



## Overview

### Goals:

- Ensure that the micro-electronics vital to U.S. defense are readily available.
- Reduce the time to produce silicon wafers from 30 days to three, and the cost from hundreds of millions to \$30 million.

### Challenge:

Provide a development environment that:

- Exploits the power, flexibility, and price-performance of client-server computing.
- Has a customizable graphical user interface to meet customers' varying needs.
- Can be easily maintained and updated throughout its life cycle.
- Supports agile, short cycle-time manufacturing strategies.

### Solution:

Cincom® VisualWorks®

### Key Results:

- TI developed the first fully integrated CIM prototype in just six months, including training time.
- TI met the Defense Department's project goals.
- TI was able to reuse up to 80% of its code without modification and 10% with minimal changes.
- Smalltalk fulfilled requirements for both the prototype and the full-scale CIM system, including reduced time and effort to create user interfaces.
- TI increased its ability to rapidly respond to customer-requested changes.

Profile in success: [Texas Instruments](#)

# Cincom Smalltalk™ Helps Texas Instruments Meet Defense Department Cost and Time-To-Market Requirements



## Situation:

In January 1989, the U.S. Department of Defense awarded Texas Instruments (TI) a \$112.6 million contract to develop the wafer fab of the future. The Pentagon's goal was to ensure that American semiconductor manufacturers could produce the micro-electronics vital to U.S. defense by developing and commercializing new technologies and dramatically reducing the time and cost involved in producing silicon wafers. TI's goal was to pare the cost of building a wafer fab from several hundred million dollars to \$30 million, decrease the wafer production cycle time from 30 days to three days, and make the production of small batches of wafers economical. TI was also responsible for making these advancements commercially available to other U.S. manufacturers.

## The Project: Develop a Computer-Integrated Manufacturing (CIM) System

TI teamed leading-edge machinery and production techniques with a computer integrated manufacturing (CIM) system to oversee the entire wafer production process. TI chose an object-oriented approach to improve productivity and application quality, lower maintenance costs, and take advantage of object reusability. Cincom Smalltalk was chosen to develop the prototype for the application. Smalltalk enabled TI to develop the first fully integrated prototype of the CIM system in just six months, including the time spent training programmers to use Smalltalk and the concepts of object-oriented programming. As a result, TI met the goals for the project that the Defense Department set.

## VisualWorks Takes the Project from the Lab to the Fab

TI developers were so impressed by Smalltalk's pure object-oriented nature and the significant code reuse during the prototyping phase that they chose to develop the production system with the VisualWorks client and server tool, instead of C++. The production system's overall goal of flexibly handling all aspects of wafer processing to cut costs, improve quality, and reduce cycle time was flushed-out with several specific requirements. These included support for client-server computing across a wide range of platforms, a customizable graphical user interface (GUI) builder, and support for quickly incorporating new features and functionality. Cincom VisualWorks met all of these requirements.

By exploiting VisualWorks' portability, TI offered customers the flexibility of picking and choosing their preferred combination of platforms. Plus, when TI found that customers required flexibility to develop customized GUIs to meet their specific requirements, it was able to use a VisualWorks framework for meeting these requirements. VisualWorks GUI builder allowed companies to readily customize user interfaces. VisualWorks also allowed TI to support their preferred "look and feel" across multiple host operating systems.

VisualWorks has also allowed TI to realize object technology's promise of easy maintenance by drastically reducing the time and effort necessary to create new features based on customer input. With VisualWorks, TI has been able to respond quickly to customer-requested changes. This support for incorporating new features makes the CIM application itself as flexible as the manufacturing processes it enables, and it allows TI to better meet the needs of its customers.

TI was able to reuse as much as 80 percent of the code it developed without modification, and 10 percent more with minimal modification. TI formally released the production CIM system in July of 1993 under the name WORKS.

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