Staying FOCUSED In a MAD, MAD, MAD, MAD World!!

MUSE Webcast

Introductions

Speaker Info:

Frank Fortner
Senior Vice President
Application Software Division

Objectives

- ***Acquire*** a basic understanding of MEDITECH's newest generation of HIS software, 6.x, built on a proprietary MEDITECH Advanced Technology platform once referred to as FOCUS.

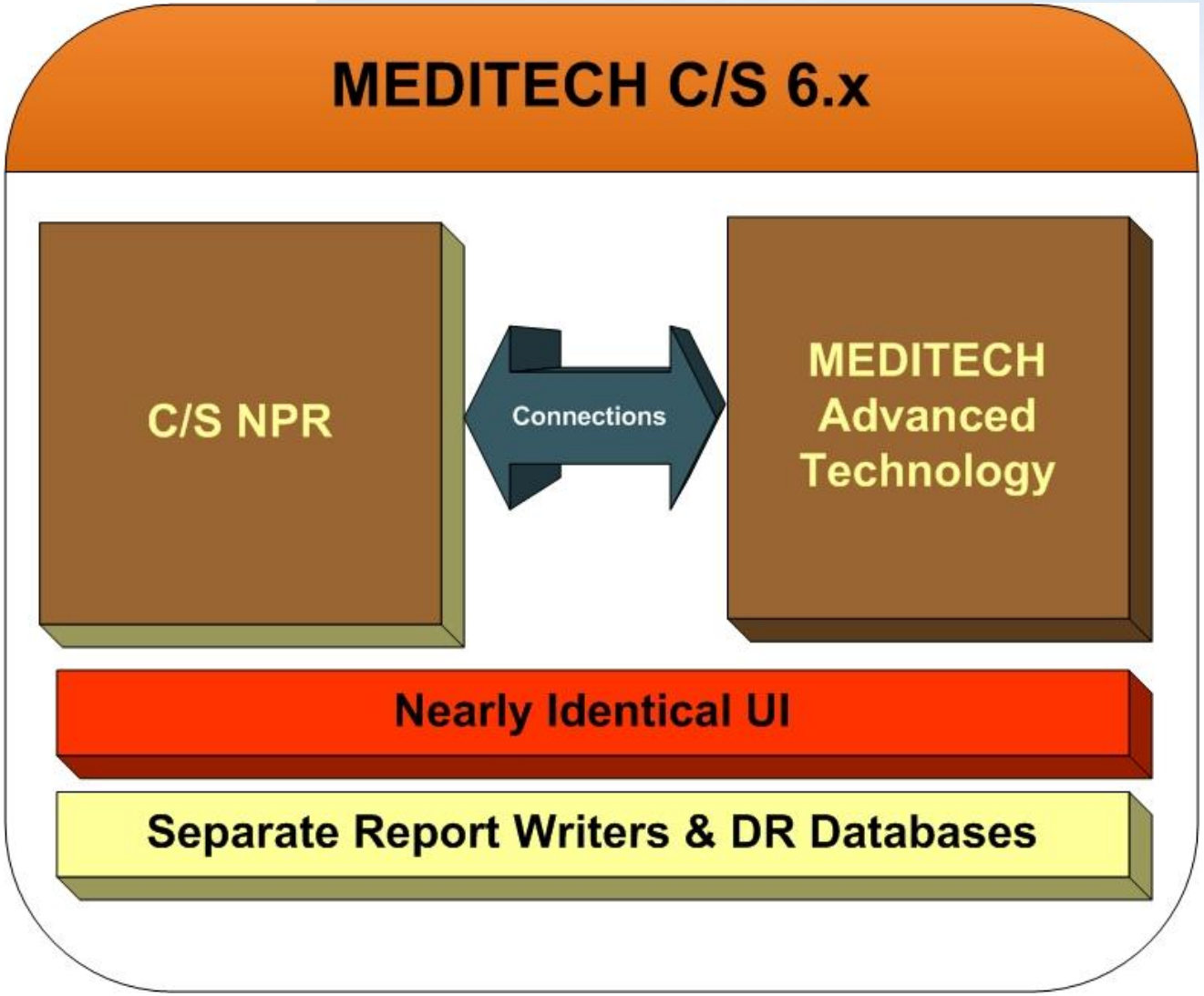
- *Become* ***empowered*** with the knowledge necessary to make wise and well-informed decisions about your own possible migration to a 6.x version, which introduces the MEDITECH Advanced Technology platform.

MEDITECH Platforms

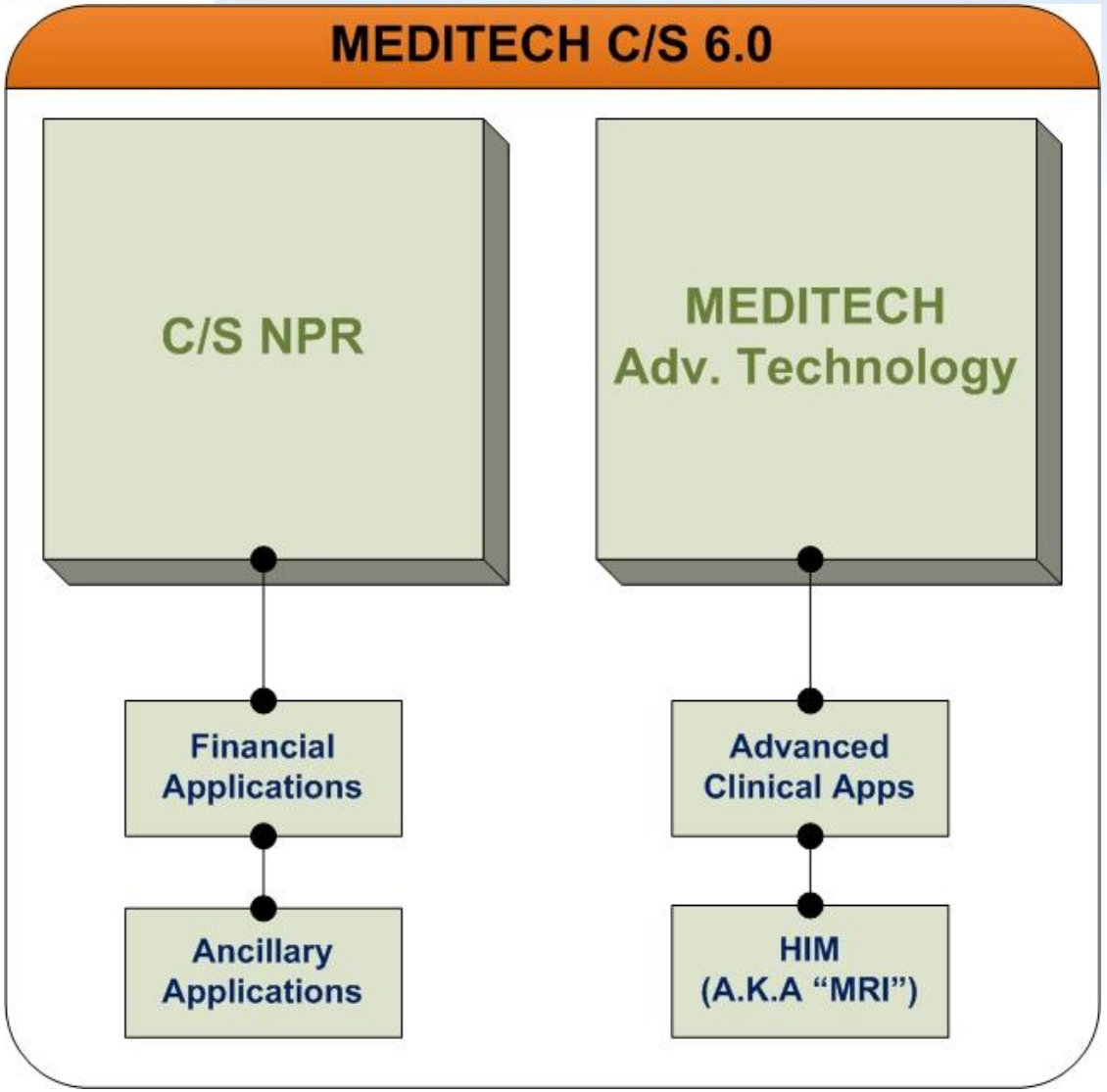
- MIIS
- **$T MAGIC**
- NPR (MAGIC)

- **Client/Server NPR (VMAGIC)**
- Client/Server FS
- **Client/Server Advanced Technology (once called FOCUS)**

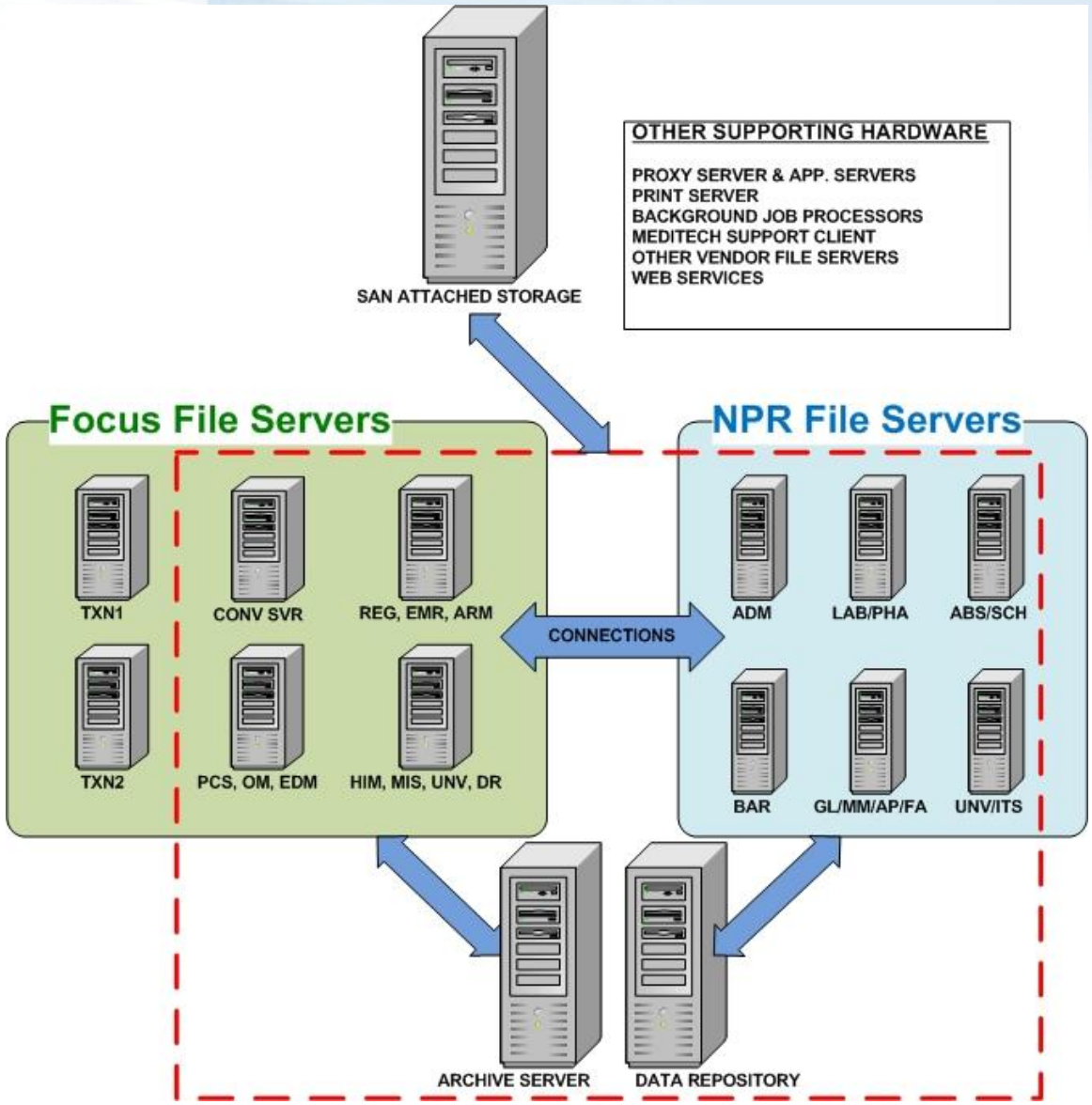
Two Sides to C/S 6.x



6.0 Platform Breakdown



Physical View of 6.0



1st Key Takeaway!

- **Current 5.x C/S customers migrating to 6.0 or 6.1 are migrating some applications to a very different C/S platform**

- **Current MAGIC customers migrating to 6.0 or 6.1 are technically migrating to TWO very different C/S platforms. Some applications to one platform and some to the other.**

C/S 6.x
A Tale of TWO Platforms
(NPR and M-AT)

Defining C/S NPR

- Primary MAGIC-like technology in 5.x (called VMAGIC)
- **Similar database and programming language to MAGIC**
- Most applications in C/S 5.x “ported over” from MAGIC
- **Ironically Stands for “Non-Procedural Representation”**
- Not a report writer and yes, “Programming is Required”

Defining C/S NPR

- Similar Report Writer to the NPR RW found in MAGIC
- **Included a few pure “FS” applications (e.g. EMR, PCS)**
- Most 6.0 applications are still on the NPR platform
- **Limited lifespan in 6.x as more apps port to M-AT**

Defining M-AT

- New development environment built around FS language
- **M-AT is to FS what NPR MAGIC was to $T MAGIC**
- New “Chronological” Database Technology (MAD)
- **Optimized Network Management**
- New User Interface Tools for Screens / Reports

Components of M-AT

MEDITECH Advanced Technology:

- Advanced Programming Language (APL)
- **Advanced Network Protocol (ANP)**
- Advanced Database (MAD)

APL

(MEDITECH Advanced Programming Language)

What Is APL?

- **Until recently, APL was being called FOCUS code**
- **High level source language; produces FS object code**
- **Similar to how NPR produces Magic object code**
- **No built-in editor; APL developers mostly use TextPad**
- **No access to write APL or FS code anywhere in M-AT**

2nd Key Takeaway!

