



DataMOCCA

Data MOodels for Call Center Aalysis

Project Partners:

Technion: Paul Feigin, Avi Mandelbaum, Sergey Zeltyn (IBM Research)

SEElab: Valery Trofimov, Ella Nadjharov, Igor Gavako

Students, RA's

Wharton: Larry Brown, Noah Gans, Haipeng Shen (N. Carolina), Linda Zhao

Students, Wharton Financial Institutions Center

Companies: US Bank, IL Telecom (both Aspect-Based), IL Bank (Genesys), ...

Project DataMOCCA

Goal: Designing and Implementing a
(universal) data-base/data-repository and interface
for storing, retrieving, analyzing and displaying
Call-by-Call-based data/information



Enables the Study of:

- Customers Wait Time, Abandonment, Retrials
- Service Providers / Agents Service Duration, Activity Profile
- Managers / System Loads, Queue Lengths, Trends

DataMOCCA **History**: The **Data** Challenge

- Queueing Research lead to Service Operations (early 90's)
- Services started with **Call Centers** which, in turn, created data-needs
- Queueing Theory had to expand to **Queueing Science**: Fascinating
- WFM was Erlang-C based, but customers abandon! **(Im)Patience?**
- **(Im)Patience** censored hence Call-by-Call data required: 4-5 years saga
- Finally Data: a small call center in a small IL bank (15 agents, 4 services)
- Technion Stat Lab, guided by Queueing Science: Descriptive Analysis
- Building blocks (Arrivals, Services, **(Im)Patience**): even more **Fascinating**

DataMOCCA History: Research & Teaching

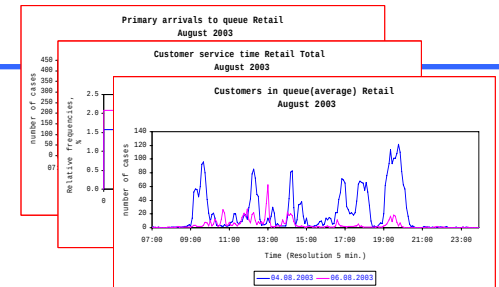
- Large well-run call centers beyond conventional Queueing Theory:
 - Both Quality and Efficiency Driven (vs. tradeoff)
 - Multi-Disciplinary view: OR/OM, HRM (Psychology), Marketing, MIS
- Research: Asymptotic analysis of the Palm/Erlang-A model, in the Halfin-Whitt regime = QED Regime
- Teaching: Service Management + Industrial Engineering = Service Engineering / Science
- Wharton: Mini-course (OPIM, Morris Cohen) + Seminar (Statistics, Larry Brown + Call Center Forum (Noah Gans) = cooperation with a large(r) banking call center (1000 agents), ...

System Components:

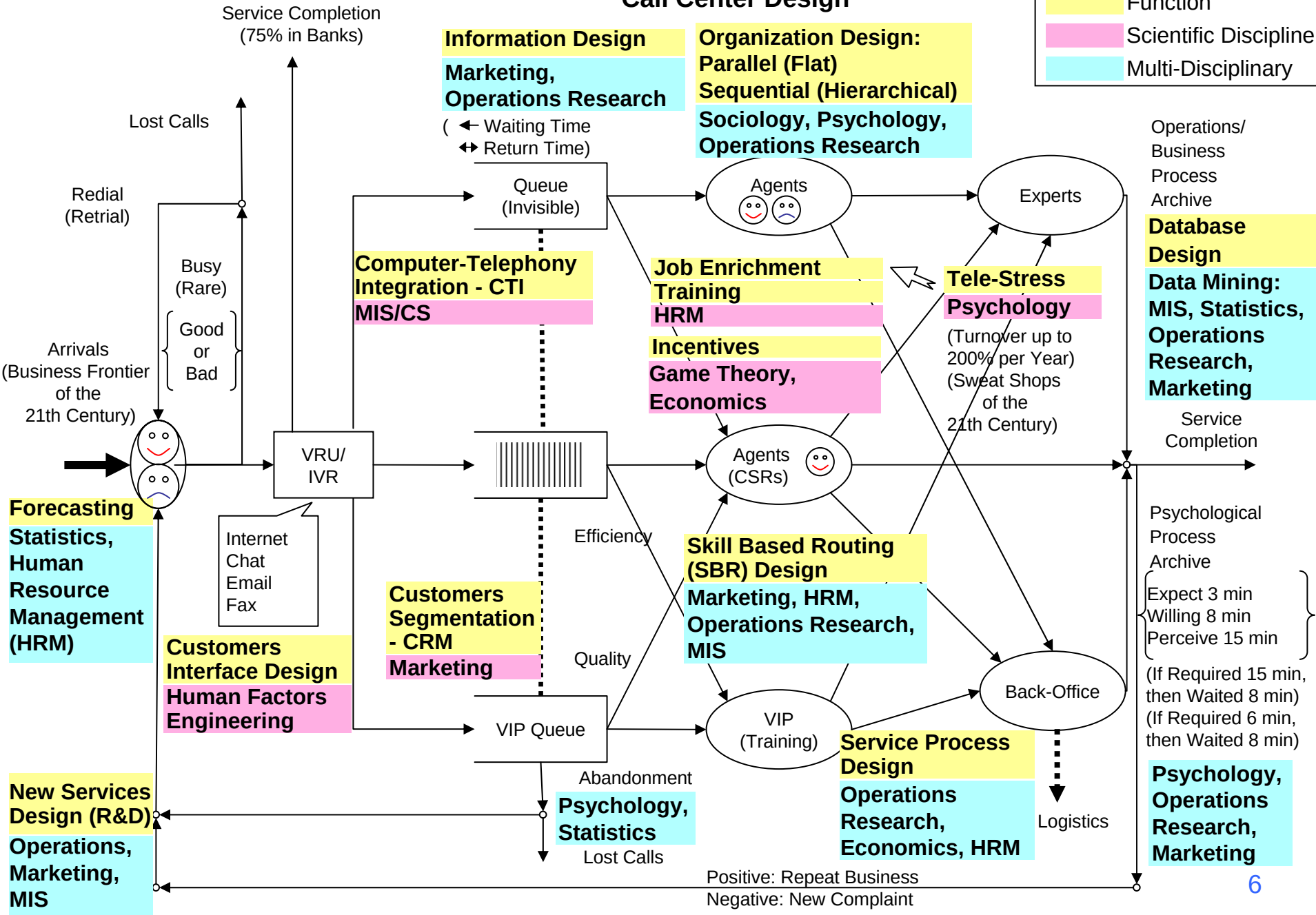
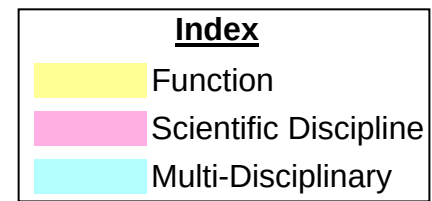
1. Clean databases: operational histories of **individual** calls, agents and sometimes customers (ID's).
2. **SEESat** (friendly powerful interface): online access to (mostly) operationa and (some) administrative data; flexible customization, statistics

Currently Three Databases:

- US Bank (220/40M calls, 1000 agents, 2.5 years;7-48GB; 3GB DVD).
- Israeli Telecom (800 agents, 3.5 years; 55GB; ongoing).
- Israeli Bank (500 agents, 1.5 years; ongoing).



