Performance Tips

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HELPING DEVELOPERS UNDERSTAND SEARCH & BIG DATA

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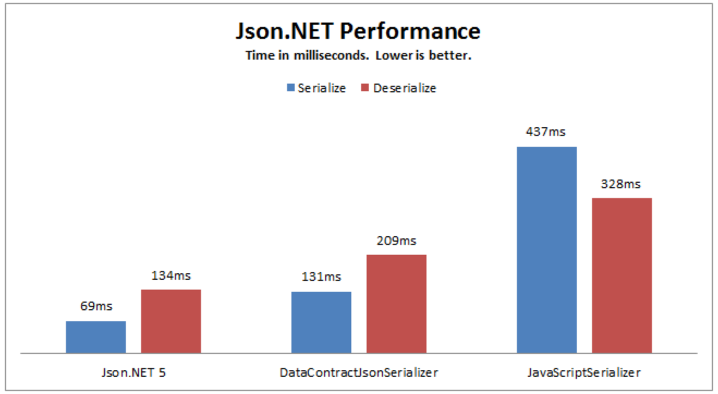
Json.NET vs. Other Serializers



Multiple benchmarks put Json.NET as the fastest serializer

But more than comparing…

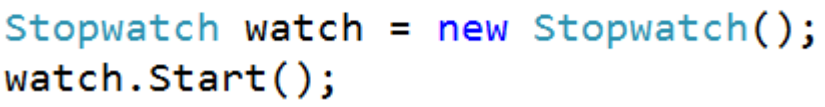
Focus on improving within Json.NET

Performance Scenarios

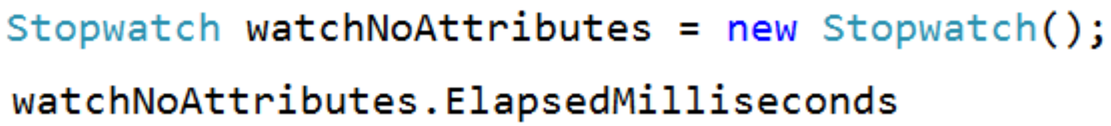
- Manual Serialization
- Fragments
- Populate Objects
- Merge
- Attributes

How We Are Going to Measure

- **StopWatch → Easy way**



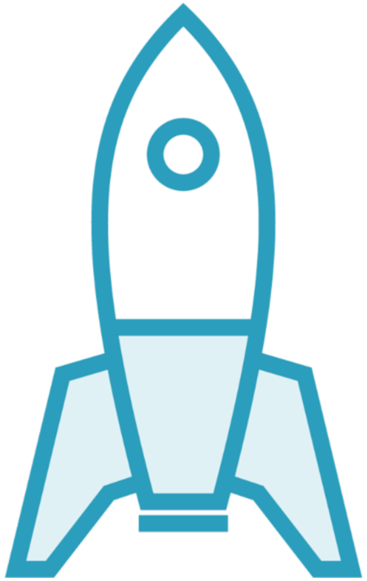
```
Stopwatch watch = new Stopwatch();
watch.Start();
```



```
Stopwatch watchNoAttributes = new Stopwatch();

watchNoAttributes.ElapsedMilliseconds
```

Serialize and Deserialize Manually



Json.NET is extremely fast

But it relies on reflection

If speed is key

- Serialize manually

Use JsonTextReader and JsonTextWriter

- Avoids using Reflection
- Less memory usage

Fastest way of reading and writing JSON

```
using (JsonWriter jsonWriter = new JsonTextWriter(stringWriter))
{
    jsonWriter.WriteStartObject();
        ...
    jsonWriter.WriteEndObject();
}
```

Serialize and Deserialize Manually

Serialization with JsonConvert uses reflection

- Reflection is an expensive operation

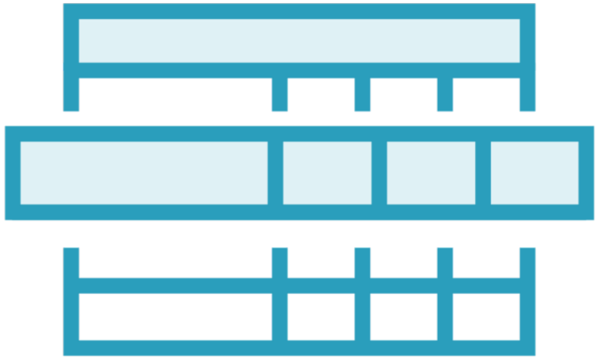
If performance is your top priority

- Serialize and deserialize using manually

Demo

Serialize and deserialize manually

JSON Fragments



Large JSON objects

- May take considerable time
  - Or consume a lot of memory
- While serializing or deserializing

