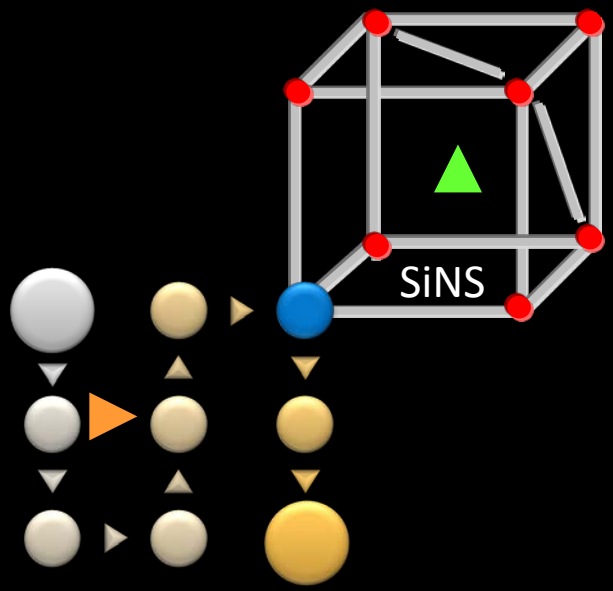
SCM

SYSTEMS AGE – DECISIONS in CONTEXT



Dr Shoumen Datta
shoumen@mit.edu

End of the Information Age

The Economic Future in Historical Perspective

Statistically documented discontinuity can be traced to critical engineering and organizational advances connected with the electrification of industry. These developments marked the culminating phase in the diffusion of the **"dynamo" as a general purpose technology** that enabled significant fixed-capital savings, while simultaneously increasing labor productivity. A narrow technological explanation of the post-WWI industrial productivity surge proves to be inadequate. It neglects the concurrence of those developments with important structural changes in US labor markets and fails to do justice to the **significance of complementarities** that emerged between **managerial and organizational innovations** and the dynamo-based factory technology, on the one hand, and, on the other, between both forms of innovation and macroeconomic conditions of 1920's.

The Economic Future in Historical Perspective

Slow pace of adoption prior to the 1920's was attributable largely to the lack of profitability of replacing still serviceable manufacturing plants adapted to the old regime of mechanical power derived from water and steam. Coexistence of older and newer forms of capital often restricted the scope for exploiting electricity's potential. Prior to 1920, the group drive system of within-plant power transmission remained in vogue. With this system (in which electric motors turned separate shafting sections, so that each motor drove related groups of machines) **primary electric motors often were merely added to the existing stock of equipment.** With the favorable investment climate of the 1920's, firms had the opportunity to switch from group drive to unit drive transmission, where individual electric motors were used to run machines and tools. Advantages of the unit drive extended well beyond savings in fuel and in energy efficiency. They also made possible single-story, linear factory layouts with reconfigured machine placement permitting flow of materials through the plant that was both more rapid and more reliable. Rearrangement of the factory contributed to cost savings in materials handling operations.

Transforming EBM to ABM

Cross-docking Variables: Decouple 'Chains' to Include/Exclude Local Effects

Traditional EBM (CLRM example): Sales of Aspirin and Variables that Impact Sales

EBM - Explanatory Variables

Example of X:
[1] Inventory
[2] Price
[K] Expiration

$$y_t = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + \ldots + \beta_K x_{Kt} + \varepsilon_t$$

Inventory Agent | **Price Agent** | **Expiration Agent**

ABM - Agents in EBM DSS

Transformed EBM plus ABM within CLRM construct: Sales of Aspirin

Decoupling Equation-Based Models (EBM) prevalent in SCM

Agent-integrated business models rapidly respond to changes in value network partners and incorporate local changes for global optimization.

Inventory Price Expiration

MODEL 1

$$y_t = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + \ldots + \beta_K x_{Kt} + \varepsilon_t$$

MODEL 2

$$y_t = \beta_0 + \beta_1 x_{1t} + \square + \ldots + \beta_K x_{Kt} + \varepsilon_t$$

MODEL 3

$$y_t = \beta_0 + \beta_1 x_{1t} + a_2 z_{2t} + \ldots + \beta_K x_{Kt} + \varepsilon_t$$

CROSS-DOCKING VARIABLES

VAR-GARCH

Auto id nodes in Supply Network Planning

n = 10; p = 1,000

10 locations

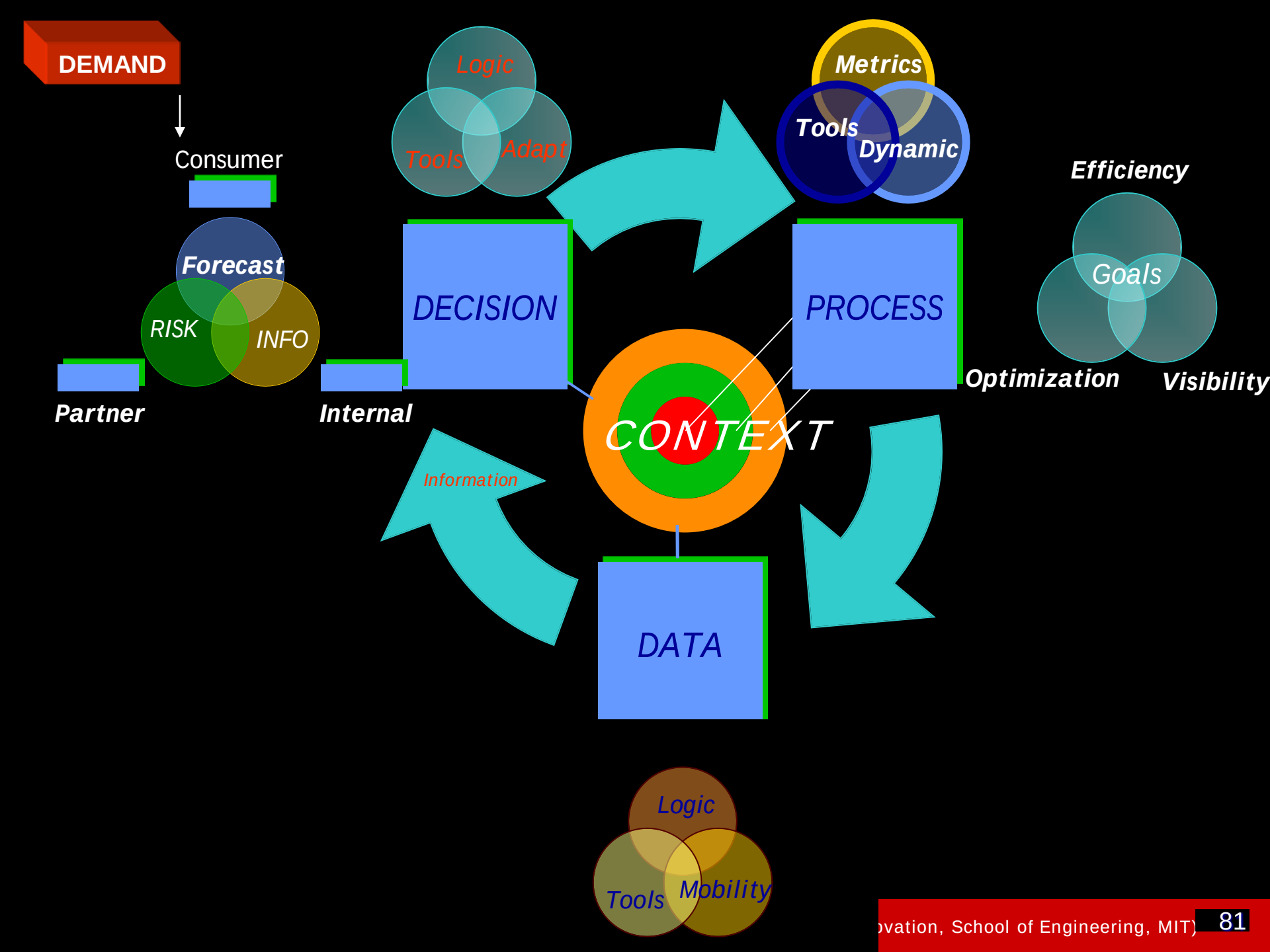
$$y_{1t} = \beta_0 + \sum_{k=1}^{K} \sum_{i=1}^{N_{x_{kt}}} \alpha_{ki} x_{kt-i} + \varphi_{11} y_{1t-1} + \varphi_{12} y_{2t-1} + \varepsilon_{1t}$$

$$y_{2t} = \beta_0 + \sum_{k=1}^{K} \sum_{i=1}^{N_{x_{kt}}} \alpha_{ki} x_{kt-i} + \varphi_{21} y_{1t-1} + \varphi_{22} y_{2t-1} + \varepsilon_{2t}$$

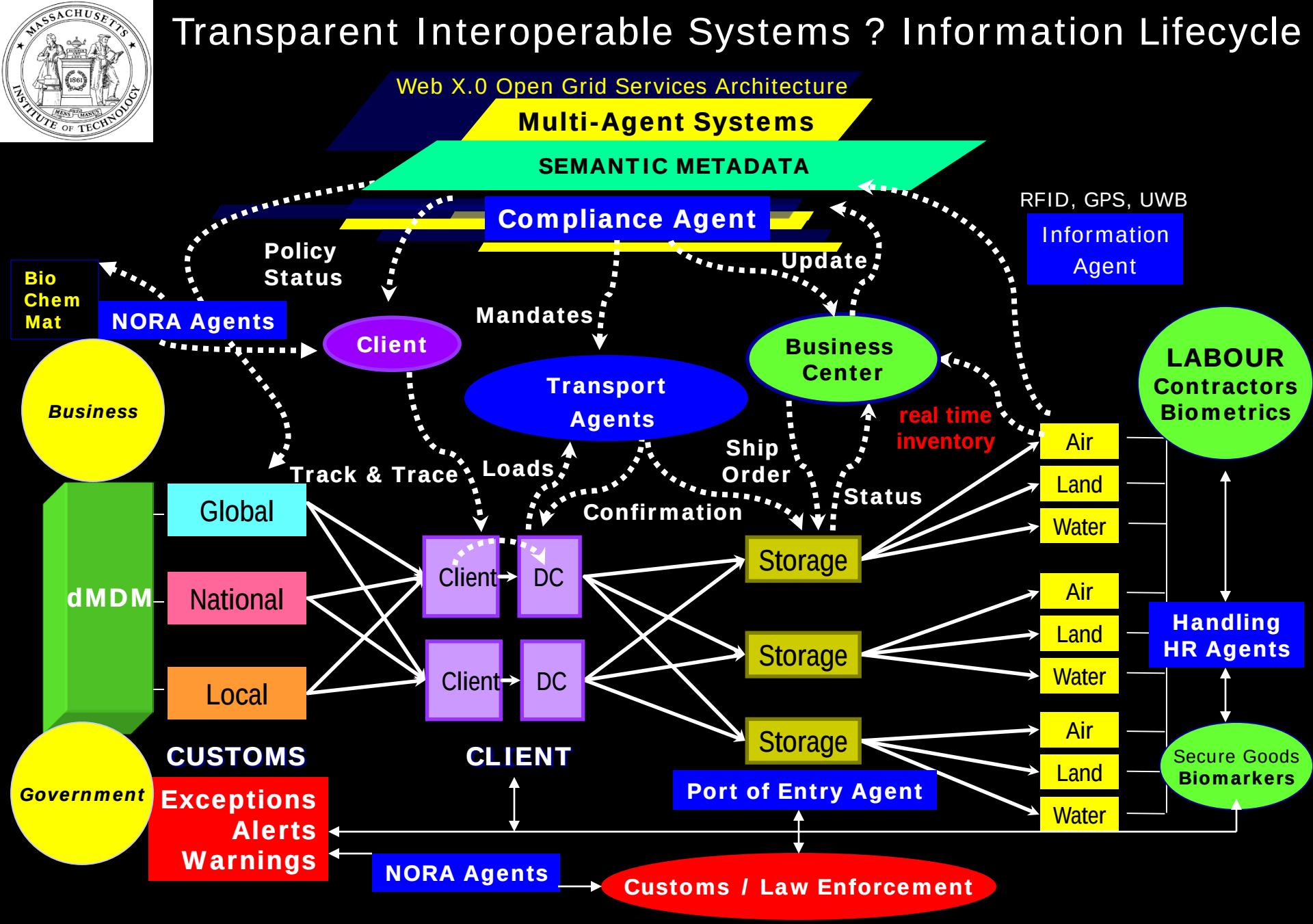
y_{10t}

Will ROI increase if business process is optimized before tech investment?

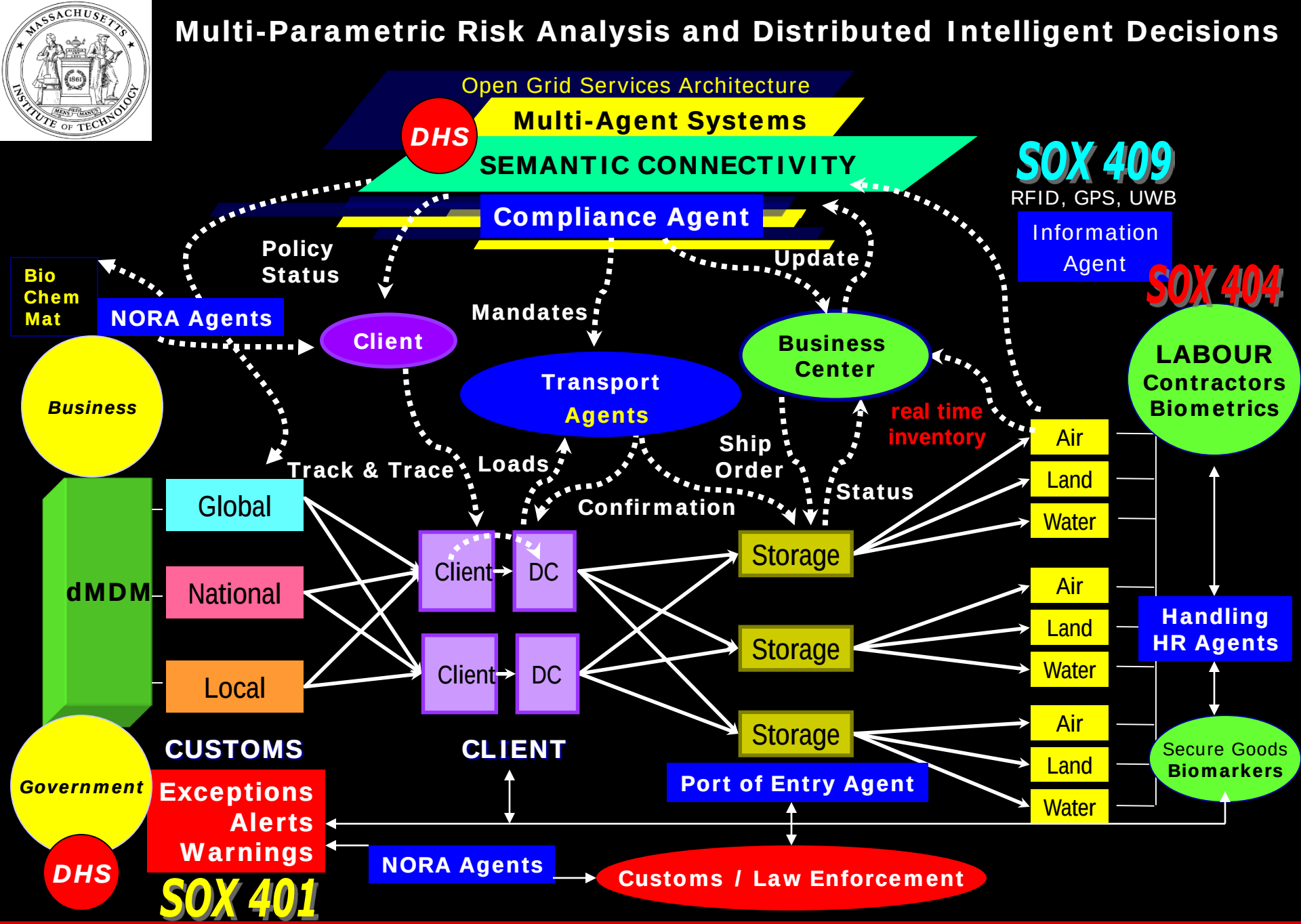
Will precision of forecasting depend on an optimized supply network planning?

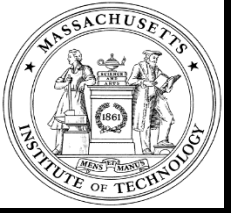

DEMAND
Consumer
Logic
Tools
Adapt
Metrics
Tools
Dynamic
Efficiency
Goals
Forecast
RISK
INFO
DECISION
PROCESS
Optimization
Visibility
Partner
Internal
CONTEXT
Information
DATA
Logic
Tools
Mobility

Transparent Interoperable Systems ? Information Lifecycle



Multi-Parametric Risk Analysis and Distributed Intelligent Decisions





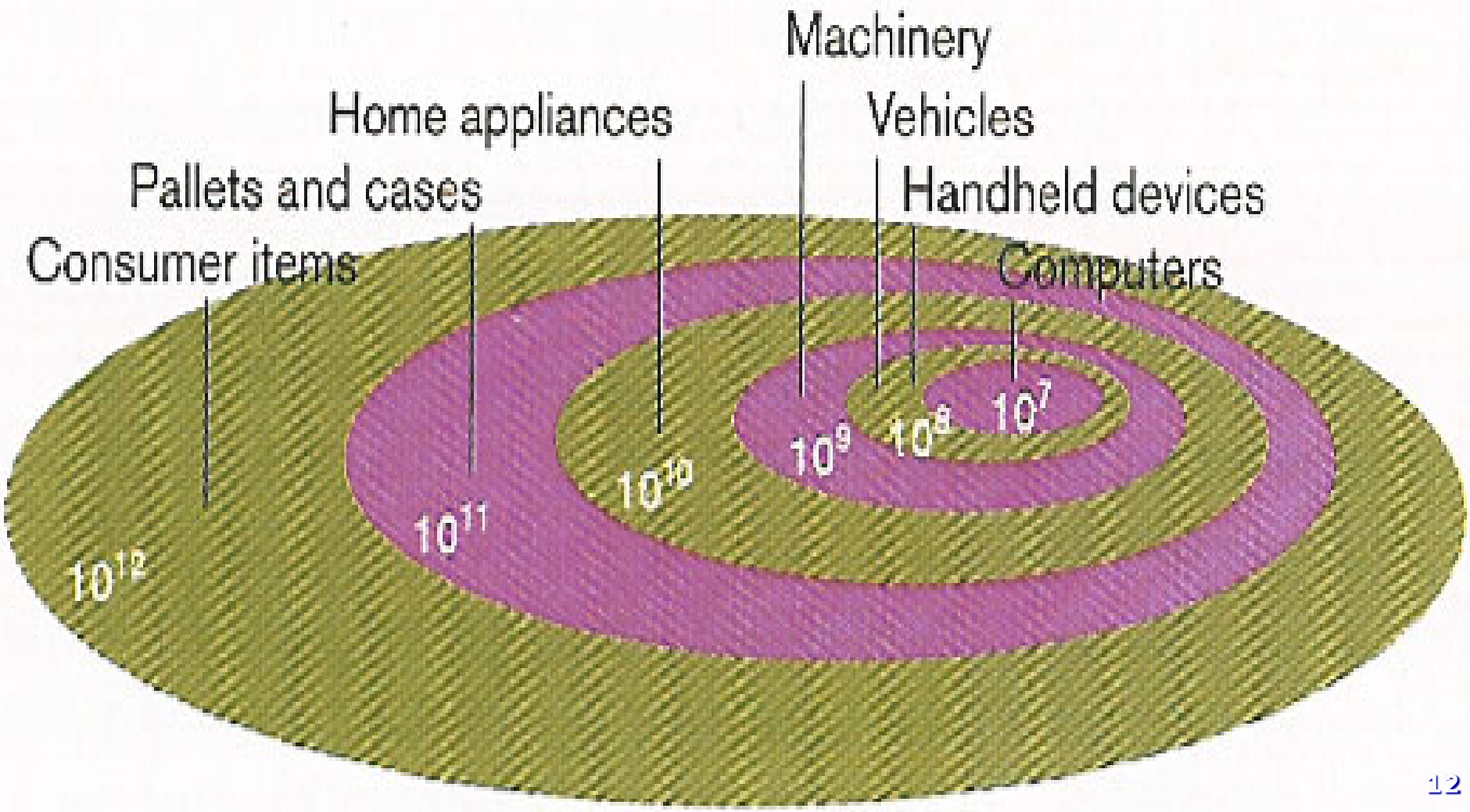
End of the Information Age

Welcome to the

SYSTEMS AGE

Devices that can be networked

Noncomputer objects will soon account for the vast majority of networked devices. The market for such things is enormous.



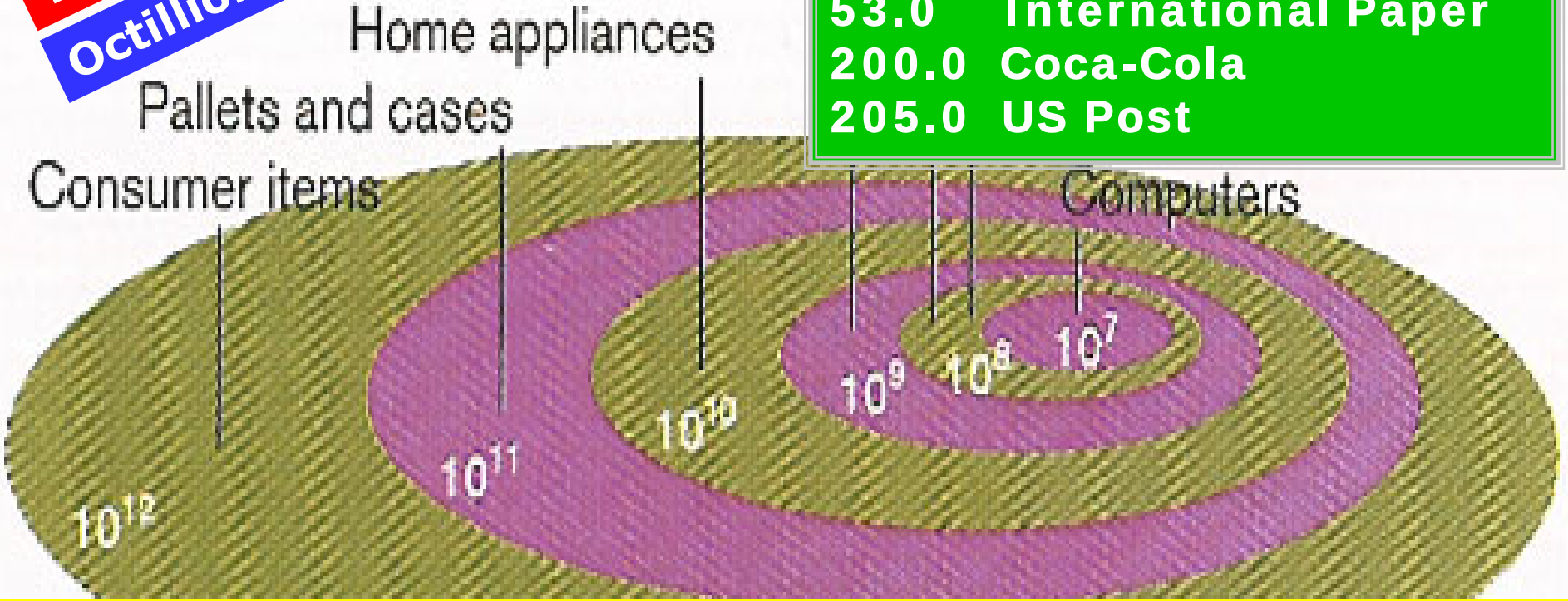
Devices that can be net

Billions of Objects

Trillions of Processes

Octillions of Identities

3.0	J & J
10.0	Kimberly Clark
15.0	Tesco
20.0	Unilever
25.0	Philip Morris
30.0	Wal-Mart
31.0	P&G
53.0	International Paper
200.0	Coca-Cola
205.0	US Post

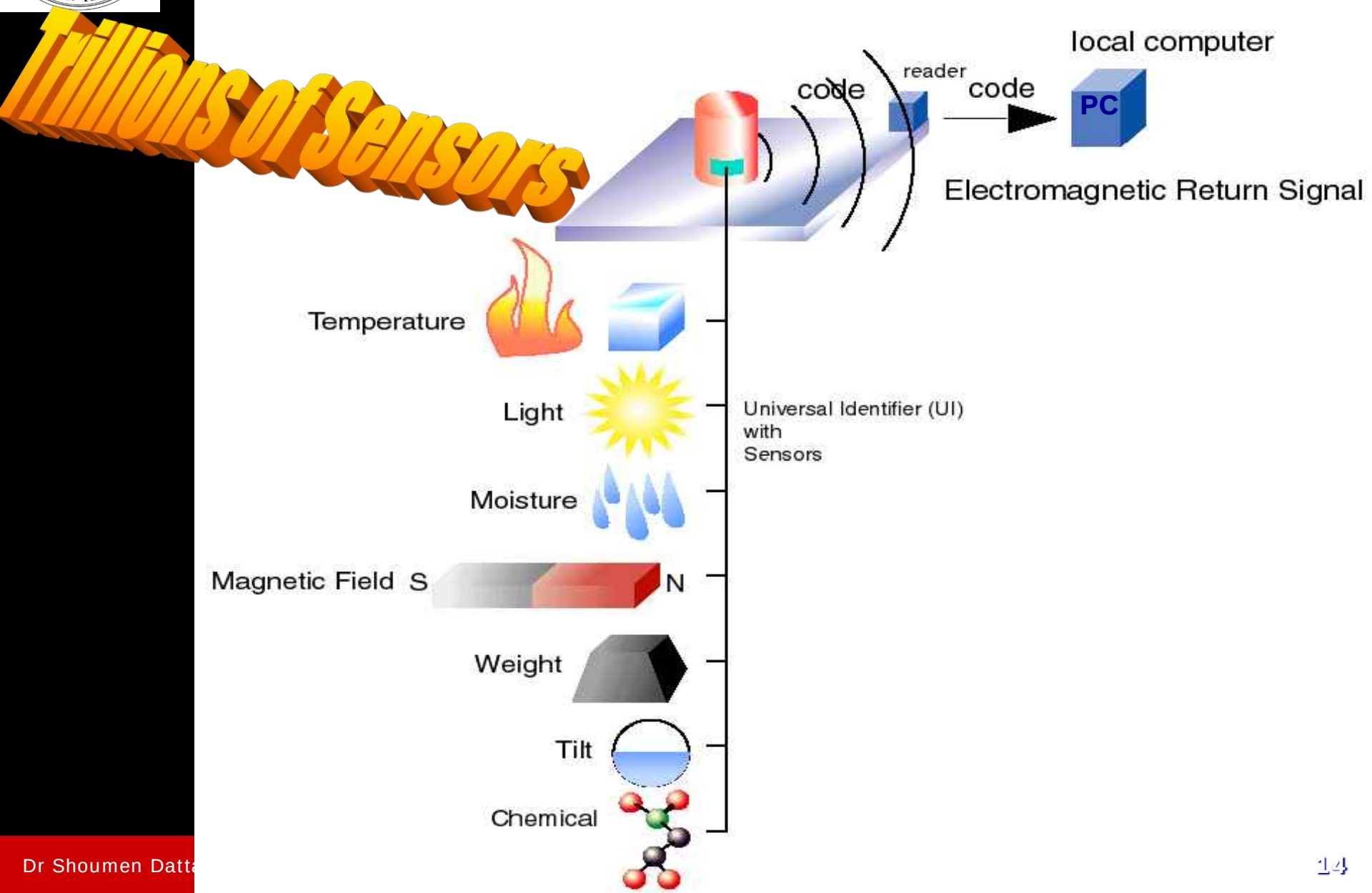


EPC 64-bit: 18,446,744,073,709,551,616 (1.8×10^{19})

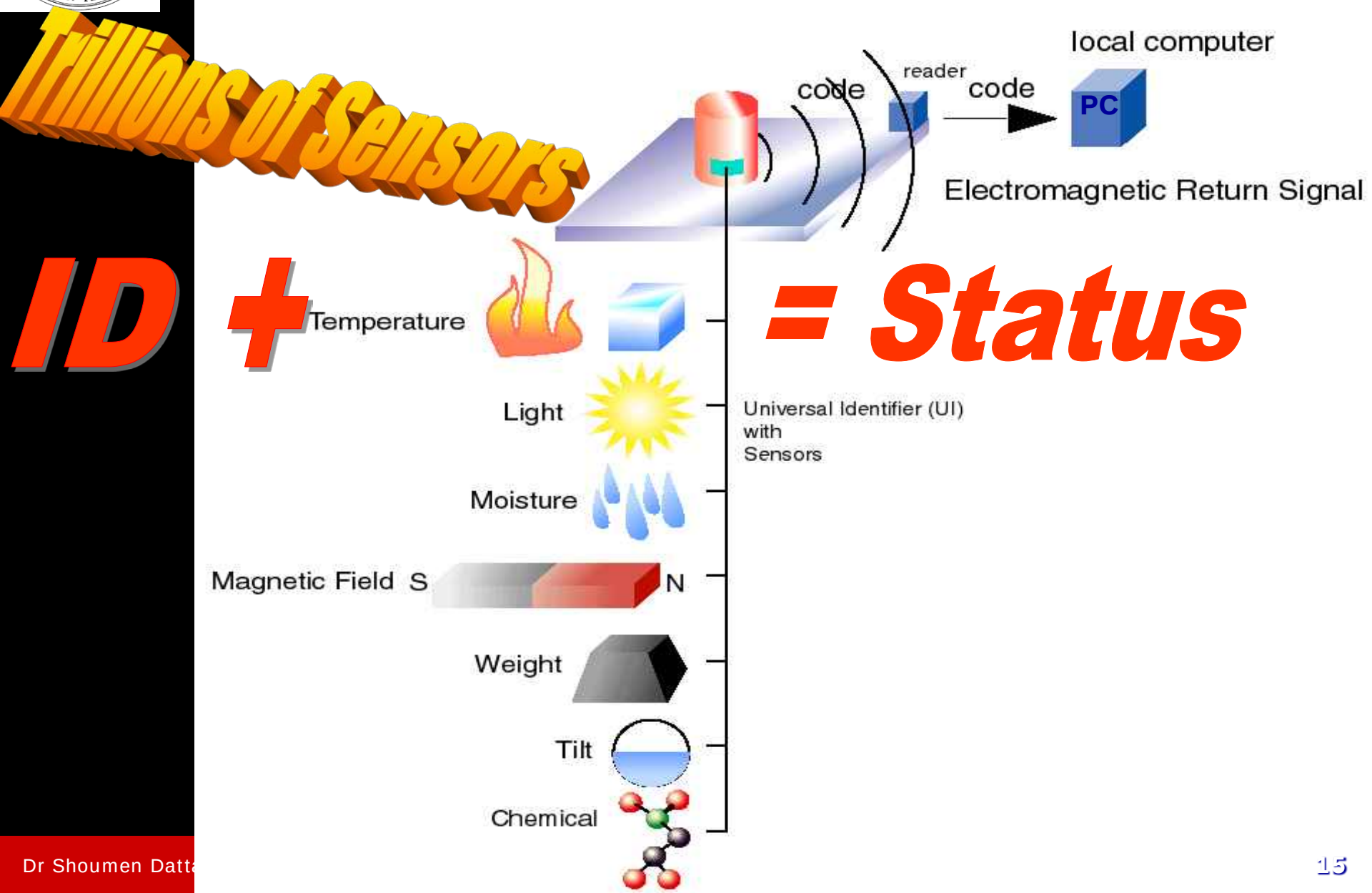
EPC 96-bit: 79,228,162,514,264,337,593,543,950,336 (7.9×10^{28})

Objects with RFID tags possess id; excludes “process” information

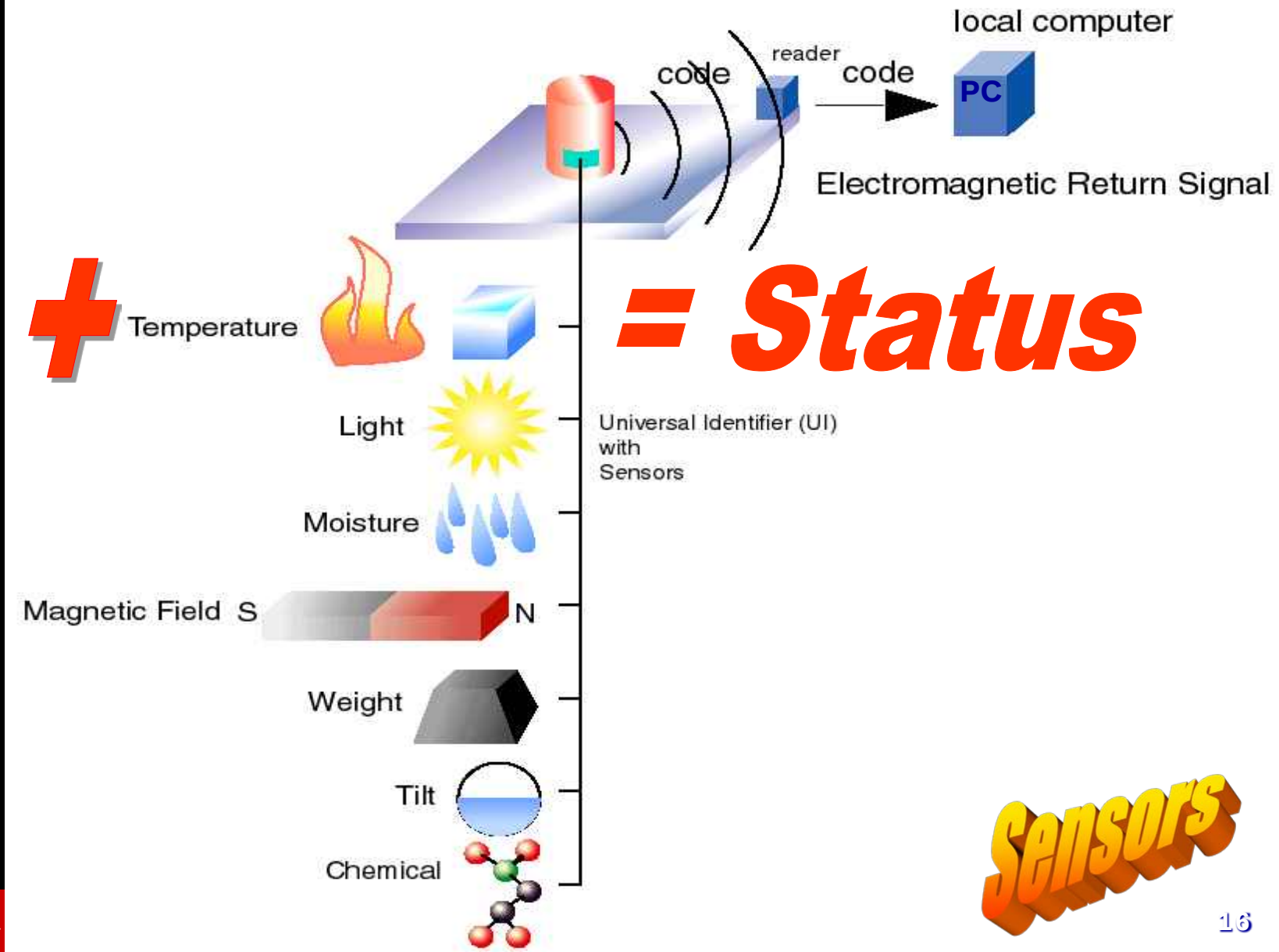
Data


Trillions of Sensors
local computer
reader
code
code
PC
Electromagnetic Return Signal
Temperature
Light
Moisture
Magnetic Field S
N
Weight
Tilt
Chemical
Universal Identifier (UI)
with
Sensors

Process, Data, Information



Data is not Information



ID + = Status

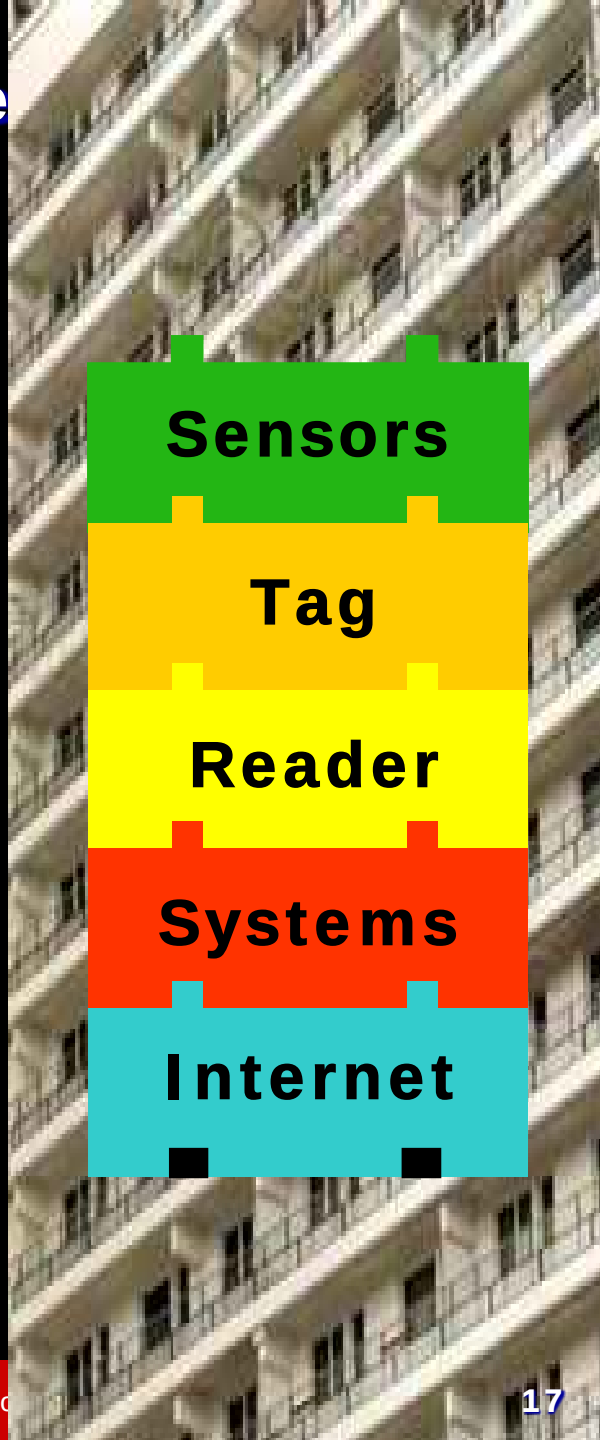
Sensors

Customs: Information Arbitrage

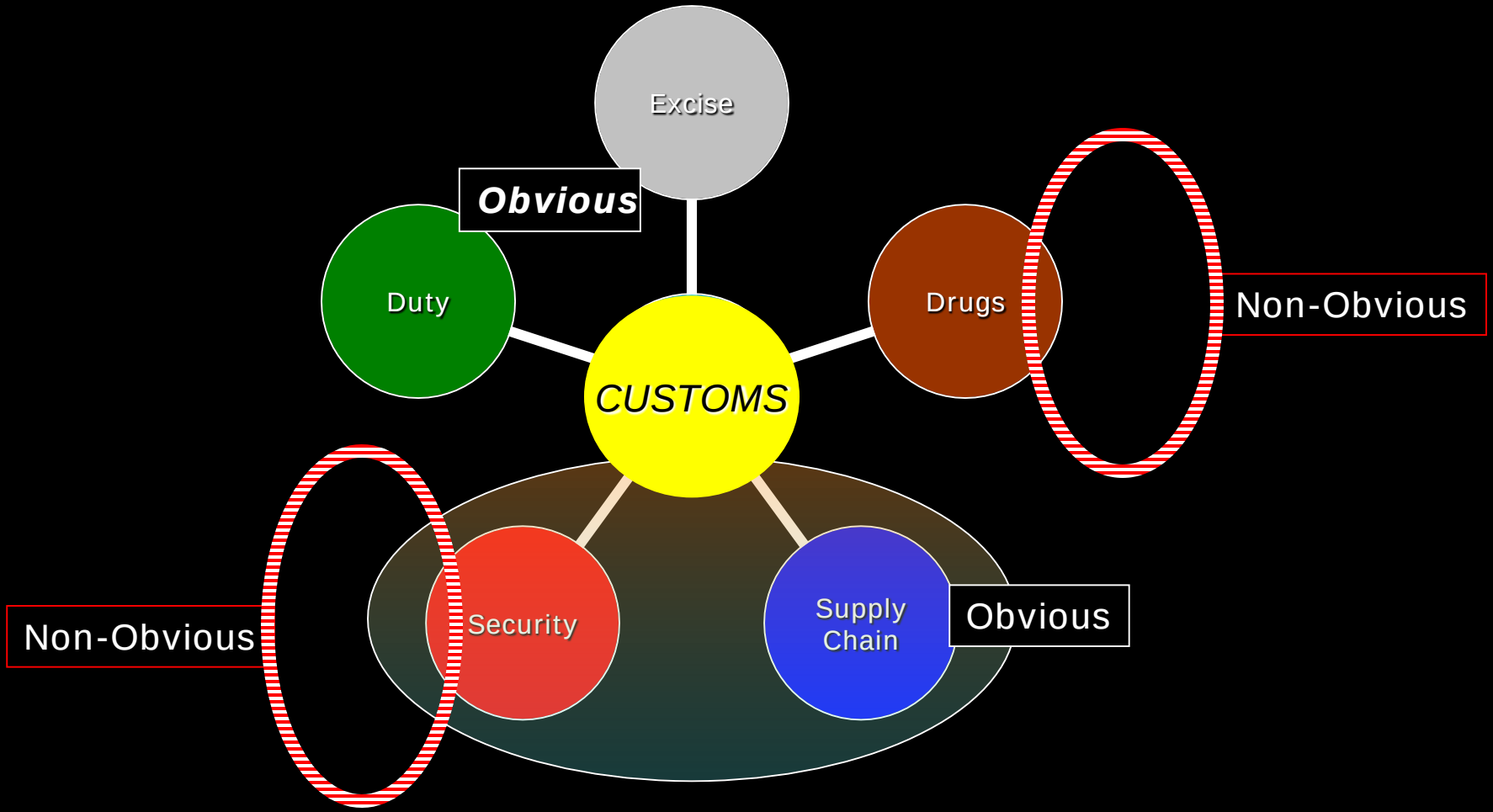
The Systems Age

The World Is Not Flat

- Interoperability
- Transparency
- Collaboration
- Adaptability
- Identity

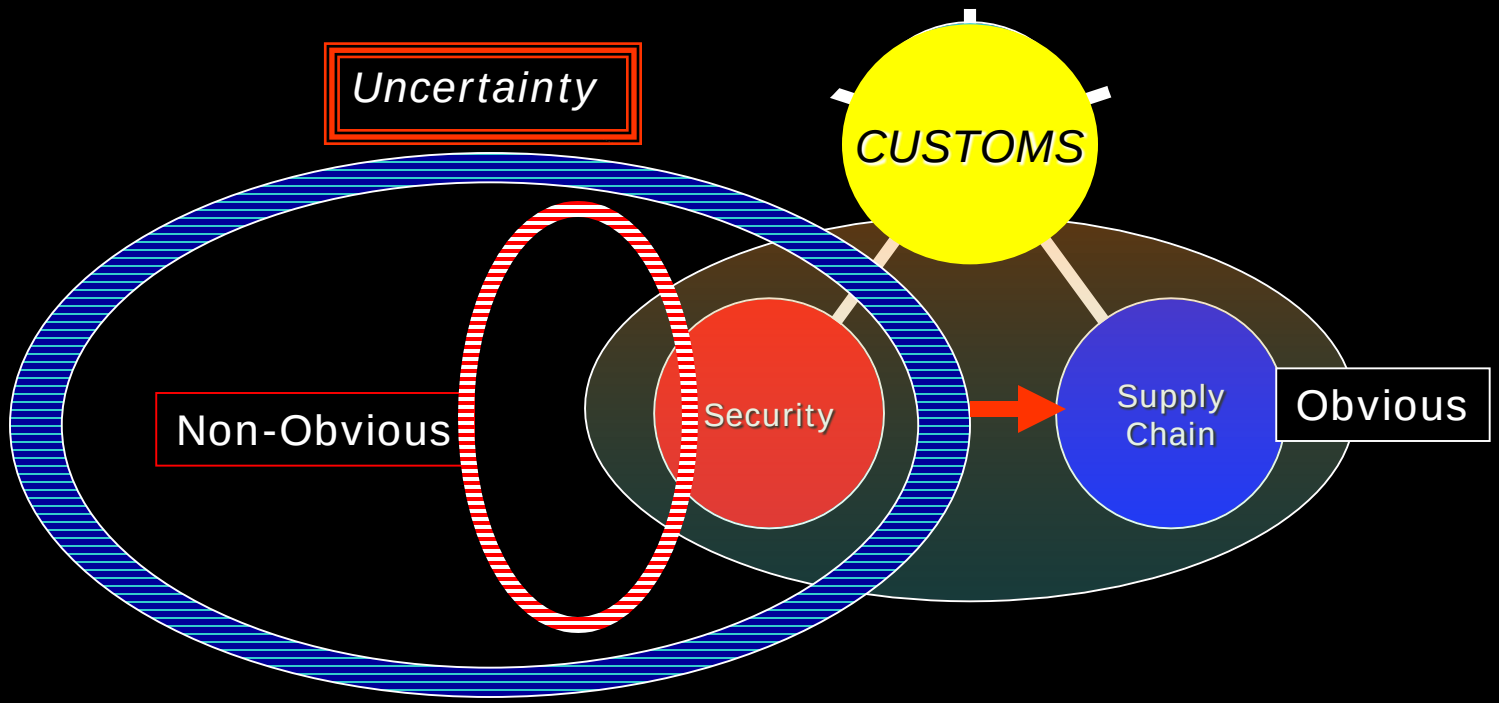


Obvious vs Non-Obvious Relationship Analysis



Uncertainty fuels demand for Risk Simulation

Assigning the correct degree of fear to distant elephants!



Customs – Security Risk
Business – Supply Chain Risk

Operation Safe Commerce: Answers, not Numbers

Goal:	Identify Weak Links in Supply Chain
Scope:	Use GPS-RFID track & trace from overseas origin to US destinations
Users:	Included Sara Lee and Motorola
Duration:	2002-2005
Ports:	SEA-TAC, LA, NY-NJ
Cost :	$75 million
Report:	Due 2005 February
Published:	None Released
Rumour:	Companies know very little about their supply chain

Operation Safe Commerce > SCM & Logistics Transparency

C-TPAT

ATS
Forecast Risk

ACE

Tier 1
Attests company performs risk analysis of supply chain and has mitigation mechanisms in place.

Tier 2
Attestation audited by Customs.

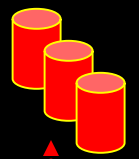
Tier 3
Audited by Customs for best practices in supply chain and information (data) sharing.

ATDI
100 Data Elements

- Trucking Route
- Driver Id (Biometrics)
- Cargo Id (Biomarkers)
- Purchase Order
- Proof of Delivery
- Advance Shipping Notice
- Ports of Passage
- Destination
- Origin

e-manifest

- *Vehicle Identification*
- *Driver's Passport Number*
- *Address of Importer*



C-TPAT > Customs-Trade Partnership Against Terrorism (may be mandated 2008)
ACE > Automated Commercial Environment (the enterprise system equivalent)
ATDI > Advanced Trade Data Initiative (may be necessary for C-TPAT Tier 3)
ATS > Automated Targeting System (in operation since 1990's)

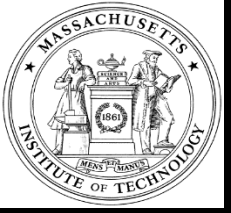
Data in multiple databases. Lack of interoperability creates blind spots.

Global Security Risk: System of Systems

Section 401 of the Sarbanes-Oxley Act (SOX) require companies to account for risk in off-balance-sheet transactions, supply chains. Companies need to have controls to protect against adverse events in their supply chains.

Section 404 of Sarbanes-Oxley (SOX) require companies to establish controls that provide reasonable protection against preventable events that may impact a company's value. **Labour personnel links to organized crime.**

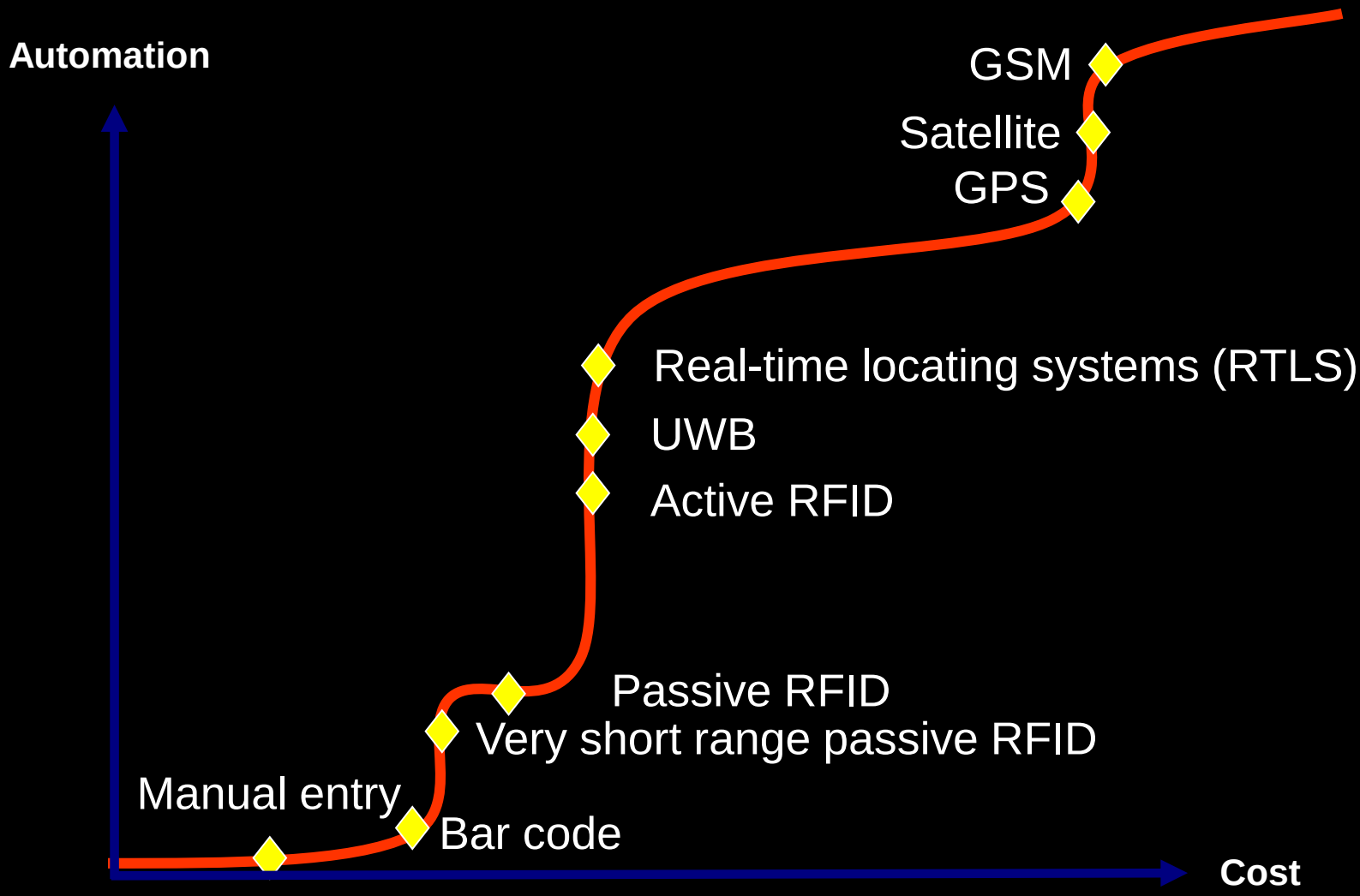
Section 409 of the Sarbanes-Oxley Act (SOX) require reports 'on a rapid and current basis' events that could have some material impact. Near-real time track and trace data or status.



