Installing, Configuring, and Troubleshooting Print Devices

CompTIA

Installing, Configuring, and Troubleshooting Print Devices

- Maintain Laser Printers
- Maintain Inkjet Printers
- Maintain Impact, Thermal, and 3D Printers
- Install and Configure Printers
- Troubleshoot Print Device Issues
- Install and Configure Imaging Devices

Printer Types

Printer: An output device that produces text and images from electronic content onto physical media.

Inkjet printer: A type of printer in which ink is sprayed onto the paper using microscopic nozzles in the print head.

Laser printer: A type of printer that develops an image on a drum using electrical charges to attract special toner, then applying it to paper.

- Connection to computing devices
- Mechanism for creating text and images
- Paper feed mechanism
- Paper input and output options

Printer Features

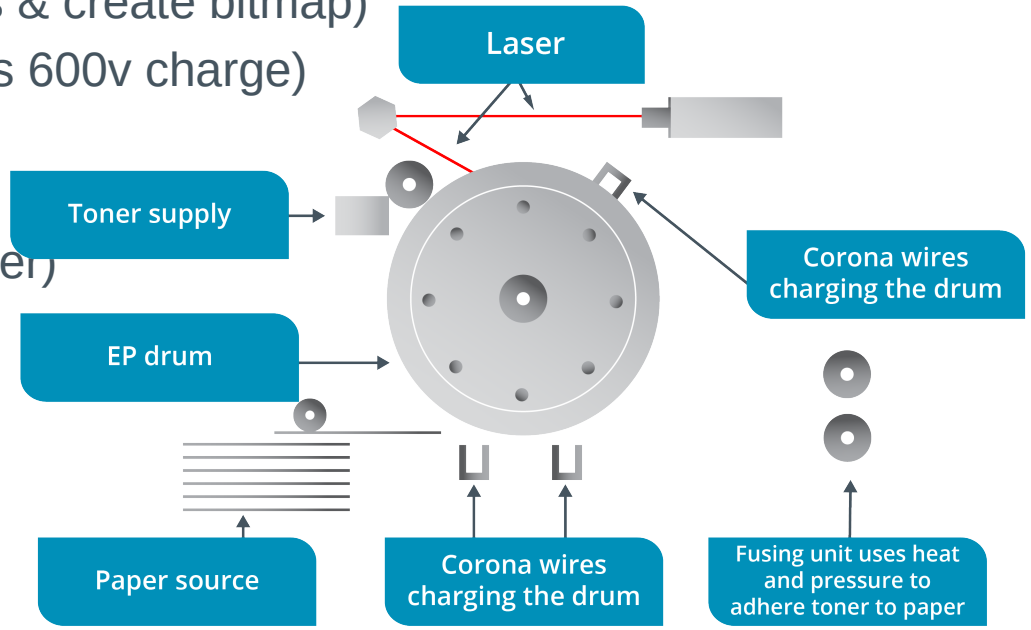
- Speed
- Interfaces (how do you interact with the printer)
- Image Quality
- Paper Handling
- TCO (Total Cost of Ownership)
- Options
- MFD (Multi-Function Device)
- PDL (Page Description Language)

Laser Printers

- Laser printing process results in a durable printout that does not smear or fade.
- Very popular for office environments:
  - Inexpensive to buy and run
  - Quiet
  - Fast
  - High-quality output
- Grayscale and color options.

Laser Printer Imaging Process (Slide 1 of 2)

- Processing (receive orders & create bitmap)
- Charging (image drum gets 600v charge) (Conditioning)
- Exposing (Writing) cancel
- out electric charge with laser)
- Developing (roller with
- same charge gets toner,
- applied to drum)
- Transferring to paper
- Fusing (heat roller)
- Cleaning drum



Laser Printer Imaging Process (Slide 2 of 2)

- Duplex printing setup can flip over paper, or can be done manually
- Color laser printers
  - (Cyan, Magenta, Yellow, and Black)
    - Either 4 separate passes or all at once on a transfer belt
- LED printers (fixed array of tiny lights make dots instead of a raster with rotating mirrors for the laser)

Laser Printer Maintenance Tasks (Slide 1 of 6)

Typical problems include:

- Overloading input trays or output trays (not collecting completed jobs promptly).
- Using unsuitable media—for example, card stock or labels in an auto-feed tray.
- Using creased, folded, or dirty paper.
- Breaking trays or covers.
- Inserting ink or toner cartridges incorrectly.

Laser Printer Maintenance Tasks (Slide 2 of 6)

Guidelines for loading paper:

- Use good quality paper designed for use with the model of printer that you have and the printing function.
- Do not overload a paper tray.
- Do not use creased, dirty, or damp paper.
- Refer to the instruction manual when loading non-standard print media.

Laser Printer Maintenance Tasks (Slide 3 of 6)

Toner cartridge replacement:

- Cartridges differ for different printer models.
- Refill or recycle spent cartridges.
- Remove the old cartridge and place it in a bag to avoid shedding toner everywhere.

Laser Printer Maintenance Tasks (Slide 4 of 6)

Cleaning guidelines:

- Unplug the printer
- Use a damp cloth with mild cleaner
- Inside of printer may be hot
- Use a special toner-safe vacuum when necessary
- If you get toner on skin or clothes, remove it with a cloth or cold water
- Use isopropyl alcohol and lint-free swabs to clean rollers
- Check documentation for replacing dust and ozone filters if installed

Laser Printer Maintenance Tasks (Slide 5 of 6)

Calibration:

- Usually automatic
- Access calibration routine from:
  - Printer control panel
  - Printer software

Laser Printer Maintenance Tasks (Slide 6 of 6)

Maintenance kit:

- Replacement feed rollers, transfer roller, and fuser unit.
- Normally replace these items after an established number of pages (copy count) is printed.
- Allow printer to cool down before replacing fuser unit to avoid burns.
- Print a test page to verify operation and reset copy count.
- Recycle fuser unit if possible.

Activity

Discussing Laser Printer Maintenance

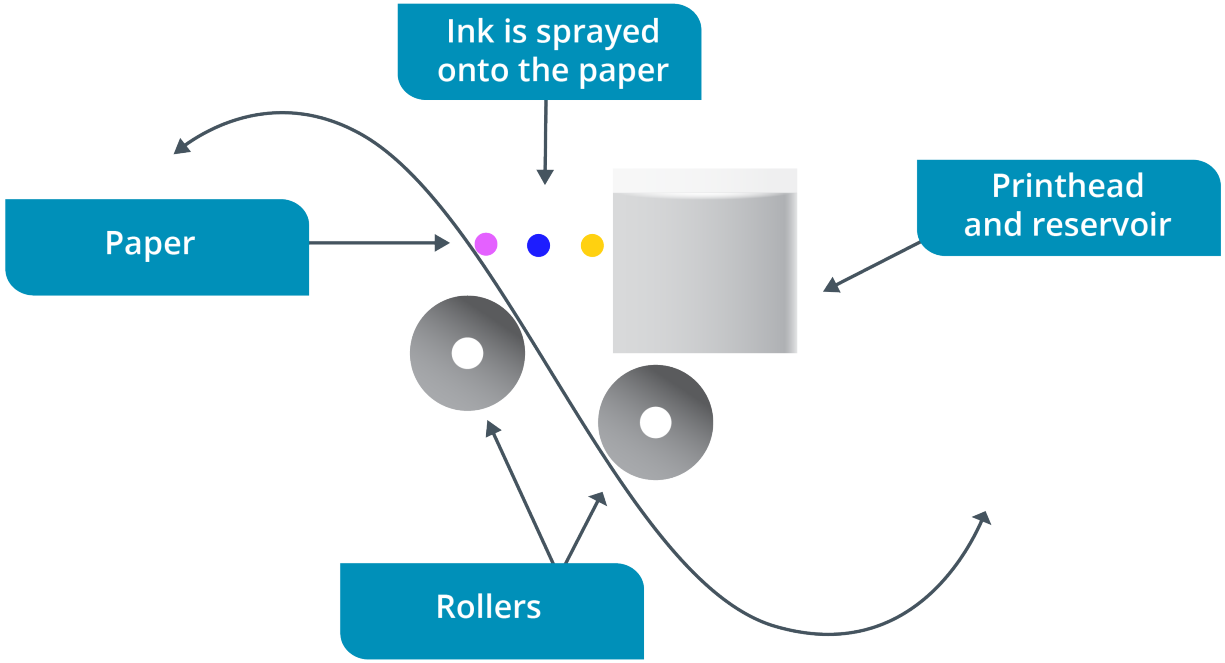
Maintenance Kit (1:15) https://www.youtube.com/watch?v=efADi663jU0

30bird 22.1.1, 22.2.1

Inkjet Printers

- Liquid ink is propelled out of nozzles in a carriage assembly that moves back and forth across the page.
- Color images use CMYK.
  - Cyan, magenta, yellow, and black.
- Wide range of quality and price available.

