

# LinksPlatform's Platform.Data.Doublets.Json Class Library

## 1.1 ./csharp/Platform.Data.Doublets.Json/DefaultJsonStorage.cs

```
1  using Platform.Numbers;
2  using Platform.Data.Doublets.Unicode;
3  using Platform.Data.Doublets.Sequences.Converters;
4  using Platform.Data.Doublets.CriterionMatchers;
5  using Platform.Data.Numbers.Raw;
6  using Platform.Converters;
7  using Platform.Data.Doublets.Sequences.Walkers;
8  using Platform.Collections.Stacks;
9  using System;
10 using System.Collections.Generic;
11 using Platform.Data.Doublets.Numbers.Rational;
12 using Platform.Data.Doublets.Numbers.Raw;
13 using Platform.Data.Doublets.Sequences.HeightProviders;
14 using Platform.Data.Doublets.Sequences;
15
16 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
17
18 namespace Platform.Data.Doublets.Json
19 {
20     /// <summary>
21     /// <para>
22     /// Represents the default json storage.
23     /// </para>
24     /// <para></para>
25     /// </summary>
26     /// <seealso cref="IJsonStorage{TLink}" />
27     public class DefaultJsonStorage<TLink> : IJsonStorage<TLink>
28     where TLink : struct
29     {
30         /// <summary>
31         /// <para>
32         /// The any.
33         /// </para>
34         /// <para></para>
35         /// </summary>
36         public readonly TLink Any;
37         /// <summary>
38         /// <para>
39         /// The zero.
40         /// </para>
41         /// <para></para>
42         /// </summary>
43         public static readonly TLink Zero = default;
44         /// <summary>
45         /// <para>
46         /// The zero.
47         /// </para>
48         /// <para></para>
49         /// </summary>
50         public static readonly TLink One = Arithmetic.Increment(Zero);
51         /// <summary>
52         /// <para>
53         /// The balanced variant converter.
54         /// </para>
55         /// <para></para>
56         /// </summary>
57         public readonly BalancedVariantConverter<TLink> BalancedVariantConverter;
58         /// <summary>
59         /// <para>
60         /// The list to sequence converter.
61         /// </para>
62         /// <para></para>
63         /// </summary>
64         public readonly IConverter<IList<TLink>, TLink> ListToSequenceConverter;
65         /// <summary>
66         /// <para>
67         /// The meaning root.
68         /// </para>
69         /// <para></para>
70         /// </summary>
71         public readonly TLink MeaningRoot;
72         /// <summary>
73         /// <para>
74         /// The default.
75         /// </para>
76         /// <para></para>
77         /// </summary>
```

```

78 public readonly EqualityComparer<TLink> EqualityComparer =
79     ↳ EqualityComparer<TLink>.Default;
80 // Converters that are able to convert link's address (UInt64 value) to a raw number
81     ↳ represented with another UInt64 value and back
82 /// <summary>
83 /// <para>
84 /// The number to address converter.
85 /// </para>
86 /// <para></para>
87 /// </summary>
88 public readonly RawNumberToAddressConverter<TLink> NumberToAddressConverter = new();
89 /// <summary>
90 /// <para>
91 /// The address to number converter.
92 /// </para>
93 /// <para></para>
94 /// </summary>
95 public readonly AddressToRawNumberConverter<TLink> AddressToNumberConverter = new();
96 // Converters between BigInteger and raw number sequence
97 /// <summary>
98 /// <para>
99 /// The big integer to raw number sequence converter.
100 /// </para>
101 /// <para></para>
102 /// </summary>
103 public readonly BigIntegerToRawNumberSequenceConverter<TLink>
104     ↳ BigIntegerToRawNumberSequenceConverter;
105 /// <summary>
106 /// <para>
107 /// The raw number sequence to big integer converter.
108 /// </para>
109 /// <para></para>
110 /// </summary>
111 public readonly RawNumberSequenceToBigIntegerConverter<TLink>
112     ↳ RawNumberSequenceToBigIntegerConverter;
113 // Converters between decimal and rational number sequence
114 /// <summary>
115 /// <para>
116 /// The decimal to rational converter.
117 /// </para>
118 /// <para></para>
119 /// </summary>
120 public readonly DecimalToRationalConverter<TLink> DecimalToRationalConverter;
121 /// <summary>
122 /// <para>
123 /// The rational to decimal converter.
124 /// </para>
125 /// <para></para>
126 /// </summary>
127 public readonly RationalToDecimalConverter<TLink> RationalToDecimalConverter;
128 // Converters between string and unicode sequence
129 /// <summary>
130 /// <para>
131 /// The string to unicode sequence converter.
132 /// </para>
133 /// <para></para>
134 /// </summary>
135 public readonly IConverter<string, TLink> StringToUnicodeSequenceConverter;
136 /// <summary>
137 /// <para>
138 /// The unicode sequence to string converter.
139 /// </para>
140 /// <para></para>
141 /// </summary>
142 public readonly IConverter<TLink, string> UnicodeSequenceToStringConverter;
143 // For sequences
144 /// <summary>
145 /// <para>
146 /// The json array element criterion matcher.
147 /// </para>
148 /// <para></para>
149 /// </summary>
150 public readonly JsonArrayElementCriterionMatcher<TLink> JsonArrayElementCriterionMatcher;
151 /// <summary>
152 /// <para>
153 /// The default sequence right height provider.
154 /// </para>
155 /// <para></para>

```

```

152     /// </summary>
153     public readonly DefaultSequenceRightHeightProvider<TLink>
        ↳ DefaultSequenceRightHeightProvider;
154     /// <summary>
155     /// <para>
156     /// The default sequence appender.
157     /// </para>
158     /// <para></para>
159     /// </summary>
160     public readonly DefaultSequenceAppender<TLink> DefaultSequenceAppender;
161     /// <summary>
162     /// <para>
163     /// Gets the links value.
164     /// </para>
165     /// <para></para>
166     /// </summary>
167     public ILinks<TLink> Links { get; }
168     /// <summary>
169     /// <para>
170     /// Gets the document marker value.
171     /// </para>
172     /// <para></para>
173     /// </summary>
174     public TLink DocumentMarker { get; }
175     /// <summary>
176     /// <para>
177     /// Gets the object marker value.
178     /// </para>
179     /// <para></para>
180     /// </summary>
181     public TLink ObjectMarker { get; }
182     /// <summary>
183     /// <para>
184     /// Gets the member marker value.
185     /// </para>
186     /// <para></para>
187     /// </summary>
188     public TLink MemberMarker { get; }
189     /// <summary>
190     /// <para>
191     /// Gets the value marker value.
192     /// </para>
193     /// <para></para>
194     /// </summary>
195     public TLink ValueMarker { get; }
196     /// <summary>
197     /// <para>
198     /// Gets the string marker value.
199     /// </para>
200     /// <para></para>
201     /// </summary>
202     public TLink StringMarker { get; }
203     /// <summary>
204     /// <para>
205     /// Gets the empty string marker value.
206     /// </para>
207     /// <para></para>
208     /// </summary>
209     public TLink EmptyStringMarker { get; }
210     /// <summary>
211     /// <para>
212     /// Gets the number marker value.
213     /// </para>
214     /// <para></para>
215     /// </summary>
216     public TLink NumberMarker { get; }
217     /// <summary>
218     /// <para>
219     /// Gets the negative number marker value.
220     /// </para>
221     /// <para></para>
222     /// </summary>
223     public TLink NegativeNumberMarker { get; }
224     /// <summary>
225     /// <para>
226     /// Gets the array marker value.
227     /// </para>
228     /// <para></para>

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229     /// </summary>
230     public TLink ArrayMarker { get; }
231     /// <summary>
232     /// <para>
233     /// Gets the empty array marker value.
234     /// </para>
235     /// <para></para>
236     /// </summary>
237     public TLink EmptyArrayMarker { get; }
238     /// <summary>
239     /// <para>
240     /// Gets the true marker value.
241     /// </para>
242     /// <para></para>
243     /// </summary>
244     public TLink TrueMarker { get; }
245     /// <summary>
246     /// <para>
247     /// Gets the false marker value.
248     /// </para>
249     /// <para></para>
250     /// </summary>
251     public TLink FalseMarker { get; }
252     /// <summary>
253     /// <para>
254     /// Gets the null marker value.
255     /// </para>
256     /// <para></para>
257     /// </summary>
258     public TLink NullMarker { get; }
259
260     /// <summary>
261     /// <para>
262     /// Initializes a new <see cref="DefaultJsonStorage"/> instance.
263     /// </para>
264     /// <para></para>
265     /// </summary>
266     /// <param name="links">
267     /// <para>A links.</para>
268     /// <para></para>
269     /// </param>
270     /// <param name="listToSequenceConverter">
271     /// <para>A list to sequence converter.</para>
272     /// <para></para>
273     /// </param>
274     public DefaultJsonStorage(ILinks<TLink> links, IConverter<IList<TLink>, TLink>
275         ↳ listToSequenceConverter)
276     {
277         Links = links;
278         ListToSequenceConverter = listToSequenceConverter;
279         // Initializes constants
280         Any = Links.Constants.Any;
281         var markerIndex = One;
282         MeaningRoot = links.GetOrCreate(markerIndex, markerIndex);
283         var unicodeSymbolMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref
284             ↳ markerIndex));
285         var unicodeSequenceMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref
286             ↳ markerIndex));
287         DocumentMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref
288             ↳ markerIndex));
289         ObjectMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
290         MemberMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
291         ValueMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
292         StringMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
293         EmptyStringMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref
294             ↳ markerIndex));
295         NumberMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
296         NegativeNumberMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref
297             ↳ markerIndex));
298         ArrayMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
299         EmptyArrayMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref
300             ↳ markerIndex));
301         TrueMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
302         FalseMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
303         NullMarker = links.GetOrCreate(MeaningRoot, Arithmetic.Increment(ref markerIndex));
304         BalancedVariantConverter = new(links);
305         TargetMatcher<TLink> unicodeSymbolCriterionMatcher = new(Links, unicodeSymbolMarker);

```

```

299     TargetMatcher<TLink> unicodeSequenceCriterionMatcher = new(Links,
300         ↪ unicodeSequenceMarker);
301     CharToUnicodeSymbolConverter<TLink> charToUnicodeSymbolConverter =
302         new(Links, AddressToNumberConverter, unicodeSymbolMarker);
303     UnicodeSymbolToCharConverter<TLink> unicodeSymbolToCharConverter =
304         new(Links, NumberToAddressConverter, unicodeSymbolCriterionMatcher);
305     StringToUnicodeSequenceConverter = new CachingConverterDecorator<string, TLink>(
306         ↪ new StringToUnicodeSequenceConverter<TLink>(Links, charToUnicodeSymbolConverter,
307             ↪ BalancedVariantConverter, unicodeSequenceMarker));
308     RightSequenceWalker<TLink> sequenceWalker =
309         new(Links, new DefaultStack<TLink>(), unicodeSymbolCriterionMatcher.IsMatched);
310     UnicodeSequenceToStringConverter = new CachingConverterDecorator<TLink, string>(
311         ↪ new UnicodeSequenceToStringConverter<TLink>(Links,
312             ↪ unicodeSequenceCriterionMatcher, sequenceWalker,
313             ↪ unicodeSymbolToCharConverter));
314     BigIntegerToRawNumberSequenceConverter =
315         new(links, AddressToNumberConverter, ListToSequenceConverter,
316             ↪ NegativeNumberMarker);
317     RawNumberSequenceToBigIntegerConverter = new(links, NumberToAddressConverter,
318         ↪ NegativeNumberMarker);
319     DecimalToRationalConverter = new(links, BigIntegerToRawNumberSequenceConverter);
320     RationalToDecimalConverter = new(links, RawNumberSequenceToBigIntegerConverter);
321     JSONArrayElementCriterionMatcher = new(this);
322     DefaultSequenceRightHeightProvider = new(Links, JSONArrayElementCriterionMatcher);
323     DefaultSequenceAppender = new(Links, new DefaultStack<TLink>(),
324         ↪ DefaultSequenceRightHeightProvider);
325 }
326
327 /// <summary>
328 /// <para>
329 /// Creates the string using the specified content.
330 /// </para>
331 /// </summary>
332 /// <param name="content">
333 /// <para>The content.</para>
334 /// </param>
335 /// <returns>
336 /// <para>The link</para>
337 /// </returns>
338 public TLink CreateString(string content)
339 {
340     var @string = GetStringSequence(content);
341     return Links.GetOrCreate(StringMarker, @string);
342 }
343
344 /// <summary>
345 /// <para>
346 /// Creates the string value using the specified content.
347 /// </para>
348 /// </summary>
349 /// <param name="content">
350 /// <para>The content.</para>
351 /// </param>
352 /// <returns>
353 /// <para>The link</para>
354 /// </returns>
355 public TLink CreateStringValue(string content)
356 {
357     var @string = CreateString(content);
358     return CreateValue(@string);
359 }
360
361 /// <summary>
362 /// <para>
363 /// Creates the number using the specified number.
364 /// </para>
365 /// </summary>
366 /// <param name="number">
367 /// <para>The number.</para>
368 /// </param>
369 /// </summary>
370

