

NDIS 6 Cheatsheet

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8:32 PM

Windows network architecture ([msdn](#))

- Miniport drivers: implement the Software Stack of NIC, i.e. OSI Physical Layer
- Protocol/Transport drivers: implement a) LLC in Data Link Layer, b) Network Layer, c) Transport Layer

Generic NDIS concepts

- Each driver at its layer
 - o Can call into a specific set of NDIS routines to gather/modify data (methods prefixed with Ndis/NdisF/NdisM/NdisIM)
 - o Must implement handlers for state changes or send/receive
 - NDIS will call into these methods from its thin wrappers (methods prefixed with Protocol/Filter/Miniport)
 - Handlers will have to be registered with NDIS in the DriverEntry method using a XxxRegisterYyyDriver method
 - o Async handlers call XxxComplete methods to signal success/fail information to upper layer
- Network data structures ([msdn](#))
 - o [NET_BUFFER](#) is the basic building of packaged network data
 - Wraps data from higher layers e.g. TCP/UDP/IP packets in list of [MDLs](#)
 - SourceHandle field is used by NDIS to determine the correct Protocols/Filters/Miniports to pass on the NBL, a driver must take care to ensure that SourceHandle is set appropriately in send/receive primitives
 - Each buffer can store additional context data in [NET_BUFFER_CONTEXT](#) data structures which are passed around the NDIS stack
 - o [NET_BUFFER_LIST](#) is a list of NET_BUFFER which is used for all calls across layers
- Data transmission primitives use NET_BUFFER_LIST structures
 - o [Send](#): also read "Send Primitives" in below table in this order
 - Protocol (Upper edge) → Filter (Upper edge) → Miniport (Upper edge) → Miniport (Lower edge) → Filter (Lower edge) → Protocol (Lower edge)
 - o [Receive](#): also read "Receive primitives" in below table in this order
 - Miniport (Lower edge) → Filter (Lower edge) → Protocol (Lower edge) → Protocol (Upper edge) → Filter (Upper edge) → Miniport (Upper edge)

Types of NDIS drivers

- Contract: Lower/Upper edges refer to the edges in [this](#) Architecture diagram
- Read from bottom to top order

Category	Signature	Functionality	Contract: Lower edge	Contract: Upper edge
Protocol	<ul style="list-style-type: none"> - Can call NdisXxx - Can implement ProtocolXxx 	<ul style="list-style-type: none"> - Allocates packets, copies data from the sending application into the packet, and sends the packets to the lower-level driver by calling NDIS functions - [Based on custom requirements, a protocol driver may be controlled by RW dispatchers that can registered in DriverEntry with DRIVER_OBJECT.MajorFunction, see sample, refer src\network\ndisproto in code WDK] 	<ul style="list-style-type: none"> - Interfaces with NDIS (above Miniport/Filter) - Send primitives <ul style="list-style-type: none"> • Handle ProtocolSendNBLComplete to complete the initiated Send with NdistSendNBL - Receive primitives <ul style="list-style-type: none"> • Handle ProtocolReceiveNBL to operate on NBLs passed from lower layer • [Modify/Save it up in the device IO buffer queue for reads by upper layers] • Call NdisReturnNBL to pass ownership of NBL to lower layer 	<ul style="list-style-type: none"> - Interfaces with private windows networking interface - Send primitives <ul style="list-style-type: none"> • [Register handler for IRP_MJ_WRITE in DRIVER_OBJECT initialize in DriverEntry] • Call NdisSendNBL to pass packets to lower layers - Receive primitives <ul style="list-style-type: none"> • None
Filter	<ul style="list-style-type: none"> - Can call NdisFXxx and NdisXxx - Can implement FilterXxx 	<ul style="list-style-type: none"> - Used for monitoring/modifying network packets - Multiple filter drivers can be attached to (layered over) a single adapter (architecture) - Order of stacking is decided by INF file - FilterSetModuleOptions handler can be used to turn on/off services (like send/receive) during runtime. See Data Bypass mode MSDN: Receiving data in a Filter Driver MSDN: Sending data from a Filter Driver MSDN: Filter driver characteristics 	<ul style="list-style-type: none"> - Interfaces with Miniport - Handles Initialize and Unload - Send primitives <ul style="list-style-type: none"> • Handle FilterSendNBLComplete to handle send complete indication from lower layer • Indicate send complete to upper layer with NdisFSendNBLComplete - Receive primitives <ul style="list-style-type: none"> • Handle FilterReceiveNBL to process IndicateReceive from below layer • Send a NdisFIndicateReceiveNBL to pass NBL to upper layer 	<ul style="list-style-type: none"> - Interfaces with NDIS (or another Filter above) - Send primitives <ul style="list-style-type: none"> • Handle FilterSendNBL to process Send requests from upper layer • Pass on the NBL to lower layer with NdisFSendNBL - Receive primitives <ul style="list-style-type: none"> • Handle FilterReturnNBL, called when upper layer is done process a receive • Call NdisFReturnNBL when done processing NBL to pass it on to lower layer

Miniport	<ul style="list-style-type: none"> - Can call NdisMxxx - Can implement Miniportxxx 	<ul style="list-style-type: none"> - Used for creating virtual adapters, load balancing etc. - Associated with a device object (Adapter) sent by NDIS in MiniportInitializeEx - Handles interrupts from physical adapter - Handles I/O primitives - Handles Receive primitives from NIC and passes to Protocol - Handles Send primitives from Protocol and passes to NIC <p>MSDN: Learning about Miniport MSDN: Miniport driver roadmap MSDN: Miniport API reference</p> <p>For sample, refer src\network\netvmini code in Windows Development Kit</p>	<ul style="list-style-type: none"> - Interfaces with NDIS (above hardware) - Handles driver initialization with MiniportInitializeEx - Must handle Interrupts raised from NDIS because of RX/TX at Adapter (MiniportInterrupt) - Send primitives <ul style="list-style-type: none"> • Calls NdisMSendNetBufferListsComplete in MiniPortSendNBL handler to indicate success/fail - Receive primitives <ul style="list-style-type: none"> • Handles interrupts from NDIS regarding raw data in MiniportInterruptDPC (read the remarks section) • Calls NdisMIndicateReceiveNBL, this will push packet to upper layer 	<ul style="list-style-type: none"> - Interfaces with NDIS (below Protocol) - Send primitives <ul style="list-style-type: none"> • Handles MiniportSendNetBufferLists - Receive primitives <ul style="list-style-type: none"> • Handles MiniportReturnNetBufferLists, called when upper layer is done processing receive call
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Not covered: NDIS intermediate drivers, [Driver stack management](#)