

# MegaMatcher Case Study



## Republic of Indonesia Biometric Passport System

Implemented by the Directorate General of Immigration  
and X/LINK Software - Based on MegaMatcher Technology

*The Republic of Indonesia uses MegaMatcher multi-biometric technology  
for Integrated Biometric Passport Issuance System*

Indonesia, a nation of islands with a large and widely spread geography, has updated their passport issuance system, increasing the speed and accuracy of document preparation, verification and delivery. PT. Berca Hardayaperkasa, working with X/LINK Software, developed a distributed passport issuance system with a centralized biometric matching component that delivers fast and accurate processing of passport applications.

After evaluating a number of biometric systems, X/LINK determined that Neurotechnology's MegaMatcher provided the best combination of high degree of accuracy, identification of duplicate registrations, exemplary technical support and a low total cost of ownership.

The Directorate General of Immigration of the Department of Law and Human Rights of the Republic of Indonesia selected PT. Berca Hardayaperkasa, working with X/LINK Software, to replace their existing passport issuance system with a distributed-node/centrally-processed biometric-matching system. X/LINK developed a system that captures data and biometric images at any Immigration Office across the nation. The resulting data and images are automatically forwarded to the Immigration Headquarters in Jakarta for consolidation and identification. The result of the identification is returned to the Immigration Office which can then continue with passport production for those found eligible.

With such large amounts of data streaming from so many client sites, the search for duplicates and disparities is a complicated task given the large number of required matching operations and the need for a high degree of reliability. After careful study from all the participants of the Passport Issuance System tender, the Directorate General of Immigration chose Neurotechnology's MegaMatcher as the ideal solution for Indonesia's Integrated Biometric Passport Issuance System.

### Background

- ◆ **The customer:** Indonesia, with geography that encompasses more than 17,000 islands, is the world's fourth most populated nation.
- ◆ **The need:** With such distributed geography, and over 100 passport offices around the country, the Directorate General of Immigration of the Republic of Indonesia needed a distributed, fast, accurate and reliable enrollment, verification and issuance technology for their passport system.
- ◆ **The integrator:** X/LINK Software was selected to implement the biometric passport system. Based in Jakarta, Indonesia, X/LINK Software provides advanced connectivity and transactional infrastructure solutions for financial, telco and governmental agencies.
- ◆ **The solution:** Neurotechnology's MegaMatcher multi-biometric facial recognition and fingerprint technology was chosen as the core enrollment and identification engine for Indonesia's Passport Issuance System solution.

*“Neurotechnology is a master of biometric technology with an excellent technical team.”*

Mr. Nunung Halim  
Director, X/LINK Software

## MegaMatcher Provides Ease of Use and Development Flexibility

Each Immigration Office in Indonesia’s new passport issuance system uses a Linux Server and a set of browser Clients running on Windows XP. This web-based application was developed using MegaMatcher Client and features Workflow Audit Trail, Integrated Biometric Capture, Automatic Image Quality Check and Passport Production with Quality Assurance, as well as supporting the ICAO (International Civil Aviation Organization) standard. Data is stored on a local MySQL database.

At the Immigration Office Headquarters in Jakarta, the Biometric Matching System is built on top of a MegaMatcher Server solution. It runs on a scalable Linux server farm and performs the N-to-N or 1-to-N identification of the data received from the Client sites.

Along with help from Neurotechnology, X/LINK developed a migration tool for existing data. Over the course of two months, X/LINK error-checked and migrated existing face and fingerprint imagery.

### Key Benefits:

- ◆ MegaMatcher accurately and rapidly enrolls applicants and identifies duplicate face and fingerprint records in Indonesia’s large database.
- ◆ System helps monitor and reconcile related revenue
- ◆ Fully automatic, the robust and fault tolerant software efficiently manages the large workload.
- ◆ The MegaMatcher SDK offers interoperability and flexibility that enables the system to easily work with a variety of other software and hardware.
- ◆ Low cost-per-unit and low hardware system requirements make MegaMatcher a cost-effective solution.

