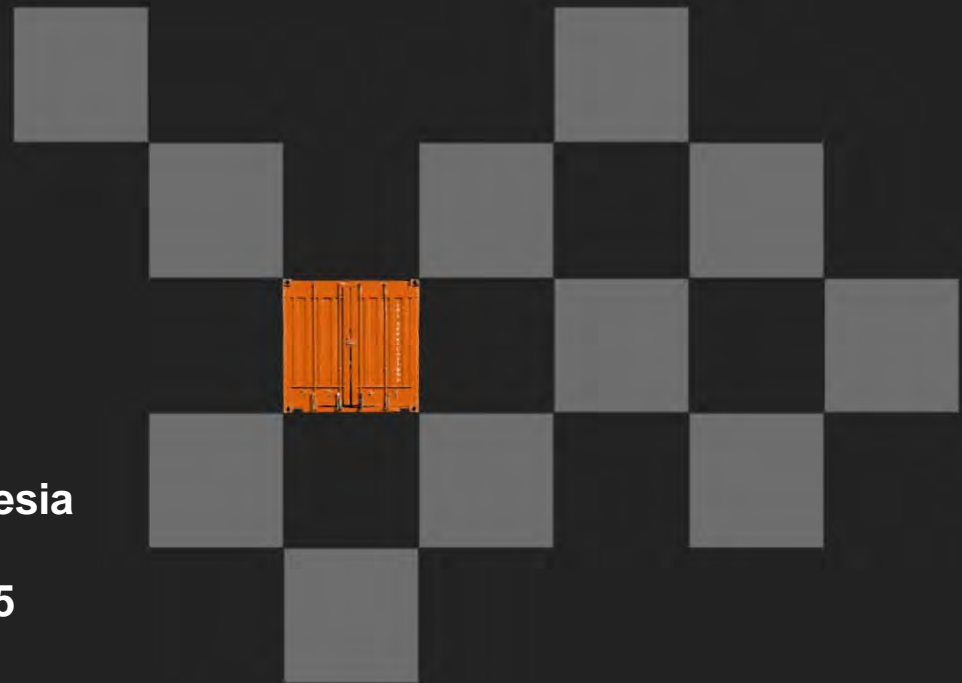# Secure the Productivity
at automated terminals
by strategic, tactical and operative Planning

Dr. Holger Schütt
ISL Applications GmbH

13th ASEAN Ports & Shipping 2015 Indonesia
Exhibition and Conference, Jakarta
Wednesday 24 and Thursday 25 June 2015

Agenda

ISL Applications

Container Terminal Simulation
→ **strategic and tactical planning**

Day to Day Operation
→ **operative planning**

ISL Applications

Container Terminal Simulation
→ strategic and tactical planning

Day to Day Operation
→ operative planning

ISL Applications GmbH

Founded 2010 as ISL's commercial subsidiary

Holger Schütt
CEO, Prof. Dr.- Ing.

Horst-Dieter Kassl
CTO, Dipl.-Ing.

ISL – **Institute of Shipping Economics and Logistics**
(R&D)

- founded 1954
- private foundation
- suited in Bremen & Bremerhaven
- some 50 employees
- research based consultancy institute in maritime logistics

RWI/ISL Container Throughput Index

2010= 100

original value
seasonally adjusted
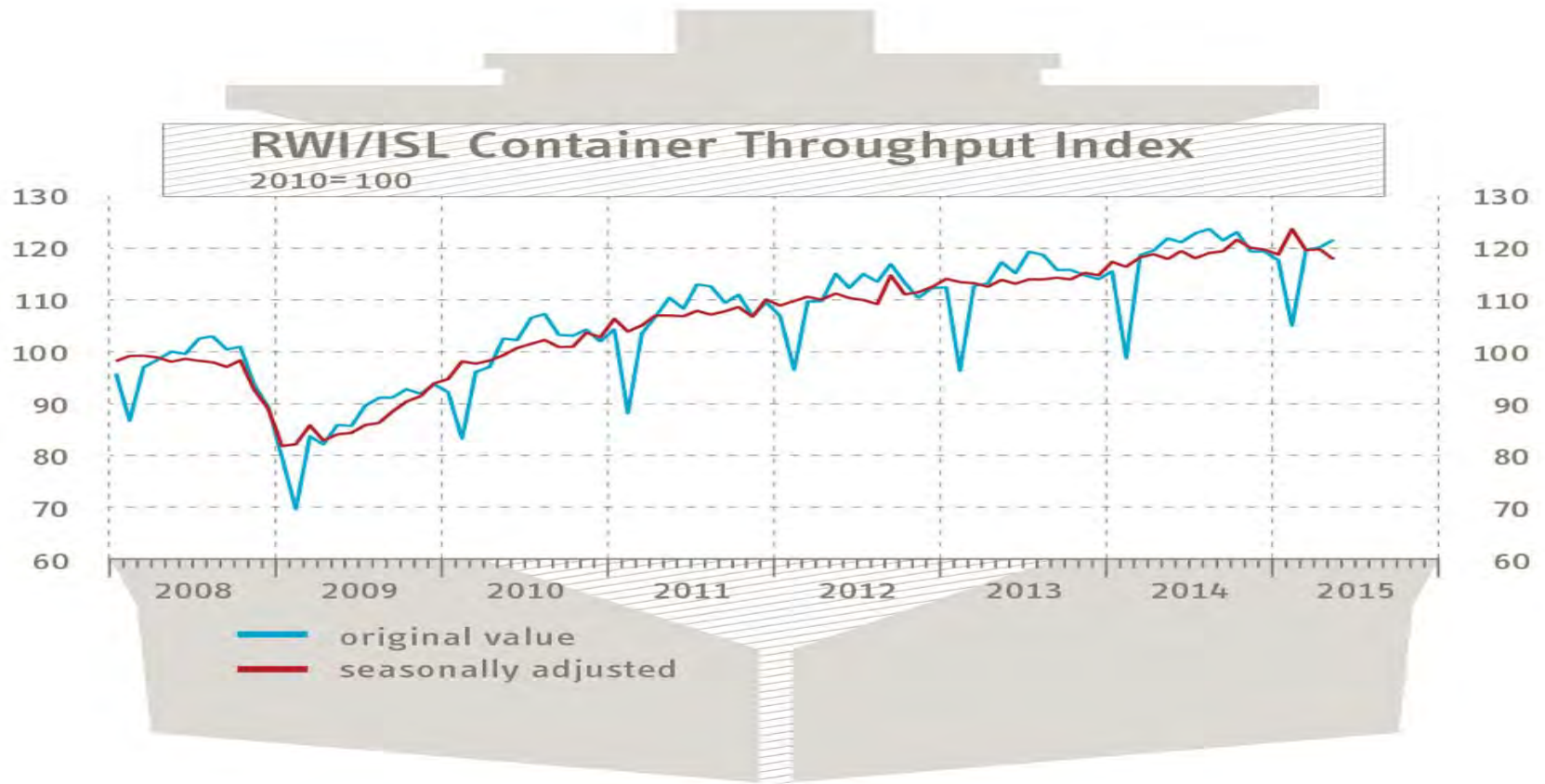
RWI/ISL computations based on data provided by 81 ports. May 2015: flash estimate.

