Advanced Drag & Drop

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February 21, 2016

Abstract

In a previous contribution, we examined how simple drag and drop can be implemented for Delphi and Lazarus. In this article, we will look at a more complex example: drag and drop from an application to the windows explorer.

1 Introduction

In Delphi and Lazarus, it is fairly easy to implement Drag and Drop inside an application, and receiving files from the explorer is also easily implemented. It becomes more complicated if the task is to drag and drop files from an application into the windows explorer (or indeed any other application). Use cases can be very simple and varied:

- an FTP or browser application where the contents of a remote directory or website are shown, and the user should be able to drag selected files to a folder on the local machine.
- An email application where the mail and attachments are dragged to the explorer, where they should be saved as files.
- A list of pictures taken by a raspberry pi, still stored on the raspberry.

This kind of interaction with the explorer is somewhat more complicated to implement.

Drag and drop to the explorer is implemented through the clipboard and makes use of several interfaces: These interfaces must be implemented by the application that wishes to implement drag and drop.

The concepts needed will be explained using a sample application which shows a simple listview, and the user can drag selected items from the listview to the explorer. The files in the listview do not actually exist, but are 'virtual' files.

2 Starting a Drag and Drop operation

To start a Drag & Drop operation to the explorer, the `doDragDrop` operation must be called:

```
Function DoDragDrop(dataObj: IDataObject;
                     dropSource: IDropSource;
                     dwOKEffects: Longint;
                     var dwEffect: Longint): HResult; stdcall;
```

This call involves 2 Interface parameters and 2 simple parameters. The `dwOKEffects` parameter gives an indication of what kind of operations are supported. It is an OR-ed combination of the following constants:

DROPEFFECT_NONE This value can only be returned in `dwEffect`: the drop target could not accept the data.

DROPEFFECT_COPY The data is copied to the target.

DROPEFFECT_MOVE The data is moved to the target (the source is responsible for deleting the data)

DROPEFFECT_LINK The data is linked in the target.

DROPEFFECT_SCROLL Scrolling is about to occur in the target. This value cannot be specified in `DoDragDrop`, but can be reported in IDropSource.

When the Drag & drop operation is finished, the `DoDragDrop` function will report the actual operation in `dwEffect`. The function will return `S_OK` if all went well.

The function needs also 2 interfaces: `IDataObject` and `IDropSource`. For the sample application, a single object will be made that implements these methods: `TDnDObject`. It will be used to implement the Drag And Drop in the sample application.

In practice, it might be a better choice to implement the interfaces in 2 separate objects. Since the object needs interfaces, we'll descend it from `TInterfacedObject`, which will make sure it handles `IUnknown` and the associated reference counting mechanism.

3 Drag & Drop : Status reporting

The `IDropSource` interface is the simplest of the 2 interfaces involved in a drag & drop operation. It is used while the user is dragging to allow the source to change for example the appearance of the Drag&Drop cursor or to abort the operation. The methods of this interface are called continuously while the user is dragging.

It looks as follows:

```
IDropSource = interface(IUnknown)
  function QueryContinueDrag(fEscapePressed: BOOL;
                             grfKeyState: Longint): HResult;
  function GiveFeedback(dwEffect: Longint): HResult;
end;
```

The `GiveFeedback` allows the implementor to set the cursor or implement some other visual effects so the user is aware of what is happening. It can be implemented as follows:

```
function TDnDObject.GiveFeedback(dwEffect: Integer): HResult;
begin
  // Maybe do something with dwEffect
  Result:=DRAGDROP_S_USEDEFAULTCURSORS;
end;
```

The return value of `DRAGDROP_S_USEDEFAULTCURSORS` tells Windows that it should display a default cursor for the current effect (one of copy, move, link etc.). If the application has set the cursor, then `S_OK` must be returned.

The `QueryContinueDrag` operation is called at regular intervals (when the mouse moves or relevant keyboard keys are pressed) to check if the operation must be aborted, or if a drop must be performed. It gets the current state of mouse and key buttons: `grfKeyState` contains a OR-ed combination of one of the following constants:

MK_CONTROL The control key is pressed: this can be used to distinguish a copy or move operation.

