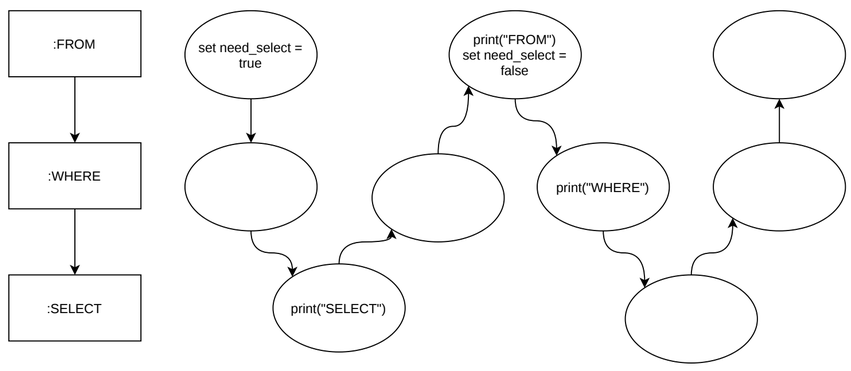
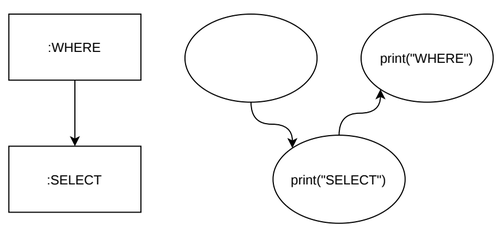
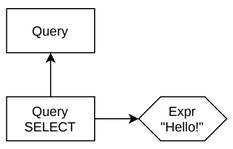

:FROM
:WHERE
:SELECT
set need_select = true
print("SELECT")
print("FROM")
set need_select = false
print("WHERE")


:WHERE
:SELECT
print("SELECT")
print("WHERE")

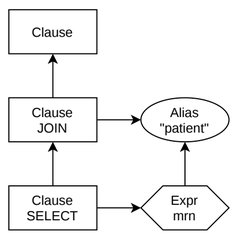
SELECT "Hello World!"

```
sql_select("Hello World!")
sql_query() |> sql_select("Hello World!")
```



SELECT p.mrn FROM patient p

```
p = sql_alias("patient")
sql_join(p) |> sql_select(p.mrn)

p = sql_alias("patient")
p |> sql_select(p.mrn)

(p = sql_from("patient")) |> sql_select(p.mrn)
```

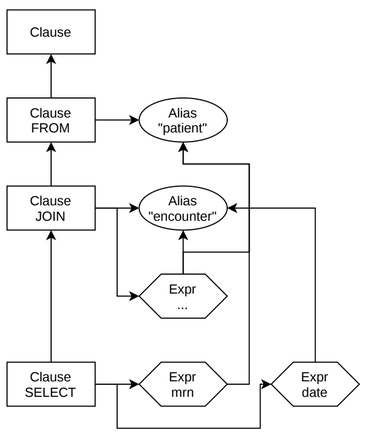


SELECT p.mrn FROM patient p

```
(p = sql_from("patient")) |> sql_select(p.mrn)
```


SELECT p.mrn, e.date
FROM patient p
JOIN encounter e ON (p.id = e.patient_id)

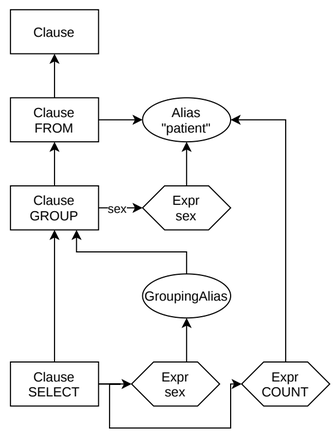
```
p = sql_alias("patient")
e = sql_alias("encounter")
sql_from(p) |> sql_join(e, p.id .== e.patient_id) |> sql_select(p.mrn, e.date)

p = sql_alias(catalog["public"]["patient"])
e = sql_alias(catalog["public"]["encounter"])
sql_from(p) |> sql_join(e, autojoin=p) |> sql_select(p.mrn, e.date)

p = sql_alias("patient")
e = sql_alias("encounter")
p |> sql_join(e, p.id .== e.patient_id) |> sql_select(p.mrn, e.date)

p = sql_alias("patient")
e = sql_alias("encounter")
sql_from(p) |> sql_join(e, p.id .== e.patient_id) |> sql_select(p.mrn) |> sql_select(e.date)
```



SELECT p.sex, COUNT(p)
FROM patient p
GROUP BY p.sex

```
p = sql_alias("patient")
g = sql_from(p) |> sql_group(sex = p.sex)
g |> sql_select(g.sex, sql_count(p))
```

```
p = From("patient")
g = Group(p, sex = p.sex)
Select(g, g.sex, Count(p))
```



SELECT p.mrn, COALESCE(g.n_e, 0)
FROM patient p
LEFT JOIN (
  SELECT e.patient_id, COUNT(e) AS n_e
  FROM encounter e
  GROUP BY e.patient_id) g ON (p.id = g.patient_id)

```
p = From("patient")
e = From("encounter")
g = Group(e, patient_id = e.patient_id)
j = LeftJoin(p, g, p.id .== g.patient_id, omit_if_unused=true)
Select(j, p.mrn, Coalesce(Count(e), 0))
```

SELECT p.mrn
FROM patient p
WHERE p.sex = 'male'

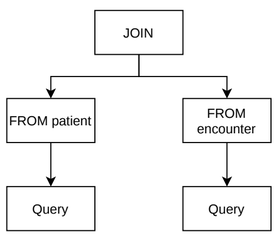
```
p = From("patient")
w = Where(p, p.sex .== "male")
Select(w, p.mrn)

p = From("patient", columns=["mrn", "sex"])
w = Where(p, Ref(1, 2) .== "male", select=[Ref(1,1)])
Select(w, select=[Ref(1,1)])
```

SELECT p.mrn, e.date
FROM patient p
JOIN encounter e ON (p.id = e.patient_id)

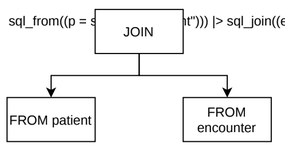
```
p = From("patient")
e = From("encounter")
g = Group(e, patient_id = e.patient_id)
gs = Select(g, patient_id = g.patient_id, n = Count(e))
j = LeftJoin(p, gs, p.id .== gs.patient_id)
Select(j, p.mrn, Coalesce(gs.n, 0))
```

```
patient_tbl = Table("patient", [("id", Int), ("sex", String), ("mrn", String)])
encounter_tbl = Table("encounter", [("id", Int), ("patient_id", Int), ("date", Date)])

auto_connect!(patient_tbl, encounter_tbl, [("id", "patient_id")])

p = From(patient_tbl)
e = From(encounter_tbl)
j = LeftJoin(p, e)
Select(j, p.mrn, e.date)
```

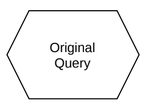
```
p = From("patient")
e = From("encounter")
j = Join(p, e, p.id .== e.patient_id)
Select(j, p.mrn, e.date)
```




```
sql_from((p = s                                    t"))) |> sql_join((e = sql_alias("encounter")), p.id .== e.patient_id) |> sql_select(p.mrn, e.date)
```