```

```

372    /// <returns>
373    /// <para>The link</para>
374    /// <para></para>
375    /// </returns>
376    public TLink CreateNumber(decimal number)
377    {
378        var numberSequence = DecimalToRationalConverter.Convert(number);
379        return Links.GetOrCreate(NumberMarker, numberSequence);
380    }
381
382    /// <summary>
383    /// <para>
384    /// Creates the number value using the specified number.
385    /// </para>
386    /// <para></para>
387    /// </summary>
388    /// <param name="number">
389    /// <para>The number.</para>
390    /// <para></para>
391    /// </param>
392    /// <returns>
393    /// <para>The link</para>
394    /// <para></para>
395    /// </returns>
396    public TLink CreateNumberValue(decimal number)
397    {
398        var numberLink = CreateNumber(number);
399        return CreateValue(numberLink);
400    }
401
402    /// <summary>
403    /// <para>
404    /// Creates the boolean value using the specified value.
405    /// </para>
406    /// <para></para>
407    /// </summary>
408    /// <param name="value">
409    /// <para>The value.</para>
410    /// <para></para>
411    /// </param>
412    /// <returns>
413    /// <para>The link</para>
414    /// <para></para>
415    /// </returns>
416    public TLink CreateBooleanValue(bool value) => CreateValue(value ? TrueMarker :
    ↪ FalseMarker);
417
418    /// <summary>
419    /// <para>
420    /// Creates the null value.
421    /// </para>
422    /// <para></para>
423    /// </summary>
424    /// <returns>
425    /// <para>The link</para>
426    /// <para></para>
427    /// </returns>
428    public TLink CreateNullValue() => CreateValue(NullMarker);
429
430    /// <summary>
431    /// <para>
432    /// Creates the document using the specified name.
433    /// </para>
434    /// <para></para>
435    /// </summary>
436    /// <param name="name">
437    /// <para>The name.</para>
438    /// <para></para>
439    /// </param>
440    /// <returns>
441    /// <para>The link</para>
442    /// <para></para>
443    /// </returns>
444    public TLink CreateDocument(string name)
445    {
446        var documentName = CreateString(name);
447        return Links.GetOrCreate(DocumentMarker, documentName);
448    }

```

```

449
450    /// <summary>
451    /// <para>
452    /// Creates the object.
453    /// </para>
454    /// <para></para>
455    /// </summary>
456    /// <returns>
457    /// <para>The link</para>
458    /// <para></para>
459    /// </returns>
460    public TLink CreateObject()
461    {
462        var @object = Links.Create();
463        return Links.Update(@object, newSource: ObjectMarker, newTarget: @object);
464    }
465
466    /// <summary>
467    /// <para>
468    /// Creates the object value.
469    /// </para>
470    /// <para></para>
471    /// </summary>
472    /// <returns>
473    /// <para>The link</para>
474    /// <para></para>
475    /// </returns>
476    public TLink CreateObjectValue()
477    {
478        var @object = CreateObject();
479        return CreateValue(@object);
480    }
481
482    /// <summary>
483    /// <para>
484    /// Creates the array using the specified array.
485    /// </para>
486    /// <para></para>
487    /// </summary>
488    /// <param name="array">
489    /// <para>The array.</para>
490    /// <para></para>
491    /// </param>
492    /// <returns>
493    /// <para>The link</para>
494    /// <para></para>
495    /// </returns>
496    public TLink CreateArray(IList<TLink> array)
497    {
498        var arraySequence = array.Count == 0 ? EmptyArrayMarker :
499            ↪ BalancedVariantConverter.Convert(array);
500        return CreateArray(arraySequence);
501    }
502
503    /// <summary>
504    /// <para>
505    /// Creates the array using the specified sequence.
506    /// </para>
507    /// <para></para>
508    /// </summary>
509    /// <param name="sequence">
510    /// <para>The sequence.</para>
511    /// <para></para>
512    /// </param>
513    /// <returns>
514    /// <para>The link</para>
515    /// <para></para>
516    /// </returns>
517    public TLink CreateArray(TLink sequence) => Links.GetOrCreate(ArrayMarker, sequence);
518
519    /// <summary>
520    /// <para>
521    /// Creates the array value using the specified array.
522    /// </para>
523    /// <para></para>
524    /// </summary>
525    /// <param name="array">
526    /// <para>The array.</para>

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```

526     /// <para></para>
527     /// </param>
528     /// <returns>
529     /// <para>The link</para>
530     /// <para></para>
531     /// </returns>
532     public TLink CreateArrayValue(ICollection<TLink> array)
533     {
534         var arrayLink = CreateArray(array);
535         return CreateValue(arrayLink);
536     }
537
538     /// <summary>
539     /// <para>
540     /// Creates the array value using the specified sequence.
541     /// </para>
542     /// <para></para>
543     /// </summary>
544     /// <param name="sequence">
545     /// <para>The sequence.</para>
546     /// <para></para>
547     /// </param>
548     /// <returns>
549     /// <para>The link</para>
550     /// <para></para>
551     /// </returns>
552     public TLink CreateArrayValue(TLink sequence)
553     {
554         var array = CreateArray(sequence);
555         return CreateValue(array);
556     }
557
558     /// <summary>
559     /// <para>
560     /// Creates the member using the specified name.
561     /// </para>
562     /// <para></para>
563     /// </summary>
564     /// <param name="name">
565     /// <para>The name.</para>
566     /// <para></para>
567     /// </param>
568     /// <returns>
569     /// <para>The link</para>
570     /// <para></para>
571     /// </returns>
572     public TLink CreateMember(string name)
573     {
574         var nameLink = CreateString(name);
575         return Links.GetOrCreate(MemberMarker, nameLink);
576     }
577
578     /// <summary>
579     /// <para>
580     /// Creates the value using the specified value.
581     /// </para>
582     /// <para></para>
583     /// </summary>
584     /// <param name="value">
585     /// <para>The value.</para>
586     /// <para></para>
587     /// </param>
588     /// <returns>
589     /// <para>The link</para>
590     /// <para></para>
591     /// </returns>
592     public TLink CreateValue(TLink value) => Links.GetOrCreate(ValueMarker, value);
593
594     /// <summary>
595     /// <para>
596     /// Attaches the object using the specified parent.
597     /// </para>
598     /// <para></para>
599     /// </summary>
600     /// <param name="parent">
601     /// <para>The parent.</para>
602     /// <para></para>
603     /// </param>

```



```

604    /// <returns>
605    /// <para>The link</para>
606    /// <para></para>
607    /// </returns>
608    public TLink AttachObject(TLink parent) => Attach(parent, CreateObjectValue());
609
610    /// <summary>
611    /// <para>
612    /// Attaches the string using the specified parent.
613    /// </para>
614    /// <para></para>
615    /// </summary>
616    /// <param name="parent">
617    /// <para>The parent.</para>
618    /// <para></para>
619    /// </param>
620    /// <param name="content">
621    /// <para>The content.</para>
622    /// <para></para>
623    /// </param>
624    /// <returns>
625    /// <para>The link</para>
626    /// <para></para>
627    /// </returns>
628    public TLink AttachString(TLink parent, string content)
629    {
630        var @string = CreateString(content);
631        var stringValue = CreateValue(@string);
632        return Attach(parent, stringValue);
633    }
634
635    /// <summary>
636    /// <para>
637    /// Attaches the number using the specified parent.
638    /// </para>
639    /// <para></para>
640    /// </summary>
641    /// <param name="parent">
642    /// <para>The parent.</para>
643    /// <para></para>
644    /// </param>
645    /// <param name="number">
646    /// <para>The number.</para>
647    /// <para></para>
648    /// </param>
649    /// <returns>
650    /// <para>The link</para>
651    /// <para></para>
652    /// </returns>
653    public TLink AttachNumber(TLink parent, decimal number)
654    {
655        var numberLink = CreateNumber(number);
656        var numberValue = CreateValue(numberLink);
657        return Attach(parent, numberValue);
658    }
659
660    /// <summary>
661    /// <para>
662    /// Attaches the boolean using the specified parent.
663    /// </para>
664    /// <para></para>
665    /// </summary>
666    /// <param name="parent">
667    /// <para>The parent.</para>
668    /// <para></para>
669    /// </param>
670    /// <param name="value">
671    /// <para>The value.</para>
672    /// <para></para>
673    /// </param>
674    /// <returns>
675    /// <para>The link</para>
676    /// <para></para>
677    /// </returns>
678    public TLink AttachBoolean(TLink parent, bool value)
679    {
680        var booleanValue = CreateBooleanValue(value);
681        return Attach(parent, booleanValue);

```

```

682     }
683
684     /// <summary>
685     /// <para>
686     /// Attaches the null using the specified parent.
687     /// </para>
688     /// <para></para>
689     /// </summary>
690     /// <param name="parent">
691     /// <para>The parent.</para>
692     /// <para></para>
693     /// </param>
694     /// <returns>
695     /// <para>The link</para>
696     /// <para></para>
697     /// </returns>
698 public TLink AttachNull(TLink parent)
699 {
700     var nullValue = CreateNullValue();
701     return Attach(parent, nullValue);
702 }
703
704     /// <summary>
705     /// <para>
706     /// Attaches the array using the specified parent.
707     /// </para>
708     /// <para></para>
709     /// </summary>
710     /// <param name="parent">
711     /// <para>The parent.</para>
712     /// <para></para>
713     /// </param>
714     /// <param name="array">
715     /// <para>The array.</para>
716     /// <para></para>
717     /// </param>
718     /// <returns>
719     /// <para>The link</para>
720     /// <para></para>
721     /// </returns>
722 public TLink AttachArray(TLink parent, IList<TLink> array)
723 {
724     var arrayValue = CreateArrayValue(array);
725     return Attach(parent, arrayValue);
726 }
727
728     /// <summary>
729     /// <para>
730     /// Attaches the member to object using the specified object.
731     /// </para>
732     /// <para></para>
733     /// </summary>
734     /// <param name="@object">
735     /// <para>The object.</para>
736     /// <para></para>
737     /// </param>
738     /// <param name="keyName">
739     /// <para>The key name.</para>
740     /// <para></para>
741     /// </param>
742     /// <returns>
743     /// <para>The link</para>
744     /// <para></para>
745     /// </returns>
746 public TLink AttachMemberToObject(TLink @object, string keyName)
747 {
748     var member = CreateMember(keyName);
749     return Attach(@object, member);
750 }
751
752     /// <summary>
753     /// <para>
754     /// Attaches the parent.
755     /// </para>
756     /// <para></para>
757     /// </summary>
758     /// <param name="parent">
759     /// <para>The parent.</para>

```

```

760    /// <para></para>
761    /// </param>
762    /// <param name="child">
763    /// <para>The child.</para>
764    /// <para></para>
765    /// </param>
766    /// <returns>
767    /// <para>The link</para>
768    /// <para></para>
769    /// </returns>
770    public TLink Attach(TLink parent, TLink child) => Links.GetOrCreate(parent, child);
771
772    /// <summary>
773    /// <para>
774    /// Appends the array value using the specified array value.
775    /// </para>
776    /// <para></para>
777    /// </summary>
778    /// <param name="arrayValue">
779    /// <para>The array value.</para>
780    /// <para></para>
781    /// </param>
782    /// <param name="appendant">
783    /// <para>The appendant.</para>
784    /// <para></para>
785    /// </param>
786    /// <returns>
787    /// <para>The new array value.</para>
788    /// <para></para>
789    /// </returns>
790    public TLink AppendArrayValue(TLink arrayValue, TLink appendant)
791    {
792        var array = GetArray(arrayValue);
793        var arraySequence = Links.GetTarget(array);
794        TLink newArrayValue;
795        if (EqualityComparer.Equals(arraySequence, EmptyArrayMarker))
796        {
797            newArrayValue = CreateArrayValue(appendant);
798        }
799        else
800        {
801            arraySequence = DefaultSequenceAppender.Append(arraySequence, appendant);
802            newArrayValue = CreateArrayValue(arraySequence);
803        }
804        return newArrayValue;
805    }
806
807    /// <summary>
808    /// <para>
809    /// Gets the document or default using the specified name.
810    /// </para>
811    /// <para></para>
812    /// </summary>
813    /// <param name="name">
814    /// <para>The name.</para>
815    /// <para></para>
816    /// </param>
817    /// <returns>
818    /// <para>The link</para>
819    /// <para></para>
820    /// </returns>
821    public TLink GetDocumentOrDefault(string name)
822    {
823        var stringSequence = GetStringSequence(name);
824        var @string = Links.SearchOrDefault(StringMarker, stringSequence);
825        if (EqualityComparer.Equals(@string, default))
826        {
827            return default;
828        }
829        return Links.SearchOrDefault(DocumentMarker, @string);
830    }
831    private TLink GetStringSequence(string content) => content == "" ? EmptyStringMarker :
832        ↪ StringToUnicodeSequenceConverter.Convert(content);
833
834    /// <summary>
835    /// <para>
836    /// Gets the string using the specified string value.
837    /// </para>

```

```

837     /// <para></para>
838     /// </summary>
839     /// <param name="stringValue">
840     /// <para>The string value.</para>
841     /// <para></para>
842     /// </param>
843     /// <exception cref="Exception">
844     /// <para>The passed link does not contain a string.</para>
845     /// <para></para>
846     /// </exception>
847     /// <returns>
848     /// <para>The string</para>
849     /// <para></para>
850     /// </returns>
851     public string GetString(TLink stringValue)
852     {
853         var current = stringValue;
854         TLink source;
855         for (int i = 0; i < 3; i++)
856         {
857             source = Links.GetSource(current);
858             if (EqualityComparer.Equals(source, StringMarker))
859             {
860                 var sequence = Links.GetTarget(current);
861                 var isEmpty = EqualityComparer.Equals(sequence, EmptyStringMarker);
862                 return isEmpty ? "" : UnicodeSequenceToStringConverter.Convert(sequence);
863             }
864             current = Links.GetTarget(current);
865         }
866         throw new Exception("The passed link does not contain a string.");
867     }
868
869     /// <summary>
870     /// <para>
871     /// Gets the number using the specified value link.
872     /// </para>
873     /// <para></para>
874     /// </summary>
875     /// <param name="valueLink">
876     /// <para>The value link.</para>
877     /// <para></para>
878     /// </param>
879     /// <exception cref="Exception">
880     /// <para>The passed link does not contain a number.</para>
881     /// <para></para>
882     /// </exception>
883     /// <returns>
884     /// <para>The decimal</para>
885     /// <para></para>
886     /// </returns>
887     public decimal GetNumber(TLink valueLink)
888     {
889         var current = valueLink;
890         TLink source;
891         TLink target;
892         for (int i = 0; i < 3; i++)
893         {
894             source = Links.GetSource(current);
895             target = Links.GetTarget(current);
896             if (EqualityComparer.Equals(source, NumberMarker))
897             {
898                 return RationalToDecimalConverter.Convert(target);
899             }
900             current = target;
901         }
902         throw new Exception("The passed link does not contain a number.");
903     }
904
905     /// <summary>
906     /// <para>
907     /// Gets the object using the specified object value link.
908     /// </para>
909     /// <para></para>
910     /// </summary>
911     /// <param name="objectValueLink">
912     /// <para>The object value link.</para>
913     /// <para></para>
914     /// </param>

