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Teaching Real-Time Systems with Witness Support

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16 – 14. 10. 2016

witness
technology for knowing

Real Time Systems (RTS) – definition of OS

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Systems classification:

Static

- systems abstracting from time

Dynamic

- their behaviour is time dependent (events – created one after one, the first precedes the second)

Typical characteristics of RTS

- event driven, reactive
- its failure is expensive and dangerous
- parallel/more threads programming
- continuous operation without operator intervention
- requests for reliability and fault-tolerance
- predicable behaviour

RTS

Simulation

Mimicry of real system activity in time flow, when progression of real system behaviour can be examined with the help of simulation model.

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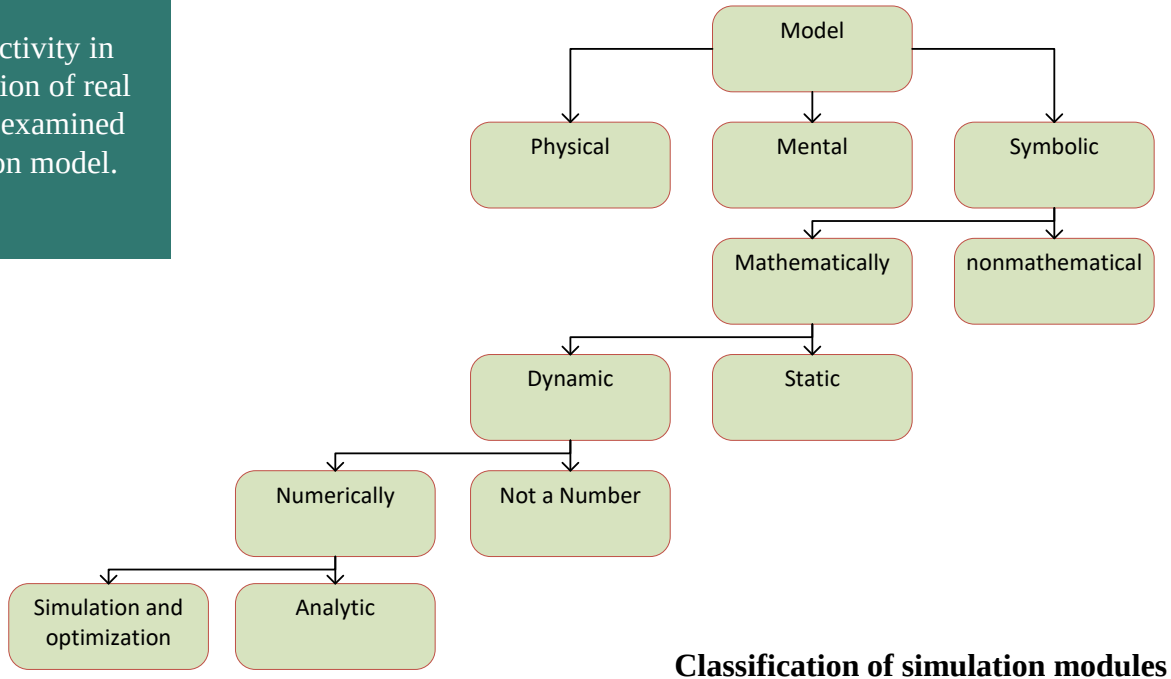