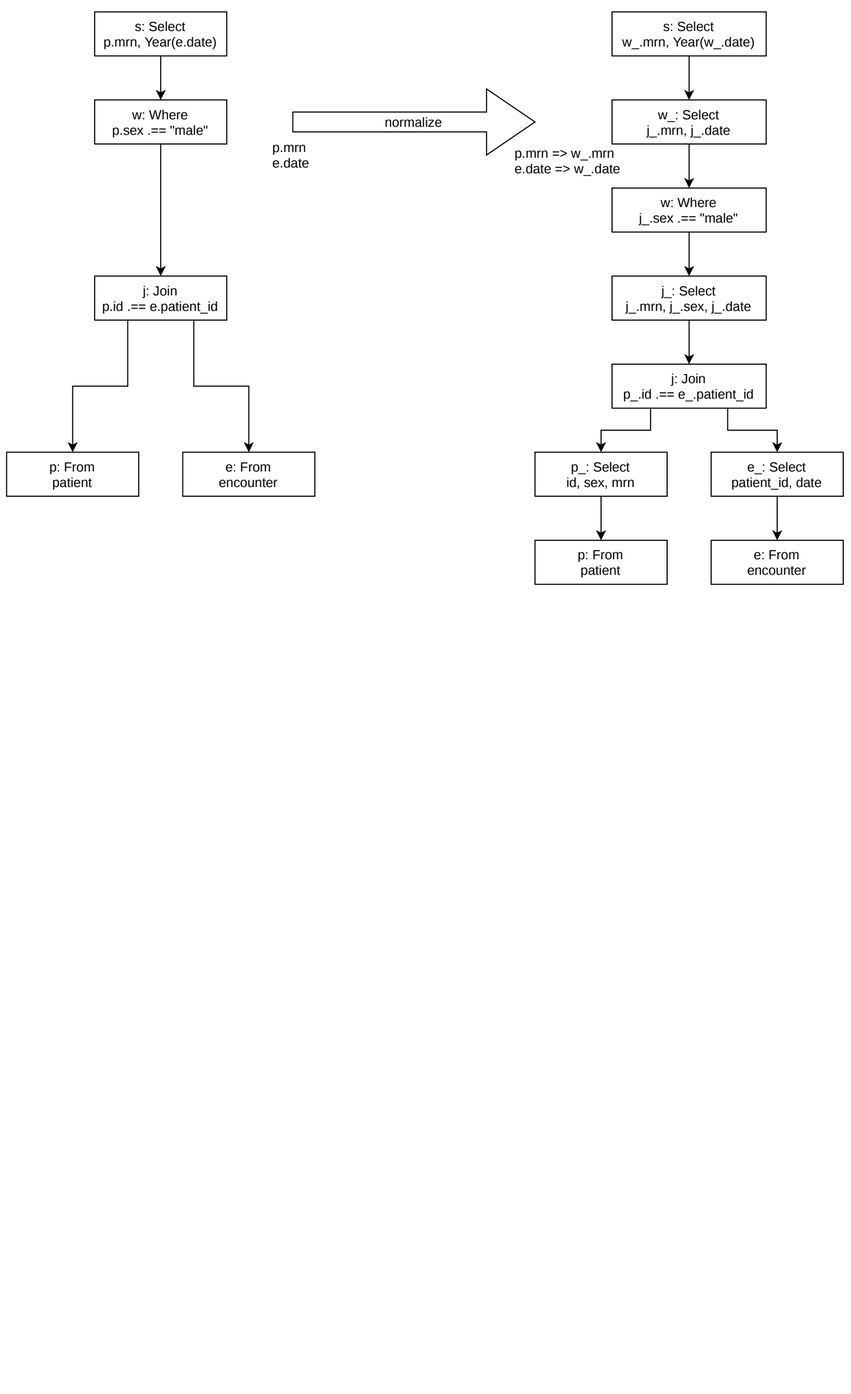

```
p = From("patient")
e = From("encounter")
g = Group(e, patient_id = e.patient_id, summarize=(; n = Count(e)))
j = LeftJoin(p, g, p.id .== g.patient_id)
Select(j, p.mrn, Coalesce(g.n, 0))
```



```
SELECT p.mrn, EXTRACT(YEAR FROM e.date)
FROM patient p
JOIN encounter e
ON (p.id = e.patient_id)
WHERE p.sex = 'male'
```

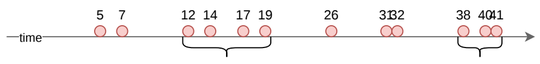
```
p = From(patient)
e = From(encounter)
j = Join(p, e, p.id .== e.patient_id)
w = Where(j, p.sex .== "male")
s = Select(w, mrn = p.mrn, year = Year(e.date))
```

```
p = From(patient)
p_ = Select(p, _id = Const(:id), _sex = Const(:sex), _mrn = Const(:mrn))
e = From(encounter)
e_ = Select(e, _patient_id = Const(:patient_id), _date = Const(:date))
j = Join(p_, e_, p_._id .== e_._patient_id)
j_ = Select(j, _mrn = p_._mrn, _sex = p_._sex, _date = e_._date)
w = Where(j_, j_._sex .== "male")
w_ = Select(w, _mrn = j_._mrn, _date = j_._date)
s = Select(w_, mrn = w_._mrn, year = Year(w_._date))
```



```
SELECT c.person_id, c.peer_id, c.timestamp, c.distance
FROM contact c
```

For each pair of persons, find the contact interval when there were detected at least once in a minute in a distance of less than 5 meters.

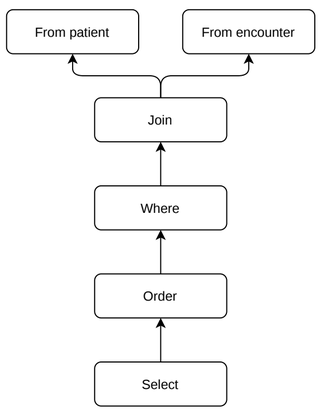


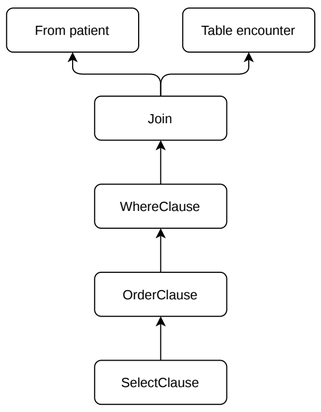
5	5		12	12		12	12		26		31	31		38	38	38							
0	2		0	2		5	7		0		0	1		0	2	3							

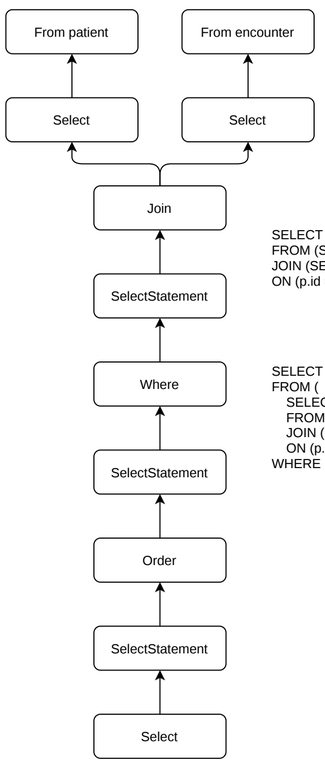
	5			12			12		26			31				38							
	2			2			7		0			1				3							

							12									38							
							7									3							

```
SELECT p.mrn, e.date
FROM patient p
JOIN encounter e ON (p.id = e.patient_id)
WHERE p.sex = 'male'
ORDER BY e.date
```



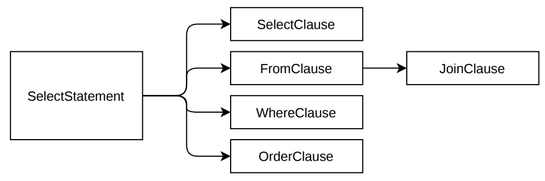


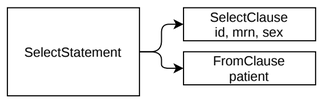


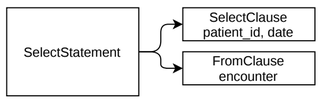

```
SELECT p.id, p.mrn, p.sex FROM patient p
    SELECT p.id, p.mrn FROM patient p
SELECT e.patient_id, e.date FROM encounter e
```

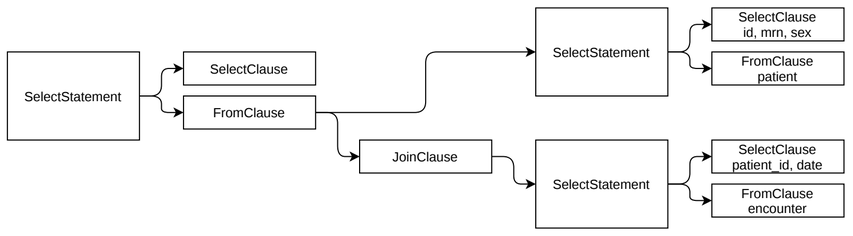
```
SELECT p.mrn, p.sex, e.date
FROM (SELECT p.id, p.mrn, p.sex FROM patient p) p
JOIN (SELECT e.patient_id, e.date FROM encounter e) e
ON (p.id = e.patient_id)
```

