



Biometric Kiosks for Border Control

Bento Correia



Presentation

1. Vision-Box

2. VBePASS Technology

3. Face Processing

4. VBePASS kiosks

5. Results

6. Future Perspectives



Our Mission is....

...to Develop

... to Produce

...to Deliver



Technological Competencies

- Biometrics
- Computer Vision & Digital Image Processing
- Image & Video Compression
- Software Engineering / Electronics
- Operating Systems & Network Engineering
- Image & Video Databases
- Information Systems

Product Portfolio



VBS-RT

- 4,8,16ch. cameras
- Real-Time Display
- 400 fps capture
- 16 ch. IP-cameras
- 1TB storage
- 30 days recording




VBS-SQ

- 4,8,16ch. cameras
- Real-Time Display
- 400 fps capture
- 16ch. IP-cameras
- 6 TB storage RAID5
- Video Content Analysis



Sentry Central

- Real-Time Display
- Video-Wall set-up
- Monitoring station for playback, logs, alarm-spots, smart-search, real-time content analysis



VB-ePASS

- Biometric Live Enrollment and verification stations:
- Face, Fingerprints, Signature, ...



VB-eGATE

- Smart Gates for electronic border control:
- e-Passport match to chip
- Face and Fingerprint

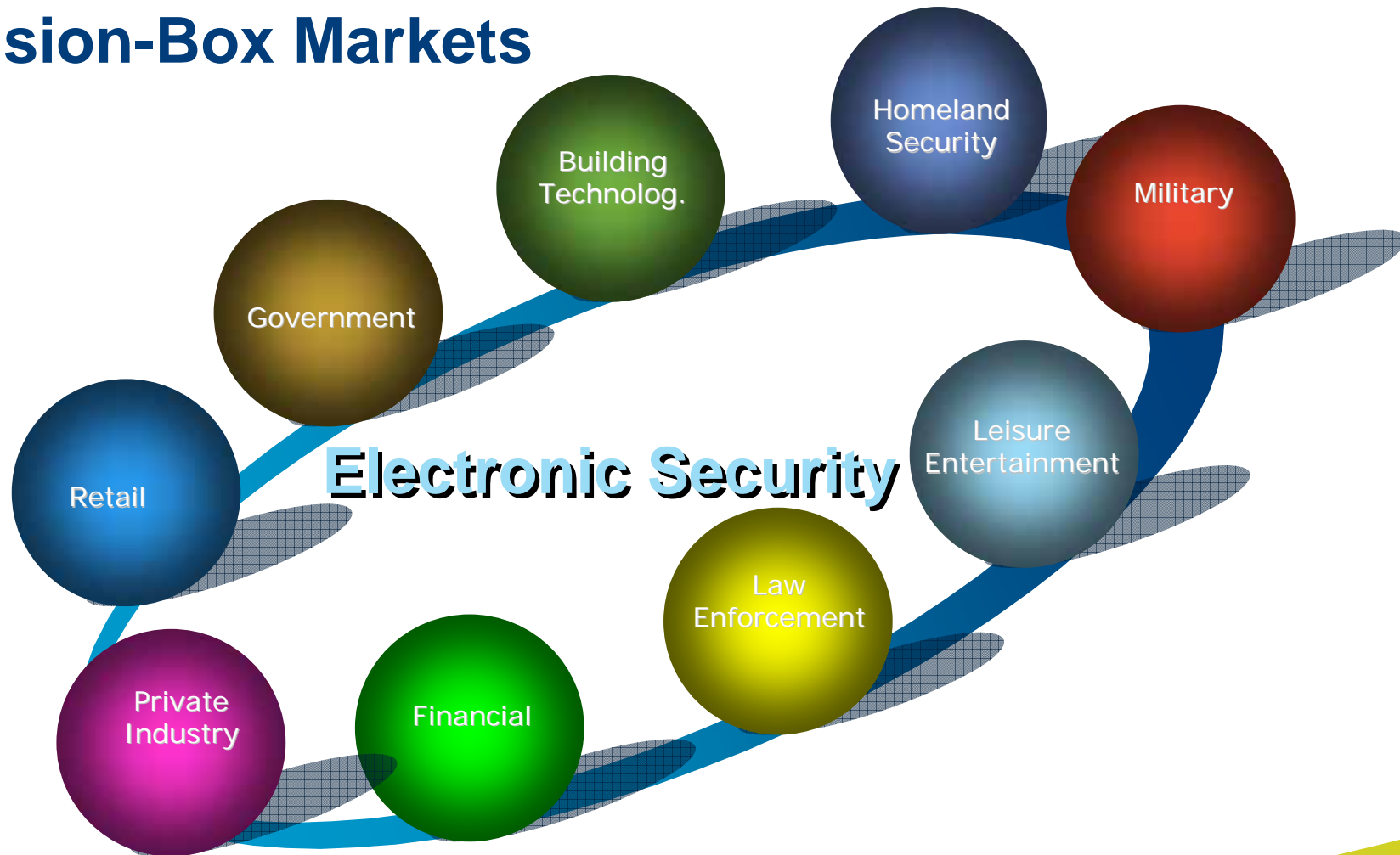




Vision-Box Competitive Advantages

	Competitive Advantage
Video Capture	16 channels @ 400 fps ; 32 channels @ 600 fps - real time per channel
MPEG4 Compression & Recording	MPEG4: 16 channels @ up to 400 fps ; 32 channels @ up to 600 fps
