IBM z Systems

TPFUG – Defining TPF Data in DFDL

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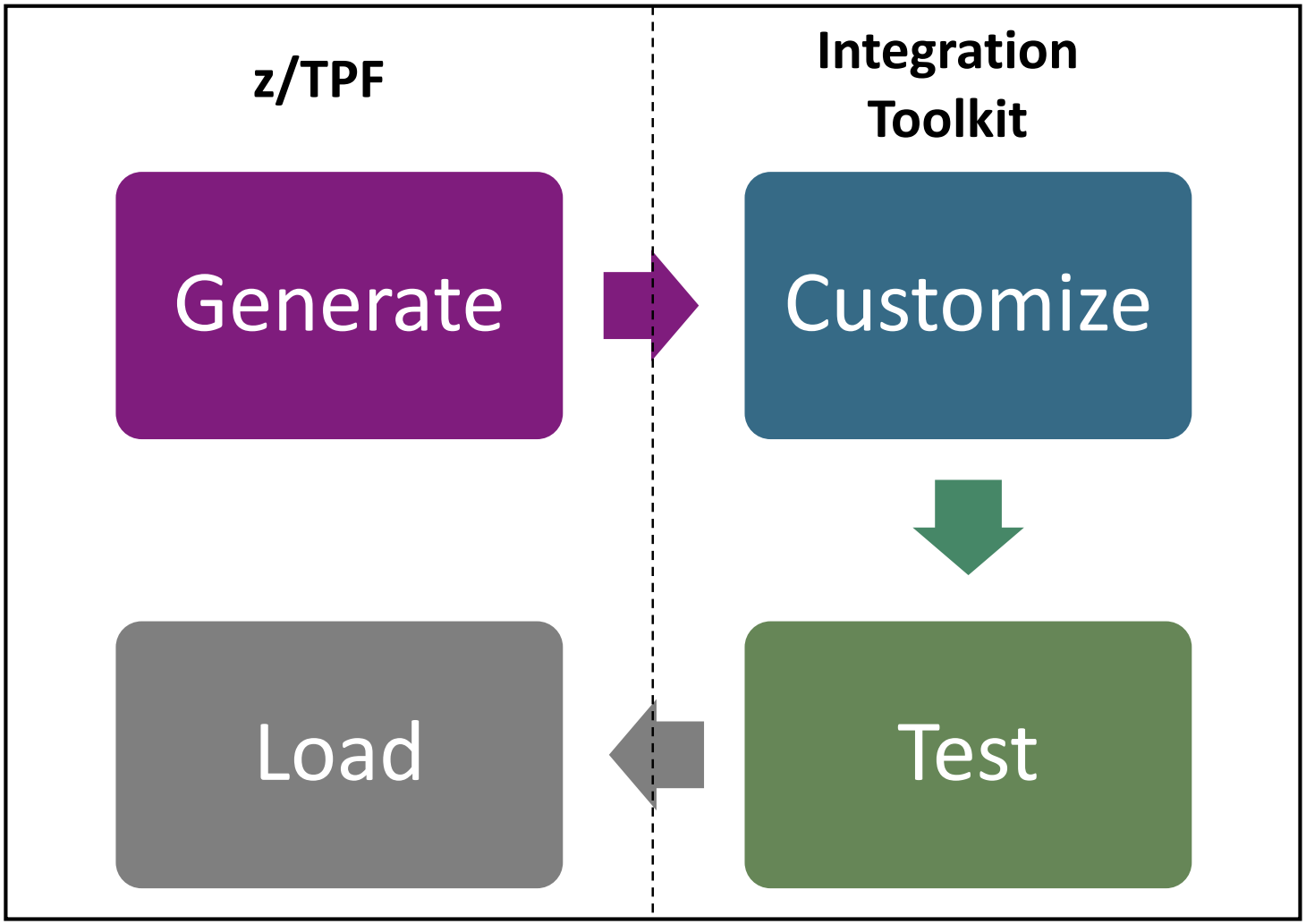
How to define TPFDF data using DFDL



Step 1: Generating DFDL for TPFDF

ZUDFM DESCRIPTOR

- Uses MLS information to create DFDL information.
- Future: method for creating DFDL for find/file.
- Creates a DFDL file (.tpfdf.dfdl.xsd extension) in UTF-8 encoding to ftp in binary mode.
- Example:

```
zudfm descr file-dr26bi
CSMP0097I 10.51.41 CPU-B SS-BSS  SSU-HPN  IS-01
UDFM0561I 10.51.41 DR26BI FILE DESCRIPTOR BUILD STARTED
/etc/ztpfdf/descr/DR26BI.tpfdf.dfdl.xsd
UDFM0562I 10.51.41 DR26BI FILE DESCRIPTOR BUILD COMPLETE.
FILES CREATED.
```

Step 2: Customizing DFDL

- Create meaningful element names
- Verify generated data types
- Create discriminators for conditional data
- Create expressions for variable length fields
- Create expressions for variable size arrays
- Customizations when using DFDL outside z/TPF

Before you begin

- A DFDL editor is included with the Integration Toolkit, part of IBM Integration Bus for Developers (no charge license)
  - Acquiring v9: http://www.ibm.com/developerworks/downloads/ws/wmbd/
  - Enrolling in v10 open beta: http://ibm.biz/iibopenbeta
- Create either a general project or data design project in the Toolkit. Other project types may also work.
- Import ../base/tpf-fdes directory on linux or copy the tpfbase.lib.dfdl.xsd file (shipped with z/TPF) to your DFDL working directory.