- There is NO end-USER access to write APL or FS code anywhere in M-AT

- **The NPR side of 6.x will still allow inserting NPR & MAGIC code in fragments, macros, computed fields and screen attributes but there is NOTHING even comparable in M-AT.**

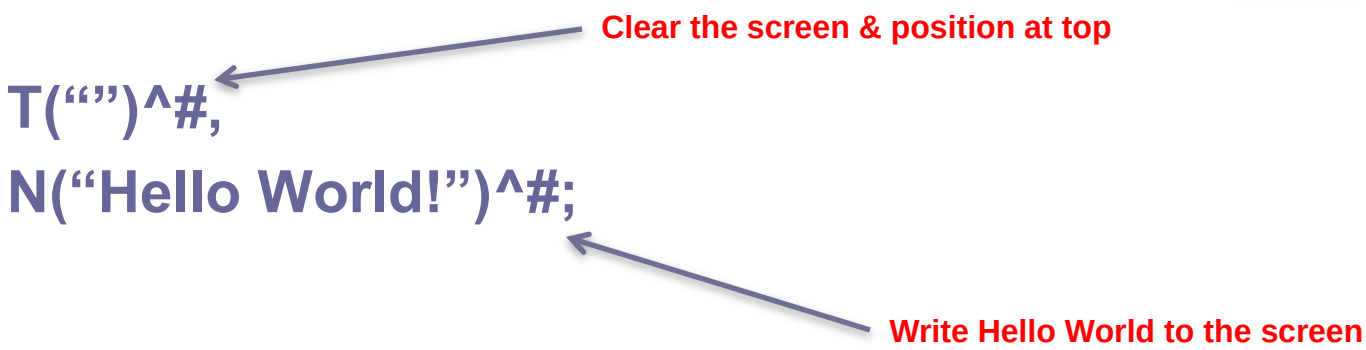
- MEDITECH's position is that writing code is not necessary if you use the rules editor M-AT provides.

What Is FS?

- **FS = new(er) object code language introduced in 90's**
- **Stands for "Functional System"**
- **Interpreted language with lots of function calls**
- **Emphasis on client-side processing**
- **Very little support of Data Defs & Variables**
- **In 5.6, was purely object code; Now APL produces FS**

CODE COMPARISON

‘Hello World’ in MAGIC



Hello World in FS

```
:Code Main
`200,300'@lw@OW,
"My First App"@lh
"Hello World!!"@Wb,
DO{@RK~=27}@CW;
```

Name of Function

Create a window

Add a title to the window

Output string in the foreground

Exit when user presses ‘ESC’
Close the window

Hello World in APL

```
#Translation

  :Options
    Result              MSFile
  :Product
    Type                Unstructured

#Preamble

  :Options
    Type                Process

 #Magic
```

```
:Code Main
`200,300'@Iw@OW,
"My First App"@Ih
"Hello World!!"@Wb,
DO{@RK~=27}@CW;
```

Same as FS code in the Main body

Hello World in APL

```
#Translation

  :Options
    Result                  MSFile
  :Product
    Type                    Unstructured
#Preamble

  :Options
    Type                    Process

 #Magic

:Code Main
`200,300'@Iw@OW,
"My First App"@Ih
"Hello World!!"@Wb,
DO{@RK~=27}@CW;
```

Used to determine "run-time" behavior

Hello World in APL

```
#Translation

  :Options
    Result                MSFile
  :Product
    Type                  Unstructured

#Preamble

  :Options
    Type                  Process

 #Magic

:Code Main
`200,300'@Iw@OW,
"My First App"@Ih
"Hello World!!"@Wb,
DO{@RK~=27}@CW;
```

Defines the Object type
i.e. how this object will be “called”

ANP

(MEDITECH Advanced Networking Protocol)

What Is ANP?

- **Data storage & retrieval service**
- **Handles all transactions between server & clients**
- **ONLY way to store / retrieve data to / from the MAD**
- **Appends records, maintains & searches indexes**
- **Sets and releases locks called “Mutexes”**

What Is ANP?

- **Can handle multiple discrete requests in one network txn**
- **This helps with network latency**
- **Limits requests to no more than 1000**
- **Also manages files and folders (create, delete, etc.)**
- **Coincidentally, the same initials as A. Neil Pappalardo**

MAD

(MEDITECH Advanced Database)

Defining the MAD

- **Chronological; Append-Only; nothing is ever deleted**
- **Naturally keeps audit trails of all entries and edits**
- **Data are stored in multiple files**
- **Much more normalized; Reg.Acct only stores pointers**
- **Very fast at filing data; not so much when retrieving**
- **Increased reliability; never an invalid state during a write**

Defining the MAD

- **Increases performance by employing “coalescence”**
- **Coalescence combines record requests to ANP**
- **The trick is knowing how many objects to request**
- **Certain data dependencies force multiple ANP requests**

Defining the MAD

Sample Report

Patient Name	Acct#	Unit#	
Order#	**Service Date**	**Category**	**Procedure**
########1	02/10/2010	Laboratory	Glucose
########2	02/11/2010	Nursing	Vital Signs
########3	02/12/2010	Radiology	Chest X-Ray
########4	02/13/2010	Dietary	Regular

How many ANP requests (imported objects) are necessary for this amount of data?

Defining the MAD

ANSWER = 14

Patient Name	Acct#	Unit#	
Order#	**Service Date**	**Category**	**Procedure**
########1	02/10/2010	Laboratory	Glucose
########2	02/11/2010	Nursing	Vital Signs
########3	02/12/2010	Radiology	Chest X-Ray
########4	02/13/2010	Dietary	Regular

1 RegAcct (Patient's account#)
1 HimRec (Patient's medical record data to pull name and unit#)
4 OmOrd (1 for each order #)
4 OmCategory (1 for each category)
4 OmProcedure (1 for each procedure

MAD Under The Hood

```
{MsGrpGe|A|{{ASPIRIN}|~}}
{MsGrpGe|C|{{COUMADIN}|~}}
{MsGrpGe|H|{{HEPARIN}|~}}
{MsGrpGe|HB|{{HEAPRIN-BOLUS}|~}}
{MsGrpGe|HC|{{HEPARIN/COUMADIN}|~}}
{MsGrpGe|N|{{NONE}|~}}
{MsGrpHi|{~|~}}
{MsGrpIds|M|LABPTPTT|{~|~}}
{MsGrpIds|N|PT/PTT RESPONSES|{~|~}}
{MsGrpMn|{{LABPTPTT|Y|PT/PTT RESPONSES||10|3}|~}}
{MsGrpwds|LABPTPTT|{~|~}}
{MsGrpwds|PT|{~|~}}
{MsGrpwds|PTT|{~|~}}
{MsGrpwds|RESPONSES|{~|~}}
{!bt|{{{20070522.192937||1529|R|+}||MTFS07|meditech||{MT|}||MT|Mt,Meditech (meditech)}|{|||1}}}
```

Initial Entry 5/22/07

```
{MsGrpGe|A|{{ASPIRIN||}|{|1}}}
{MsGrpGe|C|{{COUMADIN||}|{|1}}}
{MsGrpGe|H|{{HEPARIN||}|{|1}}}
{MsGrpGe|HB|{{HEAPRIN-BOLUS||}|{|1}}}
{MsGrpGe|HC|{{HEPARIN/COUMADIN||}|{|1}}}
{MsGrpGe|N|{{NONE||}|{|1}}}
{MsGrpHi|{{{A|C|H|HB|HC|N}}|{|1}}}
{!bt|{{{20070723.213241||1732|R|+}||MTBJP11|meditech||{MT|}||MT|Mt,Meditech}|{|||1}}}
```

Edit on 7/23/07

```
{MsGrpGe|A|{{ASPIRIN|1|}|{|1}}}
{MsGrpGe|C|{{COUMADIN|2|}|{|1}}}
{MsGrpGe|H|{{HEPARIN|3|}|{|1}}}
{MsGrpGe|HB|{{HEAPRIN-BOLUS|4|}|{|1}}}
{MsGrpGe|HC|{{HEPARIN/COUMADIN|5|}|{|1}}}
{MsGrpGe|N|{{NONE|6|}|{|1}}}
{!bt|{{{20070913.70242||0702|R|+}||MIMIS|iatrics||{iatrics|}||iatrics|Iatrics,User}|{|||1}}}
```

Edit on 9/13/07

MUTEX
(Mutual Exclusion Locking)

MUTEX Record Locking

- **ForUI Mutex**
- **ForUpdate Mutex**

ForUI MUTEX

- **Protects entire user interface session**
- **Defined with a time period of ownership**
- **To other user can gain access to the record**

ForUpdate MUTEX

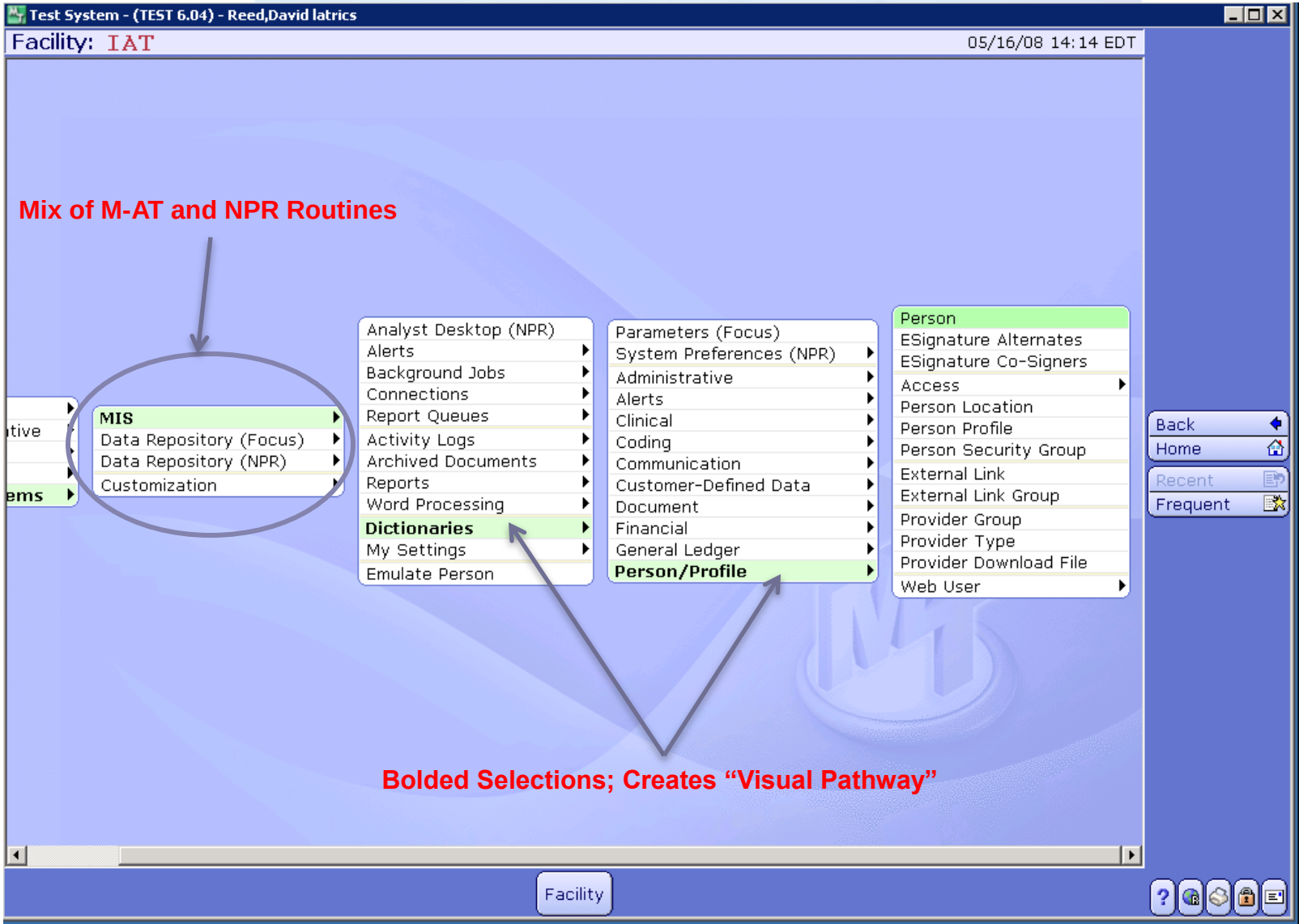
- **Defined only when updating record**
- **Time sensitive to ensure data integrity**
- **Will not allow older entry to replace newer one**