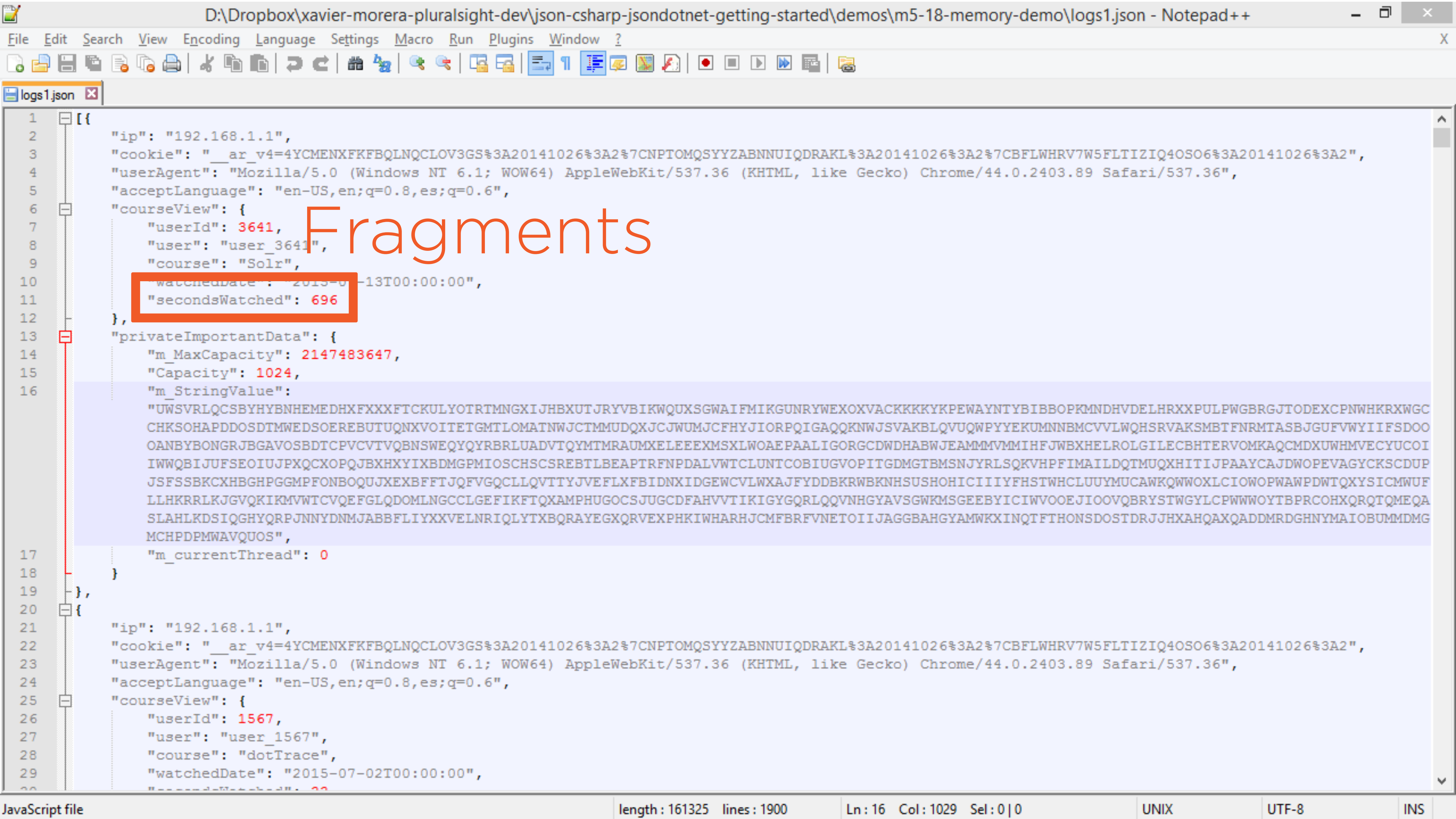
Possible to focus

- On specific subsection of the data

Fragments

- Using Linq

Fragments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File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
logs1.json
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length : 161325 lines : 1900
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```
[{
    "ip": "192.168.1.1",
    "cookie": "__ar_v4=4YCMENXFKFBQLNQCLOV3GS%3A20141026%3A2%7CNPTOMQSYYZABNNUIQDRAKL%3A20141026%3A2%7CBFLWHRV7W5FLTIZIQ4OSO6%3A20141026%3A2",
    "userAgent": "Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.89 Safari/537.36",
    "acceptLanguage": "en-US,en;q=0.8,es;q=0.6",
    "courseView": {
        "userId": 3641,
        "user": "user_3641",
        "course": "Solr",
        "watchedDate": "2015-0[illegible]-13T00:00:00",
        "secondsWatched": 696
    },
    "privateImportantData": {
        "m_MaxCapacity": 2147483647,
        "Capacity": 1024,
        "m_StringValue":
        "UWSVRLQCSBYHYBNHEMEDHXFXXXFTCKULYOTRTMNGXIJHBXUTJRYVBIKWQUXSGWAIFMIKGUNRYWEXOXVACKKKKYKPEWAYNTYBIBBOPKMNDHVDELHRXXPULPWGBRGJTODEXCPNWHKRXWGC
        CHKSOHAPDDOSDTMWEDSOEREBUTUQNXVOITETGMTLOMATNWJCTMMUDQXJCJWUMJCFHYJIORPQIGAQQKNWJSVAKBLQVUQWPYYEKUMNNBMCVVLWQHSRVAKSMBTFNRMTASBJGUFVWYIIFSDOO
        OANBYBONGRJBGAVOSBDTCPVCVTVQBNSWEQYQYRBRLUADVTQYMTMRAUMXELEEEXMSXLWOAEPAALIGORGCDWDHABWJEAMMMVMMIHFJWBXHELROLGILECBHTERVOMKAQCMDXUWHMVECYUCOI
        IWWQBIJUFSEOIUJPXQCXOPQJBXHXYIXBDMGPMIOSCHSCSREBTLBEAPTRFNPDALVWTCLUNTCOBIUGVOPITGDMGTBMSNJYRLSQKVHPFIMAILDQTMUQXHITIJPAAYCAJDWOPEVAGYCKSCDUP
        JSFSSBKCXHBGHPGGMPFONBOQUJXEXBFFTJQFVGQCLLQVTTYJVEFLXFBIDNXIDGEWCVLWXAJFYDDBKRWBKNHSUSHOHICIIIYFHSTWHCLUUYMUCAWKQWWOXLCIOWOPWAWPDWTQXYSICMWUF
