

# UML Overview

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This document captures the core architecture of `ExcelDlPlayground` using PlantUML. The project is a .NET Framework 4.8 Excel-DNA add-in that hosts TorchSharp-based deep learning helpers exposed as Excel UDFs.

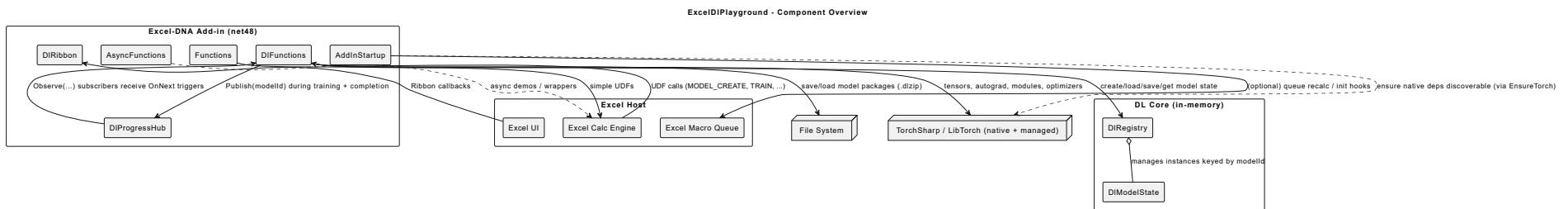
Key architectural facts reflected below:

- `DL.TRAIN` runs **async** via `ExcelAsyncUtil.RunTask(...)` and updates in-memory model state.
  - **Push-based UI updates** are done via `ExcelAsyncUtil.Observe(...)` + `DlProgressHub.Publish(...)` (STATUS / LOSS\_HISTORY / PREDICT).
  - `QueueRecalcOnce(xlcCalculateNow)` is a **throttled fallback**, mainly useful for volatile/legacy cells — *not required* for the observable functions.
  - `DL.PREDICT` is implemented as an **observable with caching** so it doesn't flicker or block Excel; it recomputes only when a **new stable model version** is available.
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# Component Diagram

## Notes

- Removed “xlcCalculateNow on load” as a *hard* behavior — startup recalc is not fundamental to the architecture.
- Made the **observable loop explicit**: `DlProgressHub` signals, and `ExcelAsyncUtil.Observe(...)` consumers re-emit values.
- Clarified that **Torch** includes both managed + native dependencies.

