



WIKIPEDIA  
The Free Encyclopedia

[Main page](#)  
[Contents](#)  
[Featured content](#)  
[Current events](#)  
[Random article](#)  
[Donate to Wikipedia](#)  
[Wikipedia store](#)

[Interaction](#)  
[Help](#)  
[About Wikipedia](#)  
[Community portal](#)  
[Recent changes](#)  
[Contact page](#)

[Tools](#)  
[What links here](#)  
[Related changes](#)  
[Upload file](#)  
[Special pages](#)  
[Permanent link](#)  
[Page information](#)  
[Wikidata item](#)  
[Cite this page](#)

[Print/export](#)  
[Create a book](#)  
[Download as PDF](#)  
[Printable version](#)

[Languages](#)  
[Français](#)  
[Edit links](#)

[Create account](#) [Log in](#)

Article [Talk](#)

[Read](#) [Edit](#) [View history](#)

# Top-nodes algorithm

From Wikipedia, the free encyclopedia



This article **needs more links to other articles to help integrate it into the encyclopedia**. Please help [improve this article](#) by adding links that are relevant to the context within the existing text. *(December 2012)*

The **top-nodes algorithm** is an [algorithm](#) for managing a resource reservation calendar.<sup>[1]</sup>

It is used when a resource is shared among lots of users (for example [bandwidth](#) in a [telecommunication](#) link, or [disk capacity](#) in a large [data center](#)).

The algorithm allows

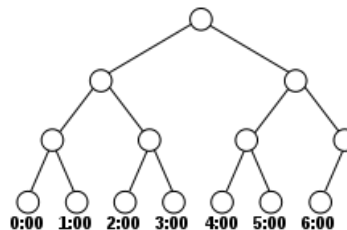
- to check if an amount of resource is available during a specific period of time,
- to reserve an amount of resource for a specific period of time,
- to delete a previous reservation,
- to move the calendar forward (the calendar covers a defined duration, and it must be moved forward as time goes by).

**Contents** [\[hide\]](#)

- [1 Principle](#)
- [2 Performance](#)
- [3 External links](#)
- [4 References](#)

## Principle [\[edit\]](#)

The calendar is stored as a [binary tree](#) where leaves represent elementary time periods. Other nodes represent the period of time covered by all their descendants.



*Example of a 7-hour calendar (with elementary periods of one hour)*

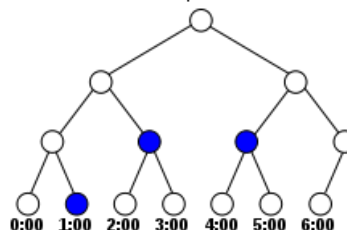
The period of time covered by a reservation is represented by a set of "top-nodes". This set is the minimal set of nodes that exactly cover the reservation period of time.

A node of the binary tree is a "top-node" for a given reservation if

- all its descendants are inside the reservation period of time,

and

- it is the root node, or at least one descendant of the parent node is outside of the reservation period of time.



*Top-nodes for a reservation from 1:00 to 5:59*

The following value is stored in each node:

$q(\text{node}) = \max(q(\text{left child}), q(\text{right child}))$

+ total amount of reserved resource for all reservations having this node as a "top-node"

(for code optimization, the two parts of this sum are usually stored separately.)

## Performance [edit]

The advantage of this algorithm is that the time to register a new resource reservation depends only on the calendar size (it does not depend on the total number of reservations).

Let "n" be the number of elementary periods in the calendar.

The maximal number of "top-nodes" for a given reservation is  $2.\log n$ .

- to check if an amount of resource is available during a specific period of time :  $O(\log n)$
- to reserve an amount of resource for a specific period of time :  $O(\log n)$
- to delete a previous reservation :  $O(\log n)$
- to move the calendar forward :  $O(\log n + M.\log n)$

where M is the number of reservations that are active during the added calendar periods.

(M = 0 if reservations are not allowed after the end of the calendar.)

## External links [edit]

- (French) C source code

## References [edit]

- ↑ Related US patent

Categories: Scheduling algorithms | Calendar algorithms

This page was last modified on 16 March 2015, at 16:37.

Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. By using this site, you agree to the Terms of Use and Privacy Policy. Wikipedia® is a registered trademark of the Wikimedia Foundation, Inc., a non-profit organization.

Privacy policy About Wikipedia Disclaimers Contact Wikipedia Developers Mobile view