        LLHKRRLKJGVQKIKMVWTCVQEFGLQDOMLNGCCLGEFIKFTQXAMPHUGOCSJUGCDFAHVVTIKIGYGQRLQQVNHGYAVSGWKMSGEEBYICIWVOOEJIOOVQBRYSTWGYLCPWWWOYTBPRCOHXQRQTQMEQA
        SLAHLKDSIQGHYQRPJNNYDNMJABBFLIYXXVELNRIQLYTXBQRAYEGXQRVEXPHKIWHARHJCMFBRFVNETOIIJAGGBAHGYAMWKXINQTFTHONSDOSTDRJJHXAHQAXQADDMRDGHNYMAIOBUMMDMG
        MCHPDPMWAVQUOS",
        "m_currentThread": 0
    }
},
{
    "ip": "192.168.1.1",
    "cookie": "__ar_v4=4YCMENXFKFBQLNQCLOV3GS%3A20141026%3A2%7CNPTOMQSYYZABNNUIQDRAKL%3A20141026%3A2%7CBFLWHRV7W5FLTIZIQ4OSO6%3A20141026%3A2",
    "userAgent": "Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.89 Safari/537.36",
    "acceptLanguage": "en-US,en;q=0.8,es;q=0.6",
    "courseView": {
        "userId": 1567,
        "user": "user_1567",
        "course": "dotTrace",
        "watchedDate": "2015-07-02T00:00:00",
logEntry["courseView"]["secondsWatched"].Value<int>();
```

JSON Fragments

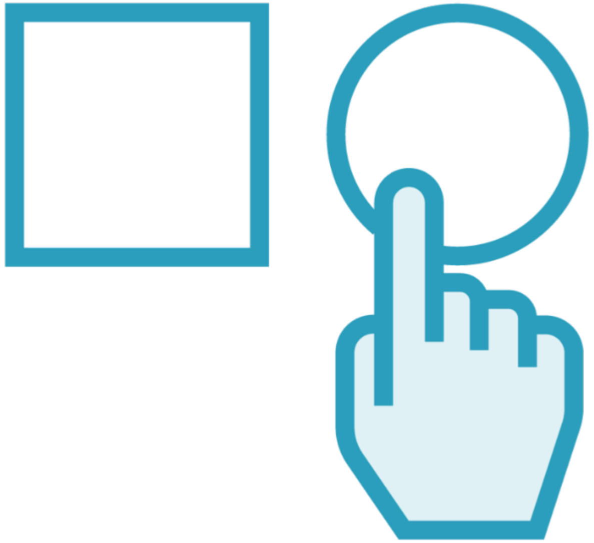
Extract a subsection of a JSON text

- **Deserialize it**
- **Instead of the full object**

Demo

JSON Fragments

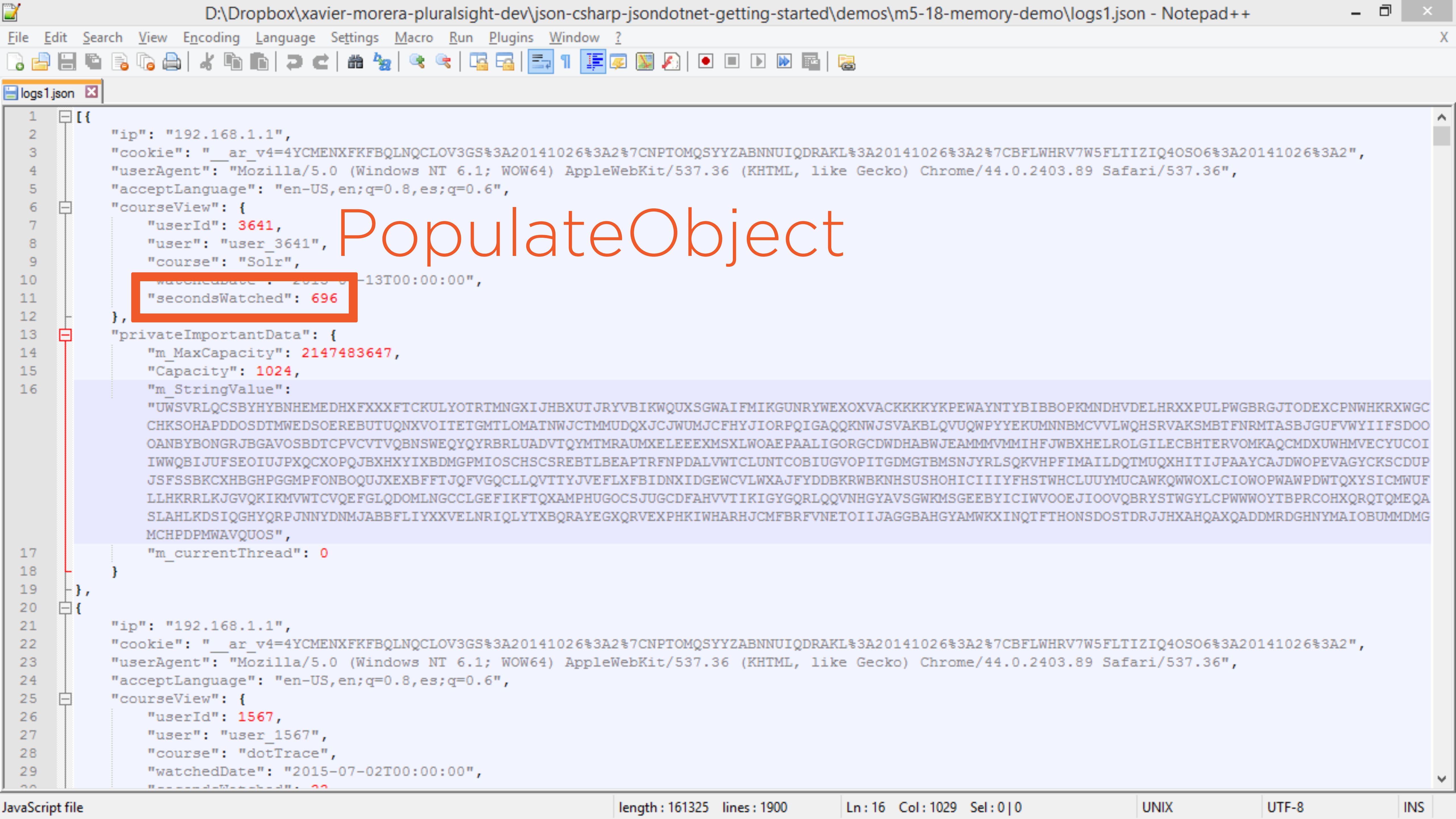
JSON Populate



PopulateObject

- Write specific values
- To large JSON objects

PopulateObject



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```
[{
    "ip": "192.168.1.1",
    "cookie": "__ar_v4=4YCMENXFKFBQLNQCLOV3GS%3A20141026%3A2%7CNPTOMQSYYZABNNUIQDRAKL%3A20141026%3A2%7CBFLWHRV7W5FLTIZIQ4OSO6%3A20141026%3A2",
    "userAgent": "Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.89 Safari/537.36",
    "acceptLanguage": "en-US,en;q=0.8,es;q=0.6",
    "courseView": {
        "userId": 3641,
        "user": "user_3641",
        "course": "Solr",
        "watchedDate": "2015-07-13T00:00:00",