Service Engineering: Multi-Disciplinary View Call Center Design



DataMOCCA: Future

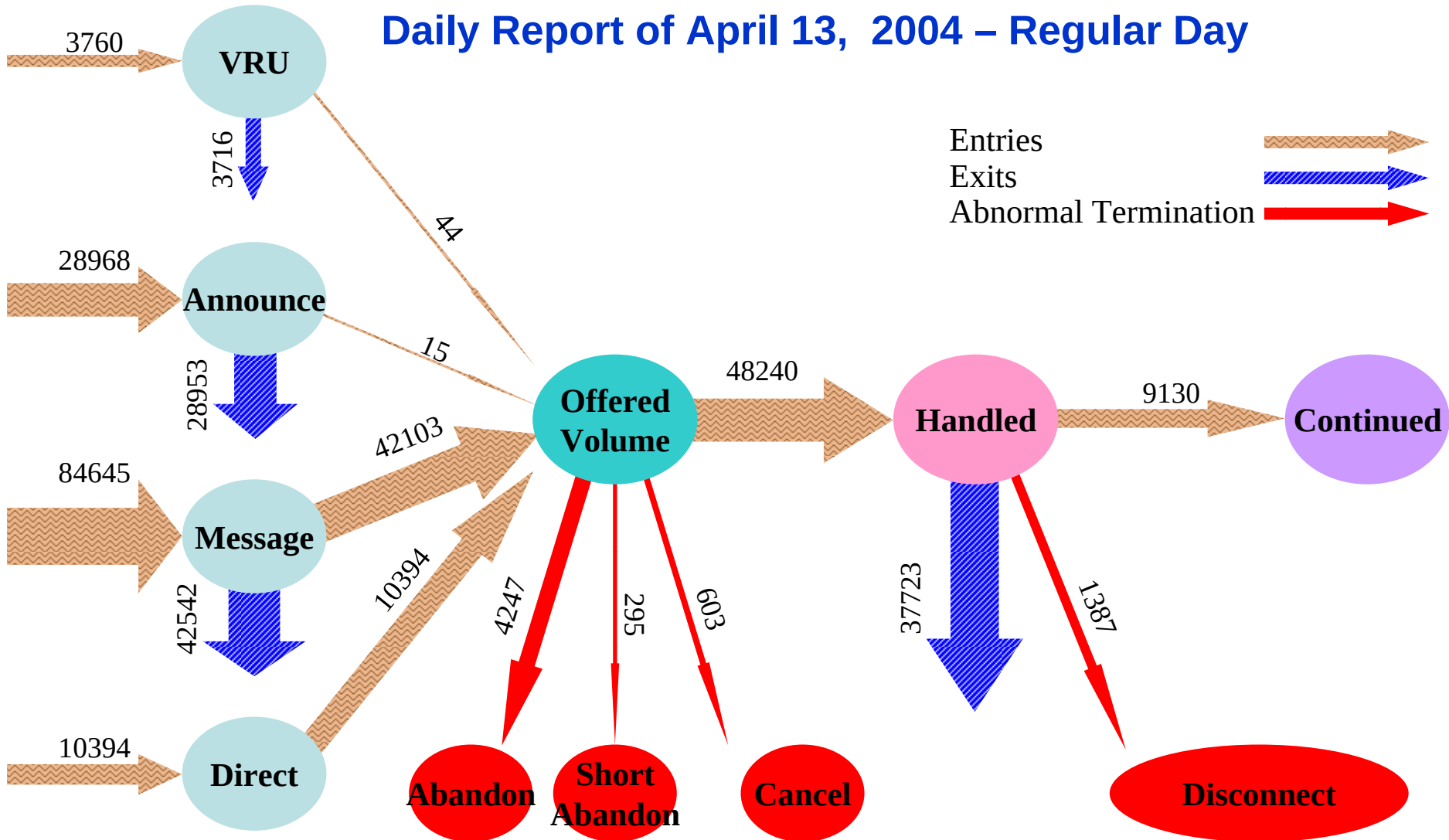
1. Operational (ACD) data with Business (CRM) data, plus Contents
2. Contact Centers: IVR, Internet, Chats, Emails, ...
3. Daily update (as opposed to montly DVD's)
4. Web-access (Research, Applications)
5. Nurture Research, for example
 - Skills-Based Routing: Control, staffing, design, online; HRM
 - The Human Factor: Service-anatomy, agents learning, incentives,
6. Hospitals (already started, with IBM, Haifa hospital): Operational, Human-Factors, Medical & Financial data; RFID's for flow-tracking

DataMOCCA Interface: SEEStat

- Daily / monthly / yearly reports & flow-charts for a complete operational view.
- Graphs and tables, in customized resolutions (month, days, hours, minutes, seconds) for a variety of (pre-designed) operational measures (arrival rates, abandonment counts, service- and wait-time distribution, utilization profiles,...).
- Graphs and tables for new user-defined measures.
- Direct access to the raw (cleaned) data: export, import.

