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The coming age of continuous monitoring and auditing

IAAIA Workshop on Continuous Monitoring
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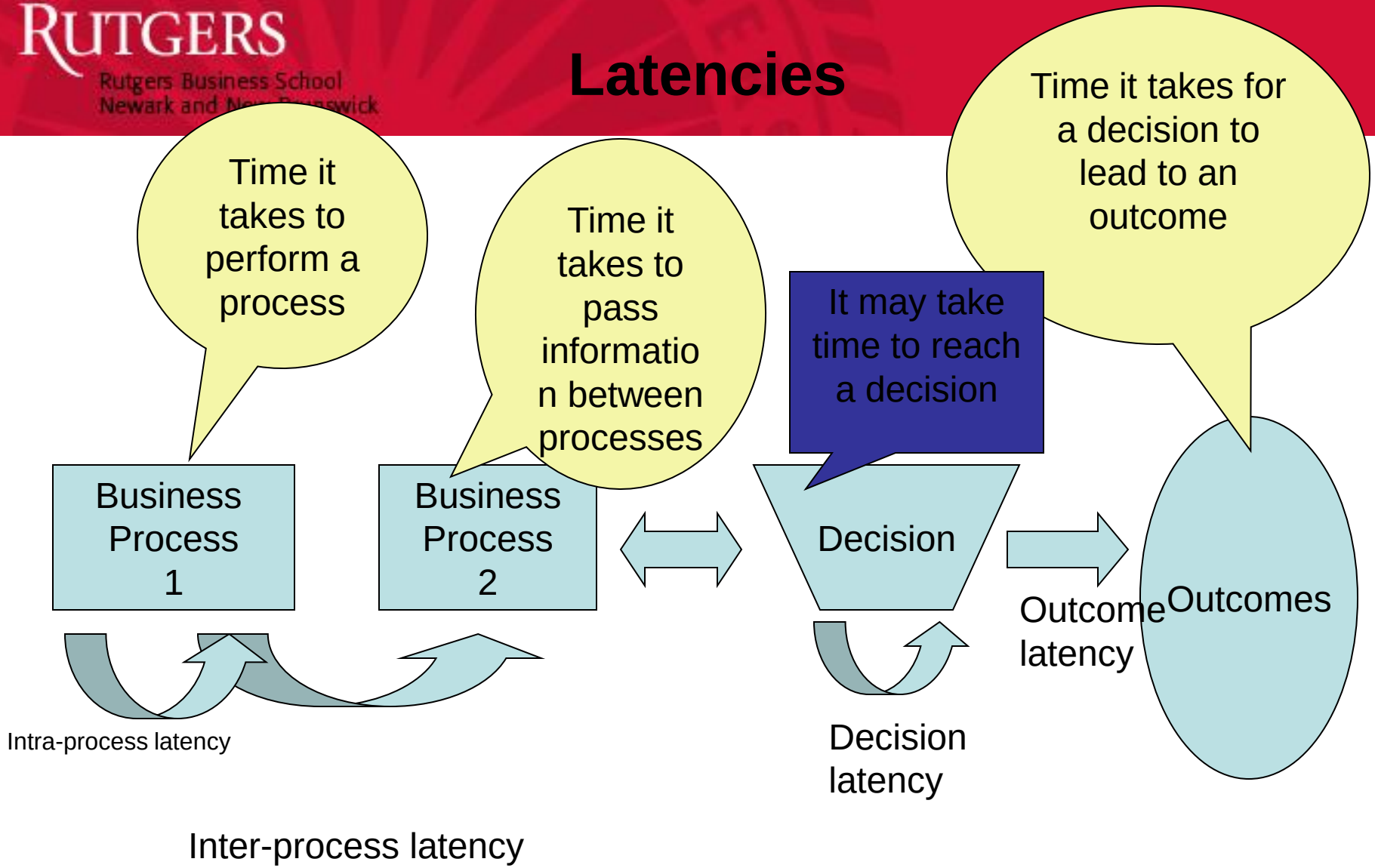
Outline

- The Real Time Economy
  - Electronic measurement and reporting (XBRL)
  - Monitoring and control
- Continuous Assurance
  - Continuous data assurance
  - Continuous control monitoring
  - Continuous risk management and assessment
- Evolving towards the future

The Real Time Economy

Latencies


Time it takes to perform a process
Time it takes to pass information between processes
It may take time to reach a decision
Time it takes for a decision to lead to an outcome
Business Process 1
Business Process 2
Decision
Outcomes
Outcome latency
Intra-process latency
Decision latency
Inter-process latency

Electronic measurement and reporting (XBRL)

- XBRL although a very positive step on the route towards automation perpetuates some of the weaknesses of the "paper oriented" reporting model
  - Audits to improve their social agency function should be of corporate measurement and databases not of financial reports
  - XBRL is a rigid model not fit for representing the interlinked fuzzy boundary organizations of today
  - As most substantive regulatory based changes XBRL presents a series of unintended consequences including
    - Pressure toward standardization of reporting
    - Facilitation of more frequent reporting
    - Evolutionary force towards the standardization of the semantics of accounting reporting
    - A poor conduit to represent corporate transactions (XBRL/FR)
- XBRL/FR will eventually lead to XBRL/GL –great airline effects

Continuous Audit (CA)vs Continuous Monitoring (CM)

Continuous Auditing
Performed by Internal Audit

- Gain audit evidence more effectively and efficiently
- React more timely to business risks
- Leverage technology to perform more efficient internal audits
- Focus audits more specifically
- Help monitor compliance with policies, procedures, and regulations

Continuous Monitoring
Responsibility of Management

- Improve governance – aligning business/compliance risk to internal controls and remediation
- Improve transparency and react more timely to make better day-to-day decisions
- Strive to reduce cost of controls and cost of testing/monitoring
- Leverage technology to create efficiencies and opportunities for performance improvements

From CA/CM as Preventive Care against Fraud by James R. Littley and Andrew M. Costello, KPMG

CA/CM roadmap *

- 1. Develop the business case
- 2. Develop a strategy for adoption
- 3. Plan Design and Implementation
- 4. Build and Implement the CM or CA system
- 5. Monitor Performance and Progress, and refine as needed

WHERE TO START IN AN AIRLINE?

* Deloitte: Continuous monitoring and continuous auditing: from idea to implementation

Five levels of RTE processes

- Business Process
- Measurement of the processes
- Relationship models
- KPI monitoring
- Continuous monitoring and assurance

Monitoring and Control: 5 levels of activity

Continuous Reporting
Continuous Assurance
Transaction assurance, Estimate assurance, Compliance assurance, Judgment evaluation

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Analytic monitoring level
KPIs: Marketing/Sales Ratio
Inventory turnover
Intra-company transfers

- Drill Down
  - History
  - Distribution

Relationship level
Sales change = Incremental Marketing cost * 2.7 +- 12%
E-Care queries = number of sales * 4.1
Delay relationships

- Drill Down
  - History
  - Distribution

Data level

- Investment
- Regions
- Clients
- Dynamics

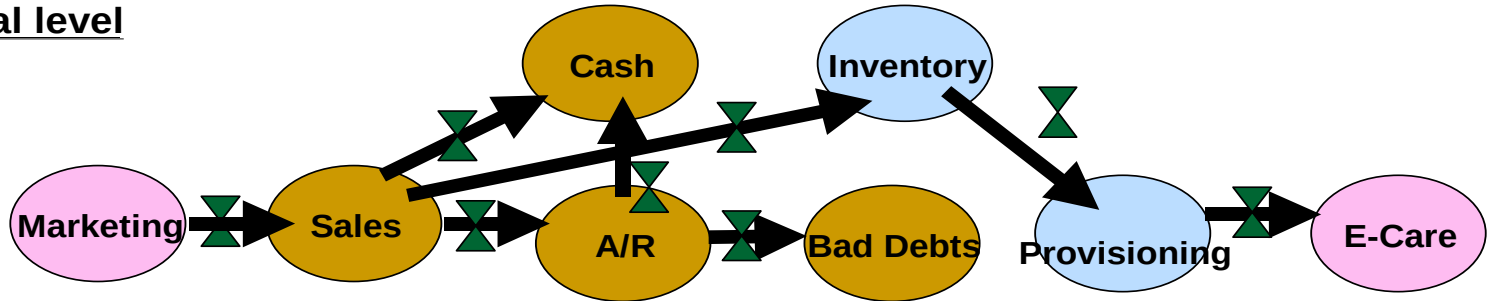
- Product detail
- Regions
- Clients
- Dynamics

