E-MERGING MARKETS
By Kevin Werbach

New markets are springing up on the Net. Not just consumer storefronts like CDNow and eToys, but multi-lateral business-to-business (B2B) exchanges as well. Selling books or PCs to the teeming masses may be sexier than moving industrial chemicals or hydraulic piping among manufacturers, distributors and corporate customers. But, as in the physical world, the B2B space houses the real action.

Aggregate transaction volumes on B2B Websites already dwarf retail e-commerce, and they are growing exponentially. B2B e-commerce also promises much more far-reaching organizational changes, as businesses and entire industries realign themselves to exploit the efficiencies of digital channels. These new marketplaces allow participants to find trading partners outside their existing channels, and to optimize transactions with far greater efficiency than they could in the physical world.

Two shifts now occurring will boost B2B marketplaces to the next level. The first is the decoupling of market makers (who operate vertical B2B sites) from market builders (who develop the software platforms that power them). The second is the catalytic introduction of dynamic pricing.

B2B e-commerce is nothing new. The past several years have witnessed many successful (VerticalNet) and unsuccessful (Nets Inc.) attempts to build multi-industry hubs on the Net, as well as scores of sites focused on specific vertical markets. But so far these have been primarily informational, providing industry-specific content and generating revenue through targeted advertising and lead-generation. The real opportunity lies in transactions, using the Net to bring together fragmented collections of buyers and sellers more quickly and efficiently than has ever been possible (see Release 1.0, 7/8-97, 9-97).

There’s more than one way to make a market. (In fact, we’ve come up with seven, listed on page 6.) Specifically, there’s a gulf between ===>

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markets with prices fixed in advance and those with some dynamic mechanism — such as an auction — to set prices on a transaction-by-transaction basis.

In broad brush, static pricing regimes are simpler, especially for buyers, but dynamic mechanisms are more efficient because they match buyer and seller interests more closely. Dynamic pricing gives buyers more options to choose from, so it generally tends to bring prices down. This effect is compounded in automated digital marketplaces, which reduce the costs of finding, negotiating and fulfilling deals.

However, well-designed dynamic markets can also benefit sellers (who wouldn't participate otherwise). One example is the traditional auction, which can sometimes create a bidding frenzy that pushes prices above what buyers would otherwise pay. (This is known in economics as the "winner's curse"). The airline industry has demonstrated that if sellers engage in effective yield management, a lower average price may still generate higher profits. And some transactions that simply don't happen under fixed pricing regimes can be realized, to the benefit of both buyers and sellers, in a dynamic environment. Win-win solutions are even more feasible when price is not the only variable considered.

Different pricing mechanisms can coexist within the same market, and marketplaces themselves may compete with one another to attract buyers and sellers. As with any network-based phenomenon, however, those who reach critical mass first enjoy increasing returns to scale that make it difficult for others to catch up. This realization, and the sheer size of the many pots of gold at the end of the B2B rainbow, have created a land-grab mentality similar to that in retail e-commerce.

But there's more to creating a successful B2B marketplace than finding an available vertical and declaring yourself king. What economists call thick, liquid markets don't just happen. They must be built...carefully.

That means designing or using transaction platforms that can scale and that can efficiently match potential buyers and sellers. It means implementing computationally complex algorithms to optimize transactions in real-time. The operators of these new markets must know the players and the standard practices of their chosen vertical intimately, but the core assets needed for their virtual trading floors cut across all industries.

To address the horizontal aspects of Web-based B2B marketplaces, two new forms of market builders are emerging. The first group, led by TimeØ and Tradex, help B2B vertical sites become commerce-enabled with multi-vendor catalogs or auctions. They handle the integration of content and workflow so that market participants are in a position to begin trading. The second category, including BusinessBots, Intelligent/Digital, Tradeum, Living Systems and TradingDynamics focus on the narrow but more complex task of building trading engines for real-time online exchanges.

1 For an extended discussion of yield management, see Release 1.0, 2-89. Maxager, a 1999 PC Forum presenter, applies similar concepts to manufacturing. See Release 1.0, 3-99.
There is, of course, overlap between the categories. Most of the players are still building out their offerings, and there will doubtless be partnerships to bring together different areas of competence. Professional services organizations and systems integrators will do the heavy lifting to deploy any of these systems (with the Y2K-inspired enterprise resource planning gusher running dry, these firms are on the prowl for new sources of big-ticket revenue). The implementers will eventually enforce order. At this stage, though, the contours of the space are sufficiently developed to provide a sense of where things are going.

B2B = Big Business

It’s often stated that B2B revenues exceed business-to-consumer revenues by a factor of ten. There’s no reason why this pattern shouldn’t continue online. If anything, B2B transactions lend themselves more readily to e-commerce than their consumer counterparts.

Unlike consumers, businesses aren’t interested in a “shopping experience”; they want to get whatever they are looking for as cheaply and efficiently as possible. (Though procurement agents still have emotions and human susceptibility.) Businesses already have commerce technologies or methodologies such as databases, request for proposal (RFP) processes, procurement systems and purchasing staffs. They need not depend solely on the information and resources a merchant provides as part of the market. Large enterprises have used electronic data interchange (EDI) for years to link together supply chains, so in principle the jump to Web-based transactions isn’t all that great.

Internet analysts have woken up to the potential of the B2B sector. Forrester Research projects $1 trillion in B2B e-commerce by 2003. Volpe Brown Whelan expects B2B exchanges themselves to generate $20 billion in revenue from advertising and transaction fees by 2002. Whatever the actual numbers turn out to be, there’s clearly a huge opportunity space opening up.

VerticalNet, Ariba and CommerceOne, the primary pure-play B2B companies in the public markets, all had rocketlike IPOs over the past several months. So did Internet Capital Group (ICG), which engages in B2B e-commerce through a network of partner companies. (Disclosure: Esther Dyson is an investor in and member of the advisory board of ICG.) Most of these stocks have experienced significant turbulence in recent months, but still command lofty valuations.

Hundreds of other B2B sites are up and running, mostly focused on large, fragmented vertical industries. Examples include chemicals (Chemdex and Sciquest), plastics (PlasticsNet), Steel (Metalsite and eSteel), mortgages (IMX), medical equipment (Neoforma), electronic components (NetBuy and FastParts) and maintenance, repair and operating (MRO) equipment (OrderZone). There’s even Wood.com for wood products, which may some day answer that age-old question about woodchucks. GartnerGroup predicts that in three years there will be some 10,000 different B2B marketplaces.
Content to catalogs to dynamic trading

The first-generation B2B sites are primarily content-oriented, offering industry-specific news and other resources. Increasingly, however, these sites are becoming hubs for transactions. Still, most B2B commerce sites so far are designed around searchable catalogs that automate but don't fundamentally alter the nature of transactions between trading partners. Like retail e-commerce sites, these static B2B hubs leverage the Web to make finding information or transactions more efficient, but they leave basic market structures intact.