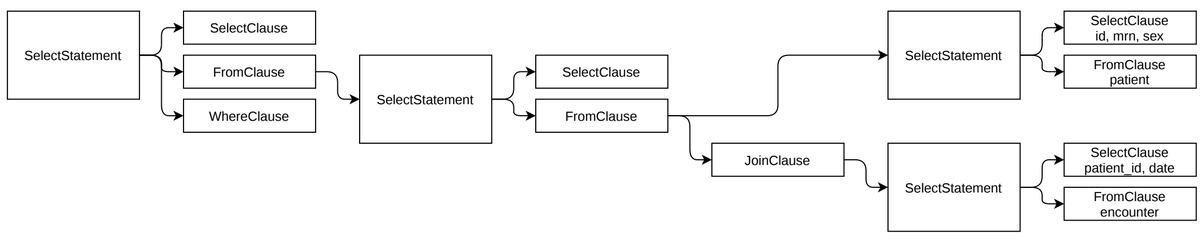
```
SELECT p.mrn, e.date
FROM (
   SELECT p.mrn, p.sex, e.date
   FROM (SELECT p.id, p.mrn, p.sex FROM patient p) p
   JOIN (SELECT e.patient_id, e.date FROM encounter e) e
   ON (p.id = e.patient_id)) p
WHERE p.sex = 'male'
```

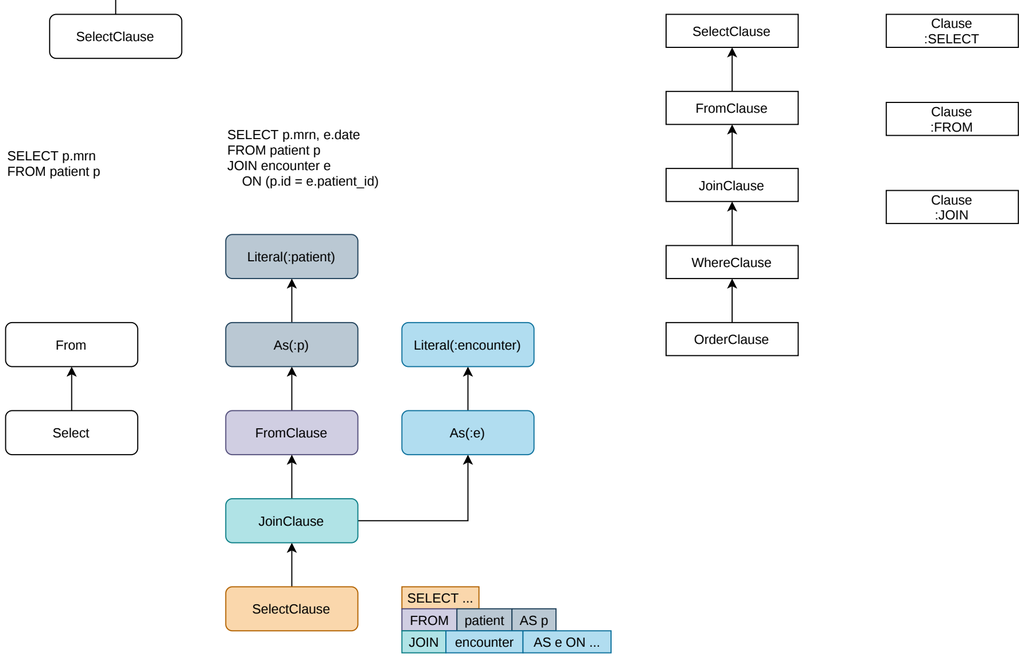


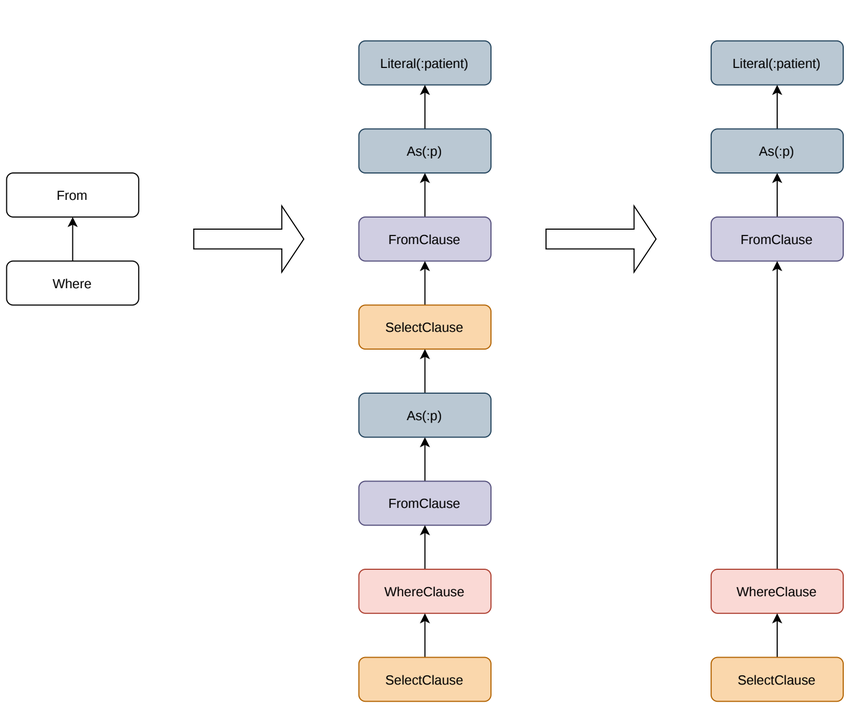


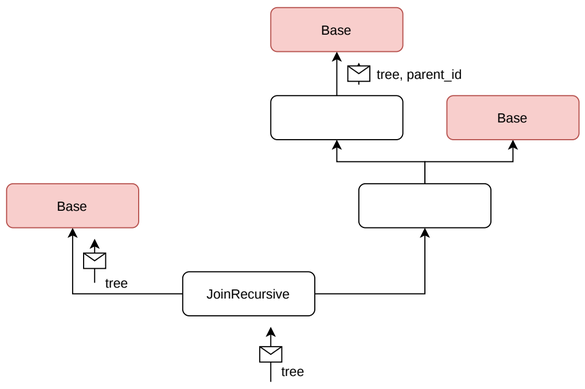




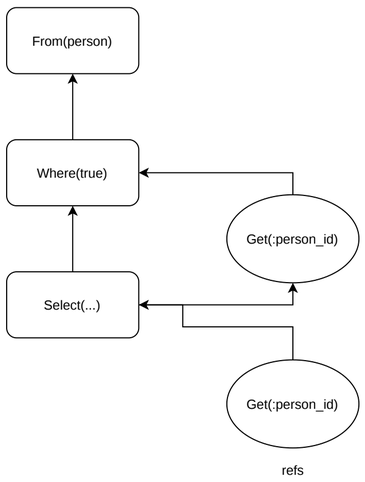


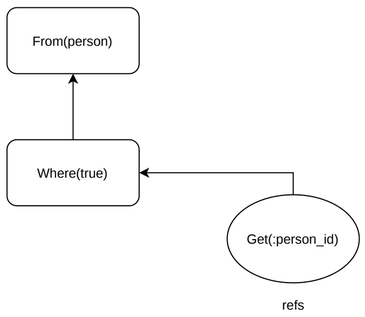


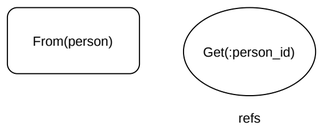


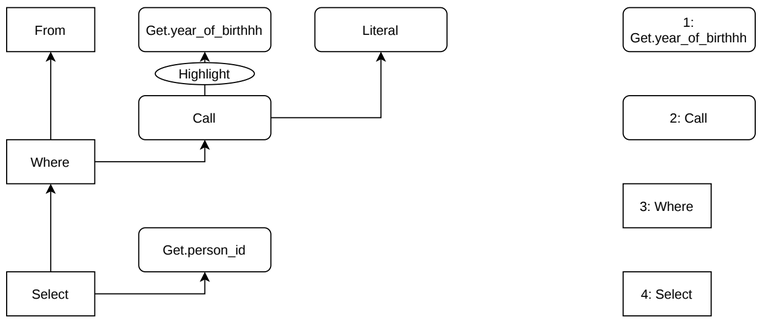



```
WITH RECURSIVE X AS (
      SELECT 1 AS N
   UNION ALL
      SELECT ...
      ...
         FROM X
      ...
         FROM X)
```


