Why Supply Chain?

by

Dr Shoumen Palit Austin Datta, MIT

Introduction

Why is the World Customs Organization interested in supply chain? You are not the only one to ask that question. Let us explore. In its traditional role, customs is responsible to check goods to enable proper revenue (tariff, excise or duty) as well as the physical security. In the world of time oriented enterprises (TOE), delays in delivery or shipment contribute to dissatisfaction which could easily manifest itself as loss of opportunity and profit. In other words, businesses all over the world are connected today because we depend on products that may involve several different stages in their production. These stages may be in different geographies. This "chain" of events necessary to produce goods is referred to as "supply chain" and its management known as supply chain management. It may be now apparent why customs is concerned with supply chain management due to its critical role in this "chain" of events which is why a product to be on the store shelf when you walk in the store or create dissatisfaction because the retailer could not offer you the product because the "shipment" is delayed.

Supply chain is a simple concept with enormous complexity due to the multitude of parameters it must integrate. Consider the steps to ensure that shelves in Dixons are stocked with Sony Vaio which may use Crusoe chips from TransMeta. Events begin with "demand" that creates movement at OEMs (original equipment manufacturers) producing hard drives, DVD, keyboard. Assembly may occur at a Sony factory in Penang followed by shipment of finished goods to distributor-retailer and tracking customer to register for warranty. Inventory and consumption (sales) information from retail travel back to Sony and translate to demand at OEMs that ship more parts to Sony.

Time for information (sales) to cycle is key in a time oriented enterprise (TOE). Reducing "lead" time is a key target for supply chain 'optimization' since lead time reduction improves manufacturing cash cycle (time it takes for a company to obtain cash for its product since the company invests to buy parts for final product and then recovers cost from sale of product to customer). The amount of unsold products (inventory) the company holds is referred to as inventory carrying cost. Minimizing carrying cost is another objective in this process since inventory adversely affects cash flow. Inaccurate demand segues to out of stock (OOS) danger. To compensate, manufacturers produce more than forecasted consumption (sales) and is forced to carry excess inventory in order to prevent OOS. In this chain of events concerning the physical supply chain and the financial supply chain, customs' role as a regulatory entity must transform to inculcate the view of customs as a trusted advisor and facilitator for global trade.

For analysts, forecasting consumer demand is key. Similarly, for customs, the forecast of goods movement is key for resource allocation to ensure that customs processes are performed with efficiency that business merits. The chain of steps soon emerge as a network because of inter-relationships between stages, thus it is more appropriate to view supply chain as a network and because supply is related to demand, it is appropriate to view this as a supply-demand network. However, because services (such as customs) are also an integral part of this operation and adds "value" but not physical goods, the supply-demand network must evolve to a far more comprehensive view of time oriented enterprise, referred to as the value network. Customs and WCO is a critical part of the global value network. The value network is never in equilibrium. Stability or "establishing a process" is merely a myth. The only certainty is that processes will change irrespective of whether the organization is competent or not to adapt to change. If you cannot adapt, you die. Hence, the increasing number of bankruptcies! Thus, as a whole, the ability to adapt to changing market situations is pivotal for survival. The innovative ability to strike the right balance between adaptability and efficiency is equivalent to profitability. In the final analysis, therefore, business and WCO must deal with the adaptable value network (AVN) which requires nimble, agile and efficient operations.

Value of Real-Time at the Right Time in Time Oriented Enterprises (TOE) and Impact on Security

If an OEM is aware when a Sony product **is** sold, the OEM anticipates demand for component. If OEMs do not have parts in stock when the manufacturer (Sony) places an order, demand will not be fulfilled. Failure to assemble final product is loss of sales. Time compression, possible through real-time data, if it is transparent to the business network, has the potential to significantly increase the ability to offer customers the right product, at the right time and at a competitive price. This is one (of a few) strategic interventions that may enable businesses to "sense" and respond to ever changing consumer demand for better products at a cheaper price.

If any one particular step in this process is out of sync, then the whole process (and the infrastructure created to deliver the process) becomes less valuable. If information from analysis of real-time data signals need for 100 cartons of milk in the store by 6am but if the logistics provider fails to deliver the goods before 6am (breakdown of vehicle), then the actionable decision value from the information extracted from real-time data is diminished or lost due to loss of sales of milk. A similar situation transpires if goods delayed due to customs at the point of entry, in turn, delays the distribution of goods (leading to a lesser return on investments for use of real-time data).

There is little debate that real-time data can improve profitability for time oriented enterprises through innovation in adaptable value networks. The vision stumbles as soon as process, information and data sharing emerge as drivers for innovation. Rational visibility between businesses are plagued by lack of systems interoperability, roadblocks in dissemination of information and the value of acquired data (even if it is real-time and accurate) continues to diminish due to inefficient analytical tools. Each of these issues are gigantic problems and the current leadership of the World Customs Organization is making a valiant effort to address these problems, albeit in part.

Business function aside, real-time data has tremendous potential to enhance security of cross-border goods traffic. For this reason alone, governments must invest in systems and infrastructure for acquisition of real-time data of goods movement ***before*** the goods approach the domain of customs and security agencies. It is easy to grasp the fact that if the "pedigree" of a particular shipment is known through visibility of the goods in the supply chain and if that pedigree is deemed credible for security purposes, then releasing that batch of goods through customs is an easier decision with a diminished security risk. Because the "chain" of events involves multiple handlers, the goods in the supply chain pass through the systems and software of different business, sometimes in different countries. To maintain adequate visibility of goods, it is necessary that different businesses using different systems must be interoperable enough to share the data on goods in manner that does not produce "black holes" for transparency. If it is feasible for customs to access such real-time data and operational transparency even from the point when a logistics provider acquires the goods, it will improve customs efficiency and significantly diminish security risks.

Process and infrastructure necessary for such transparency, albeit in part, calls for innovation in interoperability through convergence of a variety of advances in a multitude of disciplines (the articles in this book address such convergence theme, in general). For WCO, it is imperative that we educate the customs organizations and explore creating projects as proof of concepts before we can aspire for adoption. Implementation of WCO Standards will not be possible unless there is an operational system that can utilize the standards. The system complexity must be opaque to users and the systems must be available in a form that can be implemented in countries even with restricted availability for technical expertise or systems maintenance. Toward this goal, knowledge dissemination is a first step.

The Traditional View of Real-Time Data and its Enabling Technologies

When an automobile engine is manufactured, it may pass through more than 2000 work stations each specialized to perform just one operation. What if operation number 9 failed to install a piston in the proper orientation? The faulty engine may proceed through successive stages and upon completion will be subjected to quality analysis which may detect a faulty engine but may fail to pinpoint where the operation failed. Many engineer-hours may be required to disassemble and diagnose point of failure. GM assembly plant in Flint, Michigan may have a foggy idea as to how many good engines may be available, at a given time, from the engine assembly line in Ontario, Canada.

This is and other business modus operandi are under the spell of the hype of RFID (radio frequency identification). The above problem may indeed be addressed by RFID tags inserted in the pallet (on which each engine assembly commences), showing "pass/fail" status on the tag as the engine passes through each work station. Only a "pass" status from the previous work-station allows the engine to be worked on at the next station. A "fail" status allows the engine to pass through the assembly line without being worked on at subsequent stations. The engineer can read the status from RFID tags and easily determine where the engine failed. The defect may be corrected and engine re-set at assembly line to complete the remaining steps. Thus, RFID offers a significant business value, in this case. The latter is not true of many instances where RFID use is being peddled by vendors.

Visibility of real-time engine assembly data (completed or work-in-progress) at General Motors assembly plant in Flint, Michigan helps project with greater accuracy the number of finished goods (automobiles) for a given period. This data, if available to dealers, could enable dealers to offer customers precise delivery date (ATP or available-to-promise). Sales data (POS or point-of-sale) visibility at manufacturer/supplier enables lean production planning and precision ordering of components (reduced inventory reduces carrying cost). According to Kimberly-Clark, 1% reduction of its inventory, amounts to a savings of more than $25 million.

Consumer products manufacturers who are at forefront of the rejuvenated RFID endeavour, such as the behemoth Procter & Gamble, may expect to receive real-time data on sale of their goods if the retailer chooses to share such data with the manufacturer (P&G). It may enable P&G to lower inventory and improve production. Attaching RFID tags to individual items (shampoo, paper towels) allows consumption (POS) data for real-time analytics. P&G may take the initiative to share data with its suppliers to ensure they understand demand pattern, thus, reducing the need for P&G to stock raw materials and reduce material (inventory) carrying costs.

Passive RFID transponders (tags) emit radio waves when "interrogated" by RFID readers placed within 1-2 meters from products (affixed with "smart tags" or paper thin RFID transponders in the 802.11b category) or 50-100 meters for ultrawideband (UWB) class of active RFID. Automated RFID tag reading by readers placed at strategic points (check-out lane) eliminates manual scanning of barcodes (current practice). RFID data from POS may travel on the existing internet. The data may be distributed. Currently, batch uploads in time-buckets of 24-48 hours are common. The quality of the data suffers from inaccuracies inherent to manual operations. Efficiencies from RFID are expected to ameliorate such deficiencies but at present that is not the case, in general.

The great (still theoretical) interest in real-time (RFID, UWB) data is the expectation that transparency along nodes of operation (shelf, logistics provider, retail, distribution center, manufacturer, factory) will improve profitability through engagement in collaborative forecasting, planning and replenishment (CFPR) strategies between business partners. CFPR is touted as one key strategy to improve adaptability of the global value network.

Making Entrepreneurial Sense of Data through Information Arbitrage

The vision of real-time data spread like wild fire but systemic implementations are still sluggish in view of the fact that the tsunami of data leads to the question of value. To generate value from data and make sense of the data requires process efficiency, data sharing and right-time analytics (discussed in subsequent articles in this book).

In USA alone, there are 1.5 million retail outlets, 160,000 grocery chain stores, 400,000 factories and 115 million homes. The consumer packaged goods (CPG) industry alone produces 1 billion items per year. If we read each item 10 times in the supply chain, it translates to 300,000 "reads" per second. If it takes 100 bytes to store each 'read/event' data, we require 1000 terabytes per year of data storage. The few businesses listed below handle 600 billion items per year. Using the same criteria as above, if we read each item 10 times, it translates to 180 million "reads" per second and we shall require about 600 petabytes (600,000,000 gigabytes) per year of data storage (an iPod of the near-future may hold 40 petabytes). The road to ubiquitous tagging will dwarf the current internet and require a different thinking for data handling through Agents embedded in the semantic web (see next article).

3.0	**Johnson & Johnson**
10.0	**Kimberly Clark**
15.0	**Tesco**
20.0	**Unilever**
25.0	**Philip Morris**
30.0	**Wal-Mart**
31.0	**Procter & Gamble**
53.0	**International Paper**
200.0	**Coca-Cola**
205.0	**US Postal Service**

Billions

The business value of real-time data in the adaptable value network is still largely unrealized and dampened by the lack of infrastructure (particularly for small or medium business). However, the value of real-time data (at certain levels of granularity) is a boon for customs operations that is entrusted with diligent vigilance about security of goods and the containers that carry goods. The need for profitability and security are inter-dependent in the sense that if there were infrastructure to enable acquisition of real-time data, then such data may be valuable to business and critical for security. To bolster security, public investments may be justified to create ubiquitous infrastructure. The benefits in terms of security may be deemed an adequate reward (ROI). On the other hand, the data on such an "ubiquitous bus" may be a source of public revenue from businesses who may pay to have access to such data. This is the POTS (plain old telephone system) model where phone companies sowed the cables and users paid per call or volume or time. In searching for innovative ways to remain viable and important in the 21st century of global commerce, it may behove customs to develop an information arbitrage model and think and act as entrepreneurs.

AGING @ SPEED OF INTERNET

BY

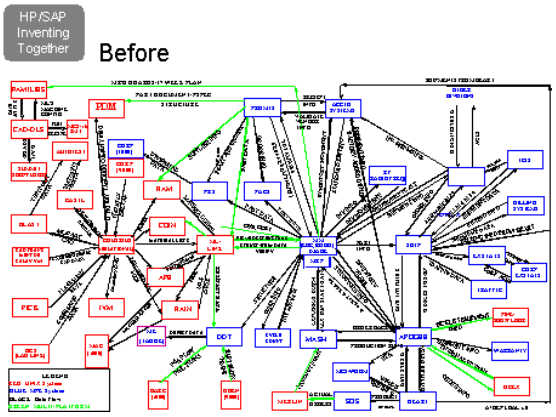
SHOUMEN DATTA

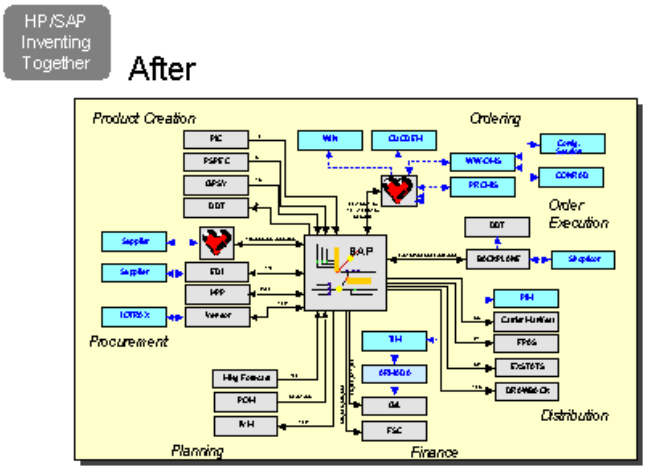
SHOUMEN@MIT.EDU

At the wonderful science museum in Barcelona, I saw an exhibit that beautifully illustrated “chaos.” A nonlinear version of a pendulum was set up so that the visitor could hold the bob and start out in a chosen position and with a chosen velocity. One could then watch the subsequent motion, which was also recorded with a pen on a sheet of paper. The visitor was then invited to seize the bob again and try to imitate exactly the previous initial position and velocity. No matter how carefully that was done, the subsequent motion was quite different from what it was the first time. I asked the museum director what the two men were doing who were standing in a corner, watching us. He replied, “Oh, those are two Dutchmen waiting to take away the “chaos.” Apparently, the exhibit was about to be dismantled and taken to Amsterdam. But I have wondered ever since whether the services of those two Dutchmen would not be in great demand across the globe, by organizations that wanted their chaos taken away. (1)

Chaos

With SAP’s offering of mySAP.com, chaos, indeed, has been taken away from business organizations and replaced with solutions: seamless, integrated, effective, scalable and customer-centric. Would you rather take our word for it or Hewlett Packard’s, the global IT giant?





Organization of this Chapter

This chapter is an outline of select business process software solutions that SAP offers through (a) mySAP.com and (b) specifically designed functionalities for the high tech industry. First, the integrated suite of solutions from mySAP.com are discussed from the perspective of business value addition to high tech industry customers of SAP. It is followed by a very brief review of the SAP High Tech Solution Map. The next section discusses three high tech industry specific solutions from SAP (industry specific solutions for the software industry [IS-SW], Distributor and Reseller Management [DRM] solution for collaborative business practices and Management Execution System [MES] solutions for the “fabless” semiconductor manufacturing segment). When ever relevant, historical developments and market facts are integrated to convey the growth and progress of the high tech industry. One example of the collaborative RosettaNet solution is also illustrated to highlight the seamless interfaces that makes SAP solutions accessible to any system integration endeavour. No chapter will be complete without a discussion of the emerging trends, their impact on the market and solutions from SAP to address the future challenges of e-business.

WHAT IS MYSAP.COM?

- It is a brand
- It is a collaborative solution
- It is a web site
- It is a licensing strategy
- It is an integrated suite of:

- Workplace
- Marketplace
- R/3
- New Dimension Products
- Customer-centric solutions (Customer Relationship Management or CRM)

Proven Success: Hewlett Packard and mySAP.com Solutions

HP/SAP Inventing Together

About HP

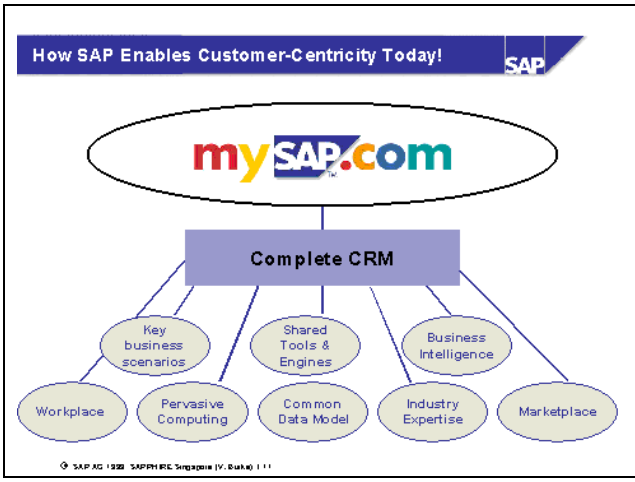
- 23 SAP projects live or in progress
- SAP R/3 and mySAP.com with BW, APO, IPC, IS-SW
- 19 physical instances
- 4 Major Data Centers
  - Singapore
  - Boise
  - Brussels
  - Boeblingen
- Most HP products touched by SAP in some way:
  - All Printers, including supplies
  - PC
  - Unix servers
  - NetServers

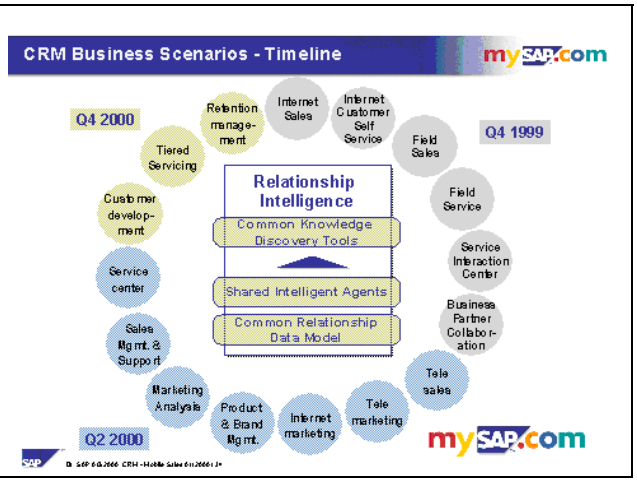
HP/SAP Inventing Together

Representative Benefits

- 1 site achieved US$14 million benefit the first day due to better utilization of inventory
- Proven 2x throughput
- On-time-delivery >95%
- Clean, buildable orders >99%
- Reduced inventory and cycle time
- Integrated environment improves communication & problem resolution
- Proven manufacturing of industry-leading high-availability solutions

The proven solution mySAP.com is a dynamic scalable offering from SAP that can successfully transact most business needs including planning, information exchange, knowledge management and business intelligence requirements for e-commerce. Enterprises may use all the components or only select functions. Thus, mySAP.com enables businesses of any size to enjoy the benefits of SAP's 25 years of experience with best practices in business. This is a collaborative single point of access via the Internet requiring only a web GUI (graphic user interface) on a PC and increasingly from mobile devices and personal digital assistants (PDA) . MySAP.com functions can be personalized to reflect individual preferences and ease of use. This chapter will elaborate on mySAP.com solutions while discussing the various types high tech industry solutions available.





EVOLUTION of SAP TO MEET THE DEMANDS OF THE INTERNET REVOLUTION ?

MYSAP.COM solutions for high tech industry, or any industry, is a robust commercial software that seamlessly integrates all back-office functions with customer-centric front-office demands. With 23 SAP projects, "every HP product is touched by SAP in some way" says Ms. Wendy Odlum, IT Manager, Hewlett Packard Inc in Palo Alto, California. HP is the first high tech company, founded in 1939, which fast-forwarded the Information Age and started the Silicon Valley. With revenues exceeding US$42 billion, Hewlett Packard is the 2nd largest high tech company and the 14th largest US corporation with 86,000 employees in 120 countries (2). HP chose mySAP.com as their solution and at one site saved US$14 million on the first day through better utilization of inventory!

Solutions for businesses during the Cold War (1945-1989) were different. In the 21st century, adapting to the exponential dynamism is vital to remain competitive in e-business and m-commerce, the seeds that germinated with the birth of this post-Cold War world. This world is only 11 years old and it was born when the Berlin Wall fell in 1989. The world's youngest economy – the global economy – is still finding its bearings. In the meantime, no one ever said growing up was easy!

Beginning in 1972, with software made for mainframe computers, SAP was the first to tie all business functions together (orders, manufacturing, production, logistics, financials). Keeping pace with progress, SAP evolved from the mainframe (R/2) to the client-server R/3 that could run on any PC and performed over 20,000 installations serving more than 10 million global users. The evolution to mySAP.com is a logical as well as a planned strategic solution coinciding with the spread of the Internet (3) as the preferred medium for businesses to talk to each other and with their customers.

In 1981, there were 213 Internet hosts which had multiplied to 159,000 when the Berlin Wall fell in 1989 and more than doubled to 376,000 by 1991. According to a survey conducted in January 2000, there are estimated 72 million Internet hosts (11). Which is why from Wall Street to Bond Street and Asoke Street (13) the markets are asking every company the same question: What is your IQ? What is your Internet Quotient?

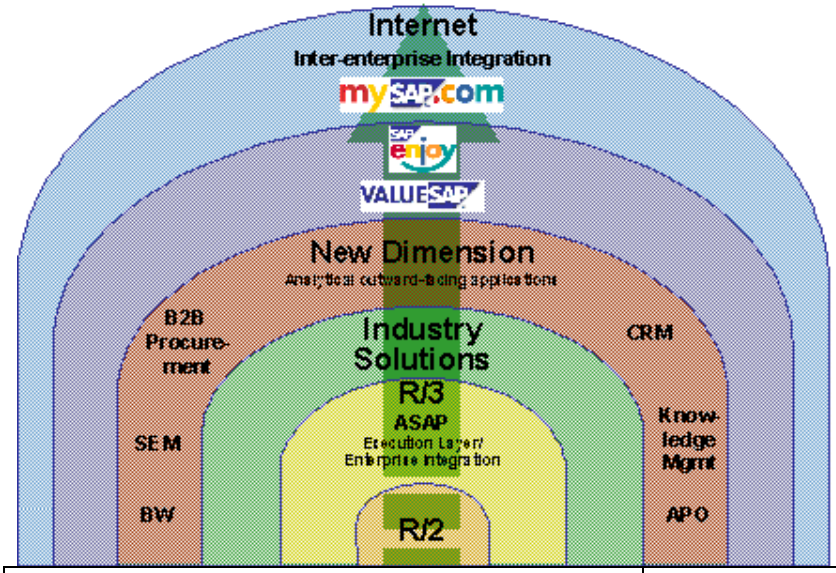
The challenge for every business in this IQ race is to reach farther, faster, deeper and cheaper (12). The high tech industry is leading the race and high tech businesses must, therefore, reach farther and *farther*, faster and *faster*, deeper and *deeper*, cheaper and *cheaper*, all with one seamless integrated "face" of the enterprise. Software that integrates back-office and front-office operations will ultimately add the most business value for total customer satisfaction and retention in any business and e-business.

