**PROBLEM DESCRIPTION**
Discretized transport equations for a fluid flow include two types of unknowns:
- Velocity components \((u, v, w)\)
- Pressure field \((p)\)

As seen in the previous chapter, scalar quantities such as \(p\) (denoted \(\phi\) in the previous chapters) are typically stored at computational nodes (i.e., CV centers).

**Question: can the velocity components be stored at the same locations?**

**EXAMPLE: PRESSURE AND VELOCITIES STORED AT THE COMPUTATIONAL NODES IN A UNIFORM GRID**
In this example, let’s assume that the pressure field (grey values) is a highly irregular “checkerboard”.

Calculation of the pressure gradients across the active CV:

\[
\frac{\partial p}{\partial x} =
\]

\[
\frac{\partial p}{\partial y} =
\]

\[
\Rightarrow
\]
**STAGGERED GRID**
To overcome this issue, a staggered grid can be used to store the velocity components:

Calculation of the pressure gradients across the u-CV:

\[
\frac{\partial p}{\partial x} = \quad \frac{\partial p}{\partial y} =
\]

Advantages:
**Staggered Grid Notation**

Unbroken grid lines:

Dashed lines: