

Modern interface between the TOS and the Crane Control System

Markus Christerson, Manager Product Management, ABB AB, Crane Systems

A modern container terminal needs an interface between the Terminal Operating System (TOS) and the crane control system onboard the cranes. If the terminal includes fully automatic cranes, it is an absolute necessity to be able to send work orders directly from the TOS to the cranes. Moreover, for cranes with semi-automation, where the automatic cycle is started and supervised by the operator onboard the crane, it is convenient with a direct interface with the TOS. The alternative is that the operator manually has to type in the target coordinates or input the target via a touch screen. Even for manual cranes, it could be useful to have an interface with the crane control system to be able to present work orders to the operator on the screens in the operator's cabin, which are nonetheless needed to control the crane.

Due to the large variety of terminal operating systems on the market, ABB has developed a special protocol – ABB Application Layer Protocol – to simplify the interface. This protocol handles communications between the TOS and the crane control system. The ABB protocol is based on the internet concept and acts as an application layer on top of TCP/IP or UDP/IP. In the protocol, the message format is defined and different standard messages are used to send information to the crane or to request information from the crane. On the crane, the messages are translated and communicated to the crane controller. Messages that can be sent are, for example:

- Crane set-up messages, such as 'Crane on' and 'Automatic mode'
- Work orders, such as 'Pick up from chassis'
- Crane status reports, such as 'Job done' or 'Ready to receive orders'
- Crane position reports, such as 'Gantry position'

The TOS side of the interface can be configured in two different ways – either the ABB protocol is implemented in the TOS, or an additional intermediate system translates the work orders into the ABB protocol. The first method has been used for Euromax in the Netherlands, Hanjin Shipping in Korea and Pusan Newport Company in Korea. Euromax uses a Navis system and the crane interface with the ABB protocol is implemented by Netherlands-based TBA. Both Hanjin Shipping and Pusan Newport Company use a system from CyberLogitec. The second method has thus far been used at the Taipei Port Container Terminal in Taiwan. They use a system developed by Evergreen. This intermediate system is a centralised system, i.e. not located onboard the cranes, and the main task is to retrieve work orders from the TOS database, and then translate them into the ABB protocol and distribute the messages to the individual cranes. The system optimises the work of automatic stacking cranes within a block. In this case, a list of work orders is first created for one block, and through optimisation, individual work orders for each crane in the block are then selected. This is done by simulating various ways of executing the work orders and then choosing the way that best utilises the cranes in the block.

The crane control system creates its own 'blockmap' where information about all containers in the block is stored. Each work order is checked against the blockmap to ensure that it is valid. If the work order is invalid, it is rejected, e.g. a set-down order to an already occupied position.

The trend is that cranes are becoming more integrated in the terminal operating systems, but also that supervision and maintenance systems on the terminal level should integrate all the cranes, as well as other terminal equipment. ABB has extensive experience of working with interfaces between cranes and different terminal operating systems, and has developed methods to simplify communications with cranes.

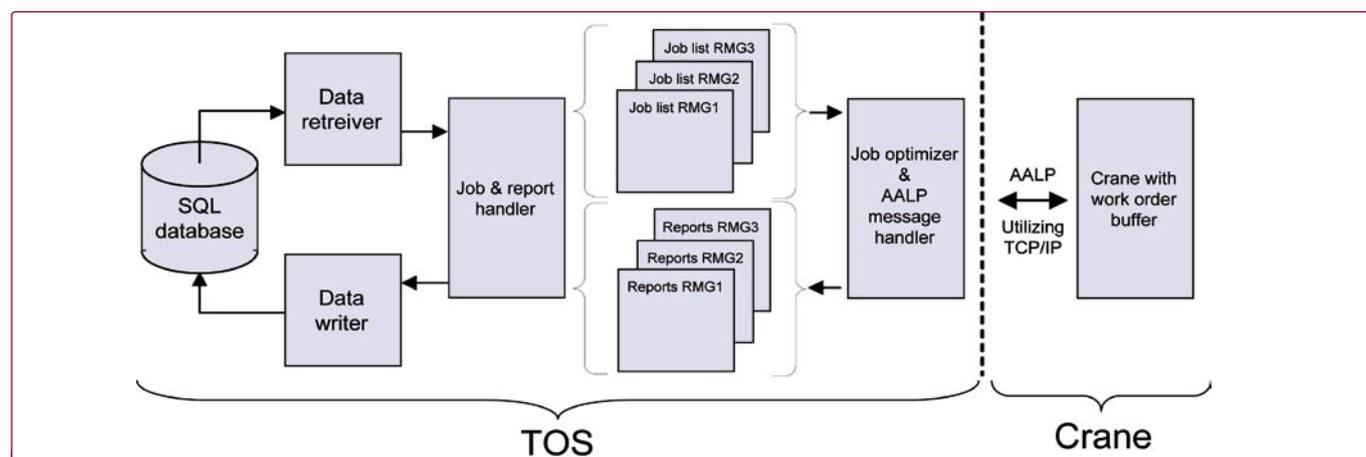


Figure 1. The interface between a TOS and a crane control system with ABB protocol implemented in the TOS.

ABOUT THE COMPANY

ABB AB, Crane Systems' main mission is the efficient and optimised handling of containers, bulk materials and steel products in ports, power plants and steel mills. The productivity and quality of the installations are improved in a cost-effective way by applying total solutions based on knowledge of the customer's processes.

ENQUIRIES

ABB AB, Crane Systems
SE - 721 59, Västerås, Sweden
Tel: +46 21 340 293 Email: markus.christerson@se.abb.com
Web: www.abb.com/cranes