The next evolution of B2B e-commerce is more radical. New platforms will shift from bulletin boards and catalogues to dynamic models such as auctions and bi-directional exchanges. In dynamic trading, the price (or other variables such as quantity and delivery time) can float up or down until the consummation of a trade, depending on each market's rules.

One market maker in the midst of this transition is PlasticsNet, which serves a fragmented plastics market worth $370 billion in the US, and four times that globally. Director of business development Paul Abeln sees a gradual evolution. “As we migrate the market from content to community and commerce,” he says, “the easiest way to migrate is to focus on catalogs.” PlasticsNet recently added auctions to its repertoire. Abeln expects it will take six to nine months from the introduction of dynamic pricing until participants become comfortable, but eventually he acknowledges that “the market will become one of true dynamic pricing in an exchange environment, not unlike NASDAQ.”

What do you call these things?

There is a serious terminology problem when it comes to B2B trading hubs. These sites go by names such as vortexes (popularized by analyst Kevin Jones of Net Market Makers), butterfly sites (preferred by Benchmark Capital’s Bill Gurley), eMarkets (used by BusinessBots) and digital marketplaces (in the lexicon of Time®). We'll generally refer to them as “B2B marketplaces.”

A further distinction lies between B2B e-commerce sites generally, and specifically those sites that allow dynamically priced transactions. Marketplaces in that smaller category, the primary focus of this issue, are most often called exchanges. In the narrowest sense, “exchange” applies only to markets, such as NASDAQ or the Chicago Mercantile Exchange, that use the bid/ask mechanism of continuous floating double-sided negotiations. But the term is frequently used for static-priced B2B markets as well.

Finally, to an economist an exchange is a form of auction (a simultaneous double-sided one, in fact). But say the word “auction” in the Internet context, and people immediately think of one-way seller-driven auctions such as eBay. Most of the companies in this B2B space therefore prefer to use “dynamic pricing,” which is still less than perfect because it implies that price is the only variable. Dynamic trading, or dynamic terms and conditions, would be more apt.
It’s too early to have any real data on how pervasive dynamic pricing will be. However, in many situations the value proposition is compelling.

By definition, fixed prices are almost never optimal. They represent a seller’s estimate of how to maximize revenue, based on assumptions about supply and demand curves. The benefit of fixed pricing is its simplicity. On the other hand, fixed pricing fails to maximize efficiency. Some buyers pay less than they would be willing to. Others don’t transact at all even though the seller would accept a lower price from them. The price that maximizes buyer and seller welfare will vary from customer to customer (and from time to time).

Priceline.com uses a form of dynamic pricing (see taxonomy page 6) to satisfy untapped consumer demand for products such as airline tickets, hotel rooms and home mortgages. (For more details on Priceline.com, see Release 1.0, 3-99.)

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<td>Business</td>
<td>B2C — auction (Onsale) or demand aggregation (Priceline, Mercata, Accompany)</td>
<td>B2B — exchanges (with auctions for non-standard/supply-constrained goods and catalogs for non-strategic purchasing)</td>
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*Figure 1 — Types of markets and dynamic trading mechanisms.*

No one pays retail

In the B2B world, there is already significant variability even in seemingly fixed prices: No one pays what's listed on the rate card, and vendors often give breaks to their best customers. When selling candy bars to consumers, Hershey wouldn't expend the effort to price items individually, but the company supplying sugar to Hershey certainly would. Online marketplaces will only extend this behavior.

There are countless ways to structure dynamic trading regimes, with many variants even within a particular category such as auctions. Yoav Shoham, Stanford professor and founder of TradingDynamics (see page 16) sees three basic axes along which markets can be designed: bidding rules (how, when and on what terms bidders may make offers); clearing rules (how, when and on what terms bids are accepted); and information-disclosure rules. Peter Crampton, a University of Maryland economics professor who is also President of Market Design Inc. (which does exactly what it says), explains, “You need to have a limited menu, but a carefully constructed menu that will jointly satisfy the needs of both the sellers and buyers.”

When the FCC auctioned wireless spectrum licenses, for example, it wanted to get licenses into the hands of those who would best use them, and to allow geographic aggregation to foster nationwide coverage. Explains Stanford
Seven lucky market types

We’ve identified seven methods used in the real world to set prices (your mileage may vary). In any given situation, these mechanisms may result in the same or different prices — or in no transaction at all. There is no universal perfect mechanism, because so much depends on the characteristics of the market, the participants, the timing (supply-demand conditions, seasonality, even people’s moods) and the relevant goods. Trading engines therefore must offer a spectrum of transaction and negotiation options.

The types vary along several axes, including unit of trade and price flexibility. In strict economic terms some are subsets of others, but laying them out this way is instructive. We’ve organized them by scope of participants: some mechanisms are best suited to isolated, one-off transactions, while others appear in communal markets where buyers, sellers or both compete with each other in real-time. The chart below gives another cut at the landscape.

One-to-one

1. **Barter** was the original means of trade, with prices negotiated between each buyer and each seller in the form of goods or services. It’s still widely used outside the industrialized world, and in specific business contexts (such as real estate swaps). Computers could automate this process, eliminating huge inefficiencies...which appears to be what the folks at www.barter.com have in mind.

2. **Haggling** (in the sense we’re using it) means the buyer and seller individually negotiate a price, expressed in terms of money. This is how most markets worked before the industrial revolution turned goods into commodities. Haggling is often a secondary mechanism after prospective buyers and sellers winnow down the possibilities using one of the more-aggregated options below.

One-to-many (or many-to-one)

3. **Fixed price** means the seller sets a price that buyers can only take or leave. This is the approach most people in industrialized countries take for granted, though it's often less than ideal for both the buyer and the seller. The two variants of fixed pricing are retail, in which most prices vary only at the seller’s discretion (such as a sale), and terms-based, in which the price follows a set schedule based on volume and term commitments or other characteristics of the buyer (used for most wholesale transactions).

4. **Auctions** (of the traditional variety) are used in seller-dominated markets to pit buyers against each other and thereby discover the highest price. There are several forms, including the familiar ascending (English) auction and descending (Dutch) auctions.
5. **Reverse auctions** can appear in buyer-dominated situations or market segments. The buyer names a desired quantity and/or price, and sellers compete against one another for the business.

