EXTENSIONS

- Types
  - Tagged Record Extension (TRE)
    - Controlled Extension (CE)
    - Registered Extension (RE)
  - Data Extension Segment (DES)
  - Reserved Extension Segment (RES)
- Structure and Placement
- TRE Overflow
- Configuration Management
- Prominent Groups of Extensions

TRE STRUCTURE

FIELD	NAME	SIZE	VALUE RANGE	TYPE
RETAG or CETAG	Unique extension type identifier	6	Alphanumeric (Value registered with the NTB)	R
REL or CEL	Length of REDATA field	5	1 - 99988	R
REDATA or CEDATA	User-defined data	*	User-defined	R

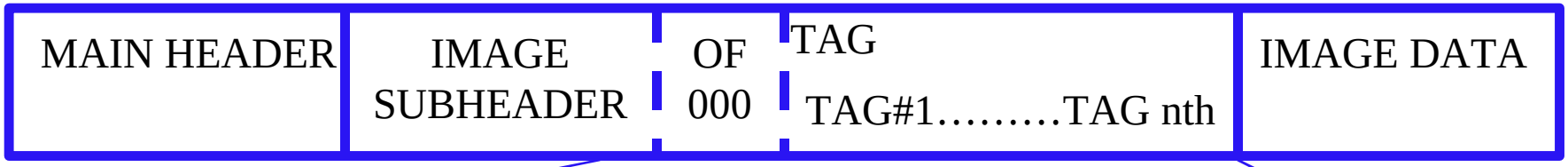
* As indicated in REL or CEL

TRE PLACEMENT

TRE may be placed in:

- File Header (2 x 99,999 bytes available)
  - UDHD (User Defined Header Data)
  - XHD (Extended Header Data)
- Image Subheader (2 x 99,999 bytes available)
  - UDID (User Defined Image Data)
  - IXSHD (Image Extended Subheader Data)
- Symbol/Graphic subheader (1 x 99,999 bytes available)
  - SXSHD (Symbol Extended Subheader Data)
- Text Subheader (1 x 99,999 bytes available)
  - TXSHD (Text Extended Subheader Data)
- OVERFLOW DES (999,999,999 bytes available).

CE & RE TAG EXTENSION DATA



FIELD NAME	FIELD VALUE	BYTE LENGTH
UDIDL	00000	5
IXSHDL	00167	5
IXSOFL	000	3
CETAG	PIATGA	6
CEL	00096	5
CEDATA	TAG INFO	96
CETAG	PIAEVA	6
CEL	00046	5
CEDATA	TAG INFO	46

***n for this case is two (2 tags)**

DES/RES STRUCTURE

FIELD	NAME	SIZE	VALUE RANGE	TYPE
DE	File Part Type	2	DE	R
DESTAG	Unique DES type identifier	25	Alphanumeric	R
DESVER	Version of the data field definition	2	1 to 99	R
DESSG	Security group	†	(See Table XVIII)	R
DESOFLOW	Overflowed header type	6	Alphanumeric	C
DESITEM	Data item overflowed	3	0 to 999	C
DESSHL	Length of user-defined subheader fields	4	0-9999	R
DESSHF	User-defined subheader fields	*	Alphanumeric	C
DESDATA	User-defined data field	**	User defined	R

RES structure uses the same field structure (i.e., RE, RESTAG, RESVER, RESSG, RESOFLOW, RESITEM, RESSHL, RESSHF, and RESDATA).

DES & RES EXTENSION SEGMENTS

- **DES (NITF 2.0)**
  - **Controlled Extensions (Overflow CEs)**
  - **Registered Extensions (Overflow REs)**

- **DES (NITF 2.1)**
  - **TRE_OVERFLOW**
  - **STREAMING_FILE_HEADER**

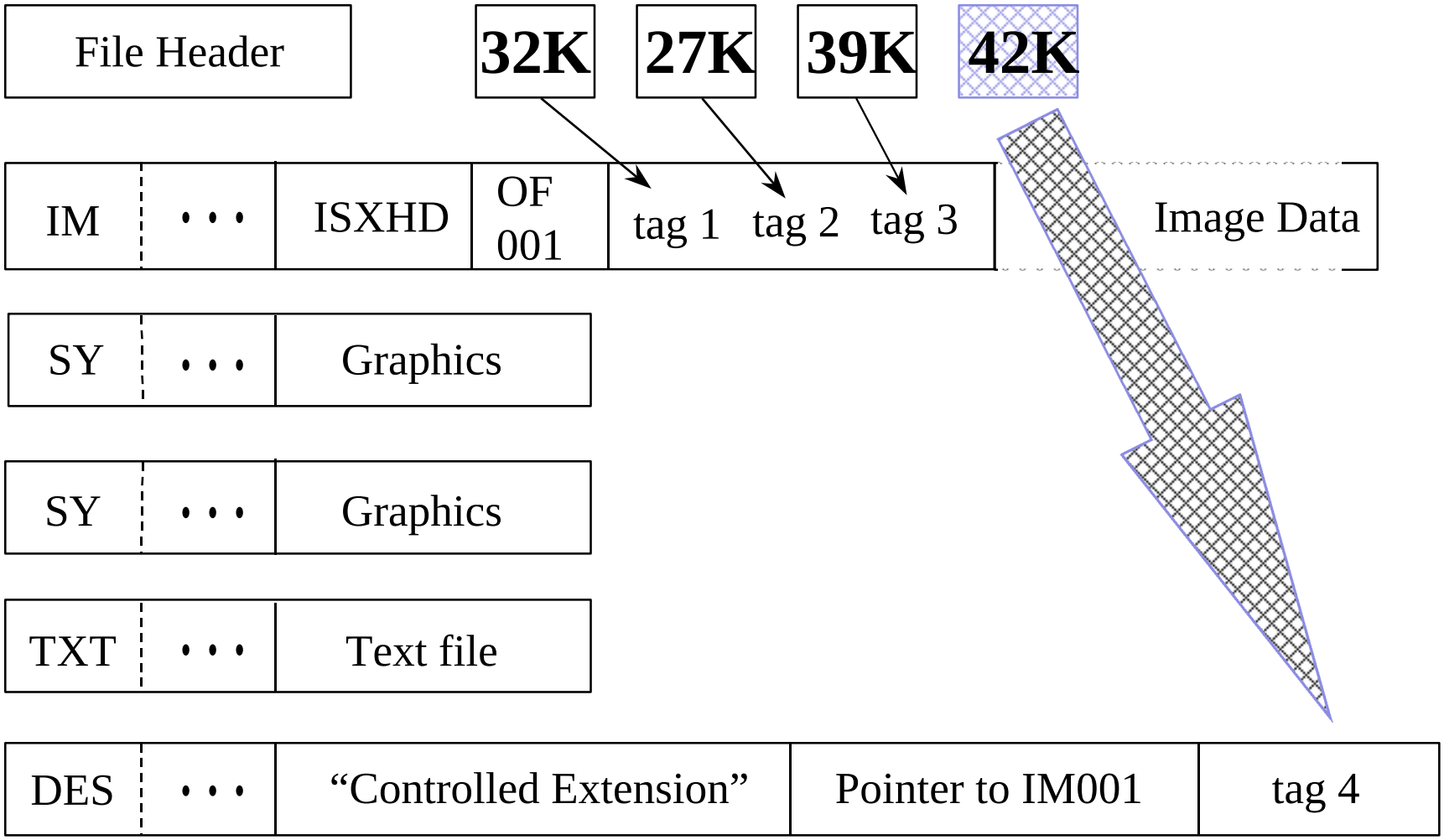
- **RES (Future)**

TRE_OVERFLOW DES STRUCTURE

Example

FIELD	VALUE	SIZE
DE	DE	2
DESID	TRE_OVERFLOW	25
DESVER	01	2
DECLAS	T, S, C, R, or U	1
SECURITY FIELDS		166
DESOFLW	UDHD, UDID, XHD, IXSHD, SXSHD, TXSHD	6
DESITEM	000 to 999	3
DESSHL	0000	4
DESDATA	User-defined TREs with no intervening octets	[illegible]