Classification of simulation modules

Witness

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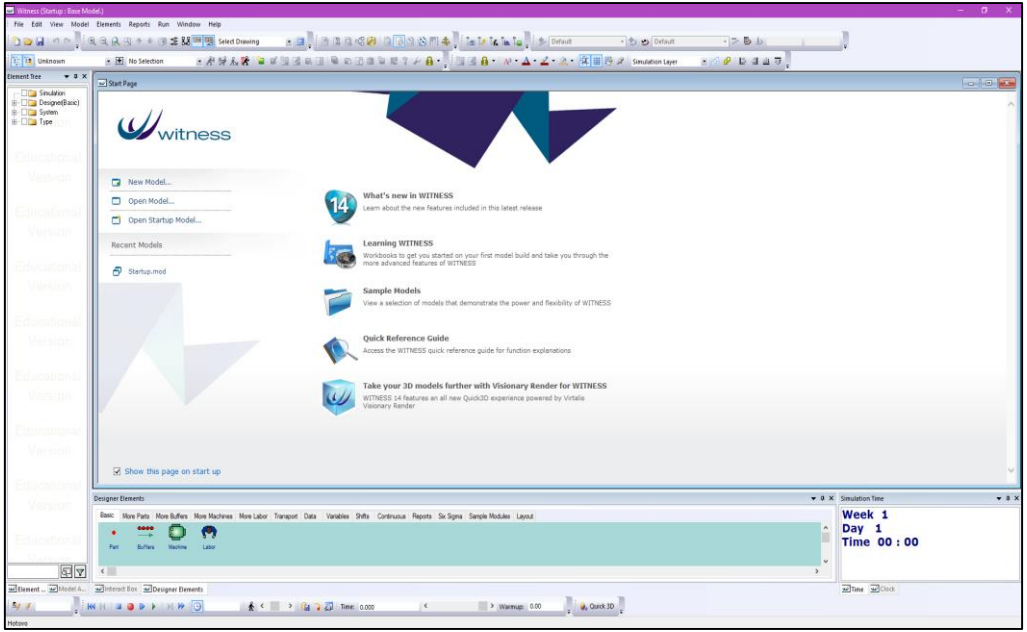

Start-up Window – Witness14

Witness application was developed by British company Lanner Group Ltd. and belongs to most used and widespread SW for simulation and optimization of manufacturing, logistics and service systems. Witness belongs to system, which are determined for support of manager's decision using created simulation models, which are subject of subsequent experiments. Created simulation model, based on the up-to-date state of knowledge, enables us to forecast better its behaviour in the future.

Compatibility:

- Microsoft VISIO
- Interface with CAD/CAM systems

Witness – Basic concept

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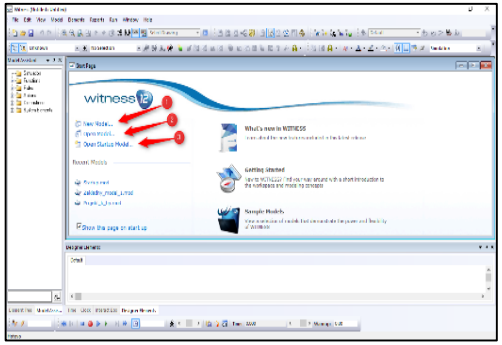
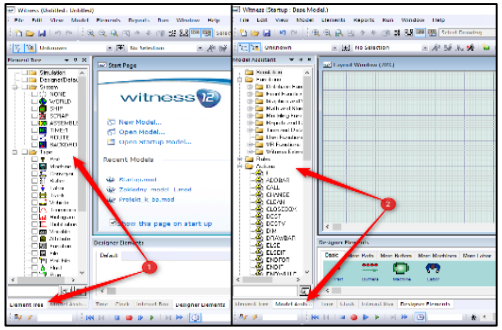
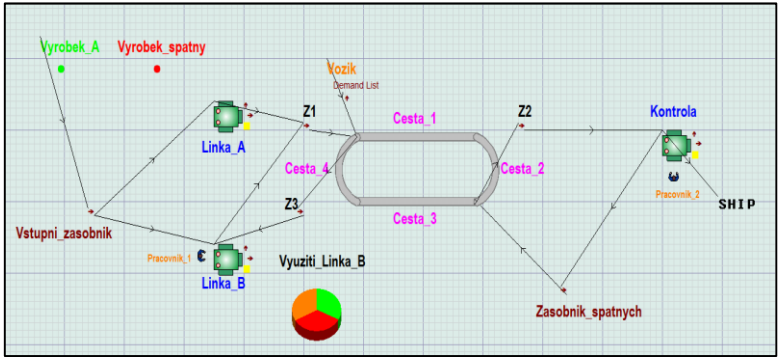
- Production
- Implementation of modern ways of solution
- Capacity planning
- Bottleneck identification in the production (GAPS)
- Quality measurement
- Technology
- Guiding logic of material flows
- Planning management practices





The purpose of the application is to be simple for every user.
Simulator utilizes simulation principles with discrete events.



