Stratum 4 Newsletter

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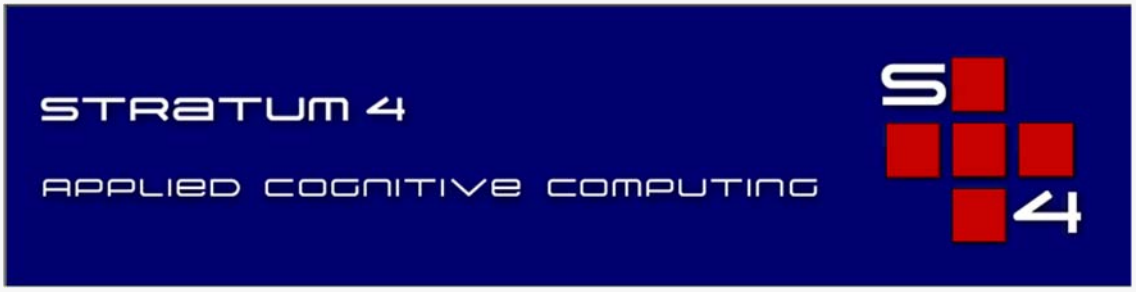


Welcome to the inaugural issue of the ***Stratum 4 Newsletter***. With this monthly email communication, we plan to provide our subscribers with the latest news and perspectives on the features, benefits, science and technologies related to *cognitive computing* -- especially as they pertain to building and deploying intelligent products and their attendant service systems -- Stratum 4's mission area. We look forward to your comments and questions.

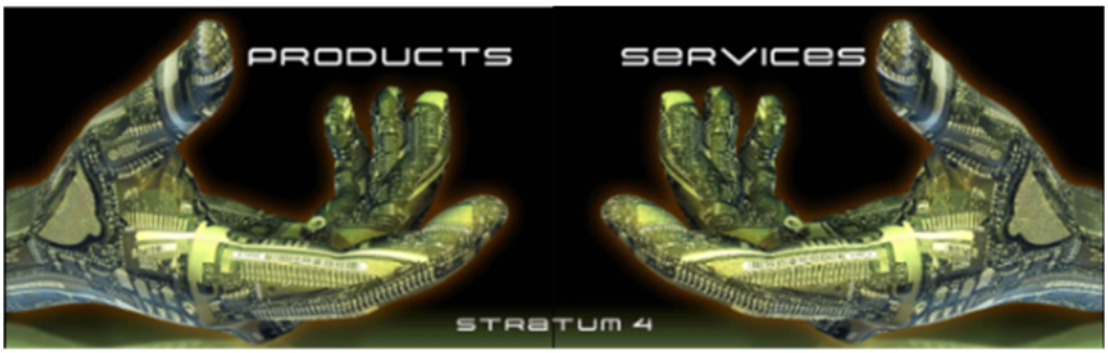
Mission Statement

Through professional consulting services, we seek to increase the value of our clients' enterprises by assisting in the creation of intelligent digital products and service systems that incorporate advanced computational science and technology.

Automation systems are evolving. Intelligent (cognitive) products and their associated service systems permit automation applications to continuously capture and maintain situational awareness, to respond to planned and unplanned events, even in the face of uncertainty, with predictable performance while providing highly available and dedicated monitoring and control of time-critical *physical* and *synthetic* processes.

Physical processes are those governing the states and behaviors of physical (natural) systems, such as those found in manufacturing, chemical, water-wastewater, power generation and distribution, and transportation systems. *Synthetic processes* are those governing the states and behaviors of man-made systems, such as found in commercial, economic, healthcare, entertainment, social and theoretical systems.

Service systems include the applications and tools required to design and engineer products; infrastructure needed to capture and maintain data from, and to sell, operate and maintain those products; the support systems necessary to develop and maintain the hardware, software and service supply chains, customer databases and interactive support organizations; and the financial and material management systems to facilitate commerce.



Products

The beginning of the 21st century digital economy is witnessing significant growth in enterprise revenues and margins derived from new services offered to customers. Opportunities to increase service revenues is driving creation of increasingly intelligent products that provide new value propositions that reach further into customers' operations. Consequently, products are expected to function as reliable and secure cloud-enabled "end-systems," designs dependent on standardized *Internet of Things* (IoT) or *Cyber-Physical Systems* (CPS) architectures and protocols.

Services

Prior to the availability of integrated cloud service platforms, products were typically designed, or upgraded from their legacy designs, with their service IT systems following in incremental and ad hoc ways. Today's products increasingly serve as "front ends" to higher value service functions, requiring products and services to be co-designed, deployed, operated and maintained. Increasingly, the design of the service system prescribes many of a product's essential operating characteristics, with both dependent on greater interoperability.

Professional Services

Stratum 4 offers CTO-class professional services dedicated to assisting clients in the design of intelligent, integrated, high-performance and high-availability *products* and *service systems* responsible for maintaining awareness and control of the states and behaviors of a wide range of industrial, commercial, governmental and scientific processes.

Stratum 4 offers services that adhere to strategic, commercial, and organizational imperatives, including technical product and service specifications, engineering methods and tools, deployment, operation and maintenance practices, and program and project management assistance.

Perspective: Enterprise as Computation

To improve its function, an argument can be made for equating "enterprise" with a "computation." The notion is often confounded by ambiguity as to just what constitutes enterprise, and partly by the idea that whatever it is, its behavior is computable -- especially given the idea that enterprise is traditionally a social construct.

Further, there are several competing definitions of *enterprise*. For some it is a *noun*, signifying a business entity of some unspecified size and mission. For others, it is an *adjective*, modifying a noun, such as "Mary is an enterprising person." And still others might associate the term with a project or process, a *verb* signifying a kind of action.

Implicitly underlying these interpretations is a *performance metric*, a *value proposition* defining the benefits of a business unit, the achievements derived from Mary's industriousness, or the results of a project. Value propositions are *cause*

celebre that justify an enterprise's existence, the benefit of being enterprising, and the results of enterprise activities. In each case, enterprise is associated with a quantifiable unit of value production.

Value propositions are conditional statements of the form "if <some condition>, then <value produced>." In short, value propositions are computable expressions, defined in possibly compound "If..., Then..., Else..." statements, neural networks, Petri nets, fuzzy logic, mathematical or algorithmic (software) expressions.

In essence, all value production is a form of computation, whether an enzyme catalyzing a biochemical reaction or a multinational company creating a new commercial service for one of its regional markets. We can imagine a more rigorous study of the dimensions of value creation. With the availability of high performance computing and associated modeling, simulation, data analytics and visualization tools, the beginning of the 21st century is witness to a tremendous growth in our understanding of physical and synthetic sciences (e.g., physics, biology, chemistry, economics, medicine, environmental), developing their respective computational sciences as complementary enablers of new discoveries.

Admittedly, some computations define value propositions that are *deterministic* (predictable), where others (perhaps the most important ones) are *nondeterministic* and governed by probabilistic effects. Nevertheless, any attempt to provide the intelligent automation of these computations requires expressing them algorithmically with as much fidelity as our computational science tools permit.

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