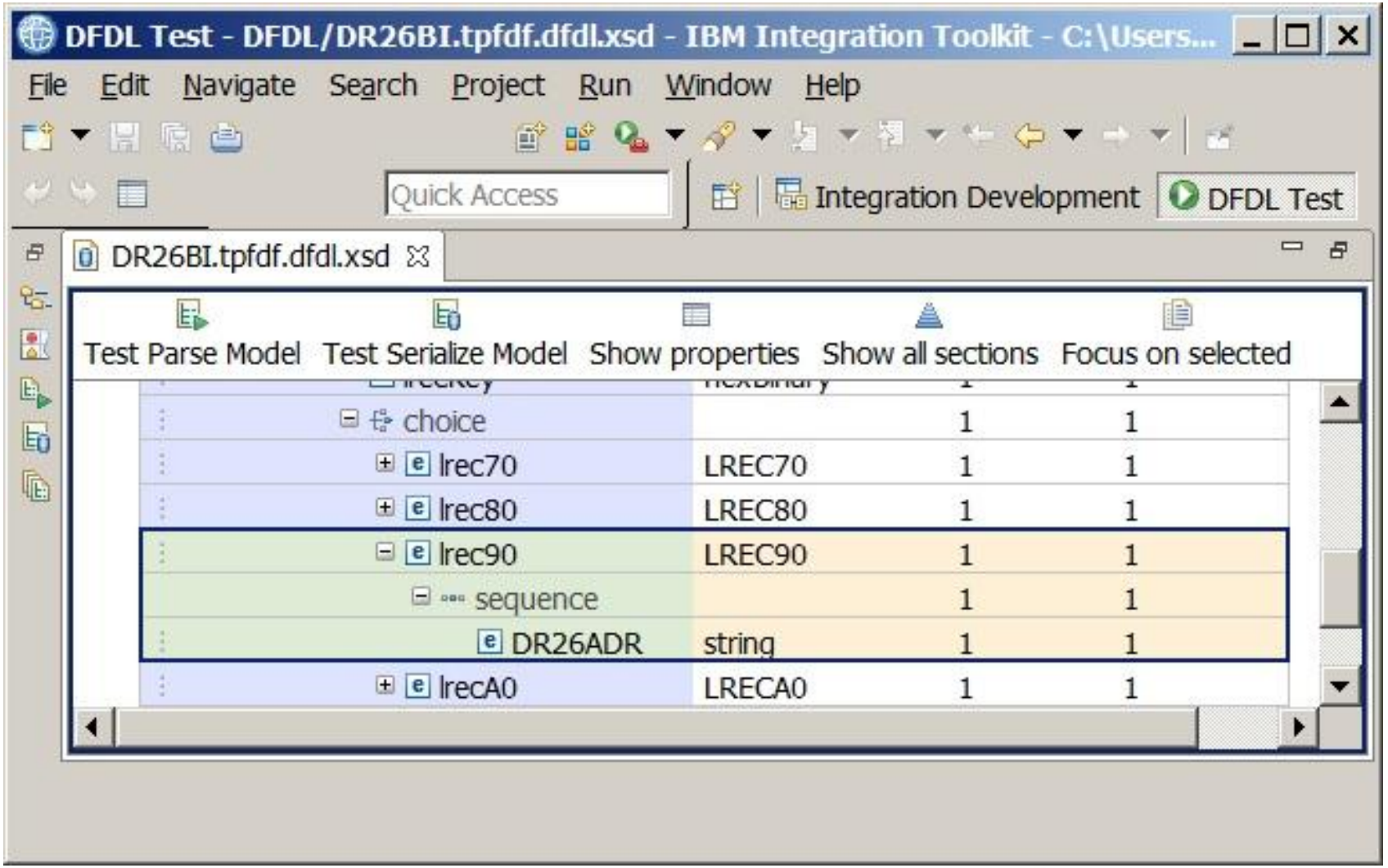
Create meaningful element names

- The generated element names are either generic names or obscure DSECT names.
- The element names in DFDL are what will appear in XML/JSON or how it will be referenced across platforms.
- complexType names can be left alone as they will not appear anywhere

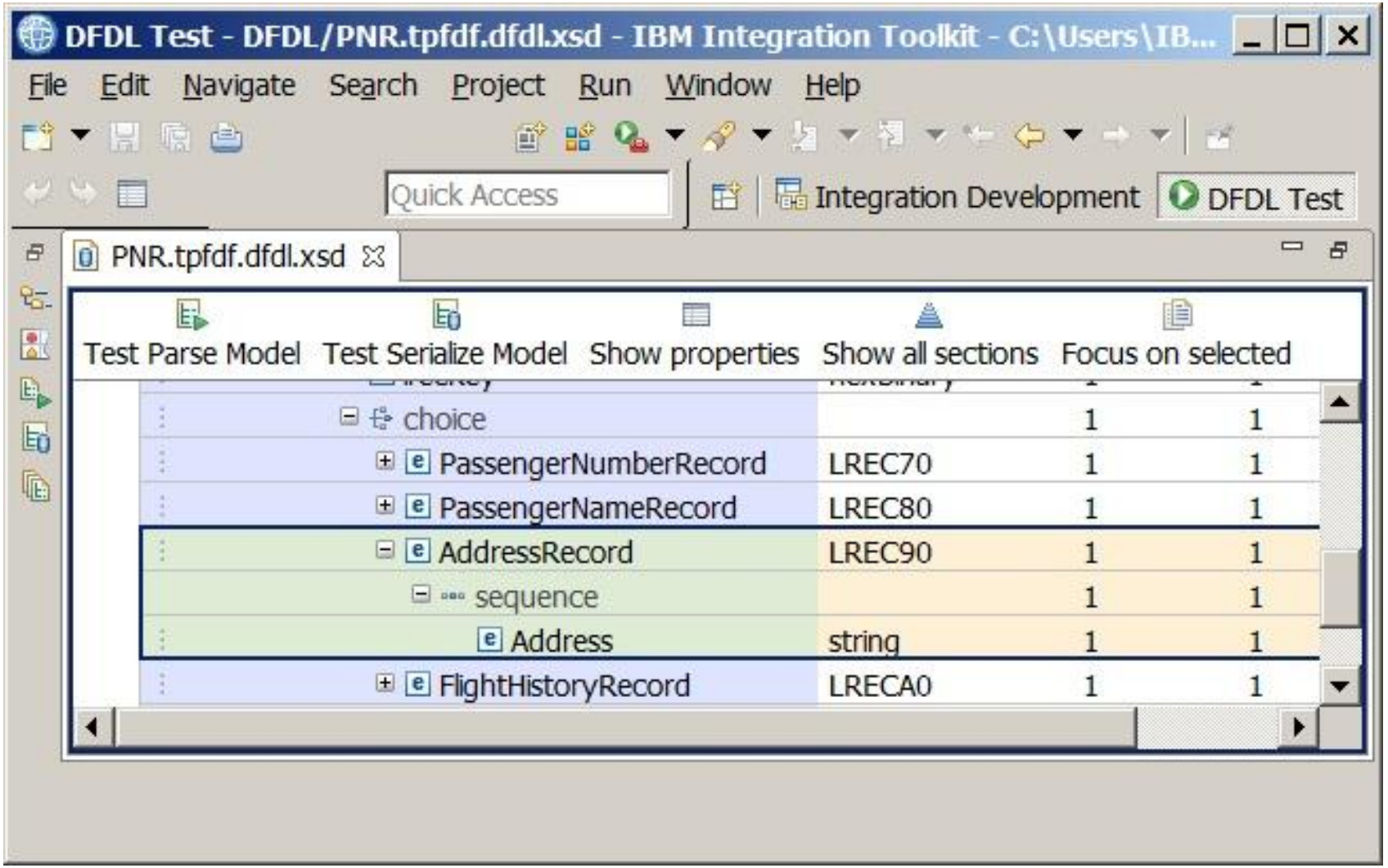
TPFDF DSECT

```
DR26ORG&CG1 EQU *    START VARIABLE DATA PER LREC
.*
*************************************************************
*         PASSENGER NUMBER LOGICAL RECORD                   *
*************************************************************
DR26PNO&CG1 DS  CL8  PASSENGER NUMBER
DR26E70&CG1 EQU *    END OF LOGICAL RECORD WITH KEY = X'70'
.*
         ORG DR26ORG&CG1
*************************************************************
*         PASSENGER NAME LOGICAL RECORD                     *
*************************************************************
DR26PNA&CG1 DS  CL25 PASSENGER NAME
DR26E80&CG1 EQU *    END OF LOGICAL RECORD WITH KEY = X'80'
.*
         ORG DR26ORG&CG1
*************************************************************
*         ADDRESS LOGICAL RECORD                            *
*************************************************************
DR26ADR&CG1 DS  0CL1 PASSENGER ADDRESS(VARIABLE 1-20)
DR26E90&CG1 EQU *    END OF LOGICAL RECORD WITH KEY = X'90'
```