6. **Demand aggregation** mechanisms decouple the buying commitment from the fixing of a final price. The seller-driven variant is the patented model of Priceline.com (though the scope of the patent is now being challenged in court). In this version, individual buyers commit to a price they name, and sellers decide whether to accept the offer.

In the buyer-driven variant, used by startups Accompany and Mercata, the buyers accept an offer at a maximum price, which falls according to a schedule as additional buyers commit and are bundled together to qualify for volume discounts. This approach is in effect a hybrid of auctions and terms-based fixed prices.

**Many-to-many**

7. **Exchanges** are essentially two-way simultaneous auctions, in which both buyer and seller prices float. In marketplaces with sufficient liquidity and balance between buyers and sellers (such as markets for stocks and other financial instruments), the exchange model tends to promote the most efficient outcomes. A common form of exchange is the “bid/ask” model, which involves a spread (collected by market-makers) between what buyers pay and sellers receive.

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<th>Dynamic $ (and other parameters)</th>
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<td>Auction</td>
<td>Reverse Auction</td>
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<td>Haggling</td>
<td>Demand Aggregation</td>
<td>(web-based barter sites?)</td>
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<td>Exchange</td>
<td>Fixed Price</td>
<td>(multi-vendor catalog hubs)</td>
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**Figure 2 -- Market types organized by characteristics.**
professor Greg Rosston, who was involved with the auctions while serving as an FCC economist: “The FCC used a novel format, simultaneous multiple-round auctions, so that bidders would have flexibility to dynamically adjust their bidding strategies throughout the course of the auction in response to the current prices of different licenses.” Rather than having to decide their strategies up front and bid all-or-nothing for individual licenses, participants could adapt their strategies to come away with the collection of licenses they valued most.

**Ceteris non paribus: multi-attribute trading**

The use of price alone also limits the space of possible transactions. All things being equal, buyers will opt for a lower price, but in the real world all things are never equal. Faced with two offers at the same price, I might take the one that offers a shorter delivery time, or that meets my quantity requirements. Or I might prefer an offer at a higher price if it is sufficiently better on those other dimensions.

This is, after all, how business works in the physical world: Companies negotiate deals with one another by trading off various factors, including delivery, variety, reliability, quality, quantity and so forth. In effect, the good itself changes rather than just the price.

Frictionless Commerce, a 1999 PC Forum company presenter, lets consumers compare more than just prices through a multi-dimensional shopping bot (see Release 1.0, 3-99). In the B2B context, however, the challenge is much more complex. The number of attributes and combinations worth modeling is far greater, and each vertical will have its own set. Reputation and prior business dealings mean a great deal, and buyers might value seemingly equal offers from two sellers very differently.

**Market builders vs. market makers**

Any industry tends to shift over time from pioneers who build custom end-to-end systems to specialists who assemble components and sell them to many customer-facing vendors. Some pioneers become dominant players, though many wind up with nothing more than arrows in their backs as next-generation competitors pass them by. Last month we described the emergence of affiliate program intermediaries such as LinkShare and Be Free. Amazon.com, the pioneer of the market, had to build its affiliate management system from scratch, but virtually all the more recent programs are outsourced to intermediaries (see Release 1.0, 7/8-99).

The same pattern will hold in B2B e-commerce. The founders of PlasticsNet won't be as good at developing a distributed multi-party dynamic exchange as a company that focuses exclusively on that challenge, but the technology supplier isn't likely to know all that much about plastics.

Developing B2B exchanges requires expertise in distributed computing, component software architectures, intelligent agents, game theory, pricing algorithms, scalable communications middleware, economics and complex ontologies (not to mention lots of coffee). The technical hurdles are many, but equally important are the challenges of achieving the benefits desired by the market participants. Economists encapsulate the goals of
markets in concepts such as “efficiency” and “gains from trade,” but these theoretical constructs must be translated into real-world systems.

ELEMENTS OF B2B MARKETPLACES

What does it take to enable these new dynamic trading environments? The goal of any marketplace is liquidity: a critical mass of buyers, sellers and transactions. Getting there isn’t always easy. Especially in electronic markets that require participants to change the way they do business, a number of conditions must be in place. Some of these have nothing to do with technology.

The core is a reliable, scalable, secure platform that links players in real-time. These are real marketplaces, potentially processing huge volumes of transactions daily. As a practical matter, this means multi-threading, object-oriented code and component architectures such as enterprise Java beans (EJB). It also implies back-end hooks to rapidly bring in new participants and their existing procurement, enterprise resource planning (ERP) and other systems. The extensible markup language (XML), emerging as the lingua franca for exchanging information over the Web, is a useful tool here.

B2B marketplaces must also be flexible. Market builders must support various pricing structures, industries, commodity attributes, information-disclosure rules and market configurations. They should also be prepared to support secondary phenomena such as derivatives (futures and options trading), agent-based program trading, arbitrage transactions and linkages between commodities or even entire exchanges (see page 20). In other words, successful marketplaces must aggregate many products and services if they want to attract many participants. “Aggregation means liquidity and liquidity determines the future of a market,” explains Kurt Kammerer of Living Systems (see page 17).

These behaviors will not emerge right away, but they will come as volumes increase. Electricity exchanges (and eBay) already have traders who take both long and short positions to exploit market instabilities. Futures in some goods, such as energy, are an important means of risk hedging and capacity planning, as prices can skyrocket when supply and demand become temporarily unbalanced.

The third element is overlay of established business practices and relationships. If a certain buyer has negotiated a 10 percent discount with a certain seller, that buyer will want a similar arrangement to carry over into online exchanges.

The entirety of existing business rules need not be modeled in software profiles – the point, after all, is to create more efficiency rather than replicate physical markets. But if standard practice in a certain vertical is 45 days of credit, volume discounts above a certain threshold and buyers who demand a minimum of two independent sources for crucial inputs, those should be the defaults in an electronic exchange.
A cynic would say that businesses want inefficient markets so that they can gouge their customers. But of course every business seller is also a buyer of something, so the argument cuts both ways. Moreover, while price-gouging sellers may want inefficient pricing, even they benefit from lowered transaction costs. But the best way to profit from inefficient markets is probably to be neither buyer nor seller, but to take on the task of making markets efficient. That is what the companies in this issue are doing, indirectly taking a share of the reduced costs as revenues.

