CSCI317 – DATABASE PERFORMANCE TUNING

Tutorial – Denormalization

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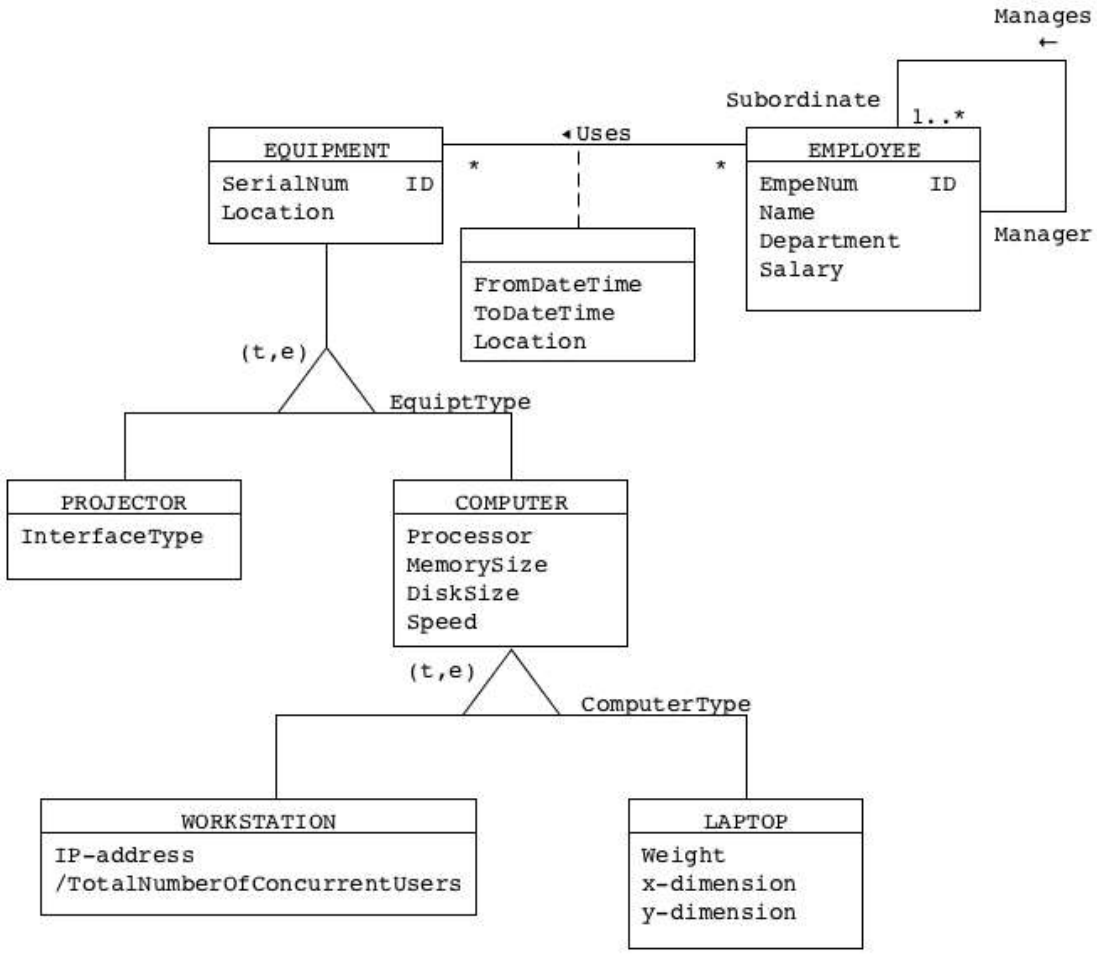
Computer Equipment



Problem statement:

Assume that:

- The queries related to Projectors, Laptops, and computer components are very rare,
- A lot of queries are consistent with the following patterns:

  “find the names of all employees using a workstation identified by a given IP address just now”

  “find all workstations which are used in a given period of time by employees from a given department.”

Problem statement:

1. Eliminate generalization hierarchy from the conceptual model given above. Assume that objective of this transformation is to optimize the performance of applications consisted with the patterns listed above.

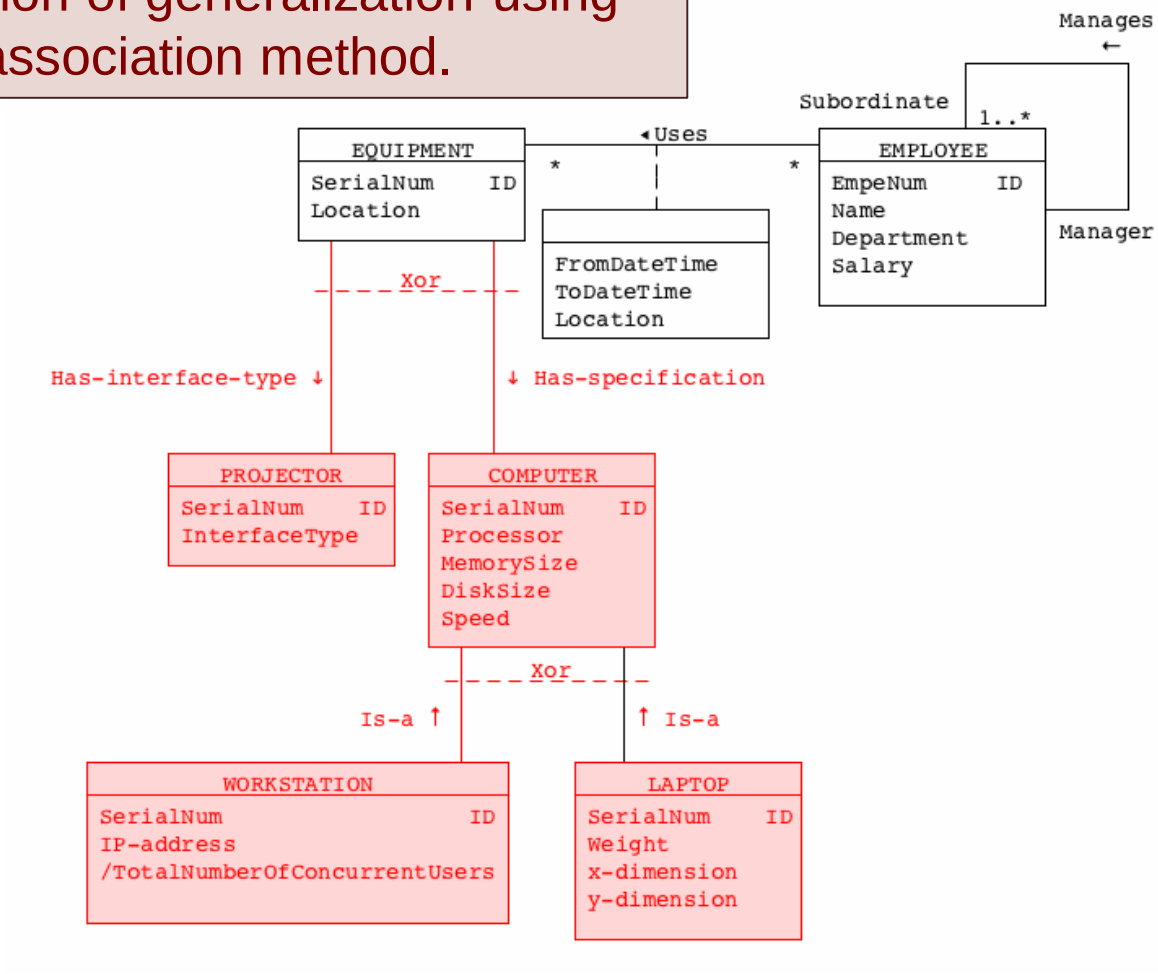
Steps involved:

- Elimination of generalization
  - Association method
  - Subset method
  - Superset method
- Simplifications
  - Elimination of association classes
  - Elimination of link attributes
  - Elimination of many-to-many associations
- Decomposition (Horizontal)
- Migrate/copy attributes

Elimination of generalization using association method

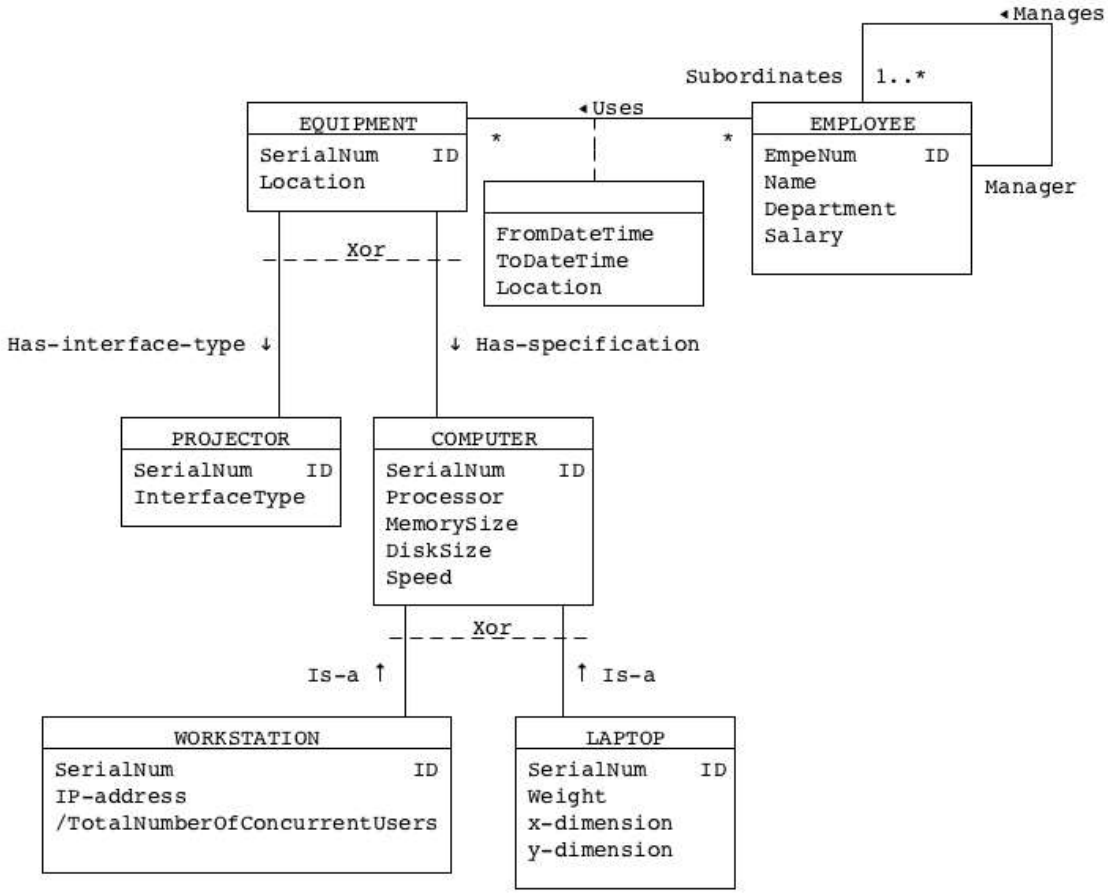
Eliminate generalization using Association Method

Elimination of generalization using association method.

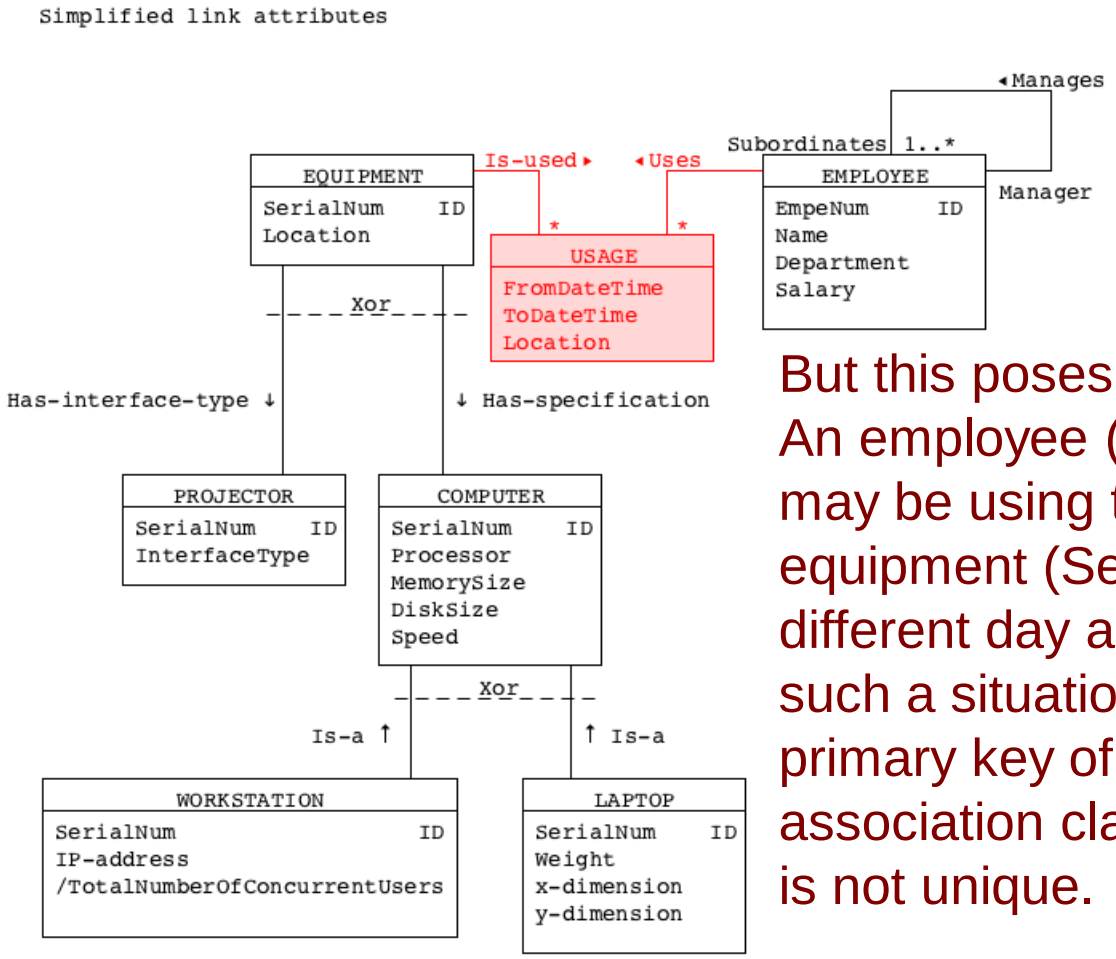


Conceptual Model With Generalization Removed

Next, we need to eliminate the link-attributes.