In May, the RWI/ISL Container Throughput Index shrank by almost two points from a (revised) 119.8 to 117.9 points. The index thus relapsed to a low level last seen in 2014.

RWI/ISL Container Throughput index
- *81 ports worldwide*
- *~ 60 % of worlds throughput*
- *available 3 weeks in new month (typically on the 19th)*
- *www.isl.org → news*

25 Years Simulation Experience

| 1989 | 1991 | 1993 | 1995 | 1998 | 2000 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2013 | 2015 |

WELCOME TO THE CHESSCON FAMILY

OPTIMIZATION TOOLS FOR CONTAINER TERMINALS

Products rebranding:
CAPS
SCUSY
ViTO

ISL APPLICATIONS

CHESSCON

Development funded by   European Union   Land Bremen   Bremerhavener Gesellschaft für Investitionsförderung und Stadtentwicklung mbH b!s

Optimisation and Simulation – References (selected)

ASEAN Terminals, Philippines

Bejaia Mediterranean Terminal, Algeria

Centerm Terminal, Vancouver, Canada

Contship, La Spezia, Italy

CSX, Jacksonville, USA

DP World Terminal Antwerp, Europe

DP World, Australia

EUROGATE, Bremerhaven, Germany

EUROGATE, Hamburg, Germany

HHLA, Hamburg, Germany

HPA Hamburg Port Authority, Germany

HIT, Hong Kong

JadeWeserPort, Germany

Kalmar Industries, Finland

CMSA ICTSI, Manzanillo, Mexico

MCT, Gioia Tauro, Italy

MTL, Hong Kong

Nhava Sheva Terminal, India

Noell Crane Systems, Germany

NTB, Bremerhaven, Germany

P&O Headquarter, London, Europe

Port of Odessa, Ukraine

Port of Tacoma, USA

PORTEK International Ltd., Singapore

Ports America, USA

PSA International, Singapore

Red Sea Gateway Terminal, Jeddah, UAE

Sandwell Eng. Inc., Vancouver, Canada

SCT, Southampton, U.K.

