

Roadmaps: Guides to Opportunities & Job Creation

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TOPICS

- Promex Industries Perspective
- Roadmap & Promex
- Optical Roadmaps for Data Communications
- Where & How Roadmaps Contribute to Finding Needs
- Assess Your Situation and ACT !!
 - **Find a Need and Fill It**
- What Next After Utilizing Roadmap Guidance
- Comments, Questions, etc.

Promex Industries Inc

- 95 employees
 - Mfg 65
 - Eng 10
 - Sales 10
 - Adm 10
- California based
 - Santa Clara, Promex Industries Inc.
 - San Diego, Quik-Pak Division
- Manufacturing Services, we have no products
- Primarily Microelectronic Assembly Service
- Medical & Biotech Customer focus

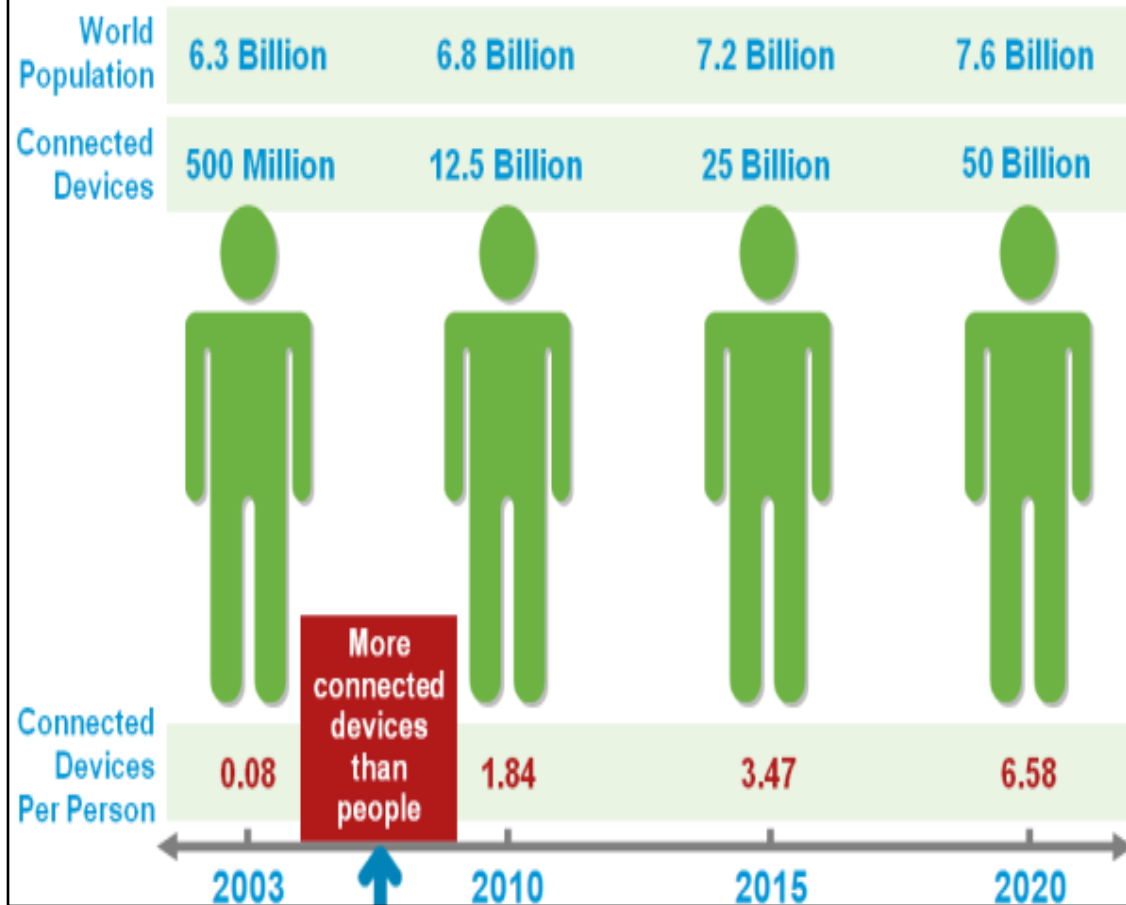
Roadmapping & Promex

- Because I am Interested (15% of my time)
- Support Roadmaps:
 - iNemi Roadmap Chair TWG for Optical Electronic Chapter
 - AIM-IP Integrated Photonic Systems Roadmap
 - Several Others
- Benefits Promex Gains:
 - Know What Opportunities Are Emerging
 - Allows Us To Demonstrate our Competence & Capabilities
 - Keeps Us In Touch With Many Activities
- Optical Technologies Because We and I know the Sector

