

DICOS Status Update

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DICOS Elevator Summary

- v02 launched and OEM experiences and recommendations assembled
- v02A issued April, 2017.
- v03 will address new modalities and functionalities.
- Interested parties ENCOURAGED to participate and provide recommendations.
- DICOS is increasingly linked to key TSA objectives.



So What? Who Cares?

- Supports TSA OSSA initiative.
- Facilitates inter-operability (“plug and play”)
- Helps integration of various sensors, e.g. CAT, Intel to provide more complete situational awareness.
- Supports remote maintenance.
- Could facilitate more selective component replacement of scanners, algorithms, graphic user interface displays as they approach end-of-life, rather than block obsolescence.



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Conclusions and Accomplishments Update

- DICOS v02A has been approved in balloting and is awaiting final publication.
 - Addresses many of the issues experienced by implementers for DICOS v02:
 - Open Platform Software Library (OPSL).
 - Common Graphical User Interface (CGUI).
 - TSA Original Equipment Manufacturer (OEM) implementations.
 - Limited private tag attributes usage.
- Stratovan under contract review to enhance and maintain the DICOS v02 SDK and toolkit to the DICOS v02A Standard.
- Activity generated Threat Detection Reports (TDRs) for Level-2 and Level-3 screening activities.
- Requesting OEM and third party participation in DICOS v03.
- Activity addressing the NEMA membership yearly dues.



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Topics Addressed in DICOS v02A

- Multi-energy X-ray detectors.
- Multi-view and multi-energy image encoding.
- Voxel and Pixel value representation (16-, 32-, and 64-bit and float and double).
 - Update DX to include:
 - Z-eff
 - Density
 - μ support
- Pixel Spacing for image display.
- Enhanced and redefined selected tag attributes:
 - Different Time-out mode
 - Different Bar code type
 - Raw and bag path



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DICOS v02A Activities

- Started the development of a Website where implementers could submit and review FAQs.
 - Reviewed bugs and recommended fixes and incorporated them into v02A.
 - Bug reporting form with recommended changes made by the submitter.
 - Compiled a list of improvements for the DICOS v02A SDK and Toolkit for Stratovan to incorporate into the DICOS v02.
 - Generate the DICOS SDK and Toolkit for Operating Systems not listed.
- Bi-weekly meetings of the DICOS Technical Committee to address discovered issues and required enhancements. Instead of waiting for a formal meeting to address and finalize the issues.



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DICOS Development Aids

- TSA has funded Stratovan to enhance and maintain a DICOS v02A development suite which includes:
 - User-Level, Module-Level, and Tag-Level API headers
 - Static and shared libraries (Windows/Linux)
 - Documentation
 - User Guide
 - API documentation
 - Real world examples
 - FAQs
 - A DICOS Image Viewer
 - Compliance and Conformance-checking software
- Using the DICOS v02A SDK and toolkit allows OEMs and Third party Implementers reduce development times and testing abilities.



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Stakeholders Activities

In order for DICOS to be successful, OEMs and third party implementers need to:

- Report DICOS implementation issues to the DICOS Technical Committee and to Stratovan for documentation, quick review and uniform resolution.
- Participate actively in the DICOS Technical Committees.
- Recommend to the DICOS Technical Committee features and attributes which should be included in future revisions of the DICOS Standard.



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DICOS v03 Future Directions

- **Topics and Issues that are under investigation for DICOS v03 include:**

- **Additional Modalities**

- Differential Phase Contrast (DPC)
- Coded Aperture Imaging (CAI)
- Phase Contrast Imaging (PCI)
- Air Cargo
- Bottle Liquid Screener (BLS)
- X-ray Diffraction (XRD)
- Explosives Trace Detection (ETD)

- **TDR Enhancements**

- Prohibitive item reporting
- Deep Learning
- Third party ATR support for reporting results
- Aggregated TDRs from all TSEs
 - Passenger
 - Baggage screening results

- Assignment of extension **dcs** to denote a **DICOS** encoded file.



