Министерство науки и высшего образования Российской Федерации

федеральное государственное автономное образовательное учреждение
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«Национальный исследовательский университет ИТМО»

Факультет инфокоммуникационных технологий

Лабораторная работа №1.2 «Создание таблиц базы данных PostgreSQL. Заполнение таблиц рабочими данными»

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Цель работы: овладеть практическими навыками создания таблиц базы данных PostgreSQL 1X, заполнения их рабочими данными, резервного копирования и восстановления БД.

Оборудование: компьютерный класс.

Программное обеспечение: СУБД PostgreSQL 1X, pgAdmin 4.

Практическое задание:

1. Создать базу данных с использованием pgAdmin 4 (согласно индивидуальному заданию).
2. Создать схему в составе базы данных.
3. Создать таблицы базы данных.
4. Установить ограничения на данные: *Primary Key, Unique, Check, Foreign Key*.
5. Заполнить таблицы БД рабочими данными.
6. Создать резервную копию БД.
7. Восстановить БД.

Выполнение:

Наименование БД – «БД Контроль выполнения заданий». Схема логической модели БД, сгенерированная в Generate ERD:

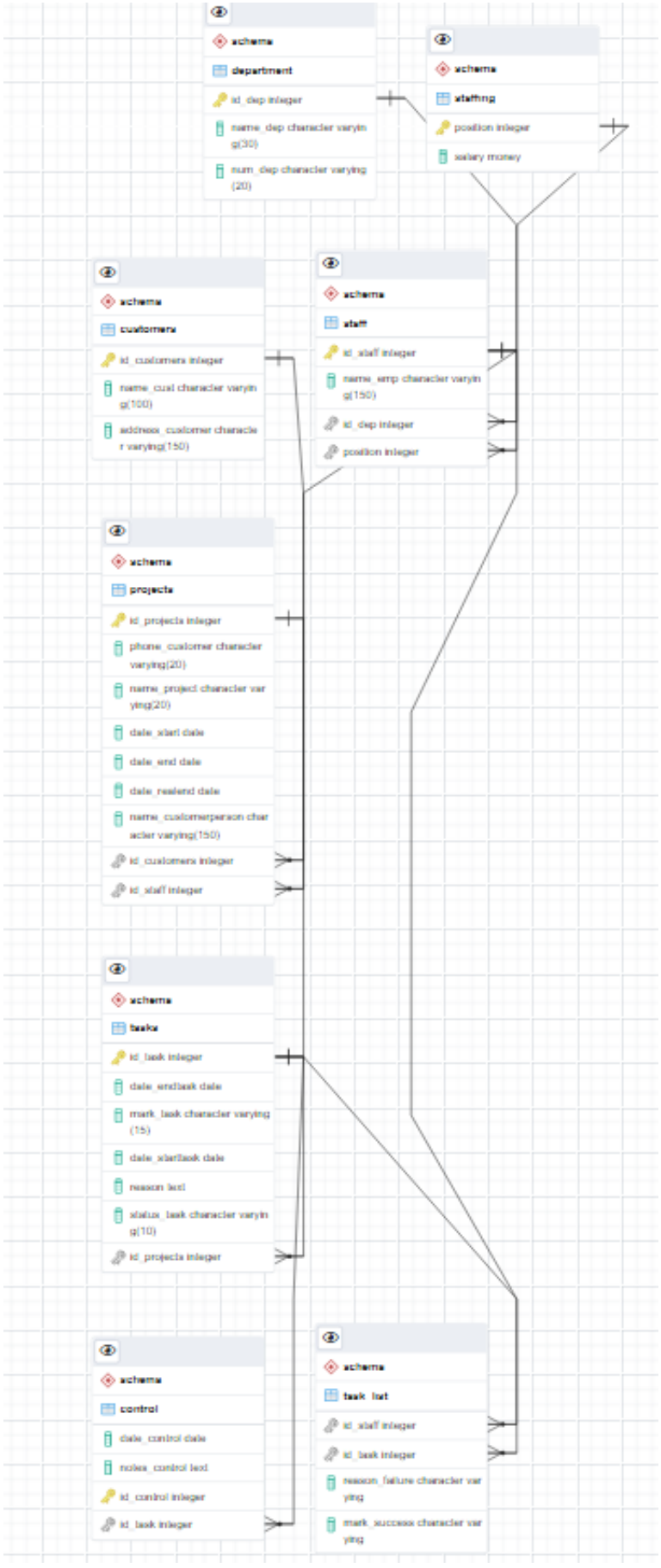

Рисунок 1 – Схема, сгенерированная в Generate ERD

Листинг 1 – Скрипт работы с БД

```
-- PostgreSQL database dump
--

-- Dumped from database version 10.20
-- Dumped by pg_dump version 10.20

-- Started on 2022-03-08 14:49:35

SET statement_timeout = 0;
SET lock_timeout = 0;
SET idle_in_transaction_session_timeout = 0;
SET client_encoding = 'UTF8';
SET standard_conforming_strings = on;
SELECT pg_catalog.set_config('search_path', '', false);
SET check_function_bodies = false;
SET xmloption = content;
SET client_min_messages = warning;
SET row_security = off;

--
-- TOC entry 8 (class 2615 OID 16396)
-- Name: schema; Type: SCHEMA; Schema: -; Owner: postgres
--

CREATE SCHEMA schema;


ALTER SCHEMA schema OWNER TO postgres;

--
-- TOC entry 1 (class 3079 OID 12924)
-- Name: plpgsql; Type: EXTENSION; Schema: -; Owner:
--

CREATE EXTENSION IF NOT EXISTS plpgsql WITH SCHEMA pg_catalog;


--
-- TOC entry 2891 (class 0 OID 0)
-- Dependencies: 1
-- Name: EXTENSION plpgsql; Type: COMMENT; Schema: -; Owner:
--

COMMENT ON EXTENSION plpgsql IS 'PL/pgSQL procedural language';


SET default_tablespace = '';

SET default_with_oids = false;
```

```
--
-- TOC entry 208 (class 1259 OID 16454)
-- Name: control; Type: TABLE; Schema: schema; Owner: postgres
--

CREATE TABLE schema.control (
    date_control date NOT NULL,
    notes_control text,
    id_control integer NOT NULL,
    id_task integer NOT NULL
);


ALTER TABLE schema.control OWNER TO postgres;

--
-- TOC entry 209 (class 1259 OID 16473)
-- Name: control_id_control_seq; Type: SEQUENCE; Schema: schema; Owner: postgres
--

CREATE SEQUENCE schema.control_id_control_seq
    AS integer
    START WITH 1
    INCREMENT BY 1
    NO MINVALUE
    NO MAXVALUE
    CACHE 1;


ALTER TABLE schema.control_id_control_seq OWNER TO postgres;