```

```

915 /// </param>
916 /// <exception cref="Exception">
917 /// <para>The passed link does not contain an object.</para>
918 /// <para></para>
919 /// </exception>
920 /// <returns>
921 /// <para>The link</para>
922 /// <para></para>
923 /// </returns>
924 public TLink GetObject(TLink objectValueLink)
925 {
926     var current = objectValueLink;
927     TLink source;
928     for (int i = 0; i < 3; i++)
929     {
930         source = Links.GetSource(current);
931         if (EqualityComparer.Equals(source, ObjectMarker))
932         {
933             return current;
934         }
935         current = Links.GetTarget(current);
936     }
937     throw new Exception("The passed link does not contain an object.");
938 }
939
940 /// <summary>
941 /// <para>
942 /// Gets the array using the specified array value link.
943 /// </para>
944 /// <para></para>
945 /// </summary>
946 /// <param name="arrayValueLink">
947 /// <para>The array value link.</para>
948 /// <para></para>
949 /// </param>
950 /// <exception cref="Exception">
951 /// <para>The passed link does not contain an array.</para>
952 /// <para></para>
953 /// </exception>
954 /// <returns>
955 /// <para>The link</para>
956 /// <para></para>
957 /// </returns>
958 public TLink GetArray(TLink arrayValueLink)
959 {
960     var current = arrayValueLink;
961     TLink source;
962     for (int i = 0; i < 3; i++)
963     {
964         source = Links.GetSource(current);
965         if (EqualityComparer.Equals(source, ArrayMarker))
966         {
967             return current;
968         }
969         current = Links.GetTarget(current);
970     }
971     throw new Exception("The passed link does not contain an array.");
972 }
973
974 /// <summary>
975 /// <para>
976 /// Gets the array sequence using the specified array.
977 /// </para>
978 /// <para></para>
979 /// </summary>
980 /// <param name="array">
981 /// <para>The array.</para>
982 /// <para></para>
983 /// </param>
984 /// <returns>
985 /// <para>The link</para>
986 /// <para></para>
987 /// </returns>
988 public TLink GetArraySequence(TLink array) => Links.GetTarget(array);
989
990 /// <summary>
991 /// <para>
992 /// Gets the value link using the specified parent.

```

```

993     /// </para>
994     /// <para></para>
995     /// </summary>
996     /// <param name="parent">
997     /// <para>The parent.</para>
998     /// <para></para>
999     /// </param>
1000    /// <exception cref="InvalidOperationException">
1001    /// <para>More than 1 value found.</para>
1002    /// <para></para>
1003    /// </exception>
1004    /// <exception cref="InvalidOperationException">
1005    /// <para>The list elements length is negative.</para>
1006    /// <para></para>
1007    /// </exception>
1008    /// <exception cref="InvalidOperationException">
1009    /// <para>The passed link is not a value.</para>
1010    /// <para></para>
1011    /// </exception>
1012    /// <returns>
1013    /// <para>The link</para>
1014    /// <para></para>
1015    /// </returns>
1016    public TLink GetValueLink(TLink parent)
1017    {
1018        var query = new Link<TLink>(index: Any, source: parent, target: Any);
1019        var resultLinks = Links.All(query);
1020        switch (resultLinks.Count)
1021        {
1022            case 0:
1023                return default;
1024            case 1:
1025                var resultLinkTarget = Links.GetTarget(resultLinks[0]);
1026                if (EqualityComparer.Equals(Links.GetSource(resultLinkTarget), ValueMarker))
1027                {
1028                    return resultLinkTarget;
1029                }
1030                else
1031                {
1032                    throw new InvalidOperationException("The passed link is not a value.");
1033                }
1034            case > 1:
1035                throw new InvalidOperationException("More than 1 value found.");
1036            default:
1037                throw new InvalidOperationException("The list elements length is negative.");
1038        }
1039    }
1040
1041    /// <summary>
1042    /// <para>
1043    /// Gets the value marker using the specified value.
1044    /// </para>
1045    /// <para></para>
1046    /// </summary>
1047    /// <param name="value">
1048    /// <para>The value.</para>
1049    /// <para></para>
1050    /// </param>
1051    /// <returns>
1052    /// <para>The target source.</para>
1053    /// <para></para>
1054    /// </returns>
1055    public TLink GetValueMarker(TLink value)
1056    {
1057        var target = Links.GetTarget(value);
1058        var targetSource = Links.GetSource(target);
1059        if (EqualityComparer.Equals(MeaningRoot, targetSource))
1060        {
1061            return target;
1062        }
1063        return targetSource;
1064    }
1065
1066    /// <summary>
1067    /// <para>
1068    /// Gets the members links using the specified object.
1069    /// </para>
1070    /// <para></para>

```

```

1071     /// </summary>
1072     /// <param name="@object">
1073     /// <para>The object.</para>
1074     /// <para></para>
1075     /// </param>
1076     /// <returns>
1077     /// <para>The members.</para>
1078     /// <para></para>
1079     /// </returns>
1080     public List<TLink> GetMembersLinks(TLink @object)
1081     {
1082         Link<TLink> query = new(index: Any, source: @object, target: Any);
1083         List<TLink> members = new();
1084         Links.Each(objectMemberLink =>
1085         {
1086             var memberLink = Links.GetTarget(objectMemberLink);
1087             var memberMarker = Links.GetSource(memberLink);
1088             if (EqualityComparer.Equals(memberMarker, MemberMarker))
1089             {
1090                 members.Add(Links.GetIndex(objectMemberLink));
1091             }
1092             return Links.Constants.Continue;
1093         }, query);
1094         return members;
1095     }
1096 }
1097 }

```

## 1.2 ./csharp/Platform.Data.Doublets.Json/IJsonStorage.cs

```

1 using System.Collections.Generic;
2
3 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
4
5 namespace Platform.Data.Doublets.Json
6 {
7     /// <summary>
8     /// <para>
9     /// Defines the json storage.
10    /// </para>
11    /// <para></para>
12    /// </summary>
13    public interface IJsonStorage<TLink>
14    {
15        /// <summary>
16        /// <para>
17        /// Gets the links value.
18        /// </para>
19        /// <para></para>
20        /// </summary>
21        public ILinks<TLink> Links { get; }
22        /// <summary>
23        /// <para>
24        /// Gets the document marker value.
25        /// </para>
26        /// <para></para>
27        /// </summary>
28        public TLink DocumentMarker { get; }
29        /// <summary>
30        /// <para>
31        /// Gets the object marker value.
32        /// </para>
33        /// <para></para>
34        /// </summary>
35        public TLink ObjectMarker { get; }
36        /// <summary>
37        /// <para>
38        /// Gets the string marker value.
39        /// </para>
40        /// <para></para>
41        /// </summary>
42        public TLink StringMarker { get; }
43        /// <summary>
44        /// <para>
45        /// Gets the empty string marker value.
46        /// </para>
47        /// <para></para>
48        /// </summary>
49        public TLink EmptyStringMarker { get; }

```

```

50     /// <summary>
51     /// <para>
52     /// Gets the member marker value.
53     /// </para>
54     /// <para></para>
55     /// </summary>
56     public TLink MemberMarker { get; }
57     /// <summary>
58     /// <para>
59     /// Gets the value marker value.
60     /// </para>
61     /// <para></para>
62     /// </summary>
63     public TLink ValueMarker { get; }
64     /// <summary>
65     /// <para>
66     /// Gets the number marker value.
67     /// </para>
68     /// <para></para>
69     /// </summary>
70     public TLink NumberMarker { get; }
71     /// <summary>
72     /// <para>
73     /// Gets the array marker value.
74     /// </para>
75     /// <para></para>
76     /// </summary>
77     public TLink ArrayMarker { get; }
78     /// <summary>
79     /// <para>
80     /// Gets the empty array marker value.
81     /// </para>
82     /// <para></para>
83     /// </summary>
84     public TLink EmptyArrayMarker { get; }
85     /// <summary>
86     /// <para>
87     /// Gets the true marker value.
88     /// </para>
89     /// <para></para>
90     /// </summary>
91     public TLink TrueMarker { get; }
92     /// <summary>
93     /// <para>
94     /// Gets the false marker value.
95     /// </para>
96     /// <para></para>
97     /// </summary>
98     public TLink FalseMarker { get; }
99     /// <summary>
100    /// <para>
101    /// Gets the null marker value.
102    /// </para>
103    /// <para></para>
104    /// </summary>
105    public TLink NullMarker { get; }
106    /// <summary>
107    /// <para>
108    /// Creates the string using the specified content.
109    /// </para>
110    /// <para></para>
111    /// </summary>
112    /// <param name="content">
113    /// <para>The content.</para>
114    /// <para></para>
115    /// </param>
116    /// <returns>
117    /// <para>The link</para>
118    /// <para></para>
119    /// </returns>
120    TLink CreateString(string content);
121    /// <summary>
122    /// <para>
123    /// Creates the string value using the specified content.
124    /// </para>
125    /// <para></para>
126    /// </summary>
127    /// <param name="content">

```



```

128     /// <para>The content.</para>
129     /// <para></para>
130     /// </param>
131     /// <returns>
132     /// <para>The link</para>
133     /// <para></para>
134     /// </returns>
135     TLink CreateStringValue(string content);
136     /// <summary>
137     /// <para>
138     /// Creates the number using the specified number.
139     /// </para>
140     /// <para></para>
141     /// </summary>
142     /// <param name="number">
143     /// <para>The number.</para>
144     /// <para></para>
145     /// </param>
146     /// <returns>
147     /// <para>The link</para>
148     /// <para></para>
149     /// </returns>
150     TLink CreateNumber(decimal number);
151     /// <summary>
152     /// <para>
153     /// Creates the number value using the specified number.
154     /// </para>
155     /// <para></para>
156     /// </summary>
157     /// <param name="number">
158     /// <para>The number.</para>
159     /// <para></para>
160     /// </param>
161     /// <returns>
162     /// <para>The link</para>
163     /// <para></para>
164     /// </returns>
165     TLink CreateNumberValue(decimal number);
166     /// <summary>
167     /// <para>
168     /// Creates the boolean value using the specified value.
169     /// </para>
170     /// <para></para>
171     /// </summary>
172     /// <param name="value">
173     /// <para>The value.</para>
174     /// <para></para>
175     /// </param>
176     /// <returns>
177     /// <para>The link</para>
178     /// <para></para>
179     /// </returns>
180     TLink CreateBooleanValue(bool value);
181     /// <summary>
182     /// <para>
183     /// Creates the null value.
184     /// </para>
185     /// <para></para>
186     /// </summary>
187     /// <returns>
188     /// <para>The link</para>
189     /// <para></para>
190     /// </returns>
191     TLink CreateNullValue();
192     /// <summary>
193     /// <para>
194     /// Creates the document using the specified name.
195     /// </para>
196     /// <para></para>
197     /// </summary>
198     /// <param name="name">
199     /// <para>The name.</para>
200     /// <para></para>
201     /// </param>
202     /// <returns>
203     /// <para>The link</para>
204     /// <para></para>
205     /// </returns>

```

```

206 TLink CreateDocument(string name);
207 /// <summary>
208 /// <para>
209 /// Gets the document or default using the specified name.
210 /// </para>
211 /// <para></para>
212 /// </summary>
213 /// <param name="name">
214 /// <para>The name.</para>
215 /// <para></para>
216 /// </param>
217 /// <returns>
218 /// <para>The link</para>
219 /// <para></para>
220 /// </returns>
221 TLink GetDocumentOrDefault(string name);
222 /// <summary>
223 /// <para>
224 /// Creates the object.
225 /// </para>
226 /// <para></para>
227 /// </summary>
228 /// <returns>
229 /// <para>The link</para>
230 /// <para></para>
231 /// </returns>
232 TLink CreateObject();
233 /// <summary>
234 /// <para>
235 /// Creates the object value.
236 /// </para>
237 /// <para></para>
238 /// </summary>
239 /// <returns>
240 /// <para>The link</para>
241 /// <para></para>
242 /// </returns>
243 TLink CreateObjectValue();
244 /// <summary>
245 /// <para>
246 /// Creates the array using the specified array.
247 /// </para>
248 /// <para></para>
249 /// </summary>
250 /// <param name="array">
251 /// <para>The array.</para>
252 /// <para></para>
253 /// </param>
254 /// <returns>
255 /// <para>The link</para>
256 /// <para></para>
257 /// </returns>
258 TLink CreateArray(IList<TLink> array);
259 /// <summary>
260 /// <para>
261 /// Creates the array value using the specified array.
262 /// </para>
263 /// <para></para>
264 /// </summary>
265 /// <param name="array">
266 /// <para>The array.</para>
267 /// <para></para>
268 /// </param>
269 /// <returns>
270 /// <para>The link</para>
271 /// <para></para>
272 /// </returns>
273 TLink CreateArrayValue(IList<TLink> array) => CreateValue(CreateArray(array));
274 /// <summary>
275 /// <para>
276 /// Creates the array value using the specified array.
277 /// </para>
278 /// <para></para>
279 /// </summary>
280 /// <param name="array">
281 /// <para>The array.</para>
282 /// <para></para>
283 /// </param>