SPIA ICTSI, Columbia

TecPlata ICTSI, Buenos Aires, Argentina

TotalSoftBank, Korea

TPT, South Africa

TRP, Buenos Aires, Argentina
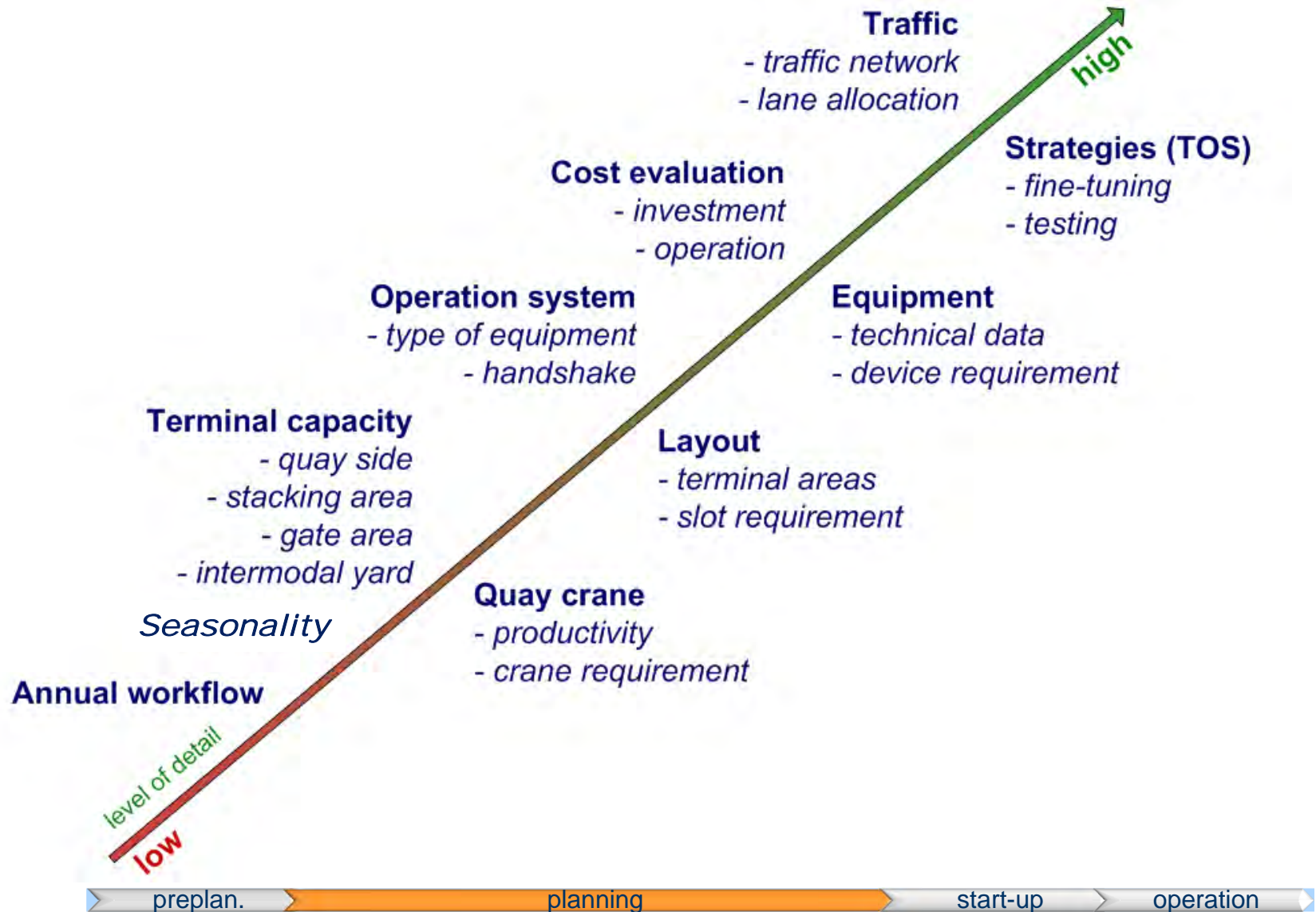
VTE, Genoa, Italy

Warsteiner Brewery, Germany

Agenda

ISL Applications

Container Terminal Simulation
→ strategic and tactical planning

Day to Day Operation
→ operative planning

Tasks in terminal planing and optimisation

Traffic
- traffic network
- lane allocation

Strategies (TOS)
- fine-tuning
- testing

Cost evaluation
- investment
- operation

Operation system
- type of equipment
- handshake

Equipment
- technical data
- device requirement

Terminal capacity
- quay side
- stacking area
- gate area
- intermodal yard

Layout
- terminal areas
- slot requirement

Seasonality

Quay crane
- productivity
- crane requirement

Annual workflow

level of detail

low

high

preplan. | planning | start-up | operation

Various layouts, which one is the best?

Tandem lift cranes, truck/chassis and RTG

© ISL 2015

Case study

Comparison of operation systems selected

	SC 1 over 3	RTG/TC	RMG/AGV auto
No. of STSCs	12	12	12
No. of SCs	45	X	X
No. of TCs/AGVs	X	53	56
No.of RTGs/RMGs	X	25	17

equipment use

> The decision from an economical view is supported based on operational costs and investment

evaluation production centres

		SC 1 over 3	RTG/TC	RMG/AGV auto
DS1000	aver. moves/hr (total)	147.0	167.0	171.0
	aver. moves/hr per STSC	29.5	32.3	33.4
DS800	average service time	12.5	10.5	10.1
	aver. moves/hr (total)	128.0	152.0	158.0
	aver. moves/hr per STSC	29.3	31.5	32.9
F120	average service time	4.5	4.3	4.1
	aver. moves/hr (total)	53.0	56.0	59.0
	aver. moves/hr per STSC	21.3	21.6	22.83
F250	average service time	8.8	8.0	7.8
	aver. moves/hr (total)	57.0	62.33	64.0
	aver. moves/hr per STSC	20.4	21.5	22.6
total berth operation time		218.0	195.0	189.0

costs

	SC 1 over 3	RTG/TC	RMG/AGV auto
costs per move [€]			

© ISL 2015

13

Tasks in terminal planing and optimisation

Traffic
- traffic network
- lane allocation

Strategies (TOS)
- fine-tuning
- testing

Equipment
- technical data
- device requirement

Cost evaluation
- investment
- operation

Terminal capacity
- quay side
- stacking area
- gate area
- intermodal yard

Saisonality

Annual workflow

Quay crane
- productivity
- crane requirement

level of detail

low   **high**

**Starting in the 90ies,
Since 2000 state of the art:**

Terminal simulation
- **Strategic planning**
- **Layout and equipment**
- **CAPEX and OPEX**
- **Ecologic impacts**
- **Decision support in strategic planning**

preplan. → planning → start-up → operation

Emulation:

- use your Terminal Operation System (TOS)