From(person)
Where(true)
Get(:person_id)
Select(...)
Get(:person_id)
refs


From(person)
Where(true)
Get(:person_id)
refs


From(person)
Get(:person_id)
refs

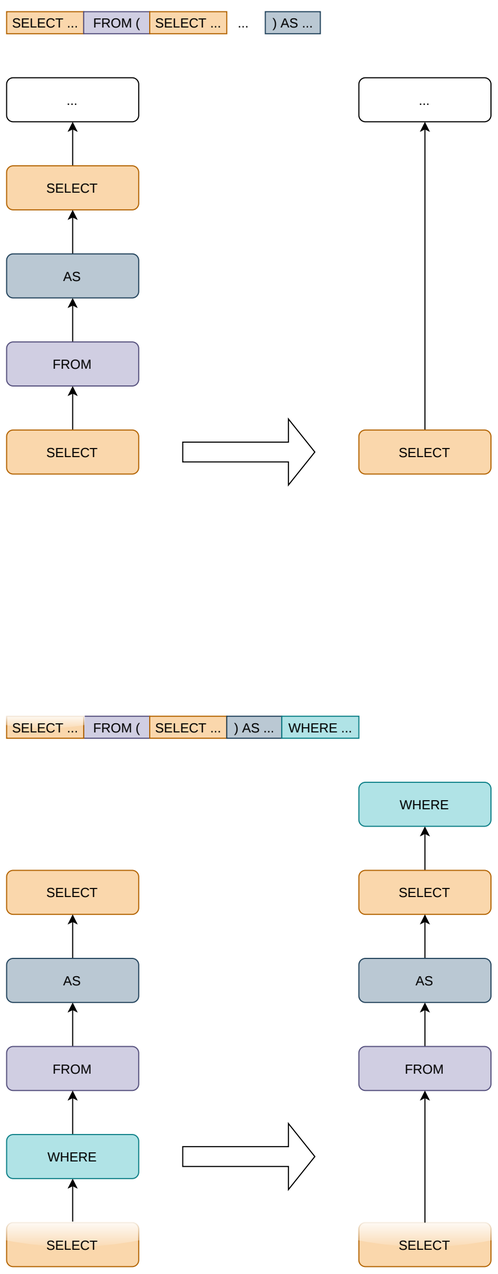


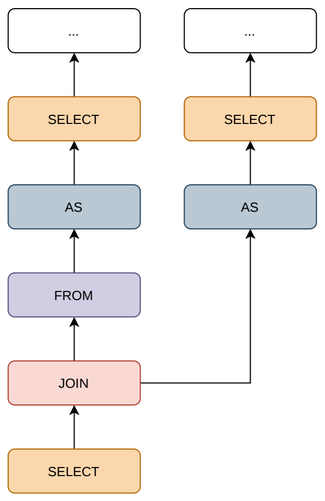
1: Get.year_of_birthhh

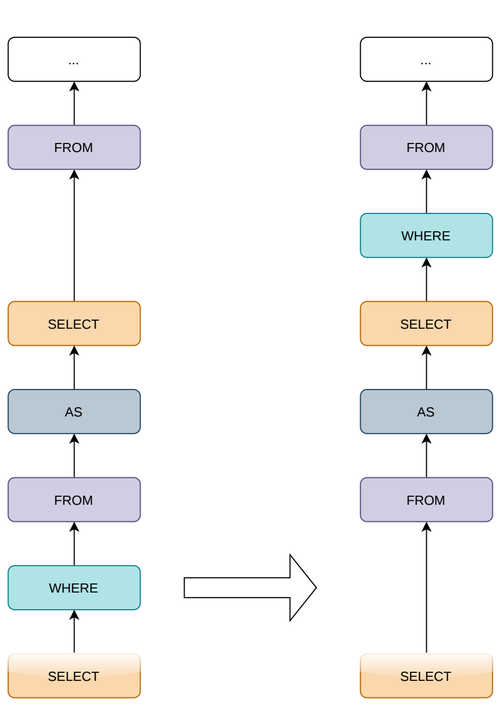
2: Call

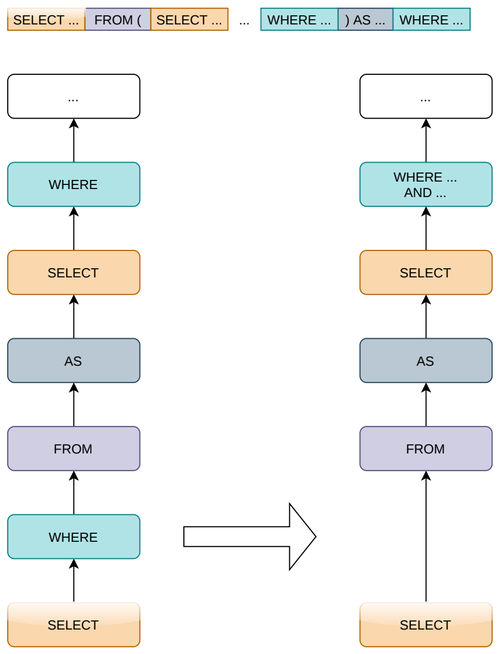
3: Where

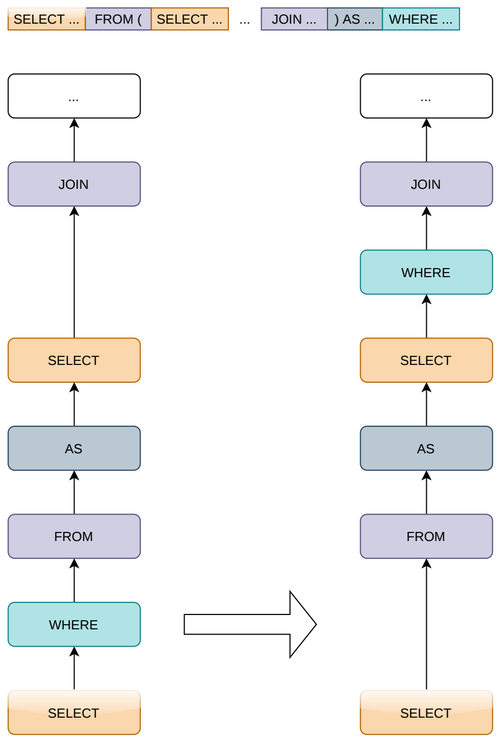
4: Select

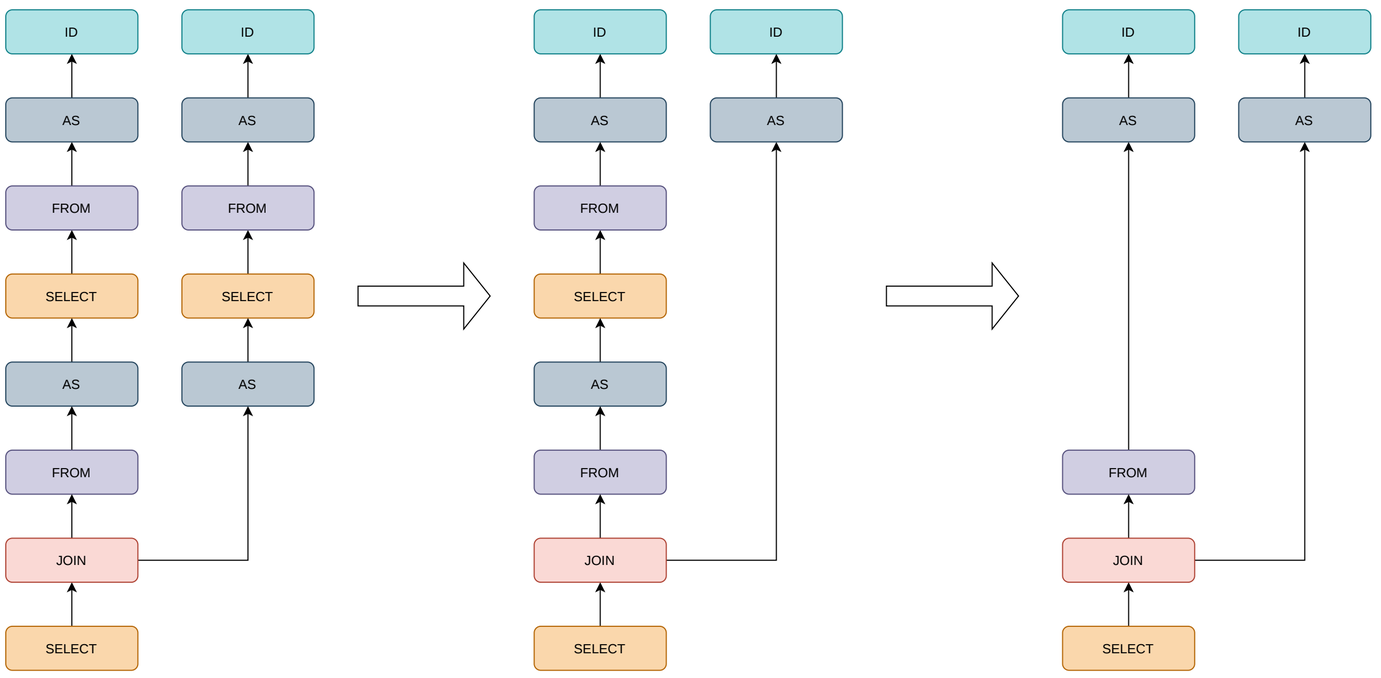

SELECT ... | FROM (| SELECT ... |) AS ... | WHERE ...
...
SELECT
AS
FROM
WHERE
SELECT
WHERE
SELECT
AS
FROM
SELECT


...
...
SELECT
SELECT
AS
AS
FROM
JOIN
SELECT


SELECT ... | FROM (| SELECT ... | FROM ... |) AS ... | WHERE ...
...
FROM
SELECT
AS
FROM
WHERE
SELECT
...
FROM
WHERE
SELECT
AS
FROM
SELECT