This is the face of mySAP.com, the high IQ solution provider for the lightning-paced high tech industry. The apparent quantum leaps, however, were preceded by decades of lag period. Internet took about 30 years (1957-1990) to implode and it took SAP almost 20 years (1972-1990's) of rigour to develop an integrated client-server software (R/3) that instantly (early 1990's) captured market share. R/3 still retains 30% of the market with Oracle as its closest competitor (13% of ERP market). No other software company has dared to mimic the power of integration of SAP's R/3. The evolution of SAP's internet strategy to mySAP.com in keeping with today's dynamic business and high tech industry needs must not obfuscate our understanding of the effort that true leadership demands. The strength of that leadership is evident from SAP's unmatched "ecosystem" with operations in 100+ countries with over 10 million users and more than 12,000 customers.

Evolution of the Internet

The Internet was born as a part of the Cold War response to the 4th October 1957 launch of the Sputnik by USSR. US President Dwight Eisenhower catalyzed the creation of Advanced Research Projects Agency (ARPA). It was the Information Processing Techniques Office at ARPA that would build the original Internet prototype influenced by the "man-computer symbiosis" vision of J. C. R. Licklider (1915-1990) who was named director of this office from 1962 to 1968 (5). In its original concoction, the Internet was called the Arpanet that linked the US Department of Defense with key university and government labs in 1969. There were only two nodes at that time on the Arpanet (6). It is ironic, that the network was first unveiled in the same year that the first man to walk on the Moon was US Astronaut Neil Armstrong. On 29th October 1969 the inaugural message was sent over the first thin reed of what was to become the Internet. Charlie Kline, a student at UCLA typed the alphabets " L O G I N " which were dutifully echoed back by a computer at the Stanford Research Institute in Palo Alto, 400 miles away, what was not yet Silicon Valley (7).

It wasn't until 1972, the year SAP was being formed, that the Internet pioneers discovered e-mail. It was Ray Tomlinson working at Bolt, Beranek and Newman of Cambridge, Massachusetts, who invented the use of the @ sign in e-mail. The virtues of e-mail began an explosion of its use, as did the whole network but they weren't able to *inter-network* since each had their own protocols (sounds familiar?) and one network could not "talk" with another!



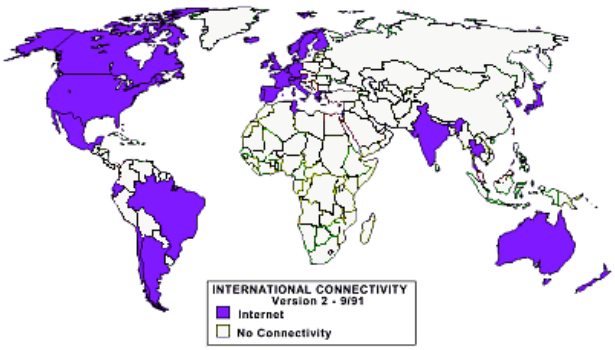
This problem eventually gave birth to the modern Internet which was essentially created by Vinton Cerf (8, 9) and Robert Kahn (10), when they created a cross-network standardized protocol (similar to SAP's participation in RosettaNet) that allowed data packets to leave one network and enter the gateway of another network. But it was the birth of the uniform resource locator (URL) at the hands of Tim Berners-Lee, an English software engineer working in CERN, Geneva, that ignited the world wide web (WWW) and the subsequent explosion of the Internet, which belonged to no one!

1991 & The Internet Revolution

Internet connectivity in 1991 enabled select few children in a middle-school in Marin County, California to view the total solar eclipse of 11th August 1991 in Bagdere, Turkey. During 1991, the Soviet Union fell apart and elsewhere, several non-governmental organizations and individuals began simultaneously to discuss the necessity of coordinating initiatives and calls for a ban on antipersonnel landmines (4).

1997 & The Internet Revolution

Spread of Internet connectivity by 1997; the year which witnessed the award of the Nobel Peace Prize to Jody Williams, the coordinator of the International Campaign to Ban Landmines (ICBL). She achieved that ban without government support and in face of opposition from all major powers, including the US. And what did she say was her secret weapon for organizing 1,000 different human rights and arms control groups on six continents? "E-mail."



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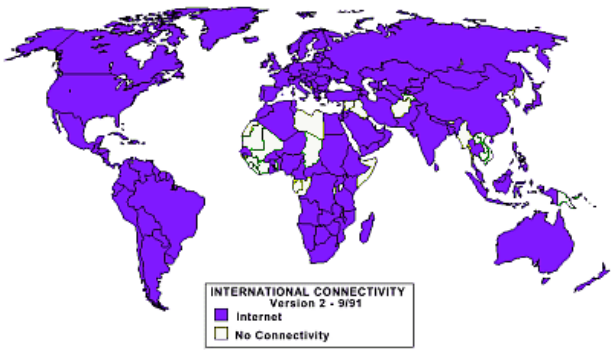


1997

"Slow Is Not An Option" reads a popular Stanford University campus T-shirt. Stanford University should know. It has invested $7.5 billion of its endowment funds in Silicon Valley high tech start-ups. The roster of companies started by Stanford faculty and students include Cisco, Silicon Graphics, Sun and Yahoo but it all started in 1939 with Hewlett Packard. Sixty years later in Silicon Valley, SAP Labs at the Stanford Research Park, adjacent to HP Labs and Xerox PARC, is an innovation leader for SAP's next generation solutions aimed at addressing future challenges, such as, voice-enabled web transactions and mobile-commerce applications using WAP.

HIGH TECH : PARADIGMS AND POTENTIAL

To appreciate the mySAP.com solutions for the high tech industry, it may be worthwhile to gain a glimpse of some customers and then review mySAP.com and high tech specific solutions. The high tech sector accounts for 11.6% of SAP's customer base and revenue, with over 3500 installations, worldwide. It is by far the fastest growing industry with volatility of adoption and innovation both in business practices and product lines. Solutions offered by mySAP.com are the de facto standard for the high tech industry and is used by several leading companies including:

Network & Communications

Palm, Nortel, Siemens, Alcatel, Ericsson, 3Com, Nokia, Lucent Technologies

Consumer Electronics

Phillips, Sony, Grundig, Hitachi, Matshushita, TMM

Semiconductor & PC Manufacturing

Intel, HP, Siemens Fujitsu, Compaq, Apple, TI, Adaptec, Motorola, Hyundai, TSMC

Contract Manufacturers

Celestica, iLogistix, Jabil Circuits, Solectron, Smart Modular, NatSteel

Distributors and Resellers

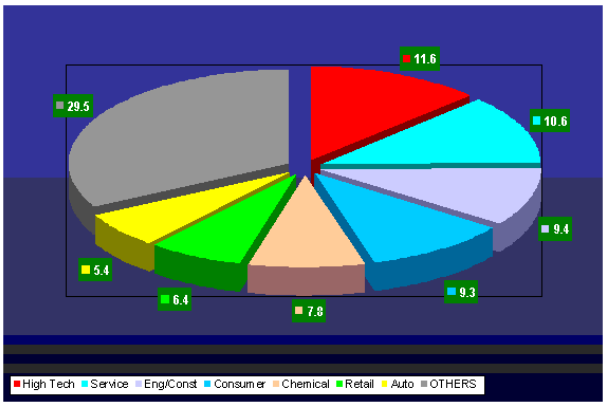
CompUSA, Merisel, Avnet

Software Manufacturers

Autodesk, Adobe, Microsoft, Infosys, IBM

DotComs

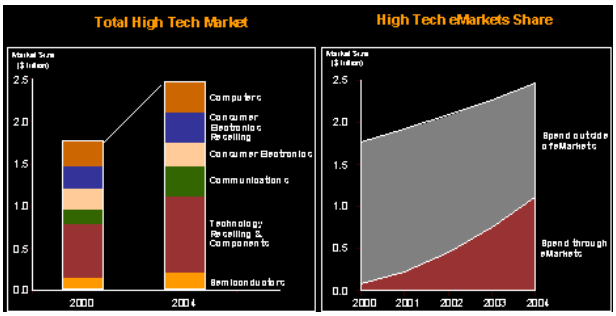
Barnes & Noble (bn.com)



INDUSTRY ENVIRONMENT

High tech industry covers a wide array of businesses that include original equipment manufacturers (OEM) of electronic components (such as semiconductors) to software corporations and dotcom companies. High tech related products and services comprise nearly a third of the US gross domestic product (GDP). In Silicon Valley alone, nearly US$50 billion was invested by US venture firms in 1998 and 1999 (14). High tech industry exports exceeded $180 billion in 1999, accounting for 26% all US goods sold abroad (15). EU was the biggest market for US high tech (US$43 billion) and US manufacturers invested US$31 billion in local EU facilities. Among individual countries, US sales to Canada led the way at US$29 billion and Germans bought goods worth US$9 billion in 1999. The US high tech industry spent more than any other US industry in research and development and average per capita income in Silicon Valley was three times the national average. Executives in Silicon Valley hold in excess of US$112 billion in stocks and options (the GDP of Portugal is US$109 billion). The grip of this industry on social as well as consumer economy is inescapable. The high tech industry is continuing to enjoy incredible market growth, being at the hub of the internet boom. Computer hardware, software and electronics is expected to have the 2nd largest market share in the business to business [B2B] global economy by 2004. Current predictions for high tech e-markets are about US$1 trillion by 2004.

IMPORTANCE OF SAP ?



The high tech industry's leadership in the development of new technology, adoption of new business practices and continuous efforts to improve software solutions are substantially helpful to SAP. The industry plays a dual role as partners and customers of SAP. Collaborative projects with industry experts has enabled SAP to offer a comprehensive leading-edge business solution benchmarked by the pioneers of high tech industry processes.

SAP has earned the coveted position of trusted advisor to the global high tech industry. SAP is working closely with industry leaders to define new standards in our mySAP.com suite of offerings that include Customer Relationship Management (CRM), Advanced Planning and Optimization (APO), Business Information Warehouse (BW), eSupply Chain Management (SCM) and the high tech specific products Distributor Relationship Management (DRM), Manufacturing Execution System (MES) and Industry Specific Software (IS-SW). To ensure seamless functionality with a broad range of software, SAP is a pro-active Member of the Board as well as an Advisory Committee member of the RosettaNet consortium. RosettaNet may be one of the most ambitious standards implementation efforts for a large group of global corporations. It is an independent consortium, with an impressive list of leaders from the entire information technology (IT) and electronic components (EC) supply chain, dedicated to the development and deployment of supply chain (SCM) e-business standards.

INDUSTRY TRENDS

Planned obsolescence is the mantra for the high tech industry to sustain continuous market share and revenues. Thus, time-to-market continues to be the overall driving force. For example, mobile devices are no longer for telephone calls only. Wireless internet services provide access to the web to check stock quotes or send/receive short e-mails via a micro-browser using the wireless application protocol (WAP). On the other hand, the fundamental physics of complementary metal-oxide semiconductor (CMOS) based integrated circuit operations is reaching its limits. But, the physics of computation is still in its infancy. Information overload is already reaching critical status and need for computation to make sense of the data may be far from adequate. Future technologies are necessary as alternatives to CMOS devices. Chemically assembled electronic nanocomputers (CAEN) with an order of magnitude higher computational power may be the next generation of "chips" for the Industrial Internet market. How will the fabrication of CAEN affect manufacturing and the software that shall run the systems?

Customer expectations and competition compels high tech companies to provide improved technology faster and cheaper. In turn, it intensifies the race to decrease time-to-market and while increasing manufacturing productivity, concurrently. In the customer-centric e-economy, exceeding customer expectations by delivering innovative and personalized products on-time is the only option. SAP's mySAP.com solution helped the world's largest chip maker to achieve their goal of decreasing a production related supply chain cycle from 2-3 weeks to an optimization of 2-3 days.

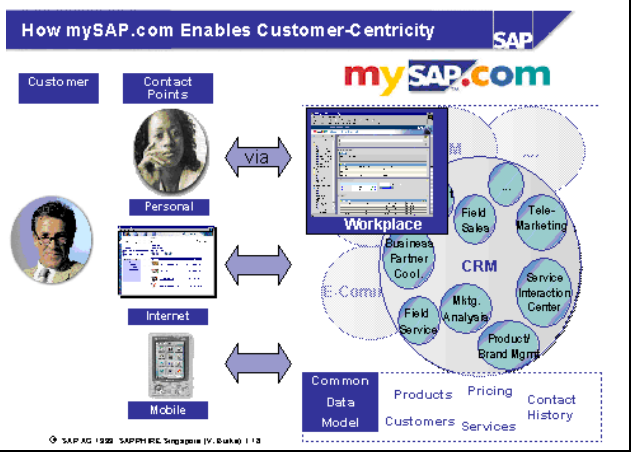
These solutions demand efficiency, flexibility and visibility of information between supply chain partners that include the component or systems supplier, service agent, manufacturer, distributor, reseller and the customer. Thus, high tech companies must optimize the global supply chain (SCM) both enterprise-wide and across business partner networks. Companies are using the Internet for collaborative engineering (to exchange product designs), e-procurement (request-for-proposal, purchasing MRO articles or production materials), sales, collaborative forecasting (sharing demand forecasts for product items between the manufacturer and retailer) and inventory (sharing product usage and stock level information between the distributor/reseller and manufacturer to enable automatic replenishment). Companies are deploying e-commerce software and target portals that enable such optimization across their value chains **(SCM)**. It is enabling business partners to collaborate and operate as though they were one seamless, virtual organization. This high tech model is rapidly influencing supply networks in almost every type of industry.

However, the primary focus is still on customer relationship management **(CRM)** to build and maintain customer loyalty. From marketing to sales and service, throughout the entire product life cycle **(PLM),** it is crucial to establish and maintain effective customer relationship management practices. Only customer-focused corporations will survive as industry leaders, as this advertisement states (16):

Sooner Or Later, All Tyrannies Crumble

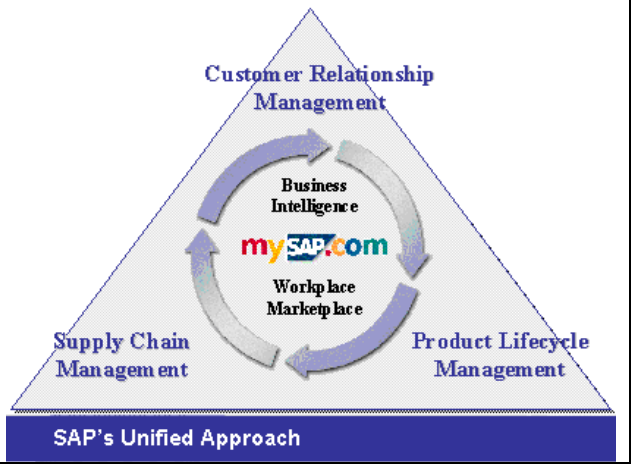
Those That Keep Putting Their Customers

On Hold Tend to Crumble Sooner.



SOLUTION IN SEARCH OF A PROBLEM: MYSAP.COM

Software functionality that adds the greatest business value to the customer is the primary goal of mySAP.com solutions. SAP's organizational infrastructure reflects this focus through its Solution Management groups, Solution Architects and Solution Managers. In July 2000, we received a request for solution (RFS) from a US$2.4 billion high tech engineering corporation in Dallas, Texas. The customer wanted to consider implementing mySAP.com solution to address a succession of business scenarios that form their core business and is key to long-term customer retention. Their scenarios and corresponding mySAP.com solutions are outlined below. Following this discussion we shall present the overview architecture of the integrated suite.



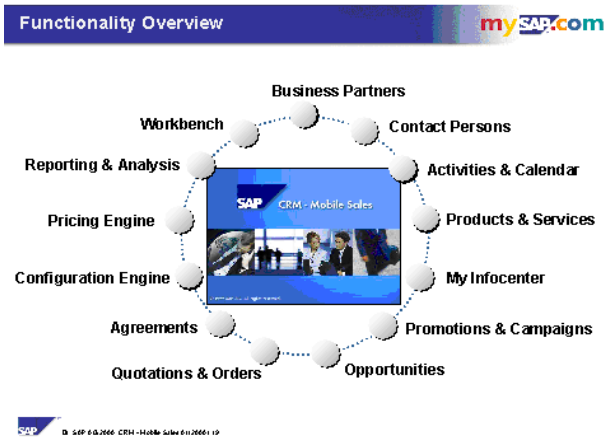
Customer's Scenario Number I	MYSAP.COM SOLUTIONS
(1) Marketing Manager initiates a campaign (phone, fax and e-mail) to existing customers and select prospects.	**Solution: CRM Campaign & Opportunity Management** is a part of mySAP.com CRM (customer relationship management) suite of functions. By selecting a list of customers from customer master data, the campaign may be initiated by fax, e-mail and telesales.
(2) Regional sales representative receives the responses for his/her territory. Follows through with a lead and calls a potential customer.	**Solution: Workplace** is a role-based single-point of entry to mySAP.com from any location. When a sales representative logs on to his/her PC or laptop, the "inbox" may contain responses to company's campaign or promotion. Depending on the location of the customer responding to the campaign, the CRM "inbox" will sort e-mails by pre-defined criteria (maintained through the **CRM Administrator Workbench** functionality) and "pushes" it out to the sales representatives. The sales representative organizes "tasks" and follows through with a call to the prospect.

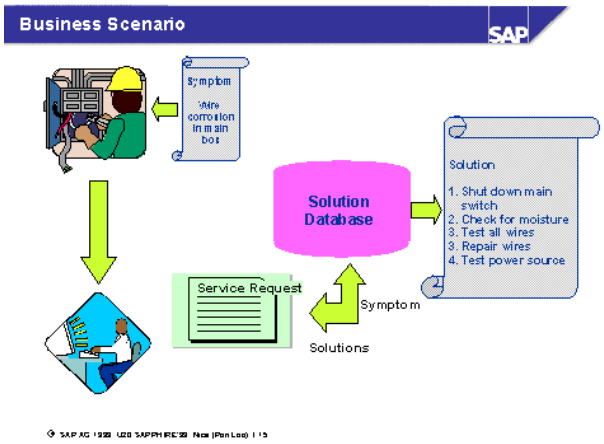
(3) The sales representative's persuasive ability and the superior product offer piques the interest of the customer. Customer calls the sales office to speak with a customer service representative (CSR). (4) CSR receives call from Customer. Verifies campaign details, customer profile, etc.	**Solution: CRM Contact Center**: Customer calls are directly sent to the CSR's PC which offers the mySAP.com CRM component Contact Center and displays basic details (customer phone number, name, address) when the customer calls. Further, the CSR can search for customer history and pull-up the campaign or promotion details on the screen. Customer master data and prior records are stored either on the **CRM Consolidated Database** or obtained from back-end office (R/3 or legacy).
(5) Customer queries about certain product types. CSR suggests specific products from catalog. Customer changes configuration on a specific model. CSR quotes price for configured product.	**Solution:** CSR uses **CRM Product Catalog** to search for specific products using keywords from the customer's query. A list of products are displayed from the Product Catalog. Customer specific configuration of product and dynamic pricing is provided by the **CRM Internet Pricing & Configurator (IPC)** that is seamlessly integrated with the back-end office (R/3 or legacy) to reflect updated changes in company's configuration parameters and pricing policies.
(6) Customer places order. CSR checks financial status of customer, product availability and confirms receipt of order by fax and e-mail providing an actual delivery date of product.	**Solution:** Standard sales order processing and availability checking (**ATP**; Available-to-Promise) functionality that takes place through the **CRM** system and the **APO (Advanced Planning & Optimization)** engine performs the ATP check. The system is synchronized with back-end systems to reflect actual supply chain functions.
(7) Confirmation of order is sent to production and shipping for pick, pack and delivery.	**Solution:** Standard back-office functionality available within mySAP.com suite of solutions. Functionality also available to **pre-stage** standard products at shipping centers (FedEx, DHL) for faster delivery upon order confirmation by sending shipping instructions to shipping center.
Customer's Scenario Number II	**MYSAP.COM SOLUTIONS**
(1) Customer places order (I.6) but CSR receives warning message that customer requested configuration change may delay delivery due to additional shipping time to obtain component required for requested configuration.	Solution: It is possible through mySAP.com to enable ATP-APO check for individual components on a bill of material for a configurable product.
(2) CSR informs customer and customer agrees to wait for an additional two days. CSR confirms order and provides tentative delivery date.	Solution: Standard back-office functionality available within mySAP.com suite of solutions.
(3) Customer gets impatient and logs on to the company web site to check status of the order and sees that his order is upgraded to priority and will be delivered 1 day prior to tentative delivery date provided by CSR	**Solution:** Company's front-office portal is connected by the **Internet Transaction Server (ITS)** to the **CRM** my SAP.com suite which has updated order status for customer self-service.
Customer's Scenario Number III	**MYSAP.COM SOLUTIONS**
(1) CSR receives call from customer about product malfunction. CSR verifies customer profile and warranty.	**Solution: Contact Center** CSR checks product (from IBase), customer info, warranty and service options.
(2) Customer reports "fan" is not working. CSR enters query and receives possible reasons. CSR guides customer through the steps to correct the problem but the fan still fails to operate.	**Solution:** mySAP.com **Contact Center** is linked to the **Solution Database (SDB)** which contains common solutions to solve product related malfunction. SAP's **Interactive Intelligent Agent** springs to action.

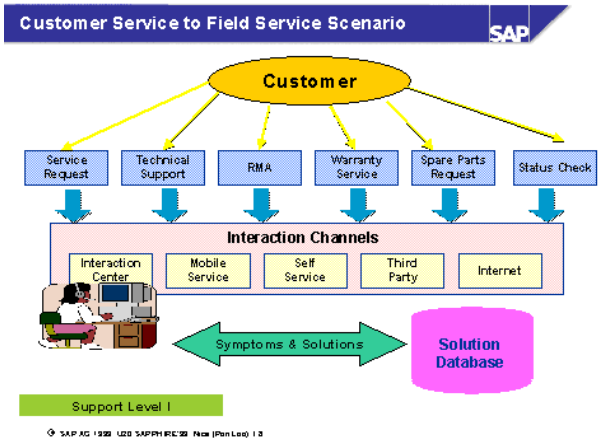
	IIA uses words in the query (typed by CSR according to complaint) and searches **SDB** for possible solutions to customer problem.
(3) CSR logs in complaint, generates confirmation to customer and sends message to service unit for prompt on-site service to customer.	**Solution: Contact Center** notification is sent via **workflow** to service unit (standard function).
(4) Service department sends e-mail to customer confirming receipt of service order and notifies the service technician for that area to service on-site the next day.	**Solution:** my SAP.com **Workplace** "inbox" of service supervisor receives notification of service request for customer. Supervisor delegates task to Field Service Technician (FST) through **CRM Mobile Service** suite of functions. FST logs on to Workplace and obtains details of service request along with customer location and required spare parts. FST arrives at customer site, conducts repairs, reconciles inventory of parts and sends confirmation of completed job through CRM MS.
(5) Customer is satisfied with prompt service. Sends note of appreciation to Regional Manager. This data is of strategic importance to company.	**Solution:** Customer satisfaction data is collected through **Business Intelligence Warehouse (BW)** component of mySAP.com for future analysis.

