```
program lid_driven_cavity
    implicit none
    integer, parameter :: N = 50  ! grid size (NxN grid)
    real :: dx, dy, dt, Re  ! grid spacing, time step, Reynolds number
    real :: u(N, N), v(N, N), p(N, N)  ! velocity and pressure fields
    integer :: i, j, step
    real :: start_time, end_time, elapsed_time

    ! Parameters
    dx = 1.0 / (N-1)  ! Grid spacing in x direction
    dy = 1.0 / (N-1)  ! Grid spacing in y direction
    dt = 0.001        ! Time step size
    Re = 100          ! Reynolds number

    ! Initialize arrays
    u = 0.0
    v = 0.0
    p = 0.0

    ! Initialize the top boundary (lid) velocity
    u(N, :) = 1.0

    ! Start timing
    call cpu_time(start_time)

    ! Main loop for time stepping
    do step = 1, 1000
        call compute_velocity(u, v, p, dx, dy, dt, Re)
        call update_pressure(p, dx, dy)

        ! Output or check convergence
        if (mod(step, 100) == 0) then
            print *, 'Step: ', step
        end if
    end do

    ! Stop timing
    call cpu_time(end_time)
    elapsed_time = end_time - start_time
    print *, 'Elapsed time for CFD simulation: ', elapsed_time, ' seconds'

contains

    ! Function to update the velocity and pressure fields (simplified)
    subroutine compute_velocity(u, v, p, dx, dy, dt, Re)
        real, dimension(:,:), intent(inout) :: u, v, p
        real, intent(in) :: dx, dy, dt, Re
        integer :: i, j

        ! Simple explicit method for velocity (simplified)
        do i = 2, N-1
            do j = 2, N-1
                u(i, j) = u(i, j) - dt * ( (u(i, j) * (u(i+1, j) - u(i-1, j))) / (2*dx)
                                         (v(i, j) * (u(i, j+1) - u(i, j-1))) / (2*dy)
            end do
        end do

        ! Simple velocity update for v (similar)
        do i = 2, N-1
            do j = 2, N-1
```

```
            v(i, j) = v(i, j) - dt * ( (u(i, j) * (v(i+1, j) - v(i-1, j))) / (2*dx) &
                                       (v(i, j) * (v(i, j+1) - v(i, j-1))) / (2*dy)
        end do
    end do
end subroutine compute_velocity

! Function to solve for pressure (simplified Poisson equation solver)
subroutine update_pressure(p, dx, dy)
    real, dimension(:,:), intent(inout) :: p
    real, intent(in) :: dx, dy
    integer :: i, j

    ! Simple pressure Poisson equation (Jacobi iteration)
    do i = 2, N-1
        do j = 2, N-1
            p(i, j) = 0.25 * ( p(i+1, j) + p(i-1, j) + p(i, j+1) + p(i, j-1) )
        end do
    end do
end subroutine update_pressure

end program lid_driven_cavity
```