Wanda 4 Architecture

Dutch Wanda User Conference

Why WANDA 4?

Questions reaching further than standard water hammer analysis

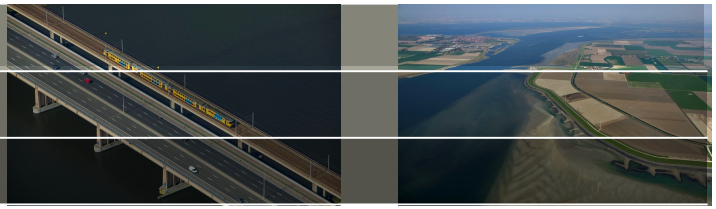
- non-liquid systems (gas, steam)
- several liquids (hot/cold fresh/salt) in a system
- oil/gas require mechanistic models,
  which fit well into the WANDA approach
- T- en X-pieces (3 and 4 connection points)
- enthusiasm about the WANDA approach

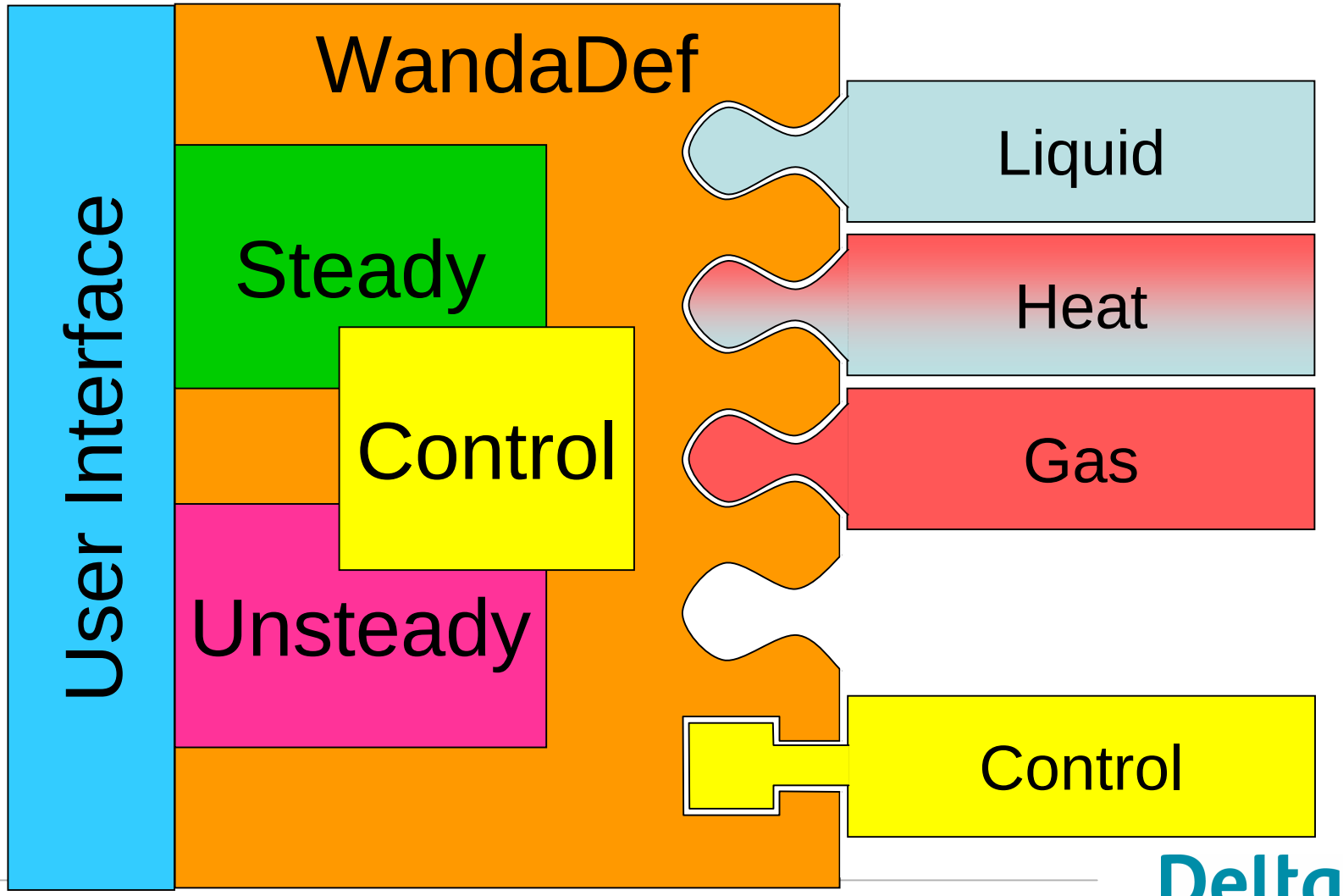
Broadening of the market based on the robust WANDA system

