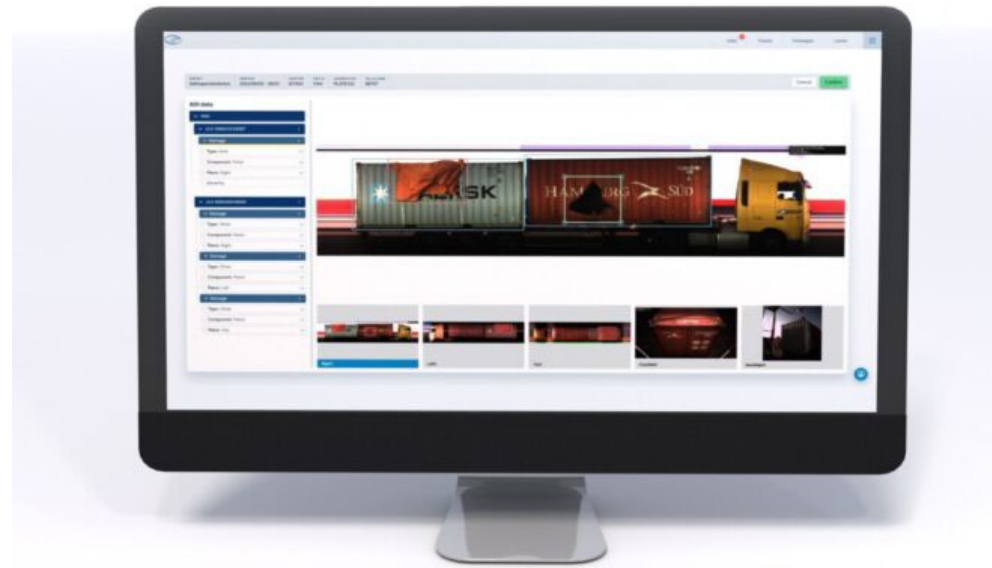


Automated Damage Inspection (ADI)

UIRR Webinar
October 21st, 2025

Bart Grauwels

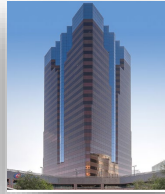




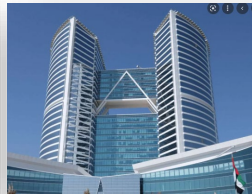
CAMCO Headquarters in Belgium



CAMCO Shanghai Office



CAMCO USA Office



CAMCO UAE Office



CAMCO Australia Office

● 26 Years The longest history

CAMCO established in 1999, with 288 employees becomes the biggest company in terminal automation. CAMCO is the most stable technology company guarantee to provide long term services for her supplied systems.

● Local M&S teams The Efficient Service

With five M&S teams located in Belgium, Abu Dhabi, Shanghai, Los Angeles and Australia, CAMCO provides the 24/7 full time efficient maintenance service globally.

● Design and produce own hardware In-house engineered Solutions

Camco designs, develops and implements its own technologies. Unlike sales organizations or system integrators, we keep total control over our hardware and software, and support a long-term product strategy.

● 300+ Biggest Project Reference

More than **300** container terminals worldwide installed Camco automation systems, it makes Camco the global leader in our industry with the richest experience and knowledge for all types of projects. And same time all the new technology developed by CAMCO are proved.

● Innovation Focus

With a >30 engineers R&D team, CAMCO never stopped innovation, it guarantees the customers of CAMCO have always the most advanced technology in the industry.

What we do, our core business

RAIL AUTOMATION

START PROCESSING TRAINS WITHOUT DELAY AND IMPROVE TRAIN TURNAROUND TIME

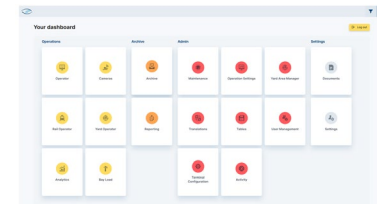
- ▶ OCR RAIL PORTAL
- ▶ RMG OCR CAMERAS
- ▶ RTLS
- ▶ SPREADER CAMERA

YARD AUTOMATION

FROM A STEP BY STEP INTEGRATION TO FULL INTEGRATION OF TERMINAL PROCESSES

- ▶ RFID RTG/RMG TRUCK HANDOVER
- ▶ VMT MANUAL / AUTO JOB STEPPING
- ▶ RTG/RMG OCR CAMERAS
- ▶ ASC KIOSKS
- ▶ RTLS
- ▶ SPREADER CAMERA

