

# Mask Automation: A Wafer Fab Perspective

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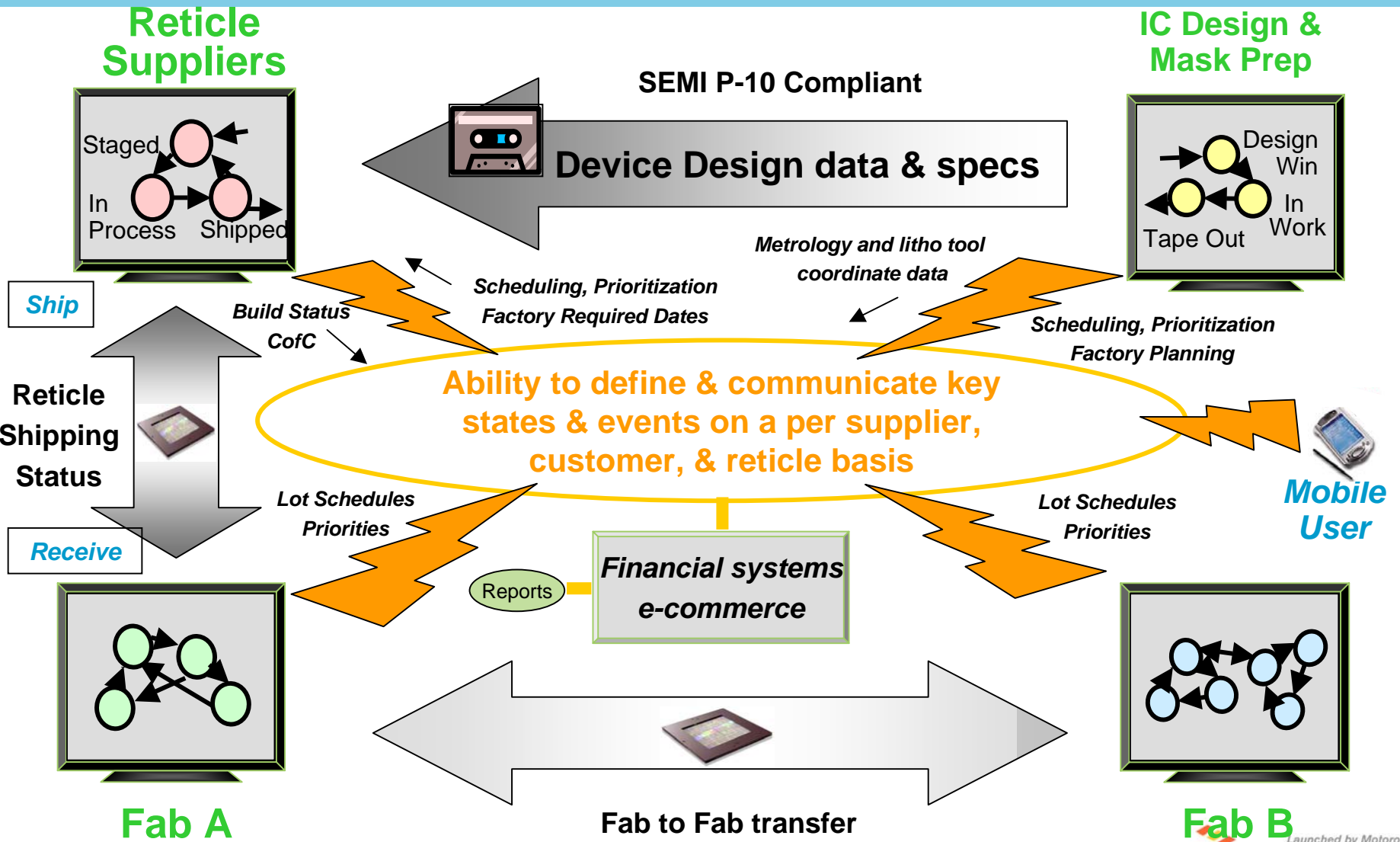
**Supply Chain Collaboration**

