HVDC Innovation, XECHNO® Power & Fresh HVDC®

Energy Saving Technology for the Data Center

Green Consulting Business Unit
Solution Business Division

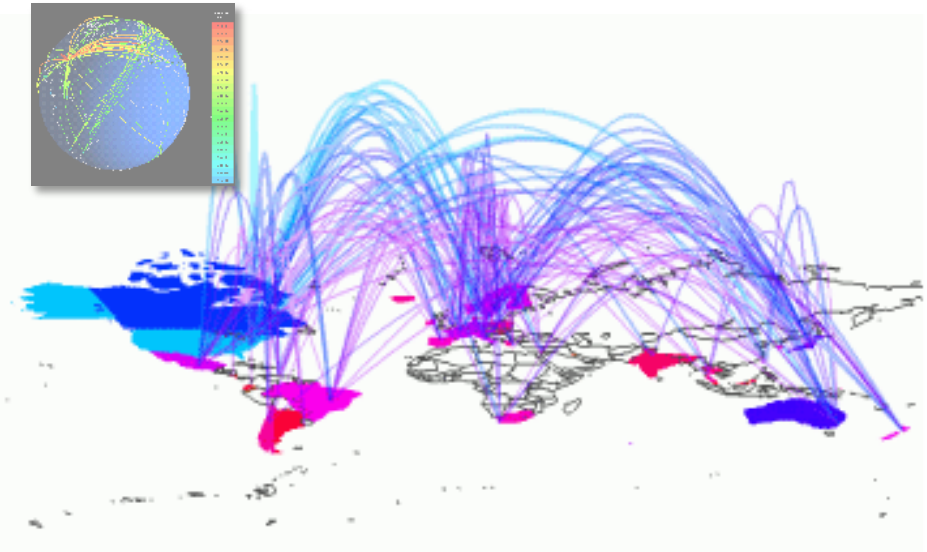
NTT DATA INTELLILINK Corporation

NTT DATA

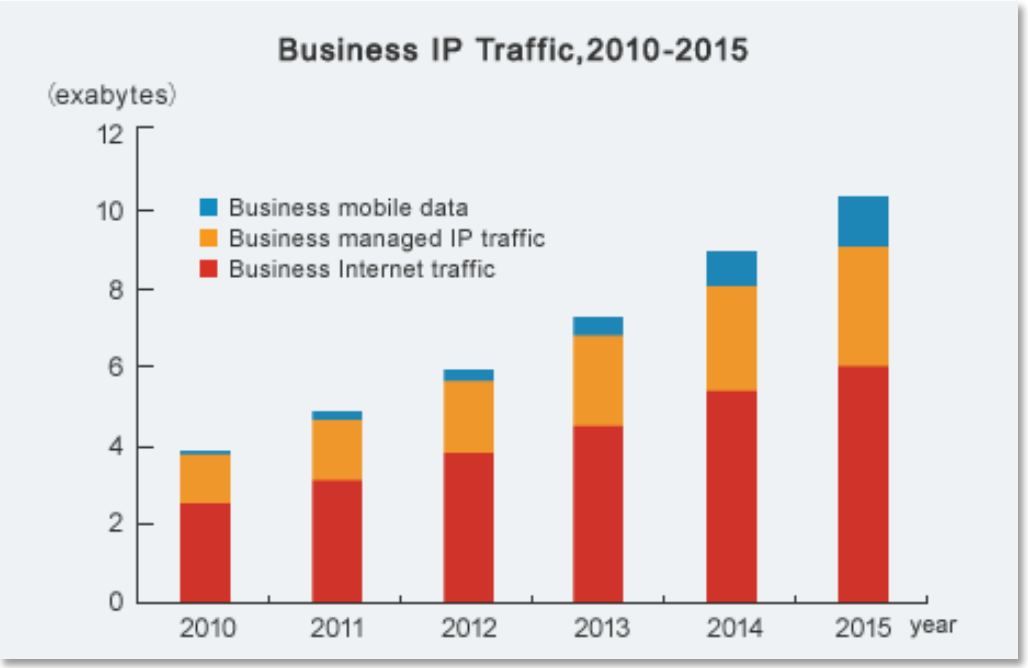
1. Introduction - Information Explosion

Data traffic has been dramatically increasing in the past several years by cutting edge of communication technology such as cloud computing and ubiquitous communications.

