GMS Progress Reports – Compilation

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Award Amount	$418,000.00
Grantee	AUTOMATED REGIONAL JUSTICE INF. SYS
Project Title	TACIDS - Tactical Identification System
Report Number	1
Reporting Period From	01-Oct-2007
Reporting Period To	31-Dec-2007
Implementing Sub Grantee	
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Commence Report Here	

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) from October 1, 2007 ¿ December 31, 2007. Upon award, approval to include the grant funds in the ARJIS budget was obtained from the San Diego Association of Governments (SANDAG), the ARJIS governing agency. A full time project manager was included in the budget and ARJIS has begun the process of filling the position.

The ARJIS technical staff has started evaluating facial recognition platforms. Also underway is an assessment of currently deployed mobile devices by obtaining feedback from a variety of users including local and federal law enforcement officials. Next steps include: designating a full time project manager, defining system requirements, and developing a high level system design.

NIJ Semi Annual Status Report for TACIDS: 01/01/2008 – 6/30/2008
This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) from January 1, 2008 – June 30, 2008. During 2008, ARJIS received information and did some cursory evaluations of facial recognition platforms including Visiphor SDK and Intel Computer Vision. In addition to searching for platforms provided by vendors, ARJIS has begun the search for previous government and NIJ projects in the field of facial and image recognition which might be leveraged as a basis platform for recognition algorithms. The ARJIS team is compiling requirements of the proposed TACIDS backend system taking into account available platforms and technologies. ARJIS will compile a technical design specification (TDS) to encompass all requirements of the project including backend facial recognition platforms, technologies and algorithms as well as web service and/or web interfaces.

NIJ Semi-Annual Status Report TACIDS 07/01/2008 - 12/31/2008

NIJ Grant Award # 2007-RG-CX-K001

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) grant from July 1, 2008 – December 31st, 2008. The focus on this period was to engage the State of California Department of Justice and to start communicating with facial recognition vendors. In addition, the ARJIS booking photo database was migrated from an unsupported Oracle database to a supported SQL Server 2005 database.

The California Department of Justice (CAL-DOJ) is involved in a variety of biometric initiatives. ARJIS has been working with CAL-DOJ to ensure the TACIDS project is consistent with the states biometrics standards and policies. In late summer and early fall of 2008, ARJIS participated in several CA- DOJ initiatives including 'Vision 2015', which incorporates facial recognition technology.

ARJIS was asked by the CAL-DOJ to participate on the newly created FBI's Facial Identification Scientific Working Group (FISWG) to address the classification and individualization of human beings through the photographic comparison of their visible physical attributes such as face, ear, skin texture, and hair.

The FISWG will develop consensus standards, guidelines, and best practices for the discipline of facial recognition. These standards will be used in the development of the TACDIS platform. The main objectives of the working group are:

- coordinate interaction of members of the relevant community for facial recognition to maximize collective resources;
- document the scientific basis for facial recognition
- standardize the practices for facial recognition to include standard operating procedures and training;
- advance the scientific basis by promoting collaboration, gap identification, and prioritization of specific research, development, test and evaluation topics
- promote the products of the FISWG to members of the pertinent operational communities, including criminal justice, intelligence, and identify management,
- maintain currently of the above and respond to emerging challenges, such as technology advancement and legal requirements.

ARJIS has been in contact with the International Biometrics Group (IBG) to discuss current and previous facial recognition projects and lessons learned. IBG is also assisting ARJIS in obtaining information on facial recognition products. After conducting initial market research on the various products on the market, ARJIS has selected the following eight vendors as potential candidates for assisting in the development of the TACIDS platform:

1. Sybernautix
2. Animetrics
3. Omniperception
4. Viisage
5. ImageWare Systems
6. Cognitec
7. Sagem Morpho
8. Visiphor

ARJIS will work with IBG to obtain further information on these vendors and their respective products; several are planning to present ARJIS staff in February 2009.

Before ARJIS could begin working on the technical aspects of this project, we needed to migrate the ARJIS booking photo database infrastructure to an environment that would integrate better with the tools available. ARJIS transitioned from an older unsupported version of Oracle to Microsoft SQL Server 2005. SQL Server integrates very tightly with ARJIS's security provider; Active Directory. Additionally, the SQL Server database provides seamless integration with ARJIS's applications which require booking photos. We are now staged to begin researching technical options for the TACIDS platform.