        "secondsWatched": 696
    },
    "privateImportantData": {
        "m_MaxCapacity": 2147483647,
        "Capacity": 1024,
        "m_StringValue":
        "UWSVRLQCSBYHYBNHEMEDHXFXXXFTCKULYOTRTMNGXIJHBXUTJRYVBIKWQUXSGWAIFMIKGUNRYWEXOXVACKKKKYKPEWAYNTYBIBBOPKMNDHVDELHRXXPULPWGBRGJTODEXCPNWHKRXWGC
        CHKSOHAPDDOSDTMWEDSOEREBUTUQNXVOITETGMTLOMATNWJCTMMUDQXJCJWUMJCFHYJIORPQIGAQQKNWJSVAKBLQVUQWPYYEKUMNNBMCVVLWQHSRVAKSMBTFNRMTASBJGUFVWYIIFSDOO
        OANBYBONGRJBGAVOSBDTCPVCVTVQBNSWEQYQYRBRLUADVTQYMTMRAUMXELEEEXMSXLWOAEPAALIGORGCDWDHABWJEAMMMVMMIHFJWBXHELROLGILECBHTERVOMKAQCMDXUWHMVECYUCOI
        IWWQBIJUFSEOIUJPXQCXOPQJBXHXYIXBDMGPMIOSCHSCSREBTLBEAPTRFNPDALVWTCLUNTCOBIUGVOPITGDMGTBMSNJYRLSQKVHPFIMAILDQTMUQXHITIJPAAYCAJDWOPEVAGYCKSCDUP
        JSFSSBKCXHBGHPGGMPFONBOQUJXEXBFFTJQFVGQCLLQVTTYJVEFLXFBIDNXIDGEWCVLWXAJFYDDBKRWBKNHSUSHOHICIIIYFHSTWHCLUUYMUCAWKQWWOXLCIOWOPWAWPDWTQXYSICMWUF
        LLHKRRLKJGVQKIKMVWTCVQEFGLQDOMLNGCCLGEFIKFTQXAMPHUGOCSJUGCDFAHVVTIKIGYGQRLQQVNHGYAVSGWKMSGEEBYICIWVOOEJIOOVQBRYSTWGYLCPWWWOYTBPRCOHXQRQTQMEQA
        SLAHLKDSIQGHYQRPJNNYDNMJABBFLIYXXVELNRIQLYTXBQRAYEGXQRVEXPHKIWHARHJCMFBRFVNETOIIJAGGBAHGYAMWKXINQTFTHONSDOSTDRJJHXAHQAXQADDMRDGHNYMAIOBUMMDMG
        MCHPDPMWAVQUOS",
        "m_currentThread": 0
    }
},
{
    "ip": "192.168.1.1",
    "cookie": "__ar_v4=4YCMENXFKFBQLNQCLOV3GS%3A20141026%3A2%7CNPTOMQSYYZABNNUIQDRAKL%3A20141026%3A2%7CBFLWHRV7W5FLTIZIQ4OSO6%3A20141026%3A2",
    "userAgent": "Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.89 Safari/537.36",
    "acceptLanguage": "en-US,en;q=0.8,es;q=0.6",
    "courseView": {
        "userId": 1567,
        "user": "user_1567",
        "course": "dotTrace",
        "watchedDate": "2015-07-02T00:00:00",
```

