# Advanced database

s1920176

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## 1 Introduction

This work achieves all the functions except DumpStatistics. This work could not support some extreme situations like when the leaf page only contains less than three slots, which will make half the leaf page equal to one. Besides, the number of total slots in an index page should better be even cause it's convenient to calculate the half number of slots or there will always be an unbalance split or redistribution in the following operations.

## 2 Workflow

### 2.1 Insert workflow

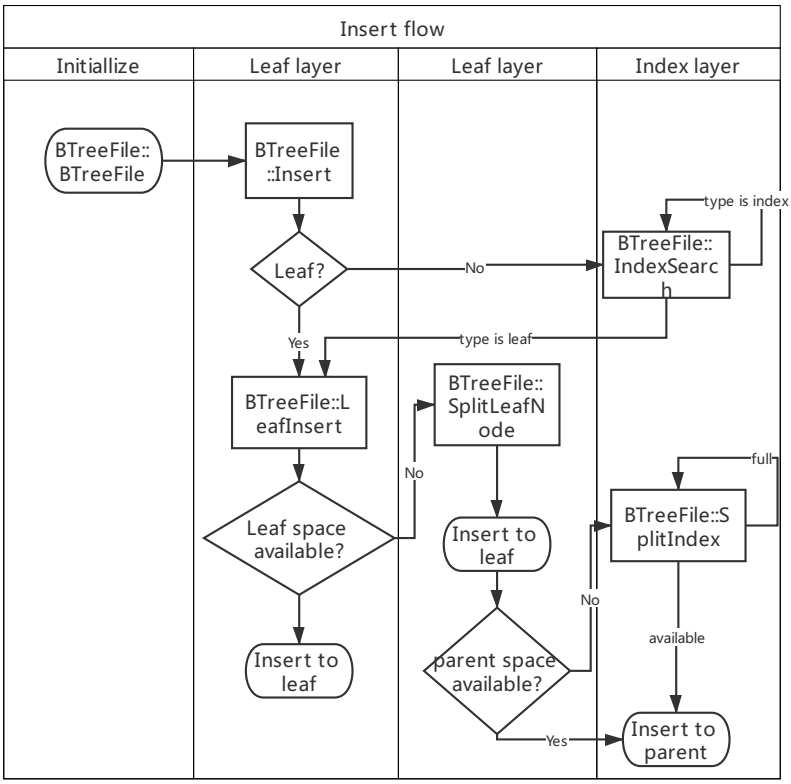


Figure 1: Insert workflow

As shown in figure 1, Insert, LeafInsert, SplitLeafNode, IndexSearch, SplitIndex methods are served for insert workflow. It is worth to mention that a stack path, which is declared in btfile.h, is maintained to record the pid of index page when recursively executing BTreeFile::indexSearch. Each time when we go though an index page, we will push into the path. In this case, we could easily get the parent pid for each node in this path by path.top().

The IndexSearch is called when the root is an index, mainly to search for the target key from root. It is a recursive method which could insert, search or delete the target record. This depends on the flag input into this method. In insert workflow, the flag will be "insert" and the IndexSearch method will call LeafInsert as soon as it finds a leaf type page as shown in Figure 1.

The splitLeafNode method will split the leaf page and insert a new index record into the parent page. If parent page is full, call SplitIndex method.

The SpiltIndex method will recursively split the index (if it is full) until the root page. If root page is also full, it will split the previous root and create a new root.

## 2.2 Delete workflow

The delete workflow is more complex shown in Figure 2, where Delete, IndexSearch, ReDistributeMerge, MergeLeaf, IndexReDistributeMerge and MergeIndex are served for delete. In this part, the IndexSearch is the most important part which recursively goes down the tree to find the target page, deleting the record in that page and then recursively returns back to the top of the tree. During this period, it will call redistribute and merge if the index page or leaf page is not at least half the page size.

Method Search and leftSearch in btindex class are developed to search a key in parent index which is to be inserted into child page. During distribution, the key in parent page will always be inserted into the child index page. Search and leftSearch are used when sibiling page is on the right or on the left. Method changeKey in btindex class is to replace the record in parent index with a new record from child index.

## 2.3 Scan workflow

Scan workflow also uses IndexSearch by flag "search". It will use IndexSearch to find the page contains lowKey and create an openscan instance, setting the scanPid and scanRid. The getNext will scan the page based on scanPid and scanRid. The DeleteCurrent will call Delete method written before.

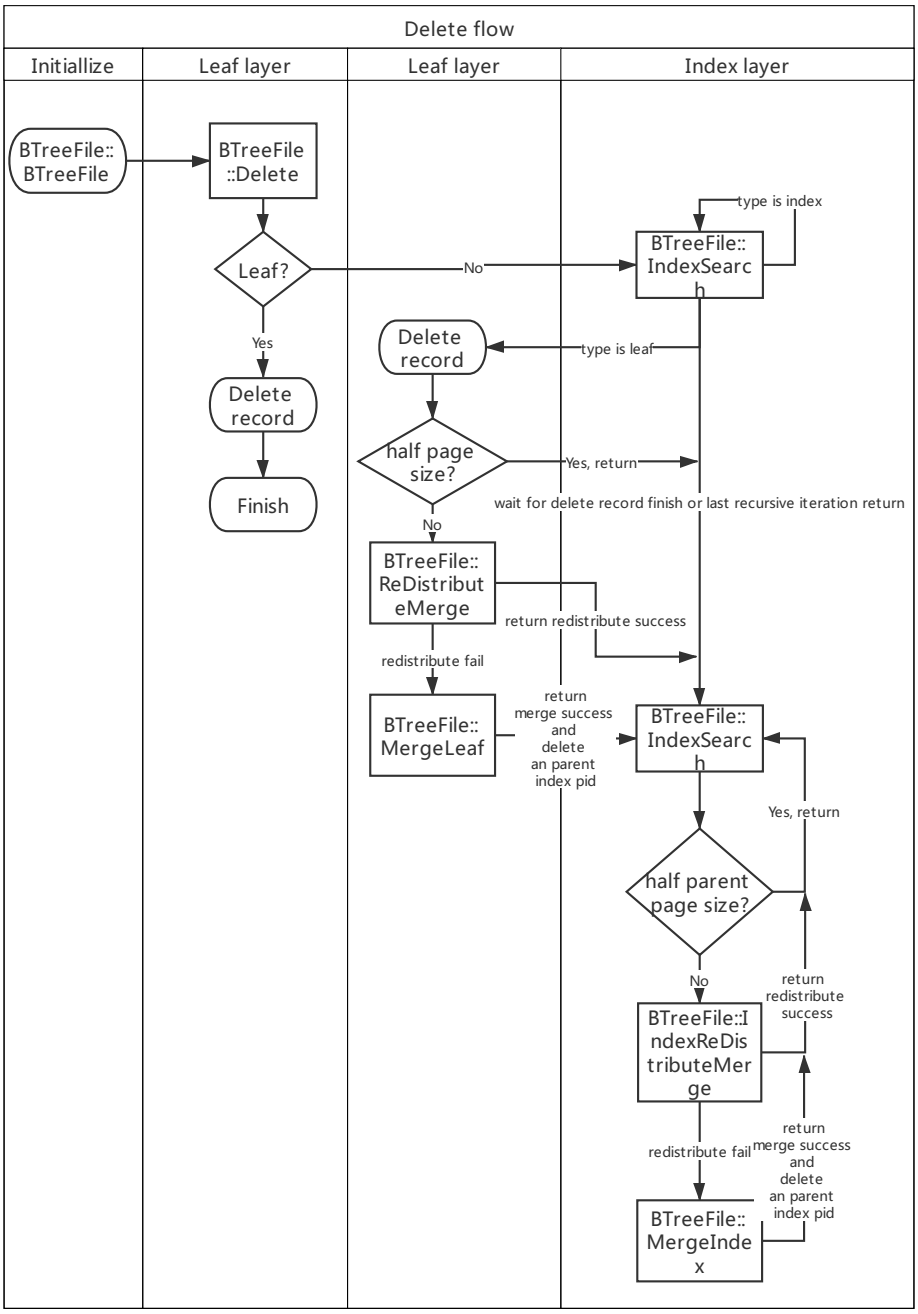


Figure 2: Delete workflow