- Collection
- Aging of receivables
- Clients
- Dynamics

- Inventory
- Distribution
- Ownership
- Dynamics

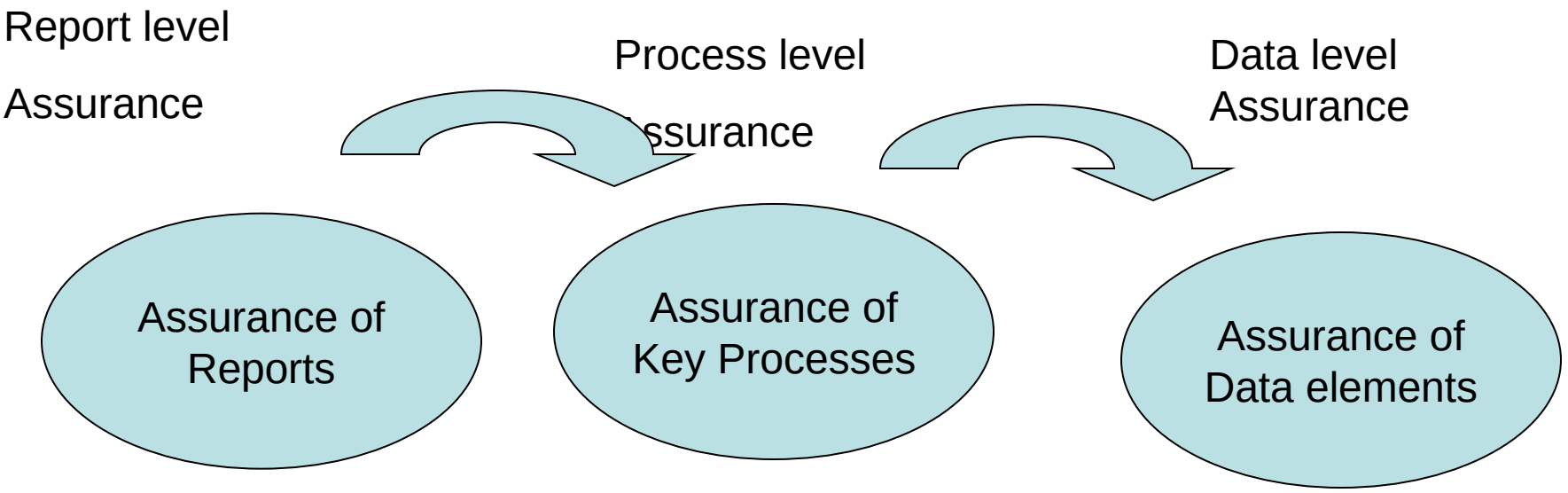
- Drill Down
  - History
  - Distribution

Structural level



Continuous Assurance

An evolving audit framework



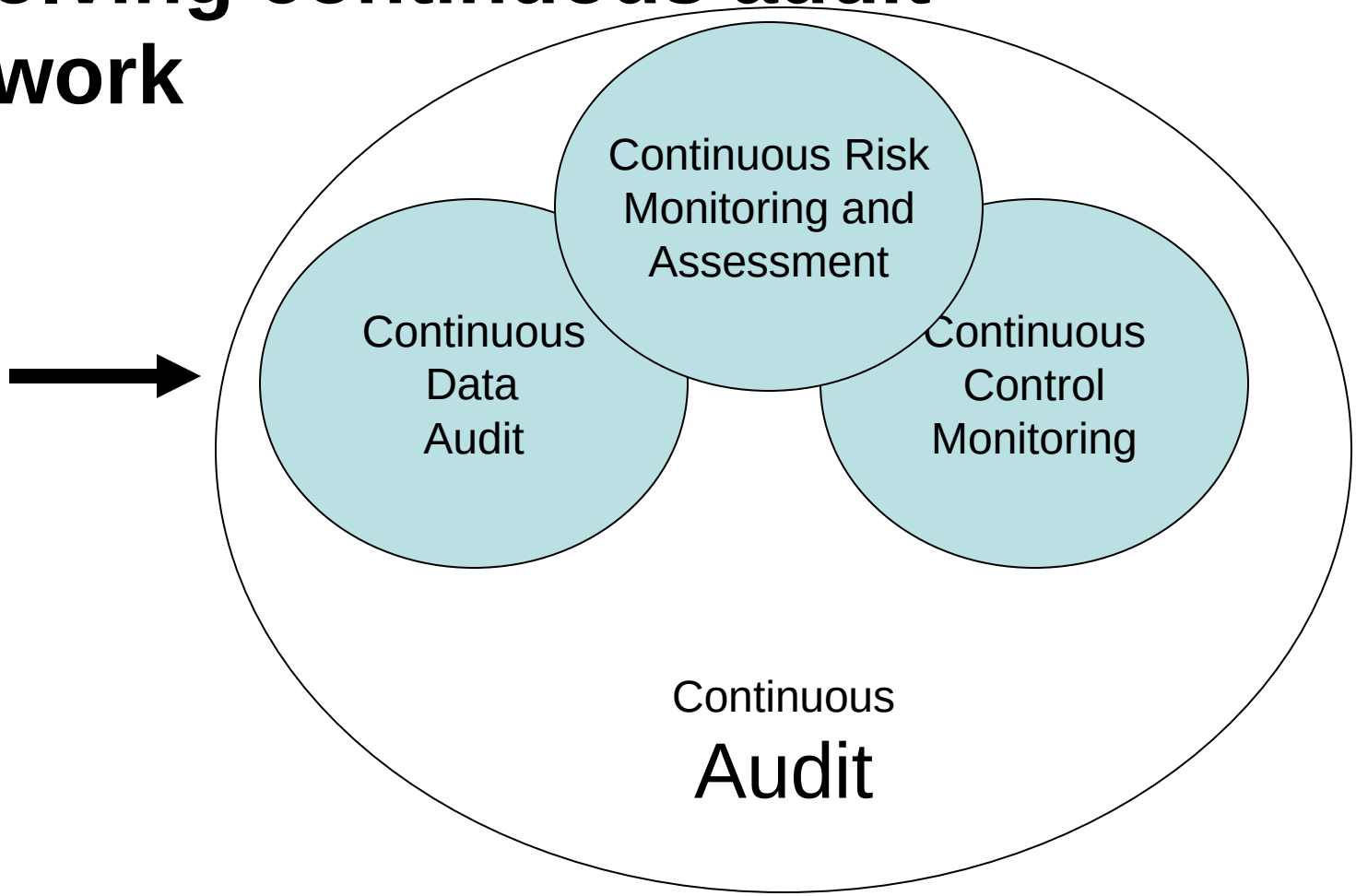
- **Compliance reports becoming commonplace**
- **Traditional audit is an instance of RLA**
- **Generated and modified by different processes**

- **Process reviews a la Systrust**
- **Internal or outsourced**
- **Third party processes are to become the norm**
- **Intra and Inter process controls an issue**

- **XML/ XBRL datum**
- **Generated and modified by different processes**
- **Balkanization of data**
- **Control / Assurance tags**

An evolving continuous audit framework

- Automation
- Sensoring
- ERP
- E-Commerce



Continuous data assurance

Continuous Process Auditing at AT&T (1986-1991)

CPAS concepts

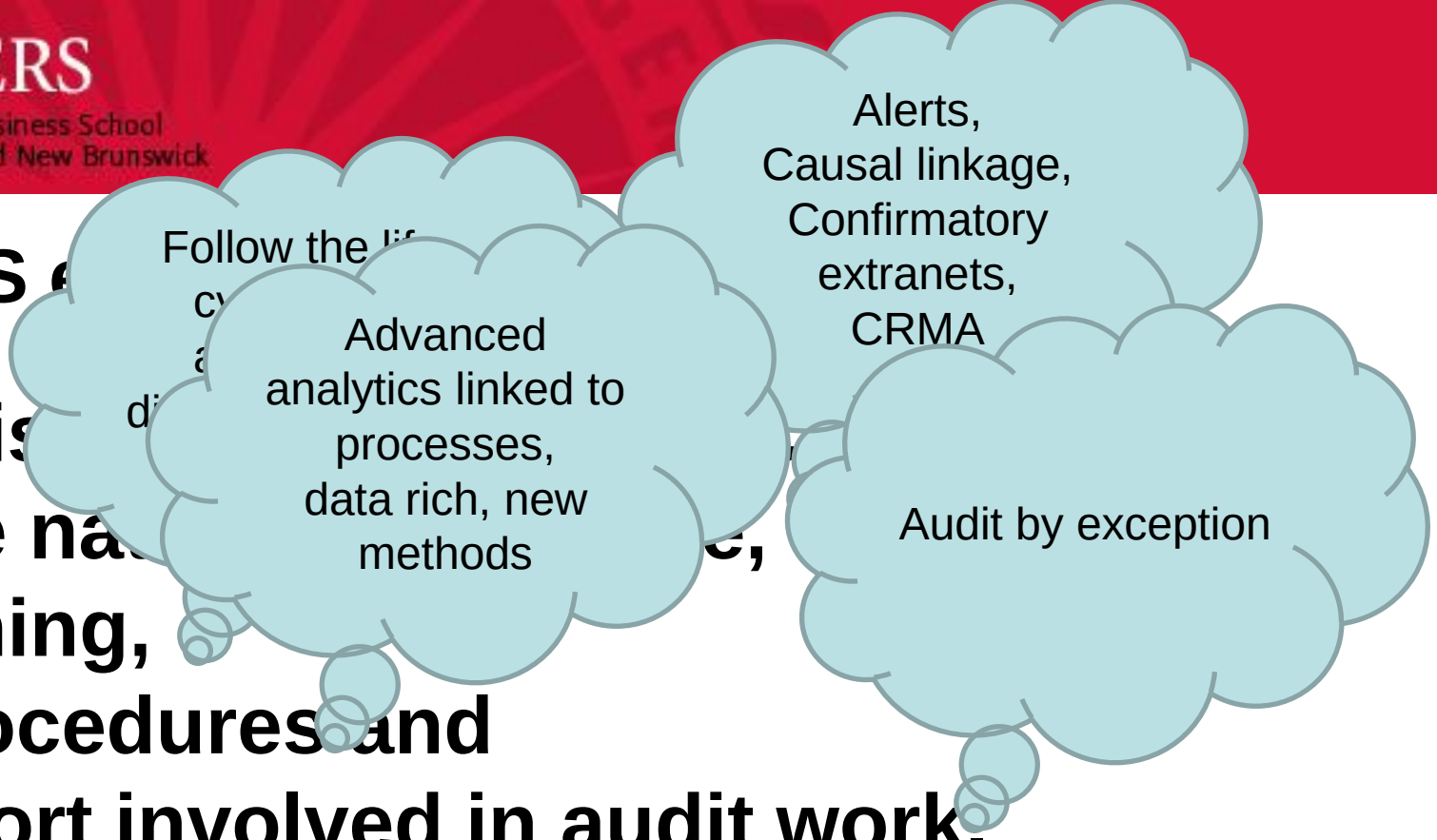
- metrics
- analytics
- standards:
  - of operation
  - of variance
  - others
- alarms
- measurement vs monitoring

