On the Effectiveness of Same-Domain Memory Deduplication

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However, in this work, we present **two case studies** that highlight one key flaw in this defense: that it is **difficult to implement** correctly, and hence, **insufficient**.

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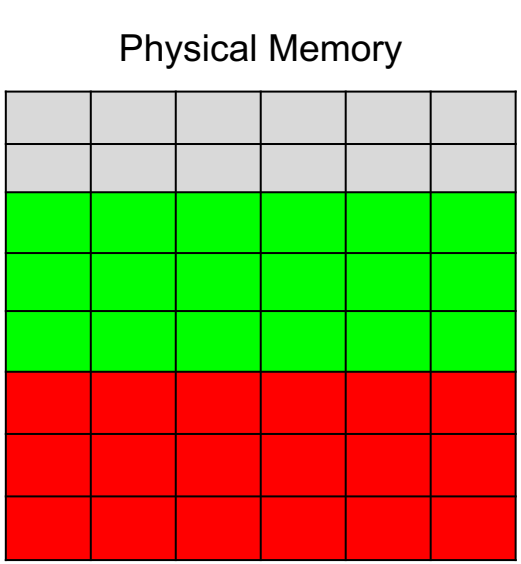

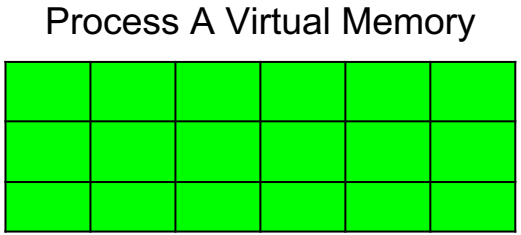

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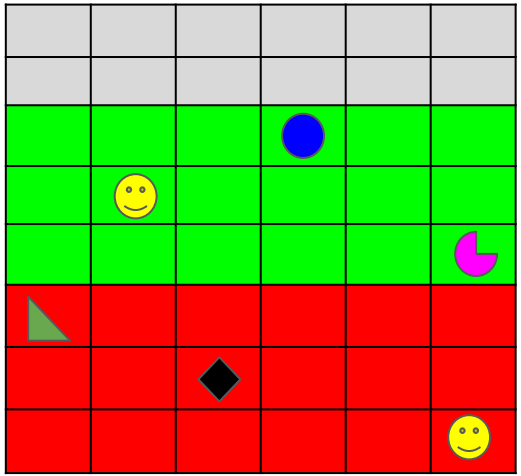

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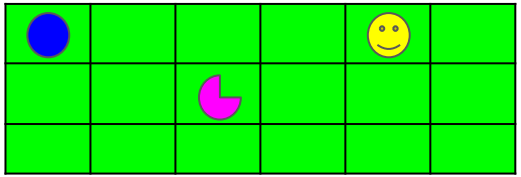

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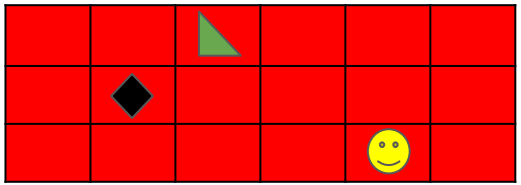

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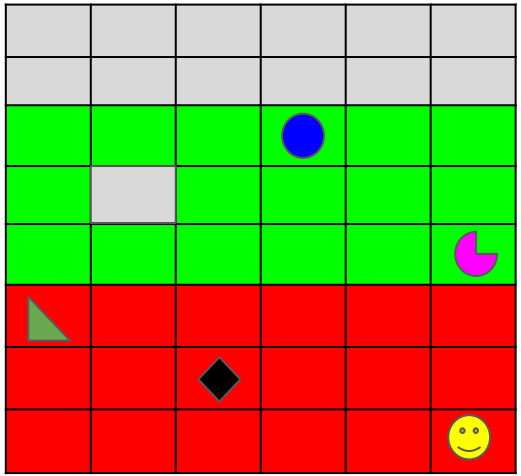

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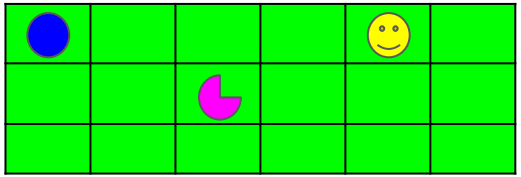

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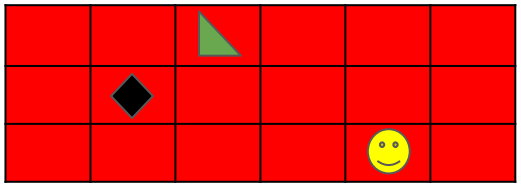

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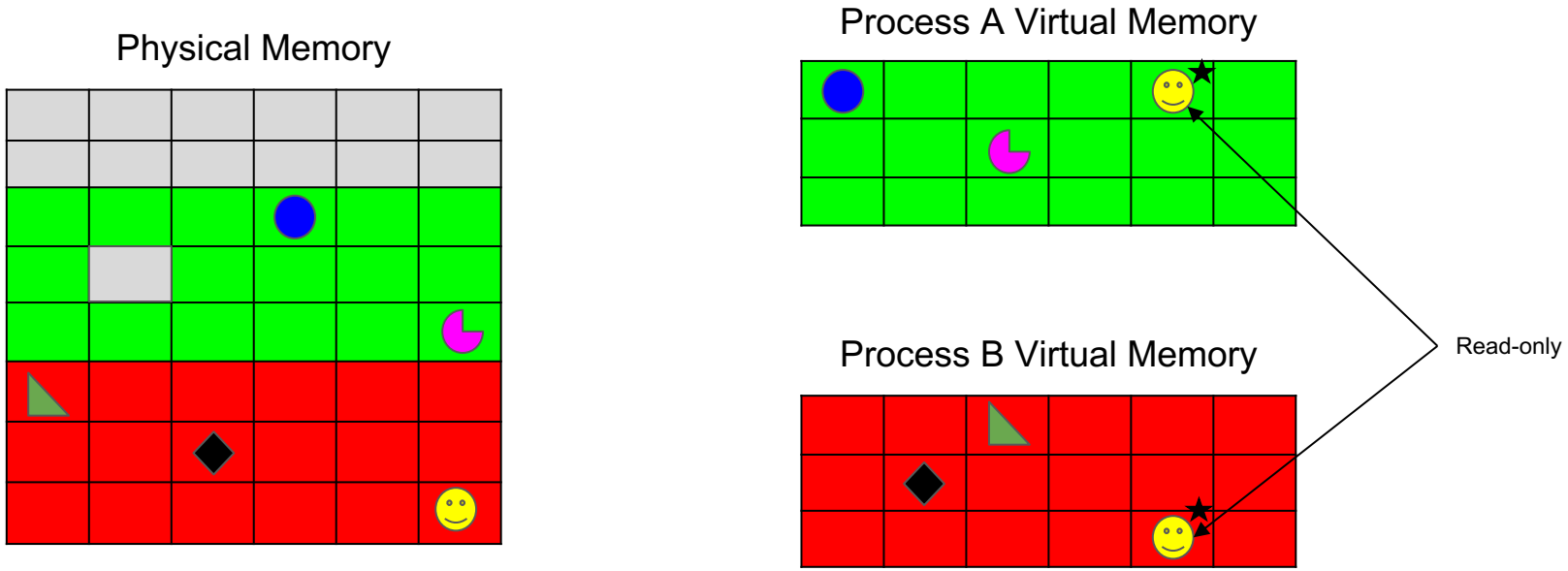

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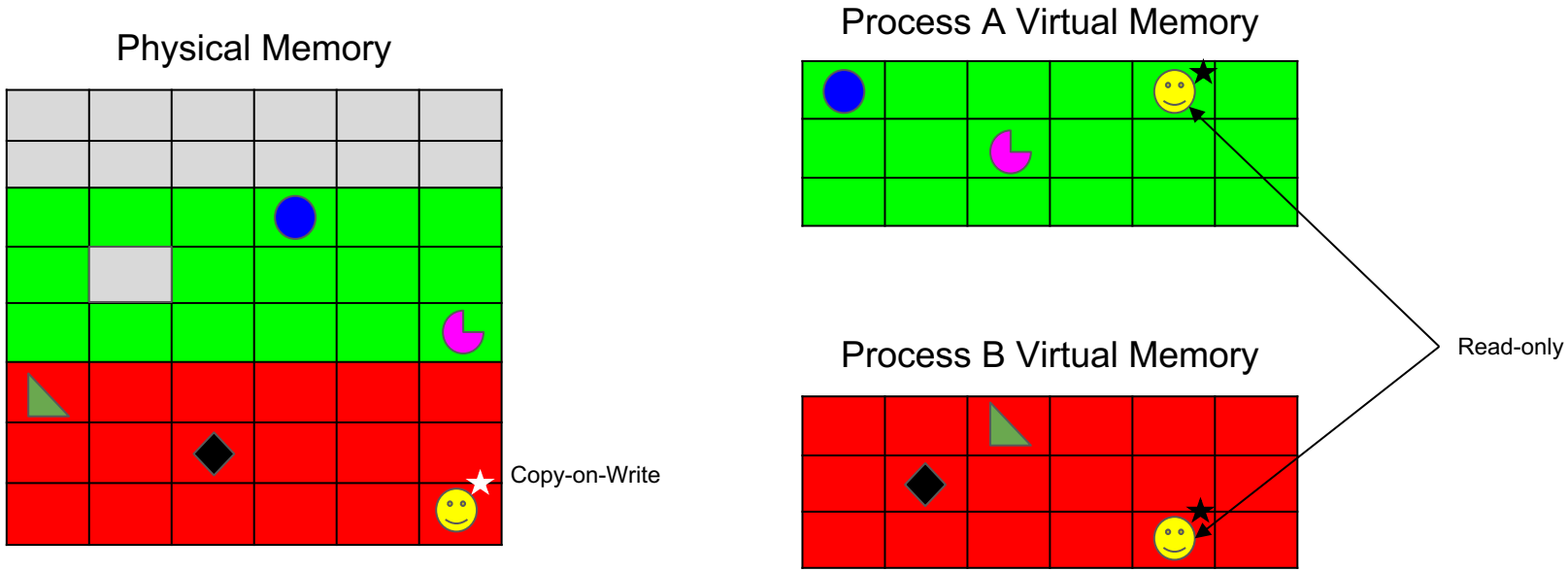

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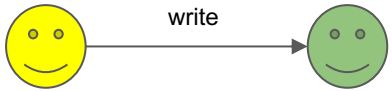
Write to a **normal** page: 

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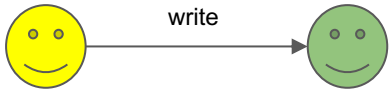

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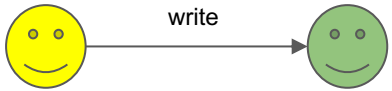

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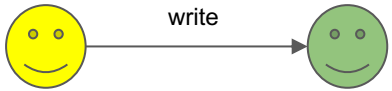

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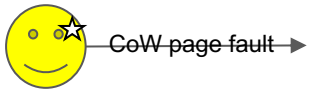

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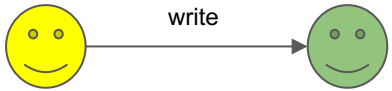

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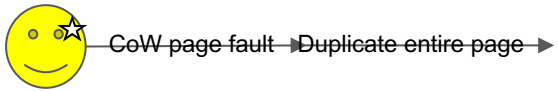

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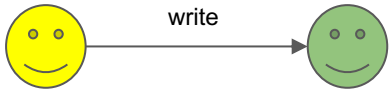

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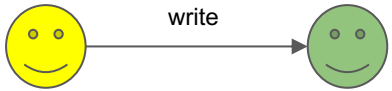

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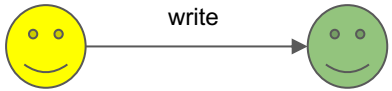

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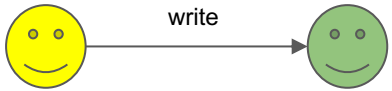

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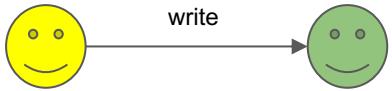

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  - Windows disabled arbitrary **inter-process deduplication** (as we will see next)

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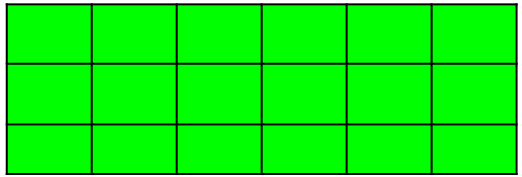

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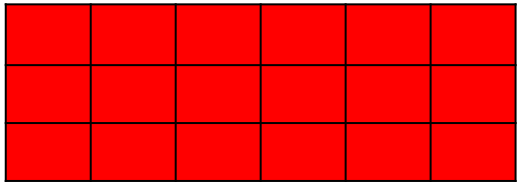

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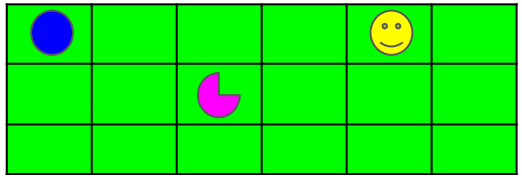

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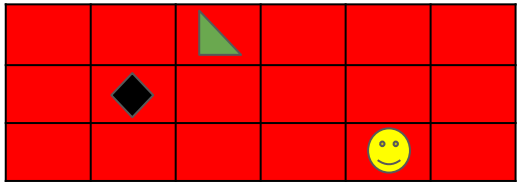

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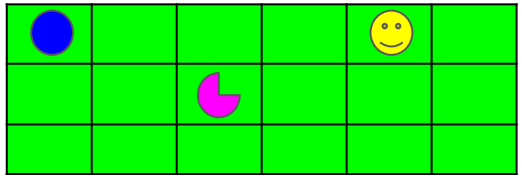

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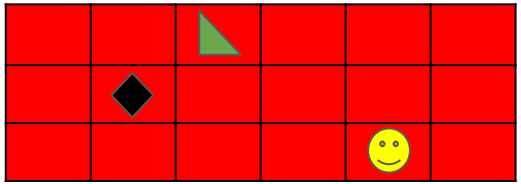

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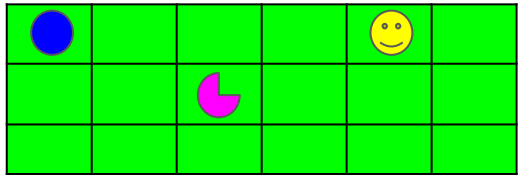

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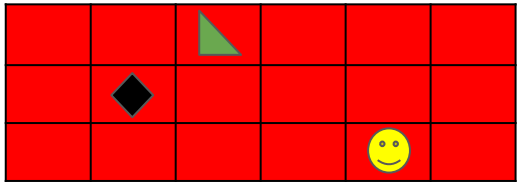

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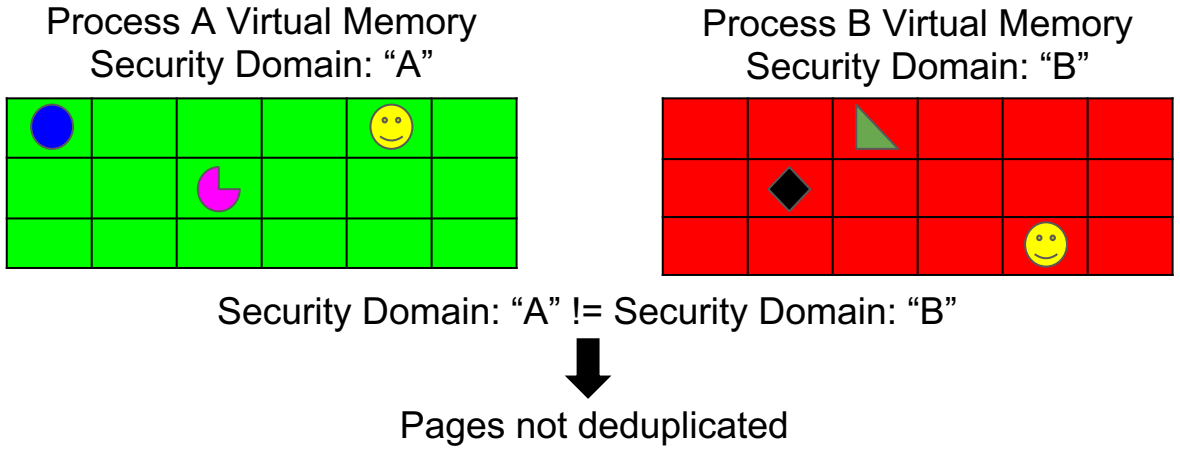

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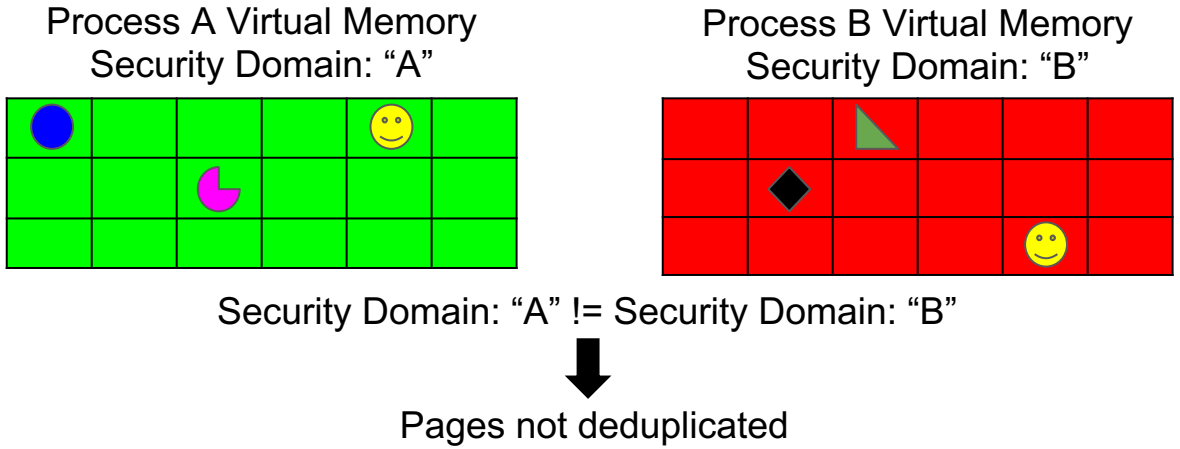

