Remote Execution System

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System zdalnego wykonywanie kodu na klastrach obliczeniowych.

Oprogramowanie

- SQLite 3
- Linux kernel
- Arch Linux
- KDE

Moduły

Moduly projektu z odpowiadajacymi tabelami.

> obsluga uzytkownikow [users]

> zadania [jobs]

> aplikacje [apps]

> rozno-architekturowe multiprocesory [workers, archs]

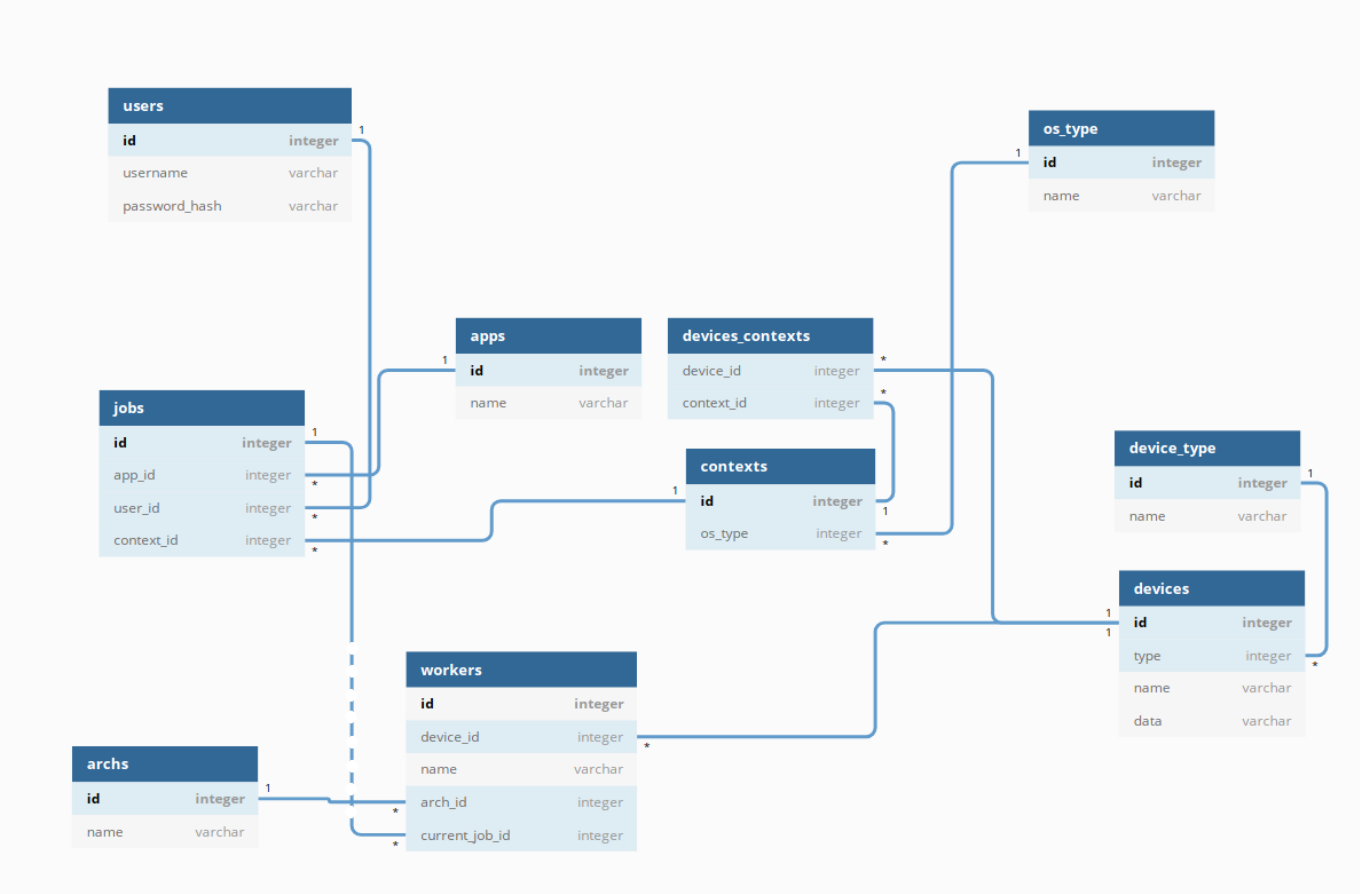
> systemy operacyjne [os_type]

> dynamiczne konteksty zadan [context]

> urzadzenia [devieces. device_contexts, device_type]

Diagram

Diagram tabel z relacjami



DBML

```
table users {
    id              integer [pk, unique]
    username        varchar [unique,
    ...
```

more...

