STORAGE DEVELOPER CONFERENCE

SDC 23

BY Developers FOR Developers

Standardized Storage Telemetry

Enabling Secure Fleet Monitoring and Debug

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Current Solutions for Monitoring and Debug

SMART

- Multiple standardized SMART pages
- No Vendor Unique (VU) SMART. All remaining fields are reserved and shall be 0h
- OCP Datacenter NVMe Specification* does not allow VU log pages outside of specification (SEC-19*) without prior written consent by the customer.

Telemetry

- Prior guidance (TEL-5*) was to use Data Area 1 for fleet monitoring but offered no payload guidance
- No guidance of Reason Identifier* payload

Security

- SEC-22* offers no guidance on what constitutes “Human Readable”

Fleet monitoring requires many periodic IOs and no support for vendor unique details
Debug is vendor unique
Varying interpretations of Human Readable decode

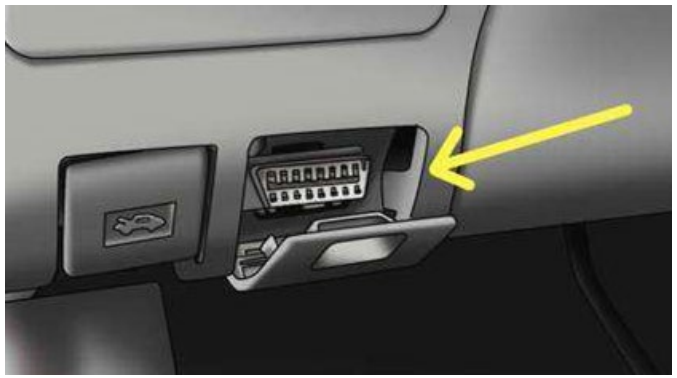
* OCP Datacenter NVMe SSD Specification v2.0, July 2021

Micron SAMSUNG SDC

New Standardized Telemetry Standard

Standardizes the NVMe® Telemetry Payloads in Data Area 1, Data Area 2 and Telemetry Reason Identifier

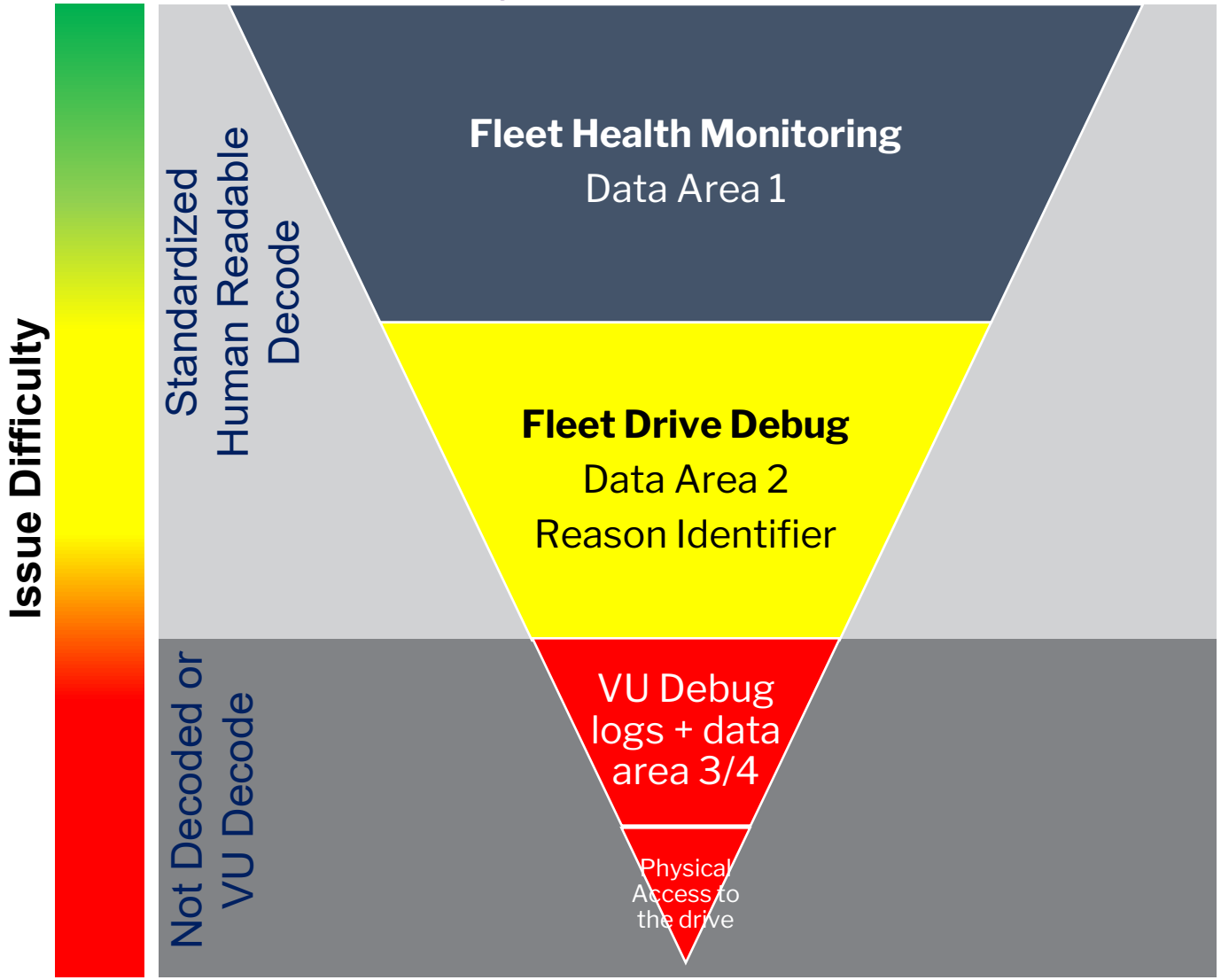
- Offers low latency / single command fleet monitoring
  - Data area 1
  - Incorporates data from other useful SMART pages
  - Additional standardized statistics supporting health monitoring and fleet balancing opportunities
  - Supports vendor unique statistics and event FIFO capabilities in a standardized way
- Offers a standardized debug method post panic
  - Data area 2
  - Reason Identifier (useful for segmentation)
- Offers a single, open-source OCP-NVMe-CLI decode generating human readable output
  - Includes Telemetry String Log for VU statistics and events



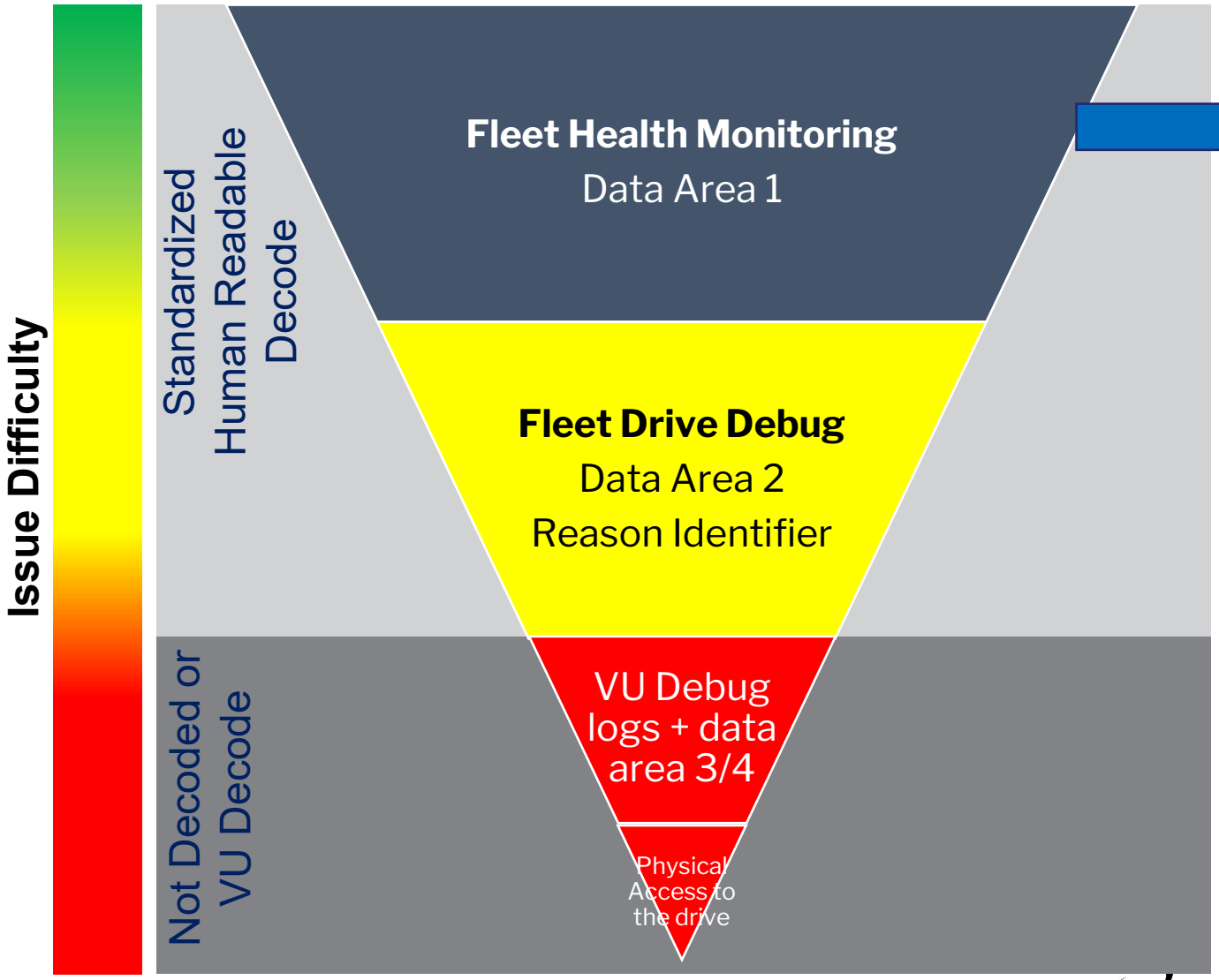
Example of standardized and VU extensible diagnostic and debug solution from automotive industry

