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# **Session 22: Good *art* Workflow**

*or*

# **Guidelines for better job configuration**

***Solutions***

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# Practice – [A.4]


---

```
// test4.fcl  
BEGIN_PROLOG  
seq1 : [ 1, 2, 3 ]  
seq2 : [ a, b, c ]  
END_PROLOG  
seq : [ @local::seq1, @sequence::seq2 ]  
seq[0] : 0
```

# Practice – [A.4]

---

```
// test4.fcl
BEGIN_PROLOG
seq1 : [ 1, 2, 3 ]
seq2 : [ a, b, c ]
END_PROLOG
seq : [ @local::seq1, @sequence::seq2 ]
seq[0] : 0
```




seq : [ [ 1, 2, 3 ], a, b, c ]

The diagram shows the resulting array structure. The first element is an array [1, 2, 3], which is indexed as [0]. The subsequent elements are a, b, and c, indexed as [1], [2], and [3] respectively.

# Practice – [A.4]

---

```
// test4.fcl
BEGIN_PROLOG
seq1 : [ 1, 2, 3 ]
seq2 : [ a, b, c ]
END_PROLOG
seq  : [ @local::seq1, @sequence::seq2 ]
seq[0] : 0
```



```
seq : [ [ 1, 2, 3], a, b, c ]
seq : [ 0           , a, b, c ]
```

# Practice – [A.5]


---

```
// test5.fcl  
BEGIN_PROLOG  
table1 : { foo : bar }  
END_PROLOG  
seq : [ @table::table1, {f:2} ]
```

# Practice – [A.5]

---

```
// test5.fcl  
BEGIN_PROLOG  
table1 : { foo : bar }  
END_PROLOG  
seq : [ @table::table1, {f:2} ]
```



```
seq : [ foo : bar, {f:2} ]
```

# Practice – [A.5]

---

```
// test5.fc1
BEGIN_PROLOG
table1 : { foo : bar }
END_PROLOG
seq : [ @table::table1, {f:2} ]
```



```
seq : [ foo : bar, {f:2} ]
```

parse error – there can be no bare  
parameter assignments within a sequence.

# Practice – [A.5]

---

```
// test5.fcl  
BEGIN_PROLOG  
table1 : { foo : bar }  
END_PROLOG  
seq : [ @table::table1, {f:2} ]
```



```
seq : [ foo : bar, {f:2} ]
```

parse error – there can be no bare  
parameter assignments within a sequence.  
They must be contained within an anonymous table.



# Practice – [A.5]

---

```
// test5.fcl  
BEGIN_PROLOG  
table1 : { foo : bar }  
END_PROLOG  
seq : [ @table::table1, {f:2} ]
```

```
seq : [ foo : bar, {f:2} ]
```

```
seq : [ { foo : bar}, {f:2} ]
```

# Practice – [A.5]

---

```
// test5.fcl  
BEGIN_PROLOG  
table1 : { foo : bar }  
END_PROLOG  
seq : [ @table::table1, {f:2} ]
```

```
seq : [ foo : bar, {f:2} ]
```

```
seq : [ { foo : bar}, {f:2} ]
```

```
seq : [ @local::table1, {f:2} ]
```

# SPoM – [B.1]

---

```
#include "alice.fcl"
physics.analyzers.inspectHits      : {
  module_type : InspectFittedHelix
  fitsTag     : fitter
  maxPrint    : 5
}
services.TFileService.fileName : "output/bob.root"
outputs.outfile.fileName: "output/bob.art"
```

# SPoM – [B.1]

---

```
#include "alice.fcl"
physics.analyzers.inspectHits      : {
  module_type : InspectFittedHelix
  fitsTag    : fitter
  maxPrint   : 5
}
services.TFileService.
outputs.outfile.fileName
```

```
inspectHits : {
  module_type : InspectTrkHits
  hitMakerTag : "makeHits"
  maxPrint    : 0
}
```