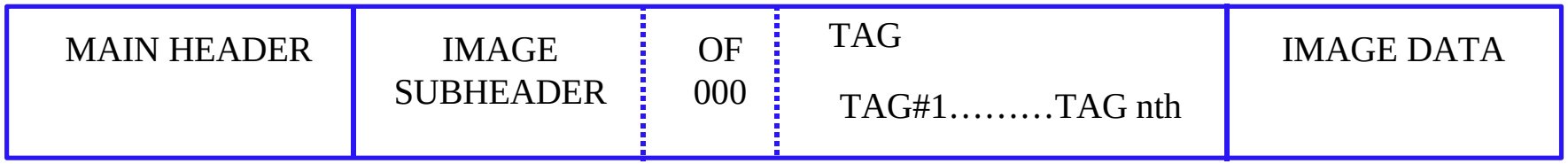
CE OR RE WITH DES OVERFLOW TAGS



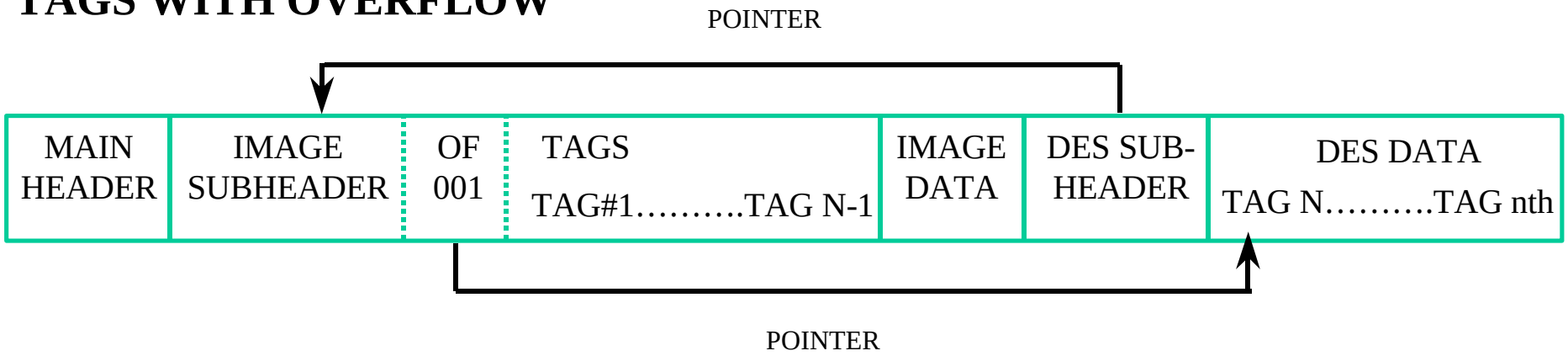
OVERFLOW

NO TAGS

TAGS NO OVERFLOW



TAGS WITH OVERFLOW



CONTROLLED TAG GENERAL STRUCTURE W/OVERFLOW

FIELD NAME	FIELD VALUE	BYTES
FHDR	NITF02.00	9
CLEVEL	06	2
ETC.	**ETC.**	**ETC.**
FL	0000805075764	12
HL	000417	6
L1001	0084934656	10
NUMS	000	3
NUML	000	3
NUMT	000	3
NUM DES	001	3
LDSH001	0249	4
LD001	000042000	9
NUM RES	000	3
UDHDL	00000	5
XHDL	00000	5
IM	IM	2
ETC.	**ETC.**	**ETC.**
IMAG	1.0	4
UDIDL	00000	5
IXSHDL	98003	5
IXSOFL	001	3
IXSHD	98000	TAG DATA
IMAGE DATA		
DE	DE	2
DES TAG	CONTROLLED EXTENSIONS	25
ETC.	**ETC.**	**ETC.**
DES FLOW	IXSHD	6
DES ITEM	001	3
DES SHL	0000	4
DATA EXTENSIONS SEG 42000		

MAIN NITF HEADER

IMAGE SUBHEADER

DES SUBHEADER

***Capacity of IXSHD is 99,999 BYTES. The first three tags fit into the IXSHD while TAG 4 is overflow in the Data Extension Seg.**

