

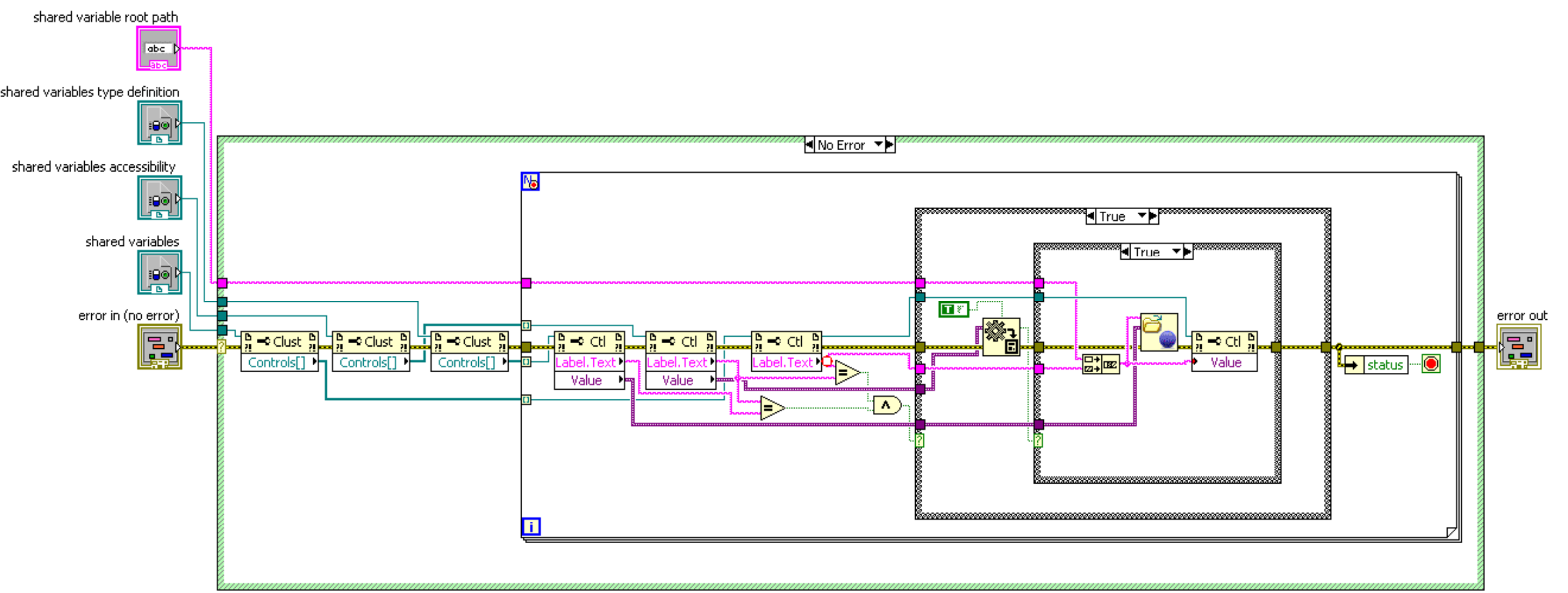
Automatic Creation of LabVIEW Network Shared Variables

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Objective

- Integration of the LabVIEW controlled system components of our Solid State Direct Drive® experiments [1] [2] [3] [4] into a Supervisory Control And Data Acquisition (SCADA) system
- Goal: efficient and inexpensive procedure for automatic generation of
 - LabVIEW network shared variable libraries
 - common shared variable client and server code
 - SCADA system configuration files
- Boundary condition: simple editing of shared variable library definition files
- For details see paper WEPKS015

Generic OpenSharedVariable Sub-VI



This generic SubVI is called by specific auto-generated VIs in order to open connections to all shared variables in the library.

