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# What's a Proxy Printer Provider?

PWG WIMS-CIM Working Group

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# Terminology

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- **CIM** - Common Information Model, a data model for system management
- **WBEM** - Web Based Enterprise Management, suite of protocols to access CIM data, namely WS-Management and CIM-XML
- **CIMOM** - CIM Object Manager, central aggregation and access point for CIM data on a system
- **CIM class** - Object definition, including class hierarchy, properties, and methods
- **MOF** - Managed Object Format, the syntax for defining a CIM class
- **CIM namespace** - Domain within which some names are required to be unique, used at runtime by CIMOM
- **WMI** - Windows Management Instrumentation, the CIMOM on Windows systems
- **WMI Tools** - Set of programmer tools for examining data in WMI, available at [msdn.microsoft.com](http://msdn.microsoft.com)
- **WinRM** - Windows Remote management, the WS-Man client interface on Windows, a simple CLI

# Background - CIM Data Model

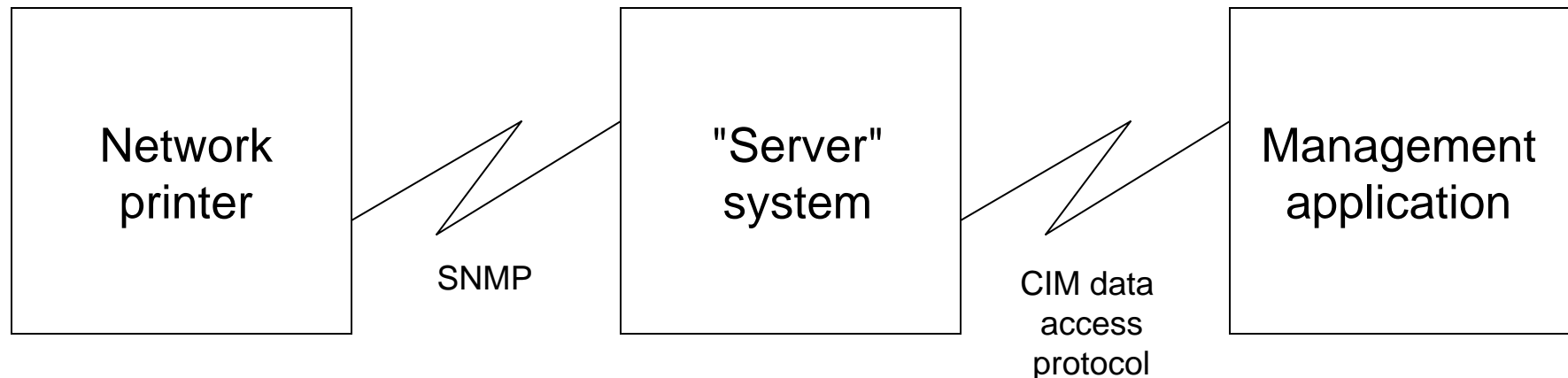
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- CIM is an architecture for accessing management data
  - Schema of management data and access protocols for it
  - Principles of access
- Management data is not available until it is asked for
  - Entirely procedure-based, not simple database access
  - No worries about stale database
- Management data is presented in a standard format
  - CIM Schema version 2.nn
  - Selected by cross vendor agreement to be generally usable
  - If the underlying data is not in that form, it must be mapped to that form

# Basic System Structure

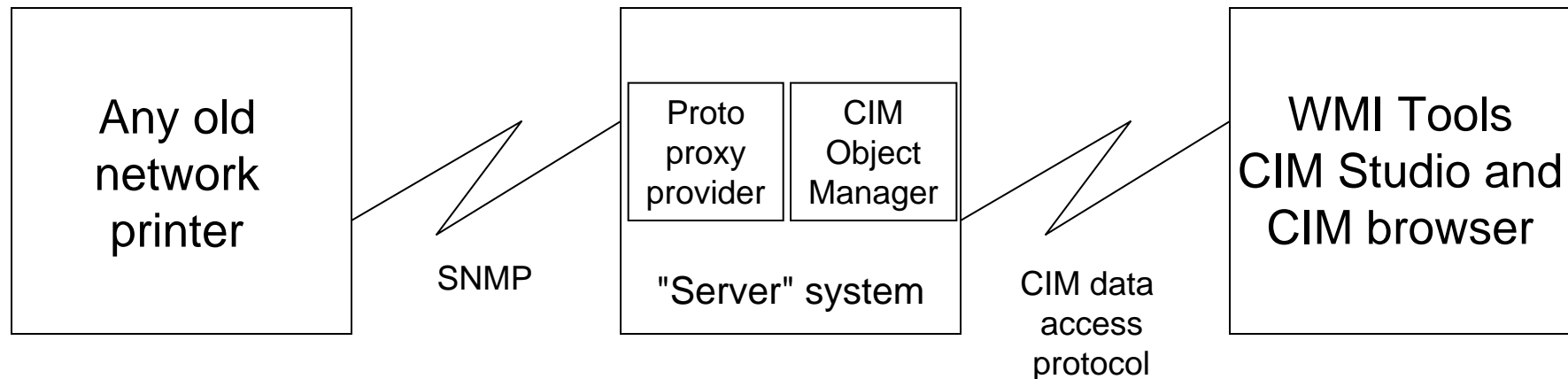
- Network printer, SNMP-capable
- "Server" system (not dedicated, not even a server)
- Management client application