ZUDFM DESCRIPTOR output



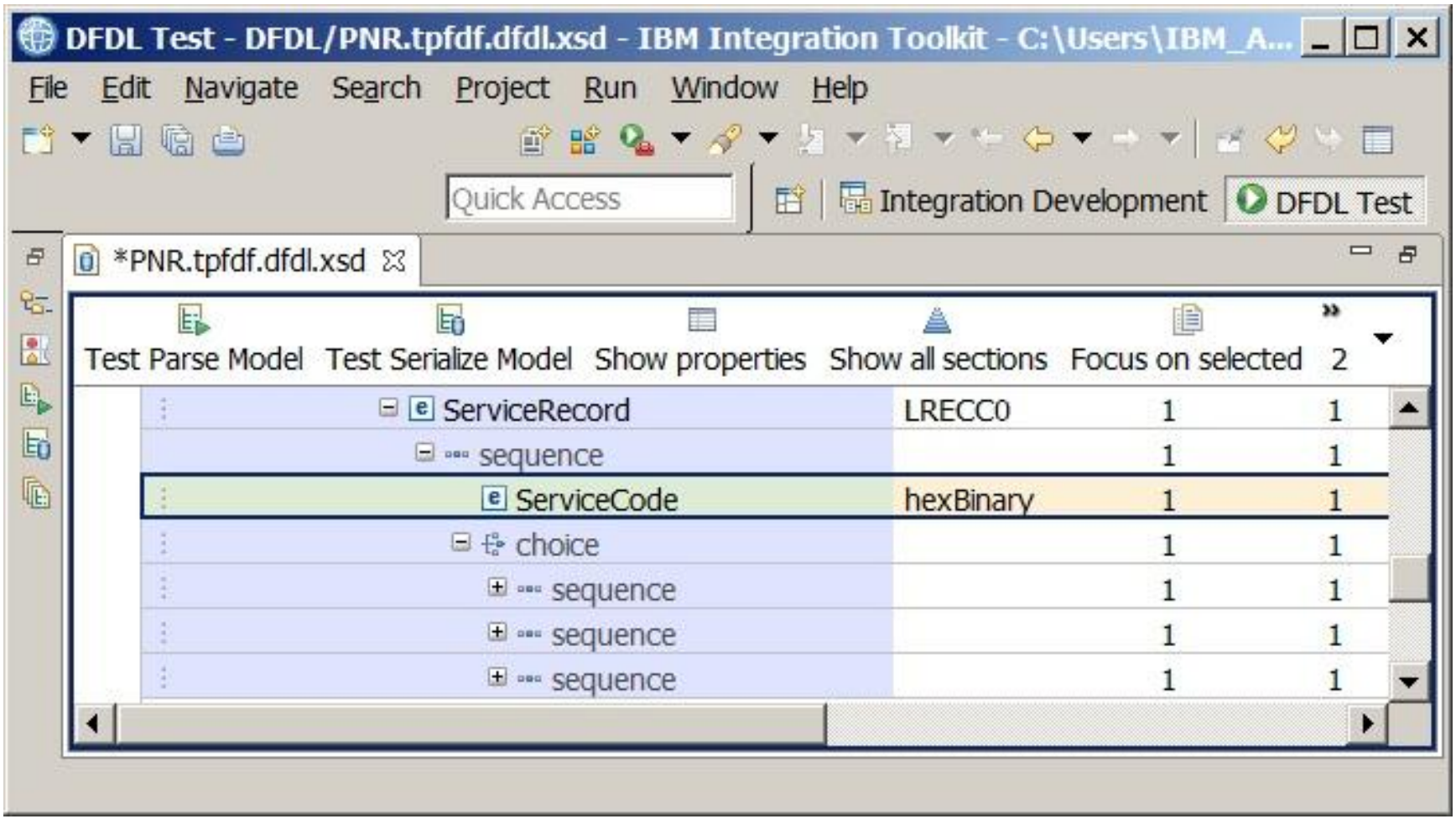
Meaningful Names



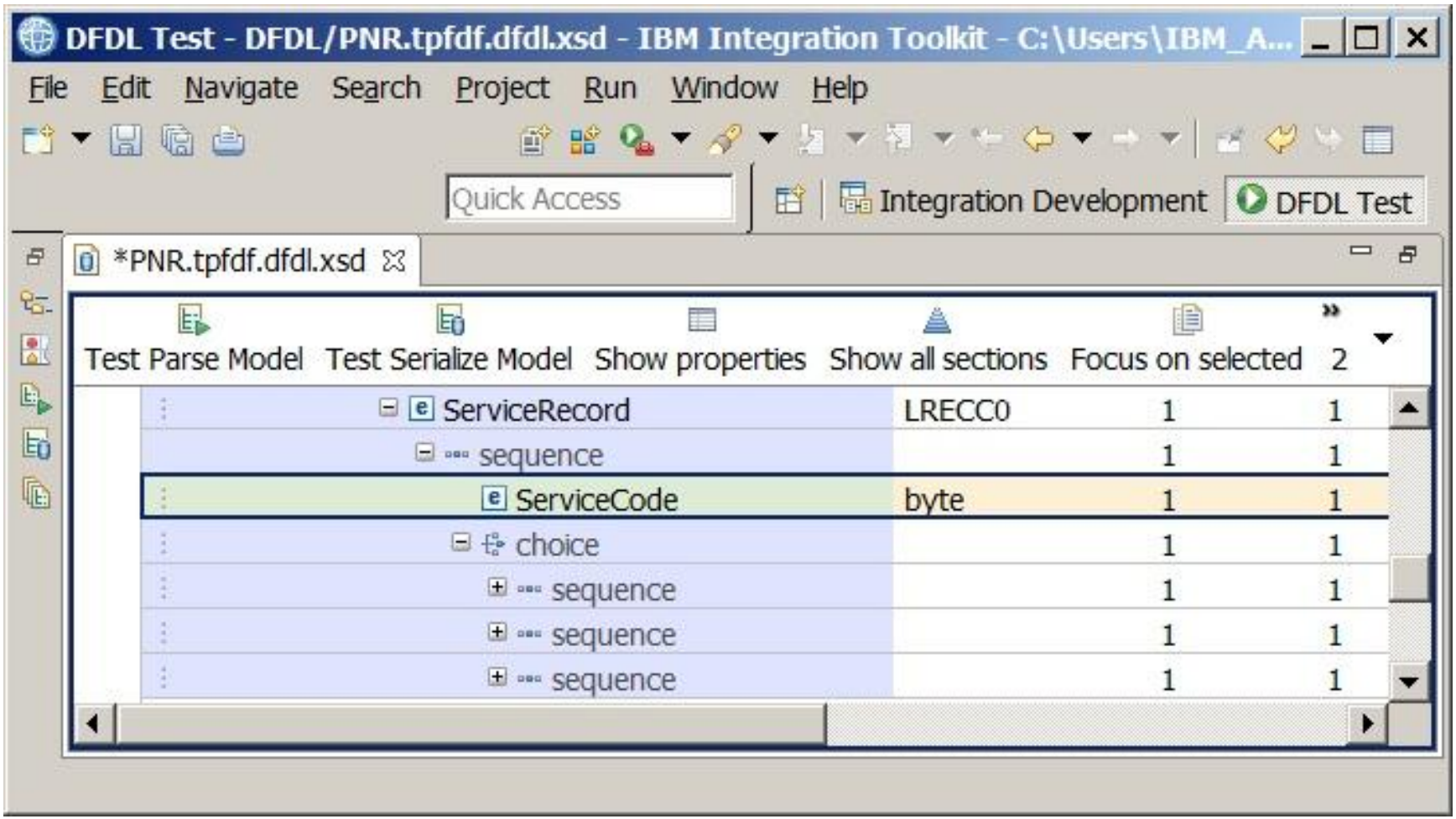
Verify generated data types

- The generated data types are best guess mappings from the DSECT types.
- Character data should be strings while non-numeric, non-character data should be hexBinary. Strings undergo character encoding changes when XML/JSON is created.
