



RISK DATA OPEN STANDARD

SDL Overview and Examples

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Structure Definition Language Overview

Structure Definition Language (SDL) allows you to form a precise subject of a treaty and specify financial positions. A Structure written in SDL models the flow of quantities such as risk, loss, premium, and expenses as they pass through CDL contracts and other transformations.

What is a Structure?

A structure is a document that specifies a collection of *positions*. A position has a name, which is unique within the structure, and a definition, which consists of an operation and one or more operands.

Structure Operations

The operations are:

- **Group: $A + B + C - D$**
 - Adds (+) or subtracts (-) corresponding quantities in its operands. Example:

A is 100\$ of Hurricane Loss

B is 200\$ of Hurricane Loss and \$50 of Earthquake loss

A + B is \$300 of Hurricane Loss and \$50 by Earthquake
- **Scale: $A * 1.2$**
 - Multiplies each quantity in the operand by the scalar value
- **Filter: $A / \{Country\ IN\ ('US', 'CANADA')\}$**
 - Applies criteria to the operand. Only rows that meet the criteria pass the filter.
- **Contract:**
 - The operand is the subject of the CDL contract corresponding to the position being defined.
Example:

A is Contract on B means the CDL contract with the name A takes the position B as its subject.

Structure Name

A structure has a name, which is unique. Since a position's name is unique within a structure, and a structure name is globally unique, this means that any position can be identified by a combination of (structure name,

position name). SDL expresses this as *structureName!positionName*.

Position Definitions

A position definition, such as

```
Gross is Direct + Assumed
```

defines a new position, named *Gross*, as the result of grouping the positions named *Direct* and *Assumed*. The operands *Direct* and *Assumed* may be defined elsewhere in the structure, or they may be leaf positions, which must be given an initial value (for example, from a Period Loss Table) before SDL can evaluate structure.

Since SDL can uniquely specify a position in another structure using the "!" notation, an external position can appear as an operand but not as the position that is being defined.

Therefore, this is a valid definition:

```
Gross is Residential!Gross + Commercial!Gross
```

This is an invalid definition:

```
SomeOtherStructure!Gross is Residential!Gross + Commercial!Gross
```

This ability to refer to external positions allows SDL to compose hierarchies of arbitrary size from building blocks of manageable size.

A reinsurer can represent a portfolio of its inforce treaties, with retrocession programs at various organizational levels, by constructing a hierarchy of structures, where individual cedant programs are each expressed as structures. By initializing the leaf positions of these cedant programs, SDL can roll up modeled loss or other quantities through the hierarchy and report statistics on positions at any level.

SDL can do the same for a large insurer or for a company that both buys and sells reinsurance.

Given any target position, in any structure, SDL can efficiently build a graph of all the positions on which the target depends, either directly or indirectly. This graph, which is mathematically the transitive closure of the target position, is called the *position graph*.

Other Characteristics of SDL

The position graph is a directed acyclic graph of positions. This means that a position cannot depend, even indirectly, on itself.

SDL is a declarative language. The order in which position definitions occur in a structure is not significant.

Structure and position names are case preserving, but case insensitive. The following example defines the positions *Adjusted* and *Modeled*:

```
Adjusted is modeled * 1.1
```

```
Modeled is Wind + Hail
```

The graph for this structure contains the four position *Modeled*, *Adjusted*, *Wind*, *Hail*, and not the five positions *Modeled*, *modeled*, *Adjusted*, *Wind*, and *Hail*.

RDOS version 1.0 of the Structure Definition Language does not specify:

- Filter syntax
- Method of initializing leaf positions
- Method of associating a CDL contract text with a Contract position

Read next: [Structure Definition Language Elements](#)

Structure Definition Language Elements

This topic describes simple structures using the Structure Definition Language (SDL) elements.

A simple Structure: Grouping

The following structure defines two positions, Gross and Net.

Structure

```
Gross is Direct + Assumed
Net is Gross - Ceded
```

The Gross position is defined by evaluating the Direct and Assumed positions and grouping (in this case, adding) the result.

The Net position is defined by evaluating the Gross and Ceded positions and grouping (in this case subtracting or "netting out") the Ceded position from the Gross.

In this structure, the Direct, Assumed and Ceded positions are not explicitly defined, since they only appear to the right of the *is* keyword. Such positions are called *leaf positions*. In order to evaluate a defined position, such as the example's Gross position, each leaf position on which it depends must be initialized. This can occur by associating each leaf with a period loss table from another analysis.

Scaling a Position

The following structure scales up each loss in GrossLoss by 20%.

Structure

```
GrossLoss is Direct + Assumed
LoadedGrossLoss is GrossLoss * 1.2
```

Filtering a Position

The following structure takes a PLT representing the modeled loss of a U.S. portfolio and creates a position representing only hurricane losses to residential lines.

Structure

```
FloridaHurricane is USLoss / { LOB is 'RES' and Peril is 'HU' }
```

A Financial Contract

The following structure defines a Contract named Cat10X10 that takes the USLoss position as its subject. The Cat10X10 contract is defined elsewhere in CDL.

Structure

```
Cat10x10 is Contract on USLoss
```

Putting it Together

The following structure shows the value of SDL:

- The structure starts from a position representing losses to US from several perils.
- It filters out all but the Florida Hurricane losses.
- It applies a Florida Hurricane Cat Fund (FHCF) contract.
- It applies a catastrophe treaty (which covers all perils and the whole US) to the US losses, net of the insuring FHCF contract.

Structure

```
Cat10x10 is Contract on USNetOfFHCF
FloridaHurricane is USLoss / {State is 'US:FL' and Peril is 'HU'}
FHCF is Contract on FloridaHurricane
USNetOfFHCF is USLoss - FHCF
```