



# Computer Science and Technology - CST 2003

## Expanding E-Type Capabilities of Legacy Systems Through Requirements Validation

*Transitioning from Requirements Driven to ROI Driven Solutions*

**Cancun, Mexico**

*19-21, May 2003*

**David Cohen, Doug McDougal, Gary Larson and Bill Ware**

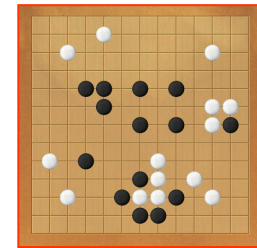
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**sente** means competitive initiative  
in the game “Go”



**Our focus is on productivity  
enhancements through Faster:**

- delivery of customer solutions
- delivery of information to users
- implementation of organizational changes

## 1. Software Investment Insights

- Existing Requirements-Driven Development-Paradigm Rarely Delivers a Good Return on Investment (ROI)
- The Challenge is to Deliver **Solutions** vs. **Software**
  - **Software Pollution™**
  - **The Ever Increasing Development Backlog**
  - **Requirements Validation** - deploy better investments
  - **E-Type** vs. **S-Type** Systems

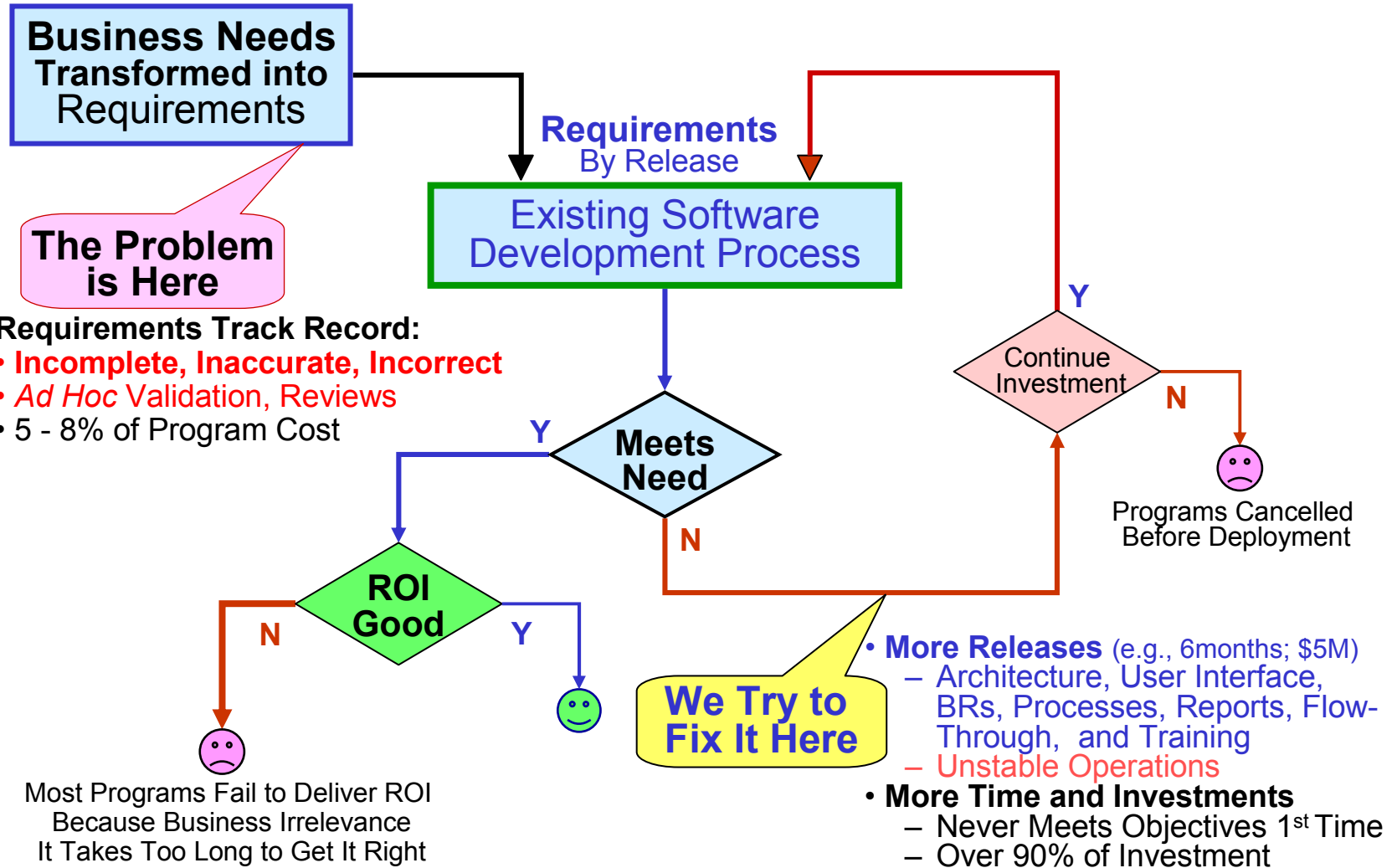
## 2. The *eccm* toolkit capabilities for Requirements Validation

- **Architecture**
- **Configuration Management**
- **Center Productivity Management**

## 3. Summary

# Software Investment (1/4)

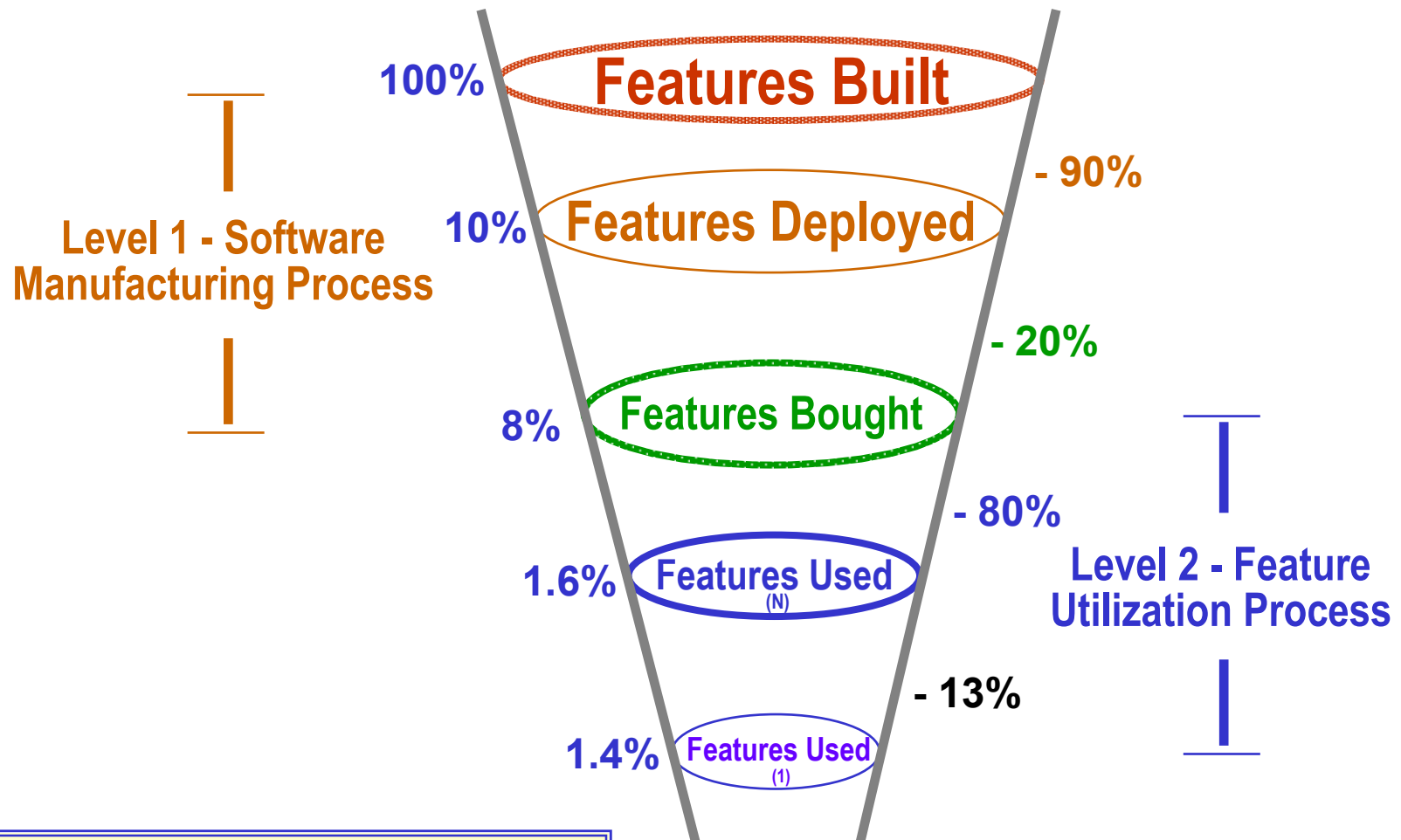
## The Requirement Driven Paradigm Fails to Deliver ROI



“Successfully Tested All Aspec/Bspec Requirements But Could Not Make a Call”

# Software Pollution™ (1/2)

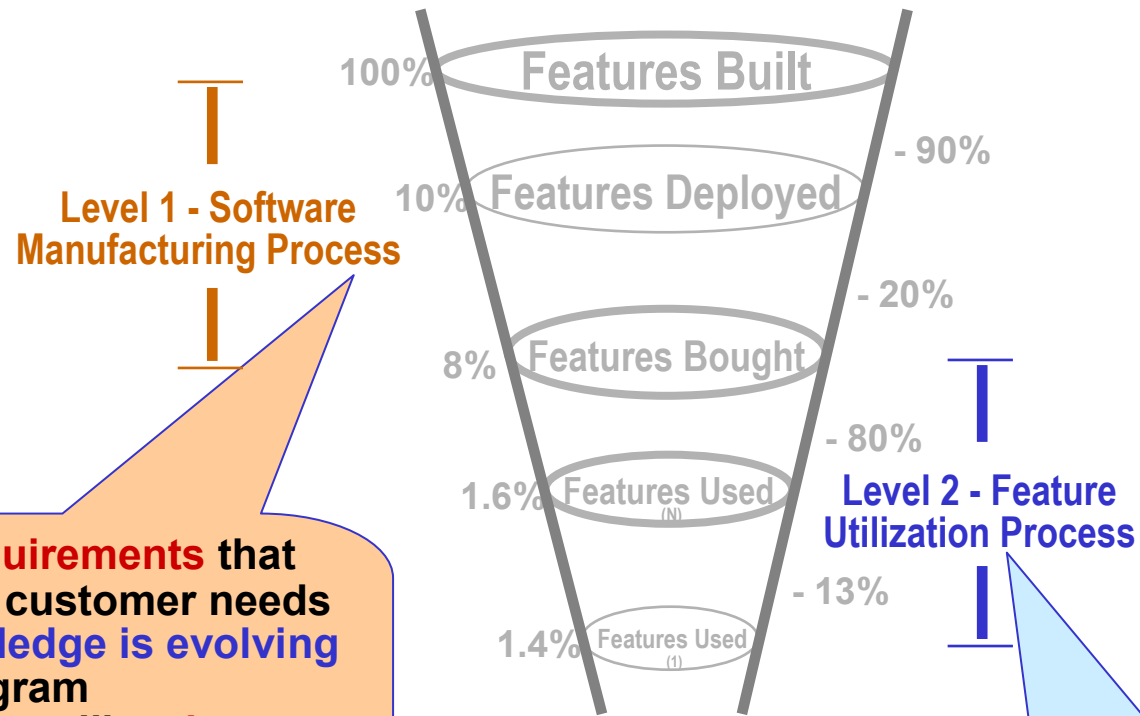
## Feature Manufacturing and Utilization Analysis