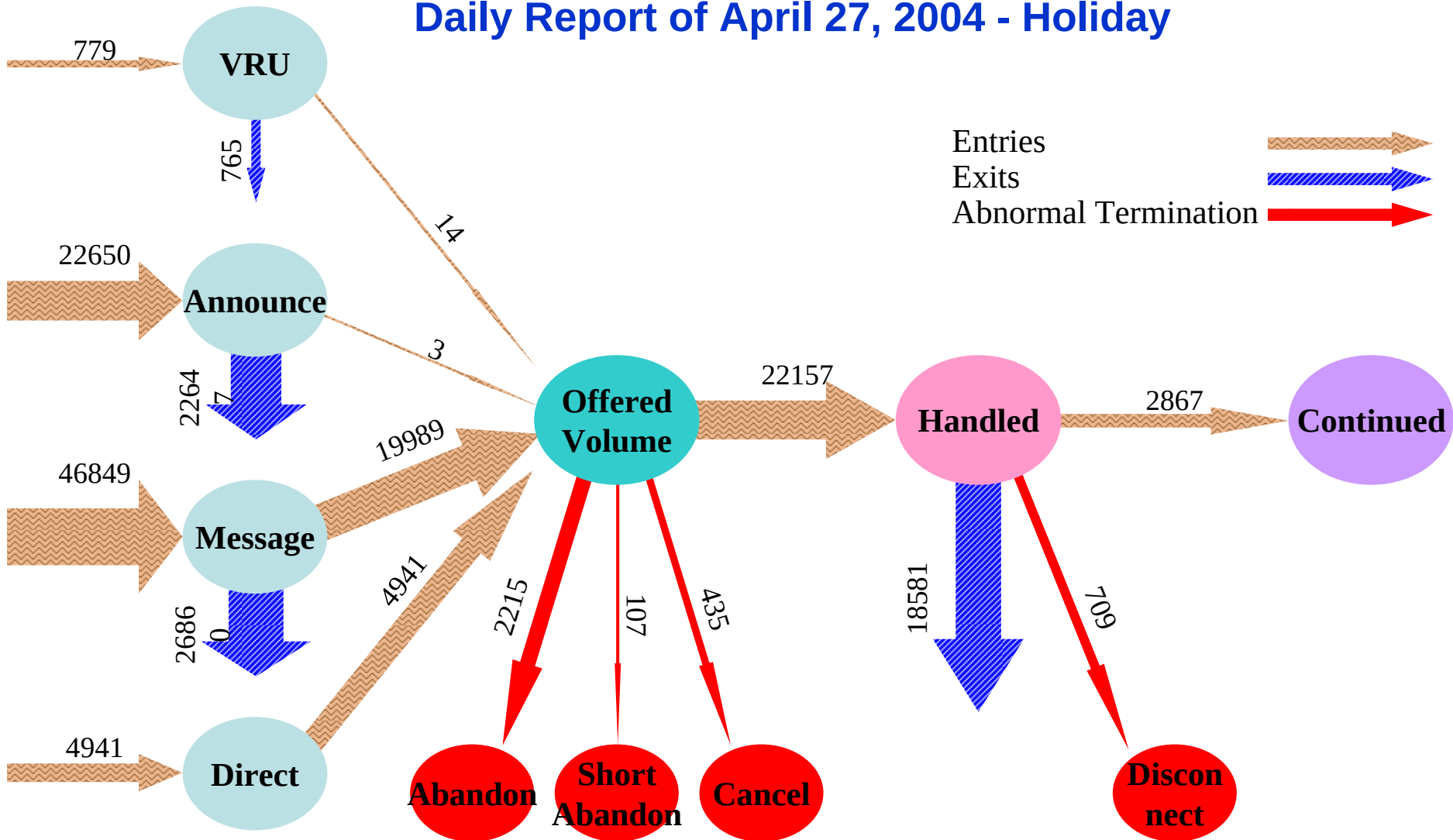
DataMOCCA – SEESat

Daily Report of April 13, 2004 – Regular Day



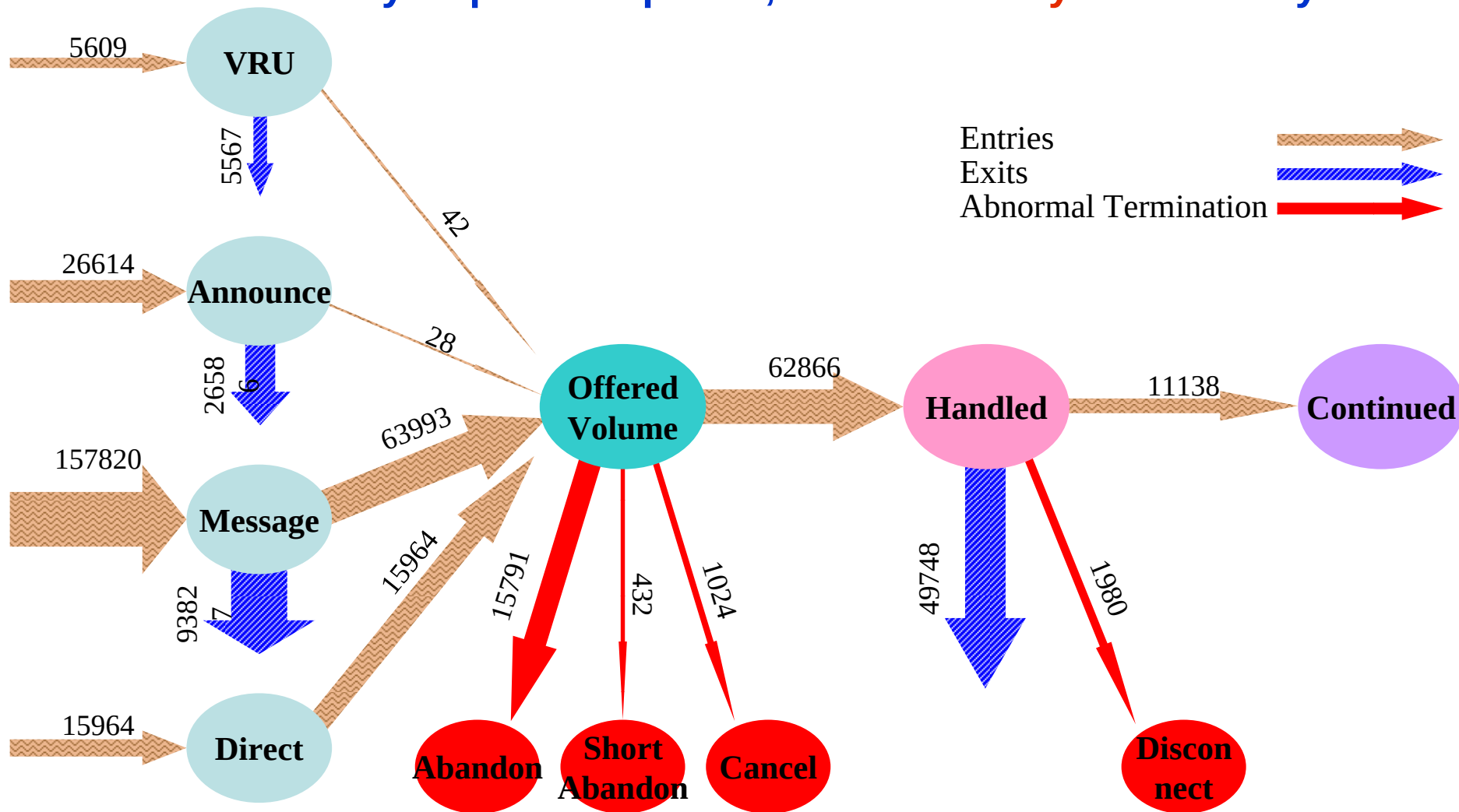
DataMOCCA – SEESat

Daily Report of April 27, 2004 - Holiday



Interesting Scenarios: Peak Days

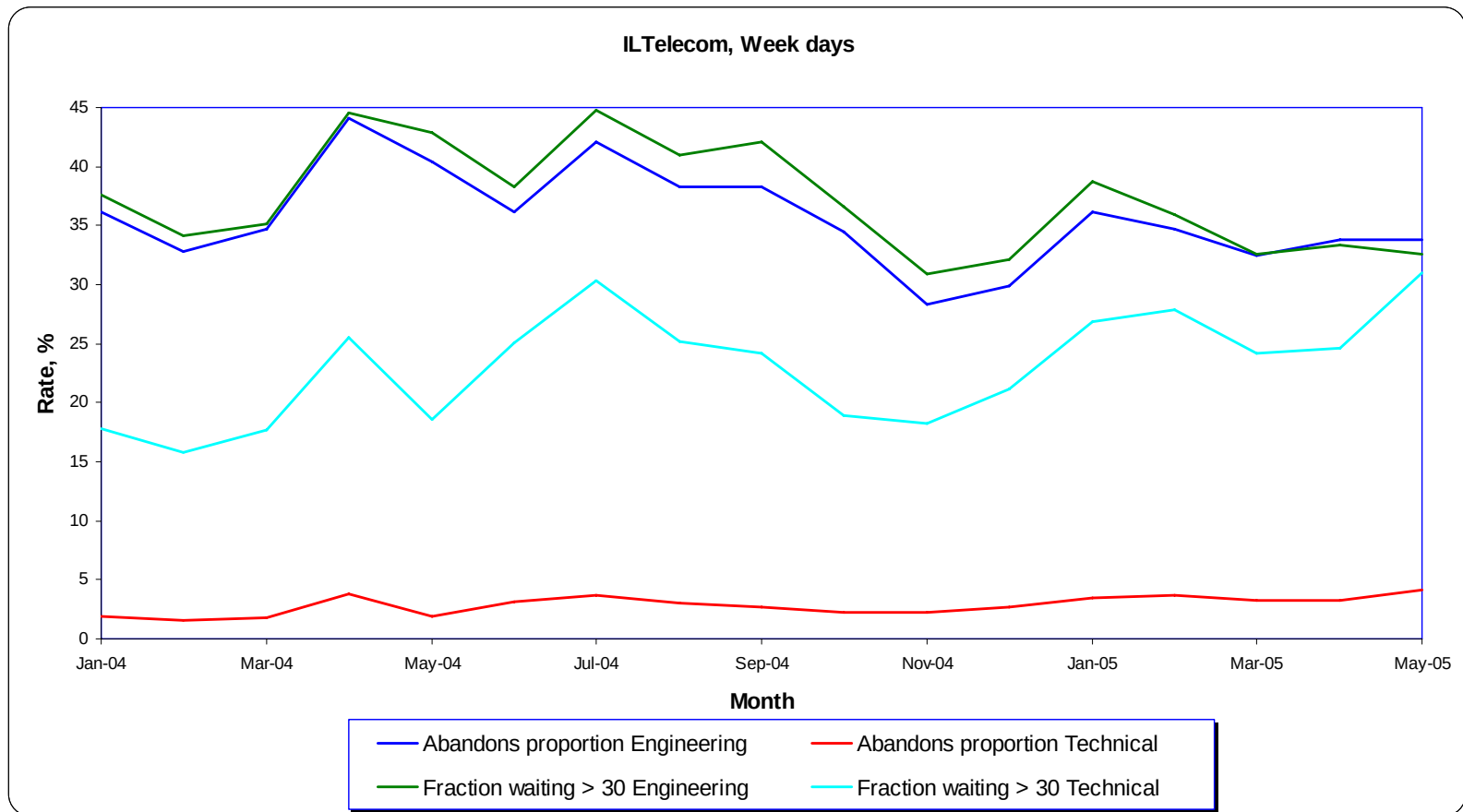
Daily Report of April 20, 2004 – Heavily Loaded Day



