```
/* singlist */
/* lang=C++11 */

/* regular (no-frills) pointer queue (not-circular) */


#ifndef CF_DEBUGS
#define CF_DEBUGS       0               /* compile-time debugging */
#endif


/* revision history:

        = 2013-03-03, David A›D› Morano
        Originally written for Rightcore Network Services.

*/

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/*******************************************************************************

        This is a conainer object (elements are stored within it). This also is
        implemented as a single-linked list of nodes. This object is very useful
        for normal queue operations (insert at tail, remove at head). The
        following operations are supported:

        + instail               insert at tail
        + inshead               insert at head
        + remhead               remove from head

        The only major operation (for relatively normal queues) which is *not*
        supported is:

        + remtail               remove from tail

        Enjoy.


*******************************************************************************/

#ifndef SINGLIST_INCLUDE
#define SINGLIST_INCLUDE        1


#include        <envstandards.h>        /* MUST be first to configure */
#include        <sys/types.h>
#include        <limits.h>
#include        <new>
#include        <initializer_list>
#include        <vsystem.h>
#include        <localmisc.h>


/* external subroutines */

#if     CF_DEBUGS
extern "C" int  debugprintf(cchar *,...) ;
extern "C" int  strlinelen(cchar *,cchar *,int) ;
#endif


/* local structures */

template <typename T>
class singlist ;
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template <typename T>
class singlist_iter ;

template <typename T>
class singlist_node {
        singlist_node<T>        *next = NULL ;
        singlist_node<T>        *prev = NULL ;
        T                       val ;
        singlist_node(const singlist_node<T> &other) = delete ;
        singlist_node &operator = (const singlist_node<T> &other) = delete ;
        singlist_node(const T &av) : val(av) {
        } ;
        ~singlist_node() {
        } ;
        friend singlist<T> ;
        friend singlist_iter<T> ;
} ; /* end class (singlist_node) */

template <typename T>
class singlist_iter {
        singlist_node<T>        *n = NULL ;
        mutable T               defval ;
public:
        singlist_iter() { } ;
        singlist_iter(singlist_node<T>* an) : n(an) { } ;
        singlist_iter(const singlist_iter<T> &it) {
            if (this != &it) {
                n = it.n ;
            }
        } ;
        singlist_iter(singlist_iter<T> &&it) {
            if (this != &it) {
                n = it.n ;
                it.n = NULL ;
            }
        } ;
        singlist_iter &operator = (const singlist_iter<T> &it) {
            if (this != &it) {
                n = it.n ;
            }
            return (*this) ;
        } ;
        singlist_iter &operator = (singlist_iter<T> &&it) {
            if (this != &it) {
                n = it.n ;
                it.n = NULL ;
            }
            return (*this) ;
        } ;
        singlist_iter &operator = (const singlist_iter<T> *ip) {
            if (this != ip) {
                n = ip->n ;
            }
            return (*this) ;
        } ;
        ~singlist_iter() {
            n = NULL ;
        } ;
        friend bool operator == (const singlist_iter<T> &i1,
                const singlist_iter<T> &i2) {
            return (i1.n == i2.n) ;
        } ;
        friend bool operator != (const singlist_iter<T> &i1,
                const singlist_iter<T> &i2) {
            return (i1.n != i2.n) ;
```

```
        } ;
        T &operator * () const {
            T &rv = defval ;
            if (n != NULL) {
                rv = n->val ;
            }
            return rv ;
        } ;
        singlist_iter &operator ++ () { /* pre */
            if (n != NULL) {
                n = n->next ;
            }
            return (*this) ;
        } ;
        singlist_iter &operator ++ (int) { /* post */
            if (n != NULL) {
                n = n->next ;
            }
            return (*this) ;
        } ;
        singlist_iter &operator += (int inc) {
            if (n != NULL) {
                while ((n != NULL) && (inc-- > 0)) {
                    n = n->next ;
                }
            }
            return (*this) ;
        } ;
        operator int() {
            return (n != NULL) ;
        } ;
        operator bool() {
            return (n != NULL) ;
        } ;
} ; /* end class (singlist_iter) */

template <typename T>
class singlist {
        singlist_node<T>        *head = NULL ;
        singlist_node<T>        *tail = NULL ;
        int                     c = 0 ;