MK_SHIFT The shift key is pressed.

MK_ALT The ALT key is pressed, this is normally sed to indicate a shortcut is created.

MK_BUTTON A mouse button is pressed.

MK_LBUTTON The left mouse button is pressed.

MK_MBUTTON The middle mouse button is pressed.

MK_RBUTTON The right mouse button is pressed.

The `fEscapePressed` parameter speaks for itself; it will be true if the user has pressed escape, and wishes to abort the operation. (this can be used for example to cancel any downloads in progress).

The `QueryContinueDrag` function must return one of the following values:

S_OK The drag and drop operation can continue normally.

DRAGDROP_S_DROP The drag and drop operation must completed. This should be returned if the mouse button is released.

DRAGDROP_S_CANCEL The drag and drop operation must be cancelled. This should be returned if the `fEscapePressed` parameter equals `True`. sed.

For our sample component, the code can be kept simple: as soon as the mouse button is released, the drag and drop should be completed, and if escape is pressed, it must be cancelled:

```
function TDnDObject.QueryContinueDrag(fEscapePressed: BOOL;
  grfKeyState: Integer): HResult;

Var
  HaveMouseButton : Boolean;

begin
  HaveMouseButton:=((grfKeyState and MK_LBUTTON)<>0) or
                   ((grfKeyState and MK_RBUTTON)<>0);
  if fEscapePressed and HaveMouseButton then
    Result:=DRAGDROP_S_CANCEL
  else if not HaveMouseButton then
    Result:=DRAGDROP_S_DROP
  else
    Result:=S_OK;
end;
```

4 Drag & Drop : Data management

The first argument in the `DoDragDrop` is a `IDataObject` interface. It is used to exchange data between the source and target of the Drag and Drop operation. It is more complicated than the `IDropSource` interface, and is used both when implementing target and sources for a drag & drop operation.

Several kinds of data must be transferred between the source and target of the operation: in our case, the file names of files to be copied, and the actual file data.

The declaration of the `IDataObject` is as follows:

```
IDataObject = interface(IUnknown)
  function GetData(const formatetcIn: TFormatEtc;
                   out medium: TStgMedium): HResult;
  function GetDataHere(const formatetc: TFormatEtc;
                       var medium: TStgMedium): HResult;
  function QueryGetData(const formatetc: TFormatEtc): HResult;
  function GetCanonicalFormatEtc(const formatetc: TFormatEtc;
                   out formatetcOut: TFormatEtc): HResult;
  function SetData(const formatetc: TFormatEtc;
                   var medium: TStgMedium;
                   fRelease: BOOL): HResult;
  function EnumFormatEtc(dwDirection: Longint;
                   out enumFormatEtc: IEnumFormatEtc): HResult;
  function DAdvise(const formatetc: TFormatEtc;
                   advf: Longint;
                   const advSink: IAdviseSink;
                   out dwConnection: Longint): HResult;
  function DUnadvise(dwConnection: Longint): HResult;
  function EnumDAdvise(out enumAdvise: IEnumStatData): HResult;
end;
```

At least the following methods will need to be implemented:

EnumFormatEtc this function is called to list the data made available by the drop source. This function returns again an interface which will be used to enumerate the available data.

QueryGetData is an auxiliary function to determine whether `GetData` will return valid data for a certain format. The result of this function is advisory only.

GetData this routine is called by the program accepting the drop to fetch the actual data. The actual data can come in many forms, but is one of the forms returned by `EnumFormatEtc`.

For the use case discussed here, the following methods are not needed:

GetCanonicalFormatEtc Data can be transferred in various formats. This function can be called to see if one kind of format is equivalent to another for the drop source.

SetData SetData needs to be implemented for Drop targets. Since we're only looking at implementing a drop source, this interface does not need to be implemented.

DAdvise is needed for advisory connections. This is an advanced feature which is not needed, and may be left unimplemented.

