

Windows Apps Cheat Sheet

Baseline (verified 2026-10-23): .NET 10 LTS (10.0.13) with C# 14, Visual Studio 2026 18.11.1, Windows App SDK 2.5.1, CommunityToolkit.Mvvm 8.4.2; .NET 11 is at RC2 (GA expected Nov 2026); .NET 8 and 9 end support 2026-11-10. Examples use the Bookshelf Desktop app. Quick reference only: verify against the official docs before production use.

1 · Stack chooser

Stack	Pick when
WinUI 3 + WinAppSDK	new native Windows app, Fluent, Store
WPF	mature LOB apps, rich binding, .NET 10
Windows Forms	existing apps, designer, quick tools
.NET MAUI	one codebase, Windows runs on WinUI
UWP	maintenance only

Also: Win32/C++, React Native for Windows, PWAs; third party: Avalonia, Uno.

2 · Templates & .csproj

```
dotnet new wpf -n App -f net10.0
dotnet new winforms -n App
<TargetFramework>net10.0-windows</TargetFramework>
<UseWPF>true</UseWPF> (or UseWindowsForms)
<OutputType>WinExe</OutputType>
<Nullable>enable</Nullable>
WinUI: net10.0-windows10.0.19041.0
+ UseWinUI + Microsoft.WindowsAppSDK
```

Enable Developer Mode; VS workloads ".NET desktop" and "WinUI application development"; winget configure.

3 · XAML essentials

x: directives: x:Class x:Name x:Key x:Type x:Null x:Static x:Array. mc:Ignorable for design-time.

```
xmlns:vm="clr-namespace:Bookshelf.Desktop.ViewModels;assembly=Bookshelf.Core" (WPF)
xmlns:vm="using:Bookshelf.Desktop.ViewModels" (WinUI)
```

Element → object; attribute or property element → property; content property; attached Grid.Row. Type converters turn strings into values. Build: XAML → BAML + partial class + InitializeComponent.

4 · Markup extensions & resources

```
{Binding} {StaticResource}
{DynamicResource} {TemplateBinding} {RelativeSource} {x:Static} {x:Type} {x:Null}.
```

Lookup: element → ancestors → Application → theme → system. **Static:** resolved once, must be defined earlier. **Dynamic:** re-evaluated, for themes and system values. Merge with ResourceDictionary.MergedDictionaries; pack URIs for assets.

5 · Layout & panels

Two passes: **Measure** (desired size) then **Arrange** (final rect). Size = Width/Min/Max, Margin outside, Padding inside, alignment.

```
<Grid RowDefinitions="Auto*,Auto"
ColumnDefinitions="1*,Auto,300">
```

Short forms are new in .NET 10 (WPF). Panels: Grid (star/Auto), StackPanel, DockPanel, WrapPanel, Canvas, UniformGrid. SharedSizeGroup aligns columns.

6 · Dependency properties

```
public static readonly DependencyProperty
IsReadProperty = DependencyProperty.
Register(
    nameof(IsRead), typeof(bool), type
of(BookCard),
    new FrameworkPropertyMetadata(false,
        FrameworkPropertyMetadataOptions.
AffectsRender());
public bool IsRead {
    get => (bool)GetValue(IsReadProperty);
    set => SetValue(IsReadProperty, value);
}
```

Value precedence (high→low): coercion · active animations · local value · template triggers · template · style triggers · style setters · theme style · inheritance · default. Attached: RegisterAttached + Get/Set.

7 · Routed events & commands

Strategies: **bubble**, **tunnel** (Preview*), **direct**. e.Handled stops routing; AddHandler(..., handledEventsToo). **ICommand:** Execute, CanExecute, CanExecuteChanged. **RoutedCommand** + CommandBinding + InputBinding/KeyBinding; built-ins ApplicationCommands. CommandParameter, CommandTarget.

