

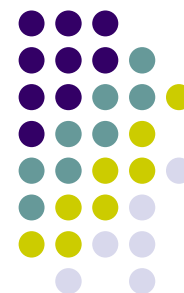
FIA Expo 2007

Bandwidth: Handling Increasing Market Data Volumes

FIXPROTOCOL
INDUSTRY-DRIVEN MESSAGING STANDARD™

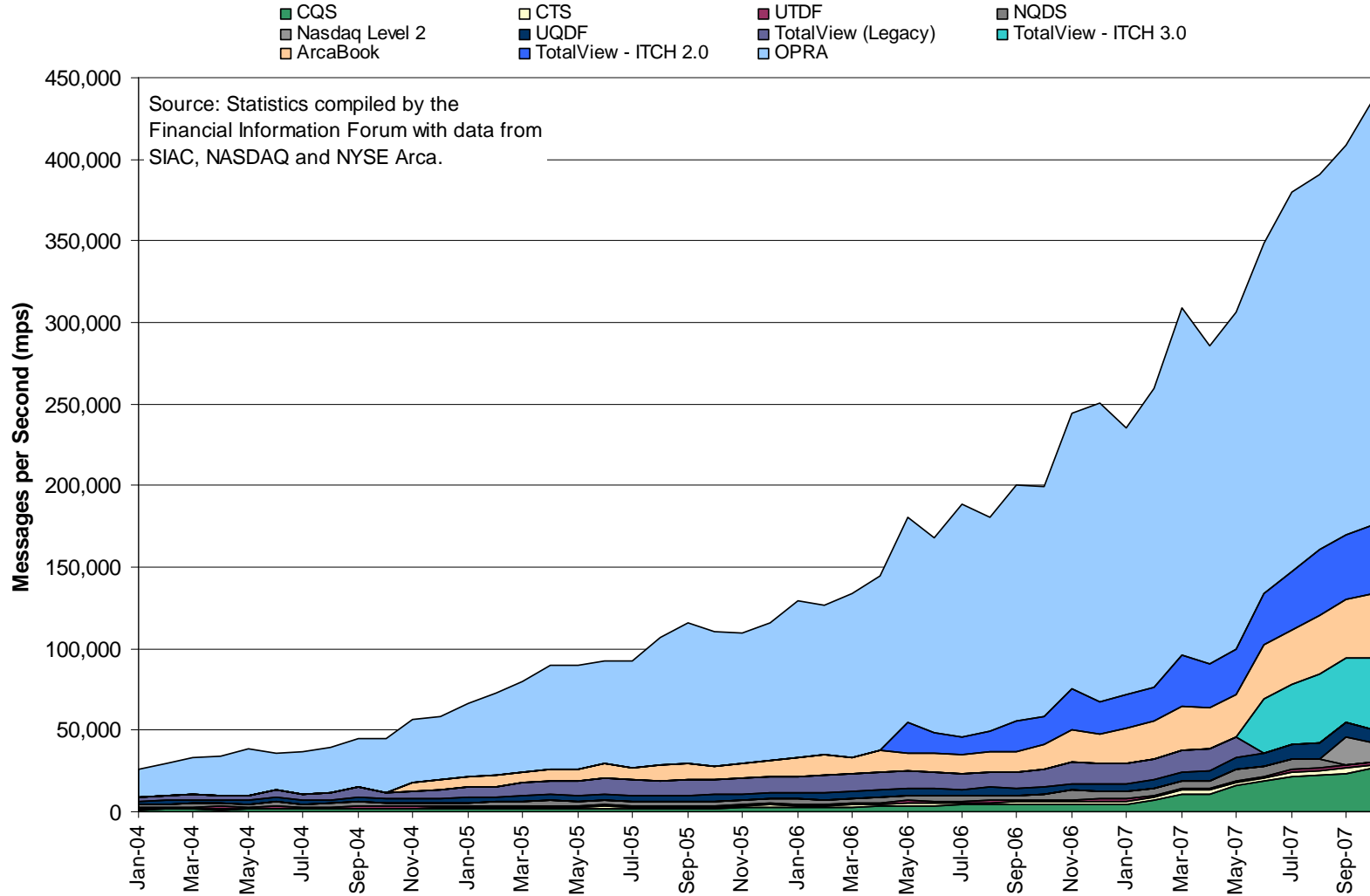
Scott Atwell
Co-Chair FPL Global Steering Committee
American Century Investments

