

Albian Sands
Barrick Gold Corporation
BHP Billiton Diamonds Inc.
BHP BMA Coal Australia
Canadian Natural Resources Ltd.
DeBeers Group
Elk Valley Coal Corporation
Iron Ore Co. of Canada
Klemke Mining Corporation
Ledcor CMI
Mitsubishi Development Pty Ltd
Prairie Mines & Royalty Ltd.
Newmont Mining Corporation
North American Construction



SMART Surface Mining Association
For Research & Technology
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Peabody Energy Corporation
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Quebec Cartier Mining
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Suncor Energy
Syncrude Canada Ltd.
Teck Cominco Ltd.
Thiess Pty Ltd
TransAlta Corporation
University of Alberta
University of Arizona
University of British Columbia
Washington Group International

One Industry Voice

Connectivity and Technology Standards for the Surface Mining Industry

Final Report
September 2007

Sponsored: Tim Skinner, Elk Valley Coal Corporation
Mark Bartlett, Phelps Dodge
Jon Peck, Queens University

Background

The expanding use of computing and network technology systems in the mining industry on large mining equipment and for mine control systems has been beneficial for productivity improvements. The need to be able to quickly utilize and apply computing and networking technology in the mine has been inhibited by several issues. In 2005 a movement began within the mining industry to address and improve the situation. The movement started with an informal group of mining companies and evolved into a formal structure under the auspices of SMART. This document identified the issues, the process, and the results of this movement. It was firmly believed that approaching these problems in a proactive and open manner would be beneficial to all.

Specific Issues that Need to be Addressed

Most of the issues have originated from the suppliers, due to:

- √ providing technologies that are proprietary and incompatible with common industry standard technology available in the market and which are commonly utilized by the mining industry, creating higher cost and effort by the mines to:
 - develop, implement, integrate and operate solutions and improvements at the operational level,
 - create and operate duplicated systems and infrastructure,
- √ a belief that the issues are not being understood nor adequately addressed by our suppliers.

Therefore, it was determined by SMART to present the common issues to the OEMs and OTMs so that the concerns are heard, acknowledged and constructively addressed.

Chronological History of Events

Prior to 2005

- √ Frequent communication of the issues between vendors and individual companies
- √ Initial communications between individual mining companies on the issue and recognition of mutual common view and concerns – “we weren’t the only ones complaining to the vendors”.

April 2005, CIM 2004 Toronto

- √ Informal meeting where it was determined there was common interest to address the subject

July 2005, Calgary Meeting

- √ Formal Meeting of interested mining companies – Minutes enclosed Attachment 1
- √ Developed formal vision statement and scope – Enclosed Attachment 2
- √ Determine method to communicate to OEMs/OTMs
- √ Developed public communication plan

Aug – Nov 2005

- √ Aligned with, and supported by, SMART
- √ Developed and distributed formal letter – Letter enclosed Attachment 3,

Nov 2005 – May 2006

- √ Direct contact meetings and phone calls with OEMs OTMs – Contact success documented in Attachment 4

May 2006 Smart Meeting

- √ Presentation of vendor results

- √ SMART direction to develop and report suggested definition of the mining industry standards
- May 2006 – September 2006
 - √ Development and documentation of standards
 - √ Presented to Smart Meeting September 13.
- September 2006 – April 2007
 - √ Final report preparation
 - √ Final report presentation and review at SMART

Results of Vendor Communication

The results from the communications with the OEMs and OTMs are summarized as follows:

- √ 99% were receptive and open to communication
- √ All participants seemed to understand the message and the overall response was generally supportive
- √ All expressed a willingness to support the initiative
- √ Most stated they were taking some actions to support the initiative
- √ The participants did not necessarily understand the consequence of the issues to the mine operator
- √ Some of the group expressed “thoughts” and sought feedback on establishing an OEM/OTM standards group; a few said there had been some vendor meetings before, but it had appeared self serving; i.e those who instigated the topic were interested in standards as long as they were their standards.
- √ The OEMs primary concern is their IP software control algorithms and related data.
- √ There was a sincere interest to work further with the customer industry
- √ A number of the OEMs and OTMs questioned the commitment of the mining industry to this effort as some of them had previous experience where it was a one time “fad” and there was no lasting effort by the industry to ensure their efforts were utilized and worthwhile.