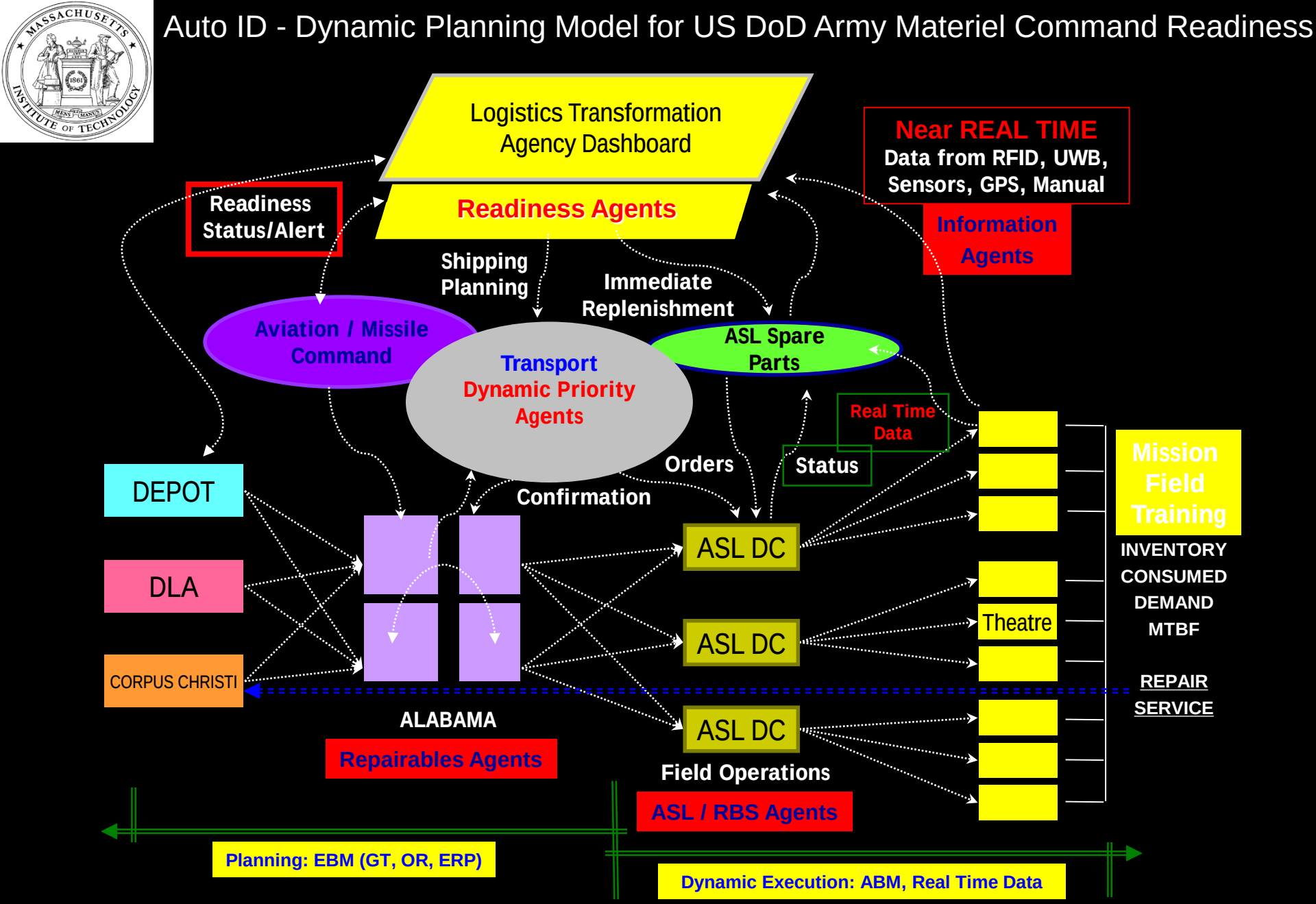
RISK ASSESSMENT THREAT

- 3.9 million miles of public roads
- 600,000 bridges
- 1.2 million trucking companies
- 15.5 million trucks
- 42,000 hazardous material (HAZMAT) trucks
- 10 million commercial vehicle drivers
- 2.7 million HAZMAT drivers
- 2.2 million miles of hazardous liquid & gas pipeline
- 120,000 miles of major railroads
- 500,000 train stations
- 15 million daily riders on mass transit
- 25,000 miles of commercial waterways
- 361 ports
- 250,000 containers per day
- 9.0 million containers through 51,000 port calls
- 11.2 million containers via Canada and Mexico
- 19,576 public airports, heliports and landing strips
- 459 Federalized commercial airports
- 211,450 general aviation aircraft
- 77% of all flights are general aviation

Automatic ID Systems



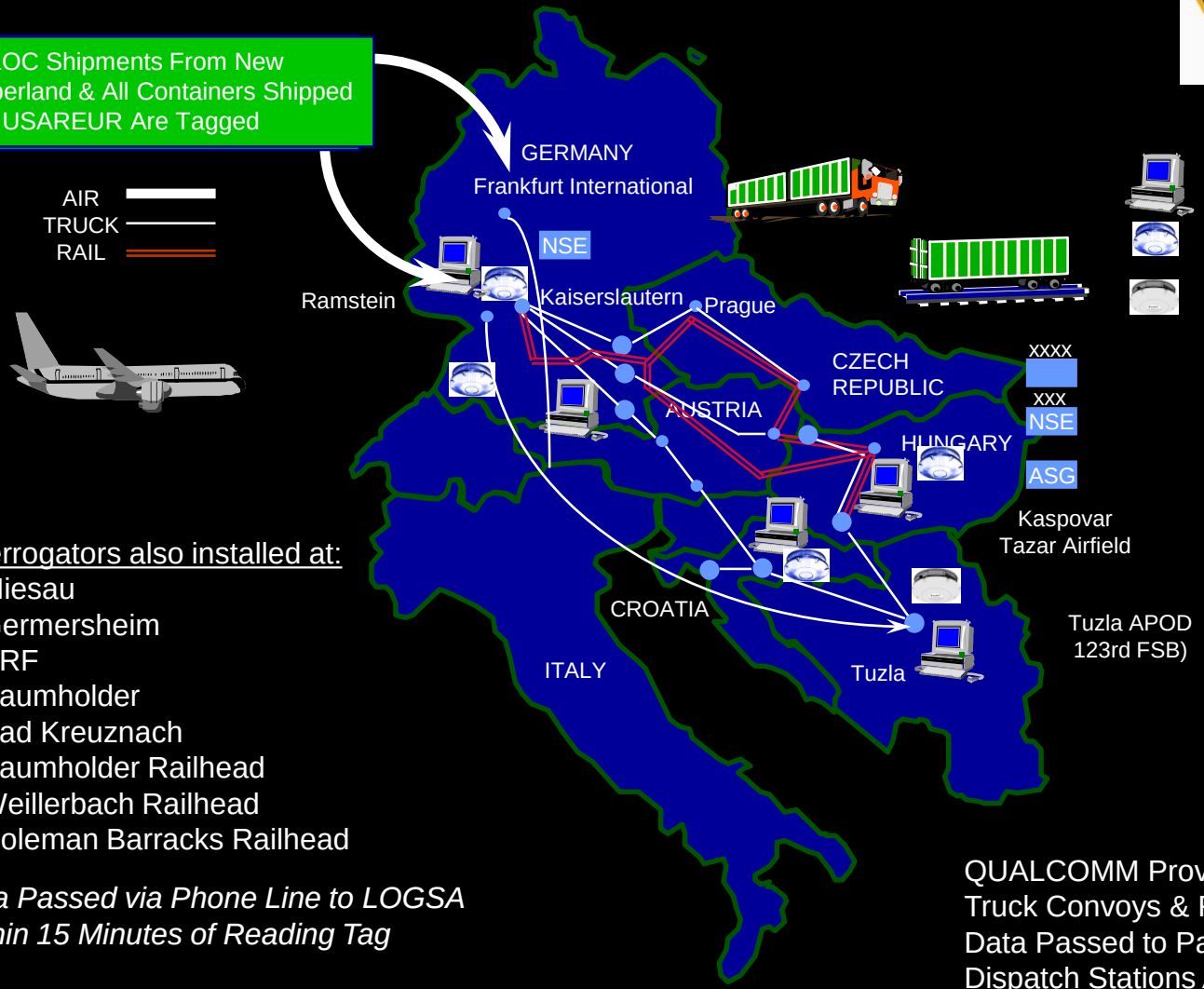
Auto ID - Dynamic Planning Model for US DoD Army Materiel Command Readiness



Acknowledgement: General Paul Kern, Commanding General and Dr Benson Adams, Deputy CG, US DoD Army Materiel Command HQ, Fort Belvoir, Virginia

Bosnian ITV Capability

All ALOC Shipments From New Cumberland & All Containers Shipped From USAREUR Are Tagged



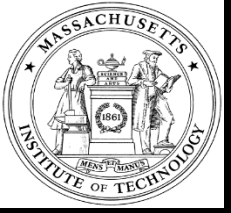
Interrogators also installed at:

- Miesau
- Germersheim
- ERF
- Baumholder
- Bad Kreuznach
- Baumholder Railhead
- Weillerbach Railhead
- Coleman Barracks Railhead

Data Passed via Phone Line to LOGSA Within 15 Minutes of Reading Tag

QUALCOMM Provides Visibility of Truck Convoys & Rail Movements
Data Passed to Paris Hub via Satellite
Dispatch Stations Access Paris Hub via Modem/Phone Line

Visibility Technology: Value is more important than Cost

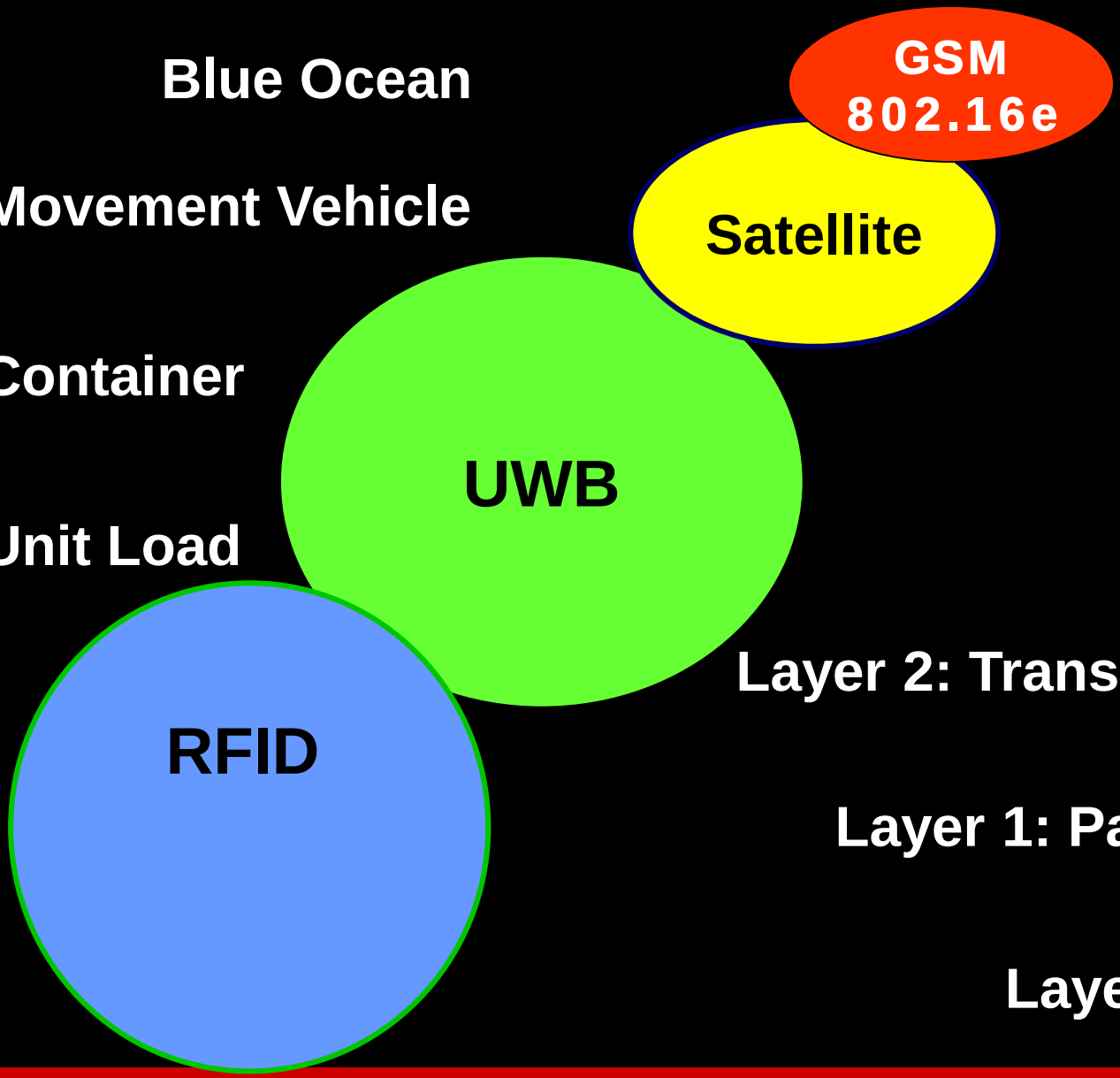


Blue Ocean

Layer 5: Movement Vehicle

Layer 4: Container

Layer 3: Unit Load

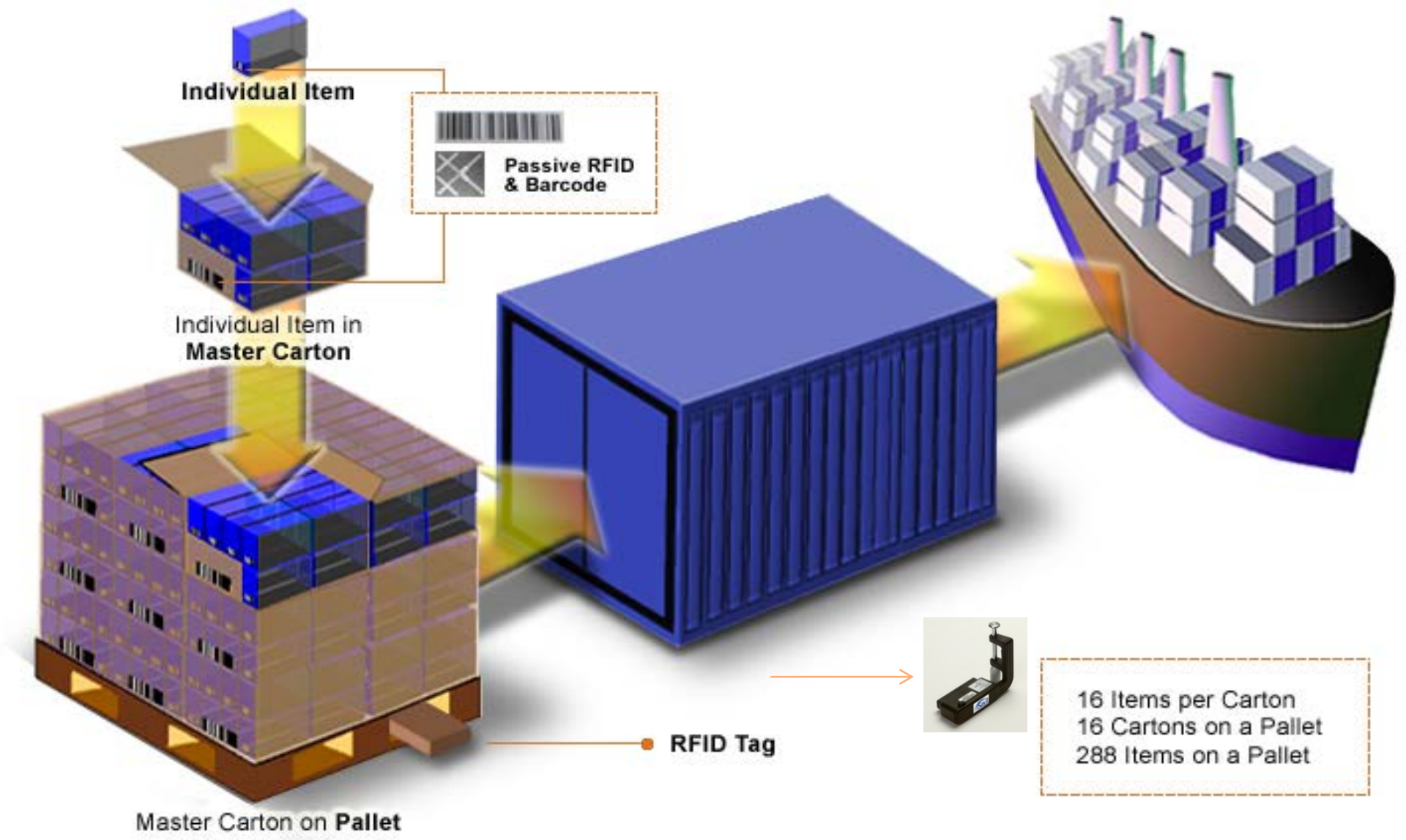


Layer 2: Transport Unit

Layer 1: Packaging

Layer 0: Item

Visibility Networks

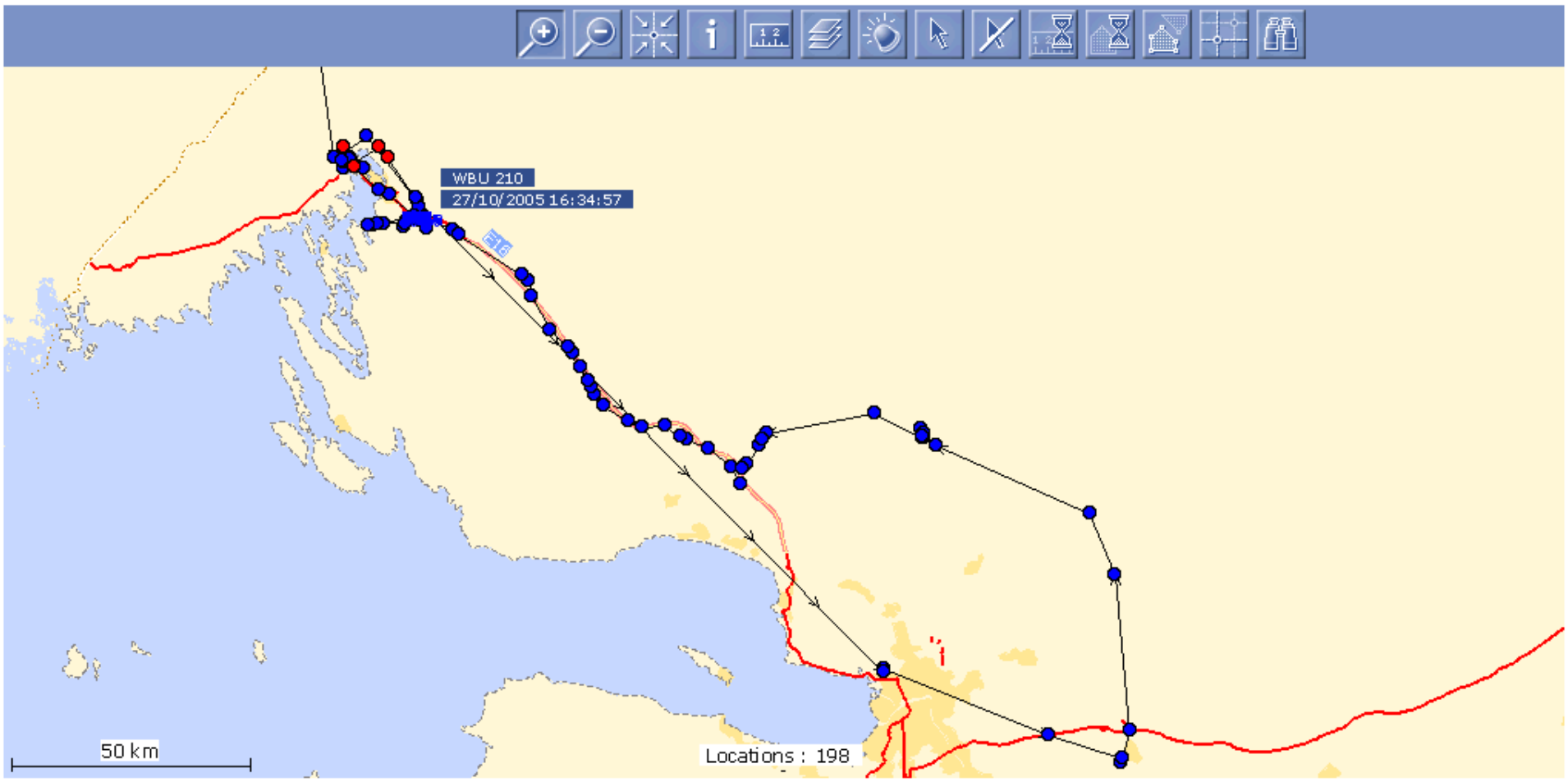


GeVeriwise ™ - Microsoft Internet Explorer

GE VeriWise ™ | Mapping

GE VeriWise Case

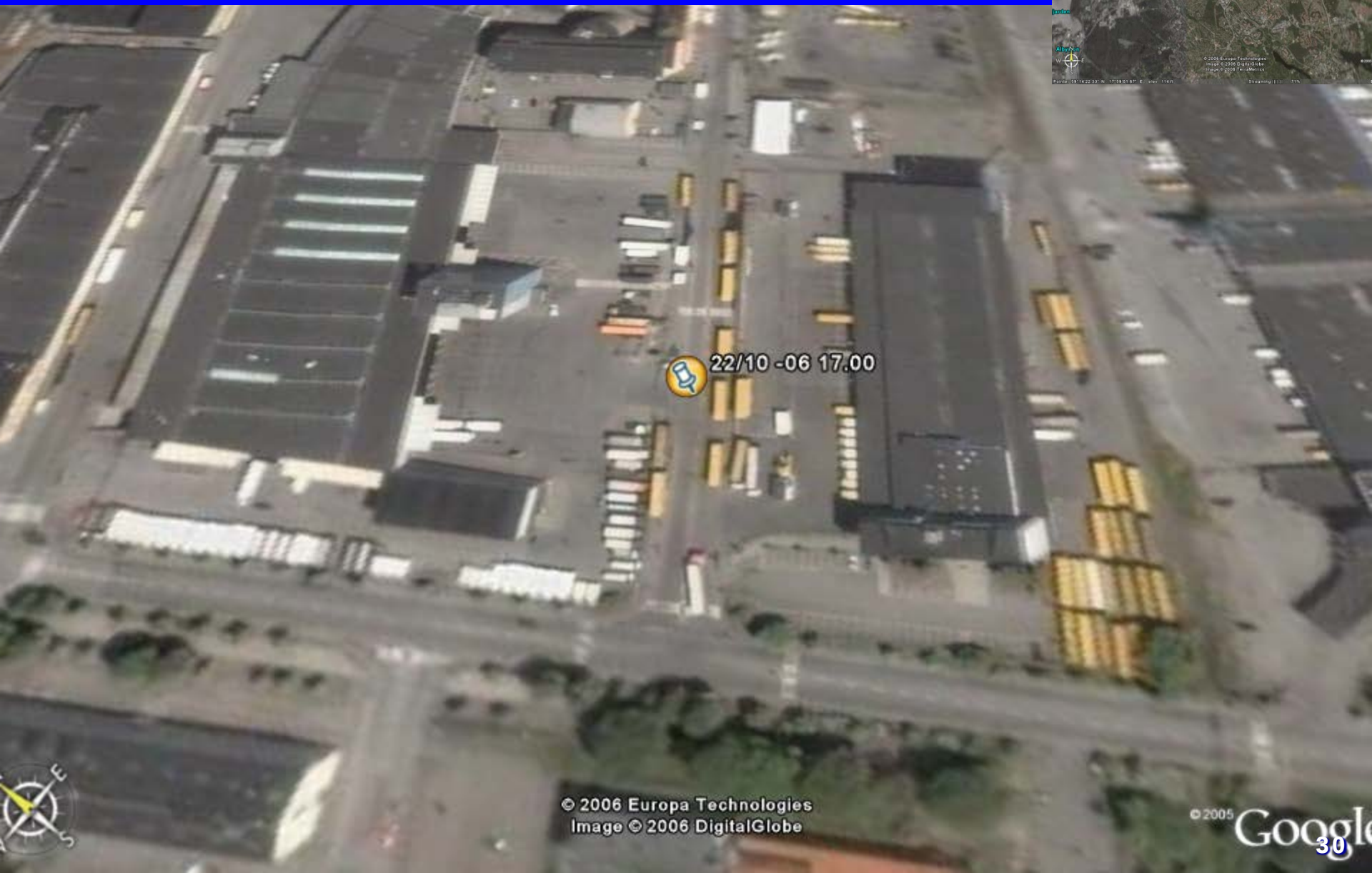
Print



Stockholm

22 Oct 2006

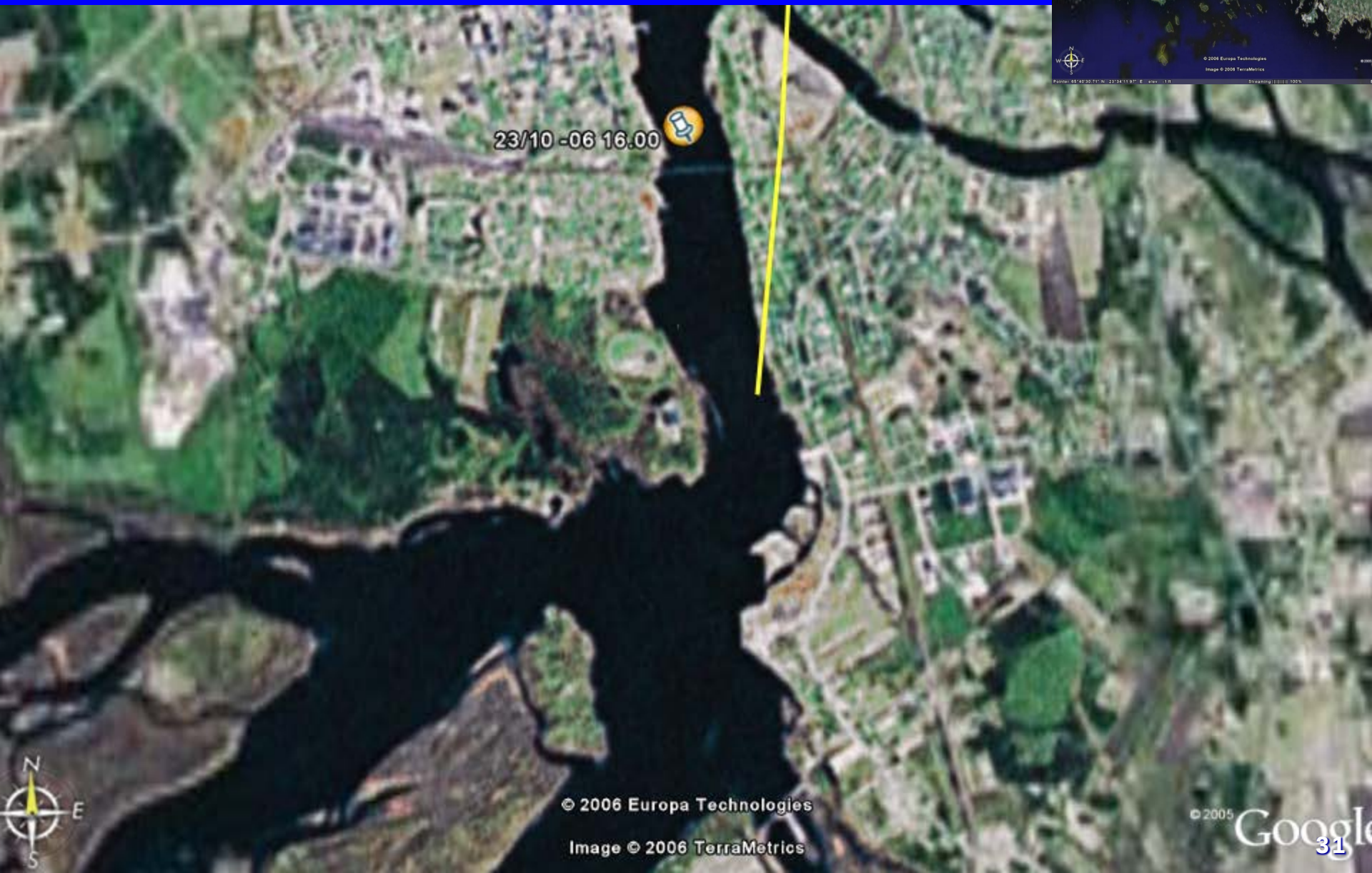
1700 hours



Border: Sweden-Finland

23 Oct 2006

1600 hours



Border: Finland-Russia

24 Oct 2006

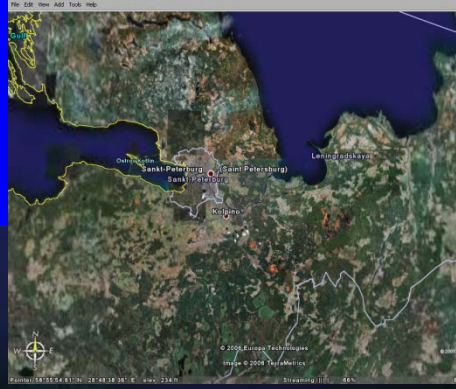
1400 hours

24/10 -06 14.00

30km East of St Petersburg, Russia

26 Oct 2006

0810 hours



erburg (Saint Petersburg)

rg

Kirovsk

26/10 -06 08.10

Mgat

Kolpino

Puskin

Pavlovsk

Kommunar

Ulyanovka

© 2006 Europa Technologies

Image © 2006 TerraMetrics

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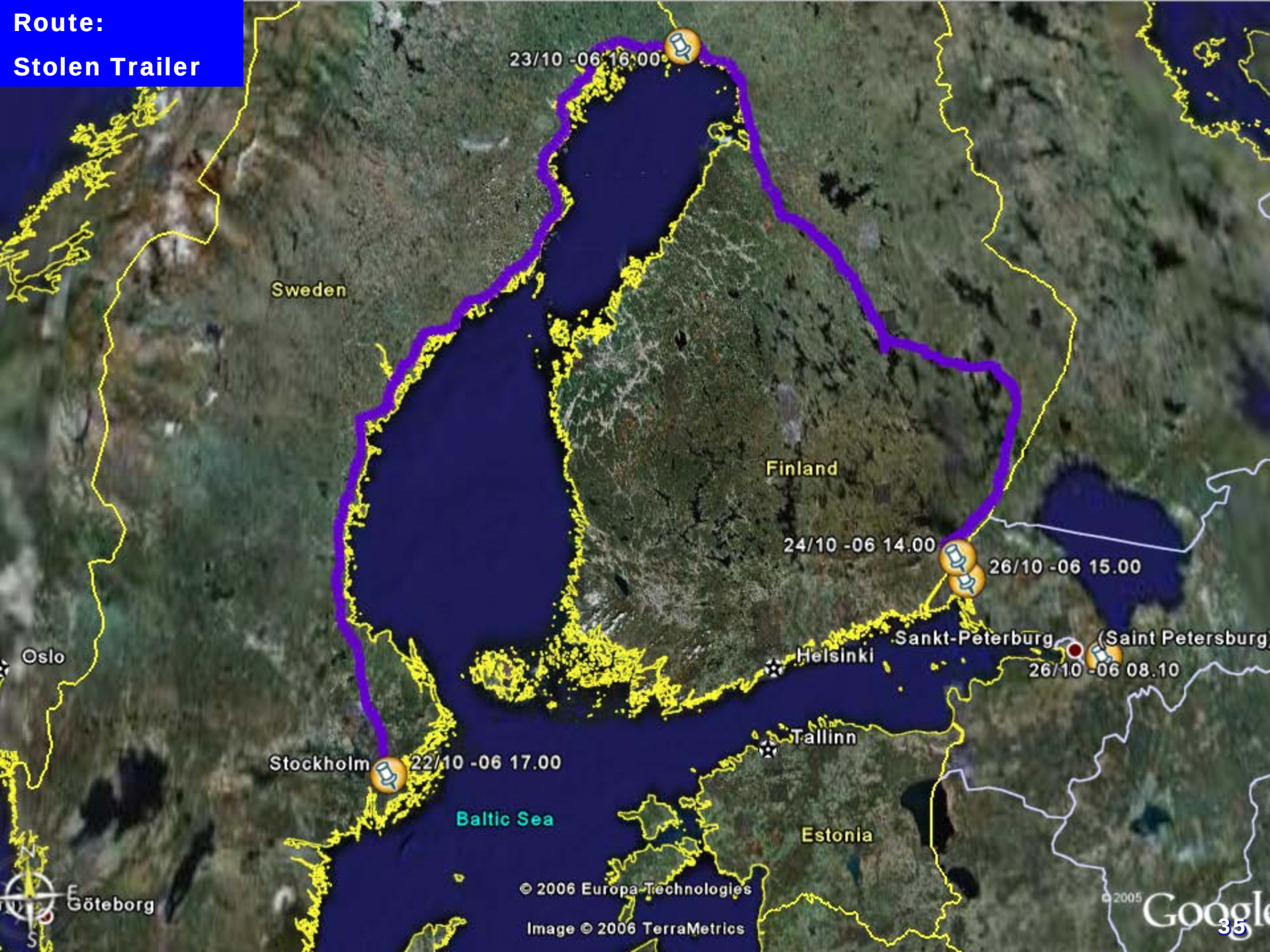
Vyborg

26 Oct 2006

1500 hours


Route:
Stolen Trailer
23/10 -06 16.00
Sweden
Finland
24/10 -06 14.00
26/10 -06 15.00
Sankt-Peterburg
(Saint Petersburg)
26/10 -06 08.10
Helsinki
Oslo
Tallinn
Stockholm
22/10 -06 17.00
Baltic Sea
Estonia
Göteborg
© 2006 Europa-Technologies
Image © 2006 TerraMetrics
© 2005
Google

GE VeriWise Systems: Global Track & Trace

Print

WBU 210
27/10/2005 16:34:57

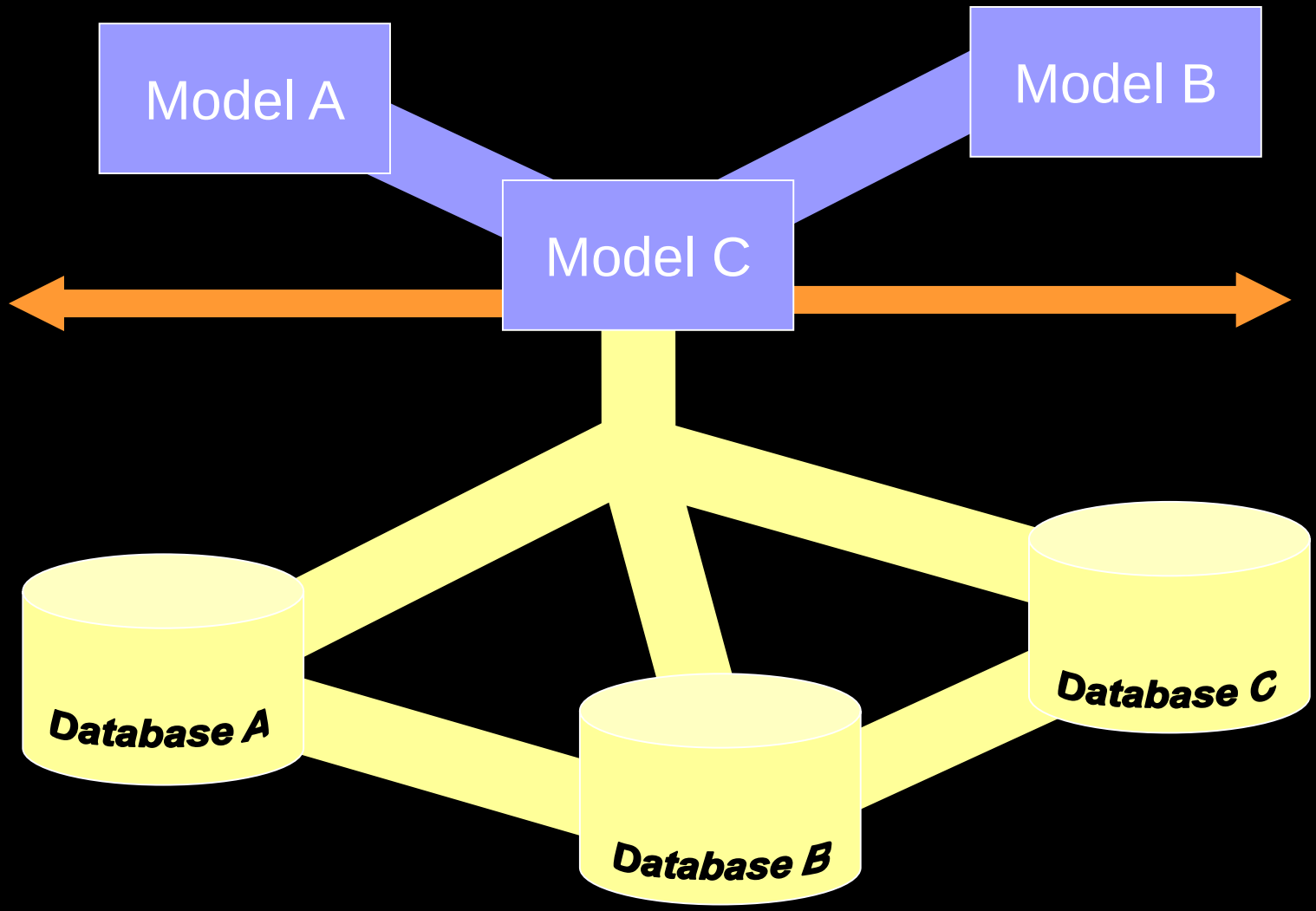
USPS

WAL*MART
46,000 trailers

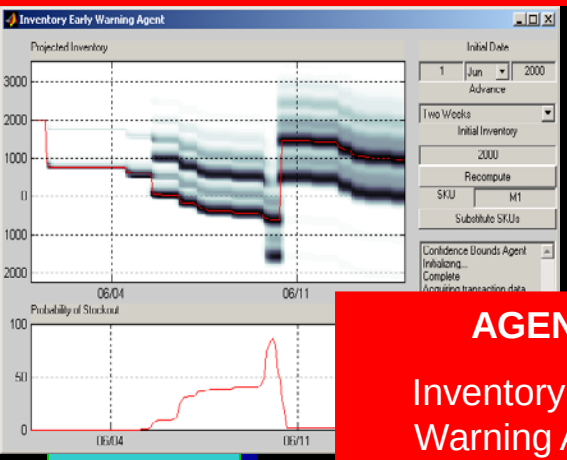
50 km

Locations : 198

System of Systems: Network Integration and Interoperability



Smart Planning with Intelligent Objects



ACTION

REPLENISHMENT

AGENT

Inventory Early Warning Agent

X days ?

Store 1

Store 2

Store 3

Store n

RETAILER

Plant

2 days

Distribution Center

3 days

Distribution Center

Y days ?

MANUFACTURER

EVENT

100

50

0

AGENT

Information Agent

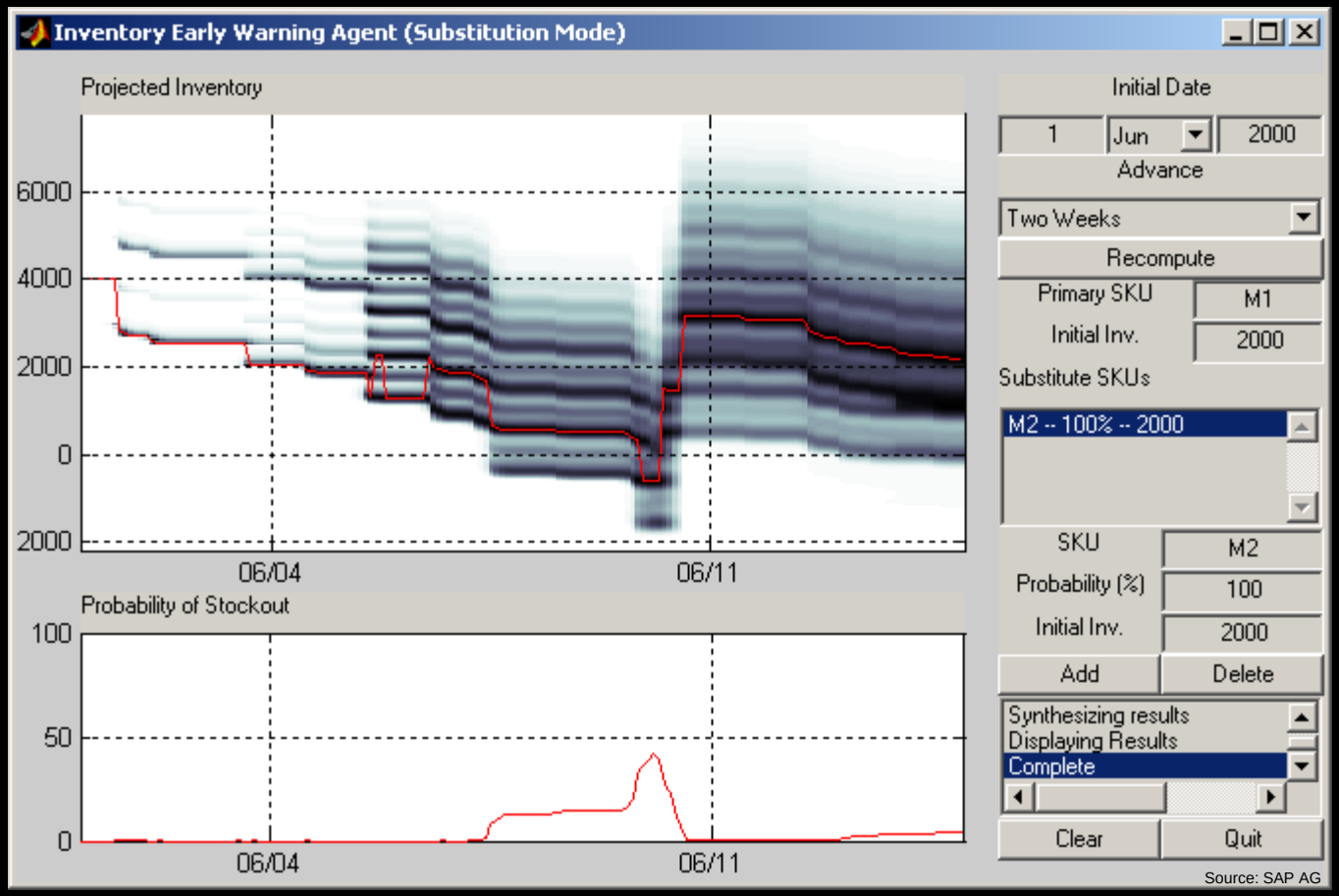
RFID Data

Inventory

Consumption

Multi-Agent System

Data Agents collect ► Data
Monitoring Agent triggers ► Alert
Inventory Management Agent executes ► Substitution



M2 can be substituted for SKU M1

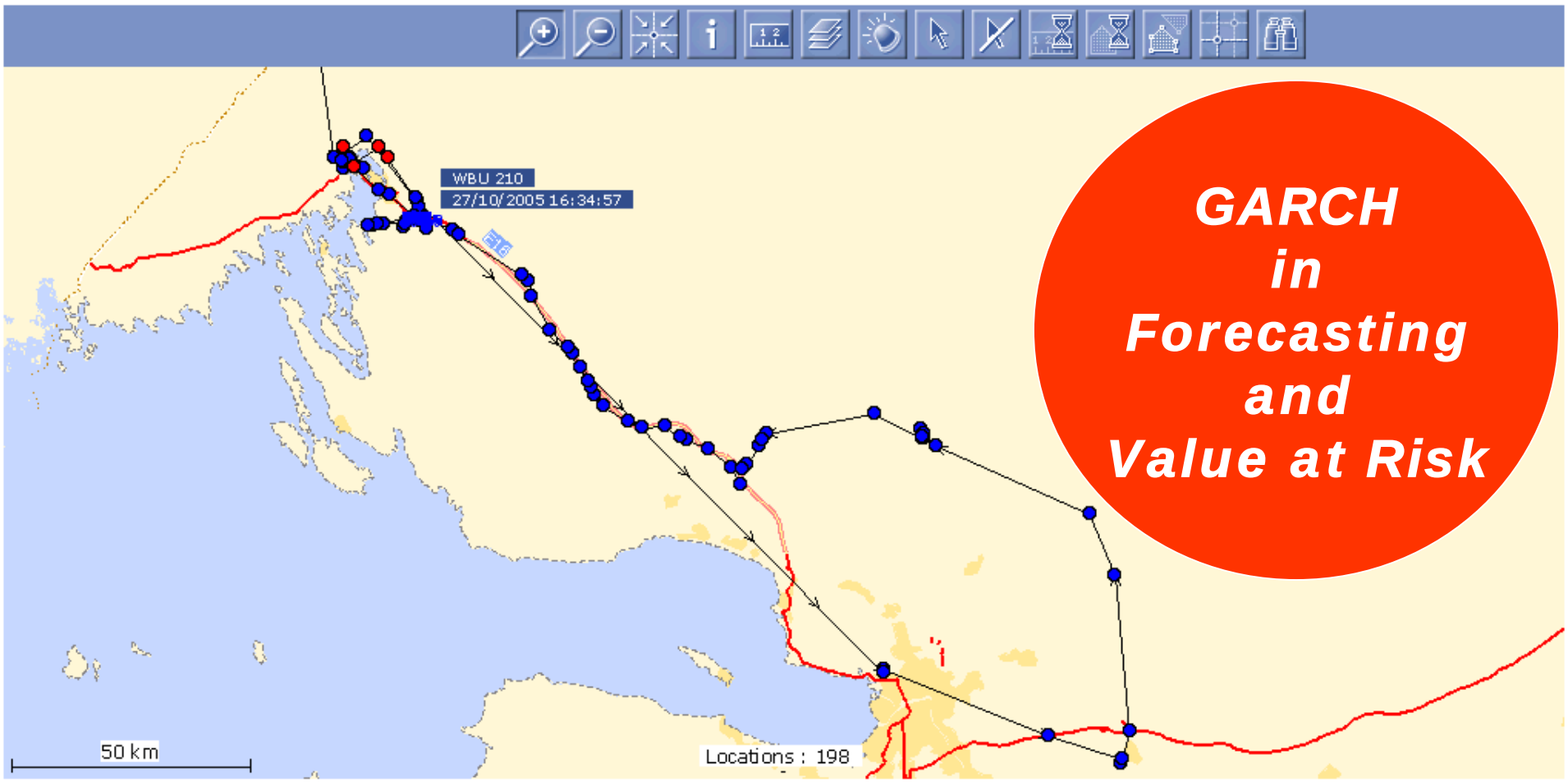
Inventory of M2 is 2000

OOS Danger

Less chance of a stockout with substitution via agent actions (M1 & M2)

GE VeriWise Systems: Predictive Analytics

Print



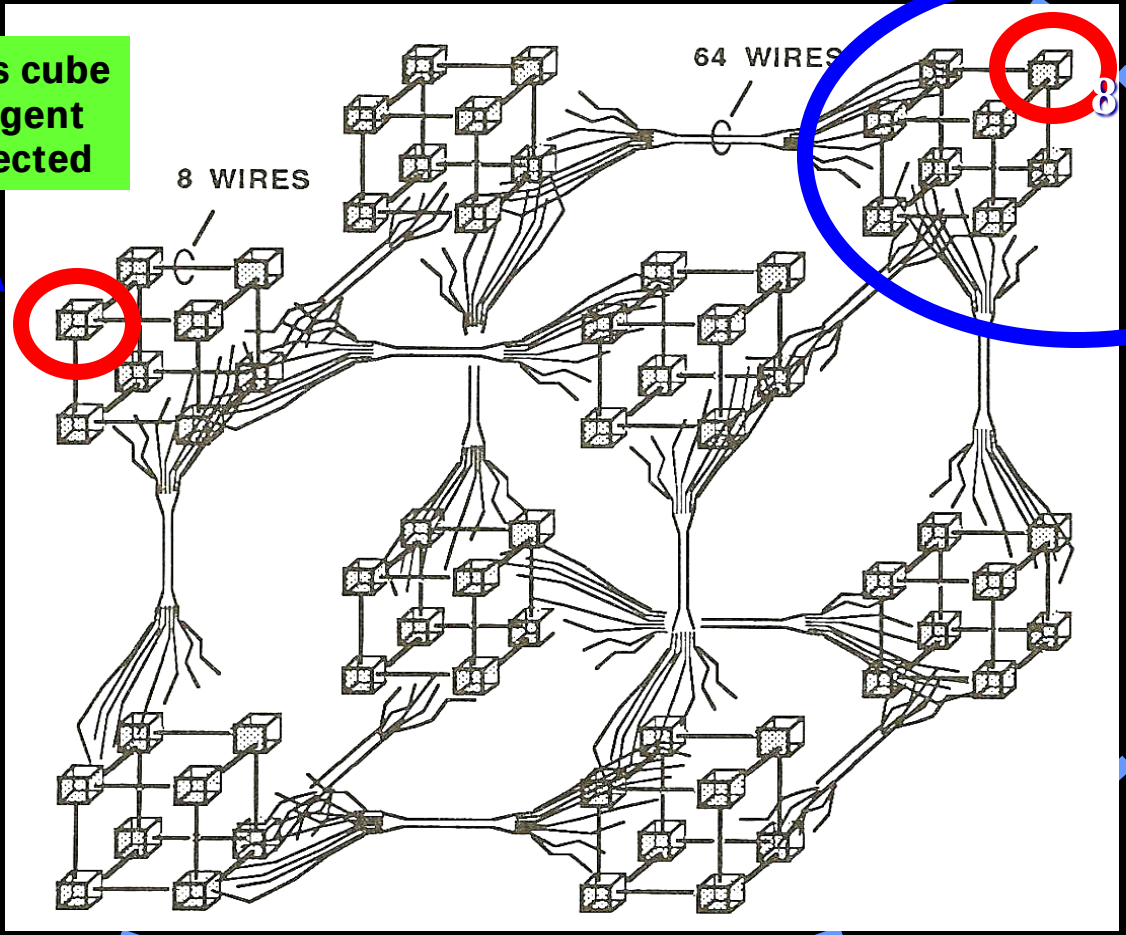
'Wiki City Rome' at MIT obtains data anonymously from phones and devices to map Rome in real time

Data → Information

8 corners of larger cube
8 Agents repeated 8 times

64

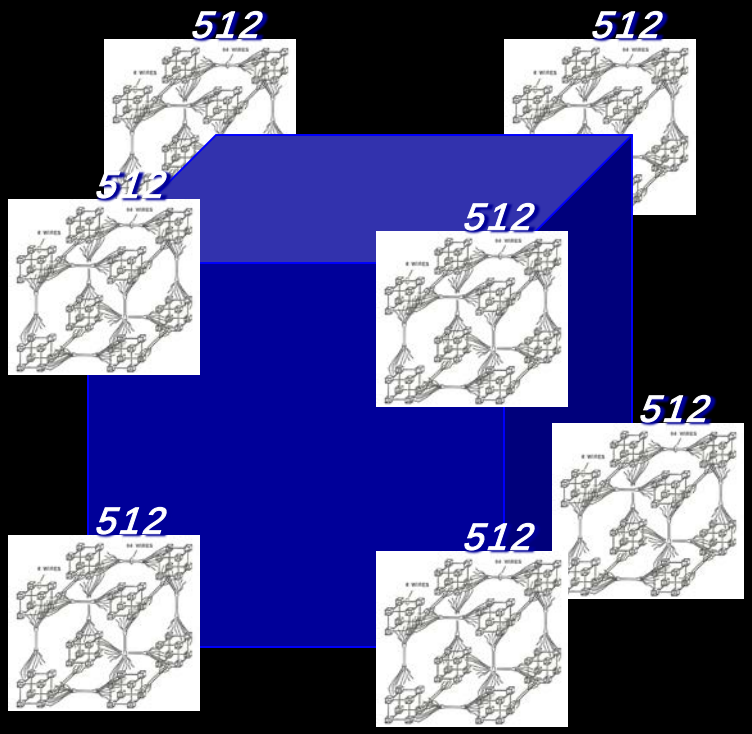
8 corners of this cube
1 corner = 1 Agent
8 Agents connected



= 512

Society of Mind by Marvin Minsky

Data Cube



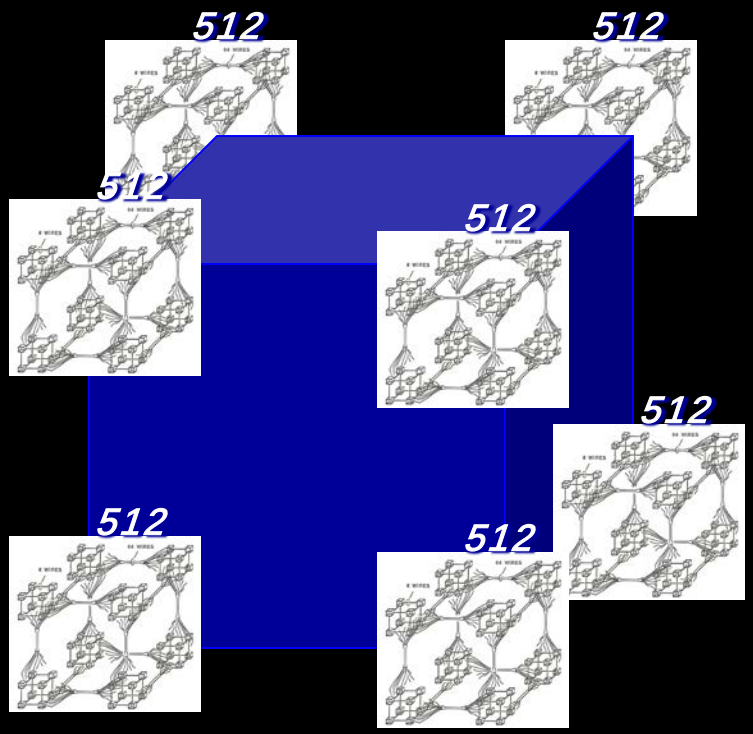
Organize information
-collection of independent variables
-Relationship analysis

Large Hadron Collider (2007)
800 million collisions/second (12 DVD/min)
- Courses and trajectory changes
- Energies of particles involved in collisions
- Where and when

Metereology – climate models
Epidemiology – spread of infection (H5N1)

Cube-on-Cube: Step 4

Cube-on-Cube: Step 4



Agents interconnected

8 X 512 = 4096

Cube-on-Cube: Step 10

Cube-on-Cube: Step 10

Repeat this cube-on-cube pattern 10 times (10 steps).