MAT USER INTERFACE

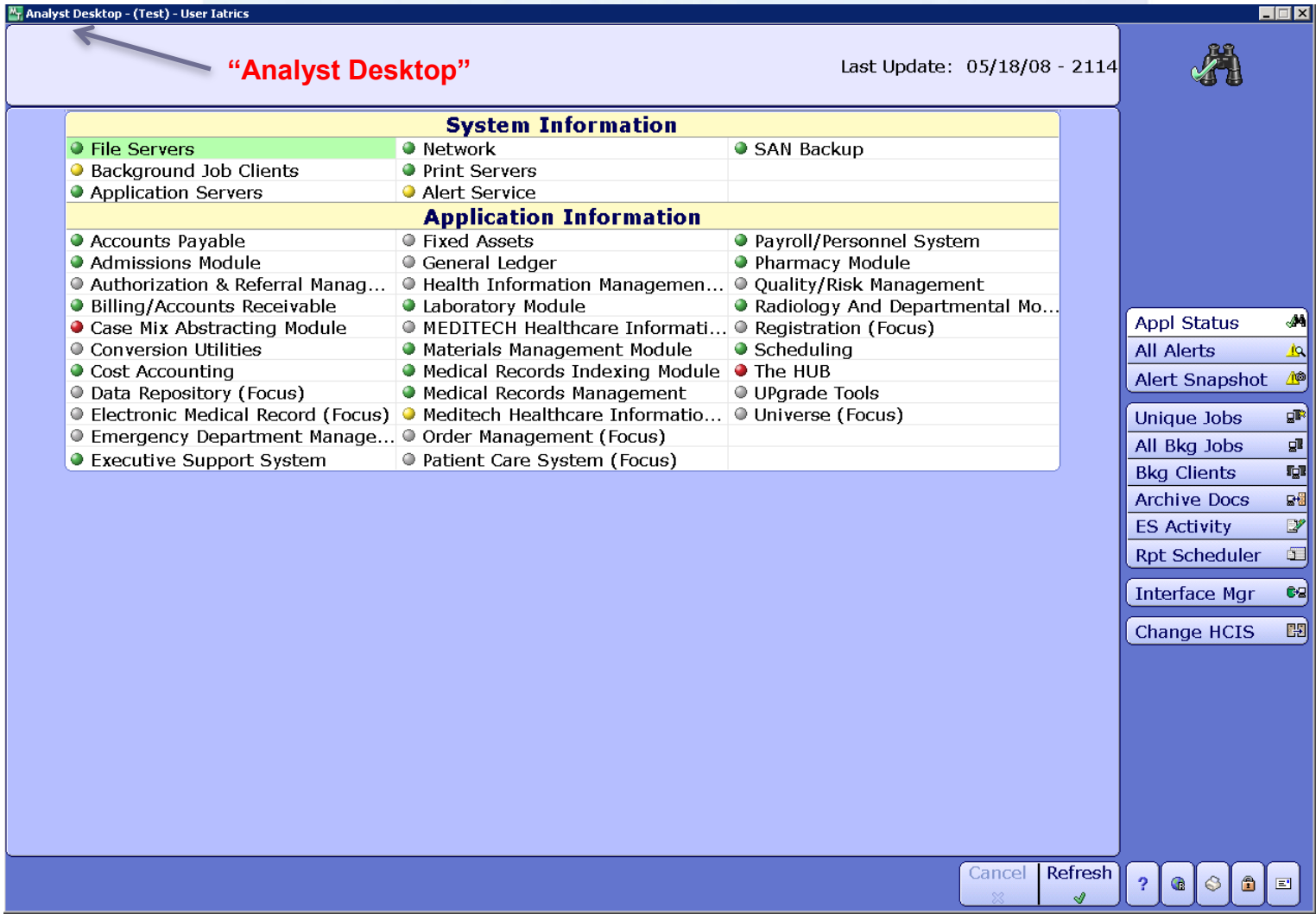
New Screen Technology

- **Menu Navigation**
- **Desktop Screen Regions**
- **Data Entry Screens**
- **FOCUS vs. NPR**
- **Lookups**
- **History / Audit Trail**

