



Information Superhighway, Personalized Medicine, and Start-ups

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Outline

- ➡ • **Information Superhighway & hunger for bandwidth**
 - Internet in 1990's → Xtera Communications
 - Video in the late 2000's
 - Mobile in the 2010's
- **Creative Destruction of Medicine**
 - Information technology for personalized medicine
 - Sensor of different sorts
 - Wearable Technologies
- **Cool Technology turning into a Company**
 - How do you decide to commercialize a technology?
 - Start-ups: six lessons learned the hard way



Telecom in the late 1990's

- **Rapid Growth**
 - Traditional phone traffic growing 4%/year
 - Internet taking off ... 2x to 16x / year predictions
- **Wavelength Division Multiplexed (WDM) Networks**
 - Multiple wavelengths on a single fiber
 - Each channel had its own virtual fiber
- **Optical Amplifiers Enabled WDM**
 - Multiple wavelengths simultaneously amplified
 - Incremental cost to add additional wavelengths
- **Bottleneck on Bandwidth: amplifier bands**
 - Fiber has wide low loss window
 - Amplifiers had limited bandwidth

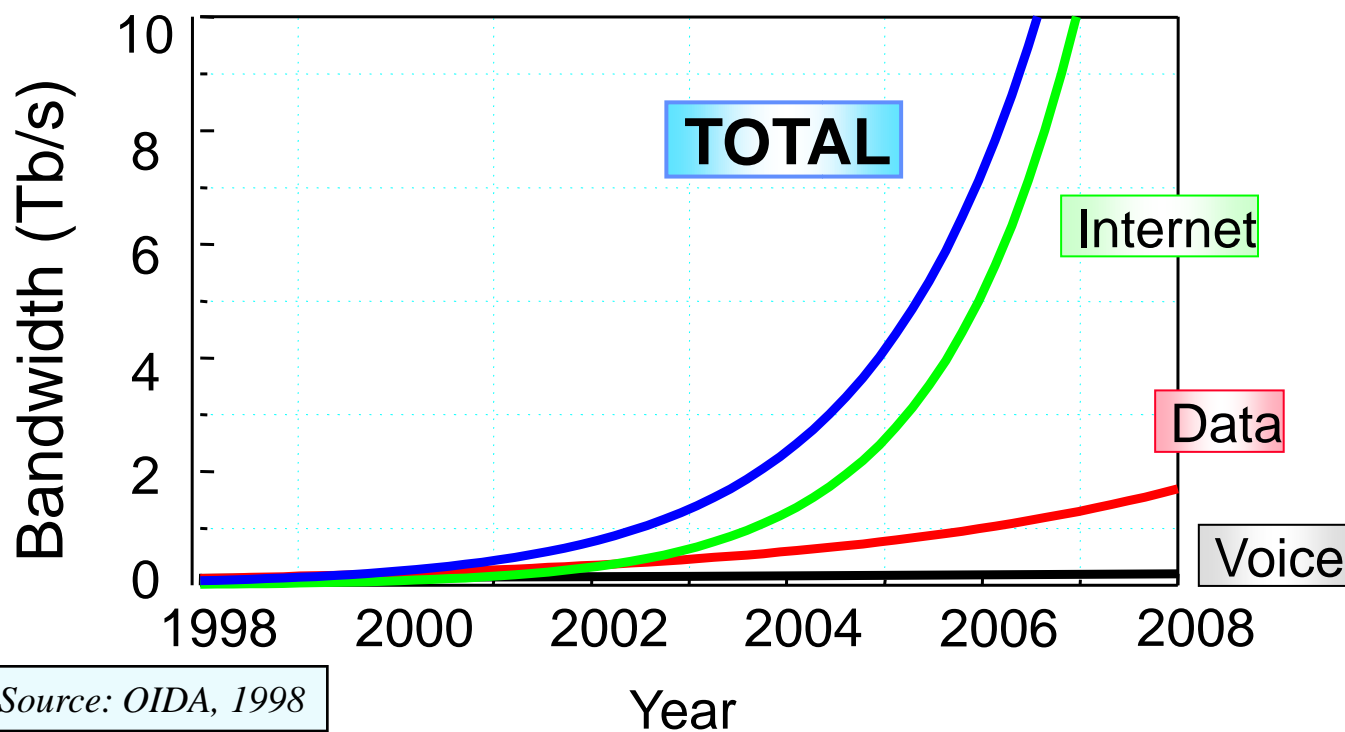


Bandwidth should be like Closet Space





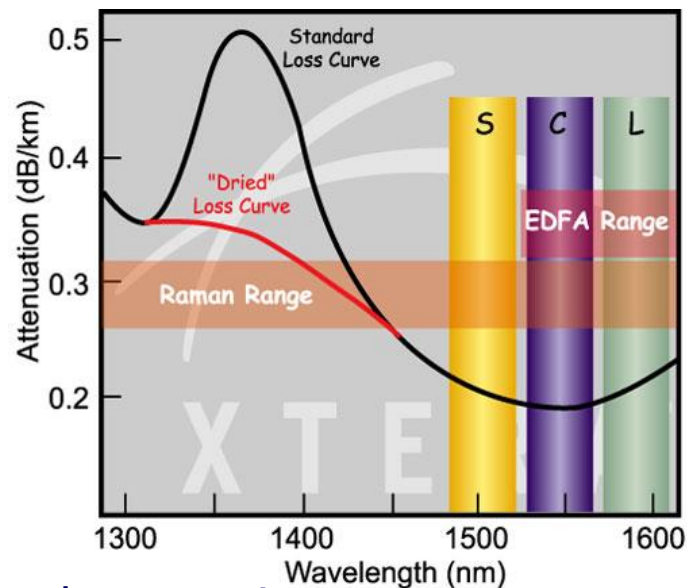
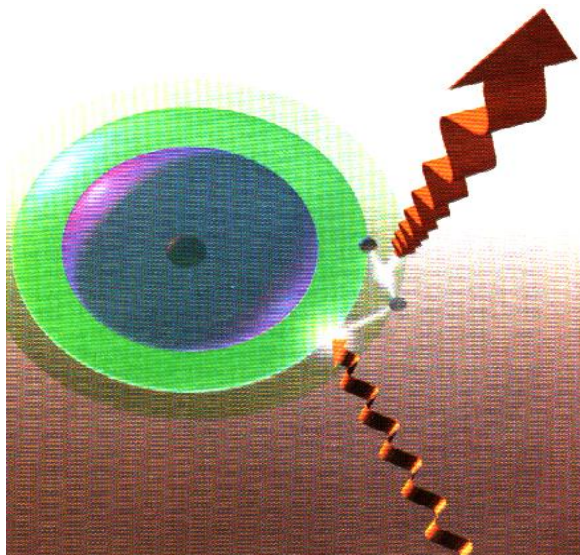
In 1998, Market Need Arising from Explosive Growth of Internet



Backbone Traffic and Bandwidth Predictions for the U.S. Network



Raman Amplification's Wide Range

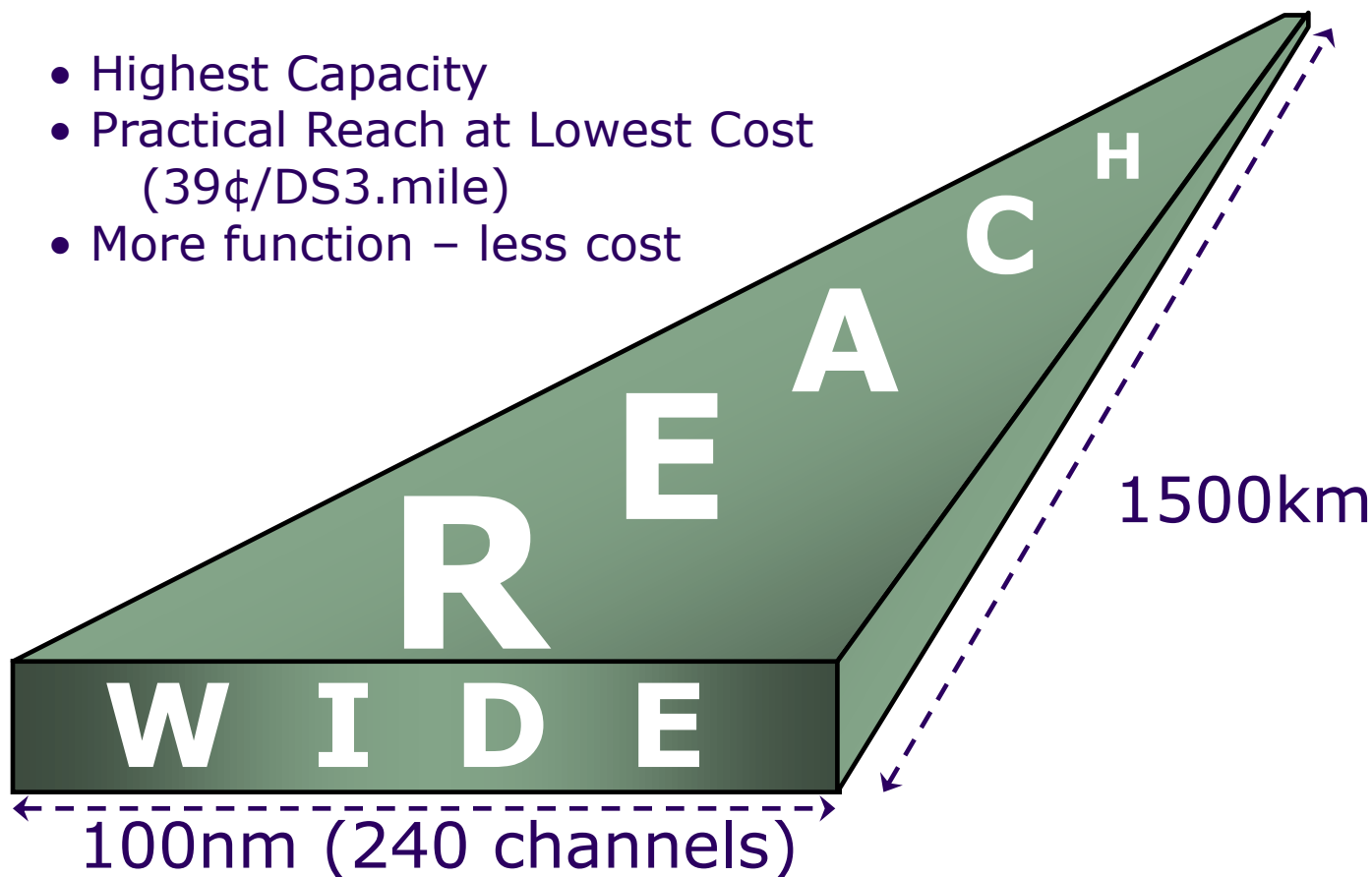


- Raman amplification wavelength agnostic
- Low noise performance of Raman amplifiers
- Analogy to electrical circuits
 - Optical Amp → transistor
 - Wavelength division multiplexing → integrated circuits
 - Laser diodes → power supply