Simulation concept includes:

- System
- Events
- Model
- Entities
- Attributes
- State variables
- Processes and activities

- which together define event driven simulation

Possibilities of Witness usage in university education - POWIE

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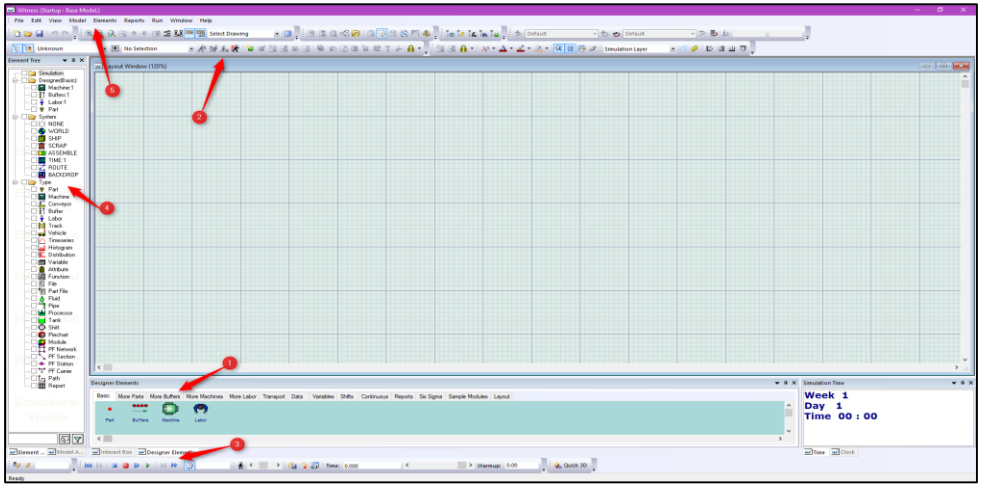
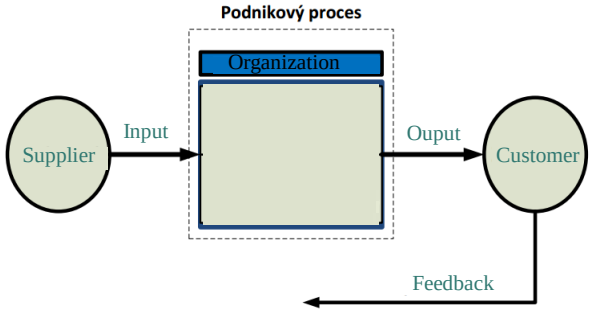
Student – how to get started with the tool

1. Designer elements
2. Standard panel
3. Time panel
4. Model assistant
5. Model setup (3D)





- Processes of management
- Processes to other interested parties
- Support
- Customer oriented processes