Inkjet Printer Imaging Process



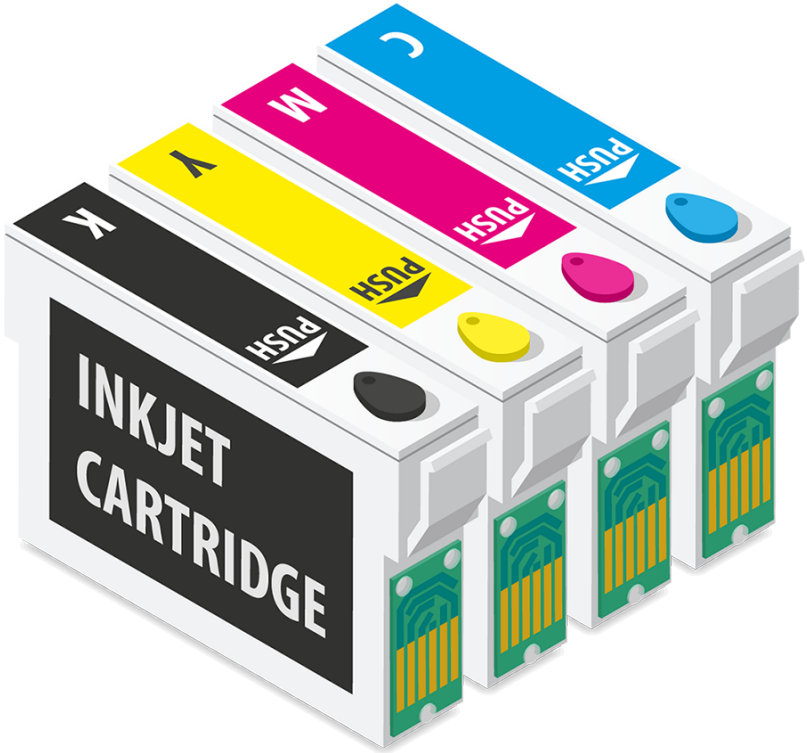
Components of Inkjet Printers (Slide 1 of 2)

Piezoelectric print method: An ink delivery system in an inkjet printer that uses a tiny element that changes shape to act as a pump used in Epson printers.

Thermal inkjet print method: An ink delivery system in an inkjet printer where the ink is heated to form a bubble that bursts through the nozzles.

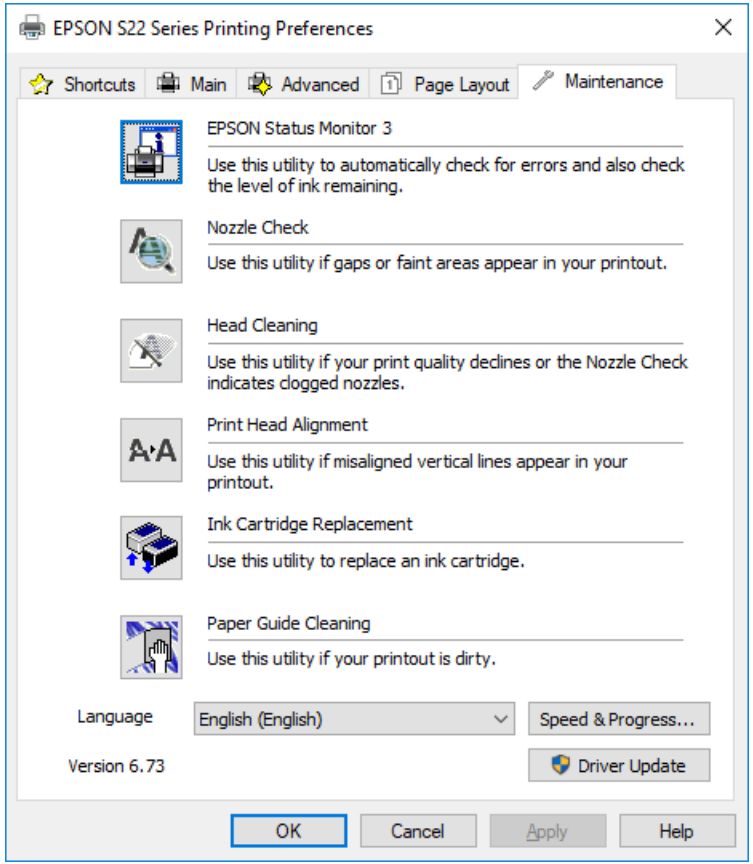
- Print heads
- Ink cartridges
- Carriage system
- Paper handling and duplex assembly

Components of Inkjet Printers (Slide 2 of 2)



Inkjet Printer Maintenance Tasks

- Loading paper
- Replacing inkjet cartridges
- Print head alignment
- Print head cleaning



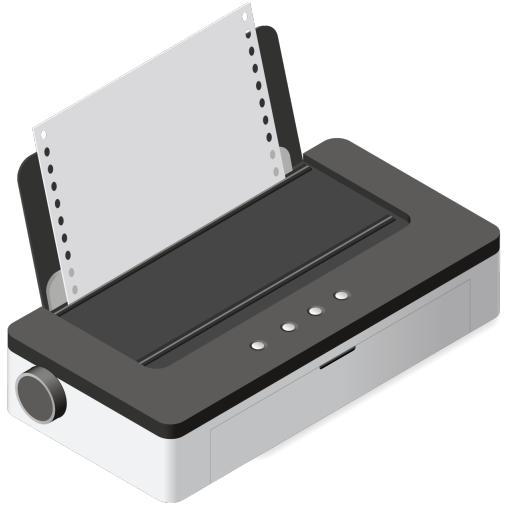
Activity

Discussing Inkjet Printer Maintenance

Impact Printers

Impact printer: Printer that uses pressure to transfer ink from a ribbon onto paper in a particular pattern, similar to the mechanism of a typewriter.

Dot matrix printer: A type of impact printer that uses a set of pins to strike the ribbon to create printed characters and images using combinations of dots.



Components of Impact Printers

- Consumables:
  - Plain paper
  - Carbon paper
  - Tractor-fed paper
- Paper feed mechanism
- Impact printer ribbons

Impact Printer Imaging Process

- Print head holds pins and is attached to the carriage.
- Carriage moves across the paper.
- Solenoids energize the pins, causing them to strike the ribbon against the paper.
- Image quality depends on how many pins in the print head.
  - 9-pin
  - 24-pin
  - 48-pin
- Platen gap lever deals with different paper thicknesses.

Impact Printer Maintenance Tips

- Take care when loading tractor-fed printers.
  - Align the marginal holes with the printer sprockets.
  - Paper is unobstructed at printer entryway.
- Follow manufacturer’s instructions for replacing print heads and ribbon cartridges.
  - Allow print head to cool before removing it.

Thermal Printers

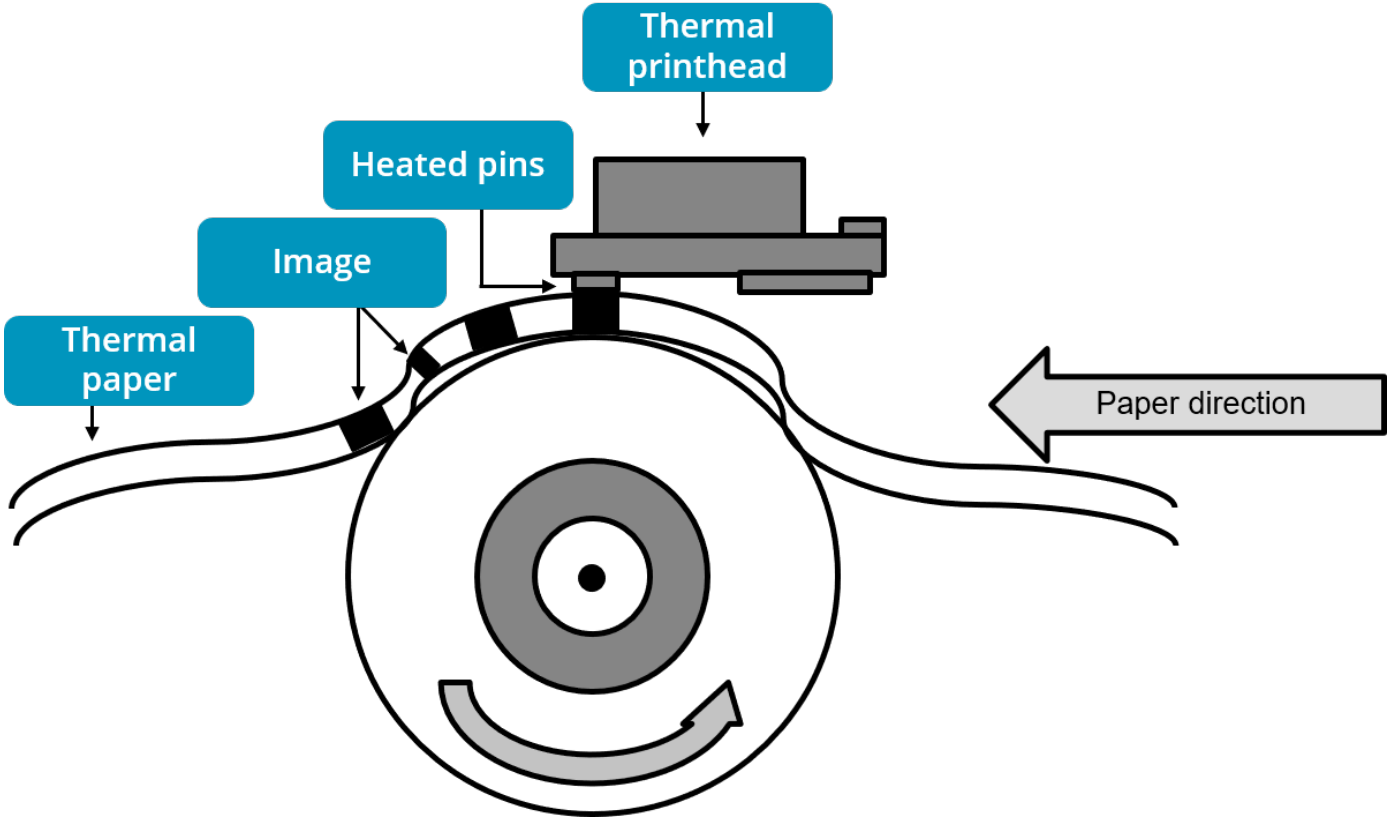
Thermal printer: A type of printer that uses a thermal (high heat) print head to fuse or transfer wax-based ink onto paper or that selectively heats specially treated paper to form the image.

