Here is a **comprehensive and deeply detailed sentence-by-sentence breakdown** of the **"Performance Monitor"** document (full version), structured into **clear study notes** for your CompTIA A+ 220-1102 prep:

**🧠 Performance Monitor — Study Notes**

**🔍 Concept Overview**

* **Performance Monitor** is a built-in Windows tool used for tracking **real-time** and **historical performance** data.
* It monitors what’s happening **inside the OS**, including **CPU, memory, storage, and network usage**.
* You can use it to:
  + **Watch live system performance**
  + **Log data for long-term analysis**
  + **Diagnose slowdowns and bottlenecks**

**🧭 Launching and Interface Basics**

* Open by:
  + Clicking the **Windows Start button**
  + Typing “**Performance**”
  + Launching the **Performance Monitor** app
* On launch, you see an **overview screen** called **System Summary**, which includes:
  + Memory usage
  + Network interface status
  + Storage performance
  + CPU performance

**⚙️ Monitoring Modes**

* The **left-hand panel** has a “**Monitoring Tools**” section — select “**Performance Monitor**” for live tracking.
* You'll see a **live updating graph** by default.
  + The **red line** shows **% Processor Time**
* Monitoring is done using:
  + **Counter logs**: Track system stats like CPU, disk, memory, and network
  + **Trace logs**: Log **services-level** activity (beyond regular logs)

**🔢 Counter Logs**

* Collect statistics for:
  + Memory
  + Disk
  + Processor
  + Network
* Help identify **system health and bottlenecks**

**🔎 Trace Logs**

* Collect stats about **services**
* Go **deeper than Event Viewer** — useful for diagnosing system components
* Appear in the **Reports** section

**➕ Adding and Using Counters**

* Click the **plus sign (+)** to add counters.
* You can browse and choose specific resource counters like:
  + **% Processor Time**
  + **% Privileged Time**
* Use the **Add** button, then click **OK** to see it on the graph.

**🎨 Customizing Counters**

* By default, new counters may share colors (e.g., two red lines).
* Right-click a counter → **Properties** → Change its color (e.g., red for Processor, green for Privileged Time).
* **% Privileged Time** = Processing time for tasks requiring **admin permissions**

**⚙️ Example – Processor Usage**

* Example: Opening **Microsoft Edge** increases CPU usage
* Graph shows spike, then drop after the app is closed
* This reflects real-time demand on the processor

**🧽 Clearing Counters**

* You can **remove all counters** by selecting and hitting the **Delete** button

**💾 Monitoring Memory**

* Add **memory counters**:
  + **Available MB** – free RAM
  + **Page Faults/sec** – memory errors needing data from disk
  + **Pages Read/sec** / **Pages Written/sec** – page file activity
* Each counter gets a **unique color**
* Real-time graph shows:
  + High green line = healthy memory (lots of RAM free)
  + Blue/Yellow spikes = paging activity

When we look at different counters this will allow us to associate what is happening with a system at a very low level. For example, if you have a very slow system and your disk feed was low you could verify that by adding counters associated with reading and writing to the disk.

We can check relationships between physical disks, read write speeds, and things like our memory because maybe I see that my system is operating very slowly, and I think it’s an issue with the disk drive. It could be that we’re running out of physical memory and so we’re constantly swapping things into or out of the page file. Hence, it’s slowing down the system.

* So, we can look at our physical disk and add it to the **counter**.
  + Avg Disk Bytes/Read: this will allow us to see if things are reading and writing from the drive.
  + Then we can add the paging file.

**💡 Virtual Memory Insight**

* If the system has little physical RAM, it uses **virtual memory (page file)** more often
* This causes:
  + High **Page Reads/Writes**
  + Spikes in **Page Faults/sec**
* Useful for detecting **memory pressure** and swapping behavior

**🔁 Understanding Counter Relevance**

* Key reason for using Performance Monitor:
  + **Correlate system behavior** with performance issues
* Example:
  + Suspect slow disk? Add:
    - **Avg Disk Bytes/Read**
    - **Page Faults/sec**
    - **% Committed Bytes In Use**

**🧪 Hands-On Test Scenario**

* Add counters:
  1. **Avg Disk Bytes/Read** – speed of disk reads
  2. **% Committed Bytes In Use** – percentage of used RAM
  3. **Page Faults/sec** – how often system accesses page file
* Run common apps (e.g., **Edge**, **Explorer**, **Microsoft Store**) to test usage
  1. **Observe**:
     + Opening apps → CPU & disk activity spike
     + Page faults increase with memory pressure
     + Closing apps → usage drops, freeing RAM

**🧠 Why This Matters**

* Helps pinpoint cause of slowdowns:
  + **CPU bottlenecks**: High % Processor Time
  + **Disk slowness**: High Avg Disk Bytes/Read
  + **Low RAM**: High Page Faults/sec, high % Committed Bytes
* Correlating trends helps identify **root causes**

**📊 Counter Summary Table**

| **Counter** | **What It Shows** |
| --- | --- |
| % Processor Time | Overall CPU usage |
| % Privileged Time | CPU time for system-level/admin tasks |
| Available MB | Remaining RAM |
| % Committed Bytes In Use | % of total memory (physical + virtual) used |
| Page Faults/sec | Memory read/write delays due to insufficient RAM |
| Pages Input/Output/sec | Frequency of paging to/from disk |
| Avg Disk Bytes/Read | Disk read performance |

**🧪 Real-Life Use Cases**

1. **Diagnose slowness**:
   * If CPU % is normal, but disk and memory paging are high → Memory bottleneck.
2. **Test app impact**:
   * Open apps and watch spikes in usage.
   * Helps identify **resource-hogging software**.
3. **Find system strain points**:
   * High **% Committed Bytes** = low memory
   * High **Page Faults/sec** = paging overload
   * High **Disk Read Bytes** = I/O delay

**✅ Exam Inclusion Notification**

* ✅ **Yes**, this topic is covered in **CompTIA A+ 220-1102**
* Matches Objective **2.2: "Use appropriate Windows tools"**
* You need to know:
  + How to open Performance Monitor
  + How to add/interpret counters
  + Real-world usage to troubleshoot CPU, memory, disk issues