



**Reach the  
Summits of ...**

# **Electrical Engineering**

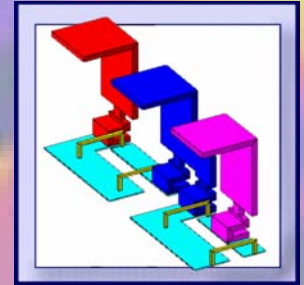
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# InCa3D and Portunus Softwares

- InCa3D : very fast cabling and connection modeling



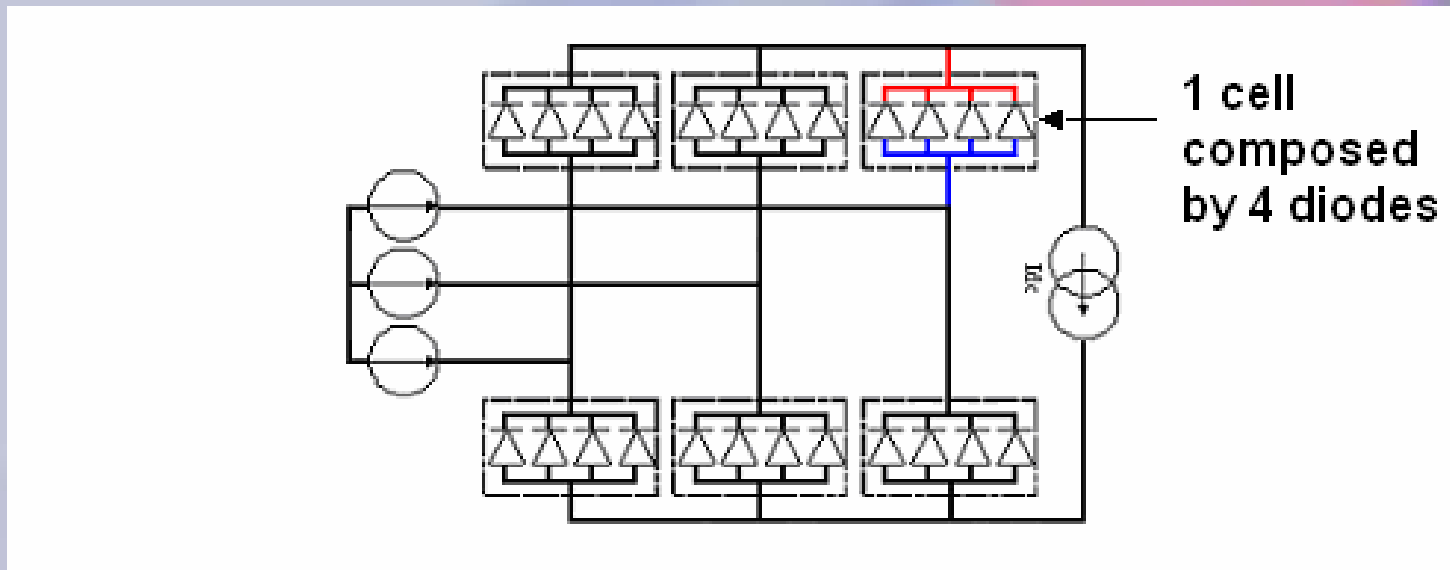
- Portunus: complete system simulator

**Portunus**

- Coupling possibilities:
  - Export reduced impedance matrix from InCa3D to Portunus