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) grant from January 1, 2009 – June 30, 2009. The focus on this period was to engage the FBI's Facial Identification Scientific Working Group (FISWG), and to continue testing new devices.

New PDA Device Testing:

Since January of 2009, ARJIS staff and users have been evaluating new PDA devices for use in the TACIDS project.

Verizon has sent nine devices to include the:
- XV6800,
- XV68900,
- HTC Ozone,
- SMT 5800,
- Blackberry Storm,
- Samsung Saga,
- Samsung Omnia,
- HTC Touch Pro,
- HTC Touch Diamond.

Sprint has sent 3 devices to include:

- Samsung Instinct
- HTC Touch Diamond
- HTC Touch Pro.

These devices were tested for usability, performance, reliability, screen resolution, and overall camera functionality. The XV6800, XV6900, HTC Ozone, SMT 5800, Samsung Saga, and HTC Touch Diamond were reported to have poor user interfaces and/or relatively poor camera quality of only 2.0 megapixels. On the other hand, the HTC Touch Pro and Samsung Omnia were well received due to their ease of usability and superior camera quality of 3.2 megapixels or greater. New devices from both providers will continue to undergo evaluation.

Meetings were held with Verizon at the International Association of Chiefs of Police Law Enforcement Information Management Conference to discuss wireless technologies and in particular request that Verizon "open" or enable the GPS functionality. This will assist investigators in the field with the ability to "geo-stamp" the location of where the photo is captured.

FISWG

ARJIS has played an integral role in the newly created FBI's Facial Identification Scientific Working Group (FISWG) and is a regular member of this Committee. FISWG delegates include scientists, practitioners, and managers from federal, state, local, and international agencies with criminal justice, intelligence, or homeland security responsibilities. Representatives from the academic and research communities are also included. The first official FISWG meeting was held in Atlanta in June. During this meeting the FISWG mission was established:

The mission of FISWG is to develop consensus standards, guidelines and best practices for the discipline of image-based comparisons of human features, primarily face, as well as to provide recommendations for research and development activities necessary to advance the state of the science in this field.

In addition the group outlined and documented basic concepts involving facial identification and facial recognition, and began working on a standards document which will be used in the TACIDS project. A presentation on TACIDS was made followed by a discussion of the feasibility of the project. Several members of the Committee expressed their concern over the cameras on the PDAs and the ability to accurately identify individuals with such technologies.

Next Steps:

During the next reporting period ARJIS will focus on developing the facial recognition platform and database.   ARJIS will provide on update on this during the

next FISG meeting in October, 2009, and intends to submit a proposal to present preliminary findings at the IACP LEIM Conference.

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) grant from July 1, 2009 – December 31, 2009. The focus on this period was to continue testing new devices, address new CAL-DOJ requirements, and work with the San Diego County Sheriffs Office to determine possible synergies between TACIDS and their facial recognition project.

New PDA Device Testing:

During the last reporting period ARJIS acquired two new devices, the Motorola Droid and the HTC Droid Eris. Both are Verizon Wireless devices and run the Android Operating System. ARJIS mobile devices require specific restricted IP addresses in order to access the arjisnet network. Both of the aforementioned Verizon devices met this requirement and have proven through testing to show promise for future use by law enforcement personnel in the field. In addition, both devices have high quality 5.0 megapixel cameras and outstanding screen resolution which are key features required in facial recognition technology. These devices also have substantially larger amounts of accessible memory (16 gigabytes) built-in and much faster processors than other models currently found on the market.

One issue that was uncovered with the Android Operating System is that it does not have a built-in ability to allow for proxy server settings, which all previous devices used by ARJIS required. However, these devices do support L2TP VPN clients with IPSec which could potentially be used to solve the proxy server issue. We are currently testing this possibility.

ARJIS also received test devices from Sprint including the HTC Touch Pro 2, which uses Windows Mobile 6.1 Professional, and the HTC Hero, which runs the Android Operating System. The Sprint devices had Hosted Radius accounts created and ARJIS restricted IP addresses assigned for testing purposes within the ARJIS network. Due to Sprint DataLink complications, neither of the Sprint test devices could be successfully configured to work within the ARJIS network.

