

# Toshiba Tec Corporation

## Remote DR for Efficiency in 3D Modeling and NetConferencing

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Takuya Ito, Group Leader  
Group Design Support Coordinator  
System-LSI Design Support Dept.  
Digital Solution Technology Center  
Document Processing &  
Telecommunication Systems  
Company

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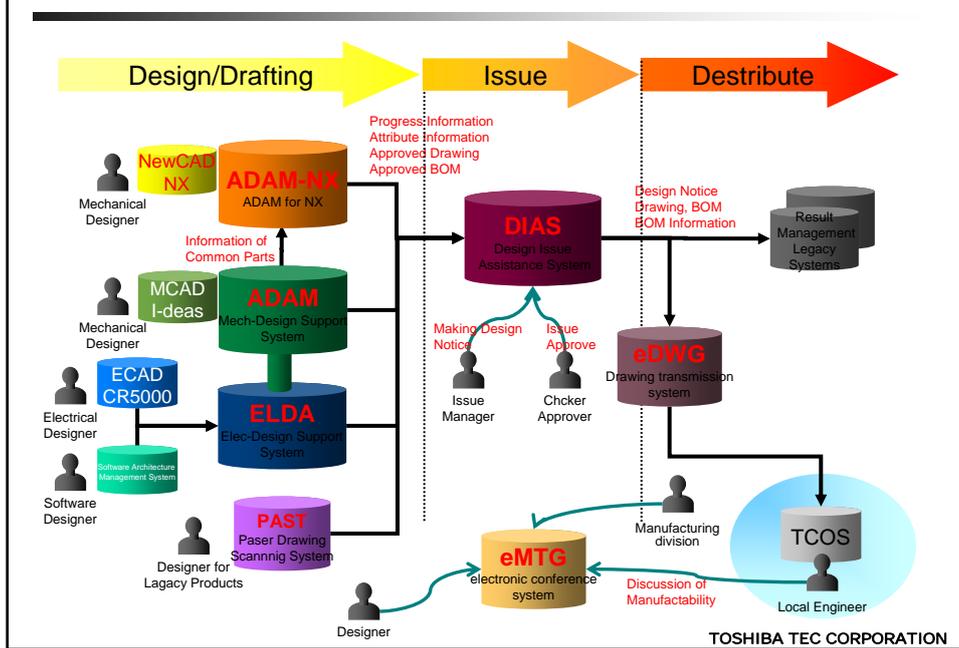
## Introduction

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- ▶ We leverage 3D CAD and PDM to innovate in a wide range of development processes
- ▶ Today, we will showcase a case study of this innovation: development collaboration, sharing design information, and efficient communication with remote locations (particularly China).

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## Overall Architecture of Development Support System As of April 2006



## About Us

### ▶ Toshiba Tec Corporation

- ▶ Incorporated 21 February 1950
- ▶ Capital ¥39.9b
- ▶ Employees Approx. 4,200 (as of April 2005)
- ▶ Consolidated Sales ¥376.2b (FYE March 2005)

### ▶ Companies

- ▶ Retail Information Systems Company
  - ▶ POS systems, electronic cash registers, office automation equipment, etc.
- ▶ Home Electric Appliances Group
  - ▶ Vacuum cleaners, cooking appliances, motors, etc.
- ▶ Document Processing & Telecommunication Systems Company
  - ▶ MFPs, copiers, facsimiles, printers, etc.

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# DPTS Products

MFP (digital multifunctional printers)

