

半導體生產自動化與 智慧工廠

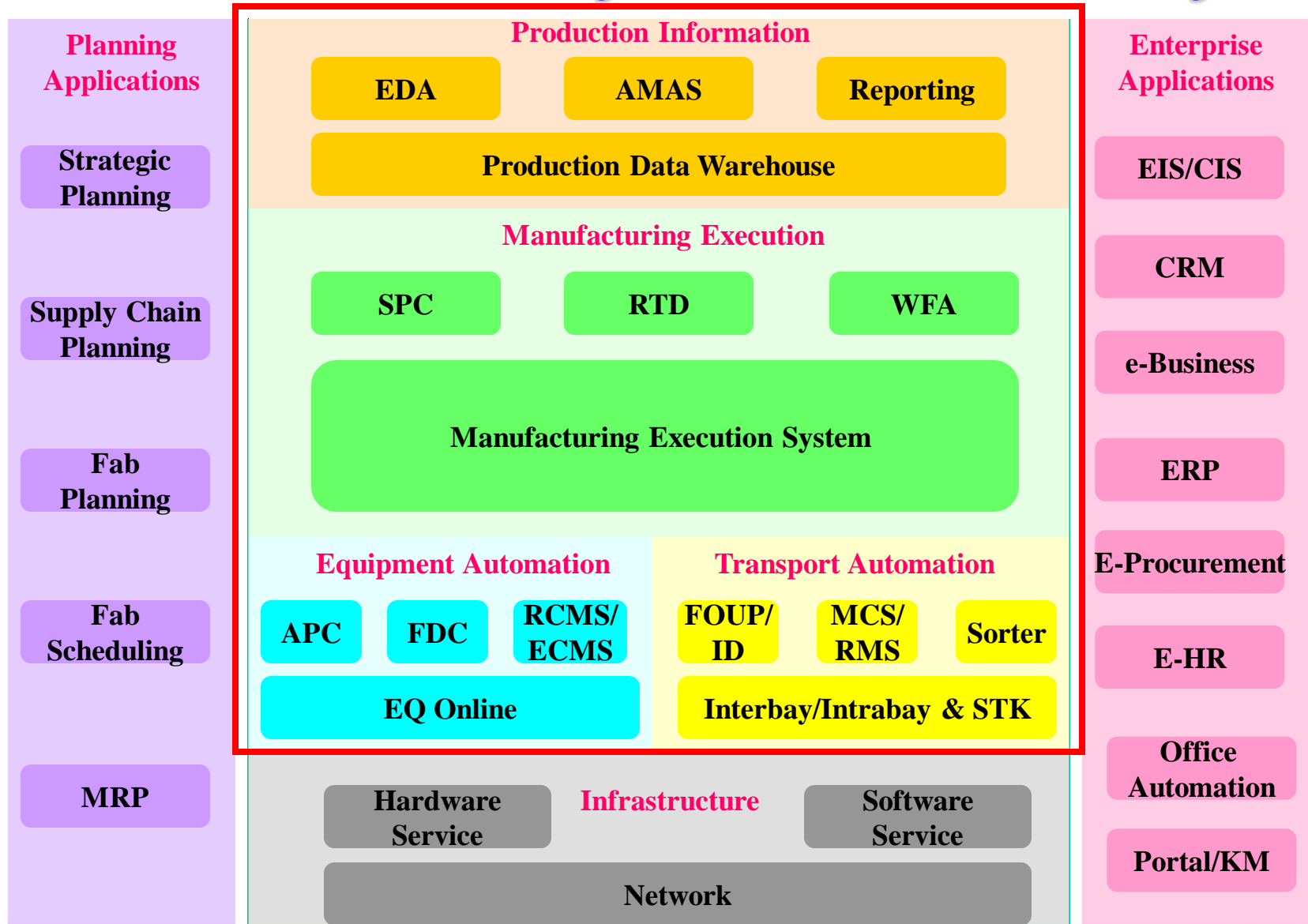
UMC/IT 王邦明

5/22/2012

Contents

- 半導體產業資訊系統
- 半導體生產自動化系統
- 半導體智慧工廠的需求
- 半導體智慧工廠的新挑戰

Information System of Foundry



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Production Automation Introduction

- ❑ to **replace all human operations** and decisions by means of computer hardware and software.
- ❑ to develop **intelligent systems** which can simplify human works.