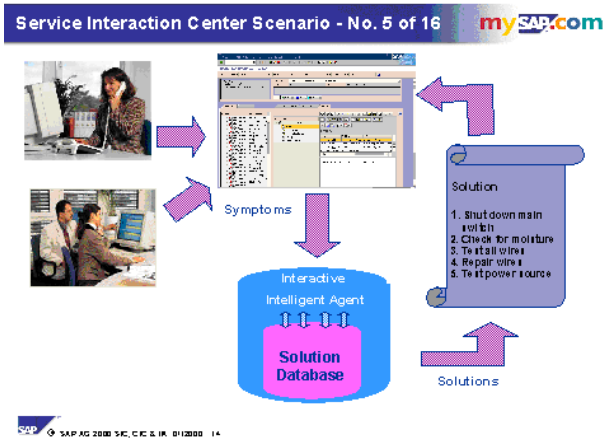
Customer's Scenario Number IV	**MYSAP.COM SOLUTIONS**
(1) Field Sales Agent (FSA) visits major customer's office to meet with purchasing department to discuss outstanding bids that were sent to customer in response to request for bids issued by customer.	**Solution: CRM Mobile Sales** integrated with mySAP.com suite of functions. Bids are equivalent to quotes. All quotations sent by the company or FSA may be viewed in the FSA's personalized mySAP.com **Workplace** by using the analytical query function of the Business Intelligence Warehouse (**BW**) component to generate a report (may be distributed by the CRM system and delivered to the FSA's Workplace at a daily or weekly interval). FSA may set as task to follow up on certain major accounts with outstanding bids (quotes).
(2) Customer wants several modifications to product and estimates on how much the changes will cost. FSA instantly re-configures product and offers corresponding pricing and discounts that the customer is eligible for based on volume and prior purchase history.	**Solution: CRM Mobile Sales** integrated with **IPC** (SAP's pricing and configurator). FSA performs configuration and dynamic pricing on the laptop while at the customer site. Pricing conditions (based on volume, past purchases) are contained in the IPC.
(3) Customer wants to know how many such products were sold to what type of businesses. FSA provides analysis summary.	**Solution: BW WorkBooks** (reports) with common queries may be prepared and delivered through the CRM system to **CRM Mobile Sales** laptops. FSA simply seeks out the appropriate analysis.
(4) Customer places multiple orders for various product combinations with selected delivery schedule. FSA provides order number and states that order confirmation and delivery dates will be e-mailed within 24 hours.	**Solution: CRM Mobile Sales** standard order functionality. Generates order number that can be tracked in the CRM and R/3 or other legacy numbers. It is possible to integrate CRM Mobile Sales with APO for near real-time availability check (**ATP**). FSA performs daily **on-line CRM synchronization** to upload sales orders, etc and receives download of confirmation of orders, BW analysis and other relevant information.
(20) Customer then requests a special pricing for another product that they will contract to buy over one year for a total value of US$1 million. FSA provides contract details and offers 25% discount on price of product for this specific value contract agreement valid for one year.	**Solution: CRM Mobile Sales** integrated with CRM **Contract Functionality** enables FSA to enter contracts and related pricing considerations from **IPC**.

(21) The next day customer (purchase manager) calls CSR at sales office to obtain the confirmation numbers over the phone. CSR verifies purchase manager authorization and provides confirmation numbers of orders taken by the FSA at the customer site. The purchase manager is satisfied by this efficient response.	**Solution: Contact Center** CSR can access order related information by searching by company name, date of order, FSA and other parameters. All processes in mySAP.com are integrated for any point of access.
Other Functions Requested by Customer	**MYSAP.COM SOLUTIONS**
Management wants to review outstanding bids by sales potential, location and type of business sector Territory manager wants sales volume breakdown by assigned FSA Customer base that is responding to campaigns and promotions	**Solution: Business Intelligence Warehouse (BW)** queries using these combination of parameters will generate analytical reports that can be structured to reveal important business decision tools, such as cost and efficacy of campaigns (C). Also, “click stream analysis” offered by Tea Leaf Technologies extracts customer browsing habits for customers with web point of entry (C). The **Strategic Enterprise Management (SEM)** cockpit offers tools for managers to use BW and other data to make business decisions.
Post-sales customer satisfaction	**Solution: BW** may be structured to extract data from on-line customer satisfaction **surveys**.
Distributor & Reseller inventory	**Solution: Distributor and Reseller Management DRM**





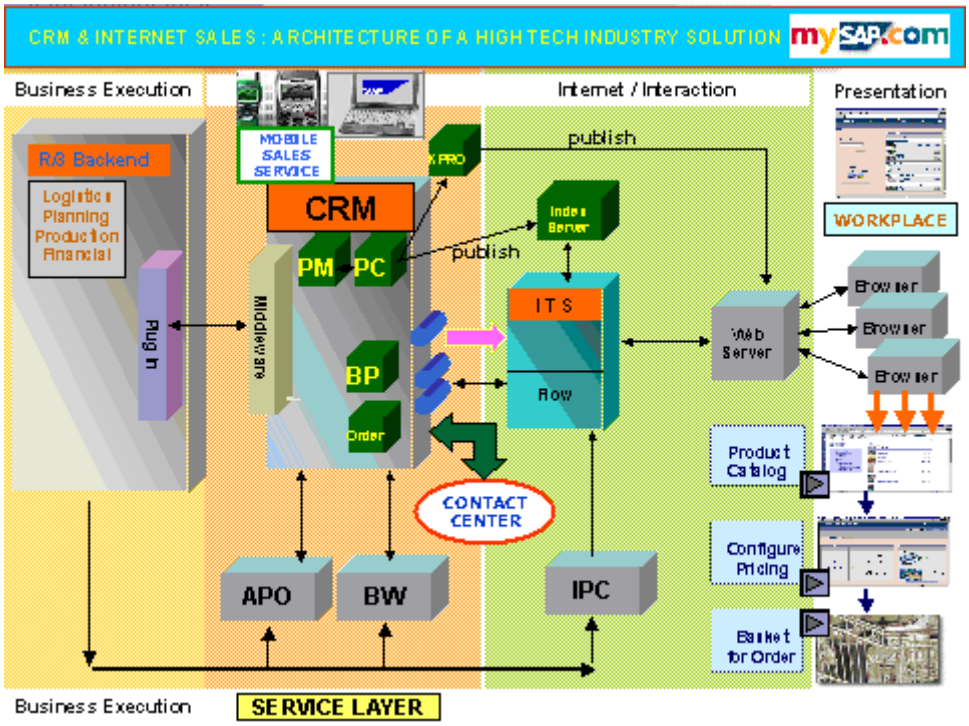




SOLUTION THAT REFLECTS INTEGRATION & COLLABORATION: MYSAP.COM

The actual business scenario and their corresponding solutions may have already offered the reader a perspective about the nature of mySAP.com solutions: **integrated.** The alphabet soup of components (CRM, ITS, IPC, APO, BW, DRM, MES, SEM, SCM, PLM) are seamless to the end-user yet most are independently scalable to adequately respond to the dynamic nature of e-business needs of in the high tech industry. Another important feature in today's business environment is the need to collaborate: intra-company as well as inter-company. Combining integration with **collaboration** makes mySAP.com offer the best value to the customer for implementing an end-to-end solution. Inter-company collaboration is key to supply network optimization and vital for large corporations because they depend on multiple sources and suppliers in order to market their products and services. APO (Advanced Planning and Optimization) and the high tech specific DRM (Distributor and Reseller Management) are key tools for cross-industry performance and supply chain planning.

What are the architectural components of this solution?



In 1995, iLogistix went live for the first time with SAP R/3. Along with SAP, iLogistix continued to evolve, too. On 31st July 2000, iLogistix went live with SAP CRM, IPC, APO, BW, Workplace, Marketplace. Currently with 19 operations in 8 languages using 21 currencies, iLogistix provides outsourced e-solutions (to Dell, Sony, Microsoft, Compaq, Qualcomm, Kyocera, HP, Seiko, etc.) for the high tech industry that uses mySAP.com for a myriad of operations:

- **e-commerce** (product management, configuration, pricing, promotion, web activity report, personalization)
- **e-fulfillment** (order capture, contracts, quotations, credit checks, on-line returns, warehousing, shipping)
- **e-collaboration** between customers, manufacturers, distributors and resellers
- **manufacturing, assembly and configuration, distribution**
- **financial services**
- **supply base management & supplier relationship management**
- **web catalog management**
- **procurement and inventory management**

iLogistix helped Kyocera using **mySAP.com Solutions** to produce results:

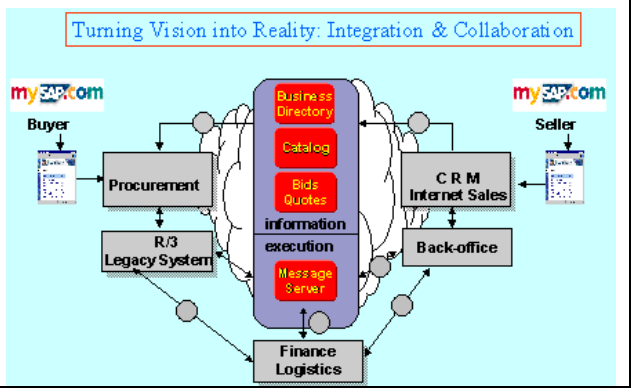
- New sales channel: cell phone accessories on the web
- Profitable within 1st year
- **300% increase in revenue** in 2nd year

iLogistix helped Hewlett Packard using **mySAP.com Solutions**:

- Case: Software fulfillment: > 5000 per day around the world
- Action: Moved from push to pull fulfillment model
  Replaced build-to-stock with manufacture-to-order
- Result: **97% reduction in inventory** from US$10 million to US$0.35 million in three years

ORCHESTRATING INDIVIDUAL COMPONENTS FOR MYSAP.COM SOLUTIONS

It may appear to the reader that mySAP.com solutions use of some components repeatedly. If that notion emerges from this discussion then you have grasped the essence of mySAP.com solutions. The use of the components are redundant because the system is integrated and a subset of functions offered by each component may be selectively or collaboratively used to solve business processes or scenarios that add value for the customer.



mySAP.com Solutions for the High Tech Industry: A Summary

It is beyond the scope of this or any chapter to outline all the functions and solutions that mySAP.com could offer for the high tech industry. It goes without saying that the details of each process and the accompanying architecture is even more gargantuan in scope. The reader is provided only with key cases and components that reflect the potential of mySAP.com solutions and some of its current applications.

SAP has been playing an important role for optimizing business processes for high tech companies for several years. Market leaders in the high tech industry have played a key role in driving the design of SAP's software evolution to support the industry's best business practices. Traditionally, SAP R/3 has been used for enterprise resource planning and back-office functions like accounting and human resource management. SAP's new dimension products like Advanced Planner and Optimizer (APO) and Business Information Warehouse (BW) are providing solutions to optimize even the most demanding and dynamic business processes. With mySAP.com, SAP integrates intra- and inter-company business needs, e-business, m-commerce as well as advanced collaborative scenarios for the high tech industry. In the next section, we will discuss the functionality we have developed for specific high tech industry segments such as the software industry as well as a common high tech business need such as Distributor and Reseller Management (DRM).

In addition to the process oriented approach, SAP now has developed the concept of user roles which assigns employees to one or more roles within the organization depending on their job functions. The mySAP.com Workplace is a role based enterprise portal, designed to support the employee in performing all necessary tasks, which are defined for this role. The Workplace is browser based and offers single sign-on to SAP as well as non-SAP applications. The user has a personalized navigation structure for all applications, an integrated inbox and applications pushing vital information such as KPIs, alerts, reports onto the screen.

SAP delivers a number of templates for roles typical in the high tech industry but roles may be adapted to individual needs including cross-industry roles with high tech specific extensions. An example of a cross industry role with relevance to the high tech industry is the Supply Chain Planner (SCP). The SCP mySAP.com Workplace is designed to work in several areas and receive information from different sources to:

- Monitor the performance of the supply chain with KPIs (such as: inventory levels, on-time delivery, product availability, costs). This data may be retrieved from a data warehouse (for example: SAP's Business Information Warehouse). With historical data in BW, a comparison of planned versus actual.
- Optimize the supply chain (including suppliers, contract manufacturers, distributors) by using optimization algorithms for the entire supply network from supply chain management tools, like Supply Network Planning, from SAP's Advanced Planner and Optimizer (APO).
- Collaborate with suppliers and distributors by sharing forecasts and planning data. The mySAP.com Workplace allows to retrieve this information from business partners and other non-SAP sources.

Subset of SAP Solutions from Advanced Planner & Optimizer (APO)

International Data Corporation (IDC) forecasts the market for supply chain optimization to approach US$7 billion in 2002 from a mere pittance of US$250 million in 1998. APO from mySAP.com is a fully integrated supply chain automation solution currently in use by major high tech leaders including Hyundai, Motorola, Intel, Texas Instruments, Sony, Hewlett Packard and Wacker Siltronics.

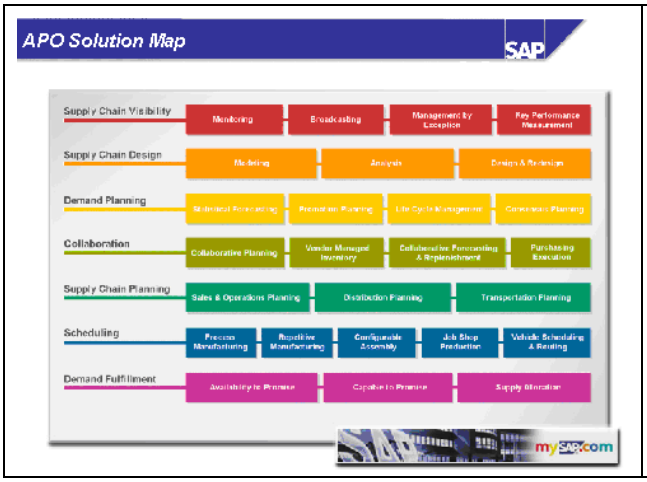
From the simplest to the most complex business need, functionalities within APO provide apt solutions. If a purchaser demands information *only* about availability of a certain product then a subset of functions offered by SAP's Advanced Planner and Optimization module (APO) may be utilized to provide the solution. On the other hand, if a **business process**

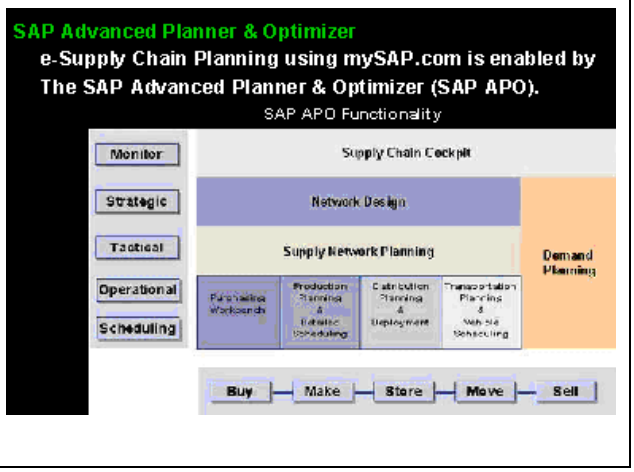
A. includes an availability check (using the available–to-promise or ATP function of APO)
B. for a web based order
C. from a product catalog
D. that needs to be drop-shipped at a certain location by a specified date

then the **mySAP.com solution will integrate**

i. the use of availability check (ATP) function of APO with
ii. CRM and Internet Sales (including ITS, Product Catalog, IPC)
iii. back-office order management
iv. warehousing, shipping
v. financials (along with credit check and tax).

The ability to optimize shipping plan is available through the Minimum Cost Flow Optimizer of APO that creates a shipment plan that minimizes costs and accounts for transportation and warehouse constraints. Even further, the Transport Load Builder of APO uses results of single product transportation recommendations to create multi-product transport orders to ensure that the transportation vehicles are filled to capacity. If the planned transport orders do not meet certain requirements, the system activates an alert. The APO Solution Map indicates the areas and sub-areas for which SAP APO Solutions are available.





APO Solution for SONY (Japan)

With high tech and electronic sales in excess of US$11 billion in the 1st quarter of FY 2000 (16), it is a major challenge for SONY to maintain optimized worldwide shipping schedules. Aggregating demands on a weekly basis to optimize for shipping volume delays market availability for SONY's products. In April 1999, SAP's APO solved the problem by taking into consideration flight schedules and weekly demand by location. The demand was distributed to optimize for shipping per day according to available flight schedule, thus allowing SONY's products to reach the market, customers and distributors even faster. APO grouped the delivery allocation plan for SONY's products with a list of available flights to optimize shipping schedule.

APO Solution for common High Tech Scenario: Computer & Peripherals

A laptop computer ordered today is often expected to be delivered the next day yet major manufacturers rely on partners to assemble or produce such configure-to-order products. APO solution provides cross-enterprise visibility to products and components which may be constrained by any number of factors within a business's own processes as well as by their sub-contract manufacturers, suppliers, vendors, distrubutors and resellers. In an actual business case, a customer may be offered 5 different hard-drive options (6 to 35 GB). At the production level, one common part in chronic short supply is the metal bracket that holds the drive in the case. The motherboard is itself made to an order placed by the assembly customer (HP, Dell) to fulfill this order. The CPU is a product that requires the manufacturer to create a chip set which sits on the motherboard. Thus, the motherboard can be constrained by the availability of the basic board, as well as the chipset. In turn, the chipset can be constrained by any 1 of the 130 parts it is made up of. The CD/RW drive is a 40/12/6 speed drive that is manufactured by a vendor. HP or Dell does not keep a stock of this product but relies on the CD drive manufacturer's just-in-time (JIT) delivery schedule for product requirement. Two components of CD are critical: laser reader and a laser system to write data.

APO Solutions:

(a) The simplest solution: ATP checks only manufacturers (HP, Dell) locations

(b) Level two ATP check: manufacturer, other contract manufacturers locations, vendors.

(c) The next level: apply a location and product procedure set based on technical source (remote, telesales or internet sales), ship to country, customer group (partner function) and then survey:

[i] solution centers of its distributors/resellers

[ii] manufacturer and its contract manufacturers (for preferred customers)

[iii] vendors

Configure to order environments are ubiquitous in the high tech industry. Visit HP based on SAP solution (18).

APO Solution for Hewlett Packard (USA)

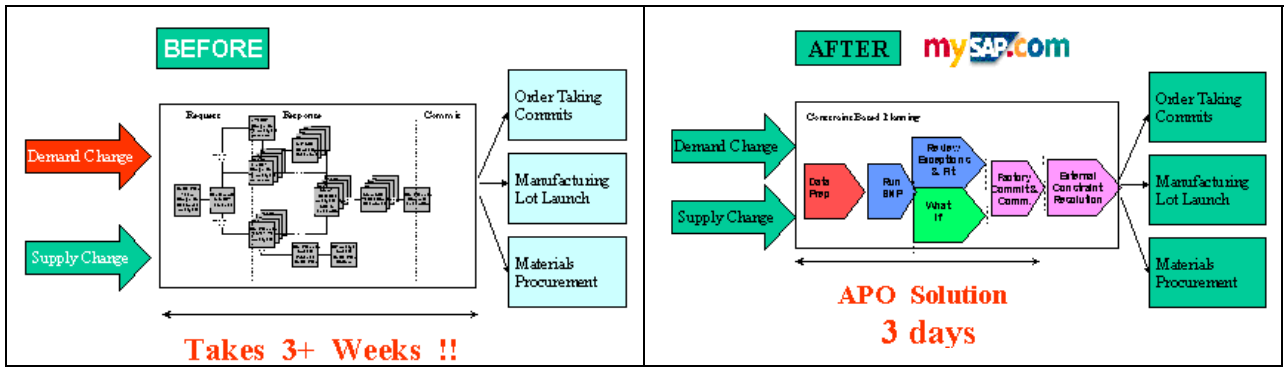
HP ships over 5000 software products each day, globally. For the 41st largest global corporation, therefore, maintaining an adequate on-site on-hand inventory is a high cost factor. Using mySAP.com APO functions, SAP partner iLogistix Corporation, reduced 97% of inventory costs, over three years, for HP by moving from a push to a pull fulfillment distribution model using the Supply Network Planning (SNP) function of mySAP.com APO. With pull distribution, all demand (within the pull deployment horizon) is met through deployment and distribution occurs according to the due date specified at the distribution centers. In HP's Boblingen, Germany, distribution center, the APO Demand Planning solution for commercial and supplies product lines is scheduled to go live in October 2000.

APO Solution for the High Tech Industry Semiconductor Manufacturers

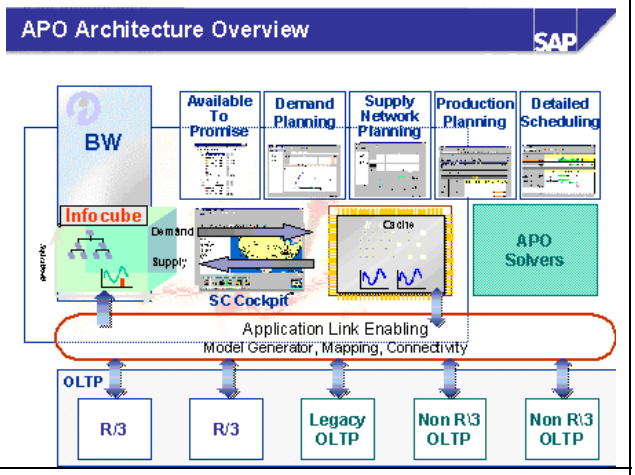
Probably the most volatile market is that of chip manufacturers where the race to time-to-market is as aggressive as its planned obsolescence. Nowhere else is optimization so crucial to survival ("only the paranoid survive"). Microprocessor manufacturing schedules are constantly in a flux depending on product strategy and marketing demands. In the global economy, a drop in crude oil prices by OPEC or political turmoil in Peru produces ebb and flow in world markets. Thus, schedule changes must have the ability to respond rapidly. **How** rapidly a corporation can effect schedule changes, therefore, depend on **what optimization solution** it is using. That in turn will directly affect the corporate image as well as its revenue potential.

It took a major semiconductor manufacturer 3 weeks to implement a “commit” to a new schedule at its factory after the corporate strategy division sent the “request” proposing necessary schedule changes as a response to market factors. Therefore, “effective immediately” took 21+ days to take effect. The situation was unacceptable to this manufacturer and after considering two other competitors (i2 and Manguistics) it chose SAP to solve its problem. SAP solved the problem with mySAP.com APO solution. APO centralized the supply chain tools and data, in the process eliminating about 25 different manufacturer’s legacy systems, to drastically reduce the schedule correction cycle from 3 weeks to 3 days.