Code Generation Chain

path to lib	library name	variable name	variable type	array?	default value	description
SharedVariableAutoCreation	SharedVarLibExample.Mib	VarInt32	Int32	no	7	describes an Int32 variable
SharedVariableAutoCreation	SharedVarLibExample.Mib	VarInt32Array	Int32	yes	Utils\SharedVariableAutoCreation\Int32Array.dat	describes an Int32 array variable
SharedVariableAutoCreation	SharedVarLibExample.Mib	VarInt64	Int64	no	77	describes an Int64 variable
SharedVariableAutoCreation	SharedVarLibExample.Mib	VarInt64Array	Int64	yes	Utils\SharedVariableAutoCreation\Int64Array.dat	describes an Int64 array variable
SharedVariableAutoCreation	SharedVarLibExample.Mib	VarStringArray	string	yes	Utils\SharedVariableAutoCreation\StringArray.dat	describes an string array variable

variable and library related information edited in Excel

save

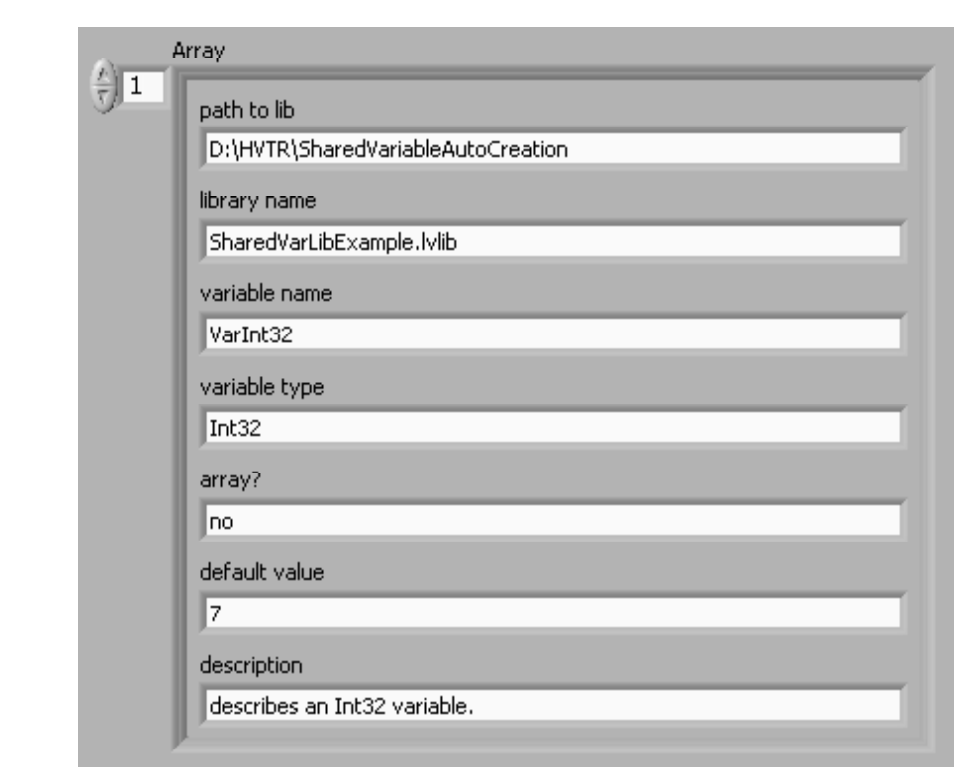
```
<Row ss:AutoFitHeight="0" ss:Height="13" ss:StyleID="s23">
<Cell><Data ss:Type="String">path to lib</Data></Cell>
<Cell><Data ss:Type="String">library name</Data></Cell>
<Cell><Data ss:Type="String">variable name</Data></Cell>
<Cell><Data ss:Type="String">variable type</Data></Cell>
<Cell><Data ss:Type="String">array?</Data></Cell>
<Cell ss:StyleID="s24"><Data ss:Type="String">default value</Data></Cell>
<Cell><Data ss:Type="String">description</Data></Cell>
</Row>
<Row ss:AutoFitHeight="0">
<Cell ss:StyleID="s21"><Data ss:Type="String">SharedVariableAutoCreation</Data></Cell>
<Cell ss:StyleID="s21"><Data ss:Type="String">SharedVarLibExample.lvlib</Data></Cell>
<Cell ss:StyleID="s21"><Data ss:Type="String">VarInt32</Data></Cell>
<Cell ss:StyleID="s21"><Data ss:Type="String">Int32</Data></Cell>
<Cell ss:StyleID="s21"><Data ss:Type="String">no</Data></Cell>
<Cell ss:StyleID="s26"><Data ss:Type="Number">7</Data></Cell>
<Cell ss:StyleID="s21"><Data ss:Type="String">describes an Int32 variable.</Data></Cell>
</Row>
```

snippet of user provided input data file (Microsoft SpreadsheetML format)