POWIE - Elements

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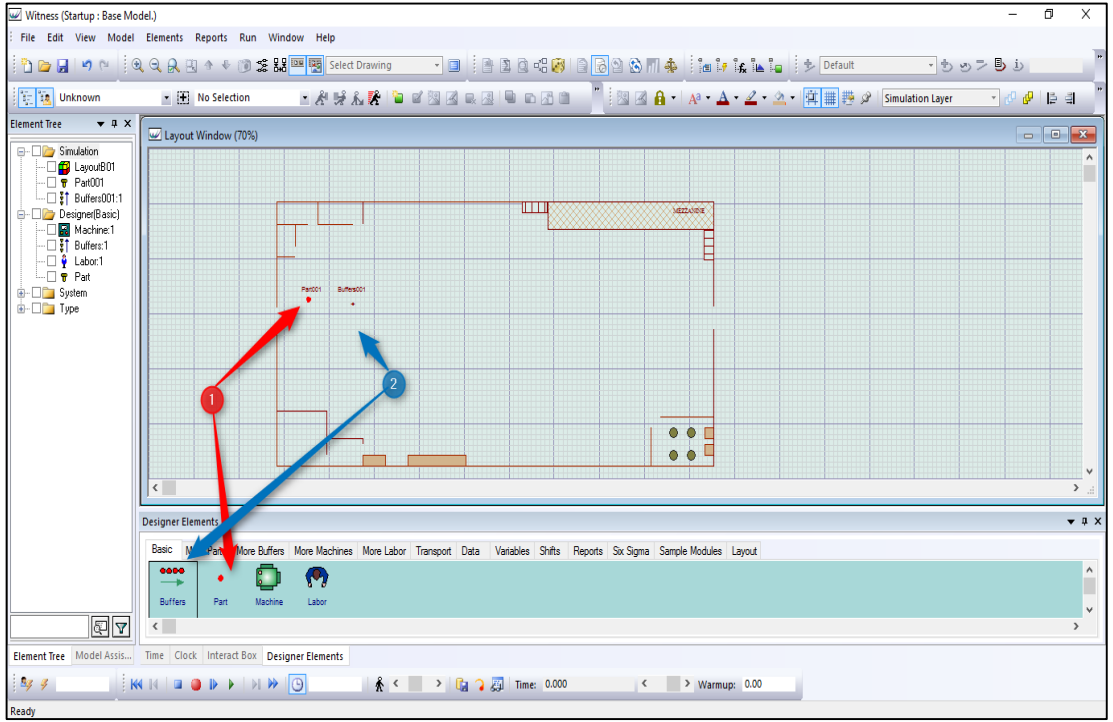
Discrete Elements
PARTs
Machines
Conveyors
Buffers
Vehicles
Tracks
Labor
Modules
Paths

Continouos processing Elements
Fluids
Pipes
Processors
Tanks

Power & Free Elements
Networks
Carriers
Sections
Stations

Logical Elements
Attributes
Variables
Distributions
Functions
Files
PART files
Shifts

Graphical Elements
Timeseries
Pie charts
Histograms



POWIE

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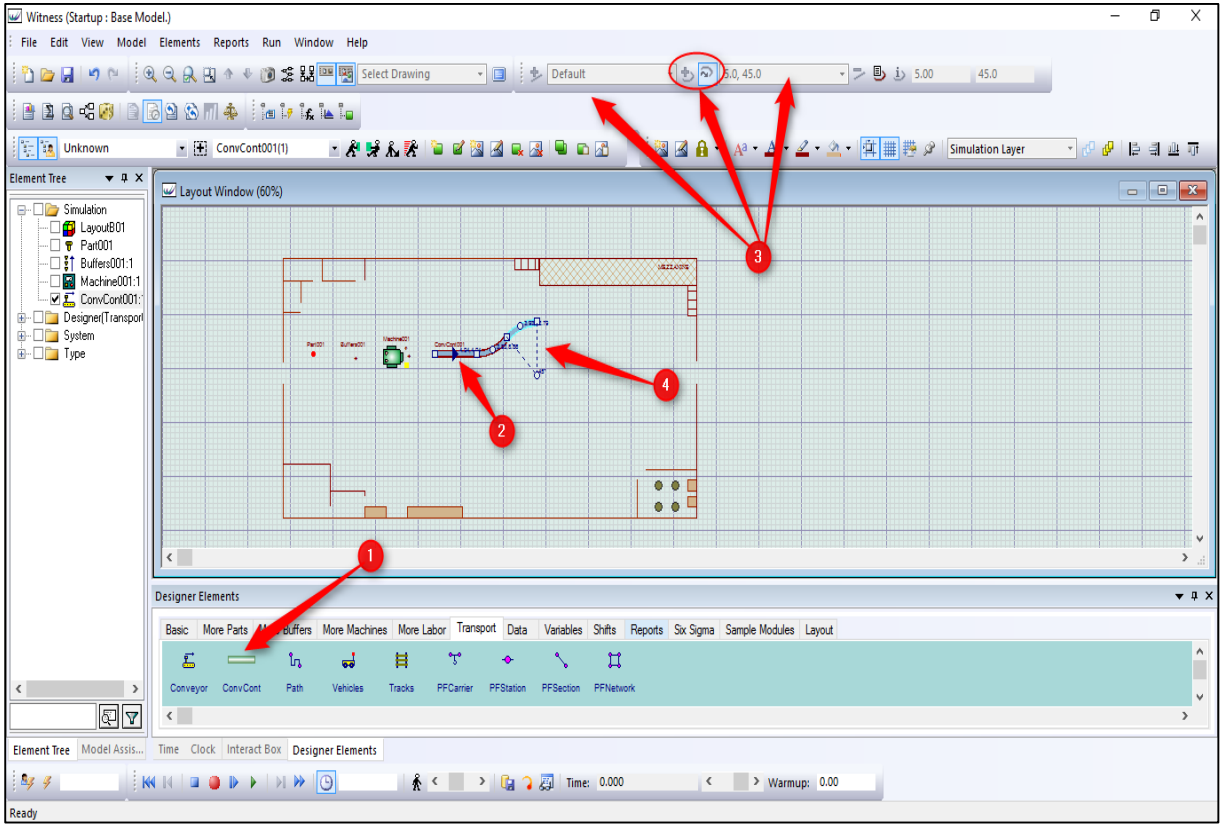