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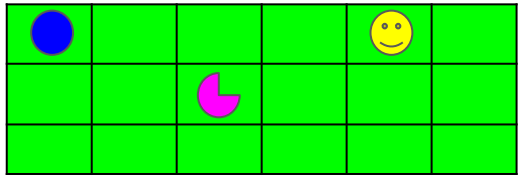

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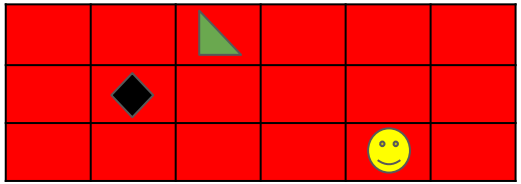

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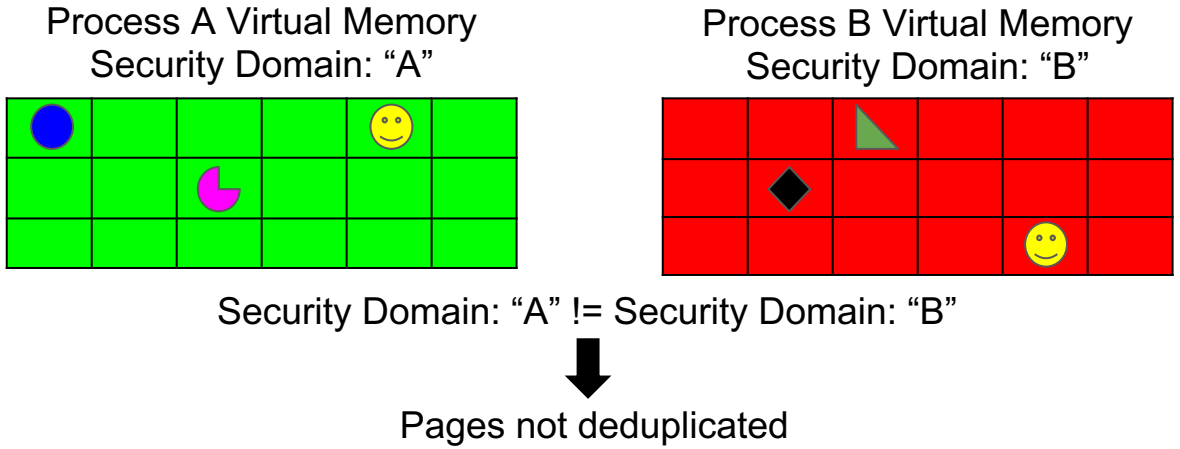

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  - This would be useful for e.g., a program handles **safe and unsafe data** within the **same process**.

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  - However, **adoption** of strict site isolation has been **slow**.

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  - E.g., by using a **SharedArrayBuffer counter**, one thread can increment a “timer” value in a loop, while the other thread polls the “timer”.

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- This resembles e.g., a server such as a nginx running a key-value store, which untrusted clients can connect to.

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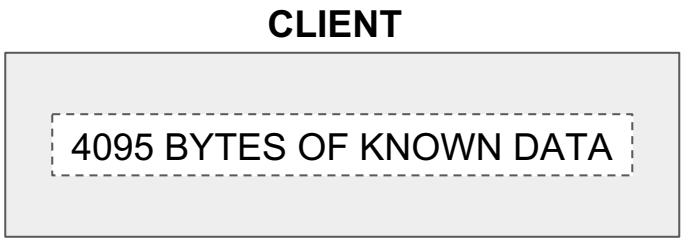

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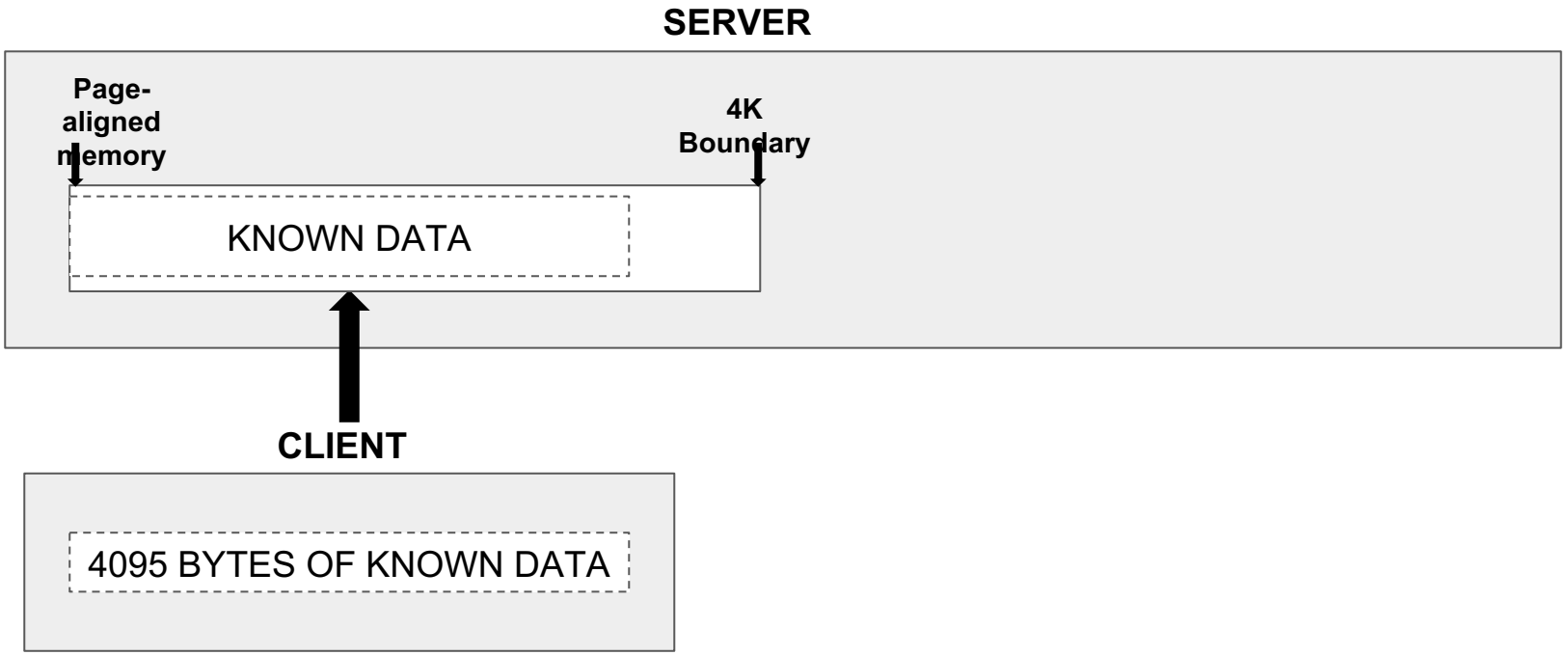

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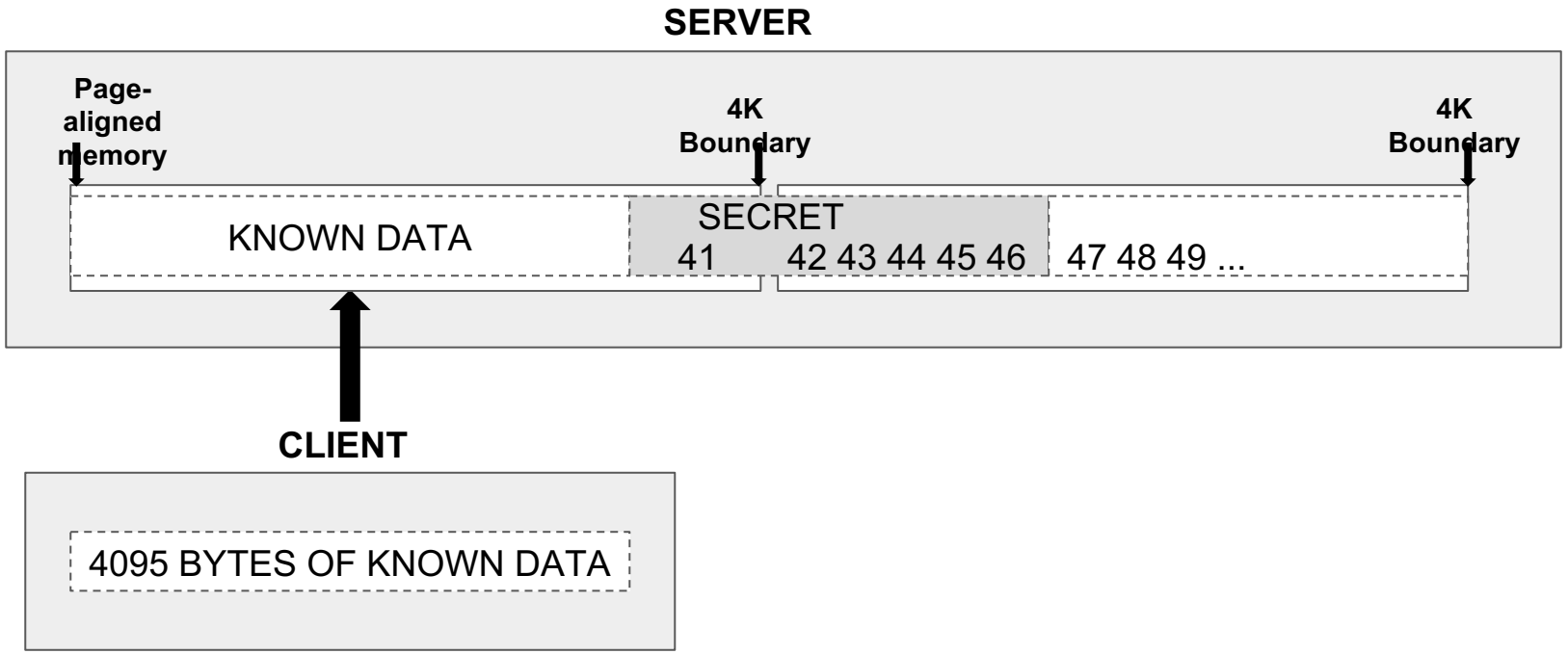

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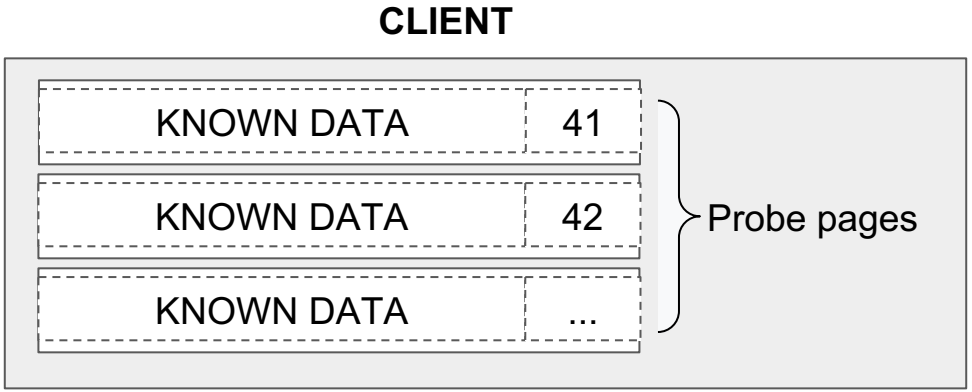

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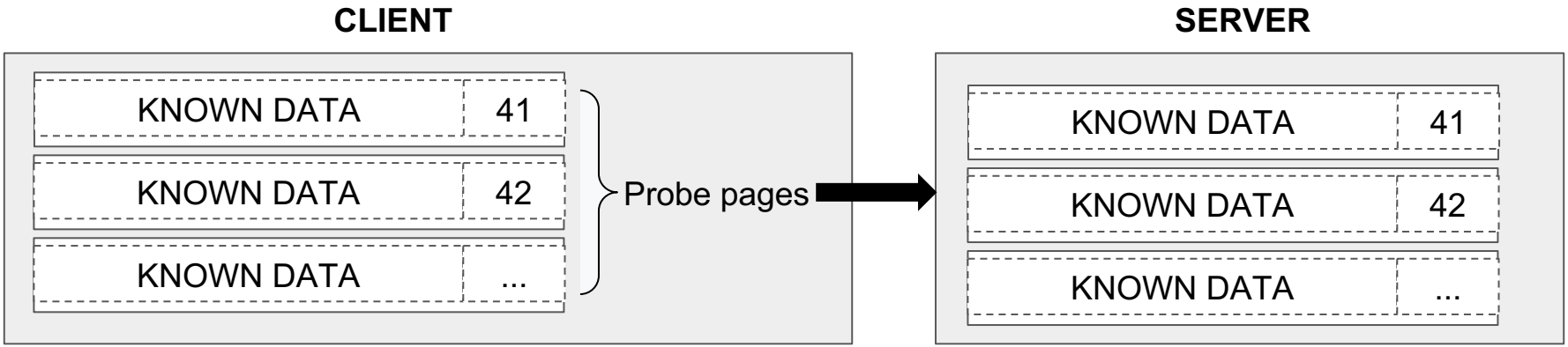

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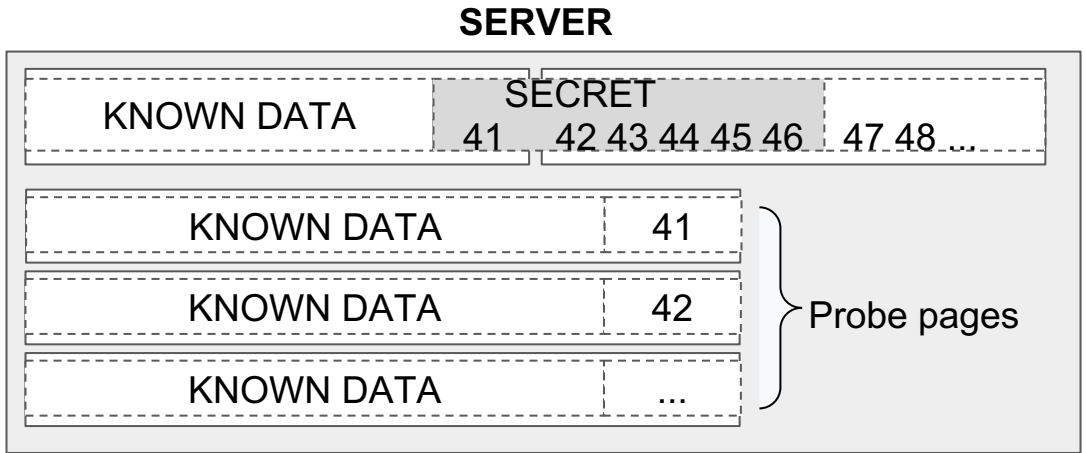

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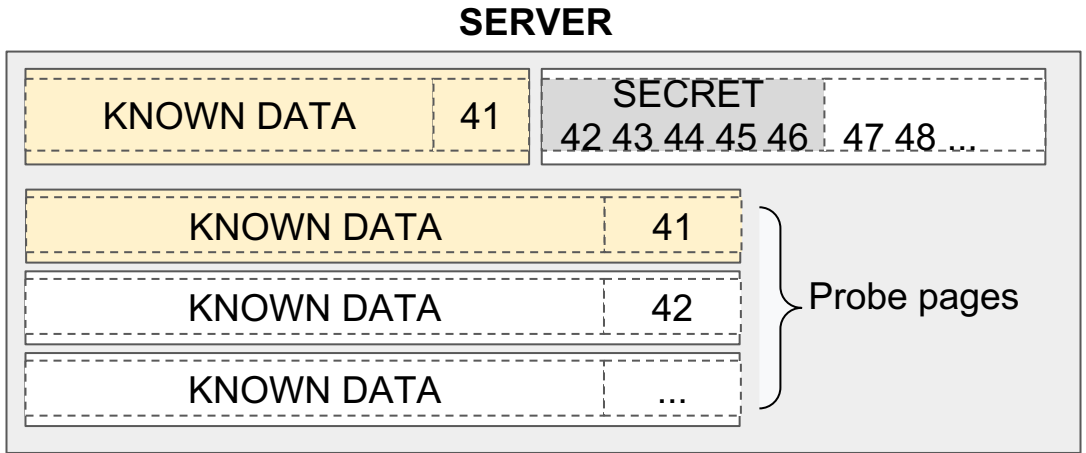

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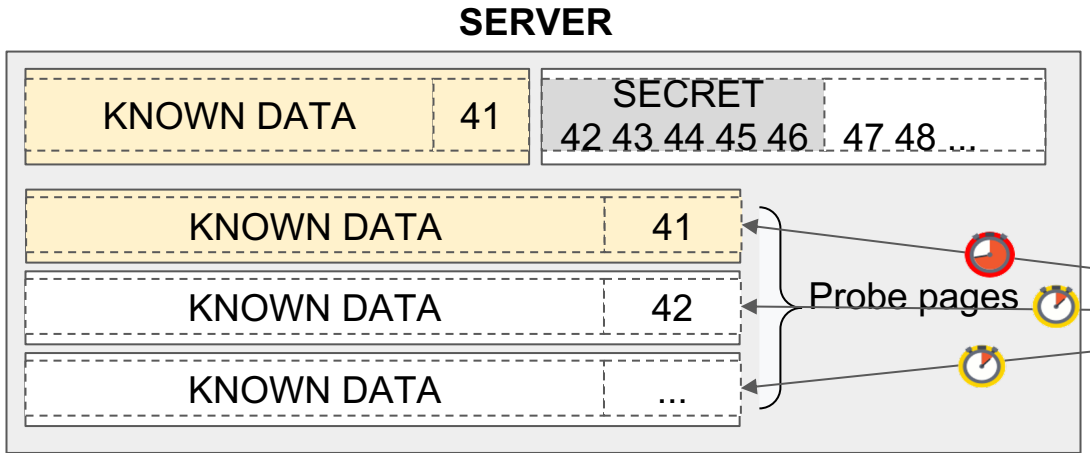

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4. The client repeats steps 1–3 to disclose secret data **byte-by-byte**.