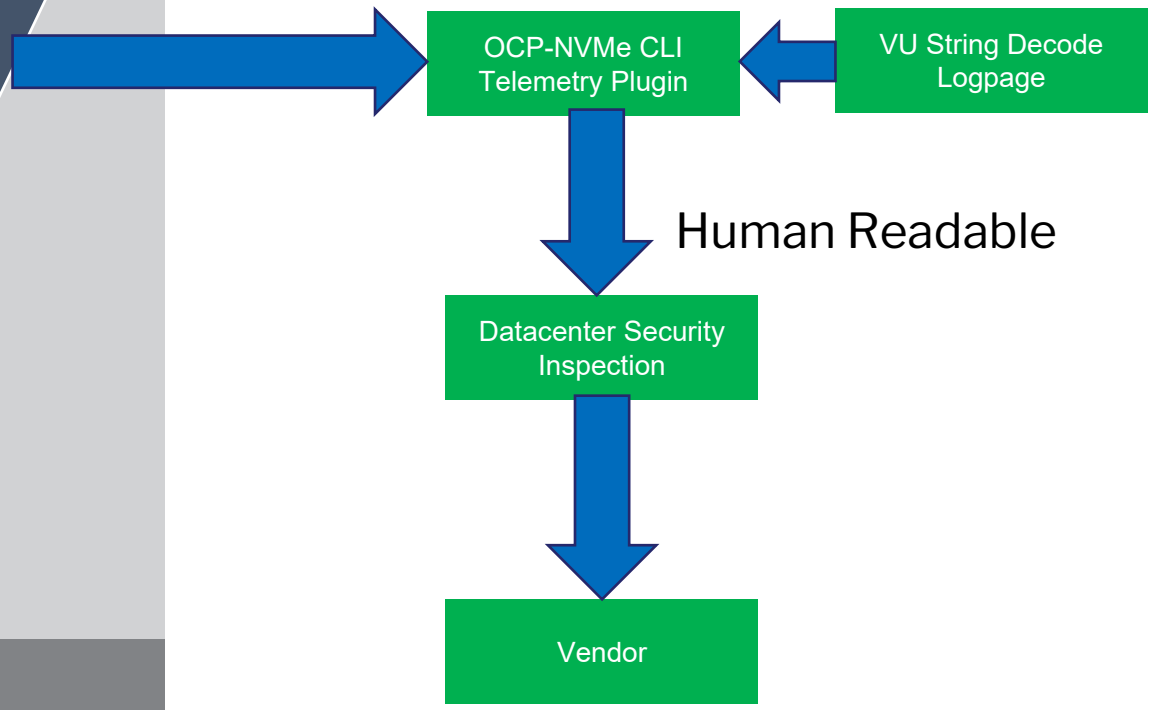
Single command periodic fleet monitoring including VU details
Open industry standardized failure analysis with human readable output

Standardized Telemetry Overview



Fleet Health Monitoring





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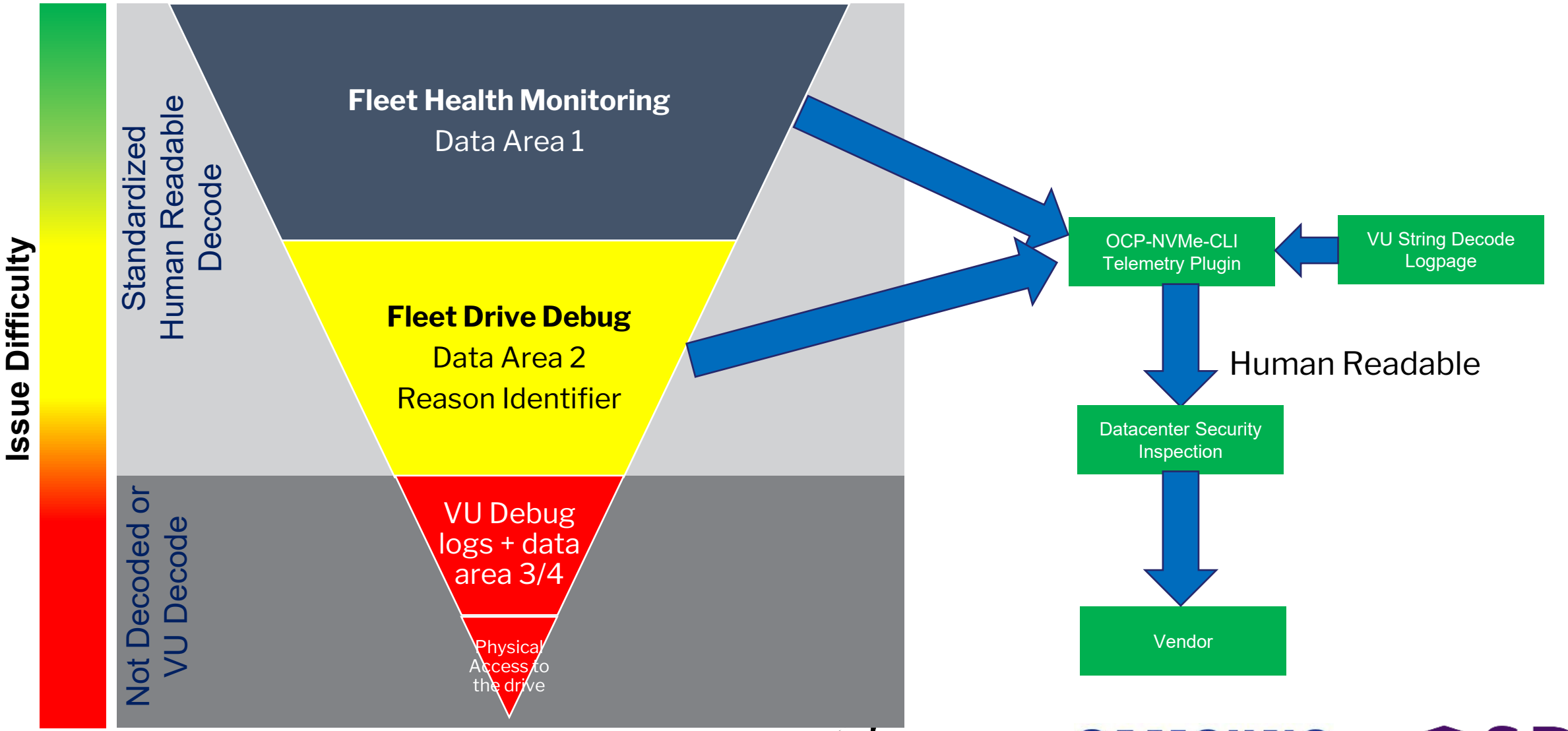
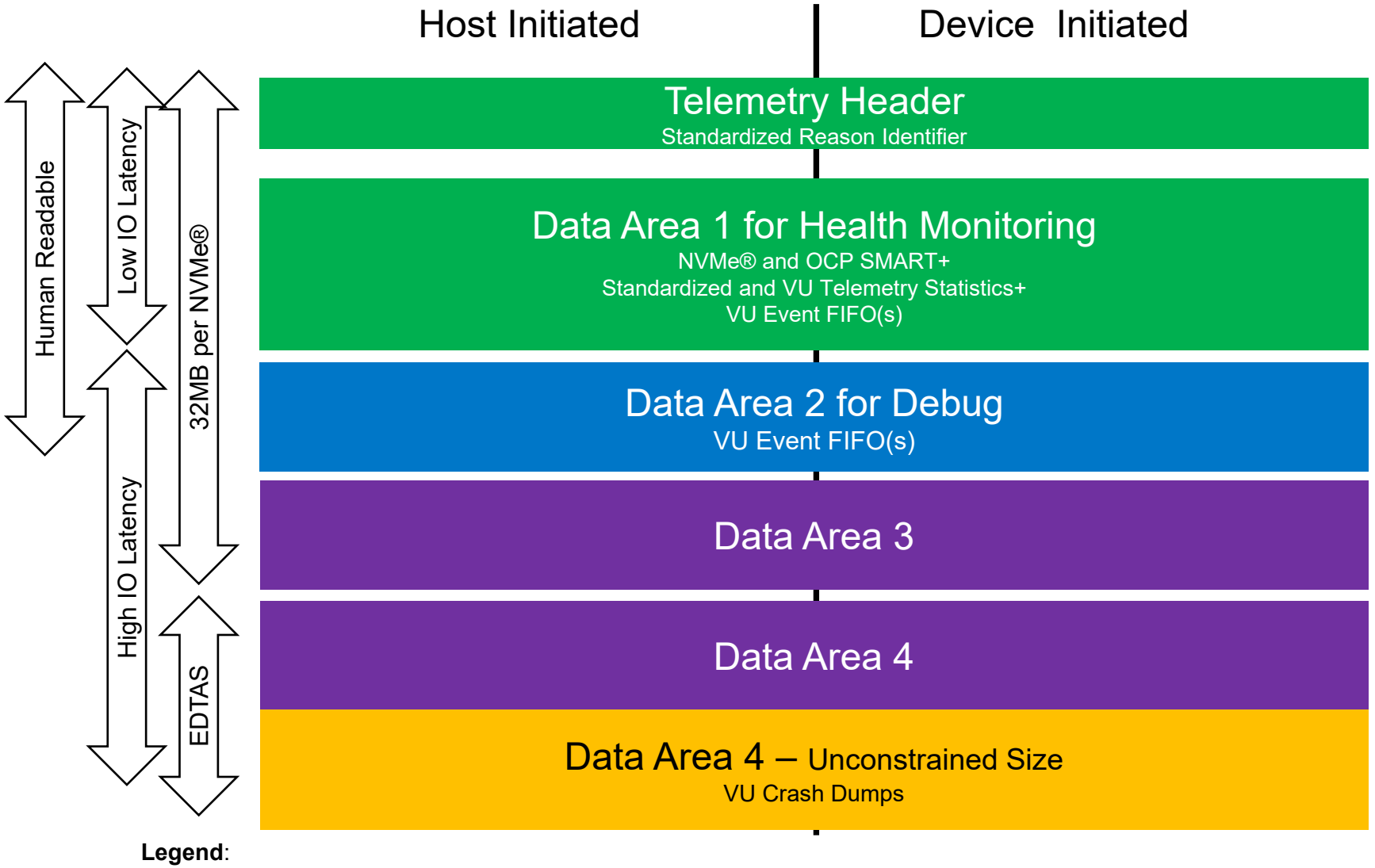
Standardized Telemetry Debug