- Dye sublimation
- Thermal wax transfer
- Direct thermal
- Used for printing barcodes, labels, and receipts

Components of Thermal Printers

- Thermal paper designed to change color when heat is applied.
- Heating element applies the heat.
- Feed assembly provides paper via friction.
  - Stepper motor turns a rubber-coated roller.
- Paper can be fanfold or roll format.

Direct Thermal Printer Imaging Process



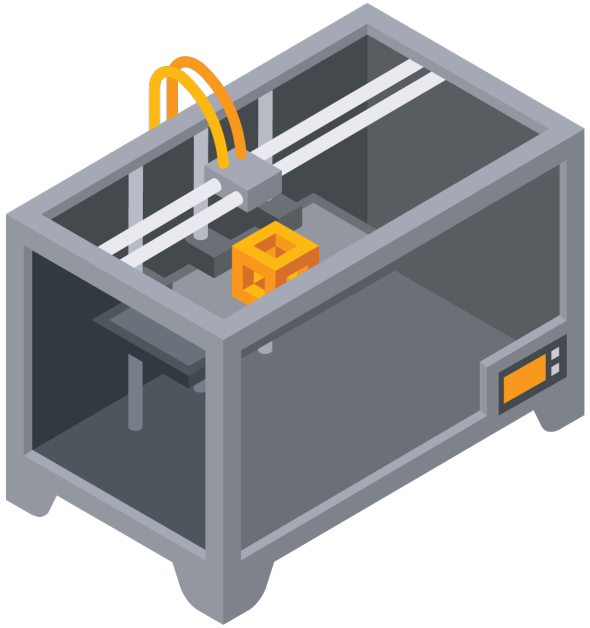
Thermal Transfer Printer Maintenance Tips

- Receipt and label printing require high availability.
- Use the right size and type of thermal paper.
- Serrated teeth cutting mechanism can cause paper dust buildup.
  - Use a vacuum or soft brush to remove dust and bits of paper.
- Labels can leave adhesive residue behind.
  - Use a swab and cleaning fluid (like isopropyl alcohol) to remove adhesive from print head and feed assembly.
  - Use cleaning cards sparingly.

3D Printers

3D print process: A printing process that builds a solid object from successive layers of material.

- Plastic, rubber, carbon fiber, and metal
- Uses are growing:
  - Manufacturing, for proof of concept models
  - Healthcare, for dentistry and prosthetics
  - Clothing
  - Product samples
  - Marketing materials



3D Printer Imaging Process

- Start with a 3D scan or 3D modeling software output.
- Create and save a 3D model.
- Model is sliced into horizontal layers.
- Resulting print job defines how each layer should be deposited onto the build surface.
- Printer melts filament and extrudes it to the build surface layer by layer.
- Extruder and build surface can move along any axis to produce the intended result.

Components of 3D Printers

- Print bed/build plate
- Bed/build surface
- Extruder
- Gears/motors/motion control
- Fan
- Filament materials made of
  - Polylactic Acid (PLA) and Acrylonitrile Butadiene Styrene (ABS)

3D Printer Maintenance Tips

- Remove any leftover filament from nozzles
- Clean any residual plastic
  - Remove any glue
- If necessary, apply grease to moving parts
- Check tubes in the feeder mechanism
- Examine couplers
- Ensure only approved printing materials are used
- Check for new versions of firmware

Other 3D Printer Types

stereolithography (SLA): Uses liquid plastic resin or photopolymer to create objects.

selective laser sintering (SLS): Fuses layers together with a pulse laser.

- SLA-created objects:
  - Cured with a UV laser.
  - Excess photopolymer is stored in a tank under the print bed.
  - Print bed lowers into tank as the object is created.
  - Solvent removes uncured polymer.
- SLS-created objects:
  - Created from metal or plastic powder.
  - Lowered into tank with each layer.

Activity

Discussing Impact, Thermal, and 3D Printer Maintenance

https://www.youtube.com/watch?v=-FtvlNrzUA8

Windows Printers

What You See Is What You Get (WYSIWYG): The effect that some applications provide where the screen output is equivalent to the print output.

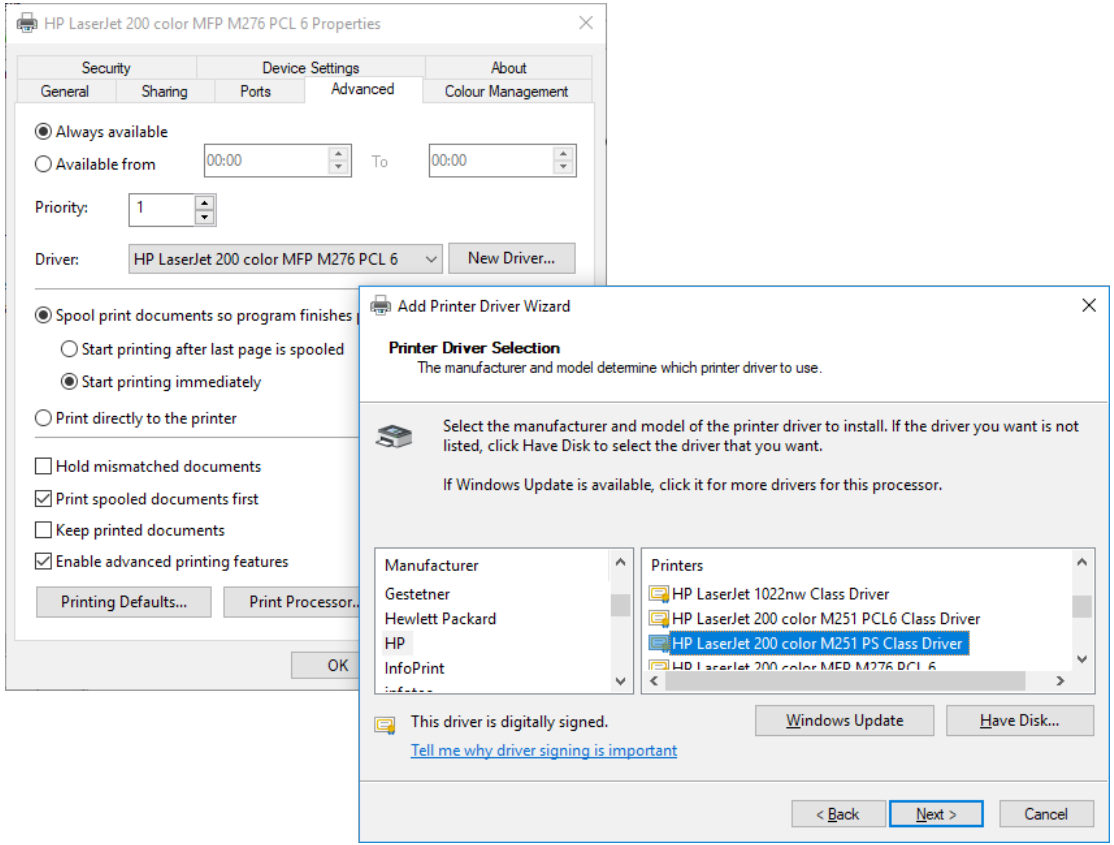
- Print driver enables communication between Windows and the print device.
- Print language support affects output accuracy.
- Printer technology affects quality, speed, and cost.

