

**Московский авиационный институт
(Национальный исследовательский университет)**

Факультет: «Информационные технологии и прикладная математика»

Кафедра: 806 «Вычислительная математика и программирование»

Лабораторная работа
по курсу «Базы данных»
Тема: «Магазин видеоигр»

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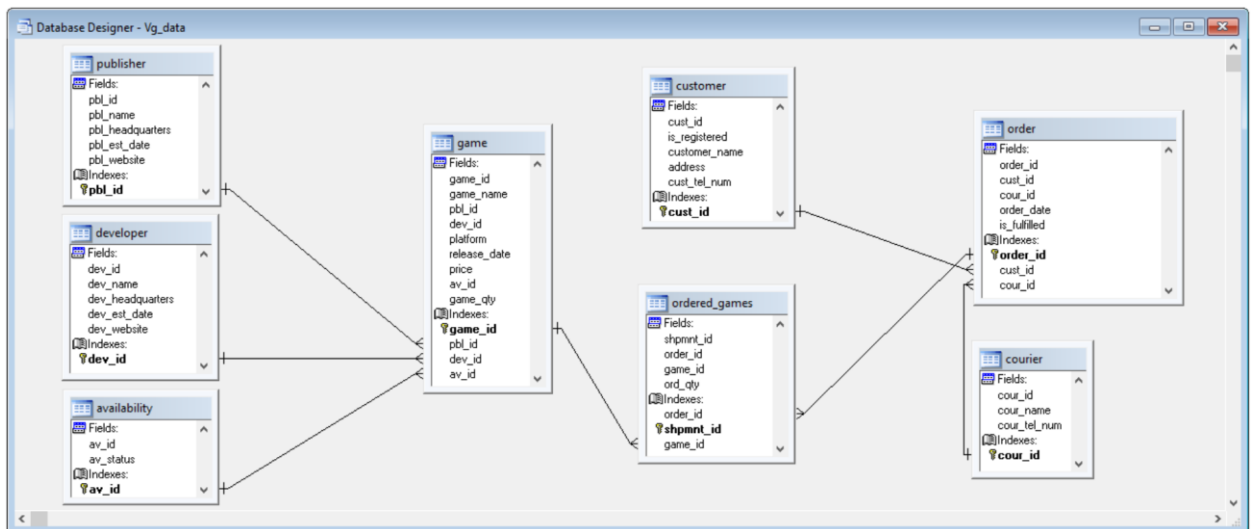
Оценка:

Москва
2021

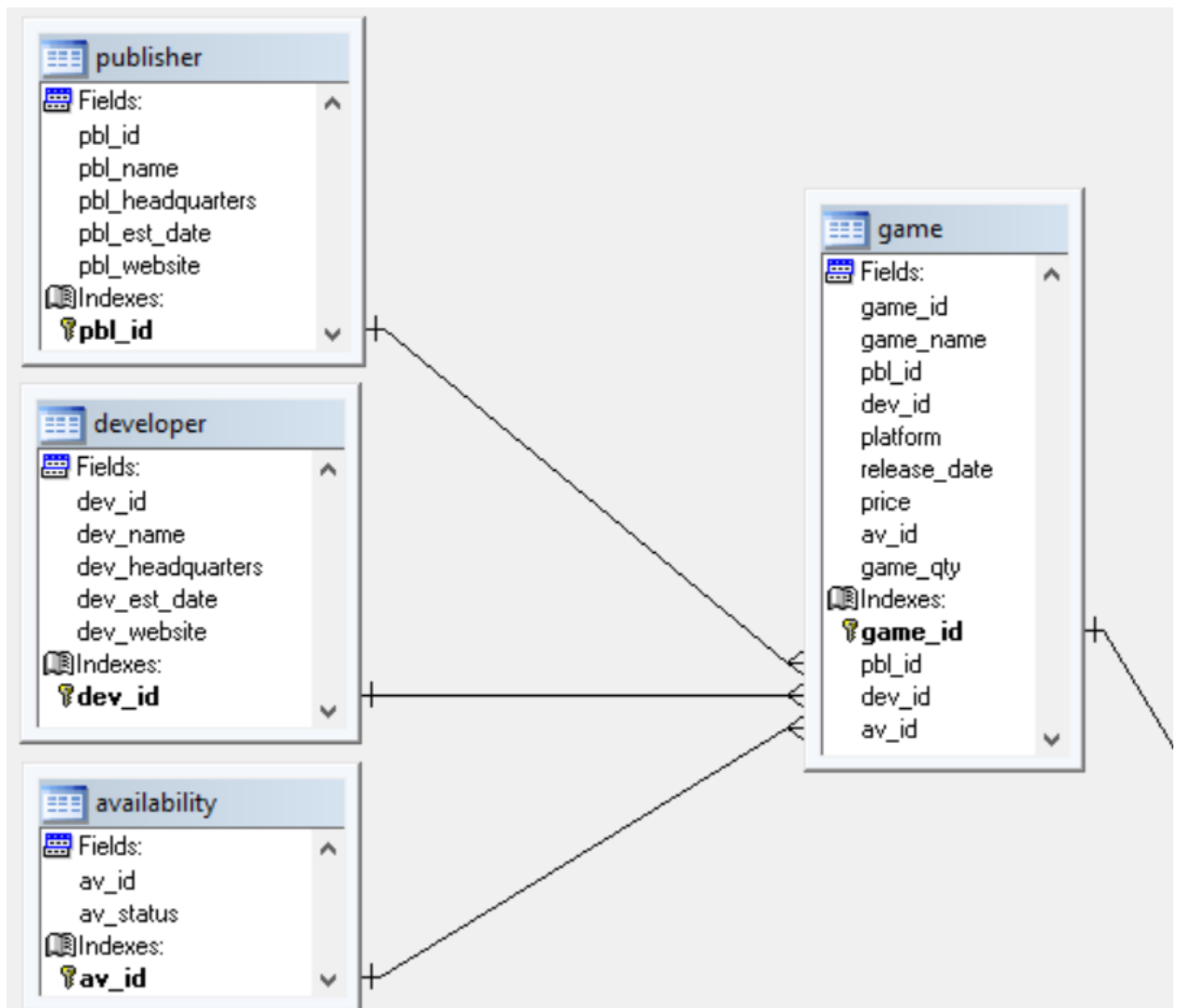
1. ТАБЛИЦЫ И СХЕМА ДАННЫХ.