Wanda 4 vs Wanda 3

Wanda 3	Wanda 4
1 of 2 connection points per component	1, 2, 3 of 4 connection points per component (extension possible)
QH-equations essential: 1 domain	Variable calculation quantities: several domains
Pipe build in to calculation core	Pipe is constructed as a component
Node equations in calculation core	Node equations external
No transport	Transport
One liquid	Several fluids

Wanda 4 Architecture





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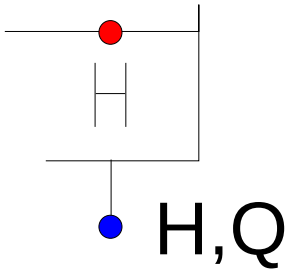
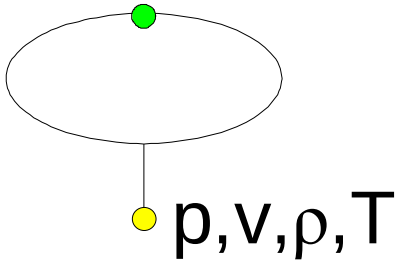
Components

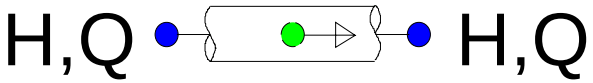
Connection points

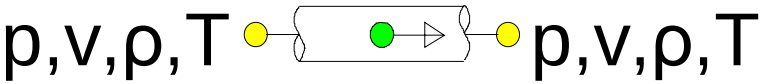
Fluid

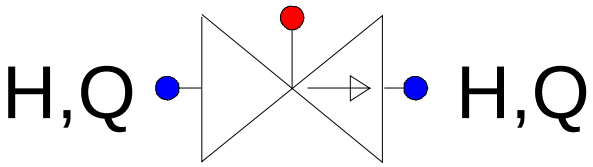


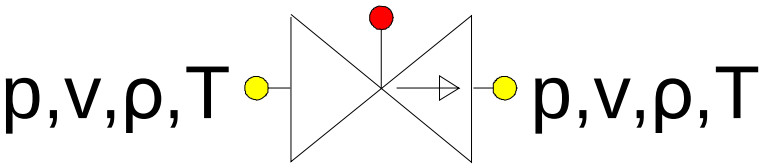
Gas











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Components and nodes

Components are connected to the nodes by their connection points

Node types correspond to connection point types (domains)

e.g. QH, pvpT, WpT, MA, Fu, Tq

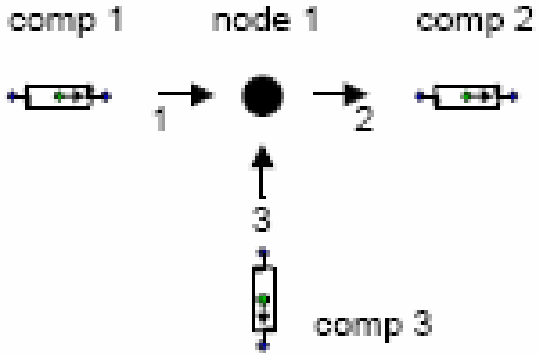
Components may have connection points of several domains: Hybrid components, for example air-coupled air vessels

Equations

Components en nodes direct all solver actions concerning:

- Construction of the matrix of the whole network
  - “standard equations” (characteristics)
  - “node equations” (balances)
    - > mass
    - > energy
    - > momentum
    - > additional
- Start vector, convergence (both calculation and own variables)
- Calculation of internal points (for pipes)
- Post processing of output variables