MPEG4 Streaming	High-resolution video transmission @ low bit-rates @ high number of cameras in the network
IP-Network	Client-Server architecture, independent from centralized or distributed systems using analog-ip-cameras or mixed camera solutions
Database	Efficient for continuous video stream recording and indexing, low maintenance, fast data retrieval and increased lifecycle for recording HW
Storage	Local, NAS or HSM, transparent for user 4 TB Raid 5 SATA or SCSI storage up to 60TB in HSM configuration
SentryCentral	All features and modules are integrated in one single multi-screen application, including content analysis (CA) and biometrics (BM). Any CA or BM function can be allocated to any camera within the network
Content Analysis	License plate recognition, people tracking and counting, abandoned objects, stolen objects, queue-management, facial recognition and database comparison, anti-skimming
Biometrics	Facial recognition and fingerprint recognition and enrolment with quality assessment compliant with international standards ICAO

Vision-Box Markets





References

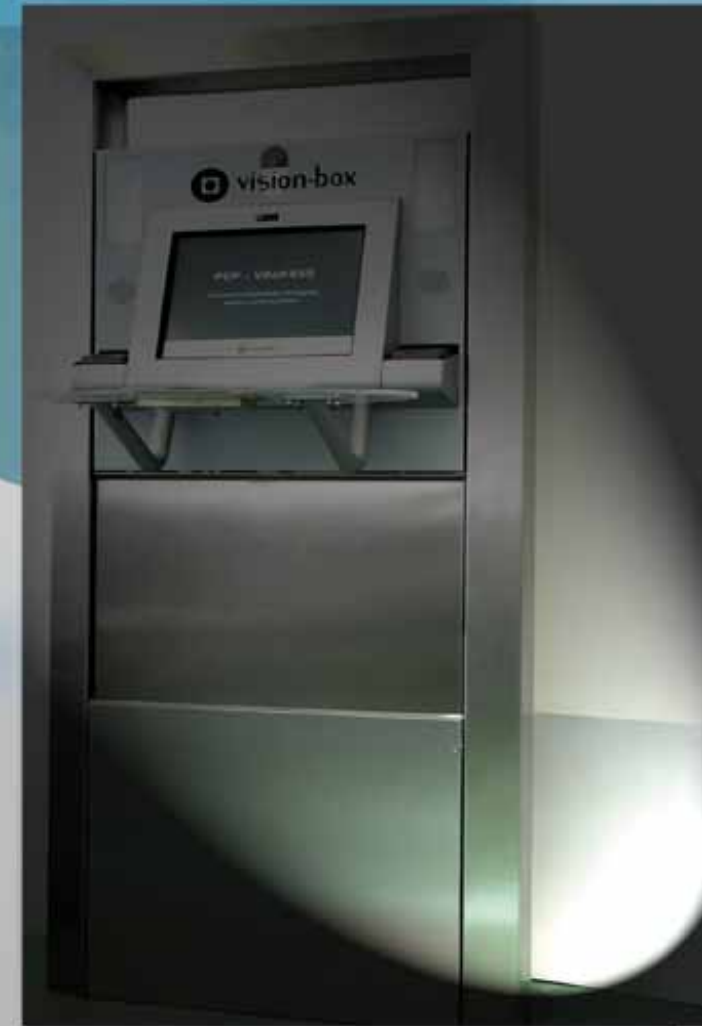
- **Banking:** Esegur, BBVA
- **Telecommunications:** Novis, Telefónica
- **Retail Parks:** Freeport, Sonae, MDC, Amorim Groups
- **Casinos:** Póvoa Varzim, Lisboa
- **Infra-structures:** Águas de Cascais, EDP
- **Security Distribution:** Siemens, Norbain
- **IT Distribution:** Sun Microsystems, IBM
- **e-ID:** Portuguese Electronic Passport, Smart Gates, National Identity Card