--
-- TOC entry 2892 (class 0 OID 0)
-- Dependencies: 209
-- Name: control_id_control_seq; Type: SEQUENCE OWNED BY; Schema: schema; Owner:
postgres
--

ALTER SEQUENCE schema.control_id_control_seq OWNED BY schema.control.id_control;


--
-- TOC entry 198 (class 1259 OID 16408)
-- Name: customers; Type: TABLE; Schema: schema; Owner: postgres
--

CREATE TABLE schema.customers (
    id_customers integer NOT NULL,
    name_cust character varying(100) NOT NULL,
    address_customer character varying(150) NOT NULL
```

```
);


ALTER TABLE schema.customers OWNER TO postgres;

--
-- TOC entry 197 (class 1259 OID 16406)
-- Name: customers_id_customers_seq; Type: SEQUENCE; Schema: schema; Owner:
postgres
--

ALTER TABLE schema.customers ALTER COLUMN id_customers ADD GENERATED ALWAYS AS
IDENTITY (
    SEQUENCE NAME schema.customers_id_customers_seq
    START WITH 1
    INCREMENT BY 1
    NO MINVALUE
    NO MAXVALUE
    CACHE 1
);


--
-- TOC entry 205 (class 1259 OID 16439)
-- Name: department; Type: TABLE; Schema: schema; Owner: postgres
--

CREATE TABLE schema.department (
    id_dep integer NOT NULL,
    name_dep character varying(30),
    num_dep character varying(20)
);


ALTER TABLE schema.department OWNER TO postgres;

--
-- TOC entry 204 (class 1259 OID 16437)
-- Name: department_id_dep_seq; Type: SEQUENCE; Schema: schema; Owner: postgres
--

ALTER TABLE schema.department ALTER COLUMN id_dep ADD GENERATED ALWAYS AS
IDENTITY (
    SEQUENCE NAME schema.department_id_dep_seq
    START WITH 1
    INCREMENT BY 1
    NO MINVALUE
    NO MAXVALUE
    CACHE 1
);
```

```
--
-- TOC entry 200 (class 1259 OID 16418)
-- Name: projects; Type: TABLE; Schema: schema; Owner: postgres
--

CREATE TABLE schema.projects (
    id_projects integer NOT NULL,
    phone_customer character varying(20) NOT NULL,
    name_project character varying(20) NOT NULL,
    date_start date,
    date_end date,
    date_realend date,
    name_customerperson character varying(150),
    id_customers integer NOT NULL,
    id_staff integer NOT NULL
);


ALTER TABLE schema.projects OWNER TO postgres;

--
-- TOC entry 199 (class 1259 OID 16416)
-- Name: projects_id_projects_seq; Type: SEQUENCE; Schema: schema; Owner:
postgres
--

ALTER TABLE schema.projects ALTER COLUMN id_projects ADD GENERATED ALWAYS AS
IDENTITY (
    SEQUENCE NAME schema.projects_id_projects_seq
    START WITH 1
    INCREMENT BY 1
    NO MINVALUE
    NO MAXVALUE
    CACHE 1
);


--
-- TOC entry 202 (class 1259 OID 16425)
-- Name: staff; Type: TABLE; Schema: schema; Owner: postgres
--

CREATE TABLE schema.staff (
    id_staff integer NOT NULL,
    name_emp character varying(150) NOT NULL,
    id_dep integer NOT NULL,
    "position" integer NOT NULL
);


ALTER TABLE schema.staff OWNER TO postgres;
```

```
--
-- TOC entry 201 (class 1259 OID 16423)
-- Name: staff_id_staff_seq; Type: SEQUENCE; Schema: schema; Owner: postgres
--

ALTER TABLE schema.staff ALTER COLUMN id_staff ADD GENERATED ALWAYS AS IDENTITY (