Still, there's an intriguing, fundamental question here: Who will benefit from the efficient marketplaces the Net will foster? In essence, these markets (and the companies who run them) will provide market-facilitation benefits: automation of transactions and some negotiations, and standardization of pricing, metrics and terms and conditions, which are the focus of this newsletter. They will also provide market participants with various levels of real-time market information, most notably prices. Most of them will also offer a second benefit, discussed below, in the form of quality control (including regulation, disclosure, reputation systems and the like).

Because of such market facilitation, prices should go down overall because resources are used better. Lack of information lets transactions occur at "artificial" prices based on inadequate information. Are 'real' prices, reflecting actual market conditions, likely to be higher or lower? Given that the overall economy, at least in the developed world, is moving towards oversupply of almost everything (including Internet stocks?), efficient markets will tend to benefit buyers. Typically, Juan sells goods that are widely available, with acceptable substitutes. Alice, the buyer, benefits from knowing that, and from being able to find alternatives. The more information, the lower the price. Alice can find many people willing to sell to her at the lowest price, and there are few people who will compete with her to drive the price up.

Conversely, Alice herself sells things on eBay. She tries hard to make them sound unique, and markets help her find more people to bid up the prices of the (allegedly) rare items she offers.

Thus, the Net creates a problem for producers in a time of surplus: prices lowered by efficiency, including a macro trend to commoditization and quantification of "quality" to make comparison and negotiation easier -- countered by sellers’ attempts at differentiation. But at the same time the Net provides solutions -- and not just for individuals in the form of auctions. For producers, the Net also offers increased opportunities and technical capabilities for personalization. In consumer markets, personalization is a driving factor and one that creates value beyond uniqueness, with goods matched to an individual's preferences. But that's a topic for another month...

Meanwhile, marketplaces have an impact on prices outside their own borders. Even if only a few people take the trouble to explore prices across markets and to negotiate, others -- and the market as a whole --
get a beneficial free ride in a "metamarket" with good information flow. Most farmers, for example, don't negotiate, but check market prices when they sell their crops and livestock. Meanwhile, most consumers assume someone else is comparison-shopping, which is usually true, and don't actually drive from store to store looking for the (often missing) labels on cereal boxes and milk cartons. Online groceries will make such comparison-shopping even easier, and will make it harder for groceries to lure people with loss-leaders and make it up with the goods at the ends of the aisles.

Benefits to the buyers

But the impact of e-commerce will not be limited to transactions that occur online. Pricing information will cross from online markets into physical ones, lowering prices in the economy as a whole. Ironically, e-commerce will probably be more beneficial for market-makers and for buyers than for all the merchants getting into e-commerce. But it will be even worse for those merchants who stay out of e-commerce.

Clearly, in the short run efficient markets mean reduced transaction costs, "fairer" prices and better allocation of products. In the long run, efficient markets also mean better allocation of productive resources and investment, as they respond to accurate market signals.

Markets and "quality control"

But markets need more than transactional efficiency, as recent experience in Russia show. They need rules. Most market regulation is designed to protect buyers, since they tend to be the side of a transaction that has less information and more need of protection. (Though ask any merchant about problems of deadbeats and credit-card fraud, and you may see D&B and Equifax as an antidote to lack of seller protection in the absence of government regulation of bad-acting consumers. It's a non-PC reality.)

Thus, buyers look to markets for goods to buy and to market regulation for safety, while sellers look to (regulated) markets for buyers. Sellers may not always appreciate the regulation, but those markets are where the customers are. That's why foreign companies come to US capital markets (which may be temporarily inefficient, or even "euphoric"). Companies trade at a discount in many foreign markets; they come to US to get fairly priced (if they can withstand the scrutiny). Moreover, sellers with a good product will sometimes appreciate regulation, because it encourages customer trust and keeps out bad-apple competition.

The very reach of online markets, which enable more people to trade with more people whom they probably don't know, will increase the importance of reputation systems -- everything from eBay's consumer feedback to formal ratings or certification of market participants. Even as the Net allows people to trade across physical legal jurisdictions, then, marketplaces will have to step into the breach with their own regulatory regimes -- and they will compete partly on the basis of their success in doing so much as stock markets already do today. The challenge will be figuring out when protection of buyers becomes protectionism for sellers.
Just trust me...

There’s a final element that bears extended discussion. A successful exchange is a complex adaptive system, meaning by definition that it evinces emergent behavior not subject to simple top-down controls. When such systems work we praise the invisible hand described by Adam Smith. When they fail, though, they can crash spectacularly. The speculative bubble around Dutch tulip bulbs in the 17th century is the paradigmatic example. More recent experiments such as privatization in Russia also show the difficulty of engineering new markets.

The success or failure of a market, at the end of the day, comes down to trust. (See the comments by Francis Fukuyama in Release 1.0, 3-96.)

The New York Stock Exchange (NYSE) had operated for nearly a century before the catastrophic collapse of 1929 that set off the Great Depression. It has grown for seven decades since without a similar plunge, the closest experience being in 1987. But the market quickly rebounded after the 1987 drop. Contrast this to the experience in many emerging markets over the past decade, where market collapses have led to widespread loss of confidence in exchanges and governments.

The 1929 and 1987 collapses didn’t kill the NYSE because participants saw them as market fluctuations rather than evidence the exchange itself was flawed. In other words, participants had learned to trust the exchange by the time the disaster happened. And after both events regulators imposed additional safeguards: disclosure and margin requirements after the 1929 crash, and circuit breakers in 1987 to limit volatility due to computerized program trading. These rules restrict the freedom of the market, but in a beneficial way. As Peter Crampton of Market Design Inc. notes, “Some constraints make for a more efficient market, and the parties will be attracted because there are those constraints.”

Web-based B2B marketplaces don’t have the luxury of a long-term track record to keep participants around in stormy times. The companies that generate those billions of dollars of B2B transactions won’t make significant changes in their buying and selling habits until they are sure the new digital markets are stable, reliable and fair.

This brings up another significant point. Like most Internet phenomena, B2B marketplaces are being built largely outside the scope of government regulation. In the US, securities markets are regulated by the Securities and Exchange Commission (SEC), while futures and other derivative markets are overseen by the Commodity Futures Trading Commission. Spot markets in non-financial goods, however, are generally unregulated, and that’s the category most of the market-makers described in this issue inhabit today.