Xtera's Value Proposition

- Highest Capacity
- Practical Reach at Lowest Cost (39¢/DS3.mile)
- More function – less cost





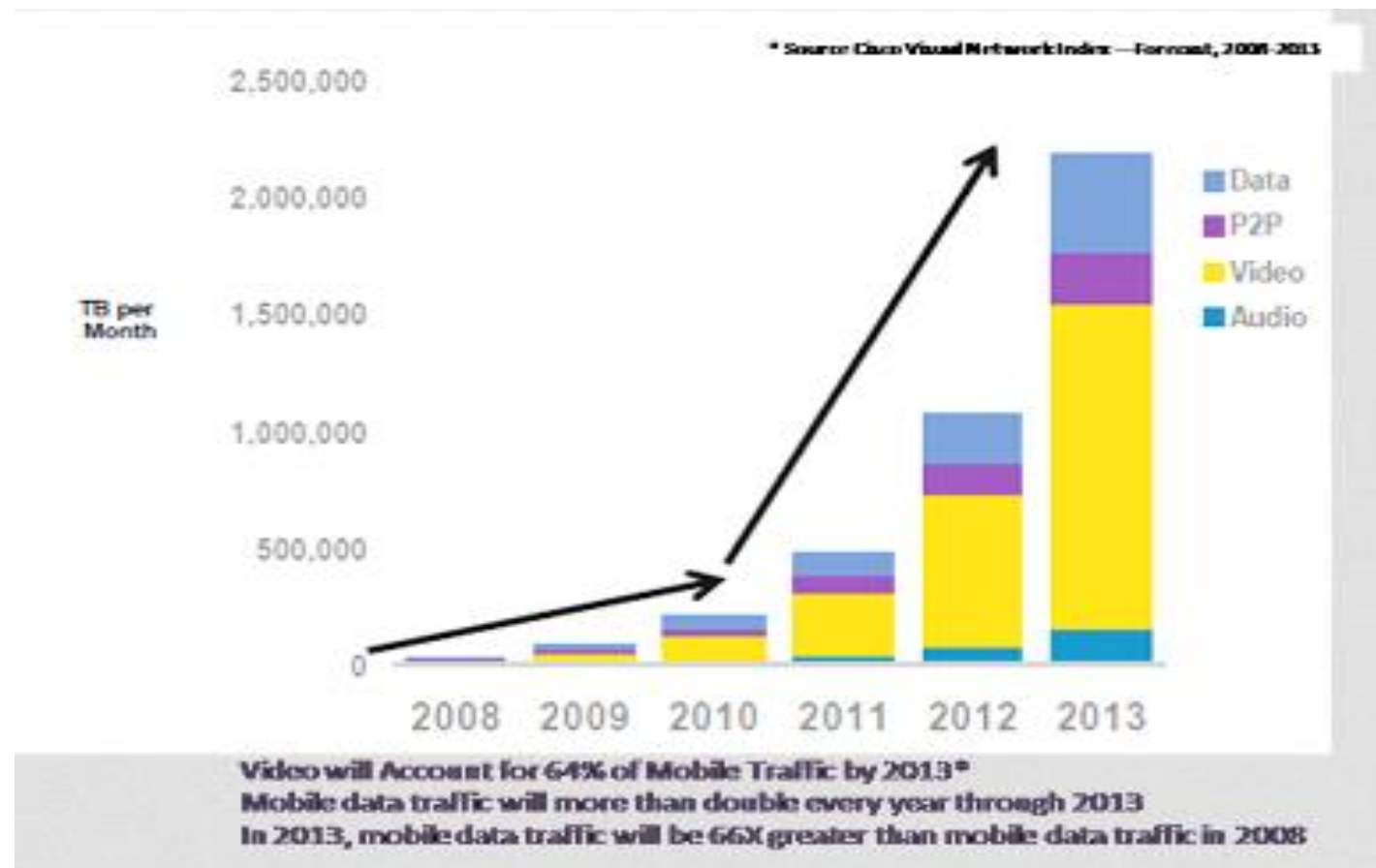
Xtera's Nu-Wave DWDM System

- Based on University of Michigan Raman technology
- Has set new price points in the industry (>\$40M sales)
- Supported by strong IP position
 - 46 patents or patents pending
- Exploits advantages of Raman Technology (clear, sustainable)
 - More than 3x bandwidth
 - More than 5x noise performance
 - Lower cost
- Started with PO's from Sprint and Nortel Networks early on
- Moved from A2 to TX in 2000
- Raised over \$250M in VC \$\$\$