DataMOCCA - SEESat

Pre-designed Operational Measures: %Abandonment, TSF

Time Series

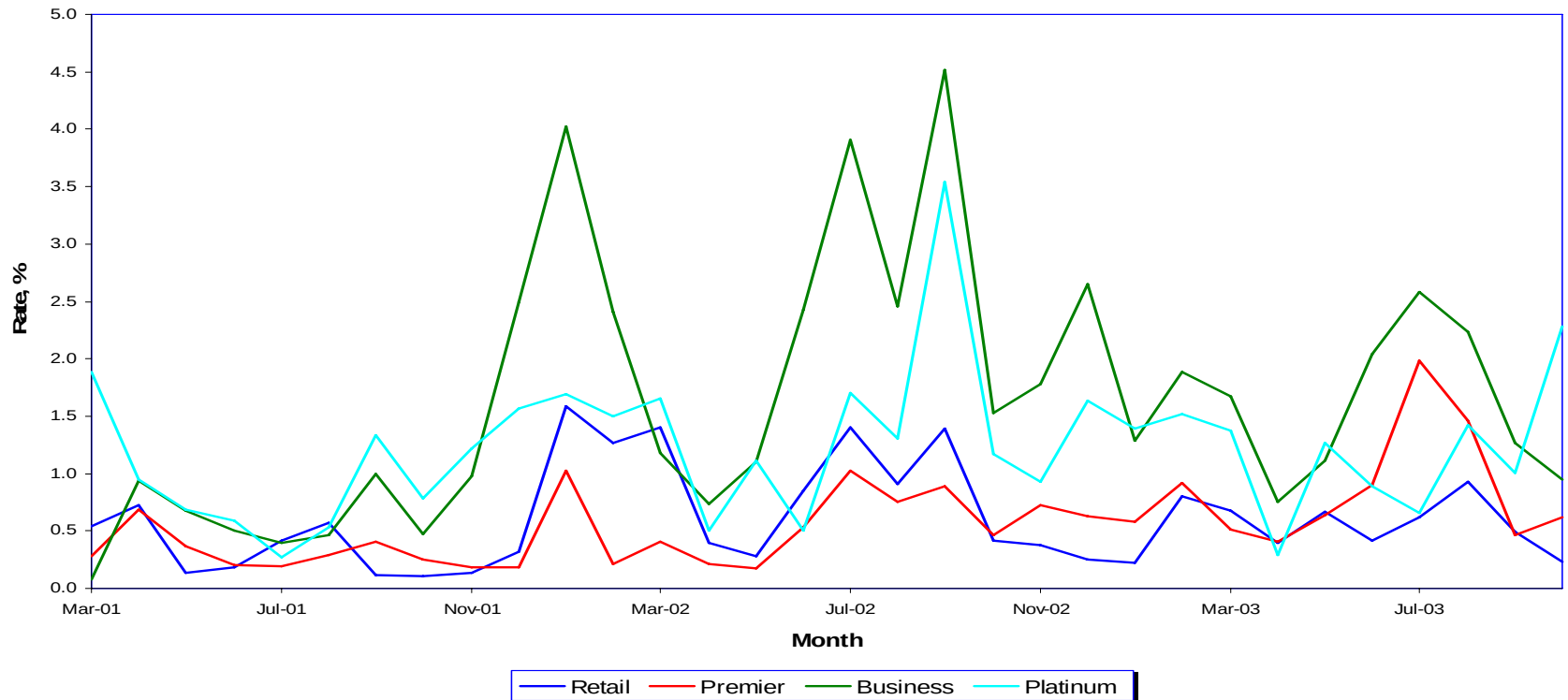


Interesting Scenarios: Platinum Customers (VIP's ?)