База данных в MS Visual FoxPro

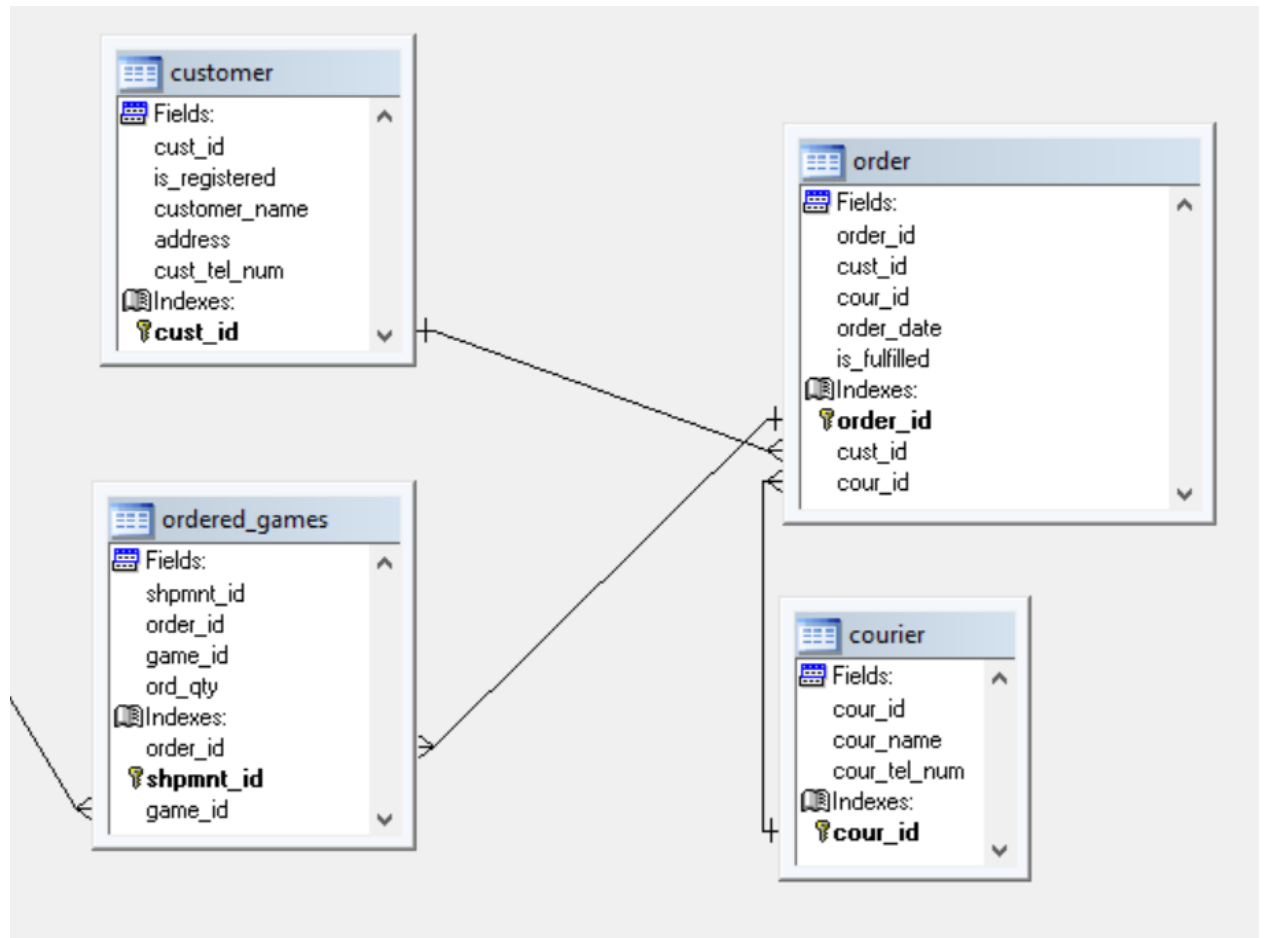
1) Общий вид



2) Приближенная левая часть



3) Приближенная правая часть



Описание таблиц

1) Издатель (Publisher)

Pbl_id	Pbl_name	Pbl_headquarters	Pbl_est_date	Pbl_website
1	Bandai Namco Entertainment	Shinagawa, Tokyo, Japan	03/31/06	https://en.bandainamcoent.eu
2	Activision	Santa Monica, California, U.S.	10/01/79	https://www.activision.com
3	Konami	Tokyo, Japan	03/21/69	https://www.konami.com
4	Bethesda softworks	Rockville, Maryland, U.S.	06/28/86	https://bethesda.net
5	Xbox Game Studios	Redmond, Washington, U.S.	03/01/00	https://www.xbox.com
6	Capcom	Osaka, Japan	05/30/79	https://www.capcom.com
7	THQ Nordic	Vienna, Austria	06/23/11	https://www.thqnordic.com
8	SOFTCLUB	Moscow, Russia	11/01/94	https://www.softclub.ru
9	Square Enix	Tokyo, Japan	09/22/75	https://www.square-enix.com
10	Nintendo	Kyoto, Japan	09/23/89	https://www.nintendo.ru
11	Sony Interactive Entertainment	San Mateo, California, U.S.	11/16/93	https://www.sie.com
12	iam8bit	Los Angeles, California, U.S.	04/19/05	https://www.iam8bit.com
13	Panic Inc.	Portland, Oregon, U.S.	01/01/97	https://panic.com
14	8-4	Shibuya, Tokyo, Japan	10/05/05	https://8-4.jp
15	Devolver Digital	Austin, Texas, U.S.	06/25/09	https://www.devolverdigital.com