Ability to Remove Features  
Guide for Re-engineering Programs

# Software Pollution™ (2/2)

## Feature Manufacturing and Utilization Analysis



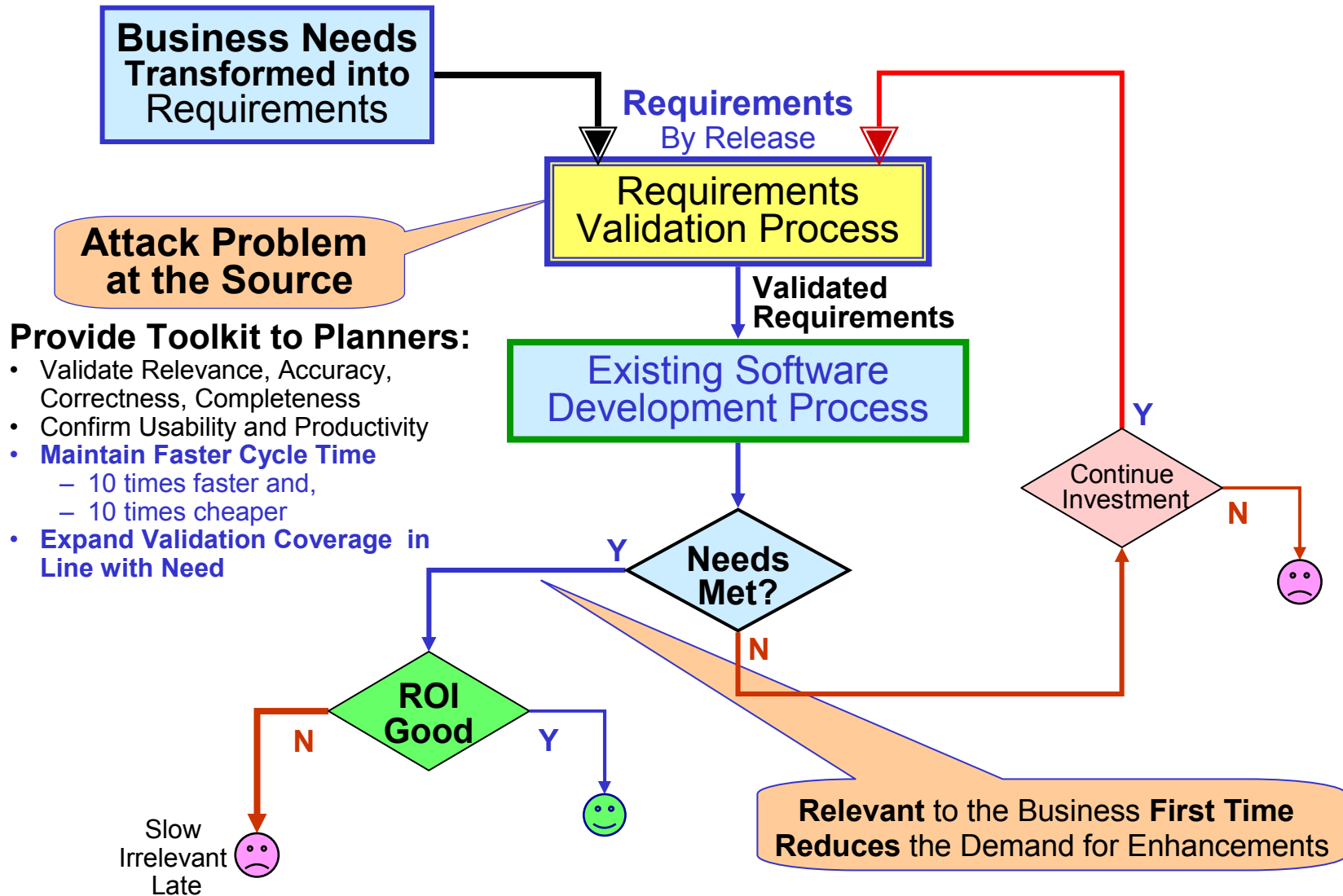
- **Incomplete Requirements** that do not capture customer needs
- **Customer knowledge is evolving** during the program
- Development Team likes **long delivery programs**
- Development Team uses **“bleeding edge”** technology

- Users' ability to **absorb new features** is limited
- Features do not fit into **any** useful process
- Late delivered features **no longer relevant**

Requirements Pollution Levels  
Aspec 100:1 Bspec 60:1 B1Spec 25:1

# Software Investment (2/4)

Improve Requirements Quality through Validation



### Provide Toolkit to Planners:

- Validate Relevance, Accuracy, Correctness, Completeness
- Confirm Usability and Productivity
- **Maintain Faster Cycle Time**
  - 10 times faster and,
  - 10 times cheaper
- **Expand Validation Coverage in Line with Need**

# Definition of S-Type vs. E-Type Systems

## The Vendor Incentives Drive the Results [Lehman 1985]



### S-Type System:

- **Specification** based software treats each release as reflected by the requirements; no capabilities are added to reflect life cycle expectations beyond software maintenance (e.g., operating system, DBMS, platforms)
  - there is no developer interest in understanding application – just do this or that
- Software is always getting bigger, more complex with an incrementally reduced capability to fix bugs or adding features cost effectively
  - There is a clear dependency between the demand for new features and increased software complexity (cause and effect)
  - The ROI is getting incrementally worse – we never hit the wall because the business unit is forced to reduce feature-demand by relevance and cost considerations
  - The IT Organization has only ONE alternative, that is to start a new replicated development programs to fight the “software development bottleneck” (developers rarely able to reuse previous platforms because of code ownership, obsolescence and reuse considerations)
  - Software pollution becomes an ROI measure (increased pollution reduces solution’s life cycle)

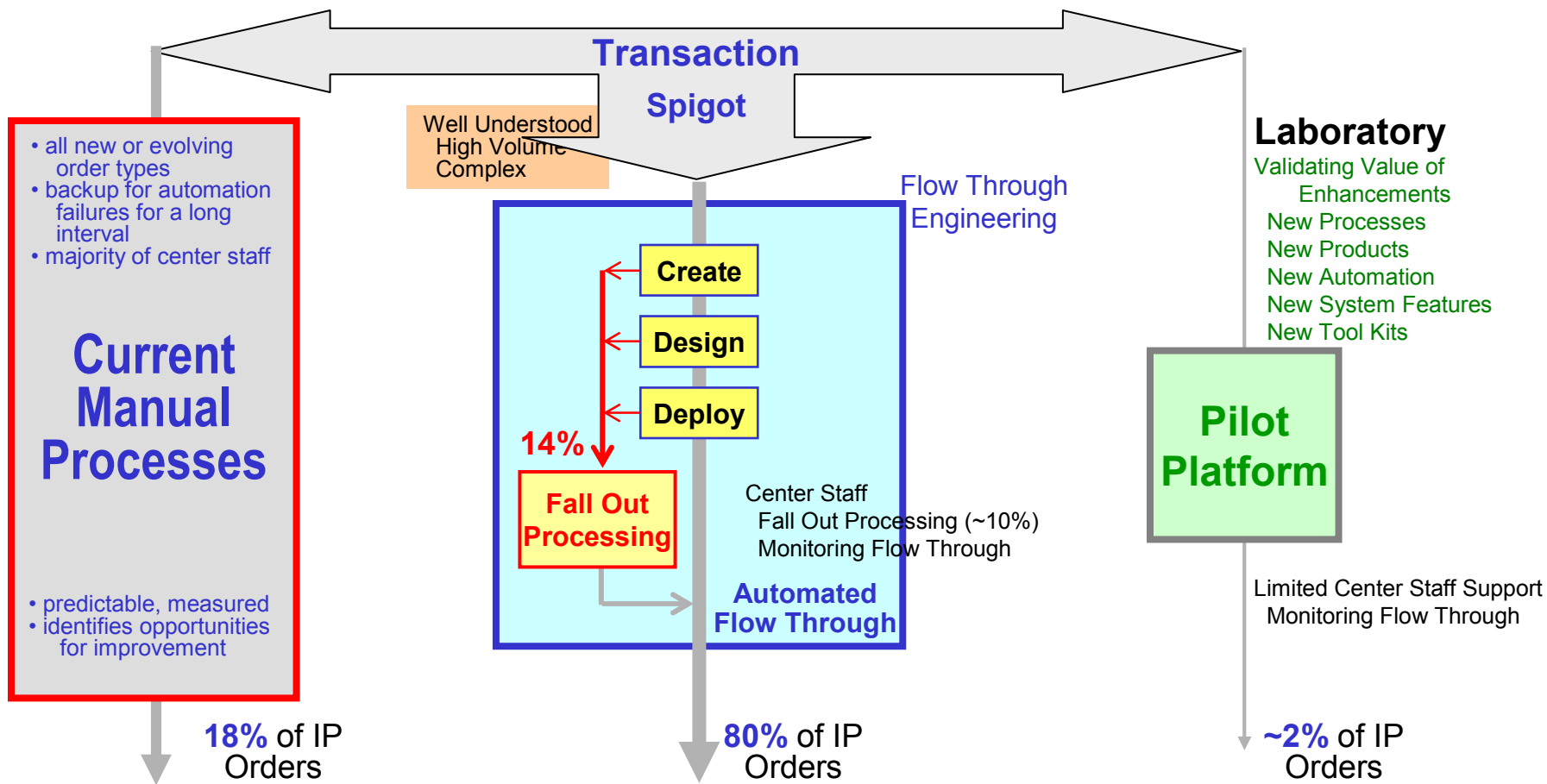
### E-Type System:

- **Evolution** Based Software is designed to handle tasks and to evolve with *expected* changing needs through configuration management (CM) capabilities
  - Requirements are viewed as representative of possible needs into the future
  - Success criteria includes the ability to expand capabilities without software development (e.g., new business rules, process changes, report changes)
  - Software complexity of E-Type systems is increasing at a **slower rate**
  - Software complexity is proactively reduced through
    - reimplementation of functionality with increased e-capabilities
    - removal of features that are no longer needed/used but add complexity and maintenance cost
- A validation platform can be used to validate requirements reducing the software churning in search of the “true” business-need definition (requirements)



