ENTERPRISE DYNAMICS®
Product Brochure

INCONTROL

Index
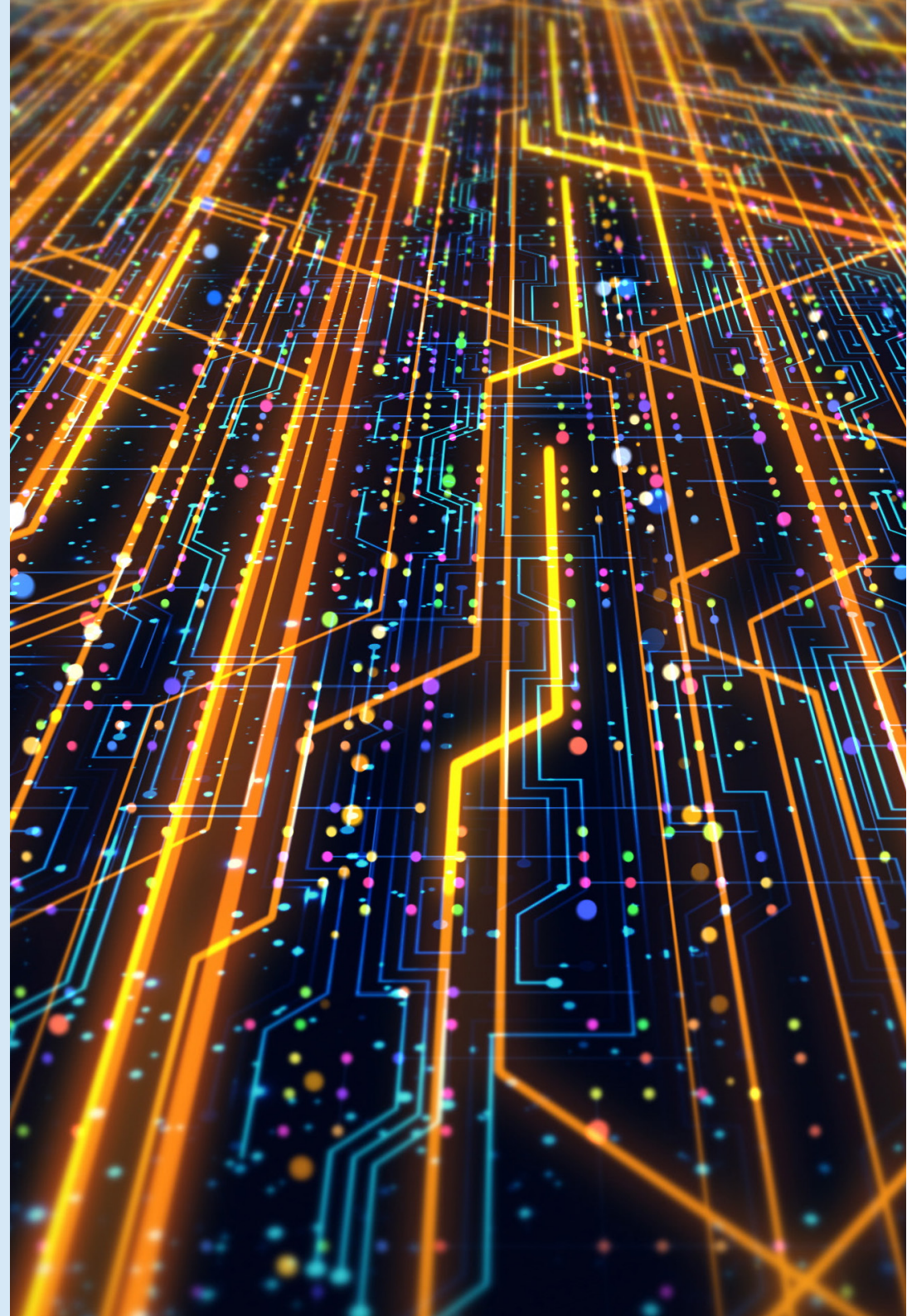
1 . Introduction

Established in 1989, InControl is a global simulation software company offering Digital Twin Software Solutions for Material Handling and Logistics, Manufacturing, Transporation, Leisure Venues and Metropolitan Areas. By mirroring the flow of people and goods through large-scale infrastructures, we help our clients to keep their customers, employees and environment Safe and Sustainable. Based on our Software Platform we deliver our customers data, graphs, and insights to analyze and improve their complex infrastructures and processes.

Our Digital Twin Software Solutions are implemented across various businesses, organizations, universities and research and development insitutes worldwide. Clients use our Software Platform to simulate large-scale logistic systems and infrastructures such as baggage handling systems, container terminals, train stations, assembly lines, football stadiums, and arenas. Our software solutions play a vital role during all phases, from design to implementation and operations.

DISCRETE EVENT SIMULATION SOFTWARE

Enterprise Dynamics® is a state-of-the-art modular object oriented simulation platform to help solve any complex people, process, technology and infrastructure related challenges with data-driven answers for most commercial, governmental, education and industrial applications. The Enterprise Dynamics® simulation model enables you to fully analyze, visualize and optimize the performance of your assets and investments. Enterprise Dynamics® can be utilized throughout the entire lifecycle of your investment, from design-build to operation and continuous improvements, and enables you to cope with resources, costs, time, reliability, safety and sustainability.

Enterprise Dynamics® offers a wide range of comprehensive, branch-specific simulation object libraries. The flexible and perfectly matched simulation objects provide the user the ability to represent both simple and highly complex processes and systems. If required, the objects can be created and / or modified individually to fit specific needs. Enterprise Dynamics® can be integrated with external data source and third party systems, if needed. Enterprise Dynamics® is a proven simulation softwae application and been widely used around the world.

With InControl software you can predict and control all kind of scenarios:
Experience the Future Today!

2. Benefits & Key Features

BENEFITS

The main benefits of simulation with Enterprise Dynamics® are:

- Virtual optimization: you can virtually test and improve any scenario through out the entire system lifecycle without disrupting the actual system and also decrease the implementation period.
- Manage complexity & variation: large scale systems are difficult to manage. Enterprise Dynamics® offers you the perfect tool to create insight in your system.
- Improve communication: state-of-the-art 2D and 3D visualization enables you to communicate effectively and supports you in convincing stakeholders.
- Planning & preparation: with simulation you can answer all your "what-if" questions and optimize you resource planning.
- Return on investment: simulation software enables you to evaluate your potential and / or future resource investments.