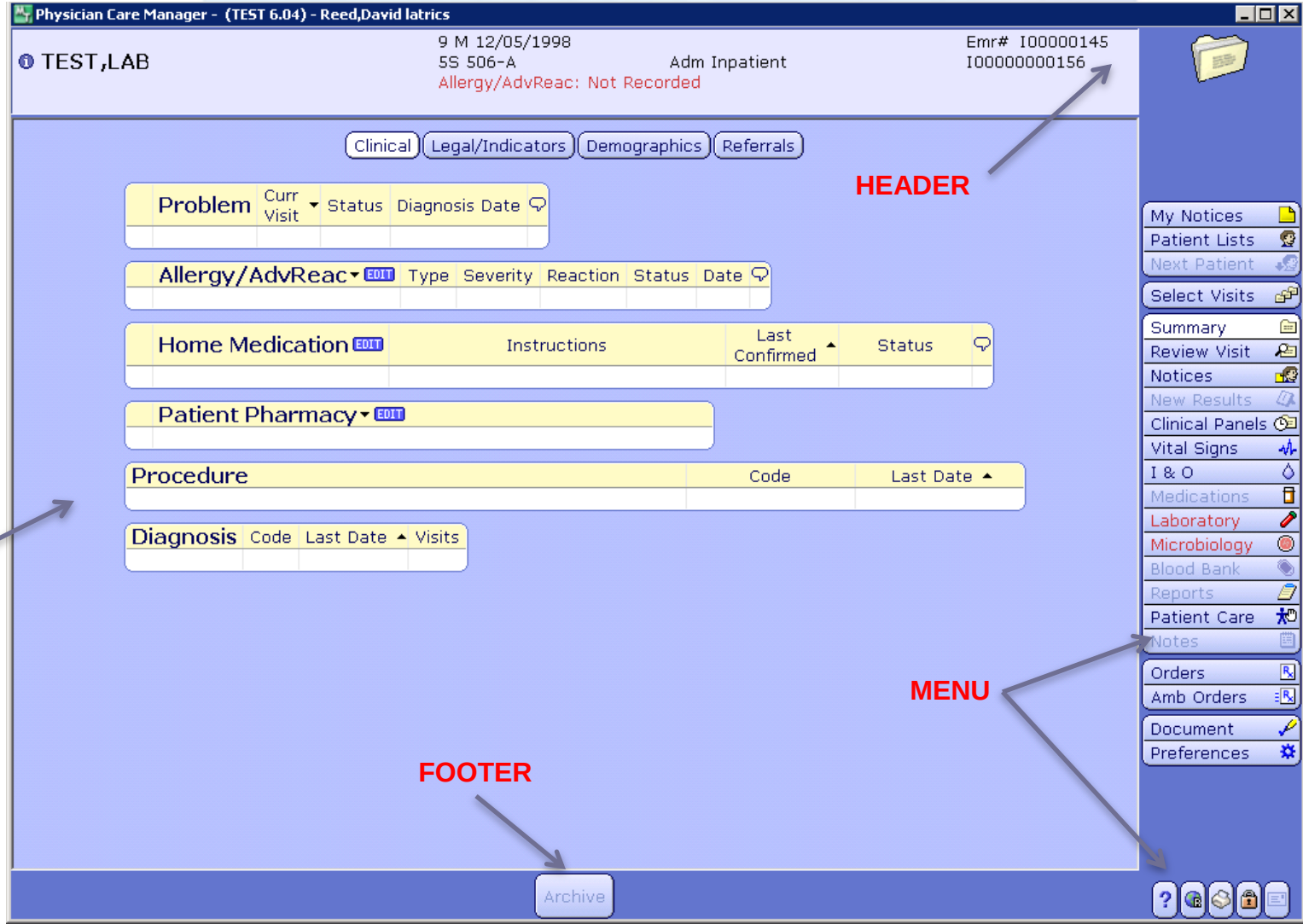
Menu Navigation



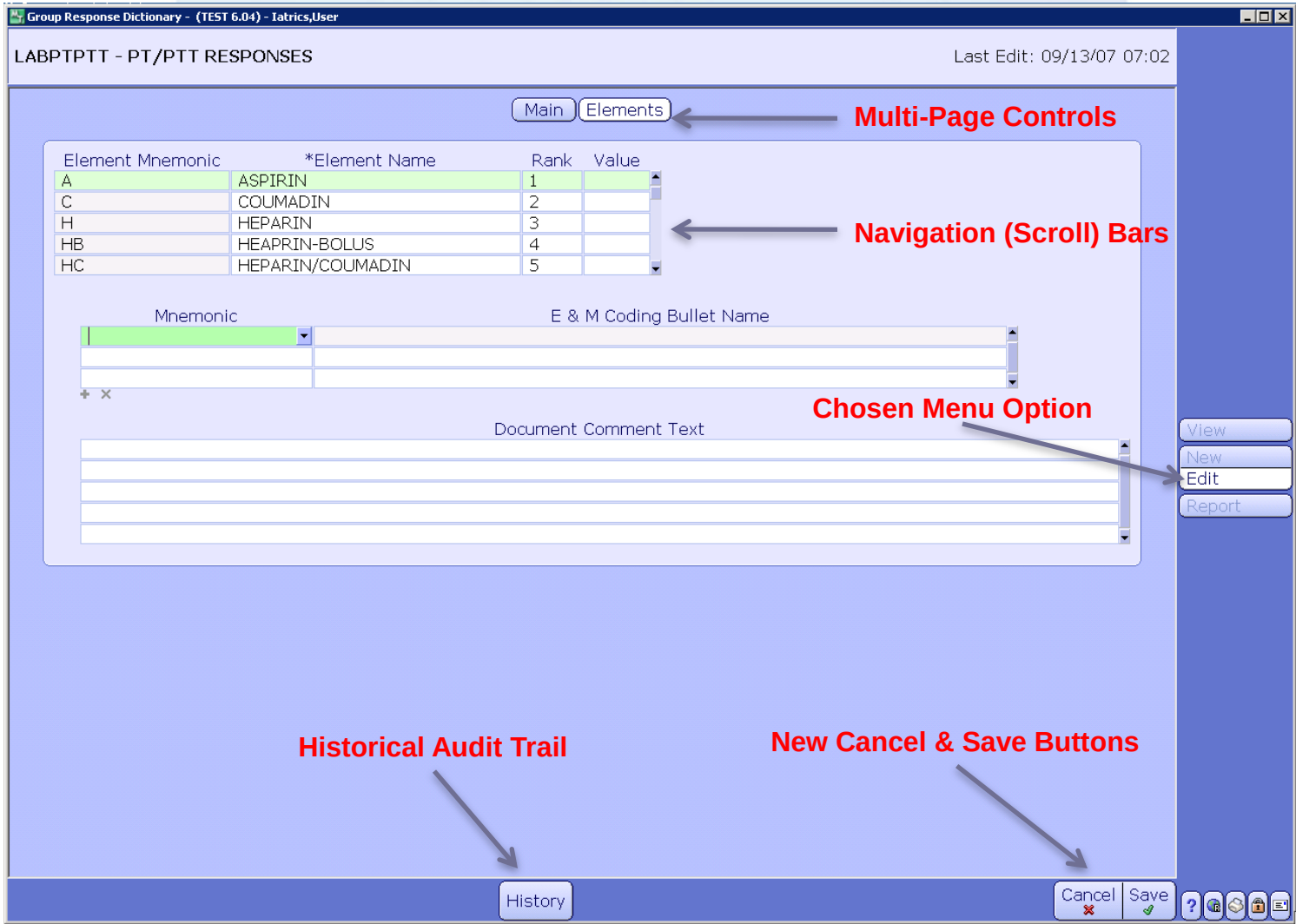
Role-Based Desktop



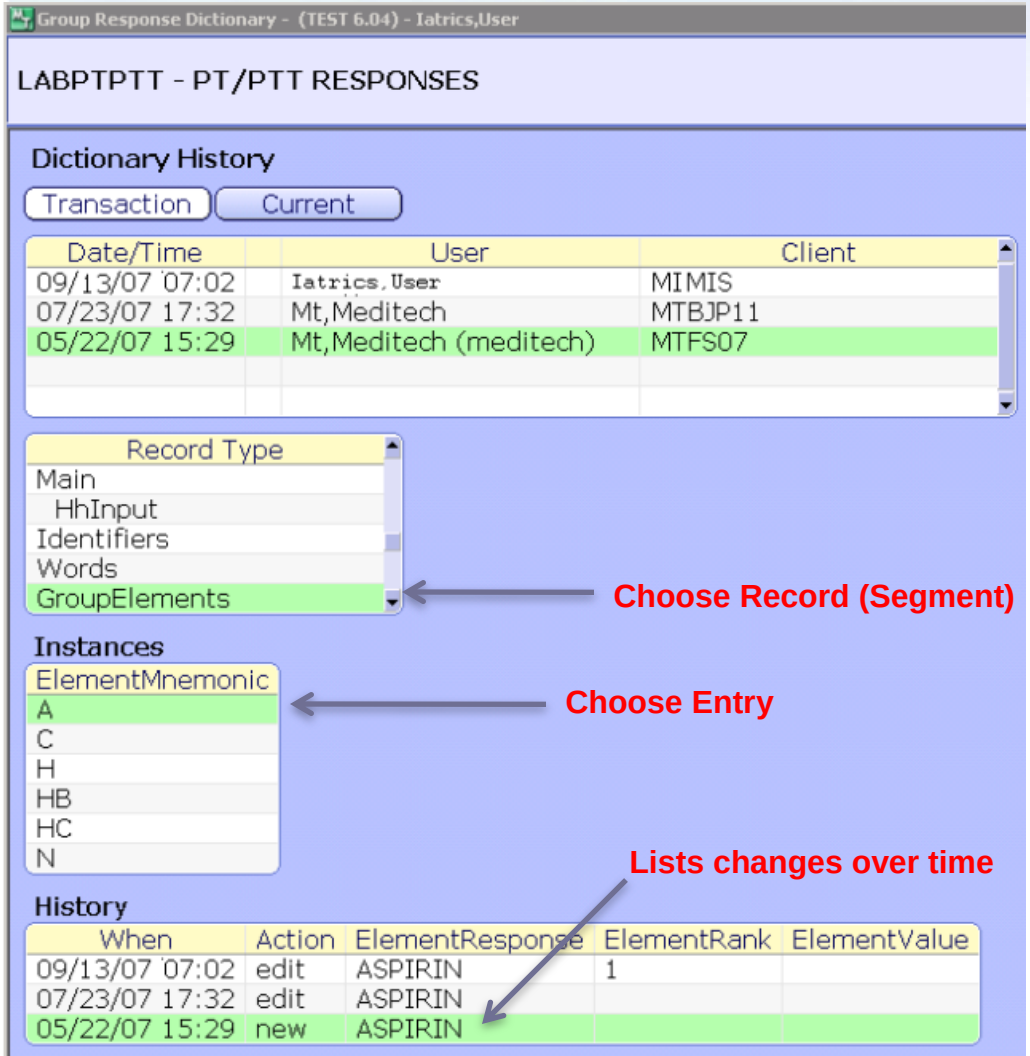
Desktop Screen Regions



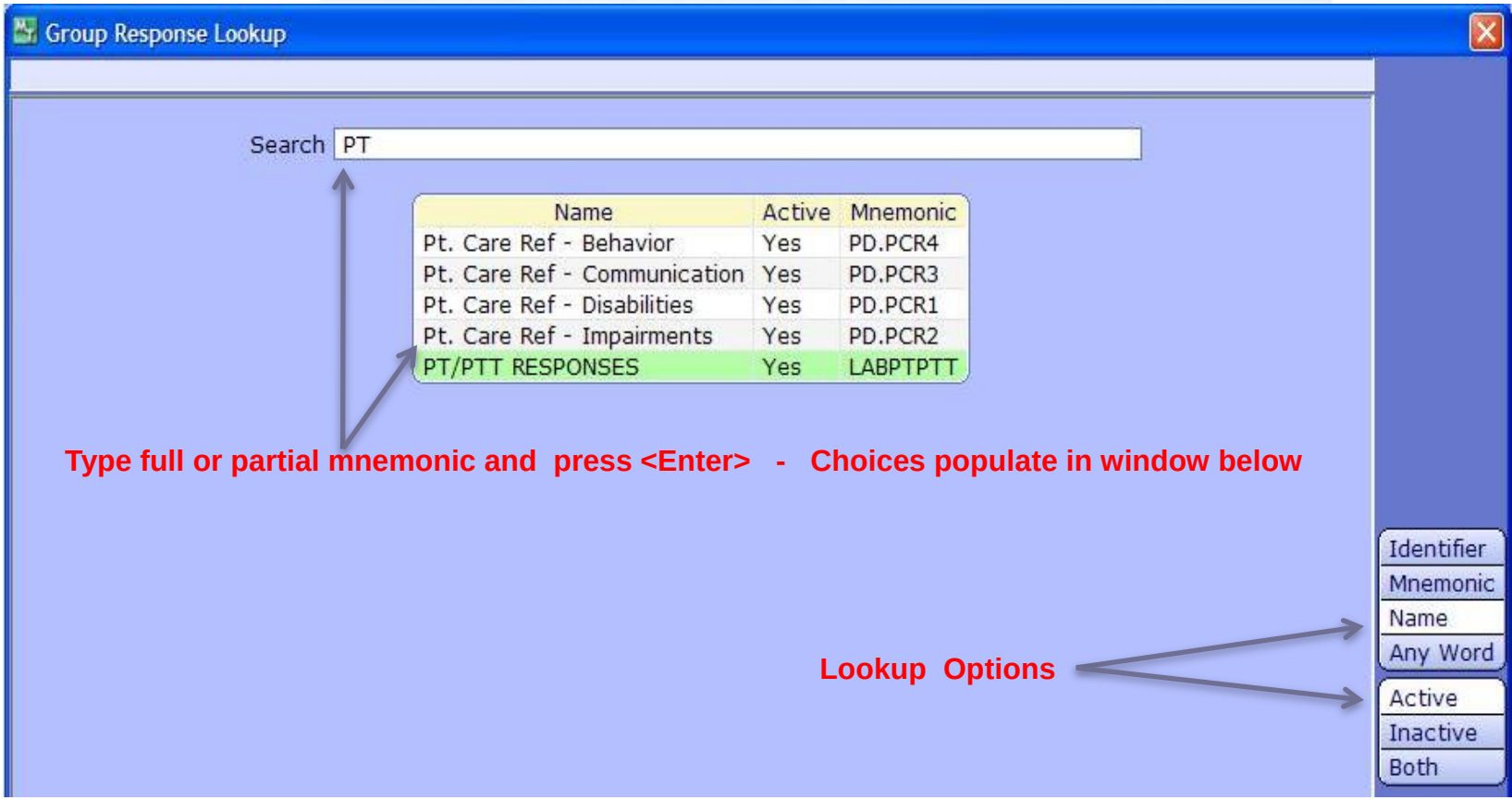
Data Entry Screens



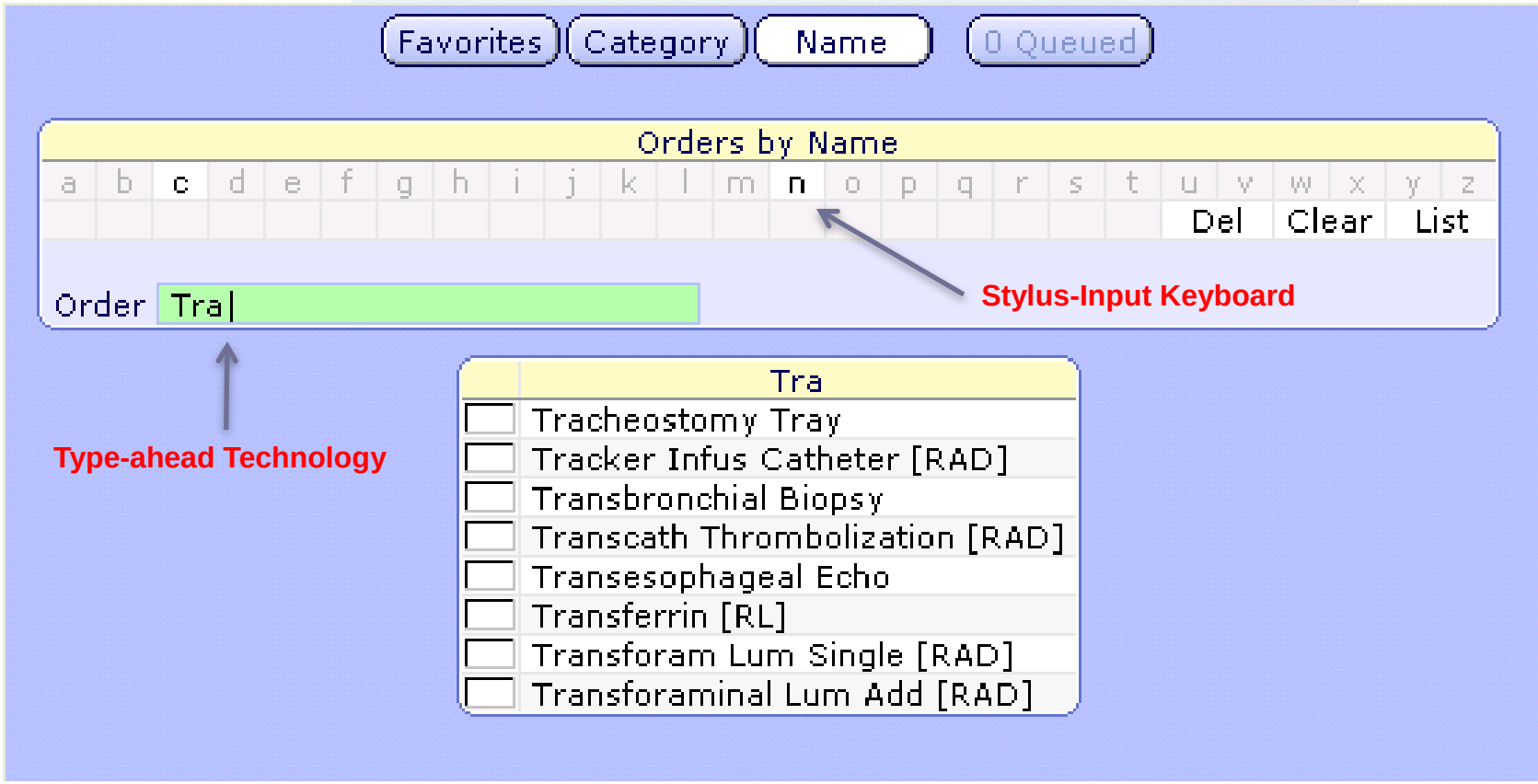
History


Group Response Dictionary - (TEST 6.04) - Iatrics,User
LABPTPTT - PT/PTT RESPONSES
Dictionary History
Transaction
Current
Date/Time
User
Client
09/13/07 07:02
Iatrics,User
MIMIS
07/23/07 17:32
Mt,Meditech
MTBJP11
05/22/07 15:29
Mt,Meditech (meditech)
MTFS07
Record Type
Main
HhInput
Identifiers
Words
GroupElements
Choose Record (Segment)
Instances
ElementMnemonic
A
C
H
HB
HC
N
Choose Entry
Lists changes over time
History
When
Action
ElementResponse
ElementRank
ElementValue
09/13/07 07:02
edit
ASPIRIN
1
07/23/07 17:32
edit
ASPIRIN
05/22/07 15:29
new
ASPIRIN

Lookups


Group Response Lookup
Search PT
Name Active Mnemonic
Pt. Care Ref - Behavior Yes PD.PCR4
Pt. Care Ref - Communication Yes PD.PCR3
Pt. Care Ref - Disabilities Yes PD.PCR1
Pt. Care Ref - Impairments Yes PD.PCR2
PT/PTT RESPONSES Yes LABPTPTT
Type full or partial mnemonic and press <Enter> - Choices populate in window below
Identifier
Mnemonic
Name
Any Word
Lookup Options
Active
Inactive
Both

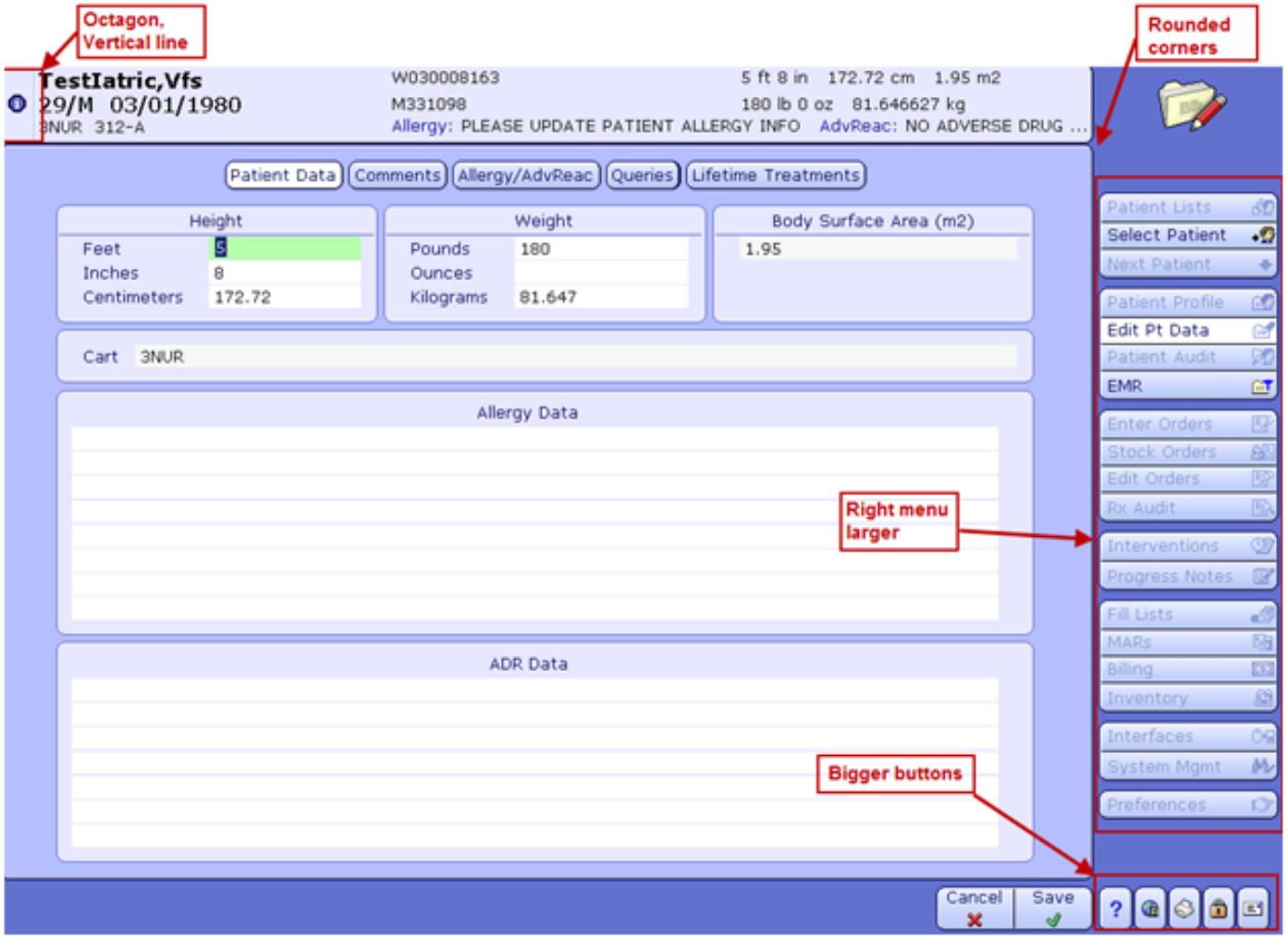
Lookups


Favorites
Category
Name
0 Queued
Orders by Name
a b c d e f g h i j k l m n o p q r s t u v w x y z
Del
Clear
List
Order Tra
Stylus-Input Keyboard
Type-ahead Technology
Tra
Tracheostomy Tray
Tracker Infus Catheter [RAD]
Transbronchial Biopsy
Transcath Thrombolization [RAD]
Transesophageal Echo
Transferrin [RL]
Transforam Lum Single [RAD]
Transforaminal Lum Add [RAD]