# Prototype Being Constructed



- Network printer: whatever is at the end of the aisle
- "Server" system: Windows box of some sort
- Management client: el cheapo CIM data browser application, not printer-specific, not suitable for actual management
  - Probably local on server system



# What is a CIM Provider?

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- A provider implements one or more classes under the CIMOM
  - Only one provider permitted to implement a class (in a namespace)
- A mapping layer between a driver and a data repository
  - Maps from physical representation to logical representation
    - Physical = hardware, driver, device-dependent
    - Logical = device-independent model, data represented using CIM schema standard classes
- Façade only
  - Passive code, called when needed, no active business logic, no active management, translation interface only

# Doing a CIM Proxy Provider

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- What is *this* CIM provider?
  - This provider implements a number of the new printer classes
- What's a proxy provider? An SNMP-to-CIM proxy agent
  - Reads SNMP data from a network printer
  - Republishes that data in CIM format
- Management applications using WBEM protocols can then access the data in CIM schema format
  - WS-Management protocol in particular
  - However, I'm not building an application as part of the prototype

# Structure of Provider

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- Provider statically registers definitions of classes to be instantiated in what namespaces
  - CIMOM uses this to determine what provider to call for what data requests: instances (of classes) in CIM namespaces
- WBEM protocols are all "pull" model
  - Data doesn't have to exist until someone asks for it, never stale
  - Data isn't stored, it's "instantiated" when requested
  - Fewer db race conditions (locking being addressed just now)
- Uses an interface up to CIMOM
- Uses an interface down to "driver(s)"
- The cheese in the sandwich translates the data



# Proxy Provider Components - Interfaces

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- Interface between CIMOM and provider logic
  - OS-specific
  - Maybe CMPI or CIMPLe (on Linux)
  - WMI provider interface (on Windows)
- Interface between provider and network printer is SNMP
  - Choose version(s), security

# Proxy Provider CIM Data

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- Provider "instantiates" (embodies) the dozen new Printer-related classes
  - Probably not all, e.g., Finisher
  - Directly map 80% of Printer MIB to CIM classes and properties
  - As general, as non-device-specific as Printer MIB
  - Can support any printer that supports Printer MIB
  - Easier to test variety of cases under simulation
    - Take MIB dumps, change structures, change values

# Where Does a Proxy Provider Fit in the Overall System?

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- "Logical Mapping Layer"
  - What's that?
- Look at the entire management stack, like a protocol stack
  - Several distinct layers, with distinct functions and defined interfaces