21st century solutions from mySAP.com APO for 21st century challenges closely parallel the evolution of the history of computing itself. In the 20th century, the first nuclear physics problem submitted to the ENIAC (Electronic Numerical Integrator and Computer with 18,000 vacuum tubes and weighing 30 tons) would have taken 2 weeks to resolve with a mechanical machine of the Babbage type (century to resolve by hand). In 1946 ENIAC completed it in 2 hours (17).



IAPO functions are analyzing large volumes of data that reflect market fluctuations and other parameters that drive the optimization engine. Of special strategic interest is forecasting and promotions management. The APO module contains an Administration Workbench that allows definition of multi-dimensional database structures containing data (Datamart) from multiple sources, such as Demand Planning. These structures are referred to as InfoCubes which are also the key elements in mySAP.com’s Business Information Warehouse (BW) solutions. Supply chain planners can define several versions or scenarios of demand planning depending on the data available in the InfoCube. This provides multiple forecasting solutions. Infocubes with data from marketing, sales, financials, logistics can provide different versions of forecasts which may be combined with profile dates or number of periods from data “buckets” to offer the best possible consensus forecast about products, product hierarchies, regions and customers. The seamless integration of Supply Network Planning, Demand Planning and other functions within APO allows data integration between demand and supply side. A Planning Book (report) can be flexibly defined via BW.

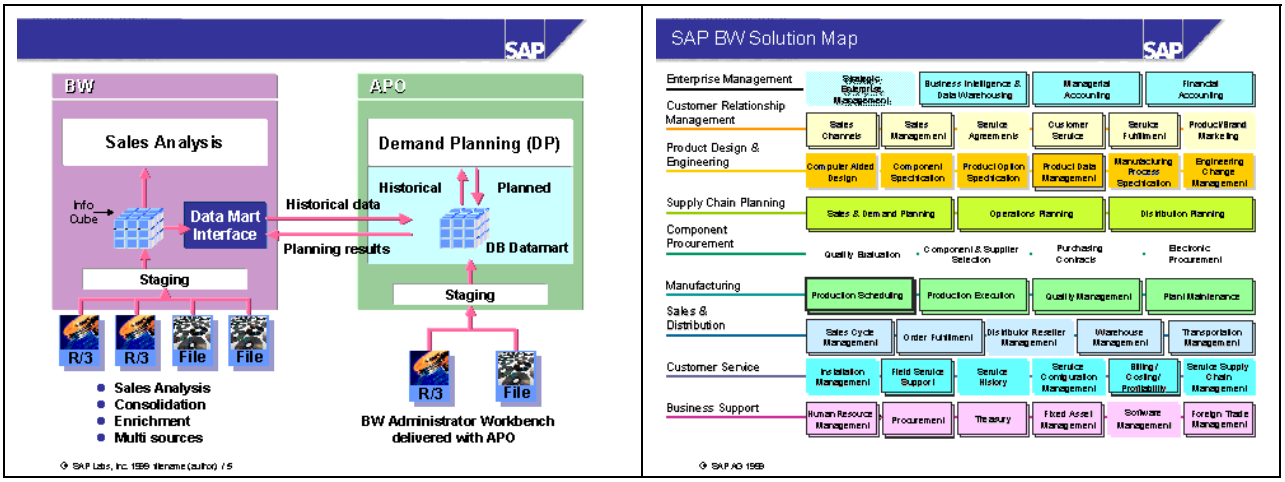
APO Architecture Overview	
BW is schematically imposed on the APO architecture only to highlight functional integration and data accumulation in the “infocube” structure of SAP’s BW component. The BW Administrator Workbench is offered with SAP’s APO to configure APO to deliver data to appropriate BW structures. APO delivers supply chain planning features for strategic, tactical and operational solutions using the several modular components. APO planning functions operate on the same consistent model in the LiveCache to guarantee real-time synchronization and optimization of the supply network. SAP’s LiveCache technology uses in-memory, data processing based, object-oriented technology to enable the planner to provide real-time decision support. The key APO modules are:	
APO Supply Chain Cockpit (SC Cockpit)	A graphical “instrument panel” for modeling, navigating and controlling the supply chain.
APO Demand Planning	A toolbox for statistical forecasting techniques and demand planning features to create accurate forecasts, what-if analysis, online simulation to create, store and compare different versions. Integrated with SAP BW.
APO Supply Network Planning	A planning approach to create tactical plans and sourcing decisions that takes the complete supply network into consideration.
APO Production Planning	Rapid response production planning using dynamic pegging and optimization techniques to generate executable plans.
APO Detailed Scheduling	Real-time scheduling for finite sequencing and final assignment of production resources to create an optimal production schedule.
APO Global ATP	Multi-level, rule-based availability checking that considers allocations, production, transportation capacities and costs in a global environment.

Subset of SAP Solutions from Business Information Warehouse (BW)

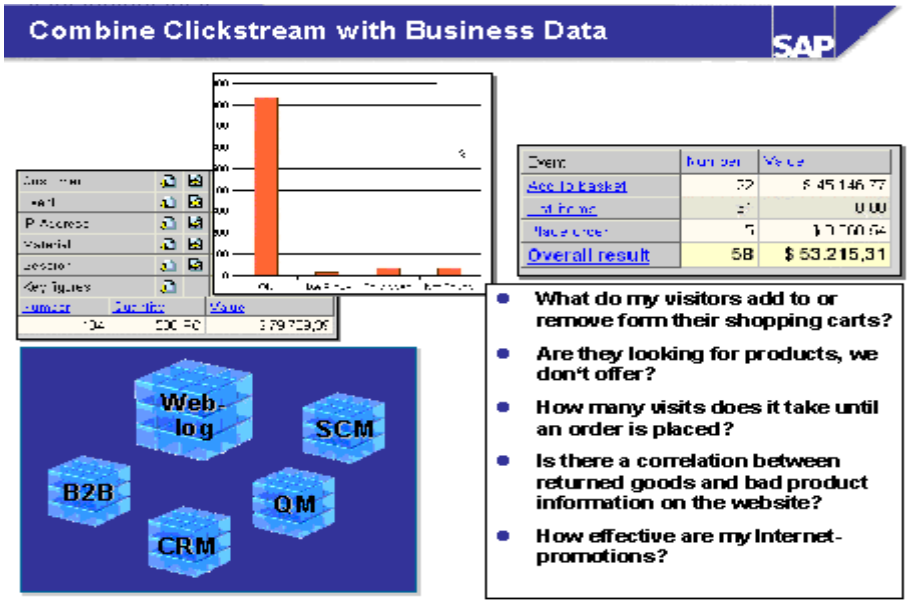
BW can act as an independent solution or integrate with APO.

1. Extract meaningful data to benchmark against industry Key Performance Indicators (KPI)
2. Organize extracted data (from enterprise and extraprise) to generate reports
3. Access to reports

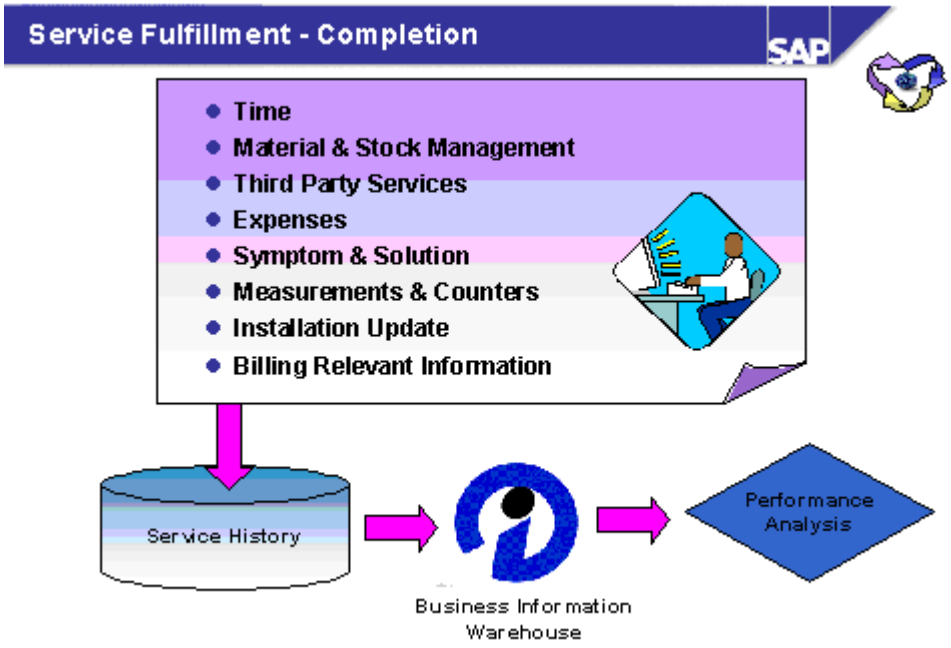
The distinction between the “after-the-fact” on-line analytical processing (OLAP) environment of traditional data warehouses and the on-line transaction processing (OLTP) necessary for e-business and m-commerce (mobile-commerce) applications are blurring the use of the term warehouse. For example, a credit card transaction at a petrol pump (gas station) is likely to pass through a very large data warehouse (to detect fraud using data mining techniques) before an authorization is issued. This highlights the coupling between OLTP (R/3) and BW. SAP’s BW was considerably improved by input from a broad range of industries and the new BW 2.0 version was first deployed at Hewlett Packard in 1999, with considerable success. With over 1000 installations, SAP’s BW is WAP-enabled and is accessible via mobile phones and personal digital assistants. BW data can be extracted from a variety of business processes including the boxed segments (double black line) in the SAP Solution Map.



IDC expects overall data warehousing market to experience robust growth from US$4 billion in 1999 to US$20 billion in 2004 (23). BW data may be analysed to best serve businesses ranging from demand planning (APO link) to campaign management (CRM link). The flexibility of SAP's BW stems from the use and sharing of data from central "containers" of data for planning, analysis and reporting. These containers are referred to as "InfoCubes" which are multi-dimensional data structures and there structures are identical irrespective of their use (for example, in APO or BW systems). InfoCubes contain two types of data: key figures and characteristics. Key figures are quantifiable values (eg: sales in units) and follows predefined business rules, for example, key figures, such as sales, might be summed up (aggregation) by product and time. InfoCubes allow users to store multiple key figures, such as orders, shipments, point of sale (POS), and forecast components. Characteristics are needed to compute and present key figures according to differing perspectives. Typical characteristics for sales are product and customer. The BW can also be used to pull data from heterogeneous data sources and information providers (such as, Bloomberg).The benefits of this integration may be better appreciated through this example. Point of sale (POS) data from AC Nielsen Data can be stored in BW. A planner can analyse this data with APO Demand Planning and determine which Nielsen Data should be used for Casual Analysis. The forecasts, created in APO, can be transferred to BW for reporting. A sales representative using SAP Mobile Sales on a Nokia WAP Phone can receive this report and adjust his/her sales strategy. At the office, sales representative can upload sales figures that updates APO Demand Planning Data Mart.



Point of sales (POS) data from web or business buyers are significant for e-business. Volumes of customer behaviour data was untapped, until now. Two SAP visionaries formed TeaLeaf Technologies to develop “Clickstream” software that now enables any business to gather data on a variety of issues important to e-business (24). Clickstream is a milestone in CRM-centric solution and SAP’s BW is fully compatible to harness and utilize this data for appropriate analysis. In the real world of field service agents, there are a multitude of customer-centric service interactions that are equally valuable and harnessed by SAP BW for analysis.

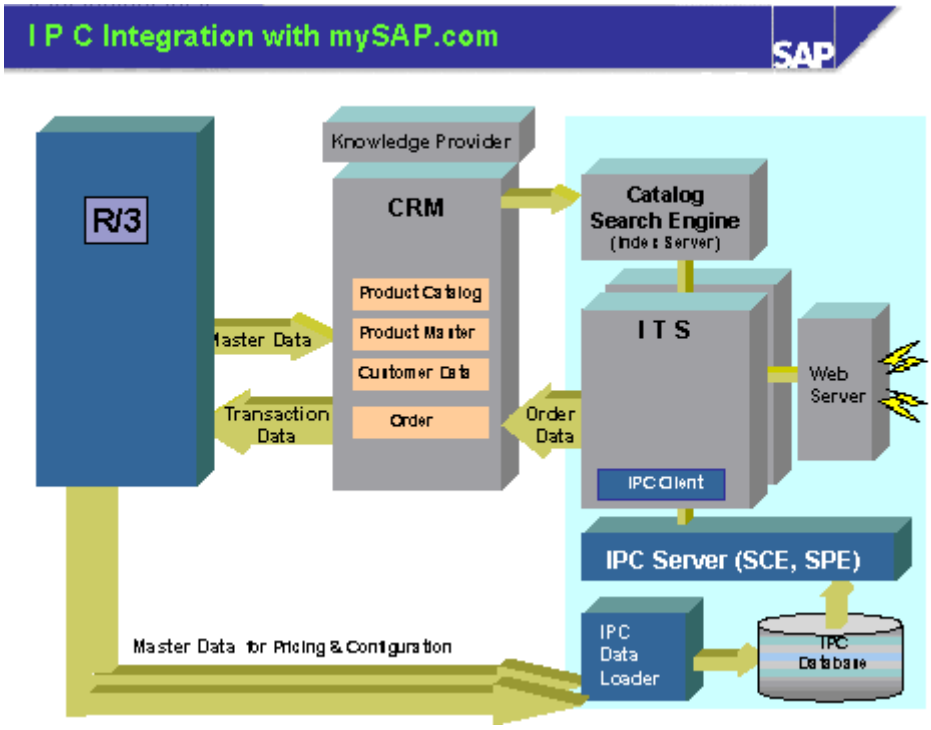


Subset of mySAP Solutions: Internet Pricing & Configurator (I P C)

The IPC serves one of the most important business functions by enabling dynamic configuration changes and pricing the customer-configured product. For the high tech industry, particularly electronics, computers and peripherals, it is rare that a consumer purchases the pre-configured advertised model. Each time a customer visits the HP site to buy its PCs, printers or the hand-held Journada, the consumer changes specifications and reconfigures a personalized PC with hard-drive, memory, screen size, etc. according to his/her preferences. Businesses that buy over the internet use the same tools. Each time a configuration is changed and the price is updated at WWW.HP.COM you have interacted with mySAP.com IPC. Several other major high tech customers use IPC either for customers using the web as point of entry or businesses using CRM Mobile Sales in business-to-business or business-to-consumer scenarios.

The customer value of IPC is related to its seamless integration with back-end office where strategic changes are made to product lines and pricing conditions. These changes are uploaded to the IPC to maintain the current version of products and prices. The volatility of the market makes it imperative to have a solution that can respond instantly to strategic directives. IPC is that solution within the mySAP.com integrated suite.

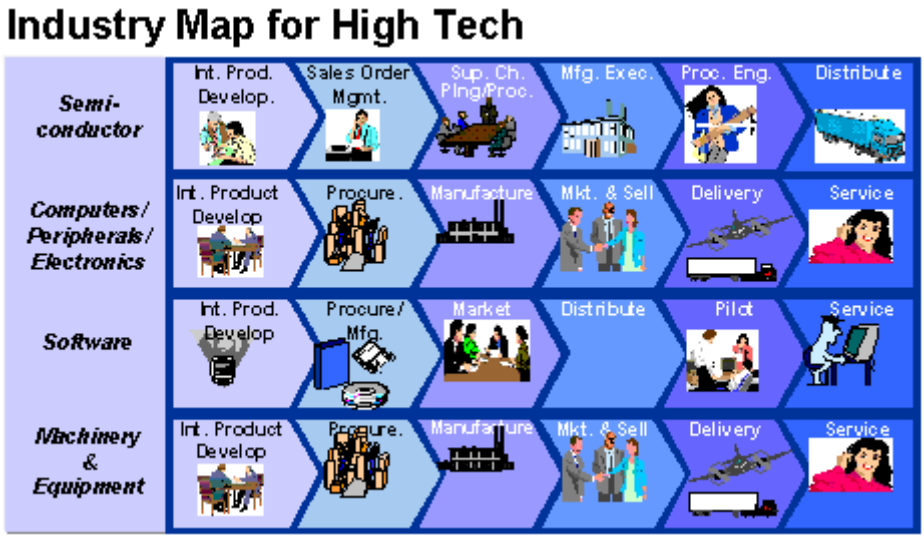
The IPC is made of two functional sectors: the sales configurator engine (SCE) and the sales pricing engine (SPE). The strength of performance of the configurator in IPC is related to the rigour of SAP’s variant configuration function and the dynamic pricing is based on SAP’s pricing condition technique. Taken together, IPC reflects the evolved configuration and pricing strengths that contributed to SAP’s recognition as the leader in business solutions.



The IPC combines the functions of the Sales Configuration Engine (SCE) and the Sales Pricing Engine (SPE) to configure and price products in any business environment including internet sales. Master data is downloaded from R/3 to IPC.

Solutions Specific for the High Tech Industry

The high tech industry has unique features (see industry map for high tech) such as the use of “intangible” goods (software) and microchip fabrication systems with very different engineering requirements as well as a vast array of partners that are vital to the productivity of original equipment manufacturers (OEM).



The high tech industry pyramid has as its base the component manufacturers as a major segment. SAP solutions for the high tech industry must take into account the business process "network" that characterizes this segment. The following is a brief overview which will help understand the reader how and why SAP's high tech specific solution such as DRM (and my SAP.com APO) are vital to this industry.

(1) At the basic level are original equipment manufacturers (OEM) that design, engineer and build sophisticated custom manufacturing equipment (such as wafer fabrication equipment).

(2) At the next level are component manufacturers who produces basic raw materials (diodes, switches, etc.)

(3) At the 3rd level are semiconductor wafer fabrication, sorting, testing and packaging activities of component producers creating SDRAM, DRAM, ASIC and CPU. Companies may sub-contract more than 60% of its wafer fabrication, test and packaging.

(4) The next level of sub-assembly manufacturers are also globally distributed enterprises producing 'end' items. They produce (their own label products) HD, CD, DVD or produce OEM sub-assemblies under the OEM license (PCB or motherboards) or act as sub-contractors to OEM to complement the OEM's own production of key assemblies.

(5) At the next level are original equipment designers (OED). An OEM can perform assembly from components to sub-assemblies and end assemblies or it may sub-contract or buy some or all of its assembly processes. An OEM can buy or sub-contract its design and engineering or it can generate its own designs but sub-contract manufacturing of its products.

(6) OEM distributors and resellers buy and sell OEM products or they can use OEM products to make-to-stock (MTS) or configure-to-order (CTO) the products (under license) or they can use assemblies of multiple OEMs to MTS/CTO their own products or solutions.

Some high tech companies have vertically integrated network of product lines in the company (semiconductors, sub-assemblies, end items) with and without additional vendors or sub-contractors. (Each of these individual areas may then require its own value chain planning and execution processes). Other high tech companies manufacture end items that are sold to OEMs for inclusion with OEM customer solutions: (a) CRT monitors are typically made in Asia and shipped via sea (which takes a minimum of 3 and up to 6 months of lead time). They are forward staged at OEM or 3rd party (DHL, FedEx) delivery/solution/merging centers. (b) Keyboard, mouse, cables, documentation is stored at merging centers.

Demand for OEM's products originates from several sales and distribution channels. An OEM can sell directly or for resale to distributors who can in turn sell to:

- Large corporate end-users
- Public sector (schools, governments, agencies)
- Value Added Distributors (VAD)
- Value Added Resellers (VAR) and Systems Integrators

Supply sources of OEM's products are:

- OEM factories, distribution or solution/merging centers globally
- Vendor factories, distribution or solution/merging centers globally
- Sub-contractor's factories, distribution or solution/merging centers globally
- Distributor / Reseller warehouse or solution/merging centers globally

Distributor & Reseller Management (DRM): High Tech Industry Specific Solution

The high tech industry business, therefore, has evolved strong synergies between manufacturers/suppliers (MS) and distributors/resellers (DR) to enable each to focus on their core competencies. Manufacturers and suppliers focus on building and developing products that will meet current and future demand. Distributors and resellers focus on providing products and services in time-frames and configurations that best serves the customer.

A product of this synergy is generation and maintenance of a large volume of data between the MS and DR. MS must track product inventory at DR as well as sold-to customers and the pricing structure. DR, in turn, must receive updates from MS about price fluctuations, allowable discounts for gaining market share, special opportunity pricing and agreements. Until recently, this dynamic data exchange has been a Herculean task for most high tech companies. In 1999, with the introduction of the high tech specific Distributor/Reseller Management (DRM) solution, SAP automated the capture and processing of this information. SAP's DRM solution was modeled on and supports best practices from several manufacturers and distributors. It has a fully scalable architecture. SAP's R/3 as well as non-SAP on-line transaction systems (OLTP) can be linked to a standalone DRM system. DRM was developed by the High Tech Industry Unit of SAP Labs, Palo Alto, California.

In 1999, DRM first went live at Texas Instruments, Dallas. With US$9.5 billion in revenue for FY 1999, TI operates in 25 countries with manufacturing partners on 4 continents and is home to over 40,000 employees.

DRM provide solutions to business management challenges associated with the distribution for resale of high technology products. High tech enterprises are inter-connected by a value chain network. Combined, they have core business activities that encompass research, design, prototype, manufacture, marketing, selling, distribution and post-sales support. In addition to services, their product offering includes computer systems, semiconductors, networks, peripherals, software, and other electronic devices.

From its scope of functionality to its web-based processing, it is a solution to the many current and future management challenges faced by manufacturers, suppliers, distributors, and resellers. The opportunities offered by DRM on mySAP.com reflect SAP's commitment to provide solutions to companies of all sizes and levels of technology.

DRM will provide two entirely independent but related channel management solutions. One DRM system solution is specifically targeted at supporting the manufacturers and suppliers of high tech products. Another DRM system solution is uniquely designed to support the distributors and resellers of high tech products. The overall scope of the DRM system solutions for manufacturers / suppliers and distributors / resellers includes solutions for the following business process activities

Agreement Negotiation: Ship and Debit, Special Buy

A negotiation process takes place between the manufacturers and their distributors or resellers for special buy and/or ship and debit agreements. Each negotiation is associated with a proposed business arrangement. In one type of arrangement the manufacturer provides a reduced price on a new purchase by the distributor or reseller. In another proposal the manufacturer provide rebate credits as cost reductions to the distributor / reseller on their resale of the product. When an agreement negotiation is complete, the ERP system is triggered to create the appropriate transactions.

Design Registration

High tech industry manufacturers select most of the components (70 - 80%) they use during the product design phase. The distributor will promote the original equipment manufacturers (OEM) use of a manufacturer's products as components or sub-assemblies within the OEM's new product designs. NEDA (National Electronics Distributors Association) has established a standard Design Forecast / Registration Reporting form for the design registration process. The OEM's project may involve multiple status, beginning with the distributor's submission of the design concept. If the distributor is allowed to enter the OEM's evaluation process, it initiates design registration. If the OEM selects the distributor's design for the project, the distributor will inform the manufacturer of its design "win" to complete the design registration process and to begin ship and debit agreement negotiation process. The registration process is well suited for a web-based solution, similar to the agreement negotiation process described above.