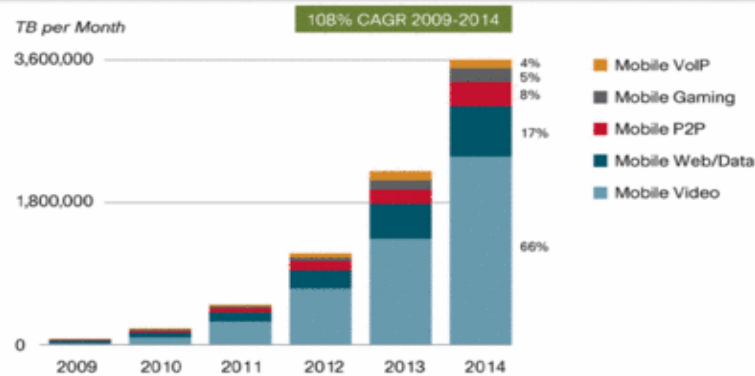
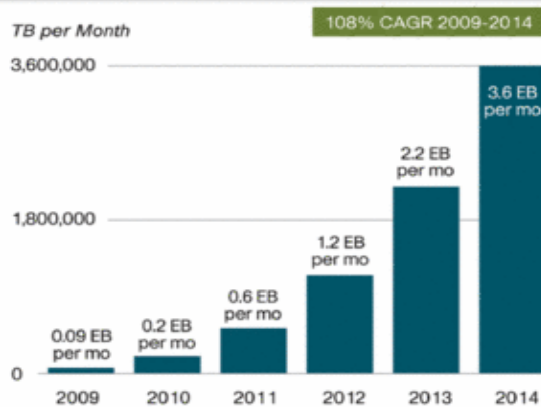
And Then Came Video...





Rapid Growth of Mobile...

Key Secular Trend: Mobile Data Traffic Explosion

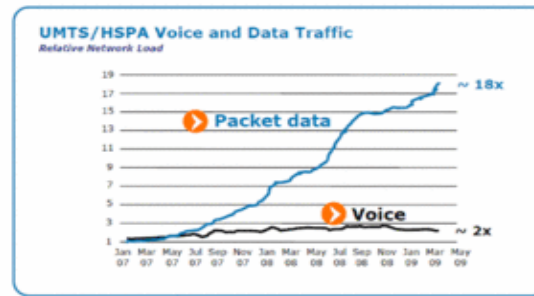


Source: Cisco VNI Mobile, 2010

For more details, see Appendix B: Forecast and Methodology.
Source: Cisco VNI Mobile, 2010



Source: at&t, LTE Americas Conference, Nov 2009



Source: 3G Americas/Peter Rysavy





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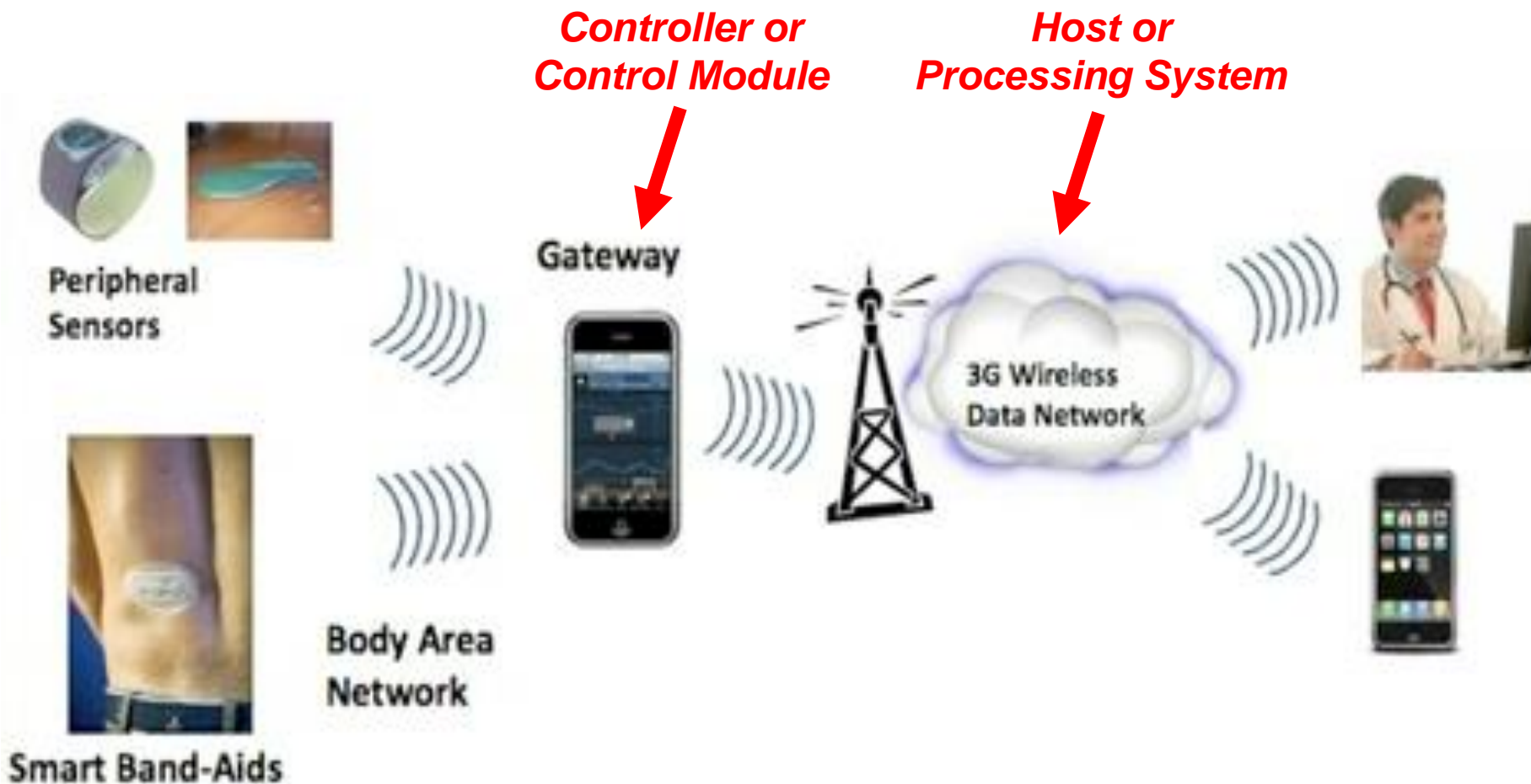
“Creative Destruction of Medicine”