# Management Stack - Layers

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Resource Management Layer

Access Layer

Aggregation Layer

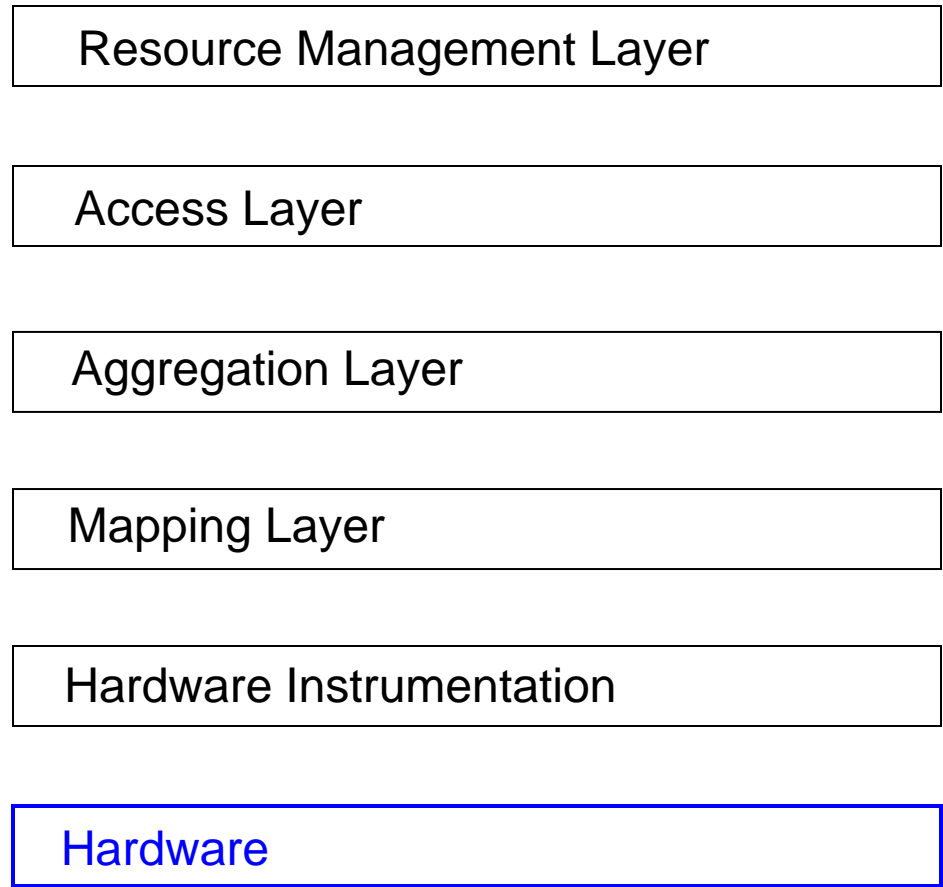
Mapping Layer

Hardware Instrumentation

Hardware



# Management Stack - Hardware

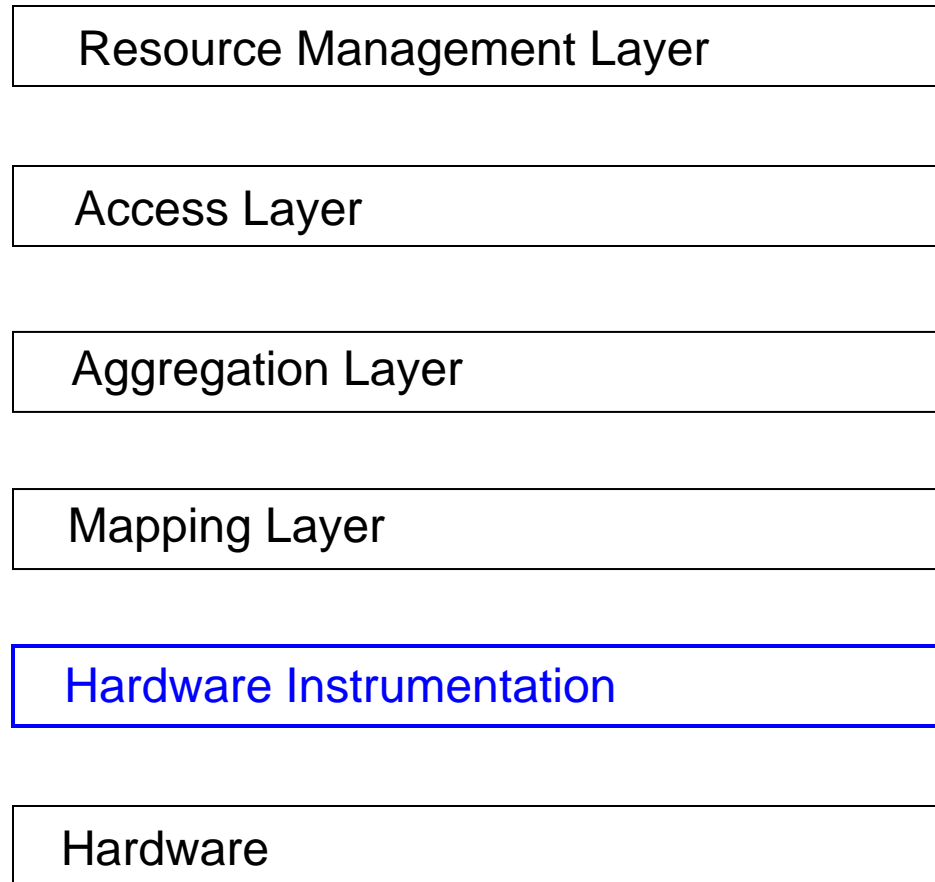


**Printer**

- Hardware mechanism