SQL Create

```
CREATE TABLE "users" (
  "id" integer UNIQUE PRIMARY KEY,
  "username" varchar UNIQUE NOT NULL,
  ...
```

more...

SQL Init

```
INSERT INTO archs (id, name) VALUES (1, 'i386');
INSERT INTO archs (id, name) VALUES (2, 'x64');
```

```
INSERT INTO archs (id, name) VALUES (3, 'arm64');
...
```

more...

Examples

Create user

```
INSERT INTO users (username, password_hash) VALUES ('will',
'006dc90467376b911362b82b0933388f075670b48d13f5bffdace5c88694676e');
INSERT INTO users (username, password_hash) VALUES ('tommy',
'e6fe09b9a125c5e31344f42f2df1156adfa00b32ca490f532cc38e5fb461c6b7');
```

Add applications

```
INSERT INTO apps (name, description) VALUES ('git', 'Fast distributed version
control system');
INSERT INTO apps (name, description) VALUES ('csc', 'C# .NET Compiler
Platform');
INSERT INTO apps (name, description) VALUES ('gcc', 'GNU Collection Compiler');
INSERT INTO apps (name, description) VALUES ('make', 'GNU make');
```

Add devices

CPUs (as workers)

```
INSERT INTO devices (type, name) VALUES (1, 'CPU#1');
INSERT INTO devices (type, name) VALUES (1, 'CPU#2');
INSERT INTO devices (type, name) VALUES (1, 'CPU#3');
INSERT INTO devices (type, name) VALUES (1, 'CPU#4');
INSERT INTO devices (type, name) VALUES (1, 'CPU#5');
INSERT INTO devices (type, name) VALUES (1, 'CPU#6');
INSERT INTO devices (type, name) VALUES (1, 'CPU#7');
INSERT INTO devices (type, name) VALUES (1, 'CPU#8');
INSERT INTO devices (type, name) VALUES (1, 'CPU#9');
INSERT INTO devices (type, name) VALUES (1, 'CPU#10');
INSERT INTO devices (type, name) VALUES (1, 'CPU#11');
INSERT INTO devices (type, name) VALUES (1, 'CPU#12');
INSERT INTO devices (type, name) VALUES (1, 'CPU#13');
INSERT INTO devices (type, name) VALUES (1, 'CPU#14');
INSERT INTO devices (type, name) VALUES (1, 'CPU#15');
```

```
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (1,
1, 'CPU#1', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (2,
2, 'CPU#2', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (3,
3, 'CPU#3', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (4,
4, 'CPU#4', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (5,
5, 'CPU#5', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (6,
6, 'CPU#6', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (7,
7, 'CPU#7', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (8,
8, 'CPU#8', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (9,
9, 'CPU#9', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (10,
10, 'CPU#10', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (11,
11, 'CPU#11', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (12,
12, 'CPU#12', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (13,
13, 'CPU#13', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (14,
14, 'CPU#14', 2, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES (15,
15, 'CPU#15', 2, NULL);
```

Memory

```
INSERT INTO devices (type, name) VALUES (2, 'BANK#0');
INSERT INTO devices (type, name) VALUES (2, 'BANK#1');
INSERT INTO devices (type, name) VALUES (2, 'BANK#2');
INSERT INTO devices (type, name) VALUES (2, 'BANK#3');
INSERT INTO devices (type, name) VALUES (2, 'BANK#4');
INSERT INTO devices (type, name) VALUES (2, 'BANK#5');
INSERT INTO devices (type, name) VALUES (2, 'BANK#6');
INSERT INTO devices (type, name) VALUES (2, 'BANK#7');
```