Pre-designed Operational Measures: %Abandonment

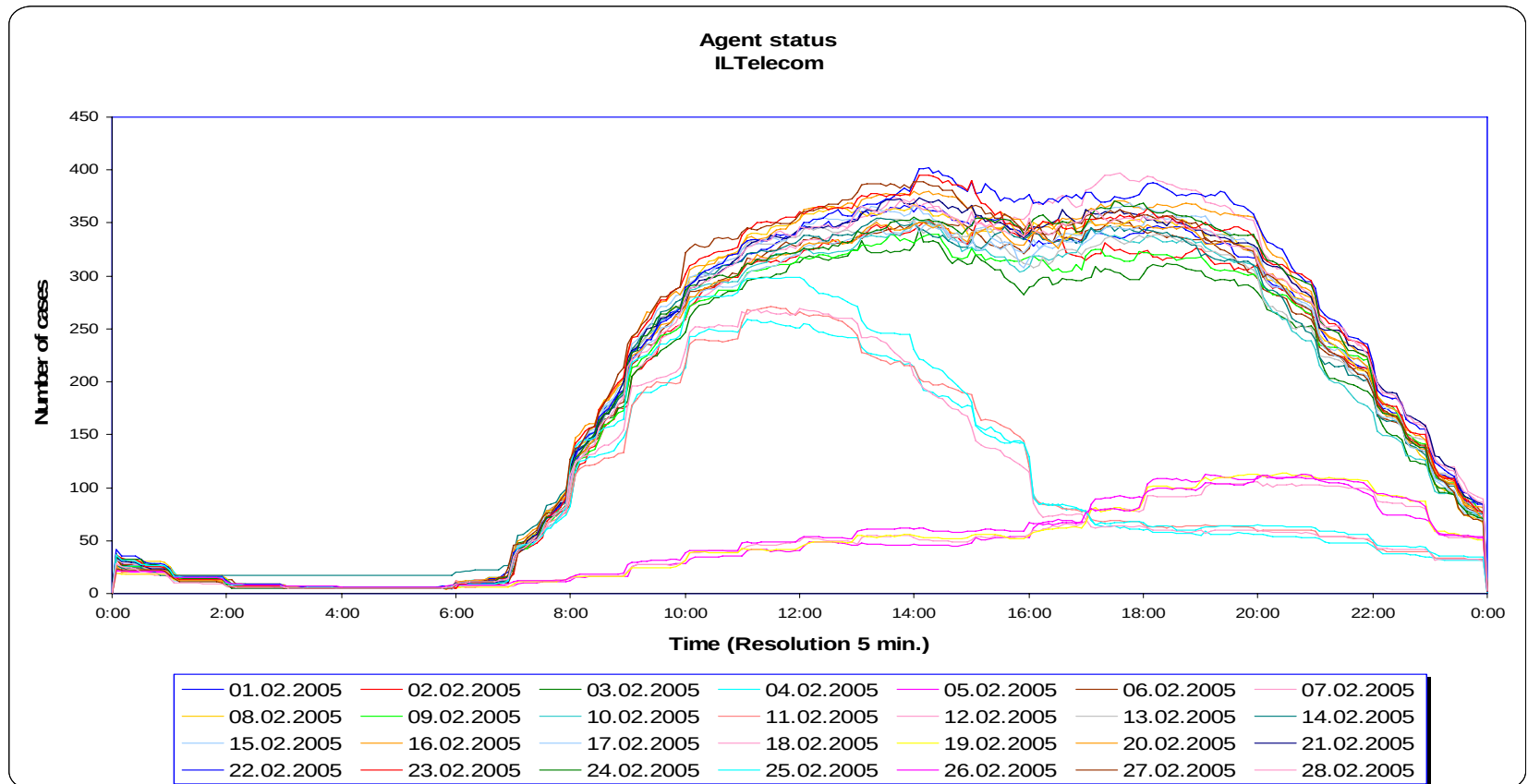
Time Series

Abandons proportion
USBank, Mondays



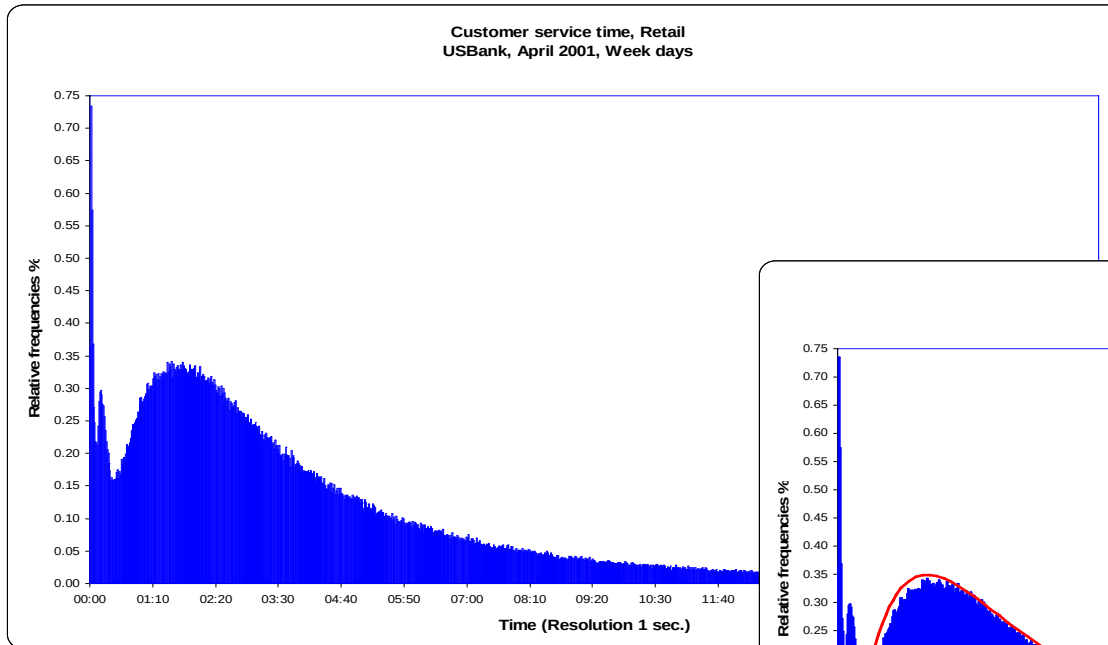
Pre-designed Operational Measures: Arrival Rates, 2/2005