- Embedded controller
- Communications



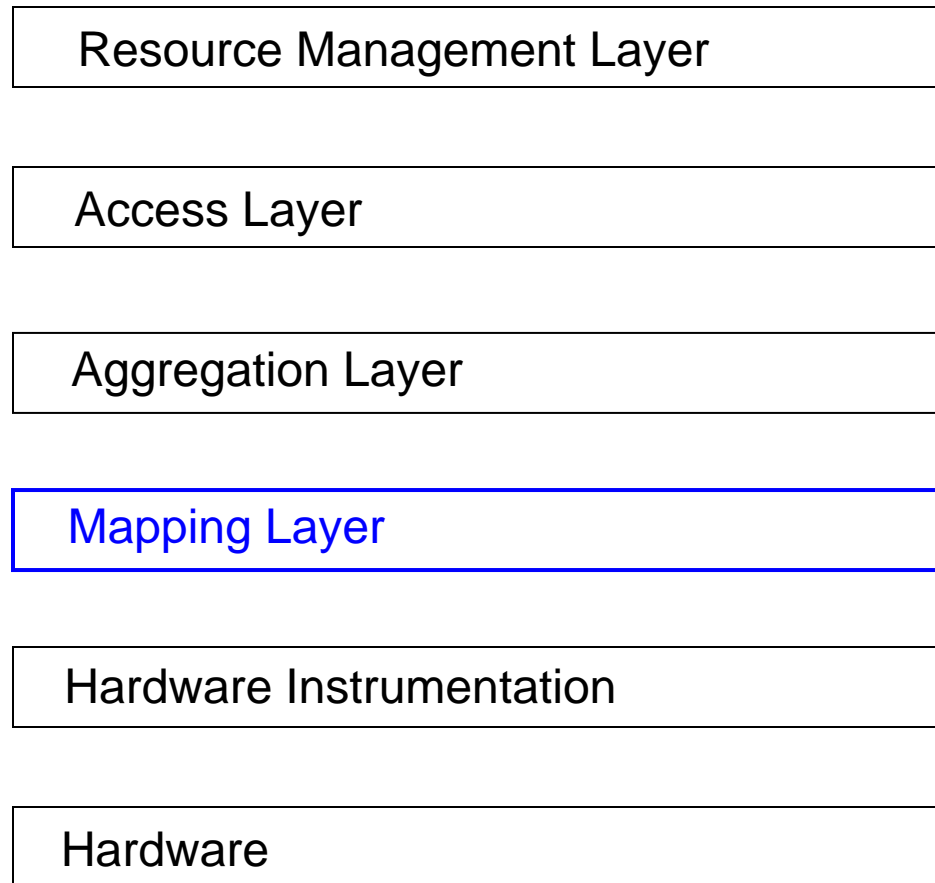
# Management Stack - Instrumentation



Management Instrumentation

- Identity
- Capabilities
- Settings
- Status
- History

# Management Stack - Mapping



**Mapping**

- Present management data in standard form
- Choice of standard form = CIM schema



