

Part 1

Question 1:

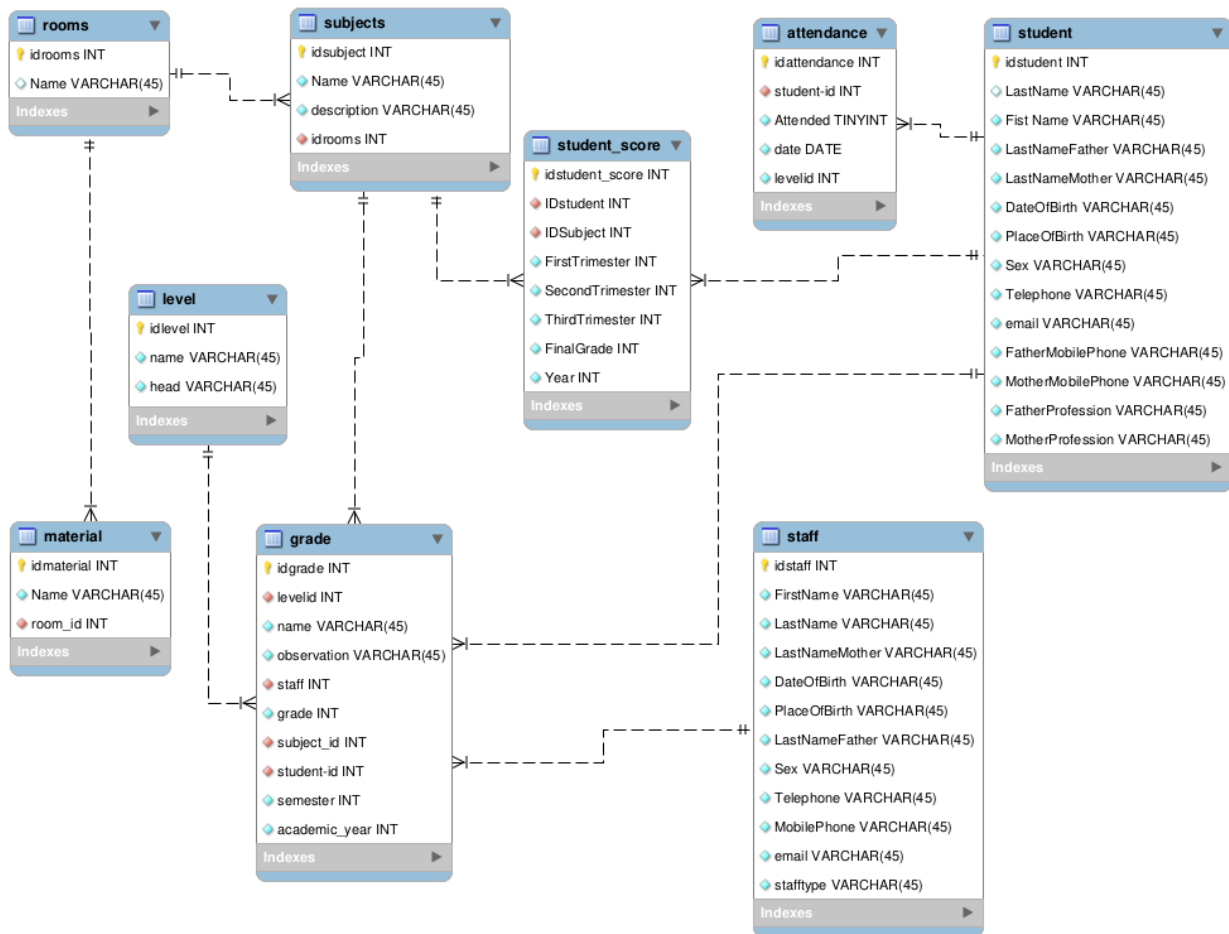
Below is the list of all the entities that we have identified:

- 1. Students**
Keeps information about the students (firstname, last name, etc..)
- 2. Staff**
Keeps information about the staff(firstname, last name, etc..)
- 3. Rooms**
Keeps information about the rooms available at the school
- 4. Levels**
Keeps information about possible levels for students
- 5. Material**
Keeps information about the school material (tables, boards, etc..)
- 6. Grade**
Store information about the student's grade
- 7. Attendance**
Stores data about student attendance
- 8. Subjects**
Keeps information about the subjects taught at the school
- 9. Student_score**
Store data about students' grade per semester

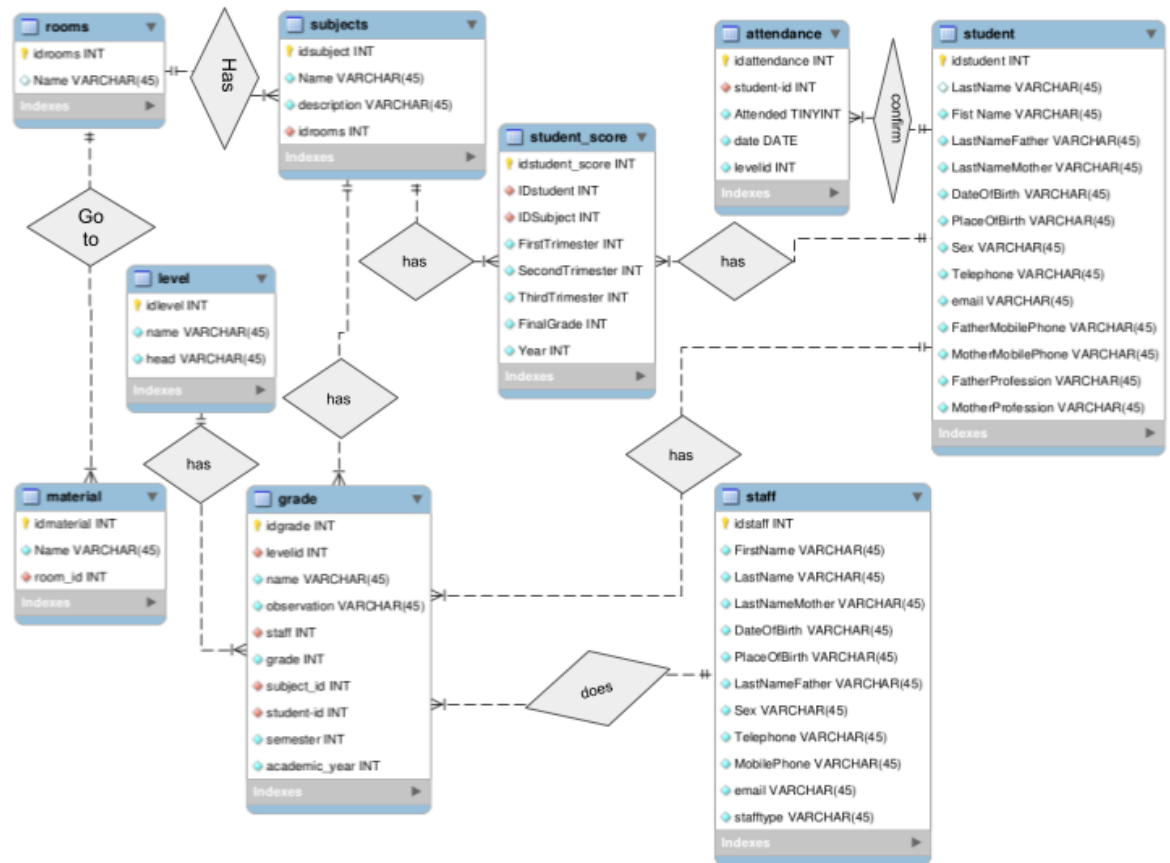
Question 2:

The below ERD has the information about the **attributes**, and **their connection through foreign keys**

- 1. EERD**



2. ERD



Question 3:

Granting privileges

We create 3 types of privileges, one with **data** access privileges, one with **data+structure** privileges and the last one with **data+structure+administration**

See below

```
# Privileges for `kolo`@`localhost`
```

```
GRANT SELECT, INSERT, UPDATE, DELETE, FILE, DELETE HISTORY ON *.* TO  
'kolo'@'localhost' IDENTIFIED BY PASSWORD  
'*5D6B75A7B9CE96BA347A1CDD3DDDF6CC53E5D0BBB';
```

```
GRANT SELECT, INSERT, UPDATE, DELETE, CREATE, DROP, REFERENCES, INDEX,  
ALTER, CREATE TEMPORARY TABLES, LOCK TABLES, EXECUTE, CREATE VIEW,  
SHOW VIEW, CREATE ROUTINE, ALTER ROUTINE, EVENT, TRIGGER ON `school_db`.*  
TO 'kolo'@'localhost';
```

```
# Privileges for `paul`@`localhost`
```

```
GRANT ALL PRIVILEGES ON *.* TO 'paul'@'localhost' IDENTIFIED BY PASSWORD  
'*5D6B75A7B9CE96BA347A1CDD3DDF6CC53E5D0BBB' WITH GRANT OPTION;
```

```
GRANT SELECT, INSERT, UPDATE, DELETE, CREATE, DROP, REFERENCES, INDEX,  
ALTER, CREATE TEMPORARY TABLES, LOCK TABLES, EXECUTE, CREATE VIEW,  
SHOW VIEW, CREATE ROUTINE, ALTER ROUTINE, EVENT, TRIGGER ON `school_db`.*  
TO 'paul'@'localhost';
```

```
# Privileges for `samuel`@`localhost`
```

```
GRANT SELECT, INSERT, UPDATE, DELETE, CREATE, DROP, FILE, INDEX, ALTER,  
CREATE TEMPORARY TABLES, EXECUTE, CREATE VIEW, SHOW VIEW, CREATE  
ROUTINE, ALTER ROUTINE, EVENT, TRIGGER, DELETE HISTORY ON *.* TO  
'samuel'@'localhost' IDENTIFIED BY PASSWORD  
'*5D6B75A7B9CE96BA347A1CDD3DDF6CC53E5D0BBB';
```

```
GRANT SELECT, INSERT, UPDATE, DELETE, CREATE, DROP, REFERENCES, INDEX,  
ALTER, CREATE TEMPORARY TABLES, LOCK TABLES, EXECUTE, CREATE VIEW,  
SHOW VIEW, CREATE ROUTINE, ALTER ROUTINE, EVENT, TRIGGER ON `school_db`.*  
TO 'samuel'@'localhost';
```

Link to the database

You will find the sql implementation of the ERD attached in the zip folder.

Below in the link to the database.

<https://paiza.io/projects/CQvxRAVZhFBGuIzjdeP9sw?language=mysql>

PART 2

We have uploaded the data in our mongodb database, using the below command

```
soro@soro-HP-Laptop-15-bs0xx:~/Desktop$ mongoimport -d AD_database -c scripts --type csv --file scripts.csv --headerline
2021-04-25T12:07:22.682+0200 connected to: mongodb://localhost/
2021-04-25T12:07:25.682+0200 [## .....] AD_database.scripts 6.68MB/63.5MB (10.5%)
2021-04-25T12:07:28.684+0200 [#####] AD_database.scripts 18.4MB/63.5MB (29.0%)
2021-04-25T12:07:31.682+0200 [#####] AD_database.scripts 27.1MB/63.5MB (42.7%)
2021-04-25T12:07:34.682+0200 [#####] AD_database.scripts 36.6MB/63.5MB (57.7%)
2021-04-25T12:07:37.682+0200 [#####] AD_database.scripts 47.4MB/63.5MB (74.7%)
2021-04-25T12:07:40.683+0200 [#####] AD_database.scripts 56.4MB/63.5MB (88.8%)
2021-04-25T12:07:42.522+0200 [#####] AD_database.scripts 63.5MB/63.5MB (100.0%)
2021-04-25T12:07:42.522+0200 973193 document(s) imported successfully. 0 document(s) failed to import.
```