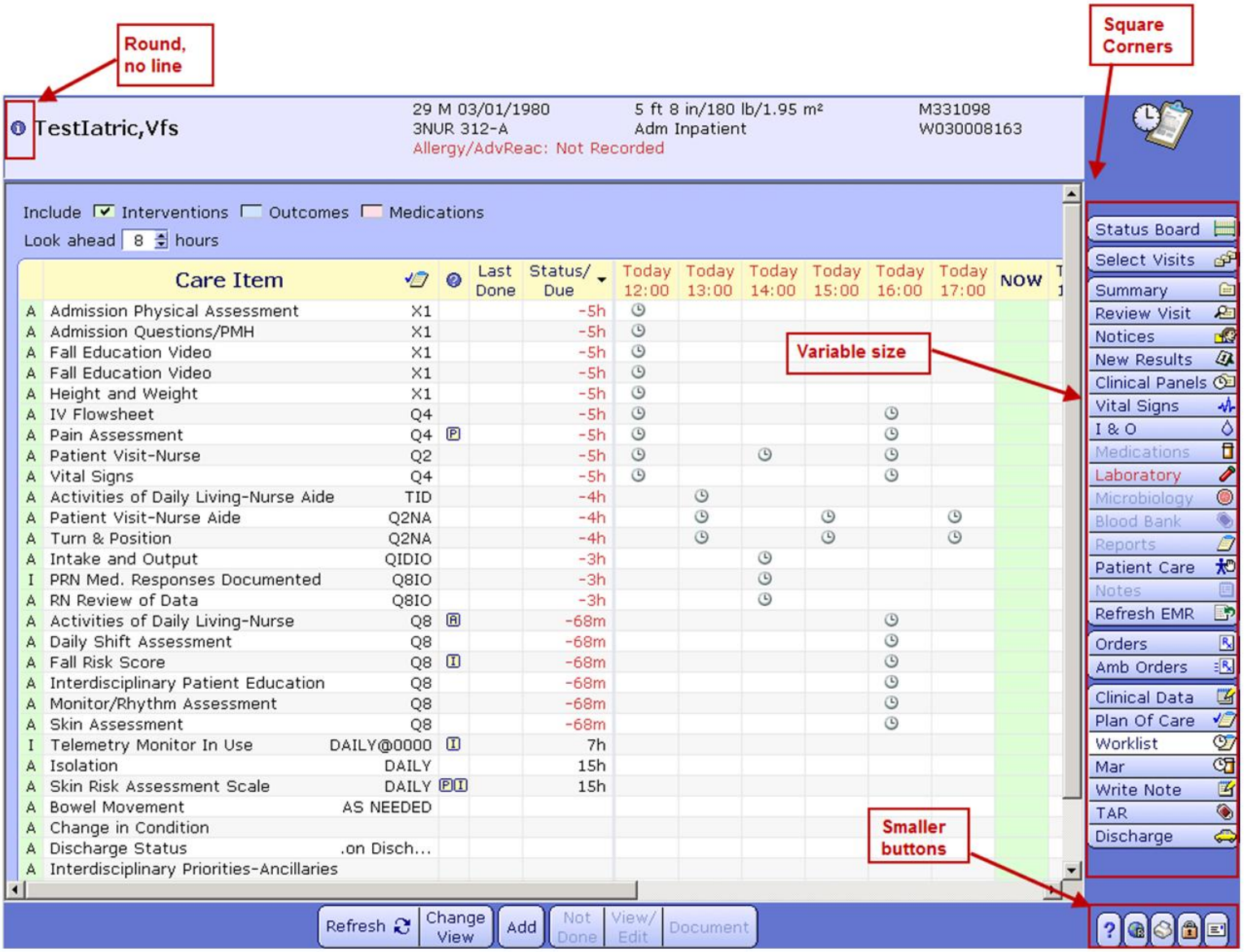
NPR vs. M-AT Screens

6.x NPR Screen

C/S PHA Edit Patient Data



M-AT Screen


Round, no line
Square Corners
TestIatric,Vfs
29 M 03/01/1980
3NUR 312-A
Allergy/AdvReac: Not Recorded
5 ft 8 in/180 lb/1.95 m²
Adm Inpatient
M331098
W030008163
Include Interventions Outcomes Medications
Look ahead 8 hours
Care Item
Last Done
Status/ Due
Today 12:00
Today 13:00
Today 14:00
Today 15:00
Today 16:00
Today 17:00
NOW
A Admission Physical Assessment X1 -5h
A Admission Questions/PMH X1 -5h
A Fall Education Video X1 -5h
A Fall Education Video X1 -5h
A Height and Weight X1 -5h
A IV Flowsheet Q4 -5h
A Pain Assessment Q4 P -5h
A Patient Visit-Nurse Q2 -5h
A Vital Signs Q4 -5h
A Activities of Daily Living-Nurse Aide TID -4h
A Patient Visit-Nurse Aide Q2NA -4h
A Turn & Position Q2NA -4h
A Intake and Output QIDIO -3h
I PRN Med. Responses Documented Q8IO -3h
A RN Review of Data Q8IO -3h
A Activities of Daily Living-Nurse Q8 R -68m
A Daily Shift Assessment Q8 -68m
A Fall Risk Score Q8 I -68m
A Interdisciplinary Patient Education Q8 -68m
A Monitor/Rhythm Assessment Q8 -68m
A Skin Assessment Q8 -68m
I Telemetry Monitor In Use DAILY@0000 I 7h
A Isolation DAILY 15h
A Skin Risk Assessment Scale DAILY PI 15h
A Bowel Movement AS NEEDED
A Change in Condition
A Discharge Status .on Disch...
A Interdisciplinary Priorities-Ancillaries
Variable size
Smaller buttons
Status Board
Select Visits
Summary
Review Visit
Notices
New Results
Clinical Panels
Vital Signs
I & O
Medications
Laboratory
Microbiology
Blood Bank
Reports
Patient Care
Notes
Refresh EMR
Orders
Amb Orders
Clinical Data
Plan Of Care
Worklist
Mar
Write Note
TAR
Discharge
Refresh
Change View
Add
Not Done
View/ Edit
Document

5-Minute Break?

HARDWARE

Hardware

Typical 6.0 Configuration (151 – 300 beds)

- 8 NPR and 3 M-AT File Servers (incl. LIVE & TEST)
- **SAN attached storage (1200+ GB addressable) Raid ten**
- 2 Transaction Servers
- **16 Background Job Processors (2 TEST / 14 LIVE)**
- Background servers running on VMWare

System Architecture

Transaction Server

- Controls all database writes; avoids partial filing
- **Protects database from client/user failure**
- Backups are transactionally aware across servers
- **Roll-forward a database from a prior backup**

System Architecture

Conversion Server

- Limits downtime for conversion of data structures
- **Allow for database file conversions to be performed offline**
- Conversion performed on a backup copy, then updated
- **When the two are close enough, “swap & update”**

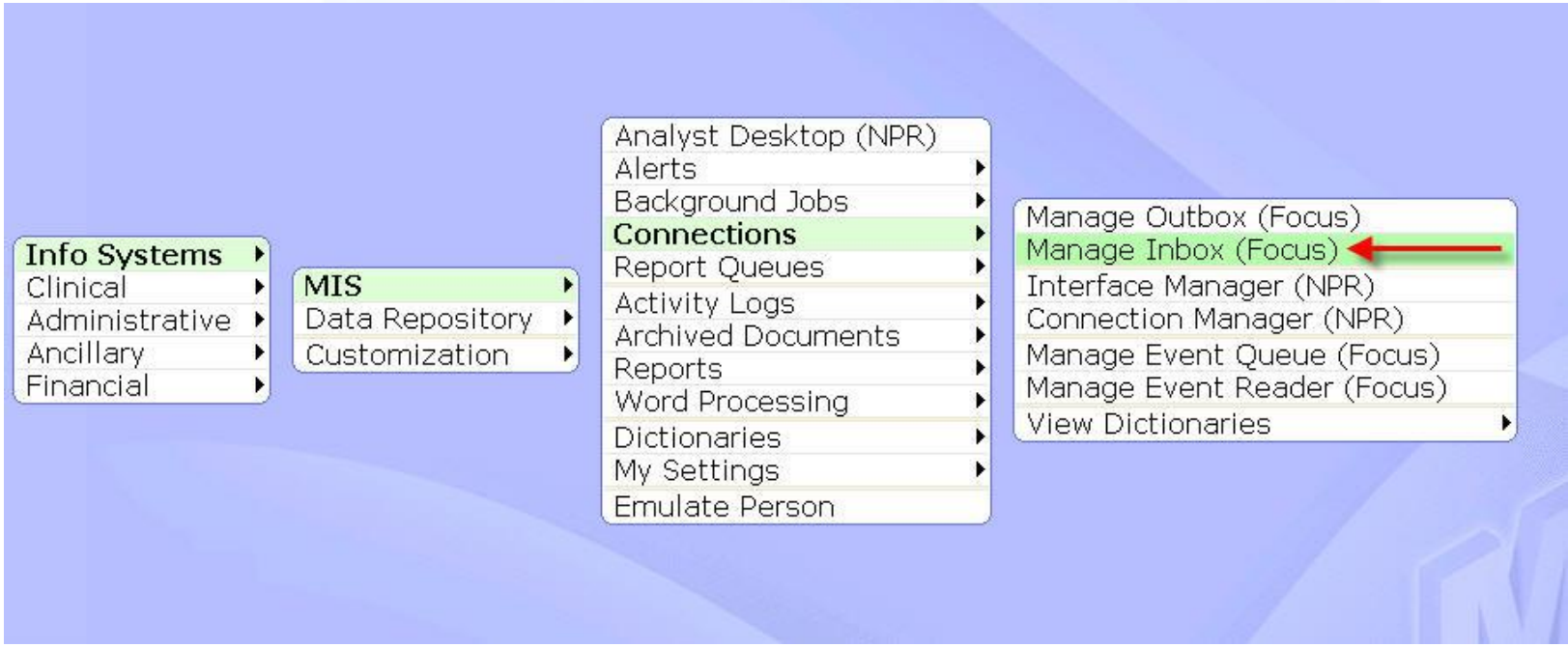
CONNECTIONS

Connections

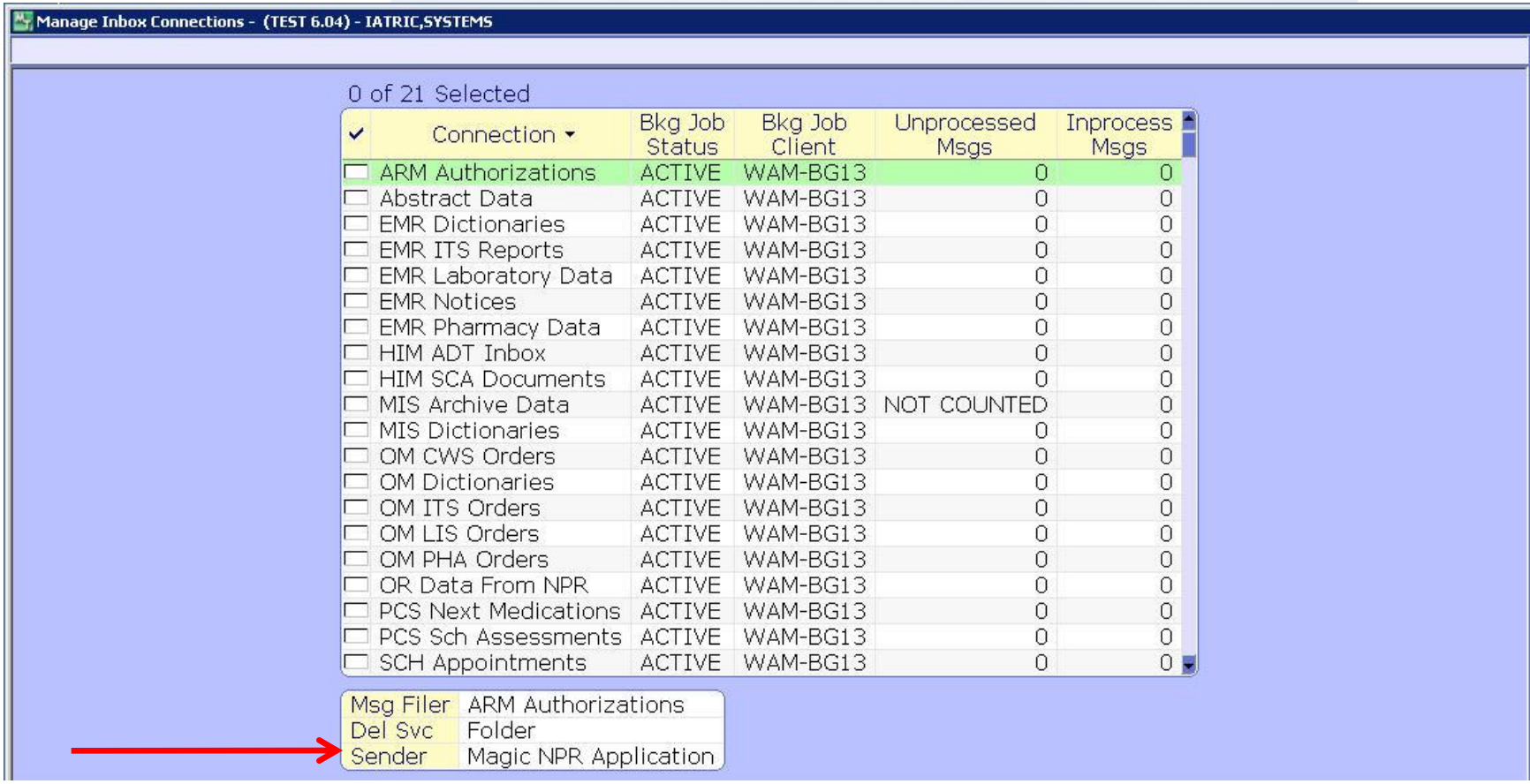
Quick Facts

- “Connection” is synonymous with interface
- **MT-2-MT Interfaces have always existed**
- The difference here is platform-2-platform