# Recommended - Order Processing Model

The ROI Model Demands a Combination of Manual, Automated and Laboratory Based Operation



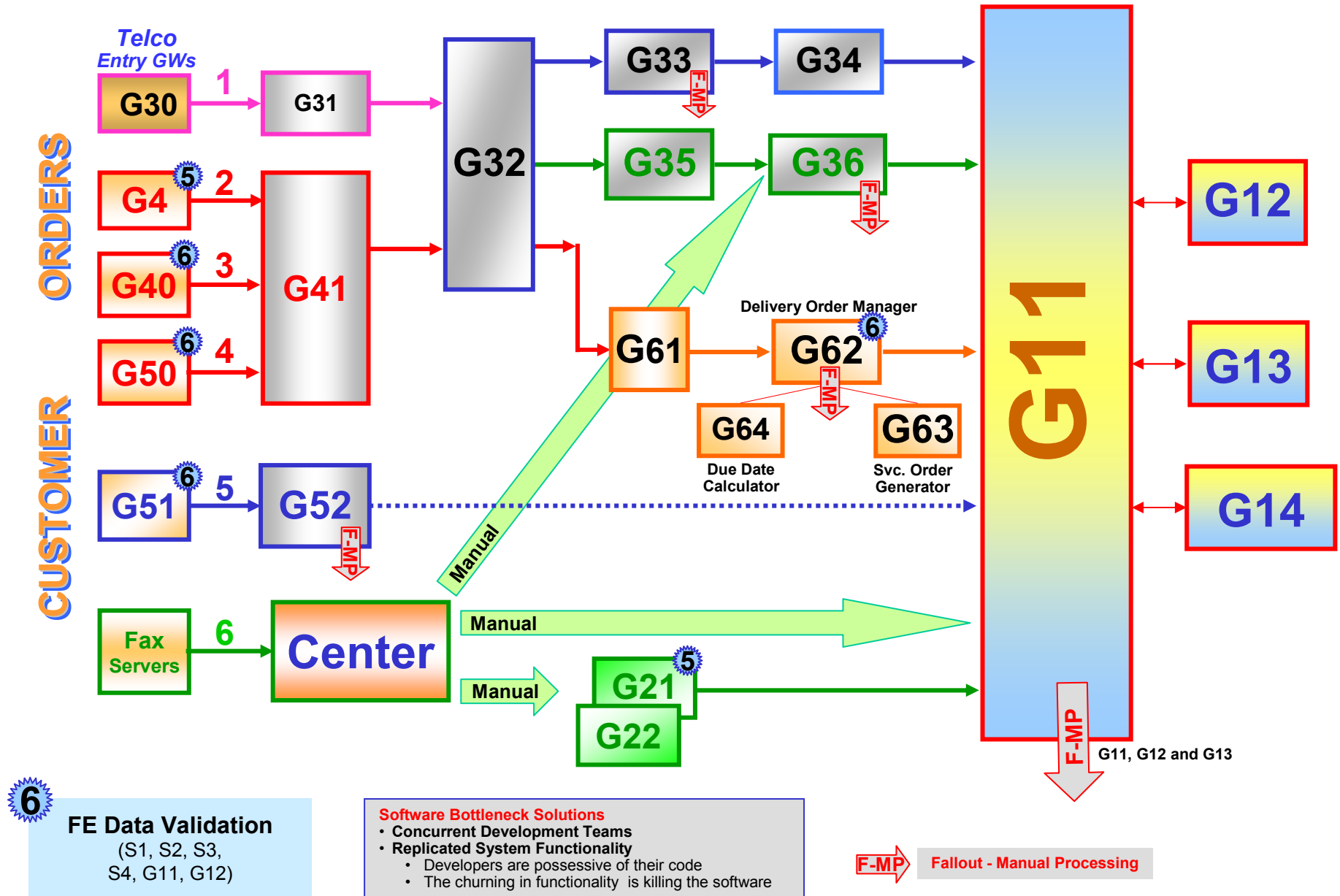
**The Combination Balance (per transaction type) Has to be Adjusted With:**

- new software releases
- new software bug appearances
- changes in the operational status of systems

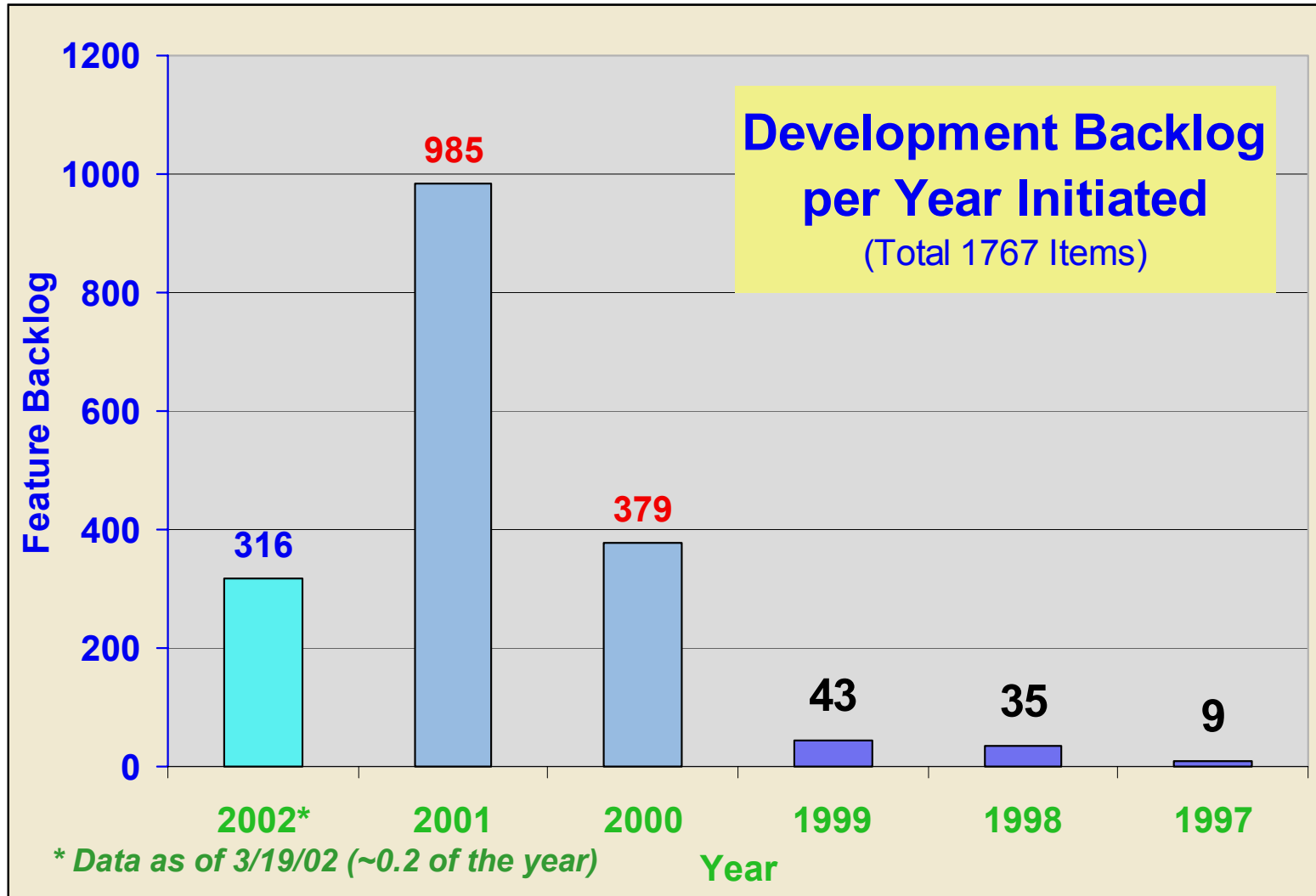
# System Architecture

## The Objective: Effective Order Processing - Real Flow Through (RFLT)

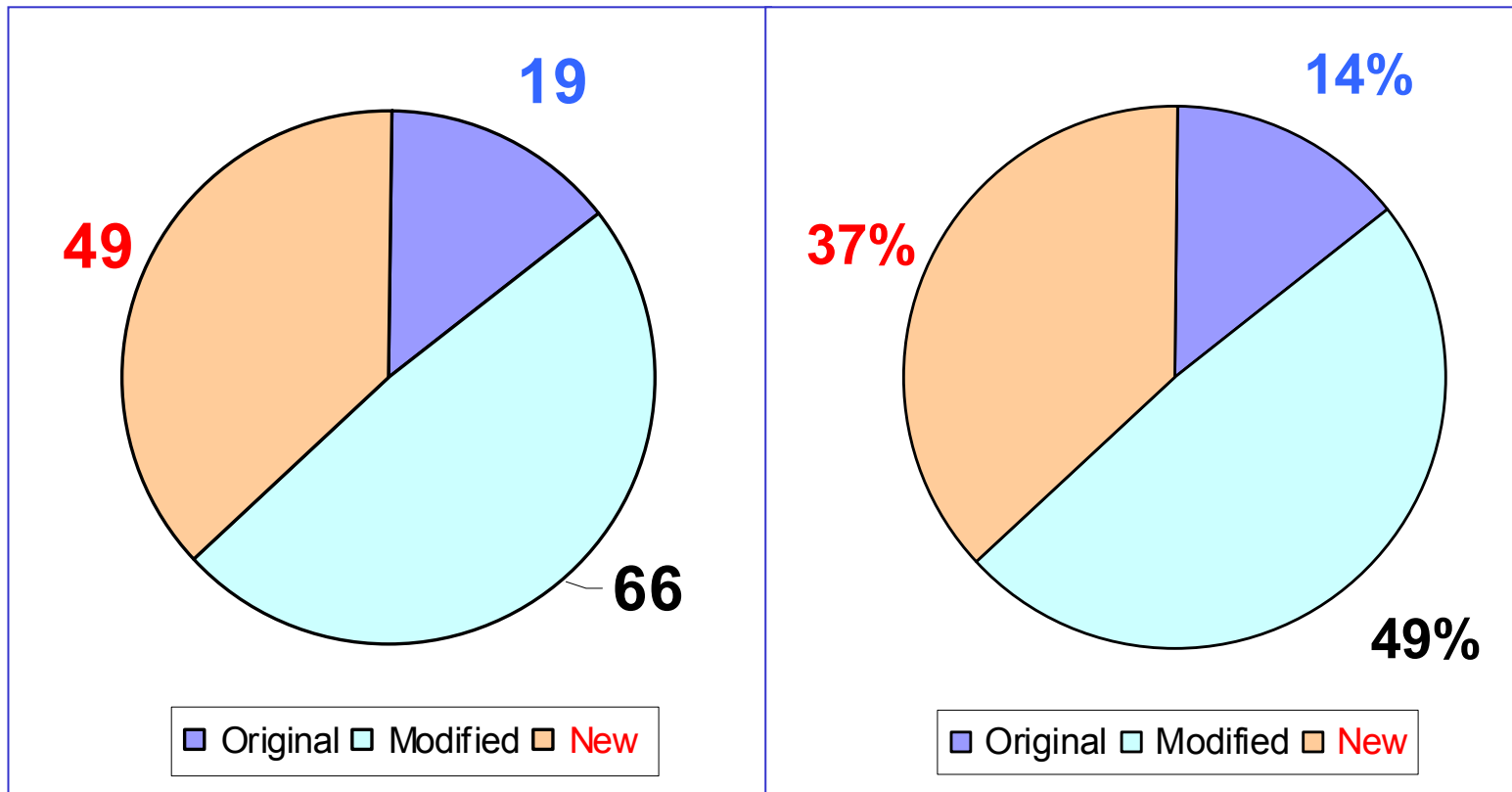
(RFLT Definition: Electronic Processing of a Customer Order Delivered to G11)