8 · Binding anatomy

```
{Binding Path=Title, Mode=TwoWay,
UpdateSourceTrigger=PropertyChanged,
FallbackValue="-", TargetNullValue="?",
StringFormat="{0:C2}", Converter={StaticResource C}}
```

Source: DataContext (inherited), ElementName, RelativeSource. AncestorType/Self/TemplatedParent, Source. Modes: OneTime, OneWay, TwoWay, OneWayToSource. Needs INotifyPropertyChanged / ObservableCollection<T>. Debug: Output window, PresentationTraceSources.

9 · Converters, views, templates

IValueConverter / IMultiValueConverter. CollectionViewSource / ICollectionView: sort, filter, group, current item, live shaping. DataTemplate (implicit by DataType), HierarchicalDataTemplate, DataTemplateSelector. Lists: ItemsSource, ItemTemplate, virtualization on by default for ListBox/ListView/DataGrid.

10 · Validation

ValidationRule, ValidatesOnExceptions, IDataErrorInfo, INotifyDataErrorInfo (multiple, async). Validation.HasError, Validation.ErrorTemplate. Bridge: ObservableValidator + DataAnnotations + [NotifyDataErrorInfo]. Do not validate an empty form at construction.

11 · Styles, templates, triggers

```
<Style TargetType="Button" BasedOn="
{StaticResource {x:Type Button}}">
<Setter Property="Padding" Value="8,4"/>
<Style.Triggers><DataTrigger Binding="
{Binding IsRead}" Value="True">...
```

No x:Key = implicit style. ControlTemplate + TemplateBinding + ContentPresenter/ItemsPresenter; parts PART_*. VisualStateManager. Triggers: Property, Data, Multi, Event. UserControl vs custom control (Themes/Generic.xaml).

12 · Fluent theme

```
<Application ThemeMode="System"> <!--
.NET 9+ -->
<Window ThemeMode="Dark">
```

ThemeMode: Light, Dark, System, None. Setting it from code is experimental (WPF0001). Fluent.xaml dictionary, SystemColors.AccentColor*, high contrast via SystemParameters.HighContrast.

13 · Dispatcher & async

```
await Dispatcher.InvokeAsync(() => Status = "Done");
var data = await repo.GetAllAsync(ct); // resumes on UI thread
await Task.Run(() => Heavy()); // CPU work
```

UI objects have thread affinity. Never .Result/.Wait() on the UI thread; avoid async void except events. Background changes to bound collections need BindingOperations.EnableCollectionSynchronization. Use IProgress<T> and CancellationToken.

14 · MVVM layers

View (XAML) ≠ binding + commands ≠ ViewModel. ViewModel → Model / IBookRepository (services). Never: ViewModel → View types.

View-first or ViewModel-first; implicit DataTemplate maps VM→View. Dialogs and navigation sit behind IDialogService / INavigationService (user patterns, not official APIs).

15 · MVVM Toolkit 8.4

```
public partial class BookViewModel(IBookRepository repo,
IDialogService dialogs) : ObservableObject
{
    [ObservableProperty]
    [NotifyCanExecuteChangedFor(nameof(DeleteSelectedCommand))]
    public partial BookViewModel? SelectedBook { get; set; }

    [RelayCommand(IncludeCancelCommand = true)]
    private async Task LoadAsync(CancellationToken ct) { ... }
    WeakReferenceMessenger.Default.Send(new BookAdded(book));
}
```

Partial properties need C# 14. Also ObservableRecipient, ObservableValidator, ValueChangedMessage<T>.

16 · Generic Host (WPF)

```
var b = Host.CreateApplicationBuilder();
b.Services.AddSingleton<IBookRepository>,
SqliteBookRepository>();
b.Services.AddSingleton<IDialogService>,
WpDialogService>();
b.Services.AddTransient<BookViewModel>();
b.Services.AddSingleton<MainWindow>();
_host = b.Build();
// OnStartup: await _host.StartAsync(); show window
// OnExit: await _host.StopAsync();
```

Remove StartupUri. Match lifetimes (no captive dependencies).