Connections

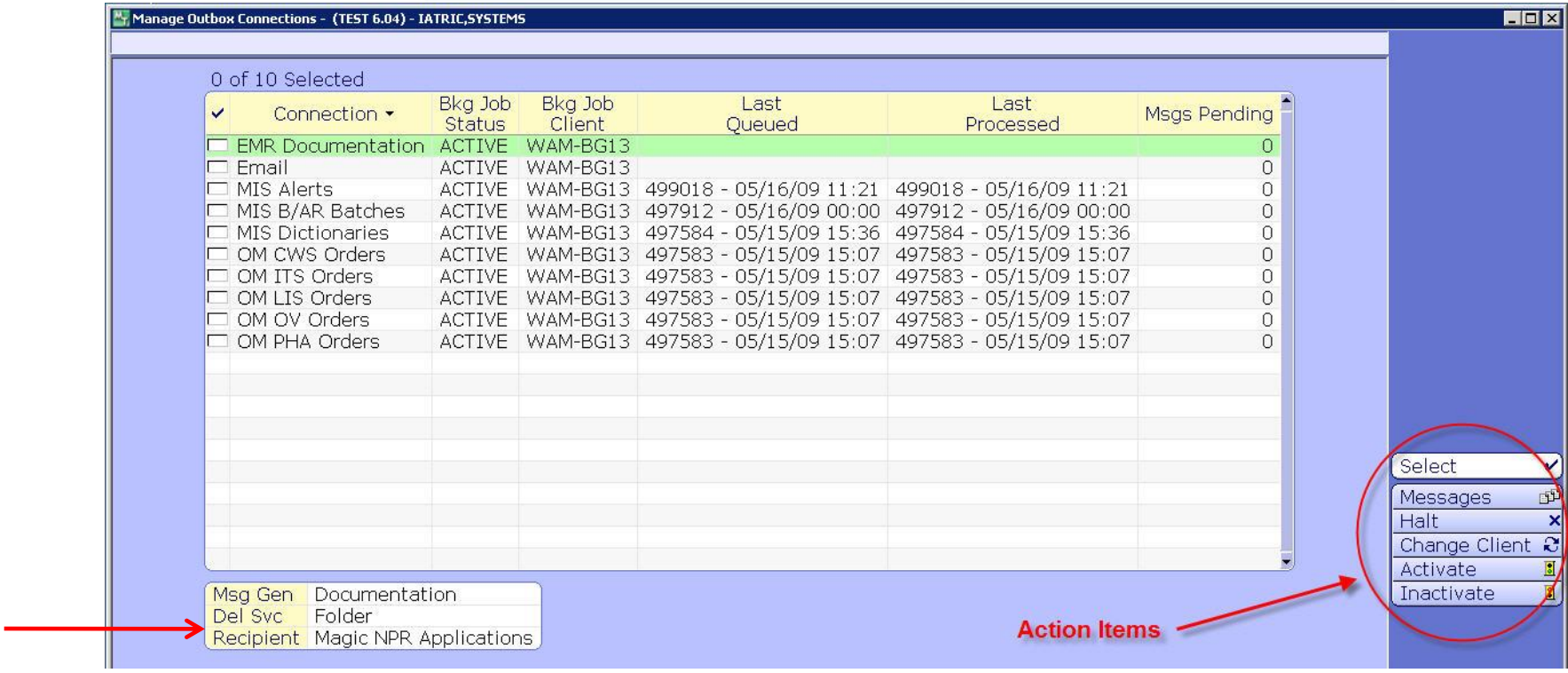


Connections



From NPR to M-AT

Connections



From M-AT to NPR

CDS & ATTRIBUTES

CDS & Attributes

Quick Facts

- Customer-defined screens exist in M-AT
- **ONLY VERY BASIC Attributes exist in M-AT**
- Rules in M-AT allow for complex logic

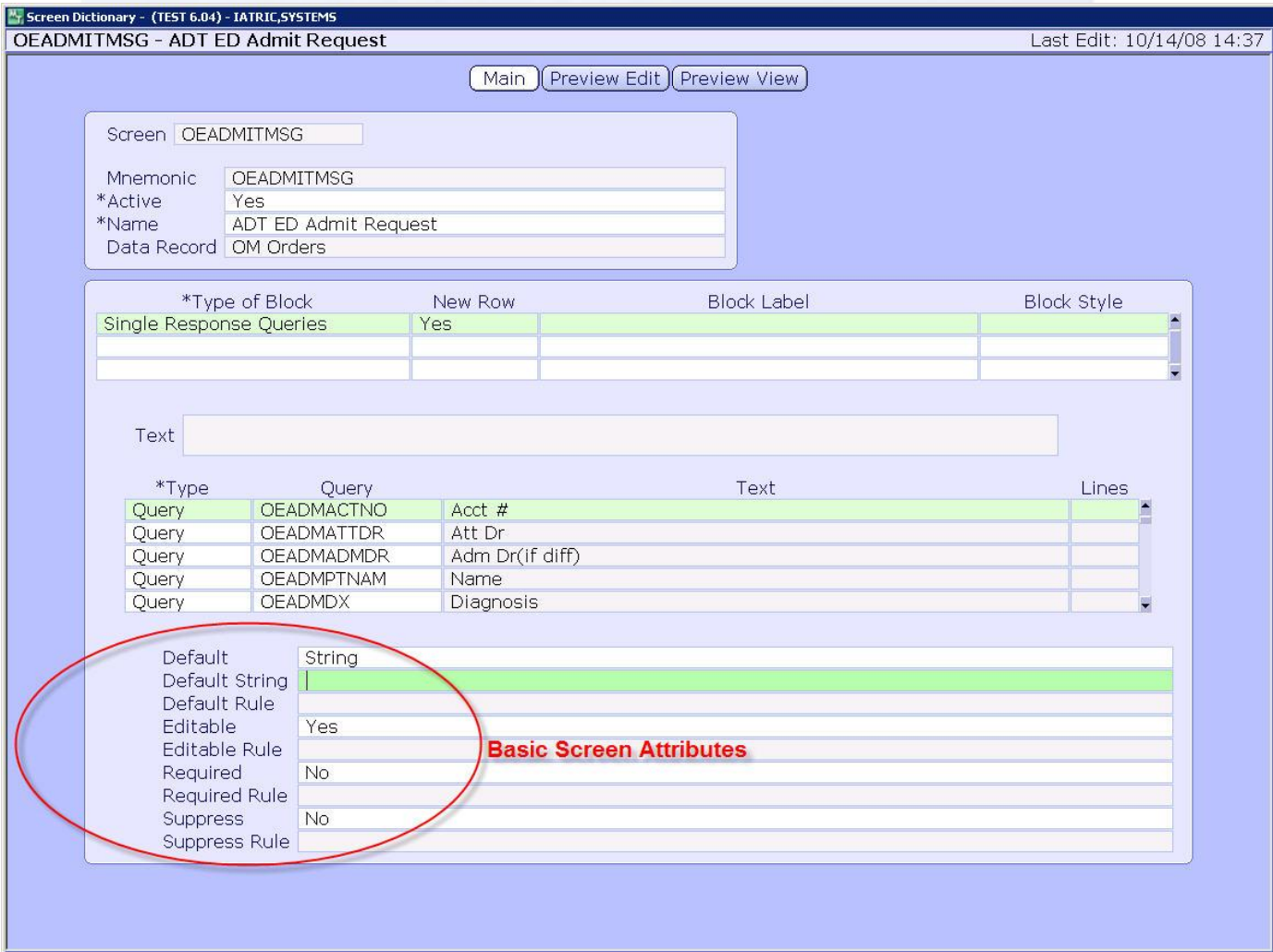
Key Takeaway!

- **Building custom screens in M-AT means a lot less coding of attributes, fancy tricks, screen pop-ups, etc.**

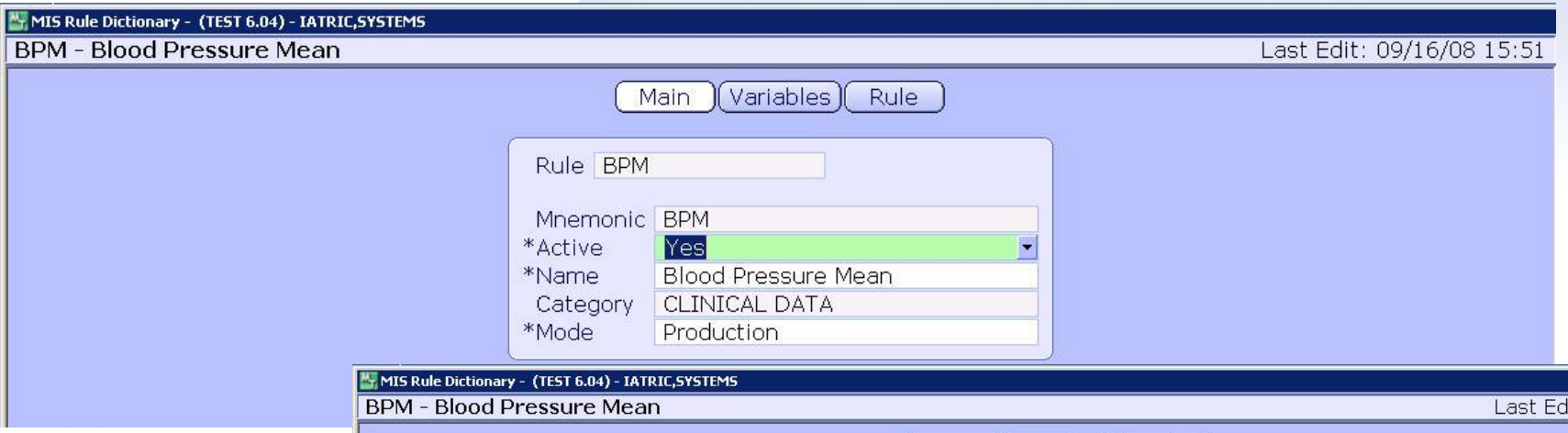
- **Complex logic of screenflow are limited by the few available attributes and the rules wizard**

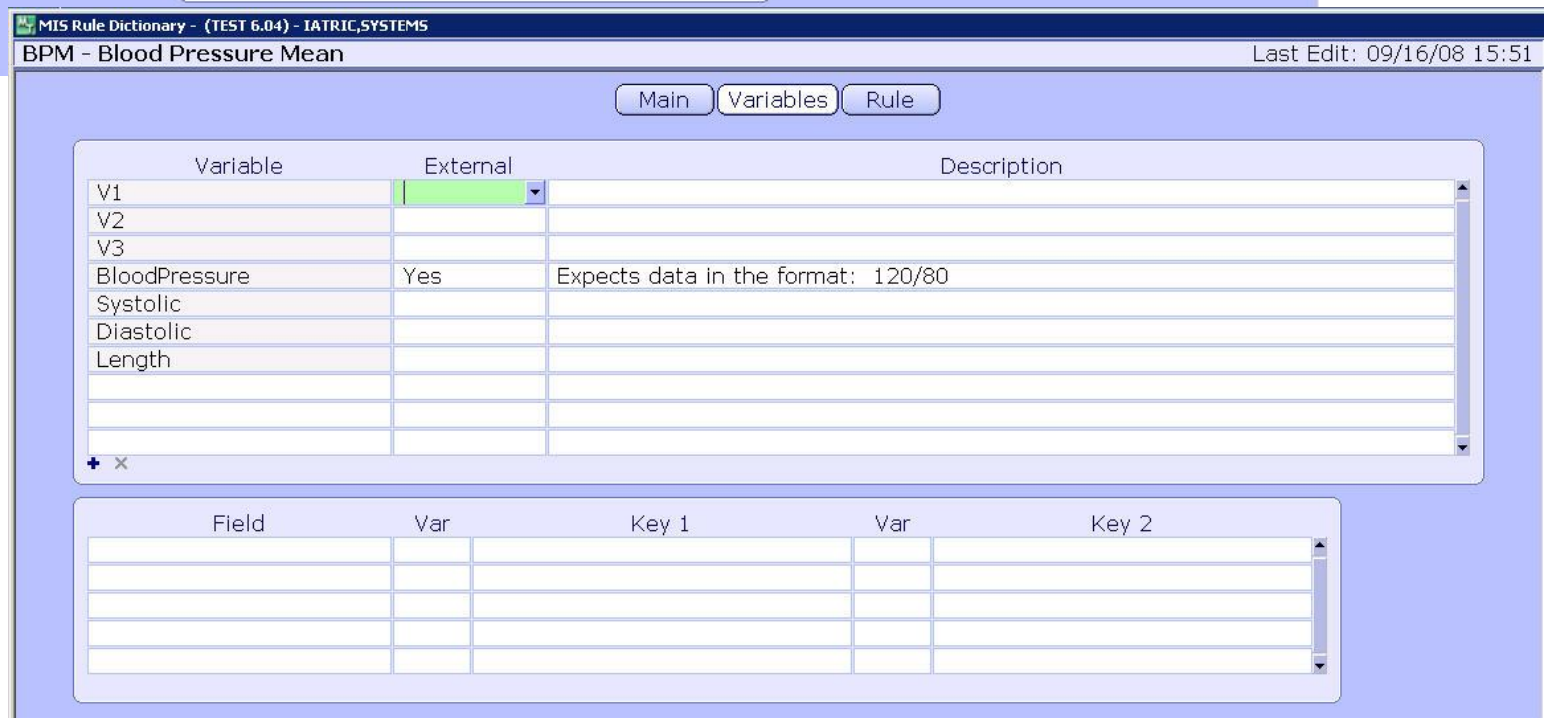
CDS & Attributes

CDS & Attributes

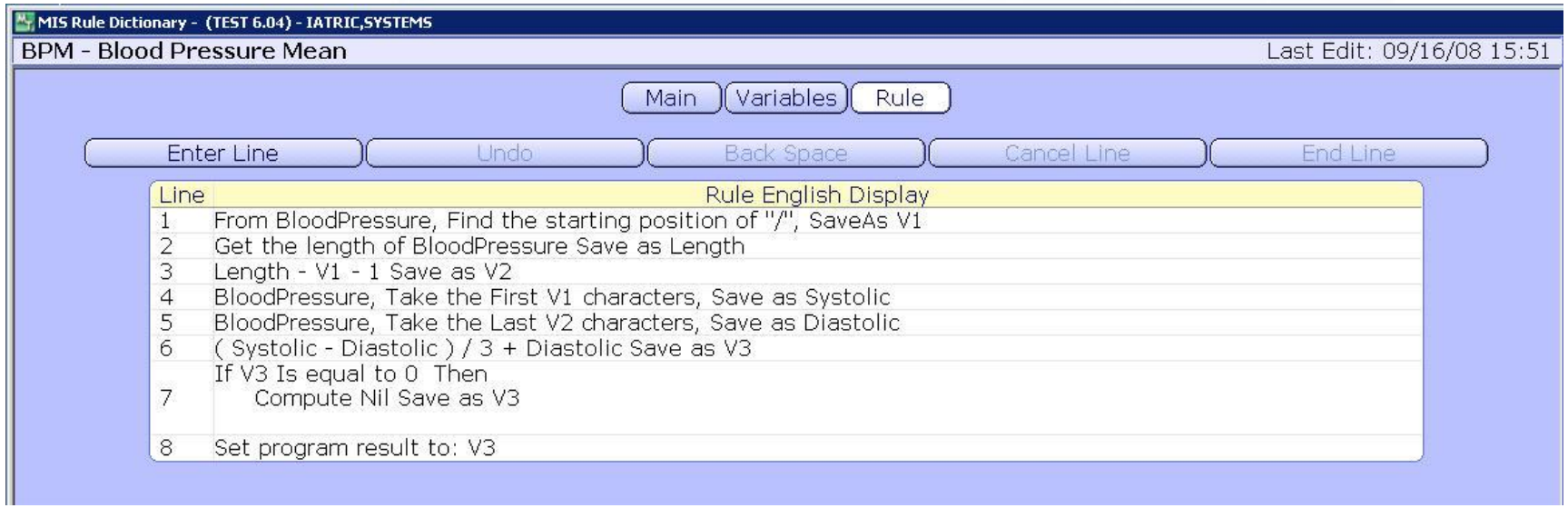


Rule Editor


MIS Rule Dictionary - (TEST 6.04) - IATRIC,SYSTEMS
BPM - Blood Pressure Mean
Last Edit: 09/16/08 15:51
Main
Variables
Rule
Rule BPM
Mnemonic BPM
*Active Yes
*Name Blood Pressure Mean
Category CLINICAL DATA
*Mode Production