# Feature Development Backlog per Year Historical Summary (e.g., 9 features still open since 1997)



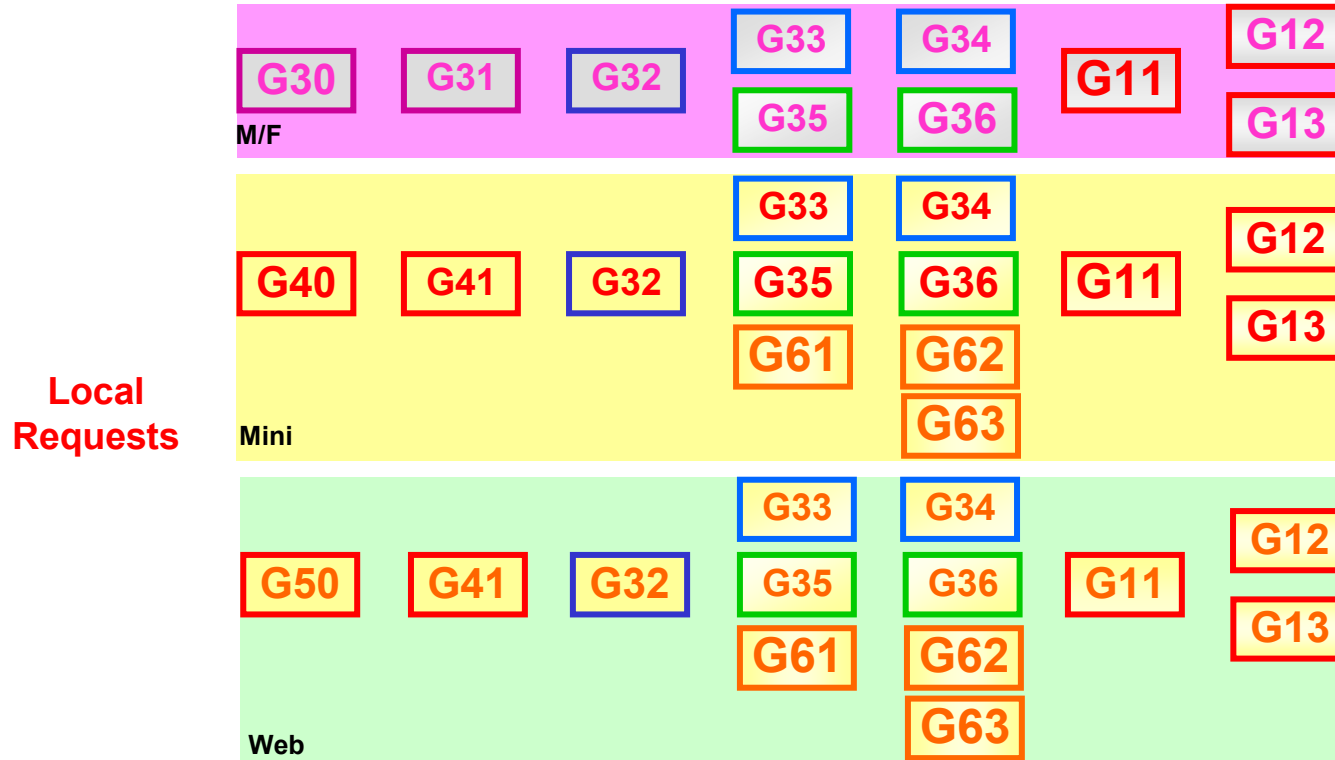
# Business Rule - Validation Results



**The Business Rules Were Professionally Maintained**  
*Two Orders of Magnitude More Complex Than "The Boolean Expression"*

# Business Needs Satisfied Through Multiple Software Solutions

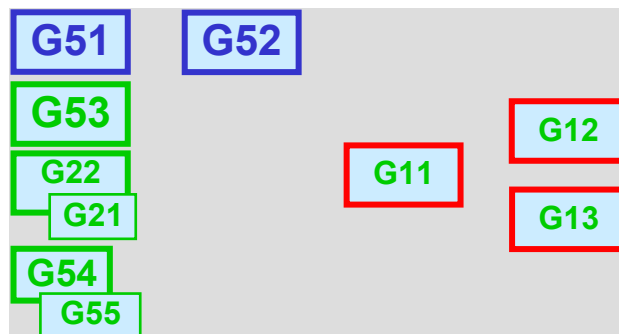
Replicated, Concurrent and Coordinated Development Programs  
Are Needed to Work Around Software Bottlenecks (1/2)