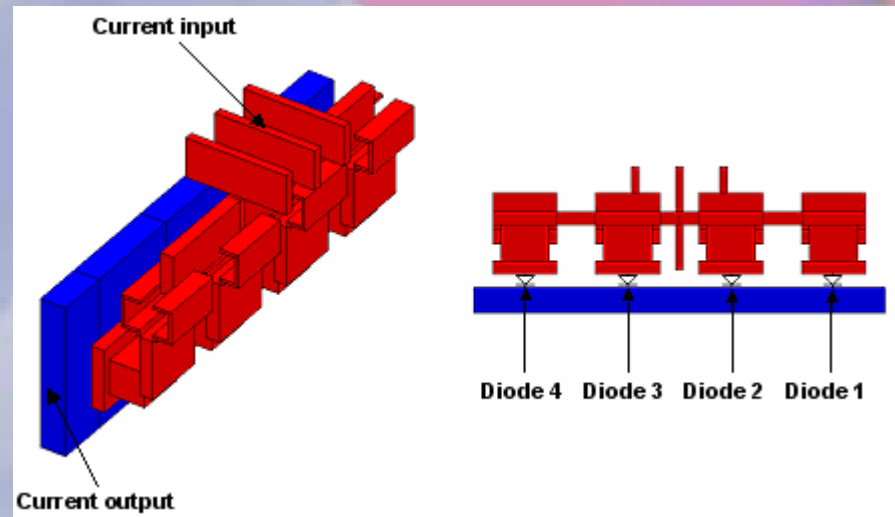
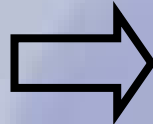
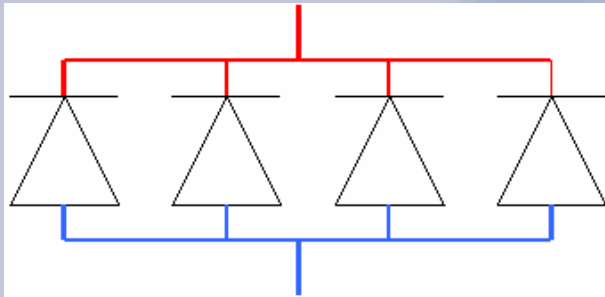
# Example