# Management Stack - Aggregation

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Resource Management Layer

Access Layer

Aggregation Layer

Mapping Layer

Hardware Instrumentation

Hardware

Aggregation  
- Collection of all  
management data





# Management Stack - Access



Resource Management Layer

Access Layer

Aggregation Layer

Mapping Layer

Hardware Instrumentation

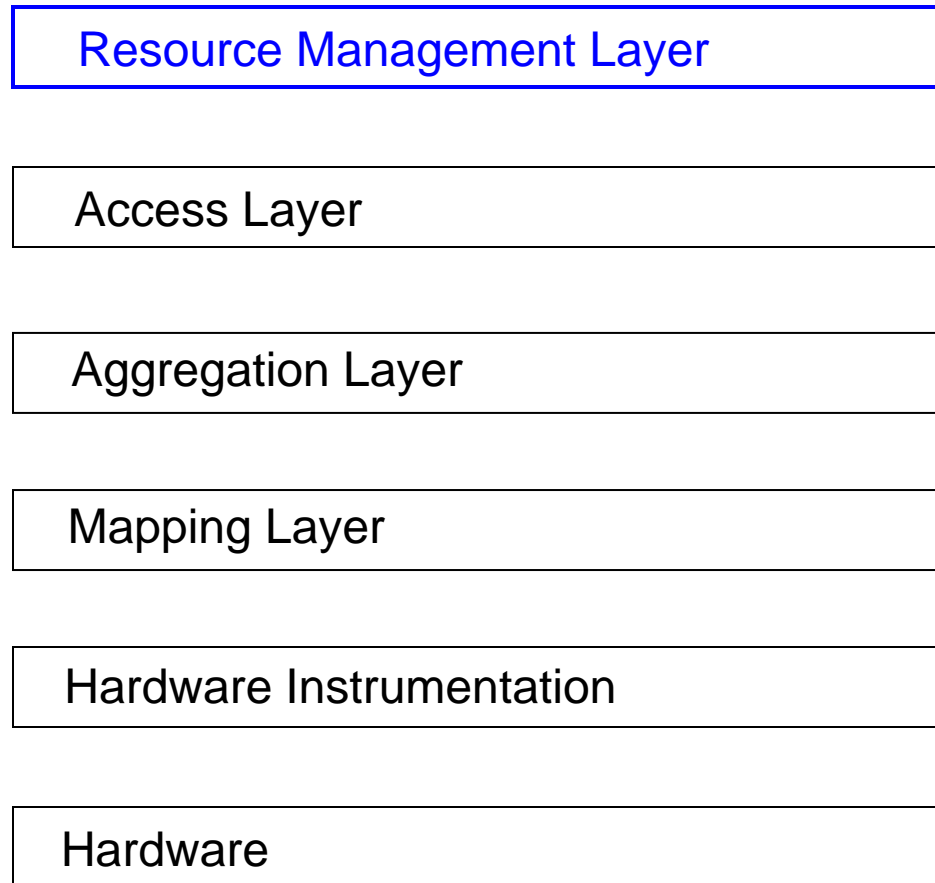
Hardware

Access Layer  
- Protocol adapter(s)  
- Mainly for remote access



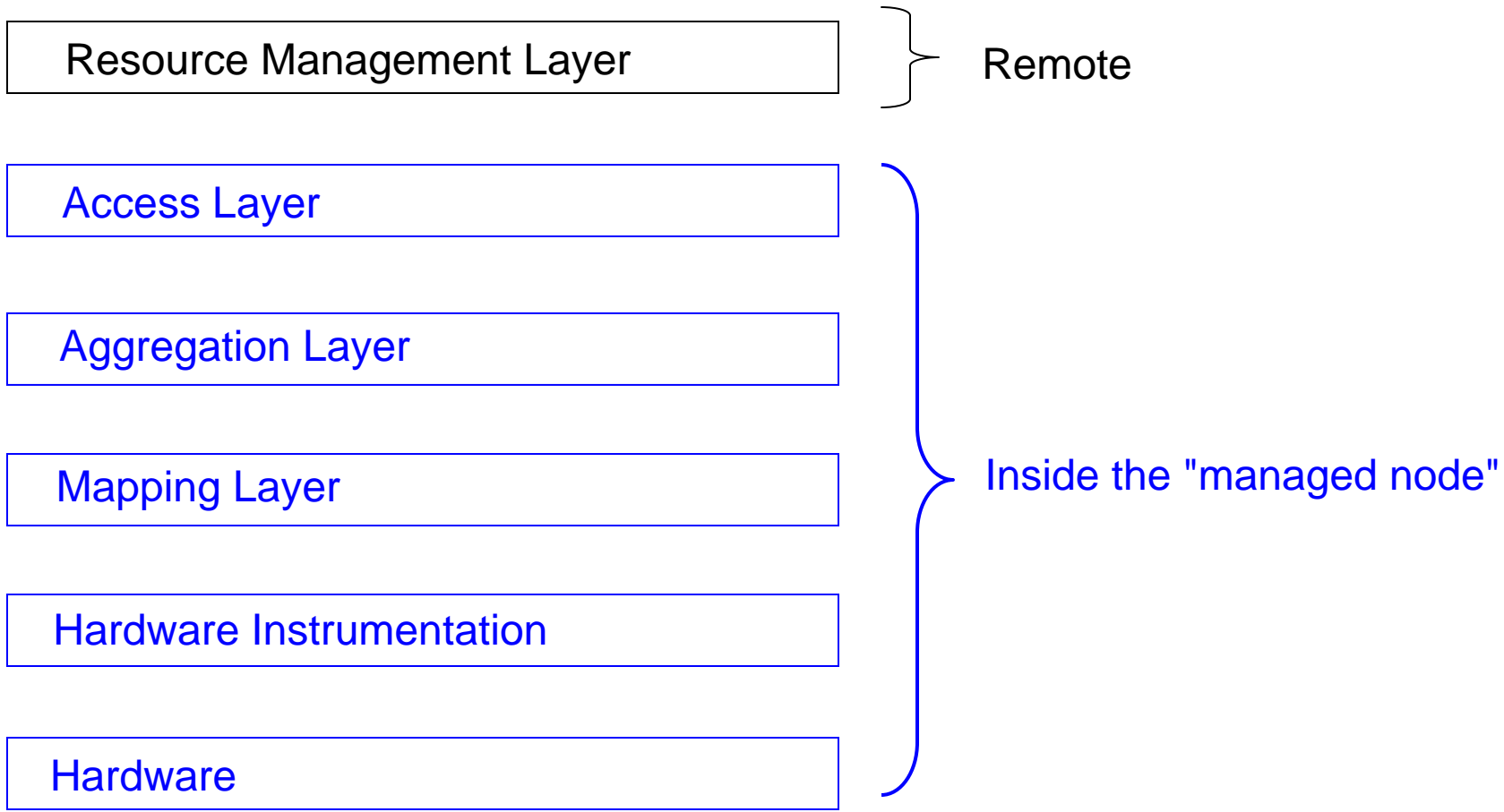
# Management Stack - Resource Management