Vision-Box “SentryCentral”



- Enables a decision making environment for complex surveillance and control procedures
- Simultaneous display of live and recorded images from remote DVRs
- Real-Time status display and external event triggered camera mosaics
- Intuitive tracking of people, cameras, sensors and alarms through interactive maps, on-line content analysis with graphical alerts and spots
- Scalable system, easy to integrate with 3rd party fire alarms, access control systems and domotic or biometric sensors
- Compatible with vision-box video servers NET, RT and SQ DVR Series

VBePASS



Live
Biometric Enrollment
Kiosks





VBePASS®

- Solution of **live biometric enrollment kiosks** that optimize the performance of recognition systems
- Integrated acquisition of high quality biometric data
- Provide ground-truth and reliable information for further live matching of face and fingerprints
- For guaranteeing the implementation of an high performance system aiming the automatic recognition of travellers with electronic identity travel documents
- Self-contained front-end platforms that perform the simultaneous capture of the Face image, Fingerprints and Electronic Signature



VBePASS[®] Background

- **9/11 – Homeland Security**
- **Constraints for immigration and travel activities**
- **World-wide adoption of ICAO regulations for machine readable travel documents (MRTD) to increase the global security of travellers and citizens**
- **US Visa Waiver program**

Biometric Recognition Technologies

- Iris
 - Immigration trials in Germany and UK have proven difficult
 - Requires cooperative subject to be physically present
- Hand geometry
 - Used mainly for access control
 - Requires cooperative subject to be physically present
- Fingerprint
 - Law enforcement standard
 - Requires cooperative subject to be physically present
- Face
 - Chosen by the International Civil Aviation Organization as a standard
 - Comparable to other biometric technologies in accuracy
 - Only currently viable technology that can be used as verification AND lookout
 - Subject does not have to be physically present to perform identification

Face Image Acquisition

- The image must be:
 - A close up of your head and top of your shoulders so that your face takes up 70–80% of the image
 - In sharp focus and clear
- The image must:
 - Show you looking directly at the camera
 - Show your skin tones naturally
 - Have appropriate brightness and contrast
 - High quality colour
 - Constrain and define directly the architecture of the kiosk: camera adjusts the position to the height of the user's eyes
- Expression and frame:
 - Show you alone (no chair backs, toys or other people visible),
 - Look at the camera with a neutral expression
 - Mouth closed

Face Image Acquisition - Style and lighting

The Images must:

- Be colour neutral
- Show your eyes open and clearly visible - no hair across your eyes
- Show you facing square on to the camera, not looking over one shoulder (portrait style) or tilted
- Showing clearly both edges of face
- Be taken with a plain light-coloured background
- Be taken with uniform lighting and not show shadows or flash reflections on the face
- No red eye

If you wear glasses:

- The picture must show your eyes clearly with no flash reflection off the glasses,
- No tinted lenses
- If possible, avoid heavy frames - wear lighter framed glasses
- Make sure that the frames do not cover any part of your eyes.