DUnadvise is needed for advisory connections. This is an advanced feature which is not needed, and may be left unimplemented.

EnumDAdvise is needed for advisory connections. This is an advanced feature which is not needed, and may be left unimplemented.

These methods must of course be present in the `TDNDObject` since they are part of the `IDataObject` interface, but they can return a standard return value (`E_NOTIMPL`) for such cases:

```
function TDnDObject.DAdvise(const formatetc: TFormatEtc;
                            advf: Integer;
                            const advSink: IAdviseSink;
                            out dwConnection: Integer): HResult;
begin
  Result:=E_NOTIMPL;
end;

function TDnDObject.DUnadvise(dwConnection: Integer): HResult;
begin
  Result:=E_NOTIMPL;
end;

function TDnDObject.EnumDAdvise(out enumAdvise: IEnumStatData): HResult;
begin
  Result:=OLE_E_AdviseNotSupported;
end;

function TDnDObject.GetCanonicalFormatEtc(const formatetc: TFormatEtc;
  out formatetcOut: TFormatEtc): HResult;
begin
  FillChar(formatetcOut,SizeOf(TFormatEtc),0);
  Result:=E_NOTIMPL;
end;

function TDnDObject.GetDataHere(const formatetc: TFormatEtc;
  out medium: TStgMedium): HResult;
begin
  FillChar(medium,SizeOf(TStgMedium),0);
  Result:=E_NOTIMPL;
end;

function TDnDObject.SetData(const formatetc: TFormatEtc;
                            var medium: TStgMedium;
                            fRelease: BOOL): HResult;
begin
  FillChar(medium,SizeOf(TStgMedium),0);
  Result:=E_NOTIMPL;
end;
```

5 Drag & Drop : Data formats

Data in a drag and drop operation is transferred in one of the formats that the shell (explorer) clipboard understands. This data then must be transferred in one of the ways that the shell understands.

The shell clipboard supports many data formats, they are listed at (the following should be one line):

```
https://msdn.microsoft.com/en-us/
        library/windows/desktop/bb776902%28v=vs.85%29.aspx
```

The ones interesting for the use case discussed are:

CF_HDROP This data format signifies existing files in the system.

CFSTR_FILECONTENTS This data format must be used to transfer actual file contents.

CFSTR_FILEDESCRIPTOR This data format must be used to transfer a series of file descriptors.

CFSTR_FILENAME This data format can be used to transfer a single filename.

CFSTR_FILENAMEMAP This data format can be used to transfer a series of file names.

CFSTR_MOUNTEDVOLUME This data format is used to indicate a mounted volume (a disk).

CFSTR_SHELLIDLIST This data format can be used to transfer a series of files, but the files are identified by a file system identifier.

CFSTR_SHELLIDLISTOFFSET This data format is used to transfer the location (on screen) of the transferred objects.

If a virtual file needs to be transferred, 2 data formats must be used together:

CFSTR_FILEDESCRIPTOR This format must be used to transfer a series of file descriptors: this is a list of records that describe the files involved in de drag and drop operation. The files must not actually exist, but they can be described by the records in this format.

CFSTR_FILECONTENTS This format must be used to transfer the actual file contents.

The various `CFSTR_*` formats must be registered with the OLE mechanism. For each registered format, the OLE mechanism will return an numerical identifier (`CF_HDROP` is such a fixed system identifier). Since our application will need the above 2 formats, they are registered in the initialization section of the unit, and the numerical values will be saved for later use in the code.

```
begin
  CF_Names:=RegisterClipBoardFormat(CFSTR_FILEDESCRIPTOR);
  CF_Contents:=RegisterClipBoardFormat(CFSTR_FILECONTENTS);
end.
```

The `CF_Names` and `CF_Contents` variables will be used further in the code.

The above describes what is being transferred. It does not describe how the data will be transferred. The transfer mechanism is described using several constants:

TYMED_HGLOBAL Data is transferred in a globally allocated memory block.

TYMED_FILE Data is transferred using a filename of an existing file on disk.