Sell-in of product from manufacturers & suppliers to distributors & resellers

The sell-in process encompasses the manufacturer's sale of its products to distributors and resellers. Sell-in is the first of several key processes at both parties that focus on tracking the distributor and reseller inventories. DRM will provide a perpetual inventory tracking of logical inventory lots representing this inventory of the manufacturer's products while applying the manufacturer's rules. These DRM inventory lots are created/updated from sell-in transactions. Manufacturers may choose to record the revenue associated with their sales at the time of sell-in or to defer the recognition of revenues and related costs until the products have been re-sold by their distributors and resellers to customers.

Sell-through of product by distributors and resellers to customers

The sell-through process represents distributor or reseller sale of products to customers. DRM solution for margin management is extremely important to the distributor or reseller. Their sales process includes an automated search and assignment of all valid existing Special Buy and/or Ship and Debit Agreements that match the actual demand data. This can be performed at quotation, sales order (create & change) and billing. A search function can also be performed after billing for those agreements that were completed later than the fulfillment processes.

Sell-through is reported by EDI from the distributor/reseller to the manufacturer or supplier. Incoming data cleansing at the manufacturer/supplier is supported. Corrections can be executed through web-based, EDI-based or manual processes. Sell-through transaction data is used at both parties to consume DRM lots. If appropriate, deferred revenue and related costs at the manufacturer/supplier will be recognized.

Drop shipment to the Distributor / Reseller customer

Occasionally, product will be drop shipped directly from the manufacturer or supplier to the customer of the distributor/reseller. The DRM inventory lots are updated at both parties. The process at the distributor/reseller will use either an automated notification or a billing from the manufacturer/supplier to trigger creation of back-to-back transactions for logical goods receipt, delivery, shipment and billing.

Ship and debit agreement claims processing

The ship and debit claims processing solution requires distributor/reseller to submit a claim to manufacturer/supplier for rebate credits based on sell-through. The distributor/reseller's claims due processing includes creating and managing accruals (if desired), releasing claim (through EDI or other means), creation of a debit memo (if permitted by the manufacturer/supplier) and matching the credit received from the manufacturer/supplier to the original claim issued.

At the manufacturer/supplier, cleansing of incoming claims data is supported. Corrections can be executed through web-based, EDI-based or manual processes. The "claims due list" automatically performs validation checks against the referenced agreement for validity periods, material, sell-through customer, values, additive versus exclusive claim conditions, etc. Valid claims are released from the due list to automatically create the desired credit memo.

Channel assembly programs

Distributors and resellers may also manufacture products. They may do this under a channel assembly program licensed by the manufacturer or they may manufacture their own products. At the distributor/reseller, the search for valid Special Buy and Ship / Debit agreements for the sell-through process is applied here at the component level. Sell-through reporting and Ship/Debit claims processing may be done at the component or end item level, based on manufacturer's rules. The DRM inventory lots are updated at both parties.

DRM inventory reconciliation

DRM has maintained a perpetual tracking of inventories according to defined rules. The distributor or reseller is also tracking its inventories within its ERP inventory management system. DRM provides two distinct reconciliation process solutions that support (even past) date effective comparisons. One solution permits the distributor/reseller to reconcile their DRM inventory lots with the inventory management system. The second reconciliation set can be used to reconcile their DRM inventory lot data to their counterpart's inventory data.

Price changes and price protection

The manufacturer determines what products will undergo price changes, the frequency of these changes, the methods of communicating price changes and distributing new distributor base price (DBP) and market price program (MPP). Price protection is a service extended by the manufacturer to its distributors and resellers to protect them from margin loss resulting from price reductions.

DRM supports price protection based on DRM inventory lots calculated at a price-effective date. DRM will apply the manufacturer's rules to determine when price changes will be supported with price protection (eg: some MPP or special buy parts may not be protected under some circumstances; some price increases may require reverse price protection).

At both the manufacturer/supplier and distributor/reseller a "price protection due list" process updates the DRM inventory lots, utilizes the DRM inventory lots to apply the price protection rules and creates the credit/debit memos as appropriate. For the distributor/reseller, the process also includes revaluation of the inventory management system balance sheet values and re-pricing open POs.

Returns of product to the Distributor / Reseller from resale customers

On some occasions, distributor or resellers may receive product returns from their customer. DRM will support returns data updates from the distributor or reseller to the manufacturer/supplier through (EDI, fax, email) methods used for sell-through. DRM inventory lots will be added back at both parties. A manufacturer may sometimes require "billups" coincide with these returns when ship and debit credits were provided to the distributor or reseller on the original sell-through. A "billup due list" is provided at both parties to manage a process similar to the ship and debit claims due list process described above.

Returns of product to the Manufacturer from Distributors / Resellers

Distributors and resellers may sometimes return product to their manufacturers or suppliers. These returns may be associated with normal returns of product for defects, transit damage, etc or with stock rotation/balancing. DRM lot inventories will be consumed at both parties. Additionally, the manufacturer or supplier may manage their stock rotation limits beginning with sell-in and ending with the related returns.

DRM Solution for a Business Scenarios

A DR is negotiating with a customer who indicates that the price is too high and displays a lower price from a competitor. In order to decide whether or not to meet the competitor price, the DR needs visibility of their margin on the sale price. The order entry process with a reduced price displays the margin. The combination of a reduced price and normal cost of product, results in a margin less than that allowed by the DR. The system blocks the order entered by the sales representative and triggers an alert message to the product manager.

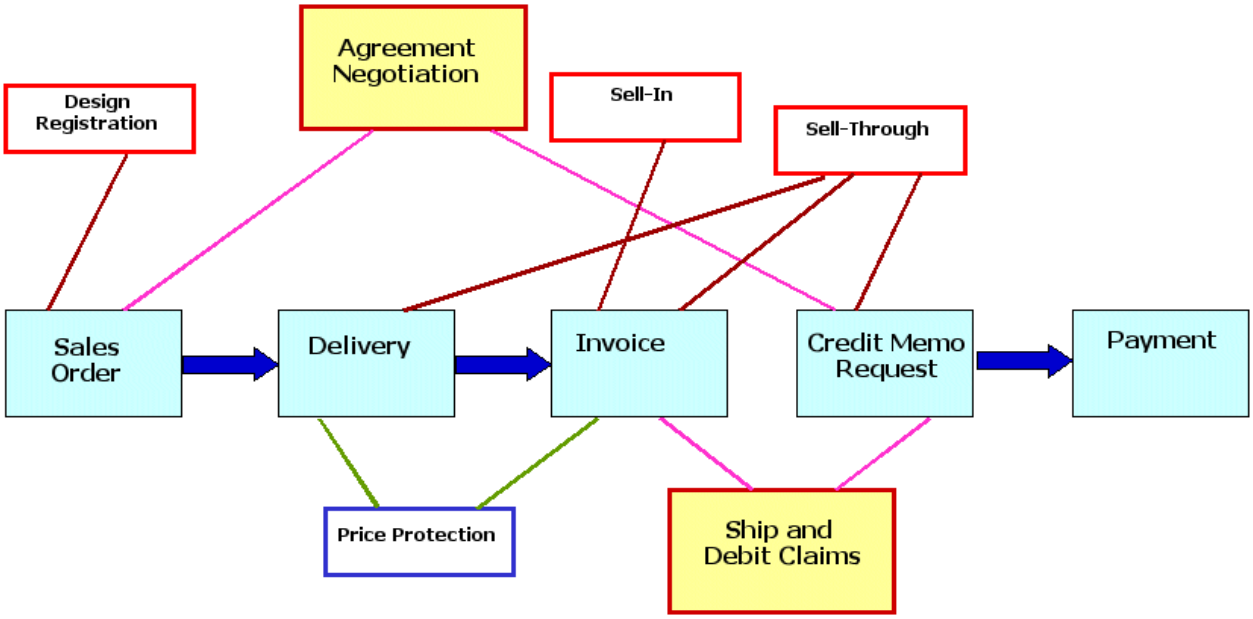
The DR Product Manager reviews the reduced selling price and purchase cost of product to arrive at a decision to request the MS to arrange a Ship and Debit Agreement. Such an Agreement allows the DR to receive a credit from the MS against the purchase price paid for goods already in stock if they are shipped to a customer for a lower than normal price.

Agreement Negotiation: The DR accesses the MS website to initiate the Ship and Debit Agreement and enters relevant information: customer, product, quantity, time-frame, competitor information, lower price. A Sales Manager at the MS reviews request and decides to support the DR's sale but the MS offers a counter proposal. the DR checks status of the agreement on the web and accepts counter proposal from the MS. This acceptance triggers automatic creation of a sales contract in the MS system and forwarding of the approved agreement to the DR. Condition records are created in the DR system reflecting the agreed price and eligibility of this sale for a ship and debit claim.

The DR Product Manager notifies the sales representative to re-price the sales order according to agreement with the MS. The system approves the new price since the new condition records are brought to bear on the order (and reflects improved margin for the DR). The block is removed and the order becomes available for delivery.

Ship and Debit Claim: After order delivery and billing, the DR initiates a Ship and Debit Claim. A debit memo request (DMR) is generated in the DR's system and the DMR triggers creation of a claim at the MS. The claim request is validated by the MS against sales contract from agreement negotiation with the DR. A credit memo request is automatically created in the MS system and DR is notified. Payment is issued for the claim amount to the DR.

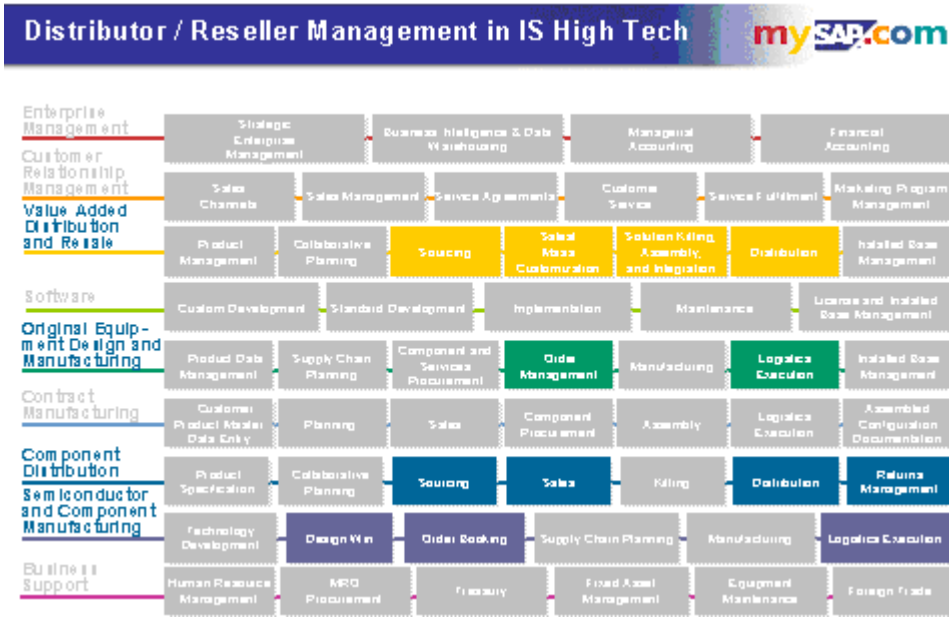
Business Solution from DRM: One Scenario



SAP's DRM Solution: Summary

DRM is a high tech industry specific comprehensive resale channel management solution from mySAP.com for manufacturers, suppliers, distributors and resellers (see Solution Map) which enables them to manage:

- sell-in
- sell-through
- special buys
- ship-and-debit
- drop shipment
- price protection
- channel assembly program
- design registration
- inventory reconciliation
- product returns

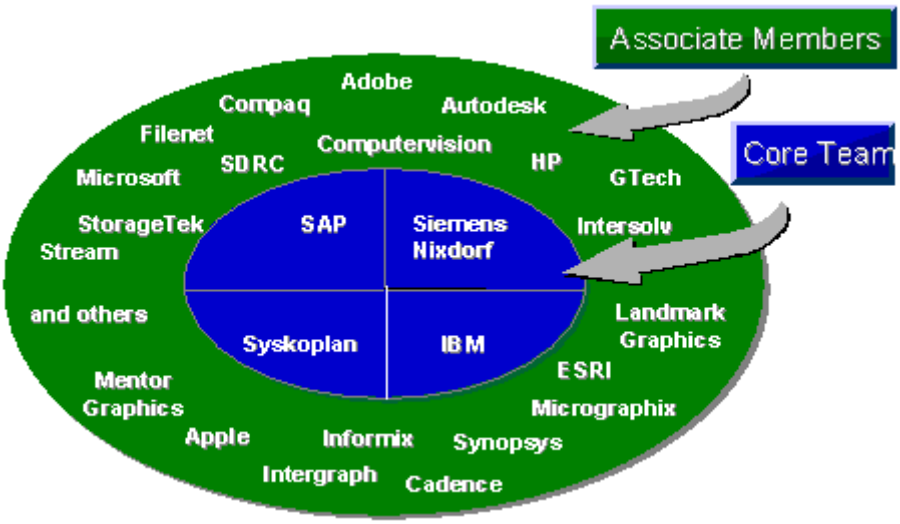


SAP's Industry Specific (IS) Solutions for the Software (SW) Industry: IS-SW

The DRM scenario of agreement negotiation between MS and DR is an everyday occurrence in software sales where the market is flooded with multiple versions of software from a plethora of vendors offering closely related functionality to vastly improve customer's choice and pricing options. Therefore, the ability for MS and DR to remain competitive in software sales often hinges on the rapidity with which these negotiations can be completed successfully and the order confirmed by the customer. The software industry has other high tech industry specific and several unique requirements.

SAP's IS-SW is an industry specific component specifically designed to meet the unique requirements of the software segment within the high tech industry. SAP has been working together with other leading software companies to develop an efficient business model for managing the licensing and support of software products. The result of this collaboration is an industry-specific business solution, IS-Software. IS-SW solutions are installed in over 50 high tech customers including HP, IBM, Autodesk, Siemens, Apple and Microsoft. IS-SW was developed by the High Tech Industry Unit of SAP Labs in Palo Alto, California. IS-SW leverages R/3 integration technologies and open interfaces to deliver optimized best of the breed business solution for the software industry that include solutions for:

- Movement of software from factory to customer
- Software installation and technical support
- Management of global licensing agreements
- Post-sales support including software and hardware upgrades
- Modeling of software products to include "intangibles" as well as "tangibles"



Software companies help businesses implement sophisticated software products to manage the complexities of modern business. Yet, the same software companies that manufacture these products often experience significant difficulty in managing their own internal operations. Critical information regarding software product licensing, installed base (IBASE), contract management and software maintenance processing (SMP) is missing or patched together from various systems. Within the context of supply chain management, the situation is further aggravated by the fact that enterprise resource planning systems focused on optimizing the procurement of material through to the distribution of finished products. These systems assume that the processes that support supply chain management deal with "tangible" materials, finished products, bills of material (BOM) and the like. In the software industry, the rules and requirements governing standard business processes, as a result of "intangible" software products that are sold and maintained, are not met by general functionalities. This is what makes SAP R/3 software industry solution (IS-SW) unique in the application software market. IS-SW business processes provide a wide range of industry solutions:

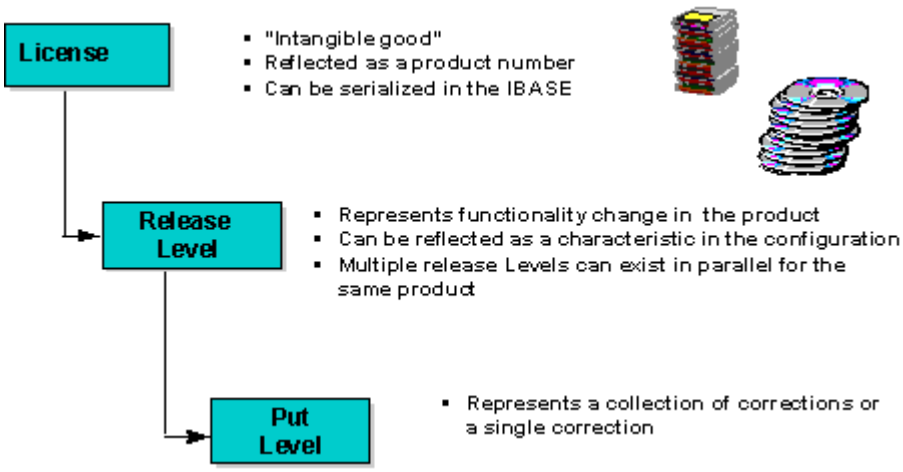
- Software License Management (creation, bump, version change)
- License bump
- Installed base (IBASE) maintenance
- Split installed base
- Software Maintenance Processing (SMP)

Although IS-SW provides solution specifically for the software industry, a company implementing this industry-specific component can take full advantage of SAP R/3 system. IS-SW can operate in a relatively independent manner utilizing primarily the IS-SW specific business processes or it can operate as an integral part of a total SAP R/3 solution. The approach differs, depending on the requirements of a specific company or segment of the software industry. The software industry can be divided into various product segments, such as, business software, entertainment software or education software, each of which have widely varying business requirements driven by their licensing and distribution arrangements, pricing policies, customer support procedures, etc. For example, vendors of “shrink wrapped” PC software may structure their licensing differently than engineering software.

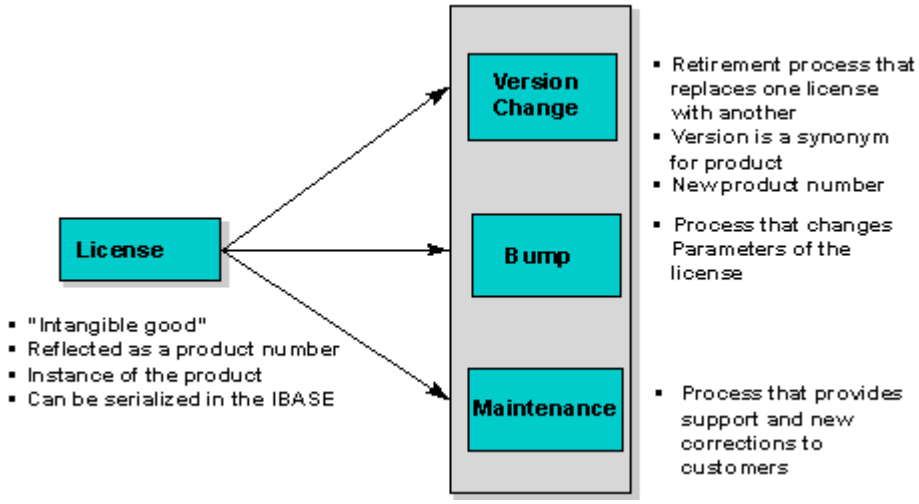
IS-SW solutions provide flexibility. IS-SW with SAP R/3 will support a software company requiring significant functionality in the area of manufacturing, packaging and inventory control. This may contrast to a software company that has limited requirements outside of the business solutions provided by IS-SW. SAP R/3 functions that may add to IS-SW solutions include:

- Sales order entry with ATP (available to promise) for supply items
- Pricing
- Production planning
- Customer service management
- Sales information
- Profitability analysis

IS-SW successfully models using standard functionality of the Product Configurator. The difficulty associated with modeling software products arises when customers purchasing the software acquire a “right to use” which encompass a number of “intangibles” with the product structure. However, the product structure might also include “tangible” supply items like manuals or documentation. IS-SW provides solutions for software licenses, versions, releases and supply-related software levels. The license represents an agreement between a vendor and a customer for one product. Typically, a release level would be modeled in the software product as a characteristic of the product configurator. Maintenance level reflects a corrective level (also referred to as a supply-related software level).

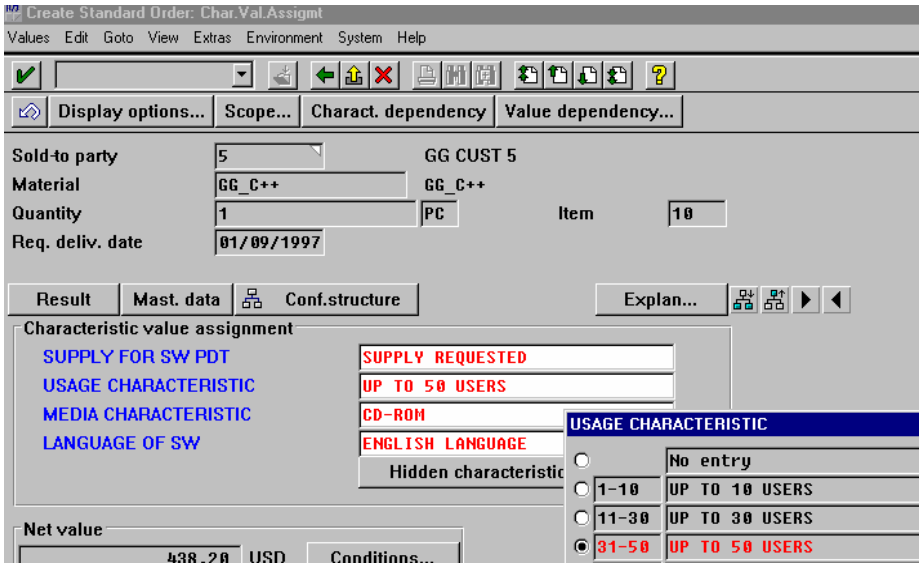


In contrast to release level (which retains the same product number even as new release levels) a software version is defined with a different product number (also known as a material number). These two different product numbers support the version change or “retirement” process, which occurs when a customer replaces one license with another. Another IS-SW license process, the license bump process, is defined as a change to an existing license (for example, increasing the number of users). Software Maintenance Processing addresses the requirement of shipping a customer the most recent upgrade or correction level of code.



License Creation Process

IS-SW product number represents an “intangible good” for which a license can be issued. Typically, one instance of the product is defined as a license. This license can be serialized in the installed base (IBASE). The determination of whether the license should be serialized and recorded in the IBASE depends on the business process. For example, in order to support the license bump process, or the license split process, a serialized license is required. By using the standard SAP R/3 Product Configurator to model software product structure, IS-SW can manage all the parameters of a software order at order entry (for example: company-specific licensing information such as number of users, language).



Modeling Software Products with the SAP R/3 Product Configurator (Variant Configuration)

IS-SW configures software licenses during the license creation process. The product configurator supports multiple logistics application components like sales order entry, available to promise (ATP) checking and production planning. For a company that sells several thousand software licenses, which might be slightly different from one another, the product configurator provides an efficient way to minimize product definition and maintenance. In SAP R/3, a configurable license, in addition to being the parent material of a configurable bill of material (BOM), is linked to one or more classes using the classification system. Classes are, in turn, linked to characteristics and each characteristic is linked to a set of values, which can be expressed as numerals or characters. The classification system allows configurable product options to be presented to the customer as freely-defined product characteristics and values. The product is configured via user selection of these product characteristics and values. If some degree of software manufacturing is relevant for the creation of the license, a configurable manufacturing routing can also be generated.