```

```

284    /// <returns>
285    /// <para>The link</para>
286    /// <para></para>
287    /// </returns>
288    TLink CreateArrayValue(TLink array) => CreateValue(array);
289    /// <summary>
290    /// <para>
291    /// Creates the member using the specified name.
292    /// </para>
293    /// <para></para>
294    /// </summary>
295    /// <param name="name">
296    /// <para>The name.</para>
297    /// <para></para>
298    /// </param>
299    /// <returns>
300    /// <para>The link</para>
301    /// <para></para>
302    /// </returns>
303    TLink CreateMember(string name);
304    /// <summary>
305    /// <para>
306    /// Creates the value using the specified value.
307    /// </para>
308    /// <para></para>
309    /// </summary>
310    /// <param name="value">
311    /// <para>The value.</para>
312    /// <para></para>
313    /// </param>
314    /// <returns>
315    /// <para>The link</para>
316    /// <para></para>
317    /// </returns>
318    TLink CreateValue(TLink value);
319    /// <summary>
320    /// <para>
321    /// Attaches the source.
322    /// </para>
323    /// <para></para>
324    /// </summary>
325    /// <param name="source">
326    /// <para>The source.</para>
327    /// <para></para>
328    /// </param>
329    /// <param name="target">
330    /// <para>The target.</para>
331    /// <para></para>
332    /// </param>
333    /// <returns>
334    /// <para>The link</para>
335    /// <para></para>
336    /// </returns>
337    TLink Attach(TLink source, TLink target);
338    /// <summary>
339    /// <para>
340    /// Attaches the object using the specified parent.
341    /// </para>
342    /// <para></para>
343    /// </summary>
344    /// <param name="parent">
345    /// <para>The parent.</para>
346    /// <para></para>
347    /// </param>
348    /// <returns>
349    /// <para>The link</para>
350    /// <para></para>
351    /// </returns>
352    TLink AttachObject(TLink parent);
353    /// <summary>
354    /// <para>
355    /// Attaches the string using the specified parent.
356    /// </para>
357    /// <para></para>
358    /// </summary>
359    /// <param name="parent">
360    /// <para>The parent.</para>
361    /// <para></para>

```

```

362     /// </param>
363     /// <param name="content">
364     /// <para>The content.</para>
365     /// <para></para>
366     /// </param>
367     /// <returns>
368     /// <para>The link</para>
369     /// <para></para>
370     /// </returns>
371 TLink AttachString(TLink parent, string content);
372     /// <summary>
373     /// <para>
374     /// Attaches the number using the specified parent.
375     /// </para>
376     /// <para></para>
377     /// </summary>
378     /// <param name="parent">
379     /// <para>The parent.</para>
380     /// <para></para>
381     /// </param>
382     /// <param name="number">
383     /// <para>The number.</para>
384     /// <para></para>
385     /// </param>
386     /// <returns>
387     /// <para>The link</para>
388     /// <para></para>
389     /// </returns>
390 TLink AttachNumber(TLink parent, decimal number);
391     /// <summary>
392     /// <para>
393     /// Attaches the boolean using the specified parent.
394     /// </para>
395     /// <para></para>
396     /// </summary>
397     /// <param name="parent">
398     /// <para>The parent.</para>
399     /// <para></para>
400     /// </param>
401     /// <param name="value">
402     /// <para>The value.</para>
403     /// <para></para>
404     /// </param>
405     /// <returns>
406     /// <para>The link</para>
407     /// <para></para>
408     /// </returns>
409 TLink AttachBoolean(TLink parent, bool value);
410     /// <summary>
411     /// <para>
412     /// Attaches the null using the specified parent.
413     /// </para>
414     /// <para></para>
415     /// </summary>
416     /// <param name="parent">
417     /// <para>The parent.</para>
418     /// <para></para>
419     /// </param>
420     /// <returns>
421     /// <para>The link</para>
422     /// <para></para>
423     /// </returns>
424 TLink AttachNull(TLink parent);
425     /// <summary>
426     /// <para>
427     /// Attaches the array using the specified parent.
428     /// </para>
429     /// <para></para>
430     /// </summary>
431     /// <param name="parent">
432     /// <para>The parent.</para>
433     /// <para></para>
434     /// </param>
435     /// <param name="array">
436     /// <para>The array.</para>
437     /// <para></para>
438     /// </param>
439     /// <returns>

```

```

440    /// <para>The link</para>
441    /// <para></para>
442    /// </returns>
443    TLink AttachArray(TLink parent, IList<TLink> array);
444    /// <summary>
445    /// <para>
446    /// Attaches the member to object using the specified object.
447    /// </para>
448    /// <para></para>
449    /// </summary>
450    /// <param name="@object">
451    /// <para>The object.</para>
452    /// <para></para>
453    /// </param>
454    /// <param name="keyName">
455    /// <para>The key name.</para>
456    /// <para></para>
457    /// </param>
458    /// <returns>
459    /// <para>The link</para>
460    /// <para></para>
461    /// </returns>
462    TLink AttachMemberToObject(TLink @object, string keyName);
463    /// <summary>
464    /// <para>
465    /// Appends the array value using the specified array value.
466    /// </para>
467    /// <para></para>
468    /// </summary>
469    /// <param name="arrayValue">
470    /// <para>The array value.</para>
471    /// <para></para>
472    /// </param>
473    /// <param name="appendant">
474    /// <para>The appendant.</para>
475    /// <para></para>
476    /// </param>
477    /// <returns>
478    /// <para>The link</para>
479    /// <para></para>
480    /// </returns>
481    TLink AppendArrayValue(TLink arrayValue, TLink appendant);
482    /// <summary>
483    /// <para>
484    /// Gets the string using the specified string value.
485    /// </para>
486    /// <para></para>
487    /// </summary>
488    /// <param name="stringValue">
489    /// <para>The string value.</para>
490    /// <para></para>
491    /// </param>
492    /// <returns>
493    /// <para>The string</para>
494    /// <para></para>
495    /// </returns>
496    string GetString(TLink stringValue);
497    /// <summary>
498    /// <para>
499    /// Gets the number using the specified value.
500    /// </para>
501    /// <para></para>
502    /// </summary>
503    /// <param name="value">
504    /// <para>The value.</para>
505    /// <para></para>
506    /// </param>
507    /// <returns>
508    /// <para>The decimal</para>
509    /// <para></para>
510    /// </returns>
511    decimal GetNumber(TLink value);
512    /// <summary>
513    /// <para>
514    /// Gets the object using the specified object value.
515    /// </para>
516    /// <para></para>
517    /// </summary>

```

```

518     /// <param name="objectValue">
519     /// <para>The object value.</para>
520     /// </para>
521     /// </param>
522     /// <returns>
523     /// <para>The link</para>
524     /// </para>
525     /// </returns>
526 TLink GetObject(TLink objectValue);
527     /// <summary>
528     /// <para>
529     /// Gets the array using the specified array value link.
530     /// </para>
531     /// </summary>
532     /// <param name="arrayValueLink">
533     /// <para>The array value link.</para>
534     /// </para>
535     /// </param>
536     /// <returns>
537     /// <para>The link</para>
538     /// </para>
539     /// </returns>
540 TLink GetArray(TLink arrayValueLink);
541     /// <summary>
542     /// <para>
543     /// Gets the array sequence using the specified array.
544     /// </para>
545     /// </summary>
546     /// <param name="array">
547     /// <para>The array.</para>
548     /// </para>
549     /// </param>
550     /// <returns>
551     /// <para>The link</para>
552     /// </para>
553     /// </returns>
554 TLink GetArraySequence(TLink array);
555     /// <summary>
556     /// <para>
557     /// Gets the value link using the specified parent.
558     /// </para>
559     /// </summary>
560     /// <param name="parent">
561     /// <para>The parent.</para>
562     /// </para>
563     /// </param>
564     /// <returns>
565     /// <para>The link</para>
566     /// </para>
567     /// </returns>
568 TLink GetValueLink(TLink parent);
569     /// <summary>
570     /// <para>
571     /// Gets the value marker using the specified link.
572     /// </para>
573     /// </summary>
574     /// <param name="link">
575     /// <para>The link.</para>
576     /// </para>
577     /// </param>
578     /// <returns>
579     /// <para>The link</para>
580     /// </para>
581     /// </returns>
582 TLink GetValueMarker(TLink link);
583     /// <summary>
584     /// <para>
585     /// Gets the members links using the specified object.
586     /// </para>
587     /// </summary>
588     /// <param name="@object">
589     /// <para>The object.</para>
590     /// </para>
591     /// </param>
592     /// <returns>
593     /// <para>The object.</para>
594     /// </para>
595     /// </returns>

```

```

596     /// </param>
597     /// <returns>
598     /// <para>A list of t link</para>
599     /// <para></para>
600     /// </returns>
601     List<TLink> GetMembersLinks(TLink @object);
602 }
603 }

```

### 1.3 ./csharp/Platform.Data.Doublets.Json/JsonArrayElementCriterionMatcher.cs

```

1  using System;
2  using System.Collections.Generic;
3  using System.Linq;
4  using System.Text;
5  using System.Threading.Tasks;
6  using System.Text.Json;
7  using System.Threading;
8  using System.IO;
9  using Platform.Converters;
10 using System.Collections;
11 using Platform.Data.Doublets.Sequences;
12 using Platform.Data.Doublets.Sequences.HeightProviders;
13 using Platform.Data.Doublets.Sequences.CriterionMatchers;
14 using Platform.Interfaces;
15
16 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
17
18 namespace Platform.Data.Doublets.Json
19 {
20     /// <summary>
21     /// <para>
22     /// Represents the json array element criterion matcher.
23     /// </para>
24     /// <para></para>
25     /// </summary>
26     /// <seealso cref="ICriterionMatcher{TLink}" />
27     public class JsonArrayElementCriterionMatcher<TLink> : ICriterionMatcher<TLink>
28     {
29         /// <summary>
30         /// <para>
31         /// The storage.
32         /// </para>
33         /// <para></para>
34         /// </summary>
35         public readonly IJsonStorage<TLink> Storage;
36         /// <summary>
37         /// <para>
38         /// Initializes a new <see cref="JsonArrayElementCriterionMatcher" /> instance.
39         /// </para>
40         /// <para></para>
41         /// </summary>
42         /// <param name="storage">
43         /// <para>A storage.</para>
44         /// <para></para>
45         /// </param>
46         public JsonArrayElementCriterionMatcher(IJsonStorage<TLink> storage) => Storage =
47             ↪ storage;
48         /// <summary>
49         /// <para>
50         /// Determines whether this instance is matched.
51         /// </para>
52         /// <para></para>
53         /// </summary>
54         /// <param name="link">
55         /// <para>The link.</para>
56         /// <para></para>
57         /// </param>
58         /// <returns>
59         /// <para>The bool</para>
60         /// <para></para>
61         /// </returns>
62         public bool IsMatched(TLink link) =>
63             ↪ EqualityComparer<TLink>.Default.Equals(Storage.Links.GetSource(link),
64             ↪ Storage.ValueMarker);
65     }
66 }

```

### 1.4 ./csharp/Platform.Data.Doublets.Json/JsonExporter.cs

```

1  using System;
2  using System.Collections.Generic;

```

```

3 using System.Text.Json;
4 using System.Threading;
5 using Platform.Data.Doublets.Sequences.Walkers;
6 using Platform.Collections.Stacks;
7
8 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
9
10 namespace Platform.Data.Doublets.Json
11 {
12     /// <summary>
13     /// <para>
14     /// Represents the json exporter.
15     /// </para>
16     /// <para></para>
17     /// </summary>
18     public class JsonExporter<TLink>
19     {
20         /// <summary>
21         /// <para>
22         /// The storage.
23         /// </para>
24         /// <para></para>
25         /// </summary>
26         public readonly IJsonStorage<TLink> Storage;
27         /// <summary>
28         /// <para>
29         /// The default.
30         /// </para>
31         /// <para></para>
32         /// </summary>
33         public readonly EqualityComparer<TLink> EqualityComparer =
34             ↪ EqualityComparer<TLink>.Default;
35
36         /// <summary>
37         /// <para>
38         /// Initializes a new <see cref="JsonExporter"/> instance.
39         /// </para>
40         /// <para></para>
41         /// </summary>
42         /// <param name="storage">
43         /// <para>A storage.</para>
44         /// <para></para>
45         /// </param>
46         public JsonExporter(IJsonStorage<TLink> storage) => Storage = storage;
47         private bool IsElement(TLink link)
48         {
49             var marker = Storage.Links.GetSource(link);
50             return EqualityComparer.Equals(marker, Storage.ValueMarker);
51         }
52         private void WriteStringValue(in Utf8JsonWriter utf8JsonWriter, TLink valueLink) =>
53             ↪ utf8JsonWriter.WriteStringValue(Storage.GetString(valueLink));
54         private void WriteString(in Utf8JsonWriter utf8JsonWriter, string parent, TLink
55             ↪ valueLink) => utf8JsonWriter.WriteString(parent, Storage.GetString(valueLink));
56         private void WriteNumberValue(in Utf8JsonWriter utf8JsonWriter, TLink valueLink) =>
57             ↪ utf8JsonWriter.WriteNumberValue(Storage.GetNumber(valueLink));
58         private void WriteNumber(in Utf8JsonWriter utf8JsonWriter, string parent, TLink
59             ↪ valueLink) => utf8JsonWriter.WriteNumber(parent, Storage.GetNumber(valueLink));
60         private void Write(ref Utf8JsonWriter utf8JsonWriter, string parent, TLink valueLink,
61             ↪ CancellationToken cancellationToken)
62         {
63             if (cancellationToken.IsCancellationRequested)
64             {
65                 return;
66             }
67             var valueMarker = Storage.GetValueMarker(valueLink);
68             if (EqualityComparer.Equals(valueMarker, Storage.ObjectMarker))
69             {
70                 utf8JsonWriter.WriteStartObject(parent);
71                 var membersLinks = Storage.GetMembersLinks(Storage.GetObject(valueLink));
72                 foreach (var memberLink in membersLinks)
73                 {
74                     if (cancellationToken.IsCancellationRequested)
75                     {
76                         return;
77                     }
78                     Write(ref utf8JsonWriter, Storage.GetString(memberLink),
79                         ↪ Storage.GetValueLink(memberLink), cancellationToken);
80                 }
81             }
82         }
83     }
84 }