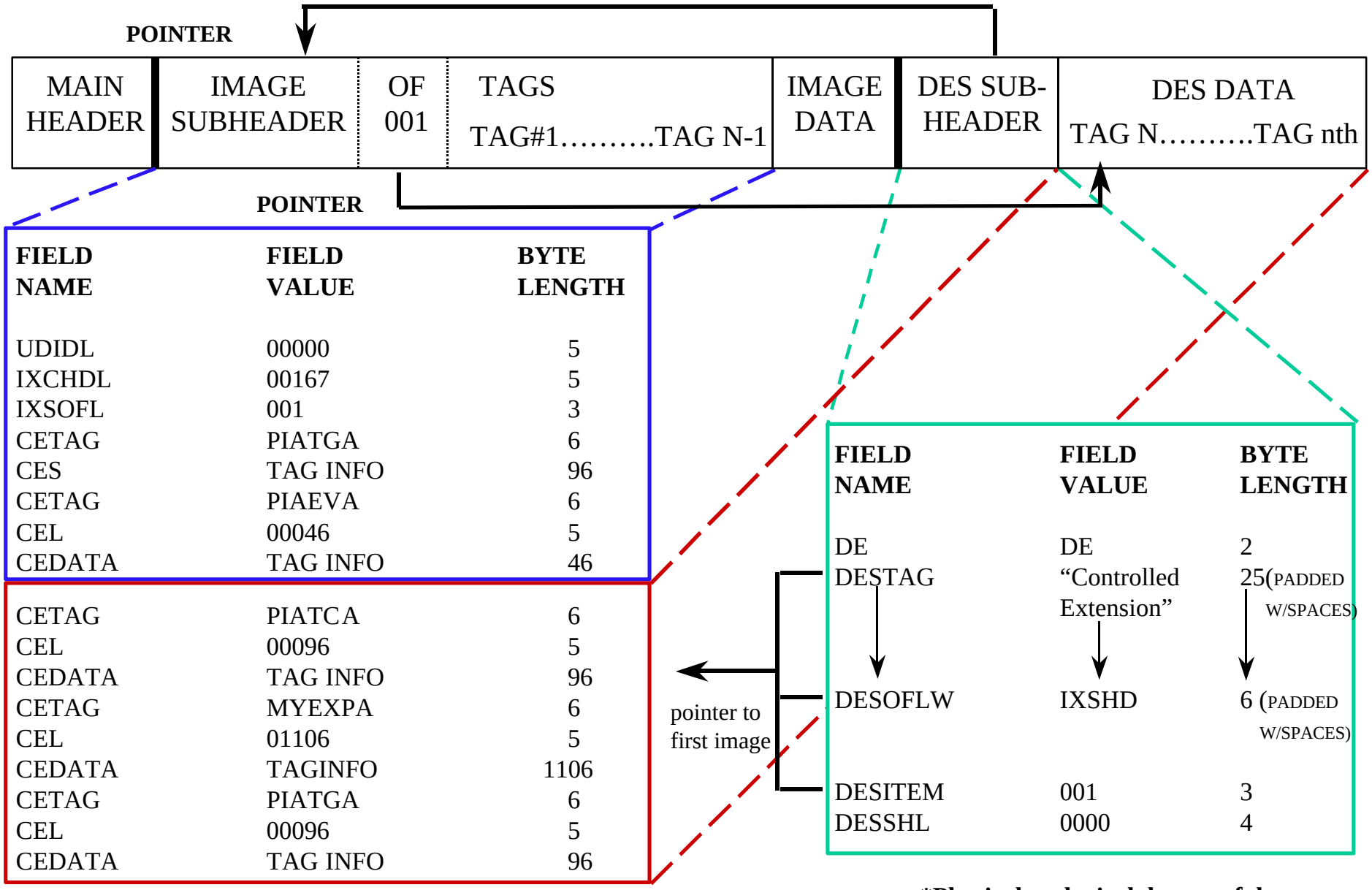
TAG 1 = 32,000 BYTES

TAG 2 = 27,000 BYTES

TAG 3 = 39,000 BYTES

TAG 4 = 42,000 BYTES

GENERAL STRUCTURE OF TAG DATA W/OVERFLOW



***Physical vs. logical layout of data**

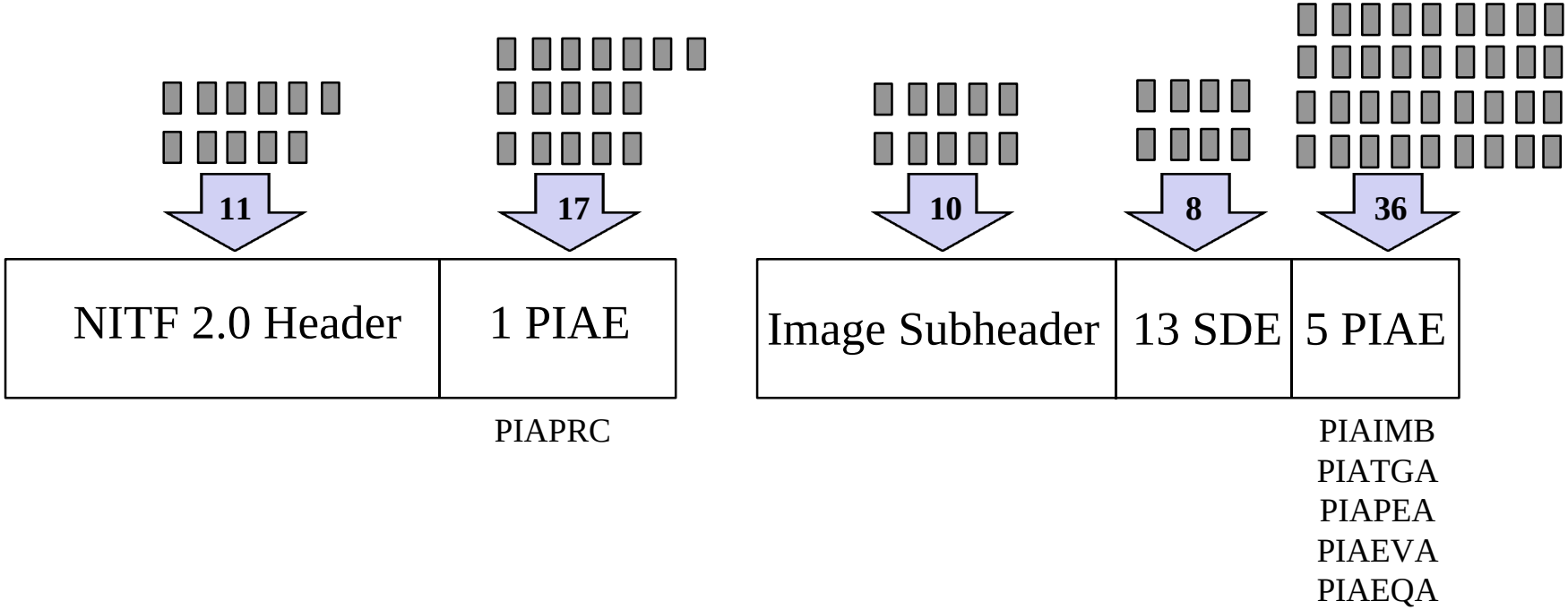
***N = 3, n = 5**

CONFIGURATION MANAGEMENT

- All Controlled Extensions (CEs) are managed by the NTB, to include : name, content, version numbers, and dates. Specifications are available to users.
- Registered Extensions (REs) are managed by name only. Developers must provide to the NTB a rationale for using a Registered Tag instead of a Control Tag. Name value registrations expire in two years.
- DES/RES, also managed by the NTB, used for more stand alone type data and/or for overflow data areas.

PIAEs

Mapping of Archiving Elements of NITF



NITFS TAGGED RECORD EXTENSIONS

- RPF - NIMA Raster Product Format Files (CIB/ CADRG)
  - RPFDES, RPFHDR, RPFIMG
- DPPDB - Digital Point Positioning Data
  - IMASDA, IMRFCA, IMCBDA, MASDIR, MSDIRA, OIMCBD, OIMRFC, OIMSD, PPRSDA, PPSD, PRADAA, PRADRA, PROADA, PSD, PROADR, PSUPDA, PTPRAA, RFGRDR, RGRDRA, SEGSPA, SIMCBD, SIMSD, SIMRFC, SSIDD, SISDDA, SSDPDA
- PIAE - Profile for Imagery Archives Extensions
  - PIAEVA, PIAEQA, PIAIMB, PIAIMC, PIAPEA, PIAPEB, PIAPRC, PIAPRD, PIATGA, PIATGB
- Geospatial - Tags to support a common geospatial format (DIGEST)
  - ACCHZ, ACCPO, ACCVT, GEOPS, GEOLO, GRDPS, MAPLO, REGPT, SNSPS, SOURC

NITFS TAGGED RECORD EXTENSIONS (CONT'D)

- Airborne SDE - Support Data Extensions for visible, IR and SAR Airborne systems
  - ACFT, AIMID, BANDS, BLOCK, EXOPT, EXPLT, MENSR, MPDRS, MSTGT, MTIRP, PATCH, RPC00, SECTG, SENSR, STERO
- Commercial SDE - Support Data Extensions for Commercial Products
  - STDIDC, STREOB, USE00A
- Complex Imagery
  - CMETAA

NITFS TAGGED RECORD EXTENSIONS (CONT'D)

- Pre and Post Processing - 12-bit JPEG
  - IOMAPA
- ECC
  - NHECCA, NIECCA
- MISCELLANEOUS
  - HISTOA, ICHIPA, ICHIPB

PRODUCTS

- Geospatial
  - DPPDB
  - CIB /CADRG
  - SRTM
  - Gridded Data Set
- Airborne
- Commercial
- Complex (CMETAA)
- Chipping

DPPDB
Digital Point Positioning Data Base

- Consists of a number of stereo Image Models that range between 50 and 60 NM on a side
- Each stereo Image Model is divided into 5-10 segment models
- Each segment model consists of a left and right segment image
- File structure and content of each DPPDB tape conforms to NITF 2.0 using DPPDB Tagged Record Extensions
- Overview image (reduced resolution)
- CADRG map files (NITF format with RPF TREs)

