VAVE Applied in Electronics Contract Manufacturing Services

ELECTRONICS MANUFACTURING SERVICES

Communications • Computing • Multimedia & Consumer • Industrial & Semiconductor • Defense & Aerospace • Medical • Automotive

By:
Pierre Marquis, Project Manager, VAVE

Toronto CSVA Conference

October 28th, 2008

Agenda

- Introduction
- Sanmina-SCI Corporate & Canada Overview
- NPI and VAVE Definitions
- VAVE Concept
- VAVE Process Applied to NPI
- NPI VAVE Case Study – Image Processing System
- NPI VAVE Case Study – Battery Pack
- Re-design Case Study – Optical Circuit Card
- VAVE Case Study – Ethernet Switch M/B
- NPI Case Study in Packaging
- Conducting the VAVE Session
- Question Period
- Back-up slides: Supervisory Data Access Point Terminal
  - NEBS III Compliant HDSL Shelf

PLAYAWAY – NPI & VE BY SANM

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Introduction

Your Host - Pierre Marquis, Project Manager, VAVE

- Sanmina-SCI Canada since 1995
- Eng Manager
- Quality/Training Manager
- Quality/Store Manager
- Global Account NPI Manager 2001
- Project Manager since 2002
- 23 Years in Telecom Mfg, Electronics & PCB Fab
- Nortel, Bell Canada, Circo Craft, Toptech

- MBA (1999)
- B.Sc. Industrial Eng. (1985)
- VE training Feb. 1999
- VAVE Session Facilitator
- Six Sigma Black Belt (2005)
- Based in Montreal
- Member of CSVA

www.scav-csva.org

SCAV
CSVA
SOCIÉTÉ CANADIENNE DE L'ANALYSE DE LA VALEUR
CANADIAN SOCIETY OF VALUE ANALYSIS

SANMINA-SCI

Sanmina-SCI Corporate Overview

We focus on delivering the highest-level quality, technology and service to our customers.

- 27 years of operation
- $8 billion in annualized revenue
- 80+ plants in over 19 countries & 5 continents
- 13M ft.2 of manufacturing capacity
- 40,000 employees
- Market Focused Organization
- Total manufacturing solution