Daily Reports

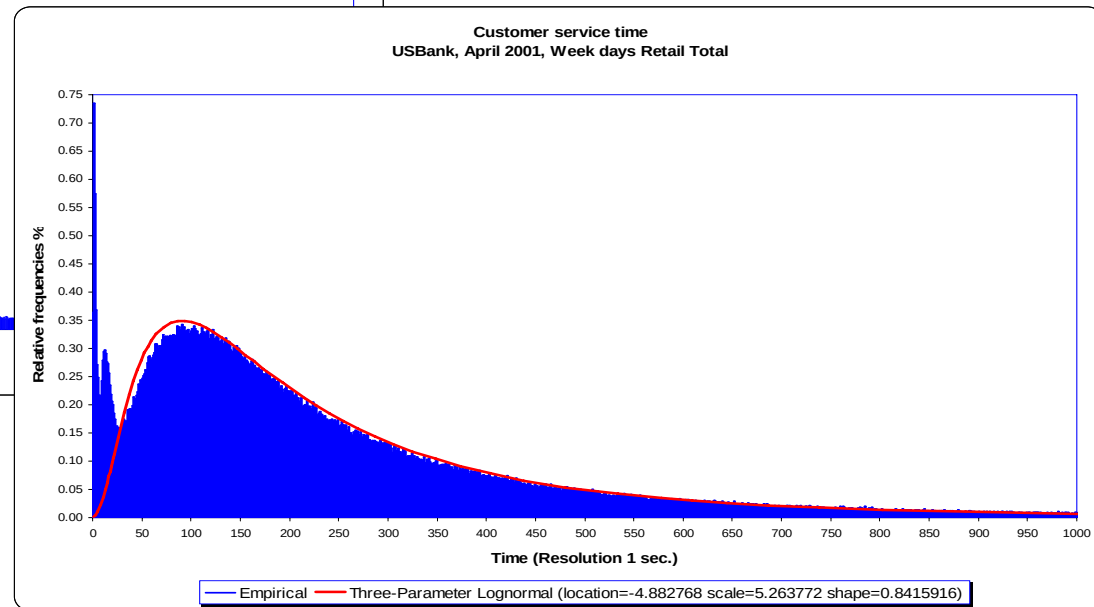


Pre-designed Operational Measures: Service Times

Histograms

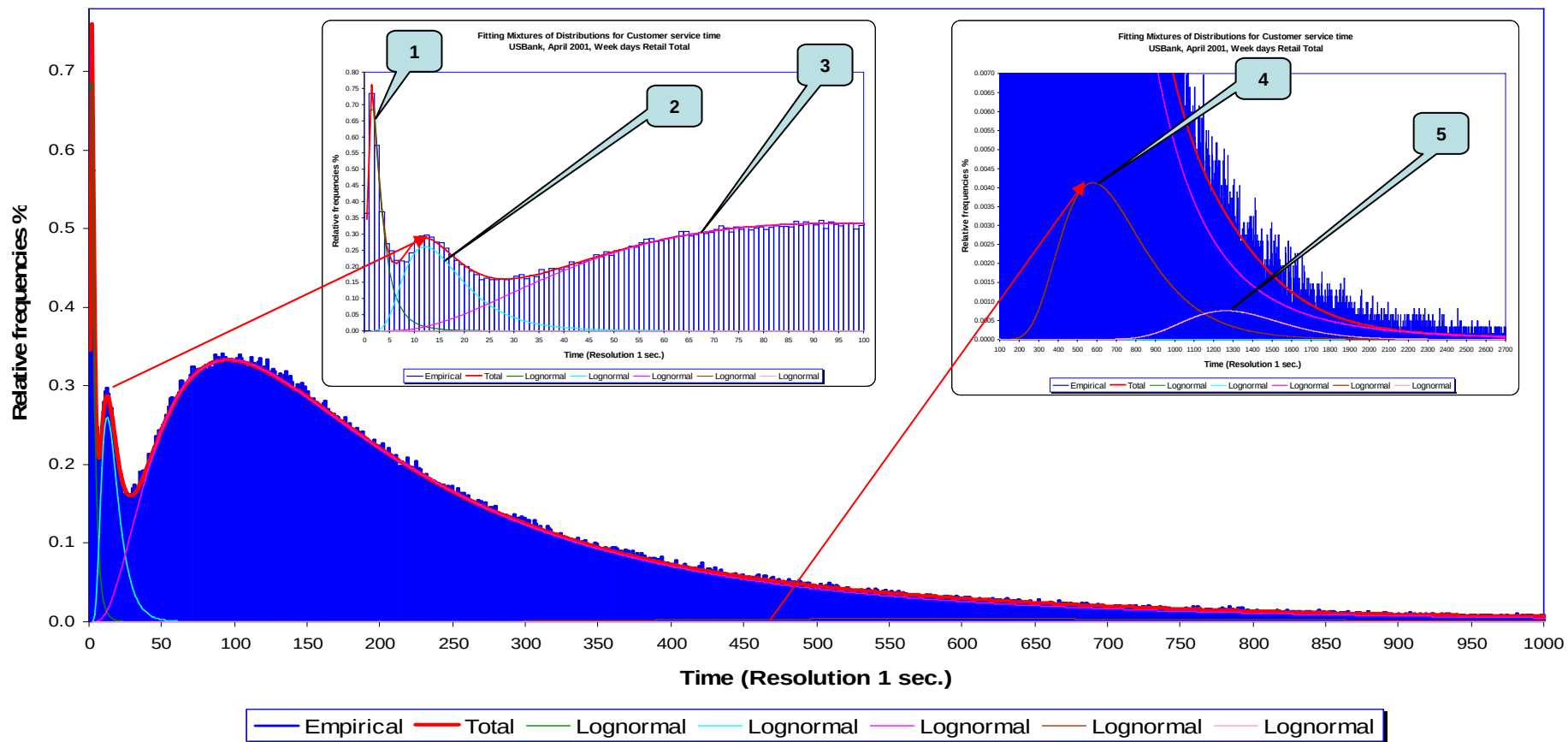


Fitting Distribution



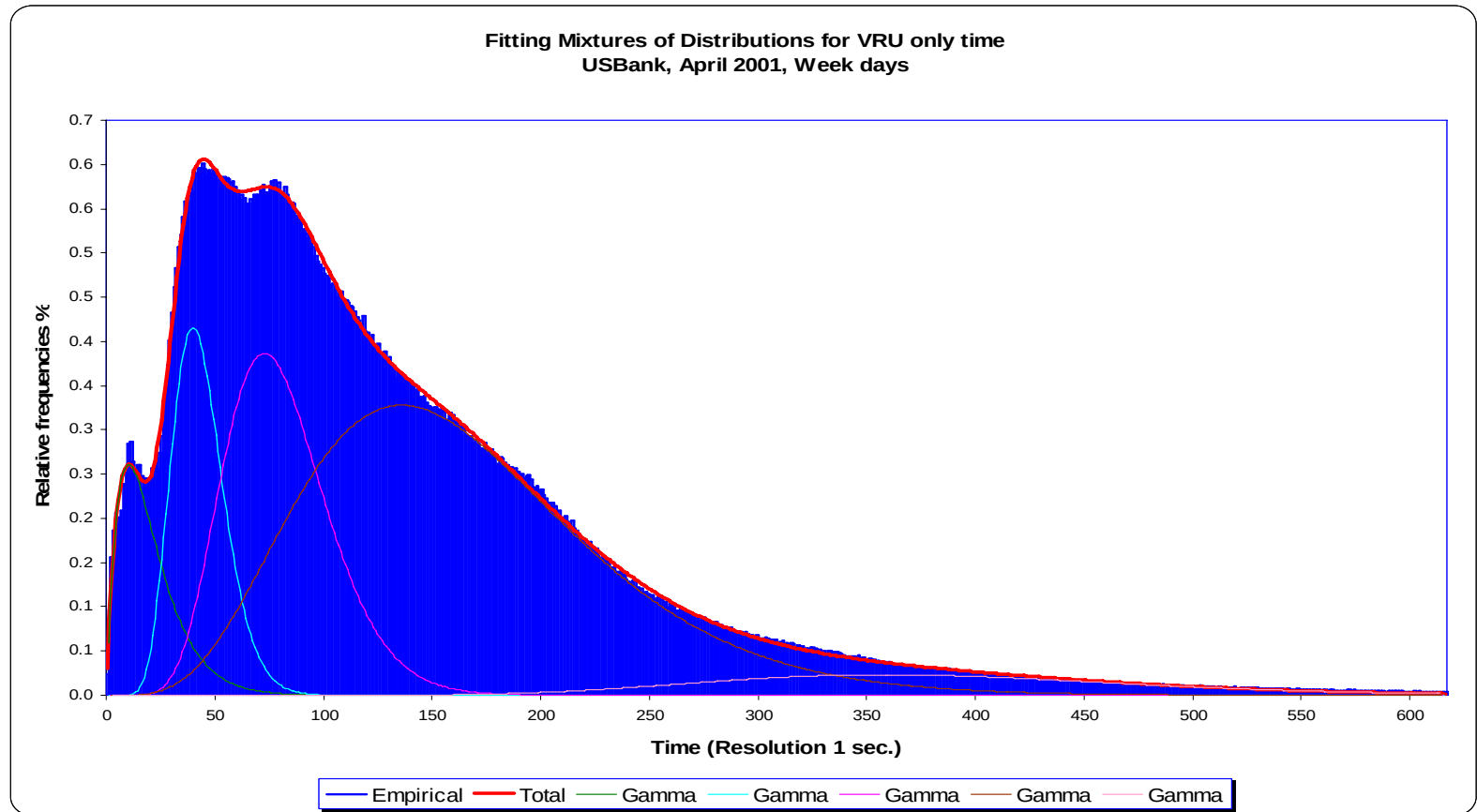
Fitting Mixture of 5 Lognormal Components

Fitting Mixtures of Distributions for Customer service time
USBank, April 2001, Week days Retail Total