KEY FEATURES

Enterprise Dynamics® offers:

- A powerful simulation platform for large-scale systems.
- Easy "drag & drop" model building.
- Extended object libraries and additional packages for different application areas.
- Extended set of pre-defined and user-defined control rules.
- Create your own object library and modify existing objects.
- State-of-the-art 2D & 3D visualization.
- Easy to use graphical user interface.
- Import your own 3D models.
- Extended result reporting module and standard output.
- Experiment wizard for fast and easy experiment design and reliable results.
- Open architecture; input and output connection based on all industry standards.
- No model limitations.

With Enterprise Dynamics® you can analyze and optimize the current and future behavior of your system or infrastructure

3. Detailed Overview

POWERFUL SIMULATION PLATFORM

The Enterprise Dynamics® simulation platform is used in situations in which speed, operational use, and user friendliness are very important. This has led to a software architecture that is powerful and also flexible in terms of adding new features, protocols, and simulation objects whenever required. Enterprise Dynamics® can be divided into three parts:

- The simulation engine
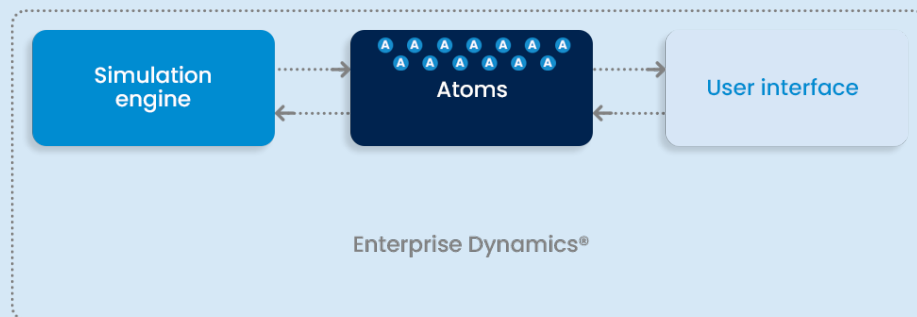- The simulation objects
- The user-interface

The simulation engine binds all objects together, and makes it possible that the various objects can communicate with each other within a simulation model, or with external applications, databases and real-life systems. Objects mimic certain real-life objects, and can be arranged (and be set with real-life parameters) to simulate a specific real-life process or system. The objects are bundled in application specific groups within the library. Furthermore additional object packages can be added to the library. The third part is the user-interface that is a presentation of functionalities within a shell. However, this is a separate part in Enterprise Dynamics® because it can be completely modified, independently from the other parts.

THE PHASES OF AN ENTERPRISE DYNAMICS® SIMULATION PROJECT

A simulation study consists out of the following phases:

- Conceptualization
- Definition
- Data Collection
- Modeling
- Verification and Validation
- Experimentation
- Training
- Implementation

Most of the phases are executed one after another. Data Collection starts right after the Conceptualization phase and is executed parallel. This is simply caused by the fact that the required data has to be collected throughout an organization and in a lot of cases has to be measured first. The Implementation phase is added to the project in cases where simulation is really integrated into the operation and where simulation is not used for design purposes alone. The rollout throughout a department or organization is an important phase to recognize, because non-simulation experts will use the simulation solution.

Enterprise Dynamics®

HOW CAN ENTERPRISE DYNAMICS® MAKE YOUR SIMULATION PROJECT SUCCESSFUL?

The better the simulation platform aids in these steps, the more likely good results become. Below we give you an overview of the way Enterprise Dynamics® can aid in the named project steps of a simulation study

CONCEPTUALIZATION
- Easy prototyping facilities to communicate between problem holders and problem solvers to get a good understanding of the boundaries of the problem.

DEFINITION
- Re-usability of existing models and components.
- Options to communicate and integrate with other (corporate) systems.

DATA COLLECTION
- Data analysis tools to filter out bad data, or to assist in the generation of functions to be used in the simulation model

MODELING
- User-friendliness.
- The availability of well-defined, strong simulation objects, which are easy to adopt and changed for the specific model at hand.
- Strong debugging facilities to search and detect modeling errors.
- Good documentation features to document the model, and specific changes when made.
- Functions accessible through keyboard shortcuts (nowadays important as part of anti-RSI measures).

VERIFCATION & VALIDATION
- Good reporting tools to be able to track the outcome of specific parts of the model.
- Strong debugging facilities to search and detect modeling errors.
- (3D) Visualization to be able to track the routing of specific parts/products/ items the model.
- The ability to change parameters while a simulation model is running to be able to "play" with the properties of all simulation objects.

EXPERMENTATION
- Good reporting tools to be able to generate data reports with the results of specific experiments.
- The ability to export data to external formats for further analysis.
- Data analysis tools to analyze the results.

TRAINING
- (3D) Visualization to be able to convey the message to the trainees.
- To run different scenarios and to demonstrate the consequences of certain actions, it is easy to make parameter changes.