- use your software interfaces

- but use a **Virtual Container Terminal**

TOS

switch
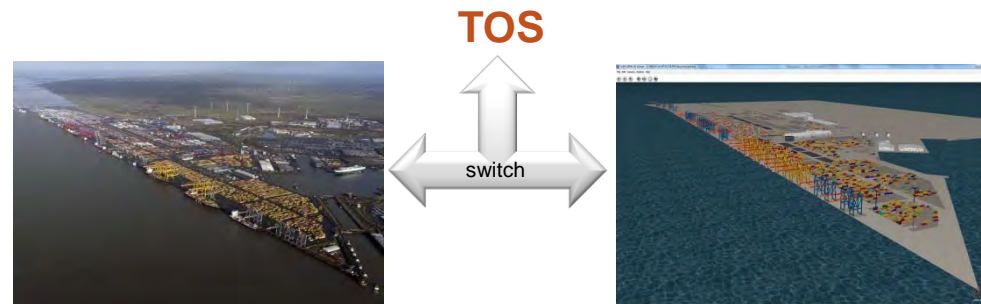
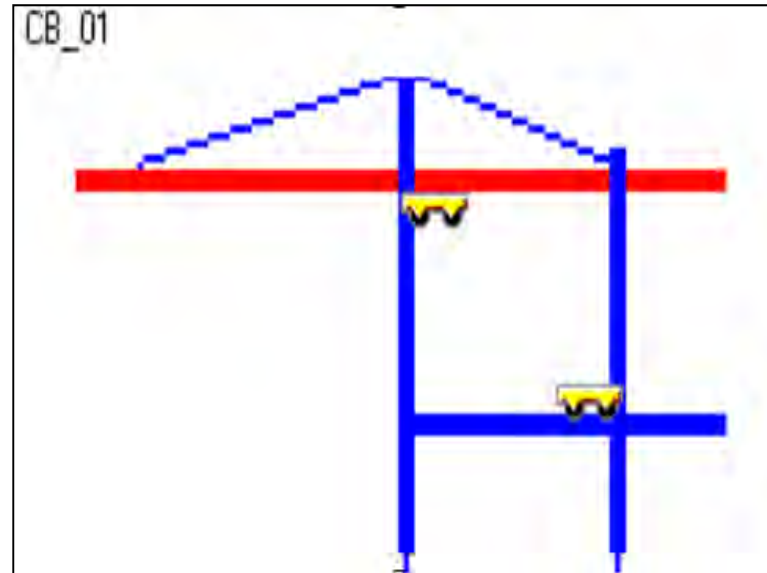# NTB (controlled by Sparcs 3.7)

CT Altenwerder

CT Altenwerder

TOS (self developed by HHLA)

QC emulator ... **emulator**

detailled simulation of double hoist cranes

AGV-system emulator

black box simulation (real control not known)

