C.3 Name Resolution Implementations

While the socket functions are both standardized and generally available, there are several options for converting between host name and address. None of the choices will be best for all systems. Some of the functions are robust and thread-safe, but these are not yet readily available on all systems. We offer several options controlled by compile-time definitions. The two UICI name resolution functions are addr2name and name2addr. Prototypes for these are in uiciname.h shown in Program C.3.

Program C.3 ──────────────────────────────── **uiciname.h**

The include file for the UICI name resolution functions.

```
/* uiciname.h  name resolution functions */

#include <netinet/in.h>
#define REENTRANT_NONE 0
#define REENTRANT_R 1
#define REENTRANT_MUTEX 2
#define REENTRANT_POSIX 3

int name2addr(char *name, in_addr_t *addrp);
void addr2name(struct in_addr addr, char *name, int namelen);
```

Program C.3 ──────────────────────────────── **uiciname.h**

Program C.4 contains four implementations of the the name resolution functions addr2name and name2addr. Conditional compilation is used to pick out one of the implementations. The constant REENTRANCY determines which implementation is used. If this constant is not defined, the default value of REENTRANT_NONE is used. This gives an implementation using gethostbyname and gethostbyaddr. The value of REENTRANCY can either be set with a #define in the source file with a compile-time option.

C.3.1 Implementation using **gethostbyaddr and gethostbyname**

The first implementation of name resolution presented here uses gethostbyname and gethostbyaddr. These functions should be available on all UNIX implementations. Their main drawback is that they are not thread-safe so they cannot be directly used by more than one thread. These are the functions that are used by default or when the constant REENTRANCY is set to REENTRANT_NONE.

The addr2name function never returns an error. If the name cannot be resolved, the address is converted to a dotted-decimal notation format. The name2addr function returns 0 on success and -1 on failure. The UICI TCP and UDP functions handle this error by returning -1 and setting errno to EINVAL.

C.3.2 Reentrant versions of name resolution functions

If `REENTRANCY` is equal to `REENTRANT_R`, the functions `gethostbyaddr_r` and `gethostbyname_r` are used. These functions were part of the X/OPEN standard, but when this standard was merged with POSIX, these functions were omitted. However, they are still available on some systems. These functions require a user-supplied buffer but there is no specification of how large this buffer should be. Stevens [109] suggests 8192 for this value since that is what is commonly used in the implementations of the non-thread-safe forms.

   If `REENTRANCY` is equal to `REENTRANT_POSIX`, then the newer `getnameinfo` and `getaddrinfo` are used. These are thread-safe functions that can also be used with IPv6. Unfortunately, they are not yet available on many systems. The details of using these functions are described in Section 18.8.

C.3.3 Reentrant name resolution using mutex locks

If neither of the reentrant name resolution functions are available, `gethostbyname` and `gethostbyaddr` can be used by protecting them with mutex locks. Set `REENTRANCY` to `REENTRANT_MUTEX` to use this implementation. A single mutex lock is used to protect calls to `gethostbyname` and `gethostbyaddr`.