< Fig.1 >



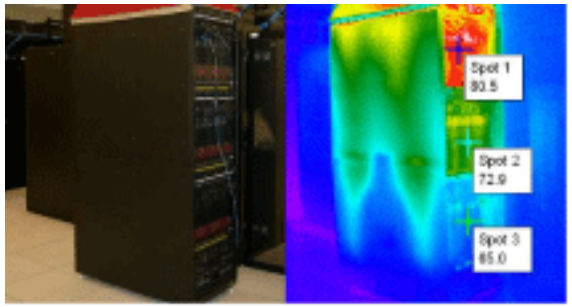
Business IP traffic is expected to increase annually by an average of 22% between 2010 and 2015, reaching approximately 10 exabytes (10 million terabytes) per month by 2015



It's been heavy load for cooling system of Data Center, and spoiling energy efficiency.

2. Introduction - Global Warming Issue

Global warming is a top-priority issue requiring an urgent, global-scale response.



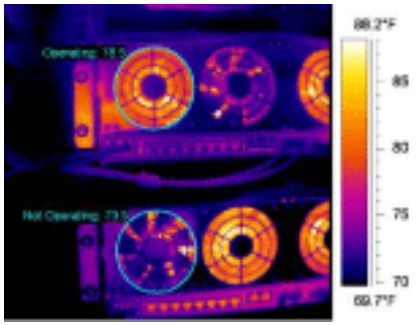
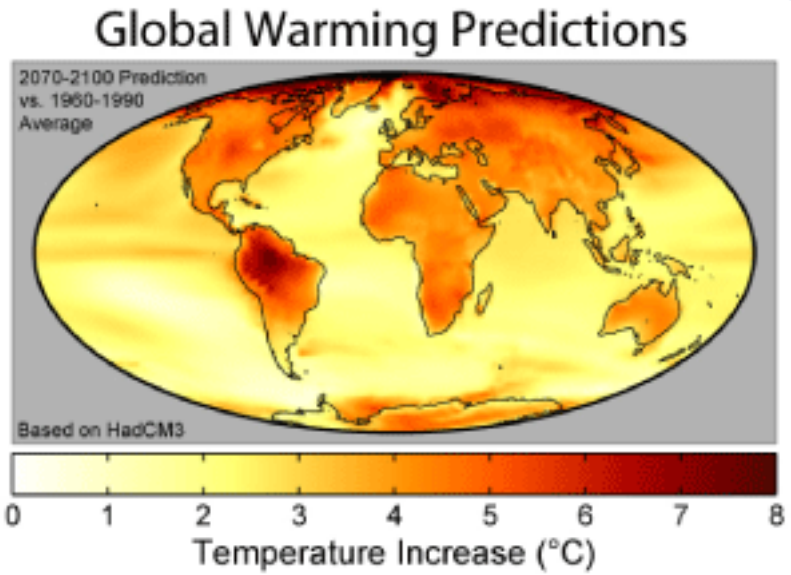


Fig.2 : Thermography
Temperature distribution of a server rack in the data center (Left) and power supply of servers (Right).



Recognizing that radical technological innovation has a critical role to play in achieving harmony between benefit by information technologies and the global environment.

