Siemens and Intel Deliver Enhanced Scalability and Robust Security for Healthcare

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**Scaling to Meet the Demands of High-Performance Healthcare**

Sweden’s county councils are undergoing significant data center consolidation and technology refresh in conjunction with the rapid pace of eHealth service deployment. Data center managers are under significant pressure to manage capital and operational expenditures. Therefore, existing data centers are typically operating at the capacity limit for storage, power, and cooling. Data center consolidation increases the need to support higher and higher levels of concurrent users1 for a particular application instance. Consolidation also raises considerations for disaster recovery, failover, and fault tolerance.

Siemens and Intel recognize these challenges and are partnering to develop innovative, cost-effective, and high-availability solutions to support the demands placed on these organizations. The two companies are working together to update their customer hardware recommendations to reflect the latest advances in data center technologies (see Table 1). They have also performed significant stress, load, and scalability testing in Intel technologies such as high-performance Intel® Xeon® processors, Intel® 10GbE connectivity, and Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) help Siemens Melior meet the IT challenges healthcare institutions face today.

Author
Kristina M. Kermanshahche
Chief Architect, Healthcare
Intel Corporation
facilities to verify that Siemens Melior can now scale to over 9,000 concurrent users, as shown in Figure 1.

Whether looking to scale to 500 or 9,000 concurrent users, it is important to create a balanced compute model, such as that shown in Figure 2. Healthcare institutions should consider available compute capacity as well as network and storage requirements. Without this balance, a major investment in database servers will only exacerbate network and storage traffic, available bandwidth, and management complexity—thereby limiting scalability and availability, and resulting in higher overall operational costs.

Intel Technology Helps Meet Healthcare IT Challenges

Intel’s latest server platforms (see the sidebar, “Intel® Xeon® Processors Bring High Performance to Healthcare”) deliver intelligent, adaptable, built-in performance that scales easily to address the key healthcare IT challenges of explosive data growth, network latency, infrastructure security, and power inefficiencies. Intel’s processors and the latest technology advances are incorporated into most networking and storage suppliers’ products, giving data center and IT managers a wide range of choice of open platforms based on industry standards.

Some of the Intel technologies that Melior customers can take advantage of include the following:

- **Unified Networking.** Reduces complexity and increases agility by consolidating network and storage traffic on the same Ethernet fabric. By combining compute, network, and storage into a single manageable framework, unified networking provides the ability to pool IT resources, automate resource provisioning, and quickly scale up and down to meet the needs of dynamic computing workloads.

- **Intel® 10 Gigabit Ethernet (Intel® 10GbE).** Enables high performance, virtualization, and cost-effective storage. Intel 10GbE replaces and consolidates older 1GbE systems, reducing power costs by 45 percent, cabling by 80 percent, and infrastructure costs by 15 percent, while doubling the bandwidth. When deployed in combination with Intel® Xeon® E5 processors, Intel 10GbE can deliver up to 3X more I/O bandwidth compared to the prior generation of Intel processors.

- **Storage improvements.** Advances in Intel® storage technologies bring high performance, endurance, and reliability for data center caching, tiering, data processing, system virtualization, and storage scalability. These new technologies can reduce total storage footprint by more than 50 percent.

### Table 1. Recommended Database Server Hardware for Different Levels of Scalability

<table>
<thead>
<tr>
<th>Siemens Melior Concurrent Users</th>
<th>Processor</th>
<th>Database Server Recommended Hardware</th>
<th>SSD</th>
<th>GbE</th>
</tr>
</thead>
</table>
| < 500                         | Intel® Xeon® Processor E5-2430 | 2 socket-12 cores 48 GB RAM | • Intel® SSD 710 Series  
• Intel® SSD 910 Series | 1 GbE |
| < 1,000                       | Intel® Xeon® Processor E5-2650 | 2 socket-16 cores 64 GB RAM | • Intel® SSD 710 Series  
• Intel® SSD 910 Series | 1 GbE |
| < 3,000                       | Intel® Xeon® Processor E5-2680 | 2 socket-16 cores 128 GB RAM | • Intel® SSD 710 Series  
• Intel® SSD 910 Series | 10 GbE transition |
| < 5,000                       | Intel® Xeon® Processor E5-4640 | 4 socket-32 cores 256 GB RAM | • Intel® SSD 710 Series  
• Intel® SSD 910 Series | 10 GbE |
| > 5,000                       | Intel® Xeon® Processor E7-4870 | 4 socket-40 cores 256 GB RAM | • Intel® SSD 710 Series  
• Intel® SSD 910 Series | 10 GbE |
reduce storage device capacity growth by 25 percent using thin provisioning, and improve storage efficiency by up to 25 percent with data deduplication.4

Providing Pervasive Security without Performance Penalties

The Swedish Patient Data Act (2008:355)5 revises and establishes a number of requirements for the protection of sensitive health information.

