



***Workshop on Startups and
Entrepreneurship***

***Wednesday, March 20, 2013
3:30pm - 5:00pm
Expo Theater II***



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The photonics industry continues to be a dynamic market in which innovation takes place at a breathtaking pace. And much of this innovation is driven by startup companies. While many people like to start a company and many admire the startups that made it big, the process of starting company can be challenging. The aim of this workshop is to provide practical guidelines and dos and don'ts by featuring a number of seasoned entrepreneurs who tell their story. The focus of the presentations is to share key insights and lessons learned that are useful for any entrepreneur wanting to start a company or develop a new business. The workshop concludes with a panel session with ample room for questions and answers.

Moderator/Organizer

Erik Pennings, GM and Principal, 7 Pennies Consulting

Speakers/Panelists

Michael Hatfield, President, Cyan

Stan Lumish, Chairman and CEO, Pilot Photonics Ltd.

Eric A. Swanson, Chairman, Acacia Communications Incorporated

Valery Tolstikhin, Founder & CTO, OneChip Photonics Inc.

James Lowrie on behalf of **Ian Jenks**, Chief Executive Officer, Intune Networks Ltd.

Handouts sponsored by a financial contribution
from Intune Networks, 7 Pennies Consulting, and the OIDA



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 he 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.

6th Workshop on Startups and Entrepreneurship

OFC, March 20th, 2013

Erik Pennings



OFC'13 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 then restarted at OFC 2011 (10 years after...)
 - So some reflection is not inappropriate

OFC'13 Startup Workshop



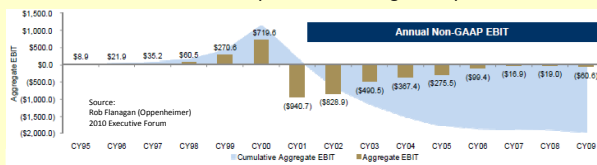
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The investment climate changed



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:
 - Si photonics, 100G, FTTH, Software Defined Networks

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Current photonic startup climate



- Startups continue to raise money...



- And startups continue to make exits...



- Earlier workshops 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
- Focus of workshop is now more on entrepreneurship
 - Invite serial entrepreneurs who tell their personal stories

OFC'13 Startup Workshop



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Workshop contents



- Great line up of speakers in this workshop:
 - Michael Hatfield (Cyan)
 - Stan Lumish (Pilot Photonics)
 - Eric Swanson (Acacia Communications)
 - Valery Tolstikhin (OneChip Photonics)
 - James Lowrie on behalf of Ian Jenks (Intune Networks)
- Panel session
- Please note:
 - There are printed handouts
 - If you want a softcopy (mailing list), please leave your business card
 - Discussion afterward encouraged, but exhibition closes at 5pm

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Thanks!

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Speaker/Panelist

Michael Hatfield, President, Cyan



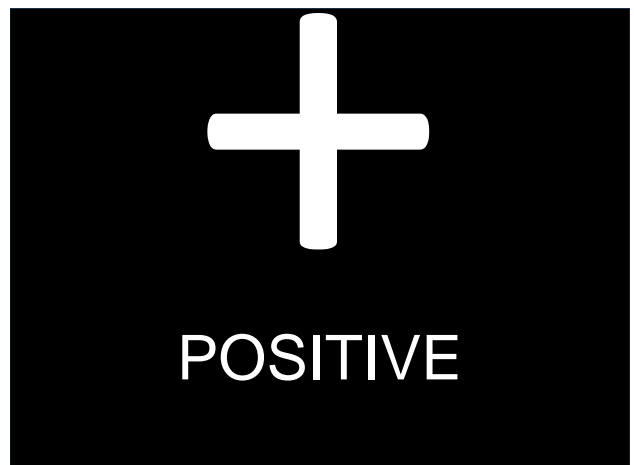
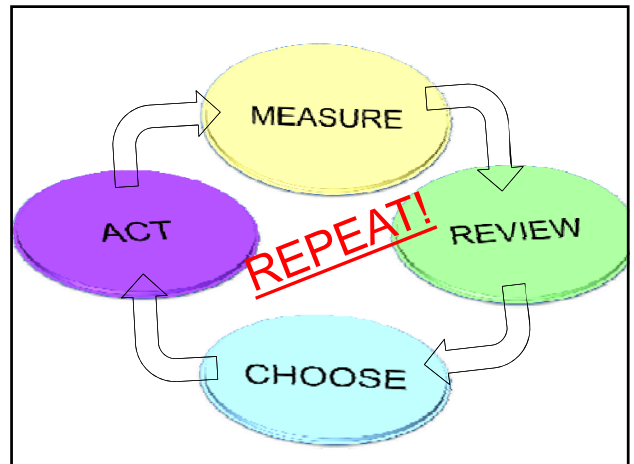
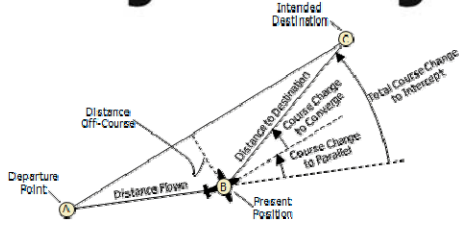
Michael Hatfield is President and co-founder of Cyan, a California-based global supplier of software-defined networks (SDNs) for service providers, data center operators, and private networks. Previously, he was a key member of three successful communications systems start-ups. Most recently Michael was founder and CEO of Calix (NYSE: CALX), a publicly held communication systems company. Prior to Calix, Michael was co-founder and COO of Cerent, a leading provider of high-speed fiber-optics systems which was acquired by Cisco for \$7B. Michael's initial start-up success came as an early team member and vice-president of marketing for Advanced Fibre Communications (AFC). He has also served in management roles at DSC Communications and Ameritech. Michael has a BSEE in Electrical Engineering and Mathematical Economics from Rose-Hulman Institute of Technology and an MBA in Finance from Indiana University.