Addressing CAL-DOJ and FBI requirements:
The recent establishment of new security policies by the California Department of Justice (Cal DOJ) pertaining to wireless devices has resulted in a need for ARJIS to select, acquire, and install personal firewall and anti-virus software on all PDAs. ARJIS devices do not currently meet these requirements. This has resulted in a delay of the selection and acquisition of the PDAs to ensure the appropriate devices can successfully operate with this new software.

ARJIS has had to do a thorough market research to identify those vendors who provide this product, and to test those products for compatibility. ARJIS has researched the Motorola Droid and the HTC Droid Eris in terms of meeting the security requirements put forth by CAL-DOJ. The Android OS is Linux which automatically gives it some of the inherent Linux security features. In addition, we are testing anti-virus and firewall software created specifically for this operating system to ensure that we are within CADOJ regulations.

FISWG

ARJIS continues to play an integral role in the FBI's Facial Identification Scientific Working Group (FISWG) and is a regular member of this Committee. ARJIS has been assigned to the Use and Operation Committee. FISWG delegates include scientists, practitioners, and managers from federal, state, local, and international agencies with criminal justice, intelligence, or homeland security responsibilities. Representatives from the academic and research communities are also included. The second official FISWG meeting was held in Jacksonville, FLA in October. During this meeting the Sub-Committees continued working to define the standards and best practices for facial identification systems, algorithms and methods.

Synergies with San Diego Sheriffs Office:

The San Diego Sheriff's Department already utilizes a Mugshot system that is a core piece of their Jail Information Management System (JIMS). The Mugshot application was developed and is maintained by DataWorks Plus. ARJIS already receives copies of the booking records, including Mugshot photos and stores those records for regional data sharing purposes. DataWorks Plus has offered to conduct a pilot project with the Sheriff's Department, to test their 3D facial recognition application called Face Plus. This is the type of software, that if successfully tested, could provide the tools for mining the already stored data to help identify crime suspects (either those detained in the field without positive ID or for investigators who are in possession of surveillance footage of unidentified suspects in the act of committing crimes). ARJIS will be working with the Sheriff's Department to participate in the proposed pilot project, leveraging existing synergies to apply this at the regional level and will explore the use of hand-held devices as part of it.

Next Steps:

During the next phase, the DataWorks Plus solution will be evaluated. A parallel effort to evaluate the use of "open source" software to create our own version of facial recognition applications will be addressed.

NIJ Semi-Annual Status Report TACIDS 01/01/2009 – 6/30/2009

NIJ Grant Award # 2007-RG-CX-K001

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Next Steps:

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**NIJ Semi-Annual Status Report for Grant # 2007-RG-CX-K001 TACIDS:
January 1, 2010 – June 30, 2010**

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) grant from January 1, 2010 – June 30, 2010. The focus of this reporting period was to continue work on the evaluation of facial recognition

vendors, and to maintain communication with the San Diego Sheriff's Offices facial recognition project team.

During this quarter, a functional requirements document was produced (see attachment A) and internal task list was established. Meetings were held with staff from the San Diego Sheriff's Office (SDSO) who is in the process of implementing a facial recognition solution. As mentioned in the previous progress report, SDSO hosts eMUG, a system tied to the initial booking process for all people booked in San Diego County. The eMUG system, whose vendor is DataWorks Plus, contains the original, full-resolution frontal, profile and other images associated with the booking process. Compressed copies of just the frontal images are sent to ARJIS on a daily basis. ARJIS is in the process of determining whether the ARJIS database images are of sufficient quality to be enrolled in a facial recognition solution. If so, then ARJIS can proceed in acquiring an already developed algorithm from a vendor and then develop web services and applications to make use of them. If not, then ARJIS will need to establish a contingency plan which will most likely involve collaborating with SDSO and their vendor. Results of the image quality assessment are pending.

In the meantime, the San Diego Sheriff's Department's DataWorks Plus solution is in the process of switching to a newer and more robust facial recognition algorithm (Cognitec). Although ARJIS still plans to evaluate that solution, it makes sense to focus on the completion of a broader market analysis of currently viable vendors who specialize in Law Enforcement biometric identification systems and specifically facial recognition technologies that can be utilized in mobile applications. To that end, ARJIS completed an Internet search which produced a list of 10 potential software vendors (see attachment B). All 10 companies were sent a survey (see attachment C), with a request to respond to 13 questions relative to how their companies might fit into this project. Of those, 9 have responded. All but one stated that they believed that they could meet the needs of the TACIDS project. Plans are underway to offer a sampling to interested vendors of ARJIS images for quality assessment purposes, to include a non-disclosure agreement form that requires vendors to keep the images confidential and to only use the image files for the intended purpose.