Proposed Surface Mining Industry Standards

The following outlines the criteria, requirements, benefits, and a set of generic guideline specifications regarding hardware and software standards. It must be noted that this set of specifications reflects a generic set of standards. There can be variations of these standards which should be refined due to business and operational needs, and the existing standards of the mining organization. Additionally these specifications will need to be updated and modified as technology changes over time due to new developments that will create new devices and improved speed, size, and performance.

Key criteria for system selection are:

- √ Cost;
- √ Proven & reliable products;
- √ Based on open standards and commercial off-the-shelf systems (COTS) for hardware & software & communication networks;

- √ Capable to provide ready access to raw, unprocessed data, APIs, configuration parameters & sub-routines from all system components as and when required by mine operator;
- √ Readily capable of multi-vendor interoperability as mine operator needs evolve;

Objectives for open systems standards

- √ Facilitate development of a single set of standard operating practices (SOPs) across all sites;
- √ Enable ready integration to an advanced, open communications infrastructure;
- √ Reduce number of different and incompatible computer systems & operator displays on mobile equipment;
- √ Reduce costs for future hardware and software acquisitions and upgrades through many choices for COTS;
- √ Sustain investment & productivity gains achieved to date from existing systems while providing a platform for on-going and continuous improvement;
- √ Through the use of non-proprietary components, facilitate system support & customization through ability for mine operators to:
 - do it themselves or;
 - engage a 3rd party of their choice (not necessarily the original supplier);

Benefits of open systems, COTS approach:

- √ Standardization, integration and on-going convergence of all site and corporate technical & business application systems to:
 - maximize mine buying power
 - reduce development, implementation, and support costs
 - improve development, implementation and support staff productivity
 - reduce elapsed time to develop and start up new solutions and applications
 - reduced solution development time;
- √ Eliminate inefficiencies and duplication across all processes and systems at the sites and corporate levels;
- √ Facilitate:
 - more transparent use of business critical data and information between sites;
 - knowledge transfer & sharing of technical and business information between the sites and corporate;
 - transfer of trained resources between sites;
 - overall support of technical systems through the development of standard processes, spare parts and agreements with suppliers;

Minimum Specifications as of September 2006

SOFTWARE:

- Operating System
 - Windows XP Embedded (XPe);
 - Linux
- Network connectivity
 - 802.11b/g
 - Mesh
- Security

- Encryption - WPA
- Industry vendor anti-virus
- Standard firewalls e.g Cisco
- System Management
 - Microsoft Device Update Agent/SMS;
- In-house applications;
- 3rd party applications;

HARDWARE:

- 733 MHz processor 512 Mb memory.
- 8.5" to 10.4" color touch screen:
 - Resolution of 800 x 600; Nits >500
- 2 GB to 8 GB Solid state flash drive;
- Audio Output;
- 2 x Network Interfaces; off board wireless
- 1 Digital Input (Truck Dump Switch);
- Additional Digital Inputs for High Precision applications;
- 1 x RS232 for NMEA GPS messages from the GPS Receiver;
- 1 x RS232 for OEM Modules (VIMS, PLM, CENSE, etc.);
- 1 x RS232 for engine service port;
- 1 x USB for Keyscan identity card;
- 3 x On-board Ethernet- onboard network/sensors;
- 1 X CANbus

LCD Display:

- Screen Size: Diagonal 10.2" (16:9)
- Resolution: 800 x 480
- Display Brightness: 430 cd/m²
- Touch Screen Interface: USB port
- Operating Voltage Range: DC 11V ~ 24V
- Operating Temperature: -4°C ~ 55°C
- Storage Temperature: -40°C ~ 55°C
- Dimension (in): 10.4W x 7.3H x 1.2D
- Weight (lb): 3.2 lbs
- Cdn \$650

Tablet PC:

- 1.2 GHz Pentium M
- Screen Size: Diagonal 10.4" (4:3)
- Resolution: 1024 x 768 touch screen
- Display Brightness: 430 cd/m²
- Touch Screen Interface
- Operating Voltage: DC 12V
- Operating Temperature: -15C to 60C
- Storage Temperature: -40°C ~ 70°C
- Dimension (in): 10.6W x 8.3H x 1.5D
- Weight (lb): 4.7 lbs
- Cdn \$4300