- Numeric data types can be either signed or unsigned but the assembler DSECT doesn’t contain information on which should be used.
- A byte consisting of various test bits could be changed to a bit-wise representation, 8 boolean bit fields with a true/false assignment.

Verify data usage



Change to numeric



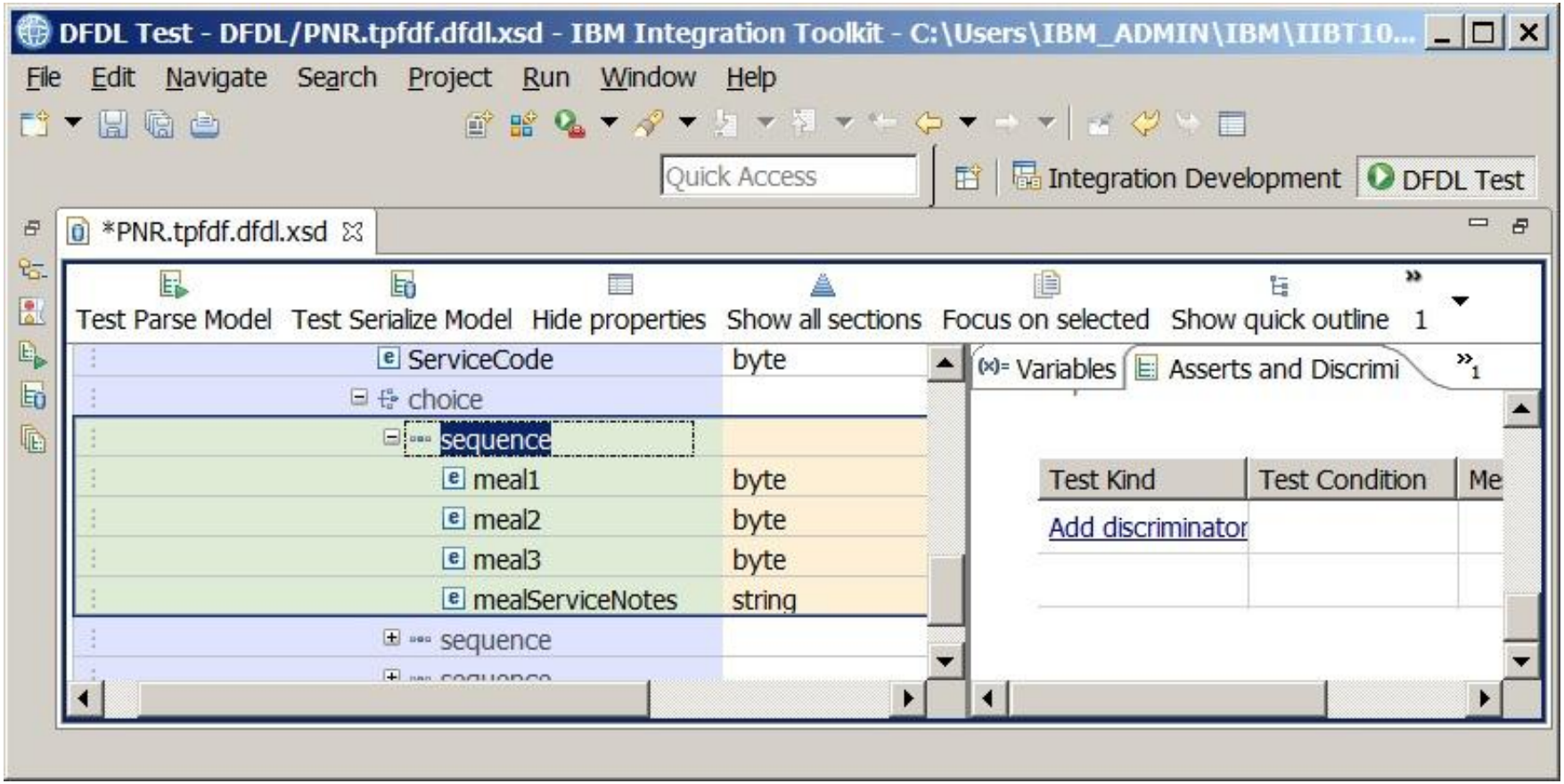
Create discriminators for conditional data