public:
        typedef         singlist_iter<T> iterator ;
        typedef         T value_type ;
        singlist() = default ;
        singlist(const singlist<T> &al) {
            if (this != &al) {
                singlist_node<T>        *an = al.head ;
                if (head != NULL) clear() ;
                while (an != NULL) {
                    instail(an->val) ;
                    an = an->next ;
                }
            }
        } ;
        singlist(singlist<T> &&al) {
            if (this != &al) {
                if (head != NULL) clear() ;
                head = al.head ;
                tail = al.tail ;
                c = al.c ;
                al.head = NULL ;
                al.tail = NULL ;
                al.c = 0 ;
            }
        } ;
```

```
singlist &operator = (const singlist<T> &al) {
    if (this != &al) {
        singlist_node<T>        *an = al.head ;
        if (head != NULL) clear() ;
        while (an != NULL) {
            instail(an->val) ;
            an = an->next ;
        }
    }
} ;
singlist &operator = (singlist<T> &&al) {
    if (this != &al) {
        if (head != NULL) clear() ;
        head = al.head ;
        tail = al.tail ;
        c = al.c ;
        al.head = NULL ;
        al.tail = NULL ;
        al.c = 0 ;
    }
} ;
singlist(const std::initializer_list<T> &list) {
    if (head != NULL) clear() ;
    for (const T &v : list) {
        instail(v) ;
    }
} ;
singlist &operator = (const std::initializer_list<T> &list) {
    if (head != NULL) clear() ;
    for (const T &v : list) {
        instail(v) ;
    }
    return (*this) ;
} ;
singlist &operator += (const std::initializer_list<T> &list) {
    for (const T &v : list) {
        instail(v) ;
    }
    return (*this) ;
} ;
singlist &operator += (const T v) {
    instail(v) ;
    return (*this) ;
} ;
~singlist() {
    singlist_node<T>    *nn, *n = head ;
    while (n != NULL) {
        nn = n->next ;
        delete n ;
        n = nn ;
    } /* end while */
    head = NULL ;
    tail = NULL ;
    c = 0 ;
} ;
int count() const {
    return c ;
} ;
int empty() const {
    return (c == 0) ;
} ;
operator int() const {
    return (c != 0) ;
} ;
operator bool() const {
    return (c != 0) ;
```

```
} ;
int clear() {
    singlist_node<T>    *nn, *n = head ;
    int         rc = c ;
    while (n != NULL) {
        nn = n->next ;
        delete n ;
        n = nn ;
        rc += 1 ;
    } /* end while */
    head = NULL ;
    tail = NULL ;
    c = 0 ;
    return rc ;
} ;
int instail(const T &v) {
    singlist_node<T>    *nn = new(std::nothrow) singlist_node<T>(v) ;
    int                 rc = SR_NOMEM ; /* error indication */
    if (nn != NULL) {
        singlist_node<T>        *n = tail ;
        if (n != NULL) {
            n->next = nn ;
        } else {
            head = nn ;
        }
        tail = nn ;
        rc = c++ ;              /* return previous value */
    } /* end if (allocation sycceeded) */
    return rc ;
} ;
int inshead(const T &v) {
    singlist_node<T>    *nn = new(std::nothrow) singlist_node<T>(v) ;
    int                 rc = -1 ;
    if (nn != NULL) {
        singlist_node<T>        *n = head ;
        if (n != NULL) {
            nn->next = n->next ;
        } else {
            tail = nn ;
        }
        head = nn ;
        rc = c++ ;              /* return previous value */
    } /* end if */
    return rc ;
} ;
int insfront(const T &v) {
    return inshead(v) ;
} ;
int insback(const T &v) {
    return instail(v) ;
} ;
int ins(const T &v) {
    return instail(v) ;
} ;
int add(const T &v) {
    return instail(v) ;
} ;
int gethead(const T **rpp) const {
    *rpp = (head != NULL) ? &head->val : NULL ;
    return c ;
} ;
int gettail(const T **rpp) const {
    *rpp = (tail != NULL) ? &tail->val : NULL ;
    return c ;
} ;
int getfront(const T **rpp) const {
```

```
            *rpp = (head != NULL) ? &head->val : NULL ;
            return c ;
        } ;
        int getback(const T **rpp) const {
            *rpp = (tail != NULL) ? &tail->val : NULL ;
            return c ;
        } ;
        int remhead(T *vp) {
            int         rs = SR_EMPTY ;
            if (head != NULL) {
                singlist_node<T>        *n = head ;
                if (vp != NULL) *vp = n->val ;
                head = n->next ;
                if (head == NULL) tail = NULL ;
                delete n ;
                rs = --c ;
            }
            return rs ;
        } ;
        int rem(T *vp) {
            return remhead(vp) ;
        } ;
        iterator begin() const {
            iterator it(head) ;
            return it ;
        } ;
        iterator end() const {
            iterator it ;
            return it ;
        } ;
} ; /* end class (singlist) */

#endif /* SINGLIST_INCLUDE */
```