Windows Print Process (Slide 1 of 2)

- WPF print jobs:
  - Formatted and spooled as XPS files.
  - Stored in %SystemRoot%\System32\Spool\Printers\ folder.
  - Processed by the device driver.
- Output:
  - Sent to XPS-compatible print device, or
  - Rendered via a PDL and converted to a raster.
- Print monitor sends job to the printer.
- Legacy GDI process:
  - EMF
  - RAW

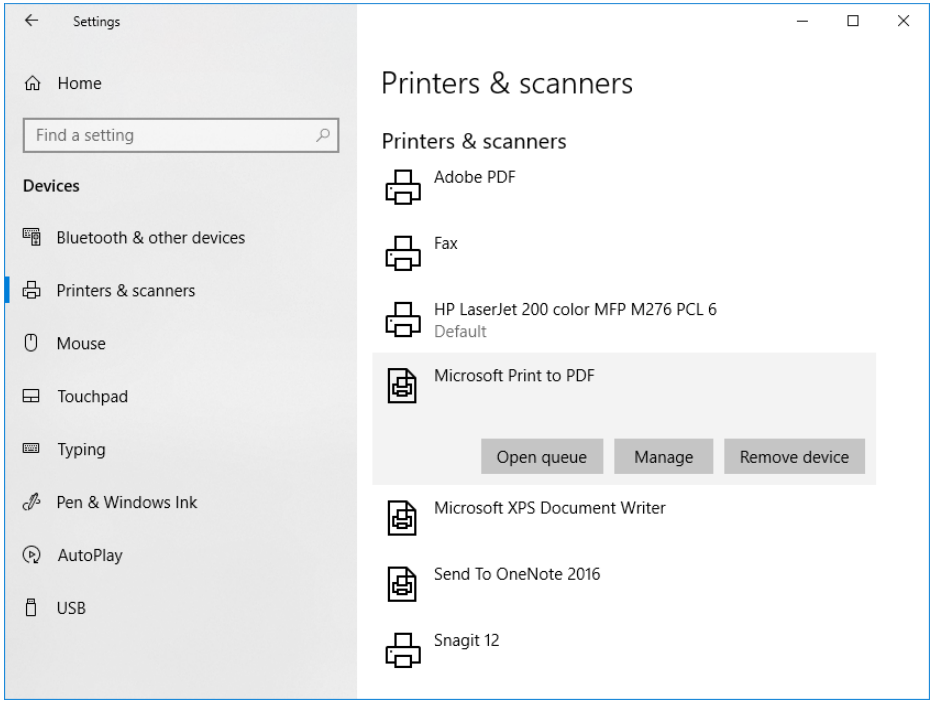
Windows Print Process (Slide 2 of 2)

- PDL features:
  - Scalable fonts
  - Color printing
  - Vector graphics



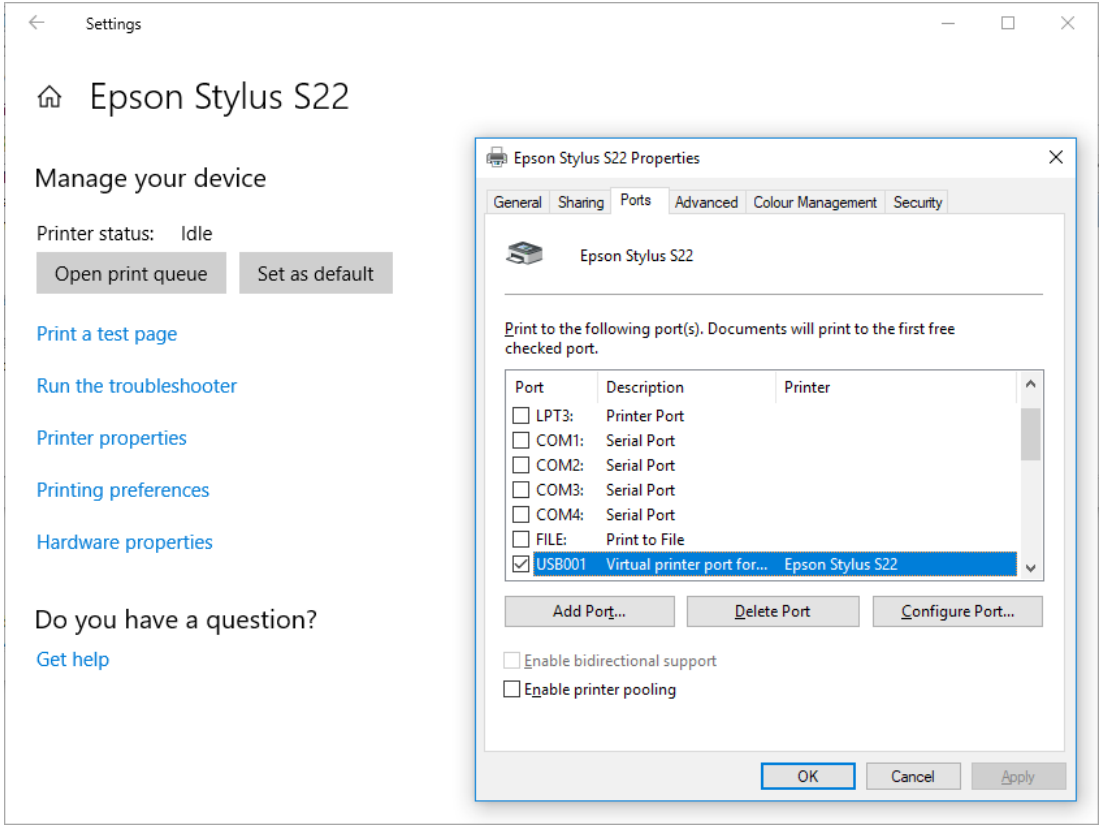
Virtual Printers

- No physical printing.
- Output is a file containing PDL instructions or bitmap image data.
- Why use virtual printers?
  - Sending documents to a fax server
  - Creating read-only documents
  - Making the content available outside of the application
  - Combining multiple documents
  - Testing print output
- Options for file formats:
  - Print to file
  - Print to PDF
  - Print to XPS