OFC Startup Workshop
March 20, 2012

Michael Hatfield



trajectory



Thank You!

Speaker/Panelist

Stan Lumish, Chairman and CEO, Pilot Photonics Ltd.



Dr Lumish has been involved in the development of optical network equipment and components for over 30 years. He has held numerous technical, management and leadership positions at AT&T, Lucent Technologies, JDS Uniphase (JDSU) including as the JDSU Corporate CTO. He has been a sought-after speaker at technical gatherings around the world. His work in optical networking has been recognized through the Bell Labs Fellow award and the IEEE Fellow award.

In 2009, Dr Lumish took a position with the US Department of Defense, where he focused on bringing technology companies into Iraq and Afghanistan to drive economic stability in those countries. His work culminated in the opening of the first Microsoft Certified Training Center in Baghdad and the first woman-owned software development company in Herat, Afghanistan. For this work he received the Joint Civilian Service Commendation Award, signed by the Chairman of the Joint Chiefs of Staff Admiral Mullen.

Dr Lumish is currently CEO and chairman of Pilot Photonics Ltd., a Dublin-based technology startup. He is on the external advisory board of the Tyndall National Institute, and is on the board of directors of Yale Hook & Eye Company. Dr Lumish is a member of Eta Kappa Nu, Tau Beta Pi and Sigma Xi, the IEEE and the Optical Society of America.



A Photonics Startup in Dublin- Why Optical Comb Sources, Why Dublin and Why Now?

Dr. Stan Lumish
CEO and chairman
www.pilotphotonics.com

Outline

- Why Optical Comb Sources?
- Why Dublin?
- Why Now?



Why Optical Comb Sources?

continuing explosive demand for bandwidth



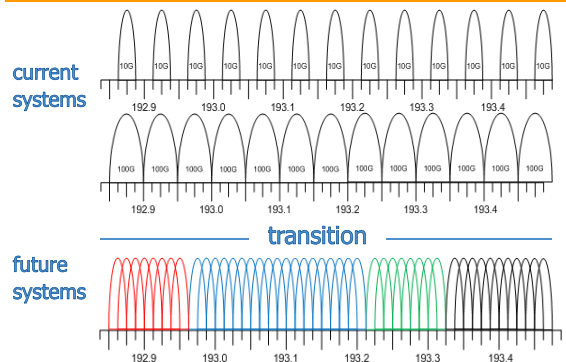
Fighting the **capacity crunch**. Orange and Alcatel-Lucent set 400 Gbps fiber link live: gigaom.com

Mobile industry faces \$9.2 billion shortfall in backhaul investment, Tellabs study finds: Feb 13, 2013
Strategy Analytics report commissioned by Tellabs highlights risks of a new **'capacity crunch'** posed by lack of backhaul investment
Naperville, Illinois — Operators are investing in radio network upgrades and migrating to LTE to meet surging user demand for mobile data.
But a report unveiled today predicts that operators will face a new mobile capacity crunch by 2017. The Strategy Analytics study reveals that operators may not be planning sufficient investment in backhaul to meet anticipated demand over the next 5 years

Aston helping to reduce telecoms **'capacity crunch'**
www1.aston.ac.uk, 26 Feb 2013

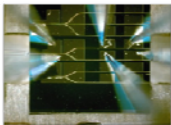
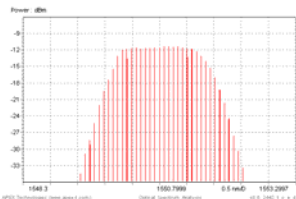


future optical networks require more closely spaced wavelengths than ever before

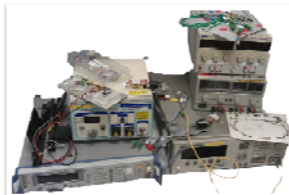


pilot photonics, ltd.