CIB
Controlled Image Base

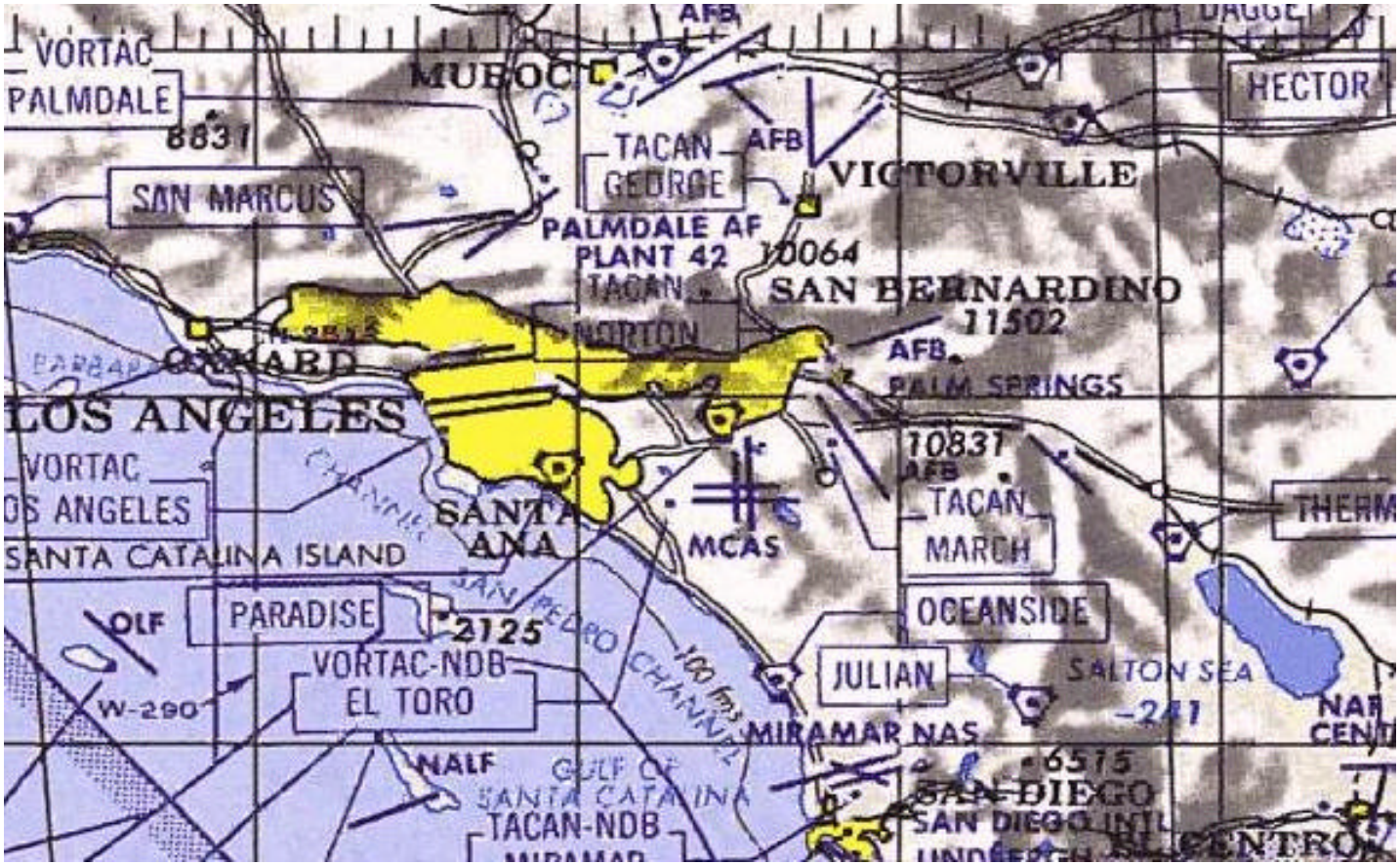
- Dataset of orthophotos made from rectified grayscale aerial images
- CIB supports:
  - weapons
  - C3I Theater Battle Management
  - Mission Planning
  - Digital Moving Map Systems
  - Terrain analysis and Intelligence Systems
- CIB files are formatted within a NITF file

SAMPLE CIB

CADRG
Compressed ARC Digitized Raster Graphic

- Computer-readable Digital Maps and Charts
- CADRG supports:
  - weapons
  - C3I Theater Battle Management
  - Mission Planning
  - Digital Moving Map Systems
- CADRG is derived directly from ADRG
- CADRG files are formatted within a NITF file

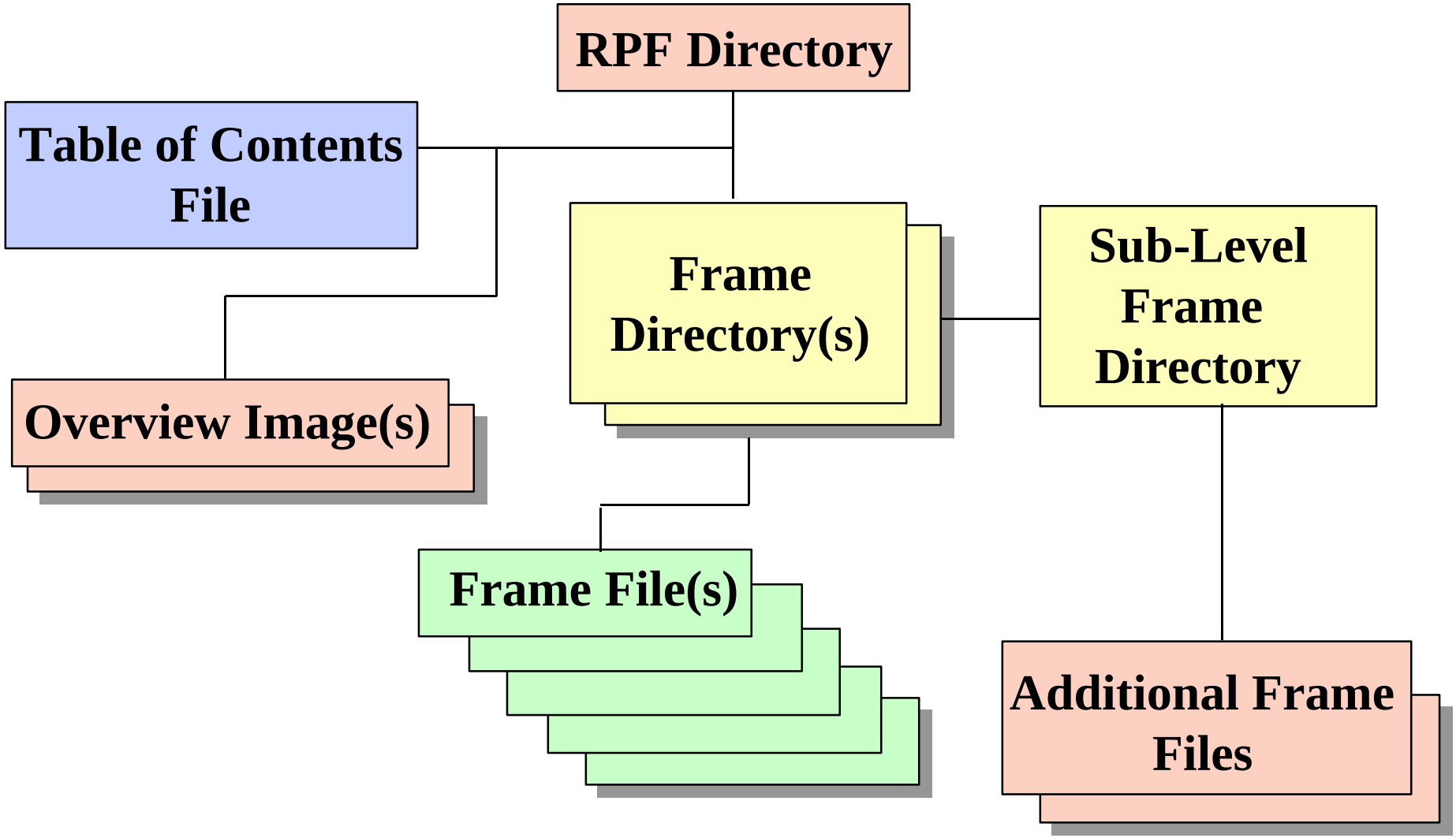
SAMPLE CADRG



RPF FILE STRUCTURE AND COMPONENTS

- Multi-file Structure
- TOC and Frame File Contents
- RPF and NITF
- Virtual Matrix