    SEQUENCE NAME schema.staff_id_staff_seq
    START WITH 1
    INCREMENT BY 1
    NO MINVALUE
    NO MAXVALUE
    CACHE 1
);


--
-- TOC entry 203 (class 1259 OID 16432)
-- Name: staffing; Type: TABLE; Schema: schema; Owner: postgres
--

CREATE TABLE schema.staffing (
    "position" integer NOT NULL,
    salary money NOT NULL
);


ALTER TABLE schema.staffing OWNER TO postgres;

--
-- TOC entry 210 (class 1259 OID 16512)
-- Name: task_list; Type: TABLE; Schema: schema; Owner: postgres
--

CREATE TABLE schema.task_list (
    id_staff integer NOT NULL,
    id_task integer NOT NULL,
    reason_failure character varying,
    mark_success character varying
);


ALTER TABLE schema.task_list OWNER TO postgres;

--
-- TOC entry 207 (class 1259 OID 16446)
-- Name: tasks; Type: TABLE; Schema: schema; Owner: postgres
--

CREATE TABLE schema.tasks (
    id_task integer NOT NULL,
```

```
    date_endtask date,
    mark_task character varying(15),
    date_starttask date,
    reason text,
    status_task character varying(10) NOT NULL,
    id_projects integer NOT NULL
);


ALTER TABLE schema.tasks OWNER TO postgres;

--
-- TOC entry 206 (class 1259 OID 16444)
-- Name: tasks_id_task_seq; Type: SEQUENCE; Schema: schema; Owner: postgres
--

ALTER TABLE schema.tasks ALTER COLUMN id_task ADD GENERATED ALWAYS AS IDENTITY (
    SEQUENCE NAME schema.tasks_id_task_seq
    START WITH 1
    INCREMENT BY 1
    NO MINVALUE
    NO MAXVALUE
    CACHE 1
);


--
-- TOC entry 2717 (class 2604 OID 16475)
-- Name: control id_control; Type: DEFAULT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.control ALTER COLUMN id_control SET DEFAULT
nextval('schema.control_id_control_seq'::regclass);


--
-- TOC entry 2880 (class 0 OID 16454)
-- Dependencies: 208
-- Data for Name: control; Type: TABLE DATA; Schema: schema; Owner: postgres
--

COPY schema.control (date_control, notes_control, id_control, id_task) FROM
stdin;
2020-11-10  отлично 2   5
2020-10-12  отлично 3   3
2020-11-10  отлично 4   5
2020-10-12  отлично 5   3
2021-09-08  хорошо  6   2
\.
```

```
--
-- TOC entry 2870 (class 0 OID 16408)
-- Dependencies: 198
-- Data for Name: customers; Type: TABLE DATA; Schema: schema; Owner: postgres
--

COPY schema.customers (id_customers, name_cust, address_customer) FROM stdin;
1	ООО Шаражкина контора	ул. Пушкина, д. Колотушкина
2	ООО Спёрбанк	ул. Улица, д. 666
3	ООО Помогите	ул. Допсы, д. Отчисления
4	ОАО Два по БД	Биржевой, 16
5	ООО Сакичарм	ул. Хорошая, д. 17
\.


--
-- TOC entry 2877 (class 0 OID 16439)
-- Dependencies: 205
-- Data for Name: department; Type: TABLE DATA; Schema: schema; Owner: postgres
--

COPY schema.department (id_dep, name_dep, num_dep) FROM stdin;
1	отдел хорошего настроения	9991112233
2	глиномесный цех 1322813371
3	столовая	766655221
4	офис психологической помощи 7771234567
5	отдел терпил	4536799121
\.


--
-- TOC entry 2872 (class 0 OID 16418)
-- Dependencies: 200
-- Data for Name: projects; Type: TABLE DATA; Schema: schema; Owner: postgres
--