yardblock emulator ... **...k emulator**

detailled simulation of 2 cranes with collission control

reefer control emulator

chassis emulator
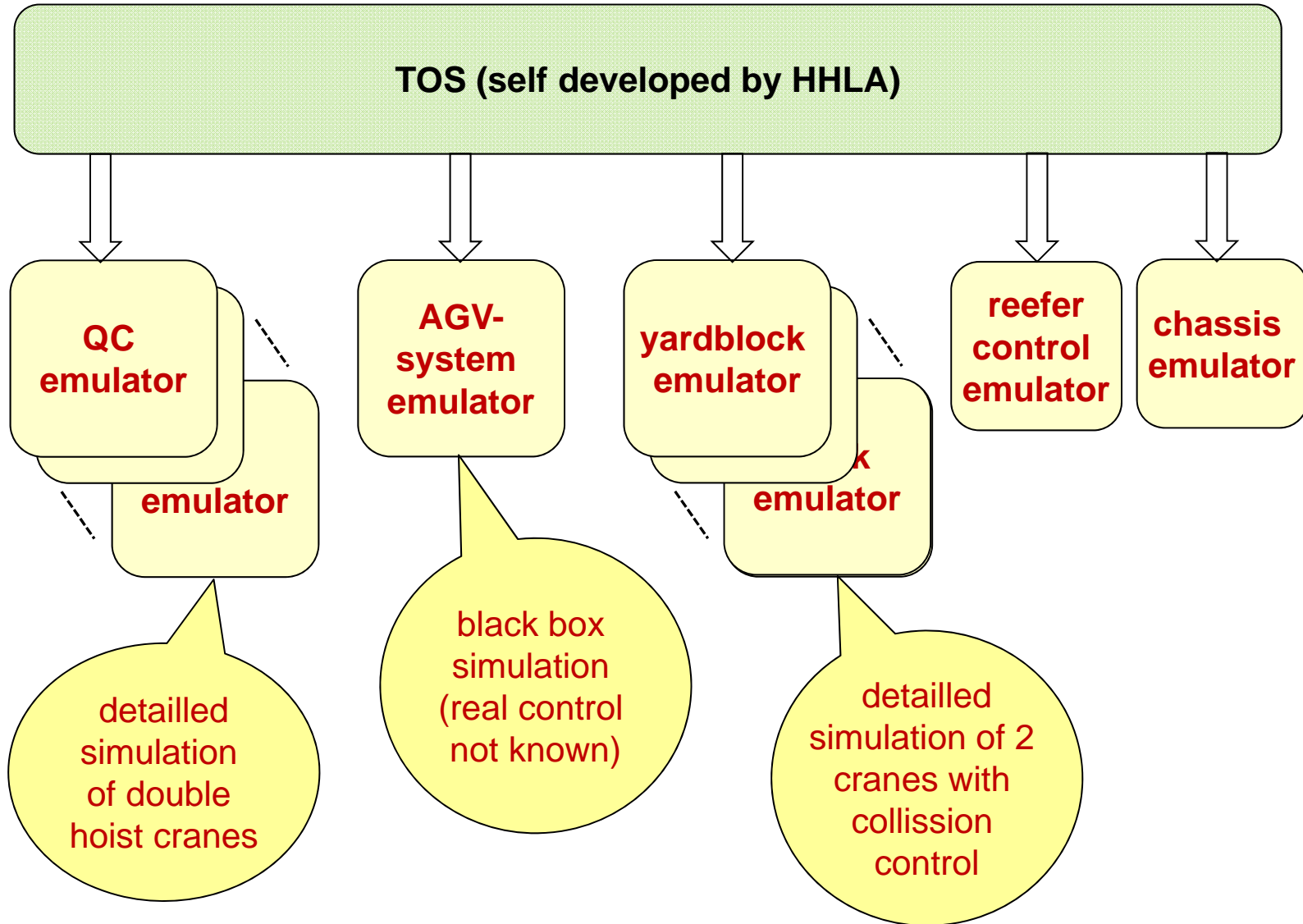
Emulator based test bed
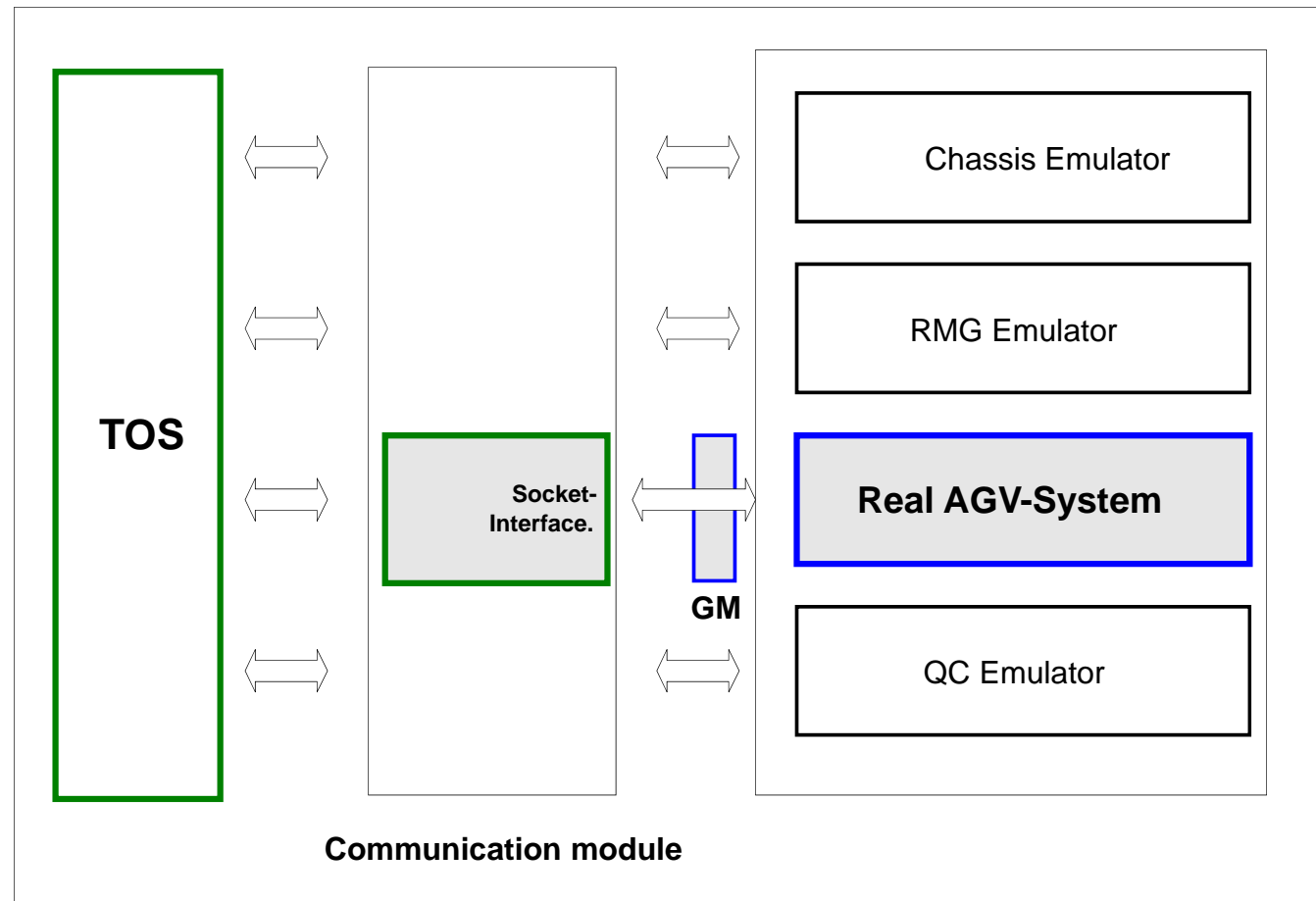
Emulator based test bed