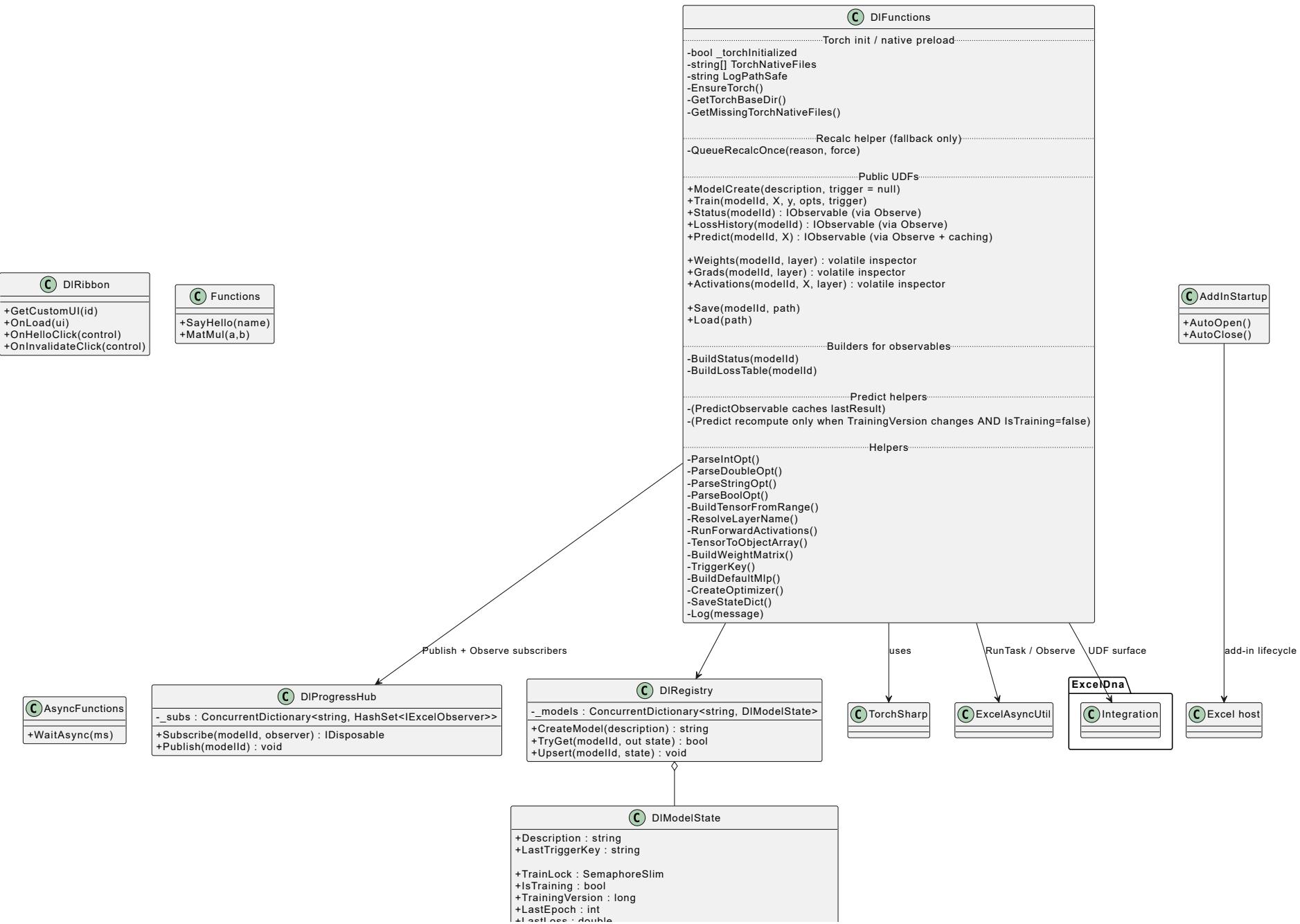


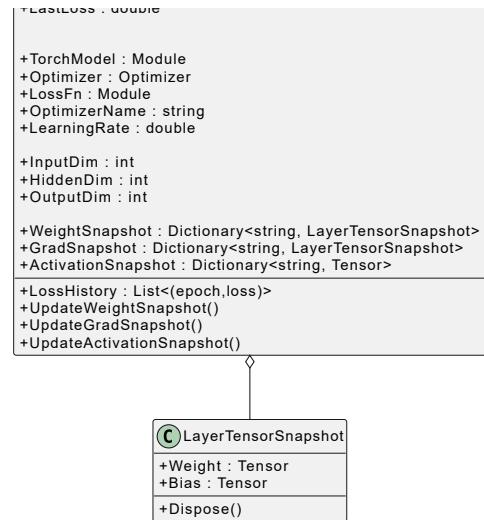
## Class Diagram (Key Types)

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### Notes

- `Status` , `LossHistory` , and `Predict` are modelled as *observable outputs* (this is crucial).
- `QueueRecalcOnce` is explicitly framed as a **fallback**, not the primary update mechanism.
- `PredictObservable` caching behaviour is captured at a conceptual level.





## Sequence (Training happy path)

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### Notes

- Shows that PREDICT recompute happens at “stable model” time (when `IsTraining=false` and `TrainingVersion` changed).
- Makes the observer loop explicit, rather than implying calc engine pulls values.
- Explicitly marks macro recalc as optional.