SELECT ... | FROM (| SELECT ... | ... | WHERE ... |) AS ... | WHERE ...
...
WHERE
SELECT
AS
FROM
WHERE
SELECT
...
WHERE ... AND ...
SELECT
AS
FROM
SELECT


SELECT ... | FROM (| SELECT ... | ... | JOIN ... |) AS ... | WHERE ...
...
JOIN
SELECT
AS
FROM
WHERE
SELECT
...
JOIN
WHERE
SELECT
AS
FROM
SELECT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ID
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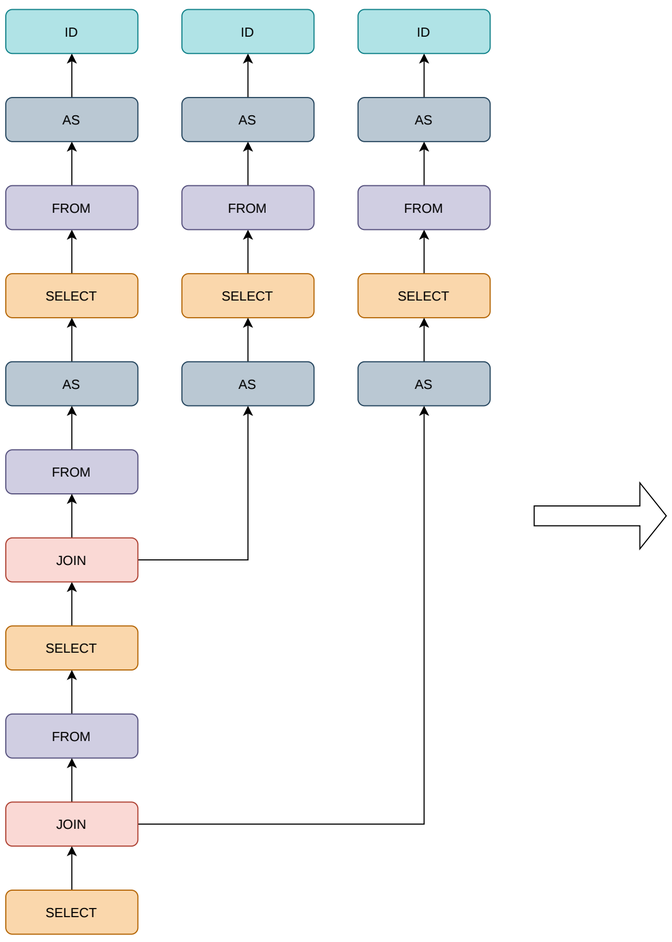
FROM
JOIN
SELECT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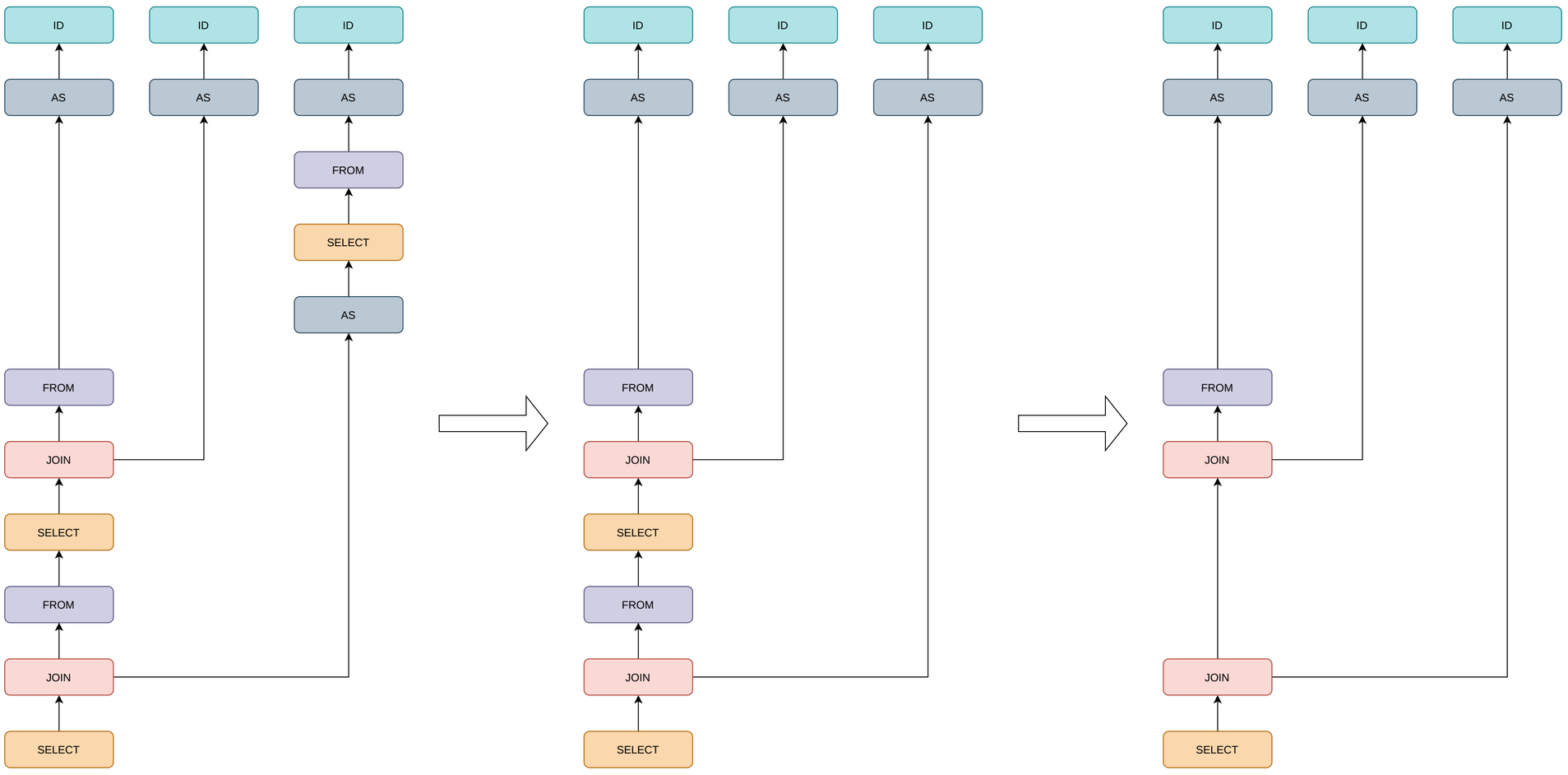
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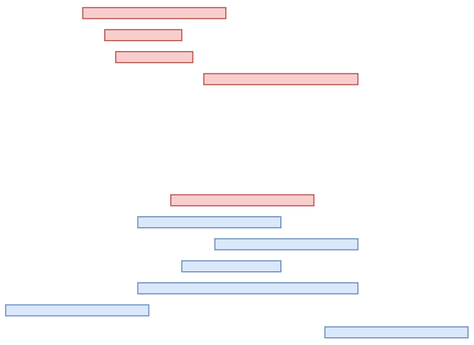
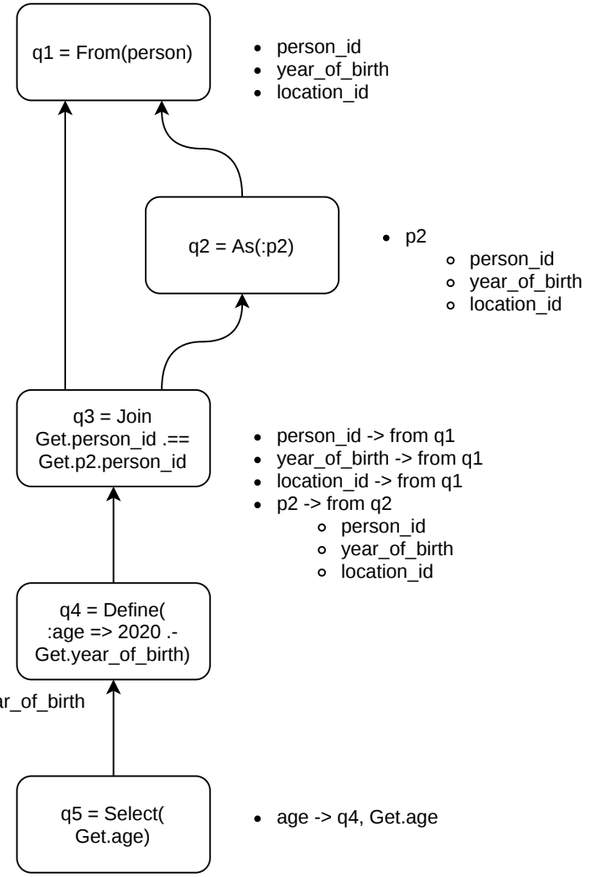
FROM
JOIN
SELECT