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```
JsonConvert.PopulateObject(jsonReviewed, log);
```

JSON Populate

Write a specific value to a JSON object

- With a single call
- Using PopulateObject

Demo

Populate JSON Objects

JSON Merge

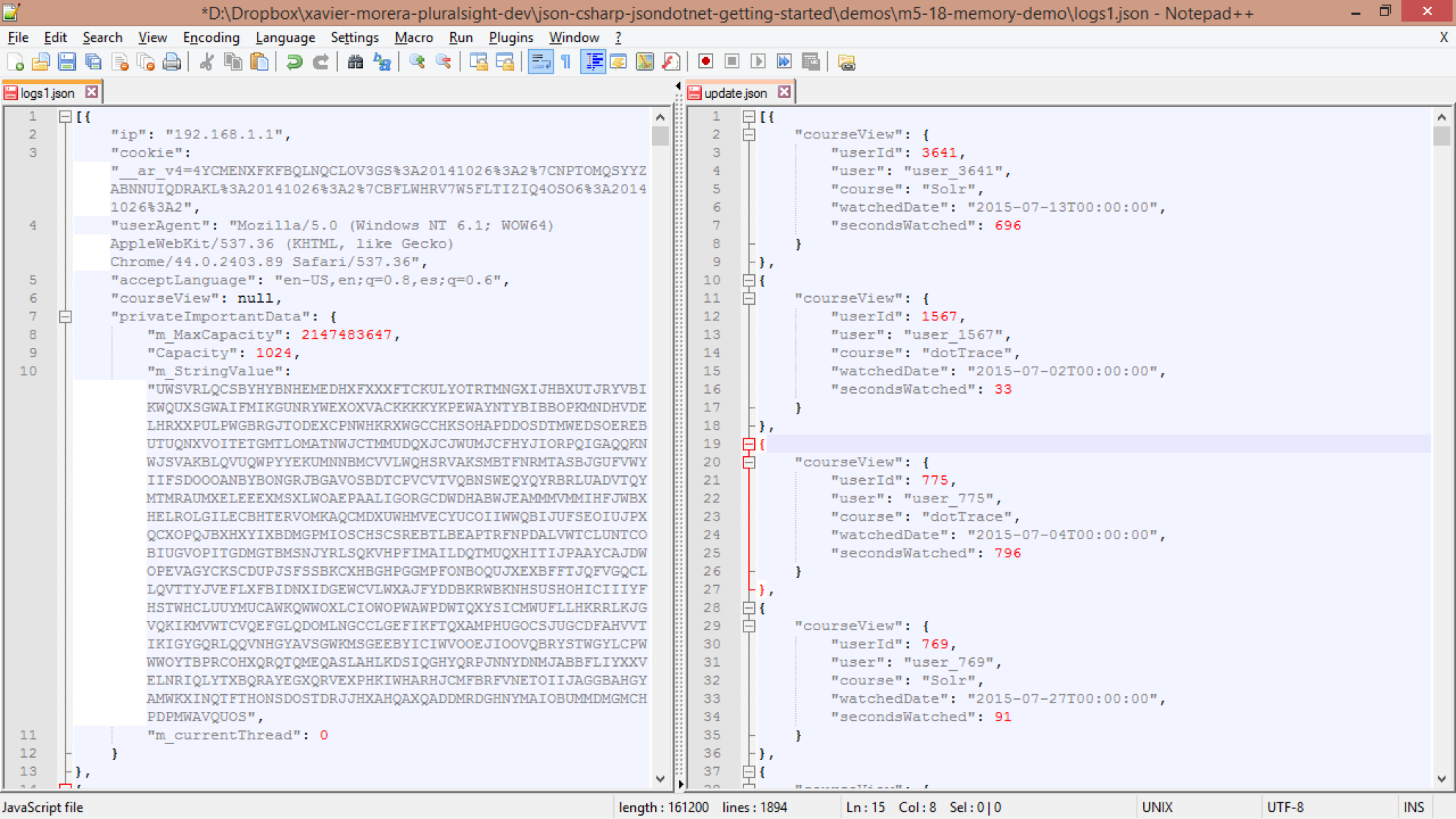
Merge two JSON objects

- Might be a complex operation

Json.NET provides merge functionality

Logic

- Name/value pairs copied across
  - Skipping nulls if the existing property is not null
  - Specify how to handle arrays



*D:\Dropbox\xavier-morera-pluralsight-dev\json-csharp-jsondotnet-getting-started\demos\m5-18-memory-demo\logs1.json - Notepad++