The product configuration engine is fueled by a knowledge base. In addition to the classification system, configurable BOMs and routings, the knowledge base includes a third valuable element: object dependencies. Object dependencies assist in the creation of the configuration and ensure that the configuration is consistent and complete. Object dependency types in SAP R/3 include preconditions, selection conditions, actions and constraints. During the sales order entry process, the configuration of the software license also offer other options:

- Display or suppression of characteristics and/or values, based upon selection of other characteristic values (through the use of object dependencies)
- Multi-lingual sales configuration supported by language-independent keys in the class and characteristic master data.
- Dynamic pricing based on pricing conditions
- Component level ATP checking

During the license creation process, the relevant values are selected and dependency knowledge can drive the selection process. For example, if the customer purchasing the license selects Windows NT® as an operating system, the product configurator will not offer data carrier tape due to the selection conditions defined in the knowledge base of the product configurator. Materials to be shipped to the customer are determined by the supply parameters and are placed automatically on the sales order and processed during a subsequent delivery. The bill of material (BOM) for the software product lists all possible materials required to ship with the product, for example, manuals in different languages, various types of media for different operating environments or media kits for different release levels. The BOM will list a default plant for these supply parameters and this will be the basis for the ATP check in the sales order process.

Calculating the Price of a Software License

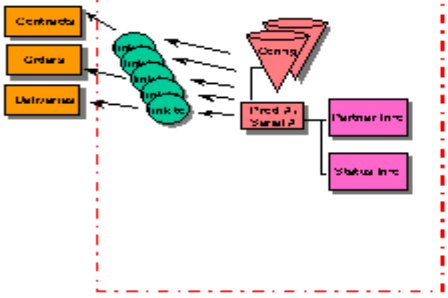
There are three methods of calculating the price of a software license, which can be used indepenently or in combination:

- Factor based pricing
  In factor based pricing, a factor is determined based on the combination of certain values in the configuration. This factor is multiplied by the base price of the software product to determine the net price.
- Characteristic value based pricing
  In characteristic value based pricing, each characteristic value may have a price or discount associated with it that affects the net price.
- Supply item pricing
  Any items listed on the sales order, such as supply items, may have a designated price.

Serialization of the License in the Installed Base

IS-SW automatically records information regarding the software license in the IBASE during the license creation process. The installed base record of the license is uniquely identified, based on the software product number and serial number. When the IBASE record is created, data from the transaction is automatically copied to the IBASE. This data may include the following: product configurator information and history, partner data, system and user status, document history and text. Timing and creation details of the installed base record are dependent on the rules defined in the serial number profile such as manual serialization at order entry/delivery or automatic serialization at order save.

IBASE Structure



- IBASE identified by
  - Software product number and
  - Serial number
- Contains software product configuration and changes
- Contains partner information
- Status controlled
- Link to current and historical sales documents

License Bump Process

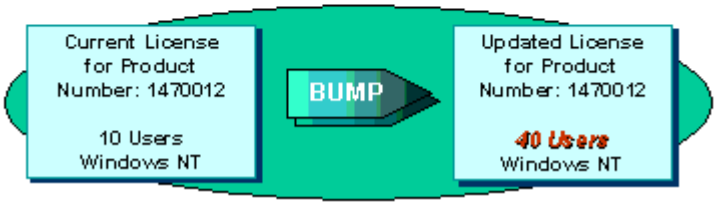
The license bump process is a change to a license recorded in the installed base. This process retrieves an existing license from the IBASE and places it into a sales document for further processing. Changes can then be made to the license attributes as modeled in the configuration of the license. For example, a license for 175 users might be increased (bumped) to 225 users. Once the license bump process is complete, the license change is recorded in the installed base. The license bump process is available only for those software products that are serialized in the installed base. The R/3 Product Configurator ensures that there are no inconsistencies between characteristics and values to be bumped during the transaction.

Pricing for the bump as defined in the characteristics and values of the license can be based on the difference between the old license and the new license parameters. If a periodic billing schedule was used for billing the customer for the old license, SAP Business Workflow notifies the user of any outstanding billing plans for this serial number at the time the bump transaction takes place.

There are two additional standard workflow templates delivered with IS-SW that support the license bump process. The first addresses the requirement of deleting or rejecting any outstanding quotes for a license that is currently undergoing the bump process in another transaction. The second informs the user of any outstanding service contracts for a license that is currently undergoing the bump process in another transaction. Two user exits are available in the workflow that allow customization of the process. If the license bump process requires delivery of any supply items, the standard delivery process will occur. All changes to the license are automatically recorded in the IBASE.

Bump Process

- IBase record is copied into a sales order line item and the parameters of the license are changed in the sales order
- Changes to the license parameters are automatically recorded in the IBase
- License number is not changed



Version Change Process

Replacing one license with another defines the version change process. This process is a variation on the license creation process. An example of this scenario would be an SAP customer who has purchased an R/2 license and then “trades-in” or “retires” the R/2 license for an R/3 license. In order to carry out this transaction, IS-SW creates an upgrade path that identifies the new product and the product it replaces. The key difference between the license bump process and the version change process is that the version change process results in the creation of a new license, which is identified by a new product number. The license bump process, on the other hand, results in a change of the license attributes but the product number remains the same.

The version change process does not require the software product to be in the IBASE or for it be modeled using the R/3 Product Configurator. This permits a customer to return a product for credit that is not tracked in the IBASE (for example, a competitor’s product). An optional return of the replaced product is allowed and if either the old or new product is serialized in the installed base, the records are linked to indicate the version change. Additionally, since the two records are linked, a version change tree can be accessed from the IBASE which depicts a complete history of the succession of product licenses.

In order to control the “trade-in” process associated with a software product, an upgrade or version change path defines the relationship and links between a predecessor and successor product. The upgrade path includes validity dates and may also indicate a sales status for the software product which controls the circumstances under which a product can be upgraded or returned but not sold.

Installed Base Management

Although a software product is largely “intangible,” there is certain information regarding the product, specifically the software license, that must be stored in the IBASE in order to carry out subsequent activities (license bump process or hotline support). IS-SW IBASE includes serial number information, which represents the license number, business information related to the customer, delivery information, the status of the license and a link to the configuration of the software license. IBASE records also contain a status that can be used to reflect various conditions of the license. For example, the license has undergone a version change or has been split. The IBASE record is automatically created when the serialization of the software product occurs. The serial number can be automatically generated in the sales order or it can be manually entered based on a number assigned to the physical delivery.

Installed Base Maintenance Process

During the life cycle of a software license, changes to a license might occur such as recording a new software license maintenance level or a bump in a license attribute. In some cases, these changes occur automatically as a direct result of a transaction being carried out. However, in other cases, direct maintenance by a user is required in order to update the information. In the installed base maintenance process, users can change and update information directly from the IBASE. The categories of installed base information are as follows:

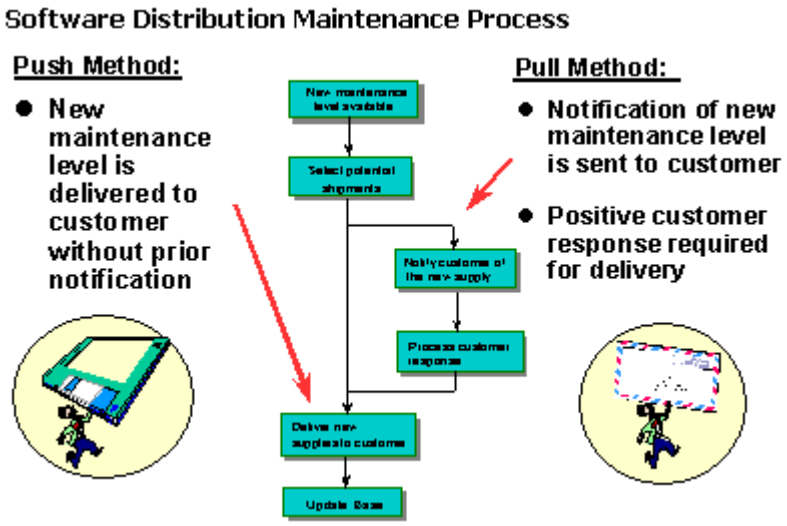
- Serial number data
- Business partner data
- Configuration data
- Status information
- Location information
- Installed base history (including IBASE configuration comparison and version change tree)

Split Installed Base Process

Many installed base updates are the direct result of a sales transaction being executed, for example, a license bump with pricing implications. However, in some scenarios, the IBASE needs to be maintained independently of a sales transaction. The split installed base process is a maintenance process that creates a new software license record, based on an existing license record, without executing a sales transaction. In this process, for example, a license record for a software product for 20 users may exist in the installed base. The customer who purchased the software product requests that the license be split into two licenses, one for5 users and one for 15 users. The customer could then upgrade the license for 15 users to the next product version change. The split license with 5 users would remain in the IBASE and be valid for support on the preceding version.

Software Maintenance Processing (SMP)

IS-SW solutions for software maintenance and support strategy ensures that customers always have the latest versions and maintenance levels of the software products. IS-SW offers tools to define and manage the software support scenarios that best fits business practices. Information from IBASE and contracts can indicate whether a customer is entitled to a shipment of latest version. All entitled shipments may be sent to a customer (push method) or issue notification (email, fax or mail) of new release and wait for instructions (pull method). Shipments are tracked and the IBASE is updated when shipment are made. This feature utilizes valuable IBASE information for marketing or sales, such as CRM Campaign or Promotion Management and thus provides the framework for active customer relationship management throughout the entire customer and product life cycle (SAP PLM or Product Lifecycle Management).



Version Change Protection (VCP) Process

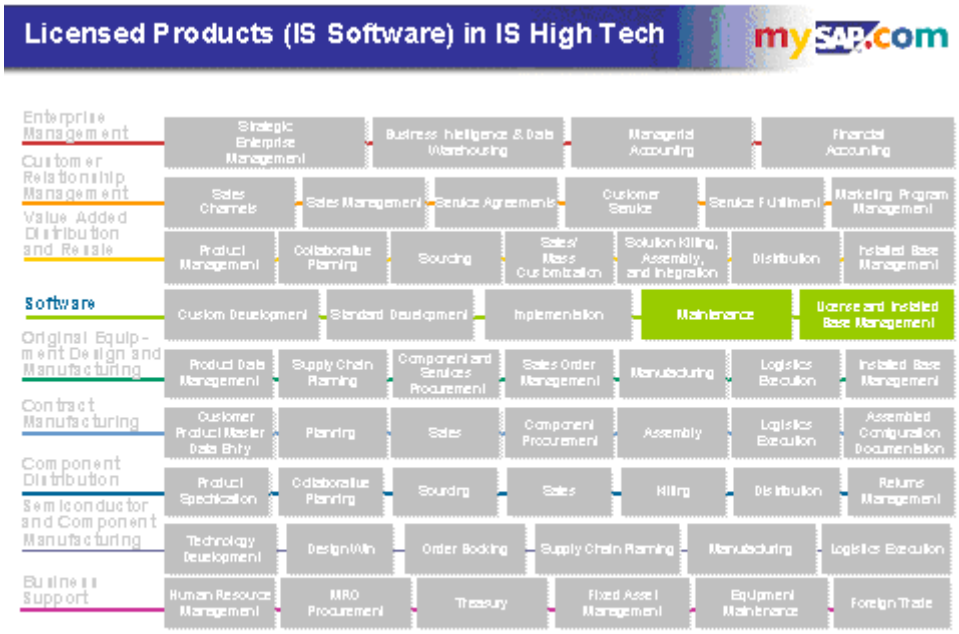
The version change process replaces one software product with another, usually as the result of a new software product becoming available to licensed customers. The version change process can be executed as a transaction-based process, requested and initiated by the customer or as a background process (SMP). The VCP process supplies customers with a new software license for a new product (in contrast to SMP). VCP can be processed using either the pull or push method. Regardless of pull or push method is used, three main scenarios are supported:

- A software license of a predecessor software product exists in the installed base and no maintenance contract is needed to receive VCP.
- A software license of a predecessor software product exists in the installed base and a maintenance contract entitles the customer to VCP.
- No software license exists in the installed base and the maintenance contract entitles VCP for this product.

IS-SW Solution for the High Tech Industry: Summary

IS-SW was developed in conjunction with software industry customers and partners, which greatly contributed to the functional breadth of the IS-SW solutions (also see Solution Map) in the context of the high tech industry. The strength of IS-SW is in its flexibility, which can support a wide range of software industry segments, from companies selling commodity products in a global environment to companies selling highly engineered software products to a specialized customer list. IS-SW solutions can be utilized by users from the SAP Worplace. It will allow users to:

- Maintain the installed base of a software product
- View history, update license, process order due list
- Run queries on IBASE to support upgrade programs, new software shipments or send corrections
- Notify customers, run promotions and administer marketing campaigns



SAP's Manufacturing Execution System (M E S)

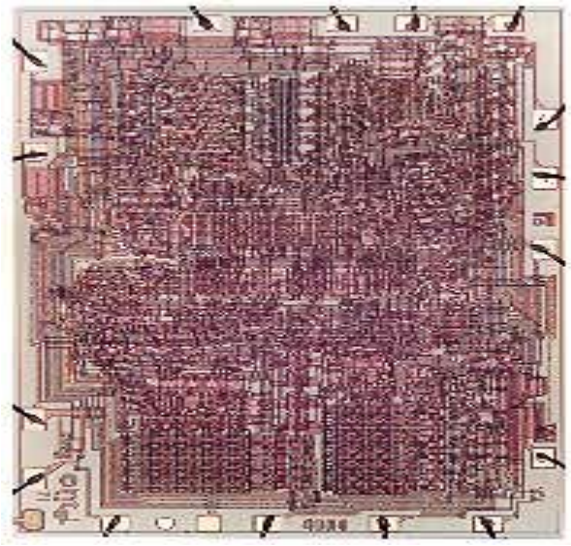
SAP's leadership at the heart of the world's foremost industry is an achievement that has far reaching implications not only through everyday products we use, but also the way we live and ultimately, the way we perceive reality and think. MES offers solutions to manage semiconductor manufacturing processes that deals with intricacies largely unknown even within the information connoisseurs. A brief overview of the microprocessor manufacturing process and a few microprocessor related facts (sidebar) may help shed some light on the importance for SAP to be a key partner of the semiconductor industry. This valuable collaboration between the semiconductor industry and SAP has enabled the High Tech Industry Unit of SAP Labs (Palo Alto, California) to develop the MES solution for semiconductor manufacturers. In 1999, SAP's MES went live at Milpitas, California based Adaptec Corporation, a semiconductor component manufacturer.

The microprocessor revolution may be an apt technical name for the internet revolution. In 1958, Robert Noyce (1927-1992), founder of Fairchild Semiconductor, gave birth to this revolution and the semiconductor industry by linking two transistors onto a silicon crystal and creating the first integrated circuit (IC). In 1968, Robert Noyce co-founded Intel with Gordon Moore and Andy Grove. At Intel, Robert Noyce oversaw the invention of the microprocessor by Ted Hoff (19). Except the early 20th century pandemic of influenza that took about 37 million lives in one year (20), perhaps no event in history has so quickly spread throughout the world or so deeply touched so many aspects of human existence as the microprocessor. Presently there are over 15 billion microchips in some kind of use. If one microchip runs one computer (PC), then we have an equivalent of 3 powerful computers for every man, woman and child on the planet. Today, you can buy greeting cards containing microprocessors with more computing power than the world's largest computers in 1971.

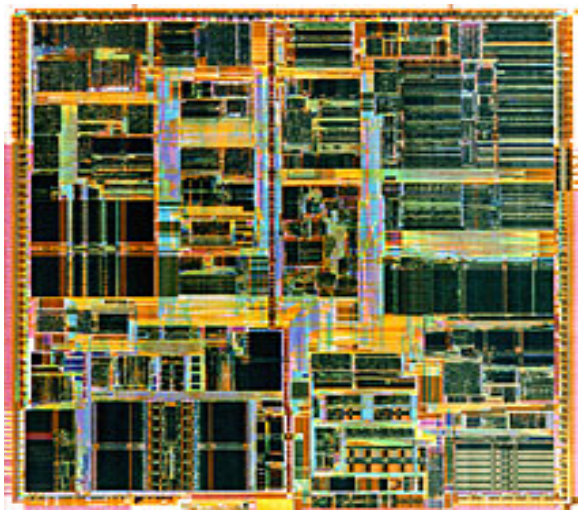
In November 1971, Intel introduced the world's first commercial microprocessor, the 4004, which powered the Busicom calculator manufactured in Japan. Primitive by today's standards, the 4004 contained a mere 2300 transistors and performed about 60,000 calculations per second. Twenty five years later, Intel's Pentium microprocessors may be the most complex mass-produced product ever, with more than 7.5 million transistors performing hundreds of billions of calculations each second. In 1974, Intel's 8080 became the brains of the first personal computer, the Altair. Hobbyists could purchase a kit for the Altair for $395. In the same year, Bill Gates, still a student at Harvard University, developed the programming language BASIC for Intel 8080 powered first personal computer, the Altair. In 1975, Bill Gates founded the Microsoft Corporation. Have you thought about the combination of digits for Microsoft's main telephone number? Hint: it ends with 8080 (425.882.8080).

Intel's co-founder Gordon Moore had predicted in the 1960's that the computing power of the microprocessor would double approximately every 18 month. What was then an esoteric observation has now been dubbed as Moore's Law. After 30 years, it still holds true as the world's foremost chip maker releases successive lines of microprocessors with faster and faster speeds (that currently exceed 1 GigaHertz). But that was only one dimension of Moore's Law. In the 2nd dimension, Moore's Law states: hold performance steady and price falls. In other words, the most powerful chip of 10 years ago costs a fraction of what it once did. The lesser publicized 3rd dimension of Moore's Law is equally profound: hold the price steady and performance skyrockets. In 1975, the Intel 8080 microprocessor cost about $300. It was powerful enough to run the Altair, the first personal computer. Today, nearly the same price buys the 7th generation Pentium® III microprocessor, with enough power to direct the Pathfinder on its exploration of Mars or generate scenes for a computer-animated full length motion picture or manage a Web site receiving 10 million hits per day. Holding the price steady but delivering even better performance has worked well for Intel which has enjoyed nearly a 10-fold revenue growth, in less than a decade, from US$3 billion in 1990 to US$30 billion in 1999. In other words, "the cost of a transistor has gone down some 10 million fold. There's no other industry in the history of mankind where a similar improvement has been made in such a short period of time" (21).

1971 Intel 4004 (2,300 transistors)



1997 Intel Pentium II (7.5 million transistors)

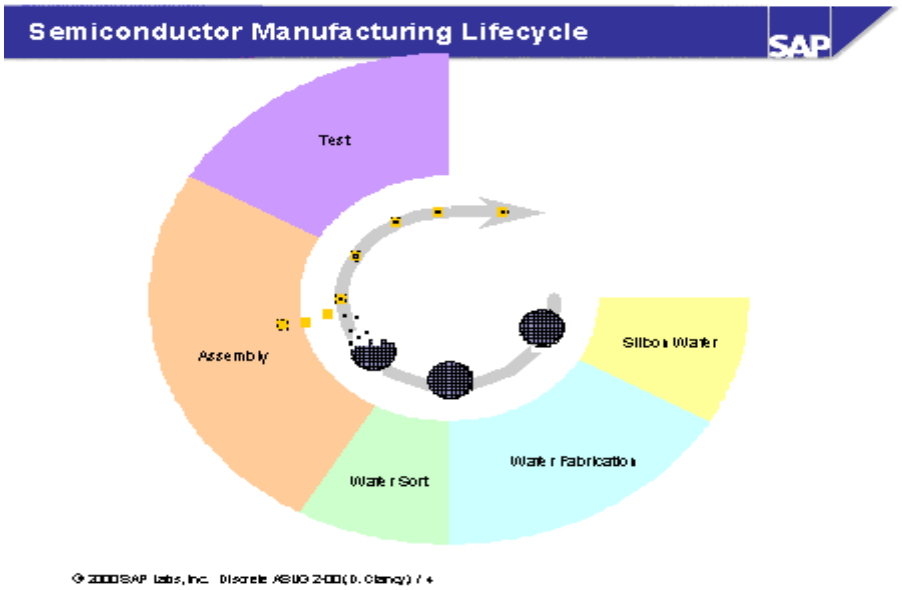


Microprocessor manufacturing may begin with Wacker Siltronic plants in Burghausen, Germany or its other plant in Portland, Oregon or their newest plant in Singapore. SAP R/3 and mySAP.com runs most of the business processes for this corporation with about 6000 employees and revenues just short of US$1 billion in FY 1999. Quartz, which makes up nearly one third of the earth's crust, is mined in quarries and shipped to Wacker Siltronic that specializes in processing this element into metallurgical-grade silicon. To weed out impurities, the silicon is converted to a liquid, distilled and re-deposited in the form of semiconductor grade rods, which are, at that point, 99.999999% pure. These rods are then mechanically broken into chunks and packed into quartz crucibles, where they are melted at 2600 degrees Fahrenheit. A monocrystal seed is introduced to the melted silicon. As the seed rotates in the melted silicon, a crystal grows. After a few days, the monocrystal is slowly extracted, resulting in a 5-foot long ingot of silicon, which, depending on its diameter, is worth from US$8,000 to US$16,000. These pure silicon ingots, weighing up to 264 pounds each, are then sliced by diamond saws into wafers, which are washed, polished, cleaned, inspected and scanned with lasers to find surface defects and contaminant particles (less than 1/300th the width of a human hair) before being shipped to customers. Every week, Wacker Siltronic produces around 800 ingots, enough to create more than 500,000 wafers to begin the chip making process.

The making of a chip is a combination of repeating steps consisting of the application of a thin film on the wafer followed by photolithography and etching. Of paramount importance is the precise alignment of each mask. If even one mask is out of alignment more than a fraction of a micron (one millionth of a meter), the entire wafer is useless. With a mask in place, through a process called ion implantation (doping), the exposed areas of the silicon wafer are bombarded with ions that gets implanted on the silicon wafer and alters the way in which silicon in these areas conducts electricity. When ultraviolet light is shone through the mask (photolithography), circuitry designs are "printed" or etched onto a wafer. Each newly designed chip requires approximately 20 masks that are positioned as overlays at different points. The process includes nearly 300 hundred steps from wafer production to finished chip. Tracking this wafer this is a software functionality of vital importance to any semiconductor fabrication plant (manufacturer). A 200 mm wafer produced by Wacker Siltronic will host more than 200 of Intel's Pentium II chips.

A major transition from above-wavelength to sub-wavelength extreme ultraviolet (EUV) photolithography is taking place in the semiconductor industry. Sub-wavelength features leave little margin for equipment error, making it difficult to control the critical dimensions of a process (22). Taken together, the software functionality for tracking lot processes (fabrication on wafers) becomes an even more crucial process with this new development. However, chips successfully etched by this new EUV technology will have 100 times the computing power and 1,000 times the storage capacity of today's best chips. We may be able to store perhaps an entire library on one of these new chips!