MIS Rule Dictionary - (TEST 6.04) - IATRIC,SYSTEMS
BPM - Blood Pressure Mean
Last Edit: 09/16/08 15:51
Main
Variables
Rule
Variable
External
Description
V1
V2
V3
BloodPressure
Yes
Expects data in the format: 120/80
Systolic
Diastolic
Length
Field
Var
Key 1
Var
Key 2

Rule Editor


MIS Rule Dictionary - (TEST 6.04) - IATRIC,SYSTEMS
BPM - Blood Pressure Mean
Last Edit: 09/16/08 15:51
Main
Variables
Rule
Enter Line
Undo
Back Space
Cancel Line
End Line
Line
Rule English Display
1 From BloodPressure, Find the starting position of "/", SaveAs V1
2 Get the length of BloodPressure Save as Length
3 Length - V1 - 1 Save as V2
4 BloodPressure, Take the First V1 characters, Save as Systolic
5 BloodPressure, Take the Last V2 characters, Save as Diastolic
6 (Systolic - Diastolic) / 3 + Diastolic Save as V3
7 If V3 Is equal to 0 Then
Compute Nil Save as V3
8 Set program result to: V3

3rd Party Integration?

3rd Party Integration

The Myths

- Rumors say no 3rd party applications in 6.x
- **No 3rd party company can access M-AT data**
- 3rd party vendors are completely locked out

3rd Party Integration

How do other vendor products integrate with MEDITECH?

- Extract data via data drivers or native code
- **Receive data via interfaces & virtual printers**
- Screen Scrape – reading data from screens
- **Send data to MEDITECH via standard interfaces**
- Scripting – sending “ghosted” keystrokes to screens
- **Link to / launch various routines from MEDITECH**

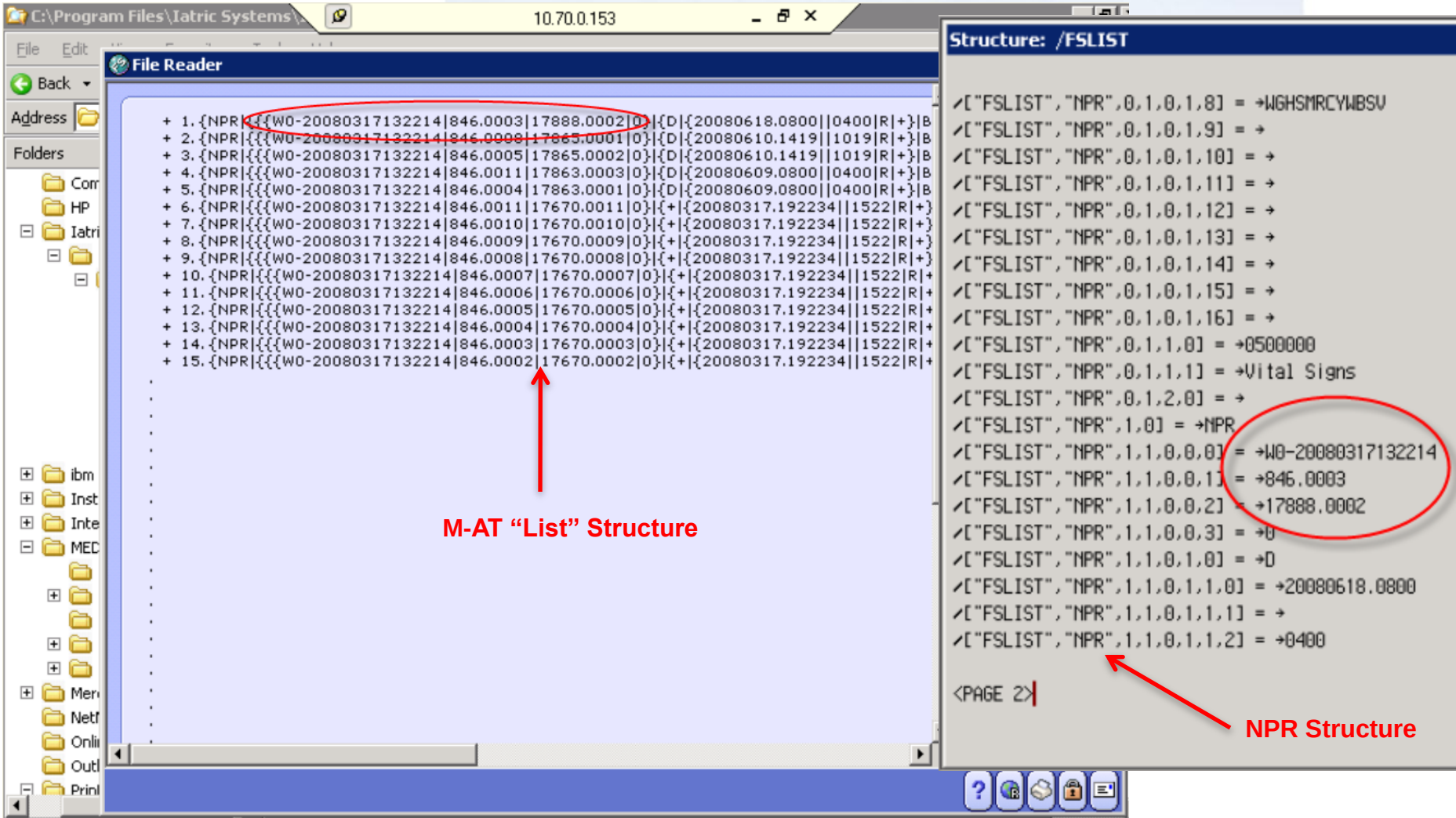
3rd Party Integration

The Truth about What Is Possible:

- **Data can be extracted from M-AT. Drivers already exist!**
- **Interfaces already exist that fetch data from M-AT**
- **Scripting and Screen Scraping works – actually better!!**
- **It is possible to link/launch from M-AT screens**

DATA EXTRACTION

FOCUS to NPR


C:\Program Files\Iatric Systems\...
10.70.0.153
File Edit
Back
Address
Folders
File Reader
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M-AT "List" Structure
Folders
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/["FSLIST","NPR",0,1,0,1,10] = →
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/["FSLIST","NPR",0,1,0,1,14] = →
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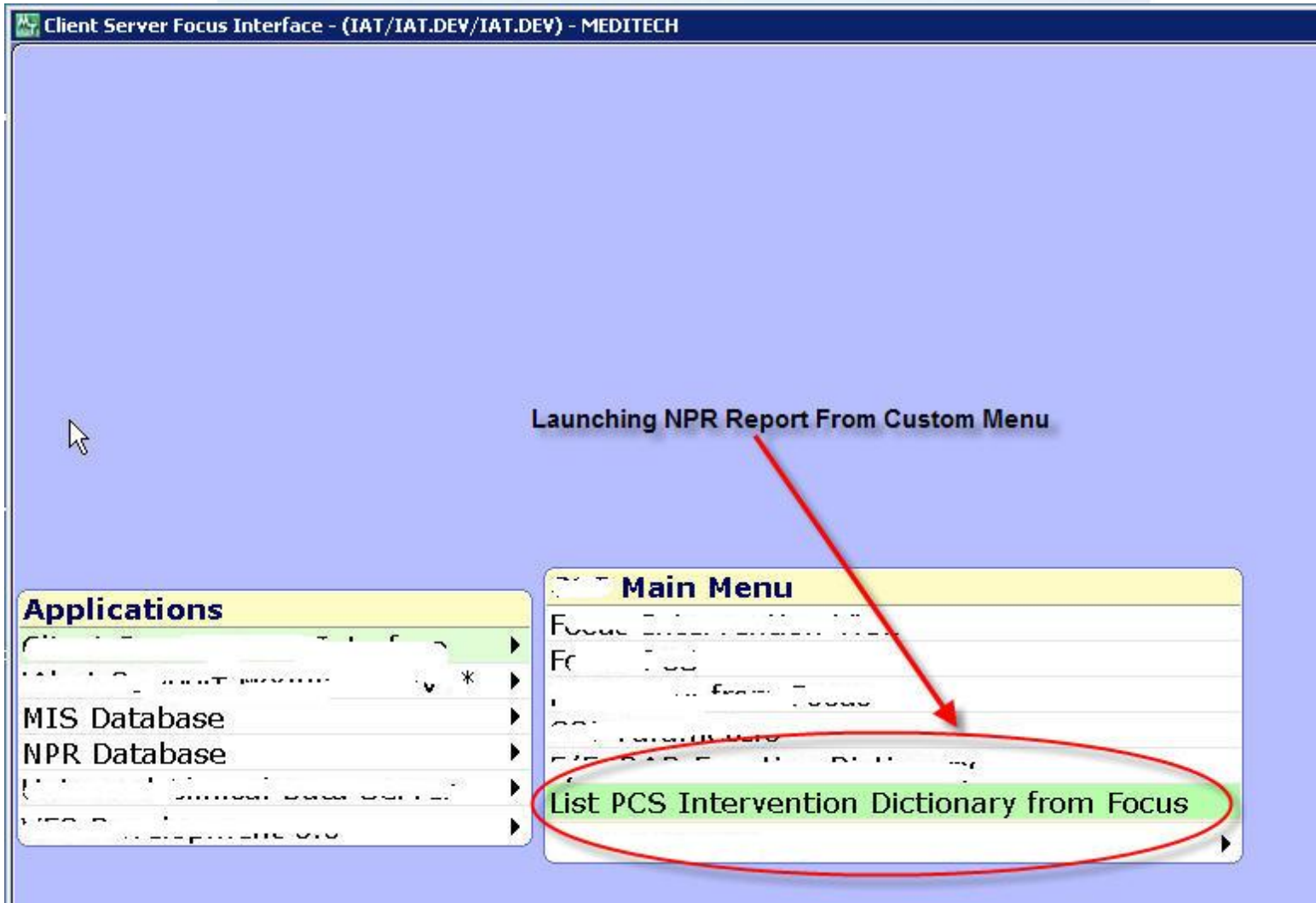
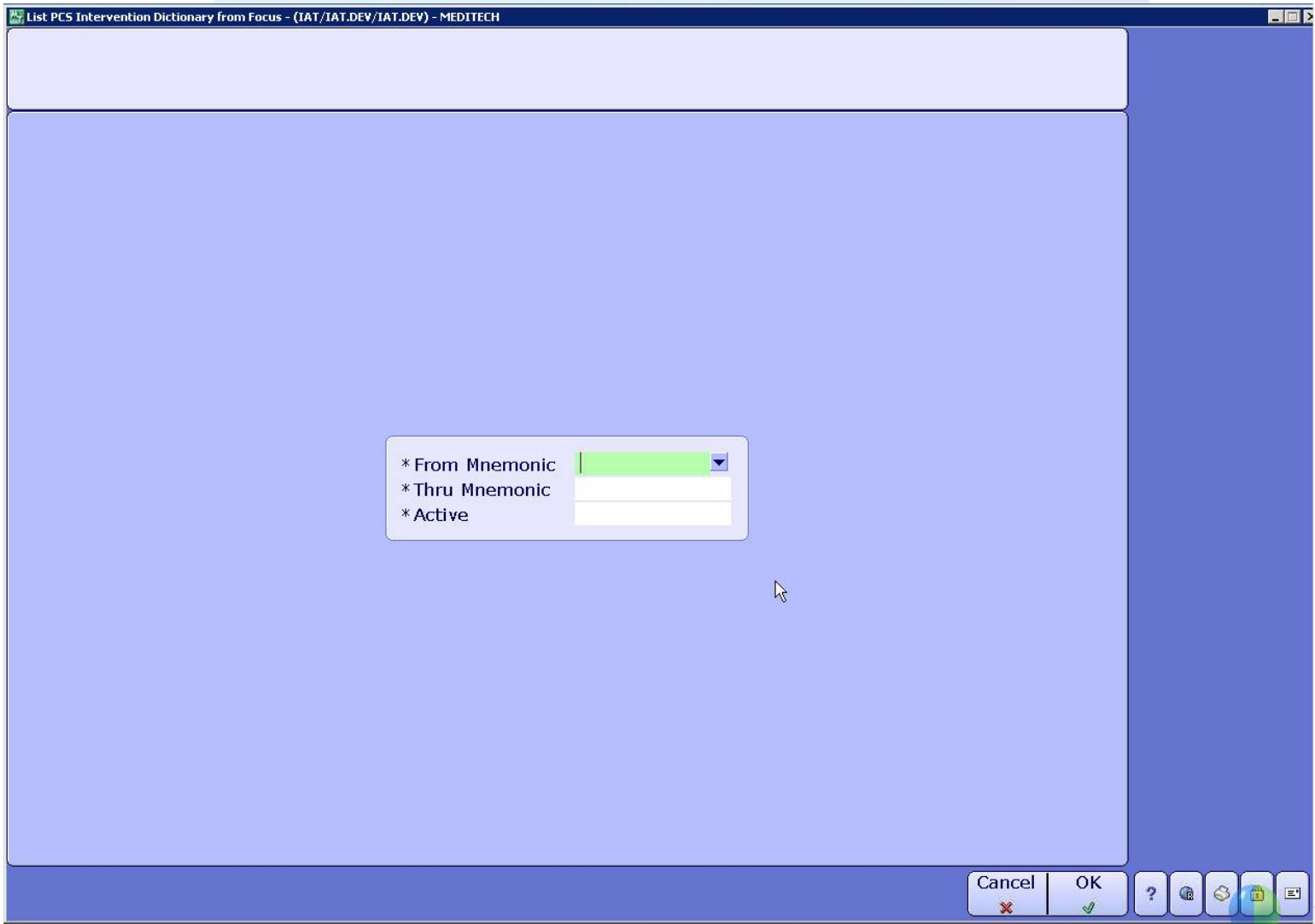
<PAGE 2>
NPR Structure