IMPLEMENTATION
- 3D Visualization to demonstrate the capabilities of a certain system in a more understandable way.
- Modifiable user-interface to fit in the company language(s) and house style.
- Options to communicate and integrate with other (corporate) systems.
- Good documentation.
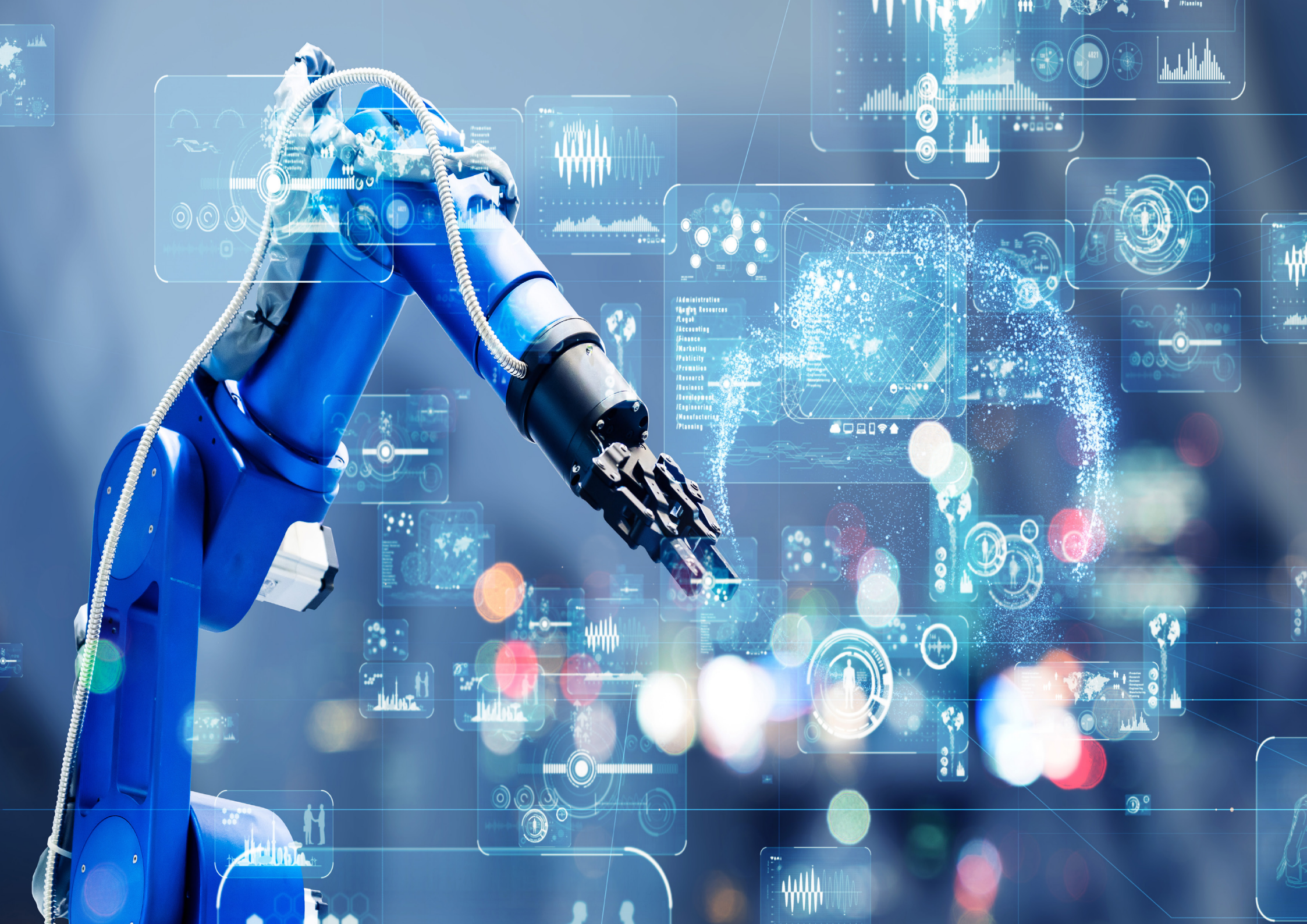
4. Licensing

ENTERPRISE DYNAMICS® LICENSING MODEL

Enterprise Dynamics® is offered as a subscription license that includes:

- The Enterprise Dynamics® platform.
- Maintenance including all product updates.
- Online access to additional free packages.
- Modeling support: experienced Simulation Engineers at InControl will help you in dealing with your modeling challenges.
- Access to our JIRA database: in this database you can propose improvements for the upcoming releases and find answers to user requests.
- Full technical support.

The subscription licensing model offers the time-limited right to run Enterprise Dynamics® and therefore offers a high degree of flexibility and maximum cost control for the user.

After activation of the software by the licensee, the installation of Enterprise Dynamics® is tied to the hardware. Individual hardware components can be changed during the contract period; an installation on another PC system is not possible without prior approval by InControl.

The subscription contracts for Enterprise Dynamics® Licenses will be automatically renewed for an additional year on expiration of the minimum or the agreed time period, unless they are cancelled in writing 3 months prior the expiration. In case of cancellation, with the end of the contract period the user's authority expires and the software can no longer be used, but a reactivation of deactivated licenses is possible at any time.

ENTERPRISE DYNAMICS® IS OFFERED IN THE FOLLOWING LICENSE TYPES:

- Enterprise Dynamics® Viewer: Open, run and view available simulation models and applications.
- Enterprise Dynamics® Runtime: Configure and run existing simulation models and applications.
- Enterprise Dynamics® Develop: Develop objects, applications and interfaces.

Function	Viewer	Runtime	Developer
Open	•	•	•
Run	•	•	•
View	•	•	•
Configure		•	•
Analyze		•	•
Model			•
Develop			•

Enterpsie Dynamics® Viewer allows you to open, run and view any simulation model or application. This license is ideal for simulation modelers who like to offer their customer(s) a working simulation model that they can run, but notmodify. In comparison to a movie (which displays a predefined sequence of frames) the user can decide which part of the model is highlighted or visualized (either 2D or 3D).

Enterprise Dynamics® Runtime allows the user to open and run simulation models and applications. The user is also capable of changing the model parameters to setup a specific simulation run. The Enterprise Dynamics® Runtime does not allow you to develop a simulation model.

Enterprise Dynamics® Developer allows you to develop simulation models based on the numerous available simulation objects within your Enterprise Dynamics® library and enables the ability to develop your own simulation objects or to modify any of the existing simulation objects. With Enterprise Dynamics® you are capable of developing your own simulation libraries and applications.

5. Features

OBJECT-ORIENTED AND EVENT-ORIENTED

Enterprise Dynamics® is an object-oriented simulation platform, simulation objects are defined with independent behavior. In addition communication between objects is realized through the simulation language runner, via events and messages.

An object-oriented simulation platform has two major benefits:

- Independent objects can easily be re-used in other simulation models
- Behavior is defined on the object itself, and not in a different part of the model (this makes the model more clear to understand).

In many cases, in an event-oriented language the entire possible behavior is programmed somewhere in the program. A selection has to be made which part of the behavior is valid before the desired behavior can be executed. Not only does this lead to complex scripting but it also decreases performance.

With object-oriented software the behavior is set on specific events. This leads to small and fast simulation models – as in Enterprise Dynamics®.

CHANNEL CONCEPT

To focus on problem solving, not programming, Enterprise Dynamics® also comes with the unique Channel-concept.

Channels are interconnections between simulation objects that are internally translated to tasks and messages to move objects and to communicate information. Channels are automatically added between objects to assist the modeler and limit the programming skills of the user. Through the use of channels, a lot of models can be designed in an event-oriented approach, while internally the full power of object-oriented programming is active.

THE ATOM CONCEPT

Every object within Enterprise Dynamics® is called an atom. From a simulation object imitating a production machine to the operator that is using the machine,everything is an object. Hence, even a simulation model, and the simulation platform itself are considered to be atoms.

Each and every atom has certain properties that can be set during model design and runtime, and is able to act on events when they occur. The specific events on which an atom is reacting can be set during design and runtime as well.

Enterprise Dynamics® comes with a lot of pre-defined atoms that are developed based on industry experience, but atoms can also be created from scratch. In some cases, existing atoms are not doing the job that is needed for a specific problem. Because of the unique atom concept, it is very easy to create completely new atoms as well. Even these custom-build atoms have all the strengths of factory-build atoms, properties can be created and set during design and runtime, and all the events an atom can react on are available to create custom-build actions.