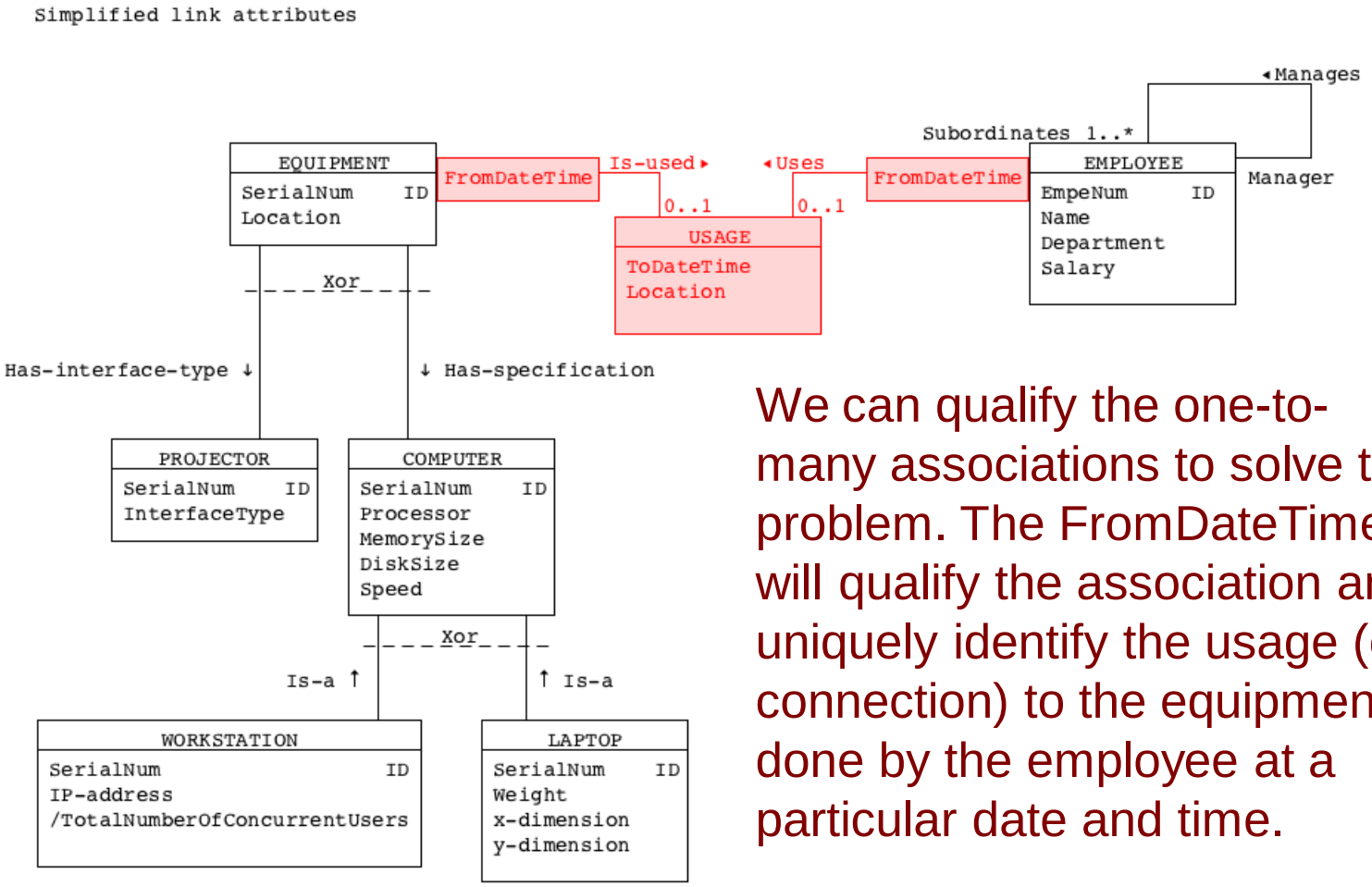
Eliminate the link attribute



But this poses a problem. An employee (EmpeNum) may be using the same equipment (SerialNum) in a different day and time. In such a situation, the primary key of the association class USAGE is not unique.

How to solve this problem?

Eliminate the link attribute



We can qualify the one-to-many associations to solve the problem. The FromDateTime will qualify the association and uniquely identify the usage (or connection) to the equipment done by the employee at a particular date and time.