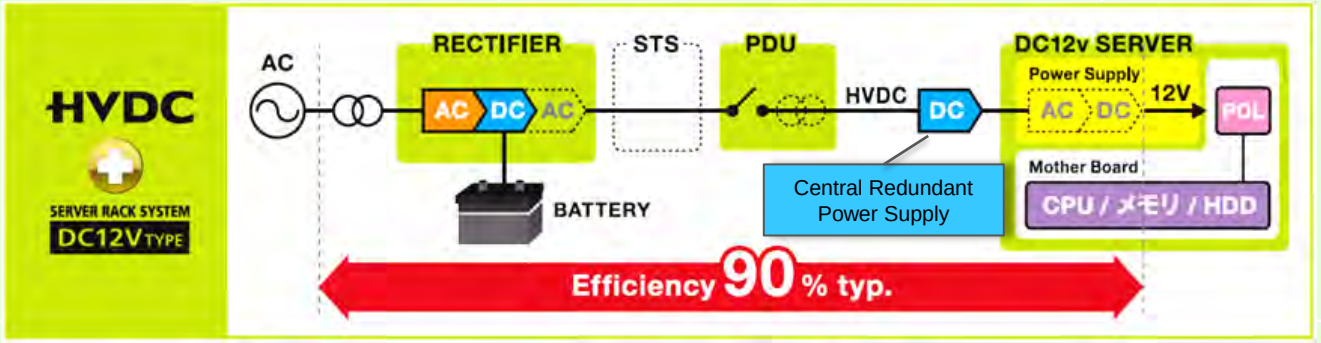
Against this background, we've developed HVDC System that is consisting of XECHNO Power and Fresh HVDC, for the next generation of the world from a long-term perspective.

3. HVDC Innovation

HVDC: High Voltage Direct Current

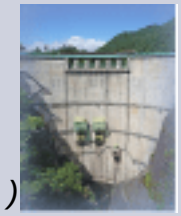
Now, NTT DATA INTELLILINK launches the strong HVDC System enabling Data Center to reduce 10-20% of power loss totally, **Fresh HVDC System®** and **XECHNO® Power**.

	Fresh HVDC System			XECHNO®Power
Power Grid	Transformer	PS Rack	PDU	Server Rack



AC → DC 340V → DC 12V

4. AC or DC ?

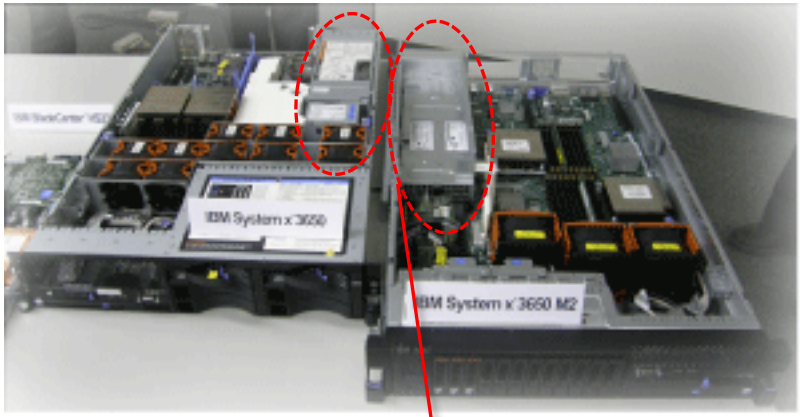
	A C	D C
Characteristics	*The movement of electric charge periodically reverses direction.* 	*The flow of electric charge is only in one direction.* 
Pros.	• *Easy to Transform (Step Up and Down)* • *Low Transmission Loss (High Voltage)* • *High Reliability by legacy technologies*	• *Easy to apply* • *High Space Efficiency (Low Voltage)*
Cons.	• *Low Space Efficiency* • *Can't be applied to almost all appliance directly.(AC needs Convertor or Transformer)*	• *Difficult to Convert (Step Up and Down)*
Applications	• *Generating Station* • *Power Substation* • *Power Transmission* • *House Power Feeding* • *Lighting* *(Incandescent Lamp, Fluorescent Lamp)* 	• *Solar Generating Station, Solar Battery* • *Cell Phone, Smart Phone, PDA* • *ITE (Server, PC, Network Switch,,,)* • *PC, TV, Audio System* • *Lighting* *(LED, Fluorescent Lamp with Inverter)* 
	 	

5. Problems surrounding Data Center

All electric appliances have a DC power supply converting AC to DC.