Supercube (8^{10} = 1, 073,741,824) will contain over 1 billion Agents.

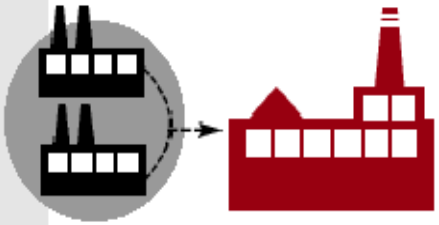
Each Agent in the original smallest cube (of 8 Agents) can communicate with 1 billion Agents (sources, variables) in 10 steps.

Link each Agent to 50 other Agents:
Each Agent communicates with >15 billion Agents in 6 steps (50^6).

CocaCola can monitor nearly *each RFID tagged unit case* of its product. Real-time data can be collected by an Agent (Agency) in mere 6 steps for analysis (inventory, distribution, storage, transit, temperature). In 2004, CocaCola produced 19.8 billion unit cases.

P&G's Agent-Enabled Supply Network in 2008

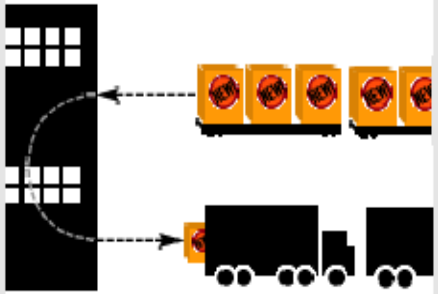
By 2008, P&G will have shortened the end-to-end replenishment cycle for a box of Tide from four months to one day. Here's how:



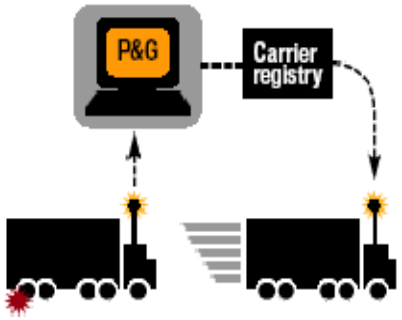
1 It's 2008, and P&G has replaced its numerous specialized plants with a few "flexi-plants" – highly versatile facilities with quick turnaround capabilities

2 Software agents of a key supplier detect a looming hurricane that threatens a Puerto Rico operation. They alert P&G's software agents and work with them to create an alternative delivery schedule so P&G's Miami plant doesn't face a material shortage.

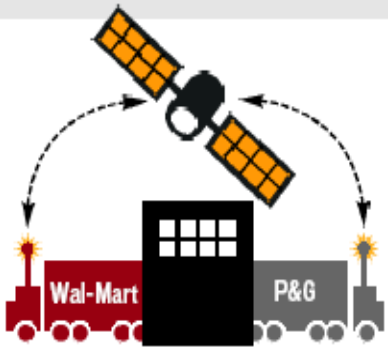
3 The Miami facility, like every P&G plant, bids via software agents for its next production run based on its capability to deliver its current job, its queued work orders and its just-in-time materials supply capability. Its low-cost bid to produce Tide wins.



4 When pallets of Tide reach P&G's distribution centers, they're dynamically dispatched, with priority given to retailers whose inventories are very low.



5 When a tire blowout threatens to delay a shipment of Tide, P&G's agents detect it and prequalify an alternative trucker, who picks up the product and delivers it to Wal-Mart just in time.



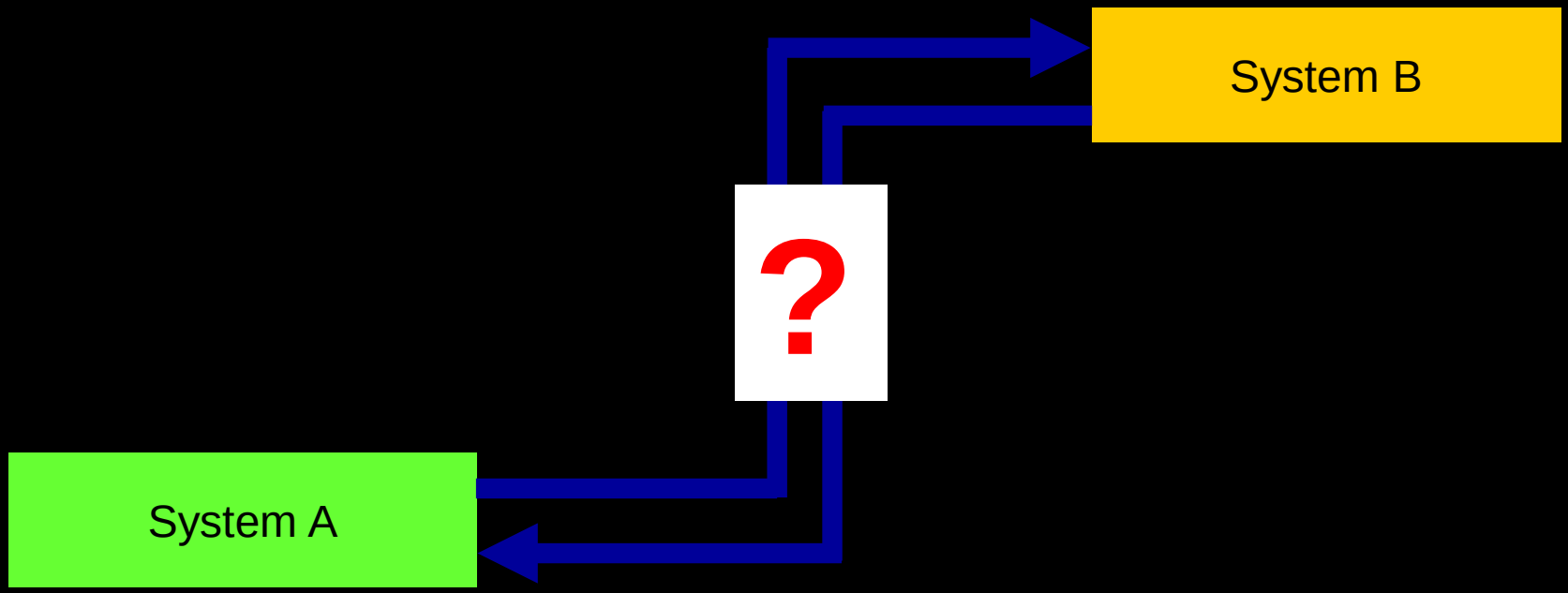
6 Wal-Mart has replaced all of its costly warehouses with docking facilities it shares with suppliers. These docking/distribution facilities ship products like Tide to stores within hours of receiving them.

7 Software agents collect real-time sales data on each P&G product from multiple retail stores. They aggregate it and relay it to P&G's sales and marketing for trend analysis.

8 Wal-Mart's smart shelves alert a stocker to immediately retrieve Tide from the back room and place it on the shelf. Tide is restocked just seconds before the last box would have been taken off the shelf.

SOURCE: FORRESTER RESEARCH INC. AND

Global Data Synchronization



Electronic Product Code (64-bit)

01.0203D2A.916E8B.0719BAE03C

EPC

2^4 **Header: 4 bits = 16**

2^{16} **ePC Mgr: 16 bits = 65,536**

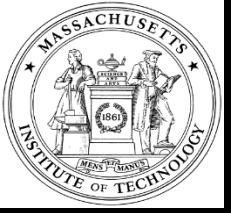
2^{16} **Object Class: 16 bits = 65,536**

2^{28} **Serial Number: 28 bits = 268, 435,456**

$2^{64} = 1.8 \times 10^{19}$

Designed for object identification as data from radio frequency tags, such as, RFID.

Not designed for syntax and information processes of the type who, where, when.



SOLUTION ??

Information Identification

Electronic Product Code (64-bit)

01.0203D2A.916E8B.0719BAE03C

EPC

$2^{64} = 1.8 \times 10^{19}$

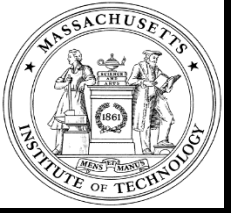
- Header: 4 bits = 16 — 2^4
- ePC Mgr: 16 bits = 65,536 — 2^{16}
- Object Class: 16 bits = 65,536 — 2^{16}
- Serial Number: 28 bits = 268, 435,456 — 2^{28}

21DA : 00D3 : 0000 : 2F3B : 02AA : 00FF : FE28 : 9C5A

IPv6

$2^{128} = 3.4 \times 10^{38}$

128-bit EPC form proposed in 1998 by Sanjay Sarma & Dan Engels of MIT is not used by EPC Global



Why ? How ??

IPv6

Global Agreement

Internet Protocol version 6

But not necessarily a panacea!

Identification: Think Identity !

Relativistic Identification

Sir Clive Granger

Blood Glucose 120 mg/dl

Identical Results

Identical Numbers 120

Different Identities

120CG

120GS

Prof Gunnar Stefansson

Blood Glucose 120 mg/dl

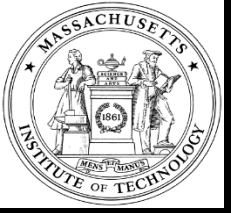
Executive Summary

- Concept — Relative Identification
- Application — Logistics, SCM, Healthcare, Security, eGov
- Tools — IPv6 Format and Semantics
- Benefits — Global Standard, Systems Interoperability

Problem Space

Object-centric Identification
Isolated, Inadequate, Heterogeneous

- Variable formats
- Systems incompatibility
- Master Data mis-Management
- Object data not linked to process
- Data, analytics, information - disconnected



- Variable formats
- Systems incompatibility

- **GIAI – Global Individual Asset Identifier**
- **GLN – Global Location Number**
- **SSCC – Serialized Shipping Container Code**
- **GTIN – Global Trade Item Number**
- **GUID – Globally Unique Identification**
- **UCR – Universal Consignment Reference**
- **EPC – Electronic Product Code**

Master (?) Data mis-Management

Manual Identification

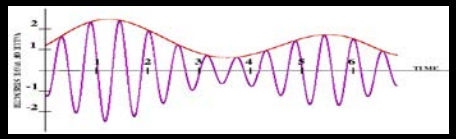
Here

METRO AG
Heinz Ketchup
Store Id 6174523211

Store Database

Regional DC Database

RFID: Automatic Identification



3PL Database

01.0203D2A.916E8B.0719BAE03C

Warehouse Database

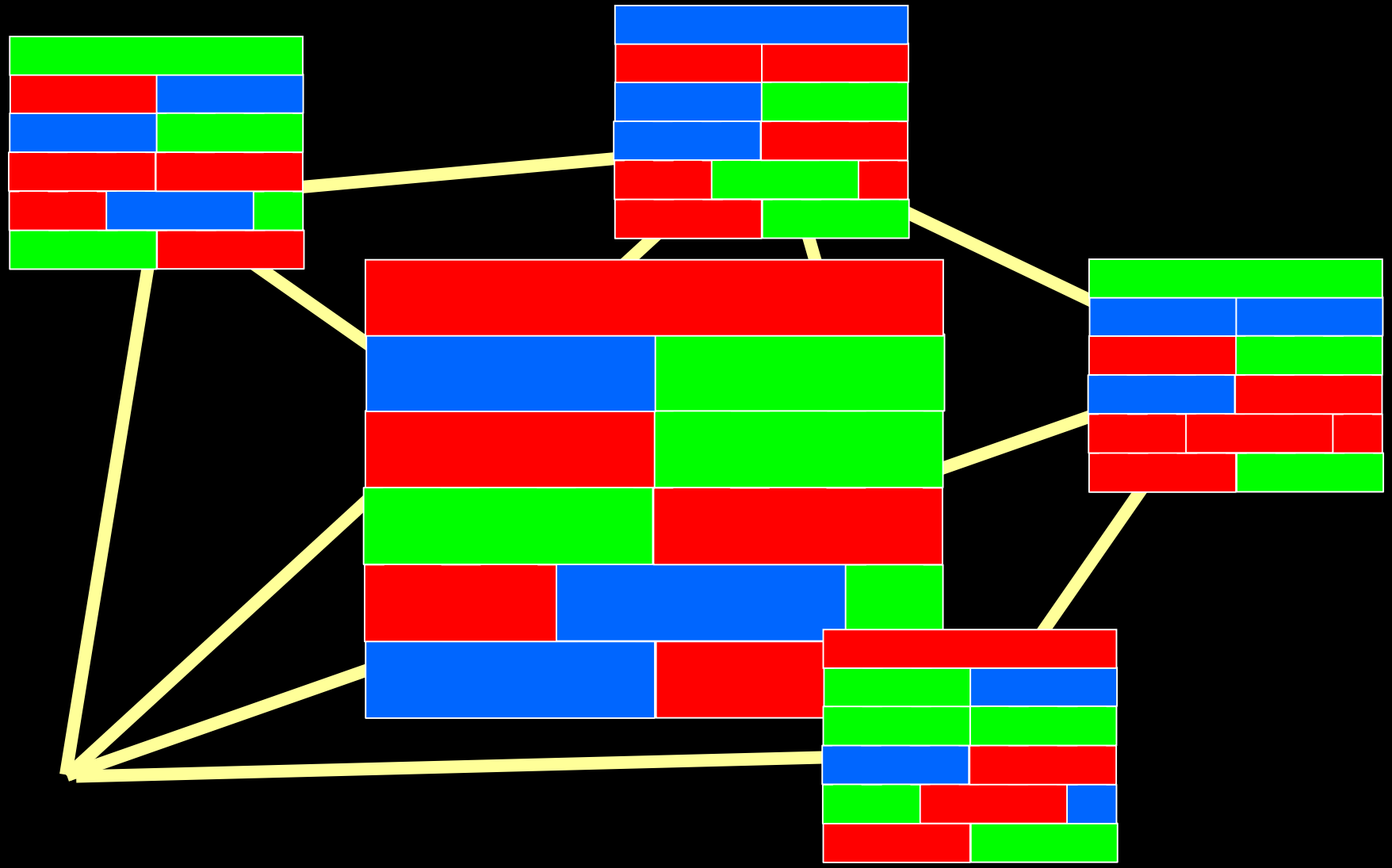
There

Heinz Ketchup
Manufacturer's EPC
010203D2A916E8B

Manufacturer's Database

Systems Incompatibility, Master Data mis-Management

Networks Lack Functional Integration, Interoperability



Systems Solution Requires

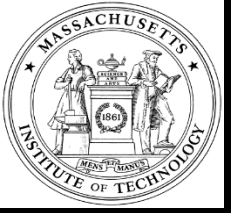
Unique Identification
Objects, Process, Information, Decisions

- Not a new standard format
- Heterogeneous systems compatibility
- Syntax and semantic relationships - defined
- Data, analytics, process, information - linked

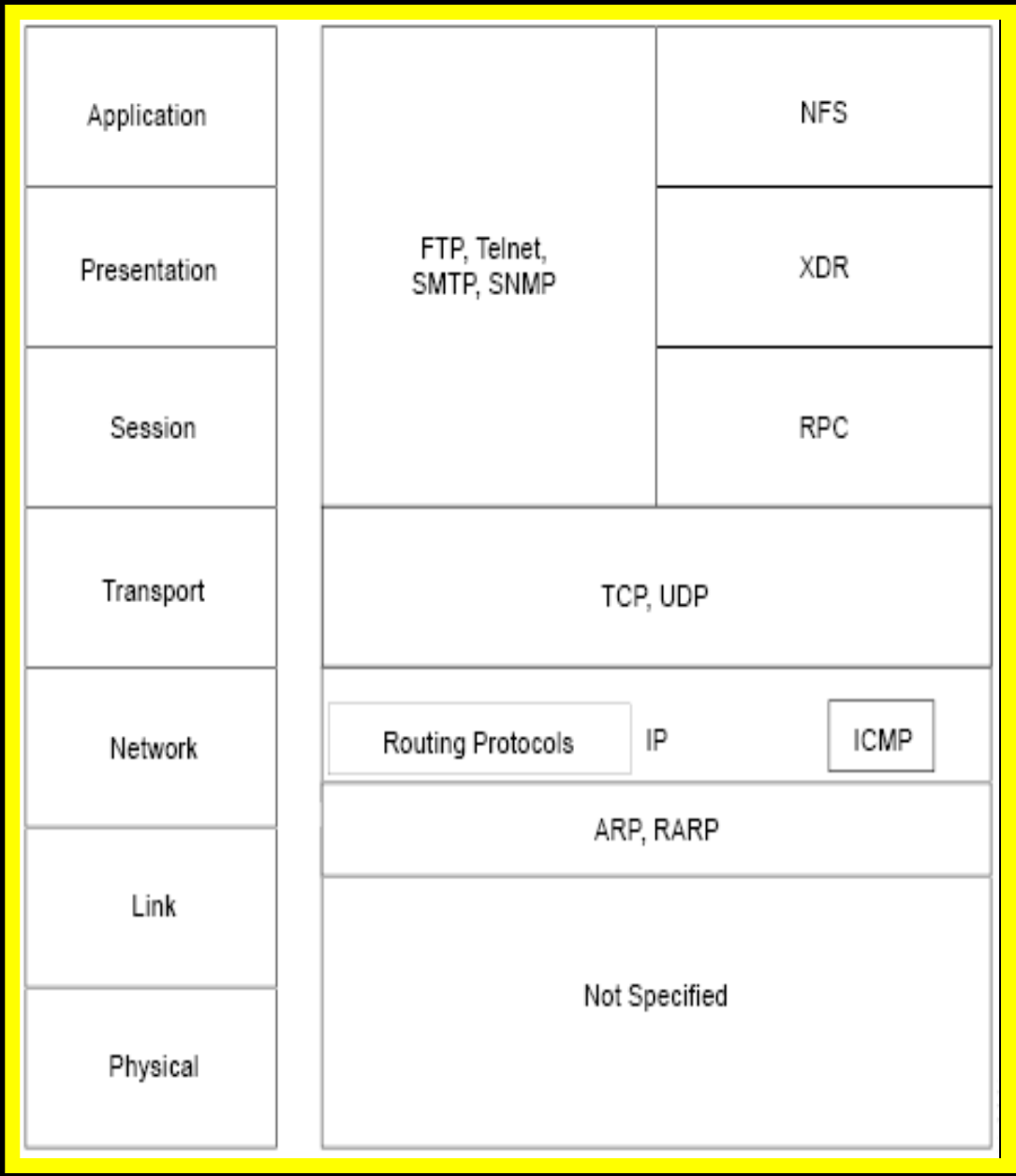
Proposed Solution

IPv6
Use Internet Protocol version 6 Format

- Not a new standard – agreed for adoption
- Heterogeneous systems compatibility - proven
- Syntax & semantics – unique id possible using URI
- Data, analytics, process, information – can be linked

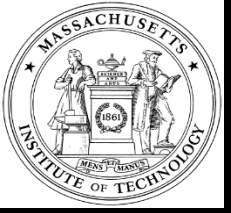


IPv6



OSI Reference Model

Internet Protocol Suite



IPv6 Format

128-bit IPv6 address in binary form is divided along 16-bit boundaries:

0010000111011010 0000000011010011 0000000000000000 0010111100111011

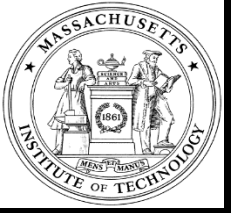
0000001010101010 0000000011111111 1111111000101000 1001110001011010

Each 16-bit block converted to colon hexadecimal form

21DA : 00D3 : 0000 : 2F3B : 02AA : 00FF : FE28 : 9C5A

With leading zero suppression

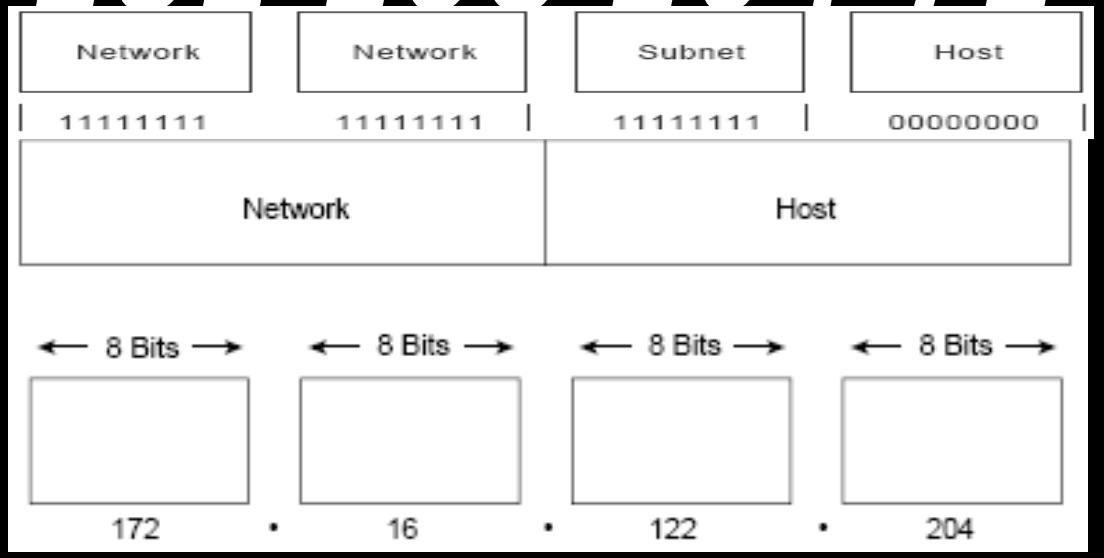
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A



2^{32}

IPv4

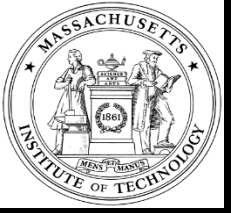
151•193•204•72



21DA : 00D3 : 0000 : 2F3B : 02AA : 00FF : FE28 : 9C5A

2^{128}

IPv6



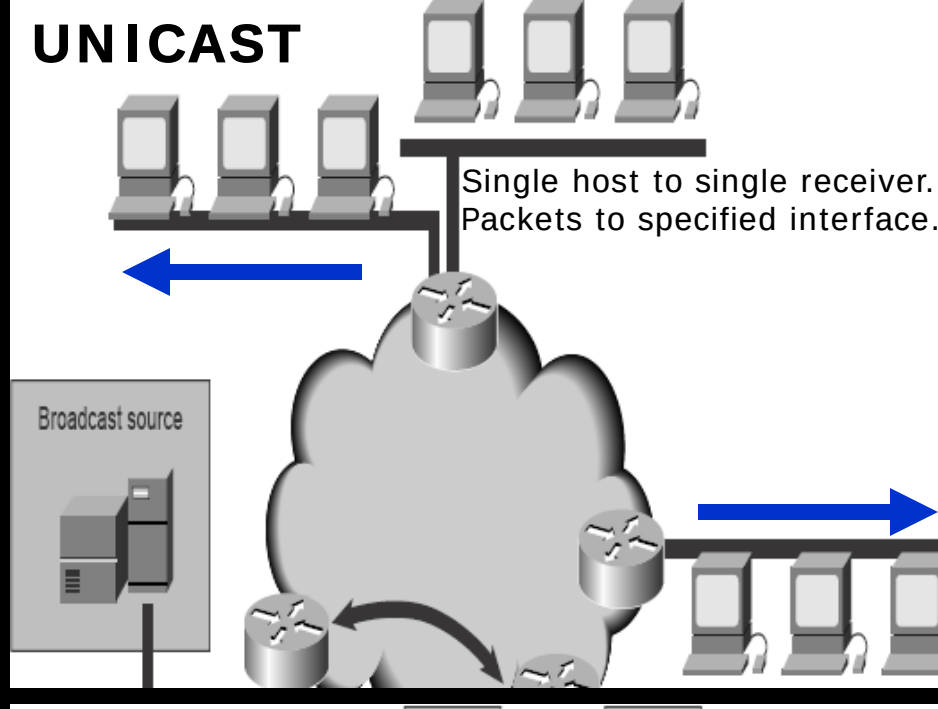
Routing

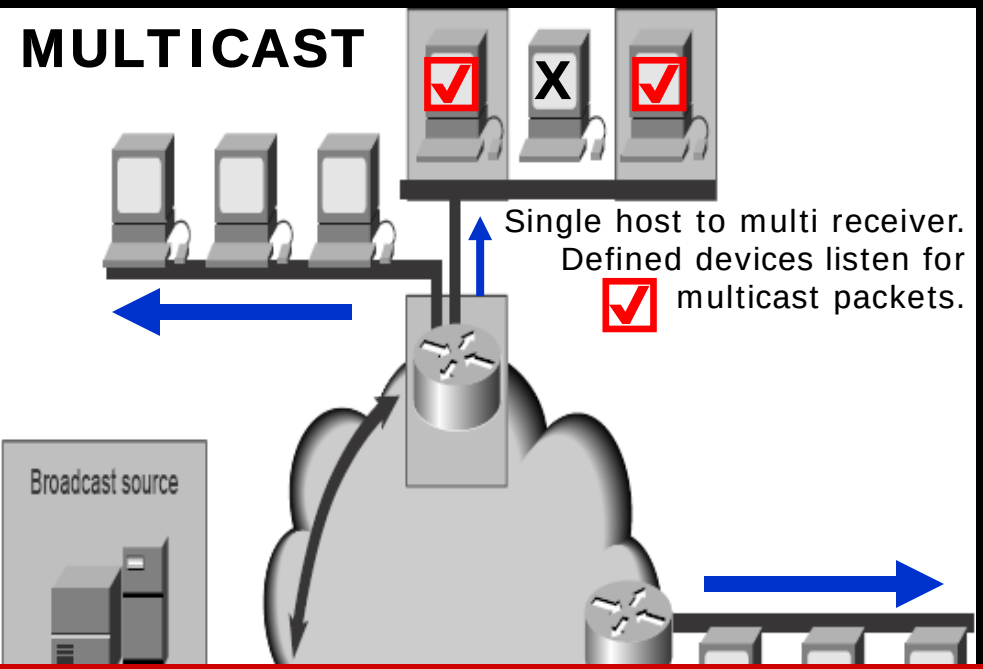
IPv6

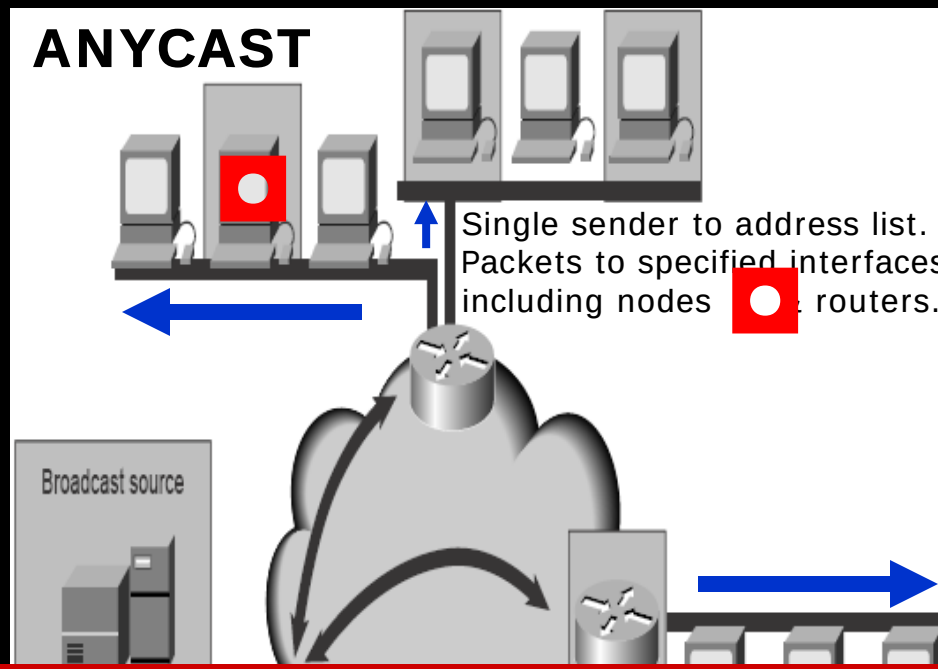
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A

-
-
-
- Data, analytics, process, information – transmission
- New revenue potential for telecommunications including P2P
- Not everything needs routing but **FORMAT** is globally adopted

IPv6 Routing

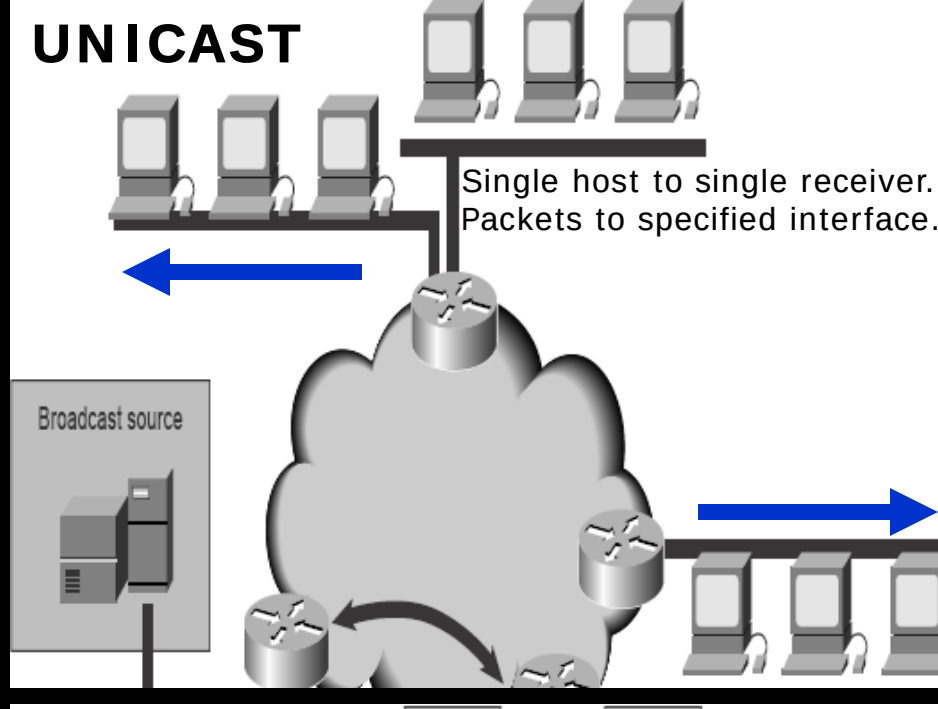


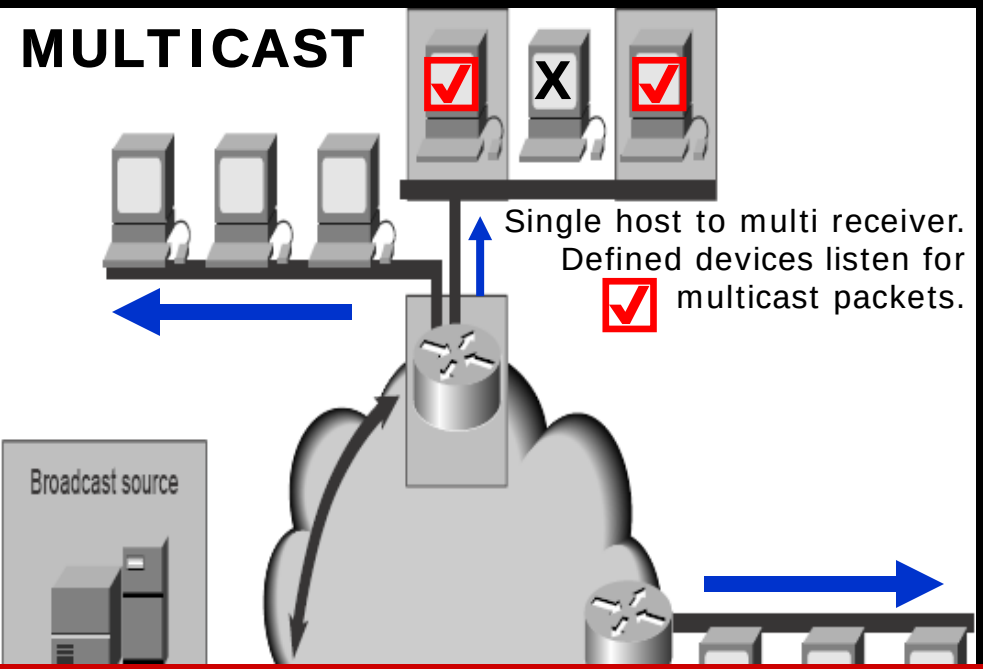


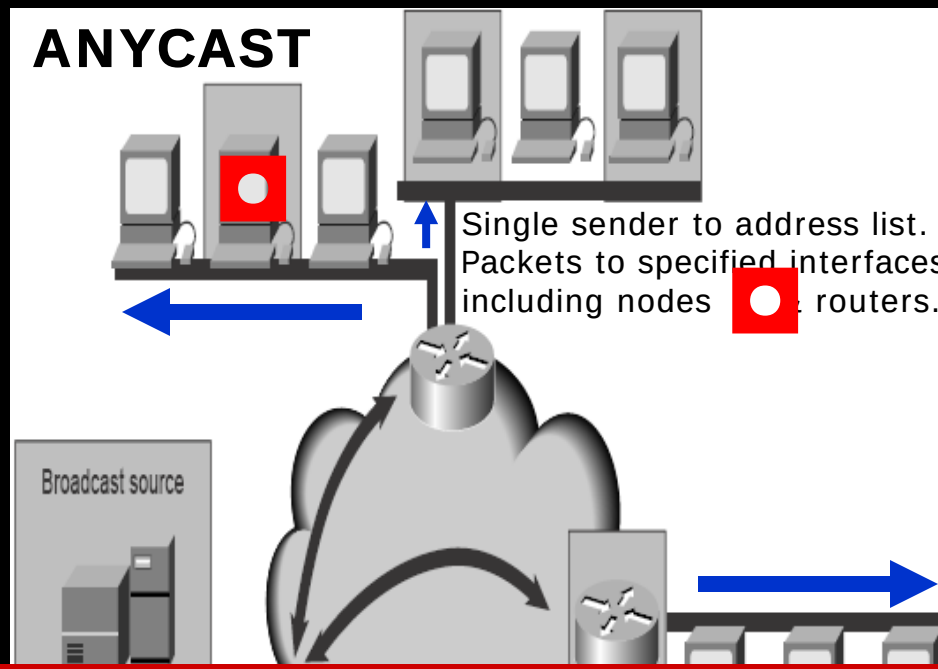


IPv6 Routing

How is this helpful in operations?





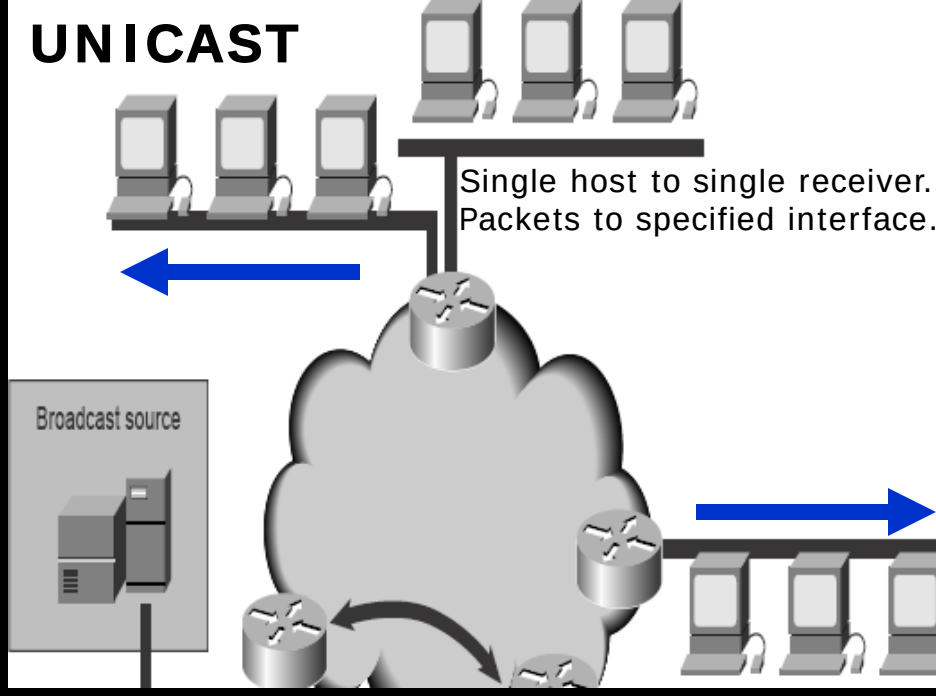


IPv6 Routing

Data Routing

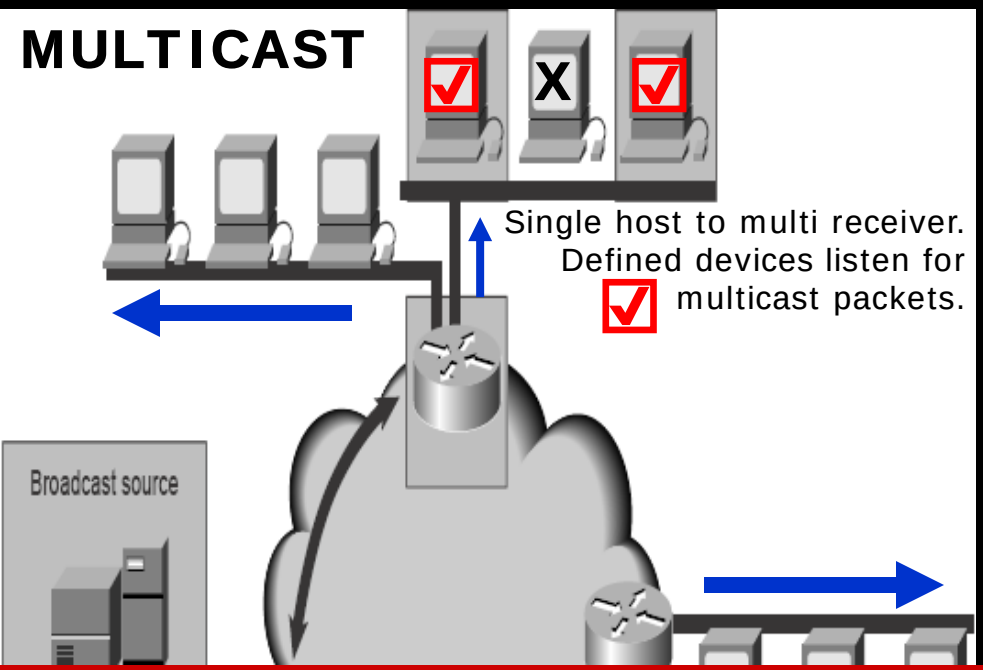
- *Where ?*
- *What ?*

UNICAST



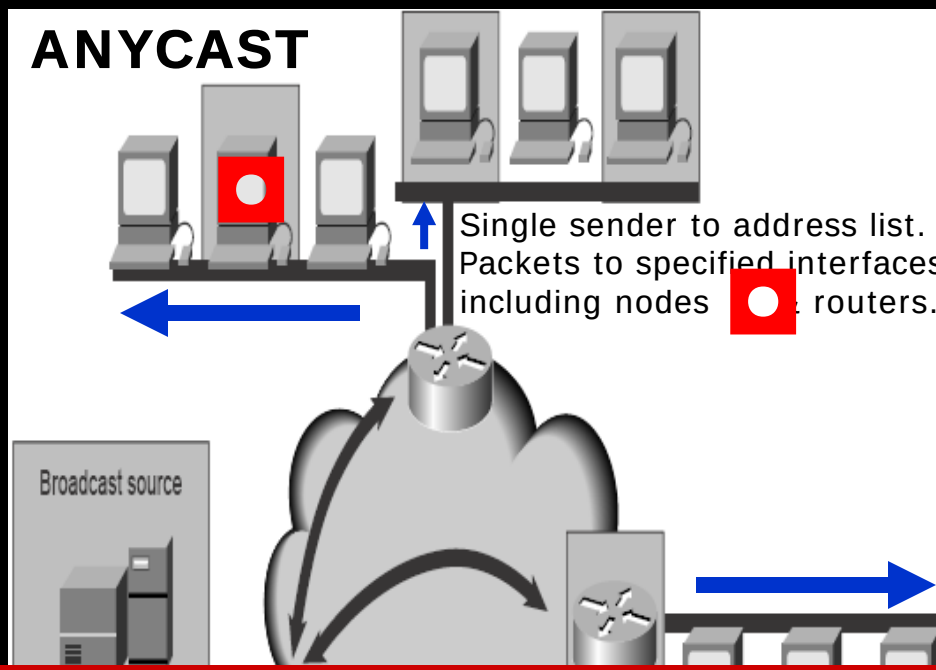
Single host to single receiver.
Packets to specified interface.

MULTICAST



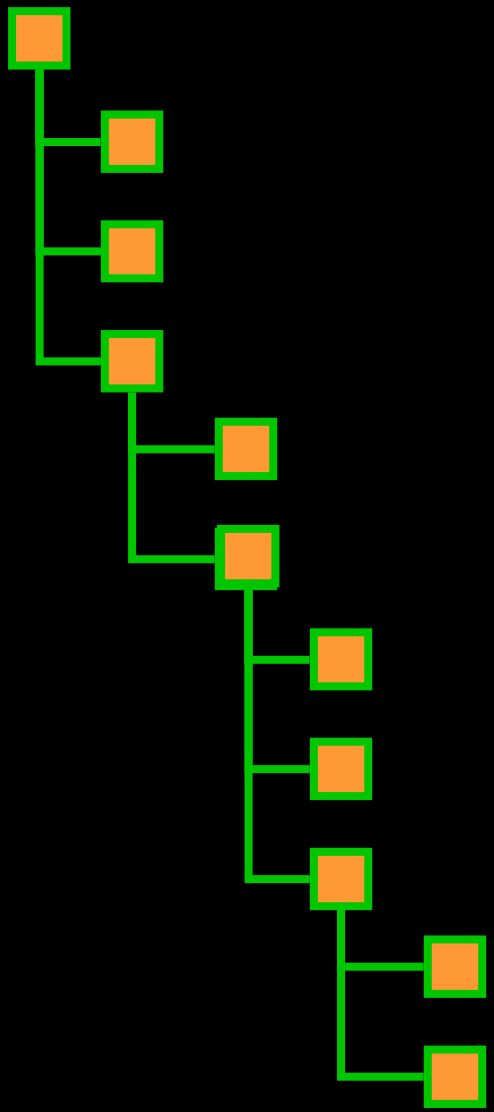
Single host to multi receiver.
Defined devices listen for
multicast packets.

ANYCAST

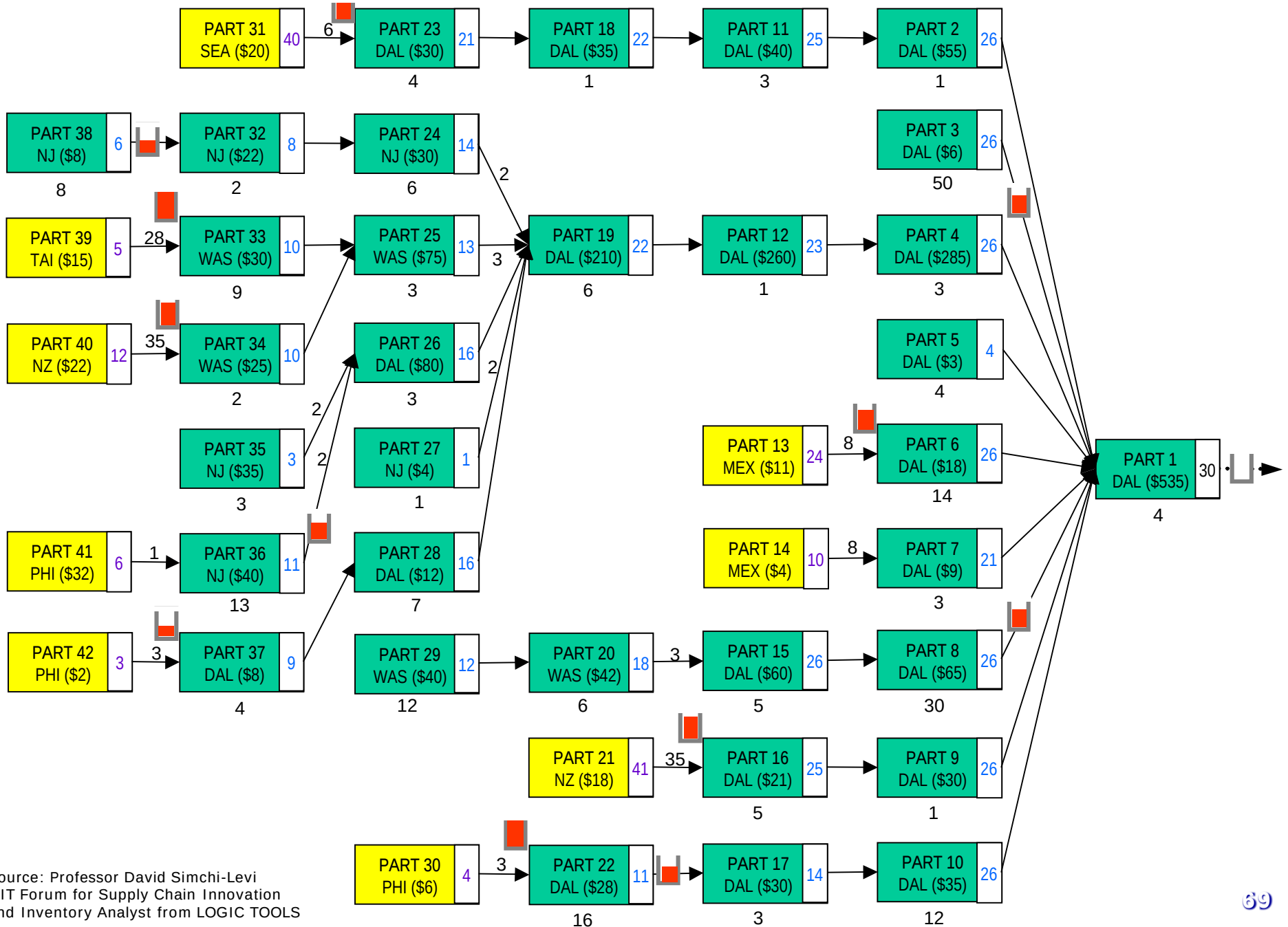


Single sender to address list.
Packets to specified interfaces
including nodes & routers.

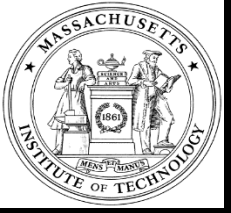
Sets, Subsets, Identification, Relation, Data



Components: Inventory Optimization in Supply Chain



Source: Professor David Simchi-Levi
MIT Forum for Supply Chain Innovation
and Inventory Analyst from LOGIC TOOLS



Billions of Objects

3.0	J & J
10.0	Kimberly Clark
15.0	Tesco
20.0	Unilever
25.0	Philip Morris
30.0	Wal-Mart
31.0	P&G
53.0	International Paper
200.0	Coca-Cola
205.0	US Post

Trillions of Processes

Octillions of Identities

32-bit address space (IPv4) allows 2^{32} or 4,294,967,296 possible unique addresses (id). A 128-bit address space used for the design of the IP version 6 allows for 2^{128} or 340,282,366,920,938,463,463,374,607,431,768,211,456 (3.4×10^{38}) possible unique addresses. EPC is a 64-bit format for 18,446,744,073,709,551,616 or 1.8×10^{19} unique object id. 96-bit identifies 79,228,162,514,264,337,593,543,950,336 (7.9×10^{28}) objects with RFID tags but excludes “process” id.