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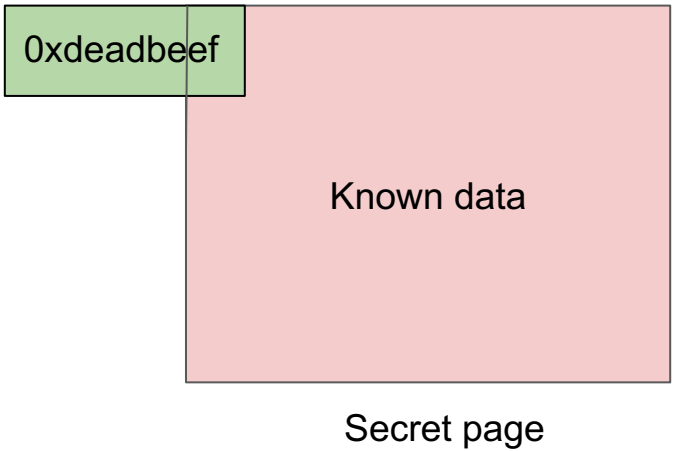

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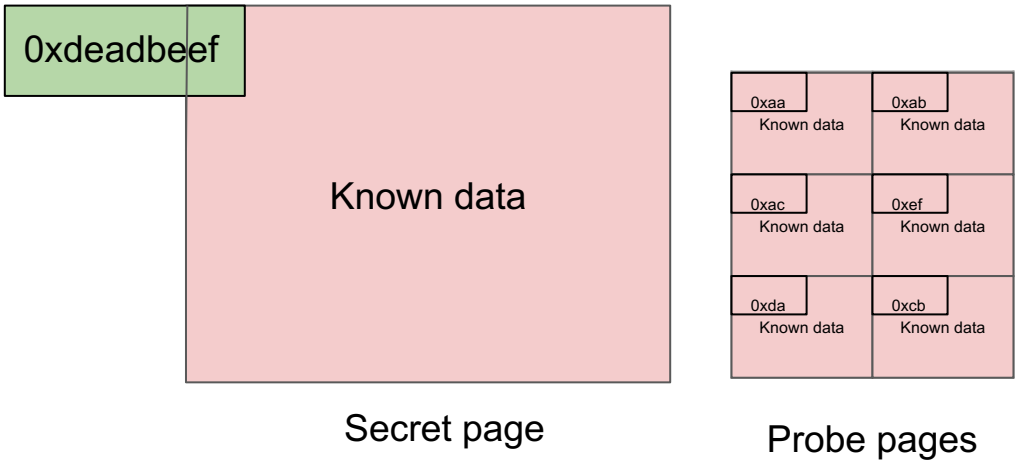

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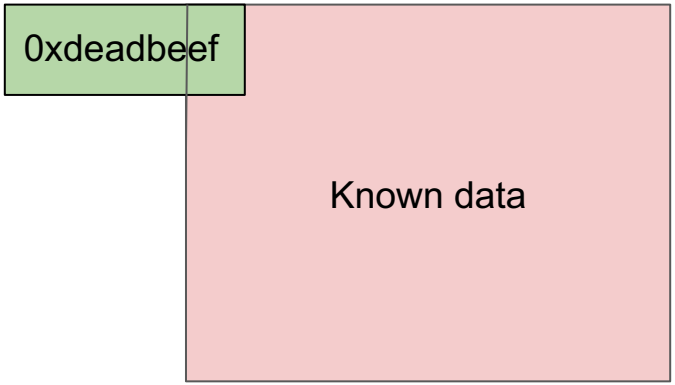

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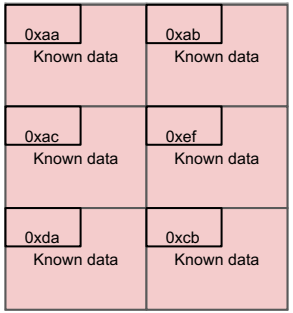

Probe pages

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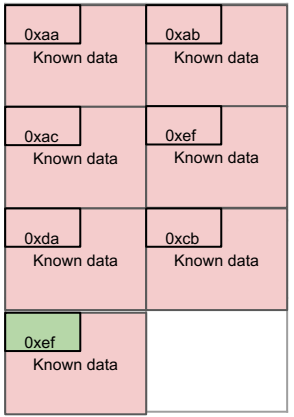

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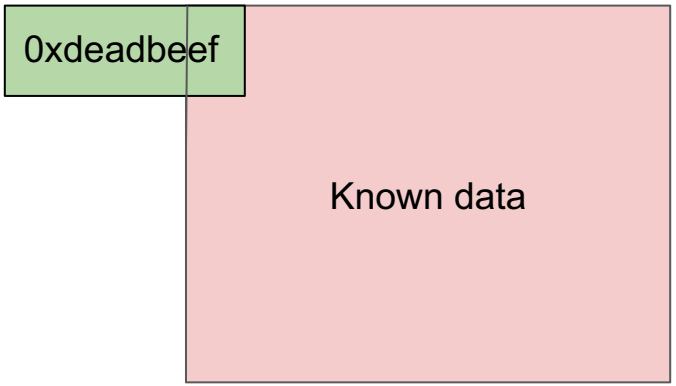

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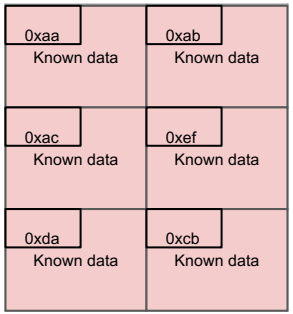

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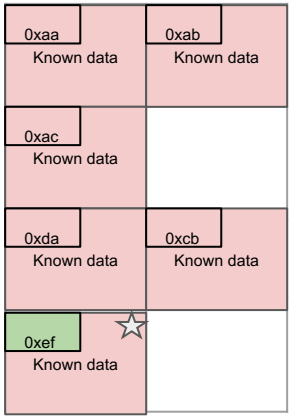

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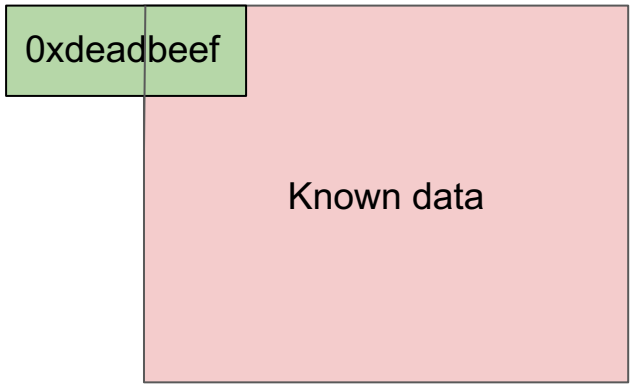

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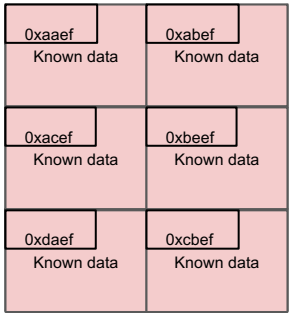

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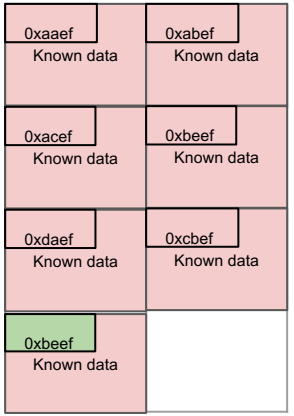

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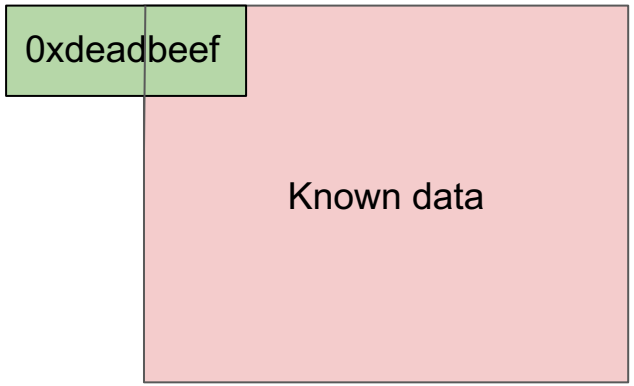

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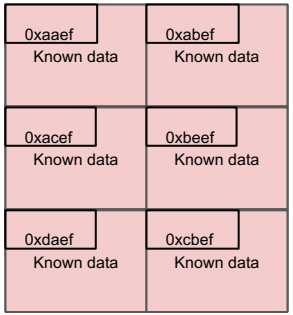

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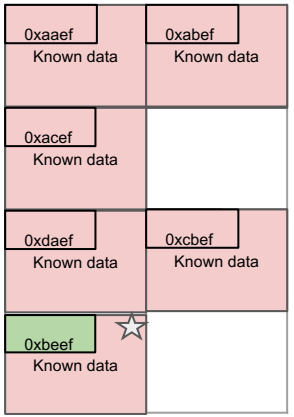

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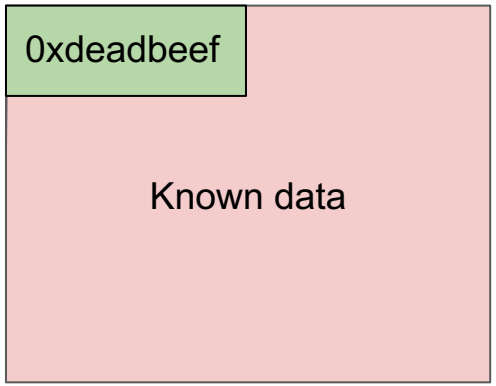

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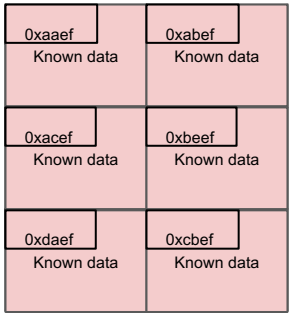

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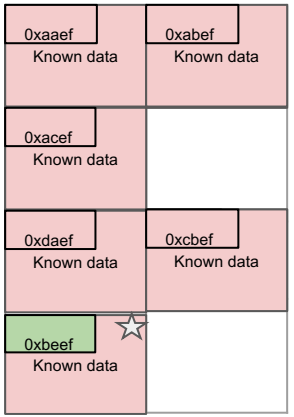

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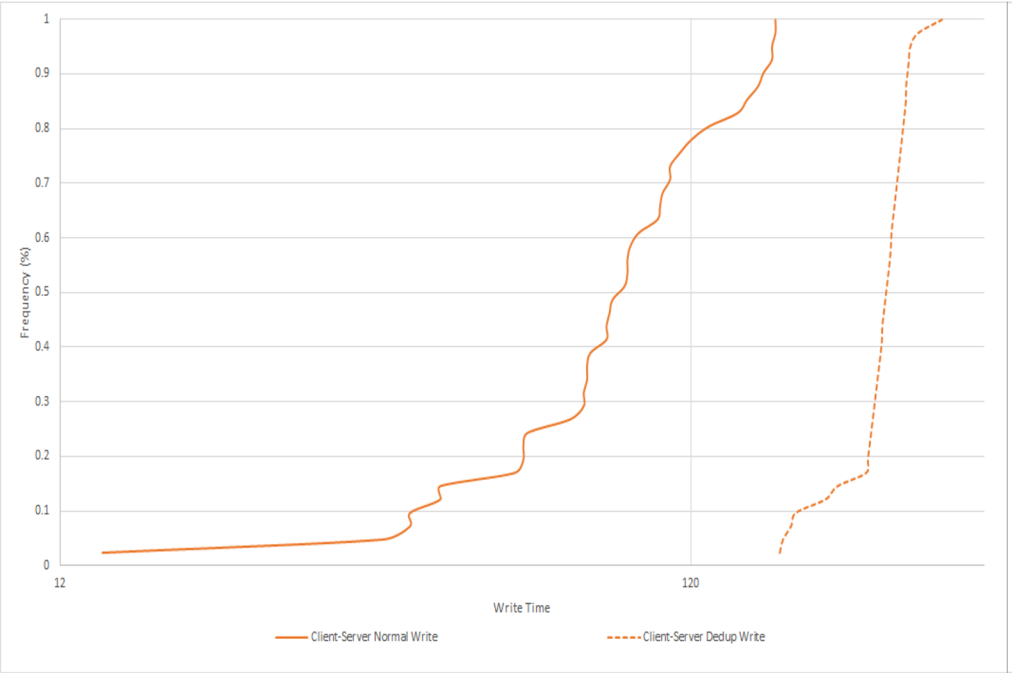

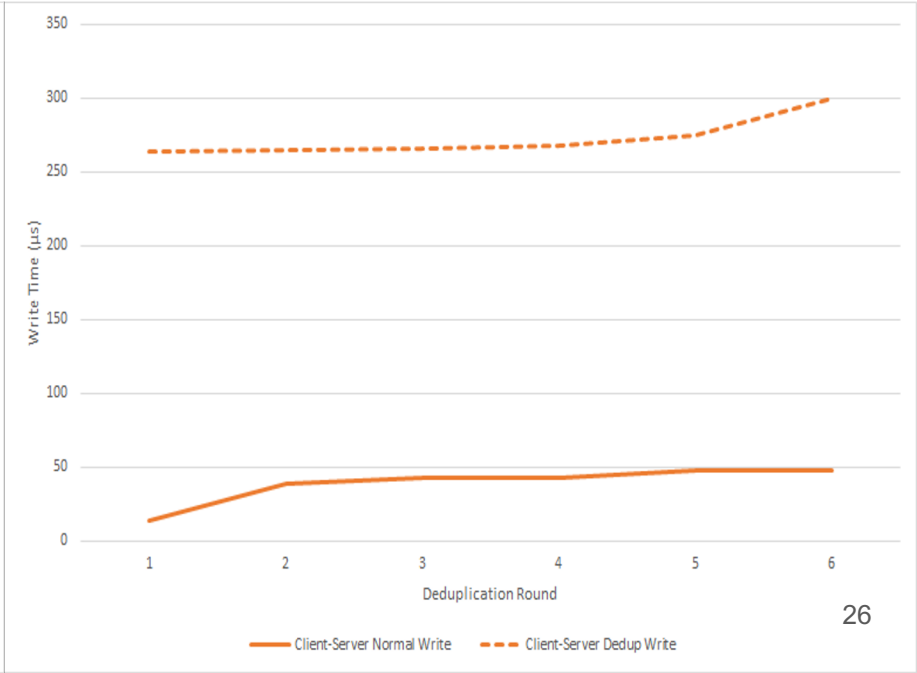

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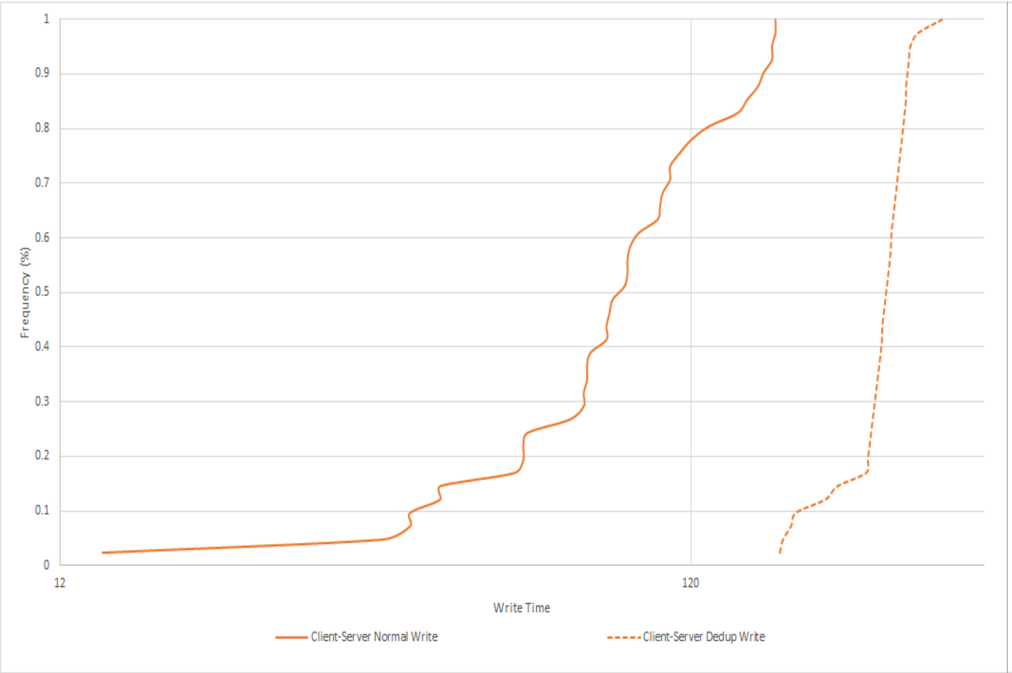