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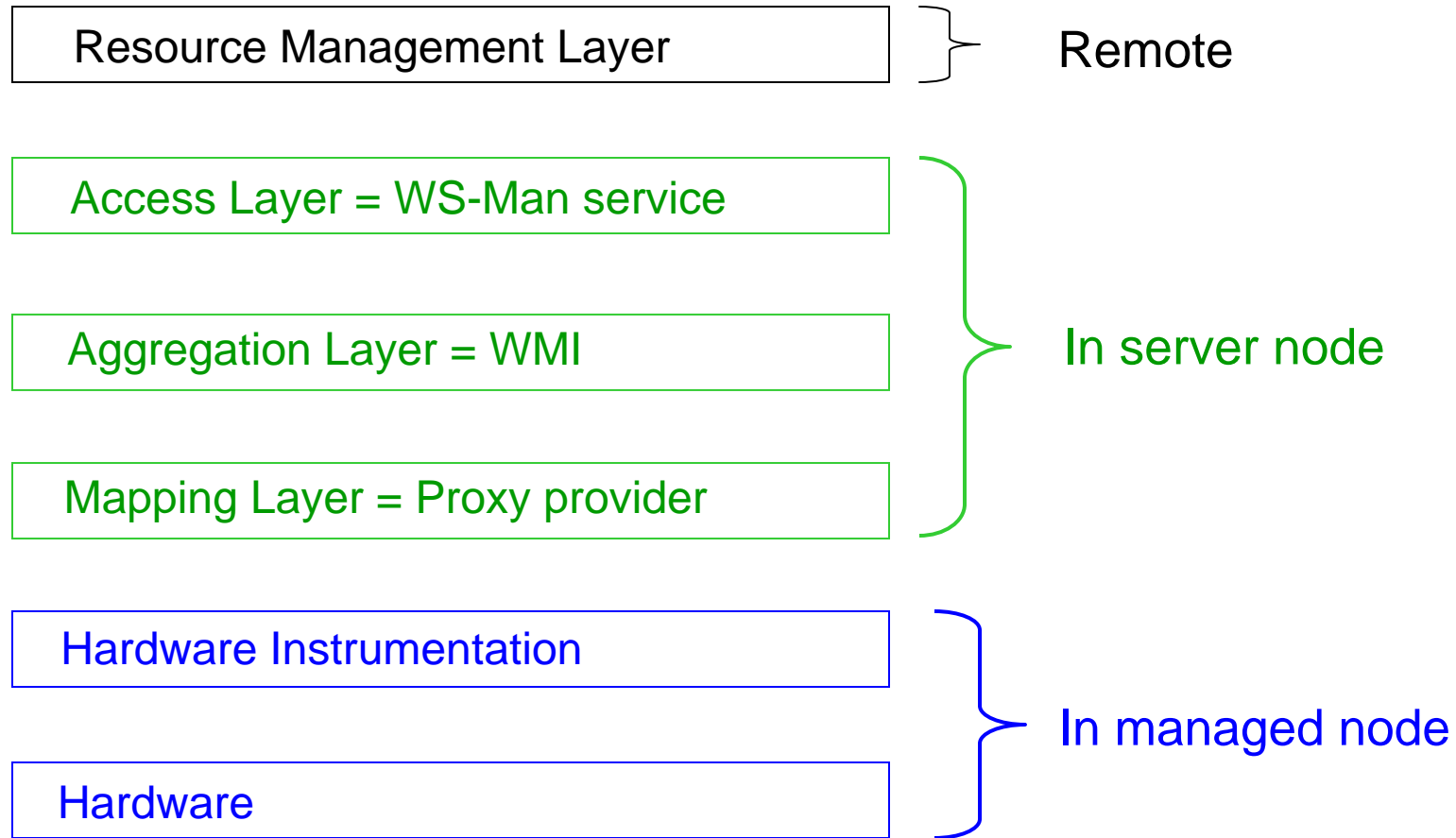


