

# QSocket: System Additions

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**IMPORTANT** If you haven't yet read [Calling BSD Sockets from Swift](#), do that first.

With addressing sorted out, there's the question of how you call the BSD Sockets API itself. The [Swift System framework](#) has wrappers for some BSD calls, like `open` and `close`, but not for BSD Sockets. However, using `QSocketAddr` it's relatively easy to create these wrappers yourself.

The full set of wrappers is rather large, so I'm just going to post the most critical stuff. Let's start with opening a socket:

```
extension FileDescriptor {  
  
    /// Creates a socket.  
    /// Equivalent to the `socket` BSD Sockets call.  
  
    public static func socket(_ domain: CInt, _ type: CInt, _ proto: CInt, retryOnInterrupt: Bool = true) throws -> FileDescriptor  
    {  
        let socket = try errnoQ(retryOnInterrupt: retryOnInterrupt) {  
            Foundation.socket(domain, type, proto)  
        }  
        return FileDescriptor(rawValue: socket)  
    }  
}
```

This extends the Swift System `FileDescriptor` type, which is a common feature of all these wrappers. To close the socket, call the file descriptor's `close()` [method](#).

This wrapper, and all the wrappers below, rely on the following helper:

```
/// Calls a closure that might fail with `EINTR`.  
/// This calls the supplied closure and, if it returns a negative value,  
/// extracts the error from `errno`. If `retryOnInterrupt` on interrupt is set  
/// and the error is `EINTR`, it repeats the call. Otherwise it throws that  
/// error.  
/// This is marked with `@discardableResult` because in many cases, like  
/// `setsockopt`, the result isn't relevant.  
/// - Parameters:  
///   - retryOnInterrupt: If true, check for `EINTR` and call the closure again.  
///   - body: The closure to call.  
/// - Returns: The closure result. This will not be negative.  
  
@discardableResult  
public func errnoQ<Result: SignedInteger>(retryOnInterrupt: Bool, _ body: () -> Result) throws -> Result {  
    repeat {  
        let result = body()  
        let e = Foundation.errno  
        if result >= 0 {  
            return result  
        }  
        if retryOnInterrupt && e == Foundation.EINTR {  
            continue  
        }  
        throw Errno(rawValue: e)  
    } while true  
}
```

The next step typically involves connecting or binding the socket. Here's how you'd call `connect` using `QSocketAddr.withSockAddr(...)` to convert the address:

```
extension FileDescriptor {  
  
    /// Connects a socket to an address.  
    /// Equivalent to the `connect` BSD Sockets call.  
    /// The `ignoreInProgressError` parameter defaults to false. If you set it,  
    /// the call treats an `EINPROGRESS` error as success. Do this for a  
    /// non-blocking connect, where you monitor the connection status using  
    /// `select` or one of its friends.  
  
    public func connect(_ address: String, _ port: UInt16, ignoreInProgressError: Bool = false, retryOnInterrupt: Bool = true)  
    throws {  
        _ = try QSocketAddr.withSockAddr(address: address, port: port) { sa, saLen in  
            try errnoQ(retryOnInterrupt: retryOnInterrupt) {  
                var err = Foundation.connect(self.rawValue, sa, saLen)  
                if err < 0 && errno == EINPROGRESS {  
                    err = 0  
                }  
                return err  
            }  
        }  
    }  
}
```

The wrapper for `bind` is very similar (sans the special case for `EINPROGRESS`).

The listen and accept operations are super easy:

```
extension FileDescriptor {  
  
    /// Configures a socket for listening.  
    /// Equivalent to the `listen` BSD Sockets call.  
  
    public func listen(_ backlog: CInt, retryOnInterrupt: Bool = true) throws {  
        try errnoQ(retryOnInterrupt: retryOnInterrupt) {  
            Foundation.listen(self.rawValue, backlog)  
        }  
    }  
  
    /// Accepts an incoming connection  
    /// Equivalent to the `accept` BSD Sockets call when you pass `NULL` to the  
    /// `address` and `address_len` parameters. If you need the connection's  
    /// remote address, call ``getPeerName(retryOnInterrupt:)``.  
  
    public func accept(retryOnInterrupt: Bool = true) throws -> FileDescriptor {  
        let newSocket = try errnoQ(retryOnInterrupt: retryOnInterrupt) {  
            Foundation.accept(self.rawValue, nil, nil)  
        }  
        return FileDescriptor(rawValue: newSocket)  
    }  
}
```

As is the get-local-address operation:

```
extension FileDescriptor {  
  
    /// Gets the socket's local address.  
    /// Equivalent to the `getsockname` BSD Sockets call.  
  
    public func getSockName(retryOnInterrupt: Bool = true) throws -> (address: String, port: UInt16) {  
        let result = try QSocketAddr.fromSockAddr() { sa, saLen in  
            try errnoQ(retryOnInterrupt: retryOnInterrupt) {  
                Foundation.getsockname(self.rawValue, sa, &saLen)  
            }  
        }  
        return (result.address, result.port)  
    }  
}
```

To get the remote address, wrap `getpeername` in the same way.

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