
OFCNFOEC 2012
THE FUTURE OF OPTICAL COMMUNICATIONS IS HERE
Workshop on Optical Startups
- 10 Years After the Bubble
Wednesday, March 7, 2012
3:30pm - 5:00pm
Expo Theater II

OFC NFOEC 2012

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Despite the bubble, it is clear that photonics continues to depend on innovation, much of which comes from startup companies. At the same time, it is clear that VC companies are now focusing more on social media and software than on photonics or hardware. The question then is how to successfully start a company in this environment? This workshop will address that question by featuring a number of seasoned entrepreneurs who will share their story with a focus on lessons learned and practical do's and don'ts. The goal is to share valuable insights and tips that are useful for any entrepreneur wanting to start a company or in fact anyone planning to develop a new business. After the presentations, the workshop concludes with a panel session that will provide ample room for questions and answers.

Moderator/Organizer

Erik Pennings, GM and Principal, 7 Pennies Consulting

Speakers/Panelists

Terry Unter, President & GM, Optical Networks Solutions BU, Oclaro

Mani Ramachandran, CEO and Co-Founder, InnoTrans Communications

Alka Swanson, CEO, COGO Optronics

Y.K. Park, CEO, OE Solutions

David Welch, Founder, Executive VP, Chief Strategy Officer, Infinera

Handouts sponsored by a financial contribution
from Innotrans, 7 Pennies Consulting, OE Solutions, and Oclaro

InnoTrans 7pennies DEDICATED CONSULTING OE SOLUTIONS oclaro

Moderator/Organizer

Erik Pennings, GM and Principal, 7 Pennies Consulting

Erik Pennings started his career in R&D working at Bellcore (now Telcordia) and at Royal Philips Electronics where he pioneered several optoelectronic components and during which time he published around 70 papers.

In 1995, he moved to sales and marketing at Philips Optoelectronics, where he was responsible for the business development for WDM lasers, tunable lasers, and high-speed EML's. Partly as a result of the growth that was achieved, Philips sold this business unit in 1998 to JDSU for well over $1 billion. Dr. Pennings continued his career being responsible for sales and marketing at ThreeFive Photonics, which grew through a number of mergers into ASIP, then into Apogee Photonics, and finally into CyOptics. During this time, he grew revenues by 50% or more each quarter. In 2007, Dr. Pennings joined Eudyna Devices Inc. where has was responsible for marketing in the U.S.

In 2009, Dr. Pennings started his own consulting company (www.7pennies.com) specializing in sales, marketing, and business development. He is working with high-tech startups as well as large corporations in order to grow their business and/or by providing targeted advice.

Dr. Pennings has a M.S. in Physics (cum laude) from Groningen University, a Ph.D. (distinction) from Delft University of Technology, and an executive MBA from the Simon Business School in Rochester.

OFC Startup Workshop

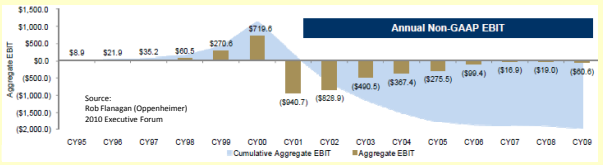
March 7, 2012

OFC'12 Startup Workshop

- Startups are exciting and inspire
- So here is your chance to hear from a number of seasoned entrepreneurs in the photonics space
- This workshop is the next in a series
  - There were workshops at ECOC 2001/02/03 (i.e. the bubble)
  - Workshop was restarted at OFC 2011 (10 years after...)
  - So some reflection is not inappropriate

The investment climate changed

Photonics as an industry is not returning money for investors



- It looks like there is more VC money now than in 2000
- But investors focus on other areas (e.g. web 2.0)
- However, there are attractive areas in photonics:
  - Silicon photonics, 100G, FTTH networks...

Current photonic startup climate

- Startups continue to raise money...
- And startups continue to make exits...
- Last year's workshop reinforced that image:
  - VCs do invest in photonics, but are more cautious
  - Photonic companies make acquisitions, but are more selective
  - Photonics industry innovates rapidly, often through startups

Workshop contents

- Great line up of speakers in this workshop:
  - Terry Unter (Oclaro)
  - Mani Ramachandran (Innotrans)
  - Alka Swanson (COGO Optronics)
  - Y.K. Park (OE Solutions)
  - Dave Welch (Infinera)
- Panel session
- Please note:
  - There are printed handouts
  - If you want a softcopy, please leave your business card
  - Discussion afterward encouraged, but exhibition closes at 5pm

Thanks!

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Speaker/Panelist

Terry Unter, President & GM, Optical Networks Solutions BU, Oclaro

Terry Unter is Executive Vice President and General Manager of Oclaro's Transport Systems Solutions business unit.

He assumed this position in July 2010 as a result of Oclaro's acquisition of Mintera Corporation (a leading supplier of high bit-rate optical transport solutions) where he was President and CEO from 2004 to 2010.

From 1998 to 2002, he was Chief Operating Officer at Corvis Corporation before which he served as Vice President of Global Optoelectronics at AMP Incorporated. From 1991 to 1997 he led the creation of Alcatel's Optronics subsidiary, where he served as its CEO based near Paris in France.