**Resource Management**  
- Management application  
that people use  
- Application-specific or  
generalized

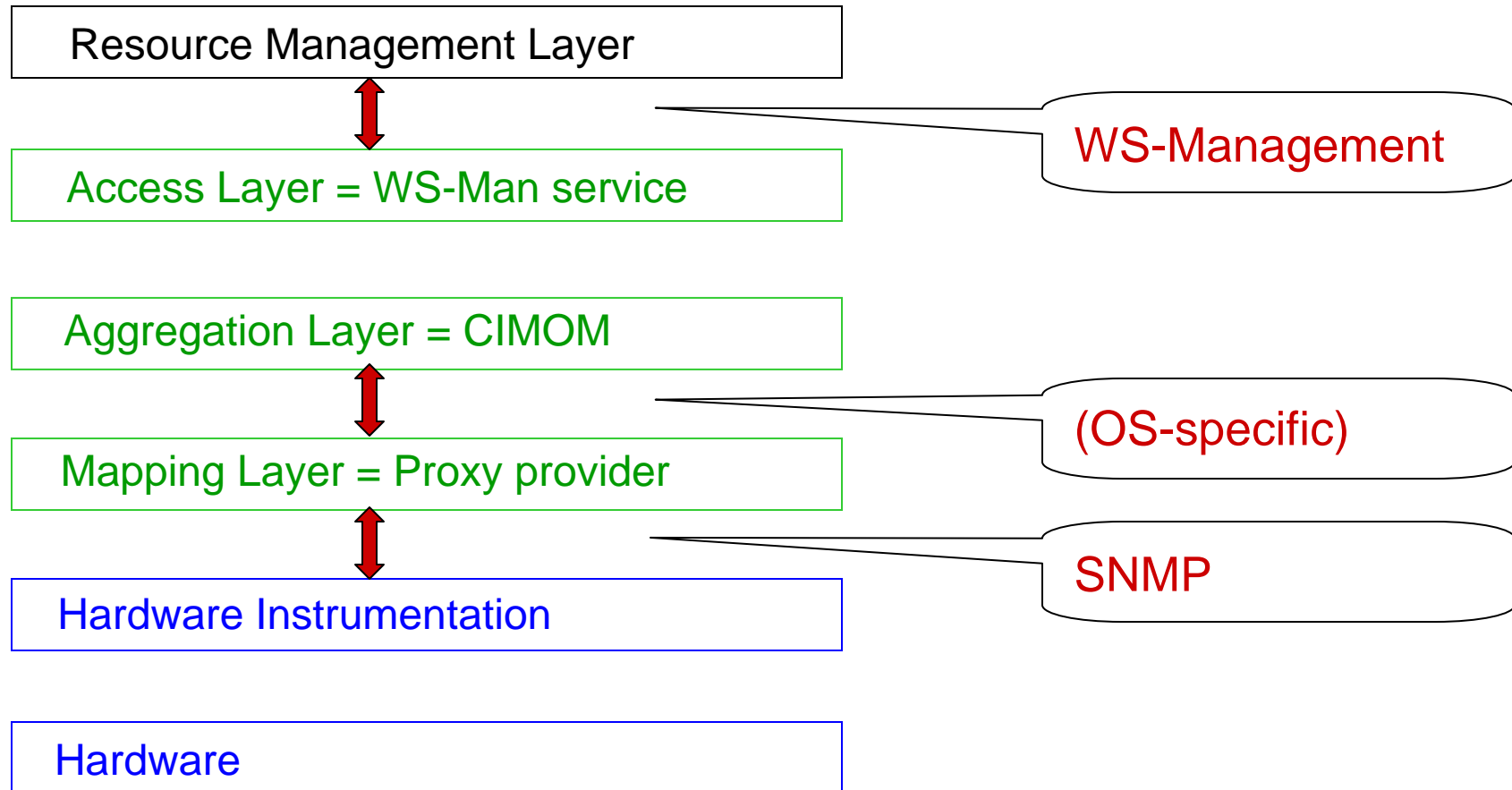
# Management Stack - Monolithic Device



# Management Stack - Proxy Provider

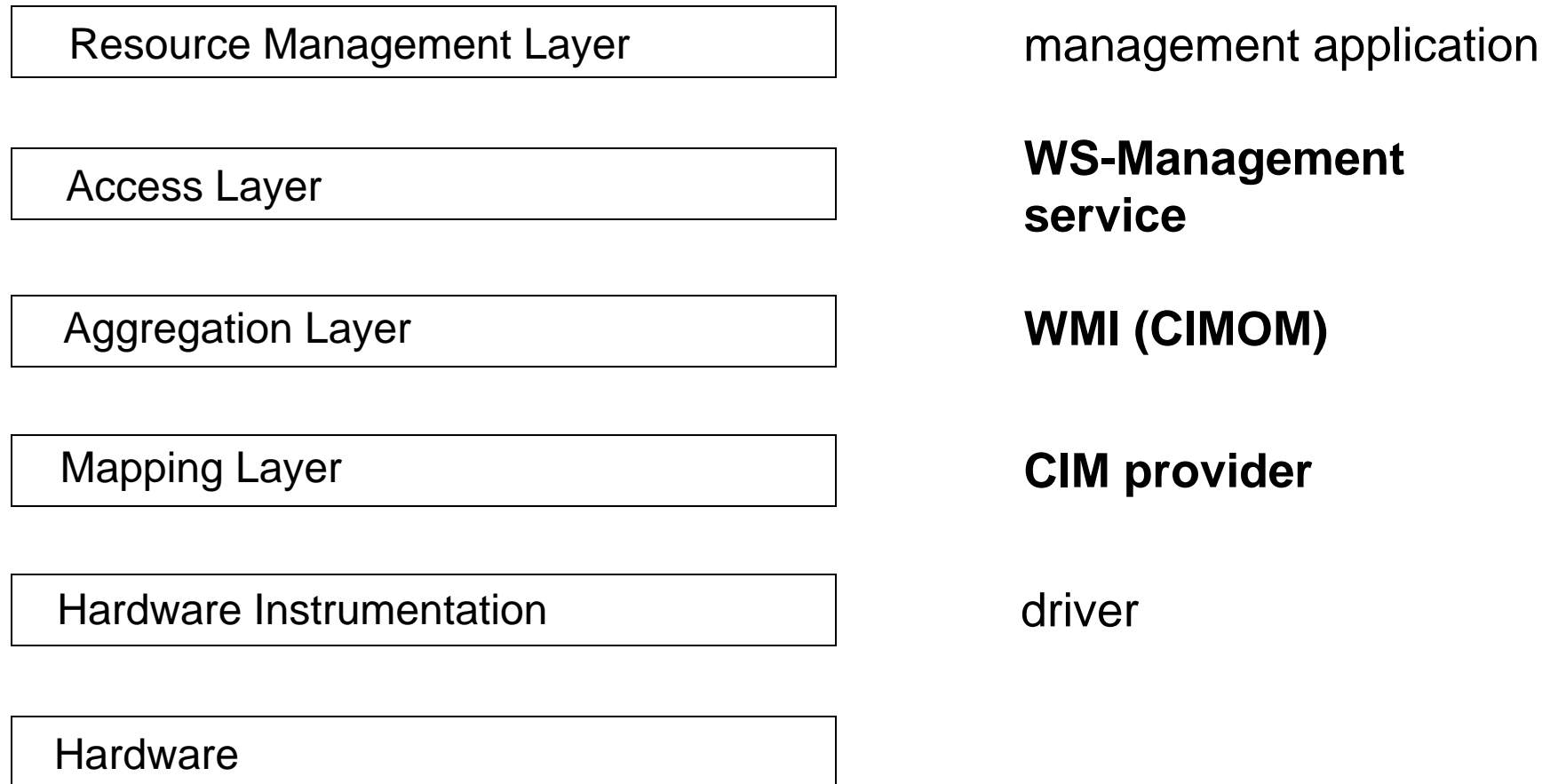


# Management Stack - Protocols Between Layers



# Management Stack on Windows

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# Where to Get More Information on CIM

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- [www.dmtf.org](http://www.dmtf.org) - Distributed Management Task Force
  - Standards
    - CIM (schema and architecture specs)
    - WBEM (protocol specs)
    - Management Initiatives (collections of specs for servers and desktops/mobiles)
    - Management Profiles (how to use the schema classes to represent a system or device)
    - Published Documents (lots more)

# Questions?

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