Up to this process, of creating the actual chip on the silicon wafer, is dubbed by the industry as microchip fabrication. Several sub-contract manufacturers can take over the process from here and proceed to test, package and mount the chip. Manufacturers in this class are referred in the industry as "fabless" semiconductor manufacturers. Each chip is tested throughout the entire process both while part of a wafer and after separation. During a procedure known as "wafer sort" an electrical test is conducted to eliminate defective chips. Needle-like probes conduct over 10,000 checks per second on each wafer. A chip that fails this test is discarded. When the chip-making process is complete, wafers are cut with a diamond saw to separate each individual chip, which, at this point, is referred to as a "die." Once each die is separated, it is placed on a static-free plate to be transported to the next step: the "die attach" where the chip is inserted into its "packaging." Chip packaging protects the die from environmental elements and provides the electrical connections needed for the die to communicate with the circuit board onto which it will be mounted. From wafer to chip to market, the process takes up to 45 days and may be divided among manufacturers in several countries around the world.



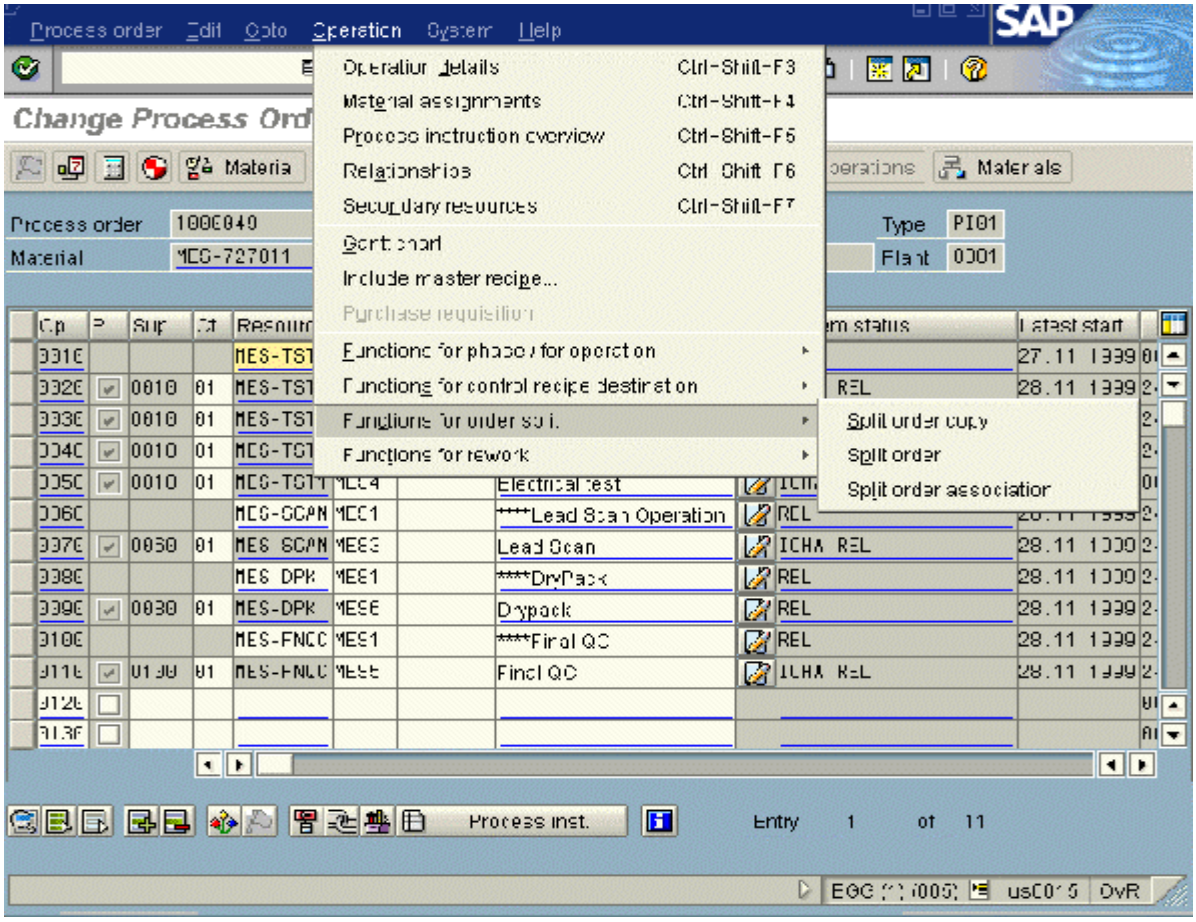
SAP's Manufacturing Execution System (MES) is a specific suite of solutions to address the needs of the fabless semiconductor manufacturers. MES extends SAP's production planning for process industries (PP-PI), material management (MM) and quality management (QM) solutions to address the specials needs of fabless semiconductor manufacturers, particularly in the wafer sort and final test areas. MES extends the SAP R/3 PP-PI, MM, and QM:

- Split process orders
- Rework all or part of an order or use a separate rework process instruction sheet for the rework flow
- Copy batch characteristic values across production
- Search for batches by characteristic value across materials and batch classes
- Graph material genealogy from purchased components to finished goods (process order splits plus batch-where-used list)
- Anticipate control chart violations with Western Electric rules

Process Order Maintenance

The MES process order maintenance solution provides the ability to split process orders in response to manufacturing requirements such as special handling for a partial batch of chips, capacity restraints or re-work processing. MES re-work processing provides the flexibility to re-work all or part of an order or to use a separate re-work process instruction sheet for the re-work flow. Business practices that require the split of a released order include:

- Unexpected capacity constraints
  parallel processing on separate equipment
- Rework processing
  some material must be reprocessed
  good material can continue through production separately
- Match customer demand
  expedite the fraction of the order needed immediately
- Alternate processing based on test (binning) results
  split order according to material grade
  assign new target material to the child order to reflect the grade
  complete production of the parent and child orders according to their grade



Types of split

- Split order copy
  The child process order is a copy of the parent order from the point of the split
  Options
  quantity to split from the parent order
  operation where parent is split next operation for child
- Split order
  The child order uses a new recipe and may produce material different from the parent order
  new recipe and/or material

Results of a Split

- Impact on parent order
  - Order quantity at unprocessed operations adjusted
  - Material requirements adjusted
  - Costs-to-date retained by parent order
- New child order
  - New order created for the split quantity
  - Remove operations prior to the split
  - Child quantities are proportional to parent quantities
  - Inspection lot created

Types of Rework

- Rework insert

  insert a pre-defined rework recipe

  create new process instructions

  rework a partial quantity

- Rework restart

  restart the process order after partial processing

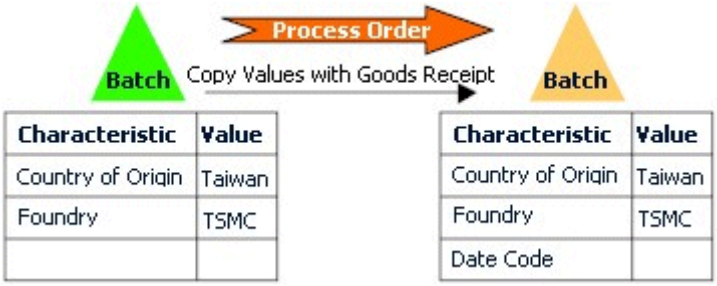
  insert the completed operations

Impact

- New process instructions for inserted operations
- Updated inspection lot
- Capacity and cost models include rework activity

Batch Inventory Management

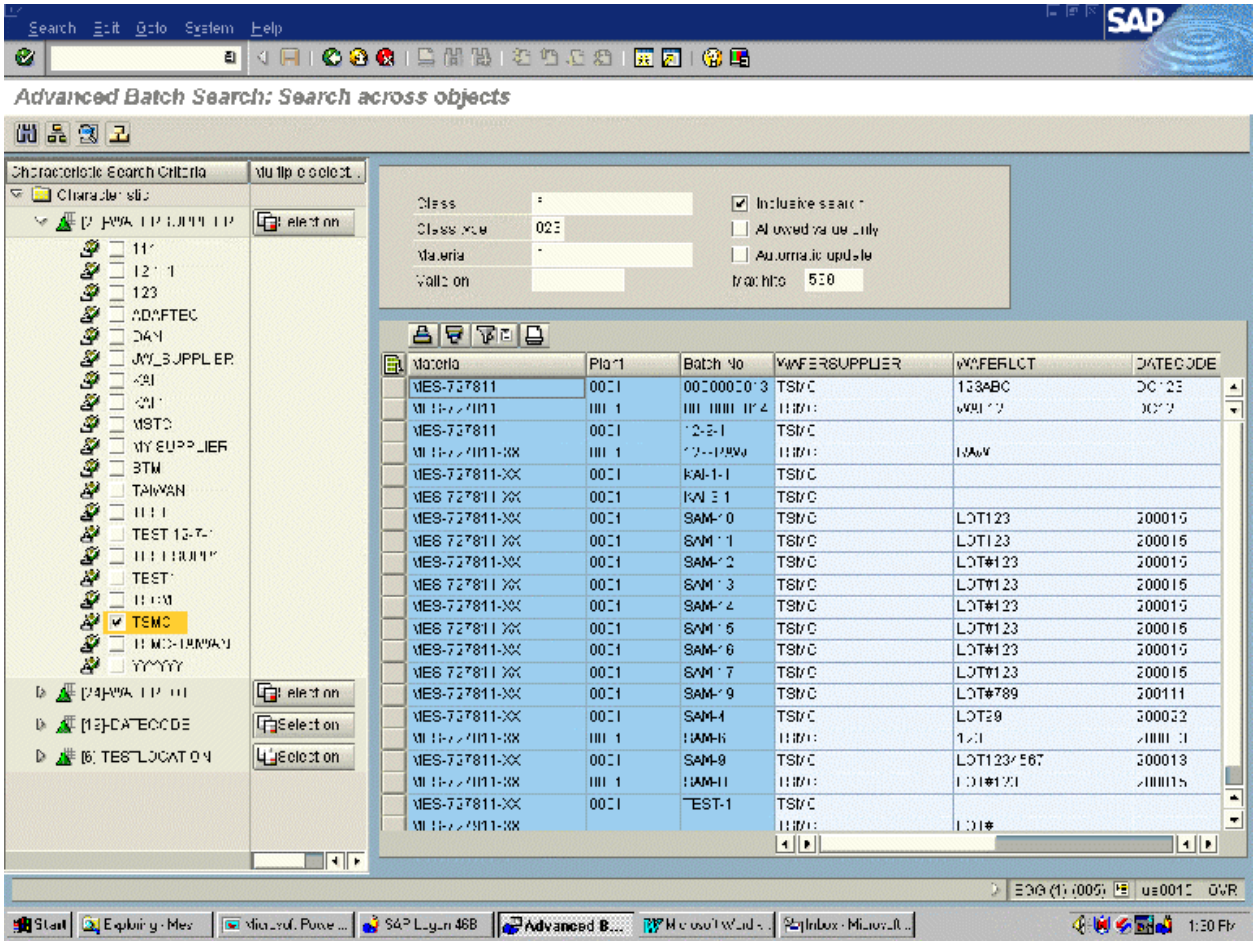
MES batch inventory management solution provides the ability to automatically copy batch characteristic values across production orders when goods are received from process and purchase orders.



Display all inventory that was produced from TSMC wafers:

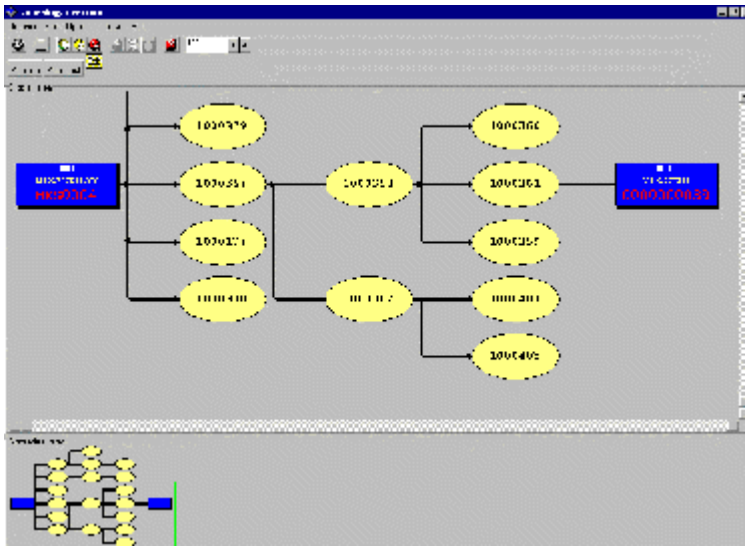
independent of current material ID

independent of production stage (batch class)



MES functionality enables batches to be searched by characteristic values across materials and batch classes. In addition, MES provides the capability to track and graph material genealogy from purchased components through finished goods, including details on all associated process order splits and activities associated with material batches.

Batch Genealogy



Report material activity associated with batches

- Goods issues
    - Process and Production orders
    - Cost centers
    - Deliveries
- Goods Receipts
    - Process and purchase orders
- Process order splits
- Material transfers
    - Between plants
    - Between storage locations

Statistical Process Control

MES enhancements to SAP R/3 statistical process control implements the use of Western Electric Rules to provide the ability to anticipate control chart violations and take appropriate corrective measures before out-of-specification conditions are reached.

Control Chart: Custom Quality Management Formula Parameters

Formula can reference material characteristics

- A single chart can be used for several materials
- Material specific characteristics can be used to normalize observations

Formula can reference a value across operations

- The difference in an equipment calibration indicator can be calculated and charted based on observations before and after material processing

Control Chart: Monitor Western Electric Rules

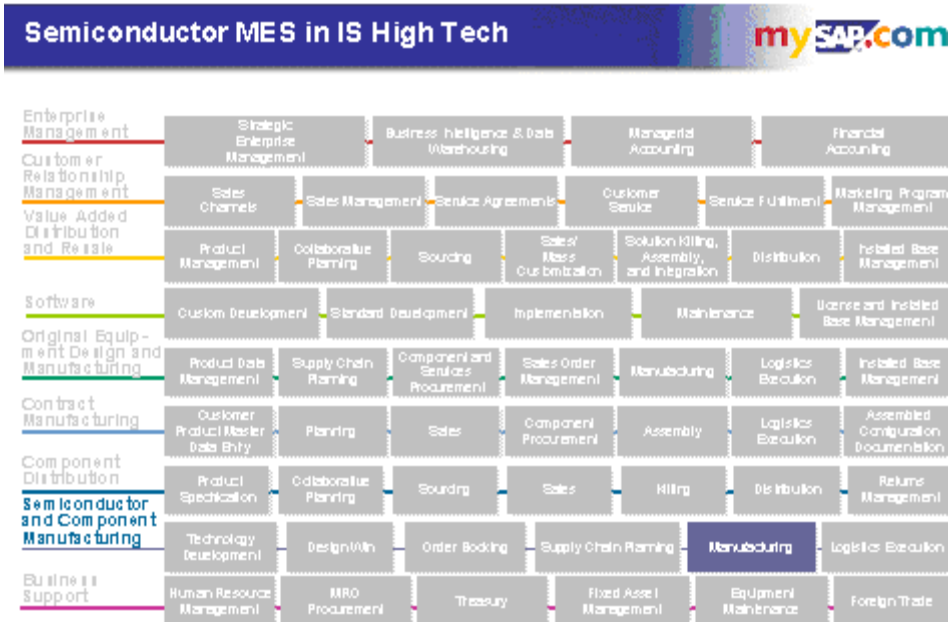
Offline control chart monitor with Western Electric Rules violations filter for engineering evaluations

1. eliminates need to know inspection lot number or view control charts only during inspection processing
2. ability to see the trend and take action before the out-of-spec condition is reached

SAP MES Solution for the High Tech Industry: Summary

Fabless semiconductor manufacturers now have a manufacturing execution system solution (see MES in High Tech Solution Map) that meets the stringent requirements of the industry:

- Work-in-progress (WIP) visibility
    - Split and rework WIP maintenance features allow closer tracking of WIP
- Material traceability
    - Batch search by characteristics shows all related material
    - Batch genealogy shows ancestors and progeny of a batch
- Short term production planning
    - Plans reflect more accurate use of capacity by split and rework orders
- Process control and improvement
    - Flexible control charting of calculated inspection characteristics allows precise process evaluation
    - Western Electric Rules and the Control Chart Monitor provide warnings before limits are reached



SAP High Tech Solution is further Integrated to provide Discrete Industries Solution

As of 31st May 2000, the high tech specific solution developers for MES, DRM and IS-SW have joined forces to provide an integrated SAP High Tech solution IS-HT 4.61 based on SAP R/3 4.6B release. For the October 2000 release of SAP R/3 4.6C, IS-HT solution will be further integrated with other related industry specific solutions and will be available as the Discrete Industries Solution (DI 4.6C1).

Solution for Implementation Woes: SAP Best Practices for the High Tech Industry

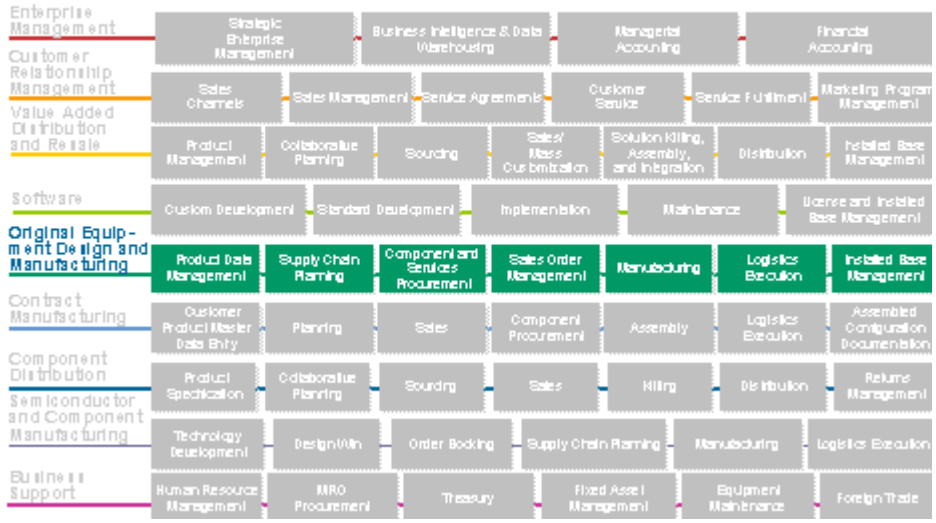
Implementation woes often weigh heavily on businesses faced with any type of change. While SAP cannot and do not want to stop change, it strives to help implementation by offering preconfigured applications. Preconfigured applications specific to the industry's best business practices have significantly reduced the time and costs associated with implementing SAP products. Garnering the experience of top industry consultants, SAP Best Practices for the High Tech Industry deliver key business scenarios that are almost out-of-the-box working solutions.

SAP Best Practices for the High Tech OEM business segment include such scenarios as Build to Order, Build to Master Schedule, Sell from Stock and Procured Products (see Solution Map). In one of the Build to Order scenarios, for example, production planning based on characteristics of configurable products, automatic component procurement, configure to order manufacturing with automatic creation of production orders is ready to run, complete with real-time integration to product costing and profitability analysis. Complementary customer service processes round out many of the preconfigured scenarios. Available since early 1999 under the name Accelerated High Tech, these preconfigured scenarios have accelerated implementations at more than 75 companies.

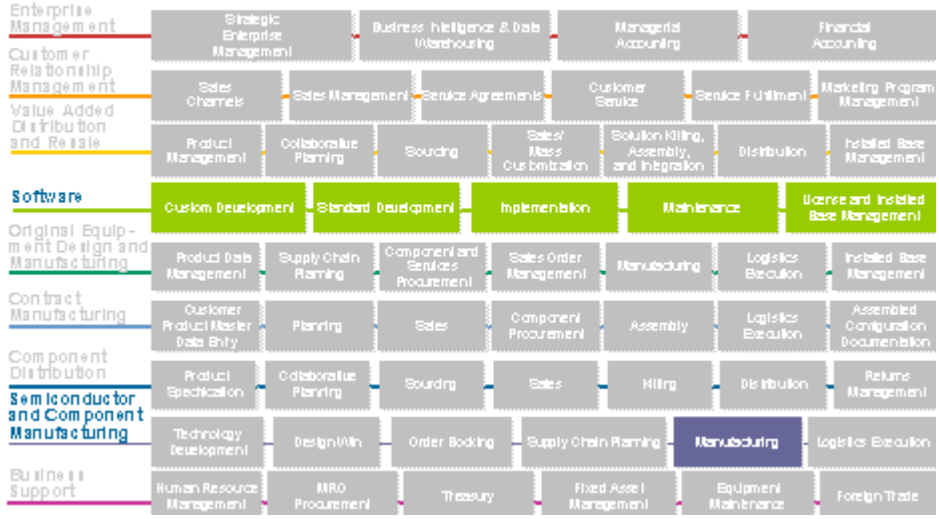
A second offering, SAP Best Practices with IS High Tech, delivers preconfigured business scenarios for providers of software products, high tech distributors and resellers, as well as semiconductor manufacturers. As an example, among the preconfigured scenarios for software products are processes for managing software license contracts and product upgrades, tracking and leveraging the installed base and providing hotline support.

Ensuring high quality, reproducible implementation of industry best practices is the goal. Although much has been preconfigured, nothing has been taken away, providing SAP customers access to the largest suite of ready-to-run business solutions available in the market.

Best Practices for High Tech (OEM)



Best Practices for High Tech with IS High Tech



RosettaNet : Solutions for the High Tech Industry

RosettaNet is a consortium of global businesses that aims to standardize certain processes to better interact in the global e-economy. The ability of software to offer solutions in diverse business environments is dependent on the ability of the software to interface with a variety of other software that may be in use. Thus, common interfaces for software are fundamental for seamless global collaborative business needs. SAP is the only business software provider that is a member of this international alliance and also holds a place on the Advisory Committee. As an active solution partner, SAP is strategically positioned to shape and benefit from the RosettaNet initiative to establish Partner Interface Process (PIP) specifications and dictionaries.

The following is an example of how RosettaNet standard PIP enabled SAP to provide a complete solution for a high tech equipment manufacturer, PowerNet, to transact with a diverse array of contractors (contract equipment manufacturers) and obtain a greater visibility of the collaborative business processes.