Earlier in his career Unter was General Manager of a joint venture producing telecom VLSI circuits in China and he also held various engineering and management positions with NorTel and Alcatel.

Unter holds B.Sc. (honors) and Ph.D. degrees in Electronic Engineering from Southampton University in the UK.

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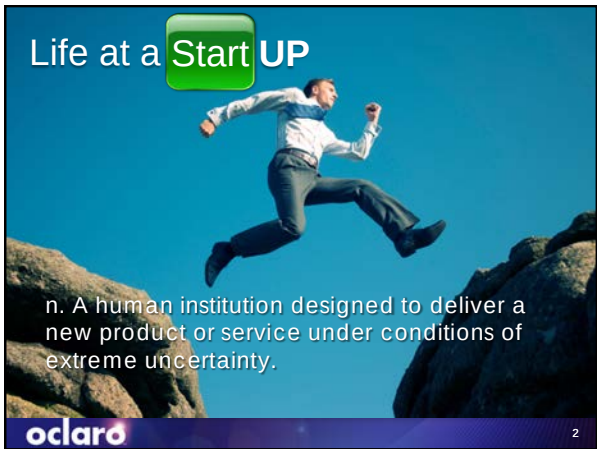
Shining light on photonic innovation™

Start-up Challenges in a Global Market

Terry Unter, President & GM Optical Networks Solutions
March 2012

Life at a Start UP



n. A human institution designed to deliver a new product or service under conditions of extreme uncertainty.

A Little Context

My 20 Years of Start-up Experience

MID 1980's
Engineering Director at Silicon IC Fab start-up in Belgium
(subsidiary of Alcatel)
Alcatel-Lucent

1991 – 1997
CEO of greenfield Photonic Component start-up "Alcatel Optronics"
(wholly owned subsidiary of Alcatel)
Alcatel-Lucent

1980's | 1990's | 2000's | 2010

1989-1991
General Manager of Silicon IC Fab Joint Venture in China
...from empty building to shipping in volume

1999 – 2002
COO of "all optical network" start-up
(Corvis)
corvis

2004 – 2010
CEO of high bit-rate optical subsystems start-up
(Mintera acquired by Oclaro in July 2010)
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Four Key Pieces of the Puzzle

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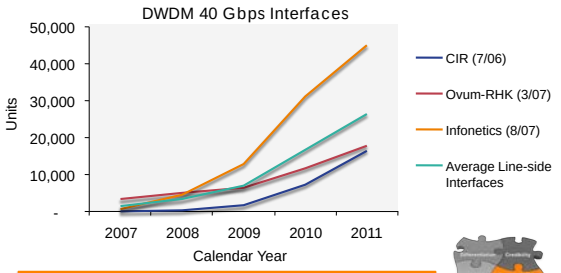
Market Forces

Market Forces

- NEED ...unmet by others
  - Ensure "need" is real and is unmet (don't blindly believe your own opinion!)
- SOLUTION ... for changing need(s)
  - Unique or order of magnitude better
- COMPETITION ...
  - Understand where a Start-up can compete and against whom
- GLOBAL MARKET ...Global presence is key
  - Partnering
  - Reps

Market Must Need the Solution
...Forecasts are Not Always Accurate!



2009 forecast increased > 5x in 12 months

Establishing Credibility

The Biggest Challenge for a Start-up

- Demonstrate relevant market experience
  - Trust gained over years of delivering similar products
- Solid management team a 'must'
  - Manage success as well as crisis
  - Well connected in the industry
- Known, reputable Investors and Board members
  - Key decision makers within their partnerships
  - Experienced, successful management

...REMEMBER

Establishing Credibility

...REMEMBER

Establishing Credibility

"A good name, like good will, is got by many actions and lost by one."
Francis, Lord Jeffery

Credible Supply Assurance

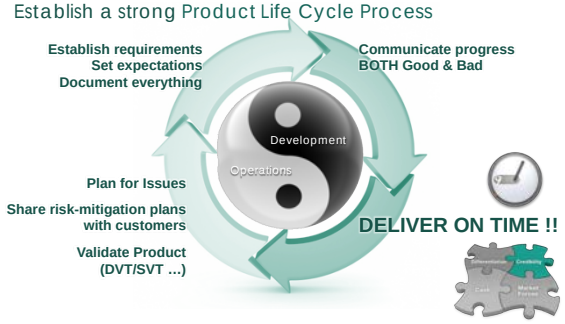
Output and In-feed

Market, sell & support products around the globe	Delivery Assurance (supply chain) is key
• Market globally with key end-users	• Diligent selection and management of suppliers
• Provide exceptional technical support	• Use an external competent and proven Contract Manufacturer
• Partner with an established company with global assets	• Partnering with well known and established suppliers
• Carefully chose representatives in key geographic locations where local knowledge is required	

Fulfill Your Promises

(Deliver a Product – That Works – On Time)