17 · WinUI 3 deltas

{x:Bind VM.Title, Mode=OneWay}: compiled, typed, default OneTime, resolves against the page. NavigationView + Frame; Mica backdrop; AppWindow for windowing and title bar; Window has no DataContext or Loaded. using: namespaces. No triggers: use VisualStateManager. PublishAot supported since WinAppSDK 1.6.

18 · Windows Forms deltas

Out-of-process designer. BindingSource, DataBindings.Add, Button.Command. Anchor/Dock/TableLayoutPanel. High DPI: PerMonitorV2. .NET 10: Application.SetColorMode(SystemColorMode.Dark) (Classic, System, Dark) before any UI; async Form.ShowDialogAsync, Control.InvokeAsync.

19 · Publish matrix

	WPF	WinForms	WinUI
FDD	yes	yes	yes
SCD	yes	yes	yes
Single-file	yes	yes	unpackaged SCD only
ReadyToRun	yes	yes	test
Trimming	no (NETSDK1168)	no	extra work
Native AOT	no	no	yes (1.6+)

```
dotnet publish -c Release -r win-x64 --self-contained false
dotnet publish -c Release -r win-x64 -p:PublishSingleFile=true
RIDs: win-x64 · win-x86 · win-arm64
```

20 · MSIX & signing

MSIX: container, clean install/uninstall, differential updates. Package.appxmanifest: identity, **Publisher must match the cert subject**, capabilities, assets. Single-project MSIX (WinUI); Windows Application Packaging Project (WPF/WinForms).

```
signtool sign /fd SHA256 /tr <timestamp-url> /td SHA256 /f cert.pfx /p $env:CERT_PASSWORD app.msix
signtool verify /pa /v app.msix
```

Keys and passwords come from CI secrets only. Prefer Azure Artifact Signing. EV certs no longer bypass SmartScreen.

21 · Distribution channels

Channel	Signing	Updates
Store (MSIX)	Store re-signs	Store, differential
Store (MSI/EXE)	you	yours
App Installer	trusted cert	.appinstaller
WinGet	cert recommended	winget upgrade
ClickOnce	cert recommended	built in (not WinUI)
MSI/EXE, zip	cert recommended	manual

Store: free developer account via Partner Center; Store Policies 7.20. ms-appinstaller: is disabled by default.

22 · WinGet

```
winget install wingetcreate
wingetcreate new <installer-url>
wingetcreate update Pub.App --urls <url> --version 1.5.0 --submit
winget settings --enable LocalManifestFiles
winget install --manifest .\manifest
```

Token via WINGET_CREATE_GITHUB_TOKEN secret.

23 · CI/CD (GitHub Actions)

```
runs-on: windows-latest
actions/checkout · actions/setup-dotnet
- dotnet restore / build / test
- dotnet publish -r win-x64
- microsoft/setup-msbuild → MSBuild M
SIX
- sign (Artifact Signing over OIDC or SignTool)
- upload-artifact · GitHub Release
- wingetcreate update · msstore publish
```

24 · .NET Framework migration

- Baseline; retarget 4.7.2+; PackageReference; SDK-style
- Copilot app modernization (Upgrade Assistant is deprecated)
- Replace AppDomain, Remoting, CAS, WCF server; WebBrowser → WebView2; BinaryFormatter → JSON
- Add Microsoft.Windows.Compatibility if needed
- Test DPI, printing, clipboard, third-party controls; then publish on .NET 10

25 · Also in the section

Interop (HwndHost, WindowsFormsHost, WebView2, CsWin32) · globalization (.resx, EN/ES, RTL) · accessibility (UIA, AutomationProperties) · local data (EF Core + SQLite, AppData) · security (MSIX container, DPAPI) · performance (R2R, virtualization, dotnet-counters) · testing (xUnit/MSTest fakes; WinAppDriver stable v1.2.1, unmaintained) · version history.