16	Atlus	Shinjuku, Tokyo, Japan	04/07/86	http://www.atlus.co.jp

Характеристики полей:

	Name	Type	Width
↕	pbl_id	Integer	4
▢	pbl_name	Character	32
▢	pbl_headquarte	Character	32
▢	pbl_est_date	Date	8
▢	pbl_website	Character	32

Описание полей:

- pbl_id ID издателя (**первичный ключ**)
- pbl_name наименование издателя
- pbl_headquarters расположение издателя
- pbl_est_date дата основания компании издателя
- pbl_website сайт издателя

2) Разработчик (Developer)

Developer					
	Dev_id	Dev_name	Dev_headquarters	Dev_est_date	Dev_website
▢	1	Nomada Studio	Barcelona, Spain	01/01/18	https://nomada.studio
▢	2	CD Projekt RED	Warsaw, Poland	02/01/02	https://www.cdprojekt.com/en/
▢	3	Atlus	Shinjuku, Tokyo, Japan	04/07/86	http://www.atlus.co.jp
▢	4	Guerilla Games	Amsterdam, Netherlands	01/01/00	https://www.guerilla-games.com
▢	5	Square Enix	Tokyo, Japan	09/22/75	https://www.square-enix.com
▢	6	Nintendo	Kyoto, Japan	09/23/89	https://www.nintendo.ru
▢	7	FromSoftware, Inc.	Tokyo, Japan	11/01/86	https://www.fromsoftware.jp/jp/
▢	8	House House	Melbourne, Australia	01/01/14	http://househou.se
▢	9	Capcom	Osaka, Japan	05/30/79	https://www.capcom.com
▢	10	Moon Studios	Vienna, Austria	01/01/10	https://www.orithegame.com

Характеристики полей:

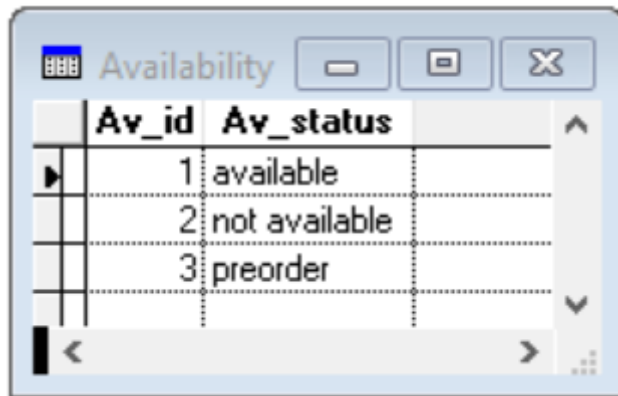
	Name	Type	Width
↕	dev_id	Integer	4
▢	dev_name	Character	32
▢	dev_headquart	Character	32
▢	dev_est_date	Date	8
▢	dev_website	Character	32

Описание полей:

- dev_id ID разработчика (**первичный ключ**)

- dev_name наименование разработчика
- dev_headquarters расположение компании разработчика
- dev_est_date дата основания компании разработчика
- dev_website сайт разработчика

3) Доступность (Availability)



Av_id	Av_status
1	available
2	not available
3	preorder

Характеристики полей:

Name	Type	Width
av_id	Integer	4
av_status	Character	32

Описание полей:

- av_id ID доступности (**первичный ключ**)
- av_status статус доступности

4) Игра (Game)

Game_id	Game_name	Platform	Price	Game_qty	Release_date	Pbl_id	Dev_id	Av_id
1	GRIS	Nintendo Switch	3990	5000	11/05/21	15	1	1
2	Witcher 3 Wild Hunt	PS4	2590	20000	05/19/15	8	2	1
3	Catherine Full Body	PS4	2490	5000	07/03/19	16	3	1
4	Catherine Full Body	Nintendo Switch	4690	2000	07/07/20	16	3	1
5	Horizon Forbidden West	PS4	4990	0	02/18/22	8	4	3
6	Horizon Forbidden West	PS5	5490	0	02/18/22	8	4	3
7	NED: The World Ends with You	PS4	3790	6000	07/27/21	9	5	1
8	NED: The World Ends with You	Nintendo Switch	3990	6000	07/27/21	9	5	1
9	Animal Crossing: New Horizons	Nintendo Switch	3690	10000	03/20/20	10	6	1
10	Elden Ring	PS4	4990	0	02/25/22	1	7	3
11	Elden Ring	Xbox One	4990	0	02/25/22	1	7	3
12	Metroid Dread	Nintendo Switch	3990	10000	10/08/21	10	6	1
13	Untitled Goose Game	PS4	3490	5000	12/17/19	13	8	1
14	Untitled Goose Game	Nintendo Switch	3590	5000	09/20/19	13	8	1
15	Resident Evil 8 Village	PS4	4290	10000	05/07/21	8	9	1
16	Resident Evil 8 Village	Xbox One	4490	10000	05/07/21	8	9	1
17	Resident Evil 8 Village	PS5	4490	6000	05/07/21	8	9	1
18	Ori and the Blind Forest Definitive Edition	Nintendo Switch	2290	9000	09/27/19	12	10	1
19	Ori and the Will of the Wisps	Nintendo Switch	2290	12000	09/17/20	12	10	1
20	NieR Replicant ver.1.22474487139...	PS4	3490	6000	04/23/21	9	5	1
21	Devil May Cry HD Collection	Xbox One	1990	0	03/13/18	6	9	2

Характеристики полей:

Name	Type	Width
game_id	Integer	4
game_name	Character	64
pbl_id	Integer	4
dev_id	Integer	4
platform	Character	32
release_date	Date	8
price	Integer	4
av_id	Integer	4
game_qty	Integer	4

Описание полей:

- game_id ID игры (**первичный ключ**)
- game_name наименование игры
- pbl_id ID издателя (**ключ связи**)
- dev_id ID разработчика (**ключ связи**)
- platform игровая платформа
- release_date дата выхода игры
- price цена
- av_id ID доступности (**ключ связи**)
- game_qty кол-во позиций в наличии

5) Заказанные игры (Ordered games)

	Shpmnt_id	Order_id	Game_id	Ord_qty
	1	1	14	1
	2	1	16	1
	3	1	20	1
	4	2	7	2
	5	2	20	1
	6	3	10	1
	7	4	6	2
	8	4	4	2
	9	5	12	1
	10	5	9	1
	11	5	1	1
	12	6	14	2
	13	6	2	1
	14	7	19	1
	15	7	18	1
	16	7	4	1
	17	8	11	1
	18	8	16	1
	19	9	7	1
	20	9	15	2
	21	9	2	2
	22	10	6	1
	23	10	17	1
	24	10	12	1