```



```

74         utf8JsonWriter.WriteEndObject();
75     }
76     else if (EqualityComparer.Equals(valueMarker, Storage.ArrayMarker))
77     {
78         var array = Storage.GetArray(valueLink);
79         var sequence = Storage.GetArraySequence(array);
80         utf8JsonWriter.WriteStartArray(parent);
81         if (!EqualityComparer.Equals(sequence, Storage.EmptyArrayMarker))
82         {
83             RightSequenceWalker<TLink> rightSequenceWalker = new(Storage.Links, new
84                 ↪ DefaultStack<TLink>(), IsElement);
85             var elements = rightSequenceWalker.Walk(sequence);
86             foreach (var element in elements)
87             {
88                 if (cancellationToken.IsCancellationRequested)
89                 {
90                     return;
91                 }
92                 Write(ref utf8JsonWriter, element, in cancellationToken);
93             }
94             utf8JsonWriter.WriteEndArray();
95         }
96     }
97     else if (EqualityComparer.Equals(valueMarker, Storage.StringMarker))
98     {
99         WriteString(in utf8JsonWriter, parent, valueLink);
100     }
101     else if (EqualityComparer.Equals(valueMarker, Storage.NumberMarker))
102     {
103         WriteNumber(in utf8JsonWriter, parent, valueLink);
104     }
105     else if (EqualityComparer.Equals(valueMarker, Storage.TrueMarker))
106     {
107         utf8JsonWriter.WriteBoolean(parent, true);
108     }
109     else if (EqualityComparer.Equals(valueMarker, Storage.FalseMarker))
110     {
111         utf8JsonWriter.WriteBoolean(parent, false);
112     }
113     else if (EqualityComparer.Equals(valueMarker, Storage.NullMarker))
114     {
115         utf8JsonWriter.WriteNull(parent);
116     }
117 }
118 private void Write(ref Utf8JsonWriter utf8JsonWriter, TLink valueLink, in
119     ↪ CancellationToken cancellationToken)
120 {
121     if (cancellationToken.IsCancellationRequested)
122     {
123         return;
124     }
125     var valueMarker = Storage.GetValueMarker(valueLink);
126     if (EqualityComparer.Equals(valueMarker, Storage.ObjectMarker))
127     {
128         utf8JsonWriter.WriteStartObject();
129         var membersLinks = Storage.GetMembersLinks(Storage.GetObject(valueLink));
130         foreach (var memberLink in membersLinks)
131         {
132             if (cancellationToken.IsCancellationRequested)
133             {
134                 return;
135             }
136             Write(ref utf8JsonWriter, Storage.GetString(memberLink),
137                 ↪ Storage.GetValueLink(memberLink), cancellationToken);
138         }
139         utf8JsonWriter.WriteEndObject();
140     }
141     else if (EqualityComparer.Equals(valueMarker, Storage.ArrayMarker))
142     {
143         var array = Storage.GetArray(valueLink);
144         var sequence = Storage.GetArraySequence(array);
145         utf8JsonWriter.WriteStartArray();
146         if (!EqualityComparer.Equals(sequence, Storage.EmptyArrayMarker))
147         {
148             RightSequenceWalker<TLink> rightSequenceWalker = new(Storage.Links, new
149                 ↪ DefaultStack<TLink>(), IsElement);
150             var elements = rightSequenceWalker.Walk(sequence);

```

```

147         foreach (var element in elements)
148         {
149             if (cancellationToken.IsCancellationRequested)
150             {
151                 return;
152             }
153             Write(ref utf8JsonWriter, element, in cancellationToken);
154         }
155     }
156     utf8JsonWriter.WriteEndArray();
157 }
158 else if (EqualityComparer.Equals(valueMarker, Storage.StringMarker))
159 {
160     WriteStringValue(in utf8JsonWriter, valueLink);
161 }
162 else if (EqualityComparer.Equals(valueMarker, Storage.NumberMarker))
163 {
164     WriteNumberValue(in utf8JsonWriter, valueLink);
165 }
166 else if (EqualityComparer.Equals(valueMarker, Storage.TrueMarker))
167 {
168     utf8JsonWriter.WriteBooleanValue(true);
169 }
170 else if (EqualityComparer.Equals(valueMarker, Storage.FalseMarker))
171 {
172     utf8JsonWriter.WriteBooleanValue(false);
173 }
174 else if (EqualityComparer.Equals(valueMarker, Storage.NullMarker))
175 {
176     utf8JsonWriter.WriteNullValue();
177 }
178 }
179
180 /// <summary>
181 /// <para>
182 /// Exports the document.
183 /// </para>
184 /// <para></para>
185 /// </summary>
186 /// <param name="document">
187 /// <para>The document.</para>
188 /// <para></para>
189 /// </param>
190 /// <param name="utf8JsonWriter">
191 /// <para>The utf json writer.</para>
192 /// <para></para>
193 /// </param>
194 /// <param name="cancellationToken">
195 /// <para>The cancellation token.</para>
196 /// <para></para>
197 /// </param>
198 /// <exception cref="Exception">
199 /// <para>No document with this name exists</para>
200 /// <para></para>
201 /// </exception>
202 public void Export(TLink document, ref Utf8JsonWriter utf8JsonWriter, in
    ↳ Cancellation token cancellationToken)
203 {
204     if (EqualityComparer.Equals(document, default))
205     {
206         throw new Exception("No document with this name exists");
207     }
208     var valueLink = Storage.GetValueLink(document);
209     Write(ref utf8JsonWriter, valueLink, in cancellationToken);
210     utf8JsonWriter.Flush();
211 }
212
213 /// <summary>
214 /// <para>
215 /// Exports the document name.
216 /// </para>
217 /// <para></para>
218 /// </summary>
219 /// <param name="documentName">
220 /// <para>The document name.</para>
221 /// <para></para>
222 /// </param>
223 /// <param name="utf8JsonWriter">

```

```

224     /// <para>The utf json writer.</para>
225     /// <para></para>
226     /// </param>
227     /// <param name="cancellationToken">
228     /// <para>The cancellation token.</para>
229     /// <para></para>
230     /// </param>
231     public void Export(string documentName, Utf8JsonWriter utf8JsonWriter, CancellationToken
        ↪ cancellationToken) => Export(Storage.GetDocumentOrDefault(documentName), ref
        ↪ utf8JsonWriter, in cancellationToken);
232 }
233 }

```

## 1.5 ./csharp/Platform.Data.Doublets.Json/JsonExporterCli.cs

```

1  using System;
2  using System.IO;
3  using System.Text.Encodings.Web;
4  using Platform.Data.Doublets.Memory.United.Generic;
5  using Platform.IO;
6  using System.Text.Json;
7  using Platform.Data.Doublets.Memory;
8  using Platform.Data.Doublets.Sequences.Converters;
9  using Platform.Memory;
10
11 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
12
13 namespace Platform.Data.Doublets.Json
14 {
15     /// <summary>
16     /// <para>
17     /// Represents the json exporter cli.
18     /// </para>
19     /// <para></para>
20     /// </summary>
21     public class JsonExporterCli<TLink>
22     where TLink : struct
23     {
24         /// <summary>
25         /// <para>
26         /// Runs the args.
27         /// </para>
28         /// <para></para>
29         /// </summary>
30         /// <param name="args">
31         /// <para>The args.</para>
32         /// <para></para>
33         /// </param>
34         public void Run(params string[] args)
35         {
36             var argumentIndex = 0;
37             var linksFilePath = ConsoleHelpers.GetOrReadArgument(argumentIndex++, "Links file
        ↪ path", args);
38             var jsonFilePath = ConsoleHelpers.GetOrReadArgument(argumentIndex++, "JSON file
        ↪ path", args);
39             var defaultDocumentName = Path.GetFileNameWithoutExtension(jsonFilePath);
40             var documentName = ConsoleHelpers.GetOrReadArgument(argumentIndex, $"Document name
        ↪ (default: {defaultDocumentName})", args);
41             if (string.IsNullOrEmpty(documentName))
42             {
43                 documentName = defaultDocumentName;
44             }
45             if (!File.Exists(linksFilePath))
46             {
47                 Console.WriteLine($"${linksFilePath} file does not exist.");
48             }
49             using FileStream jsonFileStream = new(jsonFilePath, FileMode.Append);
50             JsonSerializerOptions utf8JsonWriterOptions = new()
51             {
52                 Encoder = JavaScriptEncoder.UnsafeRelaxedJsonEscaping,
53                 Indented = true
54             };
55             Utf8JsonWriter utf8JsonWriter = new(jsonFileStream, utf8JsonWriterOptions);
56             var linksConstants = new LinksConstants<TLink>(enableExternalReferencesSupport:
        ↪ true);
57             using UnitedMemoryLinks<TLink> memoryAdapter = new (new
        ↪ FileMappedResizableDirectMemory(linksFilePath),
        ↪ UnitedMemoryLinks<TLink>.DefaultLinksSizeStep, linksConstants,
        ↪ IndexTreeType.Default);
58             var links = memoryAdapter.DecorateWithAutomaticUniquenessAndUsagesResolution();

```

```

59     BalancedVariantConverter<TLink> balancedVariantConverter = new(links);
60     var storage = new DefaultJsonStorage<TLink>(links, balancedVariantConverter);
61     var exporter = new JsonExporter<TLink>(storage);
62     var document = storage.GetDocumentOrDefault(documentName);
63     if (storage.EqualityComparer.Equals(document, default))
64     {
65         Console.WriteLine("No document with this name.");
66     }
67     using ConsoleCancellation cancellation = new ();
68     var cancellationToken = cancellation.Token;
69     Console.WriteLine("Press CTRL+C to stop.");
70     try
71     {
72         exporter.Export(document, ref utf8JsonWriter, in cancellationToken);
73     }
74     catch (Exception exception)
75     {
76         Console.WriteLine(exception);
77         return;
78     }
79     finally
80     {
81         utf8JsonWriter.Dispose();
82     }
83     Console.WriteLine("Export completed successfully.");
84 }
85 }
86 }

```

## 1.6 ./csharp/Platform.Data.Doublets.Json/JsonImporter.cs

```

1  using System;
2  using System.Collections.Generic;
3  using System.Text.Json;
4  using System.Threading;
5
6  #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
7
8  namespace Platform.Data.Doublets.Json
9  {
10     /// <summary>
11     /// <para>
12     /// Represents the json importer.
13     /// </para>
14     /// <para></para>
15     /// </summary>
16     public class JsonImporter<TLink>
17     {
18         /// <summary>
19         /// <para>
20         /// The storage.
21         /// </para>
22         /// <para></para>
23         /// </summary>
24         public readonly IJsonStorage<TLink> Storage;
25         /// <summary>
26         /// <para>
27         /// The default.
28         /// </para>
29         /// <para></para>
30         /// </summary>
31         public readonly EqualityComparer<TLink> EqualityComparer =
32             ↪ EqualityComparer<TLink>.Default;
33         /// <summary>
34         /// <para>
35         /// The parents.
36         /// </para>
37         /// <para></para>
38         /// </summary>
39         public readonly Stack<TLink> Parents = new ();
40         /// <summary>
41         /// <para>
42         /// Initializes a new <see cref="JsonImporter"/> instance.
43         /// </para>
44         /// <para></para>
45         /// </summary>
46         /// <param name="storage">
47         /// <para>A storage.</para>
48         /// <para></para>
49         /// </param>

```

```

49 public JsonImporter(IJsonStorage<TLink> storage) => Storage = storage;
50     private void PopIfParentIsMember()
51     {
52         var parent = Parents.Peek();
53         var parentMarker = Storage.GetValueMarker(parent);
54         if (EqualityComparer.Equals(parentMarker, Storage.MemberMarker))
55         {
56             Parents.Pop();
57         }
58     }
59
60     /// <summary>
61     /// <para>
62     /// Imports the document name.
63     /// </para>
64     /// <para></para>
65     /// </summary>
66     /// <param name="documentName">
67     /// <para>The document name.</para>
68     /// <para></para>
69     /// </param>
70     /// <param name="utf8JsonReader">
71     /// <para>The utf json reader.</para>
72     /// <para></para>
73     /// </param>
74     /// <param name="cancellationToken">
75     /// <para>The cancellation token.</para>
76     /// <para></para>
77     /// </param>
78     /// <exception cref="Exception">
79     /// <para>The document with the specified name already exists.</para>
80     /// <para></para>
81     /// </exception>
82     /// <returns>
83     /// <para>The document.</para>
84     /// <para></para>
85     /// </returns>
86 public TLink Import(string documentName, ref Utf8JsonReader utf8JsonReader, in
    ↳ Cancellation token cancellationToken)
87 {
88     Parents.Clear();
89     if (!EqualityComparer.Equals(Storage.GetDocumentOrDefault(documentName), default))
90     {
91         throw new Exception("The document with the specified name already exists.");
92     }
93     var document = Storage.CreateDocument(documentName);
94     Parents.Push(document);
95     TLink parent;
96     TLink parentMarker;
97     JsonTokenType tokenType;
98     TLink value;
99     TLink newParentArray;
100     while (utf8JsonReader.Read())
101     {
102         cancellationToken.ThrowIfCancellationRequested();
103         parent = Parents.Peek();
104         parentMarker = Storage.GetValueMarker(parent);
105         tokenType = utf8JsonReader.TokenType;
106         if (utf8JsonReader.TokenType == JsonTokenType.PropertyName)
107         {
108             var @object = Storage.GetObject(parent);
109             var property = utf8JsonReader.GetString();
110             Parents.Push(Storage.AttachMemberToObject(@object, property));
111         }
112         switch (tokenType)
113         {
114             case JsonTokenType.StartObject:
115             {
116                 value = Storage.CreateObjectValue();
117                 if (EqualityComparer.Equals(parentMarker, Storage.ArrayMarker))
118                 {
119                     Parents.Pop();
120                     newParentArray = Storage.AppendArrayValue(parent, value);
121                     Parents.Push(newParentArray);
122                     Parents.Push(value);
123                 }
124                 else
125                 {