CPAS definition

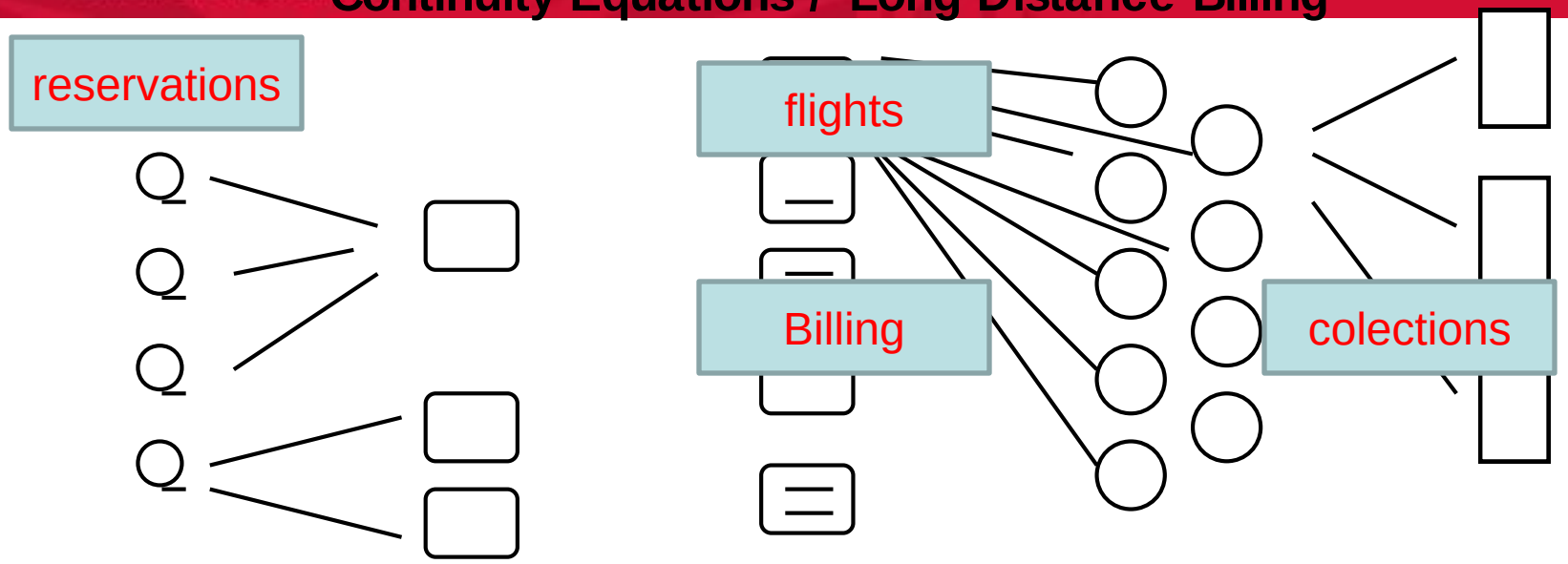
- The Continuous Process Audit System (CPAS) approach can be defined as a philosophy of auditing that aims to monitor key corporate processes on a continuous basis, in order to achieve audit by exception.

CPAS e

- **This**
  the na **e,**
  timing,
  procedures and
  effort involved in audit work.