- Conditional data is data that is not always present as is often handled in an assembler DSECT through an ORG or in a C structure through a union. These types of varying data formats are handled in DFDL through what is known as a “choice branch”.
- DFDL discriminators define a test to be used when resolving a point of uncertainty such as choice branches or optional elements.
- In the following example, the ServiceCode will be used to determine which data layout follows: the special meal plan or the unaccompanied minor information.
- The expression used is supported as of PJ42994.

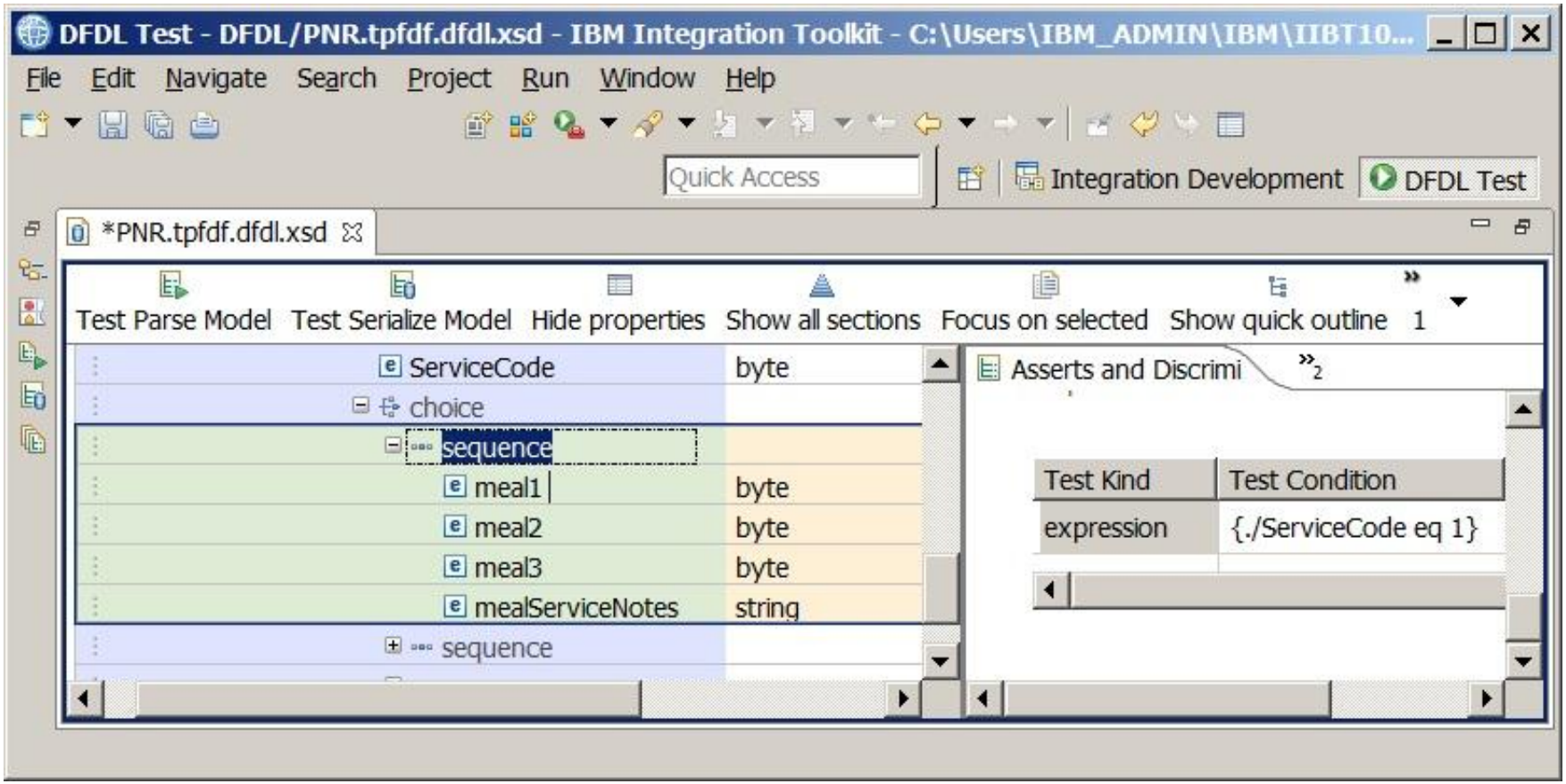
TPFDF DSECT

```
 ORG DR26ORG&CG1
*****************************************************************
*        Special Services Record - LREC C0                      *
*****************************************************************
DR26SVC&CG1 DS  X    service code
*                         1 - special meal
*                         2 - children travel alone
*                         3 - airport assistance
DR26SVO&CG1 EQU *
*                    special meal
DR26MC1&CG1 DS  X    special meal code for first meal
DR26MC2&CG1 DS  X    special meal code for the second meal
DR26MC3&CG1 DS  X    special meal code for the third meal
DR26MNT&CG1 DS  0CL1 additional notes
*
         ORG DR26SVO&CG1
*                    children travel alone
DR26AGE&CG1 DS  X    child's age, in hex
DR26GEN&CG1 DS  C    gender; Male or Female
DR26CUS&CG1 DS  0CL1 custodian contact info
```