Local Requests

Access Requests

Wireless Requests

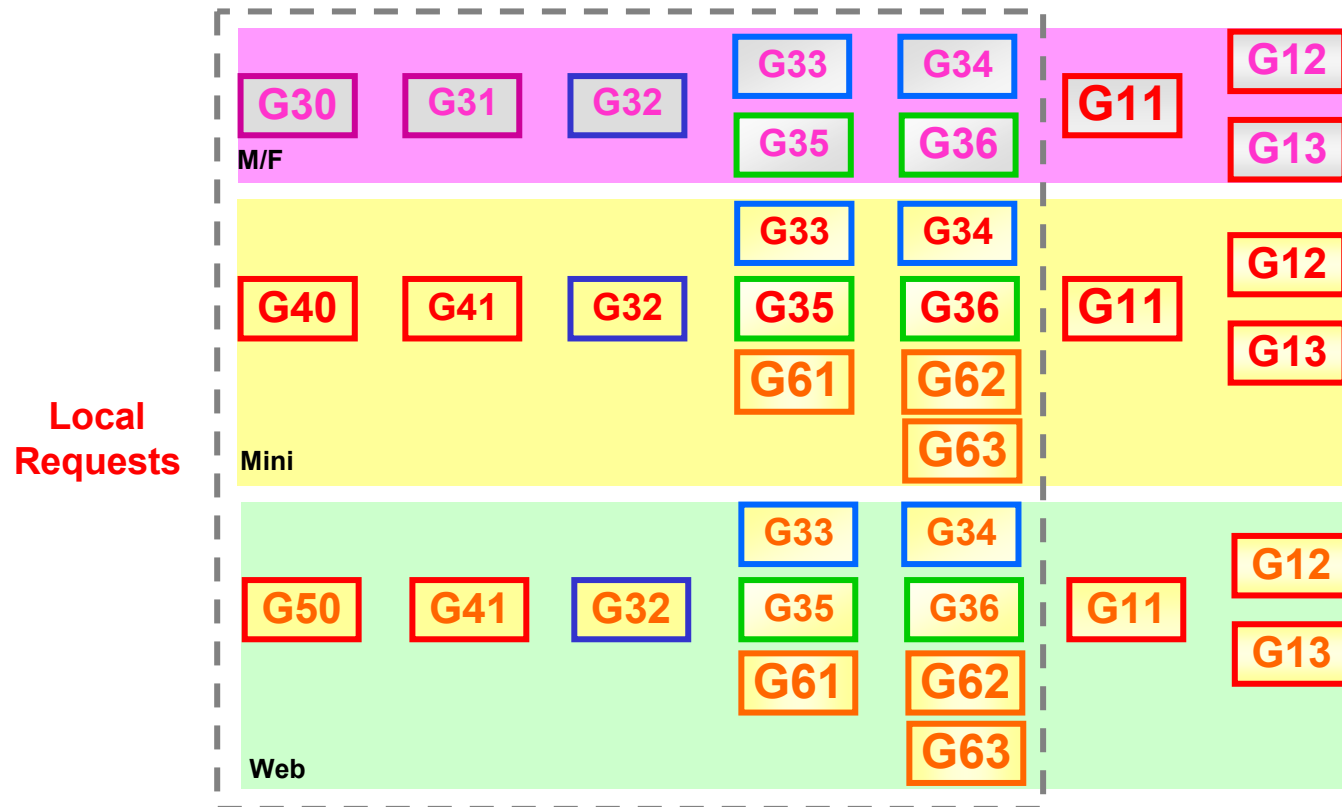


## A Solution's Life Cycle

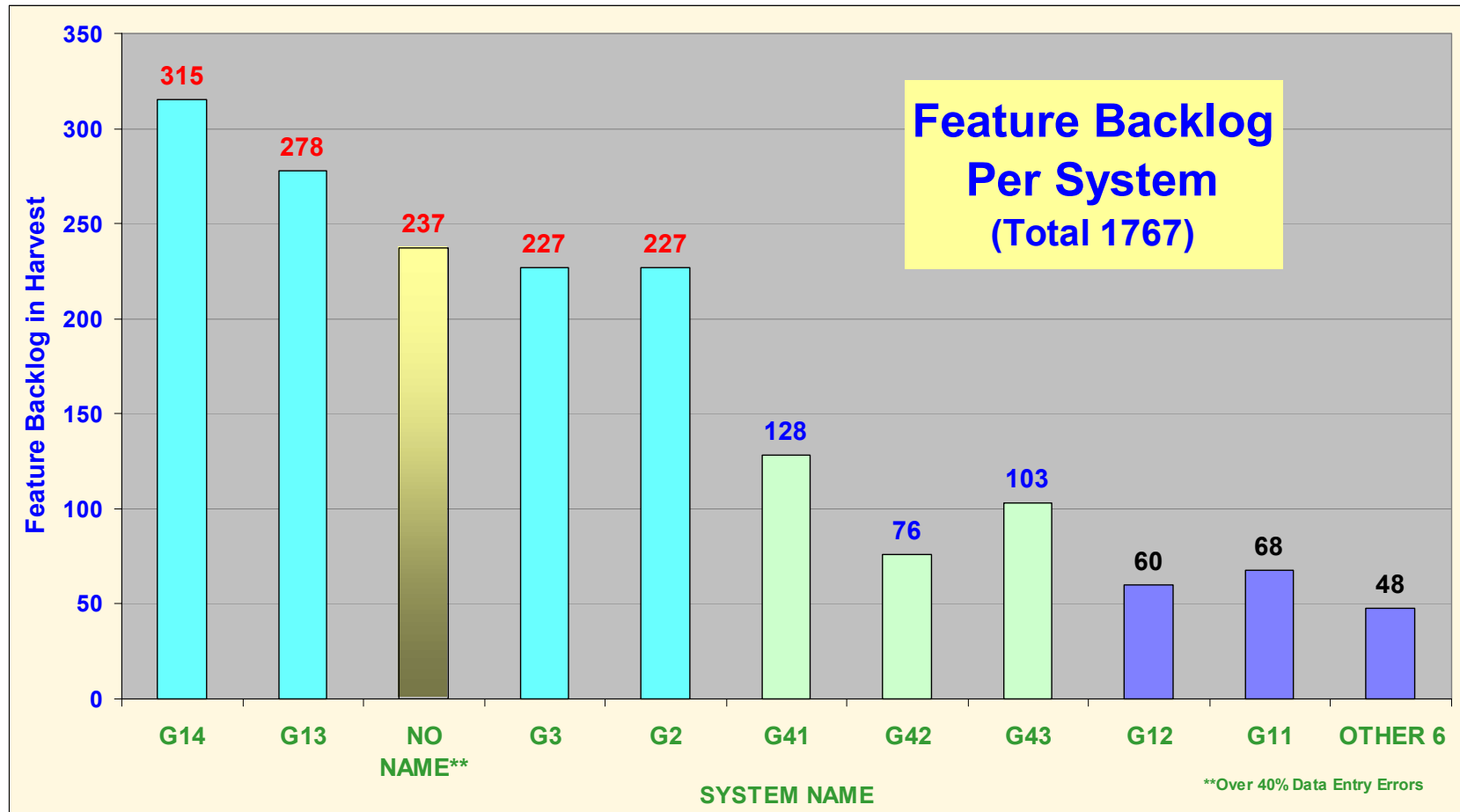
1. New needs cannot be satisfied by one of the **existing solutions** because of a large feature backlog, limited development-team throughput and it would cost too much
2. A **new solution is approved** (there is no other alternative available) - it will be significantly cheaper
3. The new solution is late to meet initial commitments
4. A feature backlog develops for the new solution .....

**Software Bottlenecks Are Generic and Predictable**

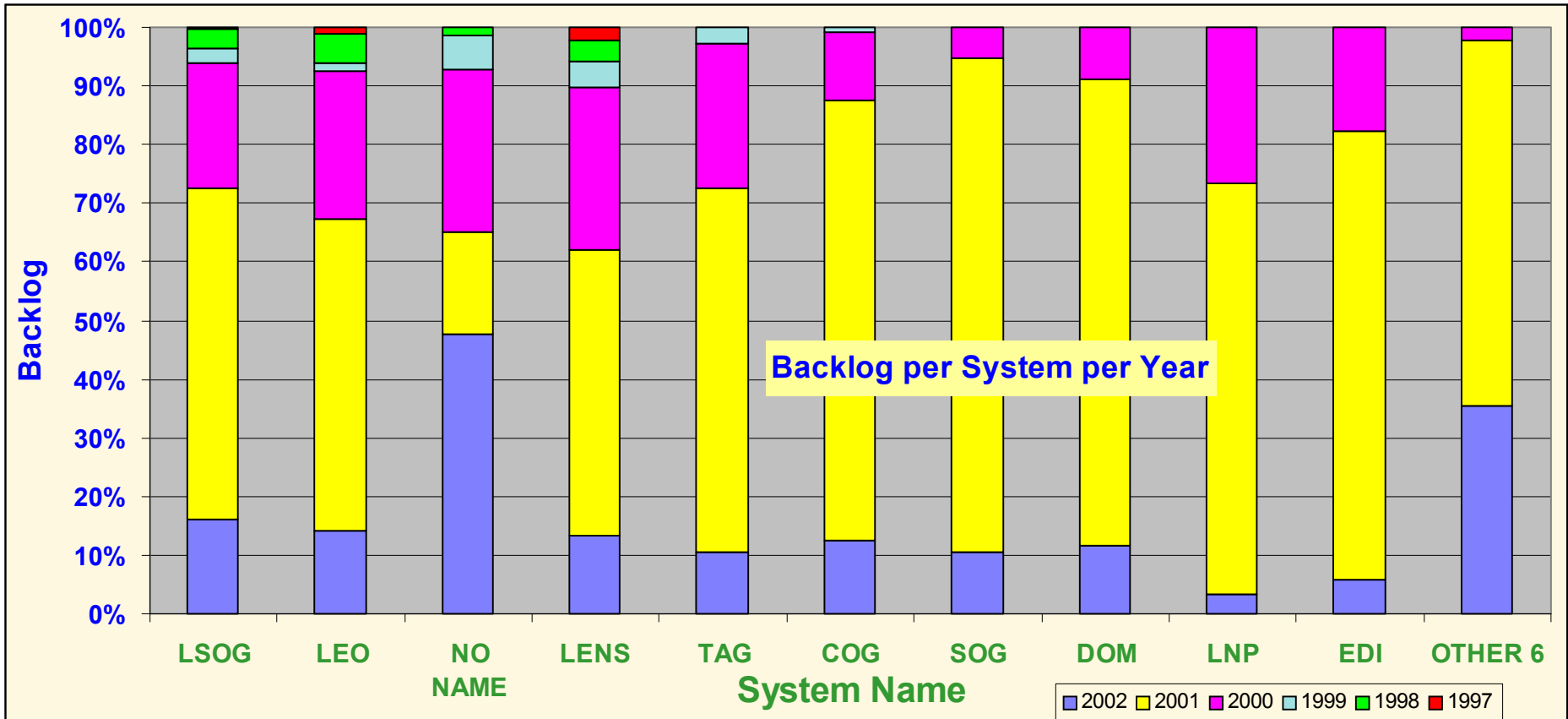
# Business Needs Satisfied Through Multiple Software Solutions (2/2)