Sanmina-SCI Corporate Overview

Customer

Design and Engineering

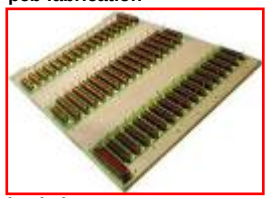
Total Solution for Our Customers

Customer

Logistics

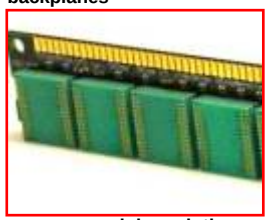
pcb fabrication

pcb assembly



backplanes

cables



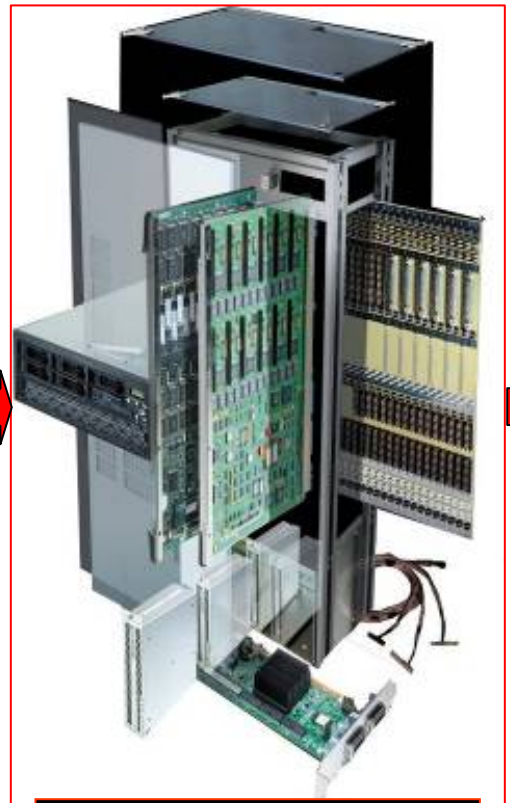
memory modular solutions

Plastic injection

precision machining

enclosures

Component Manufacturing



Systems Design and Manufacturing

Communications

Industrial & Semiconductor

Personal & Business Computing

Defense & Aerospace Systems

Computing & Storage

Medical Systems

Multimedia & Consumer

Automotive

Target End Markets

World-class Infrastructure Support Services: Supply Chain Management & Global Oracle ERP

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Sanmina-SCI Canada Overview

Sanmina-SCI in Canada

- Diverse solution
- Gateway to global services

Ottawa, ON

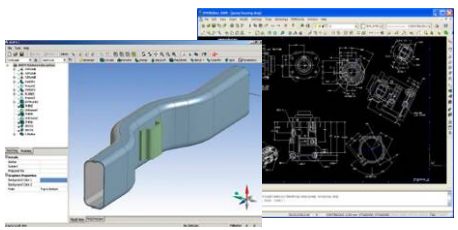
- PCB Assembly and Test / NPI Center
- System integration & test
- AS9100B Certified

Montreal, QC

- PCB Assembly and Test
- System integration & test

Toronto, ON

- Enclosure Design & Manufacturing
- System integration & test



Calgary, AB

- Design center

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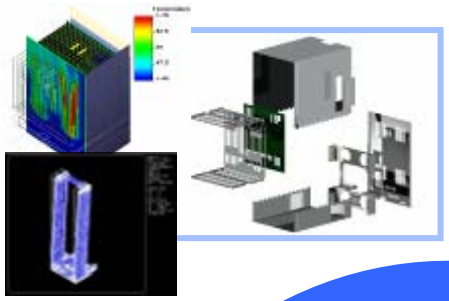
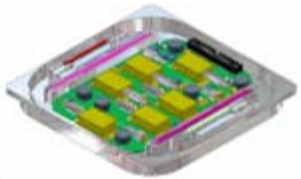
Sanmina-SCI Corporate Overview

End-to-End Design Engineering Services

Mechanical / Thermal Design.
Enclosure "Should cost" with Boothroyd-Dewhurst

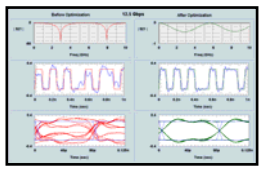




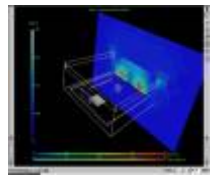
Optical Design

Test Development

Signal Integrity

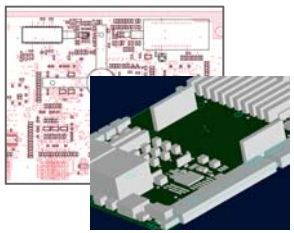


A Complete End-to-End Solution



EMC/EMI Engineering

Circuit Design



Reliability Testing HALT / HASS

DFx & VAVE Services

Product Integrity / Compliance

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NPI and VAVE Definitions

- NPI
- Involves new Form, Fit & Function Product
- One or many PCBAs
- Involves EMS DFx activities
  - DFM
  - DFA
  - DFT
  - DFD
  - DFSS
  - RoHS, REACH & WEEE
- May include enclosure (indoor or outdoor)
- Solicits Supply Chain Planning
- Includes Alpha & Beta Product Development Phases

- VAVE
- Value Analysis Value Engineering
- A methodology aimed at optimizing the value of a product or a process, existing or under development.
- It ensures maximum user satisfaction at minimal cost.