RPF MULTIFILE STRUCTURE

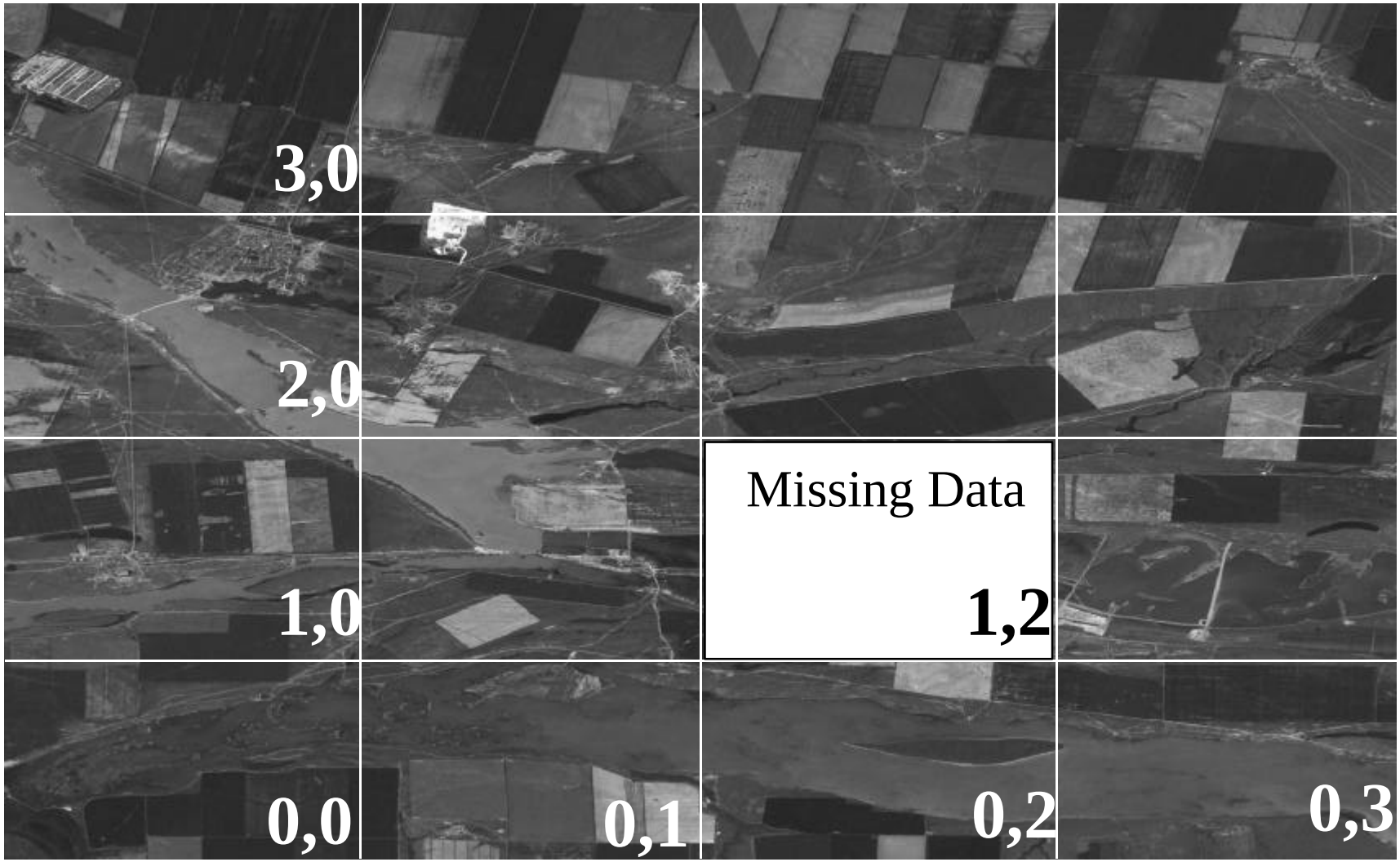


VIRTUAL MATRIX

- Both functions are accomplished via a virtual matrix of Frame Files

3,0			
2,0			
1,0		**Missing Data 1,2**	
0,0	**0,1**	**0,2**	**0,3**

VIRTUAL MATRIX EXAMPLE



SRTM PRODUCTS

- **Digital Terrain Elevation Data**
  - **DTED Level 2 format**
- **Terrain Height Error Data (THED)**
  - **NITF2.1 format with GeoSDEs**
- **Orthorectified Image Mosaic**
  - **Ascending**
  - **Descending**
  - **NITF2.1 format with GeoSDEs**
- **Seam-Hole Composite Map**
  - **Color-coded Raster showing:**
    - **Seams of the mosaic**
    - **Holes showing void data areas**
  - **NITF2.l format with transparent pixel mask**

GRIDDED DATA SETS

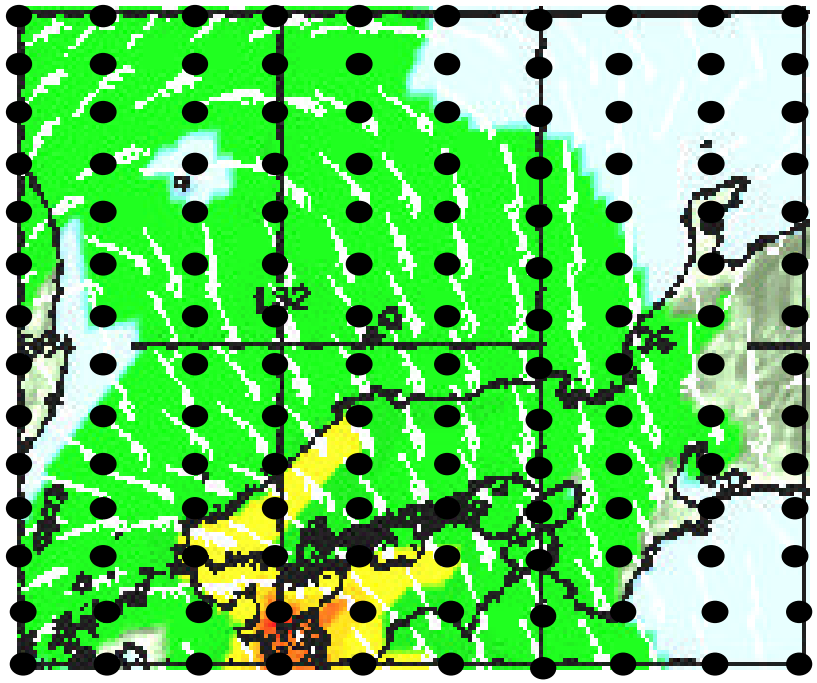
- Types
  - Location Grids
  - Digital Terrain Elevation Models
  - Multiple Layer Data Cubes
    - Climatology-Layered Information
    - Climatology-Time-based Models
- Structure and Placement
  - Uniform-Single Image Segment with multiple bands.
  - Not uniform-multiple image segments.
- Prominent Groups of Extensions

WHAT IS A GRIDDED DATA SET

- **Typically**
  - multi-dimensional
  - multi-variable
  - well ordered
- **Often**
  - "reference" data sets
  - output of models
    - gigabytes
    - may be managed as multiple files

