Министерство образования и науки Российской Федерации

Севастопольский государственный университет

Кафедра ИС

Отчёт

По лабораторной работе № 3

Исследование процессов построения информационных моделей в системе управления базами данных PostgreSQL

Выполнил: ст. гр. ИС/б-31-о

Куркчи А. Э.

Проверил:

Тимофеев И.С.

Севастополь

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1.Цель работы

Изучение возможностей и условий применения СУБД, реализующих поддержку пространственных данных на примере PostgreSQL. Построение физический модели БД.

2.Постановка задачи

1. Преобразовать/создать разработанную в MySQL базу данных в СУБД PostgreSQL.

2. Дополнить разработанную БД пространственными данными.

3. Произвести сравнительный анализ СУБД MySQL и PostgreSQL.

3. Выполнение

Разработанная под MySQL БД была преобразована под PostgreSQL. При этом таблица «студент» была дополнена пространственными данными, а именно «географическое положение».

Сравнительный анализ СУБД MySQL и PostgreSQL

Производительность

Обе базы имеют различные технологии для улучшения производительности. Исторически так сложилось, что MySQL начинала разрабатываться с прицелом на скорость, а PostgreSQL с самого начала разрабатывалась как база с большим числом настроек и соответствием стандарту. PostgreSQL имеет ряд настроек, которые повышают скорость доступа: парциальные индексы, компрессия данных, выделение памяти, улучшенный кеш.

Компрессия

PostgreSQL лучше сжимает и разжимает данные, позволяя сохранить больше данных на дисковом пространстве. При этом компрессионные данные читаются быстрее с диска.

MySQL-компрессия для разных движков частично поддерживается, частично нет, и это зависит от конкретной версии конкретного движка.

Типы данных

PostgreSQL: поддерживает механизм пользовательских данных, геометрические типы. Обьектно-реляционное расширение: структура таблицы может быть унаследована от другой таблицы.

Прочееу

На мультипроцессорности PostgreSQL имеет преимущество над MySQL.

MySQL: в таблице может быть только один столбец с автоинкрементном, который должен быть проиндексирован. PostgreSQL: SERIAL data type.

Вложенные запросы в MySQL могут работать непроизводительно.

4.Текст программы

DROP TABLE IF EXISTS "public"."attendance";

CREATE TABLE "public"."attendance" (

"id" int8 NOT NULL,

"student\_id" int8 NOT NULL,

"class\_id" int8 NOT NULL,

"mark" int8,

"presence" int2 NOT NULL,

"reason" varchar(255) COLLATE "default",

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."attendance" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."cathedra";

CREATE TABLE "public"."cathedra" (

"id" int8 NOT NULL,

"name" varchar(255) NOT NULL COLLATE "default",

"institute\_id" int8 NOT NULL,

"site" varchar(255) COLLATE "default",

"email" varchar(255) COLLATE "default",

"phone" varchar(255) COLLATE "default",

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."cathedra" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."cathedra\_teacher";

CREATE TABLE "public"."cathedra\_teacher" (

"cathedra\_id" int8 NOT NULL,

"teacher\_id" int8 NOT NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."cathedra\_teacher" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."certificate";

CREATE TABLE "public"."certificate" (

"id" int8 NOT NULL,

"student\_id" int8 NOT NULL,

"date\_from" date NOT NULL,

"date\_to" date NOT NULL,

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."certificate" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."class";

CREATE TABLE "public"."class" (

"id" int8 NOT NULL,

"discipline\_id" int8 NOT NULL,

"teacher\_id" int8,

"group\_id" int8 NOT NULL,

"location" varchar(255) COLLATE "default",

"date" timestamp(6) NULL,

"duration" time(6) NOT NULL,

"type" varchar(255) NOT NULL COLLATE "default",

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."class" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."discipline";

CREATE TABLE "public"."discipline" (

"id" int8 NOT NULL,

"name" varchar(64) COLLATE "default",

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."discipline" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."discipline\_teacher";