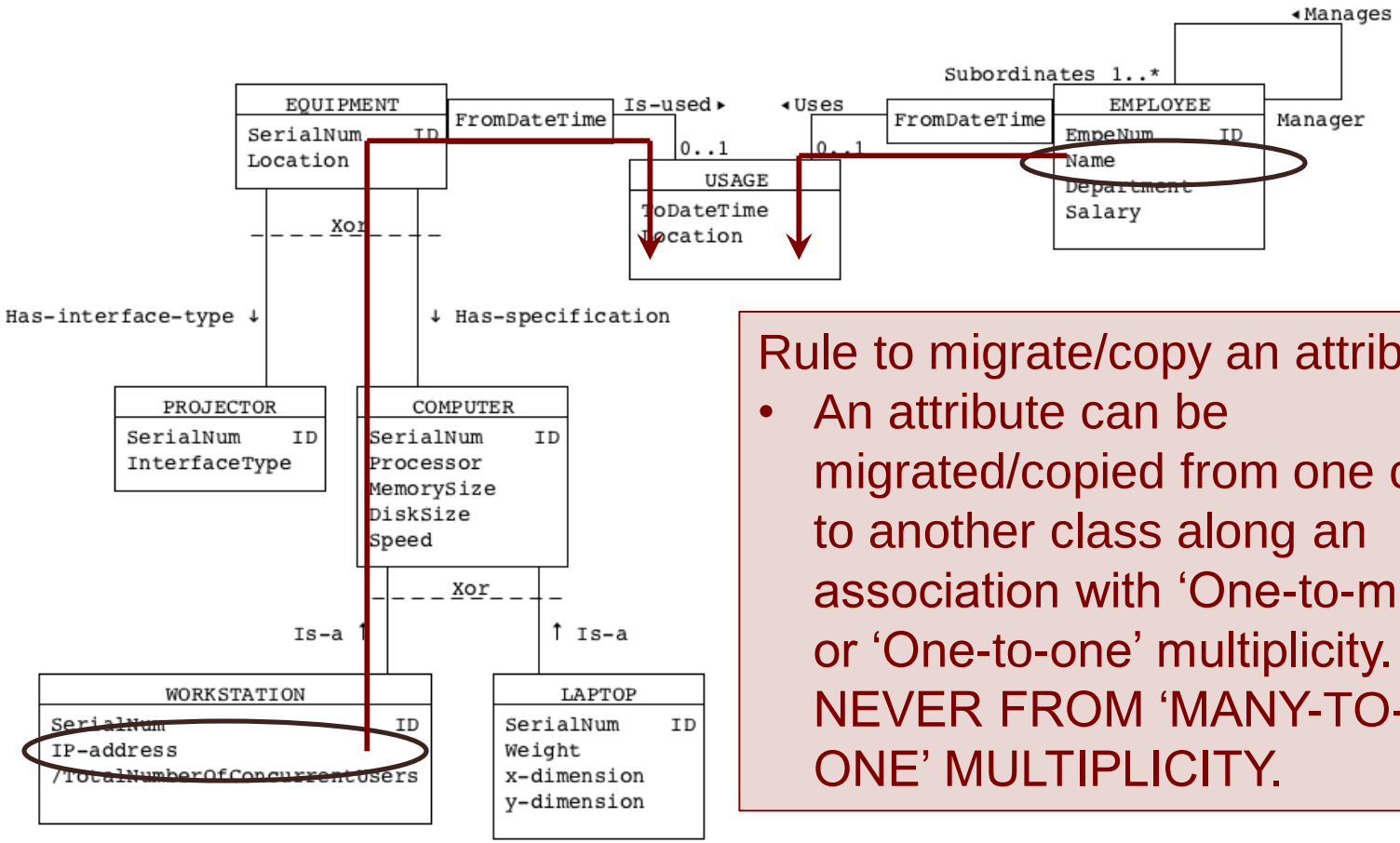
Attribute migration

A lot of queries are consistent with the following patterns:

- “find the names of all employees using a workstation identified by a given IP address just now”
- “find all workstations which are used in a given period of time by employees from a given department.”

Attribute migration

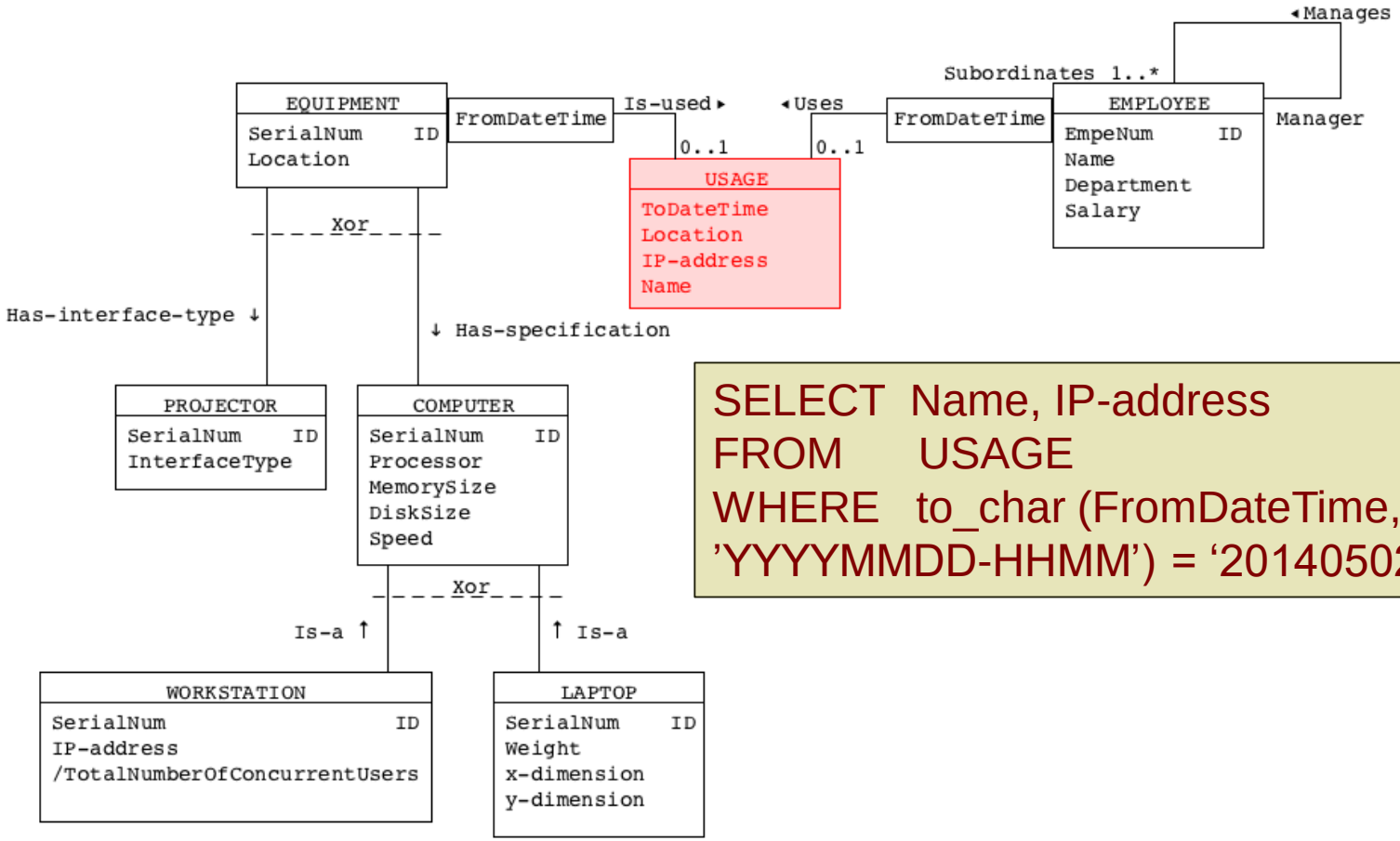
Find the names of all employees using a workstation identified by a given IP address just now



Rule to migrate/copy an attribute:

- An attribute can be migrated/copied from one class to another class along an association with ‘One-to-many’ or ‘One-to-one’ multiplicity. NEVER FROM ‘MANY-TO-ONE’ MULTIPLICITY.

