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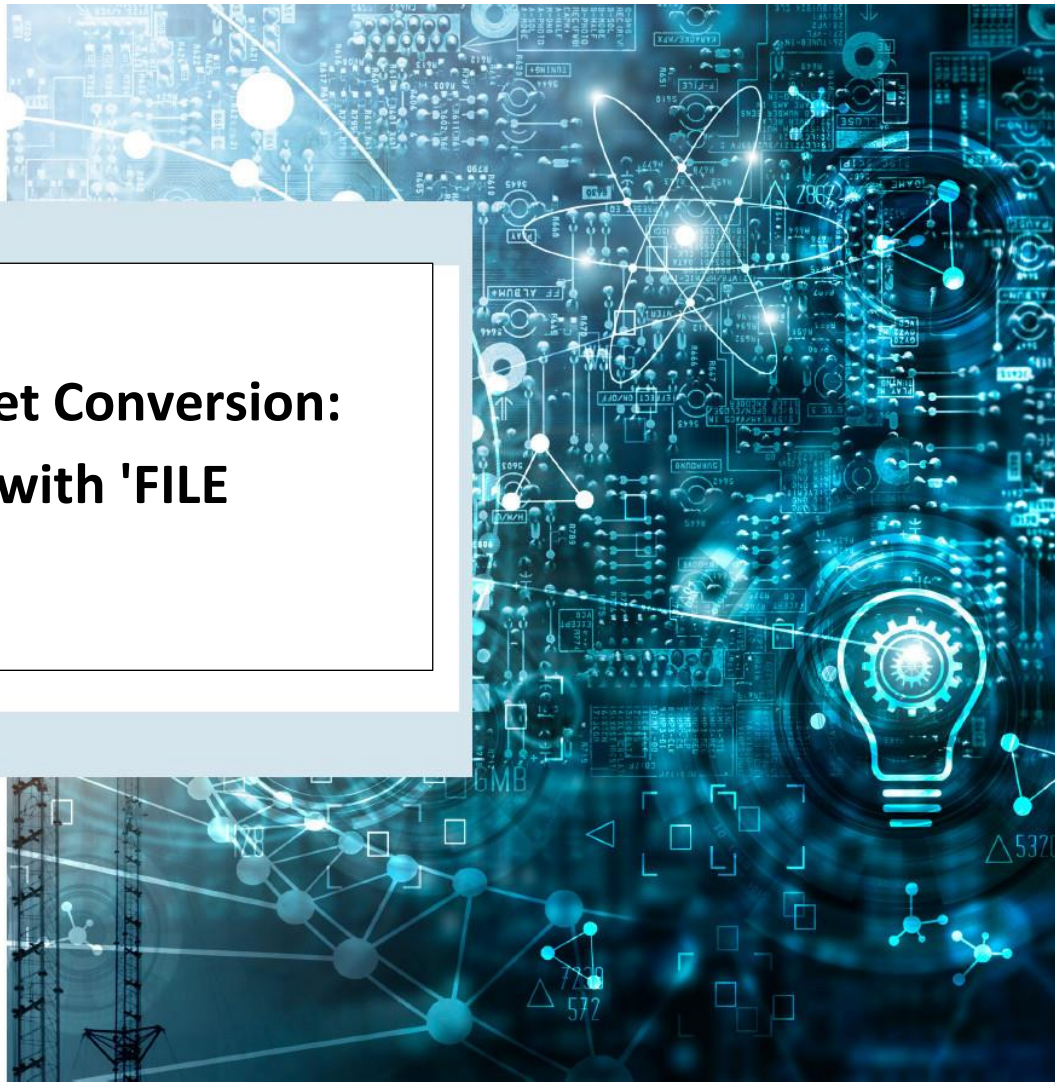

Case Study

LonWorks to BACnet Conversion: Beyond NV Values with 'FILE Template 0 2’

Overview LonWorks 'FILE template 0 2’

In LonWorks to BACnet conversion, customers interest typically revolves around NV (Network Variable) values. However, some customers have additional unique requirements, In this Case Study, we are going to showcase the need for 'FILE template 0 2' data integration. Unlike the usual focus on NV values, this specific application seeks comprehensive data conversion, including the detailed information contained in the 'FILE template 0 2.'