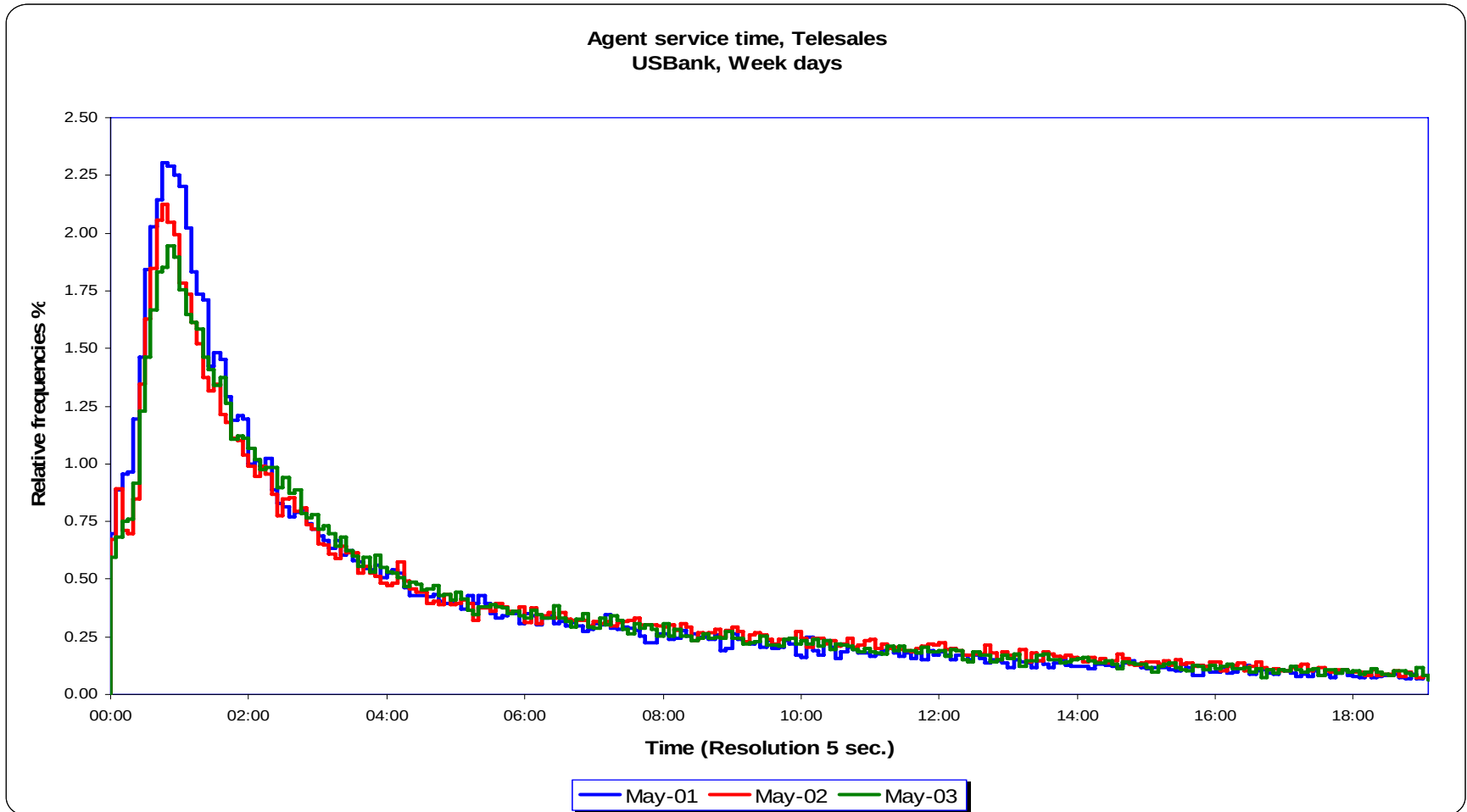
Interesting Scenarios: VRU/IVR

Fitting Mixture of 5 Gamma Components



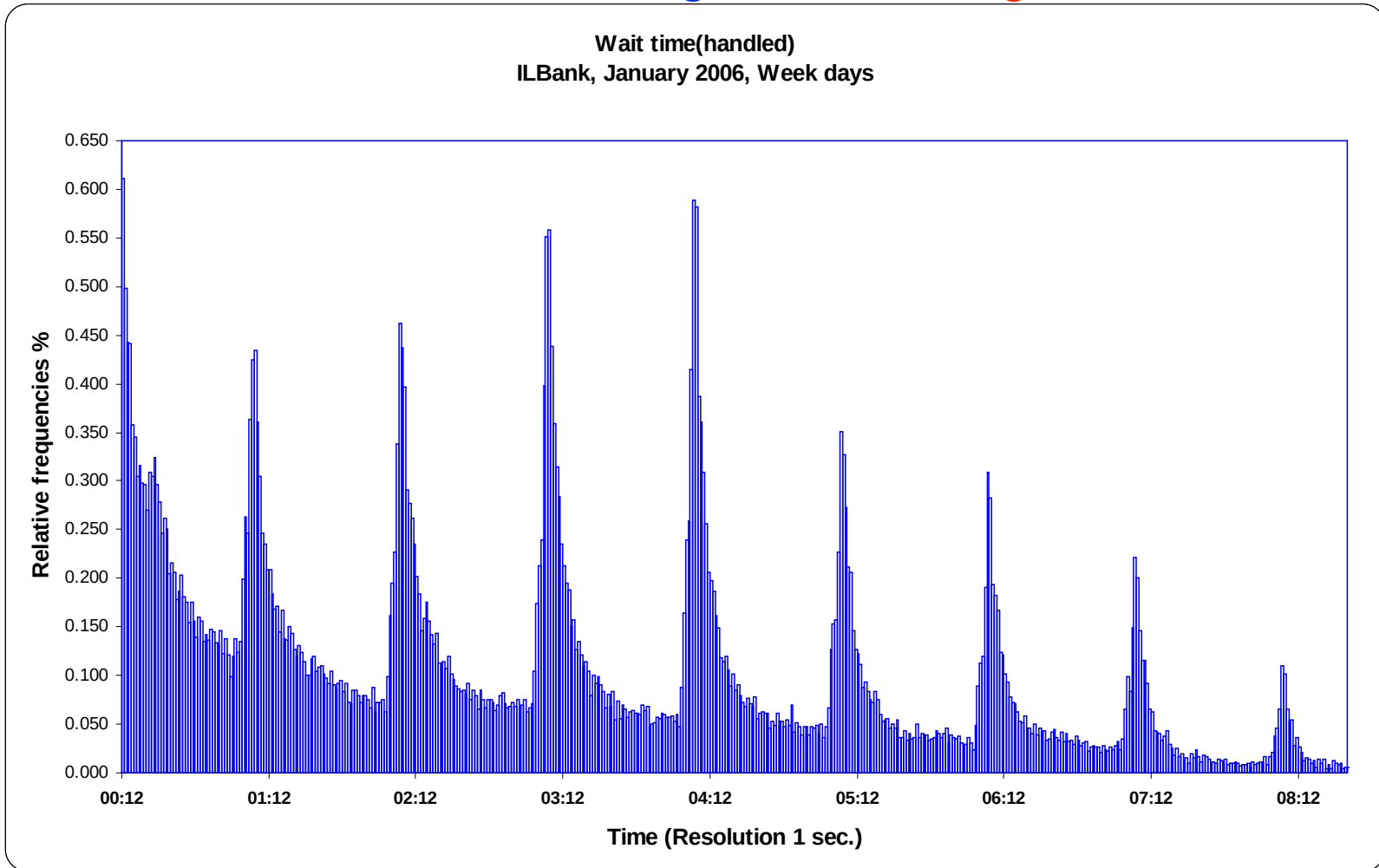
Interesting Scenarios: Service Science

US Bank: Service Time Histograms for Telesales, 2001-3



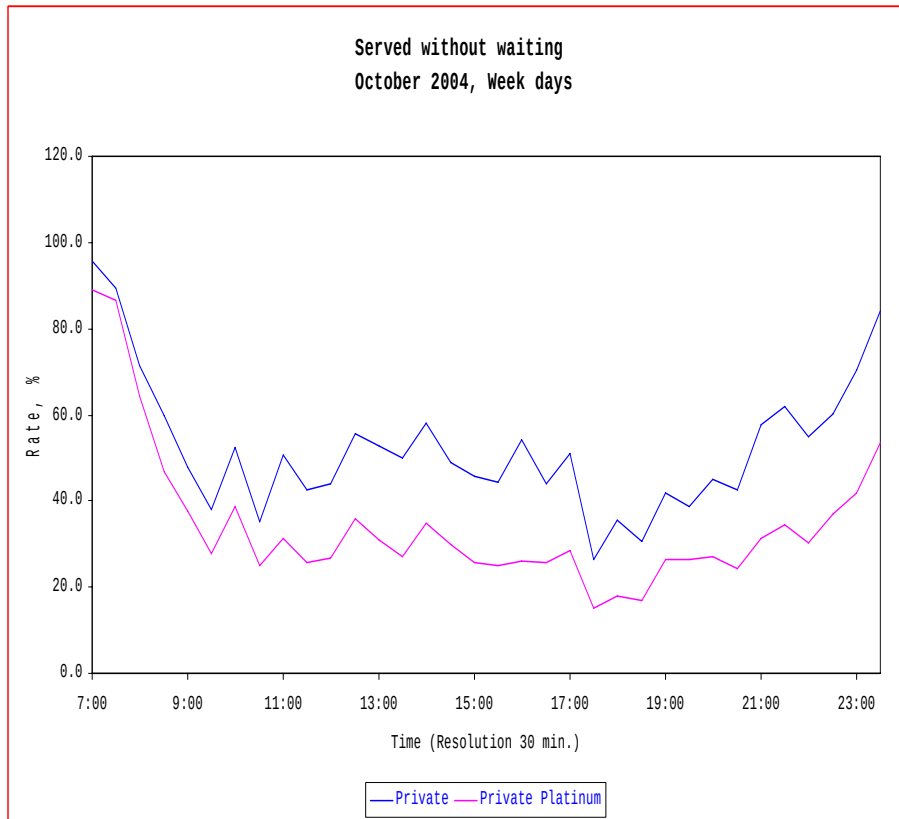
Interesting Scenarios: Psychological vs. System