COPY schema.projects (id_projects, phone_customer, name_project, date_start,
date_end, date_realend, name_customerperson, id_customers, id_staff) FROM stdin;
1	1234445566	успешный проект 2019-03-01	2019-12-12	2020-01-12	Персоналия
Персоналиевна	3	6
2	1234445566	успешный проект 2019-03-01	2019-12-12	2020-01-12	Персоналия
Персоналиевна	4	6
3	1234445566	успешный проект 2019-03-01	2019-12-12	2020-01-12	Персоналия
Персоналиевна	3	6
4	1234445566	успешный проект 2019-03-01	2019-12-12	2020-01-12	Персоналия
Персоналиевна	3	5
5	1234445566	успешный проект 2019-03-01	2019-12-12	2020-01-12	Персоналия
Персоналиевна	3	6
6	1234445566	успешный проект 2019-03-01	2019-12-12	2020-01-12	Персоналия
Персоналиевна	3	6
\.
```

```
--
-- TOC entry 2874 (class 0 OID 16425)
-- Dependencies: 202
-- Data for Name: staff; Type: TABLE DATA; Schema: schema; Owner: postgres
--

COPY schema.staff (id_staff, name_emp, id_dep, "position") FROM stdin;
2   Титенко Елена   1   13
3   Махнева Анастасия   5   11
4   Смирнов Тимур Олегович  2   2
5   Асонов Николай Павлович 3   2
6   Фатин Леша) 4   11
\.


--
-- TOC entry 2875 (class 0 OID 16432)
-- Dependencies: 203
-- Data for Name: staffing; Type: TABLE DATA; Schema: schema; Owner: postgres
--

COPY schema.staffing ("position", salary) FROM stdin;
13  500 000,00 ?
11  67 000,00 ?
1   56 000,00 ?
2   340 000,00 ?
23  40 700,00 ?
\.


--
-- TOC entry 2882 (class 0 OID 16512)
-- Dependencies: 210
-- Data for Name: task_list; Type: TABLE DATA; Schema: schema; Owner: postgres
--

COPY schema.task_list (id_staff, id_task, reason_failure, mark_success) FROM
stdin;
4   5       выполнено
2   3   не получилось   не выполнено
4   5       выполнено
2   3   не получилось   не выполнено
6   4       в процессе
\.


--
-- TOC entry 2879 (class 0 OID 16446)
-- Dependencies: 207
```

```
-- Data for Name: tasks; Type: TABLE DATA; Schema: schema; Owner: postgres
--

COPY schema.tasks (id_task, date_endtask, mark_task, date_starttask, reason,
status_task, id_projects) FROM stdin;
1   2020-12-12      2019-12-12  не получилось ничего:(  Завершен    2
2   2020-12-12  отметка 2019-12-12  не получилось ничего:(  В процессе  6
3   2020-12-12      2019-12-12  не получилось ничего:(  Завершен    2
4   2020-12-12  отметка 2019-12-12  не получилось ничего:(  В процессе  6
5   2020-12-12      2019-12-12  не получилось ничего:(  Завершен    2
\.


--
-- TOC entry 2893 (class 0 OID 0)
-- Dependencies: 209
-- Name: control_id_control_seq; Type: SEQUENCE SET; Schema: schema; Owner:
postgres
--

SELECT pg_catalog.setval('schema.control_id_control_seq', 6, true);


--
-- TOC entry 2894 (class 0 OID 0)
-- Dependencies: 197
-- Name: customers_id_customers_seq; Type: SEQUENCE SET; Schema: schema; Owner:
postgres
--

SELECT pg_catalog.setval('schema.customers_id_customers_seq', 5, true);


--
-- TOC entry 2895 (class 0 OID 0)
-- Dependencies: 204
-- Name: department_id_dep_seq; Type: SEQUENCE SET; Schema: schema; Owner:
postgres
--

SELECT pg_catalog.setval('schema.department_id_dep_seq', 5, true);


--