This Case Study sheds light on the broader scope of LonWorks to BACnet data conversion beyond standard NV values. It aims to incorporate LonWorks 'FILE template 0 2' data into larger systems, enhancing interoperability and functionality. Whether it's incorporating LonWorks configurations into centralized building management systems or integrating LonWorks data into other protocols, this overview delves into the intricacies of merging LonWorks 'FILE template 0 2' data seamlessly.

Chipkin's approach to the solution

This instance demonstrates the utilization of the XIF file for configuring a FieldServer QuickServer to retrieve file data. Specifically, the instance is derived from vvf03u.xif. (File: vvf03u.xif generated by SPP Revision 0.10, XIF Version 4.0)

Configuration Steps Using XIF File for FieldServer Data Retrieval

1. **XIF File Overview:**
   - ❒ Begin with an XIF file, in this case, vvf03u.xif, generated by SPP Revision 0.10, XIF Version 4.0.
   - ❒ Understand that an XIF file may contain a 'file template' section.

2. **SNVT Address Extraction:**
   - ❒ Explore the LonWorks XIF file, which may contain an SNVT for a file address.
   - ❒ Read the identified SNVT, which reports the address of the file header.

3. **File Header Analysis:**
   - ❒ Proceed to read the file header based on the obtained address.
   - ❒ At offset 10 in this chunk of 16 bytes of the file header, we find 2 bytes that when joined form a 16 bit number.
   - ❒ Combine these 2 bytes into a 16-bit number, representing the device's memory location where the file data is stored.

4. **Memory Location Identification:**
   - ❒ Understand the significance of the derived 16-bit number, as it points to the exact location in the device's memory housing the file data.

5. **Data Structure Understanding:**
   - ❒ Now we must understand how the data in the file data is structured. To do this we need to know how many variables there are and the byte offset in the file data where we will read those variables.
   - ❒ The File section of the XIF contains this information on the number of variables and their offsets.

6. **Variable Retrieval:**
   - ❒ Utilize the information from the 'File' section to determine the number of variables and their respective byte offsets.
   - ❒ Read these variables from the identified byte offsets within the file data.

7. **Configuration Validation:**
   - ❒ Verify the successful configuration of the FieldServer to read file data by ensuring accurate retrieval of variables based on the XIF file information.

8. **Iterative Optimization:**
   - ❒ Iterate through the configuration process, adjusting as necessary to optimize data retrieval and accommodate any specific requirements posed by the XIF file.

Outcome:
Through this systematic process, the FieldServer is configured to effectively read file data from the LonWorks XIF file.

The understanding of SNVT, file headers, memory locations, and variable structures is pivotal in ensuring accurate and meaningful data retrieval for enhanced device functionality. Below is a series of screen captures to help your through this process:

Please note that only X80 data can be extracted with this solution.