• To access sensitive health information, authorized health workers must have a patient relationship ("need to know"), receive patient consent, and use strong authentication using the Secure IT in Health Services (SITHS) smart card and digital certificates.

• Communication of sensitive health information must be encrypted in transit, which is especially important considering the consolidation of county council systems and the growth of additional eServices like the National Patient Summary (NPO), the National Quality Registry, and Sweden’s Apotekens National Prescription Service.

• Administrative and physical security practices must be guided by regular risk assessments, recognizing that the aggregation of sensitive information “at rest” in databases and storage represents an even greater risk (also known as an “attack surface”).

The Swedish Patient Data Act also governs the maintenance of security logs and requires routine audits of healthcare information disclosure, as well as patient consent, patient access, provisions for breach, and patient requests for modifications to health records.

As shown in Figure 3, Siemens Melior supports SITHS strong authentication and authorization interfacing with the National Security Service (BIF) and the Health Service Address Registry (HSA). The application applies role-based access control in support of the security principles of “need to know” and “least privilege.” Siemens protects communications of health information in transit through transport-level SSL encryption and message-level encryption using SAML tokens and digital certificates. To address data protection at rest, Siemens also deploys hardware-assisted encryption in the data center using Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI).

Siemens’ customers are advised to encrypt sensitive information in client, desktop, and mobile devices using full-disk encryption accelerated with Intel AES-NI and Intel® solid state drives (Intel® SSDs).

INTEL® SOLID-STATE DRIVES

Intel® Solid-State Drives (Intel® SSDs) can eliminate storage bottlenecks in the healthcare infrastructure by:

• Increasing disk performance up to 5X on random disk I/O tasks
• Reducing read latency by up to 10X
• Reducing write latency by up to 7X
• Reducing maximum latency by up to 8X.

In addition, SSDs can lower disk power demands by 50 percent while producing one-third less heat.12

The Intel SSD 910 Series brings high performance storage directly to the server CPU through the PCIe* bus. Servers and storage arrays become more responsive as critical data is fed directly to the system CPU, transferring more data in less time. Storage throughput is increased up to 4X faster than previous Intel® SATA 6Gb/s SSDs. Server CPU utilization is taken to new levels, accelerating data center virtualization, online transactions, and cloud computing—all of which are paramount to the new age of data center consolidation and implementation of eHealth services.

Figure 3. Siemens Melior delivers unsurpassed healthcare data protection
Intel AES-NI delivers faster, more affordable data protection and greater security, making pervasive encryption of sensitive healthcare information possible in areas where it was previously not feasible. Available with the Intel Xeon processor family and the 3rd generation Intel® Core™ processor family, Intel AES-NI accelerates the encryption of data by implementing some intensive sub-steps of the AES algorithm in hardware.

Conclusion
Together, Siemens Melior and Intel deliver advanced scalability, improved server density, superior performance, and a high level of security for the most demanding healthcare services. Healthcare institutions continue to struggle with data center consolidation, expansion of new eHealth services, and implementation of stringent security and data protection regulations. Siemens Melior, built on a solid foundation of Intel Xeon processor families combined with supporting technologies including Intel 10GbE, Intel SSDs, and Intel AES-NI, can help Nordic healthcare institutions surmount these challenges and provide the highest level of healthcare possible.

For More Information:
- Siemens Melior (in Swedish)
- Siemens Melior System Integration (in Swedish)
- Intel Premier Healthcare IT Professionals
- Intel® Xeon® Processors Server Performance
  - Energy Efficiency
  - Performance and Scalability
  - Data Center Refresh Savings Estimator
- Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI)
  - Intel AES-NI animation
  - Secure Cloud with High-Performing Intel Data Protection Technologies
- Intel® 10GbE X540 Server Adapter and Intel® 82599 10GbE Controller
  - Unified Networking with Intel® 10GbE Server Adapter
  - 10GbE ROI Calculator
- Accelerating Data Center Workloads with Solid-State Drives
  - Intel® Solid-State Drive 910 Series
  - Intel® SSD Data Center Total Cost of Ownership Calculator

ABOUT SIEMENS AND SIEMENS MELIOR
Siemens offers innovative and high-tech solutions in the fields of infrastructure, industry, energy, and healthcare. Siemens has had a presence in Sweden since 1893 and employs approximately 4,700 employees at more than 40 locations, with sales of about SWE 18 billion last year.