# Development Feature Backlog per System



# Feature Development Backlog per System (% of yearly total)

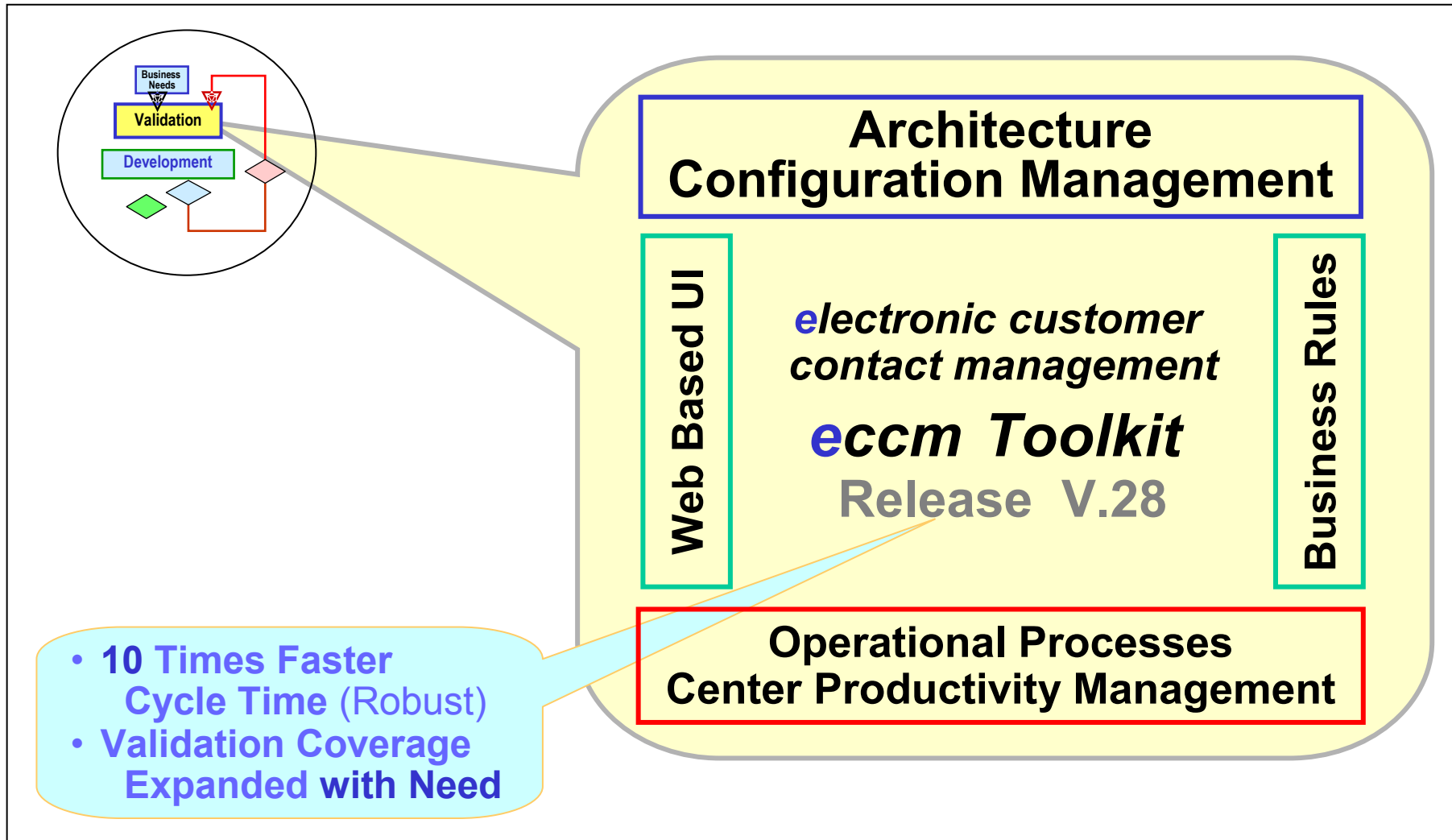


**Telcordia System Are Not Doing Better – Given the New Technology**

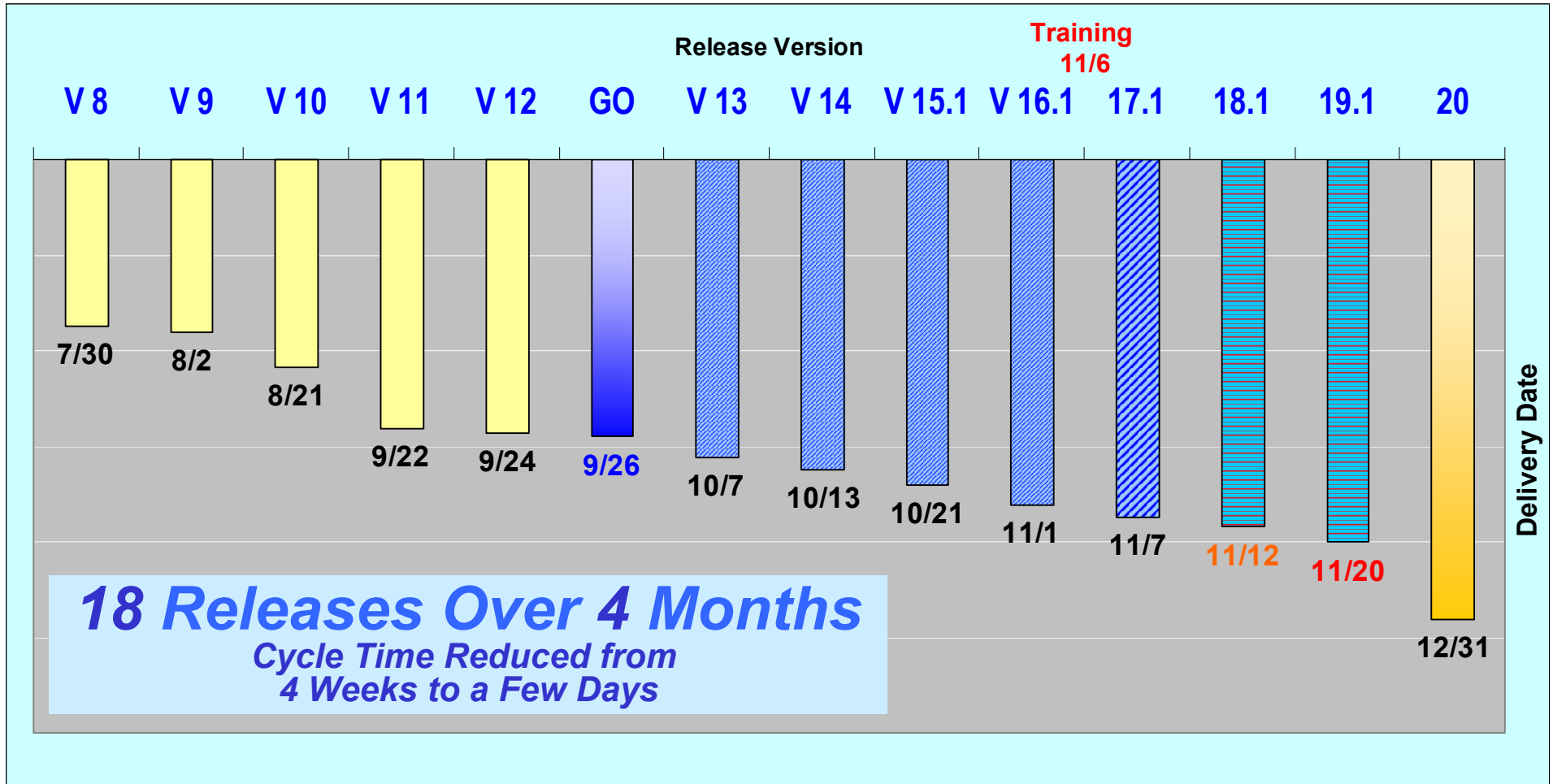


# Software Investment (3/4)

Supports Validation of Capabilities in Six Key Areas

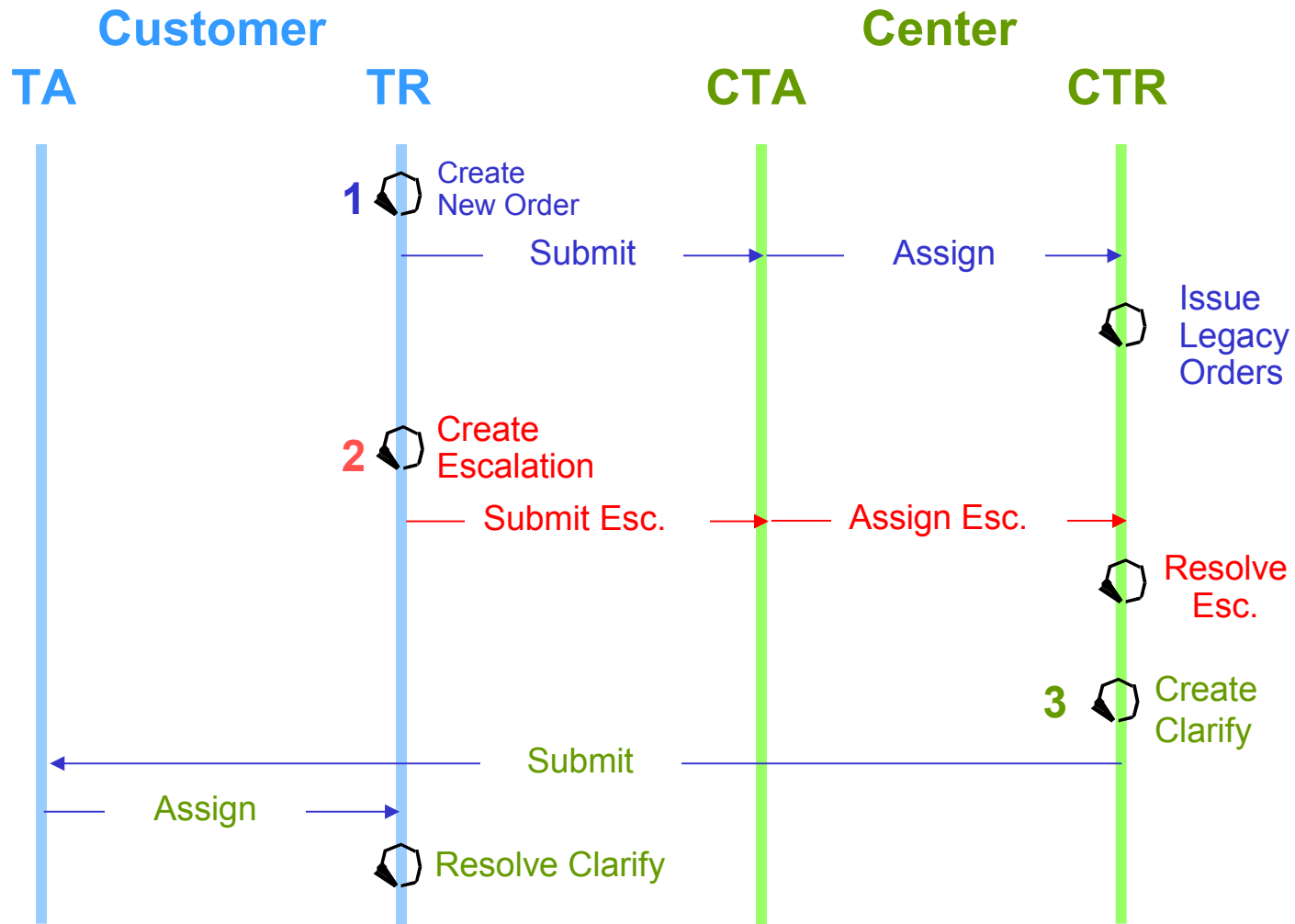


# ***eccm*** Software Releases



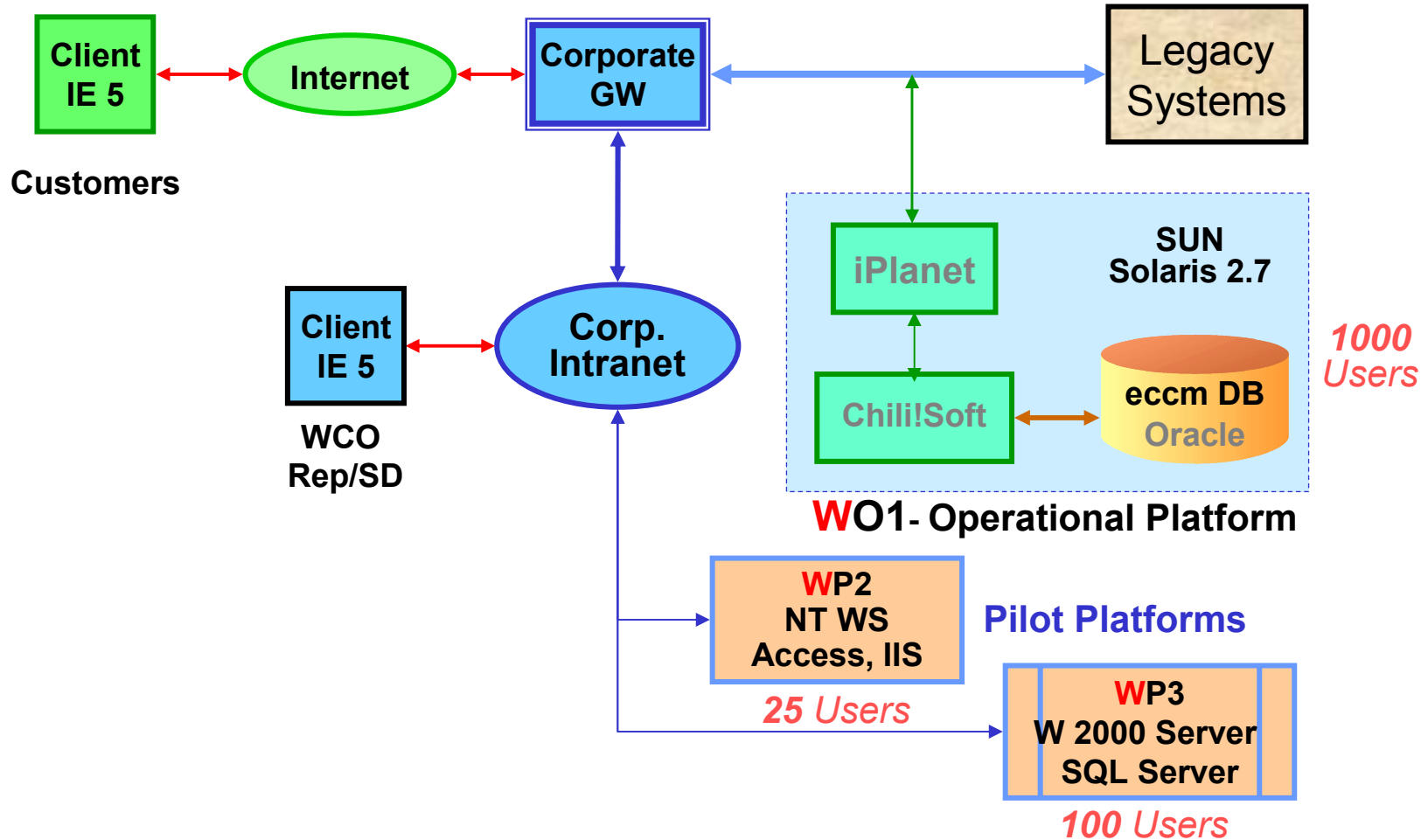
# Operational Processes Validation

Create New Order, **Escalation** and **Clarify** Processing



# Wide Deployment Architecture

## Managing Change Management



# Data Entry User Interface



### Prem to Prem MEGALINK/Light/Plus (New/Supp) Contents

[Overview \[0 - 8\]](#)  
[Section A: Administrative \[10 -17\]](#) ← 2  
[Section B: Circuit Locations \[18-46\]](#)  
[Location A \(Originating Customer Prem\) \[19-32\]](#)  
[Location B \(Terminating Customer Prem\) \[33-46\]](#)  
[Section C: Options for Prem to Prem Megalink \[47\]](#)  
[Section D: Billing/Contract Information \[48-61\]](#)  
[Section E: Remarks/Driving Directions \[62-64\]](#)