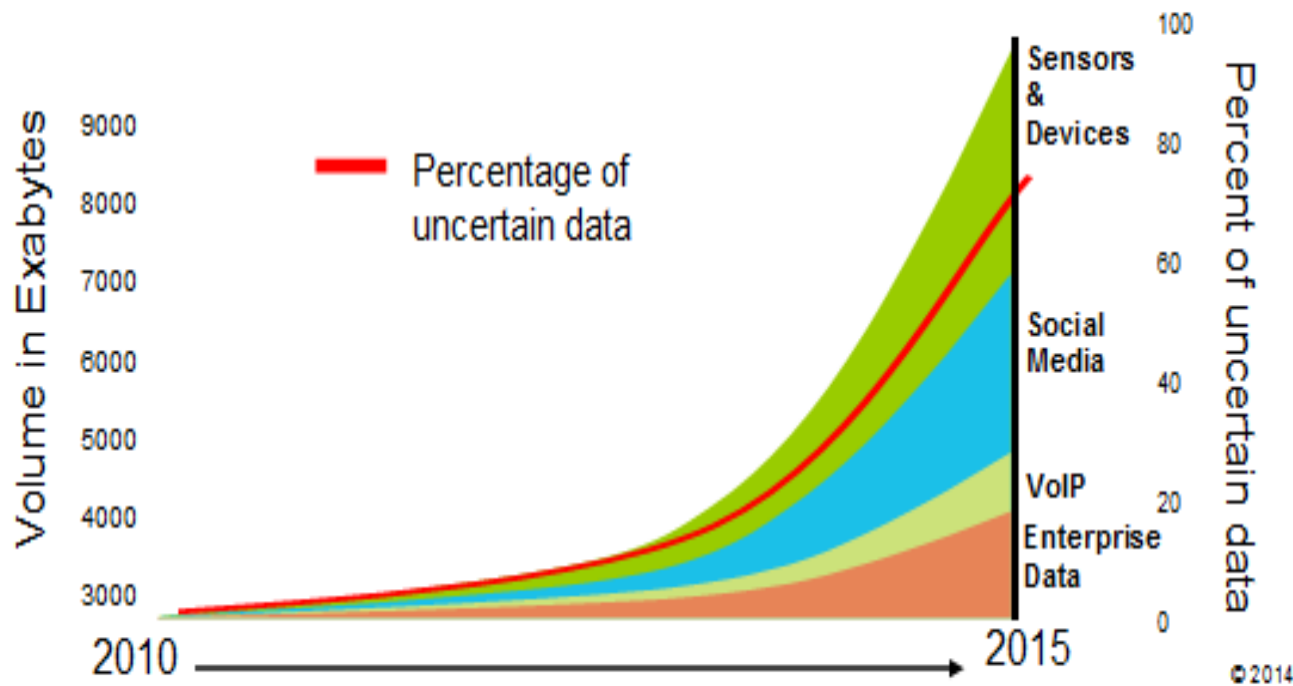
Optical Electronics For Data Communications Is One Example of Roadmaps

Data Communications utilizing Optical technology has been the most intensively Roadmapped Area of Interest by the MIT CTR. The ongoing Roadmap effort under AIM-IP launched about a year ago will address Additional Applications of Optical Technologies.