Source: http://ferret.wrc.noaa.gov/slides

LOCATION GRIDS



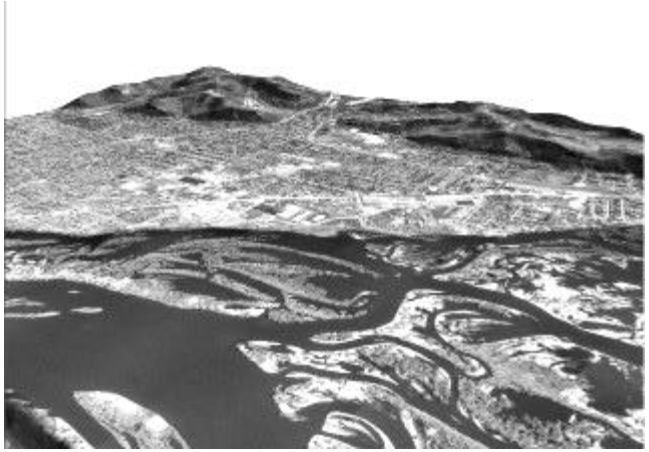
- Two Bands
  - Band X: Longitude or Easting
  - Band Y: Latitude or Northing
- Single Image Segment
  - IREP = LOCG
  - Band X ISUBCAT: CGX or GGX
  - Band Y ISUBCAT: CGY or GGY
- Regularly spaced intervals
- Grid Description
  - Origin and Ground Spacing described using the DIGEST GeoSDE GRDPS.
  - Data Density is described for rows and columns.
  - Origin for the location grid is also described.

Digital Terrain Elevation Models

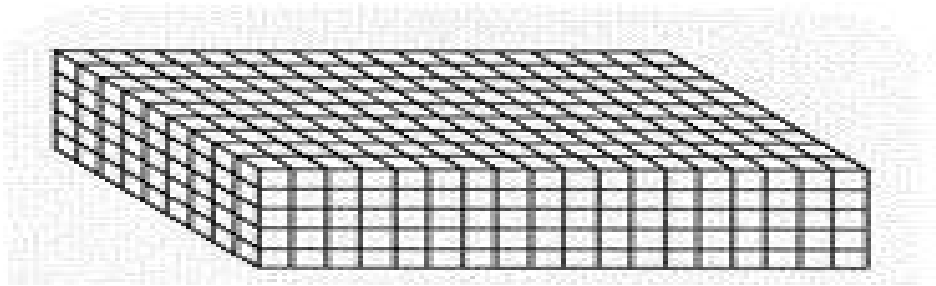
- Single Band
  - Band X: Elevation values
- Regularly spaced horizontal intervals
- Single Image Segment
  - IREP = NODISPLY
  - ICAT = DTEM
  - Band X ISUBCAT: denotes unit of measure
- Associated SDEs
  - Accuracy: ACCPO; ACCHZ; ACCVT
  - Location: GEOPS; GEOLO/MAPLO
  - Source:SOURC; SNSPS
- Examples:
  - DTED, DEM

- Output Products:
  - Contour Maps
  - Image Drape

Sample Image Drape



Multi-Variable Matrices



- Matrix Description: 3 indexes I, J and K.
- Example: Climatology Data Cube [15-20 Layers]
- Assumption: regularly spaced in all directions [I, J and K]
    - Single Image segment
    - IREP = NODISPLY
    - ICAT = MATR
    - ISUBCAT = ?
    - Associated SDEs:
        - Accuracy: ACCPO; ACCHZ; ACCVT
        - Location: GEOPS; GEOLO/MAPLO
        - Source:SOURC; SNSPS

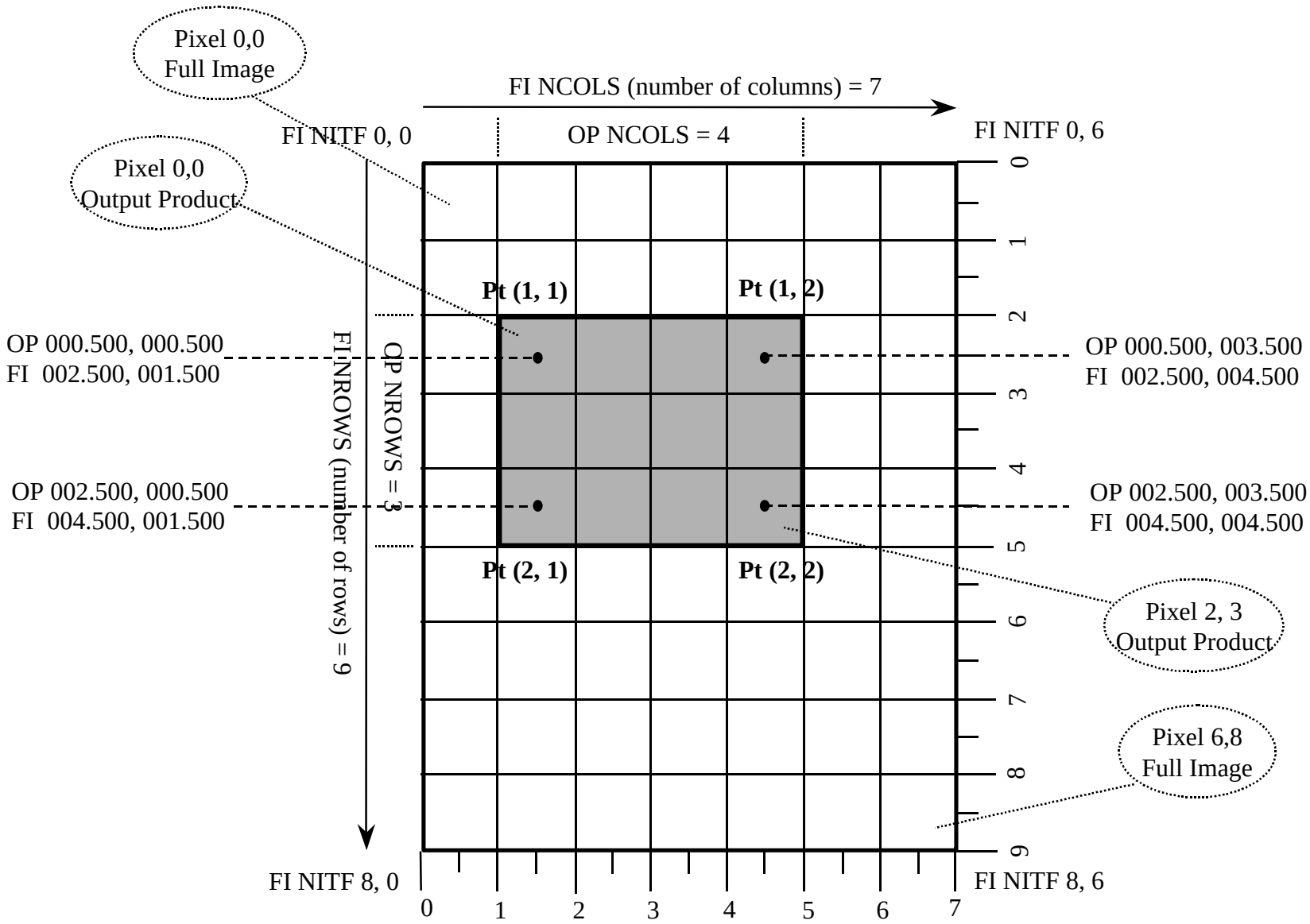
AIRBORNE PRODUCTS

- Airborne, to include UAV Collectors
- Process Under Development
- VIS, IR, SAR
- Multi-spectral/Hyper-spectral
- Support Data Extensions

