nop,TS val 1706420157 ecr 1706420157], length 0
```

```

02:12:16.486035 lo In IP localhost.44472 > localhost.5433: Flags [P.], seq 1:174, ack 1, win 512, options [nop,nop,TS val 1706420158 ecr 1706420157], length 173
02:12:16.486042 lo In IP localhost.5433 > localhost.44472: Flags [.], ack 174, win 511, options [nop,nop,TS val 1706420158 ecr 1706420158], length 0
02:12:16.488524 lo In IP localhost.5433 > localhost.44472: Flags [P.], seq 1:27, ack 174, win 512, options [nop,nop,TS val 1706420160 ecr 1706420158], length 26
02:12:16.488569 lo In IP localhost.44472 > localhost.5433: Flags [.], ack 27, win 512, options [nop,nop,TS val 1706420160 ecr 1706420160], length 0
02:12:16.489619 lo In IP localhost.44472 > localhost.5433: Flags [F.], seq 174, ack 27, win 512, options [nop,nop,TS val 1706420161 ecr 1706420160], length 0
02:12:16.492003 lo In IP localhost.5433 > localhost.44392: Flags [.], ack 167, win 512, options [nop,nop,TS val 1706420164 ecr 1706420098], length 0
02:12:16.494813 lo In IP localhost.5433 > localhost.44418: Flags [.], ack 183, win 512, options [nop,nop,TS val 1706420166 ecr 1706420106], length 0
02:12:16.494860 lo In IP localhost.5433 > localhost.44412: Flags [.], ack 169, win 512, options [nop,nop,TS val 1706420166 ecr 1706420104], length 0
02:12:16.500745 lo In IP localhost.5433 > localhost.44428: Flags [.], ack 170, win 512, options [nop,nop,TS val 1706420172 ecr 1706420113], length 0
02:12:16.502226 lo In IP localhost.5433 > localhost.44396: Flags [.], ack 172, win 512, options [nop,nop,TS val 1706420174 ecr 1706420102], length 0
02:12:16.502266 lo In IP localhost.5433 > localhost.44426: Flags [.], ack 174, win 512, options [nop,nop,TS val 1706420174 ecr 1706420108], length 0
02:12:16.502269 lo In IP localhost.5433 > localhost.44444: Flags [.], ack 162, win 512, options [nop,nop,TS val 1706420174 ecr 1706420122], length 0
02:12:16.503366 lo In IP localhost.44484 > localhost.5433: Flags [S], seq 2048329517, win 65495, options [mss 65495,sackOK,TS val 1706420175 ecr 0,nop,wscale 7], length 0
02:12:16.503387 lo In IP localhost.5433 > localhost.44484: Flags [S.], seq 2156300099, ack 2048329518, win 65483, options [mss 65495,sackOK,TS val 1706420175 ecr 1706420175,nop,wscale 7], length 0
02:12:16.503401 lo In IP localhost.44484 > localhost.5433: Flags [.], ack 1, win 512, options [nop,nop,TS val 1706420175 ecr 1706420175], length 0
02:12:16.503708 lo In IP localhost.44484 > localhost.5433: Flags [P.], seq 1:180, ack 1, win 512, options [nop,nop,TS val 1706420175 ecr 1706420175], length 179
02:12:16.504051 lo In IP localhost.5433 > localhost.44484: Flags [.], ack 180, win 511, options [nop,nop,TS val 1706420175 ecr 1706420175], length 0
02:12:16.504619 lo In IP localhost.5433 > localhost.44484: Flags [P.], seq 1:27, ack 180, win 512, options [nop,nop,TS val 1706420176 ecr 1706420175], length 26
02:12:16.504639 lo In IP localhost.44484 > localhost.5433: Flags [.], ack 27, win 512, options [nop,nop,TS val 1706420176 ecr 1706420176], length 0
02:12:16.504758 lo In IP localhost.44484 > localhost.5433: Flags [F.], seq 180, ack 27, win 512, options [nop,nop,TS val 1706420176 ecr 1706420176], length 0
02:12:16.507417 lo In IP localhost.44492 > localhost.5433: Flags [S], seq 1250218132, win 65495, options [mss 65495,sackOK,TS val 1706420179 ecr 0,nop,wscale 7], length 0
02:12:16.507446 lo In IP localhost.5433 > localhost.44492: Flags [S.], seq 4245507568, ack 1250218133, win 65483, options [mss 65495,sackOK,TS val 1706420179 ecr 1706420179,nop,wscale 7], length 0
02:12:16.507464 lo In IP localhost.44492 > localhost.5433: Flags [.], ack 1, win 512, options [nop,nop,TS val 1706420179 ecr 1706420179], length 0
02:12:16.507604 lo In IP localhost.44492 > localhost.5433: Flags [P.], seq 1:157, ack 1, win 512, options [nop,nop,TS val 1706420179 ecr 1706420179], length 156
02:12:16.507621 lo In IP localhost.5433 > localhost.44492: Flags [.], ack 157, win 511, options [nop,nop,TS val 1706420179 ecr 1706420179], length 0
02:12:16.507877 lo In IP localhost.5433 > localhost.44492: Flags [P.], seq 1:27, ack 157, win 512, options [nop,nop,TS val 1706420180 ecr 1706420179], length 26
02:12:16.507898 lo In IP localhost.44492 > localhost.5433: Flags [.], ack 27, win 512, options [nop,nop,TS val 1706420180 ecr 1706420180], length 0