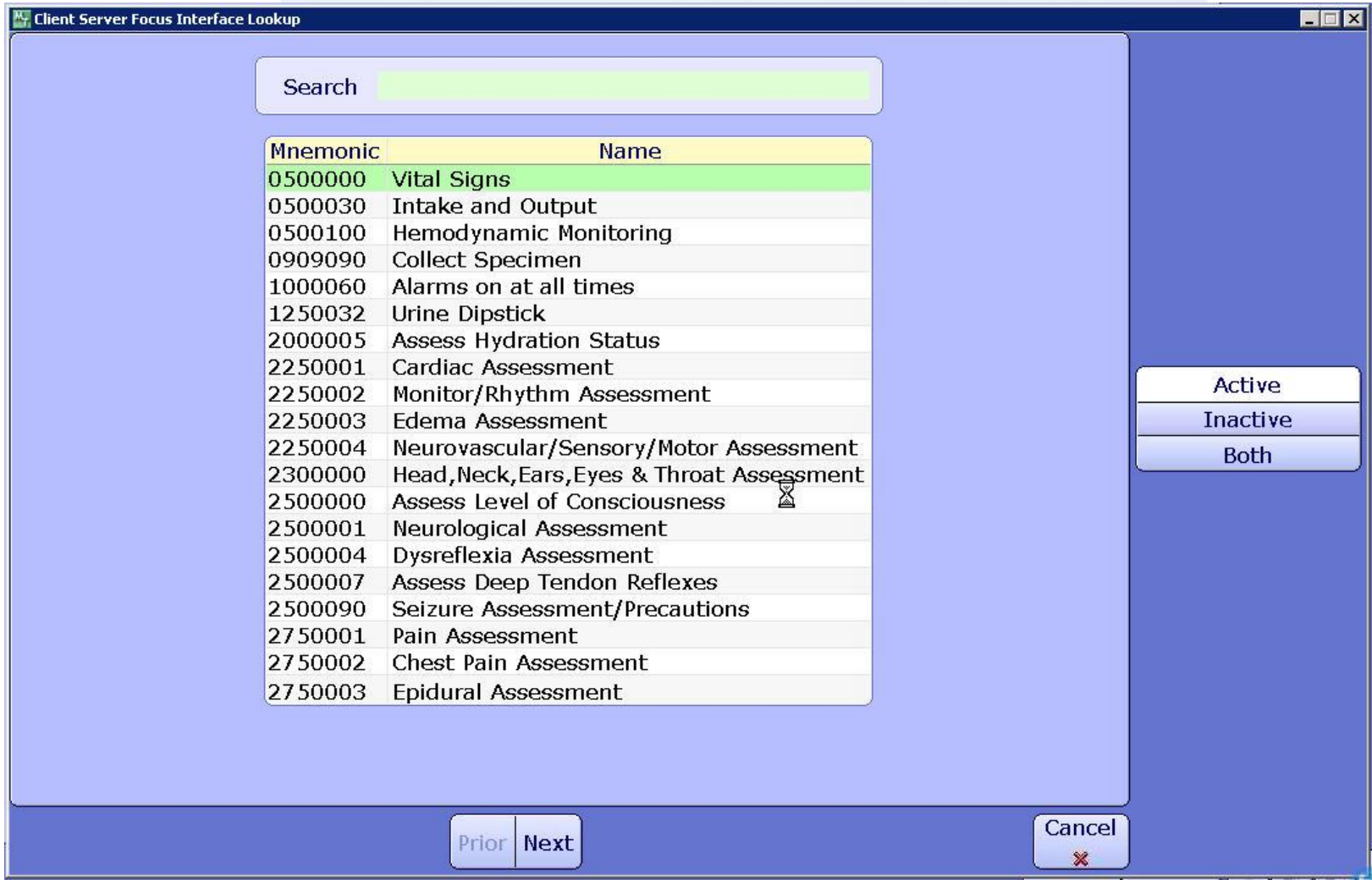
FOCUS Data from CS NPR Rpt



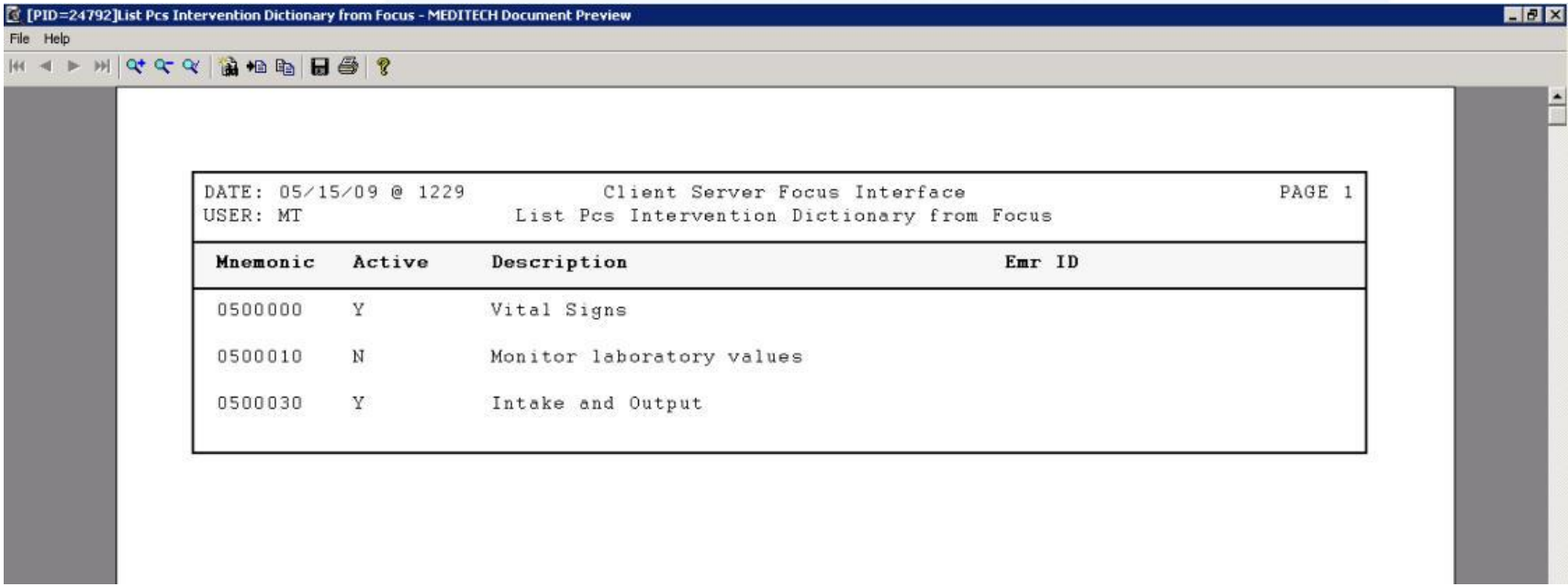
FOCUS Data from CS NPR Rpt



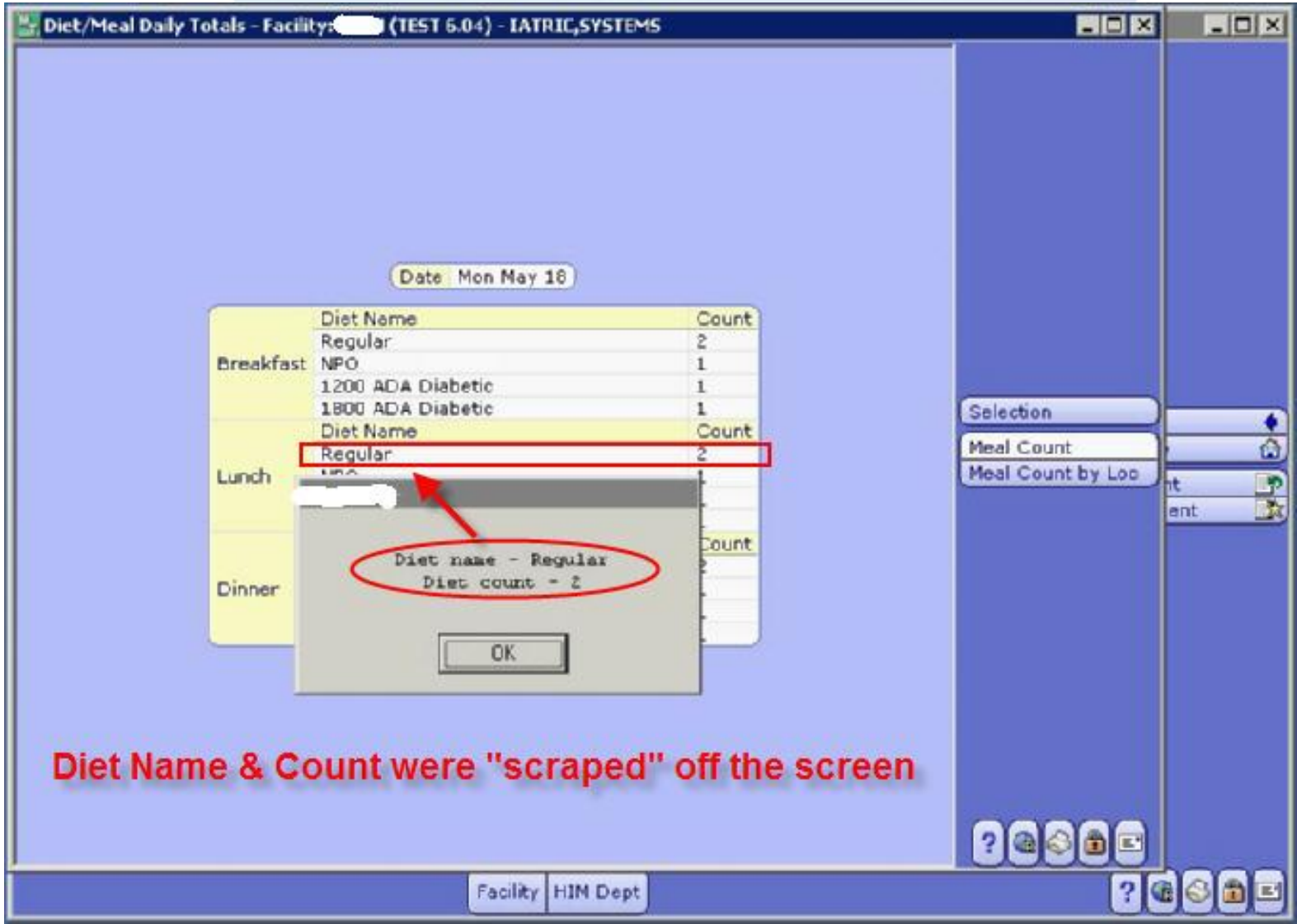
FOCUS Data from CS NPR Rpt



FOCUS Data from CS NPR Rpt



Scripting / Screen Scraping



Key Takeaway!

3rd party software is available **to interface and directly integrate with M-AT applications!!**

REPORT WRITING

Report Writing in 6.x

- There are two report writers (NPR RW & Report Designer)
- **On the M-AT side, terminology has changed**
  - **DPMs are now called Objects**
  - **Segments are now called Records**
  - **Data elements are now called Fields**
- No fragments, macros or *current* ability to use M-AT or FS code inside computed fields

Report Writing in M-AT

- Rule Editor / Wizard *may* eliminate need for code
- **Performance comparisons have been interesting**
- All M-AT application data is available with no special “tricks” needed (e.g. fragments)
- **No current plan to allow NPR to get data from MAD**
- No NPR to M-AT report conversion

IMPROVEMENTS

Improvements in M-AT

- Built-in audit trails of everything
- **Improved network performance**
- Reduced downtime; increased reliability
- **Data corruption virtually eliminated**
- Modern screen technology & workflow

Improvements in M-AT

- Easier for MEDITECH to support
- **A LOT less “locking” issues in FOCUS (thanks to MUTEX)**
- The concept of multiple databases is gone

THINKING ABOUT 6.x?

Things to consider…

- Not an update – Installing new platform(s)
- **Phased Approach / Multiple Conversions (until 6.2)**
- Put in extra effort on report conversion plan!!
- **Understand how much data will be converted**
- Count the cost & decide on best timeframe

Staying FOCUSED in a MAD, MAD, MAD, MAD World!

Thank you for attending!