

Genesis of an IoT platform for the smart grid

State of the art and challenges.



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June 2016

GreenCom's genetic code combines Telcos and Utilities



HEADQUARTER

Munich

OFFICES

Munich
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PEOPLE

Berlin
Frankfurt
Switzerland

GreenCom Networks : a German-French Startup



Our World, our vision

Paradigm Shift

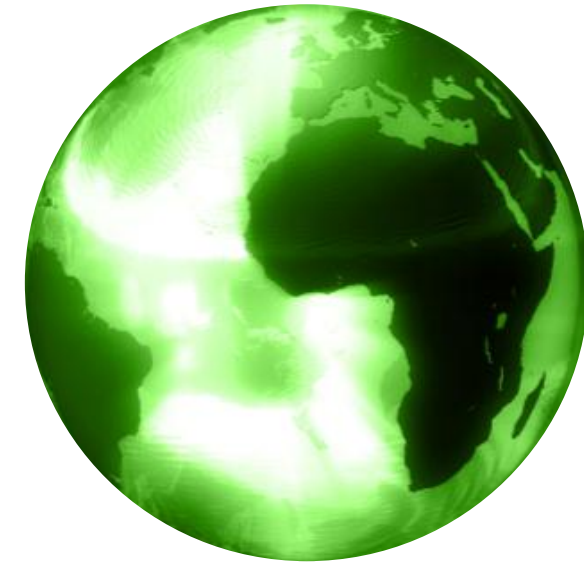
Old World



Energy Supply

- Central conventional power generation
- Central system management
- Consumers or End Points

