

CUT/COPY/PASTE/  
DRAG/DROP

CMPT 381

# Interactive data transfer

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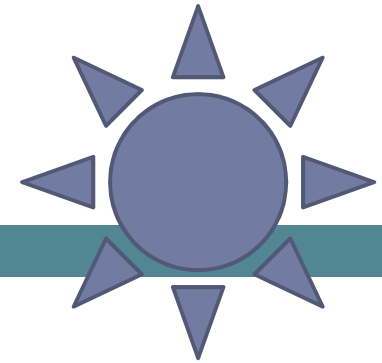
- Transfer across same (or similar) applications
- Transfer across different apps
- Issues to address:
  - What kind of data transfer?
  - Transfer mechanism
  - What to do with the transferred data?

# Basic process of data transfer

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- Obtain data from a source app
- Store data in an accessible location
- Retrieve data from a destination app
- Use the data

# From PowerPoint to Word



16-cut-copy-paste.pptx - PowerPoint

File Home Insert Design Transitions Animations Slide Show Review View Format Tell me what you want to do... Sign in Share

1 CUT/COPY/PASTE/ DRAG/DROP

2 Interactive data transfer

- Transfer across same (or similar) applications
- Transfer across different apps
- Issues to address:
  - What kind of data transfer?
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3 Basic process of data transfer

- Obtain data from a source app
- Store data in a transferable form
- Retrieve data from a destination app
- Use the data

4 PowerPoint to Word

5 Handles

- Basic interaction paradigm
  - Select and manipulate
- ATOC view of graphical shapes
  - Model stores control points of the shapes
  - User can make control points visible to user
  - "Selection handles"
- Allows for interactive manipulation

PowerPoint to Word

Style Fill Outline

Cut

Copy

Paste Options:

Edit Text

Edit Points

Group

Bring to Front

Send to Back

Hyperlink...

Smart Lookup

Save as Picture...

Set as Default Shape

Size and Position...

Format Shape...

Tap to add notes

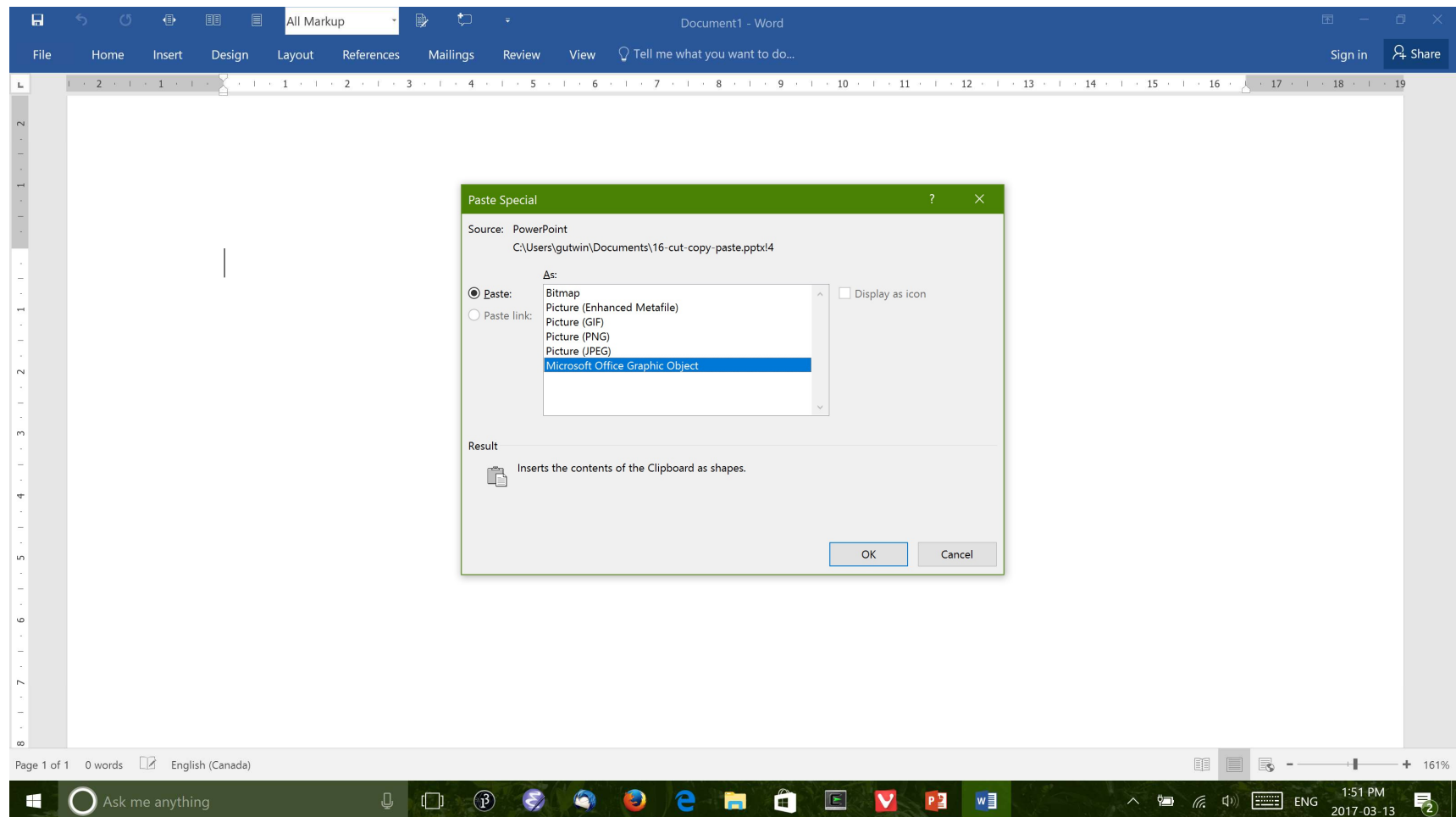
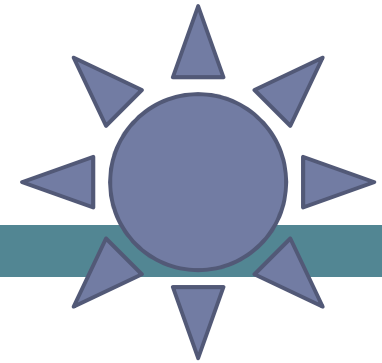
Slide 4 of 10 English (Canada)