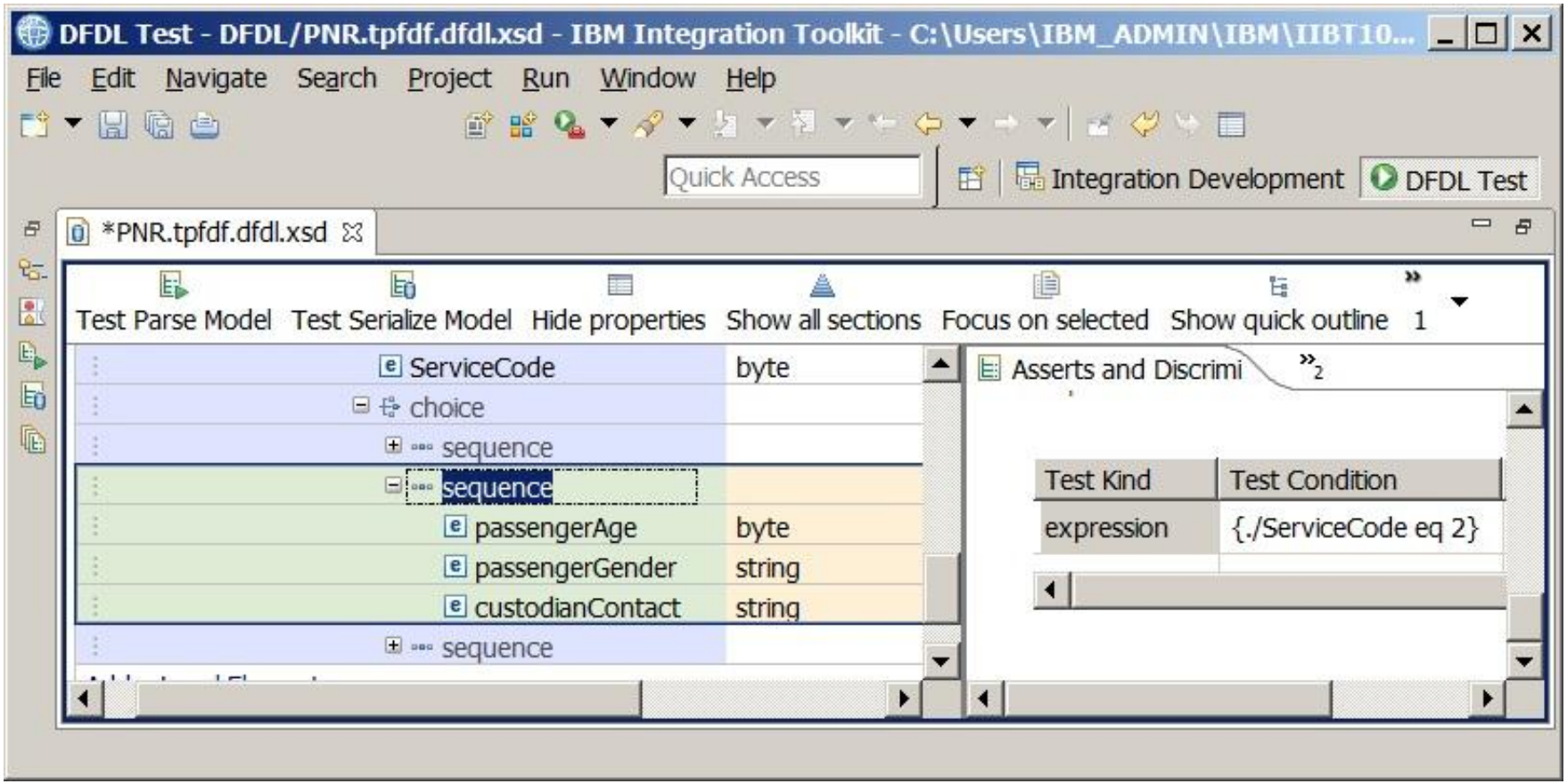
choice branch



Meal plan if ServiceCode = 1



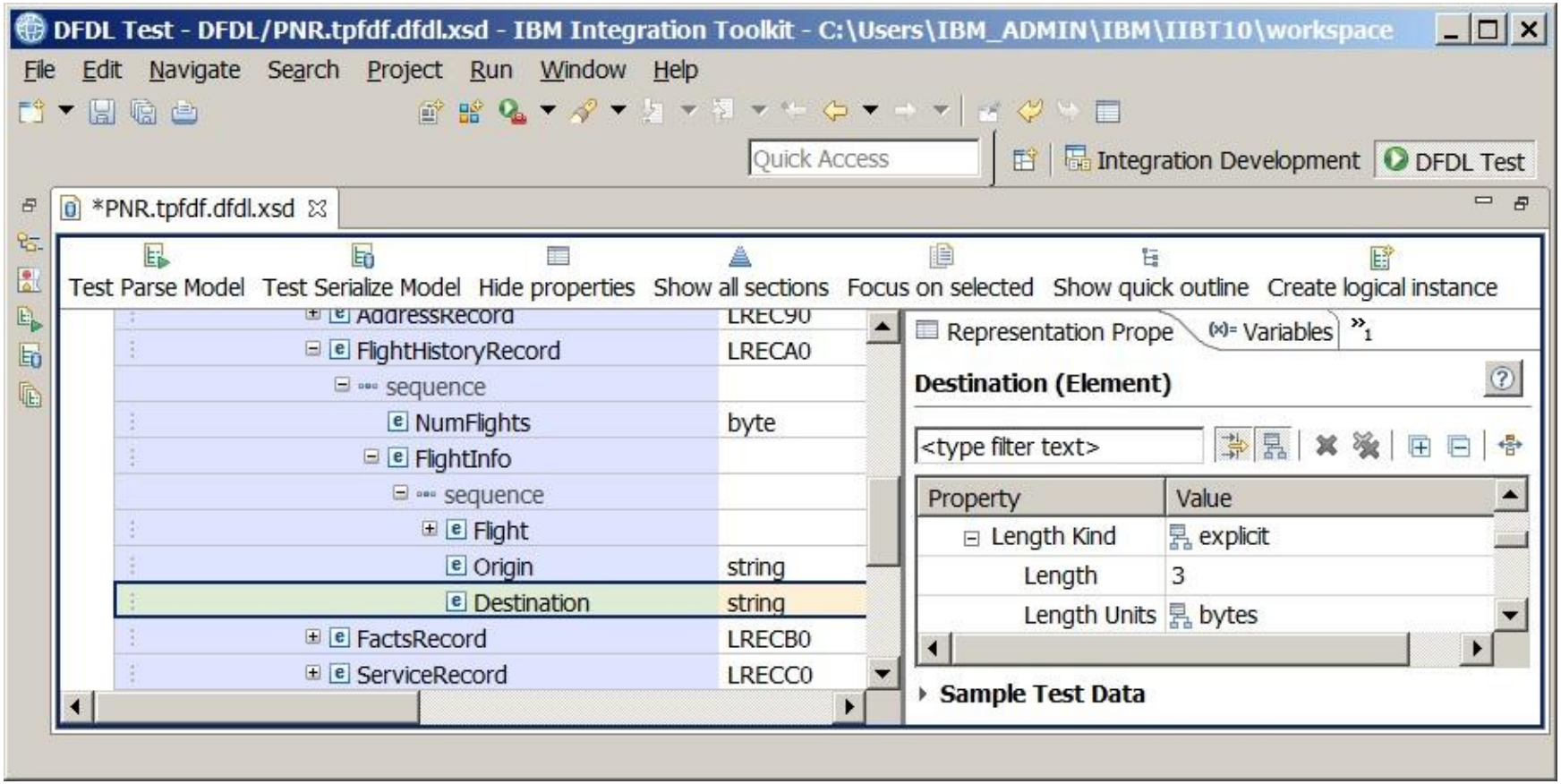
Unaccompanied minor info if ServiceCode = 2



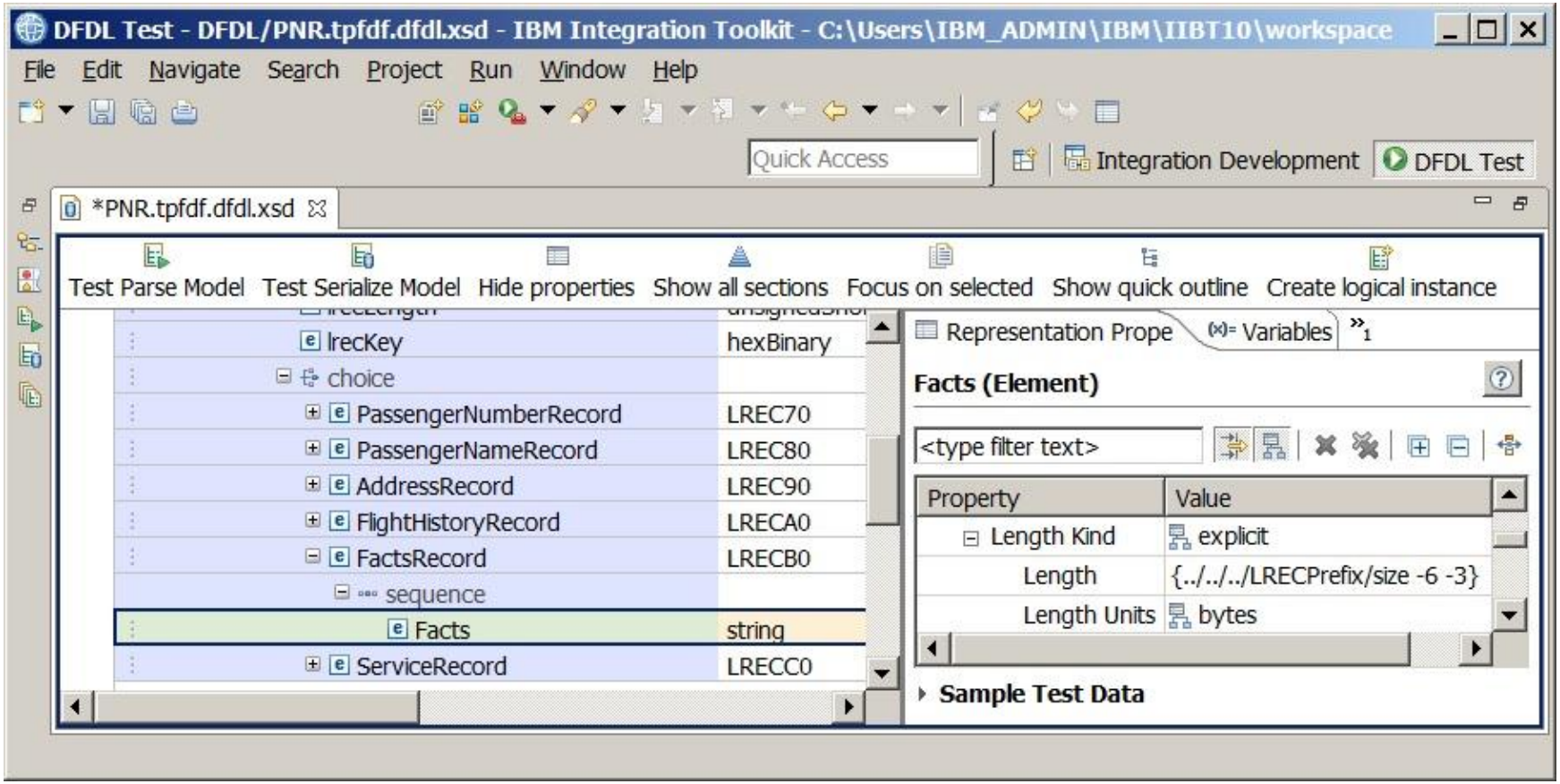
Create expressions for variable length fields

- A variable length field is typically some string where the length of the string may vary.
- An expression is used in DFDL to allow the DFDL parser to be able to calculate the length of a variable length field.
- The DFDL “length” attribute can either contain a number for a fixed length field or an expression for a variable length field.