And we displayed its value using
db.getCollection("scripts").find({});

```
> db.scripts.aggregate([ { $match: {} }, { $group: { _id: null, sum: { $sum: "$items" } } })
{ "_id" : null, "sum" : 8888304 }
> db.getCollection("scripts").find({}).
{ "_id" : ObjectId("60853f5a24c1e910afc0fa21"), "nic" : 3, "practice" : "N85639", "bnf_code" : "0304010G0", "bnf_name" : "Chlorphenamine Mal_Oral So
ln 2mg/5ml", "items" : 1, "nic" : 2.62, "act_cost" : 2.44, "quantity" : 150 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa22"), "nic" : 4, "practice" : "N85639", "bnf_code" : "0401020K0", "bnf_name" : "Diazepam_Tab 2mg", "items"
: 1, "nic" : 0.16, "act_cost" : 0.26, "quantity" : 6 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa23"), "nic" : 5, "practice" : "N85639", "bnf_code" : "0406000T0", "bnf_name" : "Prochlpzine Mal_Tab 5mg",
"items" : 1, "nic" : 0.97, "act_cost" : 0.91, "quantity" : 28 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa24"), "nic" : 1, "practice" : "N85639", "bnf_code" : "0106040M0", "bnf_name" : "Movicol Plain_Paed Pdr Sac
h 6.9g", "items" : 1, "nic" : 4.38, "act_cost" : 4.07, "quantity" : 30 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa25"), "nic" : 6, "practice" : "N85639", "bnf_code" : "0407010F0", "bnf_name" : "Co-Codamol_Cap 30mg/500mg",
"items" : 1, "nic" : 0.84, "act_cost" : 0.89, "quantity" : 24 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa26"), "nic" : 7, "practice" : "N85639", "bnf_code" : "0407010F0", "bnf_name" : "Zapain_Tab 30mg/500mg", "i
tems" : 1, "nic" : 3.03, "act_cost" : 2.82, "quantity" : 100 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa27"), "nic" : 8, "practice" : "N85639", "bnf_code" : "0407010H0", "bnf_name" : "Paracet_Oral Susp Paed 120
mg/5ml", "items" : 1, "nic" : 0.62, "act_cost" : 0.69, "quantity" : 100 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa28"), "nic" : 0, "practice" : "N85639", "bnf_code" : "0106020C0", "bnf_name" : "Bisacodyl_Tab E/C 5mg", "i
tems" : 1, "nic" : 0.39, "act_cost" : 0.47, "quantity" : 12 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa29"), "nic" : 11, "practice" : "N85639", "bnf_code" : "0501012G0", "bnf_name" : "Flucloxacil_Sod_Oral Soln 250
mg/5ml", "items" : 1, "nic" : 26.04, "act_cost" : 24.12, "quantity" : 100 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa2a"), "nic" : 12, "practice" : "N85639", "bnf_code" : "0501013B0", "bnf_name" : "Amoxicillin_Cap 500mg", "i
tems" : 3, "nic" : 3.81, "act_cost" : 3.56, "quantity" : 63 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa2b"), "nic" : 13, "practice" : "N85639", "bnf_code" : "0501013B0", "bnf_name" : "Amoxicillin_Oral Susp 250
mg/5ml", "items" : 1, "nic" : 2.26, "act_cost" : 2.1, "quantity" : 200 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa2c"), "nic" : 14, "practice" : "N85639", "bnf_code" : "0501021L0", "bnf_name" : "Cefalexin_Tab 500mg", "it
ems" : 1, "nic" : 1.75, "act_cost" : 1.73, "quantity" : 20 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa2d"), "nic" : 15, "practice" : "N85639", "bnf_code" : "0501030I0", "bnf_name" : "Doxycycline Hyclate_Cap 1
00mg", "items" : 3, "nic" : 2.61, "act_cost" : 2.45, "quantity" : 24 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa2e"), "nic" : 16, "practice" : "N85639", "bnf_code" : "0501050B0", "bnf_name" : "Clarithromycin_Oral Susp
125mg/5ml", "items" : 1, "nic" : 4.06, "act_cost" : 3.77, "quantity" : 70 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa2f"), "nic" : 3.22, "practice" : "N85639", "bnf_code" : "0301011R0", "bnf_name" : "Salbutamol_Inha 100mcg (20
0 D) CFF", "items" : 1, "nic" : 1.5, "act_cost" : 1.4, "quantity" : 1 }
{ "_id" : ObjectId("60853f5a24c1e910afc0fa30"), "nic" : 9, "practice" : "N85639", "bnf_code" : "0501011P0", "bnf_name" : "Phenoxymethylpenicillin Po
t Tab 250mg", "items" : 2, "nic" : 5.94, "act_cost" : 5.72, "quantity" : 160 }
```

A. Question 1

1. Counts

❑ Items

```
db.scripts.aggregate( [{ $count: "items" } ])
```

```
> db.scripts.aggregate( [{ $count: "items" } ])
{ "items" : 973193 }
```

❑ Quantity

```
db.scripts.aggregate( [{ $count: "quantity" } ])
```

```
> db.scripts.aggregate( [{ $count: "quantity" } ])
{ "quantity" : 973193 }
```

❑ Nic

```
db.scripts.aggregate( [{ $count: "nic" } ])
```

```
> db.scripts.aggregate( [{ $count: "nic" }])
{ "nic" : 973193 }
```

❑ **act_cost**

```
db.scripts.aggregate( [{ $count: "act_cost" }])
```

```
> db.scripts.aggregate( [{ $count: "act_cost" }])
{ "act_cost" : 973193 }
```

2. Total sum

❑ **Items**

```
db.scripts.aggregate([ { $match: {} }, { $group:
  { _id : null, sum : { $sum: "$items" } }
}])
```

```
> db.scripts.aggregate([ { $match: {} }, { $group:
...   { _id : null, sum : { $sum: "$items" } }
...   }])
{ "_id" : null, "sum" : 8888304 }
```

❑ **Quantity**

```
db.scripts.aggregate([ { $match: {} }, { $group:
  { _id : null, sum : { $sum: "$quantity" } }
}])
```

```
> db.scripts.aggregate([ { $match: {} }, { $group:
...   { _id : null, sum : { $sum: "$quantity" } }
...   }])
{ "_id" : null, "sum" : 721457006 }
```

❑ **Nic**

```
db.scripts.aggregate([ { $match: {} }, { $group:
  { _id : null, sum : { $sum: "$nic" } }
}])
```

```
> db.scripts.aggregate([ { $match: {} }, { $group:
...   { _id : null, sum : { $sum: "$nic" } }
...   }])
{ "_id" : null, "sum" : 71100424.84 }
>
```

❑ **act_cost**

```
db.scripts.aggregate([ { $match: {} }, { $group:
  { _id : null, sum : { $sum: "$act_cost" } }
}])
```

```
> db.scripts.aggregate([ { $match: {} } ], { $group:
...   { _id : null, sum : { $sum: "$act_cost" } }
...   })
{ "_id" : null, "sum" : 66164096.12 }
>
```

3. Mean

❑ Items

```
db.scripts.aggregate([ { $match: {} } ], { $group:
  { _id : null, avg : { $avg: "$items" } }
  })
```

```
> db.scripts.aggregate([ { $match: {} } ], { $group:
...   { _id : null, avg : { $avg: "$items" } }
...   })
{ "_id" : null, "avg" : 9.133135976111625 }
>
```

❑ Quantity

```
db.scripts.aggregate([ { $match: {} } ], { $group:
  { _id : null, avg : { $avg: "$quantity" } }
  })
```

```
> db.scripts.aggregate([ { $match: {} } ], { $group:
...   { _id : null, avg : { $avg: "$quantity" } }
...   })
{ "_id" : null, "avg" : 741.3298348837282 }
>
```

❑ Nic

```
db.scripts.aggregate([ { $match: {} } ], { $group:
  { _id : null, avg : { $avg: "$nic" } }
  })
```

```
> db.scripts.aggregate([ { $match: {} } ], { $group:
...   { _id : null, avg : { $avg: "$nic" } }
...   })
{ "_id" : null, "avg" : 73.05891517920907 }
>
```

❑ act_cost

```
db.scripts.aggregate([ { $match: {} } ], { $group:
```

```
{_id: null, avg: { $avg: "$act_cost" }}  
}))
```

```
> db.scripts.aggregate([ { $match: {} } ], { $group:  
... { _id : null, avg : { $avg: "$act_cost" } }  
... })  
{ "_id" : null, "avg" : 67.98661326170657 }  
>
```

4. Standard deviation

❑ Items

```
db.scripts.aggregate([ { $match: {} }, { $group:  
  { _id : null, stv : { $stdDevSamp: "$items" } }  
}])
```

```
> db.scripts.aggregate([ { $match: {} } ], { $group:  
... { _id : null, stv : { $stdDevSamp: "$items" } }  
... })  
{ "_id" : null, "stv" : 29.204198282804214 }  
>
```

❑ Quantity

```
db.scripts.aggregate([ { $match: {} }, { $group:  
  { _id : null, stv : { $stdDevSamp: "$quantity" } }  
}])
```

```
> db.scripts.aggregate([ { $match: {} } ], { $group:  
... { _id : null, stv : { $stdDevSamp: "$quantity" } }  
... })  
{ "_id" : null, "stv" : 3665.4269584678873 }  
>
```