New World

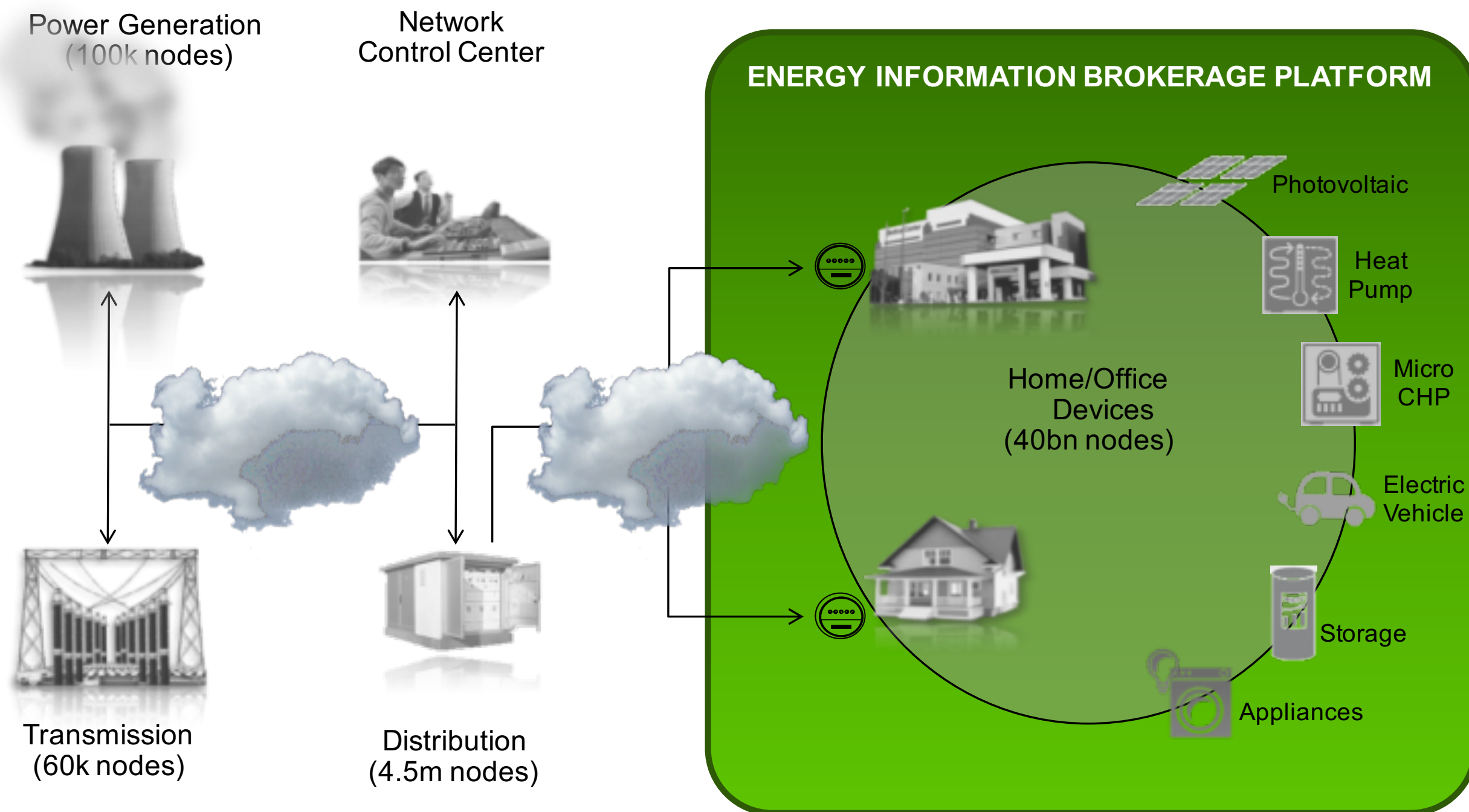


Energy Management

- Central and distributed power generation based on conventional and renewable sources
- Central and distributed system management
- Customers and Prosumers

Paradigm Shift

Cleantech and Communication Technology lead to a Paradigm Shift in the resources being used



GreenCom Today:

An IoT platform provider for the utility industry enabling new customer-driven business models