XSL Transformation

```
<Cluster>
<Name>shared variable info</Name>
<NumElt>7</NumElt>
<String>
<Name>path to lib</Name>
<Val>users\harm\SharedVariableAutoCreation</Val>
</String>
<String>
<Name>library name</Name>
<Val>SharedVarLibExample.lvlib</Val>
</String>
<String>
<Name>variable name</Name>
<Val>VarInt32</Val>
</String>
<String>
<Name>variable type</Name>
<Val>Int32</Val>
</String>
<String>
<Name>array?</Name>
<Val>no</Val>
</String>
<String>
<Name>default value</Name>
<Val>7</Val>
</String>
<String>
<Name>description</Name>
<Val>describes an Int32 variable.</Val>
</String>
</Cluster>
```

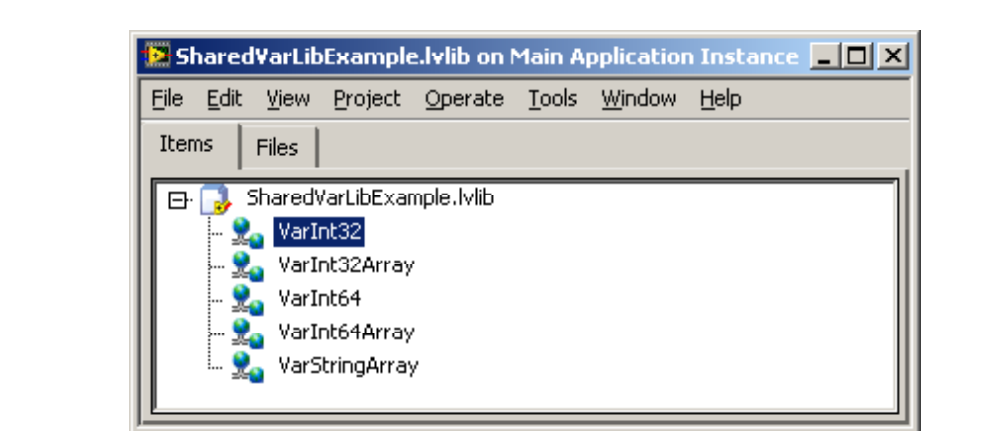
un-flatten from XML



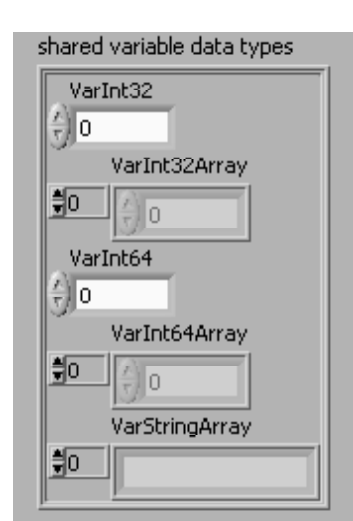
LabVIEW array of clusters with shared variable information

LabVIEW Scripting

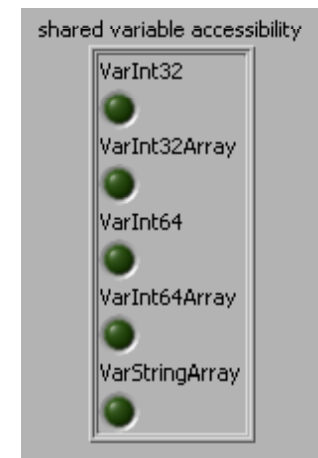
LabVIEW Scripting



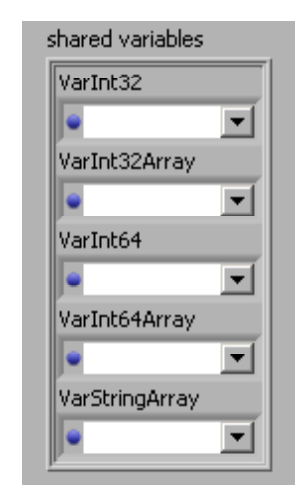
auto-generated shared variable library project



