Some Basics of Venture Capital
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What is Venture Capital?

- Private or institutional investment (capital) in relatively early-stage companies (ventures)
- Recently focused on technology-heavy companies:
  - Computer and network technology
  - Telecommunications technology
  - Biotechnology
- Types of VCs:
  - Angel investors
  - Financial VCs
  - Strategic VCs
Angel Investors

• Typically a wealthy individual
• Often with a tech-industry background, in position to judge high-risk investments
• Usually a small investment (< $1M) in a very early-stage company (demo, 2-3 employees)
• Motivation:
  - Dramatic return on investment via exit or liquidity event:
    • Initial Public Offering (IPO) of company
    • Subsequent financing rounds
  - Interest in technology and industry
Financial VCs

• Most common type of VC
• An investment firm, capital raised from institutions and individuals
• Often organized as formal VC funds, with limits on size, lifetime and exits
• Sometimes organized as a holding company
• Fund compensation: carried interest
• Holding company compensation: IPO
• Fund sizes: ~$25M to 10’s of billions
• Motivation:
  - Purely financial: maximize return on investment
  - IPOs, Mergers and Acquisitions (M&A)
Strategic VCs

• Typically a (small) division of a large technology company
• Examples: Intel, Cisco, Siemens, AT&T
• Corporate funding for strategic investment
• Help companies whose success may spur revenue growth of VC corporation
• Not exclusively or primarily concerned with return on investment
• May provide investees with valuable connections and partnerships
• Typically take a “back seat“ role in funding
The Funding Process: Single Round

- Company and interested VCs find each other
- Company makes its pitch to **multiple VCs**: business plan, executive summary, financial projections with assumptions, competitive analysis
- Interested VCs engage in **due diligence**:
  - Technological, market, competitive, business development
  - Legal and accounting
- **A lead investor is identified, rest are follow-on**
- The following are negotiated:
  - Company **valuation**
  - **Size** of round
  - Lead-investor share of round
  - Terms of investment
- **Process repeats several times, builds on previous rounds**
Due Diligence: Tools and Hurdles

• **Tools:**
  - Tech or industry background (in-house rare among financials)
  - Industry and analyst reports (e.g., Gartner)
  - Reference calls (e.g., beta’s) and clients
  - Visits to company
  - DD from previous rounds
  - Gut instinct

• **Hurdles:**
  - Lack of company history
  - Lack of market history
  - Lack of market!
  - Company hyperbole
  - Inflated projections
  - Changing economy
Terms of Investment

• Initially laid out in a **term sheet** (not binding!)
• Typically comes after a fair amount of DD
• Valuation + investment $\rightarrow$ VC equity (share)
• Other important elements:
  - Board seats and reserved matters
  - Drag-along and tag-along rights
  - Liquidation and dividend preferences
  - Non-competition
  - Full and weighted ratchet
• **Moral:** These days, VCs extract a huge amount of control over their portfolio companies.
Basics of Valuation

• **Pre-money valuation** $V$: agreed value of company **prior** to this round’s investment ($I$)
• **Post-money valuation** $V' = V + I$
• VC equity in company: $I/V' = I/(V+I)$, **not** $I/V$
• Example: $5M$ invested on $10M$ pre-money gives VC $1/3$ of the shares, **not** $1/2$
• Partners in a venture vs. outright purchase
• $I$ and $V$ are items of **negotiation**
• Generally company wants large $V$, VC small $V$, but there are many subtleties...
• This round’s $V$ will have an impact on future rounds
• Possible elements of valuation:
  - Multiple of revenue or earnings
  - Projected percentage of market share
Board Seats and Reserved Matters

• Corporate boards:
  - Not involved in day-to-day operations
  - Hold extreme control in major corporate events (sale, mergers, acquisitions, IPOs, bankruptcy)

• Lead VC in each round takes seat(s)

• Reserved matters (veto or approval):
  - Any sale, acquisition, merger, liquidation
  - Budget approval
  - Executive removal/appointment
  - Strategic or business plan changes

• During difficult times, companies are often controlled by their VCs
Other Typical VC Rights

- **Right of first refusal** on sale of shares
- **Tag-along rights**: follow founder sale on pro rata basis
- **Drag-along rights**: force sale of company
- **Liquidation preference**: multiple of investment
- **No-compete** conditions on founders
- **Right to participate** in subsequent rounds (usually follow-on)
- **Later VC rights** often supercede earlier
- **Anti-Dilution Protection**
  - Recompute VC shares based on subsequent “down round” so that issuing more shares does not “dilute” the value of VC’s holding
  - Two recomputation methods: **weighted ratchet** and **full ratchet** (see next slide)
  - Matters in **bridge rounds** and other dire circumstances
Anti-Dilution Protection

- **Example:**
  - Founders have $N_1 = 10$ shares, VC has $N_2 = 10$ shares at $p_1 = $1 per share
  - Founder issues $N_3 = 1$ additional share at $p_2 = $0.10 per share (down round)

- **Recompute number of shares to keep VC value = $N_2 \times p_1$**
  - VC now owns $\frac{N_2 \times p_1}{q}$ shares out of a total $\left(\frac{N_2 \times p_1}{q}\right) + N_1 + N_3$.