At some point, market participants may want these new exchanges to be subject to government oversight, so long as the rules aren’t too cumbersome. It’s worth noting that BusinessBots has signed on former SEC Commissioner (and 1998 PC Forum speaker) Steven Wallman as an advisor. TradingDynamics founder Shoham, while strongly agreeing that regulation is an important issue, believes “a major oversight role will be played by private independent firms, not necessarily government.”
Several companies are stepping up to the challenge of building B2B marketplaces, including BusinessBots, Tradeum, Intelligent/Digital, Living Systems and TradingDynamics. None of them have gone live with B2B marketplace customers yet, but they all have impressive technical credentials and far-reaching plans to power billions of dollars of B2B commerce. All of them hope to capture not just software license revenues, but also a share of the transaction dollars on exchanges they enable.

BusinessBots and Living Systems emphasize the importance of agents to automate and optimize complex transactions. Intelligent/Digital and Tradeum tout their sophisticated XML-based ontologies and matching engines for trades involving several parameters beyond price. TradingDynamics brings market-design expertise to bear and stresses the configurability and breadth of its applications. BusinessBots has an implementation deal with Andersen Consulting; several of the others make not-for-publication rumblings about similar arrangements in the works.

Tradeum

Tradeum was dreamed up in mid-1998 by Zvi Schreiber, a British-trained mathematician and software engineer who was then director of IsraTec, an Israeli consulting firm for high-tech companies. Schreiber was convinced that online markets would move quickly to dynamic pricing structures. In his spare time, he developed the architecture for a generic exchange system for any type of goods. In the fall, he incorporated Tradeum to advance the concept into a commercial service. Vp of business development Ilan Grobman, also from IsraTec, joined at that time.

Tradeum’s founders gradually developed a business model that involved providing hosted back-end infrastructure and services to power B2B marketplaces. They realized that market makers in each vertical had the contacts, experience and resources necessary to bring together a sufficient mass of buyers and sellers, but that the transaction engines these companies needed were largely common across industries. Schreiber recognized that XML, which was just then picking up steam as a W3C standard, could be a powerful basis for generic trading engines.

New ceo Zev Laderman, a former industrial sector vp at Oracle, joined the company last month. With his hiring, and the closing of its first venture round led by Israel Seed Partners, Vertex Management, Scorpio and The Vanenberg Group, Tradeum has shifted from pure R&D work in Israel to building its operations and sales infrastructure in the US. Schreiber himself is moving to San Francisco, where the company will now be headquartered. Tradeum currently has 20 employees and two signed (but unannounced) customers, with other deals in the pipeline.

The heart of Tradeum’s technology is a matching engine that optimizes transactions across large numbers of buyers and sellers. Participants specify their preferences through profiles that can include wildcards, ranges and linkages between parameters. In addition to supporting several dimensions (price, quality, credit terms, quantity, etc.), Tradeum brings together the full range of parties who may wish to participate in a deal, including shippers, insurers and financers as well as buyers and sellers.
The system is written in Java and is browser-based on the client side, though it also supports direct connections into ERP and supply chain management software. Tradeum uses an object database on the back end. Schreiber argues that because relational databases are inherently asymmetric (on the assumption that one party stores information and the other queries it) they aren't effective for symmetrical exchanges, where both sides constantly search each other.

Laderman believes that while catalog-based models make sense for non-production (aka maintenance, repair and operational, or MRO) goods, “exchanges are going to be dominant in the production world.” Auctions, he says, are valuable for unique, scarce goods or for excess inventory, but as businesses work to standardize components and cut inventory, these will represent an increasingly small share of the B2B pie.

Laderman sees exchanges as a spot-market complement to existing ERP and supply-chain systems, which are designed around forecasting algorithms and thus aren’t good at responding to real-time supply and demand fluctuations. “It’s not a new concept, but the Net will allow much greater and more efficient spot buying of highly liquid commodities,” he explains.

Business Bots

When we last met BusinessBots founder ceo Moses Ma two years ago, he wasn’t talking much about what his company was building (see Release 1.0, 10-97). Ma’s San Francisco-based startup was one of the participants in the eCo project initiated by CommerceNet and funded by a grant from the US Department of Commerce’s Advanced Technology Program. At the time, we described BusinessBots’ goal as developing “commercial environments based on multiple, interacting software agents.”

The result of those efforts is the Java Agent-enabled Marketplace (JAM). JAM is a multi-agent optimized dynamic trading system that can be customized to specific B2B verticals. BusinessBots has partnered with Andersen Consulting as its system integrator. Andersen will work with market makers to implement JAMs in verticals including financial services, chemicals, health care, high tech, telecommunications, small business, transportation, utilities and architecture. BusinessBots first announced customer is Secondhand.com, which has aggregated 43,000 consignment shops into an online marketplace.

Ma sees double-sided exchanges as the logical end-state of market evolution, as long as markets are sufficiently liquid. He points to the development of Wall Street in the 19th century, moving from static classified listings to auction houses and, with the creation of the New York Stock Exchange, to a real-time exchange. Traditional auctions, he believes, simply involve too much overhead once transaction volumes exceed a certain level. “A liquid market is basically the last 10 minutes of an auction,” Ma points out, and it’s difficult for participants and market makers to support large numbers of liquid auctions operating simultaneously.

BusinessBots seeks to model business practices in the physical world, so that participants are comfortable moving into online exchanges. To that end, the system offers an interactive haggling process that allows traders to reach unique agreements, and also to keep the terms of those deals private from others in the market.
Ma compares this to the way companies buy print advertising today (and notes that BusinessBots is developing a digital marketplace for a "very big media company"). Though magazine rate cards list a single advertising price schedule, experienced ad buyers know to demand placement on the right-hand page early in the magazine. Digital marketplaces must be flexible enough to support such a range of parameters, rather than just price, Ma argues.

Another element of this evolutionary approach is the online equivalent of looking your counterpart in the eye to decide whether to trust him or her. JAM includes integrated reputation servers based on the IETF-standard light-weight directory access protocol (LDAP). Trader performance could be tracked and rated by participants, as on eBay, for example, or the system could be pre-populated with historical data.

Ma sees inter-exchange connections developing, much as electronic communications networks (ECNs) connect established financial marketplaces. BusinessBots has proposed the Universal Marketplaces API, based on XML, as a standard for moving information between exchanges.

BusinessBots has 12 full-time employees supplemented by 10 contractors. It has operated so far on angel funding, with investors including Antenna Group president Melody Kean Haller and Idea Factory founder John Kao.

**Intelligent/Digital**

Intelligent/Digital was founded in November 1998 by president and ceo Zorawar Birı Singh and cto Anandeep Pannu. Singh previously was chief operating officer of Internet audience measurement firm Relevant Knowledge, prior to its merger with Media Metrix. Pannu served as project manager in the intelligent software agents group at the Carnegie Mellon University Robotics Institute, where he worked on various projects applying intelligent agents to real-world domains.