THE BRIDGE
Management by Intelligence



RT DIGITAL TWIN



GATE AUTOMATION

THE INDUSTRY REFERENCE IN VISION-BASED GATE AUTOMATION SOLUTIONS

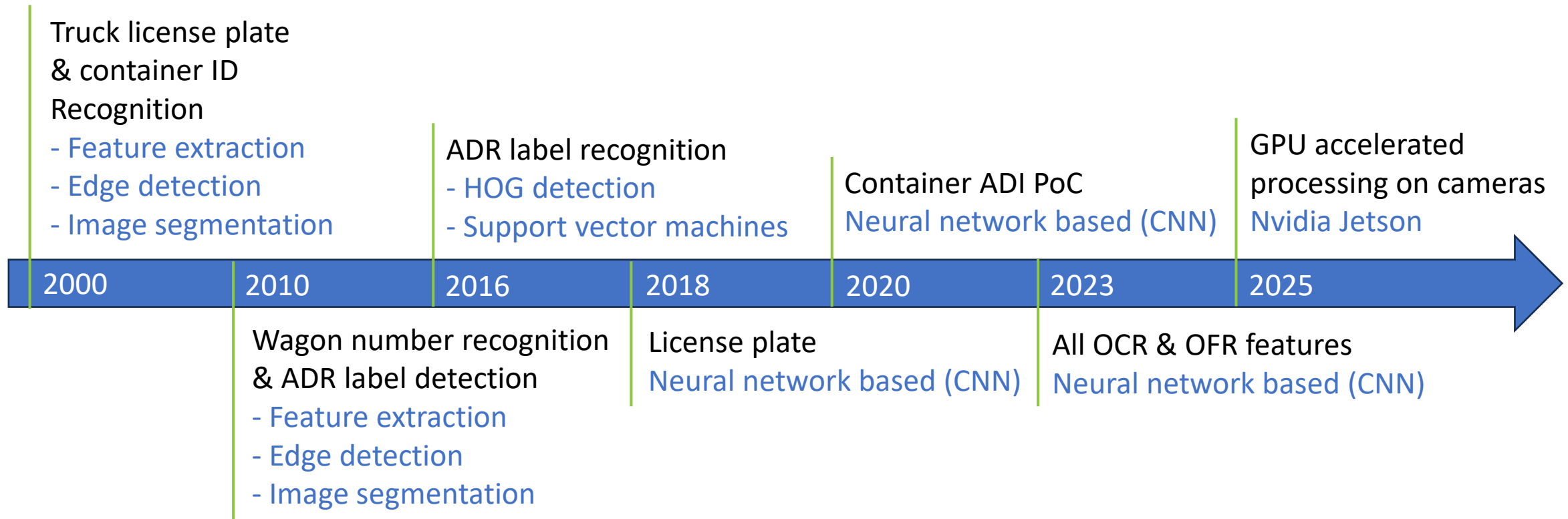
- ▶ OCR PORTALS
- ▶ KIOSKS
- ▶ VBS + ITT VEHICLE BOOKING SYSTEM
- ▶ RFID
- ▶ WEIGHT IN MOTION (WIM)

QUAY AUTOMATION

IMPROVING WATERSIDE OPERATIONS FOR A LEANER, GREENER INDUSTRY READY FOR INCREASING TRAFFIC

- ▶ OCR BOXCATCHER
- ▶ TT AND SC IDENTIFICATION AND ALIGNMENT
- ▶ BLV BAY LOAD VERIFICATION
- ▶ RTLS
- ▶ SPREADER CAMERA

Camco: AI from the Early Beginning



ADI engines are integrated with other Camco image-based solutions for

- Gate
- Rail
- Crane (BoxCatcher)

ADI engines run on the camera (not on the server).