Establish a strong Product Life Cycle Process



Stand Out in a Crowd

- As competition enters the market it's critical to establish a clear, differentiated and protected position
  - Goal "Own an Unfair Share of the Market"
- Intellectual Property must be protectable and preferably extensible to additional products

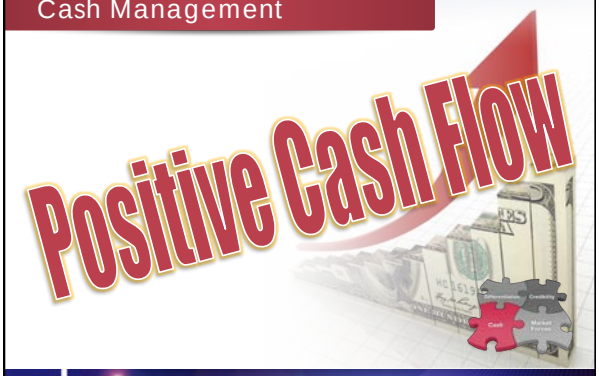
Quality Investors

- Investors should bring MORE than just cash to the venture
- Experience in
  - Corporate growth
  - Sales & marketing
  - Industry connections
- It helps if they have "Star Quality" too

Cash Management

- Cash is the lifeblood of a start-up
- Cash management and value management go hand in hand
- Each funding round providing a path to the next phase of a company's life cycle
  - Series A: Proof of Concept / Lead customer engagement
  - Series B: Product development / Initial revenues
  - Series C: Operations Expansion
- Prime goal for today's start-ups is to hit …

Cash Management



Plan for Life After Cash Flow Positive

- Success isn't achieved at "positive cash flow"
- Sustained profitability requires two constants

1. Driving for cost reduction
2. Staying ahead in the market

A Start-up Story

- Target a market where product differentiation offers financial advantage
- FOCUS on getting product out and winning key customers
- Credibility is EVERYTHING (team, investors)
  - Best possible Management Team
  - Investors
  - Working solution on time
  - Supply assurance is as important as specs and price (perhaps MORE!)
- Differentiate and protect your corner
- Plan for longevity (cash)
- AND ….

…and don't **forget**

Thank You.

"Entrepreneurship is the pursuit of opportunity without regard to resources currently controlled."

Professor Howard H. Stevenson
Harvard Business School

Speaker/Panelist

Mani Ramachandran, CEO and Co-Founder, InnoTrans Communications

Mani Ramachandran started his career after Graduate studies in Electro-Physics and is credited with many of the major innovations in the optical access market over the last two decades. These include the first analog 1550nm Externally Modulated transmitters and EDFAs in the early 90's at Optical Transmission Labs where he was the president. These inventions have formed the cornerstone of all the long reach analog transport for the last 18 years, and have also enabled video delivery over FTTH networks. Under his technical leadership, the company, renamed Synchronous, introduced innovations like AGC EDFAs and analog DWDM networks, leading to an acquisition by Motorola in 2002 for $265 M. His team was also instrumental in enabling the first DWDM Video on Demand (VOD) networks for the CATV industry.

After heading the Optics Center of Excellence for Motorola in San Jose from 2002 to 2005, Mani Ramachandran formed InnoTrans in 2006 to address the newly emerging bandwidth constraints in the CATV networks. At InnoTrans, Mani Ramachandran has revolutionized the CATV optics industry by developing a chirp-canceled transmitter which has enabled entirely new optical access architectures. Mani Ramachandran has over a dozen key patents, and has also served on the OFC paper selection committee for several years in the mid 90's.

This Time it's Different!

InnoTrans

An Optical Startup for CATV

Presented by
Mani Ramachandran, Founder

InnoTrans Mission

- Revolutionizing CATV Optical Networks, while Co-Existing with Legacy Networks
  - Contradictory Nature of the "Message" to Startups is the Biggest Challenge in the CATV Space
  - No Appetite for Mass Changeover of Field Network Elements
  - ROI Determines Fate of "Controlled Revolution"
  - InnoTrans Solutions Allow Seamless Migration, Without Forcing Customer Network Changes – "A Crucial Factor"
- Solutions are Dramatically Better, While Being Cost Effective
  - Value Proposition "Our Electronics Can Save You up to 90% in Fiber Network Capex"

Background of InnoTrans

- Focus is on Access Market, Primarily CATV
- Self Funded, with a Team of Well Known Innovators
  - History of Past Success is a Great Benefit
- Customers are Tier1 & Tier2 CATV MSO's (Multiple System Operators)
  - Large Companies with Diverse & Changing Needs with Healthy Skepticism about Startups
- Industry Experience and Contacts to establish foothold
  - Small Community Shares Good & Bad Experience

Why CATV? Market Reasons

- Addressable Market is Large & Growing
  - CATV Optical Access Networks Dwarf all Others
  - The Optical Portion of CATV Network is Constantly Expanding in North America & Worldwide
- Stable Customers with Excellent Financials
  - Ever Increasing Customer Bandwidth Needs Drives Growth
  - 30% CAGR for Commercial Services – Top 3 MSO's had >$1B Revenue in 2011 Straining Current Optical Networks
- Complex Technology & Operations Create High Barrier to Entry
  - Industry Dominated by a Few Electronics, not Optics Giants
  - Biggest Competitor is the "Status Quo"

