THE FUTURE IS CUSTOM:
A TOTAL COST OF OWNERSHIP APPROACH
TO DATA CENTER INFRASTRUCTURE DESIGN
EXECUTIVE SUMMARY

Although racks and cabinets are among the least expensive components of the IT infrastructure, they play a critical role in the total cost of ownership (TCO) of the data center environment. The right rack will be easy to install, move and reconfigure, simplifying cabling and power distribution unit (PDU) management and providing ready access to equipment. Such a rack will also optimize cooling within the data center.

While most data center racks are constructed based upon Electronics Industry Alliance (EIA) specifications, those standards apply only to the 19-inch mounting requirements of most servers and other equipment. The specifications do not address the wide variations among data centers and the complexities within each environment.

The available floor space, cooling environment and myriad other factors influence the configuration of the data center rack. Unfortunately, many racks and cabinets are generic in nature and stamped out en masse based upon some “typical” specification. These products increase installation costs and operational inefficiencies within the data center environment, resulting in a higher TCO than a properly engineered custom rack.

The trend toward the development of equipment that does not conform to EIA specifications is further driving the demand for customization. As more organizations build their own servers and other gear to meet precise performance and cost objectives, the need for flexible racks and cabinets to accommodate this equipment will continue to increase.

This whitepaper will discuss some of the factors that go into the design of a custom rack solution, and the cost and operational benefits of customization. It will then explore DAMAC’s ability to rapidly engineer and produce customized data center infrastructure solutions that deliver a significant return on investment (ROI).
COST EFFICIENCIES OF A CUSTOMIZED DATA CENTER INFRASTRUCTURE

Large rack manufacturers typically rely upon offshore manufacturing partners to mass-produce a core set of products, and lack the flexibility to produce a customized solution in a timely, cost-effective manner. This has led to the perception that customization is too expensive and time-consuming to consider when designing a data center infrastructure.

Generally speaking, custom products do cost more than generic products due to economies of scale. However, that rule of thumb doesn’t necessarily apply to data center infrastructure products. In the data center environment, installation and operational expenses far exceed the cost of the cabinets and racks. If a customized solution enables greater efficiencies, the ROI can be substantial.

Several factors must be considered in order to design a rack that meets specific data center requirements. Optimizing the data center infrastructure around each of these factors can have a very real and measurable impact on TCO:

- **Physical Space.** A rack with a footprint that optimizes data center floor space helps to reduce real estate costs.
- **Cooling Environment.** Rack design plays a key role in maximizing airflow and controlling cooling costs, whether in a hot-aisle/cold-aisle configuration or traditional raised floor environment.
- **Rack Strength.** A rack that meets strength requirements will not buckle or lose its structural integrity when subjected to seismic or transportation stresses.
- **Cabinet Bracing.** Bracing provisions, seismic floor mounting plates, floor mounting anchor points and levelers should be positioned so that they can be accessed when the rack is fully populated.
- **Cable Routing and Power Configuration.** A rack that conforms to these specifications improves the accessibility of equipment within the rack, airflow through the equipment and cable management.
- **Application.** The rack should meet the requirements of the equipment while offering the flexibility to support mixed environments.
- **Security Protocol.** If rack-level security is required, door locks should be available in keyed alike, keyed unalike or combination configurations; otherwise, doors and door locks should be optional.
Customization can also have a positive impact on the cost of the product and on the customer’s “green” initiatives. Generic cabinets typical ship with parts that may not be used — parts that the customer has to pay for and then dispose of. A custom cabinet that includes only needed components saves money and conserves environmental resources.

THE DAMAC DIFFERENCE

Because of DAMAC’s approach to product development, a standard DAMAC cabinet or rack can be configured in thousands of different ways. When a customer requests a custom solution, the DAMAC team applies the requirements to existing DAMAC products. In many cases, the desired configuration can be achieved without designing and manufacturing a unique product.

DAMAC can also produce fully customized solutions to the customer’s specifications in about six weeks — the fastest turnaround time in the industry. DAMAC provides expert engineering services free of charge and builds all of its products in the U.S. with 100 percent control. All custom products carry DAMAC’s standard 10-year warranty.