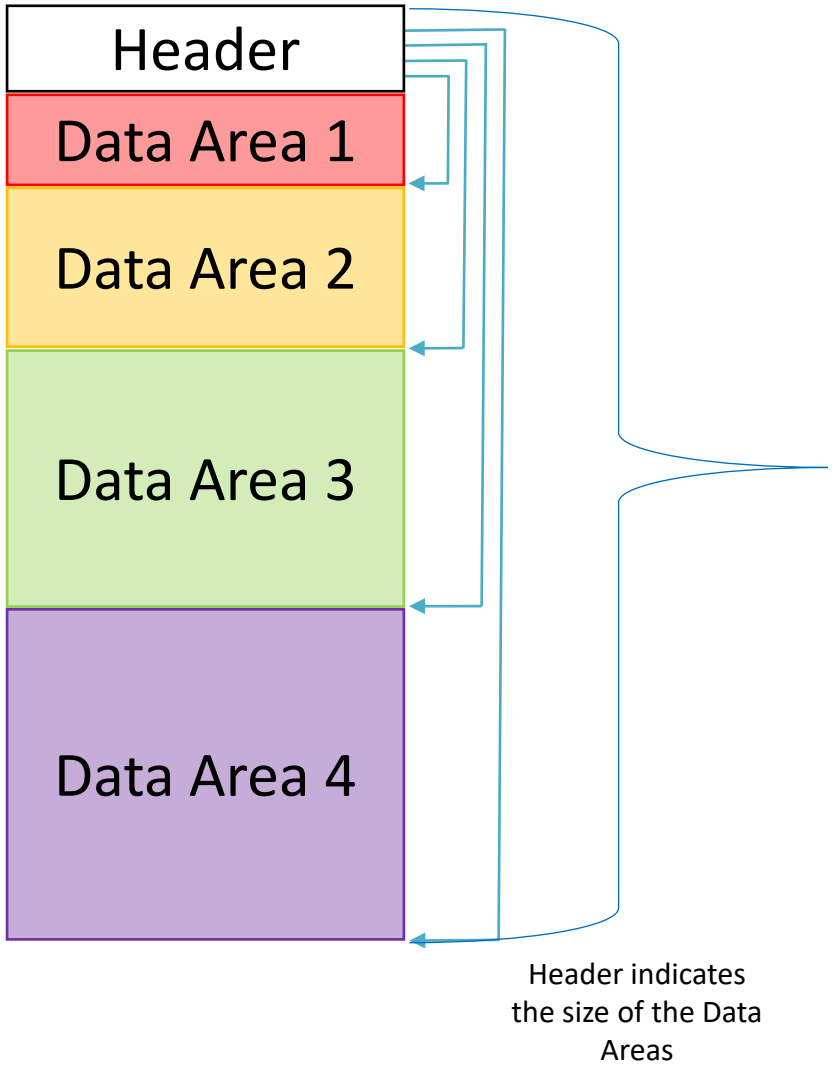


Telemetry Layout Summary



Specification Details

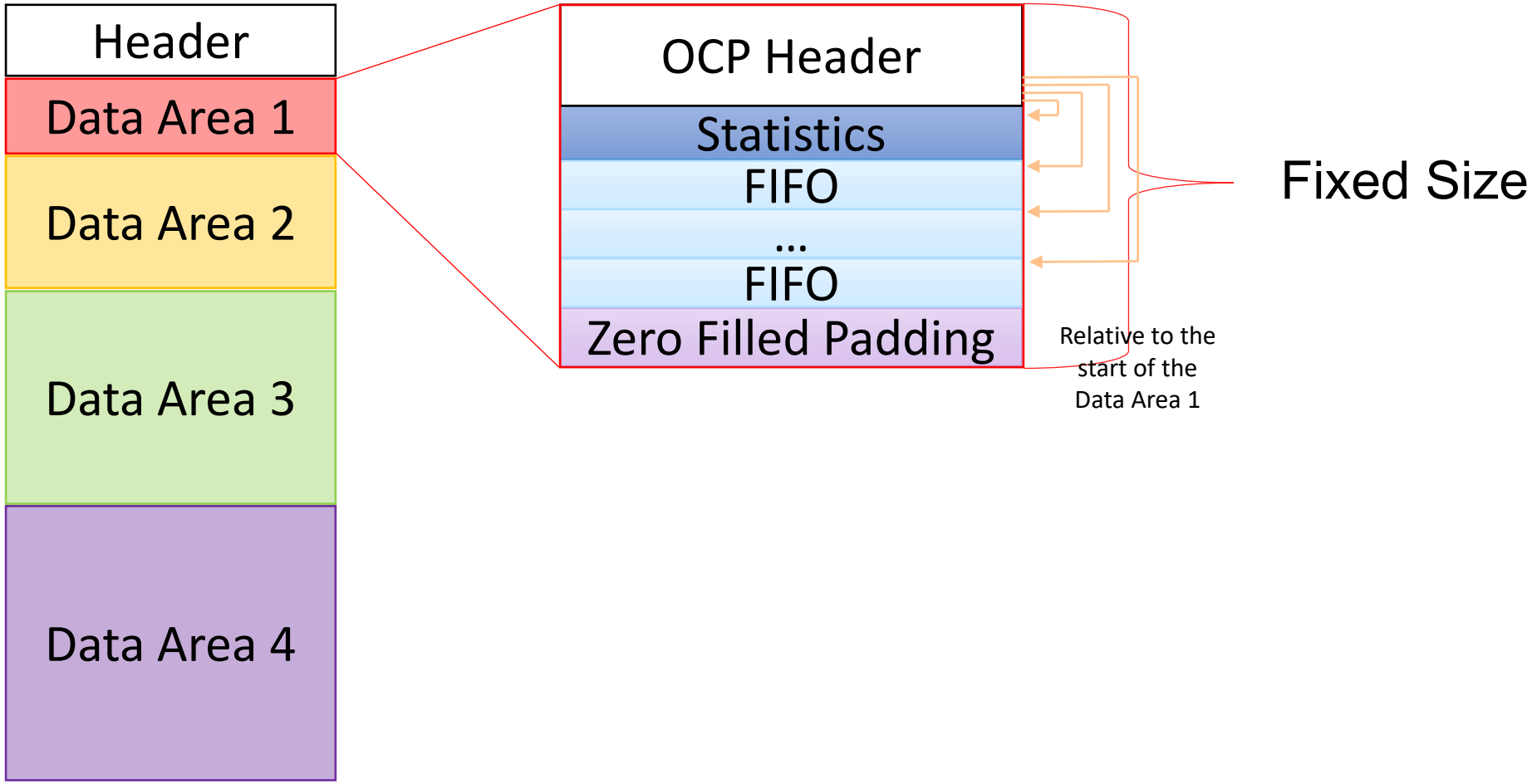
NVMe® Telemetry Log Page



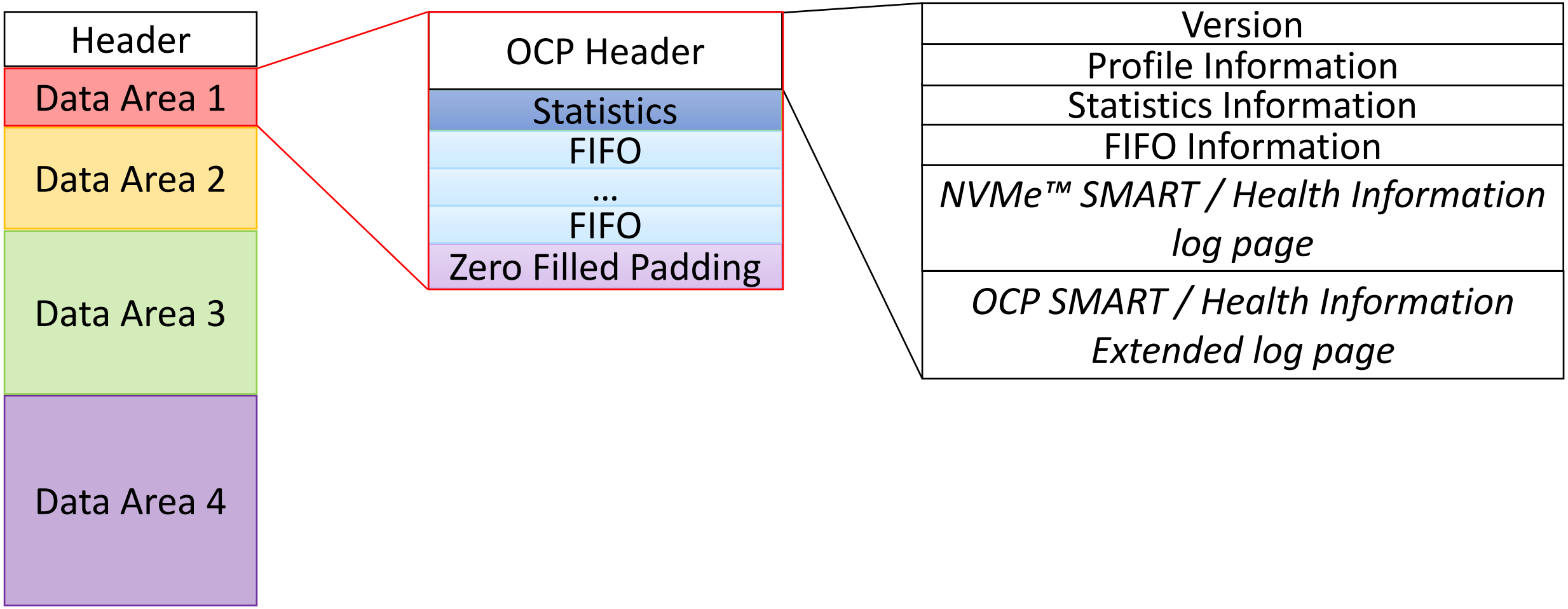
Header indicates the size of the Data Areas