Generate a namespace for each node



- person_id
- year_of_birth
- location_id

- p2
  - person_id
  - year_of_birth
  - location_id

- person_id -> from q1
- year_of_birth -> from q1
- location_id -> from q1
- p2 -> from q2
  - person_id
  - year_of_birth
  - location_id

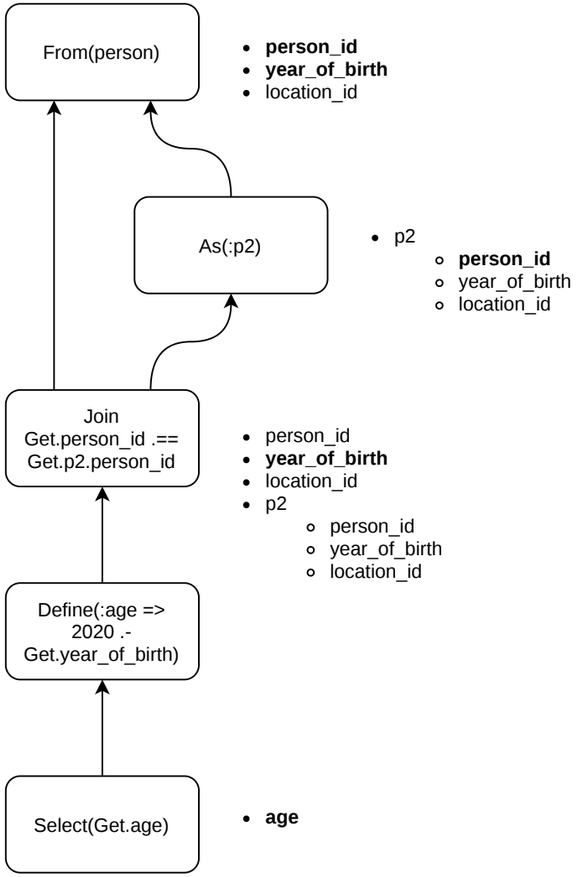
- person_id
- year_of_birth
- location_id
- age -> 2020 .- Get.year_of_birth
- p2
  - person_id
  - year_of_birth
  - location_id

- age -> q4, Get.age

A namespace must support:

- regular columns
- hierarchical aliases
- ambiguous columns
- groups
- nodes
- preserves order of columns

Generate an order for each node



- **person_id**
- **year_of_birth**
- location_id

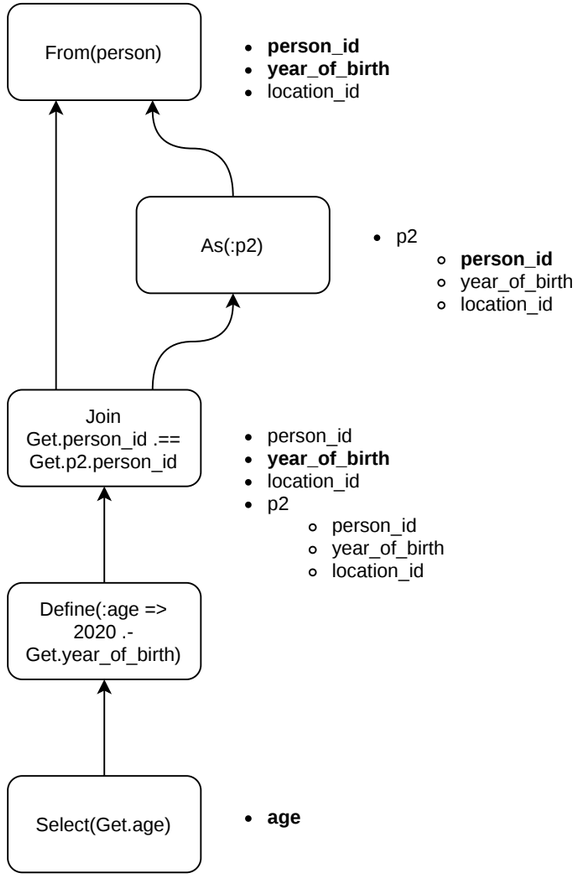
- p2
  - **person_id**
  - year_of_birth
  - location_id

- person_id
- **year_of_birth**
- location_id
- p2
  - person_id
  - year_of_birth
  - location_id

- person_id
- year_of_birth
- location_id
- **age**
- p2
  - person_id
  - year_of_birth
  - location_id

- **age**

Generate an order for each node



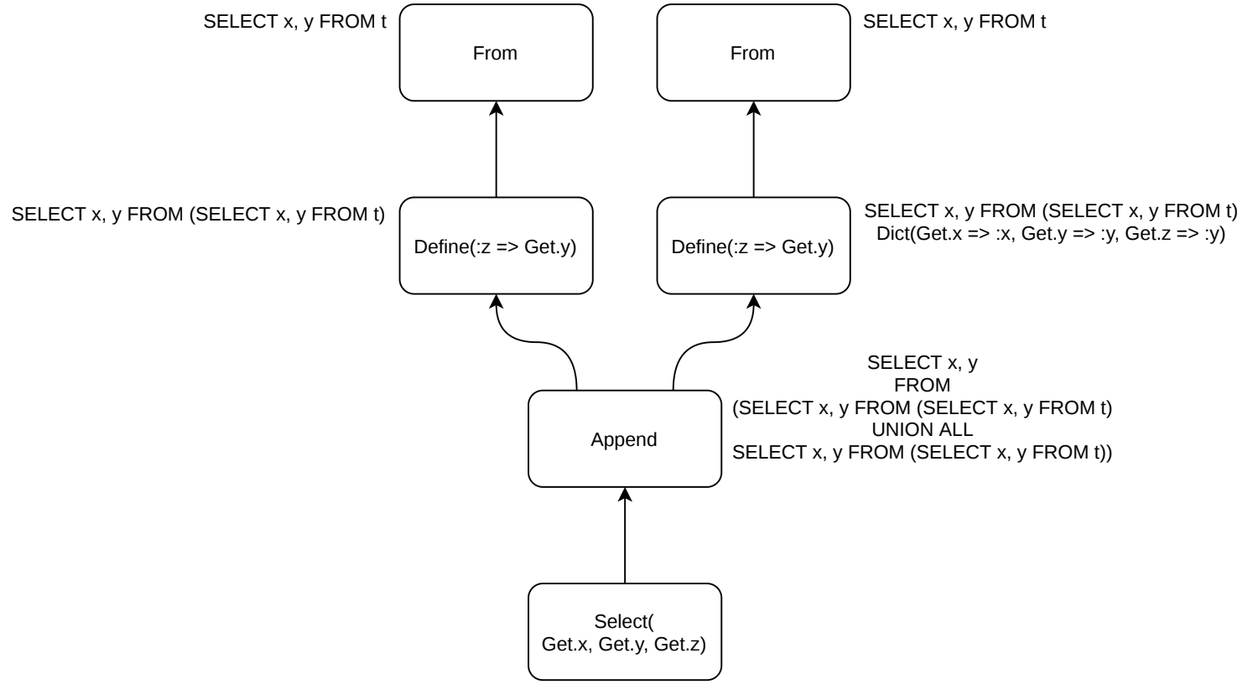
- **person_id**
- **year_of_birth**
- location_id