The Problem

PowerNet Inc is an original equipment manufacturer (OEM) of network communication equipment (ADSL, cable modem, router, switch). PowerNet adopted a contract equipment manufacturer (CEM) approach which reduces manufacturing costs and improves order delivery time for their new PowerADSL product. In order to make the CEM strategy effective, PowerNet identified these problems:

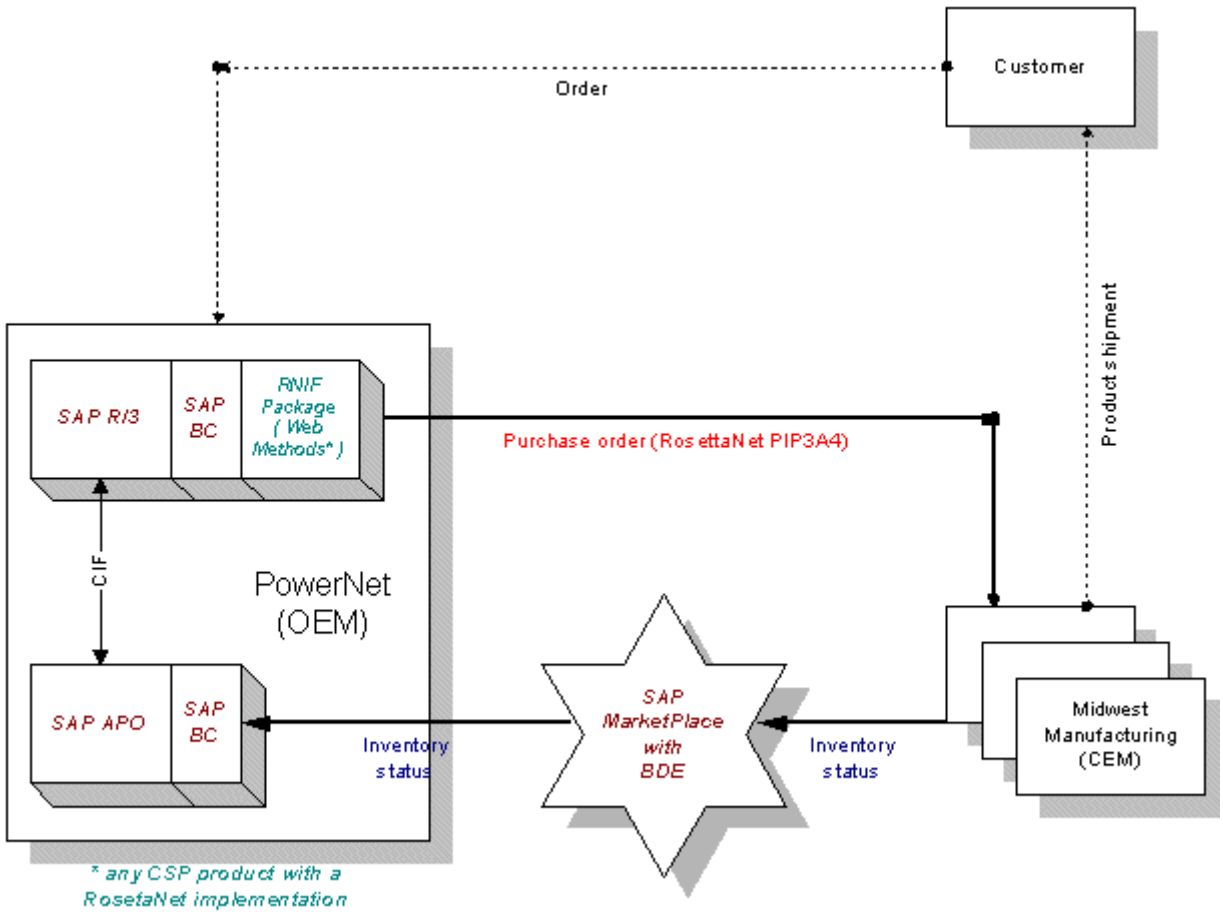
- To make better product sourcing decisions, PowerNet needed: (1) to improve collaboration with CEM, (2) to obtain up-to-date inventory status from CEM and (3) a system to support the product sourcing decision process.
- Previously, electronic data interchange (EDI) was used to communicate with select CEMs. Since EDI only provides point-to-point communication, PowerNet had to set up individual EDI links with CEM. However, the high set-up and operating costs restricted EDI connectivity to a few CEMs.

Solution from SAP: Use of RosettaNet Partner Interface Process (P I P)

SAP's solution streamlined PowerNet's entire sales order management process, including sourcing products from CEMs, creating purchase orders and sending purchase orders to selected CEMs. In addition, PowerNet receives inventory updates from CEMs. With the SAP solution, PowerNet uses:

- SAP R/3 to perform sales and purchase orders (PO) creation.
- MySAP.com APO to execute a rule-based available-to-promise (ATP) checks for sourcing product from CEMs.
- SAP Business Connector (BC) with RosettaNet package add-on to send/receive RosettaNet-compliant PO and confirmation to and from CEM.
- SAP Business Document Exchange (BDE) server on SAP MarketPlace to receive and store CEM inventory status.
- SAP BC to receive inventory status from BDE

SAP's solution provided a cost-effective approach to replace EDI-based communication with web-based RosettaNet Partner Interface Protocol (PIP) standards for e-business. The SAP solution lets PowerNet communicate with its CEMs effectively and add significant business value to its operations. In addition, SAP R/3 and APO, provide benchmarked infrastructure for collaborative supply chain planning. At PowerNet, rule-based ATP is used to select CEMs for order fulfillment (demand). Through predefined rules, the appropriate CEM is selected to deliver the product to the customer. APO's ruled-based ATP solution is highly configurable and adapts to dynamic business needs.



SAP's Solution for PowerNet's Business Process: A Composite Process

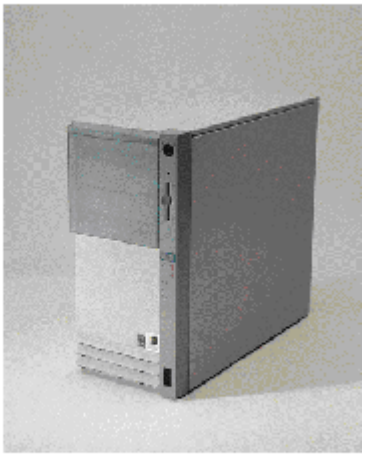
PowerNet's PowerADSL equipment is manufactured by three CEMs located in Dallas, Chicago and Atlanta.

1. PowerNet receives customer order
2. Triggers rule-based ATP to decide which CEM should ship product to customer
3. Sales Order and the corresponding Purchase Order (PO) are created in SAP R/3
4. PO is sent to a RosettaNet-enabled Business Connector (BC)
5. PO is converted into a RosettaNet Object (RNO) format and sent to CEM
6. CEM receives PO (RNO format)
7. CEM accepts PO (option to reject)
8. CEM sends PO acceptance (RNO format); (initiates delivery processing)
9. Each day CEMs update inventory status in SAP MarketPlace Business Document Exchange (BDE)
10. PowerNet APO is updated with CEM inventory data from SAP Marketplace BDE
11. PowerNet has streamlined business solution and complete visibility of collaborators

SAP's mySAP.com internet-enabled solution for PowerNet does more, overall, than the 11 steps mentioned above. It provides data access via a browser, anytime and anywhere, to extend capabilities beyond exchange of sales orders and purchase orders. SAP provides the infrastructure for true business integration that also enables partners to consider (1) collaborating on new product designs and engineering, (2) work together to create sales and order forecasts, (3) utilize on-line messages (in extensible Markup Language or XML) to provide real-time inventory status.

High Tech Success at SAP and Fujitsu Siemens mySAP.com

- SAP and FSC currently implement the Collaborative Business Scenario "One-step Business with RosettaNet" (based on BBP, R/3, Business Connector, and webMethods RosettaNet package)
- Implementation for SAP's Corporate Purchasing and for FSC's Sales Division in Europe
- Will be the first productive RosettaNet implementation in Europe going live in May 2000
- Scenario supports E-Business between SAP and FSC based on the RosettaNet standard in the High Tech industry
- Key benefits are reduced transaction costs (up to 80%), reduced cost of sales (up to 5% of sales), reduced inventory (25-40%)

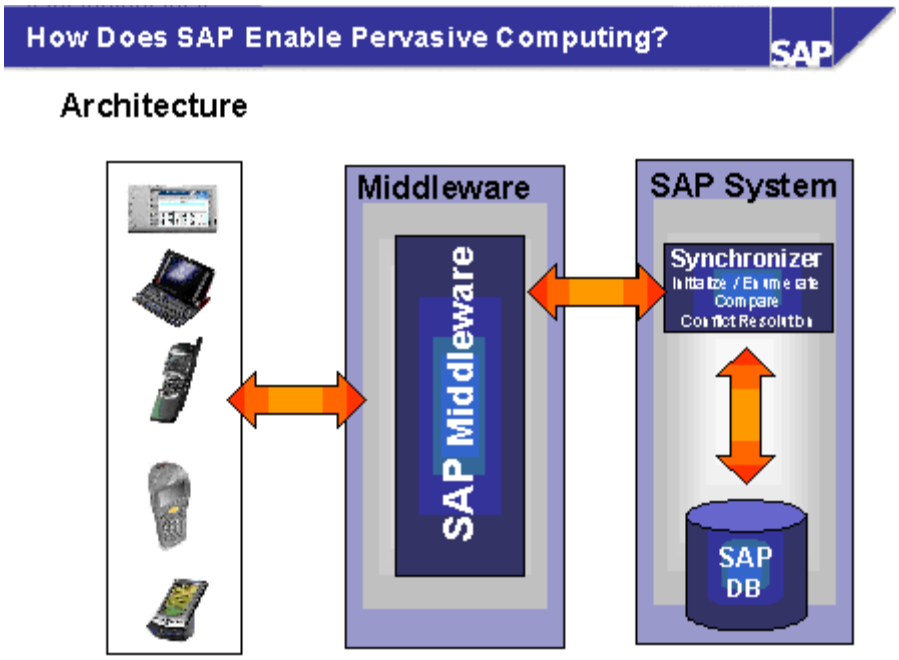


FUJITSU COMPUTERS SIEMENS

SAP Mobile :

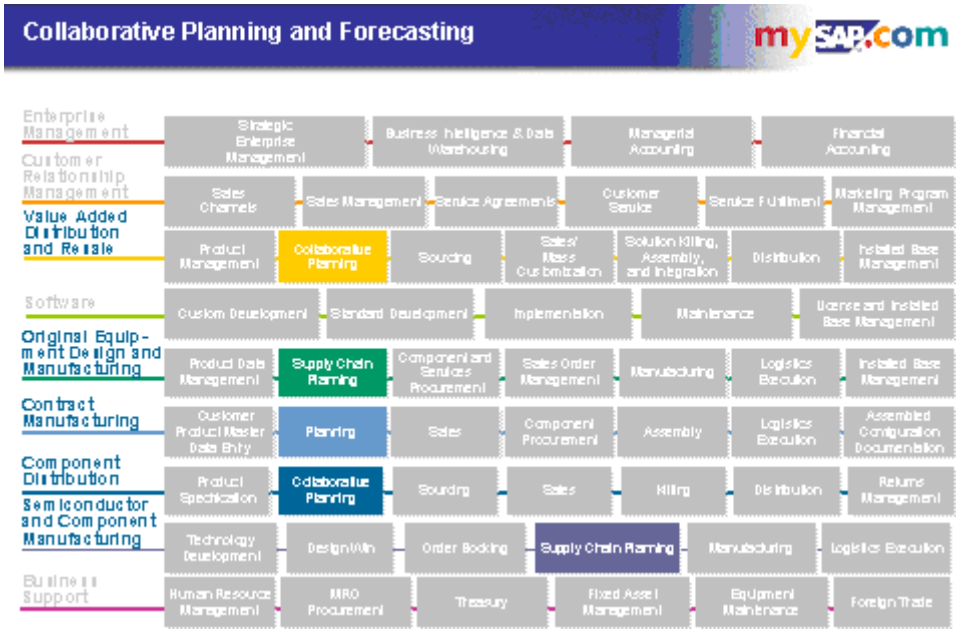
Solutions from SAP Evolving in Pace with Emerging Technologies

Economies of scale, sooner or later, outweigh most other factors in determining market acceptability and revenue growth that ensues from greater market share. Technologies that serve the enriched "human-computer symbiosis" habitats are likely to dominate the business to business (B2B) and the business to consumer (B2C) environments. Pervasive computing is the next level for access to transactions and information through PDAs or personal digital assistants (such as 3Com's Palm Pilot or HP's Journada) or web-phones (Nokia 7110 WAP Phone). Therefore, it is no longer enough for businesses to be WEB-friendly. It must also we WAP-friendly (**W**ireless **A**pplication **P**rotocol). WAP is an open global standard for communication between wireless mobile handsets and web based applications. Business software, therefore, must be web-based as well as wireless application enabled. The term global outreach will soon acquire new significance for businesses. WAP-enabling will link buyers and sellers farther, deeper, cheaper and faster, extending virtual supply networks and marketplaces hitherto unknown. Untethered to a desktop PC or an expensive (US$1500) laptop, the reach of the 10-fold cheaper (US$150) PDAs and personal mobile devices could finally involve and integrate the teeming billions in Brazil, China and India, the other half of the world's population. SAP's Mobile Data Framework (MDF) is building applications for any mobile device (write-once, deploy-everywhere) that makes this truly global usage scenario a reality. SAP supports WAP, W-CDMA and other emerging standards. On 3rd May 2000, SAP and Nokia announced partnership that will soon provide customers with the ability to access mySAP.com Mobile Workplace and mySAP.com solutions for Customer Relationship Management (CRM), Business Information Warehouse (BW) and Strategic Enterprise Management (SEM) through Nokia WAP Server on any WAP compatible phone (such as the Nokia 7110).



Virtual Supply Networks (Virtual Supply Chain)

In the past, high tech companies had the only option of using EDI data exchange over value-added networks (VAN) to streamline processes such as just-in-time inventory management. However, implementation costs for EDI limited its adoption to large suppliers. The EDI mechanism was also restricted in its ability to integrate only select business processes. In the previous section we discussed how SAP's leadership in standardizing business interface solutions with RosettaNet provided far better solutions for PowerNet. In this example, web-integration enabled PowerNet to effectively utilize its virtual supply network (VSN). WAP enabled processes takes this processs a step further by allowing access to businesses of ***any*** size and not only those with established infrastructure. With the introduction of cross-industry Marketplaces, big businesses started collaborating over the Internet. With WAP and other emerging standards, it is feasible for businesses of any size from any corner of the globe to be a part of the VSN collaborative buying and selling using hand-held mobile services to respond rapidly, such as, to offer matching bids (RFQ or request for quotation) or online auctions. Marketplaces are to add value to the customer/consumer by opening up products and services to competition by enabling greater participation through reaching new business partners and extending virtual supply networks (VSN) but without increasing transaction costs or compromising real-time transfer of information, money and goods. The Internet enabled big businesses to take advantage of this mechanism. WAP enables businesses of ***any*** size to benefit from Marketplaces and VSN. SAP continues to add functionalities to integrate mobile-commerce and extending the boundaries of collaborative planning.



mySAP.com Workplaces and SAP's Ubiquitous Information Networks

SAP is developing software tools (MDF) that will enable virtually any information appliance to intelligently interact with SAP enterprise solutions by extending the reach of mySAP.com solutions. Individual users are able to access their personalized mySAP.com Workplace from WAP-Phones and WAP-PDAs. SAP shall add functionalities that will allow WAP-enabled service configurations on all levels: personalized, role-specific, company-specific and industry-specific. By enabling mySAP.com Workplaces to be accessed by pervasive devices, SAP provides even more solutions to extend enterprise applications irrespective of geographic location. By 2002, 60% of employees will work out of office and pervasive computing could be used for:

46% Productivity Applications

28% Data / Order Entry

32% Data Analysis

40% Sales Force Automation

56% E-mail

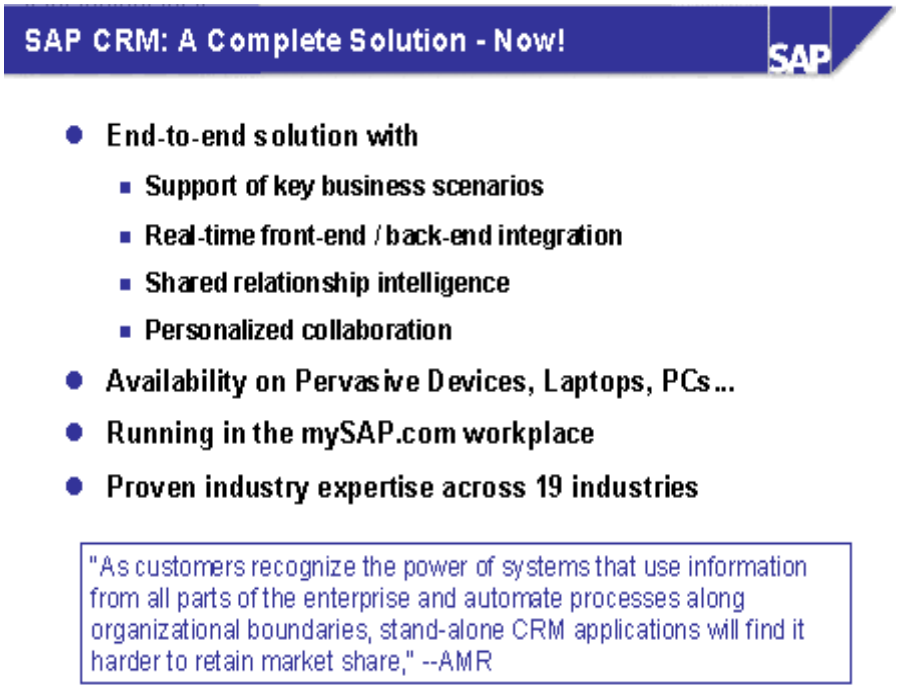
High tech companies are leading this vision by equipping remote service personnel with PDAs that enable them to process service orders, review repair history, update order status, receive information (company data, calendar, e-mail), provide technical reporting (material, time consumption) and customer satisfaction information for better customer relationship management (mobile CRM) that is integrated seamlessly.

SAP CRM on Pervasive Devices

Wuerth Japan is currently deploying the pervasive Field Sales solution offered within SAP CRM. The pervasive SAP CRM solutions provide Wuerth Japan sales team with real-time technology and Windows CE-based devices to sell merchandise out of its vans, conduct credit sales and use a web-enabled client, developed by Centura Software, to deliver personalized sales and service to its customers. In addition, Wuerth Japan chose hosted applications, another key element of mySAP.com, to reduce costs and on-site maintenance. Supported devices include personal digital assistants such as Palm Pilot, information terminals such as handheld PCs and Smart Phones. Supported operating systems include Windows CE and PalmOS. Pervasive SAP CRM business scenarios include these:

- SAP Mobile Sales, which allows real-time access to integrated customer information from all touch points, such as order history, product and pricing information
- SAP Mobile Service, which enables receipt of service notifications, installation information and information from the solution database
- MySAP.com Internet Sales, which provides remote order entry, inventory replenishment, ability to promise, automatic billing and delivery for resellers
- Consumer products manufacturer equips 25,000 retailers to enter orders remotely using Windows CE-based devices instead of staffing a manual inventory replenishment operation
- Leading distributor of maintenance, repair and overhaul (MRO) supplies uses Palm Pilots for available-to-promise (ATP) checks
- Engineering and construction company uses smart phones to deploy its service technicians to customers, and report repair status, time required for service and material consumption

SAP provides a standardized infrastructure that can support the hardware, middleware and connectivity requirements of pervasive solutions with the Internet Business Framework, an overall integration framework and methodology designed to support all types of applications and technologies. This framework supports the extraordinarily heterogeneous and geographically dispersed enterprise solutions and enables SAP to provide portable, reusable applications that make use of standard application programming interfaces (APIs), standardized database protocols, middleware and development tools for mySAP.com solutions. In addition, SAP and Microsoft Corp. are working together to link Windows CE and other mobile devices to SAP business solutions through business process integration over the Internet via the BizTalk Framework. This joint project creates pervasive computing networks capable of delivering information to any mobile device regardless of geographic location.



New Wireless Internet Initiative Formed By Ten Industry Leaders

MUNICH, Sept. 11, 2000-Intel Corporation along with nine other companies today announced a broad industry initiative to make wireless Internet access as simple and pervasive as accessing data over fixed wires. The Mobile Data Initiative Next Generation (MDI-ng) will focus on developing standards and specifications designed to accelerate the creation and adoption of wireless Internet technologies.

Backed by companies spanning telephony, computing hardware and Internet connectivity, the MDI-ng is dedicated to identifying and removing common technical and market barriers that currently limit wireless Internet connectivity and performance for mobile users. The MDI-ng member companies are BT Cellnet, Dell Computer, France Telecom, Fujitsu Siemens Computers, Hewlett Packard, Intel, Motorola, Siemens Mobile, Sonera and Toshiba. The new group will work closely with wireless standards bodies to address wireless solutions for mobile Internet-capable devices with specific focus on the needs of the business professional. Standards compatibility, application scalability between devices, security, reliability and ease of use will also be addressed by the group.

"Intel, working with other industry leaders, is committed to supporting the growing range of wireless devices from handsets to computers, so they all work together effortlessly, run applications that scale seamlessly, and use services that automatically fit to any type of user and their chosen technology," said Rob Eckelmann, VP & GM of Intel EMEA. "This founding group brings together the leaders from all of the key areas - equipment, content, networks and services - to turn this vision of a truly sweeping wireless revolution into reality."

The Europe-based Global System for Mobile (GSM) Association also supports the launch of the group. Mike Short, chairman of the GSM Association's data task force, said, "We see the interaction between vendors, application developers and operators as being critical to deliver the mobile information age around GSM based packet services. We are sure that this initiative will increase the variety of services available to customers and will give us all a genuine experience of the progression toward third generation services."

The MDI-ng will set up wireless industry meetings and workshops where service providers and suppliers will meet to discuss interoperability issues. Interoperability tests and technology overviews will be carried out to help guide the efforts of participating companies, industry standards bodies and the broader mobile services sector.

The objective of this effort is for business and consumer users to benefit, more quickly than ever before, from tested and proven wireless Internet solutions that are simpler to use and more reliable. The MDI-ng will primarily address wireless access by different mobile devices to cellular phone systems; the group will also focus on complementary wireless technologies such as Bluetooth* and wireless local area networks.

MDI-ng Technology Focus

Additionally, the MDI-ng initiative will focus on packet switched wireless networks. Packet switched services will have a tremendous impact on wireless Internet subscriber usage because they allow users to always be online and not have to wait for a modem connection, similar to digital subscriber line (DSL) service. General Packet Radio Services (GPRS) users in Europe only have to pay for actual transferred data/information/content, which should bring down costs dramatically. Tariff models can be based on pay-per-bit actually used, instead of pay-per-minute - a boon to mobile Internet users. In addition, GPRS permits much higher bandwidth for subscribers than current GSM-technologies, achieving performance comparable to fixed wire connections.

Relationship to the MDI

The MDI-ng continues and expands the work initiated in the original Mobile Data Initiative (MDI), started in 1996 with Intel, Ericsson, IBM, Toshiba, Nokia and others as founding members. The original MDI was also primarily focused on mobile computing using cellular phone systems, but only addressed GSM 900 and 1800 MHz technologies and the American PCS 1900 MHz. Now, the MDI-ng effort takes on the packet switched network technologies of today and tomorrow, and across the full range of handheld devices, from the most compact phones to mobile PCs.

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