Ver: 1.11.8.1642, Kantor Imigrasi: 208 - SUB DIT. DOKLAI TKI, User ID:rick

Daftar Antrian Cari Permohonan Cari Paspor Inventori Laporan Admin Ganti Password Logout

**PERMOHONAN**

Informasi Pemohon Alamat dan Keluarga Lampiran Foto & Sidik Jari

Hasil Wawancara Hasil Cekal Hasil BMS Hasil WVN Ganda

Hasil cekal: 00: Tidak bermasalah Hasil WVN Ganda: 00: Tidak bermasalah

Hasil BMS: 404: Baru, tapi ada yang mirip

Ibu Jari Telunjuk Jari Tengah Jari Manis Kelingking

Kiri Normal Normal Normal Normal Normal

Kanan Normal Normal Normal Normal Normal

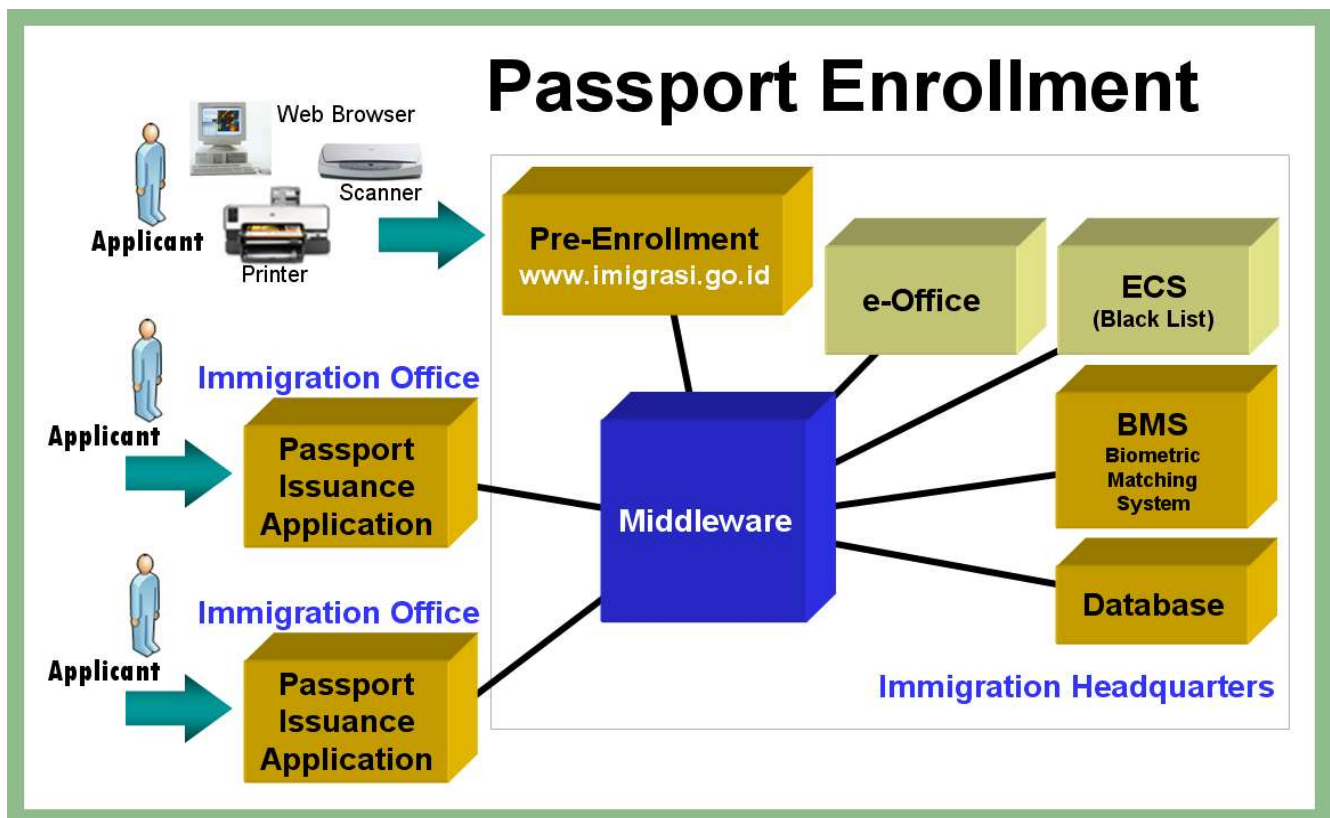
Cetak Uang: Tanda Terima Permohonan Resi Pembayaran Biodata & Penyerahan SPRI

Kembali ke Cari Permohonan

## How the System Works

### Face and Fingerprint Capturing

Using the custom-made, web-based application built by X/LINK, personnel at respective Immigration Offices input the demographic information of a passport applicant and scan supporting documents. The application captures a photo of the applicant directly from an integrated digital camera, and automatically checks the quality of the image, adjusts and crops the photo according to the ICAO standard and then saves it in J2K format. The software is then used to capture ten live-scan fingerprints directly from the fingerprint scanner, and automatically checks the quality of the fingerprint image before saving in WSQ format. The face and fingerprint images are stored, along with other demographic information, in a MySQL database on the local server at the Immigration Office.



### Template Generation

The application, using MegaMatcher Client, reads the J2K and WSQ images from the MySQL database and generates fused face and fingerprint templates.

