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1. Goals and Tasks

Prognoz is pleased to propose an integrated solution for efficient business process management Prognoz. Port and Container Terminal Analytics.

Prognoz. Port and Container Terminal Analytics provides comprehensive support to complete vital managerial tasks:

- Monitor the ongoing operational, financial, and economic situation at a port terminal
- Generate enterprise reports
- Perform comprehensive analysis of operating, financial, and economic activity of a port terminal

Our solution is customized for a wide range of business users, including:

- Senior managers, port operators, and clients
- Managers and employees of finance and economic divisions
- Experts of analytical, strategic planning, and marketing divisions

Once implemented, our solution enables you to:

- Improve the efficiency of company management by online monitoring of business, financial, and economic activities
- Receive reliable information in real time on port terminal activity through Business Intelligence tools and centralized data handling
- Ensure efficient management of terminal operations due to the real-time monitoring and multifaceted analysis of ongoing activity indicators of a port terminal
- Streamline management of financial and economic activities due to the in-depth analysis of freight turnover and trade operations
- Reduce the time and effort required to prepare analytical materials concerning key performance indicators
- Track rankings and the current global standing of the port terminal

Prognoz. Port and Container Terminal Analytics provides the following competitive advantages:

- Automated data collection and regular information updating
- Extensive analytical toolkit, enabling you to plan, analyze, and create scheduled and free-structured reports
- Modular system design, which greatly simplifies the task of adding or customizing functionality to meet your precise requirements
- Deep integration into existing IT infrastructure, including ERP systems, DBMS such as Oracle and MS SQL, and dedicated systems such as Navis Express
- Visually compelling data representation that is easy to view and analyze, with flexible functional settings, and customization and downloading capabilities into various external formats, such as Microsoft Office and PDF
- Access to all required data and functionality via a single interface
- Access via Internet or Intranet
2. Proposed Architecture

Prognoz. Port and Container Terminal Analytics is a full-blown suite designed to facilitate the key tasks of managing port terminal activity.

Figure 1 illustrates the functional and technological architecture of Prognoz. Port and Container Terminal Analytics.

The solution is built on the basis of the following key principles:

- **Modularity.** The solution is partitioned into self-contained functional modules, so that individual components of Prognoz. Port and Container Terminal Analytics can be implemented and maintained on a concurrent and independent basis.

- **Openness.** You can modify and add extra modules to the solution in the future using open architecture principles.

- **Reliability.** The solution provides robustness by ensuring continuous operation and data loss prevention.
3. Functionality

PROGNOZ. Port and Container Terminals Analytics consists of the following functional modules:

- Reports
- Freight Turnover Analysis
- Port Operations Analysis
- Executive Dashboards

3.1. Reports

The Reports module significantly reduces the time and effort required to collect regular reports on port activities from affiliated entities and improves report generation and consolidation processes.

The Reports module enables you to create reports that cover various subjects:

- Finance and the economy
- Container traffic
- Outsize cargo traffic
- Passage of ships through the terminal
- Port operations
The module comes with the following capabilities:

- Fill out relevant budget documents with the Under Development status by responsible users
- Use a unified, Excel-like interface when working with reports
- Display a report as per a customized template, including heading, font, fill, field format, and so on
- Parameterize a report (for example, according to reporting period, activity type, currency, and so on)
- Enter and calculate formulas on a report sheet
- Run data aggregation algorithms
- Import data from external sources
- Use additional services when working with a report, including sorting, searching, and filtering by indicator value and dictionary element
- Export to external formats, such as Microsoft Excel, PDF, and HTML

The solution is equipped with the following set of predefined regular reports:

- Container turnover, by category
- Container turnover, by period
- Container turnover, by category, status and size
- Container turnover, by vessel owner
- Container turnover, by freighter
- Container turnover comparison, by period
- Container exports and imports, by country
- Ten vessel owners with maximal container turnover over a reporting period
- Ten freighters with maximal turnover over a reporting period
- Summary reports on port operations with a vessel
- Use of cranes, as well as by downtime type
- Comparison of vessel turn-around time, by type and period
- Outsize cargo turnover, by type and category
- Outsize cargo turnover, by goods and category
- Road transport turnover
- Income, by tariff and period
- Income, by company and period
- Container downtime, by category, type, size, and period

3.2. Freight turnover analysis

The Freight Turnover Analysis module ensures online monitoring and analysis of port freight turnover and analytical reporting on container and outsize cargo turnover.