Step 1
Pick-up box
(emulated)
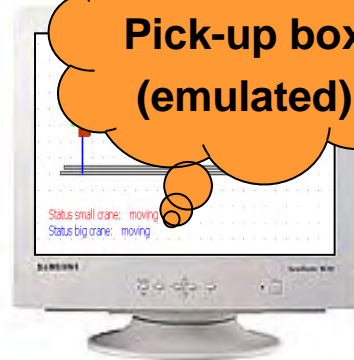
Step 2
AGV transport
(real)

STS loads box
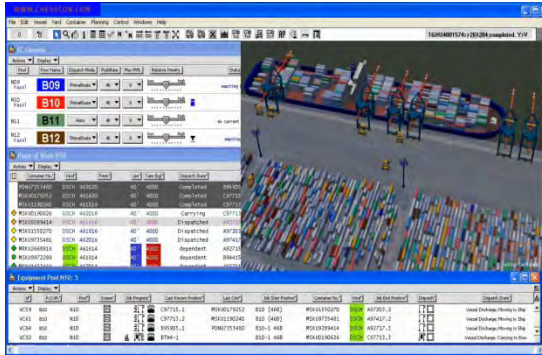(emulated)

Tasks in terminal planing and optimisation

Post-millennial:

Terminal emulation
- **Tactical planning**
- **Virtual Terminal**
- **TOS testbed**
- **Strategy testing**
- **Training**

Traffic
- traffic network

Strategies (TOS)
- fine-tuning
- testing

Cost evaluation
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- type of equipment
- handshake

Terminal capacity
- quay side
- stacking area
- gate area
- intermodal yard

Saisonality

Annual workflow

Layout
- terminal areas
- slot requirement

Quay crane
- productivity
- crane requirement

level of detail

high

low

preplan. | planning | start-up | operation

Going operational…

Agenda

ISL Applications

Container Terminal Simulation
→ strategic and tactical planning

Day to Day Operation
→ operative planning

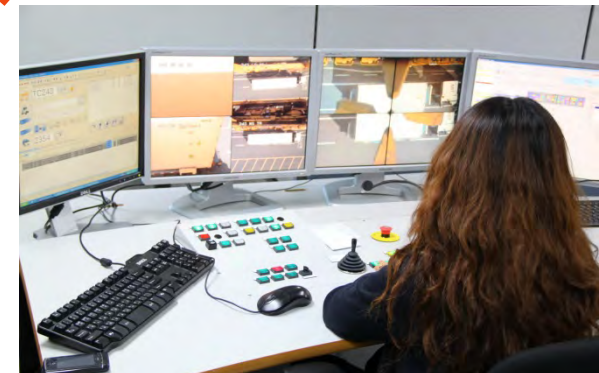# Terminal productivity

TOS

"Positioning for manual, semi automated and automated terminals"

Process automation
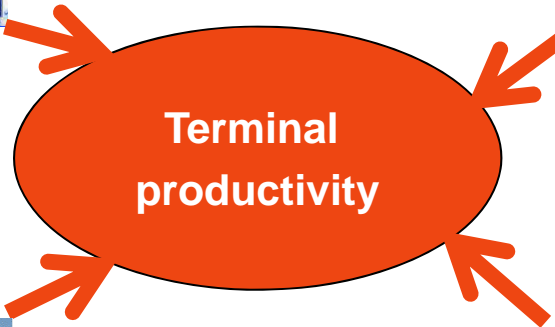
Equipment

The first ALV of KMI

Terminal productivity

Terminal staff

NOMINAL CAPACITY 19,224

Stowage planning

Berth planning

Crane split planning

Equipment planning

Yard planning
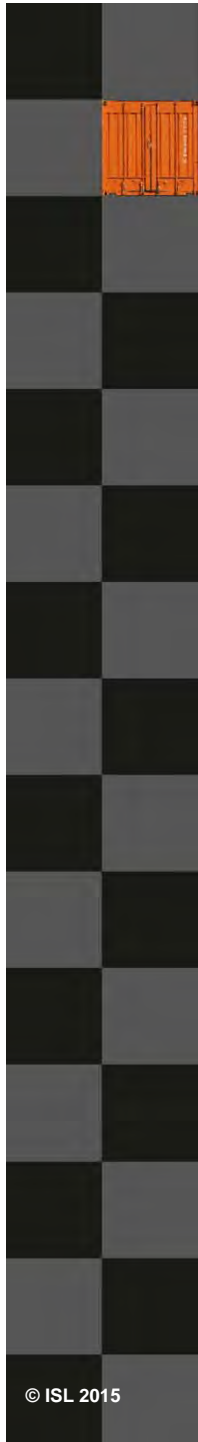
The mission of CHESSCON SHIFT PREVIEW

- Check your current shift planning

- Based on your current planned data:
  Work-queues, Yard allocations, Yard inventory
  - Optimize deployment of equipment
  - Optimize yard allocations
  - Avoid yard clashes

- On short-term basis

- High-speed calculation: 8 hr shift within minutes

Development funded by: Bremerhavener Gesellschaft
für Investitionsförderung
und Stadtentwicklung mbH b!s