EXAMPLE

One of the basic elements in simulation software is called a Server. A server act as an atom that does something with an incoming part, product or item. For a manufacturing company it could represent a manufacturing step, and it could represent a transportation step within a supply chain.

The Server has specific properties such as:

- Cycle time
- Mean time between failures
- Mean time between repairs

And, the ability to execute specific actions whenever a certain event occurs:

- OnEntry
- OnExit
- OnCreation

In all, Enterprise Dynamics® supports 15 types of events per atom.
The ability to have full control over all the properties and events makes it possible to alter existing atoms to specific needs and to build completely new atoms in the same way.

There are three big benefits of this unique approach:

- Flexibility. All atoms are completely modifiable to specific needs.
- Scalability. Only atoms and features that are required for the designed task at hand are made available, all other atoms and features can be disabled for the inexperienced users.
- Ease-of-use. All atoms have the same structure, and can be accessed and modified in the same way.

ENGINE: MODULAR DESIGN

The Enterprise Dynamics® Simulation Engine is designed in modules. On top of the custom-build simulation language runner, all functionalities are offered in separate modules that communicate with each other, when needed, through the simulation language runner. There are three main advantages for this approach:

- New features can be added without re-implementing (parts of) the engine.
- Easier tracking-and-tracing of bugs.
- An existing feature can easier be replaced with an improved version, with outdisturbing existing libraries, and models.

Communication and control between modules is done via the simulation language runner in a standardized way through a limited number of access points. This limits possible errors through the interaction between modules.
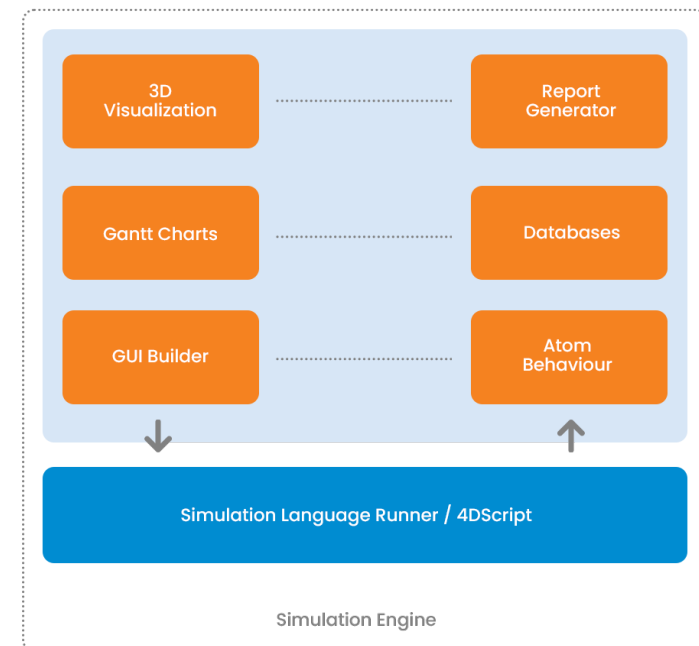
SCRIPTING LANGUAGE: 4DSCRIPT

The simulation language runner comes with a language called 4DScript. It is very easy to learn and intuitive in its use. 4D stands for x, y, z to point at the position, and t for time. Script stands for the fact that it is a script language.

With 4DScript all well-known operations are possible that are available in modern programming languages. The true strength is the possibility to use the language for specific behavioral things that happen in real life. There are language words available to give simulation objects a speed, acceleration and a rotation, and language words to batch objects or to split objects in separate items. In total there are more than 1.900 language words available, June 2013. This number is rising every week due to a close cooperation with heavy users who are fully committed to make 4DScript better and better.

Because of the good design of the available objects, many users will hardly use any 4DScript command, but each and every option in an object window is translated to 4DScript language.

4DScript, as a script language, interprets the language code at the moment it is needed. Since simulation is all about speed, the optimization is made to interpret the code whenever it first appears. In practice this means, that the simulation run is as fast as any custom-build software that imitates real-life behavior.

FOR THE EXPERTS

An interpreter language is in many occasions slower than a compiler counterpart. 4DScript is a hybrid form, in the middle between a compiler and an interpreter. This makes it versatile as an interpreter, but as fast as compiled software. During the time a model is loaded, it is already interpreted. Without any changes, the simulation language runner acts only as a loader for the interpreted model (just like compiled software).

The main advantage is that changes can be made to the model during a simulation run. With custom-build software, a new compilation would be required.

With Enterprise Dynamics® the changed code is interpreted, and reentered to the simulation runner. This approach results in two major advantages, the best of both worlds:

- Speed
- Flexibility

OBJECTS

Enterprise Dynamics® comes with various objects to be used in simulation models. These objects range from abstract objects to very particular and detailed branchspecific objects, as well as additional objects to assist in multiple tasks (like gatheringdata, communication with external sources, etc.).

All the objects that are part of Enterprise Dynamics® are developed in close cooperation with branch-specific experts. They have the knowledge to define the requirements of a good set of objects that are useful in a specific branch or for a specific solution.

Objects have been developed with much real-life behavior, and the user has the possibilities to alter many parameters according to own specific needs. These objects are equipped with a realistic 3D visualization.

Referring to this, the most important feature of Enterprise Dynamics® is to change the behavior or appearance of these objects itself. Alter existing objects or create entirely new objects is part of the standard functionality. Being able to define the correct behavior or appearance is what makes Enterprise Dynamics® the leading simulation platform.

OBJECTS: GROUPED BY FUNCTION

No matter which branch specific solution is used, available objects are always grouped by function. This makes it easier to determine which objects are available that potentially are of use for the user for a specific model. Due to the high number of objects that are supplied with each Suite, it would otherwise be hard to find the right object within the pool of objects.

As mentioned earlier, the user-interface is completely modifiable, and therefore the grouping can be changed if so desired. It is done to assist the user in finding the right object quickly.

For users who create their own set of objects, new groups can be added or existing groups can be changed entirely. If a user creates models with the same set of objects (pre-defined and/or newly created ones), the user is free to change the grouping so these objects are the top-most set of objects, which speeds up modeling.

VISUALIZATION

In a lot of cases, simulation is all about the determination of values within specific boundaries. However, a sheet with numbers, intervals and percentages is hard to read for most people. To convey the message, some other form is needed. Secondly some organizations use simulation for the sole purpose of demonstrating their own capabilities. Although they use the numbers internally, they want to demonstrate their products or services with a clear and easy to understand presentation.