- Eric Topol

People can take control of their medical care starting from their mobile device

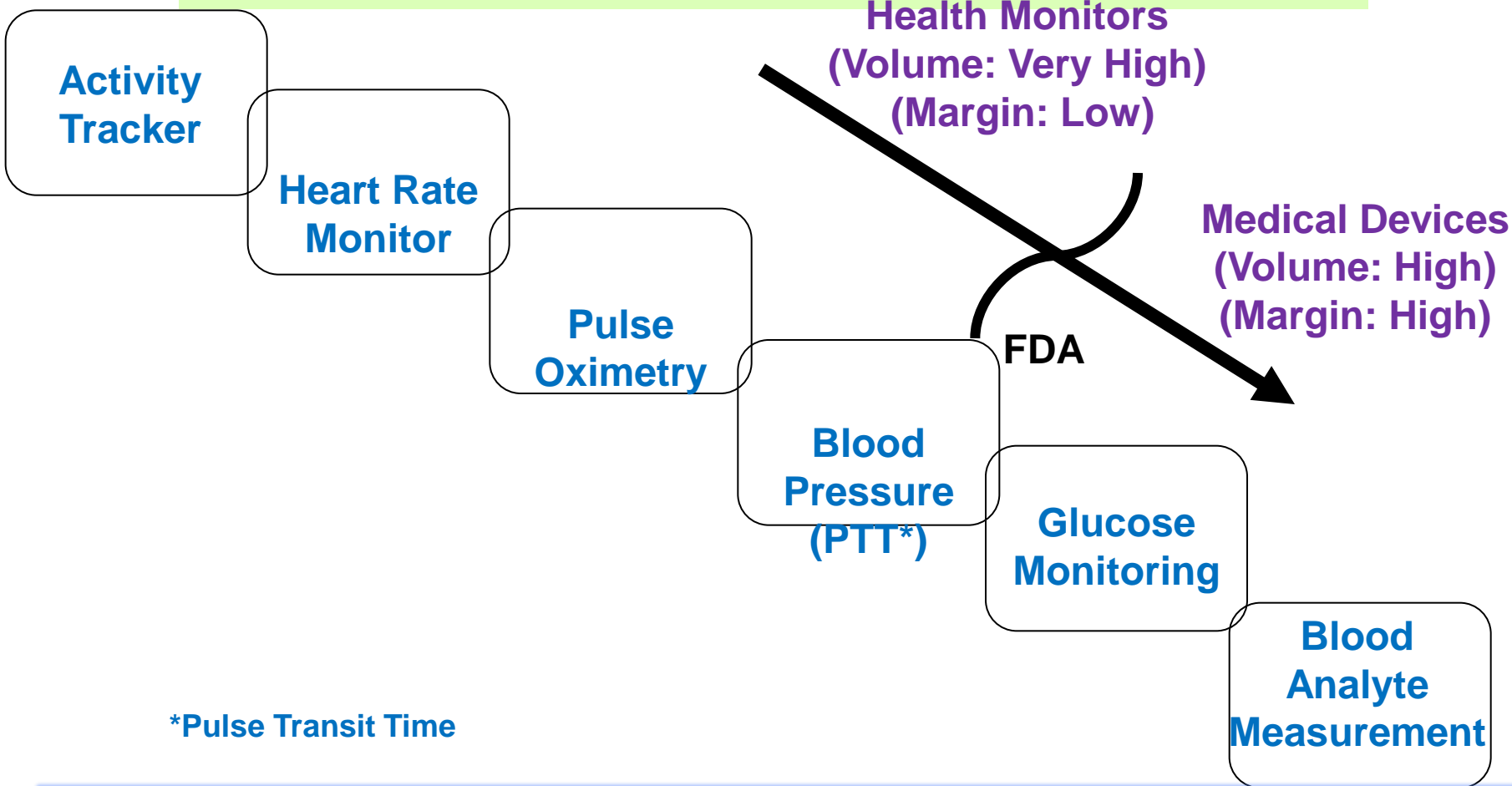


Consumer Driven Healthcare: aka “Personalized Medicine”



