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We fluidify the data traffic

Instant IT solutions fluidify
the exponentially growing data traffic,
by optimizing the access to the data
onto existing I&C infrastructures.

Why still be waiting for data?

C4eyes™

C4eyes™ **enables high-resolution Network Centric C4ISTAR**

What the US DoD's UAV Roadmap says

» "Today, and for the near-term, the paradigm is to relay virtually all airborne data to the ground and process it there for interpretation and decisions. **Eventually, however, onboard processing power will outstrip data link capacities and allow UAVs to relay the *results of their data*, vice the data itself, to the ground for decision making**. Meanwhile, data compression will remain relevant into the future as long as band-limited communications exist, **but it is unlikely that compression algorithms alone will solve the near term throughput requirements of advanced sensors**: a technology that intentionally discards information is not the preferred technique. **For now, compression is a concession to inadequate bandwidth**."

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Relaying every ISTAR Data to the Ground ?...

» The next generation HIS sensor for the Predator UAV will be continuously generating 60GBytes of RAW hyper-spectral data per second:
  – 30 frames/s
  – 4 MPixels sensor
  – 16 bits pixel depth per spectral band
  – 256 spectral bands

» This represents:
  – 480 Gbits/s of RAW data to be compressed and transferred to the Ground Segment...

100's Mbps ... Gbps

Ground Station Servers

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C4ISTAR: today's reality

» Image Compression
  – Physical Data Compression inducing Data Losses
  – Inefficiency due to massive transfer of unnecessary data

» Broadband Communication
  – Complexity and Cost

» Brute Force Computing
  – Complexity and Cost
  – Inefficiency due to massive processing of unnecessary data
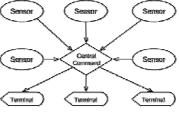
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Network Centric C4ISTAR means…

» Smart Data Extraction
  – *Functional Data Reduction* instead of Physical Data Compression
  – "*Extract what you need*" instead of Blind Downloads of huge Data Chunks

» Communication Bandwidth Independence
  – Limiting the Data Transfers to *what only makes sense*
  – Transferring *Reference to a Content* instead of the Content itself

» Smart Distributed Processing
  – Shifting a part of the Data Processing into the Sensor Platform will turn it into a Network Centric Sensor Node

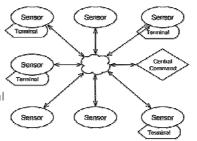*INSTANT IT*

Traditional Server-centric Approach

» Today's traditional Central Command-centric operational mode for C4ISTAR leads to severe limitations and drawbacks:
  – As every sensor's RAW data have to be transferred to its Central Computer (e.g. its Ground Station for a UAV), a huge bandwidth is required for transferring data that are not always useful
  – Tactical use of local sensors leads to generating global Information & Communication load, diminishing the overall available cross-sectional communication bandwidth

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C4eyes™ is by essence Network-centric

» By embedding an image / data server
into the sensor node, C4eyes™ turns the
C4ISTAR infrastructure into the Network-
centric mode of operation:

   – Battlefield Intranet:
every user has access
to every sensor data (*)

   – Dramatic communication
network bandwidth savings
thanks to load distribution:
tactical accesses remain local

   – Distributed multi-sensors
Data Fusion

   – Mixed operational mode:
     – Push (Events)
     – Pull (Browsing)

(*) provided that the user has the rights to access these data
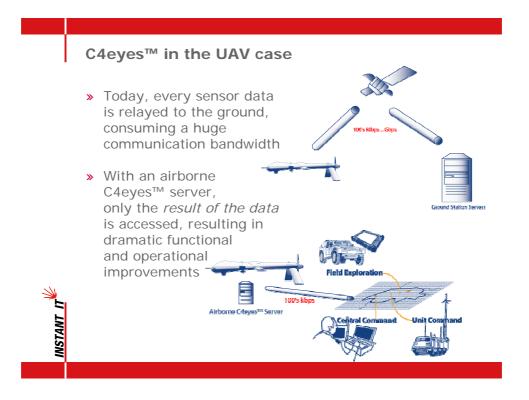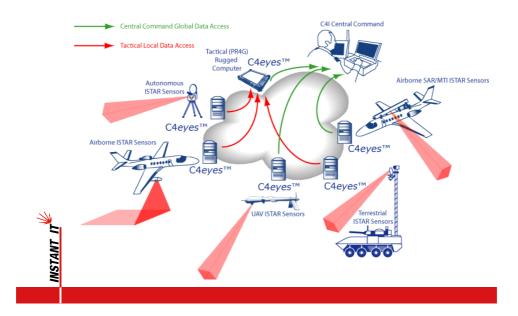

C4eyes™ generic case

» The embedded
C4eyes™ servers
turn every image
and data source
within the Digital
Battlefield to an
instantly browsable
C4ISTAR image &
data node.