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DEFINITION OF VALUE

$$\text{VALUE} = \frac{\text{SATISFACTION OF NEEDS}}{\text{COST}}$$

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VALUE OF A PRODUCT

usage functions

esteem functions

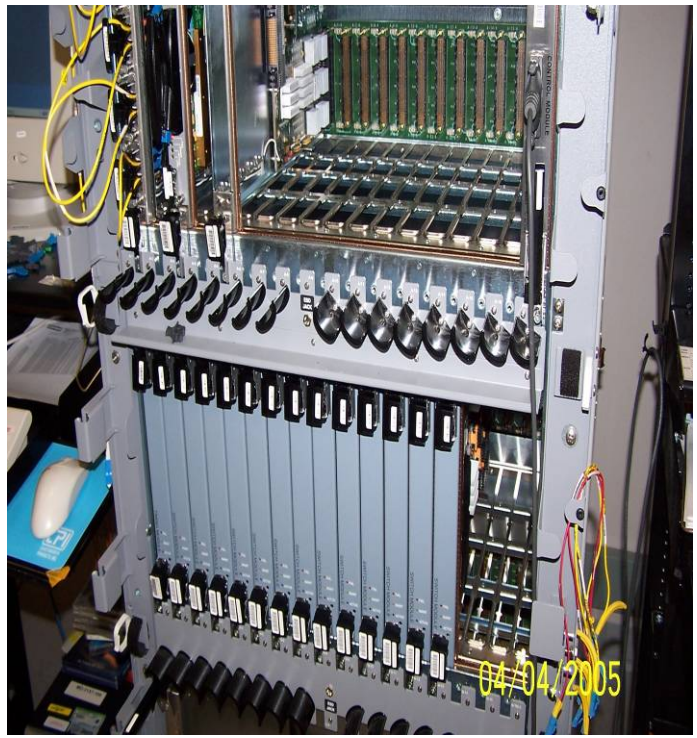
safety

reliability

maintenance

availability

comfort



development cost

design cost

manufacturing cost

operation cost

maintenance cost

disposal cost

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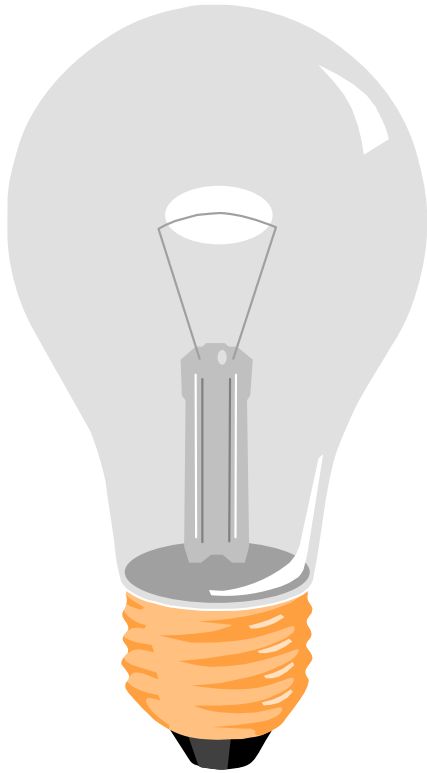
Benefits of VE

- Increased understanding of client's need and their relative importance
- Reduced cost
- More efficient team



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The multidisciplinary team

Is composed of a representative of all

the disciplines involved in the

subject being studied

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Building a team

VAVE for a Product at NPI Stage

- Accounting / Cost Prime
- Component Eng
- Design Engineers (hard. soft. electrical)
- Industrial Eng.
- Marketing / Sales
- Product / Quality Eng.
- Purchasing
- Test Eng.
- Moderator

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The VAVE Job Plan: 7 phases

STEP	WHEN vs SESSION
Organization	Before
Information exchange	Before
Function and cost analysis	During
Creativity	During
Evaluation	During
Development and Presentation	After
Implementation and follow-up	After

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Step 5 - Evaluation phase

SCORE MATRIX		
Difficulty	Benefits	Score
Low	High	4
Low	Low	2
High	Low	1
High	High	3

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NPI Case Study – Image Processing System