Configurations

Attachment 5 illustrates possible design configurations for the above standards

Ancillary Mining Organizations

Through out this project several other mining industry standard groups and efforts were discovered and communicated with. It is interesting to note that the SMART initiative is not an isolated effort and the subject matter can be seen to be recognized by the industry. The following lists and provides a brief description of these organizations:

ACARP – Australian Coal Association Research Program, www.acarp.com

CRC Mining – Australian government industry research group, www.crcmining.com

MIMOSA – Operations and Maintenance Information Opens Systems Alliance, www.mimosa.org

IREDES – International Rock Excavation Equipment Data Exchange Standard, www.iredes.org

Recommendations

1. SMART members formally adopts this report and support its findings and recommendation
2. SMART members distribute this report within their organization: Executives – key!, Purchasing, Mine Management and Engineering, Contracts, IT/IS
3. SMART members include the standards and principles in OEM and OTM Request for Proposals (RFP) and purchase orders and agreements
4. SMART members consider embedding the vision into their plans at the various operations to ensure adherence
5. SMART to distribute the enclosed letter and report to the OEMs and OTMs.
6. Actively continue to grow the membership of the team – globally with Rio Tinto & BHP; communicate with a number of large mining companies outside to SMART to update them on this SMART initiative and to collaborate on supporting it.
7. Develop a forum by which SMART can continue the industry one voice and technology standards.
8. Recommend to the OEMs and OTMs to develop a forum by which communication between the industry and the vendors regarding technology standards be continued
9. Recognize the need to protect the intellectual property of the vendor i.e. the specifics of application or algorithm logic and directly applicable algorithmic data
10. Public disclosure at:
 - √ Industry meetings & forums (e.g. SMART);
 - √ Conferences (e.g. CAMI, CIM, SME-AGM)
 - √ Publications in trade magazines;

Attachment One - Minutes of July 25 Kickoff Meeting

Meeting Whiteboard Notes:

Participants:

- T. Skinner – Elk Valley Coal Corporation (EVCC)
- M. Bartlett – Phelps-Dodge
- P. Cunningham – EVCC
- D. Treadway – Phelps-Dodge
- S. Klingmann – Albion Sands
- B. Dirk – Suncor
- C. Reardon – Suncor
- L. Hachey - Suncor
- J. Rosser – Barrick Gold (Goldstrike)
- P. Tenhet - Barrick Gold (Goldstrike)
- H. Butt – Syncrude
- G. Fosmo – Peabody Energy (Powder River Coal, North Antelope/Rochelle Complex) - - J. Peck – Queen’s University (facilitator)

Agenda: (actual whiteboard notes are shown in *italics*)

Started at 8:30AM June 21st, 2005:

1. Welcome, Introduction, Administration;

- *Information from the meeting and all subsequent documents are to be considered CONFIDENTIAL and for the use only of team members;*

2. Background;
3. Review and confirm vision statement;

- *Example: Vendors can be very secretive with respect to data accessibility and use proprietary applications to restrict end-user access;*

- *Data ownership:*

- *Who do they belong to? The mines!*
- *Need to have a statement of data ownership embedded upfront in all contracts – ensure that all within a corporation are aware of such issues of ownership;*
- *Recognize the need to protect the intellectual property of the vendor i.e. the specifics of application or algorithm logic but all data and information collected, derived, generated or processed by these routines etc. from equipment owned by a mine is the sole property of the mine;*

- *Objective (reason for the statement) is to have greater real-time access to data and information at a site;*

- *Future will require clarity on data & information accessibility and ownership as equipment becomes more sophisticated;*

- *Data and information is a critical component of optimization and maintenance;*

4. Review scope, objectives & outcomes of meeting;

5. Review and confirm “problem” to solve:

- Where & what are the current “problems”;
- What issues do these create?