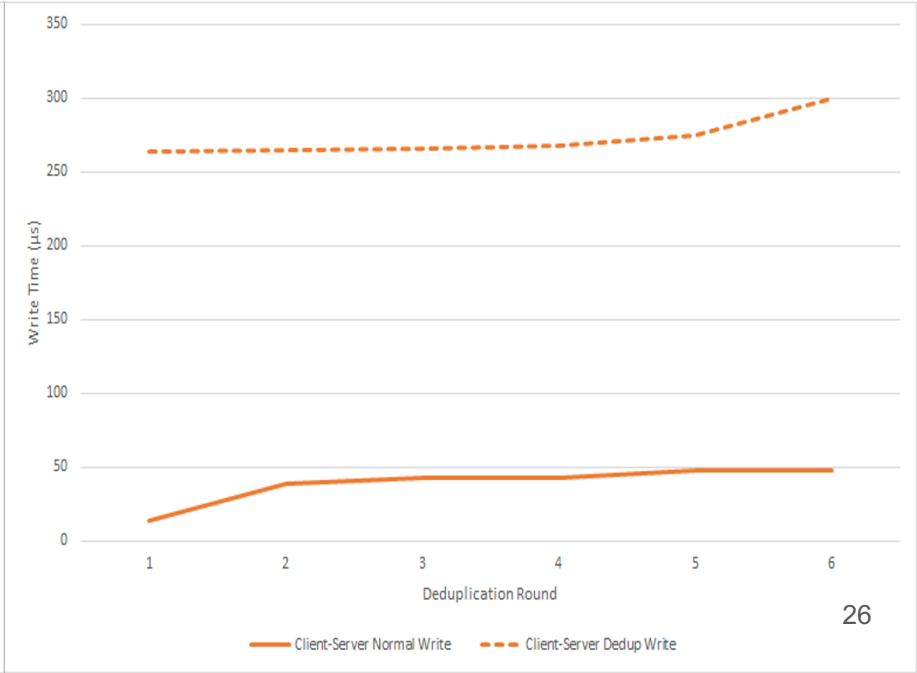

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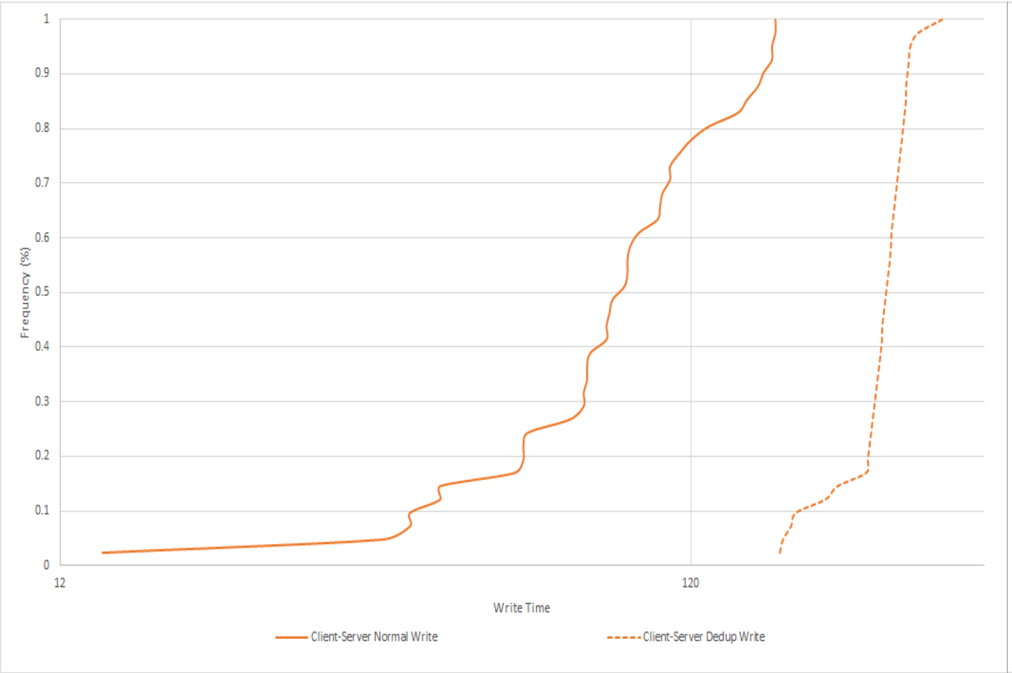

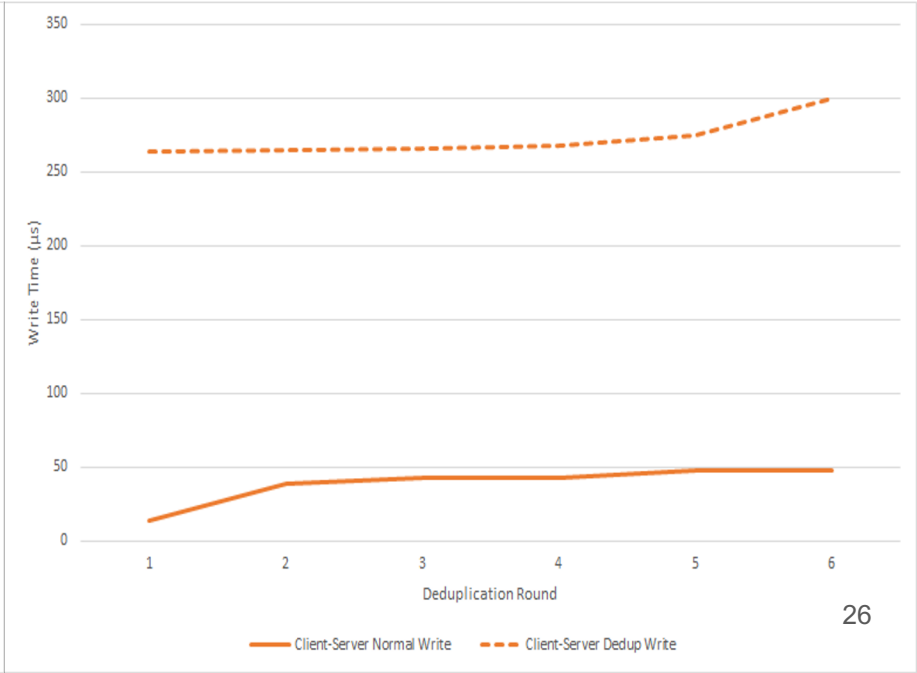

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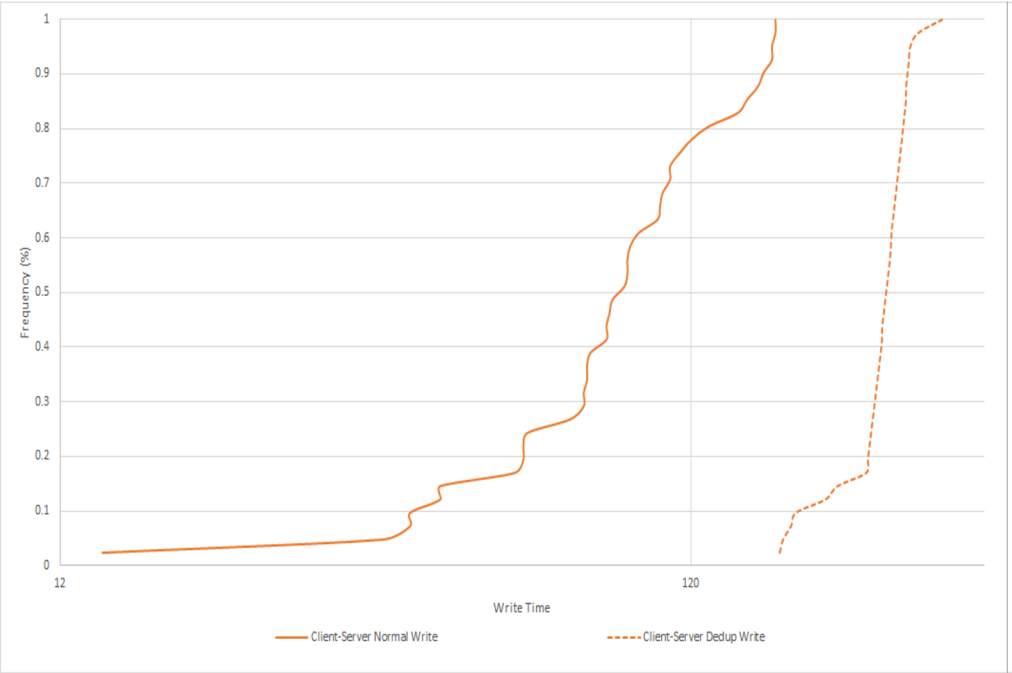

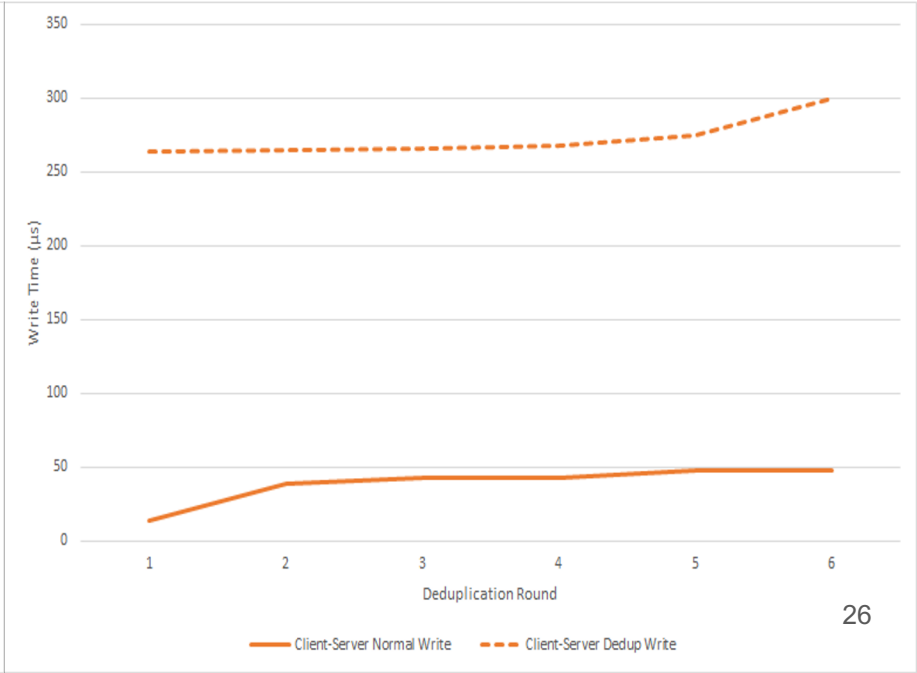

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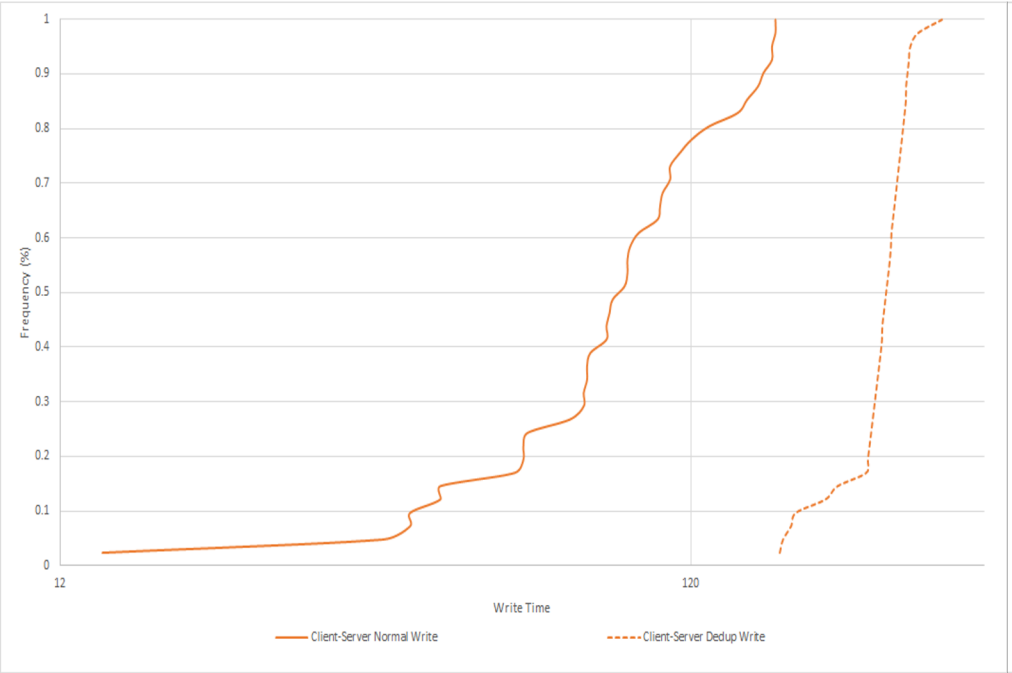

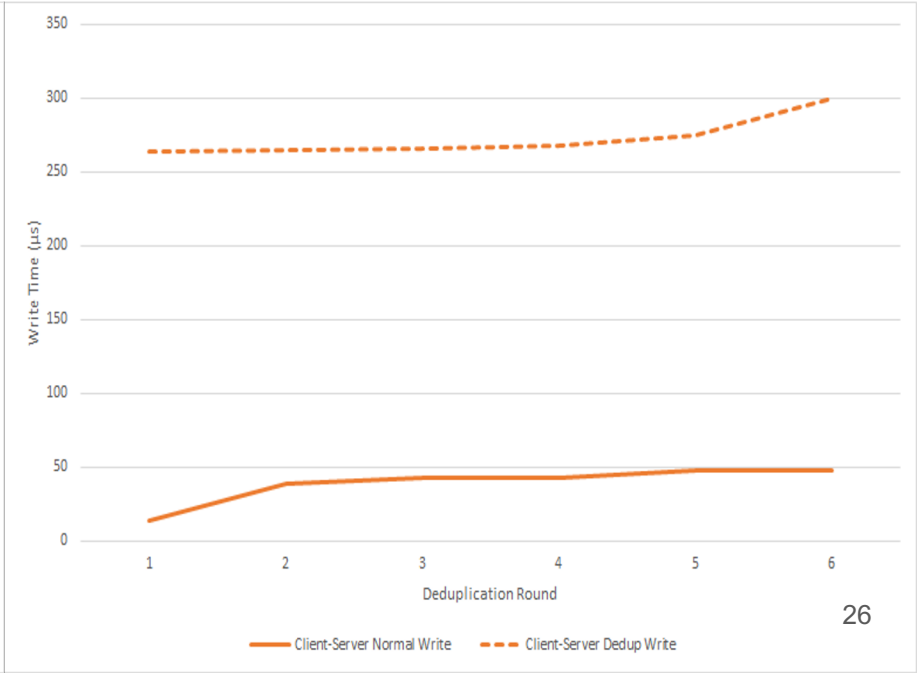

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- Hence, such programs are **not easily amenable to security domain-based deduplication mitigations**, which require the separation of trusted and untrusted data.

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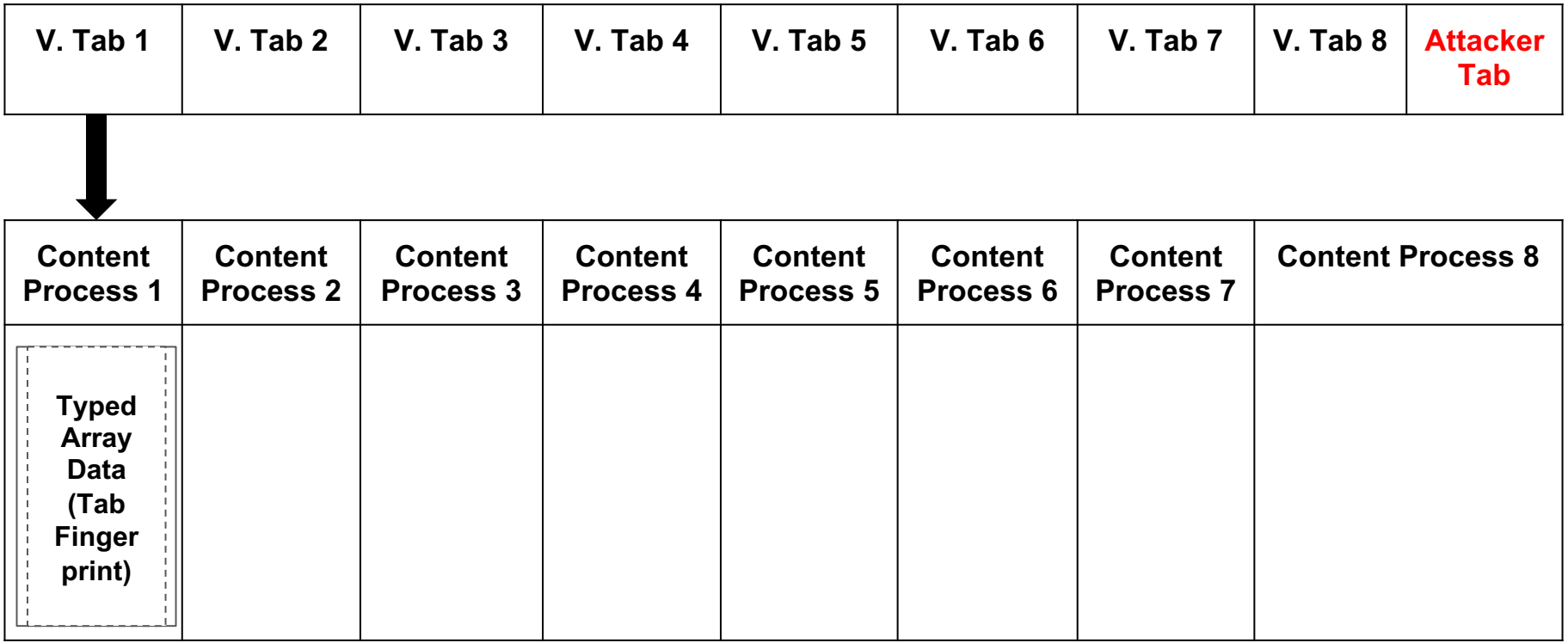