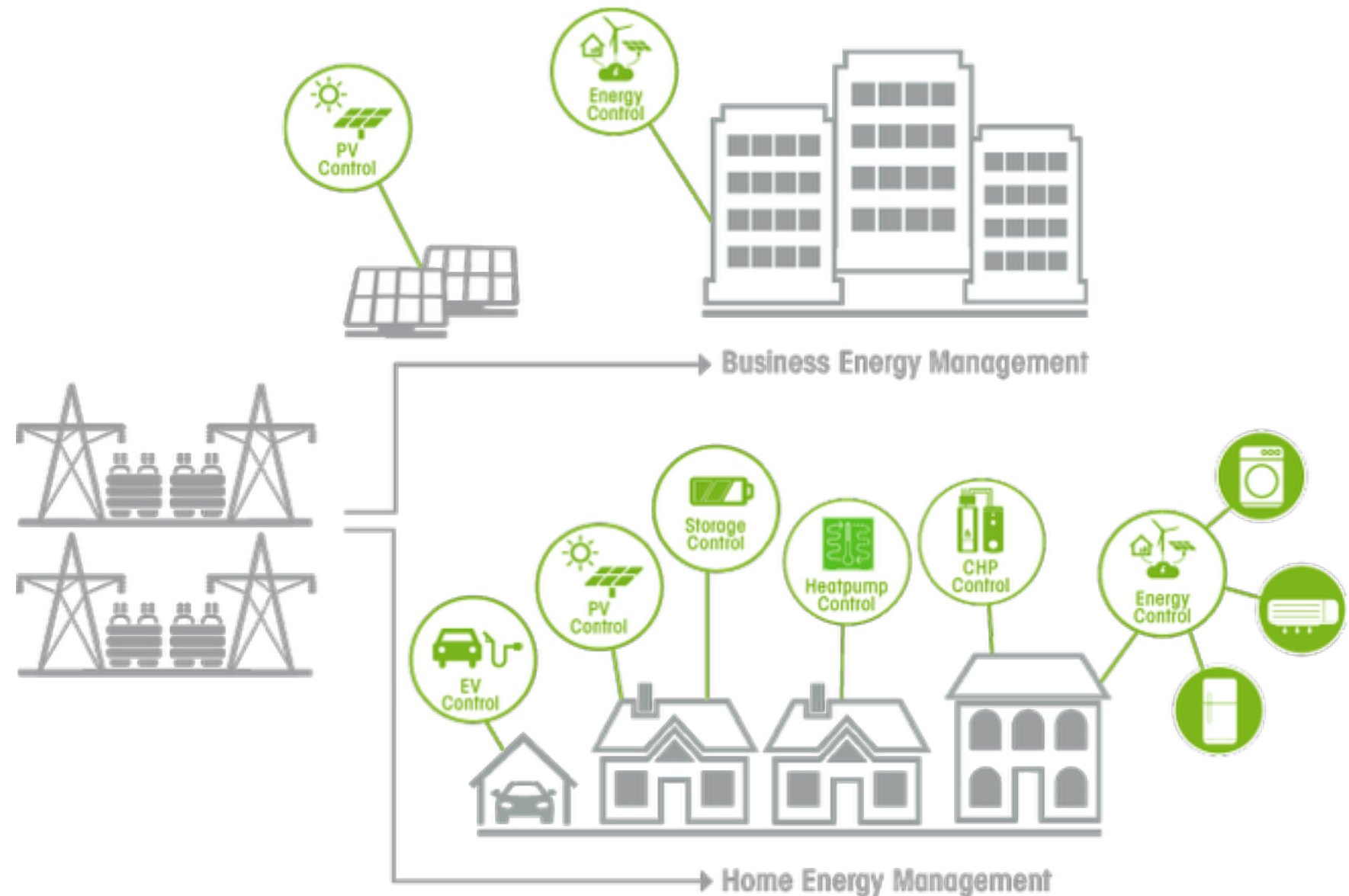
White-label SaaS platform provider

Enabling management of demand, supply and storage capacity within Virtual Power Plants for utilities and ESCOs

"Activating" utilities' and ESCO's customers through "Customer Engagement" applications

Enabling business models of the future for our utility and ESCO customers

Providing IoT Service aggregation for energy component manufacturers



Challenges

#1 : Connect the things

Internet of Big Objects ;-)



EV Charging Stations



Storages



PV Inverters



CHP



Smart Meters

Heat Pumps



#2 : Survive protocol fragmentation

A lot of protocols and alliances

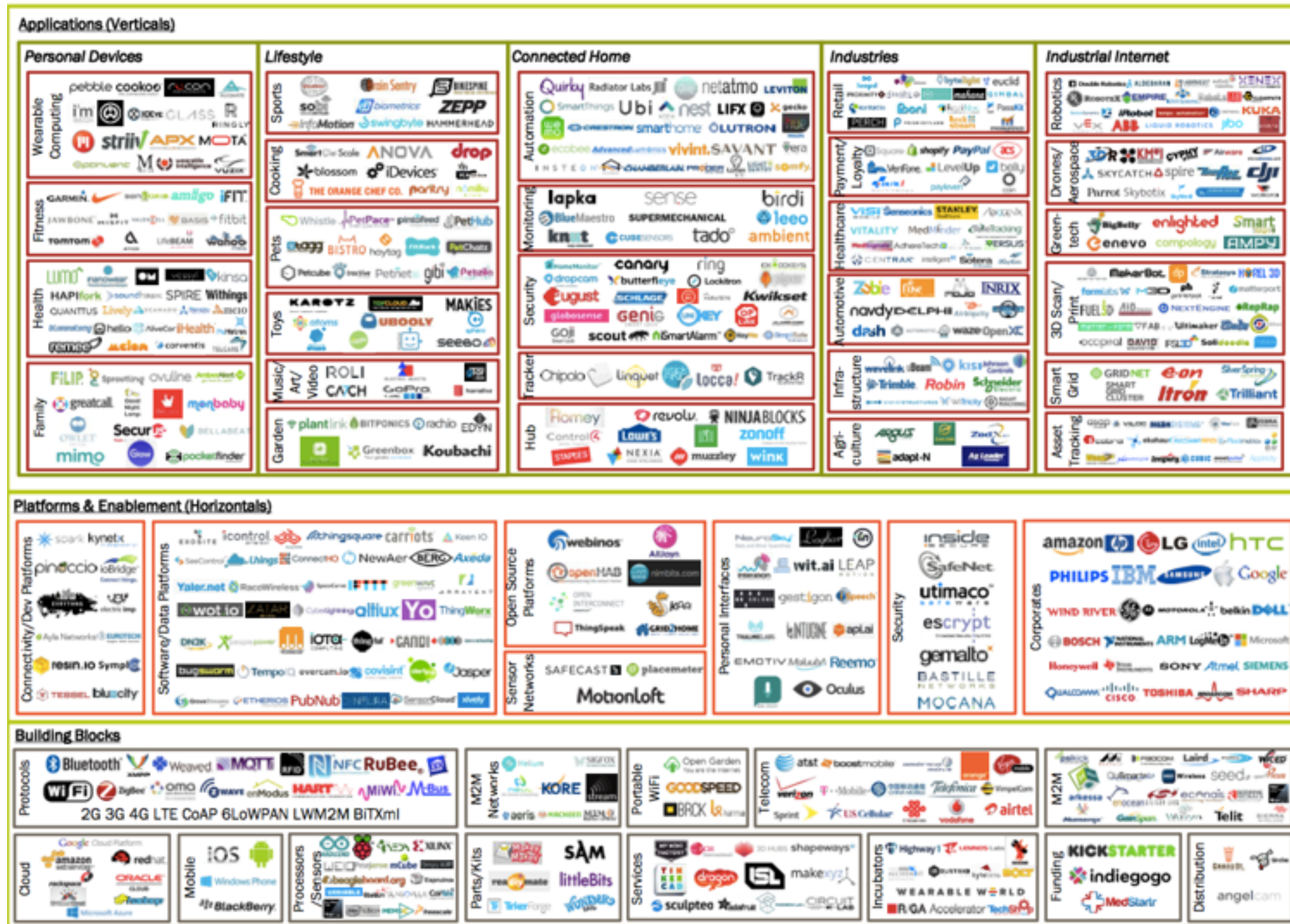
Handbook: Internet of Things Alliances and Consortia