6. Determine Industry statement purpose, format, content & level of detail:

Purpose:

- *To permit easy & unlimited access to mobile & fixed equipment data & information:*
 - *based on open systems architectures that are clearly defined;*
- *Vision statement reflects consensus of represented mines in “one, common voice”:*
 - *convey a common message internally & externally;*
 - *communicate common needs & requirements to the OEMs (original Equipment Manufacturers) and OTMs (Original technology Manufacturers);*

- *define why such an approach is important to our business and theirs e.g. they can then focus on their core competencies;*
- *inclusion of terms and conditions within all future contracts to reflect this requirement;*
 - *OEM & OTM need to adhere to these terms in order to be a “preferred” supplier?*
 - *Strongest support by the team of those vendors that comply with the stated “vision”;*

Format & Content:

- *Statement will be in the form of a letter;*
- *Will be brief, clear and to the point to reflect the “vision”;*
- *Short-concise body plus a longer version with appropriate supporting information as back-up including the “vision” statement;*
- *Constructive approach and tone, but strong and realistic to reflect credibility of the team;*
- *Should also show the list of companies (“sponsors”) and senior management names of the supporting or endorsing companies on the first page;*
- *Letter will include sections that outline:*
 - *The purpose*
 - *The requirements (high-level)*
 - *The recommendations & actions for next steps upon receipt:*
 - *Affirmation of receipt*
 - *Suggestions for follow-up and next actions e.g. face to face meetings etc.*

Level of Detail:

- *high-level of detail but clearly defined message and scope in a brief one page letter;*
- *more detail can be provided via back-up documents;*

7. Determine use of statement by participants – internal, external (conferences, papers, marketing):

Use of statement:

- *refer to products or components that adhere to the vision requirements as being “SMART Compliant” – suggested seal of approval;*

• Internal:

- *Communicate throughout the various corporations & their operations the “vision”;*
- *Get feedback and buy-in at all levels:*
 - Executives – key!*
 - Purchasing*
 - Mine Management (and Engineering)*
 - Contracts*
 - IT/IS*

- *Get endorsement of Draft statement per corporation before issuing externally;*
- *Embed vision into 5 year plans (LOM?) at the various operations to ensure adherence;*

• External:

- *Review a preliminary draft with the SMART committee at the next meeting;*
- *Select a team composed of individual team (corporations) members to roll-out statement externally as required;*
- *Meet with selected vendors to present statement and solicit feedback;*
- *Present a common front at conferences, industry meetings, forums and via white papers;*
- *Develop a common website to provide information to a wider audience on a global basis;*

8. Define scope of a mining industry technology statement for:

- Communication Networking:
- *Security & authentication – mines responsibility;*
- *Mines will own the communications backbone and overall infrastructure and everything flowing through these systems (see below);*
- *Mine will have the responsibility for the communications topology and technology;*
- *Mines will leverage open/IP standards and hardware for ready integration to existing site systems and 3rd party components as needed;*

- applies to both fixed and mobile equipment;
- either the mines or the OEMs/OTMs can execute the interfaces to 3rd party devices – CHOICE;
- Base on Open System Interconnect (OSI) architectures whereby mines handle layer 3 and below using TCP/IP;
- Use of industrial Ethernet connections for all components and products;
- Mines require the flexibility to provide their own options for solutions at their operations;
- Mines want OEMs/OTMs to “de-couple” components from systems to minimize obsolescence and upgrade costs e.g. Modular Mining hubs and 802.11b;

- Hardware Platform and operating system software:
- TCP/IP compatible/compliant;
- POSIX compliant operating system i.e. a UNIX-type file system;
 - A Browser is also required to be run on the hardware platform – remote access and messaging capabilities;
- Either the mine or the OEM/OTM can provide the non-proprietary hardware platform – choice will be based on requirements for performance and cost;
- Co-habitation of applications from different 3rd party providers to be able to reside on the same hardware platform without affecting performance of the system or any one application;
- OEMs/OTMs will provide published software & hardware requirements for the:
 - operator display:
 - standard configuration & design;
 - off the shelf i.e. PC compatible or otherwise;
 - modular in design i.e. the separation of computer CPU and input/output/interface devices from the display to provide greater flexibility for installation/mounting and upgrading;
 - and their various applications;

- Third party software applications:
- Readily integrated to the common operator display hardware i.e. is compliant with a defined software specification;
- Applications could be provided by the OEMs/OTMs or the mines to run on a mine-selected display: example: CAES running on a display other than a Navigator;
- OEMs/OTMs need to provide clearly defined and published (with recognition of the intellectual property aspects for all their applications and algorithms) data formats & types, interfaces & resource (i.e. hardware & software) requirements;
- Obligations of the OEMs/OTMs versus the mines for support of 3rd party applications if such a scenario occurs needs further clarification i.e. who supports the overall system that is a combination of pieces from multiple parties?