November 28, 2007



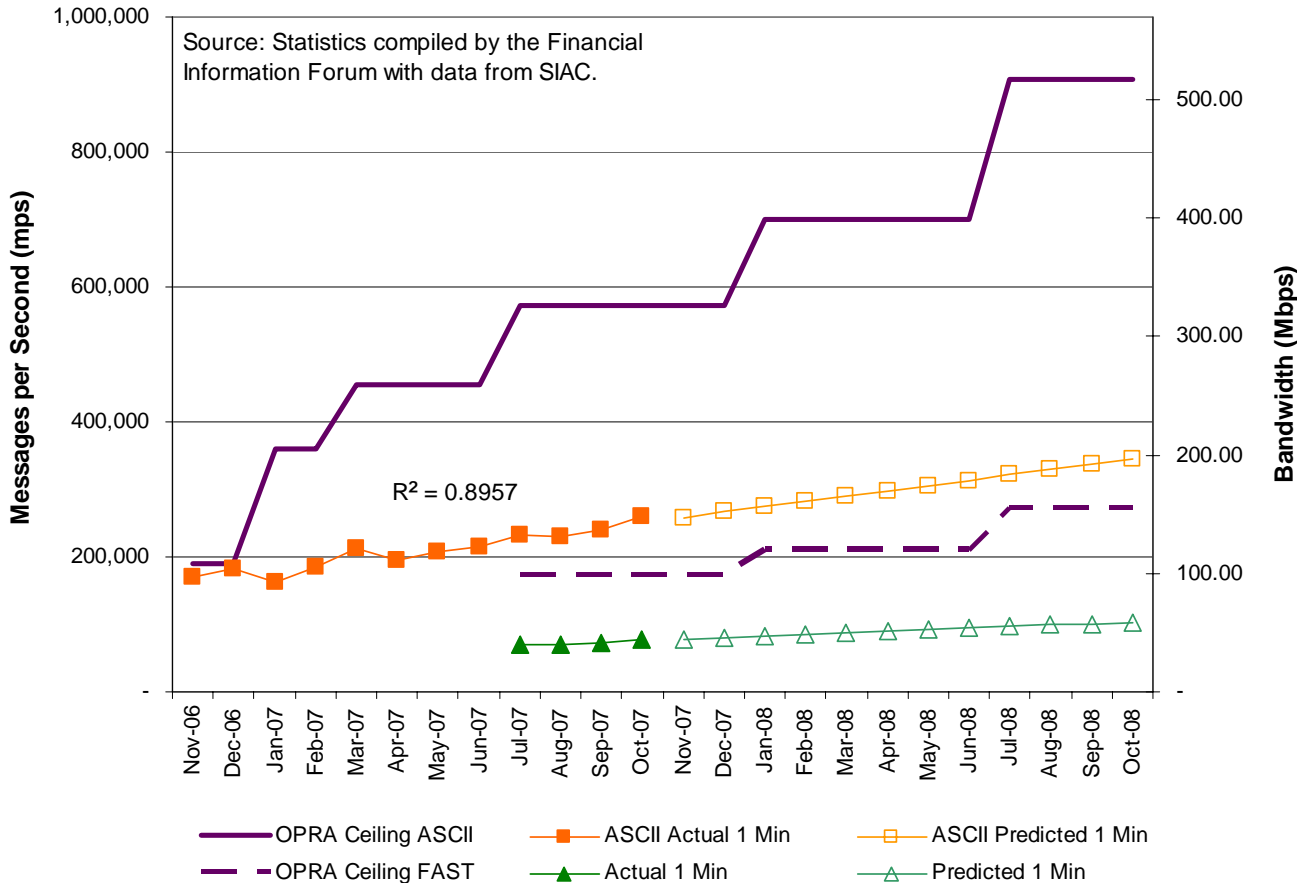


Peak message rates outpacing classic solutions





Financial Information Forum (FIF) Projection Based on OPRA 1 Minute Peak Data



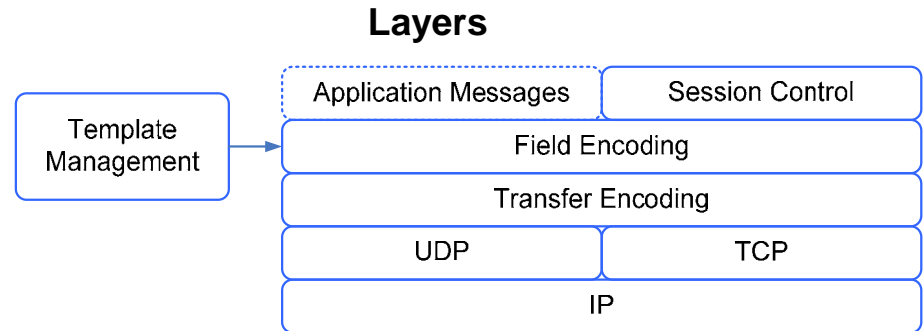
Actual 1 Minute Peak	
Nov-06	169,057
Dec-06	182,956
Jan-07	163,683
Feb-07	183,881
Mar-07	212,659
Apr-07	194,994
May-07	206,346
Jun-07	214,600
Jul-07	232,418
Aug-07	229,804
Sep-07	239,150
Oct-07	261,116
Predicted 1 Minute Peak	
Nov-07	258,723
Dec-07	266,462
Jan-08	274,460
Feb-08	282,458
Mar-08	289,939
Apr-08	297,937
May-08	305,676
Jun-08	313,674
Jul-08	321,414
Aug-08	329,411
Sep-08	337,409
Oct-08	345,148

- While a good fit to historical data, OPRA ceilings indicate that the impact of automated equity trading and other market events is driving bandwidth requirements.
- Current OPRA Ceiling: 573,000 mps; Jan 2008: 701,000 mps; Jul 2008: 907,000 mps