TYMED_ISTREAM Data is transferred using the `IStream` streaming mechanism.

TYMED_ISTORAGE Data is transferred using the `IStorage` storage component mechanism.

TYMED_GDI Data is transferred using a GDI object: a bitmap.

TYMED_MFPICT Data is transferred using a GDI metafile.

TYMED_ENHMF Data is transferred using a GDI enhanced metafile.

Obviously, not all types of transfer can be used for all kinds of data format. When a drag&drop source enumerates the data it can deliver, it must for each kind of available data indicate which transfer mechanism is available. The above constants can be OR-ed together to indicate the available mechanisms. When data is actually transferred, the used mechanism must be indicated using one of the above constants.

To know what data is available from a drag source, or what data a drop target accepts, the drag&drop loop calls `EnumFormatEtc`. This function needs to return an interface which will be used to enumerate the available or acceptable data. The `dwDirection` parameter determines whether the data is fetched or pushed. For the sample application, this means we only need to implement the read directon (`DATADIR_GET`):

```
function TDnDObject.EnumFormatEtc(dwDirection: Integer;
              out enumFormatEtc: IEnumFormatEtc): HResult;
begin
  if (dwDirection=DATADIR_GET) then
    begin
    EnumFormatEtc:=TEnumFormatEtc.Create;
    Result:=S_OK;
    end
  else
    begin
    EnumFormatEtc:=nil;
    Result:=E_NOTIMPL;
    end;
end;
```

The `TEnumFormatEtc` class implements the `IEnumFormatEtc` interface:

```
TEnumFormatEtc = class(TInterfacedObject, IEnumFormatEtc)
  FIndex : Integer;
public
  function Next(celt: Longint; out elt;
                pceltFetched: PLongint): HResult;
  function Skip(celt: Longint): HResult;
  function Reset: HResult;
  function Clone(out Enum: IEnumFormatEtc): HResult;
end;
```

The methods of this interface resemble the standard methods found in an enumerator class as found in Delphi.

The most important method is the `Next` method; It receives a maximum number (`celts`) of `TFormatEtc` elements to retrieve, and must fill the `elts` memory block with as much elements as available. If `pceltFetched` is not nil, the number of actually fetched elements must be written there. This function can be called multiple times, till all available formats have been fetched.

The `TFormatEtc` record describes the available data and transfer mechanisms, and is declared as follows:

```
TFORMATETC = record
  cfFormat: TClipFormat;
  ptd: PDVTargetDevice;
  dwAspect: Longint;
  lindex: Longint;
  tymed: Longint;
end;
```

The various fields have the following meaning:

cfFormat The available clipboard format. This is one of the standard clipboard formats, or a registered clipboard format.

ptd a target device descriptor. This is not needed for our implementation.

dwAspect A rendering aspect (how much detail is allowed in the rendering) For the purpose of file copying, this is always `DVASPECT_CONTENT`

lindex Usually -1, to indicate all of the data must be rendered. If not -1, it is a zero-based index of the part to be rendered. In the case of copying multiple files, this will indicate which file in the list must be copied.

tymed The types of storage medium used to transfer data.

For our implementation, 2 kinds of data must be reported: the filenames (clipboard format `CF_NAMES`) and the file contents (`CF_Contents`). The `Findex` field is kept to know at what position the enumerator currently is.

```
function TEnumFormatEtc.Next(celt: Integer;
                        out elt;
                        pceltFetched: PLongint): HResult;

Var
  CC,C : Integer;
  F : TFormatEtc;
  P : ^TFormatEtc;

begin
  Result:=S_False;
  P:=@Elt;
  CC:=0; // Copied count.
  // This data is the same for all records.
  F.ptd:=nil;
  F.dwAspect:=DVASPECT_CONTENT;
  F.lindex:=-1;
  // Valid indexes are 0 and 1
  While (FIndex<2) and (CElt>0) do
    begin
    Inc(CC);
    Case FIndex of
    0 :
       begin // File names are available.
       F.cfFormat:=cf_names;
       F.tymed:=TYMED_HGLOBAL;
      end;
    1 :
      begin  // File contents are available.
      F.cfFormat:=cf_contents;
      F.tymed:=TYMED_ISTREAM;
      end;
    end;  // Move into place.
    Move(F,P^,SizeOf(TFormatEtc));
    Dec(Celt); // Prepare for next iteration.
    Inc(FIndex);
    P:=P+SizeOf(TFormatEtc);
    end;
  if pceltFetched<>nil then
    pceltFetched^:=CC;
  if (CC>0) then
    Result:=S_OK;
end;
```