Enterprise Dynamics® comes with a 3D graphic environment to visualize the simulation in an instance. This 3D graphic environment animates the simulation model with respect to the entered geometry and is completely adaptable to visualize any real-life system, see also Figure 3.

The (3D) visualization in Enterprise Dynamics® is part of the standard product and is generated immediately. Even changes made during a simulation run are updated at once. In this way the effect of the visualization or the changed geometry can be evaluated without starting all over again.

Most of the objects supplied with Enterprise Dynamics® offer more than one form of visualization. This makes adapting the visualization to specific needs easy to do and assists in creating astonishing presentations without any graphic designer skills.
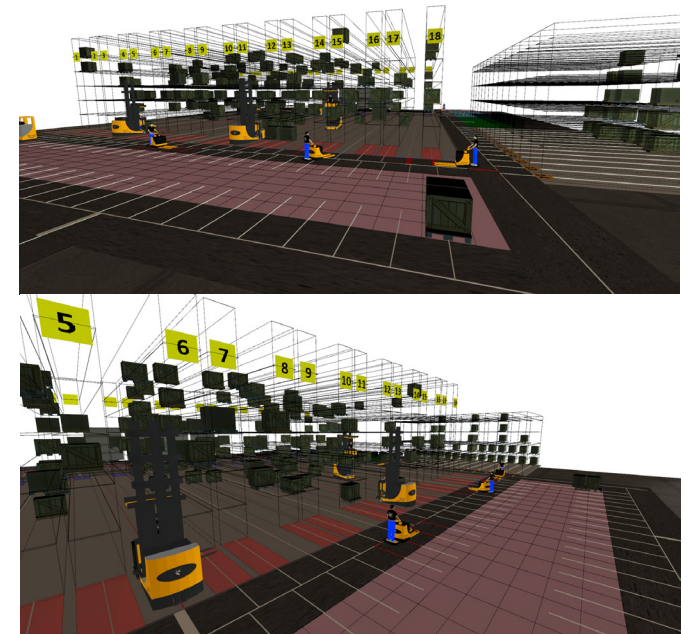

Figure 3: A 3D vizualization example of Enterprise Dynamics®

COMMUNICATION

In many occasions there is a need to communicate with databases, third-party software or even hardware. Some of the most experienced reasons are:

• A database contains data with real-life entry times of people that can be used as input data for a simulation model.
• Some third-party software is used to write data to for analysis purposes (for instance Microsoft Excel).
• Listening and responding to hardware is used to control a machine in a production line and to assist operators in specific tasks.

Enterprise Dynamics® is supplied with many features to communicate with external sources. No matter if it is a simple text-file or a piece of hardware, Enterprise Dynamics® can communicate with it! To assist in the communication, Enterprise Dynamics® comes with a set of supportive objects that act as a wizard to set up the communication, and the desired response.

ANALYSIS

Running a simulation model without good tools to analyze the results is only half the job done. Being able to analyze the results and to create clear reports is vital in a good simulation study.

Enterprise Dynamics® comes with all the necessary tools to analyze input and output data, as well as the features to create customizable reports. And if you prefer other analyzing tools, no problem, through the communication features and supportive objects, an export to these tools is very easy to accomplish.

To assist in finding the right solution, Enterprise Dynamics® is also equipped with tools to define scenarios and experiments. Scenarios and experiments are used to set a range of parameters and to run multiple simulation runs using these parameter settings. It assists the user in finding the right solution, as well as in the statistical validation of the results.

6. Packages

On top of the large object library that is included with Enterprise Dynamics® the user can add packages that fit the purpose of the project. A package is a set of additional objects and functionality, the packages are mostly available for free download. The following packages are offered in the online package database:

ADVANCED AS/RS
An ASRS is a rail bound single track vehicle to store and retrieve goods of warehouse racks. Commonly used layout contains one location for Inbound, one storage and retrieval machine (SRM) with up to 2 High Rise Racks on the sides and one location for Outbound. There are parameters to edit size, position and layout of all elements.

The SRM is made of 3 objects. The SRM object itself uses the rail track to move along aisle (x-axis) to the assigned column of the Racks. The Hoist object is lifting up to the allocated row of the rack (z-axis). The Shuttle object reaches into the racks to store or retrieve the goods (y-axis). Each axis has its own parameters to control acceleration, maximum speed and deceleration. Detailed load times can be defined for every transfer point inside the system.

Due to high level of automation, ASRS systems are driven without human interference, but controlled by strategies for Inbound, movement and Outbound of goods.

MULTICRANE-CONTROLER
Today, heavy loads are often transported by rail bound crane systems. The paper-, steal- and freight-industries mainly use several cranes in one rail system to manage high occurrence of transports. This constellation demands special coordination of crane systems for certain requirements and might need the assignment of the cranes to specific working areas. Priorities of transport chronology have to be defined to avoid collisions between the several cranes.

With every added crane you can get theoretically more transport capacity. But at the same time you will also have disproportional more efforts of control. Without a well-defined and tested operating strategy you cannot reach your target values.

Following these growing interests, we offer a special simulation based control solution for the planning and test stage. The MultiCrane-Controller System is a package that can be added to your standard simulation object library in Enterprise Dynamics®. This tool is useful for the simulation of existing as well as new planned crane systems. It supports you working out concepts and testing their reliability, while avoiding cost intensive down times of the real system.

The most important features at a glance:

- Simulation of 1 to 5 cranes per working line
- Selectable and adjustable predefined operating strategies
- Collision avoiding with influencing idle cranes to give way to the busy ones
- User-defined parameters for setting up a priority to sort the task list
- Dynamic connection to sources and sinks depending on task list
- User-defined clearance between cranes
- Free assignment of working areas per crane possible
- Comfortable user-interface for parameterization
- Unlimited numbers of working lines

ADVANCED ROBOTS

The Advanced Robots package adds 3 robot simulation objects to your object library:

- Advanced Linear Robot
- Advanced Scara Robot
- Advanced Vertical Articulated Robot

Advanced Linear Robot

A Linear Robot is a handling tool for any kind of pick-, place- and motion tasks. The sphere of action is limited by the length, width and height of workspace. Motions are defined based on a world coordinate system. The destinations of the Grabber (tool) are defined with xyz-coordinates. Any kind of action such as loading, unloading, moving and delays are defined within Routines. Those Routines are stored with global references, so they can be used by other Linear Robots as well. Every kind of command has its specific parameters like load time or speed to define the behavior of the robot. There are two ways to define routine motion commands. First one is to move the tool of the robot by hand and then get the coordinates in order to teach the command into the routine. Second one is the other way around when the robot is assigned to drive to user edited coordinates. If the destination has been reached successfully, the coordinates can be integrated into a motion command. Routines can be assigned to tasks. Routine execution is triggered if there is a task available. Strategies can be defined to decide which routine has to be executed, for what kind of task. If a Routine has been started, it executes all commands in sequence before it becomes idle again. Due to high level of danger, Advanced Linear Robot (ALR) systems are driven without human interference.