- The new price $q$ depends on the computation method:
  - **Weighted ratchet:** use average (weighted) share price
    - $q = \frac{N_1 p_1 + N_3 p_2}{N_1 + N_3} = \frac{\text{(total non-VC share value)}}{\text{(total # non-VC shares)}}$
    - Example: Avg. price 10.10/11, VC now owns ~10.89 shares out of a total 21.89
  - **Full ratchet:** use down-round share price
    - $q = p_2$
    - Example: VC now owns 10/0.10 = 100 shares (out of 111)
Why Multiple Rounds and VCs?

• **Multiple rounds:**
  - Many points of valuation
  - **Company:** money gets cheaper if successful
  - **VCs:** allows specialization in stage/risk
  - Single round wasteful of capital

• **Multiple VCs:**
  - **Company:** Amortization of control!
  - **VCs:**
    • Share risk
    • Share DD
  - Both: different VC strengths (financial vs. strategic)
So What Do VCs Look For?

- Committed, experienced management
- Defensible technology
- Growth market (not consultancy)
- Significant revenues
- Realistic sales and marketing plan (VARs and OEMs vs. direct sales force)
Case Study (2001): DDoS Defense Technology

- **DDoS**: Distributed Denial of Service
- Web server, router, DNS server, etc. flooded with automated, spurious requests for service at a high rate
- **Outcomes:**
  - Resource crashes
  - Legitimate requests denied service
  - Bandwidth usage and expense increase
- **Attack types:**
  - SYN flood
  - ICMP echo reply attack
  - Zombie attacks
  - IP spoofing
  - Continually evolving!
- **Attack characteristics:**
  - Distributed
  - Statistical
  - Highly adaptive
- Not defendable via cryptography, firewalls, intrusion detection,…
- An arms race
Market Landscape

- Victims include CNN, eBay, Microsoft, Amazon
- > 4000 attacks per week (UCSD study)
- “Code Red” attack on White House foiled, but > 300K client zombies infected
- Costs:
  - Downtime, lost productivity
  - Recovery costs (personnel)
  - Lost revenue
  - Brand damage
- Attack costs $1.2B in Feb. ’00; 2005 market estimate $800M (Yankee Group)
Who Can and Will Pay?

• Internet composed of many independently owned and operated autonomous networks
• Many subnets embedded in larger networks
• Detecting/defending DDoS requires a minimum network footprint
• Must solve problem “upstream” at routers with sufficient bandwidth to withstand attack traffic!
• May simply trace attack source to network edge
• Target customers:
  - Large and medium ISPs, MSPs, NSPs
  - Large and medium data centers
  - Backbone network providers
  - Future: wireless operators; semi-private networks (FAA, utilities)
  - Making target customers care; cannibalization
• Key points:
  - Problem did not exist until recently on large scale
  - No product available for its defense
  - No historical analysis of market possible (firewall and IDS)
The Companies

- Four early-stage companies focused specifically on DDoS
- All with strong roots in academia
- Headcounts in 10’s; varied stages of funding and BD
- Larger set of potential competitors/confusers:
  - Router manufacturers (e.g. Cisco)
  - IDS and firewall companies
  - Virus detection companies (e.g. McAfee)

- Technology:
  - All four solutions involve placing boxes & SW “near” routers
  - Differing notions of “near”
  - Boxes monitor (some or all) network traffic
  - Boxes communicate with a Network Operations Center (NOC)

- Key issues:
  - Detection or Defense?
  - Intrusiveness of solution?
Some Specifics

- **Company Detect:**
  - Emphasis on detection tools provided to NW engineer
  - *Claim more intrusive/automated solutions unpalatable*
  - Emphasis on GUI and multiple views of DDoS data
  - More advanced in BD (betas), PR, partnerships
  - More advanced in funding (>>$10M capital taken)

- **Company Defend-Side:**
  - Emphasize prevention of attacks by filtering victim traffic
  - Box sits to the *side* of router over fast interface
  - Claim there is a “sweet spot” of intrusiveness
  - Box only needs to be fast enough for victim traffic, not all
  - Don’t need perfect filtering to be effective
  - No GUI emphasis; behind in BD; less advanced in funding

- **Company Defend-Path:**
  - Also emphasizing prevention, but box sits on “data path”
  - Need faster boxes and more boxes (scalability)
  - Concerns over router integration
Due Diligence

- No company has any revenue yet
- Some have first-generation product available
- All have arranged beta trials with some ISPs
- Have roughly similar per-box pricing model and ROI argument
- Due diligence steps:
  - Repeated visits/conversations with companies: technical, sales strategy
  - Multiple conversations with beta NW engineers
  - Development of financial model for revenue projections & scenarios
  - Compare with firewall and IDS market history: winners & losers, mergers
  - Conversations with previous round VCs: DD and commitment
- In the end, a decision between:
  - More conservative technology with a slight lead in BD and R&D
  - More ambitious technology with less visibility, but a better deal
- Contemplating both investments...
- ...then came September 11.
First Exam
February 27, 2003

• Reminder: The first exam will be held in class on Thursday.
• This exam counts for 25% of your total course grade.
• Past years’ exams are available from past years’ websites (see links on this semester’s course website).