Attribute migration




```
SELECT  Name, IP-address
FROM    USAGE
WHERE   to_char (FromDateTime,
'YYYYMMDD-HHMM') = '20140502-0830';
```

Attribute migration

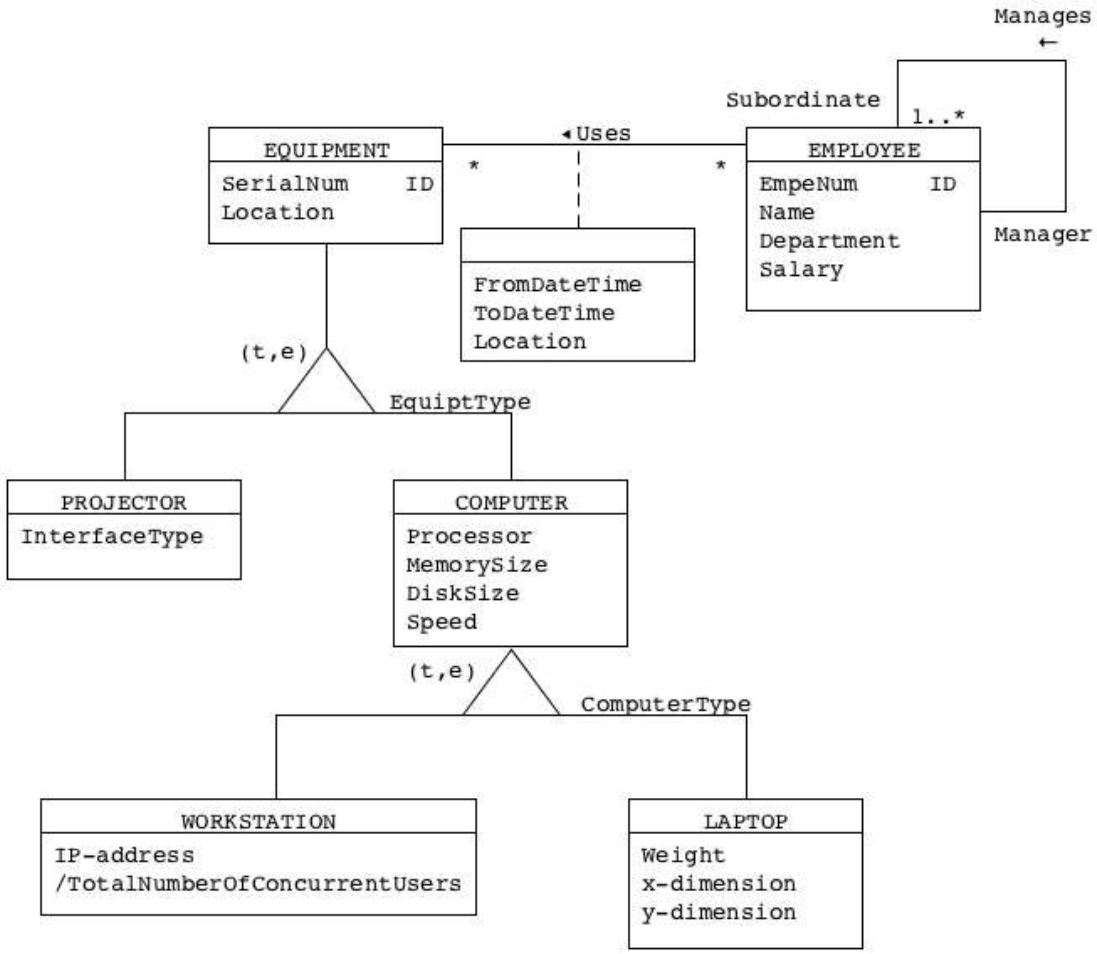
- How about this query?

  “Find all workstations which are used in a given period of time by employees from a given department.”

  Try to do it yourself as an exercise.

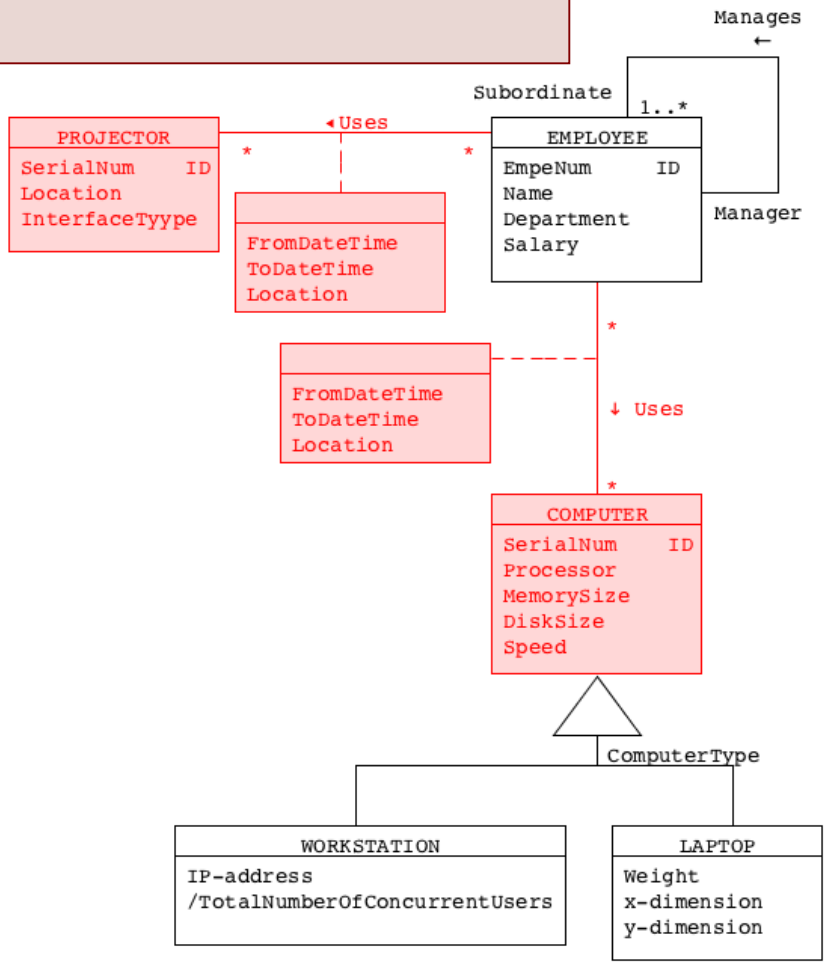
Eliminate Generalization Using Subset Method

