How detection technologies and new data sources can help re-design security controls for optimal parcel logistics — Vision of PARSEC project

Frank Janssens[1], Juha Hintsa[2] , Toni Männistö[3]

[1] CBRA Services bv (BE)
[2] CBRA Services bv (BE)
[3] Cross-border Research Association (CH)

1 Challenges and PARSEC goals

Today, the use of detection technologies and risk assessment solutions is rather disconnected and fragmented: the approach of integrated detection architecture is missing in the postal and express domain. This lack of systemic approach complicates the detection of threat materials and illicit goods in postal and express courier flows. PARSEC project improves this situation by linking data-driven targeting processes more closely with the use of detection technologies. It also develops and tests next-generation non-intrusive detection technologies, which screening capabilities go beyond traditional X-rays, sniffer dogs, and material trace detectors in terms of detection accuracy, speed of screening, and range of threat materials identified.

The PARSEC architecture or system-of-system will be modelled and optimized for both the logistics and detection goals, thereby combining the needs of postal and express operators versus customs and law enforcement agencies. Effective and integrated detection technologies, that are optimised for postal and express processes, will deliver higher capability for law enforcement practitioners and operators to detect threats and dangerous and illicit goods without disrupting the traffic of parcels and letters.

The project operates as an interdisciplinary faculty of security management, operations research, data science, applied radiography, applied particle physics, supply chain management, criminology, and innovation management. These disciplines interrelate with the technologies of the four PARSEC innovation areas

- data-analytics on combined data; multi-energy photon counting transmission and selected angle diffraction; full X-ray diffraction; and neutron-induced gamma-ray spectroscopy - and their combination into a PARSEC architecture.

PARSEC pools customs authorities and police as well as postal and express operators as end-user partners, and research and technology partners, in joint work. Methodologically such cross-disciplinary interaction works at best by doing real practical experiments. In PARSEC this is carried out through the three use-cases: Multi-threat risk assessment; Illicit drugs detection; and People safety to counter explosive and CBRN threats.

2 PARSEC architecture and integrated tools

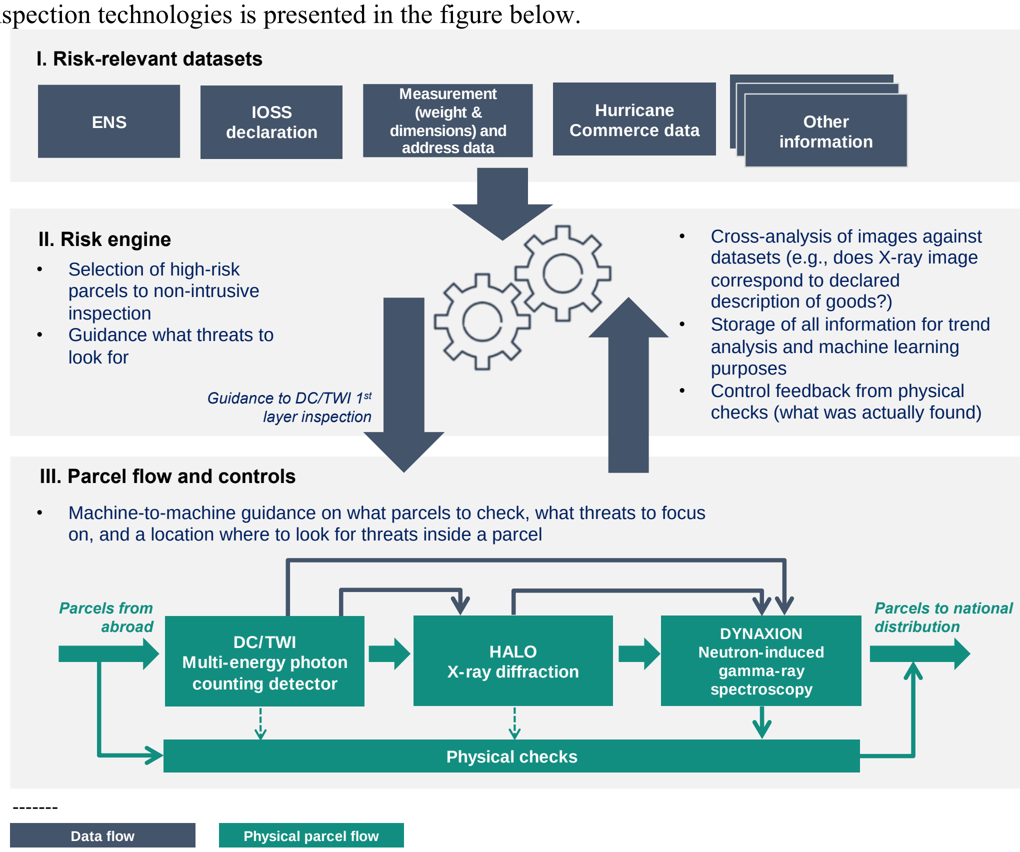
By the end of the project, PARSEC aims to deliver a comprehensive blueprint, grounded on exhaustive engineering work and practical trials, on the total PARSEC architecture, consisting of following three key elements: risk-relevant datasets; risk engine with advance data analytics; and a process for controlling parcel flows with non-intrusive and physical inspection techniques.

The first element of the architecture, access to risk-relevant datasets, provides PARSEC partners the best available datasets on parcel flows, including declaration data, operational data from postal operators, and proprietary datasets from third parties like Hurricane Commerce.

The second element— the risk engine — integrates all this information and applies advanced data analytics to identify high-risk patterns in the data. With access to data on postal and express traffic, the risk engine allows customs and other stakeholders to identify high-risk parcels earlier and more accurately, and to determine which parcels should be selected to control and to what extent, where, when, and with which techniques the selected goods should be examined.

The third element of the architecture covers the physical flow of parcels and controls of high-risk parcels with non-intrusive detection technologies and physical checks. The PARSEC architecture will combine the data-driven risk assessment with the three stages of non-intrusive inspection technologies, multi-energy photon counting detector, X-ray diffraction screening, and neutron induced gamma-ray spectroscopy.

There are several interdependencies between risk-relevant datasets, the risk engine, and the parcel flow and control process. Risk-relevant datasets feed into the risk engine and provide raw data for preliminary selection of parcels for inspection. In other words, at this stage, the risk engine points out what parcels should be subjected to non-intrusive inspection and for what threats these inspections should look for. In the PARSEC architecture, the non-intrusive inspection technologies work in sequence, communicating to one another about parcels that require further inspection, what threats should be focused, and where inside a parcel, suspicious items may be located. There is a feedback loop of information between non-intrusive inspection and the risk engine: data from inspection stations will be used to cross-analyse, for example, whether X-ray images correspond to the goods that are stated in the customs declaration. This feedback is also used for trend analysis and machine learning purposes. The overview of the interlinked risk-relevant datasets, risk engine and non-intrusive inspection technologies is presented in the figure below.



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PARSEC
Parcel and Letter Security for Postal and Express Courier Flows
Ensuring and safeguarding fast, reliable, cost-efficient and resilient postal, express courier and e-commerce flows and services.
METICOS
Control Technology