- Joint SANM/Customer VAVE Session
  - MAIN PROBLEMS / FACTS
    - Thermal issues with 1st proto
    - Actual cost is over target by 50%
    - Annual volume 1300 (yr 2)
  - SOLUTIONS from VAVE
    - SANM proposed thermal analysis
    - AVL Subs identified: $800k / yr CR
    - Use vacuum forming on cover: $200k / yr CR
    - PCBA re-design: 80% CR Potential (or $10M/yr)
  - **Potential Annual Savings: $11M (Payback Period < Two Months)**

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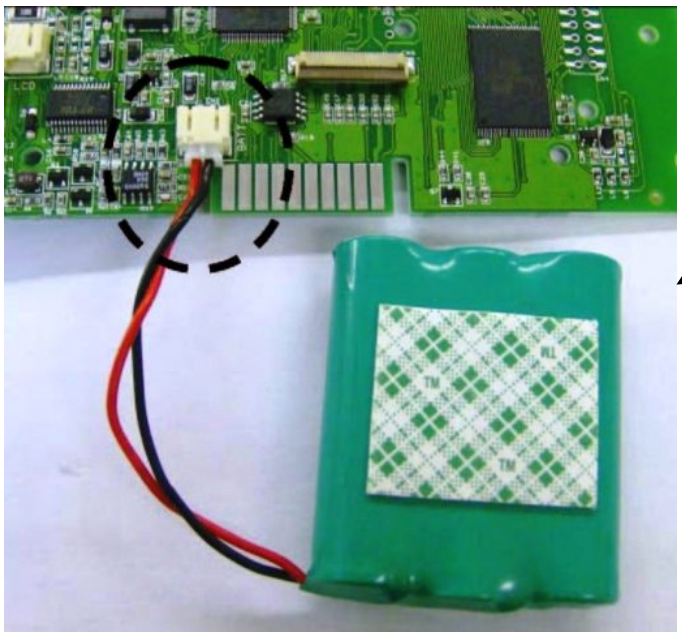
NPI Case Study – Battery Pack

JOINT SANM/OEM CUSTOMER VAVE SESSION (Jan 2008)

BEFORE (12 parts)

- Three AA Batteries
- Six Clips
- Three Shrink Tubes
- Five Minutes Assy Time



AFTER (2 parts)

- One Battery Pack
- One SMT Connector
- One Minute Assy

SAVINGS

- 59%
- Consumer Product: Will Generate Annual Savings > $1M

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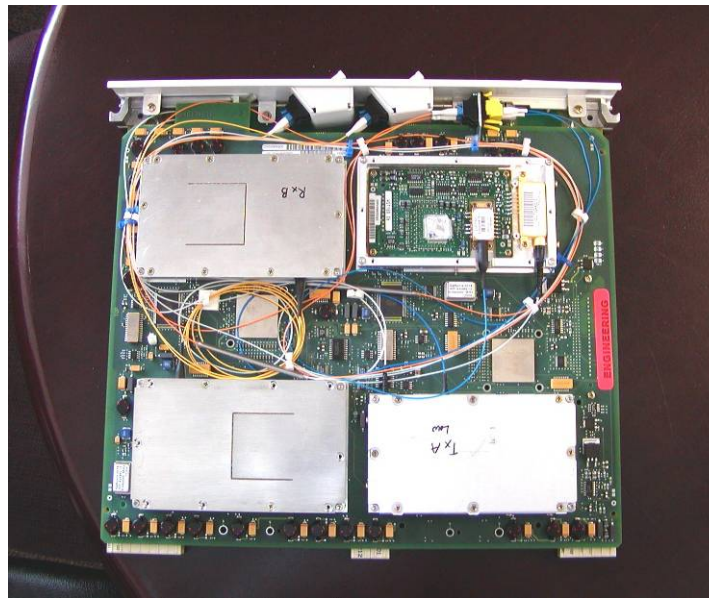
Re-design Case Study – Optical Circuit Pack

Map and Characterize the Product's Value Path Into Sanmina-SCI Technology: Opportunities Evaluated