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Questions



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Backup Slides



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Topics for this Presentation

- DICOS v02A Activities
- Topics Addressed in DICOS
- DICOS Development Aids
- Stakeholders Activities
- DICOS v03
- Backup Slides



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So What? Who Cares? (Additional)

- Facilitates *horizontal* and *vertical* communication between TSE and various TSA leadership levels; *horizontal* communication between different TSEs.
- Supports innovation (third party participation in, say, algorithms).



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NEMA DICOS Press Release

Original v02 Press Release, August 29, 2012

ROSSLYN, Va., -National Electrical Manufacturers Association (NEMA) has published NEMA IIC 1 v02 Digital Imaging and Communications in Security (DICOS) Information Object Definitions (IODs).

Known informally as DICOS v02, this revised standard maintains the extensible, interoperable data format that enables the integration of security screening technologies across multiple vendor platforms and facilitates wider participation in the development of improved security screening technologies and systems specified in its predecessor, DICOS v01. DICOS v02 now includes:

- an additional screening technology, known as Advanced Imaging Technology or AIT, which is used to examine passengers at airports, and
- a more complete definition of one type of Threat Detection Report (TDR), known as Operator.

"NEMA is proud of this newly revised standard as it is evidence of the continued success of joint efforts between manufacturers and the Department of Homeland Security's Science and Technology Directorate and its Transportation Security Administration to improve the safety of air travel," said NEMA President and CEO Evan R. Gaddis.



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NEMA DICOS Press Release (continued)

DICOS v02 retains the features of its predecessor, including:

- a data format for computed tomography (CT) images and x-ray radiographs that result from airport security examination of checked and carry-on baggage; and
- a common format for threat detection reports that capture data resulting from the use of automated threat detection methods to evaluate checked and carry-on baggage.

DICOS is inspired by, and relies heavily on, elements of Digital Imaging and Communications in Medicine (DICOM), which is used in virtually all hospitals worldwide. DICOS continues to adapt DICOM as necessary to accommodate the unique needs of an airport security screening application. Both DICOM and DICOS permit images and data to be sent from, and viewed and received by, equipment of various types-similar to the interoperability of PDF (portable document format) images on a variety of personal computers.

DICOS was developed by NEMA's Industrial Imaging and Communication Section in cooperation with the U.S. Department of Homeland Security's Science and Technology Directorate and Transportation Security Administration. DICOS serves as an ongoing, effective example of government-industry cooperation in standards development. See DICOS v02 to view the contents and scope. A hard or electronic copy may be purchased for \$215 by visiting global.ihs.com, or by contacting IHS at 800-854-7179 (U.S. only) or 303-397-7956 (international).



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Location of Stratovan DICOS SDK and Toolkit

Go to: www.Stratovan.com; click on ~ Products; select ~ Security, DICOS; complete form.