```

```

126         var @object = Storage.Attach(parent, value);
127         Parents.Push(@object);
128     }
129     break;
130 }
131 case JsonTokenType.EndObject:
132     Parents.Pop();
133     break;
134 case JsonTokenType.StartArray:
135     value = Storage.CreateArrayValue(Array.Empty<TLink>());
136     Parents.Push(value);
137     break;
138 case JsonTokenType.EndArray:
139 {
140     var arrayValue = Parents.Pop();
141     parent = Parents.Peek();
142     parentMarker = Storage.GetValueMarker(parent);
143     if (EqualityComparer.Equals(parentMarker, Storage.ArrayMarker))
144     {
145         Parents.Pop();
146         newParentArray = Storage.AppendArrayValue(parent, arrayValue);
147         Parents.Push(newParentArray);
148     }
149     Storage.Attach(parent, arrayValue);
150     break;
151 }
152 case JsonTokenType.String:
153 {
154     var @string = utf8JsonReader.GetString();
155     value = Storage.CreateStringValue(@string);
156     if (EqualityComparer.Equals(parentMarker, Storage.ArrayMarker))
157     {
158         Parents.Pop();
159         newParentArray = Storage.AppendArrayValue(parent, value);
160         Parents.Push(newParentArray);
161     }
162     else
163     {
164         Storage.Attach(parent, value);
165     }
166     break;
167 }
168 case JsonTokenType.Number:
169 {
170     value = Storage.CreateNumberValue(utf8JsonReader.GetDecimal());
171     if (EqualityComparer.Equals(parentMarker, Storage.ArrayMarker))
172     {
173         Parents.Pop();
174         newParentArray = Storage.AppendArrayValue(parent, value);
175         Parents.Push(newParentArray);
176     }
177     else
178     {
179         Storage.Attach(parent, value);
180     }
181     break;
182 }
183 case JsonTokenType.True:
184 {
185     value = Storage.CreateBooleanValue(true);
186     if (EqualityComparer.Equals(parentMarker, Storage.ArrayMarker))
187     {
188         Parents.Pop();
189         newParentArray = Storage.AppendArrayValue(parent, value);
190         Parents.Push(newParentArray);
191     }
192     else
193     {
194         Storage.Attach(parent, value);
195     }
196     break;
197 }
198 case JsonTokenType.False:
199 {
200     value = Storage.CreateBooleanValue(false);
201     if (EqualityComparer.Equals(parentMarker, Storage.ArrayMarker))
202     {
203         Parents.Pop();
204         newParentArray = Storage.AppendArrayValue(parent, value);

```

```

205         Parents.Push(newParentArray);
206     }
207     else
208     {
209         Storage.Attach(parent, value);
210     }
211     break;
212 }
213 case JsonTokenType.Null:
214 {
215     value = Storage.CreateNullValue();
216     if (EqualityComparer.Equals(parentMarker, Storage.ArrayMarker))
217     {
218         Parents.Pop();
219         newParentArray = Storage.AppendArrayValue(parent, value);
220         Parents.Push(newParentArray);
221     }
222     else
223     {
224         Storage.Attach(parent, value);
225     }
226     break;
227 }
228 }
229 if (tokenType != JsonTokenType.PropertyName && tokenType !=
    ↳ JsonTokenType.StartObject && tokenType != JsonTokenType.StartArray)
230 {
231     PopIfParentIsMember();
232 }
233 }
234 return document;
235 }
236 }
237 }

```

## 1.7 ./csharp/Platform.Data.Doublets.Json/JsonImporterCli.cs

```

1  using System;
2  using System.IO;
3  using System.Text;
4  using Platform.Data.Doublets.Memory.United.Generic;
5  using Platform.IO;
6  using System.Text.Json;
7  using Platform.Data.Doublets.Memory;
8  using Platform.Data.Doublets.Sequences.Converters;
9  using Platform.Memory;
10
11 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
12
13 namespace Platform.Data.Doublets.Json
14 {
15     /// <summary>
16     /// <para>
17     /// Represents the json importer cli.
18     /// </para>
19     /// <para></para>
20     /// </summary>
21     public class JsonImporterCli<TLink>
22     where TLink : struct
23     {
24         /// <summary>
25         /// <para>
26         /// Runs the args.
27         /// </para>
28         /// <para></para>
29         /// </summary>
30         /// <param name="args">
31         /// <para>The args.</para>
32         /// <para></para>
33         /// </param>
34         public void Run(params string[] args)
35         {
36             var argumentIndex = 0;
37             var jsonFilePath = ConsoleHelpers.GetOrReadArgument(argumentIndex++, "JSON file
    ↳ path", args);
38             var linksFilePath = ConsoleHelpers.GetOrReadArgument(argumentIndex++, "Links file
    ↳ path", args);
39             var defaultDocumentName = Path.GetFileNameWithoutExtension(jsonFilePath);
40             var documentName = ConsoleHelpers.GetOrReadArgument(argumentIndex, $"Document name
    ↳ (default: {defaultDocumentName})", args);

```

```

41     if (string.IsNullOrEmpty(documentName))
42     {
43         documentName = defaultDocumentName;
44     }
45     if (!File.Exists(jsonFilePath))
46     {
47         Console.WriteLine($"${jsonFilePath} file does not exist.");
48     }
49     var json = File.ReadAllText(jsonFilePath);
50     var encodedJson = Encoding.UTF8.GetBytes(json);
51     ReadOnlySpan<byte> readOnlySpanEncodedJson = new(encodedJson);
52     Utf8JsonReader utf8JsonReader = new(readOnlySpanEncodedJson);
53     LinksConstants<TLink> linksConstants = new(enableExternalReferencesSupport: true);
54     FileMappedResizableDirectMemory fileMappedResizableDirectMemory = new(linksFilePath);
55     var unitedMemoryLinks = UnitedMemoryLinks<TLink>.DefaultLinksSizeStep;
56     const IndexTreeType indexTreeType = IndexTreeType.Default;
57     using UnitedMemoryLinks<TLink> memoryAdapter = new(fileMappedResizableDirectMemory,
58         ↪ unitedMemoryLinks, linksConstants, indexTreeType);
59     var links = memoryAdapter.DecorateWithAutomaticUniquenessAndUsagesResolution();
60     BalancedVariantConverter<TLink> balancedVariantConverter = new(links);
61     DefaultJsonStorage<TLink> storage = new(links, balancedVariantConverter);
62     JsonImporter<TLink> importer = new(storage);
63     using ConsoleCancellation cancellation = new();
64     var cancellationToken = cancellation.Token;
65     Console.WriteLine("Press CTRL+C to stop.");
66     try
67     {
68         importer.Import(documentName, ref utf8JsonReader, in cancellationToken);
69     }
70     catch (Exception exception)
71     {
72         Console.WriteLine(exception);
73         return;
74     }
75     Console.WriteLine("Import completed successfully.");
76 }
77 }

```

## 1.8 ./csharp/Platform.Data.Doublets.Json.Tests/JsonImportAndExportTests.cs

```

1  using System.Text;
2  using System.Text.Json;
3  using System.Threading;
4  using System.IO;
5  using Xunit;
6  using TLink = System.UInt64;
7  using Platform.Data.Doublets.Memory.United.Generic;
8  using Platform.Memory;
9  using Platform.Data.Doublets.Memory;
10 using System.Text.RegularExpressions;
11 using Platform.Data.Doublets.Sequences.Converters;
12
13 namespace Platform.Data.Doublets.Json.Tests
14 {
15     /// <summary>
16     /// <para>
17     /// Represents the json import and export tests.
18     /// </para>
19     /// <para></para>
20     /// </summary>
21     public class JsonImportAndExportTests
22     {
23         /// <summary>
24         /// <para>
25         /// The balanced variant converter.
26         /// </para>
27         /// <para></para>
28         /// </summary>
29         public static BalancedVariantConverter<TLink> BalancedVariantConverter;
30
31         /// <summary>
32         /// <para>
33         /// Creates the links.
34         /// </para>
35         /// <para></para>
36         /// </summary>
37         /// <returns>
38         /// <para>A links of t link</para>
39         /// <para></para>

```



```

40     /// </returns>
41     public static ILinks<TLink> CreateLinks() => CreateLinks<TLink>(new IO.TemporaryFile());
42
43     /// <summary>
44     /// <para>
45     /// Creates the links using the specified data db filename.
46     /// </para>
47     /// <para></para>
48     /// </summary>
49     /// <typeparam name="TLink">
50     /// <para>The link.</para>
51     /// <para></para>
52     /// </typeparam>
53     /// <param name="dataDBFilename">
54     /// <para>The data db filename.</para>
55     /// <para></para>
56     /// </param>
57     /// <returns>
58     /// <para>A links of t link</para>
59     /// <para></para>
60     /// </returns>
61     public static ILinks<TLink> CreateLinks<TLink>(string dataDBFilename)
62     {
63         var linksConstants = new LinksConstants<TLink>(enableExternalReferencesSupport:
64             ↪ true);
65         return new UnitedMemoryLinks<TLink>(new
66             ↪ FileMappedResizableDirectMemory(dataDBFilename),
67             ↪ UnitedMemoryLinks<TLink>.DefaultLinksSizeStep, linksConstants,
68             ↪ IndexTreeType.Default);
69     }
70
71     /// <summary>
72     /// <para>
73     /// Creates the json storage using the specified links.
74     /// </para>
75     /// <para></para>
76     /// </summary>
77     /// <param name="links">
78     /// <para>The links.</para>
79     /// <para></para>
80     /// </param>
81     /// <returns>
82     /// <para>A default json storage of t link</para>
83     /// <para></para>
84     /// </returns>
85     public static DefaultJsonStorage<TLink> CreateJsonStorage(ILinks<TLink> links) => new
86         ↪ (links, BalancedVariantConverter);
87
88     /// <summary>
89     /// <para>
90     /// Imports the storage.
91     /// </para>
92     /// <para></para>
93     /// </summary>
94     /// <param name="storage">
95     /// <para>The storage.</para>
96     /// <para></para>
97     /// </param>
98     /// <param name="documentName">
99     /// <para>The document name.</para>
100    /// <para></para>
101    /// </param>
102    /// <param name="json">
103    /// <para>The json.</para>
104    /// <para></para>
105    /// </param>
106    /// <returns>
107    /// <para>The link</para>
108    /// <para></para>
109    /// </returns>
110    public TLink Import(IJsonStorage<TLink> storage, string documentName, byte[] json)
111    {
112        Utf8JsonReader utf8JsonReader = new(json);
113        JsonImporter<TLink> jsonImporter = new(storage);
114        Cancellation_tokenSource importCancellation_tokenSource = new();
115        Cancellation_token cancellation_token = importCancellation_tokenSource.Token;
116        return jsonImporter.Import(documentName, ref utf8JsonReader, in cancellation_token);
117    }

```

```

113
114 /// <summary>
115 /// <para>
116 /// Exports the document link.
117 /// </para>
118 /// <para></para>
119 /// </summary>
120 /// <param name="documentLink">
121 /// <para>The document link.</para>
122 /// <para></para>
123 /// </param>
124 /// <param name="storage">
125 /// <para>The storage.</para>
126 /// <para></para>
127 /// </param>
128 /// <param name="stream">
129 /// <para>The stream.</para>
130 /// <para></para>
131 /// </param>
132 public void Export(TLink documentLink, IJsonStorage<TLink> storage, in MemoryStream
    ↳ stream)
133 {
134     Utf8JsonWriter writer = new(stream);
135     JsonExporter<TLink> jsonExporter = new(storage);
136     CancellationTokenSource exportCancellationTokenSource = new();
137     CancellationToken exportCancellationToken = exportCancellationTokenSource.Token;
138     jsonExporter.Export(documentLink, ref writer, in exportCancellationToken);
139     writer.Dispose();
140 }
141
142 /// <summary>
143 /// <para>
144 /// Tests that test.
145 /// </para>
146 /// <para></para>
147 /// </summary>
148 /// <param name="initialJson">
149 /// <para>The initial json.</para>
150 /// <para></para>
151 /// </param>
152 [Theory]
153 [InlineData("{}")]
154 [InlineData("\"stringValue\"")]
155 [InlineData("228")]
156 [InlineData("0.5")]
157 [InlineData("[]")]
158 [InlineData("true")]
159 [InlineData("false")]
160 [InlineData("null")]
161 [InlineData("{ \"string\": \"string\" }")]
162 [InlineData("{ \"null\": null }")]
163 [InlineData("{ \"boolean\": false }")]
164 [InlineData("{ \"boolean\": true }")]
165 [InlineData("{ \"array\": [] }")]
166 [InlineData("{ \"array\": [1] }")]
167 [InlineData("{ \"object\": {} }")]
168 [InlineData("{ \"number\": 1 }")]
169 [InlineData("{ \"decimal\": 0.5 }")]
170 [InlineData("[null]")]
171 [InlineData("[true]")]
172 [InlineData("[false]")]
173 [InlineData("[[]]")]
174 [InlineData("[[1]]")]
175 [InlineData("[[0.5]]")]
176 [InlineData("[{}]")]
177 [InlineData("[\"The Venus Project\"]")]
178 [InlineData("[{ \"title\": \"The Venus Project\" } ]")]
179 [InlineData("[1,2,3,4]")]
180 [InlineData("[-0.5, 0.5]")]
181 public void Test(string initialJson)
182 {
183     var links = CreateLinks();
184     BalancedVariantConverter = new(links);
185     var storage = CreateJsonStorage(links);
186     var json = Encoding.UTF8.GetBytes(initialJson);
187     var documentLink = Import(storage, "documentName", json);
188     MemoryStream stream = new();
189     Export(documentLink, storage, in stream);