Notes Comments

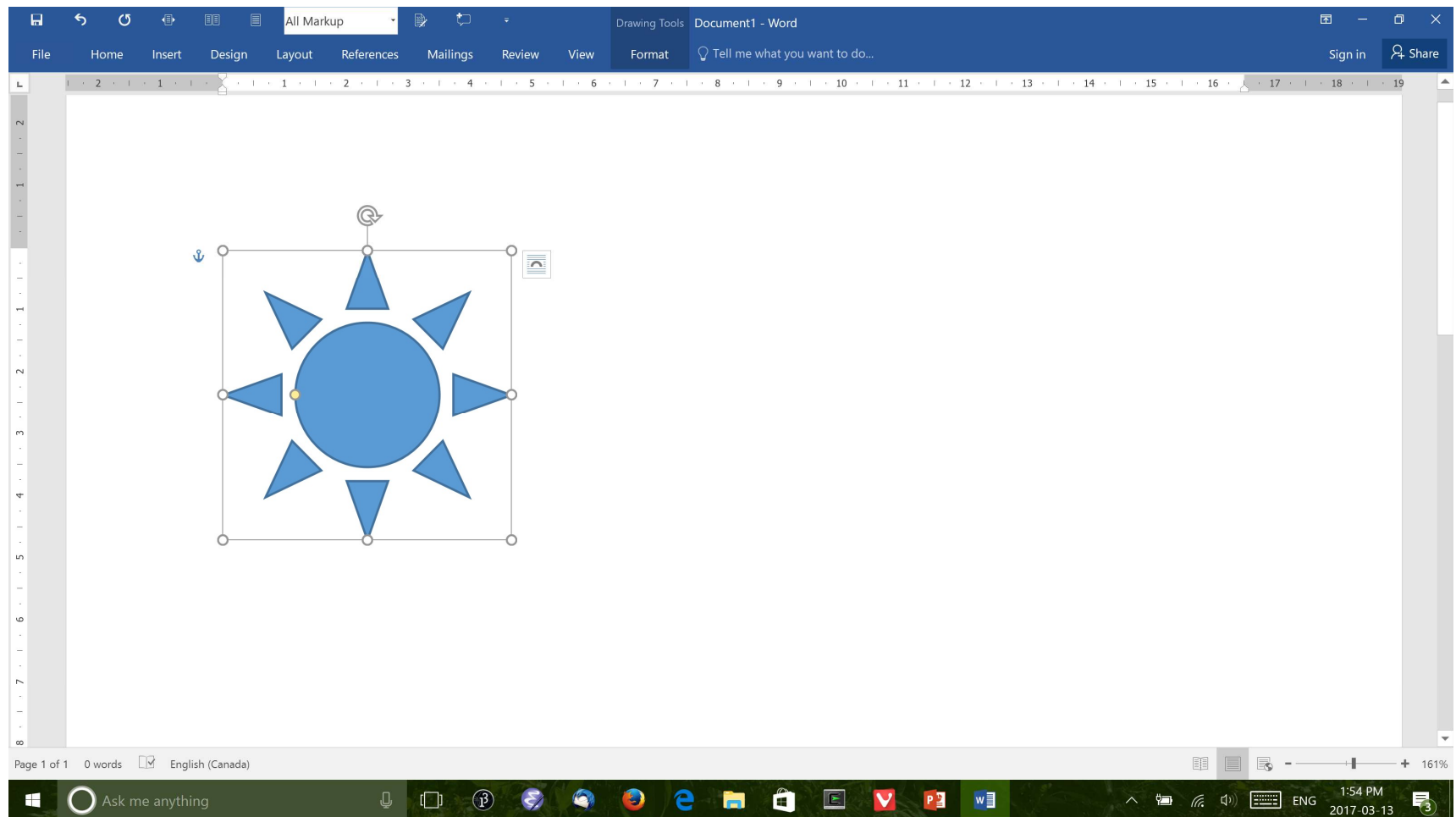
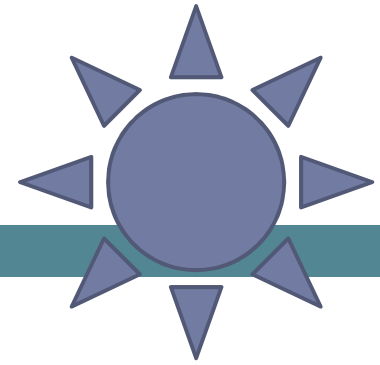
85%