**Project ID:**  
**Project Name:**  
**Order ID:** 10 ← 3  
**Version:** 1  
**Order Status:** Created  
**Days in Status:** 111  
**Prior Order Status:** New

**Assigned To:**  
AWE: Jason Nelson

**Created By:**  
AWE: Jason Nelson

**Order History:**  
**Modified** 2/1/01 12:38:47 PM, JN  
**Modified** 11/4/00 5:38:07 PM, JN ← 5  
**Modified** 10/28/00 6:30:06 PM, DJ  
**Modified** 10/13/00 2:32:55 PM, JN  
**Modified** 10/13/00 2:28:35 PM, JN  
**Created** 10/13/00 2:23:35 PM, JN

### Required Field Error Summary

No Required or Conditionally Required errors.

### Create/edit: Prem to Prem MEGALINK/Light/Plus (New/Supp)

#### Overview [0 - 8] [545]

0a. Rate Quote Requested [238] Yes  No

0b. Service Type [239]  R

0c. Originator [240]  O

0d. Pre-assigned Order Number [241]

0e. FOC Order Number [242]  ← 1

1. State [243]  R

2. [244]

3. PON [245]  O

4. Related PON [246]  O

5. From [247]  R

6a. TN [248]  R

6b. Fax No. [249]  C

6c. E-mail [250]  ← 6  
Fax TN or email must be provided for preparer of request, if this is not populated, then 6c must be or form will not be released.

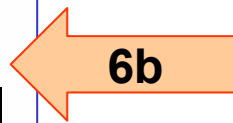
7a. FOC Case Name [251]  O

← 4

# Business Rules Knowledge Base Integrated with the Browser



6a. TN	<input type="text"/>	R
6b. Fax No.	<input type="text"/>	C
6c. E-mail	Fax TN or email must be provided for preparer of request, if this is not populated, then 6c must be or form will not be released.	
7a. FOC Cust Name	<input type="text"/>	
7b. FOC TN	<input type="text"/>	O



13. Order Firm or Inquiry	<input type="text" value="Firm Order"/>	R
14a. Order Type	<input type="text"/>	C
14b. Explain	If Firm order=yes, then this is a required field	



# List of Orders - User Interface



» Home
» Logoff

### Search

Proc Level

Current Status

Active Status  **1**

Days in Status:

- GT (>)
- LE (<=)

Proj ID

Acct

Prime User Type

CUS User

CEN User

Product Type

Order Type

State

PON

Billing Name

View

Inactive Status Displayed For:

<= 30 Days

## Order List (Rep View)

[Create Order](#)   [Add/Remove Project](#)

**8 Order forms meet the search criteria:**

ID	V A e r s i n e #	Proc Level	Current Status	Status Occur Date	Days in Status	Status Deadline Date	Proj ID	Proj Name	Acct	Prime User Type	CUS User	CEN User	# E S C - S R	# E C - A - R	# S L A - S R	Product Type	Order Type	State	PON
<a href="#">9</a>	1	Y	Work	SubmitAsg 11/15/2001 1:53:52 PM	2.1	11/16/2001 11:59:00 PM			AW	CEN	Howard, Anita	Green, Bryant	0	0	0	Mini MgLnk	New		111133
<a href="#">10</a>	1	Y	Work	SubmitAsg 11/15/2001 2:54:12 PM	2.1	11/16/2001 11:59:00 PM			AW	CEN	Nelson, Jason	Green, Bryant	0	0	0	PtoP MgLnk	New	Georgia	312- 456789
<a href="#">20</a>	1	Y	Work	SubmitAsg 11/16/2001 3:54:34 PM	1	11/20/2001 11:59:00 PM			AW	CEN	Nelson, Jason	Green, Bryant	0	0	0	Mini MgLnk	New		NL26235 120
<a href="#">24</a>	1	Y	Work	SubmitAsg 11/17/2001 4:04:42 PM	0	11/20/2001 11:59:00 PM			AW	CEN	Howard, Anita	Green, Bryant	0	0	0	Mini MgLnk	Discon		NL26235 124
<a href="#">23</a>	1	Y	Work	SubmitAsg 11/17/2001 4:05:09 PM	0	11/20/2001 11:59:00 PM			AW	CEN	Howard, Anita	Green, Bryant	0	0	0	PtoP MgLnk	New	North Carolina	1314567
<a href="#">7</a>	1	Y	Status	PIP 11/17/2001 3:52:01 PM	0	12/3/2001 11:59:00 PM			AW	CEN	Lord, Kevin	Green, Bryant	0	0	0	Mini MgLnk	New		NL26235 106
<a href="#">5</a>	1	Y	Status	PIP 11/17/2001 3:52:56 PM	0	12/3/2001 11:59:00 PM			AW	CEN	Lord, Kevin	Green, Bryant	0	0	0	Mini MgLnk	New		111120
<a href="#">1</a>	1	N	Done	Complete 11/17/2001 4:06:25 PM	0				AW	NON	Nelson, Jason	Green, Bryant	0	0	0	Trunk MgLnk	New	Georgia	456789

**2**

**3**

S - Submitted

R - Resolved

Default Search Templates By Rep

Urgency, Submitted Date, All Active Orders

# Business Rules Validation



### Prem to Prem MEGALINK/Light/Plus Contents

- [Overview \[0 - 8\]](#)
- [Section A: Administrative \[9 -17\]](#)
- [Section B: Circuit Locations \[18-46\]](#)
- [Location A \(Originating Customer Prem\) \[19-32\]](#)
- [Location B \(Terminating Customer Prem\) \[33-46\]](#)
- [Section C: Options for Prem to Prem Megalink \[47\]](#)
- [Section D: Billing/Contract Information \[48-61\]](#)

**Order ID:** 13  
**Version:** 1  
**Order Status:** Created  
**Days in Status:** 0  
**Prior Order Status:** New

**Assigned To:**  
AWE: Jason Nelson

**Created By:**  
AWE: Jason Nelson

**Order History:**  
**Modified** 10/21/00 1:28:04 PM, JN  
**Modified** 10/21/00 12:29:52 PM, JN  
**Modified** 10/21/00 12:29:24 PM, JN  
**Created** 10/21/00 12:24:24 PM, JN

### Required Field Error Summary

Total Errors: 16 **16 errors**

The following fields are Required (R) or Conditionally Required (C):

- [0b. Service Type \(R\)](#) ← 1
- [1. State \(R\)](#) ← 2
- [9. CMRS Provider Name \(R\)](#)

### Create/edit a Prem to Prem MEGALINK/Light/Plus

#### Overview [0 - 8]

0a. Rate Quote Requested	<input type="text" value="No"/> O
0b. Service Type	<input type="text" value=""/> R ← 1
0c. Originator	<input type="text" value="Customer"/> O
0d. Pre-assigned Order Number	<input type="text" value=""/> O
0e. FOC Order Number	<input type="text" value=""/> O
1. State	<input type="text" value=""/> R ← 2
2. Date	<input type="text" value="10/21/2000"/> R
3. PON	<input type="text" value="3245678"/> O
4. Related PON	<input type="text" value=""/> O
5. From	<input type="text" value="Sprint PCS"/> R
6a. TN	<input type="text" value="512-234-6666"/> R
6b. Fax No.	<input type="text" value="512-234-7777"/> C
6c. E-mail	<input type="text" value=""/> C ← 4

Buttons: Save, Exit, **Verify** ← 3, Submit, Escalate, Copy, Delete



# Summary CM Capabilities

Fields, Forms and System Parameters



## Administer Users and Teams

1. [Administer Passwords](#)
2. [Administer Users](#)
3. [Administer Active User Sessions](#)
4. [Administer Backup](#)
5. [Administer Teams](#)
6. [Administer Organizations](#)
7. [Administer Fields](#) ← 2
8. [Administer Forms](#) ← 1
9. [Administer Parameters](#) ← 3