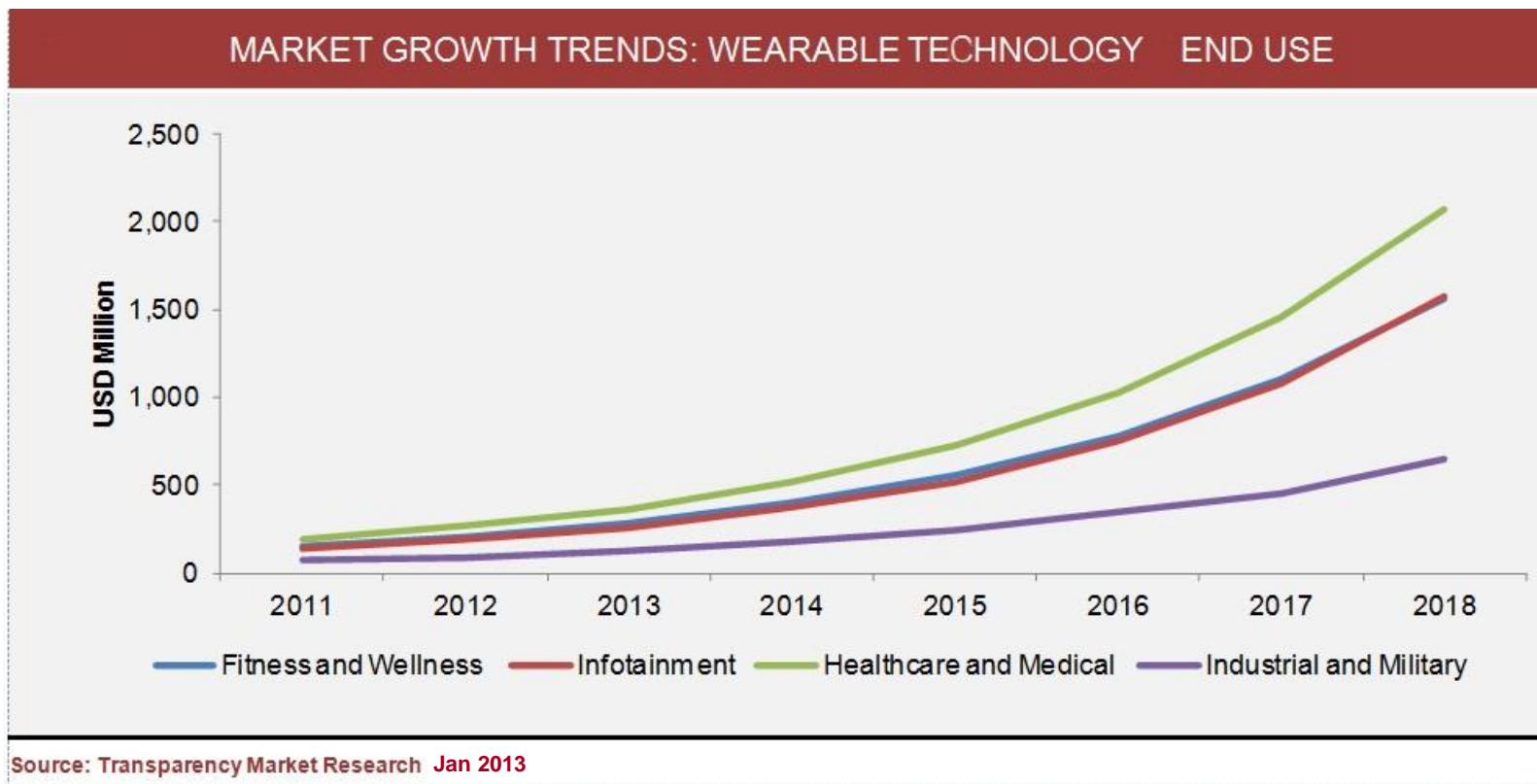


Wearable Sensors of Increasing Complexity





Market Size: Wearable Technology



Fitness and Wellness + Healthcare and Medical ~\$4B



Market Going into Inflection Point Samsung...

**Samsung Simband aims to take a big step in
wearable health**

OPEN MODULAR PLATFORM

FROM BIG DATA TO
CONTEXTUAL INSIGHT

A CLOUD-BASED SENSOR DATA PLATFORM



AGNOSTIC



SECURE



OPEN



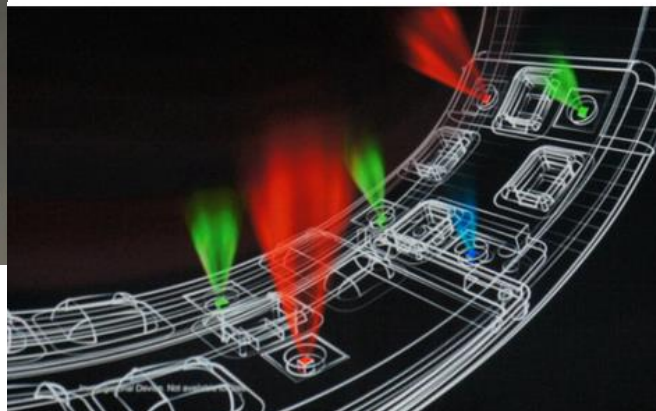
INSIGHT



SAMI
Samsung Architecture Multimodal Interactions



Samsung **SIMBAND**





Market Going into Inflection Point Google...

TECH TIMES

Google Fit is answer to Apple's HealthKit in fitness battle

By Vamien McKalin, Tech Times | June 15, 11:31 PM

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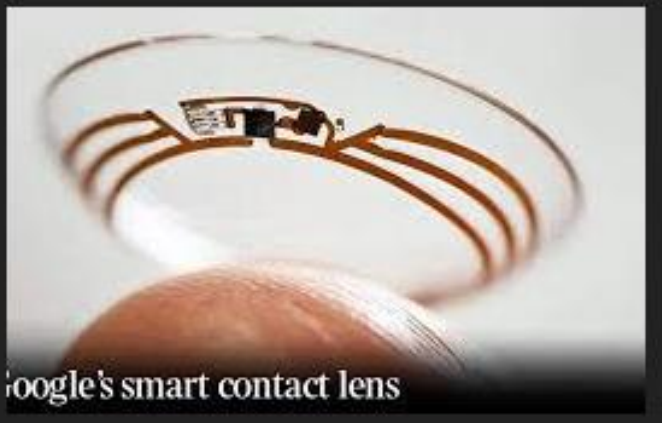
2 COMMENTS