Example construction matrix

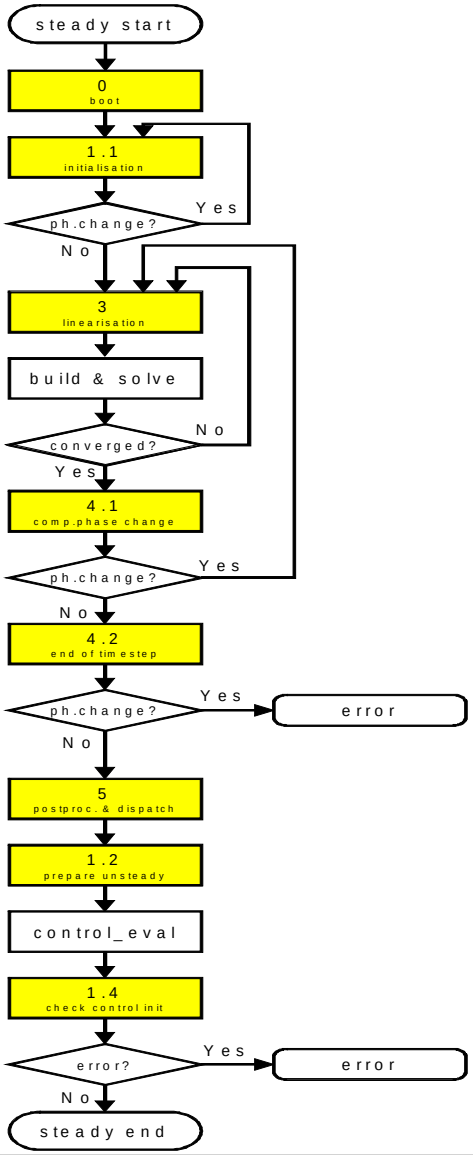


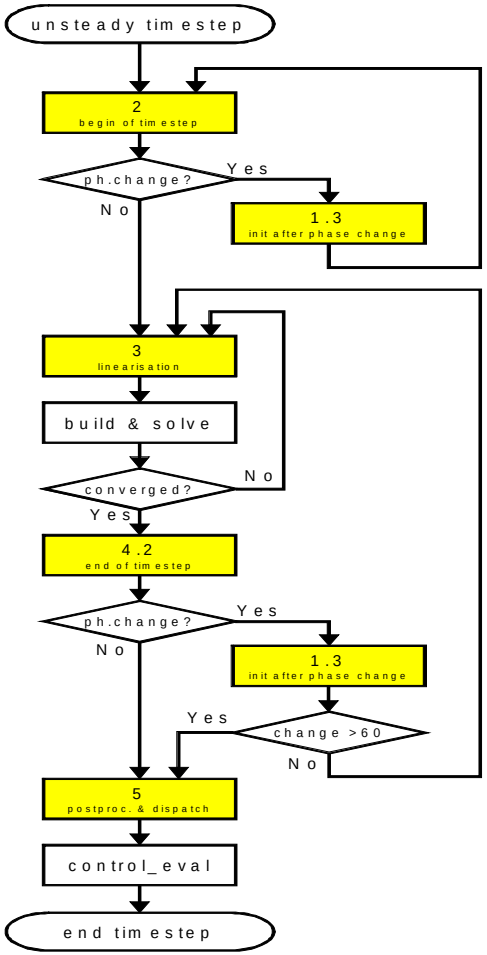
	Q1	H1	Q2	H2	Q3	H3	Q	H	rhs	Type
pv1 kar	x	x							x	1
pv2 kar			x	x					x	1
pv3 kar					x	x			x	1
knoop							x	x	x	1
massabalans	1		-1		-1		1		0	2
H1=H		1						-1	0	4
H2=H				1				-1	0	4
H3=H						1		-1	0	4

Component 1
Component 2
Component 3
Knoop

1 in 2 out 3 in

Component calculation phases





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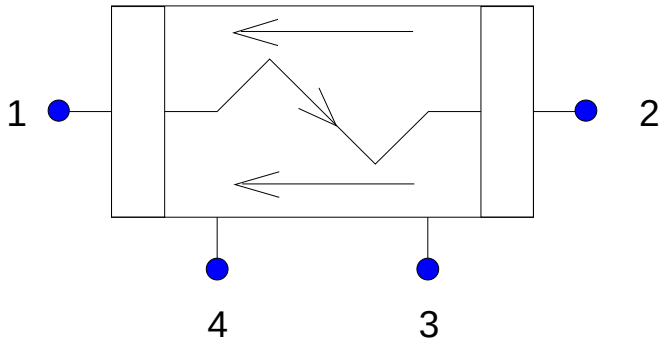
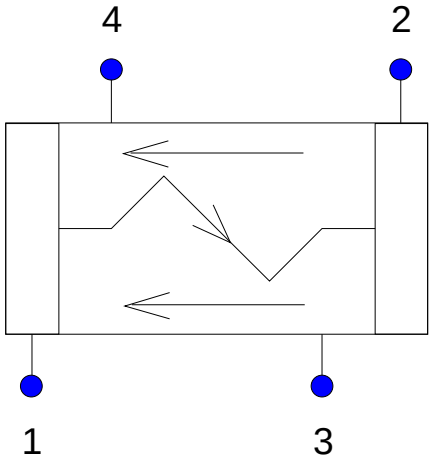
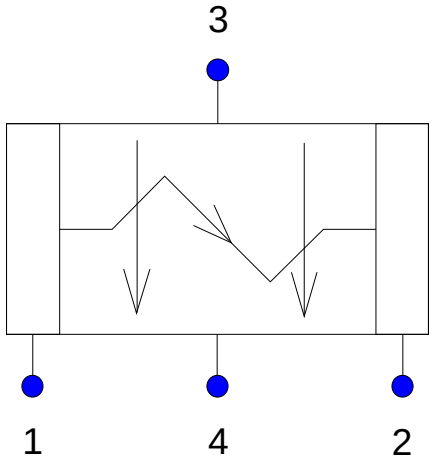
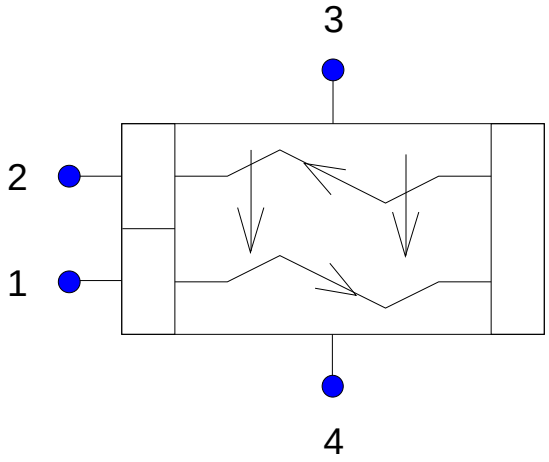
Complex components
Heat exchangers / Condensers