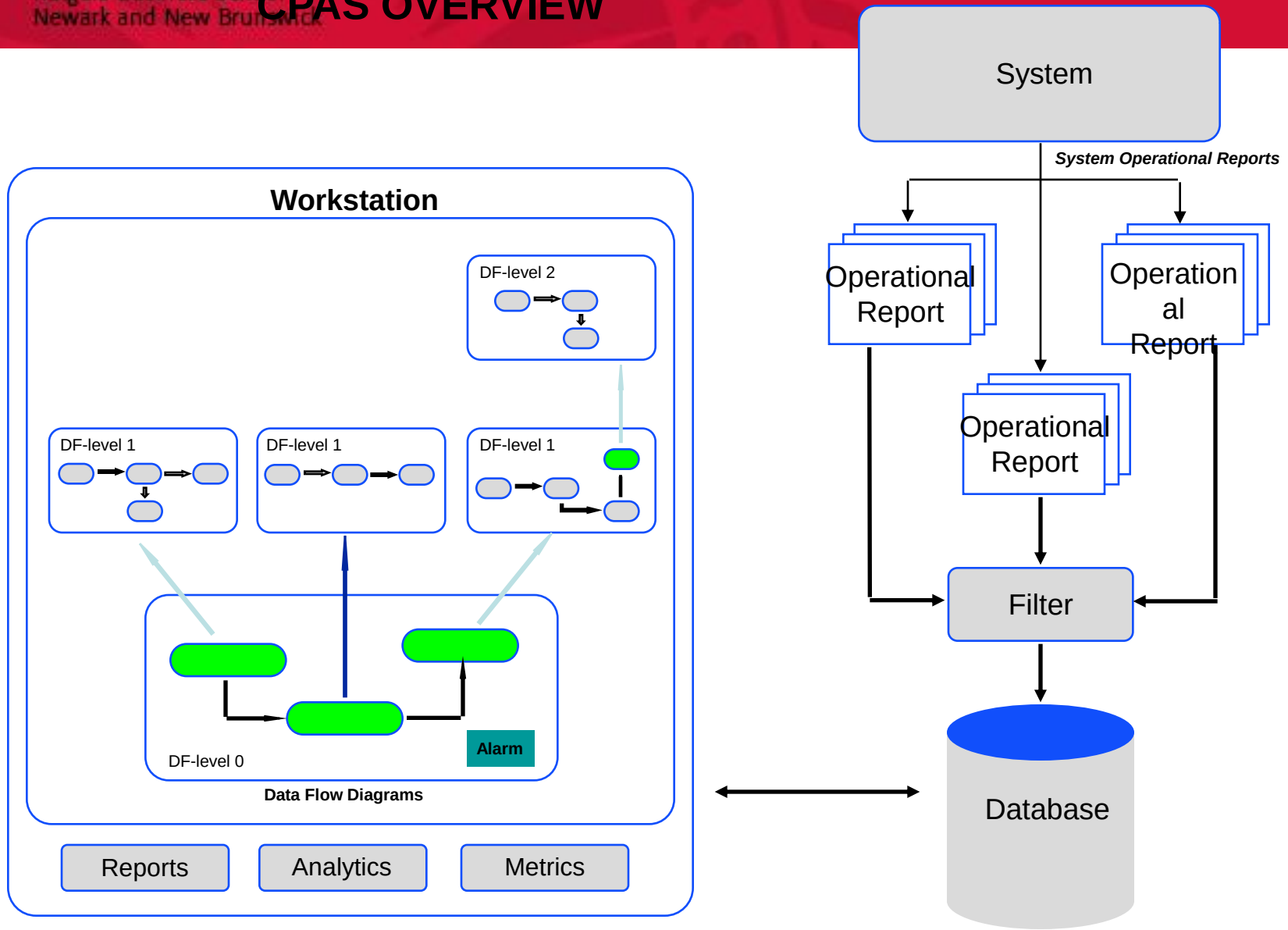


Continuity Equations / Long Distance Billing



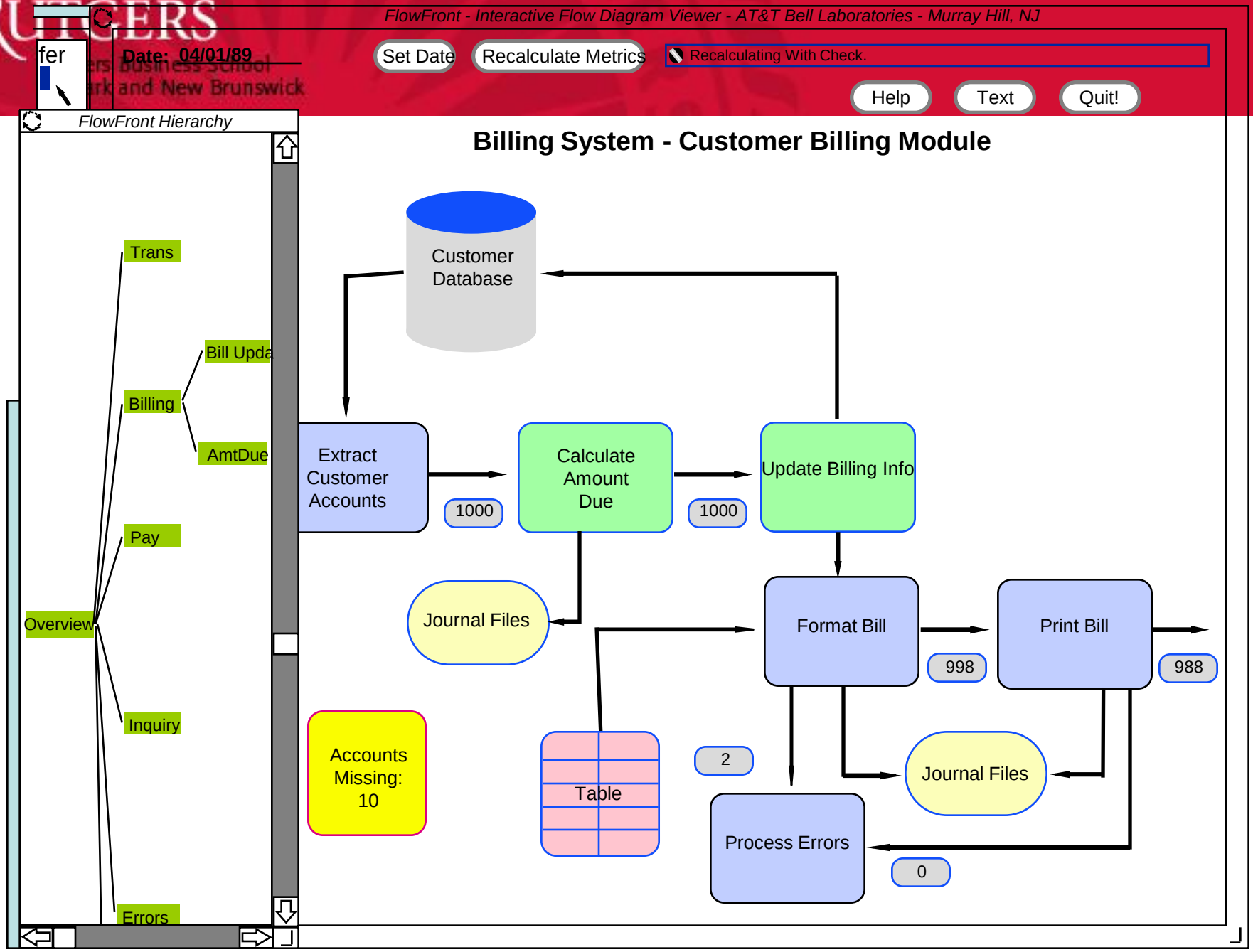
Receiving Call detail data from independent telephone companies in mag. tapes	Creating datasets one-to-one many-to-many one-to-many'	Splitting call detail into files to be posted to different billers	Posting from one biller file to accounts in several billing cycles	Rating ea Billable Customer
1	2	3	4	5

CPAS OVERVIEW



CPAS effort (II)

- The auditor will place an increased level of reliance on the evaluation of flow data (while accounting operations are being performed) instead of evidence from related activities (e.g. preparedness audits).
- Audit work would be focused on audit by exception with the system gathering knowledge exceptions on a continuous basis.


FlowFront - Interactive Flow Diagram Viewer - AT&T Bell Laboratories - Murray Hill, NJ
Date: 04/01/89
Set Date
Recalculate Metrics
Recalculating With Check.
Help
Text
Quit!
FlowFront Hierarchy
Billing System - Customer Billing Module
Trans
Bill Upda
Billing
AmtDue
Pay
Overview
Inquiry
Errors
Customer Database
Extract Customer Accounts
1000
Calculate Amount Due
1000
Update Billing Info
Journal Files
Format Bill
998
Print Bill
988
Accounts Missing: 10
Table
2
Journal Files
Process Errors
0

FlowFront - Interactive Flow Diagram Viewer - AT&T Bell Laboratories - Murray Hill, NJ

Date: 04/01/89

RPC: Silver Springs

PE: 60

Set Date | Recalculate Metrics | Plot Request graph.level 1

Help | Text | Quit!

FlowFront Hierarchy

- Overview
- Billing
  - Bill Upda
  - AmtDue
- Pay
- Inquiry
- Errors

Billing System - Overview

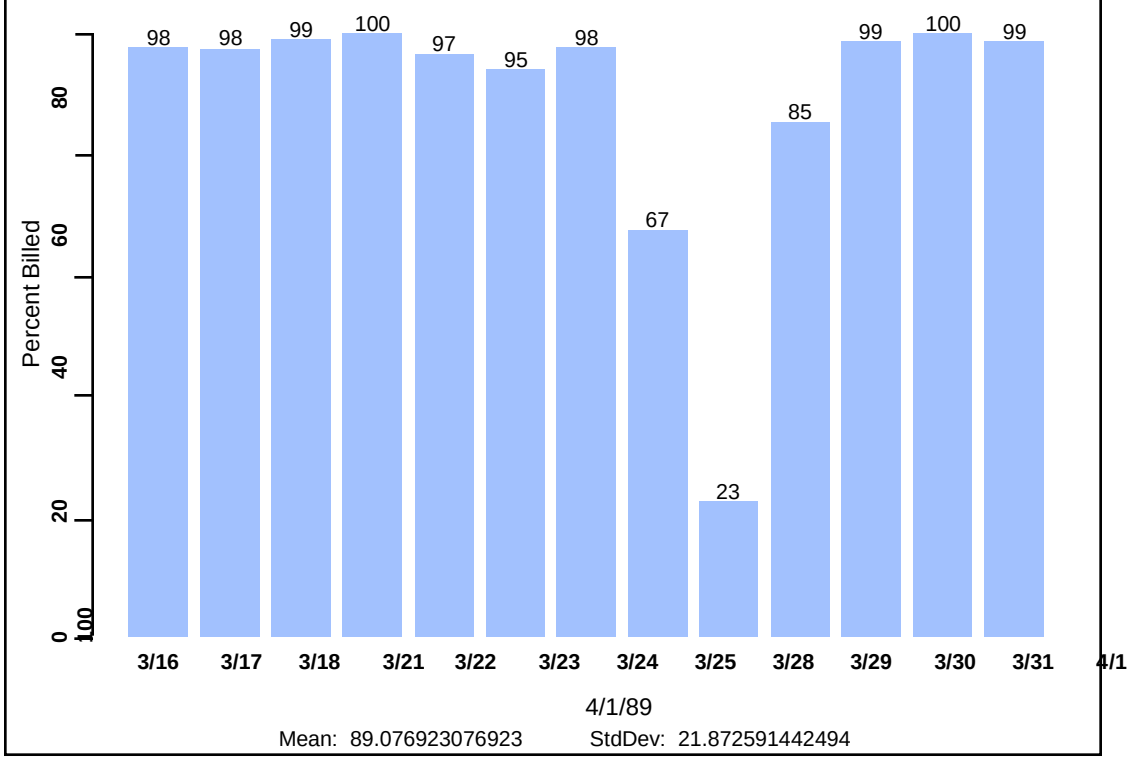
Tra

Trans
Data

Pro

S
Graphics

Percent Of Accounts Successfully Billed



Mean: 89.076923076923 StdDev: 21.872591442494

FlowFront - Interactive Flow Diagram Viewer - AT&T Bell Laboratories - Murray Hill, NJ

Date: 11/27/89 Set Date Recalculate Metrics Starting S analysis server, please wait...

RPC: Silver Springs PE: 60

Units: Records

Help Text Quit!

