

AeA
Alliance for Network Security
American Chamber of Commerce in Hong Kong
Business Roundtable
Business Software Alliance
Coalition for Employment through Exports
Computer Coalition for Responsible Exports
EDA Consortium
Electronic Industries Alliance
Emergency Committee for American Trade
General Aviation Manufacturers
Global Technology Distribution Council
Information Technology Council
International Safety Equipment Association
National Association of Manufacturers
National Association of Wholesaler - Distributors
National Council on International Trade and Development
National Foreign Trade Council
Semiconductor Industry Association
Software & Information Industry Association
U.S. Chamber of Commerce
U.S.-China Business Council
U.S. Council for International Business
United States Information Technology Office

November 30, 2006

U.S. Department of Commerce
Bureau of Industry and Security
Regulatory Policy Division
Office of Exporter Services
14th St. and Constitution Avenue, NW
Room 2705
Washington, DC 20230

Attention: Sheila Quarterman

RIN 0694-AD75

RE: Proposed Rulemaking Concerning Revisions and Clarification of Export and Re-export Controls for the People's Republic of China (PRC) and New Authorization Validated End-User (71 Fed. Reg. at 38,313, July 6, 2006)

Dear Ms. Quarterman:

We appreciate the opportunity to submit the following comments on behalf of the undersigned organizations in regard to the above referenced notice of proposed rulemaking. Our organizations

represent hundreds of U.S. companies doing business throughout the world that would be adversely impacted by the proposed rule.

All of our members are committed to protecting U.S. national security. They have a strong record of compliance with BIS regulations and cooperation with federal authorities, and they want to maintain that record. We also agree that China poses special challenges with respect to export controls due to the complexity of our bilateral trade relationship, the role of their government, including the military, in normal commercial activity, the opacity of their intentions, and the difficulties of compliance, particularly when the export is technology or know-how.

Although our fundamental view is that the regulation should be withdrawn and reconsidered in its entirety after thorough consultation with exporters, the comments that follow are also provided in the interest of making the proposed regulation clearer, simpler and less burdensome with respect to national-security-related decisions that company employees must make. Our members have found that compliance is most effective when regulations are clear and enforcement policies are consistent.

The proposed rule is a major rule

We believe the impact of the proposed regulation will be sufficiently great that it should be considered a “major rule.” The compliance costs associated with this proposed rule are likely to result in an annual effect on the economy of more than \$100 million and are also likely to result in significant adverse effects on the ability of U.S.-based enterprises to compete with foreign-based enterprises in export markets. We disagree with BIS’ conclusion that the impact does not justify major rule status, and we request that BIS’ analysis on that matter be made public. We also believe that because of the complexity of the rule and the possibility of further substantial changes in it, that, if BIS decides to go forward with it despite our recommendation, it should reissue it in proposed form in order to provide an opportunity for further private sector review.

No benefit to changing the *status quo*

The Administration has not demonstrated that this proposed change would provide any additional security benefit and has not articulated a clear purpose for it. It is extremely unlikely that it will have any impact on the military capability of the People’s Republic of China (PRC). If its purpose is to deny the Chinese military access to the listed items, it is destined to be ineffective due to widespread foreign availability of the controlled items, including production in China, and the fact that all indications thus far are that it will be unilateral and will not be implemented by our allies. Conversely, if its purpose is to make sure that U.S. exporters are not the source of these otherwise widely-available items, the regulations will impose a very high and exclusive cost on U.S. industry. Regardless, given that the equivalent of products exported by U.S. industry to China are readily available to China’s military from alternative sources, both foreign and indigenous, U.S. exports could not make a material contribution to the PRC’s military capability, as the latter would already have access to these products and technologies from such sources.

The proposed regulation is also difficult to reconcile with broader U.S. policy towards China and other U.S. strategic goals. We believe that the regulations could well have a serious deleterious impact on the significant political, military and foreign policy relationships developed with China as well as the bilateral economic relationship. . Senior Administration officials have repeatedly stressed that the United States wants China to be a “responsible stakeholder” in the community of nations and

have sought to engage China on everything from military-to-military exchanges to international trade issues. Yet the effect of these special regulations serves to undercut that effort and diminish China's role as a "responsible stakeholder." We also are aware that senior Chinese officials have already raised serious concerns about this proposal on numerous occasions, a not insignificant development since the expanded issuance of end user certificates that it would require will depend on their cooperation.

The items covered by the proposed regulation are widely available

Many of the items that would be subject to controls under this proposal ("List of Items Subject to the Military End-Use License Requirement") are widely available from other sources, including in some cases from within China. For example:

- 1) Attachment 1 identifies 35 items in Export Control Classification Numbers (ECCNs) 7A994, 8 in 6A998, 7 in 5A991-2, and several in other categories, covering a wide variety of aerospace communication and navigation equipment that is already manufactured in China or by numerous European competitors.
- 2) Attachment 2 is a document also provided to BIS separately by the Alliance for Network Security that demonstrates the widespread availability of items in ECCNs 5A/D002 and 5A/D992. As the chart makes clear, these items are already manufactured in China by Huawei, and also elsewhere by other foreign manufacturers.
- 3) Attachment 3, a study by Strategy Analytics, demonstrates the widespread foreign availability, including in China, of numerous 5D002 items which should not be added to the supplement in the proposed regulation. It is clear from the study that OS technologies are not only available but are already in wide use in China, and that there is an enormous opportunity for market growth in China for U.S. producers that will be jeopardized if the supplement is expanded to cover these items.

The proposed regulation will be unilateral

At present, indications are that the United States is the only party to the Wassenaar Arrangement intending to implement the Statement of Understanding on Control of Non-Listed Dual-Use Items with respect to China. Some of our European partners – including the United Kingdom, Germany, and Italy – have already made clear that implementation of the Statement of Understanding will not apply to the PRC. As a result of this lack of participation by other Wassenaar members, the proposed regulation is virtually guaranteed to be ineffective in denying these items to China. Senior BIS officials have implicitly acknowledged this fact by indicating their intent to visit their Wassenaar Arrangement counterparts to seek to persuade them to adopt similar restrictions. Based on our own experience with other regulators and their statements thus far, we are sceptical that any significant results can be achieved. It has been suggested in the past that BIS defer implementing the regulation until it can demonstrate that our Wassenaar Arrangement partners have adopted and are enforcing similar regulations, and we endorse that proposal.

Excessive compliance burden

While the regulation would produce no discernable benefits, the costs to American businesses – as well as to our bilateral relationship with China – would be substantial.

The proposed rule would significantly increase the risks and costs of compliance for American companies that operate globally. Ambiguous definitions, an absence of due diligence guidance and the sheer expansiveness of the proposed rule significantly increase the potential liability for American companies and make it an enormous administrative challenge for our members while simultaneously placing them at a significant disadvantage against foreign competitors. Other comments will provide details about compliance costs that will make clear they would increase significantly if this regulation is implemented. We urge the Commerce Department to consider the following specific concerns:

- The proposed regulation’s application to re-exports multiplies the already significant compliance burden on U.S. firms and effectively means that exporters of components will have to determine whether their customer’s product is a military item. The re-export provision is likely to reinforce the perception of American firms as unreliable suppliers, as foreign customers consider the use of their product further downstream in other markets and design-out U.S. components. It is also guaranteed to be ineffective and unwelcome by our trading partners, who have not applied similar restrictions. Clarifying that the *de minimis* content rule applies would be a helpful step, but it will not eliminate the problem since the U.S. exporter generally does not know his customers’ content percentages and thus must undertake the same due diligence procedures for each case, and it will not stop the ongoing trend in Europe to “design out” U.S. components in order to avoid entanglement in the U.S. regulatory scheme. The best solution would be to recognize that U.S. exporters are not in a position to obtain reliable information from their customers about their intentions with respect to resale or sale after incorporation into a new product and to apply the “is informed” rule to all such cases with respect to resales to third parties. A less preferable but nonetheless helpful step would be for the regulation to make clear precisely what information the exporter needs to obtain – and in what form he needs to obtain it – in order to satisfy himself that the reexport would not be intended for Chinese military end use.
- The reversion to the existing broad standard of knowledge is overly burdensome to companies and will add substantially to compliance costs. We are puzzled by this change, since BIS was clear in its many presentations of the draft regulation throughout the first six months of 2006 that an “actual and positive” knowledge standard would be used. For example, asked at a Materials Processing Equipment Technical Advisory Meeting about the knowledge standard, Deputy Assistant Secretary for Export Administration Matt Borman indicated that, “our view is that it should be based on knowledge, but actual knowledge, not reason to know.” From a compliance perspective, however, as noted immediately above, the best approach would be to limit the application of the regulation to an “is informed” standard, similar to the one adopted by the United Kingdom’s Department of Trade and Industry for the implementation of its Wassenaar commitments. While we believe the proposed rule is overly broad in its application to many thousands of individual products, there could be a circumstance where the U.S. Government would have specific information suggesting that a particular export of such a product could materially enhance China’s military capabilities. In such a circumstance, the U.S. Government would be in a far better position to identify the potential threat, and U.S. companies would welcome such guidance in the form of special notice from the U.S. Government not to engage in a particular export. We suggest BIS change the application of this rule solely to “is informed” circumstances. Despite BIS assertions, we believe compliance with the proposed regulation would be substantially more burdensome than compliance with the Enhanced Proliferation Control Initiative (EPCI), which contains some of the same features. EPCI is limited to WMD-related sectors, which makes it substantially narrower in focus, more specific, and its targets more easily discernible than the broad concept of “military end use” in this proposed regulation. Companies that have extensive

compliance programs tell us that the definitions in the proposed regulation will be much more difficult to build into their due diligence questionnaires than in the case of EPCI.