This is how you work out the number of variables and the byte offset of each one.

```
FILE template 0 2
        "1.0;"                  bytes
        "1,1,3\x80,39,1;"               // UCPT_AirTermType   'mdl8102/VavVF8102/T4/TrmFan/nci1'
        "1,1,0\x80,34,2;"               // SCPTbypassTime   'mdl8102/VavVF8102/T1/SpcOccupancy/nci3'
        "1,1,3\x80,22,6;"               // UCPT_ClgDmdCntr   'mdl8102/VavVF8102/T3/SpcClgDemand/nci1'
        "1,1,0\x80,46,2;"               // SCPTductArea   'mdl8102/VavVF8102/T6/TrmFlowLocal/nci2'
        "1,1,3\x80,122,12;"             // UCPT_Expansion   'mdl8102/VavVF8102/T1/SpareIO/nci4'
        "1,1,3\x80,308,1;"              // UCPT_FanCoefSel   'mdl8102/VavVF8102/T5/FanCoefSel/nci11'
        "1,1,3\x80,296,12;"             // UCPT_FanCoefs   'mdl8102/VavVF8102/T5/FanCoefSel/nci4'
        "1,1,3\x80,307,1;"              // UCPT_FanRampClgEn   'mdl8102/VavVF8102/T5/SetpointRamp/nci13'
        "1,1,3\x80,227,2;"              // UCPT_FanRampTime   'mdl8102/VavVF8102/T5/SetpointRamp/nci5'

                                FILE value 1 1
                                01,  1 byte - 1 variable
                                003c, 2 bytes - 1 variable
                                1c20, 4e20, 0000, 6 bytes - 3 variables
                                01f4,
Sample/Default data             0898, 0898, 0000, 0000, 0000, 0000,
shows how many sub              01,
variables there are             0000, 0000, 0000, 0000, 0000, 0000,
                                01,
                                0258,
                                01,
                                00.
```

```
//  ------------------------------------------------------------------------
//  From Here
//  ---------
//  This is how we find the address of the file objects
//  See section 8.10 of this document https://cdn.chipkin.com/assets/uploads/2021/Jul/FS-8700-21%20-%20LonWorks%20-%20Manual_20-15-20-44.pdf

//VAR nvoFileDirectory 2 0 0 0
//0 1 63 1 0 1 0 1 0 1 0 0 0
//@0|8;FileDirectory
//114 *   1
//2 0 0 0 0

Map_Descriptors
Map_Descriptor_Name , Data_Array_Name , Data_Array_Offset , Lon_Function , Function , Node_Name         , SNVT_Index , SNVT_Type
nviFDAddress_1      , File_Address    , 0                 , NMFETCHC      , RDBC     , TSD_FLR55_C_FPB21 , 2          , SNVT_address

Map_Descriptors
Map_Descriptor_Name , Data_Array_Name , Data_Array_Offset , DA_Address   , Address_Offset , Lon_Function , Function , Node_Name         , SNVT_Type , UNVT_ID , UNVT_Byte_Length
Poller1             , CP_Info         , 0                 , File_Address , 0              , NM_MEMORY    , RDBC     , TSD_FLR55_C_FPB21 , Not SNVT  , -       , 16

Moves
Task_Name  , Function          , Source_Data_Array , Source_Offset , Target_Data_Array , Target_Offset , Length , Scan_Interval
CP_Values2 , join_int16        , CP_Info           , 10            , CP_Address2       , 0             , 1      , 1s

//  To Here
//  ------------------------------------------------------------------------

Map_Descriptors
Map_Descriptor_Name , Data_Array_Name , Data_Array_Offset , DA_Address , Address_Offset , Lon_Function , Function , Scan_Interval , Node_Name , SNVT_Type , UNVT_ID , UNVT_Byte_Lengt
SCPTductArea        , DA_F3_21_009    ,0, CP_address2  , 9,  NM_MEMORY   , Rdbc     , 1.0s          ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 002
UCPT_FlowDmprMtr    , DA_F3_21_043    ,0, CP_Address2  , 43, NM_MEMORY   , Rdbc     , 0 secs        ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 003
UCPT_FlowFanRq      , DA_F3_21_046    ,0, CP_Address2  , 46, NM_MEMORY   , Rdbc     , 0 secs        ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 004
UCPT_FlowVav        , DA_F3_21_050    ,0, CP_Address2  , 50, NM_MEMORY   , Rdbc     , 0 secs        ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 005
UCPT_HStageCyc      , DA_F3_21_060    ,0, CP_Address2  , 60, NM_MEMORY   , Rdbc     , 0 secs        ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 002
UCPT_HtgClgSwit     , DA_F3_21_062    ,0, CP_Address2  , 62, NM_MEMORY   , Rdbc     , 0 secs        ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 006
UCPT_MaxFanClg      , DA_F3_21_085    ,0, CP_Address2  , 85, NM_MEMORY   , Rdbc     , 0 secs        ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 002
UCPT_MaxFanHtg      , DA_F3_21_087    ,0, CP_Address2  , 87, NM_MEMORY   , Rdbc     , 0 secs        ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 002
UCPT_MidFanPoint    , DA_F3_21_089    ,0, CP_Address2  , 89, NM_MEMORY   , Rdbc     , 0 secs        ,  TSD_FLR55_C_FPB21  , Not SNVT     , -       , 002
```