» Access to the data
is ensured and
controlled through
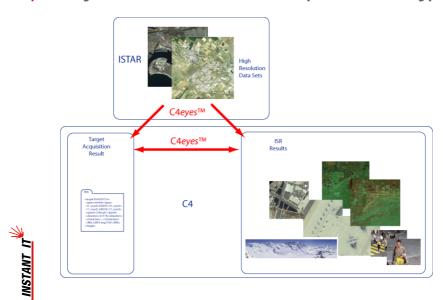content indexing
and signaling
Battlefield Intranet

C4eyes™ in the UAV case

» Today, every sensor data is relayed to the ground, consuming a huge communication bandwidth

» With an airborne C4eyes™ server, only the *result of the data* is accessed, resulting in dramatic functional and operational improvements

C4eyes™ turns Sensors into C4ISTAR Nodes

C4eyes™ addresses C4ISTAR Specific Data Types

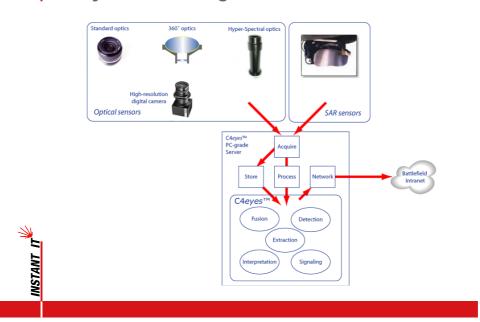## Airborne C4eyes™, the Differentiator

» Traditional optical zoom based
  - No scene overview
  - Limited resolution when in zoom out
  - One single area scanning at a time:
  - No high resolution replay capability

» C4eyes™ high resolution based
  - Full resolution, both in overview and in detail analysis
  - Multiple areas simultaneously scanned by multiple concurrent analysts
  - No more lost details because of the zoom in
  - Full resolution replay & analysis
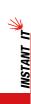
C4eyes™ for Intelligent Sensor Nodes

C4eyes™ is the Sensors Complement
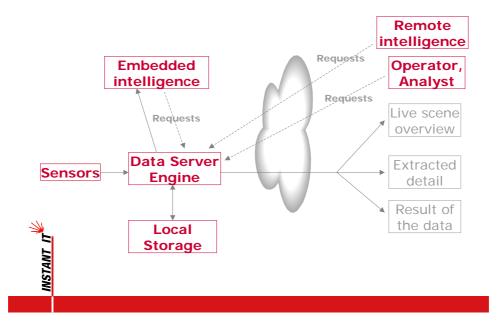
» C4eyes™ supports any type of image contents:
  – EO
  – IR
  – MSI / HSI
  – SAR

(Including Multi-sensor Data Fusion Results)

» C4eyes™ supports any data size and complexity
  – Any number of channels
  – Interlaced or not
  – Any image size
  – Any pixel depth
  – Any hyper-dimensional organization

C4eyes™ functional overview

Remote intelligence

Embedded intelligence

Operator, Analyst

Requests

Requests

Live scene overview

Requests

Sensors → **Data Server Engine** → Extracted detail

Result of the data

Local Storage

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C4eyes™: functionality

- Live Thumbnail generation (pseudo-video)

- Automated ROI extraction
  (with either on-board or remotely located
  segmentation / ROI definition functionality)

- Interactive ROI extraction
  (upon request by the user browsing the images)
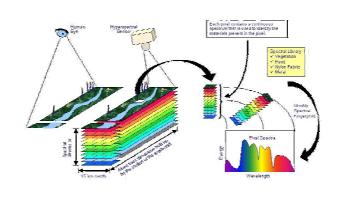
- Interactive Browsing into Hi-Res images

- Download Hi-res images

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C4eyes™ addresses ISTAR Sensors Problematics

» Complex sensors
  – MSI / HSI, >> MPixels, 16bits pixel depth

» Multi-sensors
  – Dynamic data fusion

» Low data link bandwidth
  – Smart Extraction scheme is mandatory

» Unreliable data link
  – Reliable mechanism is mandatory

» Network Centric Warfare
  – Instant Awareness is mandatory

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C4eyes™ supports Hyper-Spectral Imagery

» HIS allows to identify the physical
  materials that are present in a scene

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C4eyes™ is compliant with...

» Low-bandwidth communication links
(even works on a few kbits/s available
bandwidth)

» Unreliable, FEC-corrected communication
links

» Data and link encryption

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C4eyes™ is not simply compression

» Instantly *extracting any data* from
the storage, like a pipette would
do, independently of the original
data size and complexity

» *On-the-fly processing* the
requested extract through
extensive macro-pipelining and
macro-parallelism

» Diffusing the *result of the data* in
pipelined mode to the requesting
client, possibly using compression
techniques to optimize the
delivery

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C4eyes™ empowers the C4ISTAR evolution

» Distributed Intelligent Sensor Nodes
  – Distributed Data Fusion
  – Network Centric Warfare

» Hyper-Dimensional Data Support
  – HSI / USI Sensors support
  – HSI / USI Target Signature
    "DataBase" & Correlators

» Abnormality Detection
  – 360° Surveillance with HSI capability

» Target Tracking
  – Advanced Segmentation

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Instant IT SA offering for C4ISTAR Projects

» Strategic Technical Consulting
  – How to avoid the "Brute Force Computing" Syndrome

» System Architecture Definition
  – ISTAR Hardware Platform
  – ISTAR Software Architecture
  – C4ISTAR Communication Optimization
  – Global C4ISTAR Implementation Optimization

» Software Technology Provider
  – C4*eyes*™ ISTAR Software Framework

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