The module enables you to:

- Manage a comprehensive system of key freight turnover indicators of a port terminal broken down by such main analytical slices as:
  - Cargo categories
  - Container types
  - Container sizes
  - Country and port of origin
  - Country and port of destination
  - Vessel type
  - Freighter
  - Vessel owner
Monitor and analyze key freight turnover indicators of a port terminal (turnover in TEU and FEU, MT, cubic meters, and commodity units)
Create analytical reports
Generate analytical reports
Create, save, and perform OLAP queries to multidimensional data

The module includes the following dictionaries:
- Categories
- Container types
- Container types and sizes
- Container loading types
- Vessel types
- Outsize cargo types
- Goods
- Products
- Motor vehicle types
- Companies
- Ports
- Berths

The module comes with the following reports:
- Freight turnover analysis by country and port
- Container turnover analysis by category over a period
- Container turnover analysis by type and size over a period
- Average time spent in terminal per container
- Outsize cargo turnover analysis by category over a period
- Outsize cargo turnover analysis by type
- Analysis of motor vehicle imports/exports
- Summary report on commercial vessel traffic through a port over a period

![Figure 3. Freight Turnover Analysis module](image-url)
3.3. Port operations analysis

The Port Operations Analysis module is designed for monitoring, analysis, and quick reporting based on the key indicators of port operations.

The module enables you to:

- Manage an integrated system of key indicators of port terminal operations broken down by the main analytical divisions, including cranes, crane operators, breakage types, downtime types, vessel types, and so on
- Customize methodologies to compute values of calculated key indicators, including:
  - Average time required to perform operations with a vessel
  - Average time required to handle a container
  - Crane Utilization
  - Crane Rate
  - Vessel Rate
- Monitor and analyze key performance indicators of a freight terminal
- Generate analytical reports
- Create, save, and run OLAP queries to multidimensional data

The module includes the following dictionaries:

- Crane types
- Downtime types
- Breakage types
- Crane operators
The module displays the following indicators:

- Cranage in percents
- Crane operations in minutes
- Crane downtime
- Crane Rate
- Vessel Rate

The module comes with the following reports:

- Summary reports on port operations per day or over a certain period
- Summary reports on crane operations over a period
- Summary reports on crane operator over a period
- Analysis of crane downtime types
- Analysis of crane breakage types
- Summary reports on port operations, performed with a vessel over a period spent at a terminal
- Average time for container handling by crane

3.4. Executive dashboards

A dashboard is an interactive enterprise control panel, enabling executives to access summary data and drill down into the data via a single, easy-to-use interface. With our preset tools, you can analyze the current situation and identify common dependencies, critical deviations, and trends in indicator dynamics at anytime and anywhere.

The Executive Dashboards module visualizes data on key performance indicators of an enterprise as a whole in the form of analytical reports and interactive dashboards featured by various visual components.

The module enables you to:

- Visualize key performance indicators of a port terminal for executives, including:
  - Total number of containers handled per day
  - Total weight of outsize cargo handled per day
  - Vessels in port
  - Crane workload
  - Average movement time per container
  - Average time spent in terminal per container
  - Current use of terminal warehouse space, and so on

- Visualize key performance indicators of a port terminal for clients, as well as:
  - Summary report on operations performed with selected vessel
  - Downtime reasons and types by selected vessel
  - Generate OLAP-based ad hoc reports or queries of any structure
  - Create standardized reports
  - Display data in a visually compelling form, using tables, charts, digital maps, and dashboards
  - Modify dashboard content and type with user-friendly design tools

The system comes with the following preset dashboards:

- Analysis of key port performance indicators
Port and Container Terminal Analytics

- Analysis of container turnover over a period
- Analysis of vessel turn-around over a period
- Analysis of outsize cargo turnover over a period
- Analysis of port operation indicators
- Detailed analysis by selected client
- Detailed analysis by selected vessel

Figure 5. Executive Dashboards
3. Prognoz Platform

Prognoz. Port and Container Terminal Analytics is designed atop the Business Intelligence toolkit of the Prognoz Platform.

The Prognoz Platform is an integrated platform for developing BI and Decision Support Systems. The platform facilitates the use of cutting-edge data warehouses, reporting and OLAP tools, and monitoring and forecasting tools.

The key objective of the platform is to provide you with a flexible and easy-to-use toolkit for BI development.

