Difference between B-Trees and 2-3-4 Trees

What is the difference between B-Trees and 2-3-4 Trees? Also how would you find the maximum and minimum height of each? Thanks

data-structures tree theory b-tree

edited Mar 1 at 21:52

Steven Vascellaro
1,765 ● 2 ● 13 ● 28

asked Apr 4 '10 at 11:27

zorgo
53 ● 2 ● 3 ● 5

Smells like homework. – user97370 Apr 4 '10 at 11:39

not homework, personal revision. – zorgo Apr 4 '10 at 11:43

3 Answers

...a link to Wikipedia *and* a quote:

> *"2-3-4 trees are B-trees of order 4."*

A `2-3-4` *is a* `B-tree`.
It is called 2-3-4 tree because the number of children for a non-leaf, non-root node is 2,3 or 4.
Had it been 6, it could have been called a 3-4-5-6 tree, or 3-6 tree for short.
Since the minimum number of children is half of the maximum, one can just usually skip the former and talk about a B-tree of order *m*.
The order of a B-tree is defined as the maximum number of children a node can have.
In a 2-3-4 tree, as we have seen, the maximum is 4.

It's worst and best-case height is given by the general formula for B-trees.
Best case: $\log_m n$. *(all nodes are full)*
Worst case: $\log_{m/2} n$. *(all nodes are half-empty)*
Where

- *m* is the order of the tree - the maximum number of children a node can have, in this case, 4 - and
- *n* is the number of entries in the tree

"B tree can have an order of any number " - yes, but for a particular subclass of B-trees, you fix that number in advance. It's like talking about butterflies in general vs talking about the Monarch butterfly. B-trees are a class of data structures, just like butterflies are a class of insects. Monarch butterflies are a subclass of butterflies, just like 2-3-4 trees are a subclass of B-trees.

answered Apr 5 '10 at 21:33

Andras Vass
10.2k ● 25 ● 43

I can't do any better than just add a link to wikipedia: http://en.wikipedia.org/wiki/2-3-4_tree

answered Apr 4 '10 at 11:38

Frank Heikens
60.6k ● 17 ● 96 ● 105

I read that, however I was still unsure, is it saying that a B tree can have an order of any number whereas a 2-3-4 tree can only have a maximum order of 4? – zorgo Apr 4 '10 at 11:48

the main difference why b-tree comes into existence is the number of node splitting required in time of insertion is less than 2-4 tree. In 2-4 tree we found sometimes a term called cascade splitting but in b-tree there is no cascade splitting present.

answered Feb 10 '12 at 9:51

Soumya Banerjee
1

You can have cascade splitting in B Trees: en.wikipedia.org/wiki/B_Tree#Insertion – jrouquie Oct 26 '12 at 9:07

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