Next Steps: ARJIS will determine whether the image quality is sufficient to move forward. If so, an RFP will be prepared to acquire the facial recognition engine and SDK (software development kit) needed to implement. One or more developers will be hired to begin work on the desktop and mobile applications, along with backend database and web services development.

NIJ Semi-Annual Status Report for Grant # 2007-RG-CX-K001 TACIDS: July 1, 2010 – December 31, 2010

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) grant from July 1, 2010 – December 31, 2010. The focus of this reporting period was to continue work on the evaluation of facial recognition vendors, to maintain communication with the San Diego Sheriff's Office's facial recognition project team, to participate in the San Diego Regional Cal-ID technical advisory group and to participate in an Nlets (national) Privacy Impact Assessment working group as related to facial recognition projects.

During this period, a package of 104 sample images from the ARJIS Cal-Photo database was sent to each of 11 vendors for the express purpose of the vendors doing an in-house evaluation of these samples with their own product. This was to determine whether the ARJIS photos are of sufficient quality to be successfully enrolled into their systems. Of the 11 packages sent, answers were received from 10. Of those, 9 stated that the images were acceptable. The one company that responded negatively seemed to be the one that did the most comprehensive analysis of the samples. They were able to successfully enroll all but 4 of the images, but they reported that the images for the most part were not NIST compliant, that the camera angles and distances to the cameras were not ideal and that in many cases, the lighting was not optimal during the initial capture process. They cautioned that although the enrollments were fairly successful, they could not guarantee high probability of matching when probed with similar images.

The market analysis is now complete (see Attachment A). The goal was to assess the best of breed facial recognition algorithms and to also assess the viability of the ARJIS Cal-Photo image repository. The images seem to be of sufficient quality to proceed and the short list of the proven algorithms is included.

The below table is a summary of the vendor responses as to image quality:

11	9 yes	
Company	**Viable?**	**Quality Assessment**
Dataworks Plus	**Yes**	No written report

Cognitec	Yes	Please see the attached spread sheet for our facial recognition quality assessment (QA) of the 104 images you provided. All the images passed our QA for auto image registration to a FaceVACS-DBScan database and are of very good quality. Our face QA looks at all the NIST Mugshot Capture Best Practices specifications, so you will see some images contain "hot spots, face not full frontal, etc." descriptions in the report as well as several images with inter-eye pixel densities below the NIST recommended specification of 90-120 pixels between the eyes. But, again all the images were able to be auto enrolled in the DB without manual intervention. Please let me know if we can be of further assistance as you move forward with your project. Thank you. Sincerely, Keith
L-1 Identity Solutions	Yes	Hello Lloyd, I have the test results from Mike back and all the images look very good. As soon as I get the signed copy of the mutual NDA from you, I will release the results. Let me know. Regards, Gordon Note – NO OFFICIAL REPORT WAS RECEIVED. GORDON STATED VERBALLY THAT THE IMAGES WERE OF SUFFICIENT QUALITY FOR ENROLLMENT
Imageware	No	Lengthy, comprehensive report submitted. Essentially, all but 4 images were successfully enrolled (except 47525, 69211, 75964 and 82256). Company states capture process not NIST compliant, subjects are in many cases too close or too far from camera and that lighting is not optimal (3 point lighting is suggested). They also noted heavy shadowing in sample images. Imageware used a "tolerant" facial recognition algorithm (Neurotechnology's VeriLook). Recommendations include using background of 18% gray color, no less than 180 pixels between eyes and 4 point lighting. Also train operators to have subjects not tilt more than 5 degrees to either side. They would also want to evaluate the biographic data with the photos, to be combined into the search. See full report.
Cogent	Yes	Lloyd, I had not heard from you in a few weeks and thought I would reach out for an update on the facial recognition testing. Unfortunately, as I looked though my folders here I did not find the email I was sure I sent on the 15th (please tell me you received it!). We completed our testing of your images on the 15th and the conclusion was as follows: For the 104 sample photos, our algorithm can process them without any problem. All can be processed and saved into our database, and facial search using those photos were 100% successful. I'm really hoping you received that first message and I just deleted my copy here. If this is the first you've seen of such a message from me, I sincerely apologize for the delay. I really thought I had sent it out! Please let me know the status when you have moment. Thanks! Jim Ziska Thanks Lloyd. Look forward to hearing from you. Also, keep in mind we can do the front end application for you and use the Cognitec algorithm if desired. We are flexible and partnered with them prior to developing our own algorithm. The relationship is still good between the companies.