- founded in august 2011
- based in dublin, ireland
- funded by private, public and institutional investors
- developing optical comb sources for optical networks
- stable, narrow linewidth, C-band tunable, FSR-tunable optical comb sources.



small footprint



footprint of an
alternative comb
generation technique



footprint of pilot
photonics comb
source



Better to find an existing problem that you can solve...



'Ted prided himself on exploiting gaps in the market'



Tip #1: Solve a problem. Don't be a solution looking for a problem.

Why Dublin?

World Class ICT Research - Ireland

Tyndall The Photonics centre at Tyndall comprises internationally recognised research teams (100 people in total) carrying out R&D and commercialisation activities spanning the areas of semiconductor materials and devices, photonic integration and packaging, through to advanced photonic systems. They not only develop new technologies for the communications, healthcare and energy sectors, but also advance scientific knowledge in photonics through cutting edge research, for example into the fundamental quantum processes in semiconductor materials and cooled atomic vapours.

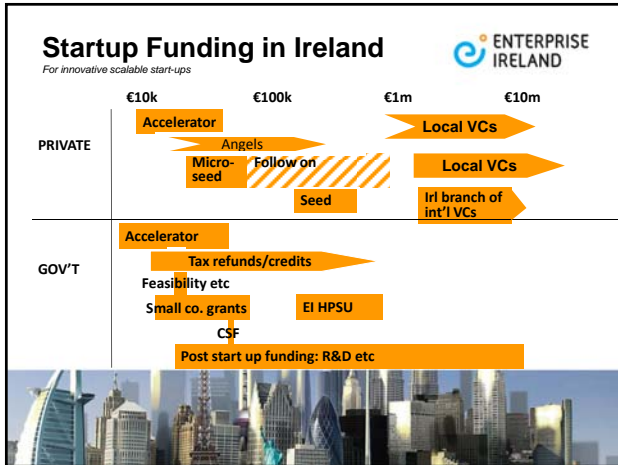
Communications-related programmes include:

- Advanced fibre-to-the-home networks
- High capacity coherent communication systems
- New technologies for beyond-4G/5G mobile networks
- High speed electronics solutions for extended reach transmission
- Carbon fibre based switching nodes
- Energy efficient transmitter technologies for datacentres
- Optimisation of the duty of optical packet processing
- High speed optical switching for device characterization
- Secure quantum key distribution networks
- SiN and Si-Membrane materials and devices
- Monolithic integration of high speed photonics and photonics integrated circuits
- Packaging hybrid integration including photonics and electronics packaging
- Photonic materials and device energy modelling and design

DCU The Ronce Institute Within the RONCE Institute at DCU, the Fields and Optical Communication Lab focuses on the design, simulation and demonstration of new technologies for future broadband photonic communication systems.
- Hybrid Silicon and Fibre Systems
- Optical Router and Packet Switching
- Transverse Modes
- Polarisation Control

Other Research Centres:
- Tyndall Photonics / Telecommunication Companies
- Borealis Photonics
- TUBS
- Borealis Photonics
- FORTH
- ICTVR
- PERC
- TUBS

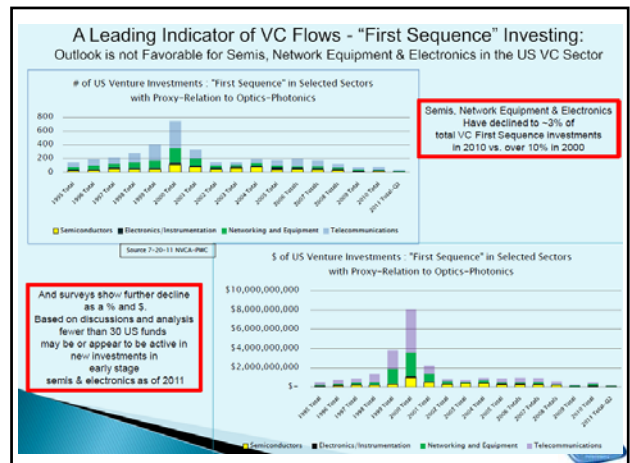
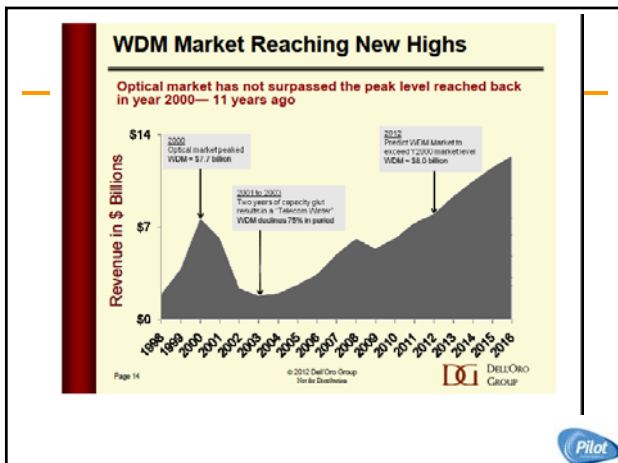