CHESS**CON** Shift Preview

0 step:
day to day work
use the TOS
~~to plan the next shift~~

1 step:
shift planning finished

CHESS**CON** Shift Preview

2nd step:
Import planning state
automatically
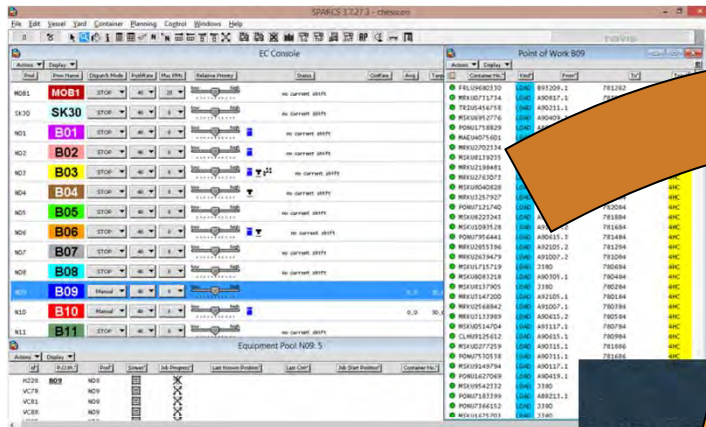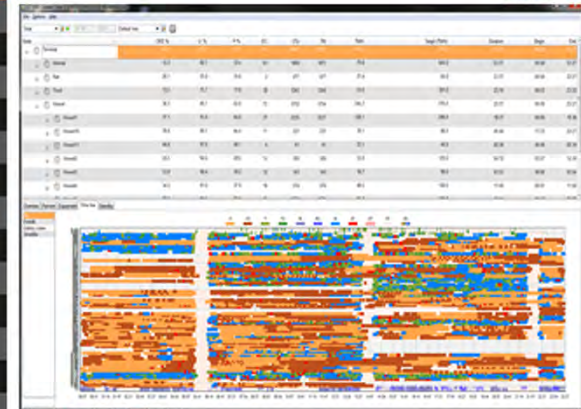
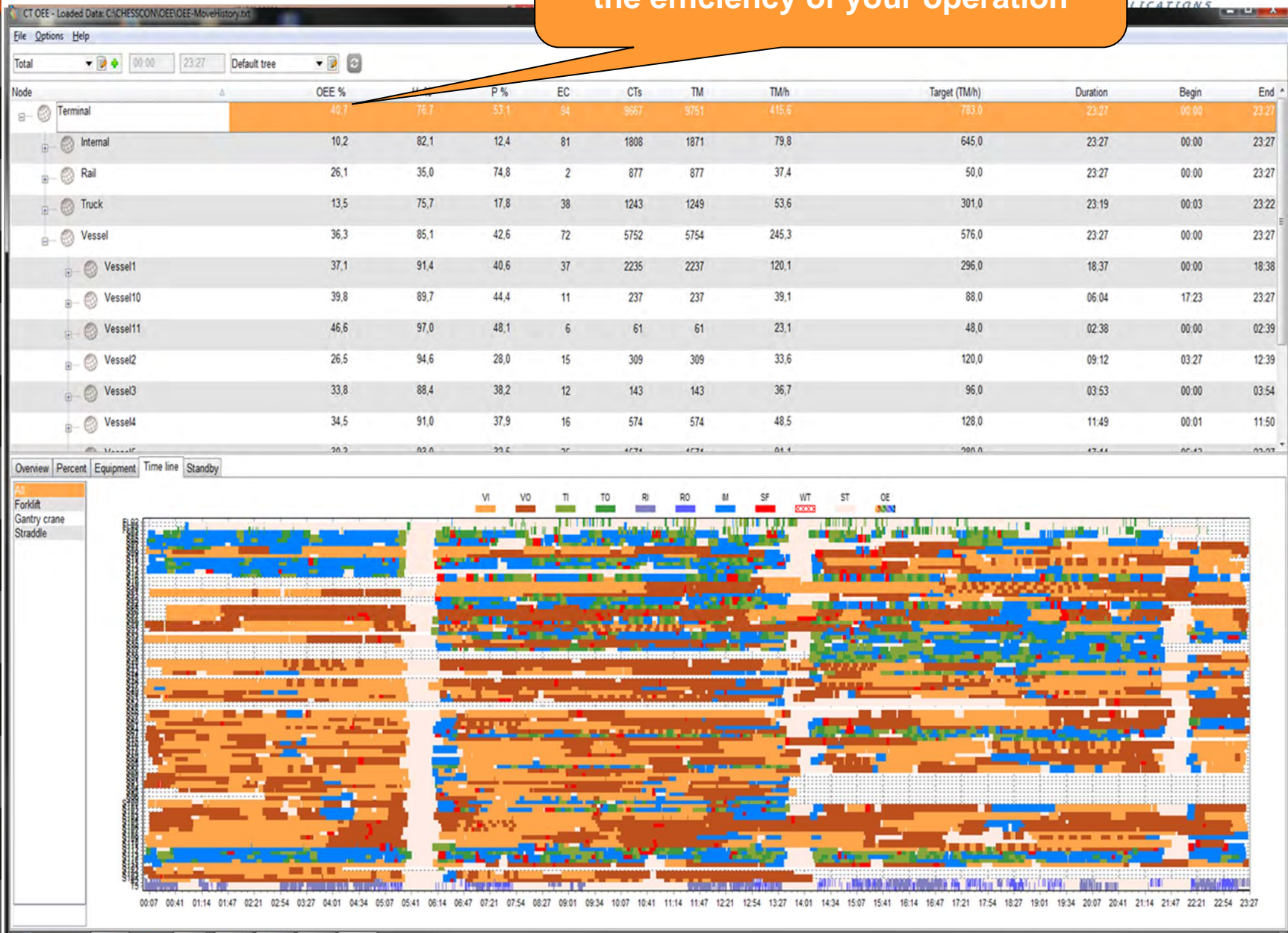**3rd step:
fast simulation of the shift**