The Prognoz Platform includes the following functional modules:

- Dashboard Designer
- Report Designer
- OLAP
- Time Series
- Modeling and Forecasting

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### Prognoz Platform

**Multiple Delivery Options**

- Desktop
- Web
- Mobile

**Search-based Data Discovery**

- Prognoz Discovery Portal

**Microsoft Office Integration**

- SharePoint
- Illustrator
- Google maps
- Open street maps

**Collaboration, Portals and GIS Integration and Embedding**

**Traditional Analysis, Pixel-Perfect Reporting, Interactive Exploration, Decision Support and Advanced Analytics Components**

- Dashboards
- Reports
- Analytical Queries (OLAP)

**Development Tools, External Products/Software Support and Data Integration Components**

- Data Warehouse Designer
- Master Data Management
- Extract, Transform, Load
- Application Development Kit
- Interactive Visualization Components

**BI Administration, Metadata Management Components and Deployment Capabilities**

- Metadata Management
  - Metadata Repository based on MS SQL, Oracle, DB, Teradata, PostgreSQL, SQLite
  - Internal file format support

- BI Server, Web Services and Cloud

**Data Sources**

<table>
<thead>
<tr>
<th>Data Warehouses and Appliances</th>
<th>MDBMS</th>
<th>RDBMS</th>
<th>Flat files</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Data</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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www.prognoz.com
4. Toolkit

The system tools are powered by the latest cutting-edge international technologies implemented in our platform and application suites. Today, our portals and applications are used by more than 350 customers around the world, including international organizations, industrial and financial corporations, and public authorities.

Prognoz. Port and Container Terminal Analytics incorporates advanced toolsets:

- Data collection and loading tools
- Data warehousing tools
- User application customization tools
- Audit and information security tools

The tools provide the following capabilities:

- The data integration tools enable you to design and populate data warehouses from various data sources.
- The modeling and forecasting tools enable you to perform in-depth data analysis and use obtained results to deliver forecasts of a situation in the future or to select an optimal management strategy.
- The application development tools enable you to extend platform capabilities and tailor them to individual needs in a time-sensitive fashion.
- You can access obtained results via Web browsers, enterprise portals, and Microsoft Office applications.
- The open architecture of the platform ensures interaction with other software products, including those from other vendors, and facilitates the process of future platform updates.

4.1. Data collection and loading tools

The data collection and loading tools are designed to collect data via the Internet as well as to extract, transform, and load data from external systems into a data warehouse.

Data collection, extraction, transformation, and loading tools (ETL)

The system provides access to external data sources, such as:

- Industrial relational and multidimensional DBMS (Oracle, MS SQL Server, IBM DB2, other ODBC or OLE DB-compatible DBMS, MS SQL Server Analysis Services, IBM DB2 OLAP Server, Hyperion Essbase, SAP BW, and others)
- External automated systems and applications (Navis Express, Oracle E-business Suite, SAP R/3, Reuters, Bloomberg, and others)
- Local data sources and desktop DBMS (XML, EDIFACT, DBF, TXT, Microsoft Excel, Microsoft Access, and others)
Logic and arithmetic data control tools

These tools are designed to customize control checks of indicator values, using data collection forms and data from external sources, as well as to:

- Set up algorithms for logic and arithmetic control of indicator values and input data validation by indicator, using logical links between indicators within a form
- Set up algorithms for the cross-form control of indicator values that ensure indicator data is saved correctly, using logical links between indicators of different forms
- Set up algorithms that enable logic and arithmetic control of external indicator values

4.2. Data warehousing tools

Tools for data warehousing structure customization

These tools are designed to build a data warehouse in order to obtain analytical reports, as well as to:

- Describe indicators
- Maintain coefficients to convert units of measurement
- Describe analytical slices of indicators and their relations with dictionaries
- Support indicators with various time spans
- Aggregate and consolidate data
- Prepare subject-oriented data sets, or data marts

MDM tools

The MDM or Master Data Management tools streamline the following tasks:

- Create dictionaries
- Support an unlimited number of dictionary attributes
- Support linear and hierarchical dictionaries
- Support compound dictionaries created on the basis of other dictionaries
- Parameterize dictionary elements (dependence of dictionary content on parameter values)
- Support configurations of unique dictionary keys
- Filter, group, and search for elements by condition

Tools to customize and run calculation algorithms

These tools are designed to customize and run calculation algorithms. They enable you to perform the following tasks:

- Set up algorithms to calculate values of data warehouse indicators, including indicators presented in regular reports and planning and budget documents
- Configure indicator calculation schemes
- Calculate configured schemes
The graphical interface of Prognoz. Port and Container Terminal Analytics toolkit enables you to represent the indicator calculation schemes (as well as patterns of regular reports and planning and budget documents) as a sequence of calculation blocks.
4.3. User application customization tools

Multidimensional query designer (OLAP)

The **OLAP customization and viewing tools** are designed to perform real-time multidimensional data analysis. Key capabilities are as follows:

- Analyze data from several sources on a concurrent basis, including cubes of different sizes
- Structure OLAP queries by analytical heading and section
- Present data in tables and charts
- Use simple and extended analytical functions, including sorting, filtering, highlighting by condition, aggregating, Pareto analysis, data highlighting, and calculated values
- Export to external files, such as HTML, PDF, XLS, RTF, and print

![Figure 8. OLAP Report Designer](image)

Report Designer

The **tools for customizing and viewing document templates** enable you to configure and display regular reports, plans, and budgets in tabular form based on information from the data warehouse.

A document template is based on a multidimensional structure that represent data in various analytical slices, such as periods, budget items, commodities, currencies, business units, scenarios, and so on. The content of dictionaries (or the composition and structure of dictionary elements) comes from a unified classifier and depends on planned period and other parameters, such as the list of commodities in terms of the business unit.
Key capabilities include the following:

- Develop regular reports in compliance with the customer requirements to their layout and design
- Create analytical notes; that is, reports that combine text, spreadsheets, and business graphics (charts, maps, indicators, “speedometers”, and so on)
- Use a unified Excel-like interface
- Apply a wide range of mathematical, statistical, and financial functions
- Use extensive design capabilities
- Export to external formats, such as HTML, XLS, PDF, RTF, and ODF, and print
Dashboard Designer

The **dashboard customization and viewing tools** are used to visualize data in an easy-to-analyze form.

Key capabilities include the following:

- Build dashboards via a visual interface without programming
- Add various types of information objects, including text, hyperlinks, Flash movies, maps, charts, and regular reports to the dashboard
- Use interactive capabilities when working with dashboards, and move, add, and delete dashboards; zoom in to specific dashboards; use one dashboard to manage others; and so on
- Arrange information objects on a dashboard, and use advanced layout capabilities for the dashboard and its objects
- Use business graphics (or graphs and charts), cartography (or digital territory maps), and 3D scenes (or concurrent visualization and analysis of up to four source data attributes as a three-dimensional graphic)
- Use two operation modes: designing (as in designing a report) and execution (as in viewing a report) to reduce resources and speed up report execution

![Figure 11. Dashboards](image-url)
Spreadsheet customization and viewing tools

The spreadsheet customization and viewing tools enable you to analyze spreadsheets with master data loaded from external systems and registries.

Key capabilities include the following:

- Drill down to the value of the regular report indicator located on a dashboard by a set of fields of the data collection registry or original external source
- Perform such analytical functions as grouping, filtering, and sorting
- Customize a set of displayed fields in a drill-down report
- Switch from one drill-down report to another
- Export to external format

4.4. Administration and information security tools

These tools delimit access to the information resources and functionality of Prognoz. Port and Container Terminal Analytics and ensure access logging.

Key capabilities include the following:

- Delimit access to information resources and system functionality by:
  - Maintaining a list of users and user groups
  - Managing rights to access information resources and functionality
  - Controlling rights to access information resources and functionality

- Log access by:
  - Keeping a log detailing access to information resources and functionality
  - Viewing the log detailing access to information resources and functionality
5. Technical requirements

5.1. Hardware requirements

System components are located on the following server equipment:
- System database server
- System Web application server

The recommended database server profile is as follows:
- Processor: 3.50 GHz, Quad Core
- 64-bit architecture support
- RAM: 16 GB
- Disk space: 300 GB or more

The recommended Web application server profile is as follows:
- Processor: 2.50 GHz, Quad Core
- 64-bit architecture support
- RAM: 8 GB
- Disk space: 100 GB or more

The database and Web application can be located on a single server. The recommended front-end computer profile is as follows:
- Processor: 1.5 GHz or more
- RAM: 512 MB or more
- Disk space: 2 GB or more

5.2. Software requirements

Application software includes the following software tools:
- Data warehouse
- Server Web application
- Client Web application
- Prognoz Platform

The data warehouse runs on a platform that includes the following software tools:
- Operating system: Microsoft Windows Server 2003 R2 x64
- Oracle Database Server 11gR2 DBMS (64-bit)