| OmniPerception | Yes | Hi Lloyd

We ran the images through a little test application that we wrote. We had only 6 images that failed against the standard, this is actually better than we need for our facial recognition algorithms, so we would be delighted to work on the complete set of images that you forwarded.

If you would like to see the results, you can download from:

http://dl.dropbox.com/u/4016355/Batch.zip

Unzip it and point your browser to the file in html/index.html...

We look forward to hearing next steps.

kind regards, Tracey |
|---|---|---|
| Sybernautix | Yes | Thanks for sending us a set of 104 images for testing the quality during enrolment and verification for the facial recognition in your prestigious project. It was found that almost all images could be registered for facial recognition except two images with names,45588.jpg&49019.jpg respectively, could not be enrolled; because the eyes in these two images are closed, which is the most crucial aspect of facial recognition in our algorithm.

We also found that three images, 52291.jpg, 58941.jpg and 62379.jpg, have a matching score of more than 50% and we could enrol all three by increasing the matching threshold to 70% and similar observation was noted between two other images, 57275.jpg and 66240.jpg.

By looking into entire exercise of enrolment and recognition in the given set of images, we found that the quality of the images is workable to an extent of 95-98% accuracy.

I am herewith attaching five images, wherein such discrepancies were observed for your kind glance.
Regards

Prasad Kalepu |
| NeuroTechnology | | NO RESPONSE |
| MorphoTrak Inc (Safran Group) | Yes | MorphoTrak has reviewed the Photo/Facial images in two ways:

The Photo/Facial images were visually inspected and MorphoTrak feels that these Photo/Facial images are of very good quality. The 104 photo/facial images were captured under good lighting conditions.
MorphoTrak enrolled all 104 Photo/Facial images using our Facial SDK and we were able to enroll all images without any failures or errors.

MorphoTrak concludes that the quality of these Photo/Images is sufficient for enrollment and subsequent matching in our environment.

Kind Regards,

Peter Whittam
Proposal Manager
MorphoTrak |
| Animetrics | Yes | No actual assessment document was received. In an e-mail dated 10/7/2010, Joel stated that his company can work with the image set we provided as samples. |
| Airborne Biometrics Group | Yes | Picture: #46011: face pitched up; #49019: Looking down/face pitched down; #63623: Yaw off center, plus intense facial expression; #64404: over exposed lack of detail; #82256: open mouthed |

ARJIS staff witnessed three additional product demonstrations during this reporting period.

Airborne Biometrics Group – September 2, 2010

Two representatives from Airborne Biometrics Group brought a live demonstration of their facial recognition products to the ARJIS offices. The demo consisted of one laptop computer (hosting the server software and client applications), a fixed digital video camera, a GPS enabled digital SLR camera, a LAN router and several cell phones. They demonstrated the enrollment process, using a cell phone and then they demonstrated multiple captures of probe images (from cell phone and from the digital camera). Then, they demonstrated how the fixed-mounted video camera could detect images that cross its path, do a match on a photo image that was flagged as "wanted" and send an alert to the cell phone. This was a very impressive demonstration. Airborne Biometrics Group is a solutions provider company that uses what they consider to be one of the top known algorithms (Cognitec).