**Mask Shop to Fab Communication Requirements**

**Enterprise Level Reticle Management**

**Electronic Communication Protocols**

# Supply-Chain Collaboration Requirements



# Mask Shop to Fab Communication Requirements

## Fab Needs (From Mask Shop):

1. **Order confirmation**
2. **Manufacturing status & delivery prediction (ETA)**
3. **Manufacturing data (metrology & inspection data)**
4. **Quality audit information**

## Mask Shop Needs (From Fab):

1. **Forecast**
2. **Prioritization of orders & WIP (Centralized)**
3. **Special requests or measurement requirements**
4. **Actual fab reticle required date (lot arrival, any early requirements)**
5. **Delivery confirmation**

# Order Confirmation

## Order acknowledgement

## Commercial terms

- Price
- Order specification
- Committed delivery date

## Data preparation results

- % Clear
- Data error notification (gap/sliver, missing data, unresolved data)

# Manufacturing Status & Delivery Prediction (ETA)

## Mask shop process step

- **Litho, Write, Etch, etc. + Chrome or psm process loop**
- **Metrology & inspection**
  - CD
  - Registration
  - Pre-pell inspection, post-pell inspection

## Delivery Prediction (ETA)

- **Current: Subjective estimate**
  - Order entry (based on history)
    - > 50% confidence (~ best case, very early)
    - > 90% confidence (~ slightly early)
    - > 99% confidence (~ due date)
  - ETA estimate / delivery window estimate (in-line feedback + history)
    - > Best case (no issues)
    - > Typical (typical repair, cycle time)
    - > Worst case (reject, major repair, tool issues, production backlogs)
- **How to make more objective?**
  - Simulation
  - Yield model
  - Statistic model
- **Factor in feedback from wafer fab on lot arrival or factory required date**

# Manufacturing Data (Metrology & Inspection Data)

## Metrology

- **Example: CD, Registration, Phase angle, Transmission,**
- **Possibly: key process data**
- **Multi-site measurement results**
  - Engineering requested data: Typically needed early
  - Normal production data: Archival purposes
  - Is data specification based or information only?

## Inspection

- **Inspection results**
- **Inspection tool settings**
- **Classification results**
- **AIMS results**
- **Marginal or questionable defects (customer notification)**
- **Opportunities?**