Major Benefits:

1. Eliminate the **human operation** cost in Fab
2. Increasing the **throughput** and reducing **cycle-time**
3. Help **yield** control and advanced process development
4. Support more **flexible and complex** manufacturing operations
5. **Optimizing and standardizing** business process to reducing waste and miss-operation



Production Automation Scope

❑ Operation Automation

❑ Replace Human Efforts

**=>Reduce HR Cost, Reduce M/O,
Improve CT, Improve Productivity,
Increase MM ratio**



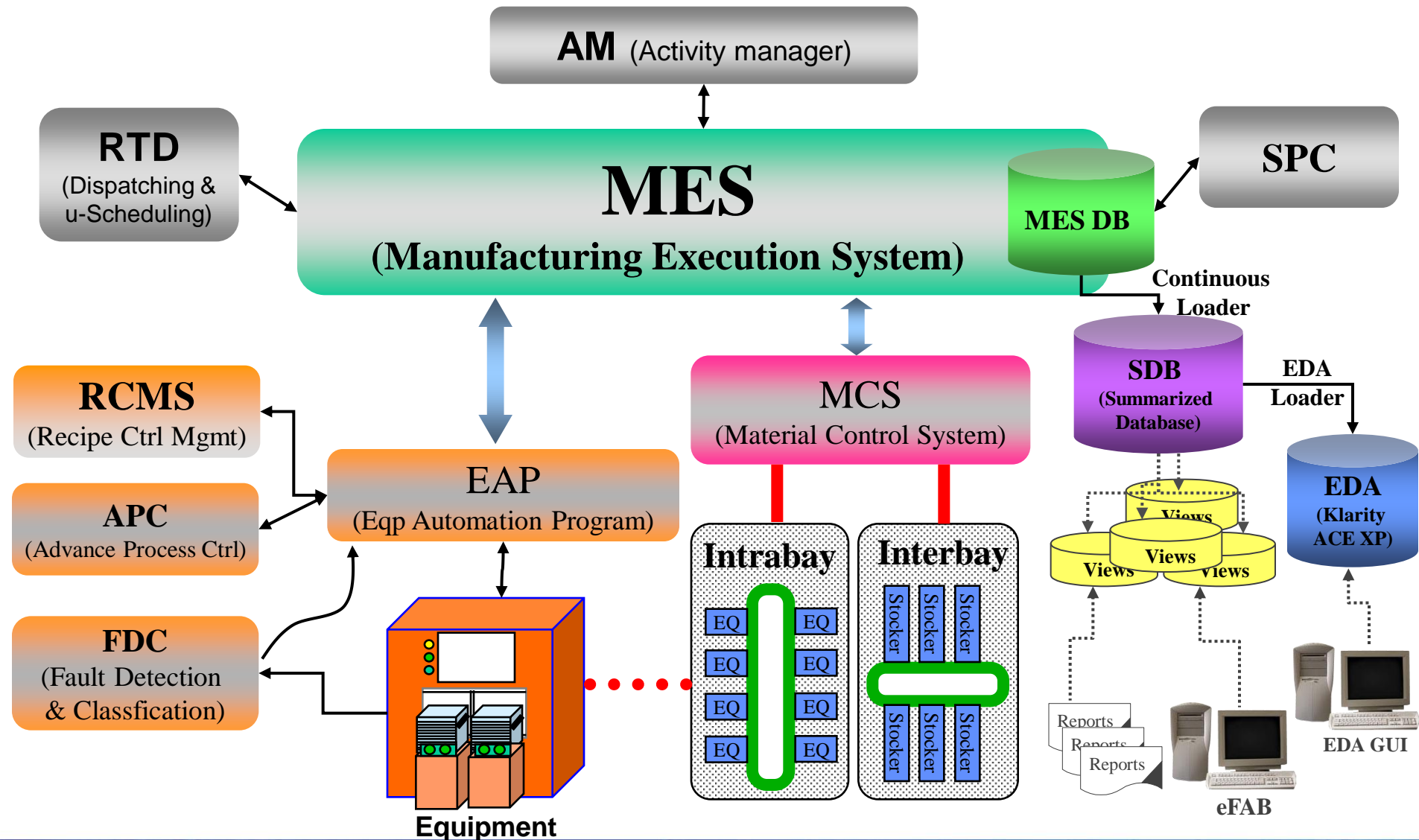
❑ Engineering Automation

❑ Support Engineer do job better and smarter

**=>Sustain EQ variance, Improve
quality, Yield, Support RD, Reduce
Engineering Cost, Improve Time-to-
Market**

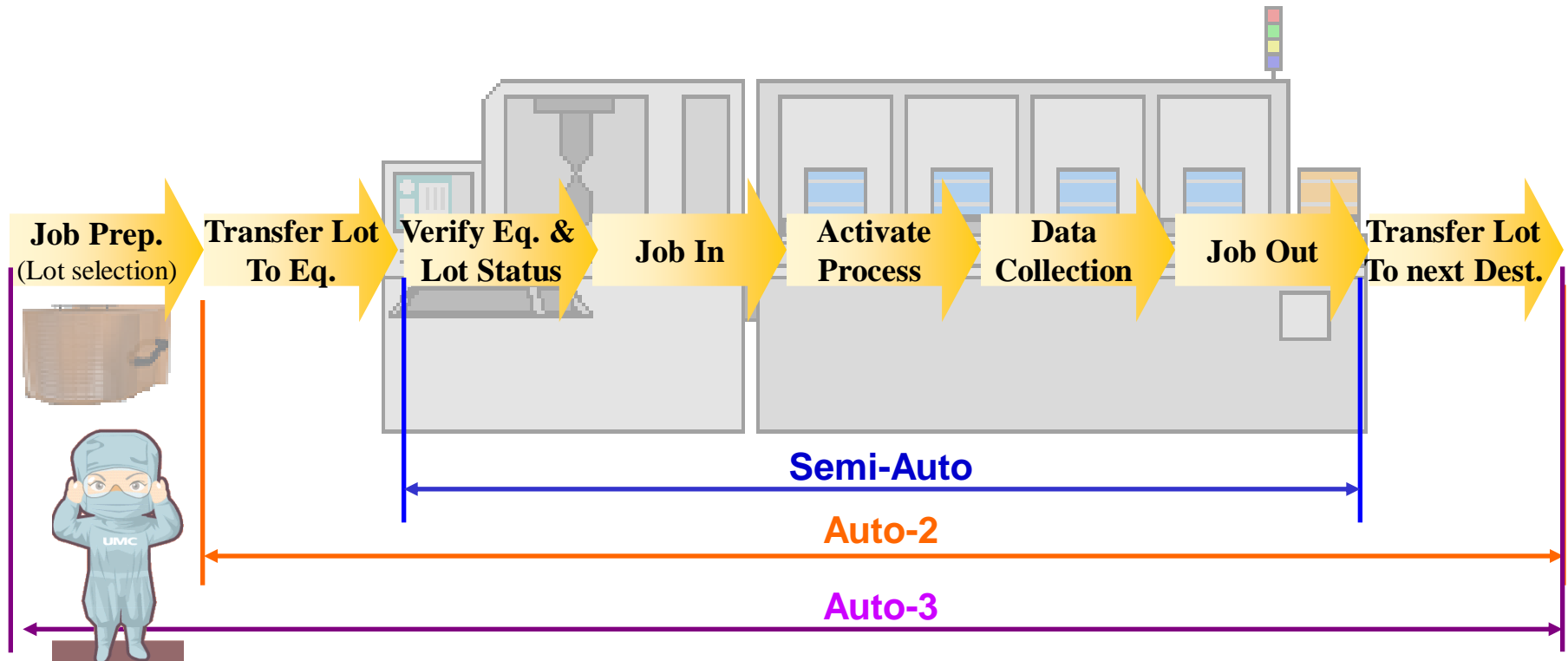


CIM System Overview



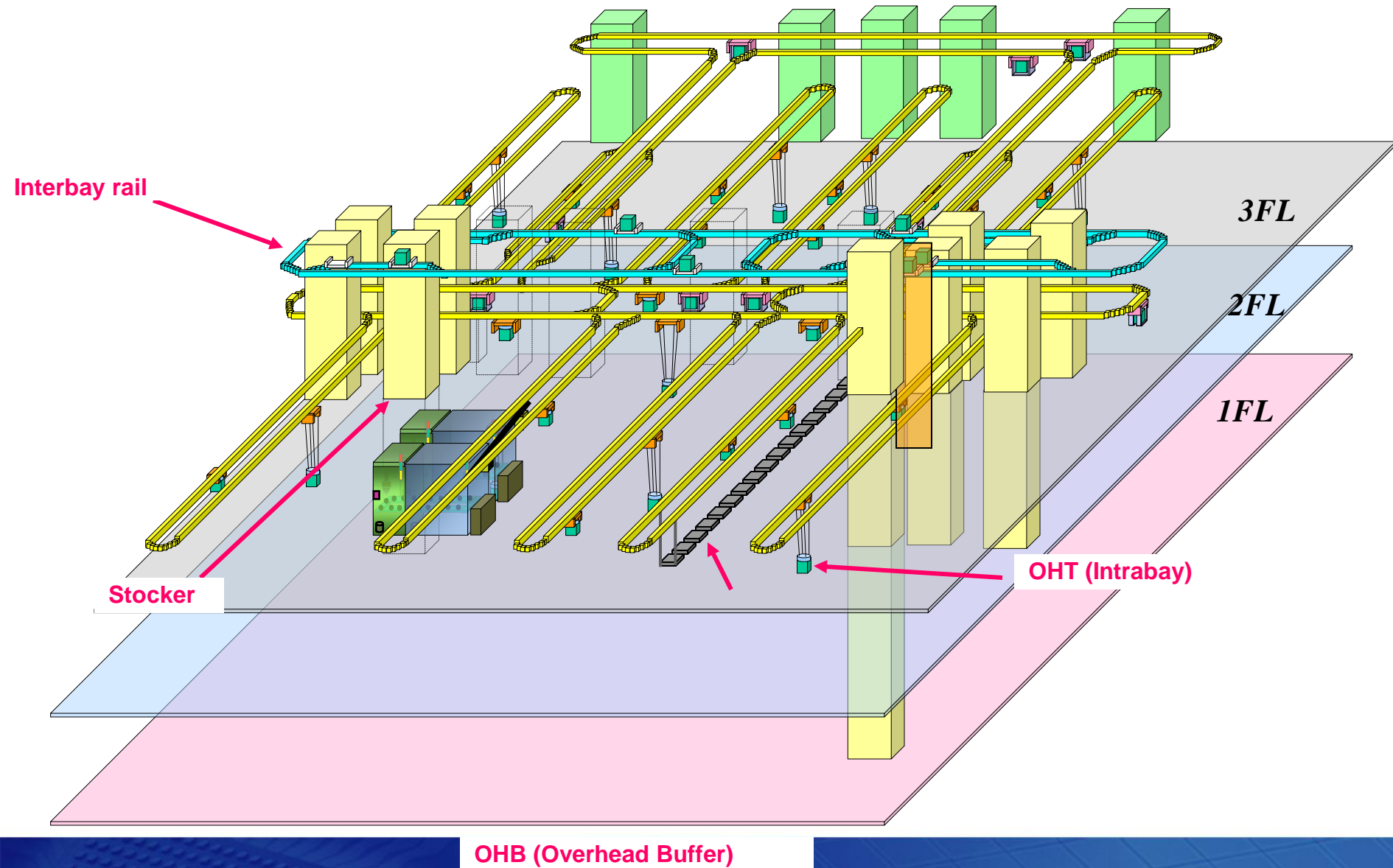
Operation Automation

Definition of Automation Modes



	Job Prep.	Transfer Lot to Eq.	Verify Eq&Lot Status	Job In	Start Process	Data Collection	Job Out	Transfer Lot to next Dest.
Manual Mode	Human	Human	Human	Human	Human	Human	Human	Human
Semi-Auto Mode	Human	Human	System	System	System	System	System	Human
Full Auto-2 Mode	Human	System	System	System	System	System	System	System
Full Auto-3 Mode	System	System	System	System	System	System	System	System

