The Virtual Terminal: Visualizing Automated Container Terminals

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Presentation Outline

- Automation in container terminal design: why and how?
- Challenges in a multi-actor environment: the need for presenting ideas.
- 3D interactive visualization: a solution.
- Evaluating the Virtual Terminal.
- Conclusions.

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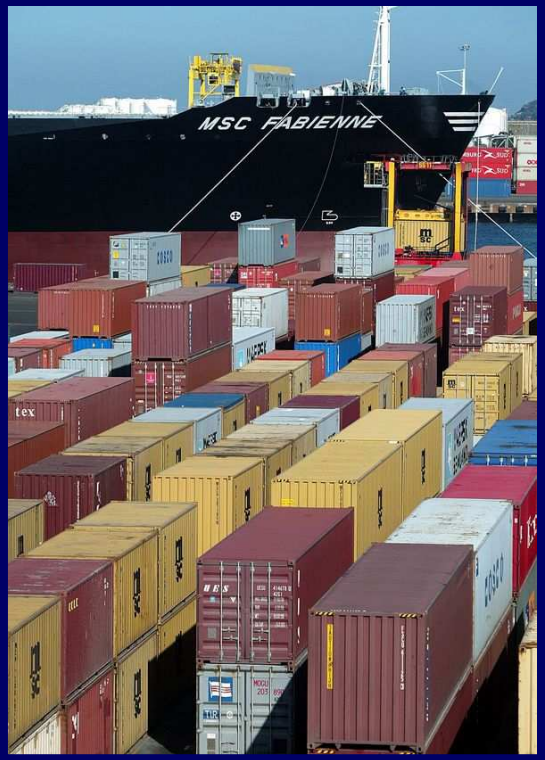
Designing automated container terminals

from abc.net.au