❑ Nic

```
db.scripts.aggregate([ { $match: {} }, { $group:  
  { _id : null, stv : { $stdDevSamp: "$nic" } }  
}])
```



```
> db.scripts.aggregate([ { $match: {} } ], { $group:
...   { _id : null, stv : { $stdDevSamp: "$nic" } }
... })
{ "_id" : null, "stv" : 188.07025690682195 }
>
```

❑ Act_cost

```
db.scripts.aggregate([ { $match: {} }, { $group:
  { _id : null, stv : { $stdDevSamp: "$act_cost" } }
  ]])
```

```
> db.scripts.aggregate([ { $match: {} } ], { $group:
...   { _id : null, stv : { $stdDevSamp: "$act_cost" } }
... })
{ "_id" : null, "stv" : 174.40170332301855 }
>
```

5. Low quantile

❑ Items

```
db.scripts.aggregate([
  { $match: { items: { $exists: true } } },
  { $group: { _id: null, count: { $sum: 1 }, values: { $push:
"$items" } } },
  { "$unwind": "$values" },
  { "$sort": { values: 1 } },
  { $project: { "count": 1, "values": 1, "midpoint": { $divide: [ {
$sum: [ "$count", 1 ] }, 4 ] } },
  { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil:
"$midpoint", "low": { $floor: "$midpoint" } } },
  { $group: { _id: null, values: { $push: "$values" }, high: { $avg:
"$high", low: { $avg: "$low" } } },
  { $project: { "beginValue": { "$arrayElemAt": [ "$values",
"$high" ] }, "endValue": { "$arrayElemAt":
[ "$values", "$low" ] } } },
  { $project: { "Quartile1": { "$avg": [ "$beginValue",
"$endValue" ] } } }
])
```

```
> db.scripts1.aggregate([
... {$match: { items: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$items" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: [ { $sum: [ "$count", 1 ] }, 4 ] } }},
... { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil: "$midpoint"}, "low": { $floor: "$midpoint" } }},
... { $group: { _id: null, values: {$push: "$values"}, high: {$avg: "$high"}, low: {$avg: "$low"} }},
... { $project: { "beginValue": {"$arrayElemAt": [ "$values", "$high" ]}, "endValue": {"$arrayElemAt":
... [ "$values", "$low" ] } }},
... { $project: { "Quartile1": {"$avg": [ "$beginValue", "$endValue" ] } } }
... ])
{ "_id" : null, "Quartile1" : 1 }
>
```

❑ Quantity

```
db.scripts1.aggregate([
    {$match: { quantity: {$exists: true } }},
    {$group: { _id: null, count: { $sum: 1 }, values: {$push:
"$quantity" } }},
    { "$unwind": "$values" },
    { "$sort": {values: 1} },
    { $project: { "count": 1, "values": 1, "midpoint": {$divide: [ {
$sum: [ "$count", 1 ] }, 4 ] } }},
    { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil:
"$midpoint"}, "low": { $floor: "$midpoint" } }},
    { $group: { _id: null, values: {$push: "$values"}, high: {$avg:
"$high"}, low: {$avg: "$low"} }},
    { $project: { "beginValue": {"$arrayElemAt": [ "$values",
"$high" ]}, "endValue": {"$arrayElemAt":
[ "$values", "$low" ] } }},
    { $project: { "Quartile1": {"$avg": [ "$beginValue",
"$endValue" ] } } }
])
```

```
> db.scripts1.aggregate([
... {$match: { quantity: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$quantity" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: [ { $sum: [ "$count", 1 ] }, 4 ] } }},
... { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil: "$midpoint"}, "low": { $floor: "$midpoint" } }},
... { $group: { _id: null, values: {$push: "$values"}, high: {$avg: "$high"}, low: {$avg: "$low"} }},
... { $project: { "beginValue": {"$arrayElemAt": [ "$values", "$high" ]}, "endValue": {"$arrayElemAt":
... [ "$values", "$low" ] } }},
... { $project: { "Quartile1": {"$avg": [ "$beginValue", "$endValue" ] } } }
... ])
{ "_id" : null, "Quartile1" : 28 }
```

❑ Nic

```

db.scripts1.aggregate([
    {$match: { nic: {$exists: true } }},
    {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$nic"
} }},
    {$unwind: "$values" },
    {$sort: {values: 1} },
    {$project: { "count": 1, "values": 1, "midpoint": {$divide: [ {
$sum: [ "$count", 1 ] }, 4 ] } }},
    {$project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil:
"$midpoint"}, "low": { $floor: "$midpoint" } }},
    {$group: { _id: null, values: {$push: "$values"}, high: {$avg:
"$high"}, low: {$avg: "$low"} }},
    {$project: { "beginValue": {"$arrayElemAt": [ "$values" ,
"$high"] }, "endValue": {"$arrayElemAt":
["$values" , "$low"] } }},
    {$project: { "Quartile1": {"$avg": [ "$beginValue" ,
"$endValue"] } } }
])

```

```

> db.scripts1.aggregate([
... {$match: { nic: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$nic" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: [ { $sum: [ "$count", 1 ] }, 4 ] } }},
... { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil: "$midpoint"}, "low": { $floor: "$midpoint" } }},
... { $group: { _id: null, values: {$push: "$values"}, high: {$avg: "$high"}, low: {$avg: "$low"} }},
... { $project: { "beginValue": {"$arrayElemAt": [ "$values" , "$high"] }, "endValue": {"$arrayElemAt":
["$values" , "$low"] } }},
... { $project: { "Quartile1": {"$avg": [ "$beginValue" , "$endValue"] } } }
... ])
{ "_id" : null, "Quartile1" : 6.535 }
>

```

❏ Act_cost

```

db.scripts1.aggregate([
    {$match: { act_cost: {$exists: true } }},
    {$group: { _id: null, count: { $sum: 1 }, values: {$push:
"$act_cost" } }},
    {$unwind: "$values" },
    {$sort: {values: 1} },
    {$project: { "count": 1, "values": 1, "midpoint": {$divide: [ {
$sum: [ "$count", 1 ] }, 4 ] } }},
    {$project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil:
"$midpoint"}, "low": { $floor: "$midpoint" } }},

```

```

        { $group: { _id: null, values: { $push: "$values" }, high: { $avg:
"$high" }, low: { $avg: "$low" } } },
        { $project: { "beginValue": { "$arrayElemAt": [ "$values" ,
"$high" ] }, "endValue": { "$arrayElemAt":
        [ "$values" , "$low" ] } } },
        { $project: { "Quartile1": { "$avg": [ "$beginValue" ,
"$endValue" ] } } }
    ] )
}