- ### Business and Living
-
- Easiest place in EU to start a business (World Bank).
 - Most business friendly tax in EU or Americas (ditto).
 - 'Best Countries for Business', ranked 1st in Europe and 4th worldwide. (Forbes)
 - Highly Globalized (2nd in world per EIU and Ernst & Young)
 - Member of EU and Euro giving access to
 - World's biggest market
 - World's biggest pool of educated labour
 - Entrepreneur visas, non EU work permits, Tech visas (2013)
 - Friendly (voted by Lonely Planet as the world's friendliest country in 2008 and 2010)
-

Tip #2: Leverage your local/national supports and grants wherever possible

Why now?



some recent acquisitions in the space



Tip #3: If you can stay afloat despite VC sector baggage, then now is the best time in years for the chance of an exit.

Conclusions

- Tip #1: Solve a problem. Don't be a solution looking for a problem.
- Tip #2: Leverage you local/national supports and grants wherever possible.
- Tip #3: If you can stay afloat despite VC sector baggage then now is the best time in years for an exit.
- Bonus Tip:
- With severe sector baggage nothing matters except customer traction; an order or investment from a corporate makes a VC sleep well.



THANK YOU



Speaker/Panelist

Eric A. Swanson, Chairman, Acacia Communications Incorporated



Eric Swanson is a director, consultant, advisor and active participant in a variety of high-tech industrial, academic, entrepreneurial, government, and non-profit initiatives. Mr. Swanson serves as a director for Acacia Communications, Curata Incorporated, and NinePoint Medical and as a research affiliate at the Massachusetts Institute of Technology, consultant at Draper Laboratory, affiliate of the MIT Deshpande Center for Entrepreneurship, does a variety of volunteer activities, and is editor of www.octnews.org. Mr. Swanson was a co-founder of three start-up companies, Advanced Ophthalmic Devices (acquired by Zeiss Meditech), Lightlab Imaging (Acquired by St. Jude Medical), Sycamore Networks (Nasdaq IPO 1999), and is a founding board member of two more Acacia Communication (private), Curata Incorporated (private). Mr. Swanson was involved in Research and Development at Massachusetts Institute of Technology Lincoln Laboratory for 15 years. He served in various technical and managerial roles of an R&D group working on Optical networks and Inter-Satellite Laser Communication Systems. Swanson has authored ~200 technical papers and conference presentations. In addition, he holds ~35 US patents and numerous foreign patents. He is a Fellow of the OSA and senior member of the IEEE. In 1992 he was a co-recipient of the Rank Prize for contributions to Opto-Electronics for his work in the field of Optical Coherence Tomography. In 2012 he was a co-recipient of the Champalimaud Vision Award for the discovery of Optical Coherence Tomography. The \$1.3M Champalimaud award is one of the largest scientific and humanitarian awards in the world. Mr. Swanson holds a B.S. summa cum laude in Electrical Engineering from the University of Massachusetts at Amherst and an M.S. in Electrical Engineering from the Massachusetts Institute of Technology.

Startup Stories

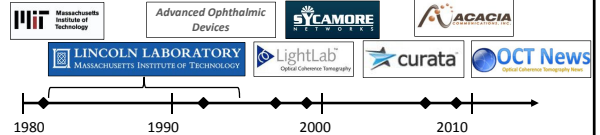
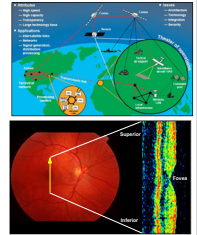
Personal Observations and Other Comments

Eric A. Swanson
Chairman



Biography

- ~30 Years in optics & photonics
- Former academic (~15 years)
 - Research scientist and group leader at MIT/LL
 - ~200 Publications/Presentations & ~35 US Patents
- Serial entrepreneur (~15 years)
 - Co-founder/founding board member of five companies : biomedical optical imaging (2), optical telecom (2), and Software(1)
 - Collectively shipped > \$1B in products worldwide
- Active in industrial, academic, entrepreneurial, government, and non-profit activities
 - Director Acacia Communication, NinePoint Medical, Curata Inc.
 - Research Affiliate at MIT, Consultant at Draper Laboratory, Deshpande Center for Technological Innovation, Editor OCT News,...