from thegreenergrass.org

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Why automation?

Various advantages:

- *Automation leads to lower life cycle costs*.
- *Automation improves safety and labour circumstances*.
- *Automation can significantly reduce the level of damage.*
- *Automated equipment can easily be electrically driven. Automated systems can increase the level of service.*

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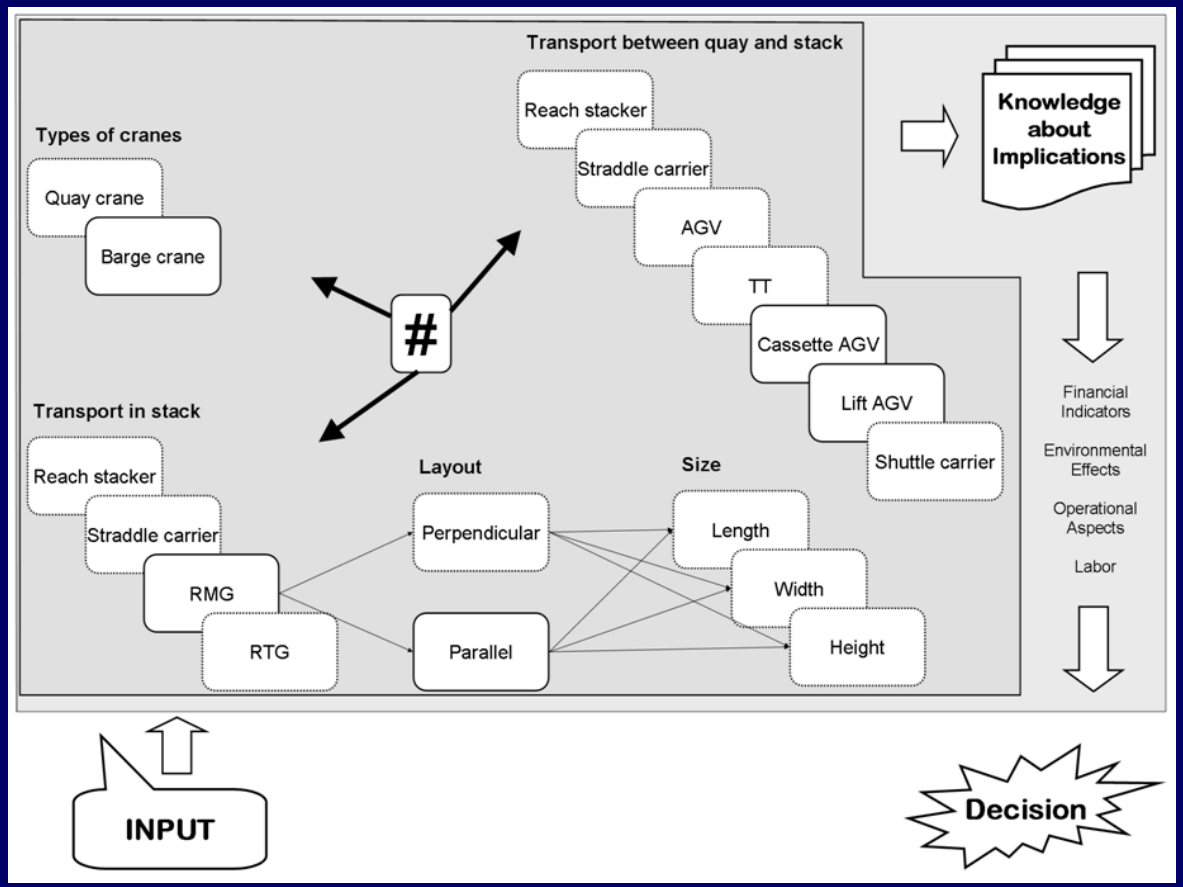
Complexity of the decision making process