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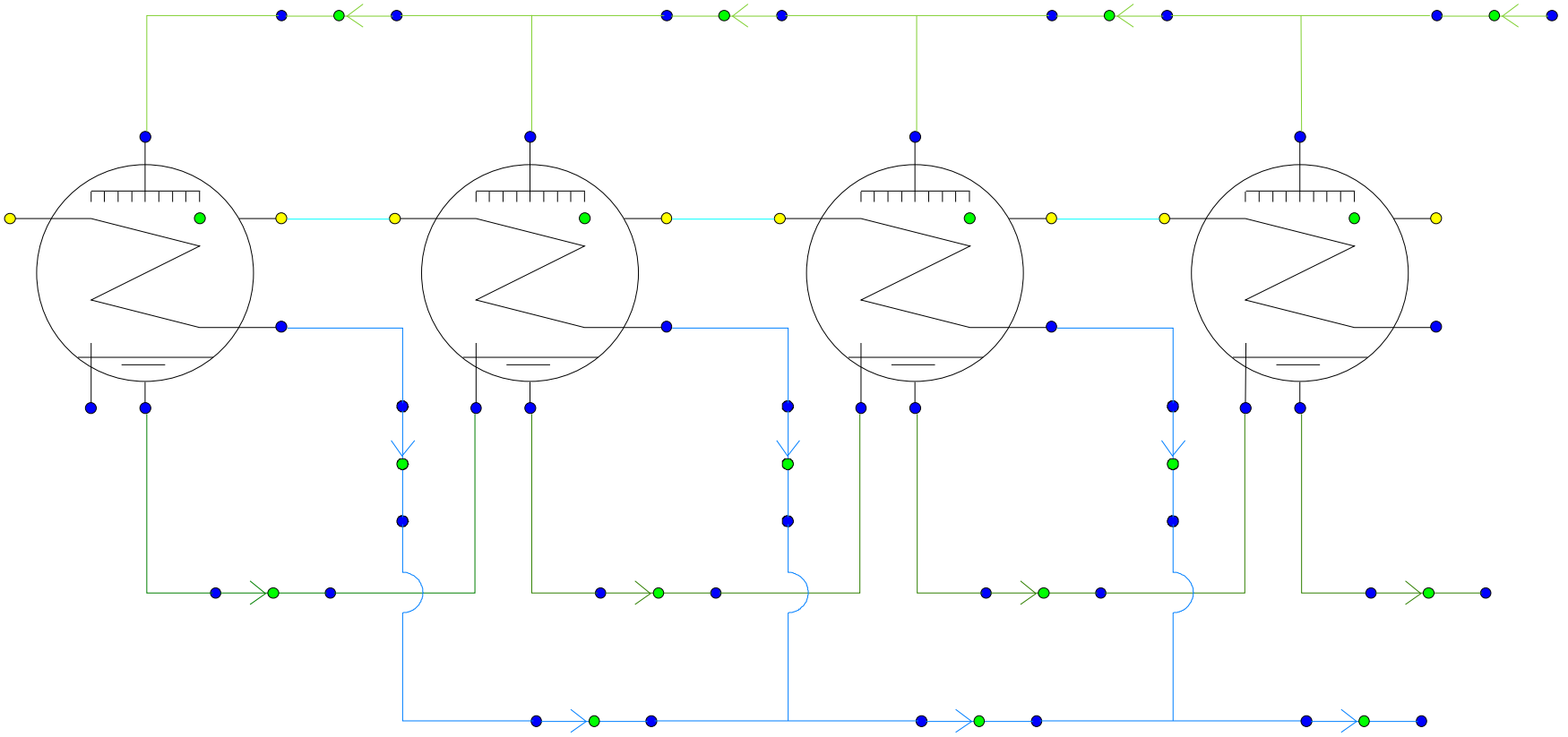
Complex components
Desalination



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