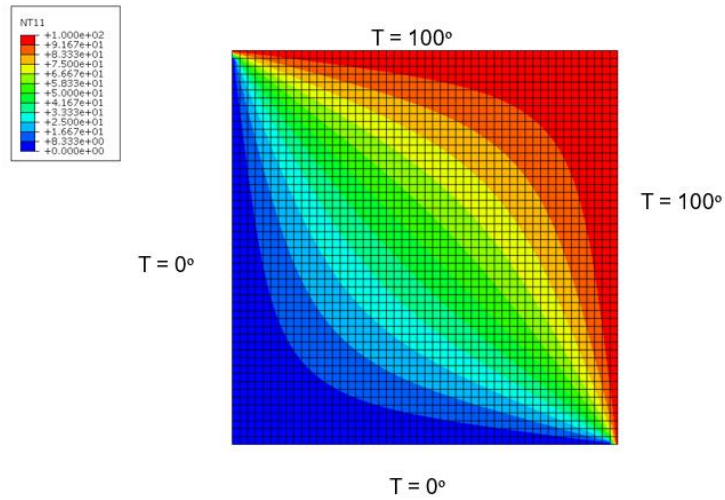


## Steady State Heat Transfer Example

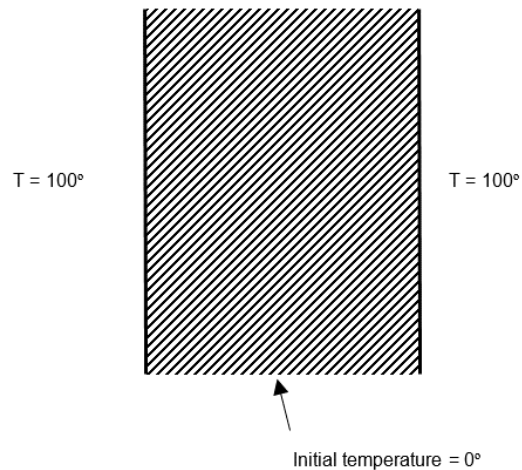
Consider a 100 mm x 100 mm x 1 mm aluminum plate with thermal conductivity,  $\kappa = 205 \text{ mW/mm}^\circ\text{C}$  subjected to temperature boundary conditions of  $0^\circ\text{C}$  on the bottom and left edges and  $100^\circ\text{C}$  on the right and top edges. Determine the steady state temperature distribution.

Solution:



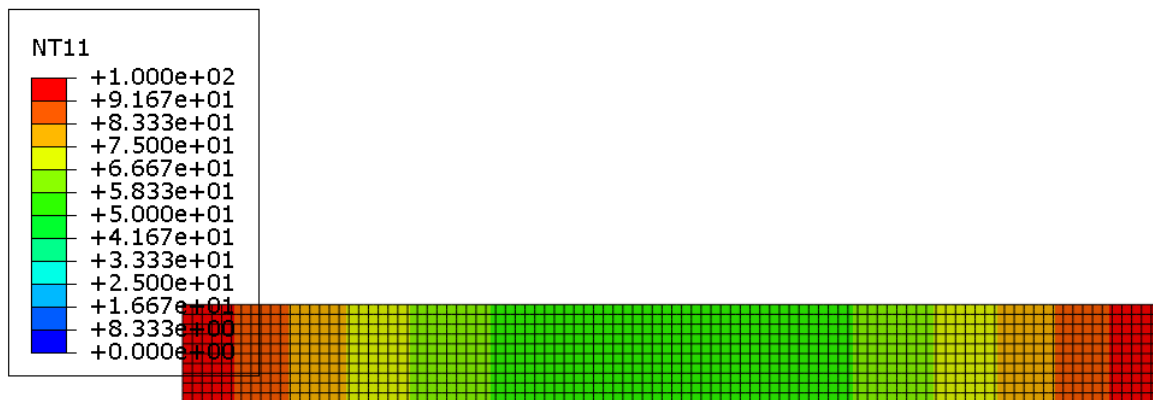
### Transient Heat Transfer Example

Consider an infinite aluminum ( $\kappa = 205 \text{ mW/mm}^\circ\text{C}$ ,  $\rho = 2.7 \times 10^{-9} \text{ tonne/mm}^3$ ,  $C_p = 900 \text{ mJ/tonne}^\circ\text{C}$ ) slab of thickness 100 mm, initially at  $0^\circ\text{C}$ , subjected to sudden temperature of  $100^\circ\text{C}$  at time,  $t = 0 \text{ sec}$ . Determine the transient temperature distribution and the time required for the center of the slab to reach  $50^\circ\text{C}$ .



Solution:

Center of slab reaches  $50^\circ\text{C}$  in approximately 11.5 seconds



Step: Step-1  
Increment 23: Step Time = 11.50  
Primary Var: NT11

Abaqus Consistent Units

**Table 1. Consistent units.**

Quantity	SI	SI (mm)	US Unit (ft)	US Unit (inch)
Length	m	mm	ft	in
Force	N	N	lbf	lbf
Mass	kg	tonne ( $10^3$ kg)	slug	$\text{lbf s}^2/\text{in}$
Time	s	s	s	s
Stress	Pa ( $\text{N/m}^2$ )	MPa ( $\text{N/mm}^2$ )	$\text{lbf/ft}^2$	psi ( $\text{lbf/in}^2$ )
Energy	J	mJ ( $10^{-3}$ J)	ft lbf	in lbf
Density	$\text{kg/m}^3$	$\text{tonne/mm}^3$	$\text{slug/ft}^3$	$\text{lbf s}^2/\text{in}^4$