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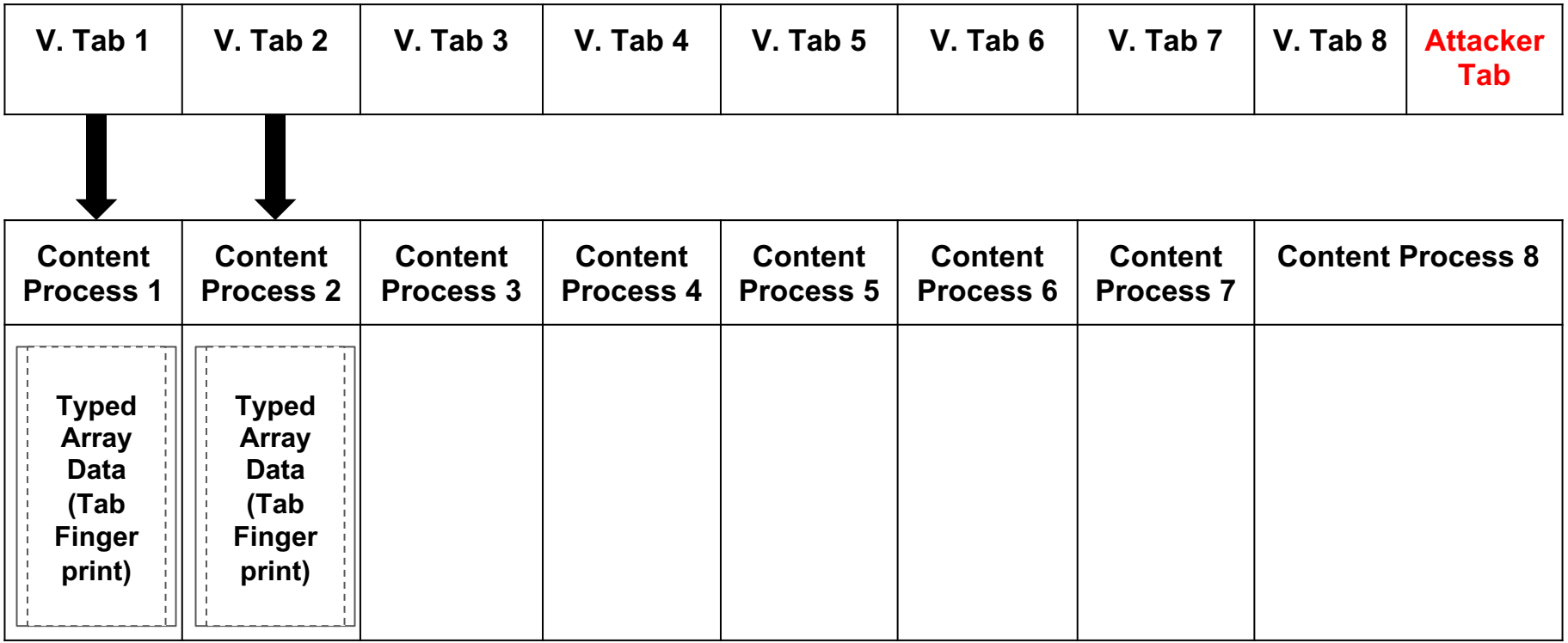

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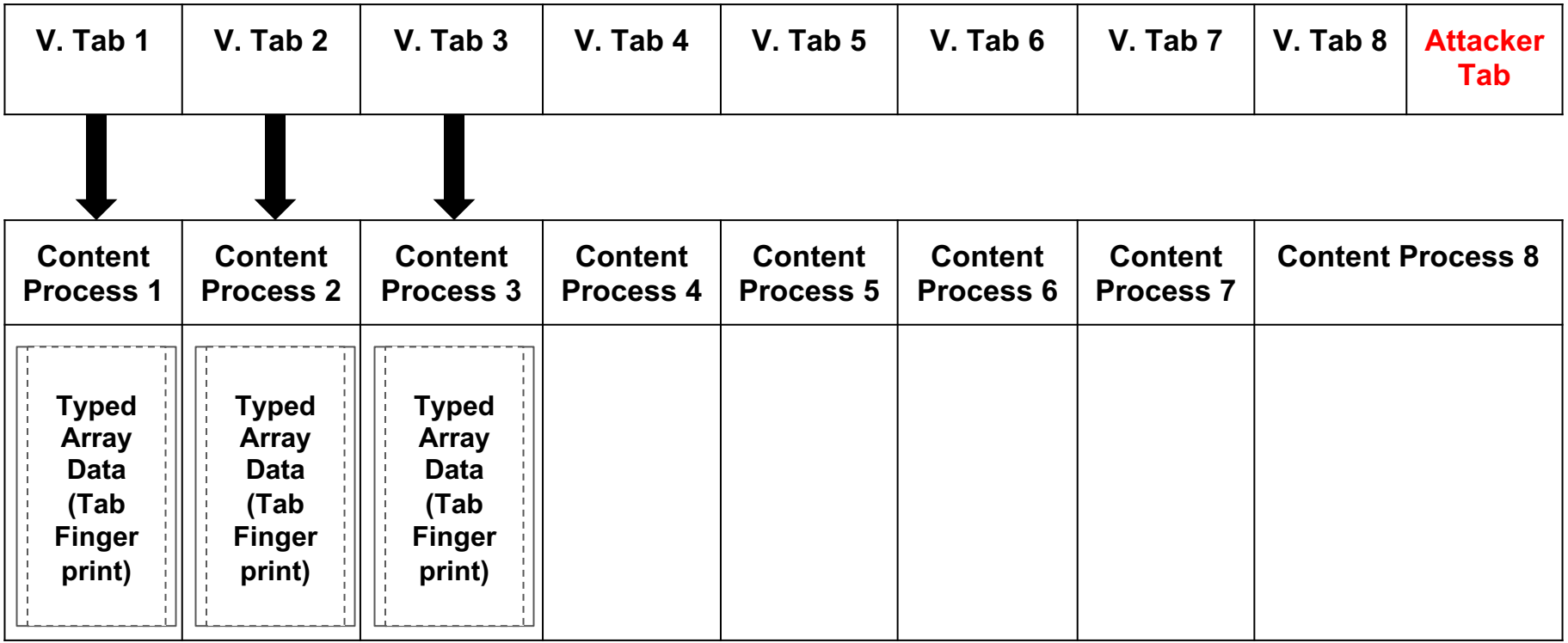

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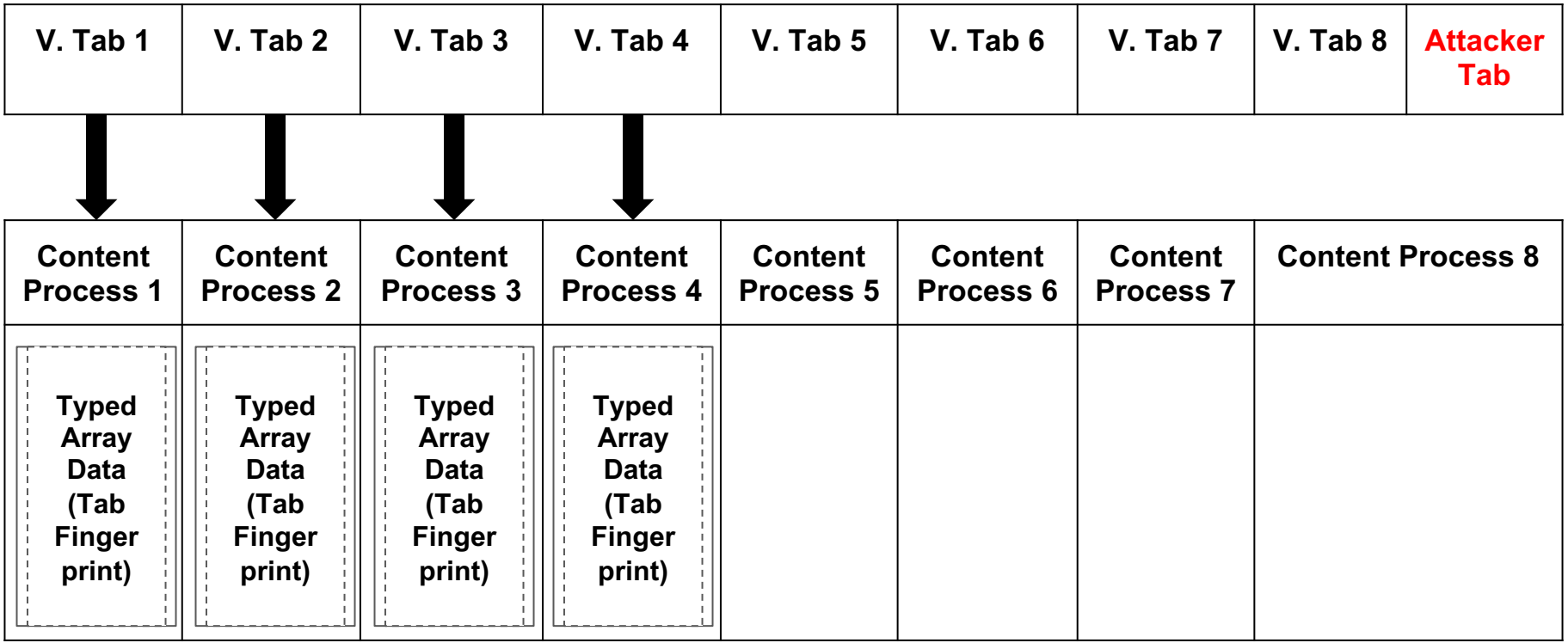

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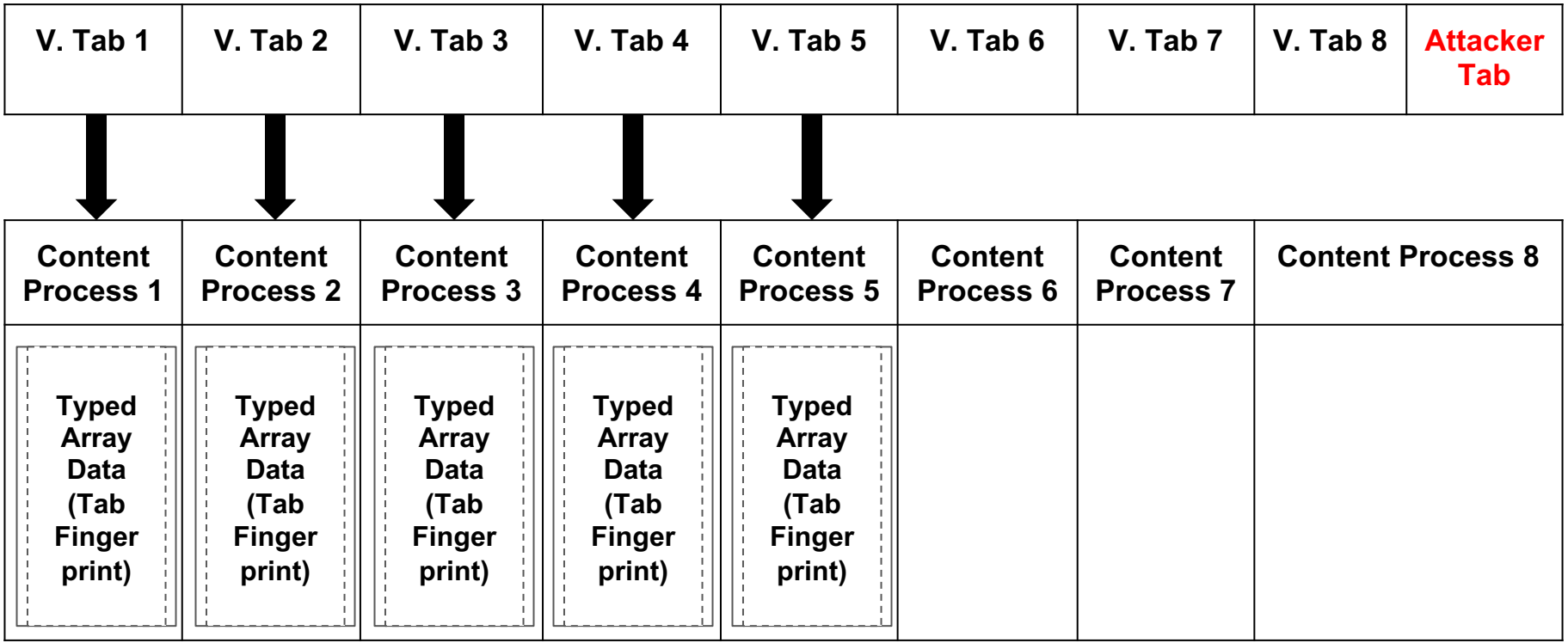

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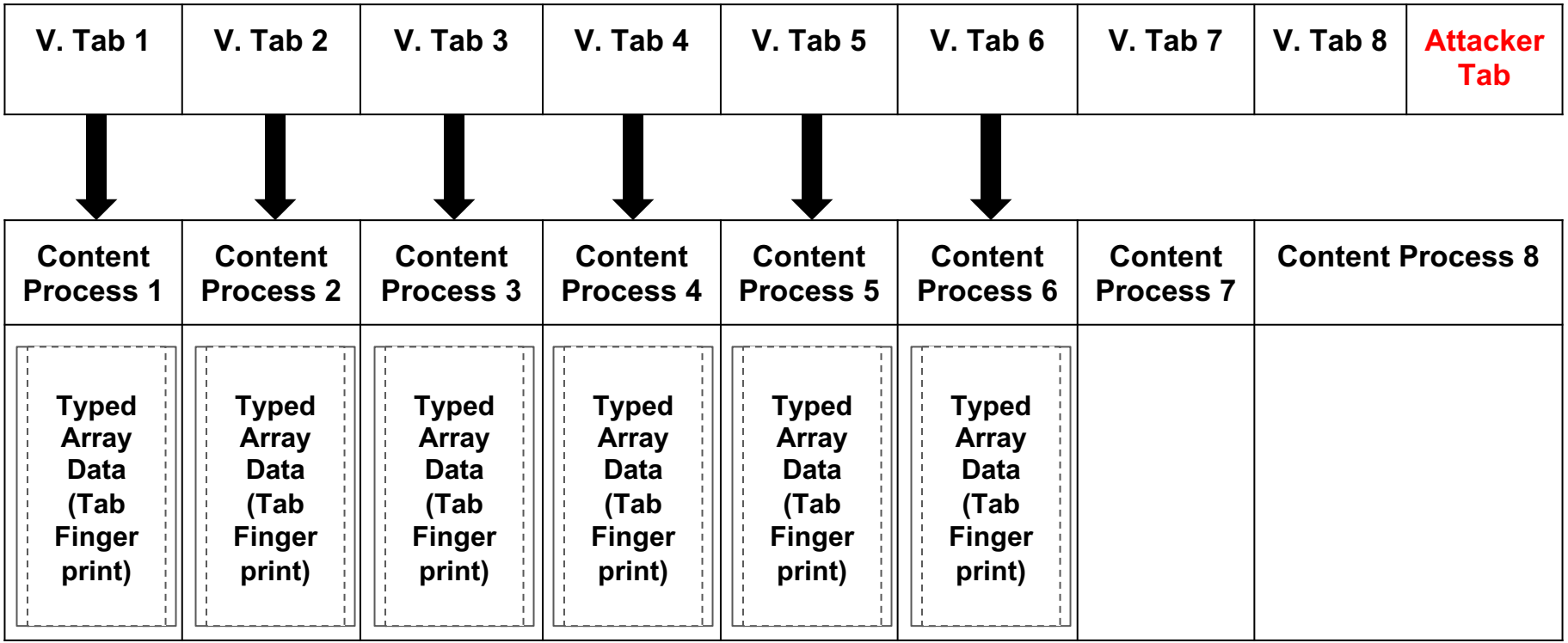

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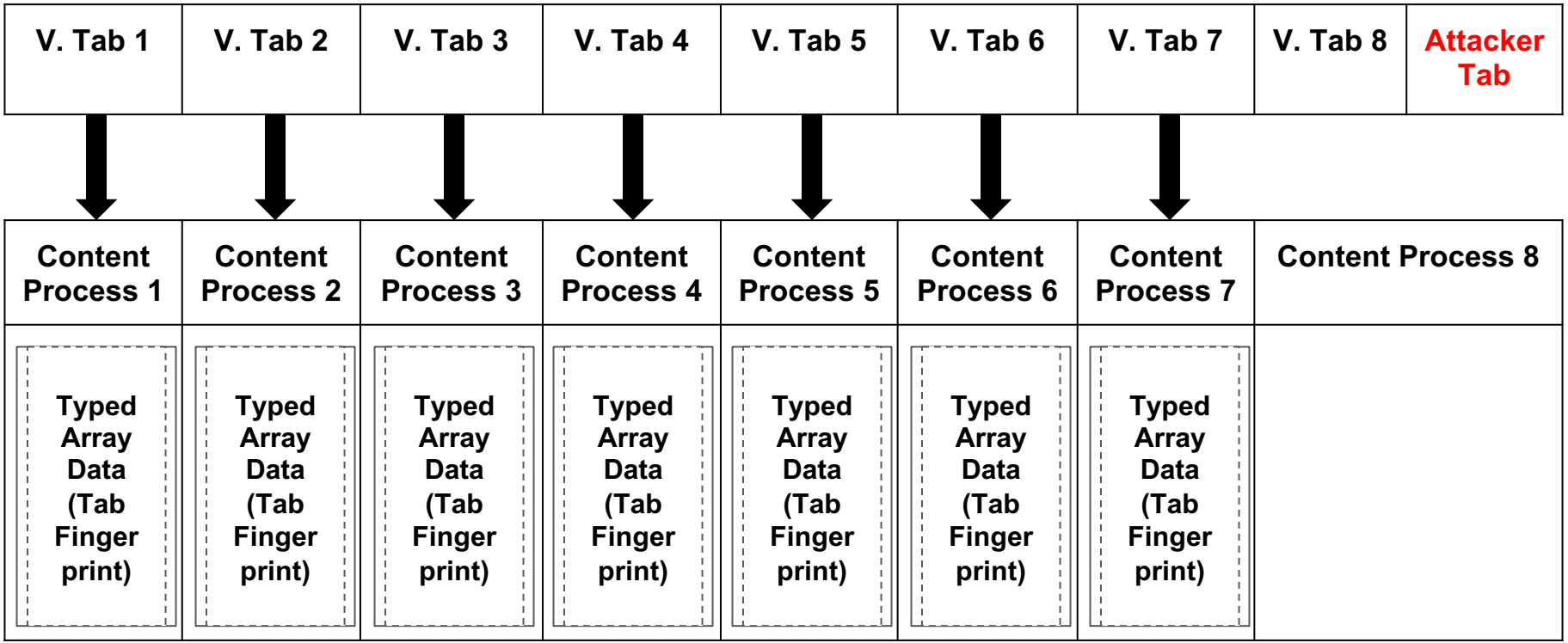