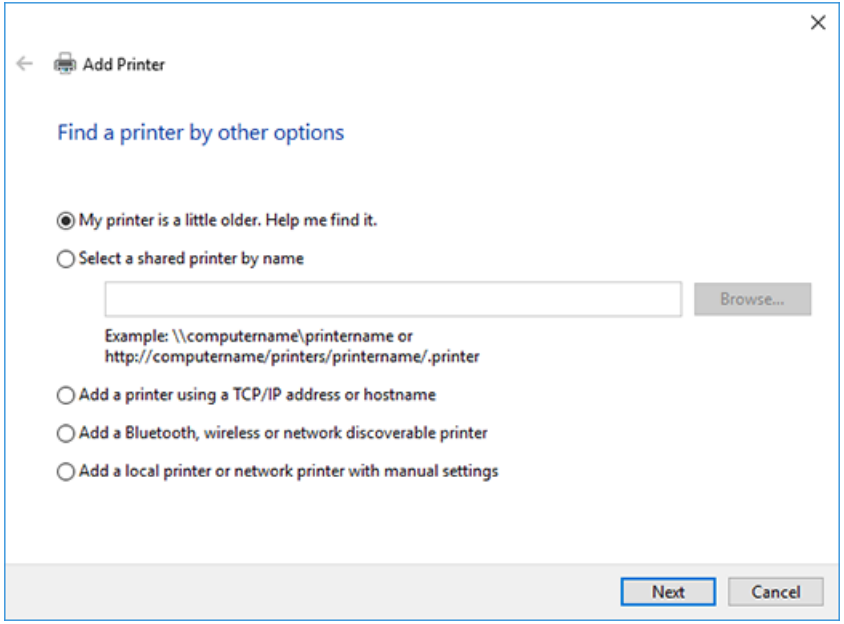
Local Printer Connections

- USB
- Ethernet
- Serial port
- Wireless



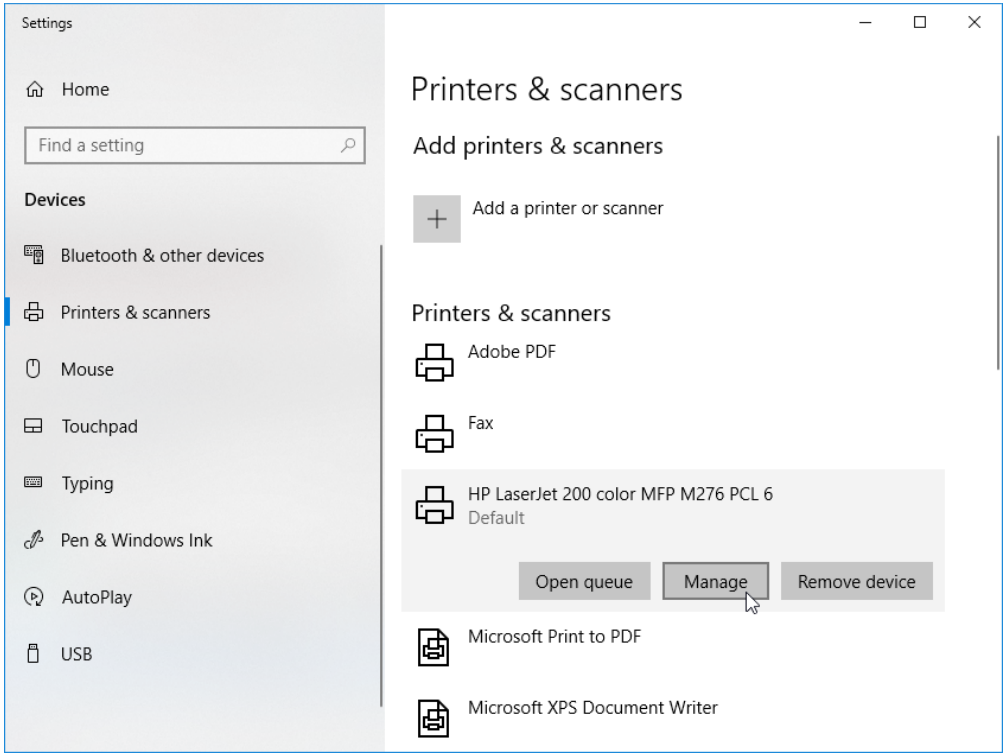
Printer Drivers

- When a print device is not auto-detected, use the **Devices and Printers** or **Windows Settings** app to install drivers.
  - UAC privileges needed.
  - 32-bit and 64-bit drivers are different.
- Print a test page after installing the drivers.

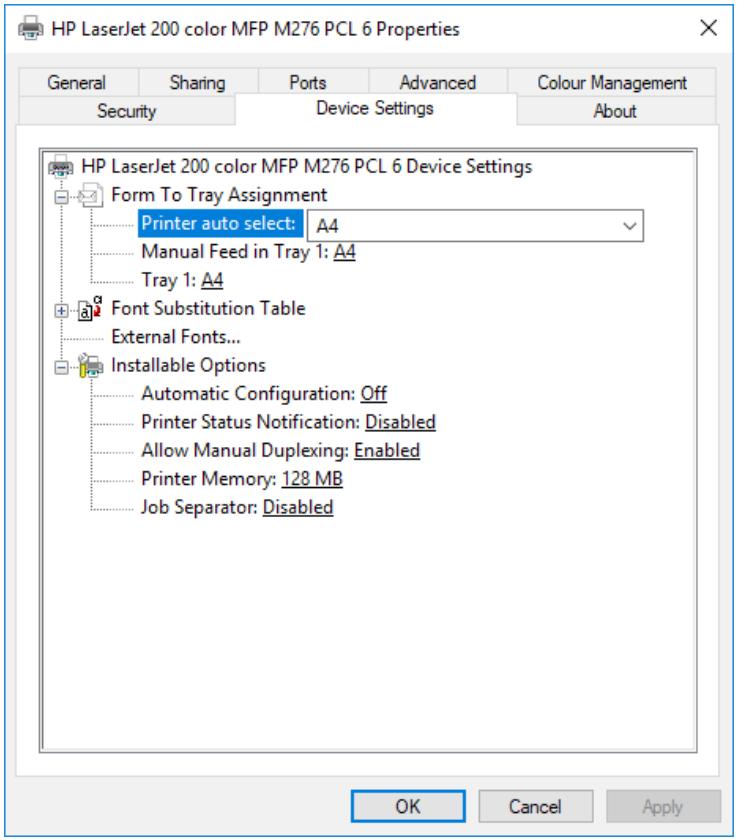


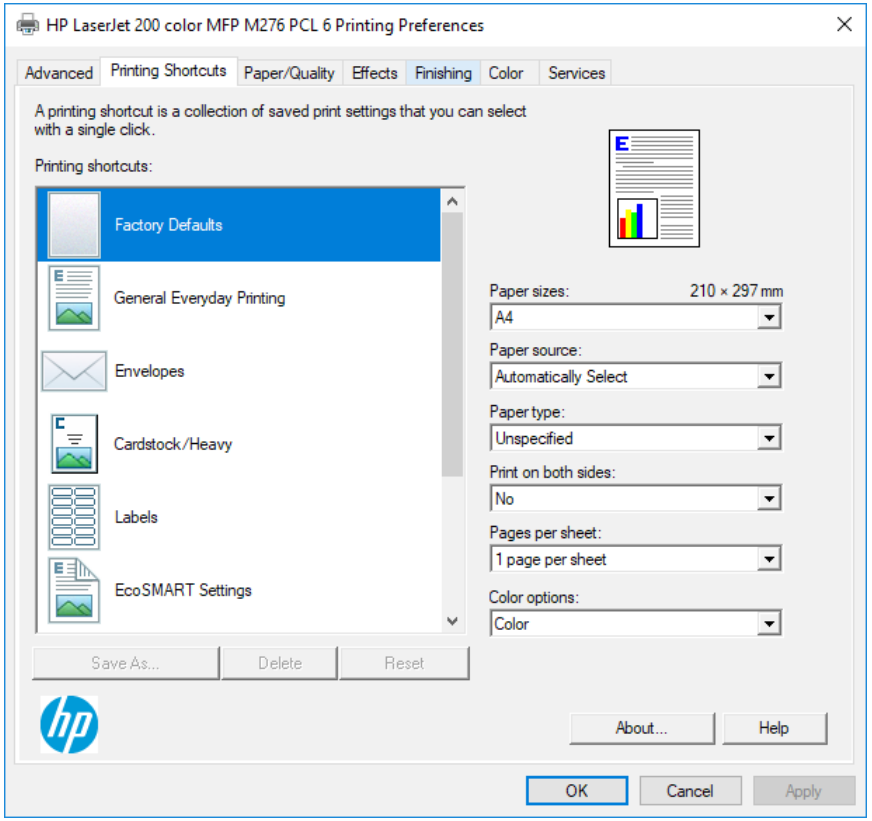
Configuration Settings (Slide 1 of 2)

- View print queue
- Open printer properties
- Open printer preferences
- Set the default printer
- Start the troubleshooter



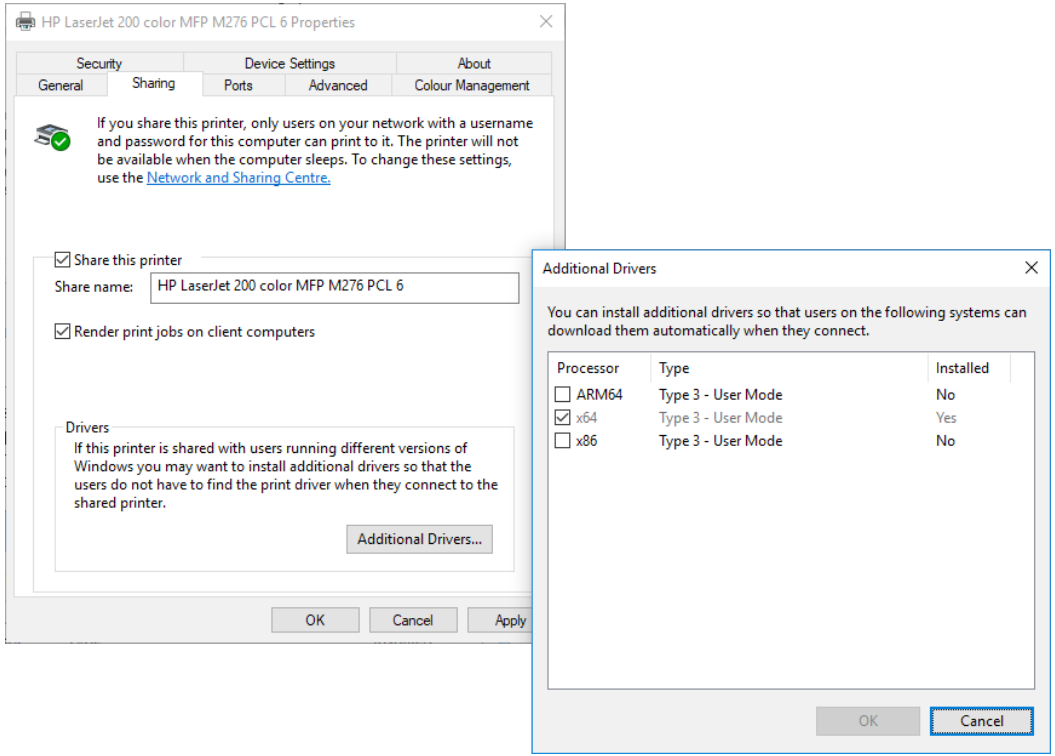
Configuration Settings (Slide 2 of 2)





