The New WAN Link: Dynamic Information and Hierarchical Caching Solutions

Keith Weng

Senior Strategist, Inktomi

12 Sep 2001

Inktomi

End-to-End Architecture

Distribute

Publish

Retrieve
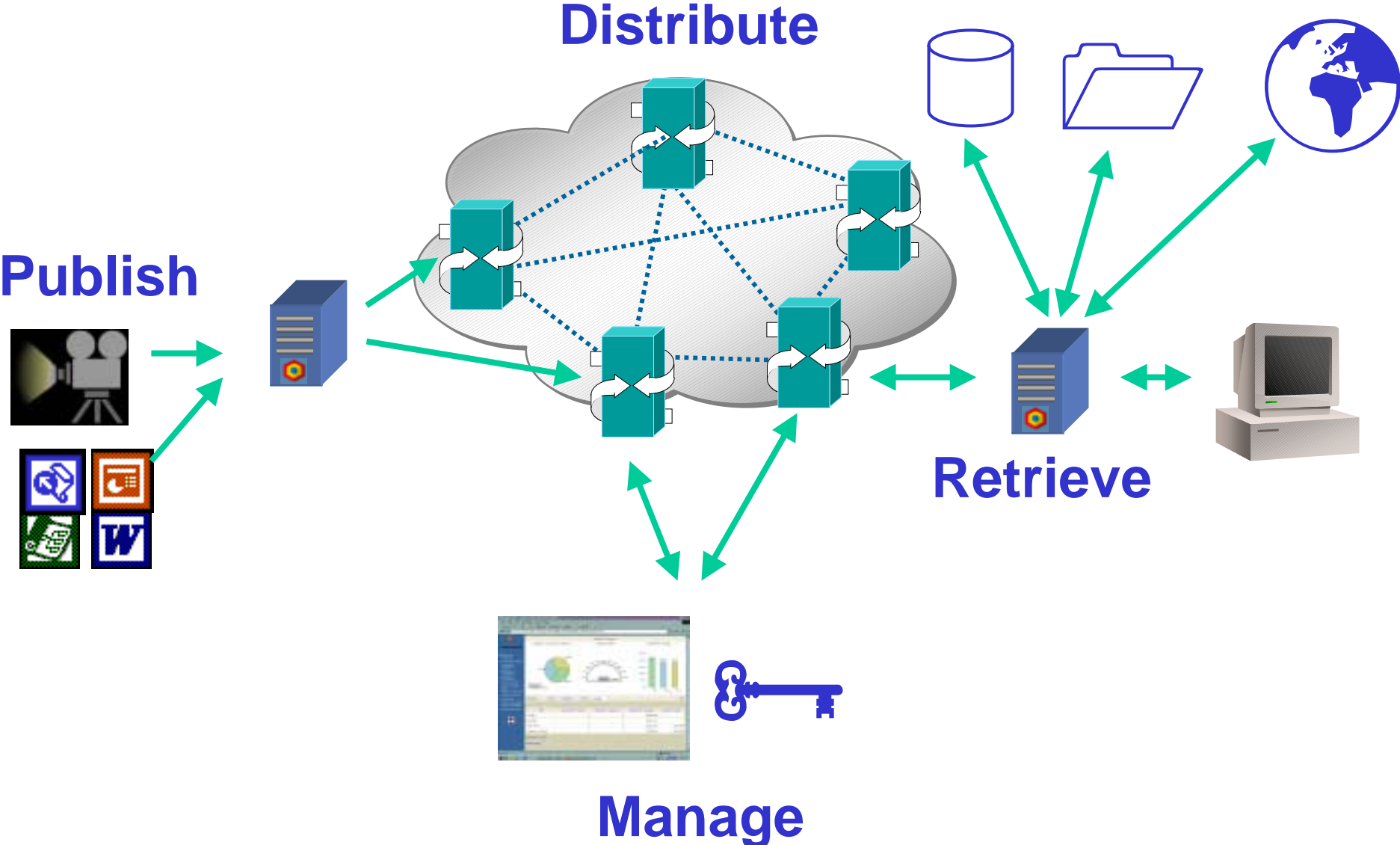
Manage

Background and Experience

- Senior Strategist, Inktomi
- Founder of Webspective 1997:
  - Content distribution & web infrastructure management
  - Acquired by Inktomi 1999
- Founder of Open Environment 1992:
  - 3-tier client/server -- DCE, Corba
  - IPO'd 1995, acquired by Borland
- Product design; systems design and onsite implementation with customers; systems administration, release management
- Technical consulting on client/server and Web infrastructure to Fortune 500: Motorola, Fidelity, American Express, BankOne, Compaq, Enron, John Deere, Sprint, Chrysler, Digital Island/C&W ...

Real-Life Deployment Required for N-Tier Computing

1991: 2-tier client/server, Powerbuilder, VB, oracle, Sybase, over dialup and on LAN, TCP/IP stacks, win3.0, LanManager

1994: 3-tier, DCE, CORBA, DCOM, over dialup, LAN and WAN, win3.1

1995: public internet, corporate email over internet, software firewalls

1996: cgi, java, applets, NTLM, win95, DHCP, (Corba/DCOM can't pass firewalls)

1997: SSL for credit cards, javascript, T-1's, hardware firewalls, Palm, kerberos

1998: Transparent caching, 100Mbps ethernet, LAN load balancers, LAN switches, LDAP

1999: app servers, EJB's, VPNs, T-3's, DNS load balancers, geographic data centers, (but db's can't replicate over WAN)

2000: CDNs, b2b automation, WAP, scalable app servers,

The Dynamic Caching Dream

"CDN for Dynamic Content"

- All applications Webified, in particular mission critical ones
- Closest cache to user handles anything redundant
  (including subcomponents of dynamic and even personalized pages)
- Application session failover and redundancy supported
- Security still assured (all of AAA)
- Origin servers / data centers don't have to scale up
- Thin pipes spared
- User experience improves
- Outsource scaling of applications to CDN's
- SLA's on whole service

The Dynamic Caching Reality

- Some "page assembly" technology available for LAN use, some internet services available for non-sensitive
- But:
  - Web Applications must be modified for page assembly
    - At minimum tagged, often rewritten or restructured
  - More complex to test than static caching/CDN, standalone app.
  - Security ACL granularity doesn't easily correspond for caching
  - No delegated security across administrative domains
  - Existing standards efforts don't form a solution (XSLT/XSL/CSS, RUP, ESI, …)
  - No management tools for many-WAN-node dynamic content