This is an extract from the NV part of the XIF. Note that it is SNVT Index = 2

Read the file header address

Read the file header

The memory location where the fiel data starts in memory is found as a 16bit integer starting at offset 10 in the header

In this task (map desc) we read 2 bytes from offset 9 in the file data

```
FILE template 0 2
        "1.0;"
offset 0    "1,1,3\x80,39,1;"              // UCPT_AirTermType   'mdl8102/VavVF8102/T4/TrmFan/nci1'
offset 1    "1,1,0\x80,34,2;"              // SCPTbypassTime   'mdl8102/VavVF8102/T1/SpcOccupancy/nci3'
offset 3    "1,1,3\x80,22,6;"              // UCPT_ClgDmdCntr   'mdl8102/VavVF8102/T3/SpcClgDemand/nci1'
offset 9    "1,1,0\x80,46,2;"              // SCPTductArea   'mdl8102/VavVF8102/T6/TrmFlowLocal/nci2'
offset 11   "1,1,3\x80,122,12;"            // UCPT_Expansion   'mdl8102/VavVF8102/T1/SpareIO/nci4'
            "1,1,3\x80,308,1;"             // UCPT_FanCoefSel   'mdl8102/VavVF8102/T5/FanCoefSel/nci11'
...         "1,1,3\x80,296,12;"            // UCPT_FanCoefs   'mdl8102/VavVF8102/T5/FanCoefSel/nci4'
```

corresponds with offset 9

```
FILE value 1 1
01,                                         1 byte - 1 variables
003c,                                       2 byte - 1 variables
1c20, 4e20, 0000,                           6 byte - 3 variables
01f4,                                       2 byte - 1 variables
0898, 0898, 0000, 0000, 0000, 0000,         12 byte - 6 variables
01,
0000, 0000, 0000, 0000, 0000, 0000,
01,
0258,
```

we take 2 bytes we read and join them to make a 16bit number

```
Moves
Source_Data_Array , Source_Offset , Target_Data_Array , Target_Offset , Length , Function
DA_F3_21_009      ,0, DA_F3_21_CFG    ,  5,1,join_int16,
DA_F3_043
DA_F3_043
DA_F3_050         ,1, DA_F3_21_CFG    , 29,2,join_int16
DA_F3_060         ,0, DA_F3_21_CFG    , 35,1,join_int16
```

Store the 16 bit number in another array (which will be used for the BACnet server objects

Sample configuration – find the file at this URL
https://cdn.chipkin.com/assets/uploads/2024/Jan/SampleLonworksFileData_26-21-21-43.csv

```
//===============================================================================

//

//


//   ??         2023Sep20 PMC   As rcvd from site for cleanup

//   29         2023Sep20 PMC   Cleanup

//                                  Sent to Kevin to check - expecially 3x MV server map descs which hav scaling as shown below

//                                  Scaling on these has to have the style  x,y,x+1,y+1

//

//                                                                                                  OCC.MODE.STS        , DA_F3_21        , 9
, Server   , vTSD_FLR55_C_FPB21 , MV        , 29        , Present_Value , No_Units , enum_occup_t     , -                 , 1
, 4                    , 1              , 4              , SNVTindex=041 VAR=nvoEffectOccup

//                                                                                                  FLOWOVRCMD.C        , DA_F3_21        , 33
, Server   , vTSD_FLR55_C_FPB21 , MV        , 117       , Present_Value , No_Units , enum_overid_t    , -                 , 1
, 49                   , 1              , 49             , SNVTindex=018 VAR=nviFlowOverride.state

//                                                                                                  FAN COEF SEL        , DA_F3_21_CFG    , 12
, Server   , vTSD_FLR55_C_FPB21 , MV        , 215       , Present_Value , No_Units , enum_fanCoefSel  , -                 , 1
, 4                    , 1              , 4              , SNVTindex=005 VAR=UCPT_FanCoefSel
```