In principle, we all can't convert any energy without loss.

< Pic.1 : Server >

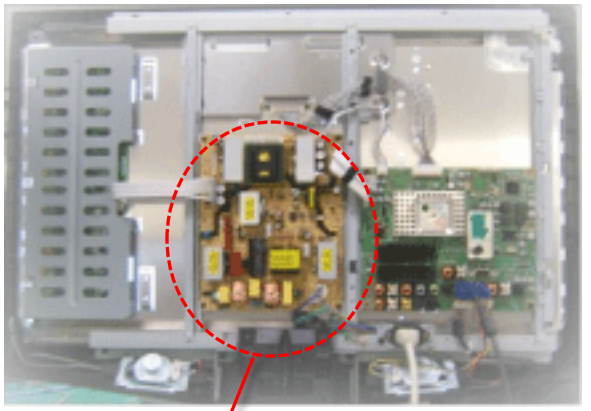


Power Supply AC DC

< Pic.2 : Note PC >

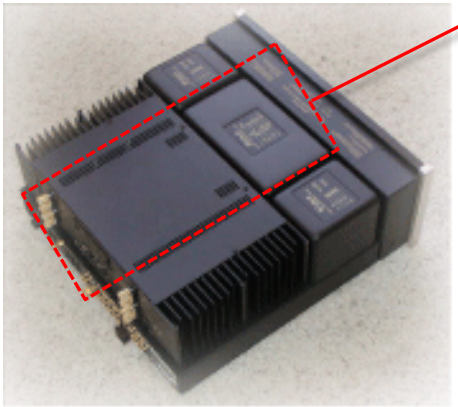
Power Supply AC DC

< Pic.3 : Inside of LCD TV >



Power Supply AC DC

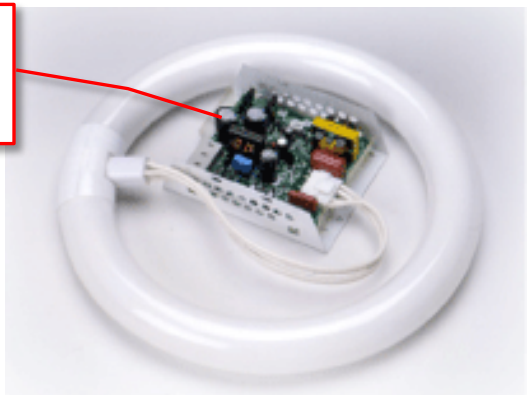
< Pic.4: Audio Amp. >



Power Supply AC DC

Inverter AC DC HF

< Pic.5: *Fluorescent Lamp* . >

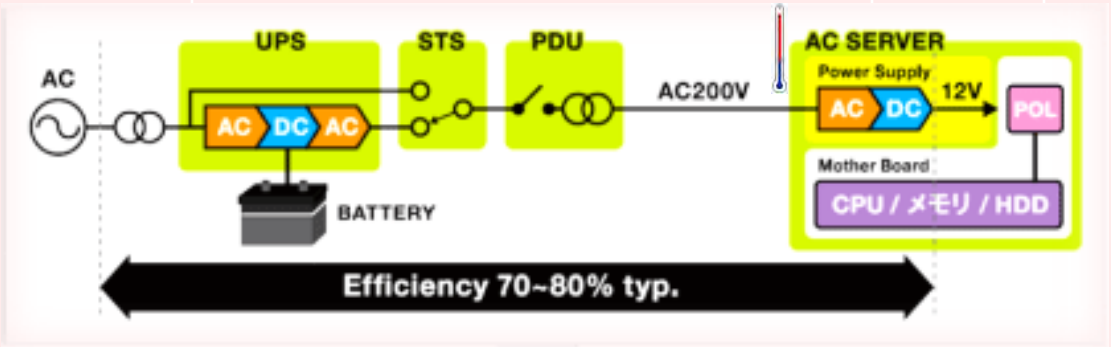


Energy (Power) Loss

5. Problems surrounding Data Center

To operate ITE(Information Technology Equipment) such as server, there are so many converters and inverters in the data center. It causes power loss, and will be a load of cooling system by heat dissipation from them.