1:47 PM 2017-03-13

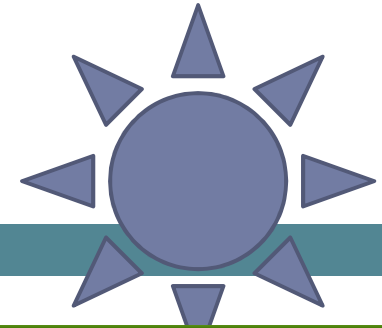
# From PowerPoint to Word



# From PowerPoint to Word



# ...and to EMACS?



“CTRL-Y”

```
emacs@CADANERA
File Edit Options Buffers Tools Lisp-Interaction Help
;; This buffer is for notes you don't want to save, and for Lisp evaluation.
;; If you want to create a file, visit that file with C-x C-f,
;; then enter the text in that file's own buffer.
1\--- *scratch*
Kill ring is empty
1\--- *scratch* All L5 (Lisp Interaction)
Kill ring is empty
```

# What will happen:

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- Copy HTML text from browser, paste in Word
- Copy HTML, paste in Notepad
- Copy image from browser, paste in PowerPoint
- Copy syntax-highlighted text from IDE, paste in Word



# Problem 1: Data format

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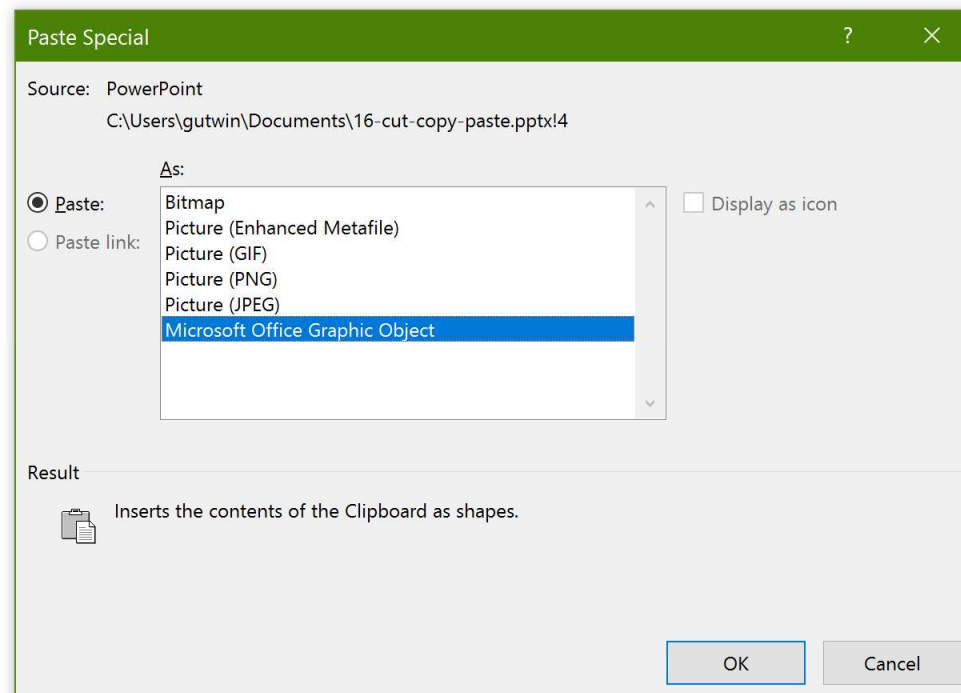
- What format to use so that both the source and destination app will understand the object?
- Solution part 1: standardized data types
- Solution part 2: store multiple types