The system back-end Web application runs on a platform that includes the following software tools:
- Operating system: Microsoft Windows Server 2003 R2 x64
- Apache Tomcat Web application server or Oracle Application Server
- Java virtual machine 1.6 or higher

The system front-end Web application runs on a platform that includes the following software tools:
- Microsoft Windows family operating system, supporting both 32- and 64-bit architecture
- Internet Explorer 7.0 or higher
- Java virtual machine 1.6 or higher
- Flash Player 9.0 or higher
6. Implementation schedule

The system development and implementation includes the following stages:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission statement</td>
<td>Negotiated project scope and duration, data warehouse requirements, data sources (IT systems), approved analysis metrics and dimensions, defined sources for metrics calculation.</td>
</tr>
<tr>
<td>Project approval</td>
<td>Project demonstration and approval.</td>
</tr>
<tr>
<td>Development of data warehouse and Statistics module</td>
<td>Integration testing, data validation, data quality and transformation testing. Testing of system functionality, Statistics module, and user interface.</td>
</tr>
<tr>
<td>Solution testing</td>
<td>Deployment on the customer Web site and integration with data sources. Testing customer adaptation.</td>
</tr>
<tr>
<td>Solution implementation and user training</td>
<td>System implementation and delivery of all deliverables to the customer. Training.</td>
</tr>
<tr>
<td>Maintenance and support</td>
<td>System debugging and enhancement. Consulting.</td>
</tr>
</tbody>
</table>

Prognoz. Port and Container Terminal Analytics can be implemented only if your IT infrastructure satisfies the recommended hardware and software requirements (see section 5).

Shown below is an indicative project schedule for Prognoz. Port and Container Terminal Analytics implementation. Deadlines for all stages will be established after the terms of reference approval.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Work schedule by weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission statement</td>
<td>1</td>
</tr>
<tr>
<td>Analysis of terms of reference and design</td>
<td>2</td>
</tr>
<tr>
<td>Project approval</td>
<td>3 4 5 6 7</td>
</tr>
<tr>
<td>Development of data warehouse and Statistics module</td>
<td>8 9</td>
</tr>
<tr>
<td>Solution testing</td>
<td></td>
</tr>
<tr>
<td>Solution implementation and user training</td>
<td></td>
</tr>
</tbody>
</table>

Maintenance and support for twelve months after solution implementation.
7. Consulting and system enhancement

Within the implementation of Prognoz. Port and Container Terminal Analytics, the Data Collection and Loading, Dashboards, Reports, and OLAP modules can be enhanced per customer requirements. The total cost and duration of these enhancements will be defined after the terms of reference development. Below are given options for module enhancement.

**Data Collection and Loading module enhancement**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Integration with additional IT systems Integration with TOS, CMMS, HR, GL, RMI, ERP, Asset Management Systems that are not supported by the standard version</td>
</tr>
<tr>
<td>2</td>
<td>Setting up system integration on the database level Integration with industrial SBMS that are not supported by the standard version</td>
</tr>
</tbody>
</table>

**Dashboards module enhancement**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Development of new dashboards or modification of existing dashboards Configuration of new dashboards</td>
</tr>
<tr>
<td>2</td>
<td>Customization for mobile devices Portal adaptation to mobile devices, development of application for data access via mobile operating systems</td>
</tr>
</tbody>
</table>

**Reports module enhancement**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Development of new regular reports Configuration of new regular reports</td>
</tr>
<tr>
<td>2</td>
<td>Customization for mobile devices Portal adaptation to mobile devices, development of application for data access via mobile operating systems</td>
</tr>
</tbody>
</table>

**OLAP module enhancement**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Development of new OLAP reports Configuration of new OLAP reports</td>
</tr>
<tr>
<td>2</td>
<td>Customization for mobile devices Portal adaptation to mobile devices, development of application for data access via mobile operating systems</td>
</tr>
</tbody>
</table>
8. Prognoz profile

Since 1991, Prognoz has become one of the top international IT companies for developing systems designed to monitor, analyze, and forecast economic, financial, and industrial processes. Prognoz forecasting and analytical systems improve the efficiency of industrial enterprises, federal and subnational authorities, banks, and financial entities.

Prognoz has offices in Perm, Moscow, various Russian regions, and abroad: in the United States (Washington, DC), China (Beijing), Belgium (Brussels), Kazakhstan (Astana), and Belarus (Minsk). The company employs over 1,500 professionals.