A number of questions have been asked regarding the decision to pursue XML as the favored method of transferring equipment information.

1. What are the advantages and practical value of XML compared to other methods such as COM or OPC?

Extensible Markup Language (XML), which complements HTML, provides a format for describing structured data.

This facilitates more precise declarations of content and more meaningful search results across multiple platforms, and promises to enable a new generation of Web-based data viewing and EDI-type manipulation applications.

HTML can be used to tag a word to be displayed in bold or italic; XML provides a framework for tagging structured data. An XML element can declare its associated data to be a retail price, a sales tax, a book title, the amount of precipitation, or any other desired data element.

As XML tags are adopted throughout an organization's intranet, and by others across the Internet, there will be a corresponding ability to search for and manipulate data regardless of the applications within which it is found.

Once data has been located, it can be delivered over the wire and presented in a browser in any number of ways, or it can be handed off to other applications for further processing and viewing.

XML is a subset of Standard Generalized Markup Language (SGML) that is optimized for delivery over the Web; it is defined by the World Wide Web Consortium (W3C), ensuring that structured data will be uniform and independent of applications or vendors. This resulting interoperability kick-starts a new generation of business and electronic-commerce Web applications.

XML provides a data standard that can encode the content, semantics, and schemata for a wide variety of cases ranging from simple to complex. XML can be used to mark up the following:

- An ordinary document
- A structured record (such as an appointment record or purchase order)
- An object with data and methods (such as the persistent form of a Java object or ActiveX® control)
- A data record (such as the result set of a query)
- Meta-content about a Web site (such as CDF)
- Graphical presentation (such as an application's user interface)
- Standard schema entities and types
- All the links between information and people on the Web

The power and beauty of XML is that it maintains the separation of the user interface from structured data, allowing the seamless integration of data from diverse sources. Asset information, work requests, maintenance data, and other information can be converted to XML on the middle tier, allowing data to be exchanged online as easily as HTML pages display data today.

Data encoded in XML can then be delivered over the Web to the desktop. No retrofitting is necessary for legacy information stored in databases or documents, and because HTTP is used to deliver XML over the wire, no changes are required for this function.

Once the data is on the client desktop, it can be manipulated, edited, and presented in multiple views, without return trips to the server. Servers now become more scalable, due to lower computational and bandwidth loads.

Also, since data is exchanged in the XML format, it can be easily merged from different sources.

XML is valuable to the Internet as well as large corporate intranet environments because it provides interoperability using a flexible, open, standards-based format, with new ways of accessing legacy databases and delivering data to Web clients.

Applications can be built more quickly, are easier to maintain, and can easily provide multiple views on the structured data.

An object specification such as Microsoft's COM, DCOM, or COM+, allow interoperability of application components at the executable level. This level of interaction is required where tighter application integration is required and where a net-based, distributed application is not desired.

The MIMOSA technical committee recommended moving quickly to the XML framework first because of its universal vendor support (Microsoft, IBM, Sun, etc.), ease of implementation, and Intranet/Internet-ready functionality. As the XML specification is being developed, the Object Committee, led by Brian Berling from SKF Condition Monitoring, will be reviewing the results to determine which XML transactions should have COM object counterparts.

2. Is MIMOSA moving to XML before the standard is fully accepted? Is there sufficient industry support for the method and are companies in the CMMS and control fields are moving in the same direction? Is MIMOSA in danger of developing a method of exchange that will be obsolete and unusable?

The Open Applications Group, Inc. has already embraced XML. MIMOSA is not going ahead of the rest of the industry in this area. The OPC Foundation is also moving ahead with an XML sub-committee to produce a standard in this area.

From a press release from OAGI:

Chicago, Illinois, USA - January 18, 1999

The Open Applications Group, Inc. (OAGI), a non-profit industry consortium comprised of many of the most prominent stakeholders in the business software component interoperability arena in the world, today announced publication of a full set of Extensible Markup Language (XML) Document Type Definition (DTD) files that define interoperability APIs for Financials, Human Resources, Manufacturing, Logistics, and Supply Chain components.

"We believe that the publication of these DTDs will decrease costs and complexity for organizations that are wrestling with the problem of tying together their business applications," said David Connelly, President of the Open Applications Group.

Interoperability model expressed in XML DTDs.