**e-STUDIO850**



**e-STUDIO4511**



Full Color MFPs

**FANTASIA312**



Facsimile

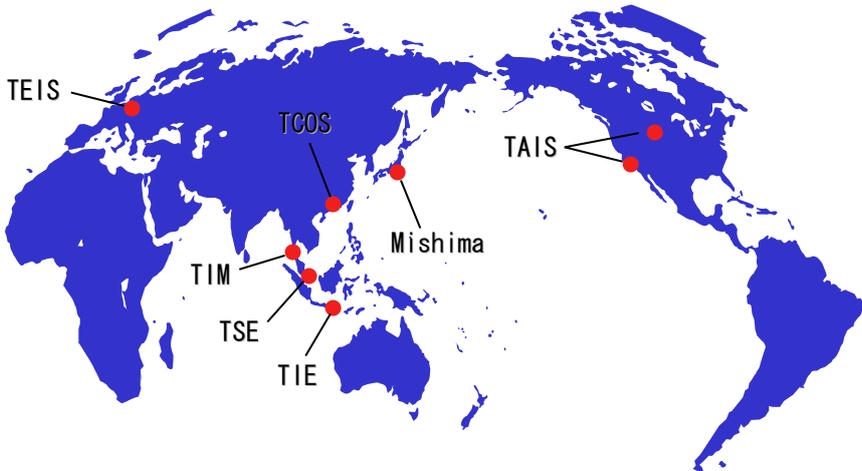
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<http://www.toshibamfp.net/mfp/>

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# DPTS Development & Manufacturing Facilities



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# Mishima & TCOS



Address: Baoan, Shenzhen City, Canton  
Employees: 1,641 (as of Mar-05)  
Net Sales: 2,634M HK\$ (FY04)  $\approx$  approx. ¥36.3b

Address: Mishima City, Shizuoka  
Employees: 1,467 (as of Apr-05)  
Production: ¥100.1b (FY 2004)



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## Issues for Collaborative Development with Remote Locations (China)

- ▶ **Difficult to revise design on site**
  - ▶ Development is transferred before design is perfected, so revisions are frequent after transfer
  - ▶ Even if an issue is discovered locally, it is difficult to view the original design/not possible to revise (no CAD, insufficient drawing database)
  - ▶ Studying countermeasures in Japan is like having an itch you can't get at; studying them after returning to Japan is too late
- ▶ **Nonverbal communication not mutually understood**
  - ▶ The language and cultural barriers are great; vague drawings and spec forms, and a routine of penciling in corrections onto drawings on the spot are not understood
  - ▶ They cannot be expected to understand Japanese cultural norms for tact, care, and attention to detail, so clear graphical instructions and corresponding accurate data are needed

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▶ **Need for security control**

- ▶ Need to ensure that drawings and electronic data are not leaked/lost
- ▶ It would cause major damage if a consumable copy were fabricated using leaked data

▶ **Need for import/export control**

- ▶ Strict import and export control is needed because we are trading with a communist country
- ▶ As a rule, all drawings and related documents must undergo separate export inspection

▶ **Unable to travel freely**

- ▶ It is too expensive to send the necessary people on site whenever they are needed
- ▶ Too much time is lost traveling back and forth

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## Proposed Solutions to Issues

- ▶ Create a real-time CAD connection

ADAM

- ▶ Framework for Japan to approve and release design changes made in China

- ▶ Framework to establish strict drawing release process and data synchronization

eDWG

- ▶ Reduced drawing-release lead time

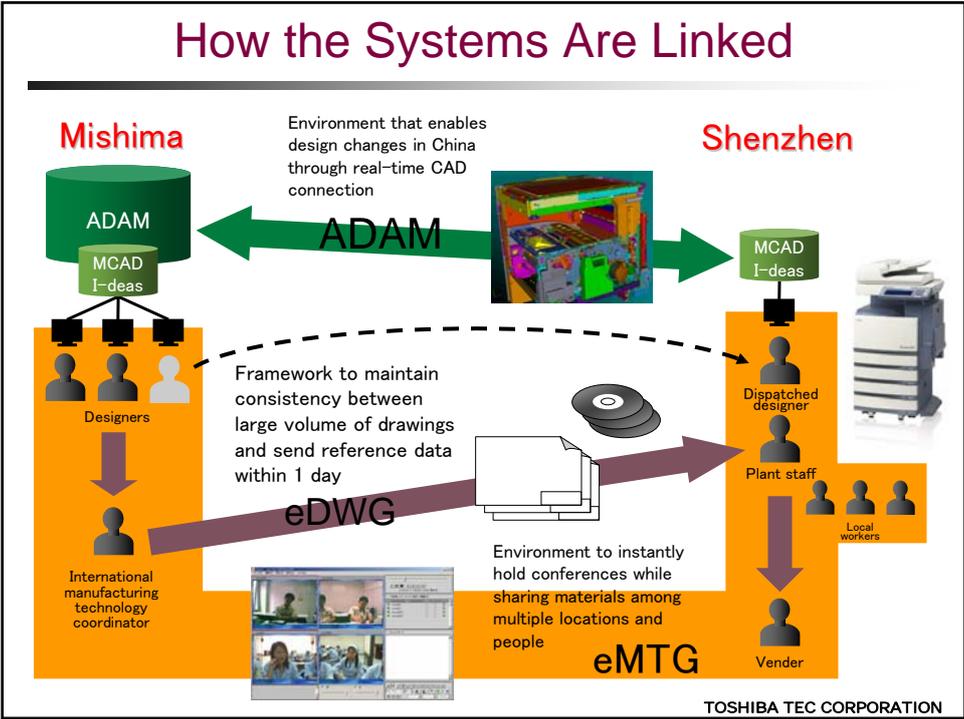
- ▶ Framework to share documents, and prototype and other drawings