Defined by the NVM Express™ Base Specification 2.0

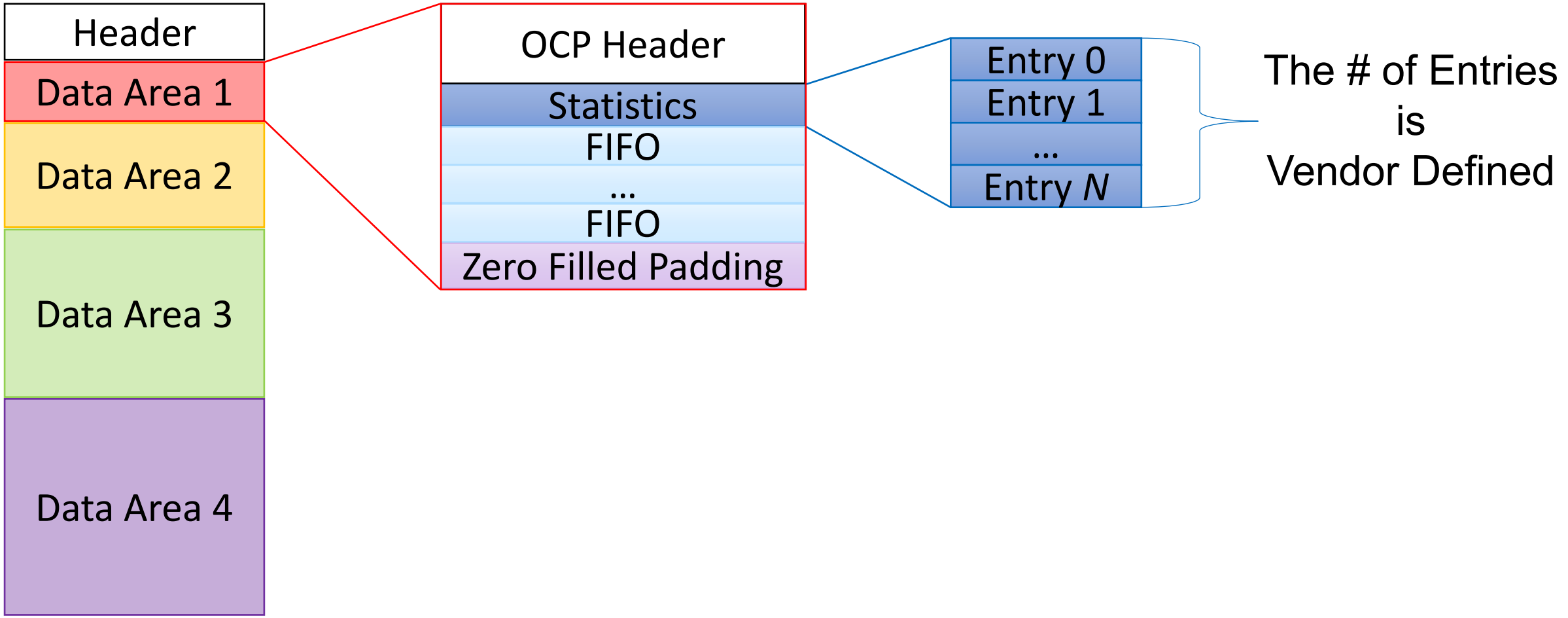
OCP Telemetry Log Page Format



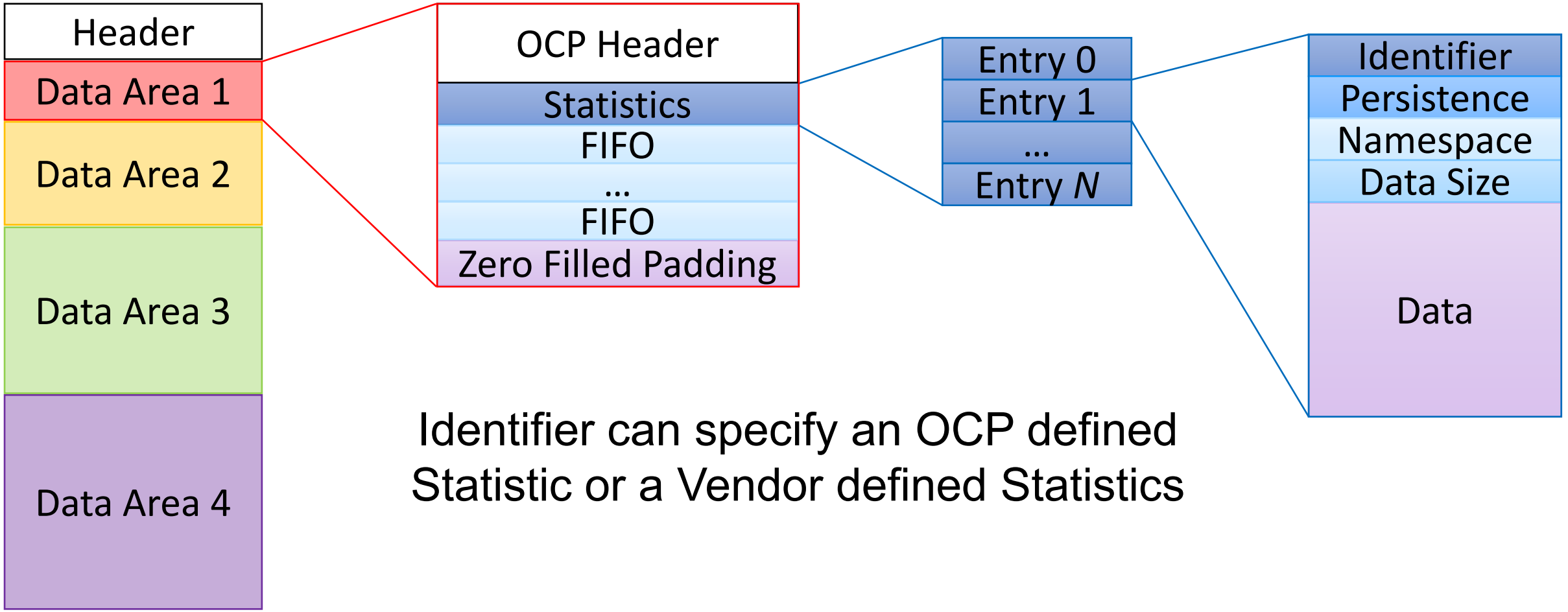
OCP Telemetry Log Page Format



OCP Telemetry Log Page Format

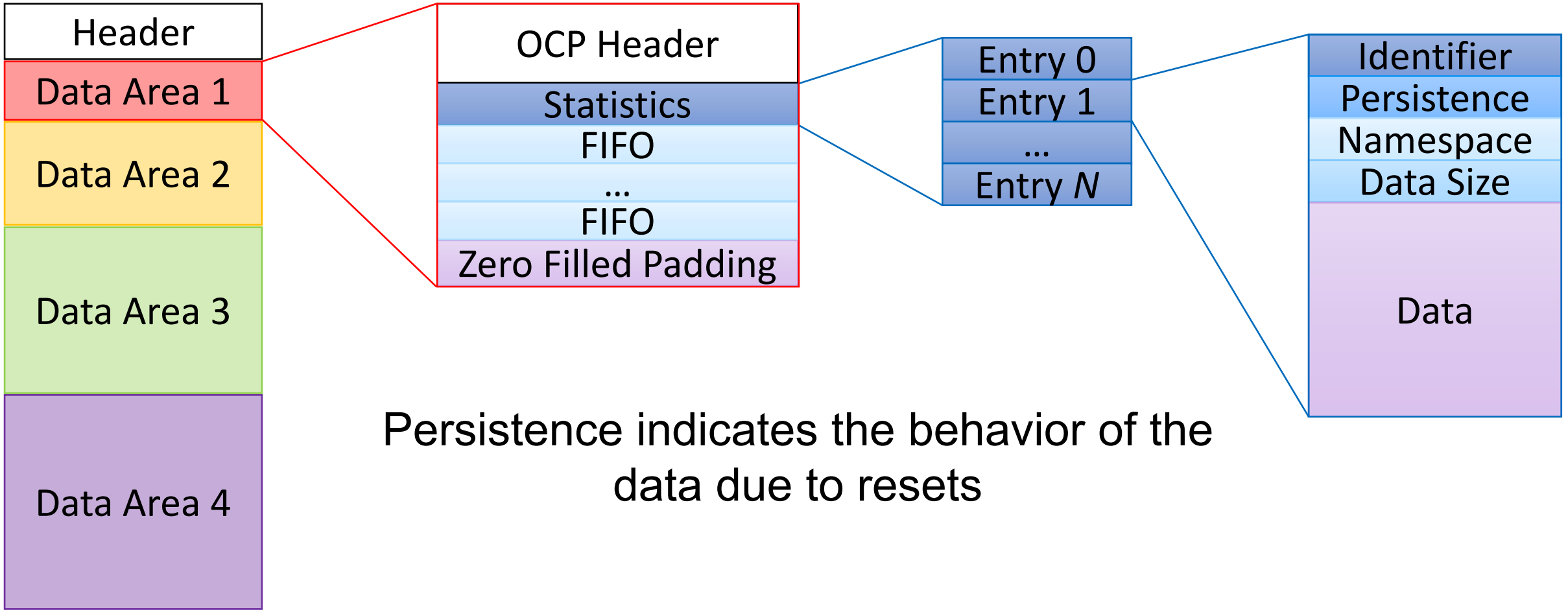


OCP Telemetry Log Page Format



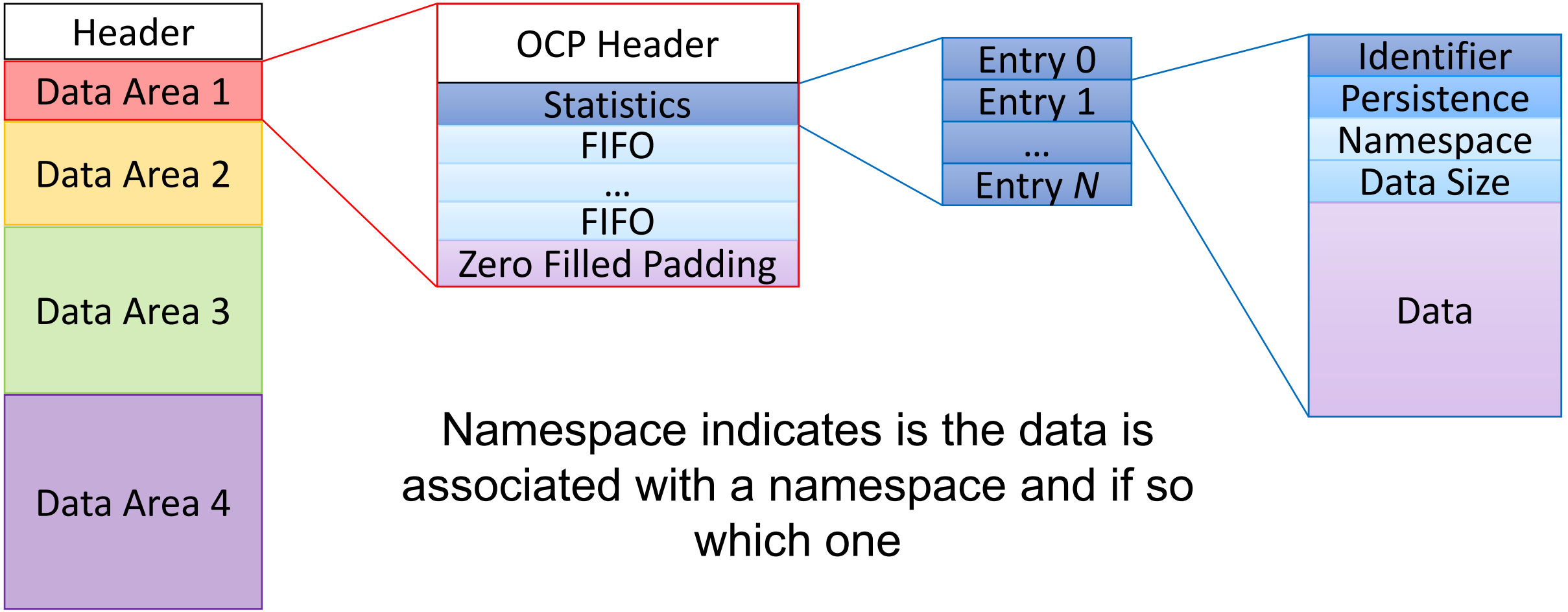
Identifier can specify an OCP defined Statistic or a Vendor defined Statistics