A need to visualize new designs

- Different actors are involved in the decision making process, visualization helps achieve **shared understanding**
- How to do it?
  - 2D cad drawings: too technical
  - Custom 3D video: time comsuming to produce and not interactive
  - Maquettes: too costly and time consuming to produce

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Requirements for solution

We aim at constructing a solution that adheres to the following requirements:

- **Easy and quick** construction of presentation material.
- Present **realistic and compelling 3D imagery** of an automated container terminal.
- Contain the **vast amount of information** gathered from different sources.
- Serve as a **communication medium** between actors.
- Provide the **context and an overview of the knowledge** present in the container terminal.
- Provide **interaction with the actors** involved.
- Contain **sufficient details** for decision making.

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The Virtual Terminal

The "Virtual Terminal" serves as a tool …

- … to present future terminals to customers,
- … to share design ideas throughout a (non-technical) design team,
- … and to share information of existing and future terminals.

From design to virtual environment in **3 steps**:

- **Create** a design in AutoCAD
- **Convert** the design to an XML
- **Visualize** the XML in the "Virtual Terminal"-client

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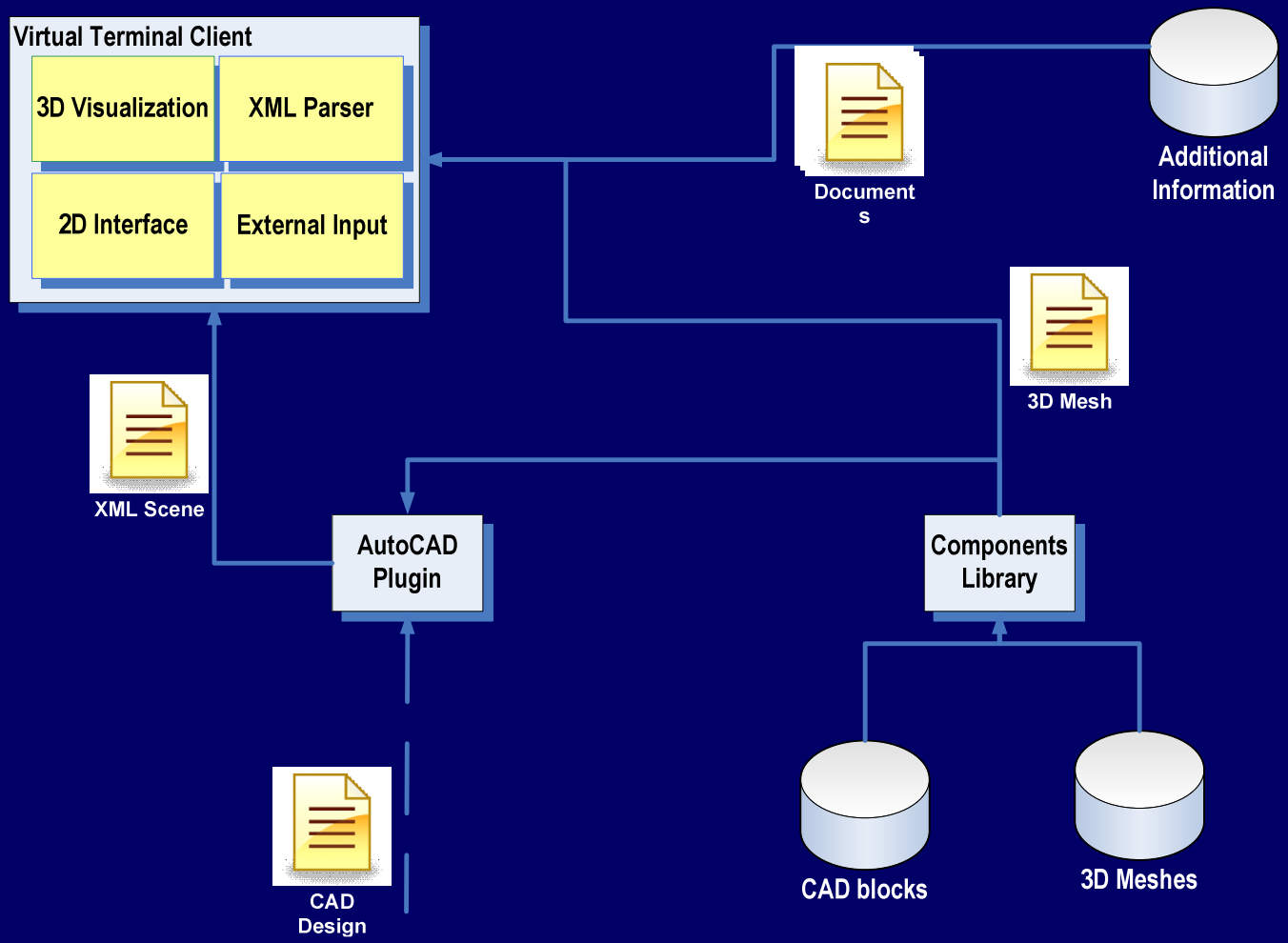
How does it work?