Exception handling is part of The Bridge, 2 modes of supervision:

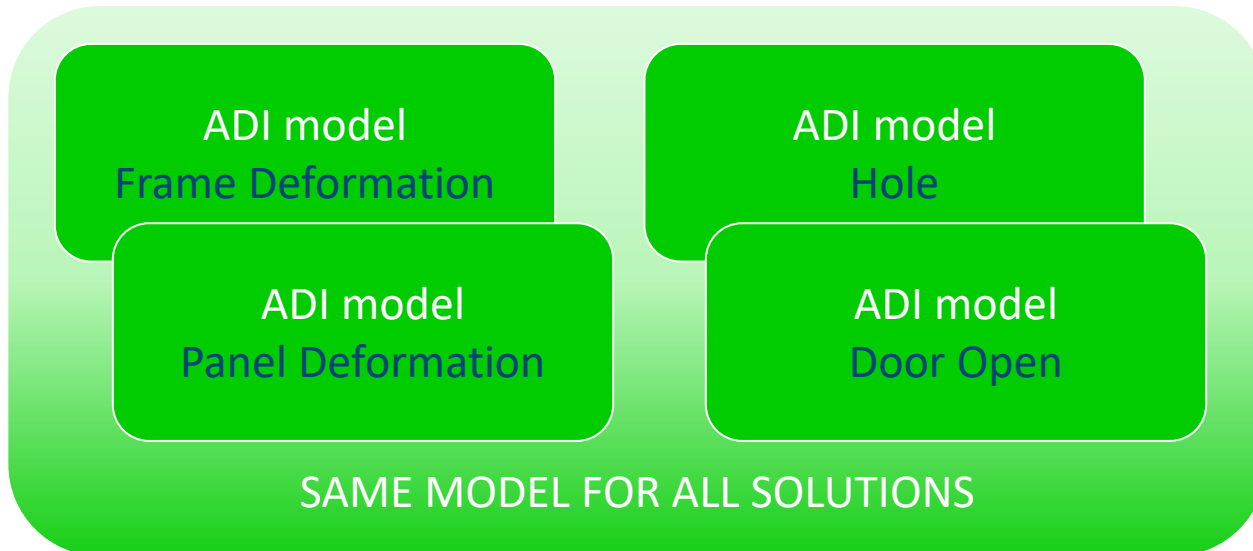
- Blocking – typically major damage (creates ADI job)
- Non-blocking – typically minor damage (logged but no job)

Send damage information to TOS or other system

- Uses damage code translation tables

Camco HQ:

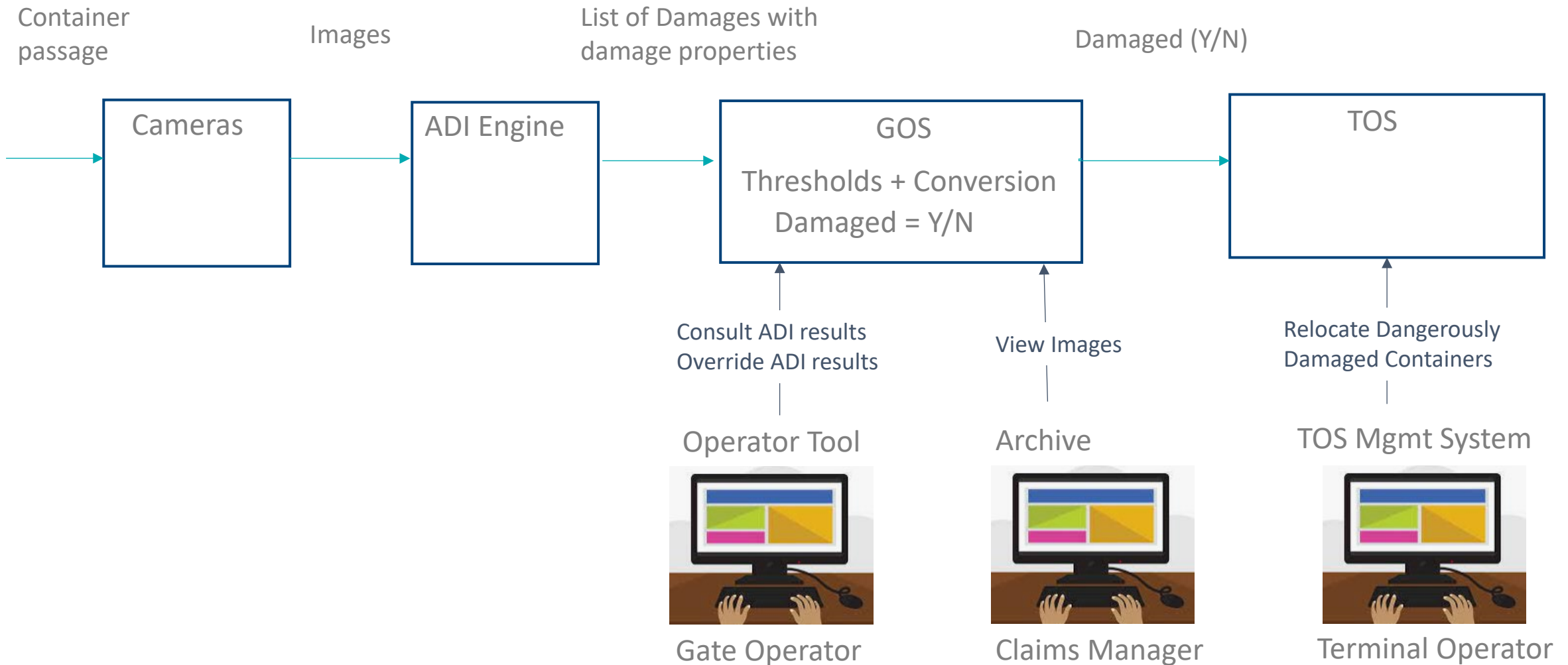
- Human: Collection of picture sets with damage.
- Human: Categorization per component and damage type = labelling process.
- Training of ADI model, one model per component / damage type.