- Data accessibility:
- OEMs/OTMs need to provide clearly defined and published (with recognition of the intellectual property aspects for all their applications and algorithms) data formats & types (“data dictionary”), interfaces & resource (i.e. hardware & software) requirements;
- Read-only access to all and any data (“raw”) created in real-time:
Mines need FULL control and selectivity of data access;
Mines will manage & control the communications throughput and bandwidth to permit required data access;
 - Mines will define and provide the required tools to achieve these objectives;

- Data ownership:
- Mine operator will own all and any data and information created by the equipment (fixed or mobile) that is owned by the mine operator;
- Mine operator has the right to analyze the data and information as required;
- Mine operator can provide any generated data and information to a 3rd party supplier to integrate and use as part of a specific application:
 - Based on a Non-Disclosure Agreement (NDA) in place between the mine and the 3rd party supplier;
 - Understanding the data and information regardless of manipulation or processing always remains the sole property of the mine operator;

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- Mine operator is aware of the intellectual property rights of the OEMs/OTMs to applications and algorithms;

9. Determine method by which statement will be presented to OEMs, OTMs:

- Start with “pre-conditioning” the various OEMs/OTMs in an informal manner prior to formal statement release;
- Face to face meetings between team and identified OEMs/OTMs at a senior level to include:
 - Presentation of Vision
 - Statement in a Letter
 - Discussion for feedback and next actions
- Public disclosure:
 - Industry meetings & forums (e.g. SMART);
 - Conferences (e.g. CAMI, CIM, SME-AGM)
 - Publications in trade magazines;

10. Identify the target OEMs/OTMs:

Original Equipment Manufacturers (OEMs):

Name:	Equipment Type:	Corporate Account Manager:	Dealer Contact:	Factory Contact:	Approach:
Caterpillar Inc.	Trucks, Dozers, Front-end Loaders	Depends on corporation	Depends on region	Gerry Shaheen, Group President, Global Mining Tel: ? Email: ?	Face to face meeting;
Komatsu	Trucks, Dozers, Loaders	Depends on corporation	Depends on region	?	Face to face meeting;
Liebherr	Trucks	Depends on corporation	Depends on region	?	Face to face meeting;
P&H	Cable Shovels, blasthole drills	Depends on corporation	Depends on region	Mark Hardwick, Senior Vice President Tel: 414-671-7271 Email: mhardwick@pbmining.com	Face to face meeting;
Bucyrus International	Cable Shovels, blasthole drills	Depends on corporation	Depends on region	Tim Sullivan, President Tel: ? Email: ?	Face to face meeting;
O&K	Hydraulic excavators	Depends on corporation	Depends on region	?	Letter
Hitachi	Hydraulic excavators	Depends on corporation	Depends on region	?	Letter
Letourneau	Front-end loaders	Depends on corporation	Depends on region	?	Letter
Atlas Copco	Blasthole drills	Depends on corporation	Depends on region	Brian Fox, Business Line Manager - Rotary Drills (USA) & Product Manager - Large Blasthole (worldwide) Office: (303) 600-2308 Cell: (303) 319-4517 Email: brian.fox@us.atlascopco.com	Letter
Sandvik	Blasthole drills	Depends on corporation	Depends on region	Tim Murphy, VP Tel: 386-418-3339 Email: tim.murphy@sandvik.com	Letter
Michelin	Tires	Depends on corporation	Depends on region	?	Letter
Bridgestone	Tires	Depends on corporation	Depends on region	?	Letter

Original Technology Manufacturers (OTMs):

Name:	Equipment Type:	Corporate Account Manager:	Dealer Contact:	Factory Contact:	Approach:
Caterpillar Information Products & Solutions Division (AQUILA, MineStar, CAES)	Information Product Technologies	See above	See above	Tim CUNNINGHAM, Manager IP&SD Tel: 309-494-4525 Email: Cunningham_J_Tim@cat.com	Face to face meeting;
Modular Mining Systems	Information Product Technologies	N.A.	N.A.	Jack SHINO, CEO Tel: 520-746-9127 Email: jshino@mmsi.com	Face to face meeting;
Siemens	Drive control systems (Bucyrus MIDAS)	N.A.	N.A.	Ken FURAM, Engineering Manager Tel: Email:	Letter
Fuller Brothers	Tire monitoring systems	N.A.	N.A.	T. Fuller, President	Letter
Jigsaw Technologies	Information Product Technologies	N.A.	N.A.	S. Blacutt, President Tel: 520-529-8729 Email:	Letter