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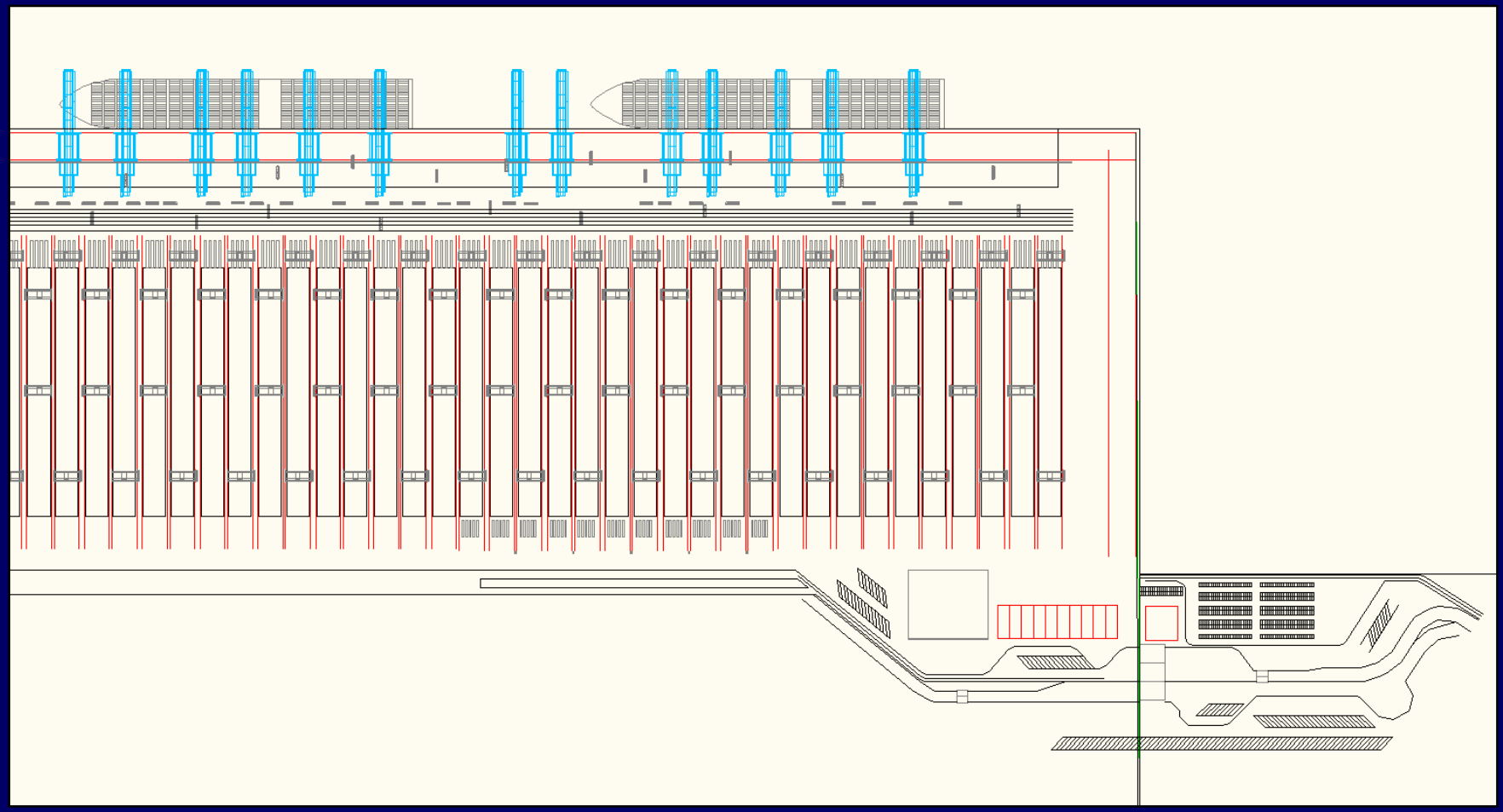
Designing in AutoCAD



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Designing in AutoCAD

Designing takes place in AutoCAD with predefined building blocks.

Why?

- Powerful tool, *de factor* industry standard
- Comfortable and known environment for designers

How?

- Using predefined CAD-blocks
- Using specific layers for lining (rails, streets, etc)