-- TOC entry 2896 (class 0 OID 0)
-- Dependencies: 199
-- Name: projects_id_projects_seq; Type: SEQUENCE SET; Schema: schema; Owner:
postgres
--

SELECT pg_catalog.setval('schema.projects_id_projects_seq', 6, true);
```

```
--
-- TOC entry 2897 (class 0 OID 0)
-- Dependencies: 201
-- Name: staff_id_staff_seq; Type: SEQUENCE SET; Schema: schema; Owner: postgres
--

SELECT pg_catalog.setval('schema.staff_id_staff_seq', 6, true);


--
-- TOC entry 2898 (class 0 OID 0)
-- Dependencies: 206
-- Name: tasks_id_task_seq; Type: SEQUENCE SET; Schema: schema; Owner: postgres
--

SELECT pg_catalog.setval('schema.tasks_id_task_seq', 5, true);


--
-- TOC entry 2739 (class 2606 OID 16484)
-- Name: control control_pkey; Type: CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.control
    ADD CONSTRAINT control_pkey PRIMARY KEY (id_control);


--
-- TOC entry 2719 (class 2606 OID 16415)
-- Name: customers customers_pkey; Type: CONSTRAINT; Schema: schema; Owner:
postgres
--

ALTER TABLE ONLY schema.customers
    ADD CONSTRAINT customers_pkey PRIMARY KEY (id_customers);


--
-- TOC entry 2733 (class 2606 OID 16443)
-- Name: department department_pkey; Type: CONSTRAINT; Schema: schema; Owner:
postgres
--

ALTER TABLE ONLY schema.department
    ADD CONSTRAINT department_pkey PRIMARY KEY (id_dep);


--
-- TOC entry 2723 (class 2606 OID 16422)
```

```
-- Name: projects projects_pkey; Type: CONSTRAINT; Schema: schema; Owner:
postgres
--

ALTER TABLE ONLY schema.projects
    ADD CONSTRAINT projects_pkey PRIMARY KEY (id_projects);


--
-- TOC entry 2721 (class 2606 OID 16529)
-- Name: customers r10; Type: CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.customers
    ADD CONSTRAINT r10 UNIQUE (id_customers);


--
-- TOC entry 2725 (class 2606 OID 16531)
-- Name: projects r11; Type: CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.projects
    ADD CONSTRAINT r11 UNIQUE (id_projects);


--
-- TOC entry 2727 (class 2606 OID 16535)
-- Name: staff r13; Type: CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.staff
    ADD CONSTRAINT r13 UNIQUE (id_staff);


--
-- TOC entry 2735 (class 2606 OID 16537)
-- Name: department r14; Type: CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.department
    ADD CONSTRAINT r14 UNIQUE (id_dep);


--
-- TOC entry 2716 (class 2606 OID 16538)
-- Name: tasks r3; Type: CHECK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE schema.tasks
    ADD CONSTRAINT r3 CHECK ((date_starttask < date_endtask)) NOT VALID;
```

```
--
-- TOC entry 2714 (class 2606 OID 16532)
-- Name: projects r8; Type: CHECK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE schema.projects
    ADD CONSTRAINT r8 CHECK ((date_start < date_end)) NOT VALID;


--
-- TOC entry 2715 (class 2606 OID 16533)
-- Name: projects r9; Type: CHECK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE schema.projects
    ADD CONSTRAINT r9 CHECK ((date_start < date_realend)) NOT VALID;


--
-- TOC entry 2729 (class 2606 OID 16429)