eMTG

- ▶ Framework for effective communications close to face-to-face

We have responded to the issues by developing three mutually supplementing systems

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## ADAM

(Advanced Development Assistance system for Mechanical design)

- ▶ Create a real-time CAD connection
- ▶ Framework for Japan to approve and release design changes made in China
- ▶ Framework to establish strict drawing release process and data synchronization

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# ADAM

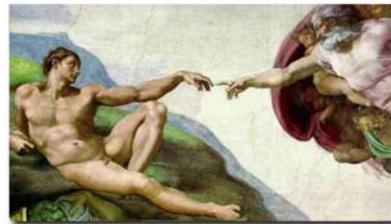
▶ ADAM: **A**dvanced **D**evelopment **A**ssistance system

for **Mech-design**

- ▶ A 3D development environment incorporating Toshiba Tec DPTS Company's development process into a system built on I-DEAS + I-DEAS Enterprise + Teamcenter-ent
- ▶ Center Server located in Mishima, with real-time connections to Osaki (Tokyo), Mifuku (Izunokuni, Shizuoka), and TSCOS (Shenzhen)

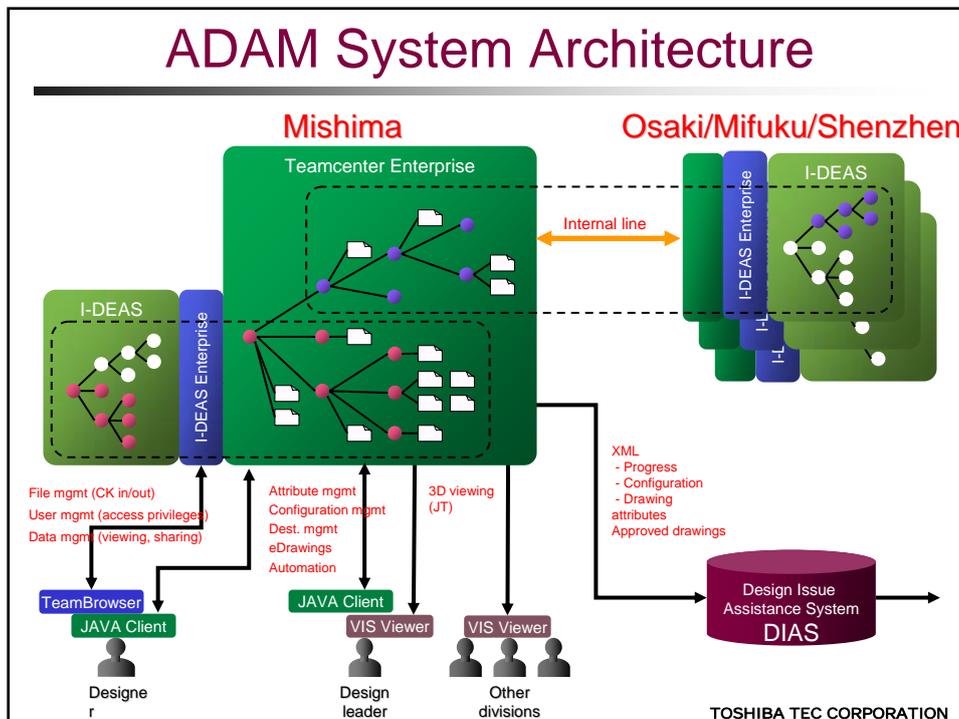
▶ **Operating Status**

- ▶ 01-12: System goes online
- ▶ 02-04: Performance improvements; general joint use started
- ▶ 02-09: Connection with China completed
- ▶ 03-1: Production operation started between Japan and China