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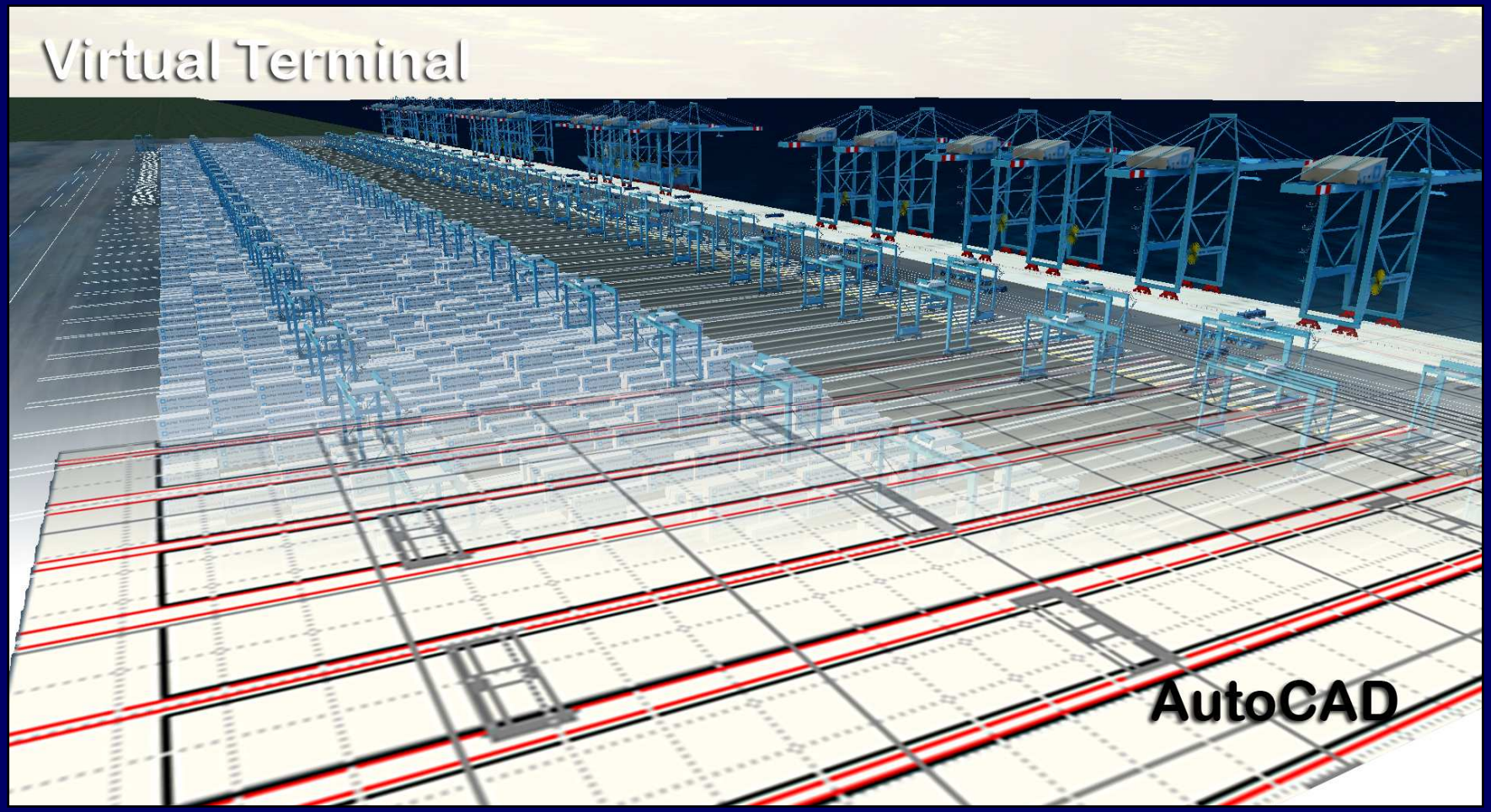
Conversion from CAD to VR



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Conversion from CAD to VR

The AutoCAD drawing is converted to an XML file that contains a description of the whole scene

Why?

- Complete independent from original CAD drawing
- Human readable and adaptable file

How?

- Custom made plugin is loaded into AutoCAD
- Conversion takes place based on an ontology