Why CATV? Technology Reasons

- The Bandwidth Explosion of the Access Network
- The Ever Increasing Fiber Portion of HFC Networks
- Existing Fibers Must Deliver much more Bandwidth
- Using InnoTrans DWDM Technology, the Capacity of Existing Fiber can be Multiplied Cost Effectively
- CATV Signals Require Very High Linearity & Good Crosstalk
- The Network Capacity Expansion will take Multiple Years & Solutions will have to Evolve as the Needs Evolve
- Each MSO will Choose Somewhat Different Strategies, but the Needs are Similar Enough that our Solution can be Universal

InnoTrans Key Milestones

Year	Technical Milestones	Company Developments
2006	– Developed Core Tech Chirp Cancelled Transmitter for CATV	– Formed Company – Developed Core Team – Identified Market Oppty
2007	– Added Product Features – Technology Demos – Filed Patents	– Trade Show Announcements – Established High Level Customer Dialog
2008	– Underwent Lab Trial – Completed Field Trials – Compliance Testing	– First Customer Shipment – First Profitable Quarter (Q4)

InnoTrans Growth Phase

Year	Technical Milestones	Company Developments
2009	– First OEM Trials – First FTTH Trials – Expanded Tech Team	– Added More Customers – Increased Sales – First Profitable Year
2010	– Introduced Additional Platform (TranScend) – First Customer Shipment of TranScend	– Sales Grew Significantly – Further Expanded Sales & Production Teams – Increased Profit
2011	– Introduced OSP Product Family & Return Path – Received Key Patents – Filed More Patents	– Signed Multi-Year Sole – Contract with Tier 1 MSO – Added Tier1 & Tier2 MSO's

InnoTrans Philosophy

- Innovation is Reason for Existence & Customer Feedback can be a Trigger
- Be Flexible, Especially with Respect to Timing
- Never Delay Decisions, but Constantly Evaluate Them
- Know Your Place in Food Chain & Add Value
  - As System Provider, Awareness & Detailed Knowledge about Components is Crucial
- If Possible, try to Start with the Most Stringent Customers on Your Initial Trials

InnoTrans : Crucial Success Factors

- Innovative Solution Addresses Today's Problems First
- Solution is Rock Solid – ASSUME NO SECOND CHANCES!
- Growth was controlled without undue pressure on development – Marketing and Sales added later
- Development Team was kept smaller than typical startup, keeping costs down during development
- Recession put customers in "Receptive" mindset
- Revenue Growth was sufficient but not too fast
  - Revenue too early is a Bigger Problem than slow growth
  - Every Shipment is a Legacy to be Supported Forever
- Getting Mindshare of Industry Technical Leaders

A Few Things A Startup Teaches One

- Impatient Innovators Create Startups
- But a Startup Forces One to be Patient
  - It is a Baby with Unpredictable Growth Spurts and Unexplainable "Failure to Thrive"
- Team Integrity is Key, as much as Funding
  - Grow Team Carefully – Slower Growth is Small Price to Pay
  - Ensure discipline, knowing productivity will drop
- Being Flexible & Dynamic can Compensate for Minor Mistakes which are Inevitable
- Technical Expertise is no Substitute for Market Savvy

InnoTrans

Thank you for your time!

Speaker/Panelist

Alka Swanson, CEO, COGO Optronics

Alka Swanson joined COGO Optronics in July 2011 from Princeton Lightwave (PLI) where, as the Chief Operating Officer, she led strategy and all operations. She established PLI as a leading defense subcontractor for imaging components.

Prior to Princeton Lightwave, Swanson was General Manager of the receiver group at JDSUniphase (JDSU).

Before JDSU, she was in charge of sales of marketing at EPITAXX where she grew a product line from zero to over $200M in sales. This growth resulted in the sale of EPITAXX, to JDSU. Subsequent to EPITAXX, Swanson was a member of technical staff at AT&T Bell Labs.

She is a graduate of Boston University where she received her Ph.D. in Physics.

Entrepreneurs:

Items to consider before launching a new venture

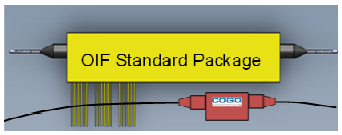
OFC Panel: 2012
Alka.Swanson@CogoOptronics.com

My background

- ✓ ATT Bell Labs: 1990-1995
  - Low Cost Packaging
  - High Temperature Superconductors
  - Voluntarily left Bell Labs in 1995, when it was not fashionable to leave big a company to go to a small company
- ✓ EPITAXX Inc./JDSU: 1996- 2002
  - EPITAXX was a $20M detector company when I joined in mid 90s
  - Started two new product lines at EPITAXX and drove our ascent up the food chain, achieving revenue run rates of $200M/year
  - EPITAXX was acquired by JDSU in 1999
- ✓ Princeton Lightwave Inc.: 2003- Now
  - Manufacturer of Sensors and Imaging InP Subsystems
  - Leader in 3D Time of Flight Imaging Cameras
  - COO/CFO from 2003 to 2009, establishing PLI as a leader in key technologies for defense and security applications and growing revenue from zero to several million dollars
  - Currently a board member

One marketing slide on COGO (Currently CEO)

Enabling growth of high speed internet access by providing a key component: manufacturers of modulators for next generation optical networks by focusing on higher bandwidth, low power consumption and reduction in size



- ✓ Relative to competing technologies, COGO's technology provides
  - ✓ 10 x reduction in size
  - ✓ 40% reduction in switching voltage
  - ✓ >2 x speed

What is essential to be an entrepreneur?