4.3 LDS Billing Subfunctions

prod/svc. request

fulfillment

Order

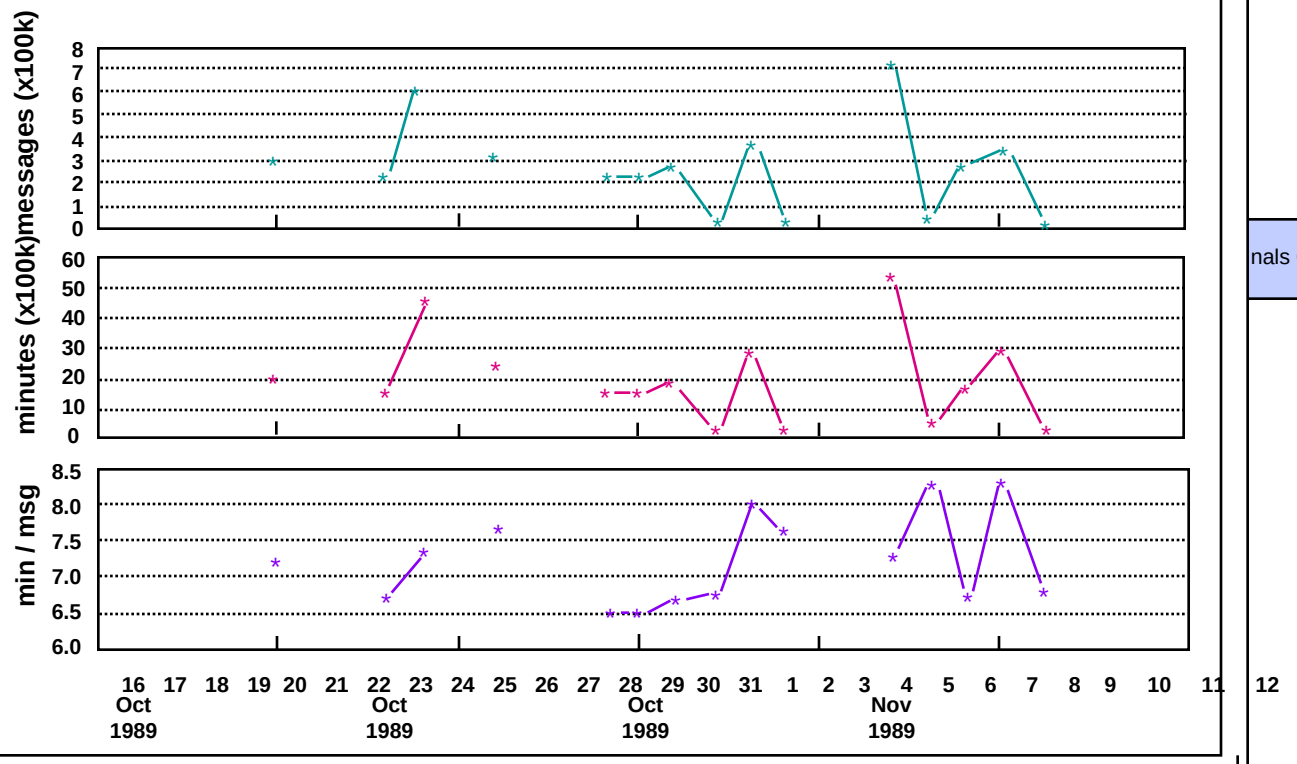
Cus

nals CTJ

Hierarchy

paymt arr

Input Volumes to Message Validation
PE: 60 RPC: Silver Springs



fer

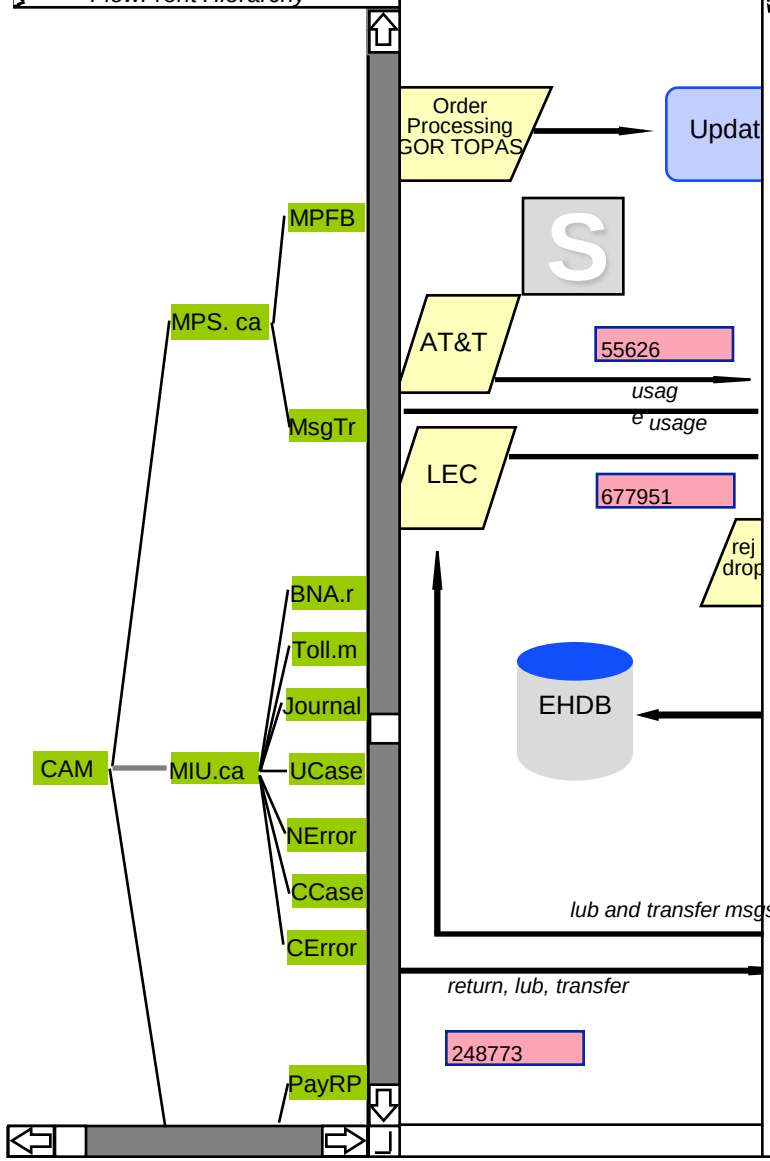
Date: 11/27/89

RPC: Silver Springs

PE: 60

Set Date | Recalculate Metrics | Text Request for MPS.cam

FlowFront Hierarchy



····· MPS.CAM ·····

NEXT | PREVIOUS | FIRST | LAST | SAVE | QUIT

Flowchart: Message Processing
Functional Level: UPE, RPE
Hierarchical Level: 1
Parent Process: CAM
Primary Source of Information: Business LDS 4.3
Functional and System Process Flows: AT&T End User Profile

1.0 PURPOSE

- To edit messages entering system
- To guide and rate messages
- To reject messages that are in error to the Message Investigation Unit (MIU)
- To send messages that should be billed in another PE or by the LEC there via the Returns and Transfer function

2.0 MAJOR INPUTS

- Usage tapes from the Local Exchange Companies
- Independent Telephone Companies (ICOs)
- Recorded Information Collection System (RICS)
- Correct Messages from MIU
- Messages from other parts of the Billing system
- Control Accounts (formerly Auditors Prefix)

3.0 MAJOR OUTPUTS

- Guided and rated messages passed to APE billers for bill preparation
- Messages sent to other parts of the billing system or returned to the LEC
- Dropped messages that should be billed in another billing system
- Errors to MIU

4.0 PROCESSES

Itau-Unibanco projects

- Branch monitoring through KPIs and transaction monitoring
- Transitory Accounts
- Product Sales Project
- Implementation considerations
  - Hiring a systems integrator
  - Effect on downstream systems
  - Behavioral changes