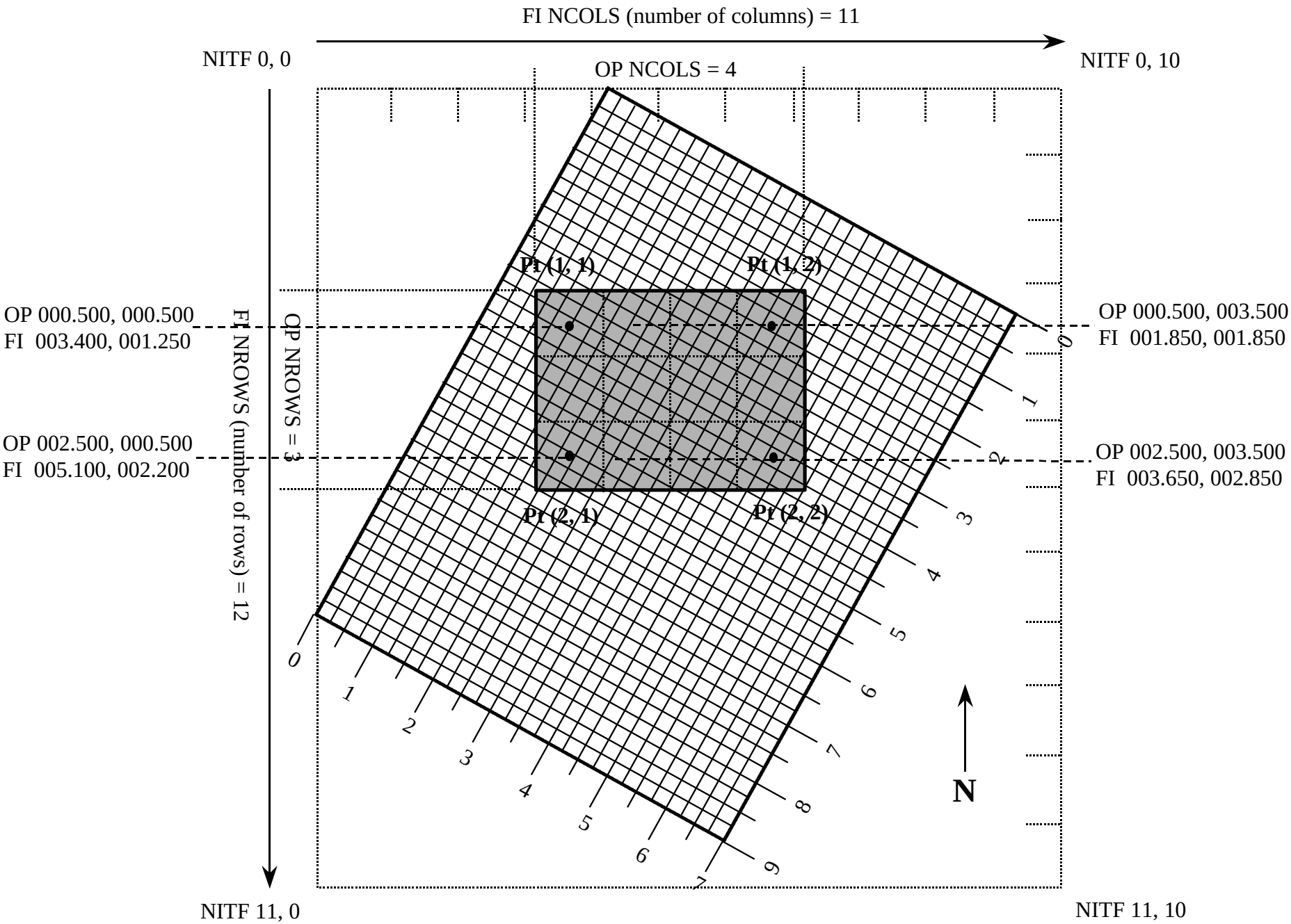
CHIPPED OUTPUT PRODUCTS

- Chip = Image “Sub-Product”
- Support Data Extension (SDE) “Coverage”
- FAF Boundaries
- Chipping on Tagged Record Extensions (TRE)
  - ICHIPB
  - I2MAPD
- Examples