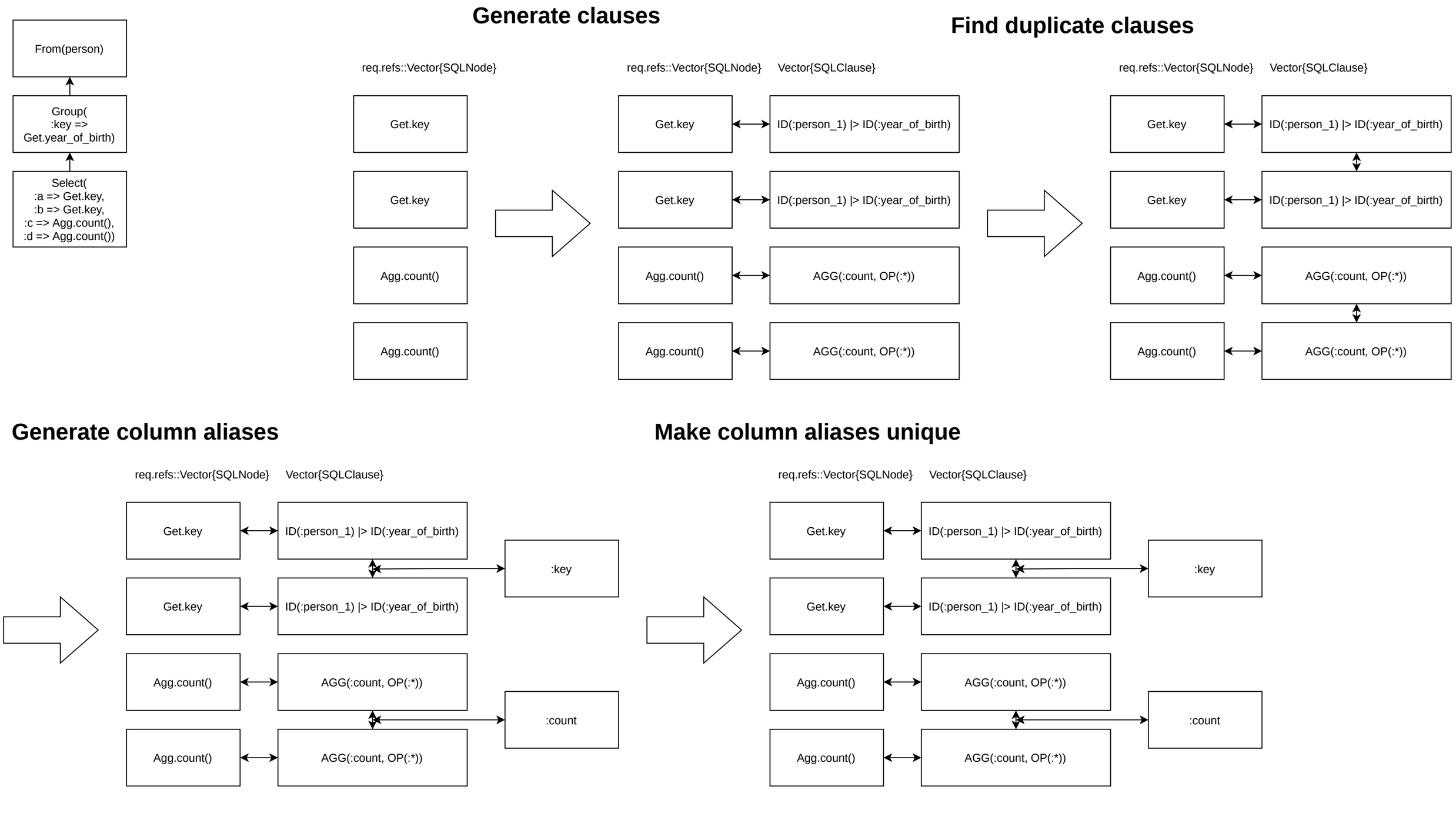
- p2
  - **person_id**
  - year_of_birth
  - location_id

- person_id
- **year_of_birth**
- location_id
- p2
  - person_id
  - year_of_birth
  - location_id

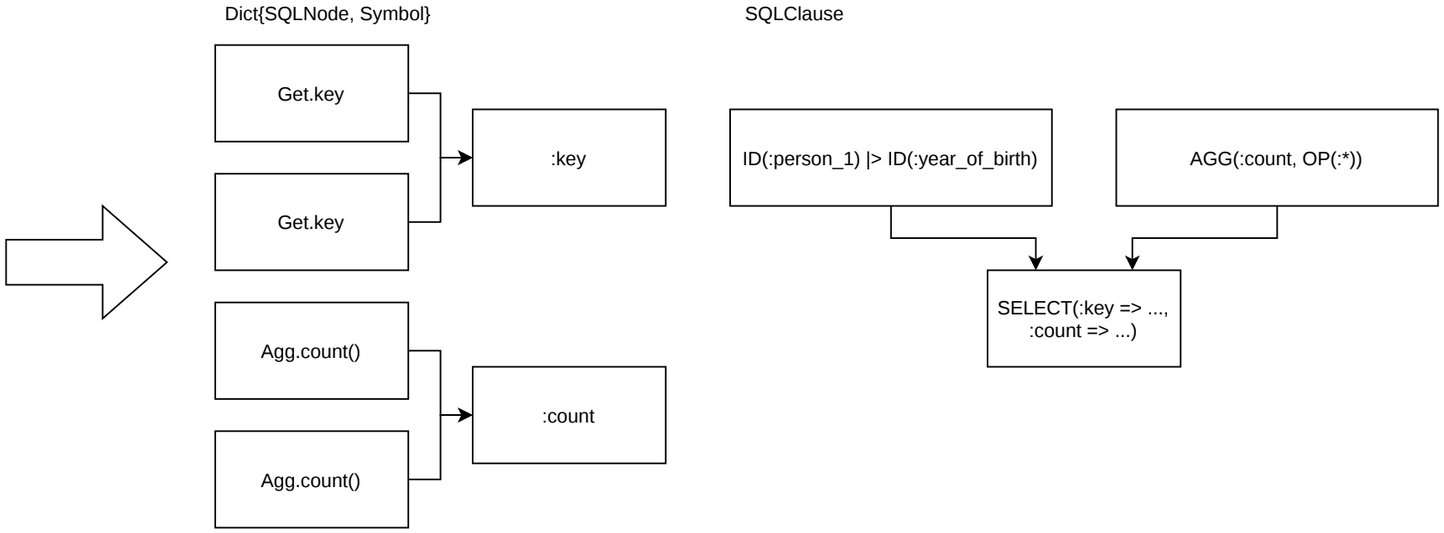
- person_id
- year_of_birth
- location_id
- **age**
- p2
  - person_id
  - year_of_birth
  - location_id

- **age**

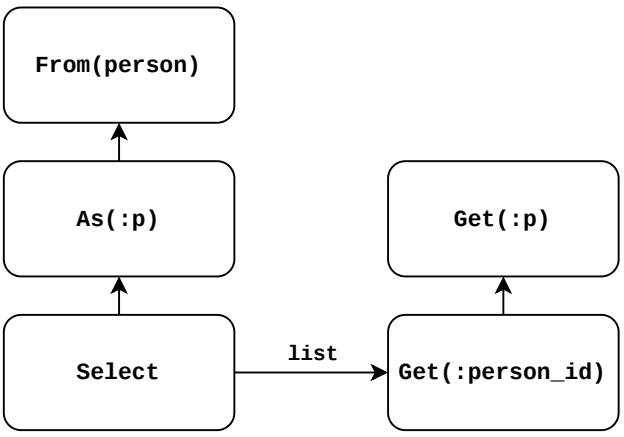



Generate clauses
From(person)
Group(
:key =>
Get.year_of_birth)
Select(
:a => Get.key,
:b => Get.key,
:c => Agg.count(),
:d => Agg.count())
req.refs::Vector{SQLNode}
Get.key
Get.key
Agg.count()
Agg.count()
req.refs::Vector{SQLNode}
Vector{SQLClause}
Get.key
ID(:person_1) |> ID(:year_of_birth)
Get.key
ID(:person_1) |> ID(:year_of_birth)
Agg.count()
AGG(:count, OP(:*))
Agg.count()
AGG(:count, OP(:*))
Find duplicate clauses
req.refs::Vector{SQLNode}
Vector{SQLClause}
Get.key
ID(:person_1) |> ID(:year_of_birth)
Get.key
ID(:person_1) |> ID(:year_of_birth)
Agg.count()
AGG(:count, OP(:*))
Agg.count()
AGG(:count, OP(:*))
Generate column aliases
req.refs::Vector{SQLNode}
Vector{SQLClause}
Get.key
ID(:person_1) |> ID(:year_of_birth)
Get.key
ID(:person_1) |> ID(:year_of_birth)
Agg.count()
AGG(:count, OP(:*))
Agg.count()
AGG(:count, OP(:*))
:key
:count
Make column aliases unique
req.refs::Vector{SQLNode}
Vector{SQLClause}
Get.key
ID(:person_1) |> ID(:year_of_birth)
Get.key
ID(:person_1) |> ID(:year_of_birth)
Agg.count()
AGG(:count, OP(:*))
Agg.count()
AGG(:count, OP(:*))
:key
:count