OCP Telemetry Log Page Format



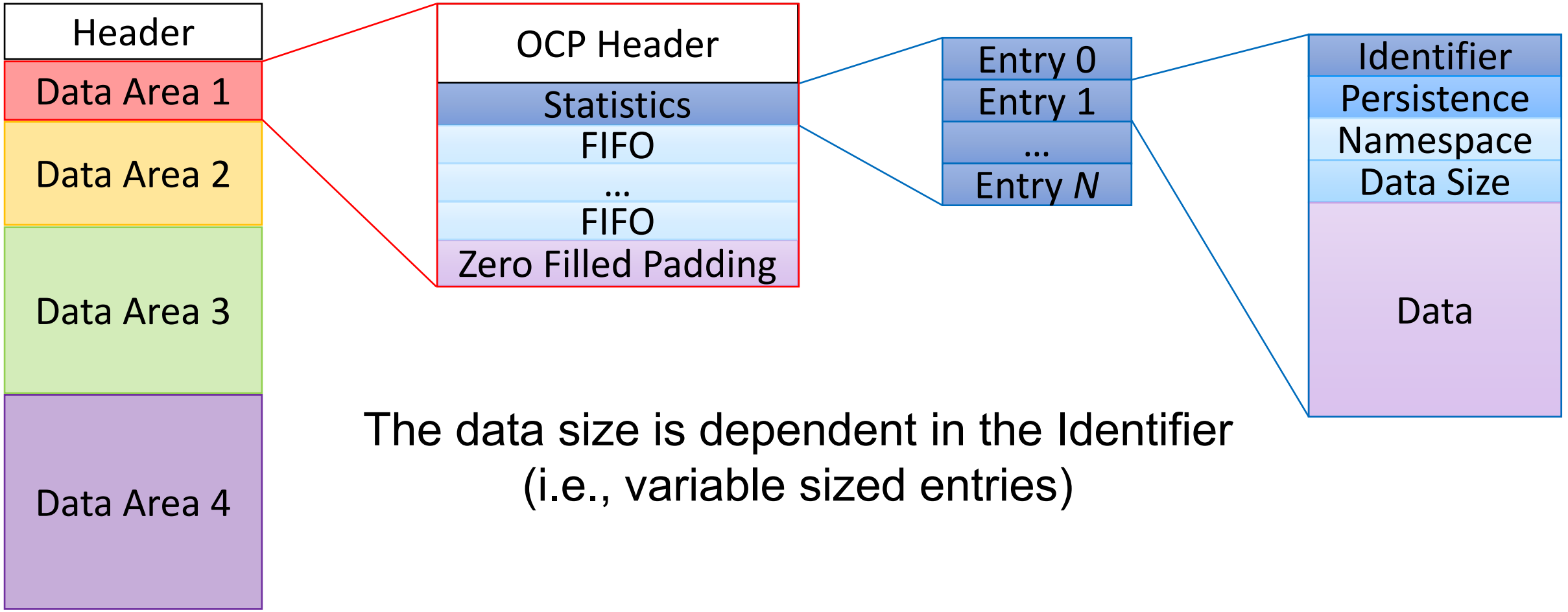
Persistence indicates the behavior of the data due to resets

OCP Telemetry Log Page Format



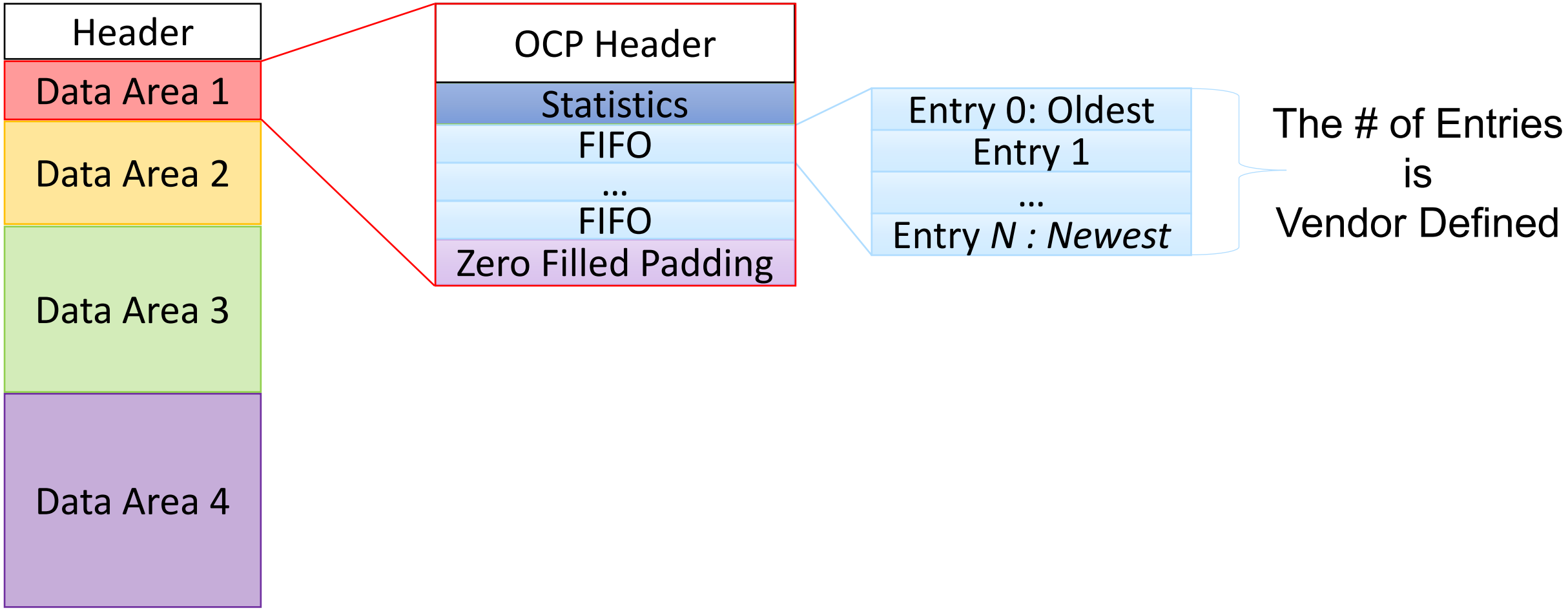
Namespace indicates is the data is associated with a namespace and if so which one

OCP Telemetry Log Page Format

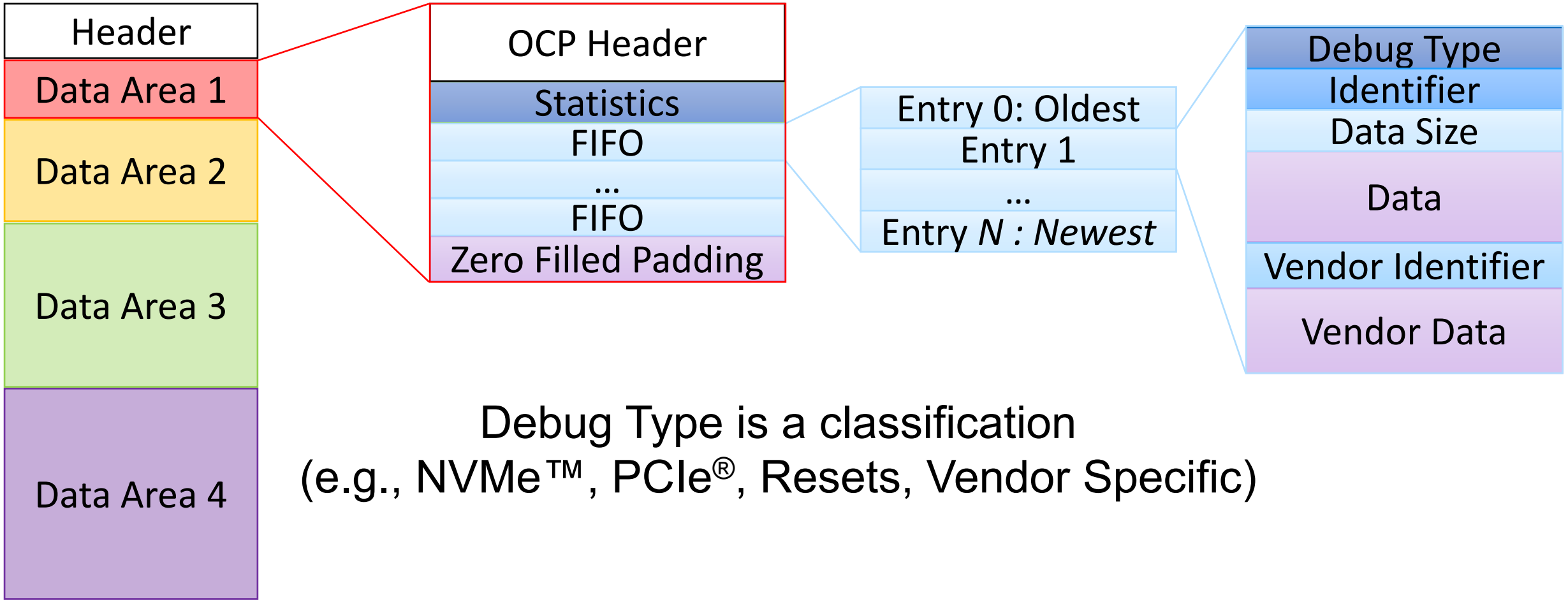


The data size is dependent in the Identifier
(i.e., variable sized entries)