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## ADAM System Architecture



## Main Features of ADAM 3.3

- ▶ **Data management**
  - ▶ Removes limitation (database lock) on number of items TDM can manage (500/project)
  - ▶ Centralized management of 3D data and strict management of revision privileges via check in/out (source control)
  - ▶ Removes library restrictions, sharing team data with other development projects
  - ▶ Search by attributes
- ▶ **Configuration management**
  - ▶ Build in product configuration at design time (seamlessly go from CAD design configuration to PDM configuration)
- ▶ **Workflow**
  - ▶ Approval of electronic designs and drawings
- ▶ **Automation**
  - ▶ Automatically create drawing templates via attribute data
  - ▶ Automatically create architectural drawings from configuration data
  - ▶ Automatically create reference data for all models and viewing data for other divisions
  - ▶ Automatically register design products in external systems upon approval
- ▶ **Collaboration**
  - ▶ Share design data and commonize designs over multiple projects
  - ▶ Share design data and jointly design between multiple locations
- ▶ **Linking with other systems**
  - ▶ Linking with existing design product management systems

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## Innovation through ADAM

- ▶ Design collaboration
- ▶ Virtual design review (VDR)
- ▶ Drawing revision

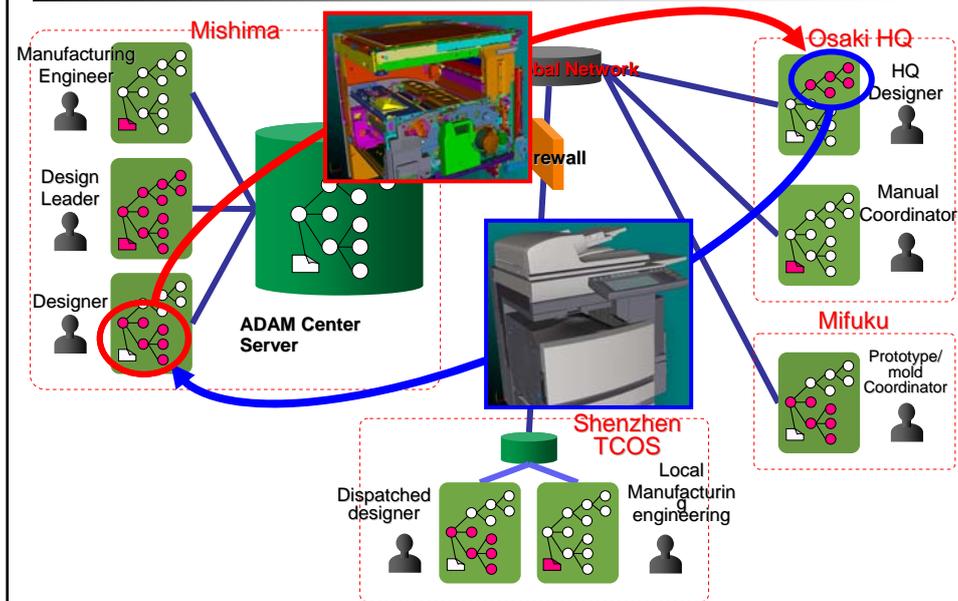
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## Design Collaboration through ADAM

- ▶ Even with a leased line, a direct CAD connection between remote sites is impossible for practical purposes
  - ▶ This has only become possible through ADAM's collaboration feature
- ▶ Required functionality for design collaboration
  - ▶ WAN-compatible framework
    - ▶ Distributed server feature supporting low-speed, low-quality connections
    - ▶ Recovery processing features for lost connections
  - ▶ Large-scale database framework
    - ▶ Large-scale database capable of stably managing all parts of all products
    - ▶ Able to process simultaneous access from large number of users
  - ▶ Security assurance framework
    - ▶ Login via password
    - ▶ Framework includes role-based access privileges