FAST Protocol Characteristics

- Basic Feature Set
 - Optimized for message streams
 - Content aware (requires knowledge about message structure)
 - Byte-oriented binary representation
 - Variable-length fields
 - Each message contains one or more fields
 - A presence map enables efficient use of default values
 - Several ways of deriving default values
- Empirically validated
 - Very fast processing (encoding / decoding)
 - High compression ratios on tested exchange feeds
 - Simple implementation
- Extensible



Proof of Concept - Phase1B Summarized FIX Results

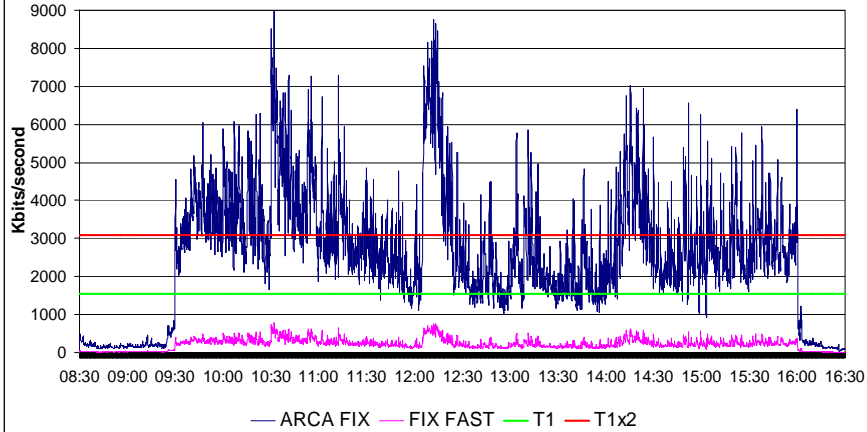
Exchange Feed	FIX Msg Size	FIX FAST Msg Size	FAST Protocol Avg Compression Rate	FAST Protocol Peak Compression Rate	FAST Protocol Msgs per second
ARCA ArcaBook	121.9	10.5	91.3%	94.1%	667,000
OPRA	177.0	20.8	88.2%	90.8%	434,000
CME Globex	241.4	29.0	88.0%	88.9%	333,000
LSE	157.7	54.4	65.5%	81.5%	149,000