The Open Applications Group, Inc. members have built a common model for business software application component interoperability over the last three years. The model is described in their Open Applications Group Integration Specification (OAGIS). OAGIS describes the major components, their integration dialogs, and the content of those dialogs for many key enterprise business applications, including financials, manufacturing, human resources, supply chain, and logistics.

Now, the content of the OAGIS specification has been expressed in a machine readable format in the form of XML Document Type Definitions (DTDs) for all of the currently defined Open Applications Group Business Object Documents. The machine-readable Document Type Definitions (DTDs) necessary to define this integration content in XML have been published on the OAGI website and are available for public access at: <<u>http://www.openapplications.org</u>>.

The DTDs will be free of charge to download and use, but a license agreement will be enacted to maintain ownership of intellectual property.

The Open Applications Group has done extensive prototyping with the XML language to successfully validate its applicability for large and small-scale business software application component interoperability and is very pleased with the results. In fact, the Open Applications Group has been working for over a year with emerging software tools and associated vendors to ensure a high quality implementation of the OAGIS specification in XML.

XML is an exciting World Wide Web Standard

Extensible Markup Language is an exciting, evolutionary, meta-data language, approved as a standard by the World Wide Web Consortium in February 1998. XML evolved from the Standard Generalized Markup Language (SGML) as a compromise between the complex SGML and the simple, but non-extensible HTML. It has been described as providing 80% of the benefit of SGML

with 20% of the effort and it is being embraced by a broad cross-section of the industry as the right language for defining the APIs necessary to make business software components talk to each other.

XML is actually a language for creating markup languages that describe data and rules about the data. It requires applications to be defined to it before it can become truly useful. The process of defining applications is done through the use of the Document Type Definition, which defines the tags and rules within XML for a well-formed XML document. The Open Applications Group, Inc. has defined the tags and rules for business software component interoperability in this application.

Since XML is data base-neutral, operating system-neutral, and device-neutral, it is an effective tool for defining heterogeneous interoperability. This is also in complete alignment with the Open Applications Group stated technology strategy, which is to be technology aware, but not technology specific.

Release of DTDs is applauded

The reaction from customer organizations to the publication of the XML Document Type Definitions demonstrates their anticipation of improved interoperability through the use of this exciting new capability. "I'm very pleased that the Open Applications Group has decided to publish the DTDs for the integration of business applications", said Ed Harter, Ph.D. a manager of developmental computing programs within Boeing's Phantom Works. "I'm looking forward to working with the Open Applications Group more closely in the future. Their approach is very practical and I believe it has considerable potential for easing the burden of integrating both commercial off the shelf and legacy applications."

Vendors as well as customers see this as a major step forward and demonstrates the extent to which the Open Applications Group is fostering an environment of cooperation among stakeholders in this effort. "DataChannel is very excited about the Open Applications Group providing their DTDs for public consumption. We are certain that this will further extend the visibility of the groundbreaking work of the Open Applications Group and engage various industry segments to participate in the wide-spread adoption of XML - based integration. The Open Applications Group and their work on the OAGIS specification is an essential part in DataChannel's technology vision of an XML - based architecture for enterprise - wide information exchange," said Norbert H. Mikula, Director of Architectural Services at DataChannel, Inc.

3. Are users going to see XML as value for them? (See the question from Greg Arzani on the Vibration Institute website discussion page.) Can MIMOSA expect users who are already slow in demanding compliance to require MIMOSA XML? If so, why?

We believe users will not care what technology is used to bring them "plug and play" connectivity between their applications, as long as it is available on all hardware, software, and network platforms where they have applications. XML is such a universal standard and will provide connectivity between disparate applications, MIMOSA believes that it can meet end-users' goals.

4. Is MIMOSA shifting from exchange mechanisms, e.g., Work Integrator to XML? What impact will this change in direction have on CMMS suppliers? Can MIMOSA expect CMMS suppliers to implement XML quickly?

With technology moving at such a rapid pace, MIMOSA believes that XML provides a better method for exchanging data and information between the Condition Monitoring and CMMS/EAM communities. By focusing on XML for the next stage of development, MIMOSA appears to be in agreement with and following the same path as both the OPC Foundation and MESA. The CMMS/EAM companies who have reviewed MIMOSA's direction have had a favorable reaction, and we know of one company currently beginning implementation.

If there are any companies actively pursuing the ODBC Work Integrator application, MIMOSA will accommodate their work.