The company, based in Atlanta, now has 30 employees, and has raised $5 million from CMG, @Ventures and SAP's venture fund. It plans to roll out a beta version of its digital marketplace platform under new, not-yet-disclosed branding at the end of the year. At that time it hopes to announce at least four beta customers, two of which have already been signed. Intelligent/Digital will deliver trading platforms as hosted services that plug into market makers, and will also license software.

Singh believes that, much as enterprise resource planning (ERP) systems homogenized corporate back-office functions, B2B marketplaces will move from vertical-specific systems to common architectures. (Hence the investment from SAP.) Custom trading engines developed at established vertical marketplaces aren't flexible enough to handle new transaction modes and an array of parallel negotiation scenarios, nor are auction-centric systems with their hard-coded market rules.

"Our functionality does the equivalent of a real-time two-way auction with many buyers and many sellers and different items," says Singh. Intelligent/Digital will offer an interactive real-time exchange application that can support various trading mechanisms.
The system also allows negotiation involving multiple parameters, rather than just price. Market-makers can seed the exchange with profiles of buyers and sellers based on their previous transaction history, to establish defaults for individual tradeoffs among various parameters. Intelligent/Digital allows market makers to show sellers, as a value-added service, the yield curves of demand for their offerings. This way, sellers can feed their experience in the marketplace back into their pricing and thereby optimize their revenues.

“We're going to head towards marketplaces with a Darwinistic model,” predicts Singh. “Who can adapt to that level of [dynamic] pricing and adjust their supply and demand chains accordingly?”

TradingDynamics

Over the past several years, a group of Stanford business and economics professors, including Paul Milgrom and Robert Wilson, has helped design government-mandated marketplaces such as the California Power Exchange (CalPX) for wholesale electricity. They became disappointed with the poor quality of existing industrial auction software, and expressed their frustrations to Yoav Shoham, a colleague in the computer science department.

Shoham realized that the trading platform the systems integrator built for CalPX lacked the flexibility necessary for the market to run most efficiently. To prove his point, he designed a configurable trading system and implemented it in Java as the Stanford Auction Manager. It became the foundation for a computer science course in applied e-commerce.

In May 1998 Shoham founded TradingDynamics to create a robust commercial system, inspired by his academic work, that would support the broadest range of markets possible. TradingDynamics has received $4.7 million in first-round funding led by New Enterprise Associates and Atlas Ventures. Its first project was a custom electricity auction mechanism for the California Independent System Operator, a sister exchange to CalPX. The company plans to launch a more general set of trading applications, based on EJB and XML, in the next few months. It currently has 35 employees and expects to reach 70 by next March.

“A market is a place where you have set rules for how to conduct commerce,” says Shoham. “It's a playing field with rules, but nobody says it has to be a level playing field.” Instead, market makers must design trading environments with carefully crafted rules and options to achieve the their desired goals.

Shoham believes TradingDynamics' expertise in market design will be a major advantage in building B2B trading engines. “If you and I were putting together a software firm, we wouldn't dream of hiring an engineer who hadn't heard of data structures and algorithms,” he explains. “Yet people are putting together analogous solutions [for B2B digital marketplaces] without understanding auction design and game theory.” He hastens to add that technology is also important, pointing to the configurability and robust architecture of TradingDynamics' applications as differentiators.

Vp of marketing Drew Harman says that “the low-hanging fruit is definitely the vertical portals looking to put up exchanges.” TradingDynamics has six
customers signed so far, and despite its secrecy it has received inquiries from B2B sites in a wide variety of verticals.

Living Systems

Europe has businesses too, and despite rumors to the contrary they are going online. The native European Internet economy is growing rapidly, with major activity centered around Sweden and the UK. (We’ll be focusing on these topics at EDventure’s 10th Annual High-Tech Forum next month in Budapest. See calendar for details!) So it’s not surprising to find a B2B market builder, Living Systems, based in Germany with a newly opened office in London (with plans to conquer the US as well).

Co-ceos Kurt Kammerer and Christian Dannegger founded Living Systems in 1996. Kammerer was working as a self-employed IT consultant following a stint at a software and consulting company; Dannegger (who is also cto) had recently started his own software company, which he merged into Living Systems. Living Systems, which provides Internet-based trading technology and related strategy consulting to market makers, has 55 employees and has been profitable and funded on cash flow to date. It expects to have 70 employees by year’s end, and to expand from Europe into the US and Asia.

Kammerer describes Living Systems as a “technological VC,” meaning that it identifies early-stage market opportunities, builds technology platforms to exploit them, then finds partners to implement them. In 1997, before online auctions really took off, Living Systems prototyped an agent-based system to operate auctions in a scalable and fully automated manner. Out of that work, the company developed two products: Living Auctions for auction management and Living Agents for automated execution of trading strategies. Its first major account is Alando, Germany’s largest person-to-person auction (and as of June the German arm of eBay). Other consumer-focused customers include BMW and METRO Group.

Living Systems also supports multi-party B2B exchanges, and plans to launch its first customer sites in the next few weeks. Kammerer says his goal is “to go for today’s non-electronic markets...and open these markets to electronic trading.” To that end, the company focuses on goods that currently are not traded on exchanges because of volume, liquidity, lack of standardization or other characteristics. Living Systems’ Agent-Mediated Trading System (AMTRAS) uses Java-based intelligent software agents to execute trading strategies. The agents can search for potential transactions, engage in bilateral or multilateral negotiation and also initiate auctions. The company has also created a specialized version of the system, called ENTRAS, for energy trading.

Kammerer believes that software agents are an important enabler for B2B electronic marketplaces, especially as dynamic pricing gains importance. “People always wanted to have dynamic prices, but it was too much of a fuss,” he says. In addition to the sheer number of interactions when every transaction becomes a negotiation, trading strategies become far more complex in multi-lateral exchanges. Agents can manage and implement those strategies more efficiently than humans. For example, an agent could monitor risk exposure and notify the trader when a set threshold is reached. Kammerer emphasizes, however, that agents must be designed to produce real business benefits, rather than simply demonstrate interesting emergent phenomena.
Living Systems’ platform allows traders themselves to specify transaction types, so long as they are consistent with the overall rules of the market. An individual participant, for example, could initiate an auction to unload a large quantity of surplus goods, even though the primary mode of the exchange is the double-sided bid/ask system. The goal is to optimize markets from the bottom up, through the interactions of traders and their legions of agents, rather than through complex top-down algorithms.