Advanced Scara Robot

A Scara Robot is a selective compliance assembly robot arm for any kind of pick-, place- and motion-tasks. The sphere of action is limited by the z-size and the radius of action. A layout of at least 4 axes is necessary to reach any destination within the sphere of action. Motions are defined based on a

world coordinate system. The destinations of the Tool are defined with xyz-coordinates. All kind of action like loading, unloading, moving, delays is defined within Routines. Those Routines are stored with global references, so they can be used by other Scara Robots as well. Every kind of command has its specific parameters like load time or speed to define the behavior of the robot. There are two ways to define routine motion commands. First one is to move the tool of the robot by hand and then get the coordinates in order to teach the command into the routine. Second one is the other way around when the robot is assigned to drive to user edited coordinates. If the destination has been reached successfully, the coordinates can be integrated into a motion command. Routines can be assigned to tasks. Routine execution is triggered if there is a task available. Strategies can be defined to decide which routine has to be executed, for what kind of task. If a Routine has been started, it executes all commands in sequence before it becomes idle again. Due to high level of danger Advanced Scara Robot systems are driven without human interference.

Advanced Vertical Articulated Robot

A Vertical Articulated Robot is a handling tool for any kind of pick-, place- and motion-tasks. The sphere of action is limited by the length of robot arms. A layout of at least 5 axes is necessary to reach any destination within the sphere of action. Motions are defined based on a world coordinate system. The destinations of the Tool are defined with xyz-coordinates. Any kind of action like loading, unloading, moving, delays is defined within Routines. Those Routines are stored with global references, so they can be used by other Vertical Articulated Robots as well. Every kind of command has its specific parameters like load time or speed to define the behavior of the robot. There are two ways to define routine motion commands. First one is to move the tool of the robot by hand and then get the coordinates in order to teach the command into the routine. Second one is the other way around when the robot is assigned to drive to user edited coordinates. If the destination has been reached successfully, the coordinates can be integrated into a motion command. Routines can be assigned to tasks. Routine execution is triggered if there is a task available.

Strategies can be defined to decide which routine has to be executed, for what kind of task. If a Routine has been started it executes all commands in sequence before it becomes idle again. Due to high level of danger, Advanced Vertical Articulated Robot systems are driven without human interference.

TRANSFER CAR

A Transfer Car system is a rail bound single or double track vehicle for fast and reasonable linear transport and/ or to combine multiple input and output locations of material flow. Especially for longer distances, Transfer Cars are used instead of conveyors for example to connect the inbounds of several warehouse aisles. The Transfer Car system consists of the Car on rails, the connected Stations and a Controller to coordinate the behavior of the system. The Car itself can have one or more storage units to carry more than one Product at the same time for example to swap Products at a particular station. Products have to be conveyed from the input station to the storage units and after the linear transport movement they have to be conveyed to the output station as well. Sometimes there are altitude differences between input and output station. In this case the Car has to compensate the vertical distance. Each transportation direction has its own behavior regarding acceleration, maximum speed and deceleration. The Stations are located on the left and right side along the rails. A Station can consist of one or more ports. Each port can be separately served by the Car. There are 3 types of ports. Pick ports are intended to absorb incoming Products. Place-ports are designated to deliver Products to the car. Pick-and Place-ports can do both. The Controller coordinates interaction between loading, transportation and unloading taking into account all predefined strategy. D

DEVELOPMENT TOOLS

There are users working with existing objects from the library and there are users who want to develop their own set of objects. The Development Tools package contains additional functionalities to assist the advanced user in developing an own set of objects. The package contains functionalities to:

- Library, object, and attribute manipulation
- Array types
- List types
- Enumeration types

With the Development Tools package it is even possible to create your own package! The Developer Tools can only be used with a valid Enterprise Dynamics® Developer license.

DLL KIT

DLLs or Dynamic Linked Libraries were invented by Microsoft to enable computer programs to share parts of their functionality with other programs. They act as if they were a part of the computer program that uses them. This way they don't lose speed and don't take up a lot of resources. DLLs offer many advantages, they can be created with any programming language, are small and highly maneuverable. They've proven to work so well, that almost all functionality of Microsoft Windows™ can be accessed through them. The ED DLL Kit makes it possible to use DLLs with Enterprise Dynamics®, which creates many advantages.

Save dramatically on your integration costs

The power of simulation is more and more used in legacy systems within the organization. Enterprise Dynamics® offers the ability to merge with these systems using the power of DLLs. Because DLLs are such a widely used standard and can be created from any programming language, they save you a lot of time integrating your legacy systems with Enterprise Dynamics®.

Expand Enterprise Dynamics® with your own added-value functionalities

The ED DLL Kit offers you the ability to extend Enterprise Dynamics® with your own programming. This means that the possibilities are endless, create new features, incorporate with customized software tools, draw specialized real-time graphs, create high-speed algorithms and operate all sorts of equipment.

Communication without boundaries

Enterprise Dynamics® can communicate with a wide variety of database systems, computer networks and software tools and supports a lot of communication protocols, but when your systems are different from all standards you may use the Enterprise Dynamics® DLL Kit for communicating with these systems. Communication via DLLs may range from high-speed communication with real-time information to simple retrieval of data from customized database systems.

Create or reuse customized front-end interfaces

Simulation is applied in many different areas, each of them having their own specialized settings, options and output which may be difficult to manipulate or visualize. Creating a customized interface would be a good solution to this problem. Using the DLL Kit you can create or reuse interfaces for manipulating and/or visualizing business related data in Enterprise Dynamics®. For example you may create complicated switchboards, make use of drag & drop within graphs or create a studying environment to train future machine operators.

EMULATION – OPC

OPC is a standard for communicating to numerous data sources, either devices on the factory floor or a database in a control room. In the past various 'drivers' have been created for businesses that require data from a specific data source. Today many companies all over the world use OPC as a standard for their field, process and business management.

By constantly providing information of the world reality, OPC acts as the link between simulation and reality in Enterprise Dynamics®. This allows simulation studies to become highly accurate. From reality in Singapore to simulation in New York, the networking capabilities of OPC make it possible to simulate situations all over the world.

With the advent of 'smart' field devices, a wealth of information can be provided concerning field devices that were previously not available. This information provides data on the health of a device, its configuration parameters, materials of construction, etc. The Enterprise Dynamics® OPC package gives two-way access to all this data in a simple and manageable way.