Fixed length string



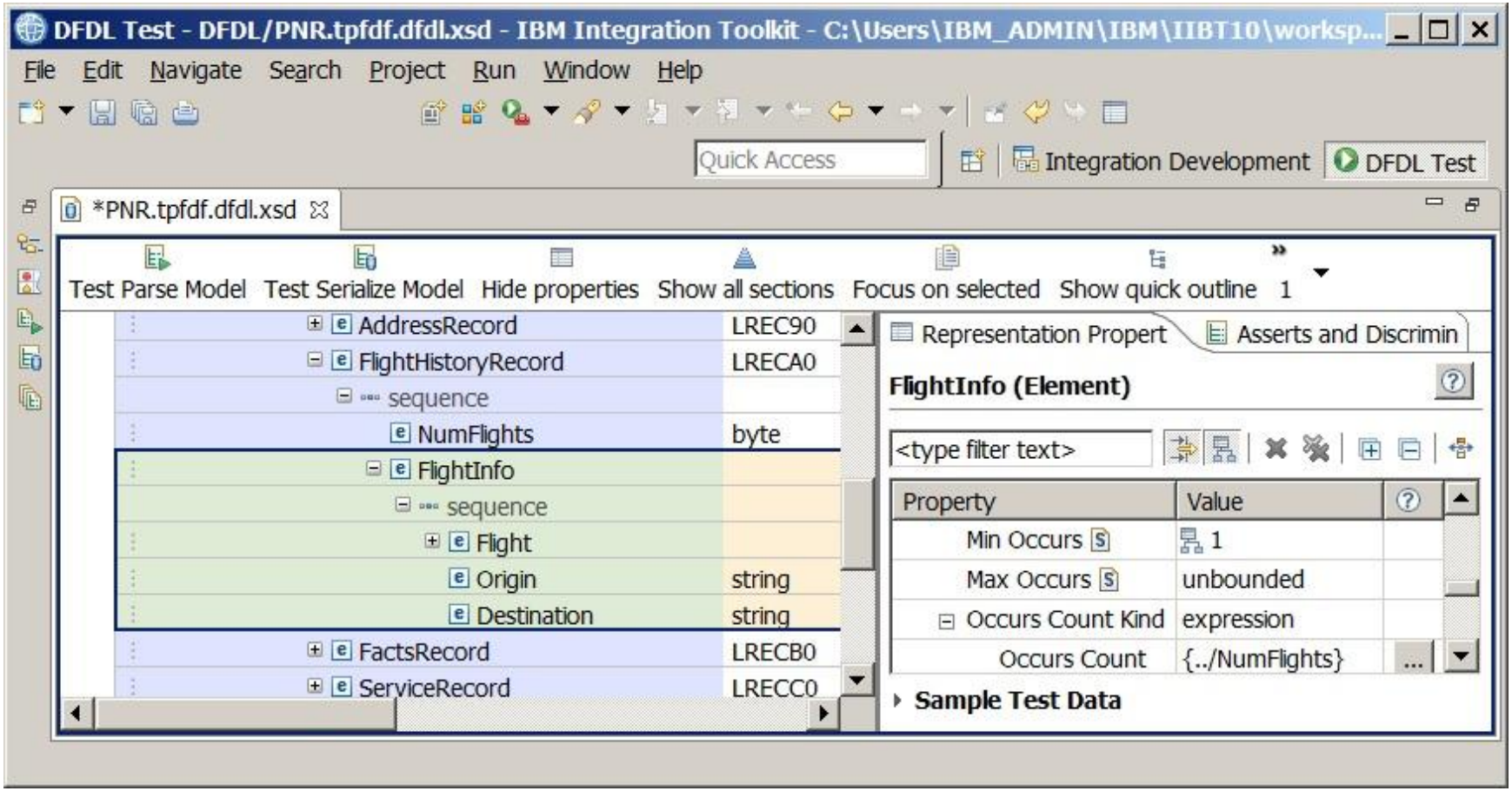
Variable length string



Create expressions for variable size arrays

- A variable size array is a structure or field that can occur any (or N) number of times.
- An expression is used in DFDL to allow the DFDL parser to be able to calculate the number of occurrences of an element.
- The XML schema attributes of “minOccurs” and “maxOccurs” give the lower and upper bounds of the array.
- The DFDL “occursCount” attribute contains the expression for calculating the size of the array.

FlightInfo for every NumFlights



Customizations when using DFDL outside z/TPF

- When choosing to transmit binary data defined by DFDL to other platforms, a number of other customizations can be considered.
- Examples:
  - String encodings other than EBCDIC
  - Field (element) alignment
  - Trimming/padding of strings
  - Changing the floating point representation
  - Changing XML/JSON numeric or date/time format

Step 3: Testing DFDL

- The DFDL editor in the IBM Integration toolkit can perform a DFDL parse and serialize test.
- A file containing the binary data can be used as input to the DFDL parse testing to create XML.
- A file containing XML can be used as input to the DFDL serialize test to create binary data.
- Future plans include creating a method to more easily extract binary data from z/TPF to use for DFDL parse testing.

Step 4: Loading DFDL

- DFDL is loaded to z/TPF using common deployment, making the DFDL information accessible to the system (DFDL APIs, Business Events, MongoDB, etc).
  - All DFDL files must have the following file exension: **.dfdl.xsd**
  - All DFDL files must be loaded to the following location on z/TPF: **/sys/tpf_pbfiles/tpf-fdes**
- DFDL files are automatically deployed by common deployment. Files are verified and active during loadset activation.

References

- DFDL tutorials created by the DFDL Working Group at the Open Grid Forum
  - http://redmine.ogf.org/dmsf/dfdl-wg?folder_id=5485
- DFDL developerWorks tutorials
  - http://ibm.biz/startdfdl
- DFDL specification reference
  - http://www.ogf.org/dfdl

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