

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ
УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ

**«САНКТ-ПЕТЕРБУРГСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ
ТЕЛЕКОММУНИКАЦИЙ
им. проф. М.А. БОНЧ-БРУЕВИЧА» (СПбГУТ)**

Факультет Информационных технологий и программной инженерии
Кафедра Систем обработки данных

ОТЧЕТ

по практическому занятию №1

Тема: «Резервное копирование и восстановление»

Выполнил: студент 3 курса, гр. ИБ-31вп
Ворожцов А. Е.

Принял:

Медведев С. А.

Санкт-Петербург, 2025 г.

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Отчет по резервному копированию

Описание предметной области

База данных описывает результаты полевых опытов сельскохозяйственного института, который изучает влияние предшественников и режимов ухода за почвой на урожайность зерновых культур в Новосибирской области. Для каждой культуры фиксируются поле, год, агротехнические условия и урожай, что позволяет анализировать эффективность технологий и подбирать оптимальные схемы севаоборота. Система служит основой для отчетности, прогнозов и планирования ресурсов.

Схема базы данных

```
CREATE TABLE cultures (
    id SERIAL PRIMARY KEY,
    name TEXT UNIQUE
);

CREATE TABLE predecessors (
    id SERIAL PRIMARY KEY,
    name TEXT UNIQUE
);

CREATE TABLE conditions (
    id SERIAL PRIMARY KEY,
    name TEXT UNIQUE
);

CREATE TABLE experiments (
    id SERIAL PRIMARY KEY,
    year INT,
    field INT,
    culture_id INT REFERENCES cultures(id),
    predecessor_id INT REFERENCES predecessors(id),
    condition_id INT REFERENCES conditions(id),
    yield NUMERIC(5,2)
);
```

Примеры запросов на вставку данных

```
INSERT INTO cultures (name) VALUES ('Горох'), ('Овёс'), ('Пшеница'), ('Ячмень');
INSERT INTO predecessors (name) VALUES ('Овёс'), ('Пар'), ('Пшеница'), ('Ячмень');
INSERT INTO conditions (name) VALUES ('Без травы'), ('С травой');
INSERT INTO experiments (year, field, culture_id, predecessor_id, condition_id, yield)
VALUES (2015, 1, 1, 1, 2, 19.10),
       (2015, 1, 4, 2, 1, 31.80),
       (2015, 2, 4, 1, 2, 22.00),
```

(2015, 2, 1, 4, 2, 16.00);

Ход экспериментов по резервному копированию

Последовательный запуск `make run_all` выполняет сборку контейнера, все варианты резервного копирования и восстановление данных. Ниже приведен полный вывод, начиная с шага «Делаем резервное копирование данных в формате `custom`».

Резервное копирование в формате `custom`

```
/Applications/Xcode.app/Contents/Developer/usr/bin/make build
docker compose down -v && docker compose up -d --build
[+] Running 3/3
✓ Container postgres-db1    Removed
  ↵ 0.1s
✓ Volume 1_backup_pgdata1  Removed
  ↵ 0.0s
✓ Network 1_backup_default Removed
  ↵ 0.2s
[+] Building 2.9s (10/10) FINISHED
=> [internal] load local bake definitions
  ↵ 0.0s
=> => reading from stdin 525B
  ↵ 0.0s
=> [internal] load build definition from Dockerfile
  ↵ 0.0s
=> => transferring dockerfile: 188B
  ↵ 0.0s
=> [internal] load metadata for docker.io/library/postgres:18.0-alpine
  ↵ 2.7s
=> [auth] library/postgres:pull token for registry-1.docker.io
  ↵ 0.0s
=> [internal] load .dockerignore
  ↵ 0.0s
=> => transferring context: 2B
  ↵ 0.0s
=> [internal] load build context
  ↵ 0.0s
=> => transferring context: 174B
  ↵ 0.0s
=> [1/2] FROM docker.io/library/postgres:18.0-alpine@sha256:48c8ad3a7284b82be4482a ]
  ↵ 52076d47d879fd6fb084a1cbfccbd551f9331b0e40          0.0s
=> => resolve docker.io/library/postgres:18.0-alpine@sha256:48c8ad3a7284b82be4482a ]
  ↵ 52076d47d879fd6fb084a1cbfccbd551f9331b0e40          0.0s
=> CACHED [2/2] COPY init/ /docker-entrypoint-initdb.d/
  ↵ 0.0s
```

```

=> exporting to image
  ↵ 0.0s
=> => exporting layers
  ↵ 0.0s
=> => exporting manifest
  ↵ sha256:14aa4934d3a2289ffac6ced2ff600abd3b425f643af013b0a9cd55cb858a7d7a
  ↵ 0.0s
=> => exporting config
  ↵ sha256:5be411ff2c7ab27bbce4e5dce2d69a6a94aa0a68b9c608140aab8e70289c23c
  ↵ 0.0s
=> => exporting attestation manifest
  ↵ sha256:825ba994a161a134726b838f251ce44c4f76be35c05c8b3b550bd464a4366b1a
  ↵ 0.0s
=> => exporting manifest list
  ↵ sha256:38b78d4987957f41ffff507e62d22f0f75ed52de6932ee7232e05a3a0b2fbb54
  ↵ 0.0s
=> => naming to docker.io/library/1_backup-db1:latest
  ↵ 0.0s
=> => unpacking to docker.io/library/1_backup-db1:latest
  ↵ 0.0s
=> resolving provenance for metadata file
  ↵ 0.0s
[+] Running 4/4
✓ 1_backup-db1          Built
  ↵ 0.0s
✓ Network 1_backup_default Created
  ↵ 0.0s
✓ Volume 1_backup_pgdata1 Created
  ↵ 0.0s
✓ Container postgres-db1 Started
  ↵ 0.1s
/Applications/Xcode.app/Contents/Developer/usr/bin/make 1_backup_custom
./scripts/backup_custom.sh db1_custom.dump
Waiting for db1 to become ready...
Writing custom-format backup to
  ↵ /Users/ami/source/manipulate/1_BACKUP/backups/db1_custom.dump
Backup completed.