Power Grid	Transformer	UPS	PDU	ITE (e.g. Server)
				



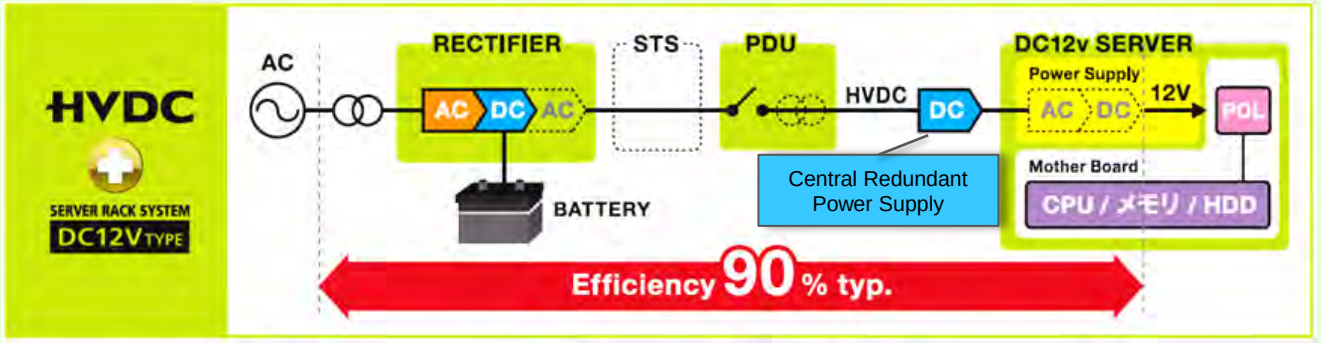
AC → DC → AC → DC

Energy (Power) Loss

6. Innovation ： HVDC and DC 12V Server

By application of HVDC that can reduce convertors, the power loss is reduced approximately 10-20% totally.

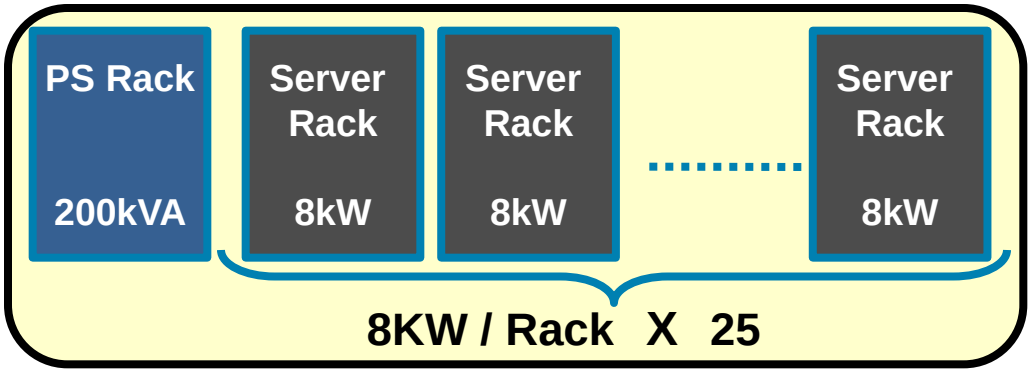
	JRC Japan Radio Co., Ltd.			NTT DATA INTELLILINK Corporation
	Fresh HVDC			XECHNO Power
Power Grid	Transformer	PS Rack	PDU	Server Rack