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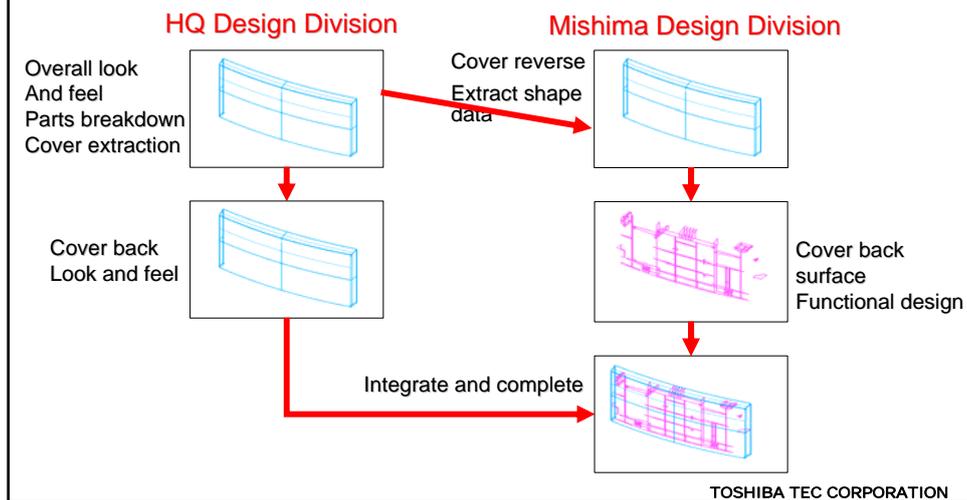
## Design Collaboration through ADAM



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## Design Collaboration through ADAM

- ▶ We have reformed the division of labor for cover design between design divisions, based on collaboration via ADAM



## VDR via ADAM

- ▶ **VDR: Virtual design review (= DMU)**
  - ▶ Detailed review of functionality, and ease of assembly, manufacturing, and servicing using only 3D data, before a prototype is made
- ▶ **Using Viewing Data (JT Data)**
  - ▶ A viewer application (Vis View) is used rather than a CAD system
    - ▶ People involved in the project from other divisions want to view 3D data on an ordinary PC
    - ▶ CAD file sizes are too large, and there is no freedom to display all parts.
  - ▶ ADAM automatically converts CAD data to JT data
    - ▶ Automated nightly conversion keeps the latest data available at all times
    - ▶ Published to each division using ADAM's collaboration feature
- ▶ **Creation of dedicated VDR room**
  - ▶ 4 screens and 4 dedicated VDR PCs permanently installed in dedicated room
    - ▶ Large-scale VDR gathering all involved divisions (materials, manufacturing, service, etc.)

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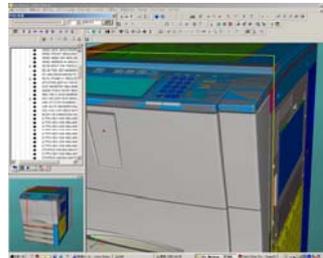
## VDR via ADAM

### ▶ Example of VDR

A VDR (defect review) in action



Description of the overall device configuration



Serviceability simulation

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C:\Program Files\Toshiba TEC\ADAM\ADAM.exe

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## Drawing Reform through ADAM

### Role of drawings for remote-site (China) production

#### ▶ More important

- ▶ Drawings are the repository for design information on site
- ▶ Drawings are not supplemented by added information via human relationships
- ▶ Can't be expected to appropriately re-interpret drawings based on understanding of intentions

#### ▶ Requires longer lead time

- ▶ Progress at each stage is slowed. This makes it necessary to get the drawings at an earlier stage

#### ▶ Getting a more accurate set of drawings out faster

- ▶ Release consistent drawings without contradictions
- ▶ The difficulty of correcting drawings once they have been released does not compare with the domestic situation

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## Drawing Reform through ADAM

### Main efforts to reform drawings through ADAM

- ▶ **Making configuration information more accurate**
  - ▶ Using PDM, integrate CAD configuration information (assembly information) with BOM configuration information, and centrally manage them.
  - ▶ Create a framework that makes it theoretically impossible for there to be inconsistencies between CAD, drawings, and configuration information.
- ▶ **Make single-part drawings more accurate, and automatically generate**
  - ▶ (Described later)
- ▶ **Make configuration drawings more accurate, and automatically generate**
  - ▶ (Described later)
- ▶ **eDrawings**
  - ▶ Change to an electronic drawing-release process, speedily releasing correct drawings in the correct combinations

