When the Dell Computer Corp. in Round Rock, Texas, decided to redesign the chassis for its computers, the company set ambitious goals. It wanted one family of chassis to serve its Optiplex, Precision, and Dimension product lines. It also wanted 25 percent less assembly time than the previous chassis, the Optiframe, and wanted it easier to service.

Introduced in 1997, the Optiframe design had reduced assembly time an average of 32 percent from earlier frames. It was so easy to put together that Dell could postpone constructing several new factories.

“We knew that to reach our goal for the new product, we had to completely transform the chassis design,” said Bradley Keup, a senior technical strategist at Dell.

The chassis had to come in three sizes and had to accommodate the characteristic variations of the three Dell desktop PC product lines. The design team’s name for the new frame family was “Transformer.” In the end, the chassis design reduced assembly times by 25 to 40 percent, depending on the configuration of the PC.

Dell calls its approach to product development Design for X. The “X” can stand for manufacturing, logistics, ergonomics, service, or just about any other practical consideration. Teams comprise mechanical engineers and experts from other parts of the business, including logistics, shipping, and the supply chain.

They start by listing most of the features of a new design, and then look at the product’s expected life, from manufacturing through warranty service. The teams chart their progress along a defined product development path.

“Back in 1997 and 1998, during development of the Optiframe chassis, DFX was still taking shape even as we applied it,” Keup said. “Now it’s a thoroughly mapped-out process with mandatory stage gates.”

One of the goals was to find ways of reducing assembly times and touches, or manual operations.

The team used analysis software called Design for Assembly, which guides engineers through a series of steps to create a numerical index of design efficiency. DFA software, developed by Boothroyd Dewhurst Inc. of Wakefield, R.I., raises questions about the design or function of parts—for example, whether one moves with respect to another.

“A key goal was eliminating fasteners,” said Dwight Stimson, a senior DFX engineer. “If you look at a DFA analysis, you’ll see that every screw you design out of a product reduces assembly time by approximately eight seconds.”

Nearly all Dell PCs require at least one CD or DVD drive and one floppy drive. Each component requires four screws to hold it in place, taking a total of 32 seconds per device.

This article was prepared by staff writers in collaboration with outside contributors.