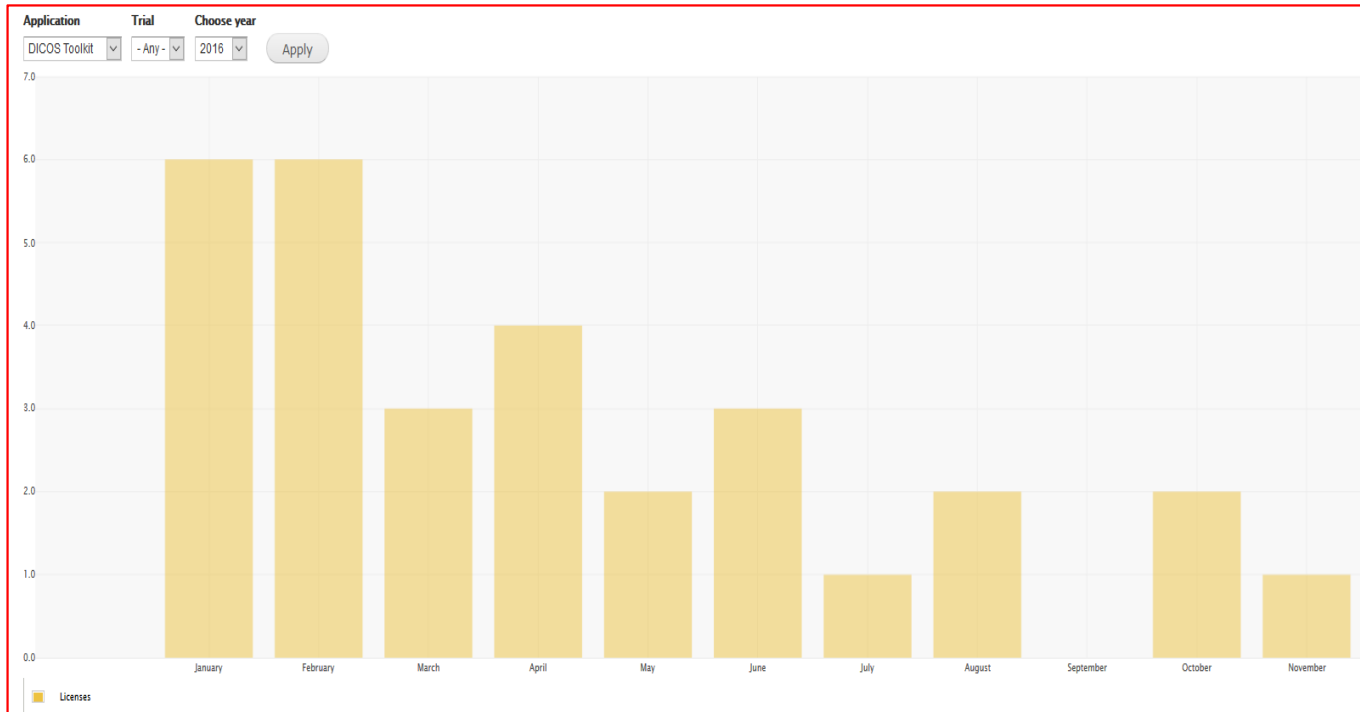


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DICOS v02 New Users in 2016



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Stratovan DICOS v02A OS Support

- Microsoft Windows
 - Visual Studio
 - Linux
 - Fedora
 - Scientific
 - OpenSuse
 - Ubuntu
- ✓ Both 32- and 64- bit versions of each OS.



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Stratovan DICOS v02A APIs

- API's allow for various levels of detail that toolkit users can choose from
 - **User Level API**
 - Allows users to interface with the toolkit without needing to know the DICOS specification (i.e. tags, VR, etc.)
 - Provides required and conditional tag validation
 - **Module Level APIs**
 - Allows users to interface with the toolkit without needing to know attribute tags and VR's
 - Requires users to know the DICOS specification's module hierarchy.
 - Provides required and conditional tag validation
 - **Tag Level APIs**
 - Requires users to know the DICOS specification
 - Allows users to interface with the toolkit using tags
 - Allows direct manipulation of tags
 - Does not provide required and conditional tag validation



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Stratovan DICOS v02A APIs

- **User-Level**
 - Represents simplified device outputs for CT, DX, AIT2D, AIT3D, QR, TDR
 - Excludes several optional attributes
 - Internally uses module-level API for file reading/writing and network transmission



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DICOS Context and History

- TSA has open architecture project.
- DHS and then TSA funded NEMA to develop standards for encapsulating and transmitting data from TSA.
- Standard denoted as Digital Imaging and Communication for Security (DICOS).
- V01 released in early 2000s
- V02 needed for the following reasons:
 - Incorporate OEM recommendations from early DICOS use.
 - Incorporate additional functionalities and modalities.

- Stratovan funded to develop toolkit to implement DICOS
- v02A out for vote.
- V03 future directions.



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