Head coverings:

- Are not permitted except for religious reasons
- Facial features from bottom of chin to top of forehead and both edges of face must be clearly shown.



too close



too far away



hair across eyes



eyes closed



dark tinted lenses



flash reflection on lenses



blurred



ink marked/creased



portrait style



eyes tilted



frames too heavy



frames covering eyes



looking away



unnatural skin tones



busy background



not centred



wearing a hat



wearing a cap



too dark



too light



lash reflection on skin



red eyes



face covered



shadows across face



washed out colour



pixelated



shadows behind head



shadows across face



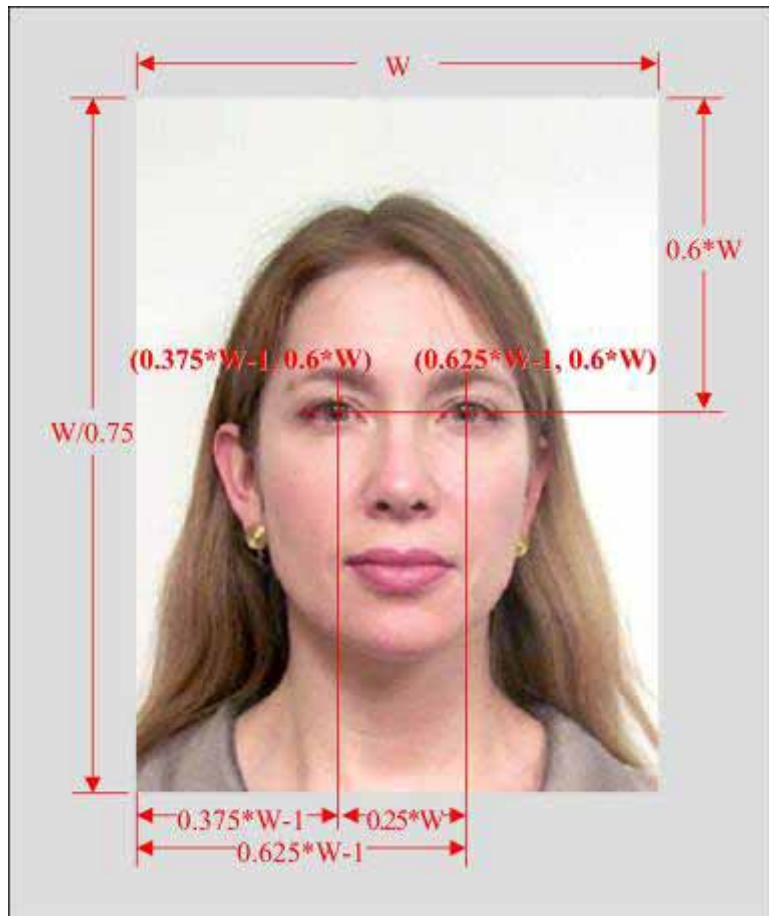
shows another person



mouth open and too close to face



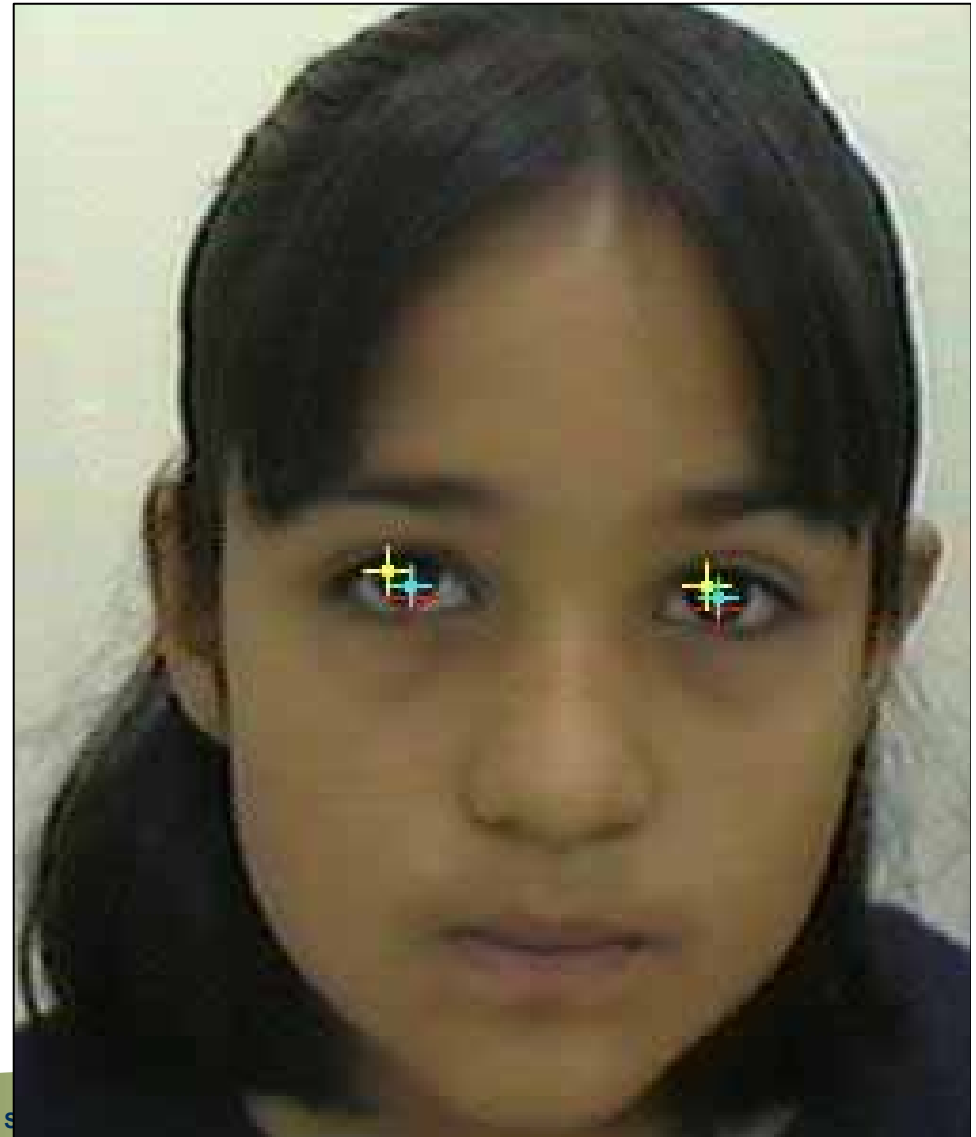
ICAO Face Encoding Standard



- Normalization ensures images are converted to ICAO standard
- This is an essential step in providing usable face recognition for future systems
- Optimized for further recognition

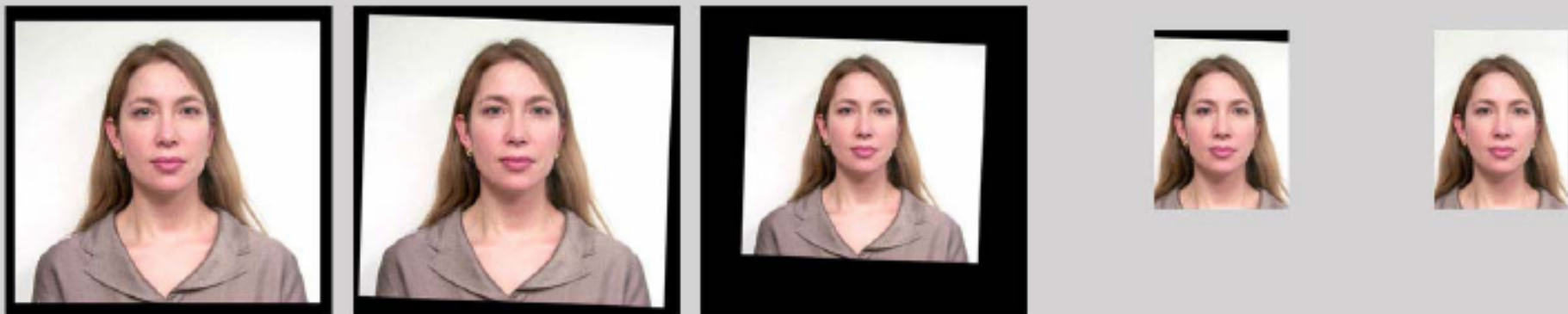
Eye Finding

- Eye Finding Technology Created To Realize Improved Face Recognition Performance
- Essential step in the facial image **normalization** process