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				sblacutt@lgsawtech.com	
Wenco International	Information Product Technologies	N.A.	N.A.	Phil Walshe, President Tel: 604-270-8277 Email: pwalshe@wenco.com	Letter
Flanders/DCS	Cable shovel and dragline monitoring systems	N.A.	N.A.	D. Patterson Tel: ? Email: ?	Letter
WBM	Vibration measurement systems	N.A.	N.A.	?	Letter
Motion Metrics	Cable shovel systems	N.A.	N.A.	?	Letter
CRCMining	Research Group	N.A.	N.A.	Dr. Mike Hood, CEO Tel: Email: Mike Hood m.hood@crmining.com.au	Letter

11. Determine feedback and actions after review with OEMs, OTMs:

- depends on requests/recommendations made within the letter and subsequent responses back from the OEMs/OTMs;

- **Public disclosure:**
 - Industry meetings & forums (e.g. SMART);
 - Conferences (e.g. CAMI, CIM, SME-AGM)
 - Publications in trade magazines;

12. Determine ongoing role of group:

- actively continue to grow the membership of the team – globally with Rio Tinto & BHP;
Maintain team for current initiative and topic until have rolled out to the external world as:

- As the current informal/unaffiliated team;
- As part of the SMART initiative;
- As part of the WME or other body (e.g. SME, CIM, other);

13. Identify Next Steps & Actions

- J. Peck to send draft of whiteboard notes to T. Skinner & M. Bartlett by July 26th – completed;
- Follow-up:
 - Call with T. Skinner, M. Bartlett & J. Peck to review notes – July 29th;
 - Edits and issuance of Draft notes to all team members – July 29th;
 - Feedback and comments from team back to J. Peck – by August 12th;
 - Distribute Final version of notes to all team members by August 12th;
- Draft letter to team by August 19th:
 - Complete Final version by August 26th;
- Internal Communications Plan within each team corporation by Sept. 19th;
- Information session with SMART on Sept. 23rd;
- Face to face meetings with OEMs/OTMs to start in early October;

14. Parking Lot Items:

- statement applicability/overlap to underground mining?
- plant/process endorsement and inclusion in statement?
- device connection – RJ-45 or other that is industrial grade and mining environment certified?
- formation of a separate sub-group to define the hardware platform specifications:
 - P. Cunningham - EVCC
 - S. Klingmann – Albion Sands
 - D. Treadway – Phelps-Dodge
 - L. Hachey - Suncor
 - Syncrude - TBD

Ended at 2:30PM

Attachment Two

One Industry Voice: Connectivity and Technology Standards “Vision” Statement:

- Major mining equipment should be configured by the OEM/OTM to be a natural extension of the mine operators Local Area Network.
- Hardware technology should be designed to be “plug & play” regardless of its intrinsic proprietary nature.
- Third-party applications can be readily integrated and cohabitate with, OEM software and application architecture.
- In all cases, data generated by an application is the sole property of the owner/operators while respecting the confidential nature thereof.
- Accessibility to the data will be freely provided without the need for additional interface programming.

Scope of the Vision:

- Communication Networking: The current and future trend will be that mines will own the communications network, overall infrastructure and everything flowing through these systems. In this regard, mines want OEMs/OTMs to “de-couple” components from systems to minimize obsolescence and upgrade costs as the base communications technology evolves.
- Hardware Platform and operating system software: In many mining operations today, multiple operator displays are installed on one piece of equipment. The inefficiencies and issues that result can be overcome via the use of a single and common operator interface that can run applications from multiple suppliers. Either the suppliers or the mines will provide such an “off the shelf” component that uses open standards for communications and operating system to permit such a capability.
- Third party software applications: In parallel to the above, software applications would be provided by the OEMs/OTMs or the mines to run on a mine-selected display. For this to be viable, OEMs/OTMs need to provide clearly defined and published (with recognition of the intellectual property aspects for all their applications and algorithms) data formats and types, interfaces and resource (i.e. hardware & software) requirements.
- Data accessibility: To meet the requirement by the mines for FULL control and selectivity of data access at any level, the OEMs/OTMs need to provide clearly defined and published (with recognition of the intellectual property aspects for all their applications and algorithms) data formats & types (“data dictionary”), interfaces & resource (i.e. hardware & software) requirements. In addition, the mines require read-only access to all and any raw data that is created in real-time. To ensure optimal system performance, the mines will manage & control the communications throughput and bandwidth to permit the required data access by all parties.
- Data ownership: The mines will own all and any data and information created by the equipment (fixed or mobile) that is owned by the mine operator. In addition, the mine operator has the right to analyze the data and information as required including providing any generated data and information to a 3rd party supplier to integrate and use as part of a specific application. The mines are insistent that the raw data and information - regardless of manipulation or processing - always remains the sole property of the mine operator. However, the mines are aware of the intellectual