- The lack of due diligence guidance associated with the proposed rule also increases compliance costs to American business and is likely to lead to delays in the compliance process. In addition, since the facilitation and transfer provisions also apply to entities throughout the supply chain, the proposed rule would dramatically broaden the compliance risks for freight forwarders and other facilitators without providing any guidance to assist these entities.
- The expansion of the Chinese end user certificate requirement is significant and is likely to create lengthy backlogs. Even if the Chinese Government decides to cooperate, it is clear that they do not have sufficient resources to issue certificates efficiently. Requiring the certificate number rather than a copy of the certificate will not speed up the process, as it is the issuance of the certificate not its receipt that will be the bottleneck. This requirement would also provide an argument for more end-use visits by the Commerce Department, which would further slow down licensing in the absence of an increase in U.S. Government staff in China beyond the one that is currently there. BIS should not implement this provision of the proposed regulation until it has obtained the Chinese government's agreement to provide end user certificates in a timely manner.
- The definitions of "military end use" and "support" are too broad. In particular, the expansive definition of military end use attaches considerable liability to a broad range of industries and raises numerous questions. For example, if an exporter has information that a product could be used for the design of both military and civilian products, would the "military end use" definition apply? What if an exporter knew that at the present time the item would be used for the production of civilian items, but that they might be used in the future to produce a military product? Does the definition of "deployment" include simple transportation of military items (or the possibility of transportation of such items)? Does BIS expect exporters to interpret the USML the same way the Department of State does currently, in that items not specifically described but that are specially designed, modified, adapted or configured for military use could be subject to their jurisdiction? If read broadly, these definitions could, for example, affect sales of components that are used in the production of items that are intended for sale to military and commercial customers even though such items have no real military value or function. These definitions raise many questions. BIS should provide specific examples to the exporting public to explain how it would apply these terms in different contexts. In addition, BIS could simplify the compliance process significantly and also increase the likelihood that our trading partners and competitors would adopt similar measures if it limited the application of its definitions to items on the International Munitions List (IML) rather than on the IML and the USML.
- The proposed new control based on BIS notification that an item is or may be intended for military end-use in the PRC does not specify how much notice BIS would give before such notices become effective and so exporters may find themselves required to act quickly to halt exports on short notice.

The Validated End User proposal is unlikely to be attractive to exporters

The Validated End User (VEU) program in its current configuration remains unattractive and would be of little utility to the American business community. While we support the VEU concept and commend BIS' good intentions in attempting to facilitate exports to civilian end-users, the proposed

VEU framework is unlikely to benefit our member companies in its current form. The benefits of the program are unclear from the proposed regulation and the criteria specified by which VEU candidates would be evaluated are overly-broad, vague and ill-defined. Exclusions to the certification would also limit its usefulness. Finally, the negative consequences of a company being denied VEU status poses a downside risk most U.S. companies would be unwilling to take. All of these factors indicate that the VEU will not be useful to our member companies or effective in facilitating exports to China. The following suggestions could make VEU more attractive to the US exporting community:


- Cleared VEUs should be eligible to receive products/technology associated with any eligible ECCN (not MT or CC). If the entity has the *bona fides* to receive this special treatment, it should not be limited to a specific category of product or technology. This would also limit the need for BIS to continuously republish a list of ECCNs assuming the program becomes successful. At a minimum, there should be an expedited route to adding additional ECCNs to an already authorized VEU.
- BIS should clarify that VEU should be allowable for employees of companies that are normally employed inside the United States if they are nationals of a country eligible for VEU status (i.e., for a US company that seeks VEU status and employs Chinese nationals).
- BIS should adopt a time limit for approving or rejecting VEU applications.
- BIS should clarify that audits associated with VEU would be expressly limited to direct activities under the authorization and would not extend to other areas of compliance.
- BIS should publish a model VEU application that would give US exporters and potential VEUs guidance on BIS expectations.
- Including a “party’s agreement to on-site compliance reviews...” and a detailing of “the party’s relationships with U.S. and foreign companies” as approval criteria will limit VEU attractiveness without producing a corresponding benefit, since it is still the Chinese government, as a practical matter, that would have to approve visits.
- Similarly, the interagency evaluation of the “status of export controls in the eligible destination and the support and adherence to multilateral export control regimes of the government of the eligible destination” are criteria that are wholly outside the applicant’s purview and, in any event, properly apply to an entire country and not to an individual company. BIS should certainly take these criteria into account in deciding whether or not to permit VEU applications from a country, but once the decision is made to do so, there is no need to reconsider it with respect to each application from that country.
- Restrictions on the end use of the export also limit VEU applicability.
- BIS should make clear that failure to obtain VEU status is not considered a “red flag.” Since the VEU process is essentially creation of a “white list,” great care must be taken to ensure that BIS does not end up creating an implicit “black list” of those who are not on the VEU list.
- BIS should also delete its comment that validated end users found not to be complying with the requirements of VEU status will be subject to “other actions, as appropriate” in addition to removal from the VEU list. We believe that non-compliance with the VEU rules should result only in removal of VEU status. If actions by the end user also violate other provisions of the law or regulations, then action is appropriate under those provisions, not under the VEU provisions. If companies believe that they could be subject to adverse actions above and beyond removal of VEU status, they will be reluctant to apply for it.

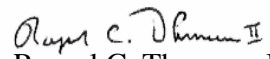
In summary, this proposed regulation presents significant costs to American companies and interferes with important U.S. policy goals towards China without offering any tangible benefit or achievable


purpose. This unilateral control is certain to be ineffective and will dramatically increase the costs of compliance to businesses.


We appreciate the opportunity to submit these comments to the Department of Commerce and hope that they are helpful to the rulemaking process. Please feel free to contact us if we can be of further assistance in this matter.


Sincerely,

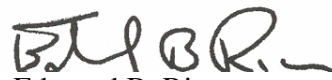

William T. Archey
President & CEO
AeA

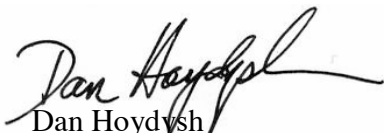

Roszel C. Thomsen II
Counsel
Alliance for Network Security

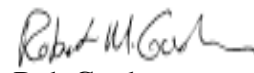

Jack Maisano
President
American Chamber of Commerce in Hong Kong



John J. Castellani
President
Business Roundtable

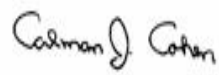

Robert W. Holleyman, II
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Edmund B. Rice
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Coalition of Employment through Exports

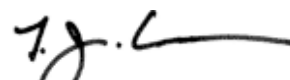

Dan Hoydysh
Chairman
Computer Coalition for Responsible Exports

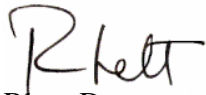

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Peter J. Bunce
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Rhett Dawson
President
Information Technology Industry Council



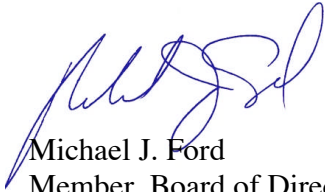
Daniel K. Shipp
President
International Safety Equipment
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John Engler
President & CEO
National Association of Manufacturers



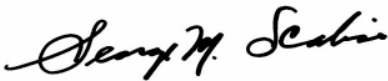
Dirk Van Dongen
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National Association of Wholesaler –
Distributors



Michael J. Ford
Member, Board of Directors
National Council on International Trade
and Development



William A. Reinsch
President
National Foreign Trade Council



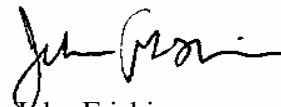
George Scalise
President
Semiconductor Industry Association