Why not B2C?

Dynamic pricing is also gaining popularity in consumer e-commerce. Horizontal technology providers, led by OpenSite and FairMarket, are becoming the leading auction enablers for B2C and C2C vertical Websites. Several consumer-oriented market makers employ dynamic pricing modes beyond traditional auctions. Priceline.com is the best known. Accompany and Mercata similarly require buyers to commit up front, though the price is not yet fixed, but they give the buyer a price ceiling and drop the price as more buyers join the purchasing collective. NexTag gives buyers and sellers of computers a variety of pricing options, and lets sellers choose (on the fly or based on pre-determined business rules) which offers to accept.

B2B COMMERCE PLATFORMS

The most established suppliers of B2B marketplace technology are the platform providers. These companies have tended to emphasize static pricing mechanisms or one-off auctions, rather than bilateral exchanges or trade optimization. But they generally have deeper functionality when it comes to managing the overall business of a B2B market-maker. These vendors are natural partners or acquirers for the trading engine companies described above, though some may try to build out the missing pieces themselves.

Tradex

Tradex Technologies, located in Tampa, FL, was founded in February 1996 as a spinoff from Swiss peripheral distributor Dynabit. While most other early B2B software providers such as Ariba and CommerceOne focused on either the buy side or the sell side, Tradex has always concentrated on market-making infomediaries who serve both constituencies. The company’s lead investor is Internet Capital Group, which also has investments in several vertical market makers, thus providing an excellent set of prospects and other keiretsu benefits. Tradex has raised $28 million so far, and has 120 employees.

“In general, building these exchanges is similar to ERP, in that no two are the same,” says chairman and ceo Daniel Aegerter. “But after you’ve done a couple of them, you get a lot better at it.” Tradex lets market makers employ various mechanisms, including catalogs, request for quotes (RFQs) and auctions, and provides software to process orders all the way through to payment. The system includes a user directory and business rules that span marketplace participants, including workflow apps or functions such as purchase-order routing and approvals.
Aegerter says that at a recent conference for ICG portfolio companies, he discovered that most B2B market makers originally thought they could build around a single trading mechanism, but were now realizing they needed more flexible systems. Tradex's value proposition for these potential customers is both flexibility and accelerated time to market. Sometimes that means bowing to reality. One might expect the majority of participants in B2B marketplaces to be large company employees with secure high-speed connections. However, 60 percent of traffic on Metalsite, a Tradex customer, originates on AOL, a consumer-oriented dial-up service.

Tradex has 15 customers today. So far these relationships have split roughly 50/50 between software license and professional services revenue. However, in about a third of the cases Tradex will receive a slice of transaction revenues from its market-maker customers, and Aegerter expects transaction fees to represent the majority of revenues within three years.

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**Moai: business auctioneers**

When Moai Technologies was founded in early 1996, and even when it released its first product in mid-1997, Internet auctions were hardly a familiar concept. eBay gained traction as consumers realized how easy it was to satisfy their cravings for Pez dispensers and Beanie Babies, but the focus was entirely on the consumer side. Moai's LiveExchange software, by contrast, is designed for business environments. Customers include both established businesses (such as Ingram Micro, through its AuctionBlock service for resellers) and new B2B market makers (Adauction.com, ChemConnect, Exchange.com and PaperDeals.com).

Ceo Anne Perlman says, "We have yet to find a market that does not benefit from dynamic commerce." The private auction capability in LiveExchange allows auctions to be divided by distribution chain relationship or customer tier, expanding the value of the mechanism beyond traditional situation such as unloading surplus inventory. Though Moai's roots are in auctions rather than exchanges, the company has been offering additional features and market types in successive releases of its product. Moai leads the market in real-world experience with B2B dynamic commerce, but its challenge is to avoid being leapfrogged by the newer competitors described in this issue.

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**TimeØ**

Shortly after Nets Inc. flamed out and filed for bankruptcy in 1997, Perot Systems hired its cto Mark Teflian and his entire technical team. Rather than buy the whole company with attendant liabilities, Perot also paid $9 million for Nets Inc.'s intellectual property. (Disclosure: Esther Dyson is an investor in Perot Systems and sits on its advisory board.) The group became the nucleus for an independent business unit within Perot Systems called TimeØ. Building on Nets Inc.'s work, TimeØ has formalized a set of technologies, architectures and methodologies to provide on a consulting/systems integration basis to B2B market makers.

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2 Long prior to that, Teflian worked at United Airlines and spoke at PC Forum in the 1980s.
Like most professional services organizations, TimeØ combines its own custom-developed software with outside products based on customer requirements. Teflian believes it's critical to understand a market maker's business model and value proposition before designing a marketplace. "It's more important to be right about the business model than it is to be right about the technology," he argues. TimeØ has developed a set of abstraction models that allow marketplaces to be stitched together from components once the business model is mapped out.

TimeØ emphasizes what Teflian calls "information liquidity," which means adding value to data by bringing together a critical mass of information with sufficient timeliness, context and navigation tools. "These marketplaces are about information consolidation," Teflian says.

Unlike most of the pure technology providers, who have gravitated toward new Internet-based third-party market makers, TimeØ focuses on established brick-and-mortar players interested in facilitating B2B marketplaces as new lines of business. Its first customers are OrderZone.com, a marketplace for business supplies and services spearheaded by W.W. Grainger Inc., and Metalsite, launched by Weirton Steel.³

Teflian believes established businesses that can re-pool their assets successfully will have a substantial advantage over online-only competitors. However, these companies must be willing to change their production and consumption relationships, and also to integrate information with competitors who may be part of the same B2B marketplace.

MERGING E-MARKETS

Among the most interesting aspects of digital markets is the potential for slippage across boundaries. Most overviews of the B2B space make the mistake of sharply dividing vertical niches. The trouble is that, as with consumer "vertical portals" (see Release 1.0, 10-98), those boundaries aren't fixed. Does a company that supplies rubber washers to plumbers think of itself as part of the plumbing-supply vertical, the washer vertical, the rubber-products vertical or something else entirely? Probably all of the above. How do its customers think of it? Companies and individuals within them also belong to horizontal categories (purchasing managers, wholesalers, salespeople, manufacturers) at the same time that they inhabit industry verticals.

Most likely, companies will participate in a limited number of marketplaces simply to avoid additional complexity and transaction costs. Yet that behavior will change if technology changes the assumptions. The two phenomena that will ultimately break down the rigid vertical model are combinatorial bidding and inter-exchange linkages. Combinatorial bidding allows buyers to bid on bundles of products rather than purchase everything a la carte.