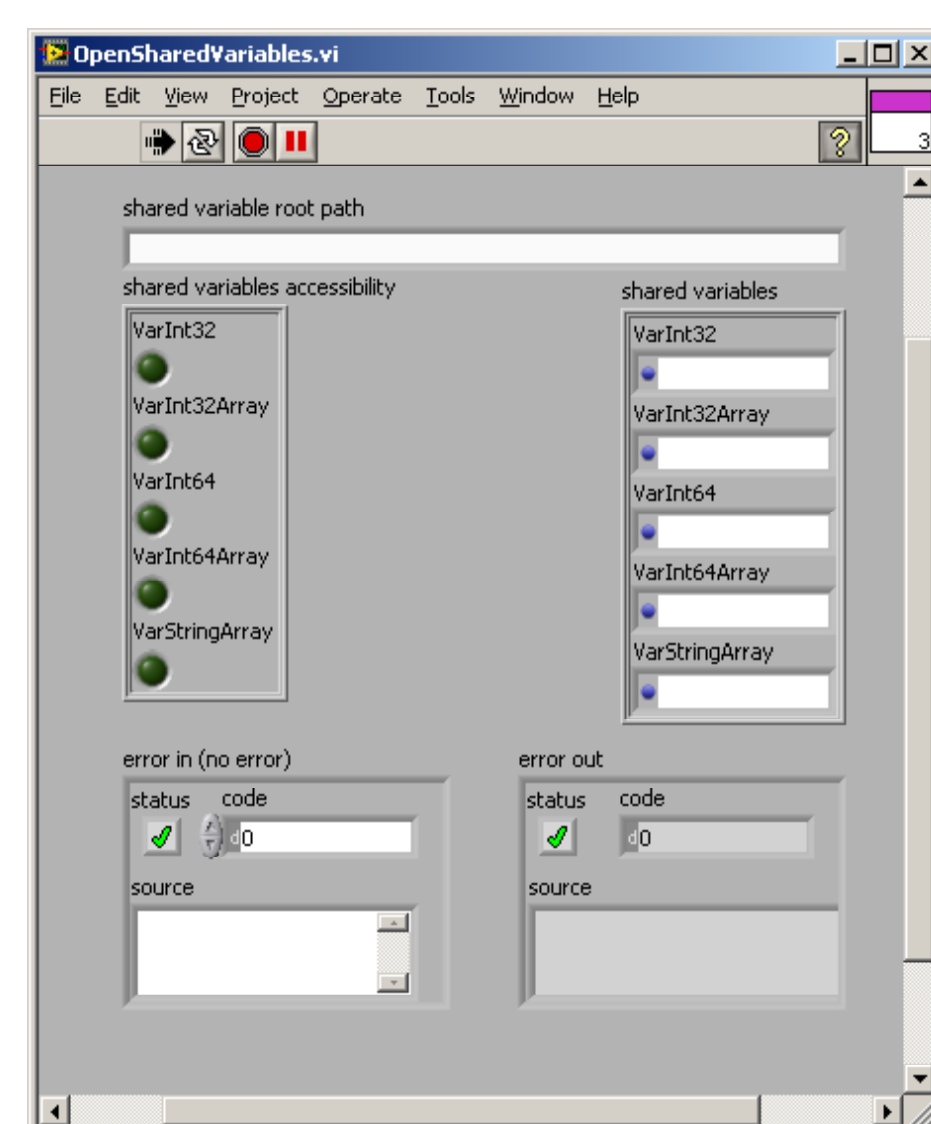
auto-generated "type cluster"