```
[{
    "ip": "192.168.1.1",
    "cookie":
    "__ar_v4=4YCMENXFKFBQLNQCLOV3GS%3A20141026%3A2%7CNPTOMQSYYZ
    ABNNUIQDRAKL%3A20141026%3A2%7CBFLWHRV7W5FLTIZIQ4OSO6%3A2014
    1026%3A2",
    "userAgent": "Mozilla/5.0 (Windows NT 6.1; WOW64)
    AppleWebKit/537.36 (KHTML, like Gecko)
    Chrome/44.0.2403.89 Safari/537.36",
    "acceptLanguage": "en-US,en;q=0.8,es;q=0.6",
    "courseView": null,
    "privateImportantData": {
        "m_MaxCapacity": 2147483647,
        "Capacity": 1024,
        "m_StringValue":
        "UWSVRLQCSBYHYBNHEMEDHXFXXXFTCKULYOTRTMNGXIJHBXUTJRYVBI
        KWQUXSGWAIFMIKGUNRYWEXOXVACKKKKYKPEWAYNTYBIBBOPKMNDHVDE
        LHRXXPULPWGBRGJTODEXCPNWHKRXWGCCHKSOHAPDDOSDTMWEDSOEREB
        UTUQNXVOITETGMTLOMATNWJCTMMUDQXJCJWUMJCFHYJIORPQIGAQQKN
        WJSVAKBLQVUQWPYYEKUMNNBMCVVLWQHSRVAKSMBTFNRMTASBJGUFVWY
        IIFSDOOOANBYBONGRJBGAVOSBDTCPVCVTVQBNSWEQYQYRBRLUADVTQY
        MTMRAUMXELEEEXMSXLWOAEPAALIGORGCDWDHABWJEAMMMVMMIHFJWBX
        HELROLGILECBHTERVOMKAQCMDXUWHMVECYUCOIIWWQBIJUFSEOIUJPX
        QCXOPQJBXHXYIXBDMGPMIOSCHSCSREBTLBEAPTRFNPDALVWTCLUNTCO
        BIUGVOPITGDMGTBMSNJYRLSQKVHPFIMAILDQTMUQXHITIJPAAYCAJDW
        OPEVAGYCKSCDUPJSFSSBKCXHBGHPGGMPFONBOQUJXEXBFFTJQFVGQCL
        LQVTTYJVEFLXFBIDNXIDGEWCVLWXAJFYDDBKRWBKNHSUSHOHICIIIYF
        HSTWHCLUUYMUCAWKQWWOXLCIOWOPWAWPDWTQXYSICMWUFLLHKRRLKJG
        VQKIKMVWTCVQEFGLQDOMLNGCCLGEFIKFTQXAMPHUGOCSJUGCDFAHVVT
        IKIGYGQRLQQVNHGYAVSGWKMSGEEBYICIWVOOEJIOOVQBRYSTWGYLCPW
        WWOYTBPRCOHXQRQTQMEQASLAHLKDSIQGHYQRPJNNYDNMJABBFLIYXXV
        ELNRIQLYTXBQRAYEGXQRVEXPHKIWHARHJCMFBRFVNETOIIJAGGBAHGY
        AMWKXINQTFTHONSDOSTDRJJHXAHQAXQADDMRDGHNYMAIOBUMMDMGMCH
        PDPMWAVQUOS",
        "m_currentThread": 0
    }
},
```

