

SmartCom Demonstrator

*Exchange of digital metrological data
in a smart overhead crane*



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Demonstrator use case

“A demonstration for secure exchange of digital metrological data in an industrial end user application”

Use case: Container weight and position measurements in harbours



Demonstrator use case

Since 2016 SOLAS has required that verified gross mass of individual containers must be delivered to the carrier ship operators.

The information is needed for optimizing stowage plans to ensure safety and stability of the ship.

Availability of the data along the route allows tracing of the container and preventing crime.

Demonstrator goal:

An easy-to-use software for secure exchange of trustworthy measurement data

What makes data trustworthy?

From metrological point of view:

- The values of the measurement results are presented with the correct units
- The results are traceable to measurement standards and the SI system
- The device has been calibrated and maintained correctly and measurement uncertainty, i.e., the quality of the data is known

Solutions:

- Digital SI
- Digital calibration certificates

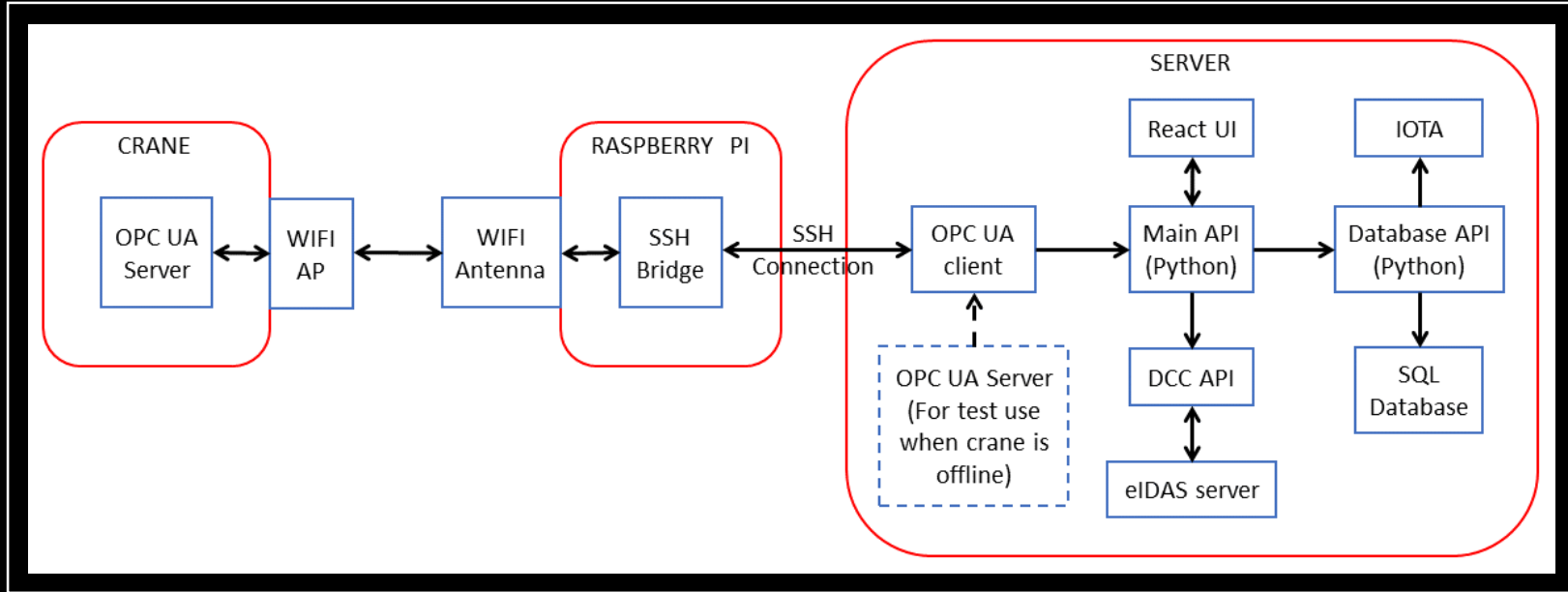
From data security point of view:

- The source of the data can be authenticated
- The integrity of the data can be verified
- Data cannot be added, deleted or replaced afterwards

Solutions:

- Digital signatures/seals
- Distributed ledger technology (blockchain)

Demonstrator architecture





CERACRANE

Crane status

Crane name	Ilmatar
Connection status	ONLINE
Current date	21/01/2021
Current time	12:05:13 (+0 UTC)

Position

Bridge position	2.618 m
Trolley position	4.927 m
Hoist position	1.303 m

Weight

Weight gross	4.778 t
Weight tared	4.778 t

DEVICE DETAILS

Create a new measurement

Container-ID



Created measurement!