Generate a subquery object and replacement map



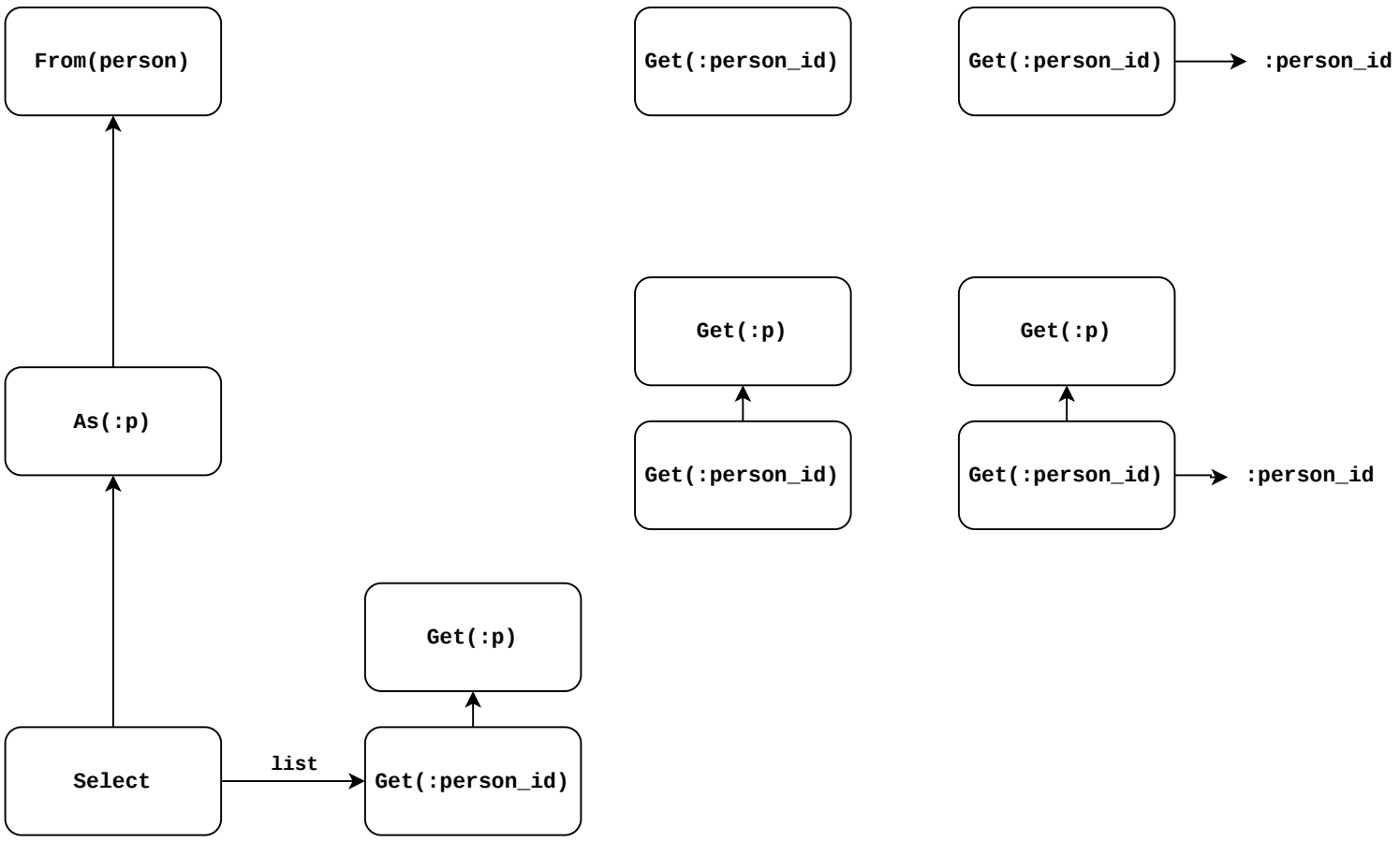
```
From(person) |>
As(:p) |>
Select(Get.p.person_id)
```

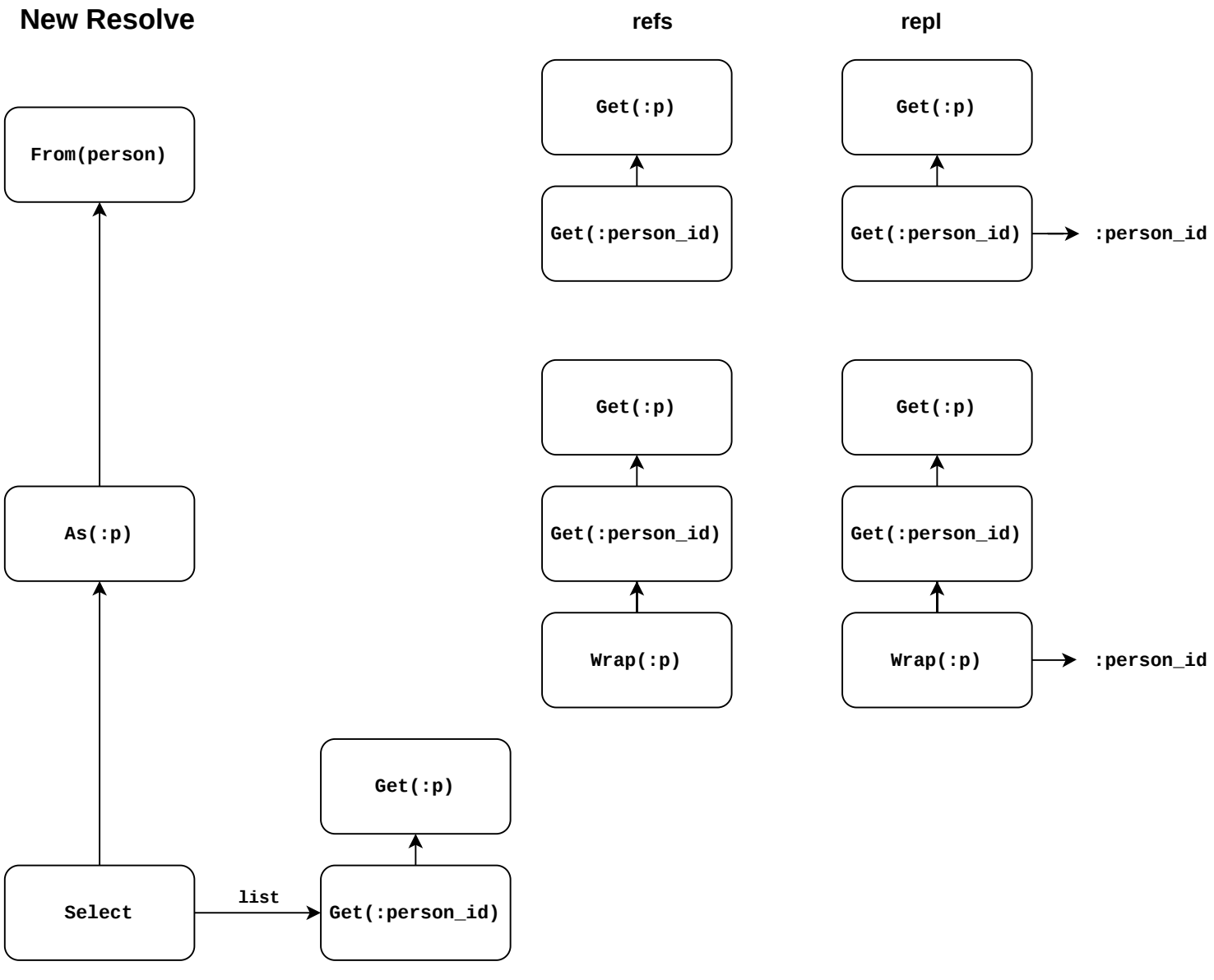


Resolve

refs

repl




New Resolve
refs
repl
From(person)
As(:p)
Select
list
Get(:p)
Get(:person_id)
Get(:p)
Get(:person_id)
Get(:p)
Get(:person_id)
Wrap(:p)
Get(:p)
Get(:person_id)
:person_id
Get(:p)
Get(:person_id)
Wrap(:p)
:person_id