The loop transfers the data to the `elts` memory block, taking care only to report as much data as still is available. After the loop has finished, the result is determined and the number of elements is returned to the caller.

The `clone` method needs to return a copy of the enumerator, which preserves the state:

```
function TEnumFormatEtc.Clone(out Enum: IEnumFormatEtc): HResult;
begin
   Result:=S_OK;
   try
     Enum:=TEnumFormatEtc.Create;
     TEnumFormatEtc(Enum).FIndex := FIndex;
   except
     Result:=E_Fail;
   end;
end;
```

The method `reset` simply resets the enumerator:

```
function TEnumFormatEtc.Reset: HResult;
begin
  FIndex:=0;
  Result:=S_OK;
end;
```

And the `Skip` method just increments the position of the enumerator:

```
function TEnumFormatEtc.Skip(celt: Integer): HResult;
begin
  if Findex+Celt<=2 then
    begin
    inc(Findex,Celt);
    Result:=S_OK;
    end
  else
```

```
    Result:=S_False;
end;
```

6 Drag & Drop: transferring data

Now that we've reported what data is available, the last part of our object must be implemented: actually transferring data. This must done by implementing the `GetData` method. The caller passes a description of the needed data in the `formatetcIn`, and the routine must respond by returning the requested data and passing it back through `medium`.

For the file drag and drop mechanism, the method needs to return 2 kinds of data: filenames of files to copy (using descriptors) and for each of the files, the file contents. In the case of file contents, the `lIndex` field of the `formatetc` record will contain the index of the file that must be returned. This means that the implementation can be done as follows:

```
function TDnDObject.GetData(const formatetcIn: TFormatEtc;
                            out medium: TStgMedium): HResult;

begin
  Result:=E_FAIL;
  if (FormatEtcIn.cfFormat=cf_names) then
    Result:=GetFileNames(medium)
  else if (FormatEtcIn.cfFormat=cf_contents) then
    Result:=GetFileContents(formatetcin.lindex,medium);
end;
```

Since we wish to be able to drag and drop multiple files from our application, the list of (virtual, they need not actually exist) filenames is passed to the constructor of our `TDNDObject`, and the list is freed when the object is freed:

```
constructor TDnDObject.Create(AFiles : TStrings);
begin
  FFiles:=AFiles;
end;

destructor TDnDObject.Destroy;
begin
  FreeAndNil(FFiles);
  inherited;
end;
```

Using this list, the `GetFileNames` routine can be implemented as follows. It starts out by reserving a block of memory for a `TFileGroupDescriptorW` structure, which is in essence an array of `TFileGroupDescriptorW` records, preceded by a count.

```
function TDnDObject.GetFileNames(out medium: TStgMedium): HResult;

Var
  G : TFileGroupDescriptorW;
  H : HGlobal;
  Psrc : PFileGroupDescriptorW;
  PF : PFileDescriptorW;
  FN : String;
  P : PByte;
  I,Count,Len : Integer;

begin
  Count:=FFiles.Count;
  // length of the block.
  Len:=SizeOf(TFileGroupDescriptorW) +
       SizeOf(TFileDescriptorW)*(Count-1);
  GetMem(PSrc,Len);
  FillChar(PSrc^,Len,0);
  PSrc^.cItems:=Count;
```

The implementation then proceeds to copy all filenames to the array of file descriptor records:

```
  PF:=@PSrc^.fgd[0];
{$R-} // Eliminate a range error.
  for I:=0 to Count-1 do
    begin
    FN:=FFiles[i];
    Move(FN[1],PF[i].cFileName,Length(FN)*SizeOf(Char));
    end;
```

Note that the `TFileDescriptorW` record contains many other fields besides the `cFileName` field, such as size, date of access etc. These fields are not needed for our implementation, so they are ignored.