On-site Cameras:

- GATE
- RAIL
- CRANE

ADI Process Steps



SUBJECT	CREATION	LOCATION	VISIT ID	LICENSE PLATE	TID_IH_CARD
AdiInspectionAction	2022/13/05 - 15:39	IGTK01	1144	PLATE123	98757

Cancel Confirm

ADI data

▼ Visit

▼ Unit CMAU1234567

▼ Damage

Type: Hole

Component: Panel

Plane: Right

Severity: Very high

▼ Unit MSKU0010000

▼ Damage

Type: Other

Component: Panel

Plane: Right

Severity: Very low

▼ Damage

Type: Other

Component: Panel

Plane: Left

Severity: Very low

▼ Damage

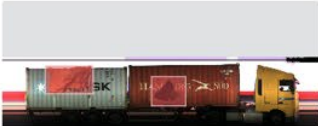
Type: Other

Component: Panel

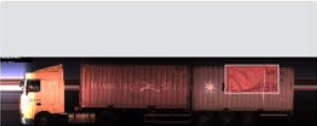
Plane: Top

Severity: Very low

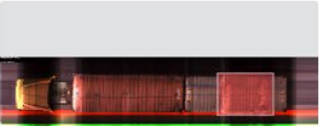




Right1



Left1



Top1



FrontMid1



BackRight1

Camco

- ADI models need to be maintainable.
→ No customer specific ADI models.
- Own ADI definition that is based on current and future capabilities.

MAPPING

Customer

- Different requirements.
- Often own definition.
- Ranging from basic, e.g.:
 - Major / Minor damage
- To detailed, e.g.:
 - CEDEX coding system