Israeli Bank: Histogram of Waiting Time

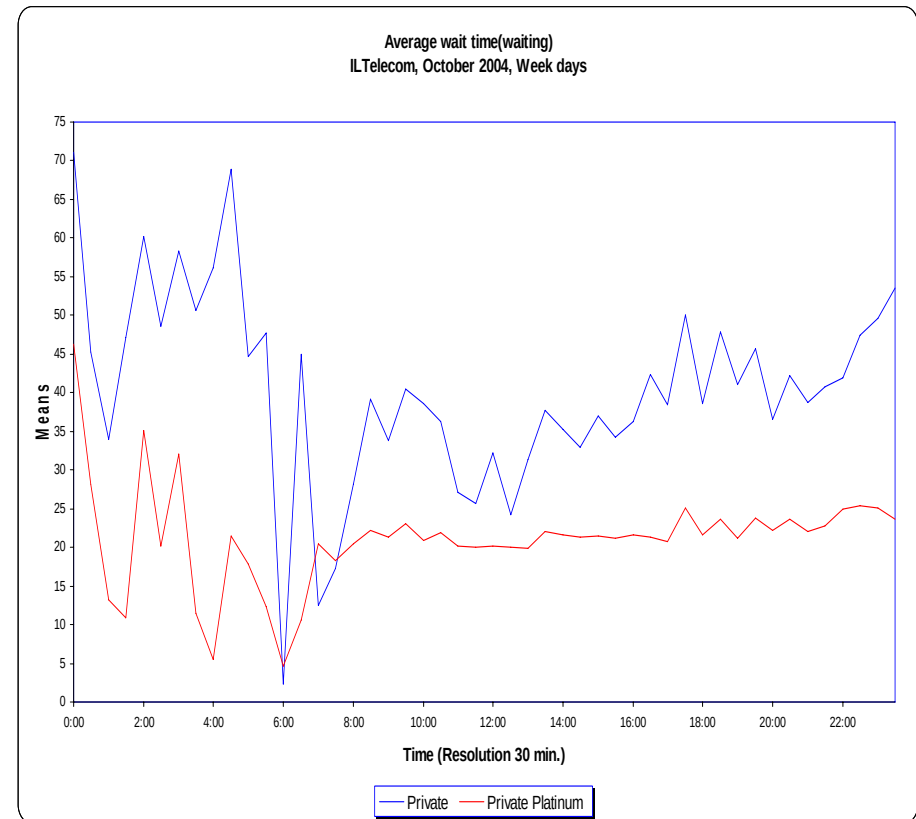


Interesting Scenarios: Skills-Based-Routing

Performance level: Regular versus VIP
More Regular get service immediately



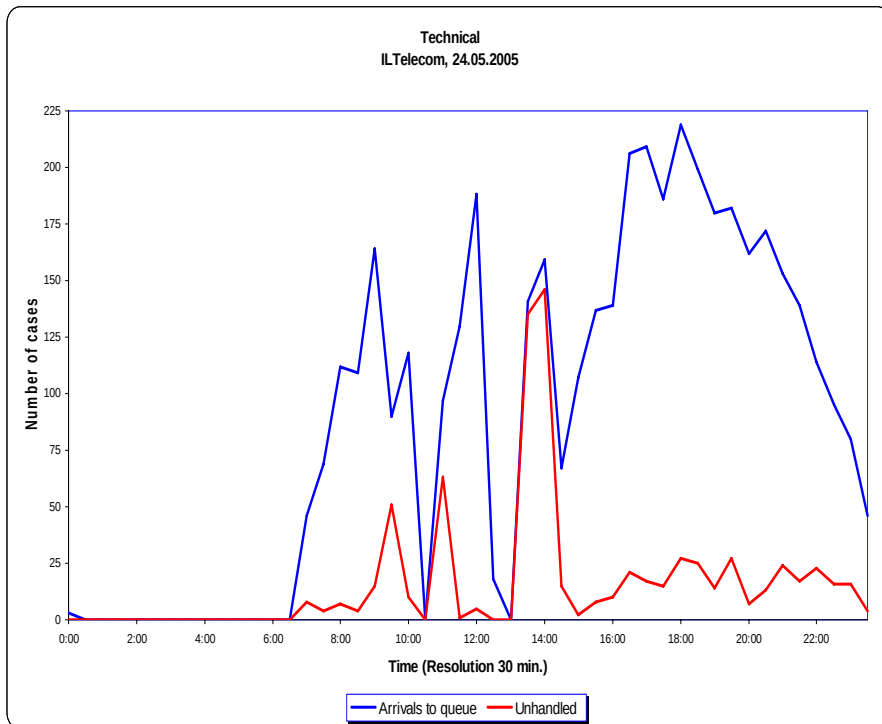
But VIP customers wait less



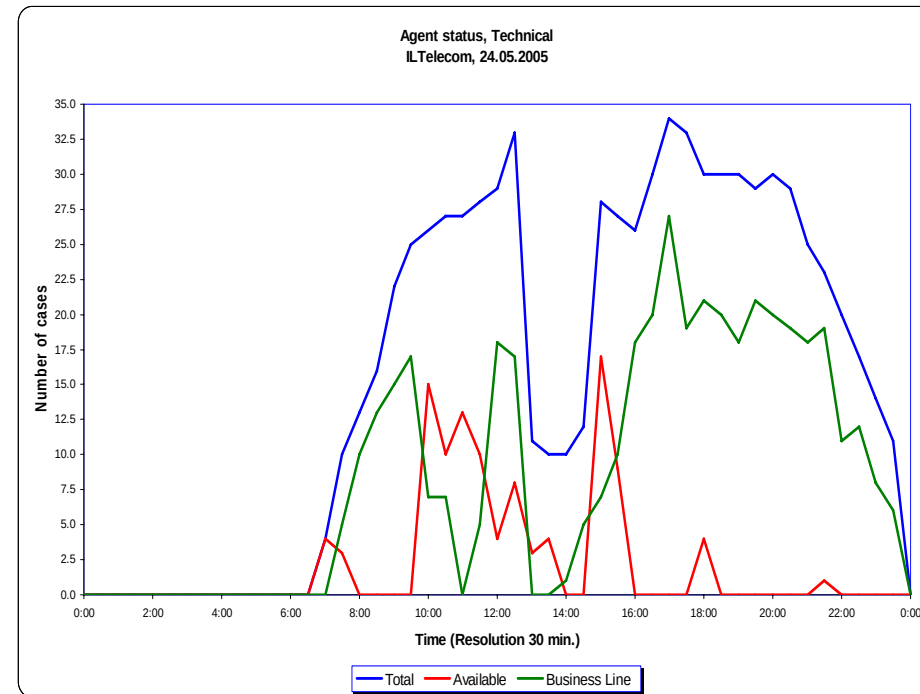
Interesting Scenarios: **Scenario Analysis**

Israeli Call Center: Technical Service

Unhandled Calls on May 24th, 2005



Agents Status on May 24th, 2005





Data-Based Research: Must (?) & Fun

- Contrast with “EmpOM”: Industry / Company / Survey Data (Social Sciences)
- Converge to: Measure, Model, Validate, Experiment, Refine (Physics, Biology,...)
- Prerequisites: OR/OM, (Marketing) – for Design; Computer Science, Information Systems, Statistics – for Implementation.
- Outcomes: Relevance, Credibility, Interest; Pilot (eg. Healthcare). Moreover,
Teaching: Class, Homework (Experimental Data Analysis); Cases.
Research: Test (Queueing) Theory / Laws, Stimulate New Models / Theory.
Practice: OM Tools (Scenario Analysis), Mktg (Trends, Benchmarking).