The Internet of Things Has Arrived



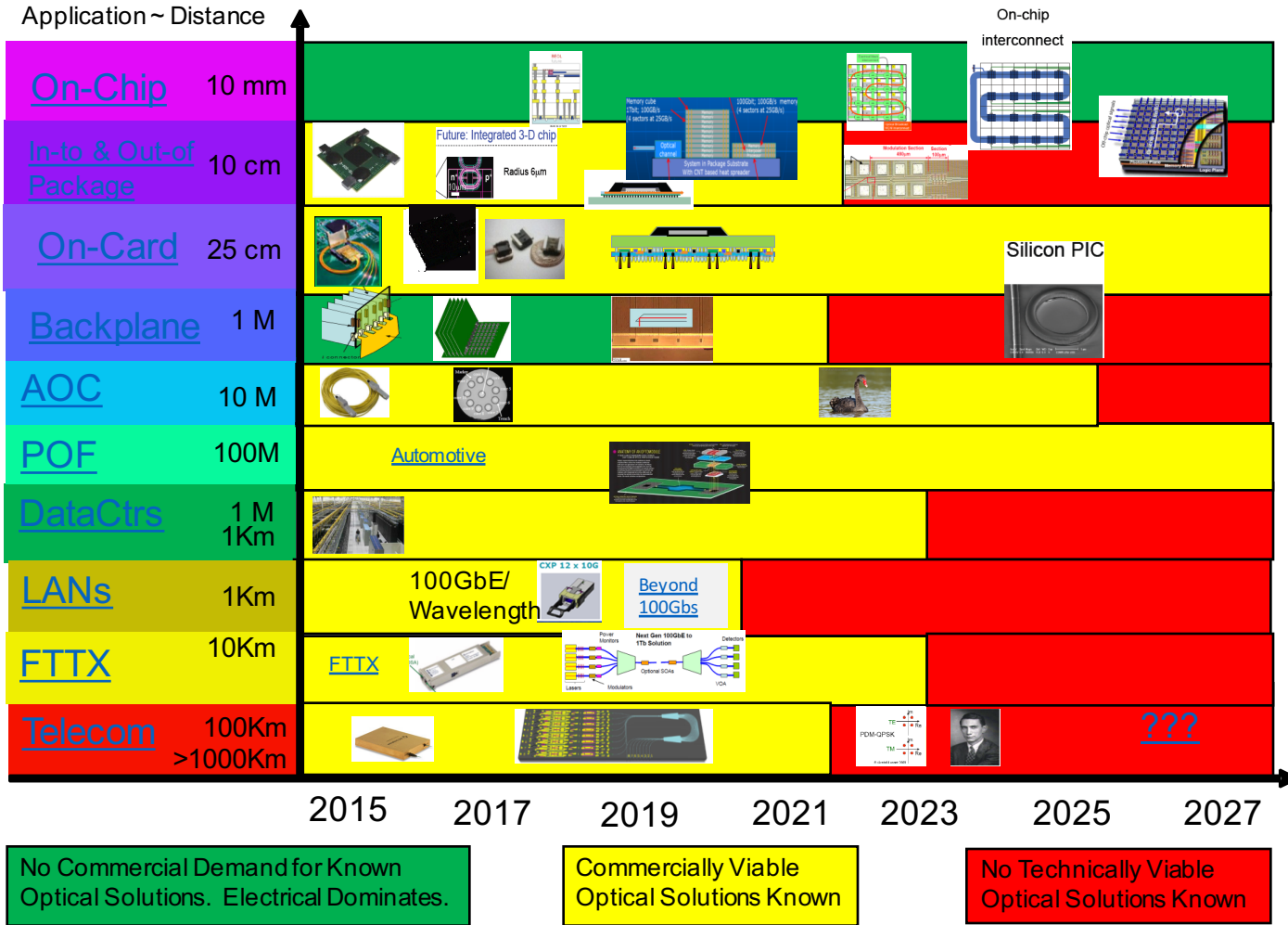
Amount of Information Transmitted Through the Internet 40%/yr Growth



Result of 40%/yr Growth

- Need a lot more equipment installed and Operating!!