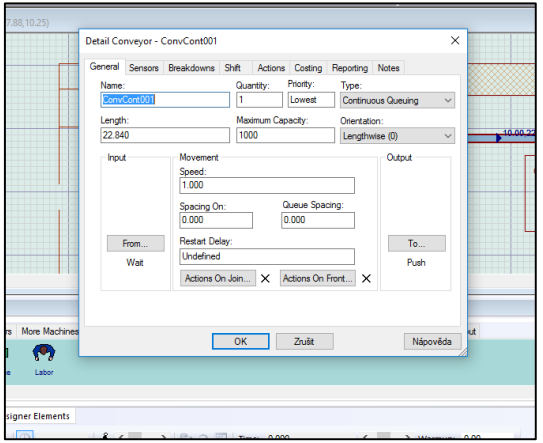

Výstupy

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Jméno	Name	Kontrola	Linka_A	Linka_B
Nečinný	% Idle	85,33	74,44	82,47
Využitý	% Busy	14,67	25,56	14,67
Zaplněný	% Filling	0,00	0,00	0,00
Vyprázdněný	% Emptying	0,00	0,00	0,00
Blokovaný	% Blocked	0,00	0,00	0,00
Čekání na pracovníka	% CycleWait Labor	0,00	0,00	0,00
Nastavení	% Setup	0,00	0,00	0,00
Čekání na nákl. pracovn.	% SetupWait Labor	0,00	0,00	0,00
Porucha	% Broken Down	0,00	0,00	0,00
Čekání na opravy	% Repair WAIT Labor	0,00	0,00	0,00
Počet operací	% No. OfOperations	44	23	22
Mimo změny	% Off-Shift	0,00	0,00	0,00

Jméno	Name	Pracovník_1	Pracovník_2
Pracuje	% Busy	17,53	83,84
Nepracuje	% Idle	82,47	16,16
Počet	Quantity	1	1
Počet začatých prací	No.OfJobsStarted	45	45
Počet ukončených prací	No.OfJobsEnded	44	44
Počet aktuálních prací	No.OfJobsNow	1	1
Počet upřednostněných prací	No.OfJobsPre-empted	0	0
Průměrný čas práce	Avg Job Time	3,50	3,50
Mimo změny	% Off-Shift	0,00	0,00

Conclusion

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Teaching Real-Time systems is for students on Universities beneficial. Student, who is familiar with basic functions productive process in factories can find failures and effectively repair it. Based on knowledge of simulation theory and introduction of simulation instrument Witness, user will be able to create his own conceptual model with its own static and dynamic structure, which may be compared with real process. This area has really big potential and it is able to save a lot of financial recourses and time.

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Thank you for attention