Computer Equipment



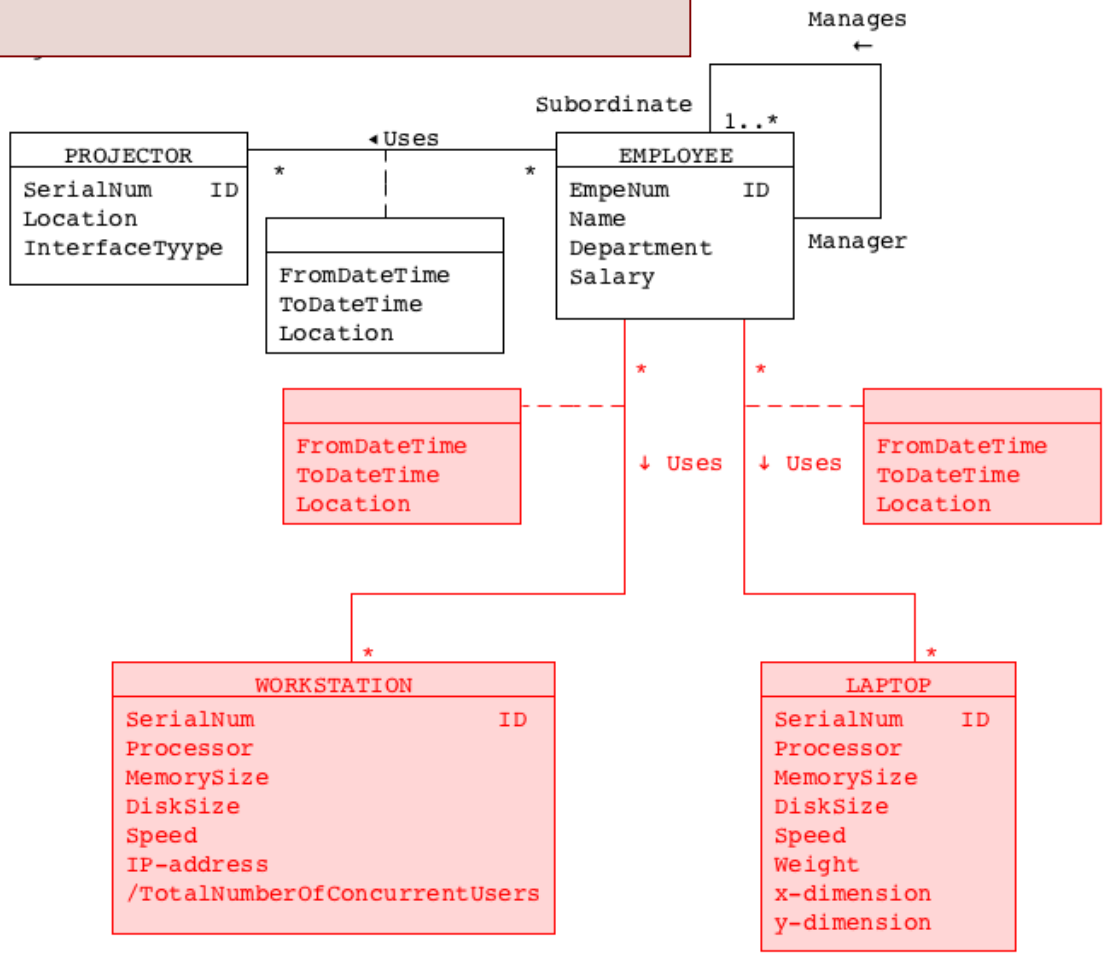
Eliminate Generalization Using Subset Method

Eliminating generalization using subset method.

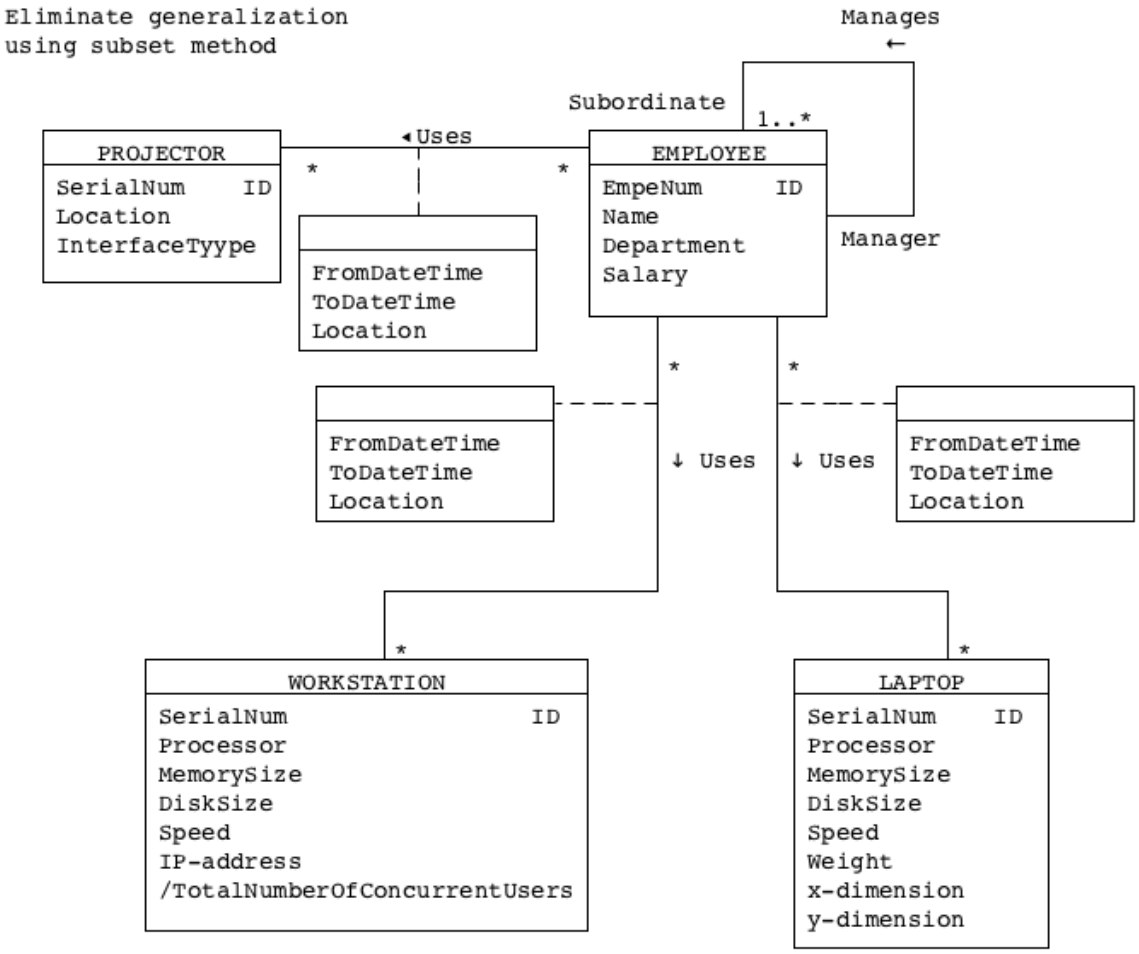


Eliminate Generalization Using Subset Method

Eliminating generalization using subset method.

