Create a rigid registration between CT1 and CT2 with CT1 as the Primary image set（reference）
and CT2 as the Secondary image set（floating）

Registration Info   ✕

Frame-of-reference registration ──────────────────────────────────────

    From frame of reference: 1.2.826.0.1.3680043.8.176.201562714214880.86.74
                                                  61328361

    To frame of reference: 1.2.826.0.1.3680043.8.176.2015627142147755.6.14
                                                  50175381

1.00	-0.01	-0.01	-0.81
0.01	1.00	0.01	14.84
0.01	-0.01	1.00	0.10
0.00	0.00	0.00	1.00

Transformation matrix: (as above)

Rigid transform:

    Translation [cm]:   -1.13, 14.97, -0.17
    Rotation axis [cm]:   0.68, 0.44, -0.59
    Rotation angle [deg]:   1.18

Image set(s) in from frame of reference: CT: CT 2 [23 Nov 2014, 15:10:16 (hr:min:sec)]
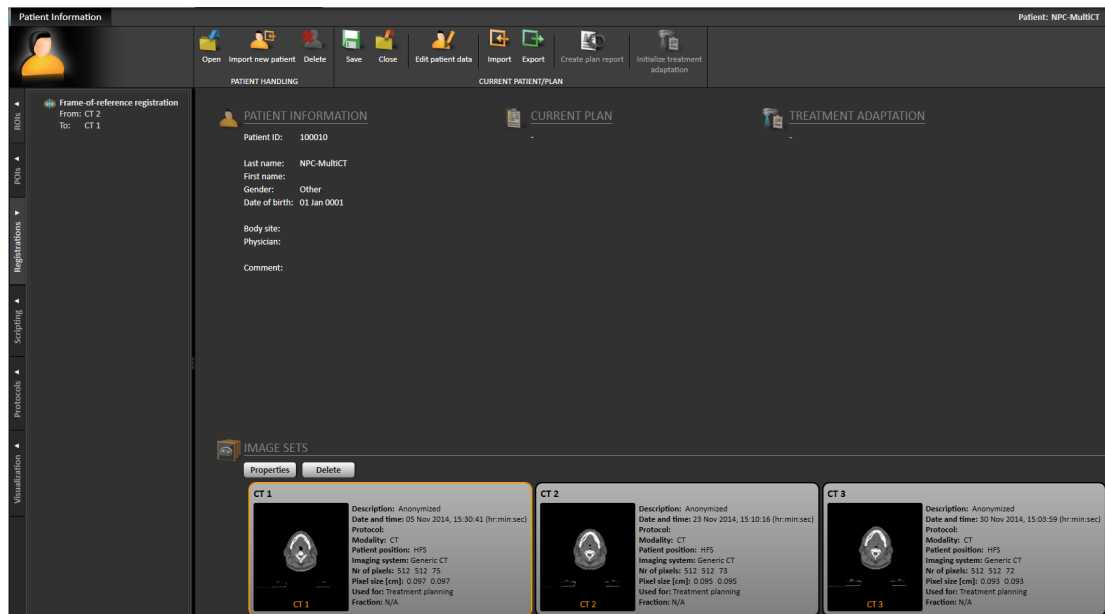
Image set(s) in to frame of reference: CT: CT 1 [05 Nov 2014, 15:30:41 (hr:min:sec)]

Image sets used when creating the registration: From: CT 2, To: CT 1

                                                                              Close

There is only frame-of-reference registration between CT1 and CT2.

Create a POI in CT1 with coordinates Right-Left 0, Inf-Sup 25, Post-Ant 10, that is, (0,25,10) with the format of (x,y,z) in RayStation while (0,-10,25) in scripting.

The rigid transform matrix in State Tree is as follows.

Registrations
  Registrations[0]
    FromFrameOfReference: '1.2.826.0.1.3680043.8.176.20156271421
    IsImplicitlyCalculated: False
    IsSetAtImport: False
    RigidTransformationMatrix
      RigidTransformationMatrix[0]: 0.999886287182557
      RigidTransformationMatrix[1]: 0.00912912600807201
      RigidTransformationMatrix[2]: -0.0120029897362678
      RigidTransformationMatrix[3]: -0.807376654166359
      RigidTransformationMatrix[4]: -0.0089611290023216
      RigidTransformationMatrix[5]: 0.999862170691532
      RigidTransformationMatrix[6]: 0.0139763295260701
      RigidTransformationMatrix[7]: -0.102316945360621
      RigidTransformationMatrix[8]: 0.0121289270458668
      RigidTransformationMatrix[9]: -0.013867179898822
      RigidTransformationMatrix[10]: 0.999830280822885
      RigidTransformationMatrix[11]: 14.841340928472
      RigidTransformationMatrix[12]: 0
      RigidTransformationMatrix[13]: 0
      RigidTransformationMatrix[14]: 0
      RigidTransformationMatrix[15]: 1