```
[{
    "courseView": {
        "userId": 3641,
        "user": "user_3641",
        "course": "Solr",
        "watchedDate": "2015-07-13T00:00:00",
        "secondsWatched": 696
    }
},
{
    "courseView": {
        "userId": 1567,
        "user": "user_1567",
        "course": "dotTrace",
        "watchedDate": "2015-07-02T00:00:00",
        "secondsWatched": 33
    }
},
{
    "courseView": {
        "userId": 775,
        "user": "user_775",
        "course": "dotTrace",
        "watchedDate": "2015-07-04T00:00:00",
        "secondsWatched": 796
    }
},
{
    "courseView": {
        "userId": 769,
        "user": "user_769",
        "course": "Solr",
        "watchedDate": "2015-07-27T00:00:00",
        "secondsWatched": 91
    }
},
{
```

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```
authorConcat.Merge(authorConcatMerge, new JsonMergeSettings
{
    MergeArrayHandling = MergeArrayHandling.Concat
});
```

JSON Merge

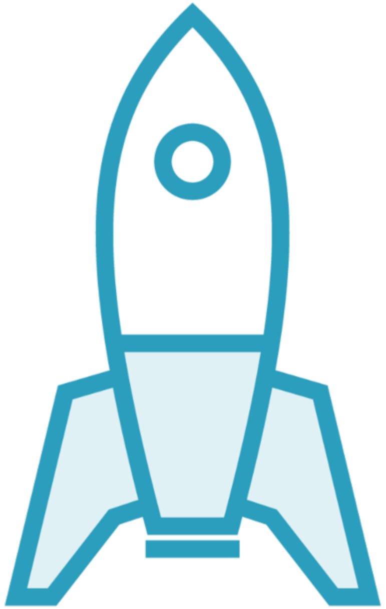
Merge two JSON objects

- Specify how to handle arrays
- Concat, union, replace, and merge

Demo

Merge JSON Objects

Using Attributes for Performance



If you are working with a large JSON object

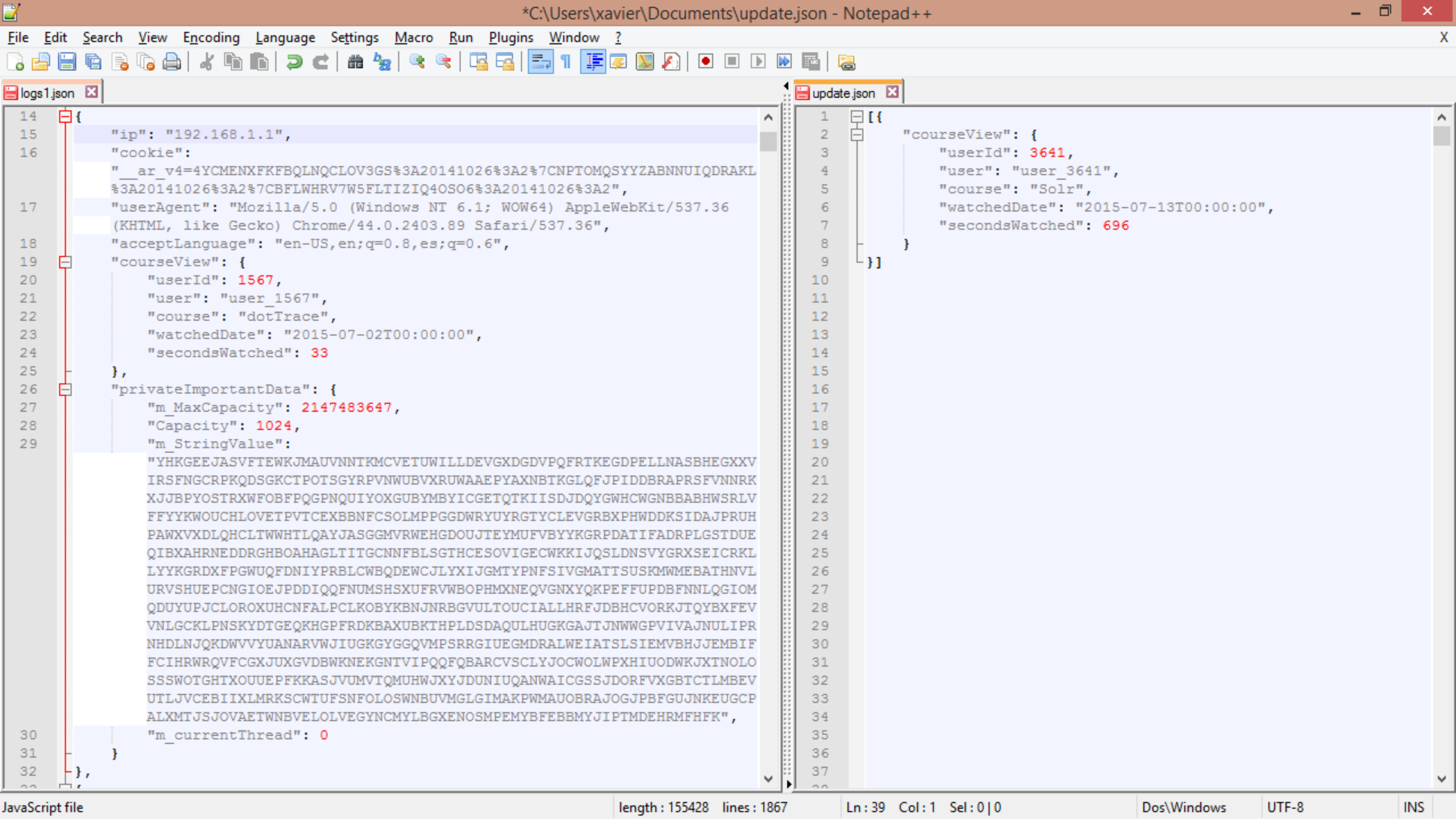
- But you only need certain values

You can use attributes

- To control what gets serialized
- Can lead to an increase in performance

Serialize and deserialize

- Only what you need



```
{
    "ip": "192.168.1.1",
    "cookie":
    "__ar_v4=4YCMENXFKFBQLNQCLOV3GS%3A20141026%3A2%7CNPTOMQSYYZABNNUIQDRAKL
    %3A20141026%3A2%7CBFLWHRV7W5FLTIZIQ4OSO6%3A20141026%3A2",
    "userAgent": "Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36
    (KHTML, like Gecko) Chrome/44.0.2403.89 Safari/537.36",
    "acceptLanguage": "en-US,en;q=0.8,es;q=0.6",
    "courseView": {
        "userId": 1567,
        "user": "user_1567",
        "course": "dotTrace",