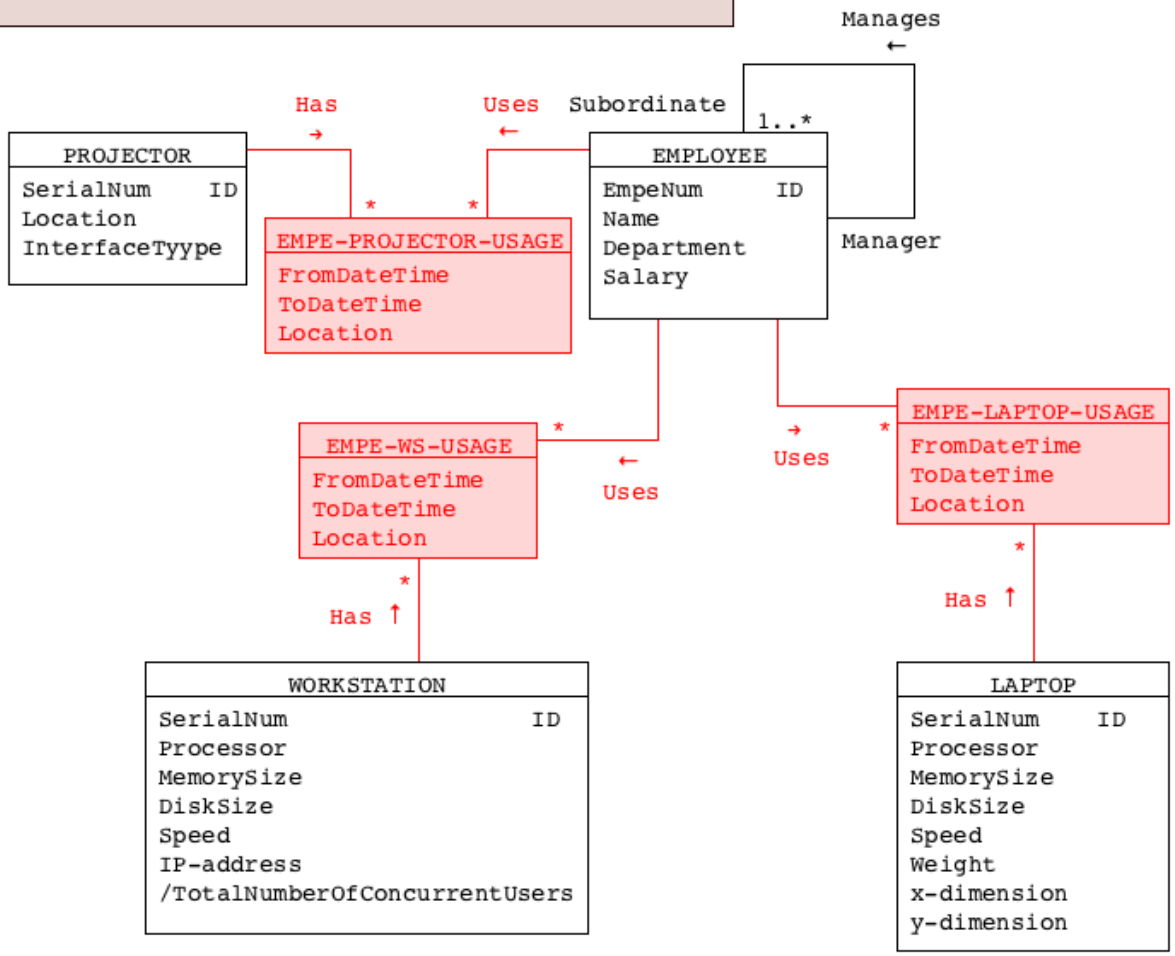


Conceptual Model With Generalization Removed

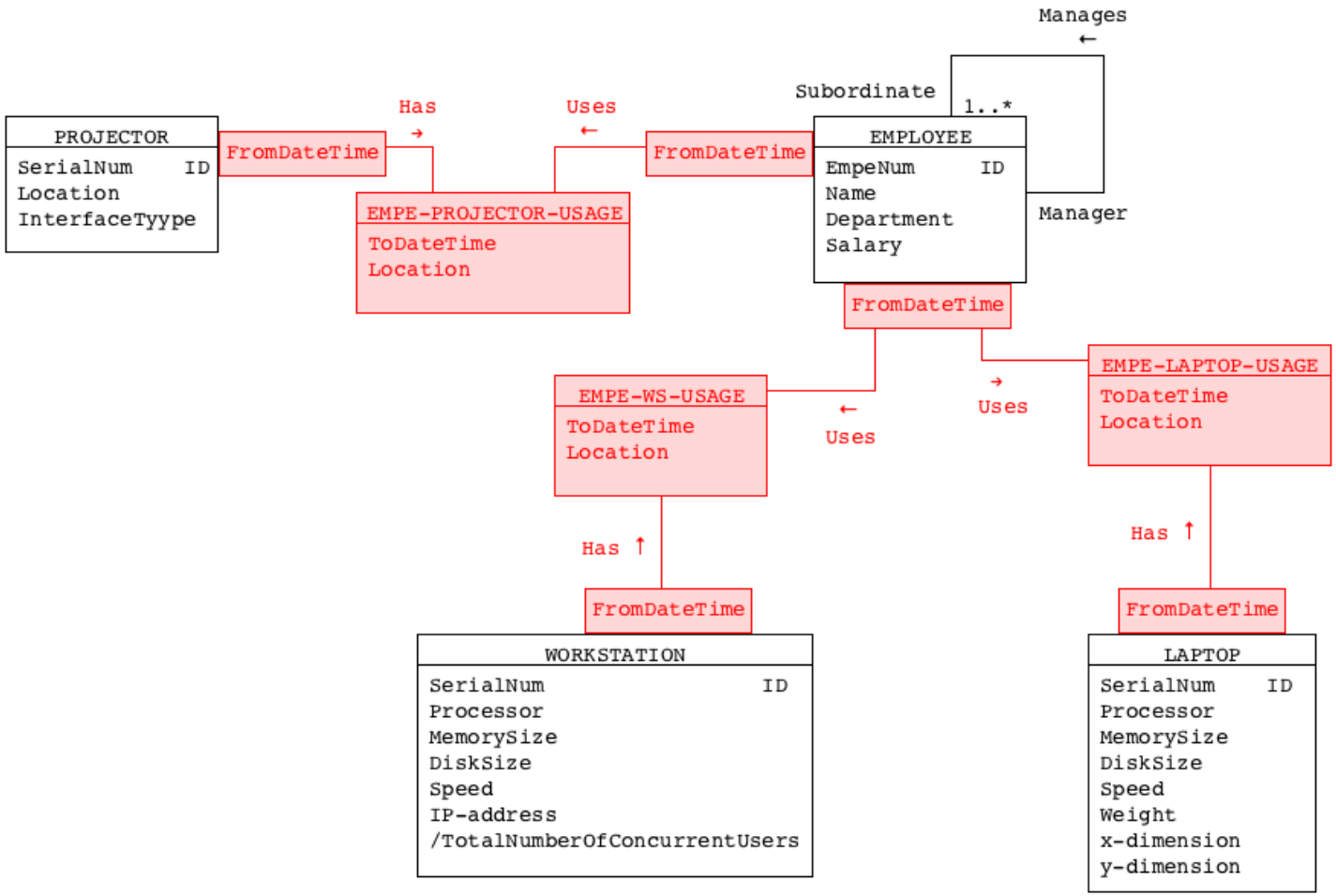


Simplify Link Attributes

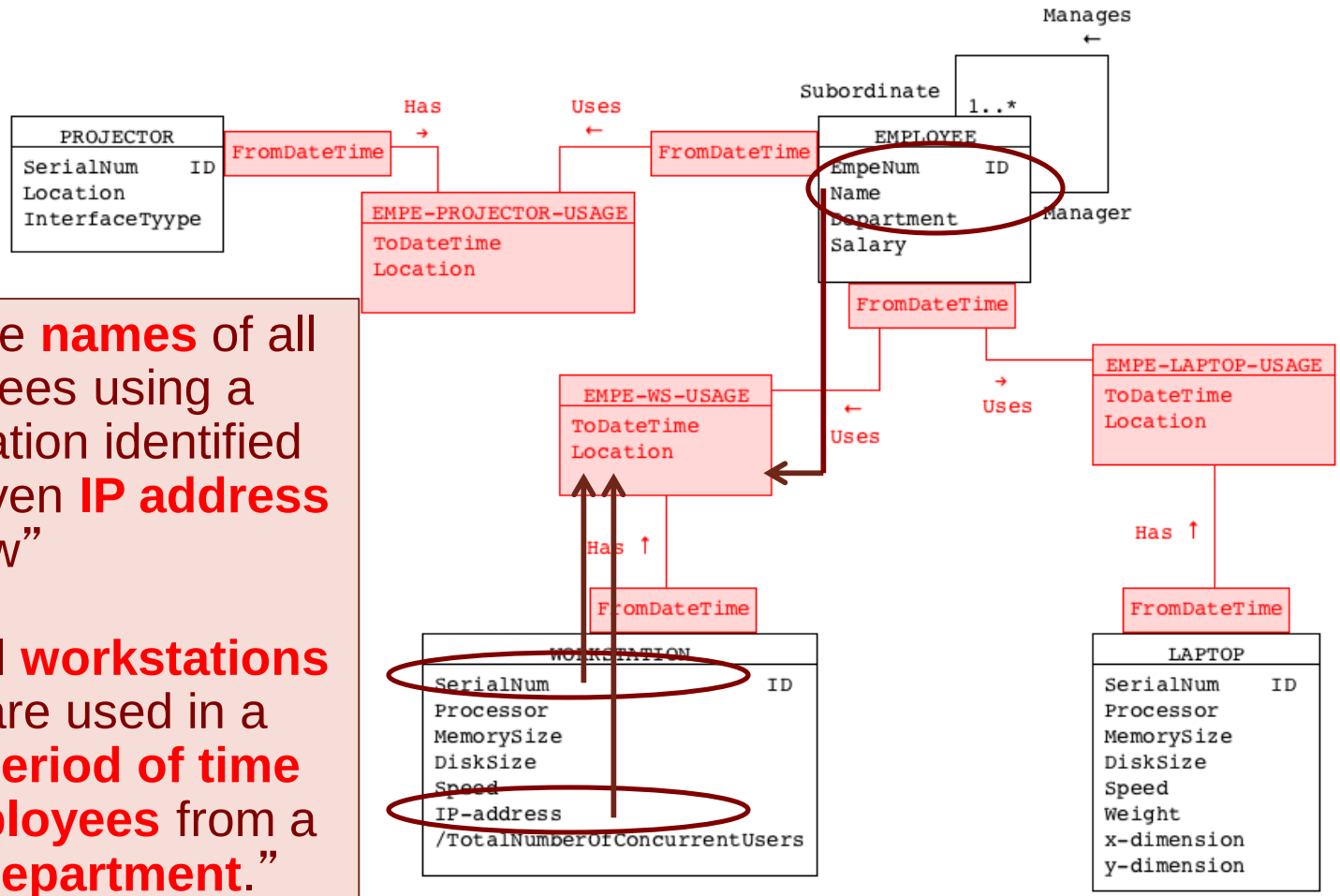
Next, we need to eliminate the link-attributes.



Simplify Link Attributes



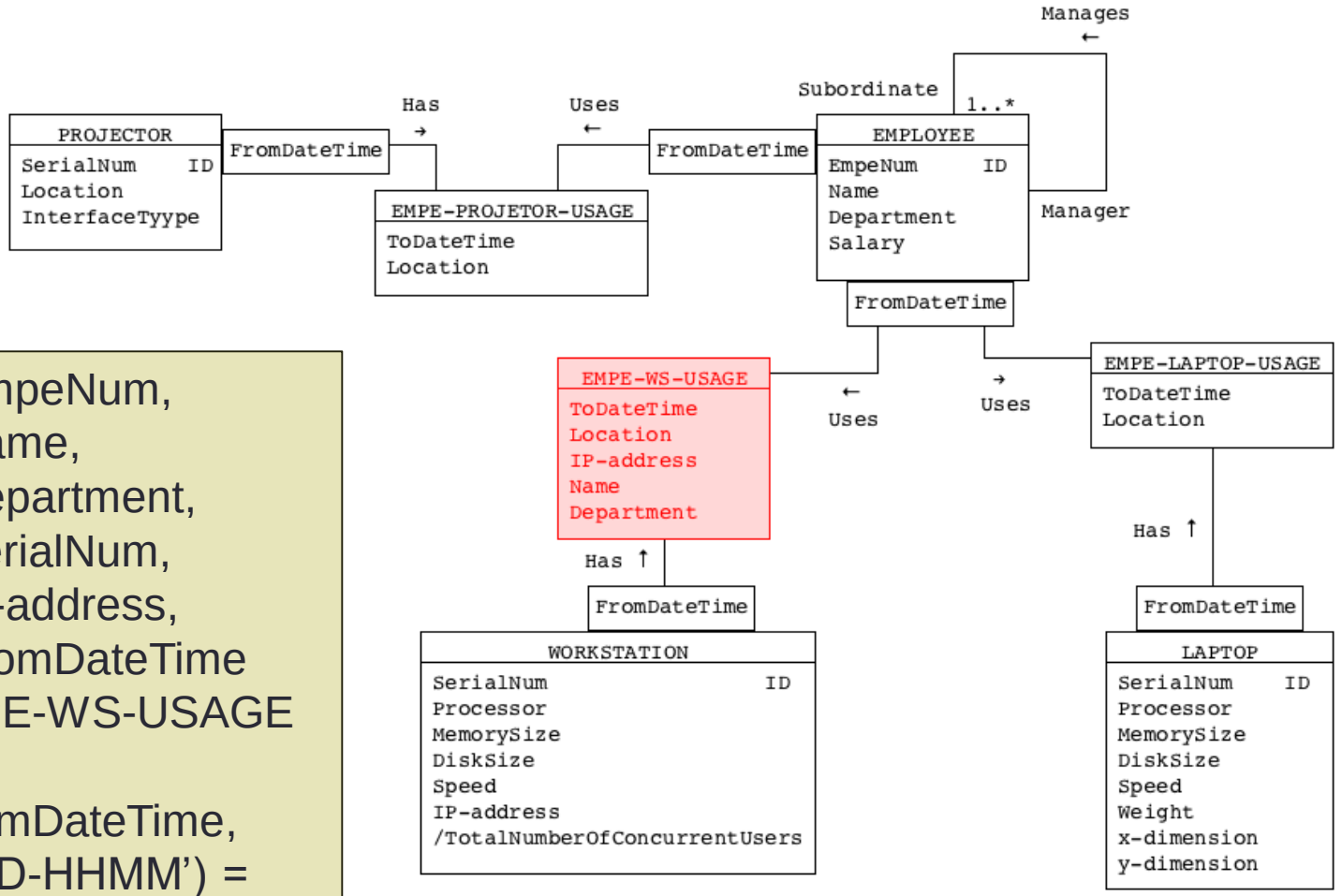
Migrate/Copy Attributes



"find the **names** of all employees using a workstation identified by a given **IP address** just now"

"find all **workstations** which are used in a given **period of time** by **employees** from a given **department**."

Migrate/Copy Attributes




```
SELECT EmpeNum,
       Name,
       Department,
       SerialNum,
       IP-address,
       FromDateTime
FROM EMPE-WS-USAGE
WHERE
to_char(FromDateTime,
'YYYYMMDD-HHMM') =
'20140502-1030';
```