# SPoM – [B.1]

---

```
#include "alice.fcl"
physics.analyzers.inspectHits : {
  module_type : InspectFittedHelix
  fitsTag : fitter
  maxPrint : 5
}
services.TFileService.
outputs.outfile.fileName
```

```
inspectHits : {
  module_type : InspectTrkHits
  hitMakerTag : "makeHits"
  maxPrint : 0
}
```

# SPoM – [B.1]

---

```
#include "alice.fcl"
physics.analyzers.inspectHits      : {
  module_type : InspectFittedHelix
  fitsTag     : fitter
  maxPrint    : 5
}
services.TFileService.fileName : "output/bob.root"
outputs.outfile.fileName: "output/bob.art"
```



```
#include "alice.fcl"
physics.analyzers.inspectHits.maxPrint : 5
services.TFileService.fileName : "output/bob.root"
outputs.outfile.fileName: "output/bob.art"
```

# SPoM – [B.2]

---

```
#include "bob.fcl"  
#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2  
physics.analyzers.massPlot.maxPrint : 6  
e1 : [ inspectGens, inspectIntersections, inspectHits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
```

# SPoM – [B.2]

---

```
#include "bob.fcl"  
#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2  
physics.analyzers.massPlot.maxPrint : 6  
e1 : [ inspectGens, inspectIntersections, inspectHits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
```



# SPoM – [B.2]

---


```
#include "bob.fcl"  
#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2  
physics.analyzers.massPlot.maxPrint : 6  
e1 : [ inspectGens, inspectIntersections, inspectHits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
```

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source.maxEvents : 2  
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e1 : [ inspectGens, inspectIntersections, inspectFits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
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# SPoM – [B.2]

---

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#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2  
physics.analyzers.massPlot.maxPrint : 6  
e1 : [ inspectGens, inspectIntersections, inspectHits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
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physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
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# SPoM – [B.2]

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physics.analyzers.massPlot.maxPrint : 6  
e1 : [ inspectGens, inspectIntersections, inspectHits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
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e1 : [ inspectGens, inspectIntersections, inspectFits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
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#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2  
physics.analyzers.massPlot.maxPrint : 6  
physics.e1 : [ inspectGens, inspectIntersections, inspectFits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
```

# SPoM – [B.2]

---

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#include "bob.fcl"  
#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2  
physics.analyzers.massPlot.maxPrint : 6  
e1 : [ inspectGens, inspectIntersections, inspectHits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
```

```
#include "bob.fcl"  
#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2
```

```
#include "bob.fcl"  
#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2  
physics.analyzers.massPlot.maxPrint : 6  
physics.e1 : [ inspectGens, inspectIntersections, inspectFits, inspectHits, massPlot, outfile ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
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```
#include "bob.fcl"  
#include "evelyns_mass_analyzer.fcl"  
source.maxEvents : 2  
physics.analyzers.massPlot.maxPrint : 6  
physics.e1 : [ inspectGens, inspectIntersections, inspectFits, inspectHits, massPlot, outfile ]  
physics.end_paths : [ e1 ]  
services.TFileService.fileName : "output/charlie.root"  
outputs.outfile.fileName: "output/charlie.art"
```

# SPoM – [B.6]

---

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"

process_name : Alice

services : {
  @table::services
  TFileService : { fileName : "output/alice.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]

  trigger_paths : [p1]
  end_paths      : [e1]
}
```

# SPoM – [B.6]

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"

process_name : Alice

services : {
  @table::services
  TFileService : { fileName : "output/alice.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]

  trigger_paths : [p1]
  end_paths      : [e1]
}
```

```
BEGIN_PROLOG

services : {
  message : {
    destinations : {
      log : {
        type: cout
        threshold : 1
        categories :
          ArtReport
          Prompt
          default
      }
    }
  }
}

RandomNumberGenerator

# From toyExperiment
Geometry : { geometri
Conditions : { conditi
PDT : { pdtFile
```

