

# Performance Analysis

In this document, *Goletas.Collections* (June 11, 2006) tree based dictionary implementation is compared against the following libraries:

- Microsoft .NET Framework 2.0
- C5 Generic Collection Library version 1.00 available at <http://www.itu.dk/research/c5/>
- Wintellect PowerCollections available at <http://wintellect.com/>  
The library was downloaded on June 04, 2006

.NET 2.0, C5, and PowerCollections all use Red-Black tree algorithms for their dictionaries while *Goletas.Collections* library uses AVL algorithms. *Goletas.Collections* does not rely on stack support and uses only iterative implementations. Each node in the *Goletas.Collections* tree dictionary contains a pointer to its parent node to help more efficiently rebalance the tree.

Operation	Goletas, TreeDictionary	.NET Framework, SortedDictionary	C5, TreeDictionary	Wintellect, OrderedDictionary
<b>Random Items<sup>1</sup></b>				
Add	34.893	43.386	48.683	52.823
Contains Key	17.341	21.474	23.398	22.602
<i>foreach</i>	1.689	2.0734	2.176	Not Available <sup>2</sup>
Remove <sup>3</sup>	20.169	37.801	31.485	46.540
<b>Adding in Ascending and Removing in Descending Orders</b>				
Add	6.738	19.651	21.237	22.714
Remove	1.727	11.998	9.527	18.560
<b>Adding in Descending and Removing in Ascending Orders</b>				
Add	6.091	19.080	20.251	23.376
Remove	1.785	11.951	9.408	17.110
<b>Adding and Removing in Ascending Orders</b>				
Add	5.917	18.824	20.938	22.660
Remove	1.795	12.003	9.145	16.419
<b>Adding and Removing in Descending Orders</b>				
Add	6.087	18.710	21.989	23.244
Remove	1.838	12.571	9.276	18.787

<sup>1</sup> All items for random operations were generated using a cryptographically secure random number generator.

<sup>2</sup> *PowerCollections* dictionary containing 3M items was consuming more than 400MB of memory while doing *foreach* iteration. The operation took 7.293 seconds. With 10M items in the dictionary, the *foreach* statement has literally put the system on its knees.

<sup>3</sup> Removals of elements were not truly random.

• All measurements are in seconds using 10M items data set.

• All measurements were performed using the same test algorithms.

• All tests were performed on a 32-bit 3.4GHz P4 HT with DDR2 533 2GB of system memory using Windows XP Pro SP2.

• All components were compiled in retail mode with all optimization parameters turned on.

• *Goletas.Collections*, the data set, and the test cases are available at <http://www.goletas.com/solutions/collections/> web page.

Contact us at [support@goletas.com](mailto:support@goletas.com) for technical support, or visit us at <http://www.goletas.com> for product updates, documentation, and more.

Goletas and the Goletas logo are either registered trademarks or trademarks of Goletas software laboratory in the United States and/or other countries. All other trademarks contained herein are the property of their respective owners. The contents of this document are protected under copyright law and may not be copied or duplicated in any form, in whole or in part, without the express written permission from Goletas. Reasonable care has been taken in preparing the information herein. However, this document may contain omissions, technical inaccuracies, or typographical errors. Goletas does not accept responsibility of any kind for customers' losses due to the use of the document. Product specifications are subject to change without notice.

Copyright © 2005 - 2006 Goletas. All rights reserved.