- Power diodes bridge (3 phases - 50 kA)
  - ◆ 6 identical cells



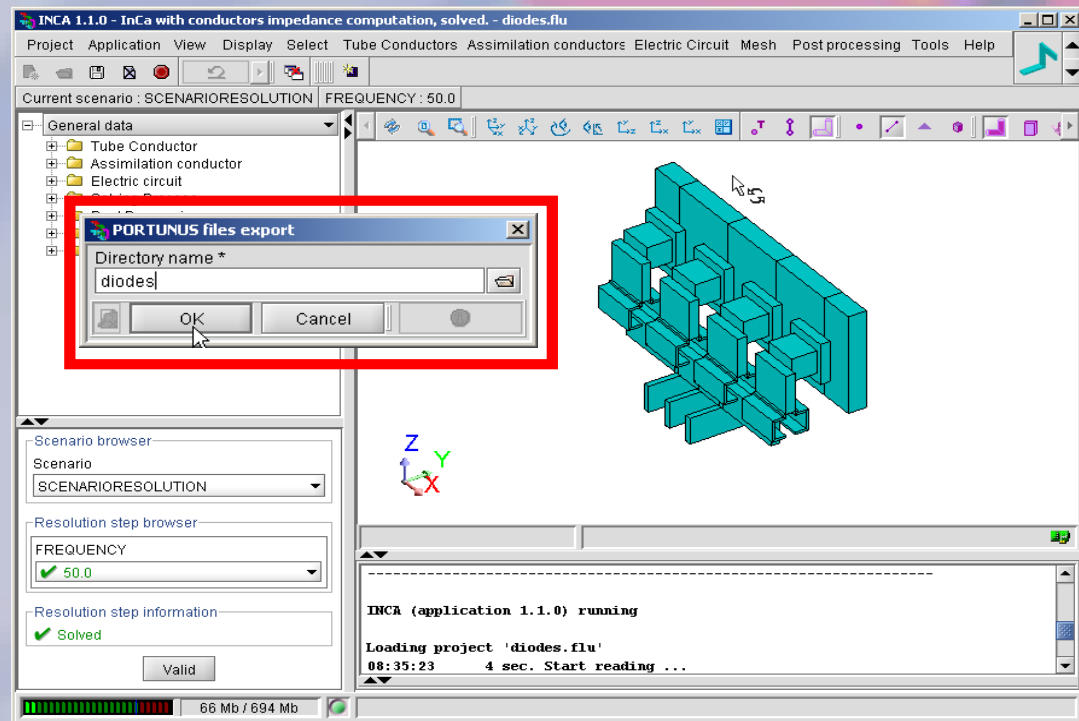
# Example

- **First step: InCa3D model**
  - Connections between the 4 parallel diodes



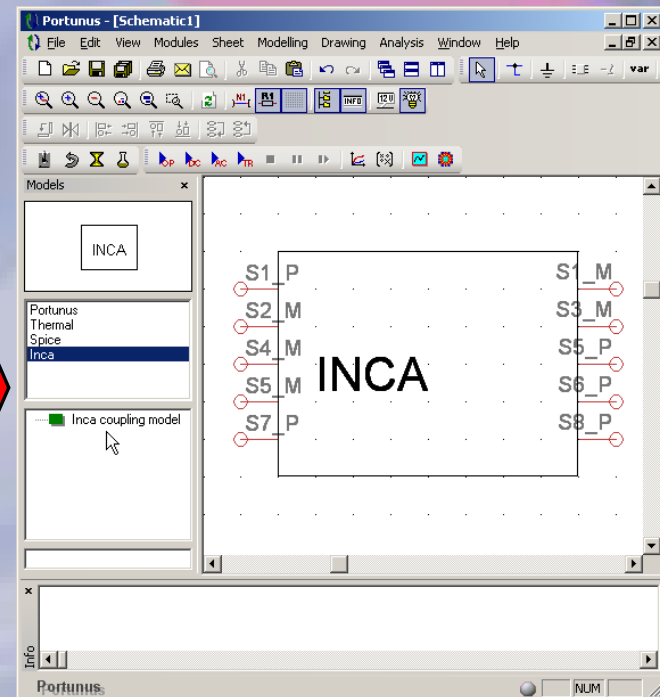
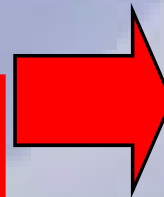
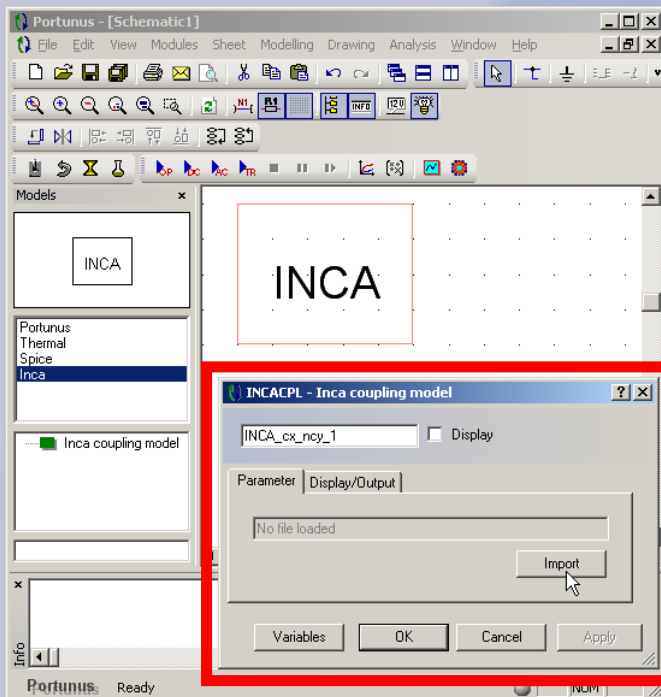
# Example

- **Second step : export file**
  - ◆ Reduced impedance matrix is exported to Portunus