CHESS**CON** Shift Preview

4th step: intuitive evaluation of the efficiency of your operation

CT OEE - Loaded Data: C:\CHESSCON\OEE\OEE-MoveHistory.txt

File   Options   Help

Total   ▼   00:00   23:27   Default tree   ▼

Node	OEE %	U %	P %	EC	CTs	TM	TM/h	Target (TM/h)	Duration	Begin	End
Terminal	40,7	76,7	53,1	94	9667	9751	415,6	783,0	23:27	00:00	23:27
Internal	10,2	82,1	12,4	81	1808	1871	79,8	645,0	23:27	00:00	23:27
Rail	26,1	35,0	74,8	2	877	877	37,4	50,0	23:27	00:00	23:27
Truck	13,5	75,7	17,8	38	1243	1249	53,6	301,0	23:19	00:03	23:22
Vessel	36,3	85,1	42,6	72	5752	5754	245,3	576,0	23:27	00:00	23:27
Vessel1	37,1	91,4	40,6	37	2235	2237	120,1	296,0	18:37	00:00	18:38
Vessel10	39,8	89,7	44,4	11	237	237	39,1	88,0	06:04	17:23	23:27
Vessel11	46,6	97,0	48,1	6	61	61	23,1	48,0	02:38	00:00	02:39
Vessel2	26,5	94,6	28,0	15	309	309	33,6	120,0	09:12	03:27	12:39
Vessel3	33,8	88,4	38,2	12	143	143	36,7	96,0	03:53	00:00	03:54
Vessel4	34,5	91,0	37,9	16	574	574	48,5	128,0	11:49	00:01	11:50

Overview   Percent   Equipment   Time line   Standby

All
Forklift
Gantry crane
Straddle

VI   VO   TI   TO   RI   RO   IM   SF   WT   ST   OE

00:07 00:41 01:14 01:47 02:21 02:54 03:27 04:01 04:34 05:07 05:41 06:14 06:47 07:21 07:54 08:27 09:01 09:34 10:07 10:41 11:14 11:47 12:21 12:54 13:27 14:01 14:34 15:07 15:41 16:14 16:47 17:21 17:54 18:27 19:01 19:34 20:07 20:41 21:14 21:47 22:21 22:54 23:27

Optimisation Tools for Container Terminals

high

Level of detaill

low

CHESS**CON**
VIRTUAL TERMINAL

CHESS**CON**
SHIFT PREVIEW

CHESS**CON**
YARD VIEW

CHESS**CON**
SIMULATION

CHESS**CON**
CAPACITY

CHESS**CON**
TERMINAL VIEW

preplan. > planning > start-up > operation

Cites from NTB – North Sea Terminal Bremerhaven

a joint venture of APM Terminals and the Eurogate group

- **CHESSCON Shift Preview was developed out of our demands for a fast simulation of the current state of shift planning.**

- **Together we (NTB) and ISL Applications GmbH defined a module, which is based on operational as well as IT expertise.**

- **The result is easy to use and supports short term optimisation of the day-to-day shift planning.**

Why Shift Preview ?

→ **Terminals,**

which today are not in the position to analyse their operation predictively,

are living yesterday

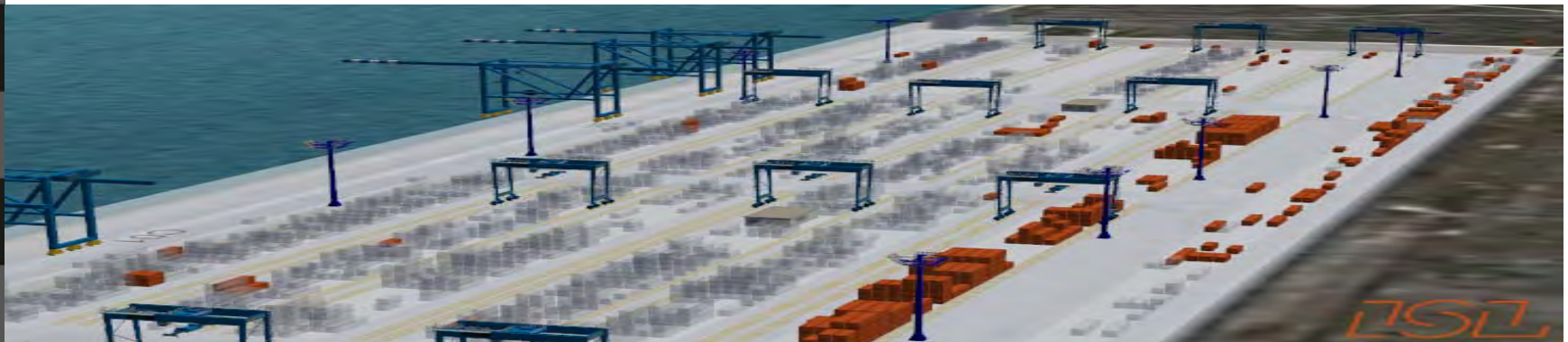*Marc Dieterich, Operations Manager at NTB*

Conclusion

Simulation to optimise terminal's processes may be used

- Within new types of advanced training

- To visualise terminal's realtime state in 3D

- To verify and optimise the current shift planning

MAKE YOUR RIGHT MOVES!

CHESSCON
VIRTUAL TERMINAL

WWW.CHESSCON.COM