property rights of the OEMs/OTMs to the various applications and algorithms that generate the data and information.

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ATTACHMENT 3 – SMART LETTER

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Teck Cominco Ltd.
Thiess Pty Ltd
TransAlta Corporation
University of Alberta
University of Arizona
University of British Columbia
Washington Group International

OEM/OTM
Anyplace, USA

August 7, 2007

Subject: **One Industry Voice: Connectivity and Technology Standards**

Dear Mr. OEM/OTM:

This letter is being sent to you to provide you with the Surface Mining Association for Research & Technology (SMART) report of the above subject matter. This report reflects our common view of the challenges of the industry and concludes the current stage of this activity. The subject matter remains of interest to the members of SMART and we would therefore like to keep the communications open. On behalf of SMART we would like to thank you for your sincere and positive participation. SMART appreciates that the industry concerns have been heard, acknowledged, and constructively addressed. We hope you find the report enlightening and helpful as you pursue the application of technology in your business. SMART believes that the industry working together and approaching these problems in a proactive and open manner will be beneficial to all. Any comment or feedback will be appreciated. Please address your comments or feedback to

Tim Skinner – Chair SIMT Group Phone: 403-241-9287 Cell: 403- 608-1390
timskinner@shaw.ca

Mark Bartlett -- Freeport McMoRan Mining Company Phone: 928-792-5912
Mark_Bartlett@FMI.com

Sincerely,

Gord Winkel, on behalf of the SMART Group



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ATTACHMENT 4 - Target OEMs/OTMs:

Original Equipment Manufacturers (OEMs):

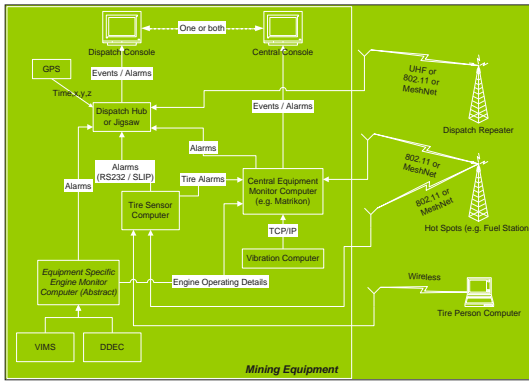
Name:	Equipment Type:	Target Contact:	Target Approach:	Actual Contact	Actual Approach
Caterpillar Inc.	Trucks, Dozers, Front-end Loaders	Gerry Shaheen Group President, Global Mining	Meeting;	Chris Curfman Vice President, Global Mining Bill Springer Vice President Marketing & Product Support	Letter
Komatsu	Trucks, Dozers, Loaders	Dave Grzelak, Chairman and CEO	Meeting	Dave Grzelak,	Meeting
Liebherr	Trucks	Francis Bartley VP Engineering	Meeting;	Francis Bartley	Letter Phone call – no return
P&H	Cable Shovels, blasthole drills	Mark Hardwick Senior Vice President	Meeting;	Mark Hardwick Kurt Hanson	Meeting
Bucyrus International	Cable Shovels, blasthole drills	Tim Sullivan, <i>President, Chief Executive Officer and Director</i>	Meeting;	Tim Sullivan Mike ONSAGER, VP Engineering	Meeting
Atlas Copco	Blasthole drills	Brian Fox, Business Line Manager,	Meeting	Brian Fox,	Meeting
Sandvik	Blasthole drills	Tim Murphy Vice President	Letter	Tim Murphy Vice President	Letter
Finning Canada	Caterpillar Distributor	Gordon Finlay VP Mining	Meeting	Gordon Finlay Darold Thorpe Dave Faber - Caterpillar	Meeting
TransWest	Komatsu Distributor	Bruce Knight President	Letter	Bruce Knight	Letter, Phone call