- ✓ Innovative idea
  - New technology
  - New manufacturing process
  - New way of marketing (less common in optical hardware, but there are examples of successes: Thorlabs)
- ✓ Belief that your idea/product will change the world
  - Must believe that your targeted customers will NEED the product
- ✓ Passion for your idea
  - Must be passionate and willing to risk…

Understand your boundary conditions for risk

- ✓ To understand your limits, ask yourself…
  - How much financial security am I willing to risk?
  - Am I willing to risk career advancement?
  - Am I willing to give up other things in my life to make this happen?
- ✓ One aspect that most entrepreneur do not think about: Am I willing to work alone for days /weeks/ months to realize my vision?
  - Caution: Working by yourself alone for extended periods can lead to self-doubts
- ✓ Once you understand your limits, you will know how much risk to take and what path to follow to develop your idea

Entrepreneurship in large companies

Large companies need entrepreneurs just as much as small ones

- ✓ An entrepreneur can succeed anywhere
- ✓ Many big companies want to expand in their market and they do so with employees who innovate
- ✓ Big companies have resources and capabilities that a small company can never match
- ✓ Just need to find the right venue, the right people and the right arguments to make it happen

Questions to ask…

Should I start a new venture earlier in life or wait until I am more secure financially?

- ✓ Advantages of launching earlier in life
  - Can take greater risks and be more independent, since there is not much to lose
  - Few family obligations, so one can devote unlimited amounts of time
- ✓ Advantages of launching later in life
  - Experience in your field and understanding of business processes
  - Established network of support and advisors

Questions to ask…

Will I go at it alone or have a business partner(s)?

✓Take care of the following, even if your business partner is your best buddy with whom you have never quarreled in your life

- Responsibilities must be well defined in the beginning
- Ownership and decision making processes must be clear from the start
- In optics, chances are one of you will have some IP. You must define who owns the IP…company or individual… will it be licensed… what happens if the owner of the IP leaves the company… will the owner of the IP be compensated more for their IP…

✓I prefer to have a partner, because I need to bounce ideas off of someone who is as involved in the business as I am

What is next?

- ✓ You have a great idea
- ✓ You know it will change the world
- ✓ You know how much you are willing to risk

Go do it. You will find a way…

Entrepreneurs:

Items to consider before launching a new venture

OFC Panel: 2012
Alka.Swanson@CogoOptronics.com

Speaker/Panelist

Y.K. Park, CEO, OE Solutions

Y.K. Park found OE Solutions in 2003. Prior to this, Park held numerous technical leadership positions in the area of optical communications including Senior Director at NanoOpto Corporation, Director of Optical Transceiver Development at Agere Systems, and Technical Manager at Lucent Technologies (former Alcatel-Lucent).

As an eighteen year R&D veteran from Lucent Technologies Bell Labs, he set numerous technical milestones including the first 1.7Gb/s 360km coherent communication field trial in 1989, breaking the 2.5G-300km repeaterless transmission barrier in 1992, and the industry first 10Gb/s field trial in 1994.

He received his B.S. (Magna Cum Laude) in Physics from Sogang University, Korea and Ph.D. in Applied Physics from Stanford University. Park has 12 patents granted and more than 100 papers published and presented in the area of optical communications. He was named IEEE fellow in 2004 and OSA Fellow in 1997.

OFC/NFOEC '12 WORKSHOP ON PHOTONICS STARTUPS

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OE SOLUTIONS

OE SOLUTIONS

OE Solutions		OE Solutions America	
OE Solutions Co., Ltd. (Gwangju Headquarter)	Manufacturing & Operation Research & Development	OE Solutions America (Englewood Cliffs, NJ)	US Headquarters East Coast Sales Europe Sales
OE Solutions Co., Ltd. (Seoul Office)	Domestic & Asia Sales Research & Development	OE Solutions America (Irvine, CA)	Engineering Support West Coast Sales Research & Development
OE Solutions Co., Ltd. (Shanghai Office)	Asia Sales (China Market)		

Who we are:

A transceiver specialist offering unique values to NEMs

- Industrial Temp SFP, XFP, SFP+
- Bi-directional WDM SFP, XFP, SFP+ (Single Wavelength CWDM)
- Ethernet OAM Smart SFP
- HD Video Transport SFP, SFP+
- Optical Supervisory Channel SFP (>250km reach)
- CPRI wireless backhaul SFP, SFP+