Damage Type

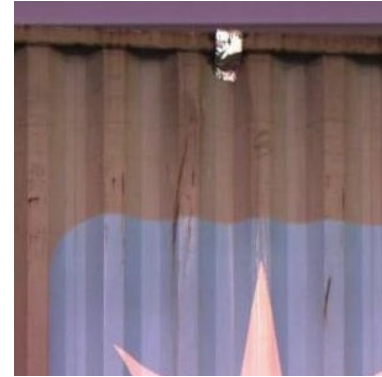
- Deformation



- Hole



- Tape



- Open



Component

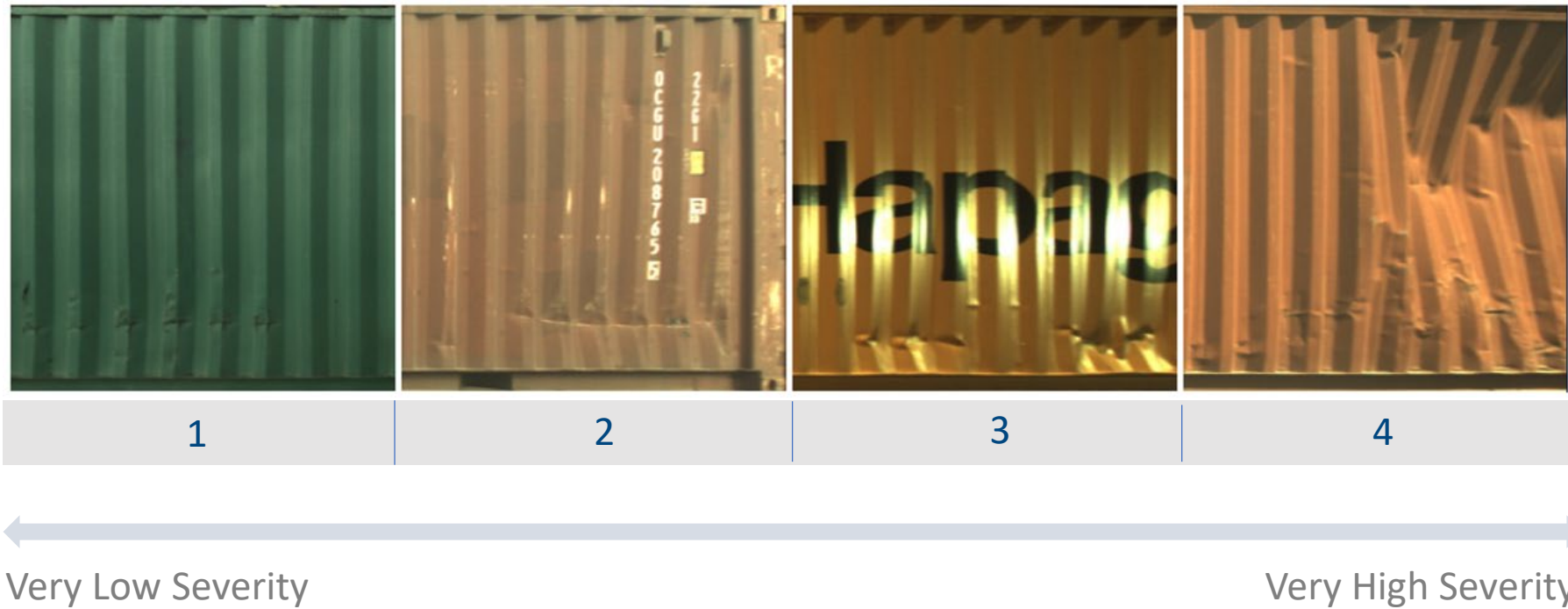
- Corner Cast
- Top Rail
- Corner Post
- Panel
- Door
- Bottom Rail