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## Drawing Reform through ADAM

### Revise conventional drawing system based on PDM management

- ▶ **a. Complete switch to CTF drawings\***
  - ▶ Greatly reduce labor for drawing creation by switching to CTF for full drawings
  - ▶ Automatically create reference data to supplement non dimension-related portions, and release as pairs
- ▶ **b. Automate creation of drawing templates**
  - ▶ Automatically create drawing templates from attribute information
- ▶ **c. Reform of assembly drawings: Break into two components (drawing and configuration)**
  - ▶ Put configuration list inside assembly drawing into an independent drawing
    - ▶ From assembly drawing to drawing (assembly drawing, notes/instructions, etc.) + configuration sheet (configuration parts list in an Excel spreadsheet)
  - ▶ Automatically create configuration from ADAM configuration information
    - ▶ Automatically create information about differences from previous release (design changes), greatly reducing labor and typos

\* CTF drawing: Critical To Function drawing.  
Abbreviated drawing containing critical functionality and dimensions and only

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## Electronic drawing distribution system: eDWG

- ▶ Framework to establish strict drawing release process and data synchronization
- ▶ Reduced drawing-release lead time
- ▶ Framework to share documents, and prototype and other drawings

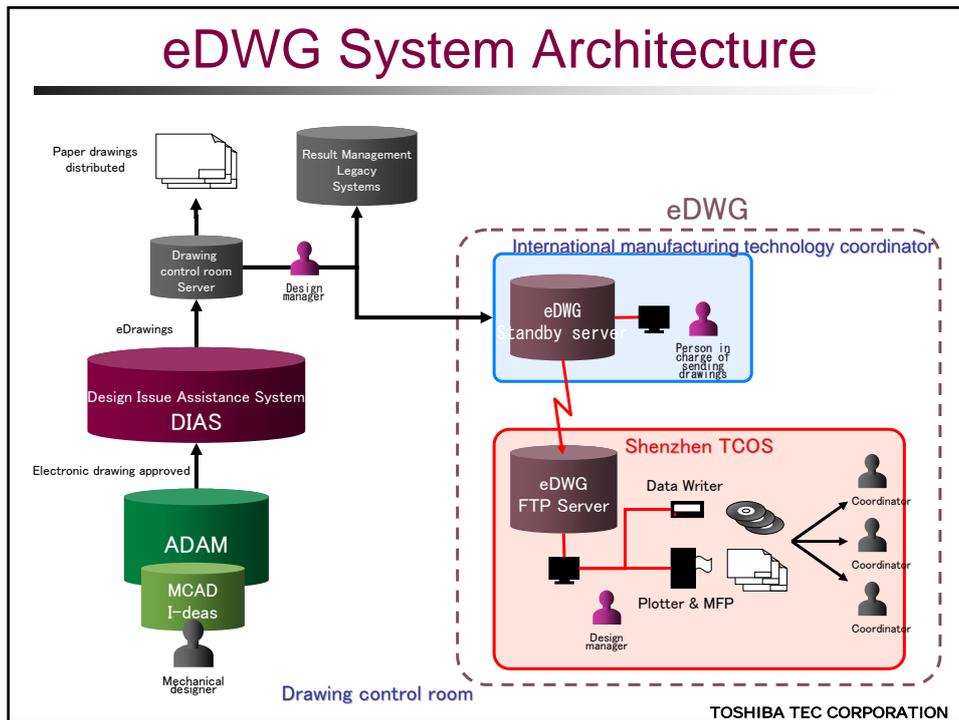
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## About eDWG