CREATE TABLE "public"."discipline\_teacher" (

"discipline\_id" int8 NOT NULL,

"teacher\_id" int8 NOT NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."discipline\_teacher" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."group";

CREATE TABLE "public"."group" (

"id" int8 NOT NULL,

"name" varchar(64) NOT NULL COLLATE "default",

"course" int4,

"cathedra\_id" int8,

"steward\_id" int8,

"super\_id" int8,

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."group" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."group\_student";

CREATE TABLE "public"."group\_student" (

"group\_id" int8 NOT NULL,

"student\_id" int8 NOT NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."group\_student" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."institute";

CREATE TABLE "public"."institute" (

"id" int8 NOT NULL,

"name" varchar(255) NOT NULL COLLATE "default",

"university\_id" int8 NOT NULL,

"site" varchar(255) COLLATE "default",

"email" varchar(255) COLLATE "default",

"phone" varchar(255) COLLATE "default",

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."institute" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."student";

CREATE TABLE "public"."student" (

"id" int8 NOT NULL,

"name" varchar(255) NOT NULL COLLATE "default",

"address" varchar(255) COLLATE "default",

"email" varchar(255) COLLATE "default",

"phone" varchar(255) COLLATE "default",

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL,

"coordinates" "public"."geometry"

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."student" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."teacher";

CREATE TABLE "public"."teacher" (

"id" int8 NOT NULL,

"name" varchar(255) NOT NULL COLLATE "default",

"email" varchar(255) COLLATE "default",

"phone" varchar(255) COLLATE "default",

"address" varchar(255) COLLATE "default",

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."teacher" OWNER TO "justnero";

DROP TABLE IF EXISTS "public"."university";

CREATE TABLE "public"."university" (

"id" int8 NOT NULL,

"name" varchar(255) NOT NULL COLLATE "default",

"address" varchar(255) COLLATE "default",

"site" varchar(255) COLLATE "default",

"email" varchar(255) COLLATE "default",

"phone" varchar(255) COLLATE "default",

"created\_at" timestamp(6) NULL,

"updated\_at" timestamp(6) NULL,

"deleted\_at" timestamp(6) NULL

)

WITH (OIDS=FALSE);

ALTER TABLE "public"."university" OWNER TO "justnero";

ALTER TABLE "public"."attendance" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "attendance\_class\_id\_fk" ON "public"."attendance" USING btree(class\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

CREATE INDEX "attendance\_student\_id\_fk" ON "public"."attendance" USING btree(student\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."cathedra" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "cathedra\_institute\_id\_fk" ON "public"."cathedra" USING btree(institute\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."cathedra\_teacher" ADD PRIMARY KEY ("cathedra\_id", "teacher\_id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "cathedra\_teacher\_teacher\_id\_fk" ON "public"."cathedra\_teacher" USING btree(teacher\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."certificate" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "certificate\_student\_id\_fk" ON "public"."certificate" USING btree(student\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."class" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "class\_discipline\_id\_fk" ON "public"."class" USING btree(discipline\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

CREATE INDEX "class\_group\_id\_fk" ON "public"."class" USING btree(group\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

CREATE INDEX "class\_teacher\_id\_fk" ON "public"."class" USING btree(teacher\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."discipline" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."discipline\_teacher" ADD PRIMARY KEY ("discipline\_id", "teacher\_id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "discipline\_teacher\_teacher\_id\_fk" ON "public"."discipline\_teacher" USING btree(teacher\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."group" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "group\_cathedra\_id\_fk" ON "public"."group" USING btree(cathedra\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

CREATE INDEX "group\_group\_id\_fk" ON "public"."group" USING btree(super\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

CREATE INDEX "group\_student\_id\_fk" ON "public"."group" USING btree(steward\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."group\_student" ADD PRIMARY KEY ("group\_id", "student\_id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "group\_student\_student\_id\_fk" ON "public"."group\_student" USING btree(student\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."institute" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE INDEX "institute\_university\_id\_fk" ON "public"."institute" USING btree(university\_id "pg\_catalog"."int8\_ops" ASC NULLS LAST);