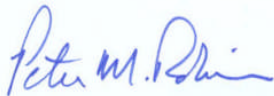
Ken Walsh
President
Software & Information Industry
Association



Thomas J. Donohue
President and CEO
U.S. Chamber of Commerce



John Frisbie
President
US-China Business Council



Peter M. Robinson
President
U.S. Council for International Business



Greg Shea
President and Managing Director
United States Information Technology
Office

| Description | ECCN | China Indigenous Capability | Foreign Availability |
|---------------------------------|-------|--|--|
| HF Equipment | | Panda Radio Corporation Haihua Radio Manufacturer | Thales, BAE, Smith, Elmer, Marconi |
| Receiver-Exciter | 5A991 | | |
| 400w Power Amplifier | EAR99 | | |
| 1Kw Power Amplifier | EAR99 | | |
| 4Kw Power Amplifier | EAR99 | | |
| Audio Distribution Unit | 5A991 | | |
| Line Flattener | 5A992 | | |
| Antenna Coupler | 5A991 | | |
| 1Kw Power Supply | EAR99 | | |
| Radio Control Software | 7A994 | | |
| Modem | 5A991 | | |
| High Speed Modem | 5A991 | | |
| | | | |
| HF Data Communication System | 5D991 | None | |
| HF Communication Link | 7D994 | | |
| HF Airborne Radio System | | None | Thales, BAE, Smith, Elmer, Marconi, Rhodes & Schwartz |
| Receiver/Exciter | 7A994 | | |
| Receiver/Exciter | 7A994 | | |
| Control | 7A994 | | |
| Antenna Coupler | 7A994 | | |
| Antenna Coupler | 7A994 | | |
| Bandpass Flattener | 7A994 | | |
| Receiver/Exciter | 7A994 | | |
| Antenna Coupler | 7A994 | | |
| Control | 7A994 | | |
| Mount | 7A994 | | |
| Mount | 7A994 | | |

| Description | ECCN | China Indigenous Capability | Foreign Availability |
|--------------------------------------|-------|---|---------------------------------------|
| Flight Display System | | | Thales, BAE, Smith, Elmer, Marconi |
| Multifunctional Display | 7A994 | Beijing Aviation Science & Technology Co. | |
| Control Panel | 7A994 | | |
| Altitude Heading Computer | | | |
| Altitude Heading Computer | 7A994 | Chengdu Aero-Instrument Corp. | |
| Flux Detector | 7A994 | Taiyuan Aero-Instrument Co. Ltd. | |
| Mount | 7A994 | Shanxi Baocheng Aviation Instrument Co. | |
| Electric Compensator Unit | 7A994 | | |
| Digital Navigation Receiver | | | |
| Navigation Receiver | 7A994 | None | |
| Mounting Bracket | 7A994 | | |
| Navigation Control | 7A994 | | |
| Distance Measuring Equipment | 7A994 | | |
| Mounting Tray | 7A994 | None | |
| Antenna | 7A994 | | |
| Automatic Direction Finder | 7A994 | | |
| Mounting Bracket | 7A994 | Haite Group Co. | |
| Antenna | 7A994 | | |
| Navigation Control | 7A994 | | |
| Radio Altimeter | | | |
| Radio Altimeter | 7A994 | | |
| Mounting Tray | 7A994 | Beijing Aviation Science & Technology Co. | |
| Radio Altimeter | 7A994 | | |
| Antenna | 6A998 | | |
| Transponder | 6A998 | | |
| Mounting Tray | 6A998 | CARERI | |
| Navigation Control | 6A998 | | |
| Antenna | 7A994 | | |
| VHF Communication Transceiver | 7A994 | | |
| Mounting Tray | 7A994 | None | |

| | | | |
|--------------------|-------|--|--|
| Navigation Control | 7A994 | | |
|--------------------|-------|--|--|

| Description | ECCN | China Indigenous Capability | Foreign Availability |
|--|-------|-----------------------------|----------------------|
| Traffic Alert and Collision Avoidance System (TCAS) | | None | Thales |
| Receiver/Transmitter | 6A998 | | |
| Control | 6A998 | | |
| TCAS Directional Antenna | 6A998 | | |
| Indicator | 6A998 | | |

ATTACHMENT 2

Attachment C

Networking Items Should Be Excluded from MEUR Because of Availability in China

Because of widespread availability of networking hardware, software and technology in China, from Chinese sources and from other sources, we respectfully submit that such items should not be subject to MEUR. We have selected four representative vendors of networking equipment. Two of them are American companies (Cisco and Juniper), one is a Chinese company (Huawei) and the final one is a French company (Alcatel), illustrating the global competitiveness of this dynamic industry. Items described below are classified under ECCNs 5A/D002 and 5A/D992. (Hardware otherwise classified under 5A991 is controlled under 5A002 or 5A992, as appropriate, after software with encryption has been added. All encryption is based on industry standards, in order to facilitate interoperability, and have similar performance.)

1. Marketplace for Routers

| | Cisco | Huawei | Alcatel | Juniper |
|----------|--|---|--|-------------------------|
| Core | Carrier Routing System (CRS-1) | Net Engine 5000E | | T-640 TX |
| Edge | XR-12000 Series 7600 Series 10000 Series | Net Engine 80E Net Engine 40 E / 20 MA 5200G | 7750 Service Router 7450 Service Switch | M320 M120 E320 |
| Midrange | 7200 Series | Net Engine 16E/8E/5 | 7710 Service Router | M10i M7i |
| Access | 3800 Series 2800 Series 1800 Series | AR 46 AR 28 AR 18 | | J6300 J4300 J2300 |

2. Marketplace for Switches

| | Cisco | Huawei | Alcatel | Juniper |
|---------------------------|---------------|---------------|------------------------------------|---------|
| Core Distribution | Catalyst 6500 | Quidway S8500 | OmniSwitch 9800 OmniSwitch 9700 | |
| Aggregation Wiring Closet | Catalyst 4500 | Quidway S6500 | OmniSwitch 7800 OmniSwitch 7700 | |



| | | | | |
|--------------|---------------------------------------|---|---|--|
| Metro Medium | Catalyst 3750 Catalyst 3560 | Quidway S5600 Quidway S3900 Quidway S3500 | OmniSwitch 6850 OmniSwitch 6800 OmniSwitch 6600 | |
| Small Office | Catalyst 2960 Catalyst Express 500 | Quidway S3000 | OmniStack LS6200 | |

3. Marketplace for Voice and IP Communications

| | Cisco | Huawei | Alcatel | Juniper |
|------------------|---|--|--|---------|
| IP Phones | 7900 Series Unified IP Phones IP Communicator | ViewPoint 8210 Videophone ViewPoint 8220 Videophone | IP Touch 8 Series Phones | |
| Call Control | Unified Call Manager BTS 10200 Softswitch | USYS- MediaX3600 SoftX3000- Softswitch | OmniPCX Enterprise 5020 Media Gateway Controller | |
| Customer Contact | Unified Contact Center | | OmniGensis | |
| Applications | Unified CRM Connector Fax Server | | OmniTouch Unified Communications | |

4. Marketplace for Wireless Networking

| | Cisco | Huawei | Alcatel | Juniper |
|---------------|--|--------------------------------------|---|---------|
| Access Points | Aironet Access Points | Quidway Wireless Access Points | OmniAccess Wireless Access Points | |
| Controllers | 4400 Series Wireless LAN Controllers 2000 Series Wireless LAN Controllers | MA5200F | OmniAccess 6000 OmniAccess 4324 OmniAccess 4308 | |



| | | | | |
|------------------|---|--|--------------------------|--------------------------------------|
| Integrated WLAN | Wireless Services for ISRs Catalyst 6500 WLSM | Aolynk BR Series Aolynk DR Series | | NetScreen-5GT Wireless Odyssey |
| Mobile Solutions | Mobile Solutions | UMTS/WCDMA CDMA 2000 GSM Mobile Core Network | Mobile Network Solutions | |

5. Marketplace for Network Security Products

| | Cisco | Huawei | Alcatel | Juniper |
|------------------------------|--|---|---------|--|
| Firewalls | PIX 500 Series Security Appliances ASA 5500 Series | Eudemon 1000/500/200/100 Series Firewalls | | Netscreen Integrated Firewall Security Platforms |
| VPN | VPN 3000 Series Concentrators ASA 5500 Series | Eudemon 1000/500/200/100 Series Firewalls | | Netscreen Integrated Firewall Security Platforms SSL VPN Appliances |
| Intrusion Prevention | IPS 4200 Series Sensors ASA 5500 Series | Quidway S8500 IDS Module | | Intrusion Prevention Product Line |
| Integrated Security Software | IOS Firewall | Intranet Security Solution | | JUNOS |