Not only does reality affects simulation; via OPC simulation may directly affect reality. With the OPC package for Enterprise Dynamics® results of overnight simulation studies could be transferred back to device controllers for extra intelligence. Simulation learns from reality and reality learns from simulation with the Enterprise Dynamics® package.

SECURITY KIT

Many simulation libraries or models contain branch or company-specific know-how. The Enterprise Dynamics® Security Kit package is developed to be able to protect this know-how. It will encrypt simulation objects and models. Only users with a valid unique encryption code are to open and use the simulation objects and models. The package also allows you to set the available features so you are able to protect your work to the level you desire.

PRE ENTERPRISE DYNAMICS® 9 OBJECTS

Over the years the Enterprise Dynamics® objects have evolved. Normally simulation models will use the current version of the objects and each simulation model will benefit from the continuous development work on these objects. Anyway, some older models might require a specific older object. This package contains previous versions of objects and is provided for backward compatibility

7. Technical Specifications

Version information

Current version	10.6
Year of Release	2023

Installations

Number of sold engine licenses	> 11.000
Number of universities using simulation engine	> 500

Support

Annual Maintenance & Support contract	Yes
Maintenance & Support includes product updates	Yes
Support Channels	Website Community Issue Tracker (JIRA) E-mail Microsoft Teams Phone Fax Int +31 (0)30 670 3798 USA: +1 704 239 2234 Onsite
Phone Support TImes	09:00 - 18:00 CET
E-mail Support Times	09:00 - 20:00 CET

Documentation

Basic Tutorial	Yes
Advanced Tutorials	Yes
Help	Yes
Example Models	Yes

Training

Available standard training courses	Basic, Advanced, Expert, Teacher and Customized (individual)
Training locations	Woerden (NL) & Mainz (DE)
Onsite training possible	Yes

Simulation Objects

Limitation of maximum number of objects	No (depending on hardware specifications and license)
Available simulation objects	More than 100 simulation objects are shipped with the product. More available via downloads.
Ability to modify existing simulation objects	Yes (depending on license)
Ability to create simulation objects	Yes (depending on license)
Simulation objects contain spatial information	Yes

Modeling

Adding simulation objects to model	Drag-Drop / Code Controlled
Modeling paradigm	Object- and Event oriented
Ability to use layers	Yes
Availability of pre-defined rules	Yes
Visualization	Integrated (2D & 3D)
Analyze input data	Autofit tool

Simulation Run

Real-time	Yes
As fast as possible	Yes
Custom speed	Yes
Run until stop time	Yes

Experimentation

Experimentation Wizard	Yes
Scenario Manager	Yes
Record Movie (avi)	Yes

Random Generator

Number of independant random generators	2,147,483,647
Repetitive	Yes
Antithetic	Yes
Generator algorithm	Default: Wichmann-Hill Selectable: Mersenne Twister

Distributions

Bernoulli	Yes
Beta	Yes
Binomial	Yes
dUniform	Yes
Emperical	Yes
Erlang	Yes
Gamma	Yes
Geometric	Yes
Logistic	Yes
LogLogistic	Yes
LogNormal	Yes
NegBinomial	Yes
NegExp	Yes
Normal	Yes
PearsonT5	Yes
PearsonT6	Yes
Poisson	Yes
Random	Yes
Triangular	Yes
TriangularTop	Yes
Uniform	Yes
Weibull	Yes
Custom distribution	Yes

Visualization & Model import

2D		Yes
3D		Yes
2D graphic formats	Microsoft Windows Bitmap > *.bmp, .rle, .dib* (Enhanced) Windows Metafile > *.emf, .wmf* Joint Photograph Experts Group > *.jpg, .jpeg, .jpe, .jfif* AutoCAD Drawing File > *.dwg* Autodesk Design Web Format > *.dwf* AutoCAD Drawing Exchange File > *.dxf* CityGML > *.gml* Graphics Interchange File > *.gif* HP Graphic Language File > *.hpgl, .hgl, .hpgl2* Targa Graphics Adapter File > *.tga, .win, .vst, .vda, .icb* Portable Map Graphic > *.pgm, .pbm, .ppm* Computer Graphics Metafile > *.cgm* Scalable Vector Graphics File > *.svg* Tag Image File > *.tif, .tiff, .fax* Adobe Photoshop File > *.psd, .pdd* Paintshop Pro File > *.psp* Portable Network Graphics File > *.pgn* Windows Icon > *.ico* PCX, RLE encoded image > *.pcx, .scr, .pcc* Autodesk Image > *.cel, .pic* Kodak PhotoCD > *.pcd*	
3D graphic formats	VRML 1.0 and 2.0 > *.wrl* 3D Studio > *.3ds* CityGML > *.gml* AutoCAD Drawing File > *.dwg* Autodesk Design Web Format > *.dwf* AutoCAD Drawing Exchange File > *.dxf*	
Ability to control 3D meshes		Yes
Texture support		Yes
Ability to create materials		Yes
Support for all geomatric primitives		Yes
Custom camera positions		Yes
Perspective projection		Yes
Parallel projection		Yes
Camera settings		Field of view In view field Near Plane Far Plane
Freehand camera		Yes
Target camera		Yes

Database Support

ODBC	Yes
ADO	Yes
Real-time database access	Yes
Model generation ready	Yes
dbExpress	Yes

Connectivity

XML	Yes
ActiveX Server	Yes
ActiveX Client	Yes
OPC Client	Yes
Text files (.txt, .csv)	Yes
Communications ports	Yes
DDE	Yes
Excel	Yes
Word	Yes
TCP/IP	Yes
UDP	Yes
SAP	Yes
IEEE 1516 (High Level Architecture) standard compliance	Yes
Custom DLL support	Yes

Customization

Programming language	4DScript
Ability to change application forms	Yes
Ability to add user forms	Yes
Ability to add new functions	Yes
Ability to add new attributes	Yes
Ability to use variables	Yes
Simulation Engine OEM ready	Yes

Output

Standard output	4DScript
Customized output	Yes
Graphs	Yes
Gantt	Yes
Export to text files (.txt, .csv)	Yes
Export to Excel	Yes
Export to Word	Yes
Export to database	Yes
Model documentation	Yes

Integration

ArcGIS	Yes
OptQuest	Yes
ISSOP	Yes

System Requierements Recommended

Processor	3.0 GHz Hexacore
RAM	16GB
Video Card	OpenGL® with 4GB dedicated memory
Hard disk	250 GB