        "watchedDate": "2015-07-02T00:00:00",
        "secondsWatched": 33
    },
    "privateImportantData": {
        "m_MaxCapacity": 2147483647,
        "Capacity": 1024,
        "m_StringValue":
        "YHKGEEJASVFTEWKJMAUVNNTKMCVETUWILLDEVGXDGDVPQFRTKEGDPELLNASBHEGXXV
        IRSFNGCRPKQDSGKCTPOTSGYRPVNWUBVXRUWAAEPYAXNBTKGLQFJPIDDBRAPRSFVNNRK
        XJJBPYOSTRXWFOBFPQGPNQUIYOXGUBYMBYICGETQTKIISDJDQYGWHCWGNBBABHWSRLV
        FFYYKWOUCHLOVETPVTCEXBBNFCSOLMPPGGDWRYUYRGTYCLEVGRBXPHWDDKSIDAJPRUH
        PAWXVXDLQHCLTWWHTLQAYJASGGMVRWEHGDOUJTEYMUFVBYYKGRPDATIFADRPLGSTDUE
        QIBXAHRNEDDRGHBOAHAGLTITGCNNFBLSGTHCESOVIGECWKKIJQSLDNSVYGRXSEICRKL
        LYYKGRDXFPGWUQFDNIYPRBLCWBQDEWCJLYXIJGMTYPNFSIVGMATTSUSKMWMEBATHNVL
        URVSHUEPCNGIOEJPDDIQQFNUMSHSXUFRVWBOPHMXNEQVGNXYQKPEFFUPDBFNNLQGIOM
        QDUYUPJCLOROXUHCNFALPCLKOBYKBNJNRBGVULTOUCIALLHRFJDBHCVORKJTQYBXFEV
        VNLGCKLPNSKYDTGEQKHGPFRDKBAXUBKTHPLDSDAQULHUGKGAJTJNWWGPVIVAJNULIPR
        NHDLNJQKDWVVYUANARVWJIUGKGYGGQVMPSRRGIUEGMDRALWEIATSLSIEMVBHJJEMBIF
        FCIHRWRQVFCGXJUXGVDBWKNEKGNTVIPQQFQBARCVSCLYJOCWOLWPXHIUODWKJXTNOLO
        SSSWOTGHTXOUUEPFKKASJVUMVTQMUHWJXYJDUNIUQANWAICGSSJDORFVXGBTCTLMBEV
        UTLJVCEBIIXLMRKSCWTUFSNFOLOSWNBUVMGLGIMAKPWMAUOBRAJOGJPBFGUJNKEUGCP
        ALXMTJSJOVAETWNBVELOLVEGYNCMYLBGXENOSMPEMYBFEBBMYJIPTMDEHRMFHFK",
        "m_currentThread": 0
    }
},
```

```
[{
    "courseView": {
        "userId": 3641,
        "user": "user_3641",
        "course": "Solr",
        "watchedDate": "2015-07-13T00:00:00",
        "secondsWatched": 696
    }
}]
```

```
[JsonIgnoreAttribute]

public int userId { get; set; }
```

Using Attributes for Performance

Attributes to increase performance

- Specifying what you want to serialize and deserialize

Demo

Using Attributes for Increasing Performance

Takeaway

Manual Serialization

Fragments

Populate Objects

Merge

Attributes