Sale Monitoring / Agent

Transitory accounts

incentives

Branch Monitoring

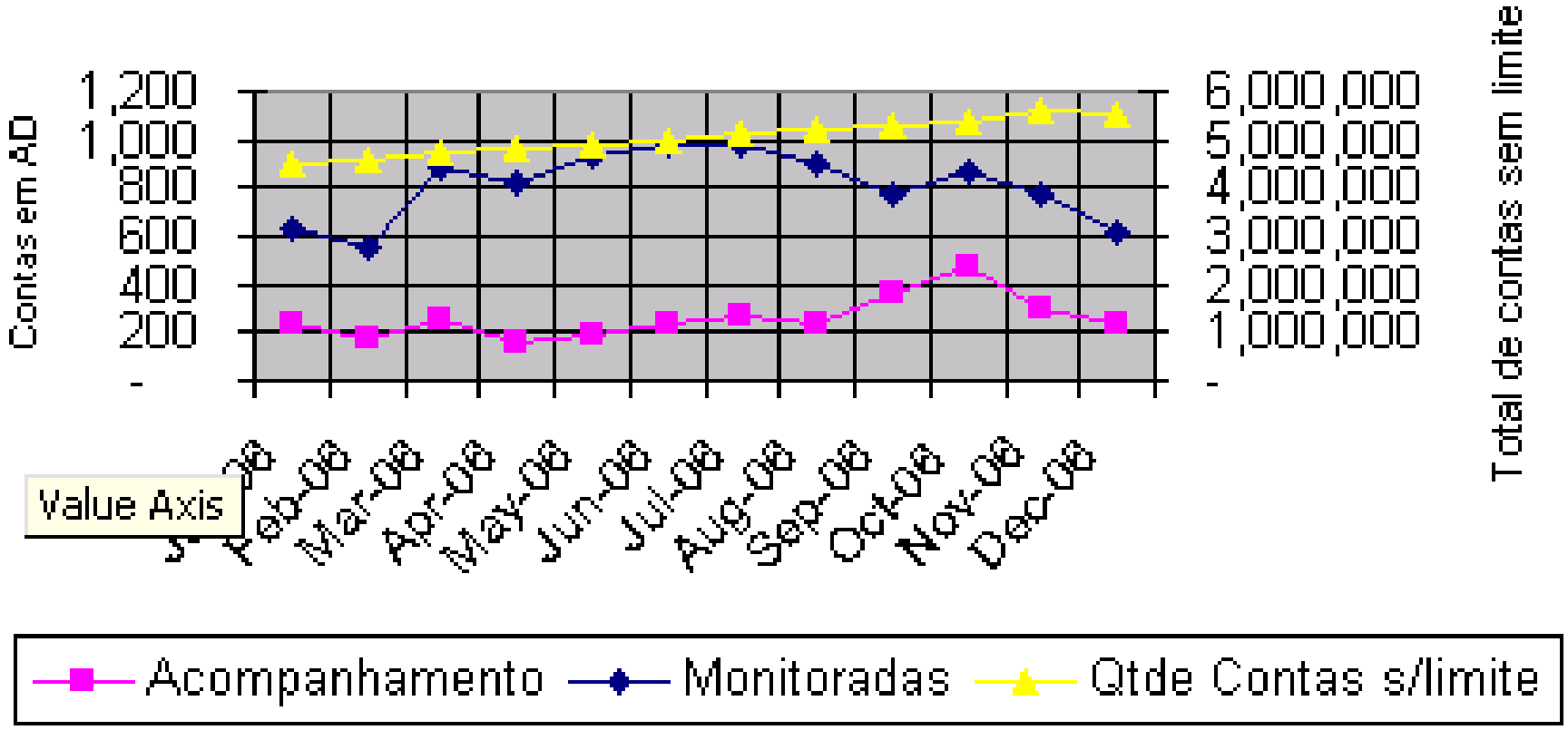
- Heuristics for 17 monitoring procedures that monitor about 1400 branches are being re-calculated
- Have retained IBM as the “systems integrator” for hardware expansion and systems implementation of continuous audit analytics
- Is focusing on transitory accounts
  - About 10,000 general ledger accounts
  - Unclear how many are transitory
  - Range a large number of business units

Unibanco – Some CA Program Features

- **Automated monitoring of over 5 million customer accounts on a daily basis using 25 automated procedures to:**
  - **Detect errors**
  - **Deter inappropriate events & behaviors**
  - **Reduce or avoid financial losses**
  - **Help assure compliance with existing laws, policies, norms and procedures**
- **Examples of "low hanging fruit:"**
  - **Customer advances**
  - **Excess over credit limit**
  - **Returned checks**
  - **Federal tax payment cancellations**
  - **TED emissions (should this be omissions?)**

Unibanco – Advances to Clients Monitoring

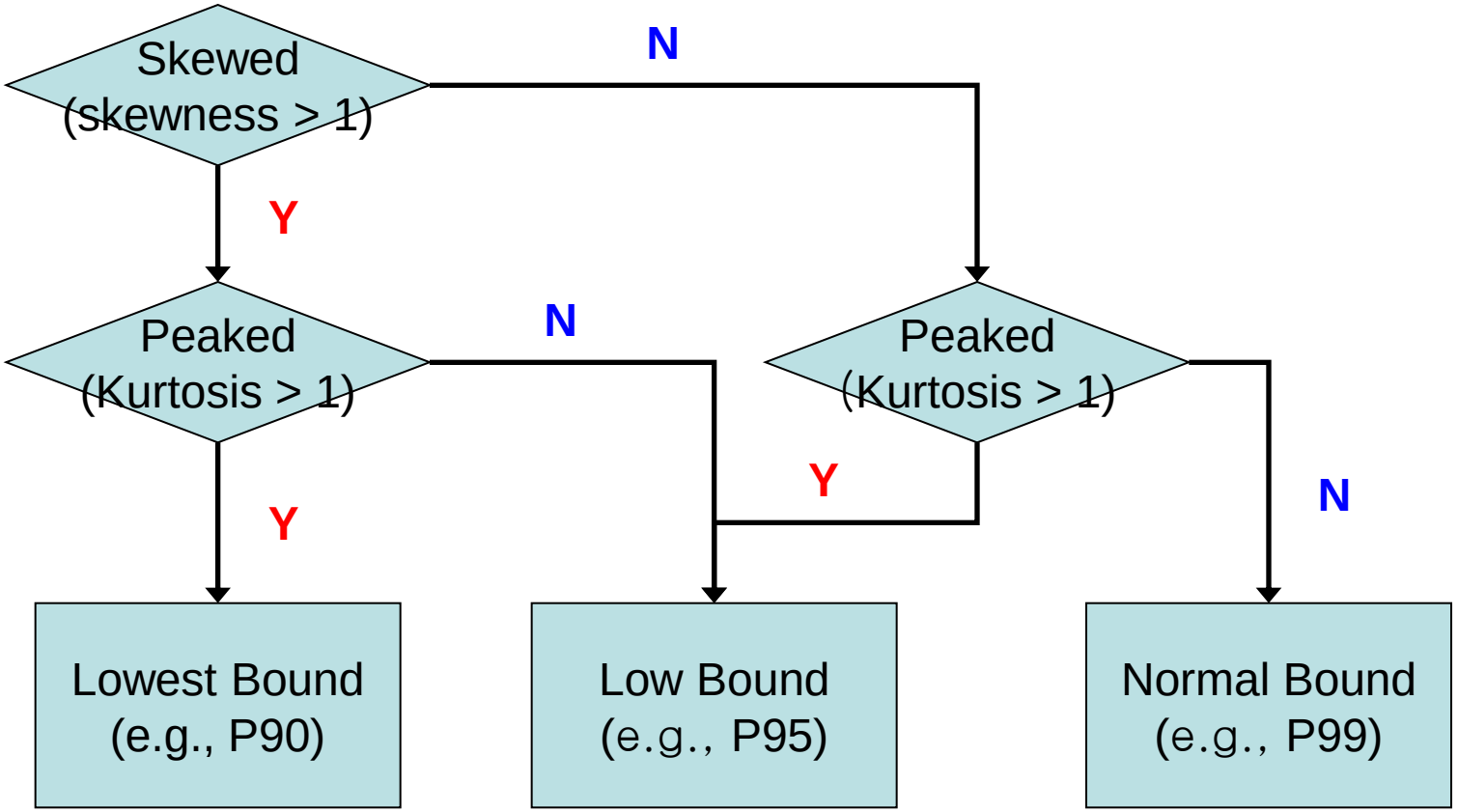
Histórico da Monitoração de Adiantamento a Depositantes



Transitory Accounts

- Level 1
  - Analytic review of all accounts
- Level 2
  - Monitoring of risky accounts at the mainframe level
- Level 3
  - Daily analytics on transactions and generic characteristics of high risk accounts
  - Generic filter to analyze daily transactions of particular accounts flagged in daily level 2 monitoring
- Level 4 (future)
  - Continuity equations and relationships

Overall Quality of each account



Continuous Data Assurance (CDA) at HCA

- HSP is a large national provider of healthcare services, composed of locally managed facilities that include numerous hospitals and outpatient surgery centers.
- IT internal audit provided access to unfiltered extracts from their transactional databases, comprising all procurement cycle daily transactions from October 1st, 2003 through June 30th, 2004: Over 500,000 data points.
- Dataset mimics what a CDA system has to deal with: highly disaggregate data flowing through CA system in real time.
- Audit procedures have to be developed for this environment.