OCP Telemetry Log Page Format

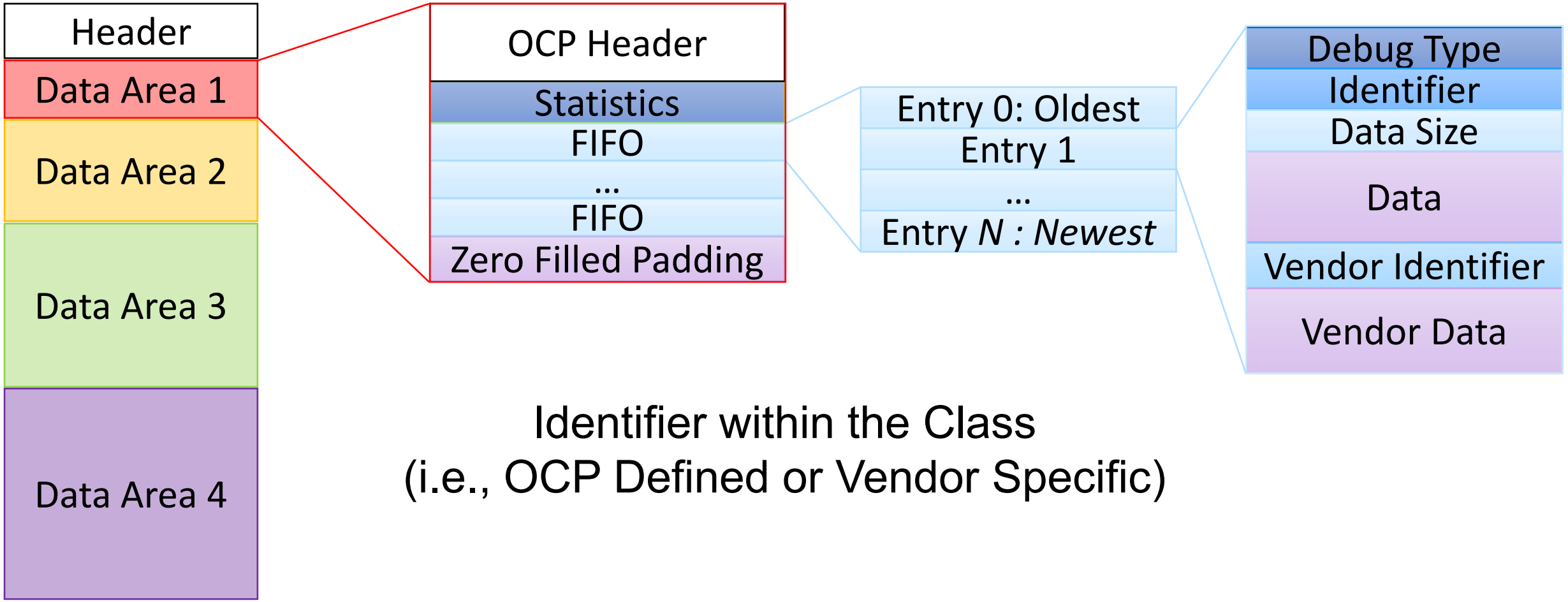


OCP Telemetry Log Page Format



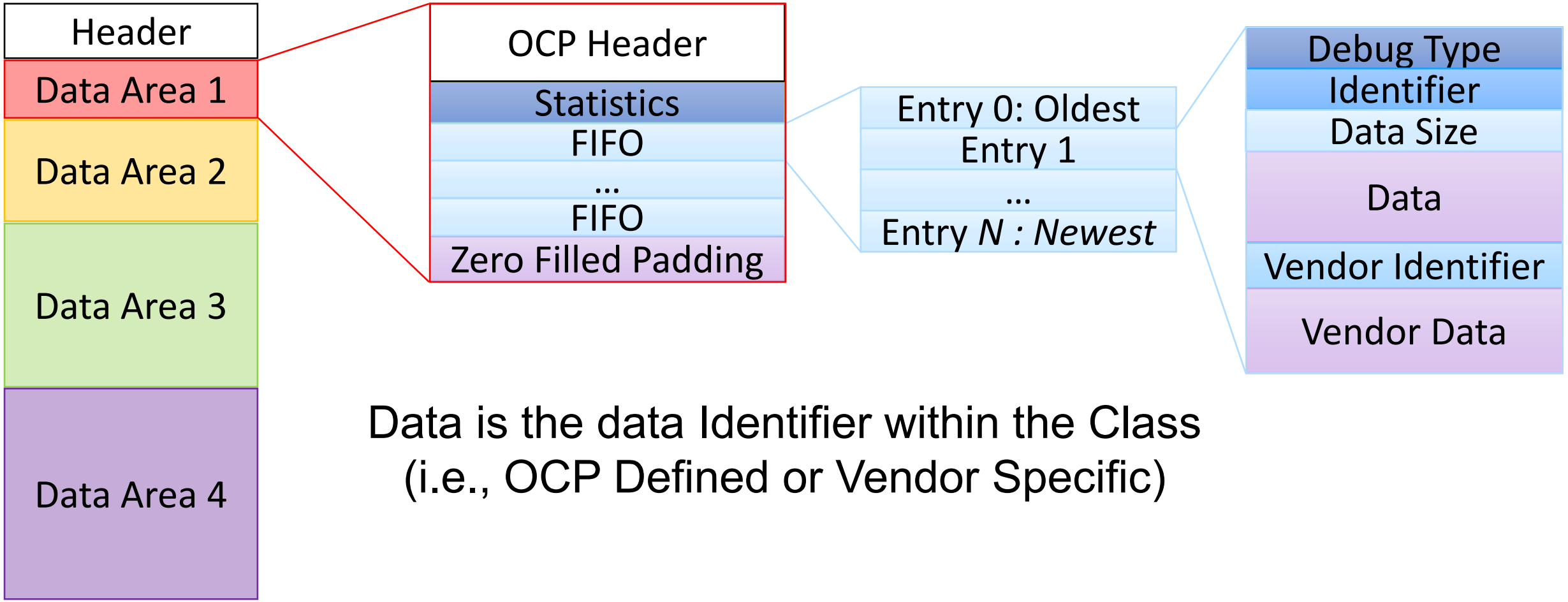
Debug Type is a classification
(e.g., NVMe™, PCIe®, Resets, Vendor Specific)

OCP Telemetry Log Page Format



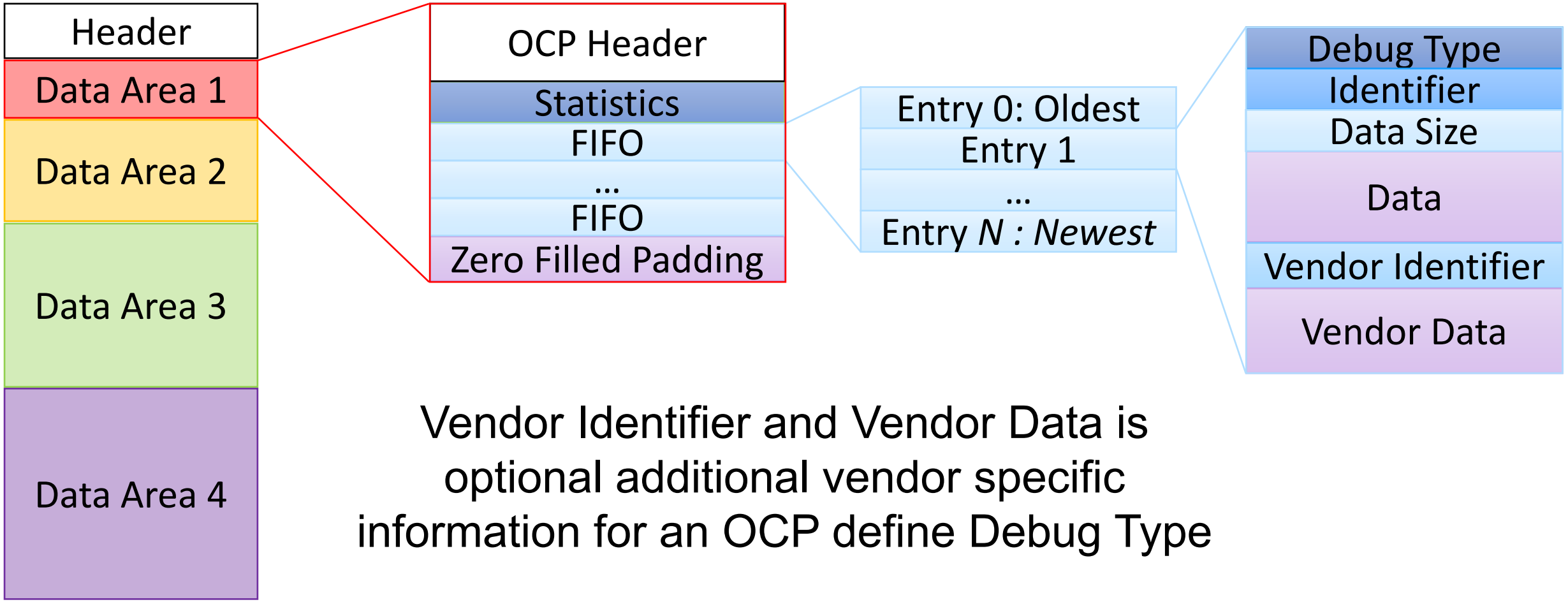
Identifier within the Class
(i.e., OCP Defined or Vendor Specific)