Mobile Dynamic Network

Billions of Objects

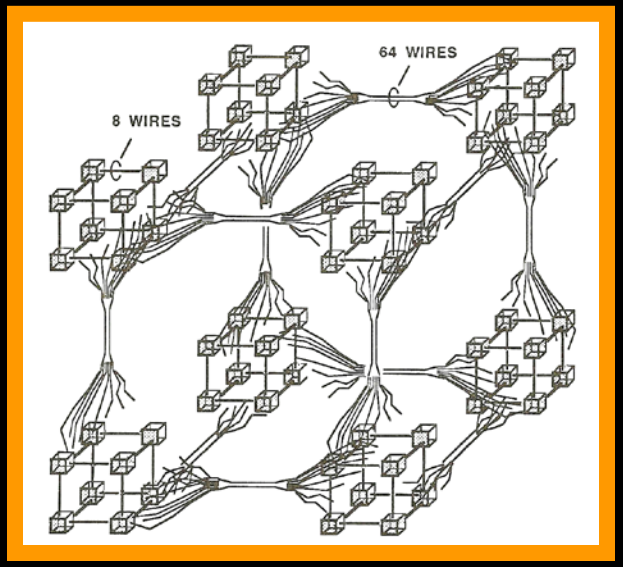
Trillions of Processes

Octillions of Identities

Exabytes of Data

SCM Logistics Transportation

- Manufacturer
  - 3PL
  - Goods Receipt
  - Distribution Planning
    - Transportation Zone
    - Distribution Center
      - Store Identifier
      - Receiving Personnel
      - Plan-o-gram Compliance
        - Shelf
        - B/A Value-Pack Present
          - GIFT BOX RFID Tag
          - GIFT BOX Acrylic Casing
          - GIFT BOX
            - WiMax-WiFi Connect Card
            - GIFT SET
              - XBOX GAME
              - CD Book+Soundtrack
              - DVD Item
                - DVD Disc
                - DVD Case



Why IPv6

IPv6 converges object, process, location, data

- Billions of Objects
- Trillions of Processes
- Octillions of Identities
- Exabytes of Data

- Manufacturer
  - 3PL
  - Goods Receipt
  - Distribution Planning
    - Transportation Zone
    - Distribution Center
      - Store Identifier
      - Receiving Personnel
      - Plan-o-gram Compliance
        - Shelf
        - B/A Value-Pack Present
          - GIFT BOX RFID Tag
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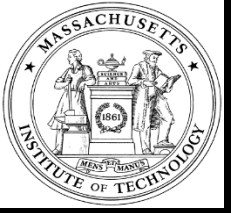
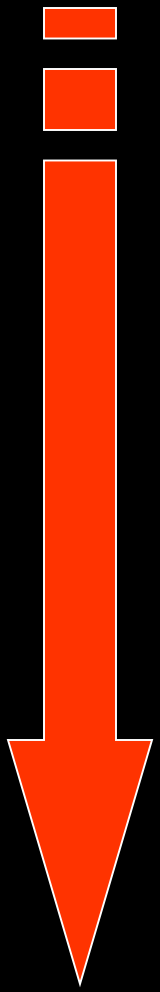
          - GIFT BOX
            - WiMax-WiFi Connect Card
            - GIFT SET
              - XBOX GAME
              - CD Book+Soundtrack
              - DVD Item
                - DVD Disc
                - DVD Case



IPv6 converges object, process location, data



- Manufacturer
- 3PL
- Goods Receipt
- Distribution Planning
- Transportation Zone
- Distribution Center
- Store Identifier
- Receiving Personnel
- Plan-o-gram Compliance
- Shelf
- B/A Value-Pack Present
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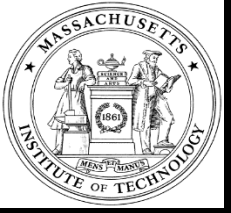
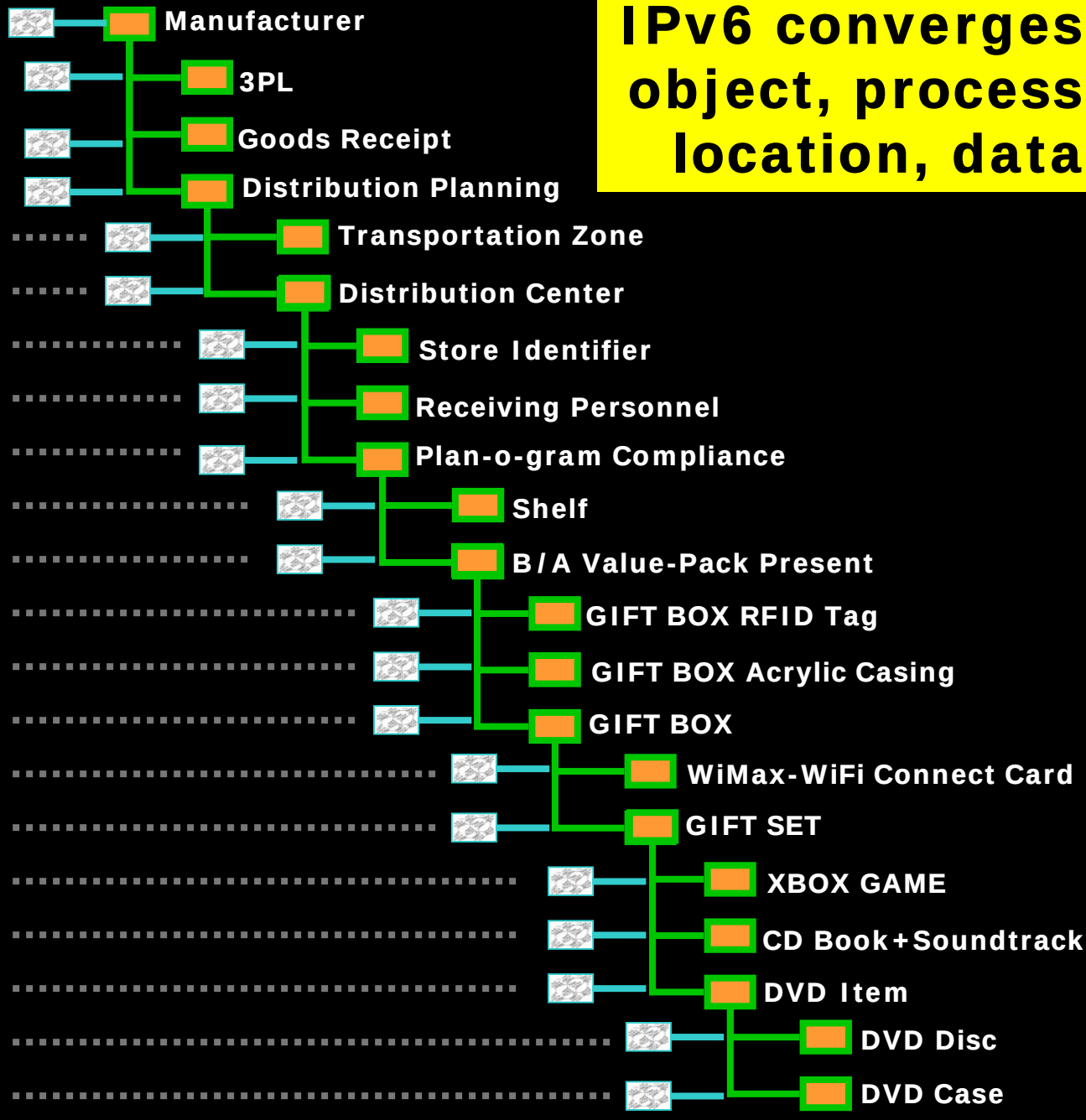
- GIFT BOX
- WiMax-WiFi Connect Card
- GIFT SET
- XBOX GAME
- CD Book+Soundtrack
- DVD Item
- DVD Disc
- DVD Case

21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D

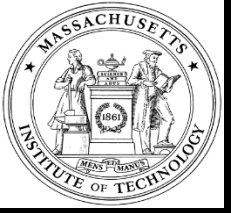


IPv6 converges object, process location, data

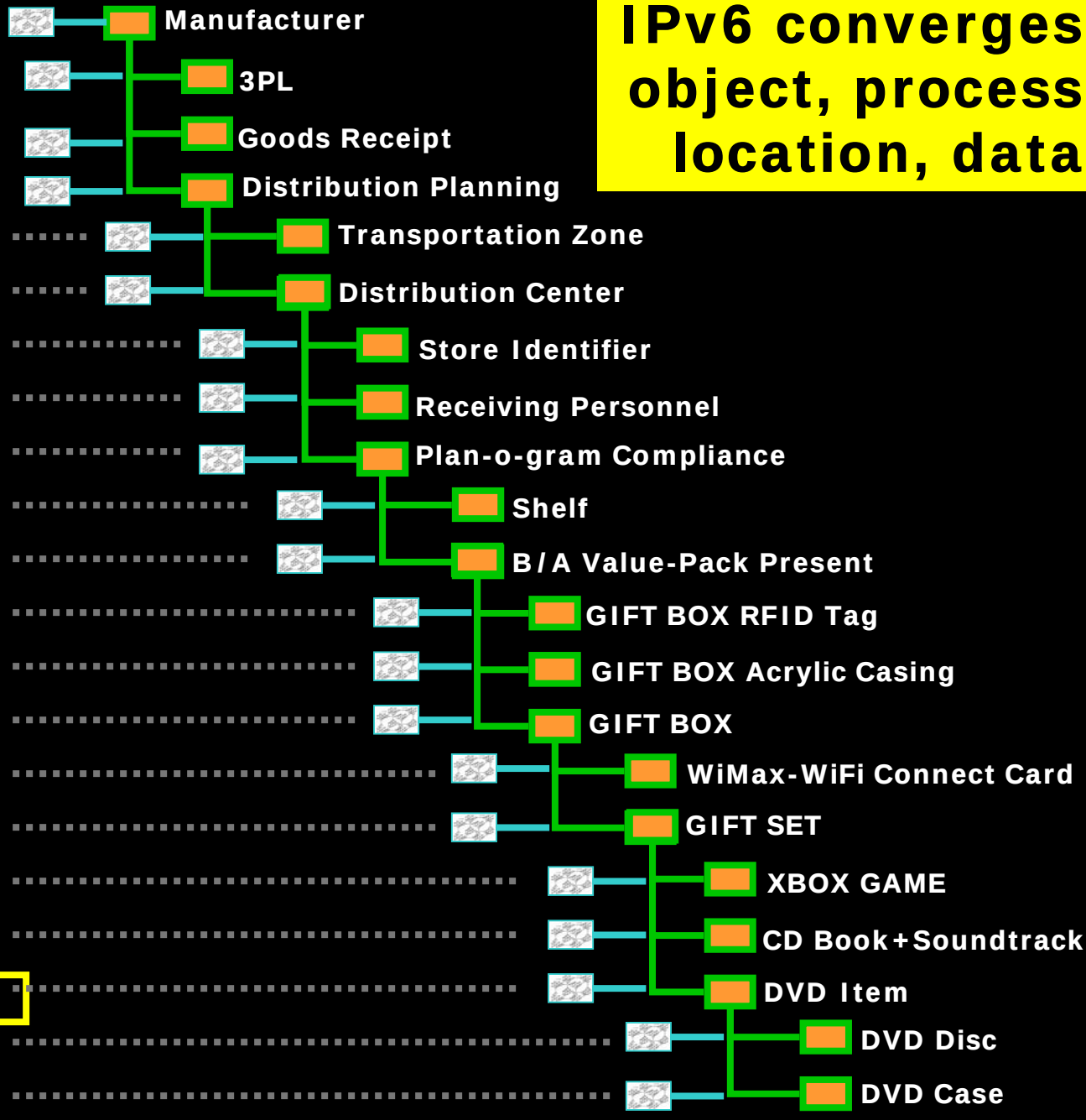


21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D



IPv6 converges object, process location, data

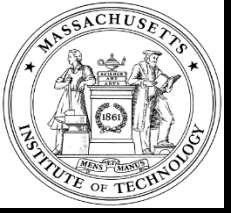


DVD "item" id

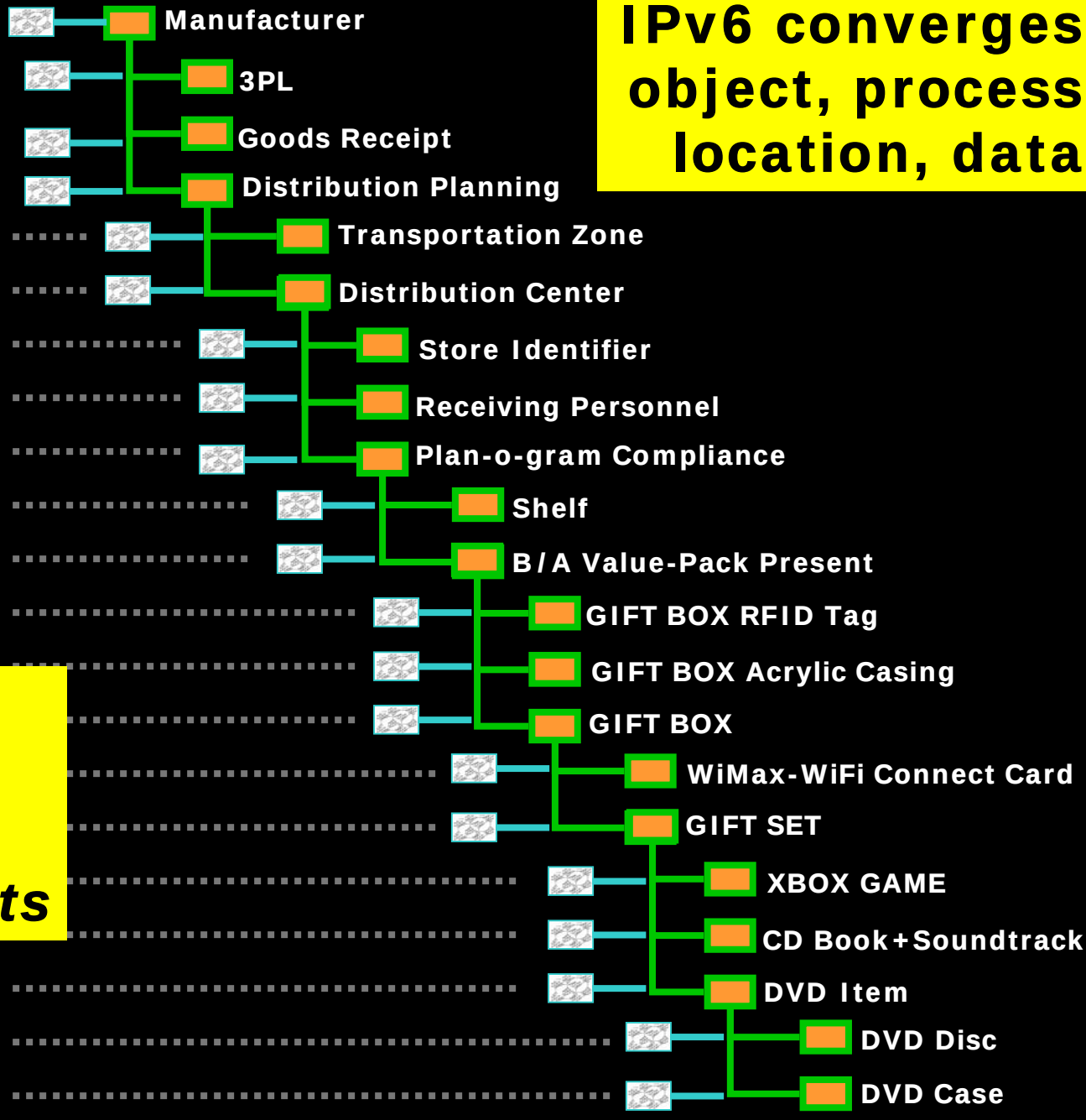
21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D



IPv6 converges object, process location, data

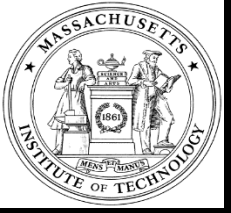


DVD "item" includes DVD disc id and DVD case id as subsets

21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D

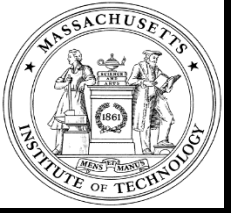


IPv6 converges object, process location, data

Value-Pack id as a domain (super-set)

- Manufacturer
- 3PL
- Goods Receipt
- Distribution Planning
- Transportation Zone
- Distribution Center
- Store Identifier
- Receiving Personnel
- Plan-o-gram Compliance
- Shelf
- B/A Value-Pack Present
- GIFT BOX RFID Tag
- GIFT BOX Acrylic Casing
- GIFT BOX
- WiMax-WiFi Connect Card
- GIFT SET
- XBOX GAME
- CD Book+Soundtrack
- DVD Item
- DVD Disc
- DVD Case

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E2 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E3 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E4 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E5 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E6 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E7 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D



IPv6 converges object, process location, data

Value-Pack id as a domain (super-set)

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E2 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E3 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E4 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E5 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E6 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E7 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D

Re-inventing

EPC ?

Electronic Product Code (64-bit)

01.0203D2A.916E8B.0719BAE03C

EPC

2^4

Header: 4 bits = 16

2^{16}

ePC Mgr: 16 bits = 65,536

2^{16}

Object Class: 16 bits = 65,536

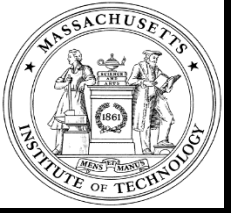
2^{28}

Serial Number: 28 bits = 268, 435,456

$2^{64} = 1.8 \times 10^{19}$

Designed for object identification as data from radio frequency tags, such as, RFID.

Not designed for syntax and information processes of the type who, where, when.



IPv6 converges object, process location, data mapping EPC

Value-Pack id as a domain (super-set)

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E2 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E3 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E4 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E5 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E6 : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E7 : FE07 : 9B2D

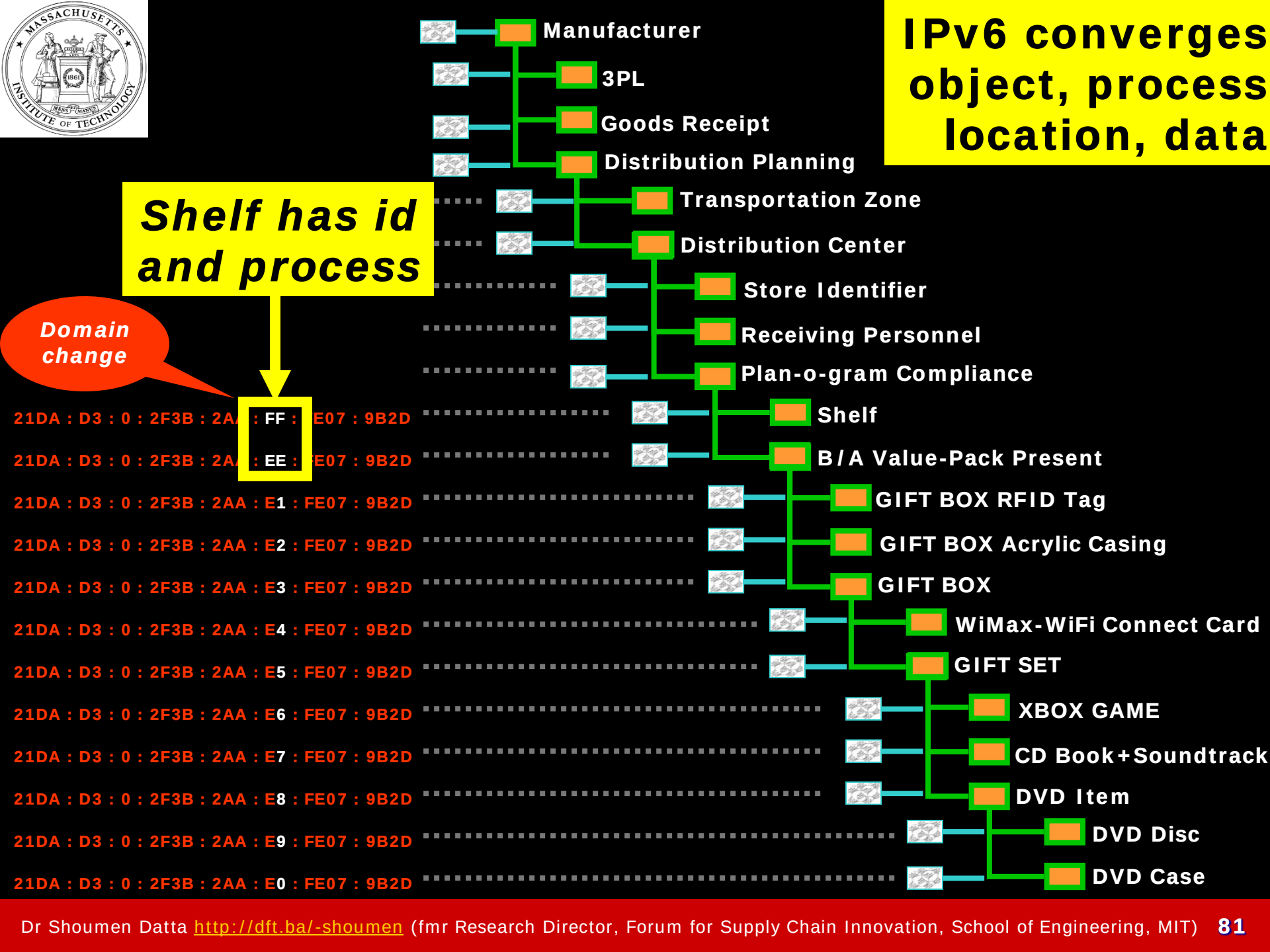
21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D

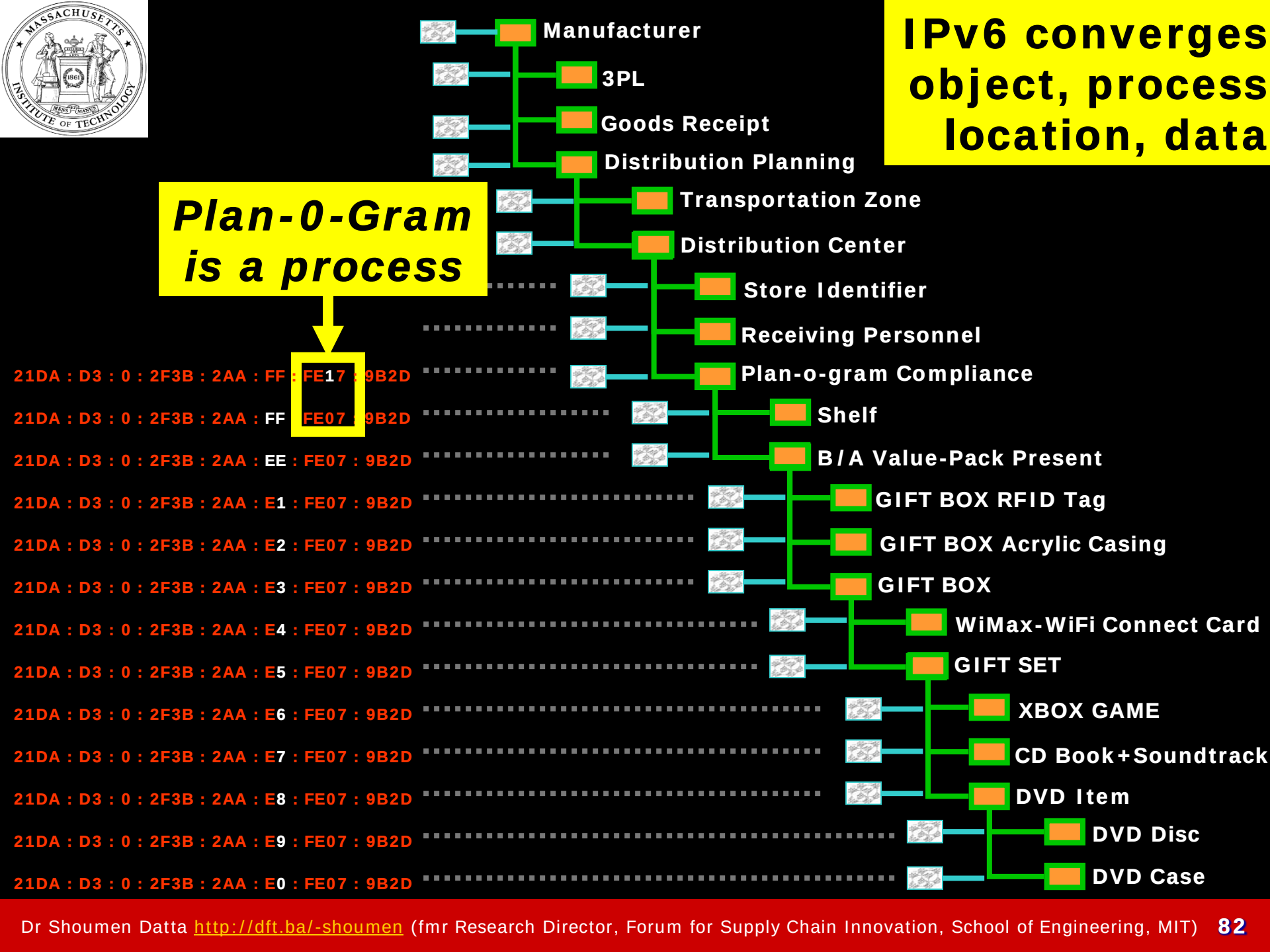
21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D

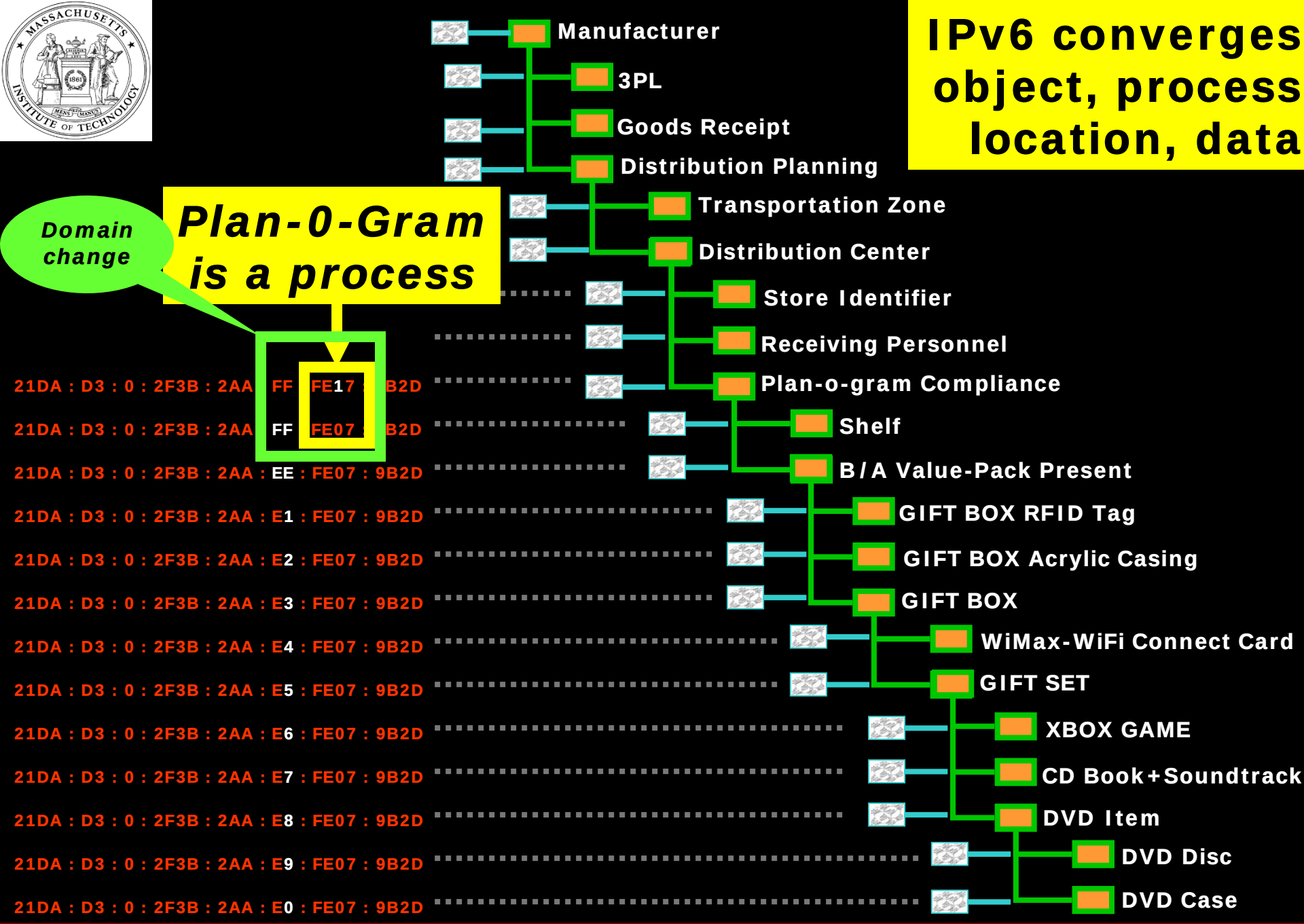
21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D

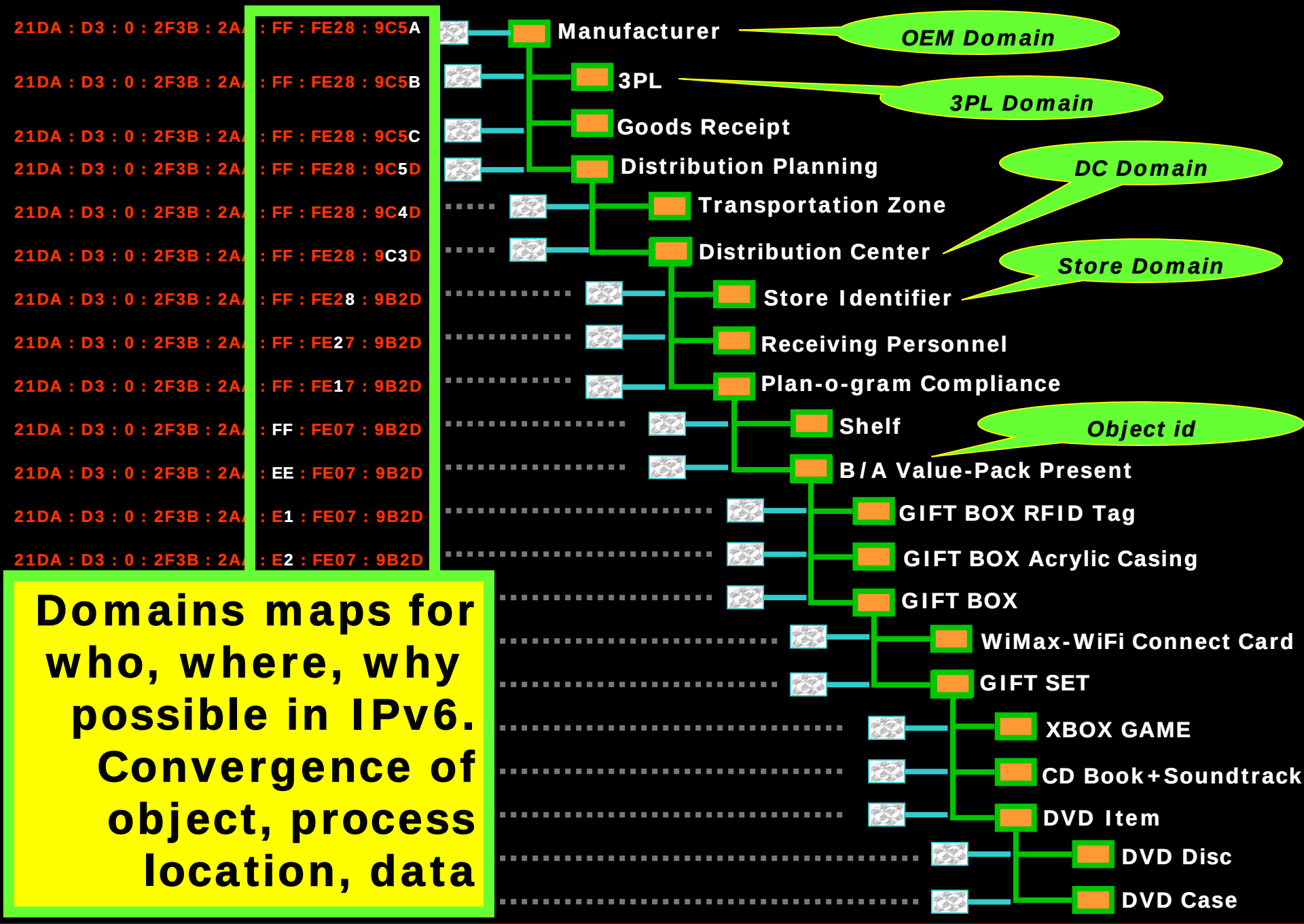
Map EPC to

01.0203D2A.916E8B.0719BAE03C


IPv6 converges object, process location, data
Shelf has id and process
Domain change
21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E2 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E3 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E4 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E5 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E6 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E7 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D
Manufacturer
3PL
Goods Receipt
Distribution Planning
Transportation Zone
Distribution Center
Store Identifier
Receiving Personnel
Plan-o-gram Compliance
Shelf
B/A Value-Pack Present
GIFT BOX RFID Tag
GIFT BOX Acrylic Casing
GIFT BOX
WiMax-WiFi Connect Card
GIFT SET
XBOX GAME
CD Book+Soundtrack
DVD Item
DVD Disc
DVD Case

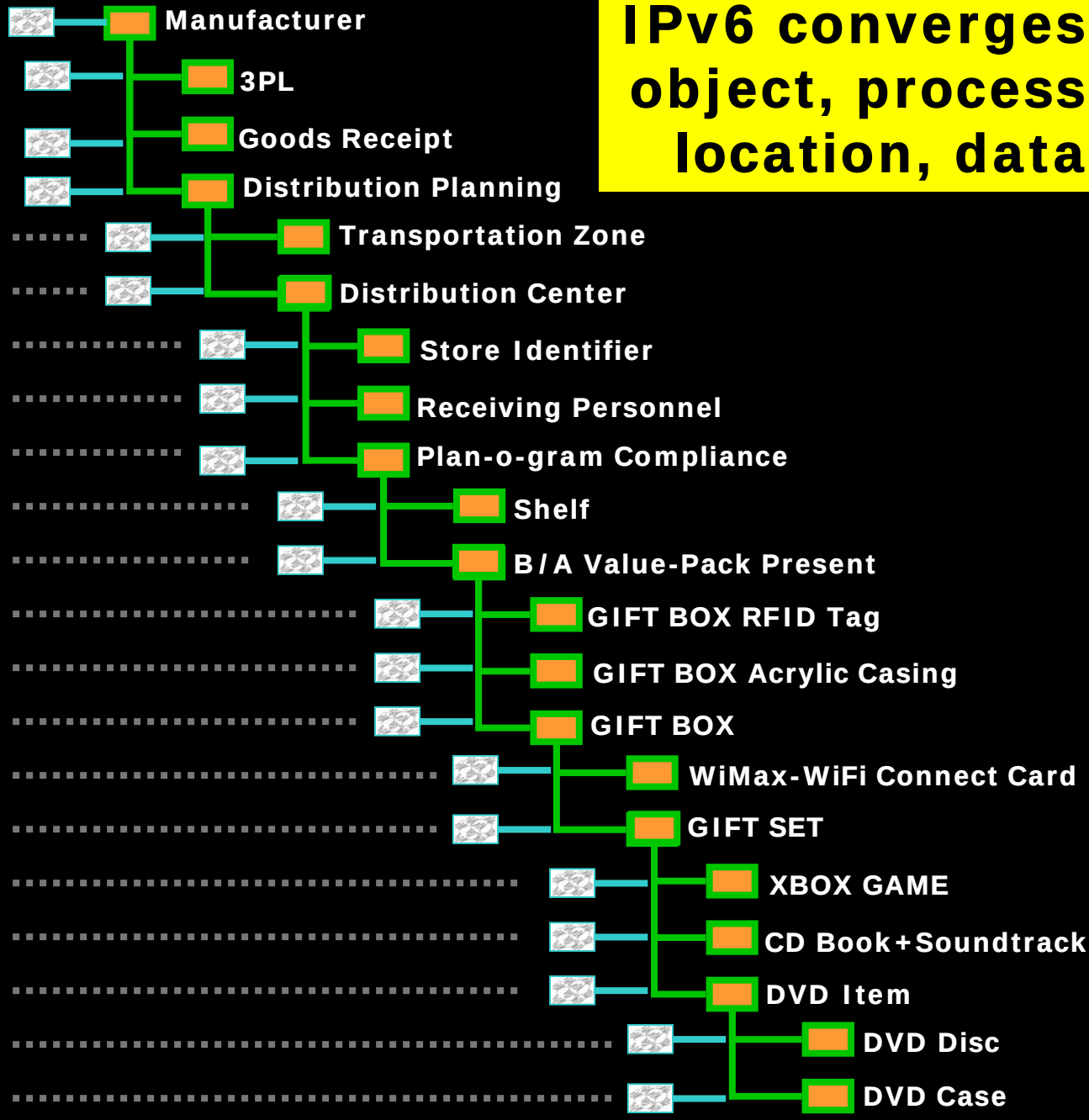

IPv6 converges object, process location, data
Plan-0-Gram is a process
21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E2 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E3 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E4 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E5 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E6 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E7 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D
Manufacturer
3PL
Goods Receipt
Distribution Planning
Transportation Zone
Distribution Center
Store Identifier
Receiving Personnel
Plan-o-gram Compliance
Shelf
B/A Value-Pack Present
GIFT BOX RFID Tag
GIFT BOX Acrylic Casing
GIFT BOX
WiMax-WiFi Connect Card
GIFT SET
XBOX GAME
CD Book+Soundtrack
DVD Item
DVD Disc
DVD Case


IPv6 converges object, process location, data
Plan-0-Gram is a process
Domain change
21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : B2D
21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : B2D
21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E2 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E3 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E4 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E5 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E6 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E7 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D
Manufacturer
3PL
Goods Receipt
Distribution Planning
Transportation Zone
Distribution Center
Store Identifier
Receiving Personnel
Plan-o-gram Compliance
Shelf
B/A Value-Pack Present
GIFT BOX RFID Tag
GIFT BOX Acrylic Casing
GIFT BOX
WiMax-WiFi Connect Card
GIFT SET
XBOX GAME
CD Book+Soundtrack
DVD Item
DVD Disc
DVD Case


21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5B
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5C
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5D
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C4D
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C3D
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : FF : FE27 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D
21DA : D3 : 0 : 2F3B : 2AA : E2 : FE07 : 9B2D
Manufacturer
3PL
Goods Receipt
Distribution Planning
Transportation Zone
Distribution Center
Store Identifier
Receiving Personnel
Plan-o-gram Compliance
Shelf
B/A Value-Pack Present
GIFT BOX RFID Tag
GIFT BOX Acrylic Casing
GIFT BOX
WiMax-WiFi Connect Card
GIFT SET
XBOX GAME
CD Book+Soundtrack
DVD Item
DVD Disc
DVD Case
OEM Domain
3PL Domain
DC Domain
Store Domain
Object id
Domains maps for who, where, why possible in IPv6. Convergence of object, process location, data

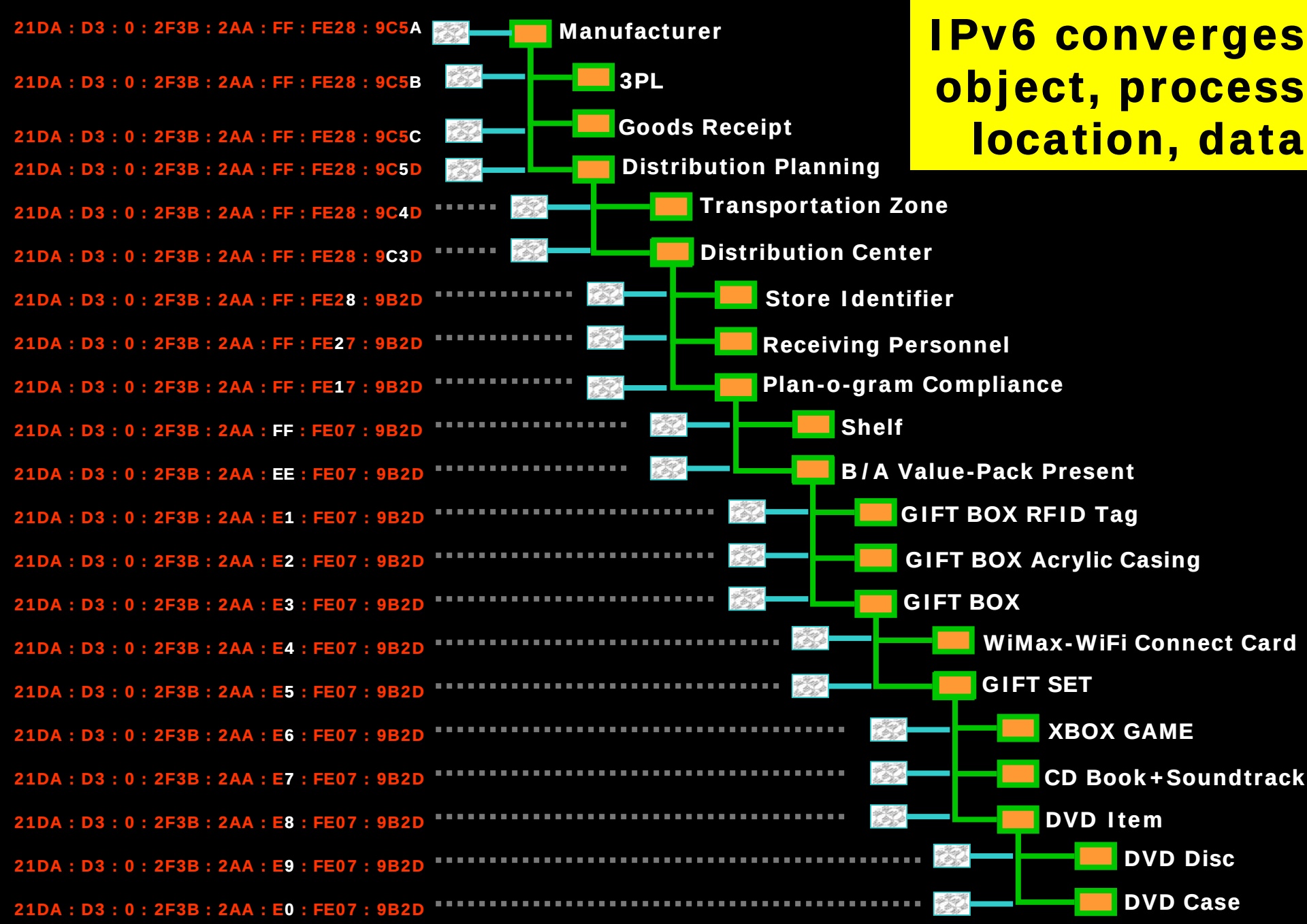
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A

Unique id relates to all information and data subsets.



IPv6 converges object, process location, data

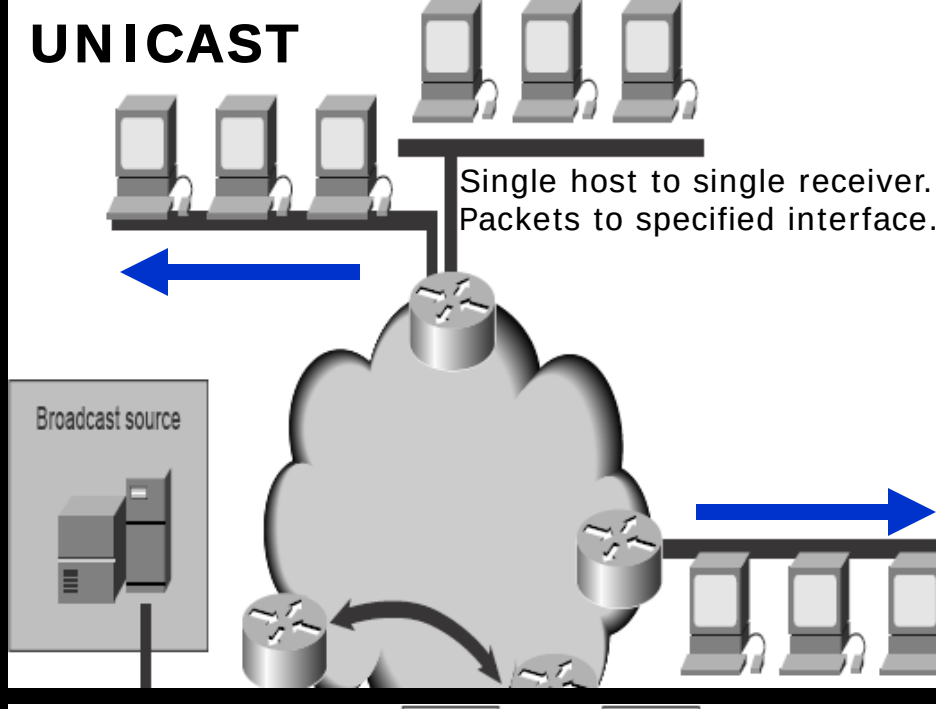
IPv6 converges object, process location, data



IPv6 Routing

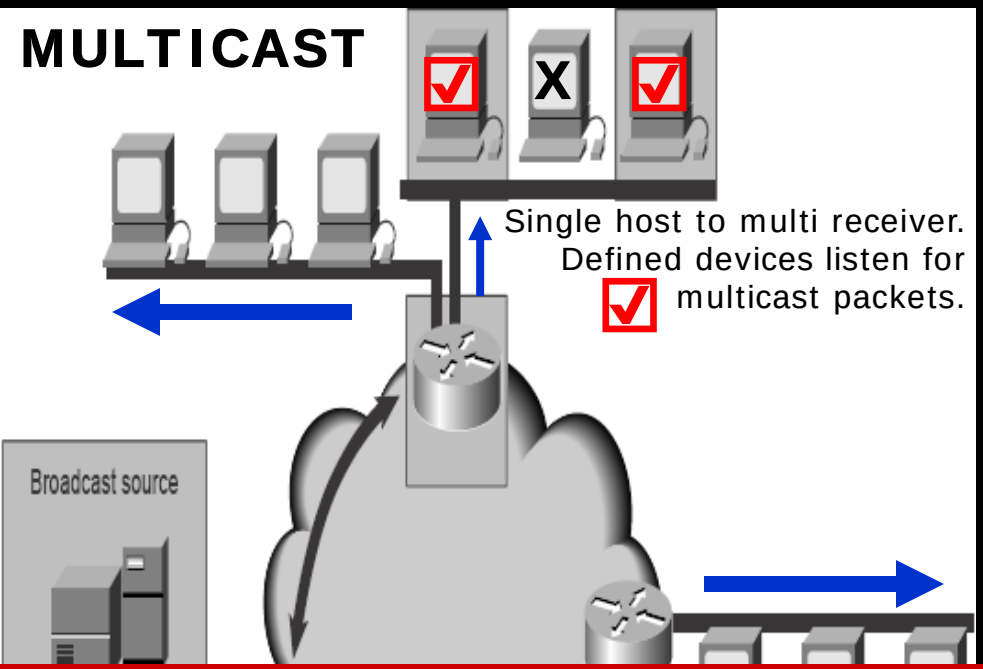
How is this helpful in operations?

UNICAST



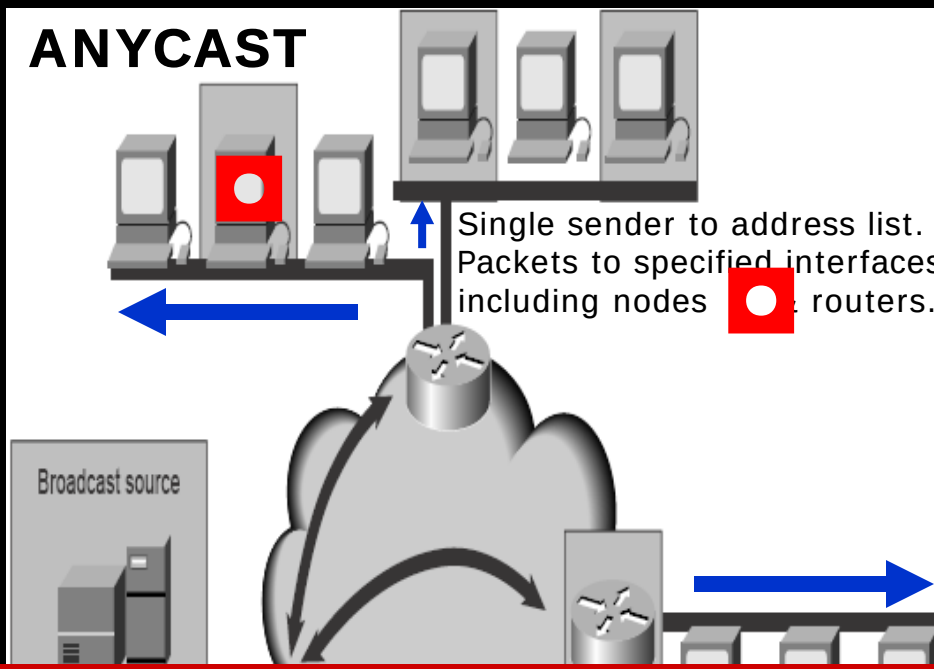
Single host to single receiver.
Packets to specified interface.

MULTICAST

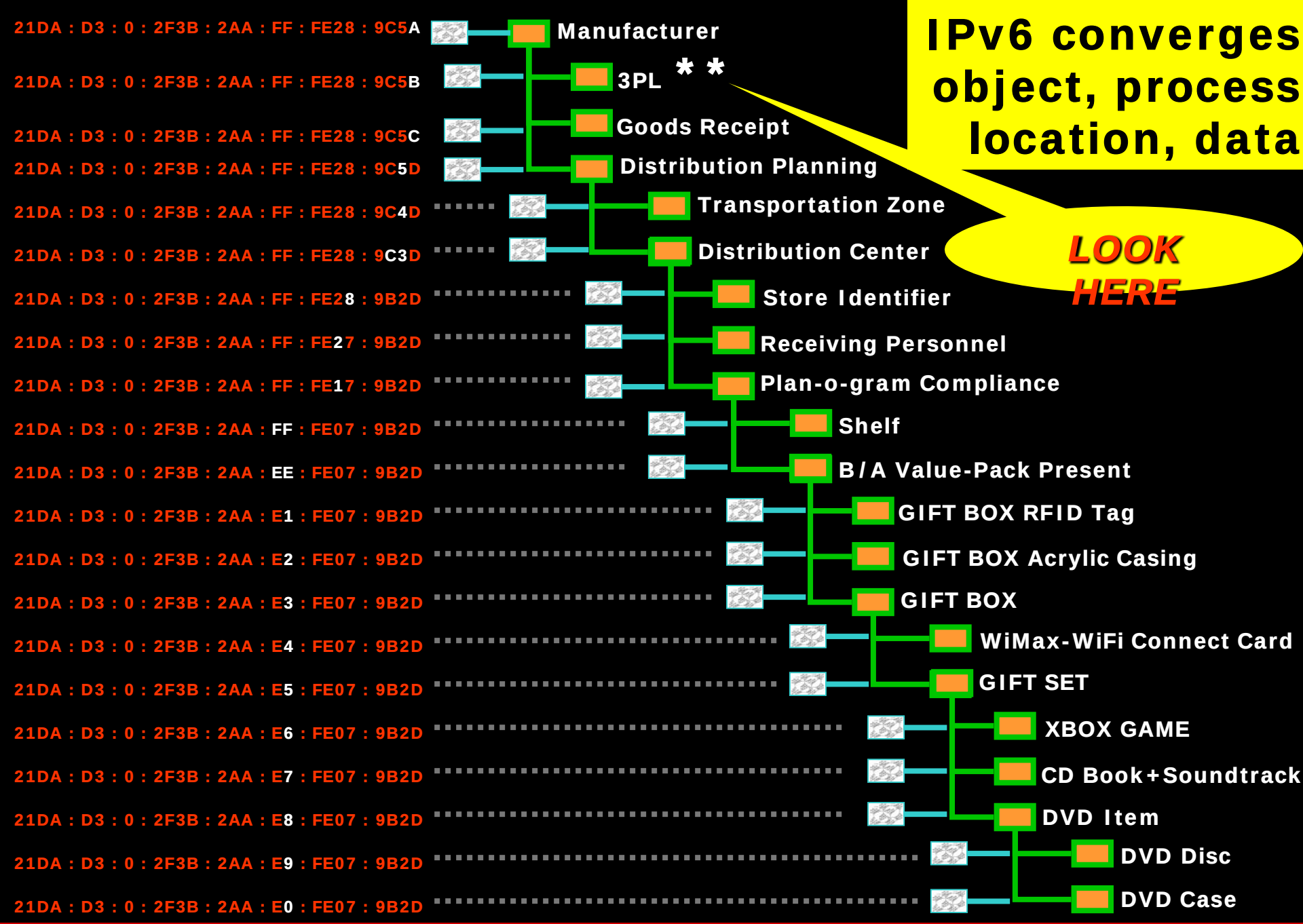


Single host to multi receiver.
Defined devices listen for
multicast packets.