Location



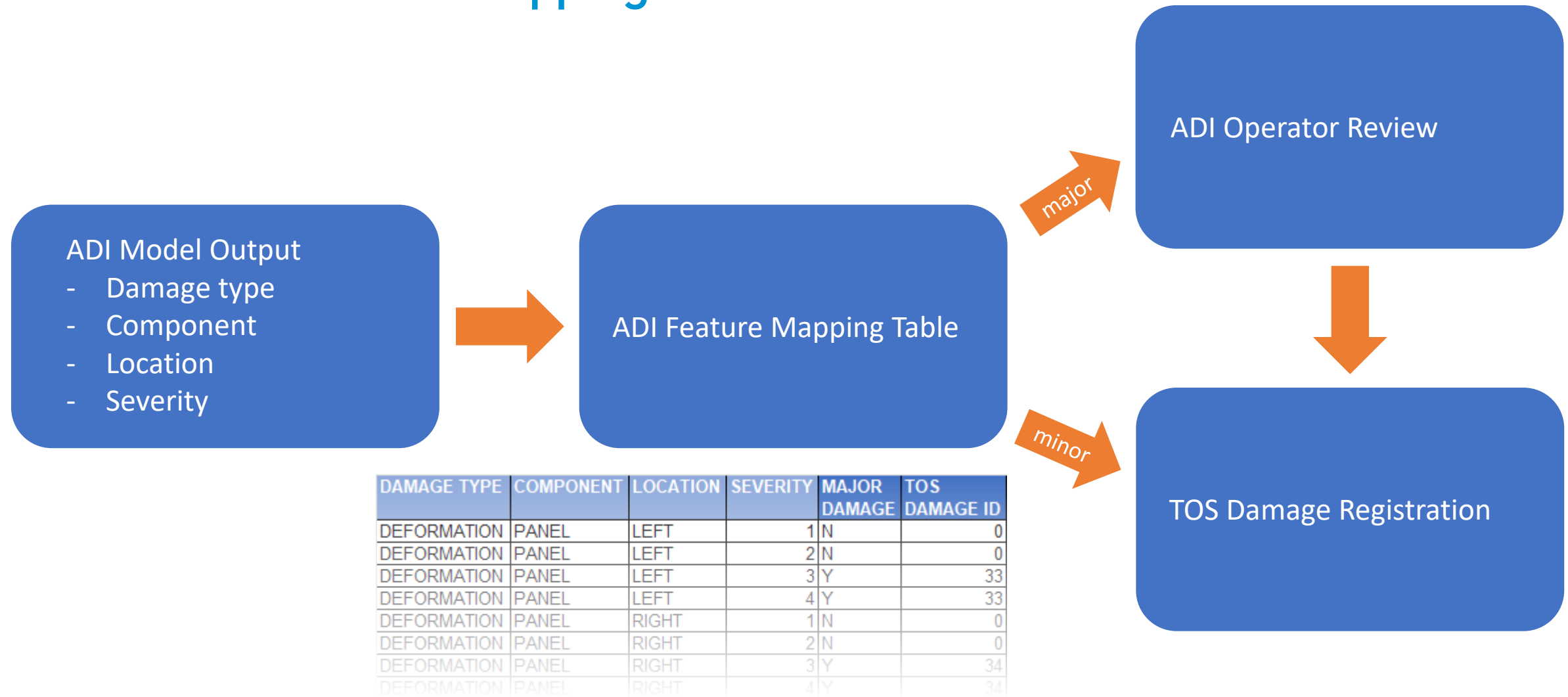
Severity



Damage defined by 4 properties.

Damage Type	Component	Location	Severity
Deformation	Rail	Back	Very low
- Bulging	Corner Post	Front	Low
- Dent	Corner Cast	Left	High
	Door Hinge/Bar/Lever	Right	Very high
Hole	Panel	Top	
- Corrosion	Genset		
- Scratch	Tarpaulin		
	Sideskirt		
Tape	Landing Gear		
	Tire		
Open	Mudflap		
- Door	Underride Guard		
- Handle	Tail Light		

Feature Overview & Mapping



OCR

TERM	DEFINITION
hit rate	$\text{hit rate} = \frac{TOK}{TOK + TNOK} \times 100$ • TOK = Total OK results • TNOK = Total NOK results

- = Accuracy evaluation
 - TOK = True Positives + True Negatives
- Calculated over population of 500 consecutive results for each OCR feature.

Container ADI

- Has >100 combined features.
- Number of True Negatives is largest share.
- Customer is interested in True Positives share (recall).
- Measuring True Positives would require very large populations, i.e. not achievable for each project.
- For now, focus on True Positive and False Positive evaluation by operator in process (precision).

	GATE	• 29 sites • 18 operational with TOS integration
	RAIL	• 4 sites • 1 operational with TOS integration
	CRANE	• 14 sites • 6 operational with TOS integration

Tank ADI

- Structural damage (frame & corner cast deformation).
- Hole detection.
- Open lid detection.

Additional Components

- Door handle and bar deformation.
- Tarpaulin presence / damage check.
- Reefer unit damage check.

Sample Collection

- Continuous effort by dedicated AI trainers.
- Continuous effort to further improve existing models (accuracy, recall, precision).

We automate, you operate.

Thank you!

bart.grauwels@camco.be
+32 479 50 15 84