6. Marketplace for Optical Networking Products

| | Cisco | Huawei | Alcatel | Juniper |
|------------|----------------------------------|-------------------------------|---------|---------|
| Metro Core | ONS 15600 MSPP ONS 15454 MSPP | OptiX Metro 1050/3000/5000 | 1670 SM | |



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| | | | | |
|------------------------|--|---|--|--|
| Metro Edge / Access | ONS 15327 MSPP ONS 15310 ONS 15302/305 MSPP | OptiX Metro 100/500/1000 | 1642 Edge Multiplexer 1660 SM Optical Multi-Service Node | |
| Metro DWDM | ONS 15454 MSTP ONS 15500 Series Metro DWDM | OptiX METRO 6100/6040 DWDM OptiX BWS 1600G DWDM | 1696 Metrospan (Metro WDM) | |

THE OPPORTUNITIES FOR OPERATING SYSTEM SOFTWARE SUPPLIERS IN THE CHINESE CONVERGED DEVICE MARKET

Revenues derived from the sale of devices using operating systems (converged devices) in the Chinese handset market represent a US\$2 Billion opportunity in 2006 and will swell over 50% to US\$4 Billion opportunity in 2011. The IPTV market, while facing near-term regulatory and business delivery issues, has a bright long-term future and major service providers continue to drive developments forward towards the launch of commercial IPTV service. These lucrative opportunities have suppliers, multi-national companies based in the US, Japan, Europe, and Asia, positioning to participate in the market in the long term, and US specific non-tariff trade barriers will significantly restrict US-based operating system suppliers from participating in this market. This white paper provides an assessment of the handset market in China and the role operating systems play in realizing this opportunity. This paper also summarizes the key global operating system players and the global and market level strategies they are implementing to drive their separate solutions into the Chinese converged device market.

October 2006

1 Executive Summary

Non-tariff trade barriers will significantly restrict operating system suppliers from participating in the Chinese market.

As the suppliers of the primary technology driving sales, Operating System vendors are well positioned to benefit from the projected future growth in the Chinese converged device market. These vendors currently face significant regulatory and business model challenges in the medium term, and should be allowed to concentrate freely on driving revenues and user growth for their mobile service provider customers.

The multi-functional capabilities and rich application sets offered via software-based operating systems will be the primary driver of the long term appeal of these devices. Basic cellular phones cannot match this capability, and mobile operators in China are anxious to have richer functionality, in order to enable growth in sales revenues via consumption of data services. This is the core value proposition of the operating system on converged devices vs. the lower functionality, low value approach of conventional cellular handsets.

The Chinese handset market will reach 105 million units in 2006 and will grow at a compound annual rate of 6% through 2011 to reach 137 million total handsets sold in that year.

Converged devices will emerge as one of the main device segments within the Chinese cellular device market. This total device market, by the end of 2006, will be the second largest single country market worldwide.

The operating system in a converged device serves as the platform to deliver rich, multi-tasking application functionality while simultaneously maintaining and managing voice and data connectivity. This rich application functionality is a core, long-term requisite that mobile service providers will aggressively utilize to drive (data) revenue growth in the Chinese cellular market.

All of the major operating system suppliers have established and are executing on long-term strategies to localize and develop the Chinese converged device market opportunity.

Operating system suppliers are each positioning around the core application-enhancing assets that they own in their system solutions. Strategies are diverse, with Research in Motion using

push email and messaging, Microsoft using productivity via Office™ applications and rich media, Symbian leveraging highly integrated communications utility and rich media functionality on Nokia devices, and Access/Palmsource leveraging low-cost open source assets.

Service providers continue to push for commercialization of IPTV services:

- In December 2005, Shanghai Telecom and Shanghai Media Group have collaborated with Siemens to create commercial services this year;
- In May 2006, China Telecom selected infrastructure equipment providers; In May 2006 China Netcom made its equipment vendor selections public;
- China's state administration of radio, film and television (SARFT) is reportedly close to issuing licenses for local IPTV services to one or more vendors;

There are concerns with the government's ability and willingness to offer licenses for IPTV services. There are also concerns about the requirement for service providers to negotiate distribution agreements with local telecom operators and the need to secure SARFT approval on these agreements. However, these issues are centered primarily on business issue of the acceptable rates and pricing structures, issues that are common with any new commercial IP services.

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2 The Chinese Converged Device Market

2.1 China Handset Market Overview & Summary

The Chinese handset market opportunity is immense. Total subscriptions will grow 14% and reach 429 million at the end of 2006, while cellular penetration, as measured against penetration of the total population, will reach 25% by the end of 2006¹. 15% of the world's active cellular users are accessing cellular services in China.

Table 2.1: Chinese Cellular User & Subscription Metrics

| China Cellular Users | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | CAGR |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Total Subscriptions (M) | 206.6 | 257.6 | 317.8 | 376.1 | 429.1 | 472.6 | 506.6 | 535.6 | 556.6 | 574.6 | 6.0% |
| Cellular Users (M) | 150.1 | 187.1 | 231.7 | 280.0 | 326.9 | 369.0 | 403.0 | 433.4 | 457.9 | 480.5 | 8.0% |
| Population Penetration | 11.6% | 14.3% | 17.6% | 21.1% | 24.5% | 27.4% | 29.8% | 31.8% | 33.4% | 34.8% | 7.3% |

This subscription growth, combined with improving handset replacement dynamics, creates one of the largest cellular device markets globally. In 2006, 105 million cellular handsets will be sold in China, making it the country with the second largest handset sales totals globally. Handset sales are projected to grow at a 6% 5-year compound annual growth rate (CAGR) through 2011, to 137 million units annually being sold in 2011².

In 2006, subscriptions sold on pre-paid service tariffs will grow to account for 66% of total subscriptions, and will continue to rise through 2011 to reach 73% of total subscriptions in that year. Furthermore, annual revenues per user (ARPU) will reach US\$110, a third of the global average of US\$318 per user.

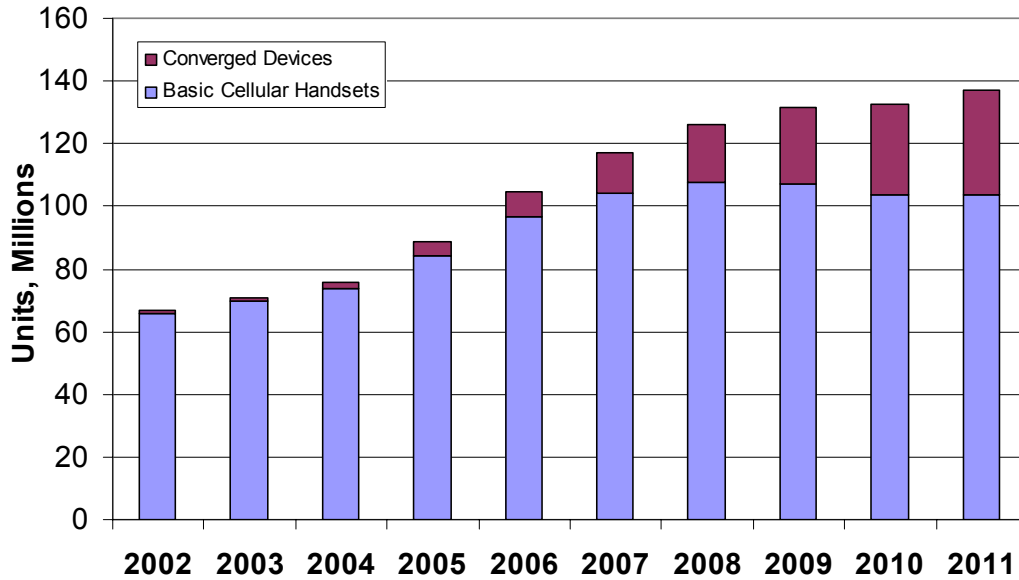
Users buying on unsubsidized pre-paid tariffs with very low annual spending profiles for services have historically purchased handsets in lower price ranges. In China, this is the norm, and the metrics on Chinese average revenue per user (ARPU) and pre-paid penetration contribute to the fact that most handsets sold in this market today are lower price, more basic product configurations. Furthermore, this is likely to be the case continuing through the medium term. Strategy Analytics estimates that the average selling price (ASP) for cellular handsets in China is approximately US\$85 at the end of 2005, and will fall gradually through 2011 to near US\$75.

¹ Strategy Analytics, Wireless Network Strategies estimate, September, 2006.

² Strategy Analytics, Wireless Device Strategies estimate, October 2006.