Automatic Material Handling System



Engineering Automation

Automatic Engineering System



**Micro-view
Historical Analysis**

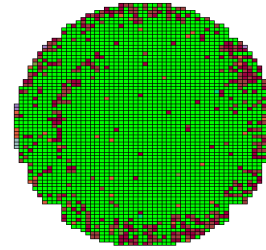
**Real time
In site Control**



Offline

FDC

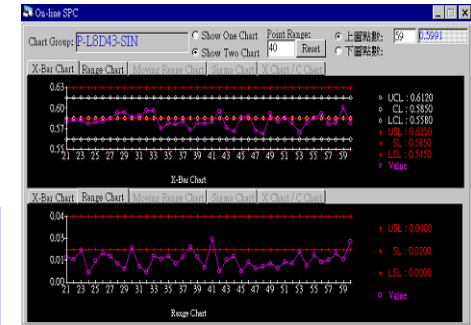
Online



A9256-06

EDA

PRODUCT=AL0055
PROCESS=AL0050
TEXT_PROG=MQC_PDA
GROUP=DIE-2017
GOOD_DIE=2113
wafer1>=83.28%
wafer1L1>=00.00%
wafer1L2L1>=00.00%
wafer1L2L2>=00.00%
wafer1L2L3>=00.00%
wafer1L2L4>=00.00%
wafer1L2L5>=00.00%
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wafer1L2L99>=00.00%
wafer1L2L100>=00.00%



**Historical
Engineering Data
Analysis**

**Process Control
via previous
processed results**

**Process Control
via past data**

Avoid Human MO

APC

CMP
APC
PH APC
ETCH
APC

SPC

Product
SPC
Monitor SPC
WAT SPC
EQ SPC
FE SPC

Equipment Automation

Intelligent Factory

Achievement of FAB automation Today

High product mix
operations enabled
using automation

Pervasive use of Standards for
carriers, equipment interfaces,
and software systems

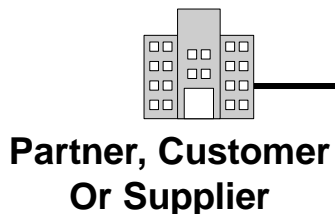
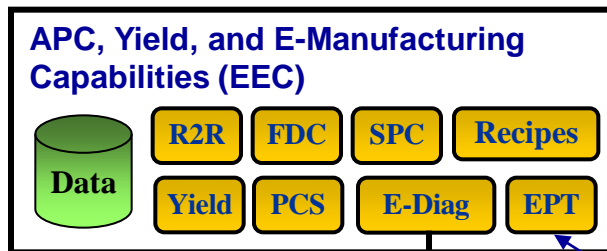
Some Wafer Level Tracking &
Recipe/Parameter Changes

Very high use of APC and
Yield systems

Aggressive focus
on lot cycle time
reduction

100% AMHS
Storage and
Intrabay Transport
Systems in place

FOUP carrier
tracking using ID
tags at load ports



Some use of
E-Diagnostics

Most equipment data
feed through SECS/GEM
& IF/A communications

Equipment Performance
Tracking (EPT) Data

Factory Scheduler
And Material Control

On-line Equipment
Control Systems

Manufacturing
Execution Systems

Systems Scaled
for > 100k

All lots and wafers
tracked and processed
using the MES

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半導體智慧工廠的新挑戰

- ☐ Predicable PM
- ☐ Virtual metrology
- ☐ Waste Time reduction
- ☐ Material consumption
- ☐ Intelligent Data mining

Q&A