Outline

- Why Be in a Start-up Company?
- Many Ways to Fund Startup Companies
- What Do All Start-Up Companies have in Common?
- What is the most important thing for a startup company to be successful?
- Six Startup Stories: *Personal Observations and Other Comments*
- Should I Stay or Should I Go?
- Summary

Speaker/Panelist

Valery Tolstikhin, Founder & CTO, OneChip Photonics Inc.




Valery Tolstikhin is a Founder and CTO of OneChip Photonics Inc., a fabless developer and manufacturer of optical transceiver components based on original photonic integrated circuit (PIC) technology. He has been involved in the research and commercialization of advanced semiconductor devices for micro- and optoelectronics for more than 30 years. An industry veteran with a solid academic background and international credentials acquired through his work in Canada, The Netherlands, Sweden and Russia, Dr. Tolstikhin has a long track of achievements as innovator, team builder and R&D organizer. Most recently, he has been with MetroPhotonics Inc., Nortel Networks, Optiwave, and National Research Council of Canada (NRC), all in Ottawa, Canada.


Dr. Tolstikhin received his Ph.D. in Physics from Moscow Institute of Physics & Technology and then D. Sc. (higher doctorate) in Semiconductor Physics from the Institute of Radio Engineering & Electronics of the Russian Academy of Sciences, both in Moscow, Russia. He has published over 80 research papers, given numerous invited presentations and chaired or served on program committees for many major international conferences. He is an adjunct professor at University of Ottawa.

Starting-Up Photonics Company: Why, What and How?


Valery Tolstikhin
OneChip Photonics Inc., Ottawa, Canada




OneChip Photonics Snapshot



- ❖ Incorporated in Nov 2005, 1st VC round – Mar 2007
- ❖ Technology: regrowth-free photonic integration in InP
- ❖ Value proposition: cost-efficient PICs for mass deployment
- ❖ Markets: optical access (PON) and interconnects (data centers)
- ❖ Fables ops: proprietary designs and outsourced manufacturing
- ❖ Funded by venture capital, headquartered in Ottawa, ON, Canada
- ❖ Currently 85 full-time employees, 15-strong PIC development team



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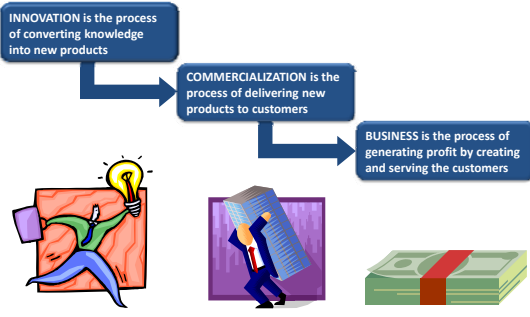


Innovation, commercialization & business


INNOVATION is the process of converting knowledge into new products

COMMERCIALIZATION is the process of delivering new products to customers

BUSINESS is the process of generating profit by creating and serving the customers



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Why to start?

Before you even start thinking of starting up, check these:

- ✓ There is a market
- ✓ It has a serious problem
- ✓ You got a disruptive solution
- ✓ It can be delivered to the market

❖ You think you got an innovation. May be, but so what?

❖ Most of the technology companies are started on innovation... but only few have ever commercialized it;

❖ Successful high-tech companies all are built on the market opportunity created by their innovation.



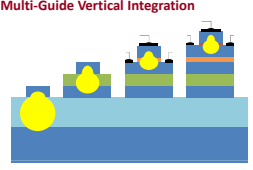



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OneChip's case: innovative technology

Multi-Guide Vertical Integration

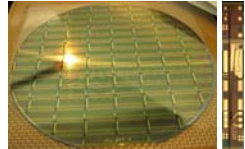


Basic principles


- Vertical integration of the functionally diverse active and passive waveguide devices through epitaxial growth of all the required materials onto one InP substrate, in one growth step;
- Functional waveguides vertically stacked in a descending order of their core layer bandgap;
- Optical signal transfer between evanescent-field coupled functional waveguides affected by lateral tapers defined at each vertical guiding level.

Key advantages

- Functional (vertical) and parallel (lateral) integration in a regrowth-free process;
- One – original – epitaxy step → low-defect, high-yield and low-cost fabrication process;
- Epitaxy and processing decoupled → enables for outsourcing both to separate foundries → leveraging of the cost structure of pure-play, high-volume foundries (those with a core business in the areas outside photonics).



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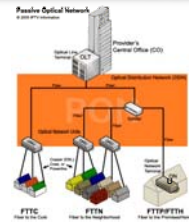


OneChip's case: market opportunities

- ❖ **Optical access (first targeted market)**
 - Brings bandwidth to the end user
 - Requires optical Tx/Rx at each ONU

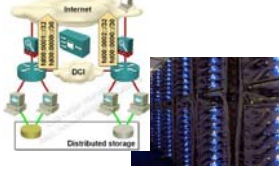
The most massive and yet the most cost-sensitive telecom transceiver market.

