Supply Chain Optimization in an Outsourced Environment
Agenda

- NVIDIA overview
- Intrigo overview
- Context
- Modeling vendor capacity
- Data maintenance challenges
- Beyond supply commitments…
FACTS

Founded in 1993
Jen-Hsun Huang is co-founder, president, and CEO
Listed with NASDAQ under the symbol NVDA in 1999
Invented the GPU in 1999, shipped more than 1 billion to date
FY13: $4.3 billion in revenue
5,500 patents issued, allowed, or filed
Ranked #6 “greenest” company in America by Newsweek
Headquartered in Santa Clara, CA
End-to-End Visual Computing
About Intrigo

We are a solution provider of Business Applications focused on orchestrating Customer Value Networks in the changing SAP Enterprise technology landscape.
Intrigo Systems’ Clients

“The ability of Intrigo’s leadership team to execute in a complex, multi-party environment directly contributed to the success of our project.”

-- John Hanna,
Director - iPlan Project, Clorox

“Intrigo's deep industry domain knowledge and their expertise in SAP made for an effective implementation of our Business Systems. Their commitment and focus to making us successful make Intrigo a key partner for Aptina.”

-- Joe Passarello, CFO, Aptina Imaging
Supply Planning Cycle

Customer / Sales Monthly Cycle

Field Sales Forecast

Fiscal Sales Plan

Demand Planning (Sales & Business Units) place a demand on Operations

SAP/ APO System

Planning commits supply to specific dates, recorded in SAP

Boards Supply

Chips Supply

Supply is Updated Weekly

Demand

APO System

Supply Planning Cycle
Outsourced Supply Chain

- Engineering/NPI
- Wafer Foundry
- Assembly
- Distribution

Locations:
- Santa Clara
- Hong Kong
- TSMC
- SCK
- Amkor
- SPIL
- ASE
- KYEC
Design Guiding Principles

• NVIDIA manufacturing flows are “typical” semiconductor

• Goals: no planning in Excel & improve the data quality
  • Master data must be capable of being easily maintained
  • Master data must be transparent for other NVIDIA teams to use

• Part numbers must represent form, fit, and function

• Results must be explainable to executive management

• Models must enable inventory postponement strategies

• This became an opportunity for Finance to make improvements as well
MODELING VENDOR CAPACITY
Capacity Alignment

- NVIDIA provides long range forecasts (12-24 months)
- Monthly, NVIDIA provides a rolling forecast (> 6 months)
- NVIDIA places purchase orders as required

- Vendors respond with capacity commitments
- Vendors respond with a commitment and efficiency opportunities
- Vendors respond with acknowledgements and delivery commitments

- Weekly meetings review WIP, efficiency, flexibility, delivery status, & action plans

- Quarterly Business Reviews scrutinize results, goals, & improvement plans
Weekly Communication Routine

- Each week, a plan is collaboratively prepared that documents daily loading plans for the next two weeks.
  - By device, allocated capacity and throughput assumptions are transparently shared by vendors.
  - Planning priority is to align daily loading & capacity to achieve a standard cycle time.
  - Expedites are requested prior to shop floor WIP release.
  - Mix can be changed daily, by mutual consent.

- Performance metrics trigger improvement actions:
  - Daily delivery to plan
  - Max cycle time by lot
  - Equipment efficiency vs. plan
  - Performance to expedite requests
Efficiency is Actively Managed
Planning Solution Overview

- **Wafer planning by SAP APO Optimizer**
- **Custom UI for Data Management**
- **Configuration planning by SAP CTM**
DATA MAINTENANCE CHALLENGES
Today’s Planning World

APO adoption challenges

Master Data maintenance challenges

Managing changing business models

Continuous feedback and what-ifs

Explain and interpret the planning results

Sustainability of the solution

Leads to:
- Abandonment to offline systems
- APO functions only as a data repository
- No trust in any system or numbers
Key APO Challenges

Master data maintenance
It take a tremendous amount of effort to manage Master Data across multiple systems; e.g., APO, ECC, BW

Lack of ‘explainability’
Inability to bridge between planning runs; i.e., what changed

Lack of ‘usability’
Poor planner user experience coupled with a long learning curve
What is PDMT?

- Planning Data Master Tool
- A layer of software that sits on top of APO
- User friendly interface
- Allows changes to capacity and planner priorities
- Integrated into APO for data consistency
- Manages input data into a weekly/monthly buckets
### Master Data & Planning Parameters

<table>
<thead>
<tr>
<th>Master Data</th>
<th>Fact Based</th>
<th>Examples:</th>
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<tbody>
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<td></td>
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<td>- Product gross weight</td>
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<table>
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<th>Planning Parameters</th>
<th>Strategy &amp; Outcome</th>
<th>Examples:</th>
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<td>- Capacity algorithms</td>
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<td>- Consumption mode</td>
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Both are central to planning practices, but reside across multiple systems.
**BOM Example, Time Phase Settings**

![Image of Planning Data Management Tool > Bill Of Material Maintenance](image)

**Time-phased parameters**

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BOM Example, Time Phase Settings

Time-phased parameters

Product Group: FGP  Product Family: IN04

Input Component: Attribute Type

- Header Only
- Exclusion TP
- Priority TP
- Down Binning TP

Bill Of Material Maintenance

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Constraints & Consumption

Secondary constraints

Planning Data Management Tool > Resource Consumption

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Maintain Consumption

Operation: SLT
Resource Group Code: Select

Global Value Range

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BEYOND SUPPLY COMMITMENTS
SAP Served as a Foundation

- Supply commits were captured within SAP.
- All capacity was calculated in Excel.
- Priorities were kept in human brains.

DATA

Unit Demand → Product Assumptions →

NVIDIA in 2011

SAP Models

RESULTS

Supply Commit → Maximum Supply Bucket
SAP Can Now Be Exploited

Supply commits and all factory loading are planned within SAP.

Proving to the organization that assumptions can be wisely used.

DATA

- Unit Demand
- Product Assumptions
- Material Strategies
- Demand Priorities
- Capacity Assumptions
- Factory Strategies

OPTIMIZER

- CODE
- SAP Models

RESULTS

- Supply Commit
- Maximum Supply
- Constrained Supply
- Scenarios—What-if’s
- Execution Instructions
- Transparent Assumptions
Transparent Information

Priorities
- Demand
- BOM
- Loading strategies

Rules
- SKU selection
- NVIDIA practices

Strategies
- Buffer stock
- Factory loading
- Substitution

- Time phased data
  - Yields
  - Equipment availability
  - Daily device throughput

- Time phase priorities
  - Product
  - Demand segmentation
  - BOM
  - Routing

- Max and minimum volume constraints
Thank You