# Standard data types

- In early days of GUIs, only text allowed
- E-mail introduced the problem of data sharing
- MIME types (Multipurpose Internet Mail Extensions)
  - Content-Type: text/plain
  - Content-Type: image/bmp
- List of types: <http://www.iana.org/assignments/media-types/media-types.xhtml>
- What about custom objects (e.g., BoxDemo Box?)
  - Serialize to XML / JSON
  - Register new MIME type

# Store multiple types

- Store an object in several formats, so that the destination application has more chance of understanding



# Problem 2: Where to store?

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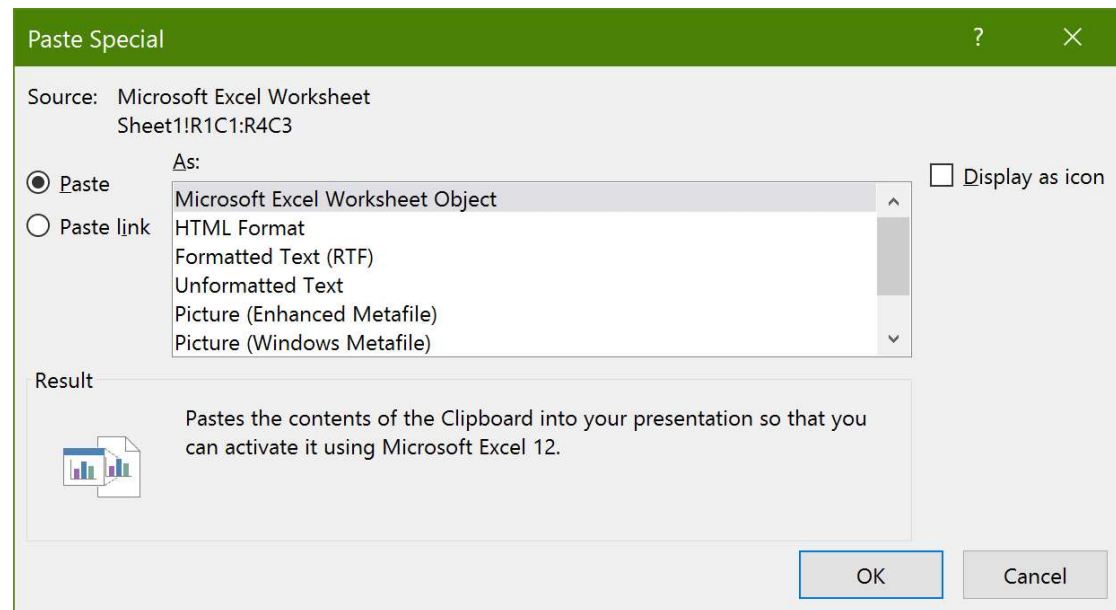
- Clipboard: system-level shared memory
- Implementation non-trivial:
  - Different languages, processes, security models
- How many items are stored on the Clipboard
  - Multiple versions of cut/copied object
  - What happens to Clipboard contents on next cut?

**JavaFX:**

```
Clipboard clip = Clipboard.getSystemClipboard();
```

# Problem 3: What to do with the data?

- Source app – destination app relationship:
  - Use data from clipboard, no lasting relationship
  - Include link to source app (for later editing)
  - Include live link to source app (for data updates)



# Drag and Drop

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- Just a variant of cut/paste
- How to decide that the user is drag/dropping?
  - E.g., crossing window boundary
  - Send dragged object back to original location?
- What feedback during dragging?
  - How to provide feedback outside of application?
  - Highlight drop targets in destination application
- Semantics of “drop”
  - Combination of “paste” and app semantics for target

# JavaFX demo