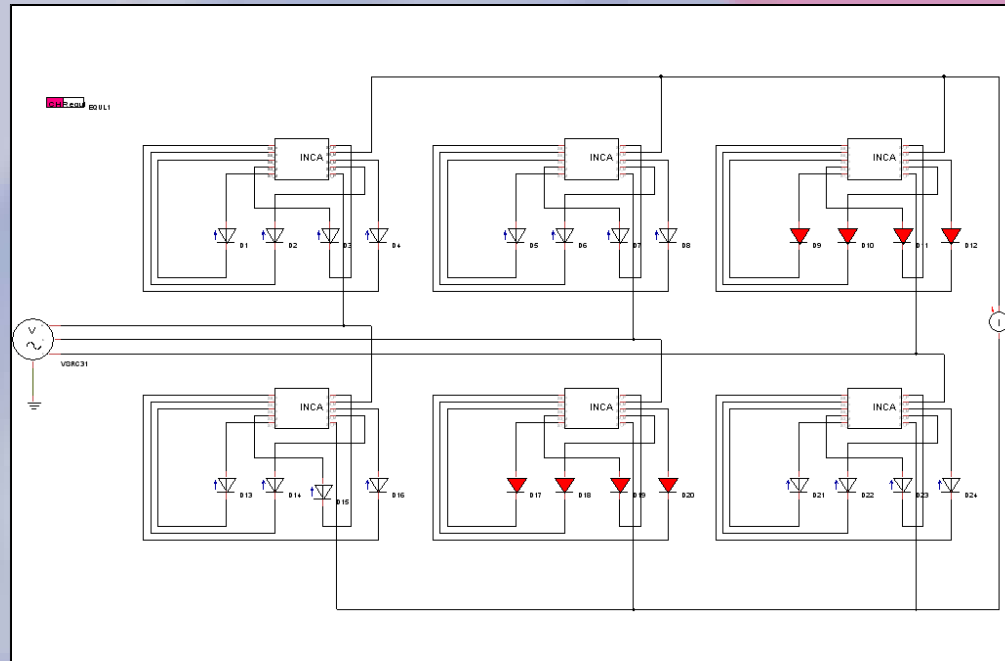
# Example

- **Third Step : Portunus model**
  - ◆ **Specific InCa3D component to include the connection block into an electric system**



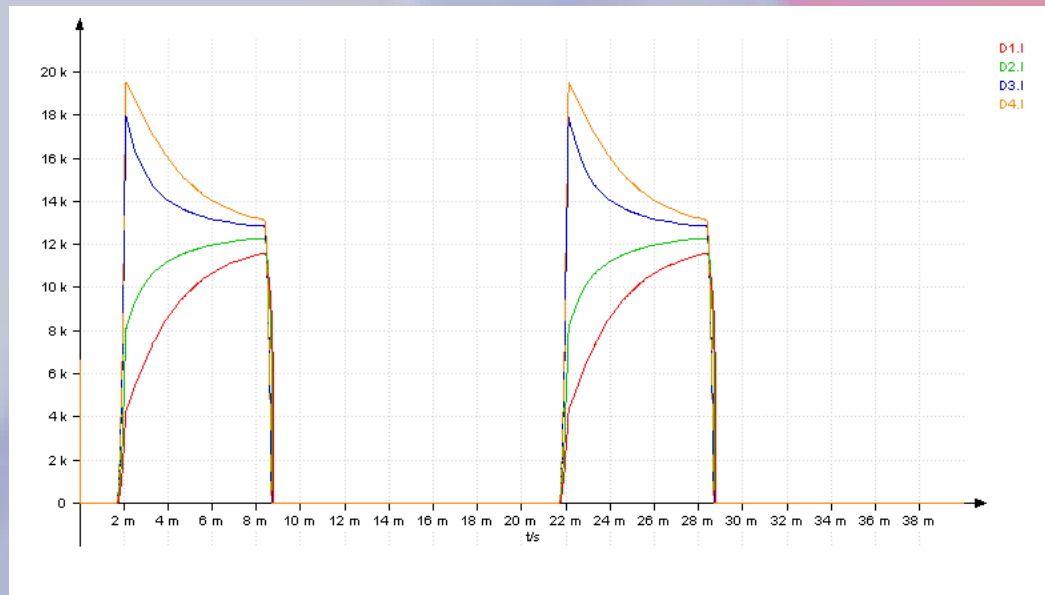
# Example

- Full Portunus model
  - ◆ 6 InCa3D components to model the connections of the 6 cells



# Example

- Portunus simulation results
  - ◆ Diode currents within a cell



→ Unbalanced currents between the 4 diodes

# Conclusions

- **Simulations tools:**
  - ◆ Cabling model: InCa3D
  - ◆ Transient analysis: Portunus
- **InCa3D to Portunus coupling**
  - ◆ Quick and easy
  - ◆ Include cabling model into system simulations
    - more accurate results



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