5. Does MIMOSA have a workable plan and real commitments from any companies, especially companies in the CMMS industry, to implement XML transfer?

We have not had express commitments to certain timetables, but have had one major CMMS/EAM supplier working closely with us in the XML DTD development due to their desire for early adoption of this technology.

6. Does MIMOSA know anything further about the meeting held between the OPC Foundation and Microsoft to discuss XML?

See the press release below...

The OPC Foundation Announces Plans to Develop XML Schema for Manufacturing Application Integration

Philadelphia, PA. - OCT. 6, 1999 - Today at the ISA Tech 99 Conference, the OPC Foundation® announced that it will publish XML schema compatible with Microsoft Corp.'s BizTalk framework for improved business-to-business and business-to-consumer computing. The new schema will be based on OPC specifications that define application interoperability and communications between disparate industrial automation devices, systems and applications running across the manufacturing enterprise. The OPC Foundation is an independent, non-profit organization comprised of more than 210 member companies providing leading edge industrial automation solutions worldwide.

Gil Pareja, with Fisher Rosemount Systems Inc. and President of the OPC Foundation, says that it is very important for OPC to be proactive and take a leadership role defining how manufacturing companies can leverage OPC with new technologies like XML and the Internet. "The OPC Foundation is taking the initiative in defining XML schema for discrete and process manufacturing data to assure that there will be an industry-standard implementation," says Pareja.

The OPC Foundation has formed the OPC XML Working Group headed by Al Chisholm, OPC's Technical Steering Committee Chairperson and Chief Technical Officer at Intellution Corp. The OPC XML working group will create XML data schema for use in exposing OPC data to applications over the Internet, essentially providing OPC-compliant solutions with enhanced e-commerce capabilities and functionality. The OPC Foundation already provides industry-wide standards for exposing OPC data through the Component Object Model (COM). "Extending OPC specifications to include XML, which is a very Internet friendly technology, is a logical and significant next step for the OPC Foundation and its member companies", said Chisholm.

OPC XML creates keywords and attributes necessary to describe OPC data items and various aspects of an industrial device, control system or manufacturing application properties and operation. Don Holley, OPC Foundation Marketing Director and Industrial Automation Marketing Manager at National Instruments, says, "OPC XML is the key that will unlock the value of sharing timely manufacturing information from control devices and automation systems on the plant floor with applications throughout the manufacturing enterprise."

"We have worked closely with the OPC Foundation to help develop OPC plant floor integration specifications as well as the Windows DNA for Manufacturing framework for plant floor to ERP integration. BizTalk is the next phase of this collaboration and will open up technologies for improved information flow throughout the manufacturing enterprise and beyond to incorporate trading partners and customers, " said Don Richardson, discrete manufacturing industry manager at Microsoft Corp. "It is very exciting to see the preeminent manufacturing standards body adopting this new e-commerce framework to help manufacturers utilize the latest technologies and redefine the way they conduct business. "

"BizTalk is an industry-wide effort to produce universal XML technologies that will ease integration hassles and enhance business-to-business and business-to-consumer relationships," said Becky Kaske, global industry manager for manufacturing and engineering at Microsoft. "The support for BizTalk from standards groups like OPC Foundation for industrial automation and other vertical industry groups is paramount and will help drive the adoption of common XML schema for application integration and interoperability within and across various industries, such as discrete and process manufacturing. "Introduced in March, the BizTalk Framework makes it easy for businesses to exchange information between software applications and conduct business over the Internet with trading partners and customers. The BizTalk Framework includes a design framework for implementing an Extensible Markup Language (XML) schema and a set of XML tags used in messages sent between applications. Microsoft, other software companies and industry-standards bodies will use the BizTalk Framework to produce XML schemas in a consistent manner to enable integration across industries and between business systems, regardless of platform, operating system or underlying technology.

More information about the OPC Foundation and OPC specifications is available at **http://www.opcfoundation.org**. More information about the BizTalk Framework is available at **http://www.biztalk.org/.** More information about Microsoft's initiatives for BizTalk Framework is available at **http://www.microsoft.com/industry/biztalk**/.

The OPC Foundation is an independent, non-profit organization comprised of 212 factory and process automation suppliers and manufacturers worldwide. The OPC Foundation charter is to leverage Microsoft technologies to develop industry-standard specifications for multi-vendor hardware/software interoperability in the manufacturing industries.