## Certificate of Conformance (CofC)

### Waiver request

- Data package supporting waiver
- Waiver approval audit trail

# Enterprise Reticle Management Requirements

**Reticle Asset Sharing, Location, Usage, and Availability Status**

**Inter-company, Inter-fab Reticle Lifecycle Tracking**

**Store Fab Technology and Product Capabilities**

**Store Supplier Performance Data**

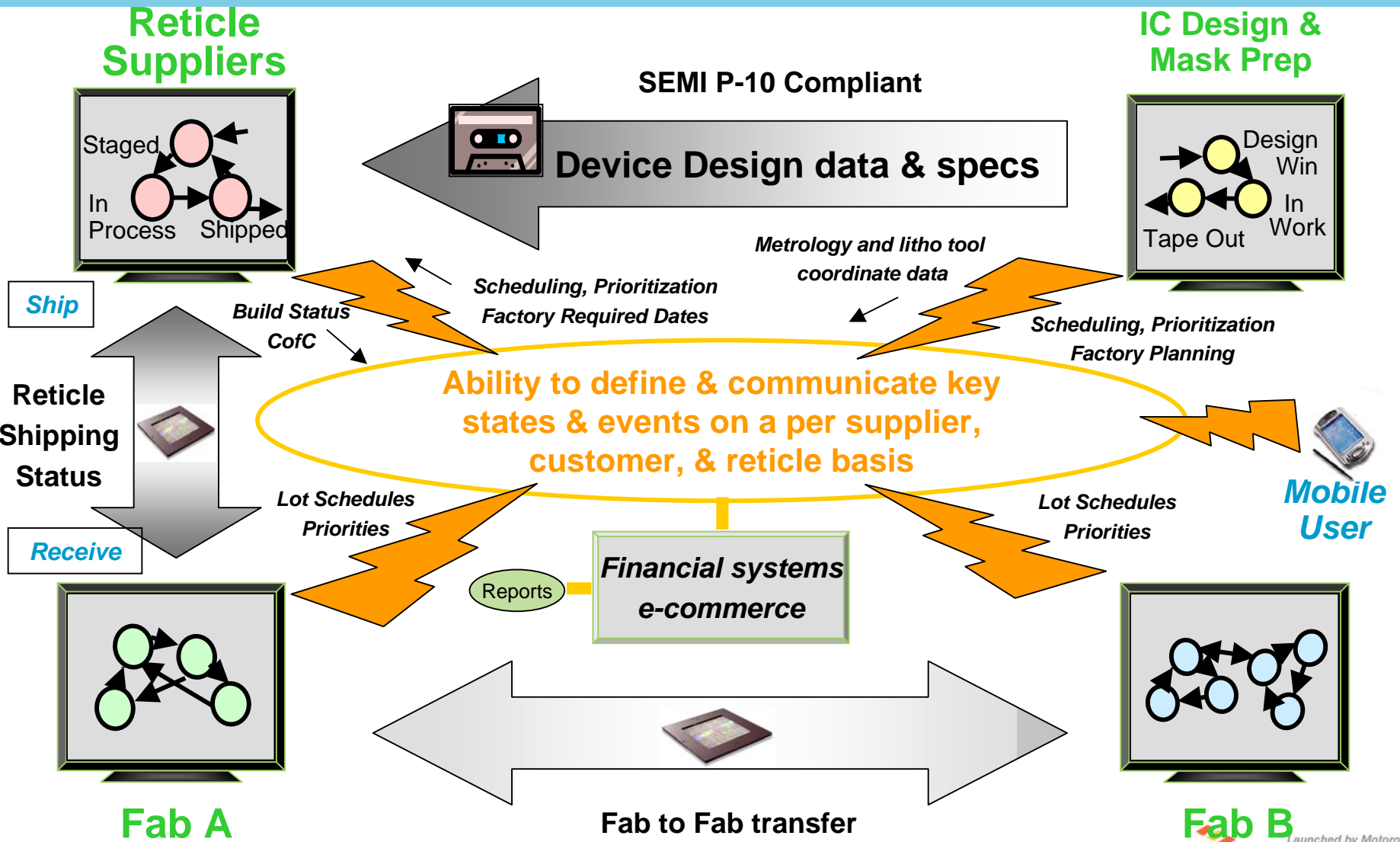
**Waiver Repository**

**Visibility of Design Win Pipeline**

**Reticle Order Forecasting**

**Enterprise-wide Reticle Analysis & Reporting**

# Supply-Chain Collaboration Requirements



# Information Transfer Alternatives

Alternative	Pros	Cons
Email Parsing	<ul style="list-style-type: none"> <li>• Universally supported &amp; understood</li> <li>• Firewall independent</li> </ul>	<ul style="list-style-type: none"> <li>• Delivery not guaranteed</li> <li>• Subject to content corruption</li> <li>• Parsers required at each end to automate</li> </ul>
Web Connect (Eg, Web Server).	<ul style="list-style-type: none"> <li>• Browser-based client UI</li> <li>• Higher reliability than email</li> <li>• Can leverage advances in web technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Some firewall challenges</li> <li>• More complex implementation</li> </ul>
Third Party Application Service Provider	<ul style="list-style-type: none"> <li>• Enables pooling of subscriber inputs for analysis</li> <li>• High reliability</li> <li>• Outsourced support &amp; maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Complex to manage X different customers with X different state models, X different measurement and custom field configurations and, possibly, X different language needs.</li> <li>• Steep development curve due to need for completely different database, GUI, and database.</li> </ul>
Ftp Transfer Site	<ul style="list-style-type: none"> <li>• Ease of use. Familiar technology.</li> <li>• Great for the sender as they don't have to reshape their data into XML.</li> </ul>	<ul style="list-style-type: none"> <li>• Does not guarantee adherence to SEMI P-10 or other specified data structure.</li> </ul>