```

```

> db.scripts1.aggregate([
... { $match: { act_cost: { $exists: true } } },
... { $group: { _id: null, count: { $sum: 1 }, values: { $push: "$act_cost" } } },
... { "$unwind": "$values" },
... { "$sort": { values: 1 } },
... { $project: { "count": 1, "values": 1, "midpoint": { $divide: [ { $sum: [ "$count", 1 ] }, 4 ] } } },
... { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil: "$midpoint" }, "low": { $floor: "$midpoint" } } },
... { $group: { _id: null, values: { $push: "$values" }, high: { $avg: "$high" }, low: { $avg: "$low" } } },
... { $project: { "beginValue": { "$arrayElemAt": [ "$values" , "$high" ] }, "endValue": { "$arrayElemAt":
        [ "$values" , "$low" ] } } },
... { $project: { "Quartile1": { "$avg": [ "$beginValue" , "$endValue" ] } } }
... ] )
{ "_id" : null, "Quartile1" : 6.155 }

```

6. Median

From here, we reduced the size of our dataset, due to the computer's inability to process everything.

```

uncaught exception: Error: command failed: {
  "ok" : 0,
  "errmsg" : "Sort exceeded memory limit of 104857600 bytes, but did not opt in to external sorting.",
  "code" : 292,
  "codeName" : "QueryExceededMemoryLimitNoDiskUseAllowed"
}

```

❏ Items

```

db.scripts1.aggregate([
    { $match: { items: { $exists: true } } },
    { $group: { _id: null, count: { $sum: 1 }, values: { $push:
"$items" } } },
    { "$unwind": "$values" },
    { "$sort": { values: 1 } },
    { $project: { "count": 1, "values": 1, "midpoint": { $divide:
["$count", 2 ] } } },
    { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil:
"$midpoint" }, "low": { $floor: "$midpoint" } } },
    { $group: { _id: null, values: { $push: "$values" }, high: { $avg:
"$high" }, low: { $avg: "$low" } } },

```

```

        { $project: {"beginValue": {"$arrayElemAt": ["$values" ,
"$high"]}, "endValue": {"$arrayElemAt":
        ["$values" , "$low"]}} },
        { $project: {"median": {"$avg": ["$beginValue" , "$endValue"]}}
    }
}
])

```

```

> db.scripts1.aggregate([
... { $match: { items: { $exists: true } } },
... { $group: { _id: null, count: { $sum: 1 }, values: { $push: "$items" } } },
... { "$unwind": "$values" },
... { "$sort": { values: 1 } },
... { $project: { "count": 1, "values": 1, "midpoint": { $divide: ["$count",2 ] } } },
... { $project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil: "$midpoint"},"low": { $floor: "$midpoint" } } },
... { $group: { _id: null, values: { $push: "$values" }, high: { $avg: "$high" }, low: { $avg: "$low" } } },
... { $project: { "beginValue": {"$arrayElemAt": ["$values" , "$high"]}, "endValue": {"$arrayElemAt":
... ["$values" , "$low"] } } },
... { $project: {"median": {"$avg": ["$beginValue" , "$endValue"] } } }
... ])
{ "_id" : null, "median" : 3 }
>

```

❑ Quantity

```

db.scripts1.aggregate([
    { $match: { quantity: { $exists: true } } },
    { $group: { _id: null, count: { $sum: 1 }, values: { $push:
"$quantity" } } },
    { "$unwind": "$values" },
    { "$sort": { values: 1 } },
    { $project: { "count": 1, "values": 1, "midpoint": { $divide:
["$count",2 ] } } },
    { $project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil:
"$midpoint"},"low": { $floor: "$midpoint" } } },
    { $group: { _id: null, values: { $push: "$values" }, high: { $avg:
"$high" }, low: { $avg: "$low" } } },
    { $project: { "beginValue": {"$arrayElemAt": ["$values" ,
"$high"]}, "endValue": {"$arrayElemAt":
        ["$values" , "$low"] } } },
    { $project: {"median": {"$avg": ["$beginValue" , "$endValue"]}}
}
])

```

```
> db.scripts1.aggregate([
... {$match: { quantity: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$quantity" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: ["$count",2 ]} }},
... {$project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil: "$midpoint"},"low": { $floor: "$midpoint" }}}},
... { $group: { _id: null, values: {$push: "$values"}, high: {$avg: "$high"}, low: {$avg: "$low"} }},
... { $project: {"beginValue": {"$arrayElemAt": ["$values", "$high"]}, "endValue": {"$arrayElemAt":
... ["$values", "$low"] } }},
... {$project: {"median": {"$avg": ["$beginValue", "$endValue"] } } }
... ])
{ "_id" : null, "median" : 120 }
```

❑ Nic

```
db.scripts1.aggregate([
    {$match: { nic: {$exists: true } }},
    {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$nic"
    } }},
    { "$unwind": "$values" },
    { "$sort": {values: 1} },
    { $project: { "count": 1, "values": 1, "midpoint": {$divide:
    ["$count",2 ]} },
    {$project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil:
    "$midpoint"},"low": { $floor: "$midpoint" }}}},
    { $group: { _id: null, values: {$push: "$values"}, high: {$avg:
    "$high"}, low: {$avg: "$low"} }},
    { $project: {"beginValue": {"$arrayElemAt": ["$values",
    "$high"]}, "endValue": {"$arrayElemAt":
    ["$values", "$low"] } }},
    {$project: {"median": {"$avg": ["$beginValue", "$endValue"] }
    }}
])
```

```
> db.scripts1.aggregate([
... {$match: { nic: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$nic" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: ["$count",2 ]} }},
... {$project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil: "$midpoint"},"low": { $floor: "$midpoint" }}}},
... { $group: { _id: null, values: {$push: "$values"}, high: {$avg: "$high"}, low: {$avg: "$low"} }},
... { $project: {"beginValue": {"$arrayElemAt": ["$values", "$high"]}, "endValue": {"$arrayElemAt":
... ["$values", "$low"] } }},
... {$project: {"median": {"$avg": ["$beginValue", "$endValue"] } } }
... ])
{ "_id" : null, "median" : 21.56 }
> 
```

❑ Act_cost

```

db.scripts1.aggregate([
    {$match: { act_cost: {$exists: true } }},
    {$group: { _id: null, count: { $sum: 1 }, values: {$push:
"$act_cost" } }},
    { "$unwind": "$values" },
    { "$sort": {values: 1} },
    { $project: { "count": 1, "values": 1, "midpoint": {$divide:
["$count",2 ] } }},
    { $project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil:
"$midpoint"},"low": { $floor: "$midpoint" } }},
    { $group: { _id: null,values: {$push: "$values"}, high: {$avg:
"$high"},low: {$avg: "$low"} }},
    { $project: {"beginValue": {"$arrayElemAt": ["$values" ,
"$high"]}, "endValue": { "$arrayElemAt":
["$values" , "$low"] } }},
    { $project: {"median": {"$avg": ["$beginValue" , "$endValue"] } }
    ]
})

```

```

> db.scripts1.aggregate([
... {$match: { act_cost: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$act_cost" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: ["$count",2 ] } }},
... { $project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil: "$midpoint"},"low": { $floor: "$midpoint" } }},
... { $group: { _id: null,values: {$push: "$values"}, high: {$avg: "$high"},low: {$avg: "$low"} }},
... { $project: {"beginValue": {"$arrayElemAt": ["$values" , "$high"]}, "endValue": { "$arrayElemAt":
["$values" , "$low"] } }},
... { $project: {"median": {"$avg": ["$beginValue" , "$endValue"] } }
... ]}
{ "_id" : null, "median" : 20.38 }
>