- ▶ A system to electronically send drawings released electronically by DIAS (Design Issue Assistance System) to overseas subsidiaries
  - ▶ Electronically sent drawings are printed out locally and distributed to coordinators
  - ▶ Reference data is synchronized with the drawings and sent together, then written to media locally
    - ▶ Example: Die procurement drawing & IGES data; ROM drawing & ROM data; ...
- ▶ Developed in house on FTP core
- ▶ Operating Status
  - ▶ 02-10-E: Trial operation started
  - ▶ 03-2-B: Formal operation begins with TCOS (Shenzhen)
  - ▶ 03-3: SARS outbreak
  - ▶ 04-3-E: Operation begins with TIM (Malaysia)
  - ▶ Data sent to date: Since going online, 513,000 drawings have been sent (as of end-Oct. 2005)

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# eDWG System Architecture



## Notes on eDWG

- ▶ Reduces the time it takes from drawing release to handing a valid drawing to the coordinator
  - ▶ The framework does not deliver electronic data; it ensures that paper drawings are delivered to the coordinator
- ▶ Architecture kept as simple as possible to avoid development costs
  - ▶ Does not use PDM; developed using general commercial application and Applet developed in house
- ▶ Extremely easy to use
  - ▶ A specialized UI is placed over the system; file and other system operations are completely hidden from the user
- ▶ The system prevents the re-use of electronic data locally
  - ▶ Separate from the ordinary local LAN
  - ▶ Local operators print out documents without ever touching a file
  - ▶ After printing, the sent data is deleted; data does not remain on the local computers

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## Benefits of eDWG

- ▶ **Lead time for releasing drawings to TCOS greatly reduced**
  - ▶ Reduced from maximum of 5 days before to maximum of 1 day (time between release of drawings by designer and local coordinator receiving the drawings)
- ▶ **Labor needed to send drawings overseas greatly reduced**
  - ▶ From two dedicated staff in the manufacturing engineering department to none (became part of other duties)
- ▶ **Large volumes of drawings released quickly and without errors**
  - ▶ Nearly no sending errors after sending about 3,000 drawings/month over three years
- ▶ **No customs risk**
  - ▶ Even something like a SARS outbreak would have no impact on sending of drawings
- ▶ **Releases accurately synchronize drawings with reference data**
  - ▶ Example: Die procurement drawing & IGES data; electronic drawings and PCB data; ROM drawing & ROM data; ...

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## From eDWG to eISSUE

- ▶ **System extended from simply sending electronic drawings to true electronic drawing release**
  - ▶ Plan to re-develop using application/extension of upstream PDM system: from eDWG to eISSUE
- ▶ **Improved productivity at overseas subsidiaries**
  - ▶ Will be handed by one division at overseas subsidiary: Encourages effective use of electronic data by overseas subsidiaries.
- ▶ **Support for tighter security**
  - ▶ Data transactions collected and managed in a detailed log
    - ▶ Retrieve evidence of who accessed what information, when, and for what purpose
  - ▶ Detailed access control using PDM's role, privilege, and permissions features
- ▶ **Lays foundation for elimination of drawings**
  - ▶ Communicate design information directly to the system without using medium of drawings

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Multi-site/multi-party electronic conference system: **eMTG**

- ▶ Framework to share documents, and prototype and other drawings
- ▶ Framework for effective communications close to face-to-face

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## Need for eMTG

- ▶ E-conferences supporting multiple participants needed in order to improve the precision of multi-site collaboration
- ▶ There are many restrictions with conventional teleconferencing, preventing free rollout

Teleconferences:

What we want to do

- |                                     |  |
|-------------------------------------|--|
| ▶ Require leased line (ISDN)        | ↔ Use the Internet                           |
| ▶ Cost a lot for connections        | ↔ Use any time without worry over cost       |
| ▶ Require dedicated fixed equipment | ↔ Use P2P DTM                                |
| ▶ Have no document-sharing feature  | ↔ Sharing documents is the main purpose      |
| ▶ Based on two-way conferencing     | ↔ Have multi-way conferences with many sites |