If I'm a food service supplier I may need to purchase coffee, creamer and styrofoam cups, and I don't care how much I pay for each component as long as long

³ TimeØ helped develop the strategy, business models and architecture for Metalsite, which also worked with Tradex (see page 18).
as I minimize the total cost. (And I'll take delivery by truck or train, depending on which is cheaper, which may depend on whether I buy powdered or liquid creamer.) A printer may pay more for a shipment of ink deliverable next week to take advantage of the great deal it just got on paper. Then again, if another print supply wholesaler knew that, it might offer a better bundle even though it can't match the paper price.

Combinatorial bidding can lead to "win-win" solutions if the buyer and seller have complementary mixes of preferences. In effect, this mechanism captures some of the flexibility benefits of barter along with the liquidity, fairness, speed and information richness of exchanges. The challenge is that effective combinatorial bidding requires sophisticated algorithms to optimize multi-product solutions. Several of the companies here either offer or are working on combinatorial bidding features.

The other landscape-altering development will be linkages between exchanges. Participants in online exchanges will eventually want the ability to transact across multiple trading environments. Though the familiar network effects will lead to a limited number of winners in each vertical, we think it will be rare for a buyer or seller to have only one option. All companies buy and sell many different products, and there will be exchanges of different levels of specificity to cater to these needs. For example, the newspaper supply market (including paper), and the paper market, including newspaper customers.

In the consumer auction market, new intermediaries such as AuctionWatch have emerged to let users monitor and participate in auctions on multiple sites (such as eBay, Amazon.com and Yahoo!). Similar functionality in the B2B arena will require standards for securely exchanging complex data and order flow, and ways to match up conflicting ontologies. It's early for this to happen, though BusinessBots is already promoting its Universal Market API to link exchanges. Even without formal connections between marketplaces, sharp traders will identify and exploit arbitrage opportunities when price or availability spreads emerge.
RESOURCES & PHONE NUMBERS

Moses Ma, BusinessBots, (415) 782-6067; fax, (415) 538-7874; moses@bizbots.com
Zorawar Biri Singh, Intelligent/Digital, (404) 815-8888; fax, (404) 685-0997; biri@intelligentdigital.com
Kurt Kammerer, Living Systems, +49 (772) 198-910; fax, +49 (772) 198-9191; kurt.kammerer@living-systems.de
Peter Crampton, Market Design, Inc., (301) 405-6987; fax, (301) 405-3542; peter@cramton.umd.edu
Anne Perlman, Moai, (415) 625-0601/1211; fax, (415) 625-1200; aperlman@moai.com
Paul Abeln, PlasticsNet.com, (312) 464-7554; pabeln@plasticsnet.com
Greg Rosston, Stanford University, (650) 725-0722; fax, (707) 922-0185; grousston@leland.stanford.edu.
Mark Teflian, TimeØ, (617) 303-5074; fax, (617) 303-5100; mark.teflian@ps.net
Zvi Schreiber, Ilan Grobman, Tradeum, (877) 872-3386; zvi@tradeum.com, ilan@tradeum.com
Zev Laderman, Tradeum, (415) 577-5115; fax, (415) 621-6024; zev@tradeum.com
Daniel Aegerter, Tradex, (813) 222-2050; fax, (813) 222-5658; daniel@tradex.com
Vijay Sundaram, Tradiant, (510) 596-0053; fax, (510) 596-8980; vijay@tradiant.com
Yoav Shoham, Trading Dynamics, (650) 567-5919; yshoham@tradingdynamics.com
Drew Harman, Trading Dynamics, (650) 567-5903; fax, (650) 964-6953; drewh@tradingdynamics.com

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## Release 1.0 Calendar

### 1999

#### September 20-21
*Dynamic Pricing Online* - San Francisco, CA. If this issue hasn't answered all your questions.... Call +44 (171) 840-2700; www.access-conf.com.

#### September 24-25
*Governing the Commons: The Future of Global Internet Administration* - Alexandria, VA. Presented by Computer Professionals for Social Responsibility (CPSR). Discussion with the shakers and makers of Internet policy. To register, e-mail cpsr@cpsr.org; www.cpsr.org.

#### September 25-27

#### September 27-30
Fall Voice on the Net - Atlanta, GA. Pulver.com brings together the Internet telephony community. Call (516) 547-0800; fax, (516) 396-7870; www.pulver.com.

#### October 3-6
Agent Systems and Applications/Mobile Agents '99 - Palm Springs, CA. Experimental research on agent technologies. For information e-mail Robert Gray, robert.s.gray@dartmouth.edu; www.genmagic.com/asa.

#### October 4-8
Fall Internet World - New York, NY. The big kahuna of Net trade shows. Call (800) 500-1959; e-mail fiwprogram@iw.com, events.internet.com/fall99/.

#### October 10-17
Telecom 99 + Interactive 99 - Geneva, Switzerland. The ITU's massive trade show. Call +41 (22) 730-6161; fax, +41 (22) 730-6444; www.itu.int/telecom.

#### October 18-19
International Symposium on Wearable Computers - San Francisco, CA. Sponsored by the IEEE Computer Society. Information at iswc.gatech.edu, or call David Mizell (425) 865-2705; e-mail david.mizell@boeing.com.

#### October 24-26
EDventure's Tenth Annual High-Tech Forum - Budapest, Hungary. With Living Systems' Kurt Kammerer (from this issue); Judy Balint, E*Trade; Andreas Schmidt, AOL Europe; Jerry Yang, Yahoo! among others. Call Daphne Kis, (212) 924-8800; fax, (212) 924-0240; daphne@edventure.com; register at www.edventure.com.

#### November 2-4
ICANN annual meeting and board meeting - Los Angeles. With interim chairman Esther Dyson and nine newly elected board members. Y'all come! See www.icann.org.

#### Nov 30 - Dec 2
IIr's ISP Forum - Amsterdam, Netherlands. Europe's primary annual forum for internet service provision and convergence platforms. 158 speakers from 38 countries, including, Esther Dyson and Kevin Werbach.

#### December 31
Fin de siecle.

* Events Esther plans to attend.  # Events Kevin plans to attend.

Lack of a symbol is no indication of lack of merit.

The full, current calendar is available on our Website, www.edventure.com.

Please contact Kara Holmstrom (kara@edventure.com) to let us know about other events we should include.

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13 September 1999
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Daphne Kis
Publisher