ALTER TABLE "public"."student" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."teacher" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."university" ADD PRIMARY KEY ("id") NOT DEFERRABLE INITIALLY IMMEDIATE;

CREATE UNIQUE INDEX "university\_name\_uindex" ON "public"."university" USING btree("name" COLLATE "default" "pg\_catalog"."text\_ops" ASC NULLS LAST);

ALTER TABLE "public"."attendance" ADD CONSTRAINT "attendance\_class\_id\_fk" FOREIGN KEY ("class\_id") REFERENCES "public"."class" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."attendance" ADD CONSTRAINT "attendance\_student\_id\_fk" FOREIGN KEY ("student\_id") REFERENCES "public"."student" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."cathedra" ADD CONSTRAINT "cathedra\_institute\_id\_fk" FOREIGN KEY ("institute\_id") REFERENCES "public"."institute" ("id") ON UPDATE NO ACTION ON DELETE NO ACTION NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."cathedra\_teacher" ADD CONSTRAINT "cathedra\_teacher\_cathedra\_id\_fk" FOREIGN KEY ("cathedra\_id") REFERENCES "public"."cathedra" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."cathedra\_teacher" ADD CONSTRAINT "cathedra\_teacher\_teacher\_id\_fk" FOREIGN KEY ("teacher\_id") REFERENCES "public"."teacher" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."certificate" ADD CONSTRAINT "certificate\_student\_id\_fk" FOREIGN KEY ("student\_id") REFERENCES "public"."student" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."class" ADD CONSTRAINT "class\_discipline\_id\_fk" FOREIGN KEY ("discipline\_id") REFERENCES "public"."discipline" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."class" ADD CONSTRAINT "class\_group\_id\_fk" FOREIGN KEY ("group\_id") REFERENCES "public"."group" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."class" ADD CONSTRAINT "class\_teacher\_id\_fk" FOREIGN KEY ("teacher\_id") REFERENCES "public"."teacher" ("id") ON UPDATE CASCADE ON DELETE SET NULL NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."discipline\_teacher" ADD CONSTRAINT "discipline\_teacher\_discipline\_id\_fk" FOREIGN KEY ("discipline\_id") REFERENCES "public"."discipline" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."discipline\_teacher" ADD CONSTRAINT "discipline\_teacher\_teacher\_id\_fk" FOREIGN KEY ("teacher\_id") REFERENCES "public"."teacher" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."group" ADD CONSTRAINT "group\_cathedra\_id\_fk" FOREIGN KEY ("cathedra\_id") REFERENCES "public"."cathedra" ("id") ON UPDATE CASCADE ON DELETE SET NULL NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."group" ADD CONSTRAINT "group\_group\_id\_fk" FOREIGN KEY ("super\_id") REFERENCES "public"."group" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."group" ADD CONSTRAINT "group\_student\_id\_fk" FOREIGN KEY ("steward\_id") REFERENCES "public"."student" ("id") ON UPDATE CASCADE ON DELETE SET NULL NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."group\_student" ADD CONSTRAINT "group\_student\_group\_id\_fk" FOREIGN KEY ("group\_id") REFERENCES "public"."group" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."group\_student" ADD CONSTRAINT "group\_student\_student\_id\_fk" FOREIGN KEY ("student\_id") REFERENCES "public"."student" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

ALTER TABLE "public"."institute" ADD CONSTRAINT "institute\_university\_id\_fk" FOREIGN KEY ("university\_id") REFERENCES "public"."university" ("id") ON UPDATE CASCADE ON DELETE CASCADE NOT DEFERRABLE INITIALLY IMMEDIATE;

Выводы

В ходе лабораторной работы была изучены возможности и условия применения СУБД, реализующих поддержку пространственных данных на примере PostgreSQL. Построена физическая модель БД. Проведен сравнительный анализ СУБД MySQL и PostgreSQL.