Facial Image Normalization Process

1. Locate Eyes
2. Determine eye line and distance ω
3. Rotate head
4. Crop
5. Resize based on ω for ICAO compliance
6. Colour balance



VBePASS® Kiosk Models

Two main types of biometric live enrollment kiosks:



- Totem based unit **K-PEP**
 - Automatically adjusts the position of a moving module integrating all the biometric devices according to the height of the user
 - Automatic height adjustment of all sensors for easy access to any tall person, small person, young child and disabled in wheelchair
- Mobile unit **M-PEP** optimized in volume and weight
 - Easy transportation
 - Enrollment of disabled people
 - Applicable to all situations in which the user does not go into an enrollment site but instead the enrollment station goes to the end-user for its biometric data capture



Quiosque Móvel de Captura de Dados Biométricos

- Plataforma " TUDO em UM"
- Capacidade de recolha de dados Biométricos num único equipamento
 - Reconhecimento Facial
 - Impressão Digital
 - Assinatura Digital
- Validação interna da qualidade dos dados biométricos, de acordo com as normas internacionais:

ICAO, Doc. 9303 Part 1, Volume 2
ISO / IEC FCD 19 794, 19785
ANSI / NIST
WSQ for FBI

- Captura em 90 segundos
- Utilização Intuitiva e Amigável.



VBePASS[®] Workflow

1. Automatic height adjustment
2. Automatic adjustment of illumination
3. Capture face & quality access
4. Normalize: rotate head, crop, color balance, comply with ICAO
5. Capture both fingerprints simultaneously and quality access
6. Capture signature and quality access
7. Present all data to user and operator
8. Repeat any enrollment step if required
9. Save and send all data to production



K-PEP Workflow



VBePASS® Solutions

- Robust design
- Maintenance free mechanics
- Convenient either for small and tall users, including children and people in wheel-chairs
- Small footprint
- Easily installed in office spaces
- Very intuitive operation





VBePASS[®] Features

- Internal processing power, for immediate quality assessment and normalization algorithms, generates production-ready ICAO and NIST compliant biometric data
- On-line enrolment in less than 90 seconds
- Automatic eye finding and height adjustment covering 1.20 to 2.10 meters
- Perfect horizontal alignment between camera and user eyes for ideal face capture conditions



VBePASS[®] Features

- Easy deployment: integrated wheels on base allow easy moving inside buildings. Shell frame allows for easy transportation and setup all around the globe, as already happened in a unique system world wide, for the deployment into embassies and consulates.
- Efficient programming interfaces compliant with standard API formats permit a fast and easy integration with centralized life-cycle management e-ID solutions – Portuguese Electronic Passport and National Identity Card.

VBePASS[®] M-PEP

- The mobile enrollment station was developed for solving situations of difficult access in which a totem unit is not easily adapted as imposing a fixed location and definitive infrastructure
- Very convenient for allowing the enrollment of disabled people either at home or in hospitals and can be easily mounted for campaign enrollments and at military operation theatres.
- The mobile enrollment unit presents **two independent modules assembled in a rugged executive case, namely the processing module and the removable biometric module** that integrates all the biometric devices required by ICAO regulations.

VBePASS[®] M-PEP





VBePASS[®] Regulation Compliance

- All the data generated at the VBePASS[®] live enrollment kiosks are quality assessed and fully compliant with all the existing international standards for machine readable travel documents (MRTD):
 - ICAO Doc.9303 Part 1, Vol.2 – Biometrics in MRTD
 - ISO/IEC FCD 19794 (Face Image), 19785
 - NFIS – Fingerprint quality ANSI/NIST
 - WSQ fingerprint data format



Market Applications

- Electronic passport industry
- Border management
- National identity cards
- Driver's Licenses
- Law Enforcement
- Secure access control
- Smart cards
- Government Employee IDs
- Finance & Consumer
- Healthcare



 vision-box







VBePASS[®] K-PEP kiosk Variations

- Shelve without pad
- Shelve with special fingerprint device for 4 fingers capture at once
- Several alternatives of fingerprint readers, from Crossmatch and Sagem
- Software platform very versatile can be easily adapted to accommodate new processes and to integrate any e-ID lifecycle management system



Biometric Kiosks for Border Control

Bento Correia