-- Name: staff staff_pkey; Type: CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.staff
    ADD CONSTRAINT staff_pkey PRIMARY KEY (id_staff);


--
-- TOC entry 2731 (class 2606 OID 16436)
-- Name: staffing staffing_pkey; Type: CONSTRAINT; Schema: schema; Owner:
postgres
--

ALTER TABLE ONLY schema.staffing
    ADD CONSTRAINT staffing_pkey PRIMARY KEY ("position");


--
-- TOC entry 2737 (class 2606 OID 16453)
-- Name: tasks tasks_pkey; Type: CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.tasks
    ADD CONSTRAINT tasks_pkey PRIMARY KEY (id_task);


--
-- TOC entry 2746 (class 2606 OID 16518)
-- Name: task_list id_staff; Type: FK CONSTRAINT; Schema: schema; Owner: postgres
--
```

```
ALTER TABLE ONLY schema.task_list
    ADD CONSTRAINT id_staff FOREIGN KEY (id_staff) REFERENCES
schema.staff(id_staff) NOT VALID;


--
-- TOC entry 2747 (class 2606 OID 16523)
-- Name: task_list id_task; Type: FK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.task_list
    ADD CONSTRAINT id_task FOREIGN KEY (id_task) REFERENCES schema.tasks(id_task)
NOT VALID;


--
-- TOC entry 2742 (class 2606 OID 16462)
-- Name: staff r1; Type: FK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.staff
    ADD CONSTRAINT r1 FOREIGN KEY (id_dep) REFERENCES schema.department(id_dep)
NOT VALID;


--
-- TOC entry 2744 (class 2606 OID 16541)
-- Name: tasks r15; Type: FK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.tasks
    ADD CONSTRAINT r15 FOREIGN KEY (id_projects) REFERENCES
schema.projects(id_projects) NOT VALID;


--
-- TOC entry 2743 (class 2606 OID 16467)
-- Name: staff r2; Type: FK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.staff
    ADD CONSTRAINT r2 FOREIGN KEY ("position") REFERENCES
schema.staffing("position") NOT VALID;


--
-- TOC entry 2745 (class 2606 OID 16485)
-- Name: control r4; Type: FK CONSTRAINT; Schema: schema; Owner: postgres
--
```

```
ALTER TABLE ONLY schema.control
    ADD CONSTRAINT r4 FOREIGN KEY (id_task) REFERENCES schema.tasks(id_task) NOT
VALID;


--
-- TOC entry 2740 (class 2606 OID 16500)
-- Name: projects r6; Type: FK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.projects
    ADD CONSTRAINT r6 FOREIGN KEY (id_customers) REFERENCES
schema.customers(id_customers) NOT VALID;


--
-- TOC entry 2741 (class 2606 OID 16505)
-- Name: projects r7; Type: FK CONSTRAINT; Schema: schema; Owner: postgres
--

ALTER TABLE ONLY schema.projects
    ADD CONSTRAINT r7 FOREIGN KEY (id_staff) REFERENCES schema.staff(id_staff)
NOT VALID;


--
-- TOC entry 2890 (class 0 OID 0)
-- Dependencies: 8
-- Name: SCHEMA schema; Type: ACL; Schema: -; Owner: postgres
--

REVOKE ALL ON SCHEMA schema FROM postgres;
GRANT ALL ON SCHEMA schema TO postgres WITH GRANT OPTION;


--
-- TOC entry 1712 (class 826 OID 16397)
-- Name: DEFAULT PRIVILEGES FOR TABLES; Type: DEFAULT ACL; Schema: schema; Owner:
postgres
--

ALTER DEFAULT PRIVILEGES FOR ROLE postgres IN SCHEMA schema GRANT ALL ON
TABLES  TO postgres;


-- Completed on 2022-03-08 14:49:35

--
-- PostgreSQL database dump complete
--
```