Характеристики полей:

Name	Type	Width
shpmnt_id	Integer	4
order_id	Integer	4
game_id	Integer	4
ord_qty	Integer	4

Описание полей:

- shpmnt_id ID отправки (**первичный ключ**)
- order_id ID заказа (**ключ связи**)
- game_id ID игры (**ключ связи**)
- ord_qty кол-во позиций в заказе

6) Заказ (Order)

Order						
	Order_id	Cust_id	Cour_id	Order_date	Is_fulfilled	
	1	4	2	11/05/21	T	
	2	6	1	11/18/21	T	
	3	6	5	10/09/21	F	
	4	1	7	10/23/21	F	
	5	2	1	11/18/21	T	
	6	3	9	11/01/21	T	
	7	3	2	11/18/21	T	
	8	6	1	10/23/21	F	
	9	9	7	11/09/21	T	
	10	6	4	11/05/21	F	

Характеристики полей:

Name	Type	Width
order_id	Integer	4
cust_id	Integer	4
cour_id	Integer	4
order_date	Date	8
is_fulfilled	Logical	1

Описание полей:

- order_id ID заказа (**первичный ключ**)
- cust_id ID покупателя (**ключ связи**)
- cour_id ID курьера (**ключ связи**)
- order_date дата заказа
- is_fulfilled выполнение (да/нет)

7) Покупатель (Customer)

Customer				
	Cust_id	Is_registered	Customer_name	Address
	1	T	Maronin Igor Aleksandrovich	Malyy Cherkasskiy Pereulok, 92, Moscow, Russia 186936
	2	T	Bogdanov Kirill Miroslavovich	Prechistenskiy Pereulok, 99, Moscow, Russia 135759
	3	T	Agafonova Kseniia Semenovna	Gagarinskiy Pereulok, 73, Moscow, Russia 127891
	4	T	Zorina Irina Dmitrievna	Ulitsa Ostozhenka, 56, Moscow, Russia 168003
	5	F	Pavlov Maksim Lvovich	Taganskaya Ulitsa, 68, Moscow, Russia 163236
	6	T	Kotov Vladimir Aleevich	Malyy Cherkasskiy Pereulok, 21, Moscow, Russia 138005
	7	T	Nikolaeva Anna Lvovna	Prechistenskiy Pereulok, 91, Moscow, Russia 158600
	8	F	Iakovlev Roman Dmitrievich	New Arbat Ave, 92, Moscow, Russia 171568
	9	T	Zhilina Kira Ivanovna	Myasnitskaya Ulitsa, 81, Moscow, Russia 12160
	10	T	Efremova Margarita Markovna	Ulitsa Ostozhenka, 95, Moscow, Russia 153816

Характеристики полей:

	Name	Type	Width
	cust_id	Integer	4
	is_registered	Logical	1
	customer_name	Character	64
	address	Character	64
	cust_tel_num	Character	32

Описание полей:

- cust_id ID покупателя (**первичный ключ**)
- is_registered регистрация (да/нет)
- customer_name ФИО покупателя
- address адрес покупателя
- cust_tel_num телефон покупателя

8) Курьер (Courier)

Courier			
	Cour_id	Cour_name	Cour_tel_num
▶	1	Grigorev Denis Artemevich	+79778208442
	2	Bogdanov Timofei Ivanovich	+79778789579
	3	Antonov Andrei Kirillovich	+79581577357
	4	Ivanov Egor Sviatoslavovich	+79778963554
	5	Pakhomov Vasilii Aleksandrovich	+79191377001
	6	Kuzmin Sergei Mironovich	+79309293540
	7	Belikov Mark Artemevich	+79919829346
	8	Ivanov Mikhail Lvovich	+79191375879
	9	Artamonov Georgii Arsentevich	+79012596287
	10	Kiselev Lev Konstantinovich	+79262150957

Характеристики полей:

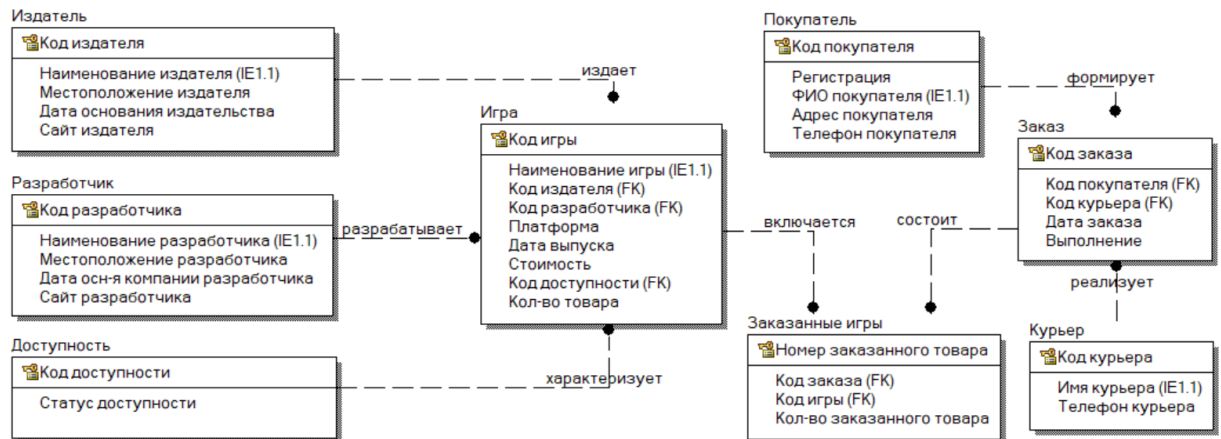
	Name	Type	Width
↕	cour_id	Integer	4
	cour_name	Character	32
	cour_tel_num	Character	32

Описание полей:

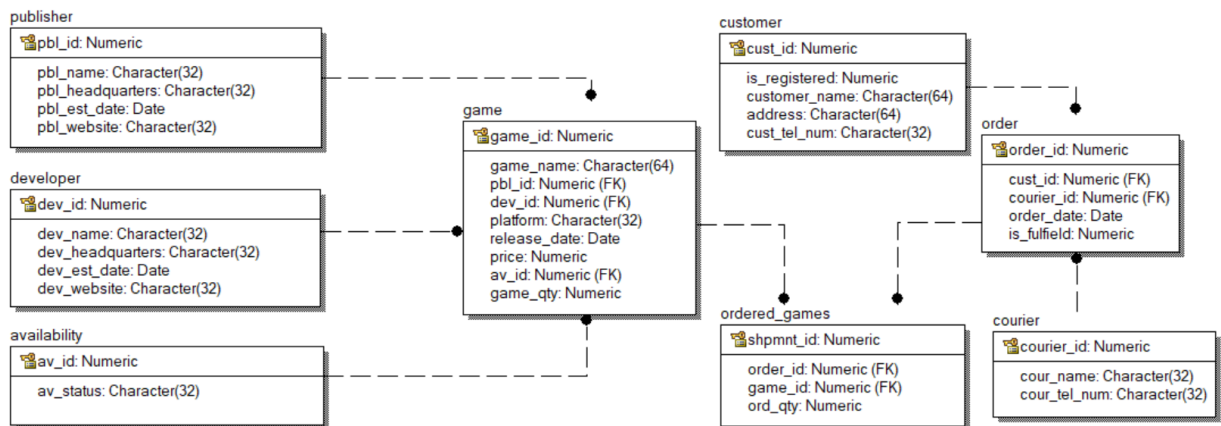
- cour_id ID курьера (**первичный ключ**)
- cour_name ФИО курьера
- cour_tel_num телефон курьера

2. СХЕМА в ErWin.

ERwin Логическая Схема



ERwin Физическая Схема



Описание сгенерированной БД на DDLSQL для VisualFoxPro

```
CREATE TABLE publisher
```

```
(
    pbl_id                Numeric NOT NULL,
    pbl_name               Character(32) NOT NULL,
    pbl_headquarters       Character(32) NOT NULL,
    pbl_est_date           Date NULL,
    pbl_website            Character(32) NOT NULL
);
```

```
CREATE TABLE developer
```

```
(
```

```

        dev_id            Numeric NOT NULL,
        dev_name          Character(32) NOT NULL,
        dev_headquarters  Character(32) NOT NULL,
        dev_est_date      Date NULL,
        dev_website       Character(32) NOT NULL
    );

```

```
CREATE TABLE availability
```

```

(
    av_id            Numeric NOT NULL,
    av_status       Character(32) NOT NULL
);

```

```
CREATE TABLE game
```

```

(
    game_id         Numeric NOT NULL,
    game_name       Character(64) NOT NULL,
    pbl_id          Numeric NOT NULL,
    dev_id          Numeric NOT NULL,
    platform        Character(32) NOT NULL,
    release_date    Date NOT NULL,
    price           Numeric NOT NULL,
    av_id           Numeric NOT NULL,
    game_qty        Numeric NOT NULL
);

```

```
CREATE TABLE ordered_games
```

```

(
    shpmnt_id       Numeric NOT NULL,
    order_id        Numeric NOT NULL,
    game_id         Numeric NOT NULL,
    ord_qty         Numeric NOT NULL
);