2.2 China Operating System-enabled Converged Device Market Potential

Exhibit 2.2: Chinese Cellular Device Market Historical Sales & Projections, 2000-2011



As the suppliers of the primary technology driving sales, Operating System vendors are well positioned to benefit from the projected future growth in the Chinese converged device market.

The multi-functional capabilities and rich application sets offered via software-based operating systems will be the primary driver of the long term appeal of these devices.

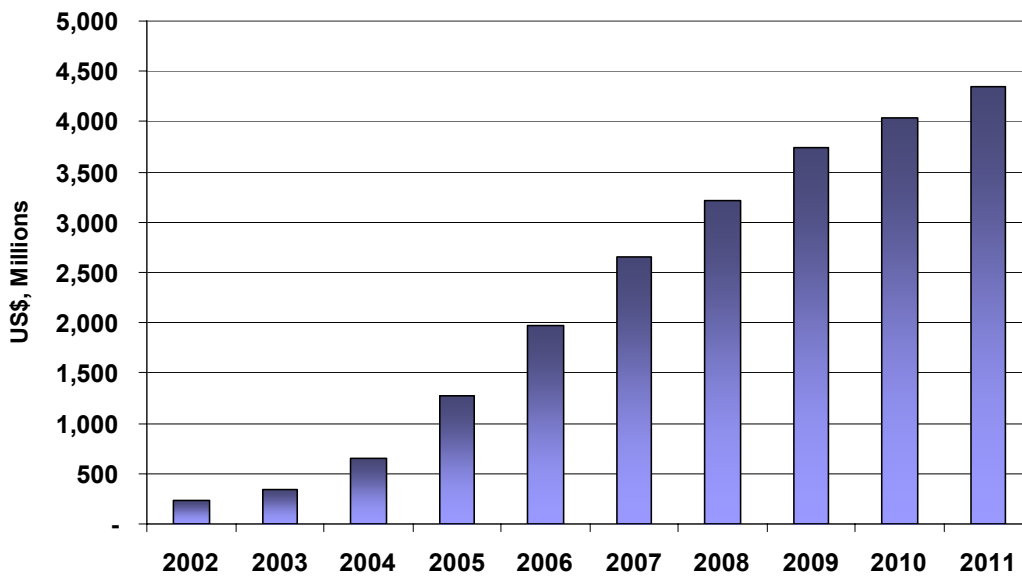
Basic cellular phones cannot match this capability, and mobile operators in China are anxious to have richer functionality, in order to enable growth in sales revenues via consumption of data services. This is the core value proposition of the operating system on converged devices vs. the lower functionality, low value approach of conventional cellular handsets.

Sales of converged devices in the Chinese market are estimated to account for 8% of total cellular device sales in 2006, or roughly 8 million units. This trails the global penetration of

converged device sales, which are projected to reach 85 million units globally, or 9% of total cellular-enabled devices sold worldwide³.

This equates to just under US\$2 Billion in device revenues in 2006, and this will grow nearly 50% to US\$4 Billion opportunity in 2011.

Exhibit 2.3: China Converged Device Revenues, US\$ Millions, Historical and Projected



Several factors are contributing to this lower penetration of sales:

- Generally lower levels of corporate/enterprise IT and systems support;
- Lower broadband penetration in households, creating a general lack of awareness of the benefits of internet and connected mobile technologies beyond cellular voice and SMS;
- Higher level of grey-market⁴ device sales;

³ Strategy Analytics, Wireless Device Strategies estimates, June 2006.

⁴ Devices purchased in other regional and/or country markets, then resold in domestic market.

-
- Lower spending levels on both services and device purchases in China.

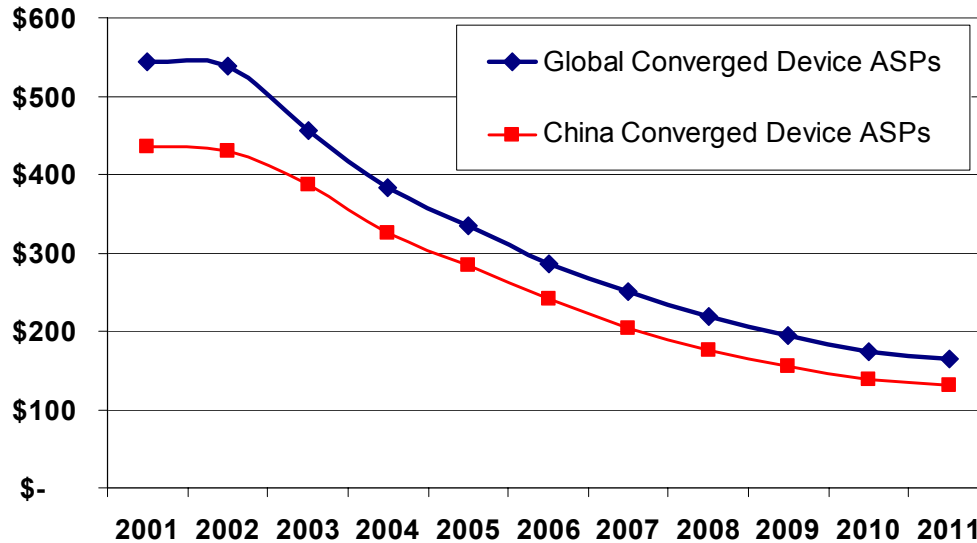
However, as illustrated in Exhibit 2.2, converged device sales in China are projected to grow at a 35% 5 year CAGR through 2011 to reach 33 million units⁵. This growth will be driven by a number of factors:

- Cellular service providers are keen to attempt to drive ARPU levels by offering richer sets of applications and devices to their users. China Mobile and China Unicom are already working with nearly all of the top original equipment manufacturers (OEMs and Operating System (OS) suppliers to improve their converged device portfolios and will increasingly look to these devices to offer the broadest set of data-revenue generating applications in the long-term;
- Handset suppliers continue to lower the bill of materials (BOM) costs in their converged device offerings, and ASPs for these devices are expected to fall significantly over the next several years (see Exhibit 2.3).
- As converged device prices fall, OEMs will be able to increasingly offer a wider array of segmented converged devices targeted for delivering specific application sets to a wider range of mass market users. Like the Nokia N Series devices, these media-centric designs, at much lower selling price points, will drive longer term adoption beyond business/enterprise users into more mass market, consumer oriented user segments.

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⁵ Strategy Analytics, Wireless Device Strategies, October 2006.

Exhibit 2.4: Global and China Converged Device ASPs, Historical and Projected



2.3 Operating System Supplier Status in China⁶

2.3.1 Research in Motion

In May 2006, Research in Motion announced a device and email solution to be offered via China Mobile, China's largest cellular service provider. To be offered via its GPRS (2.5G) network, Research in Motion expects to begin selling devices through China Mobile in Q3 2006.

In April 2006, the second largest cellular service provider in China, China Unicom, launched a Redberry™ branded push email service that closely copies Research in Motion's successful Blackberry™ product line. While there is more than anecdotal evidence that this could constitute trademark and/or copyright infringement, Research in Motion has been subdued in its response. Confident in the superior nature of its email solution, Research in Motion appears to be willing to allow this brand-mimicking to continue in order to avoid "upsetting the apple cart" and possibly derailing its efforts to drive long-term adoption of its own products with a lawsuit against one of the top service providers in China.

⁶ More information is included on each of these operating system vendors in section 4.

2.3.2 Symbian

As it is experiencing in global sales, Symbian-enabled device sales are being driven in China primarily by Nokia. Nokia's competitive position in the global handset market (all device types) has seen China become one of its core markets for localized manufacturing, research & development, and distribution resources. Nokia has consistently had nearly 30% market share of all handsets sold in China for the past several years, which equates to roughly 25 million handsets⁷ or nearly than 10% of Nokia total global volumes⁸ in 2005.



With this level of market commitment, Nokia has been proactive in supporting popular internet content brands and service providers in China via its Symbian-enabled converged devices:

- In March 2005, announced that it's N Series line of converged device products, the N70, N90 and other select Series 60 devices (all Symbian-enabled) would support Baidu Wireless Search services. Nokia now provides customized, mobile presentation of content searches from a variety of Baidu online communities.
- Launched the Nokia 6708 model with Chinese handwriting recognition feature in October 2005.
- Symbian reported that it held a 62% share of OS-enabled converged device sales in China in Q1 2006. Nokia sold 100% of this volume, estimated to be approximately 1.1 million units, approximately 10% of Symbian volumes in the quarter.⁹

2.3.3 Access/Palmsource

Access purchased the Palmsource OS in November 2005 with the intention of transitioning the OS to a Linux or open source-based platform. In February 2006, Access announced that the OS will now be known as the Access Linux Platform (ALP), an open and flexible Linux-based platform tailored for converged devices.