ANYCAST



Single sender to address list.
Packets to specified interfaces
including nodes & routers.


21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A
Manufacturer
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5B
3PL
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5C
Goods Receipt
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5D
Distribution Planning
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C4D
Transportation Zone
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C3D
Distribution Center
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9B2D
Store Identifier
21DA : D3 : 0 : 2F3B : 2AA : FF : FE27 : 9B2D
Receiving Personnel
21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D
Plan-o-gram Compliance
21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D
Shelf
21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D
B/A Value-Pack Present
21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D
GIFT BOX RFID Tag
21DA : D3 : 0 : 2F3B : 2AA : E2 : FE07 : 9B2D
GIFT BOX Acrylic Casing
21DA : D3 : 0 : 2F3B : 2AA : E3 : FE07 : 9B2D
GIFT BOX
21DA : D3 : 0 : 2F3B : 2AA : E4 : FE07 : 9B2D
WiMax-WiFi Connect Card
21DA : D3 : 0 : 2F3B : 2AA : E5 : FE07 : 9B2D
GIFT SET
21DA : D3 : 0 : 2F3B : 2AA : E6 : FE07 : 9B2D
XBOX GAME
21DA : D3 : 0 : 2F3B : 2AA : E7 : FE07 : 9B2D
CD Book+Soundtrack
21DA : D3 : 0 : 2F3B : 2AA : E8 : FE07 : 9B2D
DVD Item
21DA : D3 : 0 : 2F3B : 2AA : E9 : FE07 : 9B2D
DVD Disc
21DA : D3 : 0 : 2F3B : 2AA : E0 : FE07 : 9B2D
DVD Case
IPv6 converges object, process location, data
LOOK HERE

IPv6 converges object, process location, data

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A — Manufacturer

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5B — 3PL * *

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5C — Goods Receipt

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5D — Distribution Planning

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C4D — Transportation Zone

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C3D — Distribution Center

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9B2D — Store Identifier

21DA : D3 : 0 : 2F3B : 2AA : FF : FE27 : 9B2D — Receiving Personnel

21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D — Plan-o-gram Compliance

21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D — Shelf

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D — B/A Value-Pack Present

21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D — GIFT BOX RFID Tag

GIFT BOX Acrylic Casing

GIFT BOX

WiMax-WiFi Connect Card

GIFT SET

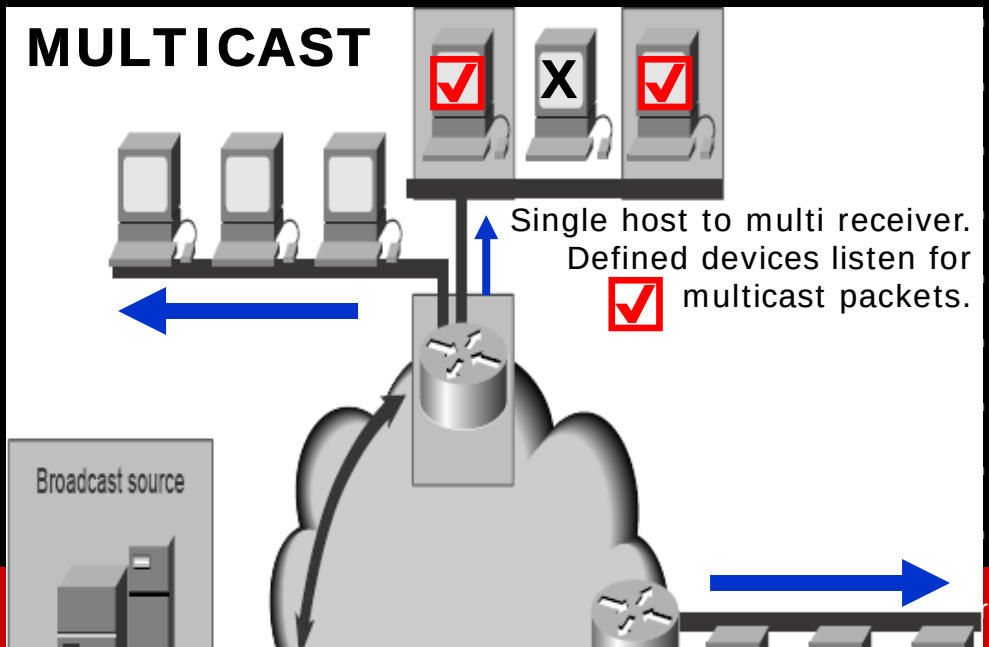
XBOX GAME

CD Book+Soundtrack

DVD Item

DVD Disc

DVD Case



IPv6 converges object, process location, data

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A — Manufacturer

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5B — 3PL **

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5C — Goods Receipt

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5D — Distribution Planning

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C4D — Transportation Zone

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C3D — Distribution Center

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9B2D — Store Identifier

21DA : D3 : 0 : 2F3B : 2AA : FF : FE27 : 9B2D — Receiving Personnel

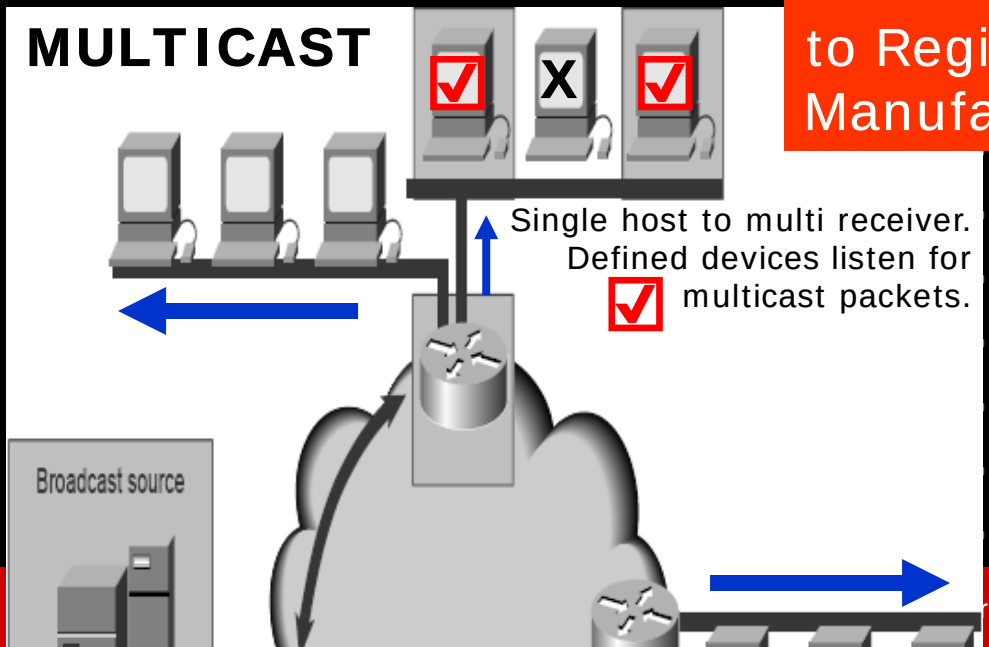
21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D — Plan-o-gram Compliance

21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D — Shelf

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D

** 3PL transmits
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C50
to Regional Distribution Center & Store Manufacturer is automatically updated.



WiMax-WiFi Connect Card

GIFT SET

XBOX GAME

CD Book+Soundtrack

DVD Item

DVD Disc

DVD Case

IPv6 converges object, process location, data

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5B

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5C

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C4D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C3D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE27 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D

Manufacturer

3PL * *

Goods Receipt

Distribution Planning

Personnel

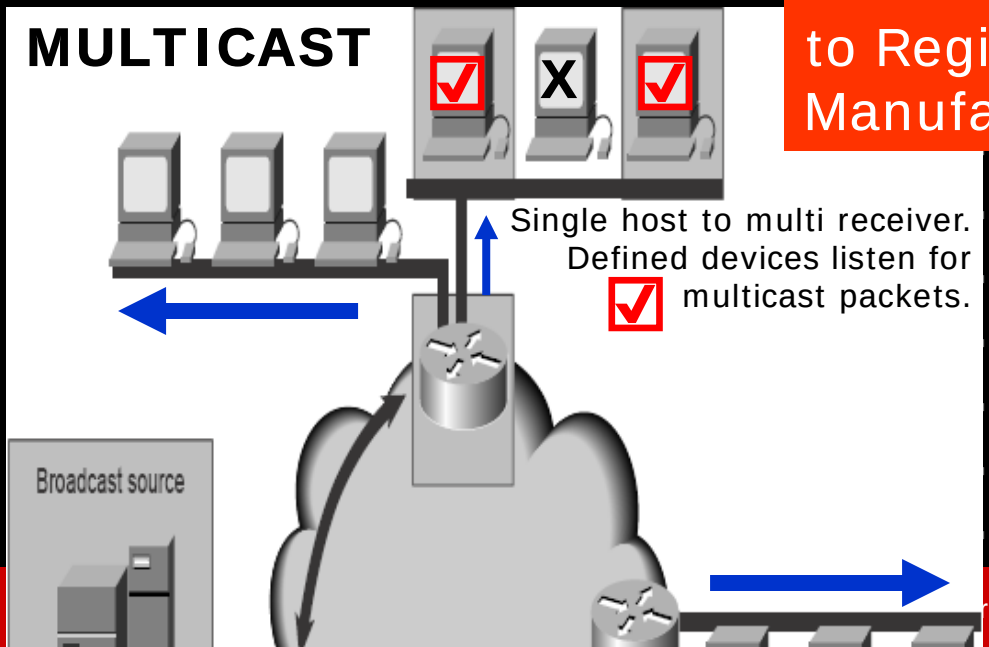
Plan-o-gram ... pliance

Shelf

Id transmitted is different than id linked.

** 3PL transmits
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C50
to Regional Distribution Center & Store Manufacturer is automatically updated.

MULTICAST



Single host to multi receiver.
Defined devices listen for multicast packets.

WiMax-WiFi Connect Card

GIFT SET

XBOX GAME

CD Book+Soundtrack

DVD Item

DVD Disc

DVD Case

IPv6 converges object, process location, data

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A — Manufacturer

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5B — 3PL * *

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5C — Goods Receipt

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5D — D… …tion Planning

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C4D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C3D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE27 : 9B2D — R… …Personnel

21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D — Plan-o-gra… …pliance

21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D — Shelf

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D

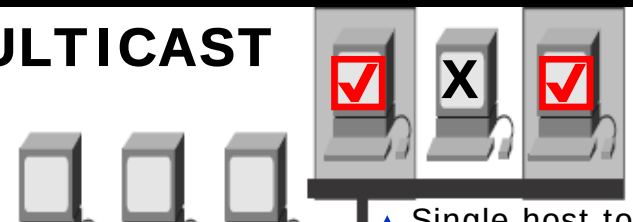
21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D

Id transmitted is different than id linked.

Why?

** 3PL transmits
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C50
to Regional Distribution Center & Store Manufacturer is automatically updated.

MULTICAST



Single host to multi receiver.
Defined devices listen for ☑ multicast packets.

WiMax-WiFi Connect Card

GIFT SET

XBOX GAME

CD Book+Soundtrack

DVD Item

DVD Disc

DVD Case

IPv6 converges object, process location, data

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5B

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5C

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C4D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C3D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE27 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D

Manufacturer

3PL * *

Goods Receipt

Distribution Planning

Id transmitted is id shown + arrival time

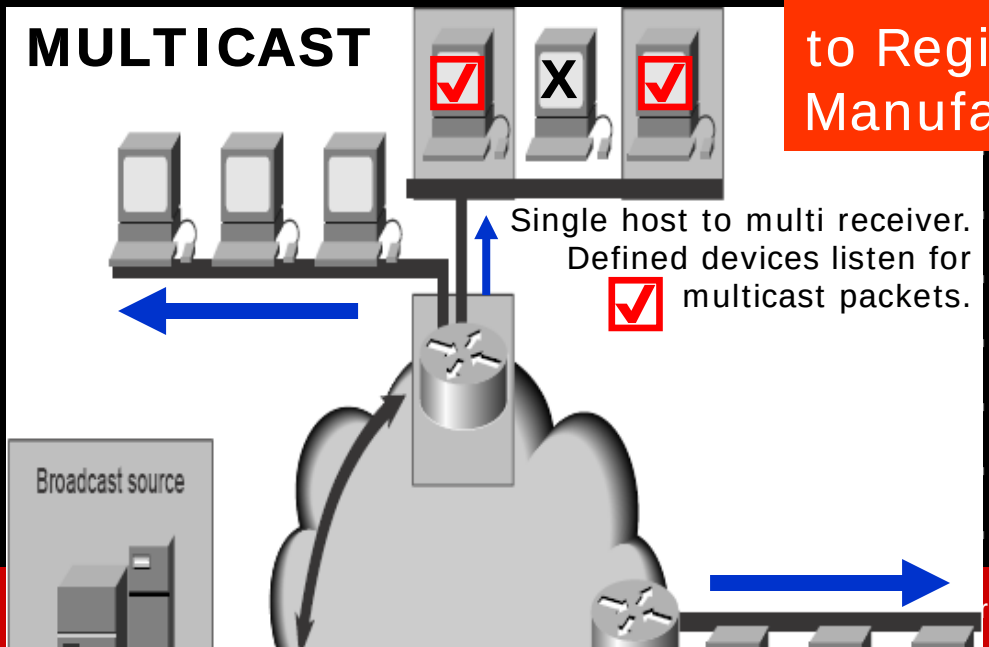
Personnel

Plan-o-gram Compliance

Shelf

** 3PL transmits
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C50
to Regional Distribution Center & Store Manufacturer is automatically updated.

MULTICAST



Single host to multi receiver.
Defined devices listen for multicast packets.

WiMax-WiFi Connect Card

GIFT SET

XBOX GAME

CD Book+Soundtrack

DVD Item

DVD Disc

DVD Case

IPv6 converges object, process location, data

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5A — Manufacturer

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5B — 3PL **

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5C — Goods Receipt

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C5D — Distribution Planning

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C4D — Transportation Zone

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C3D — Distribution Center

21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9B2D — Store Identifier

21DA : D3 : 0 : 2F3B : 2AA : FF : FE27 : 9B2D — Receiving Personnel

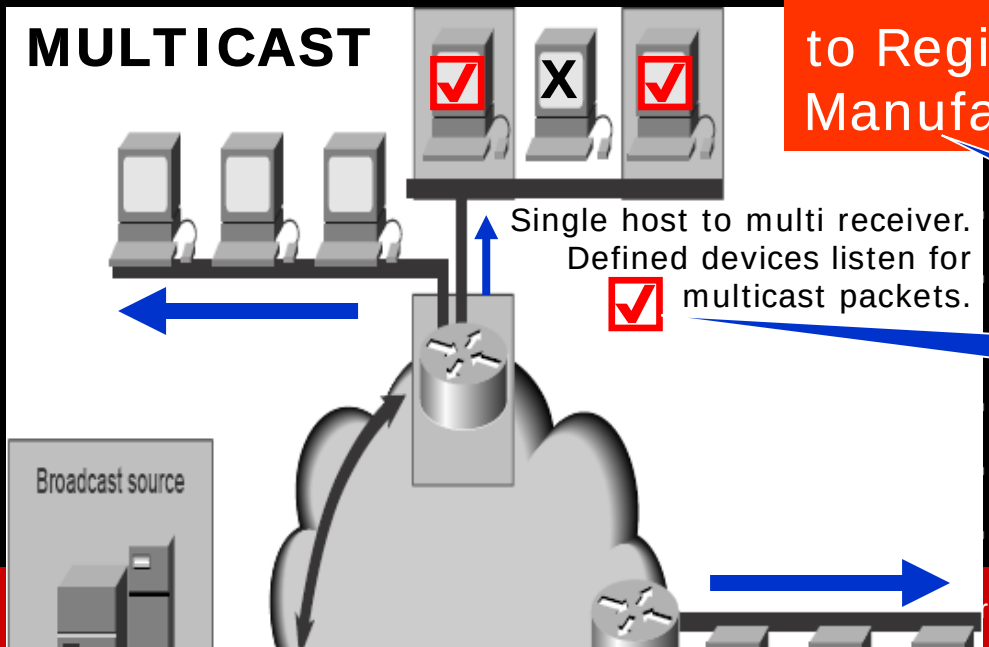
21DA : D3 : 0 : 2F3B : 2AA : FF : FE17 : 9B2D — Plan-o-gram Compliance

21DA : D3 : 0 : 2F3B : 2AA : FF : FE07 : 9B2D — Shelf

21DA : D3 : 0 : 2F3B : 2AA : EE : FE07 : 9B2D

21DA : D3 : 0 : 2F3B : 2AA : E1 : FE07 : 9B2D

** 3PL transmits
21DA : D3 : 0 : 2F3B : 2AA : FF : FE28 : 9C50
to Regional Distribution Center & Store
Manufacturer is automatically updated.



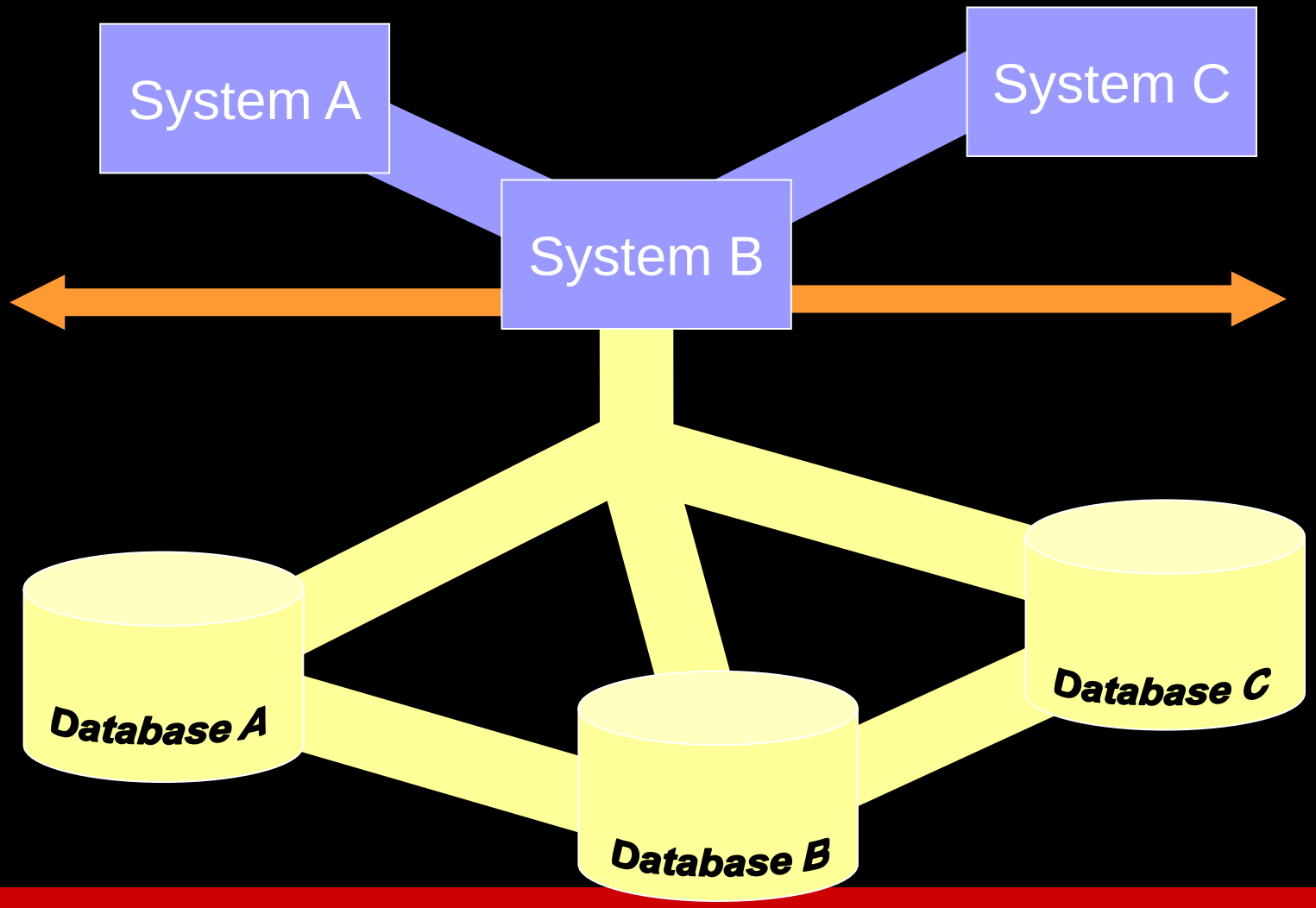
GIFT SET

Manufacturer is a “defined device” process.

DVD Case

Benefit from IPv6 Format with Data Routing

Related Information Integration and Systems Interoperability

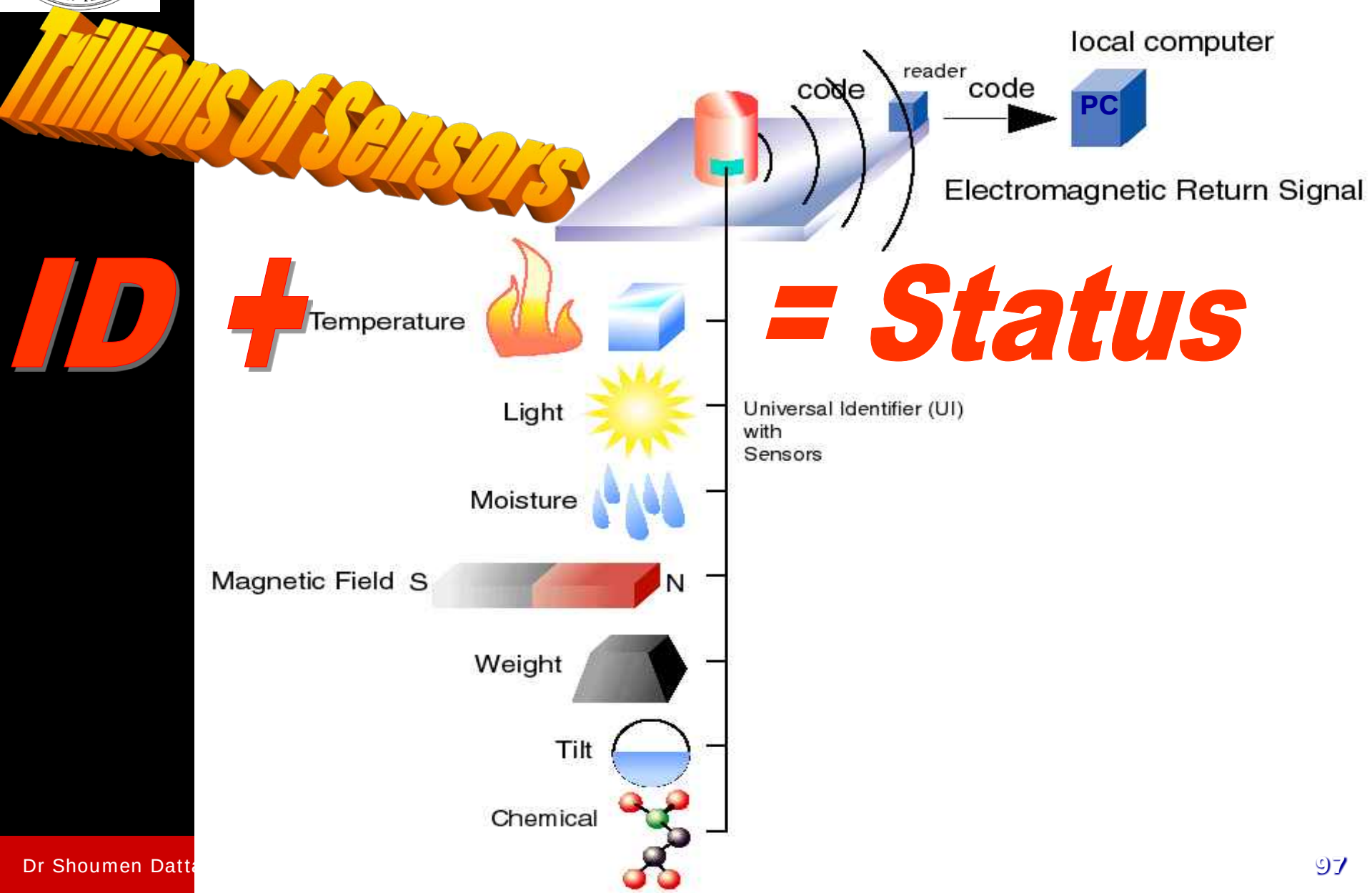


Data


Trillions of Sensors

local computer
reader
code
code
PC
Electromagnetic Return Signal
Temperature
Light
Moisture
Magnetic Field S
N
Weight
Tilt
Chemical
Universal Identifier (UI)
with
Sensors

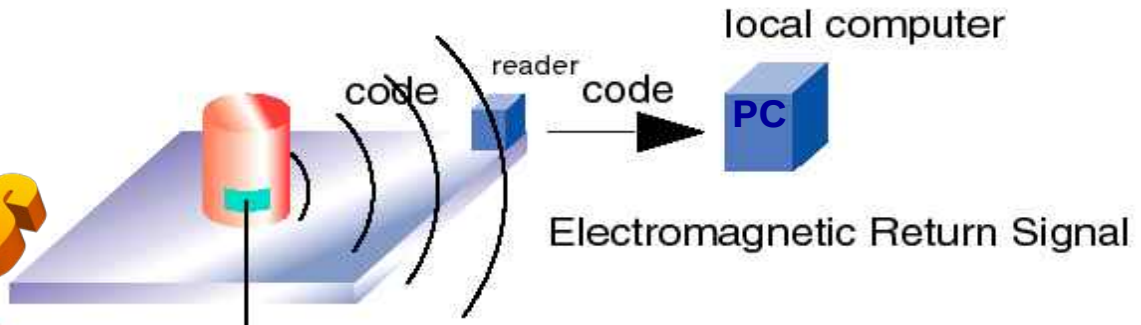
Process, Data, Information

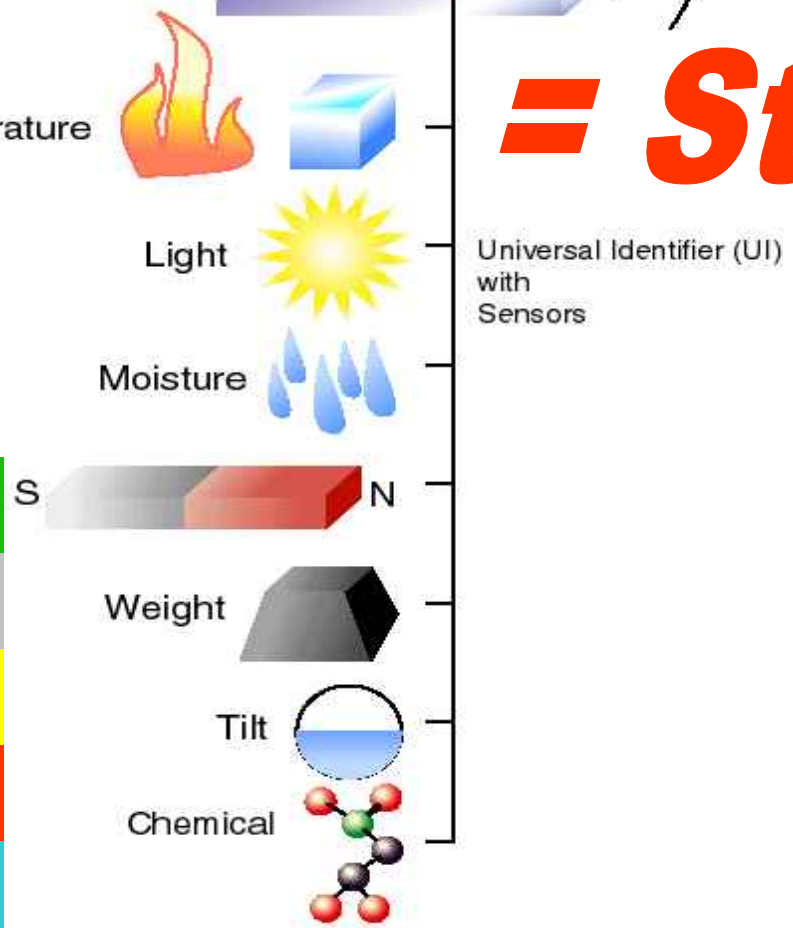


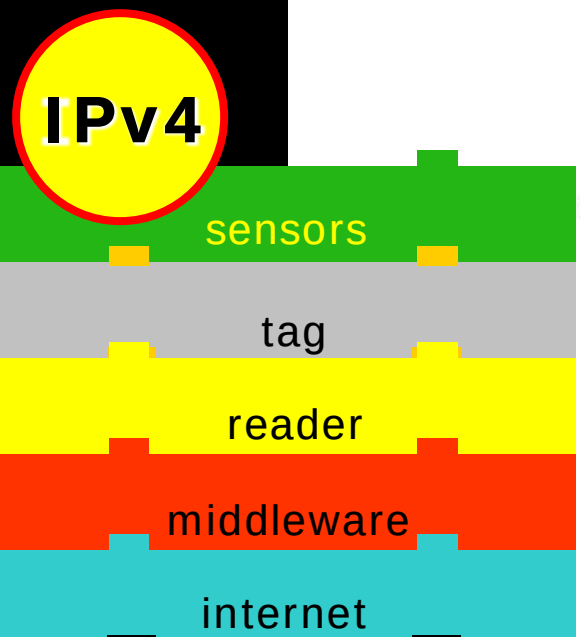
Process, Data, Information

Trillions of Sensors

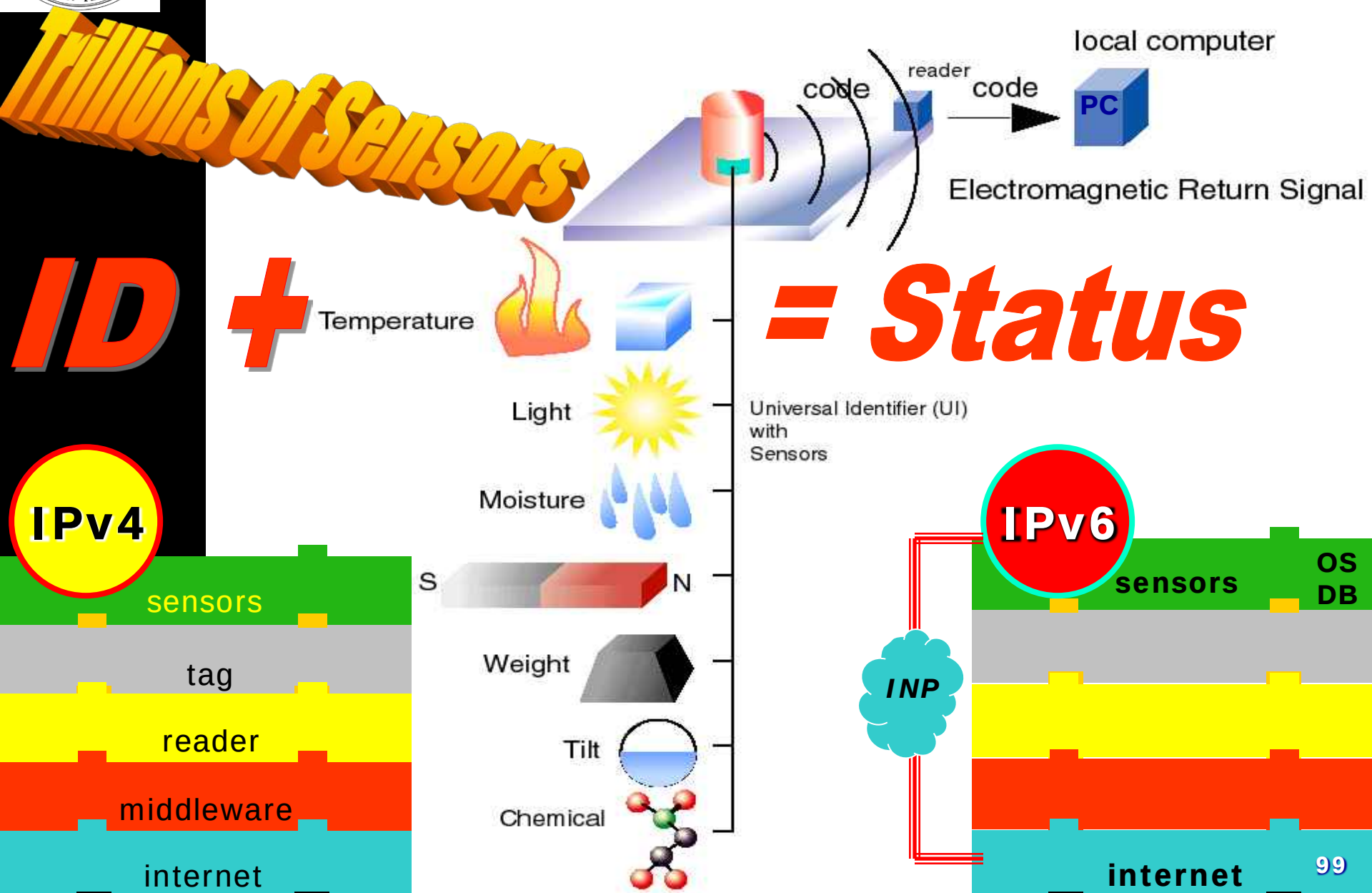
ID + = Status



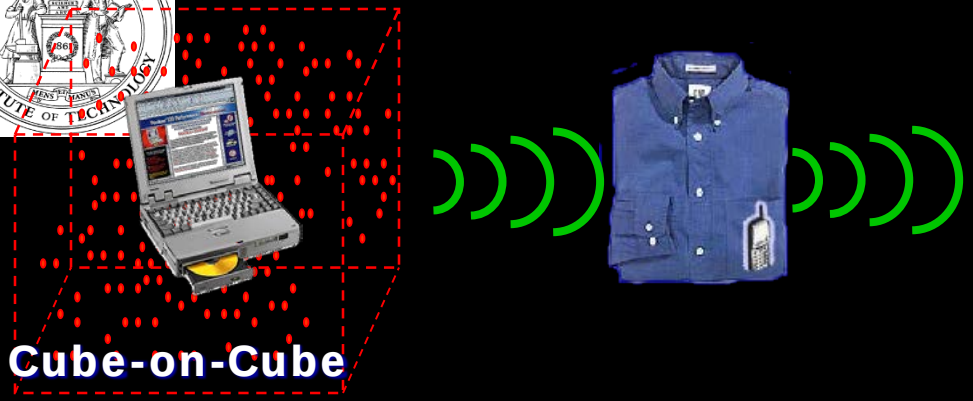




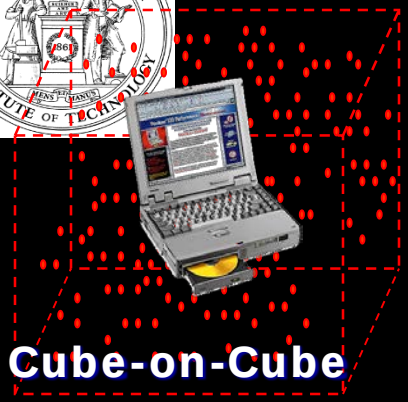
Process, Data, Identity & Information

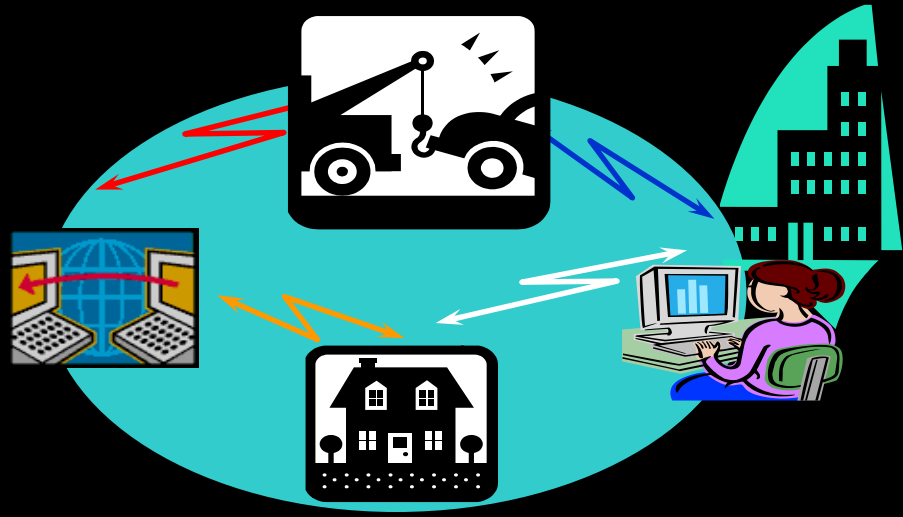


MANET (Mobile *ad hoc* Networks)

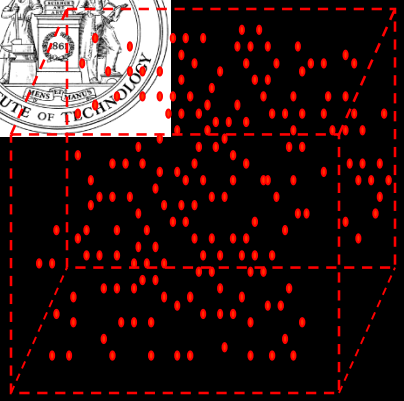


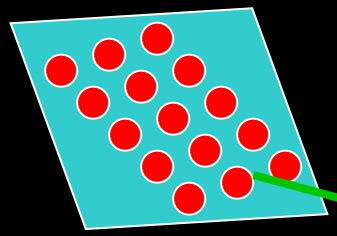
MANET (Mobile *ad hoc* Networks)

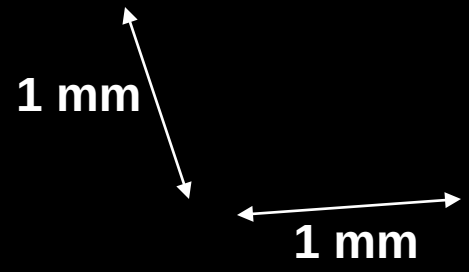




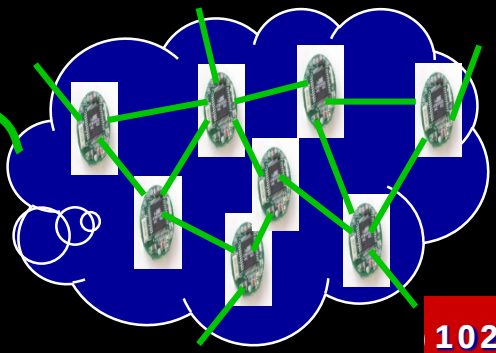
MANET (Mobile *ad hoc* Networks)



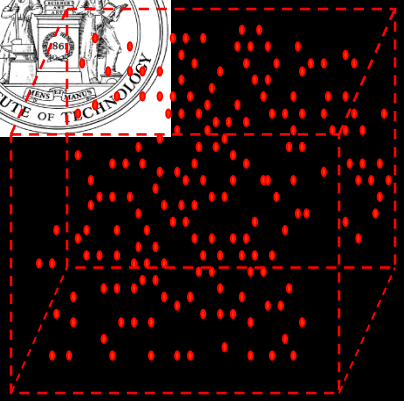


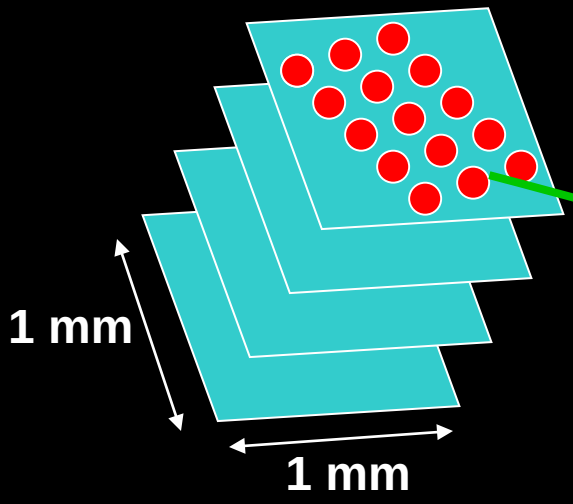


60 billion interfaces
per square mm
requires unique id

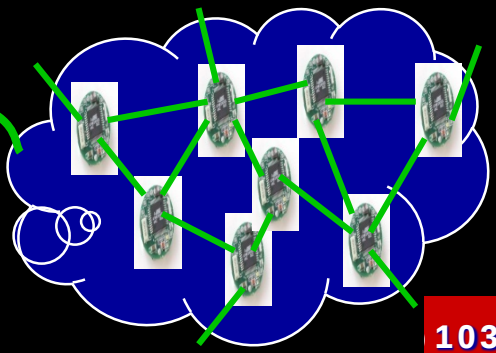


MANET (Mobile *ad hoc* Networks)

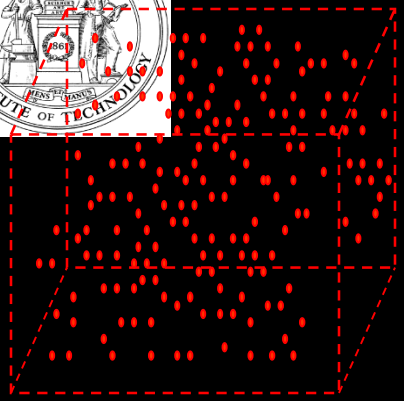




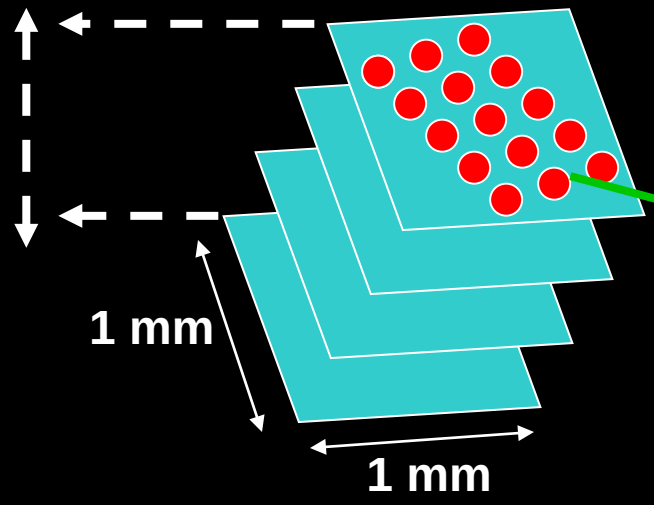
60 billion interfaces
per square mm
requires unique id



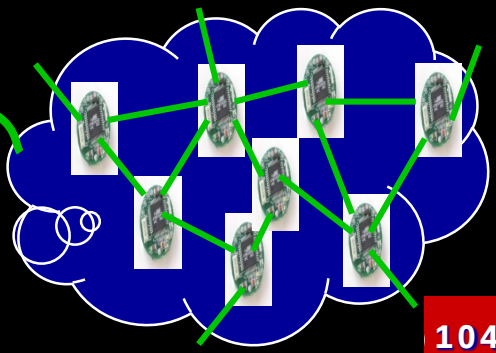
MANET (Mobile *ad hoc* Networks)



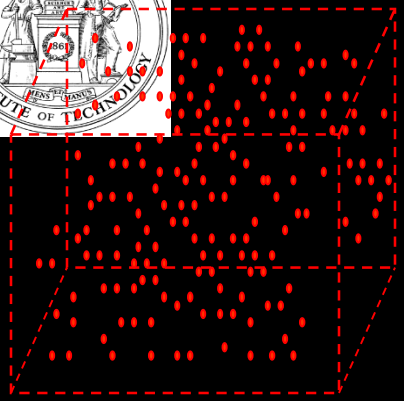
Layer is 100 km deep
or 1,000,000,000 mm



60 billion interfaces
per square mm
requires unique id



Examples of Mobile *ad hoc* Networks: Automobile Industry & Civil Engineering



Layer is 100 km deep
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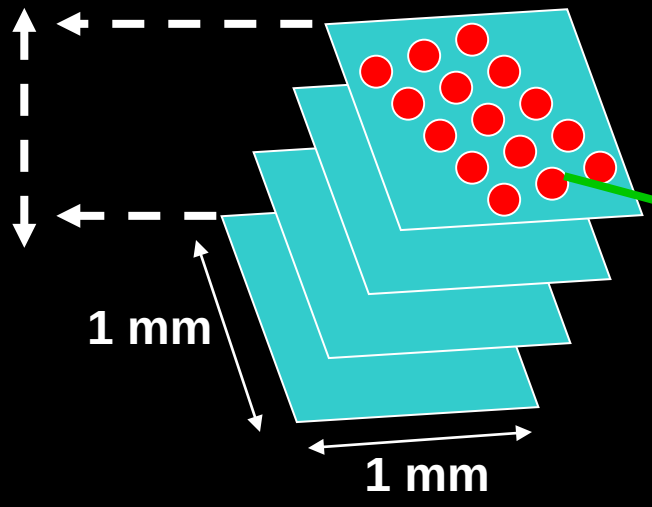
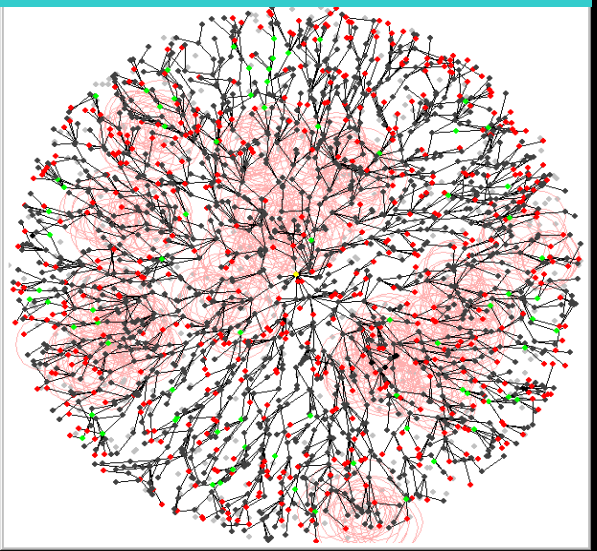
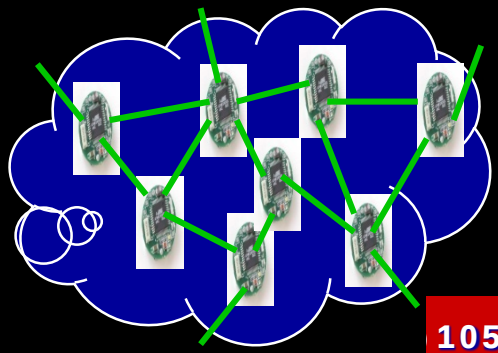


60 billion interfaces
per square mm
with unique IPv6 id

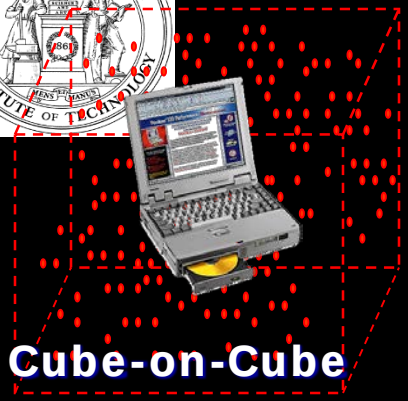
DEEPLY EMBEDDED **SENSOR NETWORKS**

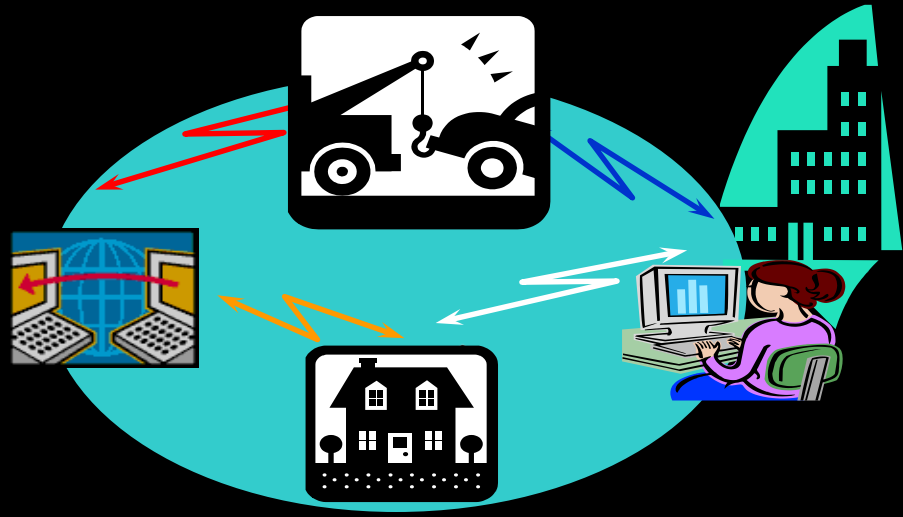


Automobile Building

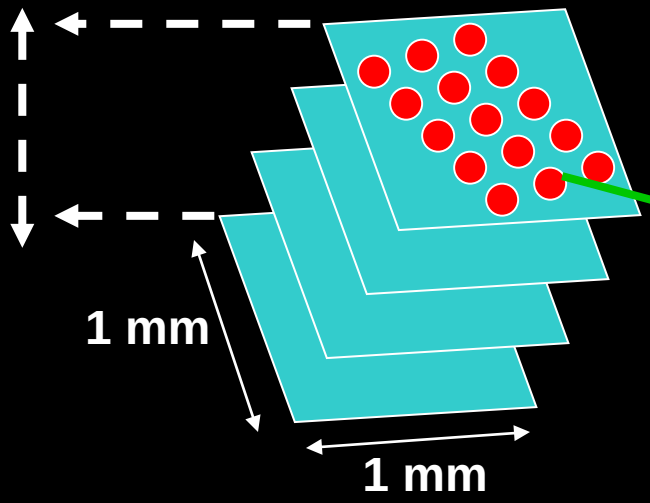


MANET (Mobile *ad hoc* Networks)