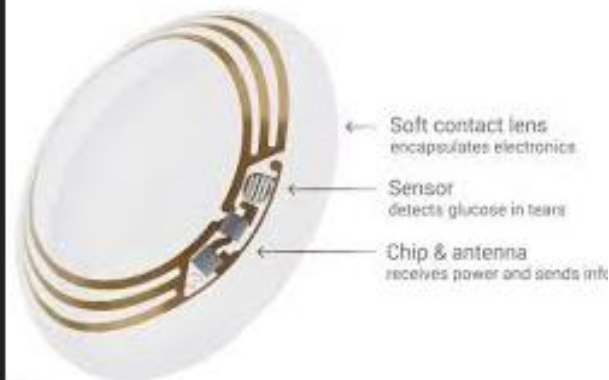
Google Fit is the online search giant's second major push to have a meaningful presence in the health and fitness

Google is working on a potential competitor to Apple's HealthKit, called Google Fit, according to a new report. Chances are, we should get some information at the Google I/O conference in July if this information proves to be true.

According to the report from Forbes, Google began working on its own fitness system after learning about Apple's HealthKit, and Samsung's nebulous SAMI concept. It's a move that is designed to make sure that Google doesn't get left behind in this area, and the company is working hard to ensure that is available as soon as possible.



Google's smart contact lens





Market Going into Inflection Point Apple...

TECH 6/17/2014 @ 9:46AM | 13,373 views

Forbes

The Revolution Hidden In The Apple Health Kit

“ Apple is positioning its Health app as the point of aggregation for all the user’s different health data, and Health Kit the development platform to enable that integration. But critically, indications are that the health data will for the most part be collected by sensors (Nike+, Withings Scale, Fitbit Flex etc) of other wearable manufacturers.... offering – i.e stay away from the hardware for now and instead provide the services & software glue to tie all the existing hardware into some sort of cohesive whole.

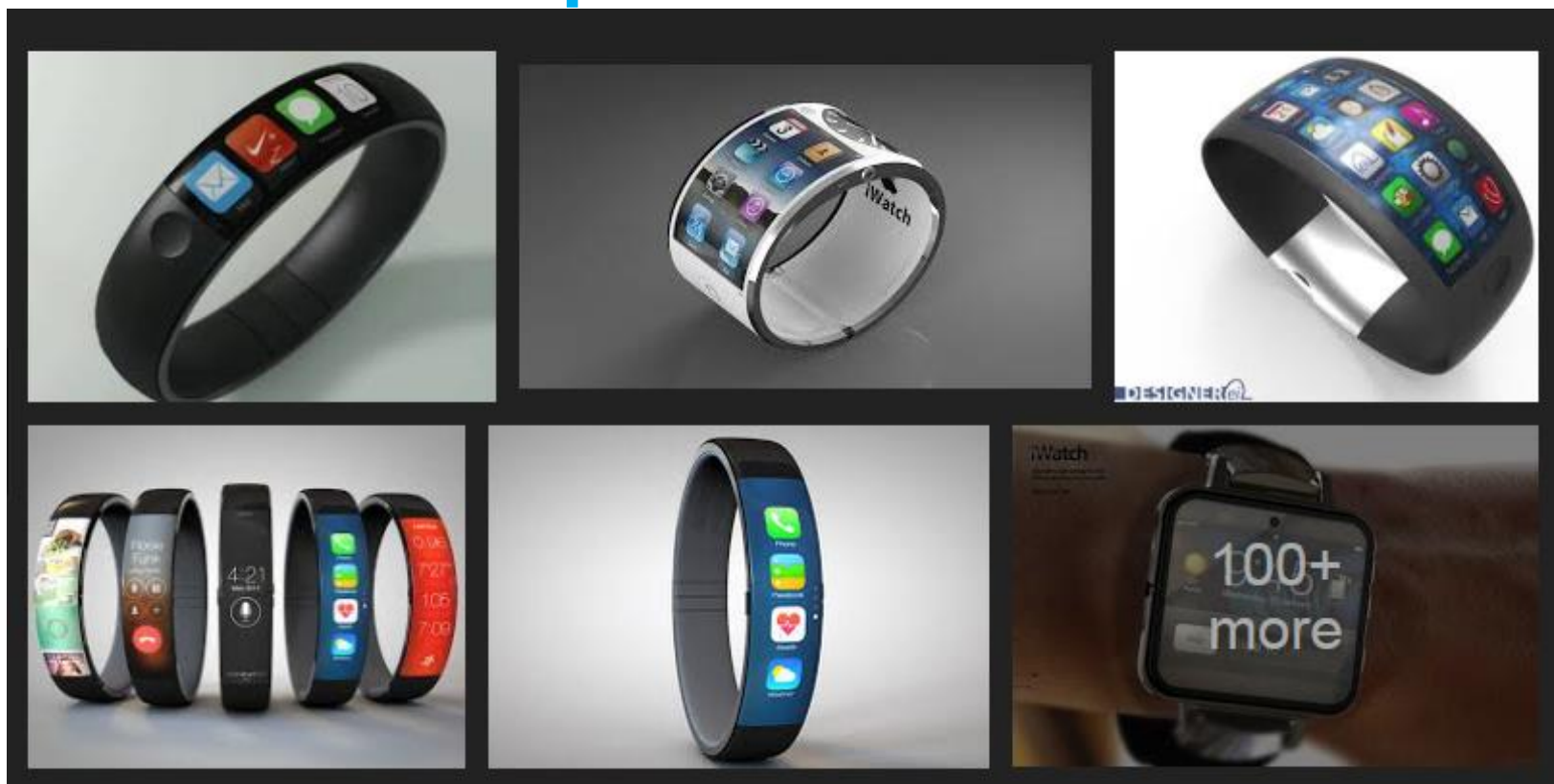
Front Row: Apple Developers Conference (6/13/14)





Market Going into Inflection Point Apple...

iWatch Concept...out in October 2014?