⁷ Includes both traditional cellular handsets and cellular converged devices.

⁸ Strategy Analytics estimates, based on Nokia annual sales of 265 million handsets sold globally in 2005.

⁹ Strategy Analytics estimates, Canals estimates, Symbian China OS-enabled estimates.

Today, Palm (the device vendor based in the US and now separate from the US supplier after a spin-off in 2004) supports the Palmsource OS on an increasingly smaller segment of its device sales globally, and also supports the Microsoft Windows Mobile OS. Samsung and several smaller Chinese OEMs are offering Palm-enabled products globally and in China, respectively. Access is actively involved in the process of transitioning the OS to an open source platform, but information on its status and devices that are available which are supporting the platform is minimal at present, suggesting slow take-up in the global and Chinese device community.

2.3.4 Microsoft



Microsoft has a larger strategy to drive sales of its IT computing software products and services in China and has been promoting these corporate initiatives since the early 2000s. Its effort to sell Windows Mobile™ operating system enabled converged devices is one of these major corporate initiatives in the Chinese market.

Microsoft has been attempting to drive an application development community in China for several years. In May 2006, Microsoft signed a working agreement with TechFaith Wireless, a handset design company, to develop converged devices for the Chinese market.

Chinese mobile device manufacturers offering Microsoft Windows Mobile OS-enabled converged devices include Lenovo Mobile, Amoi, HTC/Dopod, and Mio Technologies.

2.3.5 Linux

China Mobile and China Unicom are part of a regional alliance with cellular service providers in South Korea and Japan to support the development of an application development ecosystem for mobile Linux-based products.

The Chinese government, via several different regulatory bodies including the MII subsidizes Linux research and development, to some unknown degree, for domestic competitors, i.e. RedFlag and others. It is important to note, however, that this support for Linux by these major service providers is not exclusive, and they continue to offer products from other OS suppliers. In fact, both major cellular service providers currently offer devices utilizing OS products from at least three of the four major OS suppliers globally.

The mid-term potential for Linux-based OS products is primarily in basic cellular handsets. In this product segment, OEMs stand to benefit from the low cost nature of the system and the

more basic requirements of these communication-centric products vs. the more robust processing requirements of converged devices. Many domestic handset OEMs, including TCL, Ningbo Bird, Lenovo, Haier, ZTE, Huawei, G28, Gtek, offer basic handsets utilizing the Linux OS, but converged devices utilizing Linux will be limited to only 2 to 3 million units in 2006, roughly 25% of converged devices sold¹⁰. Share of Linux-enabled converged devices in China is projected to remain relatively static at this level through 2008¹¹.

[The remainder of this page intentionally left blank.]

¹⁰ Strategy Analytics estimates.

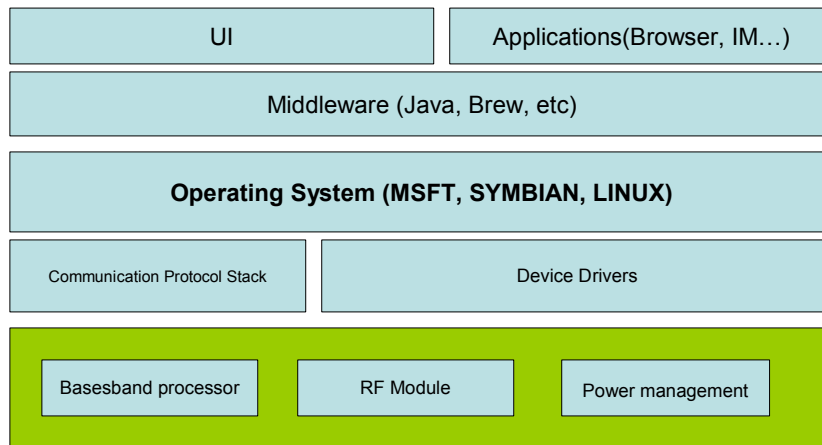
¹¹ Strategy Analytics estimates.

3 Role of the Operating System in the Converged Device Domain

The operating system in a Converged device serves as the platform to deliver rich, multi-tasking application functionality while simultaneously maintaining and managing voice and data connectivity. These devices utilize advanced features and computing architectures, including but not limited to:

- **Cellular connectivity.** This is the core communications technology enabling WAN connectivity. This technology is integrated into the device and provides value-added functionality linked to productivity and entertainment applications.
- **Advanced mobile computing architectures** that include several application processors (i.e. media engines, graphics processors, etc.) in addition to RF baseband computing cores;
- **large blocks of embedded memory**, as well as Removable Storage Media support;
- **Rich Personal Area Network (PAN) connectivity**, including Bluetooth, Wifi/WLAN, USB, infra-red, etc;
- **High-resolution color LCDs**, often touch-screen panels;
- **QWERTY or partial-QWERTY keypads** to facilitate messaging and text-based communications;
- **Rich entertainment/media functions** like media players and high resolution cameras;
- **Rich productivity applications**, including email/messaging, scheduling, spreadsheet, database, and word processing, contact management and scheduling (Personal Information Management or PIM);

Exhibit 3.1: Converged Device Configuration



Converged Devices utilize “Open” operating systems. These are called ‘open’ operating systems because:

- These systems, or platforms, deliver key productivity and communications solutions in the mobile and desktop computing environment;
- These systems have their own application development ecosystems, which is organized and managed by the OS owners, which serve to manage, support, and enhance wider usage of the operating systems across device and application markets for both consumer and business/enterprise users.

The major Open Operating Systems on offer in the Chinese and global mobile device market today include Symbian, Microsoft, Research in Motion, Palm, and Linux. Relevant supporting companies, locations, current market positions and product summaries are included in Section four (4), “**Operating Systems - Competitive Market Assessment.**”

Since voice and increasingly data communications are the core value of the product, converged devices integrate communications into the productivity and entertainment applications when mobile. Users can run several applications on the device, either simultaneously (multi-tasking) or individually. Via the communications feature, users can also link to the internet (choosing the most convenient WAN or PAN connectivity option) to update, exchange, or manage vital data located in other network nodes, extranets, etc. that is required in the application. The

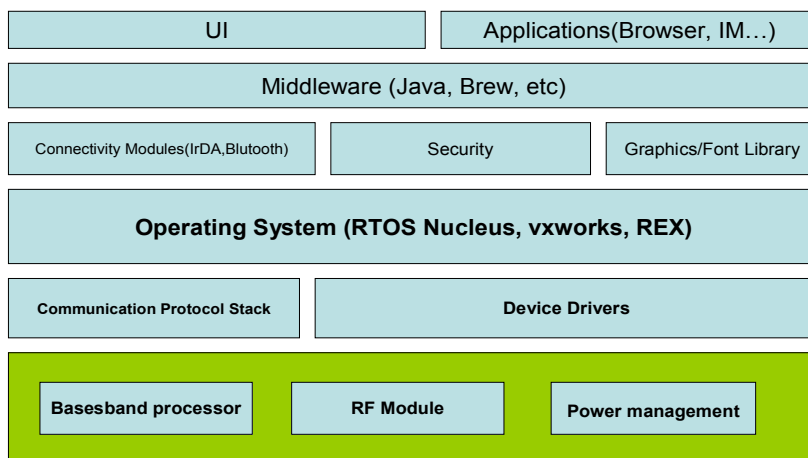
In short, the operating system supports rich communications, productivity, and entertainment application capabilities that utilize the advanced features and connectivity technologies found on converged devices.

most widely known example of this functionality is the Blackberry, which allows users to synchronize, review, create and send email from the converged Blackberry device.

This differs from typical or average cellular handsets in several important areas:

- Typical cellular handsets use streamlined computing architectures. These devices often complete all the application processing on the single baseband core which is used primarily to process the basic RF communications. As RF signal processing is increasingly resource intensive, especially on advanced network deployments (i.e. 3G) this serves to limit the breadth and richness of applications that the typical cellular handset can support.
- Typical cellular handsets utilize more basic sets of value-added features, i.e. smaller and lighter designs; lower resolution LCDs, smaller levels of embedded memory, etc.

Exhibit 3.2: Typical Cellular Handset Configuration



OEMs and service providers offer these more streamlined device capabilities in order to keep average selling prices (ASPs) low for voice-centric cellular users. These users, who often do not require rich application functionality beyond basic text (SMS) messaging will often seek out lowest price and best brand combinations for these products. This makes it low price a key component of handset products targeting this segment.

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4 Operating Systems - Competitive Market Assessment

This section includes 5D.002 items regarding identification of the major operating system vendors with a summary of key products and supporting organizations.