OneChip's technology is uniquely suited to the needs of this market → now shipping in volumes



- ❖ **Optical interconnects (recently added)**
 - DCI are the bottleneck of internet traffic
 - NG optical interconnects require optics on PCB (or optical PCB) with 100G+ up to 2km capacity → need multiplexing (space, wavelength, phase & polarization) → photonic integration is a must

The most massive and yet the most cost-sensitive datacom transceiver market.

Technology, first developed for optical access, is a perfect match to DCI market → now sampling



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OneChip's case: disruptive solution (1/2)

Optical access – ONU BOSA

- All the incumbents in this massive market build their BOSAs from off-the-shelf components → multiple packaging / testing steps to align – and maintain aligned – many discrete optical parts;
- OneChip's solution is a 1mm² monolithic PIC, flip-chip mounted on a silicon optical bench, which needs just one – passive – alignment and allows for an automated on-wafer testing.



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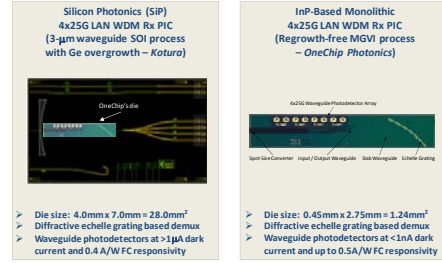
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OneChip's case: disruptive solution (2/2)

Optical interconnects – high-density 100G interface

- Even though technologies capable of delivering products to this emerging market are many, only integrated photonics solutions can meet the footprint, robustness and cost-efficiency requirements;
- OneChip's solution, based on MGVI technology, responds to the challenge by offering the smallest footprint size and highest cost-efficiency PICs, which still deliver state-of-the-art performance.



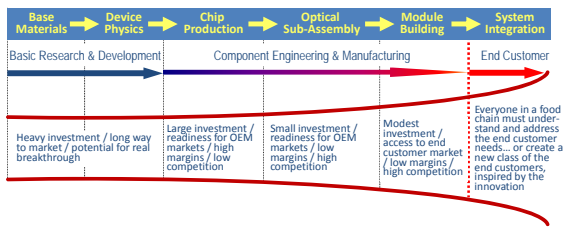
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What to start?

Photonics for optical communications: a food chain



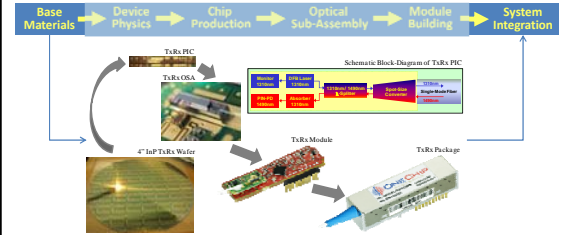
- ❖ **The further from the end customer, the more room for the disruptive innovation but less ability to affect revenue distribution over food chain**

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OneChip's case: position in a food chain



❖ Value proposition: Cost-efficient PIC technology for cost-sensitive markets

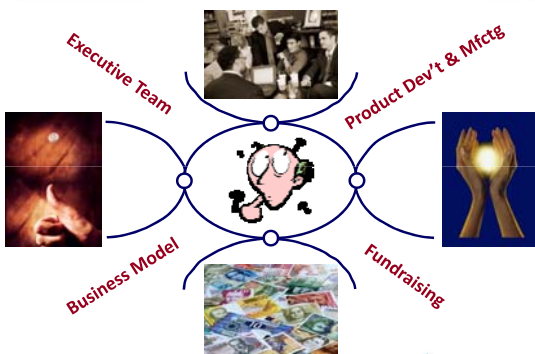
- **Photonic Integration in InP** allows for monolithic PICs with active and passive devices onto the same substrate → cost saving on bill of materials, optical sub-assembly and testing.
- **Multi-Guide Vertical Integration** enables for cost-efficient PICs in InP, by providing a regrowth-free PIC manufacturing platform;
- **Fabless Design & Manufacturing Model**, based on decoupling of epitaxial growth and wafer fabrication, allows for outsourcing both to pure-play commercial foundries → economies of scale and further improving the cost-efficiency.

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How to start?



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11



VC fundraising: to do or not to do?