Siemens Healthcare is one of Sweden's largest suppliers of electronic medical records, with Melior deployed as a strategic healthcare system in several large regions and counties in Sweden. Siemens Melior was first developed in the early 1990s, growing to support more than 80,000 users across both inpatient and ambulatory care, with an emphasis on patient safety features and user-friendly interface.

Siemens Melior is developed using software best practices including service-oriented architecture. It leverages common databases and development frameworks. Melior includes all necessary modules, such as Clinical Documentation, Referrals and Consultations, Orders (labs, prescriptions, imaging), Medication Management, Reminders/Alerts, Patient Management and Care Coordination. The application is readily extended to comprehend additional web-based services and facilitates integration across disparate health systems, along with regional and national quality systems. Melior medication management is integrated with the Swedish Apotekens national prescription service and SIL formularies, managing current prescription lists, drug allergies, and alerts to potential adverse drug interactions.
INTEL® XEON® PROCESSORS BRING HIGH PERFORMANCE TO HEALTHCARE

Several Intel® Xeon® processors are appropriate for Melior deployments, depending on the number of concurrent users.

- **E5-2600**: The Intel Xeon processor E5-2600 product family can boost server performance by up to 80 percent over previous-generation Intel Xeon processor-based servers. Advanced features such as Intel® Integrated I/O reduce I/O latency by up to 30 percent while doubling the available bandwidth. Intel® Data Direct I/O allows Intel® Ethernet controllers to route I/O traffic directly to the processor cache—saving power and improving I/O latency up to 2.3X.

- **E5-4600**: The high-density, cost-effective four-socket Intel Xeon processor E5-4600 product family offers up to an 83 percent general application performance increase and up to 2X the memory and I/O capabilities compared to the Intel Xeon processor E5-2600 product family. This product family can better handle large workloads and dynamically respond to unpredictable demand spikes. It can help data center and IT managers avoid costly mid-cycle upgrades by providing a simple upgrade path to accommodate business growth.

- **E7-4800**: The four-socket Intel Xeon processor E7-4800 product family delivers the highest reliability and scalability, highest memory capacity, and highest enterprise and database performance as compared with the Intel Xeon processor E5-4600 product family, setting more than 25 performance records. This processor delivers performance that is ideal for data-demanding workloads with improved scalability, increased memory, and increased I/O capacity. Advanced reliability and security features work to maintain data integrity, accelerate encrypted transactions, and maximize the availability of mission-critical applications.

Each of these product families supports different levels of data center consolidation. Using fewer servers can lower the total cost of ownership with lower licensing costs, lower maintenance and cooling, and a smaller data center footprint—all of which help meet the IT challenges healthcare institutions face today.

For more information about Intel Health IT visit: www.intel.com/healthcare

For more information about Siemens Melior visit: www.nwe.siemens.com/sweden/internet/se/healthcare/it-losningar/melior/pages/melior.aspx
Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. For more information, see http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni.

Intel® Data Direct I/O: Intel Ethernet Labs, April 2011. 64B L2 Forwarding Benchmark, Rose City CRB, 8x2GB DDR3-1333MHz, 1xSNB-EP 8C B0, 2.8GHz (2.7GHz + turbo), Green City Platform, 6x2GB DDR3-1333MHz, Xeon 5680 6C, 3.3GHz, 1-4x X520-DA2 Dual 10GbE Ethernet NICs, Linux 2.6.32, legbe 2.0.94 (stackless driver w/ data touch).

Up to 2.3x I/O performance is 1S with a Xeon processor 5600 series vs. 1S Xeon Processor E5-2600 data for L2 forwarding test using 8x10GbE ports. See Performance end notes for configuration details.

Based on comparing the best published results with the Intel Xeon processor E5-2600 product family to the E5-4600 product family, both at the 130W TDP processor specification.

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