Operating System (OS) vendors competing in the global market today include Symbian, Microsoft, Research in Motion, Palm/Access, and Linux/Open Source. These vendors develop their OS products for mobile/portable cellular device OEMs to offer on their devices in markets in which they compete in globally. Supporting devices across the range of network technologies deployed globally, these vendors also develop related or complementary OS components that support or enhance the usability of their products in different markets and market segments. Device OEMs are required to license the OS from these OS vendors, and usually if not always pay licenses on a per-unit sold basis, at either a fixed price or as a percentage of the handset sales price.

4.1 Symbian

Table 4.1: Symbian Summary

| Symbian, Ltd. | | http://www.symbian.com/ |
|----------------------------|---|---|
| Location: | Headquarters are based in London, United Kingdom with offices in the United States, Europe and Asia (Bangalore, Beijing, Seoul and Tokyo) | |
| Product Mftg. Location(s): | London, with research and product development resources in the United States, Europe, and Asia. | |
| Key facts: | Founded, 1998, employees, 1366 | |
| Key stakeholders: | Nokia (47.9%), Ericsson (15.6%), Panasonic (10.5%), Samsung (4.5%), Siemens (8.4%) and Sony Ericsson (13.1%) | |
| Current Licensees: | Mobile phone manufacturers that license Symbian OS are Arima (Taiwan), Ben Q (Taiwan), Fujitsu (Japan), Lenovo (China), LG Electronics (S. Korea), Motorola (U.S.A), Mitsubishi (Japan), Nokia (Finland), Panasonic (Japan), Samsung (S. Korea), Sharp (Japan) and Sony Ericsson (Japan/Sweden). | |
| Key products: | Symbian OS™ | |
| Others: | Nokia has several User Interfaces (Series 60 and Series 80) designed to run specifically on the Symbian OS; NTT DoCoMo has developed the MOAP user interface for its FOMA™ 3G network; UIQ Technology, a wholly owned Symbian subsidiary, has developed the UIQ interface that runs exclusively on Symbian and is currently deployed on devices from Sony Ericsson Mobile Communications. | |

Nokia is a key driver of Symbian OS development, until last year having had a majority ownership interest and now still the single largest shareholder in the Symbian entity. Nokia is

also the nearly sole company driving Symbian device sales to date. For example, in Q2 2006 Symbian reported that 12 million devices utilizing the Symbian OS were shipped. Nokia reported that it sold 9 million Symbian enabled devices under its brand, accounting for 75% of the devices sold that quarter. Symbian reports that there is an installed base of 86 million units globally. Strategy Analytics estimates that Nokia-branded devices account for 90% of those or 77 million Symbian-enabled devices. While there are twelve (12) licensees of the Symbian OS, Nokia still accounts for the overwhelming share of Symbian enabled devices sold. Motorola, Samsung and LG have yet to offer a Symbian device commercially.

Besides Europe, Japan is the other major market where Symbian devices are utilized to some meaningful albeit minimal level to date.

Symbian’s strategy is to offer a communications intensive platform at low-cost to licensees, to facilitate broader usage across consumer mass market segments that require low-cost device solutions. Symbian applications are efficiently integrated with communications capabilities of their devices, affording value-added functionality based on the primary services offered by cellular service providers.

4.2 Research in Motion

Table 4.2: Research in Motion Summary

| Research in Motion, Ltd. (RIMM) | | http://www.rim.net/ |
|--|--|---|
| Location: | Based in Waterloo, Ontario, with offices in North America, Europe and Asia Pacific. | |
| Product Mftg. Locations: | Canada, with product development resources in the United States and Europe. | |
| Key facts: | Founded in 1984. | |
| Key stakeholders: | Publicly owned and traded. RIMM, NASDAQ National Market and Toronto Stock Exchange. | |
| Current Licensees: | Does not currently offer its OS for licensed use. Does license Blackberry Connect™, the push email component of its wireless messaging platform, to the top 6 global handset OEMs, but currently accounts for 95% ¹² of its own OS-enabled devices sold. | |
| Key products: | Provides platforms and solutions for seamless access to time-sensitive information including email, phone, SMS messaging, Internet and intranet-based applications. RIM technology also enables a broad array of third party developers and manufacturers to enhance their products and services with wireless connectivity. The company has an increasingly strong presence in the business and corporate mobile email market, via its BlackBerry® wireless platform, as well as its wireless device product line, software development tools, radio-modems and software/hardware licensing agreements. | |

¹² Strategy Analytics estimate, as of end of calendar Q2 2006.

Research in Motion (RIMM) does not currently license its operating system to other handset OEMs. It derives 72%¹³ of its revenues from the sale of BlackBerry™ devices that it sells directly to service providers and 19%¹⁴ of its revenues from services associated with its BlackBerry Wireless email solutions. Due to the popular nature of its BlackBerry wireless email products in the corporate/enterprise market (the company reported that at the end of its fiscal 2Q 2006, that it had 6.2 million subscribers to its email platform globally), there is a growing base of application developers designing applications to run on the platform.

4.3 Microsoft

Table 4.3: Microsoft Summary

| Microsoft Corporation | | http://www.microsoft.com/ |
|------------------------------|---|---|
| Location: | Redmond, Washington U.S.A. with corporate office locations on major continents globally. | |
| Product Mftg. Locations: | The United States, with product development and research resources contributing globally. | |
| Key facts: | Founded 1975, public issue in March 1986. | |
| Key stakeholders: | Bill Gates | |
| Current Licensees: | Licensees include Motorola (U.S.A), Samsung (S. Korea), Benq Siemens (Taiwan), HTC (Taiwan), HP (U.S.A.), Palm (U.S.A.), Intermec, Symbol Technologies (recently acquired by Motorola), Lenovo Mobile (China), Amoi (China), Dopod (acquired by HTC in June 2006, China), Mio Technology Ltd. (China), Compal Computing (Tawian) and numerous other Asian-based contract and original equipment manufacturers. | |
| Key products: | Its products for Converged device and cellular handset products are designed to offer rich internet, email, and Office™ application functionality. Microsoft Smartphone and Windows Mobile OS products are licensed products created and managed within its Mobile and Embedded Devices Business Group. Its Windows Media and Activesync products are also licensed to mobile device OEM and enabling technology suppliers. | |

Microsoft entered the converged device market in 2001, using its experience of offering OS products on unconnected PDA devices and experience gleaned from competing with Palm and several proprietary OS players (Ericsson, Psion) to make entry into the mobile converged device market.

A market leader in operating systems deployed in desktop, network computing, and Exchange™ based email systems for both consumer and enterprise users, Microsoft seeks to extend this

¹³ Source: RIMM fiscal Q2 2006 report, Sept 28, 2006.

¹⁴ Source: RIMM fiscal Q2 2006 report, Sept 28, 2006.

expertise into the converged device market via its mobile computing platform. In converged devices, its strongest competitive position is currently in the North American market where it holds a 17% market share¹⁵ of OS enabled converged devices sold in 2005 Windows Mobile OS in all major cellular markets globally.

Microsoft has a close working relationship with High Tech Computers (HTC). HTC offers Microsoft OS-enabled products exclusively, via both OEM-branded Windows Mobile products and contract equipment manufactured (CEM) products for other device vendors and cellular service providers like O2 in the UK and Cingular T Mobile in Europe and the US. HTC accounted for more than 75% of Microsoft-enabled OS converged devices sold in 2005, and will continue to play an important role in driving Microsoft-enabled converged device sales globally.

4.4 Palmsource

Table 4.4: Palmsource/Access Summary

| Palmsource owned by Access Co., Ltd. | | http://www.access-us-inc.com/ |
|---|---|---|
| Location: | Headquarters in Tokyo, Japan, with offices in Germany, China, Taiwan, Korea, France, and the U.S.A. | |
| Product Mftg. Locations: | Japan. | |
| Key facts: | Founded April 1979, 1256 group employees, capitalization of 31.28 Billion Yen ¹⁶ or US\$272 million. | |
| Key stakeholders: | NTT Docomo, Inc. | |
| Current Licensees: | For its Palmsource OS, licensees include Palm (U.S.A.), Samsung (S. Korea), Motorola, Kyocera Wireless (U.S.A.), Sharp (Japan), and a number of smaller Chinese OEMs, including Haier and Amoi. 14 of the top 15 OEMs license their Netfront browser or components of their Netfront Mobile client suite. | |
| Key products: | Netfront browser/iMode browser, Netfront Mobile Client Suite of applications for cellular phones, Palmsource operating system, Netfront User interface and other products for portable/mobile consumer electronics products (i.e. Netfront software is used in the Sony Playstation Portable, PSP®). | |

Palmsource was purchased by Access Co., Ltd. in November 2005. The original operating system deployed in the early Palm handhelds, the installed base of Palmsource-enabled devices swelled globally to in excess of 20 million devices globally in 2004. Sales of the platform began to slide

¹⁵ Strategy Analytics estimates, for full year 2005.