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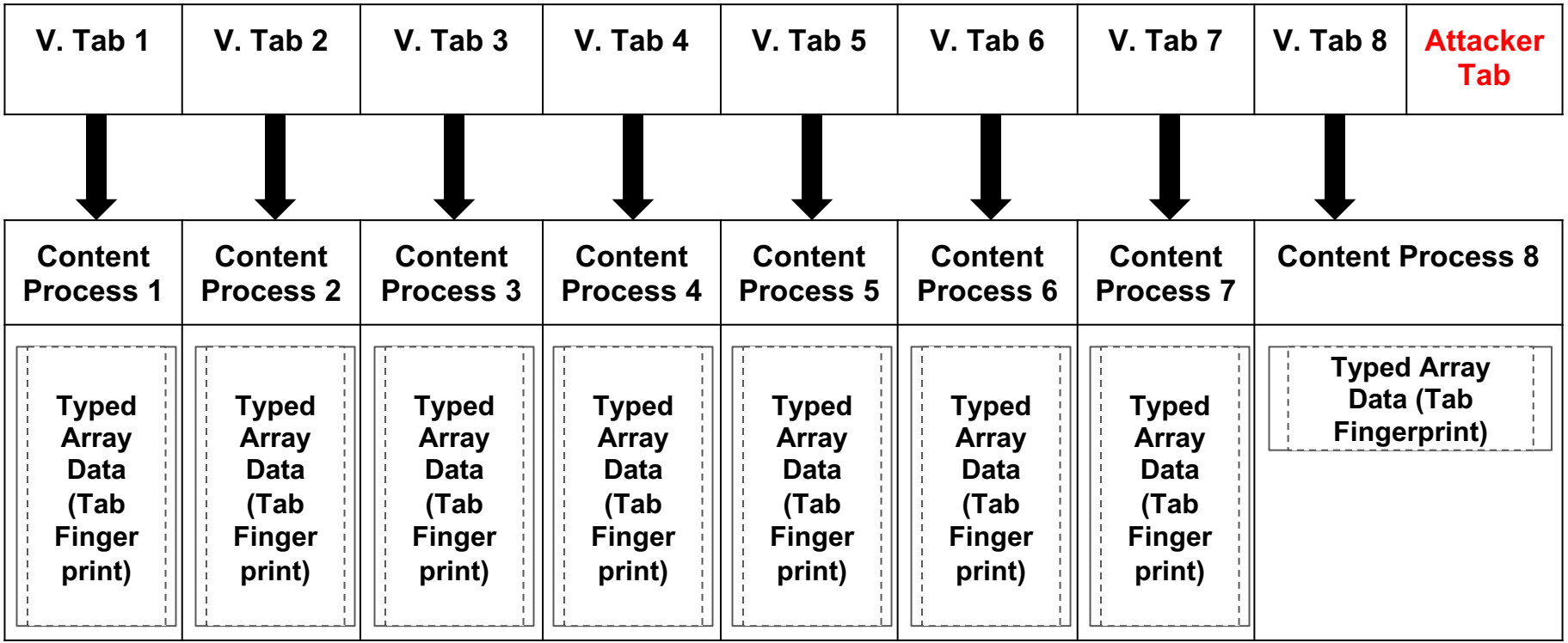

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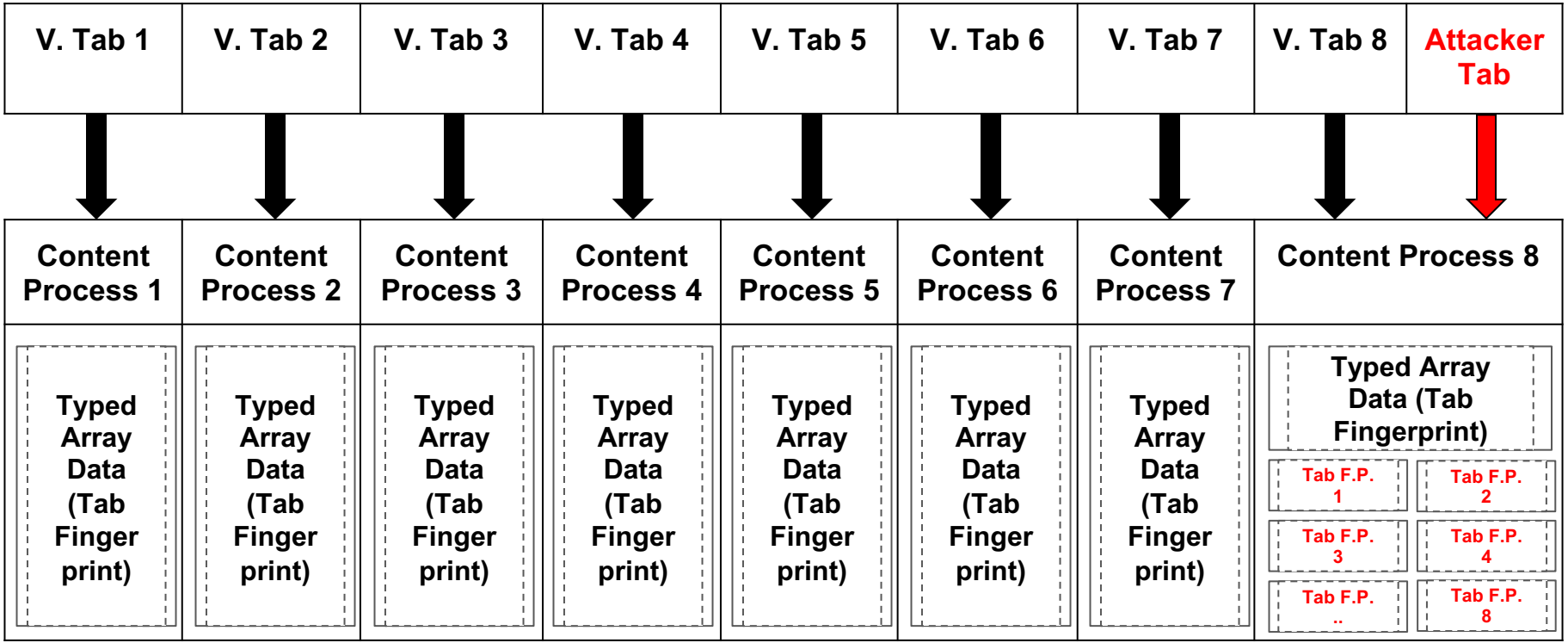

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4. After a **deduplication pass**, the attacker **writes** to each of its fingerprints, **timing** each operation via a **SharedArrayBuffer counter**.

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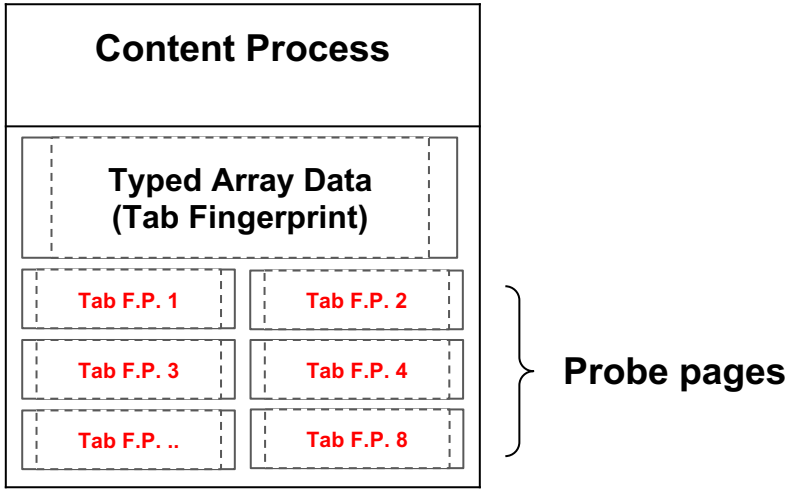

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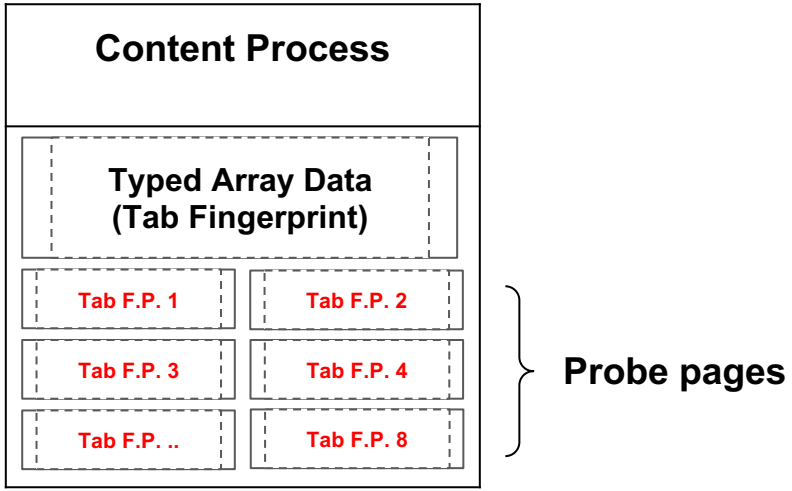

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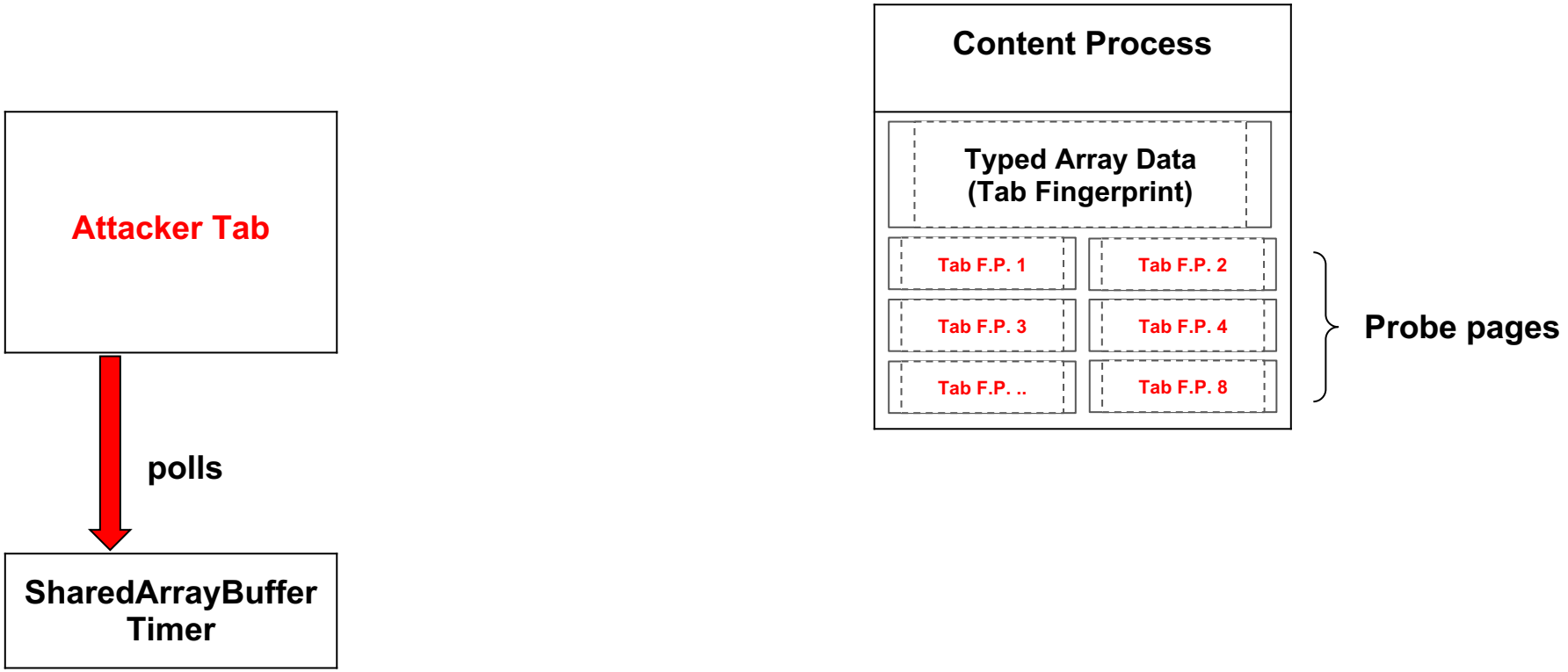

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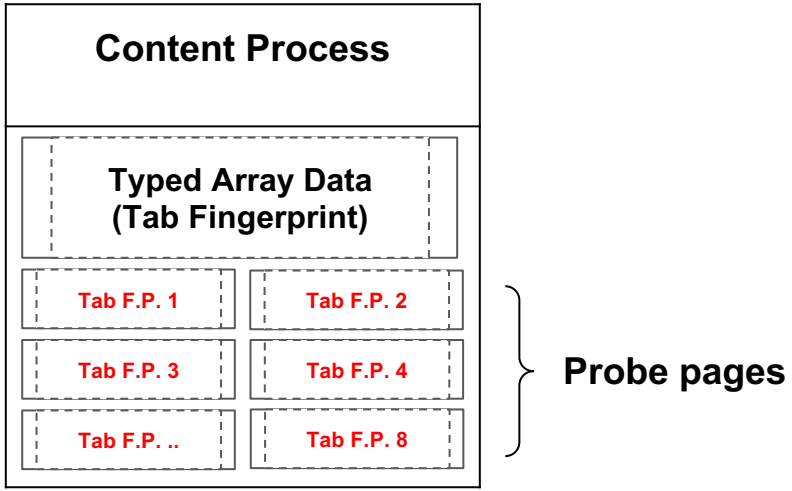

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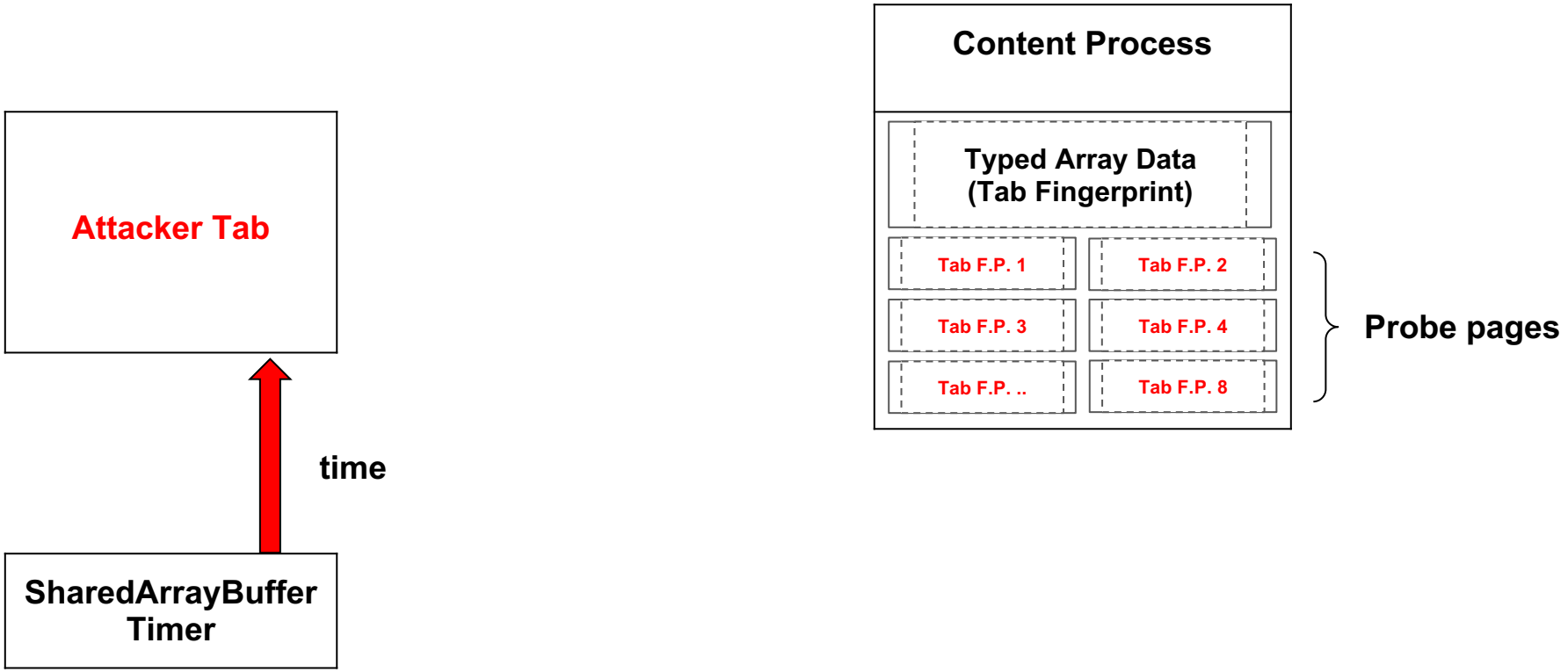

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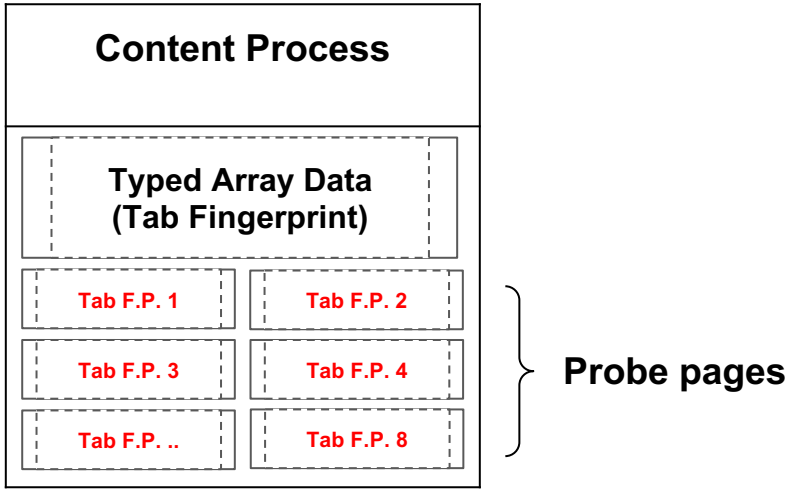