# SPoM – [B.6]

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"

process_name : Alice

services : {
  @table::services
  TFileService : { fileName : "output/alice.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]

  trigger_paths : [p1]
  end_paths      : [e1]
}
```

```
simulation : {
  evtgen      : @local:
  detsim      : @local:
}
simList : [ evtgen, detsim ]

tracking : {
  makeHits    : @local:
  fitter      : @local:
}
trackList : [ makeHits,
```

# SPoM – [B.6]

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"

process_name : Alice

services : {
  @table::services
  TFileService : { fileName : "output/alice.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]

  trigger_paths : [p1]
  end_paths      : [e1]
}
```

```
simulation : {
  evtgen      : @local:
  detsim      : @local:
}
simList : [ evtgen, detsim ]
tracking : {
  makeHits    : @local:
  fitter      : @local:
}
trackList : [ makeHits,
```



# SPoM – [B.6]

---

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"

process_name : Alice

services : {
  @table::services
  TFileService : { fileName : "output/alice.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]

  trigger_paths : [p1]
  end_paths      : [e1]
}
```

# SPoM – [B.6]

---

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"

process_name : Alice

services : {
  @table::services
  TFileService : { fileName : "output/alice.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]

  trigger_paths : [p1]
  end_paths      : [e1]
}
```

- Notice no **source** or **outputs** tables.
  - The relevant parameters can be specified at the command-line.

# SPoM – [B.7]

---

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"

process_name : Bob

services : {
  @table::services
  TFileService : { fileName : "output/bob.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]

  trigger_paths : [p1]
  end_paths      : [e1]
}

physics.analyzers.inspectHits.maxPrint : 5
```

# SPoM – [B.7]

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"

process_name : Bob

services : {
  @table::services
  TFileService : { fileName : "output/bob.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]

  trigger_paths : [p1]
  end_paths      : [e1]
}

physics.analyzers.inspectHits.maxPrint : 5
```

# SPoM – [B.8]

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"
#include "art-workbook/GoodWorkflow/evelynsAnalyzers.fcl"

process_name : Charlie

services : {
  @table::services
  TFileService : { fileName : "output/charlie.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
    massPlot : @local::evelyns.massAnalyzer
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]
  e2 : [ massPlot ]

  trigger_paths : [p1]
  end_paths      : [e1,e2]
}

physics.analyzers.inspectHits.maxPrint : 5
```

# SPoM – [B.8]

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"
#include "art-workbook/GoodWorkflow/evelynsAnalyzers.fcl"

process_name : Charlie

services : {
  @table::services
  TFileService : { fileName : "output/charlie.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
    massPlot : @local::evelyns.massAnalyzer
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]
  e2 : [ massPlot ]

  trigger_paths : [p1]
  end_paths      : [e1, e2]
}

physics.analyzers.inspectHits.maxPrint : 5
```

# SPoM – [B.8]

```
#include "art-workbook/GoodWorkflow/standardServices.fcl"
#include "art-workbook/GoodWorkflow/standardProducers.fcl"
#include "art-workbook/GoodWorkflow/alicesAnalyzers.fcl"
#include "art-workbook/GoodWorkflow/evelynsAnalyzers.fcl"

process_name : Charlie

services : {
  @table::services
  TFileService : { fileName : "output/charlie.root" }
}

physics :{

  producers : {
    @table::simulation
    @table::tracking
  }

  analyzers: {
    @table::alices.analyzers
    massPlot : @local::evelyns.massAnalyzer
  }

  p1 : [ @sequence::simList, @sequence::trackList ]
  e1 : [ @sequence::alices.analyzerList ]
  e2 : [ massPlot ]

  trigger_paths : [p1]
  end_paths      : [e1, e2]
}

physics.analyzers.inspectHits.maxPrint : 5
```

path ordering is not necessarily respected.

- Okay for analyzers
- Could be problematic producers/filters.