```

7. High quantile

❏ Items

```

db.scripts1.aggregate([
    {$match: { items: {$exists: true } }},
    {$group: { _id: null, count: { $sum: 1 }, values: {$push:
"$items" } }},
    { "$unwind": "$values" },
    { "$sort": {values: 1} },

```

```

        { $project: { "count": 1, "values": 1, "midpoint": { $divide: [
{$multiply :[ { $sum: [ "$count", 1 ] }, 3] , 4  ] } }},
        { $project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil:
"$midpoint"},"low": { $floor: "$midpoint" } }},
        { $group: { _id: null, values: { $push: "$values" }, high: { $avg:
"$high"}, low: { $avg: "$low" } }},
        { $project: { "beginValue": { "$arrayElemAt": [ "$values" ,
"$high" ] }, "endValue": { "$arrayElemAt":
[ "$values" , "$low" ] } }},
        { $project: { "Quartile3": { "$avg": [ "$beginValue" ,
"$endValue" ] } } }
    })

```

```

> db.scripts1.aggregate([
... { $match: { items: { $exists: true } } },
... { $group: { _id: null, count: { $sum: 1 }, values: { $push: "$items" } } },
... { "$unwind": "$values" },
... { "$sort": { values: 1 } },
... { $project: { "count": 1, "values": 1, "midpoint": { $divide: [ { $multiply :[ { $sum: [ "$count", 1 ] }, 3] , 4  ] } }},
... { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil: "$midpoint"}, "low": { $floor: "$midpoint" } }},
... { $group: { _id: null, values: { $push: "$values" }, high: { $avg: "$high"}, low: { $avg: "$low" } }},
... { $project: { "beginValue": { "$arrayElemAt": [ "$values" , "$high" ] }, "endValue": { "$arrayElemAt":
... [ "$values" , "$low" ] } } },
... { $project: { "Quartile3": { "$avg": [ "$beginValue" , "$endValue" ] } } }
... ])
{ "_id" : null, "Quartile3" : 10 }

```

❑ Quantity

```

db.scripts1.aggregate([
    { $match: { quantity: { $exists: true } } },
    { $group: { _id: null, count: { $sum: 1 }, values: { $push:
"$quantity" } } },
    { "$unwind": "$values" },
    { "$sort": { values: 1 } },
    { $project: { "count": 1, "values": 1, "midpoint": { $divide: [
{$multiply :[ { $sum: [ "$count", 1 ] }, 3] , 4  ] } }},
    { $project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil:
"$midpoint"},"low": { $floor: "$midpoint" } }},
    { $group: { _id: null, values: { $push: "$values" }, high: { $avg:
"$high"}, low: { $avg: "$low" } }},
    { $project: { "beginValue": { "$arrayElemAt": [ "$values" ,
"$high" ] }, "endValue": { "$arrayElemAt":

```



```

        ["$values" , "$low" ]} }},
        {$project: {"Quartile3": {"$avg": ["$beginValue" ,
"$endValue" ]} }}
    );

```

```

> db.scripts1.aggregate([
... {$match: { quantity: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$quantity" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: [ {$multiply :[ { $sum: [ "$count", 1 ] }, 3] } , 4 ] } }},
... { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil: "$midpoint"}, "low": { $floor: "$midpoint" } }},
... { $group: { _id: null, values: {$push: "$values"}, high: {$avg: "$high"}, low: {$avg: "$low" } }},
... { $project: {"beginValue": {"$arrayElemAt": ["$values" , "$high"]}, "endValue": {"$arrayElemAt":
["$values" , "$low" ]} }},
... { $project: {"Quartile3": {"$avg": ["$beginValue" , "$endValue" ]} }}
... ]);
{ "_id" : null, "Quartile3" : 420 }
>

```

❏ Nic

```

db.scripts1.aggregate([
    {$match: { nic: {$exists: true } }},
    {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$nic"
} }},
    { "$unwind": "$values" },
    { "$sort": {values: 1} },
    { $project: { "count": 1, "values": 1, "midpoint": {$divide: [
{$multiply :[ { $sum: [ "$count", 1 ] }, 3] } , 4 ] } }},
    { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil:
"$midpoint"}, "low": { $floor: "$midpoint" } }},
    { $group: { _id: null, values: {$push: "$values"}, high: {$avg:
"$high"}, low: {$avg: "$low" } }},
    { $project: {"beginValue": {"$arrayElemAt": ["$values" ,
"$high"]}, "endValue": {"$arrayElemAt":
["$values" , "$low" ]} }},
    { $project: {"Quartile3": {"$avg": ["$beginValue" ,
"$endValue" ]} }}

```

```

> db.scripts1.aggregate([
... {$match: { nic: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$nic" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: [ {$multiply :[ { $sum: [ "$count", 1 ] }, 3] } , 4 ] } }},
... { $project: { "count": 1, "values": 1, "midpoint": 1, "high": { $ceil: "$midpoint"}, "low": { $floor: "$midpoint" } }},
... { $group: { _id: null, values: {$push: "$values"}, high: {$avg: "$high"}, low: {$avg: "$low" } }},
... { $project: {"beginValue": {"$arrayElemAt": ["$values" , "$high"]}, "endValue": {"$arrayElemAt":
["$values" , "$low" ]} }},
... { $project: {"Quartile3": {"$avg": ["$beginValue" , "$endValue" ]} }}
... ]);
{ "_id" : null, "Quartile3" : 65.85 }
>

```

```

))

```

❑ Act_cost

```
db.scripts1.aggregate([
  {$match: { act_cost: {$exists: true } }},
  {$group: { _id: null, count: { $sum: 1 }, values: {$push:
"$act_cost" } }},
  {$unwind: "$values" },
  {$sort: {values: 1} },
  {$project: { "count": 1, "values": 1, "midpoint": {$divide: [
{$multiply :[ { $sum: [ "$count", 1] }, 3] } , 4 ] } }},
  {$project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil:
"$midpoint"},"low": { $floor: "$midpoint" } }},
  {$group: { _id: null,values: {$push: "$values"}, high: {$avg:
"$high"},low: {$avg: "$low"} }},
  {$project: {"beginValue": {"$arrayElemAt": ["$values" ,
"$high"]}, "endValue": { "$arrayElemAt":
["$values" , "$low"] } }},
  {$project: {"Quartile3": {"$avg": ["$beginValue" ,
"$endValue"] } } }
])
```

```
> db.scripts1.aggregate([
... {$match: { act_cost: {$exists: true } }},
... {$group: { _id: null, count: { $sum: 1 }, values: {$push: "$act_cost" } }},
... { "$unwind": "$values" },
... { "$sort": {values: 1} },
... { $project: { "count": 1, "values": 1, "midpoint": {$divide: [ {$multiply :[ { $sum: [ "$count", 1] }, 3] } , 4 ] } }},
... { $project: { "count": 1,"values": 1, "midpoint": 1,"high": { $ceil: "$midpoint"},"low": { $floor: "$midpoint" } }},
... { $group: { _id: null,values: {$push: "$values"}, high: {$avg: "$high"},low: {$avg: "$low"} }},
... { $project: {"beginValue": {"$arrayElemAt": ["$values" , "$high"]}, "endValue": { "$arrayElemAt":
["$values" , "$low"] } }},
... { $project: {"Quartile3": {"$avg": ["$beginValue" , "$endValue"] } } }
... ])
{ "id" : null, "Quartile3" : 60.989999999999995 }
>
```

