

## map.cm

```
/*  
  
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    )  
  
*/  
  
// Copyright (c) 1994  
// Hewlett–Packard Company  
// Copyright (c) 1996  
// Silicon Graphics Computer Systems, Inc.  
// Copyright (c) 2009 Alexander Stepanov and Paul McJones  
  
using System;  
using System.Concepts;  
  
namespace System.Collections  
{  
    public class Map<Key, Value, KeyCompare = Less<Key>> where Key is  
        Semiregular and Value is Semiregular and KeyCompare is Relation  
        and KeyCompare.Domain is Key  
    {  
        public typedef Key KeyType;  
        public typedef Value MappedType;  
        public typedef KeyCompare Compare;  
        public typedef Pair<KeyType, MappedType> ValueType;  
        private typedef Map<KeyType, MappedType, KeyCompare> Self;  
        private typedef RedBlackTree<KeyType, ValueType, SelectFirst<  
            KeyType, MappedType>, KeyCompare> TreeType;  
        public typedef TreeType.ConstIterator ConstIterator;  
        public typedef TreeType.Iterator Iterator;  
  
        public nothrow inline Iterator Begin()  
        {  
            return tree.Begin();  
        }  
        public nothrow inline ConstIterator Begin() const  
        {  
            return tree.CBegin();  
        }  
        public nothrow inline ConstIterator CBegin() const  
        {  
            return tree.CBegin();  
        }  
        public nothrow inline Iterator End()
```

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{
    return tree.End();
}
public nothrow inline ConstIterator End() const
{
    return tree.CEnd();
}
public nothrow inline ConstIterator CEnd() const
{
    return tree.CEnd();
}
public nothrow inline int Count() const
{
    return tree.Count();
}
public nothrow inline bool IsEmpty() const
{
    return tree.IsEmpty();
}
public nothrow inline void Clear()
{
    tree.Clear();
}
public nothrow inline Iterator Find(const KeyType& key)
{
    return tree.Find(key);
}
public nothrow ConstIterator Find(const KeyType& key) const
{
    return tree.CFind(key);
}
public nothrow ConstIterator CFind(const KeyType& key) const
{
    return tree.CFind(key);
}
public MappedType& operator [] (const KeyType& key)
{
    ValueType valueType(key, MappedType());
    Pair<Iterator, bool> ib = Insert(valueType);
    Iterator i = ib.first;
    return i->second;
}
public inline Pair<Iterator, bool> Insert(const ValueType& value)
    where ValueType is Copyable
{
    return tree.Insert(value);
}
public nothrow inline bool Remove(const KeyType& key)
{
    return tree.Remove(key);
}
public nothrow inline void Remove(Iterator pos)
{

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        tree.Remove(pos);
    }
    private TreeType tree;
}

public nothrow bool operator==(Key, Value, KeyCompare>)(const Map<Key,
    Value, KeyCompare>& left, const Map<Key, Value, KeyCompare>&
    right)
    where Key is Regular and Value is Regular and KeyCompare is
        Relation and KeyCompare.Domain is Key
{
    if (left.Count() != right.Count())
    {
        return false;
    }
    Map<Key, Value, KeyCompare>.ConstIterator first1 = left.CBegin();
    Map<Key, Value, KeyCompare>.ConstIterator last1 = left.CEnd();
    Map<Key, Value, KeyCompare>.ConstIterator first2 = right.CBegin();
    ;
    Map<Key, Value, KeyCompare>.ConstIterator last2 = right.CEnd();
    while (first1 != last1 && first2 != last2)
    {
        if (first1->first != first2->first || first1->second !=
            first2->second)
        {
            return false;
        }
        ++first1;
        ++first2;
    }
    return first1 == last1 && first2 == last2;
}

public nothrow bool operator<<(Key, Value, KeyCompare>)(const Map<Key,
    Value, KeyCompare>& left, const Map<Key, Value, KeyCompare>& right
    )
    where Key is Semiregular and Value is TotallyOrdered and
        KeyCompare is Relation and KeyCompare.Domain is Key
{
    Map<Key, Value, KeyCompare>.ConstIterator first1 = left.CBegin();
    Map<Key, Value, KeyCompare>.ConstIterator last1 = left.CEnd();
    Map<Key, Value, KeyCompare>.ConstIterator first2 = right.CBegin();
    ;
    Map<Key, Value, KeyCompare>.ConstIterator last2 = right.CEnd();
    KeyCompare less;
    while (first1 != last1 && first2 != last2)
    {
        if (less(first1->first, first2->first))
        {
            return true;
        }
        else if (less(first2->first, first1->first))
        {

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        return false;
    }
    else if (first1->second < first2->second)
    {
        return true;
    }
    else if (first2->second < first1->second)
    {
        return false;
    }
    ++first1;
    ++first2;
}
return first1 == last1 && first2 != last2;
}

```