AC → DC 340V → DC 12V

7. Energy Saving (For Reference)

Energy Saving of 1,000KW Data Center



Conditions :
Efficiency difference of UPS and HVDC : 20%
Loading Factor of Server (CPU) : 50%

① HVDC System PWR Reduction :1,355MWH/Year
② Air Conditioning System PWR Reduction : 484MWH/Year
③ Totally Power Reduction of Data Center :1,840MWH/Year
④ Energy Charge Reduction / Year（kWH：US$ 0.16） : US$ 284,832
⑤ Demand Charge Reduction / Year（ Demand Charge ）
（ US$ 22.35） : US$47,859
⑥ Total Energy Charge Reduction : US$332,691

※Specific design in accordance with requirements will be necessarily for more detail calculation.

※Exchange Rate : JP¥77.5/$

Co2 Reduction：62t/Year

8. Strong Partnership

Energy Saving

Reliability

Safety

HVDC Power Supply

High Voltage DC Power Supply System

FRESH HVDC

JRC Japan Radio Co., Ltd.

DC12V Server Rack

DC Solution

XECHNO® Power

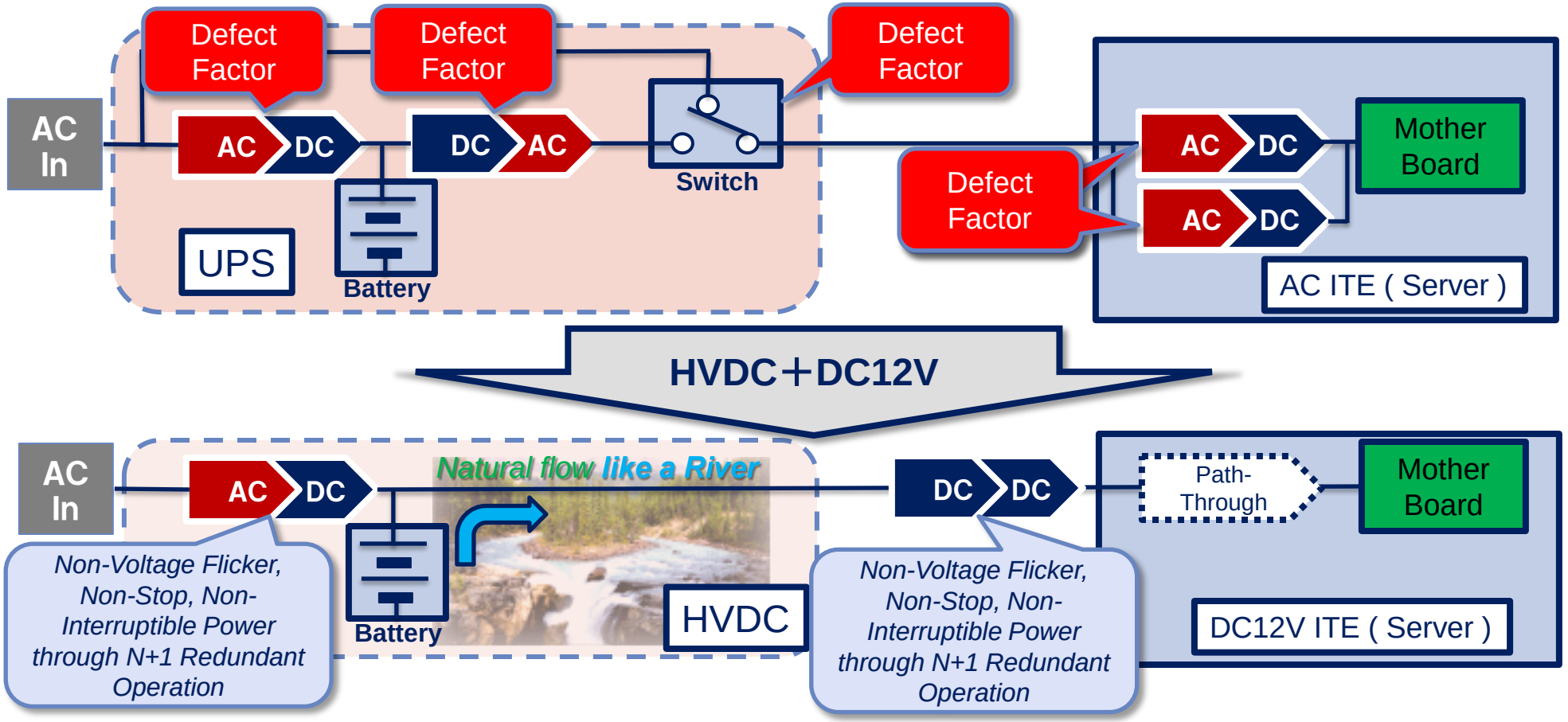
NTT DATA NTT DATA INTELLILINK Corporation