Storage

```
INSERT INTO devices (type, name, data) VALUES (3, 'STORAGE#0', 'Type: SSD');
INSERT INTO devices (type, name, data) VALUES (3, 'STORAGE#1', 'Type: SSD');
```

```
INSERT INTO devices (type, name, data) VALUES (3, 'STORAGE#2', 'Type: SSD');
INSERT INTO devices (type, name, data) VALUES (3, 'STORAGE#3', 'Type: SSD');
INSERT INTO devices (type, name, data) VALUES (3, 'STORAGE#4', 'Type: HDD');
INSERT INTO devices (type, name, data) VALUES (3, 'STORAGE#5', 'Type: HDD');
INSERT INTO devices (type, name, data) VALUES (3, 'STORAGE#6', 'Type: HDD');
INSERT INTO devices (type, name, data) VALUES (3, 'STORAGE#7', 'Type: HDD');
```

GPU (as workers)

```
INSERT INTO devices (type, name, data) VALUES (5, 'GPU#0', 'CPUID: nVidia,
Arch: Kepler');
INSERT INTO devices (type, name, data) VALUES (5, 'GPU#1', 'CPUID: nVidia,
Arch: Kepler');
INSERT INTO devices (type, name, data) VALUES (5, 'GPU#2', 'CPUID: nVidia,
Arch: Kepler');
INSERT INTO devices (type, name, data) VALUES (5, 'GPU#3', 'CPUID: nVidia,
Arch: Kepler');
INSERT INTO devices (type, name, data) VALUES (5, 'GPU#4', 'CPUID: nVidia,
Arch: Kepler');
INSERT INTO devices (type, name, data) VALUES (5, 'GPU#5', 'CPUID: nVidia,
Arch: Kepler');
INSERT INTO devices (type, name, data) VALUES (5, 'GPU#6', 'CPUID: nVidia,
Arch: Kepler');
INSERT INTO devices (type, name, data) VALUES (5, 'GPU#7', 'CPUID: nVidia,
Arch: Kepler');


INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES
(1000, 16, 'SIMD#0', 9, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES
(1001, 17, 'SIMD#1', 9, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES
(1002, 18, 'SIMD#2', 9, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES
(1003, 19, 'SIMD#3', 9, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES
(1004, 20, 'SIMD#3', 9, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES
(1005, 21, 'SIMD#5', 9, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES
(1006, 22, 'SIMD#6', 9, NULL);
INSERT INTO workers (id, device_id, name, arch_id, current_job_id) VALUES
(1007, 23, 'SIMD#7', 9, NULL);
```

Create job

Create execution context

```
INSERT INTO contexts (id, os_type) VALUES (1, ( SELECT id from os_type where
name = 'linux'));
```

Bind free memory to context

```
INSERT INTO devices_contexts VALUES( (select id from devices
WHERE type = (select id from device_type where name='memory')
    AND id NOT IN (select device_id from devices_contexts) LIMIT 1), 1);
```

Create jobs

```
INSERT INTO jobs (id, app_id, user_id, context_id)
VALUES (1,
 (select id from apps where name='git'),
 (select id from users where username='will'), 1);

INSERT INTO jobs (id, app_id, user_id, context_id)
VALUES (2,
 (select id from apps where name='csc'),
 (select id from users where username='will'), 1);

INSERT INTO jobs (id, app_id, user_id, context_id)
VALUES (3,
 (select id from apps where name='csc'),
 (select id from users where username='tommy'), 1);
```

Run jobs on free worker

```
UPDATE workers
SET current_job_id = 1
where
    id = (select id from workers where arch_id = 2 AND current_job_id IS NULL
LIMIT 1);
INSERT INTO devices_contexts VALUES ( (SELECT id from workers where
current_job_id = 1), 1);


UPDATE workers
SET current_job_id = 3
where
    id = (select id from workers where arch_id = 2 AND current_job_id IS NULL
```

```
LIMIT 1);
INSERT INTO devices_contexts VALUES ( (SELECT id from workers where
current_job_id = 2), 1);



UPDATE workers
SET current_job_id = 2
where
    id = (select id from workers where arch_id = 2 AND current_job_id IS NULL
LIMIT 1);
INSERT INTO devices_contexts VALUES ( (SELECT id from workers where
current_job_id = 3), 1);
```

Show jobs

```
select contexts.id, jobs.id, username, apps.name, apps.description
from jobs
left join users on user_id = users.id
left join apps on app_id = apps.id
left join contexts on jobs.context_id = contexts.id;
```

Show devices by context

```
select  devices.name, device_type.name
from contexts
left join devices_contexts on devices_contexts.context_id = contexts.id
left join devices on devices.id = device_id
left join device_type on devices.type = device_type.id
where contexts.id = 1;
```