```

```
CREATE TABLE customer
```

```

(

```

```

        cust_id            Numeric NOT NULL,
        is_registered      Numeric NULL,
        customer_name      Character(64) NOT NULL,
        address            Character(64) NOT NULL,
        cust_tel_num       Character(32) NOT NULL
    );

```

```

CREATE TABLE order

```

```

(
    order_id              Numeric NOT NULL,
    cust_id               Numeric NOT NULL,
    courier_id            Numeric NOT NULL,
    order_date            Date NOT NULL,
    is_fulfield           Numeric NULL
);

```

```

CREATE TABLE courier

```

```

(
    courier_id            Numeric NOT NULL,
    cour_name             Character(32) NOT NULL,
    cour_tel_num          Character(32) NOT NULL
);

```

3. ЗАПРОСЫ.

1. Пары игр одного заказа заданного покупателя (Agafonova Kseniia Semenovna).

Код на SQL:

```
SELECT g.game_id As game_1_id, g.game_name As game_1, g2.game_id As game_2_id, g2.game_name As game_2, o.order_id, c.cust_id, c.customer_name;

FROM ordered_games As og,ordered_games As og2, order As o, customer As c, game as g, game as g2;

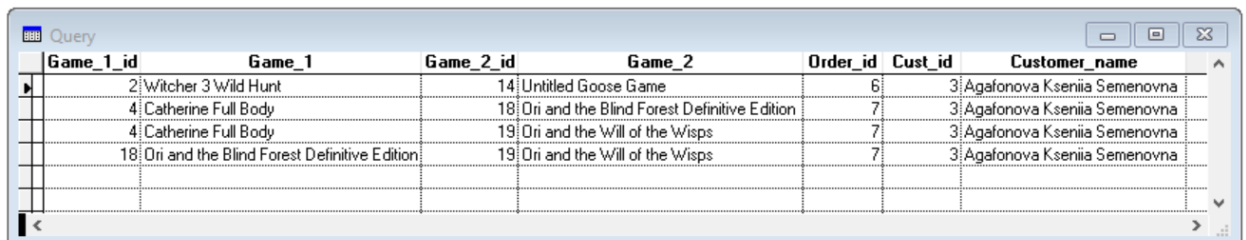
WHERE og.order_id=o.order_id AND og.order_id=og2.order_id AND og.game_id=g.game_id AND;

      og2.game_id=g2.game_id AND og.game_id<og2.game_id AND o.cust_id=c.cust_id AND;

      c.customer_name="Agafonova Kseniia Semenovna";

ORDER BY o.cust_id
```

Результат:



Game_1_id	Game_1	Game_2_id	Game_2	Order_id	Cust_id	Customer_name
2	Witcher 3 Wild Hunt	14	Untitled Goose Game	6	3	Agafonova Kseniia Semenovna
4	Catherine Full Body	18	Ori and the Blind Forest Definitive Edition	7	3	Agafonova Kseniia Semenovna
4	Catherine Full Body	19	Ori and the Will of the Wisps	7	3	Agafonova Kseniia Semenovna
18	Ori and the Blind Forest Definitive Edition	19	Ori and the Will of the Wisps	7	3	Agafonova Kseniia Semenovna

2. Игры каких разработчиков не приобретал заданный покупатель (ID покупателя 6 или Kotov Vladimir Alievich).

Код на SQL:

```
SELECT DISTINCT d.dev_id, d.dev_name;

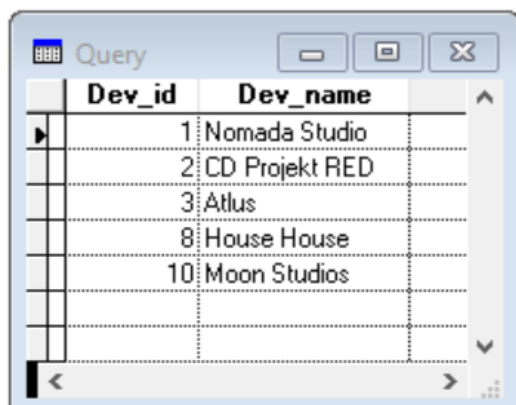
FROM game As g, developer As d;

WHERE d.dev_id=g.dev_id AND g.dev_id not in(SELECT g.dev_id;

FROM game As g,ordered_games As og, order As o;

WHERE g.game_id=og.game_id AND og.order_id=o.order_id AND o.cust_id=6)
```

Результат:



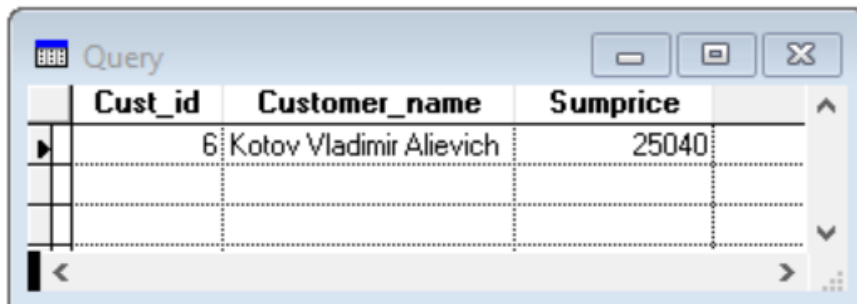
Dev_id	Dev_name
1	Nomada Studio
2	CD Projekt RED
3	Atlus
8	House House
10	Moon Studios

3. Покупатель, купивший игр на максимальную стоимость на заданном интервале дат (ноябрь 2021).

Код на SQL:

```
SELECT o.cust_id As Cust, Sum(og.ord_qty*g.price) As SumPrice;
FROM game As g,ordered_games As og, order As o;
Where g.game_id=og.game_id AND og.order_id=o.order_id AND;
      o.order_date between {'2021-11-01'} and {'2021-11-30'};
      GROUP BY o.cust_id into cursor tmp
SELECT tmp.Cust As cust_id, c.customer_name, tmp.SumPrice;
FROM tmp, customer As c;
WHERE c.cust_id=tmp.Cust AND SumPrice=(SELECT MAX(SumPrice) FROM tmp)
```

Результат:



Cust_id	Customer_name	Sumprice
6	Kotov Vladimir Alievich	25040

4. Найти наиболее популярных разработчиков, которых покупает выше среднего покупателей.

Код на SQL:

```
SELECT DISTINCT o.cust_id, g.dev_id;
FROM game As g,ordered_games As og, order As o;
Where g.game_id=og.game_id AND og.order_id=o.order_id into cursor tmp

SELECT tmp.dev_id, COUNT(tmp.cust_id) As AvgCust;
FROM tmp;
      GROUP BY tmp.dev_id into cursor tmp1

SELECT tmp1.dev_id, d.dev_name, tmp1.AvgCust As Cust_Qty;
FROM tmp1, developer As d;
WHERE tmp1.dev_id=d.dev_id AND tmp1.AvgCust>(SELECT avg(tmp1.AvgCust) FROM tmp)
```

Результат:

Dev_id	Dev_name	Cust_qty
2	CD Projekt RED	2
3	Atlus	2
4	Guerrilla Games	2
5	Square Enix	3
6	Nintendo	2
8	House of the Dragon	2
9	Capcom	3

5. Придумать и реализовать запрос на EXISTS.

Курьеры, которые назначены на несколько заказов

Код на SQL:

```
SELECT DISTINCT o1.cour_id, c.cour_name;
FROM order As o1, courier As c;
WHERE o1.cour_id=c.cour_id AND EXISTS(SELECT * FROM order As o2;
WHERE o1.cour_id=o2.cour_id AND o1.order_id<>o2.order_id)
```

Результат:

Cour_id	Cour_name
1	Grigorev Denis Artemevich
2	Bogdanov Timofei Ivanovich
7	Belikov Mark Artemevich

6. Игры, которые заказаны, но не реализованы (любые игры, находящиеся в одном заказе с невыпущенной игрой, считаются нереализованными; одинаковые игры, находящиеся при этом в разных заказах, считаются разными).

Код на SQL:

```
SELECT o.order_id;
FROM game As g,ordered_games As og, order As o;
WHERE g.game_id=og.game_id AND og.order_id=o.order_id AND;
o.order_date < g.release_date into cursor tmp

SELECT o.order_id, og.game_id, g.game_name, o.order_date, g.release_date;
FROM game As g,ordered_games As og, order As o;
```



```

WHERE g.game_id=og.game_id AND og.order_id=o.order_id AND;

o.order_id=ANY(SELECT tmp.order_id FROM tmp);

ORDER BY o.order_id

```

Результат:



Order_id	Game_id	Game_name	Order_date	Release_date
3	10	Elden Ring	10/09/21	02/25/22
4	4	Catherine Full Body	10/23/21	07/07/20
4	6	Horizon Forbidden West	10/23/21	02/18/22
8	11	Elden Ring	10/23/21	02/25/22
8	16	Resident Evil 8 Village	10/23/21	05/07/21
10	6	Horizon Forbidden West	11/05/21	02/18/22
10	12	Metroid Dread	11/05/21	10/08/21
10	17	Resident Evil 8 Village	11/05/21	05/07/21