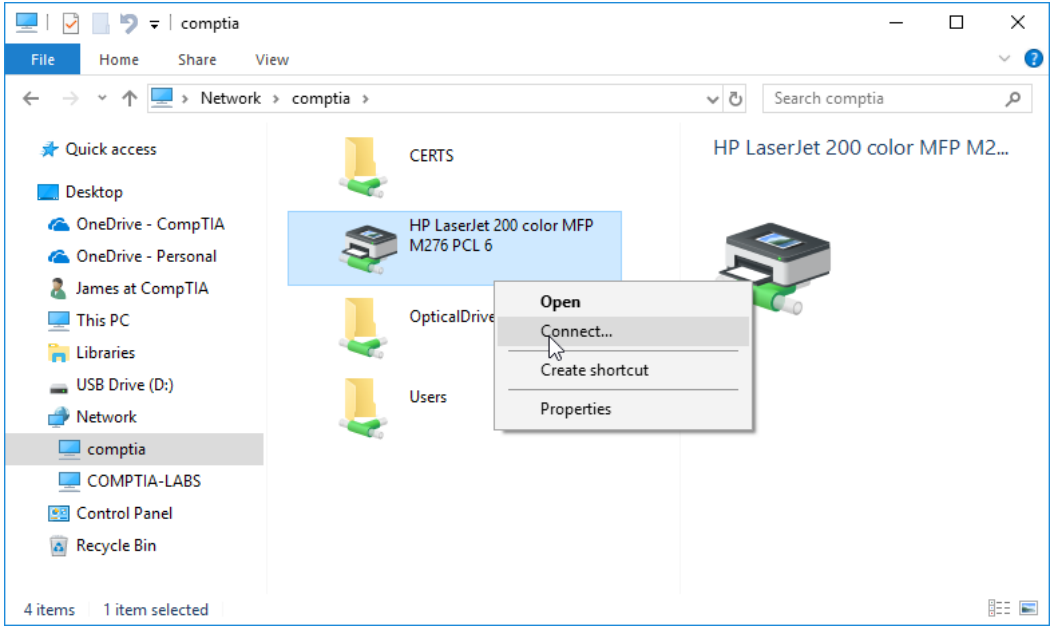
Printer Sharing and Networking (Slide 1 of 2)

- Windows printer sharing
- Hardware print server sharing



Printer Sharing and Networking (Slide 2 of 2)

- Shared printer connections
- Integrated hardware print servers/NAS
- Cloud and remote printing
- Bonjour and AirPrint



Data Privacy and Security Issues

- When you use shared printers:
  - Hard drive caching might allow someone with access to cached print files to recover confidential information.
  - User authentication might be needed to prevent improper use of network or cloud printers.
  - Data privacy might be more difficult to guarantee for print jobs that travel over a network.

Activity

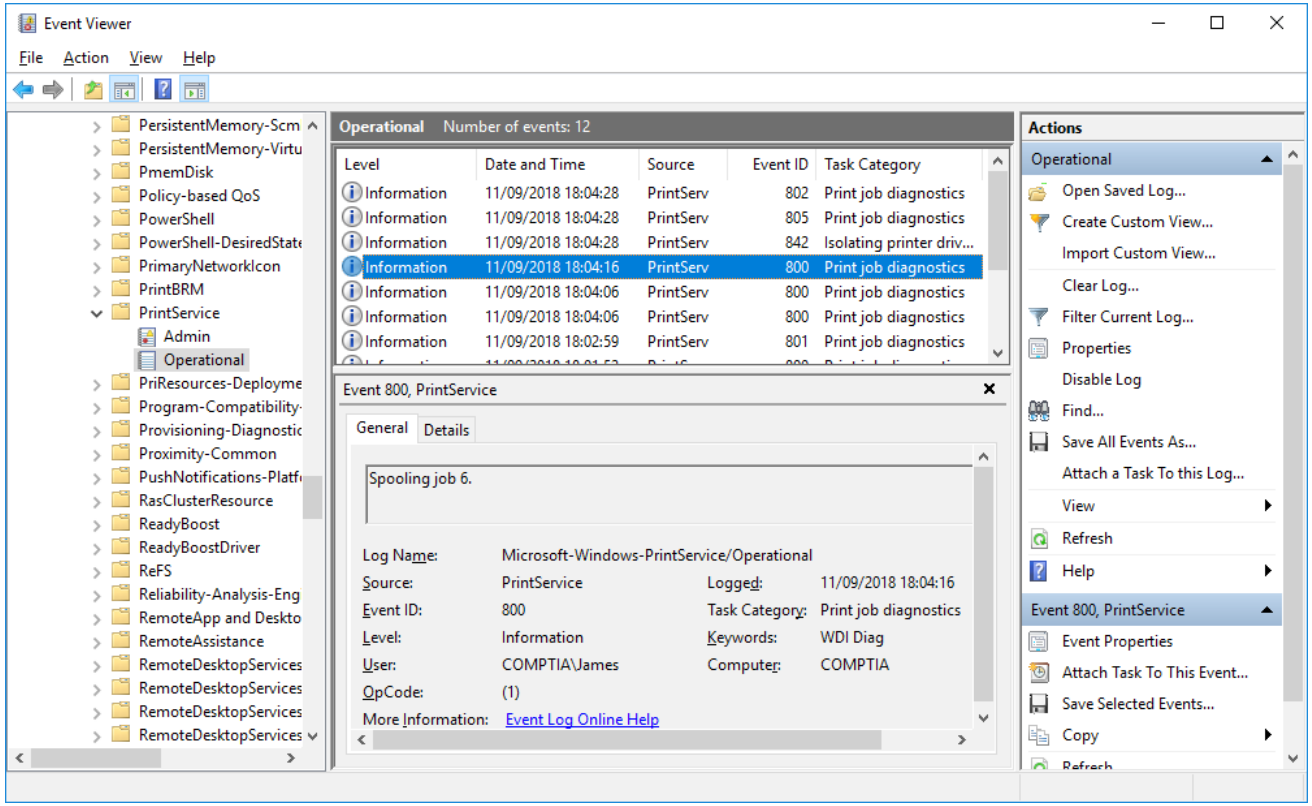
Discussing Printer Installation and Configuration

Activity

Installing and Configuring Printers

Printer Connectivity Troubleshooting

- Error message or code on printer's control panel
- Printer log files
- Device management software



General Troubleshooting Approach

- Test the obvious things first.
  - Is the printer switched on and loaded with paper?
  - Is there enough ink or toner?
  - Is the connection between the printer and PC good?
  - Can you print a test page?
- Check environmental conditions.
  - Overheating can cause printer malfunctions.
  - Verify adequate airflow around the device.
- What has changed?
  - If nothing changed, possibly an installation issue.
  - If something changed, possibly a configuration issue.

Guidelines for Troubleshooting Print Device Issues

No image on the printer display, but power LED is on:

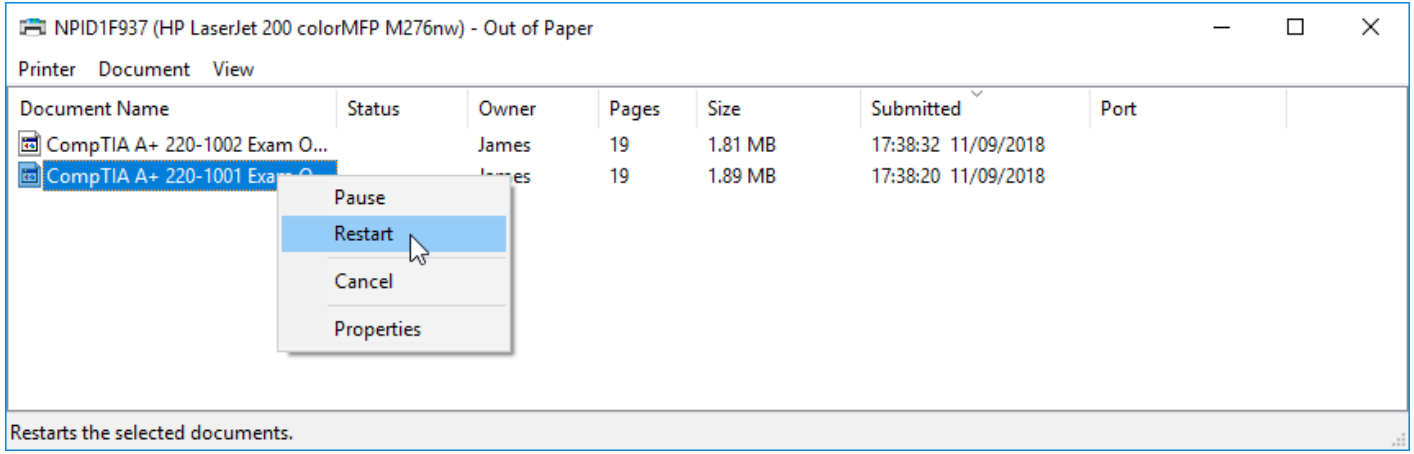
- Verify that the printer has not gone into a power-saving sleep cycle.
- Try powering down the printer.
  - Remove the power cord and any peripheral cables, and leave the printer switched off and unplugged for at least one minute.
  - Then reconnect and restart the printer.
- If these steps do not resolve the issue, check for a hardware fault.