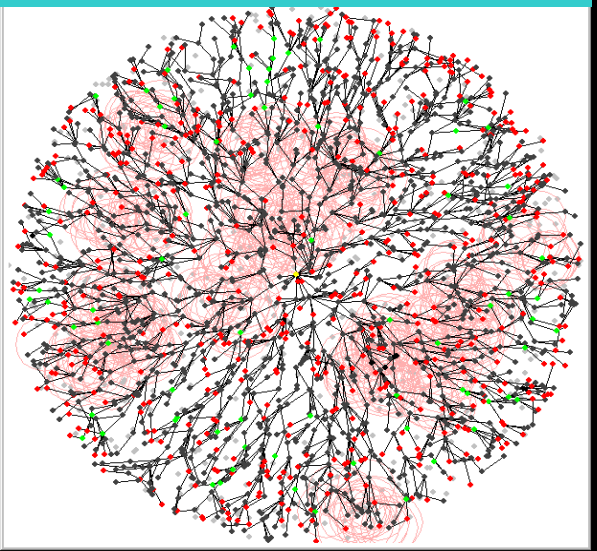


Layer is 100 km deep
or 1,000,000,000 mm

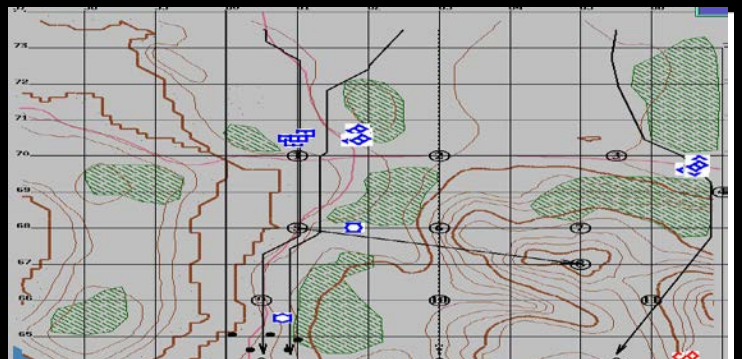


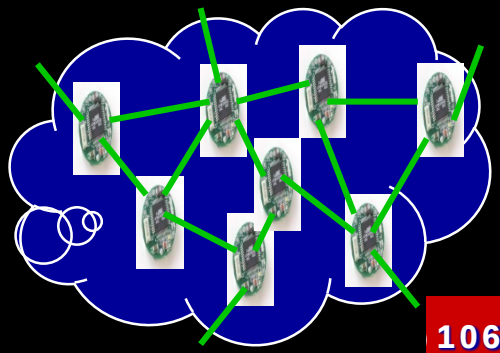
60 billion interfaces
per square mm Earth
with unique IPv6 id

DEEPLY EMBEDDED **SENSOR NETWORKS**

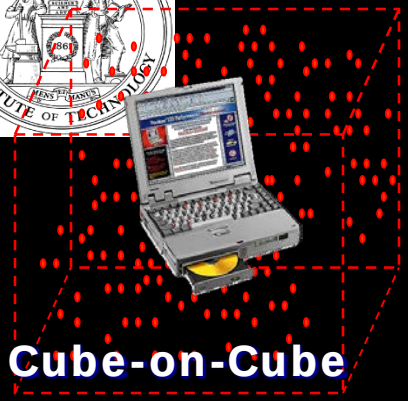


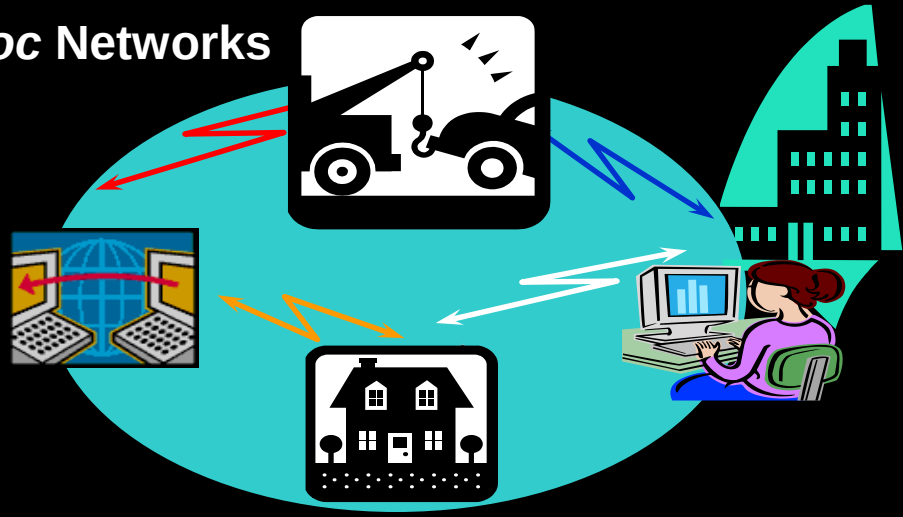
Earth's Surface



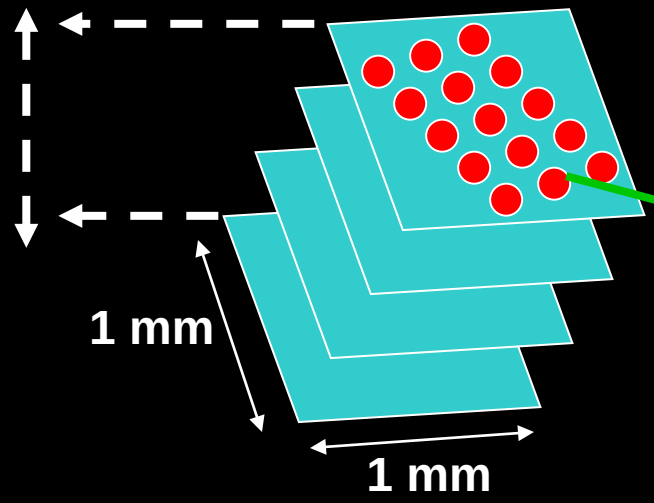


TRANSPORTATION = Mobile *ad hoc* Networks



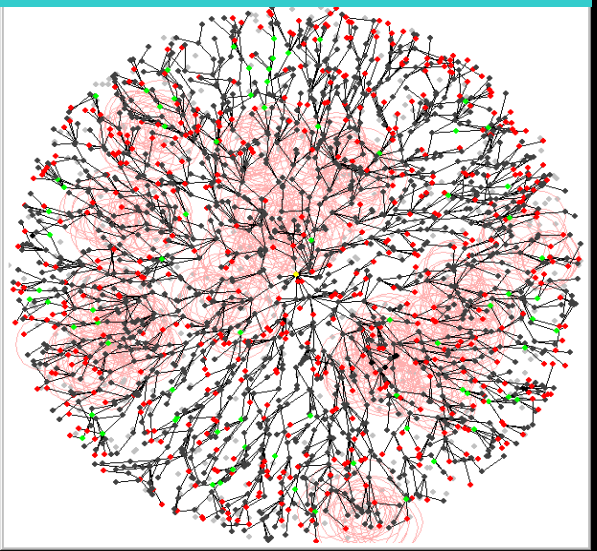


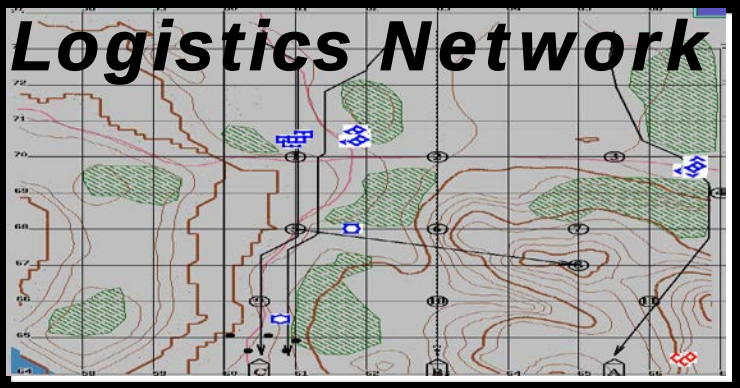
Layer is 100 km deep
or 1,000,000,000 mm

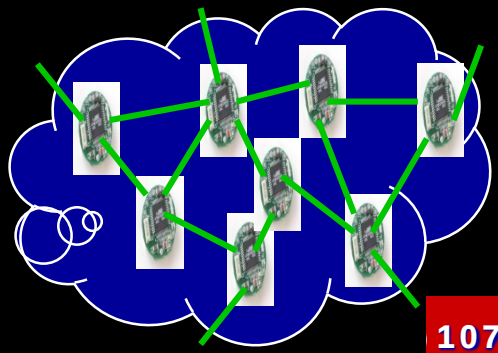


60 billion interfaces
per square mm Earth
with unique IPv6 id

DEEPLY EMBEDDED **SENSOR NETWORKS**







MANET

SCM
Logistics
Transportation

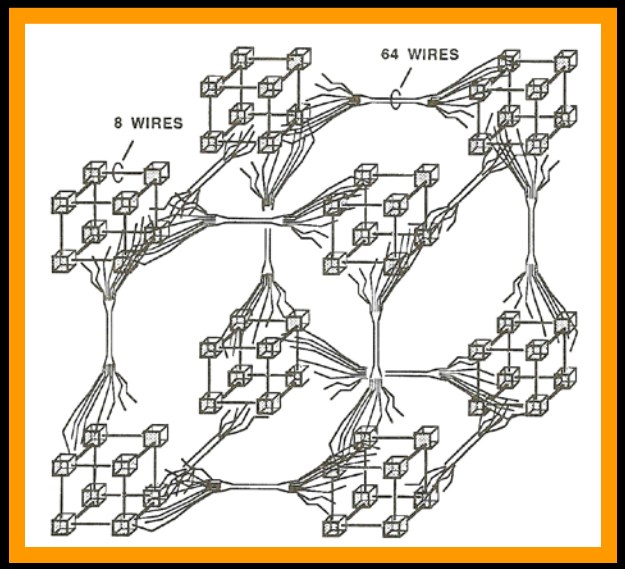
- Manufacturer
  - 3PL
  - Goods Receipt
  - Distribution Planning
    - Transportation Zone
    - Distribution Center
      - Store Identifier
      - Receiving Personnel
      - Plan-o-gram Compliance
        - Shelf
        - B/A Value-Pack Present
          - GIFT BOX RFID Tag
          - GIFT BOX Acrylic Casing
          - GIFT BOX
            - WiMax-WiFi Connect Card
            - GIFT SET
              - XBOX GAME
              - CD Book+Soundtrack
              - DVD Item
                - DVD Disc
                - DVD Case

Billions of Objects

Trillions of Processes

Octillions of Identities

Exabytes of Data



End of the Information Age

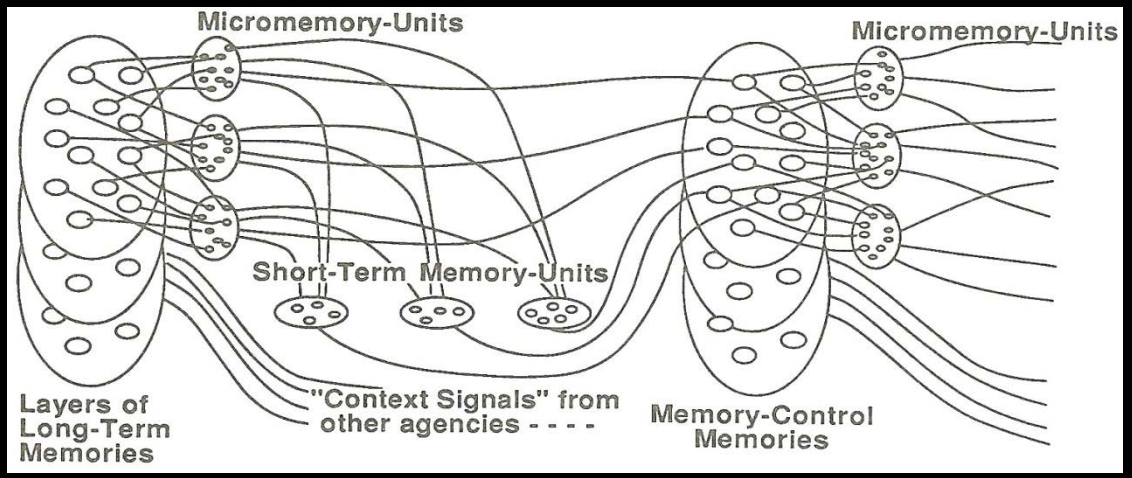
Making Sense of Data

End of the Information Age

Welcome to the

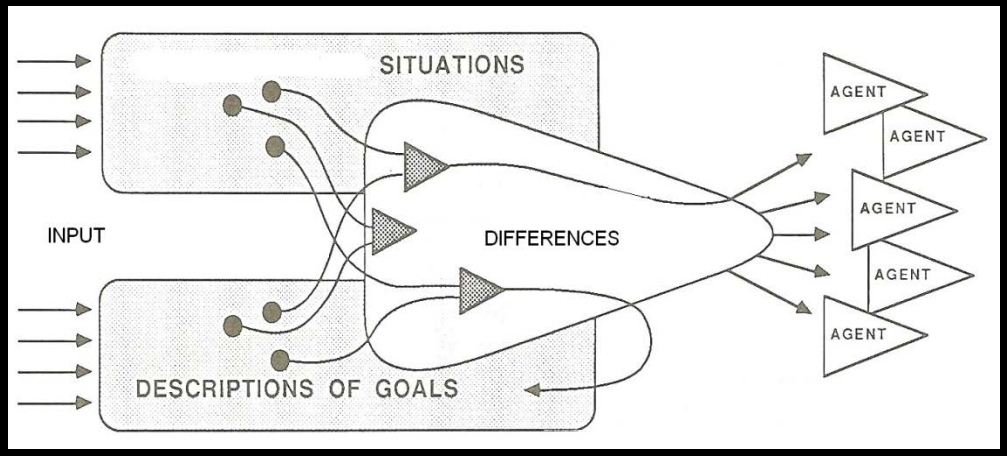
SYSTEMS AGE

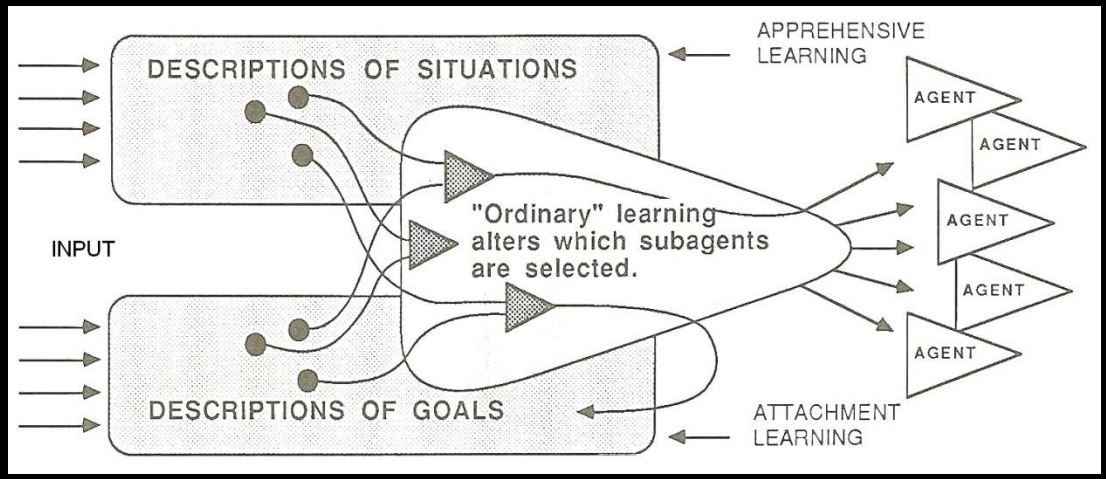
aking Sense of Data: Introducing Elementary AI



Basic Neural Circuits

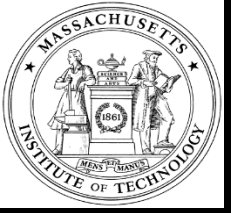
Difference Engines (1950)



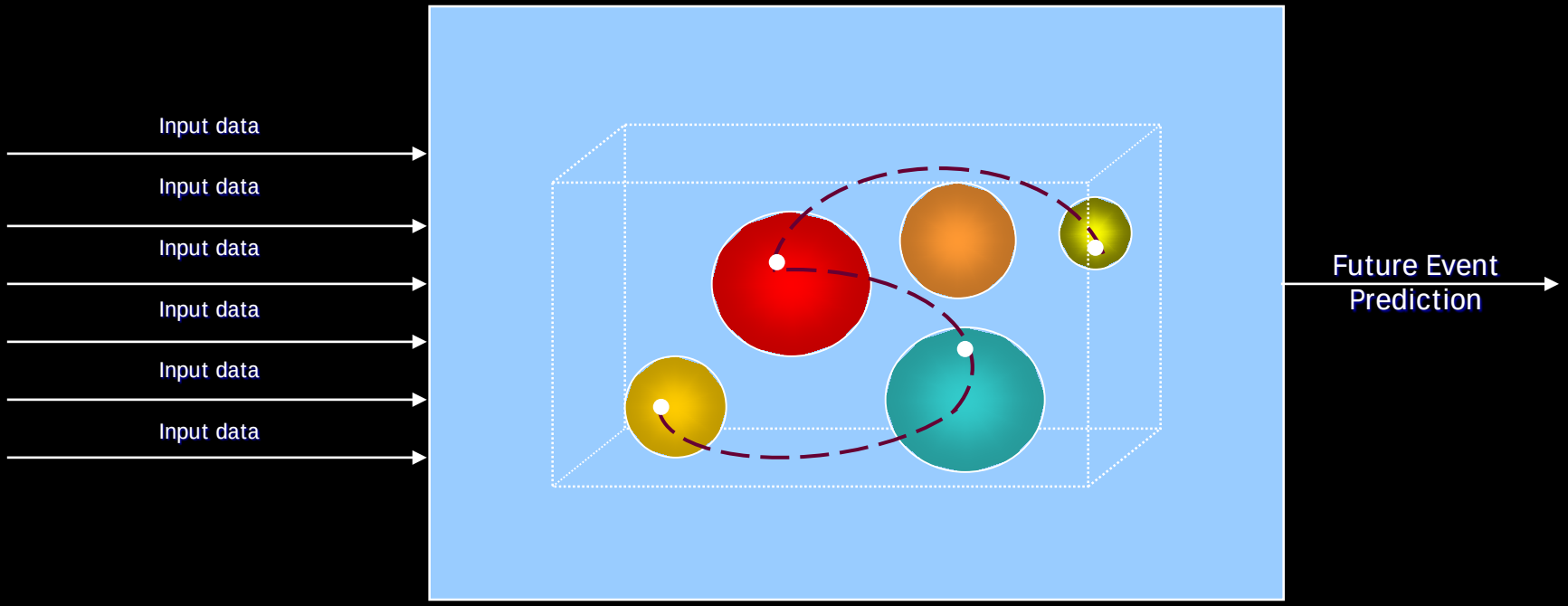


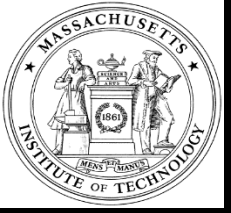
Rule Based Applications

BANKING/ FINANCE	INSURANCE	MANUFACTURING	GOVERNMENT	OTHER INDUSTRIES
Online Mortgage Underwriting	Point-of-Sale Underwriting	Parts Selection	Welfare Eligibility Determination	Transportation
Credit Scoring	Claims Processing	Order Configuration	Regulatory Compliance	Retail
Portfolio Management	Renewal Processing	Production Planning/Routing	Tax Assessment	Petroleum/ Oil & Gas
Cross Selling	Intelligent Policy Configuration and Pricing	Production Scheduling	Entitlements and Benefits Determination	Health Care
Fraud Detection	Eligibility Determination	Maintenance and Labor Scheduling	Pension Plan Forecasting	Telecom
Overdraft Authorization	Cross Selling	Material Safety Data Sheets	Worker's Compensation Claims	Pharmaceutical
SEC Regulatory Compliance	Fraud Detection	Distribution Management		Utilities
Risk Management				

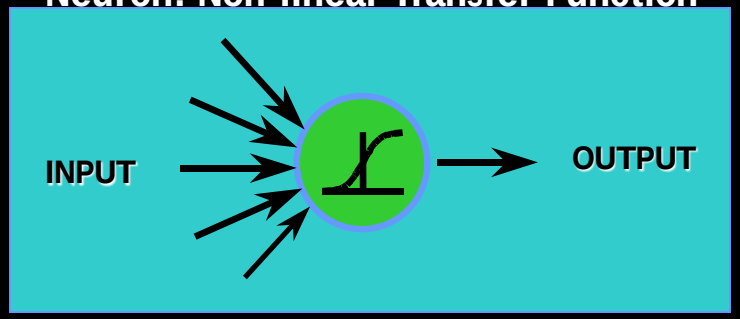


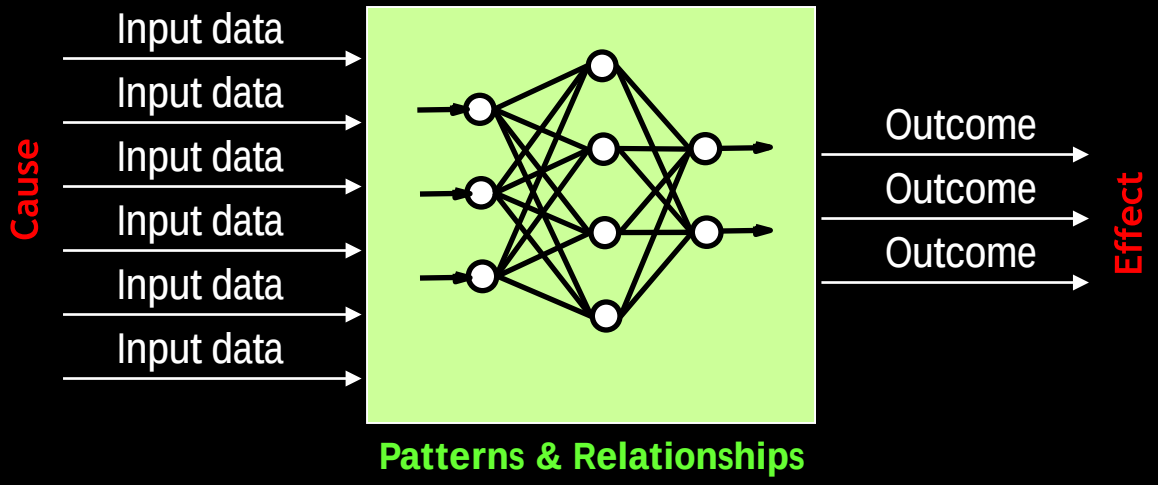
State Transitioning



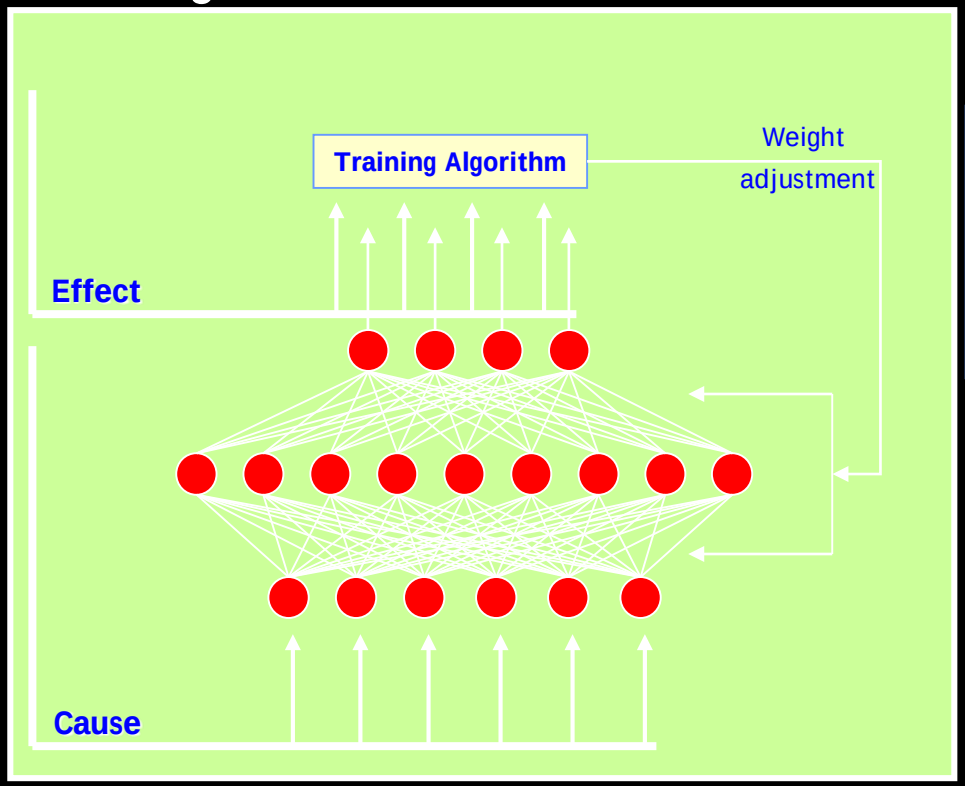


Neuron: Non-linear Transfer Function





Training



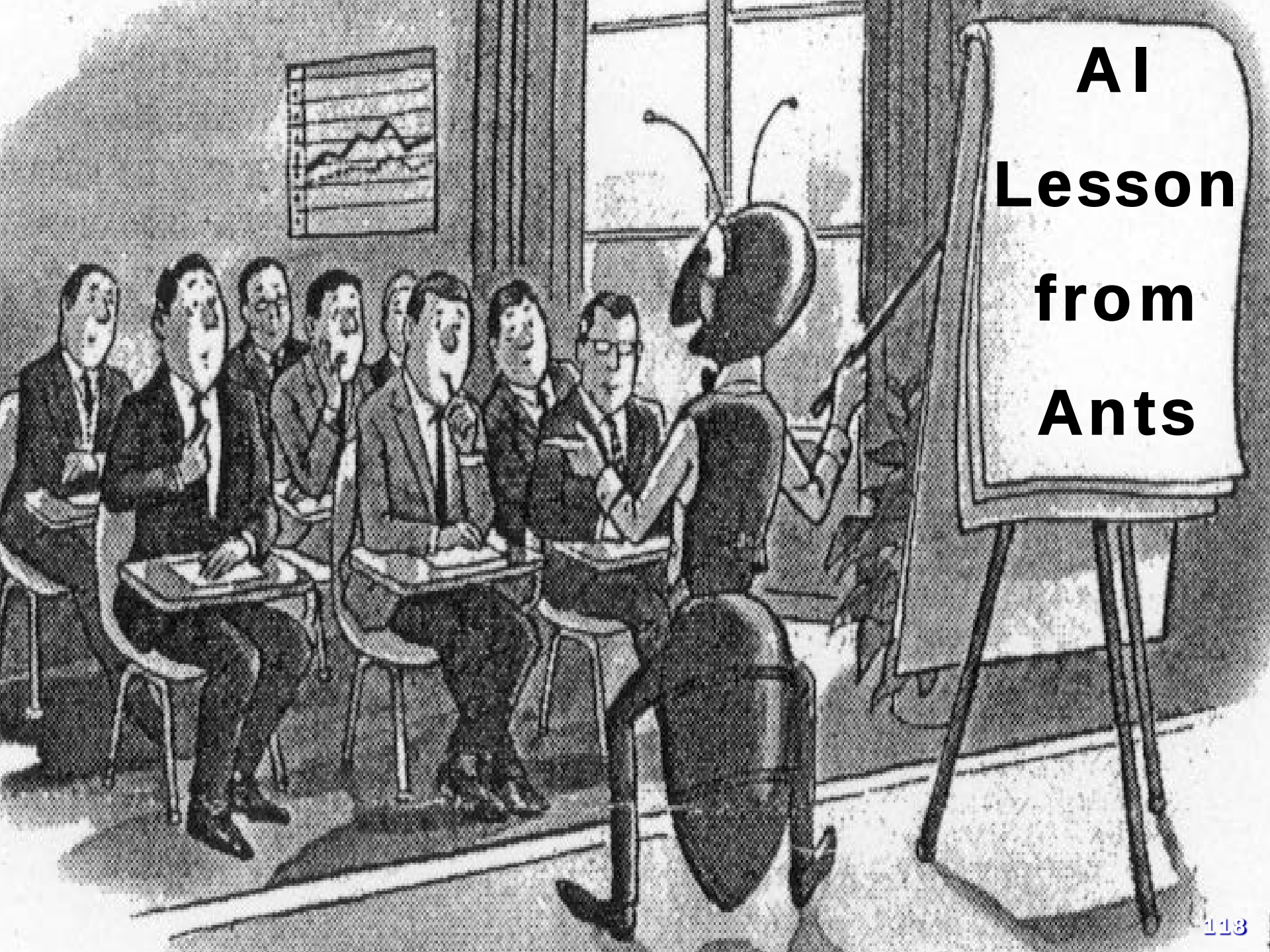
Input data
Input data
Input data
Input data
Input data
Input data

Prediction

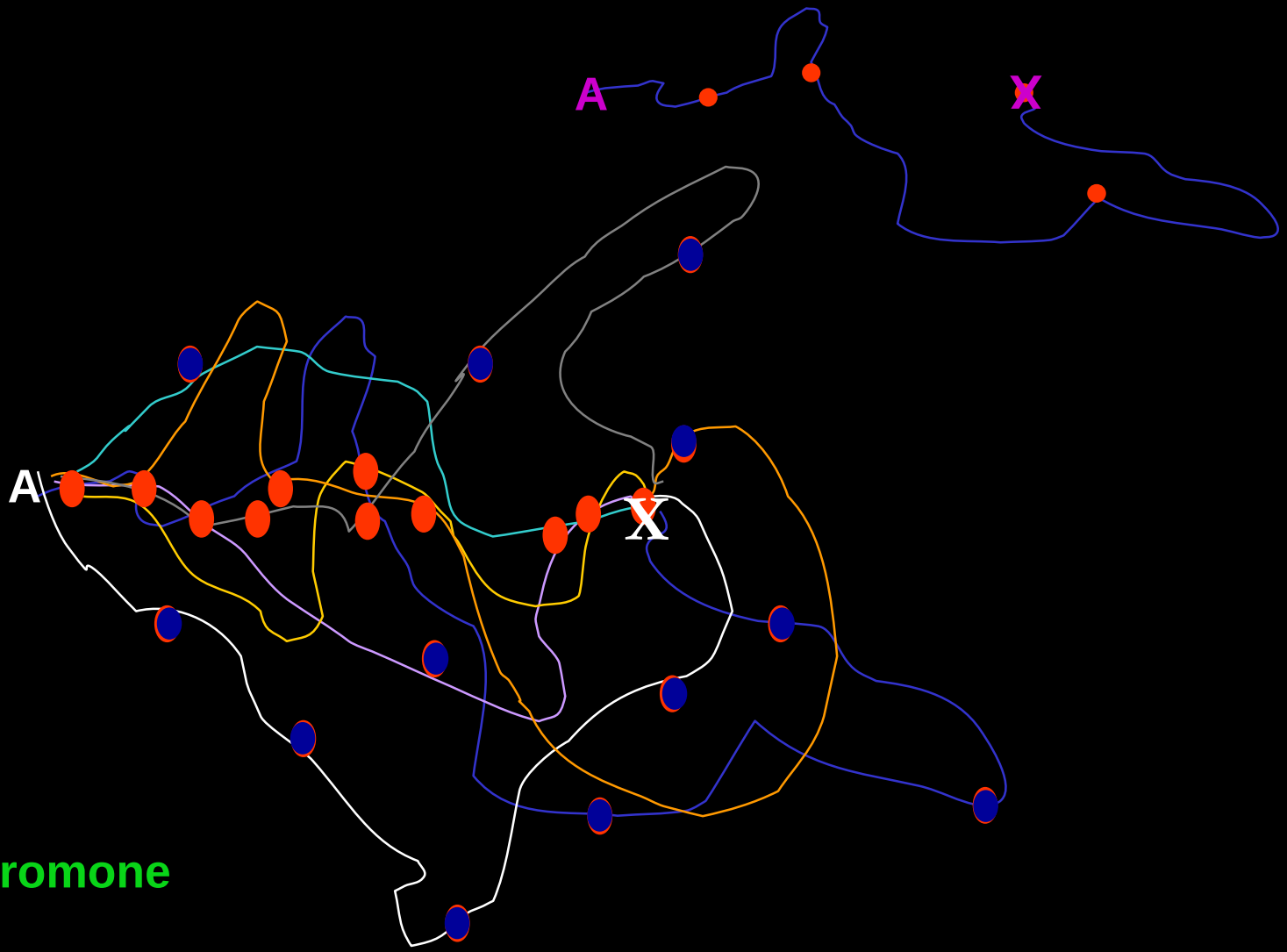
- Anticipate component failure
- Replace part prior to failure
- Preventive maintenance plan
- Improve customer response
- Reduce repair cycles
- Support performance metrics
- Better identify causes of problems
- Learn to adapt to the environment

Outcome
Outcome
Outcome
Outcome
Outcome
Outcome

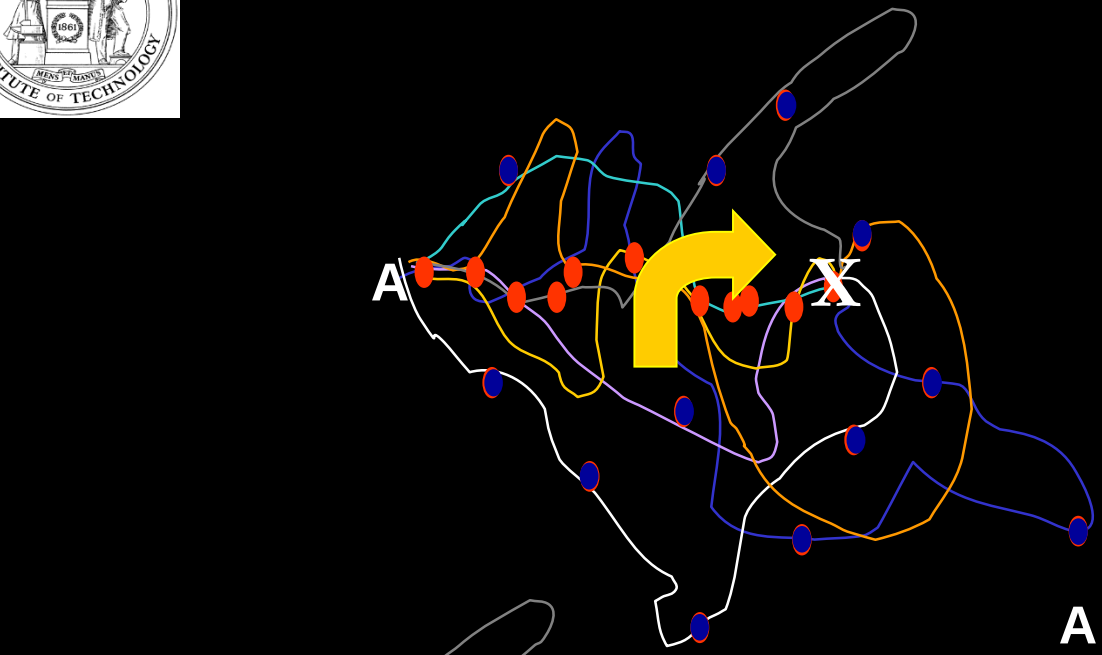

May I help?

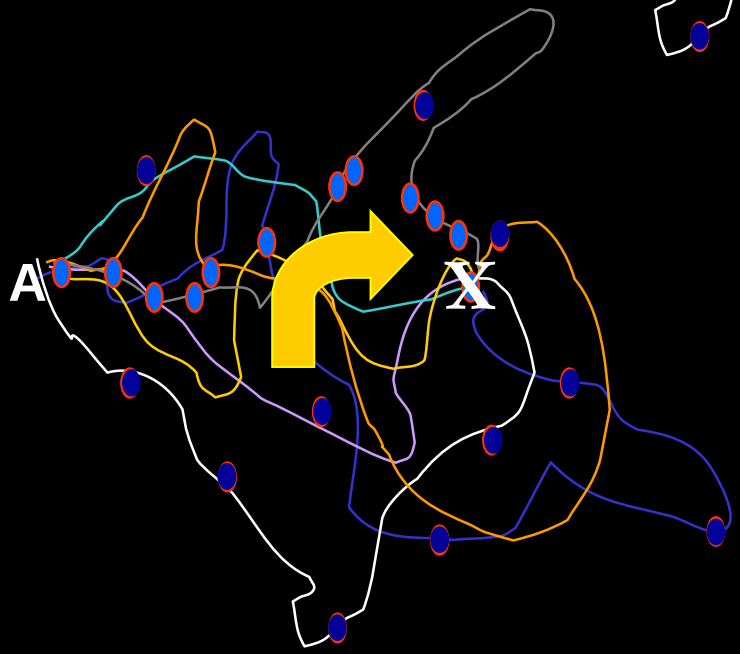

AI
Lesson
from
Ants

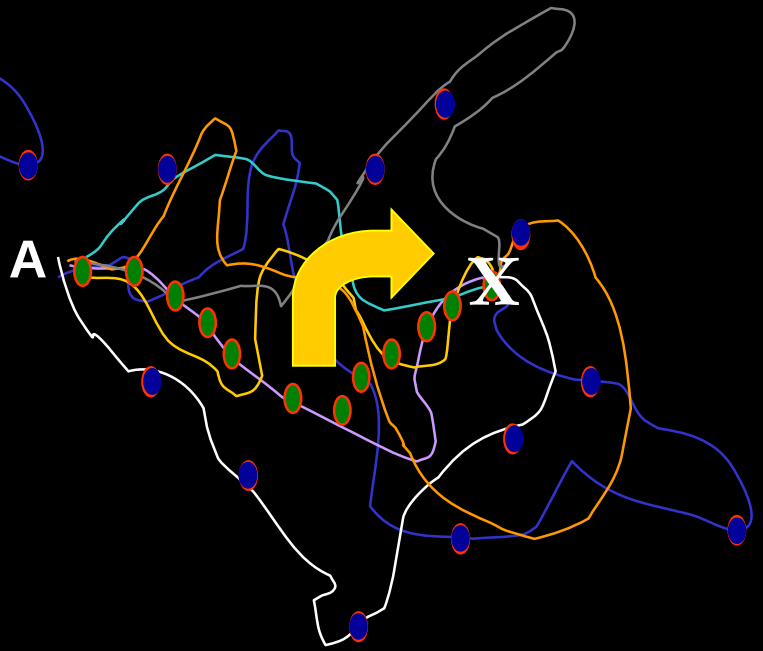
Swarm Intelligence: Ant–based Algorithms

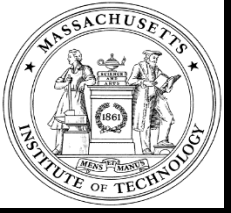


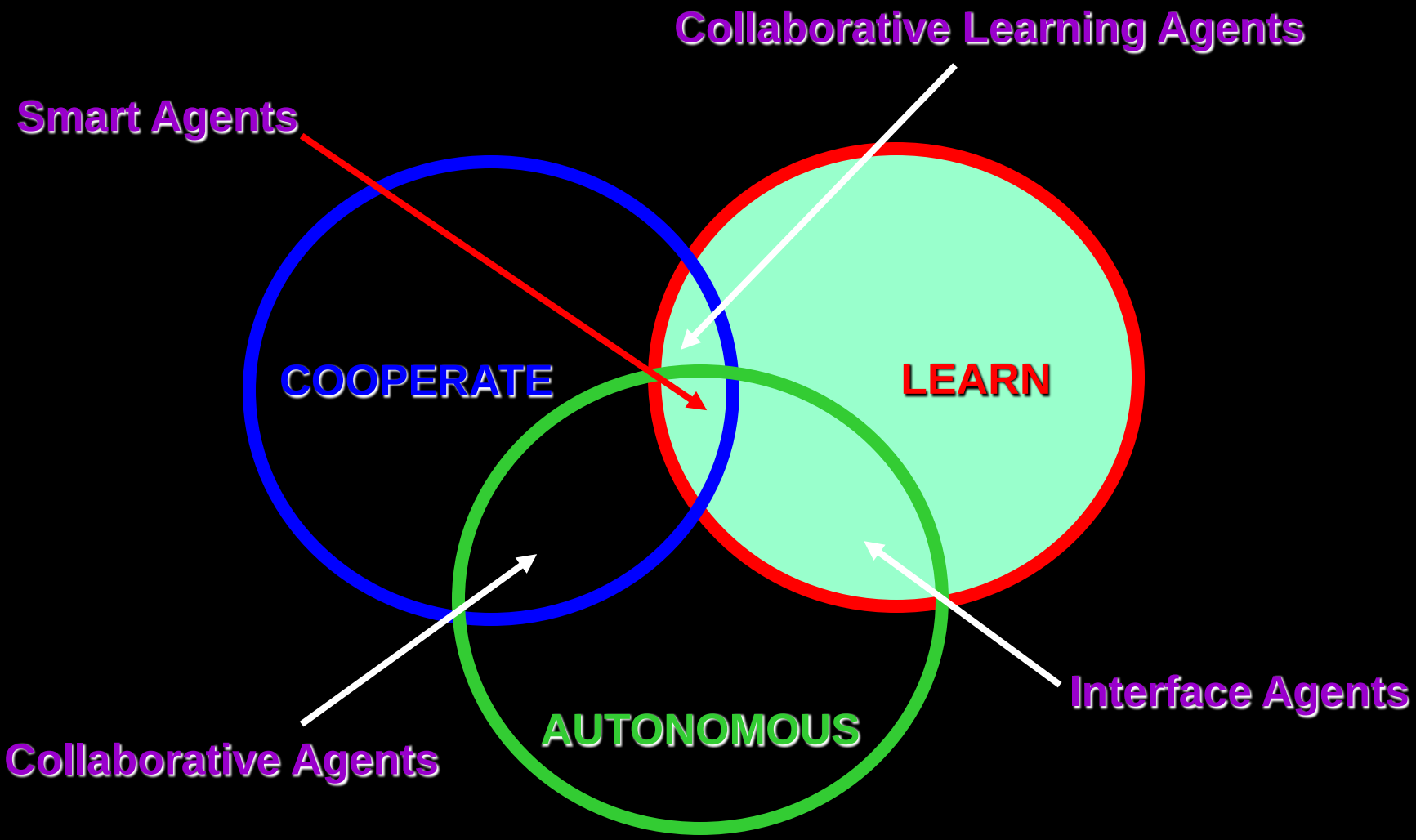
Adaptive ?





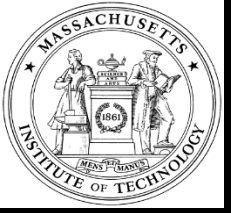





Collaborative Learning Agents
Smart Agents
COOPERATE
LEARN
AUTONOMOUS
Interface Agents
Collaborative Agents

In brief ...

- Concept — Relative Identification
- Application — Logistics, SCM, Healthcare, Security, eGov
- Tools — IPv6 Format and Semantics
- Benefits — Global Standard, Systems Interoperability



Structure, Relations

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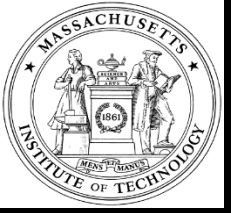

Structure, Relations, Syntax

"CallsPerDay"

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Structure, Relations, Syntax, Semantics

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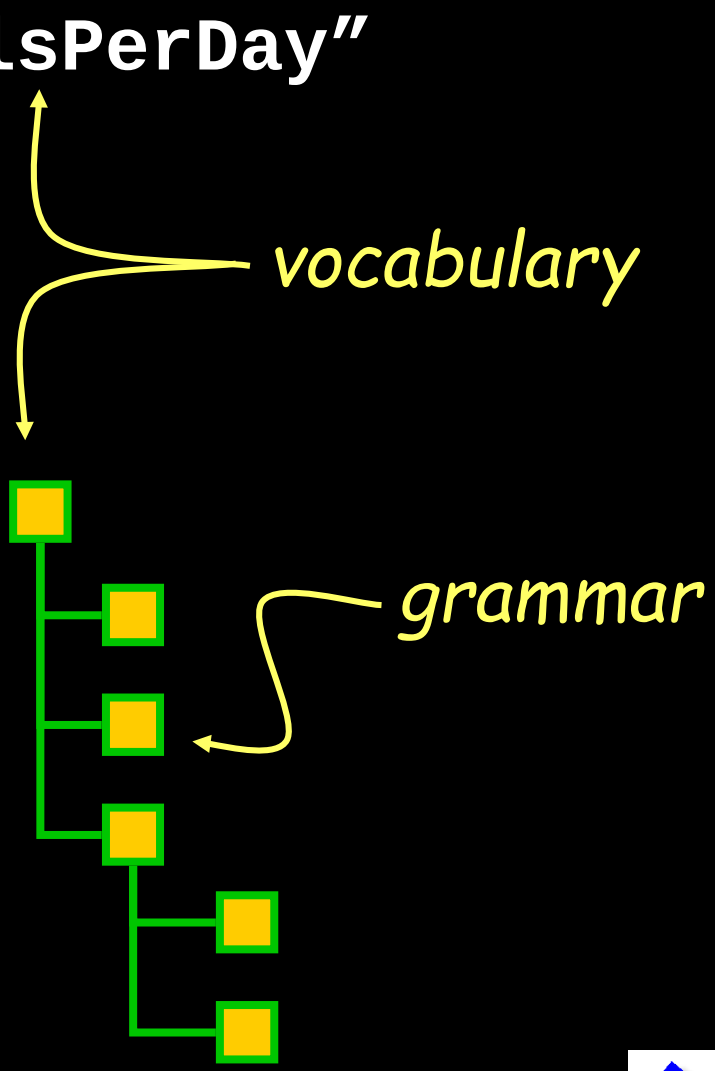

Data, Structure, Relations, Syntax, Semantics

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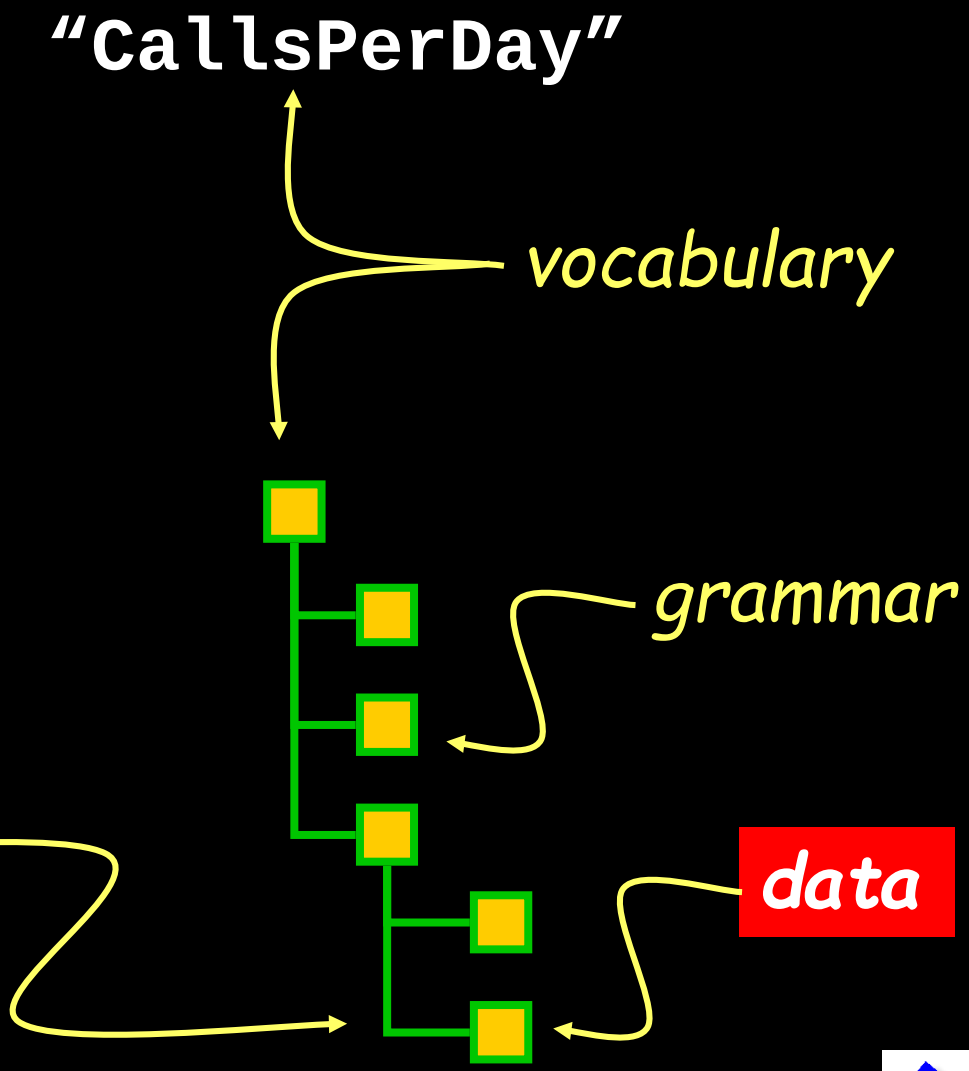
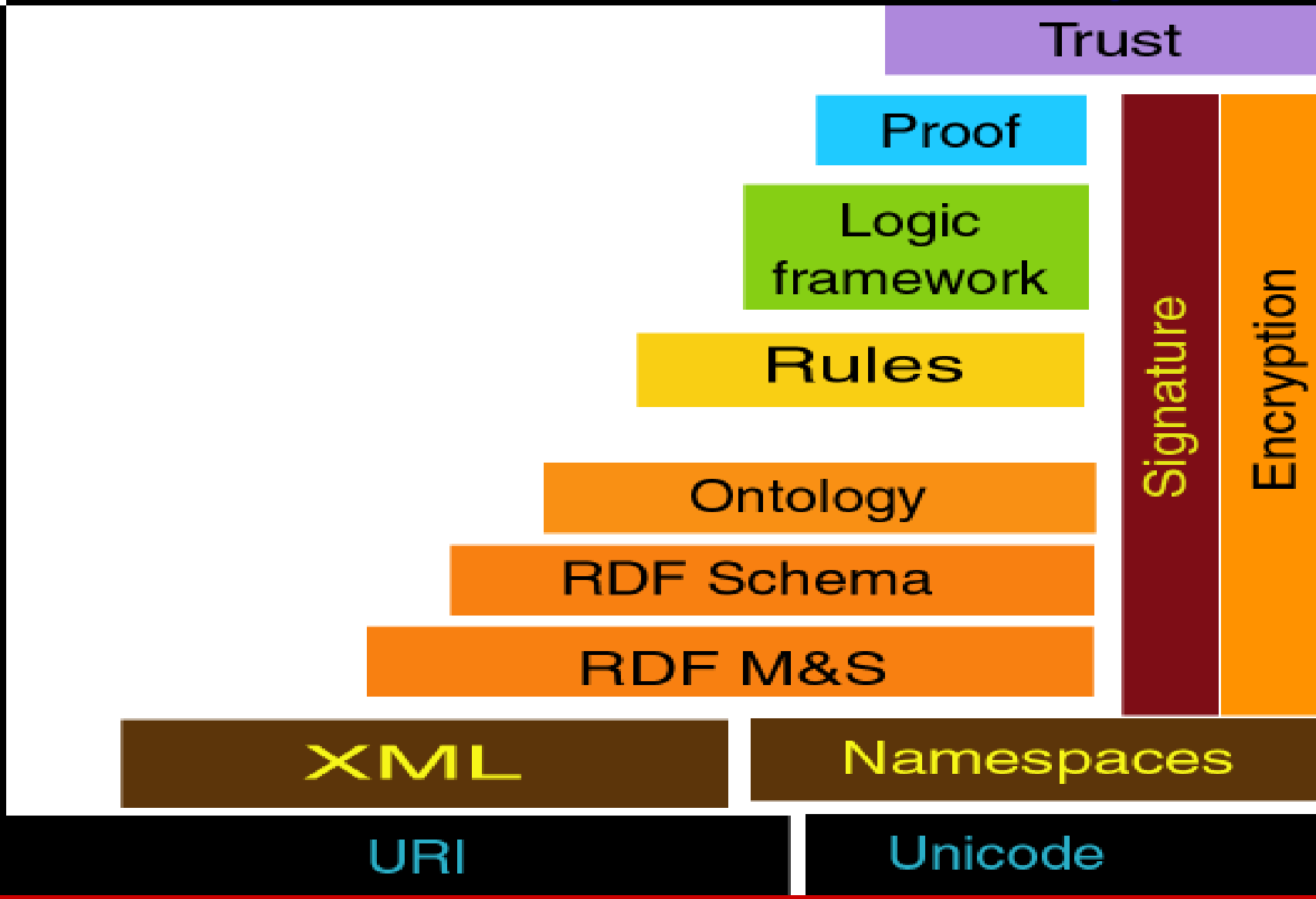