Original Technology Manufacturers (OTMs):

Name:	Equipment Type:	Target Contact:	Target Approach:	Actual Contact:	Actual Approach:
Caterpillar Information Products & Solutions Division	Information Product Technologies	Tim Cunningham Manager IP&SD	Meeting;	Tim Cunningham	Letter
Modular Mining Systems	Information Product Technologies	Jack Shino CEO Peter Carter	Meeting;	Peter Carter	Meeting;
Jigsaw Technologies	Information Product Technologies	S. Blacutt President	Meeting	Sergio Blacutt	Meeting
Wenco International	Information Product Technologies	Phil Walshe President	Meeting	Phil Walshe	Meeting

ATTACHMENT 5 – Possible Design Configurations

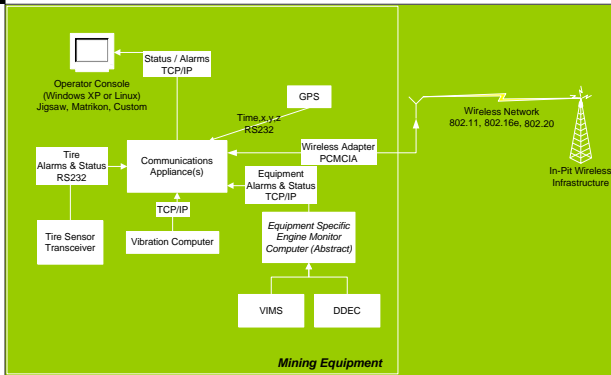
Hardware – Current Multi-box:



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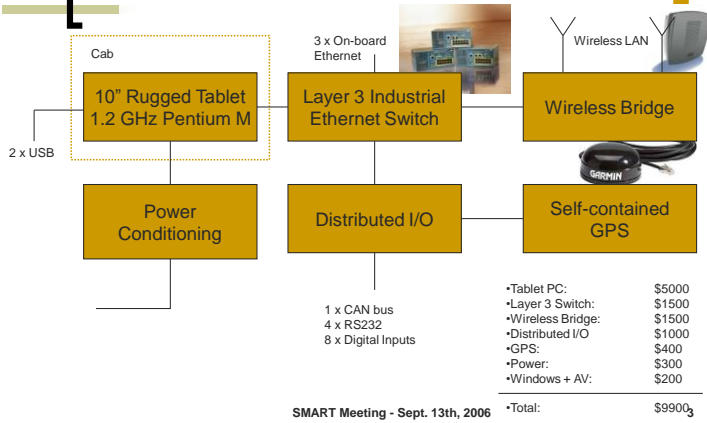
Hardware – Future Consolidated:



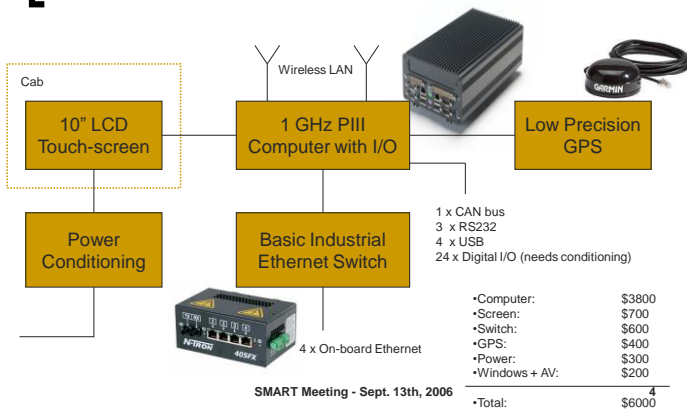
SMART Meeting - Sept. 13th, 2006

2

Tablet Computer, external I/O



“Brick” Computer, internal I/O



[Hardware – Computer Board:]

Octagon Systems XE-900 Single Board (COTS) Computer:

- 733 MHz processor;
- –40° to +80° C operating range;
- Conductive cooling;
- Include all components in sealed casing