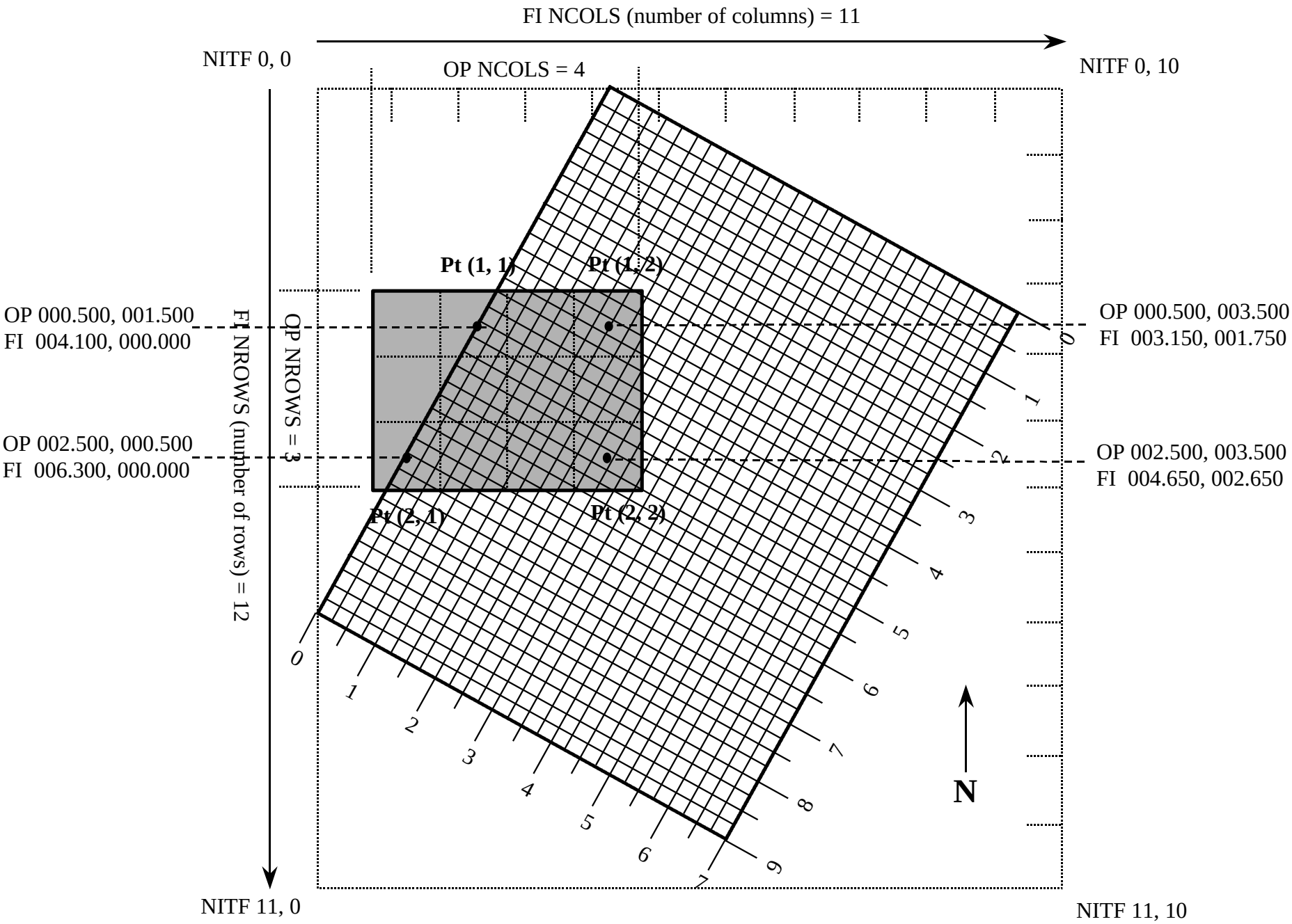
PIXEL VS. GRID ORIENTATION



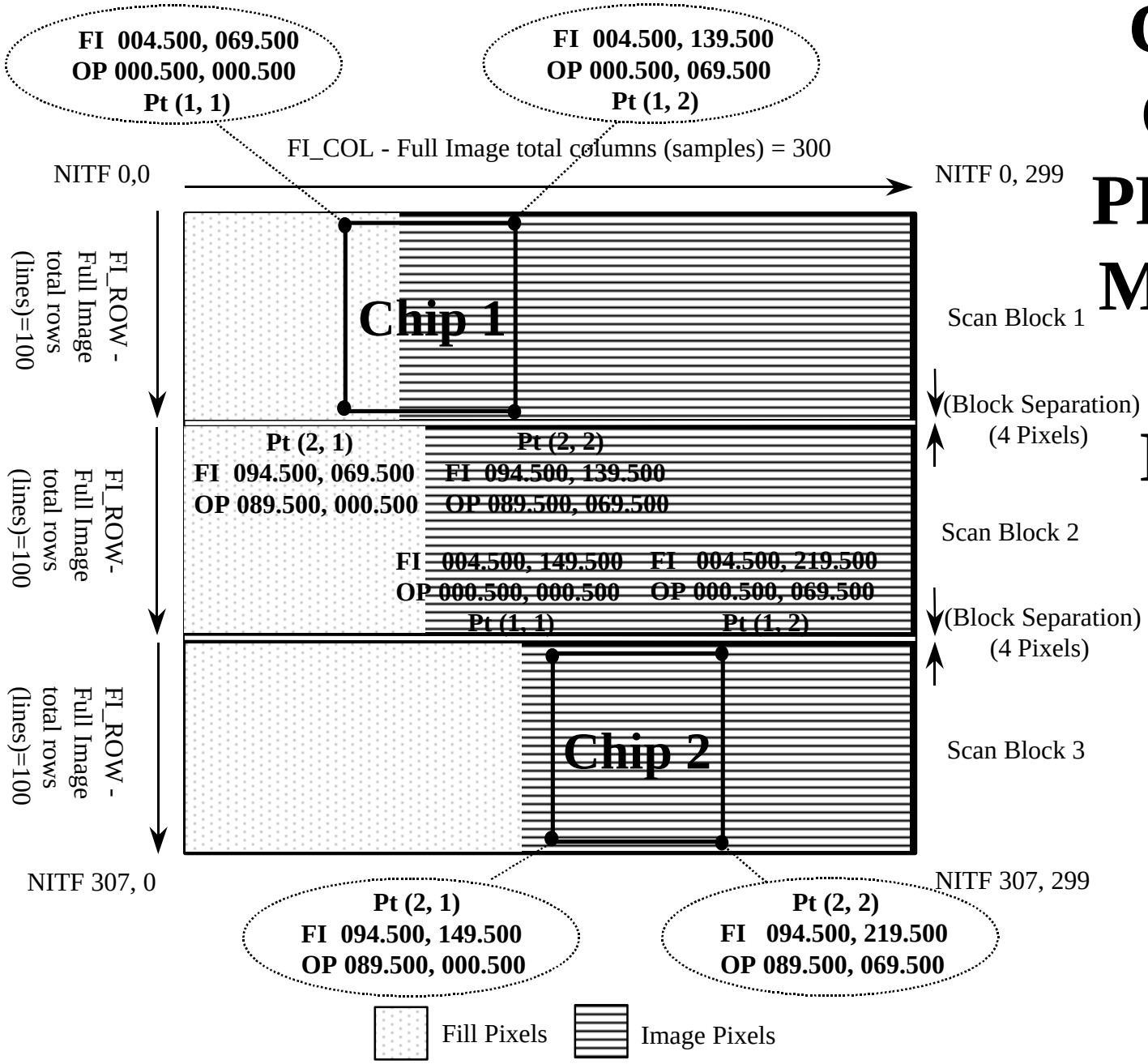
PIXEL VS. GRID ORIENTATION - ROTATION



PIXEL VS. GRID ORIENTATION - ROTATION W/ “INSIGNIFICANT” PIXELS



CHIPPED OUTPUT PRODUCT - MULTIPLE SCAN BLOCKS



WRAP-UP

- Enhancements in NITF 2.1
- Change Summary NITFS 2.0 to NITFS 2.1
- Internationalization
- The BIIF Relationship
- NITF Test Services

ENHANCEMENTS IN NITF 2.1

NITF 2.1

* Adds New Features Based On Requirements Coming From Field Use
* Is the US Documentation of NATO STANAG 4545
* Represents What Will Eventually Be A Profile of BIIF

MAIN ENHANCEMENTS:

* Year 2000 Compatible Data Structure
* Modified Security Fields to Align With New Exec Order
* Rectangular Block Size
* Alternative Textual Character Sets For International use
* Increases Flexibility of Product Configuration
* Expanded CGM
* Graphic Bounding Rectangles
* Multi-spectral
* Hyper-spectral
* Real Data Types
* Complex Data Types
* JPEG 2000 Compression

CHANGE SUMMARY NITFS 2.0 TO 2.1

	NITF 2.0	NITF 2.1
C-Levels	01-06 & 99	03, 05-07
STYPE	Unused	BF01
Date & Time	Year, ZULU	Added Y2K (Century)
Security Fields	Old policy	New policy
Background Color	Optional	Required
Block Shape/SIZE	Square, 32 x 32 To 1024 x 1024	Rectangular, variable
Block/Pixel Masks	Optional	Required
JPEG 12-bit	Optional	Required (Decompression)
VQ	Optional	Required (Decompression)
Geographic Info	Minimal	Robust
Multi-Spectral	4-band only	Supported
Hyper-Spectral	Not supported	Supported
Complex Imagery	Not supported	Supported
Video Clips	Not supported	Support Planned

INTERNATIONALIZATION OF THE FORMAT

- International Standardization Organization (ISO) Effort
- International Standard 12087-5, Basic Image Interchange Format (BIIF)
  - Approved as an IS, Feb. 1998, published 1 Dec 98
- ISO Registration Authority
  - Profiles of BIIF
  - Profiles of CGM
- NATO STANAG 4545 NSIF
  - Ratified, promulgation date of 2 December 1998

THE BIIF RELATIONSHIP

*BIIF

Format (ISO/IEC 12087-5)

Graphics (Profile of ISO/IEC 8632)

Bandwidth Compression

- JPEG (Profile of ISO/IEC 10918-1)
- VQ (ISO/IEC 12087-5 Annex B)
- Bi-Level (ITU-T RECMN T.4)

Audio (To be defined by Profile)

Video (To be defined by Profile)

Geospatial SDE (TC211)

*NITF & NSIF

Format (NITF: MIL-STD-2500B)
(NSIF: STANAG 4545)

Graphics (MIL-STD-2301)

Bandwidth Compression

- JPEG (MIL-STD-198A)
- VQ (MIL-STD-199)
- Bi-Level (MIL-STD-196)

Audio (undefined)

Video (Definition in progress)

Geospatial SDE (DIGEST)

NITF TEST SERVICES

- Sample NITF 2.1, NITF 2.0 & NITF 1.1 Files
  Call 520-538-5458
  DSN 879-5458
- WWW Access
  http://jitc.fhu.disa.mil/nitf/nitf.htm
- Email: jitcn@fhu.disa.mil
- Phone: (520) 538-5458
  DSN 879-5458

OTHER KEY URLS

- ISMC/GSMC
  - http://www.ismc.nima.mil
- NTB

  http:// www.ismc.nima.mil/ntb
- TRE Register/Product Register

  http://jitc.fhu.disa.mil/nitf/nitf.htm