DAMAC takes a forward-thinking approach to product development by staying abreast of trends in equipment design. This industry knowledge ensures that customers gain cabinets and racks that will not only meet their needs today but also in the future.

THE GROWING IMPORTANCE OF CUSTOM SOLUTIONS

The technology that is installed in data center racks is changing dramatically as more organizations begin to design and build their own servers and other equipment. These organizations purchase chassis, motherboards, hard drives and other components in order to assemble a more cost-effective, performance-driven technology suite.

A prime example is the Open Compute Project (OCP), which Facebook launched in order to create a more efficient computing infrastructure at the lowest possible cost. The project team decided to custom-build software, servers and other components from the ground up, and to share those technologies with the OCP community. The result is an infrastructure that is 38 percent more efficient and 24 percent less expensive to build and operate than other state-of-the-art data centers.
These solutions are not designed to fit an industry-standard rack — each has a unique footprint based upon the technology requirements of the system. Racks and cabinets must be custom-built around the equipment without consideration for the EIA specifications that drive traditional rack design. An OCP rack might, for example, be built to accommodate larger pieces of equipment that contain more processors and hard drives, while allowing for greater cooling across the motherboard.

As these types of initiatives gain ground, the industry is seeing a shift toward equipment-driven specifications at the rack level. It only makes sense to create a customized and optimized rack to further enhance the TCO benefits of the custom technology.

**THE DAMAC DIFFERENCE**

In DAMAC, customers have a partner that can build products to EIA specifications but also provide non-EIA products as the demand for custom technologies increases. In fact, DAMAC’s standard racks have been modified for use in OCP projects and are mentioned by name in OCP specifications.

In addition, DAMAC has developed an OCP rack that combines three traditional server racks into one triple-wide rack system. This unique design saves floor space and provides a three-rack cluster for building out specific equipment configurations. The rack system features a fully welded tubular steel frame that incorporates DAMAC’s seismic design and construction and supports a rolling weight capacity of 6,000 pounds. It is an ideal solution for extreme equipment densities and for shipping fully populated cabinets to and from an offsite integration facility.
A LEGACY OF CUSTOMIZATION

DAMAC started its business back in the 1980s, before data center racks became mainstream products. DAMAC’s philosophy was to determine the customer’s needs and build products to satisfy those needs. The company takes that same approach today.

Recognized leaders in Web 2.0, social media, financial services and other technology-intensive market segments rely upon DAMAC to build some of the world’s largest data centers. No two environments are the same. DAMAC has proven its ability to accommodate the unique design needs of web-scale data centers, and that expertise drives the company’s approach to customization for customers of all sizes.
CONCLUSION

Because data centers are highly complex and dynamic, it is difficult to overstate the value of a data center rack or cabinet that complements the environment in which it is installed. A custom solution streamlines installation and moves, adds and changes, reducing costs and enabling a faster time-to-value of the technology.

Custom racks and cabinets also enable greater efficiencies in equipment access, cabling management, airflow and other factors, cutting operational expenses and cooling costs. As a result, a custom rack delivers greater value through the continued TCO savings across the product’s lifespan.

Despite these benefits, there is a conception within the industry that custom solutions are too expensive and require long lead times. While large manufacturers lack the agility to deliver custom products, DAMAC has been at the forefront of customization for more than 30 years. DAMAC racks and cabinets can reduce TCO by 25 percent by streamlining mounting, cabling, equipment installation and ongoing maintenance. These products also reduce the time needed for moves, adds and changes by 60 percent compared to competitive solutions.

DAMAC believes that the data center should not have to conform to the specifications of a generic rack, and that the customer should not have to pay for unneeded parts and components. Instead, the rack should precisely meet the customer’s requirements and enhance the data center environment.

That philosophy complements the growing trend toward custom-built data center equipment. Now, more than ever, flexibility and forward thinking are key criteria in the selection of a data center infrastructure partner, and DAMAC delivers.