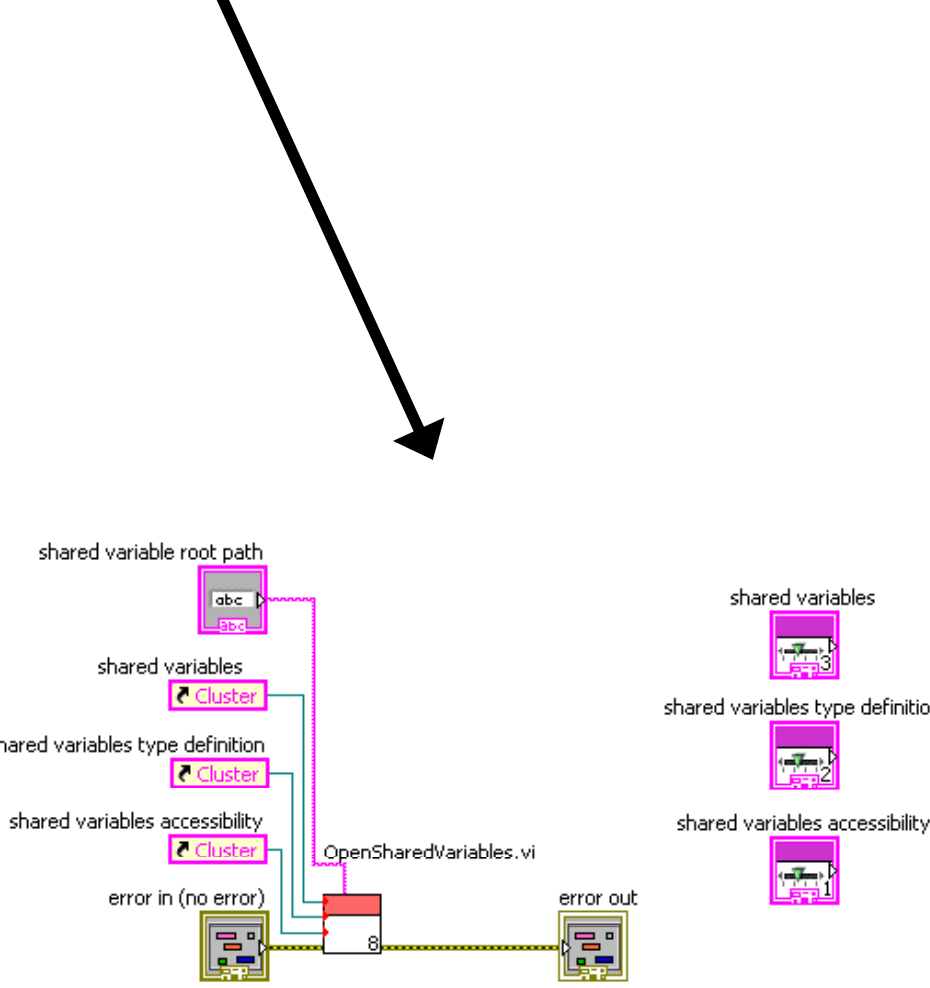
auto-generated "access cluster"



auto-generated "refnum cluster"