Coplink (i2) – December 2, 2010

A conference call was initiated between ARJIS and Coplink staff, utilizing a live web-meeting. ARJIS already utilizes Coplink in a production environment for all of its customers. The "Face Match" component is an add-on feature of the existing Coplink Detect product and is tightly coupled with the existing search capabilities on persons. Coplink (i2) purchased Visiphor and its proprietary algorithm in the past year or so. They are currently implementing their "Face Match" component in Orange County at this time. They demonstrated Face Match on a test database but in their current version of Coplink Detect. It appeared a sub-tab of the Person search. This allows for standard biographic filtering while simultaneously submitting a probe image for comparison. It's as simple as dragging and dropping or browsing for a jpg image into the Coplink Face Match photo frame. When the search is executed, the user sees different images quickly superimposing in the lower right corner (much like a CSI TV show) and then similar images with probability scores are displayed in a gallery where the officer can review each one and then select for more detail. Once selected, the user is presented with the standard list of incident documents and associations for that person. Additionally, ARJIS and Orange County are already connected node to node and these searches can be executed across nodes.

Pinellas County, Florida Facial Recognition Project

One of the law enforcement leaders in facial recognition systems is the Pinellas County Sheriff's Department. They have a very robust system with several law enforcement partners, including Miami-Dade police and the Florida State DMV. They have been using L-1 Identity Solutions (Viisage algorithm) for several years. It is used to capture mug shot images during the booking process and is probed from desktop and mobile applications. The ARJIS TACIDS project manager witnessed a live demonstration of this product during an Nlets working group meeting in Chicago (listed later in this report). A captain from the Pinellas

County Sheriff's Office gave the demonstration, adding that they have been using this technology for about ten years. He is proud of their system and has several success stories compiled.

Regional Cal-ID Technical Advisory Group
The ARJIS TACIDS project manager was asked to participate in this working group and has to date, attended two meetings. This group is tasked with making recommendations to the RAN Board, which oversees state revenues earmarked for Law Enforcement biometric identity solutions (primarily Automated Fingerprint Identification Systems) on new biometric ID technologies, including facial recognition. A successful "proof of concept" application developed through this TACIDS grant within the ARJIS environment has the potential of leveraging RAN Board funding for ultimate build-out and sustainment funding for the future of facial recognition systems within San Diego County.

Nlets Privacy Impact Assessment Working Group
Nlets is the National Law Enforcement Telecommunications System, the secure, private law enforcement network that allows DMV and other law enforcement data to traverse state lines. The ARJIS TACIDS project manager was selected to participate on a committee consisting of key practitioners from multiple states, to assist with the development of a Privacy Impact Assessment report on the topic of Facial Recognition tools, specifically targeting State Department of Motor Vehicles driver's license photo repositories. This group met in Chicago on December 8 to discuss and finalize this document.

Next Steps
Now that the ARJIS photo repository has been deemed viable, there are several options for moving forward. In keeping with the project goals:
1) The Market Analysis is complete
2) The best of breed facial recognition algorithms are known
3) ARJIS will implement one or more back-end solutions
4) ARJIS will build or cause to be built, a mobile application that incorporates facial recognition.

NIJ Semi-Annual Status Report for Grant # 2007-RG-CX-K001 TACIDS: January 1, 2011 – June 30, 2011

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) grant from January 1, 2011 – June 30, 2011. The focus of this reporting period was to continue to evaluate and refine the scope of work relative to this grant, given the progress of facial recognition software and applications available on the market today. To retain this project as a meaningful initiative and with the market analysis completed and licensing and maintenance costs noted,

ARJIS will strive to build a mobile application, using an acceptable proven algorithm which can be leveraged to not only assist in the identification of persons but to also be used in the completion of field interview and/or citation documents by way of mobile devices.

The San Diego Sheriff's Department recently upgraded their eMUG system (used to capture mug shots within the jail management system) with the Cognitec facial recognition algorithm and it has already proven effective in identifying previously unidentified felons via desktop workstation. eMUG is available throughout the San Diego law enforcement community today and ARJIS no longer needs to prove that concept. Therefore, the mobile application option seems the most appropriate solution for ARJIS to pursue via this grant.

The TACIDS project manager continues to maintain communication with the San Diego Sheriff's Office's facial recognition project team, to participate in the San Diego Regional Cal-ID technical advisory group and to participate in an Nlets (national) Privacy Impact Assessment working group as related to facial recognition projects.