Job created

Data fetched from the crane

XML created and signed

XML signature was valid

Waiting for data to be written to IOTA and
database

Job is complete

SWITCH TO SEARCH VIEW

INFO



CERACRANE

Search containers



Ilmatar

21/01/2021, 12:05:00 (+0 UTC)



Container ID: Container-ID

Integrity checks

Crane position

Bridge position: 2.994 m

Hoist position: 1.837 m

Trolley position: 4.607 m

Container weight

Weight: 4.700 t

Tared weight: 4.700 t

Measurement chain is consistent
ISTA confirmed

DEVICE DETAILS

SHOW MEASUREMENT XML

SWITCH TO OPERATOR VIEW

INFO



CERACRANE

Search containers



SWITCH TO OPERATOR VIEW

INFO

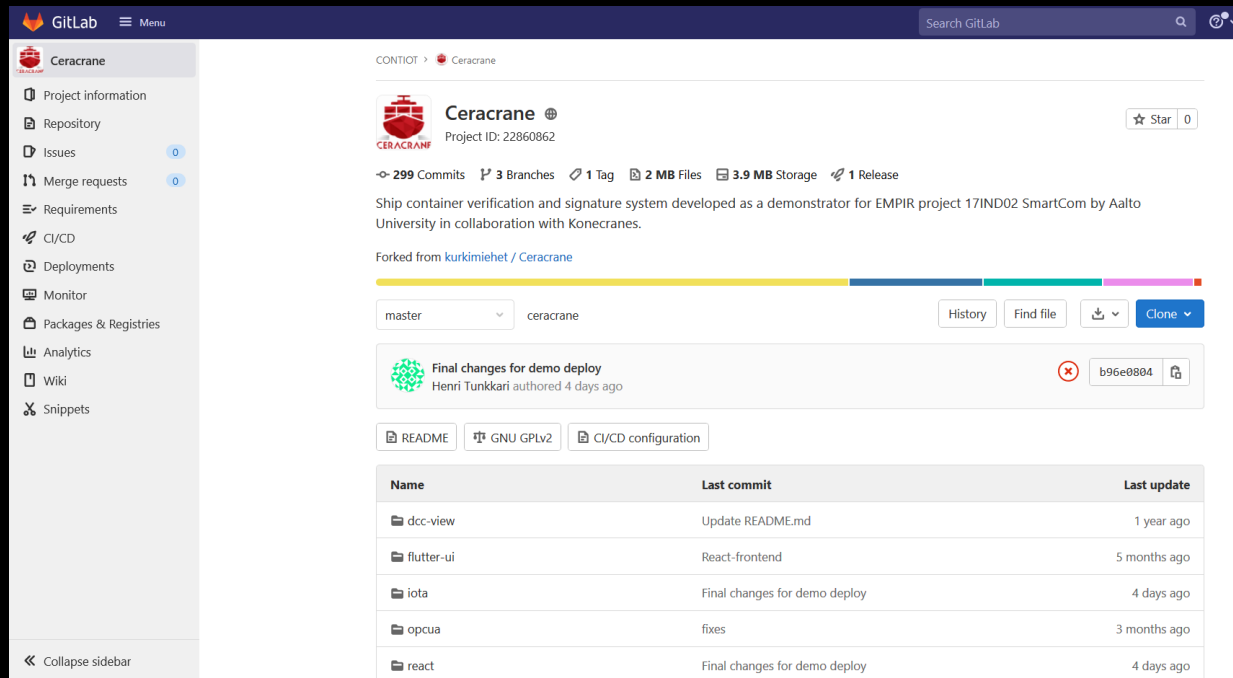
Outcomes

Demonstrator repository @:
<https://gitlab.com/aalto-smartcom/ceracrane>

Signature demo @:
<https://github.com/AaltoSmartCom/dss-demonstrations/tree/master/>

SmartCom deliverable D7:
DOI: 10.5281/zenodo.5522855

Comprehensible paper is
under publication



The screenshot shows the GitLab interface for the 'Ceracrane' project. The left sidebar contains navigation links: Project information, Repository, Issues (0), Merge requests (0), Requirements, CI/CD, Deployments, Monitor, Packages & Registries, Analytics, Wiki, and Snippets. The main content area displays the project name 'Ceracrane' with its logo and Project ID '22860862'. It shows 299 commits, 3 branches, 1 tag, 2 MB files, 3.9 MB storage, and 1 release. A description states it's a ship container verification and signature system developed as a demonstrator for the EMPIR project 17IND02 SmartCom by Aalto University in collaboration with Konecranes. It was forked from 'kurkimiehet / Ceracrane'. Below this is a progress bar and buttons for 'master' branch, 'ceracrane', 'History', 'Find file', 'Clone', and 'Download'. A commit summary for 'Final changes for demo deploy' by Henri Tunkkari is shown. At the bottom, there are buttons for 'README', 'GNU GPLv2', and 'CI/CD configuration'. A table lists the project's components and their last updates.

Name	Last commit	Last update
dcc-view	Update README.md	1 year ago
flutter-ui	React-frontend	5 months ago
iota	Final changes for demo deploy	4 days ago
opcua	fixes	3 months ago
react	Final changes for demo deploy	4 days ago

Acknowledgements

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Thank you for your attention

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