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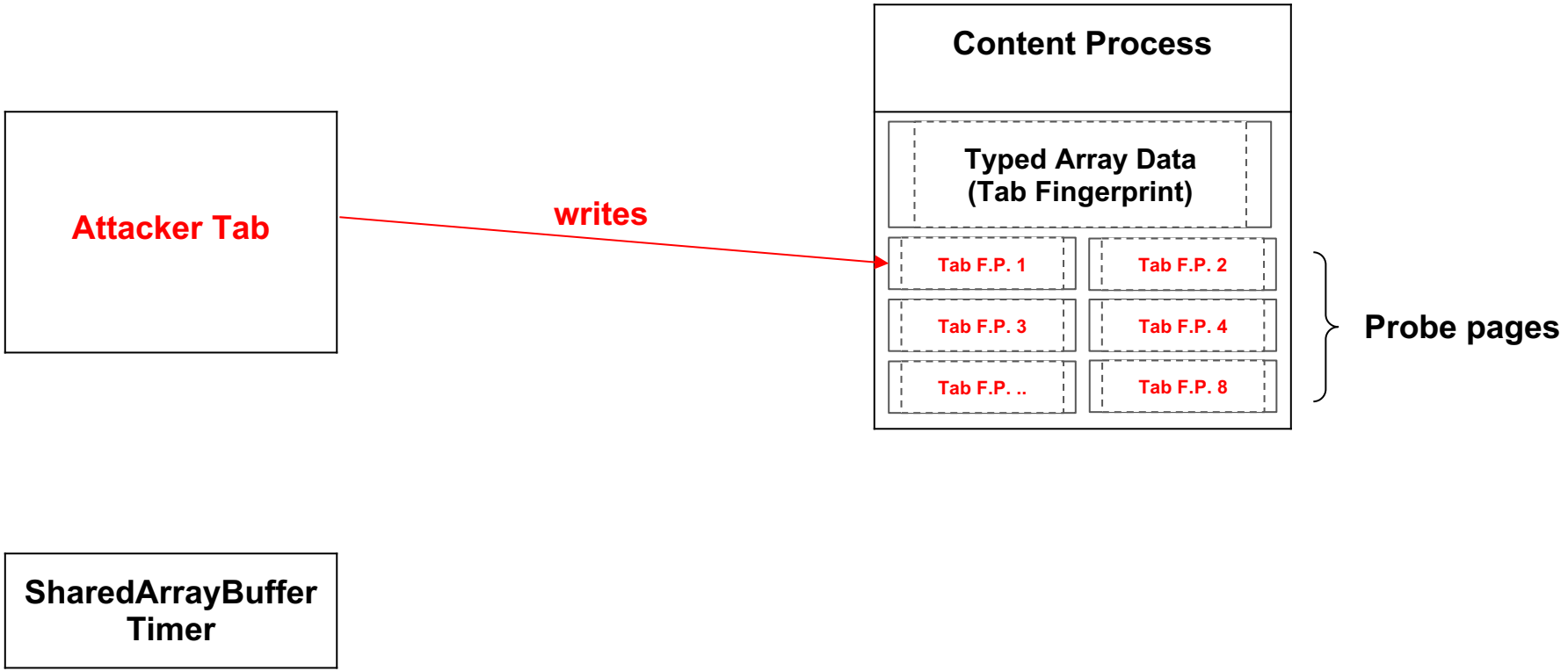

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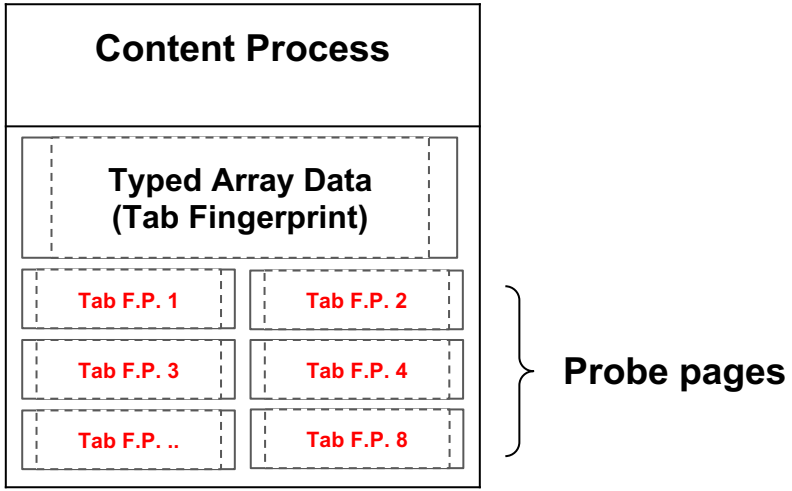

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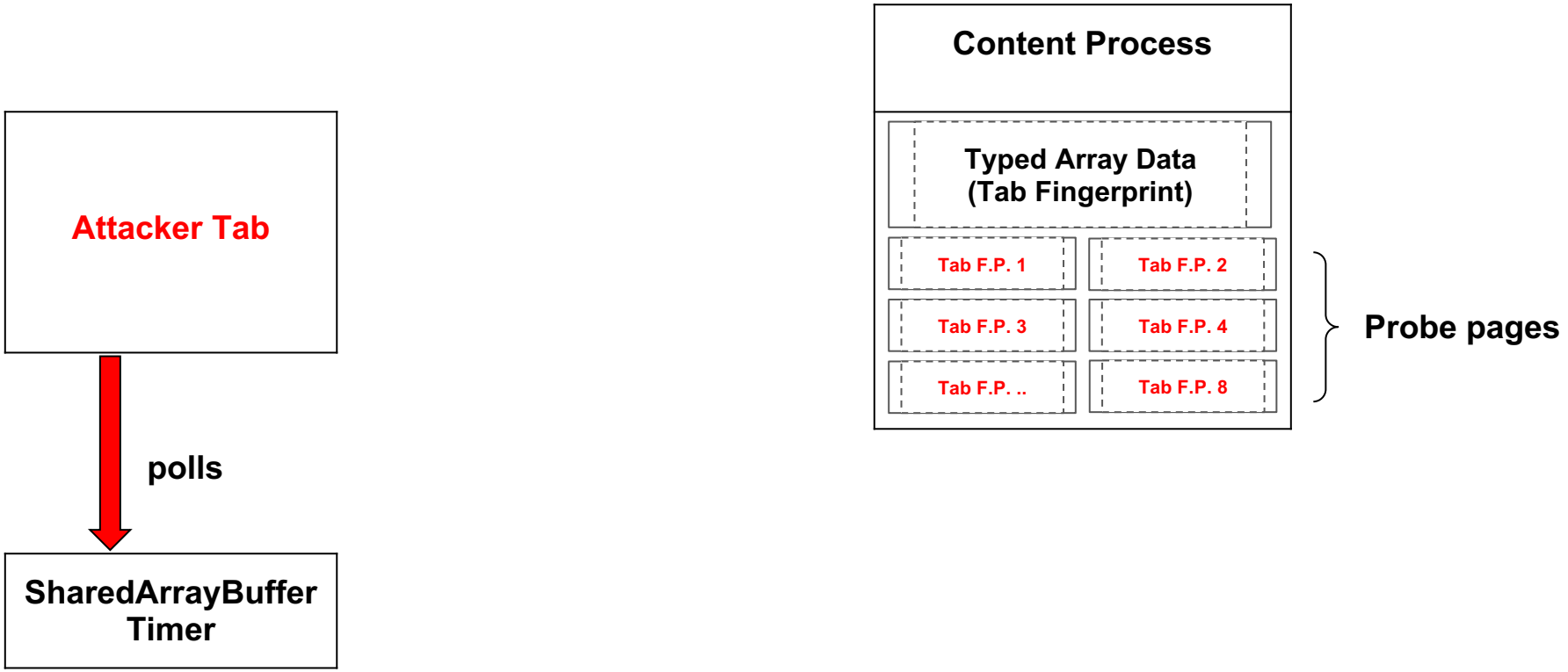

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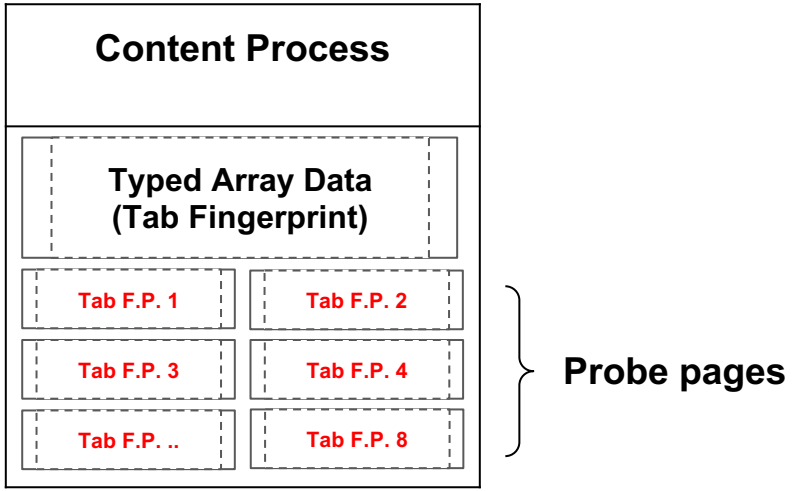

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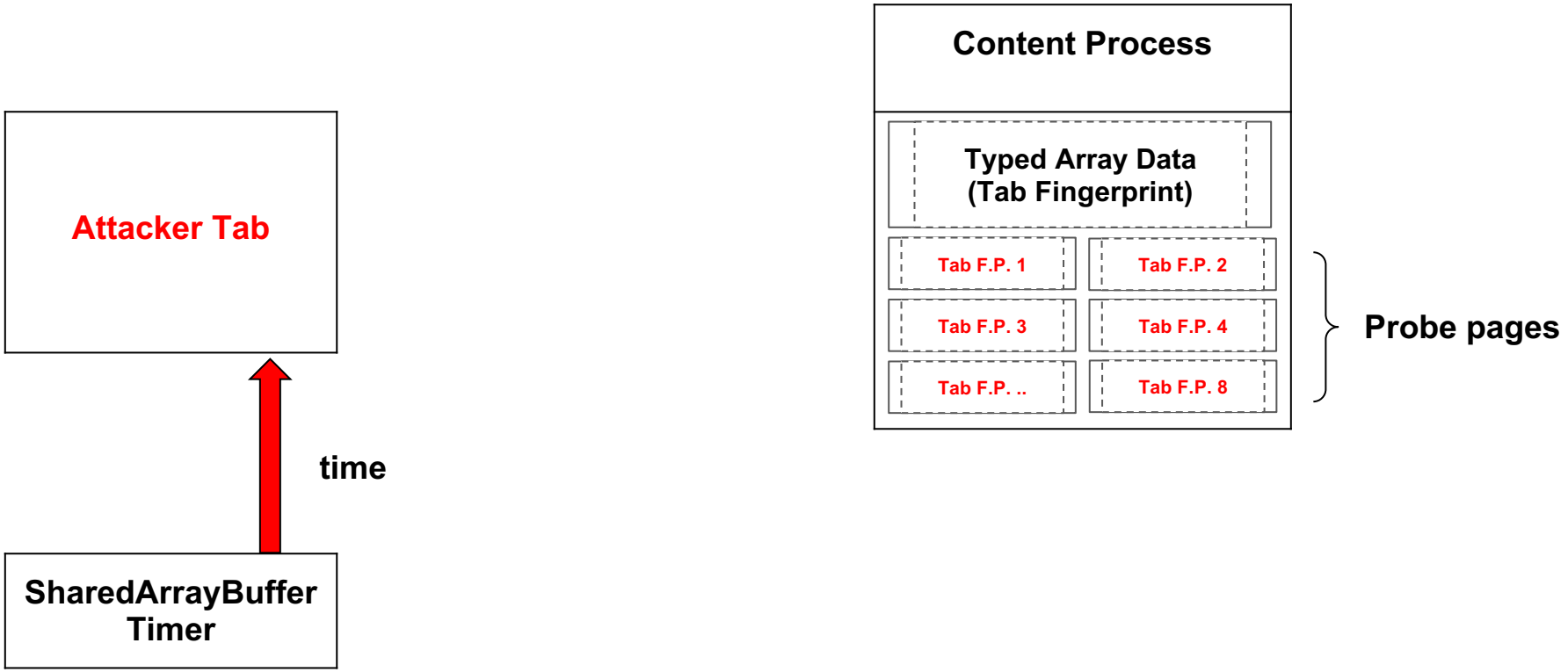

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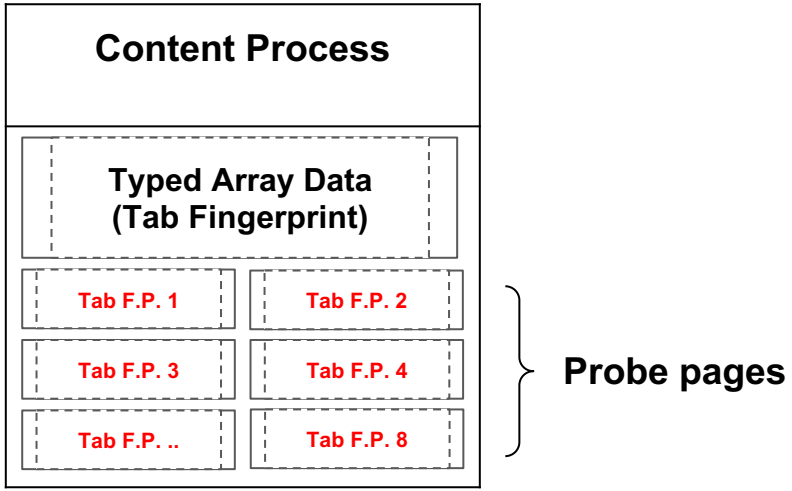

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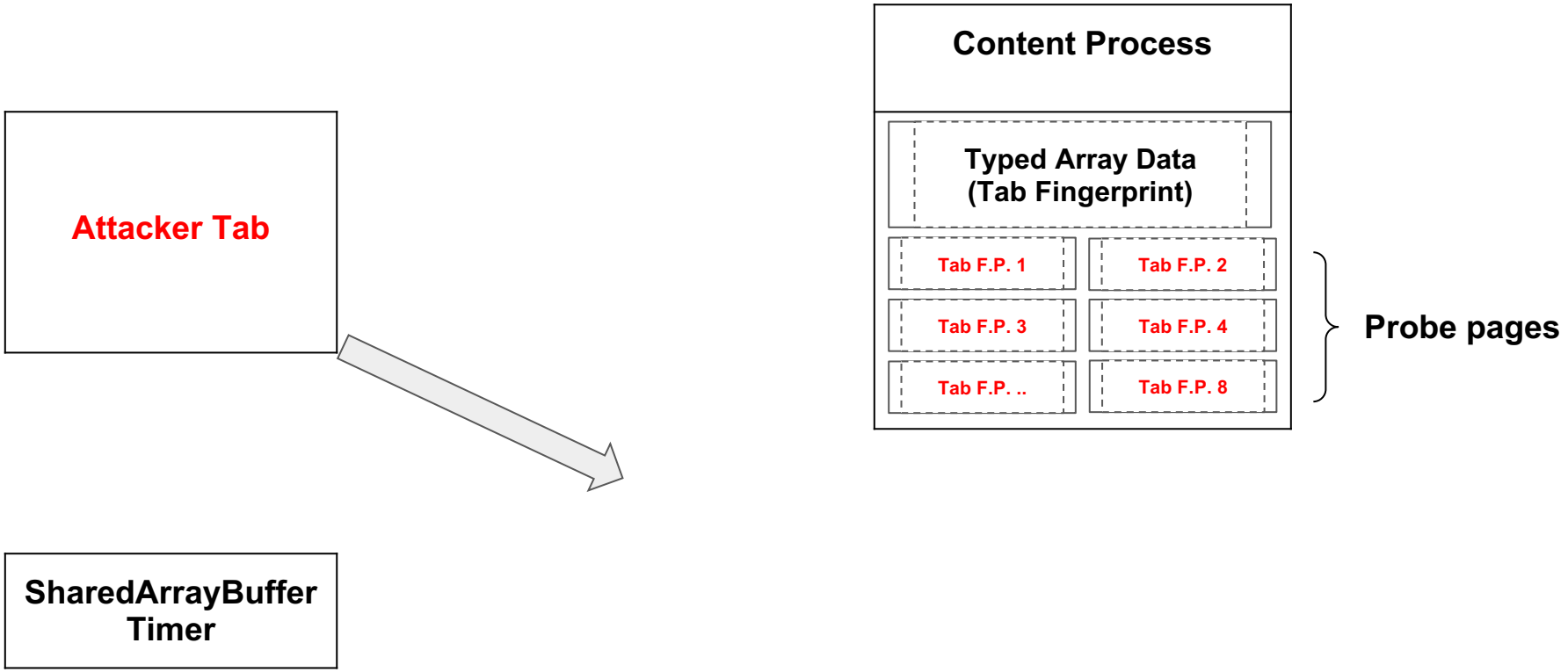

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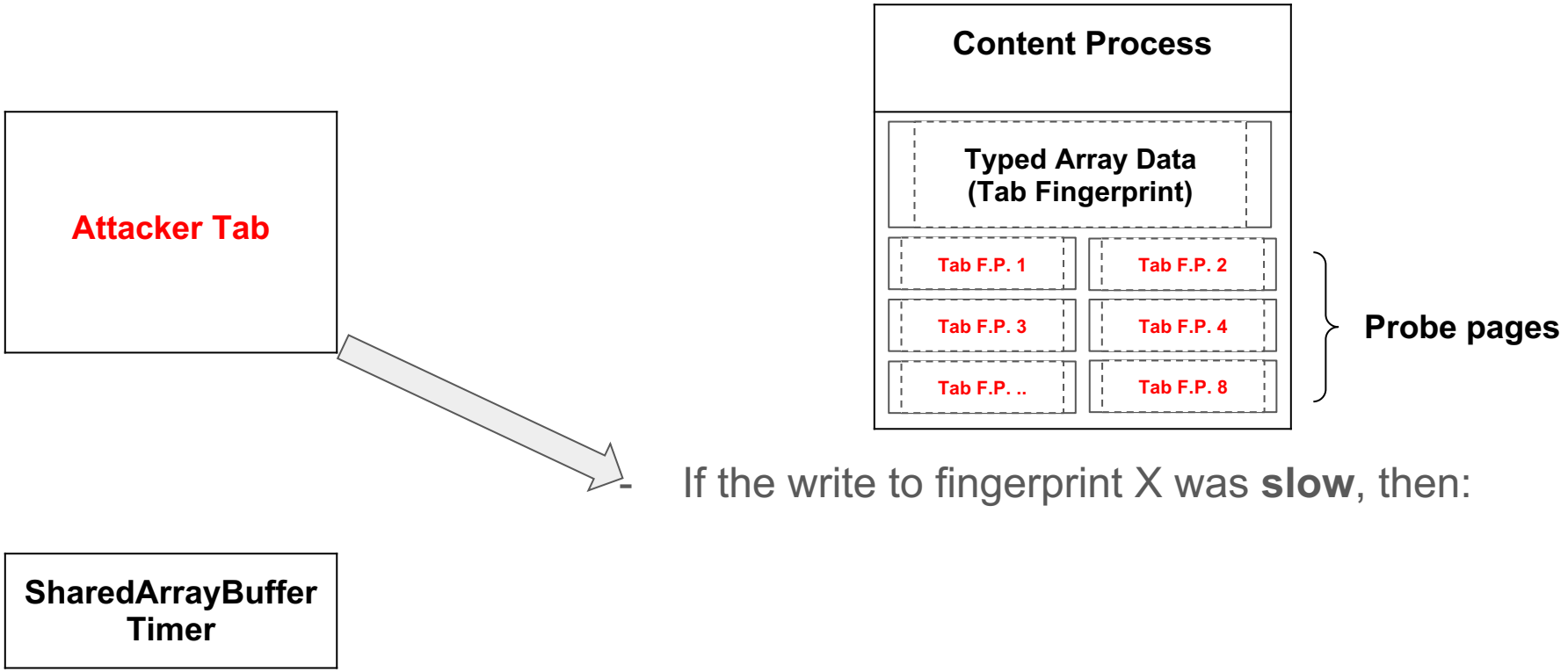