¹⁶ Using exchange rates and capitalization information as of January 31, 2006.

as the OS vendor did not anticipate the need to support its OS in the mobile or cellular-connected user environment.

As users began to migrate away from unconnected devices in 2004, Palmsource struggled to maintain its position in the OS marketplace. In 2005, among other initiatives aimed at stabilizing its global position, Palmsource mobilized resources to begin integrating Linux-based software code into the Palmsource OS for future product demand in China and other Asia-Pacific markets. Its purchase of China Mobilesoft, a Linux platform supplier was part of this effort.

Access purchased Palmsource and its mobile OS products in November 2005 with the intention of transitioning the OS to a Linux or open source-based platform. In February 2006, Access announced that the OS will now be known as the Access Linux Platform (ALP), an open and flexible Linux-based platform tailored for converged devices.

Today, Palm (device vendor, a different company from the OS supplier) supports the Palmsource OS on an increasingly smaller segment of its device sales globally, and also supports the Microsoft Windows Mobile OS. Samsung and several smaller Chinese OEMs are offering Palm-enabled products globally and in China, respectively. Access is actively involved in the process of transitioning the OS to an open source platform, but information on its status and the commercial availability of devices supporting the platform is minimal at present, suggesting slow take-up in the global and Chinese device community.

4.5 Linux

Table 4.5: Linux Summary

| Linux - Open source | |
|----------------------------|---|
| Location: | A community of developers using open source code to develop operating system products for a variety of different computing environments, one of which includes mobile computing via converged devices. |
| Product Mftg. Locations: | Most development efforts happening in Asia, with a concentration of efforts in S. Korea, Japan, China. Organizations contributing from Europe and North America. |
| Key stakeholders: | Montavista software, Motorola, Access, Linux Phone Standards Forum (LiPS), Open Source Development Labs started. |
| Current Licensees: | License is not required for Linux based open source OS products in theory. The community development efforts are meant to provide public development and leverage of development resources. However, several companies are aggressively seeking to establish products that differentiate on a competitive position established on Linux-based systems, among them Montavista and Motorola. These players are not likely to make their system developments available to their competing OEM or |

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| | software suppliers. |
| Key products: | <p>The Mobile Linux Initiative, a working group designed to optimize the Linux operating system for handheld devices. That group is working to unify developments around the mobile Linux kernel, focusing on such functions as power management, boot time, and system footprint; Linux Phone Standards Forum (LiPS) Forum is to create application programming interfaces that will allow developers to build applications that will interoperate across Linux handsets made by all manufacturers; Motorola Moto-linux and several handsets available, including Ming A1200, A728, A760, A768, A910, A780. Motorola reports 5 million Linux enabled handsets sold globally (cumulatively) through Q2 2006¹⁷. Samsung ships several Linux-based smart phones, and the SCH-i519 Smartphone was its first Linux Smartphone that began shipping in 2003. Samsung also worked with Infineon to develop a Linux based Smartphone platform (announced at 3GSM in 2005) and has since launched two new smart phones, the Qtopia and the i858.</p> |

The appeal of low-cost, open source handset development via the Linux platform has been debated in the global device market since 2000. Linux has been very successful in displacing other platforms in network switching and process-intensive computing environments in the last decade.

The requirement for a closely integrated link between communications and application functionality of the operating system has proven to be a stumbling block for Linux OS diffusion into the mobile converged device market globally. Several OEMs, including Sharp, have had limited success in driving Linux device adoption, especially in mature cellular markets in Western Europe and North America. The resource-intensive nature of the OS, combined with the lack of an established ecosystem of supporting application developers has virtually limited Linux OS-based converged device sales to nil in these markets.

In Asia Pacific, Linux OS development has continued to gain steam. Mobile operators and IT software players in Korea, China, Taiwan, and Japan have developed a core group of suppliers and developers for Linux based products. This development, led by players like China Mobilesoft and Montavista, among others, has been fragmented until 2005. With broader commitment to the deployment of the Linux OS from Motorola (the company has stated that it will deploy Linux across its converged and traditional cellular handset products in the future), the platform is gaining some momentum with sales concentrated in Asia Pacific.

The recent launch of several Linux consortiums - specifically the Mobile Linux Initiative and the Linux Phone Standards Forum (LiPS) - continue to create momentum for broader Linux OS support in Asia and Western Europe.

¹⁷ Source: Motorola, Montavista Software.

4.6 Others, Proprietary

Handset OEMs and CEMs utilize their own operating system products in various product segments. These operating systems are primarily meant to meet the need for communications support and basic application functionality on a mid tier, basic cellular handset. VXWorks, Rex, etc, and several other proprietary Real Time operating systems (RTOS) developed by handset OEMs and their software suppliers are used in these product categories. The main purpose of these operating systems is to support basic communications and application functionality on streamlined computing architectures at a total lower cost. These products do not directly compete in the same product segments with converged devices running open operating systems, but will still account for over 70% of cellular in 2007.

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5 Definitions

ARPU - Average Revenue per User. A metric utilized by cellular service providers to measure average services spending levels for their current, active cellular customer base.

ASP- Average selling price. In this report, this refers to the price that handset OEMs charge to cellular service providers for their devices. This is essentially the wholesale or trade price.

CEM - Contract Equipment Manufacturer. Manufacture devices on contract for other OEMs and/or service providers.

Converged device - Also known as smart devices, smart phones, and wireless PDAs. These devices utilize advanced computing architectures and connectivity technologies that provide a much higher level of functionality and application potential than typical cellular handsets. The support of voice and data communications “converges” with rich application and multi-tasking capabilities on these devices at a level typically much higher than what is available on an ordinary or average cellular handset. These devices utilize an operating system to deliver rich, multi-tasking application functionality while simultaneously maintaining and managing voice and data connectivity. These devices support a rich set of communications, entertainment, and productivity applications that are typically not found on basic, mass market cellular handsets utilizing a real-time operating system. Integrated support for Wide Area Connectivity serves as the core value of these devices, allowing key user data, information, and communication to be actively managed and updated while the user is mobile.

Data-centric - The data or packet based communications functions are the main usage/functionality. Basic voice and SMS functions are also present.

Emerging Market - Countries with cellular service penetration below 50% of the total population. Nearly all also demonstrate per-capita income levels across the total population that are significantly lower than developed or mature cellular markets in Europe and the United States.

IPTV - Internet Protocol Television. Television programming delivered in internet protocols, via broadband internet services.

MMS - Multi-Media Messaging, a cellular messaging protocol enabling both text and data messages. MMS enabled devices allow users to both send and receive text messages as well as images, videos and other data file formats.

OEM - Original Equipment Manufacturer. In this report, these are also called ‘cellular handset vendors.’

PDA - Personal Digital Assistant. A device that offers enhancements based on productive use of Personal Information Management (PIM) applications, i.e. contact management, scheduling, messaging, etc.

Personal Area Network (PAN) - Technologies that provide short-range connectivity, typically from device to device, either wirelessly or via cable connection. i.e. Bluetooth, Wifi/WLAN, USB, infra-red. Data transfer rates vary depending on the technology.

PIM - Personal Information Management.

Pre-paid - Cellular service delivered on a “pay as you go” basis, where users pay upfront for monthly services and cannot use an amount beyond their self-determined pre-paid level of service.

RF - Radio frequency. Cellular radios work in certain licensed radio frequencies which vary depending on market and regulatory factors.

SMS - Short Messaging Service, a cellular text messaging protocol used globally by cellular service providers. Also called ‘text messaging’, offers 160 symbol message length and can be enhanced (EMS) to support longer, concatenated messages and icons.

Subscriptions - An active cellular service delivered to a user, billed and paid monthly.

Voice-centric - Voice and basic SMS functions are the main applications utilized or offered.

Wide Area Network (WAN) - Technologies, i.e. cellular, PCS, 3G, Wimax, that use radio frequency to provide voice and/or data connectivity in distances from a few meters to several miles, depending on network configuration. Data transfer rates vary depending on the generation of RF technology used for connection.

2.5G - Cellular handsets supporting the GSM/GPRS interface. Broadly defined by the International Telecommunications Union as devices that can theoretically support data transfer speeds below 144 kbps.

3G - Third generation wireless products. Broadly defined by the ITU as products that can deliver data transfer speeds of 144kbps or higher without additional hardware and/or silicon based enhancements.

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