Next Steps
Now that the ARJIS photo repository has been deemed viable, there are several options for moving forward. In keeping with the project goals:
1) Market Analysis - **COMPLETE**
2) ARJIS will implement one or more back-end solutions - **ONGOING**
3) ARJIS will build or cause to be built, a mobile application that incorporates facial recognition - **ONGOING**

NIJ Semi-Annual Status Report for Grant # 2007-RG-CX-K001 TACIDS:
July 1, 2011 – December 31, 2011

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) grant from July 1, 2011 to December 31, 2011. The focus of this reporting period was to select the data sources that will be accessed for the comparison of images, narrow down the potential facial recognition vendors who will produce the Software Development Kit (SDK) to three, and to contract with San Diego Data Processing Cooperation (SDDPC) to develop the backend process for handling the images and the interfaces to the three selected data sources.

Data Sources
Originally, ARJIS intended to develop an interface to one database for image submission. However, after meetings with San Diego County Sheriff's office (SDSO) and the procurement of the Coplink Face Match product, ARJIS will attempt to develop interfaces to three data sources. This unprecedented research and development effort

seeks to compare facial recognition technologies, algorithms, performances, and the quality of the responses from the various data sources. In addition, ARJIS will assess images from the various data sources to ensure they are NIST compliant. Finally, ARJIS will seek input from law enforcement officers on the practicality of facial recognition technologies in the field.

Coplink Facematch

Through another initiative ARJIS has procured the Coplink Facematch product that utilizes algorithms developed by Visiphor. This product is currently designed for desktop use; ARJIS will be the first agency to enable access in the field. Face Match integrates seamlessly with Coplink and provides the capability for to use the results in other COPLINK analytical tools.

eMUG

The Sheriff's eMUG system is available through the SDLaw domain via a web service. The system contains all of the images taken from the SDSO Jail Management System. SDSO has offered to stand up a web service for ARJIS to run requests through multiple databases for access to images. SDSO utilizes the Cognitec algorithm and has already procured a regional license for this product.

ARJIS Cal-Photo

ARJIS manages the San Diego County node for the state wide Cal-Photo system. The database is contained within the ARJISnet domain and ingests photos hourly from Jail Information Management System.

Facial recognition vendors for SDK development

ARJIS is in the process of executing a contract with the San Diego Data Processing Cooperation for the development of the backend process and the interfaces to the three different databases via web-services. SDDPC staff will then need to subcontract with one of the facial recognition vendors that were chosen through the TACIDS market analysis process. The subcontractor must be willing and able to work with the Cognitec and Visiphor algorithms. This is because the San Diego Sheriff's Department has already paid the cost for a regional Cognitec license and ARJIS has already purchased the rights to use Visiphor through the FaceMatch project.The potential vendors to assist in the development of TACIDS include:

- Airborne Biometrics Group
- Dataworks Plus
- Cognitec

Together, SDDPC and the chosen sub-contract will be responsible for the following technical tasks:

- Setup internal process for enrolling ARJIS Cal-Photo mug shots using high-end algorithms
- Produce interfaces to Cal-Photo, eMUG (SDLaw) and Coplink, complete with all necessary communications, store and forward message hub, query and retrieval processes
- Produce mobile application that can run on Android and Windows Mobile operating systems. This application will be capable of utilizing the device camera and will send the request and receive responses directly from the web services at ARJIS. Ideally, the application will be device and operating system agnostic. It will also allow the user to select one or more of the existing databases when submitting images for comparison.
- At minimum, provide a mechanism to leverage the existing Cognitec face recognition algorithm that is currently in use at the San Diego Sheriff's Department's eMug system (the vendor is DataWorks Plus).
- Utilize Cognitec algorithm to enroll photo images that are contained in the ARJIS Cal-Photo database and then provide a similar process for matching field-acquired facial images to the enrollment database (template-based).
- Work with Coplink (IBM) staff to develop an interface to the new FaceMatch database for use on mobile devices. Coplink FaceMatch utilizes the Visiphor algorithm.