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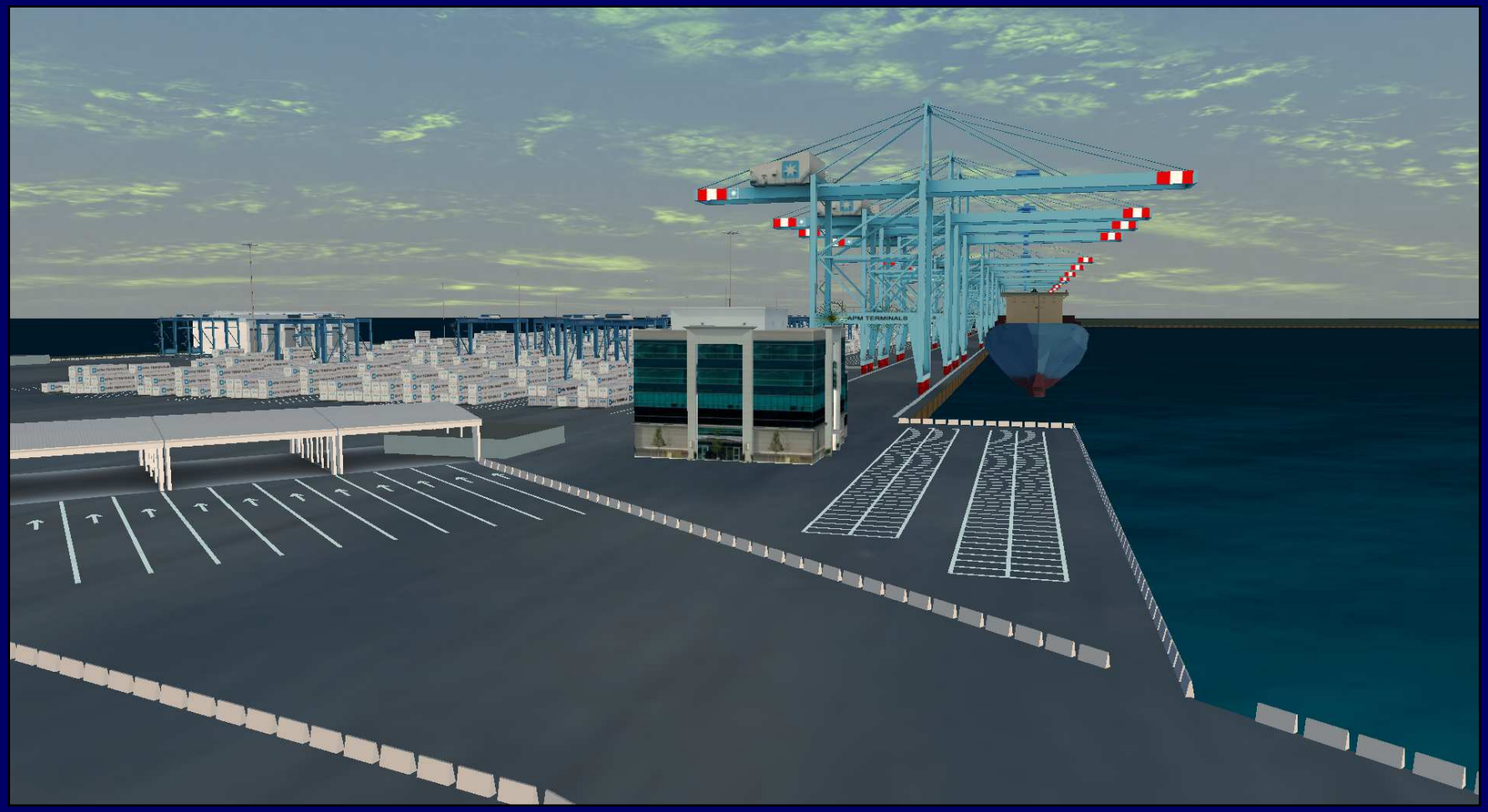
Visualizing the future terminal



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Visualizing the future terminal

The future terminal is visualized highly detailed using state-of-the-art game rendering technology

Why?

- Realistic imaginery of a non-existing terminal
- Possibility to visualize very large sceneries

How?

- Custom made optimized 3D models
- Specialized algorithms to feed the visualization