02:12:16.508098 lo In IP localhost.44492 > localhost.5433: Flags [F.], seq 157, ack 27, win 512, options [nop,nop,TS val 1706420180 ecr 1706420180], length 0
02:12:16.509348 lo In IP localhost.44494 > localhost.5433: Flags [S], seq 3577475033, win 65495, options [mss 65495,sackOK,TS val 1706420181 ecr 0,nop,wscale 7], length 0
02:12:16.509361 lo In IP localhost.5433 > localhost.44494: Flags [S.], seq 1675241539, ack 3577475034, win 65483, options [mss 65495,sackOK,TS val 1706420181 ecr 1706420181,nop,wscale 7], length 0
02:12:16.509371 lo In IP localhost.44494 > localhost.5433: Flags [.], ack 1, win 512, options [nop,nop,TS val 1706420181 ecr 1706420181], length 0
02:12:16.509486 lo In IP localhost.44494 > localhost.5433: Flags [P.], seq 1:173, ack 1, win 512, options [nop,nop,TS val 1706420181 ecr 1706420181], length 172
02:12:16.509490 lo In IP localhost.5433 > localhost.44494: Flags [.], ack 173, win 511, options [nop,nop,TS val 1706420181 ecr 1706420181], length 0
02:12:16.509798 lo In IP localhost.5433 > localhost.44494: Flags [P.], seq 1:27, ack 173, win 512, options [nop,nop,TS val 1706420181 ecr 1706420181], length 26
02:12:16.509816 lo In IP localhost.44494 > localhost.5433: Flags [.], ack 27, win 512, options [nop,nop,TS val 1706420181 ecr 1706420181], length 0
02:12:16.510002 lo In IP localhost.44494 > localhost.5433: Flags [F.], seq 173, ack 27, win 512, options [nop,nop,TS val 1706420182 ecr 1706420181], length 0
02:12:16.542497 lo In IP localhost.5434 > localhost.5433: Flags [S], seq 3570274853, win 65495, options [mss 65495,sackOK,TS val 1706420214 ecr 0,nop,wscale 7], length 0
02:12:16.542498 lo In IP localhost.5433 > localhost.44472: Flags [.], ack 175, win 512, options [nop,nop,TS val 1706420214 ecr 1706420161], length 0
02:12:16.542511 lo In IP localhost.5433 > localhost.5434: Flags [S.], seq 474336176, ack 3570274854, win 65483, options [mss 65495,sackOK,TS val 1706420214 ecr 1706420214,nop,wscale 7], length 0
02:12:16.542520 lo In IP localhost.5434 > localhost.5433: Flags [.], ack 1, win 512, options [nop,nop,TS val 1706420214 ecr 1706420214], length 0
02:12:16.542622 lo In IP localhost.5434 > localhost.5433: Flags [P.], seq 1:165, ack 1, win 512, options [nop,nop,TS val 1706420214 ecr 1706420214], length 164
02:12:16.542652 lo In IP localhost.5433 > localhost.5434: Flags [.], ack 165, win 511, options [nop,nop,TS val 1706420214 ecr 1706420214], length 0
02:12:16.543073 lo In IP localhost.5433 > localhost.5434: Flags [P.], seq 1:27, ack 165, win 512, options [nop,nop,TS val 1706420215 ecr 1706420214], length 26
02:12:16.543080 lo In IP localhost.5434 > localhost.5433: Flags [.], ack 27, win 512, options [nop,nop,TS val 1706420215 ecr 1706420215], length 0
02:12:16.543279 lo In IP localhost.5434 > localhost.5433: Flags [F.], seq 165, ack 27, win 512, options [nop,nop,TS val 1706420215 ecr 1706420215], length 0
02:12:16.546739 lo In IP localhost.5433 > localhost.44460: Flags [.], ack 158, win 512, options [nop,nop,TS val 1706420217 ecr 1706420154], length 0
02:12:16.549105 lo In IP localhost.5434 > localhost.5433: Flags [S], seq 610741372, win 65495, options [mss 65495,sackOK,TS val 1706420221 ecr 0,nop,wscale 7], length 0
02:12:16.549123 lo In IP localhost.5433 > localhost.5434: Flags [S.], seq 1507590314, ack 610741373, win 65483, options [mss 65495,sackOK,TS val 1706420221 ecr 1706420221,nop,wscale 7], length 0
02:12:16.549140 lo In IP localhost.5434 > localhost.5433: Flags [.], ack 1, win 512, options [nop,nop,TS val 1706420221 ecr 1706420221], length 0
02:12:16.549384 lo In IP localhost.5434 > localhost.5433: Flags [P.], seq 1:168, ack 1, win 512, options [nop,nop,TS val 1706420221 ecr 1706420221], length 167
02:12:16.549392 lo In IP localhost.5433 > localhost.5434: Flags [.], ack 168, win 511, options [nop,nop,TS val 1706420221 ecr 1706420221], length 0
02:12:16.550104 lo In IP localhost.5433 > localhost.5434: Flags [P.], seq 1:27, ack 168, win 512, options [nop,nop,TS val 1706420222 ecr 1706420221], length 26
02:12:16.550138 lo In IP localhost.5434 > localhost.5433: Flags [.], ack 27, win 512, options [nop,nop,TS val 1706420222 ecr 1706420222], length 0
02:12:16.550457 lo In IP localhost.5434 > localhost.5433: Flags [F.], seq 168, ack 27, win 512, options [nop,nop,TS val 1706420222 ecr 1706420222], length 0

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