```

```

190         string exportedJson = Encoding.UTF8.GetString(stream.ToArray());
191         stream.Dispose();
192         var minimizedInitialJson = Regex.Replace(initialJson,
193             ↪ "(\\"(?:[^\\"\\\\]|\\\\\\\\.)*\\")|\\s+", "$1");
194         Assert.Equal(minimizedInitialJson, exportedJson);
195     }
196 }

```

## 1.9 ./csharp/Platform.Data.Doublets.Json.Tests/JsonStorageTests.cs

```

1  using Xunit;
2  using Platform.Data.Doublets.Memory.United.Generic;
3  using Platform.Data.Doublets.Memory;
4  using Platform.Memory;
5  using TLink = System.UInt32;
6  using Xunit.Abstractions;
7  using Platform.Collections.Stacks;
8  using Platform.Data.Doublets.Sequences.Walkers;
9  using System.Collections.Generic;
10 using Platform.Data.Doublets.Sequences.Converters;
11
12 namespace Platform.Data.Doublets.Json.Tests
13 {
14     /// <summary>
15     /// <para>
16     /// Represents the json storage tests.
17     /// </para>
18     /// <para></para>
19     /// </summary>
20     public class JsonStorageTests
21     {
22         private readonly ITestOutputHelper output;
23         /// <summary>
24         /// <para>
25         /// The balanced variant converter.
26         /// </para>
27         /// <para></para>
28         /// </summary>
29         public static BalancedVariantConverter<TLink> BalancedVariantConverter;
30
31         /// <summary>
32         /// <para>
33         /// Initializes a new <see cref="JsonStorageTests"/> instance.
34         /// </para>
35         /// <para></para>
36         /// </summary>
37         /// <param name="output">
38         /// <para>A output.</para>
39         /// <para></para>
40         /// </param>
41         public JsonStorageTests(ITestOutputHelper output)
42         {
43             this.output = output;
44         }
45
46         /// <summary>
47         /// <para>
48         /// Creates the links.
49         /// </para>
50         /// <para></para>
51         /// </summary>
52         /// <returns>
53         /// <para>A links of t link</para>
54         /// <para></para>
55         /// </returns>
56         public static ILinks<TLink> CreateLinks() => CreateLinks<TLink>(new
57             ↪ Platform.IO.TemporaryFile());
58
59         /// <summary>
60         /// <para>
61         /// Creates the links using the specified data db filename.
62         /// </para>
63         /// <para></para>
64         /// </summary>
65         /// <typeparam name="TLink">
66         /// <para>The link.</para>
67         /// <para></para>
68         /// </typeparam>
69         /// <param name="dataDBFilename">

```

```

69     /// <para>The data db filename.</para>
70     /// <para></para>
71     /// </param>
72     /// <returns>
73     /// <para>A links of t link</para>
74     /// <para></para>
75     /// </returns>
76     public static ILinks<TLink> CreateLinks<TLink>(string dataDBFilename)
77     {
78         var linksConstants = new LinksConstants<TLink>(enableExternalReferencesSupport:
79             ↪ true);
80         return new UnitedMemoryLinks<TLink>(new
81             ↪ FileMappedResizableDirectMemory(dataDBFilename),
82             ↪ UnitedMemoryLinks<TLink>.DefaultLinksSizeStep, linksConstants,
83             ↪ IndexTreeType.Default);
84     }
85     /// <summary>
86     /// <para>
87     /// Creates the json storage.
88     /// </para>
89     /// <para></para>
90     /// </summary>
91     /// <returns>
92     /// <para>A default json storage of t link</para>
93     /// <para></para>
94     /// </returns>
95     public static DefaultJsonStorage<TLink> CreateJsonStorage()
96     {
97         var links = CreateLinks();
98         return CreateJsonStorage(links);
99     }
100     /// <summary>
101     /// <para>
102     /// Creates the json storage using the specified links.
103     /// </para>
104     /// <para></para>
105     /// </summary>
106     /// <param name="links">
107     /// <para>The links.</para>
108     /// <para></para>
109     /// </param>
110     /// <returns>
111     /// <para>A default json storage of t link</para>
112     /// <para></para>
113     /// </returns>
114     public static DefaultJsonStorage<TLink> CreateJsonStorage(ILinks<TLink> links)
115     {
116         BalancedVariantConverter = new(links);
117         return new DefaultJsonStorage<TLink>(links, BalancedVariantConverter);
118     }
119     /// <summary>
120     /// <para>
121     /// Tests that constructors test.
122     /// </para>
123     /// <para></para>
124     /// </summary>
125     [Fact]
126     public void ConstructorsTest() => CreateJsonStorage();
127     /// <summary>
128     /// <para>
129     /// Tests that create document test.
130     /// </para>
131     /// <para></para>
132     /// </summary>
133     [Fact]
134     public void CreateDocumentTest()
135     {
136         var defaultJsonStorage = CreateJsonStorage();
137         defaultJsonStorage.CreateDocument("documentName");
138     }
139     /// <summary>
140     /// <para>
141     /// Tests that get document test.

```

```

143 /// </para>
144 /// <para></para>
145 /// </summary>
146 [Fact]
147 public void GetDocumentTest()
148 {
149     var defaultJsonStorage = CreateJsonStorage();
150     var createdDocumentLink = defaultJsonStorage.CreateDocument("documentName");
151     var foundDocumentLink = defaultJsonStorage.GetDocumentOrDefault("documentName");
152     Assert.Equal(createdDocumentLink, foundDocumentLink);
153 }
154
155 /// <summary>
156 /// <para>
157 /// Tests that create object test.
158 /// </para>
159 /// <para></para>
160 /// </summary>
161 [Fact]
162 public void CreateObjectTest()
163 {
164     var defaultJsonStorage = CreateJsonStorage();
165     var object0 = defaultJsonStorage.CreateObjectValue();
166     var object1 = defaultJsonStorage.CreateObjectValue();
167     Assert.NotEqual(object0, object1);
168 }
169
170 /// <summary>
171 /// <para>
172 /// Tests that create string test.
173 /// </para>
174 /// <para></para>
175 /// </summary>
176 [Fact]
177 public void CreateStringTest()
178 {
179     var defaultJsonStorage = CreateJsonStorage();
180     defaultJsonStorage.CreateString("string");
181 }
182
183 /// <summary>
184 /// <para>
185 /// Tests that create member test.
186 /// </para>
187 /// <para></para>
188 /// </summary>
189 [Fact]
190 public void CreateMemberTest()
191 {
192     var defaultJsonStorage = CreateJsonStorage();
193     var document = defaultJsonStorage.CreateDocument("documentName");
194     defaultJsonStorage.AttachObject(document);
195     defaultJsonStorage.CreateMember("keyName");
196 }
197
198 /// <summary>
199 /// <para>
200 /// Tests that attach object value to document test.
201 /// </para>
202 /// <para></para>
203 /// </summary>
204 [Fact]
205 public void AttachObjectValueToDocumentTest()
206 {
207     var links = CreateLinks();
208     var defaultJsonStorage = CreateJsonStorage(links);
209     TLink document = defaultJsonStorage.CreateDocument("documentName");
210     TLink documentValueLink = defaultJsonStorage.AttachObject(document);
211     TLink createdObjectValue = links.GetTarget(documentValueLink);
212
213     TLink valueMarker = links.GetSource(createdObjectValue);
214     Assert.Equal(valueMarker, defaultJsonStorage.ValueMarker);
215
216     TLink createdObject = links.GetTarget(createdObjectValue);
217     TLink objectMarker = links.GetSource(createdObject);
218     Assert.Equal(objectMarker, defaultJsonStorage.ObjectMarker);
219
220     TLink foundDocumentValue = defaultJsonStorage.GetValueLink(document);

```

```

221     Assert.Equal(createdObjectValue, foundDocumentValue);
222 }
223
224 /// <summary>
225 /// <para>
226 /// Tests that attach string value to document test.
227 /// </para>
228 /// <para></para>
229 /// </summary>
230 [Fact]
231 public void AttachStringValueToDocumentTest()
232 {
233     var links = CreateLinks();
234     var defaultJsonStorage = CreateJsonStorage(links);
235     TLink document = defaultJsonStorage.CreateDocument("documentName");
236     TLink documentStringLink = defaultJsonStorage.AttachString(document, "stringName");
237     TLink createdStringValue = links.GetTarget(documentStringLink);
238
239     TLink valueMarker = links.GetSource(createdStringValue);
240     Assert.Equal(valueMarker, defaultJsonStorage.ValueMarker);
241
242     TLink createdString = links.GetTarget(createdStringValue);
243     TLink stringMarker = links.GetSource(createdString);
244     Assert.Equal(stringMarker, defaultJsonStorage.StringMarker);
245
246     TLink foundStringValue = defaultJsonStorage.GetValueLink(document);
247     Assert.Equal(createdStringValue, foundStringValue);
248 }
249
250 /// <summary>
251 /// <para>
252 /// Tests that attach number to document test.
253 /// </para>
254 /// <para></para>
255 /// </summary>
256 [Fact]
257 public void AttachNumberToDocumentTest()
258 {
259     var links = CreateLinks();
260     var defaultJsonStorage = CreateJsonStorage(links);
261     TLink document = defaultJsonStorage.CreateDocument("documentName");
262     TLink documentNumberLink = defaultJsonStorage.AttachNumber(document, 2021);
263     TLink createdNumberValue = links.GetTarget(documentNumberLink);
264
265     TLink valueMarker = links.GetSource(createdNumberValue);
266     Assert.Equal(valueMarker, defaultJsonStorage.ValueMarker);
267
268     TLink createdNumber = links.GetTarget(createdNumberValue);
269     TLink numberMarker = links.GetSource(createdNumber);
270     Assert.Equal(numberMarker, defaultJsonStorage.NumberMarker);
271
272     TLink foundNumberValue = defaultJsonStorage.GetValueLink(document);
273     Assert.Equal(createdNumberValue, foundNumberValue);
274 }
275
276 /// <summary>
277 /// <para>
278 /// Tests that attach true value to document test.
279 /// </para>
280 /// <para></para>
281 /// </summary>
282 [Fact]
283 public void AttachTrueValueToDocumentTest()
284 {
285     var links = CreateLinks();
286     var defaultJsonStorage = CreateJsonStorage(links);
287     TLink document = defaultJsonStorage.CreateDocument("documentName");
288
289     TLink documentTrueValueLink = defaultJsonStorage.AttachBoolean(document, true);
290     TLink createdTrueValue = links.GetTarget(documentTrueValueLink);
291
292     TLink valueMarker = links.GetSource(createdTrueValue);
293     Assert.Equal(valueMarker, defaultJsonStorage.ValueMarker);
294
295     TLink trueMarker = links.GetTarget(createdTrueValue);
296     Assert.Equal(trueMarker, defaultJsonStorage.TrueMarker);
297
298     TLink foundTrueValue = defaultJsonStorage.GetValueLink(document);
299     Assert.Equal(createdTrueValue, foundTrueValue);