B. Question 2

```
db.scripts.aggregate([
{$match:{}},{ $group:{_id:"$bnf_name",total:{$sum:"$items"}}},{ $sort: {total:-1}}])
```

**The item with the highest total is ([Omeprazole_Cap E/C 20mg, 218583])
see from below**

```
> db.scripts.aggregate([{$match:{}},$group:{_id:"$bnf_name",total:{$sum:"$items"}},{$sort:{total:-1}}])
{"_id": "Omeprazole_Cap E/C 20mg", "total": 218583 }
{"_id": "Paracet_Tab 500mg", "total": 151669 }
{"_id": "Aspirin Disper_Tab 75mg", "total": 148591 }
{"_id": "Simvastatin_Tab 40mg", "total": 132941 }
{"_id": "Amlodipine_Tab 5mg", "total": 128245 }
{"_id": "Lansoprazole_Cap 30mg (E/C Gran)", "total": 125985 }
{"_id": "Salbutamol_Inha 100mcg (200 D) CFF", "total": 119757 }
{"_id": "Atorvastatin_Tab 20mg", "total": 111133 }
{"_id": "Metformin_HCL_Tab 500mg", "total": 109818 }
{"_id": "Bendroflumethiazide_Tab 2.5mg", "total": 85940 }
{"_id": "Amlodipine_Tab 10mg", "total": 85148 }
{"_id": "Simvastatin_Tab 20mg", "total": 84173 }
{"_id": "Atorvastatin_Tab 40mg", "total": 83358 }
{"_id": "Amoxicillin_Cap 500mg", "total": 82706 }
{"_id": "Ramipril_Cap 10mg", "total": 81965 }
{"_id": "Levothyrox_Sod_Tab 100mcg", "total": 79973 }
{"_id": "Levothyrox_Sod_Tab 50mcg", "total": 78504 }
{"_id": "Levothyrox_Sod_Tab 25mcg", "total": 75805 }
{"_id": "Clopidogrel_Tab 75mg", "total": 72087 }
{"_id": "Lansoprazole_Cap 15mg (E/C Gran)", "total": 69272 }
Type "it" for more
```

C. Question 3

For this question we first merged the two datasets: scripts and practices, into a table called scripts_practices

```
> db.getCollection('scripts_practices').find({});
{"_id": "ObjectId('6085562d8b9017b792997dba')", "items": 3, "practice": "H84015", "bnf_code": 238031080, "bnf_name": "3m Health Care_Cavilon No Sting Barrier", "items": 1, "nic": 5.98, "act_cost": 5.54, "quantity": 1, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dbb')", "items": 4, "practice": "H84015", "bnf_code": 90607000, "bnf_name": "Abidec_Ops", "items": 4, "nic": 19.98, "act_cost": 18.55, "quantity": 150, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dbc')", "items": 5, "practice": "H84015", "bnf_code": 210102301, "bnf_name": "Able Spacer", "items": 1, "nic": 4.39, "act_cost": 4.08, "quantity": 1, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dbd')", "items": 6, "practice": "H84015", "bnf_code": "0601023A0", "bnf_name": "Acarbose_Tab 50mg", "items": 1, "nic": 7.16, "act_cost": 6.74, "quantity": 56, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dbe')", "items": 7, "practice": "H84015", "bnf_code": "0503021C0", "bnf_name": "Aciclovir_Tab 200mg", "items": 3, "nic": 4.08, "act_cost": 3.81, "quantity": 75, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dbf')", "items": 8, "practice": "H84015", "bnf_code": "0503021C0", "bnf_name": "Aciclovir_Tab 400mg", "items": 2, "nic": 8.88, "act_cost": 8.24, "quantity": 168, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dc0')", "items": 1, "practice": "H84015", "bnf_code": 238031080, "bnf_name": "3m Health Care_Cavilon Durable Barrier C", "items": 1, "nic": 3.98, "act_cost": 3.7, "quantity": 1, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dc1')", "items": 0, "practice": "H84015", "bnf_code": 200301006, "bnf_name": "365 Film 10cm x 12cm VP Adh Film Dress", "items": 2, "nic": 6.4, "act_cost": 5.95, "quantity": 40, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dc2')", "items": 9, "practice": "H84015", "bnf_code": "0503021C0", "bnf_name": "Aciclovir_Tab 800mg", "items": 1, "nic": 3.36, "act_cost": 3.12, "quantity": 35, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dc3')", "items": 10, "practice": "H84015", "bnf_code": 212700006, "bnf_name": "Actilymph Class 1 B/Knee Closed Toe Blk", "items": 1, "nic": 28.65, "act_cost": 26.54, "quantity": 2, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dc4')", "items": 2, "practice": "H84015", "bnf_code": 238031080, "bnf_name": "3m Health Care_Cavilon Durable Barrier C", "items": 1, "nic": 8.12, "act_cost": 7.53, "quantity": 1, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
{"_id": "ObjectId('6085562d8b9017b792997dc5')", "items": 14, "practice": "H84015", "bnf_code": "0206020R0", "bnf_name": "Adalat Ret_Tab 10mg", "items": 1, "nic": 14.68, "act_cost": 13.6, "quantity": 112, "code": "H84015", "name": "BRUNSWICK SURGERY", "addr_1": "BRUNSWICK SURGERY", "addr_2": "SURBITON HTH CTR EWELL RD", "borough": "SURBITON", "village": "SURREY", "post_code": "KT6 6EZ" }
```

```
db.scripts_practices.aggregate([
  {"$group": {
    "_id": {
      "post code": "$post_code",
      "item name": "$bnf_name"},
    "item": {"$sum": "$items"}
```

```

    },
  },
  {"$project": {"amount": {"$divide": [ "$item", 100 ]}}},
  {"$sort": {"amount":-1}}
])