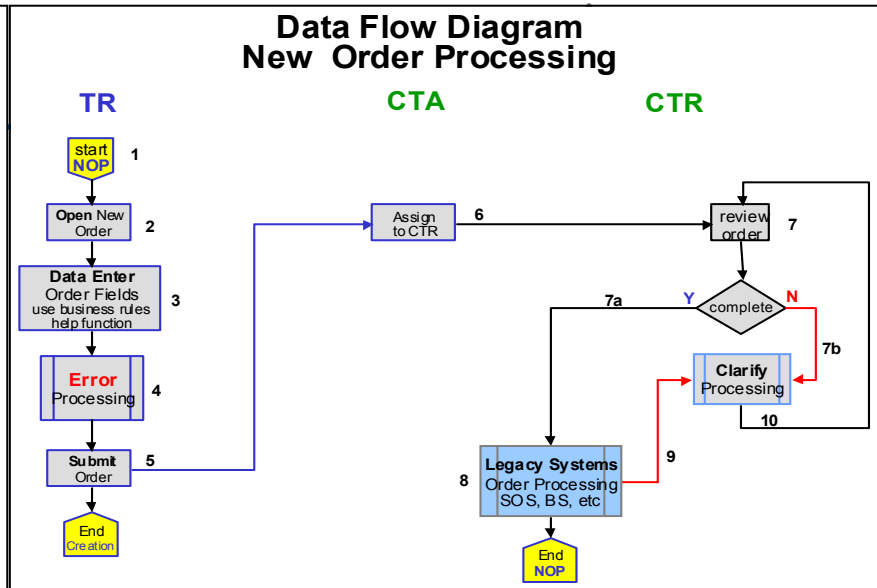
*How the Steak is Cooked*

**FASTER**

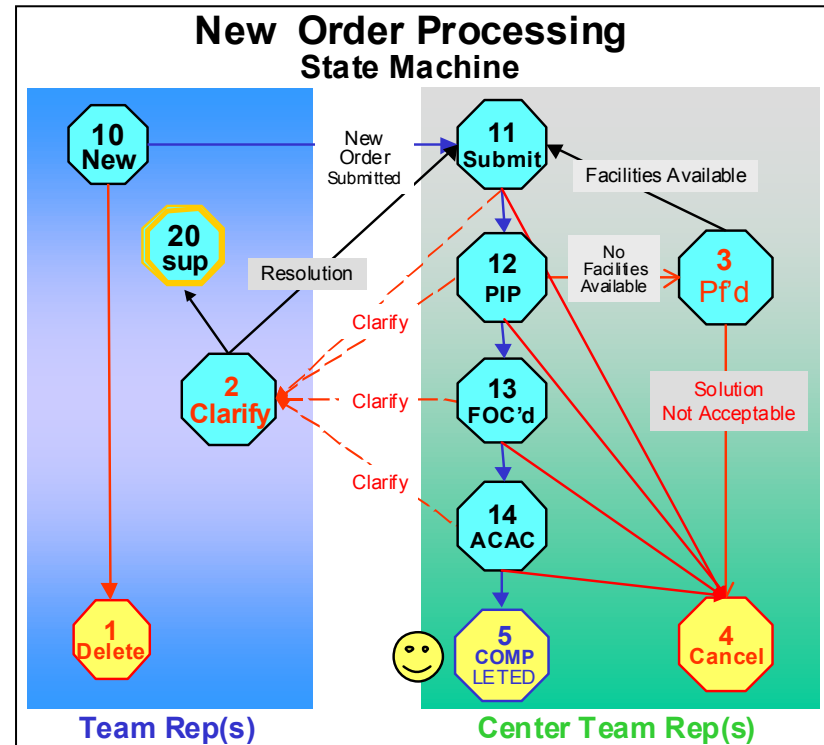
# Process Definitions in 4D

**Description**  
**New Order Processing**

- Initial Conditions:** The Customer Wants to Purchase a Link (e.g., Prem to Prem) to Meet their Wireless Network Needs.  
 A TR is assigned by the TA to Create a New Order in Line with the business needs.
- The TR Logs-in to the **eccm** application:
  - selects **Prem to Prem MEGALINK/Light/Plus**
  - selects **Create New Order**
- The TR Data Enters the details of the new order - one field at a time
  - periodically the TR saves the content of the order
  - periodically the TR may verify completeness of the order
    - error messages will be presented in a separate window
    - errors can be fixed incrementally or once the data entry was completed
  - if necessary the session can be terminated and the data entry operation can be renewed at a later time
- The TR makes all the error corrections
  - clicking on each error message will position the cursor at the right field for correction
  - required and conditionally required business rules are enforced
  - data integrity business rules (telephone number, date, email) are enforced
  - any attempt to submit an incomplete order results in automatic verification with all defects presented in the error window
- The TR Submits the verified (completed) order to the CTA
  - the order status is changed from New to Submitted
  - the TR no longer can make changes to the order unless a Sup Order is created
- The CTA Assigns the New Order to appropriate CTR
- The CTR Reviews Order for completeness
  - If the order is not complete issues a Clarify to the TR
- Initiate Legacy System Processing

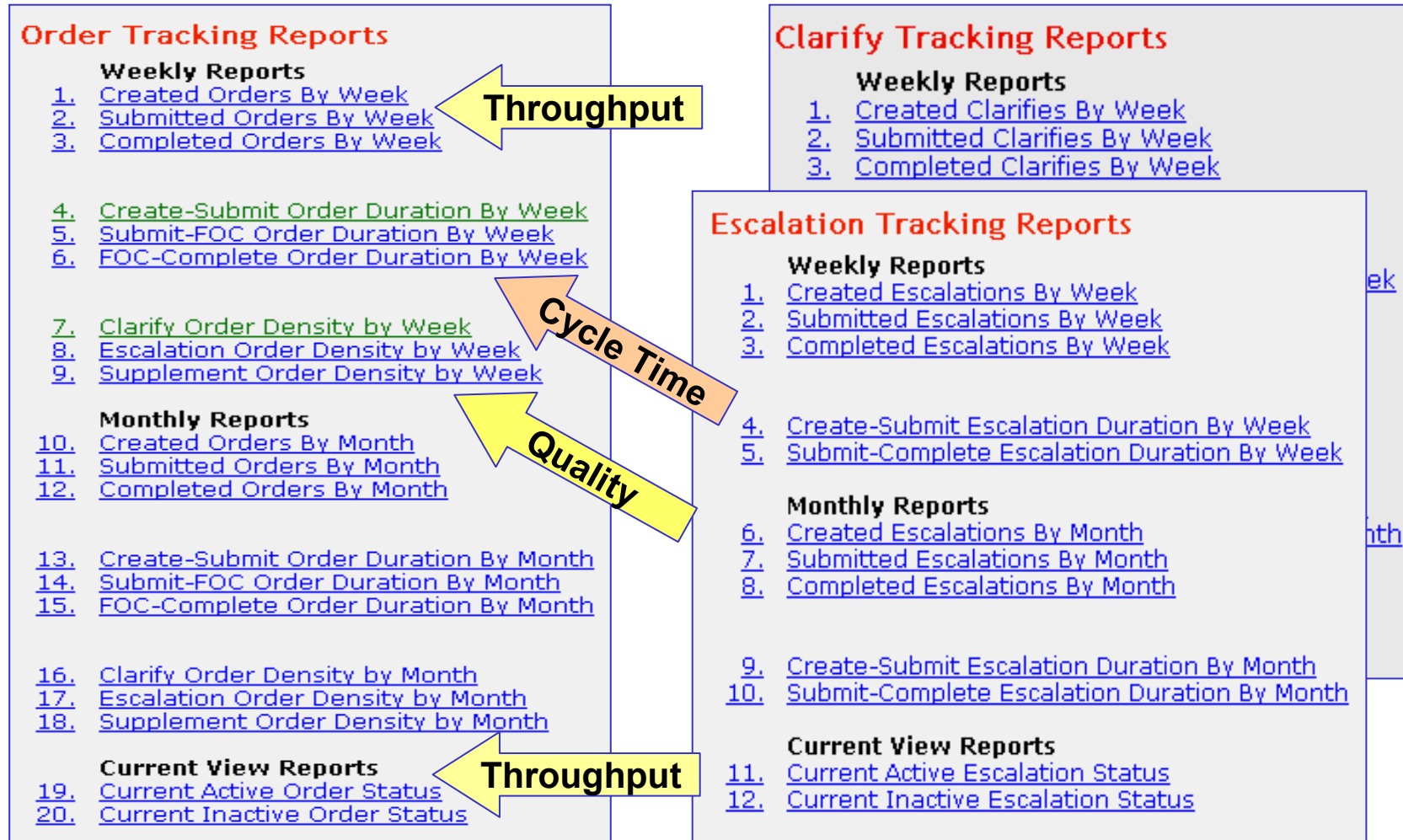


**Screen Layouts**  
**New Order Processing (1/23)**



# Center Management Processes

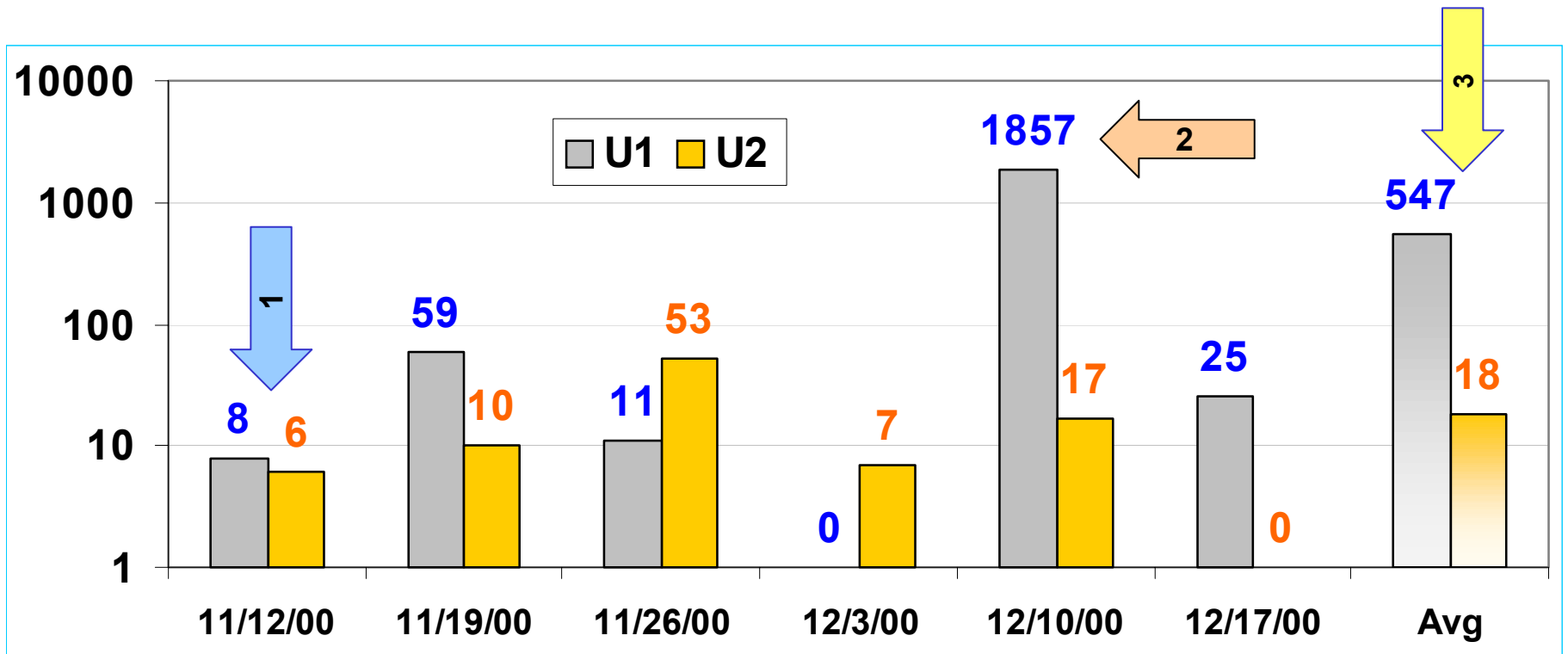
## Interval Analysis: Orders, Escalations and Clarifies



**Cycle Time, Throughput and Quality**

# Order Tracking (1/3)



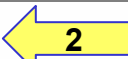
Average [Create - Submit] Interval (minutes)



*Invention of the Copy Command*

## Order Entry/Project Management

### 1. Orders (Rep View)

Process	<u>Rep View</u>	<u>Admin View</u>	<u>Full View</u>
Assign	0	0	2
Work	5 *	0 	11 * 
Status	2	0	5 *
Track	0	0	1
Done	1	0 	1
<b>Total</b>	<b>8</b>	<b>0</b>	<b>20</b>