- So today usable for least sensitive, least critical content
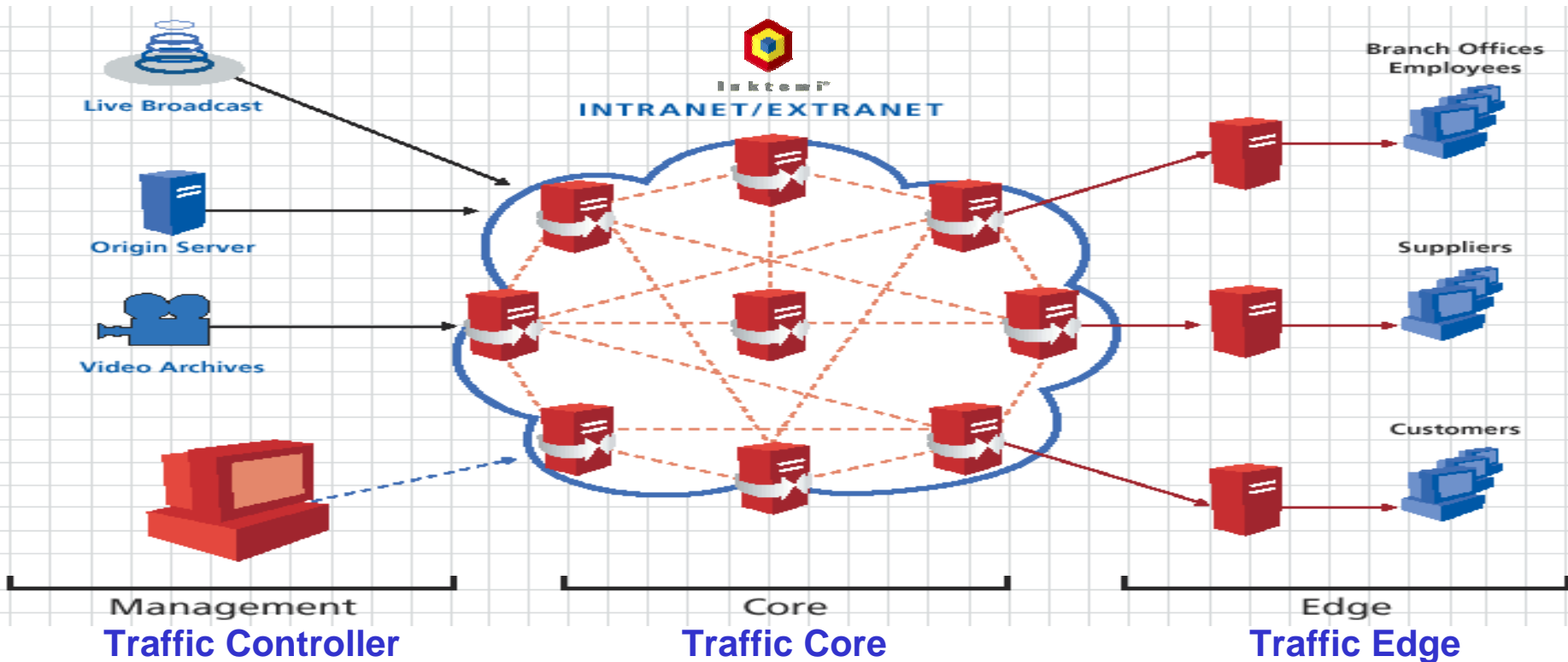- How to solve for more sensitive, more critical ? …

Biggest Issues

- Control and trust across administrative domains
  - b2c: Fidelity stock trading -> Sprint -> Earthlink -> user device
  - b2b: GM procurement -> Uunet -> Genuity -> NapaAutoparts
  - How can app owner *trust* what happens in network twice removed?
    - E.g. Guarantee accurate access controls on sensitive data on a cache in Earthlink POP or in NapaAutoparts datacenter
  - How can app owner *control* what happens there ?
    - Eg. Control when cache invalidations or preloads are to be cascaded to all hierarchical internal caches within NapaAutoparts ?

- Scalable, reliable coordination across many WAN processing nodes
  - How to update content in an event-driven way (not just expiration)?
  - How to manage lights-out closet boxes for *application* processing, not just caching?

Possible Answers

- Across administrative domains (extranet and internet):
  - Proprietary CDN with API's
    - Have ESI now, but when with AAA?   Lockin?
  - Standards for remote page assembly and AAA (slow to develop)
    - Need multi-network SLA's on AAA? (never?)
  - .Net/hailstorm
    - Everything a pay-for-use service, everyone meet in the middle
    - Actually probably still need caching at edges
  - Build it yourself with middleware and caching components
    - Cost, reliability?
  - End-to-end solutions

Example: End-to-End Solution for Streaming

Live Broadcast

Origin Server

Video Archives

INTRANET/EXTRANET

Branch Offices Employees

Suppliers

Customers

Management

Core

Edge

Traffic Controller

- Monitor all nodes
- Control content updates
- Aggregated logs
- Control QoS

Traffic Core

- "Application-Level Networking"
- True fail-around, not splitters
- Manage 000's of subs
- Manage 000's updates
- QoS, prioritize management

Traffic Edge

- Cache multiple formats
- LDAP integration
- Feedback mgmt stats
- Remote upgrade