Semantic Layers

Tim Berners-Lee, MIT



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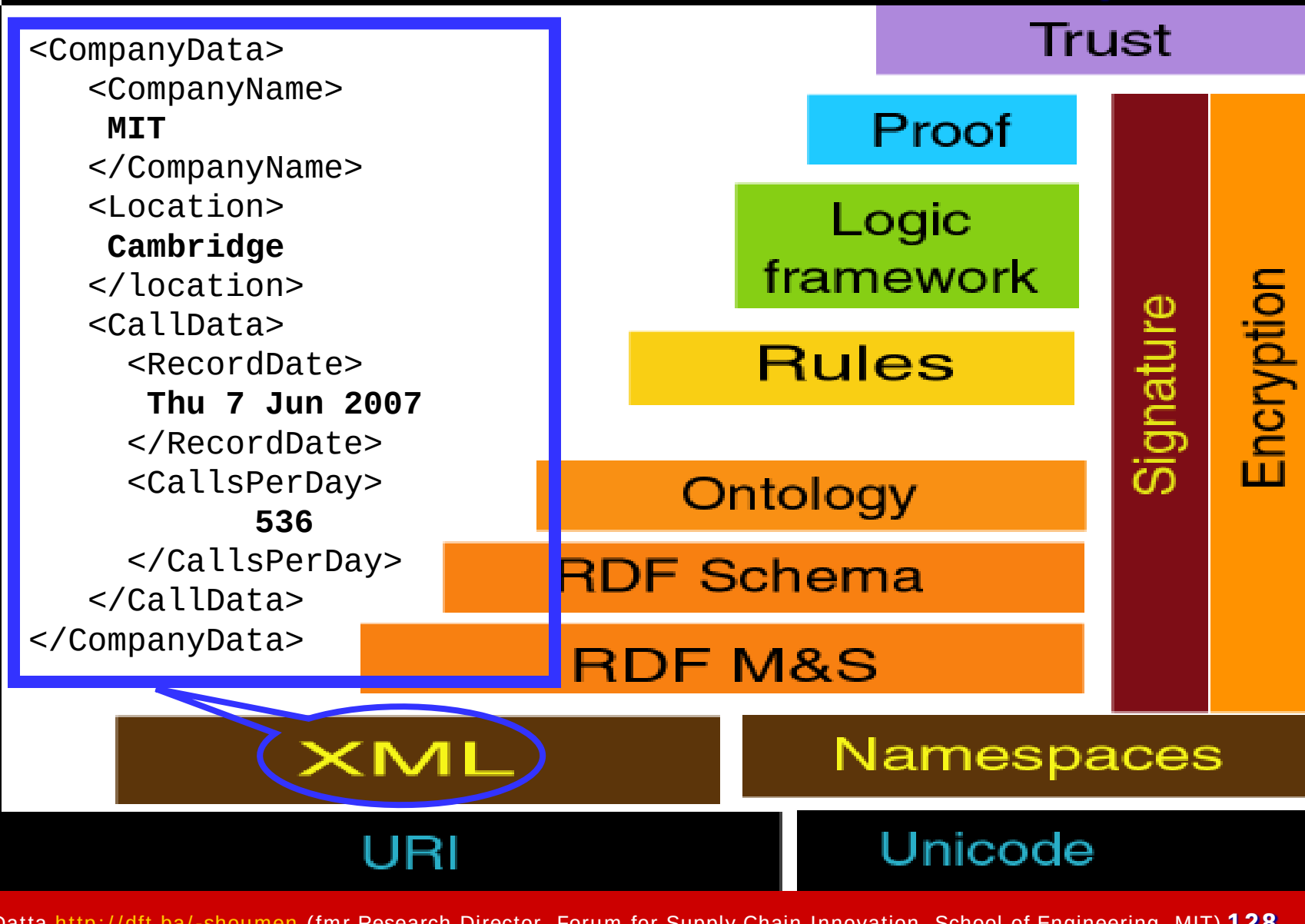
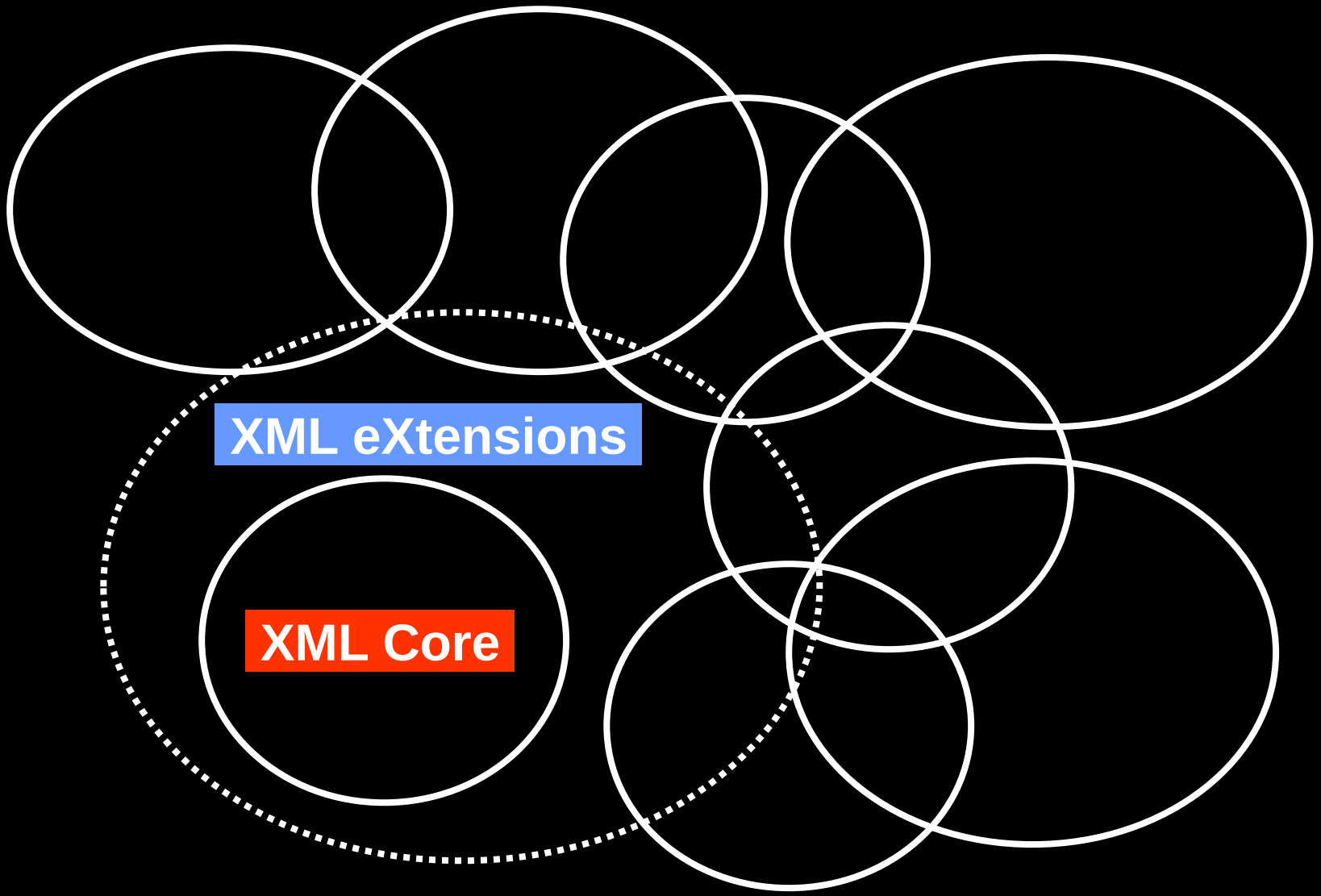
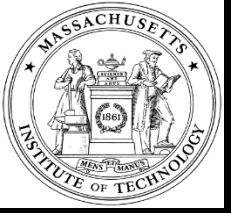


XML: Languages & Open Standards





Evolution

2003 Ontology Working Language (OWL) DAML + OIL
DARPA Agent Markup Language + Ontology Inference Layer

1999 XML-based Physical Markup Language (PML)
RFID Object Description Language (AIDC, MIT)

1998 eXtensible Markup Language (XML)
World Wide Web Consortium (W3C)

1996 eXtensible Markup Language (XML)
World Wide Web Consortium (W3C) Initiative

1993 HTML Browser Mosaic - Marc Andreessen
National Center for Supercomputing Applications (NCSA) University of Illinois

1989 HyperText Markup Language (HTML) - Tim Berners-Lee, CERN

1986 SGML - International Organization for Standardization (ISO)

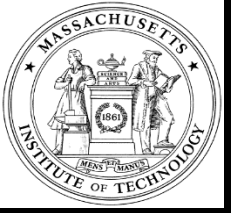
1983 SGML Computer Graphics Association (CGA)

1978 Standard General Markup Language (SGML) ANSI Initiative

1975 Document Composition Facility (DCF)

1971 Document Type Definition (DTD)

1969 General Markup Language (GML) - Charles Goldfarb, Ed Mosher, Ray Lorie



XML Explosion .....

Compiled by: David Brock

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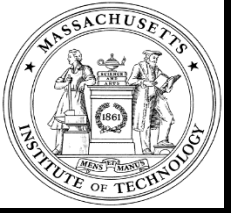

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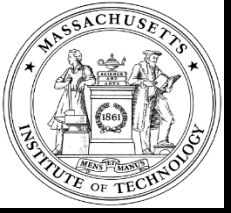
Compiled by: David Brock, MIT Data Center



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OSD
OTA
PML
PML
PML
PML
PML
PML
P3P
PDML
PDX
PEF XML
PetroML
PGML
PhysicsML
PICS
PMML
PNML
PNML
PNG
PrintML

PrintTalk
ProductionML
PSL
PSI
QML
QAML
QuickData
RBAC
RDDI
RDF
RDL
RecipeML
RELAX
RELAX NG
REXML
REPML
ResumeXML
RETML
RFML
RightsLang
RIXML
RoadmOPS
RosettaNet PIP
RSS
RuleML
SML
SML
SML
SML
SAML
SABLE
SAE J2008
SBML
Schemtron
SDML
SearchDM-XML
SGML

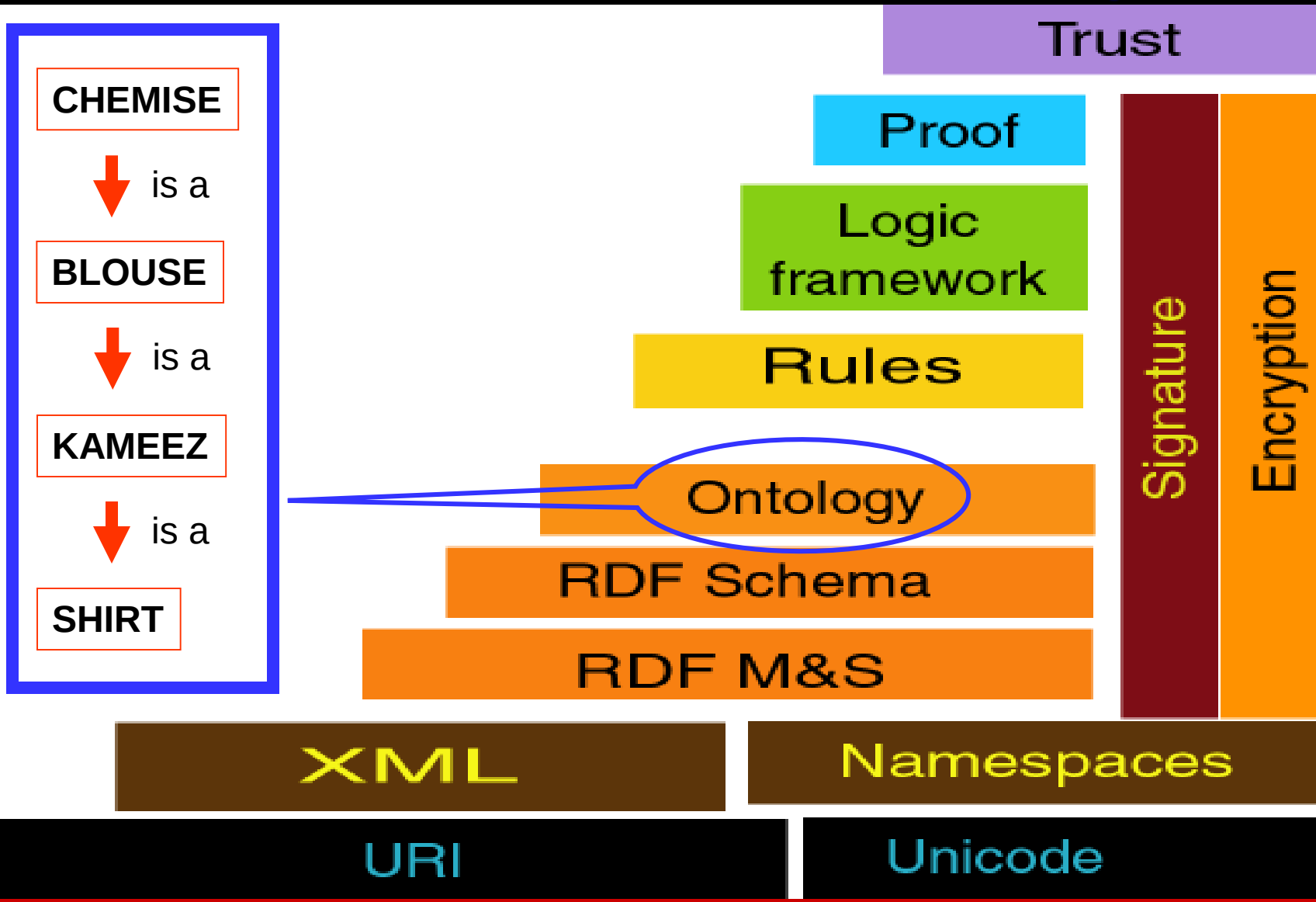
SHOE
SIF
SMML
SMBXML
SMDL
SDML
SMIL
SOAP
SODL
SOX
SPML
SpeechML
SSML
STML
STEP
STEPML
SVG
SWAP
SWMS
SyncML
TML
TML
TML
TalkML
TaxML
TDL
TDML
TEI
ThML
TIM
TIM
TMML
TMX
TP
TPAML
TREX
TxLife

UML
UBL
UCLP
UDDI
UDEF
UIML
ULF
UMLS
UPnP
URI / URL
UXF
VML
vCalendar
vCard
VCML
VHG
VIML
VISA XML
VMML
VocML
VoiceXML
VRML
WAP
WDDX
WebML
WebDAV
WellML
WeldingXML
Wf-XML
WIDL
WITSML
WorldOS
WSML
WSIA
XML
XML Court
XML EDI

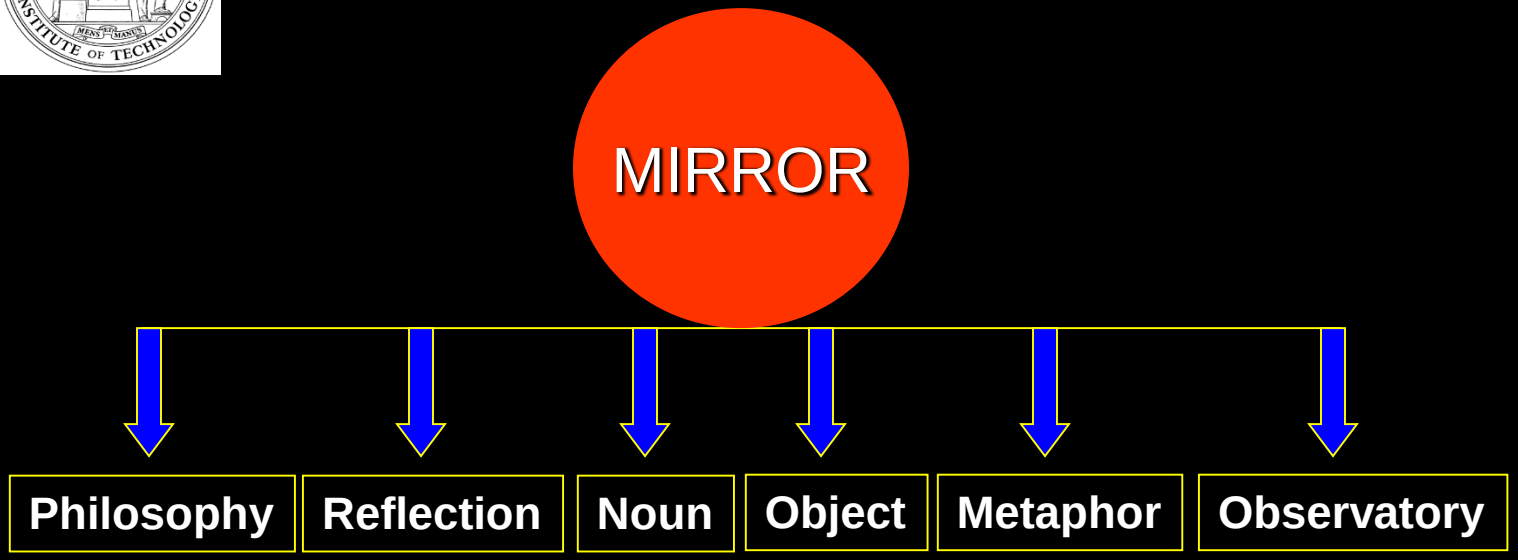
XML F
XML Key
XMLife
XML MP
XML News
XML RPC
XML Schema
XML Sign
XML Query
XML P7C
XML TP
XMLVoc
XML XCI
XAML
XACML
XBL
XSBEL
XBN
XBRL
XCFF
XCES
Xchart
Xdelta
XDF
XForms
XGF
XGL
XGMML
XHTML
XIOP
XLF
XLIFF
XLink
XMI
XMSG
XMTP
XNS

Is XML still a standard ?

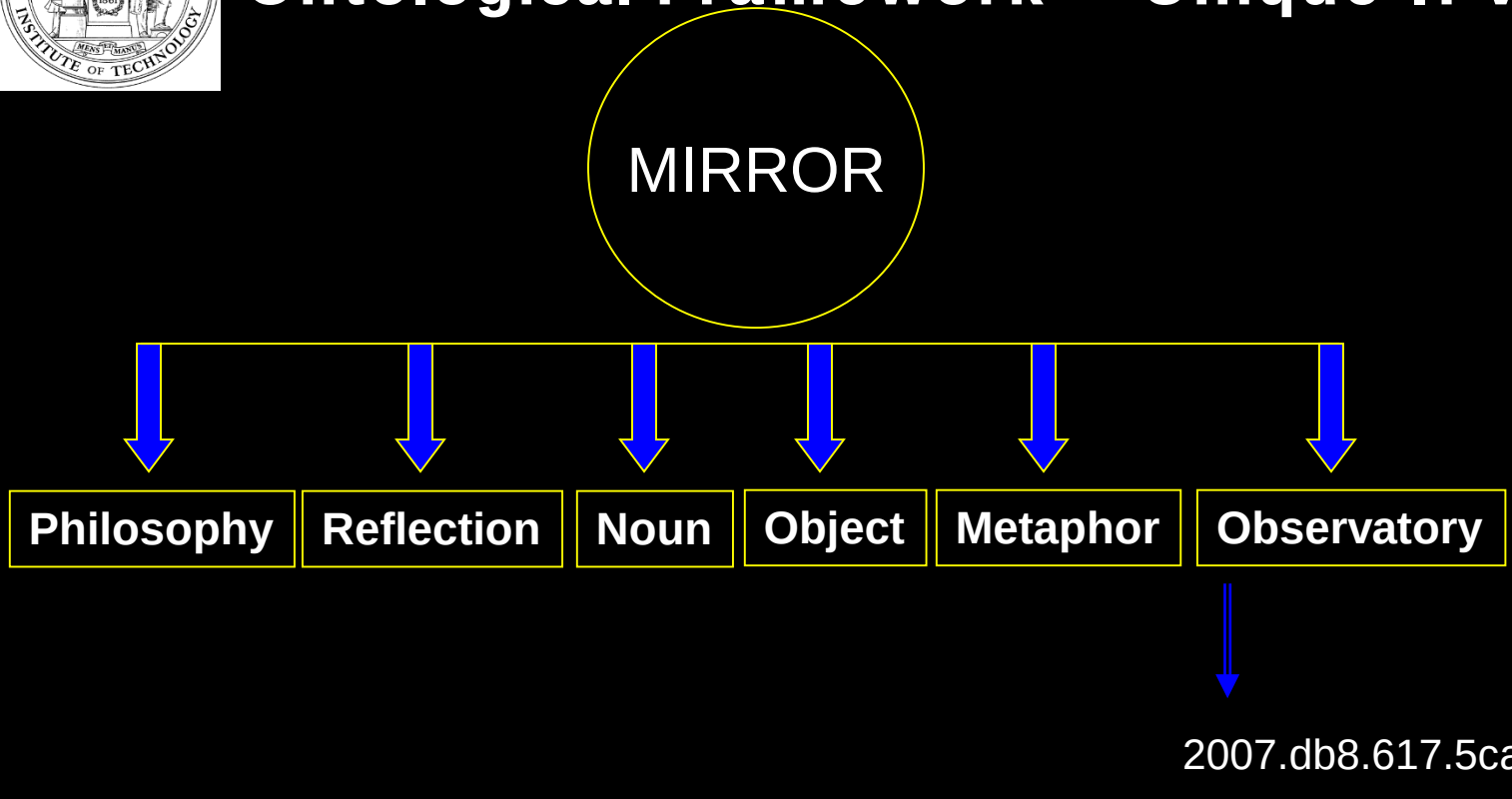
Semantic Layers: Relationships
Tim Berners-Lee, MIT



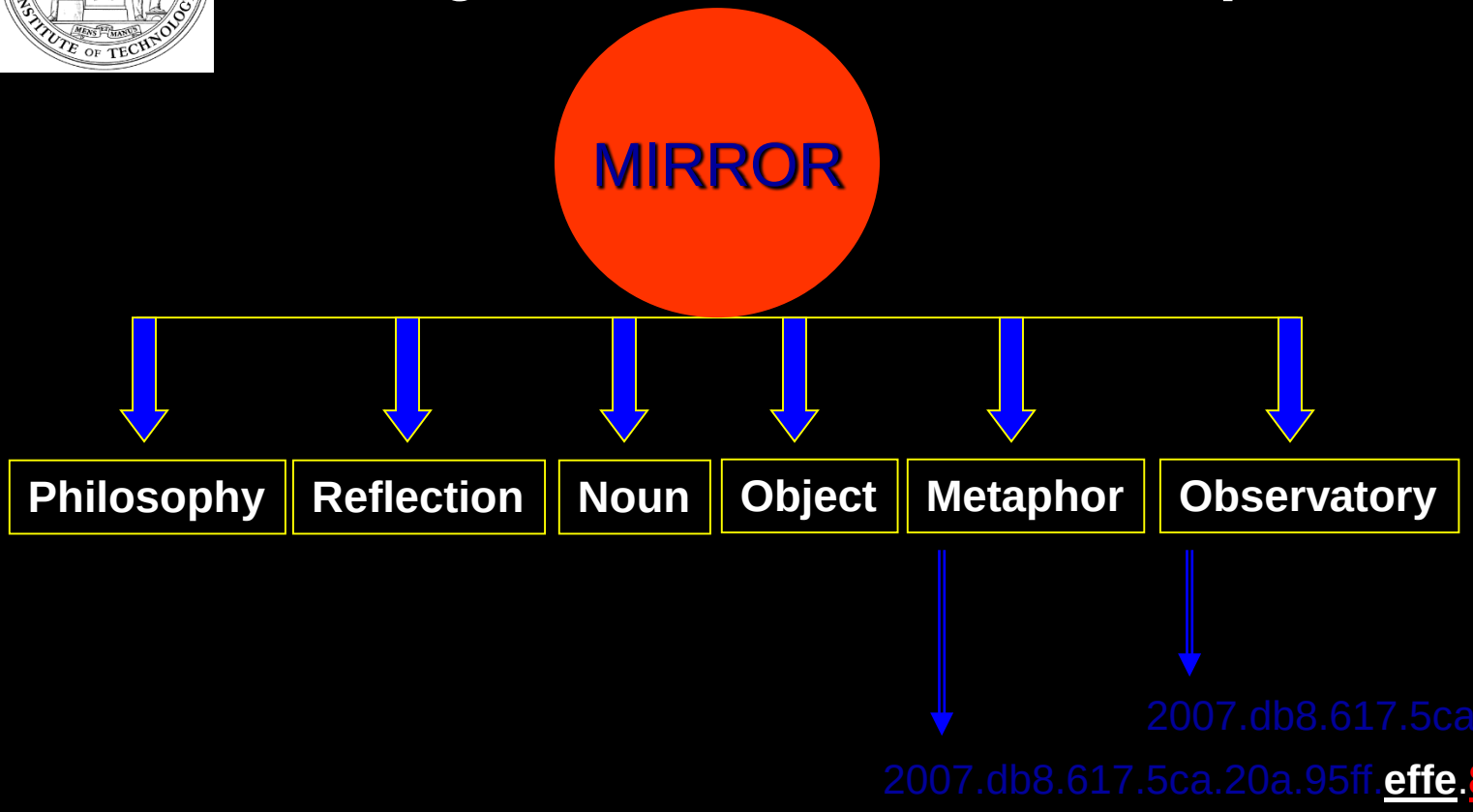
Ontological Framework



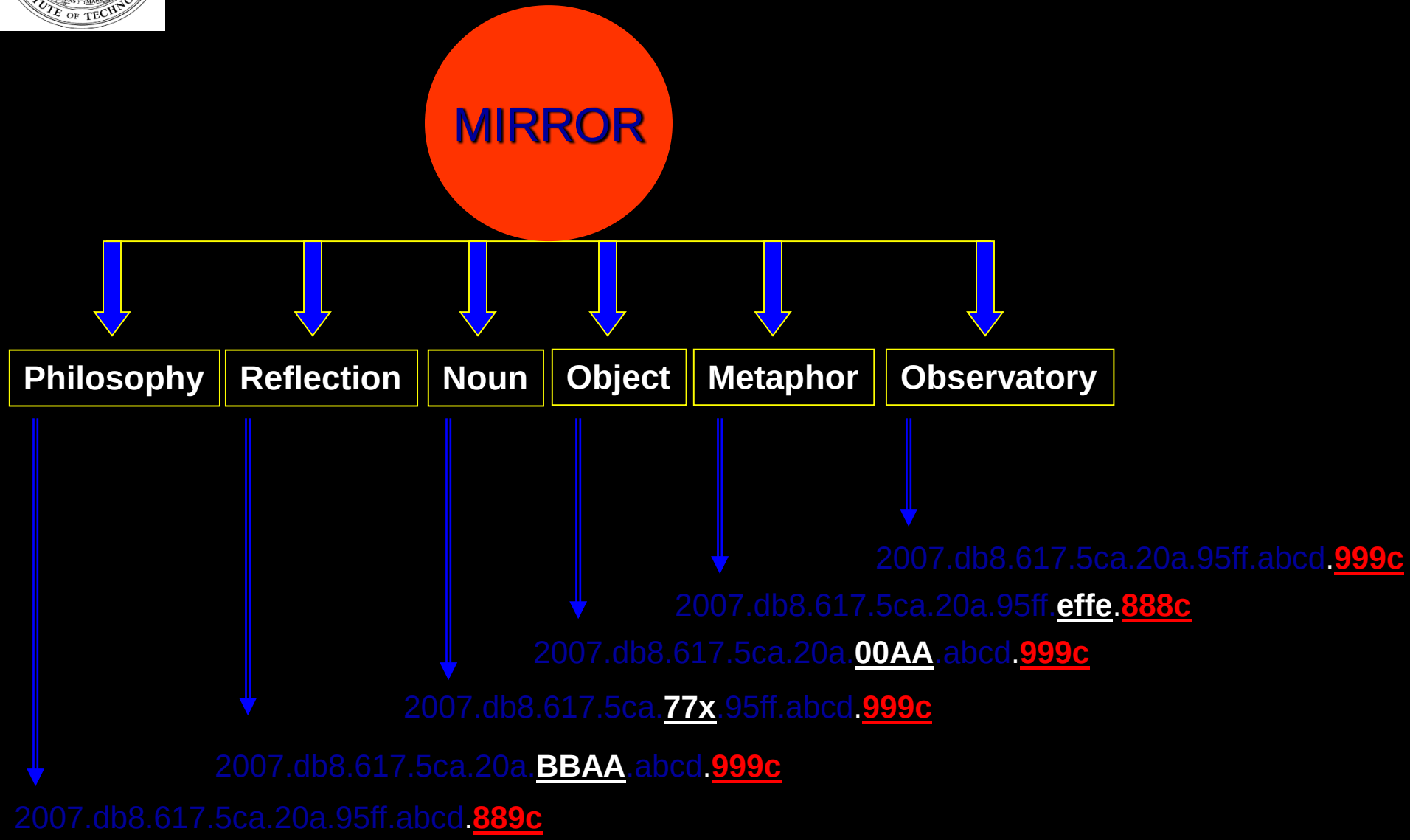
Ontological Framework + Unique IPv6 Identifier



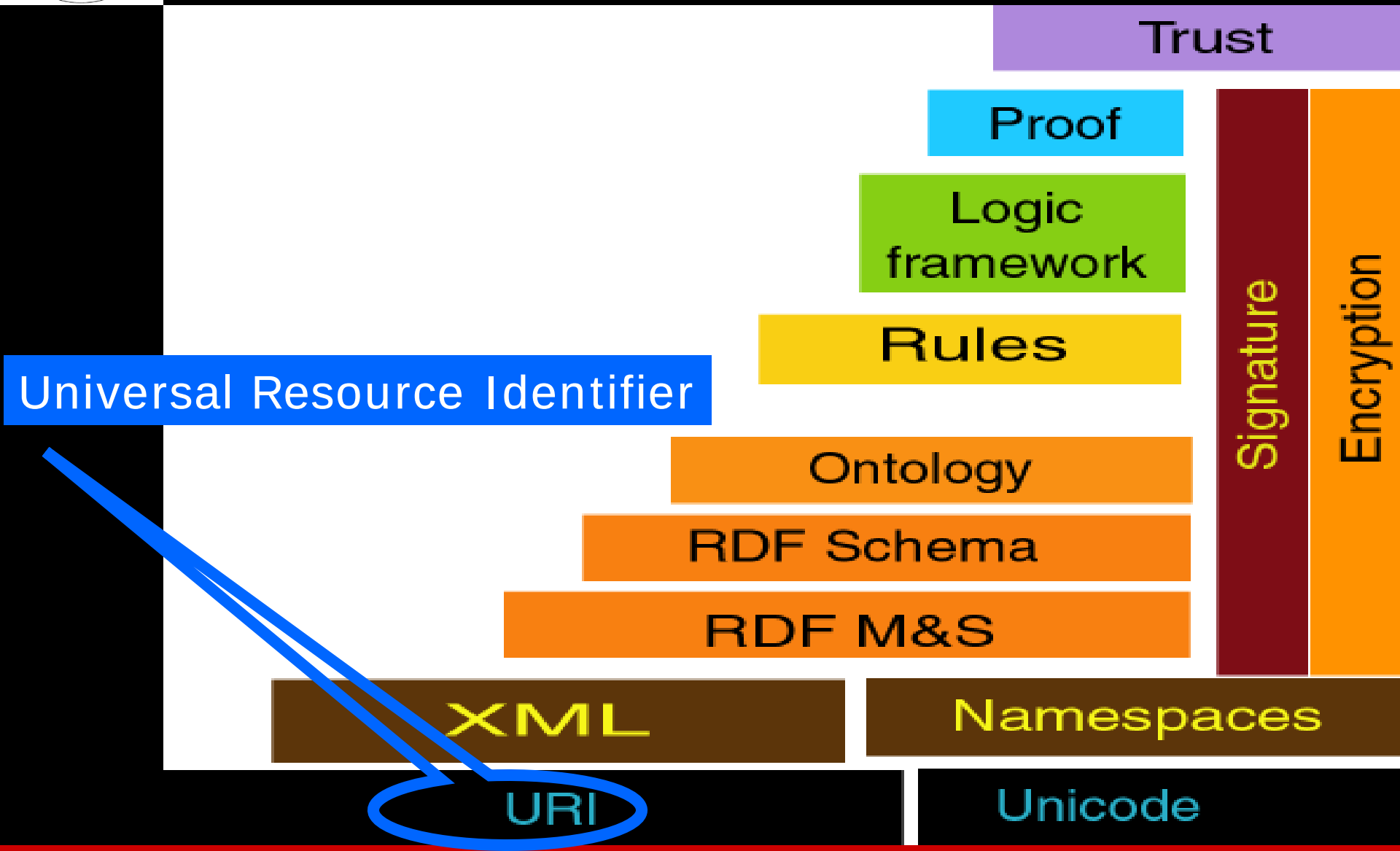
Ontological Framework + Unique IPv6 Identifier



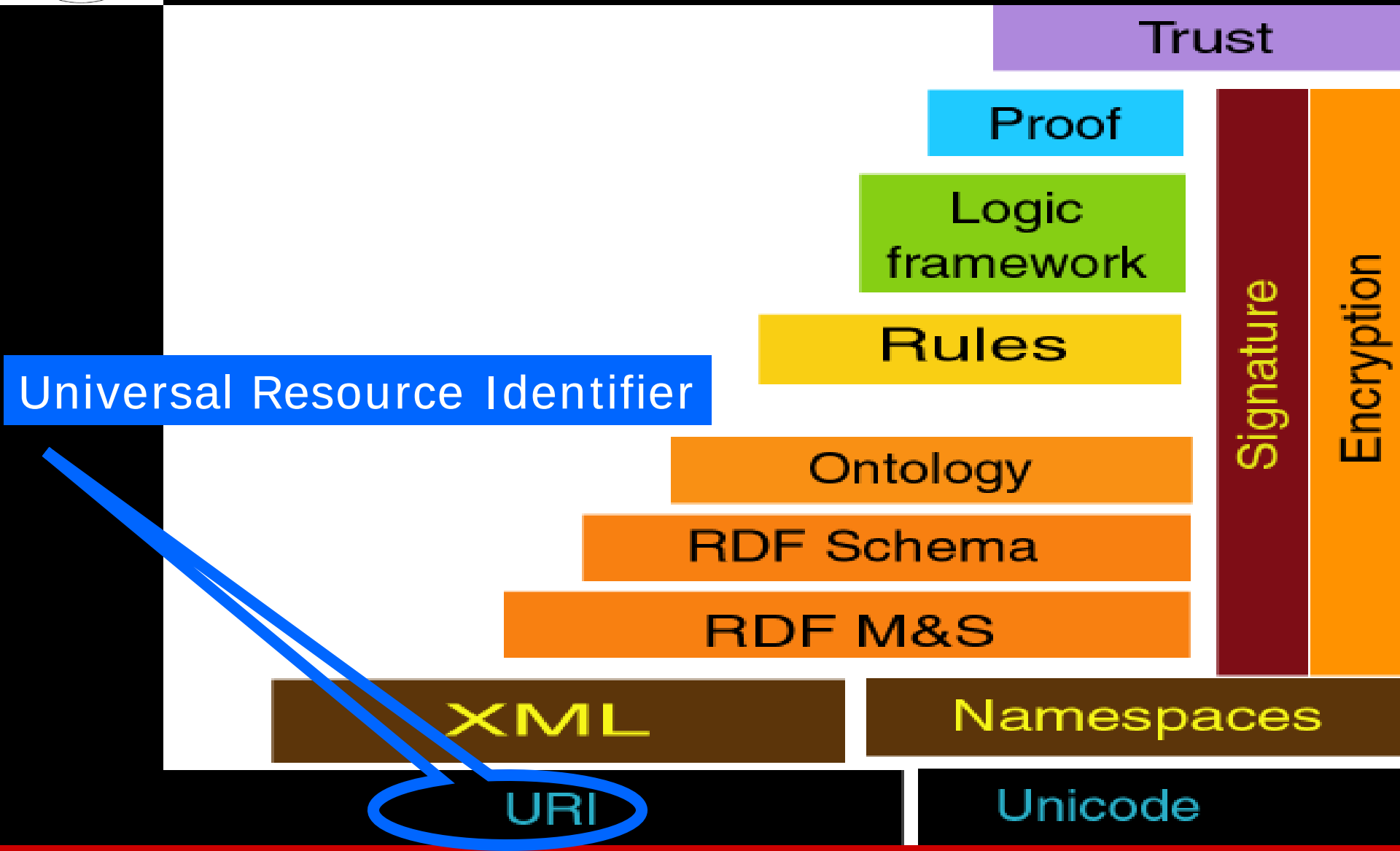
Unique IPv6 id: Ontological Identifier



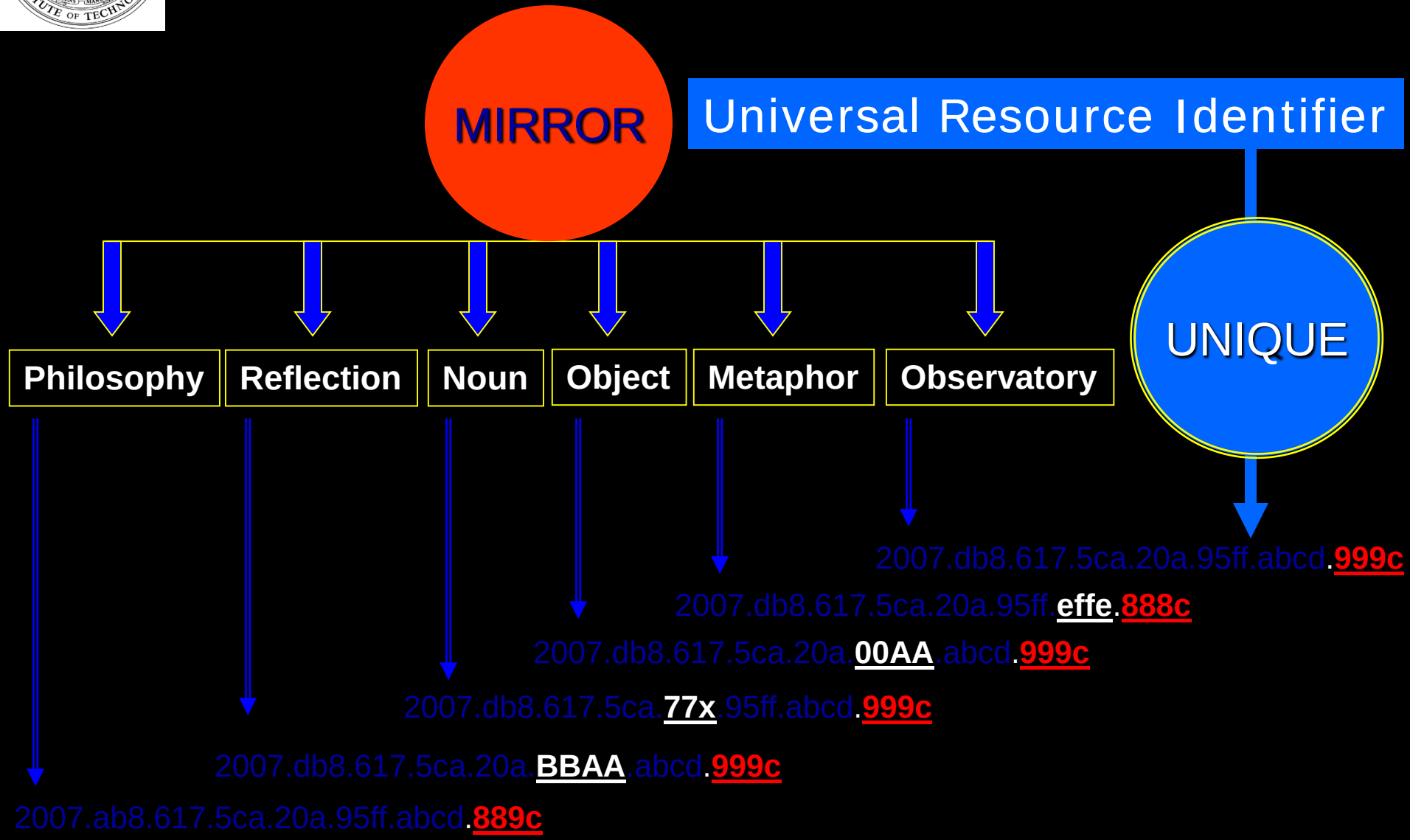
URI Abstraction <http://www.mit.edu>



URI: Universal but not Unique Identifier

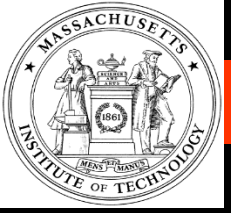


Digital Ontology: Use IPv6 id over URI ?



This is a proposed idea by the author. It is not a fact or form of identification of ontologies, in practice.

Unique IPv6 type id as a sub-layer to URI abstraction ?



MIRROR

Universal Resource Identifier

UNIQUE

Philosophy | Reflection | Noun | Object | Metaphor | Observatory

2007.ab8.617.5ca.20a.95ff.abcd.**889c**

2007.db8.617.5ca.20a.**BBAA**.abcd.**999c**

2007.db8.617.5ca.**77x**.95ff.abcd.**999c**

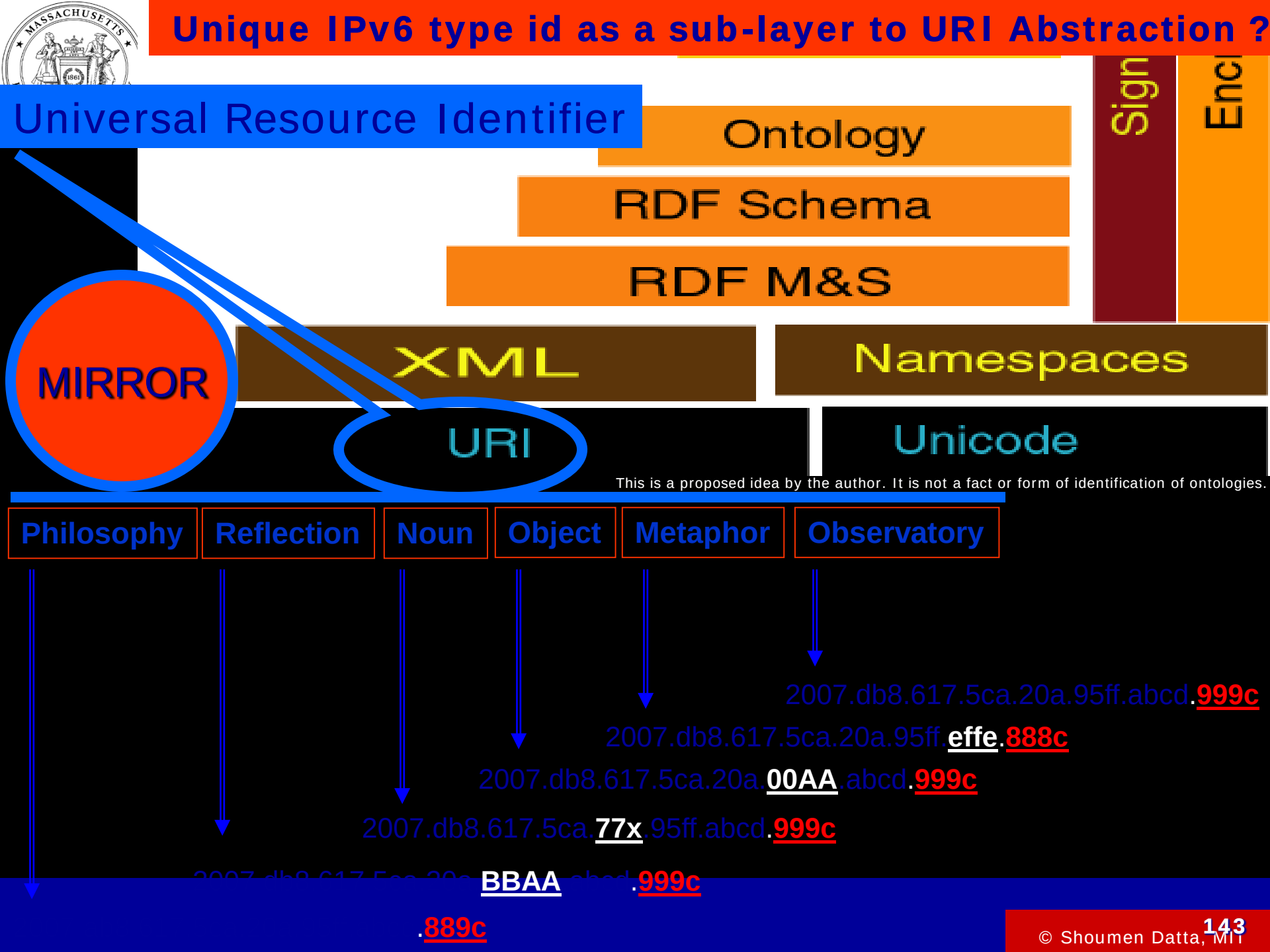
2007.db8.617.5ca.20a.**00AA**.abcd.**999c**

2007.db8.617.5ca.20a.95ff.**effe**.**888c**

2007.db8.617.5ca.20a.95ff.abcd.**999c**

This is a proposed idea by the author. It is not a fact or form of identification of ontologies, in practice.

Unique IPv6 type id as a sub-layer to URI Abstraction ?



Class

Upperbody Outerwear

IPv6 Range →

2007. db8. 617. 5ca. 20a. 95ff. **200a.** **0000**
to
2007. db8. 617. 5ca. 20a. 95ff. **400f.** **8888**

Unique IPv6 type id as a sub-layer to URI Abstraction ?

CHEMISE 2007.db8.617.5ca.20a.95ff.**320a.1617**

↓ is a

BLOUSE 2007.db8.617.5ca.20a.95ff.**320b.0452** →

Serial Number

Additional identification may be included in the encapsulating security header section for data integrity or 'uniqueness'

↓ is a

SHIRT 2007.db8.617.5ca.20a.95ff.**320c.3211** →

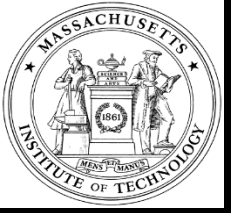
↓ **is it a ?**

KAMEEZ
2007.db8.617.5ca.20a.95ff.**300d.2020**

↓ **is a ?**

KIMONO
2007.db8.617.5ca.20a.95ff.**203f.8080**

Subclass:
Japanese Traditional Outer Garments
Range:
2007.db8.617.5ca.20a.95ff.**202a.7777**
to
2007.db8.617.5ca.20a.95ff.**210f.9944**



Why is it necessary to define ontology class with unique id ?

Why is it necessary to define ontology class with unique id ?

Global Agreement

- **Anterior Pituitary <u>is a</u> part of hypothalamus**
- **Minute Hand <u>is a</u> part of a time clock**

Why is it necessary to define ontology class with unique id ?

Language Ambiguity

Class

Upperbody Outerwear

CHEMISE

is a

BLOUSE

is a

SHIRT

is it a ?

KAMEEZ

is a ?

KIMONO

Why is it necessary to define ontology class with unique id ?

Western Ontology Classification

Kimono

is a

Shirt

Class

Upperbody Outerwear

CHEMISE

is a

BLOUSE

is a

SHIRT

is it a ?

KAMEEZ

is a ?

KIMONO

Why is it necessary to define ontology class with unique id ?

Japanese Ontology Classification

Kimono

is a

Traditional Garment

Class

Upperbody Outerwear

Unique id eliminates semantic ambiguity

CHEMISE

↓ is a

BLOUSE

↓ is a

SHIRT

↓ is it a ?

KAMEEZ

↓ is a ?

KIMONO

2007.db8.617.5ca.20a.95ff.203f.8080

Unique id enables classification agnostic application

Western Ontological Framework

Japanese Ontological Framework

Subclass or a Separate Class:
Japanese Traditional Outer Garments
Range:
2007.db8.617.5ca.20a.95ff.202a.7777
to
2007.db8.617.5ca.20a.95ff.210f.9950

Semantics

Call
Loud cry, shout

Call
Animal's call

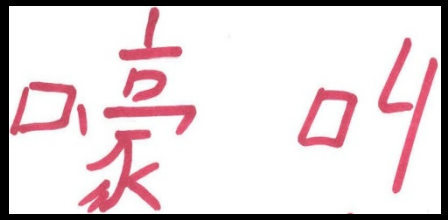
Call
Telephone call

Call
House visit

Semantics and Chinese Script

Call 1
Loud cry, shout

Call 2
Animal's call



Call 3
Telephone call

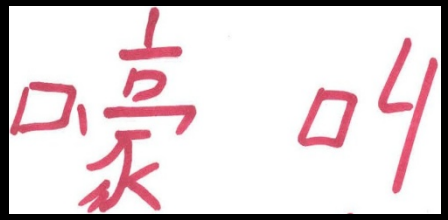
Call 4
House visit

Semantic Differences

Call 1
Loud cry, shout

喊叫

Call 2
Animal's call



嚎叫

Call 3
Telephone call

电话

Call 4
House visit

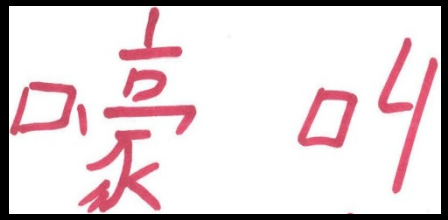
需求

Semantic Ambiguity ?