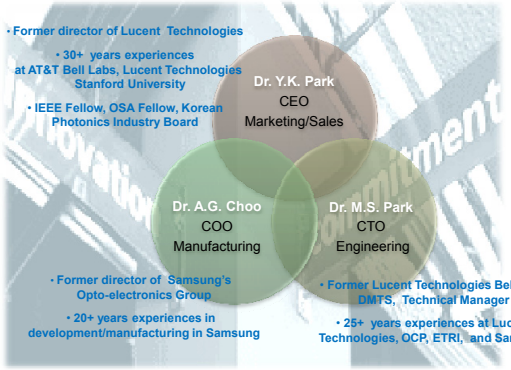
OE SOLUTIONS

OE Solutions at a glance

2003.8	• OE Solutions founded (in Korea).
2004	• SFP/SFF Transceivers s
2005	• Industrial Temperature CWDM SFP • OE Solutions America (USA subsidiary)
2006	• RoHS compliant/ ISO 9001/14001 certified • Bi-directional SFPs (CWDM and SW) for wireless backhaul
2007	• Supervisory Channel CWDM SFP(>250km reach)
2008	• 10G XFP transceiver & SFP+ 40km industrial temp. • HD Video Transport SFP
2009	• BIDI SFP with APD receiver. • 3G Video Transport SFP – Tx-only, Rx-only, Dual Tx, Dual Rx
2010	• 10G & Single-wavelength BIDI XFP • CWDM / DWDM XFP, SFP+ Industrial temp
2011	• Factory Capacity 80,000/month with ~300 employees • 10GPON ONU & OLT (XGPON1 & 10GEPON) • Smart SFP

OE SOLUTIONS

OE Solutions Leadership



OE SOLUTIONS

OE Solutions' Product s & Markets

• IT (- 40℃ ~ + 85℃) CWDM &DWDM SFP
• IT 10Gb/s CWDM & DWDM XFP
• IT 10Gb/s CWDM & DWDM SFP+ (Bi-directional)
• Smart SFP (EFM & CFM OAM)

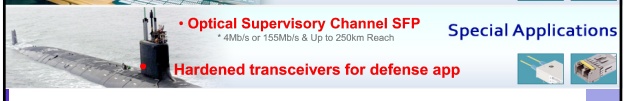
Wireline Telecom & Datacom

• IT 10Gb/s Bi-Directional XFP
• IT Bi-Di CWDM SFP, SFP+
• Smart SFP (link OAM)

Wireless Backhaul

• 3G/6G SDI Transceiver
• Single/Dual Transmitter
• Single/Dual Receiver
* SMPTE Compliant

Digital HD Video



• Optical Supervisory Channel SFP
* 4Mb/s or 155Mb/s & Up to 250km Reach

Hardened transceivers for defense app

Special Applications

OE SOLUTIONS

Korean Telecom Market and Climate

Carriers	KT ($20B)	SKT ($13B)	LG U+ ($7B)
NEMs	**Oversea :** ALU, NSN, Cisco, Huawei, Ciena, Motorola, Fujitsu, NEC, etc **Korean**: Samsung, LG-Ericsson, SI/NIs		
Module Suppliers	**Oversea**: Finisar, JDSU, OpNext, Oclaros, Avago, Sumitomo, Chinese suppliers **Korean**: OE Solutions, Lightron, ARTech, (~20 smaller suppliers)		
Component Suppliers	**Oversea** : Cyoptics, Mitusbishi, Sumitomo, Japanese and Chinese suppliers **Korean**: ~100 component suppliers		
Korean Market Climate	- Advanced telecom infrastructure - an ideal test bed of broadband service - Fast pace demand and deployment (e.g. 4G Wireless LTE) - Price competitive - Close interaction between customers and suppliers (including "After Service") - Strong influence of the government policy on telecom industry/market - Frequent and unpredicted changes		

OE SOLUTIONS

Korean Start-up Climate

Start-up Climate

- **Conservative VC Investment - "later stage"**
- **IPO/Investors stress more on "Profit" than "Revenue"**
- **Korean market centric (less global view) : no mega-size funding**
- **ROK government 's stress on the geographic balance of industries**
- **Strong local government support: Regionally specialized hightech clusters**

Gwangju Photonics Industry Cluster :

•Strong Infrastructure and Supporting Systems for Photonics Start –ups
- ✓KOPTI: ~$200M facility with Fab and optics test equipments for industry use
- ✓Gwangju Techno Park : ~100 small size companies with start-up incentives
- ✓ETRI Gwangju Branch : R&D with private industries
- ✓KAPID: Photonics industry and business promotion and service
- ✓Several Universities with ample engineering pools
- ✓Gwangju City Government R&D funding support

Nicknamed as "Korean Photonics Valley"

OE SOLUTIONS

OE as a Start-up: did well, didn't well

Did reasonably well

- Focused on value differentiators ; Unique Value offers
- Conservative cash flow and calculated "risk taking"
- Emphasis on the long term growth view
- Be agile, flexible, adaptable to rapid changing industry