- ▶ We have decided on an e-conferencing system that uses the Network

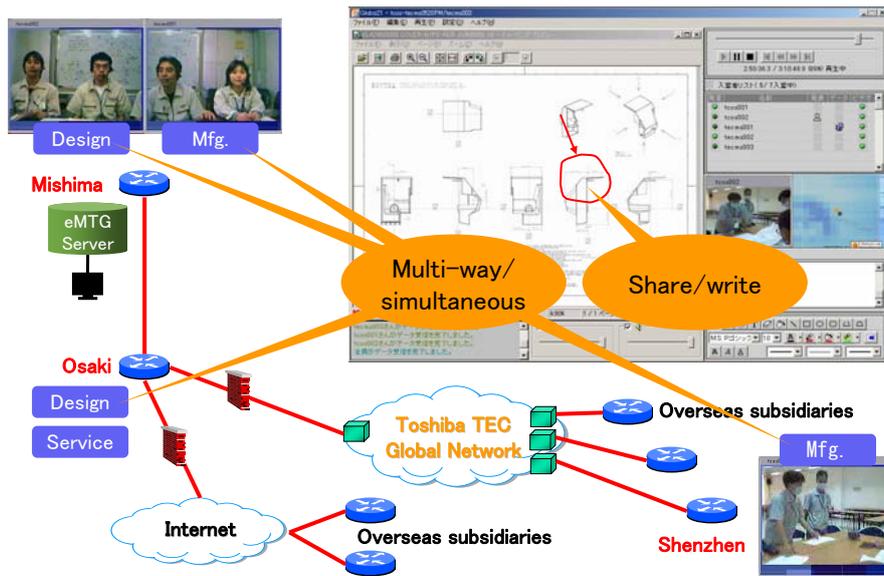
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# About eMTG

- ▶ We selected GloBiz21 from ISID as our tool
  - ▶ Using a proprietary CODEC, it has a small bandwidth footprint and is very secure
  - ▶ Document-sharing feature
  - ▶ High voice quality using voice-compression technology developed by KDDI
  - ▶ Up to 24 simultaneous participants, with recording, marking, whiteboard, and chat features
- ▶ Operating Status
  - ▶ 03-2B: Tool selected
  - ▶ 03-4M: Launched urgently between Mishima and TCOS due to ban on travel because of SARS
  - ▶ 03-8: Regular use between Mishima and Shiba (Tokyo)
  - ▶ 04-9: P2P online
  - ▶ 05-6: Online between Mishima and TABS (US), Mishima and WIPRO (India), and TABS and WIPRO

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# The eMTG Framework



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## Benefits of eMTG

- ▶ **Complete replace conventional phone conferences**
  - ▶ Eliminate prior distribution of drawings and arranging meetings via trial and error using documents and telephone (c.f. game "Battleship")
- ▶ **Reduce amount of travel and travel lead time**
  - ▶ Reduce travel expenses
  - ▶ Save precious designer time: Full 2 days to travel from Mishima to Shenzhen and back
- ▶ **Designers can release Chinese-style drawings while remaining in Japan**
  - ▶ Many drawing review conferences have been held using designers and interpreters, TCOS manufacturing engineers, and local die providers
  - ▶ Required revisions follow cycle of same-day change, eDWG release, and review at drawing review conference following day
- ▶ **Avoids/reduces country risk**
  - ▶ Prevented increase in losses due to travel restrictions from SARS (Mar. 03 to Sep. 03)

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## Issues for eMTG

- ▶ **Better image and sound quality**
  - ▶ Support for high image resolution/video
  - ▶ Clearer sound to make out intonation and inflection
  - ▶ Waiting for new high-quality, high-compression Codec like H.246
- ▶ **Easier setup**
  - ▶ Difficulties with basic PC setup and stability
  - ▶ Once a connection is made, there will at least be an image, the connection will not be lost, and will operate stably for the duration of the conference
- ▶ **More flexible security support**
  - ▶ Currently runs on leased line; no support for general Internet connections yet
  - ▶ Even if a system is installed in DMZ, cannot be fully supported with firmware settings
  - ▶ We are hoping for a smarter security mechanism

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## Conclusions

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- ▶ A success factor is to act with a story, and deploy simultaneously, rather than launching systems separately
- ▶ Goal was to create a smooth development cycle of release drawings, send drawings, and review drawings on site
- ▶ Rather than just improving speed, it is vital to also improve accuracy

After reaching an international division of labor for development, it is impossible to think of going back

In order to achieve this, the support of an IT system is essential

Rather than stay with the present system, we plan to continue to build on and improve the systems

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## Thank you

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Thank you for using Toshiba MFPs



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