- **Integration Of Optical Circuit Pack Main/Child/Mezzanine Cards Into Single 11x17 PCB**
- **Integration Of Optical Laser Transmit & Receive Daughter Cards Into Single 9x3.5 PCB**
- **Alternate AVL Optical Components**
- **Elimination Of Connectors**
- **Remove Delay Component Lines, Replace With Etch**
- **Substitute AVL Low Cost Parts (Oscillators)**
- **Substitute Power Bricks For Reduced Cost**
- **Replacement Of Obsolete/EOL Components**
- **Dramatically Improve Fiber Management**
- **Reduce In-Process And Field Failures With 100% DFT**

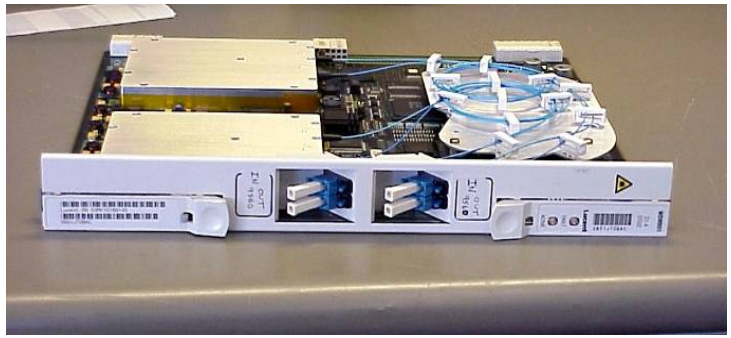


Before

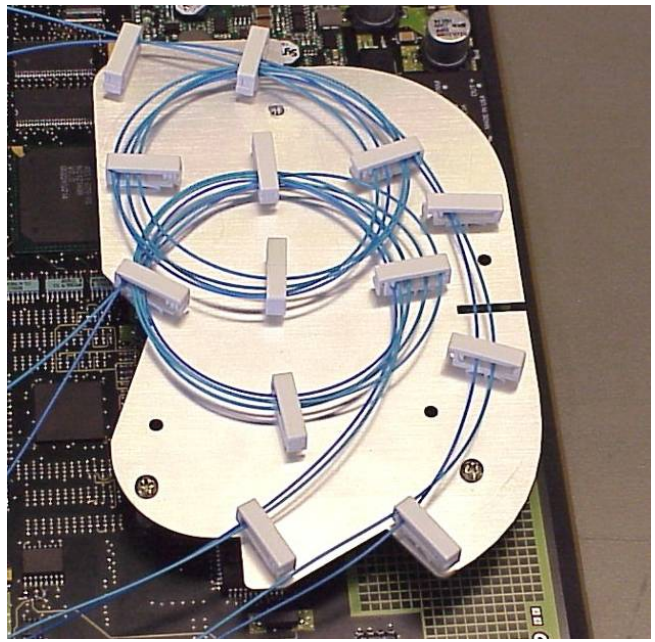
Re-design Case Study – Optical Circuit Pack

Result:

- **Integrated seven PCBAs into three**
- **Substantially improved thermal performance**
- **Provided base platform for product family reuse**
- **Six month elapsed time: concept – engineering - NPI to volume release**



After



Total Redesign Manufacture Cost Savings Exceeded 30%, per add/ drop pair!
Profit Margin Measured At Sales Increased By 18% Per Add / 22% Per Drop

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VAVE Case Study – Ethernet Switch M/B

- Joint Sanmina-SCI / Telecom Customer VAVE Session
- Protos Completed & Approved within 6 Months
  - Affected 15 parts on a Internet Switch Assy
    - Introduced Two New Memory IC AVL: 42% CR
    - Eliminated Three Temperature Sensors: 60% CR
    - Eliminated 4 unused connectors (over 15): 27% CR
    - Introduced a new Heat Sink AVL: 65% CR
    - Re-designed ship box packaging: 15% CR + Product Quality Improved
- NREs: $20K
- **Annual Savings Realized: $1.75M (Payback < One Month)**