Scalability

Reasonable

9. Reliability

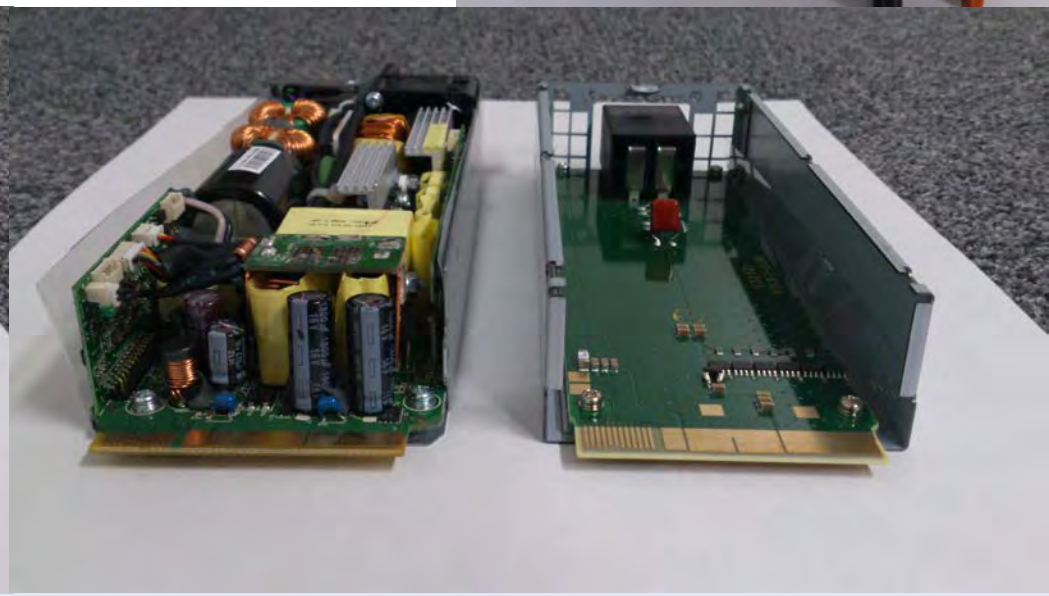
- Awareness to reliability of the Data Center has been rising after big earthquake that shocked to Japan on March 11, 2011.
- Nowadays, High failure rate of Power Supply and defect of UPS are critical issue in the data center.
- Simplex architecture by DC application can reduce component count, and will be able to improve Data Center reliability.