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#3 : Survive platform fragmentation

and we're not even mentioned ;-)



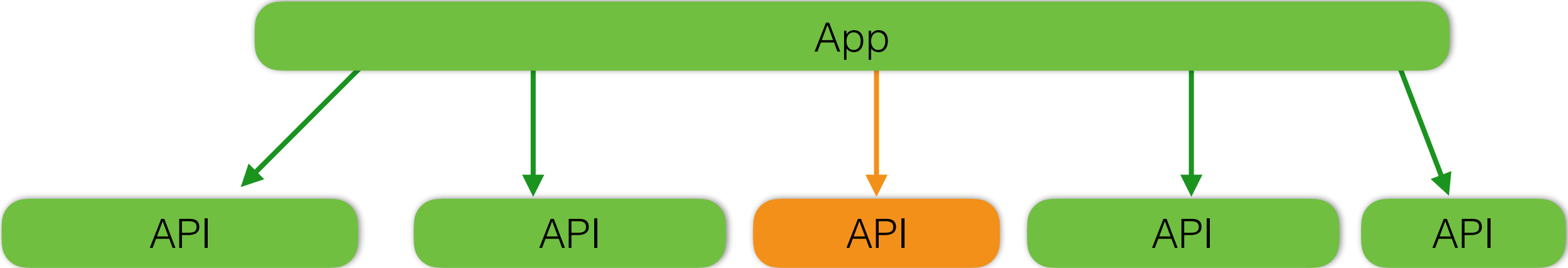
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**IoT will only become a reality if objects
cooperate.**

Who said I'm a geek...



Who said I'm a geek...



Who said I'm a geek...

One ontology to rule them all ?

One API to rule them all ?



```
{  
  "dashboard_data": {  
    "time_utc": 1460709133,  
    "Temperature": 11.3,  
    "temp_trend": "up"  
  }  
}
```

```
"samples":  
[{"air_temperature_celsius": "18.7",  
  "capture_ts":  
    "2014-04-13T06:30:00Z",  
  "par_umole_m2s": "xxx",  
  "vwc_percent": "20"}]
```



Domain	Number of ontologies
Smart Home	~50
Smart Energy	~10
Weather	~10
IoT	~20
Sensors	~20
Measurement	~5

How to shape an IoT platform in such an ecosystem

What do we need?

What do we need ?