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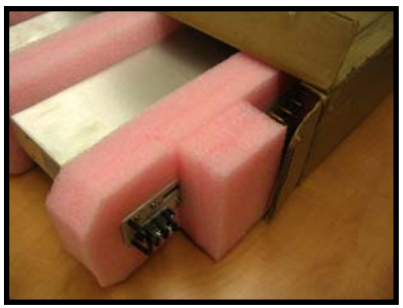
SANMINA-SCI Proposal on 1U Chassis Packaging re-design



ACTUAL DESIGN

Actual packaging consisting of :

-1x outer box, RSC 200BC, kraft, printed 1 color

-3x anti-static polyethylene foam end caps inserts

NEW DESIGN

Proposal packaging consisting of :

-1x outer box, FOL 275C,kraft, printed 1 color

-1x die-cut corrugated, 275BC, kraft, insert

- 1 ESD bag (not shown on picture)

PRICES (based on annual usage of 25k, 2000 per production – FOB Guad)

TOTAL	**TOTAL**
$7.40/kit	**$5.19/kit (-30%)**

SHIPPING BOX SIZE

20 1/8 x 4 7/8 x 19 ¾ (1.12cu.ft)

18 ¼ x 2 7/8 x 19 ½ (0.59 cu.ft.)

(-47% volume)

OTHER ADVANTAGES

-Less warehousing space if shipped flat

- Reduced logistics costs for Customer

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OVERVIEW of VAVE Process (26 wk)

▪Select VAVE candidates & Define scope;	▪ Week 1-2
▪Establish Team Members (Customer & SANM);	▪ Week 1-2
▪Prepare & distribute preliminary information	▪ Week 3
▪ Costed BOMs, AVLs, product flow chart, labor content	
▪Conduct VAVE session (one or two days);	▪ Week 4
▪ Establish cost by function, brainstorm on CR ideas	
▪ Produce VAVE report for follow-up	
▪Follow-up on CR ideas - weekly conf. Calls;	▪ Week 5-11
▪Write business case & Approve in SANM;	▪ Week 12
▪Present business case to customer for approval;	▪ Week 13-14
▪ Obtain P.O. for NREs (if applicable)	
▪Produce FPEs & Perform tests (ICT, FCT, PI, etc);	▪ Week 15-23
▪Implement design documentation changes	▪ Week 24-26

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Conduct VAVE Session (1 day)

- Introduction & Session Goal by animator;
- Presentation of PCBA (or enclosure) functions by customer designer;
- Presentation of mfg flow, labor times & quality issues by product eng;
- Presentation of major cost components by cost prime;
- Discussion on functions of major components & their worth, with customer designer;
- Brainstorm on CR ideas, capture of ideas by animator;
- Screening of ideas captured by team (score matrix);
- Do an action plan, including delegation of responsibilities;
  - Use of SANM, Excel forms developed for VAVE sessions
- Establish a schedule for follow-up (e.g. regular conf calls).

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CONCLUSION

- VAVE allows SANM's customers to increase their client's satisfaction, while reducing cost
- VAVE at Design & NPI stages ensures best ROI
- VAVE is indispensable in our global and competitive business environment

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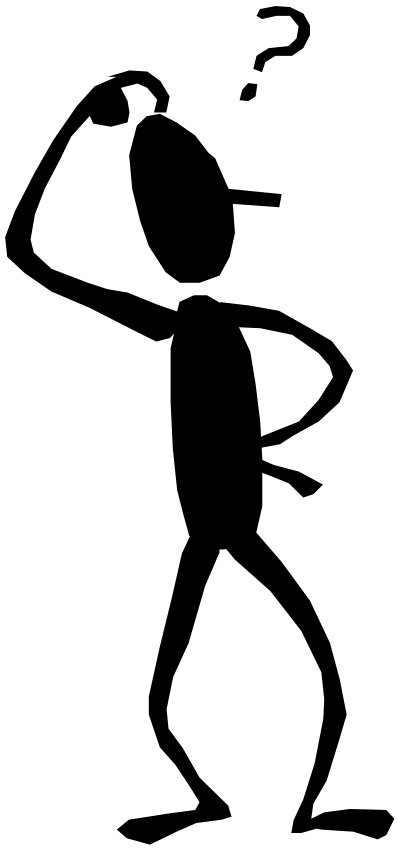
QUESTIONS ?



