Solution 1

```csharp
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using System;
using System.Collections.Generic;

public class Program {
  // O(n) time | O(min(n, a)) space
  public static string LongestSubstringWithoutDuplication(string str) {
    Dictionary<char, int> lastSeen = new Dictionary<char, int>();
    int[] longest = {0, 1};
    int startIdx = 0;
    for (int i = 0; i < str.Length; i++) {
      char c = str[i];
      if (lastSeen.ContainsKey(c)) {
        startIdx = Math.Max(startIdx, lastSeen[c] + 1);
      }
      if (longest[1] - longest[0] < i + 1 - startIdx) {
        longest = new int[] {startIdx, i + 1};
      }
      lastSeen[c] = i;
    }
    string result = str.Substring(longest[0], longest[1] - longest[0]);
    return result;
  }
}
```