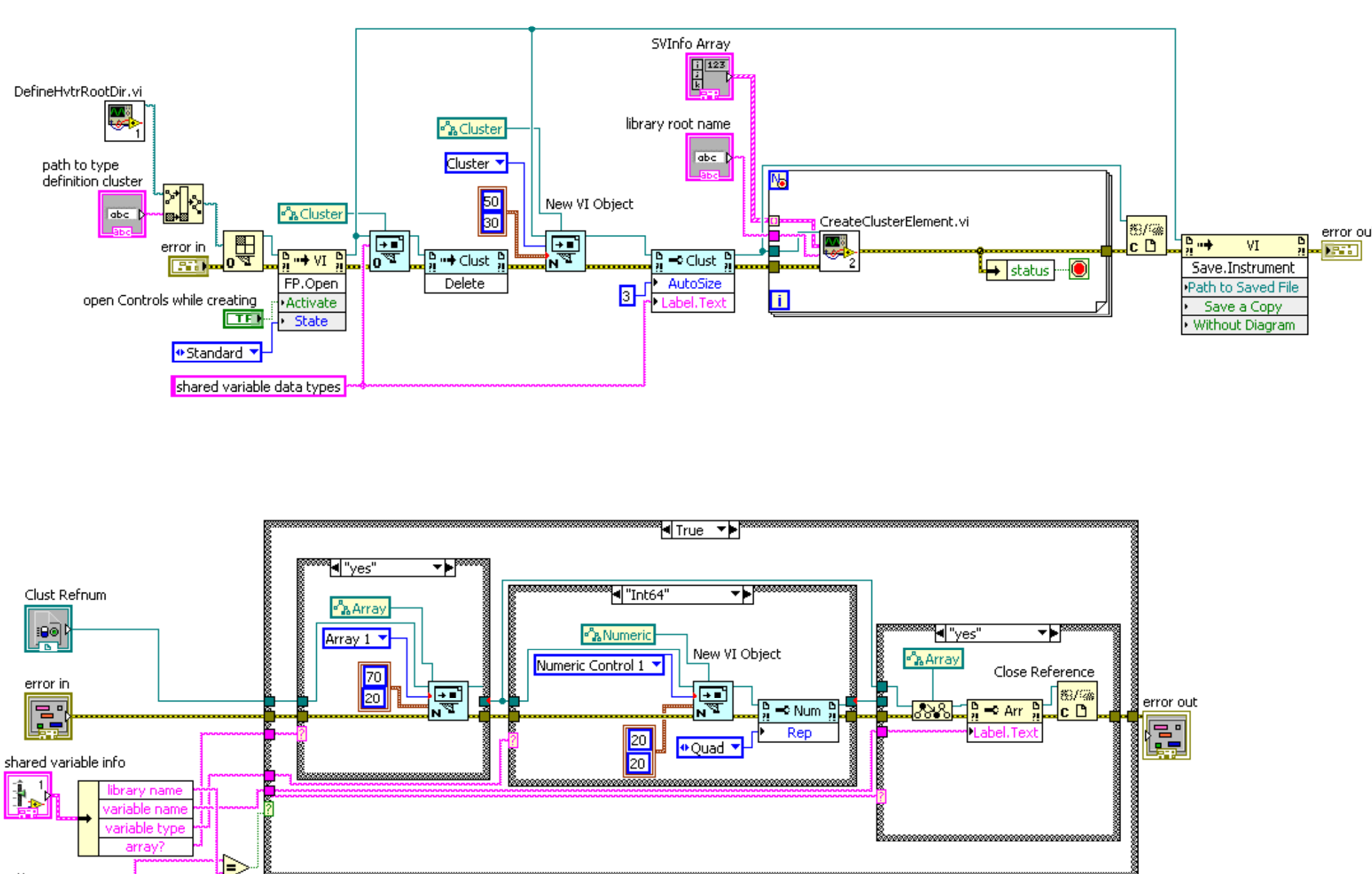
auto-generated OpenSharedVariables.vi front panel



auto-generated OpenSharedVariables.vi block diagram (specific) using generic SubVI

snippet of intermediate input data file (LabVIEW LVData XML format)

LabView Scripting



Block Diagram of SubVI CreateClusterElement.vi

Conclusion

- LabVIEW scripting has successfully been utilized for the auto-generation of shared variable libraries and code using the variables.
- Significant reduction of recurring tasks has been achieved.
- XML source file can be utilized for further text-base code generation steps in the build process, e.g. the generation of configuration files for the SCADA system of choice.

References

- [1] Heid O., Hughes T., THPD002, IPAC10, Kyoto, Japan
- [2] Irsigler R. et al, 3B-9, PPC11, Chicago IL, USA
- [3] Heid O., Hughes T., THPD68, LINAC10, Tsukuba, Japan
- [4] Heid O., Hughes T., MOPD42, HB2010, Morschach, Switzerland