FR & GOV'T FUNDING

- ❖ **Surviving the infancy**
 - Any funding is good when you're just starting up, but free cash is the best
- ❖ **Government programs**
 - Government programs are great (e.g. in Canada valuable cash comes along with even more valuable mentoring) but... taxpayer's money won't pay your way into a real world business
- ❖ **Nothing is really for free**
 - Occasionally, government funding may take you up to a proof of concept stage. However, nothing comes for free: think about the strings, which limit your exit
- ❖ **And still you need VC funding**
 - If you past all the initial steps and still want to start-up a real company, then you need a real funding

VC FUNDING

- ❖ **What do you want?**
 - Long-term funding on minimal commitments, without loss of control over your company
- ❖ **What do VCs look for?**
 - Short-time, high-rate return at minimal risk, with critical control over company
- ❖ **For VC, it's all about money**
 - Venture Capital is a money distribution business in a Fund Providers – VC Firms – Portfolio Companies loop, where the start-ups compete for "shelf space" and only 1 in 100 get funded!
- ❖ **You have to play by VC rules**
 - By raising VC, be prepared to make a choice between finding your dream company to become neither a dream nor yours OR having no company at all

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OneChip's case: funding

❖ Strong and supportive investor syndicate

➤ 77M USD equity raised since 2007

	BDC (Business Development Bank of Canada) Venture Capital www.bdc.ca
	DCM (Doll Capital Management) www.dcm.com
	GrowthWorks www.growthworks.ca
	Morgenthaler Ventures www.morgenthaler.com/ventures
	Northwater Capital Management www.northwatercapital.com

Technology entrepreneurship dilemma

Herbert Kroemer
Device Physicist and
Nobel Prize Laureate



Peter Drucker
Business Management
Theorist and Educator



"The principle applications of any sufficiently new and innovative technology always have been and will continue to be applications created by that new technology"

Technology entrepreneurship always starts with innovation, but where does it go next? Creating the killer application for the future or solving the market problems of today?

"Innovation is the specific instrument of entrepreneurship... that endows resources with a new capacity to create wealth."

Speaker/Panelist


James Lowrie on behalf of **Ian Jenks**, Chief Executive Officer, Intune Networks Ltd.




Ian Jenks has more than 20 years of board-level experience in the communications technology field, both as an investor and as CEO of operating companies in the U.S. and Europe. Most recently, Ian was a general partner with VC firm Crescendo ventures. Previously, Ian was Chairman of Oplink Communications Inc., which he took Public in 2000.

Prior to Oplink, Ian was President of the Laser and Fiber Optic groups of Uniphase Inc. (now JDS Uniphase), where his responsibilities included the management of business operations in the United States, England, Switzerland and The Netherlands. Ian has also served as the CEO of Novalux Inc., and as Executive Chairman of IE Optomech Ltd. Ian has a degree in Aeronautical Engineering from Bristol University.


Ian has also served on the Boards of a wide range of communications technology companies including Altitun, CoreOptics, Quantasol, Evo Electric, Crystal Photonics, Digilens, Novalux, Oplink, Symmorphix, and Zolo Technologies.



VC's and Photonics



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VCs and Photonics – let the good times role?


- The Myth: Investors invest in “Good Companies”
- The Reality: Investors invest in “Good Exits”
- It's why \$40Bn went into Photonic based solutions in the late 90's
- It's also why investment in Photonics based solutions has practically dried up since
- So will “Irrational Exuberance” return?

There are some promising signs

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There's a bandwidth tsunami hitting the carriers




- By 2015, global IP networks must transfer the equivalent of every movie ever made - every 5 minutes
- That's 1 zetabyte every year! (what's a Zeta byte?)

- Video
- YouTube, Facebook, Netflix...
- Devices
- By 2015 number of IP devices will be double the global population

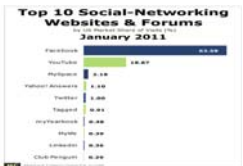


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Users and content are increasingly nomadic and sporadic

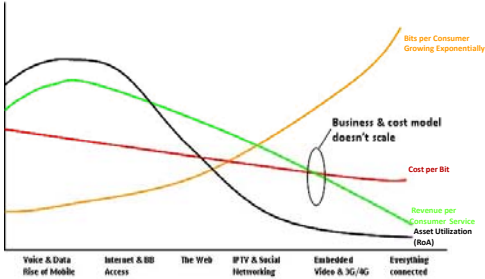




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But....the carriers' business model is broken

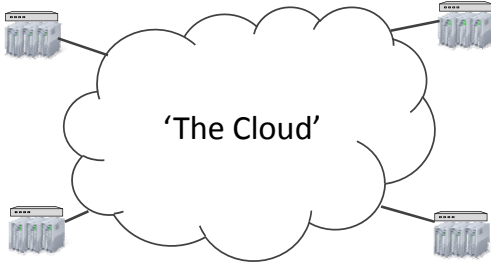


You can't scale inefficient architectures

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There's a cloud with a silver lining on the Horizon



Assumes everything is connected to everything - it isn't

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Inside the cloud – a world of complexity

Doesn't scale economically without virtualising the physical assets

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When you try and virtualize a data center