Should have done better

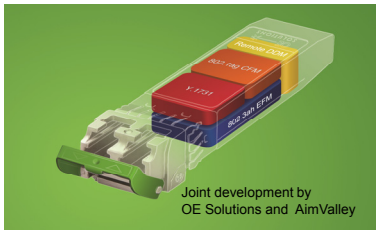
- More "risk taking" and more rapid expansion
- Breakthrough IPs for entry barrier building
- Timing to China market & manufacturing base
- Close customer relation at all levels

OE SOLUTIONS

Unique value offer example: Smart SFP

- Ethernet OAM functions and remote DDMI features integrated into a SFP optical transceiver
- Easy to install, monitor and trouble shoot Ethernet links
- Reduce cost and installation/maintenance efforts
- Save rack space and power consumption

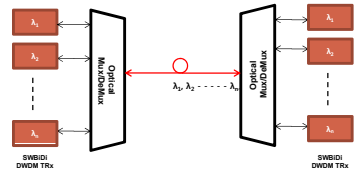
SMART



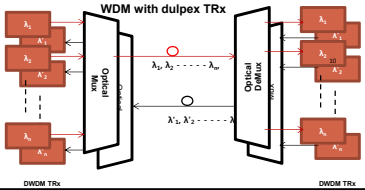
OE SOLUTIONS

Unique value offer example: Single Wavelength Bi-directional Transceivers

- **Single fiber carrying both upstream and downstream link**
- **One mux/demux pair**
- **Fiber Mgmt & Fool-proof transceiver installation**



WDM with dulpex TRx



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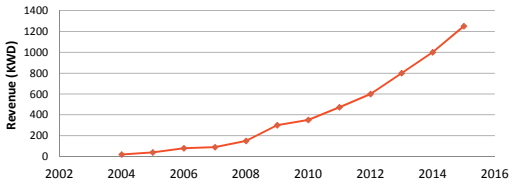
Lessons learned (and learning)

- Focus more on "Value Differentiators"
- More agile, more flexible and more adaptable
- Competitive cost structure with quality products
- Close customer relation at all levels
- Balance between Global and local market
- Focus on the long term sustainable growth



OE SOLUTIONS

Speaker/Panelist

David Welch, Founder, Executive VP, Chief Strategy Officer, Infinera

David F. Welch co-founded Infinera, and served on the board of directors (2001-2006) and as CTO and CMO before his appointment as EVP and CSO in January 2010.

Previously, he was CTO and VP Corporate Development at SDL. Welch holds more than 125 patents, and has been awarded the Adolph Lomb Medal, Joseph Fraunhofer Award and the John Tyndall Award in recognition of his technical contributions to the optical industry.

He is a Fellow of the OSA and the IEEE. Welch holds a B.S. in Electrical Engineering from the University of Delaware and a Ph.D. in Electrical Engineering from Cornell University.

Lessons from a Start Up

Dave Welch, Ph.D.

Co-Founder, EVP

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My Timeline -

SDL/Spectra Diode Labs ***Infinera***

- Digital Optical Networks
- Photonic Integration
- #1 NA Market Share in 2010

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What makes a success?

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what THE NETWORK will be

#1 - The People and The Culture

SDL
Founder - Don Scifres CEO
Bill Streifer

Culture
- Team
- Integrity
- Visionary
- Data driven decisions
- Speed
- Smart

Spectra Physics
Founder – Herb Dwight

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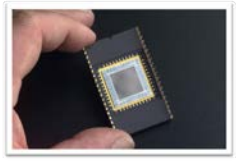
#2 - The Disruption



A specially developed CCD used for ultraviolet imaging in a wire bonded package. Source: Wiki Commons

- The CCD chip
- Nobel Prize Winners
  - Willard Boyle
  - George E. Smith

  } Shared 2009 Nobel Prize for Physics
- First commercial Digital camera
  - Dycam 1 (Logitech Fotoman), 1990
  - 320x240 pixels
  - 256 gray levels

- ***The Disruption was in the Market; it was enabled by the component***

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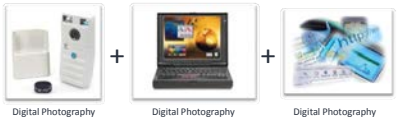
Digital Photography Innovation

- Poorer image quality
- More expensive



- But when combined with other innovations…

Need some place to back this stuff up!

Inkjet Printing
Online photo prints
Canvas prints
Photo books, etc.

etc.

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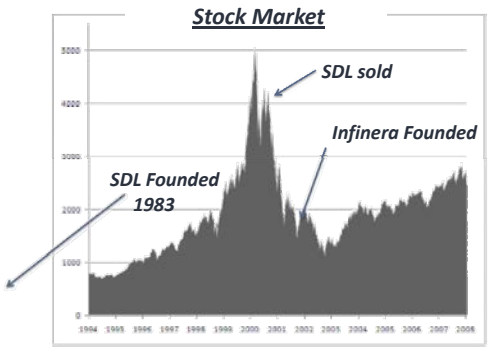
#3 - Timing



