# USB Endpoint Topology



Figure : Topology heirarchy for a given device

## Endpoint

The following is from the USB 2.0 standard:

*Condition 1: The combination of the device address, endpoint number, and direction allows each endpoint to be uniquely referenced*

*Condition 2: An endpoint is not shared among interfaces within a single configuration unless the endpoint is used by alternate settings of the same interface.*

In Figure 1, Endpoint 1 IN is an endpoint in Interface 0 of Configuration 1.

* Based on the set interface request, Endpoint 1 IN can be BULK in Alternate Setting 0 or ISO in Alternate Setting 1 since the same endpoint can be used by different alternate settings of the same interface.
* However, Endpoint 1 IN is not allowed to be in Interface 1 of Configuration 1 since endpoints cannot be shared among interfaces within a single configuration.
* Endpoint 1 IN is allowed to be in Interface 1 of Configuration 2 since it is a different configuration.

Sequence of requests after descriptor has been parsed:

* In Figure 1, there are two configurations and the device can be configured to one of the two configurations using the set configuration request. If set configuration 1 is requested, the configuration value will be set to 1. The host may request further send another set configuration request to set the configuration value to 2.
* After set configuration, all interfaces are activated with the default alternate setting of 0. In our example, we must set the following endpoints after setting configuration to 1:
  + Ep 1 IN BULK
  + Ep 2 OUT BULK
  + Ep 1 OUT BULK
  + Ep 2 IN BULK
* The host may send a set interface request after a set configuration request to choose which alternate setting must be active. In our example, after setting configuration to 1, if we get a request to set interface 1 to alternate setting 1, we must set Ep 1 IN from BULK to ISO. When switching the endpoint type for Ep 1 In, all other endpoints in configuration 1 will remain active.