No connectivity:

- Verify that the printer is switched on and "online."
- Check the connection between the host PC and printer.

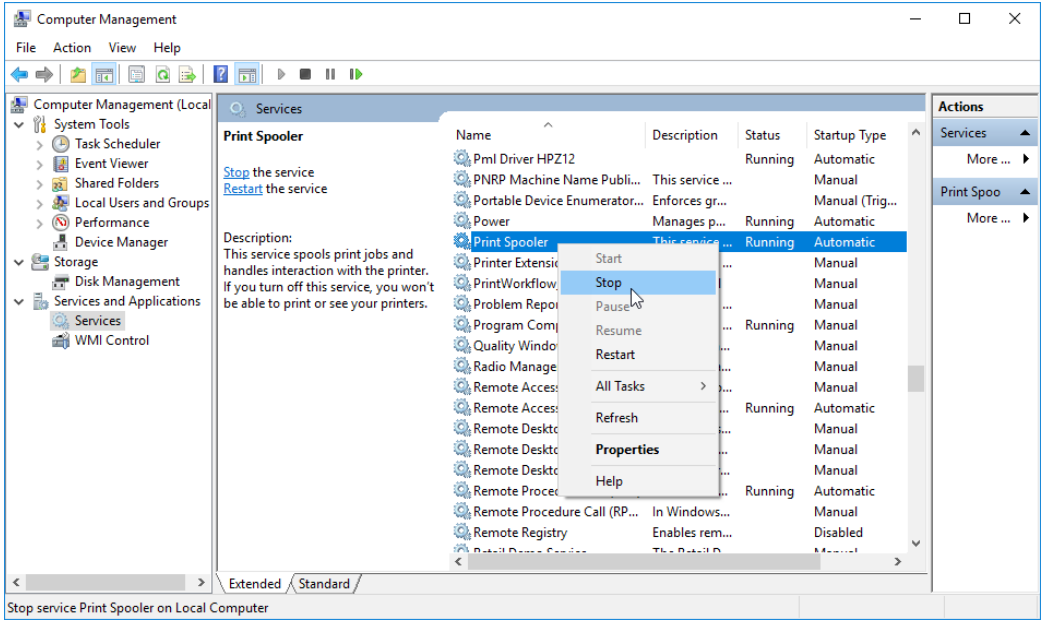
Print Queue and Spooler Troubleshooting (Slide 1 of 3)

- Backups might mean a printer is offline or out of paper, or a particular print job won't print.
  - Open the print queue and restart the print job.
  - Delete the print job and reprint.
  - Cycle power on the printer.



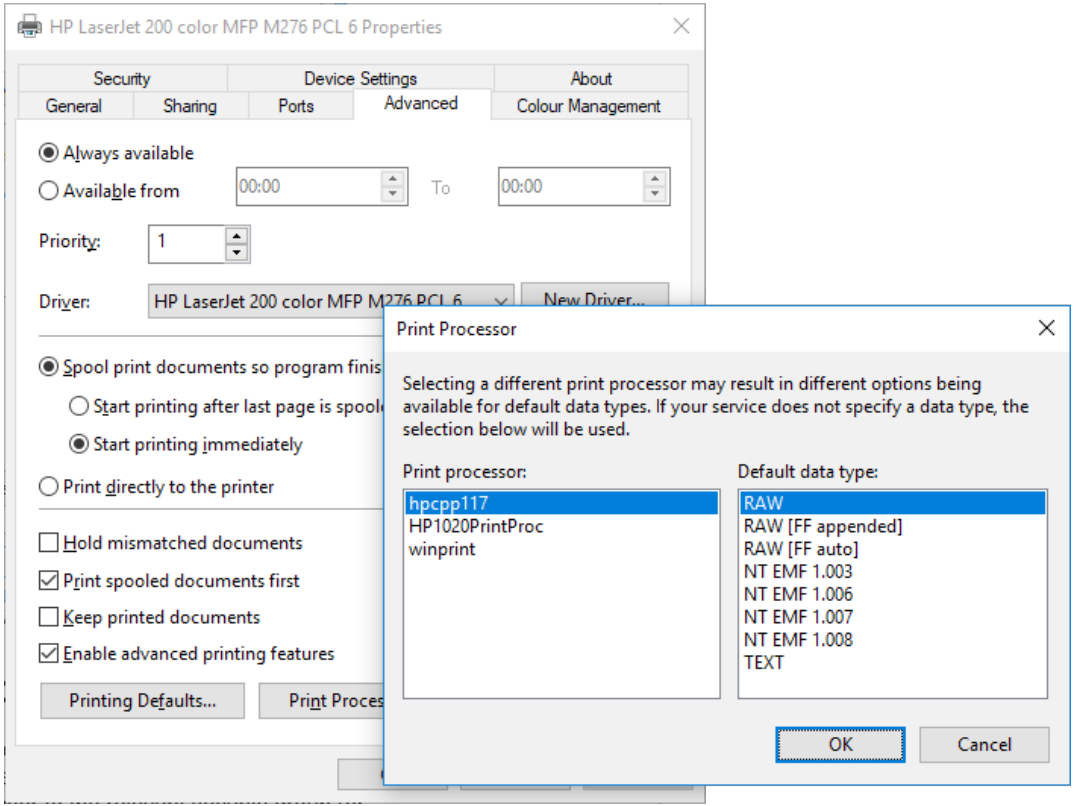
Print Queue and Spooler Troubleshooting (Slide 2 of 3)

- You might need to stop the **Print Spooler** service.
  - **Computer Management→Services and Applications→Services**. Right-click **Print Spooler**, and select **Stop**.
  - Delete the SPL and SHD files; then, restart the service.



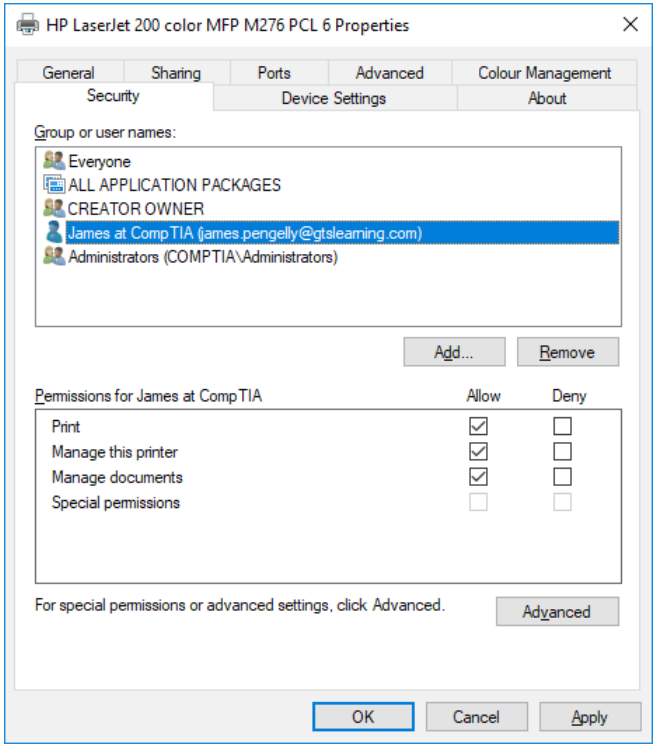
Print Queue and Spooler Troubleshooting (Slide 3 of 3)

- Try different spool settings, and test after each change.
- Verify sufficient disk space on the spooler's volume.



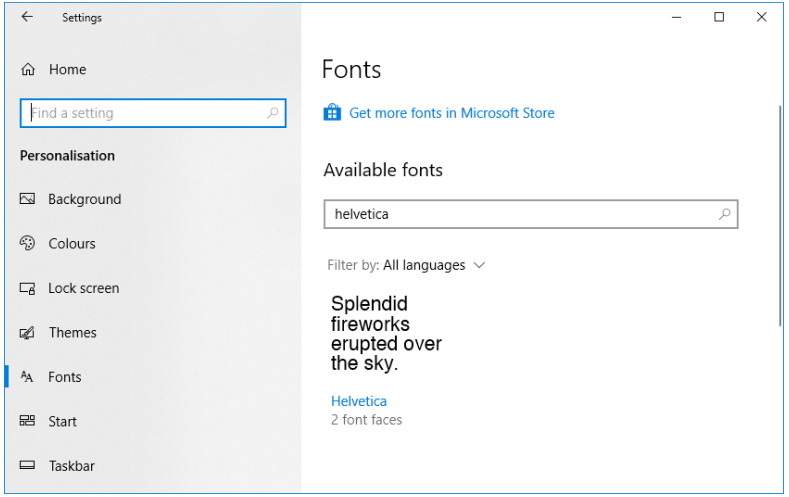
Permission Issues Troubleshooting

- **Access Denied** message:
  - Check user permissions for the printer.
  - Verify security software is not interfering.
  - Check permissions on spool folder.
- User cannot install printer:
  - User account elevation required to install the driver.
  - Administrator needs to install, or policies can allow users to install signed drivers.
  - Verify that the driver is designed for your Windows installation (version and type).
  - Make sure print spooler service is running.