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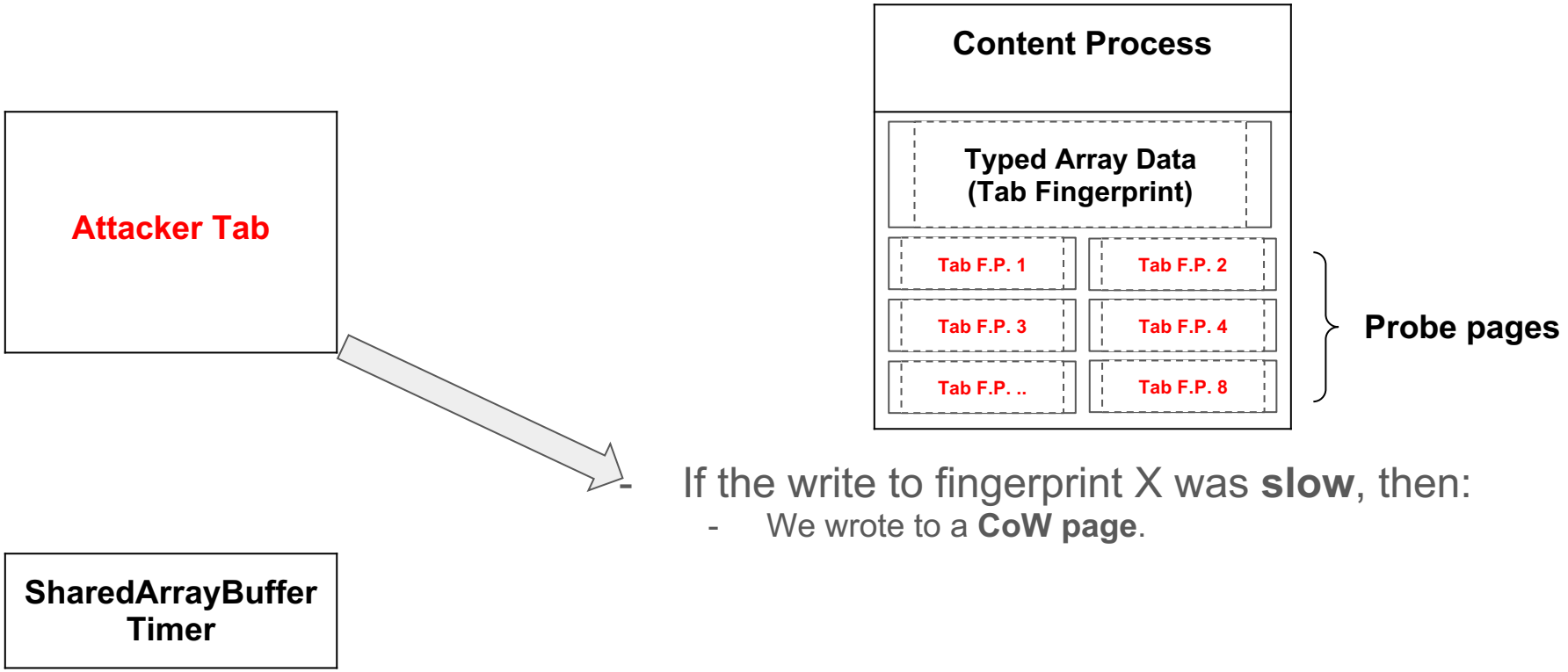

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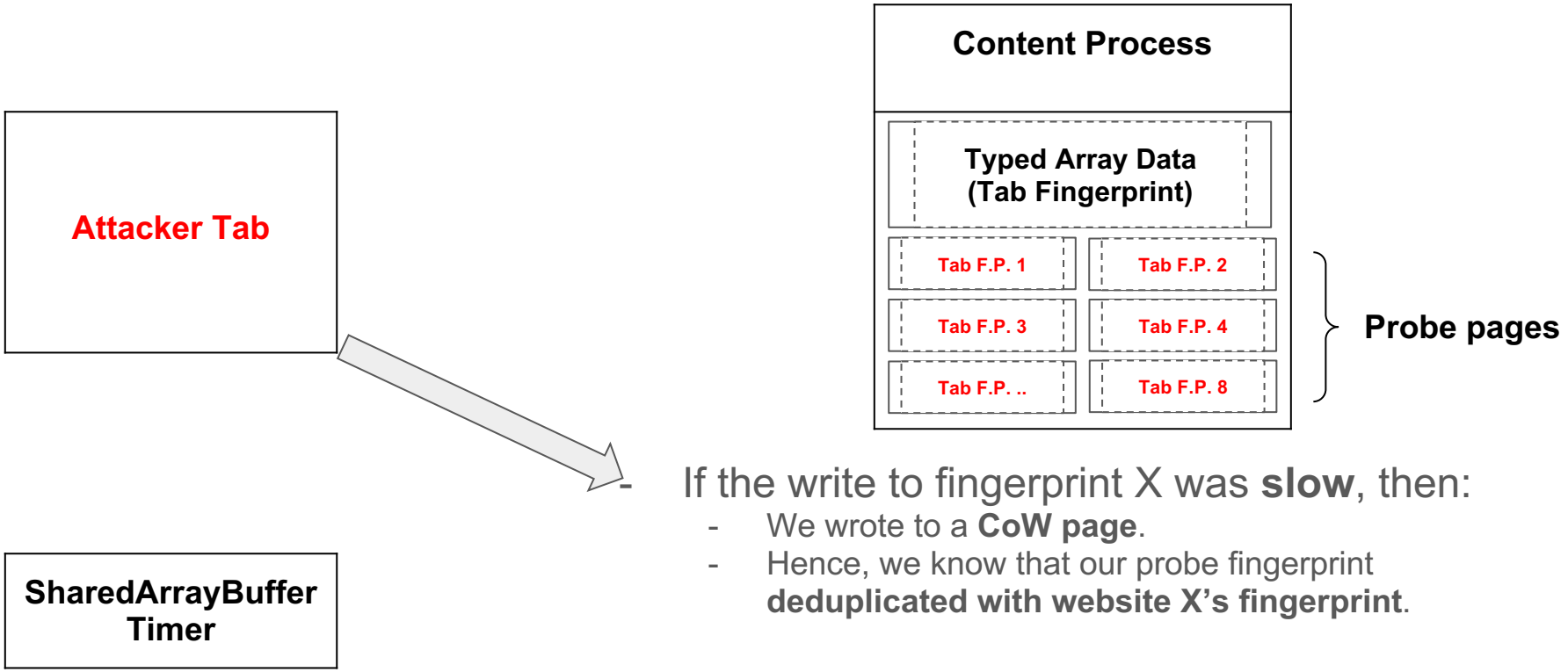

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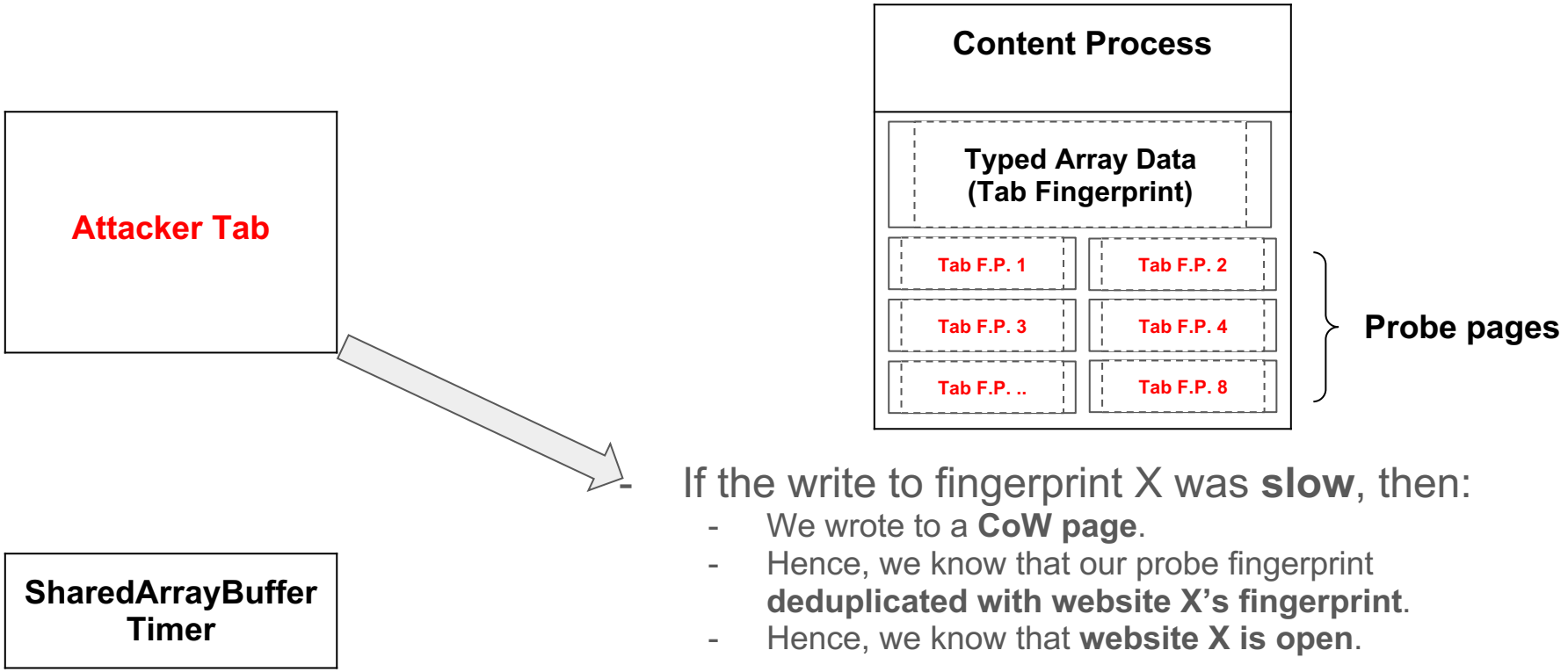

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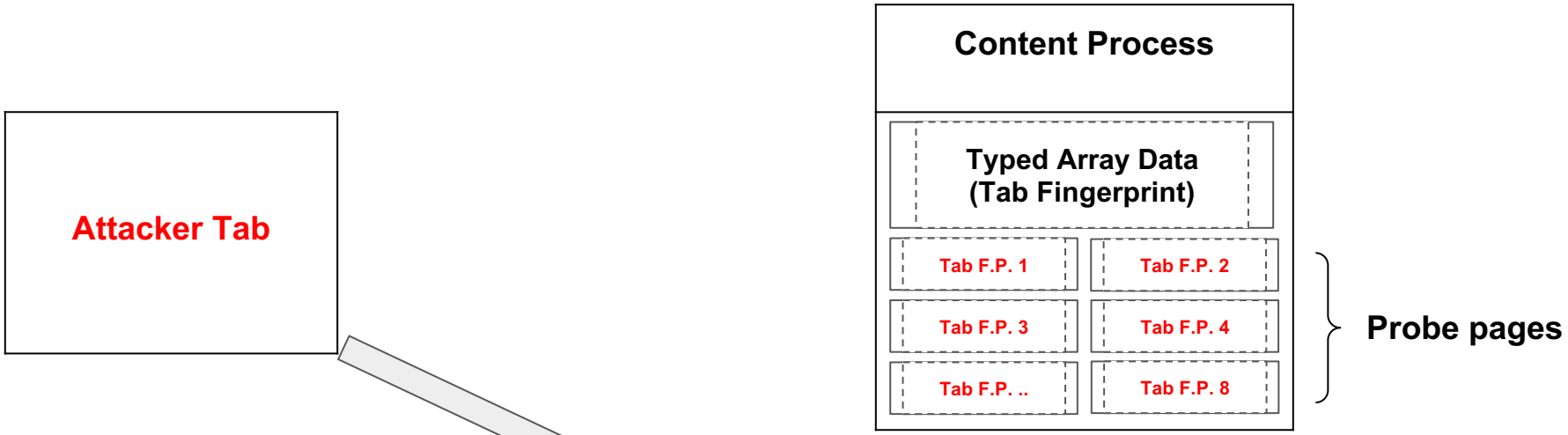

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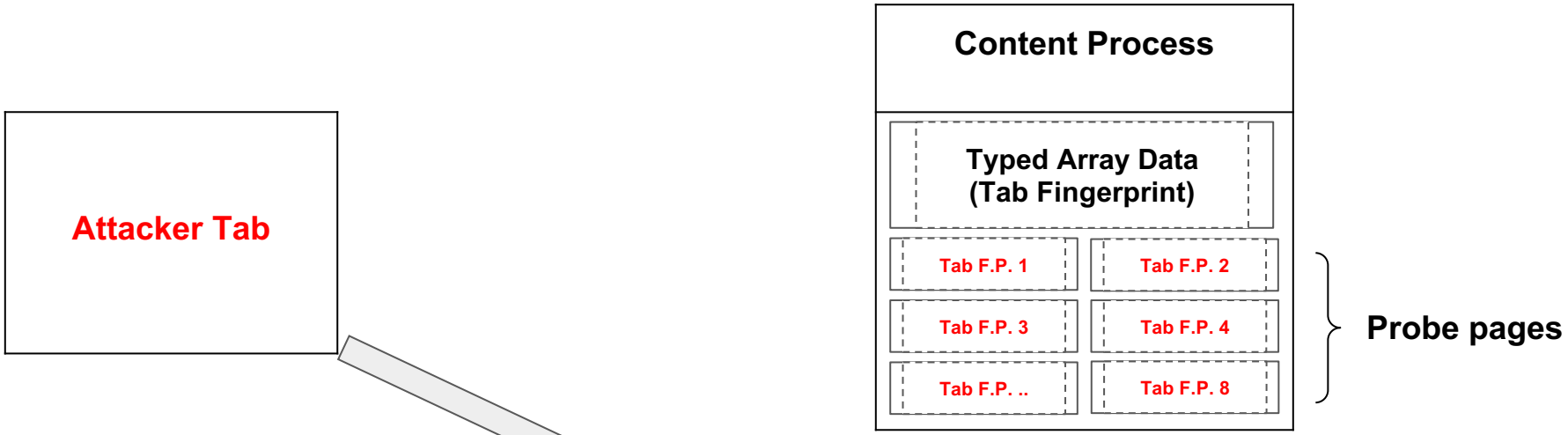

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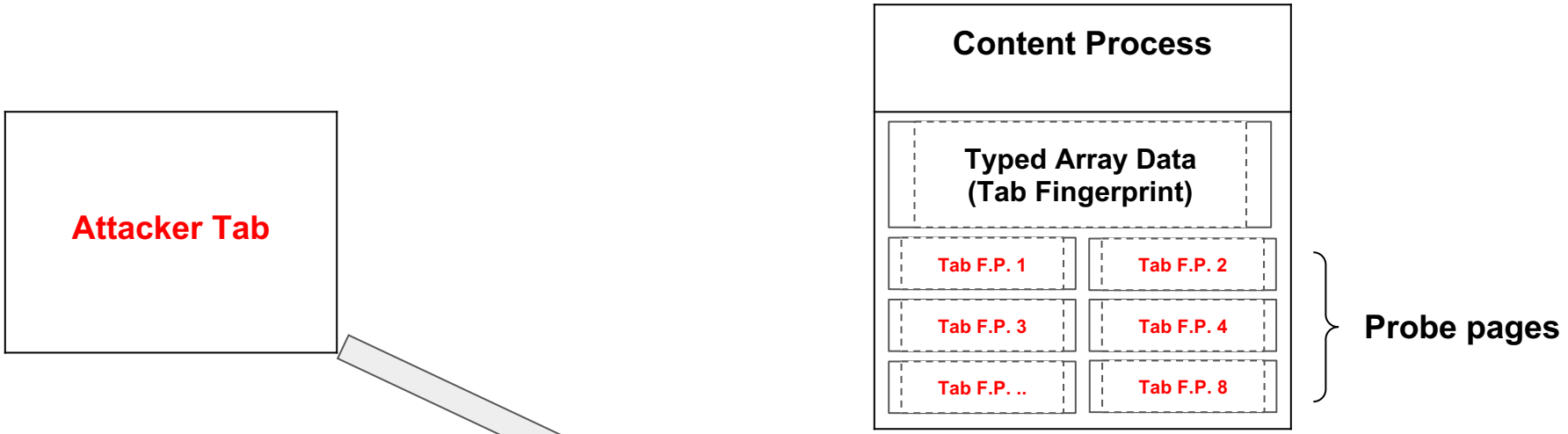

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  - **VUsion**, a mechanism that ensures the same behavior on all pages of a system.

Thank you!