The implementation then copies the structure to a global memory block, which is then returned in the `medium` record using the `TYMED_HGLOBAL` type:

```
  H:=GlobalAlloc(GHND or GMEM_SHARE,Len);
  P:=GlobalLock(H);
  try
    Move(PSrc^,P^,Len);
  finally
    FreeMem(PSrc);
    GlobalUnLock(H);
  end;
  with Medium do
    begin
    tymed:=TYMED_HGLOBAL;
    hGlobal:=H;
    unkForRelease := nil;
    end;
  Result:=S_OK;
end;
```

The last thing that remains to be done is the `GetFileContents` routine, which must transfer the actual file data. This is done using an event handler of the `TDNDObject` class:

```
Type
  TGetStreamEvent = Procedure (Sender : TObject;
                               Const AFileName : String;
                               out S : TStream) of object;
  TDnDObject = class(TInterfacedObject, IDataObject, IDropSource)
  public
    constructor Create(AFiles : TStrings);
    destructor Destroy; override;
    // Property OnGetStream
    Property OnGetStream : TGetStreamEvent ;
  end;
```

The event handler will be called for each file that needs to be copied.

Using this event handler, the `GetFileContents` method is fairly easy. It gets the stream through the event handler, wraps it in a `TStreamAdaptor` class and returns the resulting `IStream` interface through the `medium` record:

```
function TDnDObject.GetFileContents(const Index: Integer;
                                    out medium: TStgMedium): HResult;

Var
  S : TStream;

begin
  with Medium do
    begin
    tymed:=TYMED_ISTREAM;
    S:=Nil;
    if Assigned(FOnGetStream) then
      FOnGetStream(Self,FFiles[Index],S);
    S.Position:=0;
    IStream(stm):=TStreamAdapter.Create(S,soOwned) as IStream;
    unkForRelease:=nil;
    end;
  Result:=S_OK;
end;
```

The Drag and Drop mechanism is responsible for the release of the IStream interface. The StreamAdapter will then free the stream `S`, because of the `soOwned` parameter passed in the constructor.

With this last method implemented, the `TDNDObject` class is ready to be used.

7 Putting it all together

To use the `TDNDObject` class, we create a form with a listview (`LVfiles`) in it, and add some virtual items to the listview. The drag and drop operation is started manually, as the automatic drag and drop will not work for drops outside the application.

The drag and drop detection is started with a `OnMouseDown` event handler in the listview:

```
procedure TForm1.LVFilesMouseDown(Sender: TObject;
                                  Button: TMouseButton;
                                  Shift: TShiftState;
                                  X, Y: Integer);
begin
  if Button=mbLeft then
```

```
    begin
    FStartX:=X;
    FStartY:=Y;
    end
  else
    begin
    FStartX:=-1;
    FStartY:=-1;
    end;
end;
```

A drag and drop is not started, unless the user has dragged the mouse at least 10 pixels. In that case, the selected (checked) items are collected in a stringlist, and this is passed on to a newly created `TDNDObject` instance. This instance is then passed on to the `DoDragDrop` call, which sets the ball rolling for the Drag and Drop operation.

```
procedure TForm1.LVFilesMouseMove(Sender: TObject;
                                  Shift: TShiftState;
                                  X,Y: Integer);

Var
  DND : TDNDObject;
  I,Eff : Integer;
  AFiles : TStrings;

begin
  if (ssLeft in Shift) and (FStartX>0)
     and ((Abs(X-FStartX)>10) or (Abs(Y-FStartY)>10)) then
    begin
    // Collect checked files
    AFiles:=TStringList.Create;
    for I:=0 to LVFIles.Items.Count-1 do
      If LVFiles.Items[i].Checked then
        AFiles.Add(LVFiles.Items[i].Caption);
    DND:=TDNDObject.Create(AFiles);
    DND.OnGetStream:=DoGetStream;
    DoDragDrop(DND as IDataObject,DND as IDropSource,DropEffect_Copy,eff);
    end;
end;
```