Model the airline value chain

Lessons from HCA project

- Intricate processes can and must be monitored
- This may be done at the transaction levels, in addition to more aggregate levels
- Models are necessary that are adaptive and can react to current circumstances
- Errors may be automatically corrected
- A tool may be derived from the performed work that could be superior to existing tools

Metlife

- Data stream of over 200K wire transfers
- Data only currently available for the wires and the records possess little information
- Little context knowledge of the major feeding streams
- No fraud training data available
- Worked during the audit supplementing the audit team work
- Developed a series of data filters relating to specific conditions and trends
- Working on an aggregate weighting model
- Need in the field verification of picked data

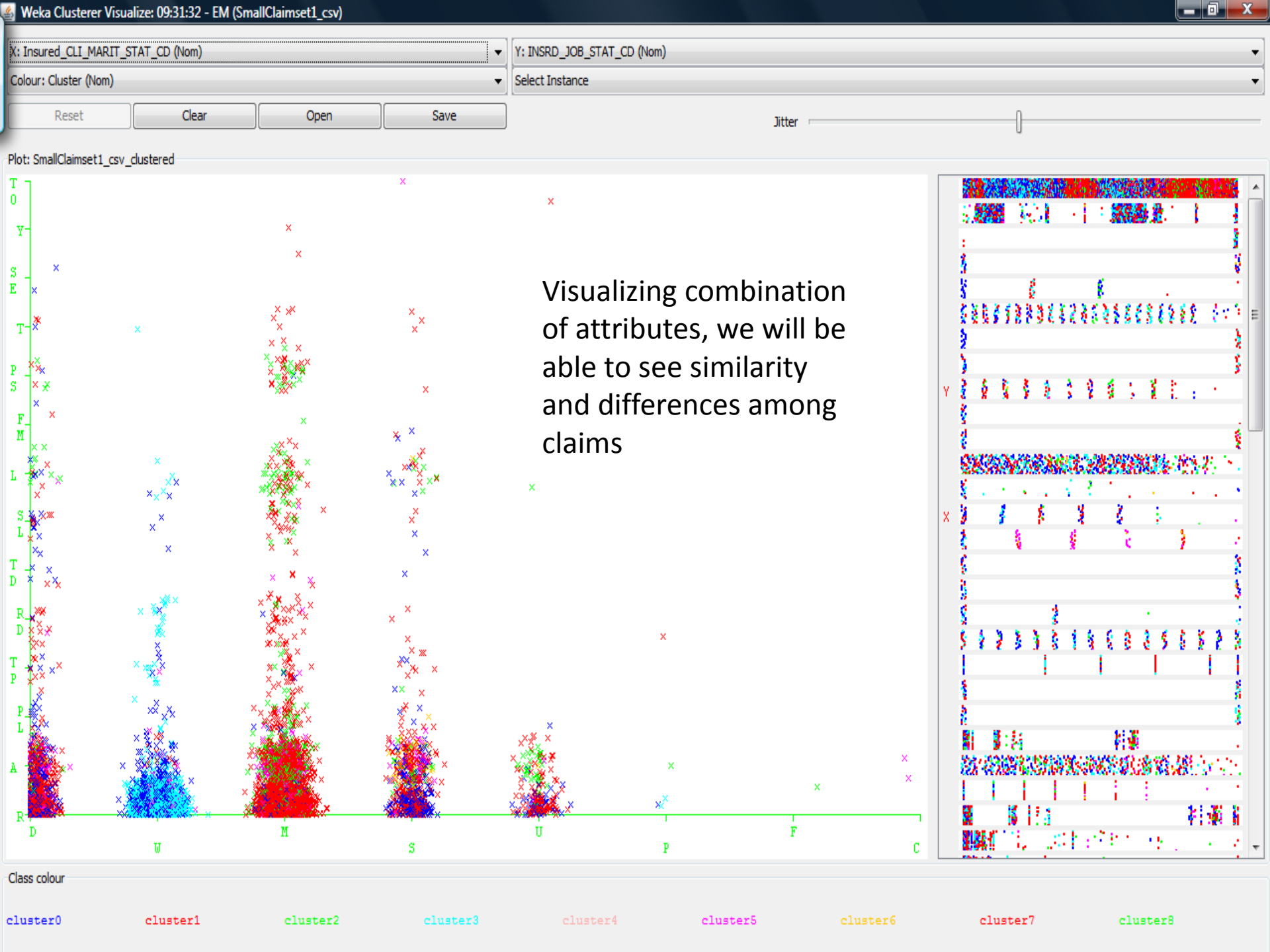
Insurance monitoring and assessment

ATL and ATL breakage

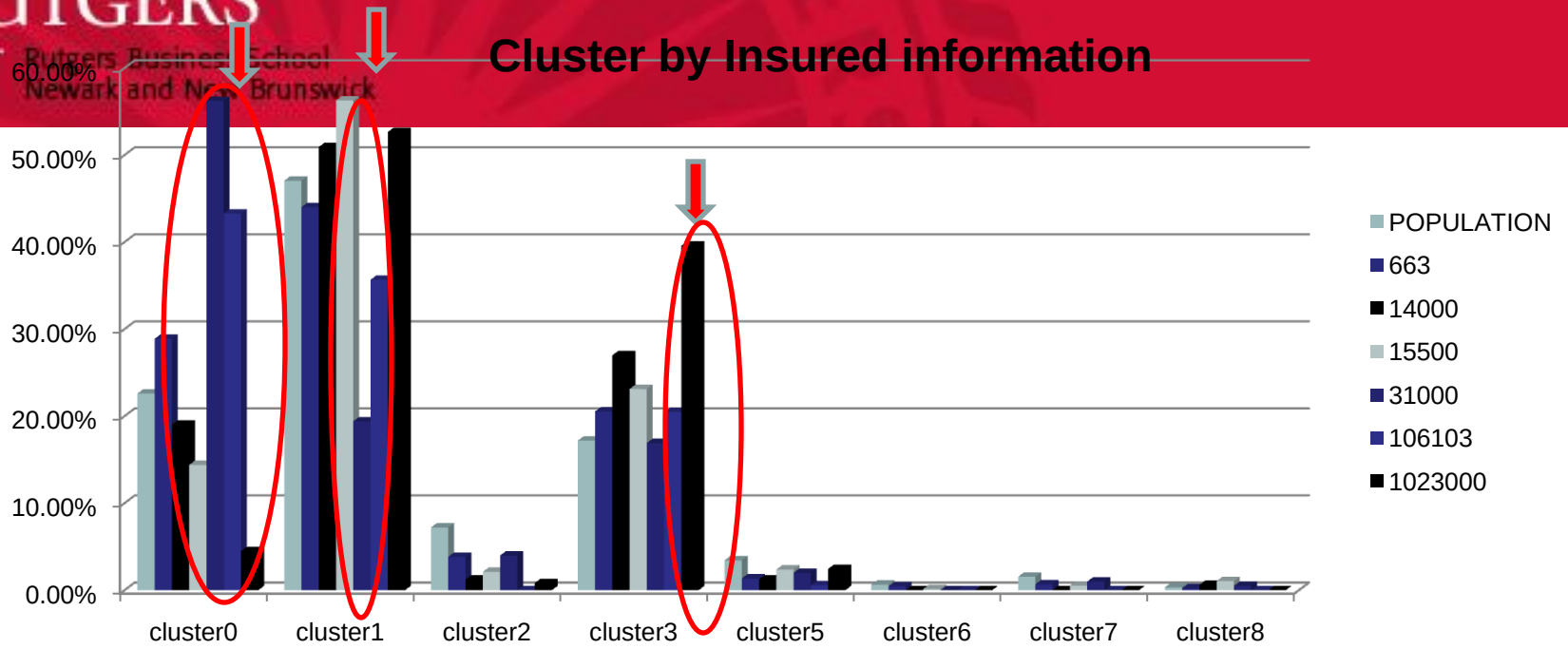
Wire transfers

Metlife (Project 2-3)

- Usage of clustering techniques to extract aberrations in data in parallel to the above discussed effort
- Usage of clustering techniques in the evaluation of exceptions in life insurance claims


Weka Clusterer Visualize: 09:31:32 - EM (SmallClaimset1_csv)
X: Insured_CLI_MARIT_STAT_CD (Nom)
Y: INSRD_JOB_STAT_CD (Nom)
Colour: Cluster (Nom)
Select Instance
Reset
Clear
Open
Save
Jitter
Plot: SmallClaimset1_csv_clustered
TOTAL_SETTLED_PAID_AMT
D
W
M
S
U
P
F
C
Visualizing combination of attributes, we will be able to see similarity and differences among claims
Y
X
Class colour
cluster0
cluster1
cluster2
cluster3
cluster4
cluster5
cluster6
cluster7
cluster8

Cluster by Insured information



Population	22.60%	47.05%	7.21%	17.19%	3.43%	0.64%	1.55%	0.33%
663	28.89%	44.02%	3.84%	20.54%	1.35%	0.45%	0.68%	0.23%
14000	19.02%	50.92%	1.23%	26.99%	1.23%	0.00%	0.00%	0.61%
15500	14.40%	56.27%	2.11%	23.12%	2.38%	0.13%	0.53%	1.06%
31000	**56.22%**	**19.40%**	3.98%	16.92%	1.99%	0.00%	1.00%	0.50%
106103	**43.27%**	**35.67%**	0.00%	20.47%	0.58%	0.00%	0.00%	0.00%
1023000	**4.49%**	52.65%	0.82%	**39.59%**	2.45%	0.00%	0.00%	0.00%
	Cluster 0	**Cluster 1**	**Cluster2**	**Cluster3**	**Cluster5**	**Cluster6**	**Cluster7**	**Cluster8**

We can cluster claims using different group of attributes and flag the claims from specific groups in specific clusters.