Driver and Garbled Output Issues

- Cancel the job and clear print queue
- Cycle power on the printer
- If necessary, update printer driver
- Verify printer is set to use appropriate PDL:
  - PCL
  - PostScript
- Try changing spool type:
  - EMF
  - RAW
  - Disable spooling
- Verify chosen font is available



General Print Defect Resolution

Paper jams:

- Gain proper access to where paper is stuck
- Gently free the paper
- If necessary, release levers to remove paper
- If jams are frequent, diagnose the problem and repair
- If multiple sheets feed at once:
  - Verify media is correctly loaded
  - Verify media is appropriate weight
  - May need to change pickup rollers

Laser Printer Print Defects

- Faded or faint prints
- Blank pages
- Skewed output
- White stripes
- Black stripes or whole page black
- Toner specks
- Persistent marks
- Toner not fused to the paper
- Wavy or wrinkled output
- Ghost images
- Wrong color or color cast
- Color missing
- Paper jams

Inkjet and Dot Matrix Print Defects

- Inkjet defects:
  - Lines that run through a printout are probably due to dirt on the print head, a blocked nozzle, or a dirty feed roller. Run a cleaning cycle.
  - Other print quality problems like smearing are probably due to paper quality.
  - For print head jamming, try cycling the power on the printer.
  - Color issues might indicate one of the ink cartridges is running out, or that color printing is not active.
- Dot matrix defects:
  - Lines in the output indicate a stuck pin in the print head.
  - Faint printing might be due to the platen gap being too wide.
  - Smudges might be due to the platen gap being too narrow.

Activity

Troubleshooting Printer Issues

Activity

Maintaining and Troubleshooting Printers

Imaging Devices

- Digital cameras
- Webcams
- Scanners

Scanners

Scanner: A type of photocopier that can convert the image of a physical object into an electronic data file.

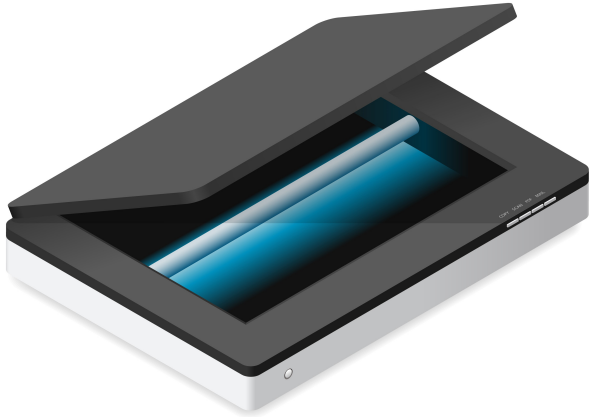
Optical Character Recognition (OCR): Software that can identify the shapes of characters and digits to convert them from printed images to electronic data files that can be modified in a word processing program.

- Typically used to input flat objects:
  - Documents
  - Receipts
  - Photos
- OCR enables translation of scanned text into editable content.
- USB, Ethernet, and wireless connections.

Flatbed Scanners

Flatbed scanner: A type of scanner where the object is placed on a glass faceplate and the scan head moves underneath it.

- Bright light (possibly CCFL) shines at an object placed on the faceplate.
- Mirrors reflect the lit-up object onto a lens.
- Lens processes image.
  - CCD
  - CMOS



Sheet-Fed and ADF Scanners

Sheet-fed scanner: A scanner in which the paper is passed over a fixed scan head.

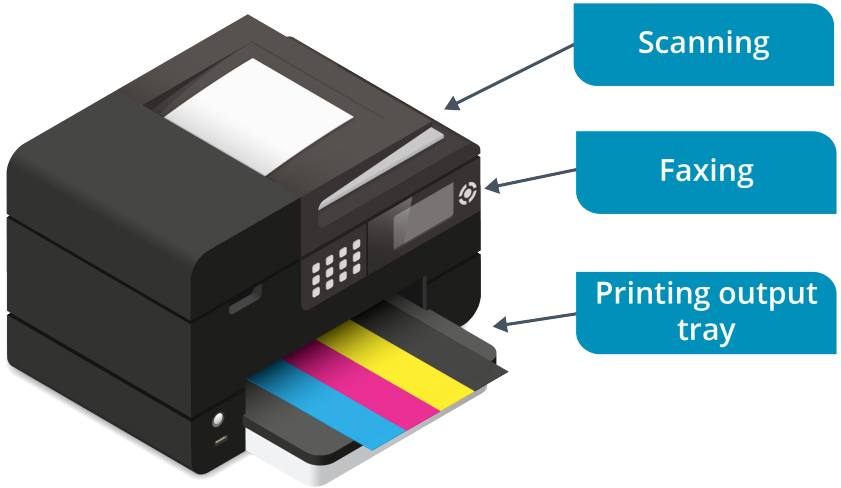
Automatic Document Feeder (ADF): A device that feeds media automatically into a scanner or printer.

- CIS strobes between red, green, and blue to illuminate an object.
- Lens is rod-shaped.
- Compact design.
- Often implemented in MFDs.

Multi-Function Devices

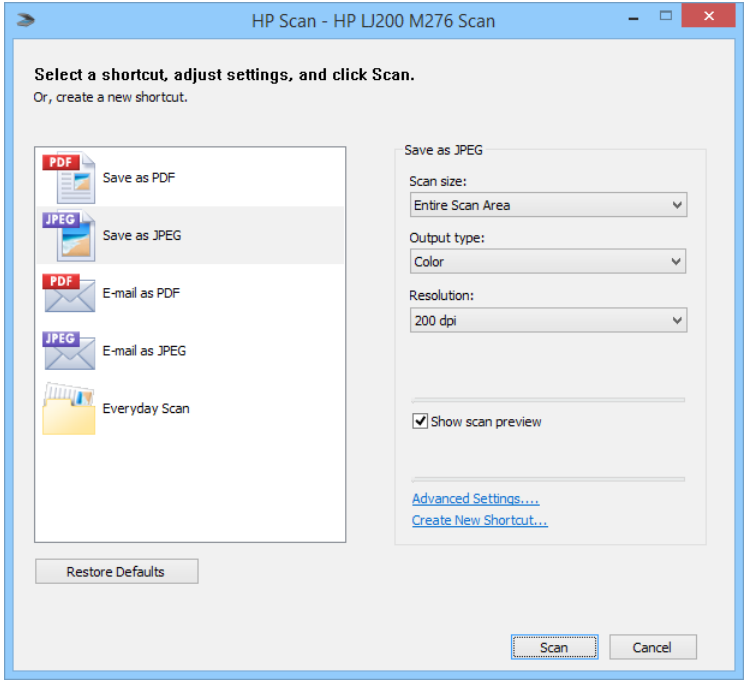
Multi-function device (MFD): An imaging device that performs several related functions.

- Printer
- Scanner
- Copier
- Possibly fax



Scan Options

- Windows Plug-and-Play enables apps to use the scanner
- Older scanners used TWAIN-based software
- Newer scanners use WIA
- Output format (PDF, JPG, others)
- Tools for selecting and editing images
- OCR conversion
- Options on the printer panel:
  - Format
  - Resolution
  - More options



Barcode Scanners

Barcode scanner: A handheld or pen-shaped device designed to scan patterns of different sized parallel bars, typically representing a product number, such as an ISBN, EAN, or UPC.

- Sensor records the light reflected off a barcode.
- Application software correlates the light reading to a product database.
- USB connections most common.

QR Scanners

Quick Response scanner (QR scanner): A type of 2D barcode scanner used to store information that can be read using a barcode scanner or the camera on a smartphone that has a barcode scanning app installed.

- Any smartphone camera, digital camera, and webcam can scan QR codes.
- No need for special scanning hardware.
- QR scanning software reads instructions in the code to perform an action.
  - Open a web page or import a contact record or calendar event.

Activity

Discussing Imaging Device Installation and Configuration

Reflective Questions

1. When would you recommend to users that they use laser printers? Inkjet printers? Impact printers? Thermal printers?

2. Which printer maintenance tasks have you performed, on which types of printers? Which maintenance tasks are most important in your organization? Why are they so important?

3. **Read Chapters 7, 8, 22**