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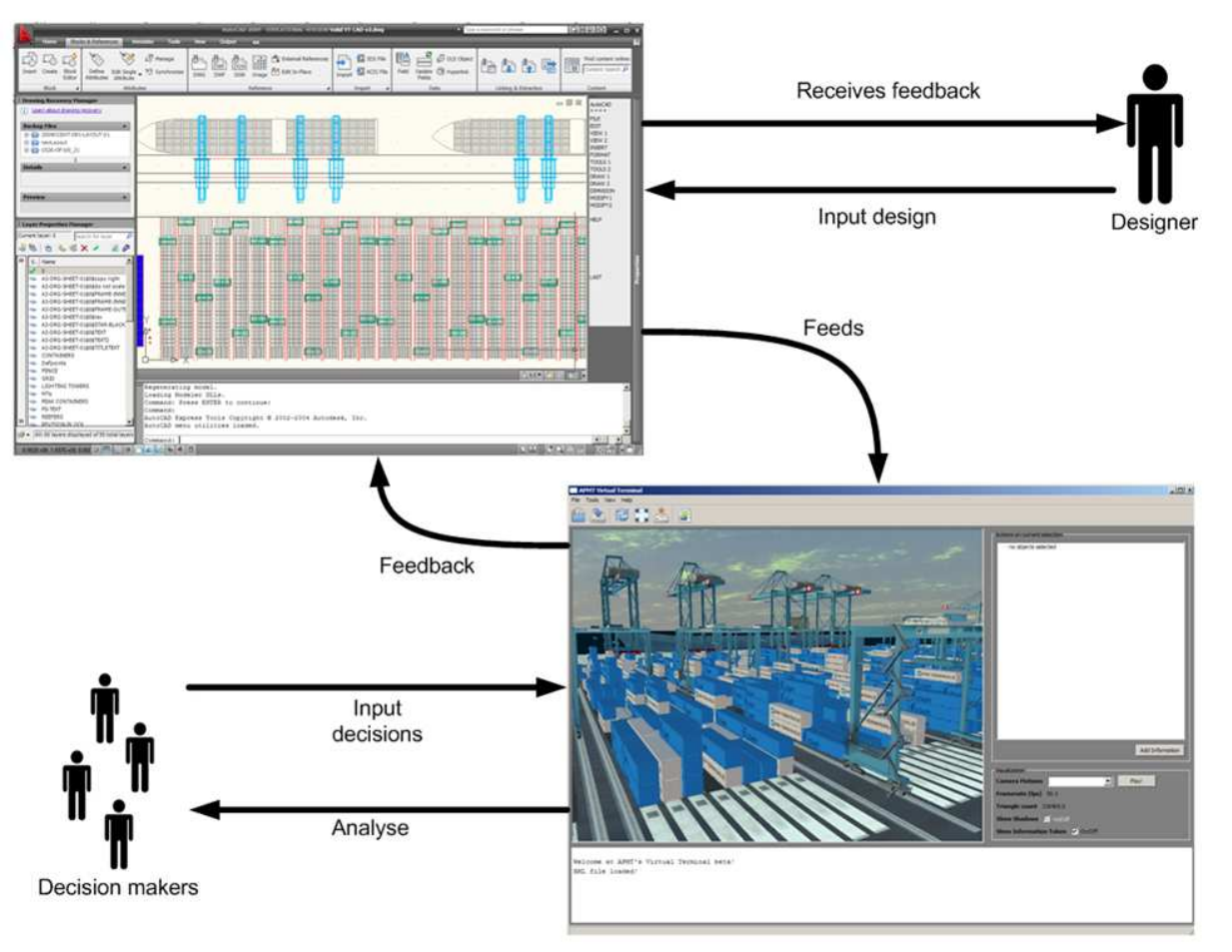
Supporting the design process



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Evaluation

- Evaluation of three aspects:
  - Usability: does the software environment support the user in his task?
  - Usefulness: does the software environment support the organization?
  - Usage: does the software environment provide future possibilities?

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Results of the evaluation

Results from the evaluation:

- No major usability issues were identified, users were able to complete their tasks.
- The design team highly valued the high realistic and compelling 3D imagery provided by the VT.
- The VT supports the communication between both internal and external stakeholders.
- The VT contains sufficient details for decision making.

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Conclusions

- Visualization to
  - **convey knowledge** between different people
  - **to gain insight** into complex multi-actor environments
- Building a software environment presents challenges: we tackled these challenges and presented the results, **the Virtual Terminal**.
- We have evaluated the Virtual Terminal to understand **how to employ it** and **how it helps** the different actors in **understanding the problem**.

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