Note: Nike pulled Fuel Band, Tim Cook on Nike Board



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Entrepreneurs...turning ideas into products and services

- **For you to have a business, you must answer the questions:**
 - **Who is your customer?**
 - **What is their pain?**
 - **How much is your solution worth to the customer to relieve the pain?**
 - **How are you going to make money, possible exit strategy?**
 - **What is your sustainable competitive advantage?**
- **In what follows, some of my lessons on start-ups**



Lessons Learned the Hard Way # 1: **Crossing the Finish Line**

- **It is NOT about how much money you can raise**
 - Although you better be able to raise \$\$\$, which is the fuel
- **It IS about crossing the finish line**
 - What is your exit strategy?
 - Aim high: IPO is the ultimate finish line
- **Begin with the end in mind**
- **How do you structure the company & financing so you maximize the probability of success?**
 - Product line with sustainable differential advantage
 - A+ dream team that works together well
 - Founding team has significant equity when crossing finish
 - All share holders win big





Lessons Learned the Hard Way # 2:

Start-Up's Biggest Asset is Its People

- **It is all about putting together the dream team**
 - Business plans are almost always wrong, but the right team will figure out how to maneuver the obstacles
 - The team as a whole has to work at the A+ level, although team members will be a combination of A and B players
 - You can't just hire winners, you have to hire potential winners
- **Know what you are best at, and hire others who are best at the other elements of the business**
 - I take the role of Founder & Chief Technology Officer
 - Look for VP Engineering and VP Marketing early in company
 - » VPE then fills in the engineering team
 - At appropriate stage in company, bring in the CEO
 - » Investors like to bring in the CEO as soon as possible, but resist the urge





Lessons Learned the Hard Way # 3: **Selecting the Playing Field**

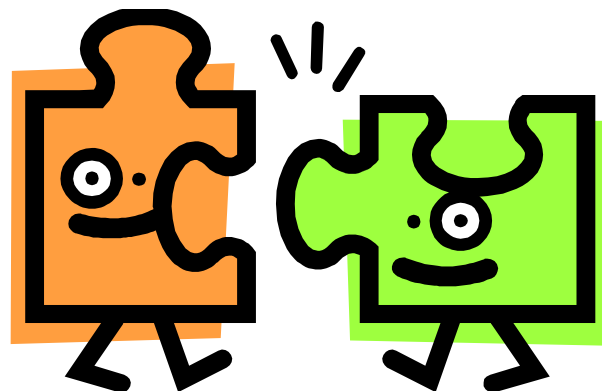
- **First question: is this technology that should be licensed, or is it technology that can make a company?**
- **Part of the answer depends on your goals**
- **For this technology to turn into a company**
 - **IT MUST SOLVE A PROBLEM.** You can't sell something unless you solve some problem or need of the customer
 - **Is there an opening in the market? Is it green field, or is it already very populated and highly competitive?**
 - **Is your technology SIGNIFICANTLY better in performance and price that it will overcome the customer's fear of buying from a start-up?**
- **My recommendation: LOOK FOR WHITE SPACE**





Lessons Learned the Hard Way # 4: **Many Pieces to the Puzzle**

- **Even in high-tech start-ups, technology is at best 10% of the ingredients for success**
 - **Necessary, but not sufficient**
- **Many other pieces to the puzzle**
 - **Marketing**
 - **Sales**
 - **Operations**
 - **Development / Engineering**
 - **Investors**
 - **Contract manufacturers**
 - **Customer Support**
 - **...etc...**
- **You don't have to do all of these yourself, but you do have to have an appreciation for the importance they play in the success of the company**





Lessons Learned the Hard Way # 5:

Trojan Horse Market Strategy

- **Breaking into the market is hard, so take the niche markets that others may overlook**
- **Once in, impress the customer with your product and service**
 - Working with customer and understanding their needs, you are in a much better position to compete for new business
 - Spread from within to increase market share
- **So...**
 - Engage the customer early
 - Make sure your product works!
 - Provide the best customer service
 - Make your customers partners and advocates for you





Lessons Learned the Hard Way # 6:

Founder must have a Clear Vision

- You have to be able to close your eyes and see what the future looks like, and what the goal or destination looks like
 - Your vision has to be compelling!
 - You have to be able to articulate your vision
- This higher purpose will keep you motivated through the tough times
- Think about it: You are asking sane people to leave good paying jobs to join your adventure
- Vision goes from the broad to the very specific





So, in a nutshell...

- **Begin with the end in mind**
 - **Structure the company for long-term success**
- **Have to solve a customer's problem**
- **Pick a “white space” market & technology with clear, sustainable differential advantage**
- **Assemble an A+ team with the combination of talents required**
- **Work early with customers, and use a “Trojan horse” strategy for increasing market share**
- **Focus on the future with a clear vision**