Several clustering of different groups of attributes can make up the score.

P&G (work with the audit innovation team)

- KPI projects
- Automating order to cash
- Vendor files / duplicate payments
- Risk dashboard

KPI project

- Company has facilities in over 160 countries
- Some facilities are manufacturing, some are pure distribution and sales
- Content is local and world sourced
- Substantive part of the work is building models for inventory and sales flow and trying to understand / model the level and flow variables
- The objective is to detect out of the normal events both of business and exception nature (errors and fraud)
- There are 4 large ERPs feeding the data / data is extracted in ACL and modeled in SAS
- 16 different models have been developed and are being tested

Order to cash project -> selective automation

- This project aims to selectively automate parts of the audit using order to cash as the context
  - Audit action sheets
  - Taxonomization of protocols
  - Change of nature of evidence
  - Classification of automation level
    - Manual
    - Deterministic
    - Table comparison
    - Historical / stochastic
  - Architecture of the Structure
  - Prototyping of selected models

Continuous control monitoring

Siemens projects

- Focused on audit automation
  - **First project** looked at automating CCM in SAP
  - **Second project** focused on a wider scope of automation
  - A **third project** would think about reengineering the audit action sheets
  - The **fourth project** aims at formalizing SOD, activities, and control structures

The Siemens project learnings

- ERPs are very opaque
- Ratings schema are used and desirable
- 20-40% of the controls may be deterministically monitored
- Maybe other 20-40% may be convertible to be monitorable
- New form of alarm evidence that we do not know how to deal
- Continuous risk management and assessment needed for weighting evidence and choice of procedures

Continuous Risk Monitoring and Assessment

Assurance on Risk Management

Increasing emphasis on risk assessment

- In compliance with SOX, management must monitor internal controls to ensure that risks are being assessed and handled well.
- With ERM companies should identify and manage all risks to achieving its objectives.
- In compliance with Basel, banks are required to assess their overall capital adequacy in relation to their risk profile.
- Regulatory authorities have encouraged financial institutions to validate their risk-related models to increase the reliability of their risk assessment.

Continuous Risk Monitoring and Assessment (CRMA)

- CRMA is a real time based integrated risk assessment approach, aggregating data across different functional tasks in organization to assess risk exposure, providing reasonable assurance on firm's risk assessment.
- CRMA continuously computes key risk indicators (KRIs) with firm's cross-functional data from its key business processes, as well as from external sources and validates them against whether they are linked to the firm's risk exposure.

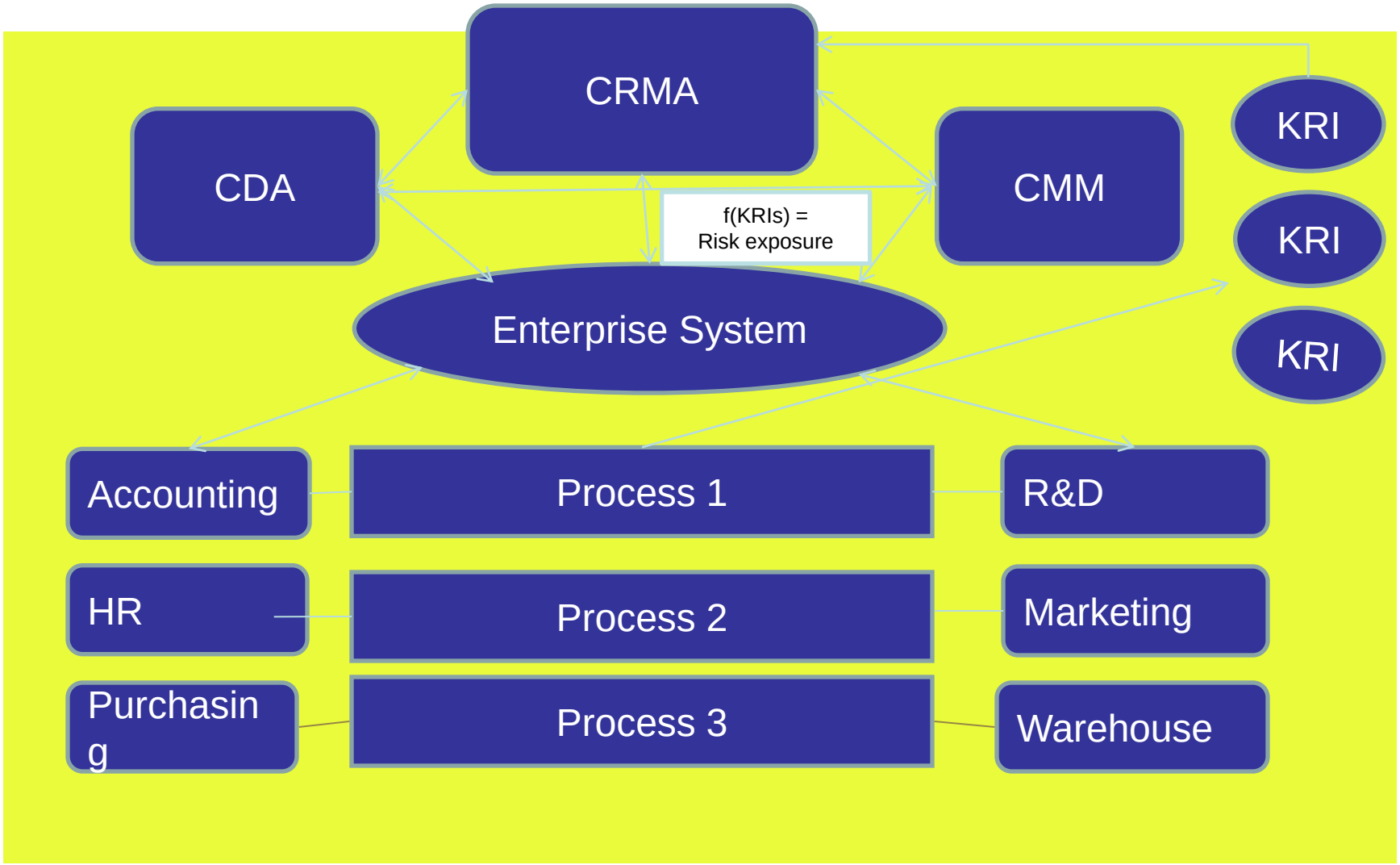
Key Risk Indicator (KRI)

- KRI provides early warning systems to track the level of risk in the organization
- KRI can be identified through analysis of key business activities
  - 6 steps for KRI identification (Scandizzo, 2005)
- Well identified and computed KRIs provide a reliable basis for computing the riskiness of firm for specific risk, such operational risk, liquidity risk, as well as the overall riskiness of firm.
  - f(KRI(i),KRI(ii),…KRI(n))= Risk exposure
  - External risk factors may be mapped manually into the computation of KRIs and risk exposure.

CDA, CCM, and CRMA

- Within CRMA, key business processes and risk factors are identified to compute KRIs and risk exposures, and they are continuously monitored.
- CCM monitors violation against business controls and provides assurance on whether controls are followed. This mitigates control KRIs. CRMA continuously monitors changes in control KRIs with CCM, assuring CCM is working.
- CDA validates transaction data and evaluates quality of transactions. This mitigates data management KRIs. CRMA assures CDA is effective by keep monitoring. CDA also helps feeding CRMA with validated transaction data.

CRMA Architecture



Evolving towards the future

Opportunities for research

- Creating Control system measurement and monitoring schemata
- Creating standards for Business Process Monitoring and Alarming
- Automatic Confirmation Tools
- Development of a variety of modular Audit bots (agents) to be incorporated into programs of audit automation
- Creation of alternative real-time audit reports for different compliance masters

Complementary research needs

- Expansion of assurance to non-financial processes to relate to these through continuity equations (Kogan et al, 2010)
- Standards are needed for CA (CICA/ AICPA, 1999; IIA, 2003; ISACA 2010)
- Research on the development of complementary assurance products

Reconsideration of concepts and standards

- Independence needs to be re-defined
- The external audit billing model has to be restructured to bill on function not hours
- Audit firms must put improved knowledge collection and management processes to feed their audit analytic toolkit
- Audit firms have to engage in auditor automation and pro-actively promote corporate data collection during-the-process
- Value added must be justified in terms of data quality
- Materiality needs to be redefined

- http://raw.rutgers.edu
  - A wide range of presentations / videos and papers from the multiple CA and CR conferences promoted by Rutgers
- http://raw.rutgers.edu/dubai