- Time Series Storage / Management
- Metadata Storage / Management
- Event processing capabilities

- Scalability
- Multi-tenancy
- Replication / Data center awareness (data safety)
- Performance
- Security

- Speed of development (ability to quickly create and deploy new connectors and energy related services)
- Agility
- Low TCO (Total Cost of Ownership)

Microservices architecture

Today at GreenCom Networks:
100+ services

- making heavy use of RESTful interfaces
- carrying JSON representation
- over HTTP / HTTPS

in a wide variety of languages and frameworks



```
#!/bin/bash
```



NoSQL Database



- **Cassandra:** open source NoSQL distributed database management system (brings high availability with no single point of failure; scales horizontally). *Originally developed by Facebook.*

distributed messaging system + computation framework



Apache Kafka



- **Kafka:** open source message broker (brings a unified, high-throughput, low-latency platform for handling real-time data feeds). *Originally developed by LinkedIn*
- **Storm:** open source distributed computation framework (brings real time stream processing capabilities through a data transformation pipeline). *Originally developed by BackType/Twitter*

cluster manager + containers

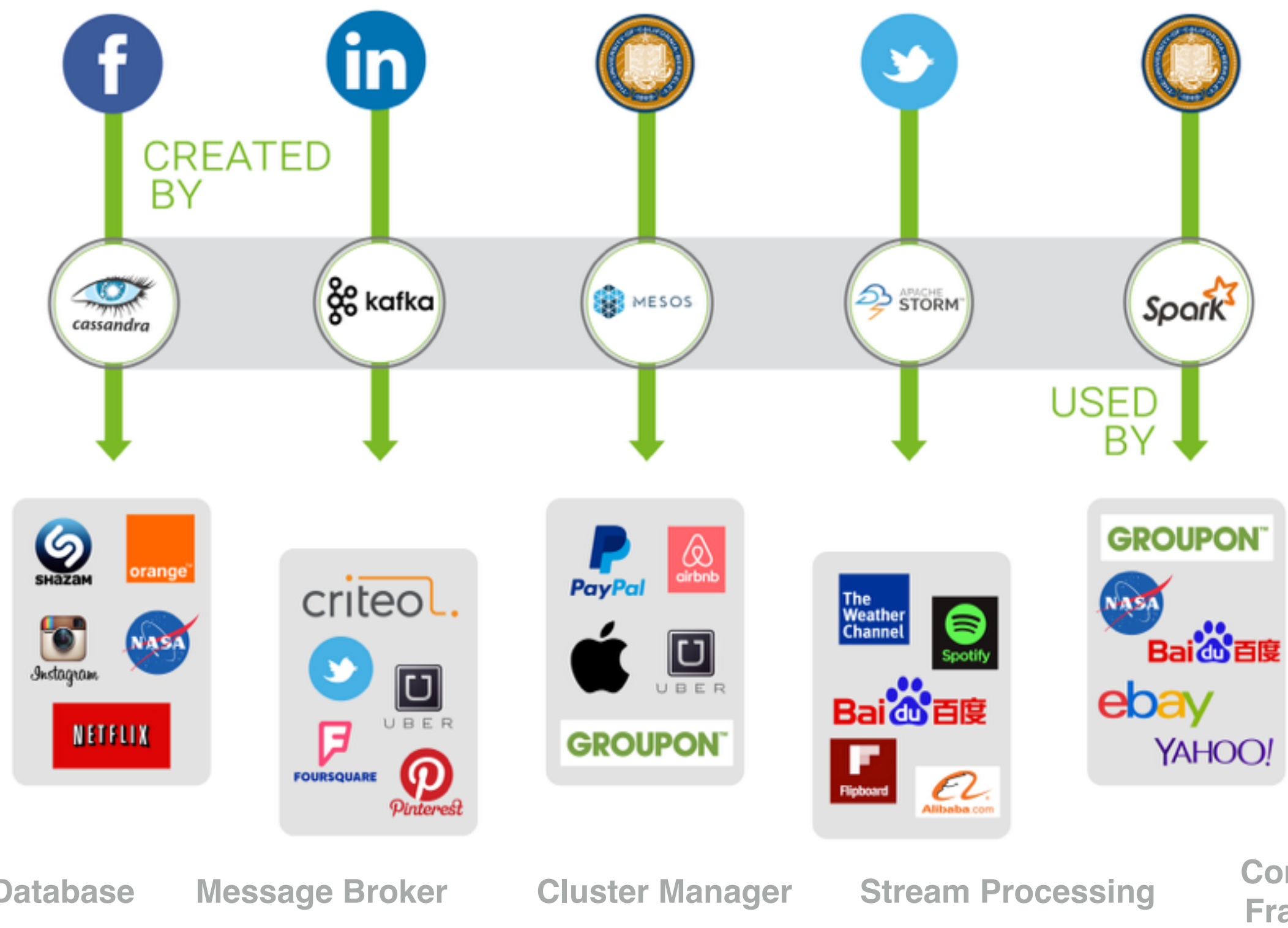


MESOS

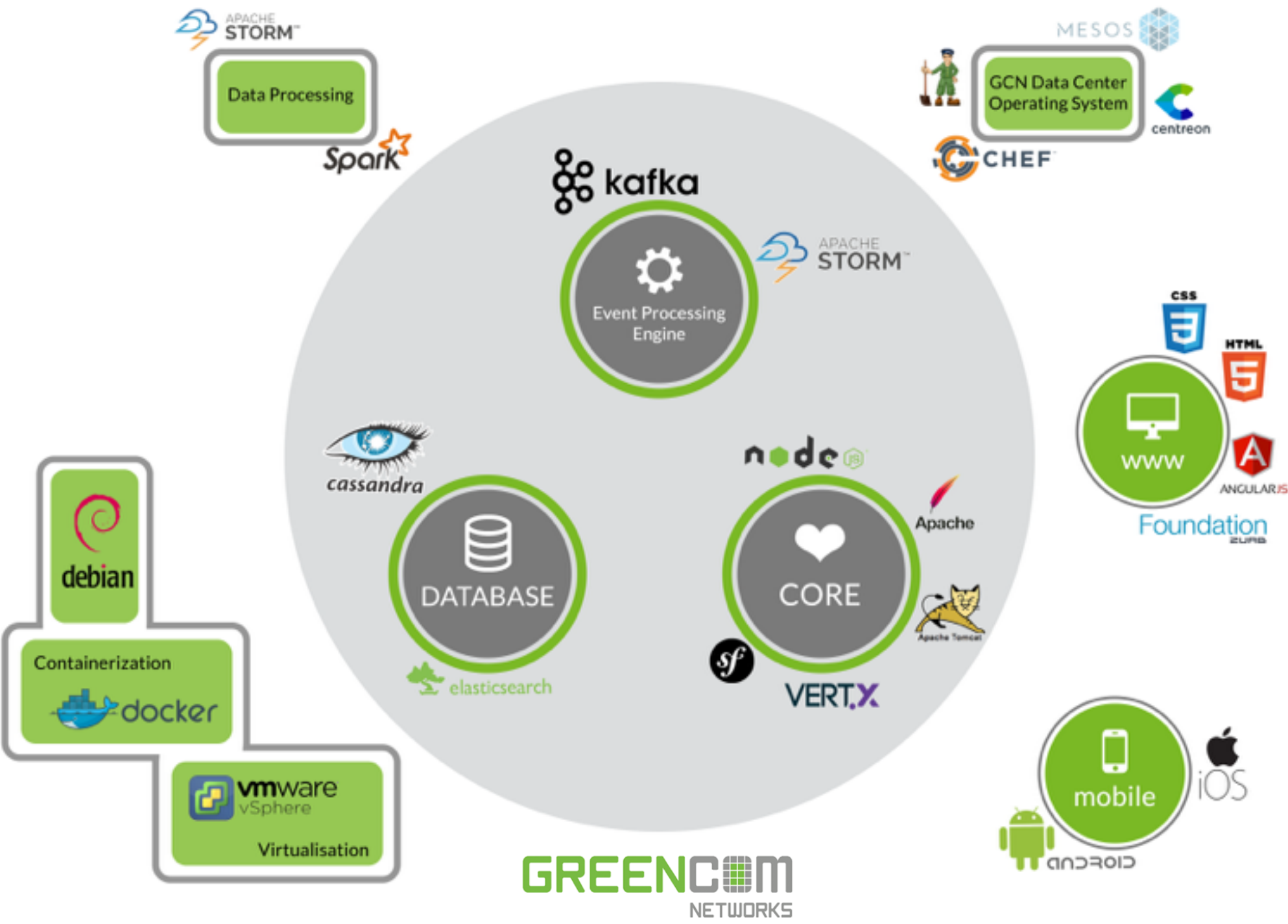


docker

- **Mesos**: open source cluster manager (brings resource sharing capabilities in a highly distributed environment) .*Originally developed at the University of California, Berkeley. Used by Twitter, Airbnb, Apple*
- **Docker**: operating-system-level virtualization on Linux



GreenCom Networks' Platform



GreenCom Networks

Energy Management as a Service

Thank You