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MERCI !
THANK YOU !

REFERENCES

Source: Nguyen-Parrot

Lucie Parrot, ing. CVS

Techniques of Value Analysis and Engineering (3rd edition)

By Lawrence D. Miles

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NPI Case Studies

Supervisory Data Access Point Terminal and NEBS III Compliant HDSL

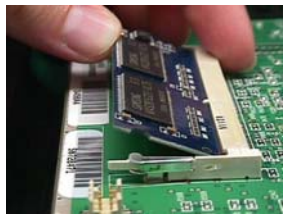
ELECTRONICS MANUFACTURING SERVICES

Communications • Computing • Multimedia & Consumer • Industrial & Semiconductor • Defense & Aerospace • Medical • Automotive

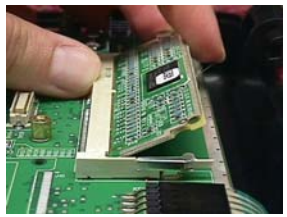
Supervisory Data Access Point Terminal Case Study

PCB Main & Reader

SDRAMM



SODIMM



Housing & Display

Annual Cost Reduction $1.8 M - $2.8 M Range
Based On EAU = 40K

DCR IDEA	Risk	Mitigation	Change HW	Change SW	PCB Spin	Value	$ Unit Est. CR
Housing Redesign	Low	Model & Prototype	Yes – I/O Plate Yes – Minor Tool	NA	NA	5 - 8%	1 - 2
Packaging	Low	Model & Prototype	Yes – Box/Inserts	No	NA	10 - 20%	1 - 2
Power Supply External Brick	Low - Med	Supply Chain	Yes – AVL BOM	No	NA	5 - 10%	1 – 2
Prox Reader PCBA	Low - Med	Design DFx & Prototype	Yes	No	Yes	25 - 30%	12 - 15
Display Assembly	Low	Supply Chain	Yes – Minor	No	No	10 – 15%	4 - 6
32 MEG SDRAMM	Low - Med	Design DFx & Prototype	Yes – Minor	No	Yes	40 – 60%	5 - 8
BOM AVL Suppliers	Low	Component Certification Quality Testing	No – Crosses Yes - Substitutes	No	Yes	5 – 10%	7 - 13
Retarget FPGA	Med	Component Engineering & Certification Testing	Yes – Substitutes	No	Yes	5 – 10%	8 - 13
SODIMM	Low - Med	Redesign Based On BOM Rev	Yes	No – FW Possible	Yes	25 – 35 %	6 - 8