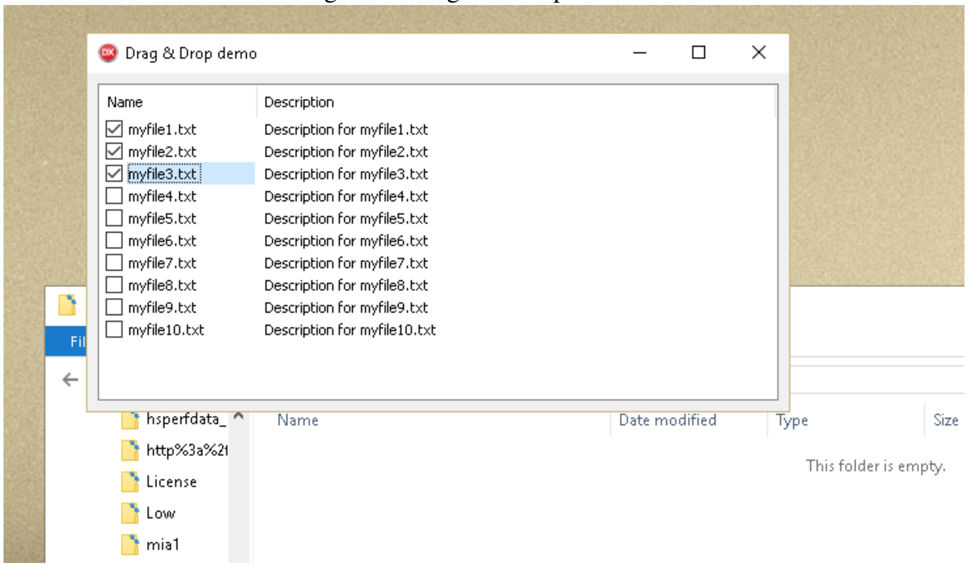
As can be seen, the only allowed effect is copy `DROPEFFECT_COPY`. The `OnGetStream` event handler, which will create the actual file contents, is set to a `DoGetStream` method. This method is very simple:

```
procedure TForm1.DoGetStream(Sender : TObject;
                             Const AFileName : String;
                             Out S : TStream);

begin
  S:=TStringStream.Create('This is some faked data for file "'+AFileName+'"');
end;
```

In a real-world application, this method would download a file or otherwise create file contents, and would then pass the contents in a stream. Here some dummy data is created.

Figure 1: Drag and Drop in action



Name	Description
✓ myfile1.txt	Description for myfile1.txt
✓ myfile2.txt	Description for myfile2.txt
✓ myfile3.txt	Description for myfile3.txt
☐ myfile4.txt	Description for myfile4.txt
☐ myfile5.txt	Description for myfile5.txt
☐ myfile6.txt	Description for myfile6.txt
☐ myfile7.txt	Description for myfile7.txt
☐ myfile8.txt	Description for myfile8.txt
☐ myfile9.txt	Description for myfile9.txt
☐ myfile10.txt	Description for myfile10.txt

Note that the passed filename is a virtual file, which doesn't actually exist on the system. It should be sufficient to determine which data is to be generated.

The result of all this is displayed in figure 1 on page 14.

8 Conclusion

Implementing drag and drop to ehe explorer manually is not for the faint of heart, but can be done, as demonstrated in this article.

The sample code presented here can be modified to suit various use cases where an application acts as a drag and drop source. A more complete suite of components which makes life easier, can be found on GitHub:

```
https://github.com/DelphiPraxis/
    The-Drag-and-Drop-Component-Suite-for-Delphi
```

Exploring the workings of this component suite is out of scope for this article but will be left for a future contribution.