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You get electrical switches that look like this

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A way forward – Software Defined Networking

- Needs a software layer that can build virtual models of infrastructure and control that infrastructure

AND

- A new virtualizable switching and transport infrastructure capable of providing any to any connectivity over a wide area network
- But where you need to Switch & Transport lots of Data (Zetabytes) over any distance Photons win
- Lots of change and in change lies opportunity

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Good Exits are happening and investment is starting

- Software control start-ups
 - Nicira (Sold for \$1.2bn to Vmware)
 - Cloudswitch (Sold to Verizon)
 - Vcider (Sold to Cisco)
 - Big switch
- Photonics within a data centre
 - Plexxi
 - Black Sea
 - Others
- Photonics in the WAN
 - Intune Networks

Green shoots of exuberance?

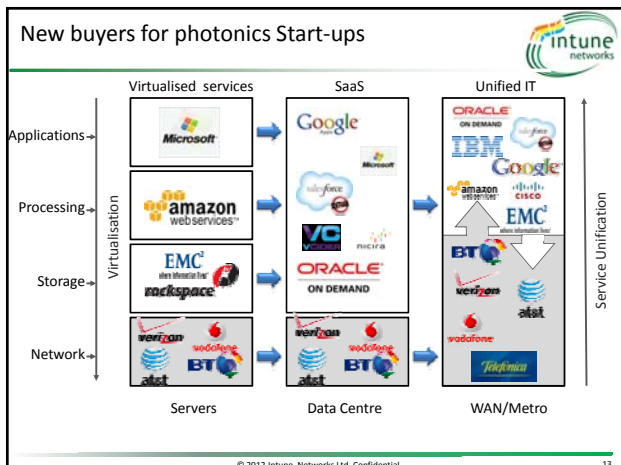
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Median Tech exit up from \$75m to \$265 in 5 Years

Rank	Date	Target	Acquirer	Transaction Value (\$M)	EV / Revenue Multiple (x)	Business Description
1)	03/24/13	Acme Packet	Oracle	\$2,004	2.2x	Acme Packet, Inc. provides session delivery network solutions that enable the delivery of voice, video, data, and unified communications services
2)	12/05/12	Venue	Akamai Technologies	NA	NA	Venue, Inc. develops and markets IP platforms that enable network operators to distribute, deliver, and manage IP-based multimedia
3)	07/23/12	Opnext	Oclaro	\$218	0.8x	Oclaro, Inc. designs and manufactures optical components, modules, and subsystems for communications
4)	05/24/12	Lightwire	Cisco Systems	\$161	NA	Lightwire, Inc. develops advanced optical interconnect technology for high-speed networking applications
5)	05/09/12	StorimD	EMC Corp	\$440	NA	StorimD LLC develops storage system solutions based on architecture and storage algorithms
6)	11/29/11	Mekeralated AB	Marvell Technology Group	\$75	0.8x	Mekeralated AB provides network processing and programmable Ethernet switching solutions
7)	09/02/11	BlueArc Corp	Hitachi Data Systems Corp	\$687	7.5x	BlueArc Corporation provides unified network storage systems
8)	07/02/11	Voltare Ltd	Mellanox	\$187	2.6x	Voltare Ltd. and its subsidiaries develop, market, and sell server and storage switching and software solutions
9)	12/24/10	Trapeze Networks	Juniper Networks	\$152	6.2x	Trapeze Networks, Inc. offers wireless local area network (WLAN) mobility systems for the mobile enterprise workforce
10)	12/22/10	Compellent Technologies Inc.	Dell	\$959	6.5x	Compellent Technologies, Inc. provides enterprise storage solutions that automate the investment and management of data
11)	10/29/10	Blade Network Technologies	IBM	NA	NA	Blade Network Technologies, Inc. provides Ethernet, IP, and application switches for blade server systems and data centers
12)	07/24/10	Core Optics GmbH	Cisco Systems	\$99	12.5x	Core Optics GmbH develops and manufactures subsystems for optical networking applications in the telecommunications and information technology industries
13)	07/21/08	Foundry Networks	Brocade Comms	\$2,391	3.7x	Foundry Networks LLC provides enterprise and service provider switching, routing, security and application traffic management solutions
14)	03/13/08	World Wide Packets	Ciena Corp	\$269	11.9x	World Wide Packets, Inc. provides communications network equipment for the delivery of various carrier Ethernet-based services

75 th Percentile	\$755	7.4x
Mean	644	6.0
Median	390	4.4
25 th Percentile	178	2.9

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- ### Summary
- We are moving to the world of the Zetabyte
 - New architectures are needed to scale virtualised networks economically
 - Photonic solutions will be an important part of solving these problems
 - New buyers and competition for the best solutions will drive good returns for investors
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