Unit Cost Reduction $45 - $70 Range (15-25%) **ROI = One Business Quarter**

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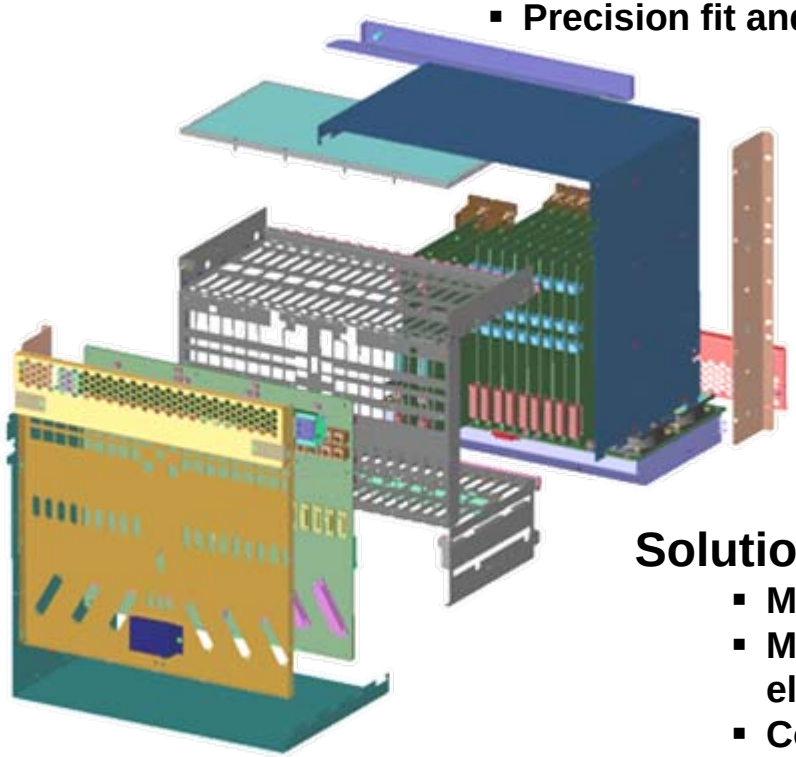
NEBS III Compliant HDSL Case Study

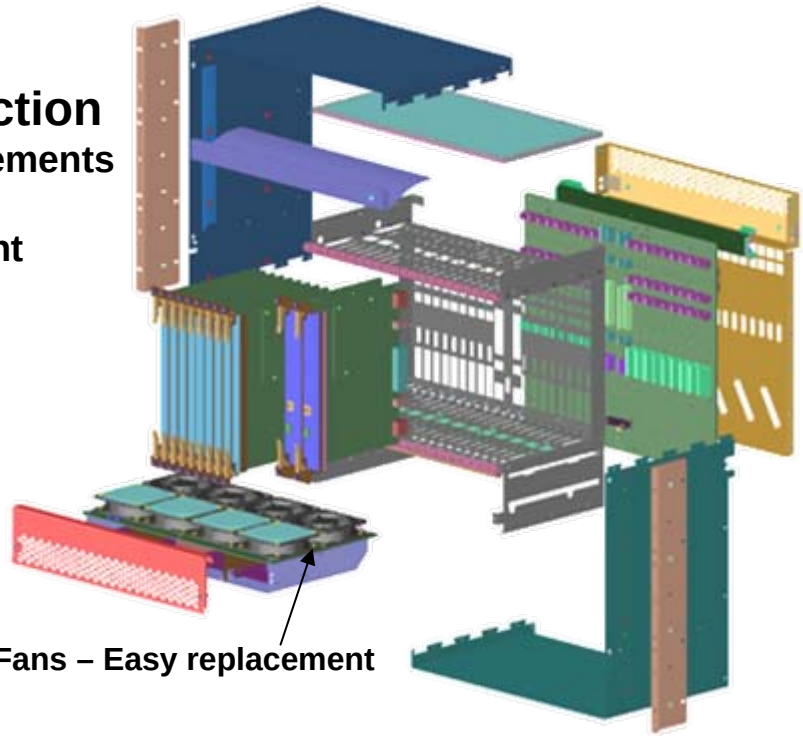
Telecom Customer Issues

- Sub-standard Thermal Performance
- High Cost
- Reliability

Solution: Shelf Construction

- Three major structural elements
- Unstressed backplane
- Precision fit and alignment





Pig Tails Fans – Easy replacement

Solution: Shelf Construction

- Minimal mechanical fasteners
- Mating attachment features avoids shear stress failure and eliminates gasketing
- Common LH/RH parts
- Formex Plastic sheets

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NEBS III Compliant HDSL Case Study - Result

Front

Back

Fully integrated NEBS III Compliant HDSL Shelf

- Sheetmetal enclosure (SANM Calgary Design, includes Thermal)
- High density Midplane – no cables required (SANM Salem Design)
- PCB/PCBA
- Cooling module
- Dual high current PIMs
- Material CR of 40%, Labor CR of 7%

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