Call 1
Loud cry, shout

喊叫

Call 2
Animal's call



嚎叫

Call 3
Telephone call

电话

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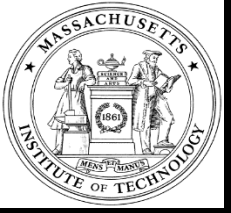
需求



OMICS

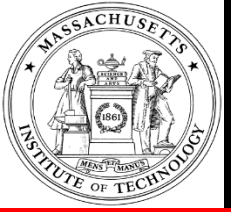
CELL Ontology

```
[Term]
id: CL:0000236
name: B-cell
is_a: CL:0000542 ! lymphocyte
develops_from: CL:0000231 ! B-lymphoblast
```

Augmented GO

```
[Term]
id: GO:0030183
name: B-cell differentiation
is_a: GO:0042113 ! B-cell activation
is_a: GO:0030098 ! lymphocyte differentiation
intersection_of: is_a GO:0030154 ! cell differentiation
intersection_of: has_participant CL:0000236 ! B-cell
```

Data: Suzanna Lewis, GO Consortium and National Center for Biomedical Ontology



OMICS

Is it possible? Transition to IPv6 Format

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is_a: CL:0000542 ! lymphocyte
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OMICS

Is it possible? Transition to IPv6 Format

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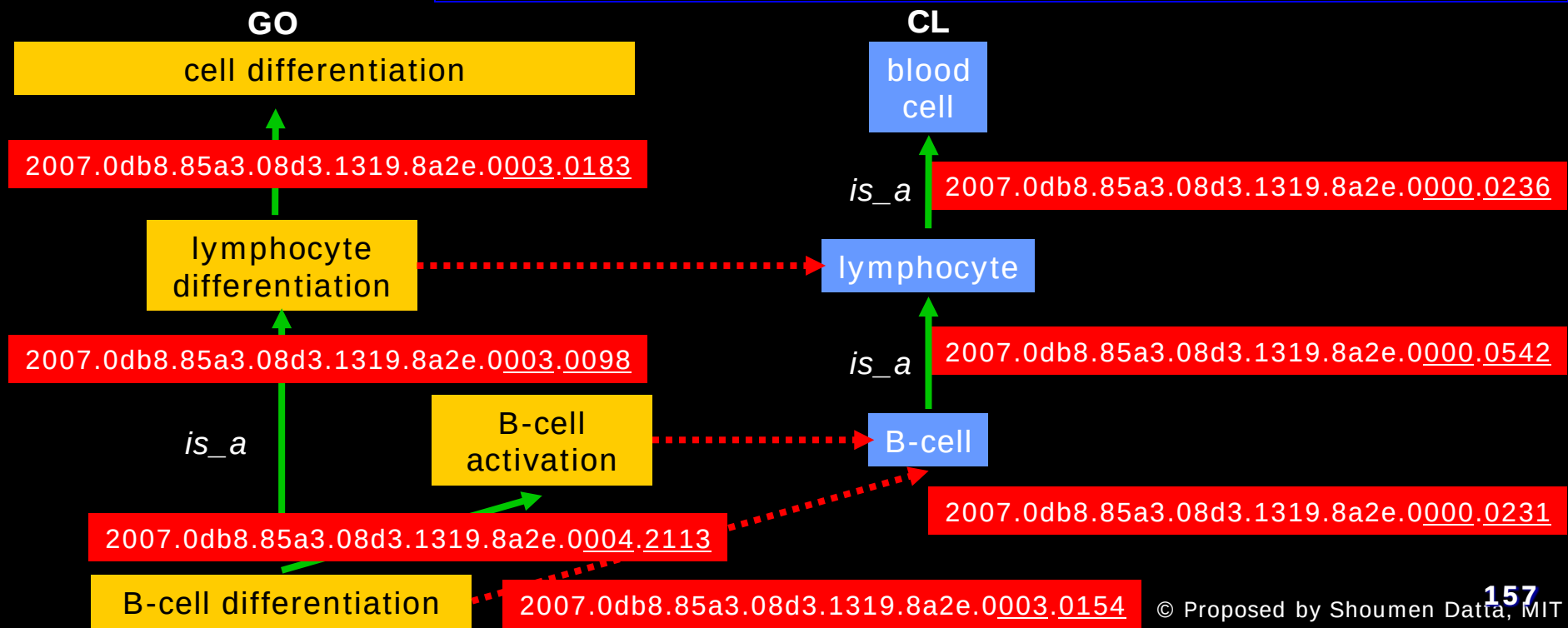
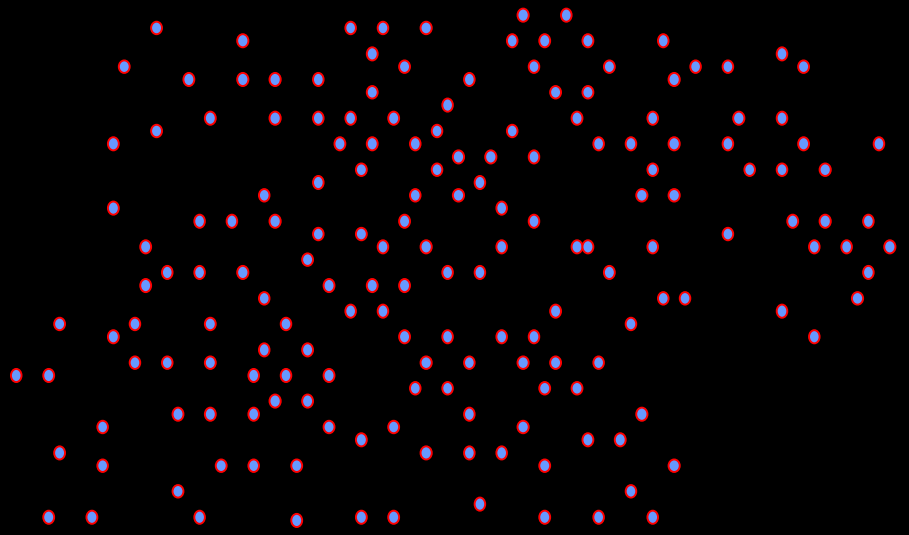
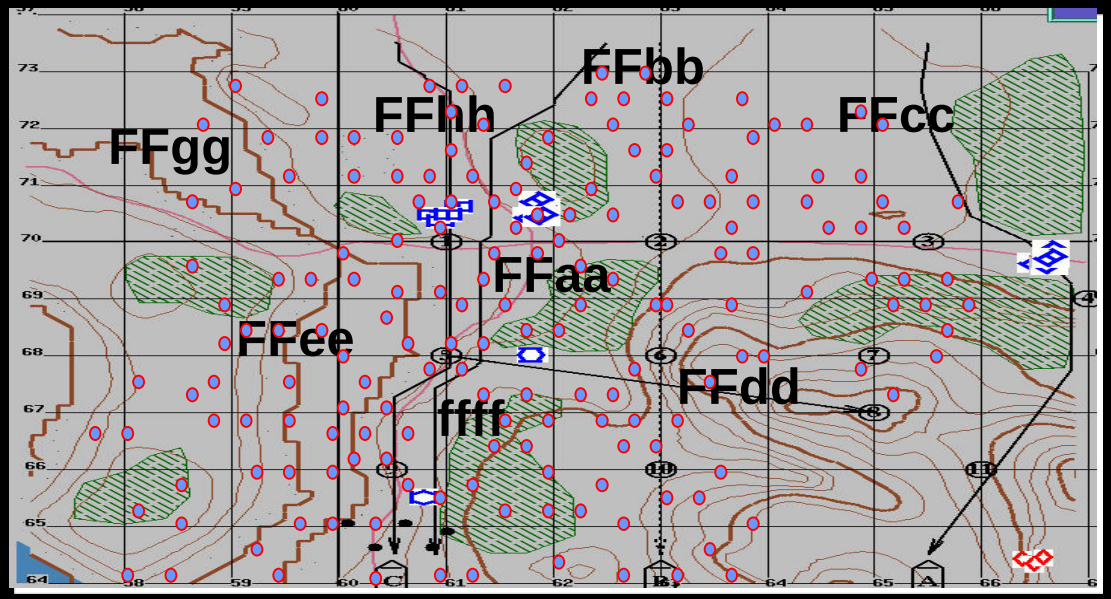


Defense: Mobile *ad hoc* Networks in Remote Sensing



Sensors
Light
Magnetic
Vibration

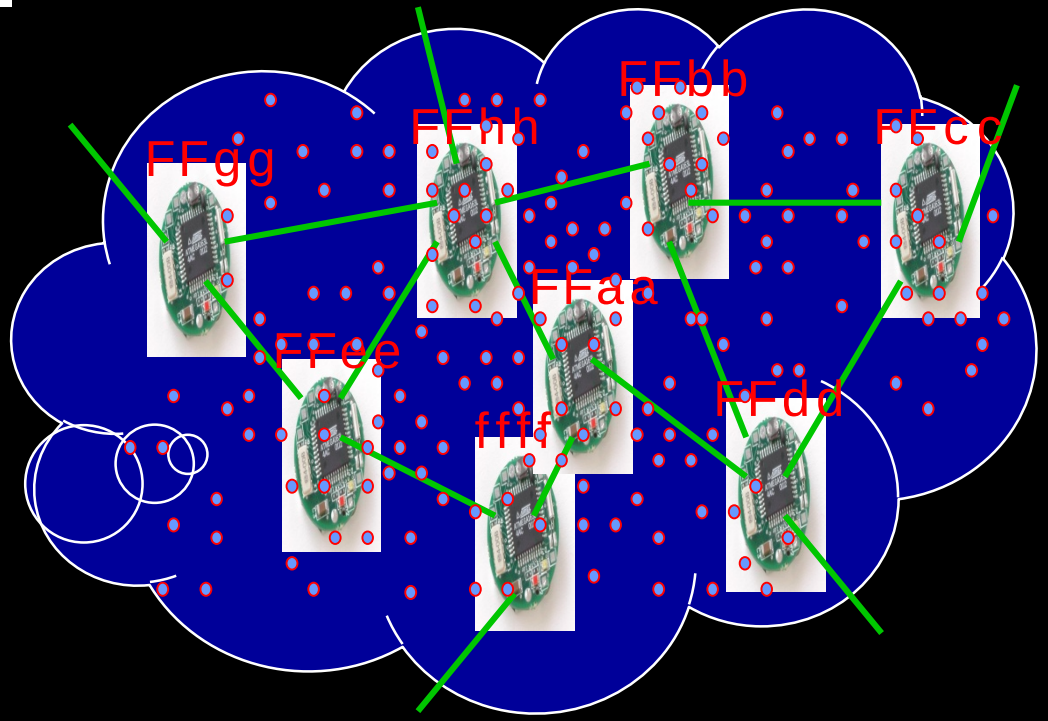
Defense: Mobile *ad hoc* Networks in Remote Sensing



FFxx **Unique Sensor Node**
Mobile Cluster Agent

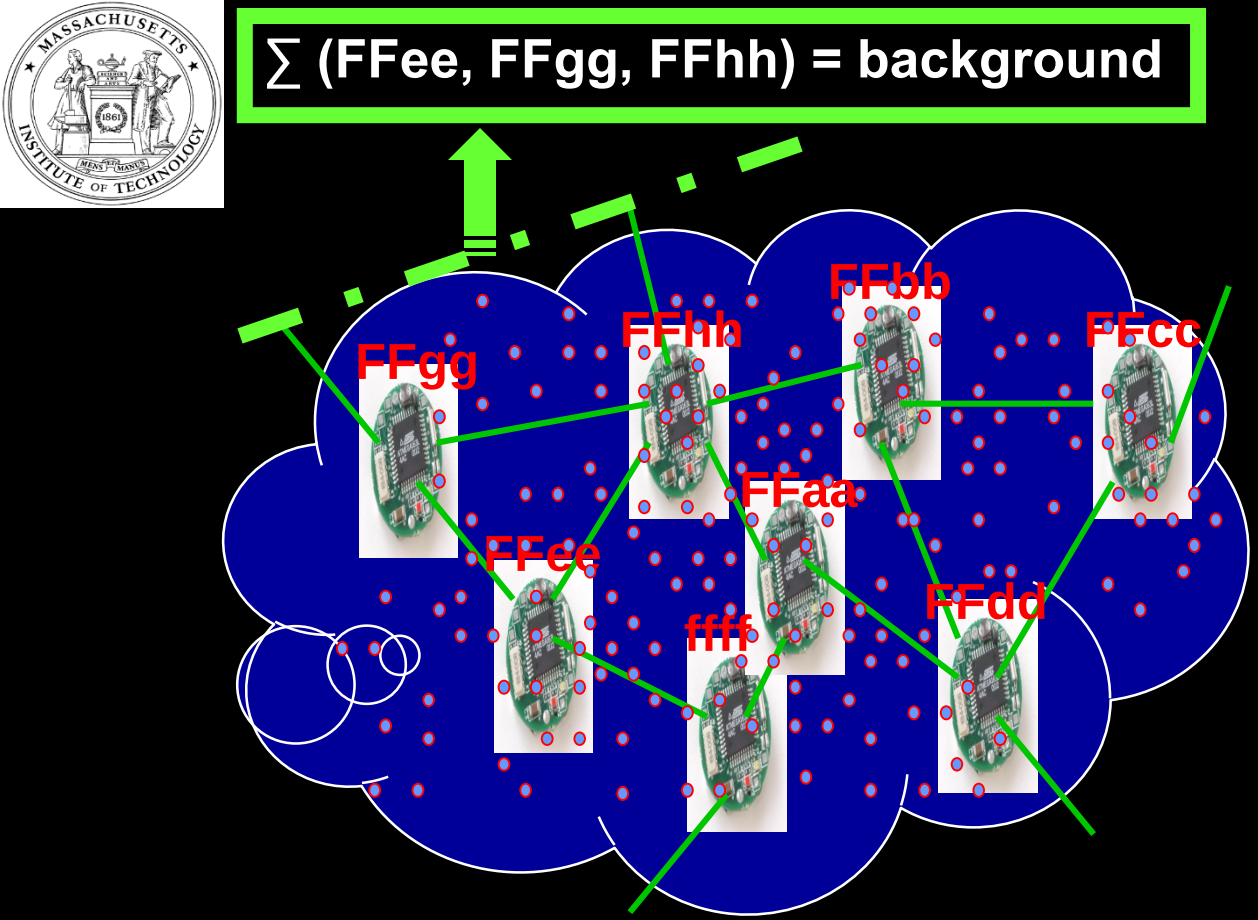
Sensors
Light
Magnetic
Vibration

Defense: Mobile *ad hoc* Networks in Remote Sensing



FFxx **Unique Sensor Node**
Mobile Cluster Agent

Sensors
Light
Magnetic
Vibration



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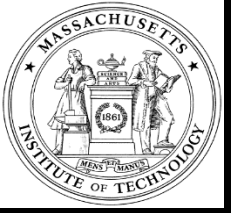
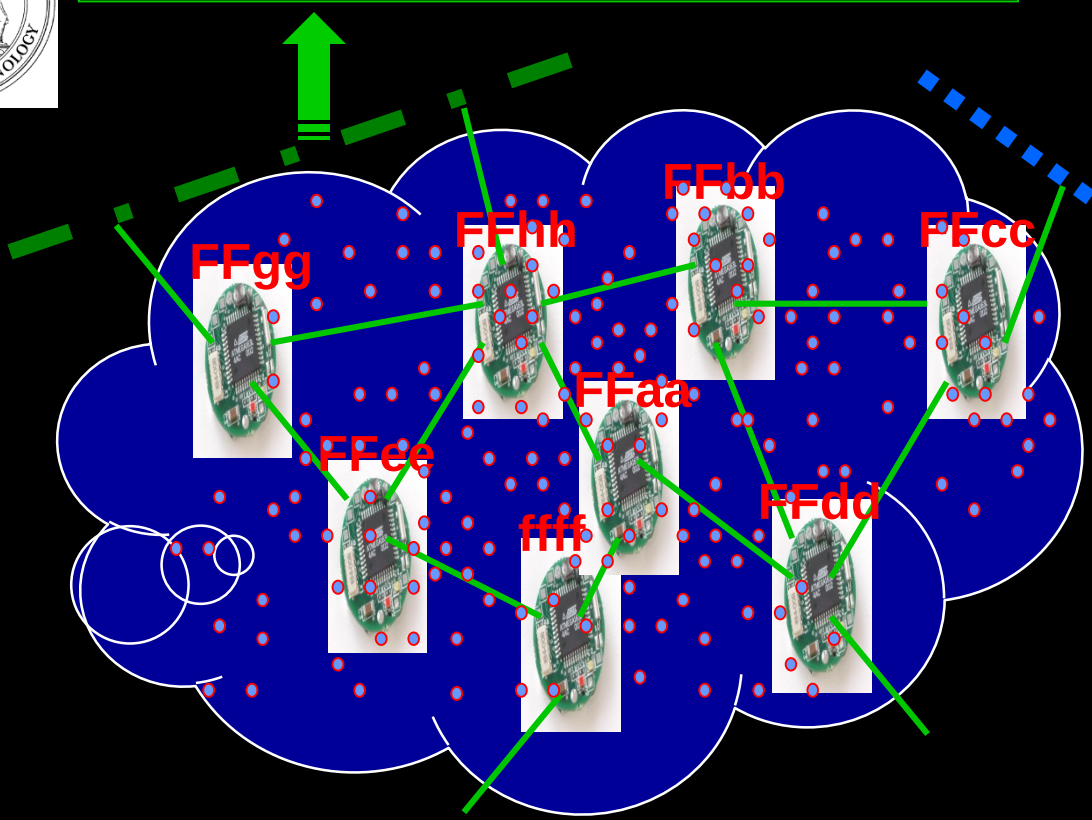


∑ (FFee, FFgg, FFhh) = background

∑ (FFcc, FFbb) = low



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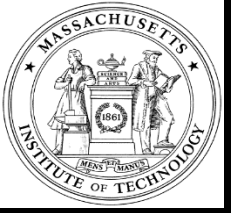
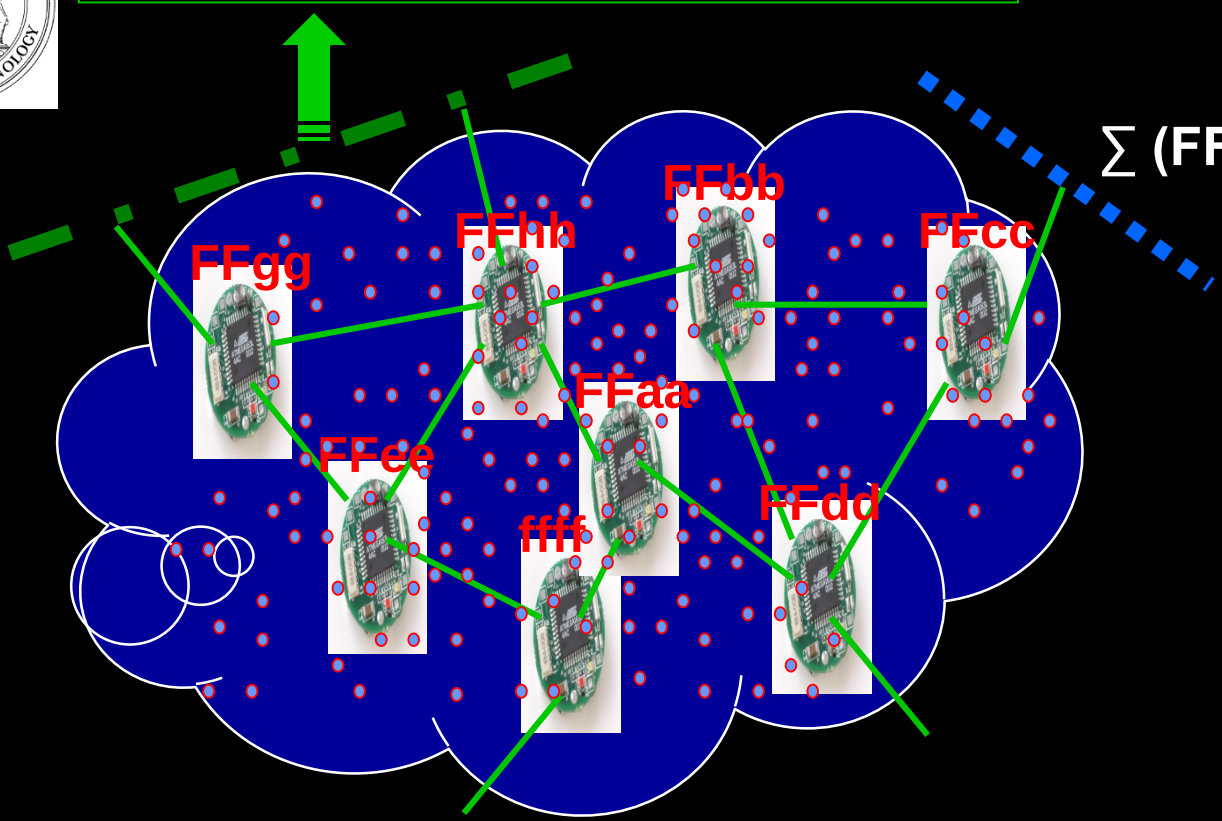


∑ (FFee, FFgg, FFhh) = background

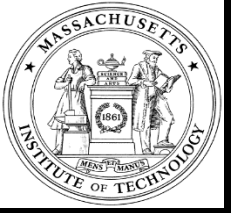
∑ (FFcc, FFbb) = low

Single Vehicle Approaching ?



FFxx **Unique Sensor Node**
Mobile Cluster Agent

Sensors
Light
Magnetic
Vibration



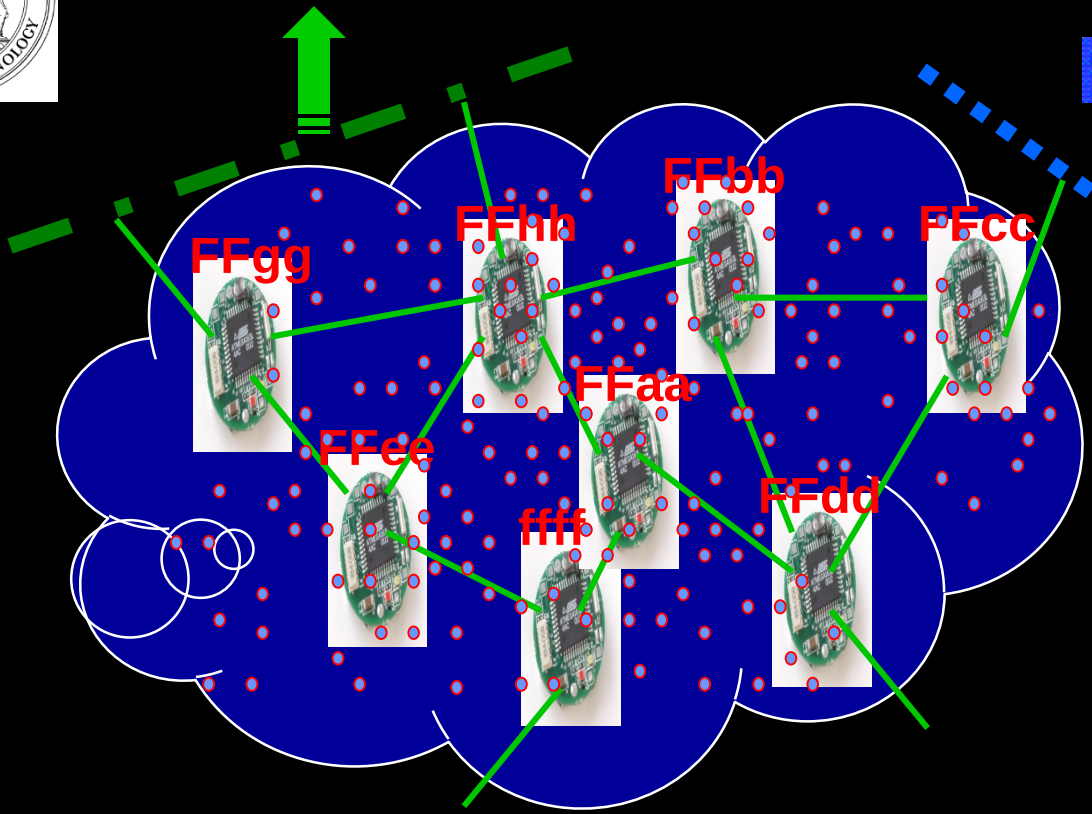
∑ (FFee, FFgg, FFhh) = background

Unique Analysis Id

200 l :db8:3:4:283: l eff:fea3:faa

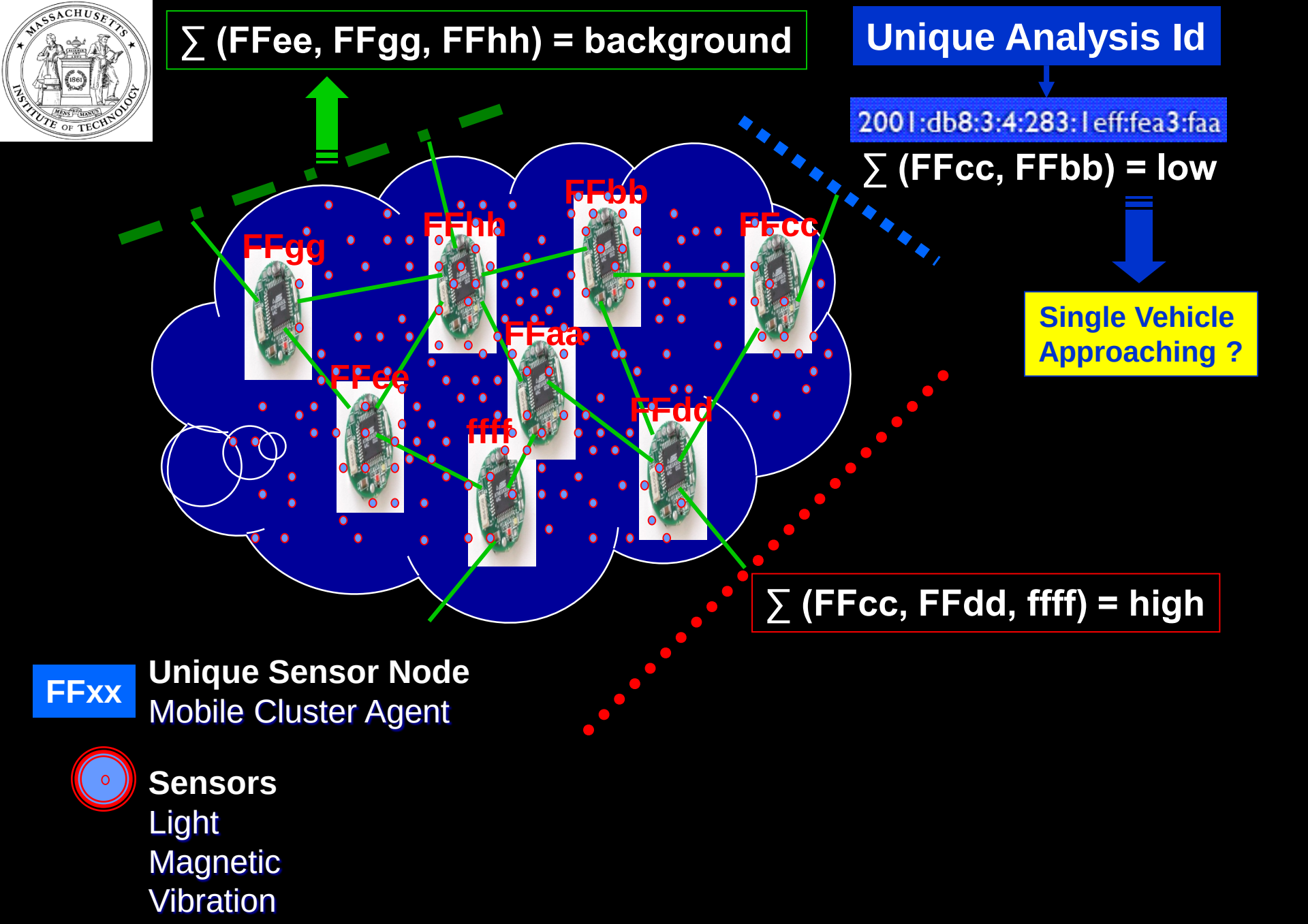
∑ (FFcc, FFbb) = low

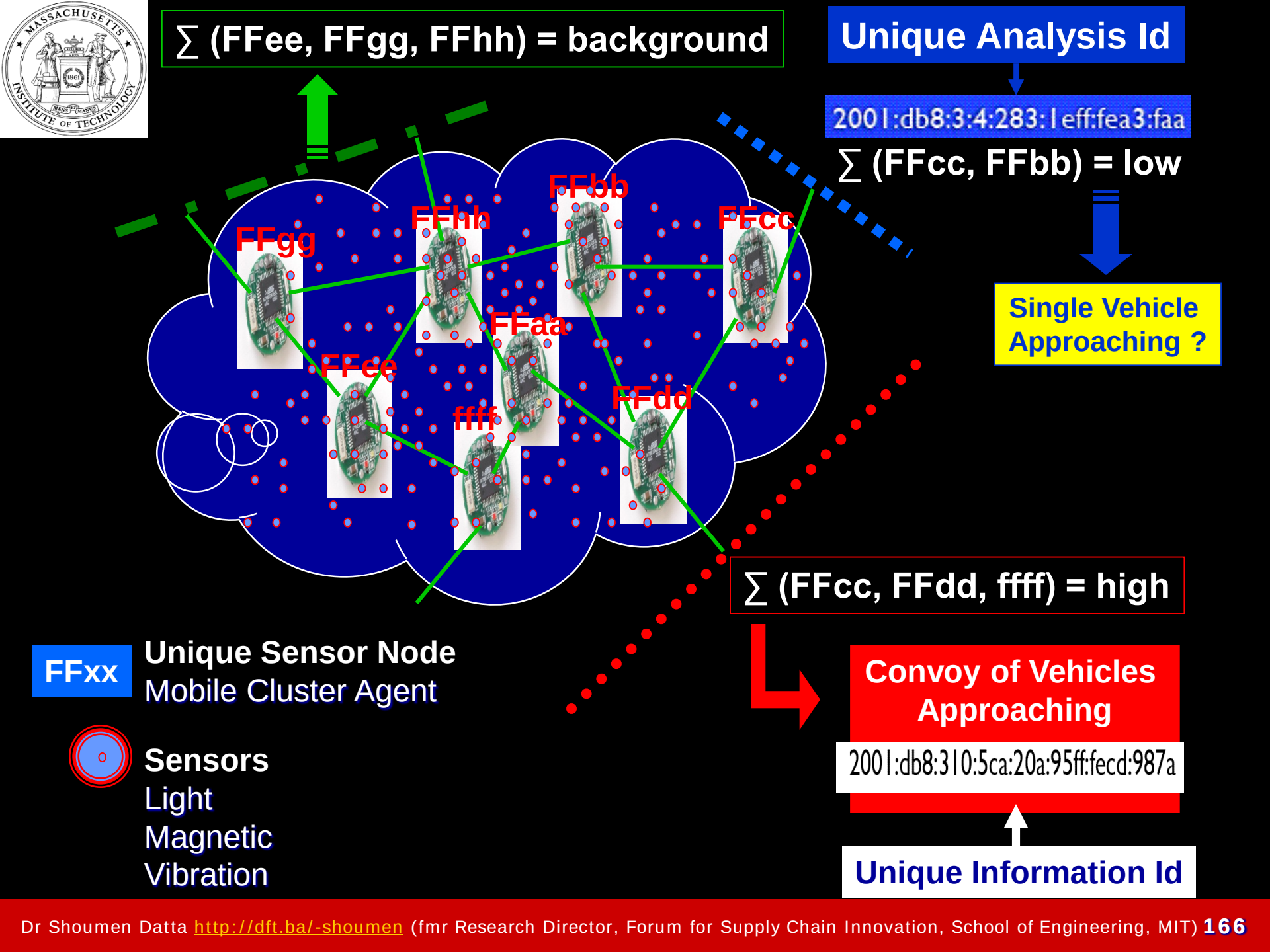
Single Vehicle Approaching ?



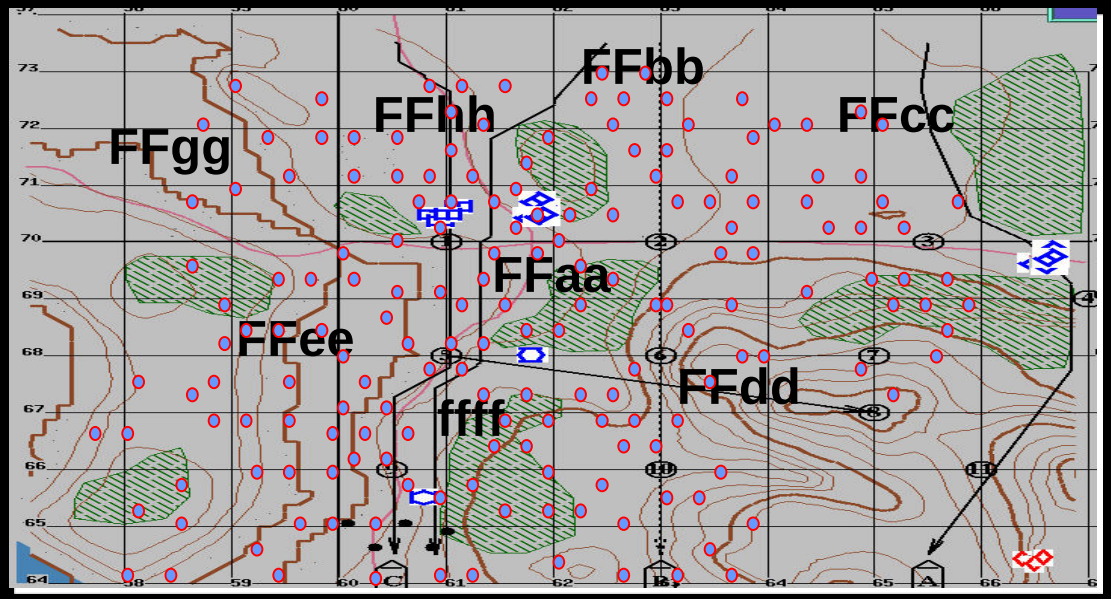
FFxx **Unique Sensor Node**
Mobile Cluster Agent

Sensors
Light
Magnetic
Vibration


∑ (FFee, FFgg, FFhh) = background
Unique Analysis Id
200 l :db8:3:4:283: l eff:fea3:faa
∑ (FFcc, FFbb) = low
Single Vehicle Approaching ?
FFgg
FFhh
FFbb
FFcc
FFaa
FFee
ffff
FFdd
∑ (FFcc, FFdd, ffff) = high
FFxx
Unique Sensor Node
Mobile Cluster Agent
Sensors
Light
Magnetic
Vibration

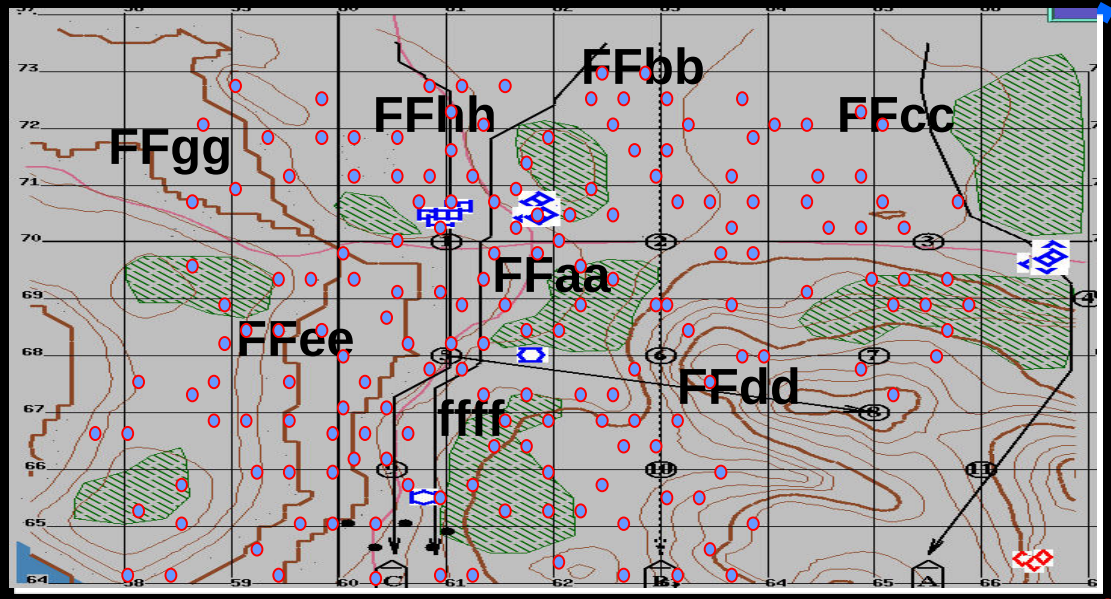

∑ (FFee, FFgg, FFhh) = background
Unique Analysis Id
200l:db8:3:4:283:leff:fea3:faa
∑ (FFcc, FFbb) = low
Single Vehicle Approaching ?
FFgg
FFhh
FFbb
FFcc
FFaa
FFee
ffff
FFdd
∑ (FFcc, FFdd, ffff) = high
FFxx
Unique Sensor Node
Mobile Cluster Agent
Sensors
Light
Magnetic
Vibration
Convoy of Vehicles Approaching
200l:db8:310:5ca:20a:95ff:fecd:987a
Unique Information Id

War Fighter: *Answers, not Numbers*



Defense: Mobile *ad hoc* Network Decision Support Systems

War Fighter: *Answers, not Numbers*

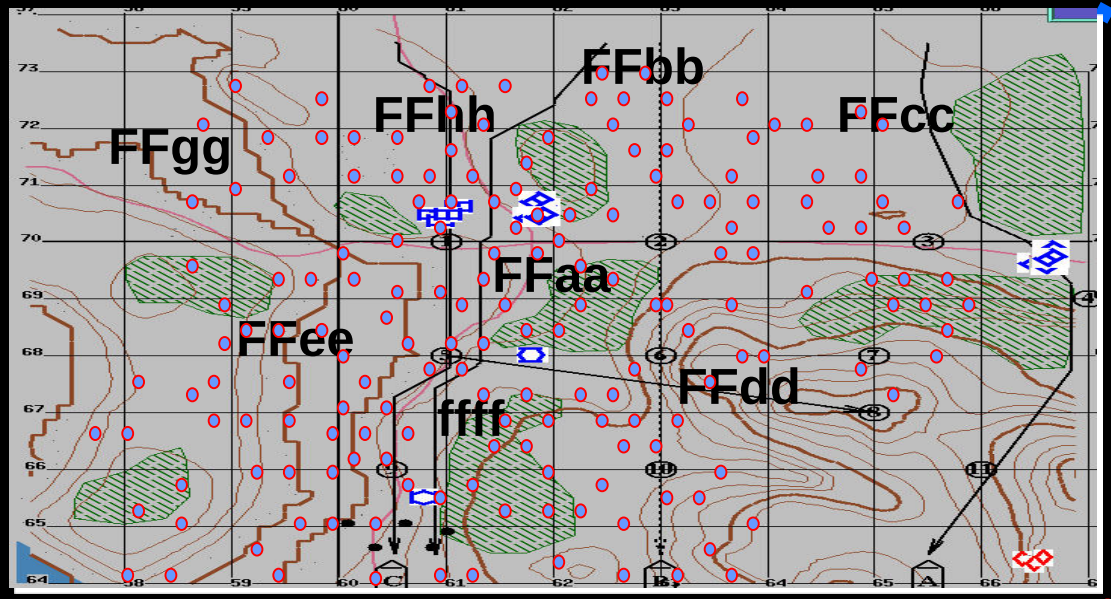


Single Vehicle Approaching ?

Large Convoy Approaching

Defense: Mobile *ad hoc* Network Decision Support Systems

Military Analysis: *Numbers*



Single Vehicle Approaching ?

Documented with unique id

- ***Data***
- ***Analysis***
- ***Decision***
- ***Action***

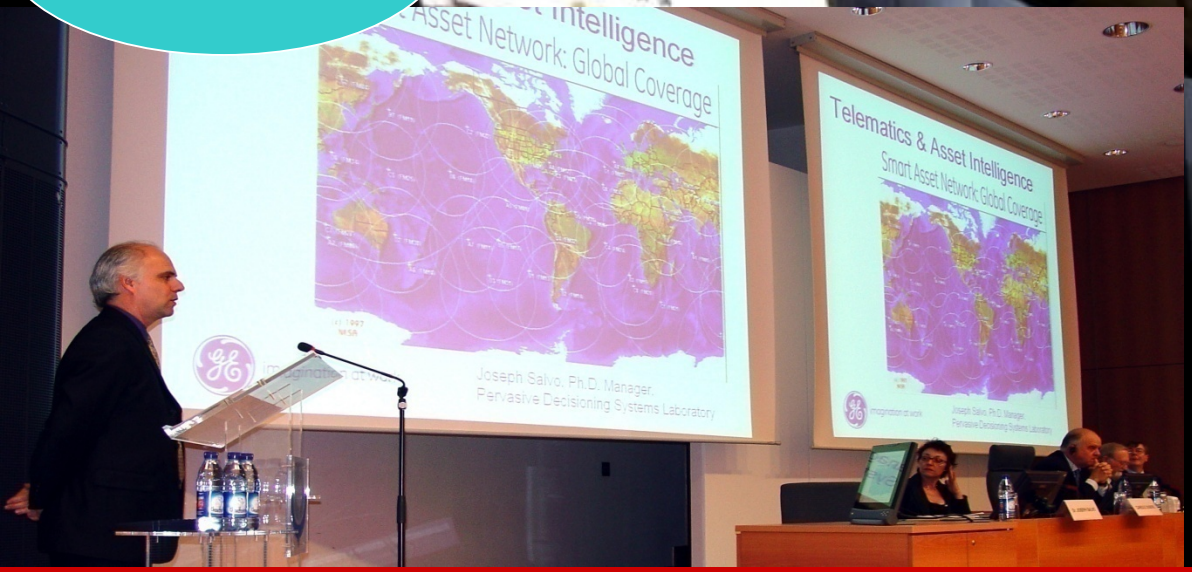
Large Convoy Approaching

Defense: Mobile *ad hoc* Network Decision Support Systems

Collaborators

Paul Kern

Joe Salvo

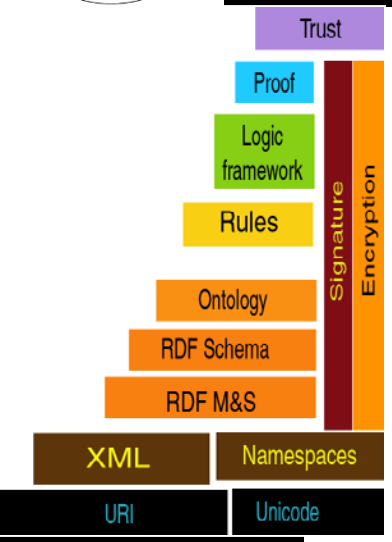


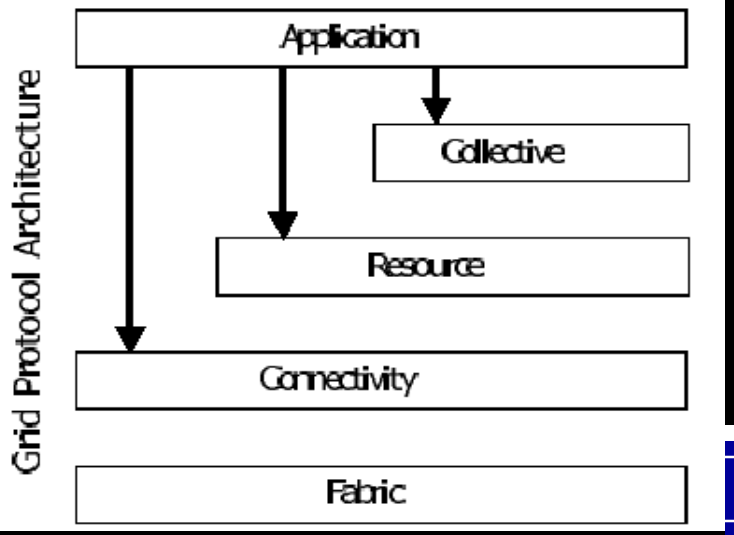
Collaboration Acknowledgement:

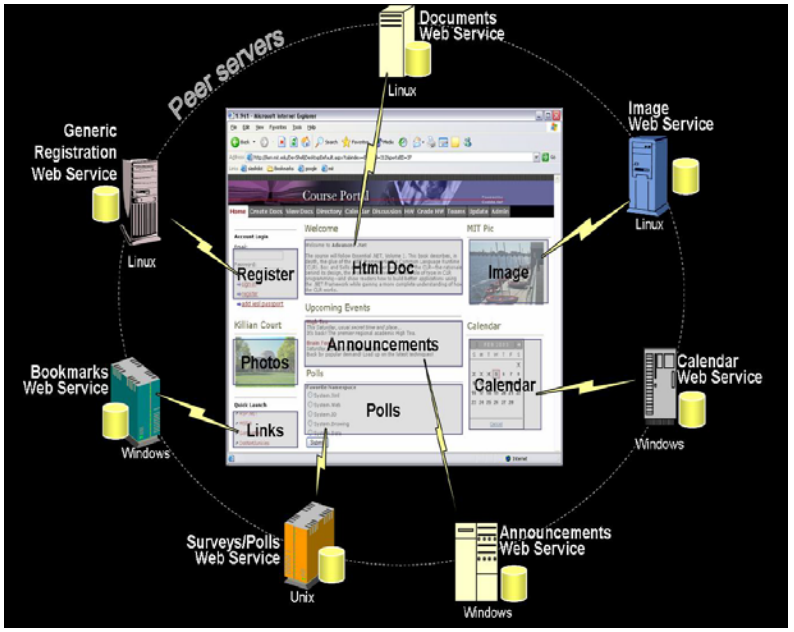
General Paul Kern
Commanding General (fmr), US DoD, US Army, AMC
The Cohen Group, Washington DC
www.cohengroup.net/about/teammember.cfm?id=7

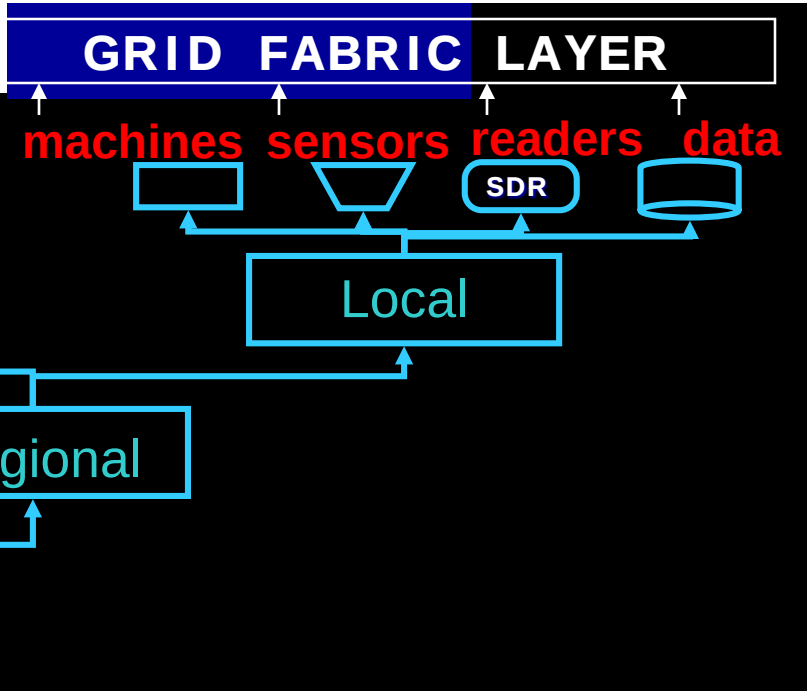
Dr Joseph Salvo
Director, Pervasive Decision Systems Laboratory
GE Global Research, New York

Web X.0


Trust
Proof
Logic framework
Rules
Ontology
RDF Schema
RDF M&S
XML
Namespaces
URI
Unicode
Signature
Encryption


Grid Protocol Architecture
Application
Collective
Resource
Connectivity
Fabric

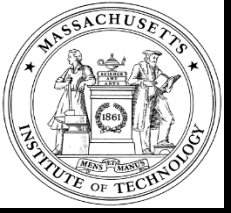

Peer servers
Documents Web Service
Linux
Generic Registration Web Service
Linux
Image Web Service
Linux
Course Portal
Register
Html Doc
Image
Photos
Announcements
Calendar
Polls
Links
Bookmarks Web Service
Windows
Calendar Web Service
Windows
Surveys/Polls Web Service
Unix
Announcements Web Service
Windows


GRID FABRIC LAYER
machines
sensors
readers
data
SDR
SDR
Local
Local
Regional
Regional
National

IPv6 Systems Solution

May Offer Unique Identification for Objects, Process, Information, Decisions

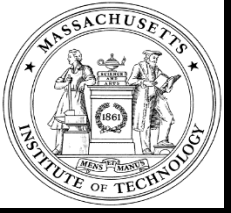
- Pre-agreed for global adoption
- Systems and platform agnostic
- Syntax and semantic relationships - defined
- Data, analytics, process, information - linked



"Did not entail being right all the time. It was rather to dare, to propose new ideas, and then to verify them and to know how to admit errors."

Professor Pierre-Gilles de Gennes* (1932-2007) after receiving the 1991 Nobel Prize for Physics

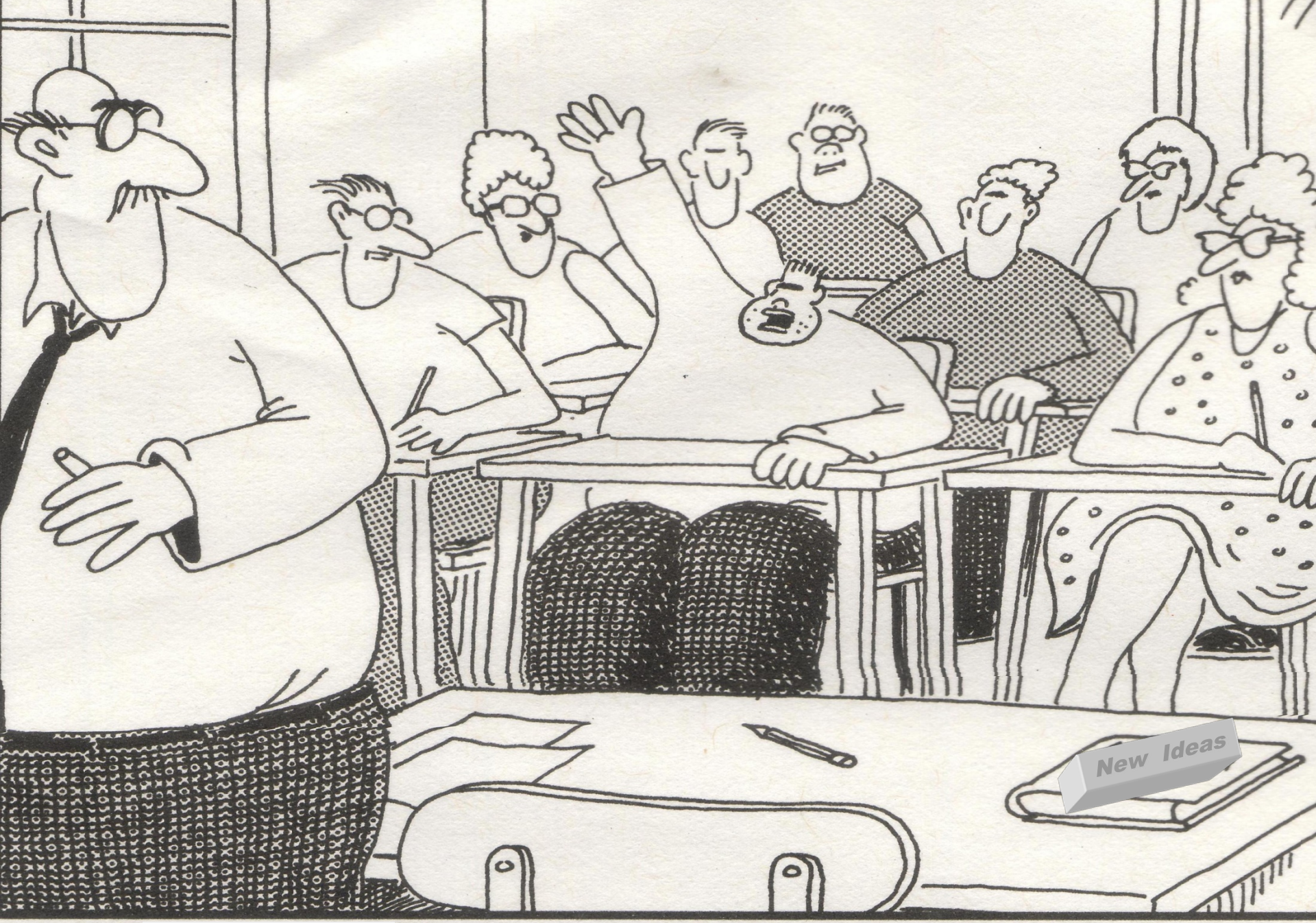
** Died 18 May 2007*



Thank you!

Questions ?

shoumendatta@gmail.com



"Mr. Datta may I be excused? My brain is full."