Резервные копии и восстановление:

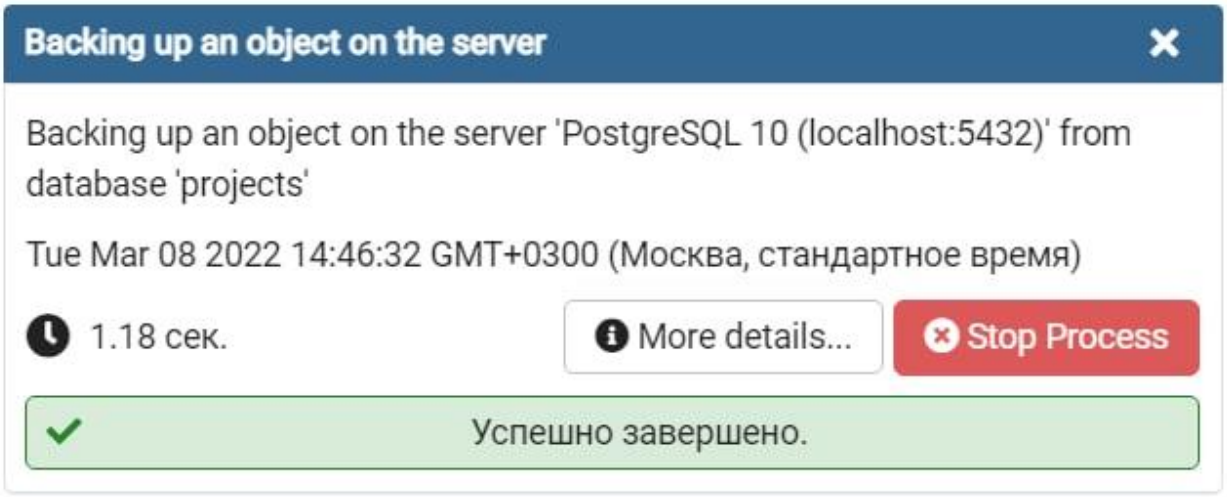

Рисунок 2 – Создание резервной копии в формате Custom

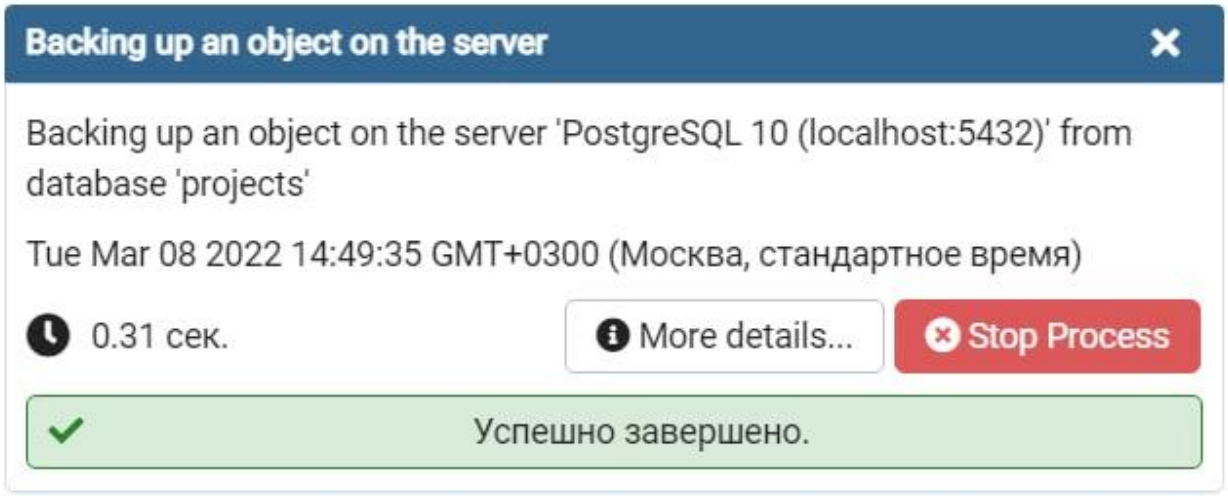

Рисунок 3 – Создание резервной копии в формате Plain

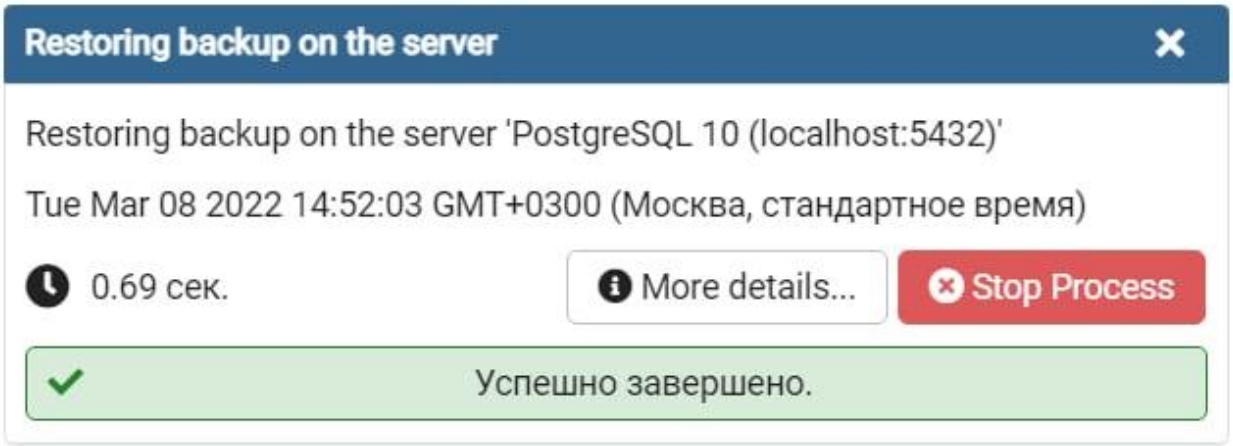

Рисунок 4 – Восстановление из резервной копии

Вывод: pdAdmin – отличная среда для создания баз данных и работы с ними. Мною была создана база данных на основе схемы, разработанной в прошлом семестре. Были созданы таблицы с первичными и внешними ключами, проверкой значений. Построена схема, аналогичная схеме, выполненной в ERwin Data Modeler. Кроме того, БД была заполнена данными, сделана ее резервная копия, проведена проверка восстановления из данной копии.