```

Проверка и изменение данных перед восстановлением

```

/Applications/Xcode.app/Contents/Developer/usr/bin/make 7_show_update_experiment
./scripts/show_update_experiment.sh
Waiting for db1 to become ready...
BEGIN
 id | year | field | culture_id | predecessor_id | condition_id | yield
---+-----+-----+-----+-----+-----+
 14 | 2015 |    7 |        3 |         3 |         1 |   28.30

```

```
(1 row)
UPDATE 1
+-----+
| id | year | field | culture_id | predecessor_id | condition_id | yield |
+-----+
| 14 | 2025 |    7 |         3 |             3 |           1 |   28.30 |
+-----+
(1 row)
```

Восстановление и проверка результата

```
COMMIT
/Applications/Xcode.app/Contents/Developer/usr/bin/make 2_restore_custom
./scripts/restore_custom.sh ./backups/db1_custom.dump
Waiting for db1 to become ready...
Restoring db1 from ./backups/db1_custom.dump
Restore completed.
/Applications/Xcode.app/Contents/Developer/usr/bin/make 8_show_experiment
./scripts/show_experiment.sh
Waiting for db1 to become ready...
+-----+
| id | year | field | culture_id | predecessor_id | condition_id | yield |
+-----+
| 14 | 2015 |    7 |         3 |             3 |           1 |   28.30 |
+-----+
(1 row)
```

Plain-бэкапы с различными Section

```
/Applications/Xcode.app/Contents/Developer/usr/bin/make 3_backup_sections
./scripts/backup_plain_sections.sh
Waiting for db1 to become ready...
Dumping pre-data section
Dumping data section
Dumping post-data section
Section-specific backups are stored in
↳ /Users/ami/source/manipulate/1_BACKUP/backups/plain_sections
/Applications/Xcode.app/Contents/Developer/usr/bin/make 3_sections_pre
./scripts/backup_plain_sections.sh pre-data
Waiting for db1 to become ready...
Dumping pre-data section
Section-specific backups are stored in
↳ /Users/ami/source/manipulate/1_BACKUP/backups/plain_sections
/Applications/Xcode.app/Contents/Developer/usr/bin/make 3_sections_data
./scripts/backup_plain_sections.sh data
Waiting for db1 to become ready...
Dumping data section
Section-specific backups are stored in
↳ /Users/ami/source/manipulate/1_BACKUP/backups/plain_sections
/Applications/Xcode.app/Contents/Developer/usr/bin/make 3_sections_post
./scripts/backup_plain_sections.sh post-data
```

```
Waiting for db1 to become ready...
Dumping post-data section
Section-specific backups are stored in
↳ /Users/ami/source/manipulate/1_BACKUP/backups/plain_sections
/Applications/Xcode.app/Contents/Developer/usr/bin/make 4_backup_types
```

Проверка влияния настроек Type of objects

```
./scripts/backup_plain_types.sh
Waiting for db1 to become ready...
Dumping schema-only script
Dumping data-only script
Type-specific backups are stored in
↳ /Users/ami/source/manipulate/1_BACKUP/backups/plain_types
/Applications/Xcode.app/Contents/Developer/usr/bin/make 4_type_schema
./scripts/backup_plain_types.sh schema
Waiting for db1 to become ready...
Dumping schema-only script
Type-specific backups are stored in
↳ /Users/ami/source/manipulate/1_BACKUP/backups/plain_types
/Applications/Xcode.app/Contents/Developer/usr/bin/make 4_type_data
./scripts/backup_plain_types.sh data
Waiting for db1 to become ready...
Dumping data-only script
Type-specific backups are stored in
↳ /Users/ami/source/manipulate/1_BACKUP/backups/plain_types
```

Резервная копия в формате Directory и восстановление

```
/Applications/Xcode.app/Contents/Developer/usr/bin/make 5_backup_directory
./scripts/backup_directory.sh
Waiting for db1 to become ready...
Creating directory-format backup at /Users/ami/source/manipulate/1_BACKUP/backups/d_
↳ irectory/db1_directory_20251103_194226
[+] Copying 1/1
✓ postgres-db1 copy postgres-db1:/tmp/db1_directory_20251103_194226 to /Users/ami/_j
↳  source/manipulate/1_BACKUP/backups/directory/db1_directory_20251103_194226
↳  Copied0.0s
Directory backup stored at /Users/ami/source/manipulate/1_BACKUP/backups/directory/_j
↳  db1_directory_20251103_194226
/Applications/Xcode.app/Contents/Developer/usr/bin/make 6_restore_directory
./scripts/restore_directory.sh
Using latest directory backup: /Users/ami/source/manipulate/1_BACKUP/backups/direct_
↳  ory/db1_directory_20251103_194226
Waiting for db1 to become ready...
Copying /Users/ami/source/manipulate/1_BACKUP/backups/directory/db1_directory_20251_
↳  103_194226 into container path /tmp/db1_directory_20251103_194226
```

```
[+] Copying 1/1
✓ postgres-db1 copy /Users/ami/source/manipulate/1_BACKUP/backups/directory/db1_directory_20251103_194226 to postgres-db1:/tmp/db1_directory_20251103_194226
    ↵ Copied 0.0s
Restoring db1 from directory backup
Directory restore completed.
```