ARJIS Mobile Facial Recognition Application
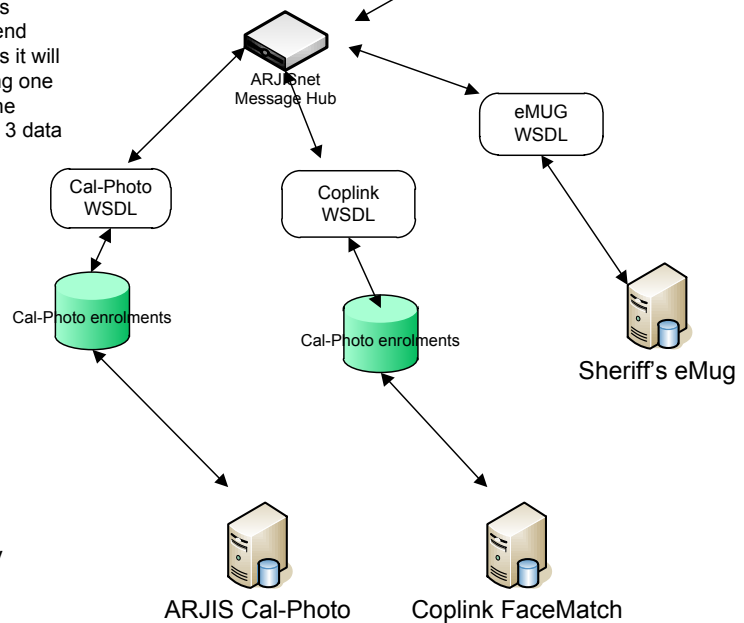## Conceptual Technical Diagram

ARJIS Mobile TACIDS Application

The ARJIS mobile device application will use the onboard camera to capture photos, check for quality and send to the web service/s. The user will select one or more databases to search. The application will receive responses in a viewable format for the user, along with a candidate list in ranking order of match probability and biographical data on the candidates.

Broadband Wireless Provide (Sprint/Verizon)
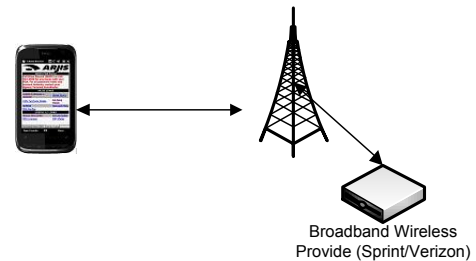
ARJIS Mobile TACIDS Backend process

The ARJIS message hub will forward the messages that contain TACIDS requests (including images) to the TACIDS backend process. Once received by each process it will convert the photo to a digital string, using one or more algorithms and then compare the string to enrolled image strings from the 3 data sources.

ARJISnet Message Hub

eMUG WSDL

Cal-Photo WSDL

Coplink WSDL

Cal-Photo enrolments

Cal-Photo enrolments

Sheriff's eMug

Each system will independently provide a confidence-based hierarchal list of candidates (of predetermined number of records) and will extract the respective images from the databases, along with metadata. These records and photos will be sent back to the mobile device via message hub asynchronously.

ARJIS Cal-Photo

Coplink FaceMatch

Next Steps

ARJIS will develop the various web services to the selected data sources. The final vendor will be selected and will assist SDDPC in this development work. Agreements will be executed with SDSO and Coplink/IBM. The PDA users will be identified and a test and roll out plan will be developed.

NIJ Semi-Annual Status Report for Grant # 2007-RG-CX-K001 TACIDS:
January 1, 2012 – June 30, 2012

This report covers the work completed for the ARJIS Tactical Identification System (TACIDS) grant from January 1, 2012 to June 30, 2012. The focus of this reporting period was to select the most appropriate software development vendor for the task at hand, given the data sources that will be accessed for the comparison of images.

San Diego Data Processing Corporation (SDDPC) assisted ARJIS with the selection process (RFQ) and ultimate sub-contract with Airborne Biometrics Group (ABG). Airborne Biometrics Group is leading the development of the backend process for the encoding of images and the interfaces to the three selected data sources. They are also providing the basis for an ARJIS customized version of mobile software that will enable field officers to interact with the system using Android computer tablets.

The subcontract with ABG was executed on May 22, 2012 after a lengthy selection, vetting and negotiation process.

A kickoff meeting was held at ARJIS offices on June 14, 2012. Project managers, technical staff and stakeholders came together to discuss the project in general; set expectations; understand any dependencies and limitations; and to initiate the list of next steps. Technical /management staff from the San Diego Sheriff's Department was also present as they are strategic partners in this effort.

On June 22, 2012, ARJIS received a "deliverables" document from the ABG project manager.

Next Steps
ARJIS to work directly with ABG staff and SDDPC staff to build the back-end process and to develop the companion mobile application.

ARJIS to develop test plan and implement test procedures on the TACIDS system.

ARJIS to prepare final report to the National Institute of Justice on all aspects, findings and recommendations of the TACIDS project.