### Store And Forward System (SAF)

Data stored at each Immigration Office is automatically forwarded via SAF (Store and Forward) automation to the Biometric Matching System at Immigration Headquarters for identification. The result of identification is returned to the Immigration Office via SAF, guaranteeing accurate delivery of the data without need of human intervention.

*“Neurotechnology’s support is fabulous: fast, responsive, and competent. When questions arose during our solution development their team analyzed issues and provided answers very quickly.”*

Mr. Nunung Halim  
Director, X/LINK Software

## Middleware

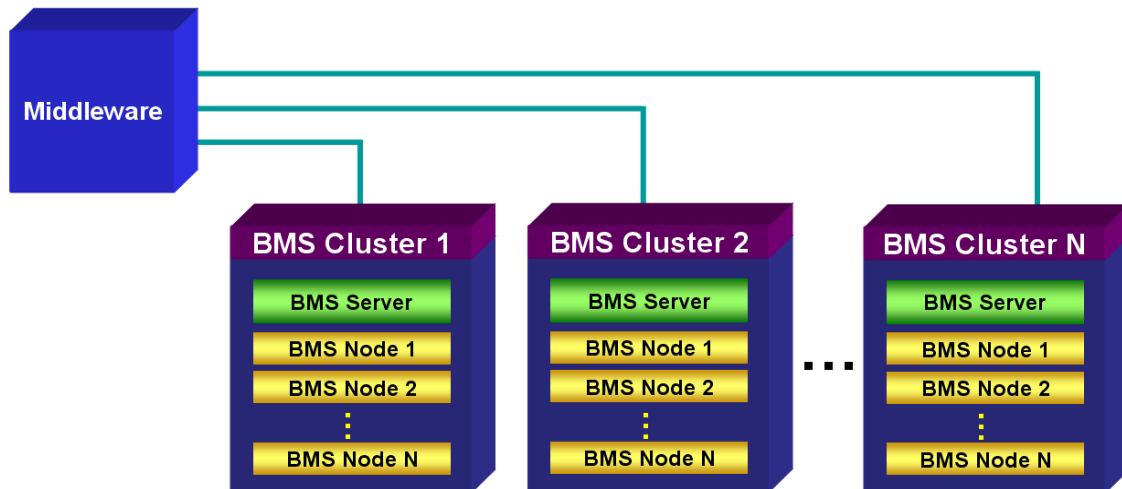
To simplify system connectivity and to control the traffic queue, interfaces between servers at all Immigration Offices and the Biometric Matching System at Immigration Headquarters are handled by Middleware created by X/LINK.

## Biometric Matching System (BMS)

The Biometric Matching System performs fusion matching in two ways:

- Fuse always
- Face then fuse

“Fuse always” is for complete N-to-N matching and requires more time than the “face then fuse” option. “Face then fuse” means that the system first generates a facial recognition score. If the facial score exceeds the threshold value then the attendant finger template is matched. In this scenario MegaMatcher’s high speed face-matching algorithm significantly reduces the amount of time required for duplicate entry identification.



**BMS Configuration with Load Balancing and Redundancy**

*“We would not hesitate to work with Neurotechnology again and hope to make use of some of their other products.”*

Mr. Nunung Halim  
Director, X/LINK Software

## About MegaMatcher

MegaMatcher SDK is designed for the development of large-scale automated fingerprint identification systems (AFIS) and multi-biometric face-fingerprint identification systems. MegaMatcher includes both fingerprint and face identification engines with a fusion algorithm that allows the two technologies to work together to provide very fast 1:N (1 to many) matching with even higher reliability than AFIS or facial recognition alone.

MegaMatcher’s powerful fused algorithm can produce up to 400,000 matches per second on a single processor PC; and with MegaMatcher’s fault-tolerant, scalable cluster software, this number can be multiplied across multiple PCs to perform extremely fast, parallel fingerprint and face matching using databases of practically unlimited size. MegaMatcher’s latent fingerprint template editing capabilities also allow it to be used in forensic AFIS applications.

The MegaMatcher fingerprint engine has received full NIST MINEX Certification for use in U.S. government applications.

## About X/LINK

X/LINK provides high quality software design and development services to banks, institutions, and government agencies. X/LINK develops transaction-based real-time processing middleware with centralized authentication and workflow-based Graphical User Interface. X/LINK is highly competent in multi-biometrics and system interfacing.

## For more information:

### X/LINK Software

For more information about X/LINK Software and their products, go to: <http://www.xlinksoftware.com>

### Neurotechnology

For more information about MegaMatcher pricing, product capabilities and specifications as well as other products from Neurotechnology, go to: <http://www.neurotechnology.com>

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