```

```

> db.scripts_practices.aggregate([
...   { "$group": {
...     "_id": {
...       "post code": "$post_code",
...       "item name": "$bnf_name"},
...     "item": { "$sum": "$items" }
...   },
...   {"$project": {"amount": {"$divide": [ "$item", 100 ]}}},
...   {"$sort": {"amount":-1}}
... ])
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Omeprazole_Cap E/C 20mg" }, "amount" : 2.23 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Aspirin Disper_Tab 75mg" }, "amount" : 1.97 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Simvastatin_Tab 20mg" }, "amount" : 1.61 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Salbutamol_Inha 100mcg (200 D) CFF" }, "amount" : 1.6 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Amlodipine_Tab 5mg" }, "amount" : 1.39 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Amoxicillin_Cap 500mg" }, "amount" : 1.18 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Ramipril_Cap 10mg" }, "amount" : 1.15 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Metformin_HCl_Tab 500mg" }, "amount" : 1.11 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Atorvastatin_Tab 40mg" }, "amount" : 0.96 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Amlodipine_Tab 10mg" }, "amount" : 0.96 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Atorvastatin_Tab 20mg" }, "amount" : 0.92 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Ramipril_Cap 2.5mg" }, "amount" : 0.9 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Levothyrox Sod_Tab 100mcg" }, "amount" : 0.79 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Levothyrox Sod_Tab 50mcg" }, "amount" : 0.76 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Bisoprolol Fumar_Tab 2.5mg" }, "amount" : 0.74 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Lansoprazole_Cap 30mg (E/C Gran)" }, "amount" : 0.73 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Citalopram Hydrob_Tab 20mg" }, "amount" : 0.73 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Fluoxetine HCl_Cap 20mg" }, "amount" : 0.7 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Prednisolone_Tab 5mg" }, "amount" : 0.7 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Furosemide_Tab 40mg" }, "amount" : 0.66 }
Type "it" for more
> it
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Levothyrox Sod_Tab 25mcg" }, "amount" : 0.65 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Paracet_Tab 500mg" }, "amount" : 0.65 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Bendroflumethiazide_Tab 2.5mg" }, "amount" : 0.65 }
{ "_id" : { "post code" : "KT6 6EZ", "item name" : "Sertraline_HCl_Tab 50mg" }, "amount" : 0.6 }

```

Part 3

performance, scalability, security,

1. CENTRALIZED SYSTEMS

Centralized systems are architectures where one or more nodes are directly connected to a central server or database. In such a system, the central center or the central data center serves all the other nodes, providing them with the data. The data center is considered as the server, whereas all the other nodes

are clients.



Scalability

This type of architecture only allows vertical scaling on the central server/data center. Horizontal scaling will contradict the single central unit characteristic of this system of a single central entity.

Performance

This most commonly used system can function well as long as you have a very light number of nodes and requests. However, its performance becomes weaker as the number of nodes and requests per second increases, if there are no request handlers.

Applications

Some real-life application of Centralized system can be found below:

- Centralized databases – all the data in one server for use.
- Single-player games like Need For Speed, GTA Vice City – entire game in one system(commonly, a Personal Computer)
- Application development by deploying test servers leading to easy debugging, easy deployment, easy simulation
- Personal Computers

Security

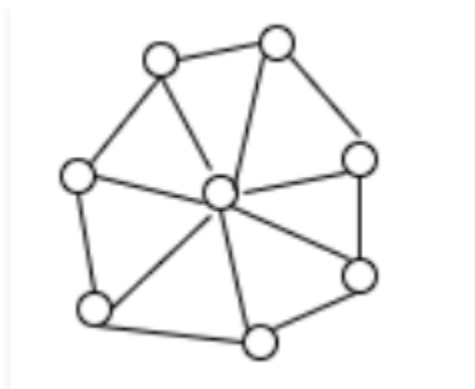
Given that you're dealing with a single server, handling its security seems easier as you only focus on developing security for only one data center and you also can control the client's interaction with that only destination.

Load balancing

To control the number of requests per second that the server can handle, we can implement load balancing.

2. DISTRIBUTED SYSTEMS

Unlike centralized systems, nodes in a distributed system make its own decision. The sum of the individual node decisions determines the system's final behavior. It's worth noting that the submission is not received and responded to by a single person.



Scalability

Both Horizontal and vertical scaling is possible.

Applications

- SOA-based systems
- Multiplayer online games

Performance

These systems allow for better performance as they do not only rely on a single server or data center

Security

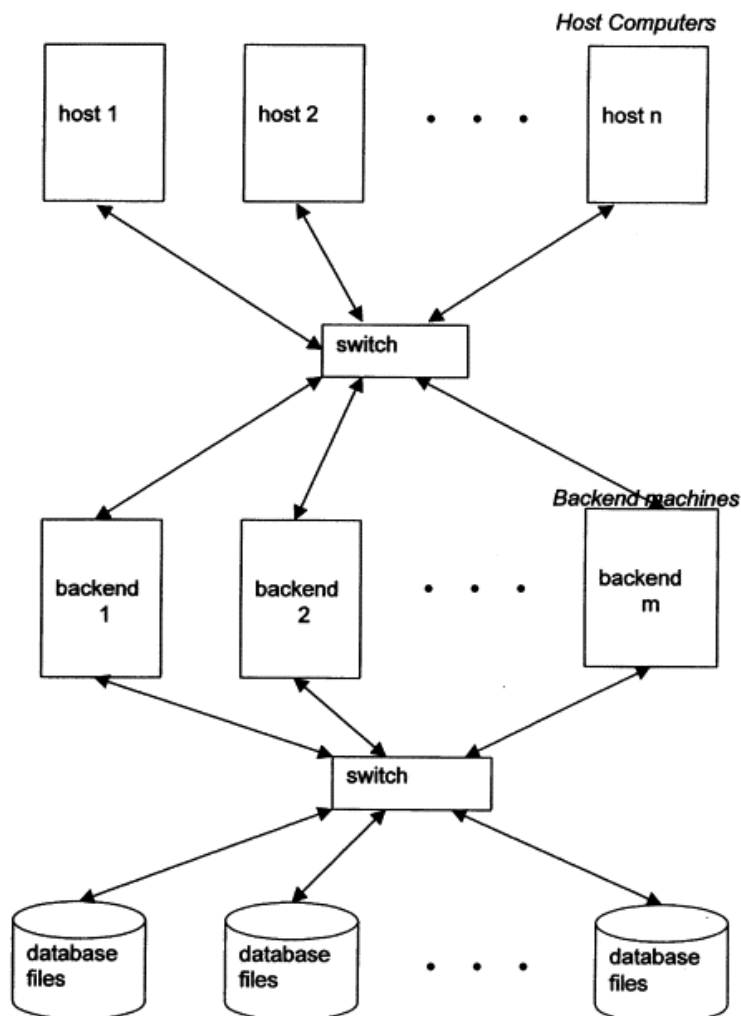
Security is also strong but may require additional resources as they are several ends' security to handle. It may be costly but is a reliable system when implemented.

Load balancing

Load balancing is also very possible here, as you can a load balancer to send a certain number of requests per second to a specific server/data center/database

2. PARALLEL SYSTEMS

Instead of a single backend, several backend machines are linked to a single host or several hosts in a parallel database system environment. The database is stored on several disk units, which are controlled by the backends. The entire archive can be mirrored across several disks, or the archives can be partitioned across several disks. Data partitioning can be accomplished by putting new records on top of old ones.



Scalability

This type of system is very scalable since it allows you to always bring an additional database to the architecture, without interfering with other databases.

Applications

- Multi-layered applications
- Video games

Performance

These systems allow for smooth performance and also helps avoid overload.

Security

Keeping these systems secured 100% feasible.

In fact, these systems allow you to create parallel backups of your data and reduce downtime.

Load balancing

Just like the above load balancing is also possible, but will be made easier here, due to the number of available data nodes