8. Object Library

Basic Modeling

Product	General product object
Source	Object to generate other objects / Entry point
Queue	Waiting area for objects
Server	Machine which handles single objects
Sink	Exit point for objects
Node	Connector for objects
Container	Pallet / Drum

Conveyor Objects

General Conveyor Functions	General functions for conveyors
Accumulating Conveyor	Accumulating conveyer
Fast Accumulating Conveyor	An accumulating conveyor
Advanced Accumulating Conveyor Straight	Sophisticated accumulating conveyer
Speed Changing Accumulating Conveyor	Conveyor capable of speed changes
Left Curved Accumulating Conveyor	Left Curved Accumulating Conveyor
Right Curved Accumulating Conveyor	Right Curved Accumulating Conveyor
Advanced Accumulating Conveyor Curved	Sophisticated curved conveyor
Non Accumulating Conveyor	Non-accumulating conveyor
Fast Non Accumulating Conveyor	A non-accumulating conveyer
Advanced Non Accumulating Conveyor Straight	Sophisticated non-accumulating conveyor
Buffer Conveyor	Belt conveyor with buffer options
Left Curved Non Accumulating Conveyor	Left Curved Non Accumulating Conveyor
Right Curved Non Accumulating Conveyor	Right Curved Non Accumulating Conveyor
Advanced Non Accumulating Conveyor Curved	Sophisticated curved conveyor

Intersections Objects

Corner Transfer Unit	Guides a product around a corner
Corner Transfer Lifter	Guides a product up, down and around the corner
TurnTable Unit	Rotates product

Floorbound Objects

Transporter	Transporter / Truck
Advanced Transporter	Sophisticated transporter
Battery Charging Station	Battery charging station to be used with the Advanced transporter
Dispatcher	Sends an advanced transporter to designated locations
Destinator	Destination point for an advanced transporter when the transporter has multiple destinations
Speedometer	Supportive object to display the speed of an advanced transporter
RFID-Gate	RFID gate

Elevation Objects

Elevator	Elevator to transport products between various elevations

Robot Objects

Robot	Simple Robot

Crane Objects

Portal crane	Single portal crane

Storage Objects

Fast Queue FIFO	Simple FIFO queue
Kanban Bin	Used to model pull systems
Reservoir	A container for fluids
Warehouse	Multi-level storage container
Ground Storage	A ground area that behaves like a buffer to store productsr

Process Objects

Fast Server	Simple server
MultiService	Machine capable of handling multiple objects at the same time
Carousel Server	Server that acts as a carousel with multiple process positions
Assembler	Machine that joins 2 objects into 1
Splitter	Machine that slits 1 object into multiple
Unpack	Machine that separate objects
Assembler with Inventory	Same as the assembler object with an additional inventory
Stacker	Stacks products on top of each other
SingleTransform	Machine which transforms an object
MultiTransform	Machine which is capable of multiple transformations to an object

Network Objects

Network Node	A node in a network. Networks are used to control movments of operators and transporters
Node Manipulator	Supportive object to design networks
Network Controller	Object to control and optimize the network

Human Resource Objects

HumanResource	Human Resource
HumanResourceTeam	Dispatches tasks to the available Human Resources
HumanResourceTransportRouter	Object used when a human resource needs to transport items from one location to another
HumanResourceSchedules	Object used to have Human Resources work according schedules
FreeHumanResources	Object to free the Human Resources
CallHumanResources	Object to call the Human Resources

Availability Objects

Availability Control	Object that controls the availability of other objects
Mtbf Mttr Availability	Time schedule for failure and repairs
Switch Availability	On/off switch
Time Schedule Availability	Time schedule for availability

Flow Control Objects

Condition Control	Controls the flow by checking conditions of objects
Notify Router	Used when multiple Condition Controls are used in a model
Lock	Controls the amount of objects in a part of a model
Unlock	Controls the amount of objects in a part of a model

Time Objects

ShowDateTime	Displays date time
User Events	Definition for specific user events
ArrivalList	A time schedule for the arrival of objects / Entry point

Data Objects

Table	An object that defines a table
Export Table	Object to export a table to file
Database Connection	Connector to a ODBC database
Socket Listen	Object to listen to TCP/IP messages
Socket Send	Object to send TCP/IP messages
ExcelActiveX	Object to communicate with Excel

Tools Objects

Composition Container	Container for objects / Sub-models
Empirical Distribution	Assists in defining a new distribution
Function Editor	Allows you to add custom functions to a model
Initialize	Contains initialization code of the model

Status Objects

StatusIndicator	Display the status in a model
StatusMonitor	Display the status in a model
StatusHistogram	Display the status in a model
StatusMonitorStackedBar	Display the status in a model

Gantt Objects

Gantt Initialize	Initializes a storage point for the Gantt Chart
Gantt Chart	Guides a product up, down and around the corner

Results Objects

CircleDiagram	Circle Diagram
Histogram	Histogram
Scatterplot	Scatterplot
Data Recorder	Container for data that you want to store during simulation run
Graph	Graph
History Viewer	Allows you to view the history after a simulation run
Model Documentation	Generates model documentation
Generic Monitor	Displays the value of a value in time
Report	Generates a simulation run report

Visualization Objects

Background	An object to visualize something as a background in 2D & 3D
MovieCreator	Records a movie
Camera	Adds a camera in 3D
Color Glasses	Object to display the 3D animation with anaglyphs
Omni Light	Adds an omni light
Textbox	Displays text

Virtual Reality Objects

VR Box	Displays a box
VR Cylinder	Displays a cylinder
VR Flexbox	Displays a box
VR Plane	Displays a plane
VR Sphere	Displays a sphere
VR Wall	Displays a wall
VR Building	Displays a building

Interested in how Enterprise Dynamics®can make you and your organization successful?

Please contact us on siminfo@incontrolsim.com or download the <u>free trial</u> on our website and experience the software

InControl
Enterprise Dynamics

United States
516D River Hwy. 267
Mooresville, NC 28117
C: +1 704 239 2234
E: siminfo.usa@incontrolsim.com

The Netherlands
Jaap Bijzerweg 21 A
3446 CR Woerden, The Netherlands
T: +31 (0) 30 670 4015
F: +31 (0) 30 670 5634
E: siminfo@incontrolsim.com

Germany
Robert-Koch-Straße 11A
55129 Mainz, Germany
T: +49 (0)6131 6355-271
F: +49 (0)6131 6355-273
E: siminfo.germany@incontrolsim.com

Japan
822 Shinkokusai Building
3-4-1 Marunouchi, Chiyoda
Tokyo, 1000005, Japan
T: +81-3-6689-4161
F:+81-3-5217-5054
E: siminfo.japan@incontrolsim.com

www.incontrol.us

INCONTROL