Patient.GetTotalTransformForExaminations(FromExamination='CT 2',ToExamination='CT 1')

```
Array[float]((0.99988628718255745, 0.0091291260080720062, -0.012002989736267823,
 -0.80737665416635918, -0.0089611290023216012, 0.99986217069153205, 0.0139763295
26070115, -0.10231694536062114, 0.012128927045866756, -0.013867179898821963, 0.9
9983028082288539, 14.841340928472048, 0.0, 0.0, 0.0, 1.0))
```

Patient.GetTransformForExaminations(FromExamination='CT 2',ToExamination='CT 1')

Correct data to two decimal places

```
[1.0, 0.01, -0.01, -0.81000000000000005, -0.01, 1.0, 0.01, -0.10000000000000001,
 0.01, -0.01, 1.0, 14.84, 0.0, 0.0, 0.0, 1.0]
```

Calculate the corresponding point in CT2

$$\begin{bmatrix} 1 & 0.01 & -0.01 & -0.81 \\ -0.01 & 1 & 0.01 & -0.10 \\ 0.01 & -0.01 & 1 & 14.84 \\ 0 & 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 0 \\ -10 \\ 25 \\ 1 \end{bmatrix} = \begin{bmatrix} -1.16 \\ -9.85 \\ 39.94 \\ 1 \end{bmatrix}$$

Test with functions:

Patient.TransformPointFromExaminationToExamination(FromExamination='CT 1',ToExamination='CT 2',Point= {'x':0, 'y':-10, 'z':25})

```
>>> c.x
1.0191928945313875
>>> c.y
-10.02982017349234
>>> c.z
10.008910738660244
```

Patient.TransformPointFromExaminationToExaminationUsingTotalTransform(FromExamination='CT 1',ToExamination='CT 2',Point= {'x':0, 'y':-10, 'z':25})

```
>>> a.x
1.0191928945313875
>>> a.y
-10.02982017349234
>>> a.z
10.008910738660244
```

Map a POI of CT1 to CT2, and get the coordinate in the CT2

Patient.GetTransformForExaminations(FromExamination='CT 1',ToExamination='CT 2')

```
Array[float]((0.99988628718255745, -0.0089611290023216012, 0.012128927045866758, 0.6
2635842836150268, 0.0091291260080720079, 0.99986217069153205, -0.013867179898821963,
 0.31548103089352908, -0.012002989736267821, 0.013976329526070115, 0.999830280822885
28, -14.847082986651188, 0.0, 0.0, 0.0, 1.0))
```

Correct data to five decimal places

```
[0.99988999999999995, -0.0089599999999999992, 0.01213, 0.62636000000000003, 0.009129
999999999992, 0.99985999999999997, -0.01387, 0.31547999999999998, -0.012, 0.0139799
99999999999, 0.99983, -14.84708, 0.0, 0.0, 0.0, 1.0]
```

Calculate the corresponding point in CT2

$$\begin{bmatrix} 0.99989 & -0.00896 & 0.01213 & 0.62636 \\ 0.00913 & 0.99986 & -0.01387 & 0.31548 \\ -0.01200 & 0.01398 & 0.99983 & -14.84708 \\ 0 & 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 0 \\ -10 \\ 25 \\ 1 \end{bmatrix} = \begin{bmatrix} 1.0192 \\ -10.0299 \\ 10.0089 \\ 1 \end{bmatrix}$$

The two matrices are the inverse matrices of each other

$$\begin{bmatrix} 0.99989 & -0.00896 & 0.01213 & 0.62636 \\ 0.00913 & 0.99986 & -0.01387 & 0.31548 \\ -0.01200 & 0.01398 & 0.99983 & -14.84708 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\times \begin{bmatrix} 0.9999 & 0.0091 & -0.0120 & -0.8074 \\ -0.0090 & 0.9999 & 0.0140 & -0.1023 \\ 0.0121 & -0.0139 & 0.9998 & 14.8413 \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$