www.fixprotocol.org/fast



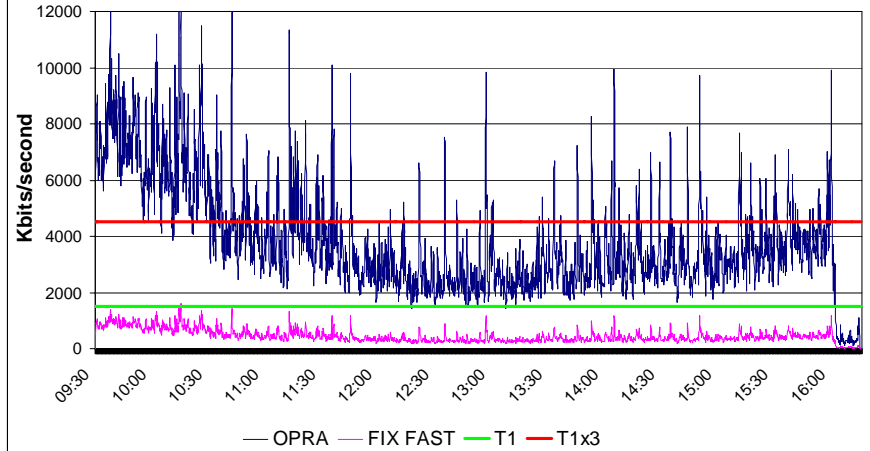
ARCA

ARCA Feed - FIX vs FAST Bandwidth Utilization



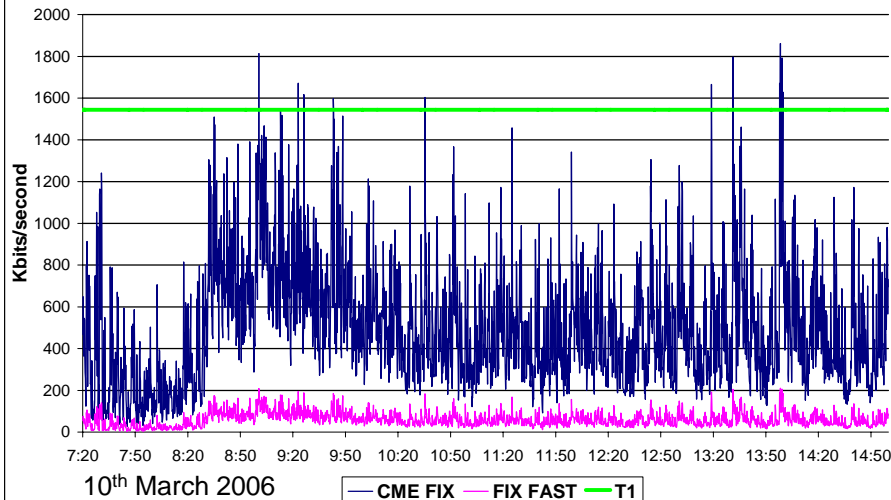
OPRA

OPRA Feed - FIX vs FAST Bandwidth Utilization



CME

CME Feed - FIX vs FAST Bandwidth Utilization
1400 byte frames, 5 ms holdback



LSE

LSE Feed - Native vs FAST Bandwidth Utilization
1400 byte frames, 1 ms holdback