OCP Telemetry Log Page Format



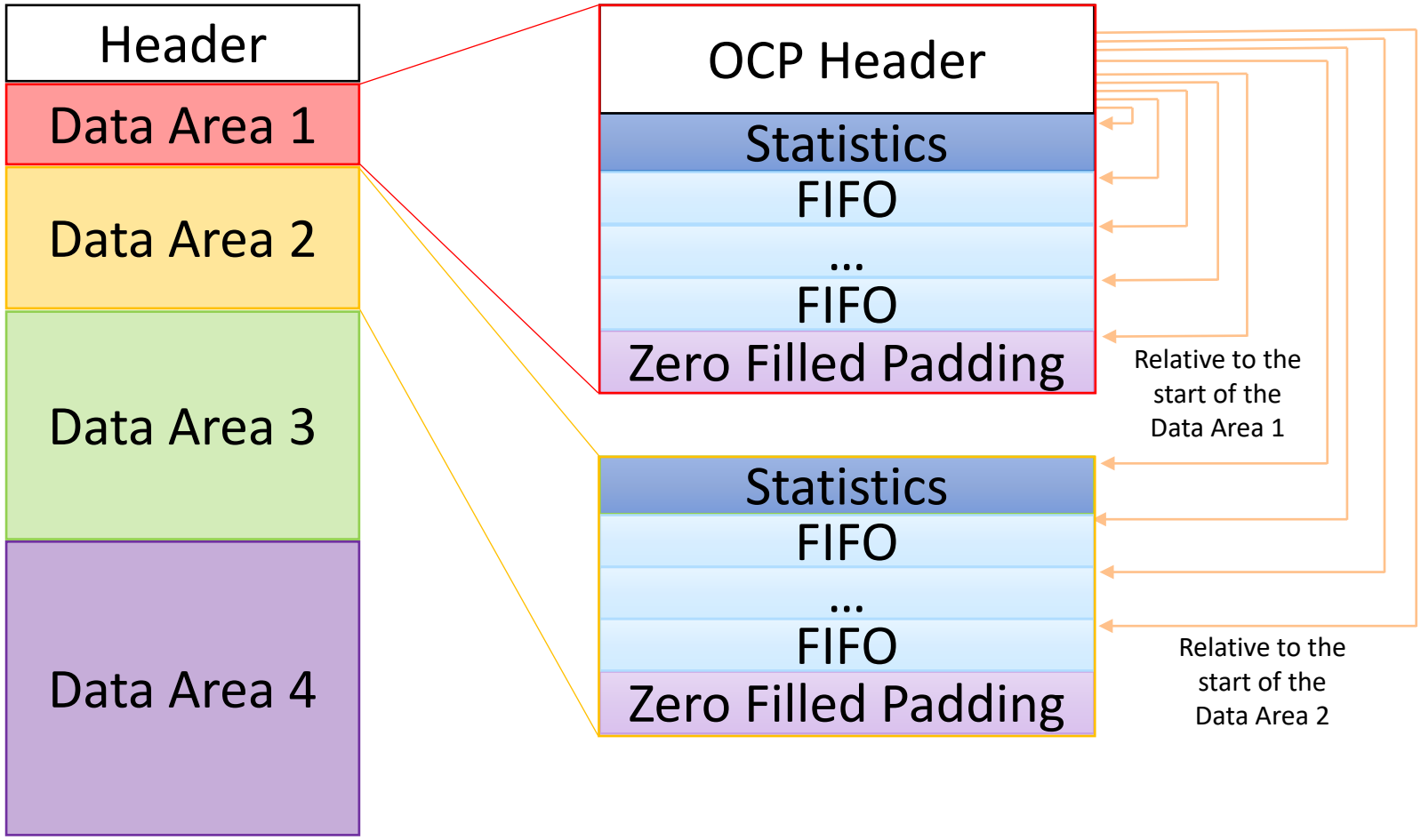
Data is the data Identifier within the Class
(i.e., OCP Defined or Vendor Specific)

OCP Telemetry Log Page Format

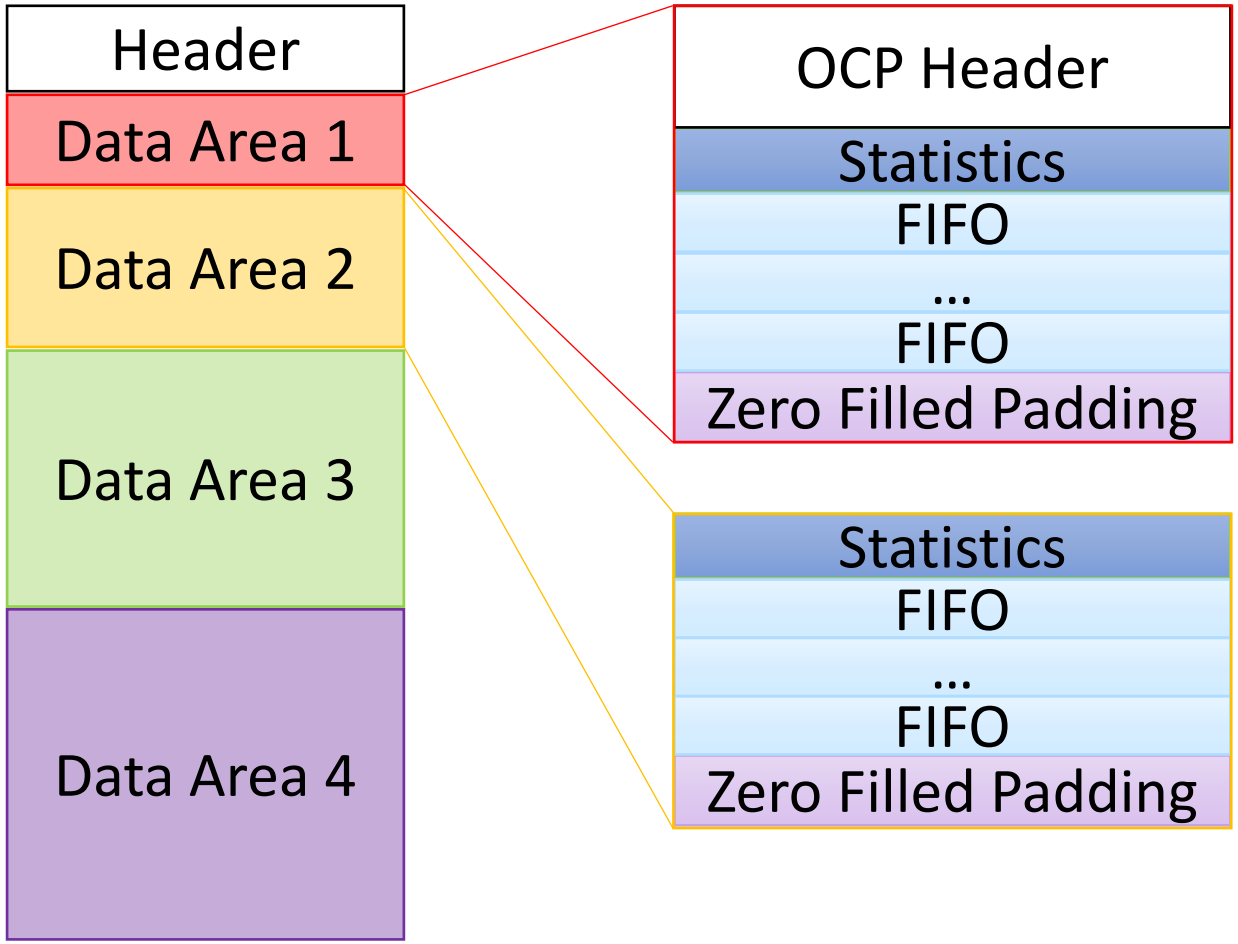


Vendor Identifier and Vendor Data is optional additional vendor specific information for an OCP define Debug Type

OCP Telemetry Log Page Format

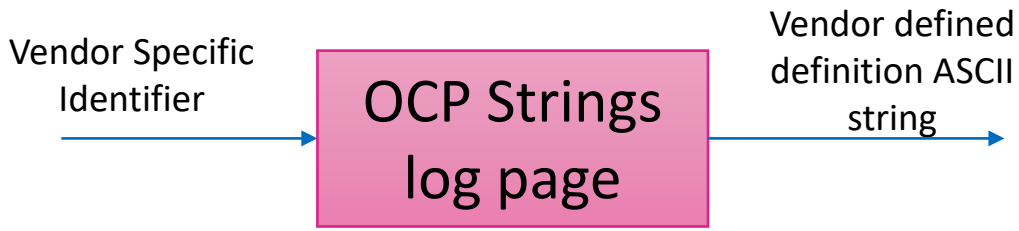


Generating Human Readable Strings

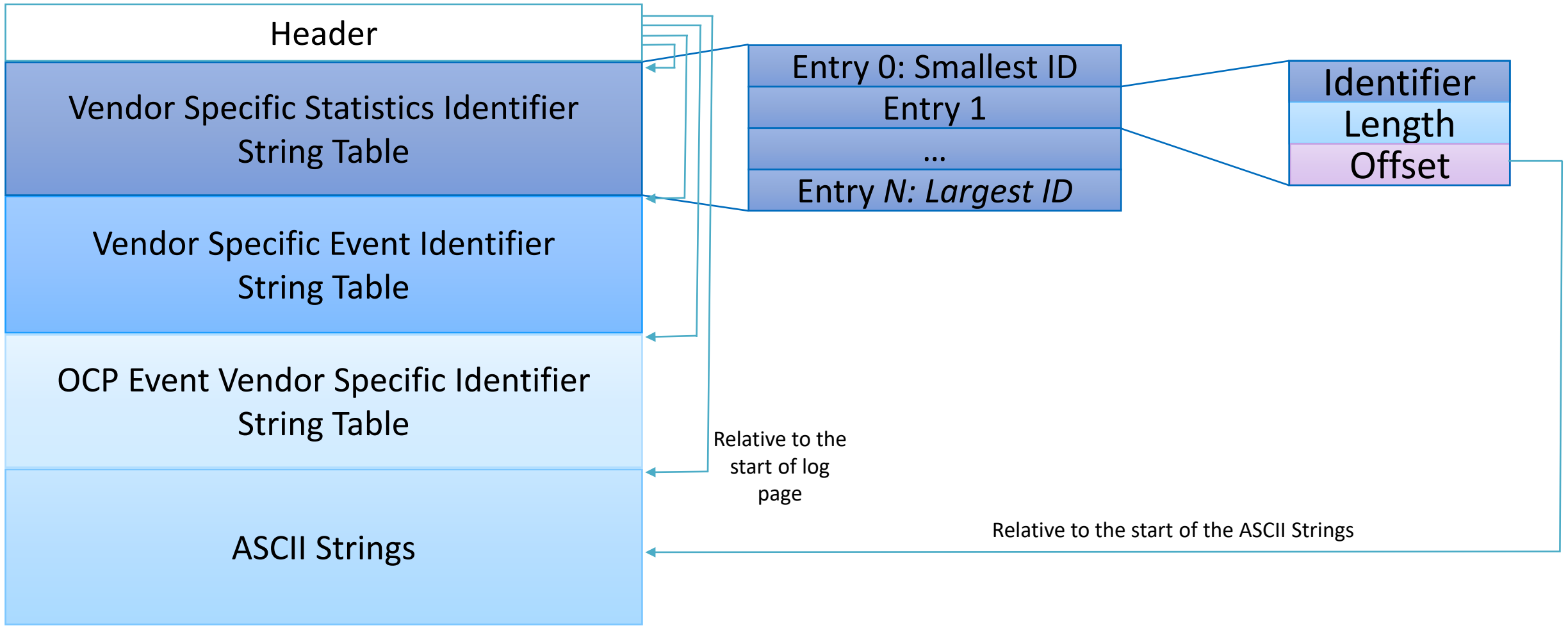


Parse the Telemetry log page and for each Statistics or Event print:

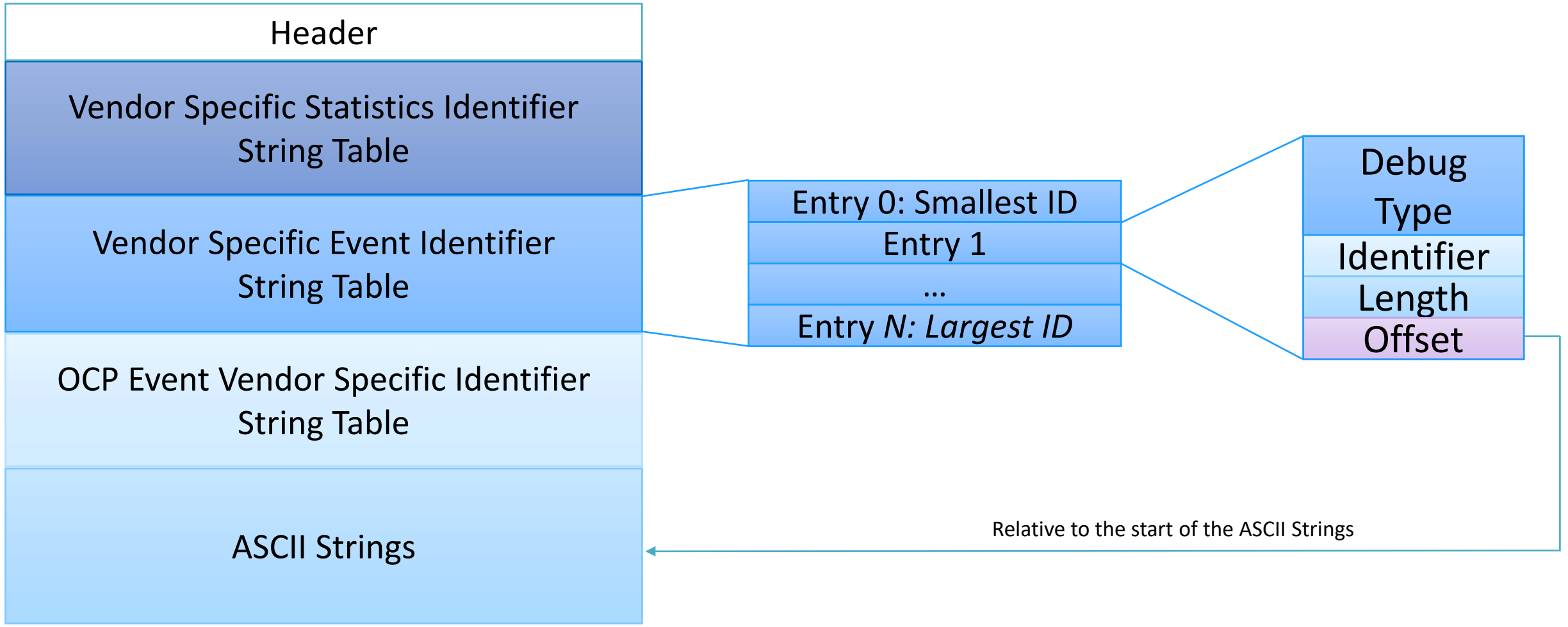
- The data
- The ASCII string definition
  - Hard code standards defined text
  - Lookup Vendor defined text in the OCP Strings log page



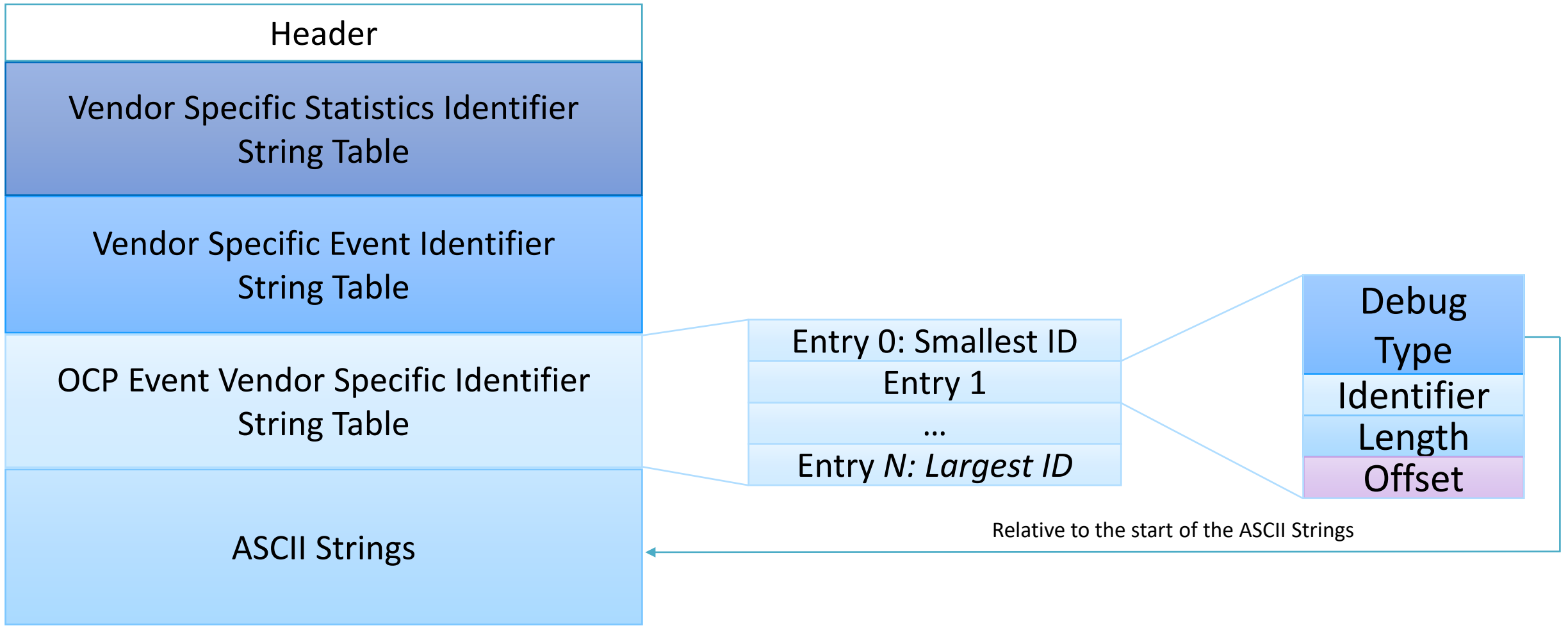
OCP Strings Log Page

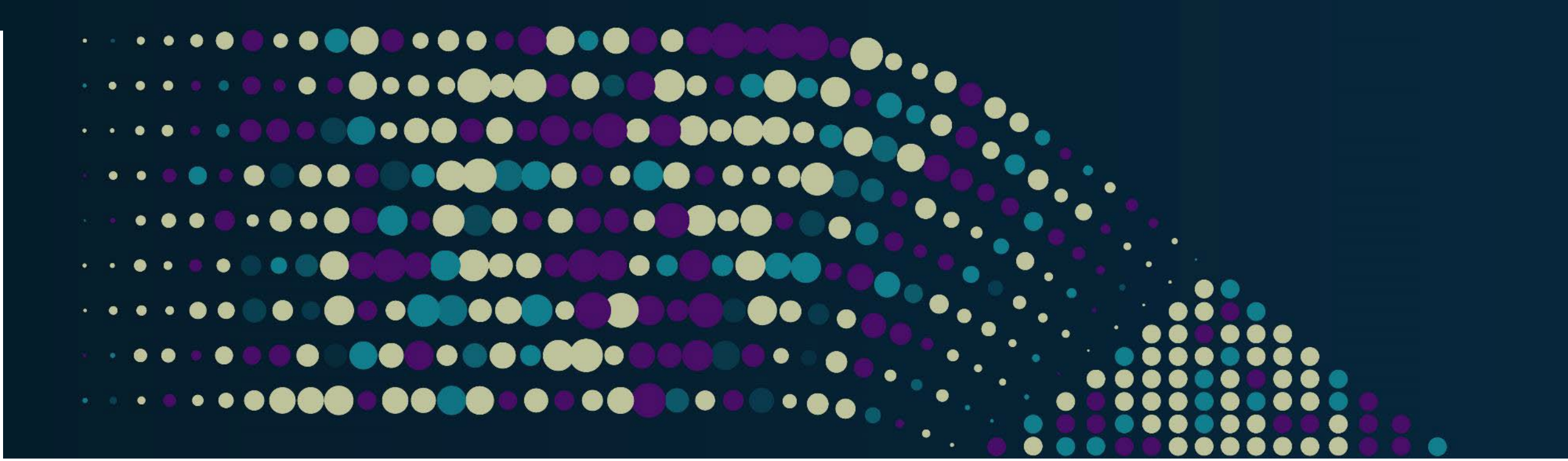


OCP Strings Log Page



OCP Strings Log Page





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