9. Reliability（Path-Through）

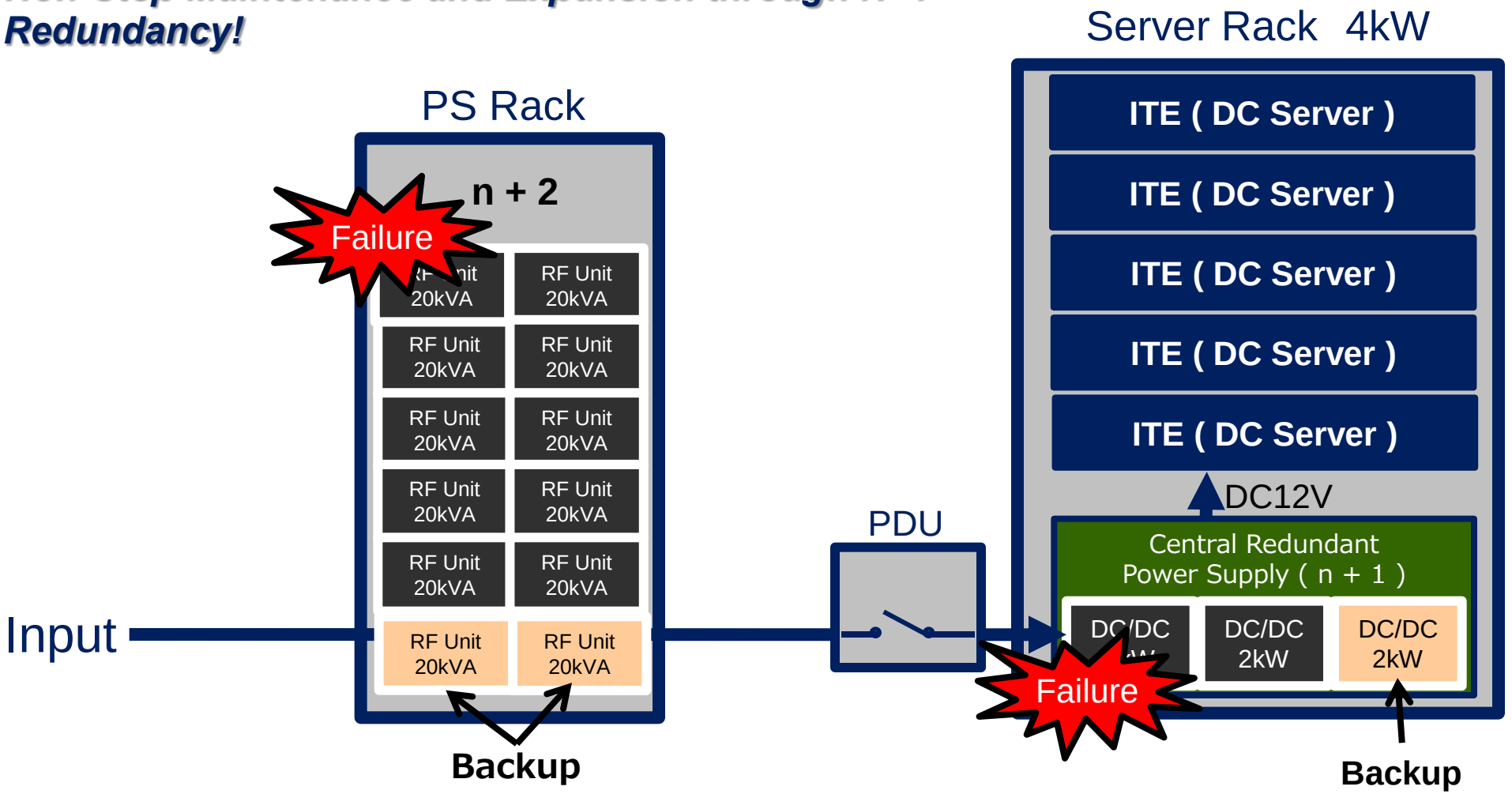
THE AC power supply is unnecessary.

①Efficiency－－－ 99～99.5%typ.
②Long life －－－ Fanless・Liquid condenser less
③Reliability－－－ Few part marks



9. Reliability

Non-Stop Maintenance and Expansion through N+1 Redundancy!



Even if any defect happened on the system, you'll be able to replace all components without any interruption through N+1 redundancy.
Likewise, Non-Stop expansion in accordance with power consumption that ITE needs will be available .