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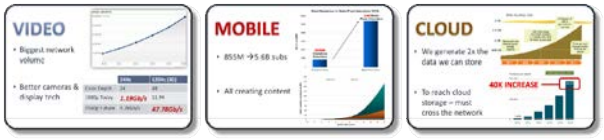
Insatiable Growth



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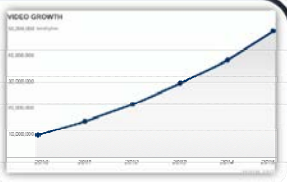
VIDEO



	24Hz	120Hz (3D)
Color Depth	24	48
1080p Today	1.19Gb/s	11.94
2160p Future	4.78Gb/s	47.78Gb/s

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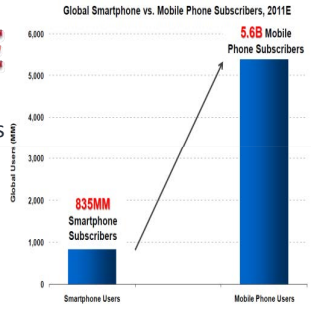
MOBILE

- 855M →5.6B subs



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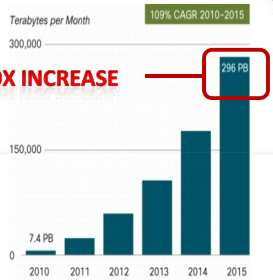
CLOUD

- We generate 2x the data we can store
- 40X in 4 years



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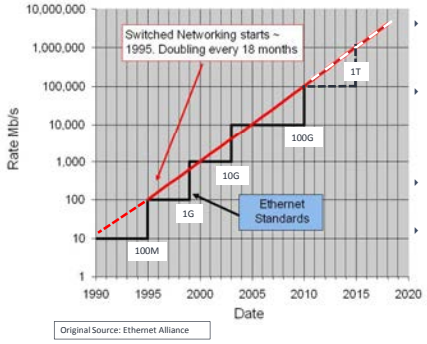
Ethernet Standards Trend Line



- Networking bandwidth demands doubling ~18 months
- Industry consensus:
  - 100M & 1G standards timed well
  - 10G ~1 year early
- Many feel 100G is 1 year late at 2010
- Tb/s Ethernet demand is 2014 - 2015

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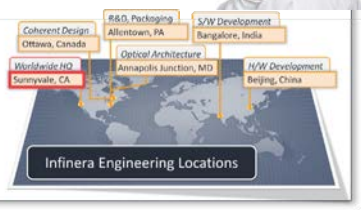
Infinera

- Company
  - ~1,200 employees
  - Headquarters Sunnyvale, CA
  - Presence in 20 Countries



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The Disruption

- Speed
  - Speed of Deployment
  - Speed of service turn-up; 10 Gb in 10 Days
- Network Economics
- An infinite pool of intelligent bandwidth

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Question the Norm – Skate to where the puck is going

- ***Bandwidth not wavelengths***
- ***Vertically integrated company***
- ***Photonic Integrated Circuits***
- ***Big project***

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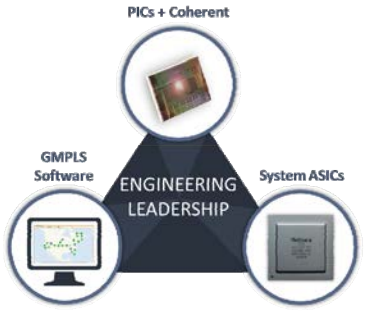
The Technology Core - Differentiation



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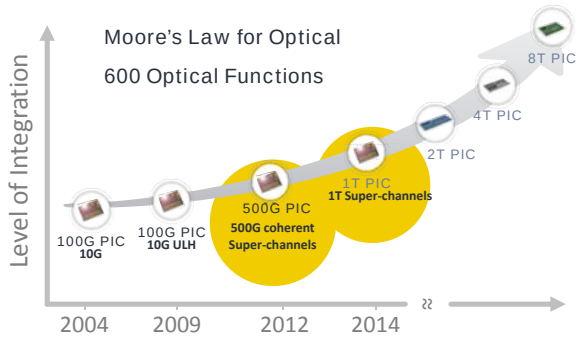
Manufacturable from Day 1



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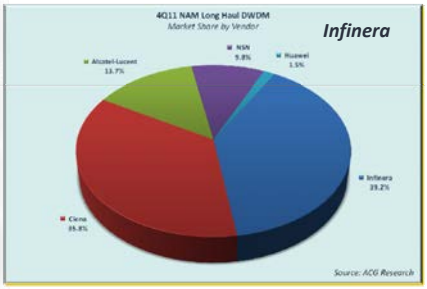
The Result … for now

- **Q4'11 Market Share Position**
  - **#1 LH DWDM North America**
- **98+ Customers in 50+ Countries**



*Source: Infonetics 2Q11 Optical Network HW 4-Quarter Rolling Avg

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#4 - Persistence

- Prepare to get lucky
- Anticipate Success
- You aren't the smartest, but you can be the fastest
- A company never went out of business because it had too much money.
- Hire people that are smarter than you
- Facts make the decisions
  - Do not control information
- Invest into weakness
- Think 2 generations out and make it 1 generation away

Thank You

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