```

```

300 }
301
302 /// <summary>
303 /// <para>
304 /// Tests that attach false value to document test.
305 /// </para>
306 /// <para></para>
307 /// </summary>
308 [Fact]
309 public void AttachFalseValueToDocumentTest()
310 {
311     var links = CreateLinks();
312     var defaultJsonStorage = CreateJsonStorage(links);
313     TLink document = defaultJsonStorage.CreateDocument("documentName");
314
315     TLink documentFalseValueLink = defaultJsonStorage.AttachBoolean(document, false);
316     TLink createdFalseValue = links.GetTarget(documentFalseValueLink);
317
318     TLink valueMarker = links.GetSource(createdFalseValue);
319     Assert.Equal(valueMarker, defaultJsonStorage.ValueMarker);
320
321     TLink falseMarker = links.GetTarget(createdFalseValue);
322     Assert.Equal(falseMarker, defaultJsonStorage.FalseMarker);
323
324     TLink foundFalseValue = defaultJsonStorage.GetValueLink(document);
325     Assert.Equal(createdFalseValue, foundFalseValue);
326 }
327
328 /// <summary>
329 /// <para>
330 /// Tests that attach null value to document test.
331 /// </para>
332 /// <para></para>
333 /// </summary>
334 [Fact]
335 public void AttachNullValueToDocumentTest()
336 {
337     var links = CreateLinks();
338     var defaultJsonStorage = CreateJsonStorage(links);
339     TLink document = defaultJsonStorage.CreateDocument("documentName");
340
341     TLink documentNullValueLink = defaultJsonStorage.AttachNull(document);
342     TLink createdNullValue = links.GetTarget(documentNullValueLink);
343
344     TLink valueMarker = links.GetSource(createdNullValue);
345     Assert.Equal(valueMarker, defaultJsonStorage.ValueMarker);
346
347     TLink nullMarker = links.GetTarget(createdNullValue);
348     Assert.Equal(nullMarker, defaultJsonStorage.NullMarker);
349
350     TLink foundNullValue = defaultJsonStorage.GetValueLink(document);
351     Assert.Equal(createdNullValue, foundNullValue);
352 }
353
354 /// <summary>
355 /// <para>
356 /// Tests that attach empty array value to document test.
357 /// </para>
358 /// <para></para>
359 /// </summary>
360 [Fact]
361 public void AttachEmptyArrayValueToDocumentTest()
362 {
363     var links = CreateLinks();
364     var defaultJsonStorage = CreateJsonStorage(links);
365     TLink document = defaultJsonStorage.CreateDocument("documentName");
366
367     TLink documentArrayValueLink = defaultJsonStorage.AttachArray(document, new
        ↪ TLink[0]);
368     TLink createdArrayValue = links.GetTarget(documentArrayValueLink);
369     output.WriteLine(links.Format(createdArrayValue));
370
371     TLink valueMarker = links.GetSource(createdArrayValue);
372     Assert.Equal(valueMarker, defaultJsonStorage.ValueMarker);
373
374     TLink createdArrayLink = links.GetTarget(createdArrayValue);
375     TLink arrayMarker = links.GetSource(createdArrayLink);
376     Assert.Equal(arrayMarker, defaultJsonStorage.ArrayMarker);
377

```

```

378
379     TLink createArrayContents = links.GetTarget(createdArrayLink);
380     Assert.Equal(createArrayContents, defaultJsonStorage.EmptyArrayMarker);
381
382     TLink foundArrayValue = defaultJsonStorage.GetValueLink(document);
383     Assert.Equal(createdArrayValue, foundArrayValue);
384 }
385
386 /// <summary>
387 /// <para>
388 /// Tests that attach array value to document test.
389 /// </para>
390 /// <para></para>
391 /// </summary>
392 [Fact]
393 public void AttachArrayValueToDocumentTest()
394 {
395     var links = CreateLinks();
396     var defaultJsonStorage = CreateJsonStorage(links);
397     TLink document = defaultJsonStorage.CreateDocument("documentName");
398
399     TLink arrayElement = defaultJsonStorage.CreateString("arrayElement");
400     TLink[] array = new TLink[] { arrayElement, arrayElement, arrayElement };
401
402
403     TLink documentArrayValueLink = defaultJsonStorage.AttachArray(document, array);
404     TLink createdArrayValue = links.GetTarget(documentArrayValueLink);
405
406     DefaultStack<TLink> stack = new();
407     RightSequenceWalker<TLink> rightSequenceWalker = new(links, stack, arrayElementLink
408         ↪ => links.GetSource(arrayElementLink) == defaultJsonStorage.ValueMarker);
409     IEnumerable<TLink> arrayElementsValuesLink =
410         ↪ rightSequenceWalker.Walk(createdArrayValue);
411     Assert.NotEmpty(arrayElementsValuesLink);
412
413     output.WriteLine(links.Format(createdArrayValue));
414
415     TLink valueMarker = links.GetSource(createdArrayValue);
416     Assert.Equal(valueMarker, defaultJsonStorage.ValueMarker);
417
418     TLink createdArrayLink = links.GetTarget(createdArrayValue);
419     TLink arrayMarker = links.GetSource(createdArrayLink);
420     Assert.Equal(arrayMarker, defaultJsonStorage.ArrayMarker);
421
422     TLink createdArrayContents = links.GetTarget(createdArrayLink);
423     Assert.Equal(links.GetTarget(createdArrayContents), arrayElement);
424
425     TLink foundArrayValue = defaultJsonStorage.GetValueLink(document);
426     Assert.Equal(createdArrayValue, foundArrayValue);
427 }
428
429 /// <summary>
430 /// <para>
431 /// Tests that get object from document object value link test.
432 /// </para>
433 /// <para></para>
434 /// </summary>
435 [Fact]
436 public void GetObjectFromDocumentObjectValueLinkTest()
437 {
438     ILinks<TLink> links = CreateLinks();
439     var defaultJsonStorage = CreateJsonStorage(links);
440     TLink document = defaultJsonStorage.CreateDocument("documentName");
441     TLink documentObjectValueLink = defaultJsonStorage.AttachObject(document);
442     TLink objectValueLink = links.GetTarget(documentObjectValueLink);
443     TLink objectFromGetObject = defaultJsonStorage.GetObject(documentObjectValueLink);
444     output.WriteLine(links.Format(objectValueLink));
445     output.WriteLine(links.Format(objectFromGetObject));
446     Assert.Equal(links.GetTarget(objectValueLink), objectFromGetObject);
447 }
448
449 /// <summary>
450 /// <para>
451 /// Tests that get object from object value link test.
452 /// </para>
453 /// <para></para>
454 /// </summary>

```



```

455 [Fact]
456 public void GetObjectFromObjectValueLinkTest()
457 {
458     ILinks<TLink> links = CreateLinks();
459     var defaultJsonStorage = CreateJsonStorage(links);
460     TLink document = defaultJsonStorage.CreateDocument("documentName");
461     TLink documentObjectValueLink = defaultJsonStorage.AttachObject(document);
462     TLink objectValueLink = links.GetTarget(documentObjectValueLink);
463     TLink objectFromGetObject = defaultJsonStorage.GetObject(objectValueLink);
464     Assert.Equal(links.GetTarget(objectValueLink), objectFromGetObject);
465 }
466
467 /// <summary>
468 /// <para>
469 /// Tests that attach string value to key.
470 /// </para>
471 /// <para></para>
472 /// </summary>
473 [Fact]
474 public void AttachStringValueToKey()
475 {
476     ILinks<TLink> links = CreateLinks();
477     var defaultJsonStorage = CreateJsonStorage(links);
478     TLink document = defaultJsonStorage.CreateDocument("documentName");
479     TLink documentObjectValue = defaultJsonStorage.AttachObject(document);
480     TLink @object = defaultJsonStorage.GetObject(documentObjectValue);
481     TLink memberLink = defaultJsonStorage.AttachMemberToObject(@object, "keyName");
482     TLink memberStringValueLink = defaultJsonStorage.AttachString(memberLink,
483         ↪ "stringValue");
484     TLink stringValueLink = links.GetTarget(memberStringValueLink);
485     List<TLink> objectMembersLinks = defaultJsonStorage.GetMembersLinks(@object);
486     Assert.Equal(memberLink, objectMembersLinks[0]);
487     Assert.Equal(stringValueLink,
488         ↪ defaultJsonStorage.GetValueLink(objectMembersLinks[0]));
489 }
490
491 /// <summary>
492 /// <para>
493 /// Tests that attach number value to key.
494 /// </para>
495 /// <para></para>
496 /// </summary>
497 [Fact]
498 public void AttachNumberValueToKey()
499 {
500     ILinks<TLink> links = CreateLinks();
501     var defaultJsonStorage = CreateJsonStorage(links);
502     TLink document = defaultJsonStorage.CreateDocument("documentName");
503     TLink documentObjectValue = defaultJsonStorage.AttachObject(document);
504     TLink @object = defaultJsonStorage.GetObject(documentObjectValue);
505     TLink memberLink = defaultJsonStorage.AttachMemberToObject(@object, "keyName");
506     TLink memberNumberValueLink = defaultJsonStorage.AttachNumber(memberLink, 123);
507     TLink numberValueLink = links.GetTarget(memberNumberValueLink);
508     List<TLink> objectMembersLinks = defaultJsonStorage.GetMembersLinks(@object);
509     Assert.Equal(memberLink, objectMembersLinks[0]);
510     Assert.Equal(numberValueLink,
511         ↪ defaultJsonStorage.GetValueLink(objectMembersLinks[0]));
512 }
513
514 /// <summary>
515 /// <para>
516 /// Tests that attach object value to key.
517 /// </para>
518 /// <para></para>
519 /// </summary>
520 [Fact]
521 public void AttachObjectValueToKey()
522 {
523     ILinks<TLink> links = CreateLinks();
524     var defaultJsonStorage = CreateJsonStorage(links);
525     TLink document = defaultJsonStorage.CreateDocument("documentName");
526     TLink documentObjectValue = defaultJsonStorage.AttachObject(document);
527     TLink @object = defaultJsonStorage.GetObject(documentObjectValue);
528     TLink memberLink = defaultJsonStorage.AttachMemberToObject(@object, "keyName");
529     TLink memberObjectValueLink = defaultJsonStorage.AttachObject(memberLink);
530     TLink objectValueLink = links.GetTarget(memberObjectValueLink);
531     List<TLink> objectMembersLinks = defaultJsonStorage.GetMembersLinks(@object);
532     Assert.Equal(memberLink, objectMembersLinks[0]);

```

```

530     Assert.Equal(objectValueLink,
    ↪     defaultJsonStorage.GetValueLink(objectMembersLinks[0]));
531 }
532
533 /// <summary>
534 /// <para>
535 /// Tests that attach array value to key.
536 /// </para>
537 /// <para></para>
538 /// </summary>
539 [Fact]
540 public void AttachArrayValueToKey()
541 {
542     ILinks<TLink> links = CreateLinks();
543     var defaultJsonStorage = CreateJsonStorage(links);
544     TLink document = defaultJsonStorage.CreateDocument("documentName");
545     TLink documentObjectValue = defaultJsonStorage.AttachObject(document);
546     TLink @object = defaultJsonStorage.GetObject(documentObjectValue);
547     TLink memberLink = defaultJsonStorage.AttachMemberToObject(@object, "keyName");
548     TLink arrayElement = defaultJsonStorage.CreateString("arrayElement");
549     TLink[] array = { arrayElement, arrayElement, arrayElement };
550     TLink memberArrayValueLink = defaultJsonStorage.AttachArray(memberLink, array);
551     TLink arrayValueLink = links.GetTarget(memberArrayValueLink);
552     List<TLink> objectMembersLinks = defaultJsonStorage.GetMembersLinks(@object);
553     Assert.Equal(memberLink, objectMembersLinks[0]);
554     Assert.Equal(arrayValueLink, defaultJsonStorage.GetValueLink(objectMembersLinks[0]));
555 }
556
557 /// <summary>
558 /// <para>
559 /// Tests that attach true value to key.
560 /// </para>
561 /// <para></para>
562 /// </summary>
563 [Fact]
564 public void AttachTrueValueToKey()
565 {
566     ILinks<TLink> links = CreateLinks();
567     var defaultJsonStorage = CreateJsonStorage(links);
568     TLink document = defaultJsonStorage.CreateDocument("documentName");
569     TLink documentObjectValue = defaultJsonStorage.AttachObject(document);
570     TLink @object = defaultJsonStorage.GetObject(documentObjectValue);
571     TLink memberLink = defaultJsonStorage.AttachMemberToObject(@object, "keyName");
572     TLink memberTrueValueLink = defaultJsonStorage.AttachBoolean(memberLink, true);
573     TLink trueValueLink = links.GetTarget(memberTrueValueLink);
574     List<TLink> objectMembersLinks = defaultJsonStorage.GetMembersLinks(@object);
575     Assert.Equal(memberLink, objectMembersLinks[0]);
576     Assert.Equal(trueValueLink, defaultJsonStorage.GetValueLink(objectMembersLinks[0]));
577 }
578
579 /// <summary>
580 /// <para>
581 /// Tests that attach false value to key.
582 /// </para>
583 /// <para></para>
584 /// </summary>
585 [Fact]
586 public void AttachFalseValueToKey()
587 {
588     ILinks<TLink> links = CreateLinks();
589     var defaultJsonStorage = CreateJsonStorage(links);
590     TLink document = defaultJsonStorage.CreateDocument("documentName");
591     TLink documentObjectValue = defaultJsonStorage.AttachObject(document);
592     TLink @object = defaultJsonStorage.GetObject(documentObjectValue);
593     TLink memberLink = defaultJsonStorage.AttachMemberToObject(@object, "keyName");
594     TLink memberFalseValueLink = defaultJsonStorage.AttachBoolean(memberLink, false);
595     TLink falseValueLink = links.GetTarget(memberFalseValueLink);
596     List<TLink> objectMembersLinks = defaultJsonStorage.GetMembersLinks(@object);
597     Assert.Equal(memberLink, objectMembersLinks[0]);
598     Assert.Equal(falseValueLink, defaultJsonStorage.GetValueLink(objectMembersLinks[0]));
599 }
600
601 /// <summary>
602 /// <para>
603 /// Tests that attach null value to key.
604 /// </para>
605 /// <para></para>
606 /// </summary>

```

```

607 [Fact]
608 public void AttachNullValueToKey()
609 {
610     ILinks<TLink> links = CreateLinks();
611     var defaultJsonStorage = CreateJsonStorage(links);
612     TLink document = defaultJsonStorage.CreateDocument("documentName");
613     TLink documentObjectValue = defaultJsonStorage.AttachObject(document);
614     TLink @object = defaultJsonStorage.GetObject(documentObjectValue);
615     TLink memberLink = defaultJsonStorage.AttachMemberToObject(@object, "keyName");
616     TLink memberNullValueLink = defaultJsonStorage.AttachNull(memberLink);
617     TLink nullValueLink = links.GetTarget(memberNullValueLink);
618     List<TLink> objectMembersLinks = defaultJsonStorage.GetMembersLinks(@object);
619     Assert.Equal(nullValueLink, defaultJsonStorage.GetValueLink(objectMembersLinks[0]));
620 }
621 }
622 }

```

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