## Chapter 4.1 Introduction of Physics Query Plan Operator

***Principle:***

The Physics Query Plan consists of operator, and each operator realizes one step of the plan. The Physics Operator is usually a realization of Relation Algebra Operator. But, the Physics Operator is also needed to do some other tasks which has nothing to do with Relation Algebra Operator.

***Example:***

*Scan* a table is calling each tuple of some Relation of Operation Object from Relation Algebra Expression into main memory. Of course, this relation is a Typical Operation Data of some other operations.

***Supplement:***

The concept *iterator* also needs to be introduced. It is an important method which is included in Operators which is used to transmit the request for tuples and results.

### Chapter 4.1.1 Scan Table

***Principle:***

The basic thing that we do for the Physics Query Plan is to read the whole contents of the relation R. One variant of Operator is to include a simple *Predication(谓词)*, and we only need to read the tuple that satisfied with Predication.

***Methods:*** (Locate tuples in Relation R)

1. In many situation, relation R is stored in some area of the secondary storage and the tuples are arranged in the blocks. The system knows the blocks that including the tuples of Relation R, it can get these blocks one by one. The Operation is called *Table - Scan*.
2. If there has any index on a random property of Relation R, then we can use the index to retrieve all tuples of Relation R. For instance, the sparse index can be used to guide us to all blocks that including Relation R. The Operation is called *Index – Scan*.

***Attention:***

We can get all tuples from index of all Relations, and can also get some tuples that having the specific values (or values in specific range).

### Chapter 4.1.2 Sorting when Scan Table

***Principle: (Make us sort Relation)***

1. Query the Relation which may includes *ORDER BY*, and sort the Relation.
2. Multiple algorithms of Relation Algebra require Sorted Operation Object.

***Operation:***

*Sort – Scan* accepts Relation R and illustrations of other properties, and generates the finial sorted R.

***Methods: (To realize the Sort - Scan)***

1. Scan the property A in Relation R, (such as B – Tree index), get sorted R.
2. Relation R is small, and even can be stored into main memory, then scan table or index to get required tuples. At last, using *main memory sort algorithm*.
3. If R is too big to store into the main memory, just using *Merge Sort Algorithm*.

### Chapter 4.1.3 Calculation Module of Physics Operator

### Chapter 4.1.4 Parameters to Measure the Cost

### Chapter 4.1.5 The I/O Cost of Scan Operator

### Chapter 4.1.6 The Iterator that used to Realize Physics Operator