Optical Data Transmission Roadmap



Typical Dat Center Illustrating Where Roadmaps Contribute



Where Roadmaps Contribute



Where Roadmaps Contribute

- Describe in moderate Detail the “Current Situation”
 - What is being done by who and why.
- Describes the Emerging Needs, i.e.
 - More Capacity
 - Less Power
 - Smaller Size
- Attempt to Quantify Needs over Time
- List the Gaps
- List the “Show Stoppers”

Roadmap of Quantified Key Attribute Needs-Assembly and Test

Parameter	Metric	2013	2015	2017	2019	2025
Assembly						
	#REF!					
Single Mode Fiber attach to substrate	sec/joint	300	240	192	154	98
Single Mode Part Placement to <0.5 microns accuracy	sec/joint	20				
Multi-mode Part Placement to <5.0 microns accuracy	sec/joint	5				
Number of Parts	parts/module					
Implementation of Parallel Processing	Percentage					
Assembly rate	sec/module					
Joining process time	sec/module					
Average Board Assembly Cost	¢ per I/O	0.75	0.7	0.65	0.55	0.35
Average Final Product Assembly Cost	\$/unit	1300.00	1100	900	500	300
Package Costs						
	#REF!					
IC Package Cost	¢ per I/O	0.18	0.16	0.15	0.15	0.12
Package Cost (High Density Ceramic/w/ Area Connector)	¢ per I/O	5	4	3	2	1
Package Cost (High Density µvia Laminate w/ Area Connector)	¢ per I/O	4	3	2	2	1
Connector Cost	¢ per I/O	1.90	1.6	1.3	1	0.5
Energy Cost	\$/Wh	0.40	0.30	0.25	0.20	0.10
Memory Cost (Flash)	\$/MB	0.18	0.15	0.13	0.10	0.05
Memory Cost (SRAM)	\$/MB	0.18	0.15	0.13	0.10	0.05
Cost of Test as a ratio to assembly	ratio	0.40	0.50	0.60	0.60	0.80
Cycle Time						
NPI Cycle Time	Weeks	20	16	12	6	3
Product Production Life (not including spares)	Years	7	6	5	3	3

Assembly & Test, Key Attributes

Cost Of Parts	\$\$dollars	cents	
# Of Parts	10's	<5	
Assy Time	minutes	many seconds	few seconds
Assy Tolerance	0.5 micron	0.05 micron	
Assy Set Up	hours	minutes	
Assy Equip Cost	\$50K to \$1000K	<\$200K	
SM Fiber Attach	many minutes	minutes	seconds
Test Method	functional test	self test/self repair	
Test Time	minutes/unit	nil	
Overall Yield	>90%	~100%	
	NOW	NEXT	LIMITS

Small Commercial Demand for
Technically Viable Optical Solutions

Commercially Viable
Optical Solutions Deployed

No Technically Viable
Optical Solutions Exist

Gaps and Showstoppers

The 25GHz barrier resulting from conventional CMOS capability forcing parallel solutions rather than higher data rates.

Low speed of suitable assembly, test and other process equipment resulting in high costs.

Inability to overcome the cost driving, rate limiting step/bottle neck of manufacturing/testing such as the number of assembly steps or length of time to perform test, especially BER testing. "Time is money"

Limits resulting from adopting existing equipment, materials and methods to optical test because more specific equipment is not available because the demand is not sufficient to incentivize equipment manufactures to make it available.

Designing for Manufacturing and test:

- Maximizing output to reduce cost
- Studying designs to trade off accuracy and speed

Inability to utilize materials or processes due to environmental related constraints (RoHS, REACH, WEEE, etc. TBD)

How the Roadmap Helps

- Shows current and emerging needs
- **“Find a Need and Fill it”**
 - Roadmaps list needs, gaps, show stoppers
 - Each is a potential business opportunity
- Not driven by “our” capability but by market needs.
- Easier to find a need and fill it than to find a market for a technology

What Next After Utilizing Roadmap Guidance ?

- Dig In and Get To Work
- Published Roadmaps provide Very Broad Area of Need/Opportunity
- Assess your Resources
 - Skills
 - Contacts
 - Capabilities
 - What You Are Passionate About and Interested in
- Act !!
 - Talk to People
 - Try or Make Something

Many Roadmaps Are Written & Published

- iNemi Bi-Annual Roadmap Covers Electronics Worldwide
- Many Corporations Publish a Road Map for Their Products
- Some Industry Organizations Publish Roadmaps for their Industries

Thank You for Your Attention